MDA & SOA in the Enterprise

VCA
MDA
SOA/ESB

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

Cory Casanave

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

Architected Solution
- One-GSA Solutions
- Buildings
- Schedules
- I.T.
- Telecoms
- Auto
- Supplies
- Finance
- H.R.
Acquisition Model
Today

Customer Needs

FTS

PBS

FSS

Solution Provider

Finance

Acquisition system

Solution Provider

Finance

Acquisition system

GSA

Supplies

IT Services

Space lease

Customer Solutions
To Be Acquisition Model

Customer Needs → Solution Provider → Contracting → Solution Provider → Vendor Solution

Solution Provider

Finance

Project Management
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

One-GSA Business Model

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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.
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

System

System

System

Role

Role

Role

Role

Role

Role

Role

Role

Role

Role

Role

Role

Role

System

System

System

System

System

System

System

Enterprise Service Bus

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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

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

Target State

• Are you here?
MDA Enhanced Procurement

Current

Order & Requirements
Fund/Contract
Contractor Design Implement Test
Solution

Strategic

Analyze Requirements against or Create BA
MDA Enterprise Architecture
Elaborate Components
Service Component Reuse Library
Fund/Contract Reuse
Generate Adapt Construct
SC Integration Testing
Solution

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EA Governance Structure

One GSA Target EA

- Guides
- Refines
- Satisfies

Initiative

OMB - 300

Acquisition

Business Drivers
“One GSA” EA Strategic Integration

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

EA is a STRATEGIC ASSET

- 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
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

One GSA Target EA

- Business Drivers
- Business Models
- Current Processes
- Workflow
- FAR
- I.T. Systems Specs
- Current Environment
- Collaborative Environment
- Initiatives
- Documentation & Training
- Trends
- Projects
- Time Line
- Critical Success Factors
Simulated Model Driven Architecture

Enterprise Architecture Model (CIM)

Domain Architecture

ECA Standard “Meta-Model” & UML Profile

Simulator

Live Process Simulation

Refine/Iterate
Automated Model Driven Architecture

- Meta-Model: UML Profile (E.G. ECA)
- Domain Architecture
- Enterprise Architecture Model (CIM)
- Infrastructure Mapping (E.G. J2EE-WS)
- Tools: Produce & Integrate
- Enterprise Components
- Framework & Infrastructure (E.G. J2EE-WS)
- PSM

Mapping is tuned to the infrastructure

Minimize and structure manual implementation

Technical Architecture
Automated Model Driven Architecture

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

Enterprise Architecture Model (CIM)

Domain Architecture

Infrastructure Mapping (E.G. J2EE-WS)

Tools - Produce & Integrate

J2EE-WS Enterprise Components

Mapping is tuned to the infrastructure

Multiple and Changing Technology Support

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

Simulated Enterprise Components

Framework & Infrastructure (E.G. -NET-WS)

Simulation Infrastructure
## Mission Critical Value Chain

### L0: Segment

<table>
<thead>
<tr>
<th>Develop Market Making Strategy and goals 1.1</th>
<th>Establish/ maintain marketplace 1.3</th>
<th>Provide product support, education and communication 1.4</th>
<th>Establish and manage contracts 2.1</th>
<th>Plan, manage, maintain, monitor inventories 2.2</th>
<th>Receive order/request for goods/services 2.3</th>
<th>Respond to order/request 2.4</th>
<th>Fulfill order/request 2.5</th>
<th>Billing/Payment 2.6</th>
<th>Provide problem management support 3.1</th>
<th>Provide contract/schedules support 3.2</th>
<th>Maintain partner service level performance 3.3</th>
<th>Provide customer care, mission response, and solicit feedback 3.4</th>
</tr>
</thead>
</table>

### L1: Process

<table>
<thead>
<tr>
<th>FSS Gen</th>
<th>PBS Gen</th>
<th>FTS Gen</th>
</tr>
</thead>
</table>

### L2: Task

- Engage in proactive communication and marketing 1.3.3

### L3: Activity

<table>
<thead>
<tr>
<th>Business Lines</th>
<th>Activity generic across business lines</th>
<th>Detailed Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedules</td>
<td>Assess/re-assess needs 1.33.1</td>
<td></td>
</tr>
<tr>
<td>Supply</td>
<td>Assess/re-assess needs 1.33.1</td>
<td></td>
</tr>
<tr>
<td>O V A L S</td>
<td>Assess/re-assess needs 1.33.1</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Assess/re-assess needs 1.33.1</td>
<td></td>
</tr>
<tr>
<td>Travel and Transportation</td>
<td>Assess/re-assess needs 1.33.1</td>
<td></td>
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<tr>
<td>New Construction</td>
<td>Assess/re-assess needs 1.33.1</td>
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<tr>
<td>Repairs and Alterations</td>
<td>Assess/re-assess needs 1.33.1</td>
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<tr>
<td>Owned Inventory</td>
<td>Assess/re-assess needs 1.33.1</td>
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</tr>
<tr>
<td>Leased Inventory</td>
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<tr>
<td>RWA</td>
<td>Assess/re-assess needs 1.33.1</td>
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<tr>
<td>IT Services</td>
<td>Assess/re-assess needs 1.33.1</td>
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</tr>
<tr>
<td>Network Services</td>
<td>Assess/re-assess needs 1.33.1</td>
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</tr>
<tr>
<td>Professional Services</td>
<td>Assess/re-assess needs 1.33.1</td>
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</tr>
</tbody>
</table>

