



U.S. General Services Administration

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

George Thomas, GSA Enterprise Chief Architect

# 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, Tools, Next Steps
- OSERA
  - Web Service PSM generation (BPEL, WSDL, XSD)
  - Collapse CPIC and SDLC
  - Test driven 'Service Based Procurement'
  - LoB's models as Authoritative RA's, RI for eGov Factory
  - Model Based Acquisition

# 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 (Things)</i>	FUNCTION <i>How (Process)</i>	NETWORK <i>Where (Location)</i>	PEOPLE <i>Who (People)</i>	TIME <i>When (Time)</i>	MOTIVATION <i>Why (Motivation)</i>
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>		<b>Enterprise Architecture (EA)</b>					
SYSTEM MODEL (Logical) <i>Designer</i>		<b>Reference Architecture (RA)</b>					
TECHNOLOGY MODEL (Physical) <i>Builder</i>		<b>Solution Architecture (SA)</b>					
DETAILED REPRESENTATIONS (Out-of-Context) <i>Sub-Contractor</i>		<b>Reference Implementation (RI)</b>					

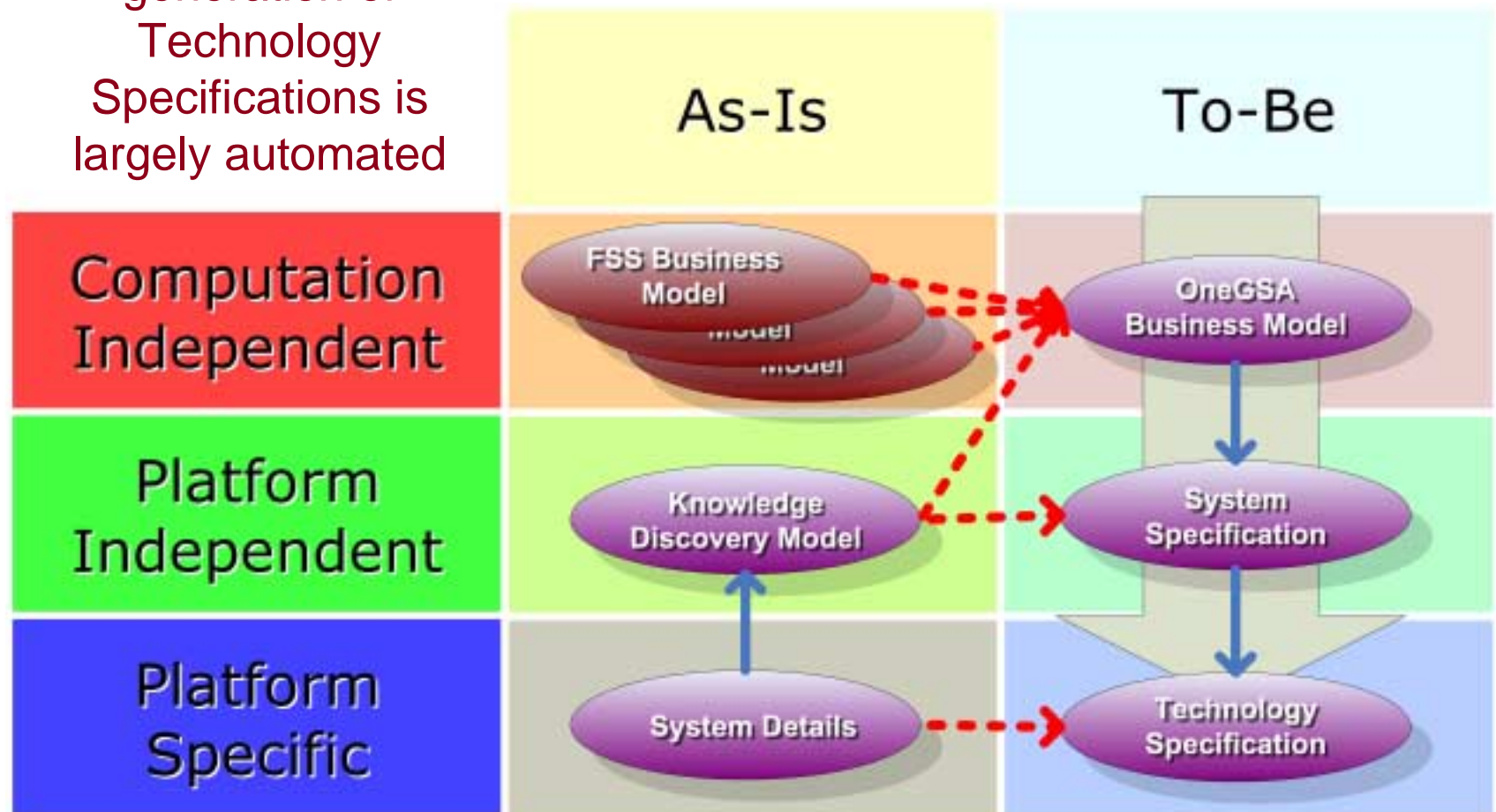
Perspectives (Rows)

# FMEA: MDA Top Down - ADM Bottom Up

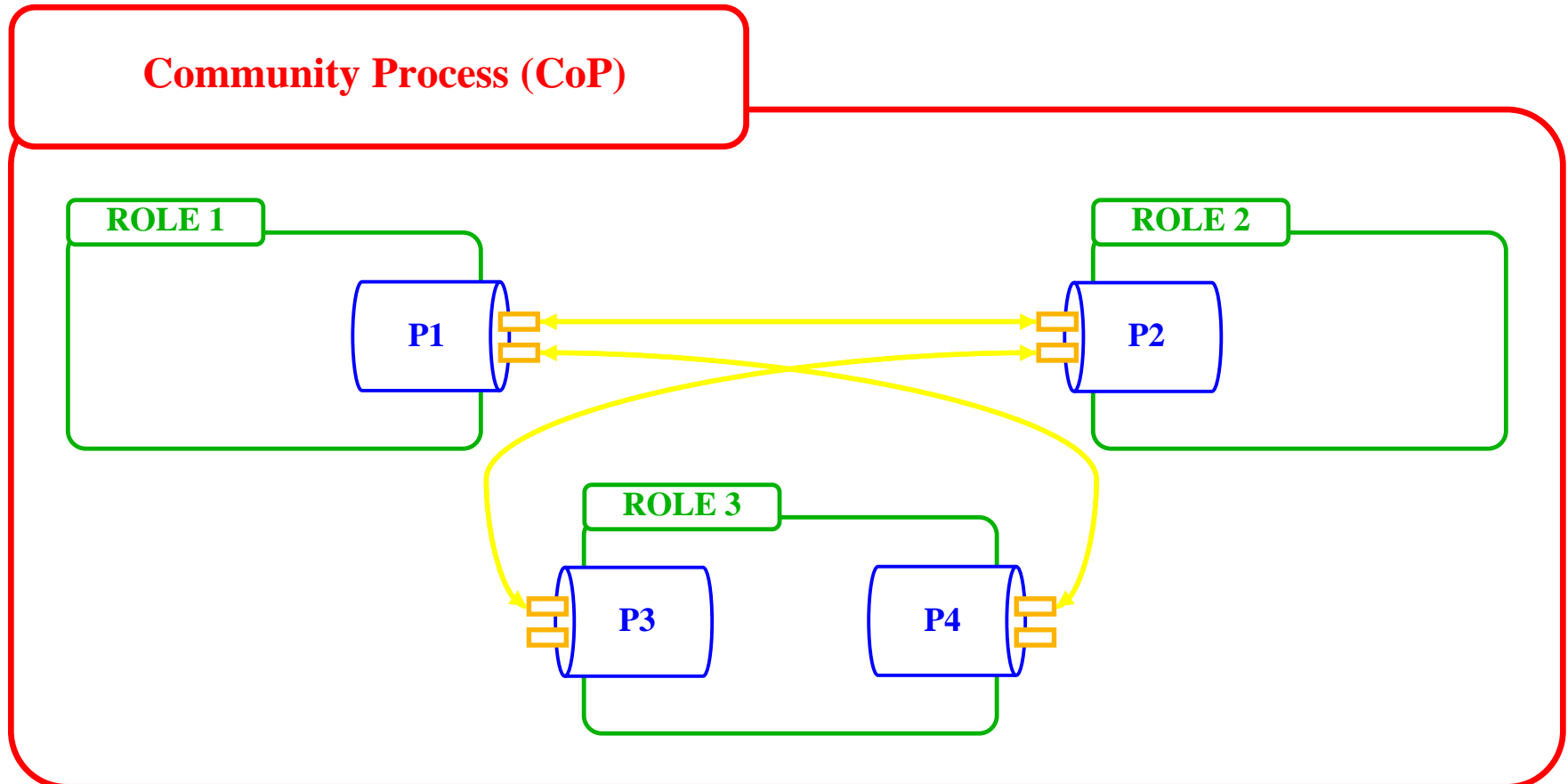
Discovery of System Details and generation of Technology Specifications is largely automated

Architecture Driven Modernization (ADM)

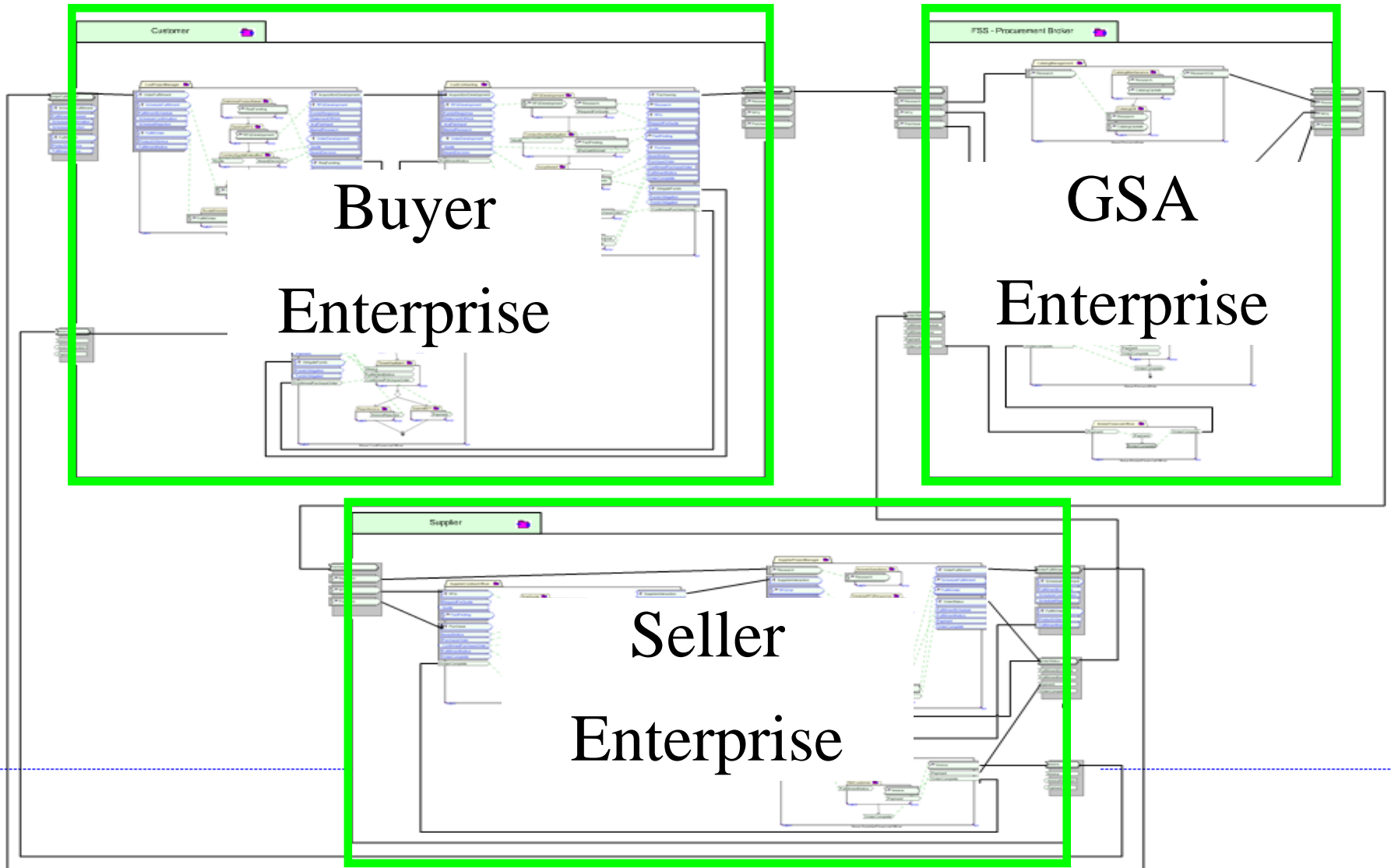
Model Driven Architecture (MDA)



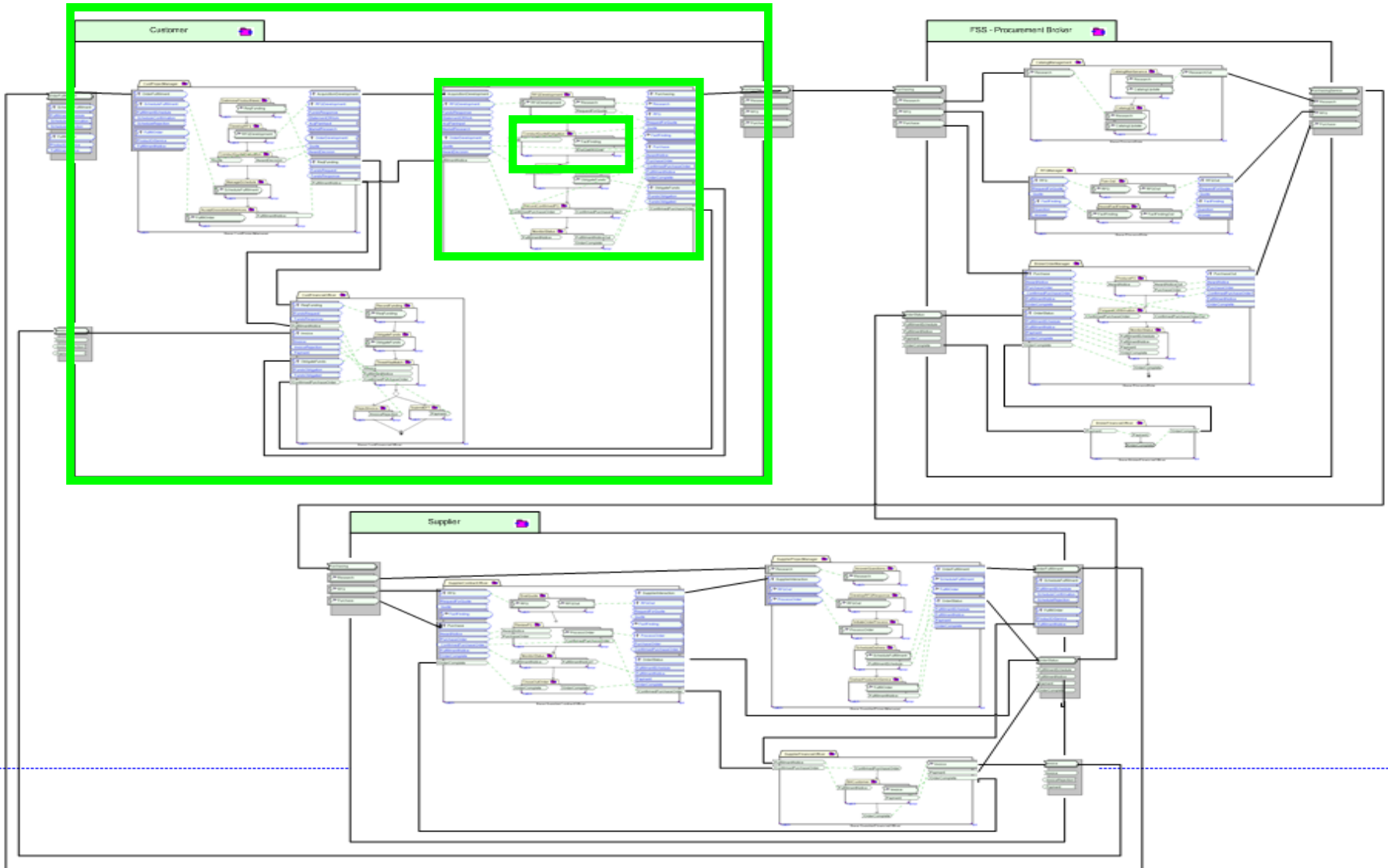
- Recursive decomposition for 'systems of systems' modeling
  - Business processes described as a composition of *services*
    - Collaborative Role Interactions (CRI), service choreography
  - Services are realized by (a composition of) components



