



**HOMELAND SECURITY GEOSPATIAL ENTERPRISE
ARCHITECTURE**

GEOSPATIAL MANAGEMENT OFFICE

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1.0 INTRODUCTION

The Department of Homeland Security (DHS) is establishing the Baseline ('As-Is') and Target ('To-Be') Homeland Security (HLS) Enterprise Architecture (EA), the Transition Strategy for migrating from Baseline to Target EA, and the Governance Strategy for incremental implementation of the Target HLS EA. The Target HLS EA is conceptual in nature and was developed following a "top-down, business-driven" process, thereby making it fully supportive of the mission and business objectives of the Department, and the broader HLS community.

Version 1.0 of the Final Target EA Description, dated August 29, 2003, has been characterized as "a mile wide and an inch deep". This version of the EA, called the Geospatial Enterprise Architecture (GEA), adds a dimension of depth by elaborating on the role of geospatial data and technology in HLS. It is an extension of the Target EA, not a separate EA. The GEA provides further detail on the nature of HLS business, data, applications and technology, and the context for how geospatial capabilities permeate the Target HLS EA.

To carry out its mission and meet strategic objectives, DHS and the broader HLS community must operate in a fully 'location-enabled' environment. Therefore, it is crucial for the geospatial context of the HLS enterprise to be fully represented and integrated within the HLS EA. [The geospatial context was not fully represented in version 1.0 of the Final Target EA Description, dated August 29, 2003.]

1.1 Purpose

This document describes the role of geospatial data and technology in the HLS EA, heretofore referred to as the HLS GEA. The HLS GEA:

- Provides an integrated view of the geospatial context across all facets of the HLS EA;
- Presents recommendations for extending the HLS EA to address the role of geospatial data and technology;
- Stands alone as a model for integrating the geospatial technology across DHS and the broader HLS Community
- Provides a baseline for governing geospatial technology insertions.

1.2 Audience

This document is oriented to the following audiences:

- DHS component policy-makers, planners, architects, and developers involved in location-based business activities;
- Anyone involved in the broader HLS mission, including state, local, tribal, and private sector, that has a need for geospatial information technology; and
- The Federal EA community.

1.3 Updates

This version of the HLS GEA is the fourth draft. The first draft provided initial recommendations for extending the geospatial context of the EA as viewed by DHS Geospatial

Management Office (GMO) staff. This version elaborates on those recommendations and provides a set of EA artifacts that define the geospatial capabilities envisioned for the Target EA. It is also worthy to note that this version was the result of an Interagency GEA Task force made up of participants from:

- DHS GMO
- United States Geological Survey (USGS)
- National Geospatial-Intelligence Agency (NGA)
- United States Northern Command (NORTHCOM)
- Open GIS Consortium (OGC)

This document will be updated as the HLS EA evolves; and as additional information is made available within DHS and from other sources.

1.4 HLS Enterprise Architecture Framework

The HLS Target EA provides the enterprise with an architecture vision of where DHS and the broader HLS community intend to be at some point in the future. This starts with a description of the business value chains and activities, as represented in a business model. Regarding the data and applications architecture, the Target EA defines the major kinds of data, applications and components needed to support HLS business activities. The Target EA Technical Architecture defines the technology components, patterns and platforms needed to support the HLS applications. The HLS Target EA is described in the following artifacts:

- Business Model
- Conceptual Data Model
- Notional Application Architecture
- Notional Component Architecture
- Technology Architecture
- Application Technology Drivers
- Mapping of Technology Patterns to Components

1.5 Document Organization

The HLS GEA leverages the HLS EA framework to provide a set of geospatial business, data, technology and domain specific artifacts. This document summarizes and references that set of artifacts as follows.

Exhibit 1: Document Organization

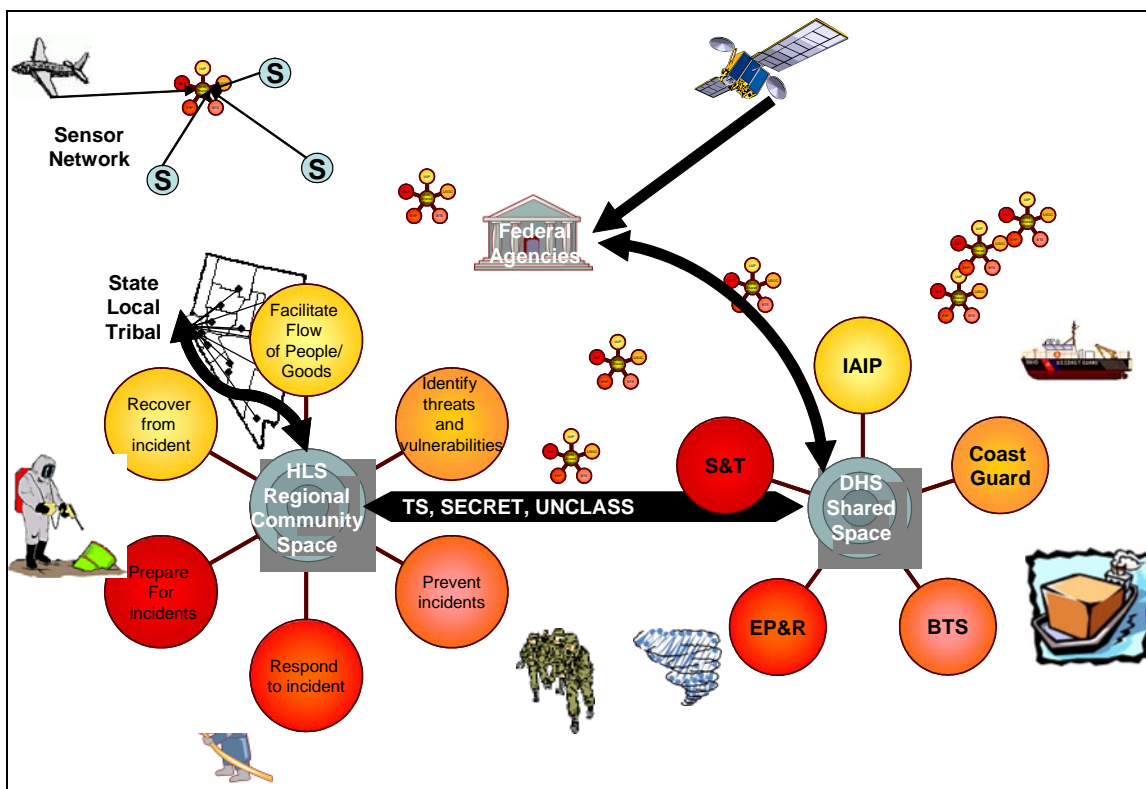
Section	Purpose
Section 1 Introduction	Describes the purpose of this document, intended audiences, and plans for updates

Section 2 HLS Geospatial Concept of Operations	Describes the key operational aspects of the HLS GEA
Section 3 Geospatial Business Context	Describes the business and mission aspects of the HLS GEA
Section 4 Data and Information Architecture	Describes the data and information aspects of the HLS GEA
Section 5 Geospatial Application and Component Architecture	Describes the service, component, and application aspects of the HLS GEA
Section 6 Geospatial Technical Architecture	Describes the technical aspects of the HLS GEA
Acronyms	Defines acronyms used in this document
List of References	Identifies referenced sources in addition to the references to standards that are included within individual sections

2.0 HLS GEOSPATIAL CONCEPT OF OPERATIONS

At present, the contributions of geospatial data and technology are implicit in the HLS Geospatial Concept of Operations (Exhibit 2), which employs a map of the United States to convey the scope of operations. In its current form, the HLS Geospatial Concept of Operations provides a conceptual depiction of HLS geospatial operations developed using mission-based business scenarios. Its primary purpose is to provide a visual depiction of the high-level operations of the Department in order to convey the broad scope of HLS geospatial operations. The following sections describe key aspects of the HLS GEA Concept of Operations.

Exhibit 2: HLS Geospatial Concept of Operations



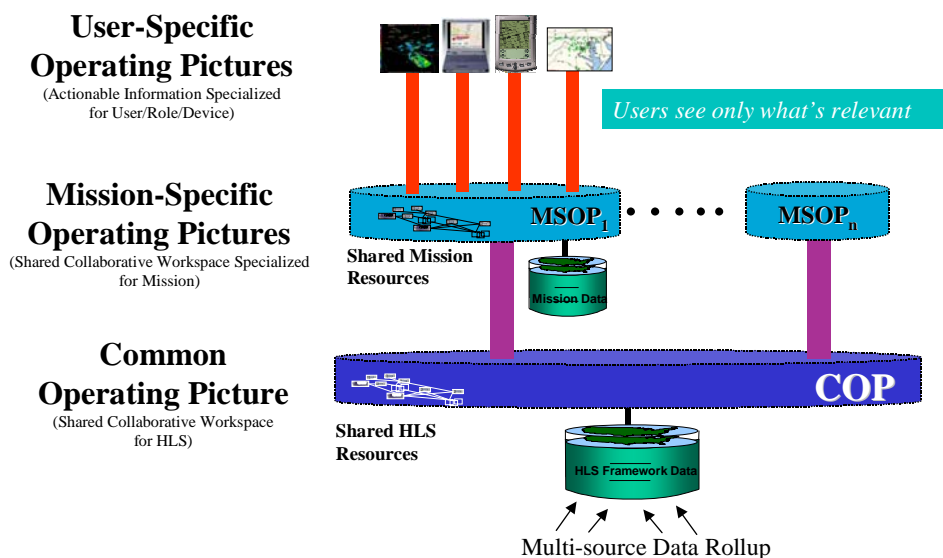
2.1 Location: A Fundamental Concept in HLS Operations

(Geospatial) Location is a foundational property for modeling and understanding HLS business activities and is a ubiquitous information ingredient in the HLS mission. Location can be exploited as a unifying information theme to better understand the context of most real and abstract phenomena associated with HLS. Location, in its simplest form, can be used to depict where something is on the earth. It is contextually simple and intuitive to most people, and it is the way people commonly understand and relate to the world around them. Location provides a common semantic-business framework upon which HLS activities are conducted. The HLS GEA exploits the value of location throughout the enterprise, providing its value wherever and whenever it is needed.

2.2 Common Operating Picture

The COP is a collection of time-sensitive, mission-critical, shared data and services (i.e., set of capabilities) associated with an area of interest that conveys geospatial situational context (a composite of HLS Framework Data and HLS Auxiliary Data), the disposition and behaviors of threat(s), friendly personnel and assets, as well as incidents, events, observations, related intelligence and other HLS operations data. A COP represents a collaborative workspace for interoperations between distributed stakeholders in support of time-sensitive, mission-critical HLS operations. The COP is not merely a common data view, rather it consists of many possible views generated on-the-fly based upon relevant services, available data, and application context. [Note: Direct viewing of the COP is not practical due to the overwhelming quantity and detail of the composite HLS Framework Data. Thus, the more practical, coherent MSOP and USOP.]

Exhibit 3: Shared Resources and Operating Pictures



2.3 Mission-Specific Operating Picture

A Mission-Specific Operating Picture (MSOP) is a collaborative workspace (data and services), which exists for a specific mission. The MSOP is a collaborative workspace comprised of the subset of shared COP resources that are required for a mission, integrated with other shared, collaborative mission-specific resources. The MSOP is effectively a filtered portal to the COP that integrates mission-specific resources. Thus, there are many MSOPs, at least one for each DHS component mission, but perhaps several for a mission.

2.4 User-Specific Operating Picture

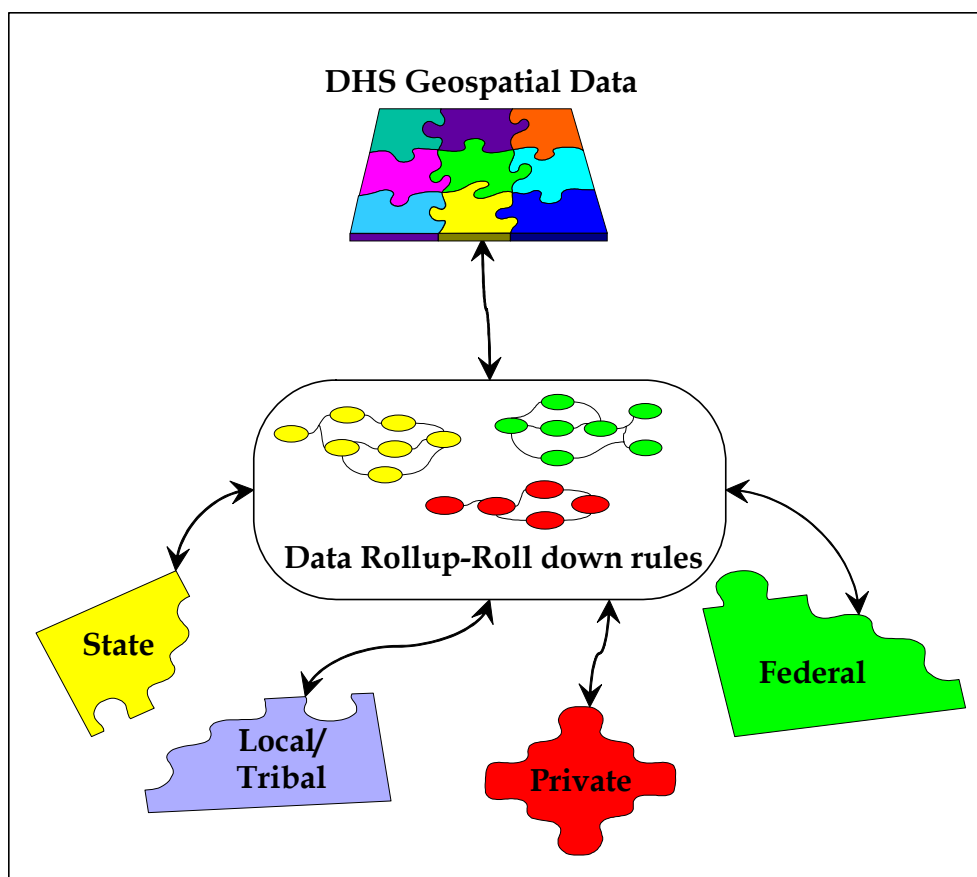
A User-Specific Operating Picture (USOP) is a specialized, actionable view of a shared collaborative COP/MSOPs, which is created for a specific user. The USOP is effectively a filtered portal to the COP/MSOPs, through which a user in a specific role, on a specific mission/task, and using a specific device, views the COP/MSOPs. Thus, there are many USOPs (views) of the COP/MSOPs.

2.5 Geospatial Data Rollup and Roll down Operations

The greatest challenge of creating the COP for the HLS mission is the provision of mission relevant, current, accurate, time-sensitive geospatial information. This challenge is magnified by the fact that much of the high-value information is created and owned by state, local, tribal, private, federal entities and must be rolled-up to form the COP (see Exhibit 4). The converse of this may also hold true, where the most timely and accurate information exists at the federal level, in which case it needs to be rolled down to the MSOP. A Geospatial Data Rollup/down (GDR) process is critical to responding to these challenges. Following are the specific technical issues that must be addressed to enable rollup/down operations.

- An Essential Model for HLS Framework Data must be established to ensure logical consistency and semantic interoperability. Geospatial data modeling to support the HLS GEA is discussed in Section 4, Geospatial Data Architecture
- Catalogs must be employed for registering, publishing and sharing information about geospatial metadata, data and associated geospatial enterprise services, including the semantic meaning, schema, structure, and access protocols; and
- Standards-based geospatial data access and other required geospatial enterprise services with well-known semantics must be employed to support GDR operations

Exhibit 4: Geospatial Data Rollup/down



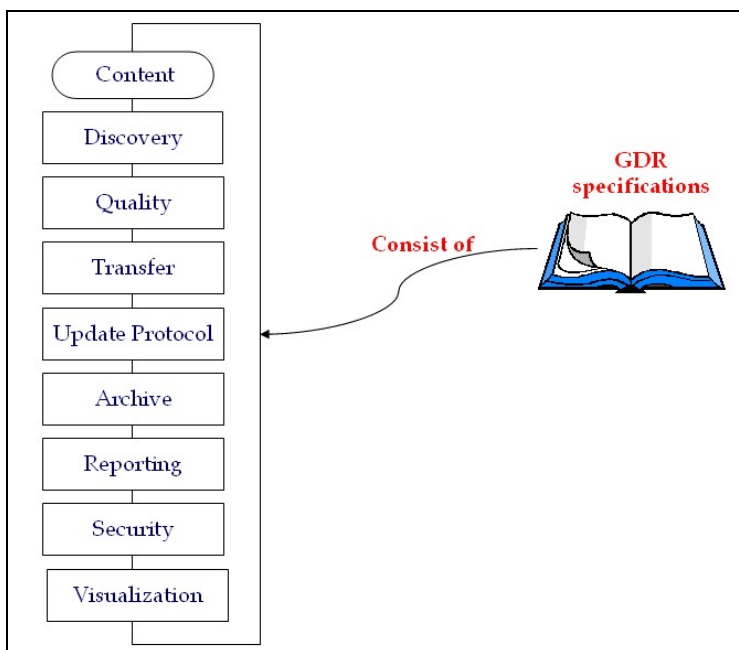
The GDR Concept of Operations (CONOPS) serves as a roadmap for defining policies, procedures, and detailed implementation specifications for required components to accomplish GDR and create the geospatial data required for HLS. Local, Tribal, State, and Federal data providers will use this CONOPS and the required specifications to plan and engage in developing GDR components, policies, and procedures to support seamless, automated data rollup/down. Private sector providers, with relevant content, will use this CONOPS to plan and engage in developing GDR components that will handle HLS and private sector interactions. This includes, but is not limited to, copyrights and pricing.

2.5.1 Conceptual View

This section provides a top-level description of the Geospatial Interoperability Framework (set of interoperability specifications) required in support of GDR (Exhibit 5):

- **Data Content & GDR Operations Specifications:** Contains detailed description of the Essential Model for HLS Framework Data. The GDR Operations Specification contains a detailed description of operations to rollup/down and translate data from data providers/stewards to HLS databases.
- **Discovery Specifications:** Contains detailed description of the mandatory and optional metadata elements. All HLS Framework Data must meet the minimum metadata requirements defined by the GEA. These specifications also contain taxonomies of HLS Framework Data types to assist in data discovery. (The Catalog Service defines common information models and standard operations that allow applications and services to interact with registry instances, regardless of their role or content, in order to discover, access and manage geospatial resources (data and services).)
- **Quality Specifications:** Prescribe the minimum quality parameters of the data that providers must meet before they can publish their data as HLS Framework Data. Quality information is defined in the metadata for that particular dataset. It is expected that each framework data theme (e.g., routing) will have its own specific quality specifications.
- **Transfer Specifications:** Defines the structure and semantics for data exchange between providers and HLS. These are expected to be Geography Markup Language (GML) application schemas. It is expected that each HLS Framework Data class will have its own application schema.
- **Update Protocol Specifications:** Geospatial data change in varying frequencies. For example, Road Network data do not change frequently, while weather data can change frequently during the day. Update Protocol Specifications define the means to synchronize between HLS databases and providers of these data sources. They also define appropriate technologies to achieve this task, and include alert, notification, and update mechanisms.
- **Archiving and Mirroring Specifications:** HLS Framework Data is a critical cornerstone of the HLS mission. GDR must ensure data availability at all times to support critical HLS tasks. These specifications define the essential guidelines and protocols to ensure automated periodic archiving and data replication involving redundant/backup enterprise nodes.
- **Reporting Specifications:** Defines technologies and protocols to enable periodic and on-demand reporting about HLS Framework Data contents and GDR operations status.
- **Geosecurity Specifications:** Defines technologies for secure exchange of sensitive geospatial content across the Internet (e.g., public/private keys). It also defines authentication and authorization (credentials) technologies to access HLS Framework Data.
- **Visualization Specifications:** Provide predefined specifications to view geospatial data differently depending on the role of HLS user (symbolization standards). It also defines the appropriate technologies to visualize the data.

Exhibit 5: Required GDR Specifications

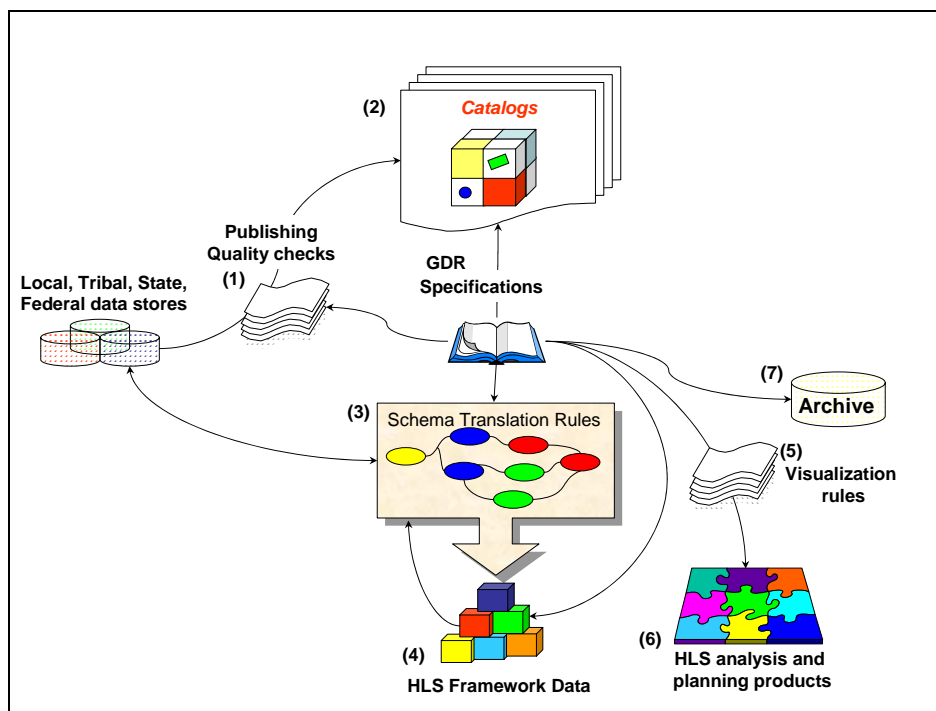


2.5.2 GDR Operational Environment

Exhibit 6 shows the CONOPS for GDR. HLS Framework Data and GDR specifications provide the blue print for implementing GDR:

1. Data providers/stewards must pass interoperability compliance tests before publishing their data and participating in GDR
2. Data sets must be published on the Master HLS Framework Data Catalog
3. Data must be translated to the required, standard schemas defined by DHS (Schema should be flexible and easily translatable through standard interfaces and protocols)
4. Data can either be stored locally at HLS system nodes or retrieved on-demand from remote servers. Access to data must be provided by Digital Rights Management Services (DRM)
5. Users must be able to access geospatial symbol sets and styles depending on their needs. They must also be able to dynamically render geospatial data for visualization using appropriate rules, depending on user roles, device and mission/tasks
6. Users must be able to use geospatial data to perform planning, analysis, management and other operational tasks
7. To ensure quick recovery in case of emergency, geospatial data must be archived (and replicated) according to HLS Framework Data and GDR specifications

Exhibit 6: Concept of Operations for Geospatial Data Rollup/down



3.0 GEOSPATIAL BUSINESS CONTEXT

3.1 Geospatial Business Language: Key Terms

A *Geospatial Business Language* is defined to describe the key concepts (ontology) for the role of geospatial business processes, data and technology within the HLS enterprise (See Attachment G_Bus_1_Geospatial_Business_Language_Key_Terms). These definitions form the basis for a consistent business language, a lingua franca for describing the role of geospatial in HLS Business Activities. It embodies the geospatial semantics for the HLS mission. Further, these terms are used to construct the *Geospatial Business Statements*, which describe the role of geospatial for each of the HLS Business Activities.

The *Geospatial Business Language* is comprised of five basic types of terms:

- **Application** – A computer program with a user interface or computer program component that employs geospatial data and technology; a geospatial business process or sub-process that is implemented as a software program or program component.
- **Data** – A geospatial information class, type or property.
- **Function** – A geoprocessing unit; a geoprocessing user tool; a geospatial service component.
- **Process** – A general business series of actions that employs geospatial data and technology.
- **Technology** – An application of science that generates, displays, manages or otherwise processes geospatial data. (Excluding general-purpose Information Technology.)

3.2 Geospatial Business Activities

The role of geospatial data (location) and geospatial technology in the HLS mission is defined in terms of *Geospatial Business Statements*. These statements are based upon the *Geospatial Business Language*. Most HLS Business Activities have one or more such statements that describe the primary uses of geospatial data and technology, and also defines the main Geospatial Applications (and application components) involved in the HLS enterprise. Many of the applications include non-geospatial data and technology, and may be predominantly non-geospatial in nature. As such, the value of geospatial service components is crucial to many HLS Business Activities. HLS applications will need authorized access to these components when and where they are needed in the HLS enterprise.

Attachment_G_Bus_2_Geospatial_Business_Activities maps HLS Business Activities to HLS Geospatial Roles, where each role is expressed in terms of *Geospatial Business Statements* and Geospatial Applications. Some *Geospatial Business Statements* are broad capabilities that apply across the entire enterprise, while others may only apply to specific activities that are unique to a particular business area. For example, the first HLS Business Activity, HLS007, lists several *Geospatial Business Statements* that apply across the enterprise. These broadly relevant applications are only listed under the first activity and are not repeated for the other activities in which they apply. On the other hand, a number of more specialized *Geospatial Business Statements* and Geospatial Applications are repeated for several business activities. This is done where necessary to emphasize specialization, and to demonstrate commonality between HLS Business Activities.

Finally, it is important to note that many Geospatial Applications will have several specialized implementations. For example, it is unlikely that there will be a single Mission Planning application. Rather, the complexity and diversity of mission operations necessitates the need for specialization and diversity of mission planning business processes and sub-processes. However, there will be a number of common geospatial service components and data upon which all Mission Planning applications will depend.

4.0 GEOSPATIAL DATA ARCHITECTURE

An Essential Model for geospatial-temporal data is required in order to effectively and efficiently benefit from geospatial-temporal context throughout the HLS enterprise. It is critical to achieving interoperability. The Essential Model for GEA consists of: 1) common, standard Geospatial Entity Types, the base models for representing geospatial data within GEA, 2) Geospatial Elements and Properties, which are the common, standard elements-properties for expressing location reference information in all HLS business data, and 3) a Geospatial Data Dictionary, which contains the authoritative standard definitions for all geospatial data classes used in the HLS mission. This version of the GEA defines an initial framework for these components of the Essential Model.

Version 1.0 of the HLS EA Conceptual Data Model includes a Subject Area named Location, which contains the Data Objects: Physical Location and Virtual Location. In order to extend the HLS EA Conceptual Data Model, the GEA Team replaced the Physical Location Data Object with Geospatial Entity to more fully describe this category of objects. The descriptions of these key terms are provided in Exhibit 7 and Exhibit 8.

Exhibit 7: HLS EA Subject Areas Directly Related to Geospatial Data

Subject Area	Description
Location	Details about geospatial and/or virtual location. Includes, but not limited to, information about navigable waters, air, bridges, icebergs, cyberspace, etc. [Taken from the Target EA.]

Exhibit 8: HLS EA Data Objects Relating to Geospatial Data

Subject Areas	Data Objects	Description
Location	Geospatial Entity	Root Data Object for HLS geospatial data that are used in Geospatial Enterprise Services and other geospatial components. Decomposed into the following types: Location Object, Feature, Coverage, Observation, Route, Mobile Object and Structure
Location	Virtual Location	Cyberspace address, e-mail, web site address (URL), TCP/IP address

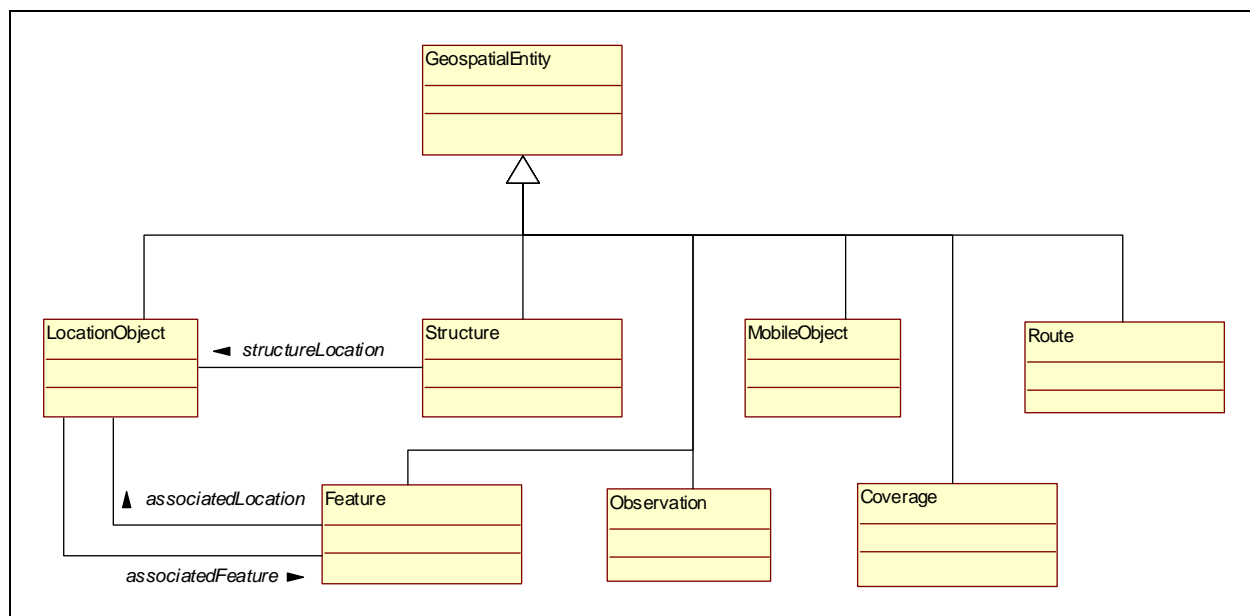
The Virtual Location Data Object is not described in this version of the HLS GEA.

4.1 Geospatial Entity Types

Geospatial Entity Types represent the foundational geospatial data objects (models) for representing geospatial data within the HLS Geospatial Interoperability Framework (i.e., the primary representation of geospatial content in network messages, and the representation of geospatial types within request-response parameters comprising geospatial service interfaces).

A Geospatial Entity represents a large domain of geospatial data and a wide range of uses. The Geospatial Entity is used to identify a location on the Earth or a model of any real-world phenomena, and contain location representations that support transformations between geospatial reference systems. A Geospatial Entity is decomposed into seven objects: Location Object, Feature, Coverage, Mobile Object, Observation, Route, and Structure. The hierarchy of the Geospatial Entity is illustrated in Exhibit 9, Geospatial Entity Types.

Exhibit 9: Geospatial Entity Types



A description of each Type follows:

- The Location Object describes a site or place in a normalized structure suitable for data interchange.
- A Feature describes real-world phenomena in a geospatial context. It may have an associated Location Object (or the Location Object may be associated with the Feature) to support transformation between the two representations for the same real-world entity. Other classes also describe real-world phenomena, but the Feature is typically used for immobile phenomena or those that are slow to move or change.
- A Structure describes a building or other structure in a more detailed 3D context with references to its geospatial location.
- An Observation associates an observed or measured value with the geospatial-temporal context of the observation.
- A Mobile Object describes dynamic real-world phenomena that change position or state relatively rapidly (e.g., person, conveyance, etc).
- A Coverage associates a set of discrete values with a geospatial area.
- A Route describes a path between locations.

A detailed description of each of the Geospatial Entity Types can be found in Attachment_G_Data_1_Geospatial_Entities. Subsequent versions of this artifact will elaborate on these types and identify the associated standards for implementing these types. All Geospatial Entity Types will be based upon industry standards.

4.2 Geospatial Properties and Elements

A number of common geospatial data elements and properties have been defined for the HLS EA to support the widespread exploitation of geospatial data. These elements and properties are the building blocks for defining Geospatial Entity Types, as well as any location reference data associated with non-geospatial data (e.g., an address in an INS record). They must be standardized to achieve geospatial interoperability.

Attachment_G_Data_2_Geospatial_Properties_Elements, lists the data geospatial elements and properties that can be utilized by all data objects within the HLS EA, including Geospatial Entity Types and predominantly non-geospatial data objects, thus providing a normalized geospatial context for all HLS Data Objects.

Consistent use of these elements-properties throughout the HLS EA will enhance interoperability and the use of standard Geospatial Enterprise Services that exploit these elements-properties. For example, by using common elements-properties for the specification of an address, any HLS business data that includes an address can be exploited and shared between systems and jurisdictions.

4.3 Geospatial Data Dictionary

The Geospatial Data Dictionary (Attachment_G_Data_3_Geospatial_Data_Dictionary) defines the primary classes of geospatial data for the HLS GEA. There are two top-level super-classes of geospatial data associated with the HLS mission: HLS Framework Data and HLS Auxiliary Data. HLS Framework Data consists of the geospatial data classes that are required for the HLS mission. It includes classes that are created by active participants in the mission, as well as those created by supporting data providers/stewards. HLS Auxiliary Data consists of any geospatial data classes that are not required for the HLS mission but may be used in the mission.

The dictionary employs a simple three-tier data classification scheme for HLS Framework Data. The three tiers consist of Category (data class), Sub-Category (data subclass), and Type. The data dictionary lists all major data categories and sub-categories. Although many data types are listed in the geospatial definitions, they are not defined in full and require elaboration by data providers/stewards of the data.

5.0 GEOSPATIAL APPLICATIONS

The analysis of the HLS business led to the definition of several Geospatial Applications and Application Components for HLS GEA (Exhibit 10). Many of these applications/application components include non-geospatial data and technology, and may be predominantly non-geospatial in nature. Many Geospatial Applications will have several specialized implementations. For example, it is highly unlikely that there will be a single Mission Planning application. Rather, the complexity and diversity of mission operations necessitates the need for specialization and diversity of mission planning business processes and sub-processes. However, there will be a number of common Geospatial Enterprise Services and associated data upon which all Mission Planning applications will depend. A complete definition of each of the applications can be found in Attachment_G_App_1_Geospatial_Applications.

Exhibit 10: HLS Geospatial Applications & Application Components

Asset Inventory Management	Monitor Locations
Biographical Analysis	Monitor Parties
Case Analysis	Monitor Recovery
Common Operating Picture Manager	National Security Special Event Reporting
Countermeasure Planning	Operational Planning
Critical Infrastructure Inventory Management	Performance Planning & Analysis
Damage Assessment	Post Mission Analysis
Data Acquisition/ Generation	Preparation Planning
Data Collection Management	Program Planning
Data Collection Planning	Public Information Outreach
Disaster Assistance	Recovery Planning
Electronic Navigation	Response Planning
Emergency Reporting	Risk Analysis
Evacuation Planning & Management	Screening and Risk Analysis
Event Analysis	Search and Rescue Planning
Event Planning & Analysis	Search and Rescue Response
Exercise Planning	Security Planning
Facility Mapping & Management	Security Protection & Management
Geospatial Data Transfer	Sensor Management
Geospatial Integration & Test Tools	Site Analysis
Hazard Mapping	Situation Awareness
Health & Safety Monitoring	Suspicious Activity Reporting
Hydraulic-Hydrographic Modeling	Tariff Management
Incident/Event Management	Threat Analysis
Incident Reporting	Threat Consequence Assessment
Location Search & Reporting	Threat Detection
Logistics Planning	Training Exercise Simulation
Map Publication	Training Planning & Support
Mission Planning	Travel Planning
Mission Rehearsal	Vulnerability Analysis
Mitigation Planning & Analysis	Warning/Alert Management
Monitor Assets	Waterway Management
Monitor Conveyances	Weather Modeling & Analysis
Monitor Goods	

6.0 GEOSPATIAL TECHNICAL ARCHITECTURE

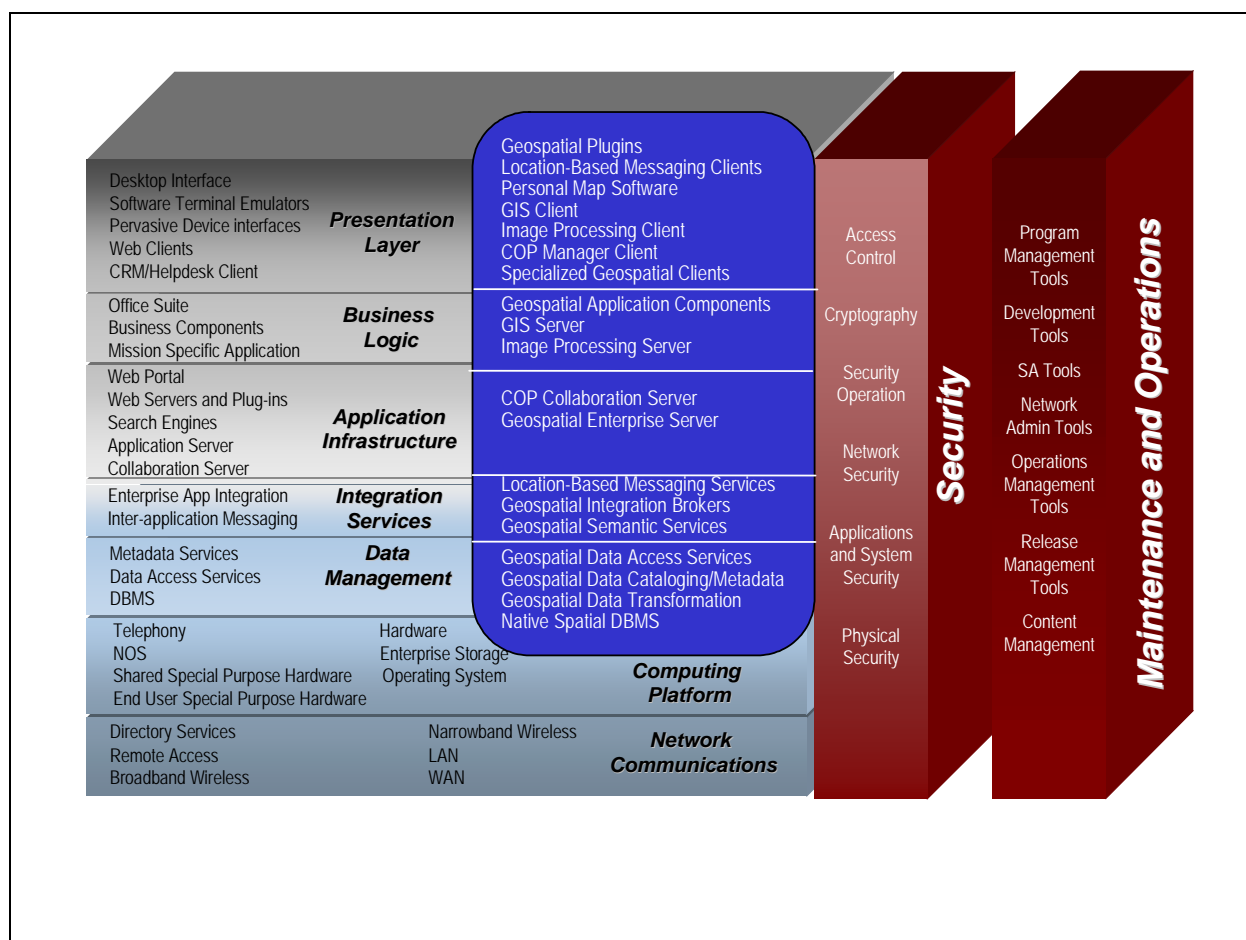
6.1 Geospatial Technical Reference Model

The HLS Technical Reference Model (TRM) provides a common conceptual framework that will assist in effectively and efficiently coordinating the acquisition, creation, development,

operation, and recapitalization of Information Technology (IT)-based systems within the HLS enterprise.

The GEA version of the TRM (Exhibit 11) emphasizes the role of Geospatial Information Technology (GIT) in the HLS Technical Architecture (see Attachment_G_Tech_1_Geospatial_Technical_Reference_Model). It extends version 1.0 of the DHS EA TRM (DTCGHS-03-A-FLC035-001-0009A, published August 29, 2003). The GEA version also reflects some recent enhancements to the DHS EA, which will appear in the next version of the TRM.

Exhibit 11: HLS GEA TRM



As illustrated in Exhibit 11, the main types of geospatial components in the layers of the TRM are:

- **Presentation Layer**
 - Geospatial Plug-ins
 - Location-based Messaging Clients
 - Personal Map Software
 - Specialized Geospatial Clients (67 types)

- Geographic Information System (GIS) Clients
- Image Processing Clients
- Common Operating Picture (COP) Manager Client
- Business Logic Layer
 - Geospatial Application Components
 - GIS Server
 - Image Processing Server
- Application Infrastructure Layer
 - Geospatial Enterprise Server
 - COP Collaboration Server
- Data Interchange/Integration Layer
 - Location-Based Messaging Services
 - Geospatial Integration Brokers
 - Geospatial Semantic Services
- Data Management Layer
 - Geospatial Data Access Services
 - Geospatial Data Cataloging & Metadata Management Services
 - Geospatial Data Transformation Services
 - Native Spatial DBMS
- Computing Platform Layer
 - Position Determination Technology
 - Navigation Technology
 - Remote Sensing Hardware

6.2 Geospatial Components

The HLS GEA TRM presents the EA context for all geospatial technology components. Attachment_G_Tech_2_Geospatial_Components summarizes these components. The layers of the HLS TRM that have geospatial components are as follows:

- Presentation—the technical services required to create and present application interfaces to end users;
- Business Logic—application-specific logic representation;
- Application Infrastructure—the technical services required to allow business logic, and other application logic to function;

- Integration Services—the technical services and components required to interchange data among applications and services;
- Data Management—the technical services and components required to access and modify data of all types; and
- Computing Platform—physical hardware and operating system services that support the components of the TRM Service Framework.

6.3 Technology Patterns

The geospatial technology patterns that are commonly used throughout the HLS GEA are documented in Attachment_G_Tech_3_Geospatial_Technology_Patterns. The patterns included in this version of the GEA TRM are the primary patterns required to support GDR operations, which are needed to create the HLS COP. Additional patterns will be added in subsequent versions of the TRM.

The patterns involved in GDR are:

- Data Publishing Pattern - The function of this pattern is to enable data providers/stewards to publish their data and support HLS operations using tools to validate and verify compliance with GDR standards. The Publishing Pattern provides data validation and verification services. The services validate the published data against a well-defined application schema. The services also verify that the data quality parameters and currency are within acceptable ranges.
- Data Discovery Pattern - Catalog Services provide a common mechanism to classify, register, describe, search, maintain, and access information about available geospatial resources. These resources are network addressable instances of typed data or services. This pattern is designed to allow users/clients to search HLS geospatial databases based on data type, named location, and user-defined bounding areas. When multiple sources exist for a specific data type in an area of interest, users will be able to select among them, based on available metadata. Furthermore, when multiple sources exist for a specific data type in an area of interest, this pattern will automatically select one based on appropriate criteria and policies. Users may need to search for desired data by ‘drilling down’ multi-levels of metadata, from general to more specific data. Multi-level search can be based on HLS Framework Data hierarchy.
- Translation Pattern - The function of this pattern is to allow HLS users to obtain desired data for a particular area, without needing to know the details of how the data are stored and maintained. For example, DHS might maintain a service providing interstate highway data, a State might serve data about the highways under its jurisdiction, and a city might serve urban street data. An HLS user should be able to obtain and seamlessly manipulate these data, including roads from all of these jurisdictions simultaneously, letting the Translation Pattern automatically interact with the necessary services and integrate data as necessary to fulfill the request. Users can send a query based on standard schemas, and the Translation Service will have the task of translating the query to other schemas, as well as map the response back to the Target HLS application schema.

- **Digital Rights Management (DRM) Pattern** - In its broadest view, DRM is concerned with the management of all rights, not just digital rights. DRM technology was originally focused on the problem of persistent protection of digital content. Persistent protection mechanisms involve authentication, authorization and encryption technologies for locking digital contents and limiting distribution to those who pay. Protection is persistent when it remains in force wherever the content is in the enterprise. Today, DRM covers a much broader spectrum of capabilities and underlying technologies supporting description, identification, trading, protection, monitoring, and tracking of all forms of rights usages for geospatial data.
- **Update and Synchronization Pattern** - This pattern is designed to achieve three tasks, 1) Notify and alert HLS users of new updates to HLS Framework Data, 2) Poll service providers for new updates to specific data, and 3) Respond to update and synchronization requests sent by data providers/stewards. A Transactional Web Feature Service (WFS) and Web Coverage Service (WCS) provide an open, standard interface to manipulate and manage Features and Coverages, respectively. A standard notification and synchronization protocol is required for geospatial content.
- **Visualization Pattern** - A Catalog Service can be used to publish and register symbol libraries as well as customized symbolization and styling rules for use by other authorized users. These rules must be used to generate standard HLS maps that depend on users' roles and current tasks. A Web Map Service (WMS) and Coverage Portrayal Service provide interfaces to generate standard maps and coverages respectively. Client applications are required to provide symbol and style management as well as visualization.
- **Data Access Pattern** – This pattern provides a level of isolation between the data and the code that requires or manipulates it. It acts as an adaptor and allows data calls in the code to be standardized. In this manner, it exposes a simpler interface to the code. This allows the DA pattern to adapt to different storage schemas without affecting its clients (the components requiring data access). [This pattern is described in greater detail in the Target EA.] There is a specialized variation of this general pattern required for accessing geospatial data, the Geospatial Data Access Pattern, which includes the ability to handle spatial indexes and operators.
- **Content Management Pattern** – This pattern is used in solutions that assemble and manage data in support of HLS operations. There is a specialized variation of this general pattern required for managing geospatial data, the Geospatial Data Access Pattern, which includes the ability to handle spatial indexes and operators.

7.0 ACRONYMS

Acronym	Definition
BTS	Bureau of Transportation Statistics
CAC	Civil Applications Committee
CIA	Central Intelligence Agency

CONOPS	Concept of Operations
COP	Common Operating Picture
DBMS	Database Management System
DHS	Department of Homeland Security
DIA	Defense Intelligence Agency
DoD	Department of Defense
DOE	Department of Energy
DOS	Department of State
DRM	Digital Rights Management
EA	Enterprise Architecture
EP&R	Emergency Preparedness & Response
GDR	Geospatial Data Rollup
GEA	Geospatial Enterprise Architecture
GIT	Geospatial Information Technology
GML	Geography Markup Language
GMO	Geospatial Management Office
HLS	Homeland Security
HUMINT	Human Intelligence
IAIP	Information Analysis and Infrastructure Protection
IMINT	Imagery Intelligence
IT	Information Technology
LAN	Local Area Network
MASINT	Measurement and Signature Intelligence
MSOP	Mission-Specific Operating Picture
NASA	National Aeronautics & Space Administration
NGA	National Geospatial-Intelligence Agency
NOAA	National Oceanic & Atmospheric Administration
NORTHCOM	United States Northern Command
NOS	Network Operating System
NSA	National Security Agency

NTM	National Technical Means
S&T	Science & Technology
SIGINT	Signals Intelligence
TCP/IP	Transmission Control Protocol/Internet Protocol
TNM	The National Map
TRM	Technical Reference Model
TTIC	Terrorist Threat Integration Center
URL	Uniform Resource Locator
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WAN	Wide Area Network
WCS	Web Coverage Service
WFS	Web Feature Service
WMS	Web Map Service

8.0 ATTACHMENTS

Attachment Name	File Name
Attachment G Bus 1: Geospatial Business Language Key Terms	Attachment_G_Bus_1_Geospatial_Business_Language_Key_Terms.doc
Attachment G Bus 2: Geospatial Business Activity	Attachment_G_Bus_2_Geospatial_Business_Activity.doc
Attachment G Data 1: Geospatial Entities	Attachment_G_Data_1_Geospatial_Entities.doc
Attachment G Data 2: Geospatial Properties-Elements	Attachment_G_Data_2_Geospatial_Properties-Elements
Attachment G Data 3: Geospatial Data-Dictionary	Attachment_G_Data_3_Geospatial_Data_Dictionary
Attachment G App 1: Geospatial Applications	Attachment_G_App_1_Geospatial_Applications.doc
Attachment G Tech 1: Geospatial Technical Reference Model	Attachment_G_Tech_1_Geospatial_Technical_Reference_Model.doc
Attachment G Tech 2: Geospatial Components	Attachment_G_Tech_2_Geospatial_Components.doc
Attachment G Tech 3: Geospatial Technology Patterns	Attachment_G_Tech_3_Geospatial_Technology_Patterns.doc

9.0 REFERENCES

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- ⁱⁱ Homeland Security Enterprise Architecture Compendium and Transition Strategy, Version 1
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**HOMELAND SECURITY GEOSPATIAL ENTERPRISE
ARCHITECTURE**

**ATTACHMENT G BUS 1
GEOSPATIAL BUSINESS LANGUAGE KEY TERMS**

GEOSPATIAL MANAGEMENT OFFICE

DRAFT VERSION 0.6.1

April 13, 2004

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1.0 HLS GEOSPATIAL BUSINESS LANGUAGE: KEY TERMS

The *Geospatial Business Language* defined herein consists of the key terminology used to define the role of geospatial in the HLS (Homeland Security) Geospatial Enterprise Architecture (GEA). More than a glossary, these definitions form the basis for a consistent language, a *lingua franca* for describing the role of geospatial in all HLS Business Activities. The geospatial semantics of the HLS mission are embodied in these terms. Further, these terms are used to construct the *Geospatial Business Statements*, which describe the role of geospatial for each of the HLS Business Activities (See Geospatial Business Activities, Attachment G.Bus.2.).

The *Geospatial Business Language* is comprised of five basic types of terms:

- **Application** – A computer program with a user interface or computer program component that employs geospatial data and technology; a geospatial business process or sub-process that is implemented as a software program or program component.
- **Data** – A geospatial information class, type or property.
- **Function** – A geoprocessing unit; a geoprocessing user tool; a geospatial service component.
- **Process** – A general business series of actions that employs geospatial data and technology.
- **Technology** – An application of science that generates, displays, manages or otherwise processes geospatial data. (Excluding general-purpose Information Technology.)

Geospatial Term	Type	Definition/Description	Reference
Absolute Location	Data	Specifies a precise position on the earth. Defined by an address, position, feature geometry (e.g., point, line or polygon), or Place of Interest. A subtype of Location Object.	GEA
Activity	Data	Any current, historical or planned exercise of interest with geospatial context (location/time, extent, geographic, national), or a temporal series of actions with a series of geospatial contexts. An Activity may pertain to a plan, event (occurrence, incident, Event—National Security Special Event (NSSE)), asset, party, case, risk, conveyance, goods, governance, training, benefit, communication, etc. A HLS Framework Data category.	GEA
Activity	Process	An HLS business activity. A process or sub-process involving one or more elements of the HLS enterprise architecture.	GEA
Activity Report	Data	Reports that contain the geospatial-temporal context of any HLS function. Reports contain interlinked, multi-media data that characterize the nature, context and status of the function. A type of HLS Framework Data under subcategory Report, under the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Activity Report Service	Technology	Able to generate an Activity Report for any location-based function.	GEA
Address	Data	Specifies street location, postal location or street intersection as used in navigation and locating parties and facilities. As defined by the Open GIS Consortium (OGC), address consists of a street address (or intersection), place name (e.g., country, municipality, etc.), postal code, street locator, building locator, and supplemental address information. As used here, the OGC address model is extended to include postal address. Addresses are the means of referencing primarily residences and buildings (of all types). A subtype of Absolute Location under Location Object.	GEA, OGC
After Action Report	Data	The geospatial-temporal context of post-incident/event lessons learned in location-based account form. Based upon understanding of the root cause, status of recovery and recommended actions. Detailed accounts (reports) contain interlinked, multi-media data that adequately characterize the nature and context of the incident/event. Detailed accounts (reports) may contain references to plans, maps and other reports. A type of HLS Framework Data under subcategory Report, under the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
After Action Report Service	Technology	Able to generate a detailed account (After Action Report) with the geospatial context of the root cause, status and recommendations pertaining to post-incident recovery operations.	GEA
Alert	Data	A communication message with geospatial and temporal context that is triggered by any suspicious or threatening event. Can be determined by evaluating observed or calculated conditions through a “watch” function, an output from a modeling and simulation activity, by correlating incidents, occurrences and/or intelligence and predicting a potential threat or threat condition. Example: A sensor alert that results from one or more observations that meet predefined ‘threat detection’ conditions. Alerts may lead to false alarms or develop into Warnings (as determined by a qualified party). A subcategory of HLS Framework Data under the Communication category.	GEA
Alert-Warning Report Service	Technology	Able to generate a communication message with a detailed account (Alert-Warning Report) containing information about location-based alert or warning messages.	GEA

Geospatial Term	Type	Definition/Description	Reference
Area of Interest (AOI)	Data	A defined parameter (circle, bounding box, or polygon representing a region of concern. Generally, any area of interest within the mission. Used as a search parameter or can be displayed. A designated area of interest in an application. May be represented as a Feature or Coverage. A subtype of Place of Interest under Absolute Location, which is under Location Object.	GEA, OGC
Assessment	Data	Generally, the results of analysis pertaining to a topic of interest, such as a threat, threat consequence, risk, vulnerability, etc. The geospatial-temporal context of geospatial analysis results, which includes supporting facts, interpretations, hypotheses and projections. May consist of maps, annotated images, reports, plans, etc. A subcategory of HLS Framework Data under the Geospatial Product category.	GEA
Asset	Data	A valuable item that is owned. Generally, any equity used in HLS operations. Critical and key assets as defined by the HLS EA team, Presidential Decision Directive (PDD) – 63, and further defined by the joint US Geological Survey – National Geospatial-Intelligence Agency (USGS-NGA) Homeland Security Infrastructure Program (HSIP) Tiger Team Report, September 2002.	HLS EA

Geospatial Term	Type	Definition/Description	Reference
Asset Inventory	Data	The management data associated with equities (Assets critical, key, or other).	GEA
Asset Inventory Management	Application	Enterprise-level application(s) that is used to manage fixed and mobile equities (Assets). In particular, to monitor and track the location/time/identity/activity/status for a set of equities (Assets).	GEA
At Risk Location	Data	A site that is considered to be under possible threat, danger, or harm. Normally associated with critical or key assets. The geospatial extent of the geospatial area surrounding the location. A type of Mission Feature.	GEA
Audit Trail	Data	A history of significant geoprocessing operations. e.g., Records of geospatial database update operations (what, when, where). A subcategory of HLS Framework Data under Administration.	GEA

Geospatial Term	Type	Definition/Description	Reference
Auxiliary Data	Data	Any geospatial information of value to the mission that are not available as HLS Framework Data, but are directly accessible to the Geospatial Enterprise Architecture through sharable external resources. Information (data) used in support of the HLS mission that are available from all possible sources. Collection is triggered by NSSE or significant incidents. Information (data) may not have been merged or integrated in order to conform to or be consistent with any National standards. A category of HLS data.	GEA
Background Check (Records)	Data	The geospatial context associated with historical analysis, examination or exploration. A subcategory HLS Framework Data under Person Records.	GEA
Base	Data	The foundational data required for generating multi-purpose maps and other geospatial products. The data that comprise a Base Map. May consist of one or more features and/or coverages. All Base data should be registered to a common coordinate reference system. An HLS Framework category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Base Map	Data	A multi-purpose representation of the earth (or portion thereof) that conveys general geospatial context, as depicted by predominant geographic features.	GEA
Benefit (Records)	Data	The compensation for a party. Privileges that are granted or provided by the government. Also medical compensation (Benefits), including medical care and crisis counseling, and relief compensation (Benefits), including assistance to victims and their families for emergency relief. The geospatial context of benefits represented as a subcategory of HLS Framework Data under Party (Person or Organization) Records.	HLS EA, GEA
Biographical	Data	The geospatial vita for persons (e.g., physical address, place of birth, citizenship, person/organization affiliations, residence history, travel history, etc). A subcategory of HLS Framework Data under Person.	GEA
Biographical Analysis	Application	The means to examine a person (records) in conjunction with other geospatial data, including events, person/organization affiliations, incidents, threats and intelligence data.	GEA

Geospatial Term	Type	Definition/Description	Reference
Boundary Zone	Data	An area associated with an administrative demarcation that is patrolled and protected, e.g., a buffer zone along the U.S. border. A subtype of Mission Feature.	GEA
Capital Asset	Data	Capital assets are land, structures, equipment, and intellectual property (including software) that are used by the Federal Government and have an estimated useful life of two years or more. Examples include: easements, rights of way, buildings, facilities, and other structures. The geospatial records describing these assets. See Facilities, a category of HLS Framework Data, Critical Assets, Key Assets and Assets.	HLS EA
Cargo (Records)	Data	Current, historical, and predicted location/time/identity/activity/status (e.g., tracked location, route, speed, direction, conveyance, etc.) of payload/freight/shipment/goods and their containers. Includes geospatial context of shipping manifest records (i.e., identification of organization/place of manufacture, place of shipping origin, destination, shipping route, etc.) Includes identity, location, time and status for seized cargo. Cargo locations may relate to mobile conveyances or fixed locations (cargo may be in a warehouse, pier, wharf, etc.) A subcategory of the HLS Framework Data under the Goods category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Case (Records)	Data	Generally, all information (records) associated with an investigation. As used here, specifically the geospatial context (location/time/identity/activity/status) pertaining to an investigation. Current, historical, and predicted geospatial context (tracking) for persons, organizations, incidents, occurrences, conveyances, cargo, etc., as associated with an investigative case. Includes location/time/identity/activity/status for related confiscation and seizures of goods, assets, conveyances, etc., and current and historical locations associated with evidence. May reference conveyance, risk (threat), event (incident, occurrence, Event), or party (person or organization) records. A category of HLS Framework Data.	GEA

Geospatial Term	Type	Definition/Description	Reference
Case Analysis	Application	Generally the evaluation of all information (records) associated with an investigation. The means to (data) mine, integrate, and correlate varied types of case-related data for the purpose of extrapolating, analyzing and deriving geospatial data in the form of profiles, patterns, trends, networks, tendencies, indicators, hypotheses, and conclusions, as it pertains to case understanding. Source data include, but are not limited to, intelligence, incidents, occurrences, criminal and suspicious activities, financial transactions, persons, organizations, goods, cargo, hazmat, conveyances, etc. May also involve geoparsing and geocoding functions to scan and annotate associated textual data for geographic and temporal references.	GEA
Catalog Service	Technology	The Catalog Service defines common information models and standard operations that allow applications and services to interact with registry instances, regardless of their role or content, in order to discover, access and manage geospatial resources (data and services). Specialized Catalog Services may exist for specific data classes, e.g., an Image Catalog Service (ICS).	GEA, OGC

Geospatial Term	Type	Definition/Description	Reference
Change detection	Function(s)	The assessment of alterations to features or coverages over time to support geospatial/intelligence analysis. This is often accomplished using a time-series of imagery to identify areas or features where any detected change may have occurred. Change is characterized in the spatial-temporal domain. Change may be represented as an alteration in location, identity, activity or status.	GEA
Citizenship	Data (Property)	A person's country of origin or home country, as established through naturalization.	GEA
Collaboration	Function	The means to share information and interact with common resources (data, services and applications). [More than merely sharing data.] Involves timely dissemination of the right actionable information to actors in an operational setting, and thus depends upon interoperable communications to all parties (cross-jurisdictional) and to all operational nodes, including the field. Effective collaboration functions are optimized in terms of the duplication/distribution of shared, collaborative resources.	GEA

Geospatial Term	Type	Definition/Description	Reference
Collaboration (Geospatial)	Process	(Geospatial) collaboration refers to the process of sharing and interacting with common resources that are based on geospatial data, service and application (business) standards, supporting interoperations across all levels of government and private institutions. As used herein, specifically refers to the COP and the MSOP. The COP is comprised of broadly used collaborative HLS workspace capabilities. The MSOPs are mission-specific collaborative workspace capabilities. Collaboration is enabled by collaborative technologies that are based upon common standards for geospatial data, services and applications.	GEA
Collection Plan	Data	The planned schedule, tasking and resource allocations pertaining to a given assemblage asset, asset mission and set of assemblage requirements for geospatial data, imagery or intelligence. A type of HLS Framework Data under the Plan subcategory of the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Collection Requirements	Data	Requests for geospatial data (including remote sensing) and intelligence, including location and geospatial extent of collection area of interest, observables and required geospatial attributes or properties, which can then be converted into data requests for known collection methods and systems. A category of HLS Framework Data.	GEA

Geospatial Term	Type	Definition/Description	Reference
Common Operating Picture (COP)	Data/ Technology	<p>The collective set of time-sensitive, mission-critical, shared resources (data and services) for HLS. Contains geospatial context (a composite of HLS Framework Data and HLS Auxiliary Data), the disposition and nature of threat(s), friendly personnel and assets, as well as incidents, events, observations, related intelligence, and other relevant HLS operations data. A COP represents a collaborative workspace for interoperations between all distributed actors in support of time-sensitive, mission-critical HLS operations. It is not practical to consider a COP as merely a common data view. Rather, many possible views may be generated on the fly for a given mission and/or user (depending on associated services, available data and application context). Related to the COP, MSOP is a collaborative workspace comprised of the subset of shared COP resources that are required for a mission, with additional resources that are unique to the mission. The User-Specific Operating Picture (USOP) is an actionable data view of the MSOP that is specialized for a user, in a specific role, on a specific device. The COP is a category of HLS Framework Data.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
COP Collaboration Server	Technology	A Collaboration Server is a computer connected to clients via a network used for hosting, managing, and monitoring shared COP/MSOP/USOP resources and the cooperative exchange of geospatial data.	GEA

Geospatial Term	Type	Definition/Description	Reference
COP Manager	Application	<p>The means to direct or control the scope and resources associated with a COP and MSOP. The scope is defined in terms of geospatial extent (area of interest), timeframe, subject of interest (e.g., threat(s), case, monitor cargo, etc), operations objectives (e.g., respond to incident, recover from disaster, etc), the data required to support the execution of operations (e.g., support threat modeling & analysis, case analysis, cargo tracking, etc), and other operations parameters (e.g., constraints, mission features, etc). Resources may include physical entities (e.g., personnel, assets, conveyances, technology, etc) and logical entities (e.g., business components and processes, data, services). The COP Manager provides the means to select and allocate resources, manage and monitor collaboration activities, monitor status and performance of resources, and monitor and manage external communications. The distinction between the COP Manager and other operations-related applications is that the COP Manager is managing the big picture (COP), and subsets of the COP (MSOPs), whereas other HLS applications focus on USOP in user-specific operations activities.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
COP Manager Client	Technology	COP Manager provides the means to direct or control the scope and resources associated with a COP, select and allocate resources, direct and monitor collaboration activities, monitor status and performance of resources, and monitor and control external communications. The distinction between the COP Manager and other operations applications is that the COP Manager is managing the big picture (COP), and subsets of the COP (MSOPs).	GEA
Communication	Data	Correspondence, outreach content, warnings or alerts. A category of HLS Framework Data.	HLS EA
Community of Interest (COI)	Data	A group of enterprise users who share common data, services and/or business processes. Communities of Interest (COIs) defines the semantics for sharing enterprise resources. These semantics (ontology) form the basis for achieving autonomous, robust interoperability throughout the enterprise.	GEA
Containment Area	Data	The geospatial extent of a target geospatial boundary to contain an incident, and the impact and consequences of the incident. A subtype of Mission Feature.	GEA

Geospatial Term	Type	Definition/Description	Reference
Contingency Plan	Data	A program of action designed for handling possible future circumstances or events. Geospatial and temporal context for contingency plans associated with any plan or operation. A type of HLS Framework Data under the Plan subcategory of the Geospatial Product category	GEA
Conveyance (Records)	Data	A vehicle, vessel, boat, aircraft, truck, or other mode of transportation that is able to transport cargo or passengers. The records for description, tracking and monitoring of conveyances (aircraft, marine vessels, motor vehicles, trains). Includes identity (digital records of credentials, owner's address, etc.) and other tracking and monitoring information. Tracking and monitoring of conveyances produces current, historical and future (planned or projected) location/time/identity/activity/status data. These records may include travel history, travel itinerary, shipping manifest and license/permit information. May reference events (occurrences, incidents, EVENTS), cases, persons and organizations. A category of HLS Framework Data.	HLS EA, GEA

Geospatial Term	Type	Definition/Description	Reference
Coordinate Reference System	Data	A function that associates locations in space to geometries of coordinate tuples in a mathematical space, usually a real valued coordinate vector space, and conversely associates coordinate values and geometries to locations in the real world, e.g., geographic coordinates (latitude, longitude) and Universal Transverse Mercator (UTM) (projected coordinates).	OGC
Coordinate (and Unit) Transformation Service	Technology	The ability to convert geospatial data between different coordinate reference systems, datums and units. Support map re-projections on-the-fly for map viewing, as well as permanent coordinate conversions that result in a converted output data set.	OGC
Correlation (geospatial)	Process	The process of relating data through geospatial-temporal properties.	GEA
Countermeasure (Plan)	Data	Documents the steps in response for protecting persons, assets, goods, conveyances, etc., in map and report form. A type of HLS Framework Data under the Plan subcategory of the Geospatial Product category.	HLS EA

Geospatial Term	Type	Definition/Description	Reference
Countermeasure Planning	Application	The means to determine and document the preventive actions to secure key, critical and other assets, Events, conveyances and persons, in geospatial context. Plans may contain Maps and Reports.	GEA
Coverage	Data	A two- (and sometimes three or higher) dimensional geographic representation of earth phenomena. A subtype of Feature. Common examples include imagery and digital terrain models. An HLS geospatial entity subtype.	OGC
Coverage Portrayal Service	Technology	Coverage Portrayal Service is chained to a Web Coverage Service (WCS) to convert geospatial coverage data (grid/image) to a map. The resultant map can be overlaid with data fetched from other servers for reference and orientation.	OGC

Geospatial Term	Type	Definition/Description	Reference
Critical Asset	Data	Critical infrastructures are those physical and cyber-based systems essential to the minimum operations of the economy and government. They include, but are not limited to, telecommunications, energy, banking and finance, transportation, water systems and emergency services, both governmental and private. Any 'Critical Assets' as defined in PDD – 63. The geospatial context of these assets is represented by a category of HLS Framework Data.	HLS EA
Critical Infrastructure Inventory Management	Application	The means to keep track of and report on the location and status of critical assets and key assets. To generate reports and maps conveying this information.	GEA
Custody (Records)	Data	The custody records for a person. A subcategory of HLS Framework Data under the Person category.	GEA
Damage Assessment	Application	The means to analyze and determine the extent and nature of destruction, harm, injury, and loss of value caused by a threat or natural hazard through the use of imagery and other sensor and human observations. Includes loss estimations. To generate reports and maps conveying this information.	GEA

Geospatial Term	Type	Definition/Description	Reference
Damage Assessment	Data	A map, image and/or related report that characterizes the location, extent and severity of destruction, harm, injury, and loss of value caused by a threat or hazard. A type of HLS Framework Data under subcategory Assessment, under the Geospatial Product category.	GEA
Data Acquisition/Generation	Application	Generally, the means to acquire, collect, process and/or generate new information (data) for the enterprise. There are many such specialized applications and tools for collecting, reformatting, verifying, editing, integrating and transforming new information (data) for the enterprise. e.g., Supervisory Control and Data Acquisition (SCADA).	GEA
Data Collection Management	Application	The means to submit new information (data) gathering requirements and administer these requests through fulfillment or obsolescence. Includes the means to manage requirements for human/sensor collection activities.	GEA
Data Collection Planning	Application	The means to devise, schedule and allocate requests for new information (data) to gather assets; to develop assembly plans that convey schedule, tasking and resource allocation for collection assets.	GEA

Geospatial Term	Type	Definition/Description	Reference
Data Correlation	Function	The family of functions for determining the spatio-temporal interrelationships and statistical correlation between data sets, and elements and properties within these sets. Correlation functions include intersection (AND, AND NOT), union (OR, NOT), proximity, statistical correlation (as it relates to accuracy and precision), pairings, regression, etc. Also the functions that determine the meanings of geospatial-temporal correlations.	GEA
(Geospatial) Data Dictionary	Data	A repository for well-known data terms (classes, elements, types, properties, relationships) for all data that are to be shared within a COI. The names, definition, schema fragments (format/syntax), legal values/value ranges for these terms.	GEA
Data Discovery Service	Technology	Able to search for and locate desired data through open, standard publish-find mechanisms. Search requests may be defined in terms of geospatial-temporal, mathematical and statistical filters for discovering data and data relationships, and optionally storing the metadata results as a new data set.	GEA, OGC

Geospatial Term	Type	Definition/Description	Reference
(Geospatial) Data Mining	Function	The family of search and retrieval functions that employ search filters with Boolean, mathematical (geometric and topological) and statistical operators for discovering patterns, trends, tendencies, etc. in geospatial data.	GEA
Decision Support Aids	Data	Artifacts used to assist in judgments. Broadly, HLS decision support data that have geospatial properties or are defined as geospatial entity subtypes. Consists of plans, reports and maps with geospatial content. A type of HLS Framework Data under the Aids subcategory of the Geospatial Product category.	GEA
Deployment Plan	Data	The procedures to bring forces, material, people, systems into operation. Geospatial and temporal context for deployment plans associated with any operation. Depicts terrain, objectives, threats, (blue & white) assets, etc. A type of HLS Framework Data under the Plan subcategory of the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Digital Rights Management Services	Technology	DRM is the use of a range of techniques to control copyright material and the terms and conditions on which it is made available to users. Digital Rights Management Services provide secure, controlled access to geospatial data provided by private providers/stewards for mission-critical HLS business activities. This is crucial for operations that involve Critical Infrastructure and Key Assets.	GEA
Direction	Data (Property)	The relationship by which the alignment or orientation of any position with respect to any other position is established.	GEA
Disaster Assistance	Application	The means to support hazard/disaster related benefits processing. To share hazards and related assessments [e.g., Digital Flood Insurance Rate Maps (DFIRMs) for lending institutions and flood insurance purposes (Human Services – Individual Assistance & Public Assistance), post disaster Housing Habitability data (individual structures and public infrastructure) for rebuilding purposes, etc.]	GEA
Distance	Data (Property)	A linear extent of space between two points. The travel distance between two places.	GEA

Geospatial Term	Type	Definition/Description	Reference
Electronic Navigation	Application	<p>The use of computerized systems to track movements/shipments/conveyances/aeronautics. The means to determine, verify and simulate navigation guidance for mobile assets. To produce navigation instructions and guidance data for use in computer-assisted navigation. These need to be uploaded to conveyances (for navigation) and simulators (for mission rehearsal). Employ navigation technologies such as Long Range Radio Aid to Navigation (LORAN), Global Positioning System (GPS), digital nautical charts (National Oceanic & Atmospheric Administration (NOAA), and flight planning and management software with digital aeronautical charts (Federal Aviation Administration (FAA)), automatic vehicle locator (AVL) and in-vehicle navigation systems, and inertial navigation systems (INS).</p>	GEA
Emergency Declaration	Data	<p>The geospatial extent and nature of a serious situation or occurrence that happens unexpectedly and demands immediate action, portrayed in map and/or report form. A subcategory of HLS Framework Data under the Communication category.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
Emergency Declaration Report Service	Technology	Able to generate an Emergency Declaration Report with the geospatial extent and nature of an emergency.	GEA
Emergency Reporting	Application	The means to document and account in detail the nature and geospatial-temporal context of a serious situation or occurrence to proper authorities; to declare state and federal emergencies. Reference threats, threat consequence assessments, warnings, alerts and other location-based content germane to the emergency.	GEA
Emergency Report	Data	The geospatial-temporal context of a disaster/incident/danger/accident. A location-based detailed-account pertaining to a state or federal emergency. Reports may reference maps, mission plans, incidents, occurrences, parties, threat intelligence, risks/threats/vulnerabilities and associated assessments, etc. Reports contain interlinked, multi-media data that adequately characterize the nature and context of the emergency. A type of HLS Framework Data under subcategory Report, under the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Environmental Impact Assessments	Data	The analysis of environmental data for a recovery site(s) and the examination of the impact on the external conditions and surroundings. Analysis of the effectiveness of recovery plans and operations as they pertain to safety and health concerns in a post-incident environment. A type of HLS Framework Data under subcategory Assessment, under the Geospatial Product category.	GEA
Evacuation Plan	Data	The documented process of departure of people from a particular location, usually due to an emergency or natural disaster. The geospatial-temporal context of the evacuation plan, which includes maps and reports that convey plan objectives, schedules and details, which includes: estimated population densities, threat locations, threat consequences, evacuation routes, mutual aid support facilities, etc. A type of HLS Framework Data under the Plan subcategory of HLS Framework Data under the Geospatial Product category.	GEA
Evacuation Planning & Management	Application	The means to produce and implement plans that convey the details pertaining to evacuation of a current or planned disaster/threat area. Produces Evacuation Plans.	GEA

Geospatial Term	Type	Definition/Description	Reference
Event Analysis	Application	<p>The means to (data) mine, integrate, and correlate varied types of events (occurrences, incidents, activities) for the purpose of extrapolating, analyzing and deriving geospatial data in the form of patterns (e.g., cluster), densities, trends, networks, tendencies, indicators, hypotheses, and conclusions, as it pertains to event understanding. The means to document and share the context for NSSEs. Source data include, but are not limited to, intelligence, incidents, occurrences, case, criminal and suspicious activities, financial transactions, persons, organizations, goods, cargo, hazmat, conveyances, etc. May also involve geoparsing and geocoding functions to scan and annotate associated textual data with geospatial-temporal references.</p>	GEA
Event Plan	Data	<p>The documented process of an organized occurrence. The results of Event Planning & Analysis for major events (e.g., Super Bowl). The geospatial-temporal context of the event plan, which includes maps and reports that convey plan objectives, schedules and details which includes: event venue (location/time/activity), facilities, assets, personnel, security plans, evacuation plans, mutual aid support plans, etc. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
Event Planning & Analysis	Application	The means to produce Event Plans for major events (e.g., Super Bowl), and to examine the potential threats and vulnerabilities in context with event venue (location/time/activity), facilities, assets, personnel, security plans, evacuation plans, mutual aid support plans, etc.	GEA
Event (Records)	Data	Any event (incident, occurrence, or EVENT) of interest with geospatial and temporal context. A category of HLS Framework Data.	HLS EA

Geospatial Term	Type	Definition/Description	Reference
EVENT (Records)	Data	A special event (Olympics, Super Bowl, World Series) that may be the target of a terrorist. A threat to national security. A NSSE includes historical records of interlinked, multi-media data that characterize the EVENT. EVENT records provide a complete historical geospatial and temporal context for all activities associated with the EVENT, and link to intelligence, maps, reports, imagery, analyses (risk, threat, vulnerability), plans (mitigation, preparation, response, recovery, etc.), threat consequence modeling outputs, assessments, and tracking of assets, parties, conveyances, goods, etc. that are related to the EVENT. Includes location/time/identity/activity/status for all occurrences and activities associated with the EVENT. A category of HLS Framework Data.	GEA
Event Venue	Data	A schedule of planned activities and locations for a major event (e.g., Super Bowl). A subtype of Event Plan.	GEA
Evidence	Data	The current and historical location/time/identity/status associated with the collection of individual pieces of data or artifacts associated with a case, and locations of evidence storage to ensure chain of custody. A subcategory of HLS Framework Data under the Goods category. (Also see Case.)	GEA

Geospatial Term	Type	Definition/Description	Reference
Exercise Planning	Application	The means to produce accounts that convey the details pertaining to training drills for simulated threat(s) for a given area/facility/event. Produces Exercise Plans.	GEA
Exercise Plan	Data	The document process for drills related to training and preparation. The results of training exercise planning. The geospatial-temporal context of the plan, which includes maps and reports that convey objectives and situation context for the exercise, including: area/facility/event location detail, simulated threats, threat consequences, response objectives, asset locations, population densities, evacuation routes, mutual aid support facilities, etc. A type of HLS Framework Data under the Plan subcategory, under the Geospatial Product category.	GEA
Facilities	Data	Geospatial representations of surface, above surface and sub-surface structures, and installed Heating, Ventilation & Air Conditioning (HVAC), plumbing, electrical, security systems, and other installed infrastructure for any facility identified as a critical or key asset. Also, associated real property (e.g., rights of way, easements, etc) A category of HLS Framework Data.	GEA

Geospatial Term	Type	Definition/Description	Reference
Facility Mapping & Management	Application	<p>The means to create and maintain detailed geospatial records of structure(s) for the purpose of managing the structure(s) and related land and infrastructure. Used in planning, construction, security and maintenance. Used to produce facility Maps, Plans and Reports. Assure compliance with all applicable laws regulating the development, use or transfer of property. These include National Environmental Policy Act (NEPA), Americans with Disabilities Act (ADA), Clean Water Act (CWA), Occupational Safety and Health Act (OSHA), Superfund Act, state and local permitting, and so on. Any planned construction activity at federally owned/operated facilities requires compliance with these laws. Used to manage space utilization of existing facilities to assure that space, furniture and equipment are adequate to support current and future mission requirements.</p>	GEA
False Alarms	Data	<p>Alerts generated by observation and/or analysis that are determined to be invalid threat indications through subsequent analysis. A type of HLS Framework Data under the Alert subcategory of the Communications category.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
Feature	Data	An abstraction of a real world phenomenon. A geographic entity with a location relative to the earth. Usually represented by vector data (points, lines and polygons) with geometry, topology and descriptive properties (attributes). An HLS geospatial entity subtype.	OGC, ISO
Foundation Data (NGA)	Data	Base features or coverages that can be used as a common underlay for more specific mission or project data.	NGA
(HLS) Framework Data	Data	The core types of geospatial data required in support of the HLS mission. Meets HLS geospatial data standards. All HLS Framework Data are registered to a common coordinate reference system.	GEA
Fusion	Process	The process of merging data by exploiting their geospatial-temporal properties. To combine geospatial data. To combine any HLS enterprise data on the basis of their geospatial-temporal properties.	GEA

Geospatial Term	Type	Definition/Description	Reference
Gateway Service	Technology	The Gateway Service is a technology used to determine the geospatial position of a known mobile terminal from a wireless network. Position is expressed in geographic coordinates. Mobile terminals (cell phones, Personal Data Assistant (PDAs), etc) must be equipped with GPS or some other position determination technology. An important service used in Location-Based Services (LBS), in the wireless realm.	GEA
Gazetteer	Data	An authoritative source of geographic names with coordiante locations (see Geographic Names and Geonames).	GEA
Gazetteer Service	Function	The ability to determine the geospatial coordinates for a place, given place name and/or attributes. This function accesses a database of geographic place names, together with their geographic locations and other descriptive information.	GEA

