Smart SOA in Action

SOA Governance

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SOA Governance is a key requirement for overall successful SOA implementations

"You only need one service to need governance. You only need one service to destroy your business."

Gartner
Companies recognize importance of Registry and Repository

Top 3 Technological Challenges of Adopting SOA

- Scaling to production volumes, reliability & availability: 50%
- Creating a metadata registry & repository: 50%
- Establishing a realistic project timeframe: 44%

Middleware considered most important in an SOA

- Registry & Repository: 18%
- Security: 17%
- Management: 18%
- App Server: 29%
- ESB: 18%

Source: Aberdeen Group 2006. 600+ company respondents across 4 studies
A scenario on the importance of SOA governance*

1. Provide a currency service that fills a specific line of business (LOB)
2. Other LOBs start using the service
3. LOBs increase use of services / quality suffers
4. Service is fixed at provider’s expense
5. Fix works temporarily but problem reappears
6. Maintenance costs soar / provider ends service

* Scenario from Introduction to SOA Governance, Bobby Woolf.
SOA Governance and Service Lifecycle Management aligns IT and business goals for enterprises

A holistic approach spanning business, process, and IT

- #1 CIO priority: Aligning IT and business goals
  
  Source: CIO Magazine; January 2007
SOA Governance is critical no matter…

Whether you are…

...here or here or here

Smart SOA

Critical for maximizing SOA success and value on the path toward becoming a Globally Integrated Enterprise
Key Technologies for Web Services

- **SOAP** over HyperText Transfer Protocol (HTTP) is the common protocol for Web services.
- **WSDL** is the interface contract language between Web service providers and requestors.
- Web services can be discovered using Universal Description, Discovery, and Integration (UDDI).
How is Web Service Defined

**WSDL portType**
A portType element defines the abstract operations used by the Web service.

**WSDL message**
A message element defines each message used by the Web service and associates it with a particular name and data type.

**WSDL type**
A types element defines the data types, typically expressed using XML Schema, describing the messages exchanged with the Web service.
How is Web Service Defined

WSDL service
A service element groups a set of related ports together. Each port is associated with a particular binding definition. The actual location of the Web service is defined within the port definition of a service.

WSDL binding
A binding element defines the message format and protocol details for operations and messages defined by a particular portType. Each operation defined under portType is associated with an access protocol, such as SOAP, and various formatting options.
How to access Web Services using SOAP

**SOAP request message**

```xml
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:m="Some-URI">
  <soapenv:Body>
    <m:GetLastTradePriceInput>
      <m:tickerSymbol>IBM</m:tickerSymbol>
    </m:GetLastTradePriceInput>
  </soapenv:Body>
</soapenv:Envelope>
```

**SOAP response message**

```xml
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:m="Some-URI">
  <soapenv:Body>
    <m:GetLastTradePriceOutput>
      <m:price>75.5</m:price>
    </m:GetLastTradePriceOutput>
  </soapenv:Body>
</soapenv:Envelope>
```
**UDDI**

- **UDDI** is an open framework defined by the Organization for the Advancement of Structured Information Standards (OASIS) for describing, publishing, and finding Web services on the Internet.

- Similar to the traditional phonebook’s yellow and white pages, **UDDI** is an XML-based registry where companies can list the Web services they provide, and locate the Web services they need.
Is UDDI Enough?

*Universal Description, Discovery and Integration*

- Good only for finding services
  - usually Web services at development time
- No service metadata and relationships
  - inflexible data model
- No integration with middleware at runtime
- No repository capabilities
  - to store artifacts and control their change
What Information is in a Service Registry and Repository

**Registry**
- Stores, manages and queries service metadata
  - Properties
  - Relationships
  - Classifications
    - captured as ontologies

**Repository**
- Stores, manages and queries service artifacts
  - Physical Documents
    - WSDL, XSD, WS-Policy, SCDL, XML
  - Logical Derivations
    - PortType, port, message, complexType
  - GenericObject
    - a container (collection) for metadata
Service Descriptions

