

SOA & Web services

PV207 – Business Process Management

Spring 2016

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Last lecture recap

- **Processes**
 - **What is business process?**

Last lecture recap

- Processes
 - What is business process?
 - **What is BPM?**

Business Process Management

Is a **Management discipline**, focused on systematic **definition** and **execution** **measurement of processes** in organizations

- **An effort to describe processes** in organisation measure results and **manage process changes** towards higher efficiency
- **"Evolution not Revolution"**

Last lecture recap

- Processes
 - What is business process?
 - What is BPM?
 - **What is BPM adoption?**

Last lecture recap

- Processes

- What is business process?
- What is BPM?
- What is BPM adoption?
- Why BPM ?
- Roles in BPM

- Process life-cycle

- Phases of process based development

- BPMS

- **BPMS components**

Last lecture recap

- Processes

- What is business process?
- What is BPM?
- What is BPM adoption?
- Why BPM ?
- Roles in BPM
- Process life-cycle
- Phases of process based development

- BPMS

- BPMS components
- Architecture
- Human Tasks
- Business Rules
- BAM
- Existing BPMS

Lecture summary

- Motivation for SOA
- Role BPM in IT management
- Core BPM architecture
- BPM – SOA relationship
 - SOA concept
 - SOA architecture
 - SOA Governance
 - SOMA
- TEAMBUILDING
- Web Services
 - What are WS?
 - Artifacts WS
 - WSDL
 - SOAP
 - WS - standards
- WS in Java
 - Client side
 - Server side
- REST

3 meanings of the word "service"

- "Business" service
 - Google offers paid advertising to restaurants
 - Defined by contract / service offering

3 meanings of the word "service"

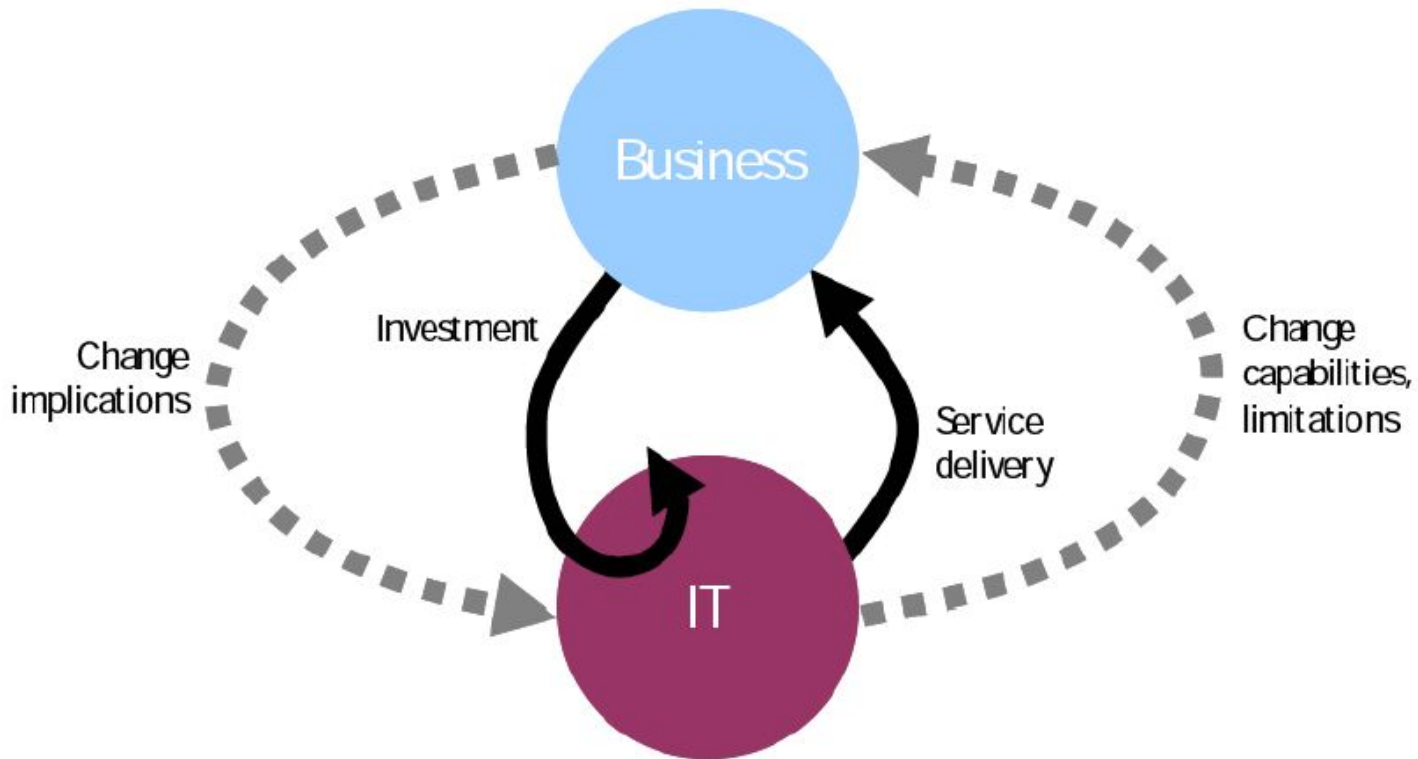
- "Business" service
 - Google offers paid advertising to restaurants
 - Defined by contract / service offering
- "Technical" service
 - Google provides a search for addresses of restaurants in neighbourhood
 - Defined by a User Interface / Programming interface

3 meanings of the word "service"

- "Business" service
 - Google offers paid advertising to restaurants
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- "Technical" service
 - Google provides a search for addresses of restaurants in neighbourhood
 - Defined by a User Interface / Programming interface
- Web Service
 - Google provides Web Service API for retrieving GPS coordinates of particular address
 - Defined by a WSDL/REST methods definition
 - Request - response model

Business & IT alignment

Figure 1: The elements of IT-business alignment



There are three important elements in IT-business alignment: investment, service delivery, and collaboration in change management.

SOA motivation

- **Reduction of costs** on development and integration
- Efficient **maintenance and integration** across various systems
- Component/service **reusability**
- Integration of **Legacy applications**
- Efficient **management and monitoring**
- **Just-in-time management** (real time business)

