



U.S. General Services Administration

Executable EA for GSA's FMLoB: Enabling *Model Based Acquisition*

George Thomas, GSA Enterprise Chief Architect

The slide features a light blue horizontal bar at the top, a thin blue horizontal line below the title, a light blue horizontal bar below the presenter's name, a dark red horizontal bar below that, and a dark blue horizontal bar at the bottom.

This Presentation

- Executable EA Methodology
 - MDA primer, EDOC as SOA DSL
 - Quick comparison with SCA
 - FEA as Federal Enterprise DSL and CRI ‘aspect’
 - Analytical framework for ITPM, Resource Rationalization
- FMEA – FMLoB Case Study
 - EDOC CIM/PIM conventions
 - ADM Mainframe Analysis
 - UML Information, Transaction, Message, Persistence Models
 - Team and Tools
- OSERA
 - ‘Model to Integrate’
 - Test driven ‘Service Based Procurement’
 - ‘Model Based Acquisition’
 - Semantic Interoperability

Part 1 - Executable EA

- Slides 3 to 23
- Executable EA Methodology
 - MDA primer, EDOC as SOA DSL
 - Quick comparison with SCA
 - FEA as Federal Enterprise DSL and CRI 'aspect'
 - Analytical framework for ITPM, Resource Rationalization

MDA and Zachman 'Perspectives'

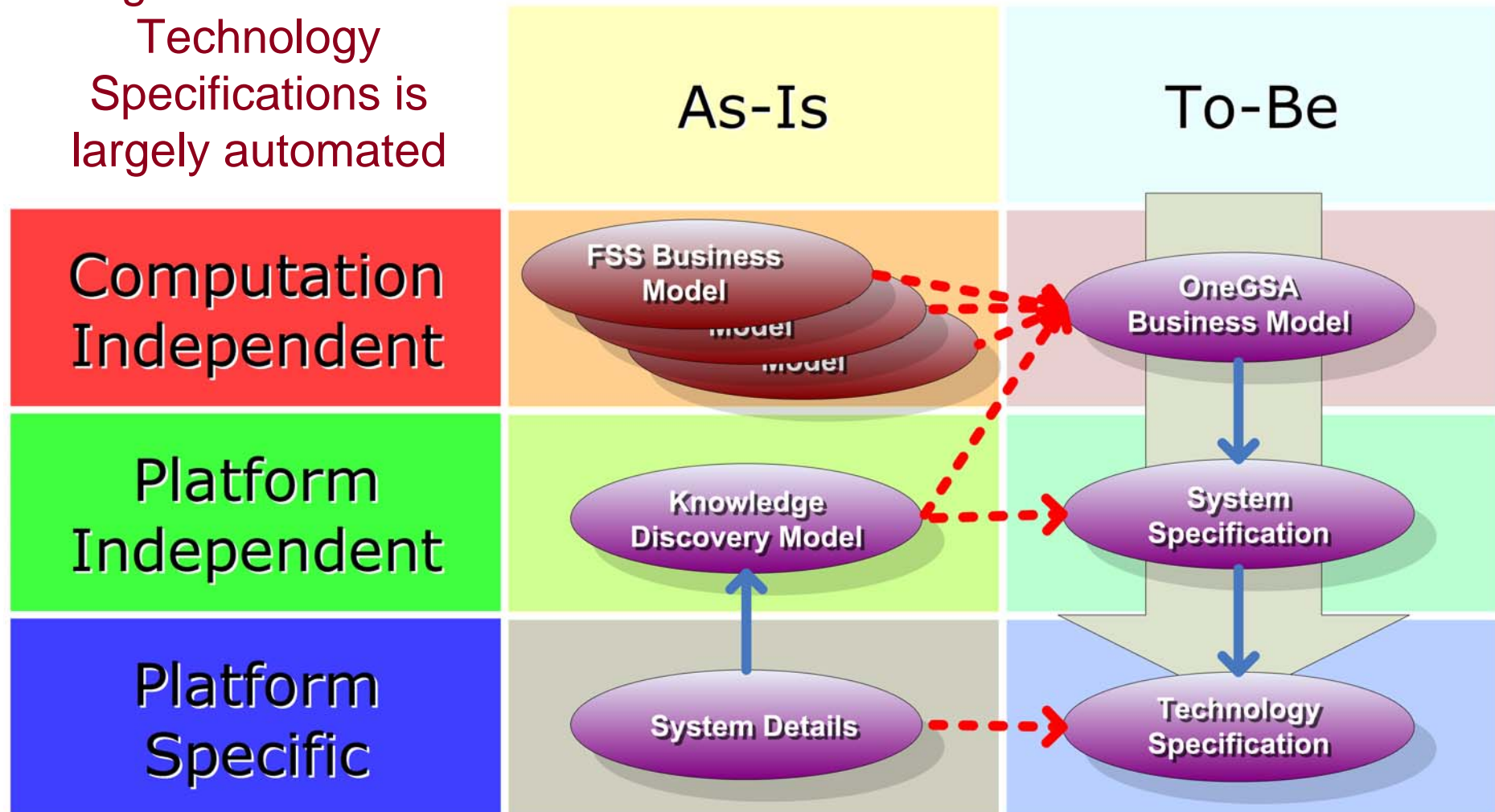
		← Abstractions (Columns) →					
The Zachman Framework		DATA <i>What</i> <i>(Things)</i>	FUNCTION <i>How</i> <i>(Process)</i>	NETWORK <i>Where</i> <i>(Location)</i>	PEOPLE <i>Who</i> <i>(People)</i>	TIME <i>When</i> <i>(Time)</i>	MOTIVATION <i>Why</i> <i>(Motivation)</i>
↑ Perspectives (Rows) ↓	SCOPE (Contextual) <i>Planner</i>	List of things important to the business	List of processes the business performs	List of Locations in which the business operates	List of Organizations important to the Business	List of Events Significant to the Business	List of Business Goals/Strategies
	BUSINESS MODEL (Conceptual) <i>Owner</i>	Enterprise Architecture (EA)					
	SYSTEM MODEL (Logical) <i>Designer</i>	Reference Architecture (RA)					
	TECHNOLOGY MODEL (Physical) <i>Builder</i>	Solution Architecture (SA)					
	DETAILED REPRESENTATIONS (Out-of-Context) <i>Sub-Contractor</i>	Reference Implementation (RI)					

FMEA: MDA Top Down - ADM Bottom Up

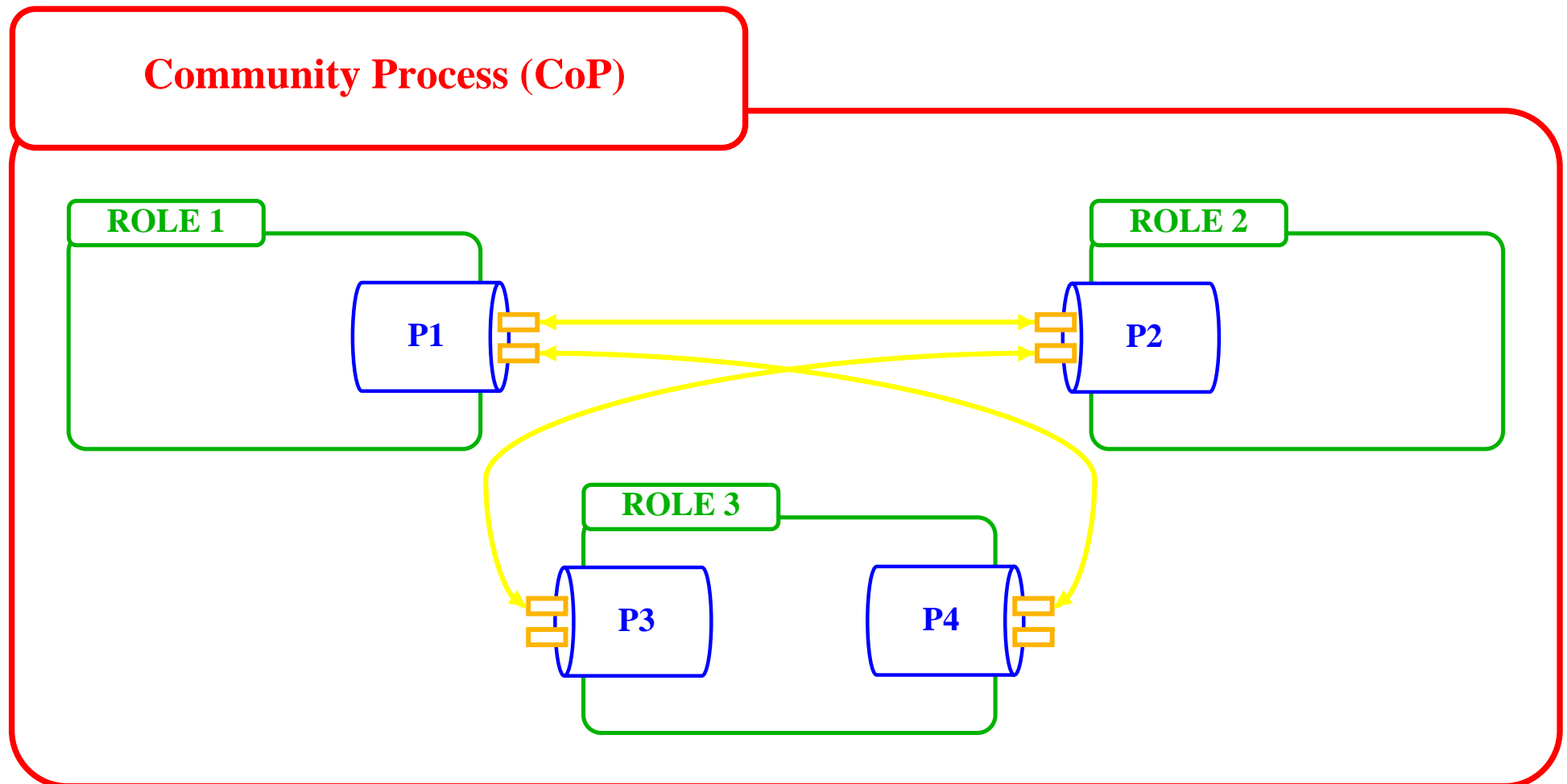
Discovery of System Details and generation of Technology Specifications is largely automated

Architecture Driven Modernization (ADM)

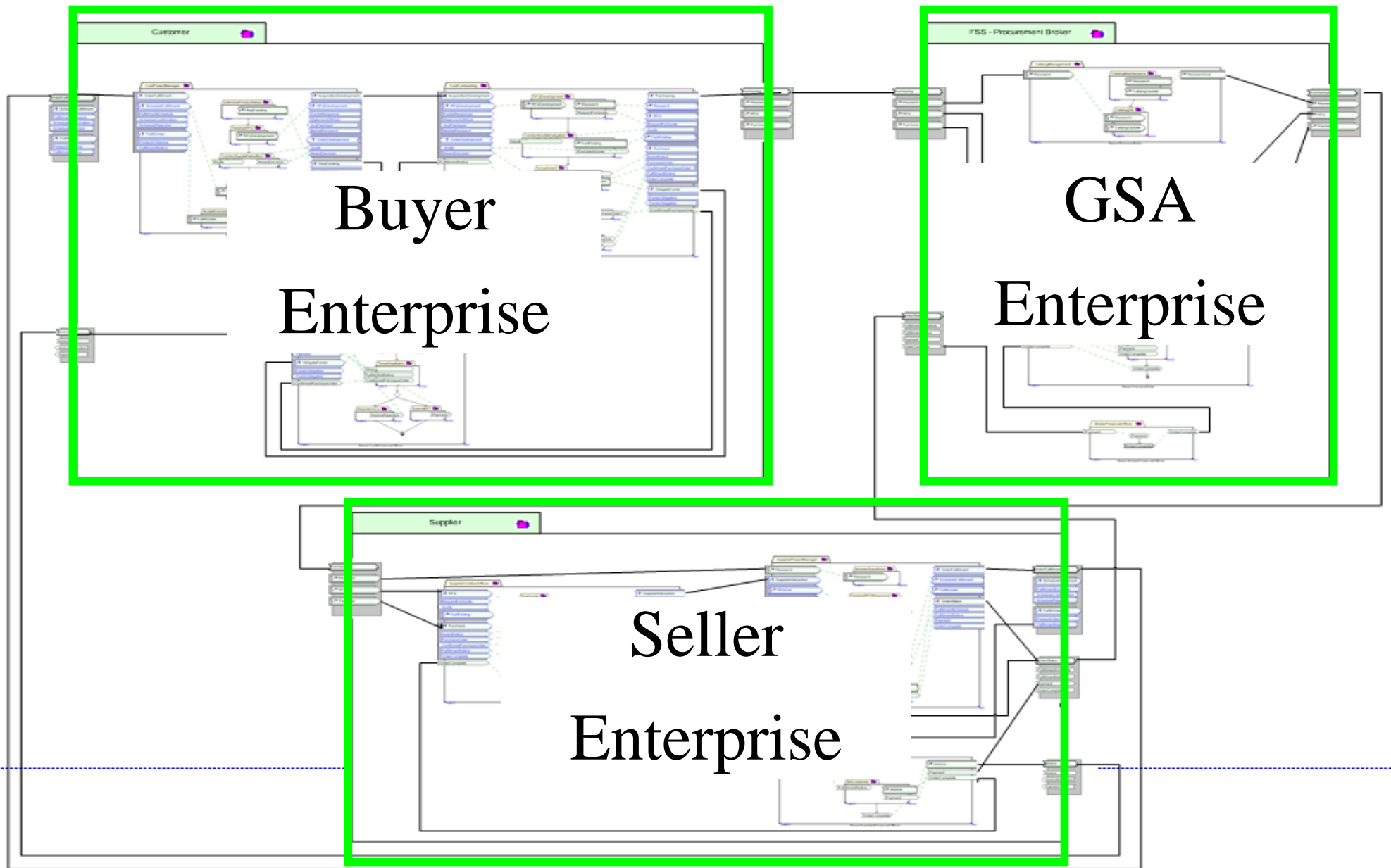
Model Driven Architecture (MDA)



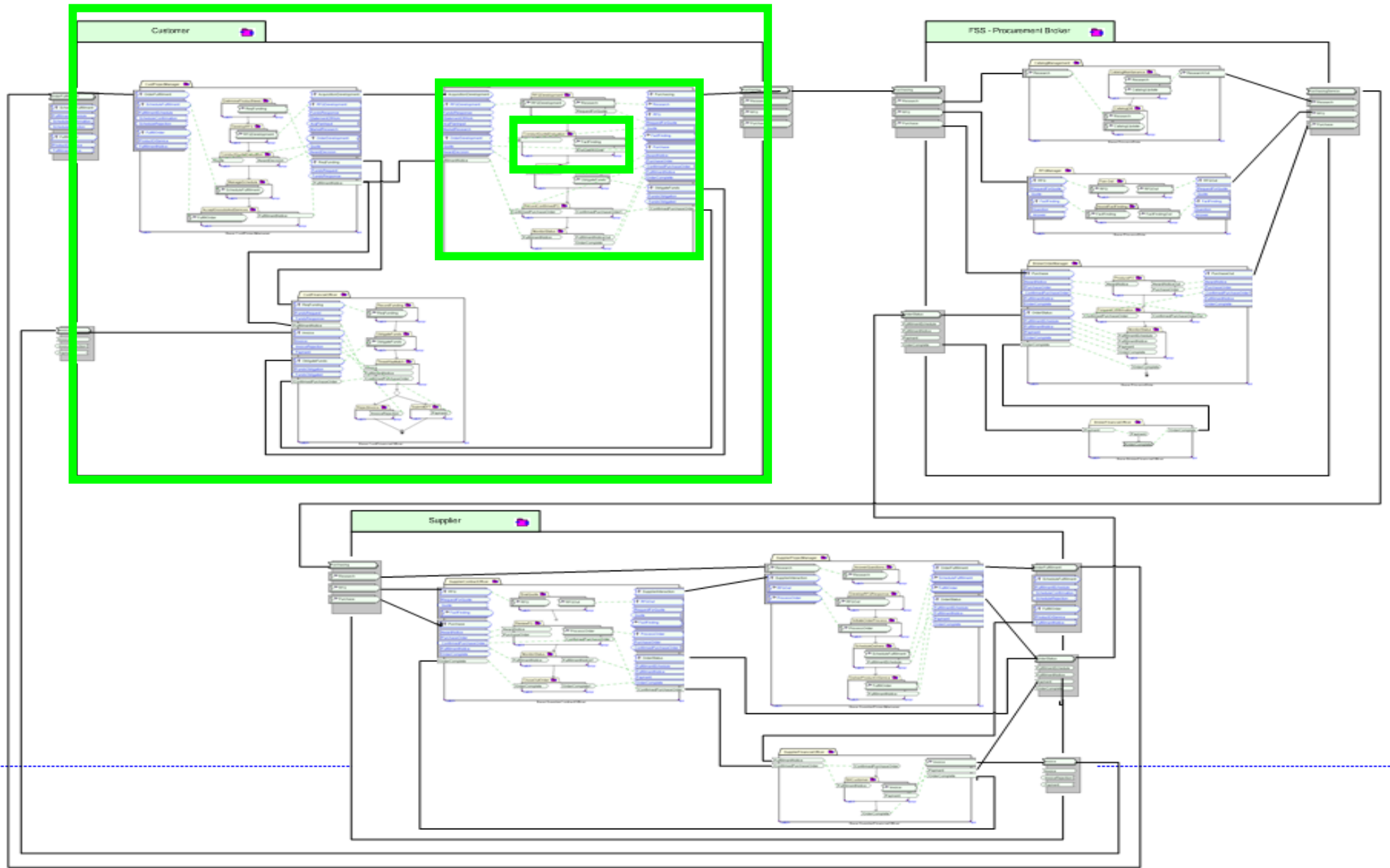
- Recursive decomposition for 'systems of systems' modeling
 - Business processes described as a composition of *services*
 - Collaborative Role Interactions (CRI), service choreography
 - Services are realized by (a composition of) components



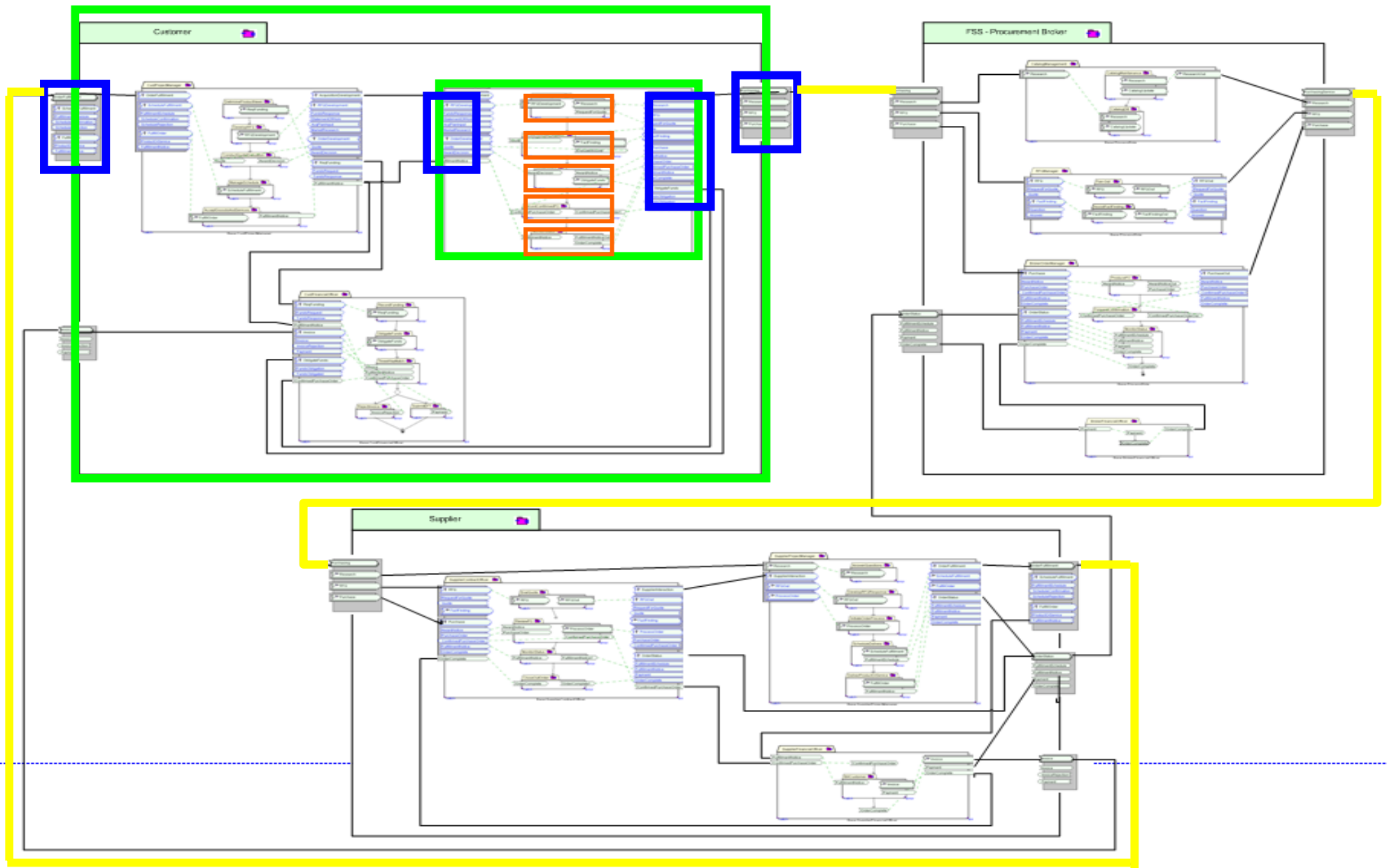
Collaborations Contextualize Roles = Service Providers