- Stores, manages and queries service artifacts
  - Physical Documents (versionable)
    - WSDL, XSD, WS-Policy, SCDL, XML
  - Logical Derivations (non-versionable)
    - Logical derivations are shredded documents
    - PortType, port, message, complexType
  - GenericObject
    - non-XML pieces of information
    - a container (collection) for metadata

Repository
Service Descriptions
Service Metadata

- Stores, manages and queries service metadata
  - Properties
    - simple name/value pairs
  - Relationships
  - Classifications
    - captured as ontologies
Ontology for description of a concept

• An **Ontology** is a *data model* that represents a set of concepts within a **domain** and the relationships between those concepts. It is used to reason about the objects within that domain.

• Ontologies are used in artificial intelligence, the semantic web, software engineering and information architecture as a form of **knowledge** representation about the world or some part of it.

(*) from Wikipedia
Example of Service Description

- Policy
  - policy Definition Files
  - Service v1.0
  - Service v1.1
  - provided Interface
  - WSDL

- Endpoint 1
  - available Endpoint

- Endpoint 2
  - available Endpoint
  - defining WSDL

- Endpoint 3
  - available Endpoint
  - defining WSDL

XML Document
OWL – Ontology Web Language

• *A taxonomy indicates only class/subclass relationship whereas an ontology describes a domain completely.*

• Ability to define properties of classes.

```xml
<owl:Class rdf:about="&wsrrg;State">
  <rdfs:label xml:lang="en">State</rdfs:label>
</owl:Class>

<owl:Class rdf:about="&wsrrg;Transition">
  <rdfs:label xml:lang="en">Transition</rdfs:label>
</owl:Class>

<owl:ObjectProperty rdf:about="&wsrrg;fromState">
  <rdfs:domain rdf:resource="&wsrrg;Transition"/>
  <rdfs:range rdf:resource="&wsrrg;State"/>
</owl:ObjectProperty>

<owl:DatatypeProperty rdf:about="&wsrrg;generateNotification">
  <rdfs:domain rdf:resource="&wsrrg;Transition"/>
  <rdfs:range rdf:resource="&xsd;boolean"/>
</owl:DatatypeProperty>

<owl:Class rdf:about="&wsrrg;Planned">
  <rdfs:label xml:lang="en">Planned</rdfs:label>
  <rdfs:subClassOf rdf:resource="&wsrrg;State"/>
</owl:Class>

<owl:Class rdf:about="&wsrrg;Specified">
  <rdfs:label xml:lang="en">Specified</rdfs:label>
  <rdfs:subClassOf rdf:resource="&wsrrg;State"/>
</owl:Class>

<owl:Class rdf:about="&wsrrg;Specify">
  <rdfs:label xml:lang="en">Specify</rdfs:label>
  <rdfs:subClassOf rdf:resource="&wsrrg;Transition"/>
  <wsrrg:fromState rdf:resource="&wsrrg;Planned"/>
  <wsrrg:toState rdf:resource="&wsrrg;Specified"/>
  <wsrrg:appliedAccessControl rdf:resource="&wsrrg;GovernanceAccessControl"/>
  <wsrrg:generateNotification rdf:datatype="http://www.w3.org/2001/XMLSchema#string"/>
</owl:Class>
```
Concept Templates

- **Flat XSD type**
  - Properties represented by attributes with type xsd:String
  - Relationships represented by attributes with type xsd:IDREFs
- **Pre-defined templates**
  - Application
  - Process
  - Service
  - Policy

```xml
<xsd:complexType name="Service">
    <xsd:attribute name="businessOwner" type="xsd:string" />
    <xsd:attribute name="serviceExposureRationale" type="xsd:string" />
    <xsd:attribute name="providedInterface" type="xsd:IDREF" />
    <xsd:attribute name="availableEndpoints" type="xsd:IDREFS" />
    <xsd:attribute name="serviceDependencies" type="xsd:IDREFS" />
</xsd:complexType>

<xsd:complexType name="Endpoint">
    <xsd:attribute name="businessOwner" type="xsd:string" />
    <xsd:attribute name="definingWSDL" type="xsd:IDREFS" />
    <xsd:attribute name="endpointReference" type="xsd:IDREF" />
</xsd:complexType>
```
Service Registry & Repository Content

Service Description Entities

- **Physical Documents**
  - WSDL
  - XSD
  - SCDL
  - WS-Policy
  - XML - *User-defined Documents*
  - ...