SOA definition

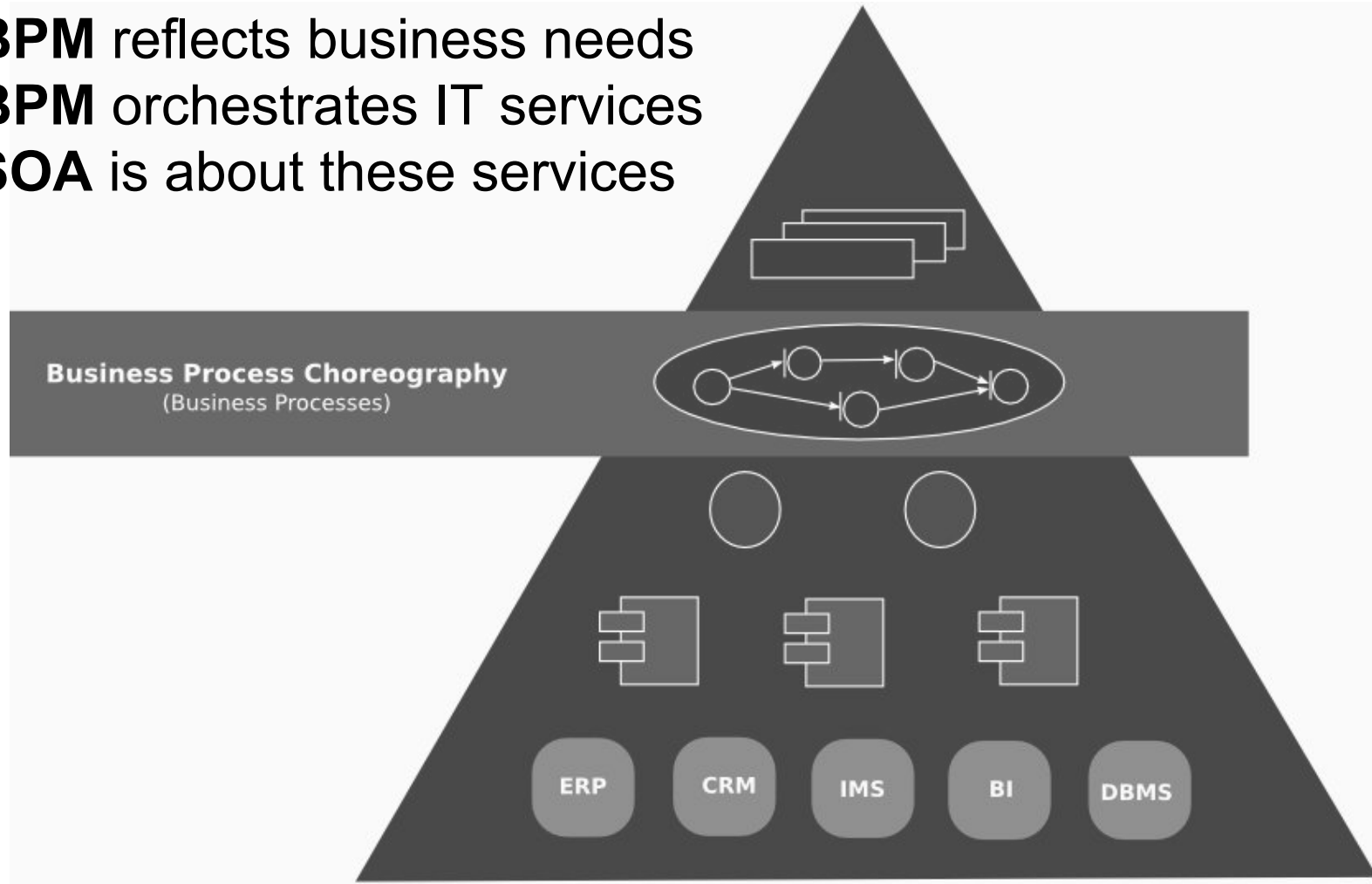
Service-Oriented Architecture (SOA) is an *architectural style* that supports *service-orientation*.

Service-orientation is a way of thinking in terms of services and service-based development and the outcomes of services.

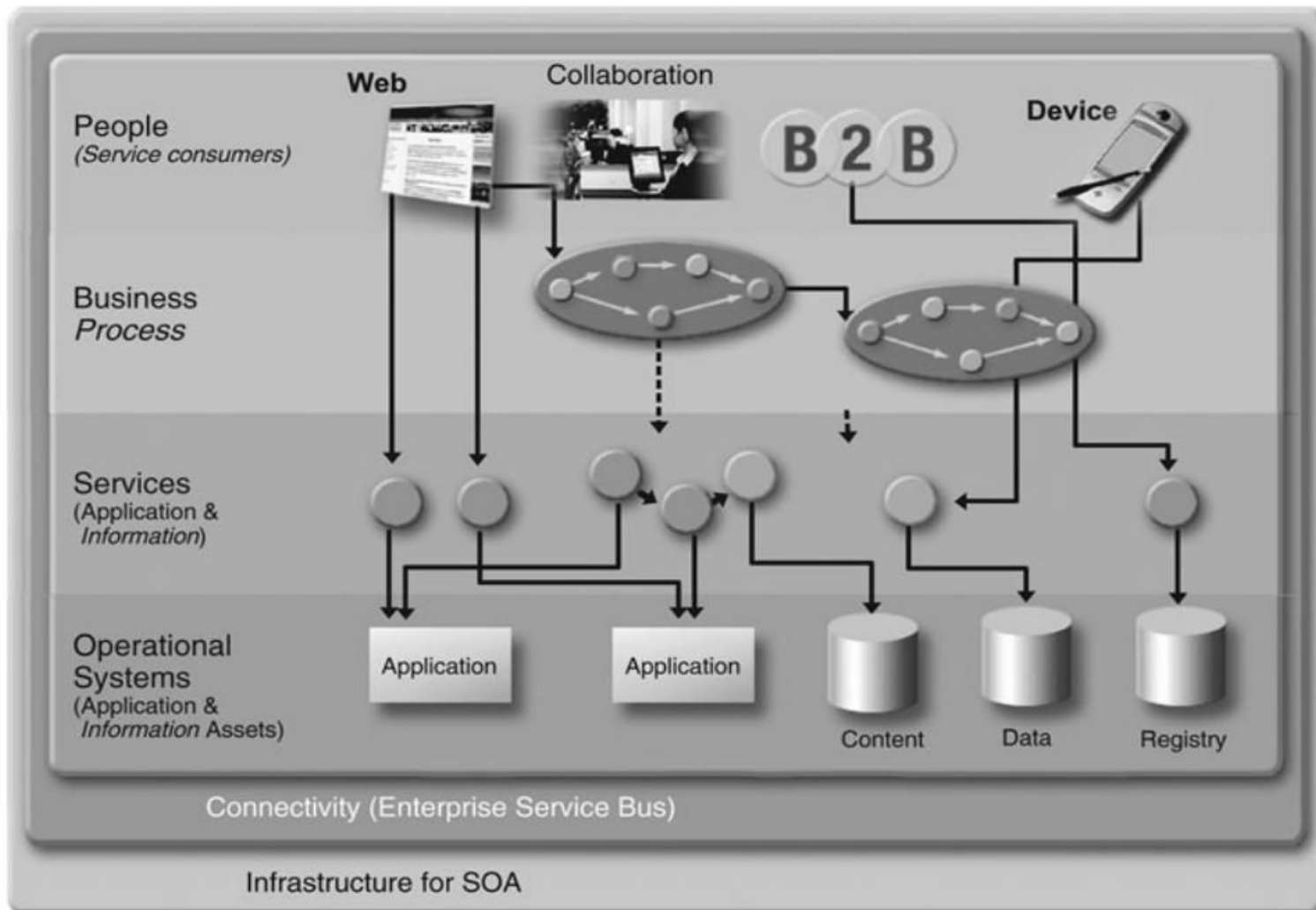
-- The Open Group

How is BPM and SOA related?

