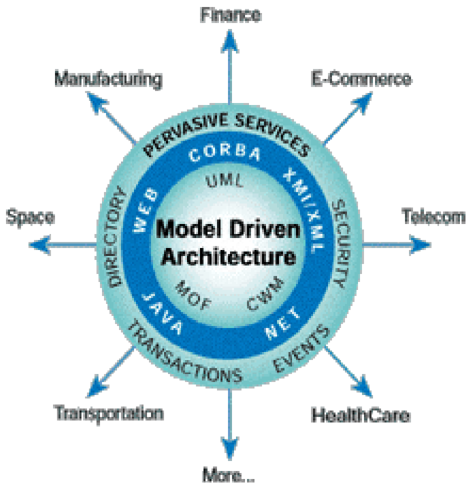
MDA & SOA in the Enterprise



VCA
MDA
SOA/ESB

EDOC

UNIFIED MODELING LANGUAGE UML TM

Applying Model Driven Architecture (MDA) and Value Chain Analysis (VCA) to Services Oriented Architecture (SOA) to enable the Executable Enterprise

Introductions

DataAccessTechnologies

Where Business Meets Technology

Cory Casanave

cory-c@enterprisecomponent.com

Primary author of “CCA” in EDOC

Case Study

U.S. General Services Administration (GSA)

Customer: GSA OCIO

Provider: LMI & Data Access Technologies

Tooling: Component-X

Sections reproduced with the permission of the GSA – George Thomas

“Sea Change”

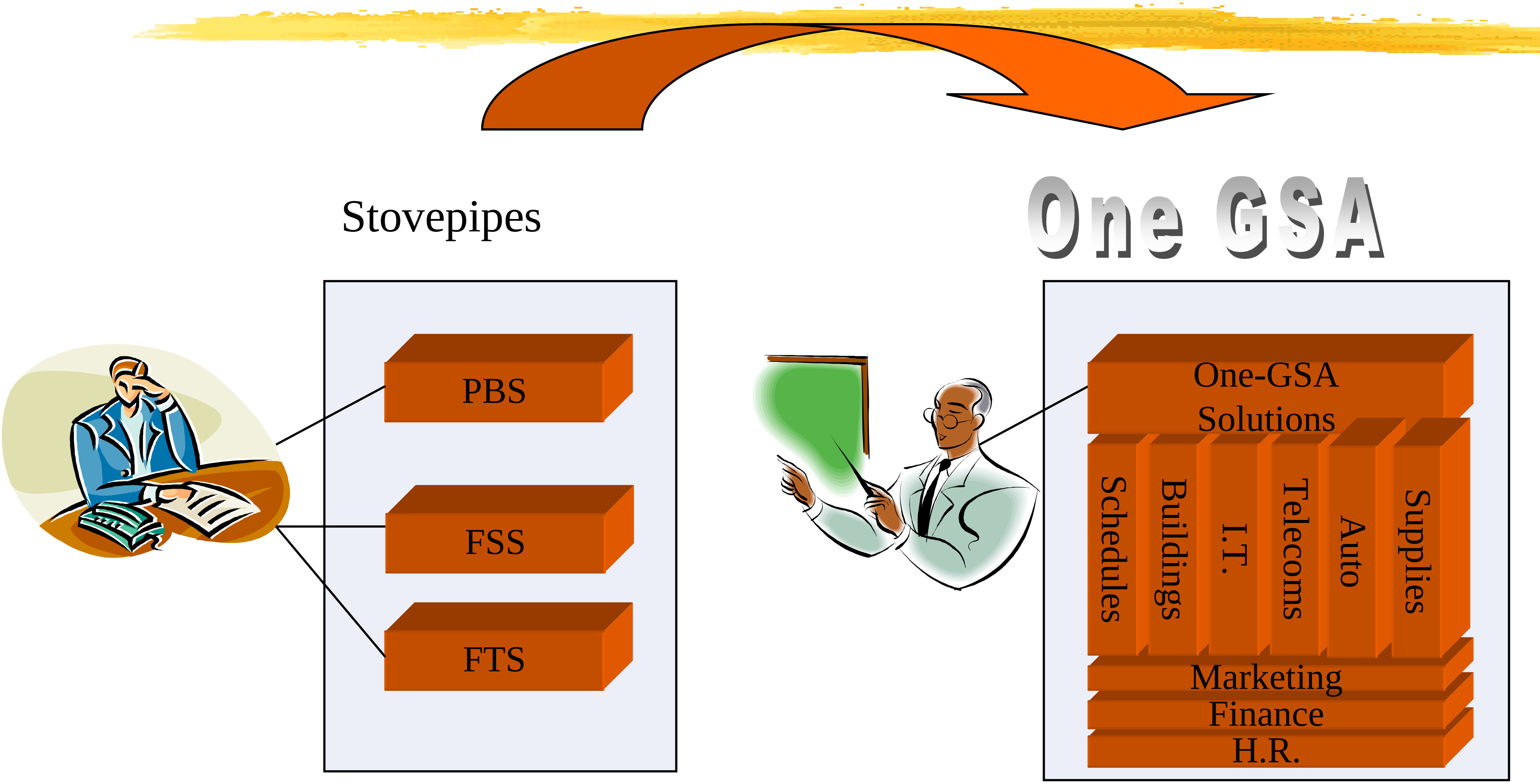
- Sea of change
  - Get-it-right (Initiative for better acquisition)
  - Merger of FTS/FSS (Major Internal Organizations)
  - Restructuring to provide a unified face to the customer
  - OMB and Congressional mandates and changes of mission
  - Integrating and modernizing financial management
  - Reduction of redundant processes and systems
- Implications
  - Massive organizational change
  - Massive system changes
  - Retraining staff
  - High cost of change
  - Risky and hard to achieve
  - Change combined with current costs and inefficiencies of redundant stovepipe systems is not practical

“Sea Change” Enablers & Cost Reduction

- Value Chain Analysis
  - Analyzing and restructuring business processes based on realized customer value
- Model Driven Executable Architecture
  - Executable enterprise architecture to realize business goals with systems and workflow automation
- Business Service Oriented Architecture / ESB
  - An enterprise modernization strategy supporting business services, integration, reuse and common components across a system of systems integrated with SOA/ESB
- Combined effect of more automated processes

Being able to realize your business goals – priceless!

One-GSA Initiative



Stovepipes

PBS

FSS

FTS

Un-Architected Solution

One GSA

One-GSA Solutions

Schedules

Buildings

I.T.

Telecoms

Auto

Supplies

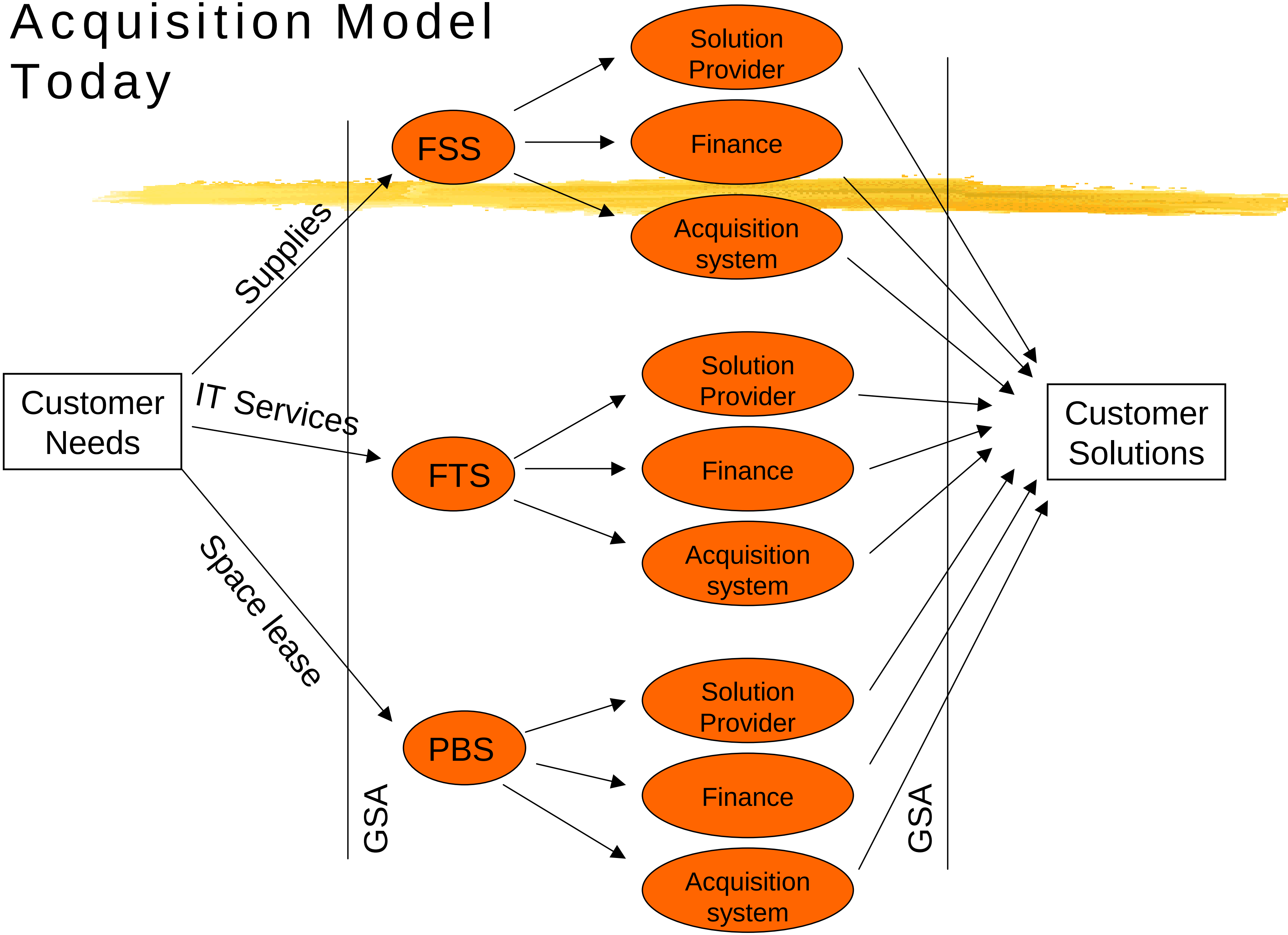
Marketing

Finance

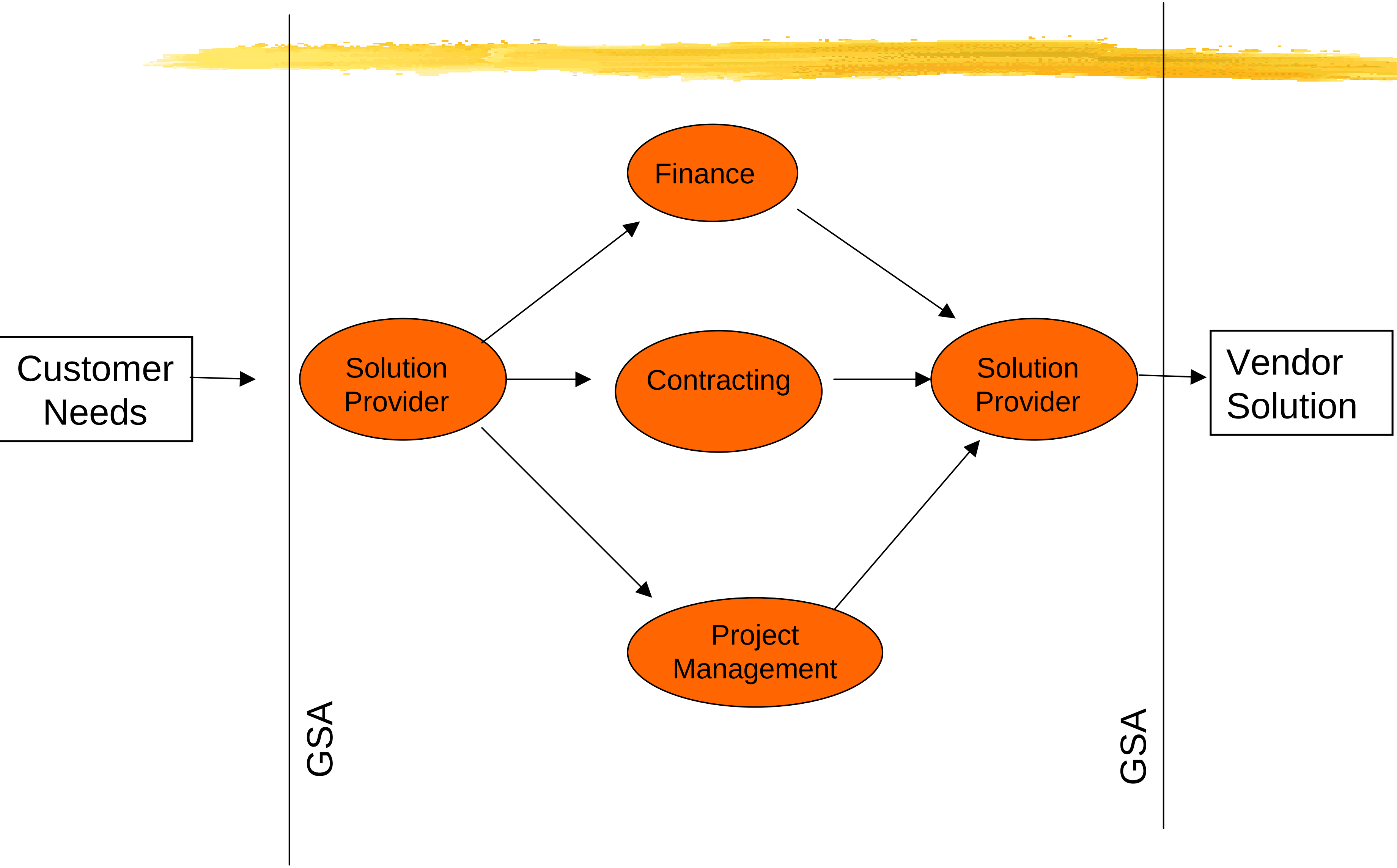
H.R.

Architected Solution

Acquisition Model Today

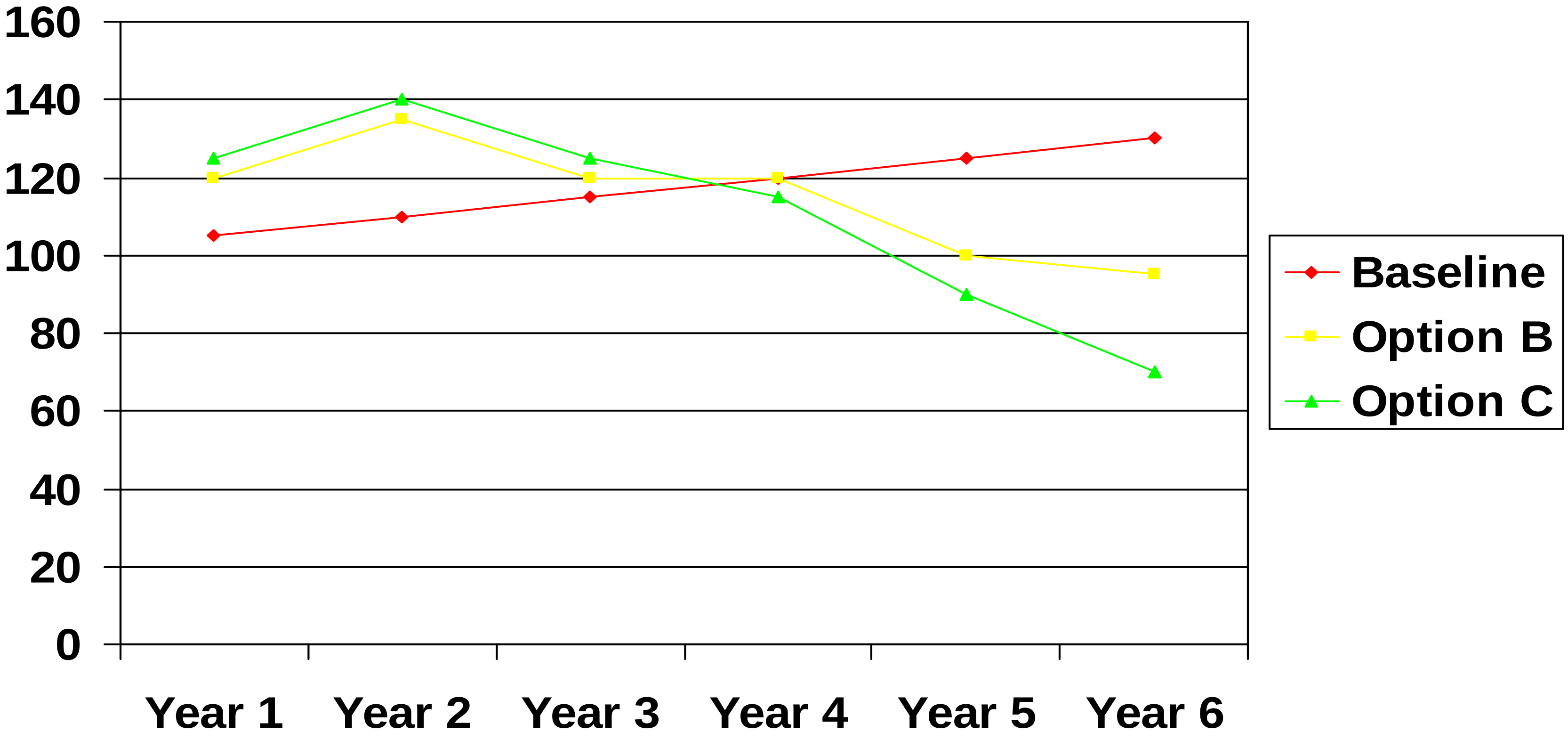


To Be Acquisition Model



System + Investment cost over 6 years

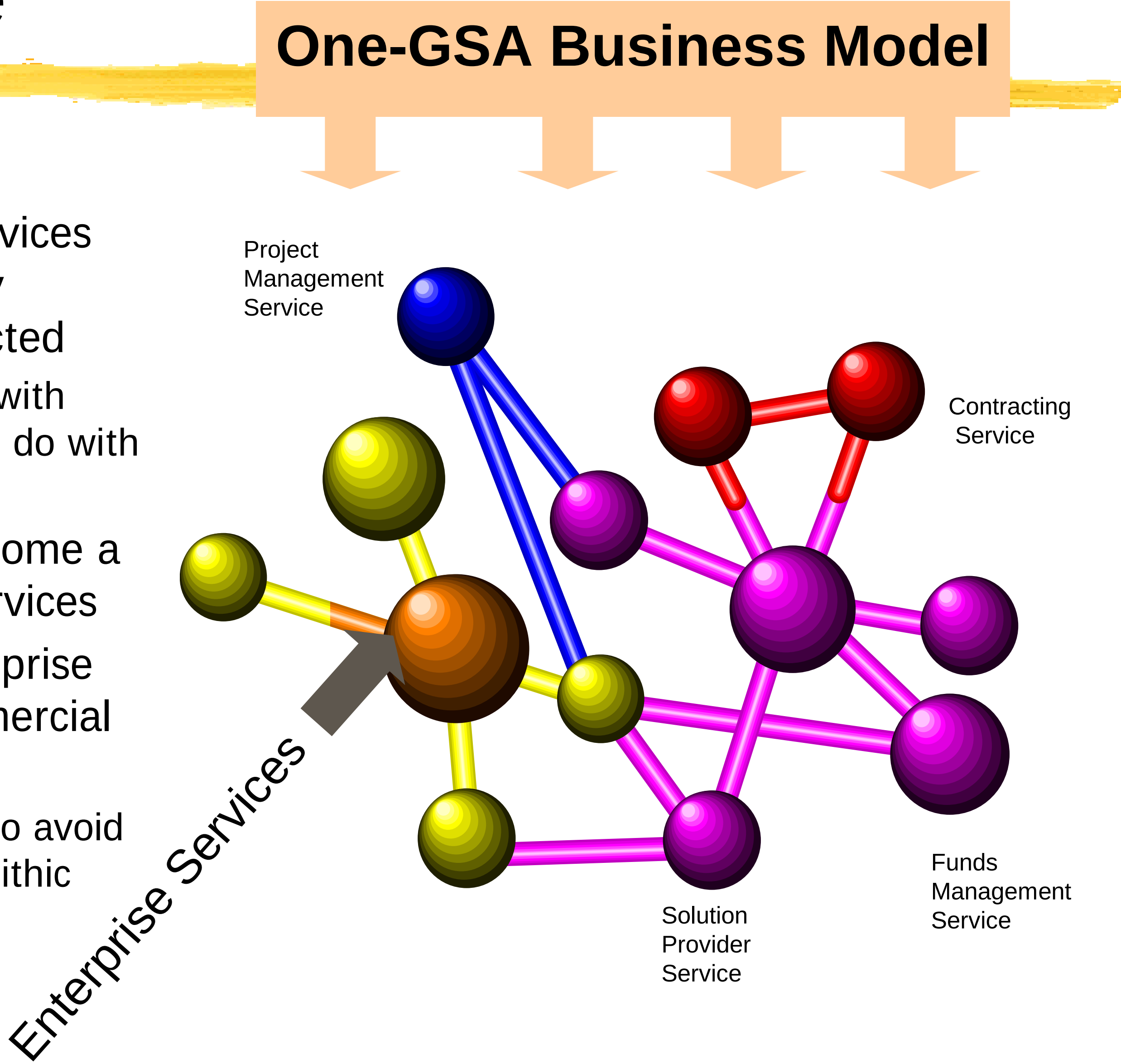
Business Advantage Savings Not Included



Note: Representative Numbers Est. NPV Break Even – About 6 Years

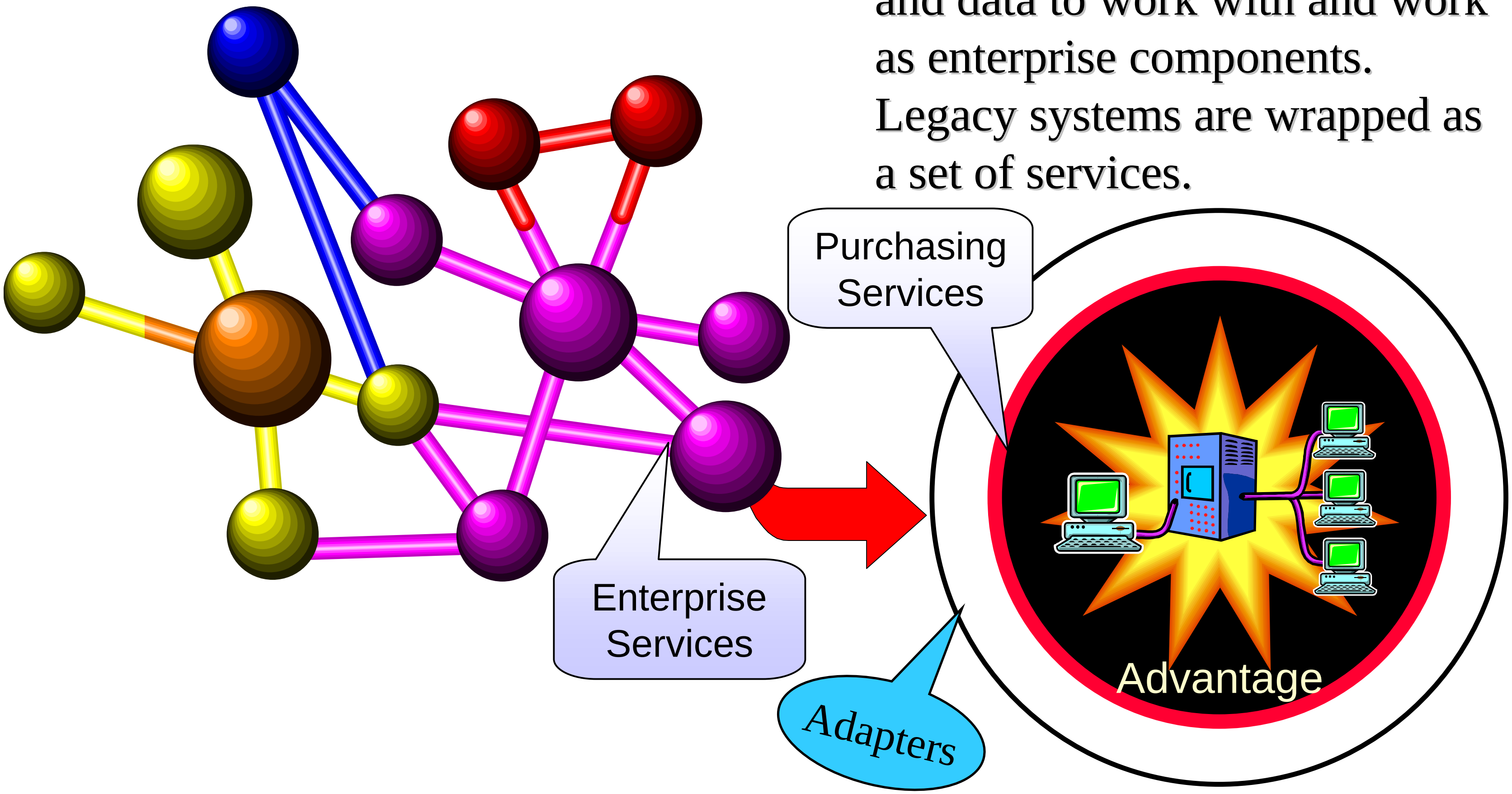
Enterprise Service Bus to Enable Target State

- ⌘ Services driven from the business model
- ⌘ Reusable Enterprise Services are independent & easily adapted and interconnected
  - Services communicate with each other like humans do with email
- ⌘ Information systems become a lattice of cooperating services
- ⌘ CIO to Provide an "Enterprise Service Bus" using commercial standards
  - Industry best practice to avoid developing large monolithic applications



Legacy “Wrapping”

Wrapping allows existing programs and data to work with and work as enterprise components. Legacy systems are wrapped as a set of services.



Purchasing Services

Enterprise Services

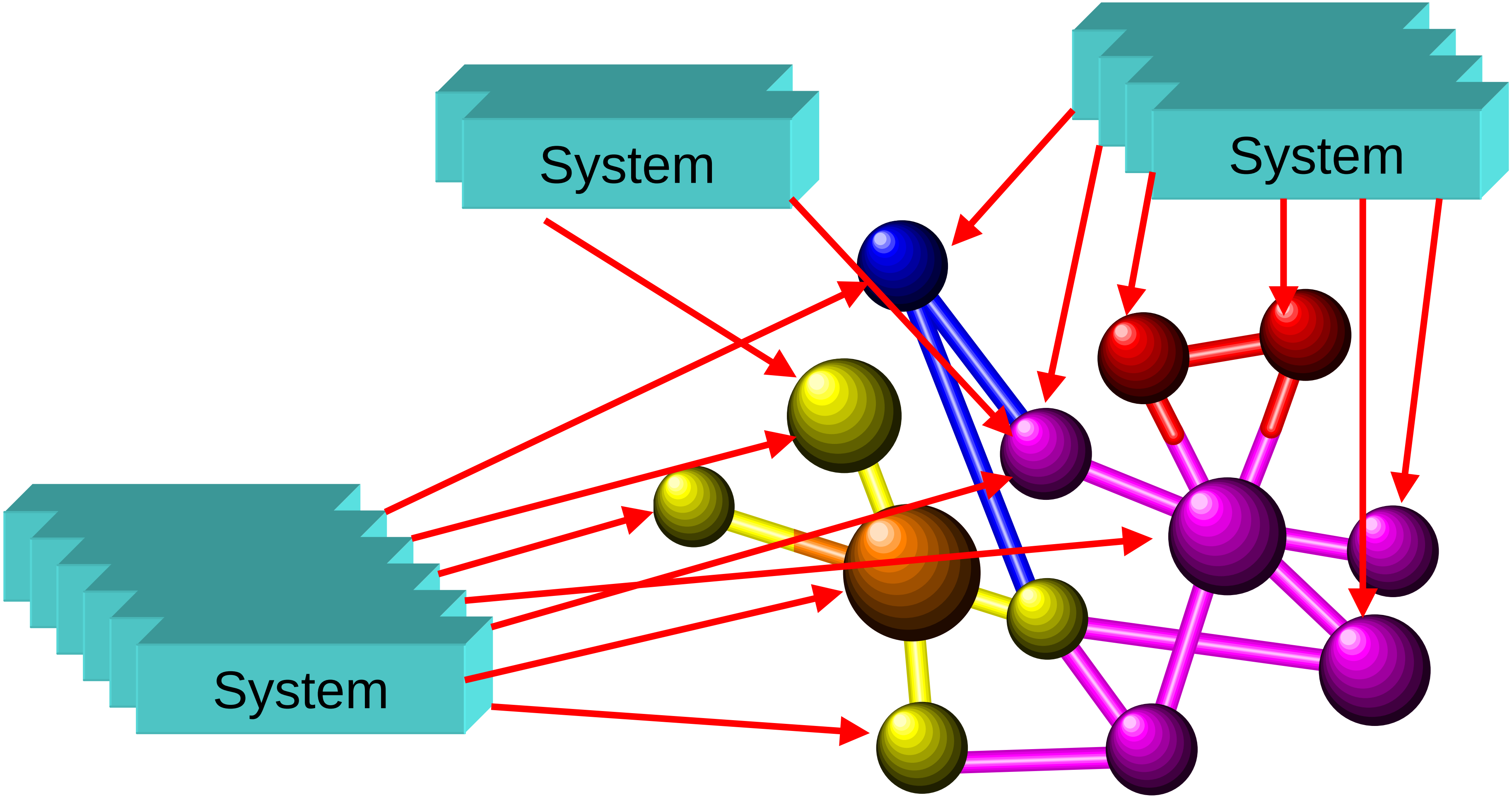
Adapters

Advantage

Enterprise Modernization Strategy

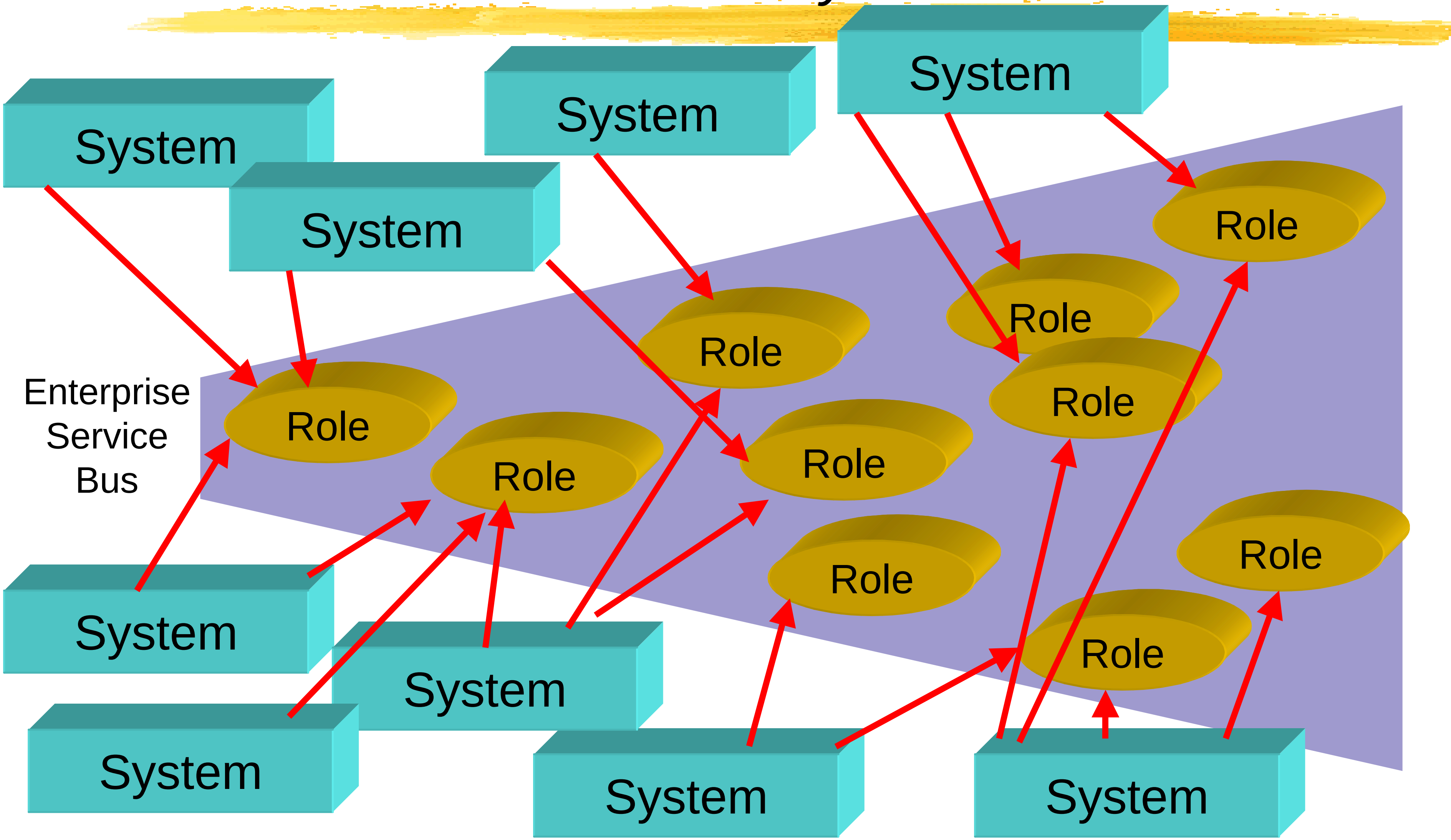
- Identify components that will offer greatest ROI
  - Create target executable model
    - We have a baseline with the One-GSA model!
  - Identify system of systems to consider for target
  - Pick an alternative for each;
    - Evolve one or more current systems to support target processes, take on new capabilities and support One-GSA interfaces and/or
    - Harvest one or more systems to build a replacement and/or
    - Integrate functionality into shared services as common components and/or
    - Replace systems or parts of systems that are no longer suitable.
  - Model driven SOA provides the flexibility to mix and match approaches as required. Commonality where possible – diversity where necessary. Evolving over time from integration to common components.
  - End result – architected system of systems

Systems to Role Based Service Components



Transition by role, not system

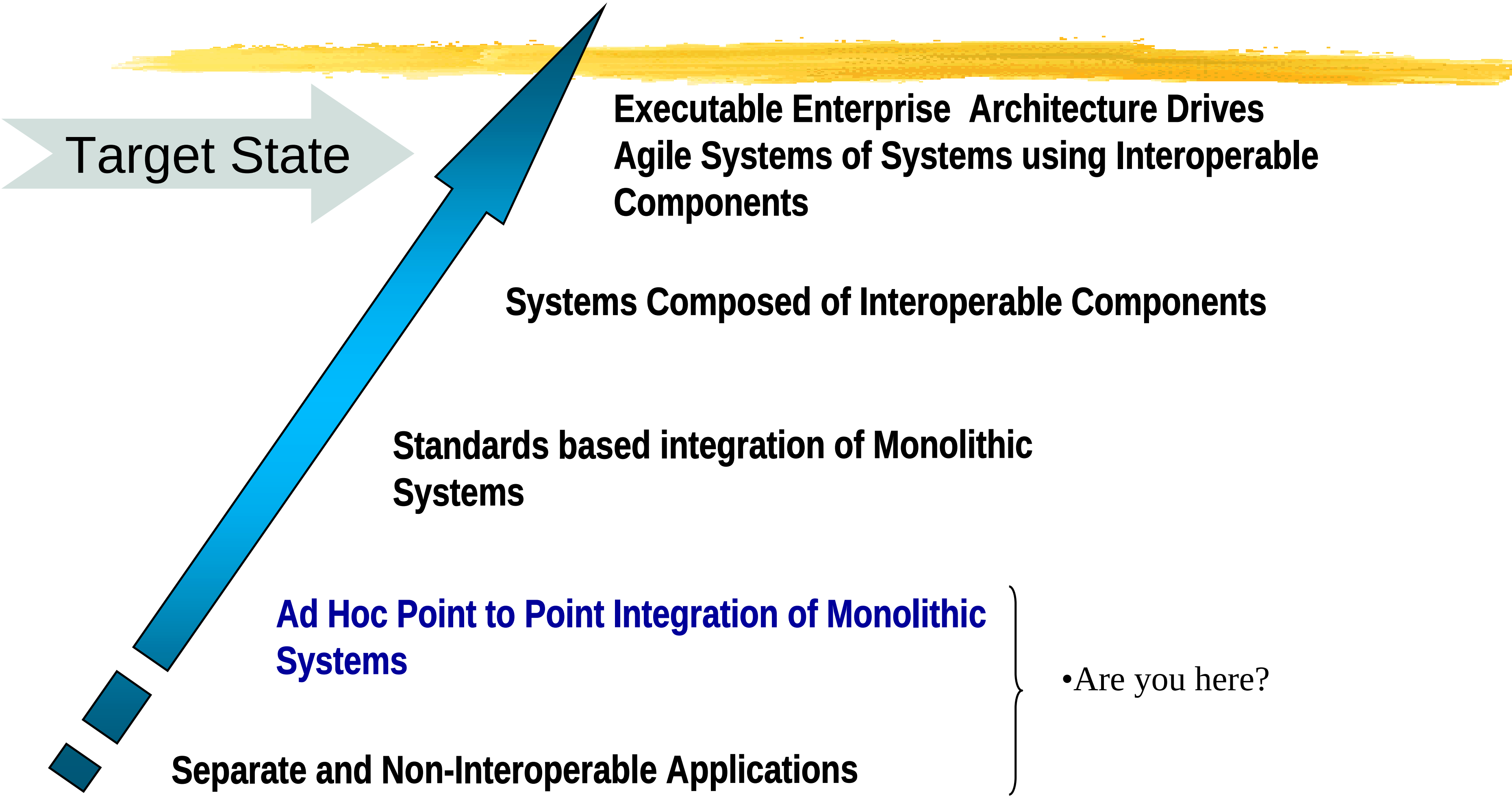
Still Theory



Consolidation into Service Components

- The Good
  - Strategic reduction in operating cost – up to 50%
  - Agile business processes
  - Unification of the enterprise
  - Only way to achieve enterprise transition?
- The Bad
  - Investment in change – As high as 25%
  - Legacy and packaged systems are not componentized
- The Ugly
  - Change is expensive and can be disruptive
  - Current boundaries and ownership change – may require centralized authority and budgeting
  - Requires more “enterprise” agreement – very difficult to get consensus

Strategic Migration



Target State

Executable Enterprise Architecture Drives Agile Systems of Systems using Interoperable Components