### L4: Action

Detailed Workflows (Out of scope)

---

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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

1. travelPermissionRequest
2. travelPermission
3. expenseReport
4. authorizedExpenseReport
5. paymentRequest
Diagram
Travel Expense Model

Objects --> ClassifierRoles
Collaboration Diagram

- Traveler
- Authorizer
- Book Keeper
- Paymaster
The Marketplace Example

Mechanics Are Us
Buyer

Physical Delivery

Order
Conformation

Process Complete

Status

Acme Industries
Seller

Ship Req
Shipped
Delivered

GetItThere Freight
Shipper
Where are the services?

Mechanics Are Us
Buyer

Web Service

GetItThere Freight
Shipper

Web Service

Acme Industries
Seller

Order
Conformation
Shipped

Web Service

Ship Req
Shipped
Delivered

Physical
Delivery

Status
Inside the Seller

Order Processing

Shipping

Event

Receivables

Order

Conformation

Shipped

Ship Req

Shipped

Delivered

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Roles to Systems

Component in Role

Interaction Path

Interaction (With Information)

Implementation

Operating System

Framework, Middleware & Container

Role

Collaboration

Hardware

Net
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

<table>
<thead>
<tr>
<th>Plan and Design</th>
<th>Develop &amp; Deliver</th>
<th>Aftercare</th>
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</thead>
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<td>Assess/re-assess needs 1.33.1</td>
</tr>
<tr>
<td><strong>L4: Action</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detailed Actions</td>
<td>Detailed Workflows (Out of scope)</td>
<td></td>
</tr>
</tbody>
</table>

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Order to Payment Process Diagram

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

Customer: Project Manager
- Request project need for products and services
- Coordinate Acquisition Planning
- Receive purchase request data from PM
- Combine Project requirements
- Develop Acquisition Plan
- Develop Purchasing Request (SOW, SLA, pricing, timeline)

Controlling
- Develop Market Research/Survey
- Conduct market research using e-Library/eBuy

Supplier: Contract Officer
- Submit Response to RFQ
- Receive RFQ
- Review RFQ
- Develop response to RFQ
- Determine item price/availability/contract

Customer: Financial Officer
- Record funding availability
- Funding validated

Customer: Financial Officer
- Issue RFQ
- Build RFQ
- Evaluate vendor responses

Evaluate
- Final fact finding with suppliers
- Responses via eBuy
- Answer questions/provide input

Evaluate Perform
- Evaluate RFQ
- RFQ via eBuy

Answer
- Questions

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Finding the Roles and Inner Roles

“Swim Lanes”

Customer
- Customer Project Manager
- Customer Contracting
- Customer Financial Officer

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

Supplier
- Project Manager
- Contracting Officer
- Financial Officer

Procurement Broker
- Catalog Manager
- RFQ Manager
- Order Manager
- Financial Officer

Order to Payment

Roles in a Collaboration
High-level role identification

Agency
Customer

Customer Contact

Customer Finance

Customer Program Management

Customer Contracting

User

GSA

Account Management

Business Planning

Customer Strategy

Customer Liaison

Offering Management

Offering Line Management

Solution Provider

Project Management

Funds Management

Contracting

Contracting Team

Small Business Specialist

Source Selection Authority

Legal Officer

Technical Management

Administrative Support

Industry Partner

Customer Care

Accounting

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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
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
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 model is correct and ultimately to test the implemented components.
Drill-down
Sample Information Model

- **Company**
  - **Key**: CompanyKey
  - **+Companyld**: String

- **Account**
  - **Key**: AccountKey
  - **+AccountNo**: String
  - **+Name**: String
  - **+Balance**: Decimal = 0
  - **+AccountNo**: long

- **Address**
  - **+Street**: String
  - **+City**: String
  - **+State**: String
  - **+Zip**: String

- **Invoice**
  - **Key**: InvoiceKey
  - **+InvNum**: Integer
  - **+Total**: Decimal

- **LineItem**
  - **-Part**: string
  - **+PartId**: String
  - **+Description**: String
  - **+Quantity**: float
  - **-Price**: Currency

