Developing Web Services in SAP Web Application Server 6.40

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Agenda

Web Service Overview

- What are Web services?
- Why do we need them?

SAP NetWeaver Web Service Technology

SAP Web Application Server 6.40

- Providing Web Services
- Consuming Web Services

Web Services Definition
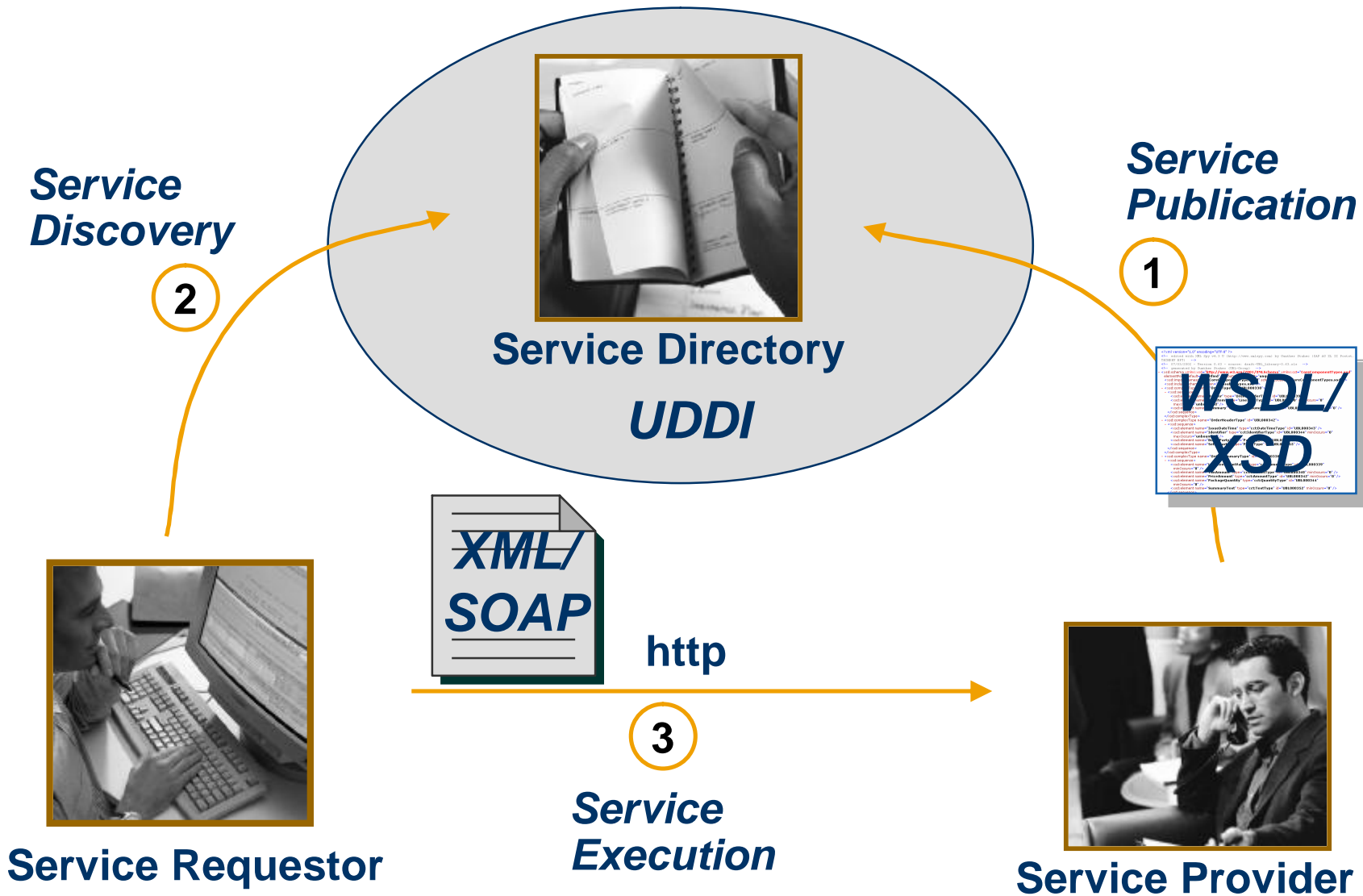
Web Services **are**

application functionalities

supporting *direct interaction*

by responding to *service requests*

based on open *Internet Standards*

SAP

Web Service Paradigm

Service Discovery

2

Service Directory

UDDI

Service Publication

1

WSDL/ XSD

Service Requestor

XML/ SOAP

http

3

Service Execution

Service Provider

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UDDI Overview

Universal Description, Discovery and Integration (UDDI)

Describes how to advertise and discover a Web service

- n **Differentiates Web service provider, Web service and Web service type**
- n **Holds metadata that can be used to search for services (names, IDs, categories, types, etc.)**
- n **Specifies the interface for Web service registries**

UDDI Business Registry

- n *The* **directory for Web services on the Internet**
- n **Publicly available, free of charge**
- n **Operated by SAP, IBM, Microsoft, and NTT Communications**
- n **UDDI Version 3 Beta available now**
- n **SAP's node at http://uddi.sap.com**

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WSDL Overview

Web Service Description Language

Describes the basic characteristics of a Web service

- n **Supported operations and their data format**   **e.g. xCBL Order**
- n **Supported protocols**   **e.g. SOAP**
- n **Network address**   **e.g. http://a.com/order**

Further information

- n **Working Group:** **http://www.w3.org/2002/ws/desc/**
- n **Specification:** **http://www.w3.org/TR/wsdl12/**