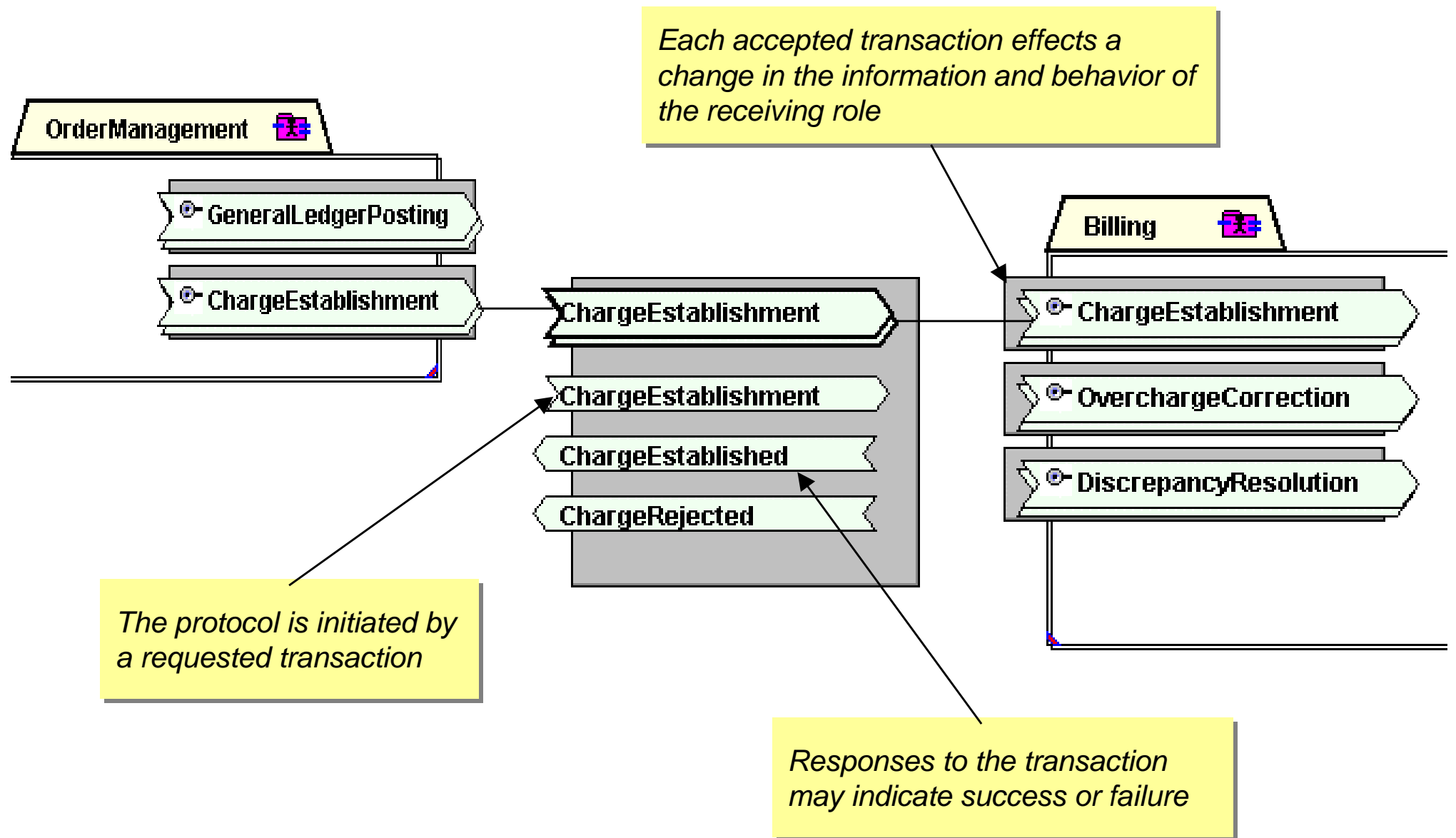
Roles Compose Inner Roles = Service Granularity



Protocols Organize Conversations Choreographed by Roles



CCA Protocol = Interface Specification



Protocol WSDL Representation (PSM/SA, TRM)

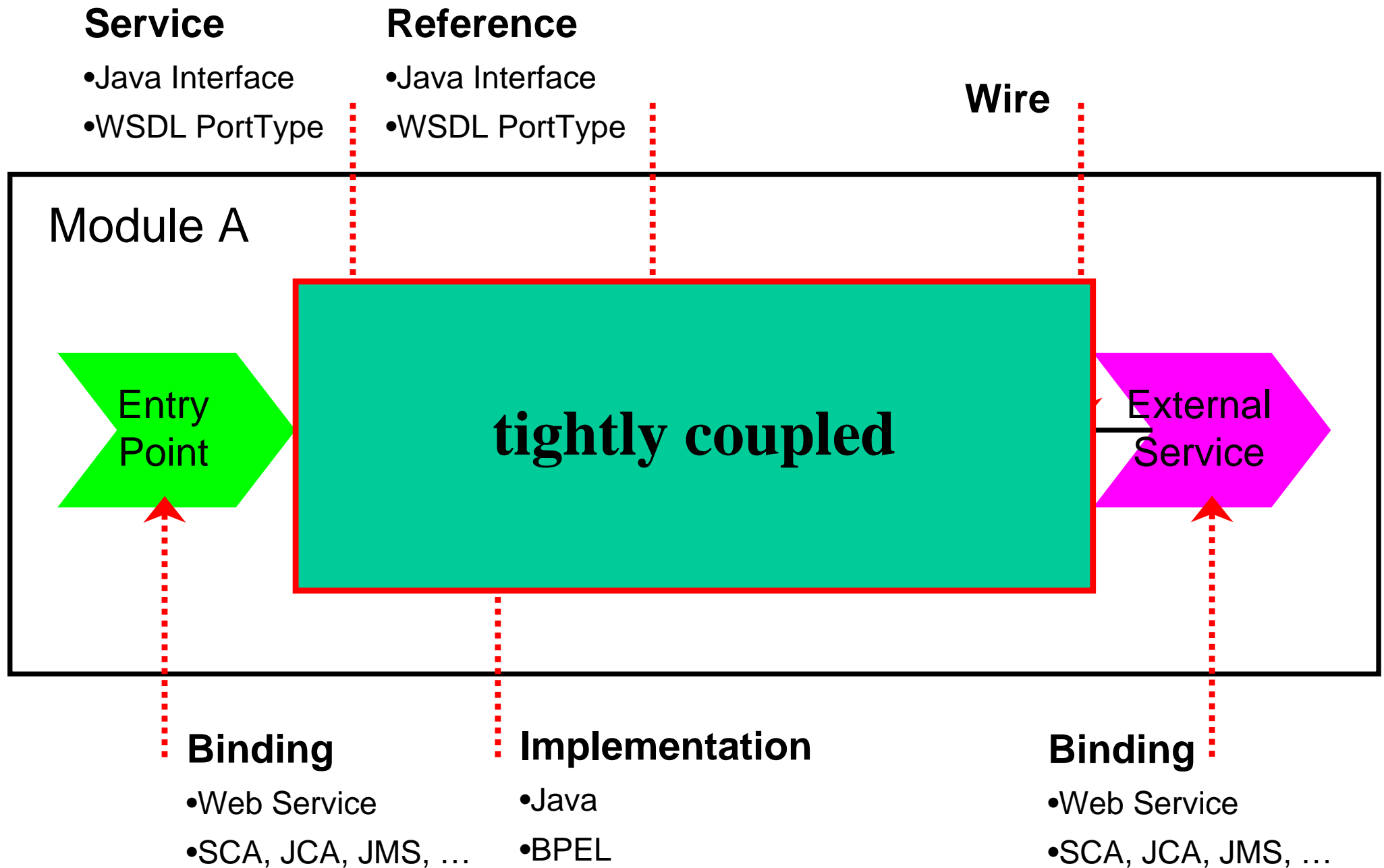
```
<portType name="ChargeEstablishmentRequestInterface">  
  <operation name="sendChargeEstablishment">  
    <input name="ChargeEstablishment"  
      message="tns:ChargeEstablishment" />  
  </operation>  
</portType>
```

```
<portType name="ChargeEstablishmentResponseInterface">  
  <operation name="sendChargeEstablished">  
    <input name="ChargeEstablished"  
      message="tns:ChargeEstablished" />  
  </operation>  
  <operation name="sendChargeRejected">  
    <input name="ChargeRejected"  
      message="tns:ChargeRejected" />  
  </operation>  
</portType>
```

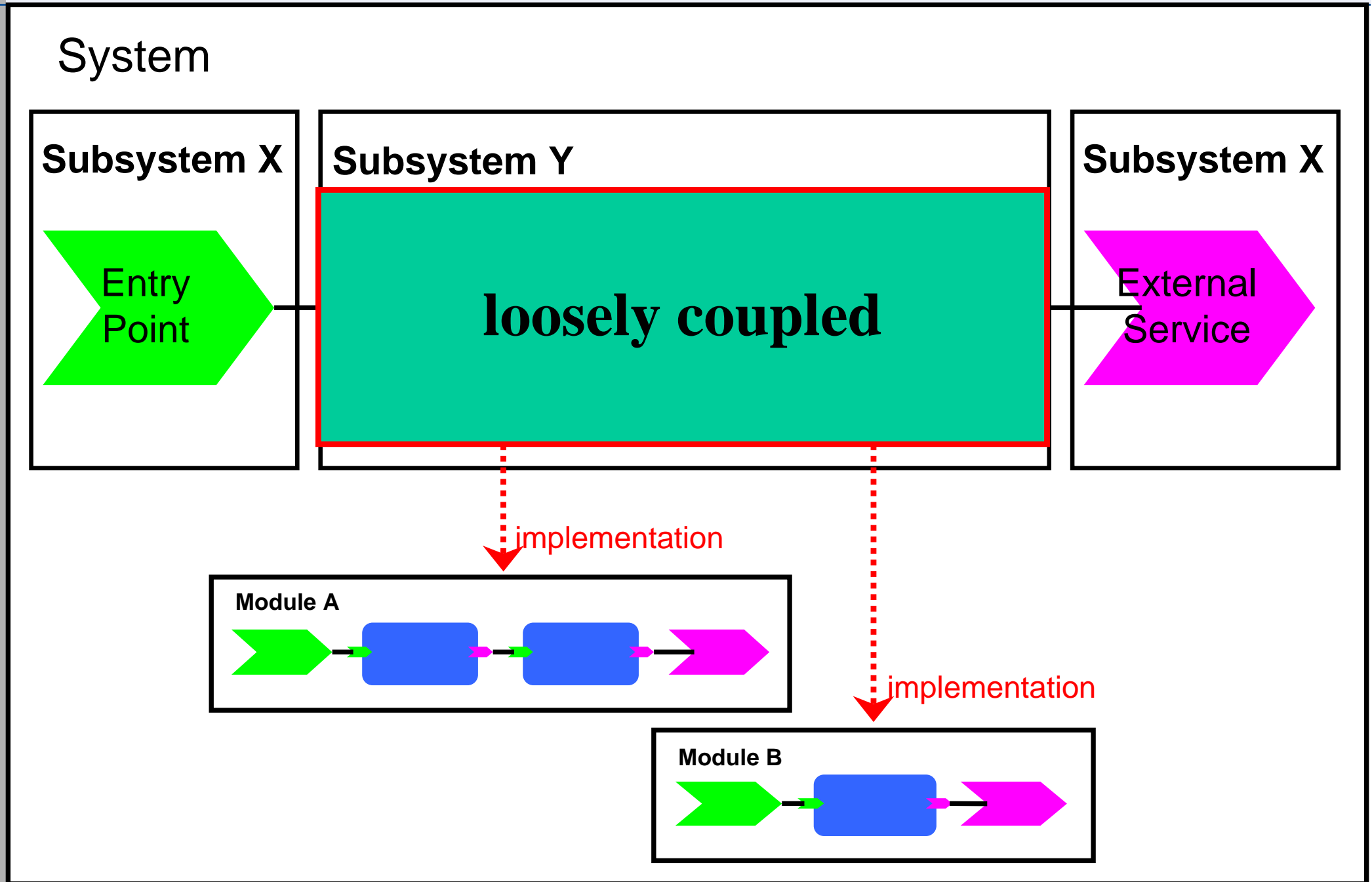
Service Component Architecture (SCA)

- IBM, BEA, Oracle, SAP, IONA, Siebel, Sybase, Interface21
 - ‘SOA is a composition model that connects the functional units of an application, called services, through well-defined interfaces and contracts between these services’
 - ‘SCA is a set of specifications which describe a model for building applications and systems using a Service-Oriented Architecture’
 - ‘SCA divides up the steps in building a service-oriented application into two major parts:
 - The **implementation** of components which provide services and consume other services
 - The **assembly** of sets of components to build business applications, through the **wiring** of service references to services’
- Another example of a SOA DSL
 - Nov '05 v0.9 specs describe an SCA runtime platform

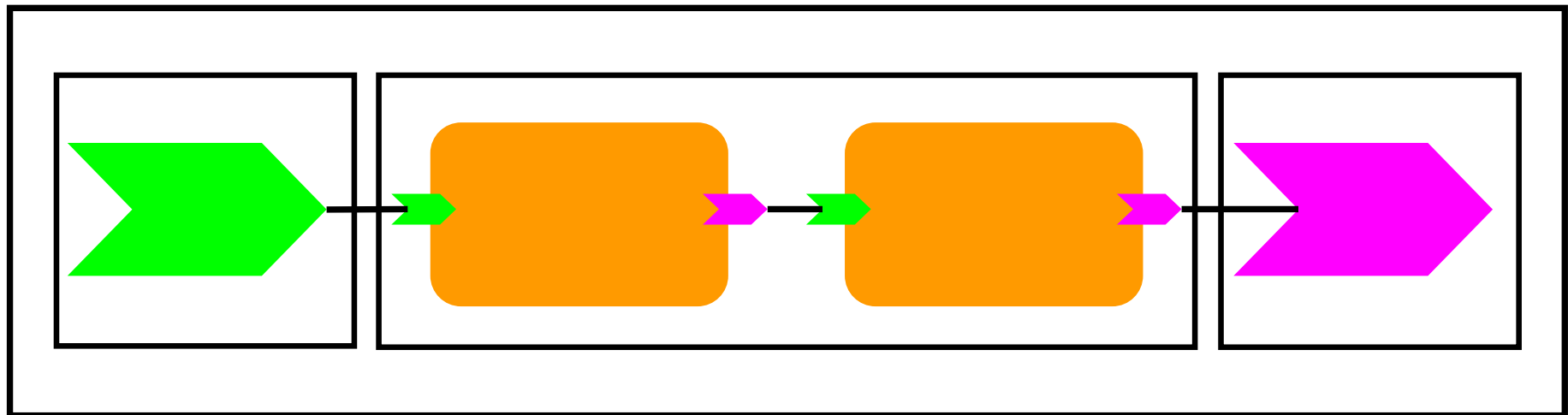
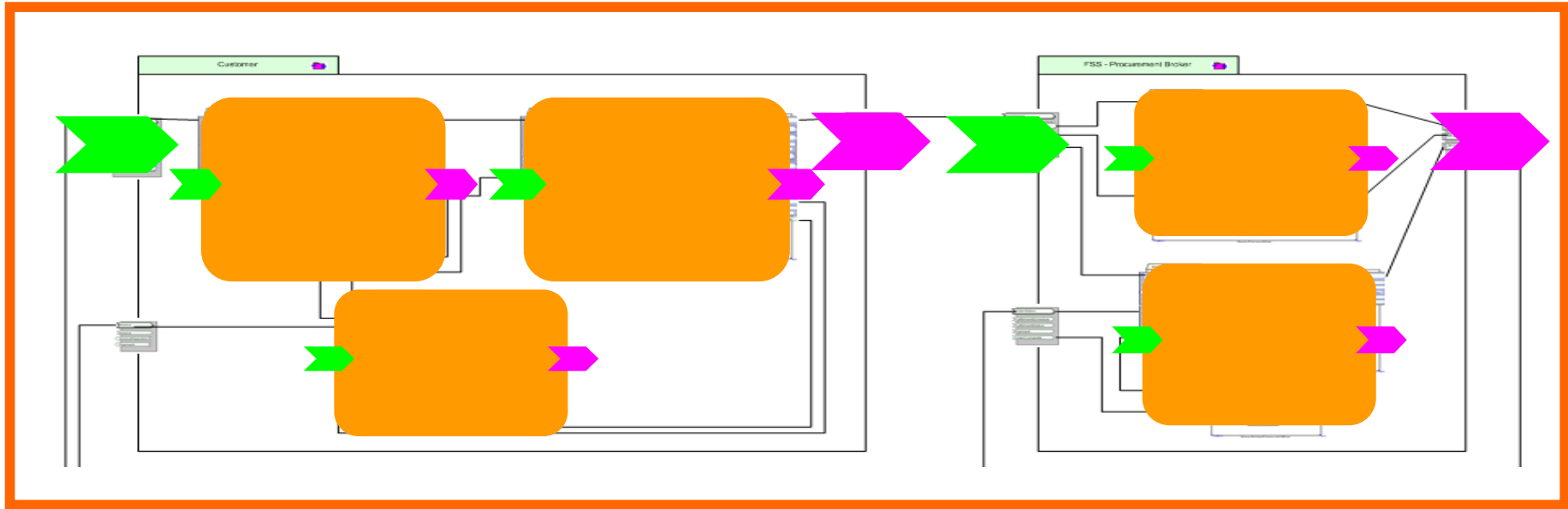
SCA - Module Assembly Diagram



SCA - System Assembly Diagram



eGov SOA System of Systems, Quick CCA-SCA Comparison



FEA as CCA Aspect = PRM Line of Sight

FEA Aspects of PRM Metrics, BRM/SRM classifications, and DRM schema definitions are associated with and applied directly to **Business** model elements

PRM

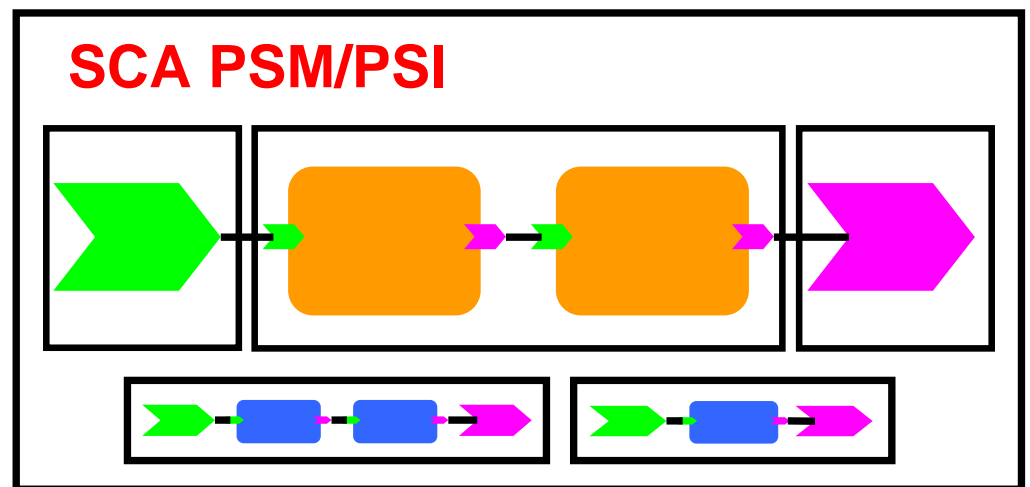
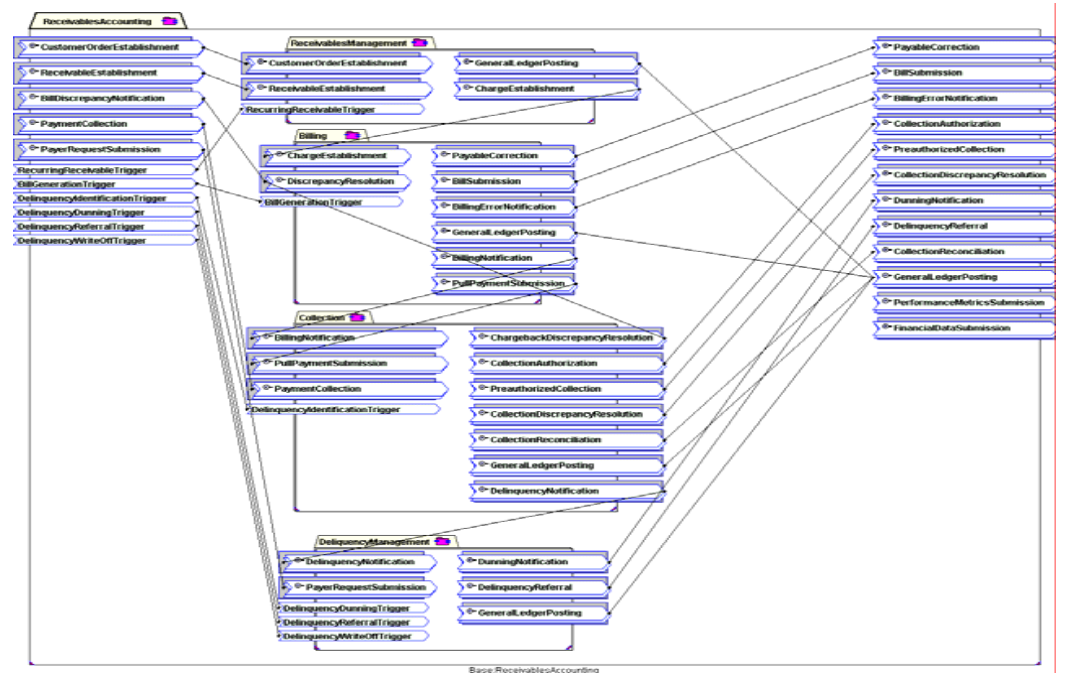
Elaborated **Platform** model elements inherit these annotations, adding further PRM and TRM annotations as a model is transformed and deployed to a J2EE Server

BRM

SRM

DRM

TRM



ITPM - Business Process, FSS/FTS, Exhibit 53

Value Chain 05X.AcquisitionExternal

Count of Exhibit 53 Investment point:

