IBM's SOA Experience, Trends and Outlook

a tour through IBM's SOA landscape

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SOA Day at
Carnegie Mellon University
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SOA: To Enable Globally Integrated Enterprises

*a strategic imperative in our flat world*

... a service?
A repeatable business task
e.g., check customer credit; open new account

... service-oriented architecture?
An IT architectural style that supports integrating your business as linked services

Agility: Mobility to Support the Globally Integrated Enterprise

*But haphazard approaches to SOA can reduce the benefits*
SOA Addresses Barriers to IT Flexibility

*spaghetti, point-to-point plumbing does not scale*

“Point-to-point interfaces result in an ever-increasing maintenance burden.” — Gartner
The Key Value of SOA: Business and IT Alignment
*a transformation interlinking domain views*

- Business and IT Alignment
  - Driving IT design decisions from a fundamental understanding of the business model to which IT is being applied

- Business Flexibility
  - Ability to accelerate change
  - Ability to deliver innovative new business functions/capabilities
  - Ability to shift IT spend toward new function => reduce costs
An Industry Example: Insurance Ecosystem

dynamic applications supported by flexible business services
Snapshot of SOA Adoption Trend by IBM Clients Worldwide

- 3 of the world’s 5 biggest Financial Firms
- 10 of the world's 10 biggest banks
- Half of the world’s 30 biggest electronics companies
- 10 of the world's 10 biggest auto manufacturers
- More than 3,500 SOA Business Partners
- 3 of the world's 5 biggest retailers
- 80% of the biggest US health plans
- 10 of the world’s 10 biggest telcos
- 8 of the world's 10 biggest insurers

97% of customers justified their SOA project on cost
100% saw increased business flexibility
51% saw revenue growth
Cross-Industry SOA Adoption Patterns

how customers are leveraging SOA

- Infrastructure services focus: 55% Using SOA, 41% Considering
- Internal integration: 54% Using SOA, 46% Considering
- Customer-facing applications: 53% Using SOA, 47% Considering
- Employee-facing applications: 51% Using SOA, 43% Considering
- Extended/integrated business processes: 44% Using SOA, 41% Considering
- Legacy modernization: 38% Using SOA, 31% Considering
- Supplier-facing applications: 37% Using SOA, 27% Considering

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## Keeping it Simple with SOA Entry Points
to streamline adoption paths

<table>
<thead>
<tr>
<th>People</th>
<th>Process</th>
<th>Information</th>
<th>Reuse</th>
<th>Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deliver role-based interaction and collaboration through services</td>
<td>Achieve business process innovation through treating tasks as modular services</td>
<td>Provide trusted information in business context by treating it as a service</td>
<td>Service-enable existing assets and fill portfolio gaps with new reusable services</td>
<td>Connect systems, users, and business channels based on open standards</td>
</tr>
<tr>
<td>Improved productivity by putting the user experience within the context of the business process</td>
<td>Greater innovation and flexibility through faster deployment and modification of business processes</td>
<td>Better business operations, more informed decisions and reduced risk with information delivered in-line and in-context</td>
<td>Lower risk and faster time to market by leveraging proven, time-tested functionality</td>
<td>Reduced maintenance costs and greater reliability and consistency through flexible, any-to-any linkages</td>
</tr>
</tbody>
</table>
SOA Business Value Realized by IBM Clients

flexibility, agility and cost benefits

The IBV studied a subset of IBM engagements and found:

- 97% justified SOA projects based on cost savings & impact to profitability
- 71% reduced risk
- 100% realized improved flexibility
- 51% experienced increased revenue

“Over 50% of companies indicated that SOA has a positive impact on their business agility.” Roy Schulte, Gartner Research

Source: IBM Institute for Business Value “The Business Value of Service-Oriented Architecture” 2006
SOA Personal Impact to C-level executives

*a more streamlined career path and a thicker wallet!*

**SOA Leads to the Executive Committee’s Door**

CIO is part of the Executive Committee

- **WITH SOA:** 74%
- **WITHOUT SOA:** 59%

**SOA Spells Money**

<table>
<thead>
<tr>
<th>Average Compensation of CIOs Working</th>
<th>WITH an SOA</th>
<th>WITHOUT an SOA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>$250,000</strong></td>
<td></td>
<td><strong>$159,000</strong></td>
</tr>
</tbody>
</table>

And their budgets are Bigger too

<table>
<thead>
<tr>
<th>WITH SOA</th>
<th>WITHOUT SOA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8.9%</strong></td>
<td><strong>5.8%</strong></td>
</tr>
</tbody>
</table>

Source: “State of the CIO”, January 1, 2007, CIO Magazine

Note: IT budget as percent of overall revenue
Lack of SOA Skills: A key inhibitor to SOA Adoption

56% respondents says SOA skills were #1 Inhibitors to SOA Adoption

- IBM Survey on SOA, IBM Market Intelligent

“One dire prediction for 2007 is that there simply won’t be enough qualified and SOA experienced enterprise architects (EA) around.”