Geospatial Term	Type	Definition/Description	Reference
Gazetteer Service	Technology	<p>Able to access a Gazetteer, which is a directory of well-known places and their locations. It generally consists of point features. A Gazetteer Service is a network-accessible service that retrieves one or more features, given a query (filter) request. This filter request must support selection by well-known feature properties. Queryable feature properties include, but are not limited to, feature type, feature name, authority, or identification code. Each instance of a Gazetteer Service has an associated vocabulary of identifiers. Thus, a Gazetteer Service may apply to a given region, such as a country, or some other specialized grouping of features. The returned features will include one or more geometries expressed in a well-known Coordinate Reference System.</p>	GEA, OGC
Geocode	Function	<p>The ability to determine geospatial coordinates, given an address.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
Geodetic Control	Data	Points of known precise location on the earth (latitude, longitude, elevation) as established through surveying or photogrammetric methods. Control points that are expressed in a common coordinate reference system (e.g., World Geodetic System 1984 (WGS – 84)). Geodetic control is required to accurately register spatial data. The National Spatial Reference System is the fundamental geodetic control for the United States. A subcategory of HLS Framework Data under the Base category.	GEA
Geographic Affiliation	Data (Property)	Relates a person, good or asset to a physical location related to the earth (relative or absolute). These geospatial-temporal properties are stored in HLS Framework Data under Party (Person or Organization), Goods or Asset Records.	GEA
Geographic Information System (GIS)	Technology	An integrated system of computer hardware, software, and set of procedures designed to create, store, query, display and analyze geospatial data and related attributes.	GEA

Geospatial Term	Type	Definition/Description	Reference
Geographic Names	Data (Property)	An authoritative source of geographic names with locations. E.g., Trafalgar Square, White House, Washington, D.C. Typically available through an online Gazetteer or Location-based Directory. (See Gazetteer and Geonames). A subcategory of HLS Framework Data, under the Base category.	GEA
GIS Client	Technology	A general-purpose client, either thick or thin, that provides visualization and interaction with geospatial data.	GEA
GIS Server	Technology	The GIS server is comprised of bundled services that support the generation, revision, management, processing, and output of geospatial data. Consists of the server-side components comprising a GIS.	GEA

Geospatial Term	Type	Definition/Description	Reference
Geocoder/Reverse Geocoder Services	Technology	<p>Able to determine geospatial coordinates, given an address (Geocoder), or determine address, given geospatial coordinates (Reverse Geocoder). A Geocoder transforms a description of a feature location, such as a place name, street address or postal code, into a normalized description of the location, which includes coordinates. A Geocoder Service receives a description of a feature location as input and provides a normalized address with coordinates as output. The feature location descriptions are any terms, codes or phrases that describe the features, and that are well known to the Geocoder Service, such as a street addressing or postal coding scheme.</p> <p>These services are very important across the HLS enterprise, as they enable enterprise users to exploit the geospatial-temporal context of the wide diversity of HLS business data that contain Location References, such as address, building name, census tract, etc. They are also key to correlating, integrating and fusing dissimilar data on the basis of geospatial-temporal characteristics.</p>	GEA, OGC

Geospatial Term	Type	Definition/Description	Reference
Geolink	Data (Property)	A geo-enabled hyperlink (URI). This link may reference any geospatial-temporal resource (data/service). e.g., A geolink may reference a Location Object or a particular Feature on a given map. Geolinks provide the means to link between digital text/voice terms and the geospatial realm.	OGC
Geolocate	Function	The means to determine a geospatial position (the coordinates in a geographic coordinate reference system, a.k.a. position determination), or more generally, a location, for an object of interest (e.g., person, asset, conveyance, goods, cargo, device, etc.)	GEA
Geolocate Service	Technology	The means to determine a location for a fixed or Mobile Object of interest (e.g., geospatial feature, person, asset, conveyance, goods, cargo, device, etc.) Mobile Objects must be equipped with GPS, Radio Frequency Identification Device (RFID), and/or other position determination technologies.	GEA, OGC
Geometry (Geospatial)	Data (Property)	The geometric properties of geospatial data.	GEA

Geospatial Term	Type	Definition/Description	Reference
Geoname	Data (Property)	The designation/identifier (name) associated with a specific geographic location/place. A place name. E.g., Trafalgar Square, White House, Washington, D.C. Typically available through an online Gazetteer or Location-based Directory.	GEA
Geoparse	Function	The means to decompose text data in order to pinpoint geospatial and temporal terms. Optionally, also the means to geocode the terms and establish geospatial hyperlinks to geospatial-temporal resources (e.g., Location on a particular Map).	GEA
Geoparser Service	Technology	Geoparsing refers to the capability to scan and decompose a textual document, identifying key words and phrases that have geospatial-temporal context. A Geoparser Service works in the context of two bodies of information: a reserved vocabulary (a dictionary of place names, a gazetteer or a directory of Points of Interest (POIs) and a text source (e.g., a newspaper or cable.) The Geoparser returns all occurrences of the use (in the text source) of any term in the reserved vocabulary. Each occasion establishes a geolinks (geospatial/temporal-aware hyperlink) between text terms and the geospatial location associated with the reserved word. That result is an annotated text document with geolinks.	GEA, OGC

Geospatial Term	Type	Definition/Description	Reference
Geoprocessing	Process	The process of creating, updating, analyzing, modeling, rendering and otherwise utilizing geospatial data.	GEA
Georeferenced	Data	Any geospatial data. Earth associated data employing a geographic coordinate reference system.	GEA
Geosecurity	Data	The means to control and manage access on the basis of geospatial properties.	GEA
Geospatial Analysis	Data	The information products (data) that results from geospatial analysis. An Assessment. A type of HLS Framework Data under the Assessment subcategory of the Geospatial Product category.	GEA
Geospatial Analysis	Process	The process of mining, integrating, correlating, extrapolating, or otherwise analyzing geospatial data to determine geospatial-temporal patterns (e.g., cluster), densities, trends, networks, line of sight, tendencies, indicators, hypotheses and conclusions. See Threat Analysis, Threat Consequence Analysis, Vulnerability Analysis, Case Analysis, Damage Assessment, Event Analysis, Mitigation Planning & Analysis, Performance Planning & Analysis, and Screening and Risk Analysis.	GEA

Geospatial Term	Type	Definition/Description	Reference
Geospatial Application Components	Technology	Specialized Geospatial Applications may have one or more server-side Geospatial Application Components. These server-side components contain geospatial business logic and reference Geospatial Enterprise Services, which are common geospatial services that are available throughout the enterprise.	GEA
Geospatial Context	Data	Broadly, the geospatial characterization (classes, types and properties) of HLS data.	GEA
Geospatial Coordinate	Data (Property)	The coordinates of a geospatial position expressed in a geospatial coordinate reference system, e.g., geographic – latitude, longitude, and elevation.	GEA
Geospatial Data	Data	Broadly, HLS data that have geospatial properties or are defined as geospatial entity subtypes. HLS geospatial entity subtypes include: Location Object, Feature, Coverage, Observation, Route, Mobile Object and Structure. HLS requires standards for common exchange of all geospatial entity subtypes embedded in any network messages, e.g., an Observation encoded in Geography Markup Language (GML).	GEA, OGC, ISO

Geospatial Term	Type	Definition/Description	Reference
Geospatial Data Format Conversion, Import/Export Services	Technology	Able to import/export, manipulate and convert geospatial data, through standard services. Formats include GML, MapInfo, ESRI, Intergraph, etc.	GEA, OGC
Geospatial Data Rollup (GDR)	Process	The means by which geospatial data are “rolled up” from data producer/steward nodes to common higher-level enterprise nodes, and then replicated as necessary. GDR is made possible by standards that are strictly and rigorously enforced between all nodes involved in rollup operations. Strict rules and guidelines for data creation and update transactions and reporting must also be followed. The objective of GDR is to optimize automation of the process so that all operational elements involved in HLS always have the best data.	GEA
Geospatial Data Standards	Data	The accepted models of authority associated with geospatial information (data). A type of standard under the Mandate subcategory of the Governance category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Geospatial Data Transfer	Application	The means to move, copy, or exchange geospatial data between enterprise database nodes, which cuts across the HLS enterprise. Includes operations to support periodic synchronizations of databases based upon update transactions to the master database. Used to accomplish replication operations between redundant nodes to support continuous 24/7 assured mission operations. Used to accomplish data rollup operations for HLS Framework Data (synchronize data up the local-state-federal chain). Includes the required management tools. Produces Transaction Reports and Audit Trails.	GEA
Geospatial Data Transfer Standard	Data	Geospatial data format specifications to facilitate the exchange of geospatial data between organizations in a common data format. A type of standard under the Mandate subcategory of the Governance category.	GEA
(HLS) Geospatial Entity Type	Data	The basic data type for HLS geospatial data that are used in geospatial services. Includes the subtypes: Location Object, Feature, Coverage, Observation, Route, Mobile Object and Structure.	GEA
Geospatial Extent	Data	The area of a geospatial entity type, as defined by a minimum bounding rectangle or polygon.	GEA

Geospatial Term	Type	Definition/Description	Reference
Geospatial Information Technology (GIT)	Technology	Broadly applies to all geospatial information processing technologies. e.g., Position determination (GPS, etc.), GIS, Remote sensing (sensors and observations), Surveying, LBS, Location-Based Tag & Track, Telematics, AVL, Modeling & Simulation, Image Processing, Terrain Visualization, AM/FM and SCADA.	GEA
Geospatial Infrastructure	Technology	The underlying base or foundation geospatial technologies required for the HLS enterprise.	GEA
Geospatial Integration Broker	Technology	A key component used in moving geospatial data between systems. Involved in data sharing and collaboration operations in support of the COP and MSOP. Involved in GDR Operations.	GEA
Geospatial Integration & Test Tools	Application	Tools that support examining and uniting of geospatial component services and applications. Consists of geospatial standards registry, reference implementations and test tools (including simulations and modeling for threat scenarios). Part of the Reference Architecture for the HLS GEA.	GEA

Geospatial Term	Type	Definition/Description	Reference
Geospatial Metadata	Data	Data about geospatial data. Any metadata that has geospatial properties.	GEA
Geospatial Model	Data	Data that define a geospatial schema. A subcategory of HLS Framework Data under the Model category.	GEA
Geospatial One-Stop Portal	Technology	An e-government initiative designed to facilitate the sharing and dissemination of geospatial data and resources over the Internet. A Web-based Portal for one-stop access to maps, data and other geospatial services.	GEA
Geospatial Processing Workstation	Technology	A Geospatial Processing Workstation is a high-end computer dedicated to GIS, Image Processing and other demanding geospatial processing tasks. Geospatial Processing workstations may be Unix or Windows based. They typically are characterized by large memory, large screen video, and massive disk storage.	GEA

Geospatial Term	Type	Definition/Description	Reference
Geospatial Product	Data	Broadly, any HLS 'product' (i.e. artifact, data, map, widget, etc.) that have geospatial properties or are defined as geospatial entities. Any geospatial information that are published in accordance with standards for consumption by HLS users, government officials and the public. Includes maps, imagery, location-based reports, assessments, analyses, plans, aids, profiles and so forth that characterize the earth and also the geospatial-temporal context of risks, threats, vulnerabilities, facilities, intelligence, events, hazards, plans, etc. A category of HLS Framework Data.	GEA
Geospatial Property	Data (Property)	The spatial geometry or attributes (including references) that define position on the earth (or location).	GEA
Geospatial Information Dissemination Protocols	Data	The standard procedures for passing geospatial content on a network (geospatial data and intelligence reporting and dissemination). A subtype of Standard under the Mandate subcategory of the Governance Category.	GEA
Geospatial Service (Component) Standards	Data	The conventions associated with geospatial service components. A subtype of Standard under the Mandate subcategory of the Governance Category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Geospatial Standards	Data	Generally, the accepted and widely recognized models of authority or excellence that apply to HLS geospatial capabilities. Consists of standards for geospatial services, data and communication protocols. A subtype of Standard under the Mandate subcategory of the Governance Category.	GEA
Global Positioning System (GPS)	Technology	A radio navigation system consisting of 24 earth-orbiting satellites that enable users to determine accurate geospatial position, velocity and time using a GPS receiver and associated computational capabilities. Determines geographic coordinates expressed in World Geodetic System 1984 (WGS - 84. Key technology for positioning, navigation and timing (PNT) in support of HLS mission. Useful for tracking and monitoring of assets, goods, cargos, persons and conveyances, especially for real-time operations.	GEA

Geospatial Term	Type	Definition/Description	Reference
Goods (Record)	Data	Assets being transported by Conveyance. The records for description (including a digital record of credentials), tracking and monitoring of assets (e.g., place of manufacture, shipping history in geospatial context – location/time/identity/status), and including money. May reference location, case, conveyance, risk, event (incident, occurrence, Event) or Party (person or organization) records. Subcategories include Cargo, parcels/packages, evidence, money, Hazmat and any other types of goods/things of interest. A category of HLS Framework Data.	HLS EA, GEA
Graphics Viewer Plug-in	Technology	The means to visualize and interact with 2D and 3D geospatial data in pictorial representation, where the user may interact/change geospatial elements. Provides tools to select geospatial features/locations/structures/routes/observations/mobile-objects for viewing, set view window, display chosen view, measure and pinpoint, navigate through view with pan and zoom, etc. Optionally choose symbology, graphics display template or select previous views.	GEA
Hazard	Data	A risk/danger (i.e., hazard) assessment in geospatial-temporal context, e.g., the floodplain for 100 year flood. May be Geospatial Data or Geospatial Product.	GEA

Geospatial Term	Type	Definition/Description	Reference
Hazard Map	Data	A graphic representation that conveys a risk/danger (i.e., hazard) assessment in geospatial-temporal context. A type of assessment, under the subcategory Assessment, under the Geospatial Product category.	GEA
Hazard Modeling, Analysis & Mapping	Application	The means to create, represent, break down, simulate and maintain detailed geospatial records of hazards for the purpose of characterizing and managing the threats (risks) associated with the hazard. Used in emergency preparedness, response and recovery planning and operations. Used to produce Hazard Maps and related Reports.	GEA
Hazmat (Records)	Data	The records for description (including a digital record of credentials), tracking and monitoring of hazardous materials, e.g., place of manufacture, or current, historical and scheduled location/time/identity/activity/status (shipping history). May reference location, case, conveyance, risk, event (incident, occurrence, Event), Party (person or organization), or case records. A subcategory of HLS Framework Data under Goods.	GEA

Geospatial Term	Type	Definition/Description	Reference
Health & Safety Monitoring	Application	The means to track the locations of Notice of Violations (NOV) and reported incidents to assess problem work sites or otherwise dangerous conditions. Perform pre-deployment environmental health and safety evaluations of potential work sites, such as Disaster Field Offices (DFOs) or other temporary work environments.	GEA
Hydraulic-Hydrographic Modeling	Application	The means to create, control, display and store the results of hydraulic and hydrographic models, e.g., Hydrologic Engineering Center 2 (HEC2), Better Assessment Science Integrating Point and Nonpoint Sources (BASINS), and others.	GEA
Hyper-spectral Scanners	Technology	Any device that is specialized for measuring radian energy using contiguous bands of spectral data across a broad range of electromagnetic spectra. The resulting image can be visualized as a 3-dimensional dataset with two spatial and one spectral dimension, which is often referred to as an image cube.	GEA

Geospatial Term	Type	Definition/Description	Reference
Identity (Records)	Data	The current descriptive geospatial information about a person, organization, or goods that defines their identity. For persons, can include place of birth, citizenship, current address(es), etc. Descriptive geospatial and identity information about goods, like place of manufacture, address, etc. Includes digital records of credentials. A type of HLS Framework Data under Person or Organization category, or the Goods category.	GEA
Image Archive Service	Technology	The Image Archive Service accesses digitally stored photographs (i.e., raster data). It makes use of WCS and Image Catalog Service Tier 3 components.	GEA
Image Processing Client	Technology	A desktop client, either thick or thin, that provides visualization and interaction with geospatial imagery data. Many specialized geospatial imagery applications may exist within the HLS EA.	GEA
Image Processing Server (IPS)	Technology	The IPS server is comprised of bundled services that support the generation, revision, management, processing, and output of geospatial image data. Consists of the server-side components comprising an IPS.	GEA

Geospatial Term	Type	Definition/Description	Reference
Image Viewer Plug-in	Technology	The means to visualize and interact with geospatial images (rectified or unrectified). Provides tools to select image and optional graphics overlays for viewing (geospatial features/locations/structures/routes/observations/mobile-objects), set view window, display chosen view, measure and pinpoint, navigate through view with pan and zoom, etc. Optionally choose symbology, image display template or select previous views.	GEA
Image(ry)	Data	A graphic representation of an object or scene, typically produced by an optical or digital electronic device. May be in still or motion format. Common examples include remotely sensed data (e.g., satellite data and airborne data), scanned data, aerial photographs, motion imagery, and photographs. An image is normally stored as a raster data set of binary or integer values that represent the intensity of reflected light, heat, or other range of values on the electromagnetic spectrum. An HLS Framework Data category. A subtype of coverage.	GEA
Imagery Analysis	Process	The process of examining (analyzing) and interpreting remotely sensed imagery in order to discern spatial patterns or features of interest.	GEA

Geospatial Term	Type	Definition/Description	Reference
Incident	Data	<p>A specific instance of carrying out a threat that may or may not result in harm to a party or asset. It requires a response above and beyond the normal daily operations. Current and historical geospatial and temporal context associated with any type of incident, whether natural or man-made. Incidents may be occurrences of an instance of a single threat type, or include combinations of occurrences of multiple threats (e.g., high explosive combined with radiological-dirty bomb; hurricane or typhoon with flooding, etc). Incident data provide a complete historical geospatial and temporal context for all activities associated with the incident (preparation, mitigation, response, recovery), and may link to intelligence, maps, reports, analyses (risk, threat, vulnerability), plans (mitigation, preparation, response, recovery, etc.), consequence modeling outputs, assessments, and tracking of assets, parties, conveyances, goods, etc. associated with the incident. Includes location/time/identity/activity/status for all occurrences and activities associated with the incident. A category of HLS Framework Data.</p>	HLS EA, GEA

Geospatial Term	Type	Definition/Description	Reference
Incident (/Event) Management	Application	The means to support command and control for an occurrence or event, including situation awareness, monitoring threats and threat assessments, coordinating and monitoring response activities, assets, personnel, etc., and reporting status to persons in the command and control chain (see incident reporting). Create and manage incident/event data. Generate and disseminate alerts and warnings. Support pertinent communications. Reference relevant weather and other supporting geospatial data. Determine containment areas, logistics and deployment plans and ingress/egress routes for incidents. Update incident/event records to reflect response results.	GEA
Incident Reporting	Application	The means to generate detailed accounts about occurrences for proper authorities.	GEA
Incident Report	Data	The geospatial-temporal context of occurrences in detailed account form(i.e., reports). Reports contain interlinked, multi-media data that adequately characterize the nature and context of the incident. Reports may contain references to plans, maps and other reports. A type of HLS Framework Data under subcategory Report, under the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Incident Report Service	Technology	Able to generate an Incident Report (detailed account of an occurrence) with information about a location-based incident message.	GEA
Integration	Process	The process of relating two or more physical data sets by exploiting geospatial-temporal properties, creating a virtual whole. To cross-reference related geospatial data. To integrate any HLS enterprise data on the basis of their geospatial-temporal properties.	GEA
Intelligence	Data	Knowledge concerning threats and potential threats as it applies to the broad HLS mission. A category of HLS Framework Data.	GEA

Geospatial Term	Type	Definition/Description	Reference
Interferometric SAR	Technology	Interferometric Synthetic Aperture Radar (InSAR) is a technique that enables measurement of very small movements of the earth's surface, as subtle as centimeters or less. The SAR interferometry technique acquires a pair of images from two radar measurements, taken from two marginally displaced coherent observations of the surface. For each pixel corresponding to the same ground area in both images, phase values are differenced to produce an interferogram, which, using the orbit parameters, is subsequently used to produce a Digital Elevation Model (DEM).	GEA
Interoperability (Geospatial)	Process	Ability of different processors, middleware, software and networks to interface and communicate with each other in order to share geospatial data and/or services.	GEA
Interview (Records)	Data	The geospatial context associated with conversations conducted to elicit specific information (i.e., interviews). A type of HLS Framework Data under the Person subcategory of the Party category.	GEA
Intervisibility	Function	The means to determine whether or not there is clear visibility between two locations, or from an observation point/platform to an observation area. See line-of-sight.	GEA

Geospatial Term	Type	Definition/Description	Reference
Itinerary (Records)	Data	The detailed account(s) pertaining to a person's planned travel. The location/time/identity/planned-activities/status of places, persons and organizations to be visited. May include the means of transit, route(s), and travel guidance. A type of HLS Framework Data under the Person subcategory of the Party category	GEA
Key Asset	Data	Individual equities whose destruction would not endanger vital systems, but could create local disaster or profoundly damage our Nation's morale or confidence. Key assets include symbols or historical attractions, such as prominent national, state, or local monuments and icons. Key assets also include individual or localized facilities that deserve special protection because of their destructive potential or their value to the local community. Examples include: National Icons, Monuments, and Marine Resources. Any 'Key Assets' as defined in PDD – 63. The geospatial context of these assets is represented by a category of HLS Framework Data.	HLS EA
Law Enforcement Assets	Data	A law enforcement officer's equipment: gun, munitions, baton, etc. These may be tracked by Asset Inventory Management and may or may not have geospatial context.	HLS EA

Geospatial Term	Type	Definition/Description	Reference
License/Permit (Records)	Data	The geospatial-temporal context associated with documented official or legal permissions. A type of HLS Framework Data under the Person or Organization subcategories of the Party category, or a type under the Goods category.	GEA
Light Detection and Ranging (LiDAR)	Technology	The Light Detection and Ranging (LiDAR) is an active remote sensing system that can be operated in either a profiling or scanning mode using pulses of light to illuminate the terrain. By accurately measuring the round trip travel time of the laser pulse from the aircraft to the ground, a highly accurate spot elevation and topology can be calculated.	GEA
Line-of-Sight	Function	The means to determine whether or not there is intervisibility (visual line-of-sight) between two or more points in space, e.g., from a viewpoint to a target, between a point and an area or line, or between a line (e.g., flight path) and a point(s), line(s) or area(s). Also, the means to determine electronic line-of-sight for a signal.	GEA
Locate	Process	The ability to determine the position of a person, thing, or phenomenon.	GEA

Geospatial Term	Type	Definition/Description	Reference
Location	Data	A broadly used term that refers to any place of interest on the earth. See Location Object for precise meaning and use as an HLS Data Object.	GEA
Location Object	Data	Any place or site on the earth of interest in the HLS mission. A position with geospatial coordinates. Generally, as used in HLS business, a place or point of interest. Also, the location of a person, thing or any other phenomenon referenced to the earth. Includes Absolute Location and Relative Location. As defined by OGC (Location), the extensible, abstract data type for all expressions of location that can be used by geospatial applications and services to specify the location of a target, asset, conveyance, person, etc. As used in LBS, a Location is the root of a semantic tree that includes a Point, Position, Address, and Point of Interest as its subtypes. An HLS geospatial entity subtype.	GEA, OGC
Location-Based Messaging Client	Technology	The means to visualize location-based messages (communications with embedded geospatial elements). Example messages include alerts, warnings, emergency declarations, location report and situation reports.	GEA

Geospatial Term	Type	Definition/Description	Reference
Location-Based Messaging Service	Technology	<p>The means to represent location-based messages (communications with embedded geospatial elements). Location-based messages include alerts, after action reports, warnings, emergency declarations, location reports, situation reports and NSSE Reports.</p> <p>The Location Organizer Folder (LOF) is a standard message container model for capturing multi-media data in a geospatial context. It is based upon XML (Extensible Markup Language) and GML.</p>	GEA, OGC
Location-Based Services (LBS)	Technology	<p>Location-Based Services combine Web, wireless and geospatial technologies to provide the means to exploit positional information anywhere, anytime, and on any device. Generally, any services involving a mobile terminal (e.g., cell phone, PDA or notebook) and mobile users.</p>	GEA
Location-Based Tag & Track	Technology	<p>Technology for designating and following assets, equipment, goods, cargos, conveyances, and persons. e.g., GPS with RFID.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
(Location) Directory Service	Technology	The (Location) Directory Service provides access to online lists (databases) of persons, places, products and/or services (e.g., Yellow/White/Green/Blue Pages, Restaurant/Travel/Entertainment Guides, Community Services, etc). This service is ordinarily used to find the location of a specific or nearest person, place, product and/or service. It is an important service used in LBS.	GEA, OGC
Location Reference	Data	Any means for representing location. A direct or indirect association to a physical location. Examples include an address, census block, geoname, coordinates, etc. Comprised of the standard geospatial elements/properties associated with any 'geospatial data' (i.e., any data which are captured, stored and managed within the HLS enterprise as geospatial data), or with any 'non-geospatial data', which are any HLS business data that are predominantly non-geospatial, and yet they have geospatial elements/properties that can be exploited through geospatial services.	GEA
Location Search & Reporting	Application	The means to search person, case, event, facility and property records using geospatial-temporal criteria, and then generate Location Reports conveying query results.	GEA

Geospatial Term	Type	Definition/Description	Reference
Location Report	Data	The query results pertaining to a person, case, event, facility or property expressed in location-based report form (detailed positional account). Reports contain interlinked, multi-media geospatial data. A type of HLS Framework Data under subcategory Report, under the Geospatial Product category.	GEA
Location (Site) Report Service	Technology	Able to generate a Location Report (detailed positional account) with information about an HLS data object's location, related entities, and geospatial context. Example objects include geospatial feature, person, asset, conveyance, goods, cargo, device, etc.	GEA
Logistics Plan	Data	The documented management of the details of an operation. The geospatial-temporal context of an logistics plan, which includes maps and reports that convey objectives, schedules, deployments and contingencies concerning the distribution and use of goods (materials and supplies), assets, conveyances and related personnel in meeting the needs of emergencies. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Logistics Planning	Application	The means to produce logistics plans that convey the movement and deployments of goods, cargo, conveyances, assets and related personnel, for HLS operations.	GEA
Manifest	Data	A list of passengers and cargo carried on a ship. A type of HLS Framework Data under the Cargo subcategory of the Goods category.	GEA
Map (and Charts)	Data	Generally, an annotated, symbolized graphical representation of select geospatial-temporal data for an intended purpose. Also, a map created by an orthorectified image. May contain annotations and marginalia. May be in hardcopy or softcopy form. May reference a Report or Plan. May be referenced by or embedded in a Report or Plan. A subcategory of HLS Framework Data under the Geospatial Product category.	GEA
Map Publication	Application	The means to produce finished softcopy and hardcopy maps for use in HLS operations. Includes the assembly and integration of data, symbolization, annotation, legend/marginalia generation and placement, and cartographic finishing. This capability is required throughout the HLS enterprise.	GEA

Geospatial Term	Type	Definition/Description	Reference
Map Publication Service	Technology	Able to automatically generate and broadcast Maps of interest for inclusion in a plan, report, or other Geospatial Product, with select content and symbolization (map template). To produce a Map for inclusion in a word or graphic document.	GEA
Map Viewer Plug-in	Technology	The means to visualize and interact with geospatial data in rendered map form. Provides tools to select base map/image data for viewing, select optional graphics overlays (geospatial features, locations, structures, routes, observations, mobile-objects), set view window, display chosen view, measure and pinpoint, navigate through view with pan and zoom, etc. Optionally choose symbology, map display template or select previous views.	GEA
Metafeature	Data	An entity (feature) that synoptically represents and/or references other features. A complex or compound feature.	GEA

Geospatial Term	Type	Definition/Description	Reference
Mission Feature	Data	A geospatial entity that represents a pursuant target (object) or constraint in some HLS operational context. Types of Mission Features include: At Risk Location (typically an area), Containment Area, Boundary Zone, Observation Area/Point, etc. Also see AOI, POI, and Place of Interest. An HLS Framework Category.	GEA
Mission-Specific Operating Picture (MSOP)	Data/ Technology	The collective set of time-sensitive, mission-critical, shared resources (data and services) associated with an area and subject of interest that conveys situational context for a mission. Contains geospatial context (a composite of HLS Framework Data and HLS Auxiliary Data), the disposition and nature of threat(s), friendly personnel and assets, as well as incidents, events, observations, related intelligence, and other relevant mission data. A MSOP draws upon the shared resources of the COP. A subcategory of HLS Framework Data, under COP.	GEA

Geospatial Term	Type	Definition/Description	Reference
Mission Plan	Data	The scheme designed to reach specific objectives or assignments. The geospatial-temporal context of a mission plan, which includes maps and reports that convey objectives, threats, deployment/route details, contingencies and situation context for the mission, as well as the navigation instructions and guidance data to support electronic navigation. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA
Mission Planning	Application	The means to scheme, program, schedule and allocate assets to a mission; to develop data collection plans that convey schedule, tasking and resource allocation for collection assets.	GEA
Mission Rehearsal	Application	The means to verify and simulate pre-planned missions involving navigation guidance for mobile assets. Employs Mission Rehearsal Models. Input to these models consists of terrain, threats, threat avoidance constraints, features, weather, other environmental conditions, planned/predicted navigation guidance, asset operating constraints, etc. Outputs consist of 4D, simulated rehearsals, in their projected operating environments.	GEA

Geospatial Term	Type	Definition/Description	Reference
Mission Rehearsal Models	Data	Schematics that characterize the behaviors of mobile/dynamic mission (plan of action) assets and the effects of these assets in a mission rehearsal context. These models are associated with simulations of mission assets in their projected operating environments. A subcategory of HLS Framework Data under Models.	GEA
Mitigation Plan	Data	The scheme designed to minimize and alleviate risks, hazards, emergencies or general occurrences. The geospatial-temporal context of a mitigation plan, which includes maps and reports that convey the planning, scheduling and allocation of all resources required to contain and minimize the impact of a disaster. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Mitigation Planning & Analysis	Application	The means to determine and assess impact of the root cause of an incident/event and to produce mitigation plans and supporting Geospatial Products (assessments, maps, reports, etc) for natural and human induced threats, hazards and disasters, in order to support future emergency response and recovery efforts for impending or possible disasters. Also, the means to analyze post-disaster response effectiveness (post mission assessments and after action reports) and create mitigation plans and supporting Geospatial Products to enhance future planning, safety, preparations, response and recovery operations, countermeasures and training for cases, threats, hazards and disasters.	GEA
Mobile Object	Data	Any entity (object) of interest that is in motion, or is otherwise dynamic, and is monitored and/or tracked. A person, good, conveyance or asset. Mobile objects have location, time, identity, activity, status, and optionally speed and direction of motion. Historical records of location/time/identity/activity/status/speed/direction may be recorded for tracking purposes. An HLS geospatial entity subtype.	GEA

Geospatial Term	Type	Definition/Description	Reference
Model	Data	The schematic description of data that accounts for its properties and characteristics. Geospatial-oriented model to support simulation and autonomous operations. Models have a data perspective (model input and output parameters) and a behavior perspective (software). A category of HLS Framework Data.	GEA

Geospatial Term	Type	Definition/Description	Reference
Model Access Service	Technology	<p>Able to determine and access the extent and nature of a Toxic Dispersion Model (e.g., plume) for a chemical or biological event in air or water. The model output is characterized by features.</p> <p>“Toxic Dispersion” refers to the effects of introducing a chemical, radioactive or biological agent into the atmosphere or a water supply at a point source. Simulation is employed to understand the effects of a toxic agent within its medium. The objective of the simulation is to ascertain contamination levels in a geospatial-temporal context, and thus, to understand the nature of toxic plumes, danger zones, warning zones, and related features, and to be able to view or analyze the output from a simulation run in conjunction with any other geospatial data, e.g., as plumes or danger/warning zones within a geospatial decision support tool.</p> <p>Also, the ability to determine and access weather, hydrographic and other environmental parameters through environmental simulation. The simulation output is characterized by observations.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
Modeling & Simulation	Process	The means to predict aspects of the behavior of some system by creating an approximate (mathematical) model of it. Modeling in space and time through a special-purpose software package, or a more general simulation package aimed at a representation of the attributes of a system.	GEA
Monitor	Process	The ability to systematically observe and report on a location (place/area/point of interest), feature (e.g., building), person, goods, assets, conveyances etc. with the purpose of collecting information about location/time/identity/activity/status.	GEA
Monitor Assets	Application	A program that observes, supervises, manages, or controls the equities or items of value. The means to monitor Assets for change in location/activity/status. To determine and record the current and historical location/time/identity/activity/status of mobile assets, including capital assets, key assets, law enforcement assets, and operational materials and equipment, through observation, tracking and analysis. To perform situation awareness. May lead to reporting of occurrences (e.g., Suspicious Activity Reporting), alerts or Situation Reports.	GEA

Geospatial Term	Type	Definition/Description	Reference
Monitor Conveyances	Application	A program that observes, supervises, manages, or controls transports. The means to monitor Conveyances for change in location/activity/status. To determine and record the current and historical location/time/identity/activity/status of conveyances through observation, tracking and analysis. To perform situation awareness. May lead to reporting of occurrences (e.g., Suspicious Activity Reporting), alerts or Situation Reports.	GEA
Monitor Goods & Cargo	Application	A program that observes, supervises, manages, or controls freight, merchandise, payload, or equities. The means to monitor Goods and Cargo for change in location/activity/status. To determine and record the current and historical location/time/identity/status of goods and cargo through observation, tracking and analysis. To perform situation awareness. May lead to reporting of occurrences (e.g., Suspicious Activity Reporting), alerts or Situation Reports.	GEA

Geospatial Term	Type	Definition/Description	Reference
Monitor Locations	Application	A program that observes, supervises, manages, or controls places, sites, positions, streets, neighborhoods, venues, localities, etc. The means to monitor Locations for change in activity/status. To determine and record the current and historical time/activity/status at a location through observation and analysis. To perform situation awareness. May lead to reporting of occurrences (e.g., Suspicious Activity Reporting), alerts or Situation Reports.	GEA
Monitor Parties	Application	A program that observes, supervises, manages, or controls people, persons, citizens, crowds, etc. The means to monitor Parties (Persons or Organization) for change in location/activity/status. To determine and record the current and historical location/time/identity/activity/status of persons in geospatial context and cyberspace, through observation, tracking and analysis. To perform situation awareness. May lead to reporting of occurrences (e.g., Suspicious Activity Reporting), alerts or Situation Reports.	GEA

Geospatial Term	Type	Definition/Description	Reference
Monitor Recovery	Application	A program that observes, supervises, manages, or controls cleanup, decontamination and restoration. The means to monitor incident locations for change in activity/status pertaining to cleanup, decontamination and restoration. Employ recovery plans to support recovery operations. Determine and record the current and historical time/activity/status at recovery locations through observation and analysis for subsequent analysis and legal implications. Produce location-based After Action Reports that contain recovery progress, and environmental impact assessments.	GEA
Monitoring Service	Technology	Able to determine (or fetch a predetermined) location/time/identity/status/activity series for a Location.	GEA
Multi-spectral Scanners	Technology	Any device that is specialized for measuring radian energy of the earth's surface using discrete bands of spectral data ranging from the blue to the near-infrared portions of the electromagnetic spectrum.	GEA

Geospatial Term	Type	Definition/Description	Reference
Mutual Aid Support Plan	Data	May result from certain planning and analysis activities for major events (e.g., Super Bowl), emergency preparations/response/recovery, etc. The geospatial-temporal context of the mutual aid support plan, which includes maps and reports that convey plan objectives (deployment sites, logistics, etc), schedules and activities in geospatial context. A type of HLS framework data under subcategory Plan, under the Geospatial Product category.	GEA
National Affiliation	Data (Property)	Relates a person, good or asset to a nation. A property of HLS Framework Data under Person, Goods or Asset data.	GEA
(The) National Map (TNM)	Data	A seamless, continuously maintained set of Base data for the U.S., consisting of both feature and coverage data that meet consistent National standards. The National Map (TNM) will serve as the central portal for the sharing and dissemination of critical geospatial information. The 'Base Map' for HLS operations.	USGS

Geospatial Term	Type	Definition/Description	Reference
National Security Special EVENT (NSSE) Report	Data	A location-based detailed-account (report) describing a NSSE. Reports may reference mission plans, incidents, occurrences, assets, persons, organizations, cases, risks/threats/vulnerabilities, risk/threat/vulnerability assessments, threat intelligence, conveyances, goods, cargo, or hazmat records. Reports may contain interlinked, multi-media data that characterize the nature and context of the EVENT. A type of HLS Framework Data under subcategory Report, under the Geospatial Product category.	GEA
National Security Special EVENT (NSSE) Reporting	Application	The means to generate detailed-accounts about NSSEs; also to document suspicious activities in a geospatial context for consideration as NSSEs.	GEA
National Security Special EVENT (NSSE) Report Service	Technology	Able to generate a NSSE Report for an EVENT.	GEA
National Spatial Data Infrastructure	Data, Technology	Provides a consistent means to share geographic data among all users. This includes all technologies, policies, and people necessary to promote sharing of geospatial data throughout all levels of government, the private and non-profit sectors, and the academic community.	USGS

Geospatial Term	Type	Definition/Description	Reference
Native Spatial DBMS	Technology	The Enterprise Database Management System (DBMS) should provide native support for storing and managing all types of geospatial data. Capabilities should include geospatial indexing, open Structured Query Language (SQL) query support with geometry and topology operators, geospatial analytics, geospatial data mining, coordinate transformation and linear referencing.	GEA
Nautical Navigation	Data	Data which pertains to nautical navigation, like waterways, ports, harbors, bridges, navigation aids, traffic, traffic control, (electronic) navigation guidance, fixed hazards and dynamic hazards. A subcategory of HLS Framework Data under the Base category.	GEA
Navigation	Process	The guidance of conveyances or persons from place to place. The act of navigating; the act of passing on water in ships or other vessels or in the air in aircraft; the state of being navigable.	GEA
Navigation Guidance	Data	The navigation instructions and directional data for use in computer-assisted navigation (e.g., Notice to Mariners). A subcategory of HLS Framework Data under the Base category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Navigation Service	Technology	An enhanced version of the Route Service, which determines routes between two or more points with enhanced navigation information. An important service used in Location-Based Services (LBS).	GEA, OGC
Network	Data	A complex interconnected group or system. Includes the following type (of networks): terrorist, hostile interest affiliation, road transportation (road, air, rail, and sea), logistical, energy distribution, communications, water supply, food distribution, emergency response, financial, sociological, etc.	GEA
Network Analysis	Function	The examination of a complex interconnected group or system. The means to analyze transportation, telecommunications, energy supply, water supply and any other networks in geospatial context. The means to determine a Route.	GEA
Notice	Data	Alert information or messaging (notification) between operational actors containing geospatial and temporal context.	GEA

Geospatial Term	Type	Definition/Description	Reference
Observation	Data	Data derived from sensor measurement, human detection, and other sensing and measurement techniques. An HLS geospatial entity subtype.	OGC
Observation Point	Data	A location from which observations (detecting, viewing, sensing) are made by human and/or sensors for monitoring or tracking purposes. A type of Mission Feature.	GEA
Observation Area	Data	An area under observation (detection, surveillance, supervision) by human and/or sensors for monitoring or tracking purposes. A type of Mission Feature.	GEA
Occurrence	Data	An activity (routine transaction) that is of interest in the HLS mission. Can be something that happens at a specific point in time or over a period of time. It requires an expected response as part of normal operations. The geospatial-temporal context of current and historical locations of any suspicious, criminal, terrorist activities of interest, including arrests, offenses, confiscations and seizures. May reference multi-media geo-referenced data (e.g., maps, reports, motion video, still images, etc.) Defines the identity/location/time/activity/status for any activity of interest. A category of HLS Framework Data.	HLS EA, GEA

Geospatial Term	Type	Definition/Description	Reference
Operational Plan	Data	<p>A documented process for a particular method of efficient, productive activity. The geospatial-temporal context of an operations plan, which specifies the allocation of funds, activities and resources by organization and geographic area (congressional district, state, territory, county, reservations, and cities). May also include maps and reports that convey objectives, schedules, deployments, contingencies and the situation context for projected operations, including: threat disposition, blue force disposition, contingency deployments, environmental constraints, etc. Plans may also include standard operating procedures for geospatial data acquisition, management and sharing, as well as the geospatial management and investment plans for all levels of government, developed in cooperation with private and public sector entities. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.</p>	GEA
Operational Planning	Application	<p>A program designed to document the process for a particular method of efficient, productive activity. The means to scheme, schedule and allocate personnel and assets for emergency operations. To develop Operational Plans.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
Organization (Records)	Data	An administrative or functional entity established formally or informally to represent interests or issues or to conduct an activity, as opposed to an individual or person representing oneself. The records for describing and monitoring organizations of interest. Description includes relevant geospatial locations. Monitoring produces current and historical location/time/identity/activity/status data. May reference events (occurrences, incidents, EVENTS), alerts, cases, assets, conveyances, persons, and affiliations with hostile interests. A subcategory of HLS Framework Data, under the Party category.	HLS EA, GEA
Party	Data	A unique individual (living or dead). Can be characterized or identified by historical, biographic, and biometric information. A person or organization of interest in the HLS mission for which geospatial-temporal context is required. A category of HLS Framework Data.	HLS EA, GEA
Patrol	Process	Moving about an area or along a border for the purpose of observation and inspection. Includes engaging adversaries, suspected threats, and perpetrators.	GEA

Geospatial Term	Type	Definition/Description	Reference
Performance Criteria	Data	The rules or standards for assessing system accomplishment (performance) based upon geospatial considerations. A type of HLS Framework Data under the Performance Measure subcategory of the Plan category.	HLS EA
Performance Model	Data	Schemas (models) that characterize the key performance indicators of HLS systems. These models are associated with system performance simulations that are used in performance analyses. Input to these models consists of performance criteria and geospatial performance factors (incidents, events, districts, etc), i.e., geospatial entities of interest for performance monitoring purposes. Model output consists of performance measures by geographic entity/locations. A subcategory of HLS Framework Data under Model.	GEA
Performance Plan	Data	The planned/projected/predicted performance of a system or system resources based upon geospatial factors and criteria. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Performance Planning & Analysis	Application	The means to determine system performance based upon geospatial-temporal factors and criteria. Track and report on Events, incidents, key assets, vulnerabilities, grants, expenses and funding by geospatial areas (congressional district, state, territory, county, reservations, and cities) for DHS activities. Create and evaluate performance criteria and annual performance plans (including accountability reports).	GEA
Person (Record)	Data	The records for description, tracking and monitoring of persons. Includes identity (digital records of credentials, place of birth, citizenship, address) and other biographical information including travel history, geographical/national affiliations, etc. Tracking and monitoring of persons produces current, historical and future (planned or projected) location/time/identity/activity/status data. Person records may include subcategories of other business data including records containing background check, interview, custody, travel, history, itinerary, and license/permit information. May reference events (occurrences, incidents, EVENTS), cases, conveyances and organizations, employment, activity, asset, and risk. A subcategory of HLS Framework Data under the Party category.	HLS EA

Geospatial Term	Type	Definition/Description	Reference
Personal Map Software	Technology	Personal Map Software includes a variety of tools for viewing, annotating and manipulating map data. Typically include map data for standalone operations. Often includes GPS capability for mobile applications. Commercial software for desktop or PDA.	GEA
Photogrammetric Cameras	Technology	Cameras that are specialized for the remote capture and measurement of panchromatic (350-1100 nm) data of the earth's surface. These units are typically mounted on airborne craft and produce photographs that can be transformed into a geo-registered image product using specialized photogrammetric software applications.	GEA
Place of Birth	Data	Location associated with a person's birth. A subtype of LocationObject.	GEA
Place of Destination	Data	Shipping or travel destination. A subtype of LocationObject.	GEA
Place of Interest	Data	May be represented as a point (i.e., point of interest) or an area (i.e., area of interest). A subtype of LocationObject.	GEA

Geospatial Term	Type	Definition/Description	Reference
Place of Manufacture	Data	Place where a good is manufactured. A subtype of Location Object.	GEA
Place of Origin	Data	Shipping or travel origin. A subtype of LocationObject.	GEA
Plan	Data	A documented course of action to be taken in order to achieve a specified goal or objective that is officially designated as a Plan. The results of planning pertaining to a topic of interest, such as an exercise, mission, recovery, etc. The geospatial-temporal context of a Plan. Plans include supporting facts, objectives and projections. May reference one or more Reports, Plans or Maps. A subcategory of HLS Framework Data under the Geospatial Product category.	HLS EA, GEA
Point of Interest (POI)	Data	A place or entity with a fixed position that may be used as a reference point or a target. Generally, any point of interest within the mission. A location of interest represented as a point in a known coordinate reference system, with metadata describing the location. May also contain name, type, category, address, phone number and other information about a place. A subtype of Location Object. (Also see Place of Interest)	OGC

Geospatial Term	Type	Definition/Description	Reference
Position	Data	Any observed or calculated position, in the broad semantic context of the use of the term. Primarily contains a geographic position and quality of position. The geospatial coordinates, accuracy and precision of a point or vertices of a line or polygon.	OGC
Post Mission Analysis	Application	The means to assess the performance of a mission and assess effectiveness of mission, event, preparation, logistics, response, deployment, evacuation, search & rescue, security, countermeasures, (training) exercise and recovery plans, and the effectiveness of mission operations (assess incident and situation reports). The ability to compare plans with mission operations details and determine lessons learned. The means to produce post mission assessments that convey analysis results (maps and location-based reports), and to produce and after action reports.	GEA
Post Mission Assessments	Data	The analysis output from Post Mission Analysis. Assessments of the effectiveness of plans, operations and training in response to an incident/event/case. A type of HLS Framework Data under subcategory Assessment, under the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Preparation Plan	Data	The geospatial-temporal context of an emergency preparedness plan, which includes maps and reports that convey preparation objectives, schedules, deployments, contingencies and geospatial-temporal situation context for planned operations. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA
Preparation Planning	Application	The means to preplan, schedule and allocate personnel and assets to a potential disaster/threat; to develop operations plans that convey schedule, tasking and resource allocation for preplanned operations, in a geospatial-temporal context. The means to produce deployment and contingency plans.	GEA
(Threat) Profile	Data	A geospatial-temporal pattern, trend, network, tendency or indicator that characterizes threat and risk behaviors. Used in determining location, identity, severity and probability of the risk/threat. A subcategory of HLS Framework Data under category Geospatial Product. [Note: Other types of location-based profile may be defined for the HLS mission.]	GEA

Geospatial Term	Type	Definition/Description	Reference
Profiling	Function	To detect or calculate a geospatial-temporal pattern, trend, network, tendency or indicator by evaluating a set of geospatial entities and/or a set of HLS business data with geospatial properties. Used for detecting new risks and threats. e.g., Detect a visitation pattern by analyzing immigration data for suspected terrorists and their associates.	GEA
Program Plan	Data	The geospatial-temporal context of a program plan, which includes maps and reports that convey program objectives, schedules and geospatial-temporal situation context for planned activities. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA
Program Planning	Application	The means to preplan, schedule, and allocate personnel and assets for an HLS activity; to develop activity plans that convey schedule, tasking and resource allocation for preplanned activities, in a geospatial-temporal context. The means to produce Program Plans.	GEA

Geospatial Term	Type	Definition/Description	Reference
Public Information Outreach	Application	The means to inform the public on the basis of location. Portray maps (e.g., NFIP (National Flood Plain Insurance Program) floodplain maps) and location-based information reports, alerts, warnings and emergency declarations concerning threats, threat consequences, response and recovery status, mitigation and situation reports, and benefits locations through public information (media) channels. Allow the public to interact through these channels (e.g., explore what's happening in their area of interest). Support electronic registration (geocoding) for the application of benefits. Numerous types of geospatial products produced by geospatial applications across the enterprise may be distributed through public information channels.	GEA
Raster	Data	An abstraction of the real world where spatial data is expressed as a matrix of cells or pixels, with spatial position implicit in the ordering of the pixels. Unlike vector data, there are no implicit topological relationships. Coverages are often represented in raster form. e.g., imagery.	OGC

Geospatial Term	Type	Definition/Description	Reference
Recovery Plan	Data	The geospatial-temporal context of an emergency recovery plan, which includes maps and reports that convey recovery objectives, schedules, resource deployments, contingencies and geospatial-temporal situation context for planned recovery operations. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA
Recovery Planning	Application	The means to preplan/plan, schedule, and allocate personnel and assets for incident recovery; to develop recovery (operations) plans that convey schedule, tasking and resource allocation for recovery operations, sharing amongst government and non-government relief organizations. Publish locations and route directions to crisis counseling, housing and other recovery centers; share with public.	GEA
Reference Architecture (Geospatial)	Technology	Consists of reference implementations of key geospatial components and applications with standard interfaces. Also consists of a registry of associated geospatial standards and conformance test tools. The Reference Architecture for the HLS GEA. (Managed by the Geospatial Management Office).	GEA

Geospatial Term	Type	Definition/Description	Reference
Relative Location	Data	A location stated as a relative position with respect to an Absolute Location (i.e., address, position, feature geometry, e.g., point, or Place of Interest). A subtype of HLS geospatial entity subtype Location Object.	GEA
Report	Data	A location-enabled, multimedia report. The results of reporting pertaining to a topic of interest, such as an emergency, incident, suspicious activity, etc. The report has geospatial-temporal context, which includes supporting data like locations, features, imagery, etc. May reference one or more Reports, Plans or Maps. A subcategory of HLS Framework Data, under the Geospatial Product category.	GEA
Response Plan	Data	The geospatial-temporal context of an emergency response plan, which includes maps and reports that convey response objectives, schedules, resource deployments, contingencies and the geospatial-temporal situation context for planned response operations. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Response Planning	Application	The means to preplan/plan, schedule and allocate personnel and assets to a disaster/threat/incidents/events, given possible risks, public safety considerations and potential affected locations, facilities, key or critical assets, etc.; to develop response operations plans that convey schedule, tasking and resource allocation for response operations, in a geospatial-temporal context. The means to produce Response Plans.	GEA
Reverse Geocode	Function	The ability to determine an Address from geospatial coordinates.	GEA
Risk	Data	The nature of the risk associated with a threat, vulnerability or weapon. Risks correlate threats with vulnerabilities. The geospatial context of a risk is defined in a Risk Assessment. A category of HLS Framework Data.	HLS EA

Geospatial Term	Type	Definition/Description	Reference
Risk Analysis	Application	The means to determine and assign risks and risk assessments for key assets, critical assets, key persons or conveyances. To analyze associated geospatial risk factors, in conjunction with related threat, vulnerability, threat intelligence and other intelligence. Consists of mapping and correlating threats to vulnerabilities. Means of analysis may consist of: (data) mine, integrate, correlate, extrapolate, and analyze data for patterns, densities, trends, networks, line of sight, tendencies, indicators, hypotheses, and conclusions, as it pertains or may pertain to risks. May also involve geoparsing and geocoding functions to scan and annotate textual risk, risk assessment, threat, threat assessment, vulnerability, vulnerability assessment, person, conveyance, threat intelligence and other all-source intelligence for geographic and temporal references.	GEA
Risk Assessment	Data	The modeling and analysis output from Risk Analysis. May consist of maps and/or reports. A type of HLS Framework Data under subcategory Assessment, under the Geospatial Product category. (See Risk Analysis)	GEA

Geospatial Term	Type	Definition/Description	Reference
Route	Data	<p>The representation of a route for navigation purposes. The route's overall characteristics, such as its start point, waypoints, end point, transportation type, total distance, travel time and bounding box. Route geometry is defined as a list of geographic positions along the route, ordered in the sequence of planned travel, starting with the position of the route's origin and ending with the position of the route's destination, including waypoints. Also, a list of travel instructions consisting of turn-by-turn directions and advisories along the route, ordered in sequence of their occurrence. Routes are derived from navigable transportation networks. An HLS geospatial entity subtype.</p>	OGC
Route Service	Technology	<p>Able to determine (or fetch a predetermined) route and navigation information for autonomous or semi-autonomous navigation between two or more points on a network. An important service used in LBS, in the wireless realm.</p>	GEA, OGC

Geospatial Term	Type	Definition/Description	Reference
Screening & Risk Analysis	Application	The means to determine and assign risks and risk assessments for parties (persons or organizations) and goods, and to screen accordingly. Analyze geospatial risk factors (e.g., physical address, place of birth, citizenship, travel history, travel itineraries, geographic/national affiliations, etc. for persons and organizations, and place of origin, place of manufacture, shipping route and place of destination for goods) in conjunction with party and goods records and related intelligence. Data mining and correlation applies here. May also involve geoparsing and geocoding functions to scan and annotate associated textual data for geographic and temporal references.	GEA
Search & Rescue Plan	Data	The geospatial-temporal context of search and rescue plan, which includes maps and reports that convey search & recovery objectives, schedules, resource deployments, contingencies and geospatial-temporal situation context for planned search & rescue operations. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Search & Rescue Planning	Application	The means to preplan/plan, schedule and allocate personnel and assets for search and rescue missions. The means to develop Search & Rescue Plans that convey schedule, tasking and resource allocation for search & rescue operations, in a geospatial-temporal context. Create and manage related incident/event data. Generate alerts and warnings, as needed. Support pertinent communications.	GEA
Search & Rescue Response	Application	The means to support command and control for an incident or event that requires search and rescue. Involves creating and managing situation awareness, monitoring threats and threat assessments, coordinating and monitoring response activities/assets/personnel, communicating with response personnel, etc., and reporting status to persons in the command and control chain (Situation Reports). Create pertinent communications. Update incident/event records to reflect response results.	GEA
Security Planning	Application	The means to determine and document the security plans, in geospatial context, to secure and protect fixed and mobile assets, persons, goods, conveyances, etc.	GEA

Geospatial Term	Type	Definition/Description	Reference
Security Plan	Data	Documents the security measures for protecting persons, assets, goods, conveyances, etc., in map and report form (e.g., Where to place barriers, guard posts, sensors, etc.). Includes details concerning sensor deployments. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA
Security Protection & Management	Application	The means to secure and protect fixed and mobile assets, persons, goods, conveyances, etc. (in geospatial context). (e.g., Where to place barriers, guard posts, sensors, etc. Where are the guards, sensor alerts, etc.). Includes integration with sensors and other security monitoring tools and the means to process and display observations. May lead to reporting of events or alerts.	GEA
Semantic Business Profiles (SBP)	Data	Business semantic schemas that define the common semantic framework (terms and their meanings within the enterprise environment) associated with shared geospatial business processes and procedures. SBPs are exposed through registry services. Defined by COI.	GEA

Geospatial Term	Type	Definition/Description	Reference
Semantic Data Profiles (SDP)	Data	Data semantic schemas that define the common semantic framework (terms and their meanings) associated with shared geospatial data description and access. SDPs are exposed through registry services. Defined by Communities of Interest.	GEA
Semantic Interoperability Services	Technology	Fully autonomous business, service and data interoperability is only possible when clients can locate and access business, service and data on-the-fly through publish-find-bind-orchestration patterns that subscribe to well-known business, service and data semantics.	GEA
Semantic Service Profiles (SSP)	Data	Service semantic schemas that define the common semantic framework (terms and their meanings) associated with shared geospatial service description and access. SSPs are exposed through registry services. Defined by Communities of Interest.	GEA
Sensor	Data	The description and parameters associated with a sensor for the purpose of sensor management and the exploitation of observations from the sensor. A category of HLS Framework Data.	GEA

Geospatial Term	Type	Definition/Description	Reference
Sensor	Technology	An electronic device that is used for detection and monitoring through signature and pattern recognition.	GEA
Sensor Alert Service	Technology	The Sensor Alert Service produce alert messages when given observation conditions are met by a sensor. Provides the means for client services/users to specify and register user profiles that contain user information, applicable sensors/observations, alert conditions (e.g., maximum/minimum values), and alert actions (what happens if conditions are met). Also, the means for client services/users to update user profiles. Clients are able to control the nature of alerts. For example, a client is able to activate/deactivate an alert capability. Also provides the means to support push/pull capabilities, e.g., to wait for observation input from associated sensors (for on/off sensors like a detector), or to actively poll for (current/historical/predicted) sensor observations.	GEA
Sensor Management	Application	The means to manage sensor assets and the allocation of data collection requirements and tasks to sensors.	GEA

Geospatial Term	Type	Definition/Description	Reference
Sensor Collection Service	Technology	A service by which a client can obtain observations from one or more sensors/platforms (can be mixed types). Clients can also obtain information that describes the associated sensors and platforms.	GEA
Sensor Planning Service	Technology	A service by which a client can determine sensor collection feasibility for a desired set of collection requests for one or more mobile sensors/platforms, or the client may submit collection requests directly to these sensors/platforms.	GEA
Service Discovery Service	Technology	Able to search for and locate desired services through open, standard publish-find mechanisms. Search requests may be defined in terms of filters for discovering services and service-data relationships, and optionally storing the metadata results as a new data set.	GEA
Share	Process	The means for two or more actors in a system to access and utilize the same resources (data, services, devices, etc.). Commonly refers to sharing data between federal, state, local, tribal and private users through network-accessible, standards-based services.	GEA

Geospatial Term	Type	Definition/Description	Reference
Site Modeling & Analysis	Application	The means to analyze, model and delineate areas based upon site characteristics (e.g., to locate ideal sites for a facility). To produce Site Plans.	GEA
Site Plan	Data	The results of site planning. The geospatial-temporal context of the plan, which includes maps and reports that convey site objectives/schedules, activity locations and the situation context for the site (e.g., facility/infrastructure locations, other key features, current imagery, etc.). A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA
Situation Awareness	Data	A coherent representation of data for an area of interest that conveys geospatial situational context, disposition and behaviors of threat(s), friendly personnel and assets, incidents, events, observations and related intelligence and HLS Framework Data. Closely related to a COP, MSOP, or a specialized view of the COP/MSOP, a.k.a. USOP. A subcategory of HLS Framework Data under COP.	GEA

Geospatial Term	Type	Definition/Description	Reference
Situation Awareness	Application	The means to combine varied sources of data to create the situational context associated with threats, vulnerabilities and friendly forces for the purpose of understanding their nature and disposition and to support decision making for threat response and mitigation. In particular, view near-real time threat disposition, related observations, and friendly force disposition in geospatial context, with the appropriate level of detail. Leads to a shared, collaborative COP, MSOP, or specialized views of the COP/MSOP that convey actionable information, a.k.a. USOP. The means to generate Situation Reports.	GEA
Situation Reports	Data	Reports that contain relevant geospatial-temporal situation context for any activity/event/incident/occurrence for command and control purposes. A type of HLS Framework Data under the Report subcategory of the Geospatial Product category.	GEA
Situation Report Service	Technology	Able to generate a Situation Report with the geospatial extent and nature of an operational situation.	GEA

Geospatial Term	Type	Definition/Description	Reference
Spatial Reference System	Data (Property)	A function that associates locations in space to geometries of coordinate tuples in a mathematical space, usually a real valued coordinate vector space, and conversely associates coordinate values and geometries to locations in the real world, e.g., coordinate reference systems, linear reference systems.	OGC
Spatial Relationship	Data (Property)	The relationship between two objects as described in geospatial terms (distance, coordinates, etc). Also topological relationships, e.g., adjacent, connected, surrounded by, etc.	GEA
Specialized Geospatial Clients (Various)	Technology	A desktop client, either thick or thin, that provides visualization and interaction with geospatial data. Also provides access to underlying Application Components and Geospatial Services. Many specialized geospatial applications will exist within the HLS EA, each which may have a Geospatial Client and one or more Application Components and/or Geospatial Services.	GEA
Speed (velocity)	Data (Property)	The rate of motion or a measure of the rate of motion. Distance traveled over an interval of time. Often represented by a vector(s) indicating direction of motion.	GEA

Geospatial Term	Type	Definition/Description	Reference
Structure	Data	The geospatial representation of a man-made structure, e.g., building or bridge. An HLS geospatial entity subtype.	GEA
Style Management Service (SMS)	Technology	The means to create, update and manage styles and symbols. The SMS must manage distinct objects that represent styles and symbols and provide the means to discover, query, insert, update, and delete these objects. Styles provide the mapping from feature types and feature properties and constraints to parameterized Symbols used in drawing maps. Symbols are bundles of predefined graphical parameters and predefined fixed graphic “images”.	GEA, OGC
Suspicious Activity	Data	Represents any suspicious activity or occurrence of interest (identity/activity/status) that poses a risk (threat or vulnerability) or potential risk, with geospatial context (location/time, extent, geographic, national), or a series of suspicious activities/occurrences with geospatial-temporal contexts. A subcategory HLS Framework Data under the Occurrence category.	GEA

Geospatial Term	Type	Definition/Description	Reference
Suspicious Activity Report	Data	The geospatial-temporal context of suspicious activities captured in report form. May reference maps, incidents, occurrences, parties, threat intelligence, risks/threats/vulnerabilities, etc. Reports contain interlinked, multi-media data that adequately characterize the nature and context of the activity. A type of HLS Framework Data under subcategory Report, under the Geospatial Product category.	GEA
Suspicious Activity Report Service	Technology	Able to generate a Suspicious Activity Report for a location-based suspicious activity.	GEA
Suspicious Activity Reporting	Application	The means to analyze and report suspicious/criminal/terrorist activities to proper authorities (e.g., indications of a threat, notifications of suspected criminal activities, etc).	GEA
Surveillance	Process	Observing activities in an area of interest or at a point of interest through visual/listen inspection or sensors.	GEA

Geospatial Term	Type	Definition/Description	Reference
Synthetic Aperture Radar (SAR)	Technology	A microwave instrument that transmits radar pulses very rapidly. In fact, SAR is generally able to transmit several hundred pulses while the platform passes over a particular object. Many backscattered radar responses are therefore obtained for that object, which can be manipulated such that the resulting image looks like the data were obtained from a big, stationary antenna. In general, the synthetic aperture is the distance traveled by the spacecraft while the radar antenna collected information about the object.	GEA
Tariff Management	Application	The means to manage tariffs for goods, in a geospatial context.	GEA
Temporal Reference System	Data (Property)	A function that associates time to a coordinate (usually one dimensional points and intervals) and conversely associates coordinate geometries to real world time.	OGC
Temporal Relationship	Data (Property)	The relationship between two events with respect to time; or pertaining to a specified period of time.	GEA

Geospatial Term	Type	Definition/Description	Reference
Test Model	Data	The test models (data and encoded procedures) to support simulations and modeling to test how geospatial data and technology will perform in local conditions and in different attack scenarios. A subcategory of HLS Framework Data under Models.	GEA
Threat	Data	An intended or unintended indication of imminent danger, harm, evil, etc. Includes infestation of a commodity by living pest. The geospatial context of a Threat is defined in a Threat Assessment. A subcategory of HLS Framework Data under the Risk category.	HLS EA

Geospatial Term	Type	Definition/Description	Reference
Threat Analysis	Application	<p>The means to define threats and threat assessments. For terrorism, the means to (data) mine, integrate, and correlate varied types of geospatial data for the purpose of extrapolating, modeling, analyzing and deriving geospatial data in the form of patterns (e.g., cluster), densities, trends, networks, line of sight, tendencies, indicators, hypotheses, and conclusions, as it pertains to threats and the understanding of threat behaviors in their environment, in order to minimize the risks associated with the threat. Source data include, but are not limited to, intelligence, incidents, events, criminal and suspicious activities, financial transactions, persons, organizations, goods, etc. For terrorism and natural hazards, this includes the means to conduct Threat Consequence Assessments and Hazard Modeling, Analysis & Mapping. May also involve geoparsing and geocoding functions to scan and annotate associated textual data for geographic and temporal references.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
Threat Assessment	Data	The modeling and analysis output from Threat Analysis. For natural hazards, this includes floodplains and areas of high susceptibility from tidal storm surge, hurricane, tornado, landslide, earthquake, fire, tsunami, volcanic events, high winds and other types of natural disasters. A type of HLS Framework Data under subcategory Assessment, under the Geospatial Product category. (See Threat Analysis)	GEA
Threat Consequence Assessment	Application	The means to understand the consequences of terrorist and natural threats as determined by modeling/simulation and analysis (e.g., Consequence Assessment Tool Set (CATS)). The means to produce Threat Consequence Assessments for threats to key assets, critical assets, key persons or conveyances (and associated routes). Means of analysis may consist of: (data) mine, integrate, correlate, extrapolate, and analyze data for patterns, densities, trends, networks, tendencies, indicators, hypotheses and conclusions, which pertains or may pertain to threats. May also involve geoparsing and geocoding functions to scan and annotate associated textual data for geographic and temporal references.	GEA

Geospatial Term	Type	Definition/Description	Reference
Threat Consequence Assessment	Data	The modeling and analysis output from Threat Consequence Assessment. A type of HLS Framework Data under subcategory Assessment, under the Geospatial Product category. (See Threat Consequence Assessment)	GEA
Threat Detection	Application	The means to detect chemical and biological threats in air and water through the employment of sensors. The means to access sensors as network resources to meet rapid response and risk mitigation requirements. Detect threats through screening and analysis of sensor observations. Create, reference and share alerts.	GEA
Threat Intelligence	Data	Intelligence data that pertains to a threat and the associated risks that the threat poses. A subcategory of HLS Framework Data under the Intelligence category.	GEA
Threat/Vulnerability Mitigation Strategy	Data	Generally, the geospatial-temporal context of a threat/vulnerability mitigation strategy. Specifically: Security Plans, Countermeasures or Mission Plans.	GEA

Geospatial Term	Type	Definition/Description	Reference
Threat Prediction	Data	The predicted location/time/identity/activity/status information for a threat. A subcategory of HLS Framework Data under Intelligence.	GEA
Threat Models	Data	Models that characterize threats and threat behaviors in a specified environment, under specified conditions/constraints. Behaviors are represented by operational constraints/patterns/preferences/tendencies/etc. (e.g., for attack, deployment, etc.), threat consequences, etc. A subcategory of HLS Framework Data under the Model category.	GEA
Threat Warnings & Alerts	Data	A Warning or Alert pertaining to a threat. Determined by observation, modeling or analysis, and correlation with one or more incident(s), occurrence(s) or observation(s). Warnings and Alerts are subcategories of HLS Framework Data under Communication.	GEA
Topology Services	Technology	Able to detect topology errors (e.g., overshoots and undershoots of common linear and polygonal features within a definable tolerance), automatically correct errors, if possible, and define topological relationships between connected/collocated linear, polygon, and point features.	GEA

Geospatial Term	Type	Definition/Description	Reference
Track	Data	A sequence of observations and/or predictions concerning the location/time/identity/activity/status for persons, goods, assets, conveyances or any other mobile objects for a given period of time (current, historical and planned/projected). Optionally, to also represent speed and direction of motion. A subcategory of HLS Framework Data under Person, Goods, Conveyance or Asset.	GEA
Tracking	Function	The means to observe or otherwise determine the location/time/identity/activity/status for persons, goods, assets, conveyances or any other mobile objects for a given period of time (current, historical and planned/projected).	GEA
Tracking Service	Technology	Able to determine (or fetch a predetermined) location/time/velocity/identity/status/activity series (track) for a Mobile Object (e.g., persons, goods, assets, devices, etc.)	GEA, OGC

Geospatial Term	Type	Definition/Description	Reference
Traffic Service	Technology	<p>The means to access traffic information regarding incidents and/or conditions for a specified area of interest, road, or road segment, for a specified time period.</p> <p>Also, the means to access traffic information regarding incidents and/or conditions for a designated route (that has been determined by a Route Service or Navigation Service) for a specified time period.</p>	GEA
Training Aids	Data	<p>The means to produce geospatial training aids in support training exercises, and in the form of maps, reports and plans. A type under the subcategory Aids in the Geospatial Product category.</p>	GEA
Training Exercise Simulation	Application	<p>Provide training simulations capabilities to support training exercises. The simulations employ geospatial data and technology to simulate different attack scenarios. Uses training models and supporting databases.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
Training Models	Data	The training models (data and encoded procedures) to support training simulations in order to test how geospatial data and technology is going to perform in local conditions and in different attack scenarios. A subcategory of HLS Framework Data under Models.	GEA
Training Planning & Support	Application	The means to plan training exercises and produce geospatial training aids in the form of maps, reports and plans.	GEA
Training Plan	Data	The results of training planning and support. The geospatial-temporal context of the resulting training plan, which includes maps and reports that convey objectives/schedules, activity locations and situation context for the (training) exercise, including: potential threat locations, threat consequences, asset locations, population densities, evacuation routes, mutual aid support facilities, etc. A type of HLS Framework Data under subcategory Plan, under the Geospatial Product category.	GEA
Transaction Report	Data	Reports that summarize geospatial transactions for specified time periods. A subcategory of HLS Framework Data under Administration.	GEA

Geospatial Term	Type	Definition/Description	Reference
Transshipment Point	Data	An intermediate location (waypoint) in a shipping route for goods and cargo where the means of conveyance changes. A subtype of Route.	GEA
Travel History (Records)	Data	The record(s) pertaining to a person's or conveyance's past travel. The location/time/identity/activity/status of places, persons, organizations that are visited. Includes the means of transit. A subcategory of HLS Framework Data under Person, Good or Conveyance.	GEA
Travel Planning	Application	The means to plan secure and safe travel for individuals. Produces itineraries.	GEA

Geospatial Term	Type	Definition/Description	Reference
User-Specific Operating Picture	Data	The User Specific Operating Picture (USOP) is an actionable data view of an MSOP that is specialized for a user, in a specific role, on a specific device. USOPs are application-dependent data views that are created through the COP and MSOP collaborative workspaces, and are dependent upon the specific user/application context. USOPs will vary from activity to activity and from individual/device to individual/device. [Thus, each HLS activity/application will have to be evaluated to consider collaboration needs and the scope of each USOP.] A type of HLS Framework Data, under COP/MSOP.	GEA
Vector	Data	An abstraction of the real world where positional data is represented in the form of coordinates. The basic units of spatial information are points, lines and polygons, where each is composed as a series of one or more coordinate points. Features are generally represented by vector geometry.	OGC
Verification Event (Records)	Data	The records of identity verification events associated with a Person or Good, A subcategory of HLS Framework Data under Person, Good or Conveyance.	GEA

Geospatial Term	Type	Definition/Description	Reference
Visualization	Process	The rendering of geospatial data into a product or medium which allows an analyst or user to review, visually assess and draw conclusions about the underlying information.	GEA, NGA
Vulnerability	Data	Potential targets where the United States and its interests are open to attack by armed forces, terrorists, etc. The geospatial context of a vulnerability is defined in a Vulnerability Assessment. A subcategory of HLS Framework Data under Risk.	HLS EA
Vulnerability Analysis	Application	The means to determine and assign vulnerabilities and vulnerability assessments for key assets, critical assets, key persons or conveyances (and associated routes). Means of analysis may consist of: (data) mine, integrate, correlate, extrapolate, and analyze data for patterns, densities, trends, networks, tendencies, indicators, hypotheses and conclusions, which pertains or may pertain to vulnerabilities. May also involve geoparsing and geocoding functions to scan and annotate associated textual data for geographic and temporal references.	GEA

Geospatial Term	Type	Definition/Description	Reference
Vulnerability Assessments	Data	The modeling and analysis results from Vulnerability Analysis, as it pertains to key and critical assets. A type of HLS Framework Data under subcategory Assessment, under the Geospatial Product category. (See Vulnerability Analysis)	GEA
Warning	Data	An expression of threat to those who need to know. A (warning) message that is indicative of a current or predicted threat, based upon modeling, analysis, and/or correlation with one or more incident(s), occurrence(s) or observation(s). A subcategory of HLS Framework Data under the Communication category.	HLS EA, GEA
Warning/Alert Management	Application	The monitoring and processing of Alerts in a geospatial-temporal context. The means to generate Warnings.	GEA
Watch	Function	A function that determines Alerts, which are triggered by any suspicious or threatening event with geospatial and temporal context, as determined by evaluating observed or computed conditions.	GEA

Geospatial Term	Type	Definition/Description	Reference
Watch	Data	A “lookout” notice for a person, goods, conveyance, activity, etc. of interest that contains geospatial and temporal context for a Watch Area. A subcategory of HLS Framework Data under the Communication category.	GEA
Waterway Management	Application	The means to perform waterways management to provide a safe, efficient and navigable waterway system to support domestic commerce, international trade and military sealift. Provide long-range and short-range aids to navigation (buoys/sensors/breaking ice), electronic charting and tide/current/pilotage information through Notices to Mariners services, weather services, vessel traffic services, technical assistance and advice, vessel safety standards and inspection, and bridge administration standards and inspections.	GEA
Weather	Data	Weather conditions at specified locations. Hindcasts, nowcasts, forecasts and climate data. A category of HLS framework data. Also might enter the HLS environment as Auxiliary data.	GEA

Geospatial Term	Type	Definition/Description	Reference
Weather Alerts & Warnings	Data	A warning or alert message that is indicative of a current or predicted storm threat, based upon modeling, analysis, and/or correlation with one or more incident(s), occurrence(s) or observation(s). A type of warning/alert under the warning/alert subcategory of HLS Framework Data, under the Communication category.	GEA
Weather Model	Data	Models that characterize the behaviors of weather systems and the effects of these systems. These models are associated with weather simulations that are influenced by terrain and features. Input to these models consists of terrain and feature data, meteorological sensor observations and model control parameters. Outputs consist of hindcast, nowcast and forecast weather conditions and climate at specified locations. A subcategory of HLS Framework Data under Models.	GEA
Weather Modeling & Analysis	Application	The means to model/simulate and analyze weather conditions at specified locations. The means to determine hindcasts, nowcasts and forecasts for a location and share this information with HLS users. The means to generate and disseminate Weather Alerts & Warnings.	GEA

Geospatial Term	Type	Definition/Description	Reference
Weather Service	Technology	The means to access weather conditions for an area of interest or location for a specified time period.	GEA
Web Annotation Service	Technology	The Web Annotation Service is a specialized WFS that accesses map/image annotations. It is based upon the XML for Image and Map Annotation (XIMA), which defines an XML vocabulary to encode annotations on imagery, maps, and other geospatial data. This vocabulary draws on the GML to express the positions of these annotations in geographic (real world) or image-pixel coordinates, and to associate each annotation with the geospatial resource(s) it describes. The XIMA encoding is useful for any activity that requires linking or tagging geospatial data in order to present and discuss it with others, to make joint decisions, or to communicate spatially.	GEA, OGC

Geospatial Term	Type	Definition/Description	Reference
Web Coverage Service (WCS)	Technology	Able to access geospatial coverage data (e.g., imagery and Digital Terrain Model (DTM)). WCS supports the networked interchange of geospatial data as “coverages” containing values or properties of geographic locations. Unlike the Web Map Service (WMS), which filters and portrays spatial data to return static maps (server-rendered as pictures), the WCS provides access to intact (unrendered) geospatial information, as needed for client-side rendering, multi-valued coverages (such as multi-spectral images and terrain models), and input into scientific models and other clients beyond simple viewers.	GEA, OGC

Geospatial Term	Type	Definition/Description	Reference
Web Feature Service (WFS)	Technology	<p>The WFS supports the query and discovery of geographic features (represented in vector form). In a typical Web access scenario, Web Feature Service (WFS) delivers Geography Markup Language (GML) representations of geospatial features. Clients (service requestors/consumers) access geographic feature data through a WFS by submitting a query for just those features that are needed for an application. The client generates a request and posts it to a WFS server on the Web. The WFS instance executes the request, returning the resulting geographic features to the client encoded in GML. A GML-enabled client can manipulate or operate on the returned geographic features.</p>	GEA, OGC

Geospatial Term	Type	Definition/Description	Reference
Web Map Service (WMS)	Technology	<p>A WMS is able to access vector and raster data and render it in the form of a map for display (combines access and portrayal). Independent of whether the underlying data are features (point, line and polygon) or coverages (such as gridded digital terrain model or images), the WMS produces an image of the data that can be directly viewed in a web browser or other picture-viewing software. A WMS labels its data as one or more “Layers,” each of which is available in one or more “Styles.” Upon request a WMS makes an image of the requested Layer(s), in either the specified or default rendering Style(s). Typical output formats include Portable Network Graphics (PNG), Graphics Interchange Format (GIF), Joint Photographic Expert Group format (JPEG), and Tagged Image File Format (TIFF).</p>	GEA, OGC
Web Notification Service	Technology	<p>A service by which a client may conduct a dialog with one or more other services. This service is useful when many collaborating services are required to satisfy a client request, and/or when significant delays are involved in satisfying the request, which is often the case in the geoprocessing realm.</p>	GEA

Geospatial Term	Type	Definition/Description	Reference
Web Registry Service (WRS)	Technology	The WRS provides a common mechanism to classify, register, describe, search, maintain and access information about geospatial resources available on a network. Resources are network addressable instances of typed data or services. Types of registries are differentiated by their role such as registries for cataloging geospatial resource types (e.g., types of geographic features, coverages, sensors, symbols, services, etc), online data instances (e.g., geospatial and image datasets and repositories, application schema, and symbol-style libraries), and online instances of services.	GEA
Web Terrain Service (WTS)	Technology	The WTS extends the WMS interface to allow the access and portrayal of three dimensional geospatial data. This service can be exploited to perform tasks such as terrain analysis, mission planning, and fly-throughs.	GEA, OGC

2.0 ACRONYMS

Acronym	Definition
ADA	Americans with Disabilities Act of 1990
AOI	Area of Interest
AVL	Automatic Vehicle Locator
BASINS	Better Assessment Science Integrating Point and Nonpoint Sources
CATS	Consequences Assessment Tool Set
COI	Community of Interest
COP	Common Operating Picture
CWA	Clean Water Act
DBMS	Database Management System
DEM	Digital Elevation Model
DFIRM	Digital Flood Insurance Rate Map
DFO	Disaster Field Office
DHS	Department of Homeland Security
DTM	Digital Terrain Model
EA	Enterprise Architecture
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
GDR	Geospatial Data Rollup
GIF	Graphics Interchange Format
GIS	Geographic Information System
GIT	Geospatial Information Technology
GML	Geography Markup Language
GMO	Geospatial Management Office
GPS	Global Positioning System
HEC2	Hydrologic Engineering Center 2
HLS	Homeland Security
HSIP	Homeland Security Infrastructure Program
HVAC	Heating, Ventilation & Air Conditioning

ICS	Image Catalog Service
INS	Inertial Navigation System
InSAR	Interferometric Synthetic Aperture Radar
IPS	Image Processing System
JPEG	Joint Photographic Expert Group
LBS	Location-Based Service
LiDAR	Light Detection and Ranging
LOF	Location Organizer Folder
LORAN	Long Range Radio Aid to Navigation
MSOP	Mission-Specific Operating Picture
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NGA	National Geospatial-Intelligence Agency
NIMA	National Imagery and Mapping Agency
NOAA	National Oceanic & Atmospheric Administration
NOV	Notice of Violation
NSSE	National Security Special Event
OGC	Open GIS Consortium
OSHA	Occupational Safety and Health Act of 1970
PDA	Personal Digital Assistant
PDD	Presidential Decision Directive
PNG	Portable Network Graphics
PNT	Positioning Navigation Targeting
POI	Point of Interest
RFID	Radio Frequency Identification Device
SAR	Synthetic Aperture Radar
SBP	Semantic Business Profiles
SCADA	Supervisory Control and Data Acquisition
SDP	Semantic Data Profiles
SMS	Style Management Service
SQL	Structured Query Language

SSP	Semantic Service Profiles
TIFF	Tagged Image File Format
TNM	The National Map
URI	Uniform Resource Identifier
USGS	US Coast Guard
USGS	U.S. Geological Survey
USOP	User-Specific Operating Picture
WCS	Web Coverage Service
WFS	Web Feature Service
WGS	World Geodetic System
WMS	Web Map Service
WRS	Web Registry Service
WTS	Web Terrain Server
XIMA	Image and Map Annotation
XML	Extensible Markup Language



**HOMELAND SECURITY GEOSPATIAL ENTERPRISE
ARCHITECTURE**

**ATTACHMENT G BUS 2
GEOSPATIAL BUSINESS ACTIVITY**

GEOSPATIAL MANAGEMENT OFFICE

DRAFT VERSION 0.6.1 — REDACTED VERSION

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1.0 HLS GEOSPATIAL BUSINESS ACTIVITIES

(Geospatial) Location is a foundational property for modeling and understanding HLS (Homeland Security) business activities. It is a ubiquitous information ingredient in the HLS mission. Location can be exploited as a unifying information theme to better understand the context of most real and abstract phenomena associated with HLS. Location, in its simplest form, can be used to depict where something is on the earth. It is contextually simple and intuitive to most people. Location is the way that people commonly understand and relate to the world around them.

