J2EE Web Services on Mac OS X

Jonathan Maron

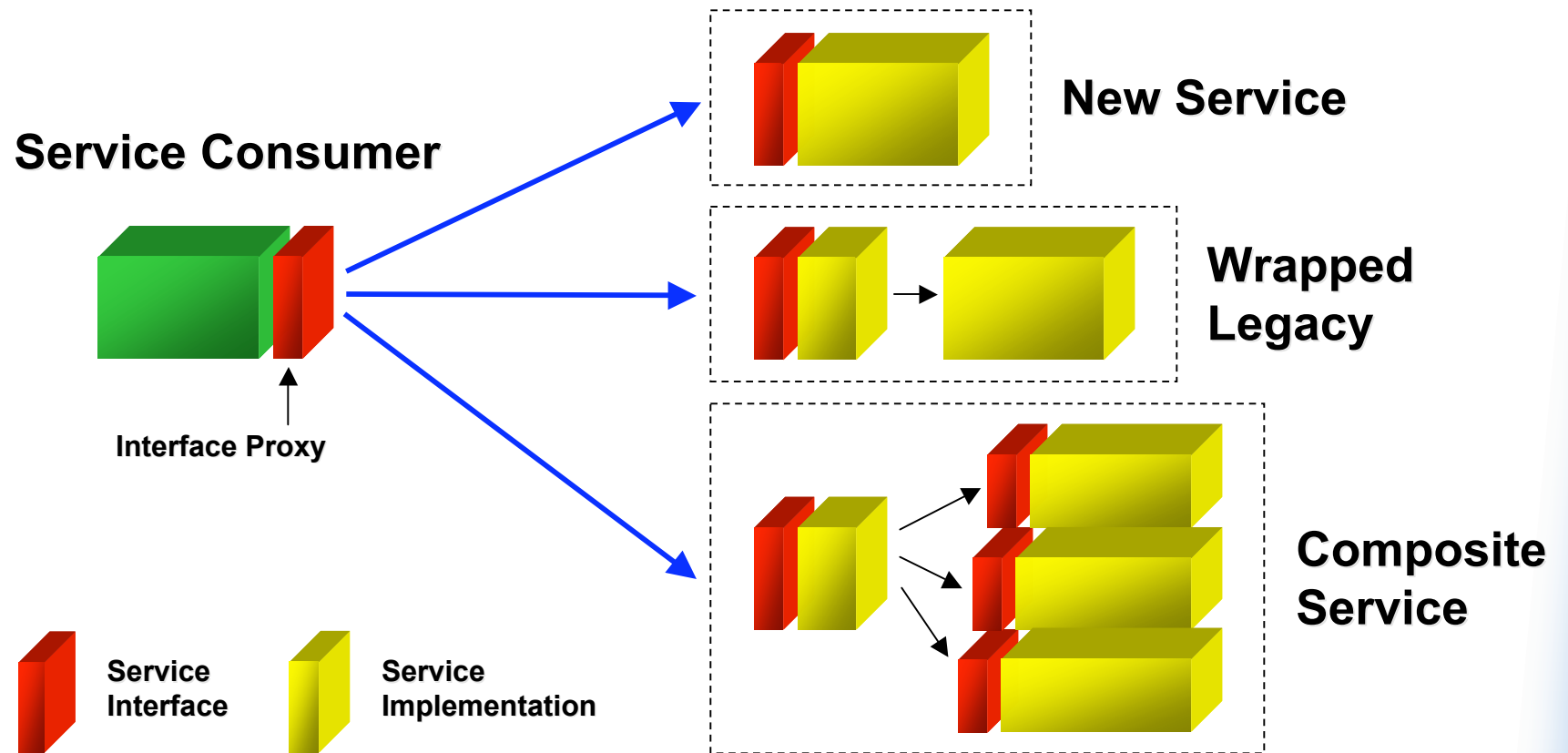Consultant Member, Tech Staff

Oracle Corp.

Agenda

- What are Web Services
- Service Oriented Architecture (SOA)
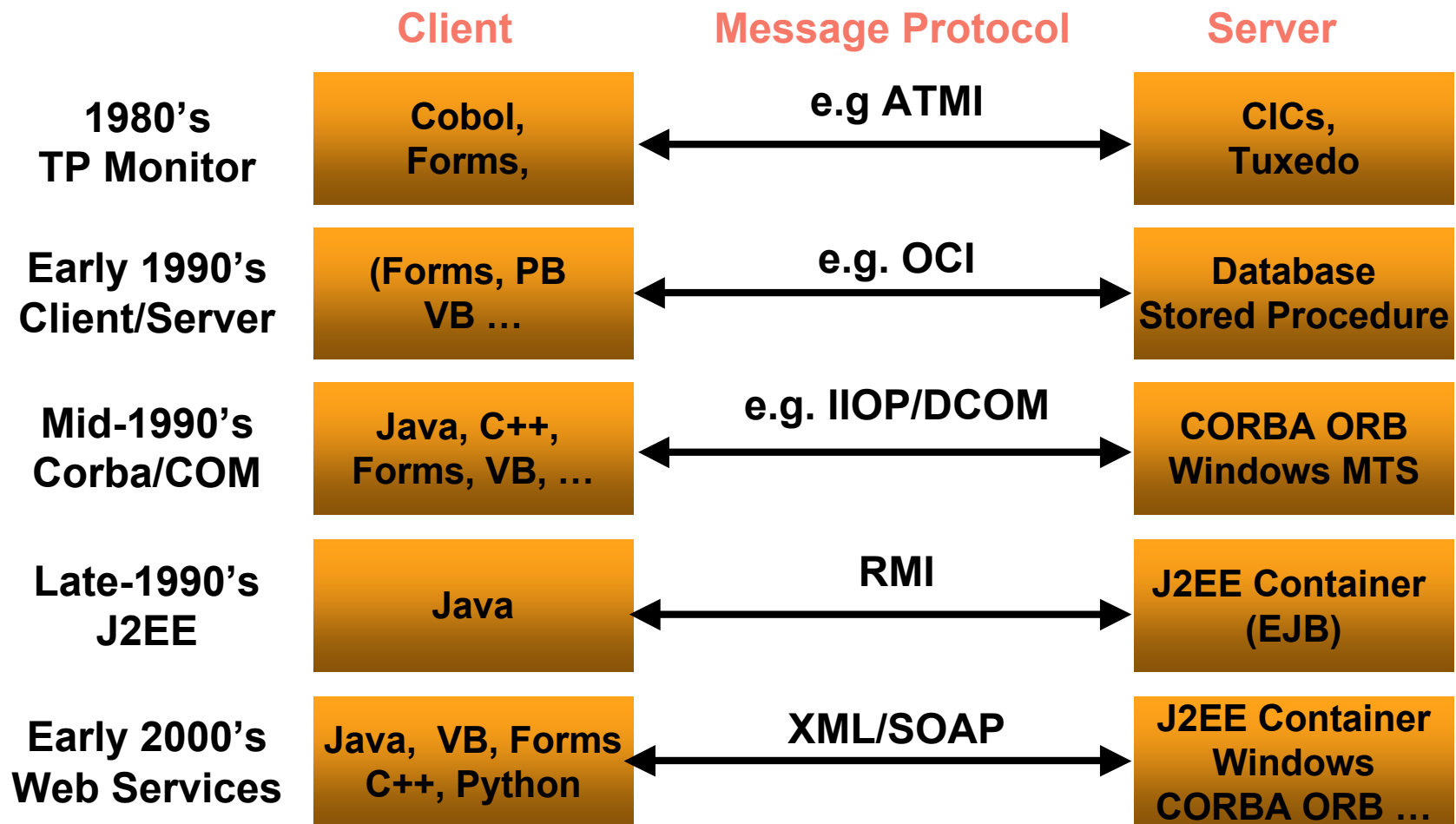- Mac OS X SOA Development