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WSDL Structure (simplified)

```
<?xml version="1.0" encoding="utf-8" ?>
<definitions>
  <types>
      … <element name="qty" type="string"
                      minOccurs="0"/> …
  </types>

  <message name="POMessageIn">
    … <part name="Quantity" type="qty"/> …
  </message>

  <portType name="POPortType">
   <operation>
    … <input message="POMessageIn" /> …
   </operation>
  </portType>

  <binding name="SOAP" portType="POPortType">
   … SOAP/HTTP binding definition …
  </binding>

  <service name="OrderWineService">
     <port name="Order" binding="SOAP">
      <address
        location="http://www.dijan.fr/Order/"/>
     </port>
  </service>
</definitions>
```

What

- n **A *portType* describes the abstract interface (Web service type) of the Web service**
- n **Each contained *operation* can have an *input*, an *output* and a number of *fault message*s**
- n **Different Messages are build from build-in or custom data types**
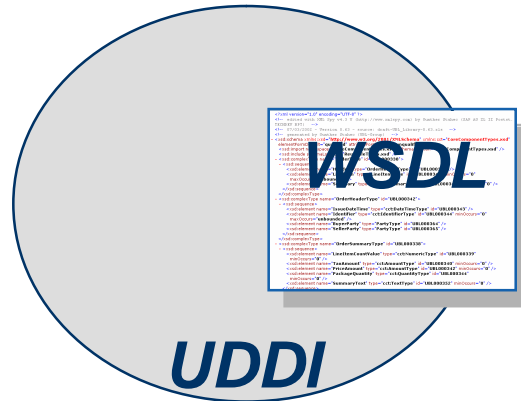- n **Data types are defined using XML Schema**

How

- n **A *binding* specifies exactly one protocol for the operations of a portType**

Where

- n **A *port* defines the Web service endpoint by specifying a single network address**
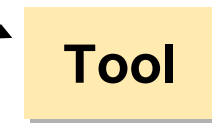
Implementing a Web Service Client
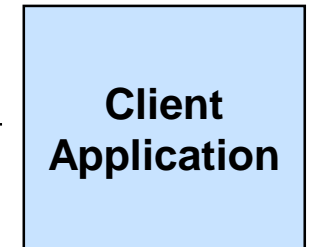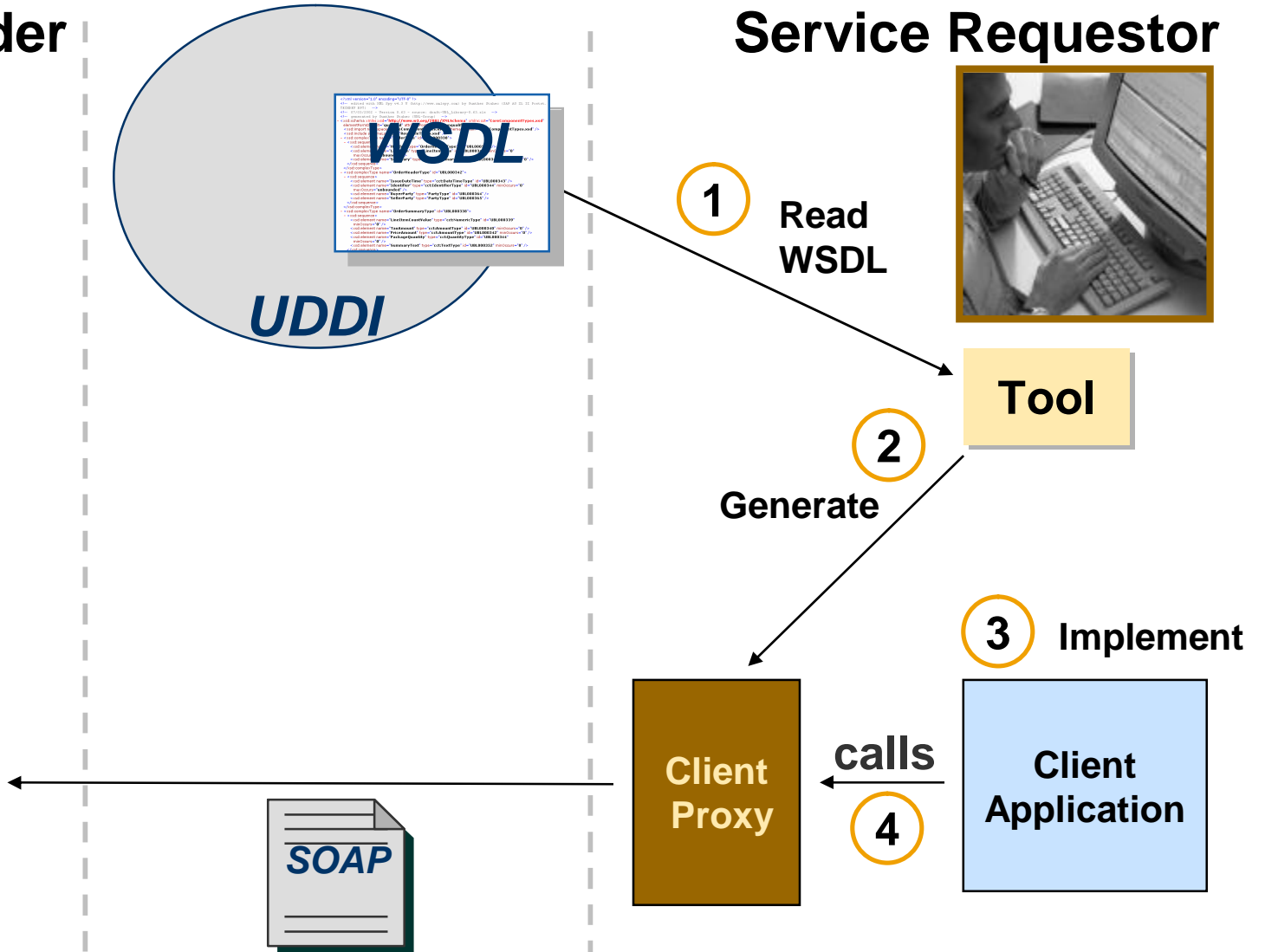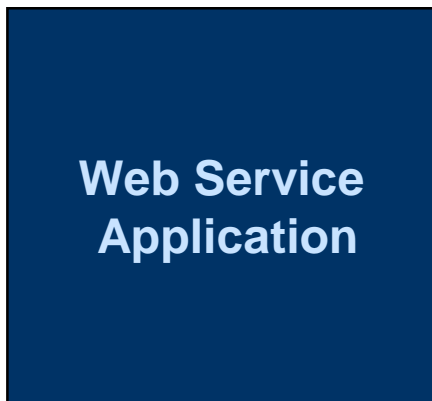
Service Provider

