SOA & Web services

PV207 – Business Process Management
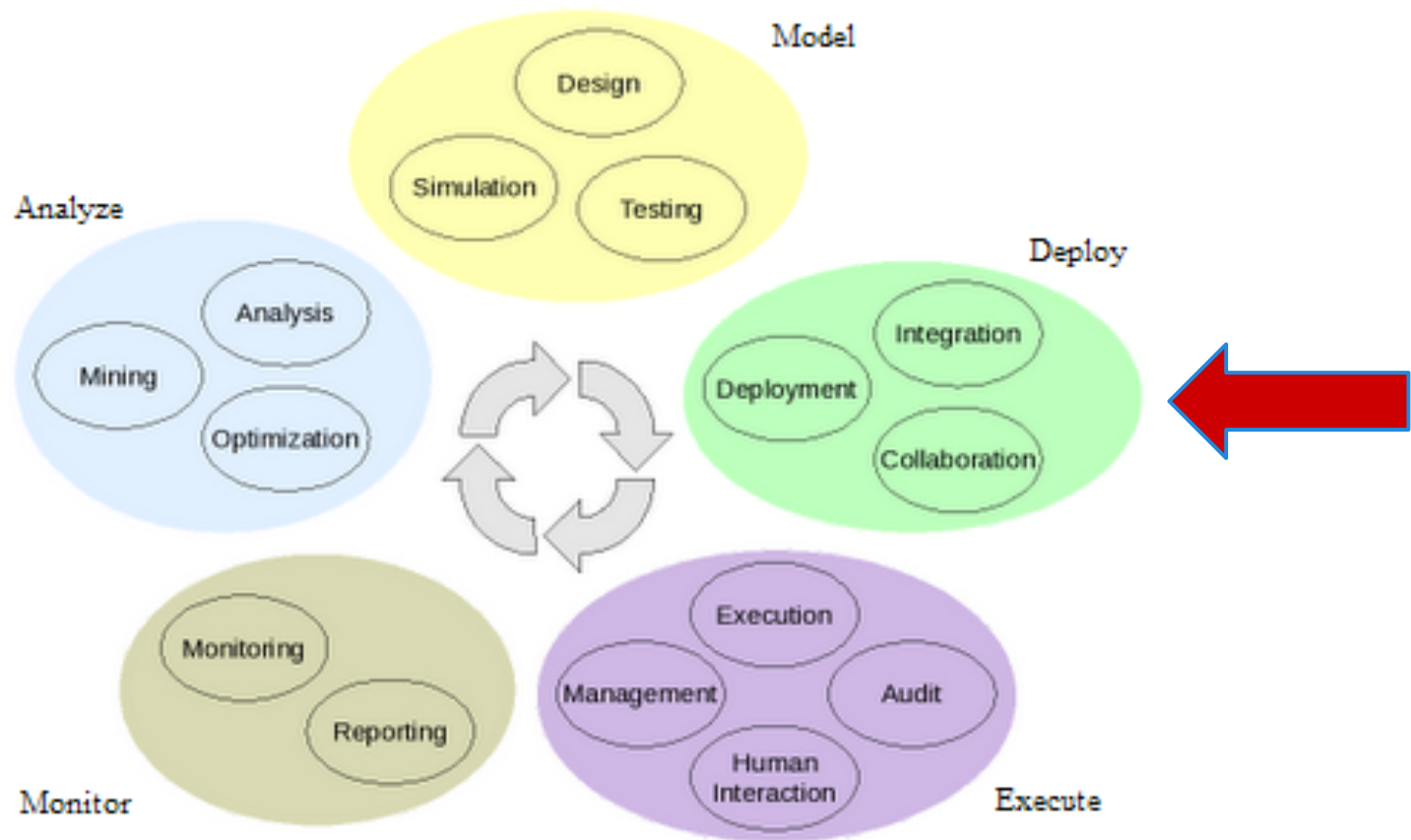
Spring 2012

Jiří Kolář

Last lecture summary

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

  - Process life-cycle

  - Phases of process based development

- BPMS

  - BPMS components
  - Architecture

  - Human Tasks
  - Business Rules
  - BAM

  - Existing BPMS

Recap: BPM lifecycle

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 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
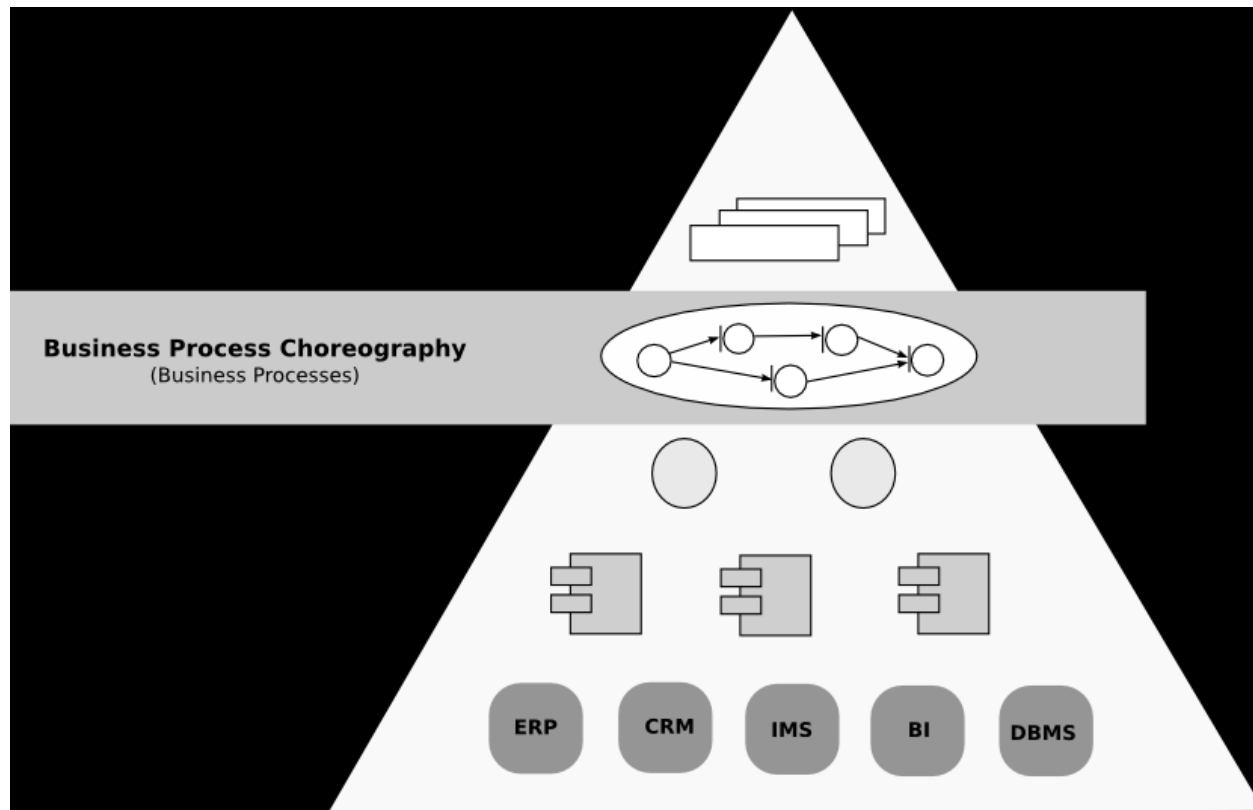 - Request - response model

