IBM SOA Architect Summit

SOA on your terms and our expertise
Infrastructure Architecture:
Architecting the Right SOA Infrastructure

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SOA Architect Summit Roadmap

What is the impact of SOA on current Enterprise Architectures?
- Alignment of Business and IT Architectures
- SOA Reference Models
- SOA Governance

How do you develop SOA with a business focus?
- Business Components
- SOA Design
- Business Process Management

How do you reuse applications in the context of SOA?
- Asset Discovery
- Application Reuse

How do you leverage information in an SOA?
- Information as a Service
- Master Data Management

How does my infrastructure support SOA?
- Service Management / QoS
- Security
Agenda

- SOA Requires New Thinking About Infrastructure
- Infrastructure Considerations for SOA
  - Performance
  - Availability
  - Service Management
  - Security
  - Virtualization
- IBM Capabilities to Support SOA Infrastructure Architecture
- Summary
SOA Represents a Marked Change in IT Prioritization  
And Requires a New Way of Thinking

Old Thinking
IT maintains IT resources that support the business

New Thinking
IT delivers services designed to meet business goals

From Silos ...  ... to Services
SOA and Layers of Abstraction
How Does SOA Impact Infrastructure and Management?

**SOA Characteristics**

- Applications reused in new dynamic ways
- Services combined from multiple sources
- Rapid deployment
- Services route to any available resource
- Distributed access

**Key Infrastructure and Management Considerations**

- **Performance**
- **Availability**
- **Service Management**
- **Security**
- **Virtualization**
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SOA Introduces Performance Challenges

- Measuring performance across organizational boundaries can be more difficult than in siloed applications
- Response time estimation is more challenging in a more distributed environment
  - Performance costs can be difficult to predict
  - Performance testing an SOA application requires the use of new techniques
- Increased requirement for XML processing may impact performance
Performance Should Not be an Afterthought
*It Should be Engineered into the Solution*

- Performance in SOA systems should be a combination of performance engineering and performance management

- SOA-based applications can change the way an infrastructure performs
  - XML message transformation, location, message size, frequency
  - More complex applications and transactions

- Each of the components should be used to build a performance budget, transaction models and use cases

- Middleware and server sizing need to be done with the application teams
  - How many, how available, virtualized, system platform

- Don’t forget about security overhead
  - Authentication, Authorization, Encryption
SOA Performance Testing Concepts

- Test SOA applications throughout the development lifecycle
- Test tools must be separate and external to the SOA environment
- Use multiple diverse datasets that are representative of an SOA workload
- Stress test the solution to detect latency issues
- Run tests in a comparable environment to the deployment environment
- Use multiple test tools – similar results from multiple test tools using identical data sets validates the tests
SOA Performance Testing and Problem Analysis Tools

- Validate system scalability
  - Workload modeling for automated generation of test clients
  - Automated generation of performance tests
  - Real-time reporting of server response time and throughput

- Isolate performance bottlenecks and resolve problems
  - Monitoring support for services across multiple platforms
  - Collection and visualization of server resource data – root cause analysis
Monitoring Transaction Performance in SOA

Response Time Metrics in a Distributed Environment

- Composite applications span technology and platform boundaries
- Can be difficult to identify and isolate performance bottlenecks
- Use lightweight instrumentation that can be dynamically configured to proactively identify performance problems
- Use industry-standard ARM-based instrumentation to isolate the problem
The SOA performance model should be created and maintained throughout the lifecycle as the application is built.

Performance testing needs to obtain sufficient metrics to validate that services meet performance expectations.

Use established techniques to meet SOA performance requirements.

Design, test, and retest to confirm that non-functional requirements are met.

Implement an integrated solution that will automatically monitor, analyze and resolve response time problems.