Systems Composed of Interoperable Components

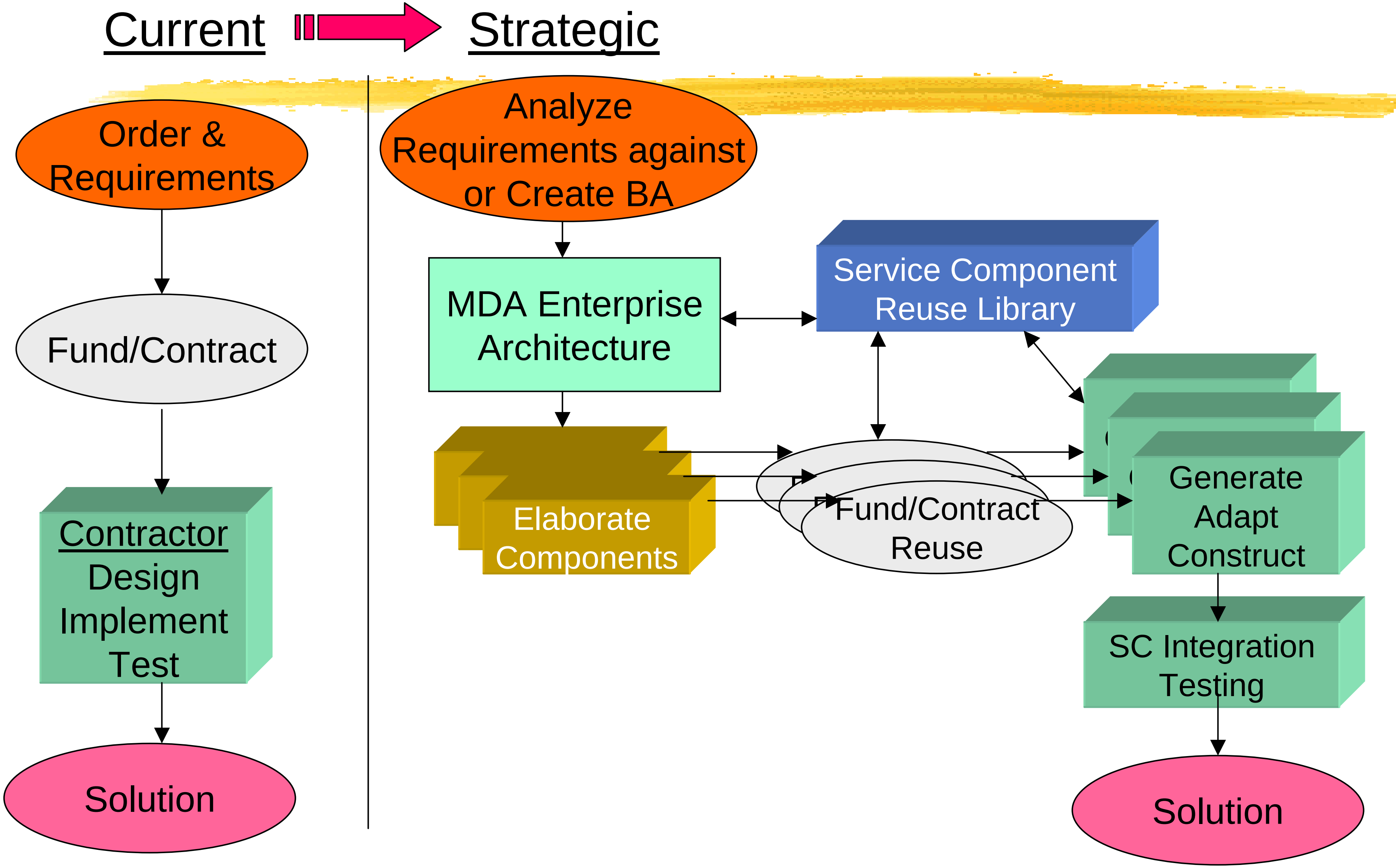
Standards based integration of Monolithic Systems

Ad Hoc Point to Point Integration of Monolithic Systems

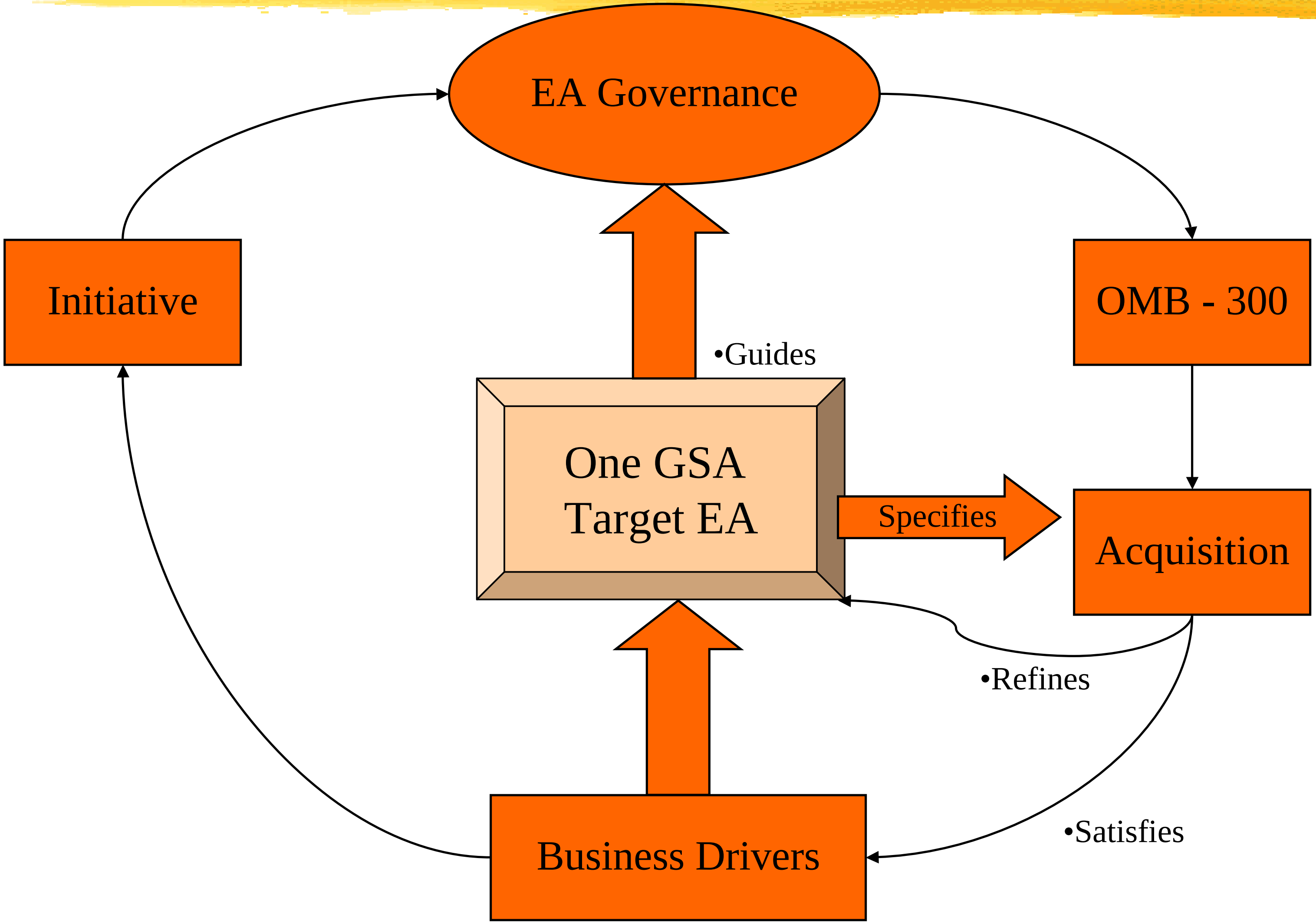
Separate and Non-Interoperable Applications

- Are you here?

MDA Enhanced Procurement

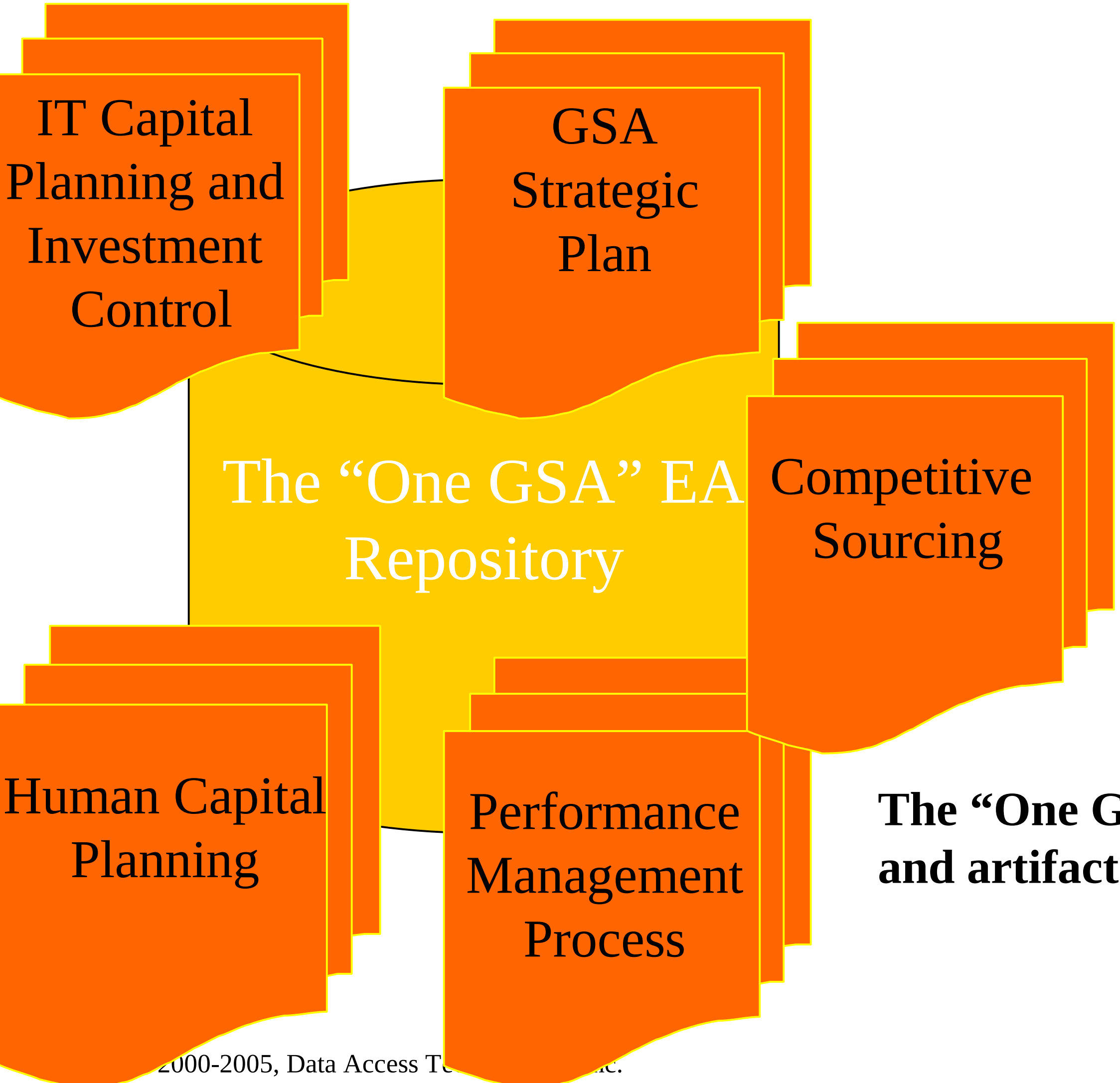


EA Governance Structure



“One GSA” EA Strategic Integration

EA is a STRATEGIC ASSET



IT Capital Planning and Investment Control

GSA Strategic Plan

The “One GSA” EA Repository

Competitive Sourcing

Human Capital Planning

Performance Management Process

•The “One GSA” EA aligns with:

- ➢GSA Strategic Plan
- ➢IT Capital Planning and Investment Control process
- ➢Human Capital Planning process
- ➢Performance Management process
- ➢Competitive Sourcing
- ➢Governance

The “One GSA” EA repository houses models and artifacts that have been vetted and agreed to.

Enterprise MDA

An approach to realizing executable enterprise architecture with MDA and SOA

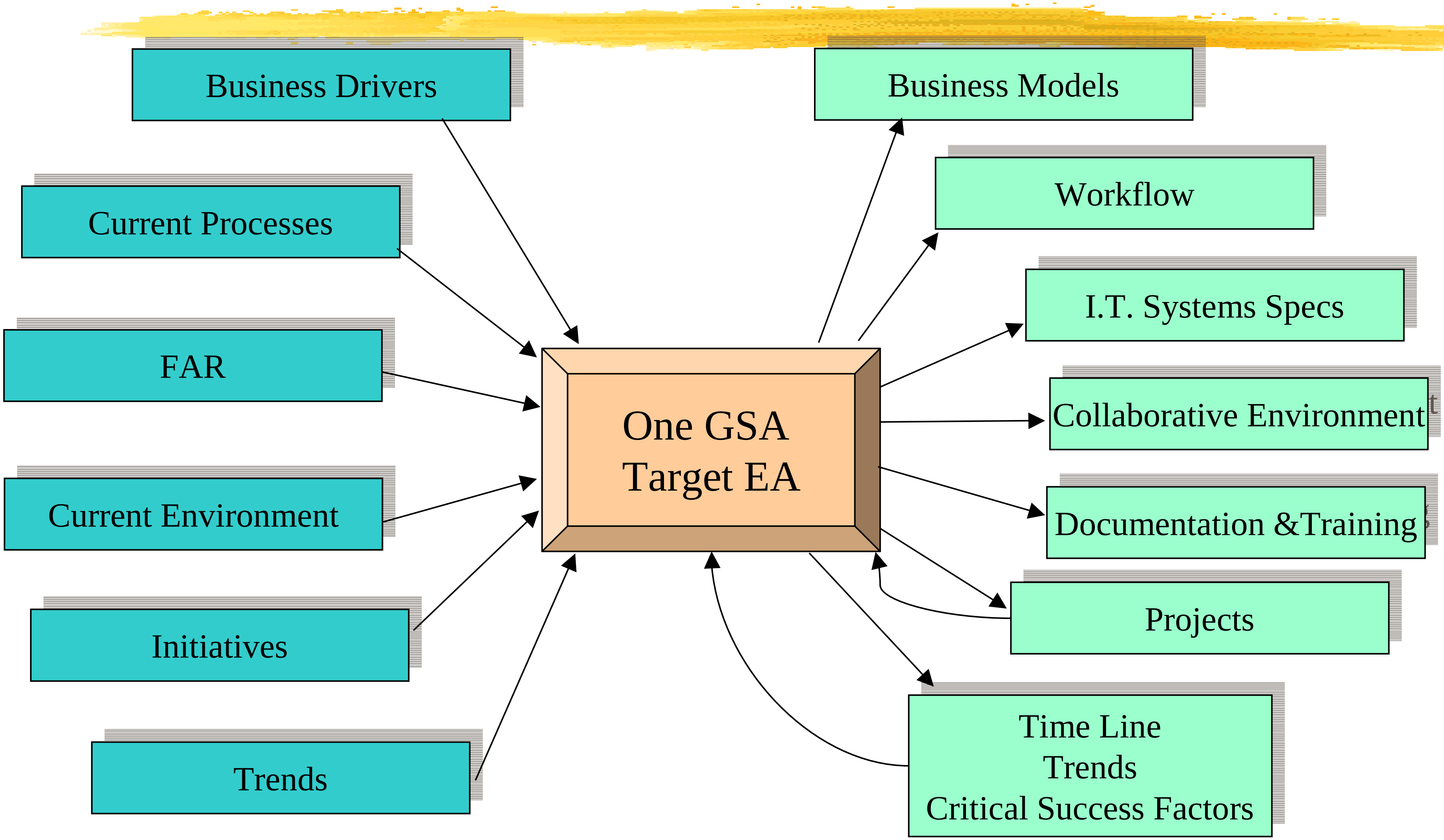
Enterprise MDA

- Architecture at the Enterprise Level
  - Systems of systems
  - Collaboration of organizations, systems & people
  - Wide-scale collaborative processes
    - roles and responsibilities
  - Business Service Oriented Architecture
  - Enterprise Components
  - Componentizing functionality – not creating it
  - Executable processes – smooth transition from model to simulation to solution
- Executable Enterprise Architecture

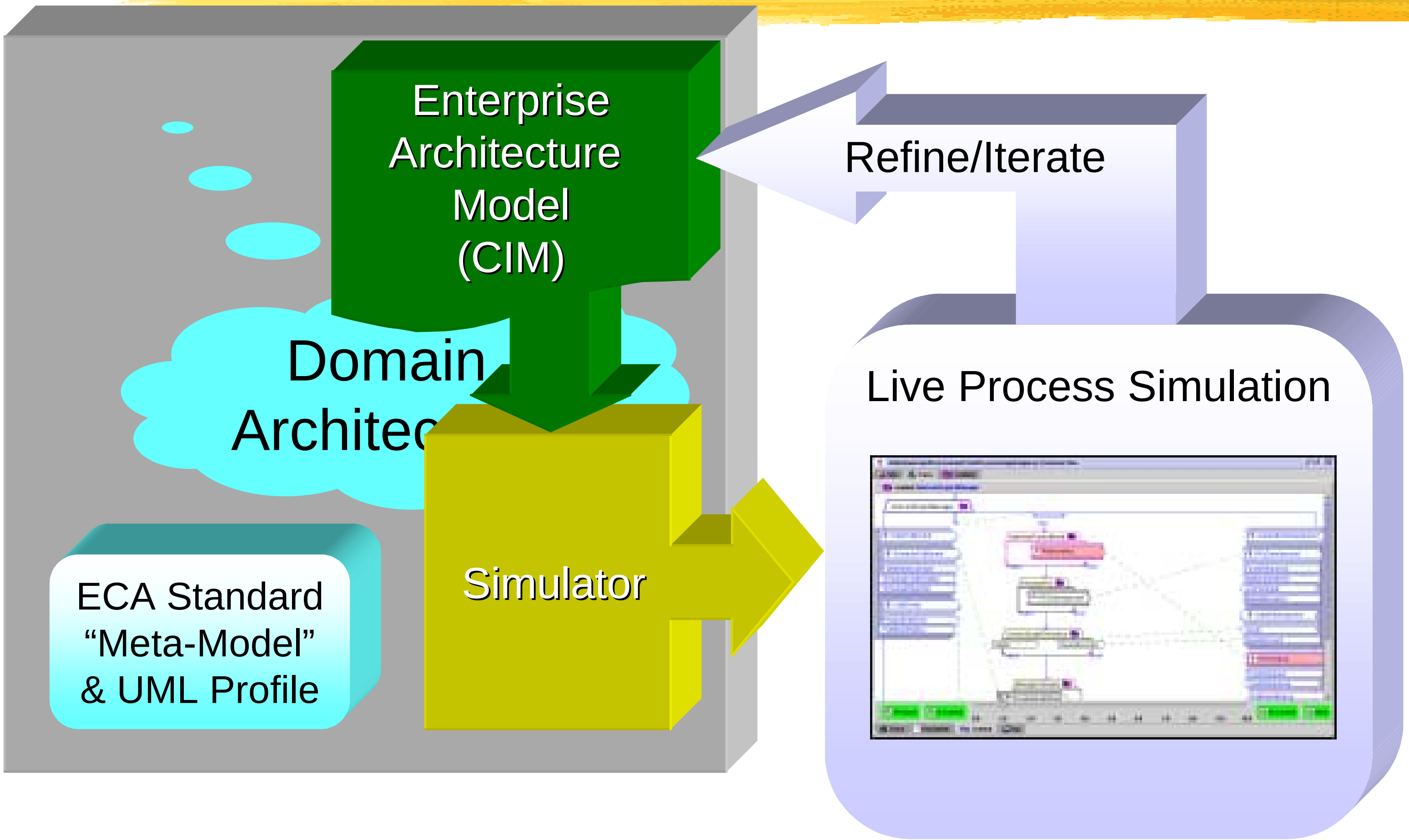
The OMG-Enterprise Collaboration Architecture

- ECA is a “profile of UML”, a way to use UML for a specific purpose - it is an OMG standard
  - That purpose is *modeling enterprise systems*.
- You can also think of this as a “modeling framework” for enterprise computing
- ECA is part of the “Model Driven Architecture” (MDA) initiative of the OMG
  - Using precise modeling techniques as part of the development lifecycle to speed development and provide technology independence
- ECA has been adopted by the OMG as part of the EDOC Profile for UML specification.

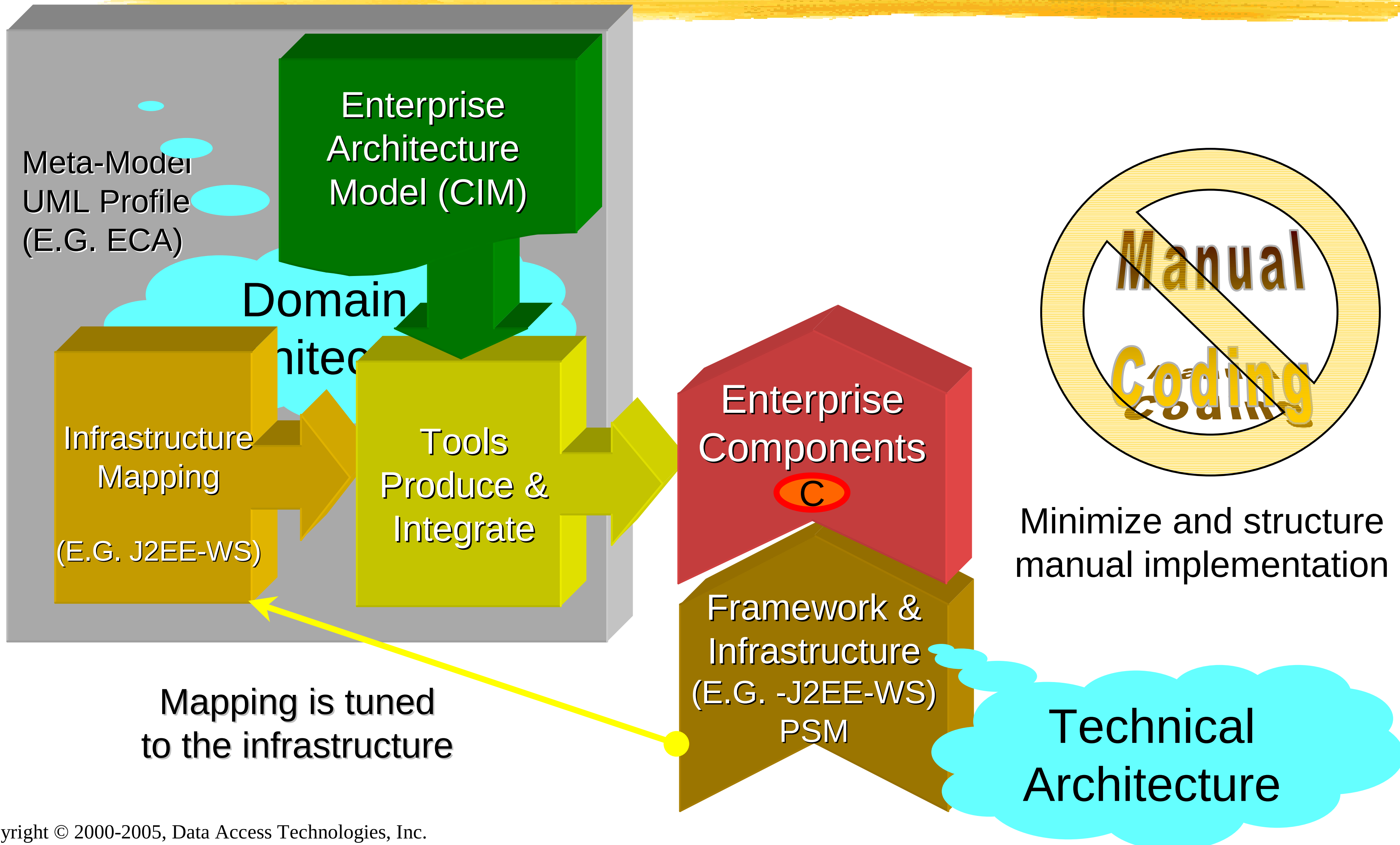
Value Focused Target Architecture



Simulated Model Driven Architecture


Enterprise Architecture Model (CIM)
Domain Architec
ECA Standard "Meta-Model" & UML Profile
Simulator
Refine/Iterate
Live Process Simulation

Automated Model Driven Architecture



Meta-Model
UML Profile
(E.G. ECA)

Enterprise
Architecture
Model (CIM)

Domain
hitec

Infrastructure
Mapping

(E.G. J2EE-WS)

Tools
Produce &
Integrate

Enterprise
Components
C

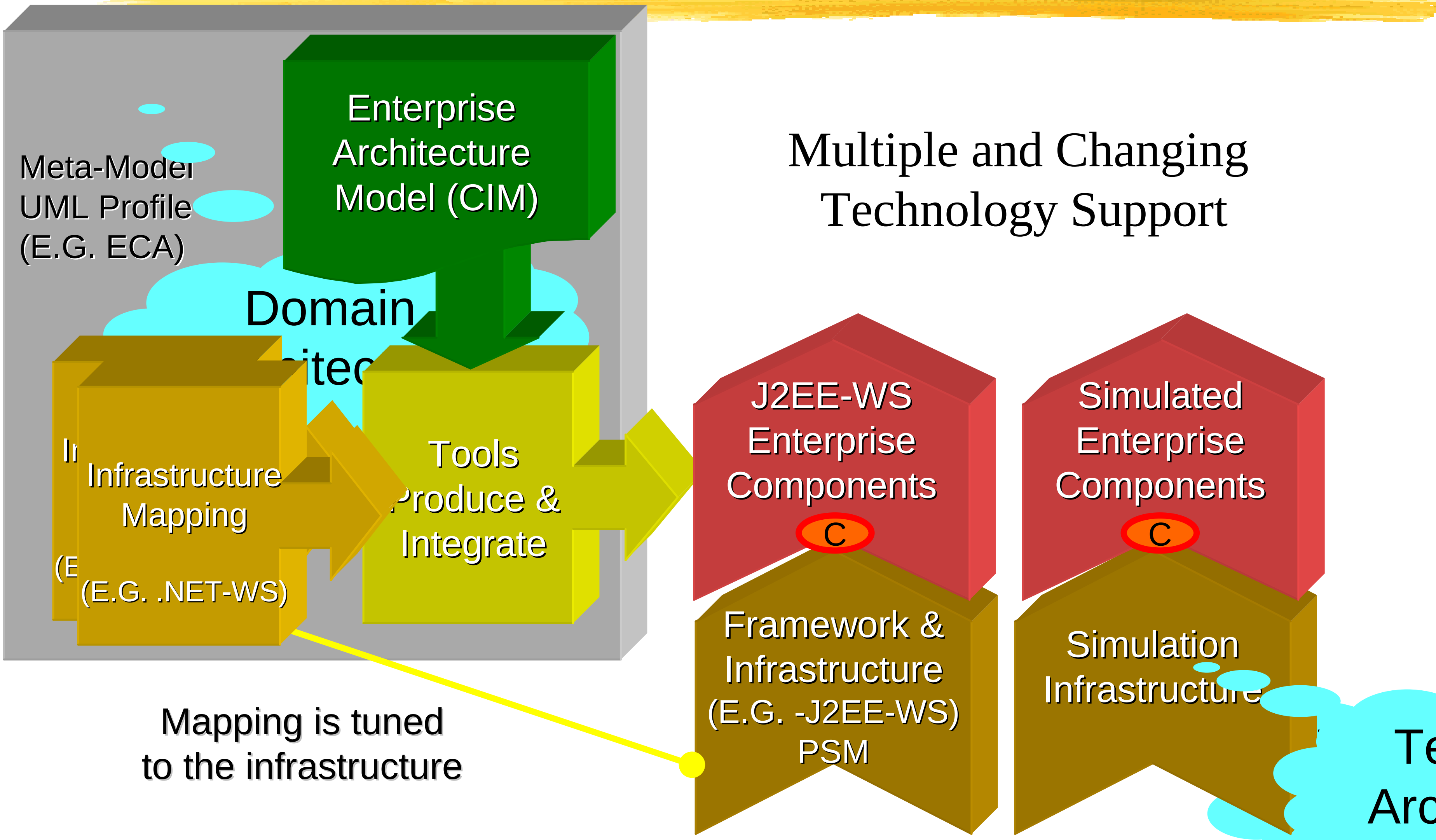
Framework &
Infrastructure
(E.G. -J2EE-WS)
PSM

Technical
Architecture

Mapping is tuned
to the infrastructure

Minimize and structure
manual implementation

Automated Model Driven Architecture



Meta-Model
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(E.G. .NET-WS)

Tools
Produce &
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Multiple and Changing
Technology Support

J2EE-WS
Enterprise
Components
C

Simulated
Enterprise
Components
C

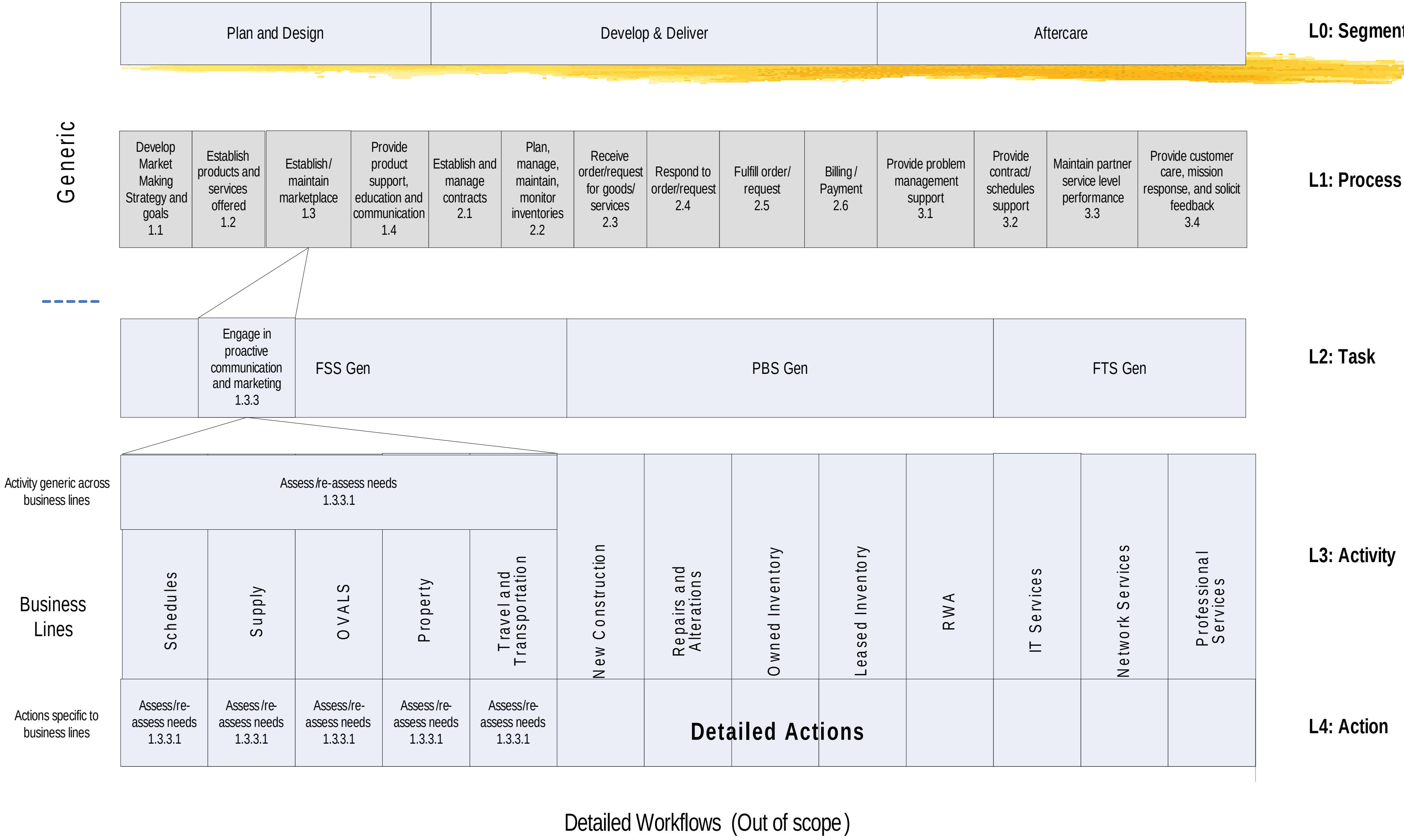
Framework &
Infrastructure
(E.G. -J2EE-WS)
PSM

Simulation
Infrastructure

Te
Arc

Mapping is tuned
to the infrastructure

Mission Critical Value Chain



Plan and Design

Develop & Deliver

Aftercare

L0: Segment

Generic

Develop Market Making Strategy and goals 1.1

Establish products and services offered 1.2

Establish/ maintain marketplace 1.3

Provide product support, education and communication 1.4

Establish and manage contracts 2.1

Plan, manage, maintain, monitor inventories 2.2

Receive order/request for goods/ services 2.3

Respond to order/request 2.4

Fulfill order/ request 2.5

Billing / Payment 2.6

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L1: Process

Engage in proactive communication and marketing 1.3.3

FSS Gen

PBS Gen

FTS Gen

L2: Task

Activity generic across business lines

Assess /re-assess needs 1.3.3.1

Business Lines

Schedules

Supply

OVALS

Property

Travel and Transportation

New Construction

Repairs and Alterations

Owned Inventory

Leased Inventory

RWA

IT Services

Network Services

Professional Services

L3: Activity

Actions specific to business lines

Assess/re-assess needs 1.3.3.1

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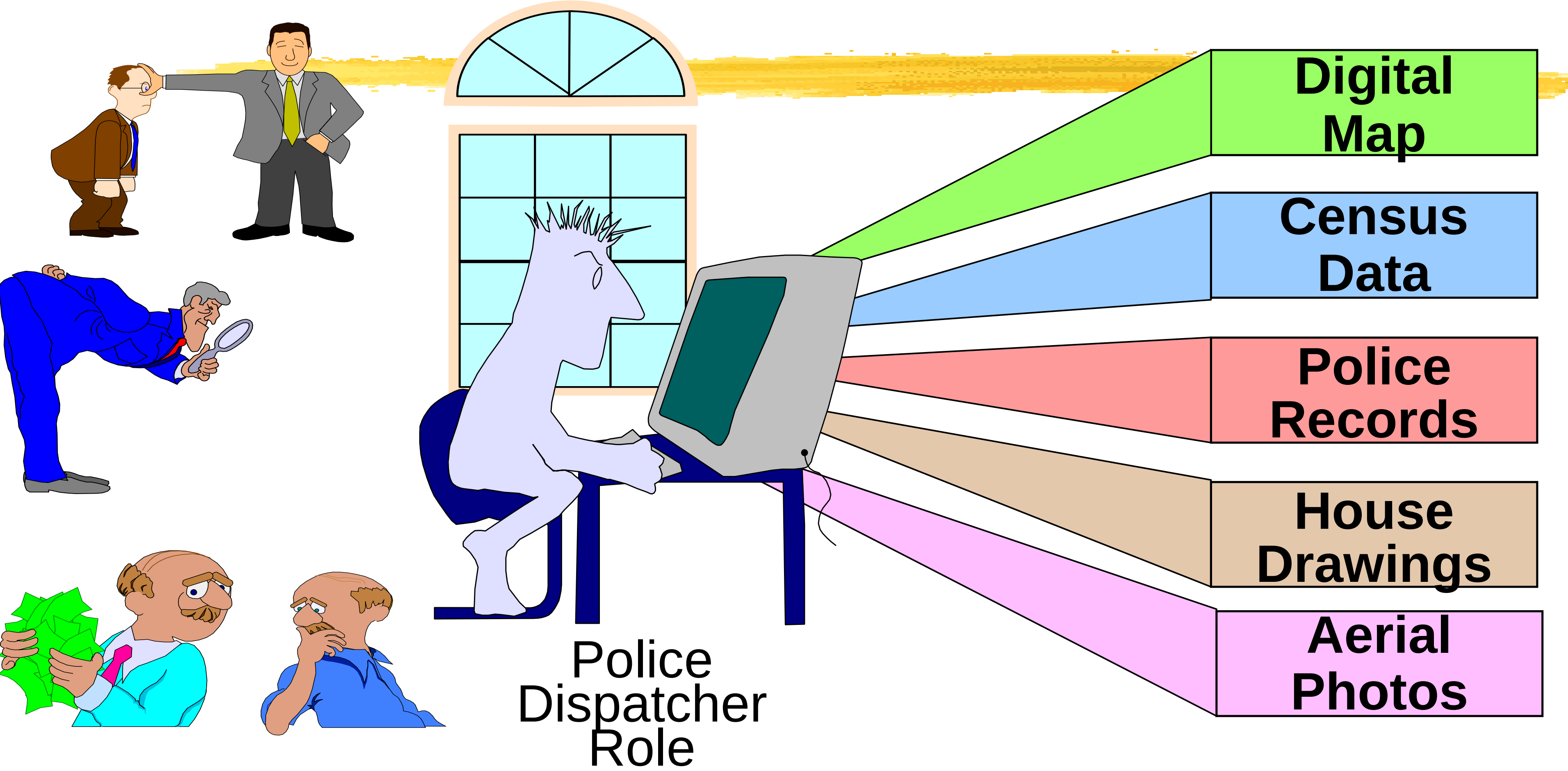
Detailed Actions

L4: Action

Detailed Workflows (Out of scope)