The role of location, geospatial data and technology in the HLS mission is defined in terms of *Geospatial Business Statements*. These statements are based upon the *Geospatial Business Language* (See HLS Geospatial Business Language: Key Terms, Attachment G.Bus.1). Most HLS Business Activities have one or more such statements. The statements describe the main uses of geospatial data and technology, and the main *Geospatial Applications* (and application components) involved in the HLS enterprise. (Data are denoted in *italics*.) Many of the applications include non-geospatial data and technology, and may be predominantly non-geospatial in nature. As such, the value of geospatial service components is crucial to many HLS Business Activities. HLS applications will need authorized access to these components when and where they are needed in the HLS enterprise.

The table below maps HLS Business Activity to *HLS Geospatial Role*, where the role is expressed in terms of *Geospatial Business Statements* (column 5) and *Geospatial Applications* (column 6). The first HLS Business Activity, HLS007, lists several *Geospatial Business Statements* that apply across the enterprise. These broadly relevant applications are only listed under the first activity and are not repeated for many other activities in which they apply. On the other hand, a number of more specialized *Geospatial Business Statements* and *Geospatial Applications* are repeated for several business activities. This is done where necessary to emphasize specialization, and because we tended towards redundancy in cases where there is overlap between HLS Business Activities.

Finally, it is important to note that many *Geospatial Applications* will have several specialized implementations. For example, it is unlikely that there will be a single *Mission Planning* application. Rather, the complexity and diversity of mission operations necessitates the need for specialization and diversity of mission planning business processes/sub-processes/applications. However, there will be a number of common geospatial service components and associated data upon which all *Mission Planning* applications will depend.

HLS Business Activity				HLS Geospatial Role	
Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
Identify Threats & Vulnerabilities	HLS007	Conduct Threat Assessments	Identify and locate threats (both foreign and domestic) to America's critical infrastructure and key assets and perform tactical threat analysis to minimize the risk of the threat. Develop mitigation strategies to minimize the impact of the threat.	<ul style="list-style-type: none"> - Reference applicable <i>base categories</i> of <i>HLS framework data</i>⁴ to meet HLS geoprocessing needs. - Conduct Critical Infrastructure Inventory Management to create, update, reference and share⁵ <i>critical asset</i> and <i>key asset inventories</i> and <i>status</i>. Update, reference and share <i>threat assessments</i> that are associated with <i>critical asset</i> and <i>key asset inventories</i>. - Conduct Threat Analysis. Create, update, reference and share <i>threat</i> data and assign probability and severity. Create, update, reference and share <i>threat assessments</i> (i.e., geospatial analysis results) as they pertain to <i>key</i> and <i>critical assets</i>. Reference related <i>incident</i> and <i>event</i> data, <i>threat intelligence</i> and other <i>intelligence</i> data in support of threat 	<ul style="list-style-type: none"> - Critical Infrastructure Inventory Management⁶ - Threat Analysis - Situation Awareness - Security Planning - Mission Planning - Electronic Navigation - Mission Rehearsal - Countermeasure Planning - Threat Consequence Analysis - Warning/Alert Management - Data Collection

¹ The *Geospatial Business Statements* are based upon a common *Geospatial Business Language*, a *lingua franca* comprised of the key terms used in describing the role of geospatial in the HLS enterprise. (See HLS Geospatial Business Language: Key Terms, Attachment G.Bus.1)

² The main classes of geospatial data used in HLS business activities are denoted in *italics*. (See HLS Geospatial Data Dictionary, Attachment G.Data.3.)

³ Any applications or application components that create, update, reference, share and/or exploit geospatial data and/or the geospatial properties of any HLS business data. Certain applications are broadly functional across the HLS enterprise. These applications are only listed under the first business activity, HLS007.

⁴ The Base categories of HLS Framework Data are referenced throughout the HLS enterprise and include The National Map, critical assets, key assets, etc. This *Geospatial Business Statement* will not be repeated for the remaining HLS Business Activities.

⁵ The term 'share', as used herein, refers to data sharing between federal, state, local, tribal and private organizations through network-accessible, standards-based services.

⁶ Critical Infrastructure Inventory Management is not directly associated with this activity, per se. But, this application is required to support this and other HLS value chains that involve key assets and critical assets.

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>analysis.</p> <ul style="list-style-type: none"> – Conduct Situation Awareness. Create, update, reference and share <i>situational awareness</i> data (i.e., geospatial analysis results) for near-real time <i>threats</i>, and resulting from tactical threat analysis. This data may contribute to a collaborative <i>Common Operating Picture (COP)</i> or <i>Mission-Specific Operating Picture (MSOP)</i>. Create, update, reference and share <i>situation reports</i>. – Conduct Security Planning, Mission Planning/Navigation/Rehearsal and Countermeasure Planning for threats. Create, update, reference and share <i>threat mitigation strategies</i> (i.e., <i>security plans, countermeasures, mission plans</i>), <i>navigation guidance</i> for mobile assets and <i>mission rehearsal models</i> in geospatial context, as they apply to <i>key assets</i> and <i>critical assets</i>. – Conduct Threat Consequence Analysis. Create, 	<ul style="list-style-type: none"> – Management⁷ – Data Collection Planning⁸ – Data Acquisition/Generation⁹ – Geospatial Data Transfer¹⁰ – Threat Detection – Hazard Modeling, Analysis & Mapping – Hydraulic-Hydrographic Modeling – Map Publication¹¹ – COP Manager¹²

⁷ The means to define and manage requests for new data, which cuts across the HLS enterprise. This application will not be repeated for the remaining activities.

⁸ The means to plan, schedule and allocate requests for new data to collection assets, which cuts across the HLS enterprise. This application will not be repeated for the remaining activities.

⁹ The means to acquire, collect, process or generate new data, which cuts across the HLS enterprise. This application will not be repeated for the remaining activities.

¹⁰ The means to transfer geospatial data between database nodes, which cuts across the HLS enterprise. This application will not be repeated for the remaining activities.

¹¹ The means to produce finished softcopy and hardcopy maps for use in HLS operations, which cuts across the HLS enterprise. This application will not be repeated for the remaining activities.

¹² The means to manage the scope and resources associated with a Common Operating Picture, which cuts across the HLS enterprise. This application will not be repeated for the remaining activities.

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>update, reference and share <i>threat predictions</i> and <i>threat consequence assessments</i> (i.e., geospatial modeling and analysis results from Consequences Assessment Tool Set resulting from the modeling, simulation and analysis of the threat and the potential consequences of a threat in a chosen environment.</p> <ul style="list-style-type: none"> - Conduct Warning/Alert Management. Create, update, reference and share <i>threat warnings</i> and <i>alerts</i> resulting from threat analysis (in geospatial context). - Conduct Data Collection Management. Create, update, reference and share <i>collection requirements</i> (requests for new geospatial data) based upon data needs for threat analysis. - Conduct Data Collection Planning. Create, update, reference and share <i>collection plans</i> with schedule, tasking and resource allocations for specified data collection assets. - Conduct Data Acquisition/Generation. Create, update, reference and share appropriate geospatial data holdings with newly acquired/collected/processed/generated data. - Conduct Geospatial Data Transfer to transfer geospatial data between enterprise database nodes. Perform database synchronization operations. Used to accomplish replication operations between redundant nodes. Used to accomplish data rollup operations for HLS framework data (synchronize data up the local-state-federal chain). Create, update, reference and share associated <i>transaction reports</i> and <i>audit trails</i>. - Conduct Threat Detection through employment of sensors to detect/monitor chemical, biological and 	

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>other <i>threats</i> in air and water. Create, update, reference and share sensor <i>observations</i>. Detect threats through screening and analysis of sensor <i>observations</i>. Create and share derived <i>threats, alerts, notices or watches</i>.</p> <ul style="list-style-type: none"> - Conduct Hazard Modeling, Analysis & Mapping. Create, update, reference and share <i>hazard maps</i> (e.g., floodplain maps) that convey the potential impacts of natural and human-induced hazards. - Conduct Hydraulic-Hydrographic Modeling in support of floodplain modeling and mapping. Create, update reference and share <i>floodplains</i>. - Conduct Map Publication to produce <i>maps</i> that depict <i>asset inventories, threat assessments, security plans, etc.</i> - Conduct COP Manager to manage and monitor the scope and collaborative resources pertaining to an HLS operations subject/area of interest. Create, update, reference and share the <i>COP</i> and associated MSOPs, which are derived from the managed, collaborative resources. The COP Manager manages the ‘big picture’ and provides the means to select and allocate resources, manage and monitor collaboration activities, monitor status and performance of resources, and monitor and manage external communications. 	
Identify Threats & Vulnerabilities	HLS008	Conduct Risk Assessments	Identify, locate , analyze, mitigate and communicate vulnerabilities and threats (probability and severity) across all infrastructure sectors and perform threat-vulnerability analysis (map threats to	<ul style="list-style-type: none"> - Conduct Risk Analysis. Create, update, reference and share <i>risk assessments</i> (i.e., geospatial analysis results), as they pertain to <i>key assets, critical assets</i>, and associated <i>threats</i> and <i>vulnerabilities</i>. Spatially correlate <i>threats</i> to <i>vulnerabilities</i>. The results of these analyses may create or update <i>threat</i> or <i>vulnerability</i> data. Reference related <i>incident, event/occurrence, threat intelligence</i> and 	<ul style="list-style-type: none"> - Risk Analysis - Situation Awareness - Security Planning - Mission Planning - Electronic Navigation - Mission Rehearsal - Countermeasure Planning

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			vulnerabilities) to identify triggers and thresholds (value of asset vs. cost of countermeasure) and develop tactical preventative actions. Value assets to determine appropriate countermeasures. Determine what steps should be taken in order to reduce vulnerability, disable threats, and/or mitigate risks associated with incidents/events.	<ul style="list-style-type: none"> – other <i>intelligence</i> data in support of risk analysis. – Conduct Situation Awareness. Create, update, reference and share <i>situational awareness data</i> (i.e., geospatial analysis results) that results from risk analysis and conveys severity and probability of <i>threats</i> and <i>vulnerabilities</i>. This data may contribute to a <i>MSOP</i>. Create, update, reference and share <i>situation reports</i>. – Conduct Security Planning, Mission Planning/Navigation/Rehearsal and Countermeasure Planning for risks. Create, update, reference and share <i>risk mitigation strategies</i> (i.e., <i>security plans, countermeasures, mission plans, navigation guidance</i> for mobile assets and <i>mission rehearsal models</i>, in geospatial context, as they apply to <i>incidents</i> and <i>events</i>). – Conduct Critical Infrastructure Inventory Management to update, reference and share <i>risk assessments</i> that are associated with <i>critical asset</i> and <i>key asset</i> inventories. 	<ul style="list-style-type: none"> – Critical Infrastructure Inventory Management
Identify Threats & Vulnerabilities	HLS017	Conduct Vulnerability Assessments	Identify, locate , analyze, and communicate vulnerabilities of America's critical infrastructure and key assets. Project the consequences of possible attacks against specific facilities or sectors of the economy or government to allow authorities to strengthen defenses against different threats. Develop mitigation	<ul style="list-style-type: none"> – Conduct Vulnerability Analysis. Create, update, reference and share <i>threat</i> and <i>vulnerability</i> data in geospatial context for <i>key</i> and <i>critical assets</i>, and assign probability and severity. [e.g. Locate and identify potential delivery conduits in existing geospatial data (Heating, Ventilation & Air Conditioning (HVAC), below ground utilities, etc).] Create, update, reference and share <i>vulnerability assessments</i> (i.e., geospatial analysis results), as they pertain to <i>key</i> and <i>critical assets</i>. Reference <i>threat intelligence</i> and other <i>intelligence</i> data in support of vulnerability analysis. – Conduct Threat Consequence Analysis. Create, update, reference and share <i>threat consequence</i> 	<ul style="list-style-type: none"> – Vulnerability Analysis – Threat Consequence Analysis – Security Planning – Mission Planning – Electronic Navigation – Mission Rehearsal – Countermeasure Planning – Facility Mapping & Management – Critical Infrastructure Inventory Management

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			strategies to minimize vulnerabilities.	<p><i>assessments</i> (i.e., geospatial modeling and analysis results) resulting from the modeling, simulation and analysis of the <i>threat</i> and the potential consequences of a <i>threat</i> in a chosen environment.</p> <ul style="list-style-type: none"> - Conduct Security Planning, Mission Planning/Navigation/Rehearsal and Countermeasure Planning for vulnerabilities. Create, update, reference and share <i>threat/vulnerability mitigation strategies</i> (i.e., <i>security plans, countermeasures, mission plans</i>), <i>navigation guidance</i> for mobile assets and <i>mission rehearsal models</i>. - Create, update, reference and share <i>real property</i> data and <i>facilities</i> for facility mapping, management and security. - Conduct Critical Infrastructure Inventory Management to update, reference and share <i>vulnerability assessments</i> that are associated with <i>critical asset</i> and <i>key asset</i> inventories. 	
Manage the Flow of People and Goods	HLS010	Examine People and Things	Screen persons and things (goods, personal possessions, luggage, credentials, travel documents, manifests, agricultural products, etc.) for the purpose of determining compliance with laws, regulations, and standards - in the course of facilitating the flow of people, goods, and services to the homeland. Receive declarations,	<ul style="list-style-type: none"> - Conduct Screening and Risk Analysis to screen parties (persons/organizations). Review (reference), update and share <i>party records</i> and assess geospatial-based risk factors for profiling and screening. Reference <i>threat</i> and <i>threat intelligence</i> for profiling and screening. - Conduct Screening and Risk Analysis to screen things. Review (reference) <i>shipping manifests</i> and assess geospatial-based risk factors. Reference <i>threat</i> and <i>threat intelligence</i> for profiling and screening. Reference, update and share <i>goods/cargo</i> records for current <i>location/time/identity/activity/status</i> and <i>route of goods/cargo</i> and <i>conveyances</i> (reference this data too) for profiling and screening. 	<ul style="list-style-type: none"> - Screening and Risk Analysis - Suspicious Activity Reporting - National Security Special Event Reporting

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			<p>appraise/value merchandise, process entry documentation, examine visa and quota restrictions and documents to determine whether an extended or secondary examination is required. Assess monetary fines and other non-monetary sanctions based on an entity's actions and violations of the law.</p>	<ul style="list-style-type: none"> - Conduct Suspicious Activity Reporting. Create <i>event</i> record with <i>location/time/identity/activity/status</i> of entry for suspicious persons/goods. Create and share <i>suspicious activity report</i>. - Conduct National Security Special Event (NSSE) Reporting. Create <i>Event/Incident</i> record (<i>location/time/identity/activity/status</i>) for NSSE threats. 	
<p>Manage the Flow of People and Goods</p>	<p>HLS011</p>	<p>Manage Requests for Government Benefits</p>	<p>Receive and analyze information (examine documents and credentials) and adjudicate (decide to grant or deny) applications for government benefits (e.g., immigration-related benefits, refugee and asylum requests, import/export licenses, post disaster assistance claims). Process applications timely and accurately. This includes the full immigration life cycle and related activities (e.g., including receipt of application or request, processing,</p>	<ul style="list-style-type: none"> - Conduct Screening and Risk Analysis to screen persons for certain benefits. Create, update, reference and share person and organization <i>benefit records</i> for geospatial information about persons,, and screen/profile this data for the purpose of immigration-related benefit processing. Create, review (reference), update and share <i>background checks, interviews</i>, etc. Create, reference, update and share associated <i>risk assessments</i> (i.e., geospatial analysis results) by analyzing <i>background checks, interviews</i>, etc. for associated geospatial-based risk factors indicating potential criminal/terrorist activities. - Conduct Suspicious Activity Reporting based upon screening results. Create <i>event</i> record with <i>location/time/identity/activity/status</i> of suspected threat/criminal activities. Create and share <i>suspicious activity report</i>. - Conduct Disaster Assistance for the purpose benefits processing. Create, update, reference and share <i>hazards, related assessments</i> [e.g., Digital 	<ul style="list-style-type: none"> - Screening and Risk Analysis - Suspicious Activity Reporting - Disaster Assistance

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			scheduling, fingerprinting, background checks, interviews, adjudications, decisions, appeals, court proceedings, etc.	Flood Insurance Rate <i>Maps</i> (DFIRMs) for lending institutions and flood insurance purposes (Human Services – Individual Assistance & Public Assistance), post disaster Housing Habitability data (<i>damage assessments</i> pertaining to individual structures and public infrastructure) for rebuilding purposes, etc.] Reference <i>address</i> of disaster assistance applicants.	
Manage the Flow of People and Goods	HLS012	Monitor Non-US Citizens	Verify that non-US citizens comply with the terms under which they were granted the right to enter and stay in the United States. (e.g., work program, parole, MS&D bonds, student study program, etc.). This includes keeping a record of the person's status current and up-to-date.	<ul style="list-style-type: none"> – Conduct Screening and Risk Analysis to screen persons for compliance with immigration regulations. Reference <i>person</i> records for non-US citizens. Create, <i>reference</i>, update and share associated <i>risk assessments</i> (i.e., geospatial analysis results) by analyzing updated current and historical <i>location/time/identity/activity/status</i> for person, as well as referencing and updating <i>intelligence</i>, and examining geospatial-based risk factors as indicators of suspicious or criminal activities. – Monitor Persons. Create, update, reference and share <i>location/time/identity/activity/status</i> of person (access <i>person</i> records). – Conduct Suspicious Activity Reporting. Create <i>event</i> record with <i>location/time/identity/activity/status</i> of suspected threat/criminal activities. Create and share <i>suspicious activity report</i>. 	<ul style="list-style-type: none"> – Screening and Risk Analysis – Monitor Parties – Suspicious Activity Reporting
Manage the Flow of People and Goods	HLS093	Categorize People and Things	Assign a risk value to people, goods, personal possessions, luggage, credentials, travel documents, etc. Classify commodities to assess tariffs.	<ul style="list-style-type: none"> – Conduct Screening and Risk Analysis to categorize person, goods, personal possessions, luggage, credentials, travel documents, etc. according to their associated risk. <ul style="list-style-type: none"> o Reference <i>person</i> records and analyze geospatial-based risk factors for people.. Assign risk factor and update <i>person records</i>. 	<ul style="list-style-type: none"> – Screening and Risk Analysis – Tariff Management (geospatial component)

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<ul style="list-style-type: none"> ○ Reference <i>goods records</i> and analyze geospatial-based risk factors for goods. Assign risk factor and update <i>goods records</i>. – Conduct Tariff Management. Classify commodities by <i>place of origin</i> and <i>place of destination</i> (reference this data) for the purpose of assessing tariffs, and update <i>goods records</i> accordingly. 	
Manage the Flow of People and Goods	HLS094	Establish Credentials	Issue permits and licenses for individuals and things, and produce license, permit or other valid credential for use by the individual (e.g., temporary work permits, boating licenses and documentation, etc.)	<ul style="list-style-type: none"> – Conduct Screening and Risk Analysis to screen persons for the purpose of permit/license processing. Reference <i>person records</i> and analyze geospatial-based risk factors for people. Create, reference, update and share <i>License/Permit records</i> to reflect <i>location</i> and <i>time</i> of application/issuance. – Conduct Screening and Risk Analysis to screen goods (things) for the purpose of permit/license processing. Reference <i>goods records</i> and analyze geospatial-based risk factors for goods. Create, reference, update and share <i>License/Permit records</i> to reflect <i>location</i> and <i>time</i> of application/issuance. – Conduct Suspicious Activity Reporting. Create <i>event</i> record with <i>location/time/identity/activity/status</i> of suspected criminal activities. Create and share <i>suspicious activity report</i>. 	<ul style="list-style-type: none"> – Screening and Risk Analysis – Suspicious Activity Reporting
Manage the Flow of People and Goods	HLS095	Verify Credentials	Verify the identity of the individual/thing against the credential provided. Validate the authenticity of credentialing document (e.g., license, permit, broker license, travel, work, or identity document, etc.)	<ul style="list-style-type: none"> – Conduct Screening and Risk Analysis to verify identity of Person. Reference <i>person records</i> and related <i>intelligence</i> and analyze geospatial-based risk factors for people. Create <i>verification event</i> record (<i>location & time</i>) as part of <i>person records</i>. Update <i>person records</i> for monitoring purposes. – Conduct Screening and Risk Analysis to verify identity of goods (things). Reference <i>goods records</i> and related <i>intelligence</i> and analyze 	<ul style="list-style-type: none"> – Screening and Risk Analysis

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				geospatial-based risk factors for goods. Create <i>verification event</i> record as part of <i>goods records</i> . Update <i>goods records</i> for monitoring purposes.	
Manage the Flow of People and Goods	HLS113	Establish Identity	Establish identity of individuals by capturing biographical and biometric information on individuals. Establish identity of goods by capturing specified physical characteristics.	– Conduct Biographical Analysis. Create, update, reference and share <i>biographical</i> , geospatial temporal crosschecks and biometric data for persons (<i>person records</i>). Reference <i>case</i> , <i>event</i> and <i>intelligence</i> records for use in biographical analysis.	– Biographical Analysis
Manage the Flow of People and Goods	HLS119	Verify Identity	Confirm the identity of an individual. This may include the need to capture and compare a biometric.	– Conduct Screening and Risk Analysis to verify a person's identity. Reference <i>person</i> records for <i>biographical</i> , geospatial temporal crosschecks and biometric data.	– Screening and Risk Analysis
Prevent Incidents	HLS014	Conduct Investigations	Conduct investigations (Preliminary Inquiry, Full Field Investigation) related to law enforcement cases or events. This includes encountering individuals and making preliminary status determinations. This includes investigating crimes against our nation's currency and financial systems; agriculture, alien smuggling, as well as terrorist incidents.	<ul style="list-style-type: none"> – Monitor and/or track assets, parties (persons or organizations) and conveyances in the conduct of investigations. Create, reference and share <i>observations</i> from sensors and persons. Create, update, reference and share the geospatial context of <i>cases</i> and related <i>occurrences</i> (suspicious activities), <i>alerts</i>, <i>notices or watches</i>, for conveyances, assets or persons. Reference <i>party</i>, <i>asset</i> and <i>conveyance</i> data, as necessary. Create, update, reference and share <i>situational awareness</i> for monitoring operations. Create, update, reference and share <i>situation reports</i>. – Monitor <i>locations</i> in the conduct of investigations. Create, reference and share <i>observations</i> from sensors and persons. Create, update, reference and share the geospatial context of <i>cases</i> and related 	<ul style="list-style-type: none"> – Monitor Assets – Monitor Parties (Persons and Organizations) – Monitor Conveyances – Monitor Locations (Surveillance) – Asset Inventory Management – Case Analysis – Event Analysis – Biographical Analysis – Mission Planning – Logistics Planning – Situation Awareness – Suspicious Activity Reporting

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			<p>Includes investigating in order to disrupt the flow of illegal money derived from global criminal activity. This includes investigation of overstays and referrals from other law-enforcement entities, e.g. investigate illegal import shipments and fraud, immigration-related violations and fraud, combating illegal drug activity, and illegal finance operations.</p>	<p><i>occurrences</i> (suspicious activities), <i>alerts</i>, <i>notices or watches</i>. Create, update, reference and share <i>situational awareness</i> for monitoring operations. Create, update, reference and share <i>situation reports</i>.</p> <ul style="list-style-type: none"> – Manage law enforcement assets (weapons, equipment and materials) to ensure their availability in good working order. Plan for shortages or emergencies. Create, update, reference and share <i>asset inventory</i> data. – Conduct Case Analysis (i.e., data integration, correlation, tracking, etc.) in geospatial context. Reference and update <i>event, case, person, goods</i> (including evidence), <i>cargo, conveyance, incident, threat</i>, and <i>intelligence</i> data as necessary to support analyses. The results of these analyses may create or update <i>case</i> records for investigations and provide input to mission planning and logistics planning. – Conduct Event Analysis (i.e., data integration, correlation, tracking, etc.) in geospatial context. Reference and update <i>event, case, person, goods, conveyance, incident, threat, threat intelligence</i>, and other <i>intelligence</i> data as necessary to support analyses. The results of these analyses may create or update <i>event</i> records for investigations and provide input to mission and logistics planning, as it pertains to investigations. – Conduct Mission Planning. Create, update, reference and share investigation-related <i>mission plans</i> in geospatial context, as they apply to <i>cases</i> and <i>events</i>. This data may contribute to a <i>MSOP</i>. – Conduct Logistics Planning to coordinate and plan the use of assets and personnel for investigations. 	

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>Create, update, reference and share <i>logistics plans</i>.</p> <ul style="list-style-type: none"> - Conduct Situation Awareness. Create, update, reference and share <i>situational awareness</i> data (i.e., geospatial analysis results) for near-real time operations associated with investigations. This data may contribute to a collaborative <i>MSOP</i>. Create, update, reference and share <i>situation reports</i>. - Conduct Suspicious Activity Reporting. Create <i>event</i> record with <i>location/time/identity/activity/status</i> of suspected criminal activities. Create and share <i>suspicious activity reports</i>. 	
Prevent Incidents	HLS015	Detain People	Hold (confine) a person in custody. Provide for the long-term, safe, secure and humane confinement of detained persons while awaiting proceedings. Includes arranging for detention/bed space.	<ul style="list-style-type: none"> - Perform Site Modeling & Analysis to <i>locate</i> new detention centers¹³. Create, reference, update and share <i>site plans</i>. - Conduct Asset Inventory Management to update facility <i>asset inventory</i> for new and expanded detention centers¹⁴. - Allocate persons to centers and update <i>case</i> and <i>custody records</i> to reflect current detention center <i>location/time/identity/activity/status</i> (Monitor Parties). - Conduct Facility Mapping & Management. Create, update, reference and share <i>real property</i> and <i>facilities</i> data in <i>map, plan</i> and <i>report</i> form for facility management, holding capacity/space utilization and security¹⁵. - Conduct Security Planning for detention centers. 	<ul style="list-style-type: none"> - Site Modeling & Analysis - Asset Inventory Management - Monitor Parties - Facility Mapping & Management - Security Planning - Sensor Management - Security Protection & Management

¹³ Needed in support of this activity.

¹⁴ Ibid.

¹⁵ Ibid.

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>Create, update, reference and share <i>security plans</i>, including details concerning guards, sensor deployments, etc.</p> <ul style="list-style-type: none"> - Conduct Sensor Management. Deploy security sensors and create, update, reference and share <i>observation</i> (and associated <i>sensor data</i>) from security sensors. - Conduct Security Protection & Management. Reference, update and share <i>security plans</i>, reference <i>observations</i> (and associated <i>sensor data</i>), and create, update, reference and share <i>situational awareness</i> for near real time security operations. Create, update, reference and share <i>situation reports</i>. 	
Prevent Incidents	HLS026	Implement Countermeasures	Deploy preventative measures (both tools and techniques) to reduce vulnerabilities and the impact of threats to America's key assets and infrastructure. (e.g. heightened security based on a targeted threat, physical barriers based on an assets vulnerability, etc.) Mitigate impact of natural and human-induced disasters.	<ul style="list-style-type: none"> - Conduct Security and Countermeasure Planning. Create, update, reference and share <i>countermeasures</i> and <i>security plans</i>, including details concerning the geospatial-temporal context of sensor, guard and barrier deployments, and other security measures. - Conduct Sensor Management. Deploy security sensors and create, update, reference and share <i>observations</i> (and associated <i>sensor data</i>) from security sensors. - Conduct Security Protection & Management. Reference, update and share <i>countermeasures</i> and <i>security plans</i>. Reference <i>observations</i>, <i>threat warnings</i>, <i>alerts</i>, <i>notices or watches</i> and <i>threat consequence assessments</i>. Create, update, reference and share <i>situational awareness</i> for near real time security operations, with disposition and status of <i>assets</i>. Create, update, reference and share <i>situation reports</i>. - Conduct Suspicious Activity Reporting. Create 	<ul style="list-style-type: none"> - Security Planning - Countermeasure Planning - Sensor Management - Security Protection & Management - Suspicious Activity Reporting - Mitigation Planning & Analysis

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p><i>event</i> record with <i>location/time/identity/activity/status</i> of suspected criminal activities. Create and share <i>suspicious activity report</i>.</p> <ul style="list-style-type: none"> – Conduct Mitigation Planning & Analysis to mitigate impact of natural and human-induced hazards/disasters. Create, update, reference and share <i>mitigation plans</i> and supporting Geospatial Products to prepare for hazards/disasters (e.g., hurricane, tropical storm preparation and resource planning). 	
Prevent Incidents	HLS027	Monitor Movement of Things	Track the movement of targeted goods, cargo and conveyances (within/to/from the US) to include agricultural products, legal and illegal goods, hazardous and non-hazardous materials for the purposes of protecting and facilitating legal commerce. Could include imports/exports.	<ul style="list-style-type: none"> – Monitor the movement of goods, cargo, and conveyances. Create, update, reference and share the geospatial context of <i>goods, cargo, hazmat</i> and <i>conveyances</i>, i.e., historical and current <i>location/time/identity/activity/status, place of origin, place of manufacture</i>, etc. Reference and update <i>security plans, credentials, transshipment points, shipping route</i> and <i>place of destination</i> for <i>conveyances</i> and <i>cargos</i>. Create, update, reference and share <i>situational awareness</i> for monitoring operations. Create, update, reference and share <i>situation reports</i>. – Conduct Threat Analysis. Create, update, reference and share <i>threat assessments</i> (i.e., geospatial analysis results) as they pertain to <i>goods, cargo, hazmat</i> and <i>conveyances</i>. Reference, update and share <i>security plans</i> for transport operations, based upon threat assessments. Reference <i>threat intelligence</i> and other <i>intelligence</i> data in support of threat analysis to detect illegal flow of goods, cargo and hazmat. – Conduct Suspicious Activity Reporting. Create <i>event</i> records with 	<ul style="list-style-type: none"> – Monitor Goods & Cargo – Monitor Conveyances – Threat Analysis – Suspicious Activity Reporting

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p><i>location/time/identity/activity/status</i> of suspected criminal activities. Create and share <i>suspicious activity report</i>.</p>	
Prevent Incidents	HLS029	Safeguard Officials and other designated persons	Provide identified individuals with protective services-- president, vice president, designated individuals, as well as visiting world leaders.	<ul style="list-style-type: none"> - Conduct secure Travel Planning. Create, update, reference and share travel plans containing person's <i>itinerary</i> for safe routes and visitation. - Conduct Threat Analysis to assess risks to safety and security of key persons. Create, update, reference and share <i>threats</i> and <i>threat assessments</i> to key <i>persons</i> (e.g., line of site analysis for force protection and movement, routing analysis for avoidance, access and egress, etc.) and assign probability and severity. Create, update, reference and share <i>threat assessments</i> (i.e., geospatial analysis results) as they pertain to <i>persons</i>. Reference <i>threat intelligence</i> and other <i>intelligence</i> data in support of threat analysis. [Revisit Travel Planning and update <i>itinerary</i> to mitigate threats.] - Conduct Vulnerability Analysis. Create, update, reference and share <i>vulnerabilities</i> and <i>vulnerability assessments</i> for key <i>persons</i>, in geospatial context, and assign probability and severity. Reference <i>threat intelligence</i> and other <i>intelligence</i> data in support of vulnerability analysis. [Revisit Travel Planning and update <i>itinerary</i> to mitigate vulnerabilities.] - Conduct Risk Analysis. Create, update, reference and share <i>risk assessments</i> that spatially correlate <i>threats</i> to <i>vulnerabilities</i>, as they pertain to <i>persons</i>. Reference and share <i>threat intelligence</i> and other <i>intelligence</i> data. [Revisit Travel Planning and update <i>itinerary</i> to mitigate risks.] - Conduct Security Planning. Create, update, 	<ul style="list-style-type: none"> - Travel Planning - Threat Analysis - Vulnerability Analysis - Risk Analysis - Security Planning - Security Protection & Management - Suspicious Activity Reporting

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>reference and share <i>security plans</i> for protective services and deployment of protective resources, including guards, barriers, details concerning sensor deployments, etc. Plans need to consider (reference) <i>itineraries, threats, vulnerabilities</i> and <i>risks</i>.</p> <ul style="list-style-type: none"> - Conduct Security Protection & Management. Deploy security sensors and create, update, reference and share <i>observation</i> (and associated <i>sensor</i> data) from security sensors. Reference, update (as situation changes warrant) and share <i>security plans, itineraries, threats, vulnerabilities</i> and <i>risks</i>. Reference <i>threat warnings, alerts, notices or watches</i> and <i>threat consequence assessments</i>. Create, update, reference and share <i>situational awareness</i> for near real time security operations. Create, update, reference and share <i>situation reports</i>. - Conduct Suspicious Activity Reporting. Create <i>event</i> record with <i>location/time/identity/activity/status</i> of suspected threat/criminal activities. Create and share <i>suspicious activity report</i>. 	
Prevent Incidents	HLS033	Manage Waterways	Perform port safety and security, waterways management, and commercial vessel safety missions and tasks. Provide a safe, efficient and navigable waterway system to support domestic commerce, international trade and the military sealift	<ul style="list-style-type: none"> - Conduct Waterway Management. Create, reference, update and share <i>Nautical Navigation</i> data and sensor <i>observations</i> pertaining to waterways, ports, harbors, bridges, navigation aids, traffic, traffic control, electronic navigation guidance, fixed hazards and dynamic hazards, and <i>hazmat</i>. Reference <i>weather, electronic charts</i> and <i>Notice to Mariners</i> to support navigation. Create, reference, update and share <i>conveyance</i> (vessel) data to support vessel safety and use. Reference <i>security plans, response plans, mission (patrol)</i> 	<ul style="list-style-type: none"> - Waterway Management - Threat Analysis - Vulnerability Analysis - Risk Analysis - Mission (Patrol) Planning - Electronic Navigation - Mission Rehearsal - Countermeasure Planning - Security Planning

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			<p>requirements for national defense. Provide long- and short-range aids to navigation services (buoys/sensors/breaking ice); charting, tide/current/pilotage information through Notices to Mariners services; vessel traffic services; technical assistance and advice; vessel safety standards and inspection; and bridge administration standards and inspections.</p>	<p><i>plans, recovery plans, and threat, vulnerability and risk assessments</i> as they pertain to waterway and related equipment, personnel and facility health and safety. Apply all data for use in creating <i>situation awareness</i> for daily operations of the marine environment. Create, update, reference and share <i>situation reports</i>, as necessary.</p> <ul style="list-style-type: none"> - Conduct Threat Analysis. Create, update, reference and share <i>threats</i> and <i>threat assessments</i> to waterways and related equipment, personnel and facilities, and assign probability and severity to these threats. Create, update, reference and share <i>threat assessments</i> (i.e., geospatial analysis results) as they pertain to waterway and related equipment, personnel and facilities. Reference <i>threat intelligence</i> and other <i>intelligence</i> data in support of threat analysis. - Conduct Vulnerability Analysis. Create, update, reference and share <i>vulnerabilities</i> and <i>vulnerability assessments</i> for waterway and related equipment, personnel and facilities, in geospatial context, and assign probability and severity to these vulnerabilities. Reference <i>threat intelligence</i> and other <i>intelligence</i> data in support of vulnerability analysis. - Conduct Risk Analysis. Create, update, reference and share <i>risks</i> and <i>risk assessments</i> that spatially correlate <i>threats</i> to <i>vulnerabilities</i>, as they pertain to waterways and related equipment, personnel and facilities. Reference and share <i>threat intelligence</i> and other <i>intelligence</i> data. - Conduct Security Planning, Mission Planning/Navigation/Rehearsal and Countermeasure Planning for threats to waterways. 	<ul style="list-style-type: none"> - Security Protection & Management - Suspicious Activity Reporting - Warning/Alert Management

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>Create, update, reference and share <i>security plans, countermeasures, mission plans, navigation guidance</i> for patrol and surveillance assets, and <i>mission rehearsal models</i>.</p> <ul style="list-style-type: none"> - Implement Security Protection & Management to maintain safe and secure <i>waterways</i> and related assets (<i>equipment</i>), personnel (<i>persons</i>) and <i>facilities</i>. Deploy security sensors and create, update, reference and share <i>observations</i> (and associated <i>sensor data</i>) from security sensors. Reference, update and share <i>security plans</i> (as situation changes warrant). Reference conveyance <i>itineraries</i> and <i>cargos, threats, vulnerabilities, risks, mission (patrol) plans, threat warnings, alerts, notices or watches</i> and <i>threat, threat consequence, vulnerability</i> and <i>risk assessments</i>. Create, update, reference and share <i>situational awareness</i> for near real time security operations. Create, update, reference and share <i>situation reports</i>. - Conduct Suspicious Activity Reporting. Create <i>occurrence</i> record with <i>location/time/identity/activity/status</i> of suspected threat/criminal activities. Create and share <i>suspicious activity report</i>. - Conduct Warning/Alert Management. Create, update, reference and share <i>threat warnings</i> and <i>alerts</i> resulting from nautical threats and risks. 	
Prevent Incidents	HLS090	Provide Physical Security	Strategic use/placement of guards and physical barriers to reduce the vulnerability of an asset/event/person and allowing the lawful entry	<ul style="list-style-type: none"> - Conduct Security Planning. Create, update, reference and share <i>security plans</i> to determine the optimal placement of guards, sensors and physical barriers, including details concerning sensor deployments. - Conduct Sensor Management. Deploy security 	<ul style="list-style-type: none"> - Security Planning - Sensor Management - Security Protection & Management

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			of individuals into the physical space/area.	<p>sensors and create, update, reference and share <i>observations</i> (and associated <i>sensor</i> data) from security sensors.</p> <ul style="list-style-type: none"> - Conduct Security Protection & Management. Deploy security sensors and create, update, reference and share <i>observations</i> (and associated <i>sensor</i> data) from security sensors. Reference, update and share <i>security plans</i>. Reference <i>threats, vulnerabilities, risks, threat warnings, alerts, notices or watches</i> and <i>threat, threat consequence, vulnerability</i> and <i>risk assessments</i>. Create, update, reference and share <i>situational awareness</i> for security operations. Create, update, reference and share <i>situation reports</i>. 	
Prevent Incidents	HLS096	Categorize Events	Assign a risk value (based on certain criteria) to a specific event (e.g., the Super Bowl, the Kentucky Derby, etc) to determine the vulnerabilities and extent of countermeasures to put in place for security.	<ul style="list-style-type: none"> - Conduct Threat, Vulnerability and Risk Analyses as it pertains to the event. Create, update, reference and share <i>threats, vulnerabilities</i> and <i>risks</i> to event and related assets, personnel and facilities, and assign probability and severity to these threats, vulnerabilities and risks. Create, update, reference and share related <i>threat, vulnerability</i> and <i>risk assessments</i>. <i>Risk assessments</i> spatially correlate <i>threats</i> to <i>vulnerabilities</i>. Reference <i>threat intelligence</i> and other <i>intelligence</i> data in support of these analyses. - Support Event Planning and Analysis related to threats and vulnerabilities. Create, update, reference and share <i>event plans</i> for major events (e.g., Super Bowl). Conduct threat and vulnerability analysis in context with (referencing) <i>event venue</i> (location/time/activity), <i>facilities, assets, personnel (persons), security plans, evacuation plans, mutual aid support plans</i>, etc. The results of these analyses may create or update 	<ul style="list-style-type: none"> - Threat Analysis - Vulnerability Analysis - Risk Analysis - Event Planning and Analysis - Security Planning - Countermeasure Planning - Threat Consequence Analysis - Response Planning - Training Planning & Support

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p><i>vulnerabilities, risks and vulnerability and risk assessments, and impact countermeasures and security plans. This may in turn result in changes to the event venue.</i></p> <ul style="list-style-type: none"> – Conduct Security Planning and Countermeasure Planning for threats and vulnerabilities pertaining to an event. Create, update, reference and share <i>security plans</i> and <i>countermeasures</i>. Plans need to consider (reference) <i>event venue</i>, potential <i>threats</i>, <i>vulnerabilities</i>, <i>risks</i>, etc. – Conduct Threat Consequence Analysis for potential threats to the event and related assets, personnel and facilities. Create, update, reference and share <i>threat predictions</i> and <i>threat consequence assessments</i> (e.g., loss estimation, impact assessments, etc) resulting from the modeling, simulation and analysis of the <i>threat</i> and the potential consequences of <i>threats</i> to the event. The results of these analyses may create or update <i>vulnerabilities</i> and the extent of <i>countermeasures</i>. – Conduct Response Planning to contingency plan for potential <i>occurrences, incidents</i> and <i>EVENTs</i>. Create, update, reference and share <i>response plans</i> that reflect (reference) <i>event venue</i> data, potential <i>threats, vulnerabilities, risks</i>, and their associated <i>assessments</i>. Preplan/plan, schedule and allocate personnel (<i>persons</i>), <i>goods</i> and <i>assets</i> to potential <i>occurrence/incident/EVENT</i> scenarios, given public safety considerations and potential affected <i>locations, facilities, assets</i>, etc to develop response operations plans that convey schedule, tasking and resource allocation for response operations. – Conduct Training Planning & Support for potential <i>occurrence, incident</i> and <i>EVENT scenarios</i>. 	

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				Create, update, reference and share <i>training plans</i> and <i>training aids</i> , which includes maps and reports that convey objectives/schedules, activity locations and situation context for the exercise. Reference <i>occurrence, incident</i> and <i>EVENT scenarios, threat consequences, assets</i> , personnel (persons), <i>population densities, evacuation routes, mutual aid support facilities</i> , etc.	
Prevent Incidents	HLS097	Test Countermeasures	Use a variety of methods (e.g., intrusion detection, penetration testing, environmental testing, etc.) to determine effectiveness of countermeasure on a periodic or recurring basis.	<ul style="list-style-type: none"> - Develop <i>mission plans</i> for exercises to test the effectiveness of <i>countermeasures</i>. Create, update, reference and share <i>mission plans</i>. Reference and analyze <i>countermeasures</i> and <i>security plans</i> to determine weaknesses that may be exploited. - Conduct Post Mission Analysis to provide feedback on countermeasure effectiveness. Create, update, reference and share <i>post-mission assessments</i>. 	<ul style="list-style-type: none"> - Mission Planning - Post Mission Analysis
Prevent Incidents	HLS098	Patrol Areas of Interest	Patrol and Survey (e.g., watch and listen) areas of interest (e.g. land and sea borders, special events, etc) for illegal or suspicious activities. Tactically deploy resources to monitor and respond to the areas of interest.	<ul style="list-style-type: none"> - Conduct Mission (Patrol) Planning for border patrols. Create, update, reference and share <i>mission plans</i> for patrol and surveillance assets. - Determine Electronic Navigation for surveillance assets. Create, update, reference and share <i>navigation guidance</i> for surveillance assets. - Conduct Mission Rehearsals for patrols and surveillance. Reference <i>navigation guidance</i>. Create, update, reference and share <i>mission rehearsal models</i>. - Conduct Sensor Management. Deploy remote sensing and security sensors and create, update, reference and share <i>observations</i> (and associated <i>sensor</i> data) from security sensors. - Conduct Logistics Planning to coordinate and plan the use of <i>assets</i> and personnel (<i>persons</i>) for patrols. Create, update, reference and share 	<ul style="list-style-type: none"> - Mission (Patrol) Planning - Electronic Navigation - Mission Rehearsal - Sensor Management - Logistics Planning - Asset Inventory Management - Monitor Location - Situation Awareness - Suspicious Activity Reporting - Incident Reporting - Incident Management

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p><i>logistics plans.</i></p> <ul style="list-style-type: none"> – Manage patrol and surveillance assets. Create, reference, update and share <i>asset inventory</i>. – Monitor <i>locations</i> in the conduct of patrols and surveillance. Create, reference and share <i>observations</i> from reconnaissance and surveillance assets (sensors and persons). Display and analyze <i>observations</i>. Detect threats through screening and analysis of <i>observations</i>. Create and share derived <i>occurrences, events, threats, alerts, notices or watches</i>. – Conduct Situation Awareness to monitor patrol and surveillance operations. Create, update, reference and share <i>situational awareness</i> data (i.e., geospatial analysis results) for near-real time operations. This data contributes to a collaborative <i>COP</i> and <i>MSOP</i>. Reference <i>observations</i> (and associated <i>sensor</i> data) from surveillance assets. Reference germane <i>threats, vulnerabilities, risks, threat warnings, alerts, notices or watches</i>, and <i>threat, threat consequence, vulnerability</i> and <i>risk assessments</i>. Create, update, reference and share <i>situation reports</i>. – Conduct Suspicious Activity Reporting. Create <i>event/occurrence</i> record with <i>location/time/identity/activity/status</i> of suspected threat/criminal activities detected during patrols and surveillance. Create and share <i>suspicious activity report</i>. – Perform Incident Management for incidents that arise through patrol and surveillance operations. Create, update, reference and share <i>incidents</i>. – Perform Incident Reporting to create and share <i>Incident Reports</i> concerning threat/criminal 	

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				activities detected during patrols and surveillance.	
Disseminate Information	HLS021	Communicate Warnings and Alerts	<p>Disseminate necessary information when specific criteria exceed certain thresholds or specific operating conditions are met. Issue warnings and alerts about individuals suspected of, or wanted for, illegal activity, impending natural disasters, etc.</p> <p>Disseminate information according to established protocols. This includes notifications to law-enforcement entities when individuals are identified who need to be located. Includes a variety of alerts, notices, or lookouts that are to be made available when law-enforcement personnel enter a query about the person so that appropriate action is taken.</p>	<ul style="list-style-type: none"> - Conduct Warning/Alert Management. Create, update, reference and share <i>threat warnings</i> and <i>alerts</i> resulting from Situation Awareness. - Situation Awareness is a key command and control application node for consuming <i>warnings</i> and <i>alerts</i>, and producing <i>alerts</i>, <i>notices</i> or <i>watches</i> (lookouts). Create, update, reference and share <i>situation awareness data</i> for near-real time context of <i>threats</i>, <i>parties</i>, <i>cases</i>, etc, and associated <i>occurrences</i>, <i>alerts</i>, <i>notices</i> or <i>watches</i>. Also, create, update, reference and share <i>situation reports</i>. 	<ul style="list-style-type: none"> - Warning/Alert Management - Situation Awareness

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
Disseminate Information	HLS102	Communicate with the Public	Communicate information through a variety of media (radio, television, print ads) to provide guidance on a range of topics including: how to respond to incidents, apply for government benefits, and access government services. Awareness campaigns. Outreach to inform community of risk identification, assessment, and mitigation findings. Provide information to promote the understanding of the various effects of both man-made and natural disasters. This would include "how-to" publications, hazard fact sheets, etc.	<ul style="list-style-type: none"> - Conduct Situation Awareness related to incidents/events for the purpose of compiling geospatial information for public safety and awareness. Create, update, reference and share <i>situation awareness</i> information for the public. Reference risks, risk and damage assessments, warnings, alerts, or notices, weather, and public-oriented plans for preparation, mitigation (location of critical relief site and services), evacuation and response. - Conduct Map Publication to produce <i>maps</i> for public consumption. Create, update, reference and share geospatial <i>reports</i> and <i>maps</i> for public outreach. - Conduct Warning/Alert Management. Create, update, reference and share <i>threat warnings</i> and <i>alerts</i> with public. - Conduct Public Information Outreach to inform the public. Portray <i>maps</i> (e.g., National Flood Insurance Program (NFIP) floodplain maps) and location-based <i>reports</i>, <i>alerts</i>, <i>warnings</i> and <i>emergency declarations</i> concerning <i>threats</i>, <i>threat consequences</i>, response and recovery <i>status</i>, mitigation and <i>situation reports</i>, <i>locations</i> of post disaster services (water, medical, shelter and disaster field offices), and benefits <i>locations</i> through public information (media) channels. Allow the public to interact through these channels (e.g., explore what's happening in their <i>area of interest</i>). Support electronic registration (geocoding) for the application of benefits. Many types of geospatial products produced by geospatial applications across the enterprise may be distributed through public information channels. 	<ul style="list-style-type: none"> - Situation Awareness - Map/Report Publication - Warning/Alert Management - Public Information Outreach

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
Prepare for Incidents	HLS006	Stockpile & Deploy Supplies	Identify, acquire, develop, maintain, and distribute resources (e.g., pharmaceutical and medical supplies) that would be required to respond to or prevent incidents and shortages. Monitor the potency of vaccines and replenish supplies as vaccines age.	<ul style="list-style-type: none"> – Conduct Logistics Planning to coordinate and plan the use of assets and personnel for incidents and shortages. Conduct routing and distribution analyses to achieve supply and logistics staging. Determine stockpile locations. Create, update, reference and share <i>logistics plans</i> and <i>situation reports/maps</i>. – Manage the assets required for incidents and shortages, including response equipment and materials, reserve supply of vaccines, pharmaceuticals, and other response supplies in anticipation of future shortage or emergency. Create, update, reference and share <i>asset inventory</i> data. – Conduct Operations Planning. Update <i>operations plans (deployment plans and contingency plans)</i> to reflect asset and personnel resources and locations. – Assemble, distribute and monitor deployable technologies and data to support response and recovery activities. 	<ul style="list-style-type: none"> – Logistics Planning – Asset Inventory Management – Operations Planning

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
Prepare for Incidents	HLS106	Conduct Training and Exercises	Conduct training and preparedness exercises with emergency workers, first responders, community leaders, public citizens, and other federal agencies. Includes fire prevention and control, conducting mock exercises requiring different response to mobilize without warning.	<ul style="list-style-type: none"> - Conduct Training Planning & Support for potential threat <i>occurrence, incident</i> and <i>EVENT scenarios</i>. Train for emergency preparation, mitigation, response and recovery. Create, update, reference and share <i>training plans</i> and <i>training aids</i>, which includes <i>maps</i> and <i>reports</i> that convey objectives/schedules, activity locations and situation context for training exercises. Reference <i>occurrence, incident</i> and <i>EVENT scenarios, threat consequences, assets</i>, personnel (persons), <i>population densities, evacuation routes, mutual aid support facilities</i>, etc. Train Geographic Information System (GIS) Reservist to support Federal Response Plan Emergency Support Function 5 “Information and Planning”. - Provide Training Exercise Simulation. The simulations employ geospatial data and technology to simulate different attack scenarios, using <i>training models</i> and supporting databases. The <i>training models</i> (data and encoded procedures) demonstrate how geospatial data and technology is going to perform in local conditions under different attack scenarios. - Conduct Operations Planning. Update <i>operations plans (deployment plans and contingency plans)</i> to reflect results from training lessons learned. 	<ul style="list-style-type: none"> - Training Planning & Support - Training Exercise Simulation - Operations Planning
Prepare for Incidents	HLS107	Coordinate Pre-Response Measures	Support state and local officials in taking actions with an impending disaster, prior to its striking, to minimize its impact. This would include such activities as plotting a hurricane track	<ul style="list-style-type: none"> - Conduct Weather Modeling & Analysis to model/simulate and analyze severe weather conditions for storm tracks. The means to determine <i>nowcasts</i> and <i>forecasts</i> and share this information. The means to generate and disseminate <i>Weather Alerts & Warnings</i>. - Conduct Threat Analysis and Threat Consequence Analysis to support emergency preparation and 	<ul style="list-style-type: none"> - Weather Modeling & Analysis - Threat Analysis - Threat Consequence Assessments - Preparation Planning - Operations Planning - Logistics Planning

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			and modeling wind to support evacuation prior to a hurricane	<p>mitigation for state and local officials. Create, update, reference and share <i>threat (disaster) predictions</i> and <i>threat consequence assessments</i> resulting from modeling, simulation and analysis of a threat and the potential consequences of a threat (e.g., results from CATS, HAZUS, etc.). <i>Threat (hazard) assessments</i> include flood maps, Special Flood Hazard Areas, National Weather Service River Flood Outlook, and areas of high susceptibility from tidal storm surge, hurricane, tornado, landslide, earthquake, fire, tsunami, volcanic events, high winds and other types of natural disasters.</p> <ul style="list-style-type: none"> - Conduct Preparation Planning to produce <i>preparation plans</i> in support of emergency preparation and mitigation. Reference <i>threat predictions</i> and <i>threat consequence assessments</i> to ensure that plans reflect the nature of threats. - Conduct Operations Planning. Update <i>operations plans (deployment plans and contingency plans)</i> to reflect results from <i>threat consequence assessments</i>. - Conduct Logistics Planning to coordinate and plan the use of assets and personnel for an impending disaster. Conduct stockpile, routing and distribution analyses to achieve supply and logistics approaches. Create, update, reference and share <i>logistics plans</i>. - Conduct Mitigation Planning & Analysis to mitigate and lessen the impact of natural and human-induced hazards/disasters, e.g., hurricane and tropical storm preparation. Create, update, reference and share <i>mitigation plans</i> and supporting Geospatial Products (e.g., <i>multi-hazard</i> 	<ul style="list-style-type: none"> - Mitigation Planning & Analysis - Evacuation Planning & Management - Response Planning - Training Planning & Support

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p><i>maps</i>) to reduce or eliminate long-term risk to people and property from hazards and their effects. Reference <i>population densities, evacuation routes, mutual aid support facilities</i> and <i>threat (hazard) assessments</i>.</p> <ul style="list-style-type: none"> – Conduct Evacuation Planning & Management in preparation for a disaster. The means to produce and implement <i>evacuation plans</i> that convey the details pertaining to evacuation of a current or planned disaster/threat area, consisting of maps and reports that convey plan objectives, schedules and details, including estimated population densities, threat locations, threat consequences, evacuation routes, mutual aid support facilities, etc. – Conduct Response Planning to contingency plan for potential <i>occurrences, incidents</i> and <i>EVENTS</i>. Create, update, reference and share <i>response plans</i> (e.g., hurricane, tropical storm preparation and resource deployment planning and activation for Federal Response Plan) that reflect (reference) potential <i>threats, vulnerabilities, risks</i> and associated <i>assessments</i>. Preplan/plan, schedule and allocate personnel (<i>persons</i>), <i>goods</i> and <i>assets</i> to potential <i>occurrence/incident/EVENT</i> scenarios (e.g., hurricane track), given public safety considerations and potential affected <i>locations, facilities, assets</i>, etc to develop response operations plans that convey schedule, tasking and resource allocation. – Conduct Training Planning & Support for potential threat <i>occurrence, incident</i> and <i>EVENT scenarios</i>. Create, update, reference and share <i>training plans</i> and <i>training aids</i>, which includes maps and reports 	

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				that convey objectives/schedules, activity locations and situation context for training exercises. Reference <i>occurrence, incident</i> and <i>EVENT scenarios, threat consequences, assets, personnel (persons), population densities, evacuation routes, mutual aid support facilities, etc.</i>	
Prepare for Incidents	HLS108	Assess Preparedness Capabilities	Improve community casualty preparedness through coordinating with appropriate external entities. (e.g., GIS, Toxic Registry, Community Evacuation and shelters, etc.). Monitor and track results and findings of the Emergency Management (EM) Accreditation Program based on onsite state assessments.	<ul style="list-style-type: none"> – Assess and enhance, as necessary, the means for communities to conduct Threat Consequence Analysis, Preparation Planning, Evacuation Planning & Management and Mitigation Planning & Analysis in support of emergency preparation and mitigation in order to minimize casualties. 	<ul style="list-style-type: none"> – Threat Consequence Analysis – Preparation Planning – Mitigation Planning & Analysis – Evacuation Planning & Management
Respond to Incident	HLS035	Perform Search and Rescue	Find (Locate) and retrieve people whose health or safety is at risk. Includes search and rescue performed at sea, along the border (Canada and Mexico), and urban/rural (within the U.S.).	<ul style="list-style-type: none"> – Conduct Search and Rescue Planning to preplan/plan, schedule and allocate <i>personnel</i> and <i>assets</i> for search and rescue missions. Determine the <i>geospatial extent</i> of the search area. The means to create, update, reference and share <i>search & rescue plans</i> that convey schedule, tasking and resource allocation for search & rescue operations. Create, update, reference and share related <i>incident/event data, alerts</i> and <i>warnings</i>. Convey the geospatial-temporal context of <i>search & rescue plans</i>, which includes <i>maps</i> and <i>reports</i> that convey search & recovery objectives, schedules, resource deployments, contingencies and the geospatial-temporal situation context for planned search & rescue operations. [Support Federal 	<ul style="list-style-type: none"> – Search and Rescue Planning – Search and Rescue Response – Asset Inventory Management

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>Response Plan Emergency Support Function (ESF) 9 (Urban Search & Rescue); mapping support for staging, team deployment mapping and resource allocation.]</p> <ul style="list-style-type: none"> - Conduct Search and Rescue Response to support command and control for an <i>incident</i> or <i>event</i> that requires search and rescue. Involves creating and managing <i>situation awareness</i>, monitoring <i>threats</i> and <i>threat assessments</i>, coordinating and monitoring response <i>activities/assets/personnel</i>, communicating with response personnel, etc., determining deployment, routing, search strategies and ingress/egress in support of search and rescue operations, and reporting status to persons in the command and control chain (<i>Situation Reports</i>). Create pertinent <i>communications</i>. Update <i>incident/event</i> records to reflect response results. Reference other supporting geospatial data. - Manage and coordinate response <i>assets</i> (equipment and materials) to ensure their availability for search & rescue operations. Plan for contingencies. Create, update, reference and share <i>asset inventory</i> data. 	
Respond to Incident	HLS036	Contain Incident	Isolate and contain incident to keep from spreading and causing additional harm or damage to persons/facilities/environment. (e.g., response to oil spills to minimize environmental degradation.)	<ul style="list-style-type: none"> - Conduct Threat Consequence Analysis to support emergency response operations required to contain an incident and minimize casualties. Determine <i>geospatial extent</i> and monitor the <i>incident</i> area. Create, update, reference and share <i>threat (disaster) predictions</i> and <i>threat consequence assessments</i> resulting from modeling, simulation and analysis of a threat and the potential consequences of a threat. - Conduct Evacuation Planning & Management to minimize casualties. Create, update, reference and 	<ul style="list-style-type: none"> - Threat Consequence Assessment - Evacuation Planning & Management - Incident Management - Search and Rescue Response - Asset Inventory Management

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>share <i>evacuation plans</i> that convey the details pertaining to evacuation of the <i>incident</i> area.</p> <ul style="list-style-type: none"> - Conduct Incident Management to support command and control for an incident or event, including situation awareness, monitoring threats and threat assessments, coordinating and monitoring response activities, assets, personnel, etc., and reporting status to persons in the command and control chain (see incident reporting). Create and manage <i>incident/event</i> data. Create and disseminate <i>alerts</i> and <i>warnings</i>. Reference <i>threats</i> and <i>threat consequences</i>. Create, update, reference and/or share <i>situational awareness</i> and <i>situation reports</i> pertaining to the incident (for dissemination to chain of command). Coordinate and monitor response <i>activities/assets/personnel</i>. Reference relevant <i>weather</i> and other supporting geospatial data. Determine <i>containment areas</i>, <i>deployment plans</i> and <i>ingress/egress routes</i> for incidents. Update <i>incident/event</i> records to reflect response results. [Enhance the ability of the United States to manage Domestic Incidents by establishing a single, comprehensive national incident management system (NIMS) with supporting geospatial capabilities.] - Conduct Search and Rescue Response for an incident that requires search and rescue. Involves creating and managing <i>situation awareness</i>, monitoring <i>threats</i> and <i>threat assessments</i>, coordinating and monitoring response <i>activities/assets/personnel</i>, communicating with response personnel, etc., determining <i>deployment</i>, <i>ingress/egress routing</i>, <i>search plans</i> in support of 	

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>search and rescue operations, and reporting status to persons in the command and control chain (<i>Situation Reports</i>). Create pertinent communications. Update <i>incident/event</i> records to reflect response results. Reference <i>weather</i> and other supporting geospatial data.</p> <ul style="list-style-type: none"> - Manage and coordinate response <i>assets</i> (equipment and materials) to ensure their availability for response and search & rescue operations. Plan for contingencies. Create, update, reference and share <i>asset inventory</i> data. 	
Respond to Incident	HLS037	Apprehend People	Take physical control of persons for the purposes of questioning or ascertaining whether further action is required.	<ul style="list-style-type: none"> - Monitor Persons for apprehension purposes. Create, update, reference and share locations pertaining to persons who are apprehended (access <i>person</i> records for <i>physical address, place of birth, citizenship, location/time/identity/activity/status, travel history</i>, associations with illegal interests, etc). - Conduct Incident Management to support command and control for the apprehension of persons, including <i>situation awareness</i> and <i>situation reporting</i>, monitoring related <i>threats</i> and <i>threat assessments</i>, coordinating and monitoring apprehension <i>activities, assets, personnel</i>, etc., and reporting status to persons in the command and control chain (see incident reporting). - Perform Incident Reporting to create and share <i>Incident Reports</i> concerning the apprehension of persons. 	<ul style="list-style-type: none"> - Monitor Persons - Incident Management - Incident Reporting
Respond to Incident	HLS038	Seize Property	Take official government possession of merchandise, currency, or other articles such as a car, vessel, or aircraft.	<ul style="list-style-type: none"> - Monitor seized property (<i>goods, cargo</i> and <i>assets</i>). Create, reference, update and/or share <i>location/time/identity/activity/status</i> pertaining to confiscations/seizures and <i>locations</i> of detention centers/impounds. Update, reference and share 	<ul style="list-style-type: none"> - Monitor Goods & Cargo - Monitor Assets - Incident Management - Incident Reporting

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			Hold until final disposition is reached. This includes detaining cargo and conveyances.	<p><i>case</i> records accordingly. Create, update, reference and share <i>situational awareness</i> for monitoring operations. Create, update, reference and share <i>situation reports</i>.</p> <ul style="list-style-type: none"> – Conduct Incident Management to support command and control for seizure of property, including <i>situation awareness</i> and <i>situation reporting</i>, monitoring related <i>threats</i> and <i>threat assessments</i>, coordinating and monitoring seizure <i>activities</i>, <i>assets</i>, <i>personnel</i>, etc., and reporting status to persons in the command and control chain (see incident reporting). – Perform Incident Reporting to create and share <i>Incident Reports</i> concerning the seizure of property. 	
Respond to Incident	HLS039	Activate Resources in Response to Incident	Deploy people and equipment that play an active role in responding to any kind of incident. (e.g., emergency response teams, medical surge response, etc.) Includes the resources associated with any organization (Department of Homeland Security (DHS), federal, state, local, tribal, maybe even international).	<ul style="list-style-type: none"> – Conduct Incident Management in response to an incident, including <i>situational awareness</i> (and generating <i>situation reports</i>), guiding personnel and resources to the incident <i>location</i>, monitoring (referencing) related <i>threats</i>, <i>threat assessments</i> and <i>threat consequence assessments</i>, coordinating and monitoring response <i>assets</i> and <i>parties</i> (e.g., police, fire, emergency management technician (EMT) and mutual aid assets, incident commander, etc), and reporting status to persons in the command and control chain (see incident reporting). [Support Federal Response Plan ESF 5 (Information & Planning); provide mapping support for staging, team deployment and resource allocation (updated hourly).] – Support navigation to incidents. Use fixed physical <i>navigational aids</i> for dead reckoning. Use analog direction finding, measuring, and positioning equipment in conjunction with <i>maps</i> and <i>charts</i> for 	<ul style="list-style-type: none"> – Incident Management – Electronic Navigation – Incident Reporting – Asset Inventory Management

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				<p>the purpose of navigating to an incident <i>location</i>. Use linear reference systems such as uniform address-interval/street address guide (SAG) to respond to an incident for which street <i>address</i> is the only locator. Identify obstructions to navigation or to locate suitable landing zones near an incident. Create, update, reference and share <i>navigation guidance</i> for response assets.</p> <ul style="list-style-type: none"> - Perform Incident Reporting to create and share <i>Incident Reports</i>. - Manage and coordinate response <i>assets</i> (equipment and materials) to ensure their availability for response operations. Plan for contingencies. Create, update, reference and share <i>asset inventory</i> data. 	
Respond to Incident	HLS046	Manage Removals of People and Goods	Based on legal, health, or safety concerns, coordinate the removal or departure with the accepting country. Preparation of any documentation, including manifests, as required by the accepting country is included in this activity. This includes activities such as issuing and canceling bonds, escorting aliens overseas, etc. This includes activities that are performed to support formal removals and voluntary returns.	<ul style="list-style-type: none"> - Monitor <i>people, goods</i> and <i>cargo</i> for removal. Create, reference, update and/or share <i>location/time/identity/activity/status</i> pertaining to <i>people, goods</i> and <i>cargo</i> and <i>locations</i> of detention centers/impounds. Update, reference and share <i>case</i> records accordingly. Create, update, reference and share <i>situational awareness</i> for monitoring operations. Create, update, reference and share <i>situation reports</i>. - Conduct Site Modeling & Analysis to determine <i>locations</i> of detention centers and shipping depots based upon legal, health, safety and logistics factors. Allocate people and goods to these locations. Reference relevant geospatial data. Create, reference, update and share <i>site/facility plans</i>. 	<ul style="list-style-type: none"> - Monitor Parties - Monitor Goods - Site Modeling & Analysis

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Respond to Incident	HLS109	Arrest People	File official charges and take physical custody of an individual, initiating legal action.	<ul style="list-style-type: none"> - Monitor <i>people</i> who are taken into custody. Create, reference, update and/or share <i>location/time/identity/activity/status, place of birth, citizenship</i>, associations with illegal interests, etc, and the <i>locations</i> of detention centers/impounds. Also update, reference and share <i>case</i> records. 	<ul style="list-style-type: none"> - Monitor Parties
Recover from Incident	HLS040	Investigate Incident	Conduct after action reports and analysis based on root cause analysis, post-incident evacuation studies, and lessons learned from mitigation studies, and close-out of case.	<ul style="list-style-type: none"> - Conduct Post Mission Analysis to assess effectiveness of (need to reference) <i>mission, event, preparation, logistics, response, deployment, evacuation, search & rescue, security, countermeasures</i>, (training) <i>exercise</i> and <i>recovery plans</i>, and also the effectiveness of mission operations (assess <i>incident</i> and <i>situation reports</i>). Reference and correlate relevant historical <i>incident</i> and <i>event</i> data. Create, update, reference and share <i>post mission assessments</i> and <i>after action reports</i> (maps and location-based reports). - Conduct Mitigation Planning & Analysis to determine and assess impact of root cause of an incident/event and mitigate the impact of threats, hazards and disasters. Reference <i>post mission assessments</i> and <i>after action reports</i>. Create, update, reference and share <i>mitigation plans</i> and supporting Geospatial Products to enhance future planning, safety, preparations, response and recovery operations, countermeasures and training for cases, threats, hazards and disasters. 	<ul style="list-style-type: none"> - Post Mission Analysis - Mitigation Planning & Analysis
Recover from Incident	HLS042	Provide Recovery Assistance	Provide access to long-term human services program (e.g. disaster housing, crises counseling, etc.).	<ul style="list-style-type: none"> - Conduct Recovery Planning to preplan/plan, schedule and allocate personnel and assets for incident recovery. Create, reference, update and share <i>recovery operations plans</i> that convey schedule, tasking and resource allocation for recovery operations; share amongst government and non-government relief organizations. Create, 	<ul style="list-style-type: none"> - Recovery Planning

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				update, reference and share <i>locations</i> and <i>route</i> directions to crisis counseling, housing and other recovery centers; share with public.	
Recover from Incident	HLS043	Restore Infrastructure and Key Assets	Restore order to the community through the restoration of utilities, clean-up, decontaminating area, etc.	<ul style="list-style-type: none"> - Conduct Damage Assessment to analyze and determine the extent and nature of damage caused by a threat or natural hazard through the use of imagery and other sensor and human observations. Create, update, reference and share <i>damage assessments</i> to support restoration activities. Generate <i>Location Reports</i> and <i>maps</i> conveying this information. - Conduct Monitor Recovery operations to monitor cleanup, decontamination and restoration efforts at incident locations for subsequent analysis and legal implications. Reference <i>recovery plans</i>. Monitor (measure and observe) contamination areas and create, reference, update and share change in <i>activity/status</i>. Create, reference, update and share location-based <i>after action reports</i> that document recovery progress, as well as <i>environmental impact assessments</i>. [Facilitate the overall activities of the federal government in providing assistance to the affected area, Federal Response Plan, ESF 5 “Information and Planning”. Helps to establish the type and magnitude of damage caused by an incident.] - Conduct Critical Infrastructure Inventory Management to update, reference and share the restoration <i>status</i> of <i>critical asset</i> and <i>key asset inventories</i>. 	<ul style="list-style-type: none"> - Damage Assessment - Monitor Recovery - Critical Infrastructure Inventory Management
Recover from Incident	HLS110	Declare Emergency	Gather information that will assist in the decision to declare a state or federal emergency for the	<ul style="list-style-type: none"> - Conduct Emergency Reporting to declare state and federal emergencies. Reference <i>threats</i>, <i>threat consequence assessments</i>, <i>warnings</i>, <i>alerts</i> and other location-based content germane to the 	<ul style="list-style-type: none"> - Emergency Reporting

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			activation of additional resources.	emergency. Create, reference, update and share nature and geospatial extent of the <i>emergency declaration</i> .	
Develop Plans and Performance Measures	HLS048	Develop Operational Plans	Develop and maintain operational plans (e.g. the National Response Plan and supporting operational plans) to prepare for and manage domestic incidents integrating all incident management activities across the continuum from pre-incident awareness, prevention, and preparedness to incident response and post-incident recovery. This also includes ensuring coordination at all levels of government and cooperation with private and public sector entities.	<ul style="list-style-type: none"> - Conduct Operational Planning to plan, schedule and allocate personnel and assets for emergency operations, in a geospatial-temporal context. Create, update, reference and share <i>operational plans</i> that specify the allocation of funds, activities and resources by organization and geographic context (congressional district, state, territory, county, reservations, and cities). Plans may include <i>maps</i> and <i>reports</i> that convey objectives, schedules, deployments, contingencies and the situation context for projected operations, including: threat disposition, blue force disposition, contingency deployments, environmental constraints, loss claims, etc. Plans may also include standard operating procedures for geospatial data acquisition, management and sharing, as well as the geospatial management and investment plans for all levels of government, developed in cooperation with private and public sector entities. 	<ul style="list-style-type: none"> - Operational Planning
Develop Plans and Performance Measures	HLS049	Develop Agency Plans	Develop and maintain the Department strategic and annual performance plans. Includes developing the Department's general and performance goals and the annual accountability reports.	<ul style="list-style-type: none"> - Conduct Performance Planning & Analysis based upon geospatial-temporal objectives and criteria. Track and report on Events, incidents, key assets, vulnerabilities, grants, expenses and funding by geospatial areas (congressional district, state, territory, county, reservations, and cities) for DHS activities. Create, update, reference and share annual <i>performance plans</i> (includes accountability reports) by geospatial areas. Create, update, 	<ul style="list-style-type: none"> - Performance Planning & Analysis - Program Planning

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
				reference and share <i>performance criteria</i> . Conduct Integrated 300B planning and coordinated data acquisition planning. <ul style="list-style-type: none"> - Program plan grants and funding by congressional district, state, territory, county, reservations, and cities for DHS activities. Create, update, reference and share <i>program plans</i>, with management and investment plans by geospatial areas. 	
Develop Plans and Performance Measures	HLS050	Monitor Performance	Monitor and assess, through objective measurement and systematic analysis, the manner and extent to which Department programs and operations achieve intended objectives. Includes conducting evaluations of programs and operations at any level within the organization by parties internal or external to the Department.	<ul style="list-style-type: none"> - Conduct Performance Planning & Analysis based upon geospatial-temporal criteria. Monitor performance by geospatial areas (congressional district, state, territory, county, reservations, cities, and other areas of interest) to support evaluations of programs and operations at any level within the organization by parties internal or external to the Department. Create, update, reference and share geospatial analysis data to support performance monitoring (e.g., how many incidents occurred within two miles of the border with Mexico within the state of Texas). Update, reference and share annual <i>performance plans</i>. Reference <i>performance criteria</i>. [Note: Relates to plans in HLS049] 	<ul style="list-style-type: none"> - Performance Planning & Analysis
Manage Knowledge and Intelligence Information	HLS005	Collaborate/coordinate w/Federal, State, Local Governments, and Private Sector	Provide a collaborative structure for effectively communicating to all levels of government (both horizontally and vertically). Increase collaboration in law enforcement and prevention, emergency response and recovery,	Geospatial provides a foundational basis for the collaborative structure of the HLS Enterprise Architecture (EA), in terms of providing a shared common data foundation (i.e., we can express most HLS data in a geospatial-temporal context), and in terms of providing standards for sharing and collaborating with this data. Geospatial collaboration refers to sharing and	<ul style="list-style-type: none"> - N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			<p>policy development and implementation so that public and private resources are better aligned to secure the homeland and develop complementary systems that avoid duplication and ensure essential requirements are met. Provide information and technical assistance to state and local governments to enhance emergency management capabilities. Coordinate standards, guidance, resources, and technical support. Compile and communicate lessons learned from incidents, homeland security initiatives, and feedback from state and local authorities.</p>	<p>interacting with resources that are based on common geospatial data, service and application standards.</p> <ul style="list-style-type: none"> - Create, update or reference and implement common geospatial data, applications, services and standards as key parts of the collaborative infrastructure across all levels of government and private institutions. These are application-dependent (i.e., the data and applicable standards are dependent upon the specific application context and nature of collaboration. This can vary from activity to activity). Thus, each HLS activity will have to be evaluated to consider collaborative needs. - Support the COP, reaching across the HLS enterprise, to first responders in state, regional and federal emergency operations centers (EOCs) and continuity of operations centers (COOP). This provides a continuum of meaningful geospatial data sharing and improves communication and response time at all levels of government. - Develop memoranda of understanding (MOU) with federal, state, county and municipal mapping agencies for geospatial data sharing. - Develop coordinated data acquisition programs (i.e. FEMA Map Modernization, USGS National Map, NOAA 'LiDAR -Anywhere', Census MAF/TIGER, NIMA, HSIP, etc.) - Ensure eGOV compliance for the Geospatial One-Stop. - Establish data partnerships with National States Geographic Information Council (NSGIC) and Public Interest Groups. 	