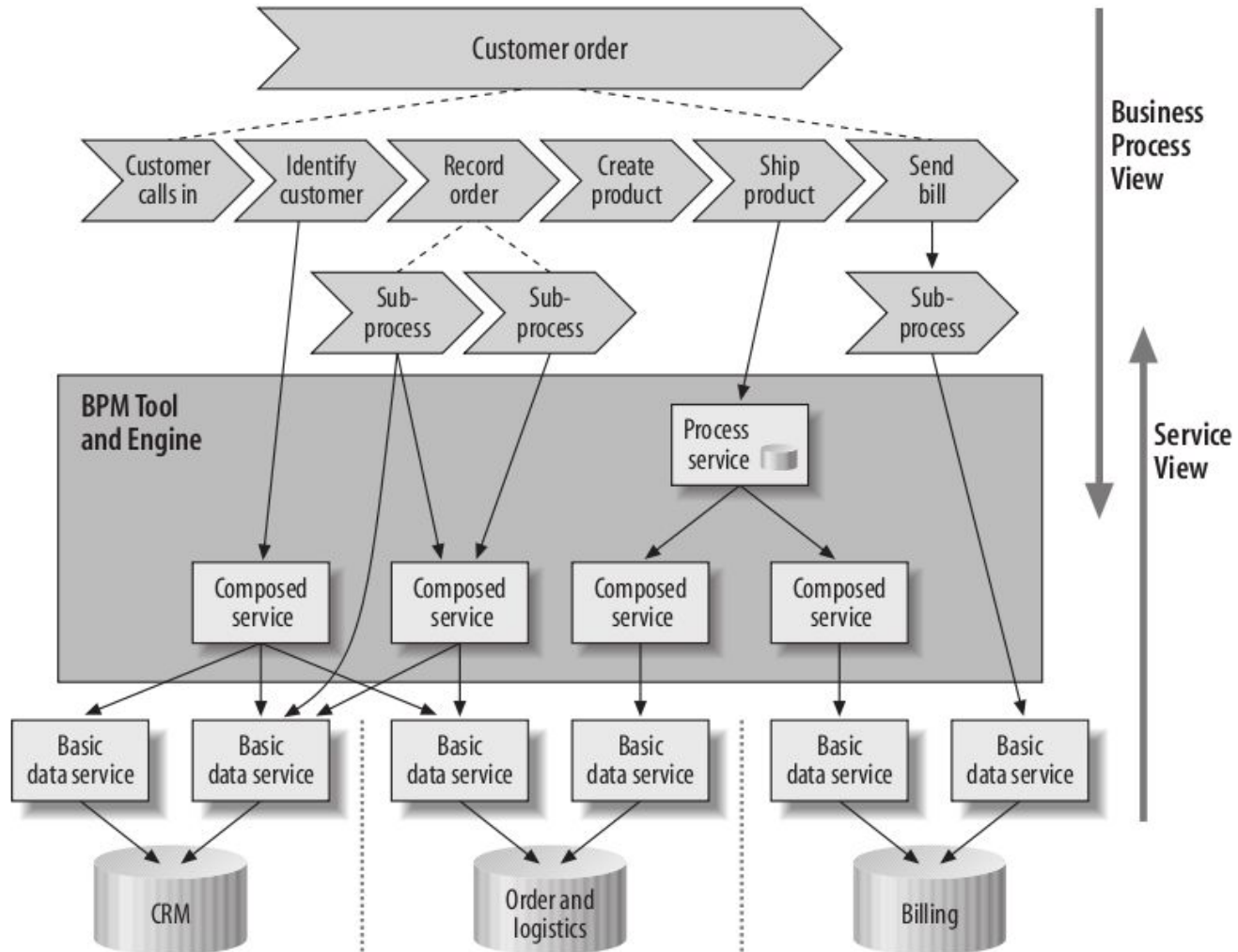
- BPM stands between IT and business
 - **BPM** reflects business needs
 - **BPM** orchestrates IT services
 - **SOA** is about these services



