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’

<table>
<thead>
<tr>
<th>Abstractions (Columns)</th>
<th>The Zachman Framework</th>
<th>DATA</th>
<th>FUNCTION</th>
<th>NETWORK</th>
<th>PEOPLE</th>
<th>TIME</th>
<th>MOTIVATION</th>
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<tbody>
<tr>
<td>SCOPE</td>
<td></td>
<td>List of things important to the business</td>
<td>List of processes the business performs</td>
<td>List of Locations in which the business operates</td>
<td>List of Organizations important to the Business</td>
<td>List of Events Significant to the Business</td>
<td>List of Business Goals/Strategies</td>
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<td>BUSINESS MODEL</td>
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<td>(Conceptual) Planner</td>
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<td>(Out-of-Context) Sub-Contractor</td>
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#### Key Concepts

- **Enterprise Architecture (EA)**
- **Reference Architecture (RA)**
- **Solution Architecture (SA)**
- **Reference Implementation (RI)**
FMEA: MDA Top Down - ADM Bottom Up

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

Architecture Driven Modernization (ADM)

Model Driven Architecture (MDA)

Computation Independent

Platform Independent

Platform Specific
EDOC/ECA/CCA **CRI** Grammar - Standard Graphic Notation

- 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

**Community Process (CoP)**
Collaborations Contextualize Roles = Service Providers

Buyer Enterprise

GSA Enterprise

Seller Enterprise
Roles Compose Inner Roles = Service Granularity
Protocols Organize Conversations Choreographed by Roles
CCA Protocol = Interface Specification

The protocol is initiated by a requested transaction

Each accepted transaction effects a change in the information and behavior of the receiving role

Responses to the transaction may indicate success or failure
<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

**Module A**

- **Entry Point**
- **tightly coupled**

- **Wire**

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

- **Implementation**
  - Java
  - BPEL

- **Binding**
  - Web Service
  - SCA, JCA, JMS, ...
eGov SOA System of Systems, Quick CCA-SCA Comparison
FEA as CCA Aspect = PRM Line of Sight

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

Elaborated **Platform** model elements inherit these annotations, adding further PRM and TRM annotations as a model is transformed and deployed to a J2EE Server.
ITPM - Business Process, FSS/FTS, Exhibit 53

Exhibit 53 Investment point:
- Customer Supply Center System
- Federal Supply Service 19
- GSA Advantage
- ITOMS and Information Technology Solutions Shop (ITSS)
- Sales Automation System (SASy)
- Federal Excess Property Disposal System
- Fleet Management System
- GSA Preferred (Third Generation System (3GS))
- Requisitioning, Ordering and Documentation System (ROADS)
- Task Order System (TOS) / Office of Integration Management (OIM)
ITPM - GSA Advantage, Business Processes, Roles
ITPM - SRM Financial Management, Business Processes
ITPM - Business Process, Roles, Exhibit 53, FEA (all)
Org Design – Flexible Role/Service Composition and Reuse

Legend
- Organization
- Position
- Role

GSA

PBS
- Mid-Atlantic Region
  - Real Estate Specialist
    - Solution Provider
    - Contracting

FTS
- Office of the Administrator
  - Commissioner
    - IT Solutions
      - Customer Service Rep

FSS
- Vehicle Acquisition & Leasing
  - Fleet Service Rep
    - Solution Provider
    - Contracting

Solutions Provider
Project Manager
To-Be BP Interoperates with As-Is Service Component

OrderToFornPayment

- 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 "RFQ1094092258455".
- 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!
### PRM Line of Sight for Activity Based Costing

The table below shows the baseline, planned, and actual values for various metrics related to Activity Based Costing.