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
Manage Knowledge and Intelligence Information	HLS114	Determine Data Sensitivity	Determine access to data and information based on sensitivity, confidentiality, and privacy. Establish, evolve, and maintain effective data manipulation capabilities suitable for used at multiple levels within DHS, and which permit access to the data by external entities, subject to security and privacy requirements. Categorize and tag information based on sensitivity, confidentiality, and privacy criteria.	<ul style="list-style-type: none"> - Provide the means to categorize and tag information based on sensitivity, confidentiality, and privacy criteria that are geospatial in nature (e.g., the location of an asset may impact sensitivity, confidentiality, and privacy) - Provide means to restrict access to some geospatial data (e.g., remote sensing source may be classified; geospatial analysis data may be classified; key and critical assets and key asset data from state, local and private sources may be sensitive) 	- All
Manage Knowledge and Intelligence Information	HLS115	Obtain Specific Case, Person, or Event Information	Obtain all necessary information pertaining to a person, case, or event from internal or external sources. Typically involves the use of biographical and biometric identifiers to retrieve information about immigration history or status, criminal history, financial or credit history, and other personal information. To the extent possible, all	- Conduct Location Search & Reporting to obtain information about a person, case or event from available sources. Reference case, person or event based upon geospatial-temporal query criteria. Generate a <i>Location Report</i> with this information.	- Location Search & Reporting

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			information should be available from a single query and should be based on positive biometric identification of individuals.		
Manage Knowledge and Intelligence Information	HLS116	Share Data Routinely with External Entities	Share data on a regular basis with both internal and external entities. This typically results from interagency agreements and does not include responses to ad-hoc or case-specific inquiries.	<ul style="list-style-type: none"> - Share geospatial data on a regular basis. Support Geospatial One-Stop eGOV initiative. 	<ul style="list-style-type: none"> - All
Perform Research and Development	HLS059	Identify HLS Technology Candidate Solutions	Conduct homeland-specific technology needs assessment and gather understanding of capabilities that exist today or that can be expected to appear in the near term. Conduct Technology Forecasts to meet HLS needs. Monitor new and evolving technologies for detection and interdiction of threats and/or improve technical capabilities of	<ul style="list-style-type: none"> - Conduct homeland-specific geospatial technology needs assessment. - Conduct Geospatial Technology Forecasts to meet HLS needs. - Monitor new and evolving geospatial technologies for detection and interdiction of threats and/or improve technical capabilities of first responders. - Monitor best practice geospatial systems implementations. - Perform Research and Development to establish new technologies for the HLS mission. - Transfer new technologies through the HLS mission. 	<ul style="list-style-type: none"> - N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			first responders.		
Perform Research and Development	HLS061	Evaluate HLS-Related Technology Research Results	Research, test and evaluate new technologies associated with new or improved capabilities to counter chemical, biological, radiological, nuclear, explosive, and cyber threats. Create testing and evaluation programs, utilize existing, or develop new, test beds where technology methods, tools, and approaches can be exercised in a controlled environment and evaluated against common, accepted standards. Includes developing the test beds and measurement-performance standards.	<ul style="list-style-type: none"> - Research, test and evaluate new <u>geospatial</u> technologies. - Perform benchmarking to compare technologies. 	<ul style="list-style-type: none"> - Various applications used in tests/evaluations
Perform Research and Development	HLS062	Conduct Demonstrations and Pilot Deployments	Conduct pilot deployments and demonstrations for HLS-specific technologies. Use simulations and modeling to test how is technology going to perform in local	<ul style="list-style-type: none"> - The Geospatial Management Office (GMO) will conduct pilot deployments and demonstrations for HLS geospatial technologies. - Provide Geospatial Integration & Test Tools that use simulations and modeling to test how geospatial technology is going to perform in local conditions and in different attack scenarios. Create 	<ul style="list-style-type: none"> - Various applications used in pilots/demos - Geospatial Integration & Test Tools

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			conditions and in different attack scenarios (I.e. large-scale attacks).	(or adopt), update, reference and share (coordinate and implement) <i>test models</i> and supporting databases, <i>geospatial standards (data, service, and protocol)</i> and <i>performance criteria</i> . Provide the Reference Architecture for the HLS Geospatial EA. (Managed by the GMO.)	
Perform Research and Development	HLS063	Deploy HLS-specific Advanced Technologies	Field HLS-technologies into an operational environment.	– Provide Geospatial Integration & Test Tools that support testing and integration of HLS geospatial technologies. Create (or adopt), update, reference and share (coordinate and implement) homeland security <i>geospatial standards (data, service, and protocol)</i> and <i>performance criteria</i> . Provide the Reference Architecture for the HLS Geospatial EA. (Managed by the GMO.)	– Geospatial Integration & Test Tools
Develop Policy	HLS065	Develop Policy	Develop directives designed to direct decisions and actions related to the DHS mission.	– Develop policy concerning the employment of geospatial data and technology for the HLS mission (GMO).	– N/A
Develop Policy	HLS111	Set Homeland Security Standards	Develop, coordinate, and implement homeland security standards and performance criteria to provide guidance to federal/state/local/tribunal . (e.g. national emergency management for first responders, homeland security technology standards for chemical, biological, radiological, nuclear, cyberspace and high-	– Provide Geospatial Integration & Test Tools that support testing and integration of geospatial component services and applications. Create (or adopt), update, reference and share (coordinate and implement) homeland security <i>geospatial standards (data, service, and protocol)</i> and <i>performance criteria</i> . Establish <i>geospatial data and intelligence</i> reporting and dissemination <i>protocols</i> between field activities and operation centers at all levels of government. Provide <i>standards</i> , tools, guidance and test and integration support to federal/state/local/tribunal entities. Provide the Reference Architecture for the HLS Geospatial EA. (Managed by the GMO.)	– Geospatial Integration & Test Tools

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			explosive technologies, HLS telecommunication and technology standards, emergency reporting standards across federal/state/local/tribunal , etc.) Establish protocols for information and intelligence reporting and dissemination between field activities and operation centers at all levels of government.		
Develop Policy	HLS118	Audit Compliance	Perform on-site audits of external parties that provide supporting functions to the enterprise, ensuring compliance with mandates, policies and agreements. This includes worksite visits for employer compliance and carrier facilities that may be acting on or performing activities on behalf of the government.	<ul style="list-style-type: none"> - Perform on-site and remote audits of external parties that support the enterprise, ensuring compliance with <i>geospatial standards</i>, mandates, policies and agreements. 	<ul style="list-style-type: none"> - N/A
Manage Human Resources	HLS067	Manage Positions	Create, move, modify, and delete positions required to perform the agency's mission. Includes workforce/workload	<ul style="list-style-type: none"> - Manage positions for enterprise-wide geospatial capabilities (GMO). - Develop position descriptions with specific knowledge, skills and abilities (KSA) criteria for geospatial professionals within DHS organizations. - Add a User Class called Geospatial Specialist defined as one who uses geospatial technology and 	<ul style="list-style-type: none"> - N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			analysis, preparing position descriptions, classifying position descriptions, determining testing required for each position, and determining position sensitivity levels.	data to support the HLS mission; conducts studies, planning and analyses, generates maps and reports; installs, operate and maintains geospatial technology used in the creation, update, manipulation, storage, output, sharing, publishing, and archiving of geospatial data; and who advocates the appropriate use of geospatial technologies by DHS and its stakeholders.	
Manage Human Resources	HLS068	Provide Employee / Management Relations	Coordinate activities and programs to administer benefits and awards, develop grievance procedures, develop performance standards, and assess employee performance and actions involving employees; e.g., termination, suspension, or reprimand. Includes retention and succession-planning activities.	– N/A	– N/A
Manage Human Resources	HLS069	Provide Health and Safety Services	Identify, collect, evaluate, and disseminate employee and environmental health and safety data and information. This includes all employee and environmental testing, ensuring compliance with standards, health and safety incident reporting, and other health services, as well as updating the	– Conduct Health & Safety Monitoring to track the <i>locations</i> of notice of violations (NOV) and reported incidents to assess problem work sites or otherwise dangerous conditions. Perform pre-deployment environmental health and safety evaluations of potential work sites (such as disaster field offices [DFOs]) or other temporary work environments.	– Health & Safety Monitoring

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			employee personnel records.		
Manage Human Resources	HLS070	Provide Employee Compensation	Provide payroll/personnel services; such as employee pay and benefits, benefit open seasons, employee payroll options, salary garnishments, payroll corrections, Time and Attendance submissions, leave audits, lump-sum payment calculations, carrier-billed overtime, etc.	– N/A	– N/A
Manage Human Resources	HLS071	Hire Employees	Advertise vacancies and select qualified applicants.	– Develop staff plans and hire qualified personnel (GMO).	– N/A
Manage Human Resources	HLS072	Provide Employee Training/Education	Provide opportunities to acquire new skills or utilize new knowledge in a specific way using a variety of instructional approaches.	– Develop Training & Education Program for geospatial applications and technologies. Provide training and education to employees (GMO).	– N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
Manage Technology	HLS080	Maintain Enterprise Architecture	Develop and maintain a four-layer (business, data, applications, and technology) architecture that includes a target architecture and a multi-year implementation plan.	<ul style="list-style-type: none"> – Develop and maintain the geospatial aspects of the HLS EA (GMO). 	– N/A
Manage Technology	HLS081	Manage IT Investments	Manage the selection, control, and evaluation of IT investments. Establish governance boards. Manage Portfolios.	<ul style="list-style-type: none"> – Manage the selection, control, and evaluation of geospatial IT investments (GMO). Establish governance boards. Manage Portfolios. – Integrate/exploit compatible legacy geospatial IT and eliminate or phase out that which is incompatible with the HLS EA. 	– N/A
Manage Technology	HLS117	Provide IT Services	Provide a variety of IT services to ensure a stable, predictable, automated environment. This includes domain areas such as IT help desk, web development services, network operations support, information security, software development and maintenance, etc.	<ul style="list-style-type: none"> – Provide geospatial-related IT services to ensure a stable, predictable, automated environment. – Identify internal clients in need of geospatial technology training and provide training. 	– N/A
Manage Grants, Procurements, and Acquisitions	HLS082	Administer Agreements and Contracts	Starts upon award of a contract (or start date of an agreement) and ends upon closeout of the contract (or end date of an agreement). These acquisition vehicles are administered and	<ul style="list-style-type: none"> – Provide a means to assess solicitations that involve or could be enhanced by geospatial technologies (e.g. projects which will yield content-rich location data that fills a gap or compliments data in the geospatial data inventory). 	– N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			monitored to ensure performance, delivery, and compliance with terms and conditions. This includes outgoing interagency agreements.		
Manage Grants, Procurements, and Acquisitions	HLS083	Certify Acceptance	Starts when goods or services have been inspected, found without discrepancies, and accepted; ends when the accepting official signs an acceptance document. The accepting official certifies in writing that acceptance is complete.	<ul style="list-style-type: none"> - Develop acceptance criteria and quality assurance metrics for geospatial data (e.g., content, completeness, accuracy, precision, resolution) and compliance with applicable standards for geospatial data and procedures. 	<ul style="list-style-type: none"> - N/A
Manage Grants, Procurements, and Acquisitions	HLS084	Determine Purchase Sources / Methods	Starts upon receipt of a requisition by the purchasing activity from the requiring activity and ends upon selection of the source for the acquisition. A source selection process is conducted.	<ul style="list-style-type: none"> - N/A 	<ul style="list-style-type: none"> - N/A
Manage Grants, Procurements, and Acquisitions	HLS085	Establish Acquisition Vehicle to Procure Goods / Services	Starts upon identification source and ends upon award of a contract or agreement for goods or services. The effort awards an agreement or contract to acquire goods	<ul style="list-style-type: none"> - Develop language for solicitations involving the procurement or acquisition of geospatial data, technology and related services. - Provide a means to assess solicitations that involve or could be enhanced by geospatial technologies. 	<ul style="list-style-type: none"> - N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			or services.		
Manage Grants, Procurements, and Acquisitions	HLS086	Develop Acquisition Requirements	Starts when a requiring activity links a mission need to a planned acquisition and ends upon the expression of such requirements in the appropriate requisition format. A requirement is developed for acquisition.	<ul style="list-style-type: none"> - Provide grant language to ensure the availability of geospatial data, infrastructure and human resources in keeping with the geospatial requirements of DHS. 	<ul style="list-style-type: none"> - N/A
Manage Grants, Procurements, and Acquisitions	HLS112	Administer Grants	Receive solicited and unsolicited proposals, receive applications, decide to grant or deny, monitor performance, transfer grant funds to state/local or private citizens/businesses. Provide grants and low interest loans to individuals, farmers, small businesses and other entities as appropriate. Includes conducting a preliminary damage assessment and preparing associated cost estimates to repair for the	<ul style="list-style-type: none"> - Conduct Damage Assessment to reference and share <i>damage assessments</i> to support grant and loan activities. Generate <i>Location Reports</i> and <i>maps</i> conveying this information. - Lobby Office for Domestic Preparedness (ODP) to place a value on grant applications that include needed geospatial data or technologies. - Provide grant language to ensure the availability of geospatial data, infrastructure and human resources in keeping with the geospatial requirements of DHS. 	<ul style="list-style-type: none"> - Damage Assessment

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			purposes of issuing grants and loans.		
Manage Legal Activities	HLS066	Provide Legal Services	Provide legal analysis of homeland security matters to include analysis of new and existing legislation and statutes. Includes supporting efforts associated with moving a case through the legal system (whether administrative, adjudicative, enforcement, etc.). Also includes cooperating with other organizations (e.g. DOJ for actual prosecution activities).	– N/A	– N/A
Manage Facilities and Property	HLS087	Manage Records	Keep records physically intact, identifiable, and retrievable to allow access by authorized users and to protect legal and financial rights. Additionally, the records are organized into logical groups to facilitate identification, access, and directions for disposition. The records should be stored on the appropriate medium, environment,	– Conduct Location Search & Reporting for the purpose of location-based records management. Reference facilities and property records based upon geospatial-temporal query criteria. Generate a <i>Location Report</i> for the purpose of managing this information.	– Location Search & Reporting

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			safeguards, and management controls based on the value, lifespan, and use of the record.		
Manage Facilities and Property	HLS088	Manage Property	Starts after the Department accepts real or personal property (including facilities) and ends when the decision is made to dispose of the property. Property is controlled to meet maintenance, inventory, and accountability requirements. This includes the oversight and maintenance of bonded warehouses that may be storing uninspected or seized goods. This does not include seized, evidence, or custodial property.	<ul style="list-style-type: none"> - Conduct Facility Mapping & Management to manage real property and facilities. Create, update, reference and share <i>real property</i> and <i>facilities</i> data for management and security purposes. Manage space utilization of existing facilities to assure that space, furniture, and equipment are adequate to support current and future mission requirements. Assure compliance with all applicable laws and regulations. [e.g., National Environmental Policy Act (NEPA) requires map and photographic characterization of the site and its immediate surrounds for potential environmental constraints to proposed action including: wetlands, floodplains, RT&E species habitat, property boundaries, hazardous materials, cultural and historic considerations, archaeological findings, environmental justice, accessibility, demographics, and so on.] - Conduct Critical Infrastructure Inventory Management to update, reference and share the <i>status</i> of <i>critical asset</i> and <i>key asset inventories</i>. - Manage personal property <i>assets/goods</i>. Create, update, reference and share <i>asset/goods inventory</i> data (<i>location/time/identity/status</i>). 	<ul style="list-style-type: none"> - Facility Mapping & Management - Critical Infrastructure Inventory Management - Asset Inventory Management
Manage Facilities and Property	HLS089	Arrange Logistics	Arrange for the distribution of needed resources. For example, providing resources to support ongoing	<ul style="list-style-type: none"> - Implement Location-based Tag & Track technologies (e.g., GPS and RFID) for land, air and sea shipments of needed resources. 	<ul style="list-style-type: none"> - N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			investigations, search & rescue operations, as well as other program activities. Restricted to things, NOT PEOPLE or INFORMATION.		
Manage Facilities and Property	HLS091	Manage Correspondence	Manage incoming and outgoing correspondence. Receive, evaluate, parse for response, track responses, send responses.	– N/A	– N/A
Manage Facilities and Property	HLS092	Provide Travel Services	Prepare travel orders, make reservations, etc. (Administrative Services)	– Conduct Travel Planning. Create, update, reference and share travel plans containing person's <i>itinerary</i> .	– Travel Planning
Manage Budget and Finances	HLS073	Account for Funds	Post and reconcile all financial transactions. Includes: Reconciling Accounts Receivable (including interagency agreements), Commitments, Open Obligations, Financial System Balances, Cash Balances, Capitalized Property, Bond balances, and Payroll accounts. Resolve discrepancies by adjusting or correcting the appropriate records. Maintain the General Ledger. All transaction codes to record accounting events as	– N/A	– N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			debits and credits, are recorded and maintained.		
Manage Budget and Finances	HLS074	Control Budget Resources	Continually monitor, track, and ensure that obligations do not exceed budgetary authority. Utilize management controls to ensure the efficient, effective, and appropriate use of any informational, human, technological, financial, or physical asset available to carry out the Enterprise mission. This includes management activities and initiatives designed to identify management risks and put in place and monitor controls to mitigate the risks. The purpose of these activities is to avoid fraud, waste, and abuse. This is done formally through periodic financial reviews and	– N/A	– N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			informally throughout the year. This activity involves all organizations throughout the Enterprise that receive budgetary resources.		
Manage Budget and Finances	HLS075	Disburse Funds	Make payments on certified invoices or other approved payables. Treasury is provided the payment information and is instructed to make payment.	– N/A	– N/A
Manage Budget and Finances	HLS076	Manage Receivables	Create bills for payment by another entity (individual, commercial firm, Federal, state, or local agency) and record the bill in an accounting system. Consolidate prior receivables, negotiate payment plans, and process returned invoices (undeliverable mail). An allowance for doubtful accounts is estimated based on collection experiences with different types of debt and the age of debt.	– N/A	– N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
Manage Budget and Finances	HLS077	Distribute Approved Budget	Based on the approved budget and budgetary authority received from Office of Management and Budget (OMB), prepare the Budget Execution Plan and Quarterly Operating Plan. The formal budgetary authority (by program and account) is entered into the official accounting records. While the majority of the budgetary resources (positions, work years, and dollars) are received in the early part of the fiscal year, additional funds may be forthcoming at any time during the current fiscal year.	– N/A	– N/A
Manage Budget and Finances	HLS078	Receive Non-Appropriated Cash	Accept, verify amount of funds received, record proof of payment, and submit for deposit. This includes receipts for applications, fines, breached bonds, fingerprint services, inspections fees, Border Crossing Cards, payments, import fees and taxes, tariffs, etc.	– N/A	– N/A

Value Chain	Activity Code	Activity Name	Activity Description	The Role of Geospatial in the Business Activity (Geospatial Business Statements) ^{1, 2}	Geospatial Applications ³
			Receipts could include cash, checks, money orders, credit transactions, etc.		
Manage Budget and Finances	HLS079	Obtain Approved Budget	Prepare the base budget, which involves the development of the estimate of resources required to operate the service at a current services level of activity. It also includes the identification and justification of additional resources (above the base level) needed to achieve mission requirements. It may include the preparation and submission of other requests for resources; including enhancements, transfers, reprogramming, supplemental appropriations, etc.	– N/A	– N/A

2.0 ACRONYMS

Acronym	Definition
CATS	Consequences Assessment Tool Set
COOP	Continuity of Operations Centers
COP	Common Operating Picture
DFIRM	Digital Flood Insurance Rate Map
DFO	Disaster Field Office
DHS	Department of Homeland Security
EA	Enterprise Architecture
EM	Emergency Management
EMT	Emergency Medical Treatment
EOC	Emergency Operation Center
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
GMO	Geospatial Management Office
GPS	Global Positioning System
HAZUS	Hazard-United States
HLS	Homeland Security
HSIP	Homeland Security Infrastructure Program
HVAC	Heating, Ventilation & Air Conditioning
IT	Information Technology
KSA	Knowledge, Skills, Abilities
LiDAR	Light Detecting and Ranging
MAF/TIGER	Master Address File/Topologically Integrated Geographic Encoding and Referencing
MOU	Memoranda of Understanding
MS&D	Master of Science & Doctoral
MSOP	Mission-Specific Operating Picture
NEPA	National Environmental Policy Act

NFIP	National Flood Insurance Program
NIMA	National Imagery and Mapping Agency
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NOV	Notice of Violation
NSGIC	National States Geographic Information Council
NSSE	National Security Special Event
ODP	Office for Domestic Preparedness
OMB	Office of Management and Budget
RFID	Radio Frequency Identification Device
RT&E	Rare, Threatened, or Endangered
SAG	Street Address Guide
USGS	United States Geological Survey



**HOMELAND SECURITY GEOSPATIAL
ENTERPRISE ARCHITECTURE**

**ATTACHMENT G DATA 1
GEOSPATIAL ENTITIES**

GEOSPATIAL MANAGEMENT OFFICE

DRAFT VERSION 0.6.1

April 13, 2004

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1.0 INTRODUCTION

This artifact documents the basic Geospatial Entity Types for Homeland Security (HLS) Geospatial Data. These types represent the foundational geospatial data objects (models) for representing geospatial data within the HLS interoperability framework (i.e., the primary representation of geospatial content in network messages, and the representation of geospatial types within request-response parameters comprising geospatial service interfaces). The data models for these types are described herein. Subsequent versions of this artifact will elaborate on these types and identify the associated standards for implementing these types (All Geospatial Entity Types will be based upon industry standards).

Version 1.0 of the HLS EA Conceptual Data Model includes a Subject Area named Location, which contains the Data Objects: Physical Location and Virtual Location. In order to extend the HLS EA Conceptual Data Model, the GEA Team replaced the Physical Location Data Object with Geospatial Entity to more fully describe this category of objects. The descriptions of these key terms are provided in Exhibit 1 and Exhibit 2.

Exhibit 1: HLS EA Subject Areas Directly Related to Geospatial Data

Subject Area	Description
Location	Details about geospatial and/or virtual location. Includes, but not limited to, information about navigable waters, air, bridges, icebergs, cyberspace, etc.

Exhibit 2: HLS EA Data Objects Relating to Geospatial Data

Subject Areas	Data Objects	Description
Location	Geospatial Entity	Root data type for HLS geospatial data that are used in geospatial services. Decomposed into Location Object, Feature, Coverage, Observation, Route, Mobile Object and Structure.
Location	Virtual Location	Cyberspace address, e-mail, web site address (URL), TCP/IP address

For this version of the HLS GEA, the Virtual Location Data Object is not considered.

1.1 Geospatial Data Elements and Properties in the Enterprise

A number of common geospatial data elements and properties have been defined for the HLS EA to support the efficient and widespread exploitation of this data. The HLS Geospatial Properties-Elements, Appendix G.Data.2, lists data elements and properties that can be utilized by all data objects within the HLS EA, including geospatial and predominantly non-geospatial objects, thus providing a normalized geospatial context for all objects.

Consistent use of these properties and elements throughout the HLS EA will enhance interoperability and the use of standard geospatial enterprise services that exploit these properties and elements. For example, by using a common semantic framework for the specification of an

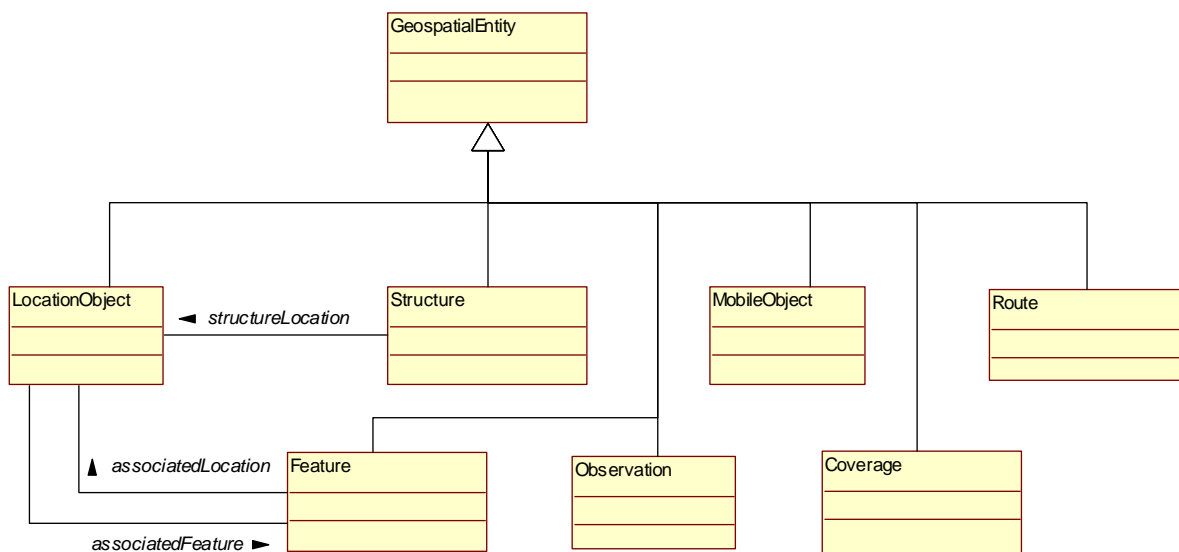
address, any HLS business data that includes the address can be more easily exploited and shared between systems and jurisdictions.

The Geospatial Entities described below contain the elements and properties described in Appendix G.Data.2. The elements and properties provide the key building blocks for the data objects comprising the GEA. The description below provides the relationships and structure of these data objects, which, as elements and properties, can be integrated into the EA to support the combination of geospatial and other business data to support viewing of HLS business data in a geospatial context.

2.0 GEOSPATIAL ENTITY DESCRIPTION

A Geospatial Entity represents a large domain of geospatial data and a wide range of uses. The Geospatial Entity is used to identify a location on the Earth, model real-world phenomena, and contain location representations that support transformations between reference systems. A Geospatial Entity is decomposed into seven objects: Location Object, Feature, Coverage, Mobile Object, Observation, Route, and Structure. The hierarchy of the Geospatial Entity is illustrated in Exhibit 3.

Exhibit 3: Geospatial Entity Types



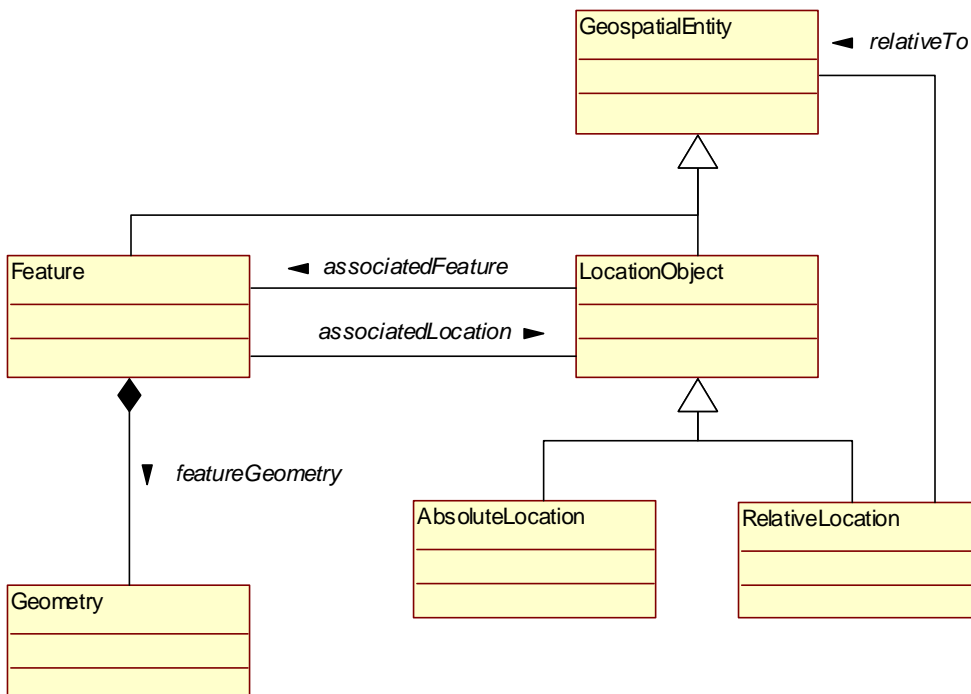
The Location Object describes a site or place in a normalized structure suitable for data interchange. A Feature describes real-world phenomena in a geospatial context. It may have an associated Location Object (or the Location Object may be associated with the Feature) to support transformation between the two representations for the same real-world entity. Other classes also describe real-world phenomena, but the Feature is typically used for immobile phenomena or those that are slow to move or change. A Structure describes a building or other structure in an engineering context with references to its geospatial location. An Observation associates an observed or measured value with the geospatial context of the observation. A Mobile Object describes real-world phenomena similar to a Feature that changes position or state

relatively rapidly. A Coverage associates a set of discrete values with a geospatial area. A Route describes a path between locations.

2.1 Location Object Class

A Location Object is a subtype of the Geospatial Entity and is used to specify a place or site somewhere in the world. The Location Object contains a normalized, structured description of a place or site on the Earth that is of interest in the HLS mission. A location is specified in terms of its absolute location within a system of reference or its location relative to another well-known point. The Location Object has Absolute Location and Relative Location subclasses to express these two types of location. This is illustrated in Exhibit 4.

Exhibit 4: Subtypes of the Location Object

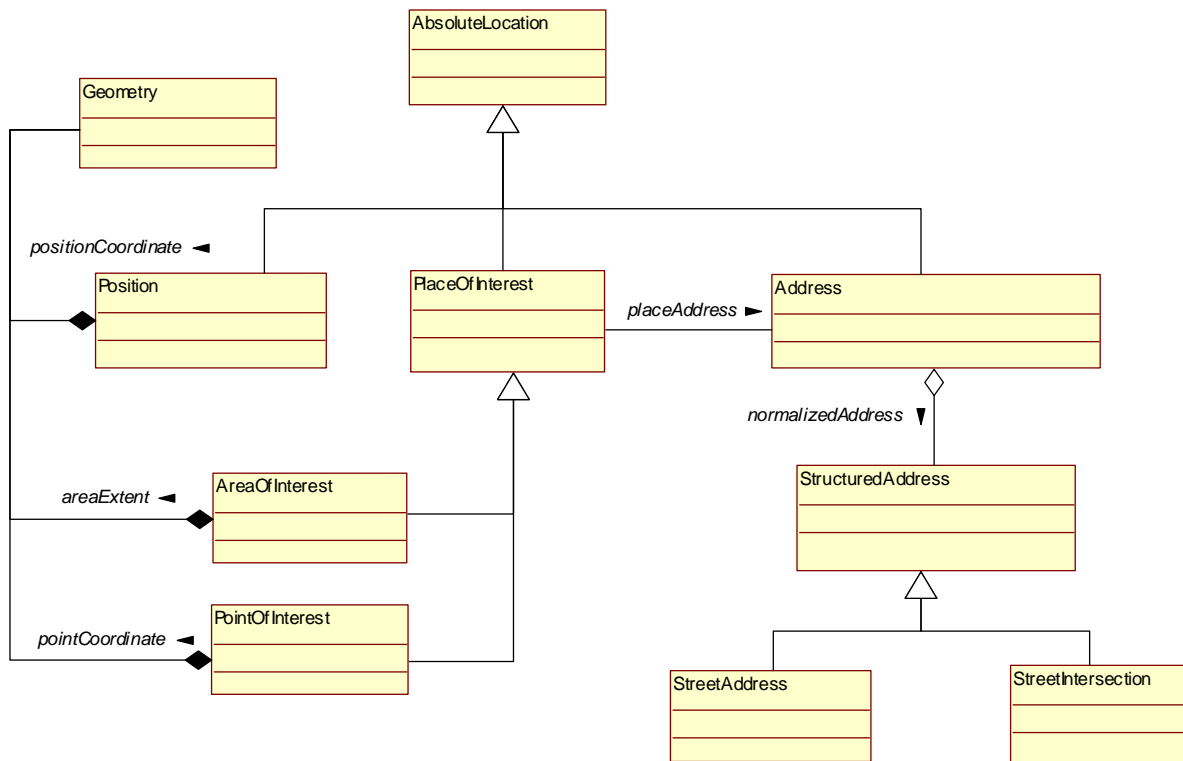


A Location Object may be associated with a Feature. For example, the Location Object implemented as an address for a school could be associated with the Feature for the school. To support symmetric transformations, a Feature can have an associated Location Object. For example, this would permit an application to determine the address of a feature from a geospatial dataset.

A Relative Location specifies a location in reference to another known geographic object (such as a feature or absolute location). For example, a relative location could be a linear reference (100 feet south of Grant Elementary School) or a network location (power transmission tower 17A231, a node on the electrical distribution grid).

An Absolute Location allows the specification of a location within a known reference system. Absolute locations can be specified by geographic coordinate, street address, place name, or an area of interest. Exhibit 5 illustrated the representations of an Absolute Location.

Exhibit 5: Absolute Location Hierarchy



A Position is used to represent a location by geographic or other coordinates, based on a coordinate reference system. A Place of Interest is a well-known place name that may have (and probably does have) an associated street address. An Area of Interest (AOI) specifies a geographic area or shape bounding an area that can be identified by name (such as the boundaries of a state) or a more transient area (such as the coastal areas along a predicted storm track). A Point of Interest (POI) is a specialization of a Place of Interest in which the geometry is specified as a point (versus a polygon or other multi-dimensional shape).

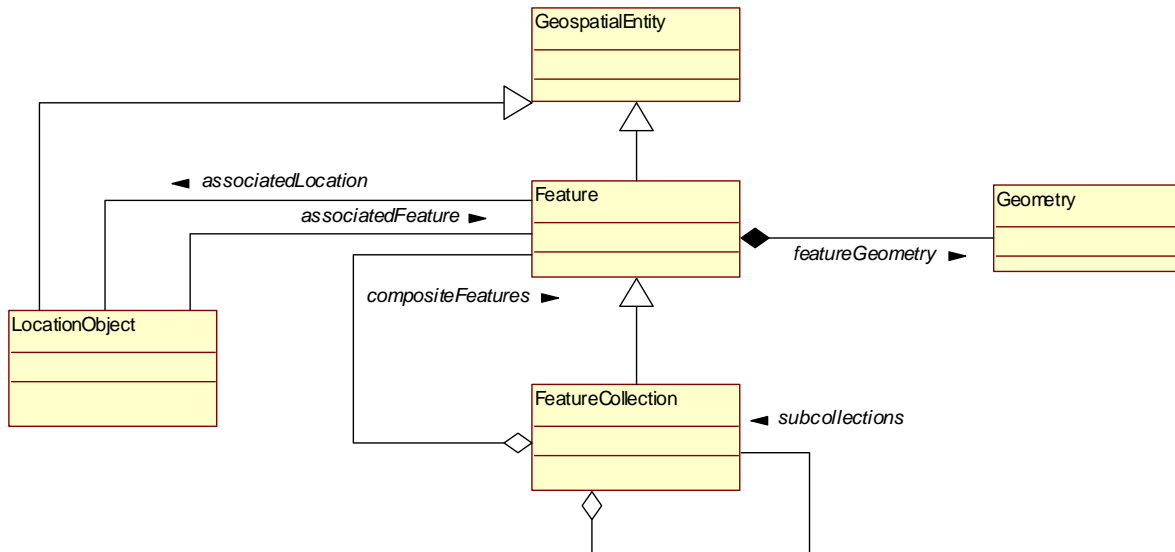
An Address is used to locate an object using named streets as reference. It provides a structural framework for the specification of addresses that can be more easily shared by automated systems and humans alike.

2.2 Feature and Feature Collection Classes

Within the context of geospatial data, a feature is an abstraction of real-world phenomena. A feature type defines the properties and constraints placed on a Feature. A Feature has a unique identity, a type (the feature type), and values for the properties that are defined through the feature type. The properties (or attributes) of a feature are particular to the type of feature being represented. For example, a property of a hospital (the feature type) might be the number of beds

(the property). A Feature represents a specific real-world object; in this example, a feature instance representing The George Washington University Hospital would have an attribute value for number of beds of 380. Exhibit 6 illustrates the hierarchy of the Feature object.

Exhibit 6: Feature Object Hierarchy



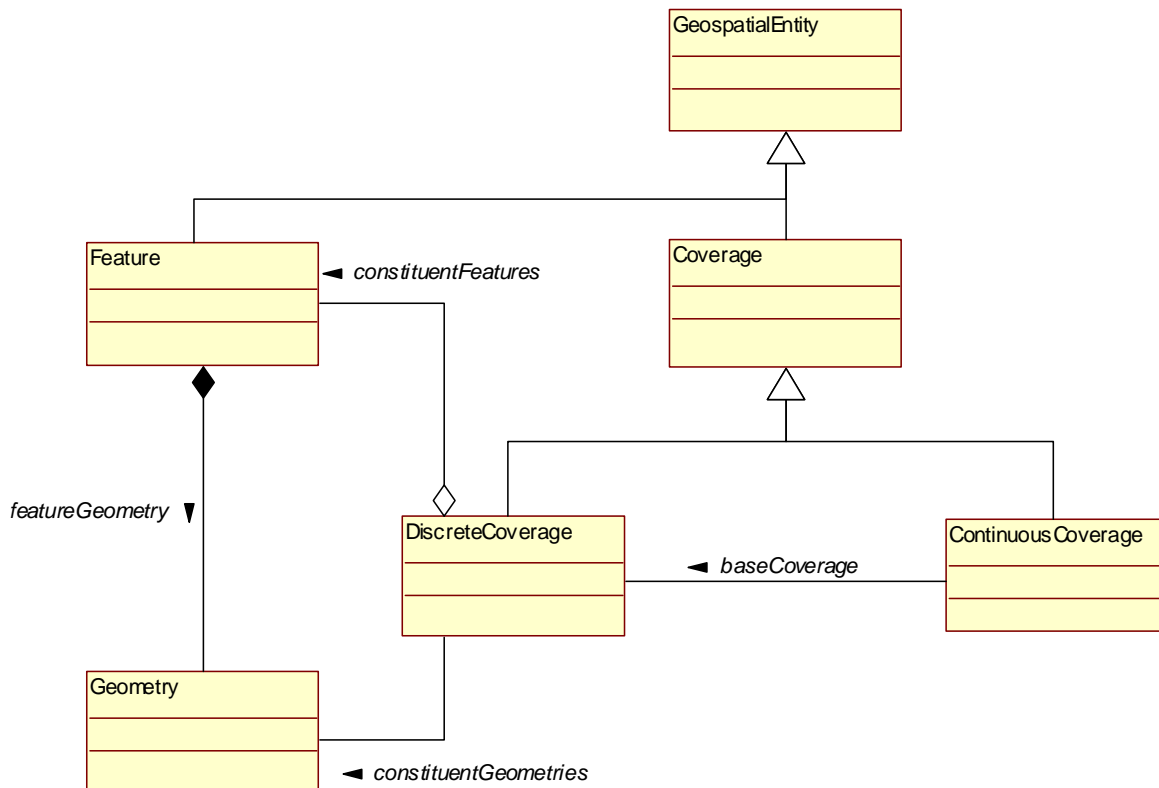
An attribute that is common to many feature types is geometry. Geometry is used to describe the geographic dimensions of the feature. It provides the location, orientation, and dimensions of a feature within the context of a reference system. The geometry for a feature can be as simple as a point (expressed as a latitude and longitude coordinate pair, for example) appropriate for discovery and display on a macro scale. A feature may also have associated geometry that is more complex, such as a description of the parcel of land and footprint of the improvements on the parcel appropriate for use in high-precision applications such as cadastral record keeping.

Within this data model, a feature can exist as a single feature or as a collection of features (including collections of collections). A Feature Collection can be treated as an instance of a feature and can contain one or more features. Feature collections are used to group features for convenience thematically, geographically, or in other ad hoc groupings. For example, a feature collection may be created that contains all hospitals (thematic grouping). In addition, there could be a collection that contains all hospitals in a given region (geographic grouping). A dynamic collection could be created in response to a query that includes all hospitals in a geographic area with more than 200 beds (an ad hoc collection based on the feature's property values).

2.3 Coverage Class

A Coverage is a feature that acts as a function to return one or more feature attribute values for any direct position within its spatiotemporal domain. An example would be a geolocated satellite image where each pixel of the image can be located using a latitude and longitude coordinate. The Coverage class is used to contain the reference to the coverage data and the functions used to return the feature attribute values for a given location. Exhibit 7 illustrates the hierarchy of the Coverage class.

Exhibit 7: Coverage Hierarchy



Coverages are implemented as one of two types: discrete and continuous. A Discrete Coverage has a finite collection of geometric objects and the direct positions contained in those objects within a spatiotemporal domain. An example of a Discrete Coverage is a set of weather reporting stations where each station has a direct position and a temperature value at a specified time. This is similar to the concept of a feature collection with the added dimension of time. A Discrete Coverage could provide an association or aggregation of Observations over a common area or time frame.

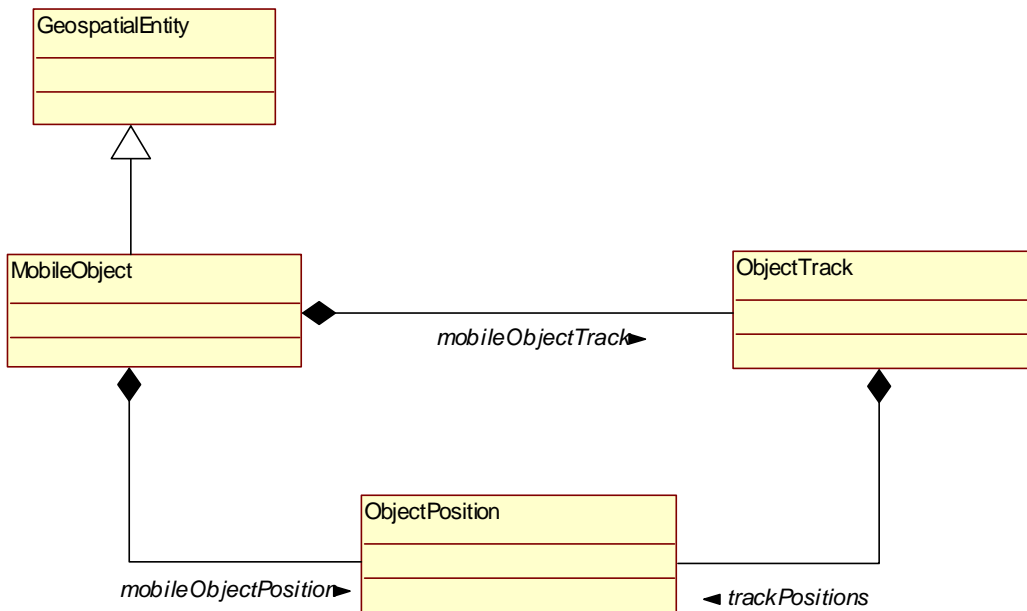
A Continuous Coverage consists of a set of direct positions in a coordinate space over a spatiotemporal domain. A Continuous Coverage maps direct positions to value records. Using the weather station example above, a Continuous Coverage would provide a temperature value for any location within the coverage extent at a specified time, regardless of whether or not the direct position corresponded to the location of a weather reporting station. The implementation of the function for the continuous coverage determines how the value is calculated (e.g. linear interpolation). A Continuous Coverage is very frequently associated with a Discrete Coverage providing a set of control values as a basis for evaluating the Continuous Coverage.

2.4 Mobile Object Class

A Mobile Object describes something that is being tracked or monitored. A Mobile Object is both geographically and temporally located. It has a position and an associated time when that

position was taken. In addition, the object has a status and an activity associated with the object. Exhibit 8 illustrates the structure of a Mobile Object.

Exhibit 8: Mobile Object Class

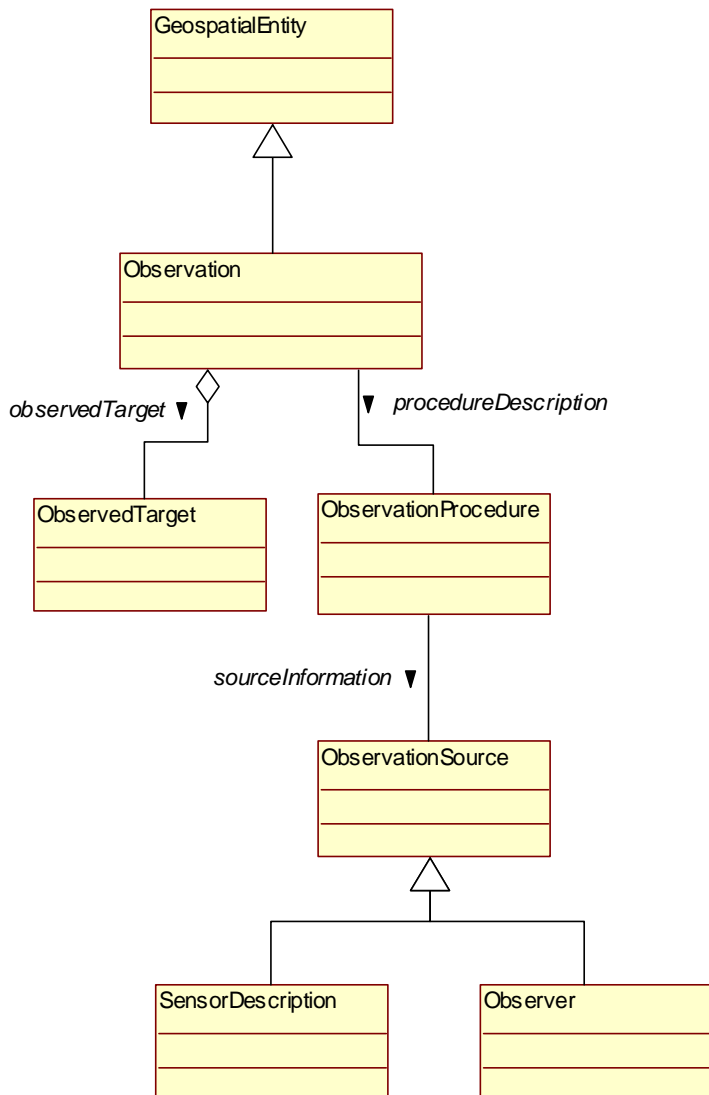


A Mobile Object is associated with two classes: the Object Position and the Object Track. The Object Position contains the current or most recent spatio-temporal location of the object, i.e. the geographic position of the object (including the quality of the position report) and the time that the position is valid. A Mobile Object has an associated Track History containing the historic (or predicted) states of the Mobile Object being tracked, including associated historic or predicted positions.

2.5 Observation Class

An observation is the act or event through which a number, term or other symbol (i.e. measurement) is assigned to a phenomenon at a location at a given point in time. An observation can be the measured value of a sensor (such as a water height meter or temperature sensor) or a report of activities at an observed location. As illustrated in Exhibit 9, an Observation is a subclass of a Geospatial Entity.

Exhibit 9: Observation Class Hierarchy

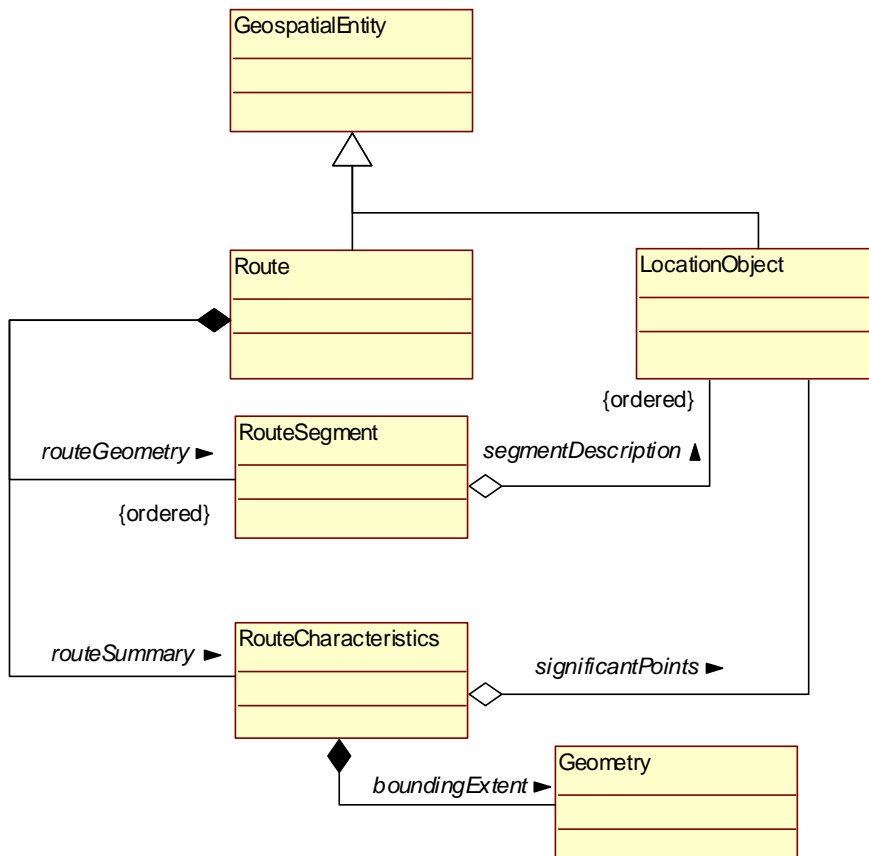


An Observation may be associated with an Observed Target, which describes the target or subject of the observation. An Observation has an associated Observation Procedure, which can be a process, instrument, or sensor. The associated Observation Source provides descriptive information on the source of the observation. Specifically, an Observation Source could be a Sensor Description or an Observer. The Sensor Description contains the characteristics, limitations and calibration information regarding the sensor that supplied the Observation. The Observer is a citation of the source of an Observation made through non-automated means, such as reporting on people entering and leaving a building.

2.6 Route Class

A route is a sequence of links, possibly including partial links, describing a path between two or more positions within a network. The Route class contains a summary of the route and the route geometry. Exhibit 10 illustrates the basic structure of the Route class.

Exhibit 10: Route Class

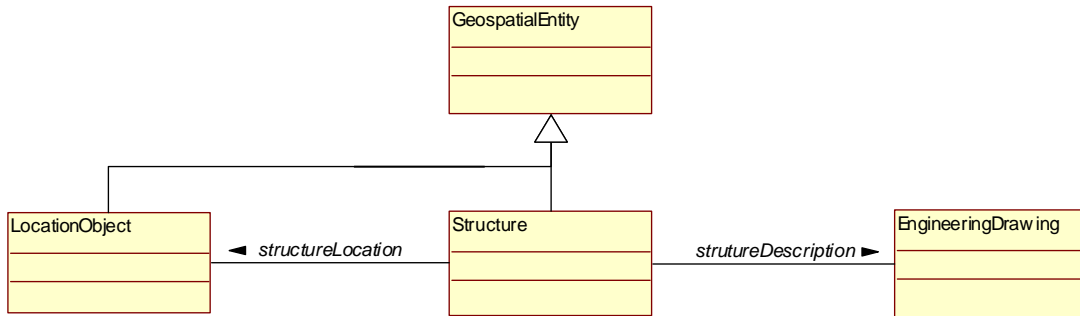


A Route has associated Route Characteristics that provide a summary of the route. The summary identifies significant points along the route (such as the starting and ending points and waypoints), the route distance and associated geographic extent of the route. The route geometry is described by an ordered list of Route Segments that describe a path between an ordered set of Location Objects.

2.7 Structure Class

A structure is a manmade object such as a building, bridge, or tunnel. The Structure class is similar to a feature in that it describes properties of the manmade object, but in more detail. As illustrated in Exhibit 11, the Structure class is used to associate engineering drawings or references to engineering data that describes a structure and the Location Object for that structure.

Exhibit 11: Structure Class



3.0 ACRONYMS

Acronym	Definition
AOI	Area of Interest
POI	Point of Interest
DHS	Department of Homeland Security
EA	Enterprise Architecture
GEA	Geospatial Enterprise Architecture
HLS	Homeland Security
TCP/IP	Transmission Control Protocol/Internet Protocol
URL	Uniform Resource Locator



**HOMELAND SECURITY GEOSPATIAL ENTERPRISE
ARCHITECTURE**

**ATTACHMENT G DATA 2
GEOSPATIAL PROPERTIES-ELEMENTS**

GEOSPATIAL MANAGEMENT OFFICE

DRAFT VERSION 0.6.1

April 13, 2004

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EXHIBITS

Exhibit 1: HLS Geospatial Properties and Elements 2

1.0 INTRODUCTION

The geospatial context of the Department of Homeland Security (DHS) business data can be used to provide insight into how and where resources are being deployed, the location and impact of past events, the predicted implications of forecast scenarios, and much more. A number of common geospatial data elements and properties have been defined for the Homeland Security (HLS) Geospatial Enterprise Architecture (GEA) to support the efficient and widespread exploitation of this data. Exhibit 1 lists data elements-properties that can be utilized by all data objects within the HLS EA, including geospatial and predominantly non-geospatial objects, thus providing a normalized geospatial context for all objects.

Consistent use of these elements-properties throughout the HLS EA will enhance interoperability and the use of standard Geospatial Enterprise Services that exploit these elements-properties. For example, by using a common definition for the specification of an address, any HLS business data that includes the address can be more easily exploited and shared between systems and jurisdictions.

Many of the elements-properties listed in Exhibit 1 can be found as location reference data in non-geospatial datasets. It may not be feasible or practical to transform non-geospatial data into geospatial data in order to exploit the geospatial elements-properties of non-geospatial data. It is better to exploit this data in place through the consistent use of standard properties/elements and standard Geospatial Enterprise Services.

2.0 HLS GEOSPATIAL DATA PROPERTIES AND ELEMENTS

The first column in Exhibit 1 is for informational purposes only and is used to identify the row for editorial purposes. The “**Name**” is the identifier for the element/property. The column headed “**Subtype of**” indicates that the element is a subtype of the named element. The “**property**” column contains an “**X**” if the element may also be used as a property of other objects within the EA. Neither elements nor properties are limited to scalar representations. The column “**Component of**” is used to indicate that the item is a property of the named element. The “**Instance of**” column is for elements or properties that are instantiations of element or property types and indicates the item type that it instantiates. The “**Definition**” is taken from the *Key Terms* artifact. In the case of an inconsistency, the *Key Terms* artifact should be considered authoritative. The “**Reference**” column indicates the organization (or, in some cases the standard) that has defined a content model for the element. This referenced information will be used to develop the HLS Data Model for the Geospatial Elements.

Exhibit 1: HLS Geospatial Properties and Elements

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
1	Absolute Location	Location				Specifies an absolute location on the earth. Defined by an address, position, feature geometry (e.g., point), or Place of Interest. A subclass of Location.	
2	Address	Absolute Location	X			Specifies street address or street intersection as used in navigation and locating parties and facilities. A subtype of Absolute Location under Location. As defined by Open GIS Consortium (OGC), address consists of a street address (or intersection), place name (e.g., country, municipality, etc.), postal code, street locator, building locator, and supplemental address information. Addresses are the means of referencing primarily residences and buildings (of all types).	OGC, USPS
3	Aerial Navigation					Identifies areas within the US National Airspace System. Includes Special Use Airspace, Airways, Waypoints, and navigation aids.	NGA, FAA
4	Area		X			Measure of the approximate surface area of an area of interest.	
5	Area of Interest	Absolute Location	X			A named area (defined by circle, bounding box, or polygon). Used as a search parameter or can be displayed. A designated area of interest in an application. May be represented as a Feature or Coverage. A subtype of Absolute Location, which is under Location.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
6	Base Data				Feature Collection	The foundational data required for generating multi-purpose maps and other geospatial products. The data that comprise a Base Map. May consist of one or more features and/or coverages. All Base data should be registered to a common coordinate reference system. An HLS Framework category.	
7	Base Map				Feature Collection	A multi-purpose map that conveys general geospatial context, as depicted by predominant earth features.	
8	Border Areas		X		Area of Interest	Administrative areas along US National borders.	Border Patrol
9	Bounding Box	Geospatial Extent	X			Geographic area of interest expressed as a rectangle.	
10	Bounding Circle	Geospatial Extent	X			Geographic area of interest expressed as a circle.	
11	Bounding Ellipse	Geospatial Extent	X			Geographic area of interest expressed as an ellipse.	
12	Building Locator		X	Street Address		Street number and other identifier for a building, either alone or in the context of a campus or collection of buildings.	OGC
13	Census District		X		Area of Interest	District defined by the Census Bureau for statistical calculations.	Census
14	Census Tract		X		Area of Interest	Sub-division of Census District defined by the Census Bureau for statistical calculations.	Census
15	Citizenship		X		Country	A person's country of origin or home country, as established through naturalization.	
16	Containment Area		X		Area of Interest	Bounded area delineating geographic extent for an incident or event that requires proactive measures to prevent expansion of the extent.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
17	Coordinate Reference System	Spatial Reference System	X	Geometry		A function that associates locations in space to geometries of coordinate tuples in a mathematical space, usually a real valued coordinate vector space, and conversely associates coordinate values and geometries to locations in the real world, e.g., geographic coordinates (latitude, longitude) and projected coordinates (UTM).	
18	Country		X			Identifier for a nation. Implemented as a name, abbreviation, or code.	
19	Country Abbreviation		X		Country	Standard (e.g., ISO 3166) abbreviation for a country.	ISO
20	Country Code		X	Address	Country	Registered code value for a country.	
21	Country Name		X		Country	Full name of a country.	
22	County		X	Address		Municipal subdivision of a state.	
23	County Code		X		County	Standard identifier for a specific county or other subdivision within a US state.	FIPS 55
24	Coverage	Geospatial Entity				A two- (and sometimes three or higher) dimensional geographic representation of earth phenomena. Common examples include imagery and digital terrain models. An HLS geospatial entity type.	
25	DHS Region		X		Area of Interest	Administrative region defined by DHS.	DHS
26	DHS Sector		X		Area of Interest	Sub-division of administrative region defined by DHS.	DHS
27	Direction	Linear Measure	X			The relationship by which the alignment or orientation of any position with respect to any other position is established.	
28	Distance	Linear Measure	X			A linear extent of space between two points. The travel distance between two places.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
29	Facility				Feature Collection, Structure	Geospatial representations of surface, above surface and sub-surface structures, and installed heating, ventilation and air conditioning (HVAC), plumbing, electrical, security systems, and other installed infrastructure for any facility identified as a critical or key asset. Also, associated real property (e.g., rights of way, easements, etc) A category of HLS Framework Data.	
30	Feature	Geospatial Entity				An abstraction of a real world phenomenon. A geographic feature with a location relative to the earth. Usually represented by vector data (points, lines and polygons) with geometry, topology and descriptive properties (attributes). An HLS geospatial entity type.	
31	Geodetic Control				Feature	Points of known precise location on the earth (latitude, longitude, elevation) as established through surveying or photogrammetric methods. Control points that are expressed in a common coordinate reference system (e.g., WGS - 1984). Geodetic control is required to accurately register spatial data. The National Spatial Reference System (NSRS) is the fundamental geodetic control for the United States. A subcategory of HLS Framework Data under the Base category.	
32	Geolink		X			A geo-enabled hyperlink (URI). This link may reference any geospatial-temporal resource (data/service). e.g., A geolink may reference a Location or a particular Feature. Geolinks provide the means to link between digital text/voice terms and the geospatial realm.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
33	Geometry		X	Geospatial Entity		The geometric properties of geospatial data.	
34	Geoname		X			The name associated with a specific geographic location/place. A place name. e.g., Trafalgar Square, White House, Washington, D.C. Typically available through a Gazetteer or Location-based Directory.	
35	Geospatial Annotation		X		Geolink	Link appended or otherwise associated with a document, message, or other communication providing a link to a geospatially-normalized description of a geospatial element referenced in the text.	
36	Geospatial Coordinate	Geometry Primitive	X		Point	The coordinates of a geospatial position expressed in a geospatial coordinate reference system, e.g., geographic – latitude, longitude, and elevation.	ISO, OGC
37	Geospatial Entity		X			The basic data types for HLS geospatial data that are used in geospatial services. Includes: Location, Feature, Coverage, Observation, Route, Mobile Object and Structure.	
38	Geospatial Extent		X			The extent of a geospatial entity type, as defined by a minimum bounding rectangle or polygon.	
39	Height		X		Distance	Value and unit of measure for the size of an object in the z-axis.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
40	Imagery	Coverage				A graphic representation of an object or scene, typically produced by an optical or digital electronic device. Common examples include remotely sensed data (e.g., satellite data), scanned data, and photographs. An image is normally stored as a raster data set of binary or integer values that represent the intensity of reflected light, heat, or other range of values on the electromagnetic spectrum. An HLS Framework Data category. A subtype of coverage.	
41	Jurisdiction		X		Area of Interest	Area of public safety responsibility.	
42	Length		X		Distance	Value and unit of measure for the size of an object in the x or y-axis.	
43	Linear Measure					Root class for defining classes used to expressed values measured based on a linear scale.	
44	Location Reference		X			General purpose, unique identification of a geospatial entity.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
45	Location Object	Geospatial Entity				Any place or site on the earth of interest in the HLS mission. A position with geospatial coordinates. Generally, as used in HLS business, a place, area or point of interest. Also, the location of a person, thing or phenomenon referenced to the earth. Includes Absolute Location and Relative Location. An HLS geospatial entity type. As defined by OGC, the extensible, abstract data type for all expressions of location that can be used by geospatial applications and services to specify the location of a target, asset, conveyance, person, etc. As used in location based service (LBS), a location is the root of a semantic tree that includes a Point, Position, Address, and Point of Interest as its subtypes.	
46	Map (and Chart)				Feature Collection	Generally, an annotated, symbolized graphical representation of select geospatial-temporal data for an intended purpose. Also, a map created by an orthorectified image. May contain annotations and marginalia. May be in hardcopy or softcopy form. May reference a Report or Plan. May be referenced by or embedded in a Report or Plan. A subcategory of HLS Framework Data under the Geospatial Product category.	
47	Mile Marker		X		Relative Location	Distance along a US limited access highway or railroad from a well-defined reference point. Mile marker signs are typically located along the side of each direction of the highway at least every mile; in some cases, every tenth of a mile.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
48	Mission Feature		X		Location Object	Dynamic or ad hoc location or area of interest pertinent to an organizational mission or event.	
49	Mobile Object	Geospatial Entity	X			Any object of interest that moves, or is otherwise dynamic, and is monitored and/or tracked. A person, good, conveyance or asset. Mobile objects have location, time, identity, activity, status, and optionally speed and direction of motion. Historical records of location/time/identity/activity/status/speed/direction may be recorded for tracking purposes. An HLS geospatial entity type.	
50	Municipal Subdivision		X	Address		Borough or other sub-division within a municipality.	
51	National Affiliation		X		Country	Relates a person, good or asset to a nation. A property of HLS Framework Data under Person, Goods or Asset data.	
52	National Map, The				Feature Collection	A seamless, continuously maintained set of Base data for the U.S., consisting of both feature and coverage data that meet consistent National standards. The National Map (TNM) will serve as the central portal for the sharing and dissemination of critical geospatial information. The 'Base Map' for HLS operations.	
53	Nautical Navigation				Feature Collection	Data which pertains to nautical navigation, like waterways, ports, harbors, bridges, navigation aids, traffic, traffic control, (electronic) navigation guidance, fixed hazards and dynamic hazards. A subcategory of HLS Framework Data under the Base category.	NOAA

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
54	Network					Includes the following type of networks: terrorist, hostile interest affiliation, road transportation (road, air, rail, and sea), logistical, energy distribution, communications, water supply, food distribution, emergency response, financial, sociological, etc.	
55	Observation	Geospatial Entity				Data derived from sensor measurement, human observation, and other observation and measurement techniques. An HLS geospatial entity type.	
56	Place Name		X	Address		Named location such as a country, municipality, or other well-defined, well-known area.	OGC
57	Place of Birth		X		Location	Location associated with a person's birth. An instance of Location.	
58	Place of Destination		X		Location	Shipping or travel destination. An instance of Location.	
59	Place of Interest	Absolute Location				May be represented as a point (i.e., point of interest) or an area (i.e., area of interest). A subtype of Absolute Location.	
60	Place of Manufacture		X		Location	Place where a good is manufactured. An instance of Location.	
61	Place of Origin		X		Location	Shipping or travel origin. An instance of Location.	
62	Point	Geometry Primitive	X			A location expressed as a set of coordinates within a defined coordinate reference system.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
63	Point of Interest	Place of Interest				A place or entity with a fixed position that may be used as a reference point or a target. A location of interest, represented as a point in a known coordinate reference system, with metadata describing the location. May also contain name, type, category, address, phone number and other information about a place. A subtype of Place of Interest. (Also see Place of Interest)	
64	Position		X			Any observed or calculated position, in the broad semantic context of the use of the term. Primarily contains a geographic position and quality of position. The geospatial coordinates, accuracy and precision of a point or vertices of a line or polygon.	
65	Postal Address	Address	X			Mailing address (may be specified as a street address, rural route, or post office box).	USPS
66	Postal Code		X	Address		National numbering system used to deliver mail. Can be used to identify a geographic area.	
67	Raster				Coverage	An abstraction of the real world where spatial data is expressed as a matrix of cells or pixels, with spatial position implicit in the ordering of the pixels. Unlike vector data, there are no implicit topological relationships. Coverages are often represented in raster form. e.g., imagery.	
68	Relative Location	Location				A location stated as a relative position with respect to an Absolute Location (i.e., address, position, feature geometry, e.g., point, or Place of Interest). A subtype of HLS geospatial entity type Location.	
69	Relative Locator	Relative Location	X			Range and bearing from a fixed, well-known point to the target location.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
70	Route	Geospatial Entity				The representation of a route for navigation purposes. The route's overall characteristics, such as its start point, waypoints, end point, transportation type, total distance, travel time and bounding box. Route geometry is defined as a list of geographic positions along the route, ordered in the sequence of planned travel, starting with the position of the route's origin and ending with the position of the route's destination, including waypoints. Also, a list of travel instructions consisting of turn-by-turn directions and advisories along the route, ordered in sequence of their occurrence. Routes are derived from navigable transportation networks. An HLS geospatial entity type.	
71	Secondary Address		X	Address		Information regarding a location within a building or structure (i.e. Suite 410).	
72	Spatial Reference System		X			A function that associates locations in space to geometries of coordinate tuples in a mathematical space, usually a real valued coordinate vector space, and conversely associates coordinate values and geometries to locations in the real world, e.g., coordinate reference systems, linear reference systems.	
73	Spatial Relationship		X			The relationship between two objects as described in geospatial terms (distance, coordinates, etc). Also topological relationships, e.g., adjacent, connected, surrounded by, etc.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
74	Speed		X	Velocity		The rate of motion or a measure of the rate of motion. Distance traveled over an interval of time.	
75	State		X	Address		Identifier for a state, province, or other national subdivision. Implemented as a name, abbreviation, or code.	
76	State Abbreviation		X		State	Standard (e.g., USPS Publication 28) abbreviation for a state.	USPS
77	State Code		X		State	Registered code value for a state (e.g., FIPS 55).	FIPS
78	State Name		X		State	Full name of a state.	
79	Street Address		X	Address		Structured street address. Example properties include building number, fractional number, prefix, street name, postfix, and direction.	FGDC, USPS, OGC, ISO
80	Street Intersection		X	Address		Intersection of one or more streets identified by name.	FGDC, USPS, OGC, ISO
81	Structure	Geospatial Entity				The geospatial representation of a man-made structure, e.g., building or bridge. An HLS geospatial entity type.	
82	Telecom Equipment Locator		X		Address	Information regarding the location of a piece of telecom equipment; may be a partial address.	TIA
83	Temporal Reference System		X			A function that associates time to a coordinate (usually one dimensional points and intervals) and conversely associates coordinate geometries to real world time.	
84	Temporal Relationship		X			The relationship between two events with respect to time; or pertaining to a specified period of time.	

	Name	Subtype of	Property	Component of	Instance of	Definition	Reference
85	Track			Mobile Object		A sequence of observations and/or predictions concerning the location/time/identity/activity/status for persons, goods, assets, conveyances or any other mobile objects for a given period of time (current, historical and planned/projected). Optionally, to also represent speed and direction of motion. A subcategory of HLS Framework Data under Person, Goods, Conveyance or Asset.	
86	Transshipment Point				Point of Interest	An intermediate location (waypoint) in a shipping route for goods and cargo where the means of conveyance changes.	
87	Velocity		X			Distance traveled in a unit of time and the direction of travel.	
88	Weather				Coverage, Feature Collection	Weather conditions at specified locations e.g., hindcasts, nowcasts, forecasts and climate data. A category of HLS framework data. Also might enter the HLS environment as Auxiliary data.	
89	Width	Linear Measure	X			Value and unit of measure for the size of an object in the x or y-axis.	
90	Zip Code		X		Postal Code	US Postal Service postal code.	USPS

3.0 ACRONYMS

Acronym	Definition
DHS	Department of Homeland Security
EA	Enterprise Architecture
FAA	Federal Aviation Administration
FGDC	Federal Geographic Data Committee
FIPS	Federal Information Processing Standards
HLS	Homeland Security
HVAC	Heating, Ventilation & Air Conditioning
ISO	International Standardization for Organization
LBS	Location Based Service
NGA	National Geospatial-Intelligence Agency
NSRS	National Spatial Reference System
NOAA	National Oceanic and Atmospheric Administration
OGC	Open GIS Consortium
TIA	Telecommunications Industry Association
TNM	The National Map
URI	Uniform Resource Identifier
USPS	United States Postal Service
UTM	Universal Transverse Mercator
WGS-84	World Geodetic Survey 1984



**HOMELAND SECURITY GEOSPATIAL ENTERPRISE
ARCHITECTURE**

**ATTACHMENT G DATA 3
GEOSPATIAL DATA DICTIONARY**

GEOSPATIAL MANAGEMENT OFFICE

DRAFT VERSION 0.6.1 — REDACTED VERSION

April 13, 2004

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1.0 HLS Geospatial Data Dictionary

The *Geospatial Data Dictionary* contained herein defines the primary classes of geospatial data for the Homeland Security (HLS) Geospatial Enterprise Architecture (GEA). There are two top-level super-classes of geospatial data associated with the HLS mission: *HLS Framework Data* and *HLS Auxiliary Data*. *HLS Framework Data* consists of the geospatial data classes that are required for the HLS mission. It includes classes that are created by active participants in the mission, as well as those created by supporting data providers/stewards. *HLS Auxiliary Data* consists of any geospatial data classes that are not required for the HLS mission, but may be used as open source in the mission.

This dictionary also describes the standard geospatial data terminology for use throughout the HLS Enterprise Architecture (EA). [Note: Where terms defined herein are also defined in ‘Attachment G.Bus.1 – HLS Geospatial Business Language: Key Terms’, the later definition takes precedence.]

The dictionary employs a simple three-tier data classification scheme for *HLS Framework Data*. The three tiers consist of Category (data class), Sub-Category (data subclass), and Type. The data dictionary lists all major data categories and sub-categories. Although many data types are listed in the geospatial definitions, they are not defined in full and require elaboration by data providers/stewards of the data.

Below is a brief description of the column headers for the data dictionary:

Rec. No. (Record Number)—The record numbers are arbitrary and subject to change.

HLS Framework Category—The category is the “top tier” in the geospatial data classification scheme, a data class, and in many instances relates directly to the Data Object defined for version 1.0 of the DHS Target EA.

HLS Framework Sub-Category—The sub-category is the “second tier” in the geospatial data classification scheme, a subclass of category.

Primary Provider—The primary provider is the suggested authoritative source for the type of data referenced. Sources shown require verification, and where no source is shown, these need to be identified.

Geospatial Definition—The definitions defines the category/sub-category, taken directly from various sources, which are listed in parenthesis.

DHS EA Subject Area—The subject area is taken directly from version 1.0 of the DHS Target EA to show the mapping between subject area, data object, category and sub-category.

DHS EA Data Object—The data object is also taken directly from version 1.0 of the DHS Target EA to show the mapping between subject area, data object, category and sub-category.

Exhibit 1. HLS Geospatial Data Dictionary

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
1.	Capital Asset	TBD	TBD-Best Available Data	(GEA) Inventory with location and geospatial extent of land, current and historical location of equipment, and physical and/or virtual location of intellectual property designated as DHS capital assets. Relates to location, party (organization) ¹ .	Asset	Capital Asset
2.	Emergency Response Stockpile	TBD	FEMA, State and local agencies	(GEA) Inventory with location of emergency response stockpiles; location of specific categories of materials within a stockpile location. Relates to location, plan, event.	Asset	Emergency Response Stockpile
3.	Incident Response Materials and Equipment	TBD	FEMA, State and local agencies	(GEA) Inventory with current and historical location of response materials and equipment with temporal context of location. Includes identity/location/time/activity/status. Relates to location, plan, event.	Asset	Incident Response Materials and Equipment
4.	Law Enforcement Asset	Weapon (Recommend change to include all law enforcement assets.)	Federal (including military), State, local, and tribal law enforcement organizations	(GEA) Current inventory and location of law enforcement weapons. Track temporal context of location. Includes identity/location/time/activity/status. Relates to location, event, training resource, plan. (Recommend expansion to include any inventory with current and historical location of law enforcement assets to include personnel, vehicles, other equipment, etc.)	Asset	Law Enforcement Asset
5.	Operational Materials and Equipment	TBD	DHS Federal, state, regional, and local organizations.	(GEA) Inventory with current and historical location of operational materials and equipment with temporal context (includes tracking equipment locations associated with deployment of assets). Includes identity/location/time/status. Relates to location, plan, event, training resource.	Asset	Operational Materials and Equipment

¹ Relation to other data categories shown is provided for general reference only and should not be taken as authoritative.

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
6.	Record	TBD	DHS	(GEA) Location of records/records management activities. Geospatial and temporal context of data contained within records. Relates to communication, agreement, conveyance, party, risk, case, goods, governance, training resource, event, benefit, plan, location, employment, and financial resource.	Asset	Record
7.	Critical Asset	Emergency Law Enforcement	TBD-Best Available Data	(PDD 63-HSIP) Locations of Federal, State, County, local, and tribal law enforcement facilities. Relates to location, plan, event.	1.1 Asset (HSIP) ²	None
8.	Critical Asset	Emergency Services and Continuity of Government	TBD-Best Available Data	(PDD 63-HSIP) Location of Federal, state, and local emergency management offices, Evacuation Routes, fire equipment manufacturers, fire hydrants, fire and EMS stations, fire training academies, and Federal, state, local and tribal government buildings. (GEA) Add geospatial context for emergency services networks. Relates to location, plan, event, structures, transportation.	1.2 Asset (HSIP)	None
9.	Critical Asset	Energy	TBD-Best Available Data	(PDD 63-HSIP) Locations of energy distribution control facilities, gas processing plants, gas stations, manifolds, natural gas storage facilities, nuclear fuel plants, nuclear research facilities, nuclear waste processing and storage facilities, nuclear weapons plants, oil and gas fields, petroleum and natural gas extraction wells and injection wells, pipelines, POL storage tanks, power lines, power plants, pumping stations, refineries, substations. (GEA) Add geospatial context for energy distribution networks. Relates to location, plan, event, structures, party, risk.	1.3 Asset (HSIP)	None

² Category “Asset (HSIP)” was derived from Presidential Decision Directive (PDD) – 63 as further defined in the joint NIMA-USGS Homeland Security Infrastructure Program (HSIP) Tiger Team Report, September 2002.

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
10.	Critical Asset	Information and Communications	TBD-Best Available Data	(PDD 63-HSIP) Locations of Cable grids, Internet provider facilities and hubs, satellite ground stations, telephone facilities, telephone lines, towers (radio, TV, cellular, microwave), TV and radio broadcast facilities. (GEA) Add geospatial context for fiber-optic networks, telecommunications networks, cellular and microwave networks, internet networks. Relates to location, plan, event, structures, party, risk.	1.4 Asset (HSIP)	None
11.	Critical Asset	Special Functions	TBD-Best Available Data	(PDD 63-HSIP) Locations and geospatial extent of critical government, military, and contractor installations. Probable overlap with Structure and other categories. Relates to location, plan, structures, risk.	1.5 Asset (HSIP)	None
12.	Critical Asset	Water Supply	USGS/The National Map State and local sources	(National Map) Overlaps with USGS National Hydrographic Dataset. (PDD 63-HSIP) Location of water supply (wells, reservoirs, aquifers, lakes, streams and rivers) dams, storage (tanks and towers), treatment and filtration, pumping stations and pipelines. (GEA) Add geospatial context for water supply networks. 1.6 Content overlaps hydrography sub-category. 1.7 Relates to location, plan, event, structures, risk.	1.8 Asset (HSIP)	None
13.	Key Asset	Public Health	TBD-Best Available Data	(PDD 63-HSIP) Locations of Health services, primary care facilities including hospitals, ambulance providers (private), blood banks, day care facilities, diagnostic laboratories, homeless shelters, mortuaries and crematoria, nursing homes, pharmacies, and research laboratories. Relates to location, plan, event, structures, party (including non-governmental organizations).	1.9 Asset (HSIP)	None
14.	Key Asset	Agriculture and Livestock	TBD-Best Available Data	(PDD 63-HSIP) Location of agricultural use areas, private and commercial farms and ranches, feed lots, fish farms and hatcheries, grain elevator complexes, poultry and hog farming complexes, and stockyards. Relates to location, party, risk.	1.10 Asset (HSIP)	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
15.	Key Asset	Chemical and Manufacturing	TBD-Best Available Data	(PDD 63-HSIP) Locations of chemical facilities, hazardous material facilities, landfill, manufacturing facilities, superfund sites, uranium mining, and other mining facilities. Relates to location, party, structures, risk.	1.11 Asset (HSIP)	None
16.	Key Asset	Important Industry, Commercial and Retail	TBD-Best Available Data	(PDD 63-HSIP) Location of corporate headquarters, grocery stores, hotels and motels, shopping malls and complexes, and warehouses. Relates to location, party, structure, risk.	1.12 Asset (HSIP)	None
17.	Key Asset	Food Industry	TBD-Best Available Data	(PDD 63-HSIP) Location of bakeries, beverage manufacturing, canneries, dairies, food distribution centers, grain mills, meat packing and processing plants. Relates to location, party, structures, risk. (GEA) Add geospatial context for food distribution networks.	1.13 Asset (HSIP)	None
18.	Key Asset	Mail and Shipping	TBD-Best Available Data	(PDD 63-HSIP) Location of mail and shipping facilities, post offices, private and express shipping facilities. Relates to location, party, structures, risk. (GEA) Add geospatial context for mail distribution and shipping networks.	1.14 Asset (HSIP)	None
19.	Key Asset	Education	TBD-Best Available Data	(PDD 63-HSIP) Location of colleges, universities, and schools. Relates to location, party, structures, risk.	1.15 Asset (HSIP)	None
20.	Key Asset	Other	TBD-Best Available Data	(PDD 63-HSIP) Locations of border crossings, cemeteries, ice rinks, maintenance yards, mobile home parks, parking lots and facilities, weigh stations and truck stops. Relates to location, base/transportation, party.	1.16 Asset (HSIP)	None
21.	Key Asset	National Symbols	DOI/NPS	(PDD 63-HSIP) Locations of Landmark structures, National symbols, and tourist attractions. (A-16) Cultural resources theme includes historic places such as districts, sites, buildings, and structures of significance in history, architecture, engineering, or culture. Cultural resources also encompass prehistoric features as well as historic landscapes. Relates to location, party, structures, risk.	1.17 Asset (HSIP)	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
22.	Key Asset	High Value or Symbolic Targets, Public Venues	1.18 TBD	(PDD 63-HSIP) Locations of amusement parks, concert halls and theatres, convention centers, fairgrounds, golf courses, houses of worship, libraries, museums, race tracks and drag strips, and sports arenas. Relates to location, party, structures, risk.	1.19 Asset (HSIP)	None
23.	Key Asset	Weather Facilities	NOAA, DoD, Commercial weather, services	(PDD 63-HSIP) Locations of weather data centers, forecast centers, severe weather warning centers, and radar sites nation-wide. Relates to location, party, structures, risk.	1.20 Asset (HSIP)	None
24.	Critical Asset	Banking, Finance, and Insurance	TBD-Best Available Data	(PDD 63-HSIP) Locations of critical financial institutions and bullion repositories. (GEA) Add geospatial context for financial networks. Relates to location, structures, party, risk.	1.21 Asset (HSIP) ³	None
25.	Case	TBD	DHS Federal, State, local, tribal, and foreign law enforcement Foreign intelligence and law enforcement	(GEA) All records associated with an investigative case, specifically the geospatial context (location/time/identity/activity/status) pertaining to an investigation. Current, historical, and predicted location (national and international) with temporal context (tracking) for persons, organizations, incidents, occurrences, conveyances, cargo, etc. associated with an investigative case. Includes locations for related confiscation and seizures of goods, assets, conveyances, etc., and current and historical locations associated with evidence. Location for parties (persons, organizations) receiving benefits. Relates to location, event, party, employment, goods, conveyances, plan, intelligence.	Case	Case

³ Category “Asset (HSIP)” was derived from Presidential Decision Directive (PDD) – 63 as further defined in the joint NIMA-USGS Homeland Security Infrastructure Program (HSIP) Tiger Team Report, September 2002. Although all categories defined in the HSIP report were identified as “critical infrastructure”, HLS sub-category has been re-defined on the basis of the DHS EA definitions of critical vs. key assets. It is recognized that dependent on context, any asset can be either critical or key. Note that content of some HSIP critical and key asset sub-categories overlap content in other Base sub-categories. These content overlaps will require resolution.