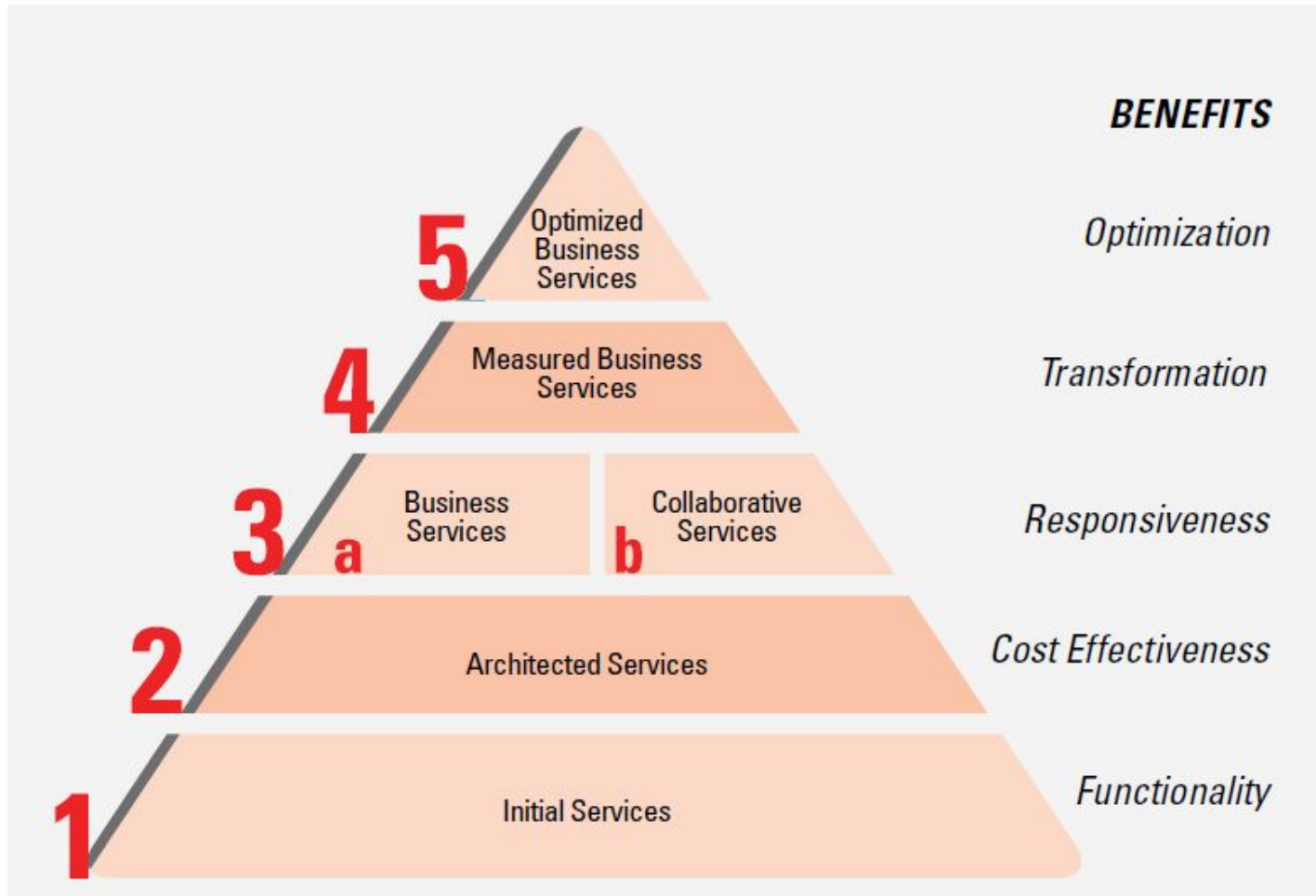
SOA Architecture



BPM and SOA Relationship



SOA – Maturity Model

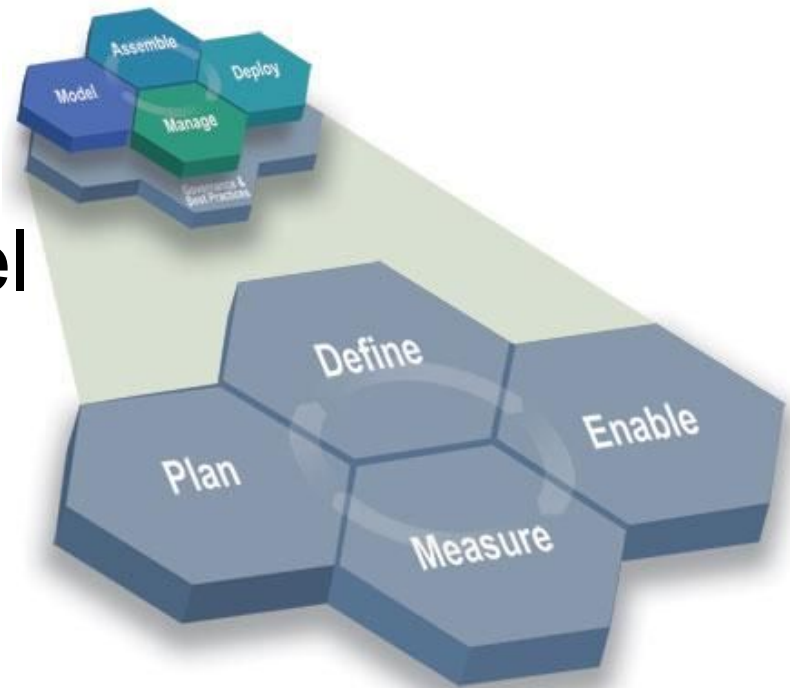


SOA Maturity Model – Dimension Matrix

	1: Ad-hoc	2: Standardised	3: Managed	4: Measured	5: Agile
People	<ul style="list-style-type: none"> No SOA team Little or no knowledge of SOA 	<ul style="list-style-type: none"> SOA Arch team Basic roles & resp. defined 	<ul style="list-style-type: none"> SOA training and certification plan Roles and resp. defined and practiced 	<ul style="list-style-type: none"> Incentives provided based on reuse KM 	<ul style="list-style-type: none"> Creating new business processes by orchestrating underlying services
Process	<ul style="list-style-type: none"> Service life cycle not defined 	<ul style="list-style-type: none"> Service life cycle defined Best practices defined for process, data & services 	<ul style="list-style-type: none"> Process, data & Service modelling Service evangelisation for re-use 	<ul style="list-style-type: none"> Business activity monitored and measured for critical business processes. 	<ul style="list-style-type: none"> Event driven modelling Agile and optimized business processes
Architecture	<ul style="list-style-type: none"> No SOA Reference Architecture No standards/best practices 	<ul style="list-style-type: none"> Initial SOA Reference Architecture with little control Tools selected 	<ul style="list-style-type: none"> Reference Architecture compliant SOA Business, information, application & tech. architectures aligned 	<ul style="list-style-type: none"> Activity and event monitoring infrastructure 	<ul style="list-style-type: none"> Dynamic / configurable SOA infrastructure Event driven technology
Governance	<ul style="list-style-type: none"> No sponsor for SOA strategy No service ownership 	<ul style="list-style-type: none"> SOA is sponsored by top mgmt Arch team tries to manage services 	<ul style="list-style-type: none"> Governance defined Communication plan exists 	<ul style="list-style-type: none"> Metrics & measures implemented Incentive for consumer and provider 	<ul style="list-style-type: none"> Metrics tracked and optimised Federated governance in place
Services	<ul style="list-style-type: none"> No services 	<ul style="list-style-type: none"> Services available Service management introduced 	<ul style="list-style-type: none"> Service management in place Service chargeback defined 	<ul style="list-style-type: none"> Service prioritization, metering implemented Measure and improve service lifecycle 	<ul style="list-style-type: none"> Service virtualisation Dynamic service discovery
Engagement, Delivery & Operation	<ul style="list-style-type: none"> Concept of service operation does not exist 	<ul style="list-style-type: none"> Service delivery engagement defined Estimation model 	<ul style="list-style-type: none"> Services operation process in place Apply lean 6 sigma 	<ul style="list-style-type: none"> Metrics based development, deployment model Benchmark service performance 	<ul style="list-style-type: none"> Integrated service delivery and operation

SOA Governance

- Service definition
- Service deployment life cycle
- Service versioning
- Service migration
- Service registries
- Service message model
- Service monitoring
- Service ownership
- Service testing
- Service security