The Connected Enterprise
Content and Communication



Digital Map

Census Data

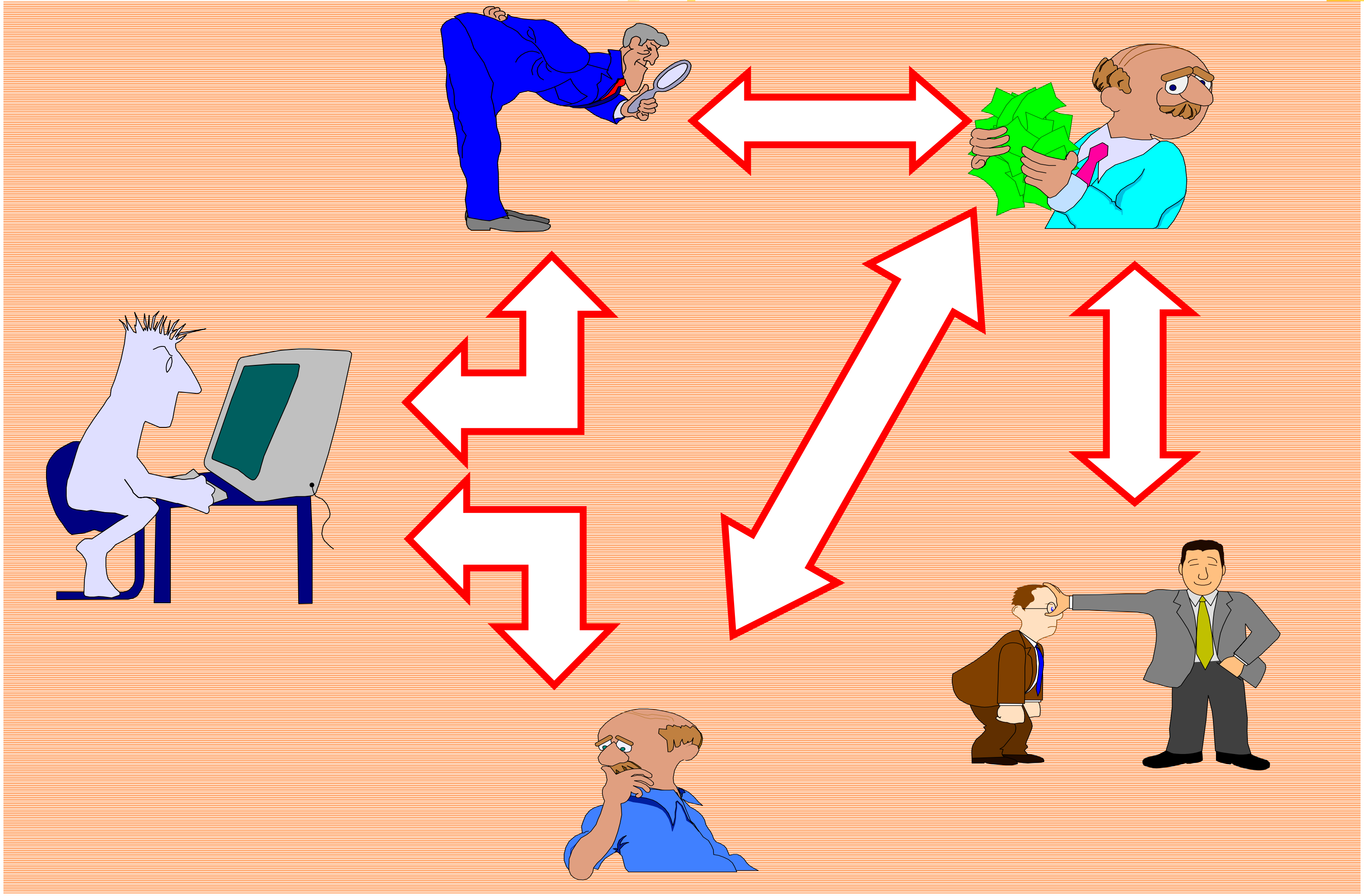
Police Records

House Drawings

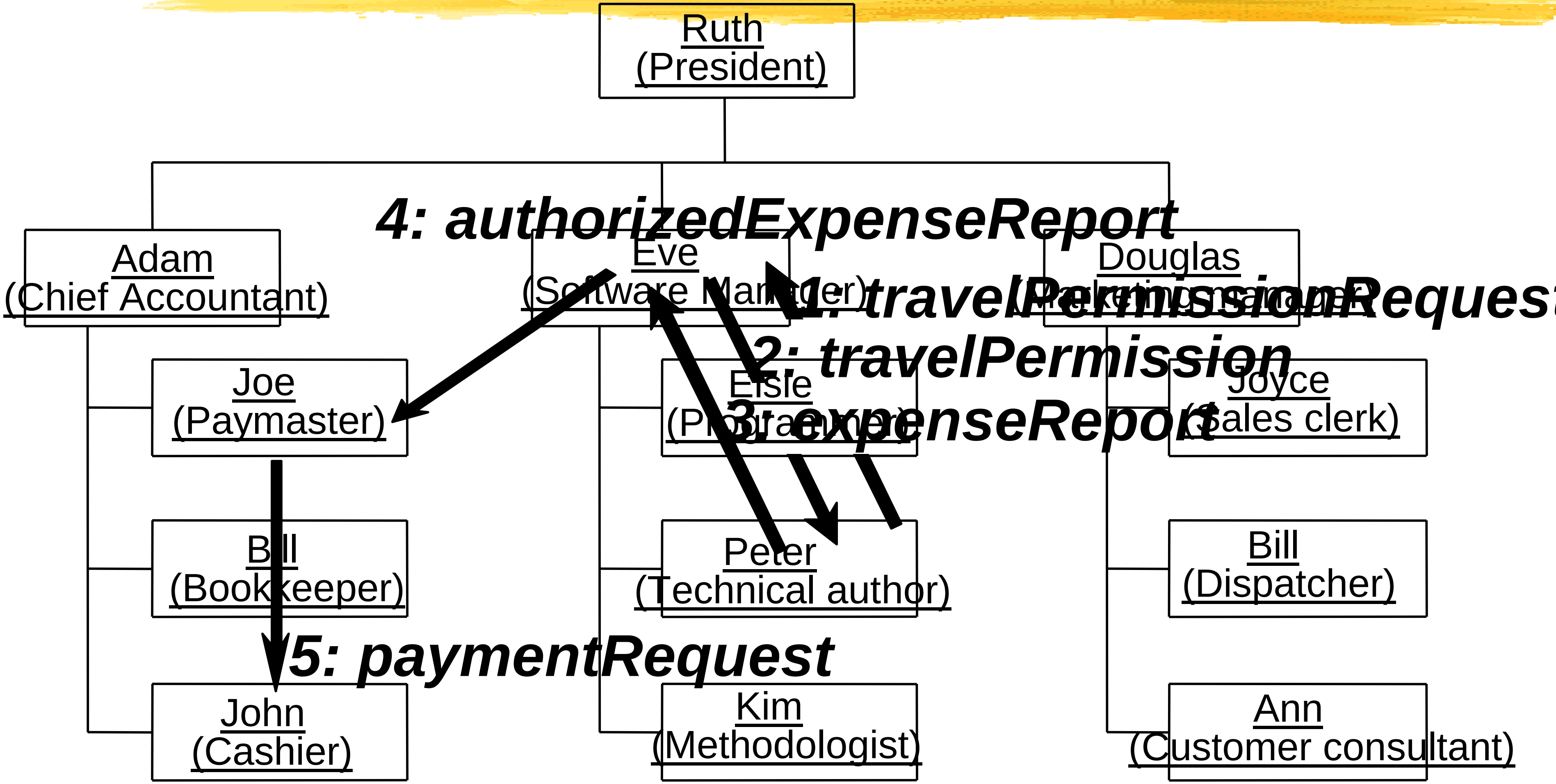
Aerial Photos

Police Dispatcher Role

Multiple roles in a collaboration



Travel Expense Example



Ruth
(President)

Adam
(Chief Accountant)

Eve
(Software Manager)

Douglas
(Marketing manager)

Joe
(Paymaster)

Elsie
(Programmer)

Joyce
(Sales clerk)

Bill
(Bookkeeper)

Peter
(Technical author)

Bill
(Dispatcher)

John
(Cashier)

Kim
(Methodologist)

Ann
(Customer consultant)

1: travelPermissionReques

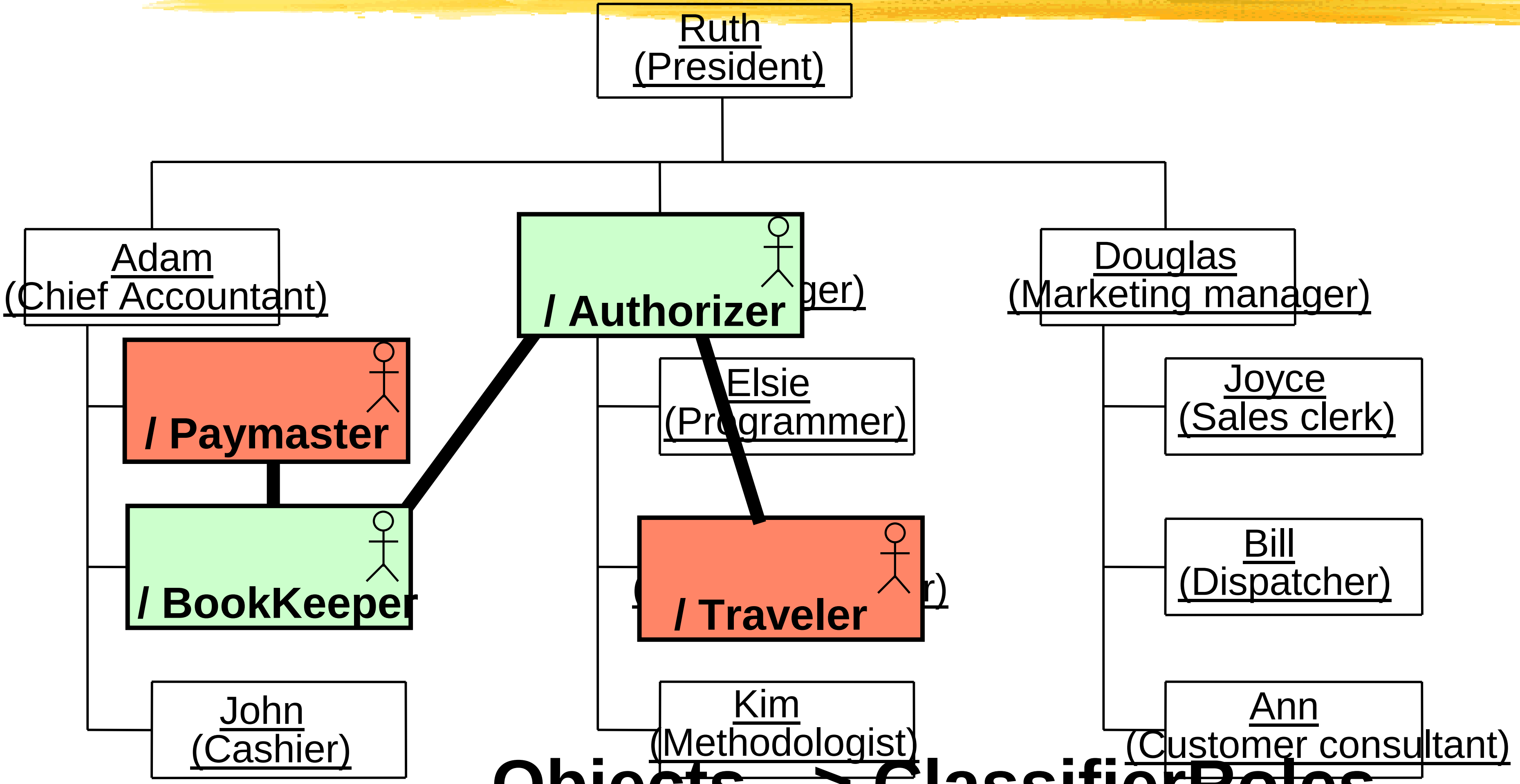
2: travelPermission

3: expenseReport

4: authorizedExpenseReport

5: paymentRequest

Diagram
Travel Expense Model



Ruth
(President)

Adam
(Chief Accountant)

/ Authorizer

ger)

Douglas
(Marketing manager)

/ Paymaster

Elsie
(Programmer)

Joyce
(Sales clerk)

/ BookKeeper

/ Traveler

r)

Bill
(Dispatcher)

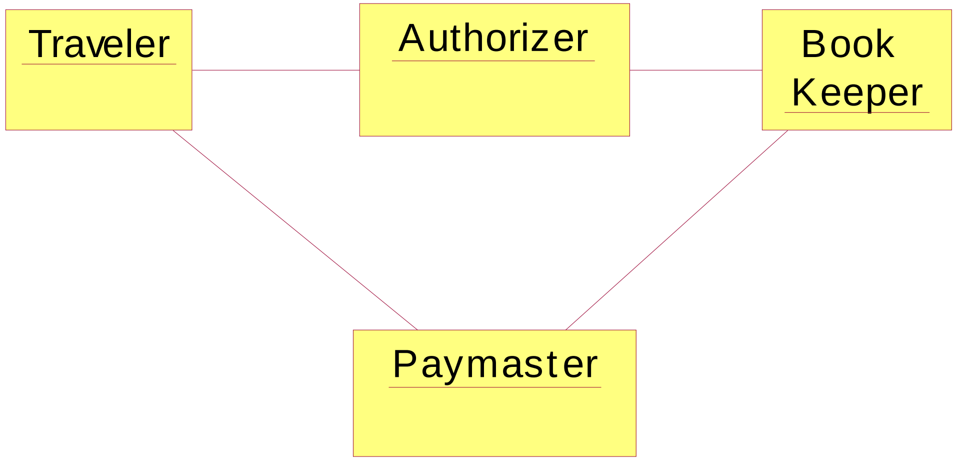
John
(Cashier)

Kim
(Methodologist)

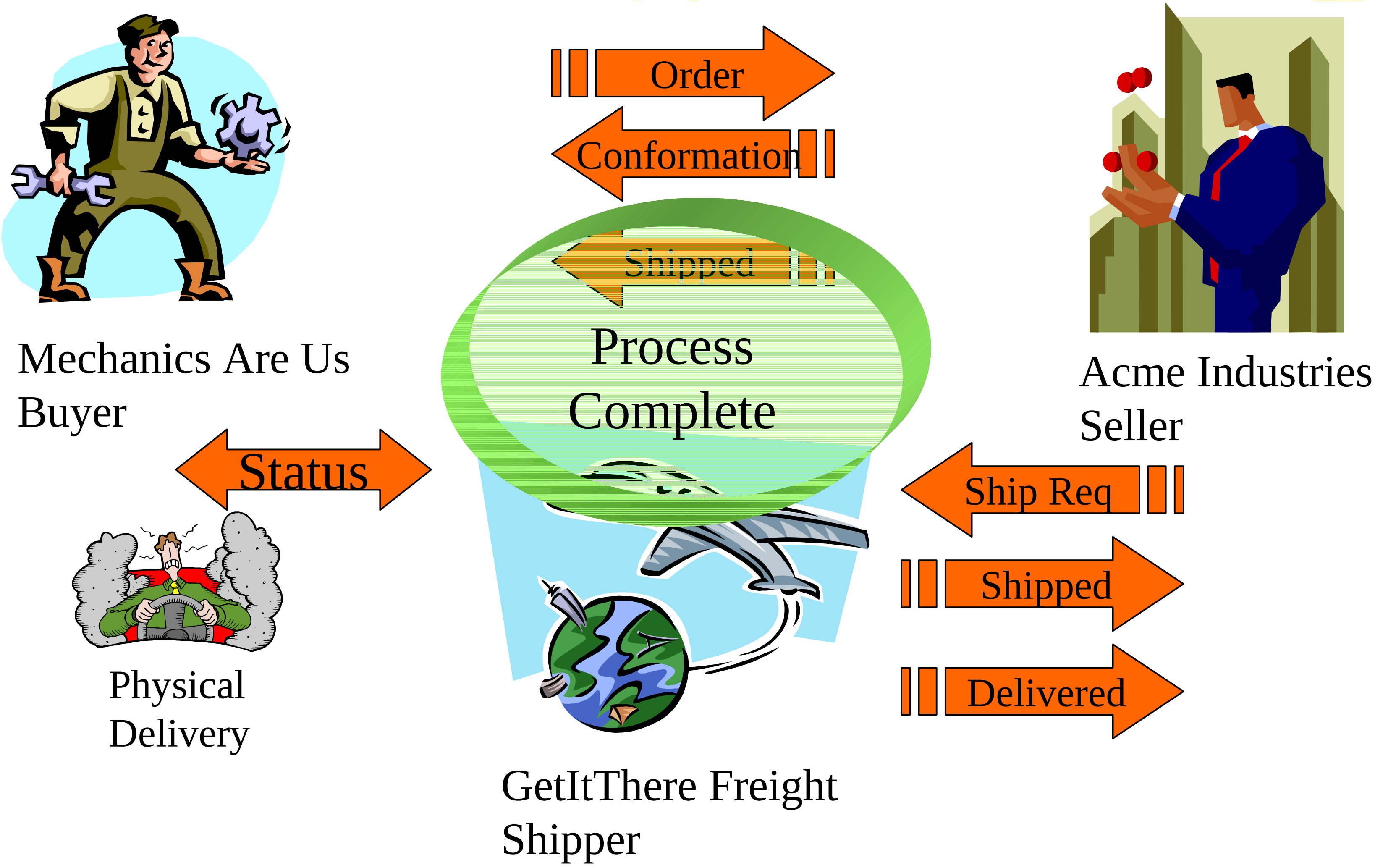
Ann
(Customer consultant)

Objects --> ClassifierRoles

Collaboration Diagram



The Marketplace Example



Order

Conformation

Shipped

Process Complete

Mechanics Are Us
Buyer

Status

Physical
Delivery

Acme Industries
Seller

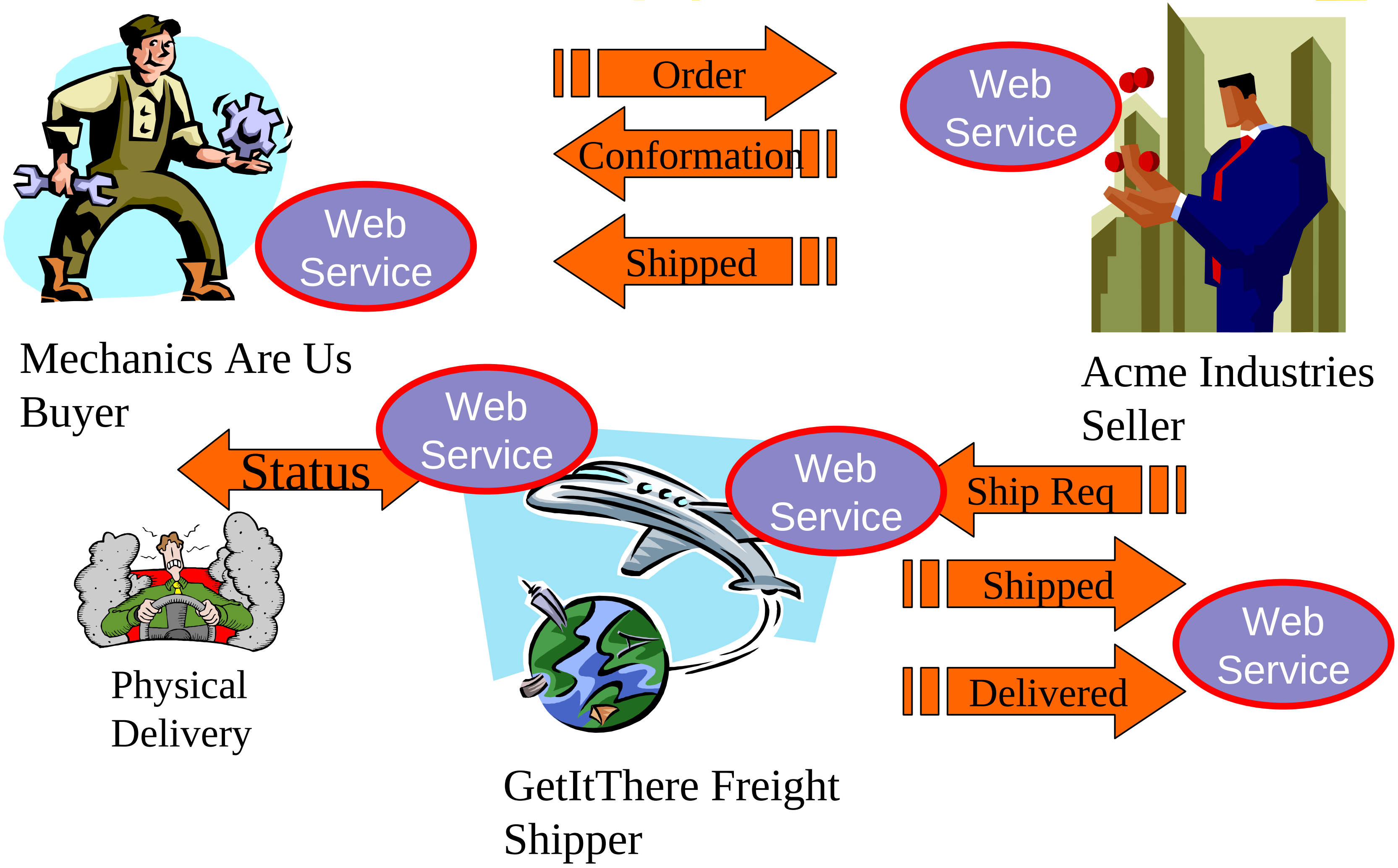
Ship Req

Shipped

Delivered

GetItThere Freight
Shipper

Where are the services?



Web Service

Order

Conformation

Shipped

Web Service

Mechanics Are Us
Buyer

Acme Industries
Seller

Status

Web Service

Web Service

Ship Req

Shipped

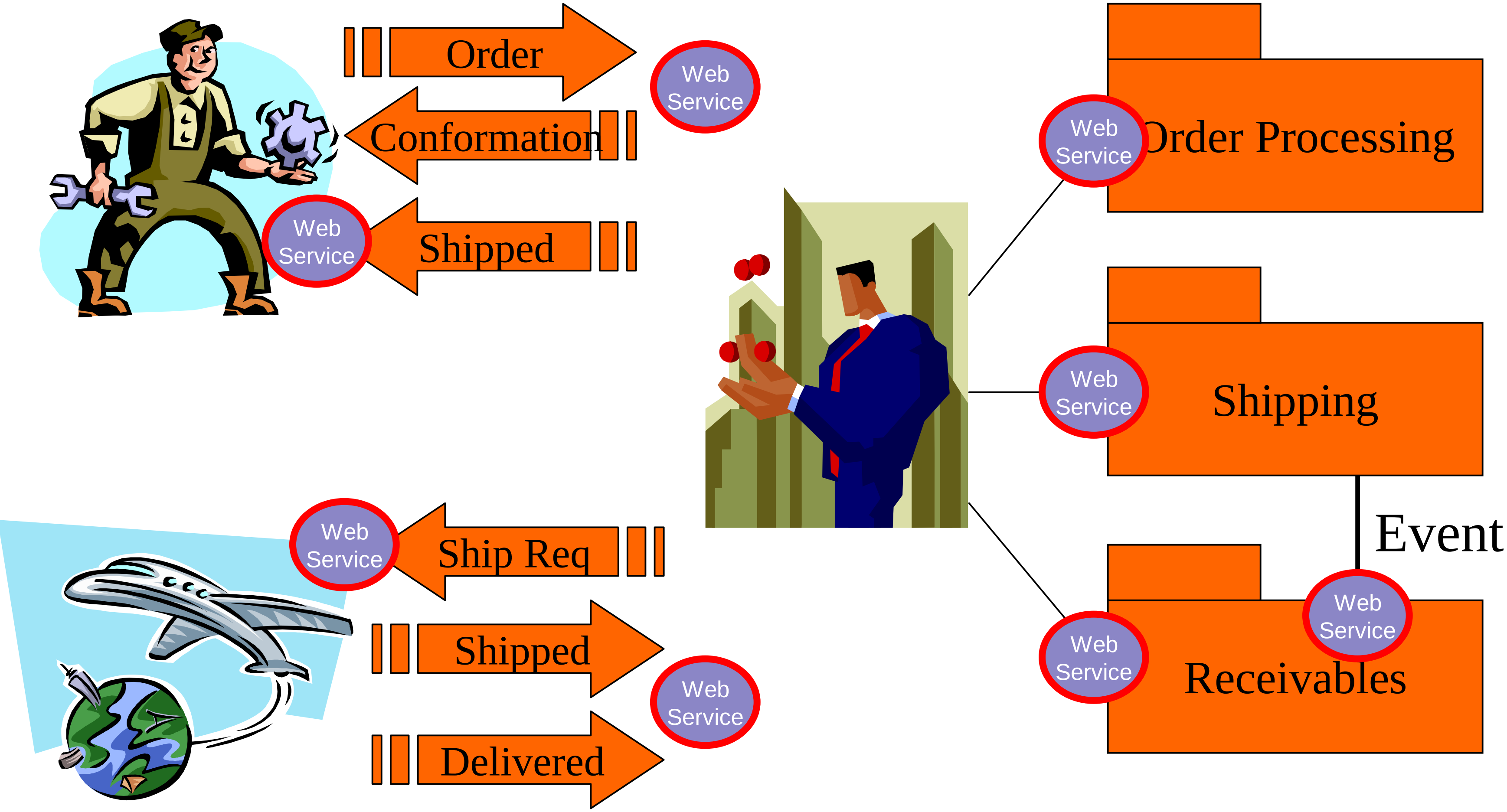
Delivered

Web Service

Physical
Delivery

GetItThere Freight
Shipper

Inside the Seller



Order

Web Service

Conformation

Web Service

Shipped

Web Service

Ship Req

Shipped

Web Service

Delivered

Web Service

Order Processing

Web Service

Shipping

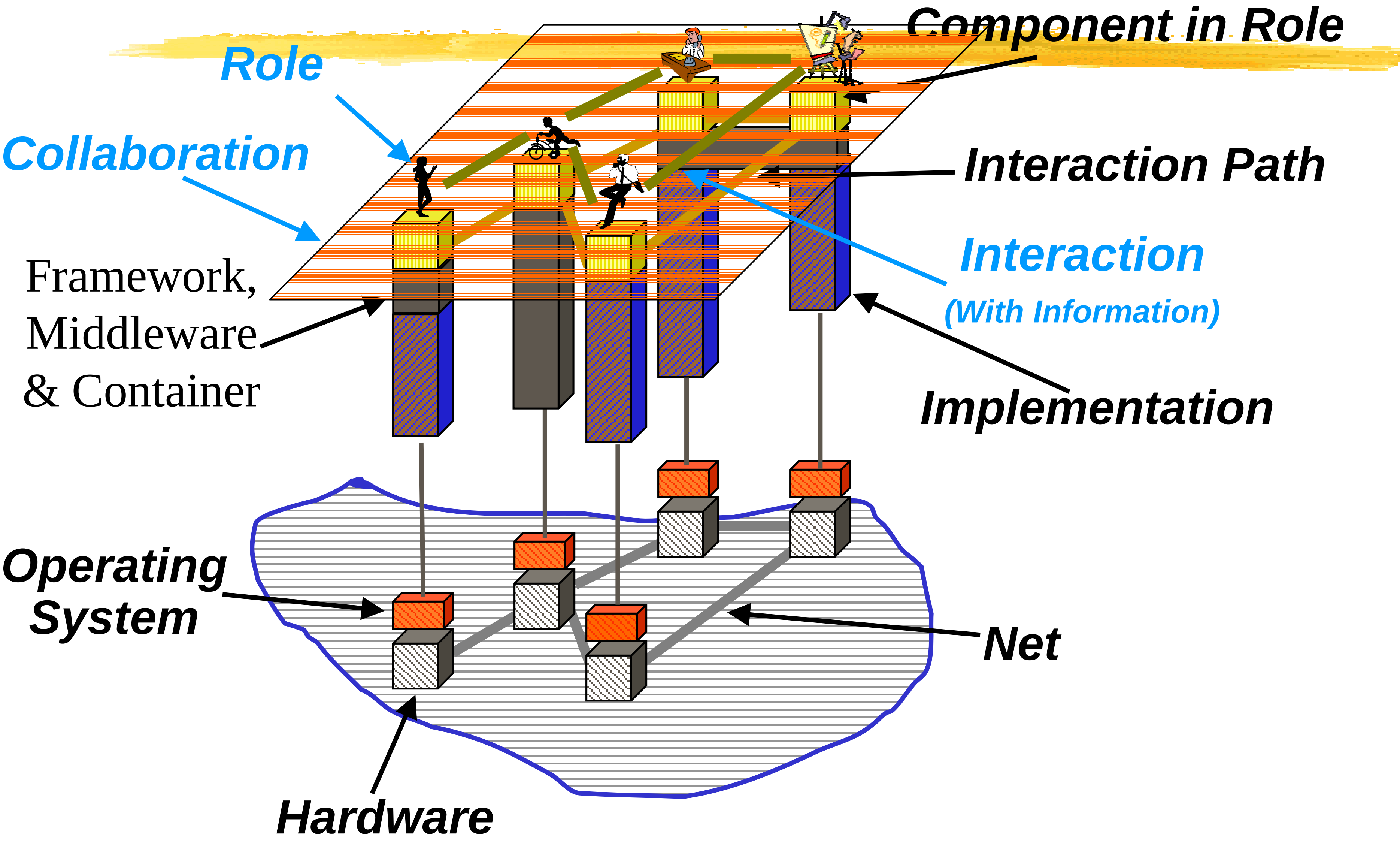
Event

Web Service

Web Service

Receivables

Roles to Systems



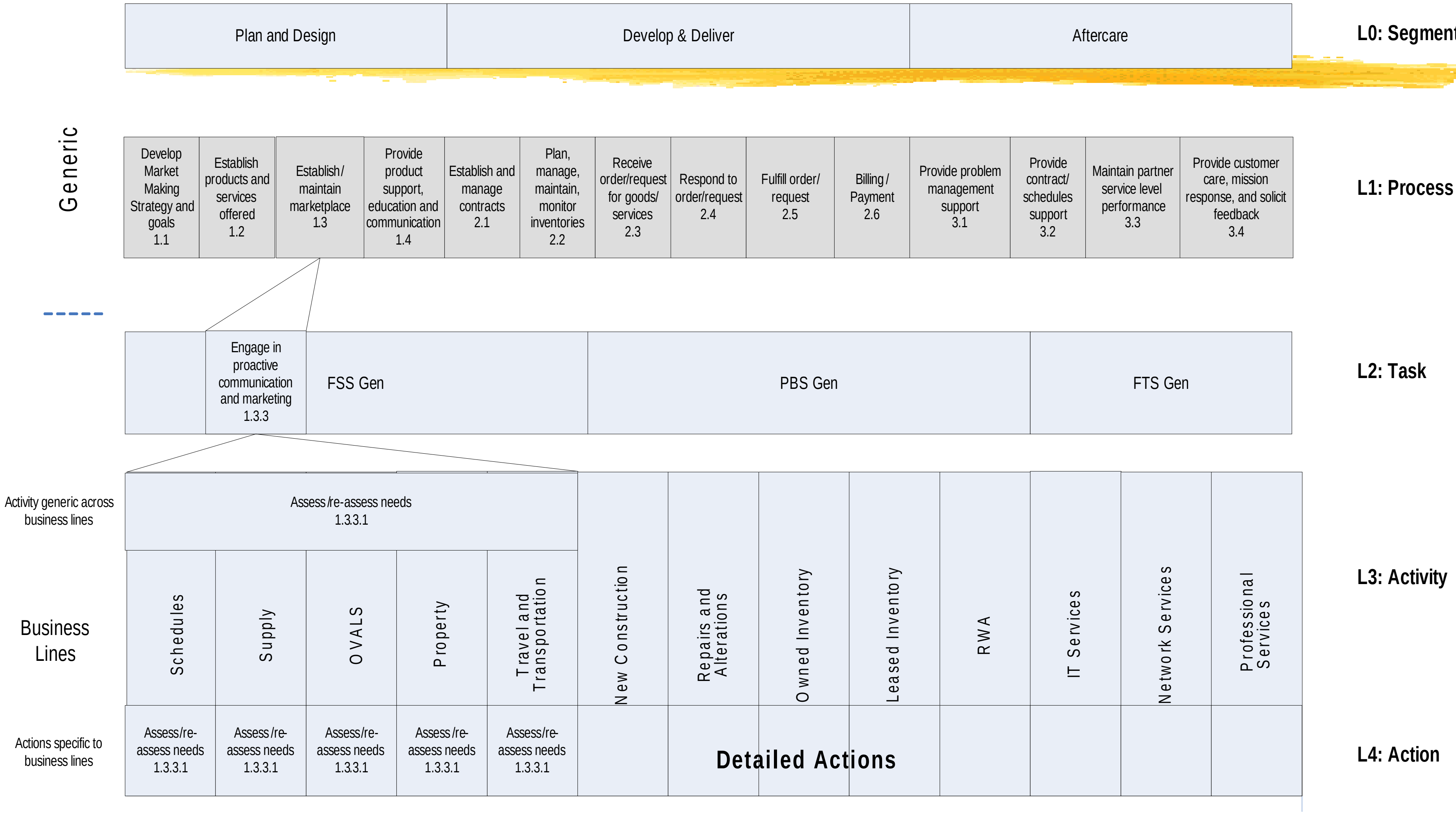
One-GSA Methodology

A simple methodology for creating collaborative business processes

Basic Steps

- Define business goals using Value Chain Analysis
- Refine to high-level activities
- Identify roles and organize roles into collaborations
- Define collaboration documents
- Create basic business transactions
- Organize into protocols and events
- Use protocols to define ports on roles
- Drill-down into role detail
- Use model as basis for acquisition
- Acquire/Implement roles
- Configure implementations for deployment with technology specifics
- Deploy

Mission Critical Value Chain



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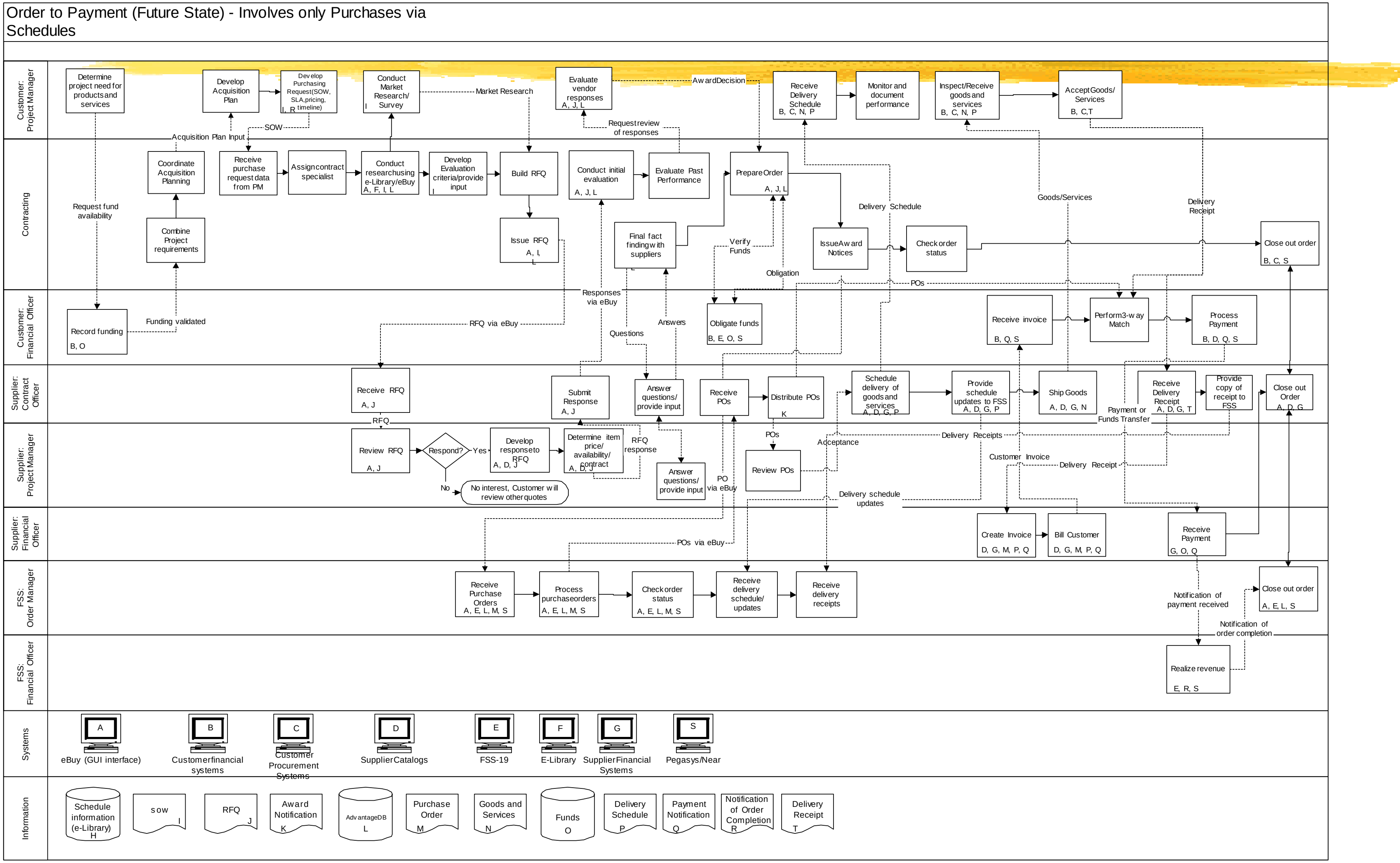
Detailed Actions

L4: Action

Detailed Workflows (Out of scope)

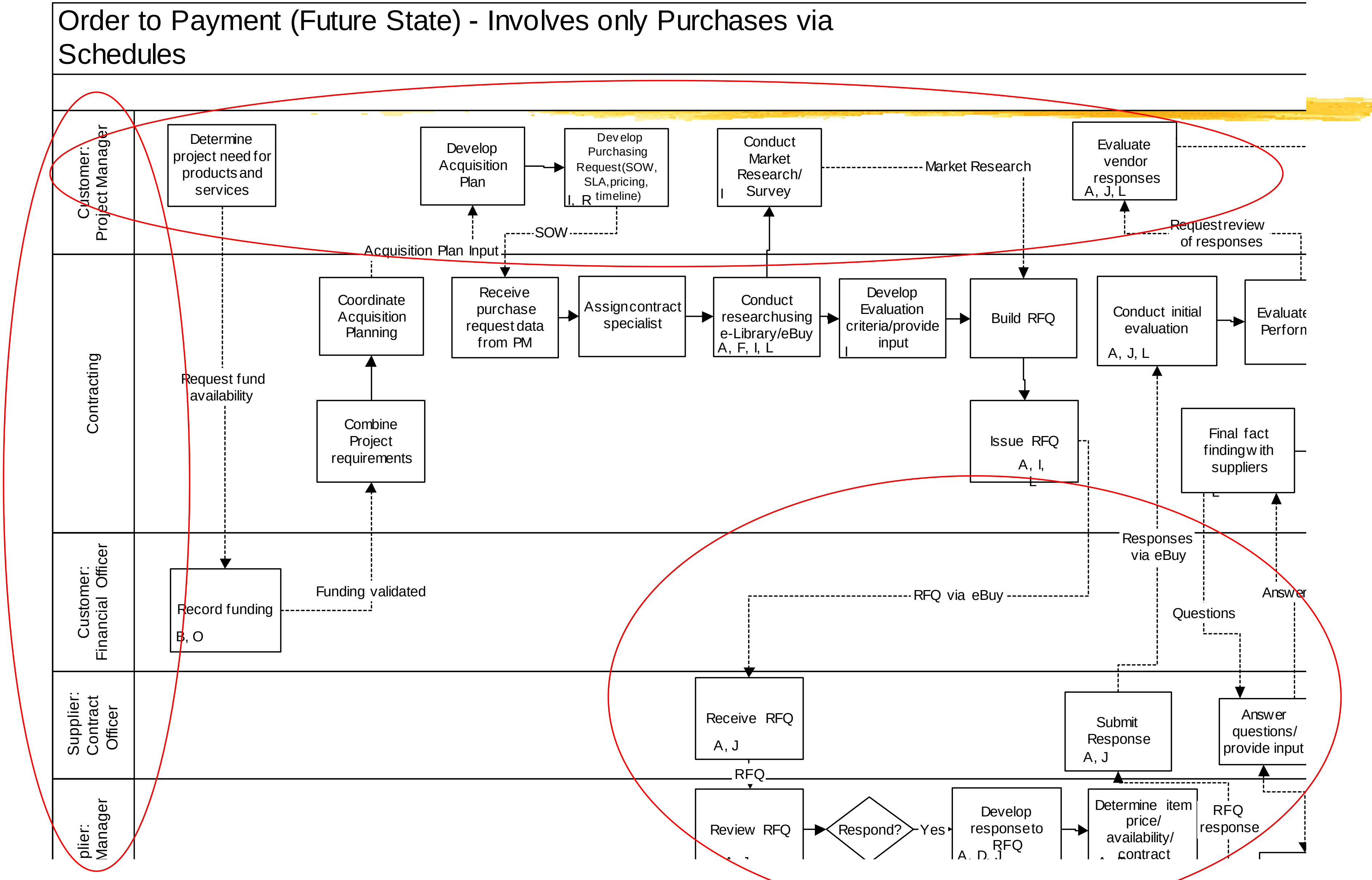
Order to Payment Process Diagram



Order to Payment (Future State) - Involves only Purchases via Schedules

Customer: Project Manager
Contracting
Customer: Financial Officer
Supplier: Contract Officer
Supplier: Project Manager
Supplier: Financial Officer
FSS: Order Manager
FSS: Financial Officer
Systems
Information
Determine project need for products and services
Develop Acquisition Plan
Develop Purchasing Request(SOW, SLA,pricing, timeline) I, R
Conduct Market Research/ Survey I
Market Research
Evaluate vendor responses A, J, L
AwardDecision
Receive Delivery Schedule B, C, N, P
Monitor and document performance
Inspect/Receive goods and services B, C, N, P
AcceptGoods/ Services B, C,T
SOW
Acquisition Plan Input
Request review of responses
Coordinate Acquisition Planning
Receive purchase request data from PM
Assigncontract specialist
Conduct researchusing e-Library/eBuy A, F, I, L
Develop Evaluation criteria/provide input I
Build RFQ
Conduct initial evaluation A, J, L
Evaluate Past Performance
Prepare Order A, J, L
Request fund availability
Combine Project requirements
Issue RFQ A, I, L
Final fact findingwith suppliers
Verify Funds
IssueAward Notices
Check order status
Delivery Schedule
Goods/Services
Delivery Receipt
Close out order B, C, S
Obligation
POs
Responses via eBuy
Record funding B, O
Funding validated
RFQ via eBuy
Answers
Questions
Obligate funds B, E, O, S
Receive invoice B, Q, S
Perform3-way Match
Process Payment B, D, Q, S
Receive RFQ A, J
Submit Response A, J
Answer questions/ provide input
Receive POs
Distribute POs K
Schedule delivery of goods and services A, D, G, P
Provide schedule updates to FSS A, D, G, P
Ship Goods A, D, G, N
Payment or Funds Transfer
Receive Delivery Receipt A, D, G, T
Provide copy of receipt to FSS
Close out Order A, D, G
RFQ
Review RFQ A, J
Respond?
Yes
No
No interest, Customer will review other quotes
Develop responseto RFQ A, D, J
Determine item price/ availability/ contract A, D, J
RFQ response
Answer questions/ provide input
PO via eBuy
POs
Review POs
Acceptance
Delivery Receipts
Customer Invoice
Delivery Receipt
Delivery schedule updates
Create Invoice D, G, M, P, Q
Bill Customer D, G, M, P, Q
Receive Payment G, O, Q
POs via eBuy
Receive Purchase Orders A, E, L, M, S
Process purchaseorders A, E, L, M, S
Checkorder status A, E, L, M, S
Receive delivery schedule/ updates
Receive delivery receipts
Notification of payment received
Close out order A, E, L, S
Notification of order completion
Realize revenue E, R, S
A eBuy (GUI interface)
B Customerfinancial systems
C Customer Procurement Systems
D SupplierCatalogs
E FSS-19
F E-Library
G SupplierFinancial Systems
S Pegasys/Near
Schedule information (e-Library) H
sow I
RFQ J
Award Notification K
AdvantageDB L
Purchase Order M
Goods and Services N
Funds O
Delivery Schedule P
Payment Notification Q
Notification of Order Completion R
Delivery Receipt T

