SOA (Service Oriented Architecture)  
ODOE (On Demand Operating Environment)
Agenda

- SOA – IT Architecture
- SOA - ODOE
- IBM SOA Leadership
<table>
<thead>
<tr>
<th>Vertical 1980’s and earlier</th>
<th>Organisation Focus</th>
<th>Mainframe centric</th>
<th>Monolithic</th>
<th>Internal use</th>
<th>Paper passing</th>
<th>Isolated applications</th>
<th>Low integrity</th>
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<table>
<thead>
<tr>
<th>Horizontal 1980’s-90’s</th>
<th>Application Evolution</th>
<th>Integration Evolution</th>
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<tbody>
<tr>
<td></td>
<td>Business Process Focus</td>
<td>EDI</td>
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<tr>
<td></td>
<td>Client/Server</td>
<td>'Fire and Forget' Messaging</td>
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<td></td>
<td>Monolithic</td>
<td>Database replication</td>
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<td>Internal Use</td>
<td>Data warehousing</td>
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<td></td>
<td></td>
<td>Tightly coupled technology</td>
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<tr>
<td></td>
<td></td>
<td>Loosely coupled applications</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ecosystem The new world</th>
<th>Extended Supply Chain Focus</th>
<th>Distributed</th>
<th>Componentised</th>
<th>Customer and Partner Access</th>
<th>Process Integration</th>
<th>Real time synchronization</th>
<th>High integrity</th>
<th>Internet-based</th>
<th>Service-based</th>
<th>Loosely coupled technology</th>
<th>Shared Applications</th>
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</table>

(Based on Gartner data)
Monoliths

Structured

Client/Server

3-tier

N-tier

Distributed Objects

Components

Services

• Mainframe
• Mini
• PC
• Device

• LAN
• WAN
• VAN
• Internet

• EDI
• B2C
• B2B
• B2I
• P2P

• Little structure or separation
• Technology Dependency

• Structure, but still physical monolith

• Physical Distribution, but often less well structured than before with logical dependencies across layers

• Structure and separation
• Encapsulation and use of Interfaces
• Though use of services still often requires knowledge of implementation
• And still Technology Dependency

• Well described services permit use without need to understand implementation
• Technology Independent
• External organisations can use same interfaces
• Enables interoperability between organisations regardless of platform
“We care most about applying new technology to develop new products and services. The main characteristic of our industry is fast change, so it depends upon who can develop new products and services quickly. If that cannot be ensured, then it is impossible to survive in this industry.”

Source: IBM Business Consulting Services, The Global CEO Study 2004

**Business Challenges**

- Increase the speed of business changes
- Improve business efficiency and performance
- Protect the privacy and security of critical information assets

**IT Imperatives**

- Become a more responsive IT organization to quickly adapt to changing business priorities
- Align IT more tightly with business strategies in a cost effective manner
- Provide a secure and managed integration environment
Flexible Business

Transformation
Business Process Outsourcing
Mergers, Acquisitions & Divestitures

Flexible IT

On demand Operating Environment

Service Oriented Architecture (SOA)

Development
Software Development

Infrastructure
Integration

Management
Infrastructure Management

Composable Processes (CBM)
Component Business Modeling

Composable Services (SOA)
SOA आणि स्वाभाविक फायदे?

**Business Benefits**
- Business flexibility provided by increased granularity of processes enabled through services
- Ability to quickly create business processes and composite applications to respond to changes in the marketplace
- Improved customer service using services without having to worry about the underlying IT infrastructure

**IT Benefits**
- Becoming a more responsive IT organization with a secure and managed integration environment
- Decrease development and deployment cycle times through the use of pre-built, reusable services building blocks.
- Reducing complexity and maintenance costs with common services
- Enhancing existing IT systems rather than replacing them
SOA is?

- Architecture that leverages open standards to represent software assets as services

- Provides a standard way of representing and interacting with software assets

- Individual software assets become building blocks that can be reused in developing other applications

- Shifts focus to application assembly rather than implementation details

- Used internally to create new applications out of existing components

- Used externally to integrate with applications outside of the enterprise
A service encapsulates a well-defined invokable unit of business function, and exists either to provide information or to facilitate a change of business data from one valid and consistent state to another.

Services are defined using explicit interfaces that are independent of service implementations, and that both service requestors and service providers agree to.

Services should be invokable through defined communication protocols that stress interoperability and location transparency.
What topics are you most interested in learning more about?