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
26.	1.22 Communication	Alert	DHS; Federal, State and local agencies (including law enforcement) Foreign intelligence and law enforcement organizations	(GEA) Communication message with geospatial location and temporal context for threat based sensor alerts that result from observations that meet pre-defined conditions. The geospatial extent and temporal context of an alert or “watch” area associated with a predicted or identified threat, derived from observation, modeling and simulation, correlation of incidents or occurrences, or intelligence. The geospatial and temporal context of a “watch” area associated with an identified person or activity of interest. 1.23 See Geospatial Business Language, Key Term: “Alert”. Relates to location, party (person or organization), case, event, risk, asset, and intelligence.	Communication	None
27.	1.24 Communication	Emergency Declaration	1.25 TBD	(GEA) Declaration of “state-of-emergency”, or presidential declaration of emergency including location, geospatial extent, and temporal context of area of the emergency. Relates to location, event, and asset.	1.26 Communication	None
28.	1.27 Communication	Notice	1.28 DHS	(GEA) A notification between operational actors that contains geospatial and temporal context.	1.29 Communication	None
29.	Communication	1.30 Warning	Federal agencies with warning responsibilities for specific threats as defined in the National Response Plan. Includes aeronautical notices to airmen (FAA, NGA), and nautical notices to mariners (NOAA, and NGA)	(GEA) Geospatial extent and temporal context of a warning area associated with a predicted or identified threat, derived from observation, modeling and simulation, correlation of incidents or occurrences, or intelligence. Location and geographical extent of warning (area under threat), including temporal context of current, historical or predicted changes in the location or geographic extent of the warning area. (GEA) Add geospatial context of warning networks Relates to location, risk, intelligence.	Communication	Warning

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
30.	Communication	1.31 Watch	DHS, Intelligence Community Federal, state, local, and foreign law enforcement	(GEA) A “lookout” notice for a person, goods, conveyance, activity, etc. of interest that contains geospatial and temporal context for the watch area. Relates to location, conveyance, activity, case, party.	Communication	None
31.	Conveyance	Trains	DOT/Railroad Administration Intelligence Community	(GEA) Current, historical, and predicted location, route, speed, distance, and direction with temporal context (location/time/identity/status). Includes travel history, travel itinerary, shipping manifests, and license/permit information, location and temporal context of instances of identity verification (e.g. at border entry points, destinations, etc.) Relates to location, event, risk, case, party, goods, intelligence, governance (credential).	Conveyance	Conveyance
32.	Conveyance	Motor Vehicles	1.32 TBD	(GEA) Current, historical, and predicted location, route, speed, distance, and direction with temporal context. (Location/time/identity/status). Includes license/permit information, and location and temporal context of instances of identity verification (e.g. at border entry points, vehicle stops by law enforcement, etc.) Relates to location, event, risk, case, party, goods, intelligence, governance (credential).	Conveyances	Conveyance
33.	Conveyance	Marine Vessels	USCG, NAVY/ONI, Intelligence Community	(GEA) Marine equivalent of NORAD (per Deputy Commandant, USCG 12/6/03) Current, historical, and predicted location, depth, route, speed, distance, and direction, with temporal context (location/time/identity/activity/status). Relates to location, event, risk, case, party, goods, intelligence and governance (credential).	Conveyances	Conveyance

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
34.	Conveyance	Aircraft	FAA, NORAD	(GEA) Current, historical, and predicted location, route, speed (airspeed & ground-speed), altitude (above ground level (AGL) & above mean sea level (AMSL)), distance, and direction with temporal context, (Location/time/identity/activity/status). Relates to location, event, risk, case, party, goods, intelligence, governance (credential).	Conveyances	Conveyance
35.	1.33 Event	National Security Special Event (NSSE)	USGS/The National Map, DHS, NGA, FBI, State, Local, commercial	(GEA) Location and geospatial extent and temporal context for NSSE (e.g., Super Bowl, Olympics, etc.). Includes Base data (HLS Framework and Auxiliary), location and temporal context data for individual NSSE activities. Relates to location, activity, asset, event, party, risk, and intelligence.	Event	None
36.	Incident	1.34 TBD	1.35 TBD	(GEA) Current and historical geospatial and temporal context associated with any type of incident, whether natural or man-made. Incidents may be occurrences of an instance of a single threat type, or include combinations of occurrences of multiple threats (e.g., high explosive combined with radiological-dirty bomb; hurricane or typhoon with flooding, etc). Incident data provide a complete historical geospatial and temporal context for all activities (preparation, mitigation, response, recovery) associated with the incident. Relates to location, risk, asset, plan, case, party, conveyance, communication, goods, and intelligence.	Event	Incident
37.	Incident	Chemical	EPA, State and local	(GEA) Current, historical, and predicted location and geospatial extent (3-dimensional-above or below ground including airborne distribution) including temporal context of affected areas. Includes tracking of actual or predicted spread of contamination. Relates to location, asset, party, case, structures, plan, and intelligence.	Event	Incident

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
38.	Incident	Biological	CDC, USDA, State and local Public health	(GEA) Current, historical, and predicted location and geospatial extent including temporal context of affected areas. Includes tracking of actual or predicted spread of contamination. Relates to location, asset, party, case, plan, and intelligence.	Event	Incident
39.	Incident	Nuclear	DOE, NRC	(GEA) Current, historical, and predicted location and geospatial extent including temporal context of damage and contamination. Includes tracking of actual or predicted spread of contamination. Relates to location, asset, party, case, plan, and intelligence.	Event	Incident
40.	Incident	Radiological	DOE	(GEA) Current, historical, and predicted location and geospatial extent (3-dimensional) including temporal context of contaminated areas. Includes tracking of actual or predicted spread of contamination. Relates to location, asset, party, case, plan, and intelligence.	Event	Incident
41.	Incident	High Explosive	ATF, FBI, State and local	(GEA) Current location and geospatial extent (3-dimensional) of damage, including temporal context. Also includes geospatial location, extent and tracking of contaminated areas. Relates to location, asset, party, case, plan	Event	Incident
42.	Incident	Cyber	FBI, federal, state, local and private	(GEA) Locations (physical and virtual) with temporal context for computer systems affected by a cyber attack. Relates to location, asset, party, case, plan, and intelligence.	Event	Incident
43.	Incident	Hostage	Federal, State, local, tribal law enforcement	(GEA) Location and temporal context for a hostage incident. Relates to location, asset, party, case, plan, and intelligence. Recommend inclusion of spatial context for location of hostages within a structure or conveyance.	Event	Incident

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
44.	Incident	Hazmat	EPA, State and local	(GEA) Stand-alone incident or associated with other incident types (chemical). Current and historical location and geospatial extent (3-dimensional) including temporal context for affected areas. Includes tracking of actual or predicted spread of contamination by hazardous materials. Relates to location, asset, and plan.	Event	Incident
45.	Incident	Power Grid Failure	Power companies, state and local	(GEA) Current and historical location and geospatial extent including temporal context of affected areas. Includes location of energy network nodes or segments impacted. Relates to location, asset, structure, plan, and intelligence.	Event	Incident
46.	Incident	Earthquake	USGS	(GEA) Location and depth of epicenter, and geospatial extent of area impacted including temporal context. Includes location and depth of epicenter of aftershocks and geospatial extent of areas affected. Relates to location, asset, structure, plan.	Event	Incident
47.	Incident	Tsunami	NOAA, USGS	(GEA) Location of triggering event (earthquake epicenter or underwater landslide), geospatial extent for areas that are or may be affected, with geospatial context for predicted arrival times for waves, and geospatial extent of predicted areas of inundation including temporal context. Relates to location, asset, plan.	Event	Incident
48.	Incident	Landslide	USGS	(GEA) Current, historical, and predicted location and geospatial extent including temporal context. Relates to location, asset, weather, plan.	Event	Incident
49.	Incident	Volcanic Eruption	USGS	(GEA) Current, historical, and predicted location of eruptions and geospatial extent of lava flows and areas affected, including temporal context. Relates to location, asset, plan.	Event	Incident
50.	Incident	Tornado	NWS and private weather services, State and local	(GEA) Current and historical location and geospatial extent of areas of damage, with storm track, including temporal context. Relates to location, asset, weather, plan.	Event	Incident

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
51.	Incident	Hurricane	NWS and private weather services, State and local	(GEA) Current, predicted, historical location and geospatial extent with storm track, including temporal context. Includes location and geospatial extent of damaged areas categorized by severity of damage. Relates to location, asset, weather, plan.	Event	Incident
52.	Incident	Typhoon	NWS and private weather services, foreign govt. and news services, CNN	(GEA) Current, predicted, and historical location and geospatial extent with storm track, including temporal context Includes location and geospatial extent of damaged areas categorized by severity of damage. Relates to location, asset, weather, plan.	Event	Incident
53.	Incident	Severe Weather	NWS and private weather services, State and local	(GEA) Current, predicted and historical location and geospatial extent with storm track, including temporal context. Includes location and geospatial extent of damaged areas categorized by severity of damage. Relates to location, asset, weather, plan.	Event	Incident
54.	Incident	Flood	NWS and private weather services, State and local	(GEA) Current, predicted and historical location and geospatial extent of areas of inundation, including temporal context. Can include depth, and speed of floodwaters, area of inundation, etc. Includes location and geospatial extent of damaged areas categorized by severity of damage. Relates to location, asset, weather, and plan.	Event	Incident
55.	Incident	Drought	USDA, State and local	(GEA) Current, predicted and historical location and geospatial extent of affected areas including temporal context. Relates to location, asset, weather, plan.	Event	Incident
56.	Incident	Wildfire	USFS, BLM, NIFC, State and local	(GEA) Current, predicted, and historical location and geospatial extent including temporal and geospatial context of fire spreading behavior, locations of fire lines and hot spots, etc. Includes geospatial context of environmental impact of fires, and planning of recovery efforts. Relates to location, asset, imagery, plan.	Event	Incident
57.	Incident	Plane Crash	FAA, State and local	(GEA) Current location and geospatial extent including temporal context. Also includes geospatial location, extent and tracking of contaminated areas. Relates to location, asset, navigation, plan, and intelligence.	Event	Incident

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
58.	Incident	Train Wreck	State and local	(GEA) Current location and geospatial extent including temporal context Also includes geospatial location, extent and tracking of contaminated areas. Relates to location, asset, plan, and intelligence.	Event	Incident
59.	Incident	Shipwreck	USCG, shipping companies	(GEA) Current location including temporal context Also includes geospatial location, extent and tracking of hazardous material spills areas resulting from the incident, depth and bathymetry and sinking site, etc. Relates to location, asset, navigation, plan, and intelligence.	Event	Incident
60.	Incident	Structural Failure	State and local	(GEA) Current location, geospatial extent and temporal context of damage. Includes location and geospatial extent, and tracking of release of any hazardous materials (e.g. World Trade Center). Relates to location, asset, structure, party, case, plan, and intelligence.	Event	Incident
61.	Occurrence	1.36 TBD	Federal, State, local, and tribal organizations including law enforcement, Foreign intelligence and law enforcement organizations.	(A-16) Law enforcement statistics describe the occurrence of events (including incidences, offenses and arrests) geospatially located, related to ordinance and statutory violations and the individuals involved in those occurrences. Relates to location, plan, asset, party, case, risk, conveyance, goods, event, and intelligence.	Event	Occurrence

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
62.	Goods	1.37 Cargo	USPS, commercial (shipping companies) Intelligence community Law enforcement community	(GEA) Current, historical, and predicted locations (tracking-location, route, speed, direction, conveyance, etc, national and international) of cargo and cargo containers with temporal context. Includes identity/location/time/status. Includes geospatial context of shipping manifest records (Identification of organization/place of manufacture, place of shipping origin, destination, shipping route. Includes identity, location, and status for seized cargo. Cargo locations may relate to mobile conveyances, or fixed locations (cargo may be in a warehouse, pier, wharf, etc. Location and temporal context of instances of identity verification (e.g. at border entry points). Relates to location, party, case, event, conveyance, risk (factors including place of origin, place of manufacture, shipping route, destination, and association with hostile interests as determined by geographic/national affiliations), and intelligence.	Goods	Cargo
63.	Goods	1.38 TBD		(GEA) Money, things, parcels/packages, and any other types of goods of interest. Relates to location, party, case, event, conveyance, risk (factors including place of origin, place of manufacture, shipping route, destination, and association with hostile interests as determined by geographic/national affiliations), and intelligence.	Goods	None
64.	Goods	1.39 Evidence	DHS	Location for collection of individual pieces of evidence associated with a case, and current and historical locations of evidence storage to ensure chain of custody. (Also see Case). Includes identity/location/time/activity/status. Relates to location, case, event, party.	Goods	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
65.	Goods	Hazardous Materials 1.40 (Hazmat)	DOE, EPA, CDC, USDA, DoD Commercial Shipping Companies	(GEA) Current, historical, and predicted locations (includes tracking-location, speed, direction, conveyance, status, etc, national and international) of any hazardous material (chemical, biological, radiological, nuclear, high explosive) of interest, with temporal context. Locations may relate to mobile conveyances, or fixed storage locations. Includes identity/location/time/status. Relates to location, party, conveyance, risk, event, and case.	Goods	None
66.	Goods	1.41 Seized Property	DHS	Current and historical location for property other than cargo (e.g., cars, marine vessels, aircraft, houses, currency, merchandise, etc.) seized by DHS law enforcement components. (Also see Case) Relates to location, case, party, conveyance, and event.	Goods	None
67.	Credential	1.42 TBD	DOS US Customs DOC Shipping Companies	(GEA) Geospatial context for information contained in passports, travel itineraries, shipping manifests, import/export licenses, personal identification, work permits, visas, etc. Includes biographical data for persons, current and historical location information, organization affiliations, etc. Relates to location, goods, party, employment, conveyance, case, and benefit.	Governance	Credential
68.	Mandate	Geospatial Data Content Standards	ISO, ANSI	(GEA) Standards for common geospatial data and metadata content within a geospatial data category or sub-category.	Governance	Mandate
69.	Mandate	Geospatial Data Transfer Standard	ISO, ANSI	(GEA) Geospatial data format standards to facilitate the exchange of geospatial data between organizations in a common data format.	Governance	Mandate
70.	Mandate	Geospatial Service (Component) Standards	OGC	(GEA) Digital specification of the interface(s) for the geospatial service (e.g., geocoder, etc.) used in service discovery and access.	Governance	Mandate

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
71.	Mandate	Geospatial Information and Intelligence Reporting, and Dissemination Protocols	ISO, ANSI	(GEA) Protocols for passing geospatial content (data and products-geospatial data and intelligence reporting and dissemination) on a network.	Governance	Mandate
72.	Location	Physical Location	1.43 TBD	(GEA) Includes absolute or relative location defined by address; or position (x,y,z point within a geospatial coordinate system); or feature geometry; or place of interest (point or area with name); or relative position (“vicinity of”) based on distance, and direction (and speed) from a feature of known location. Includes temporal context. Relates to all Base categories, activity, party, conveyance, risk, case, goods, training resource, event, plan, agreement, benefit.	Location	Location
73.	Activity	1.44 TBD	DHS	(GEA) Current, historical or planned activities of interest that have geospatial and temporal context (location and geospatial extent-national or international). Relates to location, event, plan, training resource, benefit	None	None
74.	Administration	Audit trail	DHS	(GEA) A history of significant geoprocessing operations, e.g. records of database update operations (what, where, when). Relates to location, base, auxiliary.	None	None
75.	Administration	Transaction Report	DHS	(GEA) Reports that summarize geospatial transactions for specified time periods. Relates to location, base, auxiliary.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
76.	Auxiliary	Geologic	USGS	<p>(A-16) The geologic spatial data theme includes all geologic mapping information and related geoscience spatial data (including associated geophysical, geochemical, geochronologic, and paleontologic data) that can contribute to the National Geologic Map Database as pursuant to Public Law 106-148.</p> <p>(A-16) Offshore minerals include minerals occurring in submerged lands. Examples of marine minerals include oil, gas, sulfur, gold, sand and gravel, and manganese. Relates to location, risk.</p>	None	None
77.	Auxiliary	Soils	USDA	<p>(A-16) Soil data consist of georeferenced digital map data and associated tabular attribute data. The map data describe the spatial distribution of the various soils that cover the Earth's surface. The attribute data describe the proportionate extent of the various soils as well as the physical and chemical characteristics of those soils. The physical and chemical properties are based on observed and measured values, as well as model-generated values. Also included are model-generated assessments of the suitability or limitations of the soils to various land uses. Relates to location, risk.</p>	None	None
78.	Auxiliary	Vegetation	1.45 TBD	<p>(A-16) Vegetation data describe a collection of plants or plant communities with distinguishable characteristics that occupy an area of interest. Existing vegetation covers or is visible at or above the land or water surface and does not include abiotic factors that tend to describe potential vegetation.</p> <p>(GEA) Location and geospatial extent of a collection of plants or plant communities with distinguishable characteristics that occupy an area of interest. Associated with (but is separate from) Land Cover sub-category.</p>	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
79.	Auxiliary	Wetlands	USFWS	(A-16) The wetlands data layer provides the classification, location, and extent of wetlands and deepwater habitats. There is no attempt to define the proprietary limits or jurisdictional wetland boundaries of any federal, state, or local agencies.	None	None
80.	Auxiliary	Public Health	HHS/CDC	(A-16) Public health themes relate to the protection, improvement and promotion of the health and safety of all people. For example, public health databases include spatial data on mortality and natality events, infectious and notifiable diseases, incident cancer cases, behavioral risk factor and tuberculosis surveillance, hazardous substance releases and health effects, hospital statistics and other similar data. (GEA) Current, historical, and predicted location, geospatial extent, and temporal context for outbreaks of infectious and notifiable diseases, including tracking the geospatial extent of spread of infectious and notifiable diseases. Relates to location, risk, and event.	None	None
81.	Auxiliary	Biological Resources	USGS	(A-16) Includes data pertaining to or descriptive of (nonhuman) biological resources and their distributions and habitats, including data at the suborganismal (genetics, physiology, anatomy, etc.), organismal (subspecies, species, systematics), and ecological (populations, communities, ecosystems, biomes, etc.) levels. Relates to location, risk.	None	None
82.	Auxiliary	Outer Continental Shelf Submerged Lands	NOAA	(A-16) Includes lands covered by water at any stage of the tide, as distinguished from tidelands, which are attached to the mainland or an island and cover and uncover with the tide. Tidelands presuppose a high-water line as the upper boundary whereas submerged lands do not.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
83.	Auxiliary	Weather/Climate	NOAA Private weather services	(GEA) Location and geospatial extent and properties of current, historical, and forecasted weather conditions to support situational awareness. Includes incident specific current, predicted, and historical weather data. (A-16) Climate data describe the spatial and temporal characteristics of the Earth's atmosphere/hydrosphere/land surface system. These data represent both model-generated and observed (either in-situ or remotely sensed) environmental information, which can be summarized to describe surface, near surface and atmospheric conditions over a range of scales. Relates to location, event, and plan.	None	None
84.	Auxiliary	Demography/ Cultural	Census DHS/IAIP NGA	(GEA) Incident specific current, predicted, and historical geospatial and temporal context of distribution of population related to an actual or predicted event or incident. May include data on occupancy of buildings or geographic areas temporally referenced. Relates to location, event, asset, and plan.	None	None
85.	Auxiliary	1.46 TBD	Regional, state, local, commercial	(GEA) High-resolution base and thematic data (all sub-categories) plus imagery not available in the common HLS geospatial framework. Collection is triggered by NSSE, or significant incidents. Data has not been merged or integrated in order to conform to or be consistent with any National standards. Relates to location, asset, event, case, and plan.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
86.	Base	Boundaries	USGS (The National Map) and other Federal, State, local, and tribal organizations. (National), NGA (international)	<p>(The National Map) The boundary layer depicts administrative and jurisdictional information important to the general map user. Boundaries data is comprised of data from the U.S. Census, business partners, State and local agencies, with USGS as the provider of last resort. (National coverage currently limited to State and County) (GEA) Locations of National, international, Federal, State, Province, county, municipal, tribal, jurisdictional, administrative boundaries.</p> <p>(A-16) Governmental units describe, by a consistent set of rules and semantic definitions, the official boundary of federal, state, local, and tribal governments as reported/certified to the U.S. Census Bureau by responsible officials of each government for purposes of reporting the Nation's official statistics. International boundary data include both textual information to describe, and GIS digital cartographic data to depict, both land and maritime international boundaries, other lines of separation, limits, zones, enclaves/exclaves and special areas between States and dependencies. Marine boundaries depict offshore waters and seabeds over which the United States has sovereignty and jurisdiction.</p> <p>Watershed Boundaries data theme encodes hydrologic, watershed boundaries into topographically defined sets of drainage areas, organized in a nested hierarchy by size, and based on a standard hydrologic unit coding system.</p> <p>Relates to location, plan, event, benefit, training resource, risk, party, agreement, and communication.</p>	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
87.	Base	Elevation/ Bathymetry	USGS/The National Map (national elevation), NOAA (bathymetry), NGA (international elevation)	<p>(The National Map) Equates to the National Elevation Dataset (NED). High-resolution girded elevation data (30-meter post spacing National coverage being updated to 10-meter post spacing, limited 3.3-meter post spacing data from TNM partners), including shaded relief, and limited LIDAR. National multi-resolution Raster dataset that provides the National Map elevation information in a seamless form with a consistent datum, elevation unit, and projection.</p> <p>(A-16) Elevation-Terrestrial. This data contains georeferenced digital representations of terrestrial surfaces, natural or manmade, which describe vertical position above or below a datum surface. Data may be encapsulated in an evenly spaced grid (raster form) or randomly spaced (triangular irregular network, hypsography, single points). The elevation points can have varying horizontal and vertical resolution and accuracy.</p> <p>Bathymetric data for Inland and Intercoastal waterways is highly accurate bathymetric sounding information collected to ensure that federal navigation channels are maintained to their authorized depths. Bathymetric survey activities support the Nation's critical nautical charting program. This data is also used to create Electronic Navigational Charts. The bathymetric sounding data supports the elevation layer of the geospatial data framework.</p> <p>(NOAA bathymetry) – NOAA Digital Coast shoreline data, coastal elevation data.</p> <p>(A-16) Shorelines represent the intersection of the land with the water surface. The shoreline shown on NOAA Charts represents the line of contact between the land and a selected water elevation. In areas affected by tidal fluctuations, this line of contact is the mean high water line.</p> <p>(NGA Elevation Data) Digital Terrain Elevation Data level 1 and 2 data.</p> <p>Relates to location.</p>	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
88.	Base	Geographic Names	USGS/The National Map (national), NGA (international)	<p>(GEA) An authoritative source of geographic names with locations (see Geonames). Typically available through an online Gazetteer.</p> <p>(The National Map) Equates to the Geographic Names Information System (GNIS). Information about the proper names (and point locations) for places, features, and areas in the 50 States, the District of Columbia, and the territories and outlying areas of the United States, as well as Antarctica.</p> <p>(A-16) This dataset contains data or information on geographic place names deemed official for federal use by the U.S. Board on Geographic Names as pursuant to Public Law 80-242. Geographic Names information includes both the official place name (current, historical, and aliases) and locative direct (i.e., geographic coordinates) and indirect (i.e., State and County where place is located) geospatial identifiers and categorized as populated places, schools, reservoirs, parks, streams, valleys, and ridges.</p> <p>Relates to location, asset, party, goods, training resource, plan, event, communication, benefit, risk, case, agreement, and employment.</p>	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
89.	Base	Hydrography	USGS/The National Map NGA (international) NOAA (Digital Coast)	(The National Map) Equates to National Hydrography Dataset (NHD). USGS hydrographic and EPA River reach positional, geometry, and descriptive information for naturally occurring and man-made bodies of water, paths through which water flows, and related features (entities). Proposed National Map content overlaps recommended HSIP content for water related features (see transportation, and water supply). (A-16) Hydrography data theme includes surface water features such as lakes, ponds, streams and rivers, canals, oceans, and coastlines. Each hydrography feature is assigned a permanent feature identification code (Environmental Protection Agency Reach Code) and may also be identified by feature name. Spatial positions of features are encoded as centerlines and polygons. Also encoded is network connectivity and direction of flow. Watershed boundaries data theme encodes hydrologic, watershed boundaries into topographically defined sets of drainage areas, organized in a nested hierarchy by size, and based on a standard hydrologic unit coding system. (NOAA) Digital Coast water quality data. Relates to location, asset, risk, goods, and conveyances.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
90.	Base	Land Cover	<p>USGS/The National Map (Derived from consortium of sources including USGS, USFS, USPS, BLM, EPA, NRCS, USFWS, NOAA, NASA)</p> <p>NOAA Digital Coast</p>	<p>(The National Map) Equates to the National Land Cover Dataset (NLCD). Derived from LANDSAT satellite images; data classifies (Anderson level 2) land surface cover into categories (e.g., open water, perennial ice/snow, evergreen forest, high density residential, cropland, etc.) National coverage from 1992 being updated to 2001 by eco-regions (30-meter post spacing data). (A-16) Hierarchical classification system based on observable form and structure, as opposed to function or use. This system transitions from generalized to more specific and detailed class divisions, and provides a framework within which multiple land cover and land use classification systems can be cross-referenced. This system is applicable everywhere on the surface of the Earth. This theme differs from the Vegetation and Wetlands themes, which provide additional detail. (NOAA) Digital Coast land use data. Relates to location, risk.</p>	None	None
91.	Base	Structures	<p>USGS/The National Map</p> <p>Other Federal, State, local, and tribal organizations. (National)</p> <p>NGA (International)</p>	<p>(The National Map) Contains pilot project data only, content inconsistent. Man-made features; locations of critical structures, which are of vital interest to emergency responders. Man-made structures theme is comprised of data from the Army Corps of Engineers, National Geospatial Intelligence Agency, and USGS Business Partner retailers. State and local agencies, and the private sector, with USGS as the provider of last resort. High degree of overlap with critical and key assets data defined by PDD-63, and Base category data contained in other categories. (GEA) 133-Urban Areas -footprints and 3-dimensional spatial characterization of exterior of structures (from LIDAR). Relates to location, asset (capital asset, key asset, critical asset, custodial property), event, party, risk, and case.</p>	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
92.	Base	Demography/ Cultural	Bureau of Census NOAA (Digital Coast)	(Tait) Current census demographic statistics and geographies (distribution of populations) and business demographic statistics by census geographies. (A-16) These geospatially referenced data describe the characteristics of people, the nature of the structures in which they live and work, the economic and other activities they pursue, the facilities they use to support their health, recreational and other needs, the environmental consequences of their presence, and the boundaries, names and numeric codes of geographic entities used to report the information collected. (NOAA) Digital Coast demographics. Relates location, risk, and party. Recommend adding geospatial context for sociological networks.	None	None
93.	Base	Aeronautical Navigation	DOT/FAA (national) NGA (international) Commercial (e.g. Jeppsen)	(GEA) Aerial navigation data representing the U.S. National Airspace System (NAS) in 3-dimensions. Data is updated every 56-days (e.g., visual navigation data, instrument approach data, minimum safe altitude data, high and low altitude routes, locations of electronic aids and hazards to navigation, military operating areas, restricted operating areas, terminal control areas, etc). Includes geospatial context for notices to airmen, airspace and airport facilities data. Supports aerial navigation of DHS (USCG, Customs, etc.) aircraft, and tracking of aircraft of interest in the NAS. Includes navigation guidance data. Overlap with HSIP definition of Transportation sub-category.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
94.	Base	Nautical Navigation	NOAA (national) U.S. Army Corps of Engineers NGA (international) Commercial	(GEA) Nautical navigation data (e.g., waterways, ports, harbors, bridges, navigation routes, locations of electronic and analog navigation aids, and hazards to navigation, etc). Includes navigation guidance data and supports navigation of DHS (USCG, etc.) marine vessels. Includes geospatial context for notices to mariners. (A-16) Transportation-Marine. The Navigation Channel Framework consists of highly accurate dimensions (geographic coordinates for channel sides, centerlines, wideners, turning basins, and River Mile Markers) for every federal navigation channel maintained by U.S. Army Corps of Engineers. The Navigation Framework will provide the basis for the marine transportation theme of the geospatial data framework. Includes waterway and sea-lane transportation networks. Supports navigation of DHS marine vessels and tracking of marine vessels of interest. Overlaps with Transportation and hydrography sub-categories.	None	None
95.	Base	Navigation Guidance	1.47 TBD	(GEA) Nautical, aeronautical, vehicle, or land navigation data with guidance instructions for use in computer assisted navigation of aircraft, marine vessels, motor vehicles, and ground assets.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
96.	Base	Cadastral	BLM, DoD, and local sources	<p>(A-16) Cadastral data describe the geographic extent of past, current, and future right, title, and interest in real property, and the framework to support the description of that geographic extent. The geographic extent includes survey and description frameworks such as the Public Land Survey System, as well as parcel-by-parcel surveys and descriptions.</p> <p>(A-16) Offshore Cadastre is the land management system used on the Outer Continental Shelf. It extends from the baseline to the extent of United States jurisdiction. Existing coverage is currently limited to the conterminous United States and portions of Alaska. Maximum extent of United States jurisdiction is not yet mathematically calculated.</p> <p>(A-16) Federal land ownership status includes the establishment and maintenance of a system for the storage and dissemination of information describing all title, estate or interest of the federal government in a parcel of real and mineral property. The ownership status system is the portrayal of title for all such federal estates or interests in land.</p> <p>(A-16)) Public land conveyance data are the records that describe all past, current, and future, right, title, and interest in real property. This is a system of storage, retrieval and dissemination of documents describing the right, title, and interest of a parcel.</p> <p>BLM (Federal and public lands, and Public Land Survey boundaries).</p> <p>(Local govt. sources) land parcel ownership, zoning.</p> <p>Relates to asset, event, case, party, and risk.</p>	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
97.	Base	Geodetic Control	1.48 TBD	(A-16) Geodetic control (points with precise location and/or elevation established through photogrammetric or surveying methods) provides a common reference system for establishing coordinates for all geographic data. All NSDI framework data and users' applications data require geodetic control to accurately register spatial data. The National Spatial Reference System is the fundamental geodetic control for the United States. Relates to base categories, location, imagery, intelligence.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
98.	Base ⁴ (PDD 63-HSIP) Critical Asset	Transportation	<p>USGS/The National Map (national coverage)</p> <p>State, local sources (high resolution local roads data not included in National Map)</p> <p>NGA (international)</p>	<p>(The National Map) Data includes roads, railroads, airports, and miscellaneous transportation features. Includes best available data from U.S. Census Bureau, Department of Transportation, Business Partner retailers, State and local agencies, and private industry. Currently proposed National Map content does not correspond to proposed HSIP content.</p> <p>(PDD 63-HSIP) Airports and airfields, airport facilities, navigation aids runways and taxiways, railroads (tracks), railroad facilities, railroad yards, bus stations, roads, bridges, interchanges, rest stops/oasis, toll plaza, tunnels, anchorages and fairways, breakwater, canals, channels, commercial ports, ferries, locks, marine railway, navigable waterway network, navigational aids, piers, wharfs, quays, and moles, and port facilities.</p> <p>HSIP definition overlaps DHS EA definitions for nautical and aeronautical navigation.</p> <p>(A-16) Transportation data are used to model the geographic locations, interconnectedness, and characteristics of the transportation system within the United States. The transportation system includes both physical and non-physical components representing all modes of travel that allow the movement of goods and people between locations.</p> <p>(GEA) Add geospatial context for logistical networks, road networks, air transport networks, rail networks, sea lane and waterways networks.</p> <p>Relates to location, asset, structures, goods, conveyance, party, risk, training resource, and plan.</p> <p>Overlaps with Aeronautical Navigation, Nautical Navigation sub-categories.</p>	None	None

⁴ Also Critical Assets

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
99.	Base ⁵	Orthoimagery	USGS/The National Map (consistent national coverage), NGA (133 Urban Areas) State and local sources (high resolution DOQ not included in National map)	(The National Map) Equates to the National Digital Orthophoto Program (NDOP) database. High-resolution digital orthoimagery in USGS quarter-quadrangle (3.75 X 3.75-minute) format, 1-meter GSD, derived from aerial photographs and satellite imagery. (GEA) Baseline high-resolution orthorectified imagery from civil, DoD, or commercial satellite and/or aerial sources, and NTM; Includes indices of location and geospatial extent of coverages. (A-16) Contains georeferenced images of the Earth's surface, collected by a sensor in which image object displacement has been removed for sensor distortions and orientation, and terrain relief. For very large surface areas, an Earth curvature correction may be applied. Digital orthoimages encode the optical electromagnetic spectrum as discrete values modeled in an array of georeferenced pixels. Digital orthoimages have the geometric characteristics of a map, and image qualities of a photograph. Relates to location, asset, and risk.	None	None
100.	Collection Requirements	1.49 TBD	DHS components	(GEA) Prioritized geospatial data (including remote sensing) and intelligence collection requirements including location and geospatial extent of collection area of interest, and observable and geospatial attributes or properties required. Relates to Base, intelligence, and imagery.	None	None
101.	Facilities	Mapping Data	Federal, State, local Private companies (that own or operate critical or key assets)	(GEA) Location and spatial relationship of surface and sub-surface structures, and installed HVAC, plumbing, electrical, security systems, and other installed infrastructure for any facility identified as a critical or key asset. Relates to asset, asset (HSIP).	None	None

⁵ Also Mission-specific

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
102.	Geospatial Product	Assessment	FBI, DHS Other federal agencies with responsibility for warning of natural hazards State, local Commercial (companies that own & operate key or critical assets)	(GEA) Data characterizing geospatial and temporal context of risks, hazards, threats, and vulnerabilities derived from risk, threat, vulnerability and geospatial analysis. Includes supporting facts, interpretations, hypotheses, and projections. Includes maps, reports, annotated images, plans, etc. Relates to location, risk, intelligence, imagery, case, and plan.	None	None
103.	Geospatial Product	Aids	1.50 TBD	(GEA) Includes decision support, training, and other aids that provide geospatial and temporal context. May include maps, reports, annotated images, etc. Relates to location, asset, event, training resource.	None	None
104.	Geospatial Product	Maps	DHS components NGA USGS Other federal, state, local	(GEA) An annotated or symbolized graphical representation of select geospatial-temporal data for an intended purpose. May contain annotations or marginalia. May be in hardcopy or softcopy form, and may reference or be imbedded in a report or plan. Relates to all other categories.	None	None
105.	Geospatial Product	Mission-Specific Operating Picture (MSOP)	DHS components	(GEA) A Mission-Specific Operating Picture (MSOP) is a specialized, mission view of a collaborative Common Operating Picture (COP). An MSOP is created for a mission specific need.	None	None
106.	Geospatial Product	User-Specific Operating Picture (USOP)	DHS components	(GEA) A User-Specific Operating Picture (USOP) is a specialized, actionable data view of a collaborative COP or MSOP. An USOP is created for a user specific need/device.		

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
107.	Geospatial Product	Plan	DHS components NGA USGS Other federal, state, local	(GEA) Geospatial-temporal context of current and historical plans. Includes the following plan types: collection, counter-measure-deterrence, mitigation, logistics, preparation, response, recovery, program, security, site, mission, exercise, training, deployment, search and rescue, operations, contingency, evacuation, etc. Plans may include multi-media data and may contain or be interlinked to maps, location enabled reports, annotated imagery, etc. Relates to asset, risk, event, case, intelligence, communication, and training resource.	None	None
108.	Geospatial Product	(Threat) Profile	TBD	(GEA) A geospatial-temporal pattern, trend, network, tendency or indicator that characterizes threat and risk behaviors. Used in determining location, identity, severity and probability of the risk/threat. [Note: Other types of location-based profiles may be defined for the HLS mission.]. Relates to asset, risk, threat, event, party, case, and intelligence.	None	None
109.	Geospatial Product	Report	DHS components NGA USGS Other federal, state, local	(GEA) Includes current and historical geospatial and temporal context contained in any report. Reports are geospatially enabled and contain interlinked, multi-media data and may reference other reports, maps, plans, incidents, occurrences, parties, risks/threats/vulnerabilities, suspicious activities, intelligence, and assessments, etc. pertaining to a topic of interest. Relates to event, party, case, and intelligence.	None	None
110.	Imagery	Satellite	USGS, NOAA, NASA, Commercial	(GEA) Location, geospatial extent, and geospatial properties for current and historical satellite imagery. Includes multiple digital sensor types including panchromatic, multispectral, hyperspectral, radar, etc. Relates to location, event, case, intelligence, risk, goods, and conveyances.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
111.	Imagery	Aerial	USGS, NASA, NOAA, USDA, Commercial	(GEA) Location, geographic extent, and geospatial properties of current and historical aerial film or digital imagery with temporal context. Includes Panchromatic, natural color, B&W infrared, color infrared, multispectral, hyperspectral, radar, LIDAR, Thermal infrared, and georeferenced motion video. Relates to location, event, case, intelligence, risk, goods, and conveyances.	None	None
112.	Imagery	UAV	DHS, NASA, Commercial	(GEA) Location, geospatial properties, geographic extent, and temporal context of current and historical UAV imagery from civil and commercial sources. Includes Panchromatic, natural color, color infrared, multispectral, hyperspectral, radar, LIDAR, georeferenced motion video, thermal and B&W IR). Relates to location, event, case, intelligence, risk, goods, and conveyances.	None	None
113.	Imagery	National Technical Means	NGA	(GEA) Current and historical geospatial location and extent of NTM imagery (satellite, aerial, and UAV) with temporal context. Relates to location, event, case, intelligence, risk, goods, and conveyances.	None	None
114.	Imagery	Still Images	1.51 TBD	(GEA) Still photographs with geospatial and temporal context. Relates to location case, event, asset, goods, party, risk, and conveyance.	None	None
115.	Intelligence	Imagery Intelligence (IMINT)	NGA	(GEA) Current and historical location, geospatial properties, geospatial extent and temporal context for imagery, and intelligence derived from NTM or commercial sources to identify, predict, and characterize risks, threats, and vulnerabilities. Relates to location, asset, event, case, risk, goods, and conveyances.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
116.	Intelligence	Signals Intelligence (SIGINT)	NSA, and Federal, State, local, tribal law enforcement	(GEA) Current, and historical locations and temporal context for communications and electronic signals intercepts from NTM or terrestrial law enforcement assets associated with criminal and terrorist activities, to identify, predict, and characterize risks, threats, and vulnerabilities. Relates to location, asset, event, case, party, risk, goods, and conveyances.	None	None
117.	Intelligence	Measurement and Signatures Intelligence (MASINT)	NGA, DIA	(GEA) Geospatial and temporal context of MASINT used to identify, predict, and characterize risks, threats, and vulnerabilities. Relates to location, asset, event, case, risk, goods, and conveyances.	None	None
118.	Intelligence	Human Intelligence (HUMINT)	CIA, DIA, Foreign	(GEA) Current and historical location and temporal context of data and information contained in reports derived from clandestine human source reporting, used to identify, predict, and characterize risks, threats, and vulnerabilities. Includes locations of occurrences/activities of interest related to actual, suspected, or predicted criminal or terrorist activities. Includes identification and geospatial context for terrorist networks, criminal networks, and affiliations of hostile interests. Relates to location, asset, event, case, party, risk, goods, and conveyances.	None	None
119.	Intelligence	Law Enforcement Intelligence	Federal, State, local, tribal, and foreign law enforcement	(GEA) Current and historical location and temporal context of all source law enforcement intelligence related to actual, suspected, or predicted criminal or terrorist activities, used to identify, predict, and characterize risks, threats, and vulnerabilities. Includes identification and geospatial context for criminal networks, terrorist networks, affiliations of hostile interests. Relates to location, asset, event, case, party, risk, goods, and conveyances.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
120.	Intelligence	Open Source Intelligence (OSINT)	Intelligence and law enforcement communities	(GEA) Current and historical location and temporal context for open source intelligence information and review of open source publications, related to actual, suspected, or predicted terrorist activities, used to identify, predict and characterize risks, threats, and vulnerabilities. Relates to location, asset, event, case, party, risk, goods, and conveyances.	None	None
121.	Intelligence	Threat Intelligence	1.52 TBD	(GEA) Threat intelligence derived from IMINT, SIGINT, MASINT, and OSINT, with geospatial and temporal context. Relates to asset, risk goods, conveyance, party, event.	None	None
122.	Intelligence	Threat Prediction	1.53 TBD	(GEA) Predicted location/time/identity/ activity/status information for a threat. Relates to asset, risk goods, conveyance, party, event.	None	None
123.	Mission Feature	TBD	DHS Components	A geospatial feature that represents a mission target (object) or constraint in some HLS operational context. Types of Mission Features include: At Risk Location (typically an area), Containment Area, Boundary Zone, Observation Area/Point, etc. Also see Area of Interest, Point of Interest, and Place of Interest, etc.	None	None
124.	Model	Geospatial Data Model	DHS, NGA, USGS DoD and Intelligence communities State and local	(GEA) Data and encoded procedures to support geospatial simulations and modeling to test how geospatial data and technology will perform in local conditions and in different scenarios. Relates to location, risk, event, asset, plan, and communication.	None	None
125.	Model	Mission Rehearsal Model	1.54 TBD	(GEA) Geospatial and temporal context for models that characterize the behaviors of mobile/dynamic mission assets and the effects of these assets in a rehearsal context. These data are associated with simulations of mission assets in their projected operating environments. Relates to plan, training resource, and case.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
126.	Model	Performance Model	TBD	Models that characterize the key performance indicators of HLS systems. These models are associated with system performance simulations that are used in performance analyses. Input to these models consists of performance criteria and geospatial performance factors (incidents, events, districts, etc), i.e., geospatial entities of interest for performance monitoring purposes. Model output consists of performance measures by geographic entity/locations. A subcategory of HLS Framework Data under Model.	None	None
127.	Model	Test Model	DHS	(GEA) Data and encoded procedures to support simulations and modeling to test how geospatial data and technology will perform in local conditions and in different scenarios. Relates to location, plan, and technology.	None	None
128.	Model	Threat Consequence Model	DHS, FBI, NGA	(GEA) Data and encoded procedures to support simulations and modeling to characterize the potential consequences of any threat/incident in different scenarios. Relates to risk, event, asset, and plan.	None	None
129.	Model	Threat Model	FBI, DHS	(GEA) Data and encoded procedures to support simulations and modeling to identify and characterize threats in different scenarios. Relates to asset, risk, event, and plan.	None	None
130.	Model	Training Model	DHS Components	(GEA) Data and encoded procedures to support training simulations and modeling in order to test how geospatial data and technology is going to perform in different attack scenarios. Relates to risk, event, technology, training resources, and plan.	None	None

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
131.	Model	Weather Model	NWS Private weather services	(GEA) Data and encoded procedures to support simulations and modeling to test how weather conditions will vary in local conditions and in different scenarios. Models that characterize the behaviors of weather systems and the effects of these systems. These models are associated with weather simulations that are influenced by terrain and features. Input to these models consists of terrain and feature data, meteorological sensor observations and model control parameters. Outputs consist of hindcast, nowcast and forecast weather conditions at specified locations. Relates to location, risk, event, plan, and training resource.	None	None
132.	Sensor	Observations	1.55 TBD	(GEA) Location, geospatial extent, and temporal context of terrestrial in-situ sensor observations/detects. Relates to asset, plan, case, and event.	None	None
133.	Sensor	1.56 TBD	1.57 TBD	(GEA) Information that describes a sensor for sensor management and geospatial exploitation of data collected by the sensor. Relates to intelligence, imagery.	None	None
134.	Party	1.58 Organization	TBD-Best Available Data Intelligence and law enforcement communities	(GEA) Current and historical addresses (physical location-national and international) and virtual addresses (virtual location) of all known branches of an organization. Includes geospatial context of relationship to other organizations. Includes geospatial context associated with tariffs, credentials, licenses, permits, shipping manifests, and benefits. Add geospatial context of affiliation with criminal organization networks, terrorist networks, networks of hostile interests, and tracking of organizational activities to include activity identity/location/time/activity/status. Includes reference to persons associated with the organization. Relates to location, party (person), risk, event, case, conveyance, goods, and structure.	Party	Organization

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
135.	Party	1.59 Person	<p>Commercial white pages, commercial internet providers</p> <p>Federal, State, and local law enforcement</p> <p>US Customs, TSA</p> <p>Commercial passenger travel records</p> <p>Intelligence or law enforcement communities</p>	<p>(GEA) Identification, current and historical addresses (physical location-national and international) and virtual addresses for any person of interest with temporal context. Location and temporal context of instances of identity verification (e.g. at border entry points) for any person of interest. If currently or previously in custody as a detainee or prisoner, includes current and historical locations while in custody, and/or locations associated with deportation. Current, historical, and predicted travel locations (destinations with temporal context-itineraries-national and international) for any person of interest, including location and temporal context of point of entry into the country. Current, historical, and predicted relative locations (national and international) for any person of interest. Biographic data for persons, including geospatial context for permits, licenses, benefits, credentials, etc. (Identity/location/time/activity/status). Add geospatial context for affiliation with terrorist networks, criminal networks, criminal organizations and hostile interests. Geospatial-temporal context for background check or interview data associated with a person of interest. Relates to activity, asset, location, risk, event, case, party (organization), employment, benefit, and conveyance.</p>	Party	Person
136.	Threat	Economic	TBD-Best Available Data	<p>(GEA) Terrorist threat data with current, historic and predicted geospatial and temporal context of threats to economic sectors (location of economic critical and key asset, geospatial extent of economic impacts to key sectors (e.g., financial, food supply, etc.) Relates to location, asset, intelligence, and plan.</p>	Risk	Threat
137.	Threat	Chemical	FBI	<p>(GEA) Terrorist threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, intelligence, and plan.</p>	Risk	Threat

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
138.	Threat	Biological	FBI	(GEA) Terrorist threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, intelligence, and plan.	Risk	Threat
139.	Threat	Nuclear	FBI	(GEA) Terrorist threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, intelligence, and plan.	Risk	Threat
140.	Threat	Radiological	FBI	(GEA) Terrorist threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, intelligence, and plan.	Risk	Threat
141.	Threat	High Explosive	FBI	(GEA) Terrorist threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, intelligence, and plan.	Risk	Threat
142.	Threat	Cyber Attack	FBI	(GEA) Terrorist threat data with current, historical, and predicted geospatial and temporal context (physical and virtual location, geospatial extent, and tracking) of threatened systems. Relates to location, asset, intelligence, and plan.	Risk	Threat
143.	Threat	Hostage Situation	Federal, State, local, tribal law enforcement	(GEA) Terrorist threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, party, intelligence, and plan.	Risk	Threat
144.	Threat	Hazardous Material	USCG, Private,	(GEA) Terrorist threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
145.	Threat	Power Grid failure	Private	(GEA) Terrorist threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
146.	Threat	Earthquake	USGS	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
147.	Threat	Tsunami	NOAA	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
148.	Threat	Landslide	USGS	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
149.	Threat	Volcanic Eruption	USGS	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
150.	Threat	Tornado	NWS, Private weather services	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
151.	Threat	Hurricane	NWS, Private weather services	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
152.	Threat	Typhoon	NWS, Private weather services	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
153.	Threat	Severe Weather	NWS, Private weather services	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
154.	Threat	Flood	COE, FEMA	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
155.	Threat	Drought	NOAA/NWS, USDA	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
156.	Threat	Wildfire	USFS, BLM, NIFC, FEMA, State, local	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
157.	Threat	Plane Crash	State and local, Private (Airlines), FBI	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
158.	Threat	Train Wreck	State and local	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
159.	Threat	Shipwreck	USCG, NOAA, Private	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat
160.	Threat	Structure Failure	State and local	(GEA) Threat data with current, historical, and predicted geospatial and temporal context (location, geospatial extent, and tracking). Relates to location, asset, and plan.	Risk	Threat

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
161.	Threat	1.60 Party	1.61 TBD	(GEA) Current and historical locations, and temporal context for persons or organizations known to be a threat to U.S. Interests. For persons, includes tracking current, historical and predicted location; location of place of birth, citizenship, travel history, travel itineraries, associations with organizations, persons, and hostile interests as determined by geographic/national affiliations. For organizations includes associations with organizations, persons, and hostile interests as determined by geographic/national affiliations. Includes geospatial and temporal context for association with suspicious, criminal, or terrorist activities (identity/location/time/activity/status). Overlaps with Party category, organization and person sub-categories. Relates to location, asset, party, intelligence, and plan.	Risk	Threat
162.	Vulnerability	Vulnerability (type)	Federal, State, local, and private organizations FBI	(GEA) (Physical threats) Identification, location, geographic extent, and temporal context of vulnerabilities. (Virtual threats) Virtual AND physical location, geographic extent, and temporal context of vulnerability. Relates to location, asset, intelligence, and structures.	Risk	Vulnerability
163.	Weapon	Chemical	FBI, EPA	(GEA) Current, historical, and predicted physical location of weapon (tracking, national and international) Includes identity/location/time/activity/status. Relates to location, event (occurrence), intelligence, transportation, conveyance, party, case, and plan.	Risk	Weapon
164.	Weapon	Biological	FBI, CDC, USDA	(GEA) Current, historical, and predicted physical location of weapon (tracking, national and international) Includes identity/location/time/activity/status. Relates to location, event (occurrence), intelligence, transportation, conveyance, party, case, and plan.	Risk	Weapon
165.	Weapon	Nuclear	FBI, DOE	(GEA) Current, historical, and predicted physical location of weapon (tracking, national and international) Includes identity/location/time/activity/status. Relates to location, event (occurrence), intelligence, transportation, conveyance, party, case, and plan.	Risk	Weapon

Rec. No.	HLS Framework Category	HLS Framework Sub-Category	Primary Provider	Geospatial Definition	DHS EA Subject Area	DHS EA Data Object
166.	Weapon	Radiological	FBI, DOE	(GEA) Current, historical, and predicted physical location of weapon (tracking, national and international) Includes identity/location/time/activity/status. Relates to location, event (occurrence), intelligence, transportation, conveyance, party, case, and plan.	Risk	Weapon
167.	Weapon	High Explosive	FBI, ATF	(GEA) Current, historical, and predicted physical location of weapon or high explosive device (tracking, national and international). Includes identity/location/time/activity/status. Relates to location, event (occurrence) intelligence, transportation, conveyance, party, case, and plan.	Risk	Weapon
168.	Weapon	Cyber	FBI	(GEA) Current, historical, and predicted virtual location of computer virus/worm origins (tracking, national and international). Includes identity/location/time/activity/status. Relates to location, party, event (occurrence), and intelligence.	Risk	Weapon

2.0 Acronyms

Acronym	Definition
AGL	Above Ground Level
AMSL	Above Mean Sea Level
ANSI	American National Standards Institute
ATF	Alcohol, Tobacco & Firearms
BLM	Bureau of Land Management
CDC	Center for Disease Control
CIA	Central Intelligence Agency
CNN	Cable News Network
COP	Common Operating Picture
DHS	Department of Homeland Security
DIA	Defense Intelligence Agency
DOC	Department of Commerce
DoD	Department of Defense
DOE	Department of Energy
DOI	Department of Interior
DOQ	Digital Orthophoto Quadrangles
DOS	Department of State
DOT	Department of Transportation
EA	Enterprise Architecture
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
GEA	Geospatial Enterprise Architecture
GIS	Geographic Information System
GNIS	Geographic Names Information System
GSD	Ground Sampling Distance
HHS	Health and Human Services
HLS	Homeland Security
HSIP	Homeland Security Infrastructure Program
HUMINT	Human Intelligence
HVAC	Heating, Ventilation and Air Conditioning
IAIP	Information Analysis and Infrastructure Protection
IMINT	Imagery Intelligence
IR	Infrared
ISO	International Standardization for Organization
LANDSAT	Land Remote-Sensing Satellite
LiDAR	Light Detection and Ranging
MASINT	Measurement and Signatures Intelligence
MSOP	Mission-Specific Operating Picture
NAS	National Airspace System

NASA	National Aeronautics & Space Administration
NDOP	National Digital Orthophoto Program
NED	National Elevation Database
NGA	National Geospatial-Intelligence Agency
NHD	National Hydrography Dataset
NIFC	National Interagency Fire Center
NIMA	National Imagery & Mapping Agency
NLCD	National Land Cover Characterization
NOAA	National Oceanic and Atmospheric Administration
NORAD	North American Aerospace Defense Command
NPS	National Park Service
NRC	Nuclear Regulation Commission
NSDI	National Spatial Data Infrastructure
NSRS	National Spatial Reference System
NSSE	National Security Special Event
NTM	National Technical Means
NWS	National Weather Service
OGC	Open GIS Consortium
ONI	Office of Naval Intelligence
OSINT	Open Source Intelligence
PDD	Presidential Decision Directive
POL	Petroleum, Oil & Lubricants
SIGINT	Signals Intelligence
TSA	Transportation Security Administration
UAV	Unmanned Aerial Vehicle
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USPS	United States Postal Service



**HOMELAND SECURITY GEOSPATIAL ENTERPRISE
ARCHITECTURE**

**ATTACHMENT G APP 1
GEOSPATIAL APPLICATIONS**

GEOSPATIAL MANAGEMENT OFFICE

DRAFT VERSION 0.6.1

April 13, 2004

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1.0 HLS GEOSPATIAL APPLICATIONS

The following *Geospatial Applications* (application components) are involved in the HLS (Homeland Security) enterprise. Many of these applications include non-geospatial data and technology, and may be predominantly non-geospatial in nature. Many *Geospatial Applications* will have numerous specialized implementations. For example, it is unlikely that there will be a single *Mission Planning* application. Rather, the complexity and diversity of mission operations necessitates the need for specialization and diversity of mission planning business processes/sub-processes/applications. However, there will be a number of common geospatial service components and associated data upon which all *Mission Planning* applications will depend.

	HLS Geospatial Application	Description
1.	Asset Inventory Management	Enterprise-level application(s) that is used to manage fixed and mobile Assets. In particular, to monitor and track the location/time/identity/activity/status for a set of Assets.
2.	Biographical Analysis	The means to analyze person (records) in conjunction with other geospatial data, including events, person/organization affiliations, incidents, threats and intelligence data.
3.	Case Analysis	The means to (data) mine, integrate, and correlate varied types of case-related data for the purpose of extrapolating, analyzing and deriving geospatial data in the form of profiles, patterns, trends, networks, tendencies, indicators, hypotheses, and conclusions, as it pertains to case understanding. Source data include, but are not limited to, intelligence, incidents, occurrences, criminal and suspicious activities, financial transactions, persons, organizations, goods, cargo, hazmat, conveyances, etc. May also involve geoparsing and geocoding functions to scan and annotate associated textual data for geographic and temporal references.
4.	Common Operating Picture (COP) Manager	The means to manage the scope and resources associated with a Common Operating Picture (COP). The scope is defined in terms of geospatial extent (area of interest), timeframe, subject of interest (e.g., threat(s), case, monitor cargo, etc.), operations objectives (e.g., respond to incident, recover from disaster, etc.), the data required to support the execution of operations (e.g., support threat modeling & analysis, case analysis, cargo tracking, etc.), and other operations parameters (e.g., constraints, mission features, etc.). Resources may include physical entities (e.g., personnel, assets, conveyances, technology, etc.) and logical entities (e.g., business components and processes, data, services). The COP Manager provides the means to select and allocate resources, manage and monitor collaboration activities, monitor status and performance of resources, and monitor and manage external communications. The distinction between the COP Manager and other operations applications is that the COP Manager is managing the big picture, whereas other applications focus on Mission-Specific Operating Pictures (MSOP) and other mission-specific operation activities.

	HLS Geospatial Application	Description
5.	Countermeasure Planning	The means to determine and document the countermeasures to secure key, critical and other assets, Events, conveyances and persons, in geospatial context. Plans may contain Maps and Reports.
6.	Critical Infrastructure Inventory Management	The means to keep track of and report on the location and status of critical assets and key assets. To generate reports and maps conveying this information.
7.	Damage Assessment	The means to analyze and determine the extent and nature of damage caused by a threat or natural hazard through the use of imagery and other sensor and human observations. Includes loss estimations. To generate reports and maps conveying this information.
8.	Data Acquisition/ Generation	Generally, the means to acquire, collect, process, and/or generate new data for the enterprise. There are many such specialized applications and tools for collecting, reformatting, verifying, editing, integrating and transforming new data for the enterprise. e.g., Supervisory Control and Data Acquisition (SCADA).
9.	Data Collection Management	The means to submit new data collection requirements and manage these requests through fulfillment or obsolescence. Includes the means to manage requirements for human/sensor collection activities.
10.	Data Collection Planning	The means to plan, schedule, and allocate requests for new data to collection assets; to develop collection plans that convey schedule, tasking and resource allocation for collection assets.
11.	Disaster Assistance	The means to support hazard/disaster related benefits processing. To share hazards and related assessments [e.g., Digital Flood Insurance Rate Maps (DFIRMs) for lending institutions and flood insurance purposes (Human Services – Individual Assistance & Public Assistance), post disaster Housing Habitability data (individual structures and public infrastructure) for rebuilding purposes, etc.]

	HLS Geospatial Application	Description
12.	Electronic Navigation	The means to determine, verify, and simulate navigation guidance for mobile assets. To produce navigation instructions and guidance data for use in computer-assisted navigation. These need to be uploaded to conveyances (for navigation) and simulators (for mission rehearsal). Employ navigation technologies such as Long Range Radio Aid to Navigation (LORAN), Global Positioning System (GPS), digital nautical charts (NOAA), and flight planning and management software with digital aeronautical charts (FAA), Automatic Vehicle Location (AVL) and in-vehicle navigation systems, and inertial navigation systems (INS).
13.	Emergency Reporting	The means to document and report the nature and geospatial-temporal context of emergencies to proper authorities; to declare state and federal emergencies. Reference threats, threat consequence assessments, warnings, alerts and other location-based content germane to the emergency.
14.	Evacuation Planning & Management	The means to produce and implement plans that convey the details pertaining to evacuation of a current or planned disaster/threat area. Produces Evacuation Plans.
15.	Event Analysis	The means to (data) mine, integrate, and correlate varied types of events (occurrences, incidents, activities) for the purpose of extrapolating, analyzing and deriving geospatial data in the form of patterns (e.g., cluster), densities, trends, networks, tendencies, indicators, hypotheses, and conclusions, as it pertains to event understanding. The means to document and share the context for National Security Special Events (NSSE). Source data include, but are not limited to, intelligence, incidents, occurrences, case, criminal and suspicious activities, financial transactions, persons, organizations, goods, cargo, hazmat, conveyances, etc. May also involve geoparsing and geocoding functions to scan and annotate associated textual data with geospatial-temporal references.
16.	Event Planning & Analysis	The means to produce Event Plans for major events (e.g., Super Bowl), and to analyze potential threats and vulnerabilities in context with event venue (location/time/activity), facilities, assets, personnel, security plans, evacuation plans, mutual aid support plans, etc.

	HLS Geospatial Application	Description
17.	Exercise Planning	The means to produce plans that convey the details pertaining to a training exercise for simulated threat(s) for a given area/facility/event. Produces Exercise Plans.
18.	Facility Mapping & Management	The means to create and maintain detailed geospatial records of facilities for the purpose of managing the facilities and related land and infrastructure. Used in planning, construction, security and maintenance. Used to produce facility Maps, Plans and Reports. Assure compliance with all applicable laws regulating the development, use or transfer of property. These include the National Environmental Policy Act (NEPA), Americans with Disabilities Act (ADA), Clean Water Act (CWA), Occupational Safety and Health Act (OSHA), Superfund Act, state and local permitting, and so on. Any planned construction activity at federally owned/operated facilities requires compliance with these laws. Used to manage space utilization of existing facilities to assure that space, furniture and equipment are adequate to support current and future mission requirements.
19.	Geospatial Data Transfer	The means to transfer geospatial data between enterprise database nodes, which cuts across the HLS enterprise. Includes operations to support periodic synchronizations of databases based upon update transactions to the master database. Used to accomplish replication operations between redundant nodes to support continuous 24/7 assured mission operations. Used to accomplish data rollup operations for HLS Framework Data (synchronize data up the local-state-federal chain). Includes the required management tools. Produces Transaction Reports and Audit Trails.
20.	Geospatial Integration & Test Tools	Tools that support testing and integration of geospatial component services and applications. Consists of geospatial standards registry, reference implementations and test tools (including simulations and modeling for threat scenarios). Part of the Reference Architecture for the HLS Geospatial Enterprise Architecture (GEA).
21.	Hazard Modeling, Analysis & Mapping	The means to create, model, analyze and maintain detailed geospatial records of hazards for the purpose of characterizing and managing the threats (risks) associated with the hazard. Used in emergency preparedness, response and recovery planning and operations. Used to produce Hazard Maps and related Reports.

	HLS Geospatial Application	Description
22.	Health & Safety Monitoring	The means to track the locations of notice of violations (NOV) and reported incidents to assess problem work sites or otherwise dangerous conditions. Perform pre-deployment environmental health and safety evaluations of potential work sites, such as disaster field offices (DFOs) or other temporary work environments.
23.	Hydraulic-Hydrographic Modeling	The means to create, control, display and store the results of hydraulic and hydrographic models, e.g., Hydrologic Engineering Center 2 (HEC2), Better Assessment Science Integrating Point and Nonpoint Sources (BASINS), and others.
24.	Incident/Event Management	The means to support command and control for an incident or event, including situation awareness, monitoring threats and threat assessments, coordinating and monitoring response activities, assets, personnel, etc., and reporting status to persons in the command and control chain (see incident reporting). Create and manage incident/event data. Generate and disseminate alerts and warnings. Support pertinent communications. Reference relevant weather and other supporting geospatial data. Determine containment areas, logistics and deployment plans and ingress/egress routes for incidents. Update incident/event records to reflect response results.
25.	Incident Reporting	The means to generate reports about incidents for proper authorities.
26.	Location Search & Reporting	The means to search person, case, event, facility and property records using geospatial-temporal criteria, and then generate Location Reports conveying query results.
27.	Logistics Planning	The means to produce logistics plans that convey the movement and deployments of goods, cargo, conveyances, assets and related personnel, for HLS operations.
28.	Map Publication	The means to produce finished softcopy and hardcopy maps for use in HLS operations. Includes the assembly and integration of data, symbolization, annotation, legend/marginalia generation and placement, and cartographic finishing. This capability is required throughout the HLS enterprise.
29.	Mission Planning	The means to plan, schedule, and allocate assets to a mission; to develop data collection plans that convey schedule, tasking and resource allocation for collection assets.

	HLS Geospatial Application	Description
30.	Mission Rehearsal	The means to verify and simulate pre-planned missions involving navigation guidance for mobile assets. Employs Mission Rehearsal Models. Input to these models consists of terrain, threats, threat avoidance constraints, features, weather, other environmental conditions, planned/predicted navigation guidance, asset operating constraints, etc. Outputs consist of 4D, simulated rehearsals, in their projected operating environments.
31.	Mitigation Planning & Analysis	The means to determine and assess impact of the root cause of an incident/event and to produce mitigation plans and supporting Geospatial Products (assessments, maps, reports, etc.) for natural and human induced threats, hazards and disasters, in order to support future emergency response and recovery efforts for impending or possible disasters. Also, the means to analyze post-disaster response effectiveness (post mission assessments and after action reports) and create mitigation plans and supporting Geospatial Products to enhance future planning, safety, preparations, response and recovery operations, countermeasures and training for cases, threats, hazards and disasters.
32.	Monitor Assets	The means to monitor Assets for change in location/activity/status. To determine and record the current and historical location/time/identity/activity/status of mobile assets, including capital assets, key assets, law enforcement assets, and operational materials and equipment, through observation, tracking and analysis. To perform situation awareness. May lead to reporting of occurrences (e.g., Suspicious Activity Reporting), alerts or Situation Reports.
33.	Monitor Conveyances	The means to monitor Conveyances for change in location/activity/status. To determine and record the current and historical location/time/identity/activity/status of conveyances through observation, tracking and analysis. To perform situation awareness. May lead to reporting of occurrences (e.g., Suspicious Activity Reporting), alerts or Situation Reports.

	HLS Geospatial Application	Description
34.	Monitor Goods	The means to monitor Goods and Cargo for change in location/activity/status. To determine and record the current and historical location/time/identity/status of goods and cargo through observation, tracking and analysis. To perform situation awareness. May lead to reporting of occurrences (e.g., Suspicious Activity Reporting), alerts or Situation Reports.
35.	Monitor Locations	The means to monitor Locations for change in activity/status. To determine and record the current and historical time/activity/status at a location through observation and analysis. To perform situation awareness. May lead to reporting of occurrences (e.g., Suspicious Activity Reporting), alerts or Situation Reports.
36.	Monitor Parties	The means to monitor Parties (Persons or Organization) for change in location/activity/status. To determine and record the current and historical location/time/identity/activity/status of persons in geospatial context and cyberspace, through observation, tracking and analysis. To perform situation awareness. May lead to reporting of occurrences (e.g., Suspicious Activity Reporting), alerts or Situation Reports.
37.	Monitor Recovery	The means to monitor incident locations for change in activity/status pertaining to cleanup, decontamination and restoration. Employ recovery plans to support recovery operations. Determine and record the current and historical time/activity/status at recovery locations through observation and analysis for subsequent analysis and legal implications. Produce location-based After Action Reports that contain recovery progress, and environmental impact assessments.
38.	National Security Special Event (NSSE) Reporting	The means to report suspicious activities in geospatial context for consideration as National Security Special EVENTS (NSSEs). Reports may reference mission plans, incidents, occurrences, assets, persons, organizations, cases, risks/threats/vulnerabilities, risk/threat/vulnerability assessments, threat intelligence, conveyances, goods, cargo, or hazmat records. Reports may contain interlinked, multi-media data that characterize the nature and context of the EVENT.
39.	Operational Planning	The means to plan, schedule, and allocate personnel and assets for emergency operations. To develop Operational Plans.

	HLS Geospatial Application	Description
40.	Performance Planning & Analysis	The means to determine system performance based upon geospatial-temporal factors and criteria. Track and report on Events, incidents, key assets, vulnerabilities, grants, expenses and funding by geospatial areas (congressional district, state, territory, county, reservations, and cities) for DHS activities. Create and evaluate performance criteria and annual performance plans (including accountability reports).
41.	Post Mission Analysis	The means to assess the performance of a mission and assess effectiveness of mission, event, preparation, logistics, response, deployment, evacuation, search & rescue, security, countermeasures, (training) exercise and recovery plans, and the effectiveness of mission operations (assess incident and situation reports). The ability to compare plans with mission operations details and determine lessons learned. The means to produce post mission assessments that convey analysis results (maps and location-based reports), and to produce and after action reports.
42.	Preparation Planning	The means to preplan, schedule, and allocate personnel and assets to a potential disaster/threat; to develop operations plans that convey schedule, tasking and resource allocation for preplanned operations, in a geospatial-temporal context. The means to produce deployment and contingency plans.
43.	Program Planning	The means to preplan, schedule and allocate personnel and assets for an HLS activity; to develop activity plans that convey schedule, tasking and resource allocation for preplanned activities, in a geospatial-temporal context. The means to produce Program Plans.
44.	Public Information Outreach	The means to inform the public on the basis of location. Portray maps (e.g., National Flood Insurance Program (NFIP) floodplain maps) and location-based information reports, alerts, warnings and emergency declarations concerning threats, threat consequences, response and recovery status, mitigation and situation reports, and benefits locations through public information (media) channels. Allow the public to interact through these channels (e.g., explore what's happening in their area of interest). Support electronic registration (geocoding) for the application of benefits. Numerous types of geospatial products produced by geospatial applications across the enterprise may be distributed through public information channels.

	HLS Geospatial Application	Description
45.	Recovery Planning	The means to preplan/plan, schedule and allocate personnel and assets for incident recovery; to develop recovery (operations) plans that convey schedule, tasking and resource allocation for recovery operations, sharing amongst government and non-government relief organizations. Publish locations and route directions to crisis counseling, housing and other recovery centers; share with public.
46.	Response Planning	The means to preplan/plan, schedule and allocate personnel and assets to a disaster/threat/incidents/events, given possible risks, public safety considerations and potential affected locations, facilities, key or critical assets, etc.; to develop response operations plans that convey schedule, tasking and resource allocation for response operations, in a geospatial-temporal context. The means to produce Response Plans.
47.	Risk Analysis	The means to determine and assign risks and risk assessments for key assets, critical assets, key persons or conveyances. To analyze associated geospatial risk factors, in conjunction with related threat, vulnerability, threat intelligence and other intelligence. Consists of mapping and correlating threats to vulnerabilities. Means of analysis may consist of: (data) mine, integrate, correlate, extrapolate, and analyze data for patterns, densities, trends, networks, line of sight, tendencies, indicators, hypotheses, and conclusions, as it pertains or may pertain to risks. May also involve geoparsing and geocoding functions to scan and annotate textual risk, risk assessment, threat, threat assessment, vulnerability, vulnerability assessment, person, conveyance, threat intelligence and other all-source intelligence for geographic and temporal references.
48.	Screening and Risk Analysis	The means to determine and assign risks and risk assessments for parties (persons or organizations) and goods, and to screen accordingly. Analyze geospatial risk factors (e.g., physical address, place of birth, citizenship, travel history, travel itineraries, geographic/national affiliations, etc. for persons and organizations, and place of origin, place of manufacture, shipping route and place of destination for goods) in conjunction with party and goods records and related intelligence. Data mining and correlation applies here. May also involve geoparsing and geocoding functions to scan and annotate associated textual data for geographic and temporal references.

	HLS Geospatial Application	Description
49.	Search and Rescue Planning	The means to preplan/plan, schedule and allocate personnel and assets for search and rescue missions. The means to develop Search & Rescue Plans that convey schedule, tasking and resource allocation for search & rescue operations, in a geospatial-temporal context. Create and manage related incident/event data. Generate alerts and warnings, as needed. Support pertinent communications.
50.	Search and Rescue Response	The means to support command and control for an incident or event that requires search and rescue. Involves creating and managing situation awareness, monitoring threats and threat assessments, coordinating and monitoring response activities/assets/personnel, communicating with response personnel, etc., and reporting status to persons in the command and control chain (Situation Reports). Create pertinent communications. Update incident/event records to reflect response results.
51.	Security Planning	The means to determine and document the security plans, in geospatial context, to secure and protect fixed and mobile assets, persons, goods, conveyances, etc.
52.	Security Protection & Management	The means to secure and protect fixed and mobile assets, persons, goods, conveyances, etc. (in geospatial context). (e.g., Where to place barriers, guard posts, sensors, etc. Where are the guards, sensor alerts, etc.). Includes integration with sensors and other security monitoring tools and the means to process and display observations. May lead to reporting of events or alerts.
53.	Sensor Management	The means to manage sensor assets and the allocation of data collection requirements and tasks to sensors.
54.	Site Modeling & Analysis	The means to analyze, model and delineate areas based upon site characteristics (e.g., to locate ideal sites for a facility). To produce Site Plans.

	HLS Geospatial Application	Description
55.	Situation Awareness	The means to combine varied sources of data to create the situational context associated with threats, vulnerabilities and friendly forces for the purpose of understanding their nature and disposition and to support decision making for threat response and mitigation. In particular, view near-real time threat disposition, related observations, and friendly force disposition in geospatial context, with the appropriate level of detail. Leads to a shared, collaborative COP, or specialized views of the COP that convey actionable information, a.k.a. MSOP. The means to generate Situation Reports.
56.	Suspicious Activity Reporting	The means to analyze and report suspicious/criminal/terrorist activities to proper authorities (e.g., indications of a threat, notifications of suspected criminal activities, etc.).
57.	Tariff Management	The means to manage tariffs for goods, in a geospatial context.
58.	Threat Analysis	The means to define threats and threat assessments. For terrorism, the means to (data) mine, integrate, and correlate varied types of geospatial data for the purpose of extrapolating, modeling, analyzing and deriving geospatial data in the form of patterns (e.g., cluster), densities, trends, networks, line of sight, tendencies, indicators, hypotheses, and conclusions, as it pertains to threats and the understanding of threat behaviors in their environment, in order to minimize the risks associated with the threat. Source data include, but are not limited to, intelligence, incidents, events, criminal and suspicious activities, financial transactions, persons, organizations, goods, etc. For terrorism and natural hazards, this includes the means to conduct Threat Consequence Assessments and Hazard Modeling, Analysis & Mapping. May also involve geoparsing and geocoding functions to scan and annotate associated textual data for geographic and temporal references.

	HLS Geospatial Application	Description
59.	Threat Consequence Assessment	The means to understand the consequences of terrorist and natural threats as determined by modeling/simulation and analysis (e.g., Consequences Assessment Tool Set (CATS)). The means to produce Threat Consequence Assessments for threats to key assets, critical assets, key persons or conveyances (and associated routes). Means of analysis may consist of: (data) mine, integrate, correlate, extrapolate, and analyze data for patterns, densities, trends, networks, tendencies, indicators, hypotheses and conclusions, which pertains or may pertain to threats. May also involve geoparsing and geocoding functions to scan and annotate associated textual data for geographic and temporal references.
60.	Threat Detection	The means to detect chemical and biological threats in air and water through the employment of sensors. The means to access sensors as network resources to meet rapid response and risk mitigation requirements. Detect threats through screening and analysis of sensor observations. Create, reference, and share alerts.
61.	Training Exercise Simulation	Provide training simulations capabilities to support training exercises. The simulations employ geospatial data and technology to simulate different attack scenarios. Uses training models and supporting databases.
62.	Training Planning & Support	The means to plan training exercises and produce geospatial training aids in the form of maps, reports and plans.
63.	Travel Planning	The means to plan secure and safe travel for individuals. Produces itineraries.
64.	Vulnerability Analysis	The means to determine and assign vulnerabilities and vulnerability assessments for key assets, critical assets, key persons or conveyances (and associated routes). Means of analysis may consist of: (data) mine, integrate, correlate, extrapolate, and analyze data for patterns, densities, trends, networks, tendencies, indicators, hypotheses and conclusions, which pertains or may pertain to vulnerabilities. May also involve geoparsing and geocoding functions to scan and annotate associated textual data for geographic and temporal references.
65.	Warning/Alert Management	The monitoring and processing of Alerts in a geospatial-temporal context. The means to generate Warnings.

	HLS Geospatial Application	Description
66.	Waterway Management	The means to perform waterways management to provide a safe, efficient and navigable waterway system to support domestic commerce, international trade and military sealift. Provide long-range and short-range aids to navigation (buoys/sensors/breaking ice), electronic charting and tide/current/pilotage information through Notices to Mariners services, weather services, vessel traffic services, technical assistance and advice, vessel safety standards and inspection, and bridge administration standards and inspections.
67.	Weather Modeling & Analysis	The means to model/simulate and analyze weather conditions at specified locations. The means to determine hindcasts, nowcasts and forecasts for a location and share this information with HLS users. The means to generate and disseminate Weather Alerts & Warnings.

2.0 ACRONYMS

Acronym	Definition
ADA	Americans with Disabilities Act of 1990
AVL	Automatic Vehicle Location
BASINS	Better Assessment Science Integrating Point and Nonpoint Sources
CATS	Consequences Assessment Tool Set
COP	Common Operating Picture
CWA	Clean Water Act
DFIRMs	Digital Flood Insurance Rate Maps
DFO	Disaster Field Office
EA	Enterprise Architecture
FAA	Federal Aviation Administration
GPS	Global Positioning System
HEC2	Hydrologic Engineering Center 2
HLS	Homeland Security
INS	Inertial Navigation System
LORAN	Long Range Radio Aid to Navigation
MSOP	Mission-Specific Operating Picture
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NOAA	National Oceanic & Atmospheric Administration
NOV	Notice of Violation
NSSE	National Security Special Event
OSHA	Occupational Safety and Health Act of 1970
SCADA	Supervisory Control and Data Acquisition



HLS GEOSPATIAL ENTERPRISE ARCHITECTURE

ATTACHMENT G TECH 1

GEOSPATIAL TECHNICAL REFERENCE MODEL

GEOSPATIAL MANAGEMENT OFFICE

DRAFT VERSION 0.6.1

June 18, 2004

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1.0 INTRODUCTION

The Homeland Security (HLS) Technical Reference Model (TRM) for the Department of Homeland Security (DHS) provides a common conceptual framework that will assist in effectively and efficiently coordinating the acquisition, creation, development, operation, and recapitalization of Information Technology (IT)-based systems within the DHS enterprise.

***** Important Note *****

The Geospatial Enterprise Architecture (GEA) version of the TRM emphasizes the role of Geospatial Information Technology (GIT) in the HLS Technical Architecture. It extends version 1.0 of the DHS EA TRM (DTCGHS-03-A-FLC035-001-0009A, published August 29, 2003). This version also reflects some recent enhancements to the DHS EA, which will appear in version 2.0 of the TRM.

The role of geospatial technology is highlighted in shaded text boxes throughout this version of the TRM, as illustrated here. Although not highlighted, most of the cross-cutting general purpose technology described herein also applies.

1.1 Background

The *Clinger-Cohen Act of 1996* (PL.104-106) established the Chief Information Officer (CIO) role in Federal government agencies in order to improve government performance through the effective application of information technology. Among other responsibilities, each CIO is charged with “developing, maintaining, and facilitating the implementation of a sound and integrated information technology architecture.” This statement has evolved since then—Office of Management and Budget OMB Circular A-130, *Management of Federal Information Resources* uses “architecture” in its reference to an integrated Enterprise Architecture (EA), as follows:

Policy

The EA must also include a TRM and Standards Profile.

- (i) The TRM identifies and describes the information services (such as database, communications, intranet, etc.) used throughout the agency.
- (ii) The Standards Profile defines the set of IT standards that support the services articulated in the TRM. Agencies are expected to adopt standards necessary to support the entire EA, which must be enforced consistently throughout the agency.
- (iii) As part of the Standards Profile, agencies must create a Security Standards Profile that is specific to the security services specified in the EA and covers such services as identification, authentication, and non-repudiation; audit trail creation and analysis; access controls; cryptography management; virus protection; fraud prevention; detection and mitigation; and intrusion prevention and detection.