Consider dedicated network appliances to optimize and accelerate XML parsing and security processing.
Techniques for High Availability and Scalability

1. Faster Machines
2. Replicated Machines
3. Specialized Machines
4. Segmented Workload
5. Request Batching
6. Data Aggregation
7. Connection Management
8. Caching
High Availability in the SOA World

- An application may exist on multiple servers in different locations
  - Applications need to be “availability” aware in case a service within the workflow is unavailable

- SOA applications impact service availability levels
  - SOA introduce new application dependencies, including externally provided services
  - Need to understand the end-to-end view

- Monitoring, management and reporting is required to achieve predictable availability in an SOA environment

- Plan for the unexpected
  - What are the non-functional requirements? What systems are you using? Distributed? Mainframe? Where are they located? How will they be accessed?
  - The more components in the transaction, the greater the risks for failure or human error
Guidance for SOA Availability

- There are an increased number of components in an SOA infrastructure, so test rigorously for availability.
- Create failover plans based on criticality of applications and services.
- Take advantage of established availability techniques:
  - Each component requires its own availability architecture.
  - Leverage capabilities like Workload Management, High-Availability Manager, Deployment Manager, etc.
- Some components may require both hardware and software clustering:
  - Databases, enterprise messaging infrastructure, SOA appliances.

![Diagram showing SOA components and availability metrics]

- Intranet: 99.9%
- Process Server: 99.9%
- Message Broker: 99.9%
- Relational Database: 99%
-Aggregate: 97.7%
The Challenges of Managing SOA

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

**Monitoring**
- Monitoring of business processes
- Monitoring of services
- Monitoring of operational systems
Service Management
Requires a Closed-Loop Approach

What’s happening with the infrastructure?

How does this relate to the business service?

What actions do we take to correct the problems?
IBM Service Management

What’s happening with the infrastructure?
- Infrastructure and application discovery
- Server monitoring
- Storage monitoring
- Network monitoring
- Data monitoring
- Application monitoring
- Service monitoring

How does this relate to the business service?
- Dashboard
- Application dependency mapping
- Business service management
- Service level management

What actions do we take?
- System reconfiguration
- Data restore
- User identity provisioning
- System and application restart
- Infrastructure deployment
- Service mediation
There are 3 key components in services management:

1. The runtime environment – this is where messages are routed, secured, transformed, filtered and logged

2. The management server – aggregates the data from all of the endpoints and runtimes and sends configuration changes based on policy

3. The registry – stores meta data about services and policies
Dynamic Service Support
Dynamically Changing Service and Application Relationships

Support Change Process
- Initial state
- Use to validate that planned changes were executed and that the results are as expected

Pre-Change Validation
- What applications does a component support?
- Reduce unintended consequences

Improve MTTR (Mean Time to Resolution)
- Accurate application maps show you what is important
- Find the “Last Change” before a problem shows up
- Simplify impact analysis

Configuration Drift
- Notice when Configurations change and notify operations
- Keep “bit-rot” from impacting operational readiness

Service Registry & Repository
Discover Services

Relationships & Dependencies

Service Reconciliation
Logical Elements of an SOA Management Solution

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Integrated Visibility of SOA Resources

Service Consumer

Business Services
Composition; choreography; business state machines

Services
atomic and composite

Service Consumer

Operations

Service Provider

Data Architecture (meta-data) & Business Intelligence Governance

Channel B2B

Packaged Application

Custom Application

OO Application

Integrated Reporting

Integrated Visibility of SOA Resources

Integrated Console

Service Management

Application Monitoring

Resource Monitoring

Resource Monitoring

Transaction Tracking

Integrated Reporting

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Guidance for Service Management

- Establish operational and business-focused management and monitoring perspectives
- Monitor the end-to-end solution to isolate and fix problems
- Automate provisioning and control of services to meet SLAs
- Make use of tools to improve application availability
- Track/predict change to reduce costs and downtime
SOA Security Considerations

- SOA introduces raise additional security issues
  - How do we identify and authenticate the service requester?
  - How to we identify and authenticate the source of the message?
  - Is the client authorized to send this message?
  - Can we ensure message integrity & confidentiality?
  - How do we audit the access to services?
  - How do we leverage Web services security standards?
  - How do we propagate identities with trusted service providers?