- Service-oriented architecture: 64%
- Enterprise architecture toolsets and capabilities: 61%
- Information architecture: Where do I start?: 50%
- Security architecture: How well is it baked into your enterprise architecture?: 50%
- Refresh your enterprise architecture: 43%
- Organization of the central federated EA group: 39%
- Creating a mission and vision statement and turning it into an actionable plan: 32%
- What’s the next driver of enterprise architecture?: 32%
- Identity management: 29%
- Process and project management: 21%
- Improving the image of IT: 21%
- Organizational structures and implementing organizational change: 21%
- Preparing for a new CIO: 18%
- How to measure and communicate ROI: 14%
- Negotiating better contracts: 4%

Base: 28 IT decision-makers on Forrester’s Enterprise Architecture Council (multiple responses accepted)
By year-end 2005, enterprises will deploy Web Services management platforms in 65% or more of major Web Services implementations (0.7 probability).

By 2006, more than 70% of new applications will use Web Services in some part of their architecture (0.8 probability).

In 2006, more than 80% of business application products sold worldwide will be service-oriented business applications (0.7 probability).

In 2006, Web Services standards and technologies will influence more than 60% of the $527 billion IT professional services market (0.7 probability).

By 2007, IT professional services will account for more than 50% of the revenue of large enterprise application software vendors, creating a convergence of the software and IT professional services markets (0.7 probability).

By 2008, services-oriented development of applications plus SOBAs* will enable Type A enterprises to increase programmer productivity be more than 100% (0.8 probability).
  *SOBA = Services Oriented Business Application
SOA is SOA? 

- Interface to a single service, **and not copying code or implementations.** This means services are defined once and only once.

- Implementation is hidden **and encapsulated behind a well defined interface.**

- Published functionality of service only, **not implementation.**

- Formal contract **between endpoints.**

- **Endpoint** platform independence (with Web Services).

- Standards based **protocols** (with Web Services).
IBM leverages Web Services to prevent channel partner ordering errors, increasing fulfillment speed and improving customer satisfaction

Challenge
- The IBM Systems Group sells hundreds of millions of dollars of servers, software and peripherals through its channel partners.
- When major distributors such as Avnet placed orders to IBM, it sometimes took days and even weeks for sales, fulfillment, and manufacturing, to identify and rectify configuration errors that appeared during manufacturing.
- Effective e-business execution was impossible as long as order validation could not automatically occur upstream and on demand.

Solution
- IBM Global Services designed a Web Service that seamlessly integrates into major distributor’s ordering systems.

Value
- 95% of thousands of distributor orders are now validated by SOVA
- Error rate for distributors reduced from greater than 4% to about 1%
- Estimated total operational savings of $300,000 in 4Q03 alone
- Full ROI for all phases enabled by Web Services implementation
- Identification of order failures reduced from days to seconds
- Distributor and customer satisfaction have increased

“Using SOVA and the new Web Service allows us to leverage this complex set of IBM rules and logic on-demand without modifying our software. A GREAT WIN for both IBM and Avnet.”
Dan Lukas, Senior Director of IBM Operations, AVNET
Agenda

- SOA – IT Architecture
- SOA – ODOE
- IBM SOA Leadership
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<th>On demand</th>
<th>On Demand Operating Environment</th>
<th>IBM Deliverables</th>
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<tr>
<td>Responsive</td>
<td>Integrated</td>
<td>• Web Services for on demand Application Integration</td>
</tr>
<tr>
<td>- Ability to sense and</td>
<td></td>
<td>• IBM provide 7 levels of Integration</td>
</tr>
<tr>
<td>response</td>
<td></td>
<td></td>
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<tr>
<td>Variable</td>
<td>Open</td>
<td>• IBM’s Web Services Standard Leadership</td>
</tr>
<tr>
<td>- Variable Cost Structure</td>
<td></td>
<td>• Pioneer in XML, Linux, OGSA Standard</td>
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<tr>
<td>- Process Flexibility</td>
<td></td>
<td></td>
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<tr>
<td>Focused</td>
<td>Virtualized</td>
<td>• Grid for Resource on Demand</td>
</tr>
<tr>
<td>- Concentrate on Core and</td>
<td></td>
<td>• Shared Application, Data, Processing, Storage</td>
</tr>
<tr>
<td>Differentiating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resilient</td>
<td>Autonomic</td>
<td>• Self Managing System</td>
</tr>
<tr>
<td>- Manage Changes and</td>
<td></td>
<td>- Self-optimizing</td>
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<tr>
<td>Threats</td>
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<td>- Self-protecting</td>
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<td>- Self-configuring</td>
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<td>- Self-healing</td>
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ODOE - key words