Motivation

Figure 1: The elements of IT-business alignment
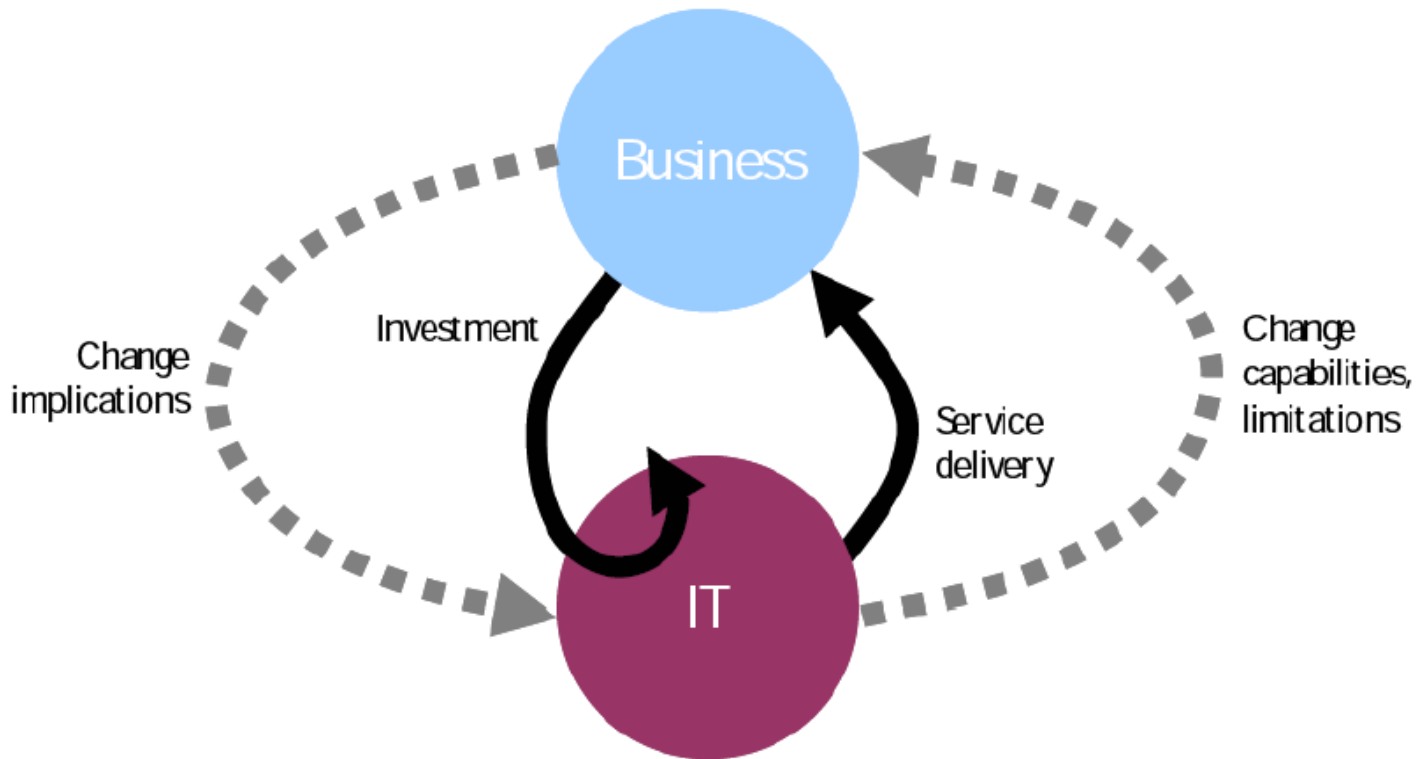
There are three important elements in IT-business alignment: investment, service delivery, and collaboration in change management.

Macehiter Ward-Dutton

Role of BPM in IT Management

- Business requests defined from top level
- Use of IT services from bottom level

# BPM and SOA Relationship

SOA in Practice, , Nicolai M. Josuttis
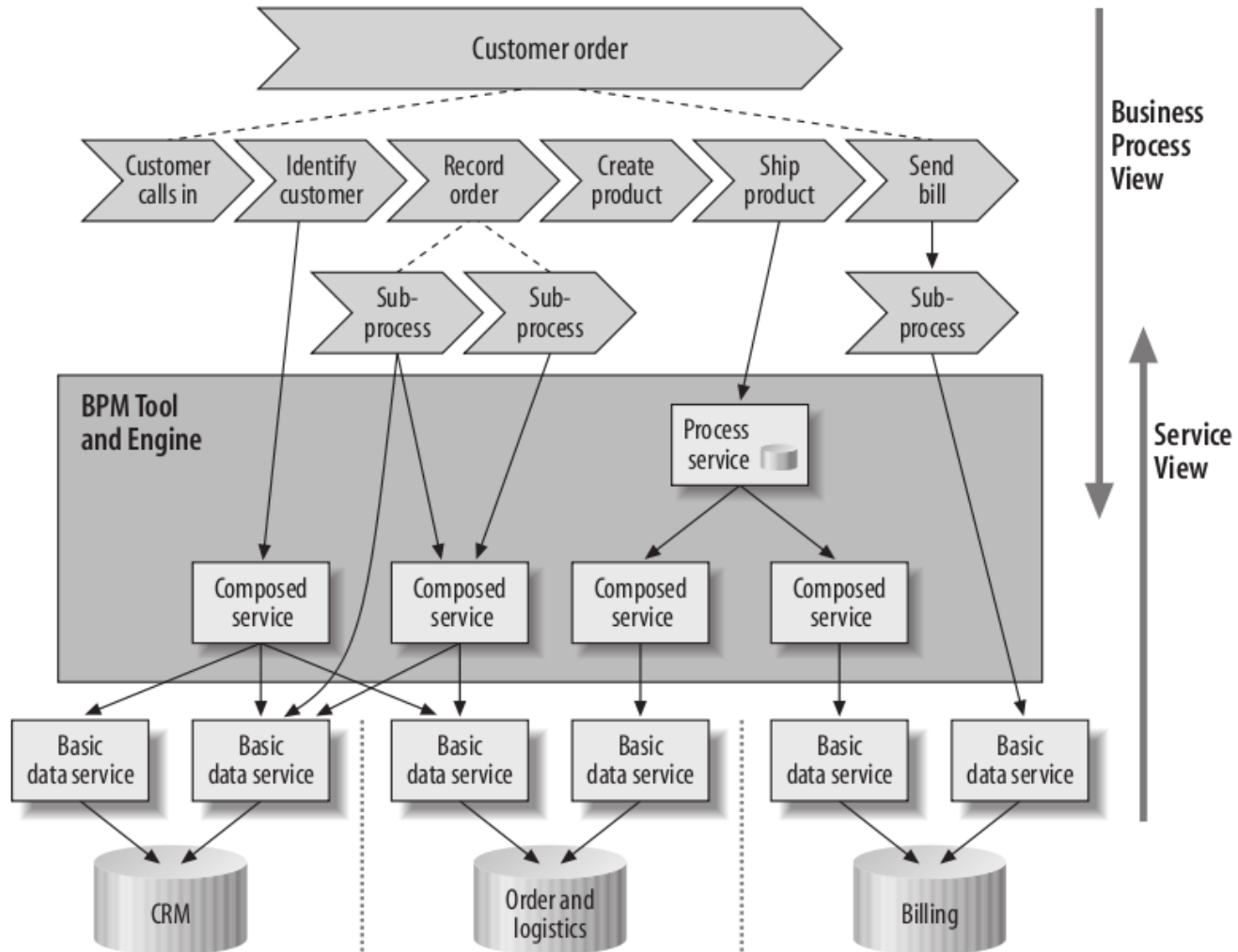
SOA Concept