- **Logical derivations**
  - Interface
  - Operation
  - Message
  - Type
  - Service
  - Binding
  - Endpoint
  - ...

- **Concepts**
  - *User-defined by classification*
  - Business Application
  - Business Process
  - Governed Collection
  - External reference
  - ...

Service Metadata

- **Properties**
  - name
  - namespace
  - version
  - description
  - modifiedDate
  - ...

- **Relationships**
  - derivedFrom
  - operations
  - messages
  - User-defined

- **Classifications**
  - User-defined
    - States
    - Created
    - Approved
    - Published
    - Operational
  - User-defined
    - Environments
    - Development
    - Test
    - Approval
    - Production
  - User-defined
    - Concepts
    - Application
    - Process
    - Capability
  - Standard Ontologies
    - NAICS
    - UNSPSC
    - ISO3166

Metadata applies to all entities
Questions about governing SOA

How do I eliminate “rogue services” and ensure control of my SOA?

How do I manage the services lifecycle?

How do I enable enforcement of policies across all internal and external services?

How do I help services interact efficiently and dynamically with each other?

How do I govern services as part of my SOA?

How do I increase service reuse?

How can I help my ESB execute in the right context?

How do I optimize service interactions to be better aligned with business process?
SOA Governance defined

Effective management of the Service Lifecycle

What is IT governance?

Establishing decision making rights associated with IT

Establishing mechanisms and policies used to measure and control the way IT decisions are made and carried out

What is SOA governance?

Extension of IT governance focused on managing the lifecycle of services
### SOA Governance & Management Method

<table>
<thead>
<tr>
<th>Plan</th>
<th>Define</th>
<th>Enable</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine the Governance Focus</td>
<td>Define the SOA Governance Model</td>
<td>Implement the SOA Governance Model</td>
<td>Refine the SOA Governance Model</td>
</tr>
<tr>
<td>Understand current governance structures</td>
<td>Define and refine governance processes</td>
<td>Implement the transition plan</td>
<td>Measure effectiveness governance processes</td>
</tr>
<tr>
<td>Create IT governance baseline</td>
<td>Define organizational change</td>
<td>Initiate SOA Org Changes</td>
<td>Measure effectiveness of organization change</td>
</tr>
<tr>
<td>Define scope of governance</td>
<td>Define IT changes in SOA development</td>
<td>Launch the SOA Center of Excellence</td>
<td>Review and refine operational environment</td>
</tr>
<tr>
<td>Conduct change readiness survey</td>
<td></td>
<td>Implement infrastructure for SOA</td>
<td></td>
</tr>
</tbody>
</table>

**Continuous SOA Governance Process Measurement & Improvement**

- Define the scope of governance: business, development governance or service management or all of the above
- Define new governance processes for services and define SOA governance mechanisms such as the SOA Center of Excellence
- Begin implementation of the SOA Center of Excellence, Skills Enablement, Organizational Change, Infrastructure Change, etc.
- Monitor composite application performance and adjust; Monitor effectiveness of governance changes
14 Critical Processes That Constitute an Effective SOA Governance Model Implementation

By effectively establishing governance mechanisms in these 14 areas, clients can address these common challenges:

- Establishing decision rights
- Defining high value business services
- Managing the lifecycle of assets
- Measuring effectiveness
SOA needs a registry and repository to enable governance

A registry AND repository is needed to enable SOA governance

- Provide an infrastructure to publish, classify and discover services
- Makes rich service metadata available to runtime applications
- Provides impact analysis and change validation
- Manages the lifecycle of services

Design the Governance Approach

Scope the Governance Need

Put the Governance Model into action

Manage & Monitor the Governance Processes
WebSphere Service Registry and Repository

*Provides value throughout the service lifecycle*

**Promote Reuse**
Find and reuse services for building new processes and applications.

**Enable Lifecycle Governance**
Govern services throughout the service lifecycle. Reconcile governed services with deployed services.