**Integrated**
- Collaboration
- Transactional Processes
- Information Management

**Autonomic**
- Availability
- Security
- Optimization
- Provisioning

**Virtualized**
- Virtualization Engine
- Servers
- Storage
- Distributed Systems
- Network

**Open**
- Flexible
- Self Managing
- Scalable
- Economical
- Resilient
- Open Standards
SOA Basic Principles

- **Decoupling of applications**
  - through the use of synchronous and asynchronous web service requests between a service consumer and a service provider.

- **Process Choreography**
  - coordinating service calls across several service providers.

- **Common information model**
  - enabling process flows to be designed using a common semantic representation of data objects even though the services accessed in the process have different data models.

- **Common service model**
  - allowing services to be defined using a common Web Services Description Language (WSDL). The services can be accessed over a variety of protocol bindings including SOAP over HTTP, SOAP over Java Message Service (JMS), RMI over IIOP, Java Connector Architecture and pure JMS. Leveraging legacy applications by using adapter technology to expose existing functionality in legacy applications as services, thereby allowing them to participate as service providers.

- **Event processing**
  - allowing service providers to send anonymous events which are routed based on content, to the appropriate services for processing.

- **Common Programming Model**
  - to improve reuse and better leverage the infrastructure. J2EE is the preferred programming model; .NET could be another choice.
<table>
<thead>
<tr>
<th>Flexible</th>
<th>Publish, Discover and Invoke</th>
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<tbody>
<tr>
<td>Self Managing</td>
<td>Although services in them self are not self-managing, the infrastructure and implementation of the service oriented architecture can be seen to support self-management, by using products such as IBM WebSphere and Tivoli</td>
</tr>
<tr>
<td>Scalable</td>
<td>Interface-based design</td>
</tr>
<tr>
<td>Economical</td>
<td>Single instance</td>
</tr>
<tr>
<td>Resilient</td>
<td>Coarse-grained</td>
</tr>
<tr>
<td>Open Standards</td>
<td>Loosely coupled</td>
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</tbody>
</table>
Enterprise Service Bus 

- Provides a single interface and service access design, which is independent of the underlying platforms
- Provides a single type system for interactions internal and external to the enterprise
- Provides a common architecture for the internal implementation of services
- Enforces separation of business logic in code, workflow, or B2B collaboration specifications from the underlying middleware, including integration subsystems, communication subsystems, and component containers
- Simplifies the enterprise development environment
Enterprise Service Bus - Portal Service

Service Flow

Data

Existing Applications

New Service Logic

SOAP Service Request (e.g. .NET)

B2B Interactions

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Services to Solve Complex Business Requirements

Business Integration Reference Architecture

- Model, Design, Development, Test Tools
- Common Runtime Infrastructure
  - Monitoring Services
  - User Interaction Services
  - Application Services
  - Process Services
  - Community Integration Services
- Enterprise Service Bus
  - Access Services
  - Data/Information Services
  - Enterprise Applications
  - Enterprise Data
Business Integration Reference Architecture

Comprehensive Services

Model, Design, Development, Test Tools

Common Runtime Infrastructure

User Interaction Services
- Delivery Services
- Experience Services
- Resource Services

Application Services
- J2EE Extensions
- J2EE Container Services
- J2EE Base Services

Process Services
- Process Choreography Services
- Transaction/Compensation
- Process State Management
- Staff Services

Community Integ’n Services
- Community Management
- Document Management
- Protocol Services

Monitoring Services

IT Monitoring

Process Monitoring

Enterprise Service Bus

Event Services
Transport Services
Mediation Services

Access Services

Data/Information Services

Enterprise Applications

Enterprise Data

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Business Integration Reference Architecture

Comprehensive Services

Model, Design, Development, Test Tools

Common Runtime Infrastructure

User Interaction Services
- Delivery
- Experience
- Resource

Application Services
- Composite Apps
  - Extension
  - Container
  - Base

Process Services
- Business Processes
  - Choreography
  - Trans/Comp
  - Process State
  - Staff