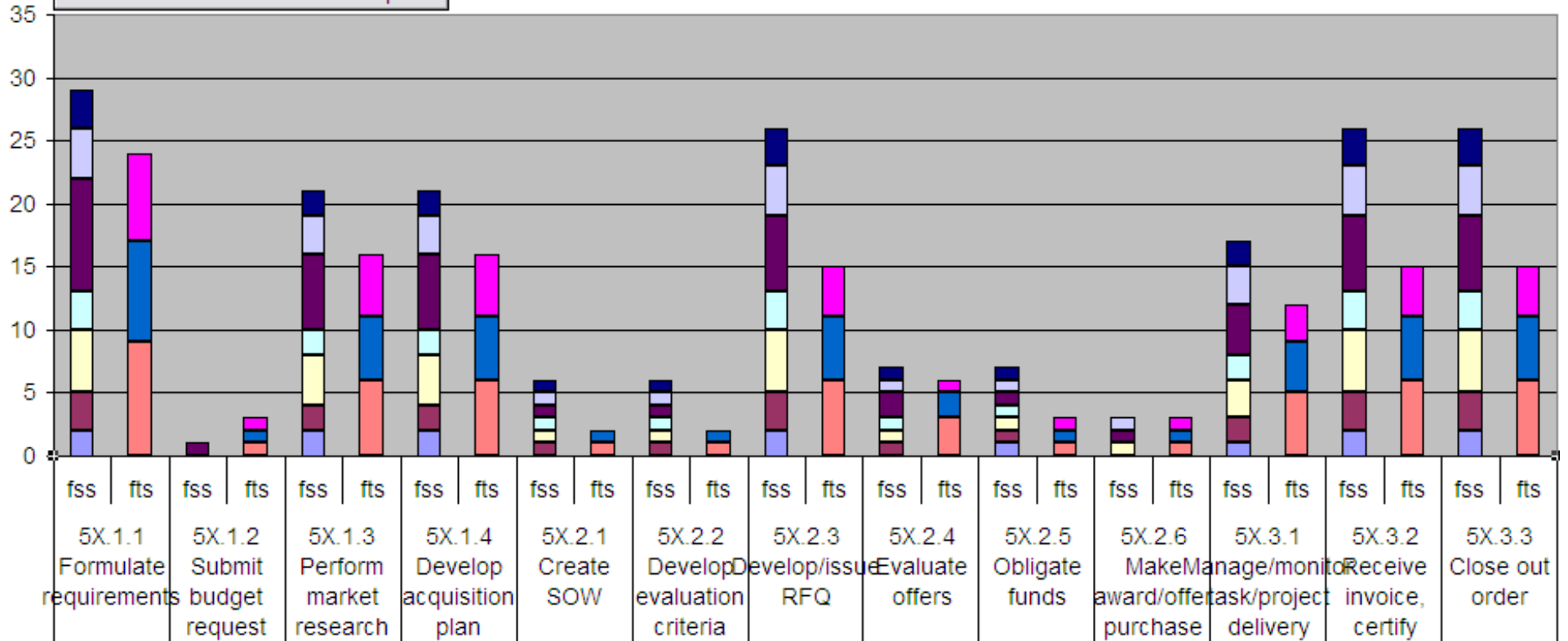


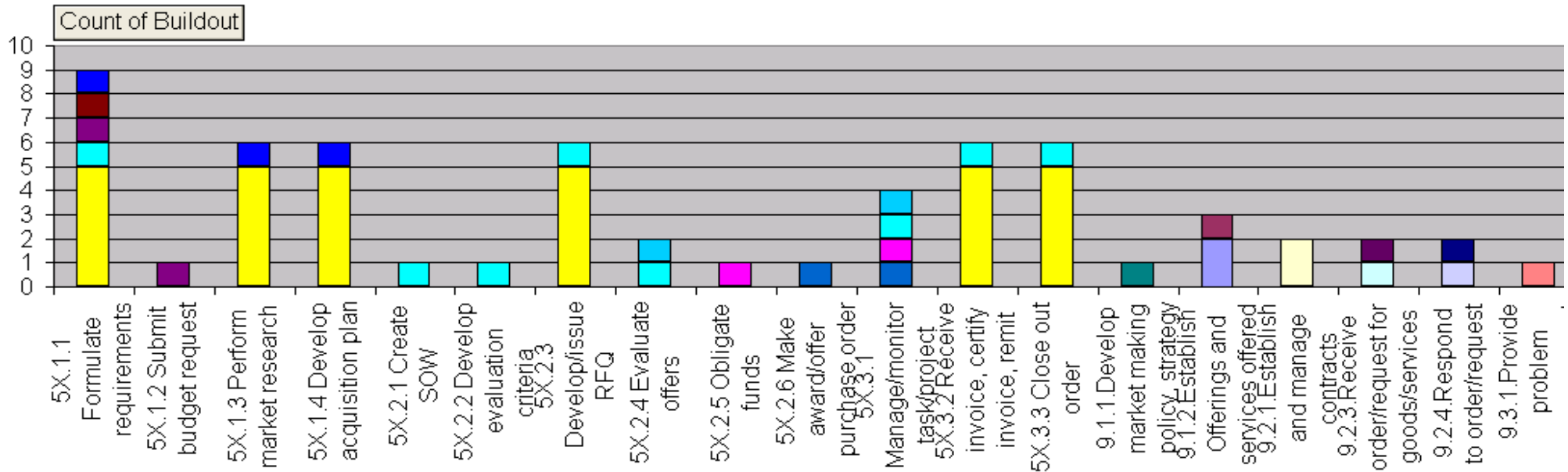
Exhibit 53 Investment point:

- Customer Supply Center System
- Federal Excess Property Disposal System
- Federal Supply Service 19
- Fleet Management System
- GSA Advantage
- GSA Preferred (Third Generation System (3GS))
- ITOMS and Information Technology Solutions Shop (ITSS)
- Requisitioning, Ordering and Documentation System (ROADS)
- Sales Automation System (SASy)
- Task Order System (TOS) / Office of Integration Management (OM)

Process Buildout

ITPM - GSA Advantage, Business Processes, Roles

Exhibit 53 Investment point: GSA Advantage



Role

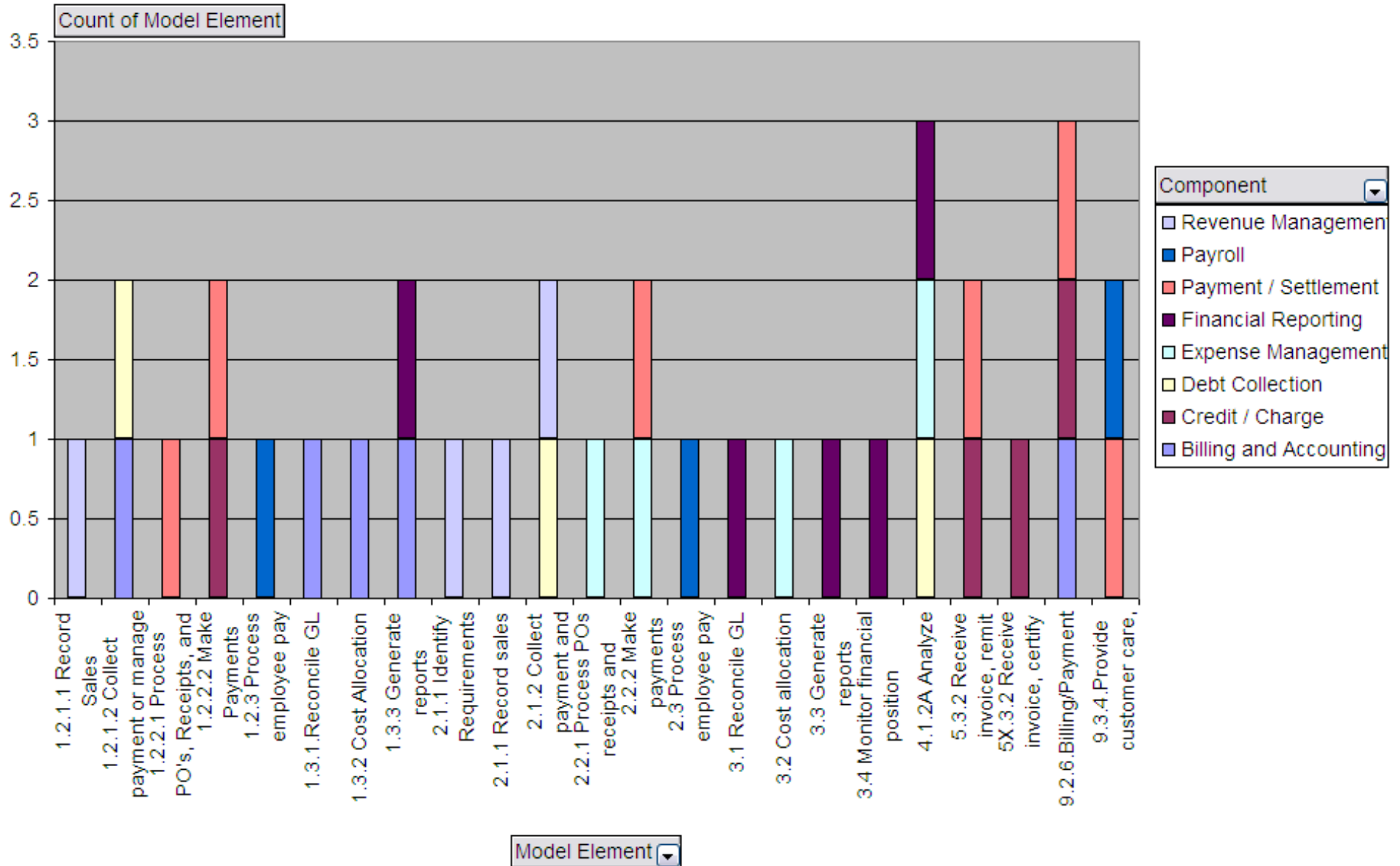
is oneGSA

9.1.2 /Business Analytics function (FSS) - FALSE	9.1.2 /Marketing function (FSS) - FALSE
9.2.1 /Customer Service function (FSS) - FALSE	9.2.3 /Assisted Service Human function (FSS) - FALSE
9.2.3 /Commodities Electronic function (FSS) - FALSE	9.3.1 / Tracking function (FSS) - FALSE
Administrative Support - TRUE	AssistedServiceHumanFunction - FALSE
CommoditiesElectronicFunction - FALSE	Contracting - TRUE
ContractingTeam - TRUE	Customer Program Management - TRUE
FundsManagement - TRUE	FundsManagement1 - TRUE
Planning function - FALSE	SolutionProvider - TRUE
TechnicalManagement - TRUE	

Process

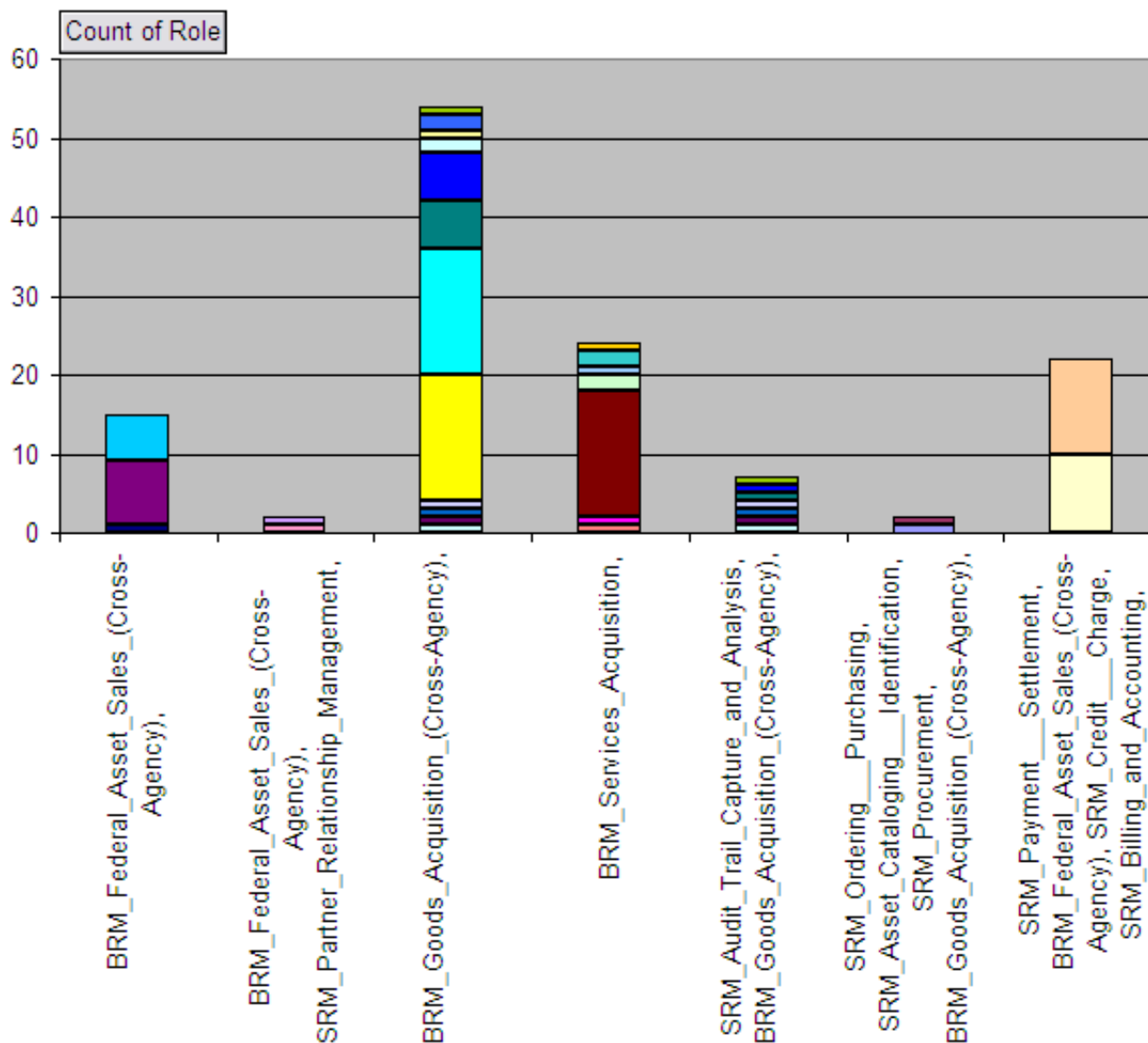
ITPM - SRM Financial Management, Business Processes

Service Domain (All) Service Type Financial Management



ITPM - Business Process, Roles, Exhibit 53, FEA (all)

Process (All) ▾



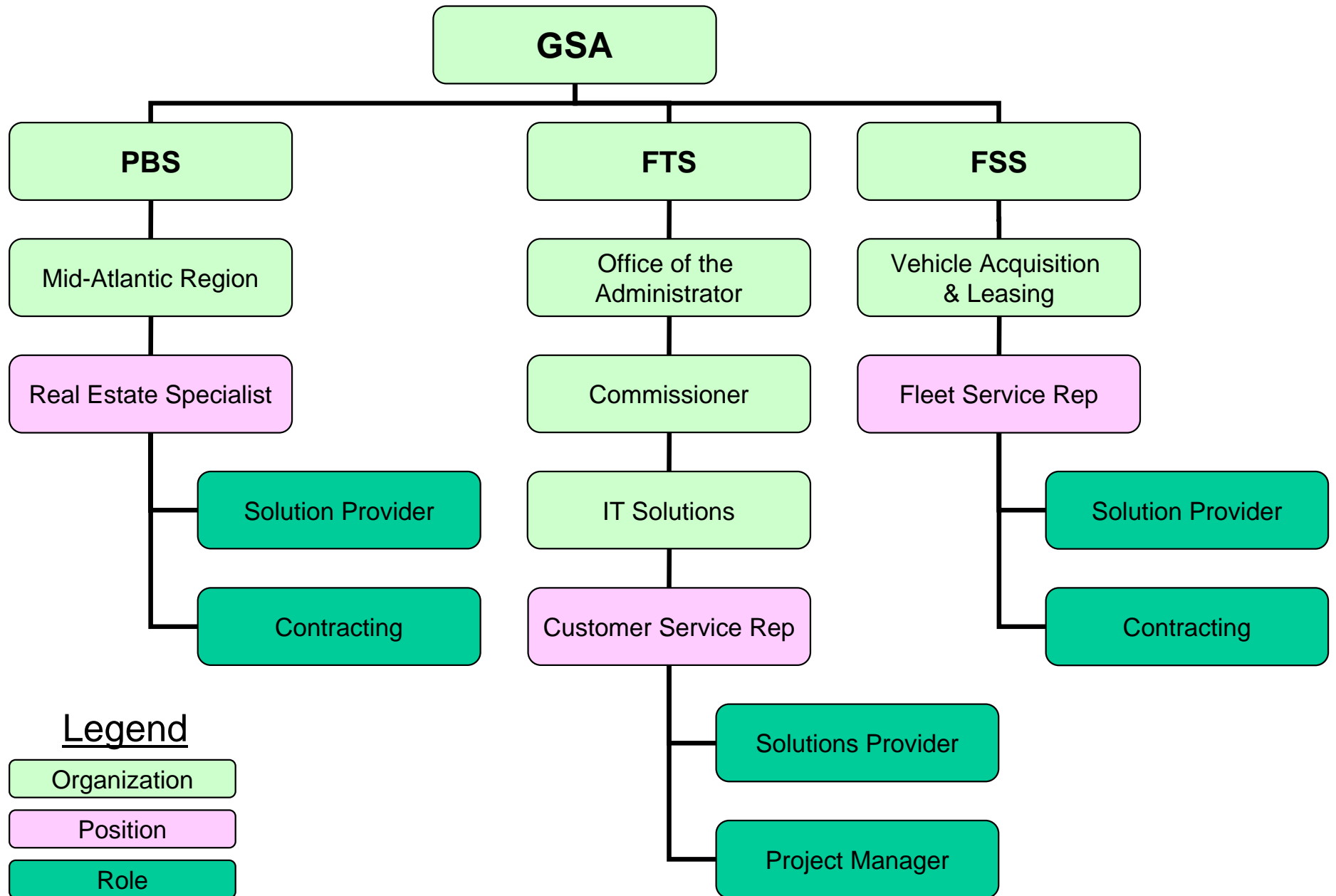
FEA: ▾

Role

Exhibit 53 Investment point: ▾

- TechnicalManagement - Task Order System (TOS) / Office of Integration Management (OMIS)
- TechnicalManagement - ITOMS and Information Technology Solutions Shop (ITSS)
- SolutionProvider - Task Order System (TOS) / Office of Integration Management (OMIS)
- SolutionProvider - ITOMS and Information Technology Solutions Shop (ITSS)
- OrderFulfillmentFunctionGSAManaged - Sales Automation System (SASy)
- MarketingFunction - Sales Automation System (SASy)
- ITfunction - Sales Automation System (SASy)
- FundsManagement1 - Task Order System (TOS) / Office of Integration Management (OMIS)
- FundsManagement1 - ITOMS and Information Technology Solutions Shop (ITSS)
- FundsManagement - Task Order System (TOS) / Office of Integration Management (OMIS)
- FundsManagement - ITOMS and Information Technology Solutions Shop (ITSS)
- Customer Program Management - Sales Automation System (SASy)
- Customer Program Management - ITOMS and Information Technology Solutions Shop (ITSS)
- Customer Program Management - Federal Supply Service 19
- ContractingTeam - Task Order System (TOS) / Office of Integration Management (OMIS)

Org Design – Flexible Role/Service Composition and Reuse



To-Be BP Interoperates with As-Is Service Component

The screenshot shows the Component-X Studio interface. On the left, a BPM diagram for 'DevelopRFQResponse' is visible, with a flow from 'RequestForQuote' to 'Quote' and 'FactFinding'. On the right, a web browser window displays the 'OrderToPayment' page. The page features a table with the following content:

Organization	Role	Activity	Sub-Activity
SupplierDetail	SupplierProjectManager	DevelopRFQResponse	

Below the table, a list of instructions is provided:

- You are a supplier who has received an RFQ. You must now determine how to respond to that RFQ.
- Use **eBuy** to prepare a Vendor Quote for this stage of the MDA demonstration.
- You are account "GS-25F-0006M" with USER_ID 1593
- Your RFQ is "RFQ1094092258465"
- NOTE: for demonstration purposes, the RFQ CLOSE_TIME will be set to time of *continue* model execution.
- When the Quote has been submitted to **eBuy**, please press [Continue](#)

At the bottom of the browser window, there is a banner for 'GSA Advantage! e-Buy' with the slogan '...Working for the U.S. Government' and a 'go to eBuy!' link. The browser's address bar shows the URL: http://icoh2w-gwl9z11:8088/cx/fss/futureState/OrderToPayment/componentEngine/CustContracting/RFQD...