- Zap Think, February

“The IT worker of 2010 won't be a technology guru but rather a ‘versatilist’.”

- Careers: IT Profession 2010, Computer World
### SOA Service Integration Maturity Model (SIMM)

<table>
<thead>
<tr>
<th>Business View</th>
<th>Organization</th>
<th>Methods</th>
<th>Applications</th>
<th>Architecture</th>
<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silo</td>
<td>Function Oriented</td>
<td>Function Oriented</td>
<td>Ad hoc IT Governance</td>
<td>Monolithic Architecture</td>
<td>Platform Specific, Level 1</td>
</tr>
<tr>
<td>Integrated</td>
<td>Function Oriented</td>
<td>Function Oriented</td>
<td>Ad hoc IT Governance</td>
<td>Layered Architecture</td>
<td>Platform Specific, Level 2</td>
</tr>
<tr>
<td>Componentized</td>
<td>Ad hoc IT Governance</td>
<td>Component Based Development</td>
<td>Component Architecture</td>
<td>Componentized Architecture</td>
<td>Platform Specific, Level 3</td>
</tr>
<tr>
<td>Services</td>
<td>Service Oriented</td>
<td>Emerging SOA Governance</td>
<td>Services</td>
<td>Emerging SOA</td>
<td>Platform Specific, Level 4</td>
</tr>
<tr>
<td>Composite</td>
<td>Service Oriented</td>
<td>SOA and IT Governance Alignment</td>
<td>Service Oriented Modeling</td>
<td>SOA</td>
<td>Platform Specific, Level 5</td>
</tr>
<tr>
<td>Virtualized</td>
<td>Service Oriented</td>
<td>SOA and IT Governance Alignment</td>
<td>Service Oriented Modeling</td>
<td>Grid Enabled SOA</td>
<td>Platform Neutral, Level 6</td>
</tr>
<tr>
<td>Services</td>
<td>Service Oriented</td>
<td>SOA and IT Governance Alignment</td>
<td>Service Oriented Modeling</td>
<td>SOA</td>
<td>Platform Neutral, Level 7</td>
</tr>
<tr>
<td>Dynamically Re-Configurable Services</td>
<td>Service Oriented</td>
<td>Grammar Oriented Modeling</td>
<td>Process Integration via Services</td>
<td>Dynamic Application Assembly</td>
<td>Dynamic Sense &amp; Respond, Level 7</td>
</tr>
</tbody>
</table>

**SOA Service Integration Maturity Model (SIMM)**
SOA Roadmaps using Service Integration Maturity Model

- **Employ Component Business Modeling (CBM)**
- **Establish SOA Center of Excellence**
- **Apply SOA Governance to Development Processes**
- **Introduce Open Standards**
- **Apply SOA Architectural methods**

**Business View**
- Silo Services
  - Function Oriented
  - Components Oriented
  - Services Oriented
  - Applications Oriented
  - Infrastructure Oriented

**Organization**
- Structure Oriented
  - Analysis & Design
  - Object Modeling
  - Component Development
  - Process Modeling
  - Application Assembly

**Methods**
- Structured Analysis & Design
- Object Oriented Modeling
- Component Based Development
- Service Oriented Modeling
- Process Integration via Services

**Applications**
- Modules
  - Service Integrations
  - Emerging SOA
  - Service Oriented Modeling
  - Dynamic Application Assembly

**Architecture**
- Monolithic Architecture
  - Platform Specific
  - Platform Neutral
  - Dynamic Sense & Respond Architecture

**Infrastructure**
- Level 1
  - Platform Specific
  - Platform Neutral
  - Dynamic Sense & Respond
  - Current Level

- Level 2
  - Platform Specific
  - Platform Neutral
  - Dynamic Sense & Respond
  - Target Level

- Level 3
  - Platform Specific
  - Platform Neutral
  - Dynamic Sense & Respond
  - Current Level

- Level 4
  - Platform Specific
  - Platform Neutral
  - Dynamic Sense & Respond
  - Target Level

- Level 5
  - Platform Specific
  - Platform Neutral
  - Dynamic Sense & Respond
  - Current Level

- Level 6
  - Platform Specific
  - Platform Neutral
  - Dynamic Sense & Respond
  - Target Level

- Level 7
  - Platform Specific
  - Platform Neutral
  - Dynamic Sense & Respond
  - Current Level
The SOA Foundation
*technical underpinning to realize SOA solutions*

- A software and hardware platform for building, deploying and managing solutions that subscribe to the SOA style of enterprise architecture.