Agenda

- What are Web Services
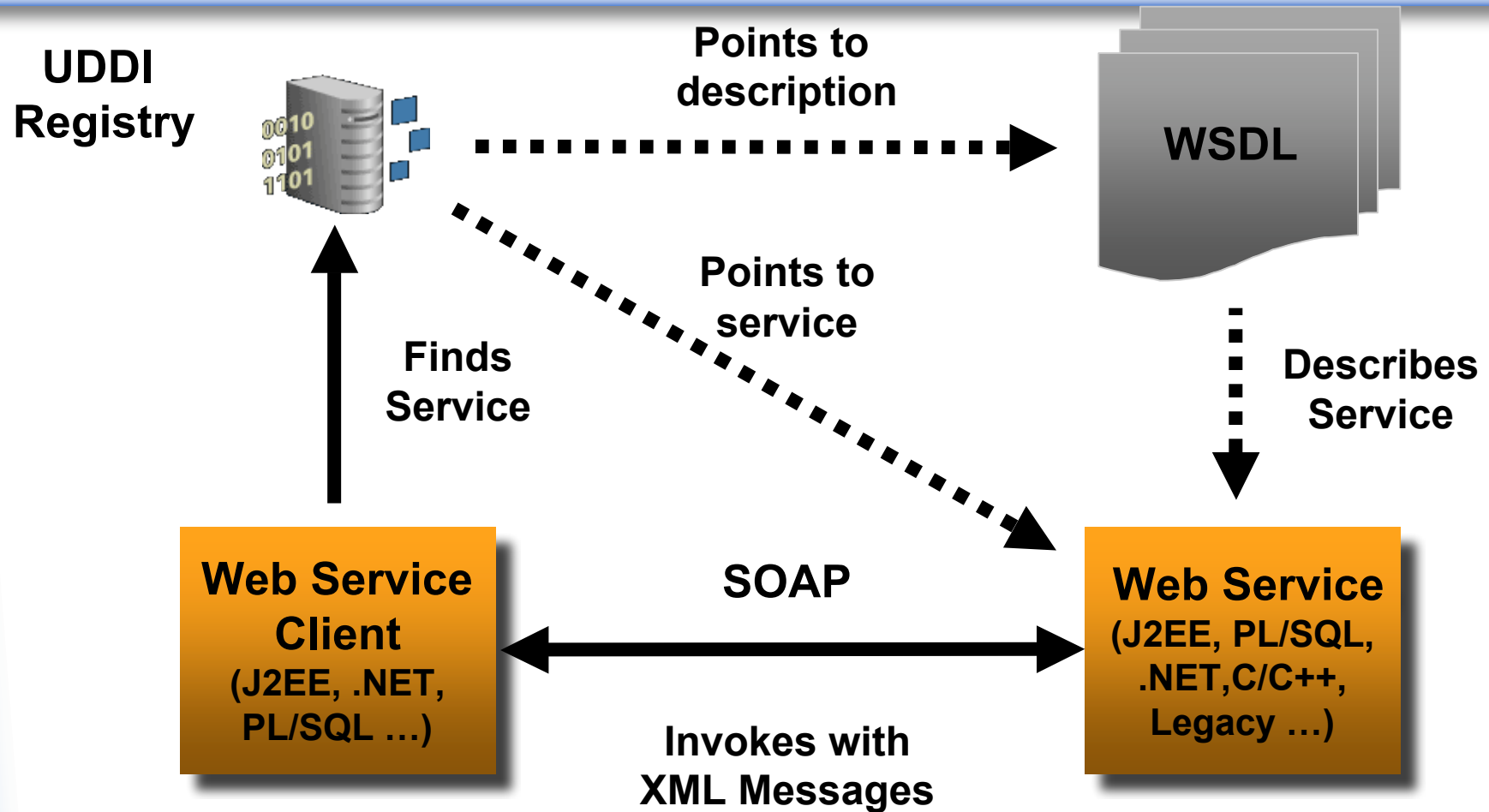- Service Oriented Architecture (SOA)
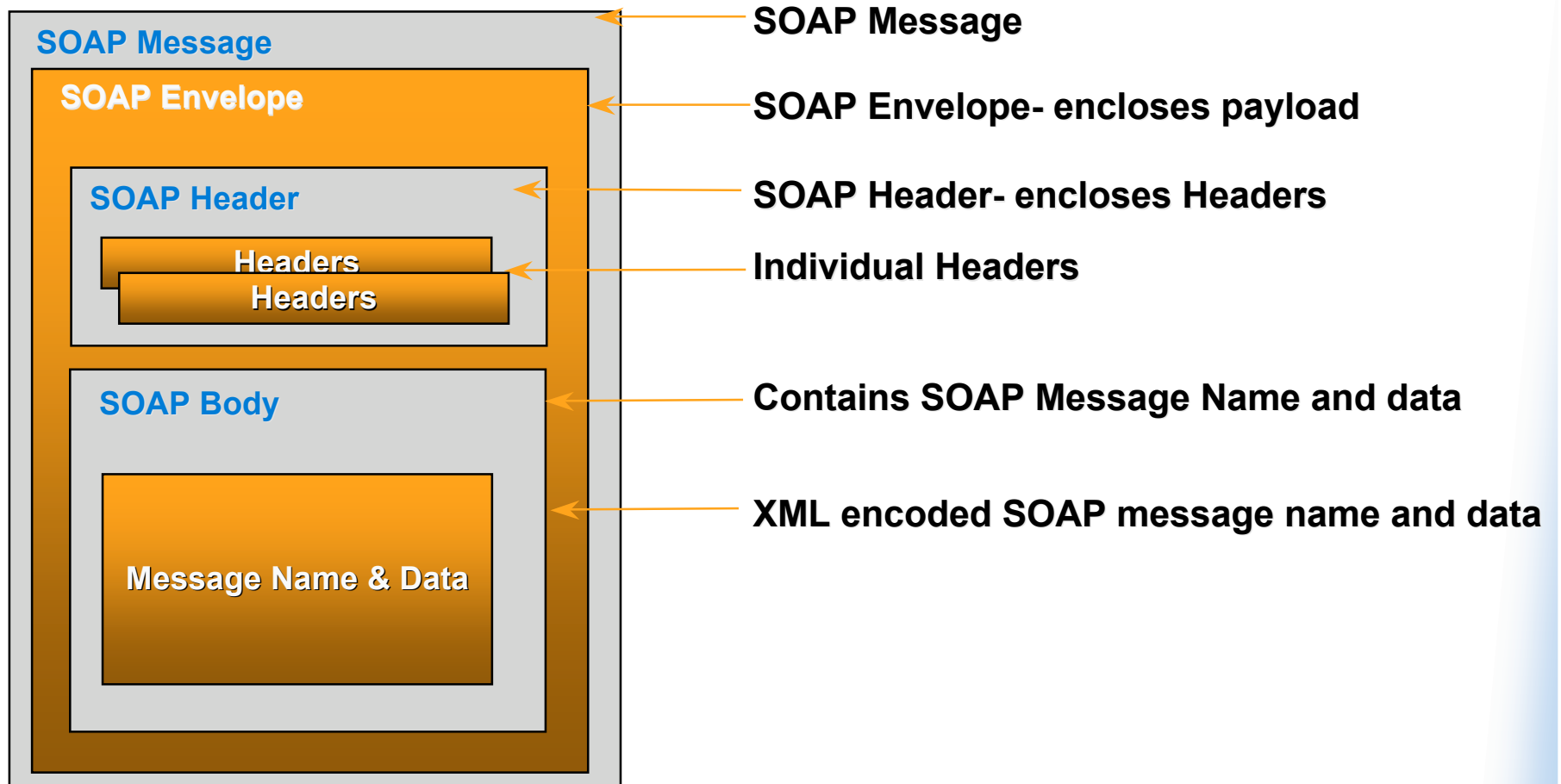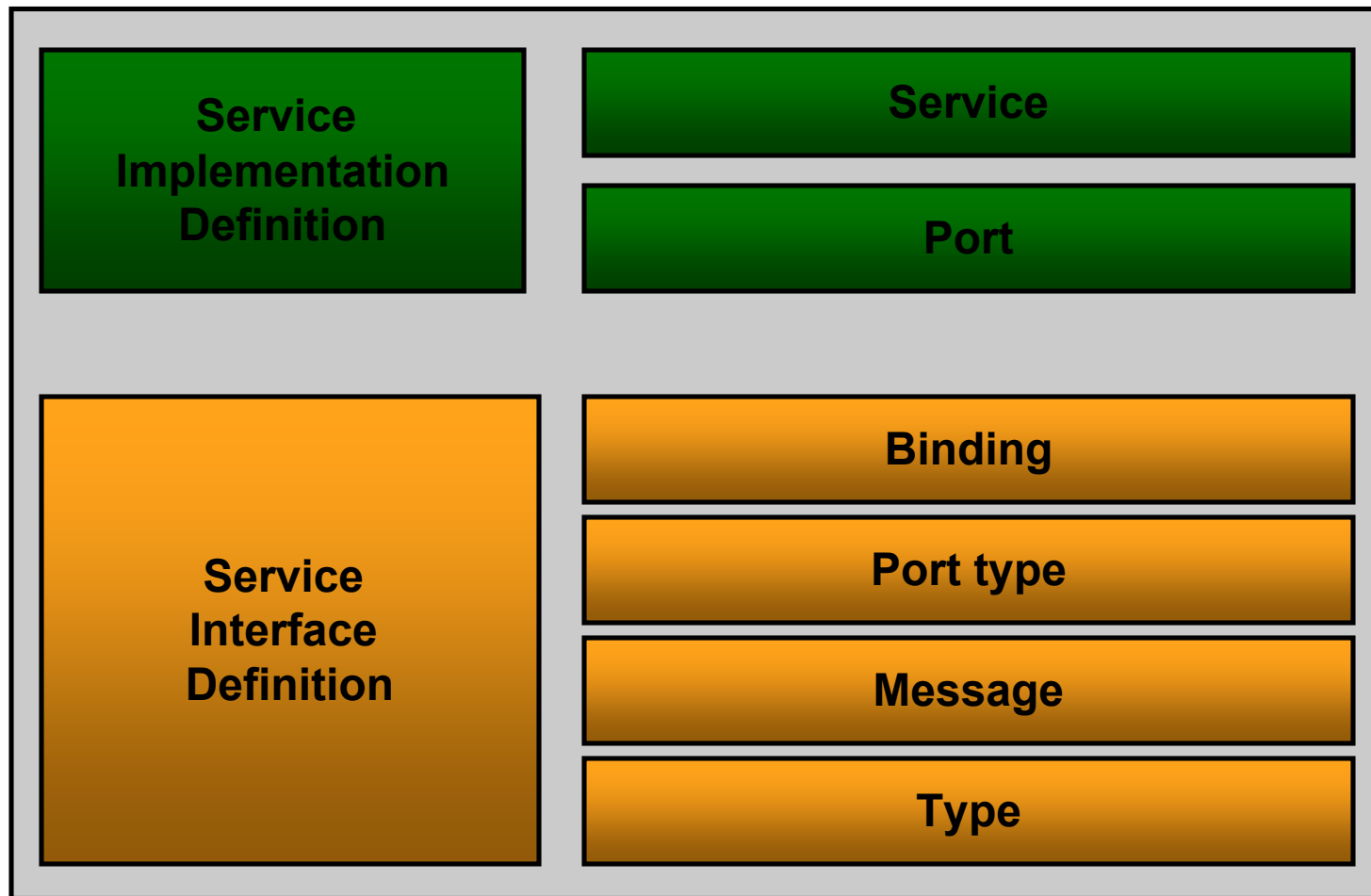- Mac OS X SOA Development