Order to Payment Process Diagram



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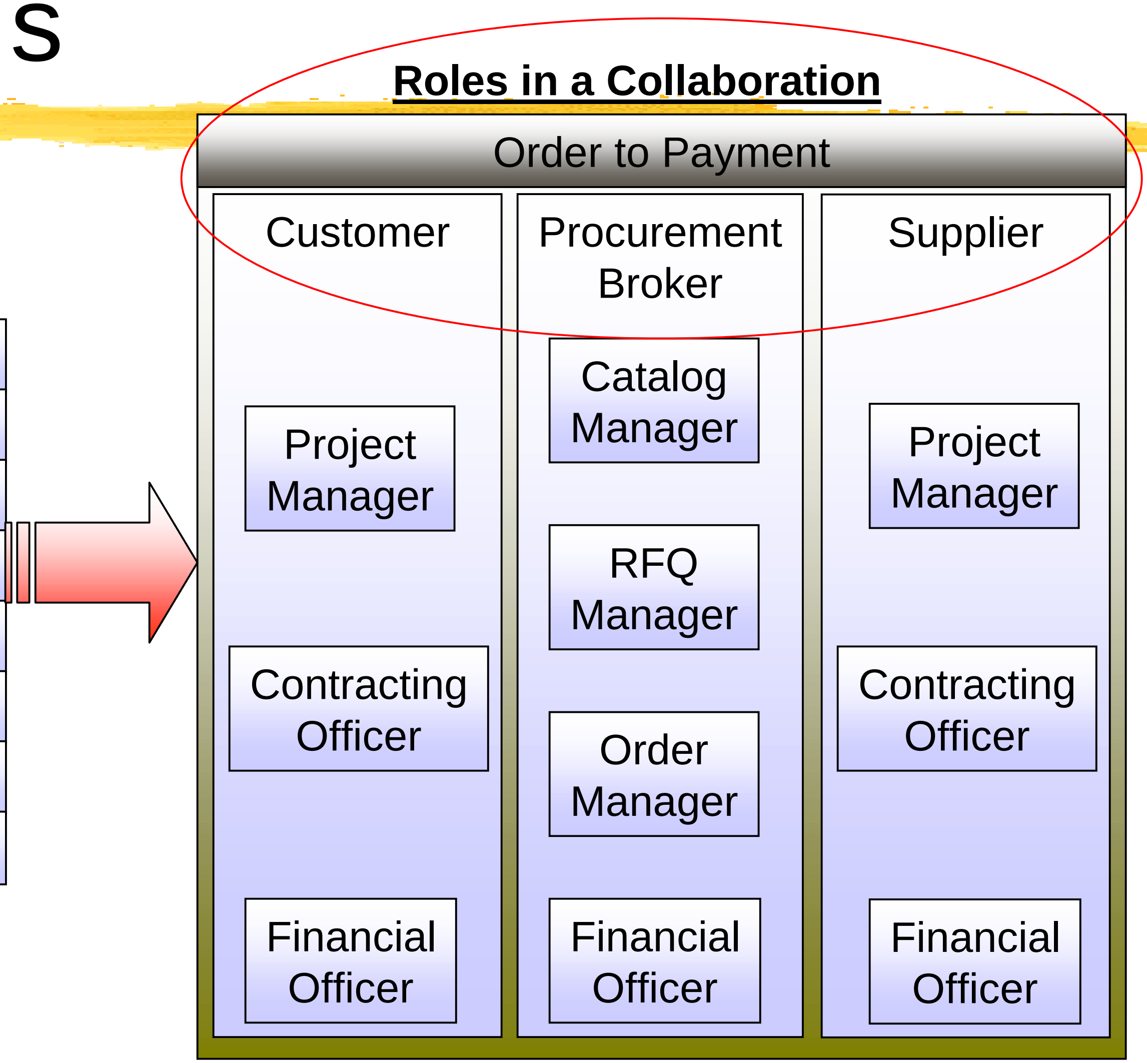
Determine project need for products and services
Develop Acquisition Plan
Develop Purchasing Request(SOW, SLA, pricing, timeline)
I, R
Conduct Market Research/ Survey
I
Market Research
Evaluate vendor responses
A, J, L
Request review of responses
SOW
Acquisition Plan Input
Contracting
Coordinate Acquisition Planning
Receive purchase request data from PM
Assign contract specialist
Conduct research using e-Library/eBuy
A, F, I, L
Develop Evaluation criteria/provide input
I
Build RFQ
Conduct initial evaluation
A, J, L
Evaluate Perforn
Request fund availability
Combine Project requirements
Issue RFQ
A, I, L
Final fact finding with suppliers
L
Customer: Financial Officer
Record funding
B, O
Funding validated
RFQ via eBuy
Responses via eBuy
Questions
Answer
Supplier: Contract Officer
Receive RFQ
A, J
Submit Response
A, J
Answer questions/ provide input
RFQ
plier: Manager
Review RFQ
A, J
Respond?
Yes
Develop response to RFQ
A, D, J
Determine item price/ availability/ contract
A
RFQ response

Finding the Roles and Inner Roles

“Swim Lanes”

- Customer Project Manager
- Customer Contracting
- Customer Financial Officer
- Supplier Financial Officer
- Supplier Project Manager
- Supplier Contracting Officer
- FSS: Order Manager
- FSS: Financial Officer



Roles in a Collaboration

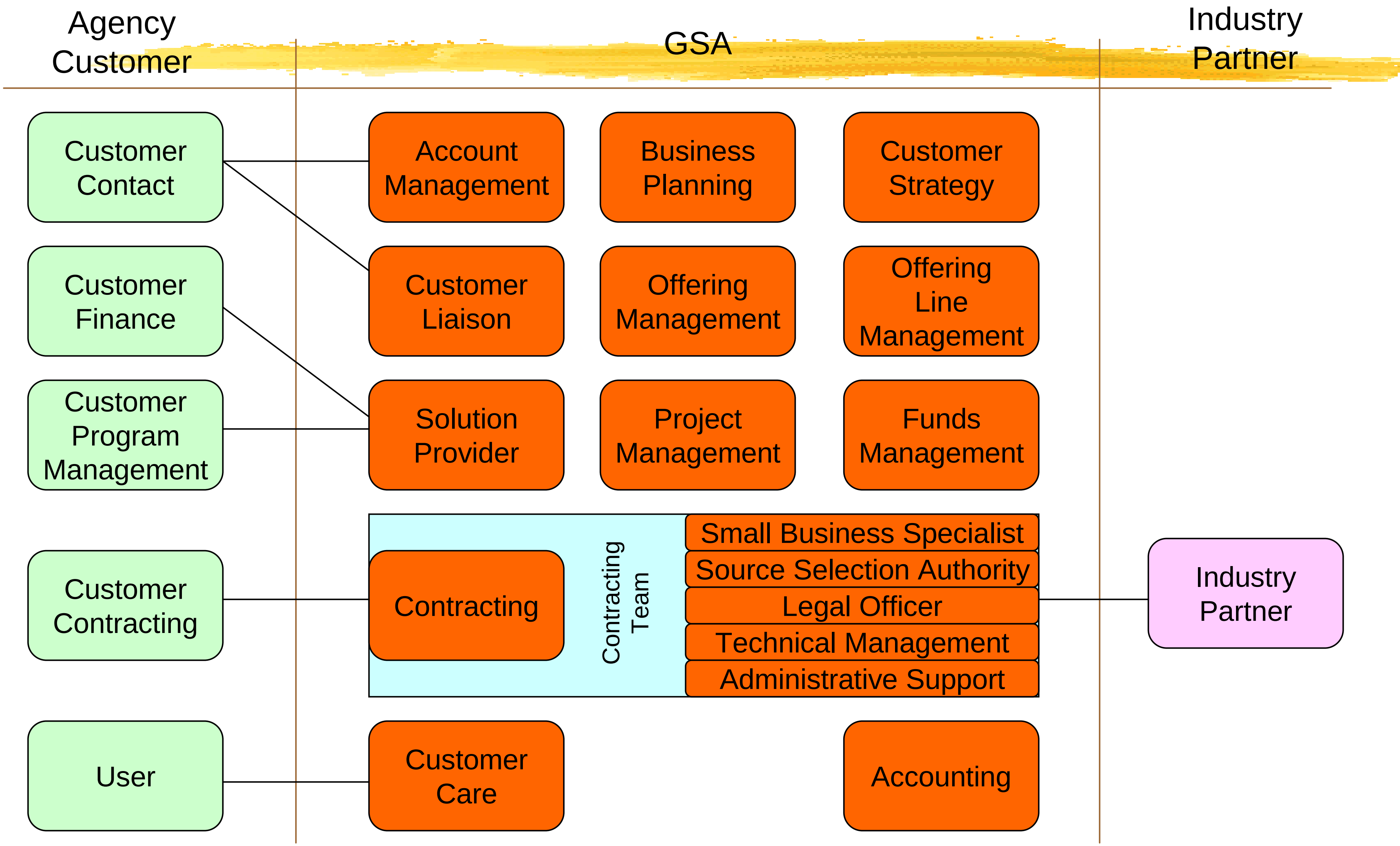
Order to Payment

Customer: Project Manager, Contracting Officer, Financial Officer

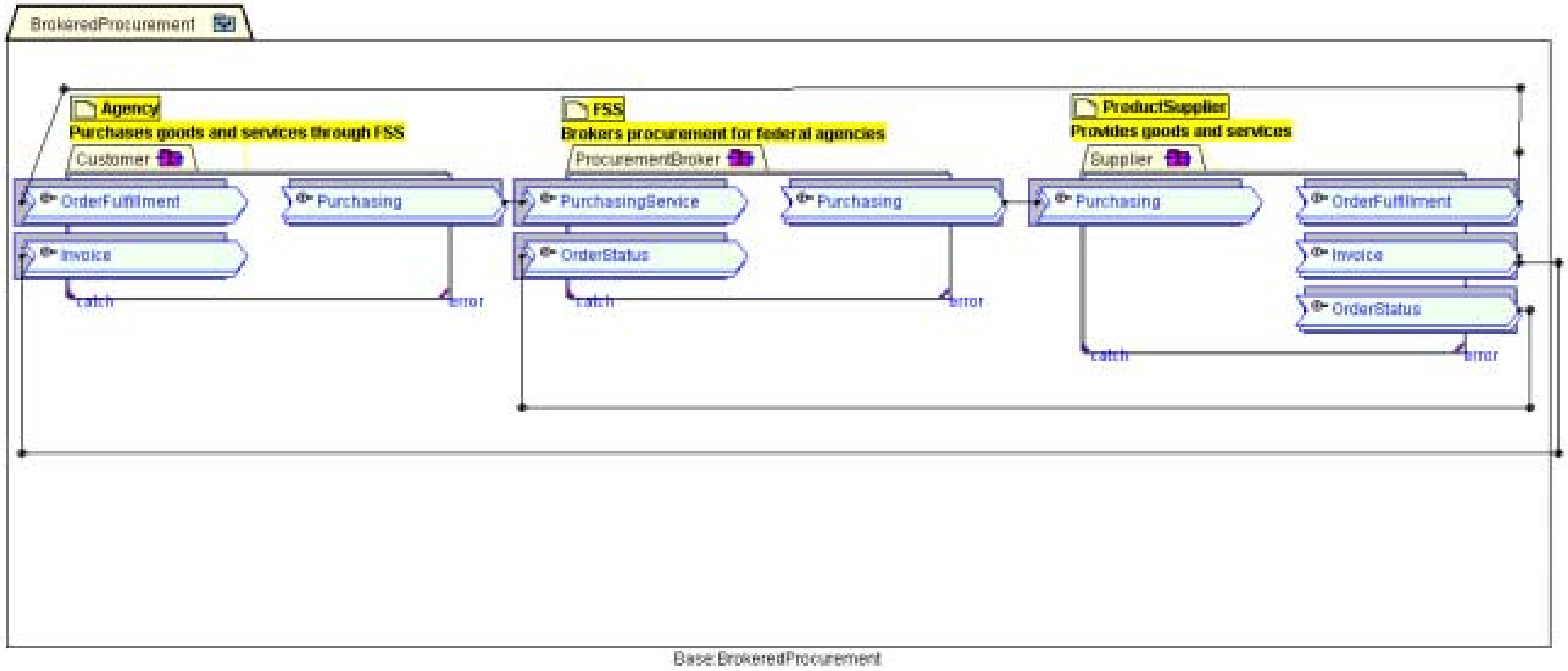
Procurement Broker: Catalog Manager, RFQ Manager, Order Manager, Financial Officer

Supplier: Project Manager, Contracting Officer, Financial Officer

High-level role identification

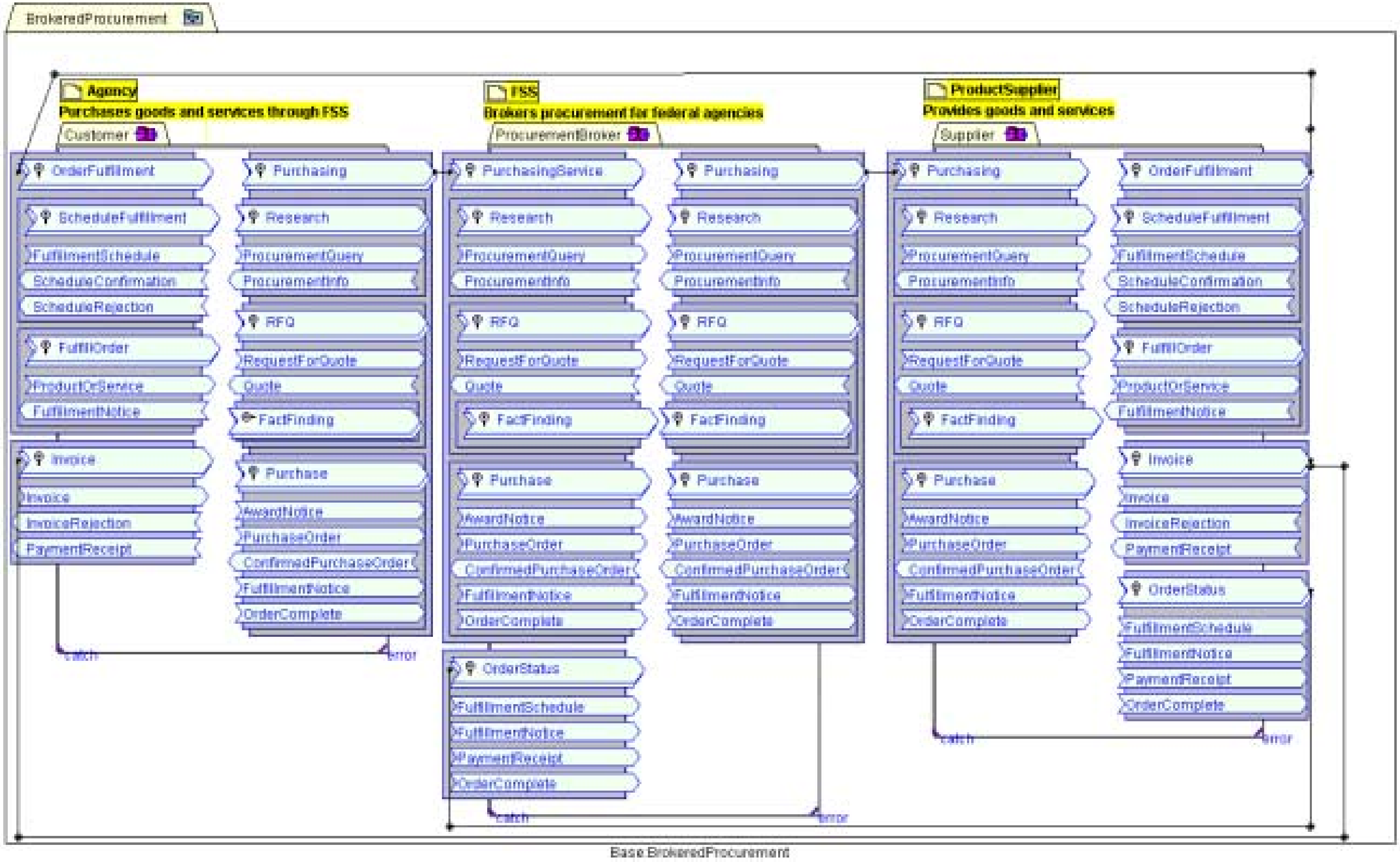


Summary Top Level Collaboration

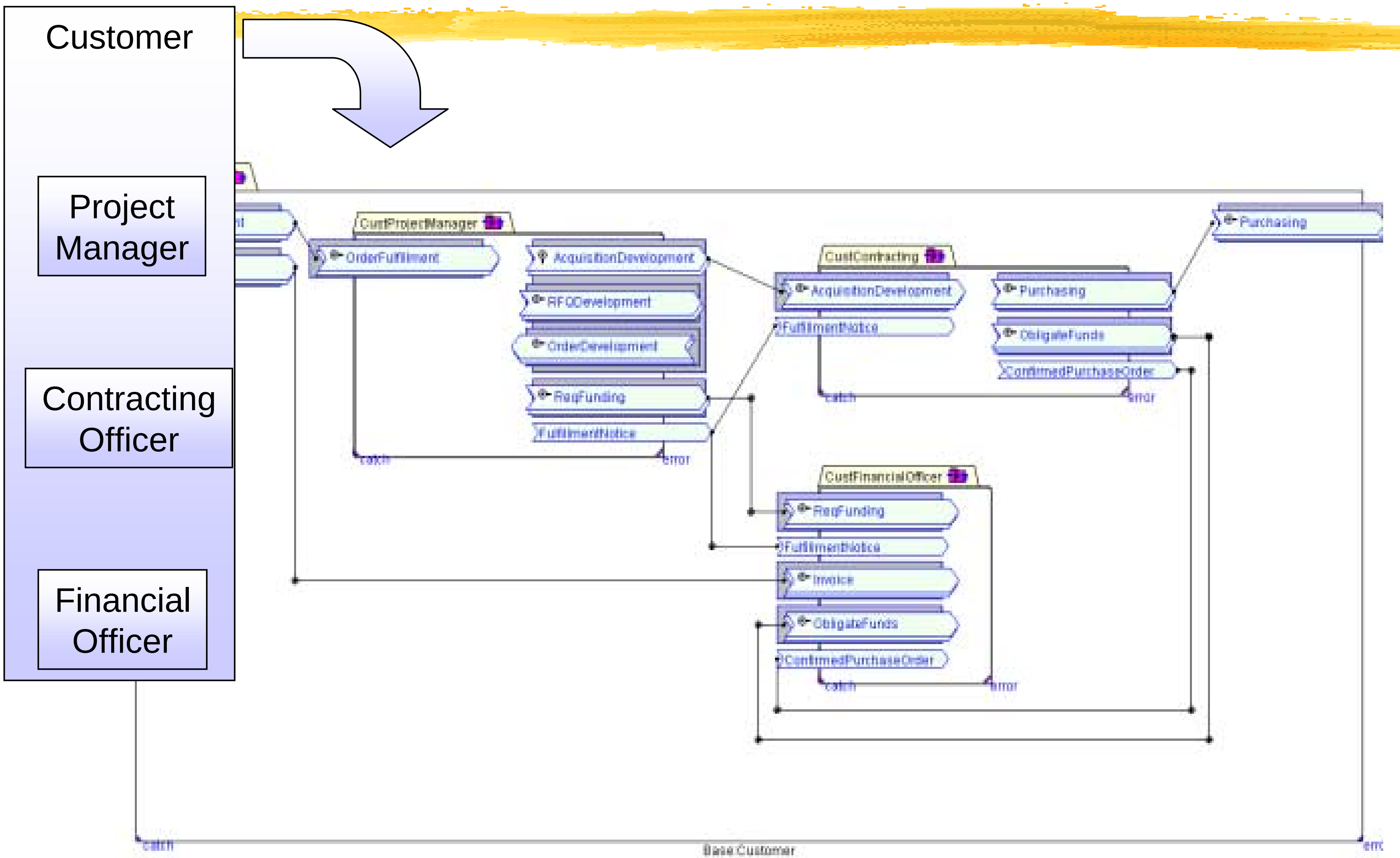


Simplified View - Level of detail is optional

Co-Managed Services Collaboration



Drilling Down into Customer Detail



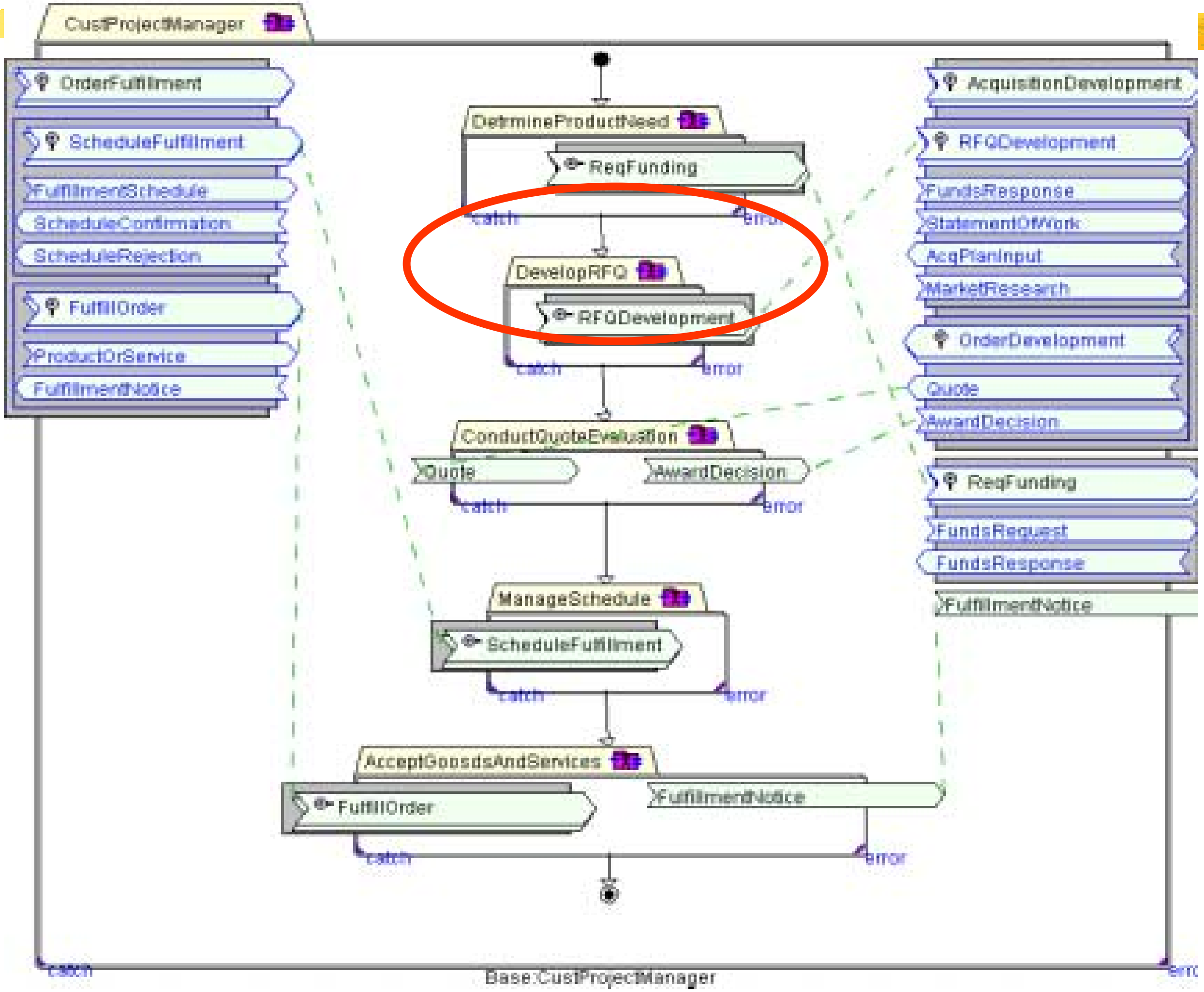
Customer

Project Manager

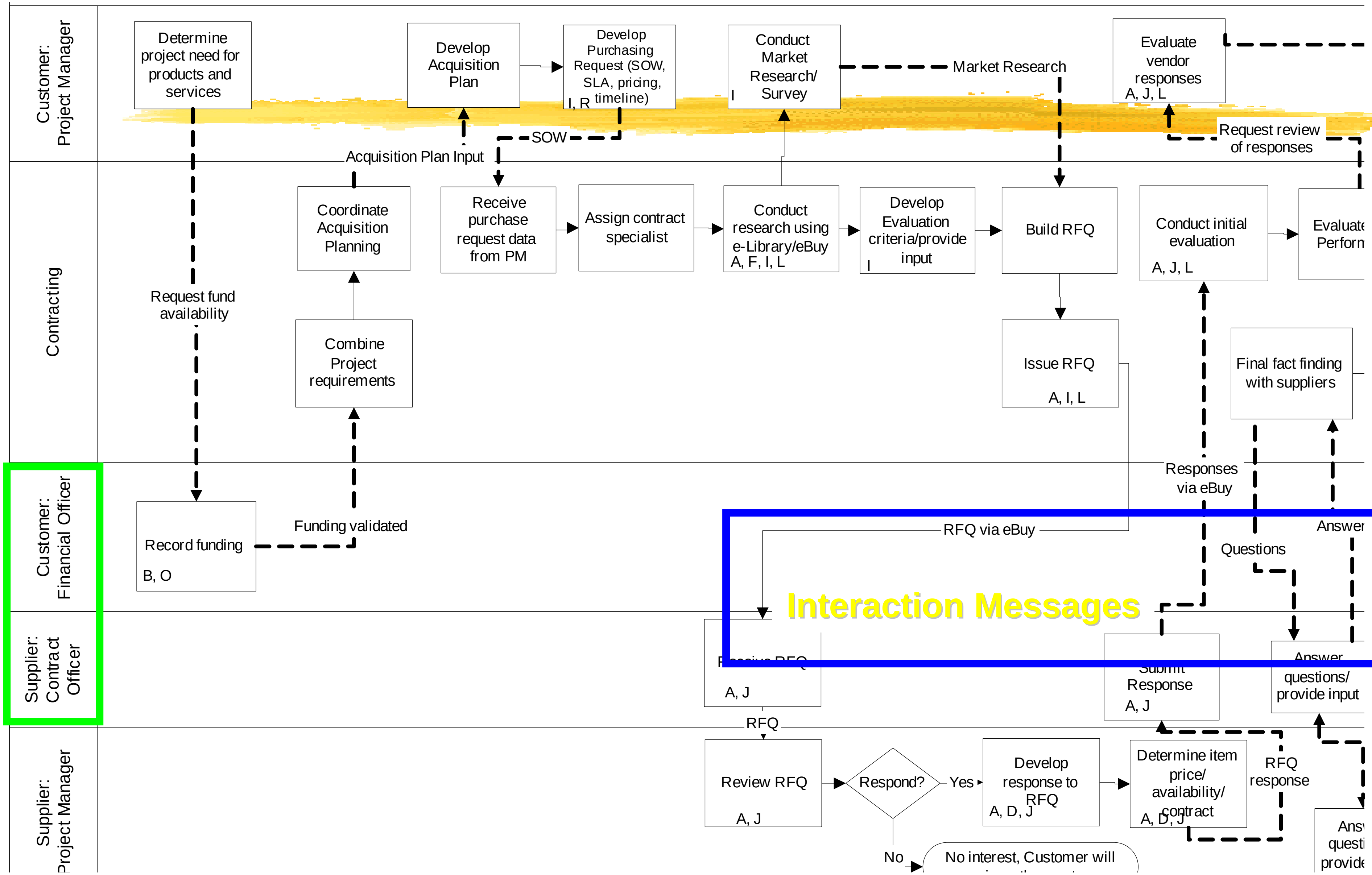
Contracting Officer

Financial Officer

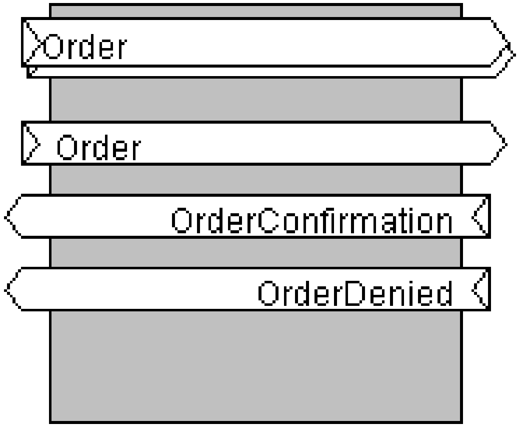
Choreography of Process



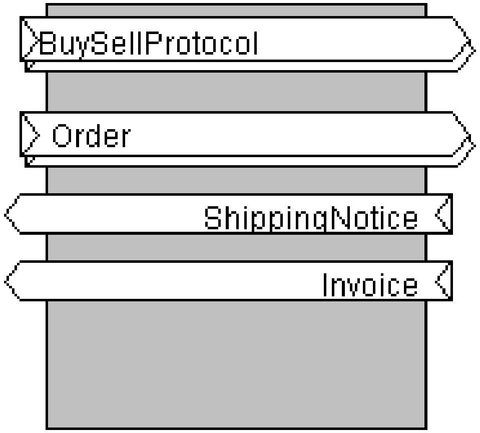
Protocols group Role Interactions into Conversations

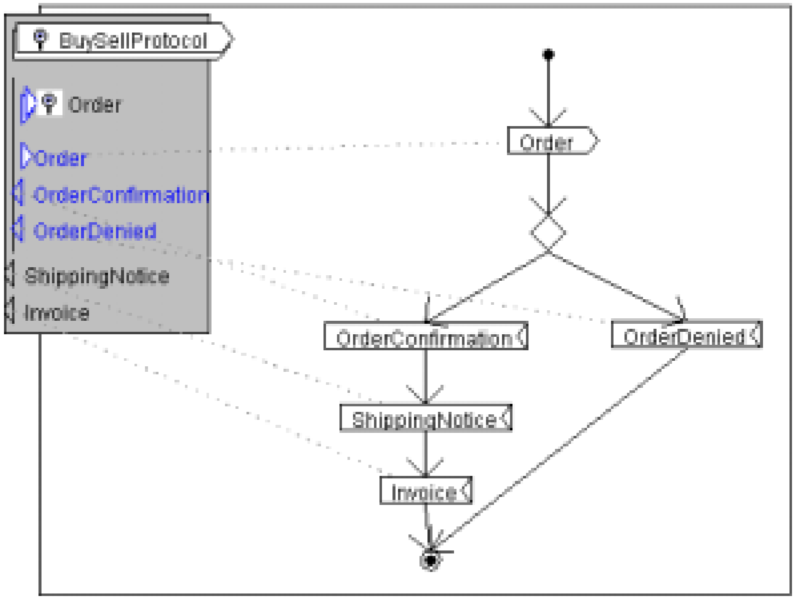

Customer: Project Manager
Contracting
Customer: Financial Officer
Supplier: Contract Officer
Supplier: Project Manager
Determine project need for products and services
Develop Acquisition Plan
Develop Purchasing Request (SOW, SLA, pricing, timeline)
I, R
Conduct Market Research/ Survey
I
Market Research
Evaluate vendor responses
A, J, L
Request review of responses
SOW
Acquisition Plan Input
Coordinate Acquisition Planning
Receive purchase request data from PM
Assign contract specialist
Conduct research using e-Library/eBuy
A, F, I, L
Develop Evaluation criteria/provide input
I
Build RFQ
Conduct initial evaluation
A, J, L
Evaluate Perform
Request fund availability
Combine Project requirements
Issue RFQ
A, I, L
Final fact finding with suppliers
Responses via eBuy
Record funding
B, O
Funding validated
RFQ via eBuy
Questions
Answer
Interaction Messages
Receive RFQ
A, J
Submit Response
A, J
Answer questions/ provide input
RFQ
Review RFQ
A, J
Respond?
Yes
No
Develop response to RFQ
A, D, J
Determine item price/ availability/ contract
A, D, J
RFQ response
No interest, Customer will
Ans questi provide

Create Business Transactions



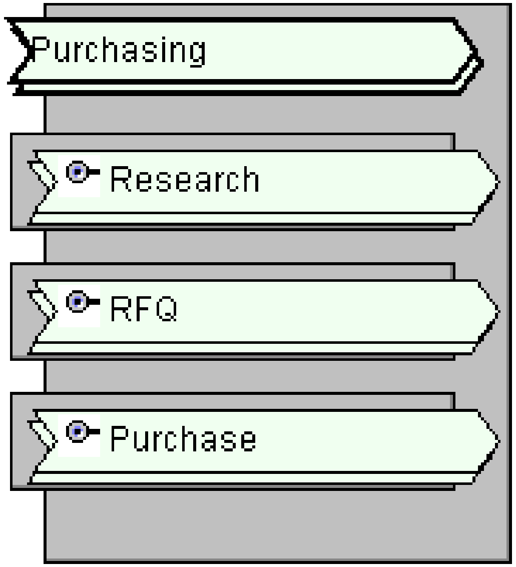
Organize into protocols





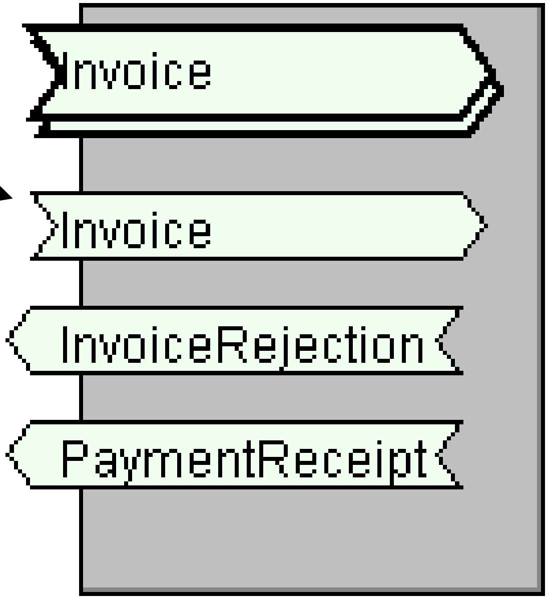
Inner Protocols

- Protocols represent conversations between roles
- Conversations frequently have sub-conversations, detail about a specific subject
- These sub-conversations are inner protocols
- Inner protocols can also be reused in other protocols or even as top-level protocols
- Protocols can “nest” to any level of detail



Operations & Business Transactions

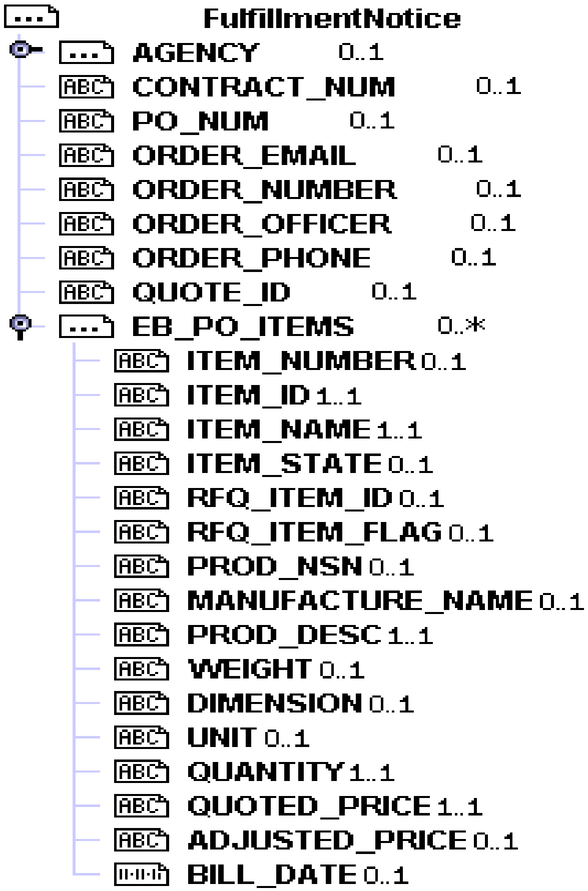
- The highest level of interaction detail is specified as the flow of documents - business information.
- This can be as events or “business transactions”
- Business transactions are a “request/reply” that usually results in creating or satisfying some business commitment - it may take place over an extended time
- We specify abstract document types to represent the information that flows.