Community Integr’n Services
- Community
- Document
- Protocol

Enterprise Service Bus

Event Services
Mediations
Mediation Services
Transport Services

Access Services

Data/Information Services

Enterprise Applications

Enterprise Data
Business Integration Reference Architecture

Well Architected Offerings

WebSphere BI Modeler  Model, Design, Development, Test Tools  WebSphere Studio

Common Runtime Infrastructure

IT Monitoring  WebSphere BI Monitor  Process Monitoring

WebSphere Portal Server  WebSphere Application Server  WebSphere BI Server  WebSphere BI Connect

WebSphere BI Modeler  Enterprise Service Bus  WebSphere BI Event/Message Broker

WebSphere MQ  Event Services  Mediations  Mediation Services  Transport Services

WebSphere MQ  Enterprise Service Bus  WebSphere BI Event/Message Broker

WebSphere BI Adapters  Enterprise Applications  DB2 Information Integrator  Enterprise Data

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Service Integration Framework

Services Integration BUS

transport
Publish
Subscribe
Response
Request
Comp.
Validation
Authentication
Database
Augmentation
Brokering

Exposed Services
App.
CRM 1
ERP 1
Legacy 1
Siebel
Data
Store
Web
Service
Supply
ERP 2
Databases

Application Layer
Enterprise Integration

Business Modeling and Monitoring
Process Integration Services

Semantic brokering

Update order

Check price

Check order

BPEL Layer

Presentation services
- Portal Interfaces

Policy Management

Services Contract

Composition - Decomposition

Event capture

Web Services Management

Tool Build & Deploy

Services Contract

Application Layer

App. Server

CRM 1

ERP 1

Legacy 1

Siebel

Data Store

Web Service

Supply

ERP 2

Legacy 2

.Net

Legacy 3

Business Customers

Corporate Customers

Retail Customers

Cash Management

Trade & Finance

Custody & Trust

Custody & Trust

CRM 1 ERP 1 Legacy 1 Siebel

.NET App.

Services Bus

Web Service

Services Bus

Se Co Services Contract

Web Service

Services Bus

Services Bus

Services Bus
SOA Quick Start

Mandatory characteristics:

- **Loose coupling**
  implying the existence of a formal, well-defined interface contract.

- **Location transparency**
  - a service user (consumer) should not hardcode any endpoint information.

- **Protocol transparency**
  - a service can be reached via several transport protocols without having to recode/recompile the service invocation logic.

Optional characteristics:

- **Multi-platform**
  standardized capabilities and interoperability

- **Modular**
  coarse-grained, self-contained, reusable and stateless abstractions (service modeling aspects)

- **Service composition and decomposition**

- **Existence of a service registry** (publish-find-bind-execute paradigm)
  Mediation, e.g. through an Enterprise Service Bus (ESB)

- **Common data model and transformations (or even semantic brokering)**

- **Single-instance** (a.k.a. singleton pattern in the large or object-based rather than object-oriented approach)

- **Manageable**
  security, deployment, logging, routing and maintenance.

- **Self-healing**

Source: SOA Roadmap Cookbook
### SOA Best Practices for Implementation and Design

<table>
<thead>
<tr>
<th>Category/Topic</th>
<th>Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Small</td>
<td>Organizations new to SoA should pick a small self contained project to gain experience.</td>
</tr>
<tr>
<td>Pilot Team</td>
<td>Create a pilot team that implements POT’s and creates implementation best practices.</td>
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<tr>
<td>Separation of Concerns</td>
<td>Make sure that the SOC environment is unplugged from legacy systems – Service and Data Authority. Remove intersystem dependencies. Factor out shared data.</td>
</tr>
<tr>
<td>Message Routing</td>
<td>Experts agree that a messaging bus will be necessary (i.e. EAI).</td>
</tr>
<tr>
<td>Master Database</td>
<td>Ensure that there is a master data repository or create one.</td>
</tr>
<tr>
<td>Don’t Model</td>
<td>DO NOT start an XML Data Modeling project. The data schema is the most important element of the data layer – allow the tools to manage transformation to XML – implementation will change the XML schema.</td>
</tr>
<tr>
<td>Category/Topic</td>
<td>Implication</td>
</tr>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Layer EIS and Mid-Tier</td>
<td>➔ Separate the EIS from the External services layer (mid-tier).</td>
</tr>
<tr>
<td>Implement a Service Directory</td>
<td>➔ Implementing a service directory provides the ability to manage interface versions and is the basis for ensuring high availability through redundant services.</td>
</tr>
<tr>
<td>Capacity Planning</td>
<td>➔ SOC Capacity Planning is more complex. A single service can significantly impact performance and availability.</td>
</tr>
<tr>
<td>Redundant Services</td>
<td>➔ Redundant services can greatly increase availability of applications.</td>
</tr>
<tr>
<td>Implement an EMS</td>
<td>➔ SOC failures can be more difficult to trace and debug – implement an Enterprise Management System to reduce complexity and facilitate problem resolution.</td>
</tr>
<tr>
<td>Data Volume</td>
<td>➔ High volume data should be transferred within services. Data transferred between services should be low volume.</td>
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SOA Roadmap