# Collaborations Contextualize Roles = Service Providers

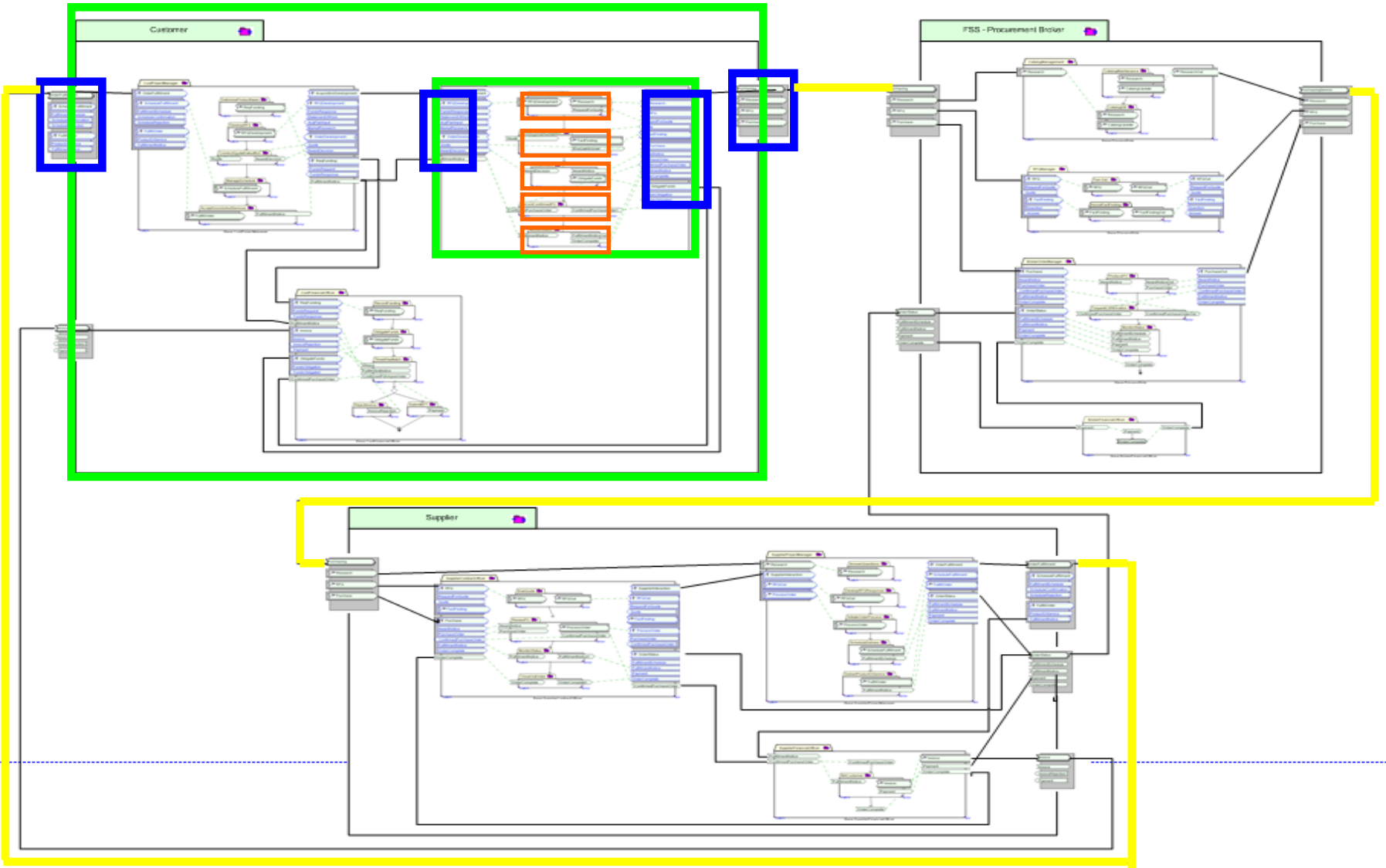


# Roles Compose Inner Roles = Service Granularity

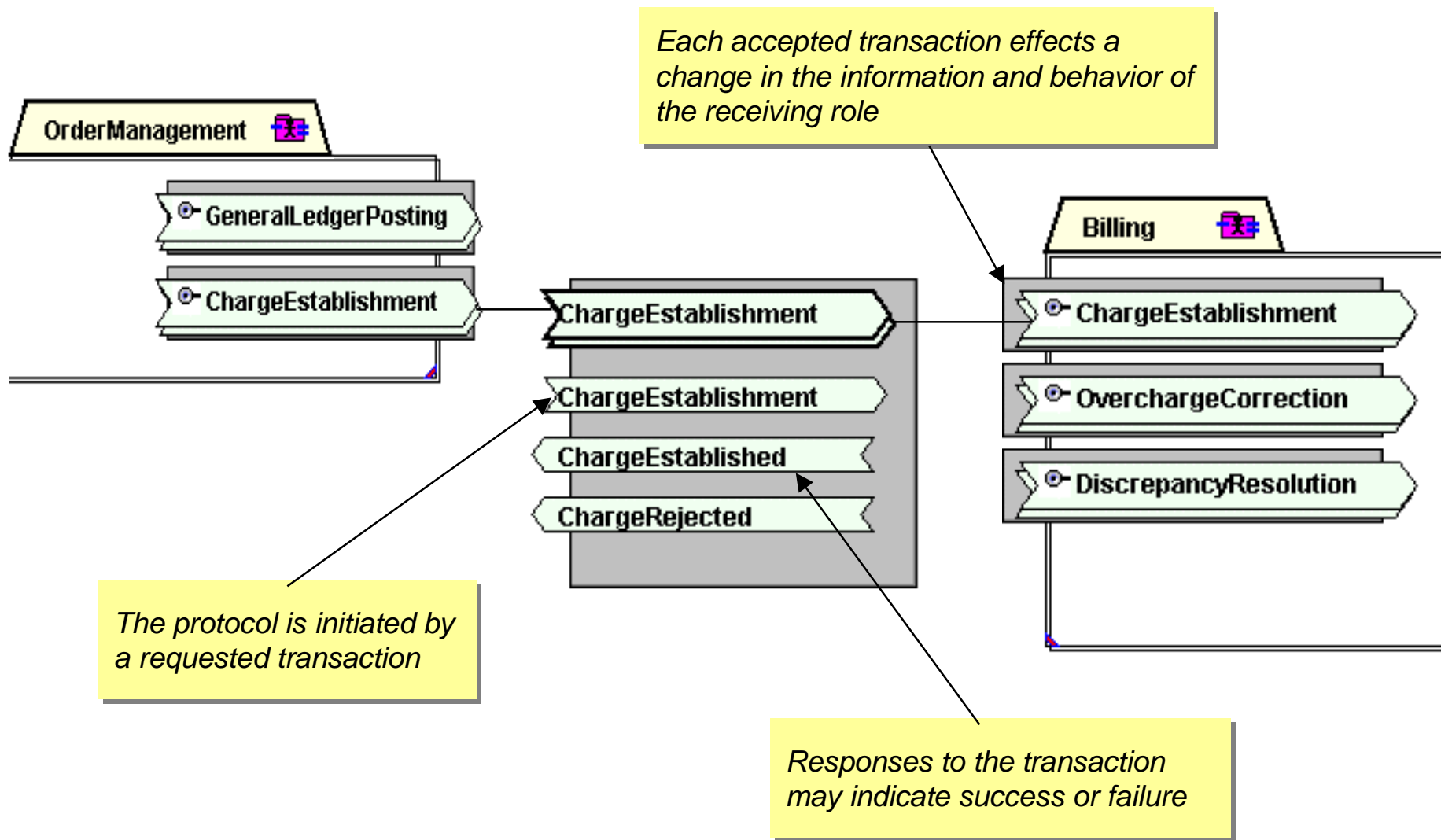




# Protocols Organize Conversations Choreographed by Roles



# 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, Sprint
  - ‘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

## Service

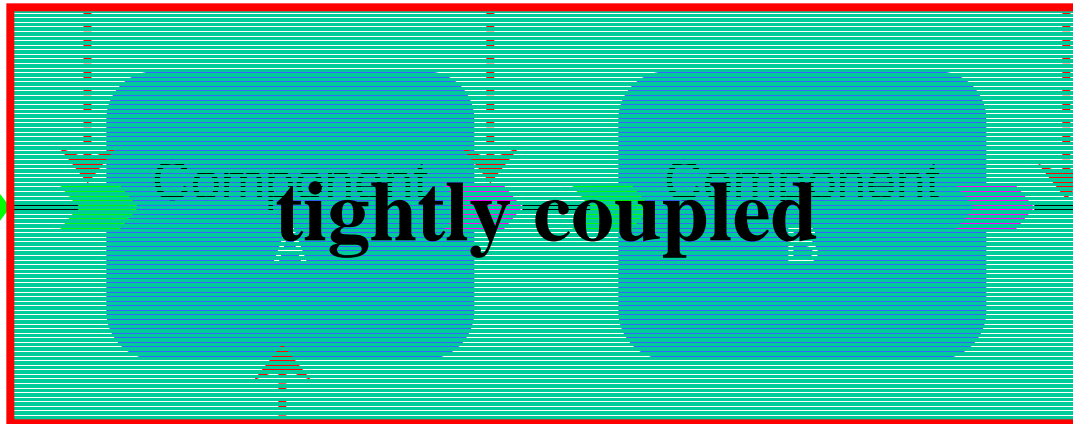
- Java Interface
- WSDL PortType

## Reference

- Java Interface
- WSDL PortType

## Wire

Module A



## Binding

- Web Service
- SCA, JCA, JMS, ...

## Implementation

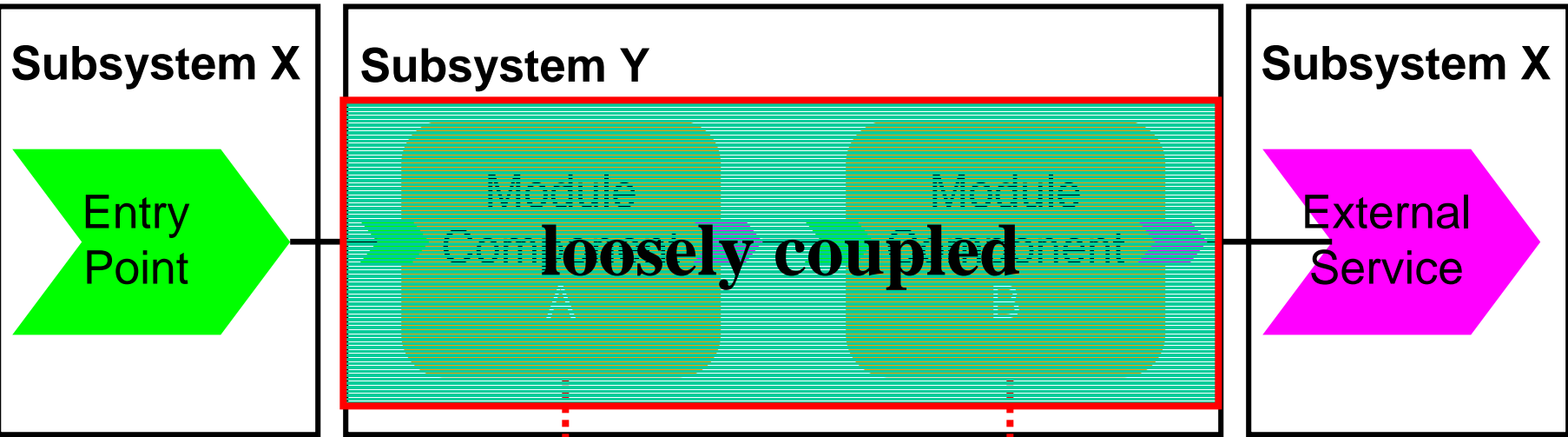
- Java
- BPEL

## Binding

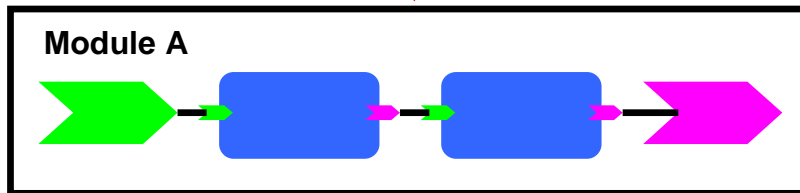
- Web Service
- SCA, JCA, JMS, ...