- **Core Principles of SOA Foundation:**
  - SOA style of Enterprise Architecture
  - Loosely-coupled
  - Strongly-coherent
  - Heterogeneous
  - Legacy enablement
  - Holistic
  - Evolutionary
  - Flexible
  - Governed

- **Supported by:**
  - Community
  - Eco-System
  - Governance
  - Content
  - Standards
SOA Foundation Reference Model
*a logical view of SOA infrastructure and enabling technologies*

- **Business Services**
  Supports enterprise business process and goals through businesses functional service

- **Interaction Services**
  Enables collaboration between people, processes & information

- **Process Services**
  Orchestrate and automate business processes

- **Information Services**
  Manages diverse data and content in a unified manner

- **Partner Services**
  Connect with trading partners

- **Business App Services**
  Build on a robust, scaleable, and secure services environment

- **Access Services**
  Facilitate interactions with existing information and application assets

- **Infrastructure Services**
  Optimizes throughput, availability and utilization

- **Development Services**
  Integrated environment for design and creation of solution assets

- **Management Services**
  Manage and secure services, applications & resources

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IBM’s SOA Experience, Trends and Outlook

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IBM Software Portfolio supporting the SOA Foundation

Business Services

WebSphere Business Modeler
WebSphere Business Monitor
WebSphere Process Server
WebSphere Information Server
WebSphere Customer Center
DB2 Data Warehouse

Interaction Services

Lotus Workplace Server
Lotus Expediter

Process Services

Enterprise Service Bus

Information Services

Management Services

Development Services

WebSphere Portal

Rational Software Architect
Rational Application Developer
WebSphere Integration Developer

WebSphere Business Modeler
WebSphere Business Monitor
WebSphere Process Server
WebSphere Information Server
WebSphere Customer Center
DB2 Data Warehouse

Data Power
WebSphere ESB
WebSphere Message Broker
WebSphere Transformation Extender

Partner Services

Tivoli Composite Application Monitor
Tivoli Identity Manager
Tivoli Federated Identity Manager
Tivoli Access Manager

Business App Services

WebSphere Partner Gateway
WebSphere Application Server
WebSphere Adapters
WebSphere Network Deployment
WebSphere Extended Deployment

Access Services

WebSphere Partner Gateway
WebSphere Application Server
WebSphere Adapters
WebSphere Network Deployment
WebSphere Extended Deployment

Infrastructure Services

Rational Application Developer
WebSphere Integration Developer

WebSphere Portal

Lotus Workplace Server
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WebSphere Network Deployment
WebSphere Extended Deployment

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A Tour through IBM’s SOA Landscape

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SOA Solution Stack
application architect’s layering perspective

- Consumers
- Business Process: Composition; choreography; business state machines
- Services: atomic and composite
- Service Components
- Operational Systems: Packaged Application, Custom Application, OO Application

Integration (Enterprise Service Bus)
QoS Layer (Security, Management & Monitoring Infrastructure Services)
Data Architecture (meta-data) & Business Intelligence
Governance

Atomic Service
Composite Service
Registry
Anatomy of an SOA Business Service

Business Services are business level "building blocks" whose execution can be adapted at runtime based on business policy and user context.

Example: "Credit Check" Business Service

- Communication Channels:
  - Web Portal
  - IVR
  - CRM

- Role-Based Users:
  - CSR
  - Consumers

- Operational Capabilities:
  - Credit Lookup: 3rd Party Service
  - Credit Eligibility: Legacy System
  - Customer Profile: Packaged CRM
  - Customer Notification: Custom J2EE

- Business Policies:
  - Pre-Approval Policies
  - Risk Assessment Policies

- Technical and industry standards:
  - WS-I for service interfaces
  - MISMO, IFW for messages and transactions
Sources of SOA Services
3 primary sources

1. Service-enable high-value existing IT assets for reuse
2. Use externally provide services to support commodity tasks
3. Fill in gaps by creating new services
SOA Programming Models