Service Requestor

WSDL

UDDI

1 Read WSDL

Tool

2 Generate

3 Implement

Web Service Application

SOAP

Client Proxy

calls

4

Client Application

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SOAP Structure and Features

Transport Binding

Message Format

Header

Body

Application Data

HTTP, SMTP, …

SOAP

**Protocol specific data
(e.g. quality of service)**

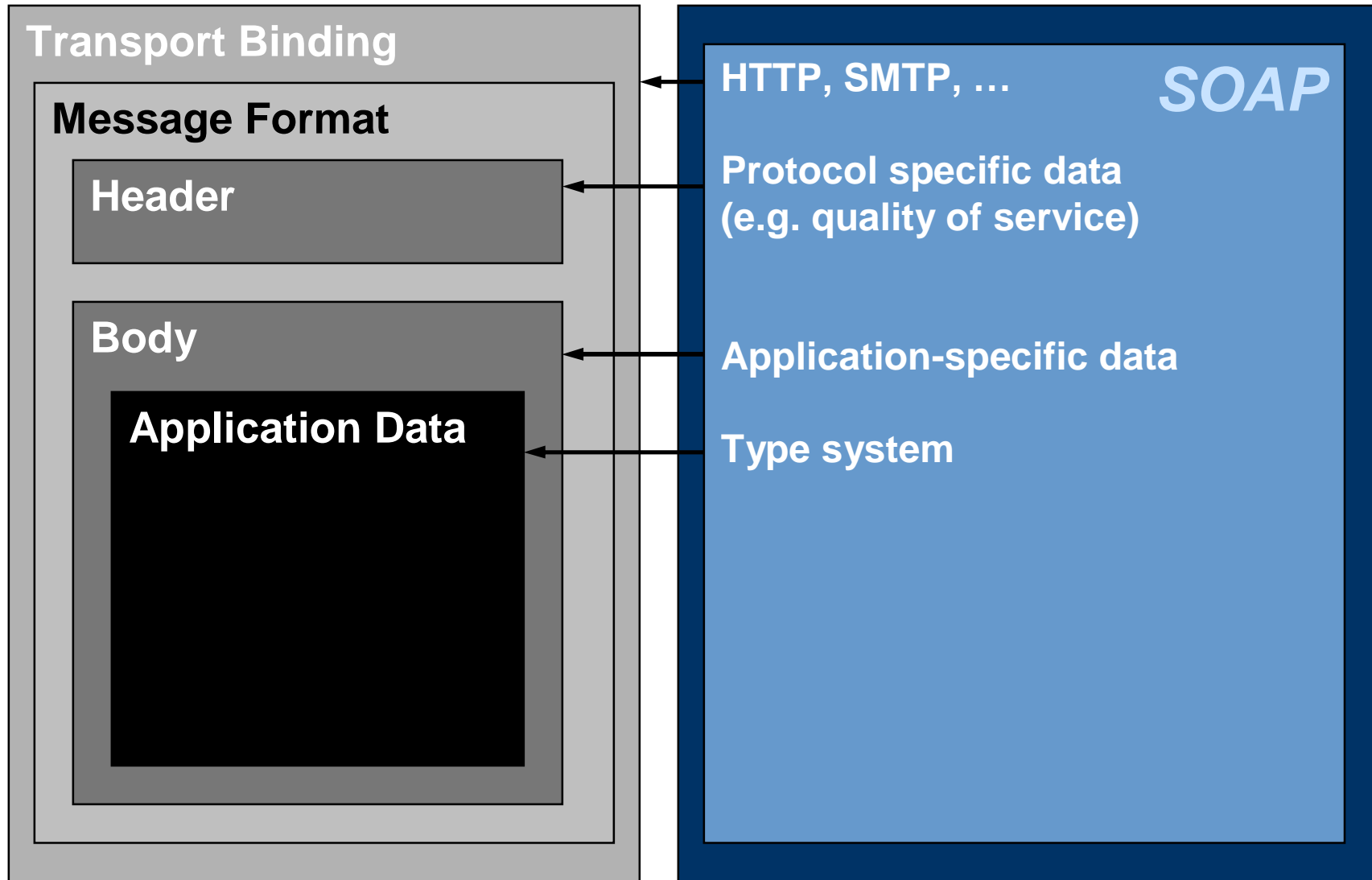**Application-specific data**

Type system

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SOAP Example

```xml
<?xml version="1.0" encoding="UTF-8"?>
  <SOAP-ENV:Envelope
    xmlns:SOAP-ENV=http://schemas.xmlsoap.org/soap/envelope/
    xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
    xmlns:xs="http://www.w3.org/2001/XMLSchema">

<Body>
  <Item>
    <Name> Burgundy First Class </Name>
    <Quantity> 12 </Quantity>
    <Unit> BOX </Unit>
  </Item>

  <Delivery address>
        <Contact> Marc Chan </Contact>
        <City> Palo Alto </City>
        <… other data …>
  </Delivery address>

 </Body>

</SOAP-ENV:Envelope>
```