- **Reduction of costs** on development and integration
- Simpler **maintenance and integration**
- Component/service **reusability**
- Integration of **Legacy applications**
- Simplification of IS management
- **Just-in-time management** (real time business)

SOA Architecture

- Process layer

- Service layer

- Application layer

- Technological layer
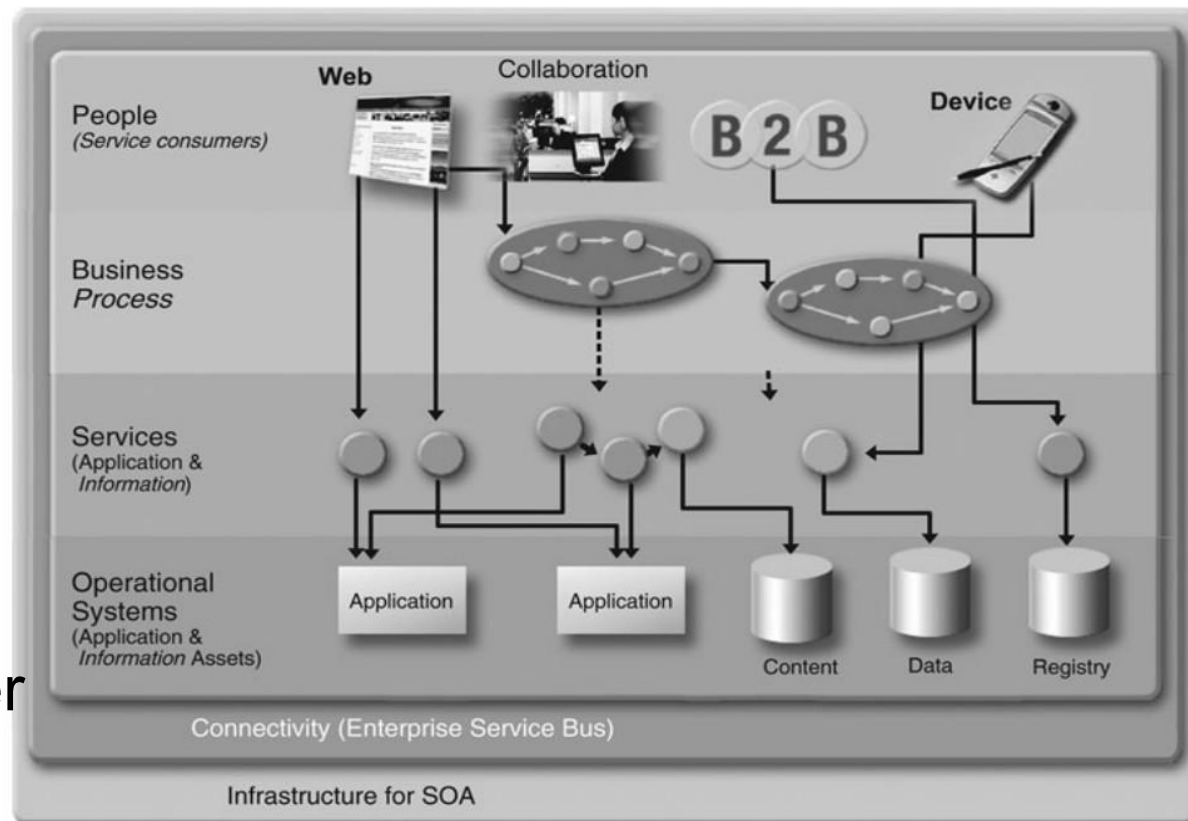
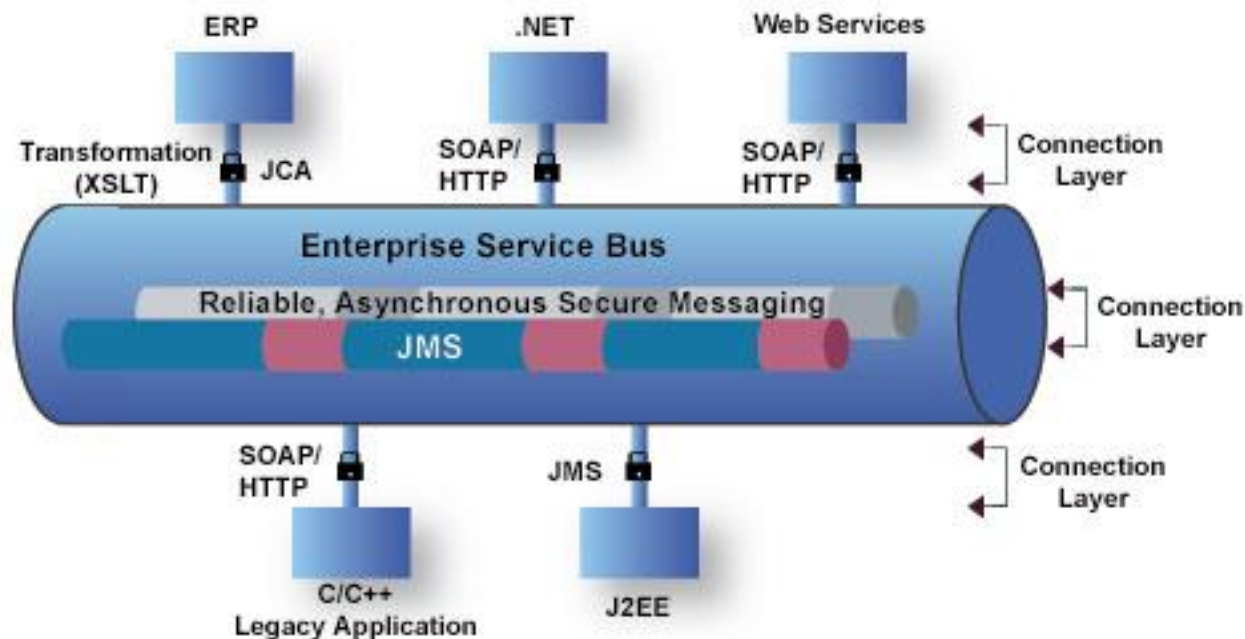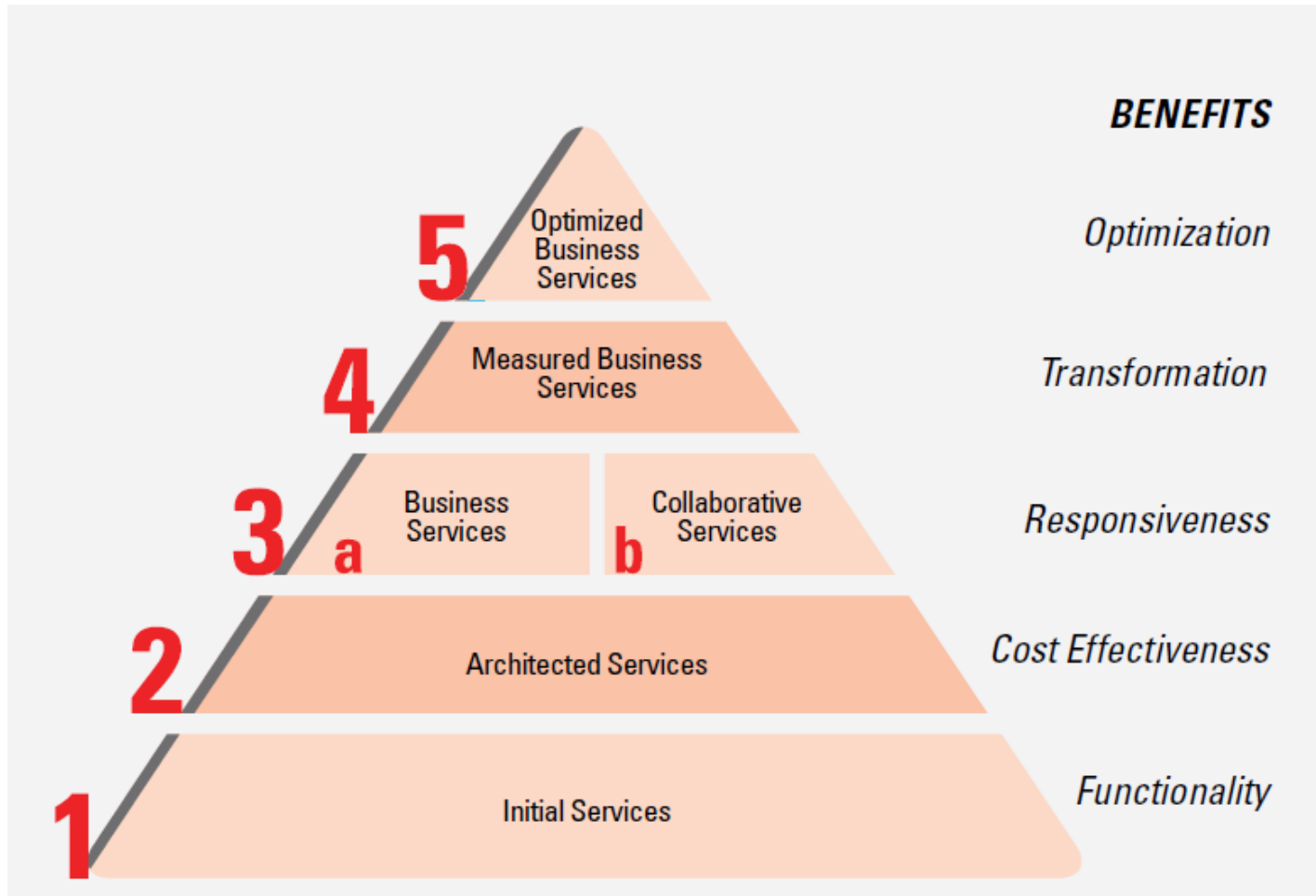Source: SOA Community of Practice, SOA Solution Stack Project