Under the DHS CIO, the Geospatial Information Officer (GIO) and the Geospatial Management Office (GMO) are responsible for defining the role of geospatial data and technology within the HLS EA.

1.2 Scope

The HLS TRM provides a common structure and vocabulary for describing all DHS information systems at all organizational levels and in all environments. This includes mission-focused systems as well as broad-use business (“back office”) systems, shared application services, and infrastructure systems and components. This TRM covers all IT elements necessary to build or procure hardware, services, or applications described by IT project Exhibit 300s.

1.3 Purpose

As a key element of the DHS EA, the TRM establishes the basic guidance necessary to help ensure that proposed IT solutions are in compliance with the intent of the EA. Specifically, the TRM is intended to describe elements of proposed solutions using a standard vocabulary and categorization scheme to allow them to be compared to identify overlaps and gaps. While adherence to this TRM in those terms is mandatory, individual organizational elements of DHS may extend and refine the TRM where necessary. Extensions and refinements must be registered with and approved by the DHS CIO before use.

1.4 Goals

Establishing and institutionalizing a comprehensive TRM, and the associated standards profiles, will provide the guidance and direction DHS needs to function as an integrated enterprise capable of accomplishing all of the missions for which it is, or will be, responsible. The goals of the TRM and DHS standards profiles are as follows:

- Promote vendor independence through the use of standards-based products and interchangeable services and components,
- Improve interoperability, reuse, and information sharing across operational entities,
- Improve operational effectiveness and efficiency through the use of common concepts and tools,
- Improve security through the identification of common security services and standards,
- Improve development and integration efficiency and responsiveness through the identification of a common infrastructure for applications, and
- Improve development and integration quality through implementation of a Department-wide systems-assurance program.

1.5 Audience

This TRM is intended for use by IT managers, procurement officials, program and project sponsors, technical and systems architects, software developers and maintainers, IT operations management and staff, security personnel, the DHS enterprise infrastructure staff, systems integrators, vendors, and service providers. Strategic Planners, Investment Managers, and enterprise architects will also use it to guide the planning process, and to guide the creation and evolution of enterprise technical and systems architectures.

1.6 Intended Uses

The HLS TRM is intended to support three principal uses in conjunction with standards profiles:

- Ensuring interoperability among DHS systems and with external systems and users,

- Guiding the design of system and technical architectures, and
- Providing the basis for assessing architectural compliance for technical solutions.

Interoperability is the primary concern at the departmental level. The HLS TRM incorporates the elements of the Federal EA (FEA) TRM to ensure interoperability with Service Components supplied by organizations external to DHS as well as with external and internal users of DHS provided Service Components.

The HLS TRM provides a technology-focused, vendor-independent view of the hardware and software services that will support the enterprise. It is intended to be used by systems architects, engineers, developers, vendors, service providers, and others involved in defining and creating new systems and modifying existing systems. This view identifies the technical services and capabilities provided by the common DHS IT infrastructure that system and application architects and engineers must consider when defining new systems or modifying existing systems.

For the DHS boards involved in making IT investment recommendations and decisions, the TRM provides a framework for considering the impact of proposed solutions on the enterprise. It does this by providing a normative model for describing the structure and relationships among technology components.

1.7 Standards Profile

The implementation of a TRM is accomplished through definition of a Standards Profile. The initial DHS Standards Profile corresponding to this TRM is attached as Appendix A.

1.8 Relationship to the FEA Service Component Reference Model (SRM)

The HLS TRM must be viewed within the context of the FEA SRM. The functionally-oriented capabilities described in the SRM in terms of “Service Components” are enabled by technical services organized as described in the FEA TRM and this document. It is assumed that, as the FEA SRM matures and a DHS-specific SRM is developed, this TRM will change in response.

1.9 Approach

The conceptual structure and taxonomy used in this TRM reflect an evolving and maturing notion of the TRM and its intended uses and builds on work performed within the Federal government and commercial industry. It draws from foundational concepts established in the *Open Systems Interconnection (OSI) Seven Layer Reference Model*, *The Institute of Electrical & Electronics Engineers (IEEE) Guide to the POSIX Open Systems Environment (OSE)*, the Society of Automotive Engineers (SAE) *Generic Open Architecture (GOA) Model*, and the Open GIS Consortium’s (OGC) *OpenGIS[®] Reference Model*. It also reflects various multi-tier reference models and architectural styles promoted by industry, as well as existing models being used by various government entities. The principal sources used in the development of this TRM were those of the Transportation Security Agency (TSA), U.S. Coast Guard (USCG), U.S. Customs, Federal Emergency Management Agency (FEMA), U.S. Secret Service (USSS), and the Immigration and Naturalization Service (INS).

1.10 Relationships to Other TRMs

This TRM responds to and satisfies the intent of the FEA TRM and System Component Reference Model.

1.11 Document Organization

This document describes the motivation and context for the HLS TRM, provides a high-level overview of how it relates to and differs from the FEA TRM, and finally, presents the TRM taxonomy through the use of a hierarchical structure keyed to the FEA TRM. See Exhibit 1 for the document structure.

Exhibit 1: TRM Document Organization

Section	Purpose
Section 1 Introduction	Provides the context for discussing the TRM
Section 2 TRM Overview	Provides an overview and walkthrough of the TRM
Section 3 TRM Description	The hierarchy of services that make up the TRM and their definitions.
Attachment A DHS Standards Profile	Describes the current set of standards (including a limited set of products) applicable to DHS IT systems.
Attachment B Acronyms	List of acronyms and abbreviations used in this document
Attachment C Glossary	Glossary of terms used in this document
Attachment D References	References used in preparing this document

1.12 Control

This document and the accompanying Standards Profile are under the authority and control of the DHS CIO.

2.0 TRM OVERVIEW

The HLS TRM is an integral part of a document set that is intended to describe the DHS EA. It presents a particular architectural view that is concerned with defining the basic technical elements that compose the broader architecture and the fundamental relationships among those elements. The HLS TRM is described in this document using two different “models.” The first is visual, a diagram that presents the highest-level partitioning of the technical elements of the target (“To-Be”) DHS technical environment, provided in Section 2.3. The second is a hierarchically organized set of service names and associated definitions that form a taxonomy for presenting and discussing technical components in a consistent manner across the DHS.

2.1 Design Drivers

The TRM focuses on the To-Be architecture, but nonetheless provides a normative model, describing current and planned IT applications and systems in terms of their technical components. While the HLS TRM is product-neutral, it does assume a particular architectural style and uses that as a key classification principle.

2.2 Terminology

The following terms and intended usage are presented to aid the reader. Their relationships are described in Section 2.3.

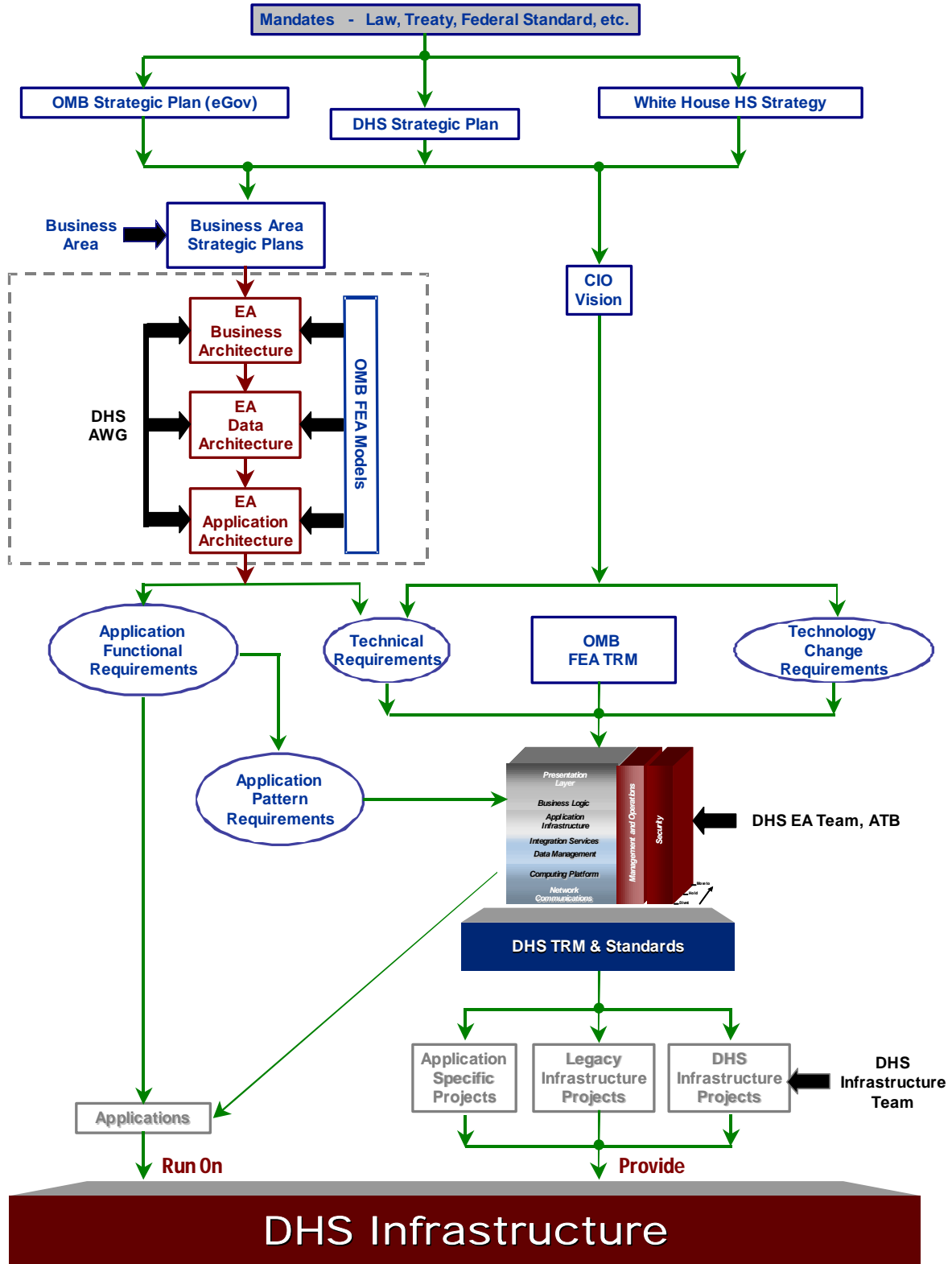
- **Application**—an automated business process or portion thereof. It is composed of components unique to the application as well as shared components.
- **Business Logic**—the portion of an application that is concerned with the encoding of business rules specific to the application.
- **Channel**—a mode of application access and delivery consisting of an end-point device, interface software, and a communications path to the application logic. An example is a Web browser executing on a Personal Digital Assistant (PDA) using a wireless protocol to access application on the Internet.
- **Data Store**—a logical data “container.” An implementation of a data store may be a relational Database Management System (DBMS), a spatial data store (for geographic information system support), an indexed file system, a flat file system, an associative data store, or any other viable storage model.
- **End-user Device**—any device and associated operating system or other run-time software that is used to connect an end-user with an application. Examples are PDAs, cellular phones, printers, plotters, and desktop and laptop computers.
- **End-user**—a human interacting with a computer-based application.
- **Infrastructure Services**—software components that provide common-use functionality to applications and/or to other services and are application-neutral; that is the services can and are expected to be used by any arbitrary application. Examples are a Web portal and an application server.
- **Service Component**—as defined by the FEA Service Component Reference Model (SRM), a *service component* is the most granular level of the SRM framework. Service components are combined to provide specific business services organized by *service type* and *service layer* in the SRM. Examples are Data Access Services and Directory Services.
- **Service Framework**—a specific configuration of technical services, protocols, and interfaces grouped by similar functionality into conceptual layers.
- **Service Platforms**—application-neutral computing, storage, and communications devices and software that provide the technical environment required by the Service Framework. These are the computers, operating systems, storage subsystems, and networks that comprise the physical level of the DHS IT infrastructure.
- **Technical Component**—in contrast to the functional capability provided by a *service component*, a technical component is the software or hardware implementation of a specific technical function. A technical component may be custom developed or acquired from a vendor, through open source channels, or from other appropriate sources.
- **Technical Service**—in this document, a technical service is a technical component that provides functionality to applications and other technical services through well-defined and published interfaces.

The key terms used in defining the role of geospatial technology in the HLS enterprise are found in the *Geospatial Business Language* (see HLS Geospatial Business Language: Key Terms, Attachment G.Bus.1.) These terms form the basis for a consistent, common language, a *lingua franca*, for describing the role of geospatial in HLS Business Activities. The geospatial semantics of the HLS mission are embodied in these terms (concepts), and thus they form a basis for the HLS business ontology.

2.3 The HLS TRM in Context

The HLS TRM both reflects the intent of the FEA TRM and provides the specificity needed for Directorate and Organizational Element implementation. Exhibit 2 illustrates the context of the HLS TRM and its relationship to the FEA Model.

Exhibit 2: HLS TRM in Context

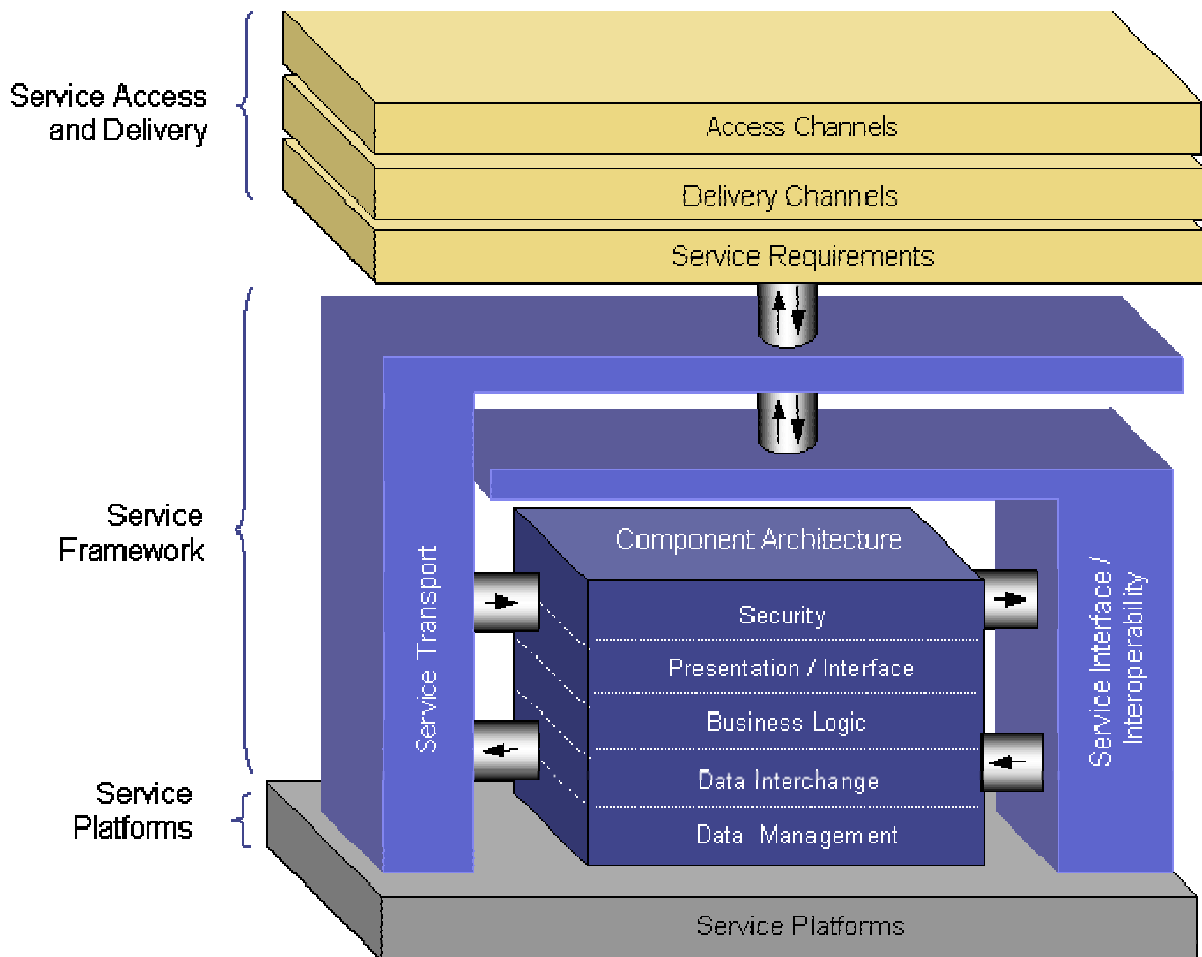


The HLS TRM incorporates the taxonomy as well as the technical services, protocols, and interfaces specified in the FEA TRM. This ensures interoperability across agencies for service components provided and consumed by DHS. The HLS TRM extends and refines the FEA TRM where necessary to satisfy “local” DHS needs for additional functionality and to ensure interoperability across DHS. DHS Directorates and Organizational Elements may, with approval, further extend the HLS TRM to satisfy their own local and unique needs.

2.3.1 FEA TRM View

The FEA TRM provides a view of technical services, protocols and interfaces that are primarily concerned with supporting the implementation of *Service Components*, as defined in the FEA SRM. This section presents a discussion of the FEA TRM in terms of how it provides context and has been incorporated into the HLS TRM (see Exhibit 3).

Exhibit 3: FEA TRM



2.3.1.1 Service Access and Delivery

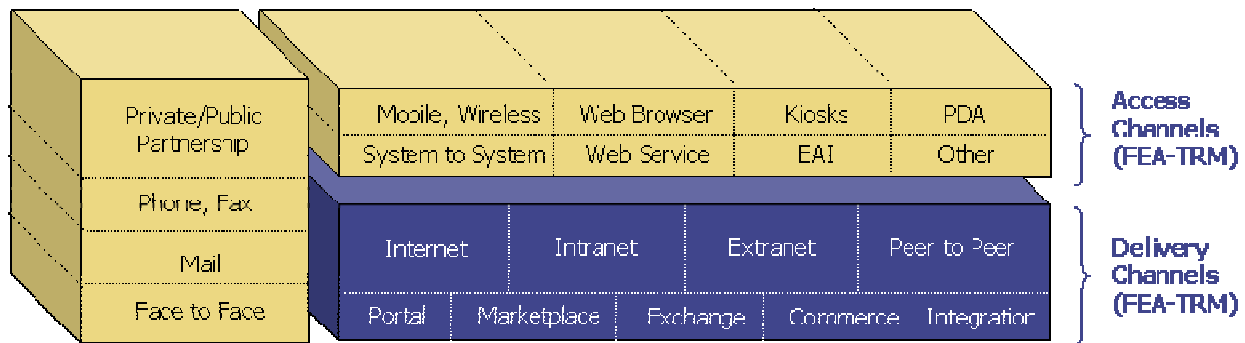
The *Service Access and Delivery Tier* of the FEA TRM is viewed as an instance of the logical subset of the components that make up the HLS TRM. The use of the channel abstraction is viewed as an architectural driver rather than a structural component. Therefore, the HLS TRM

does not specifically include the notion of channels as part of its taxonomy. The definition of any specific channel will include:

- An end-point device consisting of hardware and a browser or other client software,
- A communications path incorporating a specific logical network or other communications mechanism, and
- An appropriate set of transport protocols.

Exhibit 4, extracted from the “Agency Briefing” that presented the Draft SRM and TRM¹, identifies possible components of access and a delivery channels.

Exhibit 4: Access and Delivery Channels



2.3.1.2 Service Framework and Service Platforms

The Service Framework tier of the FEA TRM, together with the Service Platforms tier, reflect a more traditional view of a TRM; one that is more familiar to the technologists who will design the systems and components that implement its architectural direction.

2.3.2 DHS View

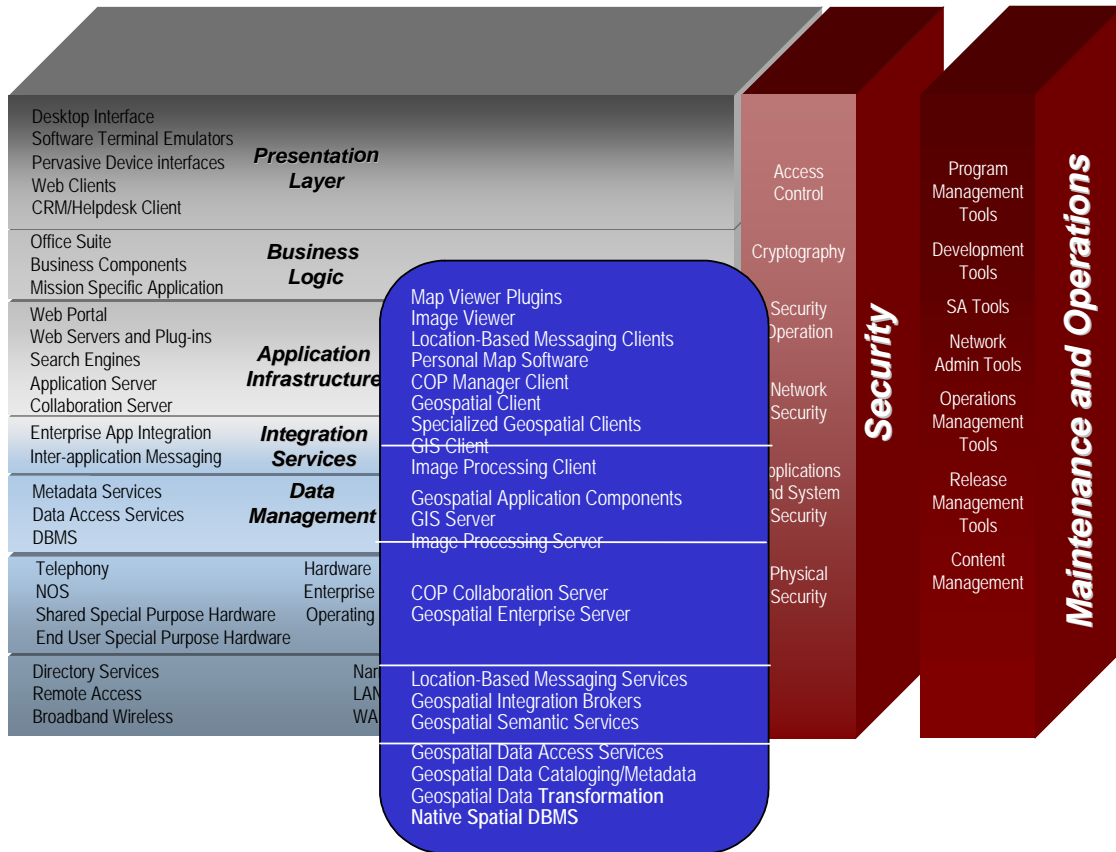
The DHS View of the TRM—shown in Exhibit 5—is primary for DHS and its subordinate organizations. Following its guidance will ensure compliance with the FEA TRM as well as with DHS direction. The HLS TRM uses the concept of functional layers. General characteristics of these layers are:

- A layer contains logically consistent groupings of services, and
- Layers “higher” in the TRM use the services of those “lower” in the TRM.

Services in one layer should not interface with services in other layers except through clearly defined paths.

¹ Federal Enterprise Architecture (FEA), Draft Service Component Reference Model (SRM), Draft Technical Reference Model (TRM), Agency Briefing, January 29,2003

Exhibit 5: HLS (Geospatial) TRM



External users at the public level will have access to HLS services via the Web. This access is provided at the Application Infrastructure Layer, with underlying services from all layers below.

External government users (including state and local) will have access at the Integration Services Layer, in the long term, primarily through Web services. Access to these services will be controlled by user role based security policies.

The main types of geospatial components are illustrated in the blue window.

2.3.2.1 Service Framework

The DHS Service Framework corresponds to the structure of the FEA Service Framework with two exceptions: an Application Infrastructure layer and a Data Interchange layer.

An Application Infrastructure layer has been added between the business logic and Data Interchange layers that contains the services needed to manage and execute business logic. The fundamental concept is one used to describe the Java 2 Enterprise Edition (J2EE) architecture and applies as well to other run-time environments such as Windows .Net services and even to the IBM Customer Information Control System (CICS) environment. Application components are managed by and execute within application environments called *containers*. Containers also

provide access, via *connectors*, to all of the various lower-level services and resources needed by applications such as databases, naming and directory services, asynchronous messaging and transaction services, and e-mail systems. Connectors are the Application Programming Interface (API) and protocols used to interchange data among application components and services. As a result of this change, some of the technical services and components included in the Platform Services tier of the FEA TRM are included in this layer. This approach better reflects the physical layering of services that exist in current vendor and Open Source products.

The Data Interchange layer of the FEA TRM has been extended to specifically include the functionality provided by integration brokers and related enterprise integration products. In addition, the protocols that make up the FEA TRM *Services Transport* area have been included here to reflect the more robust nature of the layer and to align with more traditional usage. The layer has been renamed the *Data Interchange/Integration* layer.

The layers of the HLS TRM Service Framework are as follows:

- **Presentation**—the technical services required to create and present application interfaces to end users,
- **Business Logic**—application-specific logic representation; that is, “software,”
- **Application Infrastructure**—the technical services required to allow business logic, and other application logic to function,
- **Integration Services**—the technical services and components required to interchange data among applications and services, and
- **Data Management** —the technical services and components required to access and modify data of all types.

As illustrated in Exhibit 5, the main types of geospatial components are:

Presentation Layer

- Map Viewer Plugin
- Image Viewer
- Location-based Messaging Client
- Personal Map Software
- COP Manager Client
- Geospatial Client
- Specialized Geospatial Clients (67 types)
- Geographic Information System (GIS) Clients
- Image Processing Clients

Business Logic Layer

- Geospatial Application Components

Application Infrastructure Layer

- Geospatial Server
- GIS Server
- Image Processing Client
- Geospatial Enterprise Services
- Data Discovery Service
- Service Discovery Service
- Map Publication Service
- Activity Report Service
- After Action Report Service
- Alert Warning Report Service
- Emergency Declaration Report Service
- Incident Report Service
- Location (Site) Report Service
- National Security Special EVENT (NSSE) Service
- Situation Report Service
- Suspicious Activity Report Service
- Coverage Portrayal Report Service
- Web Map Service
- Web Terrain Service
- Style Management Service
- Geocoder/Reverse Geocoder Services
- Geolocate Service
- Gateway Service
- Route Service
- Navigation Service
- Monitoring Service
- Tracking Service
- Weather Service
- Traffic Service
- Model Access Service
- Geoparser Service
- Sensor Planning Service

-- Sensor Collection Service

-- Sensor Alert Service

Data Interchange/Integration Layer

-- Geospatial Information Broker

Data Management Layer

-- Gazetteer Service

-- Web Map Service

-- Web Coverage Service

-- Web Feature Service

-- Web Terrain Service

-- (Location) Directory Service

-- Image Archive Service

-- Web Annotation Service

-- Spatial Query

-- Data Transformation Services

-- Coordinate (and Unit) Transformation Service

-- Topology Service

-- ETL

-- Native Spatial DBMS

-- Symbology Format

-- Geospatial Data Formats

-- Simple Features

-- Coverages

-- Registry Information Model

-- Service Information Model

-- Observations and Measurements

-- Sensor Model

-- Geography Markup Language

-- Sensor Model Language

2.3.2.2 Platform Services

The HLS TRM subdivides the FEA TRM Platform Services tier into two parts. Web Servers and Application Servers have been moved to the Application Infrastructure layer, as described previously. Storage is consolidated with Computing Platform. This layer now includes only those services and components that are completely application and programming model neutral.

- **Computing Platform**—physical hardware and operating system services that support the components of the Service Framework, and
- **Networking and Communications**—the devices, software, and communications media used to transport data among infrastructure components and to end-point devices.

2.3.2.3 Other Services

Three other refinements of the FEA TRM have also been made. *Security* is now shown as a vertical slice through both Platform Services and the Service Framework to indicate that security services are not monolithic, but distributed throughout the TRM.

The protocols and data format standards contained in the *Service Interface/Interoperability* area have been reallocated to appropriate layers:

- *Data Format* is now included in the Data Management layer,
- *Data Exchange/Delivery* is now included in the Integration Services layer,
- *Service Discovery* is now included in the Application Infrastructure layer, and
- *Service Description/Interface* is also included in the Application Infrastructure layer.

Finally, another category has been added to the TRM taxonomy and, as with security, appears as a vertical stack: *Management and Operations*. While many of the services required operating and managing DHS IT systems are or will be included in the FEA and/or DHS SRM (an SRM for DHS does not currently exist), there are technical services and components needed to enable those services. The Management and Operations area of the TRM includes those elements.

3.0 TRM DESCRIPTION

This section presents the structure and taxonomy for the HLS TRM. The layers are organized to reflect the technical tiers of the FEA TRM.

3.1 Service Framework Tier

3.1.1 Presentation Layer

The presentation layer includes a wide variety of user interface devices for desktop and mobile environments as well as supporting interfaces, protocols and services. The purpose of this layer is to provide flexibility in how information is presented to users by abstracting the means of presentation from the business logic. Ideally, a single application can be used over a variety of access channels using a variety of end-point devices.

This layer includes several types of clients, but the Web browser is preferred. Other client types should be used only when using a Web browser-based user interface would severely degrade performance or severely reduce availability.

3.1.1.1 Desktop Interface

The Desktop Interface is a Graphical User Interface (GUI) to a computer Operating System (OS). It allows a user to start and stop applications, manage files, and where allowed by the user's role, to manage the hardware and software, installing and uninstalling hardware and software.

This Tier maps to the FEA TRM Component Framework Presentation /Interface Category.

3.1.1.1.1 Desktop

The Desktop is the graphical environment on which Window Manager and Desktop Manager display windows, icons, and other graphic objects. The Desktop *may* be the primary handler of user interaction. Specific division of functionality may vary from one windowing environment to another. The behavior of the GUI is controlled at this level. In some systems the desktop is inherently tied to a single computer, in others it can transparently manage interaction with processes on multiple machines. The desktop may be spread across more than one physical display and may integrate windows owned by multiple users.

3.1.1.1.2 Assistive Technologies (Section 508)

The Desktop can provide various basic assistance services including keystroke alternatives to mouse actions, window magnifiers, special fonts and themes and integrated voice input and text to speech capabilities. Services covered in this category are only those inherent to or integrated with the desktop.

3.1.1.2 Web Client

Web browsers provide a generalized, standards-based client to deliver applications and services to end-users via devices that support Hypertext Transfer Protocol (HTTP)/HTTP Secure (HTTPS) delivery channels. Web browsers use plug-ins to render non-standard formats of Web pages. Plug-ins utilize standard interfaces to the browser. Web browsers are essentially ubiquitous in personal computers and workstations and “thin” workstations, and are beginning to appear in smaller pervasive service platforms such as PDAs and cellular telephones. Web browsers are the preferred application clients for DHS.

This Tier maps to the FEA TRM Service Access and Deliver Access Channel Category.

3.1.1.2.1 Web Browser

The Web Browser is the standard thin client for DHS. Web browsers are standards based and generally support local file access, remote file access using file transfer protocol (FTP), and remote file access and content rendering using HTTP or HTTPS. Browsers generally provide local print access to local print services and file services to print and save files locally. Browsers render files according to their Multipurpose Internet Mail Extensions (MIME) type. Universally supported types are Hypertext Markup Language (HTML), Text File (TXT), Graphic Interchange Format (GIF), and Joint Photographic Experts Group (JPEG). Most browsers support client side scripting via JavaScript and script interaction with browser Document Object Model (DOM) objects.

Most browsers also support additional MIME types via plug-ins.

3.1.1.2.2 PDA Web Browser

The PDA Web Browser allows you to view full HTML web pages on PDA devices over the wireless and non-wireless Internet.

3.1.1.2.3 ActiveX Control

In the Microsoft Internet Explorer environment, the browser may be extended using locally installed or downloaded “controls.” These controls may interact with the user and/or the operating environment at any level. Controls may be used to render special MIME types or they may be used to interface peripheral devices to the browser. The Microsoft standard for these controls is called ActiveX.

Specific ActiveX controls may be utilized to extend the browser’s functionality for application interaction purposes. Historically ActiveX controls have represented security vulnerabilities. DHS discourages the use of ActiveX and will not allow its use in applications and components developed under the EA.

3.1.1.2.4 Java Virtual Machine Plug-in

Plug-ins may also provide generalized services to the browser. Java is enabled in current Web browsers through a plug-in, which makes available the services of the Java Virtual Machine (JVM).

3.1.1.2.5 Document Plug-in

Various specialized document formats may be rendered by plug-ins. Some plug-ins are strictly renderers, others implement interaction with the document, as in fillable forms.

3.1.1.2.6 Map Viewer Plug-in

The means to visualize and interact with geospatial data in rendered map form. Provides tools to select base map/image data for viewing, select optional graphics overlays (geospatial features/locations/structures/routes/observations/mobile-objects), set view window, display chosen view, measure and pinpoint, navigate through view with pan and zoom, etc. Optionally choose symbology, map display template or select previous views.

3.1.1.2.7 Other Plug-in

Multiple vendors offer other plug-ins such as those that render custom multi-media (sound, animation, video) in the browser. Some plug-ins are strictly renderers, others implement interaction with the document, as in speed, volume, and viewpoint controls.

3.1.1.2.8 Graphics and Drawing Viewer

An application that provides the capability to take a snapshot of an original drawing, particularly CAD drawings, and then to markup the drawing. All changes to the drawing take place on the snapshot, while the original file remains on the server. This allows all the changes to be committed to the drawing at one time. A web-based drawing viewer can also be used to publish and view CAD drawing files and other related schematic, picture, imaging and document formats.

An application that provides the capability to take a snapshot of an original drawing, particularly CAD drawings, and then to markup the drawing. All changes to the drawing take place on the snapshot, while the original file remains on the server. This allows all the changes to be committed to the drawing at one time. A web-based drawing viewer can also be used to publish and view CAD drawing files and other related schematic, picture, imaging and document formats.

3.1.1.2.9 Image Viewer

The means to visualize and interact with geospatial images (rectified or unrectified). Provides tools to select image and optional graphic overlays for viewing (geospatial features/locations/structures/routes/observations/mobile-objects), set view window, display chosen view, measure and pinpoint, navigate through view with pan and zoom, etc. Optionally choose symbology, image display template or select previous views.

3.1.1.2.10 Audio Player

Multiple vendors offer plug-ins that render custom sound formats. These typically allow interaction through volume and other sound controls..

3.1.1.2.11 Video Player

Multiple vendors offer plug-ins that render custom video formats. These include both streaming video and two-way interactive video for conferencing.

3.1.1.2.12 Animation

Animation software allows insertion and display of motion in still pictures and video.

3.1.1.3 Messaging Client

Delivery to and sending of asynchronous messaging services to and from the desktop requires a presentation layer client. Message clients may be standalone or integrated with other products and may implement single or multiple protocols.

This Tier maps to the FEA TRM Service Access and Deliver Access Channel Category.

3.1.1.3.1 E-Mail Client

An e-mail client is a program that uses DNS Mail Exchange (MX) records and Simple Mail Transfer Protocol (SMTP) to send and get electronic mail from a server. An e-mail client normally has fields of From, To, Subject, and Body, cc, bcc, attachments, date, and content type. The content encoding of e-mail message can either be American Standard Code for Information Interchange (ASCII), or MIME type that enables any binary attachments; such as sound, image, HTML, etc. E-mail clients at a minimum allow receiving, viewing, composing and sending of simple text messages over a local network or the Internet. More capable e-mail clients allow file enclosures, rendering of MIME types and interaction with an E-Mail server to manage mailboxes, mailing lists, and rules.

3.1.1.3.2 PDA E-Mail Client

General-purpose wireless PDAs and other similar special purpose dedicated e-mail devices are capable of viewing E-Mail and in some cases composing and sending it. Both simple and complex clients exist.

3.1.1.3.3 Defense Messaging Service Client

A Defense Messaging Service (DMS) client is an e-mail client capable of interoperating with a server on the DMS network.

3.1.1.3.4 Calendar Client

Simple calendar clients may be regarded as messaging clients and are frequently integrated with e-mail clients. The calendar client interacts with a calendar server to schedule meetings and display meeting schedules. More capable clients are capable of inviting attendees and allowing selective views of prospective attendee's schedule. As with e-mail clients, calendar clients may utilize enclosures and may render MIME types. Calendar clients may be capable of generating meeting reminders. A Calendar client is typically closely integrated with e-mail and with a directory.

3.1.1.3.5 Facsimile

Desktop Facsimile (FAX) clients permit sending and receiving FAX transmissions, either via a local modem or via a FAX server and shared modem. Facsimile display is usually in image form, but some FAX clients implement Optical Character Recognition (OCR) allowing conversion of an incoming FAX to a text file. Fax transmission may be done from simple text or optionally from more complex document formats. Actual transmission is in bit-mapped format.

3.1.1.3.6 Threaded Discussion

Threaded discussion clients allow asynchronous interaction with groups or groups of groups. Text is typically transmitted to the discussion server as e-mail or via a Web client. Successive messages and replies are displayed by the client in subject and time order.

3.1.1.3.7 Location-Based Messaging Client

The means to visualize location-based messages and 'reports' (messages with embedded geospatial elements). Example messages and reports include alerts, warnings, emergency declarations, situation reports, after-action reports, suspicious activity reports, activity reports, location reports and National Security Special EVENT (NSSE) Reports.

3.1.1.4 Office Suites and Personal Productivity Tools

Office suites and personal productivity tools are a set of programs required in an office environment, typically comprised of a spreadsheet, a word processor, a presentation generator, a scheduler, a note manager, a desktop database program, personal financial package, etc. The programs are normally produced or packaged by a single vendor and may work together seamlessly. Personal Productivity Tools are commercial off-the-shelf (COTS) tools similar to office tools, but of more limited scope.

This Tier maps to the FEA TRM Service Access and Deliver Access Channel Category.

3.1.1.4.1 Word Processor

A word processor is a tool for composing, editing and formatting text documents, most commonly in letter or short document format. Word processors may incorporate graphical tools and allow generation of compound documents (for example, a letter with an embedded spreadsheet).

Should support the means to incorporate geospatial products in map and report form.

3.1.1.4.2 Spreadsheet

Spreadsheets are display, calculation, and formatting tools. A spreadsheet typically is comprised of a grid of cells possessing content and rules or formulas. A spreadsheet may incorporate graphing capabilities tied to the contents of cells.

3.1.1.4.3 Presentation Tool

A presentation tool is typically intended to produce paper or electronic presentations formatted according to a standard design or template. Presentation tools typically include an outliner and graphics tools, particularly clip art tools. Presentation tools may be capable of generating animations and incorporating sound and other media in the presentation.

Should support the means to incorporate geospatial products in map and report form.

3.1.1.4.4 Desktop Database

A desktop database is a database intended for personal or small group use. It is typically characterized by a sophisticated graphical user interface and a relatively less powerful database engine. Desktop databases may utilize Structured Query Language (SQL), but generally hide details from the user.

3.1.1.4.5 Web Page Editor

Many office suites now incorporate a Web page editor. A Web page editor is generally intended to produce HTML for small or personal Web sites. They utilize a GUI and relieve the user of the need to edit HTML code. Tools in this category are those bundled with office suites and are generally less capable than the category of Web Site Tool.

3.1.1.4.6 Project Manager

A project manager is a component of an office suite designed to capture and document schedules and resource allocation and expenditures. These tools are generally highly graphical in nature and are capable of generating many types of graphs or views of a project.

3.1.1.4.7 Desktop Budget Tool

A Desktop Budget Tool is incorporated in some office suites or bundled with workstation packages. These tools are usually designed for personal financial management, but may be capable of performing simple budget functions for small offices or groups.

3.1.1.4.8 Desktop Compression Tool

A Desktop Compression Tool is a wrapper for a standardized data compression and file aggregation and archiving tool. These tools may be used in a single user environment for recovering disk space, or in e-mail or collaboration for compressing files before transmission. Care must be taken in choosing compression tools to assure interoperability.

3.1.1.4.9 Desktop Drawing and Diagramming

A desktop drawing and charting tool may implement one or more of a variety of functions including: freehand drawing, object based drawing composition, structured drawing based on templates, rules and methodologies, and production of charts from numeric input, frequently via a spreadsheet.

This software may embed map functionality and/or other geospatial tools.

3.1.1.4.10 Portable Document Generator

A portable document generator is a tool that converts text or complex text documents to a format commonly supported by free or inexpensive viewer software. (The viewer may be stand-alone or a plug-in.) The generator may be used to generate locked or encrypted documents or fillable forms.

3.1.1.4.11 CD/DVD Authoring

CD/DVD Authoring software allows assembling of content for transfer to a CD or DVD and provides a simple user interface to the CD/DVD recorder control functions.

3.1.1.4.12 Investigative Software

Investigative software is a category of tools used in law enforcement, financial investigation, and background checking. This category may include both COTS and government off-the-shelf (GOTS) packages.

This software may embed map functionality and/or other geospatial tools.

3.1.1.4.13 Personal Map Software

Personal Map-GIS Software includes a variety of tools for viewing, annotating and manipulating map data. Typically includes map data for standalone operations. Often includes Global Positioning System (GPS) capability for applications involving mobile assets, persons, goods, cargo and conveyances. Includes Commercial Mapping or GIS software for desktop or PDA.

3.1.1.4.14 PDA Office Suite

High end PDAs commonly come bundled with a minimal office suite, including a word processor and spreadsheet.

3.1.1.4.15 Desktop Publishing

Desktop Publishing applications are designed to assist in the page layout process. These applications help integrate text, diagrams, charts, and images into a cohesive, visually pleasing whole, prior to the document being printed and distributed. They are often used to create newsletters or other small documents for public or private distribution.

3.1.1.4.16 Multimedia and Graphics Editing

The software used to edit multimedia data, which combines various elements, such as images, icons, audio, video and hypertext to create a multimedia presentation.

3.1.1.4.17 Training Software

The set of applications that are used to create, distribute, manage or use Computer Based Training (CBT) courses and training programs.

3.1.1.5 Collaboration Client

Collaboration covers a wide range of services, many characterized by two-way, synchronous interaction among two or more participants. Collaboration is a team enabler that permits reduction in travel and increased productivity. A user's collaboration client may interact with another on a peer-to-peer basis or via a collaboration server.

This Tier maps to the FEA TRM Service Access and Deliver Access Channel Category.

3.1.1.5.1 Full Featured Collaboration Client

A full-featured collaboration environment is similar in philosophy to an office suite. It uses a set of related tools to provide a set of related, interoperable services. Typical functions include.

- Discussions groups
- Chat
- Conference management
- Document sharing
- Contacts list sharing
- Tasks management
- Project Timelines
- Team Folder support
- Subproject Home Page support
- Activity View
- Geospatial-temporal based COP and Mission-Specific Operating Picture (MSOP). See COP Manager.

Collaboration Clients may be Web Based or Based on a fat client.

3.1.1.5.2 Desktop Video Conferencing

Video conferencing is an important form of collaboration. Desktop video enables this form of conferencing without use of a dedicated conference facility.

3.1.1.5.3 Voice over IP Client (VoIP)

Voice over IP (VoIP) networks are increasingly being used to replace long distance telephone calling. VoIP is available through dedicated terminal units (VoIP Phones) or through software on the desktop. Desktop and terminal solutions may interoperate, and gateways to the public switched network allow calling to conventional phones.

3.1.1.5.4 Real-time Whiteboard

Technologies exist that allow real-time interaction and sharing of concepts via a virtual or real whiteboards. The desktop real-time whiteboard is a software program that shares a drawing and access to drawing tools among two or more participants at different desktops.

This software includes geospatial tools for visualizing and interacting with the COP and MSOP. See COP Manager.

3.1.1.5.5 Instant Messaging

Instant Messaging (IM) is a server-mediated capability for one to one teletype style interaction. Instant Messaging clients maintain lists of prospective participants and provide alerts when a participant is available and willing to participate. Public IM is not encrypted. Private IM services may provide encryption.

3.1.1.5.6 Chat Room

Chat is similar to IM, but with multi-party participation. A chat room is the set of participants in the conversation. Access may be either pre planned and limited in scope, by invitation, by discovery, or publicly advertised. Some public chat systems allow for exclusion by vote of the participants. As with IM, public chat is not encrypted. Private chat services may provide encryption.

3.1.1.5.7 Facilitation Tools

Meeting facilitation, either local or virtual can be facilitated by tools that allow a leader or moderator to focus the discussion, take votes and establish consensus based either on public or anonymous discussion.

3.1.1.5.8 Distance Learning Tools

Distance Learning tools provide collaboration in a virtual classroom setting. Emphasis is on interaction with an instructor and on on-line testing.

3.1.1.5.9 Information Visualization

Information Visualization and virtual reality clients may be used in a collaborative environment. These tools may be used for collaborative analysis or collaborative planning.

This software includes geospatial tools for visualizing and interacting with the COP and MSOP. See COP Manager.

3.1.1.5.10 Wireless Collaboration

Various collaboration tools are implemented in the wireless environment. This category covers all standards and products specific to the wireless environment, and also specifies any other generic collaboration tools that *may* be used in the wireless environment.

3.1.1.5.11 COP Manager Client

The COP Manager provides the means to manage the scope and resources associated with a COP, select and allocate resources, manage and monitor collaboration activities, monitor status and performance of resources, and monitor and manage external communications. The distinction between the COP Manager and other operations applications is that the COP Manager is managing the big picture, whereas other applications focus on MSOP and other mission-specific operation activities.

3.1.1.6 Customer Relationship Management (CRM) /Helpdesk Client

CRM tools and Helpdesk support tools enable an enterprise to assure timely and consistent service internal and external and external service users.

This Tier maps to the FEA SRM Customer Services Type.

3.1.1.6.1 Customer Relationship Management Client

A CRM client may be client/server or Web based, typical features include:

- Searchable Knowledge Base
- Create, View, Update, and close support items
- Remote control capabilities
- Create, View, Update, and delete appointment entries
- Generate and review log entries
- View contact demographics and history (in geospatial context)
- Provide guided real-time ad hoc query capabilities against a customer database
- A CRM client typically is utilized in “sales” or order taking environment
- Map functionality and/or other geospatial interaction tools with customer locations.

3.1.1.6.2 Helpdesk Tool

Helpdesk tools usually are a subset of CRM emphasizing trouble diagnosis, reporting and tracking. Helpdesk systems are focused on trouble tickets and systematic problem resolution.

3.1.1.7 Document Management

Document management broadly focuses on access to documents, document workflow, dissemination, and review processes. Tools in this category frequently overlap, but frequently do not interoperate.

This Tier maps to the FEA SRM Digital Assets Services Type.

3.1.1.7.1 Document Management Client

A document management client typically accesses a server with workflow capabilities. This server manages receipt (including scanning and OCRing), searching, cataloging, routing and managing of structured review processes. The client provides user access to a set of the server’s capabilities appropriate to the user’s role.

3.1.1.8 Software Terminal Emulator

Traditionally Mainframe and Unix clients were specialized hardware devices. Today almost all client access to mainframes and to Unix systems is done through software based terminal emulation programs. These programs provide the look, feel, and functionality of legacy system hardware terminals on the desktop.

This Tier maps to the FEA TRM Service Access and Deliver Access Channel Category.

3.1.1.8.1 Dumb Terminal

Dumb terminals are a class of terminals with no or minimal local processing capability. This class includes simple teletype emulators, various generations of mainframe terminal emulators, (including IBM 3270 series emulation), and typical Virtual Memory System (VMS) and Unix command line interface terminals (VT100 series etc). Dumb terminal emulators provide the functionality of these devices in a window on the desktop. These emulators may include simulation of attached peripherals such as printers. A major issue with dumb terminal emulators is security. The protocols supported on the original hardware were not encrypted and did not support any strong form of authentication. This problem is addressed by utilizing upgraded protocols, mediated by an intermediate client/relay server running on the source machine.

3.1.1.8.2 Windows Client

It is not normally possible to remotely run desktop processes from Windows based PCs. To allow this capability, add on systems called terminal servers and Windows Clients have been developed. The Windows client is a thin client that supports only the basic window management and display capabilities of the Windows operating system. Windows clients may be implemented on hardware similar to browser based thin clients, or may simply consist of an emulator running on a full featured Windows platform.

3.1.1.8.3 X-Windows Server

An X-Windows Server is a *client* that allows both local and remote access to windowed content and controls. X-Windows is usually associated with Unix, but may run on a variety of OSs. X Servers running on Windows platforms allow communication with the Unix environment.

3.1.1.8.4 Remote Desktop Protocol

Remote Desktop Protocol (RDP) includes clients based on the Microsoft RDP protocol, other than Citrix and other full featured remote Windows implementations. This includes browser based clients, and clients implemented on non-Windows environments.

3.1.1.9 Pervasive Device Interfaces

Pervasive computing devices utilize a number of distinct interface types. The objective of pervasive computing integration is to allow all types of devices in this category to participate within the enterprise.

3.1.1.9.1 Handheld PDA

Handheld PDAs typically have a small display with overall resolution in the 320 x 240 pixel range. PDAs do not generally utilize a multiple window paradigm. PDAs usually use stylus or function key input. Handheld PDAs may be equipped with a keyboard, but generally are not.

This Tier maps to the FEA TRM Service Access and Deliver Access Channel Category.

3.1.1.9.2 Wireless Email

Wireless e-mail devices generally are single or multi line text only displays. Devices capable of sending as well as receiving generally have a built in keyboard. Devices in this class do not generally have a pointing device, but rely on the keyboard for control.

3.1.1.10 Geospatial Client

A desktop client, either thick or thin, that provides visualization and interaction with geospatial data, including vector, raster, 2D and 3D. For 3D display, supports image drape over digital terrain model (DTM), with color and texture controls. Also provides access to associated Application Components and Geospatial Services.

3.1.1.10.1 Specialized Geospatial Clients

Various specialized geospatial clients exist within the HLS EA (Table 1). The following table lists the HLS applications that involve geospatial data and technology, each which may have a Geospatial Client and one or more Application Components and/or Geospatial Services.

Table 1 - HLS Geospatial Clients & Application Components

HLS Geospatial Clients & Application Components	
Asset Inventory Management	Monitor Locations
Biographical Analysis	Monitor Parties
Case Analysis	Monitor Recovery
COP Manager	National Security Special Event Reporting
Countermeasure Planning	Operational Planning
Critical Infrastructure Inventory Management	Performance Planning & Analysis
Damage Assessment	Post Mission Analysis
Data Acquisition/ Generation	Preparation Planning
Data Collection Management	Program Planning
Data Collection Planning	Public Information Outreach
Disaster Assistance	Recovery Planning
Electronic Navigation	Response Planning
Emergency Reporting	Risk Analysis
Evacuation Planning & Management	Screening and Risk Analysis
Event Analysis	Search and Rescue Planning
Event Planning & Analysis	Search and Rescue Response
Exercise Planning	Security Planning
Facility Mapping & Management	Security Protection & Management
Geospatial Data Transfer	Sensor Management

Geospatial Integration & Test Tools	Site Analysis
Hazard Mapping	Situation Awareness
Health & Safety Monitoring	Suspicious Activity Reporting
Hydraulic-Hydrographic Modeling	Tariff Management
Incident/Event Management	Threat Analysis
Incident Reporting	Threat Consequence Assessment
Location Search & Reporting	Threat Detection
Logistics Planning	Training Exercise Simulation
Map Publication	Training Planning & Support
Mission Planning	Travel Planning
Mission Rehearsal	Vulnerability Analysis
Mitigation Planning & Analysis	Warning/Alert Management
Monitor Assets	Waterway Management
Monitor Conveyances	Weather Modeling & Analysis
Monitor Goods	

3.1.1.10.2 GIS Client

A general purpose Geographic Information System (GIS) client, either thick or thin, that provides visualization and interaction with geospatial data. Also provides access to underlying Geospatial Application Components and Geospatial Services.

The primary client capabilities are summarized below.

3.1.1.10.3 Image Processing Client

A desktop client, either thick or thin, that provides visualization and interaction with geospatial imagery data. Many specialized geospatial imagery applications may exist within the HLS EA. May also provide access to underlying Application Components and bundled Geospatial Services.

3.1.1.11 Narrow Band Wireless Access

Narrow Band Wireless is a wireless telecommunication technology that carries voice information in a narrow band of frequencies.

3.1.2 Business Logic Layer

The business logic layer contains encoded logic in various forms used to implement business rules and related functionality.

3.1.2.1 Application Components

An Application Component is a program, screen, datastore, or control member inside an application. An Application Component can be shared by more than one application.

This Tier maps to the FEA SRM Services Domain.

3.1.2.1.1 Common Business Components

Common Business Components are a category of application components that serve business functions common to multiple applications. These components may be custom developed, COTS or may be built by wrapping legacy systems with a Web services or other standardized service interface.

3.1.2.1.2 Geospatial Application Components

The Geospatial Clients defined in

Table 1 may have one or more server-side Application Components. These components contain geospatial business logic and exploit Geospatial Enterprise Services (see 3.1.3.8), which are common geospatial services that are available throughout the enterprise.

3.1.2.2 Office Suite Components

Modern integrated office suites and other integrated software environments frequently are designed to expose powerful, well documented interfaces. These interfaces allow use of this class of application as a service provider.

This Tier maps to the FEA SRM Services Domain.

3.1.2.2.1 Word Processor

Word Processor Components are common business components that specialize in rich text formatting.

Includes the means to insert Geospatial Products into word documents for publication.

3.1.2.2.2 Spreadsheet

Spreadsheet Components are common business components that specialize in computation.

Includes the means to insert Geospatial Products into spreadsheet documents for publication.

3.1.2.2.3 Desktop Database

Desktop Database components are common business components that specialize in managing structured data and providing query services.

Includes geospatial data management capabilities.

3.1.2.2.4 Project Manager

Project Management Components are common business components that specialize in scheduling and charting.

Includes geospatial project management capabilities.

3.1.2.3 Business Intelligence Components

Business Intelligence (BI) is a set of applications and technologies for collecting, storing, analyzing, presenting data to enhance business decision making process. BI includes decision support systems, query and reporting, searching, online analytical processing, statistical analysis, forecasting, pattern matching, and data mining.

This Tier maps to the FEA SRM Business Analytic Services Type.

Includes geospatial BI capabilities.

3.1.2.3.1 Data Mining

Data mining tools process data to identify patterns and relationships among data items. Data mining may include associating, sequencing, classifying, clustering, and forecasting of data.

Includes geospatial data mining capabilities.

3.1.2.3.2 Data Warehouse/Data Mart

Data Warehouse and Data Mart tools manipulate collections of data to support decision-making. The data may cover diverse sources, but presents a cohesive business picture. Tools for development of Data Warehouses and Data marts include features of data extraction from operating systems and data access via database systems. A Data Warehouse is enterprise wide data store; while a Data mart is more narrowly focused data store.

Includes geospatial data warehouse and data mart capabilities.

3.1.2.3.3 On-Line Analytical Processing

On-Line Analytical Processing (OLAP) is a set of software tools that enables in-depth analysis of data stored in a database. The analyzed data can be multi-dimensional, aggregated, or metadata, from multi database server, in multi-tier environment.

3.1.2.3.4 Knowledge Management

Knowledge Management (KM) is the category of applications and technologies designed to support the systematic process of finding, selecting, organizing, distilling and presenting information in a way that improves a user's comprehension in a specific interest area.

This includes geospatial knowledge management capabilities.

3.1.2.3.5 Decision Support Tools

Software that supports model-driven "what if" analysis for business decisions wherein decision-makers vary one or more variables within the model and the software calculates the changes that result from the decision.

3.1.2.4 Search Services

Search services provide the ability to search documents, folders, images, multi-media, web pages etc. on a computer, network, website or the Internet. This Tier maps to the FEA SRM Business Analytic Services Type.

3.1.2.4.1 Pattern Matching

Pattern Matching is a powerful, real-time, user-defined filtering option. With Pattern Matching, users can create unique rules with Boolean expression, wildcards, Regular Expression or any other methods offered by Pattern Matching tool. Those rules limits elements within user requested data and present the matched data to users.

Includes geospatial-temporal pattern and trend capabilities.

3.1.2.4.2 Search Engine

A Search Engine is a program that searches documents that contain keywords specified by user and returns list of resulting documents. A search engine contains a spider program that does the searching and an indexer program that reads resulting. It documents and creates an index based on the keywords contained in each document.

This includes geospatial-temporal (2, 3, & 4D) indexing and search capabilities.

3.1.2.5 Customer Relationship Management Tools

CRM refers to all aspects of interaction between an enterprise and it's customer. CRM includes customer data collection, centralized customer information database, sophisticated data analysis, customer-centric interaction, improving customer satisfaction.

This Tier maps to the FEA SRM Customer Services Type.

Includes map functionality and other geospatial analysis tools.

3.1.2.6 Rules Engines

A Rules Engine is an application module that enables creating, storing, modifying, and applying business rules. Rule Engine separates business rule from control logic, data storage, and user interface modules.

3.1.2.7 Geospatial Servers

3.1.2.7.1 GIS Server

The Geographic Information System (GIS) server comprised of bundled services that support the generation, revision, management, processing, and output of geospatial data. Consists of the server-side Geospatial Application Components comprising a GIS.

These server capabilities match up with the client-side capabilities listed in section 3.1.1.10.2.

3.1.2.7.2 Image Processing Server

The Image Processing System (IPS) server comprised of bundled services that support the generation, revision, management, processing, and output of geospatial image data. Consists of the server-side Geospatial Application Components comprising an IPS.

These server capabilities match up with the client-side capabilities listed in section 3.1.1.10.3.

3.1.2.8 Search Engine

A Search Engine is a program that searches documents that contain keywords specified by user and returns list of resulting documents. The search Engine is often used for document search of World Wide Web, file systems, and etc. A search Engine contains a spider program that does the searching and an indexer program that reads resulting documents and creates a index based on the keywords contained in each document.

Includes geospatial-temporal (2,3 & 4D) indexing and search capabilities.

3.1.2.9 Rules Engines

A Rules Engine is an application module that enables creating, storing, modifying, and applying business rules. Rule Engine separates business rule from control logic, data storage, and user interface modules.

This Tier maps to the FEA TRM Component Framework Business Logic Category.

3.1.3 Application Infrastructure Layer

The application infrastructure layer provides the technical services and components needed to manage and execute business and other application logic and to interact with end-users (via access and delivery channels) and/or with other service components.

3.1.3.1 Web Portal

Web portals are multi-part Web pages that provide a single, personalized Web-based user interface as the common entry point to multiple applications and optionally to multiple application clients. Web portals should have a hierarchical, topical directory, search engine service, and latest relevant news headlines. Example Web portals are www.yahoo.com and www.egov.gov.

This Tier maps to the FEA TRM Service Platform and Infrastructure Delivery Services Category.

3.1.3.1.1 Personalization

Personalization is a commonly implemented Portal service that allows the user to customize the content and functionality of portal pages to suit individual needs. An example of personalization is MyYahoo!

3.1.3.1.2 Pervasive Device

Pervasive Device support allows access to Portal services from diverse device interfaces. Typically the portal services are served as eXtensible Markup Language (XML) and gateway services format the content in the manner best suited to the target device.

3.1.3.1.3 Portal Content Management

Portal Content is frequently dynamic and/or stored in a database. Portal Content Management services perform retrieval and translation functions based on requirements of the user and of the user's personalization and device choice.

3.1.3.1.4 Wireless Portal

Specialized Portal products exist for use in the Wireless environment. These products include tools for reformatting “legacy” Web content for wireless transmission and display, as well as implementation of XML based presentation protocols.

3.1.3.2 Web Server and Plugins

A Web server provides the interface between end users using Web browsers and business logic or Web-based content. The Web server accepts and responds to requests for service, via HTTP, HTTPS, Lightweight Directory Access Protocol (LDAP), Network News Transfer Protocol (NNTP), FTP, and etc. Optionally, a Web server may also authenticate the client, via passwords or Public Key Infrastructure (PKI) certificates, establish an encrypted path to the client using HTTPS and enable access to restricted resources and services. Static HTML pages are accessed and transmitted directly by the Web server while more complex tasks are forwarded to application servers.

This Tier maps to the FEA TRM Service Platform and Infrastructure Delivery Services Category.

3.1.3.2.1 Web Server

The Web Server is the component that responds to content requests from the Browser, the Web server may obtain content directly from a file or may pass through the request to one of a number of backend services. Backend services may be implemented in a number of ways, through CGI, applets or servlets, or through components bound to the server through various plugin architectures.

3.1.3.2.2 Server Plug-ins

A server plug-in is generally statically bound to the Web server and may function in a number of ways: through scripting, through, control by external factors (say a time service or traffic camera) or by passing control parameters from the requestors Universal Resource Locator (URL). A typical example would be a charting plug-in that dynamically generates a stock chart based on external data, and a ticker symbol request passed from the browser to the server.

3.1.3.3 Application Server

An Application Server (AS) provides the execution environment for the business logic tier in a three- or n-tier software architecture. An application server is a server program or a group of programs running on a computer in a distributed network that provides the business logic and transactional processing for an application. The application server is generally viewed as the intermediary between a Web server and a database server, although it may interact with other applications servers also. The application server may closely integrate with Web server to translate HTML commands so databases can interpret them.

This Tier maps to the FEA TRM Service Platform and Infrastructure Delivery Services Category.

3.1.3.3.1 Open Standard AS

An “open standard” AS is one based on some form of an open standards based architecture. Generally, a J2EE based AS would be regarded as open in that multiple vendors conform to the

same published standard. The standard itself is not strictly open however in that it is controlled exclusively by a single vendor.

3.1.3.3.2 Proprietary AS

Proprietary AS also exists both in niche areas, and with major market share from major vendors.

3.1.3.3.3 Wireless AS

An AS specifically designed, or incorporating components designed for formatting and managing data for display on and interaction with a Wireless PDA or similar device.

3.1.3.4 Electronic Mail Server

An electronic mail (e-mail) service manages the exchange of text and other document-based data between a sender and one or more receivers. This service only addresses the message store(s) and interfaces. The e-mail clients used to read and/or create and send messages are considered to be enterprise applications. To exchange e-mail with outside of an enterprise, electronic mail server may be located in Demilitarized Zone (DMZ). Examples of electronic mail servers are Microsoft Exchange Server. An e-mail server provides SMTP, Post Office Protocol version (POP3), and/or Internet Message Access Protocol (IMAP) services. Example electronic mail servers are Sendmail, CC:Mail, and Microsoft Exchange Server.

This Tier maps to the FEA TRM Service Platform and Infrastructure Delivery Services Category.

3.1.3.4.1 IMAP Server

Internet Message Access Protocol (IMAP) allows a client to access and manipulate electronic data messages on a server; permitting manipulation of remote message folders, called “mailboxes”, in a way that is functionality equivalent to local mailboxes. IMAP also provides the capability for an offline client to resynchronize with the server.

3.1.3.4.2 POP3 Server

Post Office Protocol 3 (POP3) server is an email server that implements and supports use of the POP3 protocol for delivering email to clients.

3.1.3.4.3 MIME Server

An email server which implements the MIME standard(s) for receipt and delivery of non-ASCII email and attachments.

3.1.3.4.4 SMTP Server

An SMTP server represents a pure open standard based solution. SMTP servers may act as end point servers or as intermediate relay servers. SMTP has advantages of openness and wide compatibility, but has serious drawbacks from a security and an operational viewpoint. SMTP addressing may be trivially spoofed, and the protocol does not guarantee delivery or provide automatic notification of delivery.

3.1.3.4.5 Proprietary Server

Many proprietary E-Mail server solutions exist, most will interoperate with SMTP and all provide extensive lists of additional features addressing the shortcomings of SMTP. Most can only interoperate via SMTP however.

3.1.3.4.6 Email Gateway

An Email Gateway is a relay server that is capable of locally routing to named addresses within a local subdomain and that generally has filtering capabilities that allow enforcement of a variety of policies dealing with enclosures, message size and origin and destination.

3.1.3.4.7 Email Monitoring

Email monitoring – many organizations utilize e-mail monitoring to scan internal and internet e-mail to enforce organizational regulations and to prevent loss or compromise of sensitive information.

3.1.3.5 Collaboration Server

A Collaboration Service (CS) manages the exchange of e-mail, instant messages, and other data between a sender and one or more receivers and maintains shared calendars and other group collaboration resources. Examples of collaboration services are America On Line (AOL) IM, Microsoft IM, and WebEx Web Conference.

This Tier maps to the FEA TRM Service Platform and Infrastructure Delivery Services Category.

3.1.3.5.1 Wireless CS

A CS specifically designed, or incorporating components designed for formatting and managing data for display on and interaction with a Wireless PDA or similar device.

3.1.3.5.2 Desktop Video Conferencing Server

A server that manages the synchronous video and audio communications between two or more clients, often providing support for multicasting, video stream compression and/or stream translation into a different format.

3.1.3.5.3 Voice over IP Server

A server that manages the connection between two or more workstations capable of VoIP and provides connection related services.

3.1.3.5.4 Real-time Whiteboard Server

A server that provides the ability for two or more clients to edit, simultaneously and synchronously, a drawing (whiteboard) hosted on the server. Servers providing this service typically only send changes to the drawing to clients, limiting the amount of network traffic generated by the server and clients.

3.1.3.5.5 Instant Messaging Server

A server that manages and relays real-time, synchronous, text-based messages between two clients. These servers often support encryption and logging of messages and a feature related to

the client establishing a “virtual presence” whereby the server indicates to other clients if a client is currently logged on, active, or has set an “away message.”

3.1.3.5.6 Chat Room Server

A server that supports the real-time, synchronous, text-based communication between two or more clients whereby the clients post messages in real-time to the server, and all clients in the “chat room” receive the message automatically. Message receipt is based upon the client’s presence in the “chat room” rather than the client’s identity.

3.1.3.5.7 Facilitation Tools Server

Applications which assist one or more moderators, leaders or facilitators to focus the discussion, take votes and establish consensus based on public or anonymous discussion.

3.1.3.5.8 Distance Learning Server

A server hosting one or more tools which optimize collaboration in a virtual classroom setting between an instructor and one or more students. These tools typically include display of presentation or course content materials, the ability to take tests online, and tools which facilitate the interaction between the instructor and a student or students.

3.1.3.5.9 Information Visualization Server

Server-side software which takes data, formats it, and outputs a video or audio stream, for monitor(s), projector(s), speaker(s), which enable a user to view a data set in a variety of visual and audio formats. Information Visualization Servers are differentiated from Information Visualization Clients by the Server’s ability to drive multiple monitors, projectors, and/or speakers and the server’s ability to generate complex visualizations of massive, complex data sets, such as those generated by supercomputers, rapidly.

3.1.3.5.10 COP Collaboration Server

A CS for managing and monitoring shared COP/MSOP resources and the collaborative exchange of geospatial data.

3.1.3.5.11 Web Notification Service (WNS)

A service by which a client may conduct a dialog with one or more other services. This service is useful when many collaborating services are required to satisfy a client request, and/or when significant delays are involved in satisfying the request, which is often the case in the geoprocessing realm.

3.1.3.6 CRM/Help Desk Server

CRM tools and Helpdesk support tools enable an enterprise to assure timely and consistent service internal and external and external service users.

This Tier maps to the FEA TRM Service Platform and Infrastructure Delivery Services Category.

3.1.3.6.1 CRM Server

A CRM server may be client/server or Web based, typical features include support for:

- Searchable Knowledge Base
- Create, View, Update, and close support items
- Remote control capabilities
- Create, View, Update, and delete appointment entries
- Generate and review log entries
- View contact demographics and history
- Provide guided real-time ad hoc query capabilities against a customer database

3.1.3.6.2 Helpdesk Server

Helpdesk servers usually are a subset of CRM emphasizing trouble diagnosis, reporting and tracking. Helpdesk systems are focused on trouble tickets and systematic problem resolution.

3.1.3.7 Geospatial Server

Geospatial Servers specialize in dealing with geospatial data. Depending on vendor 'packaging', these may be available as a bundled set of related components, or as unbundled services.

3.1.3.7.1 GIS Server

The GIS server is comprised of bundled components that support the generation, revision, management, processing, and output of geospatial data. Consists of the server-side components comprising a GIS.

3.1.3.8 Geospatial Enterprise Services

The Geospatial Enterprise Server provides the means to publish, access, and process geospatial data via services that are accessible throughout the enterprise. These geospatial enterprise services are the building blocks for geospatial applications, and the means for non-geospatial applications to readily access geospatial functionality.

This category includes Location-Based Services (LBS) for wireless applications.

3.1.3.8.1 Data Discovery Service

Able to search for and locate desired data through open, standard publish-find mechanisms. Search requests may be defined in terms of geospatial-temporal, mathematical and statistical filters for discovering data and data relationships, and optionally storing the metadata results as a new data set.

3.1.3.8.2 Service Discovery Service

Able to search for and locate desired services through open, standard publish-find mechanisms. Search requests may be defined in terms of filters for discovering services and service-data relationships, and optionally storing the metadata results as a new data set.

3.1.3.8.3 Map Publication Service

Able to automatically generate and publish Maps of interest for inclusion in a plan, report, or other Geospatial Product, with select content and symbolization (map template). To produce a Map for inclusion in a word or graphic document.

3.1.3.8.4 Activity Report Service

Able to generate an Activity Report for any location-based activity.

3.1.3.8.5 After Action Report Service

Able to generate an After Action Report with the geospatial context of the root cause, status and recommendations pertaining to post-incident recovery operations.

3.1.3.8.6 Alert-Warning Report Service

Able to generate an Alert-Warning Report with information about a location-based alert or warning messages.

3.1.3.8.7 Emergency Declaration Report Service

Able to generate an Emergency Declaration Report with the geospatial extent and nature of an emergency.

3.1.3.8.8 Incident Report Service

Able to generate an Incident Report with information about a location-based incident message.

3.1.3.8.9 Location (Site) Report Service

Able to generate a Location Report with information about an HLS data object's location, related entities, and geospatial context. Example objects include geospatial feature, person, asset, conveyance, goods, cargo, device, etc.

3.1.3.8.10 National Security Special EVENT (NSSE) Report Service

Able to generate a NSSE for an EVENT.

3.1.3.8.11 Situation Report Service

Able to generate a Situation Report with the geospatial extent and nature of an operational situation.

3.1.3.8.12 Suspicious Activity Report Service

Able to generate a Suspicious Activity Report for a location-based suspicious activity.

3.1.3.8.13 Coverage Portrayal Service (CPS)

The CPS is chained to a Web Coverage Service (WCS) to convert geospatial coverage data (grid/image) to a map. The resultant map can be overlaid with data fetched from other servers for reference and orientation.

3.1.3.8.14 Web Map Service (WMS)

The means to render 2D maps. See 3.1.5.2.4.

3.1.3.8.15 Web Terrain Service (WTS)

The means to render 3D views of geospatial data. See 3.1.5.2.7.

3.1.3.8.16 Style Management Service (SMS)

The means to create, update and manage styles and symbols. The SMS must manage distinct objects that represent styles and symbols and provide the means to discover, query, insert, update, and delete these objects. Styles provide the mapping from feature types and feature properties and constraints to parameterized Symbols used in drawing maps. Symbols are bundles of predefined graphical parameters and predefined fixed graphic "images".

3.1.3.8.17 Geocoder/Reverse Geocoder Services

Able to determine geospatial coordinates, given an address (Geocoder), or determine address, given geospatial coordinates (Reverse Geocoder). A Geocoder transforms a description of a feature location, such as a place name, street address or postal code, into a normalized description of the location, which includes coordinates. A Geocoder Service receives a description of a feature location as input and provides a normalized address with coordinates as output. The feature location descriptions are any terms, codes or phrases that describe the features, and that are well-known to the Geocoder Service, such as a street addressing or postal coding scheme.

These services are very important across the HLS enterprise, as they enable enterprise users to exploit the geospatial-temporal context of the wide diversity of HLS business data that contain Location References, such as address, building name, census tract, etc. They are also key to correlating, integrating and fusing dissimilar data on the basis of geospatial-temporal characteristics.

3.1.3.8.18 Geolocate Service

The means to determine a location for a fixed or mobile object of interest (e.g., geospatial feature, person, asset, conveyance, goods, cargo, device, etc.) Mobile Objects must be equipped with GPS, Radio Frequency ID (RFID), and/or other position determination technologies.

3.1.3.8.19 Gateway Service

The Gateway Service determines the geospatial position of a known mobile terminal from a wireless network. Position is expressed in geographic coordinates. Mobile terminals (cell phones, PDAs, etc) must be equipped with GPS or some other position determination technology. An important service used in LBS, in the wireless realm.

3.1.3.8.20 Route Service

Able to determine (or fetch a predetermined) route and navigation information for autonomous or semi-autonomous navigation between two or more points on a network. An important service used in LBS, in the wireless realm.

3.1.3.8.21 Navigation Service

An enhanced version of the Route Service, which determines routes between two or more points with enhanced navigation information. An important service used in LBS.

3.1.3.8.22 Monitoring Service

Able to determine (or fetch a predetermined) location/time/identity/status/activity series for a Location.

3.1.3.8.23 Tracking Service

Able to determine (or fetch a predetermined) location/time/velocity/identity/status/activity series (track) for a mobile object (e.g., persons, goods, assets, devices, etc.)

3.1.3.8.24 Weather Service

The means to access weather conditions for an area of interest or location for a specified time period.

3.1.3.8.25 Traffic Service

The means to access traffic information regarding incidents and/or conditions for a specified area of interest, road, or road segment, for a specified time period.

Also, the means to access traffic information regarding incidents and/or conditions for a designated route (that has been determined by a Route Service or Navigation Service) for a specified time period.

3.1.3.8.26 Model Access Service

Able to determine and access the extent and nature of a Toxic Dispersion Model (e.g., plume) for a chemical or biological event in air or water. The model output is characterized by features.

“Toxic Dispersion” refers to the effects of introducing a chemical, radioactive or biological agent into the atmosphere or a water supply at a point source. Simulation is employed to understand the effects of a toxic agent within its medium. The objective of the simulation is to ascertain contamination levels in a geospatial-temporal context, and thus, to understand the nature of toxic

plumes, danger zones, warning zones, and related features, and to be able to view or analyze the output from a simulation run in conjunction with any other geospatial data, e.g., as plumes or danger/warning zones within a geospatial decision support tool.

Also, the ability to determine and access weather, hydrographic and other environmental parameters through environmental simulation. The simulation output is characterized by observations.

3.1.3.8.27 Geoparser Service

Geoparsing refers to the capability to scan and parse a textual document, identifying key words and phrases that have geospatial-temporal context. A Geoparser Service works in the context of two bodies of information: a reserved vocabulary (a dictionary of place names, a gazetteer or a directory of points of interest (POIs) and a text source (e.g., a newspaper or cable.). The Geoparser returns all occurrences of the use (in the text source) of any term in the reserved vocabulary. Each occasion establishes a geolinks (geospatial/temporal-aware hyperlink) between text terms and the geospatial location associated with the reserved word. That result is an annotated text document with geolinks.

3.1.3.8.28 Sensor Planning Service (SPS)

A service by which a client² can determine sensor collection feasibility for a desired set of collection requests for one or more mobile sensors/platforms, or the client may submit collection requests directly to these sensors/platforms.

3.1.3.8.29 Sensor Collection Service (SCS)

A SCS is a service by which a client can obtain observations from one or more sensors/platforms (can be mixed types). Clients can also obtain information that describes the associated sensors and platforms.

3.1.3.8.30 Sensor Alert Service (SAS)

The SASs produce alert messages when given observation conditions are met by a sensor. Provides the means for client services/users to specify and register user profiles that contain user information, applicable sensors/observations, alert conditions (e.g., maximum/minimum values), and alert actions (what happens if conditions are met). Also, the means for client services/users to update user profiles. Clients are able to control the nature of alerts. For example, a client is able to activate/deactivate an alert capability. Also provides the means to support push/pull capabilities, e.g., to wait for observation input from associated sensors (for on/off sensors like a detector), or to actively poll for (current/historical/predicted) sensor observations.

3.1.3.9 Transaction Processing Servers

This Tier maps to the FEA TRM Service Platform and Infrastructure Delivery Services Category.

² Client, as used here, means any software component or application that invokes a Web service.

3.1.3.9.1 TP Manager

A TP Manager manages routing and transaction processing of a service request. It manages global transactions and coordinates transaction resolution and failure recovery.

3.1.3.9.2 Transaction Server

Transactions contain a datum or data along with an associated command to be performed on the data. Transaction Servers verify that the command completed successfully on the data before the transaction completes. Transactions that do not complete successfully may be “rolled back” to a prior state.

3.1.3.9.3 OLTP

On-Line Transaction Processing (OLTP) is a class of software program that facilitates and manages transaction-oriented applications; typically for data entry and retrieval transactions in a number of industries, including banking, airlines, mail order, supermarkets, and manufacturers.

3.1.3.10 Document Management Server

A server which stores metadata concerning documents and supplies one or more document management functions including a library system, document routing, document searching and indexing. More sophisticated Document Management Servers provide support for the management of additional MIME file types.

3.1.3.10.1 Library System

A library system is a subset of a full document management system that emphasizes document access, cataloging, and search capabilities.

3.1.3.10.2 Document Routing

Document routing is a subset of document management focused on the workflow of a document. A routing system tracks the whereabouts of a real or virtual (checked out) document, and automates the handoff of a document from one recipient or process to the next.

3.1.3.10.3 File Sharing

Document management can include simple File Sharing with manual or automated search for document location.

3.1.3.10.4 Search and Indexing Tools

Tools that enable the discovery of data within text files in a library or other document store. At minimum, these tools support keyword and Boolean keyword searches. More sophisticated tools allow searches within structured documents. Indexing tools provide for the automated extraction of keywords and phrases from documents and may be used to generate human searchable indexes such as KICK indexes, or in developing indexes for other search engines.

3.1.3.10.5 Graphic Image Management

Software and standards for managing additional MIME types related to graphic images and other forms of “rich” media in a document management framework.

3.1.3.11 Remote Desktop Server

The server-side software and standards for enabling one or more remote clients to interact with the server as if the client was local to the server, through a GUI or “green screen” interface.

3.1.3.11.1 Microsoft Graphical Desktop Environment

The software and standards required to enable one or more clients to access a Microsoft Windows GUI interface on a remote server.

3.1.3.11.2 UNIX Graphical Desktop Environment

The server-side software and standards required to enable one or more clients to access a GUI interface on a remote UNIX server. X-client is the standard software and protocol suite for accomplishing this.