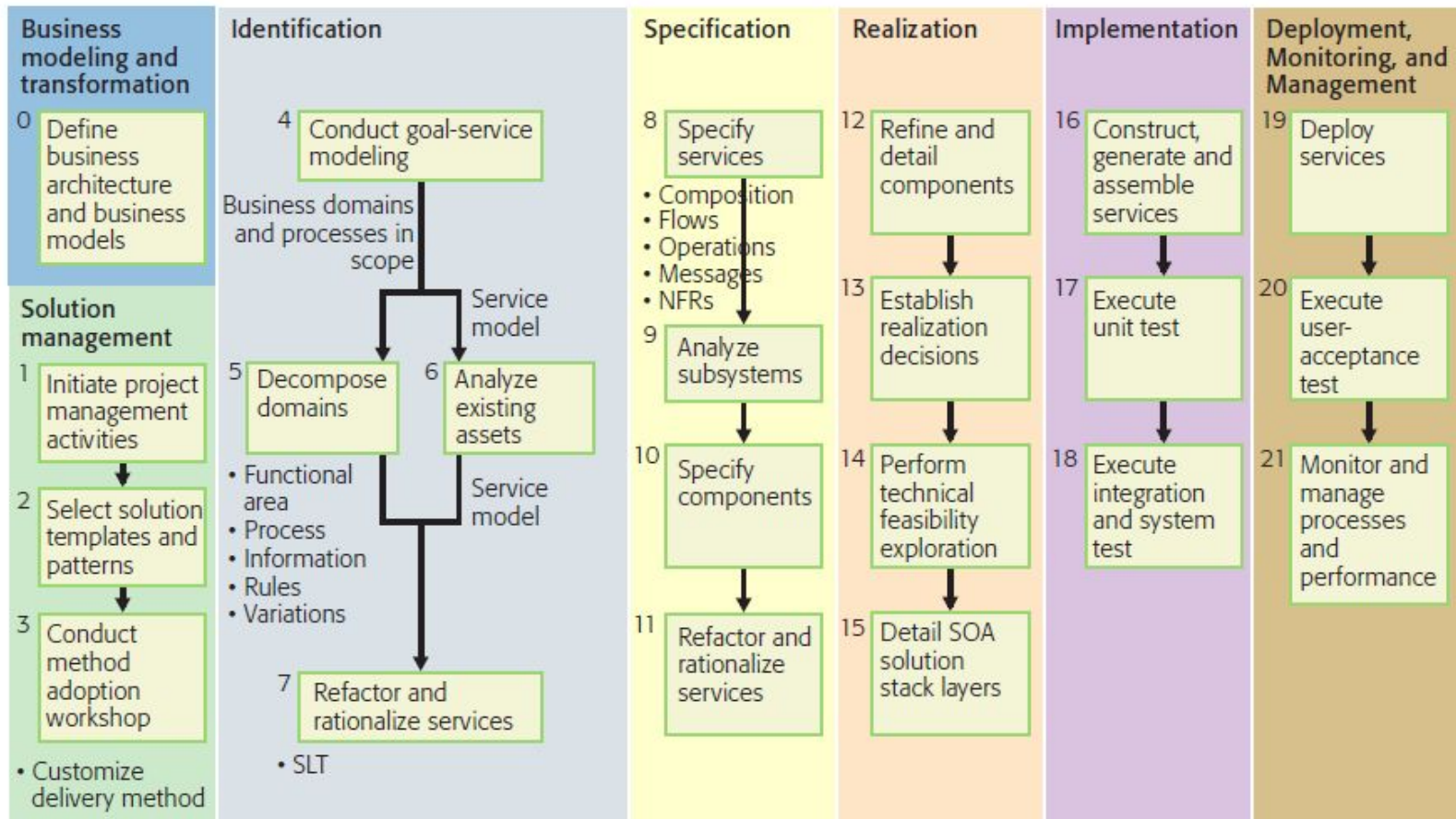


SOA – Methodologies

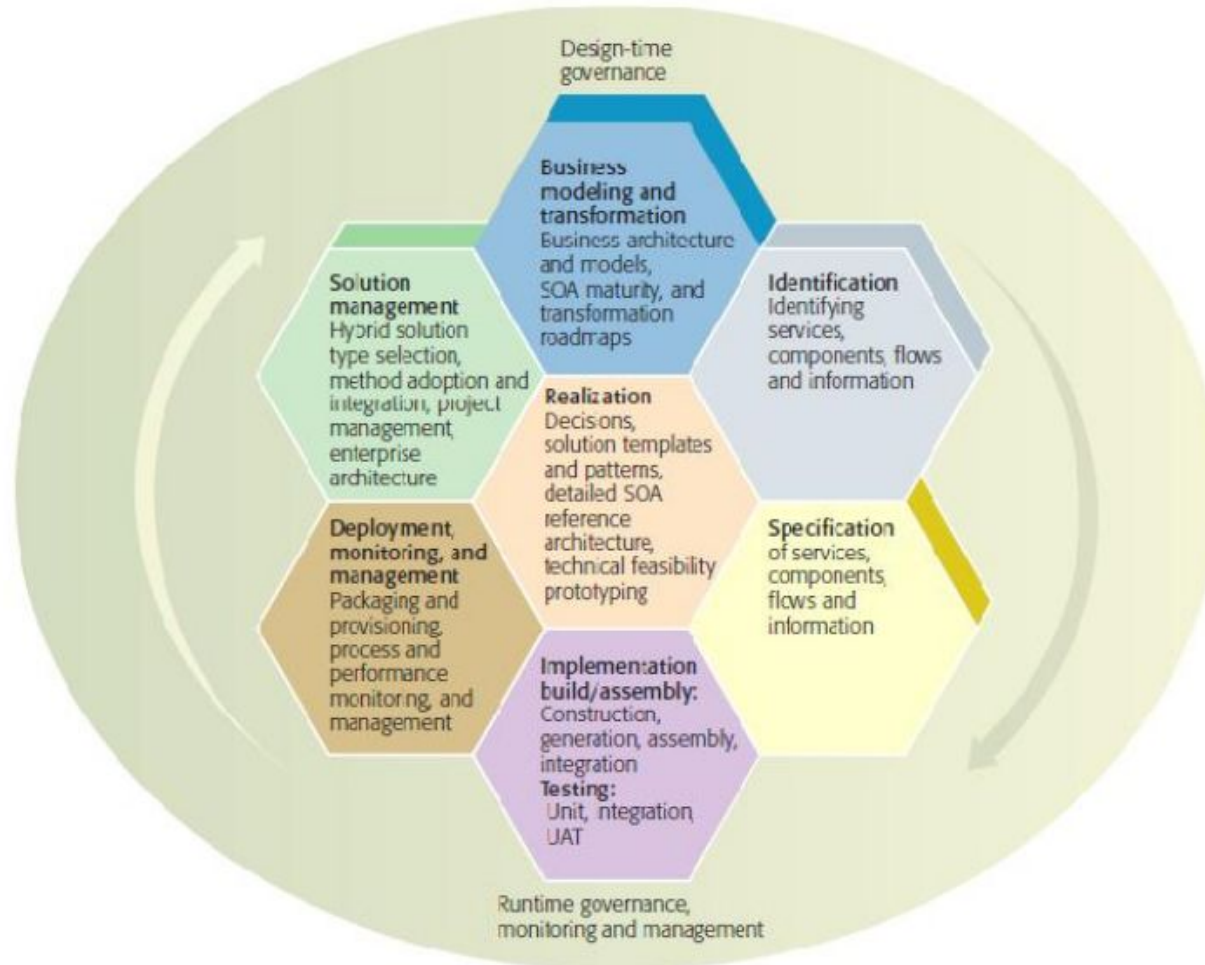
- SOA methodologies
 - IBM SOAD (Proprietary)
 - IBM SOMA (Proprietary)
 - SOA RQ (Proprietary)
 - CBDI-SAE
 - SOAF
- SOMA
 - Service-oriented modeling and architecture

--Ali Arsanjani, Chief Architect,
SOA and Web services Center of Excellence,
IBM, Software Group

SOMA – Life-cycle flow



SOMA - Phases



Questions?
Break 10mins

Teambuilding

- Teams of 4 people
- Roles in the team
 - Teamleader
 - Business analyst
 - Process analyst
 - BPM/SOA developer
- Collective responsibility
 - Your success/fail in the course depends on success/fail of your team!!
- Good mix of skills is required
- Organise your work according to your needs

Team roles

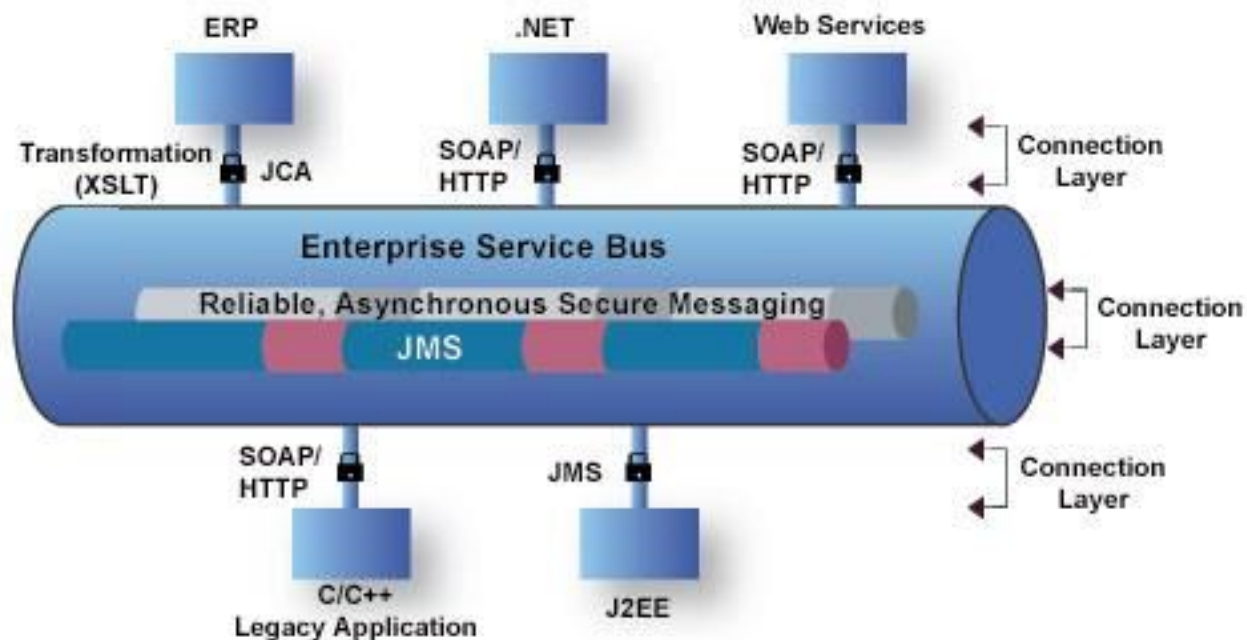
- **Team Leader**
 - Management - organising the teamwork (1 person)
 - Communication with lecturers and tutors
 - Coaching
 - Skills:
 - Soft-skills, authority, responsibility
- **Business analyst**
 - "Expert" in domain you are going to analyse
 - Accuracy in writing analytical documents
 - Understanding of basics of strategic planning and business analysis
 - Skills:
 - Accuracy, responsibility, domain knowledge