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

ESB – Enterprise Service Bus

- Message routing
- Unique message protocol conversion
- Orchestration of communication

http://wso2.com/products/enterprise-service-bus/

SOA – Maturity Model

Sonic Software Corporation, AmberPoint Inc., 2005

SOA Maturity Model – Dimension Matrix

	1: Ad-hoc	2: Standardised	3: Managed	4: Measured	5: Agile
People	• No SOA team • Little or no knowledge of SOA	• SOA Arch team • Basic roles & resp. defined	• SOA training and certification plan • Roles and resp. defined and practiced	• Incentives provided based on reuse • KM	• Creating new business processes by orchestrating underlying services
Process	• Service life cycle not defined	• Service life cycle defined • Best practices defined for process, data & services	• Process, data & Service modelling • Service evangelisation for re-use	• Business activity monitored and measured for critical business processes.	• Event driven modelling • Agile and optimized business processes
Architecture	• No SOA Reference Architecture • No standards/best practices	• Initial SOA Reference Architecture with little control • Tools selected	• Reference Architecture compliant SOA • Business, information, application & tech. architectures aligned	• Activity and event monitoring infrastructure	• Dynamic / configurable SOA infrastructure • Event driven technology
Governance	• No sponsor for SOA strategy • No service ownership	• SOA is sponsored by top mgmt • Arch team tries to manage services	• Governance defined • Communication plan exists	• Metrics & measures implemented • Incentive for consumer and provider	• Metrics tracked and optimised • Federated governance in place
Services	• No services	• Services available • Service management introduced	• Service management in place • Service chargeback defined	• Service prioritization, metering implemented • Measure and improve service lifecycle	• Service virtualisation • Dynamic service discovery
Engagement, Delivery & Operation	• Concept of service operation does not exist	• Service delivery engagement defined • Estimation model	• Services operation process in place • Apply lean 6 sigma	• Metrics based development, deployment model • Benchmark service performance	• 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
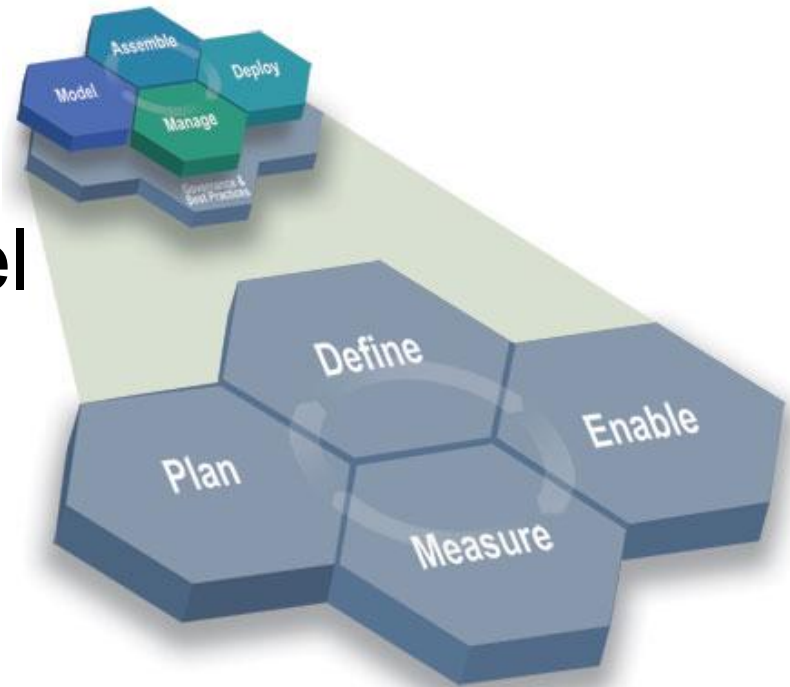
SOA – Methodologies