# SCA - System Assembly Diagram

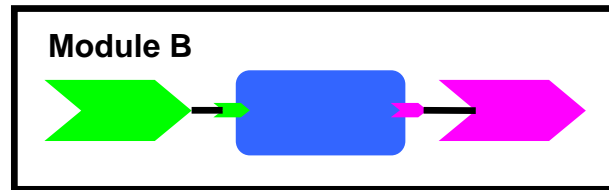
System



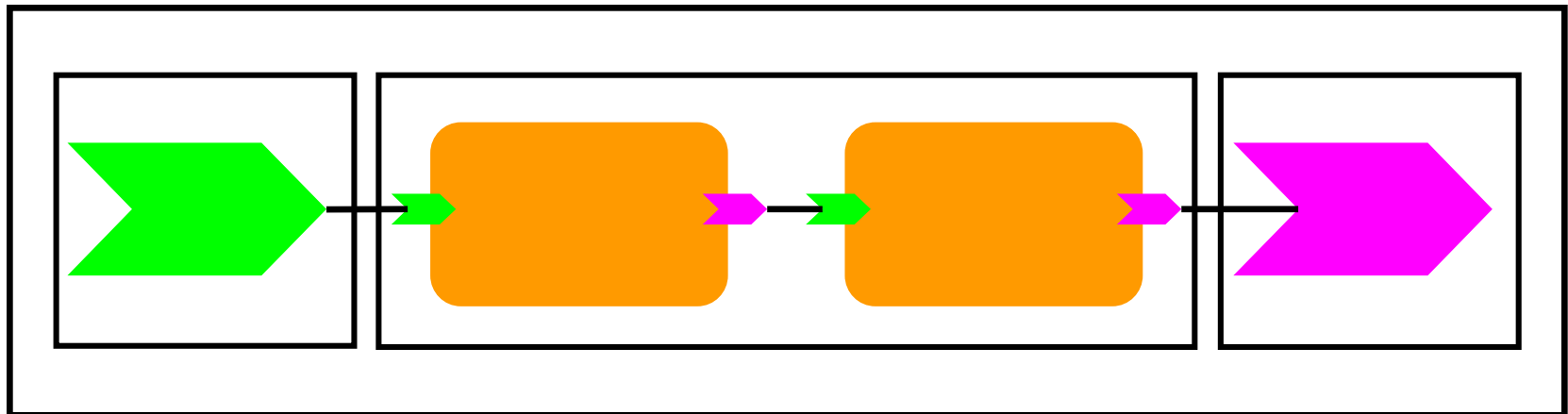
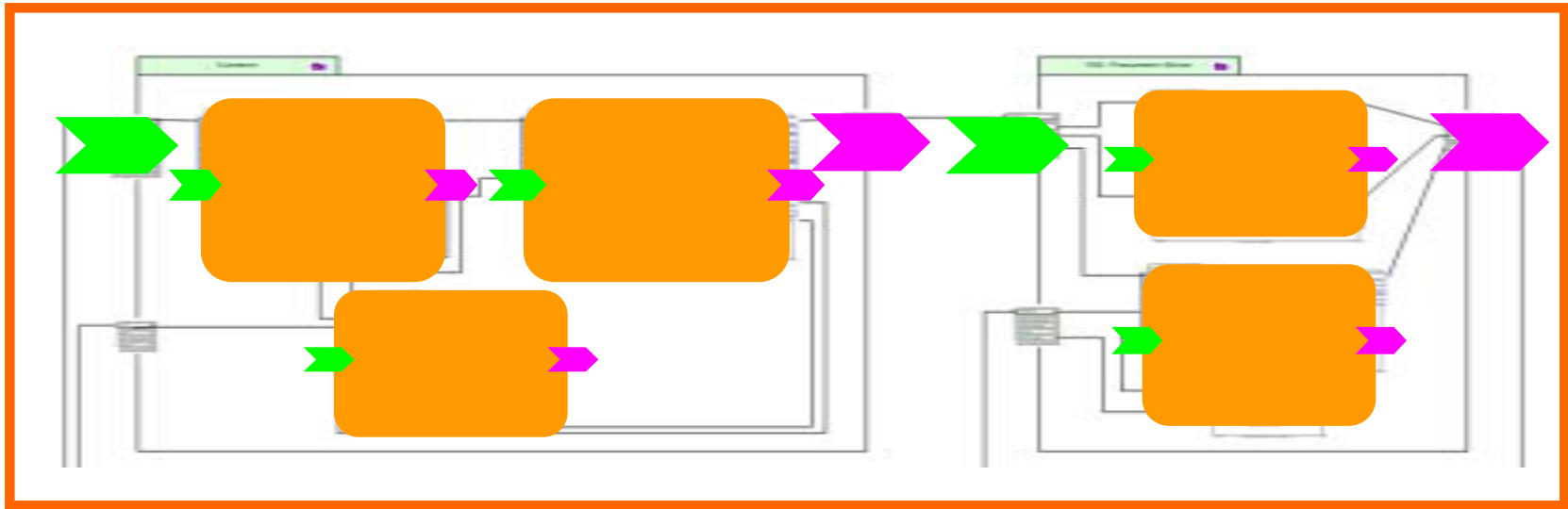
implementation



implementation



# eGov SOA System of Systems, Quick CCA-SCA Comparison







# ITPM - Business Process, FSS/FTS, Exhibit 53

Value Chain 05X.AcquisitionExternal

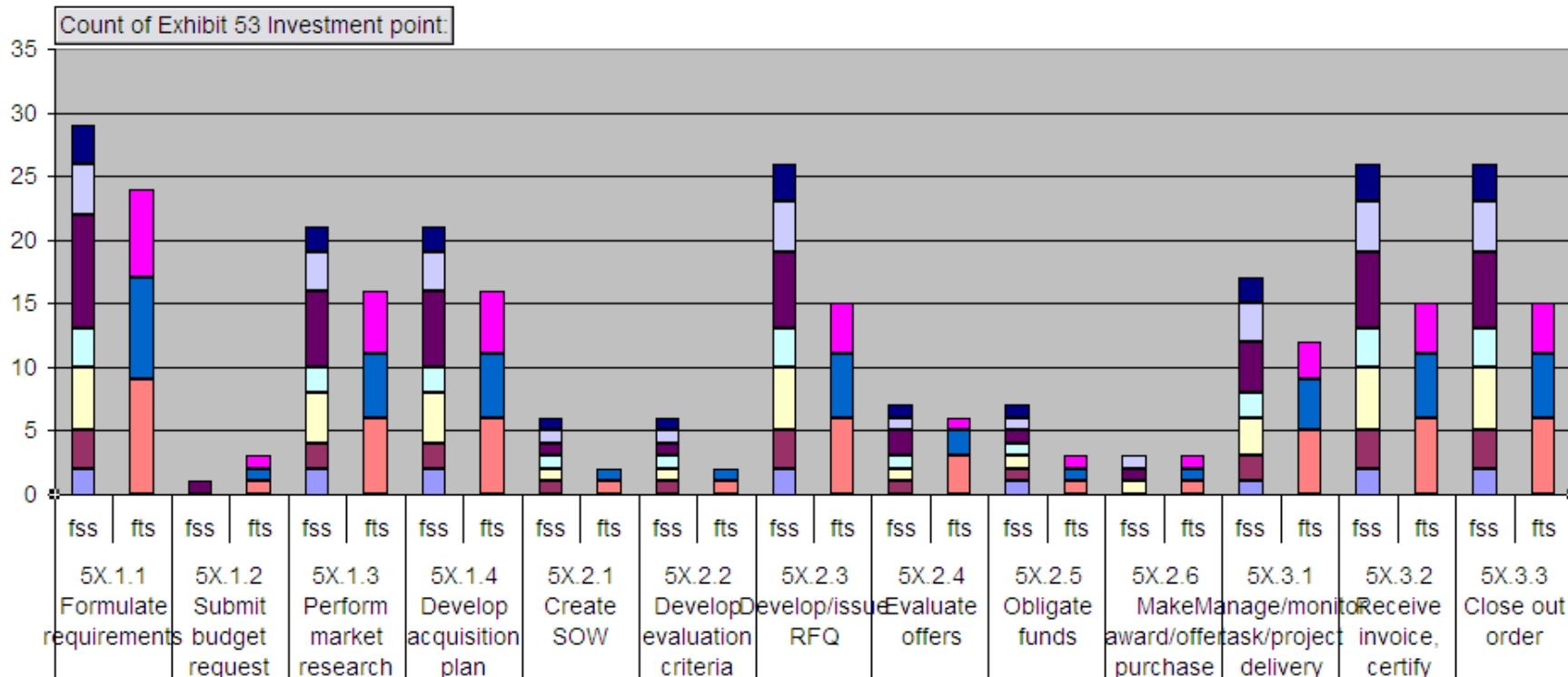


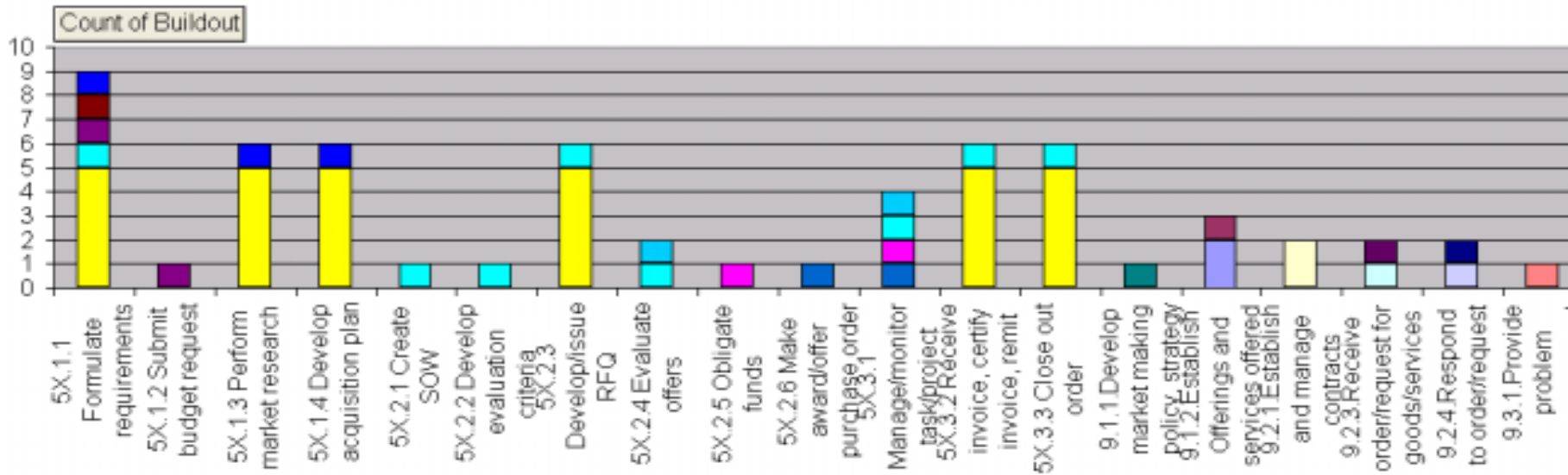
Exhibit 53 Investment point:

- 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

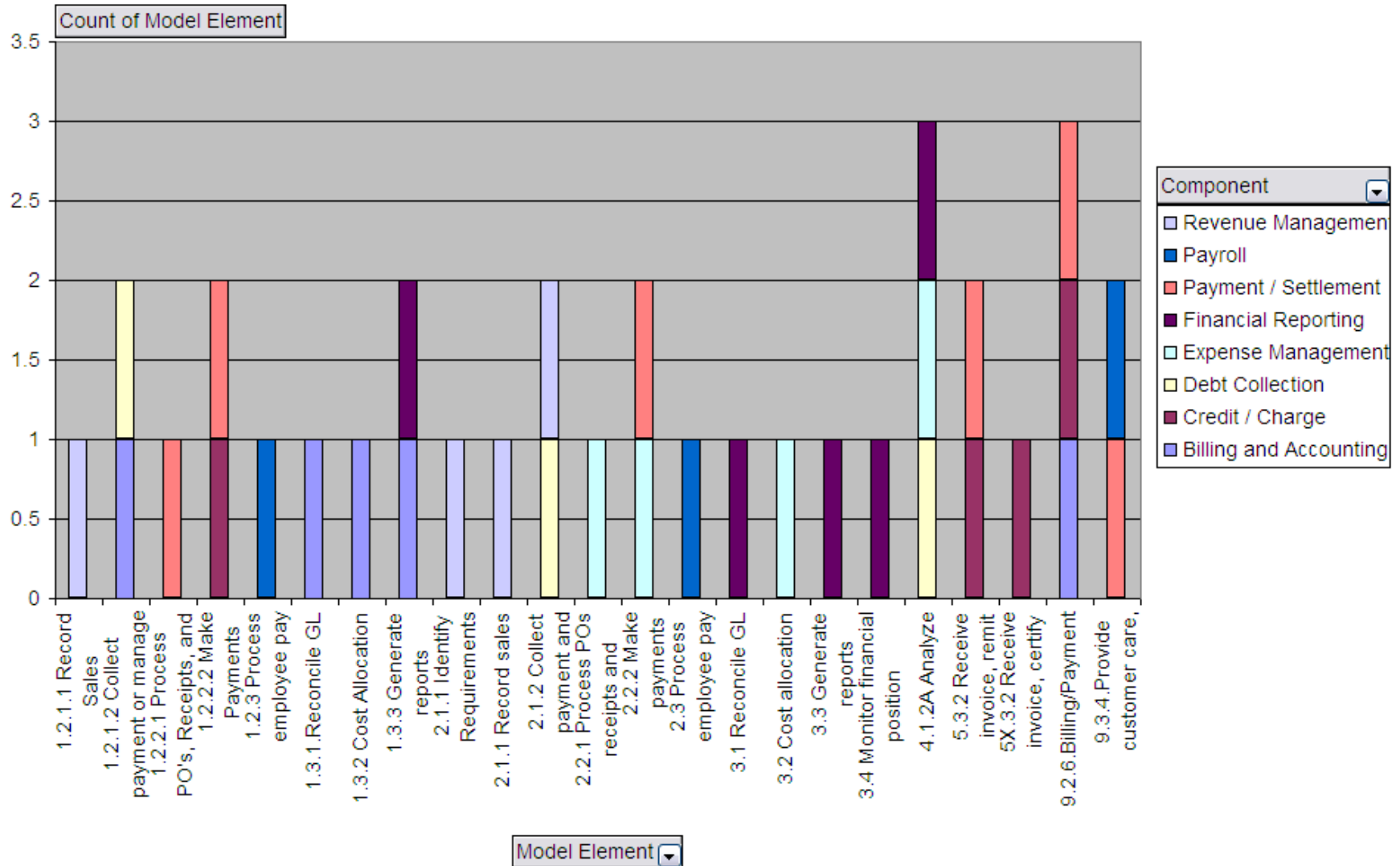


Role	
is oneGSA	
9.1.2 /Business Analytics function (FSS) - FALSE	9.1.2 /Marketing function (FSS) - FALSE
9.2.1 /Customer Service function (FSS) - FALSE	9.2.3 /Assisted Service Human function (FSS) - FALSE
9.2.3 /Commodities Electronic function (FSS) - FALSE	9.3.1 /Tracking function (FSS) - FALSE
Administrative 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

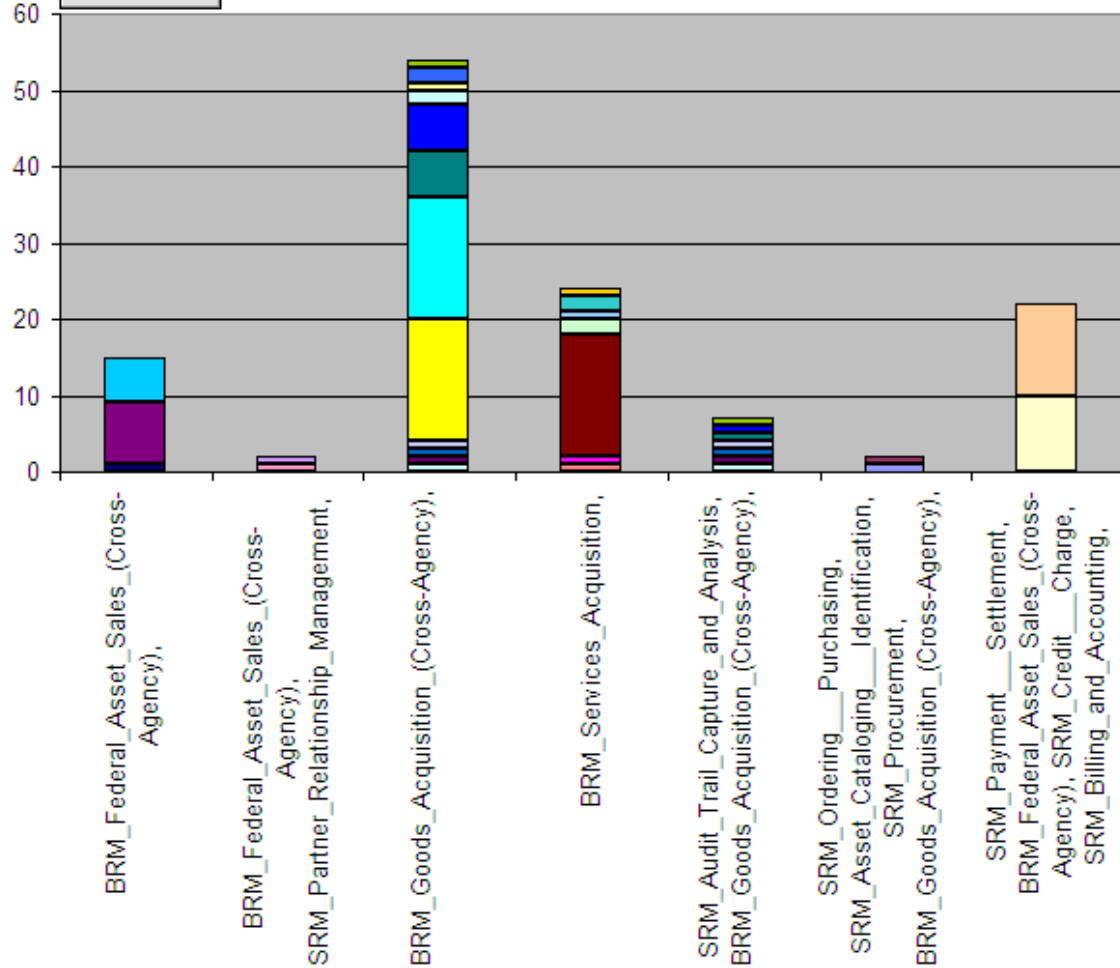
Service Domain (All) Service Type Financial Management