**Enhance Connectivity**
Enable dynamic and efficient integration of services. Enable enforcement of policies.

**Optimize Service Usage**
Promote Reuse - Requirements

Build a catalog of trusted, high quality services

**Requirements**

- Organize and describe services in our SOA?
- Keep projects within budget and on time?
- Avoid duplication and reducing cost?
- Deploy new processes quickly?
- Accelerate process improvements?

**Solutions**

- Publish and find your services and related information in one place
- Increase visibility of services throughout your organization
- Locate redundant and inefficient services
- Federate with other standard registries and repositories to support complete lifecycle
Promote Reuse in Business Process Automation

*Quickly assemble / modify business processes*

- Publish new processes as services
- Assemble and reconfigure processes rapidly using existing services
- Modify existing services for reuse but understand the impact
- Share services across business processes
Publish and find

- Using
  - Web User Interface
Publish and find

- Using
  - Web based UI
  - Eclipse plug-in
To classify published services

WSDL Document

<table>
<thead>
<tr>
<th>WSDL documents</th>
<th>Echo.wsdl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Details of the Echo.wsdl WSDL Document:</td>
<td></td>
</tr>
</tbody>
</table>

Details for the selected classification. To see the details for an item, select the classification from the list.

<table>
<thead>
<tr>
<th>System</th>
<th>Name</th>
<th>URI</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional Properties
- Port types
- Bindings
- Services
- Custom properties

Relationships
- Imported schemas
- Included schemas
- Imported WSDLs
- Custom relationships

Classifications
- Select
- Classification tree
- Default lifecycle
- IBM Enterprises Taxonomy
- Visibility
- External
- WSRF Core Ontology

Add >>>

Remove
Discovery of relationships from documents

- Through automatic discovery of relationships
  - Imported WSDLs
  - Included schemas
  - SCA
Constructing custom relationships

• Through manual definition:
Enhance Connectivity – Requirements

*Increase runtime flexibility of applications in your SOA*

**Requirements**
- Satisfy new customer demands?
- Implement new government regulations?
- Improve customer satisfaction?
- Increase revenue potential?
- Lower operational costs?
- Increase application availability and performance?

**Solutions**
- Choose the right service at the right time
- Use up-to-date information to select services during runtime
- Build flexibility and agility with enriched service interactions
- Enforce rules that govern service usage
Dynamic binding of services

- Through pre-defined nodes for
  - WebSphere Message Broker
  - WebSphere Enterprise Service Bus

Message Flow/Mediation

- SOAP
- Lookup
- Filter
- Map
- Invoke
Optimize Service Usage – Requirements

Ensure utilization, health and performance of your SOA

Requirements

• Manage multiple versions of services?
• Associate our policies with services?
• Evaluate the impact of changes?
• Eliminate redundant / rogue services and improve utilization?
• Ensure the performance and health of our services?

Solutions

• Support versioning and changing of services and related metadata
• Assess utilization of services in your SOA
• Enable enforcement of service level agreements
• Store statistics and status on the availability, performance and health of services
Impact analysis

Specify dependency relationship options for performing impact analysis.

**Impact analysis results**

This is the collection of entities that may be impacted by changes to the entity concept Repair Address.

<table>
<thead>
<tr>
<th>Entity Type</th>
<th>Description</th>
<th>Object Type</th>
<th>Version</th>
<th>Impact Relationship</th>
<th>Relationship Name</th>
<th>Originating Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>RepairLocalAddressService</td>
<td>Update the customer local address</td>
<td>concept</td>
<td>1.0</td>
<td>Depends on</td>
<td>serviceDependencies</td>
<td>Repair Address</td>
</tr>
<tr>
<td>RepairGlobalAddressService</td>
<td>Update the customer global address</td>
<td>concept</td>
<td>1.0</td>
<td>Depends on</td>
<td>serviceDependencies</td>
<td>Repair Address</td>
</tr>
<tr>
<td>BusinessNames.wsdl</td>
<td>J2E Enterprise business objects</td>
<td>XML schema definition document</td>
<td>1.0</td>
<td>Depends on</td>
<td>serviceDependencies</td>
<td>Repair Address</td>
</tr>
</tbody>
</table>