PRM Line of Sight for Activity Based Costing

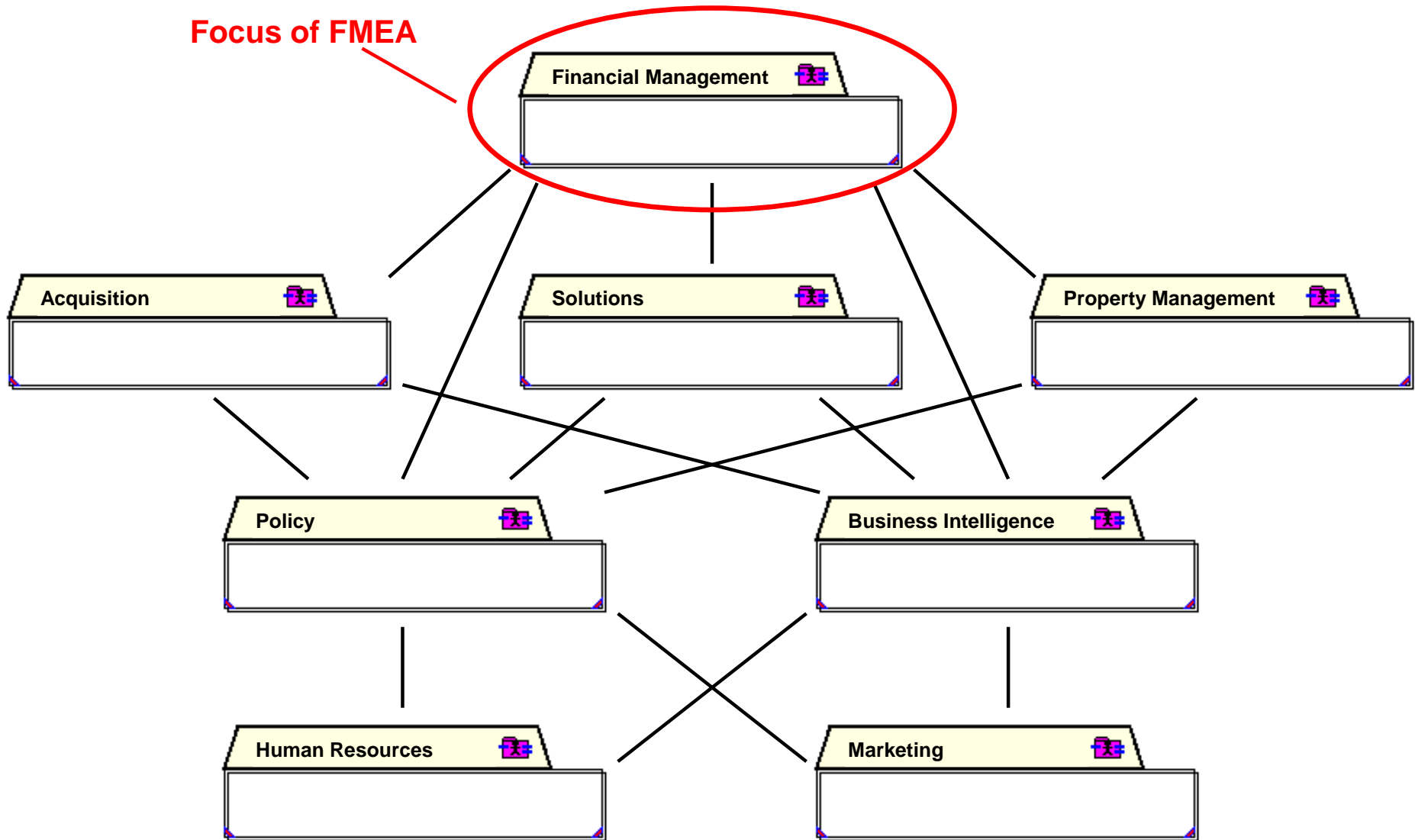
The screenshot shows a web browser window displaying a PRM Line of Sight for Activity Based Costing. The browser address bar shows the URL: <http://localhost:8080/cx/GSA/demo/Engine/traceToPerformance.pdf?component=/GSA>. The browser interface includes a menu bar (File, Edit, View, Favorites, Tools, Help), an address bar, and a toolbar with navigation and zoom controls. The main content area is divided into two panes. The left pane, titled 'Bookmarks', shows a hierarchical tree structure of categories and sub-items. The right pane displays a table with five columns: 'name', 'baseline', 'planned', 'actual', and 'achieved'. The table contains various performance metrics, some with numerical values and others with progress bars. The 'achieved' column uses blue bars to represent the percentage of completion relative to the 'planned' value.

name	baseline	planned	actual	achieved
Financial Avoidance				
Productivity QuantityPerTime	0	10	2	
Productivity ProductsPerFTE				
Productivity PercentResourcesUsed				
Productivity PercentImprovement				
Productivity PercentElectronic	0	100	0.9	
CycleTime ProductionTime	5	0	2.5	
CycleTime CycleToWaitTimeRatio	1	0	0.2799999999	
CycleTime PlannedVersusActual	.8	1	1.1	
Quality EffectivityRate	.8	1	0.99	
Quality ComplaintsPerCustomer	.1	0	0.01	
Management Involvement				
Management PolicyCoverage				
Management ApplicationsRequired	5	1	0	
Management				
RequirementComplianceExtent				
Management PolicyComplianceExtent				
Management UnidentifiedRiskEvents				

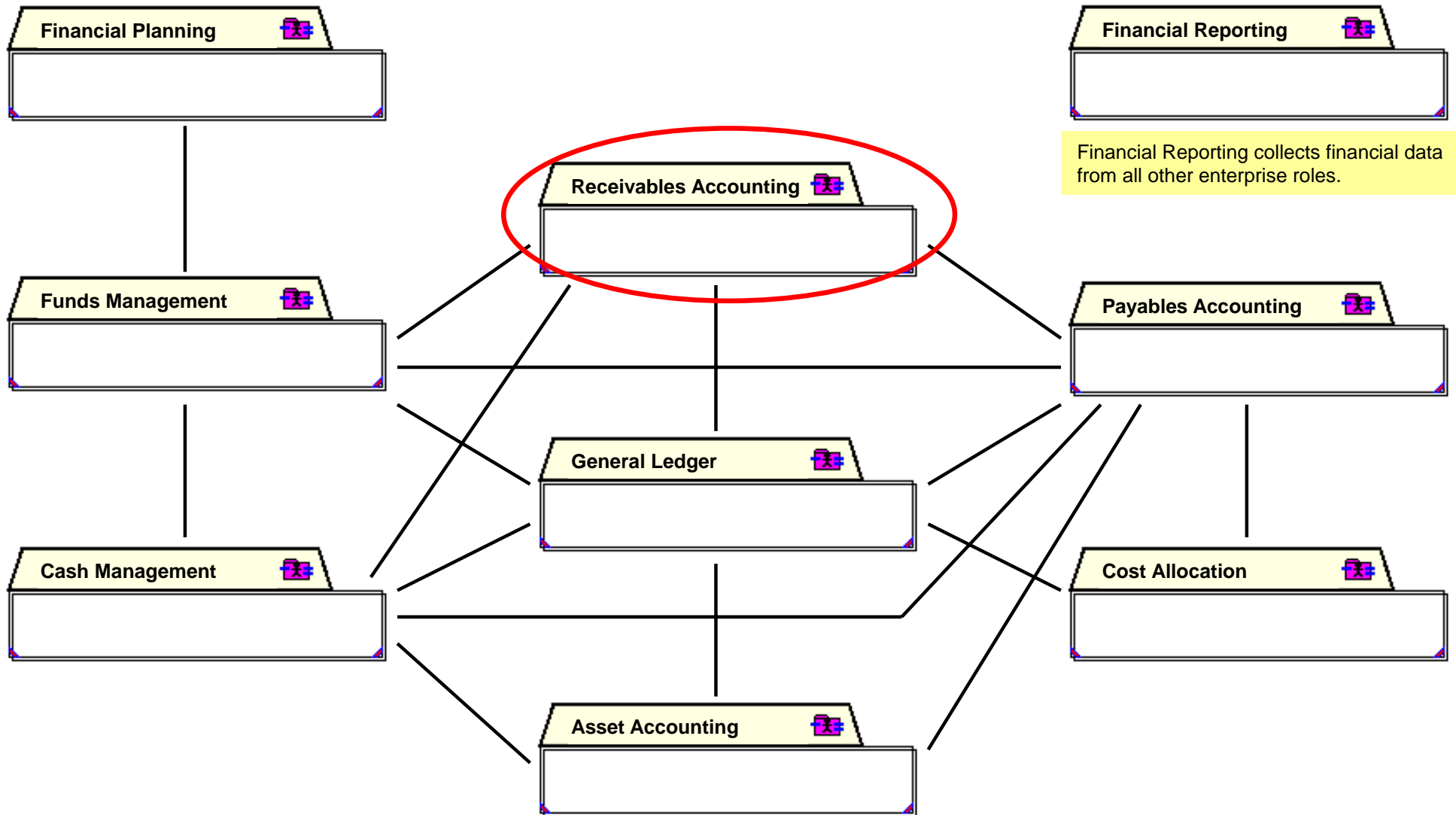
Part 2 - FMLoB

- Slides 24 to 45
- FMEA – FMLoB Case Study
 - EDOC CIM/PIM conventions
 - ADM Mainframe Analysis
 - UML Information, Transaction, Message, Persistence Models
 - Team and Tools

CIM: "One GSA" Disciplines



CIM: Financial Management Enterprise Roles



GSA's FMLoB: CIM Decomposition Conventions

Enterprise Role. A major area of functional responsibility within the discipline of financial management

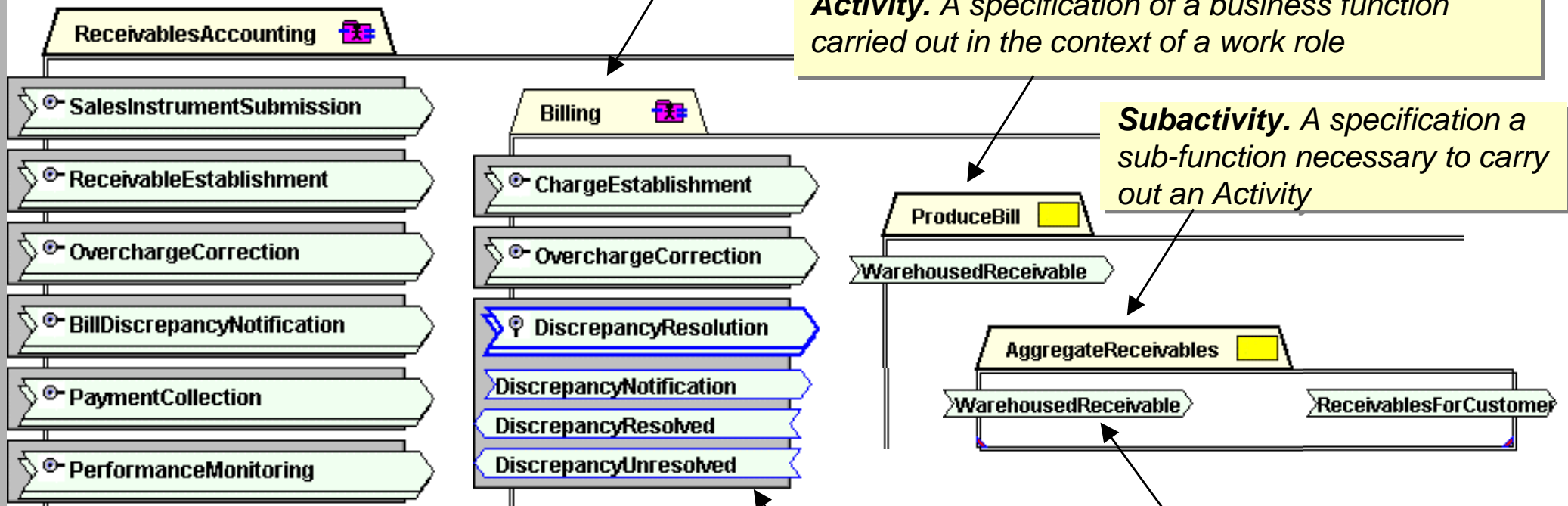
Work Role. A role responsible for a specific functional area within an enterprise role, such as might be assigned to a single worker and supported by an IT system

Activity. A specification of a business function carried out in the context of a work role

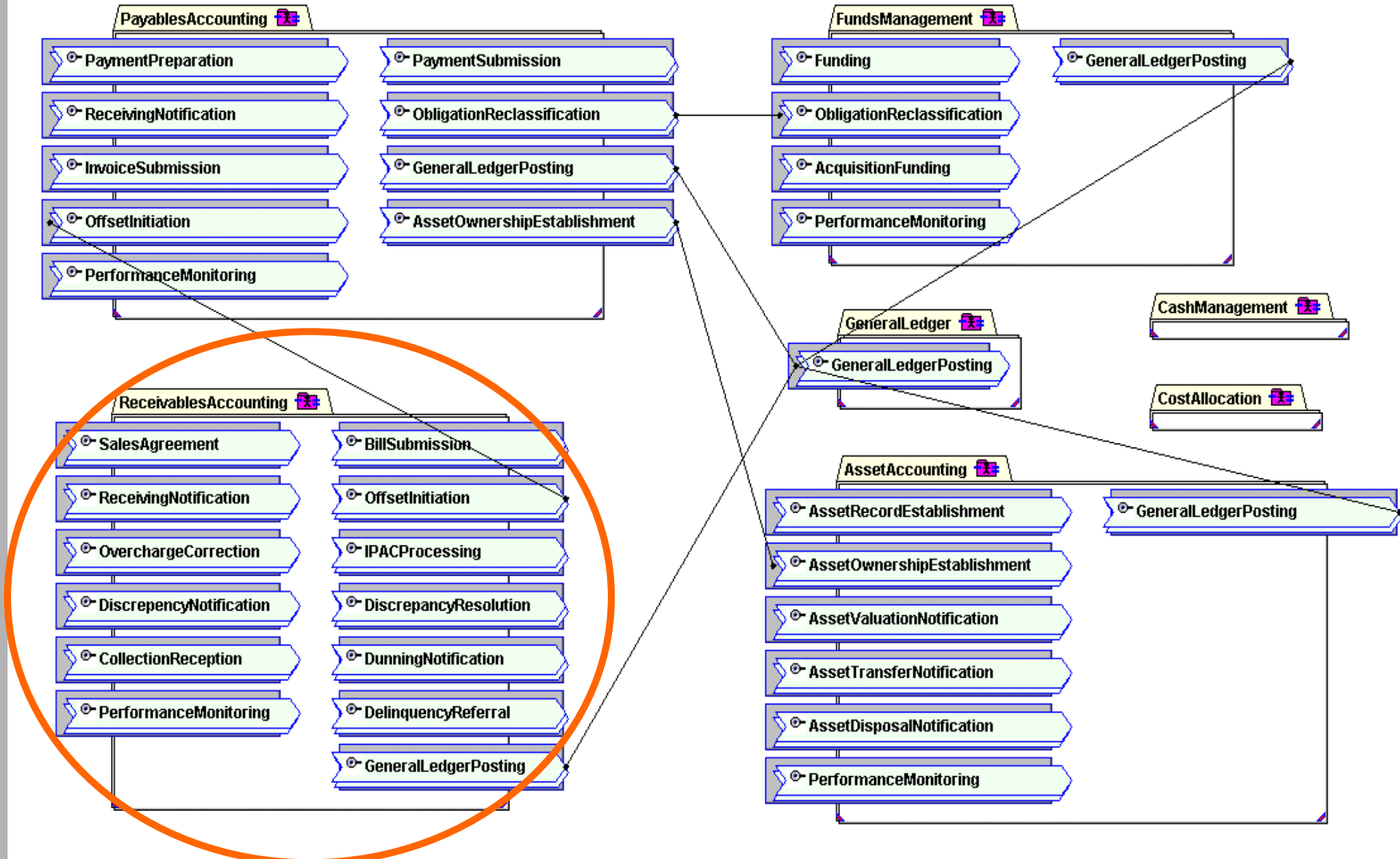
Subactivity. A specification a sub-function necessary to carry out an Activity

Protocol. A defined conversation between two roles that may be extended over time. One role initiates and the other responds to the protocol, but information may flow both ways across the protocol

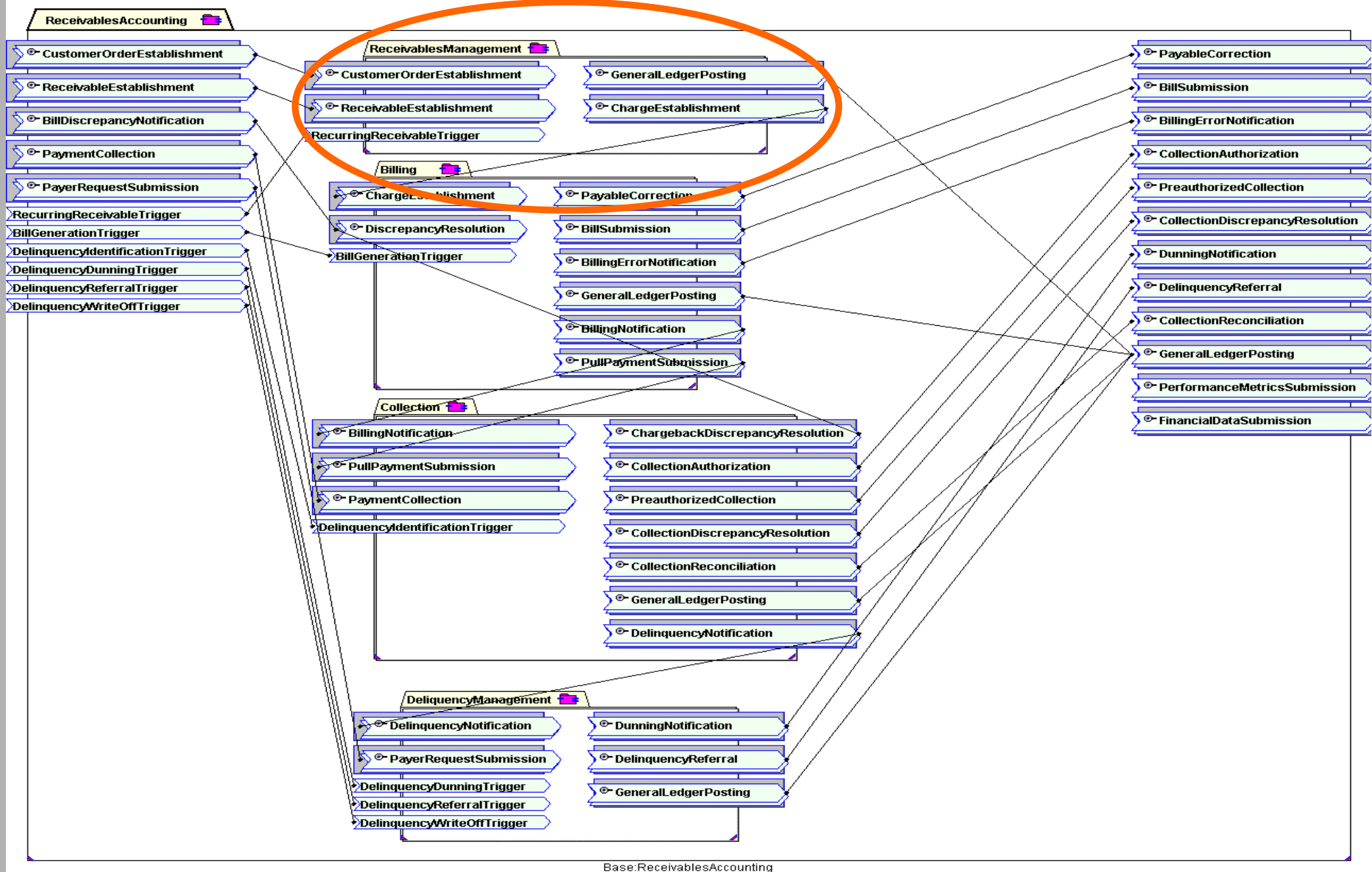
Information Flow. An individual flow of information across a protocol or into or out of an Activity or Subactivity



CIM: FMLoB Enterprise Roles



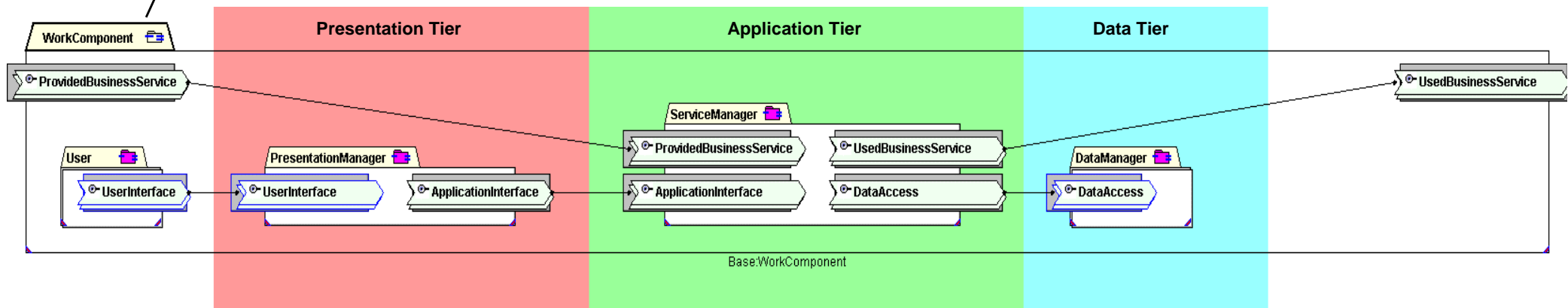
CIM: Enterprise Role Composes Work Roles



Base:ReceivablesAccounting

PIM/PSM: Service-Oriented Component Architecture

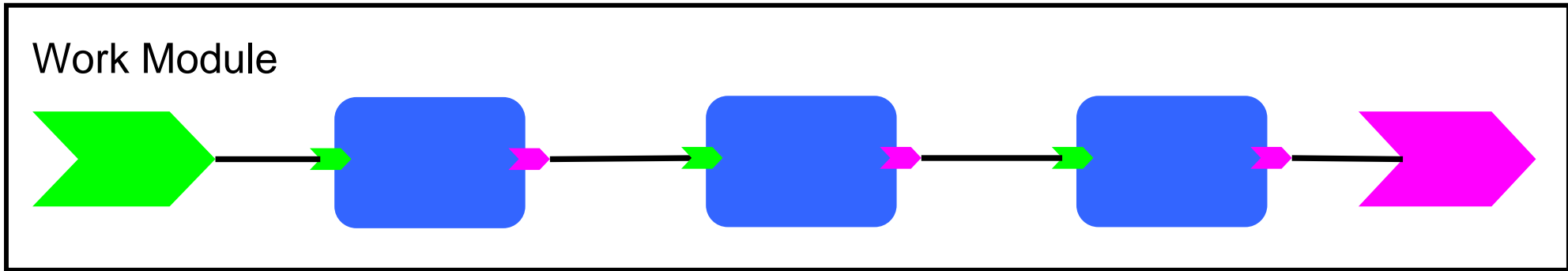
Each Work Component in the PIM implements a Work Role from the CIM



Presentation Manager components provide user access to application services

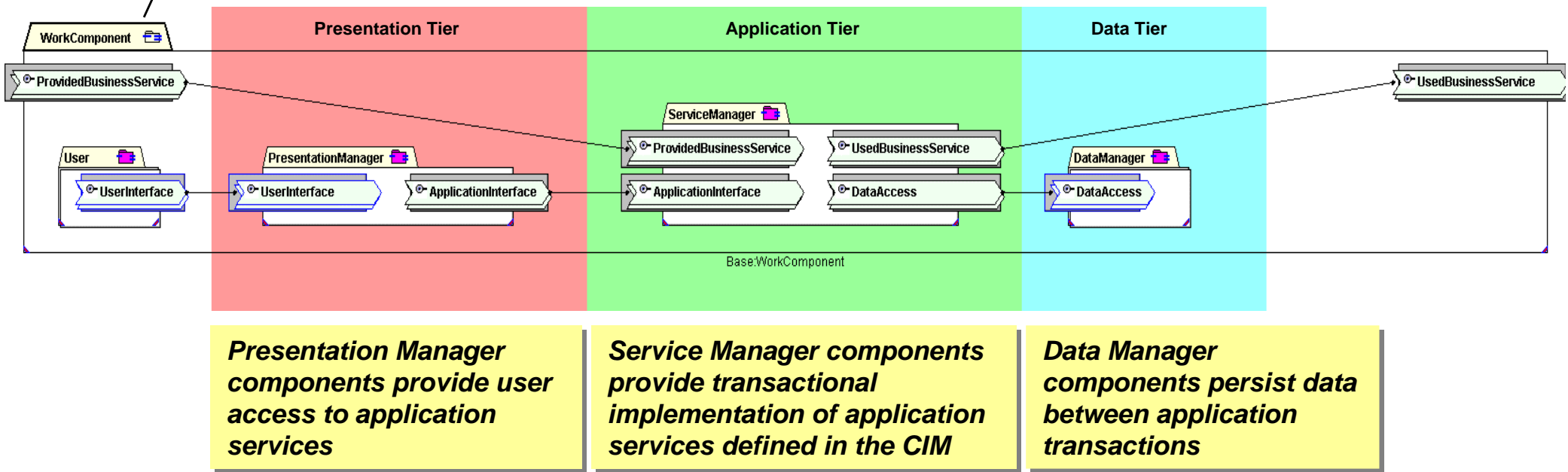
Service Manager components provide transactional implementation of application services defined in the CIM