Empty – “Abstract”

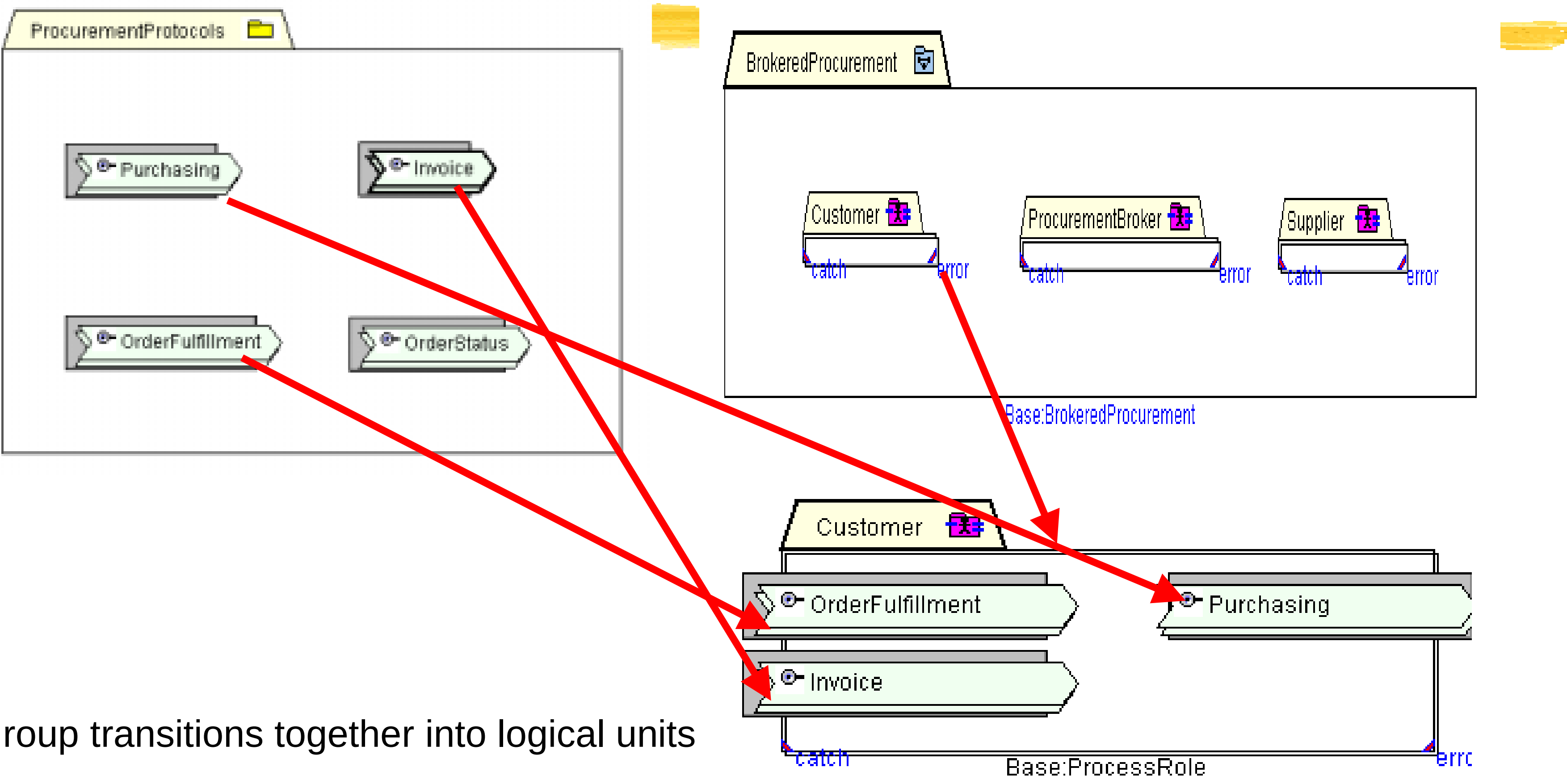
Modeling Collaboration Documents

- Fill in details of the documents
- Focus on business information - not technology
- Collaboration - Not an information model
- May be derived from existing sources
- Helps in creating technology mappings - E.G. Web Services
- Includes
  - Composition
  - Type
  - Cardinality



```
FulfillmentNotice
  AGENCY 0..1
  CONTRACT_NUM 0..1
  PO_NUM 0..1
  ORDER_EMAIL 0..1
  ORDER_NUMBER 0..1
  ORDER_OFFICER 0..1
  ORDER_PHONE 0..1
  QUOTE_ID 0..1
  EB_PO_ITEMS 0..*
    ITEM_NUMBER 0..1
    ITEM_ID 1..1
    ITEM_NAME 1..1
    ITEM_STATE 0..1
    RFQ_ITEM_ID 0..1
    RFQ_ITEM_FLAG 0..1
    PROD_NSN 0..1
    MANUFACTURE_NAME 0..1
    PROD_DESC 1..1
    WEIGHT 0..1
    DIMENSION 0..1
    UNIT 0..1
    QUANTITY 1..1
    QUOTED_PRICE 1..1
    ADJUSTED_PRICE 0..1
    BILL_DATE 0..1
```

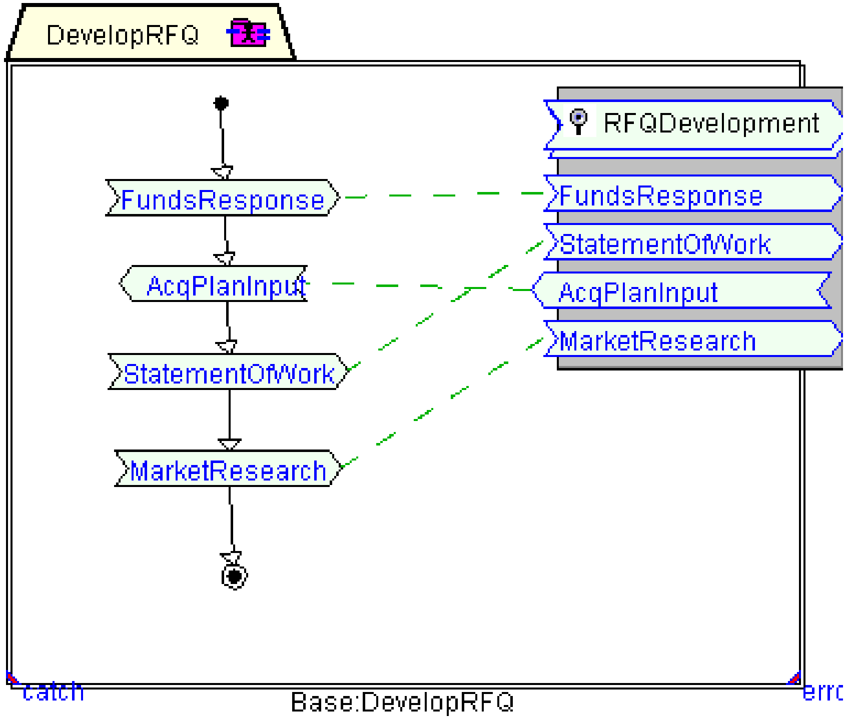
Attach Protocols to Roles as “Ports”



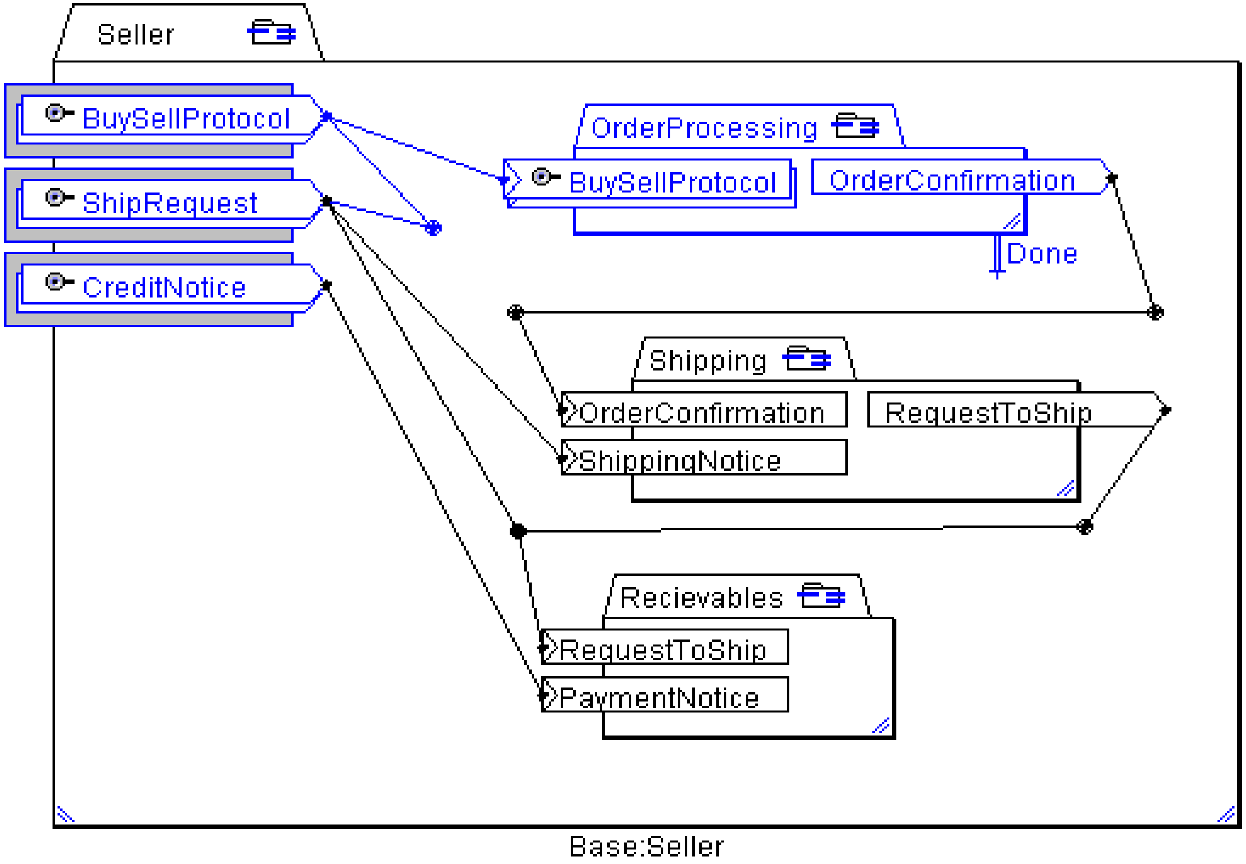
Group transitions together into logical units

Detailed Information Flows

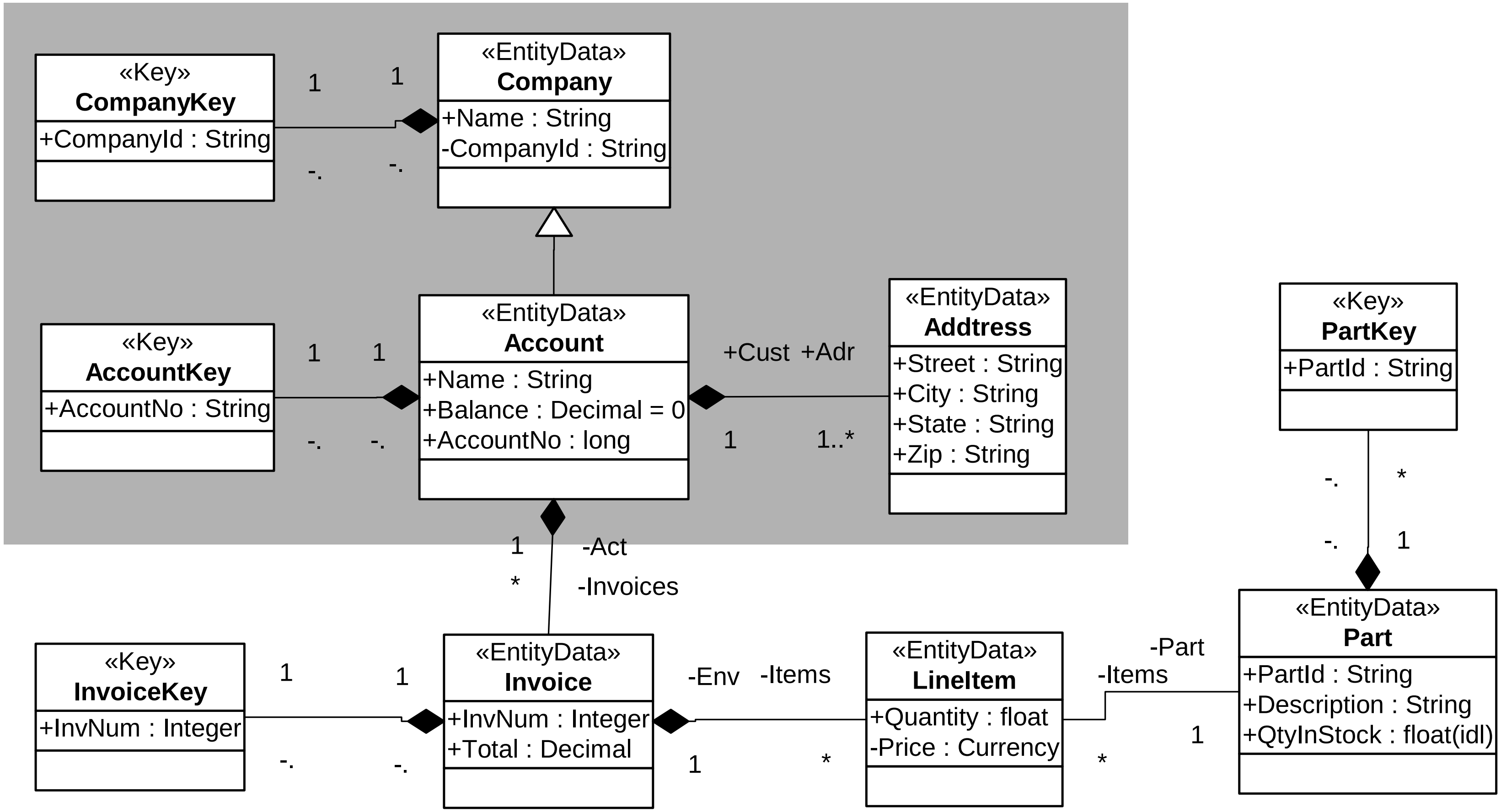
- Inside the activities we can drill down to inner activities or detailed document flows - sending and receiving information
- This is used for the simulation, to validate the the model is correct and ultimately to test the implemented components.



Drill-down

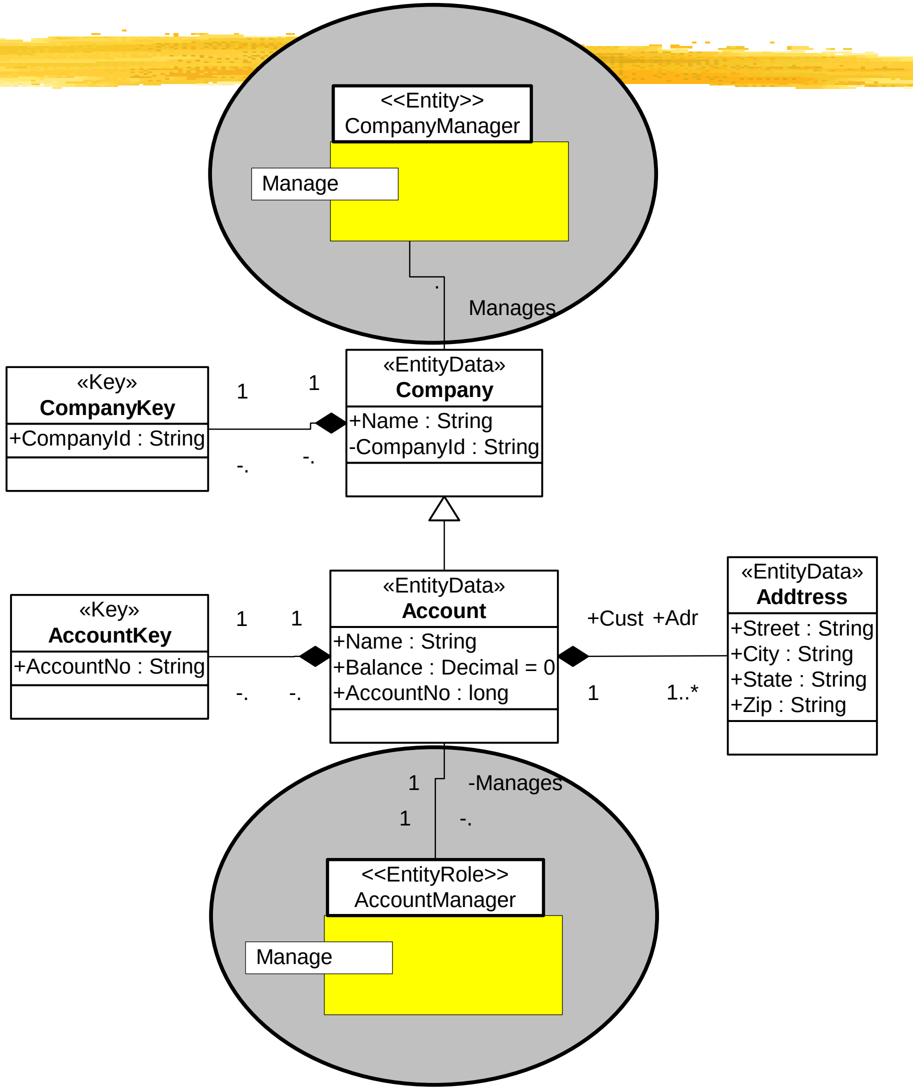

Seller
BuySellProtocol
ShipRequest
CreditNotice
OrderProcessing
BuySellProtocol
OrderConfirmation
Done
Shipping
OrderConfirmation
RequestToShip
ShippingNotice
Recievables
RequestToShip
PaymentNotice
Base:Seller

Sample Information Model

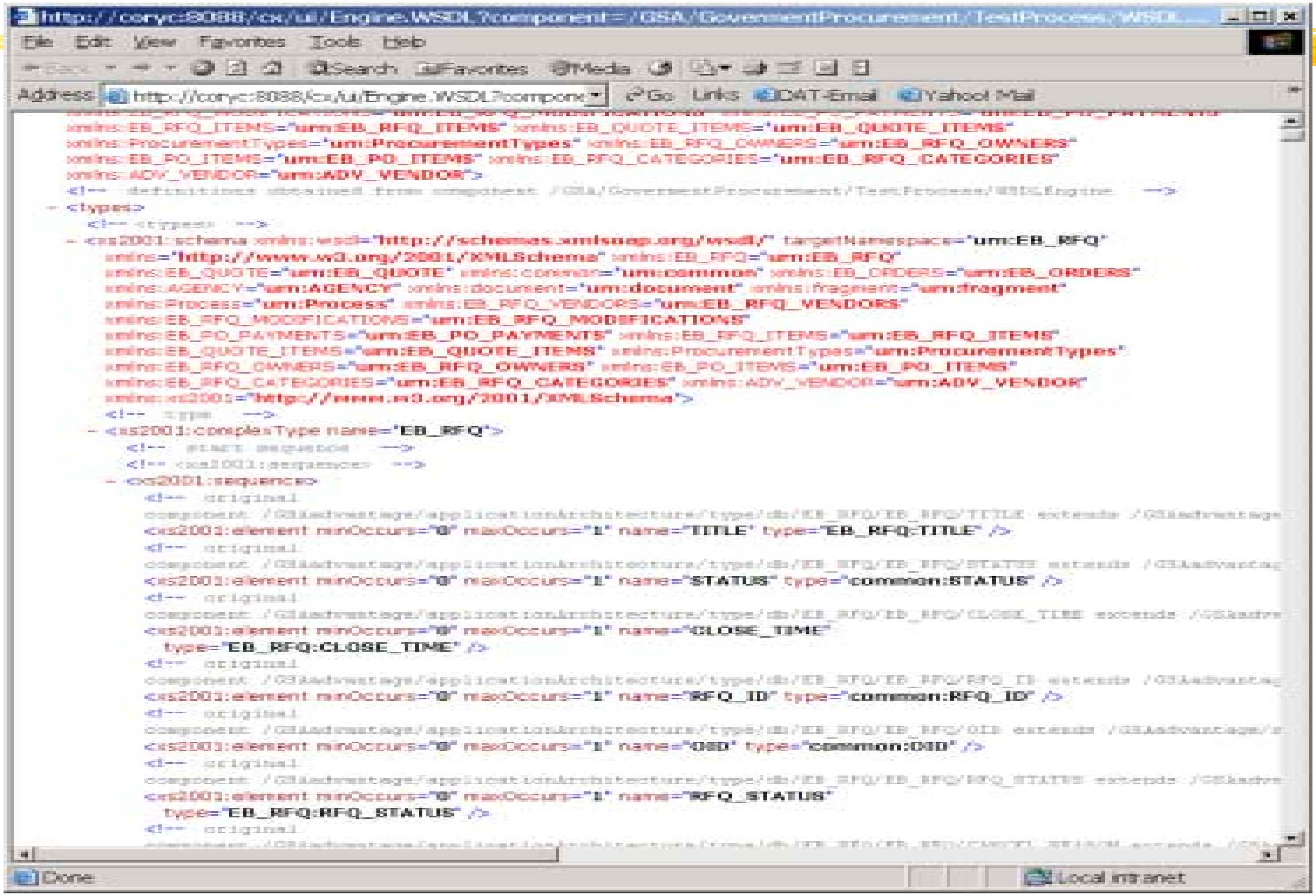


Adding Entities

- Entities are added to manage entity data
- Entity Roles are managers that provides a view of the same identity in another context
- The Entities have ports for managing and accessing the entities
- Non-entities which are owned by (aggregate into) an entity are managed by the entity



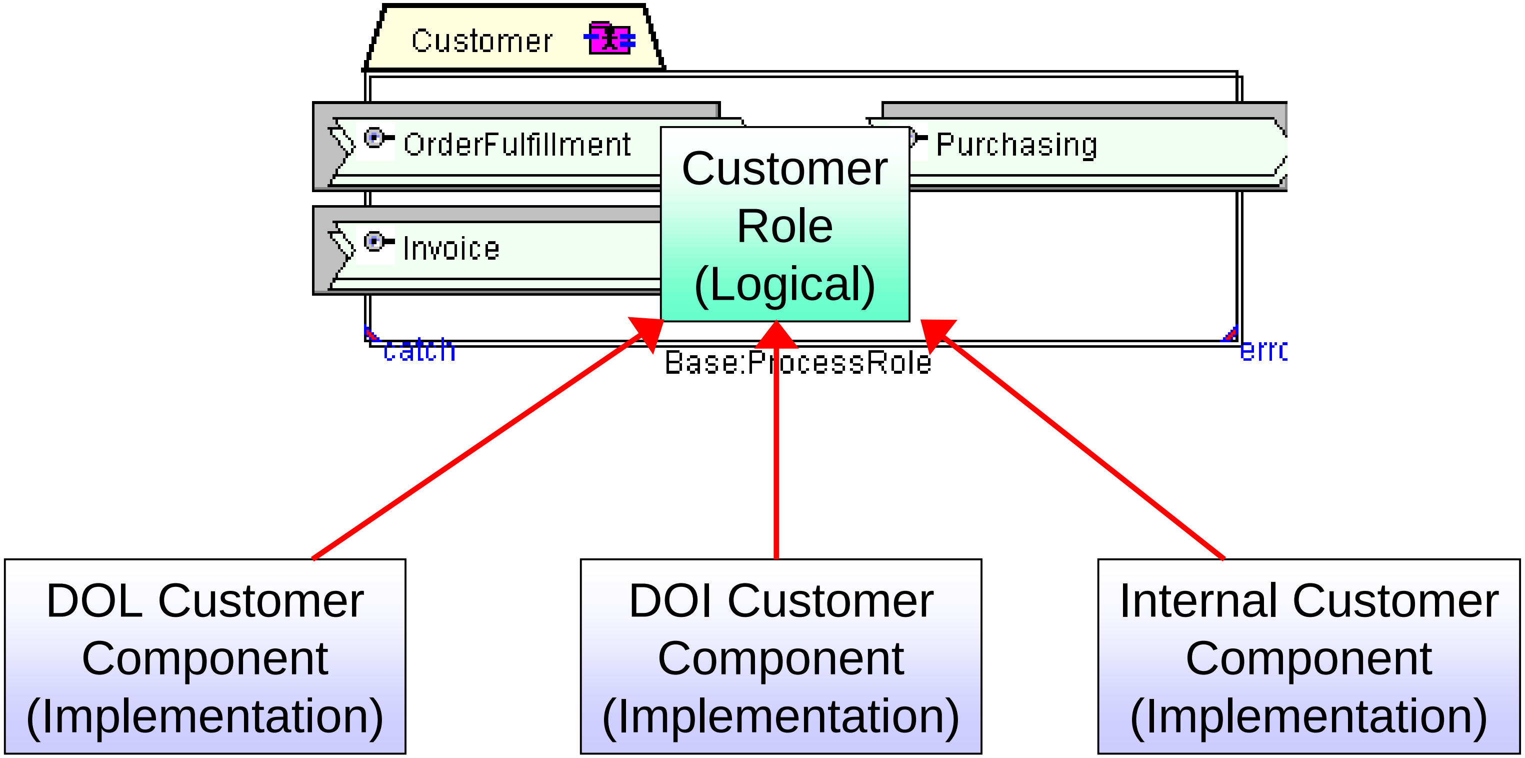
Generated Web Service



http://coryc:8088/cx/ui/Engine.WSDL?component=/GSA/GovernmentProcurement/TestProcess/WSDL...
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://coryc:8088/cx/ui/Engine.WSDL?compone
Go Links DAT-Email Yahoo! Mail
Done
Local intranet

```
  xmlns:EB_RFQ_ITEMS="urn:EB_RFQ_ITEMS" xmlns:EB_QUOTE_ITEMS="urn:EB_QUOTE_ITEMS"
  xmlns:ProcurementTypes="urn:ProcurementTypes" xmlns:EB_RFQ_OWNERS="urn:EB_RFQ_OWNERS"
  xmlns:EB_PO_ITEMS="urn:EB_PO_ITEMS" xmlns:EB_RFQ_CATEGORIES="urn:EB_RFQ_CATEGORIES"
  xmlns:ADV_VENDOR="urn:ADV_VENDOR">
  <!-- definitions obtained from component /GSA/GovermentProcurement/TestProcess/WSDLEngine -->
- <types>
    <!-- <types> -->
  - <xs2001:schema xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/" targetNamespace="urn:EB_RFQ"
      xmlns="http://www.w3.org/2001/XMLSchema" xmlns:EB_RFQ="urn:EB_RFQ"
      xmlns:EB_QUOTE="urn:EB_QUOTE" xmlns:common="urn:common" xmlns:EB_ORDERS="urn:EB_ORDERS"
      xmlns:AGENCY="urn:AGENCY" xmlns:document="urn:document" xmlns:fragment="urn:fragment"
      xmlns:Process="urn:Process" xmlns:EB_RFQ_VENDORS="urn:EB_RFQ_VENDORS"
      xmlns:EB_RFQ_MODIFICATIONS="urn:EB_RFQ_MODIFICATIONS"
      xmlns:EB_PO_PAYMENTS="urn:EB_PO_PAYMENTS" xmlns:EB_RFQ_ITEMS="urn:EB_RFQ_ITEMS"
      xmlns:EB_QUOTE_ITEMS="urn:EB_QUOTE_ITEMS" xmlns:ProcurementTypes="urn:ProcurementTypes"
      xmlns:EB_RFQ_OWNERS="urn:EB_RFQ_OWNERS" xmlns:EB_PO_ITEMS="urn:EB_PO_ITEMS"
      xmlns:EB_RFQ_CATEGORIES="urn:EB_RFQ_CATEGORIES" xmlns:ADV_VENDOR="urn:ADV_VENDOR"
      xmlns:xs2001="http://www.w3.org/2001/XMLSchema">
      <!-- type -->
    - <xs2001:complexType name="EB_RFQ">
        <!-- start sequence -->
        <!-- <xs2001:sequence> -->
      - <xs2001:sequence>
          <!-- original
          component /GSAadvantage/applicationArchitecture/type/db/EB_RFQ/EB_RFQ/TITLE extends /GSAadvantage
          <xs2001:element minOccurs="0" maxOccurs="1" name="TITLE" type="EB_RFQ:TITLE" />
          <!-- original
          component /GSAadvantage/applicationArchitecture/type/db/EB_RFQ/EB_RFQ/STATUS extends /GSAadvantag
          <xs2001:element minOccurs="0" maxOccurs="1" name="STATUS" type="common:STATUS" />
          <!-- original
          component /GSAadvantage/applicationArchitecture/type/db/EB_RFQ/EB_RFQ/CLOSE_TIME extends /GSAadve
          <xs2001:element minOccurs="0" maxOccurs="1" name="CLOSE_TIME"
            type="EB_RFQ:CLOSE_TIME" />
          <!-- original
          component /GSAadvantage/applicationArchitecture/type/db/EB_RFQ/EB_RFQ/RFQ_ID extends /GSAadvantag
          <xs2001:element minOccurs="0" maxOccurs="1" name="RFQ_ID" type="common:RFQ_ID" />
          <!-- original
          component /GSAadvantage/applicationArchitecture/type/db/EB_RFQ/EB_RFQ/OID extends /GSAadvantage/a
          <xs2001:element minOccurs="0" maxOccurs="1" name="OID" type="common:OID" />
          <!-- original
          component /GSAadvantage/applicationArchitecture/type/db/EB_RFQ/EB_RFQ/RFQ_STATUS extends /GSAadve
          <xs2001:element minOccurs="0" maxOccurs="1" name="RFQ_STATUS"
            type="EB_RFQ:RFQ_STATUS" />
          <!-- original
```

Dealing with Variation Multiple Implementations of a Role



Customer Role (Logical)

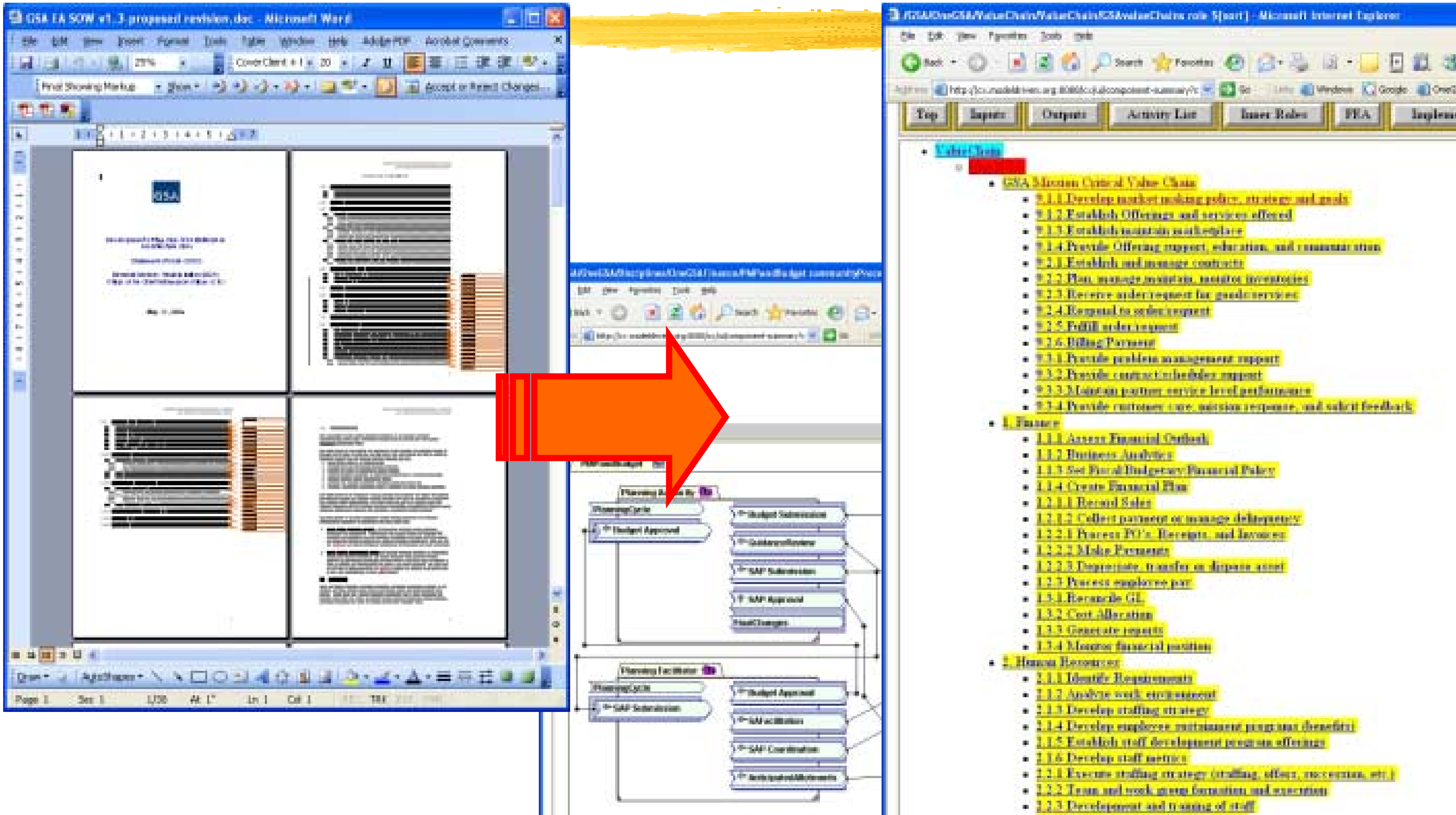
DOL Customer Component (Implementation)

DOI Customer Component (Implementation)

Internal Customer Component (Implementation)

The “Inside” can change as long as the external “contract” is satisfied

Architecture becomes part of Acquisition

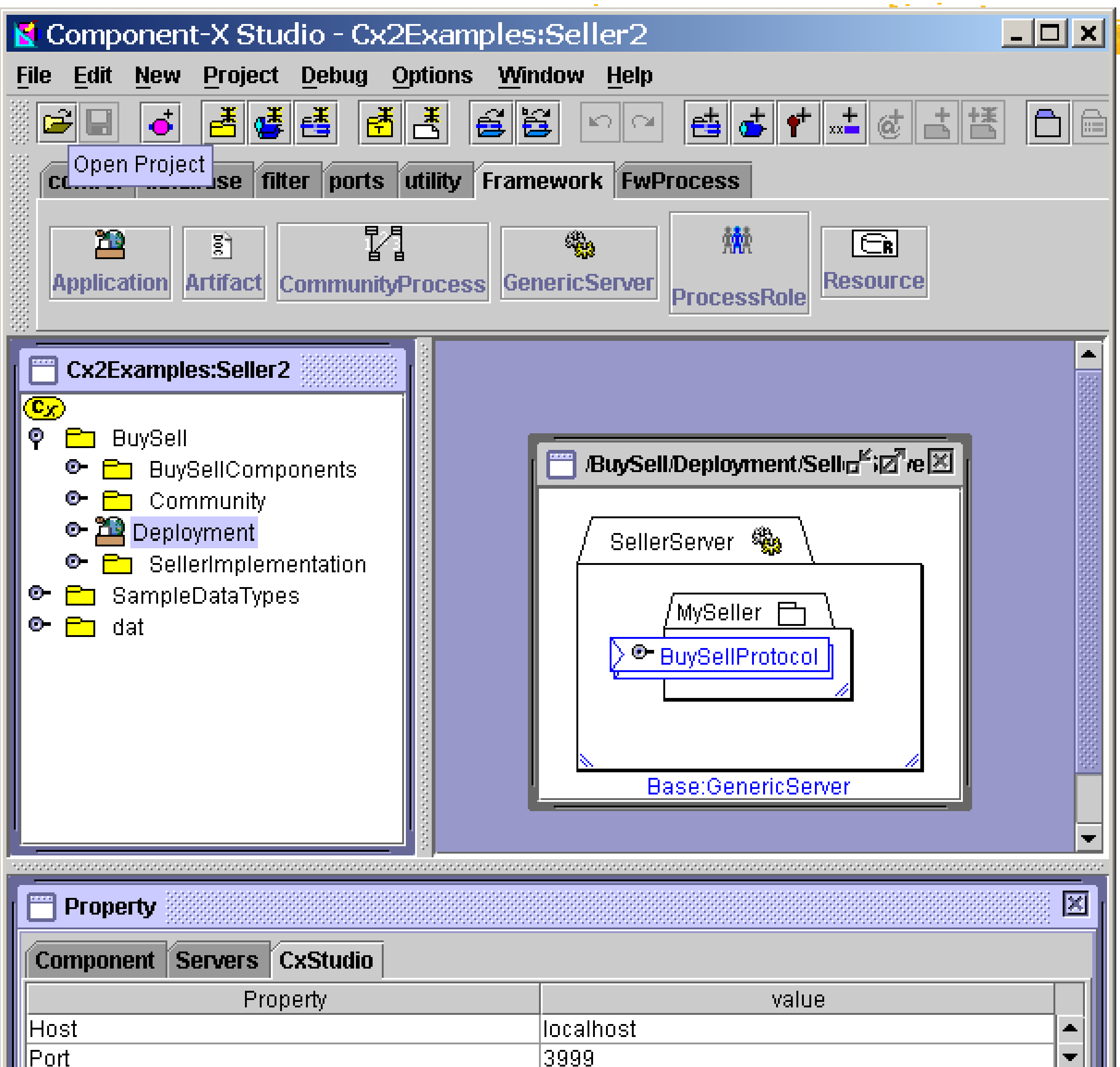


- Value Chain
  - GSA Mission Critical Value Chain
    - 9.1.1 Develop market making policy, strategy and goals
    - 9.1.2 Establish Offerings and services offered
    - 9.1.3 Establish/maintain marketplace
    - 9.1.4 Provide Offering support, education, and communication
    - 9.2.1 Establish and manage contracts
    - 9.2.2 Plan, manage/maintain, monitor inventories
    - 9.2.3 Receive order/request for goods/services
    - 9.2.4 Respond to order/request
    - 9.2.5 Fulfill order/request
    - 9.2.6 Billing/Payment
    - 9.3.1 Provide problem management support
    - 9.3.2 Provide contract/schedules support
    - 9.3.3 Maintain partner service level performance
    - 9.3.4 Provide customer care, mission response, and solicit feedback
  - 1. Finance
    - 1.1.1 Assess Financial Outlook
    - 1.1.2 Business Analytics
    - 1.1.3 Set Fiscal/Budgetary/Financial Policy
    - 1.1.4 Create Financial Plan
    - 1.2.1.1 Record Sales
    - 1.2.1.2 Collect payment or manage delinquency
    - 1.2.2.1 Process PO's, Receipts, and Invoices
    - 1.2.2.2 Make Payments
    - 1.2.2.3 Depreciate, transfer or dispose asset
    - 1.2.3 Process employee pay
    - 1.3.1 Reconcile GL
    - 1.3.2 Cost Allocation
    - 1.3.3 Generate reports
    - 1.3.4 Monitor financial position
  - 2. Human Resources
    - 2.1.1 Identify Requirements
    - 2.1.2 Analyze work environment
    - 2.1.3 Develop staffing strategy
    - 2.1.4 Develop employee retainment programs (benefits)
    - 2.1.5 Establish staff development program offerings
    - 2.1.6 Develop staff metrics
    - 2.2.1 Execute staffing strategy (staffing, offers, succession, etc.)
    - 2.2.2 Team and work group formation and execution
    - 2.2.3 Development and training of staff

Add implementation

- As component compositions
- In a programming language
- By using an external service
- By Wrapping legacy systems