Anatomy of a Service

Service Consumer

Interface Proxy

New Service

Wrapped Legacy

Composite Service

Service Interface

Service Implementation

Haven't we been here before?

	Client	Message Protocol	Server
1980's TP Monitor	Cobol, Forms,	e.g ATMI	CICs, Tuxedo
Early 1990's Client/Server	(Forms, PB VB …	e.g. OCI	Database Stored Procedure
Mid-1990's Corba/COM	Java, C++, Forms, VB, …	e.g. IIOP/DCOM	CORBA ORB Windows MTS
Late-1990's J2EE	Java	RMI	J2EE Container (EJB)
Early 2000's Web Services	Java, VB, Forms C++, Python	XML/SOAP	J2EE Container Windows CORBA ORB …

Basic Web Services

UDDI Registry

Points to description

WSDL

Points to service

Finds Service

Describes Service

Web Service Client
(J2EE, .NET, PL/SQL …)

SOAP

Invokes with XML Messages

Web Service
(J2EE, PL/SQL, .NET,C/C++, Legacy …)

SOAP Message Structure

SOAP Message		← SOAP Message
SOAP Envelope		← SOAP Envelope- encloses payload
SOAP Header		← SOAP Header- encloses Headers
Headers		
Headers		← Individual Headers
SOAP Body		← Contains SOAP Message Name and data
Message Name & Data		← XML encoded SOAP message name and data

WSDL Schema Details

| Service Implementation Definition | Service |
| | Port |

Service Interface Definition	Binding
	Port type
	Message
	Type

Two Approaches
Top Down And Bottom Up

Bottom Up

Service Implementation
Server Interface

↓
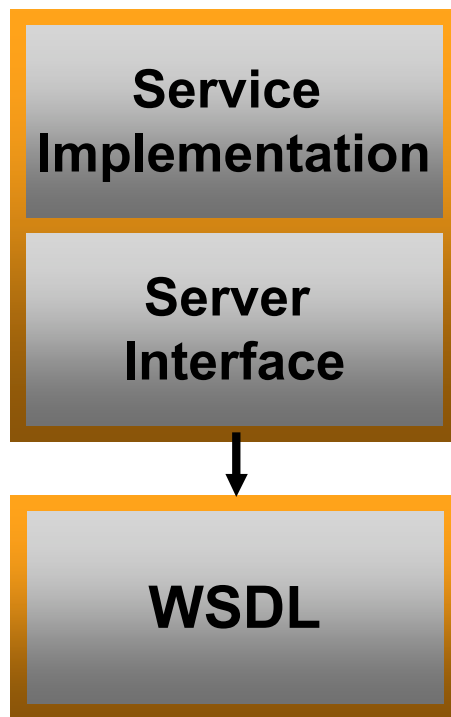
WSDL

e.g. EJB/Java Class
to WSDL

Top Down

WSDL

↓

Service Interface
Server Implementation
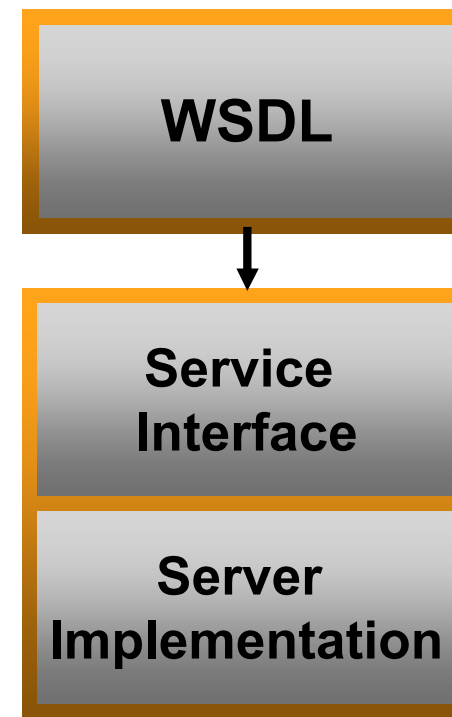
e.g. WSDL contract as the
interface & message description

J2EE 1.4 Web Services

Java APIs for XML	Description
JAXP	Java API for XML Parsing
JAXB	Java API for XML Data Binding
JAX-RPC	Java API for XML Remote Procedure Call
SAAJ	SOAP API for Attachments in Java
JAXR	Java API for XML Registries
EJB 2.1	Stateless Session EJB Endpoint Model
JSR 109	Web Services Deployment Model

Beyond J2EE 1.4

	Description
JSR- 181	Web Services Metadata for the Java^{TM} Platform
EJB3.0	Simplifying EJB development
WSIF	Web Services Invocation Framework
JSR-208	Java Business Integration

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What Is SOA?

- IT architecture for request – reply applications
- Application functions are modularized and presented as services
- Services are loosely coupled
  - Service interface is independent of the implementation

Characteristics of SOA

- Services have platform independent, self describing interfaces (XML)
- Messages are formally defined
- Services can be discovered
- Services have quality of service characteristics defined in policies
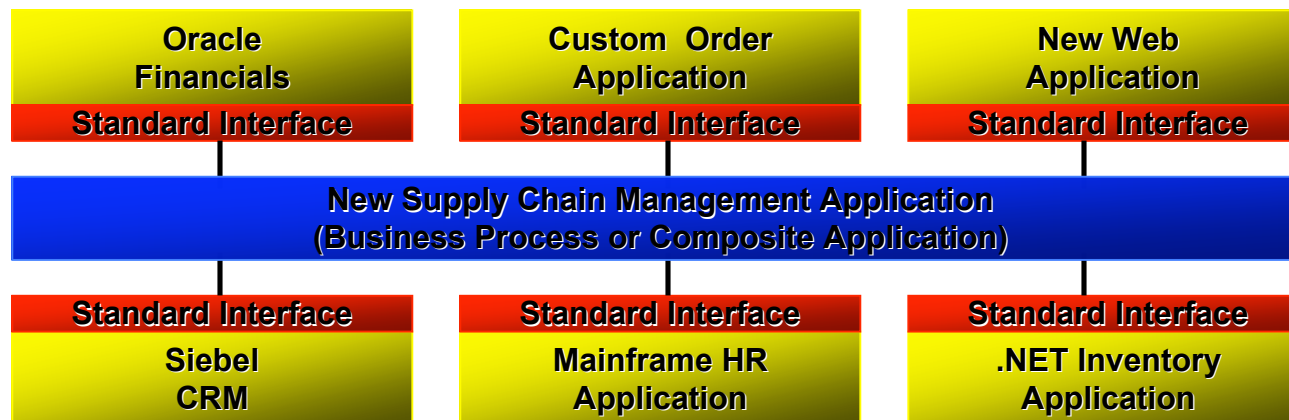- Services can be provided on any platform

Composable

Interoperable

SOA

Re-Usable

Loosely Coupled

Why SOA?