- ## 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 servicesCenter of Excellence,
    IBM, Software Group

SOMA - Phases
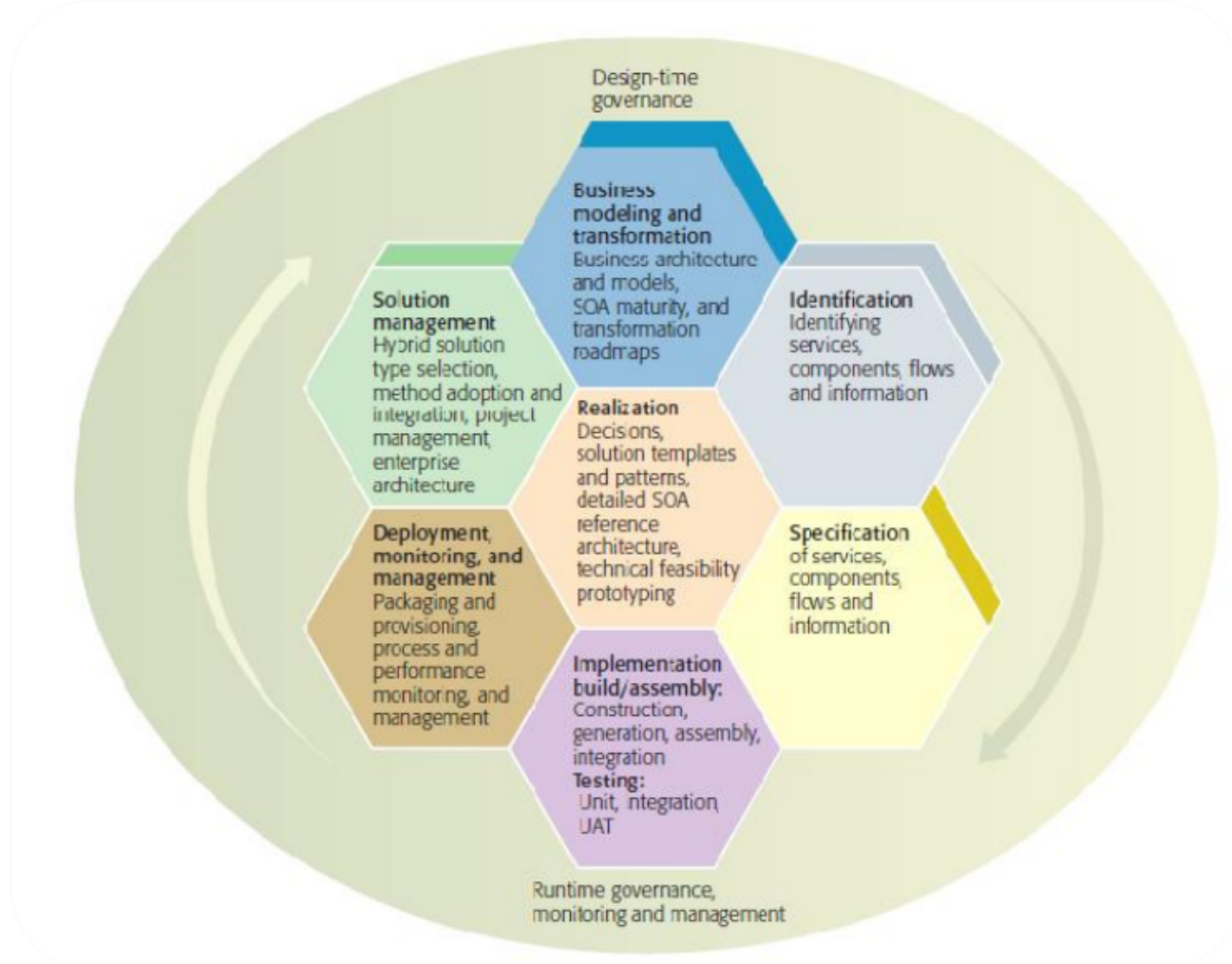
SOMA – Life-cycle flow

SOA Implementation

CEO & Board
Business Units
CIO
Architecture Boards
Projects
Data Center

Top-down

CEO & Board
Business Units
CIO
Architecture Boards
Projects
Data Center

Bottom-up

Sandy Carter, The New Language of Business SOA & Web 2.0, 2007
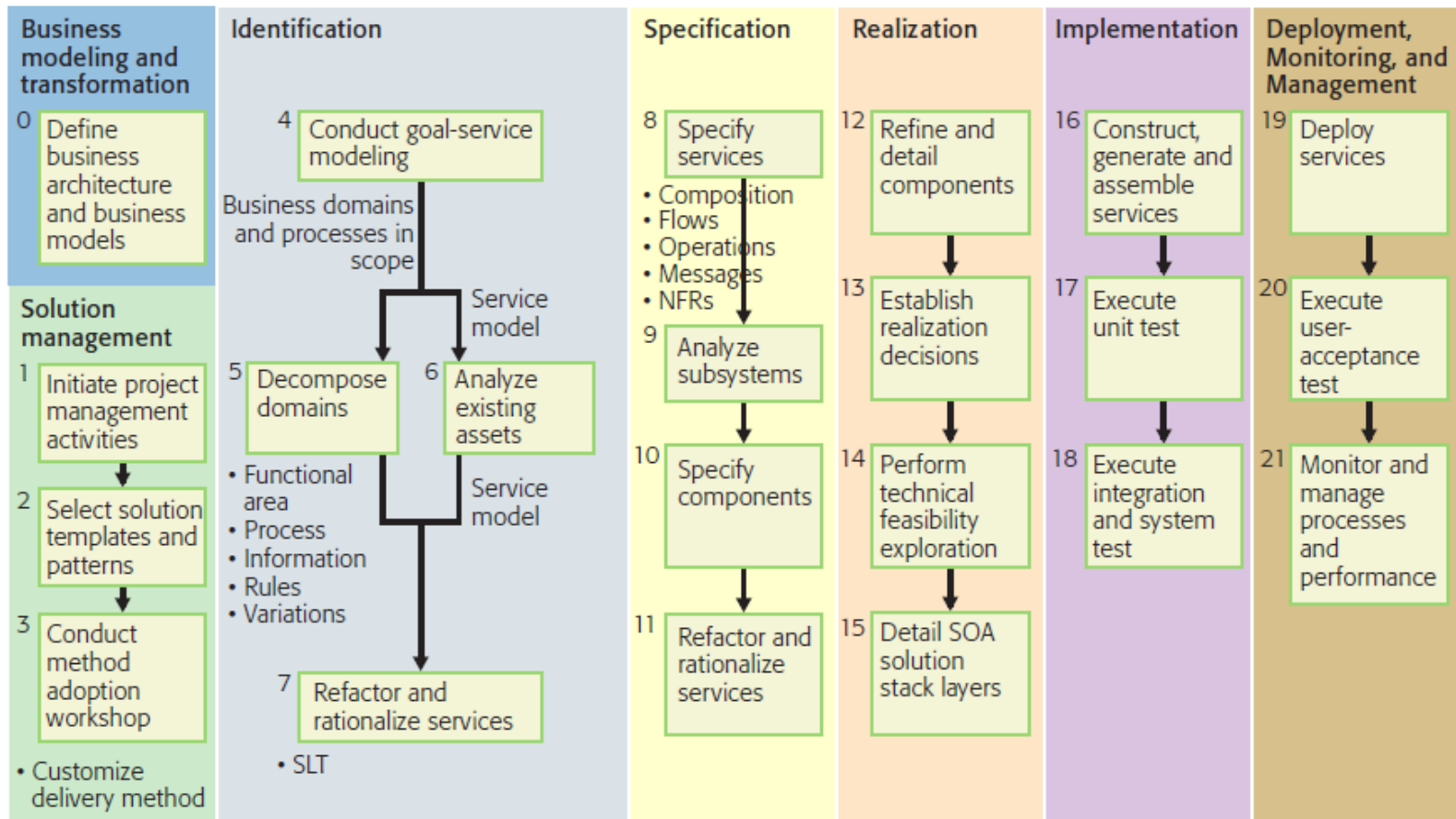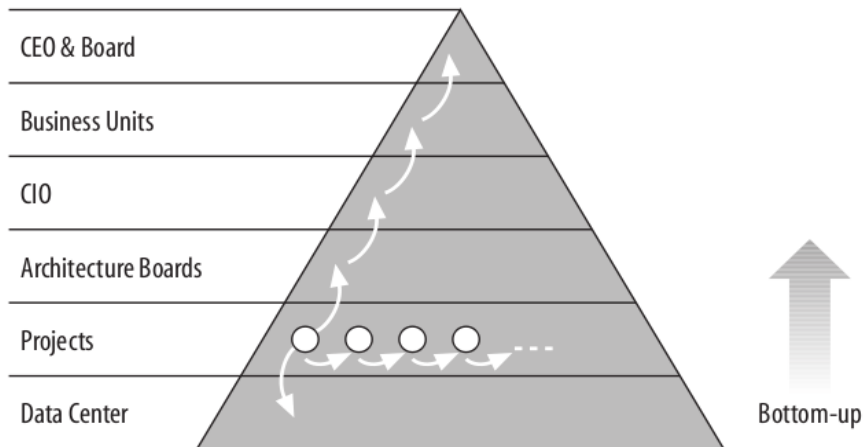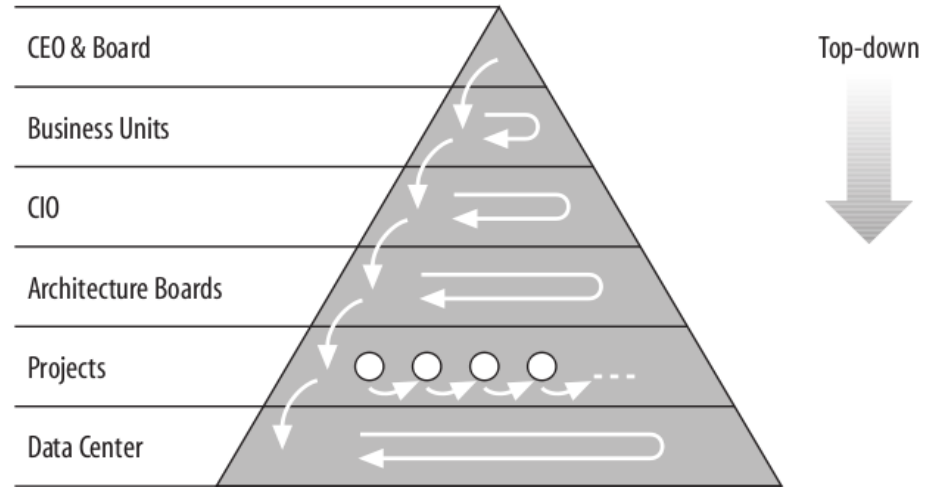
SOA Recapitulation

- BPM and SOA architecture **needs to has its reason in company business**
- Investment needs to return (**ROI**)
- Enterprise **environment analysis** and optimal SOA design is **crucial**
- SOA has **maturity levels**
- SOA implementation must correspond to company strategy
- SOA IT architecture represents restriction for BPM

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
  - Couching
  - 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 knowledge of process modeling style
  - 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

Web services part

- Web Services
  - What are WS?
  - Artifacts WS
    - WSDL
    - SOAP
  - WS - standards
- WS in Java
  - Client side
  - Server side
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Web Service

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Expected knowledge

- What is expected
  - Basic knowledge of XML
  - Basic knowledge of Java SE
  - Basic knowledge of Netbeans
- What is recommended for WS in Java
  - Knowledge of J2EE
  - Knowledge of application container in J2EE
  - XML processing in Java
    - (JAX-B Marshalling/Unmarshalling)