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

Process (All)

Count of Role



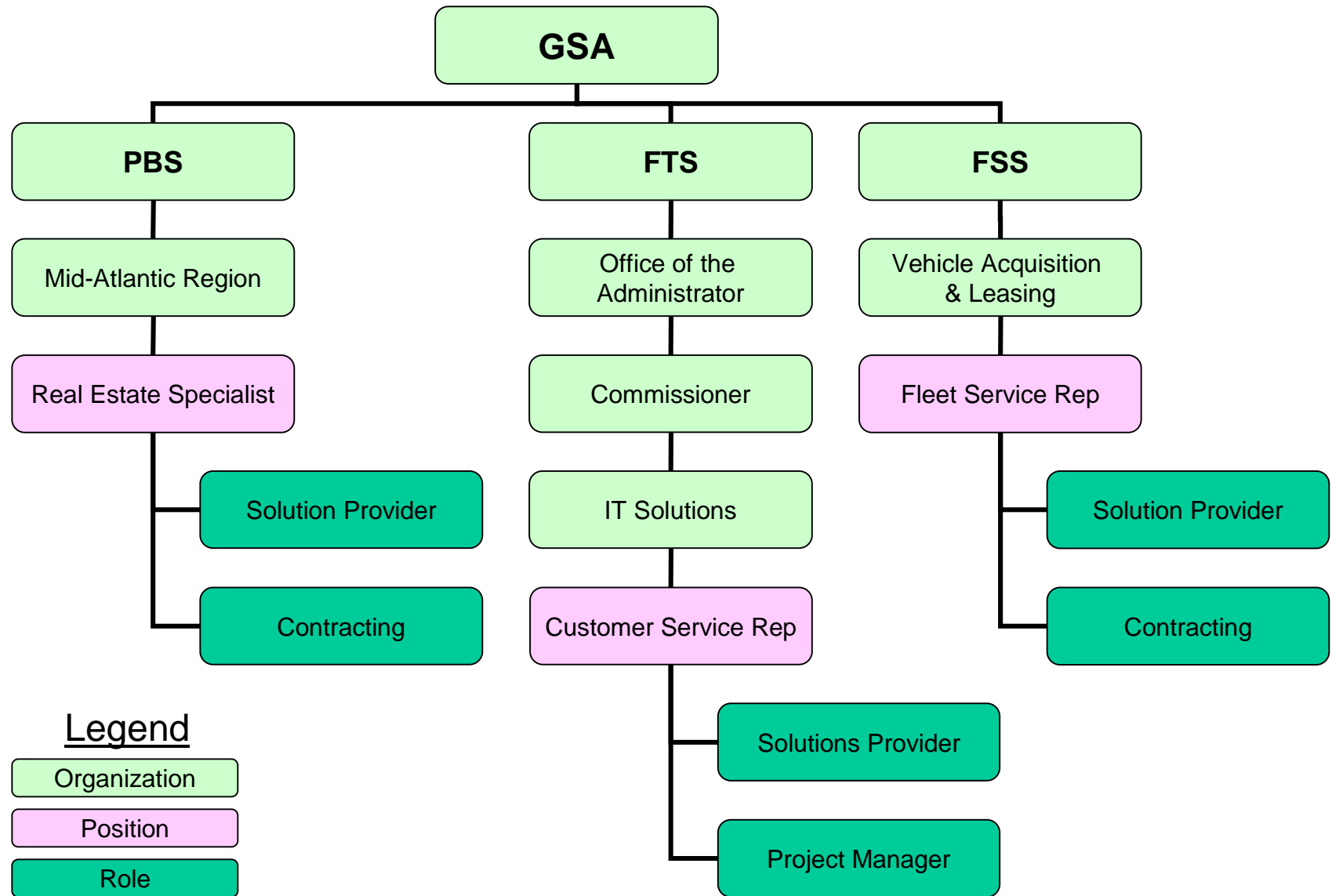
FEA:

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, displaying a process diagram for 'DevelopRFQResponse'. The diagram includes steps: RFQOut, RequestForQuote, Quote, and FactFinding. A pink arrow points from 'RequestForQuote' to a pink box labeled 'in' in the browser window.

The browser window on the right displays the following content:

## OrderToPayment

Organization	Role	Activity	Sub-Activity
SupplierDetail	SupplierProjectManager	DevelopRFQResponse	

- 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](#)

**GSA Advantage! e-Buy**  
*...Working for the U.S. Government* [go to eBuy!](#)

At the bottom of the browser window, there are navigation buttons: Previous, In Context, and Next, along with a progress bar from 0.0 to 10.0.

# PRM Line of Sight for Activity Based Costing

http://localhost:8080/cx/GSA/demo/Engine/traceToPerformance.pdf?component=/GSA - Microsoft Internet Explorer provided by Genera

File Edit View Favorites Tools Help Address http://localhost:8080/cx/GSA/demo/Engine/traceToPerformance.pdf?component=/GSA

← Back → Search Favorites Media

150%

Bookmark

- 1 Introduction
- 2 Community Processes
  - 2.1 BuyerAgentSellerMarketPlace
  - 2.2 MarketPlace
- 3 Roles
  - 3.1 AcquisitionManagement
  - 3.2 AgencyBuyer
  - 3.3 Buyer
  - 3.4 ChannelManagement
  - 3.5 Consumer
  - 3.6 Customer
  - 3.7 FundsTransferAgent
  - 3.8 GSAbuySell
  - 3.9 IndustryPartner
  - 3.10 IndustryPartnerSeller
  - 3.11 Payee
  - 3.12 Payor
  - 3.13 Provider
  - 3.14 Seller
  - 3.15 ServiceDeliveryManagement
  - 3.16 SettlementManagement
- 4 Engines
  - 4.1 GSAbuySellEngine
  - 4.2 IndustryPartnerSellerEngine
- 5 Endpoints
  - 5.1 GSAbuySellEndpoint
  - 5.2 IndustryPartnerSellerEndpoint
  - 5.3 UnallocatedEndpoint
- 6 Resource Endpoints
  - 6.1 DataEndpoint
- 7 Implementations

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				

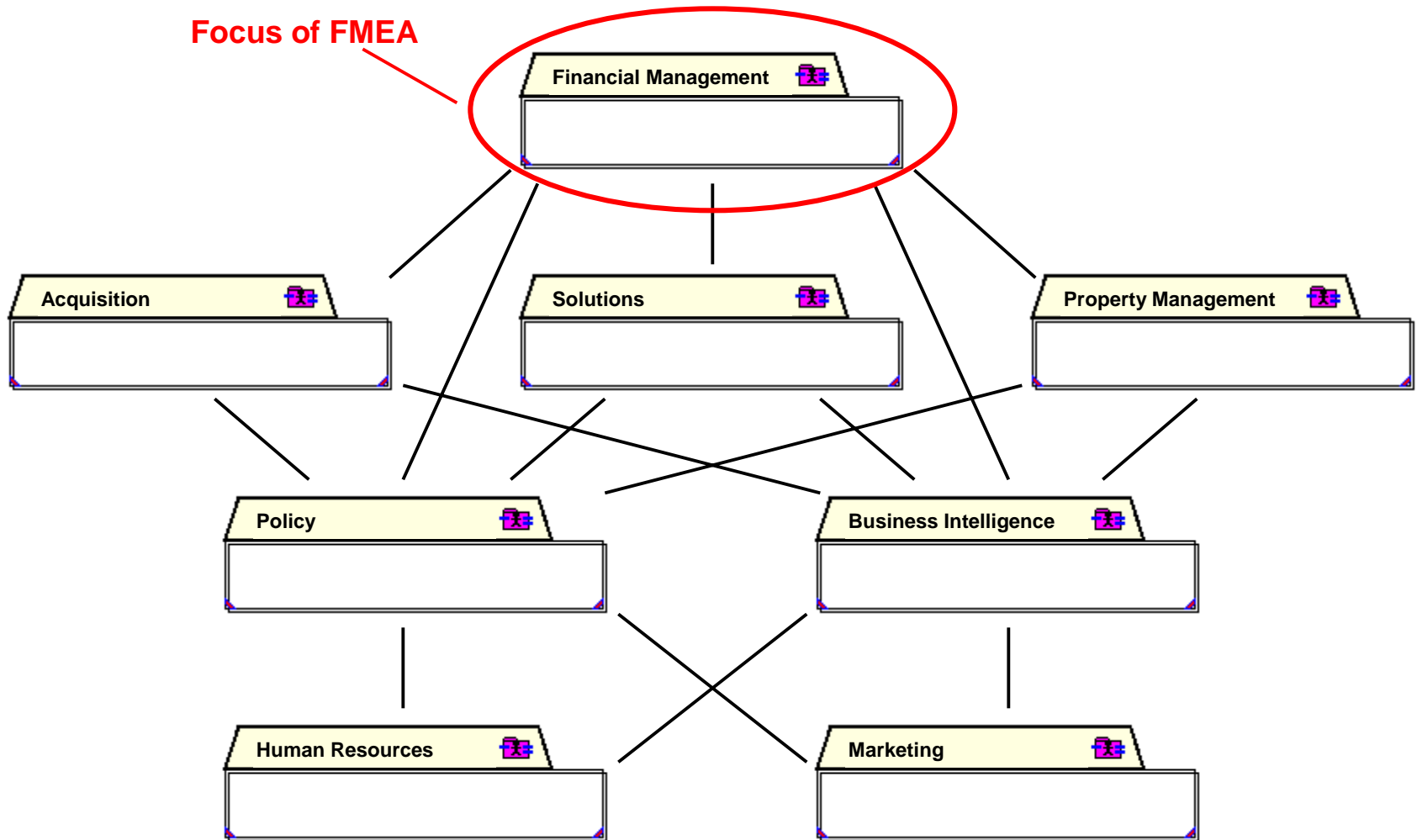
Done Local intranet

## Part 2 - FMLoB

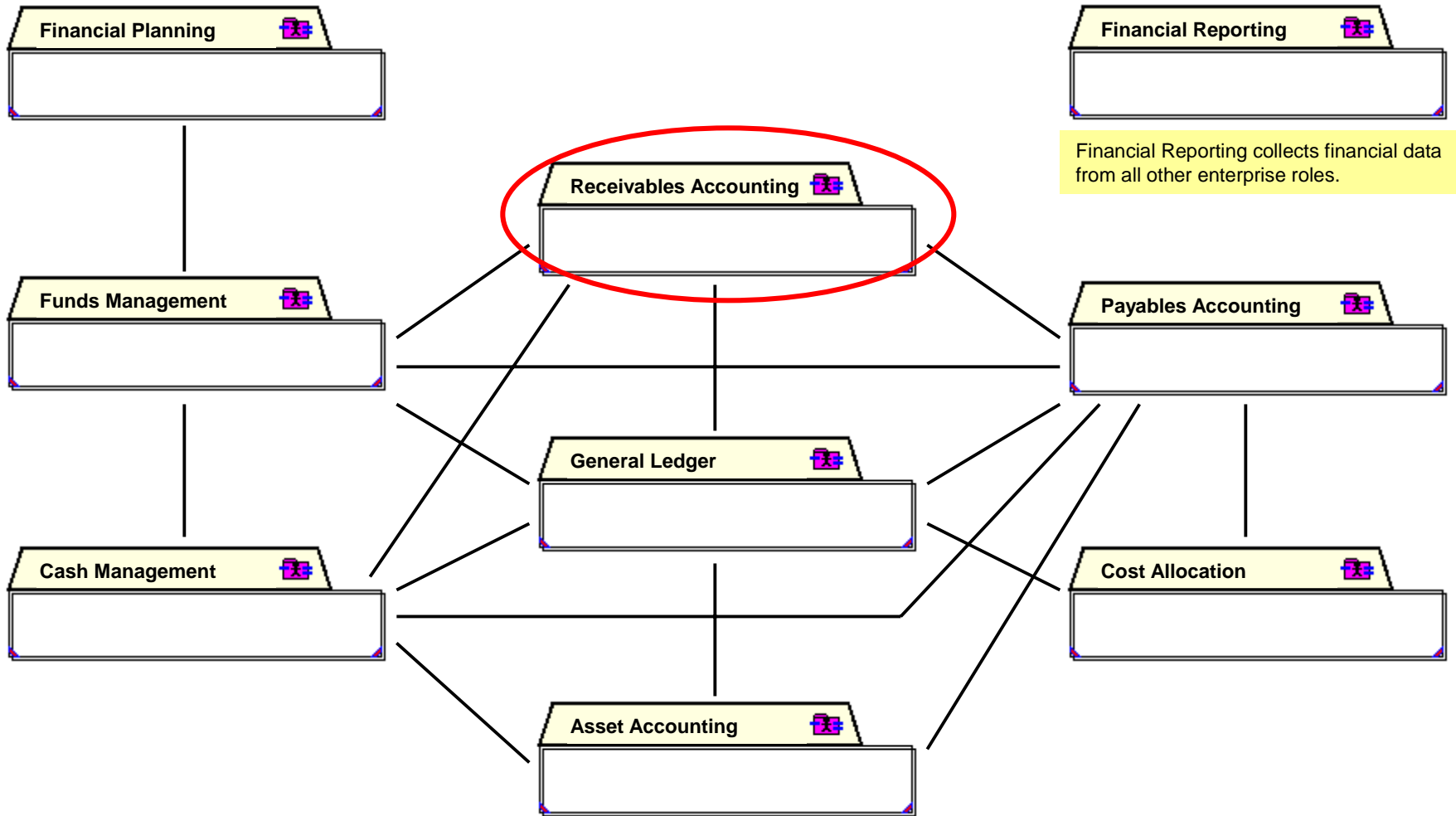
- Slides 24 to 45
- FMEA – FMLoB Case Study
  - EDOC CIM/PIM conventions
  - ADM Mainframe Analysis
  - UML Information, Transaction, Message, Persistence Models
  - Team, Tools, Next Steps