Data Manager components persist data between application transactions



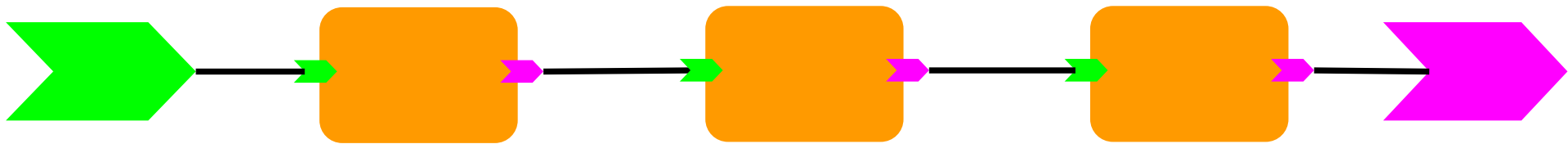
PIM/PSM: Service-Oriented Component Architecture

Each Work Component in the PIM implements a Work Role from the CIM

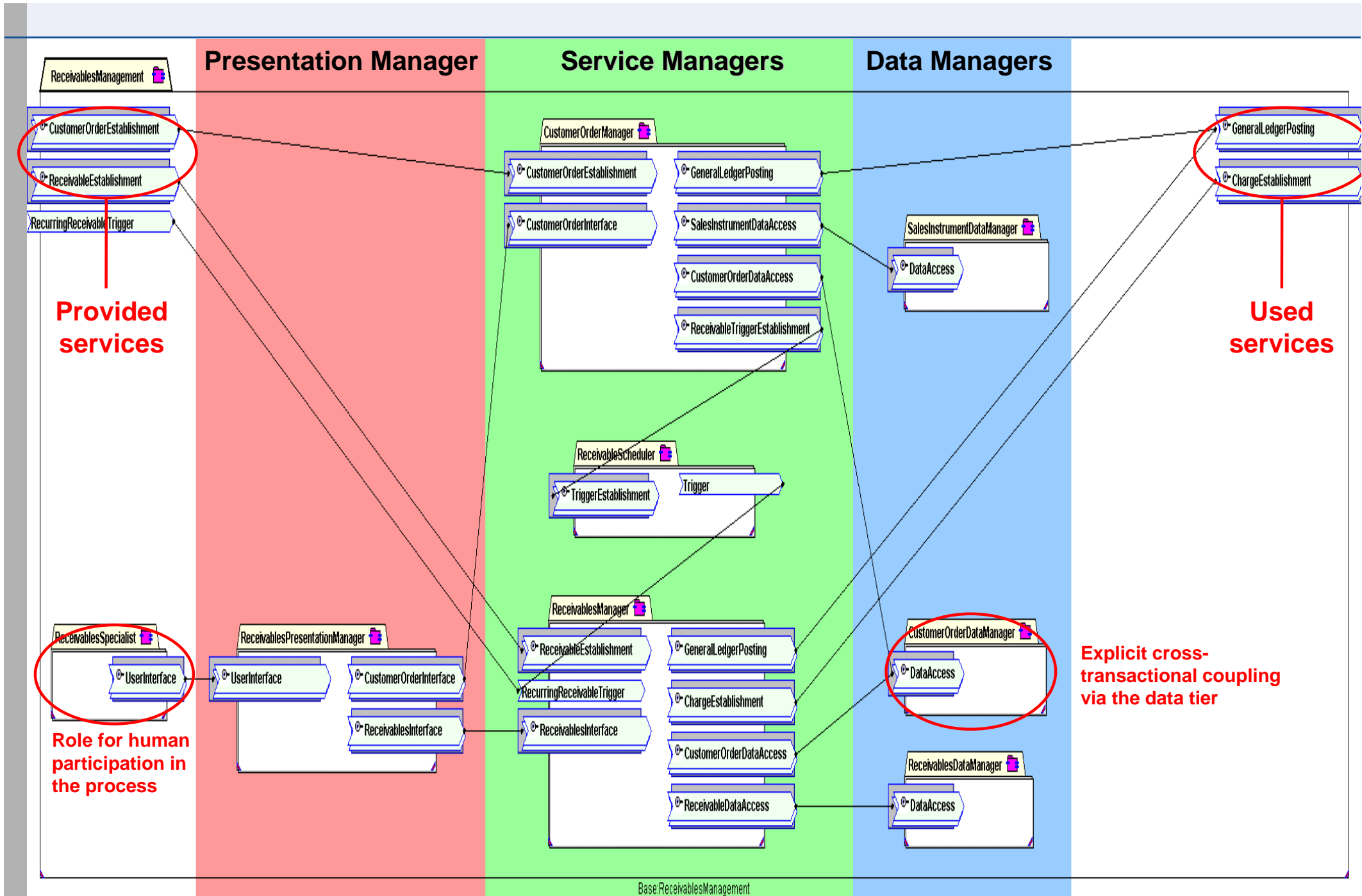


System Assembly

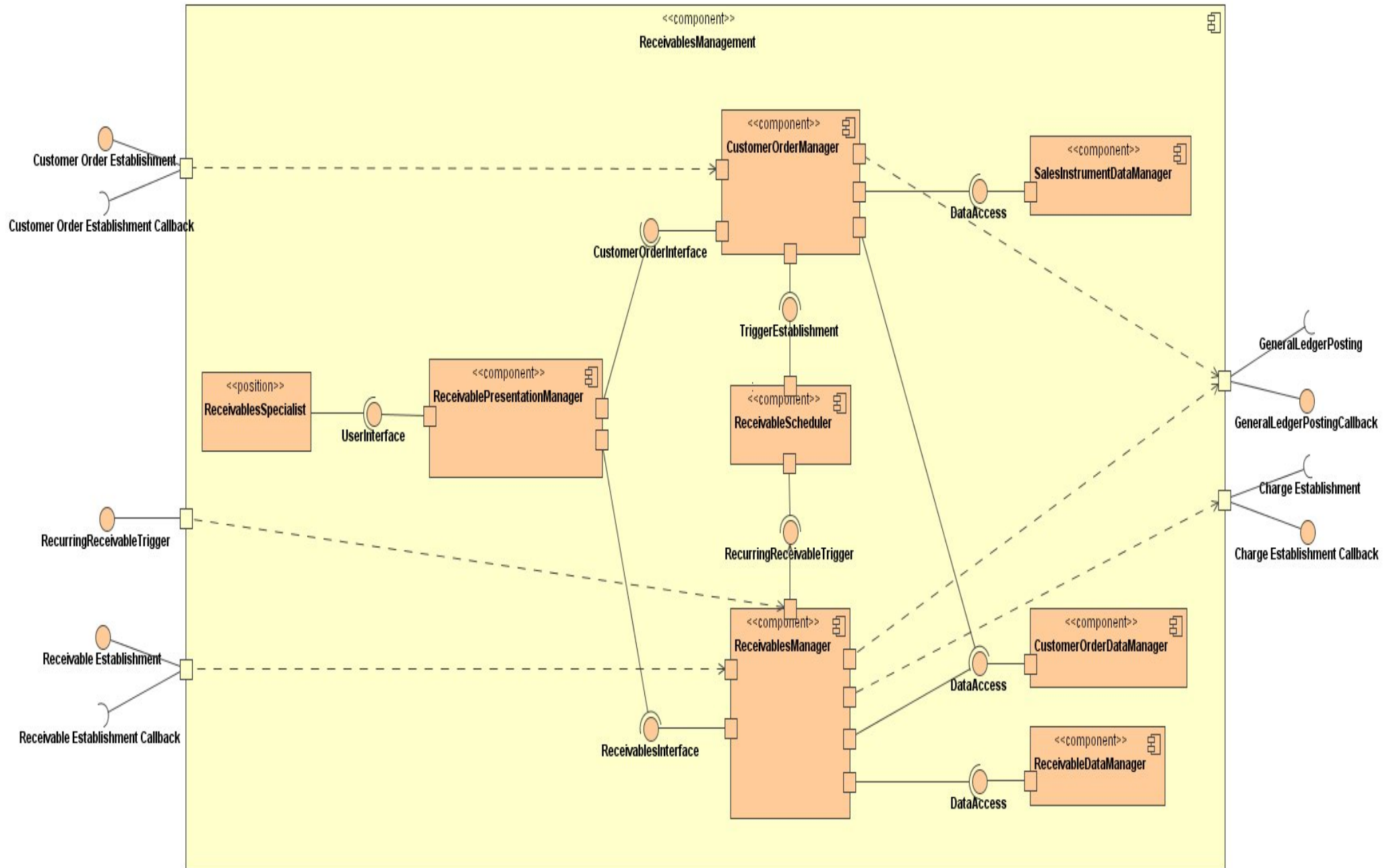
Subsystem



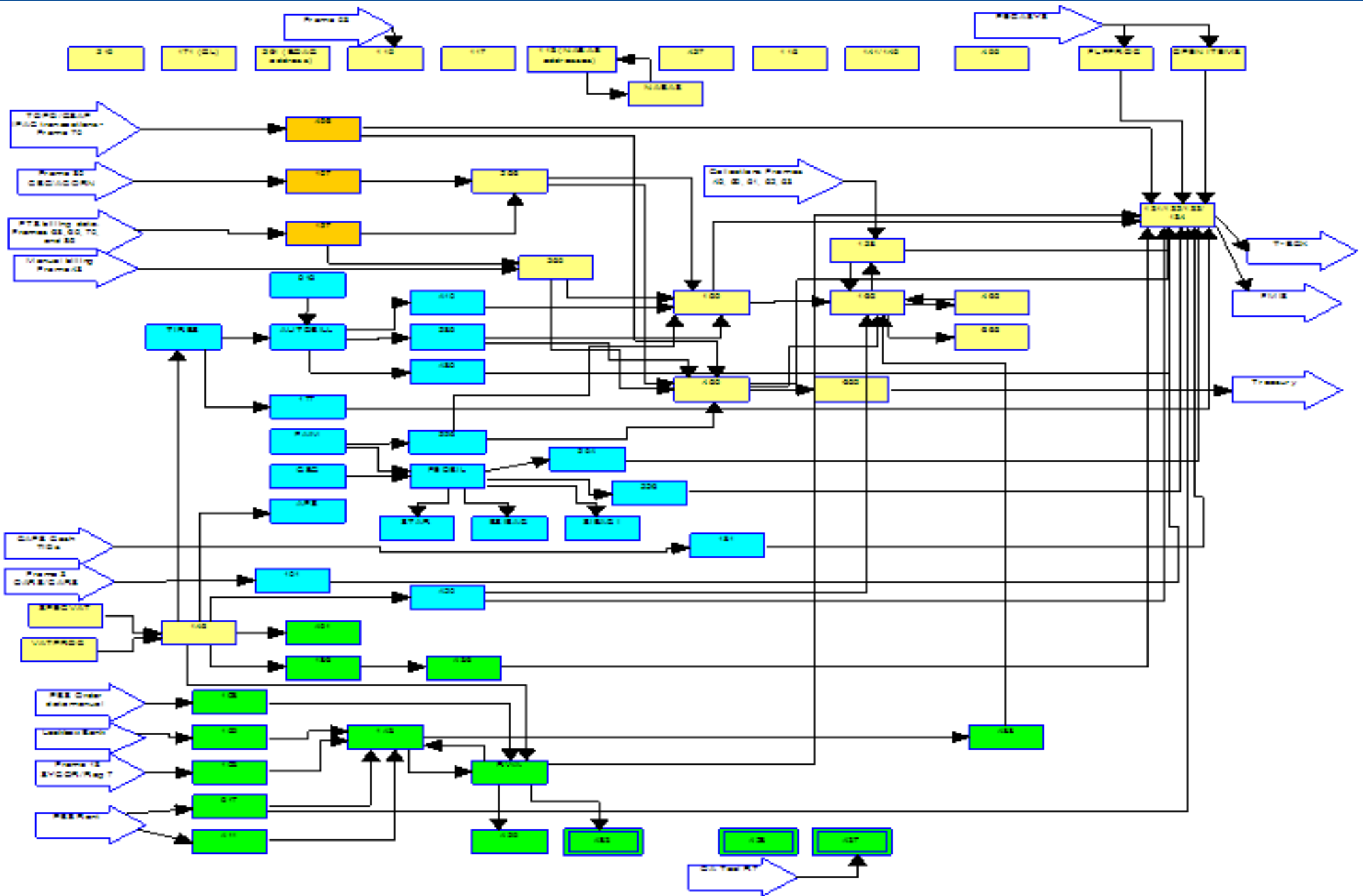
PIM: Receivables Management Work Role



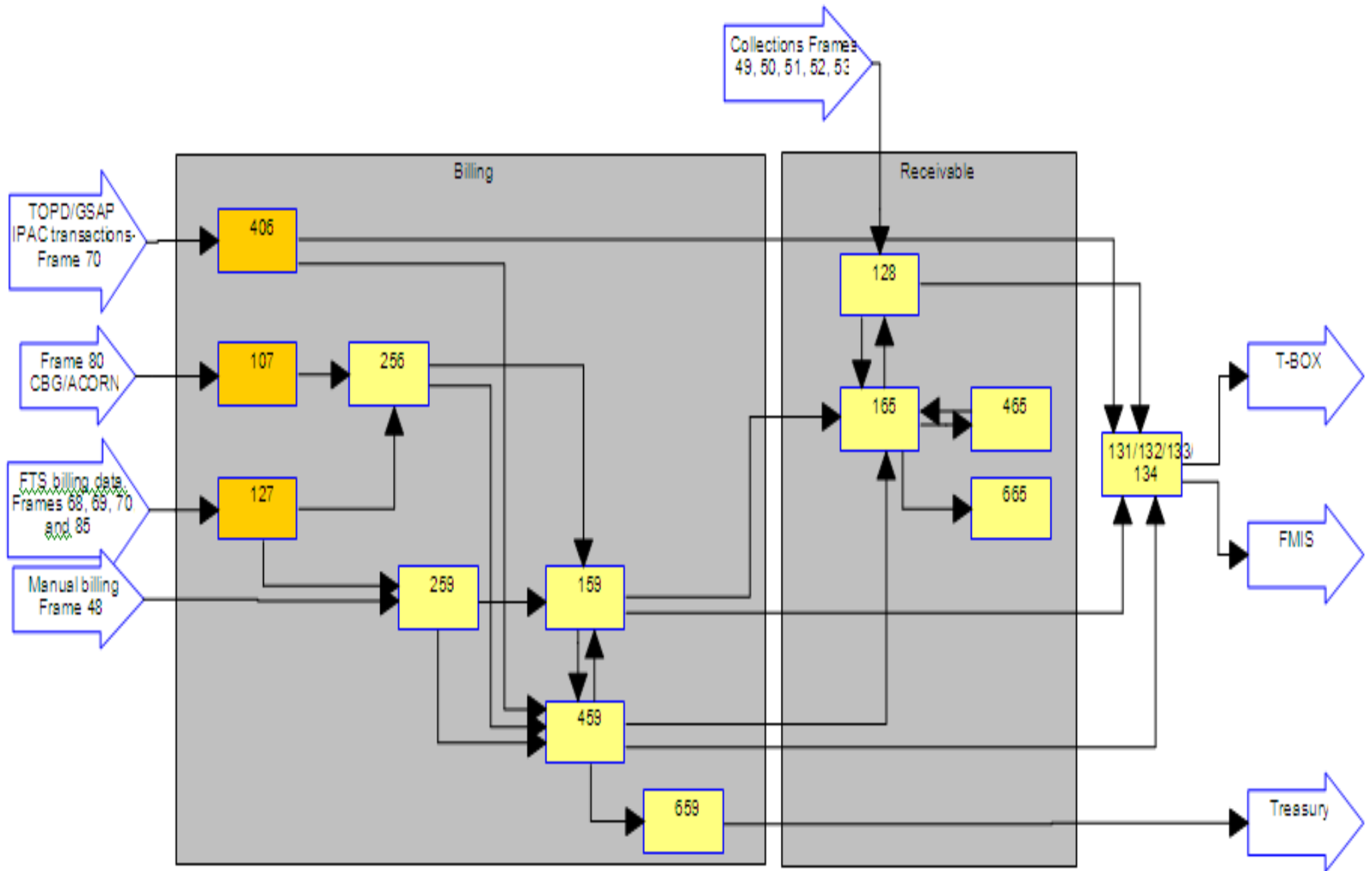
UML2 Receivables Management Composite Component



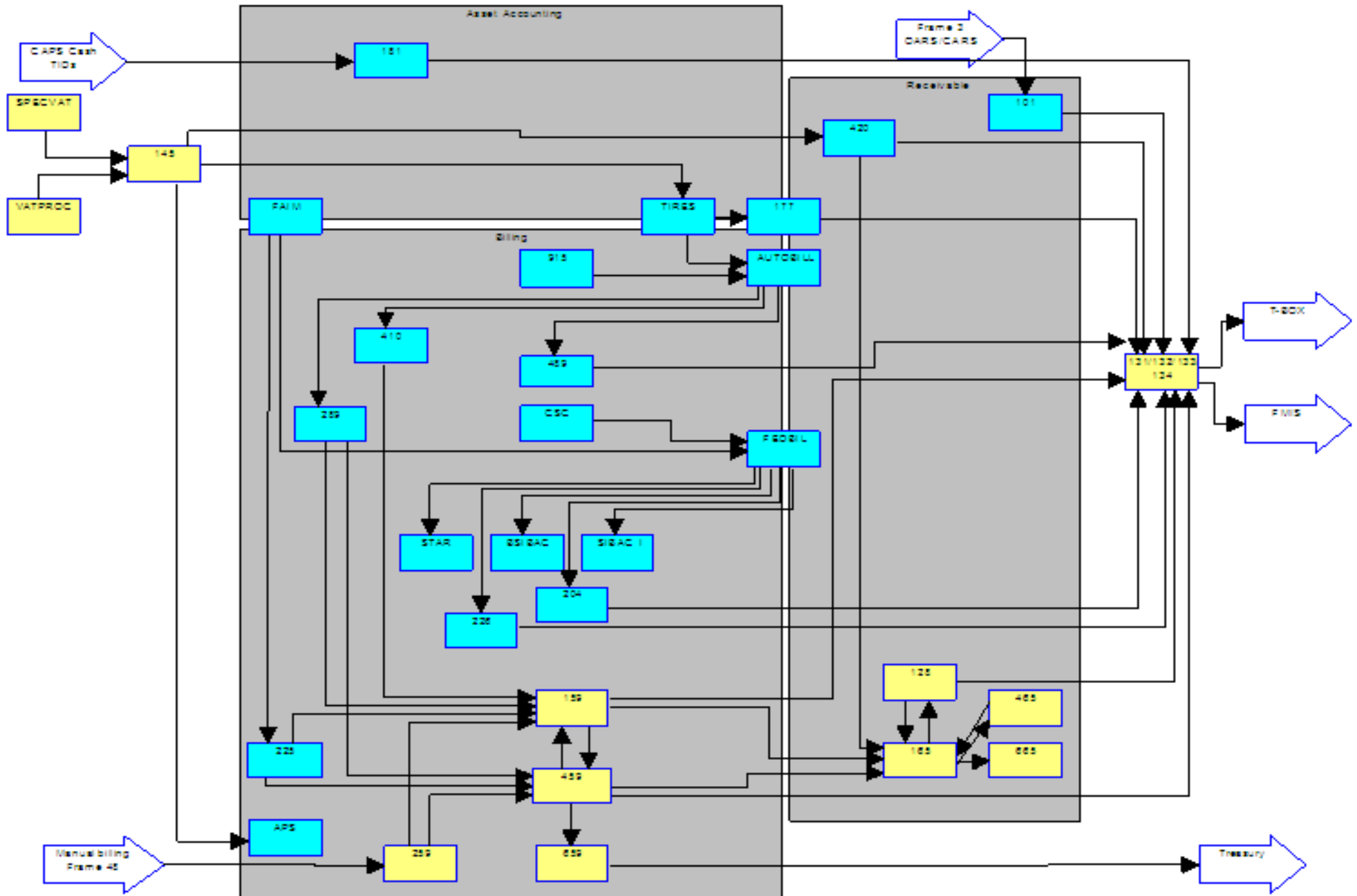
ADM - Flow of NEAR Modules



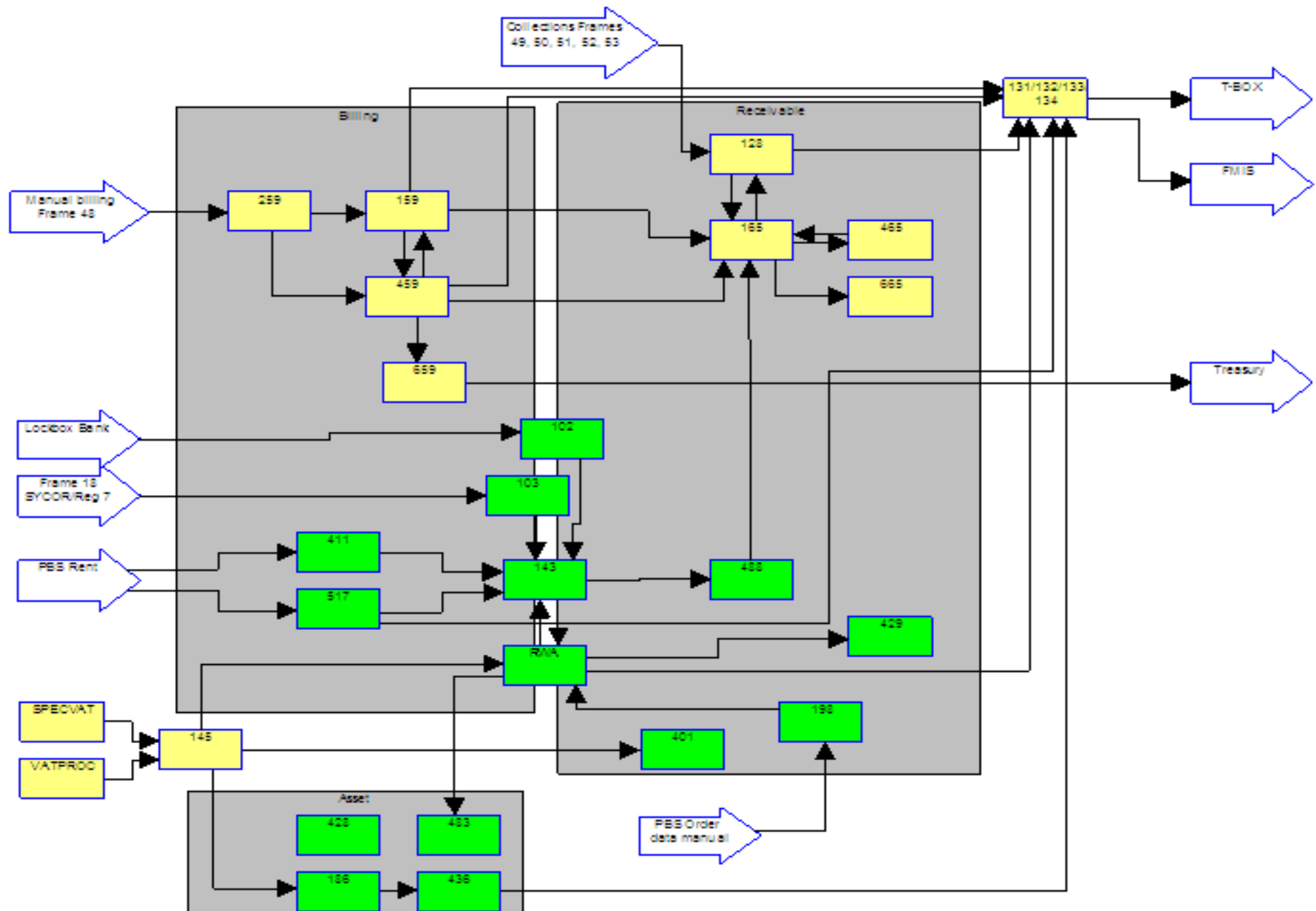
ADM - FTS Module Flows, with Process Mapping



ADM - FSS Module Flows, with Process Mapping



ADM - PBS Module Flows, with Process Mapping



Record Unfilled Customer Order - Requirements

- ADM enabled identification and analysis of 86 modules, 728 programs and 342 copybooks (735,000 loc)
- Tools offer query, reporting, sorting capabilities useful for extracting business rules
 - ~3 FTE person months - 636 business rules extracted
 - Only used this analysis technique on a COBOL mainframe slated for deprecation, other parsers available

Description: Record a new unfilled customer order, as established via a specific sales instrument.