- **Service Components**
  - A technology- and language-independent representation of a service which can be composed with other services

- **Service Data**
  - A technology- and language-independent representation of a data entity that can be passed between services

- **Service Bus**
  - A technology- and protocol-independent representation of the interconnection between services
SOA and Business Process Management

Source: Gartner's BPM Adoption Model
SOA Governance

Governance:
Establishing chains of responsibility, authority and communication to empower people (decision rights)
Establishing mechanisms and policies used to enable people to carry out their roles and responsibilities

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

SOA Governance:
Intersection of Business and IT governance focused on the lifecycle of services to ensure the business value of SOA
Service Lifecycle Management

Service Development
- Service Development Lifecycle
- Service Asset Manager
- Other Service Endpoint Registries / Repositories
  - UDDI Registries
  - Info based Services
  - Other External Reg / Rep

Service Deployment
- Runtime Repository
- Change & Release Management
- Service Registry & Repository
- CMDB

Service Management
- Operational Efficiency & Resilience
- Composite Application Manager
A Peek at the SOA Horizon

waves of innovation to further enrich SOA’s market value

Service-Oriented Architecture

Industry Semantics, Models & Accelerators

Process Integrity

Complex Event Handling

Web 2.0

Emerging Standards
Information Modeling and Business Semantics

*glue to compose flexible, robust business processes*

- Data Model
- Message Model
- Service Model
- Process Model
- Operational Model

- Semantic Model
  - Classification and Business Dictionary
  - Policies and Constraints
  - Service Relationships

Insufficient for ensuring the integrity of service composition
SOA Industry Models and Accelerators

customizable business packs based on well-established industry best practices

- Accelerate initial Business Service deployment
- Accelerate Business Service assembly into industry business processes
Process Integrity Takes SOA to the Next Level

**Process Integrity** is the ability to conduct reliable business activity in a secure, scalable SOA environment with seamless synchronization between:
- Services
- **Human Tasks**
- Information
- Domains
- Users

Users Must Be Provided with Up-to-date, Secure Access to Information and Content

Transactions Must Execute Consistently with Ability to Recover as Required

Information Must be Reliable, Complete and Manageable
Process Integrity is the degree to which loosely coupled “open” systems deliver the reliability, consistency and predictability of tightly coupled “closed” systems.
SOA and Web 2.0

WEB 2.0

Componentized

Interoperable

Rich User Experience

Create

Combine

Distribute

Collaborate

Modular

Scaleable

Services

Components

Process

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SOA Enhancements through Web 2.0

*Further leveraging the Web as a key business platform*

SOA helps Enterprise Mash-ups to:

- Empower knowledge worker to **assemble** their own situational Web applications
- Enable non-programmers to **wire** software components together
- **Share** web applications for quick and simple collaborative decision making

### Rich Internet Applications
- Mashboards
- Mashup Makers
- Portals

### Social Networking
- DogEar
- Instant Messaging

### Content Syndication:
- Atom
- RSS

Industry XML Standards, Web Services

- Business process & event customization
- Reliable messaging
SOA Capabilities to Process Complex Events
enhancing event monitoring and handling facilities

Seize opportunities and mitigate risks by:
- Spotting trends and trapping anomalies
  - Complex event infrastructure (CEI) emitter nodes for monitoring
- Triggering alerts
- Executing business rules-driven responses
  - Fully integrated complex event processing (CEP) capabilities

Event Sense SOA-managed business rules Services-executed response End-user result
Advancements in Industry and Open Standards

IBM continues to lead and drive SOA-based standards

**Service Component Architecture (SCA)** provides for the simpler assembly of solution components through a technology-neutral model.

**Service Data Objects (SDO)** reduces the skill levels and time required by providing a common way to access many different kinds of data.

- Expanded participation with 9 new partners
- New BPEL and PHP authoring models
- Improved connectivity descriptions

**XForms** extends SOA to the end-user through business rules at the point of data entry.

**Web Service Interoperability profiles** make SOA standards simple, useful and open.
SOA Resources and a shameless plug!
for further reading and/or to play with IBM’s SOA offerings

- SOA Compass is available at your favorite on-line bookstore! – foreword by Vinton Cerf

- Play with the recently announced IBM SOA Sandbox:

- For technical articles, visit the IBM SOA and Web Services Zone on developerWorks:
  http://www.ibm.com/developerworks/webservices

- For keeping tabs on IBM’s SOA story:
  http://www.ibm.com/soa
Thank You