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
<?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)
- **HTTP/HTTPS** used as common transport protocol used
- Classic **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>
```
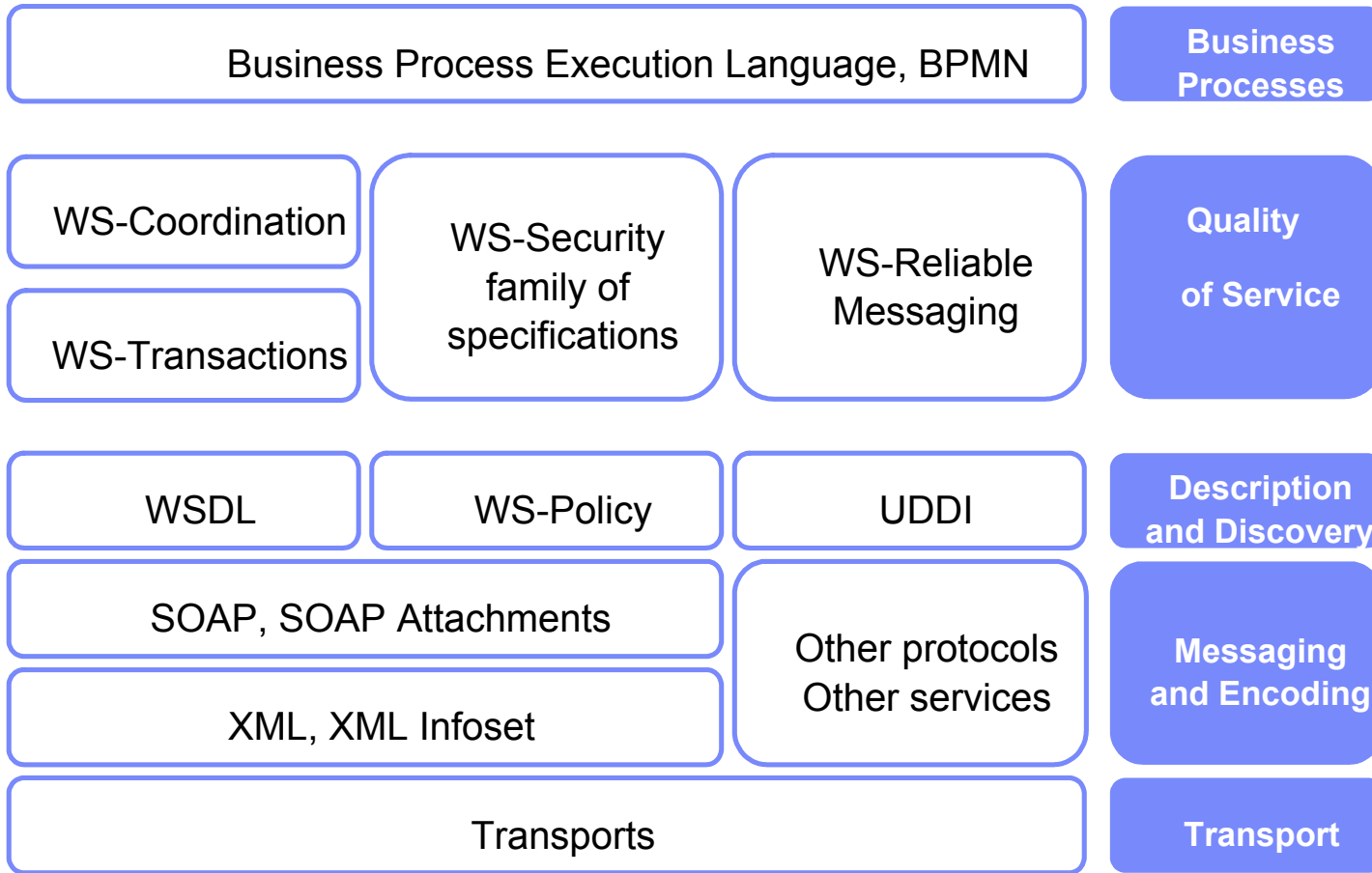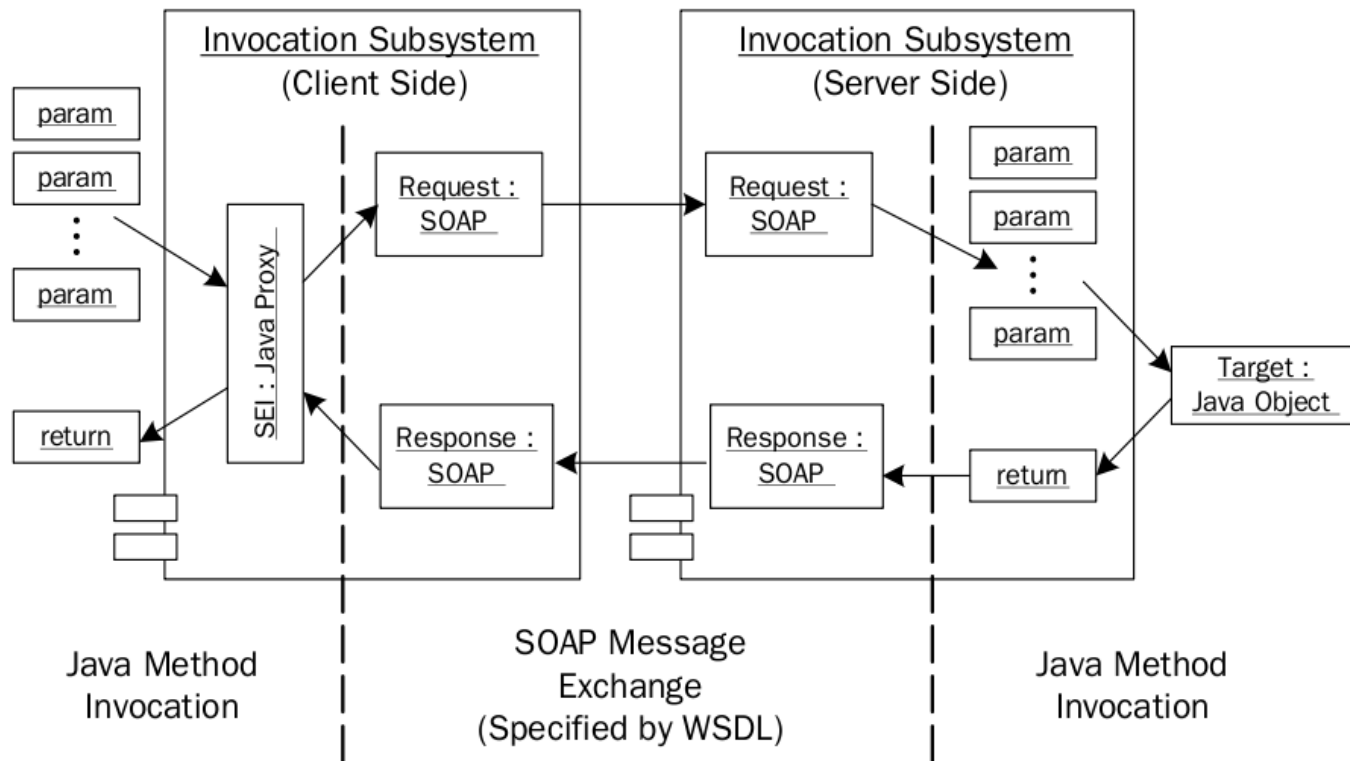
WS - Standards

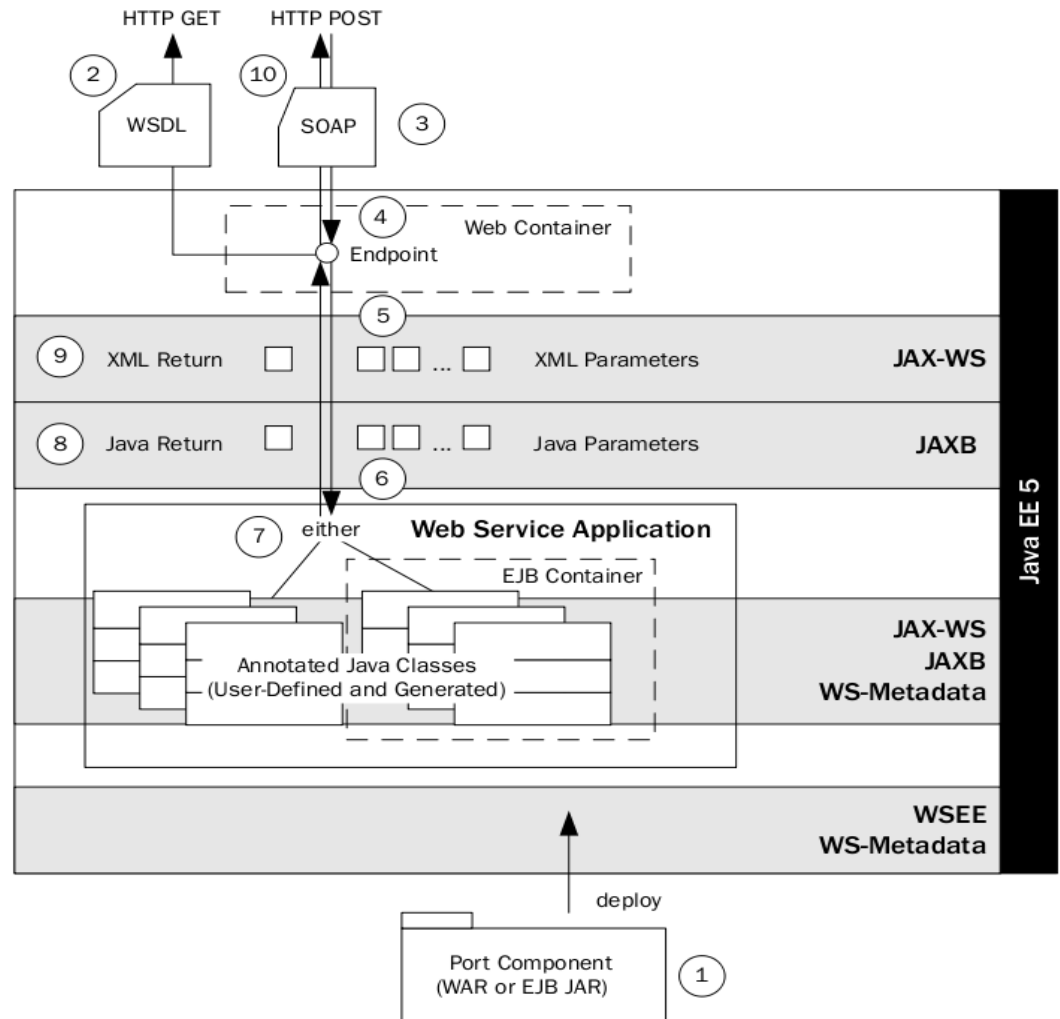|	
Business Process Execution Language, BPMN	**Business Processes**
WS-Coordination / WS-Transactions — WS-Security family of specifications — WS-Reliable Messaging	**Quality of Service**
WSDL — WS-Policy — UDDI	**Description and Discovery**
SOAP, SOAP Attachments / XML, XML Infoset — Other protocols Other services	**Messaging and Encoding**
Transports	**Transport**