Source: Gartner
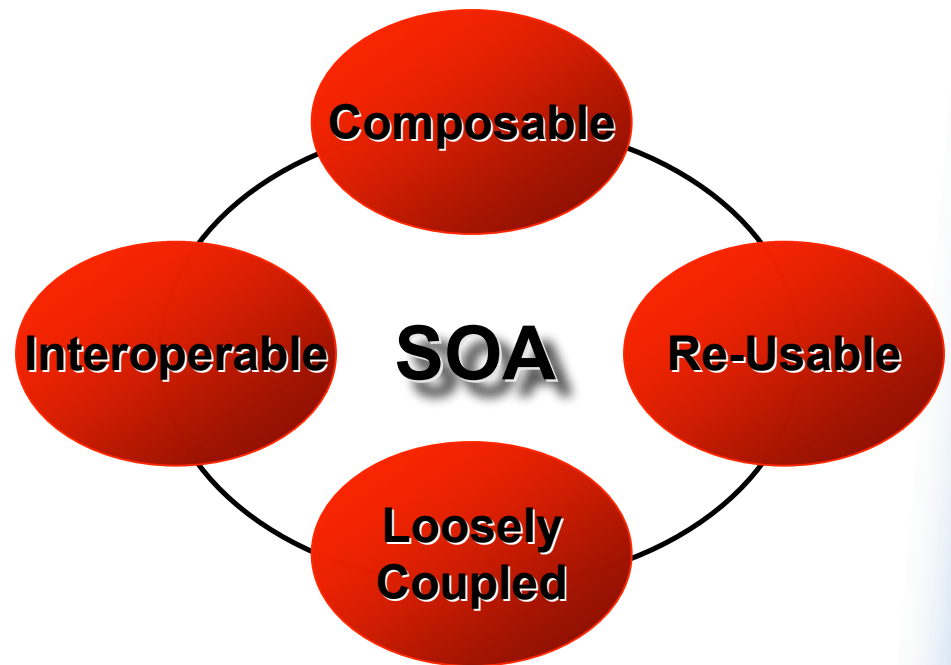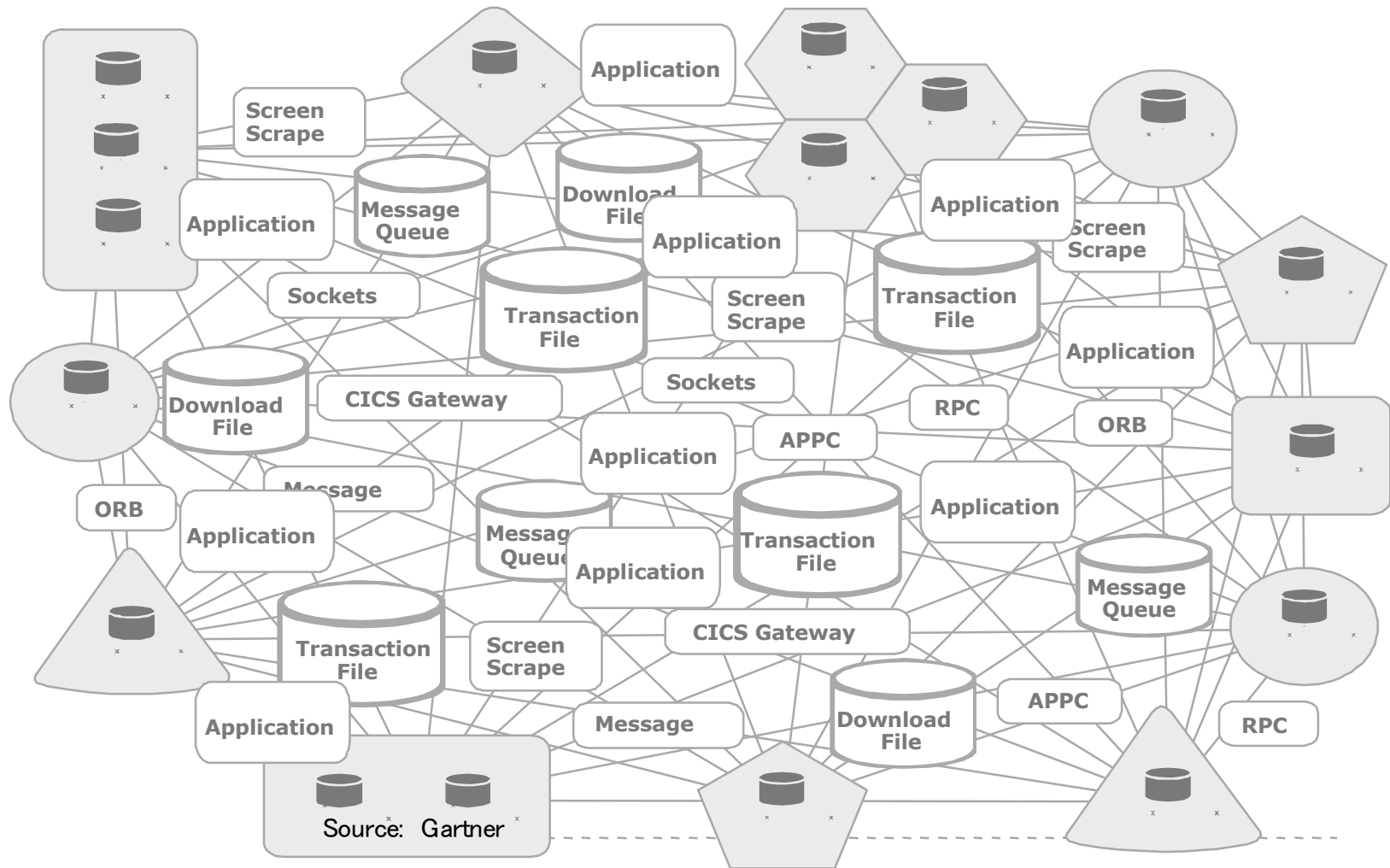
SOA To the Rescue

- Respond to business changes
- Address new needs with existing applications
- Unlock existing application investments
- Support new channels & complex interactions
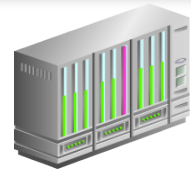- Support organic business

Oracle Financials	Custom Order Application	New Web Application
Standard Interface	Standard Interface	Standard Interface

New Supply Chain Management Application
(Business Process or Composite Application)

Standard Interface	Standard Interface	Standard Interface
Siebel CRM	Mainframe HR Application	.NET Inventory Application

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OS X SOA Development

- Java/J2EE
  - Multiple vendors
  - More details to come…
- .NET
  - Mono framework
    - Provides the necessary software to develop and run .NET client and server applications on OS X
    - http://www.mono-project.com/Main_Page

SOA Elements
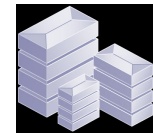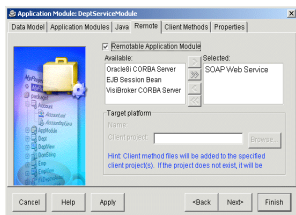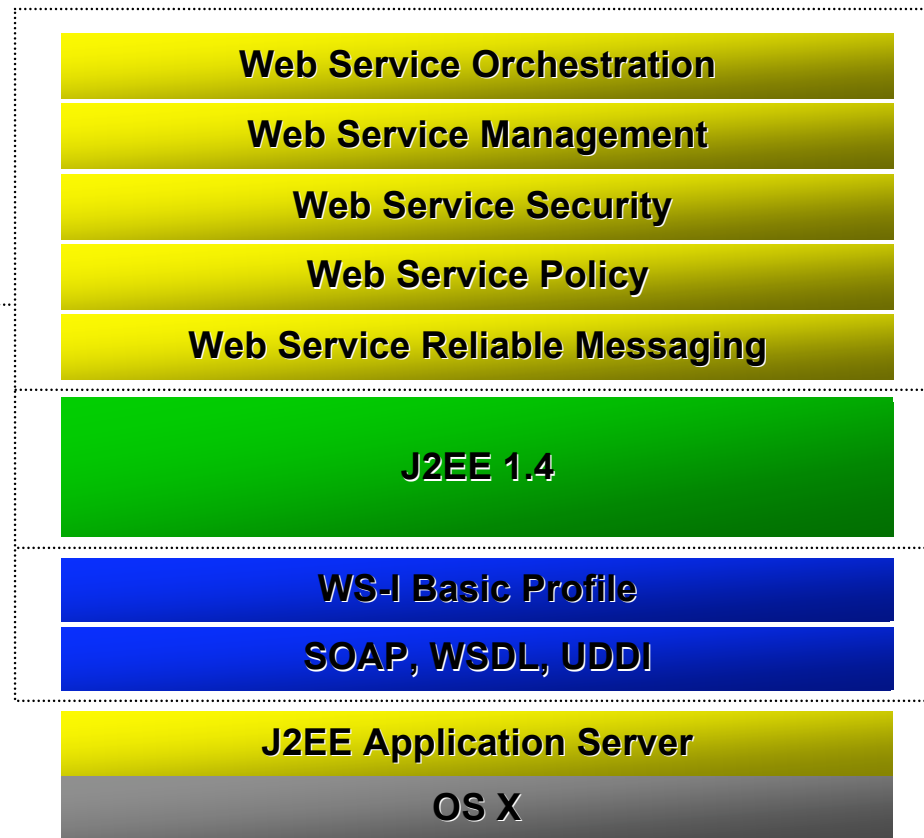
SOA Tools
App Dev Framework