Team roles

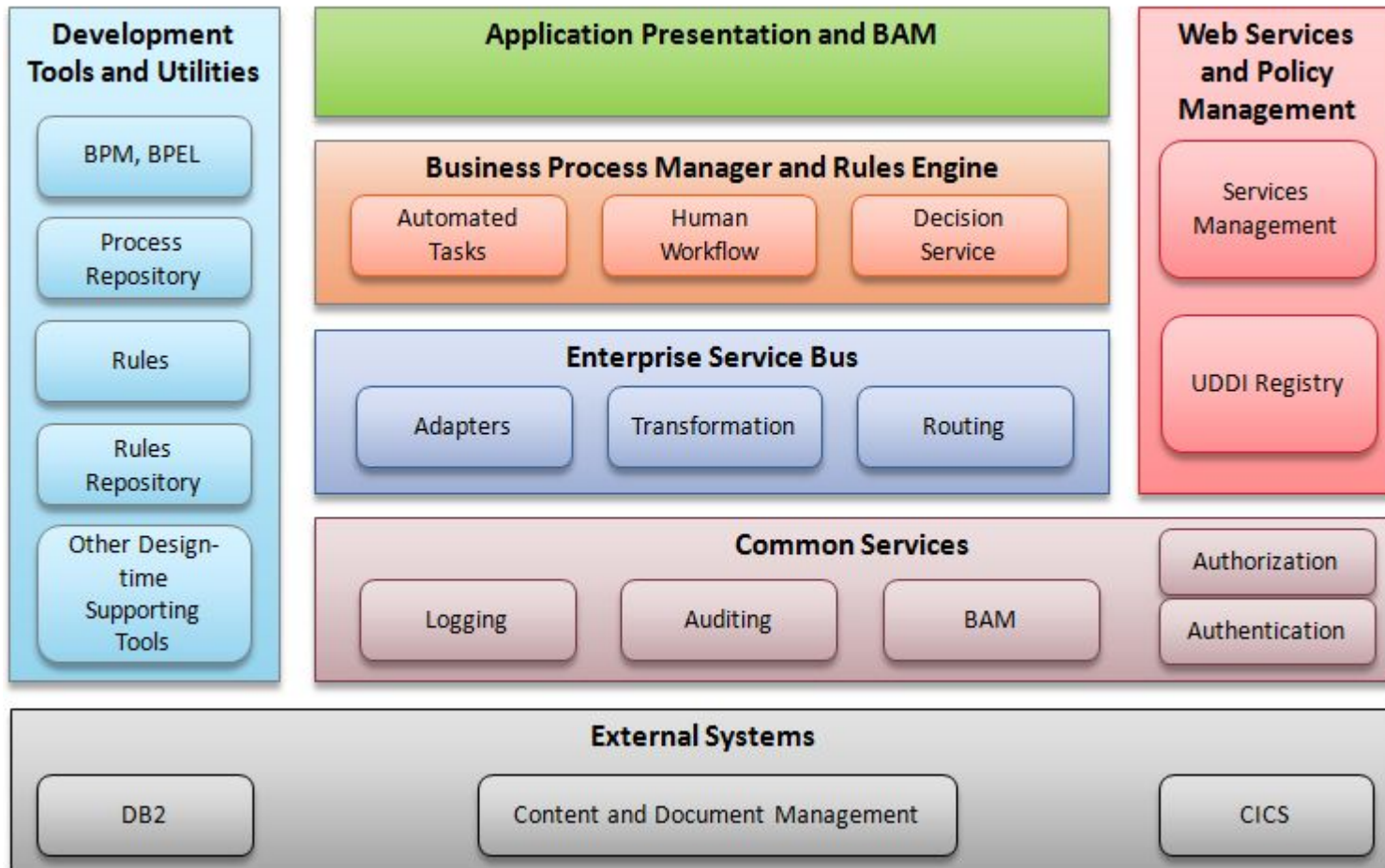
- **Process analyst**
 - Good knowledge of process modeling and BPMN
 - Good understanding of the domain
 - Skills:
 - Accurate, communicative, solution oriented
- **BPM/SOA developer**
 - Good understanding of process modeling
 - Technical skills
 - Chosen BPMS
 - Web services
 - Java/.NET programming
 - Required skills:
 - Patience, accuracy, technically skilled

SOA in practice: ESB – Enterprise Service Bus

- Message routing
- Protocol conversion
- Security, reliability



SOA in practice: ESB – Enterprise Service Bus



3 meanings of word "service"

- "Business" service
 - Restaurant owner can register his restaurant to Google database and be shown in Google Maps
 - Defined by contract / service offering
- "Technical" service
 - Users can search for their favourite restaurant in Google Maps
 - User interface for "Human task"
- **Web Service**
 - Google provide Web Service API for retrieving location of certain address
 - WSDL interface definition
 - Request - response model

Web Service

- Service for message transport and remote procedure calls
- Messages are transported in XML format
- Transport protocol is HTTP/HTTPS (mostly)
- Web service define:
 - Operations (method) a and their parameters
 - Return types

WSDL

- WSDL (Web Service Description Language)
 - Describes basic interface of the service
 - Methods
 - Parameters and their types
 - Return values
 - Specify **where** is WS available
 - Protocol (HTTP/HTTPS/SMTP)
 - Port (:1666)
 - machine (kore.muni.cz)
 - URL (<http://kore.muni.cz:1666/My> Service)

WSDL example

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="PrvniSluzba"
  targetNamespace="urn:mojeURI"
  xmlns:tns="urn:mojeURI"
  xmlns:SOAP-ENV="http://schemas.xmlsoap.
  org/soap/envelope/"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.
  org/soap/encoding/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:ns1="urn:mojeURI"
  xmlns:SOAP="http://schemas.xmlsoap.org/wsdl/soap/"
  xmlns:WSDL="http://schemas.xmlsoap.org/wsdl/"
  xmlns="http://schemas.xmlsoap.org/wsdl/">
```

```
<!-- definice typů -->
```

```
<types>
  <schema targetNamespace="urn:mojeURI"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns="http://www.w3.org/2001/XMLSchema"
    elementFormDefault="unqualified"
    attributeFormDefault="unqualified">
    <element name="cislo" type="xsd:long"/>
    <element name="vysledek" type="xsd:boolean"/>
  </schema>
</types>
```

```
<!-- komunikační zprávy -->
```

```
<message name="jePrvocisloRequest">
  <part name="cislo" element="ns1:cislo"/>
</message>
<message name="jePrvocisloResponse">
  <part name="vysledek" element="ns1:vysledek"/>
</message>
```

```
<!-- dostupné operace -->
<portType name="Cisilka">
  <operation name="jePrvocislo">
    <documentation>Operace jePrvocislo()</documentation>
    <input message="tns:jePrvocisloRequest"/>
    <output message="tns:jePrvocisloResponse"/>
  </operation>
</portType>
```

```
<!-- volatelné přes HTTP -->
```

```
<binding name="PrvniSluzba" type="tns:Cisilka">
  <SOAP:binding style="rpc" transport="http://schemas.xmlsoap.
  org/soap/http"/>
  <operation name="jePrvocislo">
    <SOAP:operation style="rpc" soapAction=""/>
    <input>
      <SOAP:body use="literal" namespace="urn:mojeURI"/>
    </input>
    <output>
      <SOAP:body use="literal" namespace="urn:mojeURI"/>
    </output>
  </operation>
</binding>
```

```
<!-- adresy komunikačních bodů -->
```

```
<service name="PrvniSluzba">
  <documentation>Sluzba pocitajici
  prvocisla</documentation>
  <port name="PrvniSluzba" binding="tns:PrvniSluzba">
    <SOAP:address location="http://localhost:10000"/>
  </port>
</service>
</definitions>
```

SOAP

- Protocol for **transfer of XML messages**
- Used for **communication between service and its consumer** (client)
- Common use of HTTP/HTTPS as a transport protocol
- Request – Response communication model

SOAP example

POST / HTTP/1.1

Content-Type: text/xml; charset=utf-8

Content-Length: 423

Connection: close

SOAPAction: ""

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<env:Envelope
```

```
  xmlns:env="http://schemas.xmlsoap.org/soap/envelope/" xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi=""
```

```
<env:Header/>
```

```
<env:Body>
```

```
<jePrvocislo xmlns="urn:mojeURI">
  <cislo xsi:type="xsd:long">1987</cislo>
```

```
</jePrvocislo>
```

```
</env:Body>
```

```
</env:Envelope>
```