# 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

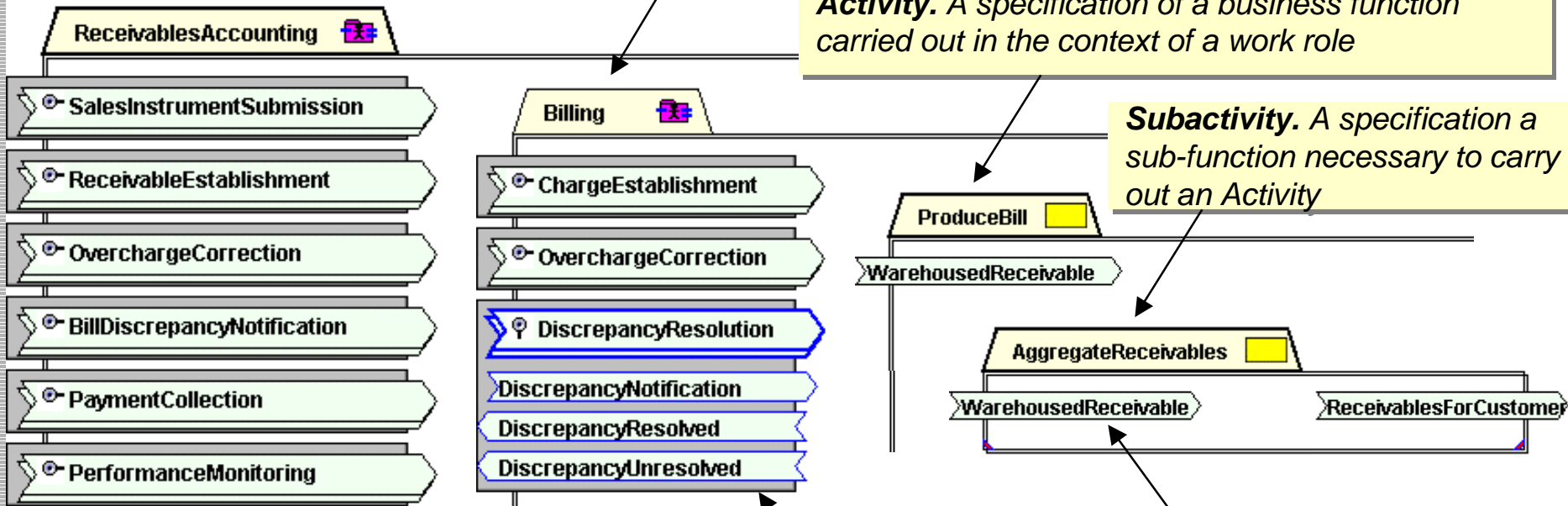
**Work Role.** A role responsible for a specific functional area within an enterprise role, such as might be assigned to a single worker and supported by an IT system

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

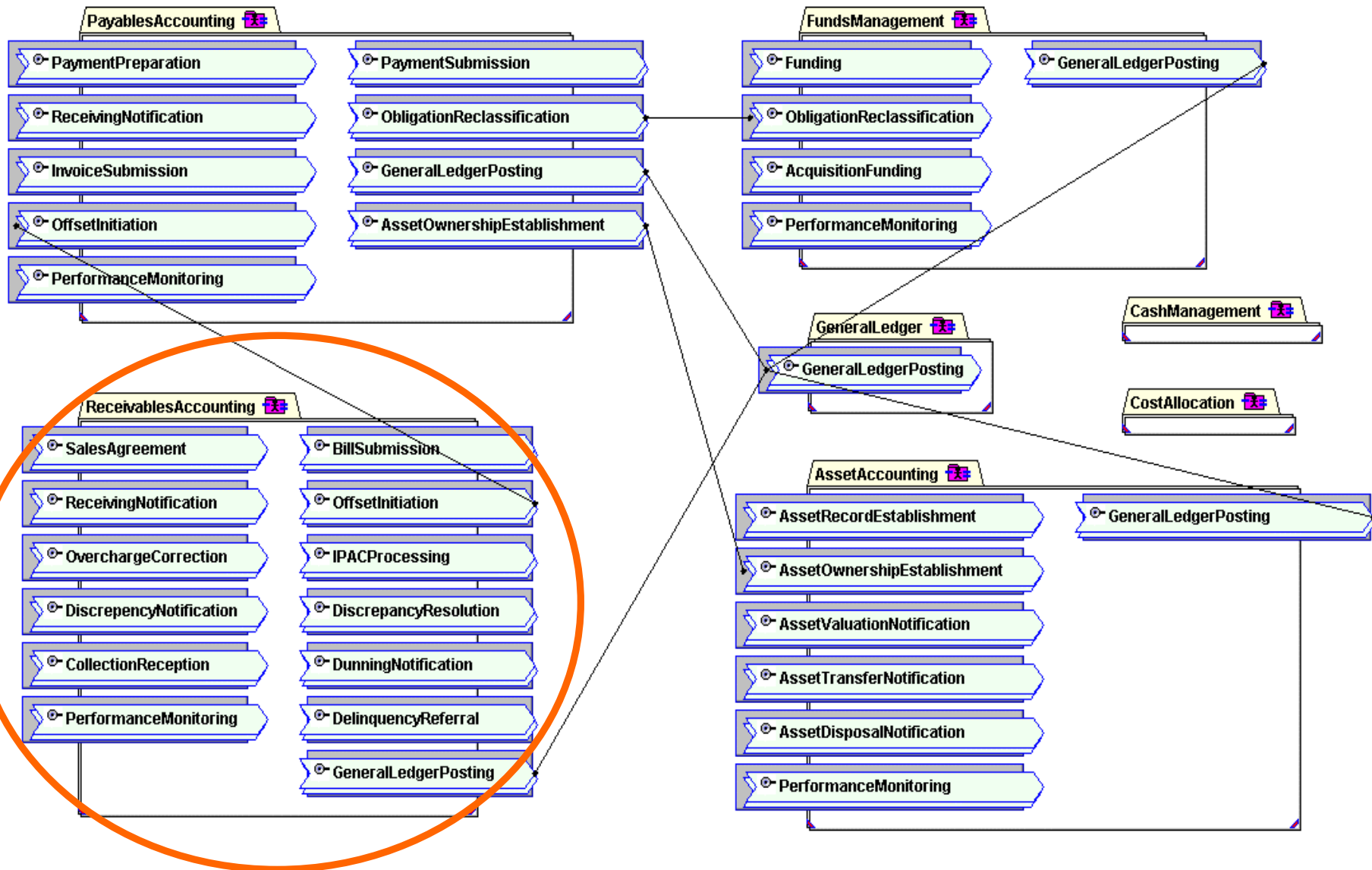
**Subactivity.** A specification a sub-function necessary to carry out an Activity

**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

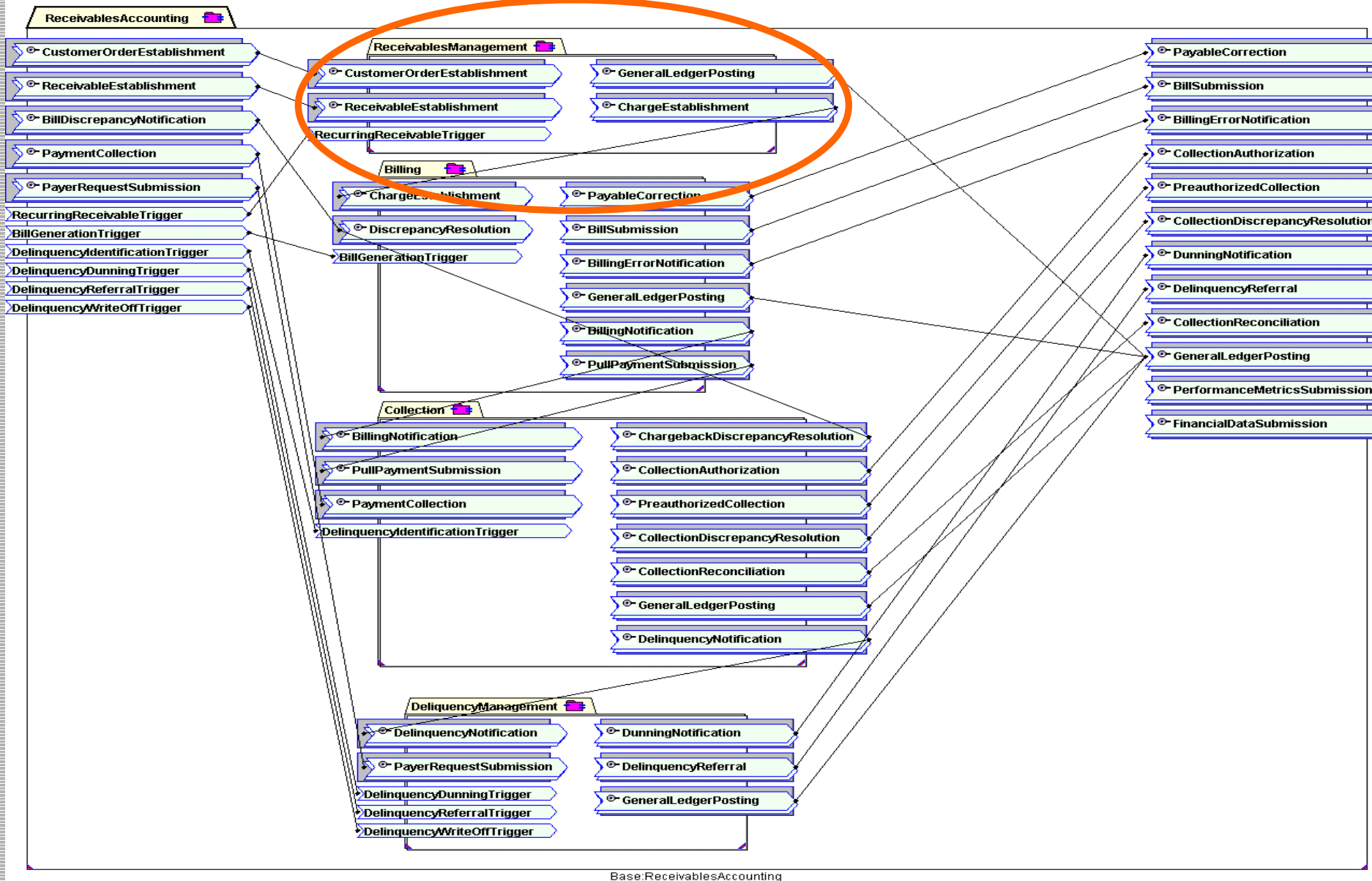
**Information Flow.** An individual flow of information across a protocol or into or out of an Activity or Subactivity



# CIM: FMLoB Enterprise Roles

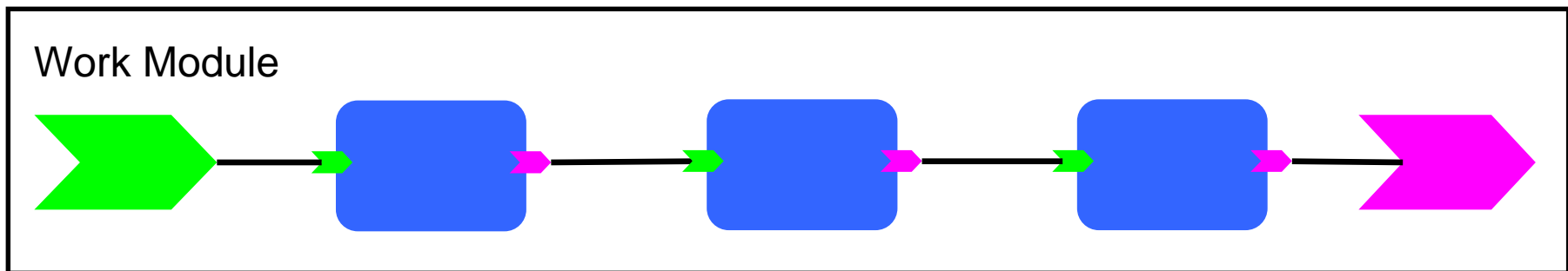
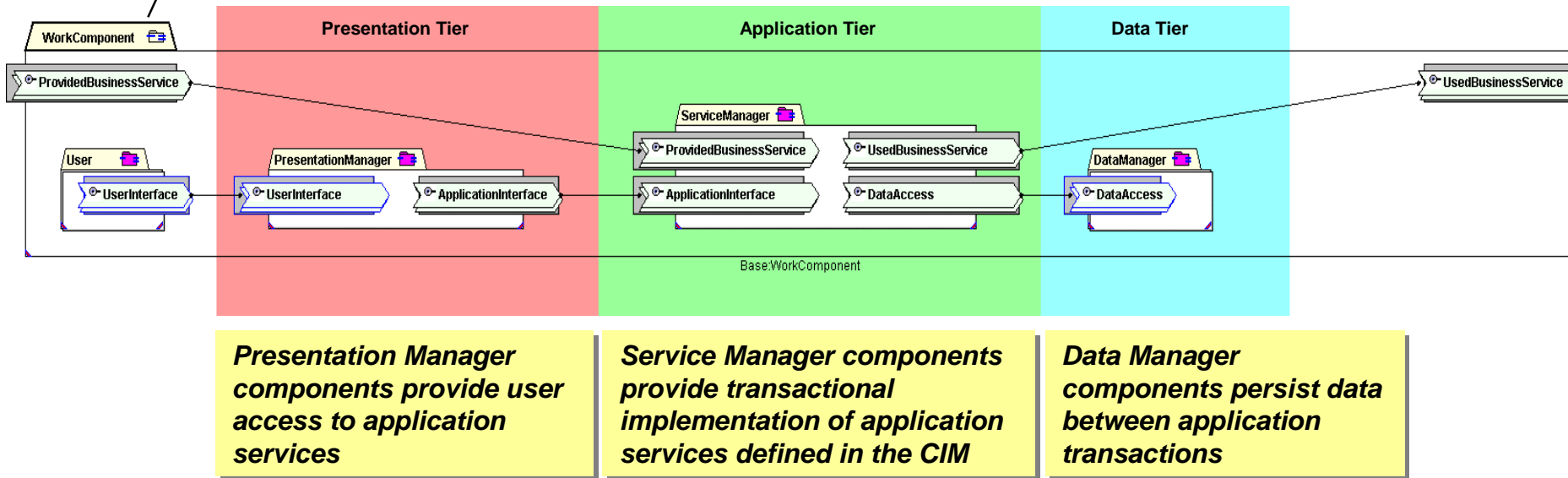


# CIM: Enterprise Role Composes Work Roles



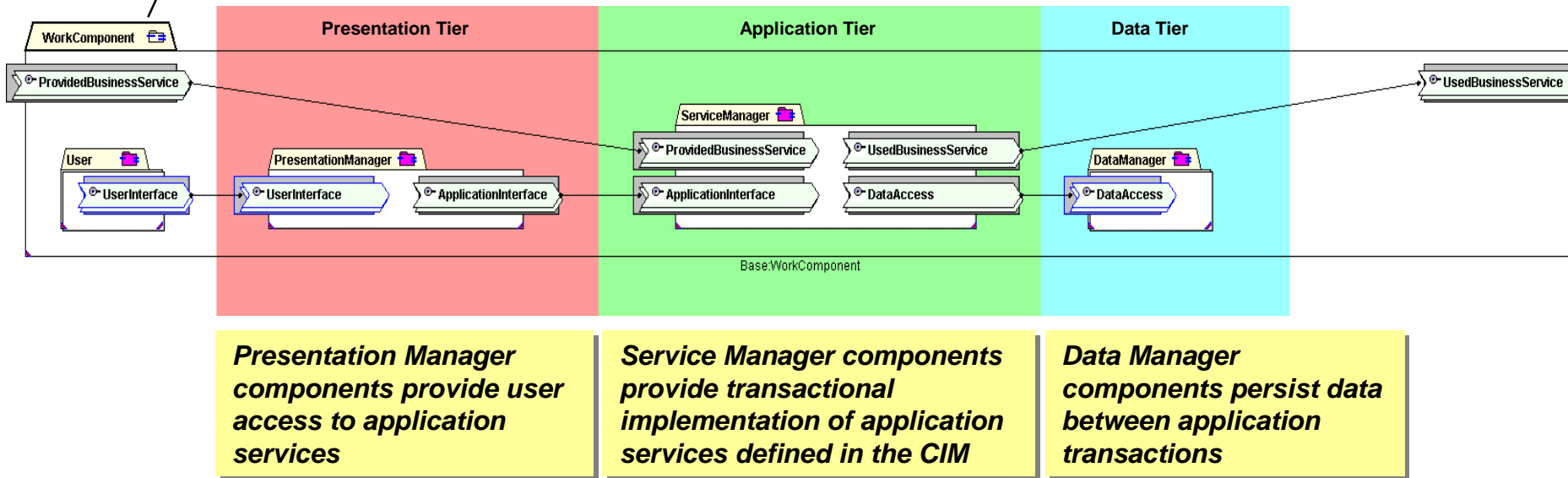
# PIM/PSM: Service-Oriented Component Architecture