Web Service Orchestration
Web Service Management
Web Service Security
Web Service Policy
Web Service Reliable Messaging
J2EE 1.4
WS-I Basic Profile
SOAP, WSDL, UDDI
J2EE Application Server
OS X

TPM, Mainframe, Legacy Sys

Applications

Databases

B2B Partners

J2EE Application Server

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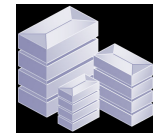
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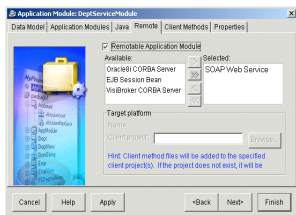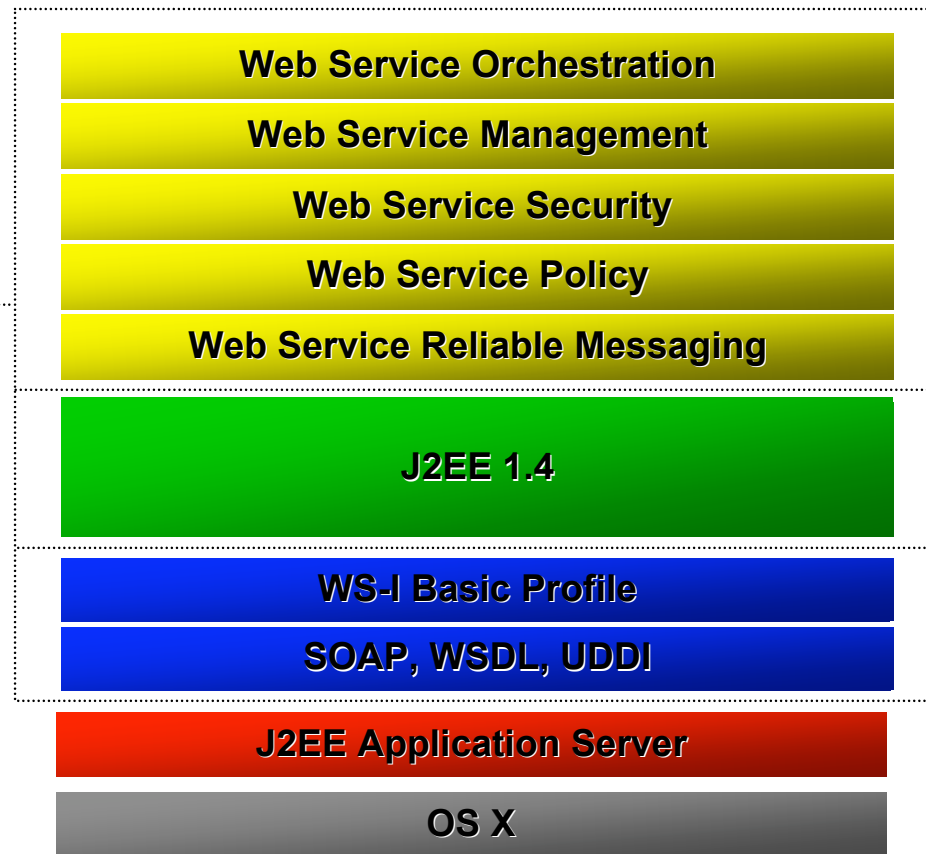
J2EE Application Server

- Open Source
  - ◆ JBoss
    - ▪ http://www.jboss.com/products/jbossas/downloads
  - ◆ Geronimo
    - ▪ http://sourceforge.net/geronimo_download_choose.php
  - ◆ Glassfish
    - ▪ https://glassfish.dev.java.net/
- Vendors
  - ◆ Oracle
  - ◆ BEA
  - ◆ IBM

Development Environment
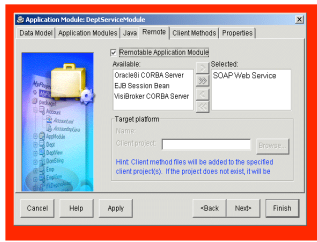
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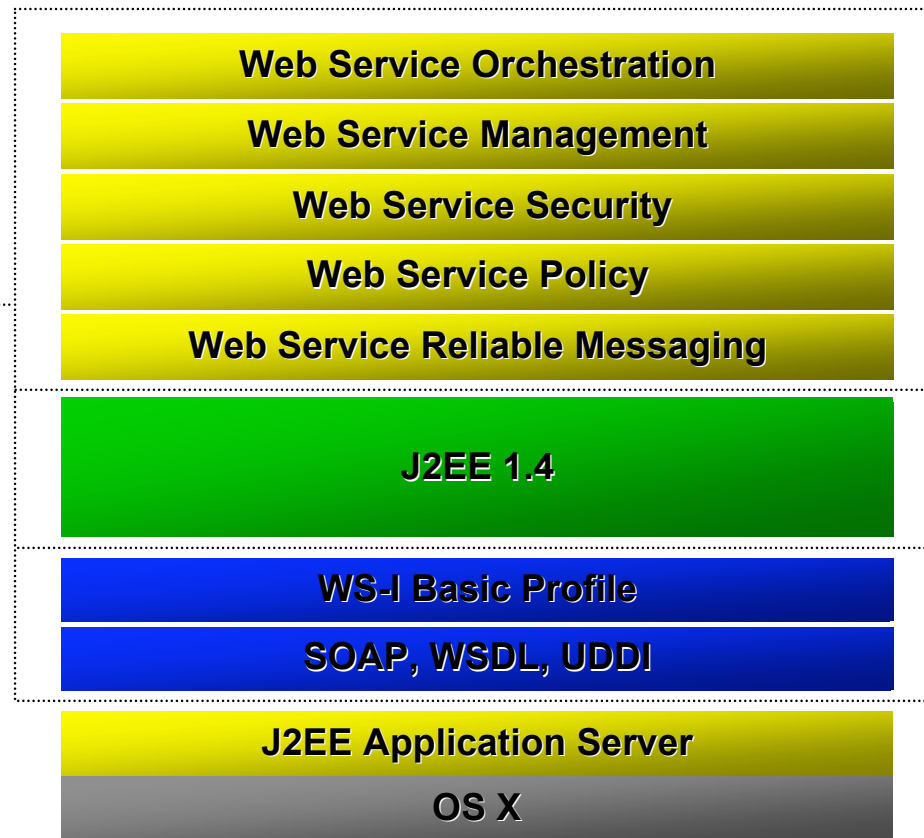
TPM, Mainframe, Legacy Sys
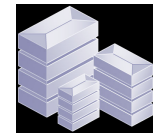
Applications

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B2B Partners

Web Service Development Tools
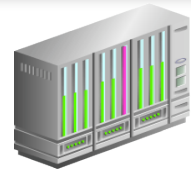
- Open Source
  - Eclipse
    - http://www.eclipse.org/downloads/
    - Deployment available via "ant" facilities
- Vendors
  - Oracle JDeveloper
  - Intellij IDEA
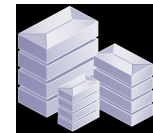- Command line
  - ant
- .NET
  - Mono
  - Ikvm.net
    - http://www.ikvm.net/

Demonstration

Web Service Development
J2EE and .NET

SOA Elements

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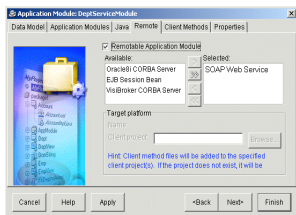
Applications