<table>
<thead>
<tr>
<th>Name</th>
<th>Baseline</th>
<th>Planned</th>
<th>Actual</th>
<th>Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Avoidance</td>
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<tr>
<td>Productivity Quantity Per Time</td>
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<tr>
<td>Productivity Products Per FTE</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Productivity Percent Resources Used</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productivity Percent Improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productivity Percent Electronic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycle Time Production Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cycle Time Cycle To Wait Time Ratio</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cycle Time Planned Versus Actual</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Quality Effectiveness Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality Complaints Per Customer</td>
<td></td>
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</tr>
</tbody>
</table>

### Diagram

The diagram illustrates the flow and connectivity of various processes and components within the PRM line of sight framework. It is designed to provide a visual representation of how different activities and roles interact with each other to achieve cost optimization.

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George Thomas, GSA OCIO Enterprise Architecture Group  
27-Mar-06
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

Focus of FMEA

- Financial Management
- Acquisition
- Solutions
- Property Management
- Policy
- Business Intelligence
- Human Resources
- Marketing
Financial Reporting collects financial data from all other enterprise roles.

Financial Reporting collects financial data from all other enterprise roles.
**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 of 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

[Diagram showing various enterprise roles and their relationships]
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

Presentation Manager components provide user access to application services
Service Manager components provide transactional implementation of application services defined in the CIM
Data Manager components persist data between application transactions

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

Presentation Manager components provide user access to application services
Service Manager components provide transactional implementation of application services defined in the CIM
Data Manager components persist data between application transactions

System Assembly

Subsystem
PIM: Receivables Management Work Role

Presentation Manager
- Provided services
- Role for human participation in the process

Service Managers
- Explicit cross-transactional coupling via the data tier

Data Managers
- Used services

Presentation Manager Services:
- CustomerOrderEstablishment
- ReceivableEstablishment
- ReceivableDestroy
- SellerEvent

Service Managers Services:
- CustomerOrderDataAccess
- GeneralLedgerPosting
- SalesInstrDataAccess
- ReceivableTriggerEstablishment
- ProceedToNextEvent

Data Managers Services:
- GeneralLedgerPosting
- ChargeEstablishment
- SalesInstrDataAccess
- DataAccess
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

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Reimbursable agreement information. Capture and accumulate reimbursable agreement information that includes the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMA-03</td>
<td>* Billing limit</td>
</tr>
<tr>
<td></td>
<td>* Billing terms</td>
</tr>
<tr>
<td></td>
<td>* Customer order amount</td>
</tr>
<tr>
<td></td>
<td>* Amount obligated</td>
</tr>
<tr>
<td></td>
<td>* Amount expended</td>
</tr>
<tr>
<td></td>
<td>* Advances collected</td>
</tr>
<tr>
<td></td>
<td>* Advances applied to earned revenue</td>
</tr>
<tr>
<td></td>
<td>* Remaining balance on advances</td>
</tr>
<tr>
<td></td>
<td>* Amount earned</td>
</tr>
<tr>
<td></td>
<td>* Amount billed</td>
</tr>
<tr>
<td></td>
<td>* Accounts receivable</td>
</tr>
<tr>
<td></td>
<td>* Collections on receivables</td>
</tr>
<tr>
<td></td>
<td>Enable access to reimbursable agreement information by customer ID number, reimbursable agreement number, project, or fund.</td>
</tr>
</tbody>
</table>
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`
A term in the vocabulary represents a class of things to be described

Entities may be described as having a unique identity

A relation between terms is described by an association between classes

An un-shaded class is further detailed on a different diagram

Attributes specify descriptive information having simple types

A class may be specialized into sub-classifications

This means “zero or more”

This indicates a compositional (as opposed to referential) association

This is a constraint that defines the sub-classification

This means “one or more”
Business Information, Business Transaction Model

- Business Transaction
- Business Entity
Business Transaction Message Model

“panoptic” inheritance of “namesakes”

“restricted” inheritance allows for explicit inclusion and exclusion of attributes and associations
<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
FMEA PSM: Generated BPEL/WSDL/XSD

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

<wSDL:message name="ReceivableEstablishmentPanopticInheritanceCluster">
    <wSDL:part name="ReceivableEstablishmentPanopticInheritanceCluster" type="Receivable_Establishment:ReceivableEstablishmentPanopticInheritanceClusterType"/>
    <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: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:complexType>
```
• 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

- Contact me:
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