3.1.3.11.3 Telnet

The server-side software and protocols for allowing one or more clients to establish a telnet or other shell type connection to the server, in a manner that allows them to run, access, or administer applications or data on the server or the server itself.

3.1.4 Data Interchange/Integration Layer

The data interchange and integration layer consists of the set of services, interfaces and protocols that enable the exchange of data among technical services and components. Vendors and the trade press variously refer to the products in this area as “middleware,” “enterprise application integration” (EAI) software, “integration software,” or, most recently, “integration buses” and “integration platforms.” The services are meant to ease the integration of heterogeneous systems at the interface, syntactic, and even semantic levels. These services will be very important to DHS as it transitions from the myriad “legacy” systems to a more uniform target technical environment.

3.1.4.1 Inter-Application Services

Enterprise Applications are complex, scalable, distributed, component-based and mission-critical business applications. Enterprise Applications may be deployed on heterogeneous platforms across enterprise intranet, extranet, and the Internet. They are data-centric and have Web-based interfaces.

This Tier maps to the FEA TRM Service Interface and Integration Category.

3.1.4.1.1 EAI Broker

Integration broker is a Web service-based middleware that move data from a source system or service to a destination system or service, and possibly transform it, based on routing rules. A broker may move data between internal systems or to and from external systems. Integration Brokers use hub-spoke based frameworks to integrate information efficiently and effectively. The communication between integration broker and applications is in the form of messages.

3.1.4.1.2 EAI Server

An Enterprise Application tool that integrates core business systems with multiple internal and external applications. The EAI Server supports the integration process, integration operational environment, and minimal programming during integration.

3.1.4.1.3 EAI Adaptors

Software connecting two applications that were not originally designed to communicate with each other. Integration Adaptors include service adapter and event adapter. Server adapter responds to message request and invokes a specific function in the underlying Enterprise information system (EIS). Event adapter propagates information from EIS to application server. The request and response messages are in standard XML format.

3.1.4.1.4 Geospatial Information Broker

A key component used in moving geospatial data between systems. Involved in data sharing and collaboration operations in support of the COP and MSOP. Involved in Geospatial Data Rollup (GDR) Operations.

3.1.4.2 Web Services

Web Services is a Web-based service that facilitates communications between software applications in a data language. The communications of Web services are implemented in standard Internet protocols, such as HTML, SMTP, FTP; XML for data tagging, WSDL for meta-data format, SOAP for data access, UDDI for service discovery are Web Services components.

This Tier maps to the FEA TRM Service Interface and Integration Category.

3.1.4.2.1 Service Discovery

Service Discovery is a process for organizations to find each others to conduct business. Universal Description, Discovery, and Integration (UDDI) is the standard protocol for service discovery.

3.1.4.2.2 Service Access

Service Access is the interface to access Web services. Simple Object Access Protocol is the standard protocol. Service access should be platform, and transport protocol independent.

3.1.4.2.3 Service Description

The capabilities required to describe accurately and fully a web service in a format that enables internal and external consumers to consume the information and determine if the web service fulfills their requirements.

3.1.4.2.4 Service Inspection

The capabilities required to determine if the web service is functioning correctly.

3.1.4.2.5 Service Publishing

The capabilities required to post the description of a web service to a centralized repository in a format that allows internal and external consumers to access and use the web service.

3.1.4.2.6 Service Security

The capabilities required to ensure that the web service is used in a secure manner, and that messages passing between entities as part of the web service are secure.

3.1.4.2.7 Service Semantic Interoperability

Fully autonomous service interoperability is only possible when clients can locate and access services on-the-fly through publish-find-bind-orchestration patterns that subscribe to well-known service semantics. In particular, the semantics of the request-response message pairs must be well-known between client and service. A Service Information Model (SIM) is required as a general container model for the common semantic framework associated with service description and access.

Service semantic interoperability is made possible by having each Community of Interest (COI) develop standards for the semantics of shared services. Standards are needed for: 1) Service Parameter Dictionaries, which are exposed through registry services, and 2) Semantic Service Profiles (SSP), which define the common semantic framework associated with service description, choreography and orchestration, and also are exposed through registry services. This supports autonomous publish-find-bind-orchestration operations through Geospatial Semantic Services.

Further, within the domain of geospatial, the semantics of each service interface must be well-known. Thus, each geospatial service component must have a well-known, published SIM and SSP Profile. This supports autonomous publish-find-bind operations through Geospatial Semantic Services.

3.1.4.3 Inter-application Messaging Services

Messages are specially formatted data exchanged between applications. Messaging service is the process of client-program exchange messages with a messaging server. Messaging service can either be point-to-point or publish/subscribe. Messaging is asynchronous. Heterogeneous programs, written in different languages, running on different platforms, can communicate through messaging server via common messaging format and protocol.

This Tier maps to the FEA TRM Component Framework Data Interchange Category.

3.1.4.3.1 Message Broker

A Message Broker is a middleware program that translates a message from the sender's formally defined message format to the receiver's formally defined message format. A Message Broker may perform message routing and may utilize Message-oriented Middleware.

3.1.4.3.2 Message-oriented Middleware

Message-oriented middleware (MOM) is software that resides in both portions of a client/server architecture and typically supports asynchronous calls between the client and server applications.

Message queues provide temporary storage when the destination program is busy or not connected.

3.1.4.3.3 Location Based Messaging Broker

The means to support routing and processing (e.g., translation) of location-based messages (messages with embedded geospatial elements). Location-based messages include alerts, after action reports, warnings, emergency declarations, location reports, situation reports and NSSE Reports.

The Location Organize Folder (LOF) is a standard message container model for capturing multimedia data in a geospatial context. It is based upon eXtensible Markup Language (XML) and Geography Markup Language (GML).

3.1.4.3.4 Electronic Data Interchange (EDI)

The EDI is a set of published and standardized formats in exchange of business data among networked computers. The EDI prescribe the formats, character sets, and the data elements used in business documents, such as purchase orders and invoices. The EDI standard is technology independent. An EDI document can be transmitted via dial-up modem, or Internet. The format of EDI document enables same data on paper and in electronic form. An EDI Gateway provides an interface to legacy value-added EDI networks.

3.1.4.3.5 Electronic Funds Transfer

Electronic Funds Transfer (EFT) (also Electronic Money or Digital Money) is form of cash or transactions over computer networks in a secure and trust worth manner. It sometimes refers to the technologies such as cryptography, enabled the form of cash or transaction.

3.1.4.4 Data Exchange/Delivery

This Tier maps to the FEA TRM Component Framework Data Interchange Category.

3.1.4.4.1 Wireless Data Exchange/Delivery

This category defines standards and protocols for exchange and delivery of data in the wireless environment.

3.1.4.4.2 Structured Data Tagging

Structured Data Tagging is a way to associate a data item with data's property in a hierarchical categorization. XML is a standard structured data tagging language. Data tagging facilitates information sharing among applications in an internet Web services environment.

GML is the standard language for representing geospatial data over the Internet.

3.1.4.4.3 File Transfer

The following standard types are applicable to this layer. This is a minimum set and is responsive to the standards specified in the FEA TRM.

- Data Transformation
- Data Format

Should support the means to transfer geospatial data in well-known data exchange formats, and transform these data, if necessary.

3.1.4.4.4 Data Semantic Interoperability

Open, robust data interoperability is only possible when clients can locate and access data on-the-fly through publish-find patterns that subscribe to well-known data semantics. In particular, the semantics of geospatial metadata and data must be well-known between client and data access service.

Data semantic interoperability is made possible by having each COI develop standards for the semantics of data they share. Standards are needed for: 1) Data Dictionaries, which are exposed through registry services, and 2) Semantic Data Profiles (SDP), which define the common semantic framework associated with data description and access, and also are exposed through registry services. This supports autonomous publish-find operations through Geospatial Semantic Services.

3.1.4.5 Business Process management

The capabilities required to monitor and manage the current state of a business process and elements within the process as well as to monitor and manage the health and efficacy of the process as a whole.

3.1.4.5.1 Workflow

The tools, protocols and software necessary to manage the transfer of data between defined roles in a business process, require those actors to act according to those roles, and pass the data on to the next actor in accordance with rules defining the business process.

This should support the means to invoke, monitor, and report on workflows that involve geospatial applications and services.

3.1.4.5.2 Business Activity Monitoring

The tools, protocols, and software required to monitor the current state, health, and/or efficacy of a business activity or business process.

This should support the means to invoke, monitor, and report on workflows that involve geospatial applications and services.

3.1.4.6 Semantic Interoperability Services

Fully autonomous business, service and data interoperability is only possible when clients can locate and access business, service and data on-the-fly through publish-find-bind-orchestration patterns supported by services that utilize well-known business, service and data semantics.

3.1.5 Data Management Layer

The data management layer is concerned with defining, logically storing, and retrieving data in all forms: structured, unstructured and semi-structured. Physical data storage is part of the Platform Services tier.

3.1.5.1 Enterprise Reporting Tools

Enterprise Reporting Tools support the capability of accessing all of the information assets in the enterprise to allow the enterprise to gain a better understanding of its business by putting critical information in the hands of all those who need it – employees, managers, partners, and customers.

3.1.5.1.1 Report Generator

A Report Generator enables specification of report format, retrieval of data into the report from a data source, and display and print of the formatted report.

3.1.5.2 Data Access Services

Data Access Service is middleware designed to provide direct access to enterprise data regardless location and format of data. The SQL is an accepted industry standard data access interface to relational databases or other databases. The data access service consists of client, data server, and Data Management System Interface (DMSI). Open Database Connectivity (ODBC) is widely used client interface.

This Tier maps to the FEA TRM Service Interface and Integration Category.

3.1.5.2.1 Database Access Middleware

Software and standards that provide uniform or simplified access to data stored in a variety of repositories through a standard interface.

3.1.5.2.2 Digital Rights Management

Digital Rights Management Services provide secure, managed access to geospatial data provided by private providers/stewards for mission-critical HLS business activities. This is crucial for operations that involve Critical Infrastructure and Key Assets.

3.1.5.2.3 Gazetteer Service

The Gazetteer Service is able to access a Gazetteer, which is a directory of well-known places and their locations. It generally consists of point features. A Gazetteer Service is a network-accessible service that retrieves one or more features, given a query (filter) request. This filter request must support selection by well-known feature properties. Queryable feature properties include, but are not limited to, feature type, feature name, authority, or identification code. Each instance of a Gazetteer Service has an associated vocabulary of identifiers. Thus, a Gazetteer Service may apply to a given region, such as a country, or some other specialized grouping of features. The returned features will include one or more geometries expressed in a well-known Coordinate Reference System.

3.1.5.2.4 Web Map Service

A Web Map Service (WMS) is able to access vector and raster data and render it in the form of a map for display (combines access and portrayal). Independent of whether the underlying data are features (point, line and polygon) or coverages (such as gridded digital terrain model or images), the WMS produces an image of the data that can be directly viewed in a web browser or other picture-viewing software. A WMS labels its data as one or more “Layers,” each which is

available in one or more “Styles.” Upon request a WMS makes an image of the requested Layer(s), in either the specified or default rendering Style(s). Typical output formats include Portable Network Graphics (PNG), Graphics Interchange Format (GIF), Joint Photographic Expert Group format (JPEG), and Tagged Image File Format (TIFF).

3.1.5.2.5 Web Coverage Service

Able to access geospatial coverage data (e.g. imagery and DTM). The WCS supports the networked interchange of geospatial data as “coverages” containing values or properties of geographic locations. Unlike the Web Map Service, which filters and portrays spatial data to return static maps (server-rendered as pictures), the Web Coverage Service provides access to intact (unrendered) geospatial information, as needed for client-side rendering, multi-valued coverages (such as multi-spectral images and terrain models), and input into scientific models and other clients beyond simple viewers.

3.1.5.2.6 Web Feature Service

The Web Feature Service (WFS) supports the query and discovery of geographic features (represented in vector form). In a typical Web access scenario, WFS delivers GML representations of geospatial features. Clients (service requestors/consumers) access geographic feature data through a WFS by submitting a query for just those features that are needed for an application. The client generates a request and posts it to a WFS server on the Web. The WFS instance executes the request, returning the resulting geographic features to the client encoded in GML. A GML-enabled client can manipulate or operate on the returned geographic features.

3.1.5.2.7 Web Terrain Service (WTS)

The WTS extends the WMS interface to allow the access and portrayal of three dimensional geospatial data. This service can be exploited to perform tasks such as terrain analysis, mission planning, and fly-throughs.

3.1.5.2.8 (Location) Directory Service

The (Location) Directory Service provides access to online directories of persons, places, products and/or services (e.g., Yellow/White/Green/Blue Pages, Restaurant/Travel/Entertainment Guides, Community Services, etc). This service is ordinarily used to find the location of a *specific* or *nearest* person, place, product and/or service. It is an important service used in LBS.

3.1.5.2.9 Image Archive Service

The Image Archive Service accesses archived images. It makes use of WCS (see 3.1.5.2.5) and Image Catalog Service (see 3.1.5.3.1).

3.1.5.2.10 Web Annotation Service

The Web Annotation Service is a specialized WFS that accesses map/image annotations. It is based upon the XML for Image and Map Annotation (XIMA), which defines an XML vocabulary to encode annotations on imagery, maps, and other geospatial data. This vocabulary draws on the GML to express the positions of these annotations in geographic (real world) or

image-pixel coordinates, and to associate each annotation with the geospatial resource(s) it describes. The XIMA encoding is useful for any activity that requires linking or tagging geospatial data in order to present and discuss it with others, to make joint decisions, or to communicate spatially.

3.1.5.3 Data Cataloguing and Registration Services

This technical component contains the functions required to record and describe the attributes of a data set, and expose that data set for use by other programs.

3.1.5.3.1 Web Registry Service

The Web Registry Service (WRS) provides a common mechanism to classify, register, describe, search, maintain and access information about geospatial *resources* available on a network. Resources are network addressable instances of typed data or services. Types of registries are differentiated by their role such as registries for cataloging geospatial resource types (e.g., types of geographic features, coverages, sensors, symbols, services, etc), online data instances (e.g., geospatial and image datasets and repositories, application schema, and symbol-style libraries), and online instances of services.

3.1.5.3.2 Catalog Service

The Catalog Service defines common information models and standard operations that allow applications and services to interact with registry instances, regardless of their role or content, in order to discover, access and manage geospatial resources (data and services). Specialized Catalog Services may exist for specific data classes, e.g., an Image Catalog Service (ICS).

3.1.5.4 Metadata Management Services

The software and standards for accessing, modifying, organizing and indexing metadata. This can include managing multiple metadata formats, integrity and security rules, and managing the metadata's location within a distributed system. Metadata services also enable end users/applications to define and obtain data that are available in the database.

3.1.5.5 Data Query Tools

Query tools are a category of tools capable of generating ad hoc queries to a database and dealing with the resultant output. The simplest tools in this category are simply command line style tools capable of sending SQL queries to a database engine. Higher-level tools use wizards or graphical interfaces and diagramming tools to construct queries.

This Tier maps to the FEA TRM Service Interface and Integration Category.

(See Geospatial Data Access above)

3.1.5.5.1 Spatial Query

Spatial Query provides the service to query, analyze, and map data in support of decision-making.

3.1.5.5.2 Non-Spatial Query

A Non-Spatial is a query that does not include the use of spatial data or map data.

3.1.5.6 Data Transformation Services

A data transform service (DTS) provides mechanisms to transform data from disparate data into meaningful information. Transformations may be accomplished in real- or near-real time or may be done off-line or in the background using extract/transform/load products. In addition to providing integration services, this type of service is also used to extract operational data and populate operational data stores, data marts and data warehoused for decision support and other analytical purposes.

This Tier maps to the FEA TRM Service Interface and Integration Interoperability Category.

3.1.5.6.1 Coordinate (and Unit) Transformation Service (CTS)

The ability to transform geospatial data between different coordinate reference systems, datums and units. Support map re-projections on-the-fly for map viewing, as well as permanent coordinate transformations that result in a transformed output data set.

3.1.5.6.2 Geospatial Data Exchange and Transformation Services

The ability to import/export, manipulate and convert geospatial data, through standard data exchange and transformation services. Formats include GML, MapInfo, ESRI, Intergraph, etc

3.1.5.6.3 Topology Service

The ability to detect topology errors (e.g., overshoots and undershoots of common linear and polygonal features within a definable tolerance), automatically correct errors, if possible, and define topological relationships between connected/collocated linear, polygon, and point features.

3.1.5.6.4 ETL

Software and standards for extracting data from one data source, transforming it into another format and loading it into a target data source.

3.1.5.7 Database Management System (DBMS)

A DBMS is a suit of software programs designed to manage a database; it serves as an interface between database users and database, carrying out users commands to database and deliver feedbacks from database to users.

This Tier maps to the FEA TRM Service Interface and Integration Category.

3.1.5.7.1 Enterprise DBMS Mainframe

Very large scale DBMS implemented on a traditional mainframe (IBM compatible) platform.

3.1.5.7.2 Enterprise DBMS UNIX

Very large scale DBMS implemented on a Unix OS platform.

3.1.5.7.3 Departmental UNIX DBMS

A small to medium scale DBMS implemented on a UNIX or Linux Operating System.

3.1.5.7.4 Enterprise x86 Server DBMS

Large scale DBMS implemented on the Windows Operating System.

3.1.5.7.5 Departmental x86 Server DBMS

A small to medium scale DBMS implemented on the Windows Operating System.

3.1.5.7.6 Non Relational

Any non-relational data base management system

3.1.5.7.7 Native Spatial DBMS

The Enterprise DBMS should provide native support for storing and managing all types of geospatial data. Capabilities should include geospatial indexing, open SQL query support with geometry and topology operators, geospatial analytics, geospatial data mining, coordinate transformation and linear referencing.

3.1.5.8 Data Formats

This Tier consists of formats for storage and transmission of enterprise data.

This Tier maps to the FEA TRM Service Interface and Integration Category.

3.1.5.8.1 Audio Format

Data formats for audio information

3.1.5.8.2 Computer Graphics Format

Digital image formats.

3.1.5.8.3 Calendar Format

The specification and format for the transmission of calendar information, particularly from one calendar agent to another in a groupware application or between groupware applications.

3.1.5.8.4 Print Format

Specifications, languages and formats for communicating with printers.

3.1.5.8.5 Symbology Format

The format and specifications for the creation of barcodes and map graphics.

3.1.5.8.6 Time Format

The format and specifications for the encoding and transmission of time data, particularly across a network.

3.1.5.8.7 Video Format

Formats and specifications for the encoding, storage and playback of video information.

3.1.5.8.8 Voice Over IP Format

The format(s) for transmitting voice conversations, especially using a telephone or telephone-like device, over an IP network.

3.1.5.8.9 Message Format

The formats and specifications for transmitting messages between applications.

3.1.5.8.10 Geospatial Data Format

Data formats for the storage, retrieval, and use of geographic information and geographic information data sets.

3.1.5.8.11 XML Schema

An XML DTD which defines the acceptable format, tags, and structure of an XML document for a subject area.

3.1.5.8.12 Wireless Format

A data format which is optimized for transmission to broadband and narrowband wireless devices. These formats are often characterized by extensive use of error checking and correction.

3.1.5.9 Data Models

This Tier consists of the standard data models that support the interoperable exchange of data.

3.1.5.9.1 Simple Features

A standard model that supports storage, retrieval, query and update of simple geospatial features. A simple feature may have both geospatial and non-geospatial attributes.

3.1.5.9.2 Coverages

A standard schema that supports storage, retrieval, query and update of coverage data. Must handle a wide range of imagery and grid data from raw to thematically classified image/grid coverages.

3.1.5.9.3 Registry Information Model

The RIM provides a blueprint or high-level schema for the content associated with the Catalog/Registry Service. It specifies the type of metadata that is stored in the registry as well as the relationships among metadata Classes. The Registry Information Model defines what types of objects are stored in the Registry and how stored objects are organized in the Registry.

3.1.5.9.4 Service Information Model (SIM)

The content model for describing Geospatial Web Services. Shares many capabilities and characteristics of more generally defined Web Services, but also has features unique to geospatial needs. SIM defines the semantics and structure for packaging metadata about services necessary for a client to make use of (i.e., “consume”) a service. SIM is a vocabulary comprised of several parts for describing different aspects of a service.

3.1.5.9.5 Observations & Measurements

The content models and encodings for observations and measurements made by sensors or humans. Expressed in GML.

3.1.5.9.6 Sensor Model Language (SensorML)

SensorML provides a schema for defining the geometric, dynamic, and observational characteristics of a sensor. Sensors are devices for the measurement of physical quantities. The purpose of SensorML is to encode general sensor information in support of data discovery, support the processing and analysis of the sensor measurements, support the geolocation of the measured data, provide performance characteristics (e.g. accuracy, threshold, etc.), and archive fundamental properties and assumptions regarding sensor.

3.1.5.10 Data Encoding

The means to encode data in standard interoperable structures and schema.

3.1.5.10.1 Geography Markup Language

The Geography Markup Language (GML) is an XML encoding for the transport and storage of geographic information, including the geometric, topologic and other schema-specific properties of geographic features. Supports the ability to handle complex properties. The means to represent geospatial data expressed as any Geospatial Entity Type or collection of types, including Location, Feature, Coverage, Route, Observation, Structure and Mobile Object.

3.1.5.10.2 Observations and Measurements Language

The means for encoding observations and measurements made by sensors or humans.

3.1.5.10.3 Sensor Model Language

The means for encoding sensor parameters.

3.2 Service Platforms Tier

3.2.1 Computing Platform Layer

The computing platform layer includes the hardware and software, both specialized and general purpose, which enables the technical services and components in the layers of the Services Framework. Computing platforms are application and service-neutral configurations of computer and peripheral hardware and operating system software. “Servers” and “Services” of the various types described in the document are hosted on these platforms.

3.2.1.1 Operating System

An operating system provides a set of basic software services needed to host applications, servers and services. An operating system schedules tasks, manages memory, handles the interface to peripheral hardware, and presents an interface to user. Operating Systems may be dependent on specific computer hardware or may be capable of being used on a wide range of computer hardware from different vendors.

This Tier maps to the FEA TRM Service Platform and Infrastructure Hardware/Infrastructure Category.

3.2.1.1.1 Mainframe Enterprise Server OS

A Mainframe OS is generally a proprietary operating system that controls multiple user processes in one or more Central Processing Units (CPU). A Mainframe OS is characterized by support of large numbers of processes and extremely high input/output bandwidth..

3.2.1.1.2 Unix Enterprise Server Clustering

Unix is a proprietary but open source operating system utilized on a wide range of hardware platforms. Unix High performance computing in the Unix environment may be obtained by clustering multiple computer systems on a high speed network, allocating processes and sharing virtual memory and other resources among systems and processes. Both proprietary, hardware vendor specific, and open, OS specific solutions exist and are included in this category.

3.2.1.1.3 Unix Enterprise Server OS

High-end Unix Enterprise Servers generally are based on proprietary hardware and utilize a manufacturer specific Unix OS with extensions to support data center management, manufacturer specific multiprocessor support, etc. A Unix OS supports one or more sets of standard interfaces; Government owned systems are generally required to support the Portable Operating System Interface (POSIX) standard. Open source Unix OS flavors (including Linux) are just beginning to be utilized in this area.

3.2.1.1.4 Unix Departmental OS

Unix Departmental Servers generally are based on proprietary hardware and may require a manufacturer specific Unix variety. Open source Unix OS flavors (including Linux and BSD flavors) are also widely utilized in this area.

3.2.1.1.5 x86 Enterprise Server OS

An operating system, using a x86 processor architecture, which is deployed to support a large number of users, who may be contained within one organizational unit, but which typically span multiple organizational units.

3.2.1.1.6 x86 Departmental Server OS

x86 Departmental Servers as a class are based on generic x86 (Intel, Advanced Micro Devices (AMD) or similar processor family) hardware and as such may utilize a proprietary or open source Unix OS flavor (including Linux and BSD flavors) or other proprietary server OS (including Windows Server OS). x86 Servers are typically utilized on LANs and may support specific features of a Network Operating System (NOS).

3.2.1.1.7 Desktop OS

The operating software for a standalone PC, such as an IBM Compatible PC, UNIX or Mac desktop, notebook or laptop.

3.2.1.1.8 Handheld OS

The operating software for a handheld standalone computing device, such as a Palm or a Microsoft Pocket PDA (personal digital assistant).

3.2.1.1.9 Wireless Platform OS

The operating system for devices for which the primary mode of communication is intended to be via a broadband or narrowband wireless, typically non-IP, network. These devices are usually designed to be portable and have limited processing and battery power.

3.2.1.2 Computer Hardware

Computer hardware consists of the physical computer equipment that runs the software required to provide services. Those equipments include CPU, main memory, storage, and input/output devices.

This Tier maps to the FEA TRM Service Platform and Infrastructure Hardware/Infrastructure Category.

3.2.1.2.1 Mainframe Enterprise Server

A Mainframe Enterprise Server is the highest capacity category of computer used by an enterprise. Salient characteristics are massive internal memory, high-capacity external storage, fast high-throughput I/O, high reliability, and high-quality technical support. Mainframes are typically fully proprietary in hardware and in operating software. A Mainframe Enterprise Server may employ enterprise level storage architectures, which may be shared across a data center among both mainframe and Unix servers.

3.2.1.2.2 UNIX Enterprise Server

A Unix Enterprise Server is typically characterized by proprietary hardware and open software. An Enterprise Server is typically operated in a data center by dedicated operators and administrators utilizing high level management and support tools. Data center servers are typically the most reliable category of server and provide services based on SLAs. A Mainframe Enterprise Server may employ enterprise level storage architectures, which may be shared across a data center among both mainframe and Unix servers.

3.2.1.2.3 UNIX Departmental Server

A Unix Departmental Server is typically characterized by use of open system software (this may include Linux). Hardware may be proprietary or generic x86 architecture. Typical use is as an application or Web server. A Departmental Server is typically operated in a local office by operators with other collateral responsibilities. A Departmental Server may be locally administered or may be subject to remote administration. Departmental servers are typically controlled by and responsive to local management.

3.2.1.2.4 x86 Enterprise Server

A high-end server which uses processors based on the x86 architecture. These servers contain multiple processors, typically four or more, are quite fault tolerant, and usually host large, multi-user applications.

3.2.1.2.5 x86 Departmental Server

An x86 Departmental server is characterized by generic x86 hardware and Windows server software. Typical use is as a file and print server. An x86 Departmental Server is typically operated in a local office by operators with other collateral responsibilities. A Departmental Server may be locally administered or may be subject to remote administration. Departmental servers are typically controlled by and responsive to local management.

3.2.1.2.6 CAD/3D/Virtual Reality Workstation

A CAD Workstation is a high-end proprietary or x86 based workstation used for Computer Aided Design tasks. CAD workstations may be UNIX or Windows based and typically are characterized by large memory, multiple large screen video, and special input and output devices such as tablets and plotters.

3.2.1.2.7 Geospatial Processing Workstation

A Geospatial Processing Workstation is a high-end workstation dedicated to GIS, Image Processing and other demanding geospatial processing tasks. Geospatial Processing workstations may be Unix or Windows based. They typically are characterized by large memory, large screen video, and massive disk storage.

3.2.1.2.8 Scientific Workstation

A Scientific Workstation is a high-end proprietary or x86 based workstation dedicated to analysis tasks. Scientific workstations may be Unix or Windows based. They typically are characterized by multiple processors, large memory, large screen video, and massive disk storage. Scientific workstations are typically used on multiple tasks..

3.2.1.2.9 Desktop Computer

A Desktop Computer or personal workstation is a computer small enough to fit on top of a office desk. In the DHS environment, this is an x86 architecture device. A desktop computer normally participates on a LAN, sharing resources on LAN servers. A desktop computer may also support standard local devices through standard interfaces.

3.2.1.2.10 Laptop Computer

A laptop computer is a computer that can be fit into a suitcase and carried around during traveling. It has a bulletin display and is powered by battery and AC. May have built in peripheral devices, such as CD-ROM drive, keyboard, trackball or touch pad, internal modem, wired wireless network interface card, USB interface, serial interface, and etc. In the DHS environment this is typically

3.2.1.2.11 Tablet Computer

A tablet computer is a personal computer that has an input method of either handwriting with a stylus or a foldable keyboard. The intention of the tablet computer is to use it as user's primary computer and note taking tool.

3.2.1.2.12 Handheld Computer

A handheld computer is a computer that can conveniently be stored in a pocket and used while the user is holding it. Wireless Mobile Hardware

3.2.1.2.13 Wireless Mobile Hardware

Wireless Mobile Hardware is hardware with a mobile application and wireless platform.

3.2.1.2.14 Graphics Workstation

A graphics workstation is a computer which is optimized for the editing of multiple types of media, particularly graphic images. These computers are characterized by large amounts of RAM, large screens for graphic editing, and often use alternative input devices, such as drawing tablets, for image editing.

3.2.1.3 Enterprise Storage

A storage system is a combination of software and hardware being tailored and specialized to disk storage management and to the storage demands of multiple hosts in order to enhance reliability availability, scalability and performance.

This Tier maps to the FEA TRM Service Platform and Infrastructure Database/Storage Category.

3.2.1.3.1 File System

A file system is a component of an operating system that defines the way that files are named, stored, retrieved, organized, and located. File system often uses hierarchical directory to organize files and uses path to locate files.

A file server provides for the physical storage of data in a file system. A file system is an element of an operating system and may be local to an instance of that operating system or may be distributed across multiple instances of like or dissimilar operating systems. Distributed file systems such as the Network File System (NFS) and the Common Internet File System (CIFS) are examples.

3.2.1.3.2 Network Attached Storage

Network Attached Storage (NAS) systems are dedicated file servers that attach to local area networks as would a traditional file server using a general purpose operating system. Users access storage devices via network access. It is in contrast to server attached storage devices, NAS does not have the overhead imposed by server and its operating system. Thus NAS has better performance than traditional server attached storage.

3.2.1.3.3 Storage Area Network

Storage Area Network (SAN) is a storage system architecture that high-speed subnetwork links together shared storage devices. All storage devices in a SAN are visible to all server in a WAN

or LAN. This architecture separates function of running business application and function of accessing storage devices, and locate them in server and SAN respectively. There better performance is achieved by server and storage device. SANs include various forms of high-speed connectivity to computing platforms as well as isolated, very high-speed backend networks to move data between storage devices. SANs provide the ability to replicate data across physical devices and to move data to near-line and archival storage independent of compute platforms.

3.2.1.3.4 DASD Direct Attached

The hardware and protocols for creating an externally powered disk storage array and for directly attaching the array to a server.

3.2.1.3.5 Tape Direct Attached

The hardware and standards for devices which store digital data on a magnetic tape and which are directly attached to a server. These devices are characterized by accessing a limited number of tapes and having a relatively limited number to tape drives with which to access stored data.

3.2.1.3.6 Tape Silo

The hardware and standards for devices which provide automated access to multiple (typically a very large number) tape spools or cassettes and is usually attached to a network. This category includes very large capacity systems (silos).

3.2.1.4 Shared Special Purpose Hardware

Special purpose equipment is generally completely contained functional hardware (and software) device that has some embedded computing capabilities, but is not meant for general purpose computing tasks as designed. Common examples of these types of devices include printing and plotting devices, Global Positioning System devices, and the new generation of cell phones and PDAs such as Blackberry RIM and the Palm Pilot. More esoteric examples for these types of devices could include Point of Sale terminals, time tracking equipment etc.

This Tier maps to the FEA TRM Service Platform and Infrastructure Hardware/Infrastructure Category.

3.2.1.4.1 Card Production Device

Many DHS organizations issue identification or access credentials in card form. High volume personalization of card media is performed at government and contractor facilities on special purpose devices that interface to the DHS network.

3.2.1.4.2 Bulk Scanner

High capacity document scanners are employed to convert paper source documents to digital form for processing or storage. Bulk scanners are characterized by high speed and automatic document feeders. Bulk scanners may integrate OCR to provide automatic conversion of text to machine-readable form, either as ASCII text or directly complex document formats.

3.2.1.4.3 Shared Plotter

A shared plotter is a device (either attached directly to the LAN, or made available from a server or workstation as a shared device) that plots large diagrams using either a moving pen or another printing device such as an ink jet. Shared Plotters typically support formats and may be either drum or flatbed type devices.

3.2.1.4.4 Large Format Plotter

Large Format Plotter for printing Maps from GIS applications.

3.2.1.4.5 Shared Printer

A shared printer is a device (either attached directly to the LAN, or made available from a server or workstation as a shared device) that prints either on single sheets or on continuous paper. Many technologies are utilized including laser, ink jet, and impact technologies. Shared printers typically are characterized by being controlled and queued by a LAN server print service.

3.2.1.4.6 Color-Separation/Pre-press

The hardware, software, and standards for taking an analog or digital photograph and separating the colors, particularly into masks, which can then be used by a printer to print large quantities of the photograph.

3.2.1.4.7 CD and DVD Production

DHS produces documents and presentations in CR-ROM and DVD formats for internal and external use. CDs and DVDs may be produced in small quantities on individual, workstation attached CD or DVD writers. Volume production requires special purpose hardware, this category includes CD and DVD volume production devices, feeders and label printers and attachers.

3.2.1.4.8 Video Production Equipment

The electronic equipment used to create, edit, format and display videos.

3.2.1.4.9 Shared Fax

In office environments where Facsimile Transmission (FAX) is utilized in the business process, it is convenient to allow users to send and receive FAX from their desktop workstation. In large office environments this can be economically achieved by sharing one or more FAX telephone circuits. This sharing is accomplished by a FAX server that incorporates and shares software and special purpose modem hardware.

3.2.1.5 End User Special Purpose Hardware

Single user hardware which directly or logically attaches to a single user's desktop, laptop, wireless hardware or PDA.

This Tier maps to the FEA TRM Service Platform and Infrastructure Hardware/Infrastructure Category.

3.2.1.5.1 Network Interface Cards

Network Interface Cards (NIC): Network connection adapter for wired networks.

3.2.1.5.2 Personal Desktop Scanner

A personal desktop scanner is a single user, workstation attached device that converts document pages and images to digital form, either in black and white or in color. This category includes flatbed and handheld type devices.

3.2.1.5.3 LCD Projector

An LCD Projector functions in place of or in addition to a standard workstation or laptop display. It is normally interfaced to a standard monitor port. It functions by projecting an image of the workstation desktop (or other images) on a screen for group viewing. This category includes technologies other than LCD, such as light valve.

3.2.1.5.4 Personal Fax

In office environments where FAX is utilized in the business process, it is convenient to allow users to send and receive FAX from their desktop workstation. In small office environments this may be achieved use of a directly connected FAX modem that may be used with special purpose software or with standard Windows OS drivers.

3.2.1.5.5 Cellular Telephone

Standard cellular telephones may participate within the enterprise environment as voice mail clients. Many standard cellular phones also support Short Message Service (SMS) that may send and receive messages via the e-mail environment.

3.2.1.5.6 Enhanced Cellular Phones

Most cellular phone networks now support Web browsing services. Enhanced data access services are covered by this category.

3.2.1.5.7 Advance Cellular Telephone

Video, collaboration and other advanced features are also becoming available. This category covers still and motion video and collaborative environment features.

3.2.1.5.8 Digital Encrypted Radio

Special hardware can communicate wirelessly using digital modulation and the transmissions of which are encrypted.

3.2.1.5.9 Digital Non-Encrypted Radio

A radio which uses digital modulation but which, by itself, is not capable of encrypting its transmissions.

3.2.1.5.10 Analog Encrypted Radio

A radio which uses analog modulation but which is capable of encrypting its transmissions.

3.2.1.5.11 Analog Non-Encrypted Radio

A radio which uses analog modulation but which, by itself, is not capable of encrypting its transmission.

3.2.1.5.12 Removable Storage

A storage device designed to be easily removable and transportable from one computer to another. Examples of these devices include USB “Pen” Drives, and removable hard drives in a specialized drive cage.

3.2.1.5.13 Wireless Device Storage

Wireless devices use many of the same storage technologies as desktop and laptop computers. The distinguishing factor is normally size and power consumption. This category specifies standards and products particular to the wireless environment.

3.2.1.5.14 Desktop Plotter

A desktop plotter is a non-shared plotter that is typically smaller than a shared plotter but utilizing similar technologies.

3.2.1.5.15 Desktop Scanner

A desktop scanner is typically a single user device, not shared on the network and not equipped with a feeder or automatic OCR capability.

3.2.1.5.16 Personal Desktop Printer

A non-shared printer. Typically of lower capacity than a shared plotter but utilizing similar technologies.

3.2.1.5.17 Portable Printer

A non-shared printer specifically designed for use with a laptop computer. May be battery or line current operated, but typically has a very small footprint and very low speed.

3.2.1.5.18 Collaboration Peripherals

This category includes all devices used in support of local or remote collaboration including such devices as electronic whiteboards, but excludes video and telephonic conferencing devices.

3.2.1.5.19 Fingerprint Devices

DHS uses fingerprint readers for purposes of registering and identifying individuals for benefit or enforcement purposes. This category includes devices used with the Automated Biometric Identification System (IDENT) system and other identity applications. It does not include devices used only for biometric authentication of credentials or access control.

3.2.1.5.20 Barcode Reader

A barcode reader is a handheld or stationary input device used to read a one or two dimensional barcode. Barcode readers may directly convert the barcode to a standard digital for or may require host software for pattern recognition and data conversion. DHS uses Barcodes on identity documents and for inventory and document control

3.2.1.5.21 Uninterruptible Power Supply

An Uninterruptible Power Supply (UPS) is a device or system that provides continuous electric power supply to critical equipment that can not shutdown unexpectedly. The UPS is inserted between a power source and the critical equipment to mitigate the effect of temporary power outage.

3.2.1.5.22 Section 508 Assistive Devices

Any auxiliary hardware device utilized to assist the handicapped user in operating IT systems. This could include special input devices, Braille printers, etc.

3.2.1.5.23 Border Security Sensors

Sensor devices utilized at the border that interface directly to the IT environment.

3.2.1.5.24 Global Positioning System Devices

Any device that uses GPS to determine and indicate the position of a person or vehicle.

3.2.1.6 Remote Sensing Hardware

Any hardware that is associated with the acquisition of digital or photographic data acquired remotely using aerial, satellite, or ground based platforms.

This Tier maps to the FEA TRM Service Platform and Infrastructure Hardware/Infrastructure Category.

3.2.1.6.1 Photogrammetric Cameras

Cameras that are specialized for the remote capture and measurement of panchromatic (350-1100 nm) data of the earth's surface. These units are typically mounted on airborne craft and produce photographs that can be transformed into a geo-registered image product using specialized photogrammetric software applications.

3.2.1.6.2 Multi-spectral Scanners

Any device that is specialized for measuring radian energy of the earth's surface using discrete bands of spectral data ranging from the blue to the near-infrared portions of the electromagnetic spectrum.

3.2.1.6.3 Hyper-spectral Scanners

Any device that is specialized for measuring radian energy using contiguous bands of spectral data across a broad range of electromagnetic spectra. The resulting image can be visualized as a 3-dimensional dataset with two spatial and one spectral dimension, which is often referred to as an image cube.

3.2.1.6.4 Light Detection and Ranging (LiDAR)

LiDAR is an active remote sensing system that can be operated in either a profiling or scanning mode using pulses of light to illuminate the terrain. By accurately measuring the round trip travel

time of the laser pulse from the aircraft to the ground, a highly accurate spot elevation can be calculated.

3.2.1.6.5 Synthetic Aperture Radar (SAR)

A microwave instrument that transmits radar pulses very rapidly. In fact, SAR is generally able to transmit several hundred pulses while the platform passes over a particular object. Many backscattered radar responses are therefore obtained for that object, which can be manipulated such that the resulting image looks like the data were obtained from a big, stationary antenna. In general, the synthetic aperture is the distance traveled by the spacecraft while the radar antenna collected information about the object.

3.2.1.6.6 Interferometric SAR (IFSAR)

Interferometric Synthetic Aperture Radar (InSAR) is a technique that enables measurement of very small movements of the earth's surface, as subtle as centimeters or less. The SAR interferometry technique acquires a pair of images from two radar measurements, taken from two marginally displaced coherent observations of the surface. For each pixel corresponding to the same ground area in both images, phase values are differenced to produce an interferogram, which, using the orbit parameters, is subsequently used to produce a Digital Elevation Model.

3.2.1.7 Telephony Equipment

The HLS TRM incorporates all categories of telephone equipment employed by the Department. This Tier maps to the FEA TRM Service Platform and Infrastructure Hardware/Infrastructure Category..

3.2.1.7.1 H.323 Terminal

A H.323 Terminal is an end-user handset device that provides real-time, two-way voice, video, or data communication in VoIP environment.

3.2.1.7.2 Automatic Call Directors (ACDs)

A telephone facility that manages incoming calls and handles them based on the number called and an associated database of handling instructions.

3.2.1.7.3 VoIP Media Gateway

Media Gateway provides the mapping and translation between IP and telephony networks.

3.2.1.7.4 VoIP Signaling Gateway

Signaling Gateway provides the interworking of the H.323 and SS7 ISUP signaling operation. Signaling Gateway is controlled by Gateway Controller.

3.2.1.7.5 VoIP Media Gateway Controller

Media Gateway controller controls both Media Gateway and Signaling Gateway. It works with H.323 Gatekeeper. It authenticates and monitors network connections.

3.2.1.7.6 Private Branch Exchange (PBX)

A PBX is a telephone switching center owned by companies or organizations and is not owned by a telephone company or a common carrier. A PBX circuit-switches calls between internal users without involvement of public switch telephone network (PSTN); and route calls between internal user and external user into or from PSTN.

3.2.1.7.7 Switch Software

Software for transmitting calls between a VoIP infrastructure and a POTS infrastructure.

3.2.1.7.8 Call Management Unit

The device or service that performs the telephone call management functions, such as call waiting, forwarding, voice mail, etc

3.2.1.7.9 Channel Service Unit

A CSU is provided by the communication carrier to customers who wish to use their own equipment to retime and regenerate the incoming signals. The customer must supply all of the transmit logic, receive logic, and timing recovery in order to use the CSU, whereas a digital service unit DSU performs these functions.

3.2.1.7.10 Conference Bridge

Hardware, software, and protocols for enabling telephone conferencing functionality on telephones which do not have this native capability.

3.2.1.7.11 Distribution Frame

The hardware and standards for constructing a central location for the main hub of a telephony network.

3.2.1.7.12 Fax Server

The FAX server incorporates and shares software and special purpose modem hardware. The shared software to send and receive FAXes from various users is the FAX server software.

In office environments where Facsimile Transmission (FAX) is utilized in the business process, it is convenient to allow users to send and receive FAX from their desktop workstation. In large office environments, this can be economically achieved by sharing one or more FAX telephone circuits.

3.2.1.7.13 Voice Mail

A device or service that allows telephone callers to leave messages for the called party.

3.2.1.7.14 Voice Response Units

VRU is an automated system that plays recorded messages in response to caller's actions, which can include either pressing of touch-tone or uttering of verbal commands. The VRU offer different options and route the call according to caller's inputs.

3.2.1.7.15 Handsets

A multi-line conference phone.

3.2.1.7.16 VoIP Handsets

A VoIP telephone or conferencing phone.

3.2.1.7.17 VoIP Switch

A network switch, which is capable of transmitting power over Ethernet and which supports the provision of quality of service services to connected devices.

3.2.1.8 Security

3.2.1.8.1 Smart Card

A reprogrammable hardware card or token that can store a limited amount of information and transmit this information to a smart card reader. Smart cards typically contain embedded memory and are often used to store digital certificates of biometric authentication data.

3.2.1.8.2 Smart Card Reader

A smart card reader reads from, and optionally writes to, a smart card device. Readers may be contact type or contactless and may incorporate other functions, such as biometric verification.

3.2.1.9 Utilities

Utilities are general purpose applications used for system maintenance, administration, or operation of hardware devices.

3.2.1.9.1 General Utilities

This describes the set of applications that are used for general-purpose system maintenance and administration.

3.2.1.9.2 Peripheral Support

This describes the set of applications, which are necessary to enable a peripheral to operate on a particular type of computer.

3.2.1.10 Position Navigation and Timing (PNT) Technology

Devices that are used to determine and/or use geographic positions and/or navigation data.

3.2.1.10.1 Global Positioning System Devices

Any device that uses the Global Positioning System to determine and indicate the position of a person or vehicle.

3.2.1.11 In-Situ Sensors

Any device that senses its local environment.

3.2.1.11.1 Border/Facility Security Sensors

Sensors utilized at the border and facilities that are used to sense intruder threats. Sensors that detect motion, heat, and visual changes.

3.2.1.11.2 Chemical Sensors

Sensors that are used to detect chemical threats.

3.2.1.11.3 Biological Sensors

Sensors that are used to detect biological threats.

3.2.1.11.4 Radiological Sensors

Sensors that are used to detect radiological threats.

3.2.1.11.5 Meteorological Sensors

Sensors that are used to sense weather and air quality conditions.

3.2.1.11.6 Hydrological Sensors

Sensors that are used to sense hydrologic and water quality conditions.

3.2.2 Networking/Communications Layer

The networking/communications layer includes all physical communications devices, media, and the services that enable communication among distributed devices. It provides the IP networks needed to communicate among DHS elements, other Federal organizations, state and local government entities, and the general public. It also provides communications for mobile users that may or may not use IP-based protocols.

Data Communication services provide interconnectivity among applications, systems, and people. This layer is implemented both inside the enterprise (e.g., local area networks) and external to the enterprise (e.g. a public telephone network carrier). Included in this layer are local and wide area data networks, voice networks, video networks, and wireless networks. This layer also includes telephone switches, ACDs (automatic call distribution), network routers and switches, load balancers, firewalls, and network security monitoring systems.

The focus of communications services is on the secure, reliable transport of voice, video or data between endpoints. It includes the protection of information in transit, the protection of communication systems from external disruptions, and response to network issues and incidents.

3.2.2.1 Directory Services

A Directory Service consists of a data store of information concerning the “objects” that comprise the enterprise IT system and the mechanisms to query and maintain that information. The objects contained in the data store typically include information about individual users, groups of users, software modules, services, and the locations and capabilities of IT equipment. The X.500 directory standard is full-scale directory service standard. But most directory service implementation is based on the LDAP, a down sized version of X.500.

This Tier maps to the FEA TRM Service Access and Delivery Service Transport Category.

3.2.2.1.1 Directory Server

A Directory Server is a server that offers directory services, providing information in directory to other applications or users. There can be X.500 directory server and LDAP directory server.

3.2.2.1.2 Meta-directory

Meta-directory is a directory integration tool to connect and join information between data sources, including directories, database, and files. The connection process identifies in real-time the changes in connected data store. The join process is to determine identical data object in two data sources. Also the join process maps schema and object names, filters unwanted information, custom-processes and transforms data. Meta-directory also enable sharing of portions of separate directories in a extranet environment.

3.2.2.1.3 Application Integration

Application Integration describes the process that applications use LDAP program API to operate LDAP commands and access data on LDAP server.

3.2.2.1.4 Directory Federation

Directory Federation is a directory technology that creates real-time directory access to other types of data stores, such as relational databases and file systems. A directory federation software extracts data directly from other data stores using native access methods and passes the data to application that made the request to directory federation software.

3.2.2.1.5 Directory Management

Software tools for set up, administering, maintaining and monitoring of a directory or system of directories.

3.2.2.1.6 Directory Shadowing

Directory Shadowing is a directory service feature that creates one or more copies of an original master directory. Those copies of original directory are called shadow directory. Shadow directory is read-only, and is synchronized with master directory. Directory shadowing contributes to load-balancing and fall-back.

3.2.2.1.7 Directory Security

LDAP data store capability can be used for storing authentication and authorization information. LDAP enabled directory can store access control information, user credentials, pre-shared keys, and digital certificates. Secure Socket Layer (SSL) is the option available for encrypting the link between client and LDAP server.

3.2.2.1.8 Directory Replication

Directory Replication is the process of exactly copying data between directories. The directory replication serves the purpose of geographic distribution of data, load balancing, scalability, and fallback. IETF is creating a standard, Lightweight Directory Update Protocol (LDUP) to be used for directory replication.

3.2.2.1.9 Dynamic IP Services

The software and standards that enable a client to obtain dynamically an IP address, typically from a centralized directory server that keeps a directory associating a client's unique identifier with an IP address.

3.2.2.1.10 Name Services

The software and standards necessary for a client to query a directory server with a name and for the directory to resolve the name to a specific client, application, resource, or other element within the directory.

3.2.2.1.11 Time Services

The software and standards that provide the ability for a client to query and retrieve the current time from the directory server.

3.2.2.1.12 Directory API

The software and standards for application programming interfaces for applications to query, retrieve, update and manage directory information in local or remote directories.

3.2.2.1.13 Directory Information Exchange

The software and standards for exchanging information between one or more separate directories. This is different from replication in that the directories contain different information, may be managed by separate entities, and not all of the data within each directory may be exchanged. Typically only a specific subset of the data within the directory is exchanged.

3.2.2.2 Network Equipment

The physical hardware and standards for this hardware that makes up the infrastructure of a wireless or wired WAN, MAN, or LAN or Personal Area Network and provides connectivity, remote access, and security.

3.2.2.2.1 Hubs, Concentrators, Bridges

This describes the set of hardware devices used to connect together multiple computers, LANs, or subnets, without routing at any of the layers in the OSI model. These devices are marked by the ability of any machine, subnet, or LAN, plugged into such a device to see all of the network traffic transiting the device.

3.2.2.2.2 Switches and Routers

This describes the set of hardware devices which are used to connect multiple computers, LANs, subnets, MANs or WANs. These devices typically provide the ability to route one or more of the layers within the OSI model. These devices are marked by the inability of any connection to hear the traffic of any other connection beyond the traffic which is addressed to it.

3.2.2.2.3 Firewall Appliance

A hardware device which screens, analyzes and blocks incoming traffic according to a set of rules determined by an administrator, typically between secure and less secure networks. A Firewall is a network gateway that controls flow of network traffic between secure and less

secure networks. It can be as simple as filtering traffic according to the traffic's starting and destination address or port number, to as complicated as screening the data the traffic contains. Firewalls typically are capable of analyzing and screening multiple, if not all, layers within the OSI model to determine if the network traffic is dangerous or legitimate.

3.2.2.2.4 VPN/Remote Access Appliance

A hardware device which provides the ability to create a secure connection, over the Internet, between a remote client or location and the VPN/Remote Access Appliance, which is typically used to allow the client to access resources inside of the firewall. VPN/Remote Access functionality is often combined with Firewall functionality as part of a combination VPN/Firewall appliance.

3.2.2.2.5 Secure Socket Layer Appliance

A hardware device designed for the management and acceleration of SSL connections between one or more servers and multiple client devices. The SSL appliance handles the encryption and decryption of SSL encrypted traffic between the server(s) and clients, as well as the key generation associated with creating an SSL tunnel.

3.2.2.2.6 Traffic Monitoring, Management and Control Appliance (includes Load Balancing appliances)

Hardware devices which monitor and manage and control the type and flow of network traffic over a network. These devices can contain a range of functions including traffic queuing, traffic type (by application) detection and reporting, bandwidth management, and network availability and usage. Additionally these devices may be capable of dynamically distributing load (typically in the form of HTTP requests) across multiple servers, which prevents variation in load from overwhelming a server and enables the usage of cheaper, less capable servers without any degradation in performance.

3.2.2.2.7 WLAN Infrastructure

Wireless access points.

3.2.2.2.8 WLAN Antennas and Accessories

WLAN specific antennas which may be deployed to increase the coverage area for the WLAN access point or to allow one access point to service multiple, disparate areas through the use of remote antennas.

3.2.2.3 Local Area Network

A LAN is a data communications network that covers a short-distance, and uses a fully controlled transmission media, such as Ethernet or Token Ring. A LAN connects personal computers, workstations, data and file servers, printers, and other network devices and enables sharing of services provided by network devices.

3.2.2.3.1 Data Transport Services

Data Transport Services comprise the services provided by, and protocols supported on, the LAN. These include the primary data transport protocols and any out-of-band control, status, or

monitoring signaling. These may typically include high bandwidth file and print service protocols not typically supported on a WAN.

3.2.2.3.2 Video Transport Services

Video Transport Services are those services necessary to deliver specified video content from an originator to a user or an intermediate server. These services encompass the delivery and control protocols for multi-channel broadcast service, on demand service and two-way and conference services. On the LAN, these are likely to include dedicated channels for security and surveillance cameras, and peer-to-peer video services.

3.2.2.3.3 IP Print Management Services

IP Print Management Services provide printing services on the LAN for non-Windows based computer systems.

3.2.2.3.4 Voice Transport Services

The software and protocols necessary to transmit voice data over a local area network.

3.2.2.4 Wide Area Network

A WAN is data communication network that covers long-distance, and often uses shared transmission media, such as Public Switched Telephone Network (PSTN), satellite communication, microwave communication, and etc. WAN technologies function at the physical, the data link, and the network layer of OSI model.

This Tier maps to the FEA TRM Service Access and Delivery Service Transport Category.

3.2.2.4.1 Data Transport Services

Data Transport Services comprise the services provided by, and protocols supported on, the WAN. These include the primary data transport protocols and any out-of-band control, status, or monitoring signaling.

3.2.2.4.2 Video Transport Services

Video Transport Services are those services necessary to deliver specified video content from an originator to a user or an intermediate server. These services encompass the delivery and control protocols for multi-channel broadcast service, on demand service and two-way and conference services.

3.2.2.4.3 Content Delivery Network

Content delivery or “Edge” networks deliver high demand static content by automatically replicating the content at distributed server locations and transparently translating address requests to serve the content from the local server rather than from a central server over the WAN

3.2.2.4.4 Satellite

Satellite services utilize geosynchronous and low altitude satellites to transport data. Satellite services may be utilized as point-to-point links or may incorporate switching. Satellite services are useful in remote areas or when quick setup is required. Latency may limit the usefulness of

satellite in some applications. Transport protocols supported are the same as for terrestrial links, but additional unique control and circuit setup protocols may be required.

3.2.2.4.5 Laser

Laser links may be used for short haul extension of high bandwidth networks in rough terrain or in urban areas. A laser link is inherently line of sight and has security advantages in that it has low dispersion. Laser links incorporate only the transport and data link layers.

3.2.2.4.6 Encrypted Voice Radio on WAN

Various proprietary techniques and protocols may be used to transport encrypted voice signals. These may be used to connect radio base stations for long-range relay of portable voice radio conversations via the WAN.

3.2.2.4.7 Voice Transport Services

The software and protocols necessary to transmit voice data over a wide area network.

3.2.2.5 Remote Access (RA)

The remote access is the ability to access a computer network or a server from the outside of LAN or WAN network. The common remote accesses are dial-up via modem and PSTN line, ISDN line, wireless connection, DSL line, or the Internet. There may be firewall, remote access server, VPN provides security and routing of traffic to proper servers. Remote Access is often used by telecommuters, remote offices, etc. to access enterprise network resources.

This Tier maps to the FEA TRM Service Access and Delivery Service Transport Category.

3.2.2.5.1 RA via Internet

Remote Access connections via the Internet may be enabled and controlled by a Remote Access server that implements access control and IP address translation.

3.2.2.5.2 RA via Dial-Up

Remote Access connections via the Dial-up Network may be enabled and controlled by a Remote Access server that implements modem pooling, modem control, access control and IP address translation. Dial-up RA servers may be used to implement dial-back access control. Remote Access servers may also support non IP services.

3.2.2.5.3 RA via VPN

Remote Access connections over the Internet may be secured by encryption and routing to give the appearance of an extension of a private Intranet. This type of connection is referred to as a Virtual Private Network or VPN. It is enabled and controlled by a Remote Access server that implements encryption, access control for initial connection setup, and IP address translation.

3.2.2.6 Narrowband Wireless Network

A wireless telecommunication network that may carry data, video, or voice information over a limited bandwidth wireless network.

This Tier maps to the FEA TRM Service Access and Delivery Service Transport Category.

3.2.2.6.1 Data Transport Services

Software and protocols specific to data communication over a narrowband wireless data network.

3.2.2.6.2 Video Transport Services

Software and protocols specific to one-way or two-way video streaming over a narrowband wireless data network.

3.2.2.6.3 Voice Transport Services

Software and protocols specific to voice communication over a narrowband wireless data network.

3.2.2.6.4 Switching

The hardware, software and standards for determining the location of a wireless recipient and ensuring that the appropriate data is transmitted by a transmitter in the recipient's location, particularly in order to prevent other transmitters from needing to also transmit this data.

3.2.2.6.5 Relay

The hardware, software and standards for retransmitting a data packet or data stream, especially to a particular recipient who is not in range of the original transmission.

3.2.2.7 Broadband Wireless Network

A wireless telecommunication network that may carry data, video, or voice information over a wireless network with relatively large amount of bandwidth.

3.2.2.7.1 Data Transport Services

Software and protocols specific to data communication over a broadband wireless data network.

3.2.2.7.2 Video Transport Services

Software and protocols specific to one-way or two-way video streaming over a broadband wireless data network.

3.2.2.7.3 Voice Transport Services

Software and protocols specific to voice communication over a broadband wireless data network.

3.2.2.7.4 Site Survey and Management System

The software and hardware necessary to evaluate the suitability of a particular site for placement of a broadband wireless network antenna or tower.

3.2.2.7.5 WWAN/WMAN

Wireless Wide Area Network (WWAN) and Wireless Metro Area Network (WMAN) is the hardware, software, and protocols specific to broadband, point to point, connections between disparate geographic points in a WAN or MAN.

3.2.2.7.6 Wireless Personal Area Network

A Wireless Personal Area Network (WPAN) is a short distance wireless network that supports mobile computing devices, such as laptop, PDA, cell phone, set-top box, and other consumer electronic devices, to form an ad hoc network to exchange information. Bluetooth is the widely used WPAN standard.

3.2.2.7.7 Wireless Security

The hardware, software, and protocols specific to providing security over a broadband wireless network

3.2.2.8 Wireless LAN (WLAN)

A WLAN is a network that permits mobile users to connect to a LAN. The IEEE standard 802.11 is the protocol, with 802.11b, 802.11a, 802.11g, and 802.11h variations. Because electromagnetic waves do not have physical protection as wired networks do, security is critical to WLAN. The old security protocol, Wired Equivalent Privacy (WEP), has security flaws and can be breached with modest effort. The Wireless Application Protocol (WAP) is a more secure protocol, and based on Wireless Markup Language (WML). Bluetooth is another less used WLAN standard.

This Tier maps to the FEA TRM Service Access and Delivery Service Transport Category.

3.2.2.8.1 WLAN Protocols

Among WLAN protocols, IEEE 802.11 is dated and offers limited bandwidth 2 Mbps; IEEE 802.11b is widely used and offers maximum 10 Mbps bandwidth; IEEE 802.11g is to be finalized and offers 54 Mbps bandwidth. All above protocols use 2.4 GHz radio frequency. IEEE 802.11a offers maximum 54 Mbps bandwidth, and uses less crowded 5 GHz radio frequency. Its drawback is that equipment can be more expensive.

3.2.2.8.2 Wireless Security

The most common and failed security mechanism for WLAN is WEP, wired equivalent protection. WLAN security should rely on VPN, wireless gateway, 802.1x compliant products rather than WEP. Wireless gateway provides security control. 802.1x is a port access control protocol as part of 802.11i WLAN protocol.

3.3 Cross Cutting Services

3.3.1 Security Layer

As discussed previously, security services should not be viewed as a “layer” since the desired level of security is achieved by placing security mechanisms at the most appropriate locations in the technical environment. Therefore, specific technical security services and supporting interfaces and protocols exist within each layer of the TRM.

This section of the TRM identifies the *technical* security services that enable the security capabilities identified in the *Security Management* service component of the FEA SRM.

3.3.1.1 Access Control

An access control service enforces end-user and service access to system resources. An object, such as an end user or service executing on behalf of an end user whose identity has been authenticated must also be authorized to access system resources. And Access Control has evolved into enterprise identity management system, which manages user accounts and access privileges at enterprise level with centralized control.

3.3.1.1.1 Identification and Authentication

An authentication is a process to identify and validate a user, a network device, or a computer application. The common authentication method is id and password. The more secure authentication methods PKI certificate, biometrics, and etc.

3.3.1.1.2 Authorization

An authorization is a process of verifying whether a user, a network entity, or an application requesting an action has the privilege to take the action. Authentication shall always precede authorization. Authorization may be facilitated by a database assigned privileges.

3.3.1.1.3 Non-Repudiation

A concept that insures contract agreed over Internet can not be denied by any of the signing parties. The Non-repudiation is achieved by attributing the signature to the holder and only the holder of the private key in asymmetrical key algorithm used in PKI. Non-repudiation is essential in E-Gov. Non-repudiation includes non-repudiation of origin --- a sender cannot deny having sent a message, and non-repudiation of receipt --- a receiver cannot deny having received a message.

3.3.1.1.4 Enterprise Identity Management System (EIMS)

EIMS is an IT infrastructure that centralizes the management of user identity, authentication and authorization information. EIMS should have centralized directory service for user information, should have centralized control and administration of user addition, change, maintenance, and termination into enterprise systems and other access privileges. It can accommodate different security level of authentication methods, from simple password to PKI certificate and to biometrics. EIMS should inherit Single Sign-On at Enterprise level.

3.3.1.1.5 Single Sign-On (SSO)

A SSO is a process that enables a user, network entity, or application to authenticate once to access one network resource and does not have to authenticate for accessing other network resources within the limit of predefined session time.

3.3.1.1.6 Biometrics

In computer security, biometrics refers to an authentication technique that relies on measurable human physical characteristics that can be stored and checked automatically. Finger print is often used in biometrics authentication. Biometrics authentication is among the strongest authentication methods.

3.3.1.1.7 Digital Signature

An electronic method of marking a document in such a manner that the mark can be attributed to one.

3.3.1.1.8 Wireless Access Control

Software and standards specific to authenticating users and computers accessing the network wirelessly.

3.3.1.2 Cryptography

A cryptography service provides the capability to encrypt and decrypt data and is a fundamental technical security service. The algorithms used for encryption and decryption have to be approved by National Institute of Standards and Technology (NIST) for SBU information, approved by National Security Agency (NSA) for classified information. Triple-Data Encryption Standard (DES) and AES (Advanced Encryption Services) are approved for SBU information. Skip-Jack and Two-Fish are approved for classified information encryption.

3.3.1.2.1 Cryptographic Module (CM)

A CM is a set of hardware, software and firmware that implements a set of security functions such as cryptographic algorithms and key generation and is contained in a cryptographic boundary. Smart cards and smart tokens are two kinds of CM

3.3.1.2.2 Symmetric Key Management

Symmetric Key Management Services provide an automated mechanism to exchange encryption “keys” in systems where each encryption end-point is a peer to other end-points. Symmetric keys are changed often to maintain security. That process can be difficult to manage if not automated.

3.3.1.2.3 Secure Hash

Secure Hash is a process of generating one-way message digest from original message and a secret key. Secure Hash is to protect integrity of messages. NIST standard FIPS 180 prescribes that Secure Hash Algorithm (SHA1) is the algorithm of choice to generate secure hash for SBU information.

3.3.1.2.4 Public Key Infrastructure

A Public Key Infrastructure (PKI) provides the mechanisms to store and manage “keys” in the form of digital certificates for purposes of user authentication and user authorization to access system resources. This includes issuing, tracking, and revoking digital keys. PKI is a generic term for a set of integrated key management mechanisms managing public keys. DHS PKI needs to cross-certify with Federal PKI Bridge, which enables validating certificates issued by all participating agencies.

3.3.1.2.5 Key Escrow

The hardware, software, and standards which implement a procedure whereby the encrypted communications between two parties may be decrypted by a third party. This is often used in the

context of government agencies that need to decrypt messages encrypted by other which they suspect to be relevant to national security.

3.3.1.2.6 Steganography

A system of confidential communication whereby the existence of the message is hidden within another object, such as a picture. Stenography is a secret communication where the existence of the message is hidden. Stenography shall have a cover message, such as a picture, an article, etc. In computer forensics, there are software tools that can reveal hidden messages in a picture.

3.3.1.2.7 Internet Cryptographic Applications

There are many internet cryptographic applications. Secure Socket Layer (SSL) or the later version Transaction Layer Security (TLS) are used extensively Web and other network communication; IPS provides encryption at network layer; Secure Shell (SSH-2) enables certificate based secure command line connection; Wireless Application Protocol (WAP) enable secure wireless communication.

3.3.1.2.8 IPsec

Standards and software for encrypting IP layer data using the IPSEC protocol. IPSEC encrypts the data portion of the IP packet, thereby providing transparent security to all the protocols and layers above the IP layer.

3.3.1.2.9 Laptop Encryption

Software and standards specifically for the encryption of data on laptops. This software is often configured to encrypt the entire hard drive so that in the event that the laptop is lost or stolen, no data can be comprised.

3.3.1.2.10 PDA Encryption

The Standards and products of this category will be applied. Software, hardware and standards specifically for the encryption of data on a PDA or other type of handheld device.

3.3.1.2.11 Removable Media Encryption

Software, hardware and standards specifically for the encryption of removable storage devices.

3.3.1.2.12 Wireless Security Encryption

The software, hardware, and standards providing encryption for the communications of wireless, particularly wireless, mobile, handheld devices such as mobile phones, Blackberry, and PDAs. Wireless encryption is differentiated from encryption used for other means due to the limited battery, processing power, and memory of the machines on which it is typically deployed.

3.3.1.3 Operation Security

Operation Security includes identifying the vulnerabilities of and threats to computer operations and formulates and implements security controls for transaction processing, system administration tasks, and external operations. These controls include repair problems and maintain auditing and monitoring processes.

3.3.1.3.1 Control and Protection

Controls are used to protect network resources from threats in the operation environment, from intruders, operators who stepped beyond their privileges. Operation controls include resources protection and user privilege control.

3.3.1.3.2 Audit Trail

A chronological record of system activities and attempted system activities to enable examination, reviewing, and reconstruction of past events to identify when and who did what in where in an information technology environment.

3.3.1.3.3 Vulnerabilities Scanning

A proactive and automated process of identifying the flaws in the configuration of networked devices. The process is conducted by a software and with a databases of known flaws. The software tests the presence of the flaws and generates reports to enable mitigation of those flaws in a network.

3.3.1.3.4 Digital Forensics

The First Digital Forensic Research Workshop defined digital forensic science as “[t]he use of scientifically derived and proven methods toward the preservation, collection, validation, identification, analysis, interpretation, documentation and presentation of digital evidence derived from digital sources for the purpose of facilitating or furthering the reconstruction of events found to be criminal, or helping to anticipate unauthorized actions shown to be disruptive to planned operations.” It includes computer forensics, forensic programming, and network forensics.

3.3.1.3.5 Risk Management

Risk Management is a process of identifying, controlling, mitigating, and eliminating uncertain events that may have detrimental effect on continuation of IT business. Certification and Accreditation is one example of Risk Management.

3.3.1.3.6 Policy Implementation Tools

In conjunction with Identification and Authentication, Policy Implementation Tools implement the business rules associated with role base access.

3.3.1.3.7 Antivirus

Software which identifies, protects against, and can remove computer viruses and worms.

3.3.1.4 Network Security

Network Security includes structures, transmission methods, transport formats, and security mechanisms that provide confidentiality, integrity, availability, and accountability for transmissions over intranet or Internet. It is also to prevent and detect misuse of network resources.

3.3.1.4.1 Network Protocols

Standards for providing authentication, non-repudiation, and/or confidentiality to voice, video or data traffic transmitted across a network.

3.3.1.4.2 Firewalls

A Firewall is a network gateway that controls flow of network traffic between secure and less secure networks. It can be as simple as filtering traffic according to traffics starting and destination address or port number, as complicated as data content the traffic contain. Firewall is often deployed in a Demilitarized Zone that is a small network served as security buffer zone.

3.3.1.4.3 Intrusion Detection and Prevention

An Intrusion Detection Service (IDS) monitors system or network activity in order to detect unauthorized access attempts. These services can detect intrusions is real or near-real time or after the fact, as the result of analysis of stored information. IDS can be host-based to protect a host, or network-based located at entry point of a network. Intrusion prevention is an added service to some IDS systems.

3.3.1.4.4 Boundary Protection Service

A Boundary Protection Service enforces a network security boundary. Components such as security guards, proxies, filters, and firewalls provide boundary protection services. There is a need to create Demilitarized Zone (DMZ) in boundary protection. The new trend is to combine IDS with DMZ

3.3.1.4.5 Virtual Private Network

A Virtual Private Network (VPN) is a network security system that manages the creation, encryption, and termination of secure communication channels over non-secure networks. VPN can be end-to-end, which is between client machine and server machine, or point-to-point, which is between two gateways of two distant networks. The later is more efficient.

3.3.1.4.6 Remote Access Authentication

A Remote Access Authentication system provides centralized authentication for remote client accessing a network. A centralized database maintains users' credentials, passwords, and user profiles that can be accessed by remote access control server, which arbitrates remote client's access request.

3.3.1.5 Application and Operating System Security

Security Services provided by the operating systems and the applications, and they include the following three components: OS Hardening, Database Security, and Programming Security.

3.3.1.5.1 Database Security

Database Security is a set of mechanisms that protect confidentiality, integrity, availability of data and system in the database. Database security should include authentication and access control to users and applications that need accessing data, encryption of data during transit and storage, audit trail of data accesses.

The means to control and manage access on the basis of geospatial properties (i.e., Geosecurity).

3.3.1.5.2 Programming Security

Programming Security is also called software security. It is a set of software programming practices. It includes input parameter sanitation, buffer overflow checking, proper handling of run time variables that contains sensitive data, and etc.

3.3.1.6 Physical Security

Physical Security includes identifying threats against, analyzing vulnerabilities of, and taking measures to protect personal, data, systems, buildings, and their related infrastructures in a physical environment. The threats can be man-made or natural events, and inadvertent or malicious.

The following geospatial applications (application components) may play a role in physical security: Security Planning, Security Protection and Management, Critical Infrastructure Inventory Management, Facility Mapping and Management, Incident Management, Incident Reporting, Monitor Assets/Locations/Parties, Risk Analysis, Sensor Management, Situation Awareness, Suspicious Activity Reporting, Threat Analysis, Threat Consequence Assessment, Threat Detection and Vulnerability Analysis.

3.3.1.6.1 Facility Administrative Control

Administrative Control includes choosing a secure site, designing a secure site, physical access audit trail, formulating emergency procedures, and personnel background checking.

3.3.1.6.2 Intrusion Detection and Alarm

Intrusion Detection and Alarm is a mechanism to identify and reveal in real-time any unauthorized attempt to penetrate the perimeters of a facility, physical or electronic.

3.3.1.6.3 Wireless Intrusion Detection

Hardware, software, and standards for detecting an unauthorized attempt to access and wireless access point or other type of wireless access.

3.3.1.6.4 Environmental and Safety Control

Environmental and Safety Control is physical control to sustain computer operation environment and the personnel's safety environment. It includes electrical power supply and safety, fire detection and suppression, heating, ventilation, and air conditioning (HVAC).

3.3.1.6.5 Inventory Control

Inventory Control is a physical control that protects equipments in a facility from theft or damage. The technologies include cable locks, port controls, switch controls for power switches, electronic security boards to control rebooting computers.

3.3.1.6.6 Facility Access Control

Facility Access Control is physical control to administrator personnel access to the facility. The technologies for facility access control are security access cards such as photo-image cards and digital coded cards, wireless proximity readers, biometric devices. The trend is to combine physical access card function and PKI smart cards into one card.

3.3.2 Management and Operations

Management and Operations is included here as an extension to the FEA TRM. As with Security, it is depicted as a vertical “slice” of the TRM in the HLS TRM diagram (Exhibit 4, HLS TRM). It includes the technical services required to deploy, deliver and operate software applications that make up the service components identified in the FEA Service Component Reference Model (SRM) and service components to be built or acquired by DHS. Some of these services are identified in the current SRM but others should be added to IT service management. It also includes the development and systems assurance functions required to guarantee the quality and suitability of components operated within the DHS environment.

The role of geospatial weaves throughout this “slice” of the TRM. There are management and operation tools for HLS geospatial resources. Also, there are many location-enabled management tools throughout the HLS mission.

3.3.2.1 Program Management Tools

Program Management tools are Software programs that support the coordinated management of a portfolio of projects to achieve optimal results that are strategically important. It is a comprehensive management of competing projects from planning, design, implementation, and to completion, against a single bottom line of quality, cost, and schedule that measures the success of a program.

3.3.2.2 Development Tools

Tools to support Software design and development. Specific Categories are assigned to specific Tiers above.

3.3.2.2.1 508 Compliance Tools

Software development tools that assist in adding or supporting Section 508 compliance features to an application. For example, text to voice interpreter.

3.3.2.2.2 Requirements Management Tools

Software development tools that assist in gathering, documenting, analyzing, publishing and maintaining requirements for IT systems, such as requirements traceability matrix generator.

3.3.2.2.3 Platform Independent Application Development Tools

Tools for developing applications in one or more computer languages that are machine or operating system independent. Machine or operating system independence is the ability to run an application on multiple types of systems using the same source code, through recompiling the source code for the specific system may be required. C/C++ and JAVA are examples of platform independent computer languages.

3.3.2.2.4 Platform Dependent Application Development Tools

Tools for developing applications in one or more computer languages that are not machine or operating system independent. In this case, the same source code is not able to run on multiple types of systems without modifying the source code or the language may be completely platform or machine specific.

3.3.2.2.5 Scripting Language Development Tools

Software development tools that assist in developing, maintaining, and sharing of scripts used in developing Web applications.

3.3.2.2.6 Database Development Tools

Tools for creating databases and database specific applications using one or more database specific languages such as PL/SQL, Transact-SQL, or SQL.

3.3.2.2.7 Wireless Device Client-side Application Languages

3.3.2.3 System Assurance Tools

Tools to support Configuration Management, Quality Assurance, and Test and Evaluation. Specific Categories are assigned to specific Tiers above.

3.3.2.3.1 Configure Management Tools

The system assurance tools that assist in performing configuration management of system artifacts.

3.3.2.3.2 Document Management Tools

The system assurance tools that assist in management of system documents.

3.3.2.3.3 QA Tools

The system assurance tools that assist in quality assurance and management of the system products and artifacts.

3.3.2.3.4 Test and Evaluation Tools

The testing tools which aid in setting up a test environment, maintaining the test cases and test database, and executing the tests, recording the results, and publishing the test reports.

3.3.2.4 Network Admin Tools (Network Management Tools)

Any hardware and software tools that supports controlling, planning, allocating, deploying, coordinating, diagnosing, and monitoring network resources. Other functions to be supported are frequency allocation, fault management, load balancing, security management, traffic routing, audit management, configuration management, and performance management.

3.3.2.5 Operations Management Tools

The Operations Management Tool is a software application that automates Operations Management process. The Operations Management is an IT business function that concerns with the production of IT products and services. It deals with the management of input resources and delivery of finished products and services to customers.

3.3.2.5.1 Asset Management Tools

Tools and software for identifying, tracking and managing IT equipment and the software loaded on the equipment. This software can typically identify assets that are plugged into the network and track them if they are moved to a different location on the network.

3.3.2.5.2 Automated Operations Tools

The tools and software required to automate IT operations tasks such as patching systems, virus scanning (if virus scan must be initiated externally), or defragging.

3.3.2.5.3 EPR/Account Management

Tools and software to manage user accounts and roles for application, network and other IT access.

3.3.2.5.4 Forms Management Tools

The software and tools to create, manage and maintain standardized, electronic, fillable forms.

3.3.2.5.5 Printshop Management Tools

3.3.2.5.6 Process Asset Library Tools

3.3.2.5.7 Drive Imaging

Drive Imaging describes the set of applications, which can be used to create a bit for bit “image” of a storage drive and store this image on another storage device.

3.3.2.5.8 Backup and Recovery

Automated software and standards for copying data from a server to another storage device in a format that permits the current state of the server to be recovered if the current data on the server is corrupted or deleted.

3.3.2.6 Release Management Tools

Release Management tool is one of configuration management tool that enables automation of creating a version of product; i.e., a release. The “release” of a software package is a bundle of related or inter-operating executable files that function as an application.

3.3.2.7 Content Management Tools

Content Management Tool is an advanced Web development tool that enables Web developer to store, index, search, retrieve, organize and grow items to be stored on a Web server. The items can be texts, links, graphics, images, audio or video clips, scripts, applets or anything that can be categorized logically and stored on Web server for browser to access.

3.3.2.8 Wireless Systems Management

Software and standards for managing the systems that provide wireless access to a network.

3.3.2.9 Performance and Capacity Management

Software and standards used to analyze the status, speed, health, and other characteristics of one or more networks, network links, servers, applications, or transactions.

3.3.2.9.1 Transaction Processing Monitoring Tools

Tools that measure the rate at which transactions are being processed. These tools often can provide statistics on the speed of particular parts of a transaction. Some of these tools are capable of monitoring and notifying the administrator if there is a failed or “stuck” transaction.

3.3.2.9.2 Network Performance Monitoring Tools

Software and standards which monitor the speed of a network or network link, and the characteristics of the traffic transiting the network.

3.3.2.9.3 Application Monitoring Tools

Software and standards for monitoring the status and health of an application and the speed at which it is executing. These products can often determine if there is a problem with the application and notify the administrator in the event that the application ceases to function or slows down beyond a certain, set, point.

3.3.2.9.4 Server Capacity and System Monitoring Tools

Software and standards for determining the current load on a server or set of servers, the capacity of the server to handle the load, and the health of the server or servers.

3.3.2.10 Modeling Tools

Software and standards, such as a standardized set of symbols, for developing an abstract representation of a system that approximates and accurately represents the behavior of a real or proposed system for specific analytical purposes.

3.3.2.10.1 Data Modeling

Software and standards used to develop representations of the data elements, relationships between data elements, and how data is used within a system. Tools such as ERWIN or Popkin’s System Management, which provide the facilities to develop and save data models.