Databases
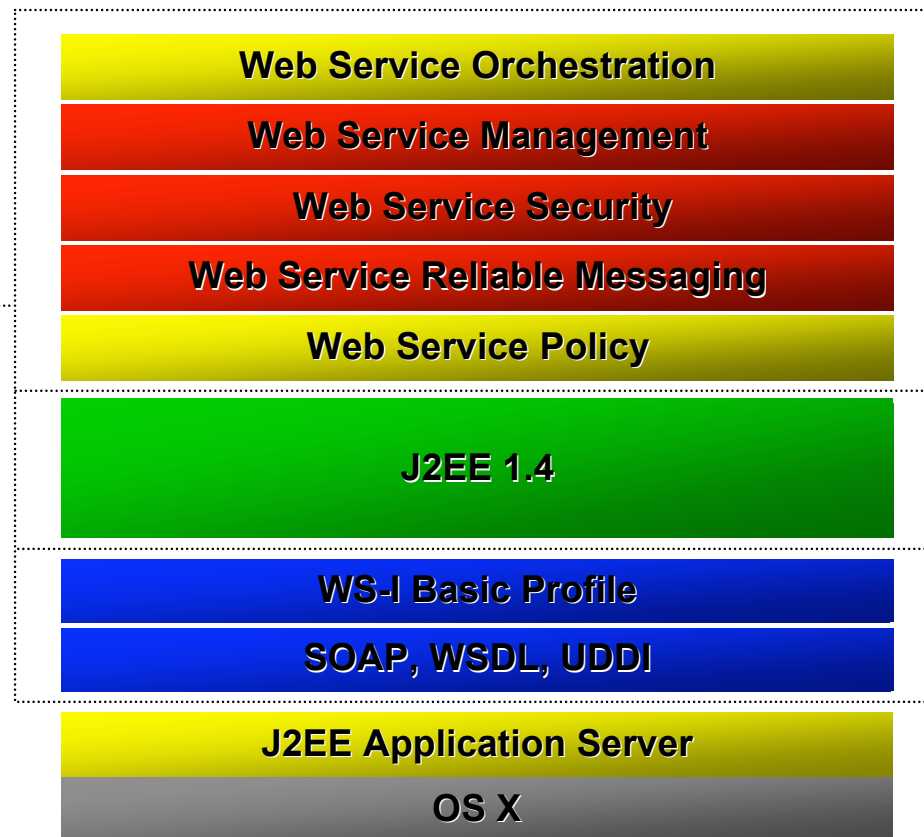
B2B Partners

Quality Of Service Concerns

- Security
  - "We have many web services exposed to the internet now"
  - "Only valid partners may access our web services"
- Exception Handling
  - "Notify operations if a transaction stalls"
  - "Send any incomplete orders to customer service for fixing"
- Compliance and Consistency
  - "All customer orders must be encrypted with 128 bit keys"
  - "All XML messages must follow this format"
- Service Level Monitoring
  - "The order system must process transactions in under 2 seconds"
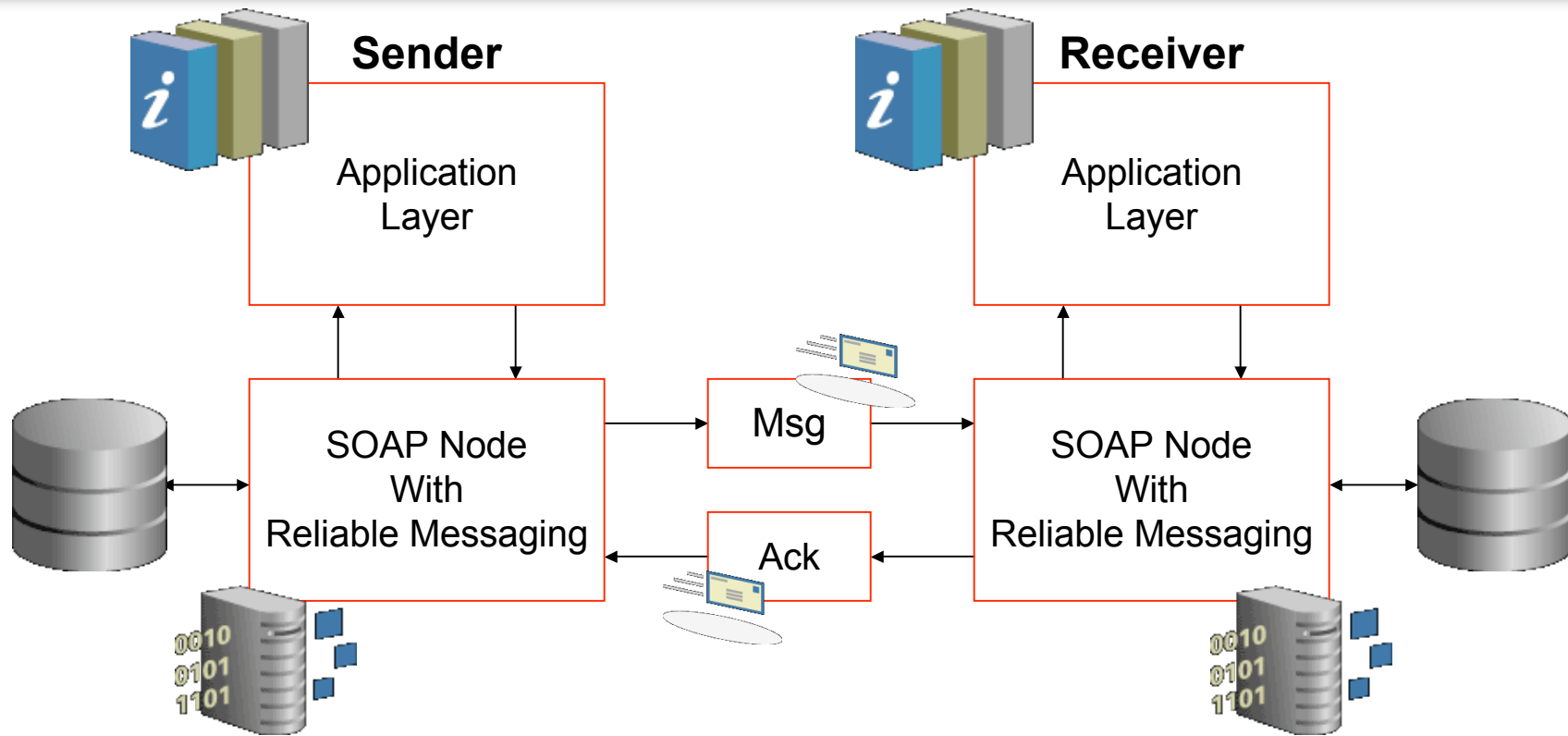 - "If uptime falls below 98% we owe contract penalties"

Quality of Service Requirements

- Reliability
  - Guaranteed delivery
- Security
  - Authentication, encryption and signing
- Management
  - Deployment, configuration, monitoring, fault handling

Standards for Quality of Service

- Web Services Reliability
    - OASIS standard August 2004
    - Will merge with WS–Reliable Exchange
- Web Services Security
    - OASIS standard April 2004
- Web Services for Distributed Management
    - OASIS specification
- Expected next steps from standards
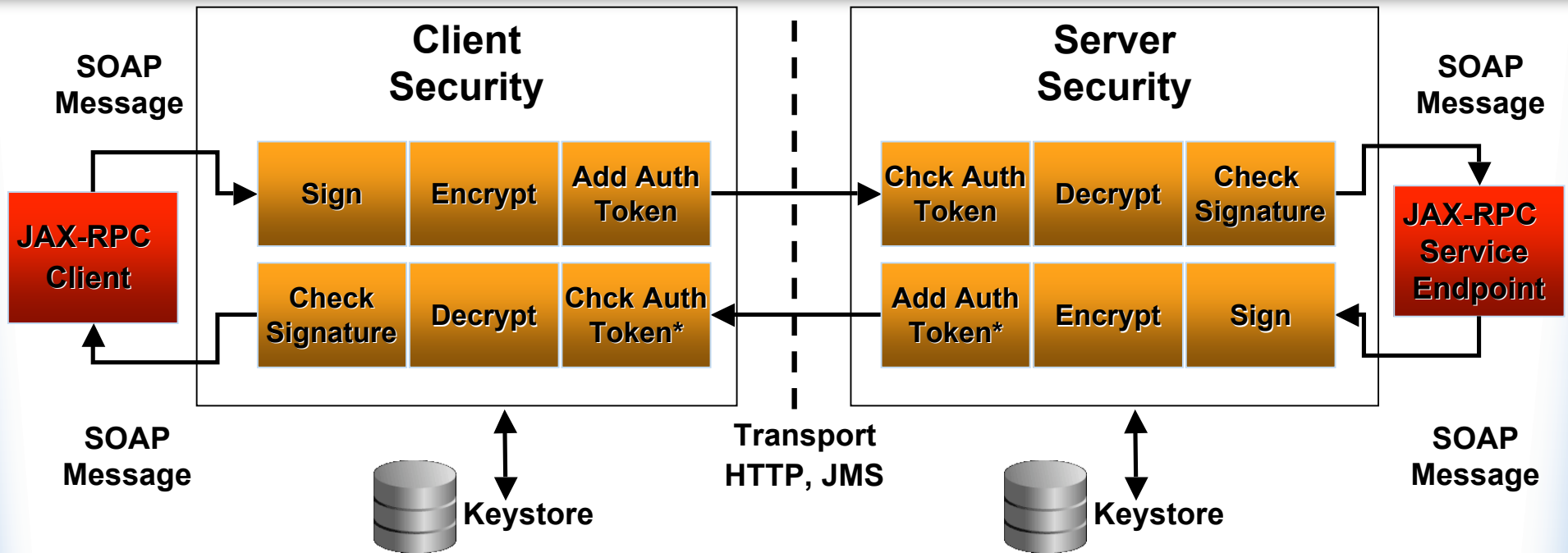   - Interoperability for reliability and security

Web Services Reliability

Sender

Application
Layer

Receiver

Application
Layer

SOAP Node
With
Reliable Messaging

Msg

SOAP Node
With
Reliable Messaging

Ack

- At least once semantics
- At most once semantics

- Guaranteed message ordering
- Exactly once semantics

Web Services Security

	Client Security		
SOAP Message	**Sign**	**Encrypt**	**Add Auth Token**
JAX-RPC Client	**Check Signature**	**Decrypt**	**Chck Auth Token***

	Server Security		
Chck Auth Token	**Decrypt**	**Check Signature**	SOAP Message
Add Auth Token*	**Encrypt**	**Sign**	JAX-RPC Service Endpoint