Generate general ledger transactions to increase Unfilled Customer Orders and decrease Anticipated Reimbursements.

Requirement

RMA-03

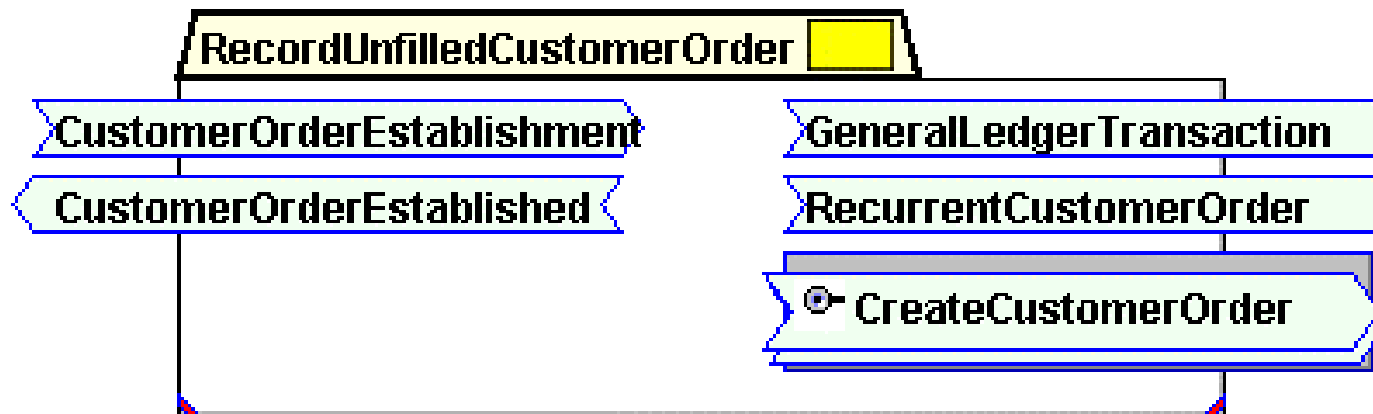
Reimbursable agreement information. Capture and accumulate reimbursable agreement information that includes the following:

JFMIP Core Requirements
2005

- * Billing limit
- * Billing terms
- * Customer order amount
- * Amount obligated
- * Amount expended
- * Advances collected
- * Advances applied to earned revenue
- * Remaining balance on advances
- * Amount earned
- * Amount billed
- * Accounts receivable
- * Collections on receivables.

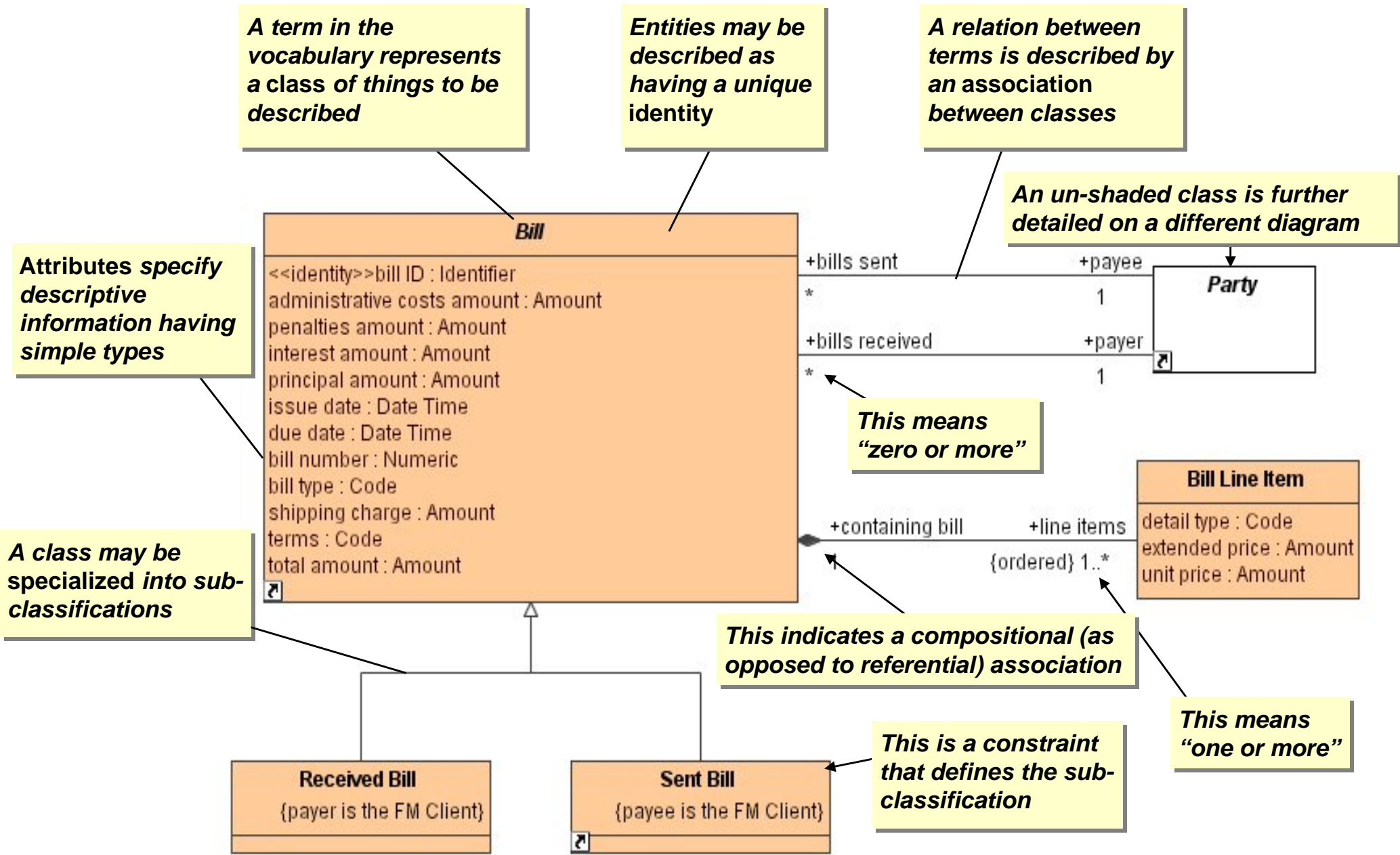
Enable access to reimbursable agreement information by customer ID number, reimbursable agreement number, project, or fund.

Record Unfilled Customer Order - Functional Spec

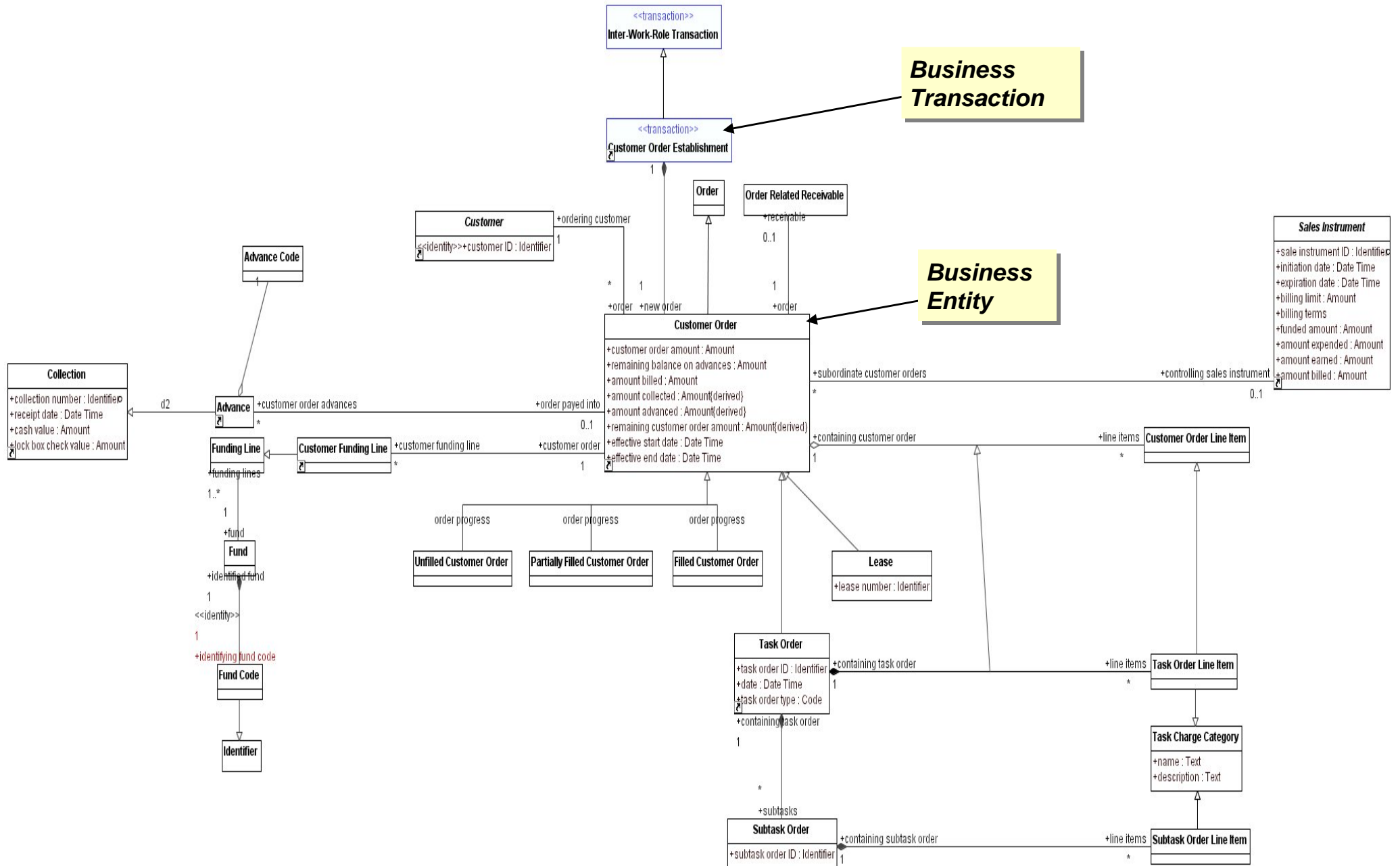


1. **Receive** CustomerOrderEstablishment
2. **Let** newOrder =
CreateCustomerOrder(CustomerOrderEstablishment.newOrder).data
3. **Send** GeneralLedgerTransaction to increase Unfilled Customer Orders and decrease Anticipated Reimbursements
4. **Send** newOrder as RecurrentCustomerOrder
(**Note:** EstablishRecurringReceivables will check if there are actually any creation triggers.)
5. **Send** CustomerOrderEstablished

Information Model Example - UML Primer



Business Information, Business Transaction Model

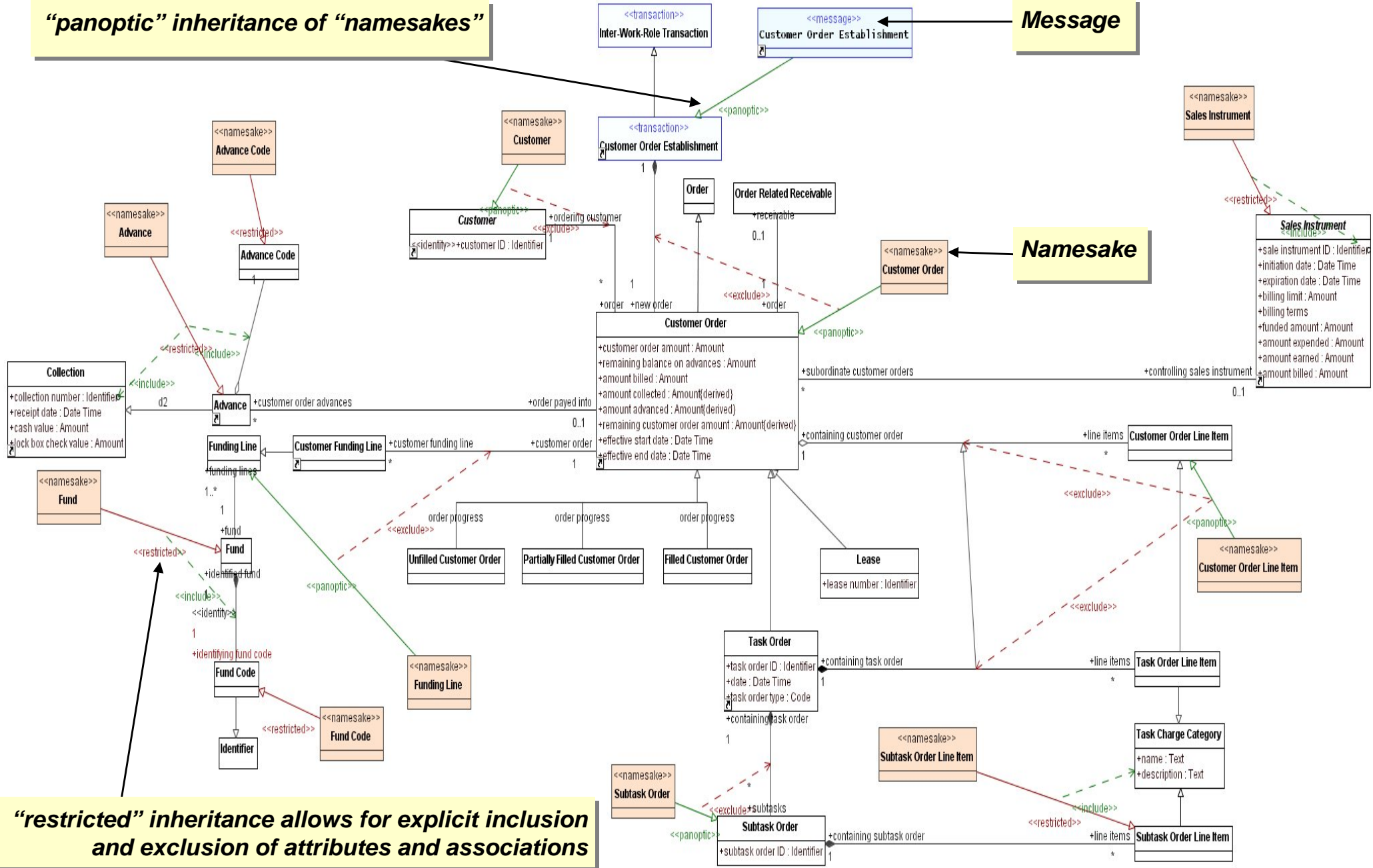


Business Transaction Message Model

“panoptic” inheritance of “namesakes”

Message

Namesake

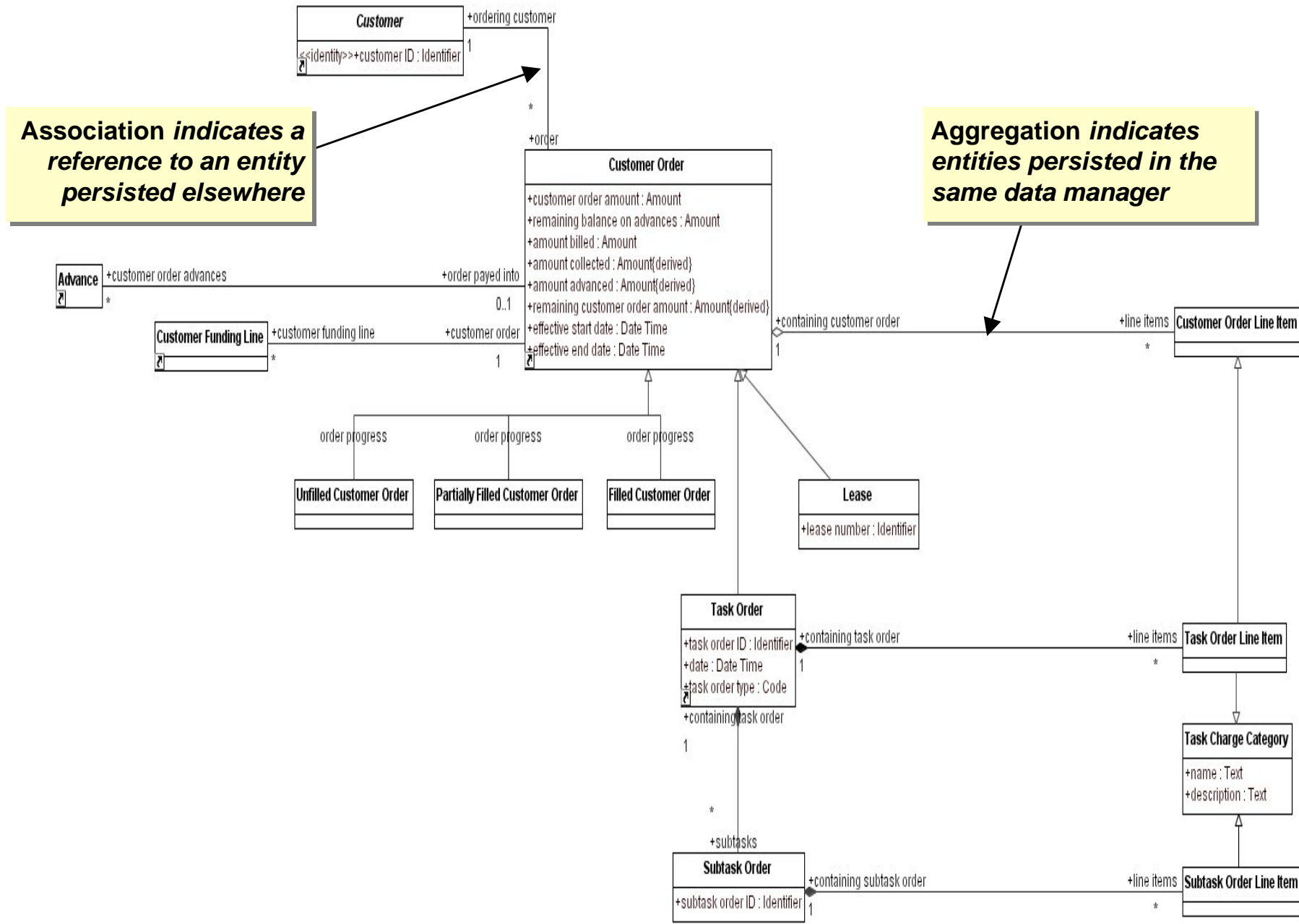


“restricted” inheritance allows for explicit inclusion and exclusion of attributes and associations

Business Transaction Message in XML for CIM/CRI

```
<CustomerOrderEstablishment>
  <Inter-Work-RoleTransaction>
    <inter-work-roleTransactionID> ... </inter-work-
roleTransactionID>
    ...
  </Inter-Work-RoleTransaction>
  <newOrder>
    <orderingCustomer>
      <customerID> ... </customerID>
    </orderingCustomer>
    <controllingSalesInstrument>
      <salesInstrumentId> ... </salesInstrumentId>
    </controllingSalesInstrument>
    <customerOrderAmount> ... </customerOrderAmount>
    ...
    <lineItems>
      ...
    </lineItems>
  </newOrder>
</CustomerOrderEstablishment>
```

Persistence Model



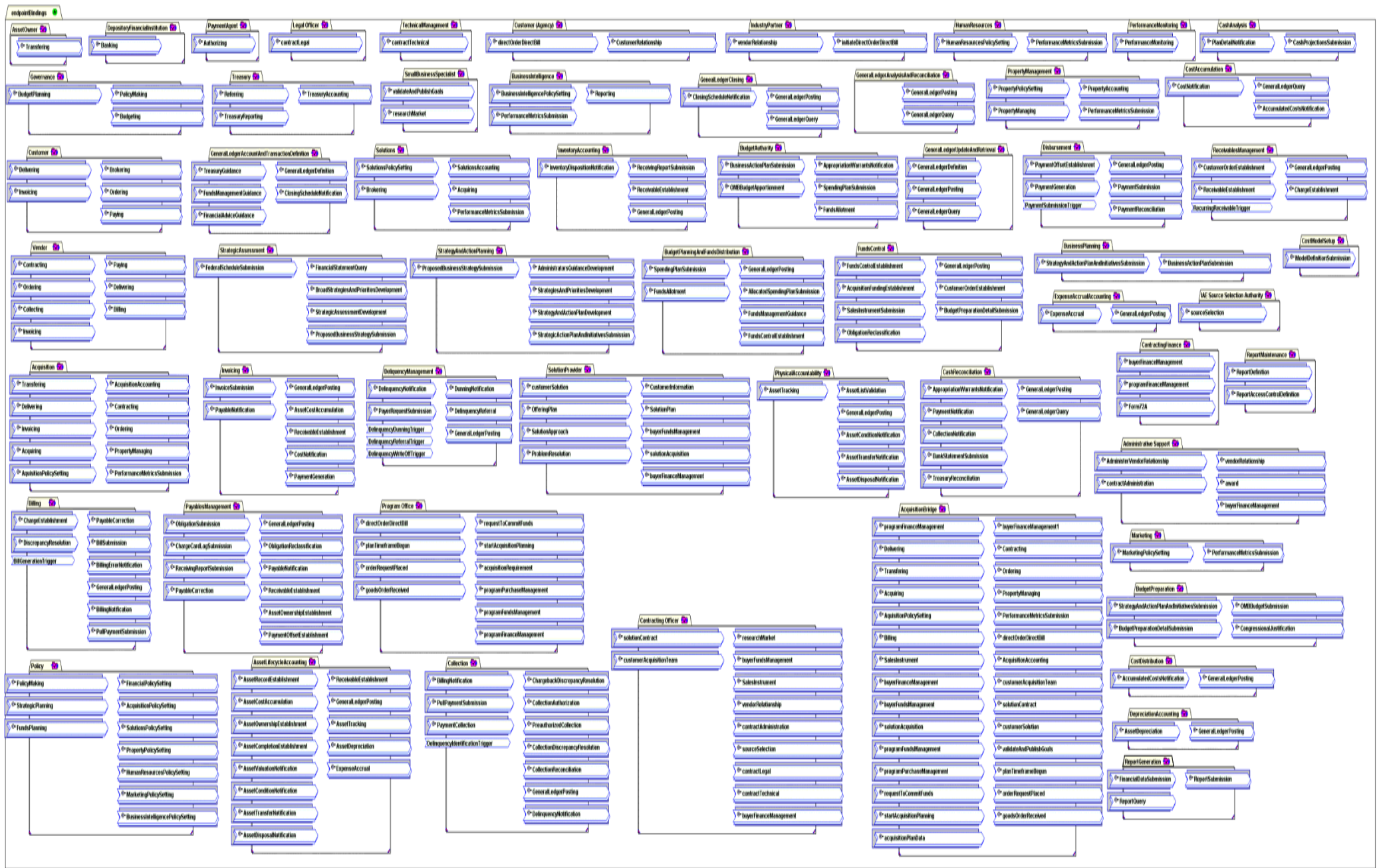
FMEA - FMLoB Thanks

- GSA OCFO
 - Driving GSA toward shared services
- LMI
 - Task Lead
 - FM domain (JFMIP-FSIO) specialists
- Data Access Technologies
 - Tech Lead
 - MDA (EDOC, UML) specialists
 - One GSA EA and ComponentX specialists
- Tactical Strategy Group
 - ADM Transformation specialists
- ASG
 - Becubic and additional support!