- XML Web services may expose backend systems in unintended ways

- SOA security may require multiple layers of enforcement – perimeter, gateway, app server, application

- Traditional security devices do not secure XML/SOAP
Logical Elements of SOA Security

Security PEP

Application Server
- WSSM
- JAAS/ JACC

Trust Management

Identity and Access Management

Integration PEP

CICS/ IMS/ DB2

Service Requestor

Web Services

ws-trust

Line of Business Security Risk Assurance Network Operations

Enterprise Directory

Enterprise Auditing and Data Warehousing

Systems Management Portal and Service Level Reporting

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SOA Security – Trust Model

1. Get Token

2. Send Message (including token)

3. Validate Token

- Identity Federation and Web Services requires trust
  - This trust is based on agreements between partners & expressed as policies

- Trust can be enabled by technology
  - Trust requirements expressed as infrastructure policies and requirements
  - Security tokens include identity information; Cryptographic keys used to sign Security Tokens

- Technology needs to be standards based
  - Standard ways to express and exchange policies that reflect trust relationships
  - Agreed token format, information content, signing and encryption methods
XML Security Appliances
Can Simplify and Accelerate SOA Security

- XML/SOAP firewall enables filtering on any content, metadata or network variables
- Incoming and outgoing XML and SOAP is validated at wire speed
- Security can be performed at the field level
  - WS-Security
  - Encrypt & sign individual fields
  - Non-repudiation
- Provides XML/Web services access control
Guidance for SOA Security

- Security authorization needs to be granular at the service level
- Understand existing corporate security policies (especially approval and audit process) and apply them in the SOA environment
- Work with the SOA application teams to understand the requirements
- Understand the trade-offs of security, performance and cost
- Choose policy-based over programmatic approaches to allow security decisions to be implemented at service invocation
- Evaluate performance implications of security implementations
- Consider XML appliances to accelerate security processing
Virtualization Decouples IT Infrastructure from Applications

- **Complex**
  - Islands of computing and data
  - Physical resources are bound to applications
  - Disparate management tools
  - Manual provisioning

- **Consolidated**
  - Fewer devices and licenses
  - Increased utilization
  - Physical resources still bound to applications
  - Disparate management tools
  - Labor intensive provisioning

- **Virtualized**
  - Pools of resources
  - Logic and physical resources decoupled
  - Standardized, automated infrastructure management
  - Automated provisioning
Optimize infrastructure investment and prioritize applications and users in a mission-critical manner

- Provide high availability and redundancy for business-critical applications
- Increase server utilization to optimize capital & administration costs
- Ensure that the most important applications and users are given priority according to business and IT policies
- Flexibly respond to unforeseen application demand

**Resource Optimization**

**Application Prioritization**

**High Availability**

*Utilization*  
*Importance*  
*Assurance*
Guidance for Virtualization

- Consolidate servers, storage & network assets for greater efficiency & reduced complexity
- IT resources should be used across applications without regard to where they physically reside
- Replace error-prone manual tasks & repetitive IT resource/capacity management tasks with automated capabilities
- Dynamically allocate IT capacity to meet business goals for increased infrastructure agility and readiness for growth
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Mapping to the IBM Products

- **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.

- **Enterprise Service Bus**: Manages diverse data and content in a unified manner.

- **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.

- **Rational Tester for SOA Quality**: Rational Performance Tester Extension for SOA Quality.

- **WebSphere XD**: WebSphere DataPower SOA Appliances.

- **Tivoli Composite Application Managers**: Tivoli OMEGAMON XE for Messaging.

- **Tivoli Federated Identity Manager**: Tivoli Access Manager.

- **Tivoli Provisioning Manager**: Tivoli Intelligent Orchestrator.
The Keys to Architecting an SOA Infrastructure

- In the real-world, SOA-based applications put a lot of stress on a typical infrastructure
- From a business view, the application layer is geared towards simplification but the infrastructure can become complex
- The IT Infrastructure/Middleware Architect cannot let the SOA application become a “black box” within the infrastructure
- Visibility of quality of service metrics within the SOA application is crucial to achieving performance and availability goals
- As an IT Infrastructure Architect, one needs to know what is in the toolbox and how to build the best infrastructure for the SOA application
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