SOAP Message

Transport HTTP, JMS

Keystore

Keystore

SOAP Message

SOAP Message

- Authentication
  - User name/password token
  - X.509 token
  - SAML token

- XML Digital Signatures
- XML Encryption

Web Services Management

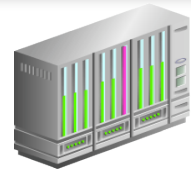**BUILD**
Policies

ENFORCE
Policies

MONITOR
Policies

Policy Gateway

Policy Agents

Policy Manager
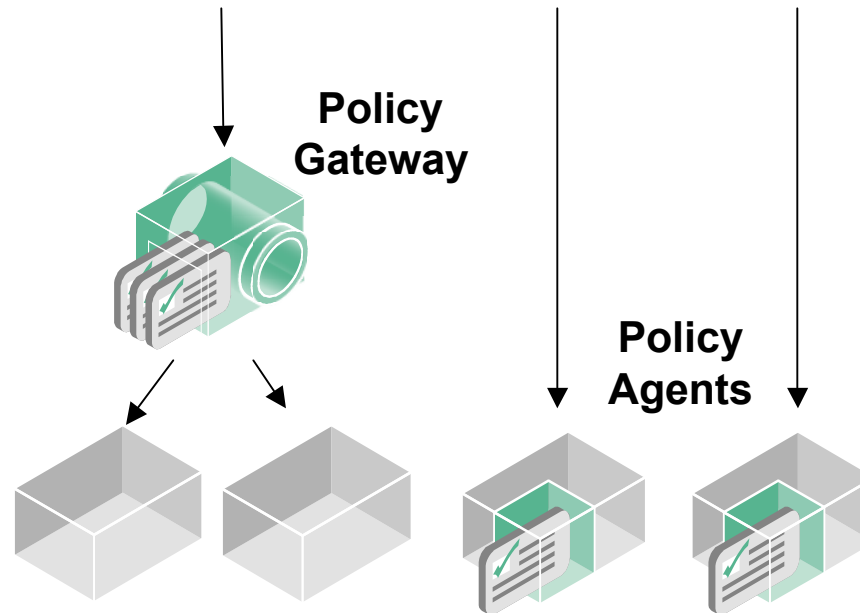
Web Service Monitor

Web Services

Demonstration

Web Service Quality of Service

SOA Elements

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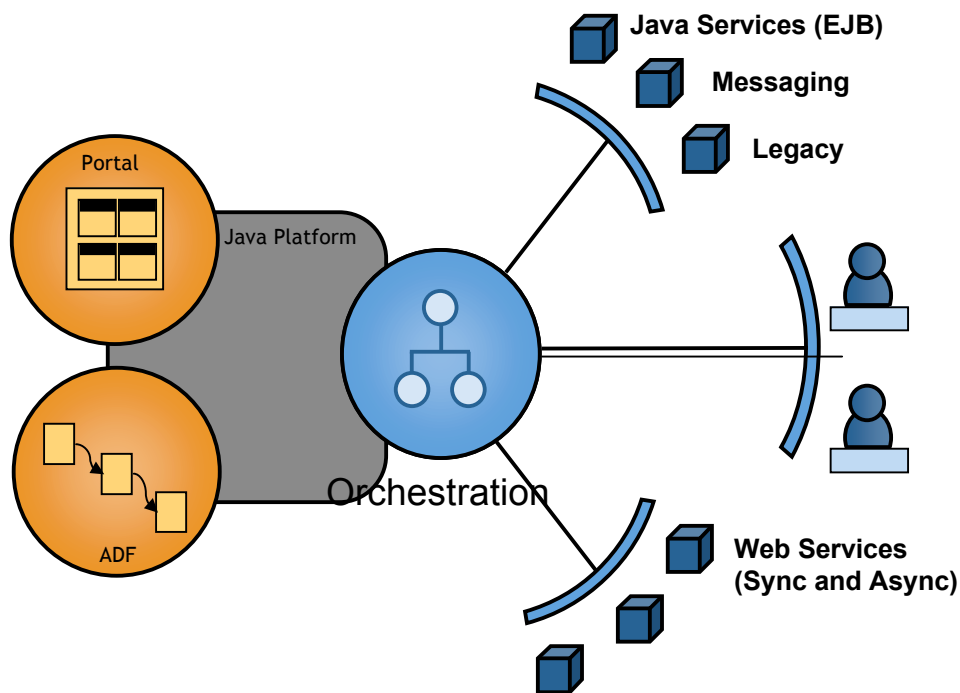**B2B Partners**
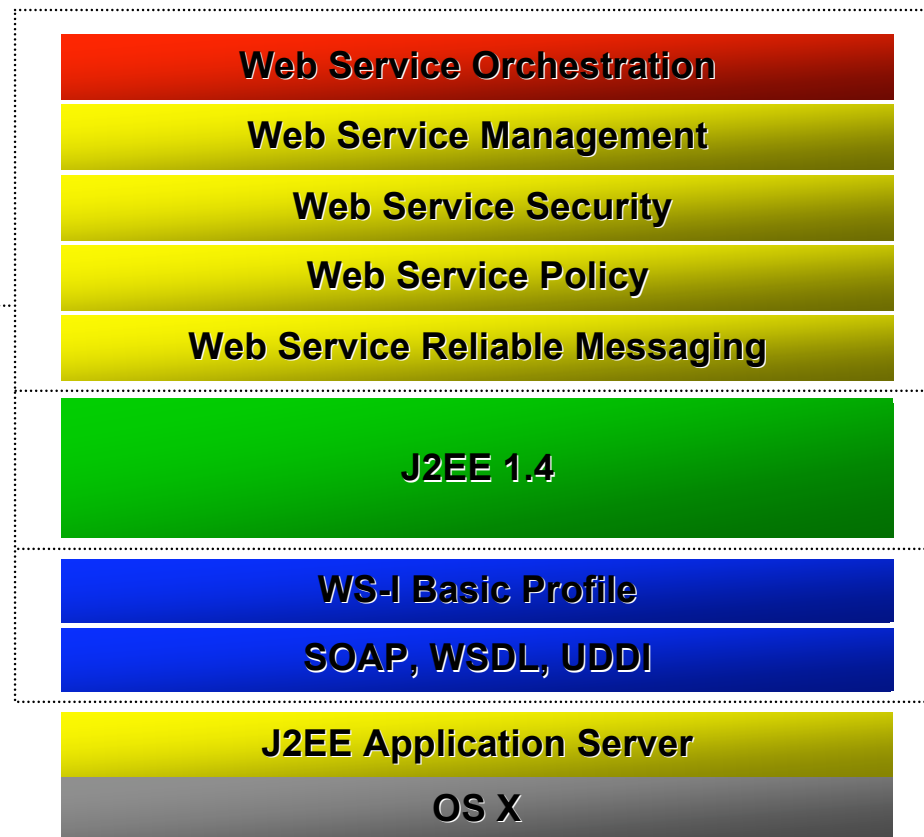
Orchestration Requirements

Connectivity
Heterogeneous Back Ends
Silos of API and mechanisms
Opaque/heterogeneous data definitions
Synchronizing multiple data stores

Flow Control
Asynchrony, Flow Coordination, Data
Transformation, Compensation, Version Control,
Auditing

Scalability
Unpredictable loads
Asymmetric performance capabilities

Management and Security
Access control, Encryption, Logging, Metering
Independent of the service

Interaction/Access
Catalog, Customization, Access

What Is BPEL?

- Markup language for composing a set of discrete services into an end-to-end process flow

- 10+ years of research and development from Microsoft (XLANG) and IBM (WSFL, FDML)

- The best integration solution for XML and Web services but also Java, JCA and JMS.

- Rich support for async interactions, parallel processing and exception management.

- Leverages XML Schema, XSLT, XML Query, WS-Security, WS-Addressing and WSIF.

- Composability: A process flow is automatically a service.