Attachment A

DHS Standards Profile

(See Attachment O of the Target Enterprise Architecture)

Attachment B
Acronyms

ACD	Automatic Call Distribution
ADO	ActiveX Data Object
AES	Advanced Encryption Services
AMD	Advanced Micro Devices
AOL	America On Line
API	Application Programming Interface
AS	Application Server
ASCII	American Standard Code for Information Interchange
ASP	Application Services Provider
ATB	Applied Technology Board
BCP	Business Continuity Plan
BI	Business Intelligence
BSD	Berkeley Software Distribution
CAD	Computer Aided Design
CD-ROM	Compact Disk-Read Only Memory
CICS	Customer Information Control System
CIFS	Common Internet File System
CIO	Chief Information Officer
CLR	Common Language Run-time
CM	Cryptographic Module
COI	Community Of Interest
COP	Common Operating Picture
COTS	Commercial Off-The-Shelf
CPS	Coverage Portrayal Service
CPU	Central Processing Unit
CRM	Customer Relationship Management
CS	Collaboration Service
CSS	Communications Support Systems
CTS	Coordinate Transformation Service
DBMS	Database Management System
DES	Data Encryption Standard
DHS	Department of Homeland Security
DHTML	Dynamic HyperText Markup Language
DMS	Defense Messaging Service
DMSI	Data Management System Interface
DMZ	Demilitarized Zone
DOM	Document Object Model
DRP	Disaster Recovery Plan
DTM	Digital Terrain Model
DTS	Data Transform Service
DVD	Digital Video Disc
EA	Enterprise Architecture
EAI	Enterprise Application Integration
ebXML	Electronic Business eXtensible Markup Language
EDI	Electronic Data Interchange
EFT	Electronic Funds Transfer
EHTML	Extended HyperText Markup Language
EIMS	Enterprise Identity Management System

EIS	Enterprise Information System
ESP	Enterprise Standards Profile
FCC	Federal Communications Commission
FEA	Federal Enterprise Architecture
FEMA	Federal Emergency Management Agency
FTP	File Transfer Protocol
GDR	Geospatial Data Rollup
GEA	Geospatial Enterprise Architecture
GIF	Graphics Interchange Format
GIO	Geospatial Information Officer
GIS	Geographic Information System
GIT	Geospatial Information Technology
GML	Geography Markup Language
GMO	Geospatial Management Office
GOA	Generic Open Architecture
GOTS	Government Off-The-Shelf
GPS	Global Positioning System
GUI	Graphical User Interface
HLS	Homeland Security
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transfer Protocol Secure
I/O	Input/Output
ICS	Image Catalog Service
IDENT	Automated Biometric Identification System
IDS	Intrusion Detection Service
IEEE	Institute of Electrical & Electronics Engineers
IFSAR	InterFerometric SAR
IM	Instant Messaging
IMAP	Internet Message Access Protocol
INS	Immigration and Naturalization Service
IP	Internet Protocol
IPS	Image Processing System
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
IT	Information Technology
J2EE	Java 2 Enterprise Edition
J2ME	Java 2 Micro Edition
JDBC	Java Data Base Connectivity
JOLAP	Java On-line Analytical Processing
JPEG	Joint Photographic Expert Group
JSP	Java Service Pages
JVM	Java Virtual Machine
KM	Knowledge Management
KWIC	Key Words In Context
LAN	Local Area Network
LBS	Location-Based Services
LCD	Liquid Crystal Display

LDAP	Lightweight Directory Access Protocol
LDUP	Lightweight Directory Update Protocol
LiDAR	Light Detection and Ranging
LOF	Location Organizer Folder
MIME	Multipurpose Internet Mail Extensions
MOM	Message-Oriented Middleware
MSOP	Mission-Specific Operating Picture
MX	Mail Exchange
NAS	Network Attached Storage
NFS	Network File System
NIC	Network Interface Cards
NIST	National Institute of Standards and Technology
NNTP	Network News Transport Protocol
NOS	Network Operating System
NSA	National Security Agency
NSSE	National Security Special Event
OCR	Optical Character Recognition
ODBC	Open Database Connectivity
OGC	Open GIS Consortium
OLAP	On-Line Analytical Processing
OLTP	On-Line Transaction Processing
OMB	Office of Management and Budget
OS	Operating System
OSE	Open Systems Environment
OSI	Open Systems Interconnection
P2P	Peer to Peer
PBX	Private Branch Exchange
PCI/ISA	Peripheral Component Interconnect/Industry Standard Architecture
PCMCIA	Personal Computer Memory Card International Association
PDA	Personal Digital Assistant
PDF	Portable Document Format
PKI	Public Key Infrastructure
PNG	Portable Network Graphics
POI	Point of Interest
POP3	Post Office Protocol version 3
POSIX	Portable Operating System Interface
PSTN	Public Switch Telephone Network
RA	Remote Access
RAID	Redundant Array of Independent Disks
RAM	Random Access Memory
RDP	Remote Desktop Protocol
RFID	Radio Frequency ID
RIM	Registry Information Model
RVM	Research Virtual Machine
SAD	Server Attached Disk
SAE	Society of Automotive Engineers
SAML	Security Assertion Markup Language
SAN	Storage Area Network

SAR	Synthetic Aperture Radar
SAS	Sensor Alert Service
SBP	Semantic Business Profile
SBU	Sensitive But Unclassified
SCS	Sensor Collection Service
SCSI	Small Computer System Interface
SDP	Semantic Data Profile
SensorML	Sensor Model Language
SHA1	Secure Hash Algorithm
SIM	Service Information Model
SLA	Service Level Agreement
SLD	Style Layer Descriptors
SMS	Symbol Management Service
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SOAP	Simple Object Access Protocol
SPS	Sensor Planning Service
SQL	Structured Query Language
SRM	Service Component Reference Model
SSH-2	Secure Shell
SSL	Secure Socket Layer
SSO	Single Sign-On
SSP	Semantic Service Profile
SWS	Sensor Web Services
TCP/IP	Transmission Control Protocol/Internet Protocol
TIFF	Tagged Image File Format
TLS	Transaction Layer Security
TP	Transaction Processing
TRM	Technical Reference Model
TSA	Transportation Security Agency
TXT	Text File
UDDI	Universal Description, Discovery and Integration
UPS	Uninterruptible Power Supply
URL	Uniform Resource Locator
USB	Universal Serial Bus
USCG	United States Coast Guard
USSS	United States Secret Service
VMS	Virtual Memory System
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
VRU	Voice Response Unit
VRU	Voice Response Unit
WAN	Wide Area Network
WAP	Wireless Application Protocol
WCS	Web Coverage Service
WEP	Wired Equivalent Privacy
WFS	Web Feature Service

WLAN	Wireless Local Area Network
WMS	Web Map Service
WNS	Web Notification Service
WPAN	Wireless Personal Area Network
WRS	Web Registry Service
WSDL	Web Services Description Language
WTS	Web Terrain Service
XBRL	eXtensible Business Reporting Language
XIMA	XML for Image and Map Annotation
XML	eXtensible Markup Language
XSLT	eXtensible Stylesheet Language Translation
Z/OS	Z series Operating System

Attachment C

Glossary

Key geospatial terms are defined in: “HLS Geospatial Business Language: Key Terms”, Appendix G.Bus.1. This *Geospatial Business Language* consists of the key terminology used to define the role of geospatial in the HLS enterprise. The geospatial semantics of the HLS mission are embodied in these terms.

Business Logic	The portion of an application that is concerned with the encoding of business rules. Applications also contain housekeeping and other, non-business specific logic.
Channel	A mode of application access and delivery consisting of an end-point device, interface software, and a communications path to the application logic. An example is a Web browser executing on a PDA using a wireless protocol to access an application on the Internet.
Data Store	A logical data “container.” An implementation of a data store may be a relational DBMS, a geographic information system (GIS), an indexed file system, a flat file system, an associative data store, or any other viable storage approach.
End-point Device	Any device, and associated operating system or other run-time software that is used to connect an end-user with an application. Examples are PDAs, cellular phones, printers, plotters and desktop and laptop computers.
End-user	A human interacting with a computer-based application.
Infrastructure Services	Technical components that provide common-use functionality to applications and/or to other services and are application-neutral; that is the services can and are expected to be used by any arbitrary application. Examples are a relational database management system and a directory service.
Service Component	As defined by the FEA Service Component Reference Model a <i>service component</i> is most granular level of the SRM framework. Service components are combined to provide specific business services organized by <i>service type</i> and <i>service layer</i> in the SRM.
Service Framework	A specific configuration of technical services, protocols and interfaces grouped by similar functionality into conceptual layers.
Service Platforms	Application-neutral computing, storage and communications mechanisms that provide the technical environment for a Services Framework.
Technical Component	In contrast to the functional capability provided by a <i>service component</i> , a technical component is the software or hardware implementation of a specific technical function. A technical component may be custom developed or acquired from a vendor, through open source channels, or from other appropriate sources.
Technical Service	In this document, a technical service is a technical component that provides functionality to applications and other technical services through well-defined and published interfaces.

Attachment D
References

1. Immigration and Naturalization Service Technical Reference Model Overview (Draft), February 2003.
2. Transportation Security Administration Technical Reference Model (Draft), data unknown.
3. United States Coast Guard Technical Reference Model (Draft), March 2003.
4. Federal Enterprise Architecture Service Component Reference Model (SRM) v1.0 June 12, 2003.
5. Federal Enterprise Architecture Technical Reference Model (TRM) v1.0 June 12, 2003.



**HOMELAND SECURITY GEOSPATIAL ENTERPRISE
ARCHITECTURE**

**ATTACHMENT G TECH 2
GEOSPATIAL COMPONENTS**

GEOSPATIAL MANAGEMENT OFFICE

DRAFT VERSION 0.6.1

April 13, 2004

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1.0 INTRODUCTION

The Homeland Security (HLS) Geospatial Enterprise Architecture (GEA) Technical Reference Model (TRM) provides a conceptual framework emphasizing the role of Geospatial Information Technology (GIT) that will assist in effectively and efficiently coordinating the acquisition, creation, development, operation, and recapitalization of GIT-based systems within the HLS Target EA. This artifact summarizes the primary geospatial components in the GEA TRM.

The layers of the HLS TRM that have geospatial components are as follows:

Presentation—the technical services required to create and present application interfaces to end users,

Business Logic—application-specific logic representation; that is, “software,”

Application Infrastructure—the technical services required to allow business logic, and other application logic to function,

Integration Services—the technical services and components required to interchange data among applications and services,

Data Management —the technical services and components required to access and modify data of all types, and

Computing Platform—physical hardware and operating system services that support the components of the Service Framework.

The geospatial components are presented in tabular form to illustrate the placement of these components within the layers of the TRM.

2.0 HLS GEOSPATIAL COMPONENTS

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Presentation	Web Client	Map Viewer Plug-in	The means to visualize and interact with geospatial data in rendered map form. Provides tools to select base map/image data for viewing, select optional graphics overlays (geospatial features, locations, structures, routes, observations, mobile-objects), set view window, display chosen view, measure and pinpoint, navigate through view with pan and zoom, etc. Optionally choose symbology, map display template or select previous views.
Presentation	Web Client	Graphics Viewer Plug-in	The means to visualize and interact with 2D and 3D geospatial data in graphics form, where the user may interact/change geospatial elements. Provides tools to select geospatial features/locations/structures/routes/observations/mobile-objects for viewing, set view window, display chosen view, measure and pinpoint, navigate through view with pan and zoom, etc. Optionally choose symbology, graphics display template or select previous views.
Presentation	Web Client	Image Viewer Plug-in	The means to visualize and interact with geospatial images (rectified or unrectified). Provides tools to select image and optional graphics overlays for viewing (geospatial features/locations/structures/routes/observations/mobile-objects), set view window, display chosen view, measure and pinpoint, navigate through view with pan and zoom, etc. Optionally choose symbology, image display template or select previous views.
Presentation	Messaging Client	Location-Based Messaging Client	The means to visualize location-based messages (messages with embedded geospatial elements). Example messages include alerts, warnings, emergency declarations, location report and situation reports.
Presentation	Office Suites & Personal Productivity Tools	Personal Map Software	Personal Map Software includes a variety of tools for viewing, annotating and manipulating map data. Typically include map data for standalone operations. Often includes Global Positioning System (GPS) capability for mobile applications. Commercial software for desktop or Personal Digital Assistant (PDA).

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Presentation	Collaboration Client	COP Manager Client	<p>The Common Operating Picture (COP) Manager provides the means to manage the scope and resources associated with a COP, select and allocate resources, manage and monitor collaboration activities, monitor status and performance of resources, and monitor and manage external communications. The distinction between the COP Manager and other operations applications is that the COP Manager is managing the big picture, whereas other applications focus on Mission-Specific Operating Pictures (MSOP) and other mission-specific operation activities.</p> <p>Matches up with COP Manager Server Tier 3 component.</p>
Presentation	Geospatial Client	Specialized Geospatial Clients (Various)	<p>A desktop client, either thick or thin, that provides visualization and interaction with geospatial data. Also provides access to underlying Application Components and Geospatial Services. Many specialized geospatial applications will exist within the HLS EA, each which may have a Geospatial Client and one or more Application Components and/or Geospatial Services.</p> <p>Matches up with server-side Geospatial Application Components Tier 3 component.</p>
Presentation	Geospatial Client	Geographic Information System (GIS) Client	<p>A general purpose GIS client, either thick or thin, that provides visualization and interaction with geospatial data.</p> <p>Matches up with GIS Server Tier 3 component. May also provide access to underlying Application Components and Geospatial Services.</p>
Presentation	Geospatial Client	Image Processing Client	<p>A desktop client, either thick or thin, that provides visualization and interaction with geospatial imagery data. Many specialized geospatial imagery applications may exist within the HLS EA.</p> <p>Matches up with Image Processing Server Tier 3 component. May also provide access to underlying Application Components and Geospatial Services.</p>

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Business Logic	Application Components	Geospatial Application Components	<p>Specialized Geospatial Applications may have one or more server-side Geospatial Application Components. These server-side components contain geospatial business logic and reference Geospatial Enterprise Services, which are common geospatial services that are available throughout the enterprise.</p> <p>Geospatial Application Components match up with the Specialized Geospatial Clients Tier 3 components.</p>
Business Logic	Geospatial Servers	GIS Server	<p>The GIS server is comprised of bundled services that support the generation, revision, management, processing, and output of geospatial data. Consists of the server-side components comprising a GIS.</p> <p>These server capabilities match up with the GIS Client Tier 3 component.</p>
Business Logic	Geospatial Servers	Image Processing Server	<p>The Image Processing System (IPS) server is comprised of bundled services that support the generation, revision, management, processing, and output of geospatial image data. Consists of the server-side components comprising an IPS.</p> <p>These server capabilities match up with the Image Processing Client Tier 3 component.</p>
Application Infrastructure	Geospatial Enterprise Server	Data Discovery Service	<p>Able to search for and locate desired data through open, standard publish-find mechanisms. Search requests may be defined in terms of geospatial-temporal, mathematical and statistical filters for discovering data and data relationships, and optionally storing the metadata results as a new data set.</p>
Application Infrastructure	Geospatial Enterprise Server	Service Discovery Service	<p>Able to search for and locate desired services through open, standard publish-find mechanisms. Search requests may be defined in terms of filters for discovering services and service-data relationships, and optionally storing the metadata results as a new data set.</p>
Application Infrastructure	Geospatial Enterprise Server	Map Publication Service	<p>Able to automatically generate and publish Maps of interest for inclusion in a plan, report, or other Geospatial Product, with select content and symbolization (map template). To produce a Map for inclusion in a word or graphic document.</p>

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Application Infrastructure	Geospatial Enterprise Server	Activity Report Service	Able to generate an Activity Report for any location-based activity.
Application Infrastructure	Geospatial Enterprise Server	After Action Report Service	Able to generate an After Action Report with the geospatial context of the root cause, status and recommendations pertaining to post-incident recovery operations.
Application Infrastructure	Geospatial Enterprise Server	Alert-Warning Report Service	Able to generate an Alert-Warning Report with information about location-based alert or warning messages.
Application Infrastructure	Geospatial Enterprise Server	Emergency Declaration Report Service	Able to generate an Emergency Declaration Report with the geospatial extent and nature of an emergency.
Application Infrastructure	Geospatial Enterprise Server	Incident Report Service	Able to generate an Incident Report with information about a location-based incident message.
Application Infrastructure	Geospatial Enterprise Server	Location (Site) Report Service	Able to generate a Location Report with information about an HLS data object's location, related entities, and geospatial context. Example objects include geospatial feature, person, asset, conveyance, goods, cargo, device, etc.
Application Infrastructure	Geospatial Enterprise Server	National Security Special EVENT (NSSE) Report Service	Able to generate a NSSE Report for an EVENT.
Application Infrastructure	Geospatial Enterprise Server	Situation Report Service	Able to generate a Situation Report with the geospatial extent and nature of an operational situation.

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Application Infrastructure	Geospatial Enterprise Server	Suspicious Activity Report Service	Able to generate a Suspicious Activity Report for a location-based suspicious activity.
Application Infrastructure	Geospatial Enterprise Server	Coverage Portrayal Service	Coverage Portrayal Service is chained to a Web Coverage Service (WCS) to convert geospatial coverage data (grid/image) to a map. The resultant map can be overlaid with data fetched from other servers for reference and orientation.
Application Infrastructure	Geospatial Enterprise Server	Web Map Service (WMS)	The means to render 2D maps. See WMS Tier 3 component.
Application Infrastructure	Geospatial Enterprise Server	Web Terrain Service (WTS)	The means to render 3D views of geospatial data. See WTS Tier 3 component.
Application Infrastructure	Geospatial Enterprise Server	Style Management Service (SMS)	The means to create, update and manage styles and symbols. The Style Management Service (SMS) must manage distinct objects that represent styles and symbols and provide the means to discover, query, insert, update, and delete these objects. Styles provide the mapping from feature types and feature properties and constraints to parameterized Symbols used in drawing maps. Symbols are bundles of predefined graphical parameters and predefined fixed graphic "images".

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Application Infrastructure	Geospatial Enterprise Server	Geocoder/Reverse Geocoder Services	<p>Able to determine geospatial coordinates, given an address (Geocoder), or determine address, given geospatial coordinates (Reverse Geocoder). A Geocoder transforms a description of a feature location, such as a place name, street address or postal code, into a normalized description of the location, which includes coordinates. A Geocoder Service receives a description of a feature location as input and provides a normalized address with coordinates as output. The feature location descriptions are any terms, codes or phrases that describe the features, and that are well-known to the Geocoder Service, such as a street addressing or postal coding scheme.</p> <p>These services are very important across the HLS enterprise, as they enable enterprise users to exploit the geospatial-temporal context of the wide diversity of HLS business data that contain Location References, such as address, building name, census tract, etc. They are also key to correlating, integrating and fusing dissimilar data on the basis of geospatial-temporal characteristics.</p>
Application Infrastructure	Geospatial Enterprise Server	Geolocate Service	The means to determine a location for a fixed or Mobile Object of interest (e.g., geospatial feature, person, asset, conveyance, goods, cargo, device, etc.) Mobile Objects must be equipped with GPS, Radio Frequency Identification Device (RFID), and/or other position determination technologies.
Application Infrastructure	Geospatial Enterprise Server	Gateway Service	The Gateway Service determines the geospatial position of a known mobile terminal from a wireless network. Position is expressed in geographic coordinates. Mobile terminals (cell phones, PDAs, etc) must be equipped with GPS or some other position determination technology. An important service used in Location-Based Services (LBS), in the wireless realm.
Application Infrastructure	Geospatial Enterprise Server	Route Service	Able to determine (or fetch a predetermined) route and navigation information for autonomous or semi-autonomous navigation between two or more points on a network. An important service used in LBS, in the wireless realm.

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Application Infrastructure	Geospatial Enterprise Server	Navigation Service	An enhanced version of the Route Service, which determines routes between two or more points with enhanced navigation information. An important service used in LBS.
Application Infrastructure	Geospatial Enterprise Server	Monitoring Service	Able to determine (or fetch a predetermined) location/time/identity/status/activity series for a Location.
Application Infrastructure	Geospatial Enterprise Server	Tracking Service	Able to determine (or fetch a predetermined) location/time/velocity/identity/status/activity series (track) for a Mobile Object (e.g., persons, goods, assets, devices, etc.)
Application Infrastructure	Geospatial Enterprise Server	Weather Service	The means to access weather conditions for an area of interest or location for a specified time period.
Application Infrastructure	Geospatial Enterprise Server	Traffic Service	The means to access traffic information regarding incidents and/or conditions for a specified area of interest, road, or road segment, for a specified time period. Also, the means to access traffic information regarding incidents and/or conditions for a designated route (that has been determined by a Route Service or Navigation Service) for a specified time period.

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Application Infrastructure	Geospatial Enterprise Server	Model Access Service	<p>Able to determine and access the extent and nature of a Toxic Dispersion Model (e.g., plume) for a chemical or biological event in air or water. The model output is characterized by features.</p> <p>“Toxic Dispersion” refers to the effects of introducing a chemical, radioactive or biological agent into the atmosphere or a water supply at a point source. Simulation is employed to understand the effects of a toxic agent within its medium. The objective of the simulation is to ascertain contamination levels in a geospatial-temporal context, and thus, to understand the nature of toxic plumes, danger zones, warning zones, and related features, and to be able to view or analyze the output from a simulation run in conjunction with any other geospatial data, e.g., as plumes or danger/warning zones within a geospatial decision support tool.</p> <p>Also, the ability to determine and access weather, hydrographic and other environmental parameters through environmental simulation. The simulation output is characterized by observations.</p>
Application Infrastructure	Geospatial Enterprise Server	Geoparser Service	<p>Geoparsing refers to the capability to scan and parse a textual document, identifying key words and phrases that have geospatial-temporal context. A Geoparser Service works in the context of two bodies of information: a reserved vocabulary (a dictionary of place names, a gazetteer or a directory of Points of Interest) and a text source (e.g., a newspaper or cable.) The Geoparser returns all occurrences of the use (in the text source) of any term in the reserved vocabulary. Each occasion establishes a geolinks (geospatial/temporal-aware hyperlink) between text terms and the geospatial location associated with the reserved word. That result is an annotated text document with geolinks.</p>
Application Infrastructure	Geospatial Enterprise Server	Sensor Planning Service	<p>A service by which a client can determine sensor collection feasibility for a desired set of collection requests for one or more mobile sensors/platforms, or the client may submit collection requests directly to these sensors/platforms.</p>

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Application Infrastructure	Geospatial Enterprise Server	Sensor Collection Service	A service by which a client can obtain observations from one or more sensors/platforms (can be mixed types). Clients can also obtain information that describes the associated sensors and platforms.
Application Infrastructure	Geospatial Enterprise Server	Sensor Alert Service	The Sensor Alert Service produce alert messages when given observation conditions are met by a sensor. Provides the means for client services/users to specify and register user profiles that contain user information, applicable sensors/observations, alert conditions (e.g., maximum/minimum values), and alert actions (what happens if conditions are met). Also, the means for client services/users to update user profiles. Clients are able to control the nature of alerts. For example, a client is able to activate/deactivate an alert capability. Also provides the means to support push/pull capabilities, e.g., to wait for observation input from associated sensors (for on/off sensors like a detector), or to actively poll for (current/historical/predicted) sensor observations.
Application Infrastructure	Collaboration Server	COP Collaboration Server	A Collaboration Server for managing and monitoring shared COP/MSOP resources and the collaborative exchange of geospatial data.
Application Infrastructure	Collaboration Server	Web Notification Service	A service by which a client may conduct a dialog with one or more other services. This service is useful when many collaborating services are required to satisfy a client request, and/or when significant delays are involved in satisfying the request, which is often the case in the geoprocessing realm.
Data Interchange/ Integration	Inter-Application Services	Geospatial Integration Broker	A key component used in moving geospatial data between systems. Involved in data sharing and collaboration operations in support of the COP and MSOP. Involved in Geospatial Data Rollup (GDR) Operations.
Data Interchange/ Integration	Web Services	Semantic Interoperability Services	Fully autonomous business, service and data interoperability is only possible when clients can locate and access business, service and data on-the-fly through publish-find-bind-orchestration patterns that subscribe to well-known business, service and data semantics.

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Data Interchange/ Integration	Inter-application Message Services	Location-Based Messaging Service	<p>The means to represent location-based messages (messages with embedded geospatial elements). Location-based messages include alerts, after action reports, warnings, emergency declarations, location reports, situation reports and NSSE Reports.</p> <p>The Location Organizer Folder (LOF) is a standard message container model for capturing multi-media data in a geospatial context. It is based upon eXtensible Markup Language (XML) and Geography Markup Language (GML).</p>
Data Management	Data Access Services	Web Map Service (WMS)	<p>A Web Map Service (WMS) is able to access vector and raster data and render it in the form of a map for display (combines access and portrayal). Independent of whether the underlying data are features (point, line and polygon) or coverages (such as gridded digital terrain model or images), the WMS produces an image of the data that can be directly viewed in a web browser or other picture-viewing software. A WMS labels its data as one or more “Layers,” each of which is available in one or more “Styles.” Upon request a WMS makes an image of the requested Layer(s), in either the specified or default rendering Style(s). Typical output formats include Portable Network Graphics (PNG), Graphics Interchange Format (GIF), Joint Photographic Expert Group format (JPEG), and Tagged Image File Format (TIFF).</p>
Data Management	Data Access Services	Web Coverage Service (WCS)	<p>Able to access geospatial coverage data (e.g. imagery and digital terrain model (DTM)). The Web Coverage Service (WCS) supports the networked interchange of geospatial data as “coverages” containing values or properties of geographic locations. Unlike the WMS, which filters and portrays spatial data to return static maps (server-rendered as pictures), the WCS provides access to intact (unrendered) geospatial information, as needed for client-side rendering, multi-valued coverages (such as multi-spectral images and terrain models), and input into scientific models and other clients beyond simple viewers.</p>

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Data Management	Data Access Services	Web Feature Service (WFS)	The Web Feature Service (WFS) supports the query and discovery of geographic features (represented in vector form). In a typical Web access scenario, WFS delivers GML representations of geospatial features. Clients (service requestors/consumers) access geographic feature data through a WFS by submitting a query for just those features that are needed for an application. The client generates a request and posts it to a WFS server on the Web. The WFS instance executes the request, returning the resulting geographic features to the client encoded in GML. A GML-enabled client can manipulate or operate on the returned geographic features.
Data Management	Data Access Services	Gazetteer Service	Able to access a Gazetteer, which is a directory of well-known places and their locations. It generally consists of point features. A Gazetteer Service is a network-accessible service that retrieves one or more features, given a query (filter) request. This filter request must support selection by well-known feature properties. Queryable feature properties include, but are not limited to, feature type, feature name, authority, or identification code. Each instance of a Gazetteer Service has an associated vocabulary of identifiers. Thus, a Gazetteer Service may apply to a given region, such as a country, or some other specialized grouping of features. The returned features will include one or more geometries expressed in a well-known Coordinate Reference System.
Data Management	Data Access Services	Web Terrain Service (WTS)	The Web Terrain Service (WTS) extends the WMS interface to allow the access and portrayal of three dimensional geospatial data. This service can be exploited to perform tasks such as terrain analysis, mission planning, and fly-throughs.
Data Management	Data Access Services	(Location) Directory Service	The (Location) Directory Service provides access to online directories of persons, places, products and/or services (e.g., Yellow/White/Green/Blue Pages, Restaurant/Travel/Entertainment Guides, Community Services, etc). This service is ordinarily used to find the location of a specific or nearest person, place, product and/or service. It is an important service used in LBS.
Data Management	Data Access Services	Image Archive Service	The Image Archive Service accesses archived images. It makes use of WCS and Image Catalog Service (ICS) Tier 3 components.

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Data Management	Data Access Services	Web Annotation Service	The Web Annotation Service is a specialized WFS that accesses map/image annotations. It is based upon the XML for Image and Map Annotation (XIMA), which defines an XML vocabulary to encode annotations on imagery, maps, and other geospatial data. This vocabulary draws on the GML to express the positions of these annotations in geographic (real world) or image-pixel coordinates, and to associate each annotation with the geospatial resource(s) it describes. The XIMA encoding is useful for any activity that requires linking or tagging geospatial data in order to present and discuss it with others, to make joint decisions, or to communicate spatially.
Data Management	Data Access Services	Digital Rights Management Services	Digital Rights Management Services provide secure, managed access to geospatial data provided by private providers/stewards for mission-critical HLS business activities. This is crucial for operations that involve Critical Infrastructure and Key Assets.
Data Management	Data Cataloguing and Metadata Management Services	Web Registry Service (WRS)	The WRS provides a common mechanism to classify, register, describe, search, maintain and access information about geospatial resources available on a network. Resources are network addressable instances of typed data or services. Types of registries are differentiated by their role such as registries for cataloging geospatial resource types (e.g., types of geographic features, coverages, sensors, symbols, services, etc), online data instances (e.g., geospatial and image datasets and repositories, application schema, and symbol-style libraries), and online instances of services.
Data Management	Data Cataloguing and Metadata Management Services	Catalog Service	The Catalog Service defines common information models and standard operations that allow applications and services to interact with registry instances, regardless of their role or content, in order to discover, access and manage geospatial resources (data and services). Specialized Catalog Services may exist for specific data classes, e.g., an ICS.

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Data Management	Data Transformation Services	Coordinate (and Unit) Transformation Service	The ability to transform geospatial data between different coordinate reference systems, datums and units. Support map re-projections on-the-fly for map viewing, as well as permanent coordinate transformations that result in a transformed output data set.
Data Management	Data Transformation Services	Geospatial Data Format Conversion, Import/Export Services	Able to import/export, manipulate and convert geospatial data, through standard services. Formats include GML, MapInfo, ESRI, Intergraph, etc.
Data Management	Data Transformation Services	Topology Services	Able to detect topology errors (e.g., overshoots and undershoots of common linear and polygonal features within a definable tolerance), automatically correct errors, if possible, and define topological relationships between connected/collocated linear, polygon, and point features.
Data Management	Database Management System (DBMS)	Native Spatial DBMS	The Enterprise DBMS should provide native support for storing and managing all types of geospatial data. Capabilities should include geospatial indexing, open Structured Query Language (SQL) support with geometry and topology operators, geospatial analytics, geospatial data mining, coordinate transformation and linear referencing.
Computing Platform	Computer Hardware	Geospatial Processing Workstation	A Geospatial Processing Workstation is a high-end workstation dedicated to GIS, Image Processing and other demanding geospatial processing tasks. Geospatial Processing workstations may be Unix or Windows based. They typically are characterized by large memory, large screen video, and massive disk storage.
Computing Platform	Remote Sensing Hardware	Photogrammetric Cameras	Cameras that are specialized for the remote capture and measurement of panchromatic (350-1100 nm) data of the earth's surface. These units are typically mounted on airborne craft and produce photographs that can be transformed into a geo-registered image product using specialized photogrammetric software applications.

HLS TRM Tier 1	HLS TRM Tier 2	HLS TRM Tier 3	Component Description
Computing Platform	Remote Sensing Hardware	Multi-spectral Scanners	Any device that is specialized for measuring radian energy of the earth's surface using discrete bands of spectral data ranging from the blue to the near-infrared portions of the electromagnetic spectrum.
Computing Platform	Remote Sensing Hardware	Hyper-spectral Scanners	Any device that is specialized for measuring radian energy using contiguous bands of spectral data across a broad range of electromagnetic spectra. The resulting image can be visualized as a 3-dimensional dataset with two spatial and one spectral dimension, which is often referred to as an image cube.
Computing Platform	Remote Sensing Hardware	Light Detection and Ranging (LiDAR)	LiDAR is an active remote sensing system that can be operated in either a profiling or scanning mode using pulses of light to illuminate the terrain. By accurately measuring the round trip travel time of the laser pulse from the aircraft to the ground, a highly accurate spot elevation can be calculated.
Computing Platform	Remote Sensing Hardware	Synthetic Aperture Radar (SAR)	A microwave instrument that transmits radar pulses very rapidly. In fact, SAR is generally able to transmit several hundred pulses while the platform passes over a particular object. Many backscattered radar responses are therefore obtained for that object, which can be manipulated such that the resulting image looks like the data were obtained from a big, stationary antenna. In general, the synthetic aperture is the distance traveled by the spacecraft while the radar antenna collected information about the object.
Computing Platform	Remote Sensing Hardware	Interferometric SAR (InSAR)	Interferometric Synthetic Aperture Radar (InSAR) is a technique that enables measurement of very small movements of the earth's surface, as subtle as centimeters or less. The SAR interferometry technique acquires a pair of images from two radar measurements, taken from two marginally displaced coherent observations of the surface. For each pixel corresponding to the same ground area in both images, phase values are differenced to produce an interferogram, which, using the orbit parameters, is subsequently used to produce a DTM.

3.0 ACRONYMS

Acronym	Definition
COP	Common Operating Picture
DBMS	Database Management System
DHS	Department of Homeland Security
DTM	Digital Terrain Model
EA	Enterprise Architecture
ESRI	Environmental Systems Research Institute
GDR	Geospatial Data Rollup
GEA	Geospatial Enterprise Architecture
GIF	Graphics Interchange Format
GIS	Geographic Information System
GIT	Geospatial Information Technology
GML	Geography Markup Language
GPS	Global Positioning System
HLS	Homeland Security
ICS	Image Catalog Service
InSAR	Interferometric Synthetic Aperture Radar
IPS	Image Processing System
JPEG	Joint Photographic Expert Group
LBS	Location-Based Services
LiDAR	Light Detection and Ranging
LOF	Location Organizer Folder
MSOP	Mission-Specific Operating Picture
NSSE	National Security Special Event
PDA	Personal Digital Assistant
PNG	Portable Network Graphics
POI	Point Of Interest
RFID	Radio Frequency Identification Device
SAR	Synthetic Aperture Radar

SMS	Style Management Service
SQL	Structured Query Language
TIFF	Tagged Image File Format
TRM	Technical Reference Model
WCS	Web Coverage Service
WFS	Web Feature Service
WMS	Web Map Service
WRS	Web Registry Service
WTS	Web Terrain Service
XIMA	XML for Image and Map Annotation
XML	eXtensible Markup Language



**HOMELAND SECURITY GEOSPATIAL ENTERPRISE
ARCHITECTURE**

**ATTACHMENT G TECH 3
GEOSPATIAL TECHNOLOGY PATTERNS**

GEOSPATIAL MANAGEMENT OFFICE

DRAFT – VERSION 0.6.1

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1.0 INTRODUCTION

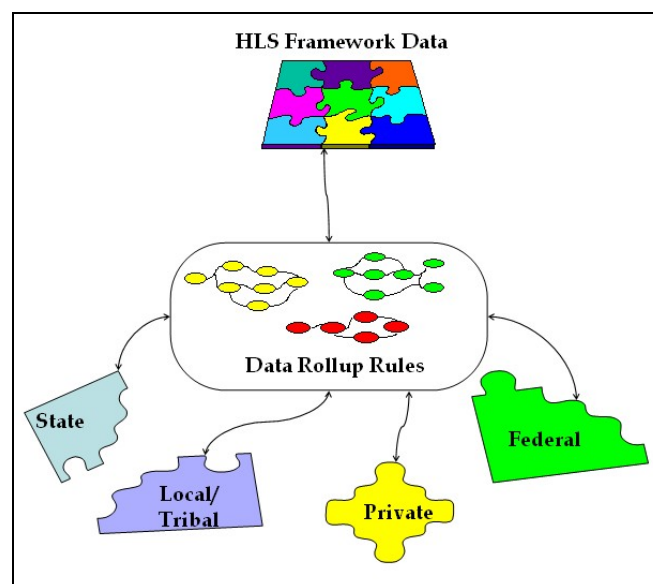
The geospatial technology patterns that are commonly used throughout the Homeland Security (HLS) Geospatial Enterprise Architecture (GEA) are documented herein. The patterns included in this version of the GEA Technical Reference Model (TRM) are the primary patterns required to support Geospatial Data Rollup (GDR) operations, which are needed to create the HLS Common Operating Picture (COP). Additional patterns will be added in subsequent versions of the TRM.

1.1 Geospatial Data Rollup Operations

The greatest challenge of creating the COP for the HLS mission is the provision of mission appropriate, current, accurate, time-sensitive geospatial information. This challenge is magnified because much of the high-value information is created and owned by state, local/tribal, private, federal entities and must be rolled-up to form the COP (see Exhibit 1). A GDR process is critical in responding to this challenge. Following are some specific technical issues that must be addressed to enable geospatial rollup operations.ⁱ

- An Essential Model for *HLS Framework Data* must be established to ensure logical consistency and semantic interoperability (currently underway). [Consists of well-known HLS Geospatial Entity Types, Elements, Properties, Data Dictionary.]
- Catalogs must be employed for registering, publishing and sharing information about geospatial metadata, data and associated geospatial enterprise services, including the semantic meaning, schema, structure, and access protocols; and
- Standards-based geospatial data access and other geospatial enterprise services with well-known semantics must be employed to support GDR.

Exhibit 1 HLS GEA Stakeholders



This Concept of Operations (CONOPS) serves as a roadmap for defining policies, procedures, and detailed implementation specifications for required components to accomplish GDR and create the geospatial data required for HLS. Local/Tribal, State, and Federal service providers will use this CONOPS and the required specifications to plan and engage in developing GDR components, policies and procedures to support data exchange in an interoperable environment. Private sector providers, with relevant content, will use this CONOPS to plan and engage in developing GDR components that will handle HLS and private sector interactions. This includes, but is not limited to, copyrights and pricing.

The following patterns support GDR.

1.1.1 Data Publishing Pattern

The Problem

HLS requires geospatial data that must meet predefined quality standards. Geospatial data can either be stored locally in a central database cluster at HLS or stored at the service provider's sites. In either case, technologies are required to enable automated data verification and publishing. Therefore, data must be described in standard metadata templates. Data also must meet minimum quality and currency specifications. The massive amount of data available to support HLS management, planning and analysis operations must be checked for their compliance with the specifications. Automated approaches are required to perform compliance tests before data are accepted for publishing.

The Solution

The function of this pattern is to enable data providers/stewards to publish their data, and to support HLS operations, using tools to validate, and verify compliance with GDR standards. The Publishing Pattern provides data validation and verification services. The services validate the published data against a well-defined application schema. The services also verify that the data quality parameters and currency are within acceptable ranges.

Application of the Pattern

The logical application of this pattern includes

- Standard metadata schema based on Federal Geographic Data Committee (FGDC) and International Standards for Organizations (ISO) 19115 standards.
- Standard Application Schema based on Geospatial Markup Language (GML).
- Well-defined test suite to indicate the compliance of the data set with respect to HLS standards.
- Tools to harvest metadata automatically of and automatically execute the test suites. If the data set passes the test, it is then published using a catalog service, which is based on OGC Catalog Service Specifications.
- Client Application to enable the functionalities mentioned above.

1.1.2 Data Discovery Pattern

The Problem

HLS Framework Data is a network of distributed databases designed to support HLS tasks. Users require single entry point to allow them to locate relevant data quickly. Users need seamless access to *HLS Framework Data* to search and select from available data.

The Solution

Catalog Services provide a common mechanism to classify, register, describe, search, maintain and access information about available geospatial *resources*. These resources are network addressable instances of typed data or services. This pattern is designed to allow users to search HLS geospatial databases based on data type, named location, and user-defined bounding areas. When multiple sources exist for a specific data type in an area of interest, users will be able to select among them based on available metadata. Furthermore, when multiple sources exist for a specific data type in an area of interest, this pattern will automatically select one based on appropriate criteria and policies. Users may need to search for desired data by ‘drilling down’ multi-levels of metadata, from general to specific data. Multi-level search can be based *HLS Framework Data* hierarchy.

Application of the Pattern

The logical application of this pattern includes

- Standard metadata schema based on FGDC and ISO 19115 standards
- Hierarchical structure of the metadata that correspond to the level of details of data from Local/Tribal, State, and Federal service providers
- OpenGIS Catalog Service Specifications will enables seamless discovery of data
- Client Application to enable the functionalities mentioned above
- Taxonomy of feature types to enable intelligent search. For example, users can enter keywords for a feature type, e.g., Road, and the catalog returns information about highways, access roads, streets, etc.

1.1.3 Translation Pattern

The Problem

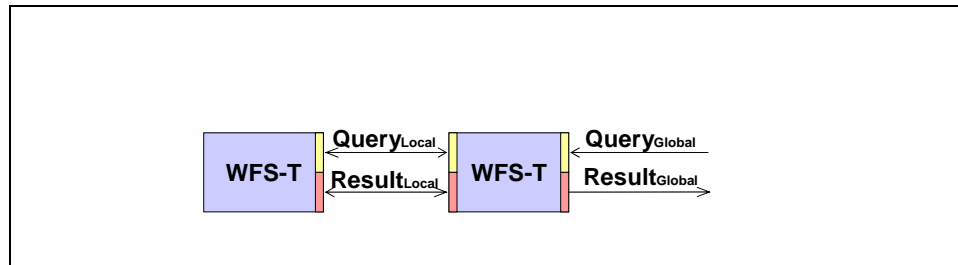
HLS is able to access geospatial data from a variety of providers distributed across the network. These providers can have their data based on different schemas. It is rather impossible for HLS users to use these heterogeneous data to perform time critical tasks. A technology is required to seamlessly translate service providers’ application schemas to HLS application schemas.

The Solution

The function of this pattern is to allow HLS users to obtain desired data for a particular area, without needing to know the details of how the data are stored and maintained by independent organizations. For example, Department of Homeland Security (DHS) might maintain a service providing interstate highway data, a state might serve data about the highways under its jurisdiction, and a city might serve urban street data. A HLS user should be able to obtain and seamlessly manipulate these data including roads from all of these jurisdictions simultaneously,

letting the Translation Pattern automatically interact with the necessary services and combine data as necessary to fulfill the request. As shown in Exhibit 2, users can send a Query based on schemas that they understand and the Translation Service will have the task of translating the query to other schemas and map the response back to the target HLS application schema.

Exhibit 2 Schema Translation Pattern



Application of the Pattern

Schema translation is an adaptation of an existing OGC web service, the Web Feature Service (WFS), with the goal of integrating distributed data in this way. The WFS-X enables the providers of the local data, who are exactly the ones to best know how their data fits into the Standard Application Schema, to be provided by HLS, to perform the task of mapping their data into the well-defined schema. The provider's standard application schemas are defined in GML. The logical application of this pattern includes:

- Standard application schemas provided by HLS
- Catalog that contains registered standard application schemas, service providers' application schemas as well as their mapping rules. This will enable automated service discovery and translation
- Transactional Web Feature Service (WFS-T), which enables seamless access to geospatial data

1.1.4 Digital Rights Pattern

The Problem

Real-time up-to-date access to data is critical to achieve HLS mission. A new paradigm is required to provide real-time access to data that change frequently, e.g., Weather data. Furthermore, private sector service providers in the United States hold geospatial content that will play an important role in HLS management, planning, and analysis tasks. While this is generally a good thing, many private enterprises involved in the production and trading of geospatial data with the federal government and HLS in particular will find the need to protect their intellectual property assets through the digital distribution value chain. Organizations want to specify, manage, control and track geospatial data distribution within safe, open and trusted environments. A system of operating agreements and interoperable technologies are needed to enable broader distribution and use of geospatial data while protecting the rights of producers and users.

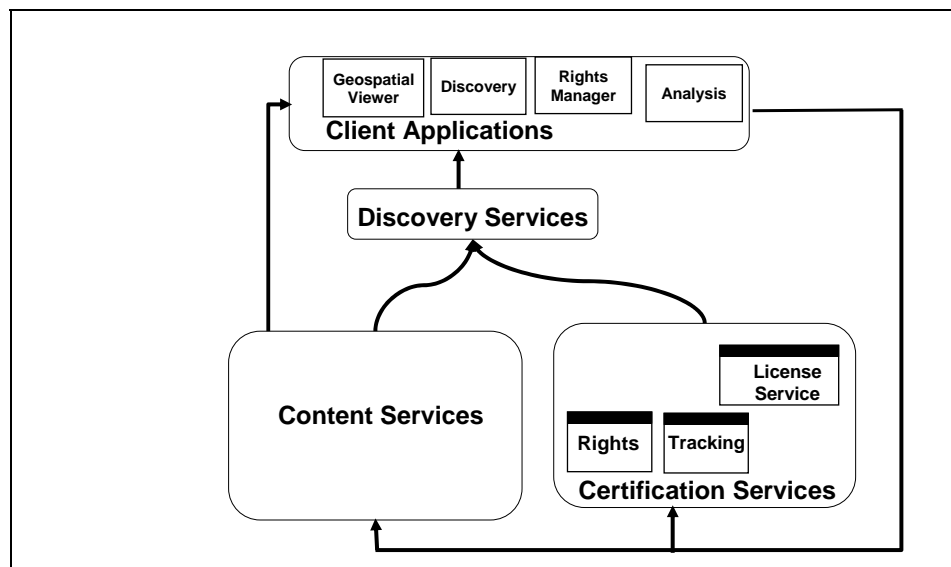
The Solution

Digital Rights Management (DRM) in its broadest view is concerned with the management of all rights, not just digital rights. DRM technology was originally focused on the narrow problem of persistent protection of digital content. Persistent protection mechanisms involve authentication, authorization and encryption technologies for effectively locking digital contents and limiting distribution to those who pay. Protection is persistent when it remains in force wherever the content is in the enterprise. Today, DRM covers a much broader spectrum of capabilities and underlying technologies supporting description, identification, trading, protection, monitoring, and tracking of all forms of rights usages for geospatial data.

Application of the Pattern

The core concept in DRM is the use of digital licenses. Instead of buying the digital content, the consumer Purchases a license granting certain rights with respect to the content. A license is a digital data file that specifies certain usage rules for the digital content. Usage rules can be defined by a range of criteria, such as frequency of access, expiration date, restriction of transfer to other devices, printing permission, copy permission etc. These rules can be combined to enforce certain business models, such as rental or subscription, try-before-buy, pay-per-use, etc.

Exhibit 3 Roll of DRM



As shown in Exhibit 3, DRM consists of the following components

- **Rights Service:** This service binds the geospatial data elements (data set, features, and attributes) with the access rights. The service is dedicated mainly to the definition and redistribution of rights between users of the system as the result of a transaction. This service also enables users to search and view available rights for each data element. eXtensible rights Markup Language (XrML) is a digital rights language used to specify rights, terms, and conditions. Using XrML, anyone owning or distributing digital resources (content, services, or software applications) can identify the parties allowed to

use those resources, the rights available to those parties, and the terms and conditions under which those rights may be exercised.

- **Licensing Service:** This service is to enable online licensing mechanisms. It enables the creation and distribution of electronic certificates for content providers, discovery service providers, and HLS user. The service creates and distributes encrypted licenses (sometimes called tickets permits, or vouchers) that describe rights to content, the identities of the users or devices to whom the rights are granted, and the conditions (e.g., payments) under which they are granted. It is also possible to include license description in the packaged data, in case online licensing is not required. Using Licensing Service, Content providers can develop different licensing schemes based on duration limitation, time limit, number of uses, or pay per use.
- **Tracking service:** The Tracking Service is responsible for logging license consumptions and transactions for every user. For instance, in an online licensing model, a user might only be allowed to print a document twice. The Tracking Service can keep a counter of the number of times a user printed the document. This service must be tight to the Distributor Service so that the appropriate charging is applied.

1.1.5 Update and Synchronization Pattern

The Problem

In a large distributed information system like HLS EA, data must be kept up-to-date at all times. Automated update and synchronization is essential to maintain data currency and integrity.

The Solution

This pattern is design to achieve three tasks

- 1) Notify and alert HLS users of new updates to *HLS Framework Data*
- 2) Poll service providers for new updates to specific data
- 3) Respond to update and synchronization requests sent by data providers/stewards

The OpenGIS Transactional WFS and Web Coverage Service (WCS) provide an open, standard interface to manipulate and manage Features and Coverages, respectively. A standard notification and synchronization protocol is required for geospatial content.

Application of the Pattern

The logical application of this pattern includes:

- Work in conjunction with Data Publishing Pattern to automatically verify and test the data for their completeness and compliance with the standard
- Work in conjunction with Schema Translation to map data from application schemas of service providers to standard application schemas of HLS
- Protocol to support polling and synchronization of geospatial content based on some predefined spatial and temporal parameters, e.g., bounding box, time and location.

1.1.6 Visualization Pattern

The Problem

The HLS user community consists of a widely varied set of individuals and roles that have different visualization requirements. A mechanism is required to publish and share symbolizing and stylizing rules.

The Solution

The OpenGIS Catalog Service can be used to publish and register symbol libraries as well as customized symbolization and styling rules for use by other authorized users. These rules must be used to generate standard HLS maps that depend on users' roles and current tasks. The OpenGIS WMS and Coverage Portrayal Service provide interfaces to generate standard maps and coverages respectively. Client applications are required to provide symbol and style management as well as visualization.

Application of the Pattern

The logical application of this pattern includes:

- Catalog Service to register symbols and styles
- Catalog service to register user-defined stylizing and symbolizing rules. This includes registering the OpenGIS Styled Layer Descriptors (SLD).
- Mechanism to dynamically bind symbols and styles according to users' roles and tasks
- Client applications to manage and create symbol and style libraries and rules
- Client applications to generate visualizations based on symbols and styles

2.0 ACRONYMS

Acronym	Definition
CONOPS	Concept of Operations
COP	Common Operating Picture
DHS	Department of Homeland Security
DRM	Digital Rights Management
FGDC	Federal Geographic Data Committee
GDR	Geospatial Data Rollup
GEA	Geospatial Enterprise Architecture
GML	Geographic Markup Language
HLS	Homeland Security
ISO	International Standards for Organizations

OGC	Open GIS Consortium
SLD	Styled Layer Descriptors
TRM	Technical Reference Model
WFS	Web Feature Service
WFS-T	Transactional Web Feature Service
WMS	Web Map Service
XrML	eXtensible rights Markup Language

3.0 LIST OF REFERENCES

ⁱ GIS: Infrastructure Underpinnings for the National Map, Dangermond and Brown, PE&RS, Volume 69, Number 10, October 2003



**HOMELAND SECURITY GEOSPATIAL ENTERPRISE
ARCHITECTURE**

**ATTACHMENT G TECH 4
GEOSPATIAL STANDARDS**

GEOSPATIAL MANAGEMENT OFFICE

DRAFT – VERSION 0.6.1

May 7, 2004

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1.0 INTRODUCTION

Geospatial information can be maintained and shared in a wide variety of formats depending on the type of data and its intended use. This geospatial data can be used for such purposes as to describe features on a map (such as roads, buildings, and lakes), to locate an image (such as a satellite weather photo) to a place in the world, or to indicate a location (such as a place name or street address). To facilitate exchange of geospatial information and other data with geospatial attributes, standards are required for the content and organization of the data. National, military, and international standards have been developed to support the broad range of uses of geospatial data. This document lists and briefly describes the standards that can be used to manage geospatial data.

2.0 GEOSPATIAL STANDARDS

Standards for describing geospatial data and that use geospatial data are developed by a number of organizations at the international and national level. Other organizations also develop standards or profiles of standards based on the work of the international and national organizations either independently or through direct or indirect participation. These standards and standard profiles are created to facilitate information management within a community of interest, but can be applicable to other communities and organizations as well.

2.1 National Standards

In addition to geospatial standards developed by ISO that are adopted as US National Standards, the Federal Geographic Data Committee is charged with developing standards for the storage and dissemination of US geospatial data assets. These standards are listed in the following tables. Exhibit 1 lists the FGDC standards that have been vetted through public review and adopted by the FGDC. Exhibit 2 lists FGDC standards that are currently in the draft stage and are available for review, but are subject to change in the future. Additional standards in the proposal and early draft stages are not listed here.

Exhibit 1 - Published FGDC Standards

Identifier	Title	Description
FGDC-STD-001-1998	Content Standard for Digital Geospatial Metadata (version 2.0)	Provides a common set of terminology and definitions for the documentation of digital geospatial data
FGDC-STD-001.1-1999	Content Standard for Digital Geospatial Metadata, Part 1: Biological Data Profile	Provides a user-defined or theme-specific profile of the FGDC Content Standard for Digital Geospatial Metadata to increase its utility for documenting biological resources data and

Identifier	Title	Description
		information
FGDC-STD-001.2-2001	Metadata Profile for Shoreline Data	Extension or profile to the existing Content Standards for Digital Geospatial Metadata (CSDGM) to capture the critical processes and conditions that revolve around creating and collecting shoreline data
FGDC-STD-002	Spatial Data Transfer Standard (SDTS)	Defines a non-proprietary format for packaging vector or raster spatial data with attributes, metadata, a data quality report and usually a data dictionary (modified version adopted as ANSI INCITS 320:1998)
FGDC-STD-002.5-1999	Spatial Data Transfer Standard (SDTS), Part 5: Raster Profile and Extensions	Specification of a profile for use with geo-referenced two dimensional raster data (intended to replace the existing Draft FIPS SDTS Part 5: Raster Profile). [The objective of this project is to develop a profile of SDTS, through the convergence of the Draft FIPS Part 5 Raster Profile of SDTS, the ISO/IEC Committee Draft 12087-5 Basic Image Interchange Format (BIIF) raster transmission standards, and the GeoTIFF version 1.0 specification.]
FGDC-STD-002.6-1998	Spatial Data Transfer Standard (SDTS), Part 6: Point Profile	Contains specifications for a SDTS profile for use with geographic point data only, with the option to carry high precision coordinates (by increasing the number of decimal places or significant figures) such as those required for geodetic network control points can be attained (This profile is a modification of Part 4, the Topological Vector Profile, and follows many of the conventions of that profile.)

Identifier	Title	Description
FGDC-STD-002.7-2000	Spatial Data Transfer Standard (SDTS), Part 7: Computer-Aided Design and Drafting (CADD) Profile	Specifications for an SDTS profile for use with vector-based geographic data as represented in CADD software
FGDC-STD-003	Cadastral Data Content Standard	Supports the automation and integration of publicly available land records information
FGDC-STD-004	Classification of Wetlands and Deepwater Habitats of the United States	Supports the use of ecological and hydrological information for the identification, classification, and mapping of wetlands in the United States and its territories
FGDC-STD-005	Vegetation Classification Standard	Supports the use of a consistent national vegetation classification system (NVCS) to produce uniform statistics in vegetation resources from vegetation cover data at the national level
FGDC-STD-006	Soil Geographic Data Standard	Proposes a set of data standards for the inventory, mapping, and reporting on the soil resources of the United States. It includes a description of the proposed data elements to be used when reporting and transferring data used to describe soil map units and their components
FGDC-STD-007.1-1998	Geospatial Positioning Accuracy Standard, Part 1: Reporting Methodology	Provides a common methodology for reporting the accuracy of horizontal coordinate values and vertical coordinate values for clearly defined features where the location is represented by a single point coordinate
FGDC-STD-007.2-1998	Geospatial Positioning Accuracy Standard, Part 2: Geodetic Control Networks	Provides a common methodology for determining and reporting the accuracy of horizontal coordinate values and vertical coordinate values for geodetic control points

Identifier	Title	Description
FGDC-STD-007.3-1998	Geospatial Positioning Accuracy Standard, Part 3: National Standard for Spatial Data Accuracy	Implements a statistical and testing methodology for estimating the positional accuracy of points on maps and in digital geospatial data, with respect to georeferenced ground positions of higher accuracy
FGDC-STD-007.4-2002	Geospatial Positioning Accuracy Standard, Part 4: Architecture, Engineering, Construction (A/E/C) and Facilities Management	Defines accuracy criteria, accuracy testing methodology, and accuracy reporting criteria for object features depicted on A/E/C spatial data products and related control surveys
FGDC-STD-008-1999	Content Standard for Digital Orthoimagery	Defines the orthoimagery theme of the digital geospatial data framework to provide a base on which to collect, register, and integrate digital geospatial information accurately
FGDC-STD-009-1999	Content Standard for Remote Sensing Swath Data	Defines the minimal content requirements for a remote sensing swath and the relationships among its individual components
FGDC-STD-010-2000	Utilities Data Content Standard	Specifies the names, definitions and domains for utility system components that can be geospatially depicted as feature types and their non-graphical attributes
FGDC-STD-011-2001	U.S. National Grid	Defines a preferred U.S. National Grid (USNG) for mapping applications at scales of approximately 1:1,000,000 and larger, how to present Universal Transverse Mercator (UTM) coordinates at various levels of precision, specifies the use of those coordinates with the grid system defined by the Military Grid Reference System (MGRS), and addresses specific presentation issues such as grid spacing
FGDC-STD-012-2002	Content Standard for Digital Geospatial Metadata: Extensions for Remote Sensing Metadata	Defines content standards for additional metadata, not defined in the Metadata Content Standard, that are needed to describe data obtained from remote sensing

Exhibit 2 - Draft FGDC Standards

Title	Description
Address Content Standard	Establishes the requirements for documenting the content of addresses applicable to entities having a spatial component
Content Standard for Framework Land Elevation Data	Describes processing, accuracy, reporting, and applications considerations for NSDI Framework digital elevation data
Digital Cartographic Standard for Geologic Map Symbolization	Provides descriptions, examples, cartographic specifications, and notes on usage for a wide variety of symbols that may be used on a typical digital geologic map or related product (includes symbol definitions)
Facility ID Data Standard	Provides a set of standardized data elements that support the location and identification of place-based objects that are generally known as facilities (a “facility” is defined in this standard as a distinct real property entity, including all objects managed by facility management and work management systems)
Geospatial Positioning Accuracy Standard, Part 5: Standard for Hydrographic Surveys and Nautical Charts	Provides minimum standards for the horizontal and vertical accuracy of features associated with hydrographic surveys that support nautical charting
Hydrographic Data Content Standard for Coastal and Inland Waterways	Nationally focused hydrographic data content standard for spatial data that supports safety of navigation that provides a consistent catalog of terms and definitions (semantics) to ensure uniform interpretation of information across a variety of organizations that develop and use hydrographic feature data and applications.
NSDI Framework Transportation Identification Standard	Provides a logical data model for identifying unique road segments which are independent of cartographic or analytic network representation

The National Spatial Data Infrastructure (NSDI) standards are being developed as part of the Geospatial One-Stop e-Gov initiative. These standards establish a framework for organizing geospatial data in themes. The standards listed in Exhibit 3 are in the process of being developed and are available for review, but are subject to change as the development of these documents progresses.

Exhibit 3 - Draft National Spatial Data Infrastructure (Geospatial One-Stop) Standards

Title	Description
American National Standard for Information Technology Geographic Information Framework Data Content Standards – (Base Standard)	Establishes common requirements for data exchange standards for seven themes of geospatial data identified as being required by many different Geographic Information Systems (GIS) applications [National Spatial Data Infrastructure (NSDI) Framework themes: geodetic control, elevation, orthoimagery, hydrography, transportation, cadastral, and digital government unit boundaries]
ANSI Geographic Information Framework Data Content Standards For Digital Orthoimagery (Part XXX)	Supports the exchange of digital orthoimagery data
ANSI Geographic Information Framework Draft Data Content Standards For Digital Elevation (Part XXX)	Defines the elements that permit collection and exchange of digital elevation data consistent with the National Spatial Data Infrastructure’s (NSDI) framework for elevation data and includes a conceptual schema expressed in the Unified Modeling Language (UML) according to ISO 19109 – Rules for Application Schema
ANSI Geographic Information Framework - Data Content Standard (Part NNN) Government Unit Boundary Data Exchange Standard	Identifies and defines terminology, encoding scheme, and the data components required for describing the governmental unit or other legal entity and its boundary, along with the metadata needed for boundary data exchange
ANSI Geographic Information Framework Data Content Standards For Cadastral Data (Part XXX)	Provides necessary information to identify the existence of parcel level cadastral information and the source of that information - the geospatial metadata provided with the information will provide information on the contact, distribution, and access requirements for the data

Title	Description
ANSI Geographic Information Framework Data Content Standards For Hydrography (Part XXX)	Provides common definitions and syntax to enable collaborative development, use, and exchange of hydrography data
ANSI Geographic Information Framework - Data Content Standard For Geodetic Control	Provides a common methodology for creating data sets of horizontal coordinate values and vertical coordinate values for geodetic control points and provides a single data structure for relating coordinate values obtained by one geodetic survey method with coordinate values obtained by another geodetic survey method
Geographic Information Framework Data Content Standards For Transportation Networks: Base Transportation Standard (Part XXX)	Defines the components of transportation systems for five modes that compose the Transportation theme of the NSDI
Geographic Information Framework Data Content Standards For Transportation Networks: Air (Part XXX)	Supports the exchange of transportation data related to aviation
Geographic Information Framework Data Content Standards For Transportation Networks: Rail (Part XXX)	Defines components of the railway system,
Geographic Information Framework Data Content Standards For Transportation Networks: Roads (Part XXX)	Supports the exchange of transportation data related to road networks
Geographic Information Framework Data Content Standards For Transportation Networks: Transit (Part XXX)	Defines components of public transportation (transit) systems

Title	Description
Geographic Information Framework Data Content Standards For Transportation: Inland Waterways (Part XXX)	Supports the use and exchange of river (inland waterway) information

2.2 OGC Standards

The Open GIS Consortium (OGC) is a non-profit, international, voluntary consensus standards organization that is leading the development of standards for geospatial and location based services. The Types of OGC standards listed here are: Open GIS Implementation Specification (IS) and Discussion Paper (DP).

Exhibit 4 - OGC Standards

Type	Title	Description
IS	Styled Layer Descriptor (SLD 1.0)	The SLD is an encoding for how the Web Map Server (WMS 1.0 & 1.1) specification can be extended to allow user-defined symbolization of feature data.
IS	Web Map Service (WMS 1.1.1)	Provides four protocols (GetCapabilities, GetMap, GetFeatureInfo and DescribeLayer) in support of the creation and display of registered and superimposed map-like views of information that come simultaneously from multiple sources that are both remote and heterogeneous.
IS	Web Map Context Documents (WMC 1.0)	Create, store, and use "state" information from a WMS based client application.
IS	Web Feature Service (WFS 1.0)	The purpose of the Web Feature Server Interface Specification (WFS) is to describe data manipulation operations on OpenGIS® Simple Features (feature

Type	Title	Description
		instances) such that servers and clients can “communicate” at the feature level.
IS	Web Coverage Service (WCS 1.0)	Extends the Web Map Server (WMS) interface to allow access to geospatial "coverages" that represent values or properties of geographic locations, rather than WMS generated maps (pictures).
IS	OpenGIS Location Services (OpenLS): Core Services [Parts 1-5] (OLS Core 1.0)	OpenGIS Location Services (OpenLS): Core Services, Parts 1-5, which consists of the composite set of basic services comprising the OpenLS Platform. This platform is also referred to as the GeoMobility Server (GMS), an open location services platform.
IS	Geography Markup Language (GML 3.0)	The Geography Markup Language (GML) is an XML encoding for the transport and storage of geographic information, including both the geometry and properties of geographic features.
IS	Catalog Interface (CAT 1.1.1)	Defines a common interface that enables diverse but conformant applications to perform discovery, browse and query operations against distributed and potentially heterogeneous catalog servers.
IS	Filter Encoding (Filter 1.0)	A filter is a construct used to describe constraints on properties of a feature class for the purpose of identifying a subset of feature instances to be operated upon in some way.
IS	Grid Coverages (GC 1.0)	This specification was designed to promote interoperability between software implementations by data vendors and software vendors providing grid analysis and processing capabilities.
IS	Coordinate Transformation Services (CT 1.0)	Provides interfaces for general positioning, coordinate systems, and coordinate transformations.

Type	Title	Description
IS	Simple Features – COBRA (SFC 1.0)	The Simple Feature Specification application programming interfaces (APIs) provide for publishing, storage, access, and simple operations on Simple Features (point, line, polygon, multi-point, etc).
IS	Simple Features – OLE/COM (SFO 1.1)	The Simple Feature Specification application programming interfaces (APIs) provide for publishing, storage, access, and simple operations on Simple Features (point, line, polygon, multi-point, etc).
IS	Simple Features – SQL (SFS 1.1)	The Simple Feature Specification application programming interfaces (APIs) provide for publishing, storage, access, and simple operations on Simple Features (point, line, polygon, multi-point, etc).
DP	XML for Image and map Annotation (XIMA 0.4)	Defines an XML vocabulary to encode annotations on imagery, maps, and other geospatial data. This vocabulary draws on the Geography Markup Language (OpenGIS® GML Recommendation Paper, Revision 2.0.)
DP	Location Organizer Folder (LOF 1.0)	The Location Organizer Folder (LOF) is a GML document that provides a structure for organizing the information related to a particular event or events of interest.
DP	Web Notification Service (WNS 0.1.0)	The Web Notification Service (WNS) is the first asynchronous messaging service specified by OGC. At the moment, the WNS message schema is optimized to fulfil the needs of services supporting the use of sensors, like “Sensor Planning Service”. Future work activities should include the adaptation of the message schema to the needs of other services.
DP	Style Management Service (SMS 0.0.9)	This document describes the proposed system design for the OGC Style Management Service (SMS). The SMS must manage distinct objects that represent styles and symbols and provide the means to discover, query, insert, update, and delete these objects. Styles provide the mapping from feature types and feature properties and constraints to parameterized Symbols used in drawing maps. Symbols are bundles of predefined graphical parameters and predefined fixed graphic "images".

Type	Title	Description
DP	Geoparser (GeoP 0.7.1)	Geoparsing refers to the capability to process a textual document and identify key words and phrases that have a spatial context.
DP	Gazetteer Service Profile of a WFS (Gaz 0.0.9)	Provides web access to an authority for place names. Returns their associated feature representations
DP	Web Registry Server (WRS 0.0.2)	A Registry Service defines a common mechanism to classify, register, describe, search, maintain and access information about OGC Web resources. The OGC Service Registry provides the methods for managing a repository; a Registry Client is an application used to access the Registry.
DP	Sensor Model Language (SensorML) for In-situ and Remote Sensors (SensorML 0.7)	The Sensor Model Language work proposes an XML schema for describing the geometric, dynamic, and observational characteristics of sensor types and instances.

2.3 Military Standards

Many military standards are used to manage geospatial data or data with geospatial attributes (such as imagery). The following exhibit lists several US military and NATO standards that are used to manage geospatial information.

Exhibit 5 - Military Geospatial Standards

Identifier	Title	Description
MIL-STD-188-196	Bi-Level Image Compression for the National Imagery Transmission Format Standard, 18 June 1993 with Notice 1, 27 June 1996	Establishes the requirements to be met by NITFS systems when image data are compressed using the bi-level facsimile compression specified by the International Telecommunications Union (ITU) International Telegraph and Telephone Consultative Committee (CCITT) Recommendation T.4 and MIL-STD-188-161C for Group 3 facsimile devices
MIL-STD-188-199	Vector Quantization Decompression for the National Imagery Transmission Format Standard, 27 June 1994 with Notice 1, 27 June 1996	Establishes the requirements to be met by NITFS compliant systems when image data are decompressed using the vector quantization (VQ) compression algorithm
MIL-STD-2045-44500	Tactical Communications Protocol 2 (TACO2) for the National Imagery Transmission Format Standard	Establishes the requirements to be met by systems complying with NITFS when using the TACO2 protocol
MIL-STD-2401	Department of Defense Standard Practice, World Geodetic System (WGS), 11 January 1994, as implemented by NIMA TR 8350.2, Department of Defense World Geodetic System 1984: Its Definitions and Relationships with Local Geodetic Systems, Third Edition, 4 July 1997, as modified by Amendment 1, 3 January 2000	Defines the technical content of WGS 84

Identifier	Title	Description
MIL-STD-2500B	National Imagery Transmission Format (Version 2.1) for the National Imagery Transmission Format Standard, 22 August 1997 with Notice 1, 2 October 1998, and Notice 2, 1 March 2001	Establishes the requirements for the National Imagery Transmission Format Version 2.1 (NITF 2.1) developed to keep the imagery format consistent with the emerging ISO Basic Imagery Interchange Format (BIIF) and the NATO Secondary Imagery Format (NSIF)
STANAG 4545	NATO Secondary Imagery Format (NSIF)	Standard for formatting digital imagery and imagery-related products and exchanging them among members of NATO
STDI-0002	National Support Data Extensions (SDE) (Version 1.3) for the National Imagery Transmission Format Standard (NITFS).	Provides the approved CE specifications to be used with the National Imagery Transmission Format (NITF) versions 2.0 (NITF2.0) or 2.1 (NITF2.1)
None	The Compendium of Controlled Extensions (CE) for the National Imagery Transmission Format (NITF) VERSION 2.1, 16 November 2000	Provides the approved CE specifications to be used with the National Imagery Transmission Format (NITF) versions 2.0 (NITF2.0) or 2.1 (NITF2.1). This compendium is an unclassified companion to STDI-0002
MIL-STD-2407	Interface Standard for Vector Product Format (VPF), 28 June 1996, with Notice of Change, Notice 1, 26 October 1999	Defines a common format, structure, and organization for data objects in large geographic databases based on a georelational data model and intended for direct use [products: Vector Map (VMap) Levels 0-2, Urban Vector Map (UVMMap), Digital Nautical Chart (DNC), VPF Interim Terrain Data (VITD), Digital Topographic Data (DTOP), and World Vector Shoreline Plus (WVSPLUS)]
MIL-STD-2411	Raster Product Format, 6 October 1994; with Notice of Change, Notice 1, 17 January 1995, and Notice of Change, Notice 2, 16 August 2001	Common format for the interchange of raster-formatted digital geospatial data among DoD components [products: Compressed ARC Digitized Raster Graphics (CADRG), Controlled Image Base (CIB), and Digital Point Positioning Data Base (DPPDB)]

Identifier	Title	Description
MIL-STD-2525B	Common Warfighting Symbology, 30 January 1999	Warfighting symbology to convey information about objects in the warfighter battlespace

2.4 International Standards

At the international level, Technical Committee 211 (TC211) of the International Organization for Standardization (ISO) is chartered with developing international standards dealing with geographic information. At the US National level, the International Committee for Information Technology Standards (INCITS) L1 Committee (Geographic Information Systems) is the US Technical Advisory Group representing the US on ISO/TC211. The American National Standards Institute (ANSI) accredits INCITS, which adopts many ISO standards in whole or part (as profiles) as US National Standards.

The following table lists the International Standards published or under development. The Status indicates if the standard is an International Standard (IS), Draft International Standard (DIS), Preliminary Draft Technical Specification (PDTS), Committee Draft (CD), or Working Draft (WD).

Exhibit 4 - ISO Geospatial Standards

Identifier	Title	Description	Status
ISO 6709:1983	Standard representation of latitude, longitude and altitude for geographic point locations	Specifies a variable-length format for the representation of latitude, longitude and altitude for use in data interchange	Review for revision
ISO/IEC 12087-5:1998	Information Technology - Computer graphics and image processing - Image Processing Interchange (IPI) - Functional specification - Part 5: Basic Image	Specification developed to provide a foundation for interoperability in the interchange of imagery and imagery-related data among applications	IS

Identifier	Title	Description	Status
	Interchange Format (BIIF)		
ISO/IEC 13249-3:2003	Information technology -- Database languages -- SQL multimedia and application packages -- Part 3: Spatial	Describes the requirements needed to store, manage and retrieve information based on aspects of spatial data such as geometry, location and topology	IS
ISO 19107:2003	Geographic information - Spatial schema	Provides a conceptual schema for describing aspects of the spatial characteristics of geographic features. Components of this schema may be specialized within an application schema to describe specific feature types.	IS
ISO 19108:2002	Geographic information - Temporal schema	Defines standard concepts needed to describe the temporal characteristics of geographic information	IS
ISO 19109	Geographic information - Rules for application schema	Shows how to develop schemas, which identify how the various parts of this standard shall be applied for particular application domains. The core of this process is the General Feature Model, which acts as a platform for the parts of this family of standards, particularly Metadata and Feature cataloguing.	DIS
ISO 19110	Geographic information - Methodology for feature cataloguing	Provides a standard framework for organizing and reporting the classification of real world phenomena in a set of geographic data. Geographic features are the representations of real world phenomena associated with a location relative to the Earth, about which data are collected, maintained and disseminated. Feature catalogues defining the types of features represented in geographic data enable the dissemination, sharing and use of geographic data through a better understanding of the contents and meaning of the data	DIS

Identifier	Title	Description	Status
ISO 19111:2003	Geographic information - Spatial referencing by coordinates	Establishes a common requirement for describing coordinate reference systems (CRSs) including the datum giving the relation to the Earth and the coordinate system used	IS
ISO 19113:2002	Geographic information - Quality principles	Provides guidelines to data producers for describing the quality of their data; the quality information may be used by data users attempting to determine whether or not specific data is of sufficient quality for their particular application	IS
ISO 19114:2003	Geographic information - Quality evaluation procedures	Establishes a framework of quality evaluation procedures for a dataset of geo-spatial data so that data producers can define how well their products meet their product specification and users can define their requirements and how well they are met	IS
ISO 19115:2003	Geographic information - Metadata	Provides a clear procedure for the description of digital geographic datasets so that users will be able to determine whether the data in a holding will be of use to them and how to access the data by establishing a common set of metadata terminology	IS
ISO 19115-2	Geographic information - Metadata - Part 2: Extensions for imagery and gridded data	Defines metadata elements to support imagery and gridded data and will extend the UML model for metadata to support the collection and processing of natural and synthetic imagery and define a data model for information describing geographic imagery and gridded data	WD
ISO 19116	Geographic information - Positioning services	Defines a standard interface data structure for use between positioning devices and geographic information application systems	DIS

Identifier	Title	Description	Status
ISO 19117	Geographic information - Portrayal	Provides applications with a common interface to supported standard symbol sets used to portray geographic information as an image understandable by humans, including the methodology for describing symbols	DIS
ISO 19118	Geographic information - Encoding	Specifies the encoding rules that shall be used for data interchange purposes to allow geographic information defined in an application schema to be coded into a system independent data structure suitable for transport or storage	DIS
ISO 19119	Geographic information - Services	Provides identification and definition of the service interfaces used for geographic information and definition of the relationships to the Open System Environment model	DIS
ISO 19123	Geographic information - Schema for coverage geometry and functions	A conceptual schema for the spatial characteristics of coverages	DIS
ISO 19125-1	Geographic information - Simple feature access - Part 1: Common architecture	Describes the common architecture for simple feature geometry	DIS
ISO 19125-2	Geographic information - Simple feature access - Part 2: SQL option	Specifies an SQL schema that supports storage, retrieval, query and update of simple geospatial feature collections; establishes an architecture for the implementation of feature tables; defines terms to use within the architecture; applies to both SQL Components and SQL with Geometry Types Components; describes a set of SQL Geometry Types together with the SQL functions on those types	DIS
ISO 19126	Geographic information - Profile - FACC Data Dictionary	Profile of ISO 19110 (in the context of DGIWG) that defines a Data Dictionary and includes the definition of Features and	CD

Identifier	Title	Description	Status
		Attributes	
ISO 19127	Geographic information - Geodetic codes and parameters	Defines rules for the population of tables of geodetic codes and parameters and identifies the data elements required within these tables, in compliance with ISO 19111, and makes recommendations for use of the tables	PDTS
ISO 19128	Geographic information - Web Map server interface	Describes a Web Map Server that can produce a map (as a picture, as a series of graphical elements, or as a packaged set of geographic feature data); answer basic queries about the content of the map; and tell other programs what maps it can produce and which of those can be queried further	DIS
ISO 19129	Geographic information - Imagery, gridded and coverage data framework	Standardizes concepts for the description and representation of imagery, gridded and coverage data in the context of the ISO 19100 suite of standards	WD
ISO 19130	Geographic information - Sensor and data models for imagery and gridded data	Specifies a sensor model describing the physical and geometrical properties of each kind of photogrammetric, remote sensing and other sensors that produce imagery data	CD
ISO 19131	Geographic information - Data product specifications	Describes requirements for the specification of geographic data products, based upon the concepts of other ISO 19100 standards	CD
ISO 19133	Geographic information - Location based services tracking and navigation	Addresses the modeling and definition of types and interfaces needed to support the specification of web services and applications in the field of tracking and navigation within a linear network	DIS

Identifier	Title	Description	Status
ISO 19134	Geographic information - Multimodal location based services for routing and navigation	Specifies the data types and associated operations for the implementation of multi-modal location based services for routing and navigation services. This standard is designed to specify web services that may be made available to wireless devices through web-resident proxy applications, but is not restricted to that environment.	CD
ISO 19135	Geographic information - Procedures for registration of geographical information items	Specifies procedures to be followed in preparing, maintaining, and publishing a register or registers of unique unambiguous and permanent identifiers, and meanings that, under the direction of ISO/TC 211, are assigned to geographic information items	CD
ISO 19136	Geographic information - Geography Markup Language	Specifies an XML encoding in compliance with ISO 19118 for the transport and storage of geographic information modeled according to the conceptual modeling framework used in the ISO 19100 series and including both the spatial and nonspatial properties of geographic features	CD
ISO 19137	Geographic information - Generally used profiles of the spatial schema and of similar important other schemas	Specifies a minimal set of geometric elements necessary for an efficient creation of geospatial application schemata	CD
ISO 19138	Geographic information - Data quality measures	Defines a set of measures for the data quality sub-elements identified in ISO 19113 and establish a registry of data quality measures to include, for each measure, an identifier and a code	WD
ISO 19139	Geographic information - Metadata - Implementation specification	Provides a comprehensive metadata implementation specification for digital geographic datasets	WD

2.5 Miscellaneous Geospatial-related Standards

Other organizations have developed standards that are not specifically geospatial, but contain geospatial attributes and can be used in HLS business processes. Exhibit 5 lists some of the standards identified so far.

Exhibit 5 - Other Geospatial Standards

Organization	Identifier	Title	Description
WMO	FM 94-X Ext. BUFR WMO No. 306	Manual on Codes, International Codes, Volume 1.2 (Annex II to WMO Technical Regulations) Parts B and C	Used for interchange, online storage, and data- archiving of atmospheric and oceanographic data
WMO	FM 92-X Ext. GRIB WMO No. 306	Manual on Codes, International Codes, Volume 1.2 (Annex II to WMO Technical Regulations) Parts B and C	Developed for the transfer of gridded data fields (including spectral model coefficients) and of satellite images
	GeoTIFF	GeoTIFF Format Specification	Metadata format, which provides geographic information to associate with the image data

3.0 ACRONYMS

Acronym	Definition
CONOPS	Concept of Operations
COP	Common Operating Picture
DHS	Department of Homeland Security
DRM	Digital Rights Management
FGDC	Federal Geographic Data Committee
GDR	Geospatial Data Rollup
GEA	Geospatial Enterprise Architecture
GML	Geographic Markup Language
HLS	Homeland Security
ISO	International Organization for Standardization
OGC	Open GIS Consortium
SLD	Styled Layer Descriptors
STANAG	Standards Agreement (NATO)
TRM	Technical Reference Model
WFS	Web Feature Service
WFS-T	Transactional Web Feature Service
WMS	Web Map Service
WMO	World Meteorological Organization
XrML	eXtensible rights Markup Language

3.0 LIST OF REFERENCES