HTTP/1.1 200 OK

Content-Type: text/xml; charset=utf-8

Content-Length: 468

Connection: close

```
<?xml version="1.0" encoding="UTF-8"?>
```

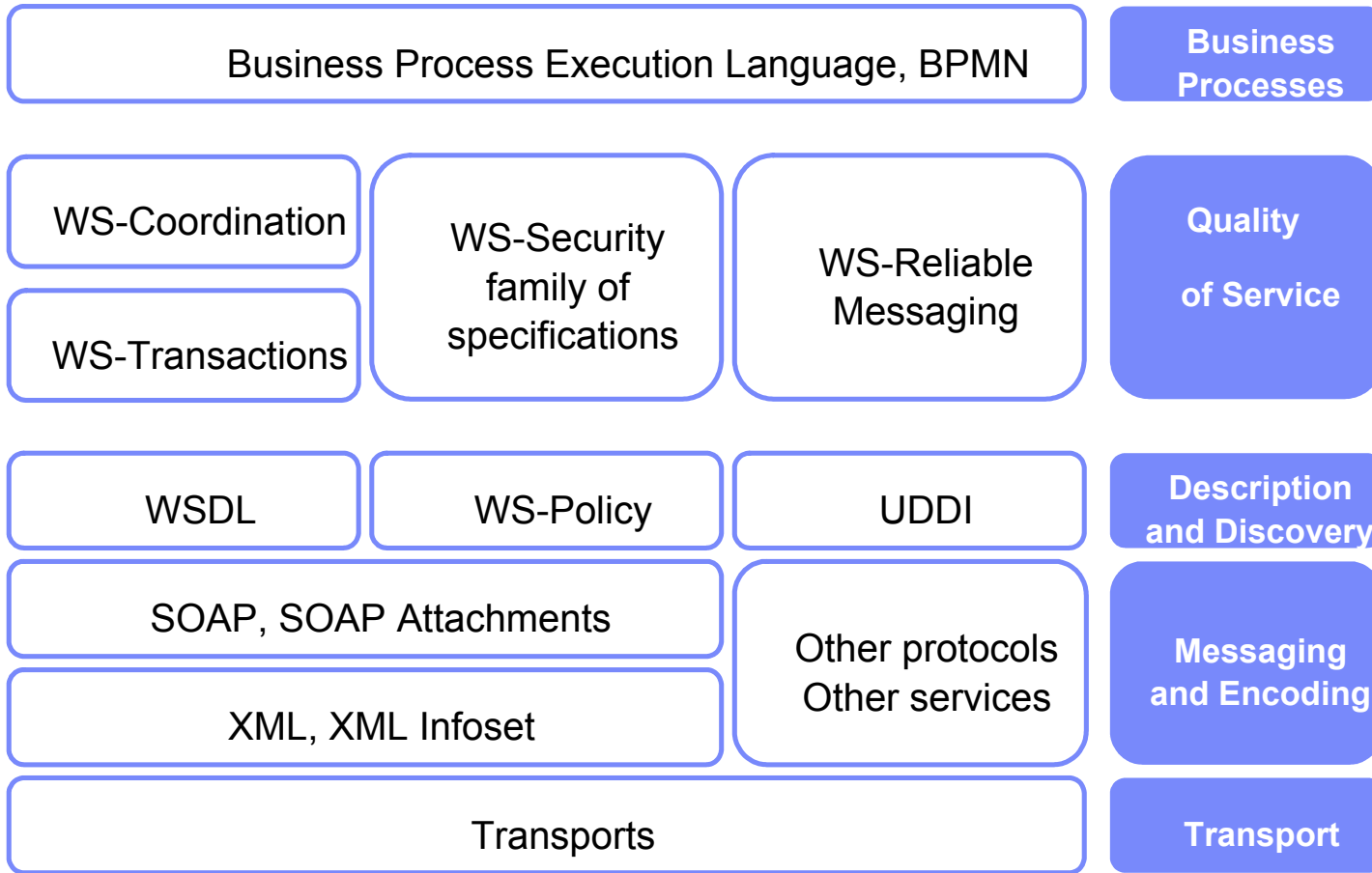
```
<env:Envelope
```

```
  xmlns:env="http://schemas.xmlsoap.org/soap/envelope/" xmlns:xsi=""
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
```

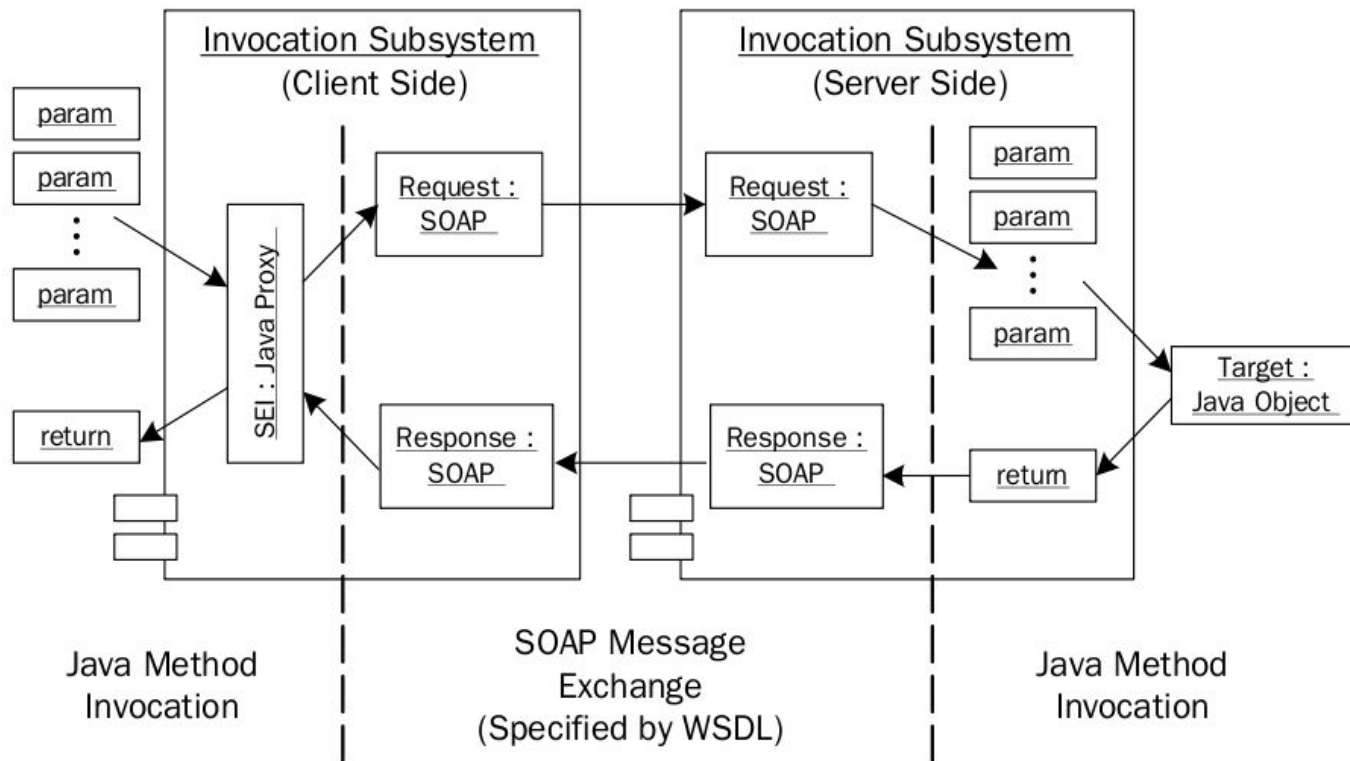
```
<env:Body>
```

```
<jePrvocisloResponse xmlns="urn:mojeURI">
  <vysledek xsi:type="xsd:boolean"
>true</vysledek>
</jePrvocisloResponse>
</env:Body>
</env:Envelope>
```