Add technology specifics for deployment



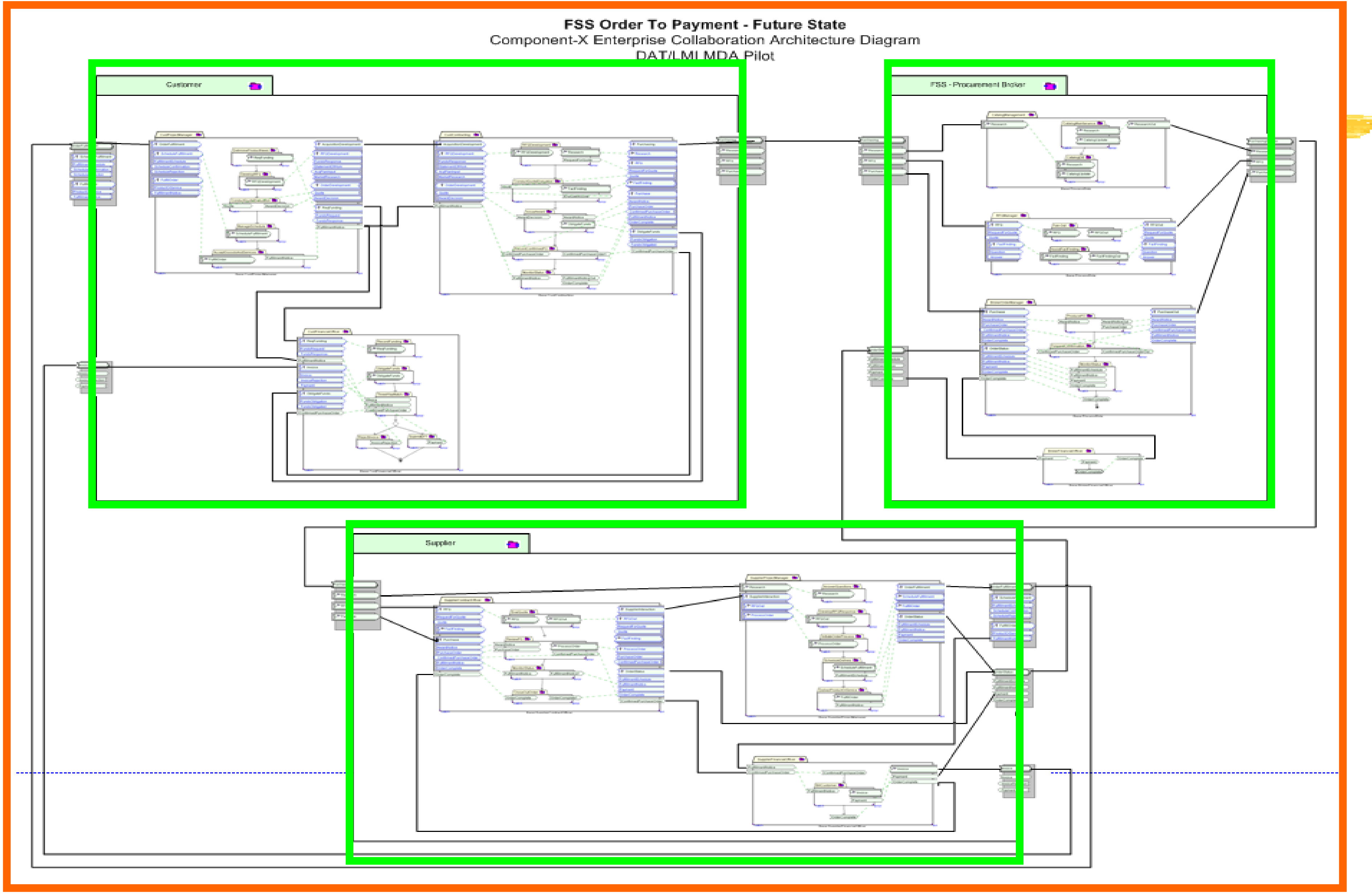
Property	value
Host	localhost
Port	3999

ECA/CCA Implementation at GSA

- Data Access Technologies
  - MDA experts, developers of ComponentX, One GSA EA support
    - enterprise-component.com
  - Creators/contributors to OMG EDOC/ECA/CCA open standards
- ComponentX
  - Implements ECA/CCA, used by GSA EAPMO to create ***collaborative role interaction models***
  - Supports ***'model to integrate',*** combining design-time and run-time tools, with an extensible 'component palette'
  - Supports ***FEA Line of Sight via aspect orientation***
  - Supports 'just in time' model driven generated documentation
- ComponentX is a J2EE application
  - The ***models are executable*** – they're java programs!
  - ***Web enabled simulations integrate with existing IT systems***

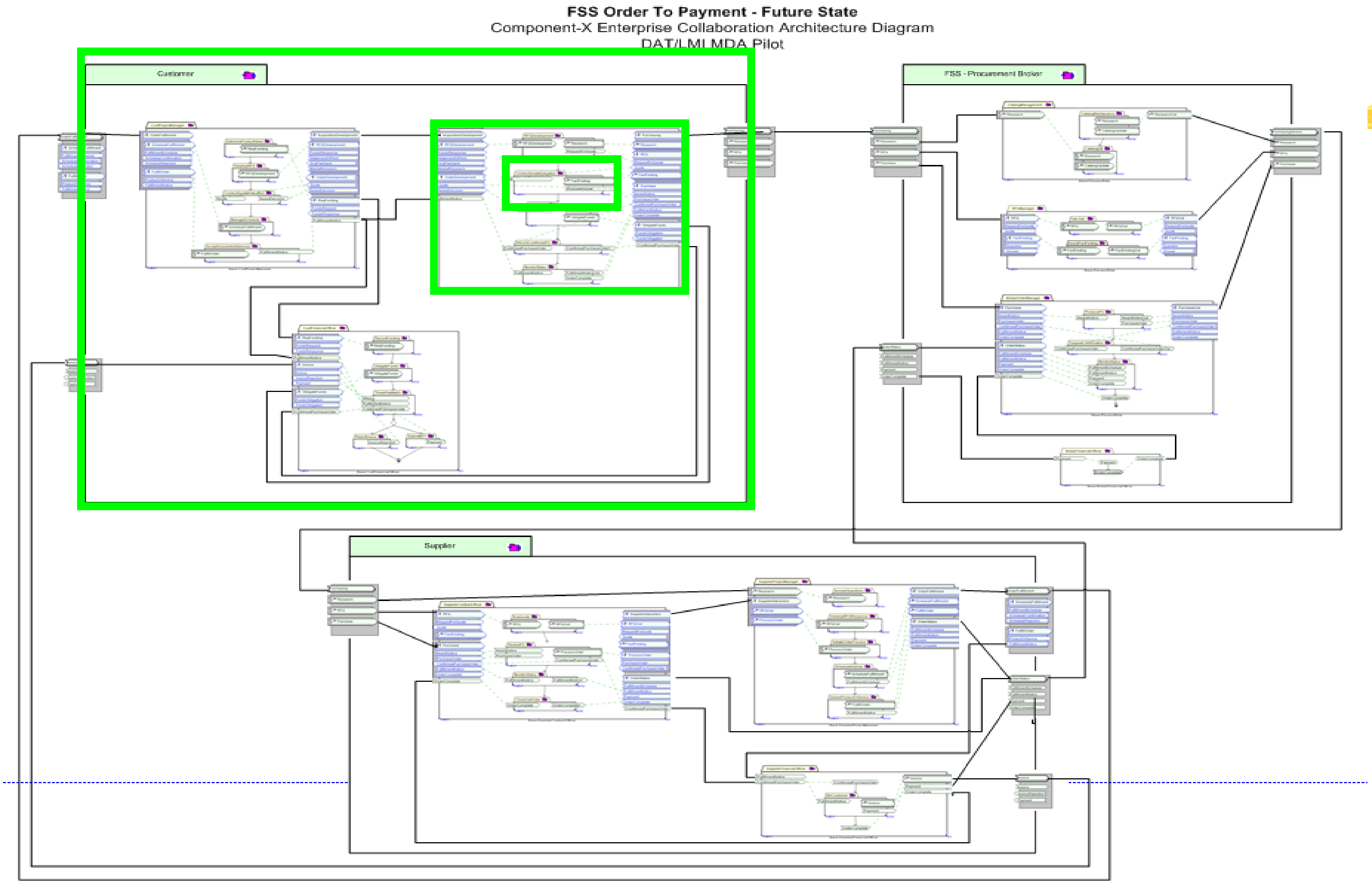
- Widely used EA tools (Mettis, Popkin, MS-Office) don't compare!

Collaborations Contextualize Roles

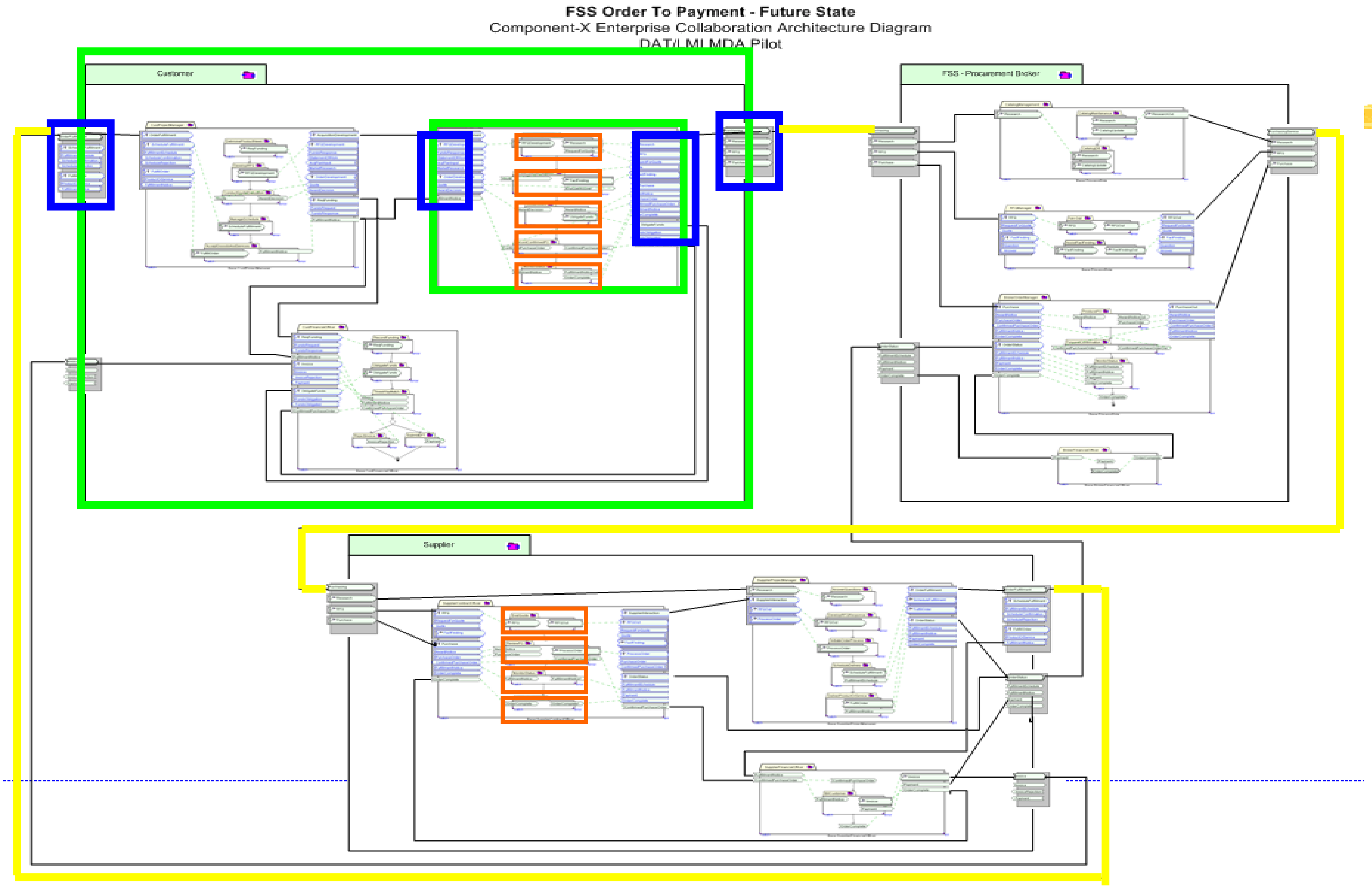


FSS Order To Payment - Future State
Component-X Enterprise Collaboration Architecture Diagram
DAT/LMI MDA Pilot
Customer
FSS - Procurement Broker
Supplier

Roles Compose Inner Roles - Specify Service Granularity


FSS Order To Payment - Future State
Component-X Enterprise Collaboration Architecture Diagram
DAT/LMI MDA Pilot
Customer
FSS - Procurement Broker
Supplier

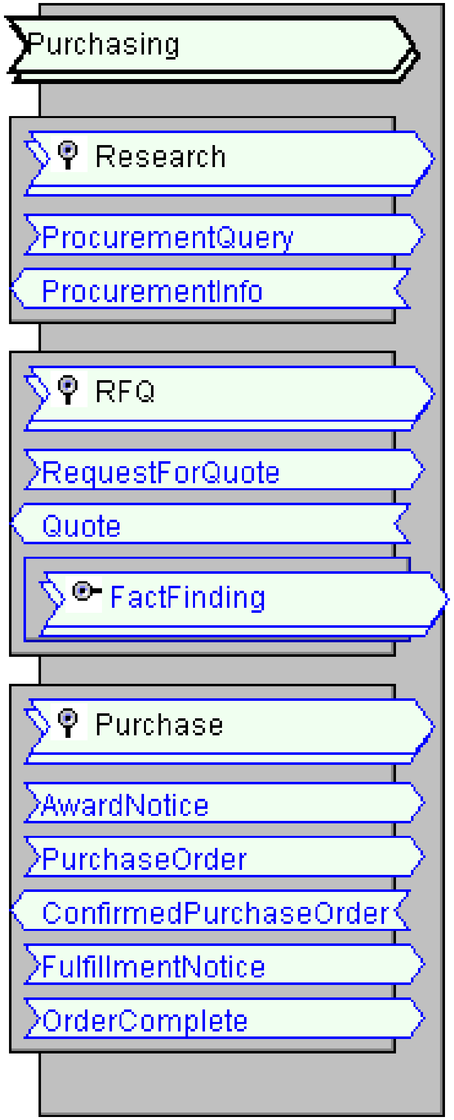
Protocols Organize Information Choreographed by Roles



FSS Order To Payment - Future State
Component-X Enterprise Collaboration Architecture Diagram
DAT/LMI MDA Pilot

Fully Elaborated Protocols – DRM

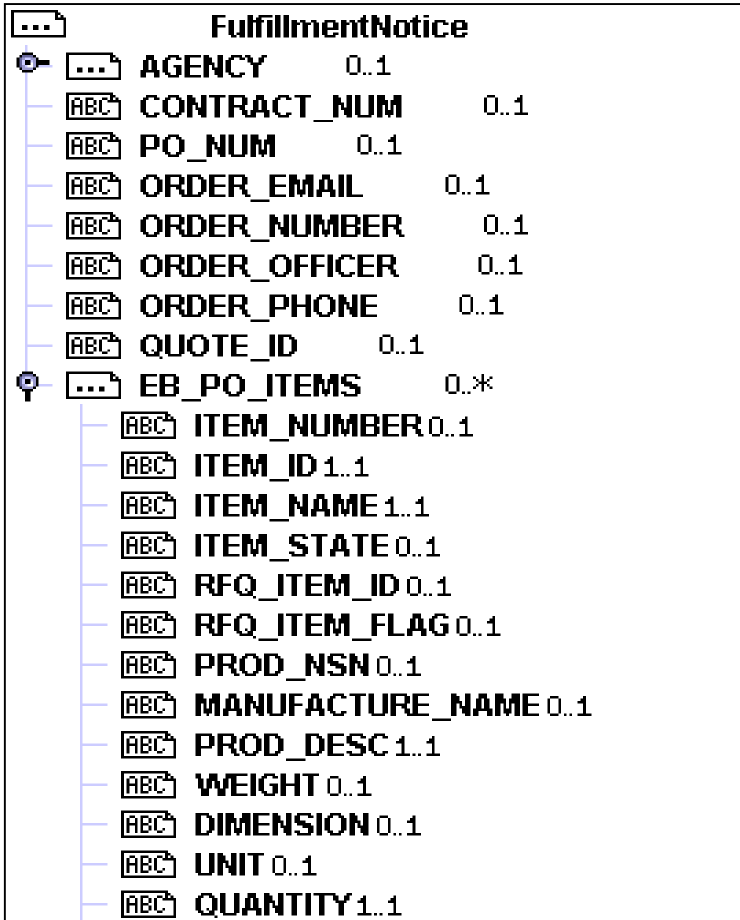
- Focus is on business collaboration information - not on technology representation, or ODS information model
- This is an example of a ‘Purchasing’ Protocol with various inner Protocols and their Types specified
- Inner Protocols are sub-conversations, and they can be reused in other Protocols or as top-level Protocols
- This is an organizing framework for data entity composition and categorization, ala the DRM Information Exchange Package (IEP) idea



Collaboration Data – DRM Business Context

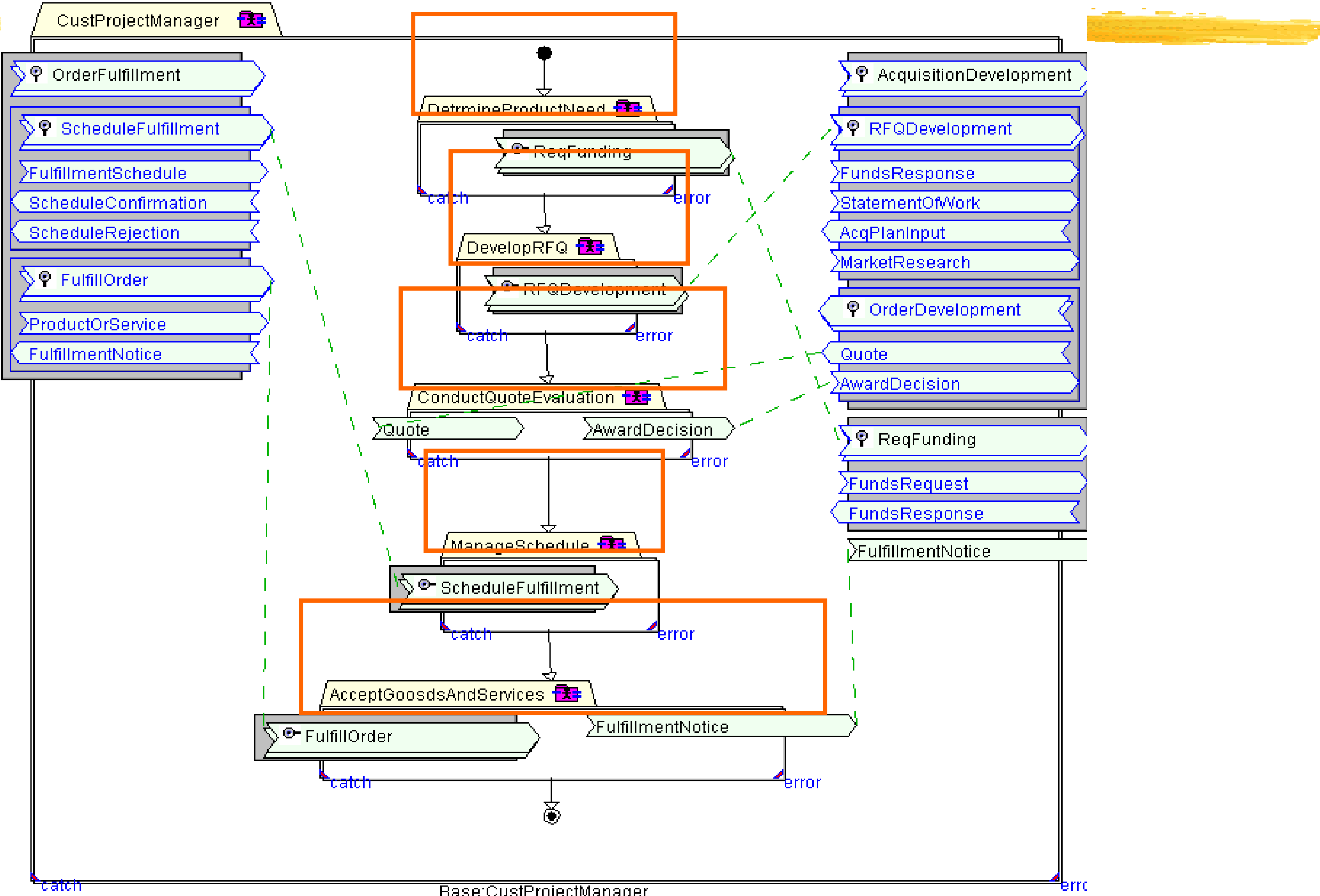
- FulfillmentNotice -Document<->Object as Business Information Entity that ***provides collaborative context*** to Core Data Components
- Includes Composition, Type and Cardinality
- May be derived from existing sources and mapped to any DRM Representation (Java Object, XML Document)

- GOAL is to link the ODS ERD to the SQL query executed by a *'component in role'* on behalf of a specific business process collaboration

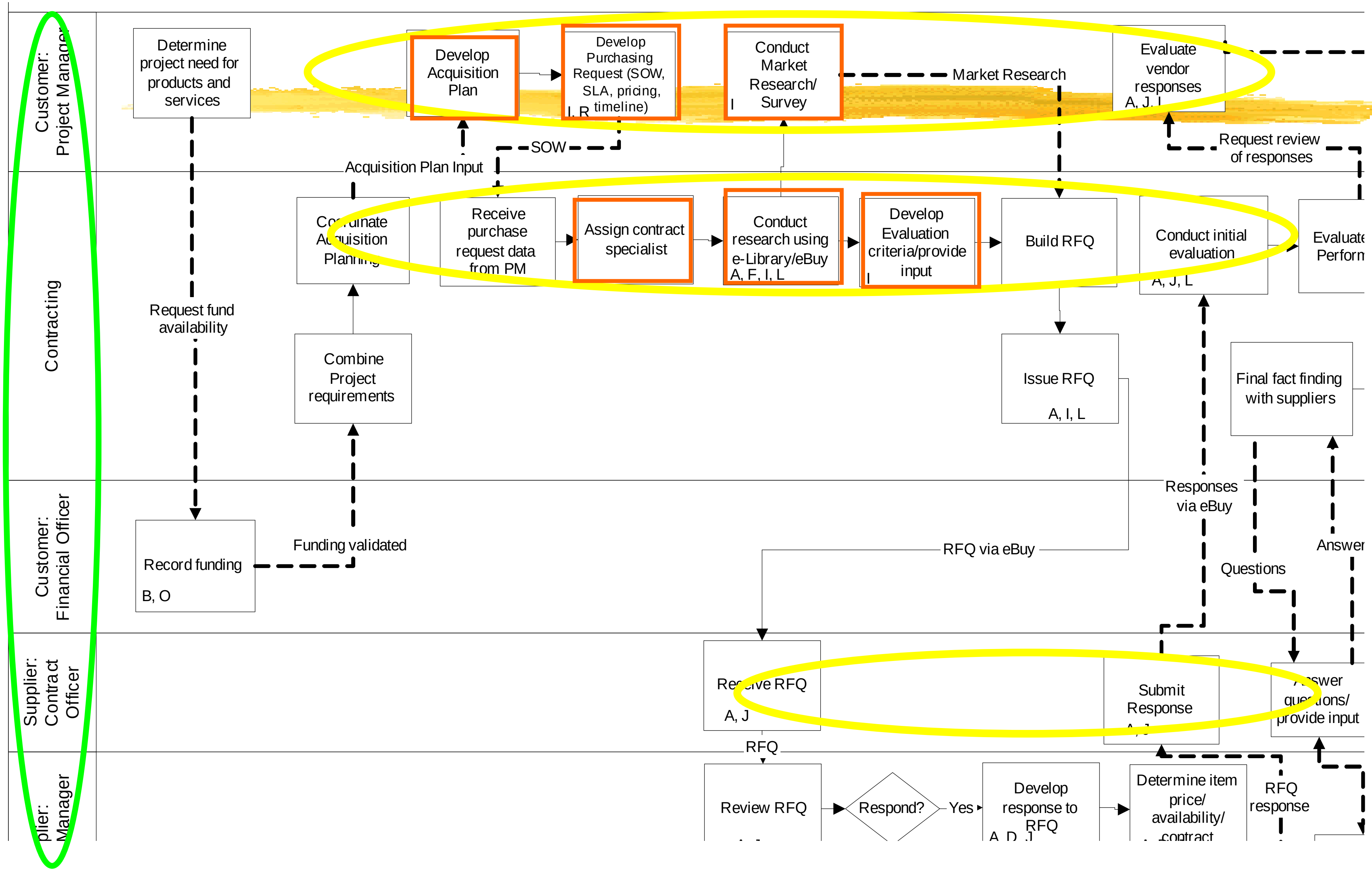


```
FulfillmentNotice
  AGENCY 0..1
  CONTRACT_NUM 0..1
  PO_NUM 0..1
  ORDER_EMAIL 0..1
  ORDER_NUMBER 0..1
  ORDER_OFFICER 0..1
  ORDER_PHONE 0..1
  QUOTE_ID 0..1
  EB_PO_ITEMS 0..*
    ITEM_NUMBER 0..1
    ITEM_ID 1..1
    ITEM_NAME 1..1
    ITEM_STATE 0..1
    RFQ_ITEM_ID 0..1
    RFQ_ITEM_FLAG 0..1
    PROD_NSN 0..1
    MANUFACTURE_NAME 0..1
    PROD_DESC 1..1
    WEIGHT 0..1
    DIMENSION 0..1
    UNIT 0..1
    QUANTITY 1..1
```

Roles Choreography Value Chain Activities



Roles Choreograph Value Chain Activities



Customer: Project Manager

Determine project need for products and services

Develop Acquisition Plan

Develop Purchasing Request (SOW, SLA, pricing, timeline)

I, R

Conduct Market Research/ Survey

I

Market Research

Evaluate vendor responses

A, J, L

Request review of responses

SOW

Acquisition Plan Input

Contracting

Coordinate Acquisition Planning

Receive purchase request data from PM

Assign contract specialist

Conduct research using e-Library/eBuy

A, F, I, L

Develop Evaluation criteria/provide input

I

Build RFQ

Conduct initial evaluation

A, J, L

Evaluate Perform

Combine Project requirements

Issue RFQ

A, I, L

Final fact finding with suppliers

Request fund availability

Customer: Financial Officer

Record funding

B, O

Funding validated

RFQ via eBuy

Responses via eBuy

Questions

Answer

Supplier: Contract Officer

Receive RFQ

A, J

Submit Response

A, J

Answer questions/ provide input

RFQ

Supplier: Manager

Review RFQ

Respond?

Yes

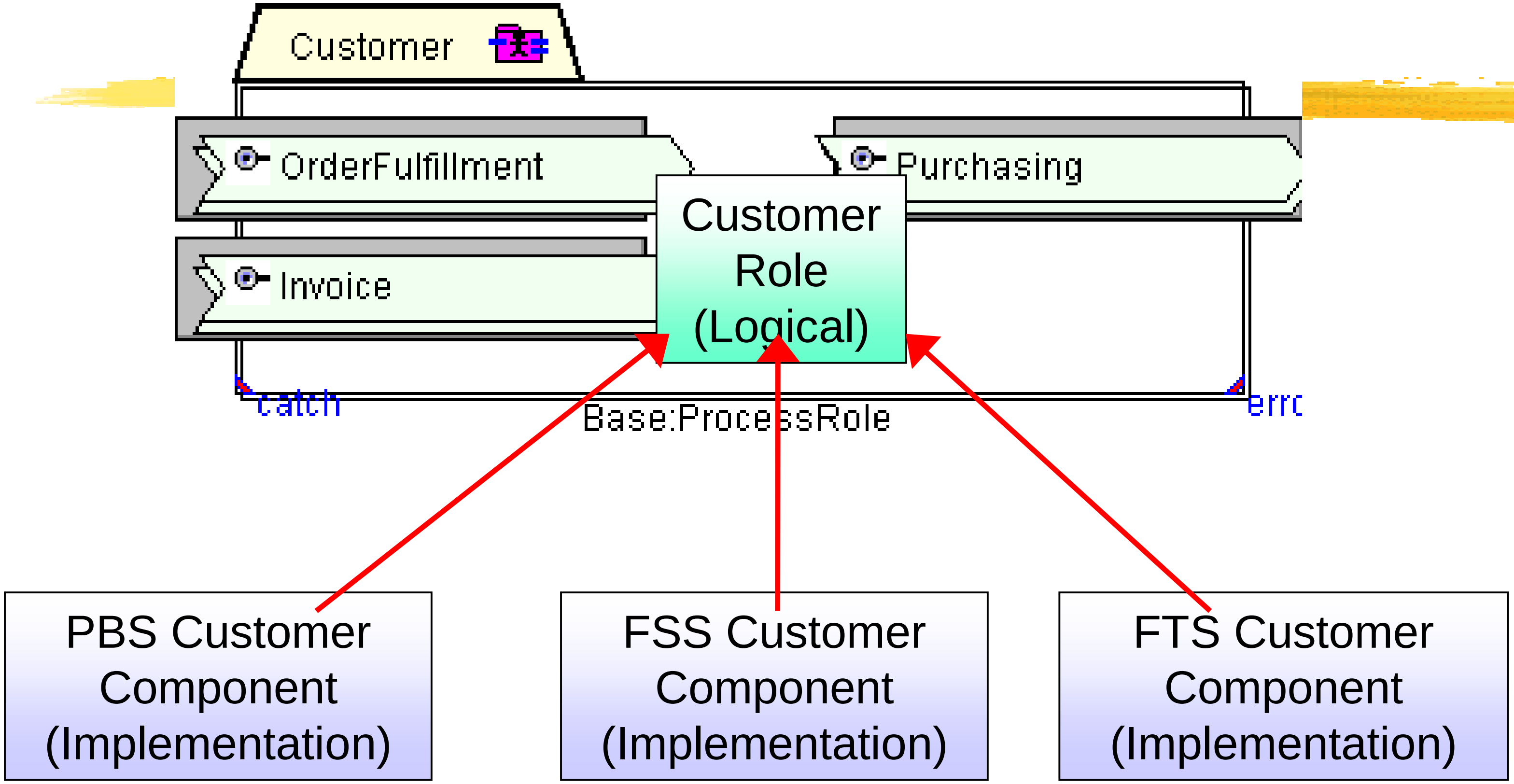
Develop response to RFQ

A, D, J

Determine item price/ availability/ contract

RFQ response

Multiple Implementations of a Role



Customer Role (Logical)

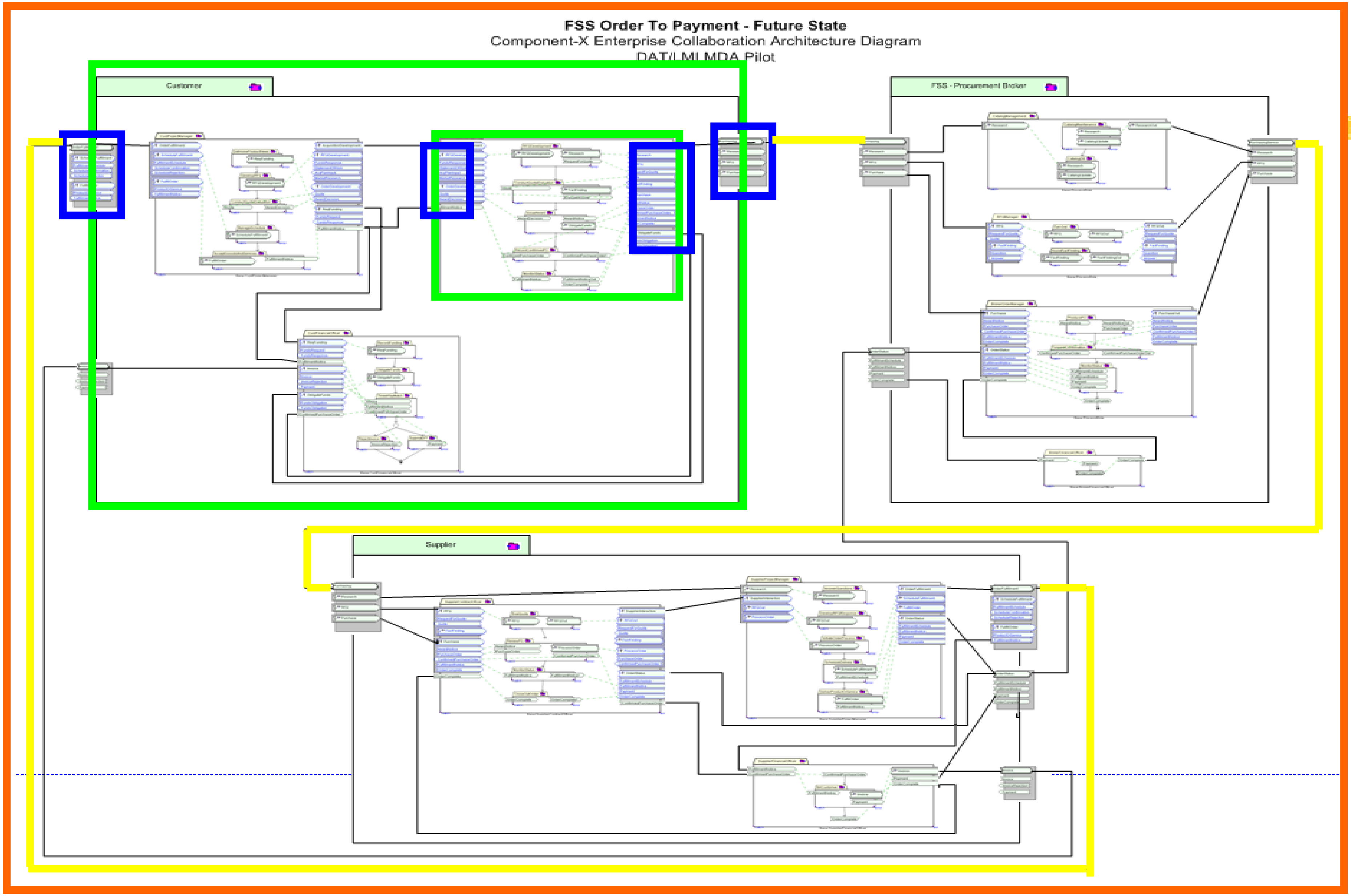
PBS Customer Component (Implementation)

FSS Customer Component (Implementation)

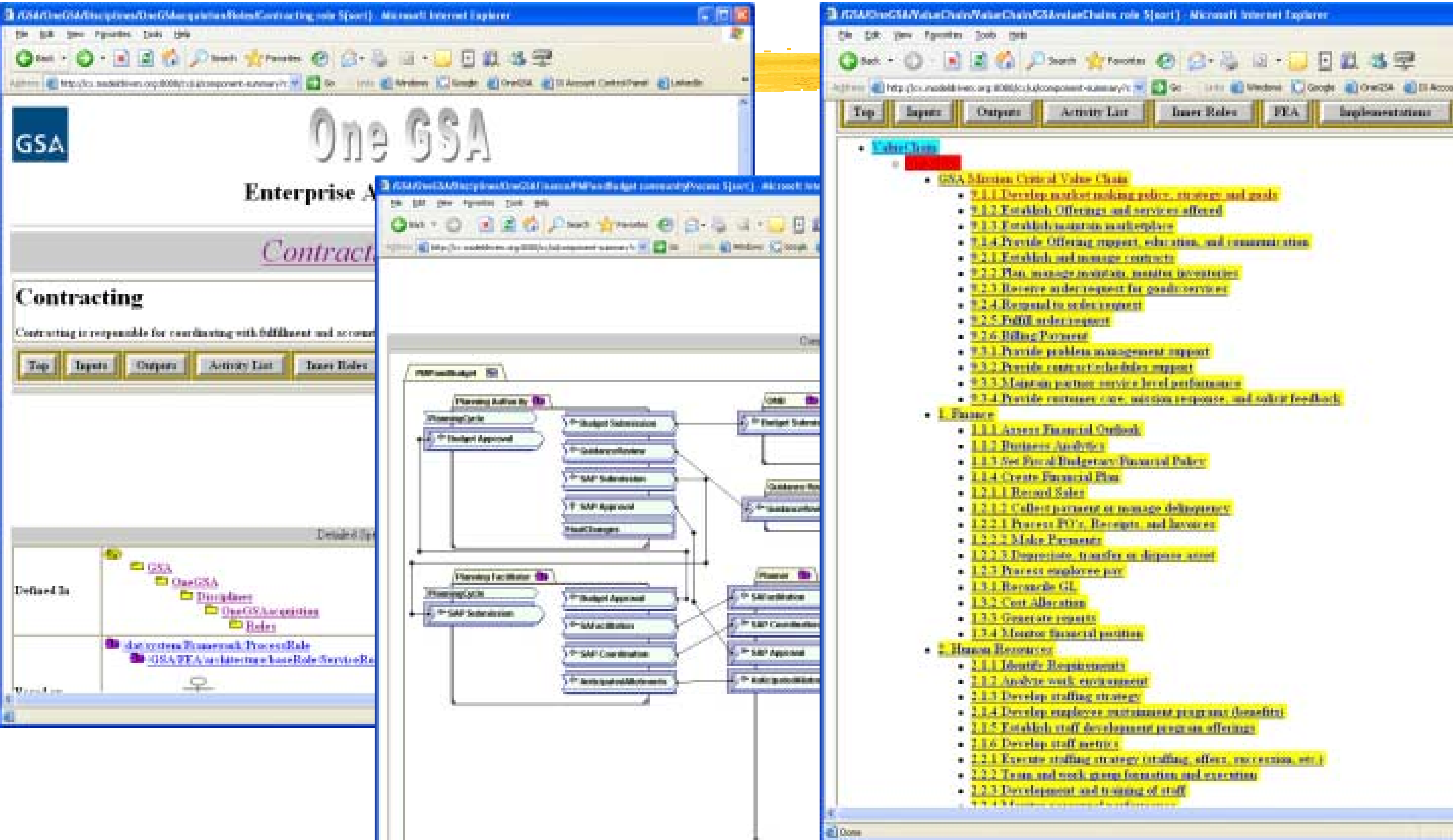
FTS Customer Component (Implementation)

The “inside” can change as long as the external “contract” is satisfied – the key message to Organizations as we evolve IT systems to realize shared services on the GSA (or eGov) ESB

PRM(BRM, SRM, DRM, TRM) - Executable FEA


FSS Order To Payment - Future State
Component-X Enterprise Collaboration Architecture Diagram
DAT/LMI MDA Pilot
Customer
FSS - Procurement Broker
Supplier

Delivering The Architecture



Contracting

Contracting is responsible for coordinating with fulfillment and accoun

Defined In
- GSA
  - OneGSA
    - Disciplines
      - OneGSAAcquisition
        - Roles

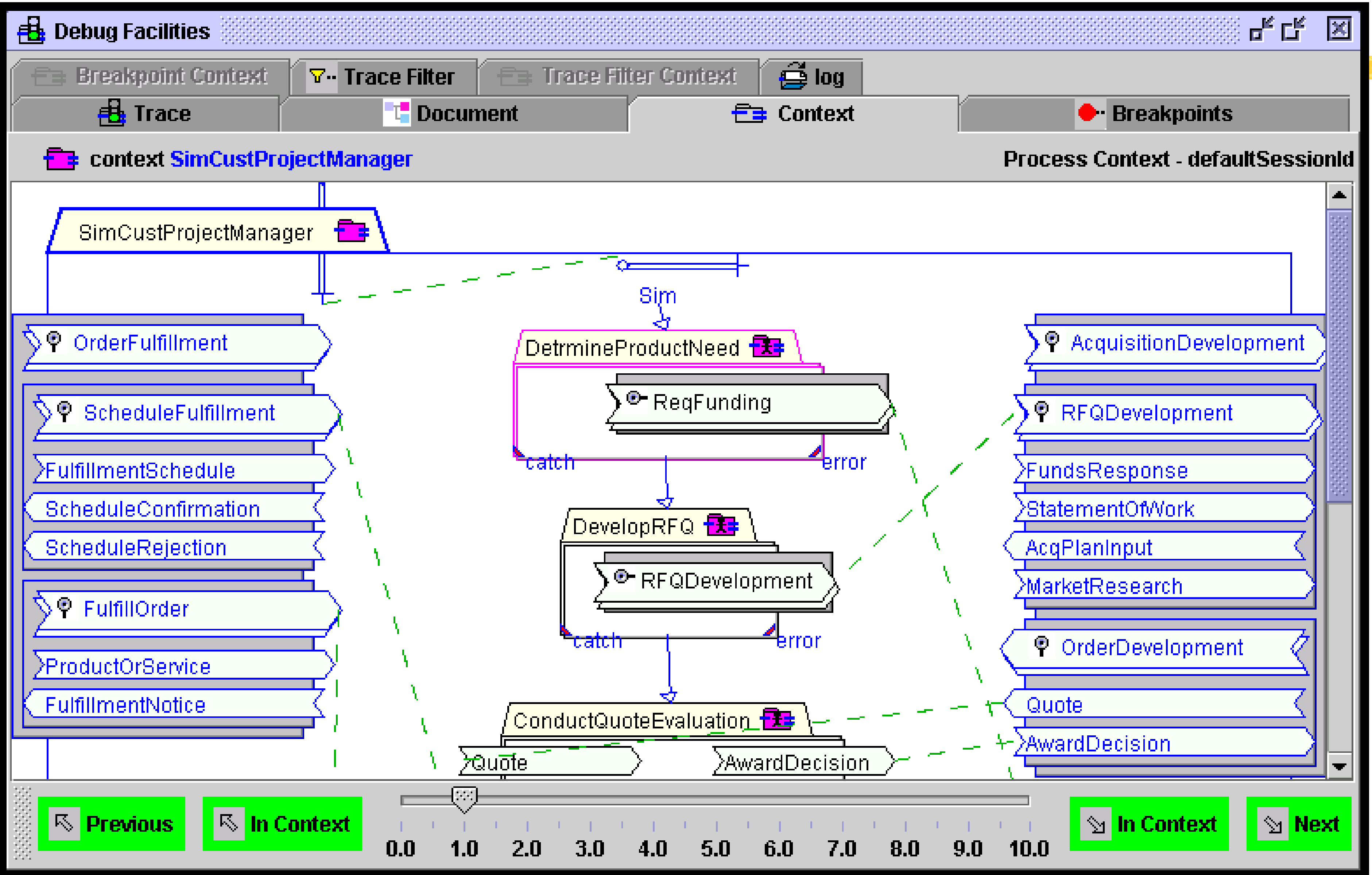
dat:system.Framework.ProcessRole
- /GSA/FEA/architecture.baseRole.ServiceRo