Web Services Interoperability Organization (WS-I)

"Accelerating the adoption of Web services by reducing the cost associated with standards adoption"

Focus on Web service interoperability

- n Select, integrate and profile existing industry standards
- n Provide implementation guidance and tools

Deliverables

- n <u>Profiles</u> specify conformance requirements for Web services
- n <u>Testing Tools</u> can be used to test profile conformance
- n <u>Sample Applications</u> demonstrate interoperable implementations

WS-I Basic Profile 1.0

- n Industry's common denominator for Web service applications
- n Covers HTTP, XML, XML Schema, SOAP, WSDL, and UDDI
- n Finalized August 12, 2003

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Open Technology Standards for Web Services

XML, WSDL, SOAP, UDDI, WS-I

Referent to business semantics

RosettaNet, Spec2000, HR-XML, XBRL, IFX, papiNet, ...

Web Service Technology

SAP NetWeaver
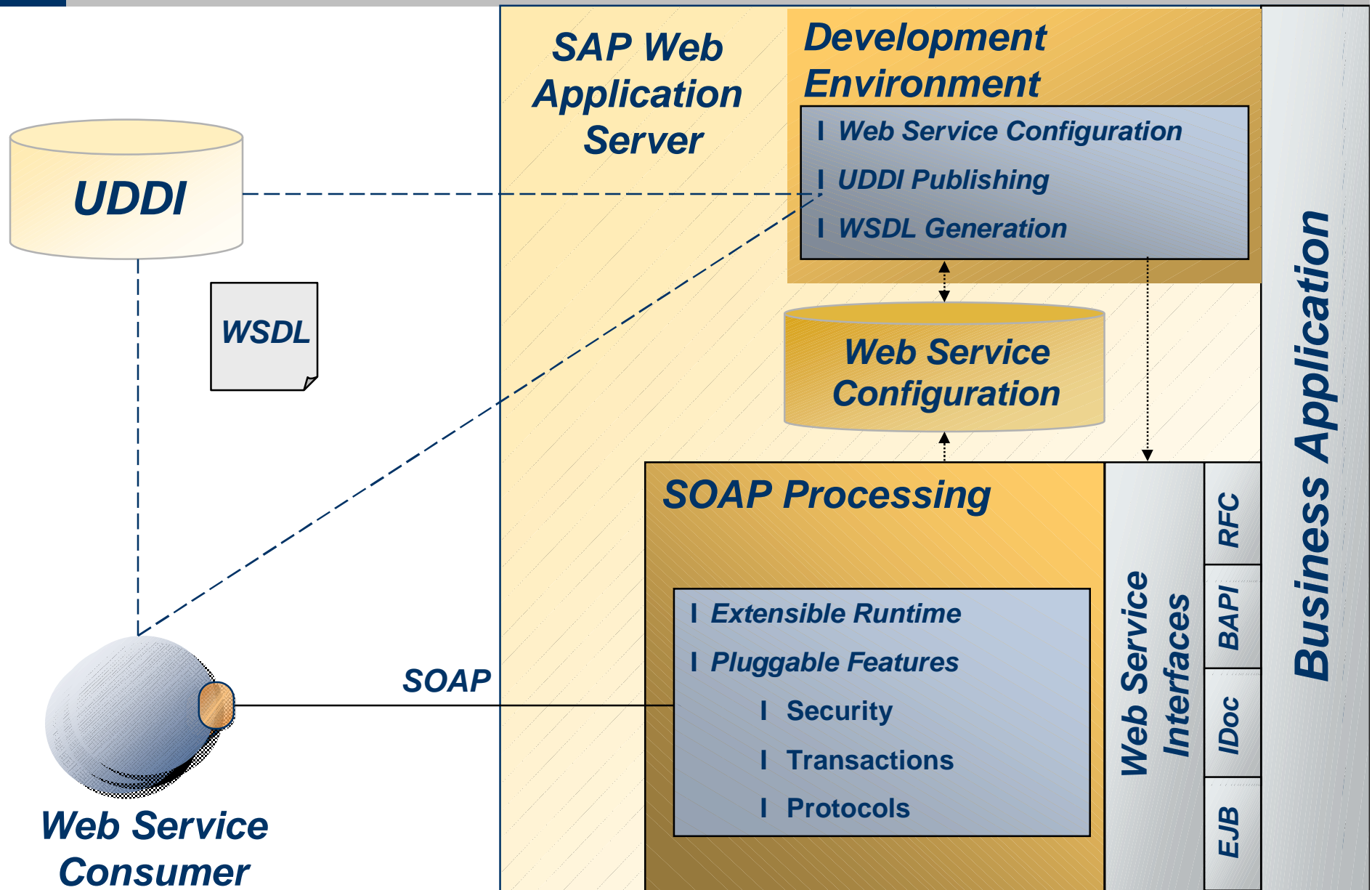
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Agenda