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



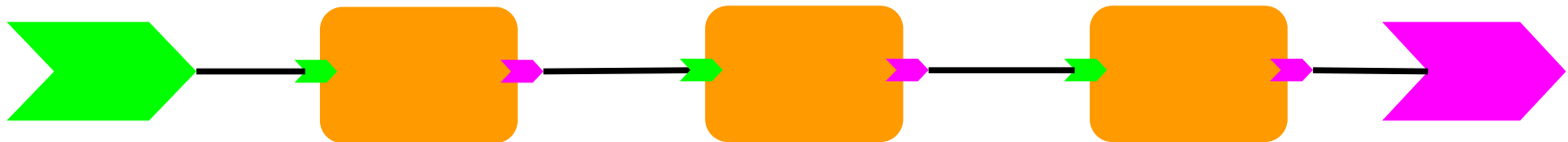
# PIM/PSM: Service-Oriented Component Architecture

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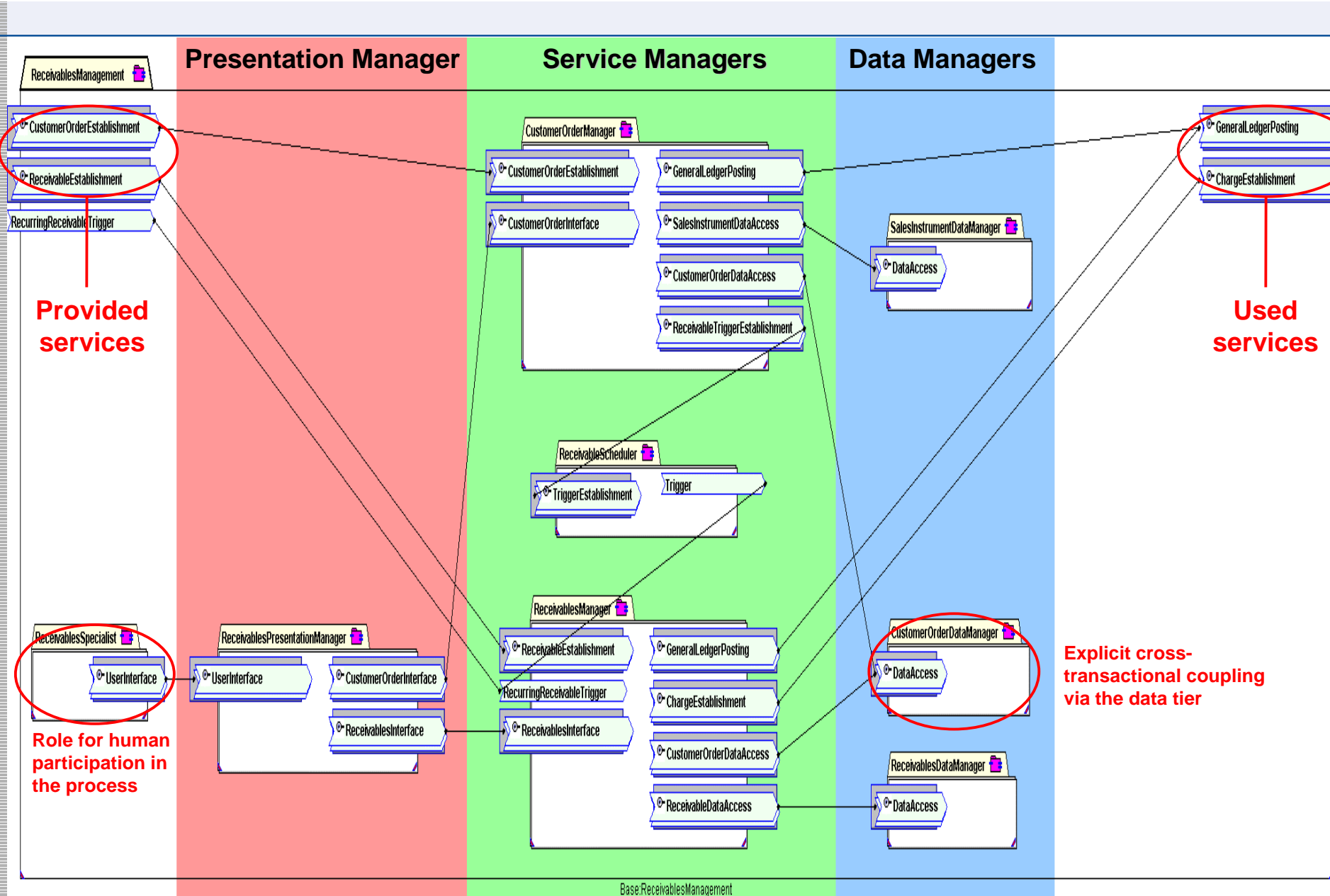


## System Assembly

Subsystem

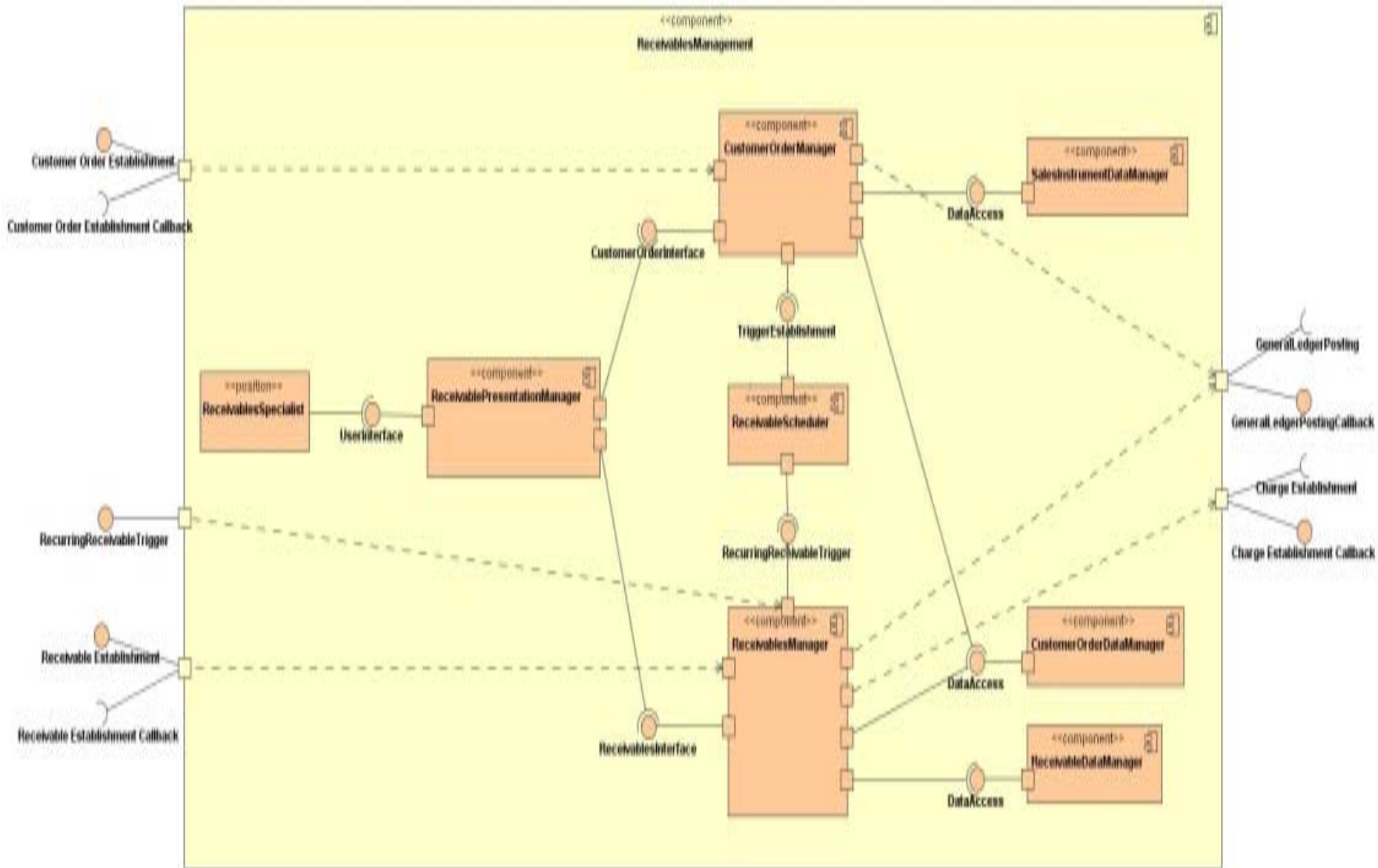


# PIM: Receivables Management Work Role

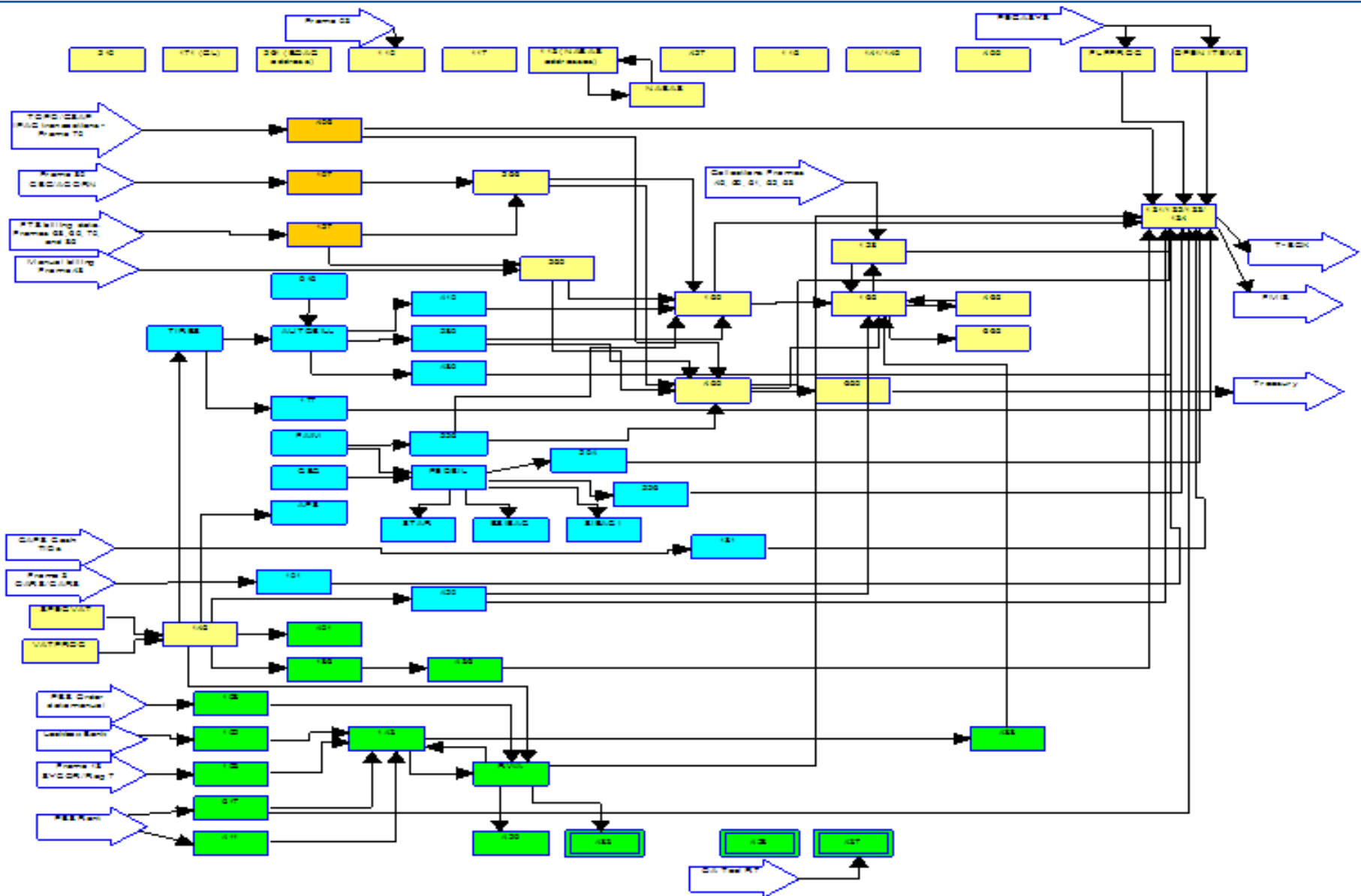




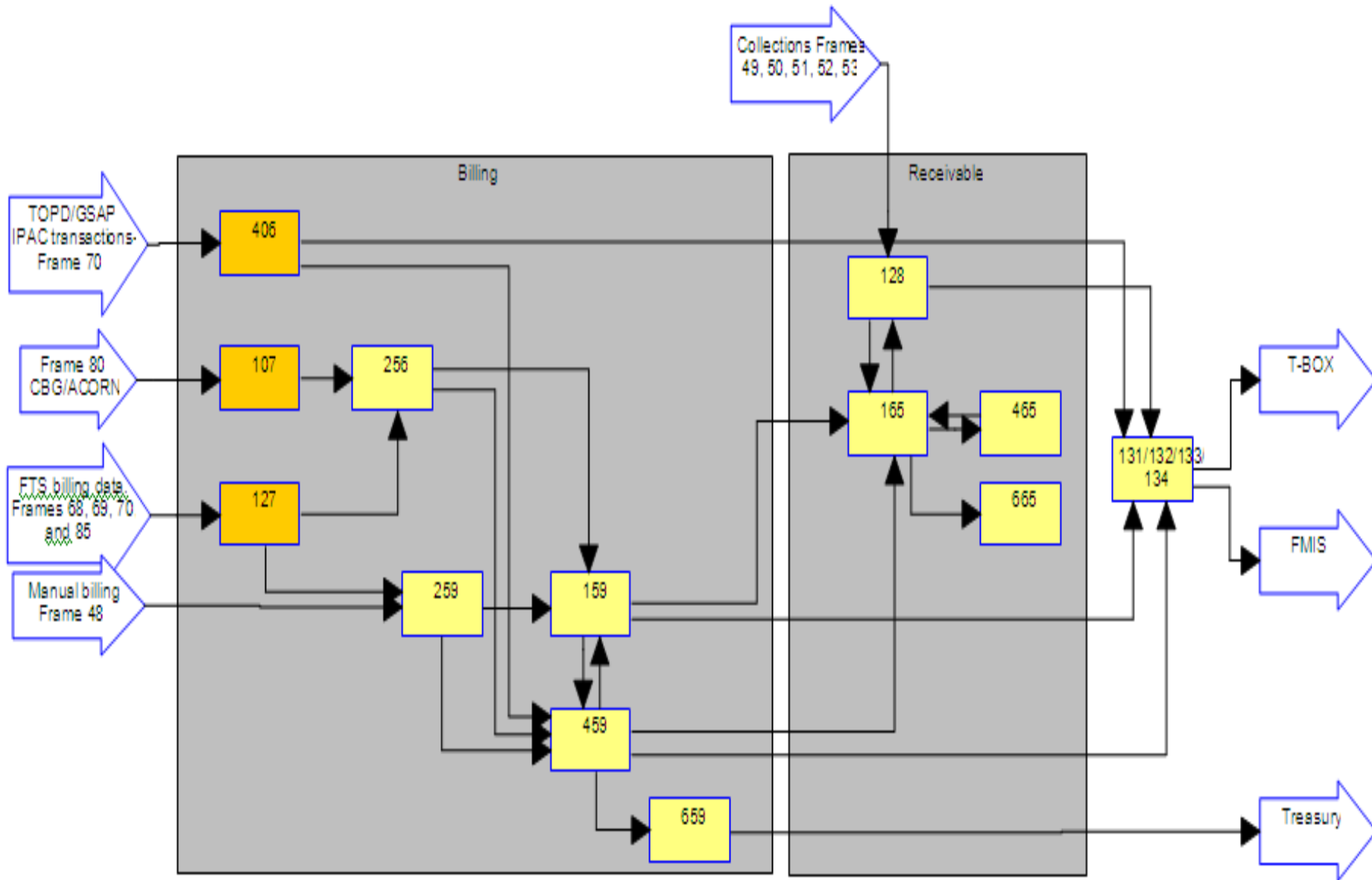
# UML2 Receivables Management Composite Component