- Value Chain
  - GSA Mission Critical Value Chain
    - 0.1.1 Develop market making policy, strategy and goals
    - 0.1.2 Establish Offerings and services offered
    - 0.1.3 Establish/maintain marketplace
    - 0.1.4 Provide Offering support, education, and communication
    - 0.2.1 Establish and manage contracts
    - 0.2.2 Plan, manage/maintain, monitor inventories
    - 0.2.3 Receive order/request for goods/services
    - 0.2.4 Respond to order/request
    - 0.2.5 Fulfill order/request
    - 0.2.6 Billing Payment
    - 0.3.1 Provide problem management support
    - 0.3.2 Provide contract/schedules support
    - 0.3.3 Maintain partner service level performance
    - 0.3.4 Provide customer care, mission response, and solicit feedback
  - 1. Finance
    - 1.1.1 Assess Financial Outlook
    - 1.1.2 Business Analytics
    - 1.1.3 Set Fiscal Budgetary Financial Policy
    - 1.1.4 Create Financial Plan
    - 1.2.1.1 Record Sales
    - 1.2.1.2 Collect payment or manage delinquency
    - 1.2.2.1 Process PO's, Receipts, and Invoices
    - 1.2.2.2 Make Payments
    - 1.2.2.3 Depreciate, transfer or dispose asset
    - 1.2.3 Process employee pay
    - 1.3.1 Reconcile GL
    - 1.3.2 Cost Allocation
    - 1.3.3 Generate reports
    - 1.3.4 Monitor financial position
  - 2. Human Resources
    - 2.1.1 Identify Requirements
    - 2.1.2 Analyze work environment
    - 2.1.3 Develop staffing strategy
    - 2.1.4 Develop employee environment programs (benefits)
    - 2.1.5 Establish staff development program offerings
    - 2.1.6 Develop staff metrics
    - 2.2.1 Execute staffing strategy (staffing, affirm, succession, etc.)
    - 2.2.2 Team and work group formation and operation
    - 2.2.3 Development and training of staff

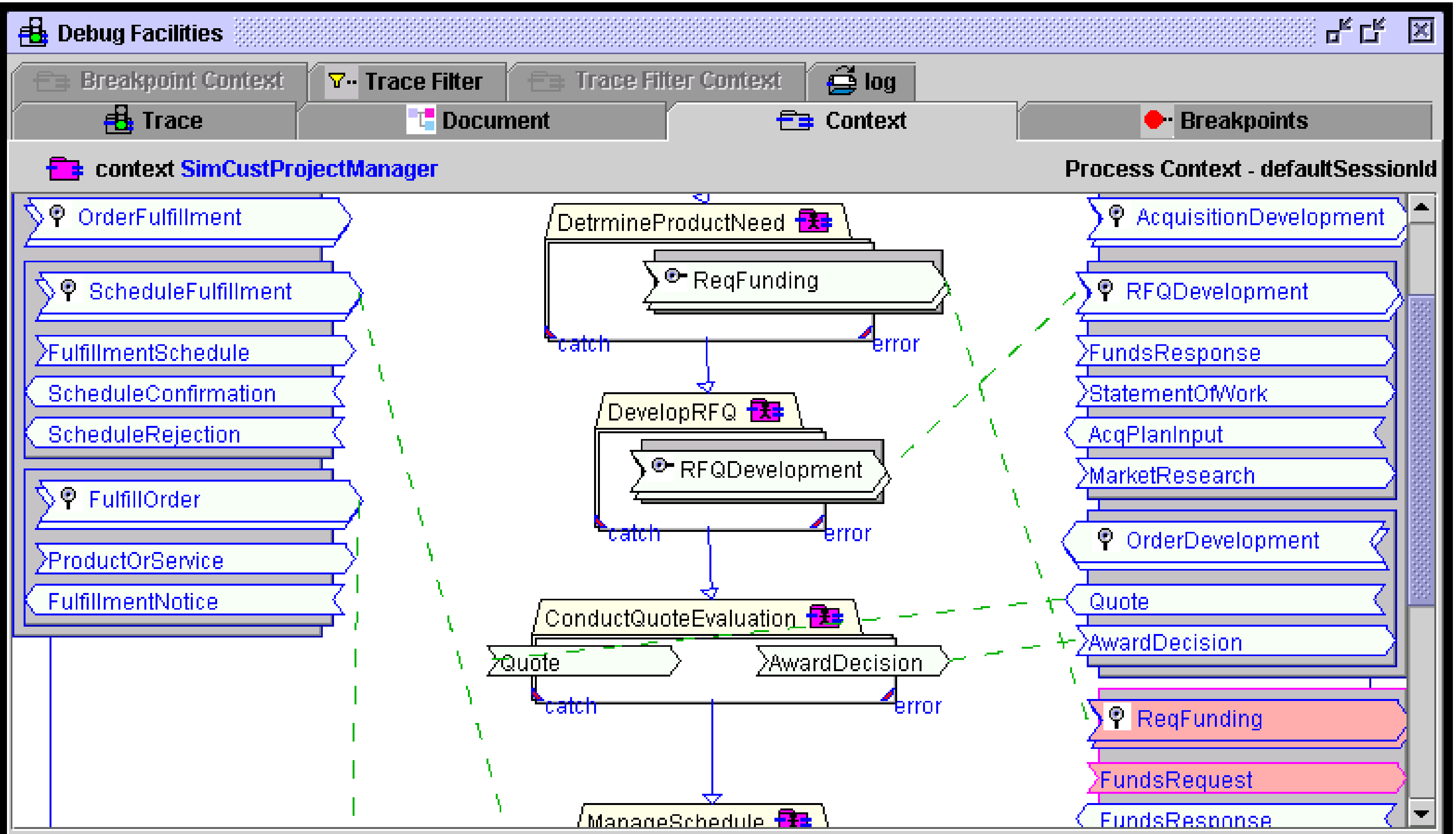
Simulating the Process

- Validation & Buy-in
  - Business stakeholders
  - SMEs
  - Systems Implementers

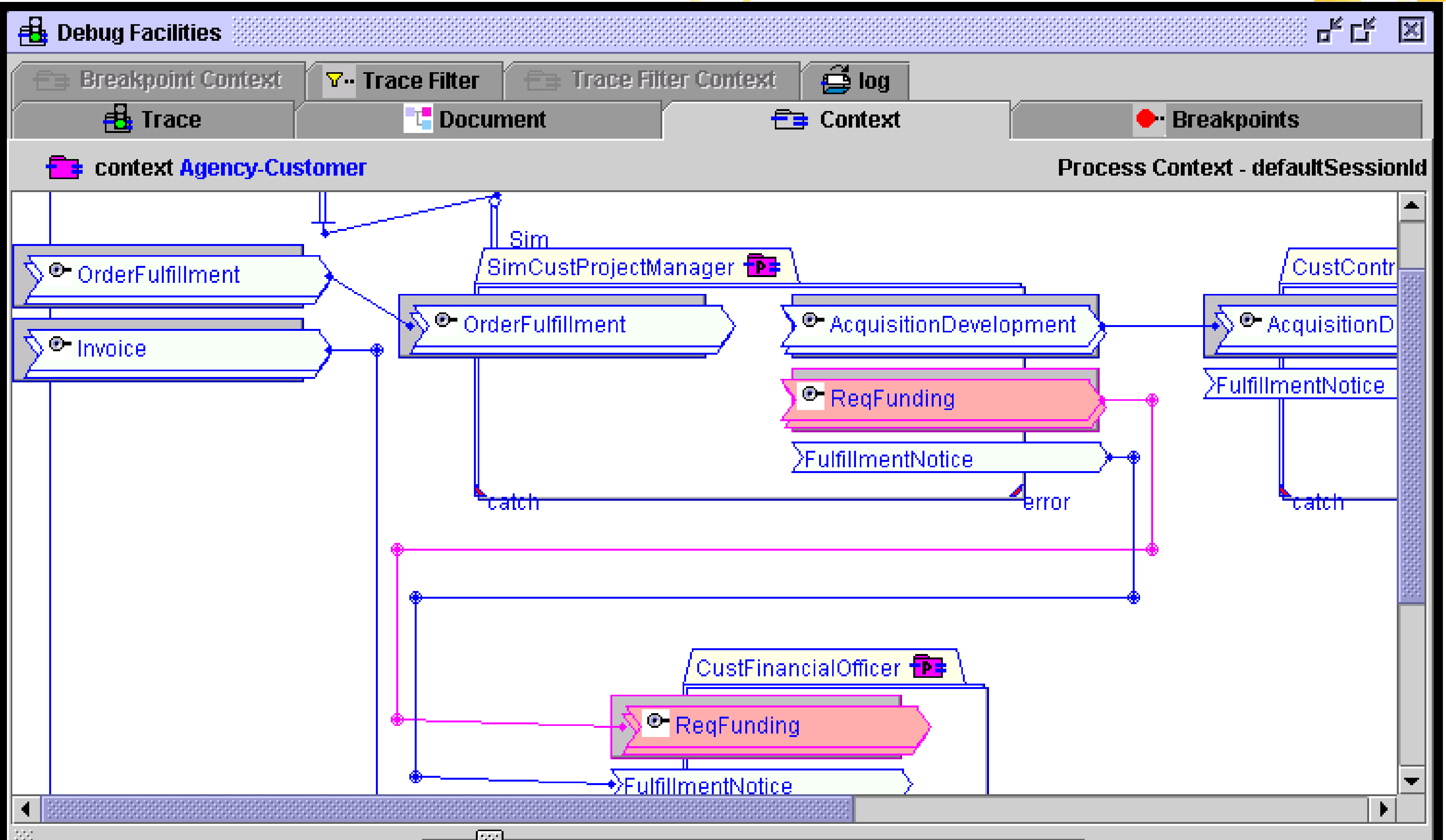
Initiating Activity



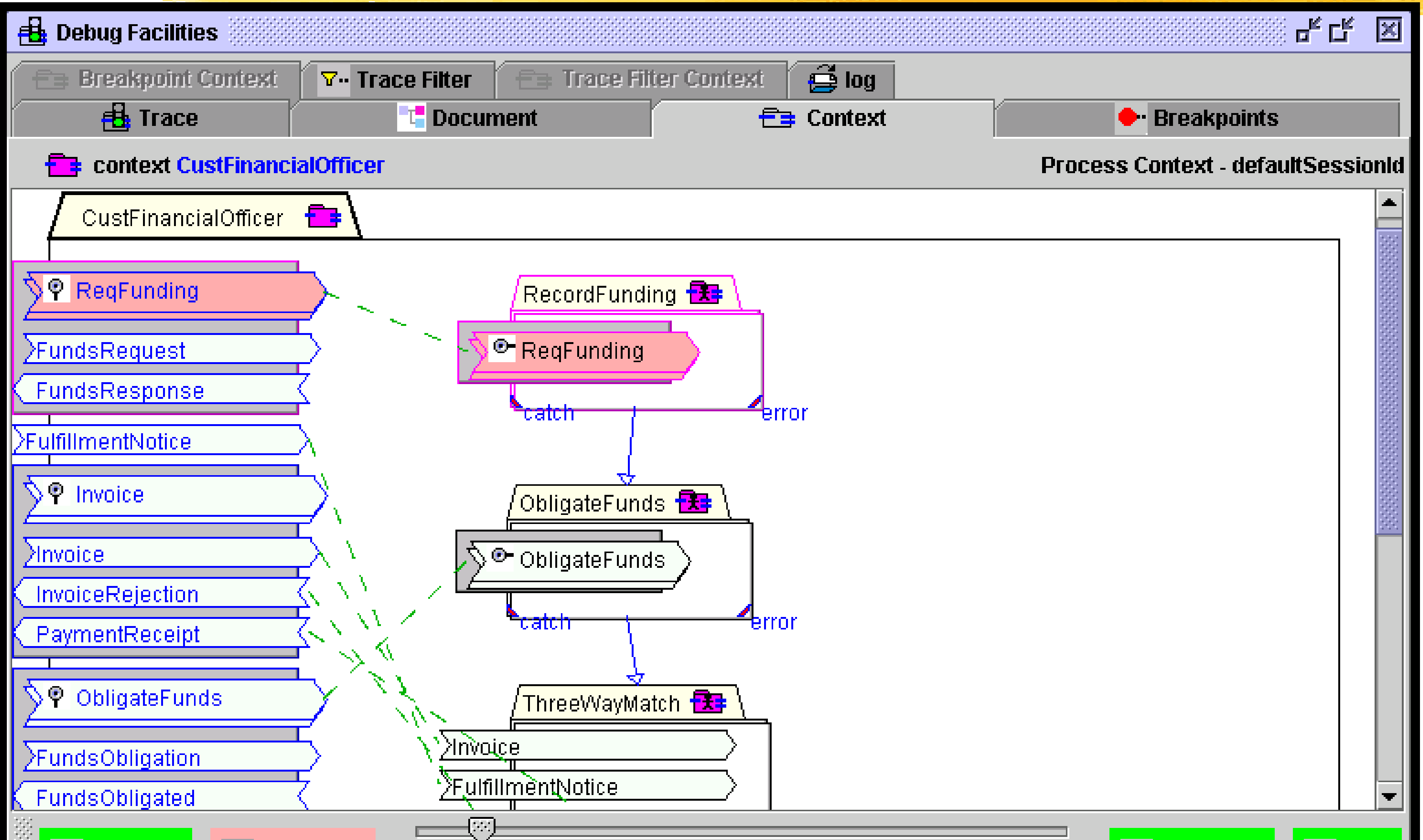
Activity interacting externaly



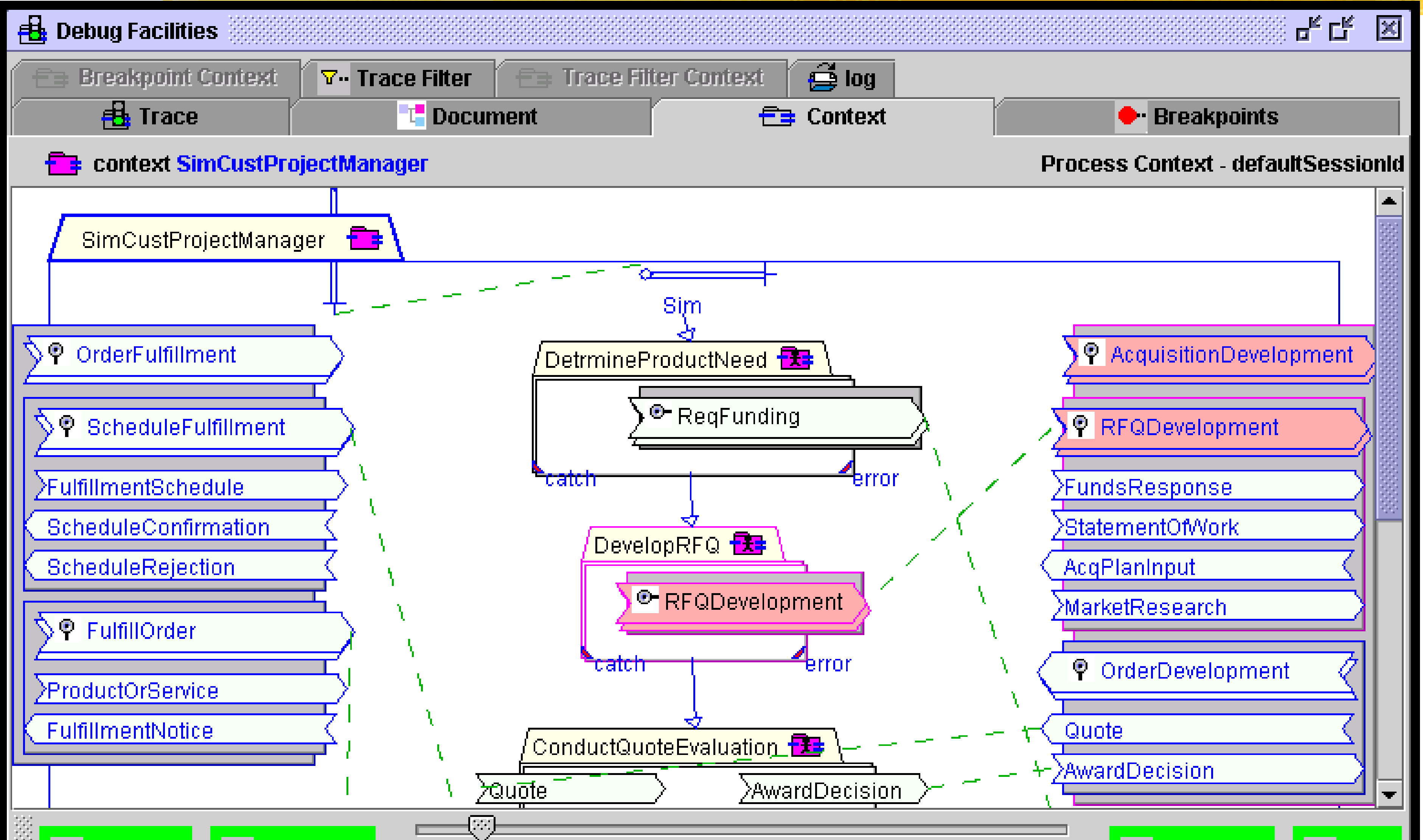
… With financial officer



Who records the funding



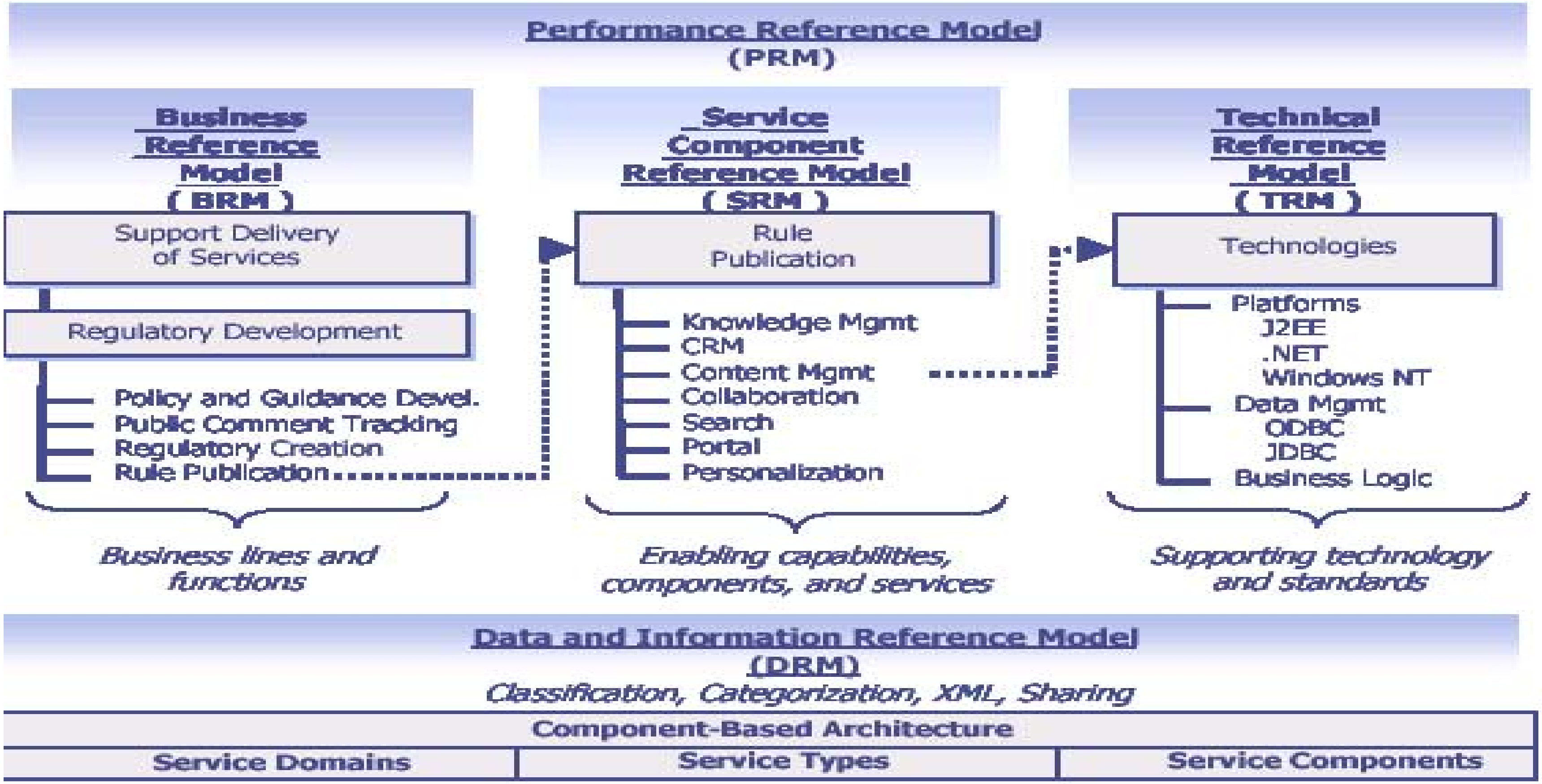
And the process returns to the PM



Federal Enterprise Architecture

Support for the FEA as a view of the enterprise architecture

FEA (from reference)



Performance Reference Model
(PRM)

Business Reference Model
(BRM)

Support Delivery of Services

Regulatory Development

- Policy and Guidance Devel.
- Public Comment Tracking
- Regulatory Creation
- Rule Publication

Business lines and functions

Service Component Reference Model
(SRM)

Rule Publication

- Knowledge Mgmt
- CRM
- Content Mgmt
- Collaboration
- Search
- Portal
- Personalization

Enabling capabilities, components, and services

Technical Reference Model
(TRM)

Technologies

- Platforms
  - J2EE
  - .NET
  - Windows NT
- Data Mgmt
  - ODBC
  - JDBC
- Business Logic

Supporting technology and standards

Data and Information Reference Model
(DRM)
Classification, Categorization, XML, Sharing

Component-Based Architecture

Service Domains | Service Types | Service Components

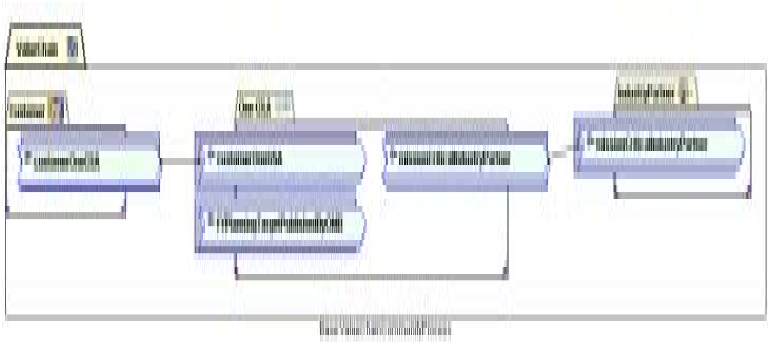
FEA/ComponentX

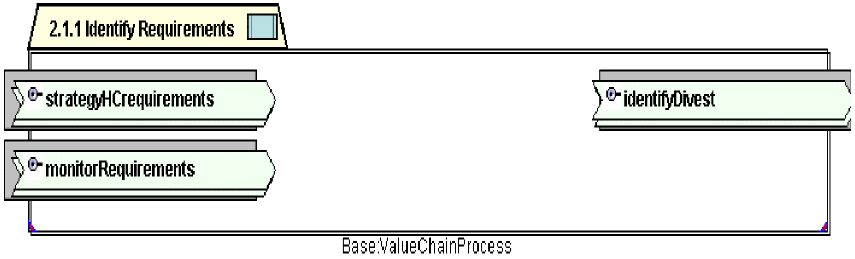
Business Reference Model (BRM)

Service Component Reference Model (SRM)

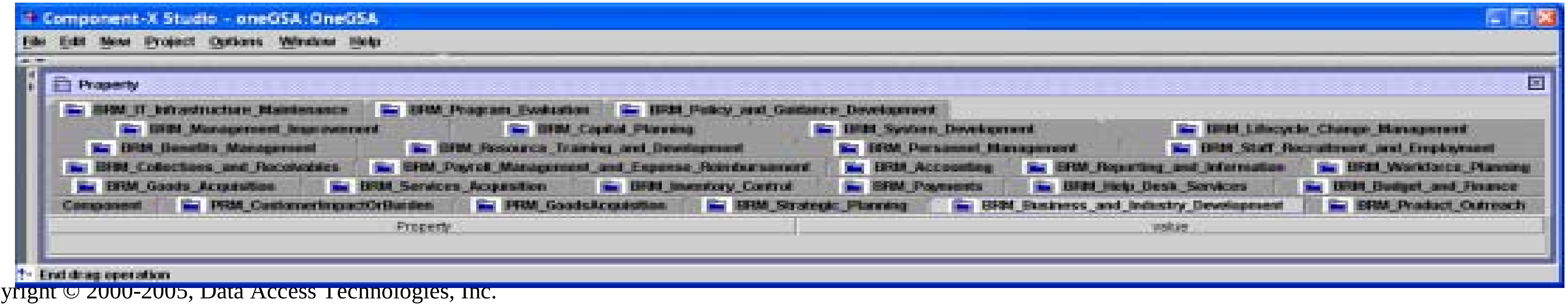
Community Process

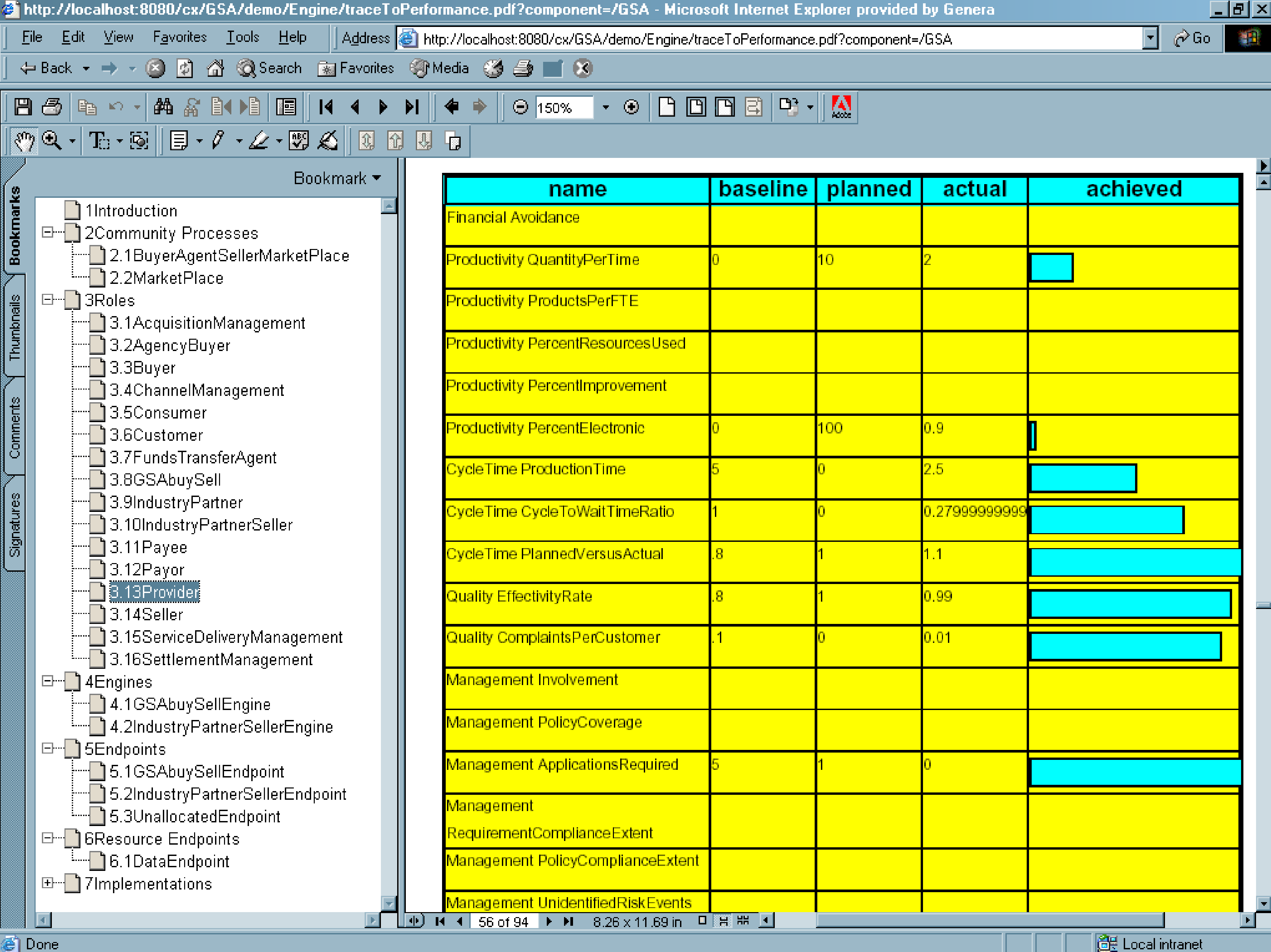
Roles, processes, activities





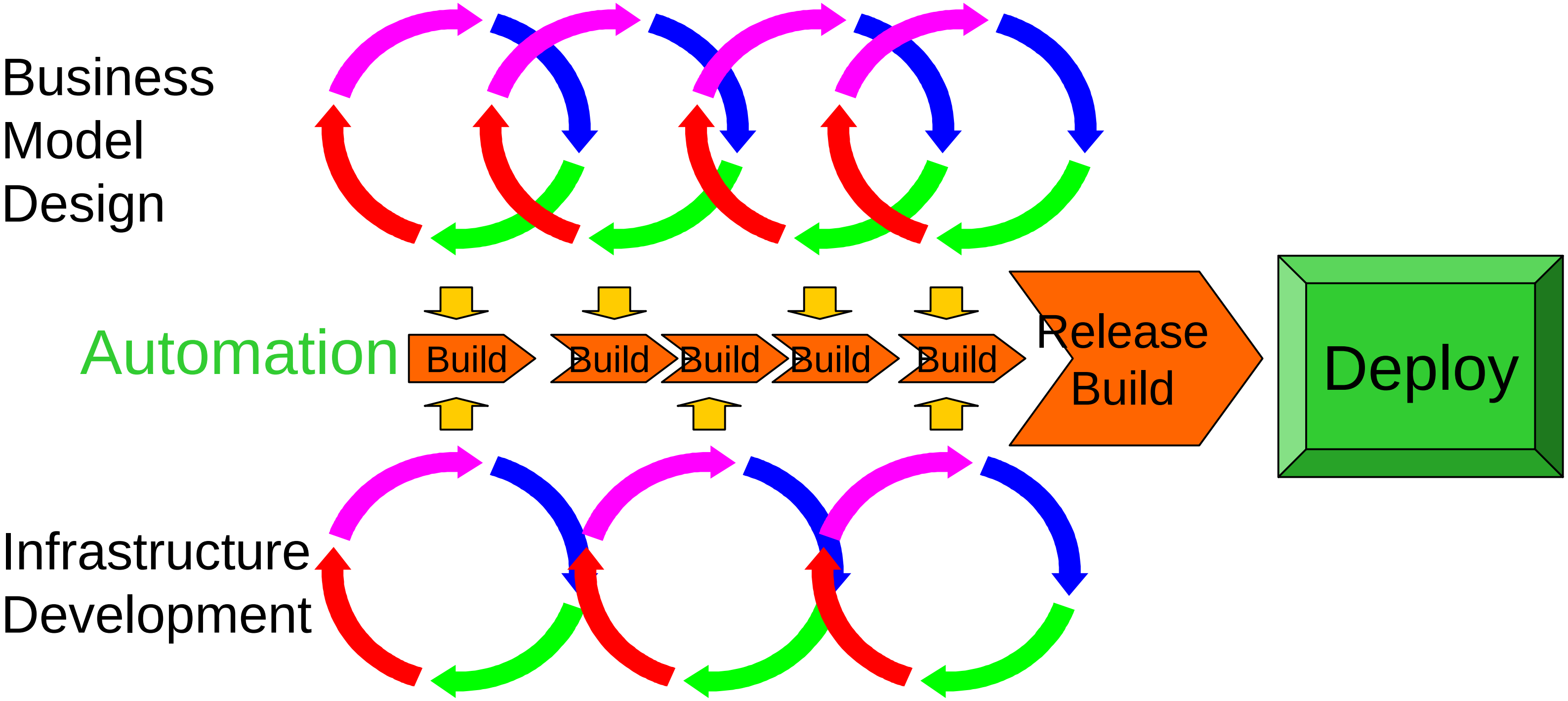
Reference model associations via aspect/properties



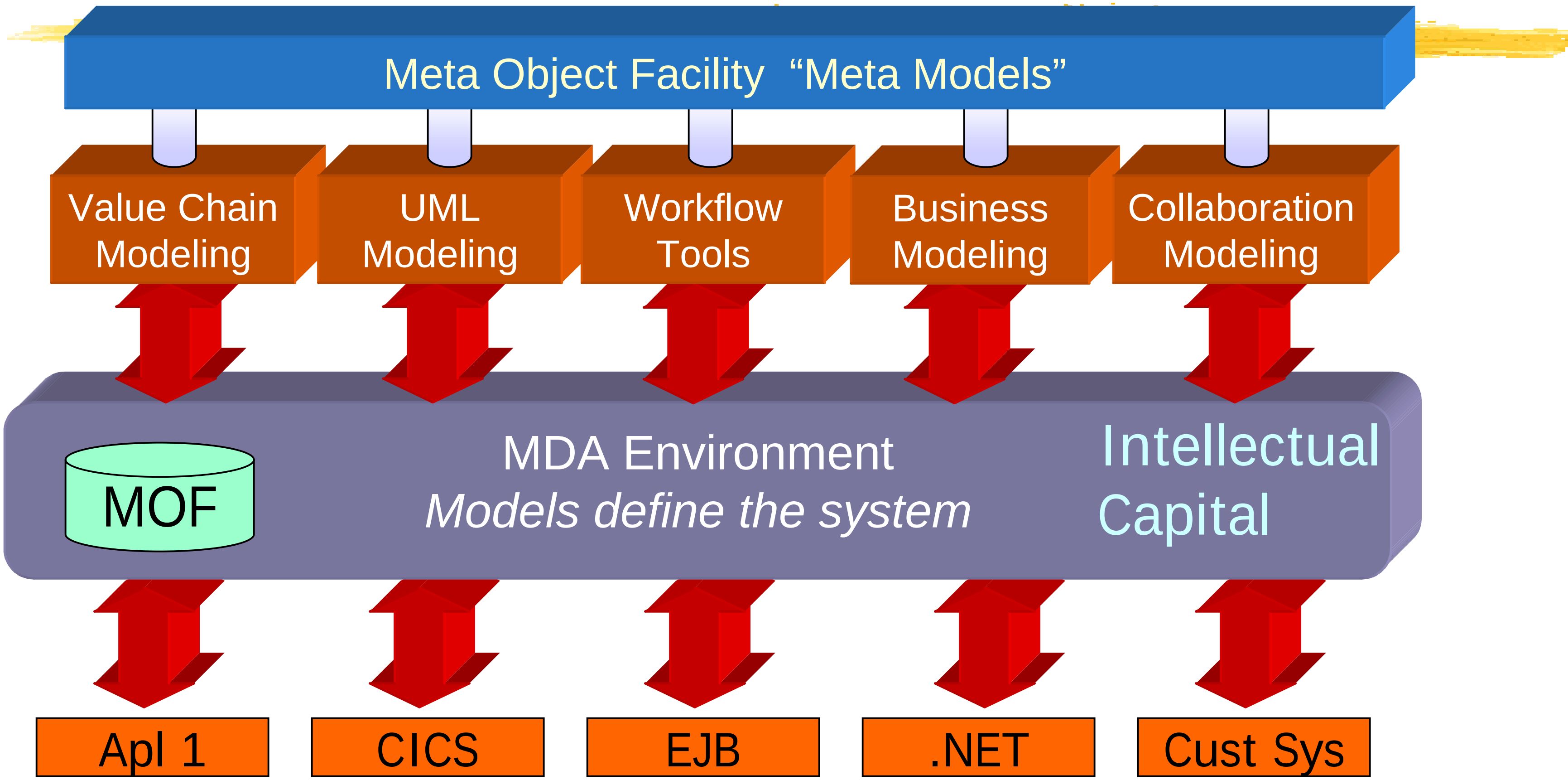


name	baseline	planned	actual	achieved
Financial Avoidance				
Productivity QuantityPerTime	0	10	2	
Productivity ProductsPerFTE				
Productivity PercentResourcesUsed				
Productivity PercentImprovement				
Productivity PercentElectronic	0	100	0.9	
CycleTime ProductionTime	5	0	2.5	
CycleTime CycleToWaitTimeRatio	1	0	0.27999999999	
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				