Web Service Overview

n **What are Web services?**

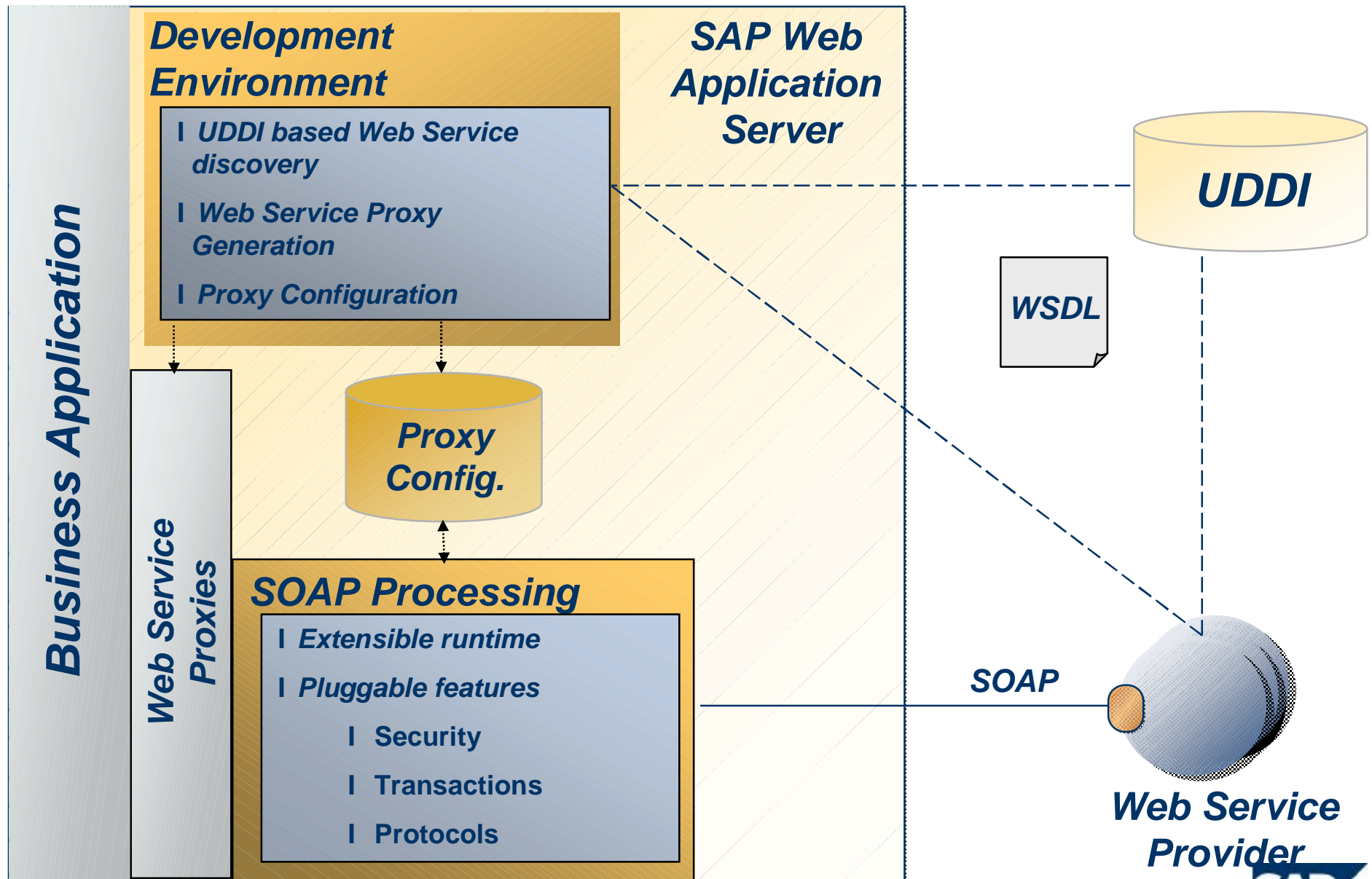n **Why do we need them?**

SAP NetWeaver
Web Service Technology

SAP Web Application Server 6.40

n **Providing Web Services**
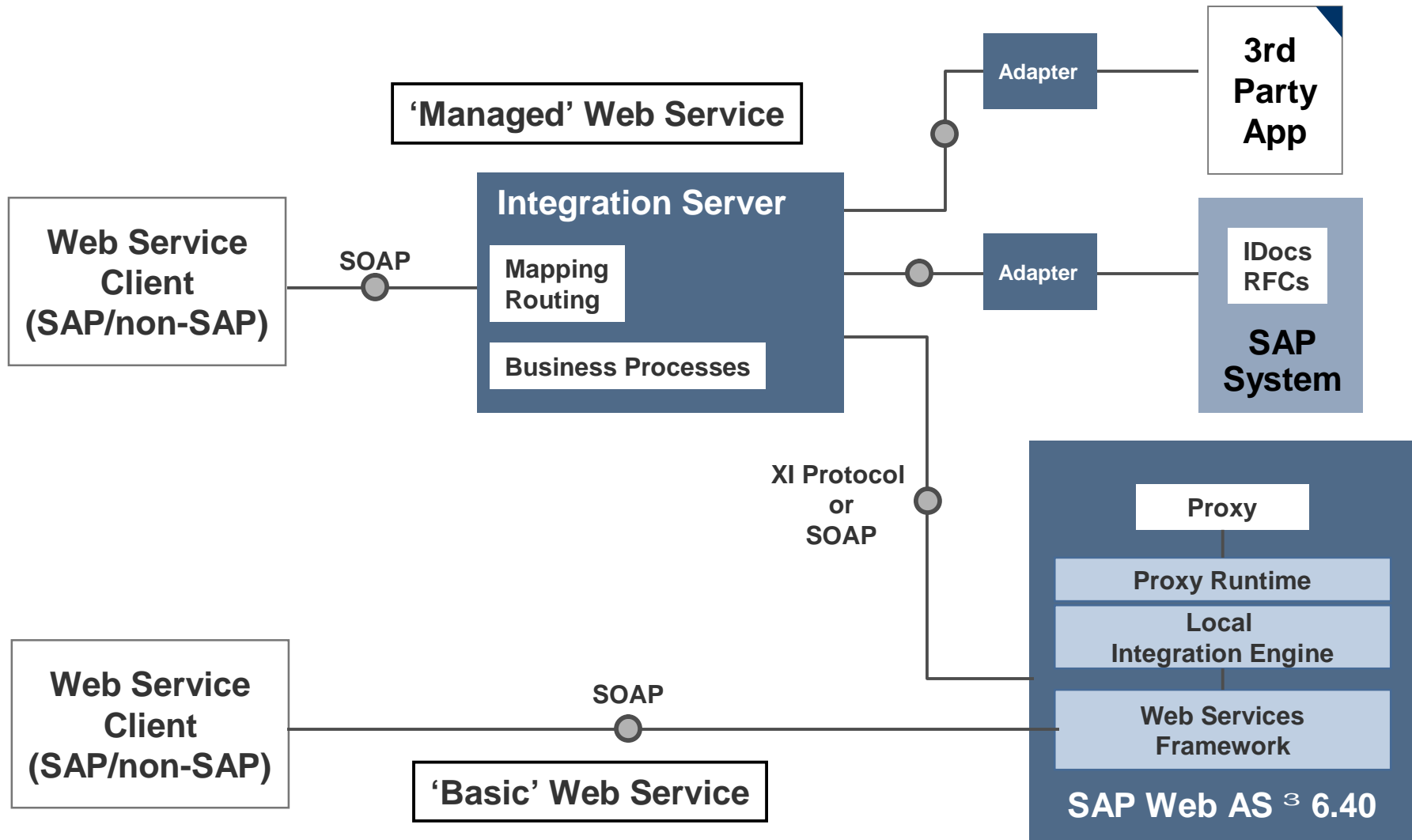
n **Consuming Web Services**

Providing Web services based on Open Standards

UDDI

WSDL

SAP Web Application Server

Development Environment
- I *Web Service Configuration*
- I *UDDI Publishing*
- I *WSDL Generation*

Web Service Configuration

SOAP Processing
- I *Extensible Runtime*
- I *Pluggable Features*
  - I *Security*
  - I *Transactions*
  - I *Protocols*

SOAP

Web Service Consumer

Web Service Interfaces

RFC

BAPI

IDoc

EJB

Business Application

SAP

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Consuming Web services based on Open Standards

Development Environment

- I *UDDI based Web Service discovery*
- I *Web Service Proxy Generation*
- I Proxy Configuration

SAP Web Application Server

Business Application

Web Service Proxies

Proxy Config.

UDDI

WSDL

SOAP Processing

- I *Extensible runtime*
- I *Pluggable features*
  - I Security
  - I Transactions
  - I Protocols

SOAP

Web Service Provider

Value-added Web Services Through XI

'Managed' Web Service

3rd Party App

Adapter

Integration Server

Mapping Routing

Business Processes

Adapter

Web Service Client (SAP/non-SAP)

SOAP

IDocs RFCs

SAP System

XI Protocol or SOAP

Proxy

Proxy Runtime

Local Integration Engine

Web Services Framework

Web Service Client (SAP/non-SAP)

SOAP

'Basic' Web Service

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Web Service Overview

- What are Web services?
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- **Providing Web Services**
- Consuming Web Services

Creating a Web Service in less than 1 minute

- **The Web Service Creation wizard**

- n **proves that Web services are easy and out-of-the-box**

- n **allows to expose an existing endpoint as a Web Service with few mouse-clicks**

- n **Only shows the most important settings in the wizard**
    - ⊔**Default values for other settings**

- n **hides technical details**

- n **implicitly creates all necessary objects**

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Steps for the Web Service Wizard