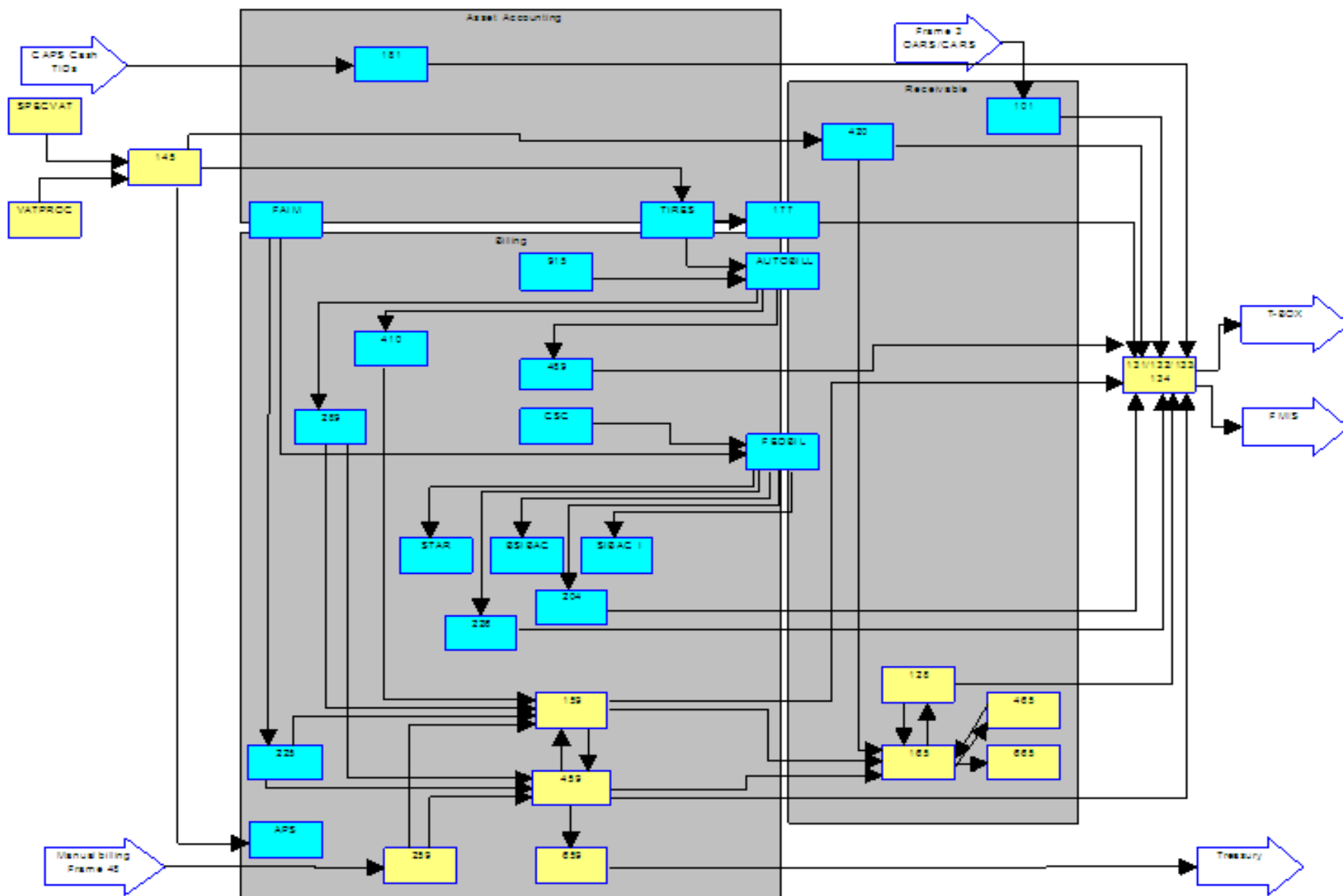
# ADM - Flow of NEAR Modules



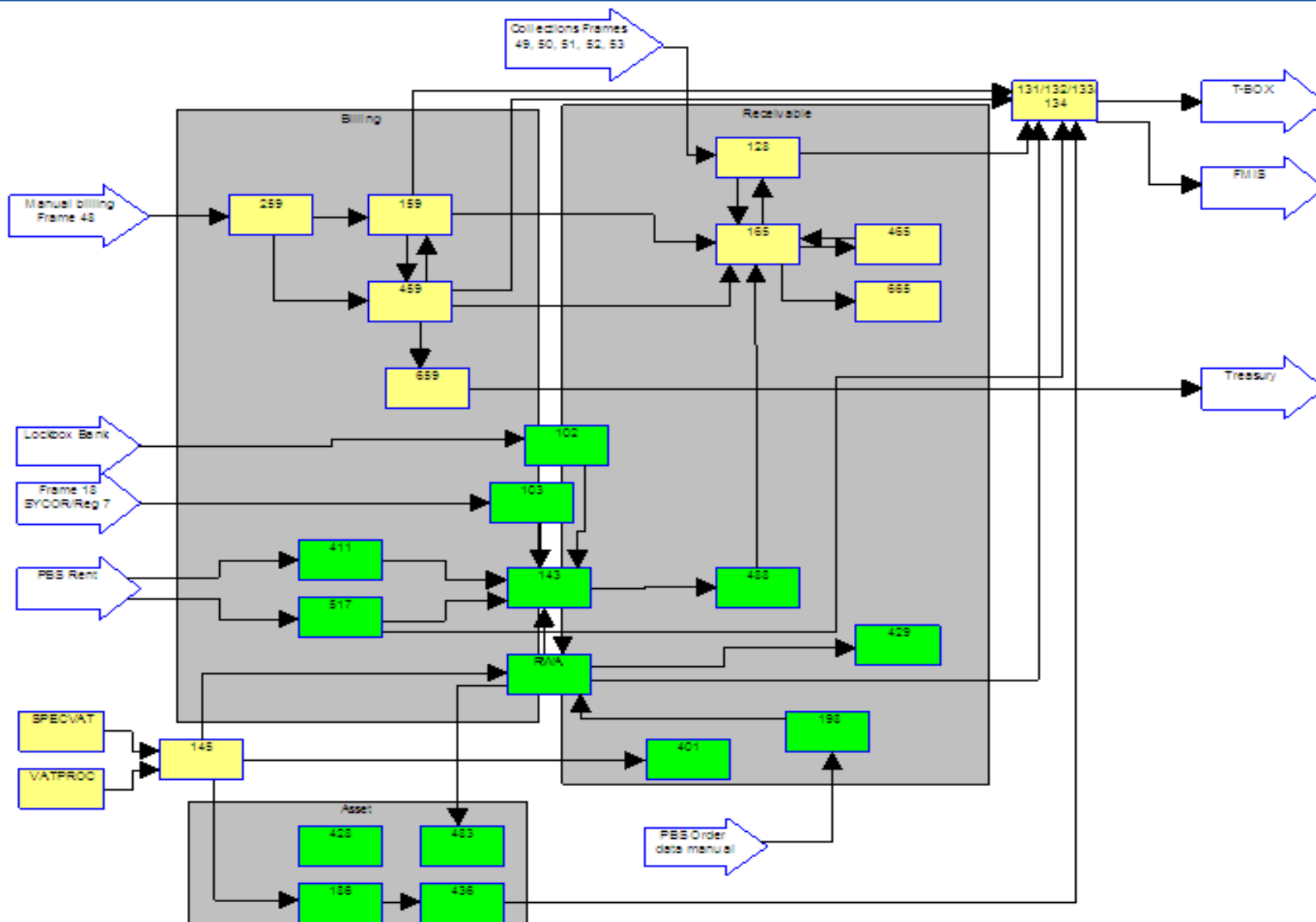
# ADM - FTS Module Flows, with Process Mapping



# ADM - FSS Module Flows, with Process Mapping



# ADM - PBS Module Flows, with Process Mapping



# Record Unfilled Customer Order - Requirements

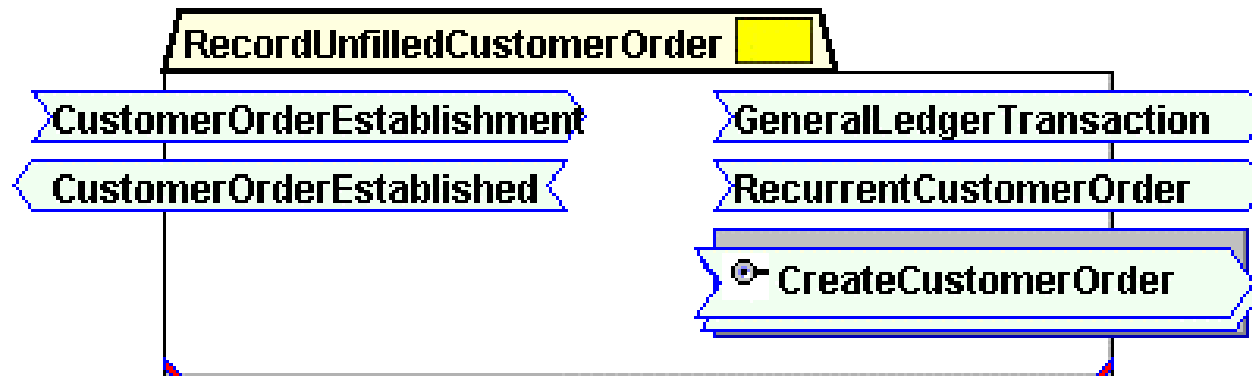
- ADM enabled identification and analysis of 86 modules, 728 programs and 342 copybooks (735,000 loc)
- Tools offer query, reporting, sorting capabilities useful for extracting business rules
  - ~3 FTE person months - 636 business rules extracted
  - Only used this analysis technique on a COBOL mainframe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

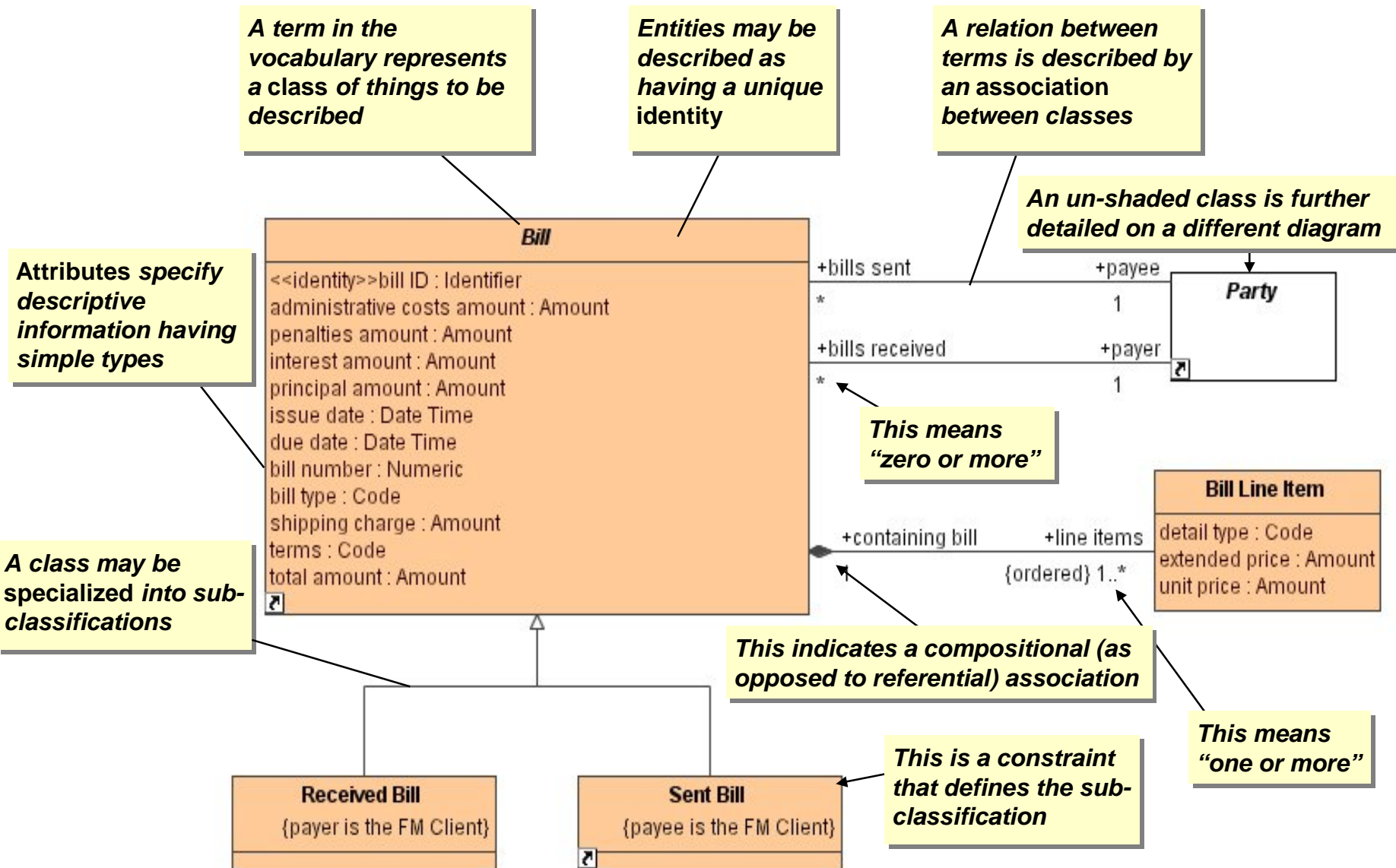
RMA-03	Reimbursable agreement information. Capture and accumulate reimbursable agreement information that includes the following: <ul style="list-style-type: none"><li>* Billing limit</li><li>* Billing terms</li><li>* Customer order amount</li><li>* Amount obligated</li><li>* Amount expended</li><li>* Advances collected</li><li>* Advances applied to earned revenue</li><li>* Remaining balance on advances</li><li>* Amount earned</li><li>* Amount billed</li><li>* Accounts receivable</li><li>* Collections on receivables.</li></ul> Enable access to reimbursable agreement information by customer ID number, reimbursable agreement number, project, or fund.	JFMIP Core Requirements 2005
--------	---	------------------------------