SOA Reach

Entire Enterprise (SOA-EE)

Enterprise Application (SOA-AE)

Standalone Application (SOA-SE)

Simple

Concepts and Principles

General IT Architecture Principles

Ref. Archs, PoCs

Full-Scope Implementation

Most Web Services Solutions (& Experience) Today

SOA Roadmap

Penetration

Source: SOA Roadmap Cookbook
Challenge

- Help Danske Bank automate business processes across banking applications.

Solution

- Process choreography capabilities of WebSphere Studio Application Developer Integration Edition and WebSphere Business Integration Server Foundation.

Value

- Replacement of current hard coded process routines with manageable and predictable business processes.
- Quick response to new opportunities is now a reality due to sophisticated features of the process choreographer.
- Danske Bank is expecting a productivity increase of 100% for the assembly of financial packages - and that represents just the first business process implemented within the new infrastructure.

“The challenge in developing IT solutions then becomes balancing the process perspective, the functional perspective and the data perspective of the solution, all at the same time. In our experience, the best way of achieving this is thinking in a Service Oriented manner. In terms of technology, the process choreography capabilities of IBM WebSphere Studio Application Developer Integration Edition and WebSphere Business Integration Server Foundation help us implement the connection between processes and services, hence is a step towards providing a service oriented technological platform”.

Claus Torp Jensen, Vice President, IT Architecture, competencies and methods, Danske Bank.
Agenda

- SOA – IT Architecture
- SOA – ODOE
- IBM – SOA Leadership
IBM Announces ...

IBM WebSphere Business Integration Server Foundation & IBM WebSphere Studio Application Developer Integration Edition

- Service oriented architecture
- BPEL4WS process choreography
- Human workflow support
- Business rules support
- Application adapters
- Programming model extensions
- Support for WebSphere Business Integration Modeler and Monitor
- Common Event Infrastructure*
- J2EE Application Server
- Integrated J2EE development environment
### What’s new?

**IBM WebSphere Studio Application Developer Integration Edition**
- Visual business process designer and debugger for creating BPEL4WS 1.1 process flows
- Support for building Web Services Interoperability (WS-I) compliant Web services and business processes
- Automated migration of version 5.0 process flows to BPEL4WS
- Unit test environment for WebSphere Business Integration Server Foundation v5.1
- Full support for all the features included in WSAD 5.1.1

**IBM WebSphere Business Integration Server Foundation**
- Native deployment support for BPEL4WS processes
- Additional platform support adding z/OS and OS/400 to AIX, HP-UX, Linux (4 platforms), Solaris and Windows
- WebSphere Business Integration Modeler and Monitor support
- Common Event Infrastructure* for managing the creation, transmission, and distribution of business, system, and network events
- Full support for all the features included in WAS v5.1

---

*IBM WebSphere Business Integration Server Foundation V5.1 evolved from the development and architectural work on WebSphere Application Server Enterprise combined with the integration experiences of over 600 successful customer implementations.*
IBM SOA Leadership – Product Leadership

- Modular – Integrated, Componentized & Incremental
- Enterprise secure and scalable

- Leader across all SOA Elements

IBM SOA Leadership – Standards Leadership

- Multi-vendor interoperability
- Investment protection
- Enhanced modularity and reduced cost structure
IBM SOA Leadership

- Mitigate risk
- Leverage best practices – Products, education and services
- Improved time to value – Industry expertise

IBM investing over $1B a year around SOA and Web services
- Over 50,000 developers in 164 countries actively working on Web services applications through IBM’s Speed start for Developers Program
- 35,000 industry-oriented consultants with experience and expertise in SOA and Web services
- 3 SOA/Web Services Centers of Excellence leveraging IBM’s deep industry knowledge to help clients in specific industries identify opportunities for Web services and SOA
- on demand Operating Environment and SOA
- SOA and Web services Zone
- Redbooks
- Speed-start Web services