| 1 | **Implement Business Logic** |

| 2 | **Start Web Service Wizard** |

generate

| **Virtual Interface** | **Web Service Definition** | **Web Service Config.** |

| 3 | **Deploy Web Service** |

| 3a | **Publish Web Service (optional)** |

UDDI

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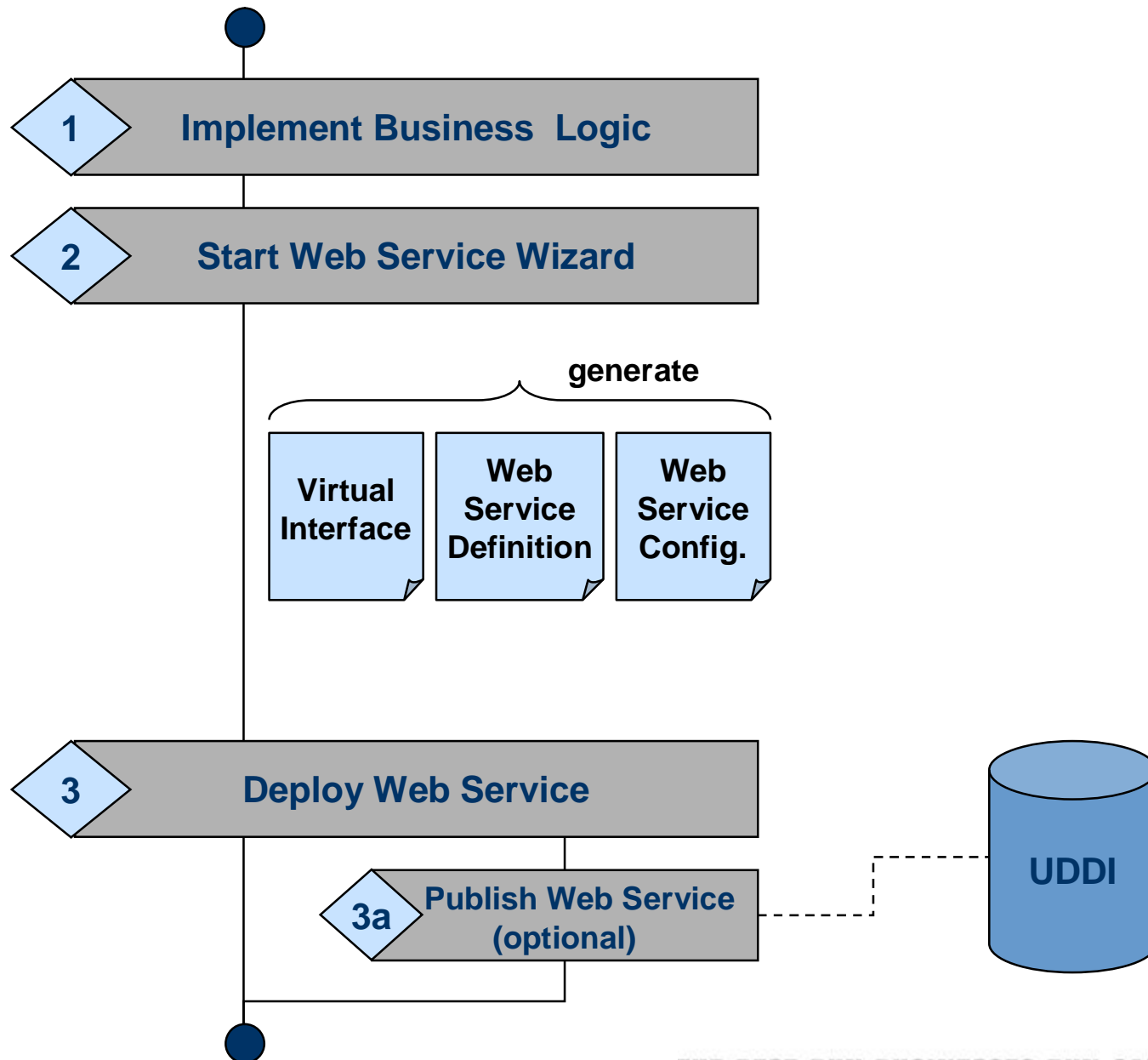
Demo

Demo

Web Service Creation Wizard

Web Service Wizard Results

All necessary files are created

- **Virtual Interfaces**

- **Web service Definition**

- **Web Service Configuration**

- **Enterprise Application Project (optional)**

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The Web Service Homepage

The Web Service Homepage

- n **is available for each deployed Web Service**

- n **shows the documentation for the Web Service**

- n **allows to retrieve WSDL descriptions in different styles**

- n **allows to generate standalone proxies**

- n **offers testing capabilities**

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Web Service Explorer

The Web Service Navigator

- n **is part of SAP NetWeaver Developer Studio**

- n **shows deployed Web services from different servers (SAP and Non SAP)**

- n **is the starting point for the Web Service Homepage**

- n **is the starting point for Web Service Proxy generation**

Demo

Web Service Homepage & Navigator

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The Step-by-Step approach

- n **Create all objects by hand**

- n **Full flexibility and options**

- n **More expenses**

- n **… but still configuration only**

The Step by Step Approach

1	**Implement Business Logic**
2	**Define Virtual Interface (VI)**
3	**Create Web Service Definition (WSD)**
3a	**Publish WSD (optional)**
4	**Configure Web Service**
5	**Deploy Web Service**
5a	**Publish Web Service (optional)**