- **Part**
  - **Key**: PartKey
  - **+PartId**: String

- **Company**
  - **Key**: CompanyKey
  - **+CompanyId**: String

- **Part**
  - **Key**: PartKey
  - **+PartId**: String

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Adding Entities

- Entities are added to manage entity data
- Entity Roles are managers that provide 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
Dealing with Variation
Multiple Implementations of a Role

The “Inside” can change as long as the external “contract” is satisfied
Architecture becomes part of Acquisition
Add implementation

- As component compositions
- In a programming language
- By using an external service
- By Wrapping legacy systems
Add technology specifics for deployment
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!
Roles  Compose  Inner Roles  - Specify Service Granularity
Protocols Organize Information Choreographed by Roles
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
Roles **Choreography** Value Chain Activities

- **Roles**
  - OrderFulfillment
  - ScheduleFulfillment
  - FulfillmentSchedule
  - ScheduleConfirmation
  - ScheduleRejection
  - FulfillOrder
  - ProductOrService
  - FulfillmentNotice

- **Choreography**
  - AcquireProductLead
  - AcquireFunding
  - DevelopRFQ
  - RFQDevelopment
  - AcquireFunding
  - AcquireProductLead
  - AcquireFunding
  - AcquireProductLead
  - AcquireFunding

- **Value Chain**
  - AcquisitionDevelopment
  - OrderDevelopment
  - Quote
  - AwardDecision
  - ReqFunding
  - FundsRequest
  - FundsResponse

- **Activities**
  - ScheduleFulfillment
  - Acquire3rdPartyServices
  - FulfillmentNotice

- **Base:** CustProjectManager
Roles Choreograph Value Chain Activities

**Customer:**
- Project Manager: Determine project need for products and services
- Financial Officer: Request funding availability

**Contracting:**
- Request purchase request data from PM
- Assign contract specialist
- Conduct research using e-Library/eBuy

**Customer:**
- Project Manager: Receive RFQ
- Finance Officer: Record funding availability

**Supplier:**
- Receive RFQ
- Submit Response

**Communications:**
- Answer questions
- Receive RFQ

**Contract Officer:**
- Develop Acquisition Plan
- Coordinate Acquisition Plan
- Receive purchase request data from PM

**Acquisition Plan Input:**
- SOW

**Market Research:**
- Conduct Market Research

**Evaluate vendor responses:**
- A, J, L

**Conduct initial evaluation:**
- A, J, L

**Evaluate Perform:**
- Final fact finding with suppliers

**Funding validated:**
- Receive purchase request data from PM

**Final fact finding:**
- Final fact finding with suppliers

**Review RFQ:**
- Respond? Yes

**Determine item:**
- price/availability/contract

**Develop response:**
- to RFQ

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Multiple Implementations of a Role

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
Delivering The Architecture
Simulating the Process

*Validation & Buy-in*
- Business stakeholders
- SMEs
- Systems Implementers
Initiating Activity
Activity interacting externally
... 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)
Community Process

Roles, processes, activities

Reference model associations via aspect/properties
<table>
<thead>
<tr>
<th>name</th>
<th>baseline</th>
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<th>actual</th>
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<tr>
<td>Management PolicyComplianceExtent</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management UnidentifiedRiskEvents</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Iterative Development

Business Model Design

Automation

Infrastructure Development

Build Build Build Build Build

Release Build

Deploy
Common Environment for Intellectual Capital

Integration of infrastructure
Realizing a Business Architecture

Roles to Enterprise Components & Services
Roles to Systems

Collaboration

Framework, Middleware & Container

Operating System

Hardware

Component in Role

Interaction Path

Interaction (With Information)

Implementation

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Business (CIM) view - Collaborating Roles
“Upper” PIM View - Enterprise Component

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

“Rotate” to look at other aspects of the component.
The “Enterprise Digital Assistant”

People, Organizations And systems play roles

Components frequently help people play these roles

People, organizations and systems components work together to realize roles

Components are the peoples Automated assistant

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

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
Mapping of a WSDL Engine

- `<definitions xmlns="http://schemas.xmlsoap.org/wsdl`
- `xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap` `
- `xmlns:mime="http://schemas.xmlsoap.org/wsdl/mime` `
- `xmlns:http="http://schemas.xmlsoap.org/wsdl/http` `
- `ENC="http://schemas.xmlsoap.org/soap/encoding/` `
- `xmlns:xs2000="http://www.w3.org/1999/XMLSchema` `
- `xmlns:xs2001="http://www.w3.org/2001/XMLSchema` `
- `targetNamespace="urn:SellerServer" xmlns:tns="urn:SellerServer` `
- `xmlns:CoreTypes="urn:CoreTypes" xmlns:Ordering="urn:` `

definitions obtained from component /BuySell/Deployment/Seller
Mapping of a protocol binding

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

Aspects
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 name="OrderDenied">
    <part name="OrderDenied" type="Ordering:OrderDenied" />
  </message>
</message>
```

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Mapping of data types

```xml
<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 concerns, enable the user

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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