Iterative Development



Common Environment for Intellectual Capital

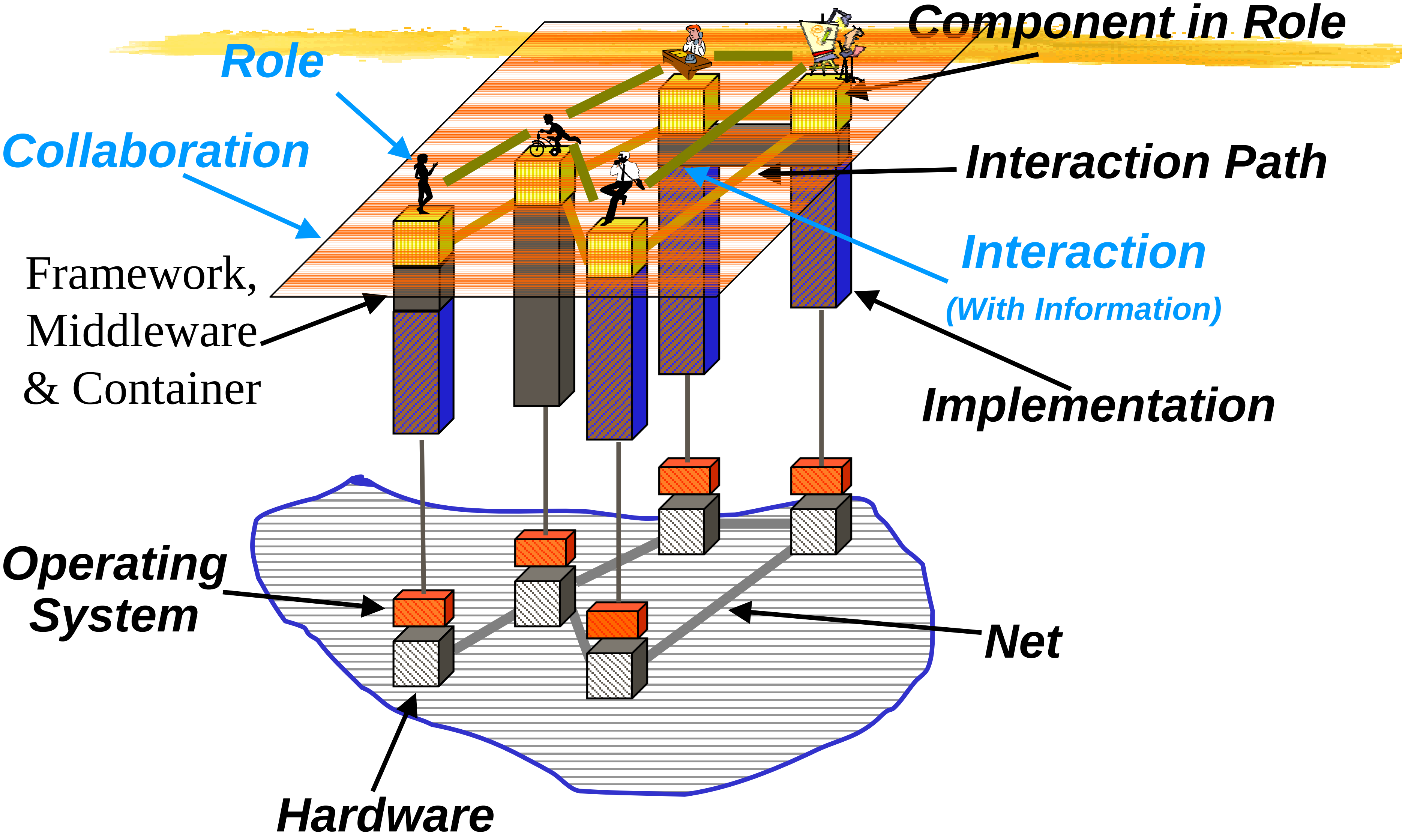


Integration of infrastructure

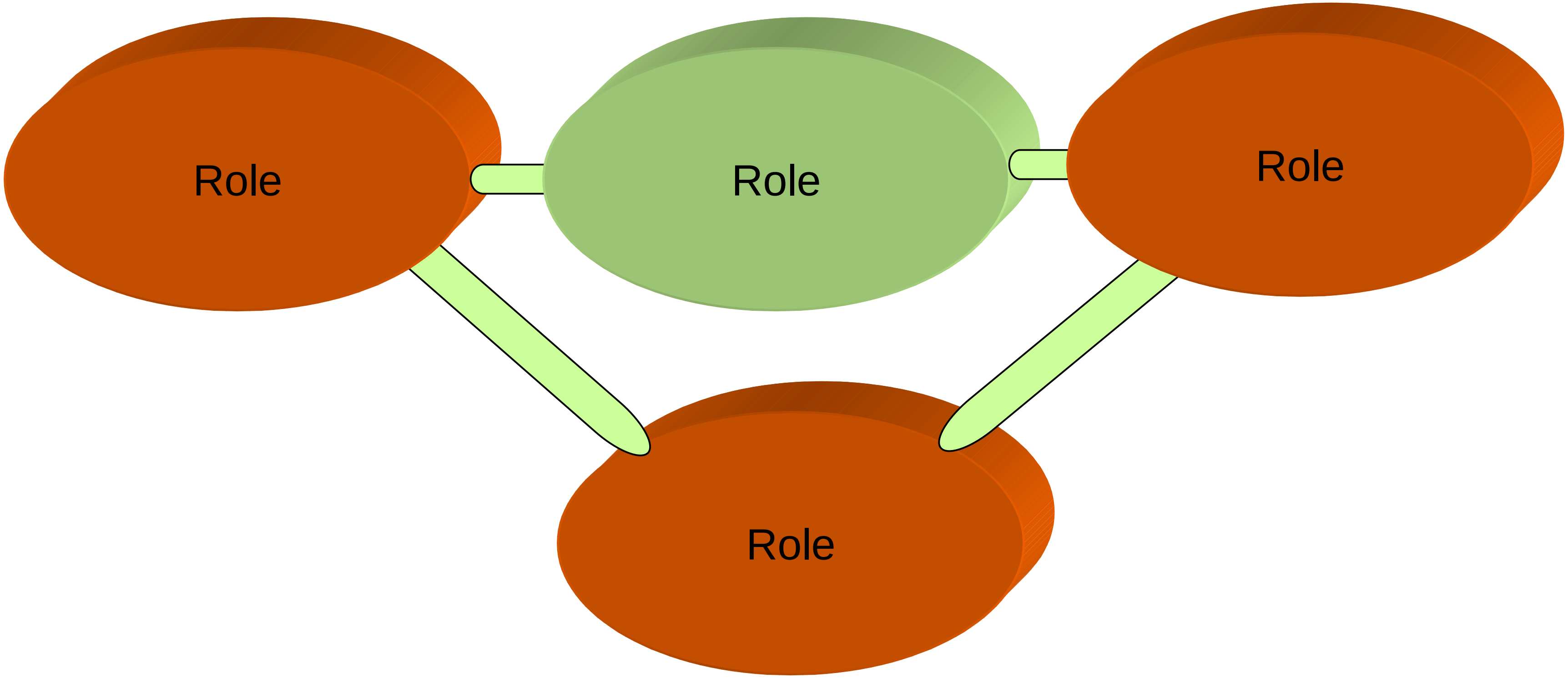
Realizing a Business Architecture

Roles to Enterprise Components & Services

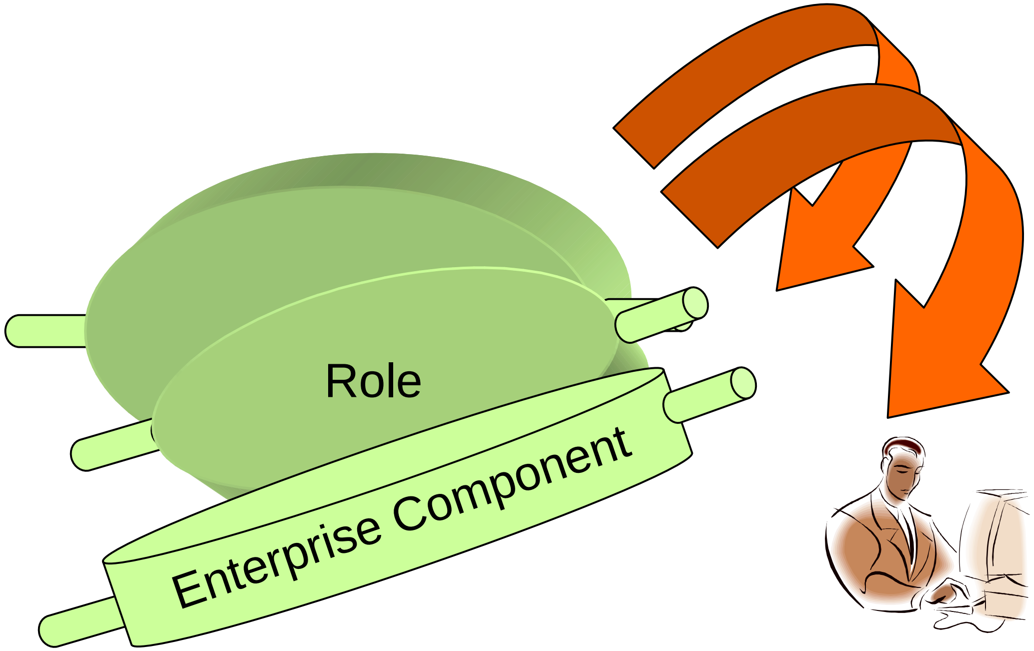
Roles to Systems



Business (CIM) view - Collaborating Roles



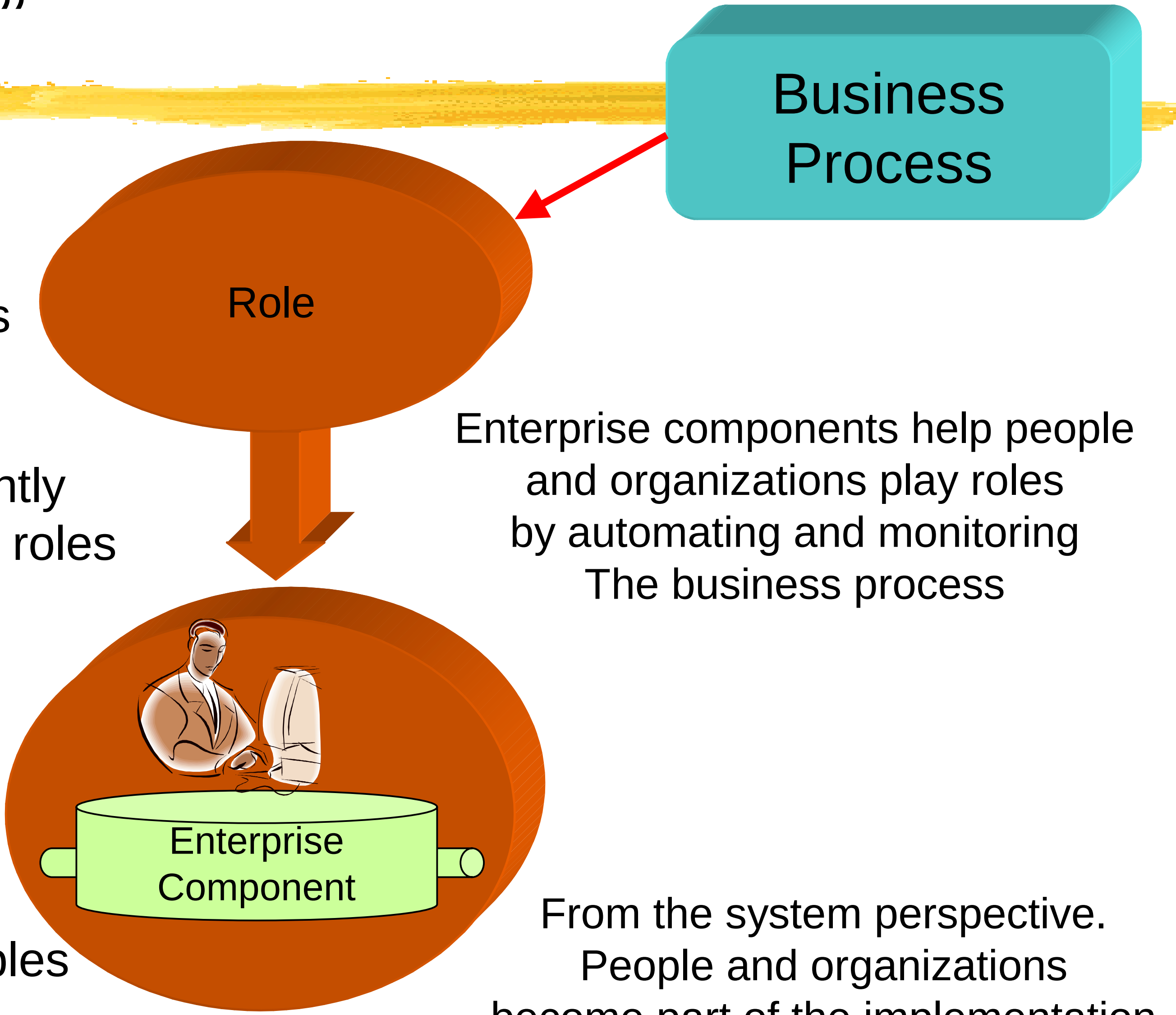
“Upper” PIM View - Enterprise Component



“Rotate” to look
At other aspects
of the component

People, organizations
And/or enterprise components
play roles in Business
Processes.

The “Enterprise Digital Assistant”



People, Organizations
And systems play roles

Enterprise components help people
and organizations play roles
by automating and monitoring
The business process

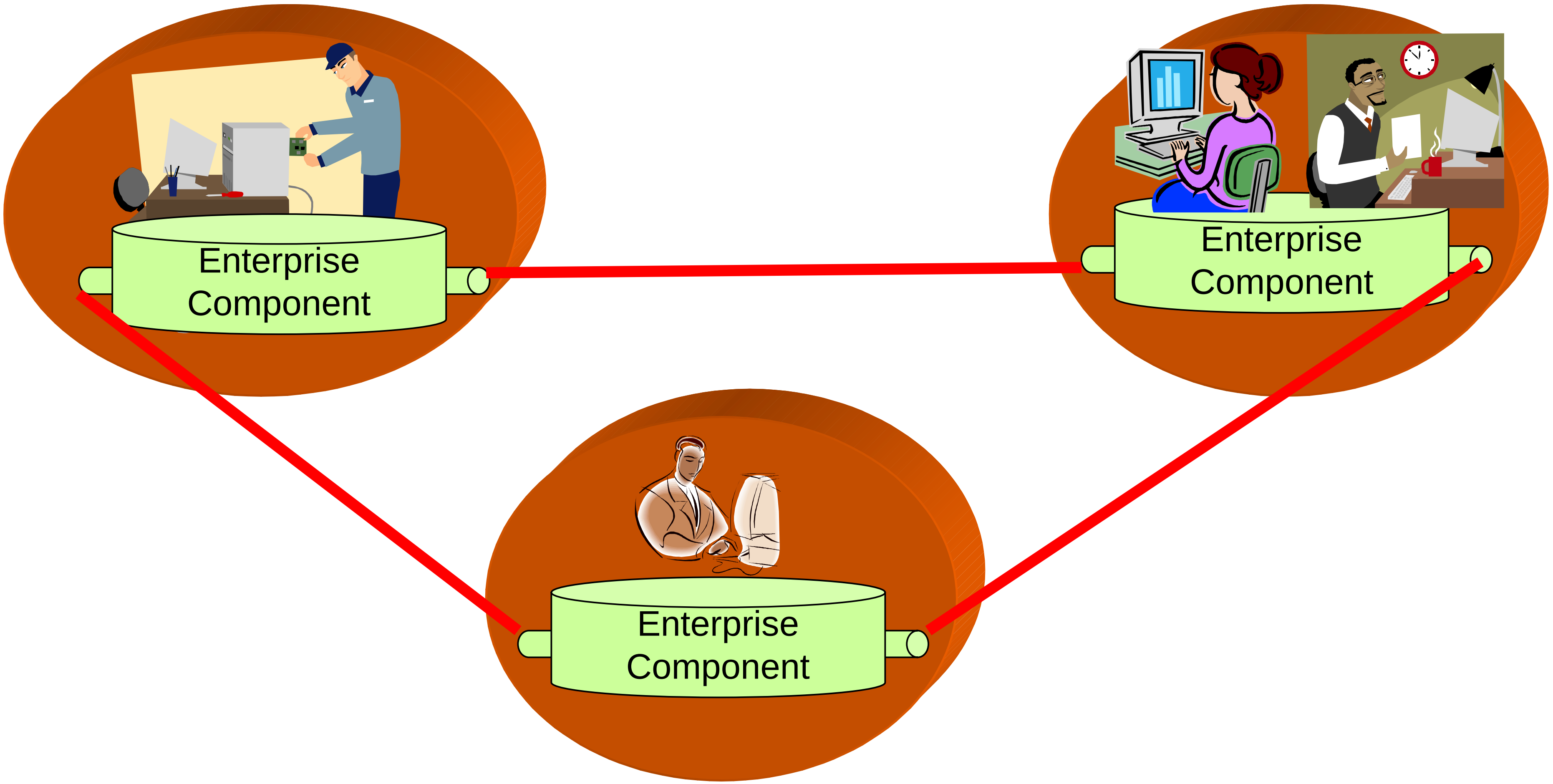
Components frequently
help people play these roles

People, organizations
and systems
components work
together to realize roles

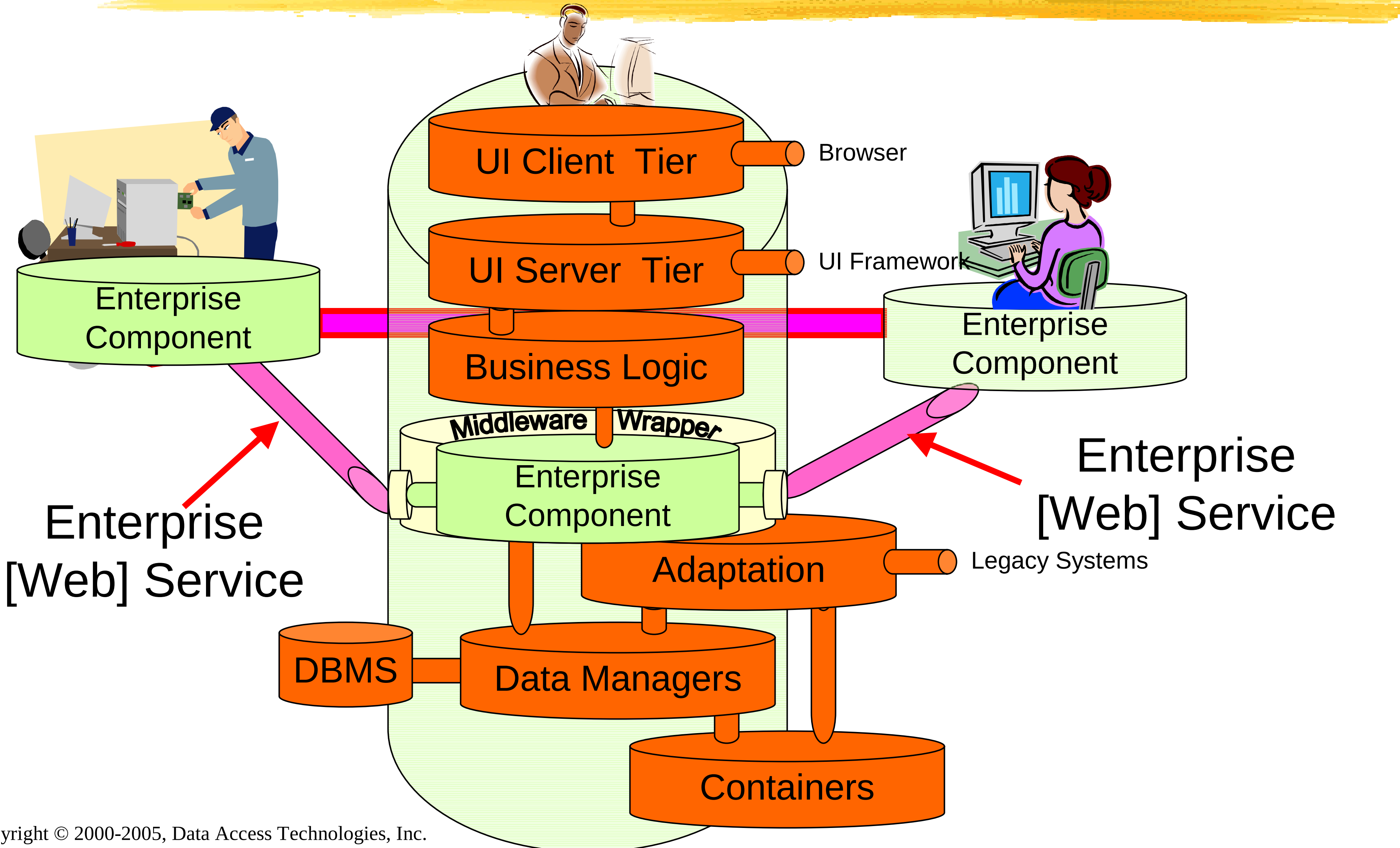
Components are the peoples
Automated assistant

From the system perspective.
People and organizations
become part of the implementation
Of the role

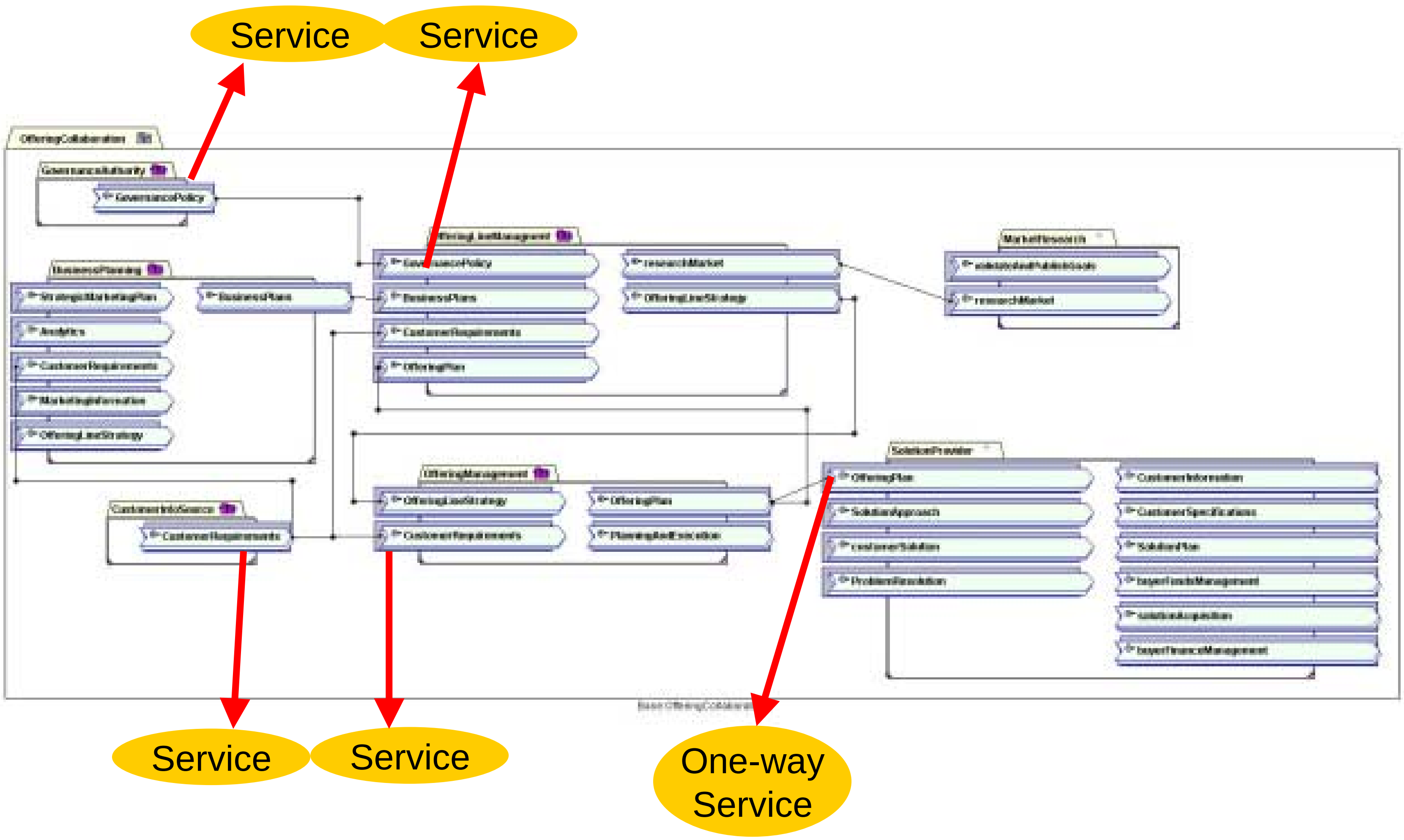
People, Components & Organizations Collaborating



“Lower” PIM View - Enterprise Component Internals



PSM View - Mapping to [web] Services



Service

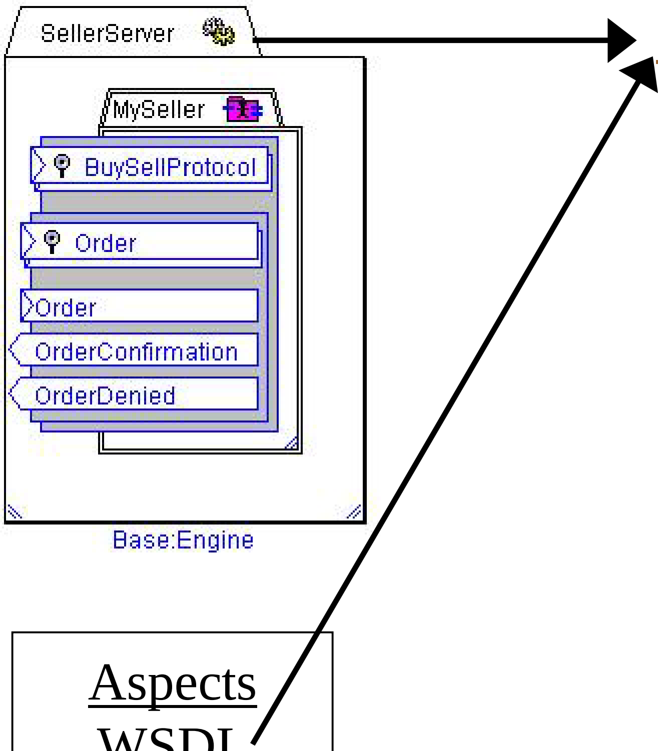
Service

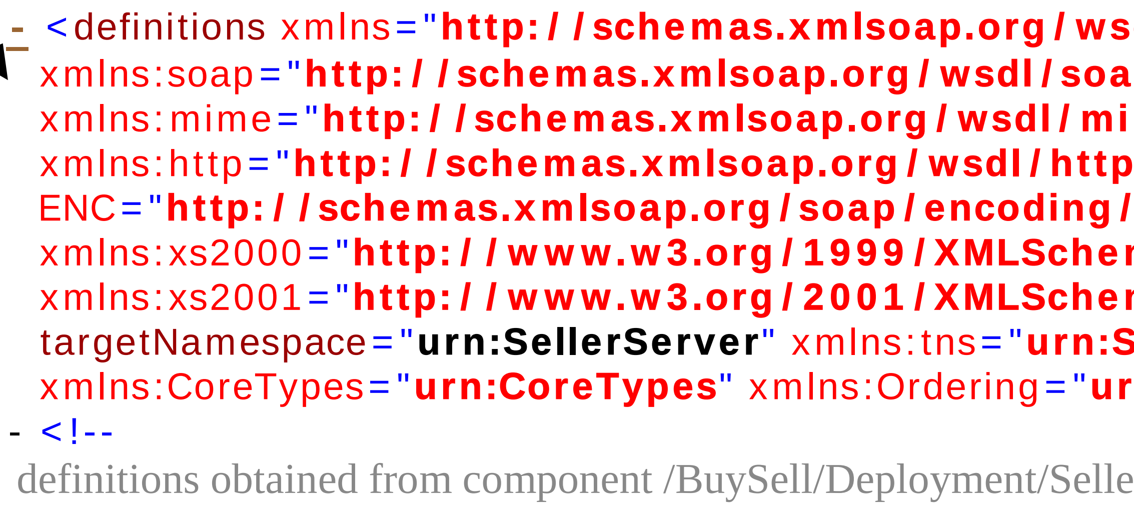
Service

Service

One-way Service

Mapping of a WSDL Engine

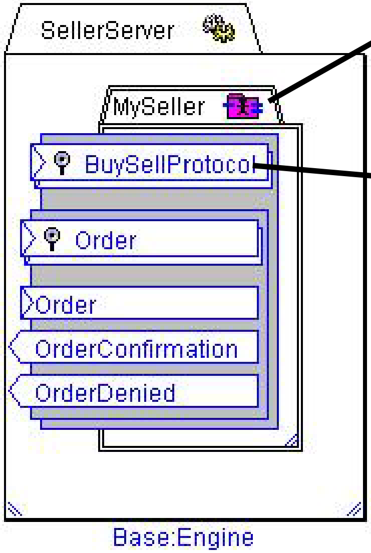




```
- <definitions xmlns="http://schemas.xmlsoap.org/ws
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soa
  xmlns:mime="http://schemas.xmlsoap.org/wsdl/mi
  xmlns:http="http://schemas.xmlsoap.org/wsdl/http
  ENC="http://schemas.xmlsoap.org/soap/encoding/
  xmlns:xs2000="http://www.w3.org/1999/XMLSche
  xmlns:xs2001="http://www.w3.org/2001/XMLSche
  targetNamespace="urn:SellerServer" xmlns:tns="urn:S
  xmlns:CoreTypes="urn:CoreTypes" xmlns:Ordering="ur
- <!--
 definitions obtained from component /BuySell/Deployment/Selle
```

Aspects
WSDL
WSDL-SOAP

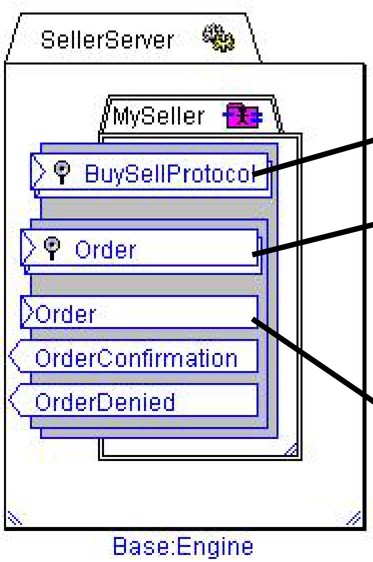
Mapping of an Enterprise Component



<u>Aspects</u>
WSDL
WSDL-SOAP

```
- <service name="MySeller">
- <!--
     implemented service role
    /BuySell/Deployment/SellerServer/MySeller    -->
      <documentation><p> </p></documentation>
    - <port name="BuySellProtocol"
    binding="tns:BuySellProtocol">
    - <!--
     original service port was
    /BuySell/Deployment/SellerServer/MySeller/BuySellProtocol (extending Component
    &lt;/BuySell/SellerImplementation/MySeller/BuySellProtocol&gt; )    -->
      <soap:address
    location="http://localhost:8080/cx/app/BuySell/Deployment/SellerServer/MySeller/BuySellProtocol" />
      </port>
      </service>
```

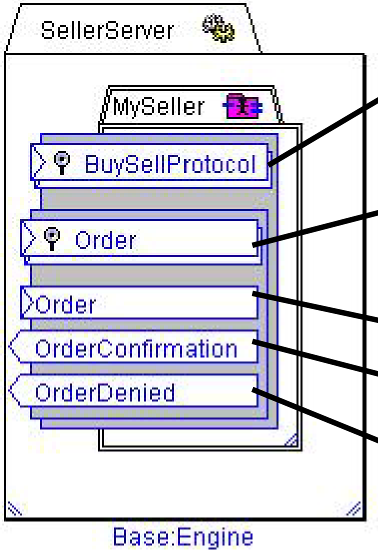
Mapping of a protocol binding



Aspects
WSDL
WSDL-SOAP

```
- <binding name="BuySellProtocol"
   type="tns:BuySellProtocol">
  <soap:binding
       transport="http://schemas.xmlsoap.org/soap/h
       style="rpc" />
- <operation name="Order">
  <soap:operation
       soapAction="urn:/BuySell/Community/BuySellPr
       col/Order" style="rpc" />
- <input name="Order">
  <soap:body use="encoded" namespace="urn:SellerServ
       encodingStyle="http://schemas.xmlsoap.org/soa
       encoding/" />
```

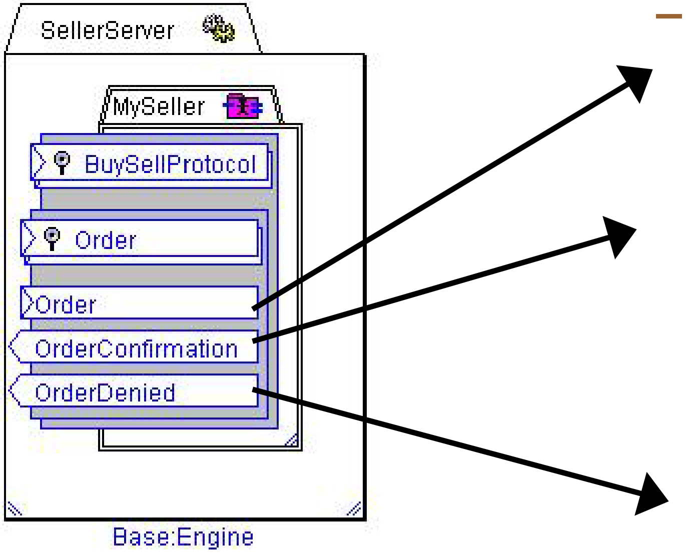
Mapping of a protocol



```
- <portType name="BuySellProtocol">
- <!--
    original cx operation =
   /BuySell/Community/BuySellProtocol/Order    -->
   - <operation name="Order">
   - <!--
    original cx flow port =
   /BuySell/Community/BuySellProtocol/Order/Order    -->
     <input name="Order" message="tns:Order" />
     <output name="OrderConfirmation"
   message="tns:OrderConfirmation" />
     <fault name="OrderDenied"
   message="tns:OrderDenied" />
     </operation>
     </portType>
```

<u>Aspects</u>
WSDL
WSDL-SOAP

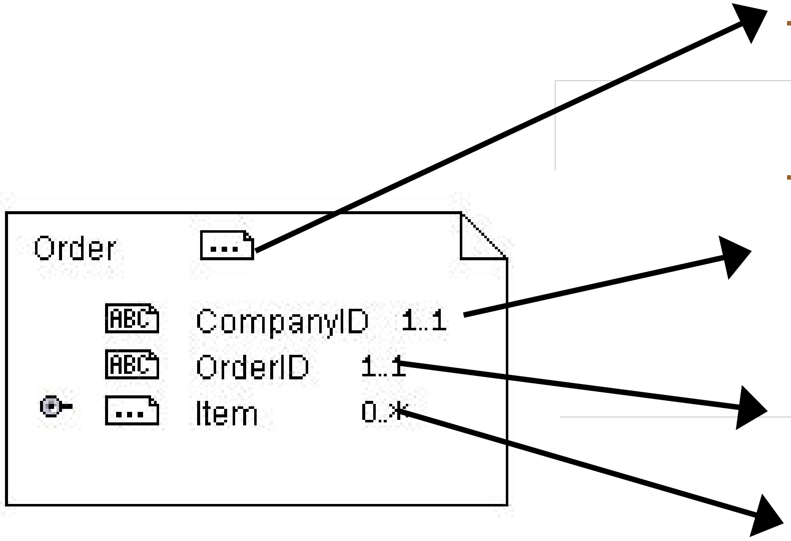
Mapping of message types



```
-
  - <message name="Order">
      <part name="Order" type="Ordering:Order"
<message name="OrderConfirmation">
      <part name="OrderConfirmation"
  type="Ordering:OrderConfirmation" />
      </message>    </message>
  - <message name="OrderDenied">
      <part name="OrderDenied"
  type="Ordering:OrderDenied" />
      </message>
```

<u>Aspects</u>
WSDL
WSDL-SOAP

Mapping of data types



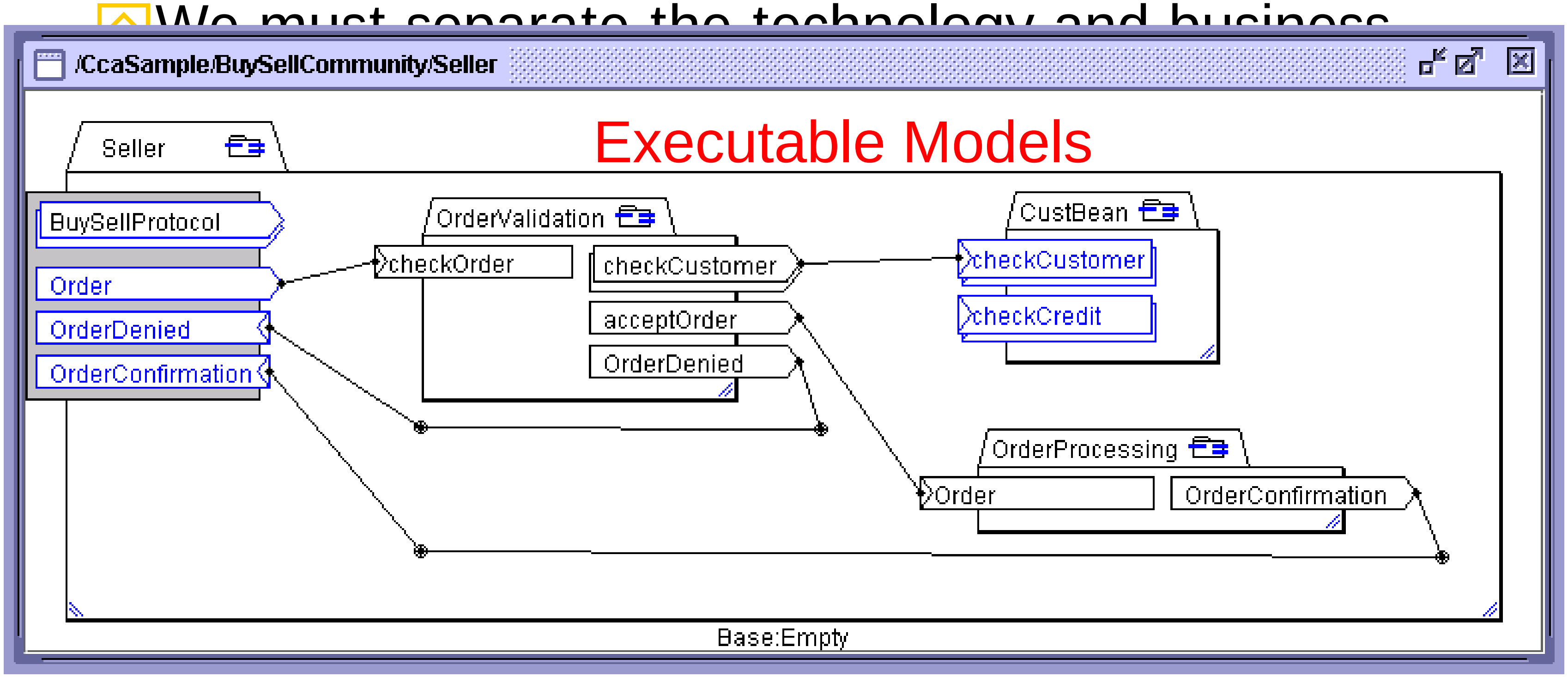
```
- <xs2001:complexType name="Order">
-
- <xs2001:sequence>
    <xs2001:element minOccurs="1"
  maxOccurs="1" name="CompanyID"
  type="CoreTypes:CompanyID" />
    <xs2001:element minOccurs="1"
  maxOccurs="1" name="OrderID"
  type="Ordering:OrderID" />
    <xs2001:element minOccurs="0"
  maxOccurs="unbounded" name="Item"
  type="Ordering:Item" />
    </xs2001:sequence>
    </xs2001:complexType>
```

High level tooling & infrastructure

- MUST BE SIMPLE!
  - We must be able to create better applications faster
  - We must separate the technology and business concerns, enable the user
- Tooling + Infrastructure
  - Executable models are source code
  - Tooling must be technology aware
  - Infrastructure must support tooling, not manual techniques
- Model based component architectures

High level tooling & infrastructure

- MUST BE SIMPLE!
  - We must be able to create better applications faster
  - We must separate the technology and business


/CcaSample/BuySellCommunity/Seller

Executable Models

Net effect

- Using these open standards and automated techniques we can;
  - 80% Reduction in complexity (Conservative)
  - Achieve the strategic advantage of an open and flexible enterprise
  - Produce and/or integrate these systems FASTER and CHEAPER than could be done with legacy techniques
  - Provide a lasting software asset that will outlive the technology of the day

Sample Applications

- One-GSA Executable Enterprise Architecture for the General Services Administration
- Enterprise Component Architecture for U.S. Army PEO-STRI
- Intelligence application for Raytheon & DARPA
- Collaboration Architecture for Kaiser Permanente

Contact

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