UDDI

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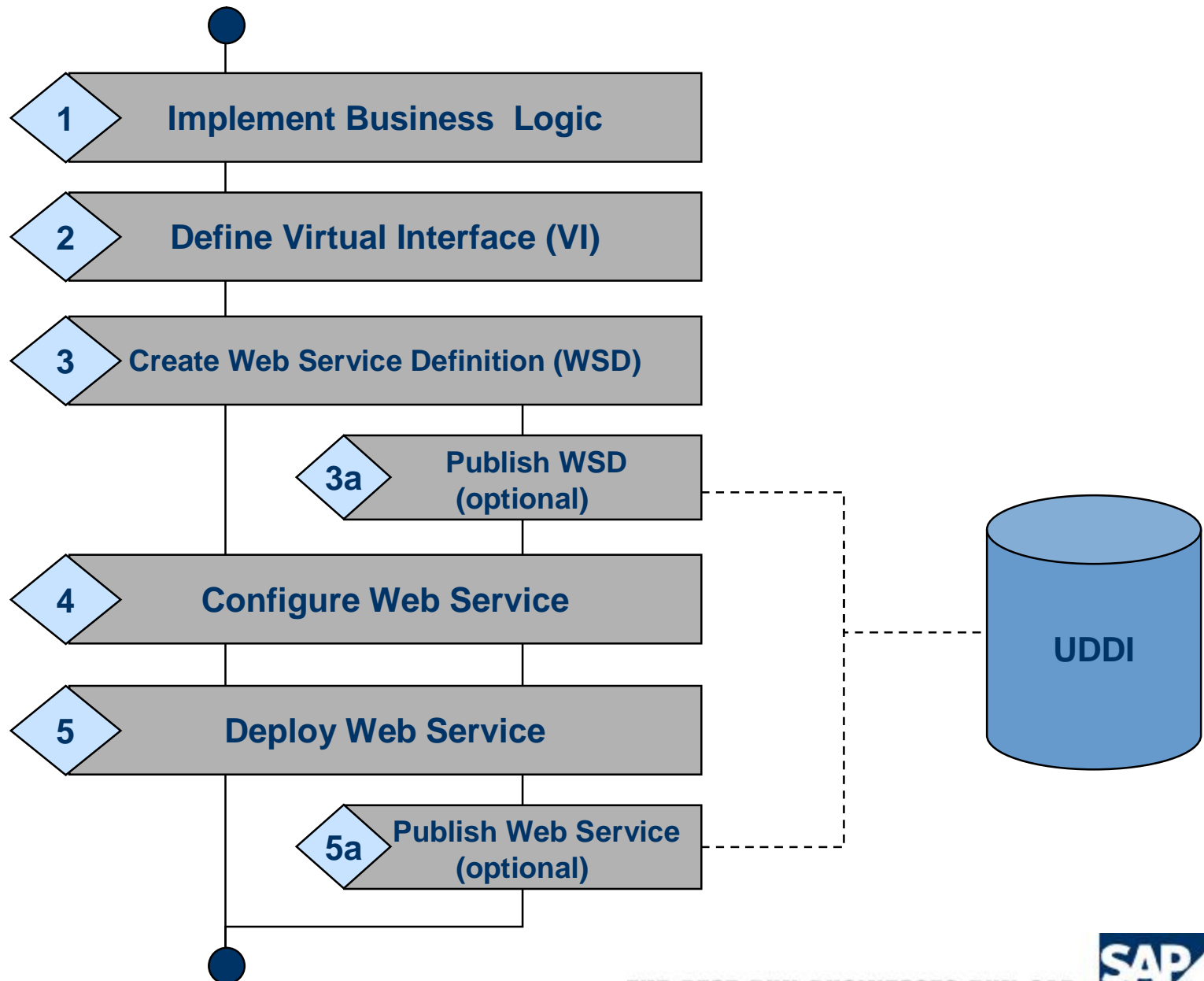
Support for Web Service Developers (2)
- Tasks of a Web Service Developer -

Step 1: Implementing the business logic

n **Supported by the standard IDE**

n **Takes place in "Endpoint-specific" standard Tools**
- u **Java: SAP NetWeaver Developer Studio**
- u **ABAP: SE80**

Step 2: Definition of Virtual Interface

- **Web Service Interface = Interface visible to clients (via WSDL, UDDI, …)**

- **Supported by the Web Service Infrastructure via *Virtual Interface Editor***

- **A Virtual Interface**
  - **provides abstraction from concrete implementation (=endpoint)**

  - **allows to publish a "view" on existing implementations as Web Service Interfaces**
    - **i.e. renaming, hiding of parameters/methods, default values**

  - **allows to define how the Web Service Interface is represented in the SOAP message**

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Virtual Interfaces

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Step 3: Creation of Web Service Definition

- n **Web Service Definition = Assignment of behavior to a Web Service Interface via features**

- n **Motivation**
  - u **a Web Service is not only described by its interface but also by its <u>behavior</u> with respect to**
    - l **stateless/stateful communication,**
    - l **transactional behavior,**
    - l **security requirements, …**

  - u **Idea:**
    - l **describe this kind of behavior via abstract features**
    - l **leave it to the Web Service Configurator to assign technical protocols to these abstract features**
    - l **Example:**
      - l **Feature:**   `Stateful`
      - l **Technical Protocols:**   `Stateful via HTTP-Cookies,`
                                    `Stateful via URL-Extensions`

Support for Web Service Developers (5)
- Tasks of a Web Service Developer -

- **Benefits**

    - **The same Web Service definition can be deployed to various application servers which may differ in their technical capabilities**

    - **Web Service Client implementations do not depend from technical server information**

        - **Clients are generated based on implementation-independent Web Service definitions**

        - **Technical details are configured <u>separately</u> in the Web Service Client Runtime**

- **Supported by the Web Service Infrastructure via**

    - **Web Service Definition Editor**

    - **UDDI Publication of Web Service Definitions**

    - **WSDL Generation for Web Service Definitions**

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Web Service Definition

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Step 1: Technical configuration of a Web Service Definition

n **Assignment of technical protocols to the abstract features**
  u **based on the Web Service capabilities of the Application Server**

n **Configuration of additional Web Service Runtime features**
  u **Logging, Tracing, Monitoring**
  u **Security Roles**
  u **…**

n **Supported by the Web Service Infrastructure via**

  u **Web Service Configuration Editor**

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Step 2: Deployment of a Web Service

n **Deployment of the Web Service archive to a specific application server**

n **Supported by Web Service Infrastructure via**

u **Integration of Web Service deployment in J2EE Deploy Tool**

u **WSDL Generation for deployed Web Services**

u **UDDI Publishing**

u **Web Service Administrator**

Demo

Web Service Configuration and Deployment

Web Service Overview

- n **What are Web services?**
- n **Why do we need them?**

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Web Service Technology

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- n **Providing Web Services**
- n **Consuming Web Services**

Step 1: Retrieve description of Web Service

- **Retrieval of URL of WSDL description**
  - **either manually,**
  - **or using UDDI Browsing**

- **Supported by the Web Service Infrastructure via**

  - **Web Service Proxy Project**
  - **UDDI Client Browser**

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Step 2: Generate Web Service Client Proxy

- **Start proxy generator based on imported WSDL Document**

- **Supported by the Web Service Infrastructure via**
    - **Web Service Proxy Project**

Step 3: Implementation of Client Application

- **Use generated client proxies**

- **Supported by the Web Service Infrastructure via**
    - **the standard Java IDE**

Demo 🎥

Web Service Proxy Project

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SAP

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