# 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





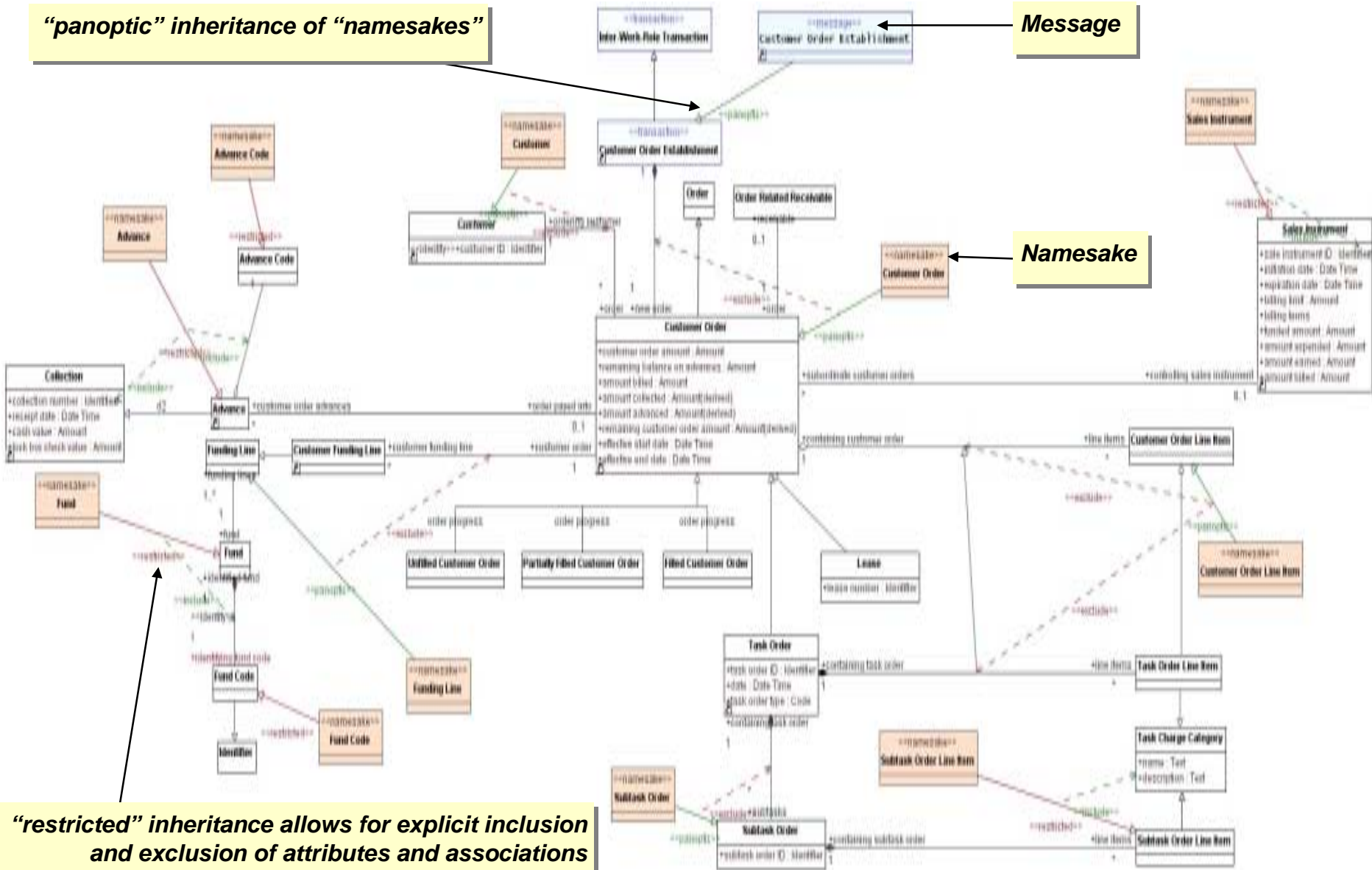


# Business Transaction Message Model

**“panoptic” inheritance of “namesakes”**

**Message**

**Namesake**



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

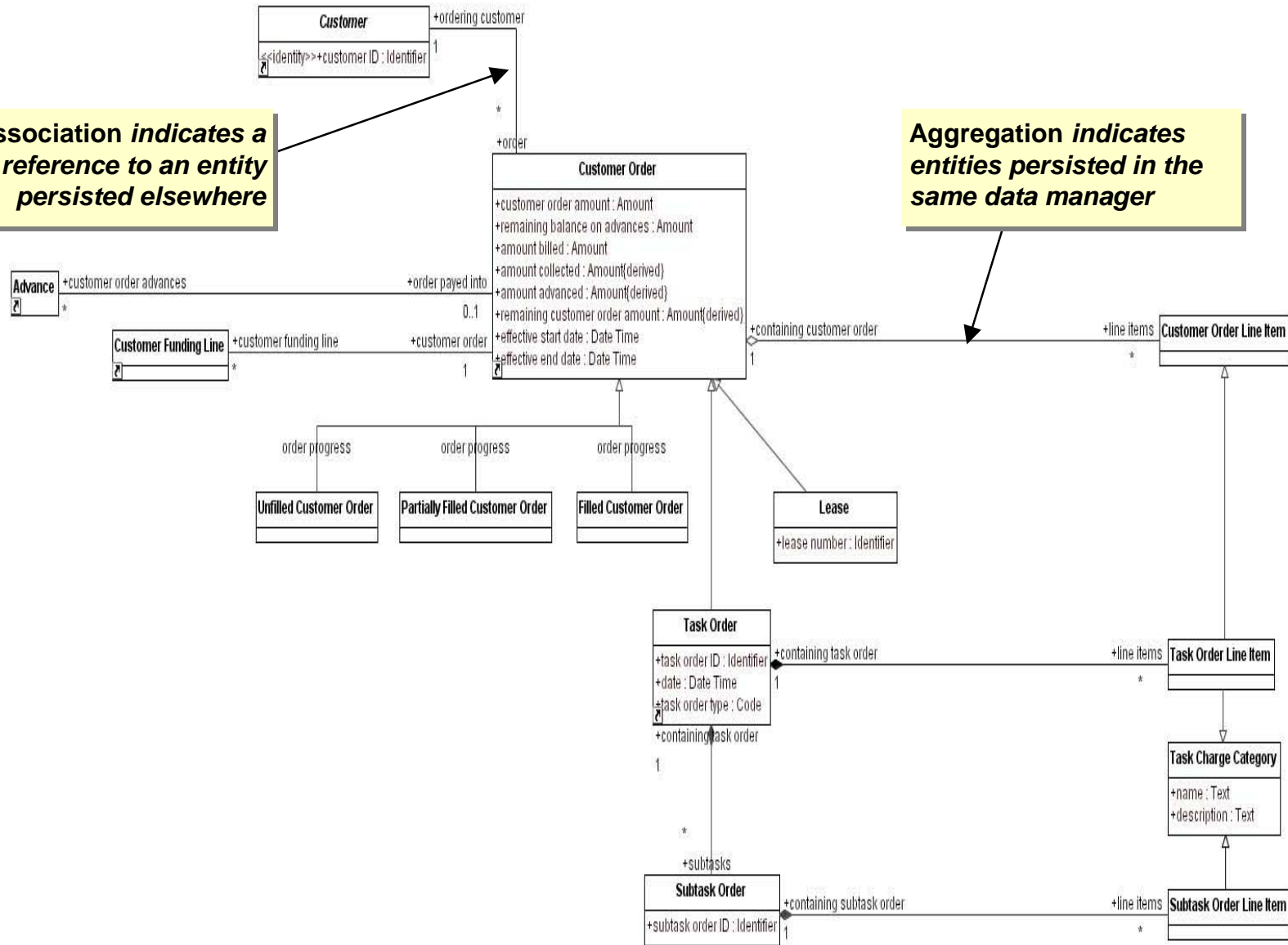
# Business Transaction Message in XML for CIM/CRI

```
<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

Association indicates a reference to an entity persisted elsewhere

Aggregation indicates entities persisted in the same data manager



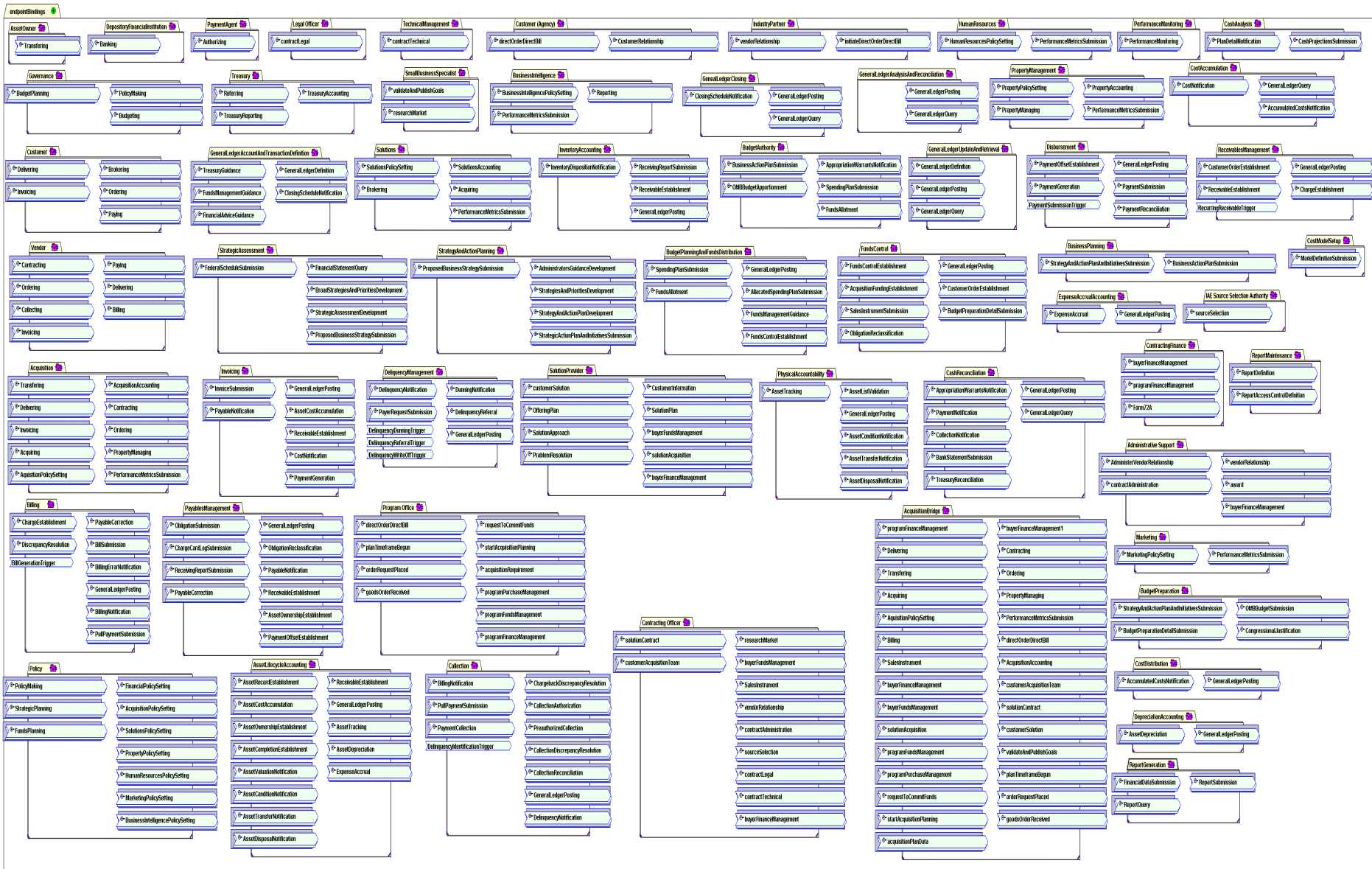
# FMEA - FMLoB Thanks

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

# Part 3 - OSERA

- Slides 46 to 51
- OSERA
  - Web Service PSM generation (BPEL, WSDL, XSD)
  - Collapse CPIC and SDLC
  - Test driven 'Service Based Procurement'
  - LoB's models as Authoritative RA's, RI for eGov Factory
  - Model Based Acquisition

# OSERA - BPEL Work Roles for Acquisition and FMLoB



Base on BPEL

# 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>
```

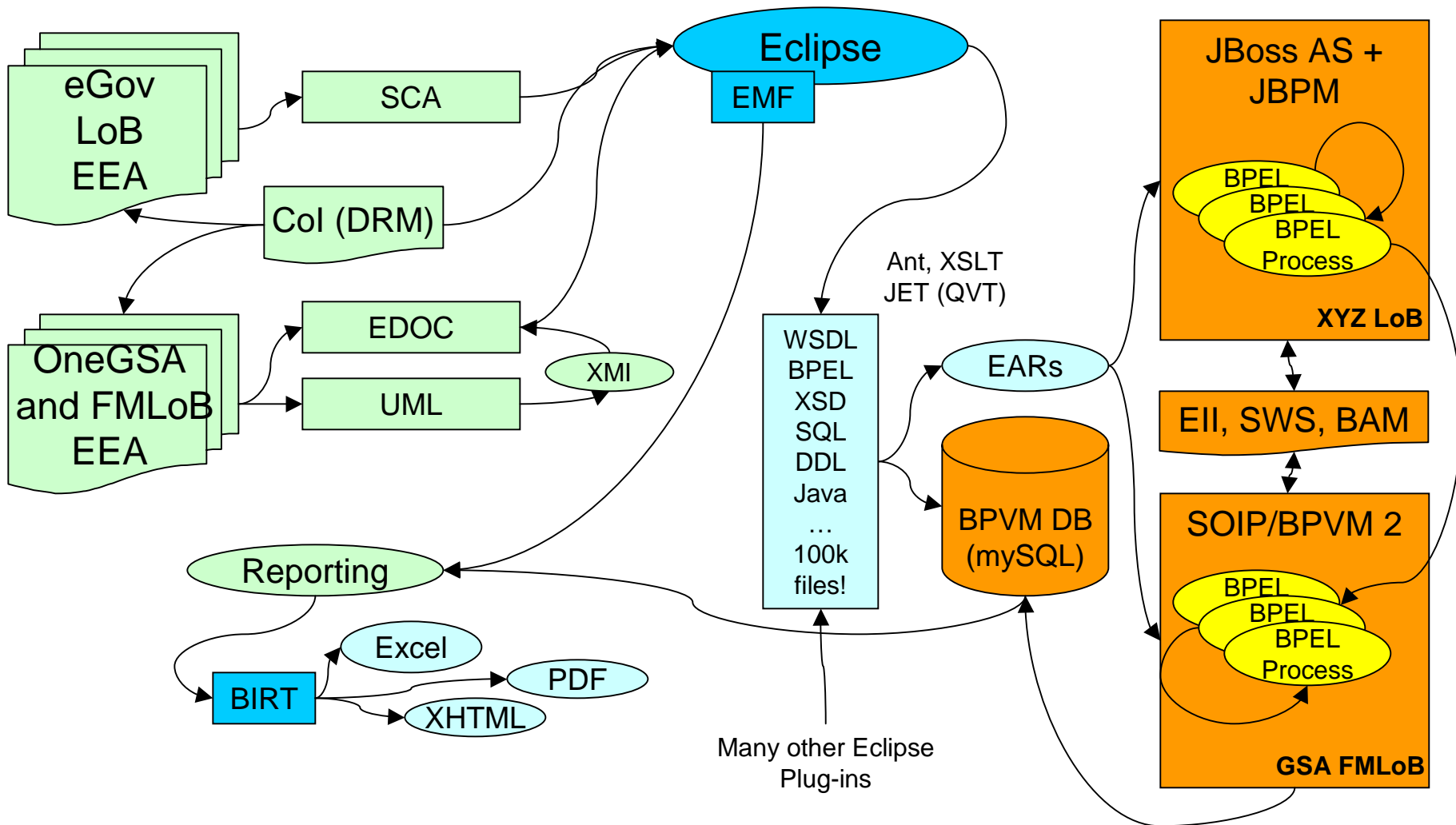
```
<wsdl:types>
  <xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified"
targetNamespace="platform:/resource/fmea.process/model/Receivable_Establishment.xsd"
xmlns="http://www.w3.org/2001/XMLSchema">
    <xsd:include schemaLocation="Receivable_Establishment.xsd"/>
 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

# 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
  - FSIO and OMB wip
- OSERA
  - FMLoB Model to Integrate from EA to Web Services
  - Platform goals and objectives
  - Model Based Acquisition

# Thank You

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