WS - Standards

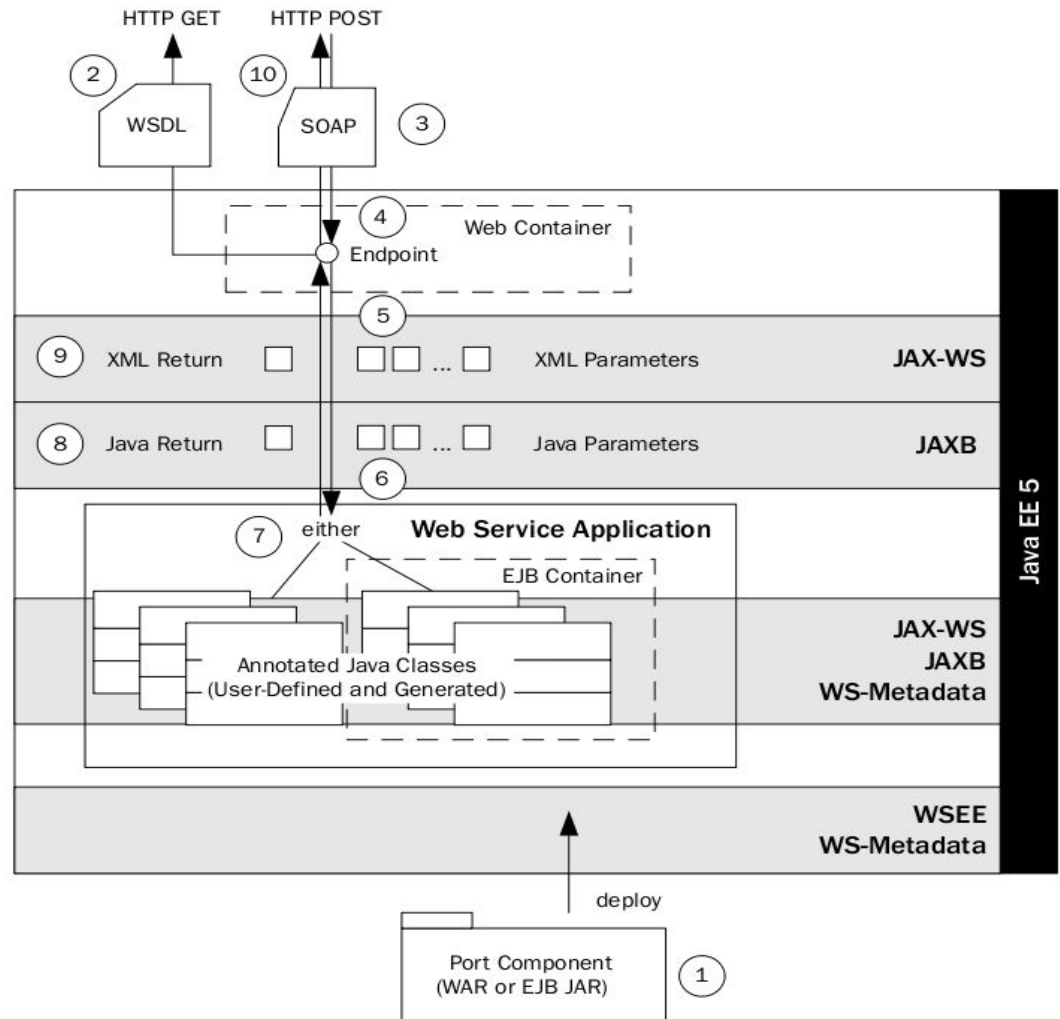


Web Services in Java



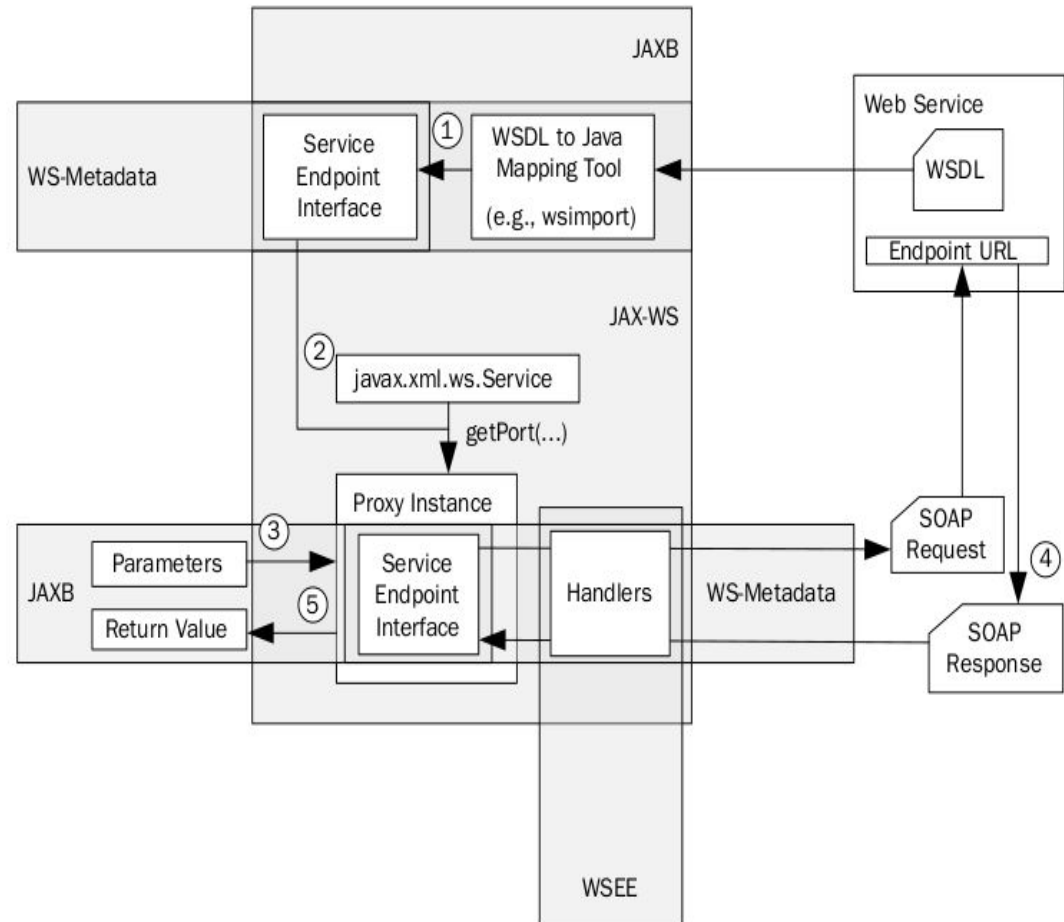
WS in Java - Server

- JAX-WS
- JAXB
- WS-Metadata
- REST



WS in Java - Client

- JAX-WS
- JAXB
- WS-Metadata
- REST



RESTful Web Service

- Representational State Transfer
 - Client-server
 - Stateless
 - Unified interface
 - Resource identification
- RESTful WS:
- HTTP/HTTPS
- POST, GET, PUT & DELETE
- XML, JSON, YAML
- WADL

WS Standards

- JAX-WS (JSR-224)
- JAX-RS (JSR-311)

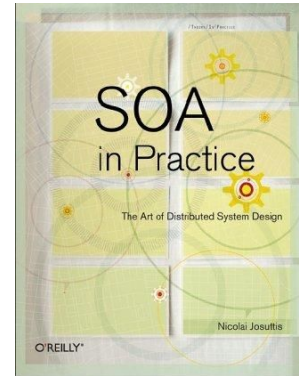
- Apache Axis, Axis2
- Apache CXF
- Jersey

Web Service tutorials

- Web Services
 - <http://netbeans.org/kb/docs/websvc/jax-ws.html>
- REST
 - <http://netbeans.org/kb/docs/websvc/rest.html>
- NetBeans Trail
 - <http://netbeans.org/kb/trails/web.html>

SOA - Information Resources

- SOA in Practice, Nicolai M. Josuttis, 2007, ISBN-13: 978-0596529550
- IBM Systems Journal, Volume 47, Number 3, 2008



FIN

Questions?

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