Part 3 - OSERA

- Slides 46 to 60
- OSERA
 - ‘Model to Integrate’
 - Test driven ‘Service Based Procurement’
 - ‘Model Based Acquisition’
 - Semantic Interoperability

OSERA - BPEL Work Roles for Acquisition and FMLoB



ENDPOINTS

FMEA PSM: Generated BPEL/WSDL/XSD

```
<wsdl:portType name="ReceivableEstablishment.ReceivableEstablishment">
  <wsdl:operation name="ReceivableEstablishment">
    <wsdl:input name="ReceivableEstablishment" message="tns:ReceivableEstablishmentPanopticInheritanceCluster">
  </wsdl:input>
  </wsdl:operation>
</wsdl:portType>
```

```
<wsdl:message name="ReceivableEstablishmentPanopticInheritanceCluster">
  <wsdl:part name="ReceivableEstablishmentPanopticInheritanceCluster"
type="Receivable_Establishment:ReceivableEstablishmentPanopticInheritanceClusterType">
  </wsdl:part> <wsdl:part name="correlationId" type="xsd:string"/>
</wsdl:message>
```

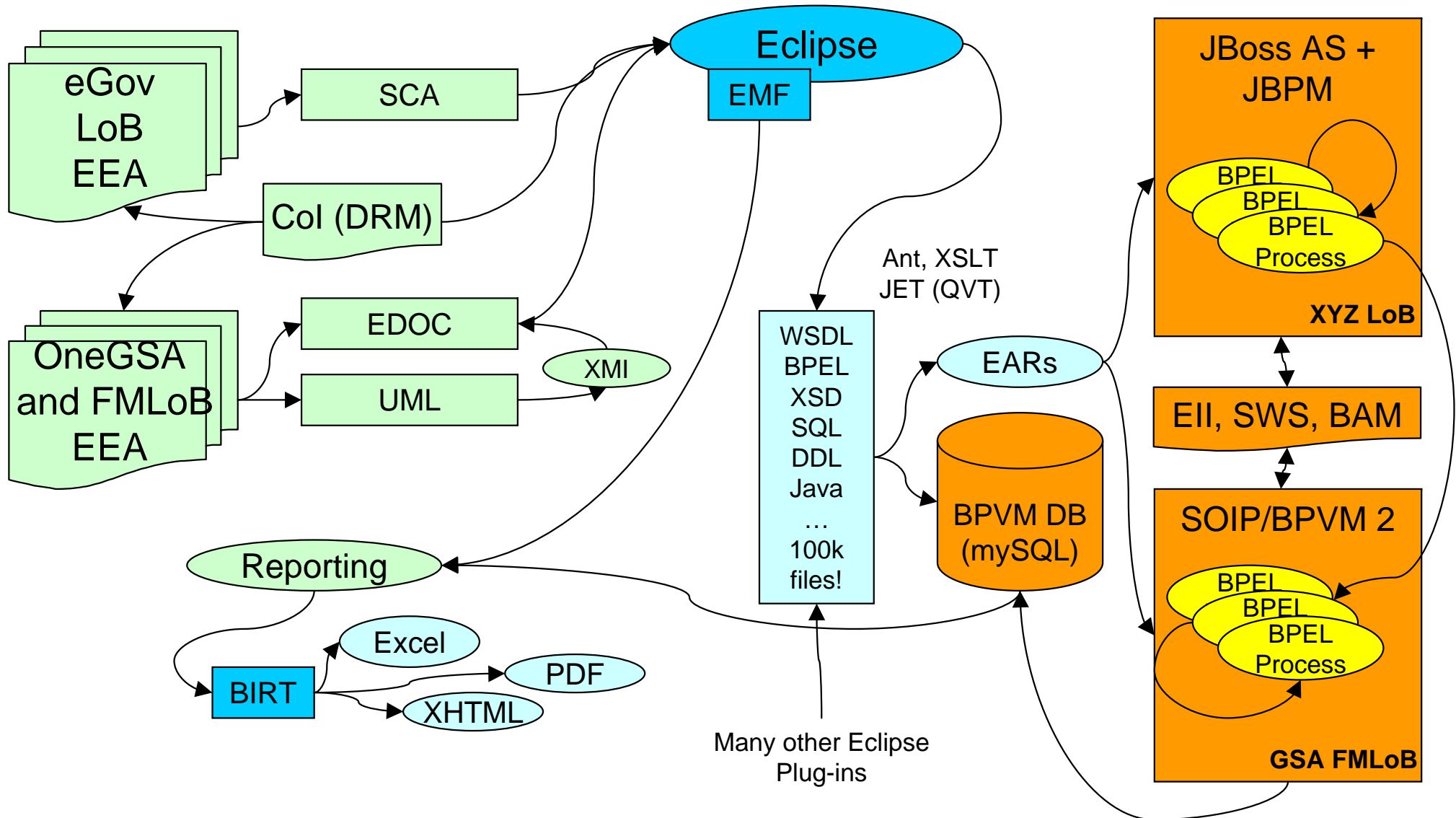
```
<plt:partnerLinkType name="ReceivableEstablishment">
  <plt:role name="PayablesManagement" portType="tns:ReceivableEstablishment.ReceivableEstablishmentCallback"/>
  <plt:role name="ReceivablesManagement" portType="tns:ReceivableEstablishment.ReceivableEstablishment"/>
</plt:partnerLinkType>
```

```
<wsdl:types>
  <xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified"
targetNamespace="platform:/resource/fmea.process/model/Receivable_Establishment.xsd"
xmlns="http://www.w3.org/2001/XMLSchema">
  <xsd:include schemaLocation="Receivable_Establishment.xsd"/>
  </xsd:schema>
</wsdl:types>
```

```
<xsd:complexType name="ReceivableEstablishmentType">
  <xsd:sequence> {...}
  <xsd:element minOccurs="1" maxOccurs="1" name="Inter-Work-RoleTransaction"
type="BusinessTransactions:Inter-Work-RoleTransactionType"/>
  <xsd:element minOccurs="1" maxOccurs="1" name="Inter-Enterprise-RoleTransaction"
type="FinancialManagement:Inter-Enterprise-RoleTransactionType"/> {...}
  </xsd:sequence>
</xsd:complexType>
```


EEA Models, IME/MDM, Code, SOIP/BPVM, Reports/Alerts

- OSERA generates, deploys and executes EEA models



OSERA Managed Platform: EEA Tools and Techniques

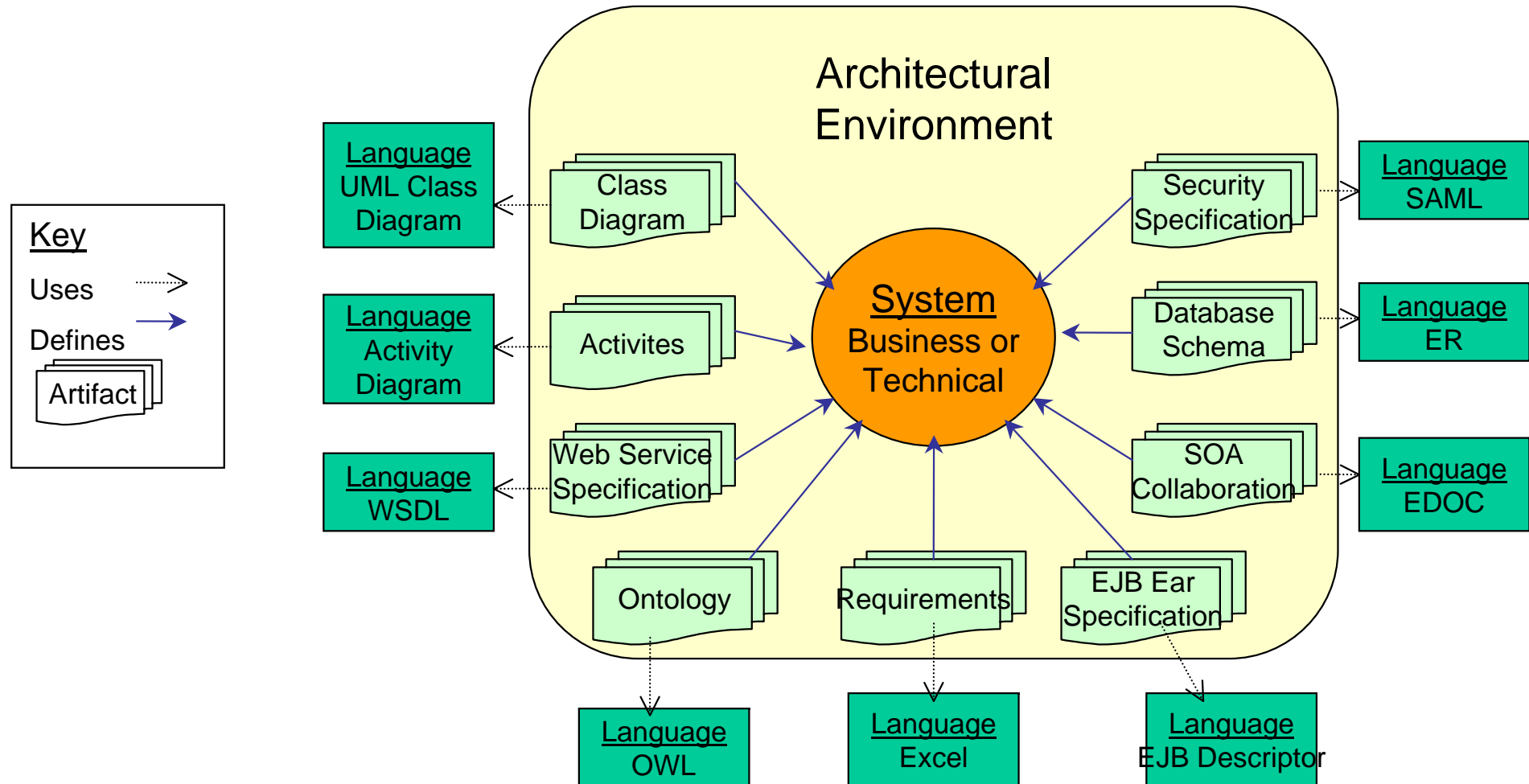
- Aggregating, enhancing and integrating existing FOSS for EA
 - Eclipse, JBoss
 - NetBeans, GlassFish
 - Platform and tool agnostic
 - Fusion, .NET
- Model to Integrate, 'collapse CPIC and SDLC'
 - IME, MDM, SOIP, BPVM, ESB
 - Integrated design and runtime tools
 - EDOC to BPEL example
- Semantic Interoperability, 'end modeling fatigue'
 - Integrating structured and knowledge representations
 - MDA (MOF, EDOC, BPDM, SBVR, UML2, KDM, GASTM, ...)
 - RDF/S, OWL-DL (others)
- Infrastructure Services
 - UDDI/ebXML Registry/Repository
 - Semantic stores and services, Policy Engine
 - Portal, Content Mgmt, SCM, Project Tracking, Listserves, Wiki

OSERA Managed Program: Model Based Acquisition

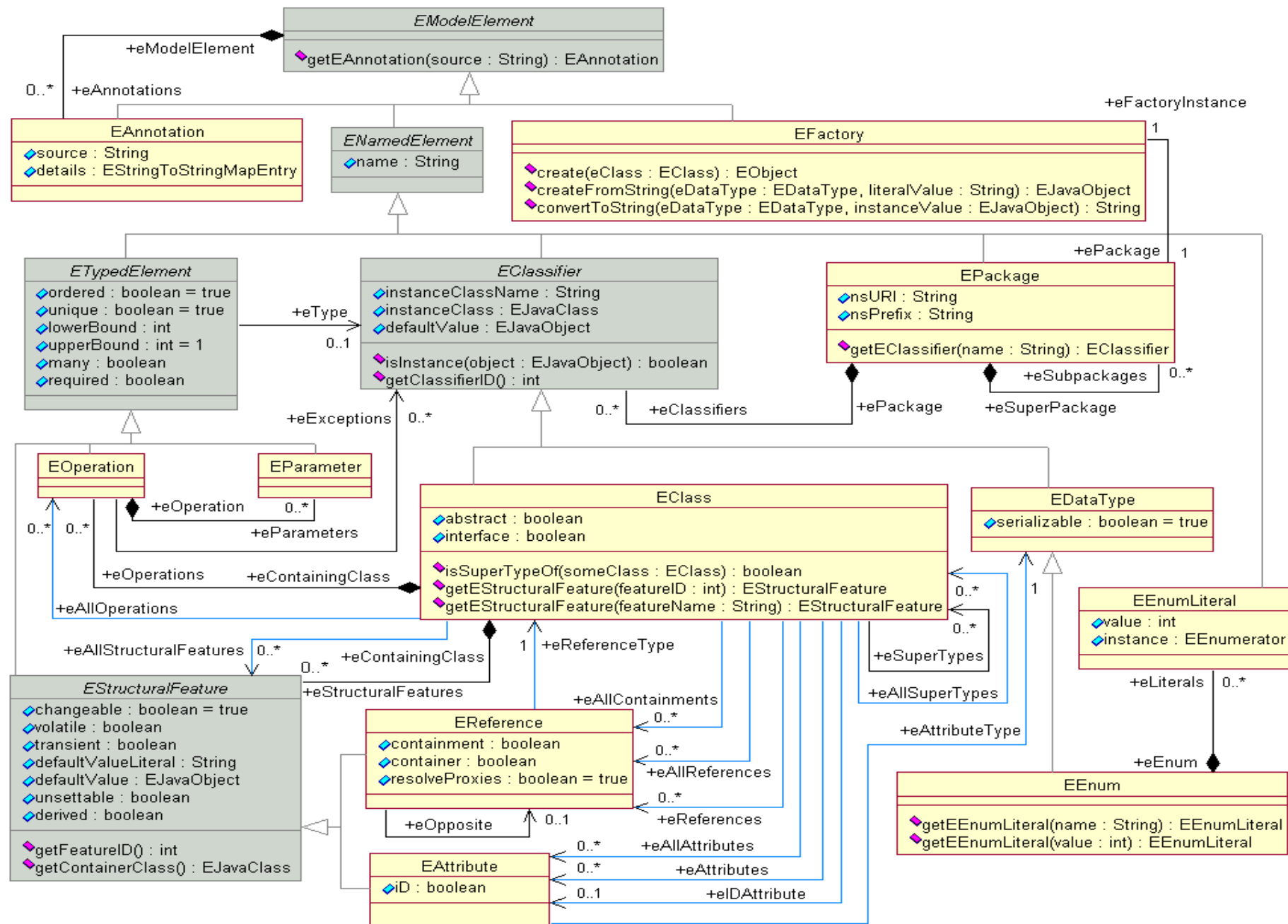
- Test driven service based procurement
 - CIOC AIC/IAC 'SCBA' whitepaper, v3.5
 - Service and component interaction testing (DoD NCES JITC)
- Federal-wide ITPM, 'Resource Rationalization'
 - Combined LoB domain models are 'RA authoritative sources'
 - Horizontal and vertical government alignment using OS-RA's
- OSERA as 'eGov Factory'
 - A RI for designing and *executing* LoB (OS-RA) interoperability
 - 'TCK' for standards (WS-I, OASIS, OMG, NIST, other) compliance
 - EEA enables FTA sequencing
- Federal Target Architecture
 - Persistent SOA/ESB enables *progression* testing
 - LoB scenarios as DBC and UAT proof
 - Leading indicators of citizen-centrism, PRM LoS
 - To-be procured service interacts with as-is services
 - Resource rationalization moves from cathedral to bazaar

Semantic Interoperability – Solving ‘Modeling Fatigue’

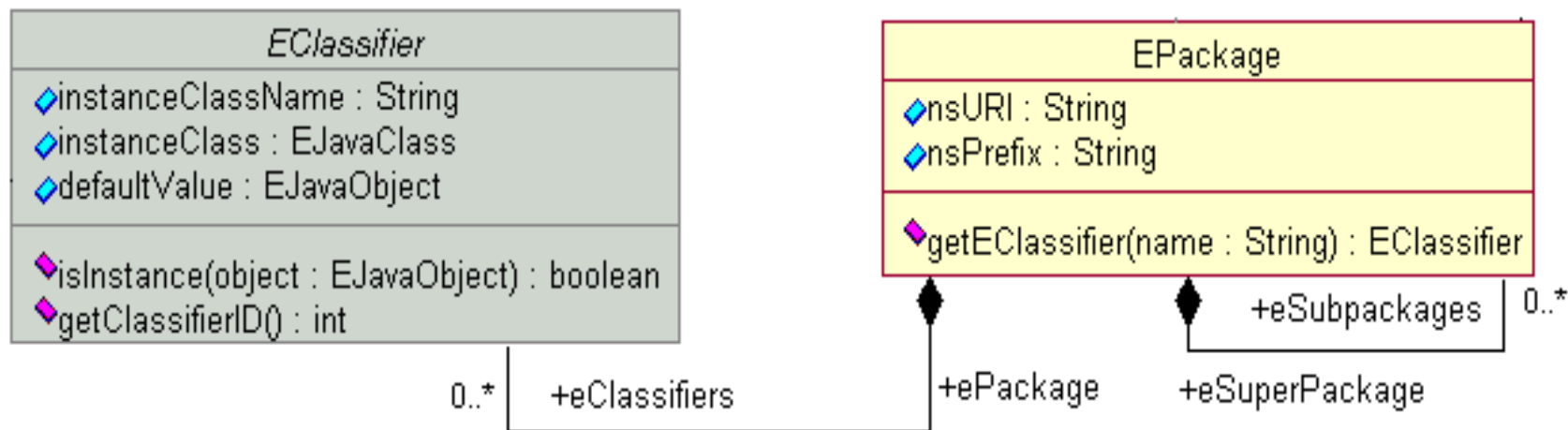
- Problem: too many ways to talk about the same thing, redundant and conflicting semantics
- Solution: integrate structured and knowledge representation disciplines



ECORE Meta-Meta Model (M3)



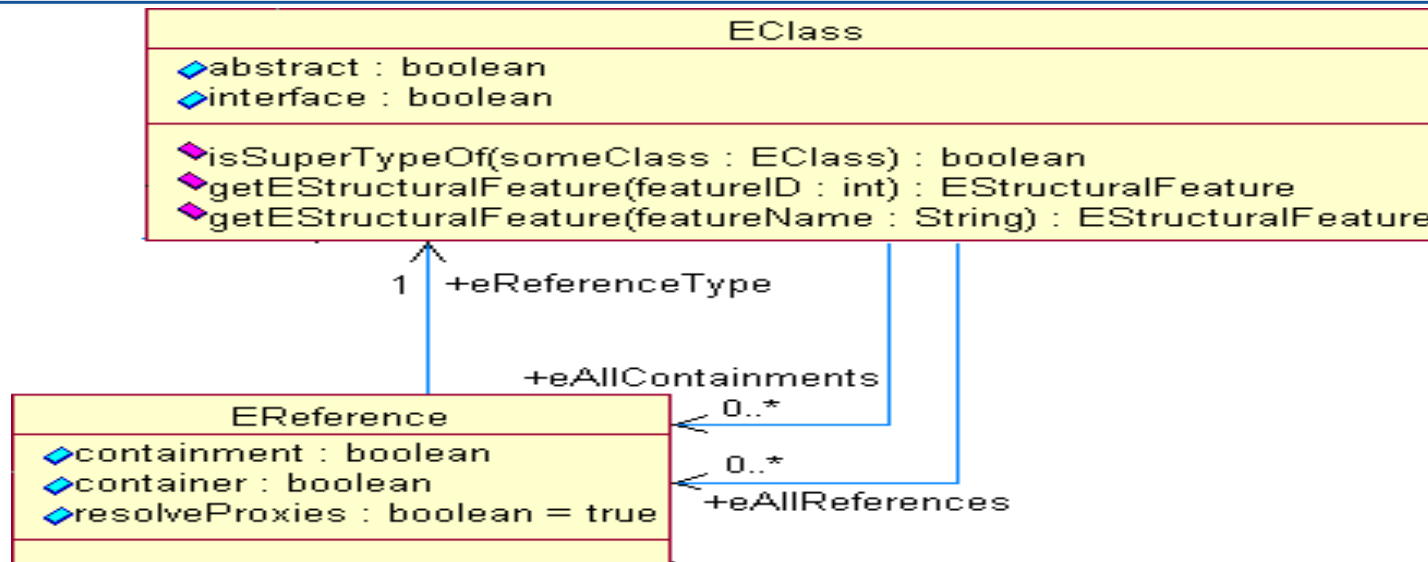
ECORE and RDFS/OWL - Composition Example



```
<owl:ObjectProperty rdf:about="&EPackage;eClassifiers">  
  <rdfs:domain rdf:resource="&EMF;EPackage"/>  
  <rdfs:range rdf:resource="&EMF;EClassifier"/>  
  <owl:inverseOf rdf:resource="&EClassifier;ePackage"/>  
</owl:ObjectProperty>
```

```
<owl:ObjectProperty rdf:about="&EClassifier;ePackage">  
  <rdfs:domain rdf:resource="&EMF;EClassifier"/>  
  <rdfs:range rdf:resource="&EMF;EPackage"/>  
  <rdf:type rdf:resource="&owl;FunctionalProperty"/>  
  <owl:inverseOf rdf:resource="&EPackage;eClassifiers"/>  
</owl:ObjectProperty>
```