" *Gartner believes that BPEL will emerge as the leading industry standard for Web service orchestration and coordination of business processes.*"

*- David Smith, Research Vice President and fellow, Gartner*

" *BPEL is the future of the integration space in my view… Why? Because the value is so much higher when you provide not only a way to integrate applications, but also a way to create services from them and put them into business processes.*"

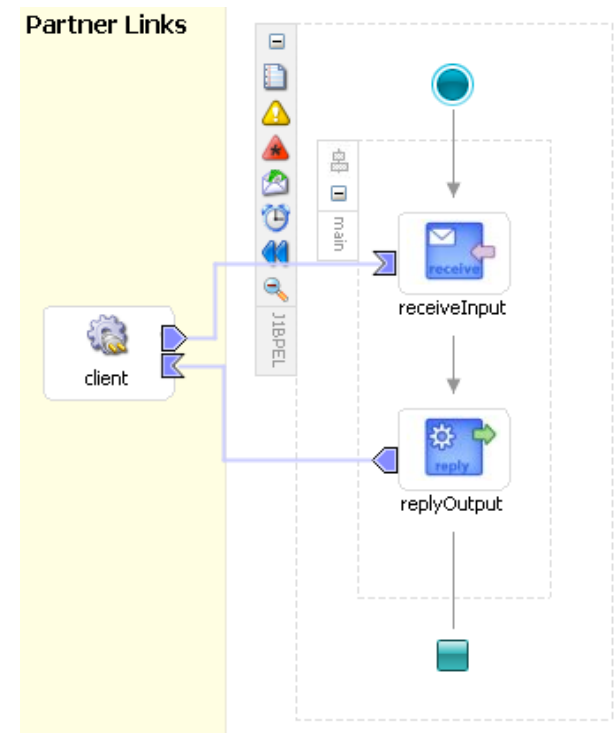*- John Rymer, Vice President, Forrester Research, Inc.*

BPEL by Example
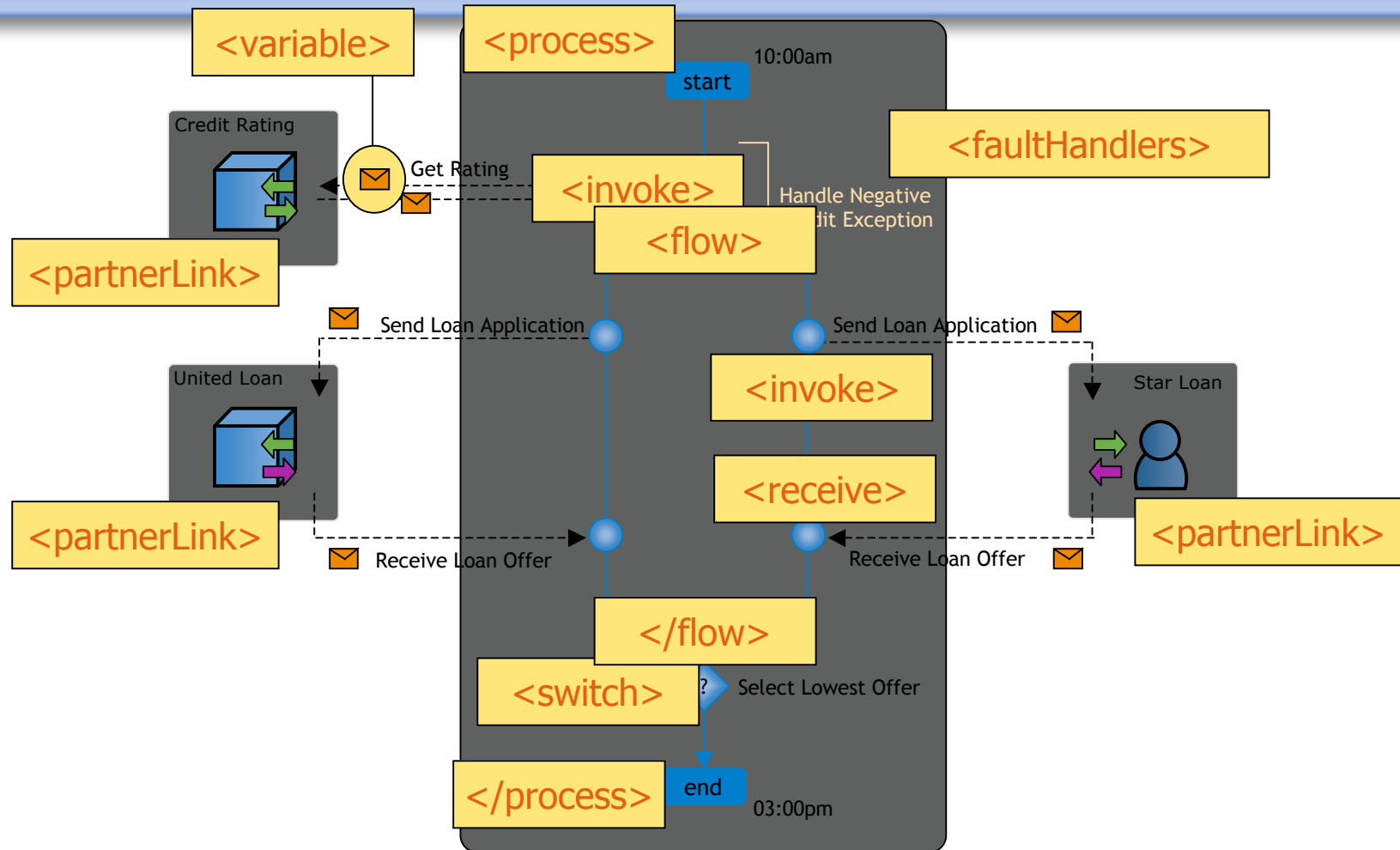
BPEL Based Applications
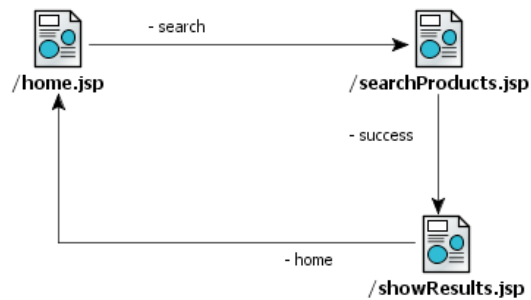
**JAX-RPC**

Web Application   **WSDL**   **BPEL Process**

Workflow

One top level Human Workflow Service which interacts with the BPEL engine and has pluggable services and encapsulates Notification, Assignment Service, TaskManager, WorklistManager, Identity Service

WSDL Contract

Human Workflow Service

Assign Task

Task Complete

BPEL Process

Update Task

Personalizable Worklist
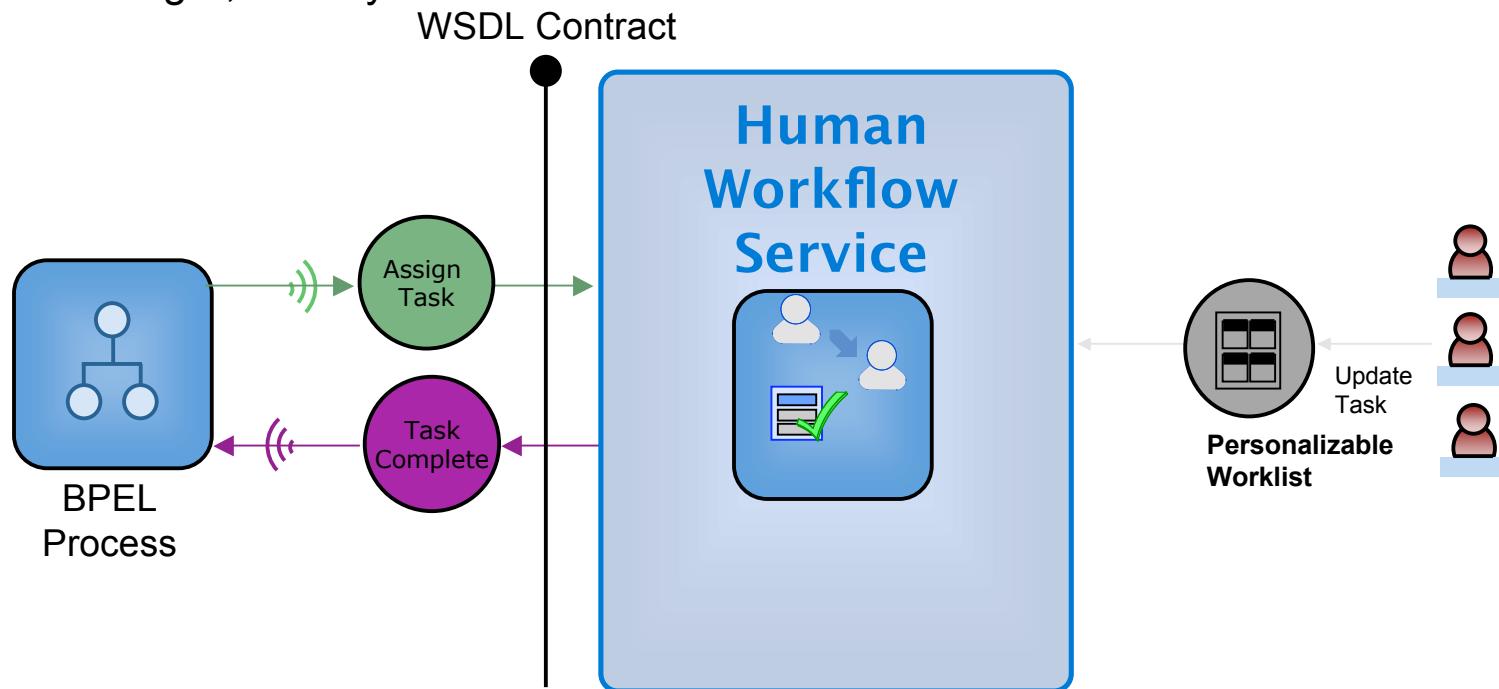
(1) assign tasks to a user/role
(2) wait for task completion as part of an end to end process flow

Demonstration
BPEL

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QUESTIONS & ANSWERS