Web Services in Java

WS in Java - Server

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

WS in Java - Client

- JAX-WS
- JAXB
- WS-Metadata
- REST
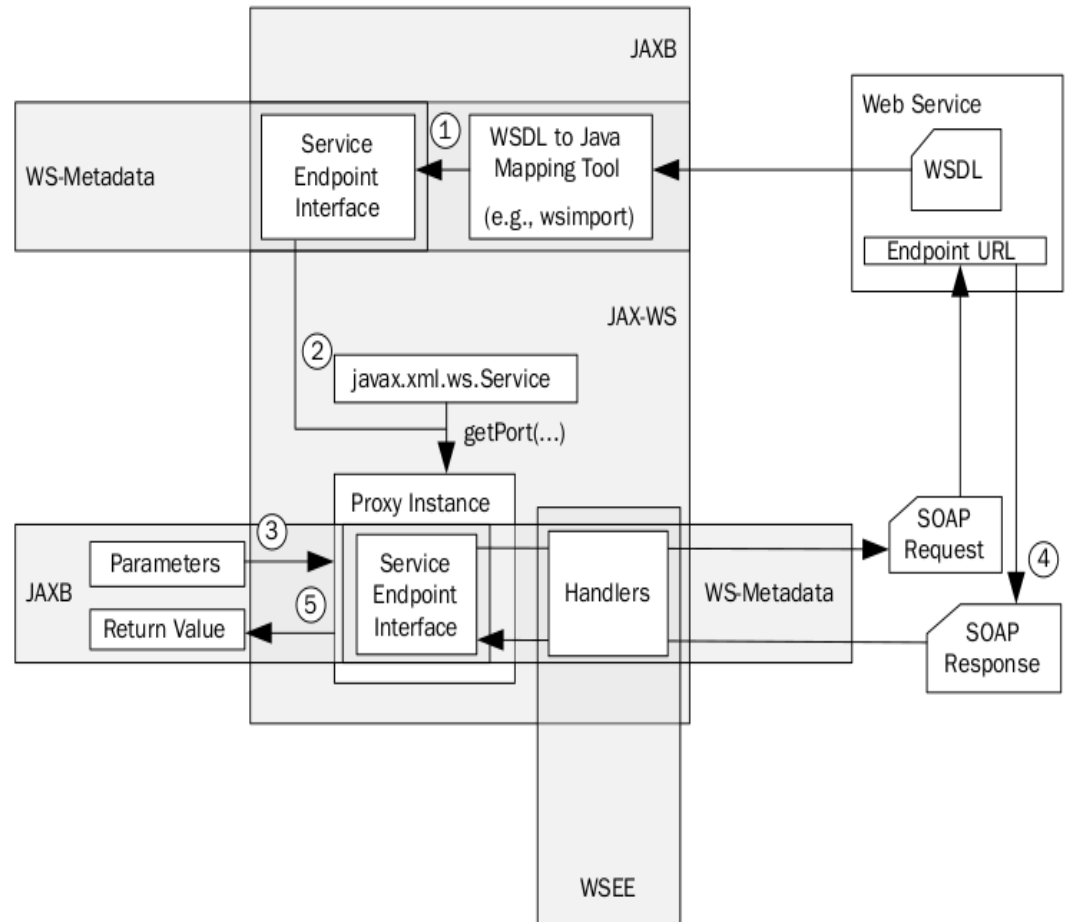
RESTful Web Service

- Representational State Transfer
  - Client-server
  - Stateless
  - Unified interface
  - Resource identification

- RESTful WS:
- HTTP/HTTPS
- POST, GET, PUT & DELETE
- XML, JSON, YAML
- WADL

Standards

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

- Apache Axis, Axis2
- Apache CXF
- Jersey

Web Services exercise

- ## 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
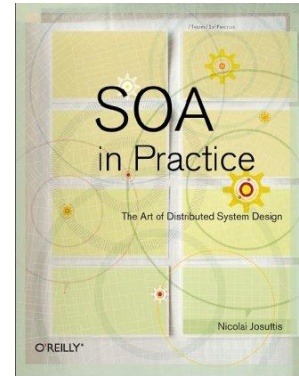
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Questions?

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