Total: 3

WSDL service to WSDL port
WSDL port to WSDL binding
WSDL port to SOAP address
WSDL binding to SOAP binding
Subscription and notification

- Email based and JMS based notification
- Extensible notification framework
- Granularity
  - Per entity
  - By classification
  - By operation ... create, update, delete
  - By transition
Optimize Service Usage – SOA Healthcheck

Monitor the health of services in your SOA

- ITCAM for SOA monitors the health and performance of services
- WSRR captures alerts generated by ITCAM for SOA if a service is not performing as expected
- DataPower SOA Appliance can discover services in WSRR and enforce associated policies
Enable governance – Requirements
Better control your SOA through governance

Requirements

• Implement decision rights and processes to make changes?
• Approve, promote and retire services?
• Maintain test environment separate from production?
• Govern high-value legacy applications?

Solutions

• Helps implement best practices in service lifecycle management
• Provides access control and promotion support for services
• Enables governance of service-enabled WebSphere MQ, CICS and IMS applications
Services lifecycle

1. Establish Ownership
2. Establish Role of intended service
3. Establish Funding
4. Impact analyses and scheduling.

Service Specified

Authorize Procurement

Service Identified

Service Retired

Certify

Service Implementation Available

Approve

Retire

9. Policy Enforcement
10. Monitoring for IT and business dashboards
11. QoS management
12. Service revision and retiring policy.

5. Development, Assembly and Test - Best Practices
6. Architectural Policy – standards adherence
7. Reuse – design for reuse and effective reuse in implementations
8. Policy and Contract Validation during development

10. Production Configuration and Workload Planning
11. Verification in Operational Context - Staging
12. Deployment to Production Systems

Governance & Best Practices
Default Service Lifecycle
Lifecycle

- Implemented as a state machine
- Uses classification to define a lifecycle states for entities
  - classification is generated from the state machine
- Fully customizable
  - Can use WID to define a new lifecycle
Governing Service Life Cycle
Validation

Document validation
  • Supplied validators for structured data verification
    • XSD
    • Generic XML
  • Invoked during Create, Update, and Delete
    • User supplied validators can be added
  • Lifecycle/Governance validation
    • Invoked during state transition
    • User supplied validators can be added
Notification

Email based and JMS based notification

Granularity
- Per entity
- By classification
- By operation … create, update, delete
- By transition

Configurable email template supplied
Custom extensions to defaults

- Through user-defined roles and resource based permissions
  - User bill can access services of type finance
  - User bill can access XSD files named FinanceBO*
- Through user-defined classifications
- Through user-defined service lifecycle
- Through user-defined validators and notifiers
Roles service registry and repository play in SOA reference architecture
Architecture for SOA Governance with Service Registry and Repository

- User/Customer (Executes Business Processes)
- Services Owner (Review and approve service transition)
- Operations Specialist (Monitor service level)
- Business Analyst (Service impact analysis)
- Reusable Asset Manager (Manage service lifecycle)
- Architect (Design and initiate service lifecycle)

- WebSphere Registry and Repository
- Intranet
- Enterprise Service Bus
- WebSphere Registry and Repository
- WebSphere Registry and Repository
- WebSphere Registry and Repository
- WebSphere Registry and Repository
- External Service Provider (Provides Services)
- Web Server
- Web Service Gateway (Service Security)
- Enterprise Service Bus (Check WSRR for dynamic binding)
- Business Applications (Provider of Services)
- Business Applications (Consumers of Services)
WebServices Life Cycle Example

Created → Plan → Model → Authorize Development → Assemble → Certify → Revoke → Manage → Deprecate → Retired

Useful Information

1. IBM Smart SOA Insight White Papers

2. IBM SOA WebSphere Registry and Repository Handbook

3. IBM SOA Portal

4. SOA and WebServices Technical Papers
   http://www.ibm.com/developerworks/webservices
Thank You