ECORE and RDFS/OWL - Association Example



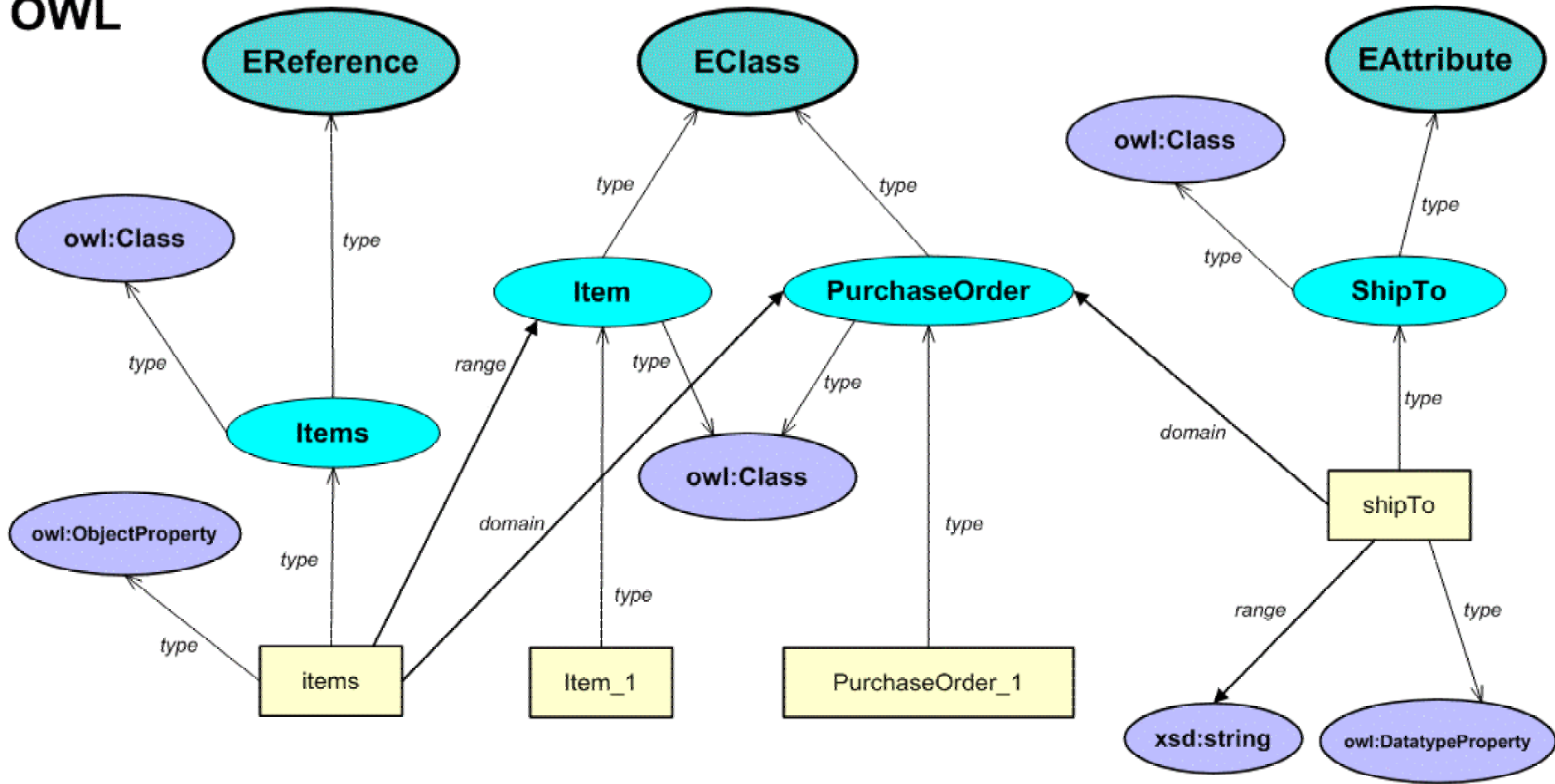
```
<owl:ObjectProperty rdf:about="&EClass;eAllContainments">
  <rdfs:domain rdf:resource="&EMF;EClass"/>
  <rdfs:range rdf:resource="&EMF;EReference"/>
</owl:ObjectProperty>
```

```
<owl:ObjectProperty rdf:about="&EClass;eAllReferences">
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  <rdfs:range rdf:resource="&EMF;EReference"/>
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```

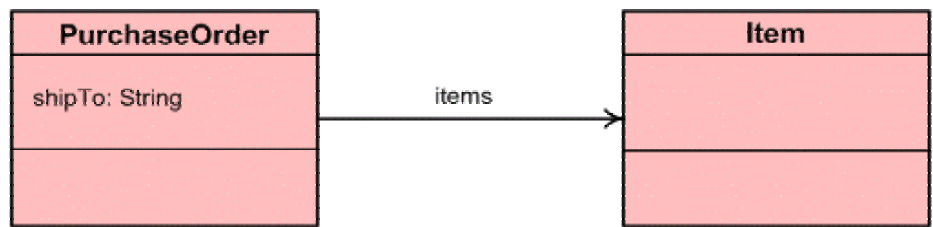
```
<owl:ObjectProperty rdf:about="&EReference;eReferenceType">
  <rdfs:domain rdf:resource="&EMF;EReference"/>
  <rdfs:range rdf:resource="&EMF;EClass"/>
  <rdf:type rdf:resource="&owl;FunctionalProperty"/>
</owl:ObjectProperty>
```

A Complete Example

OWL



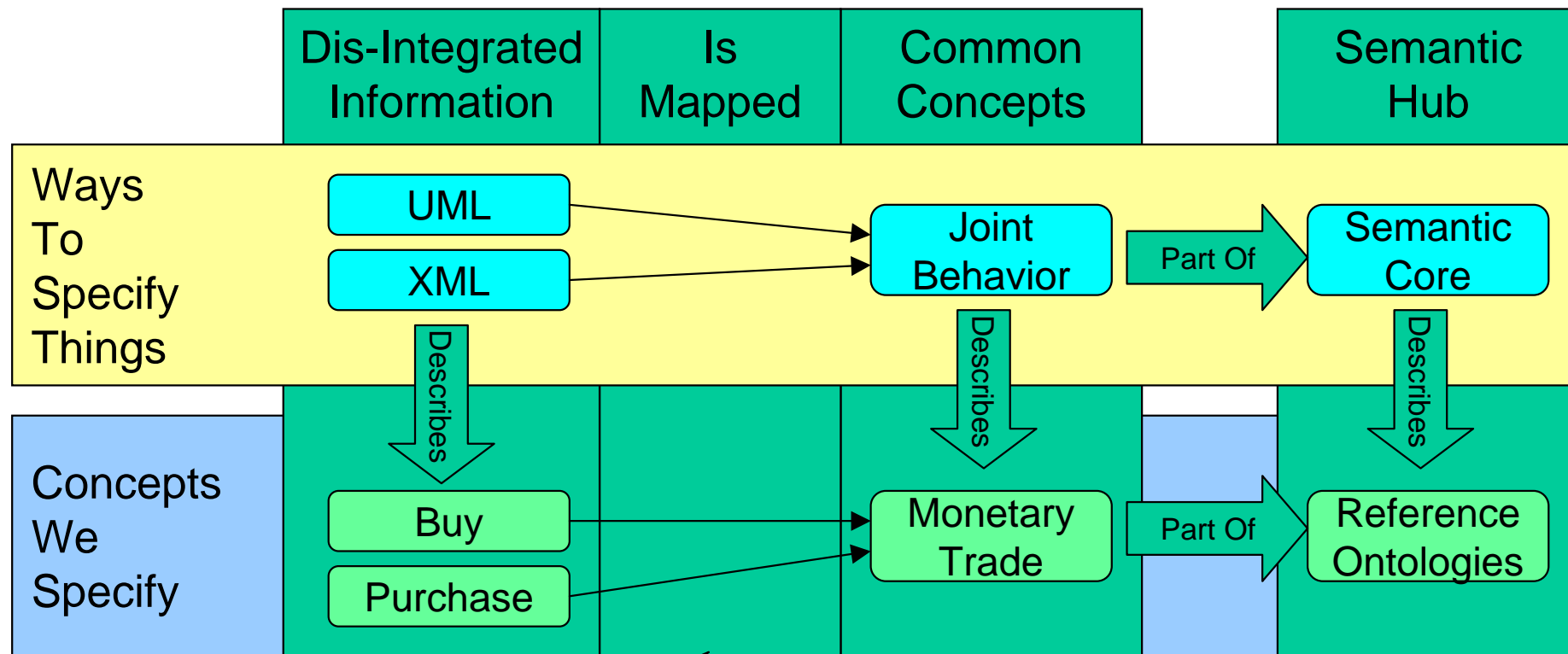
UML



- M3** ■ EMF classes
- M2** ■ OWL & XML Schema classes
- M1** ■ Application classes
- M0** ■ Application instances
- UML classes

Normalize Locally, Harmonize Globally

- Integrate architecture concepts expressed in multiple languages
- Hubs can be connected across Col/CoP's

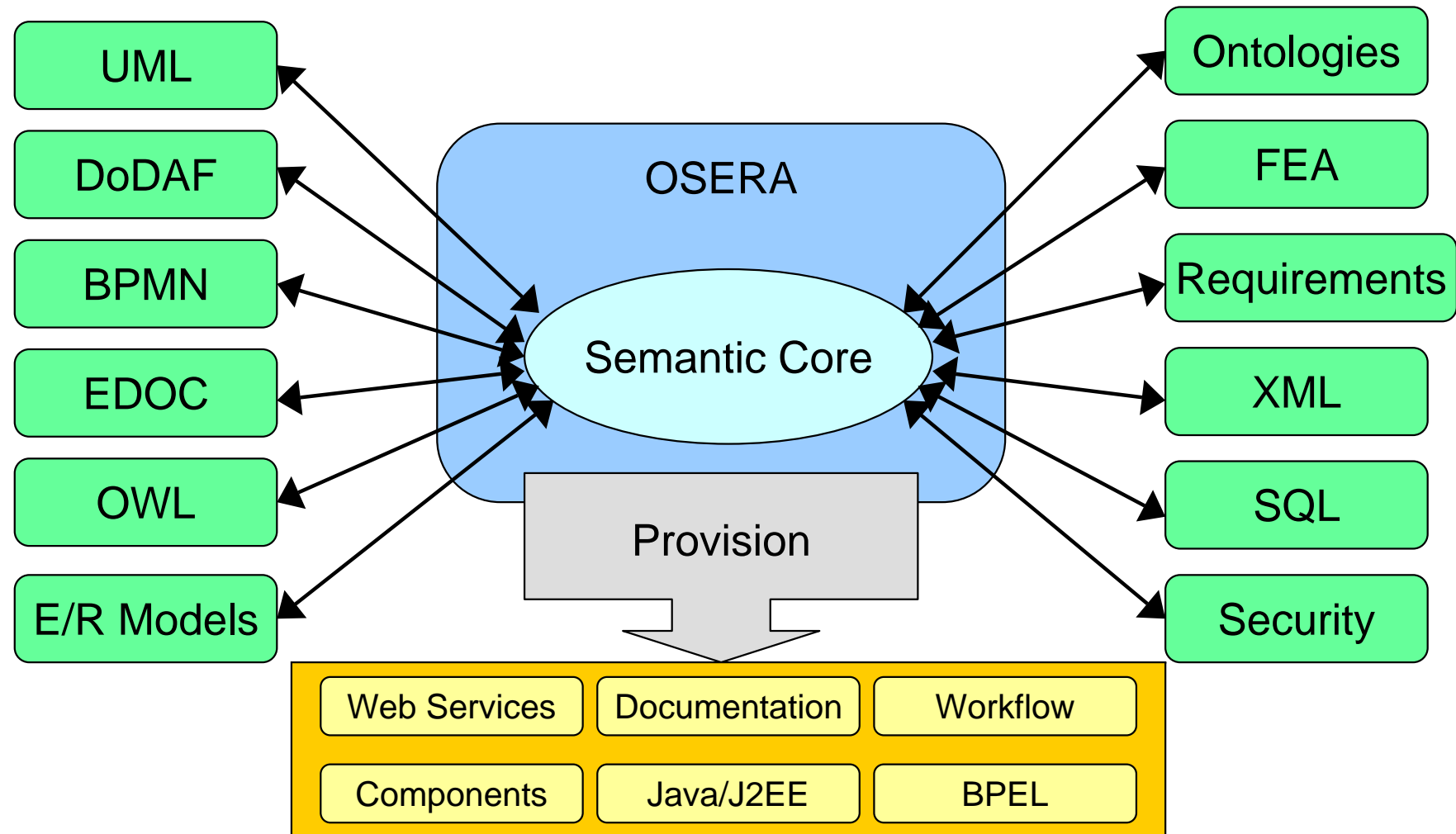


Mapping is not "one-one"

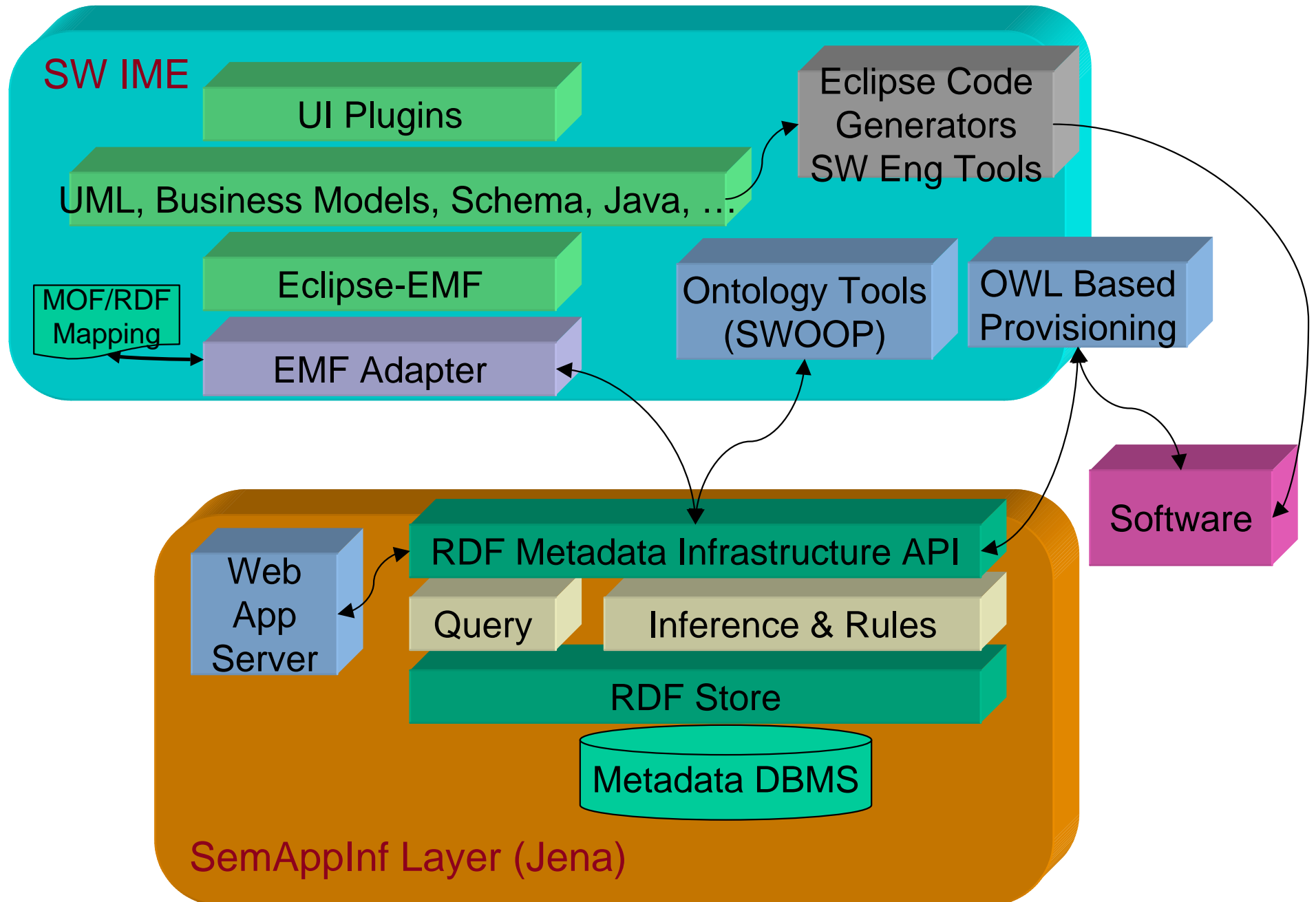
Library of common concepts
Can grow over time

'Views' of Integrated Information

- semanticcore.org - mid-level ontology/metamodel of architecture
- Normalize terms and concepts in a domain of discourse

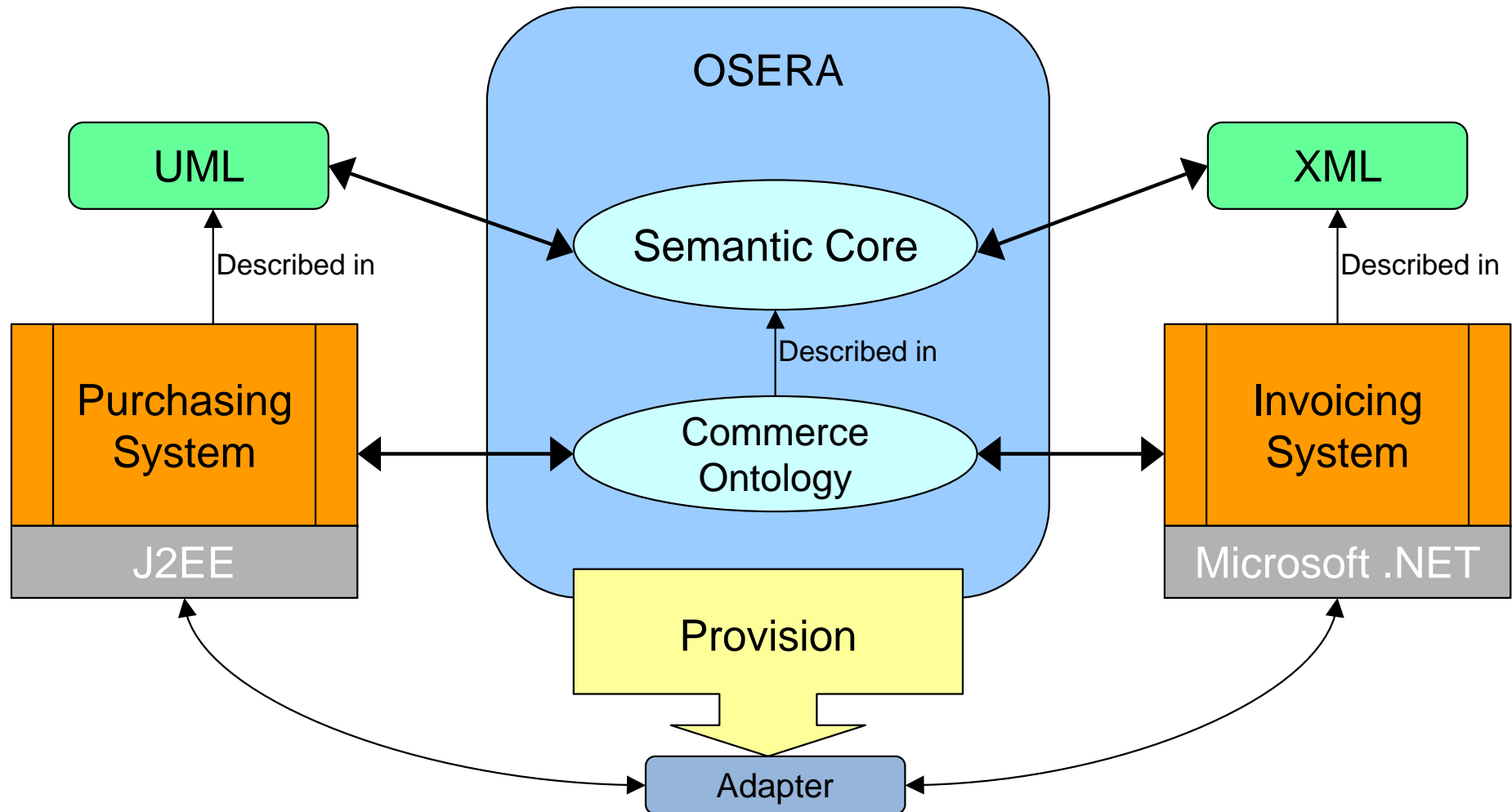


OSERA KM and BAM Tools



Adapting Systems with OSERA

- Design time, or run time?
- Architecture integration and semantic web services
- Autonomic configuration



Summary

- Executable EA
 - GSA shared service target using MDA standards as SOA DSL
 - Consistent with Industry direction
 - Open standards based model simulations drive SME validation and stakeholder consensus
 - FEA Reference Model integration
 - ITPM framework, IT and Organizational Resource Rationalization
- FMEA and FMLoB
 - MDA (EDOC/UML) modeling conventions
 - ADM enables target traceability for mainframe sunset
 - XML Message assembly of business transactions
- OSERA
 - FMLoB 'Model to Integrate' from EA to Web Services
 - Platform goals and objectives for 'Model Based Acquisition'
 - Semantic Interoperability for intellectual capital unification and systems adaptations across trading partner communities

Thank You

- Contact me:
 - George Thomas
 - Enterprise Chief Architect
 - GSA Office of the Chief Information Officer
 - g.thomas@gsa.gov
 - 202.219.1979