



Building Web Services with Java and SAP Web Application Server

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Learning Objectives

**As a result of this lecture, you will
be able to:**

- Comprehend the main ideas of SAPs Web Service definition
- Understand the architecture of the Web Service Framework
- Understand what Virtual Interfaces, Web Service Definitions, Web service Configurations and other concepts of the Web Service Framework are



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

Summary



Web Services Definition

Web Services are

application functionalities

supporting *direct interaction*

by responding to *service requests*

based on open *Internet Standards*



Web Services

act like a black-box that may require input and deliver a result

are modular, self-contained and self-describing

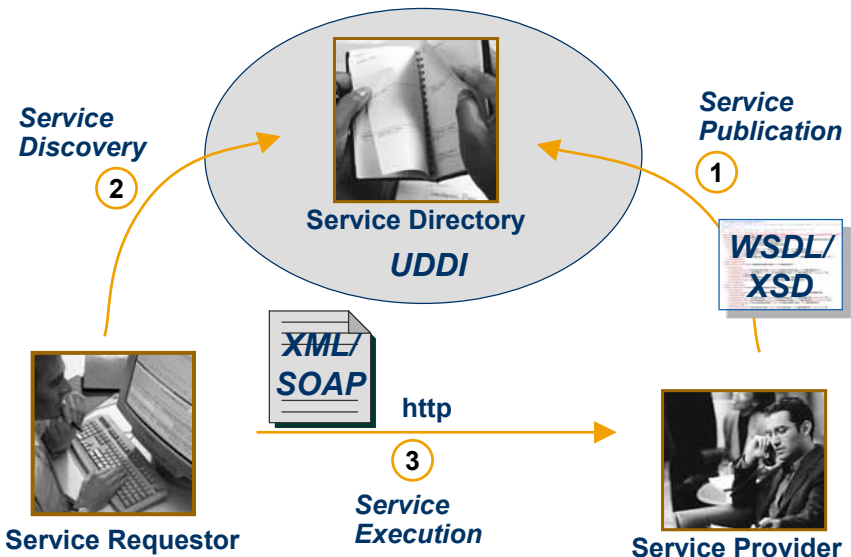
work on top of any communication technology stack

can be published, discovered and invoked based on open technology standards

work in synchronous and asynchronous scenarios

facilitate integration within an enterprise as well as cross enterprises

Web Service Paradigm



Web Services: Examples

Intelligent product catalog search

Product availability check

Pricing inquiry

Customer credit check

Order status check

Vendor managed inventory

- Demand forecasts, stock replenishment ...

Dynamic auctioning and bidding

Publish and analyze financial reports (XBRL based)

Electronic bill presentment and payment

Matching vacancies and job applicants profiles

Postal service address check

UDDI registration and discovery services

Automated web searches (Google)



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Demo



Demo



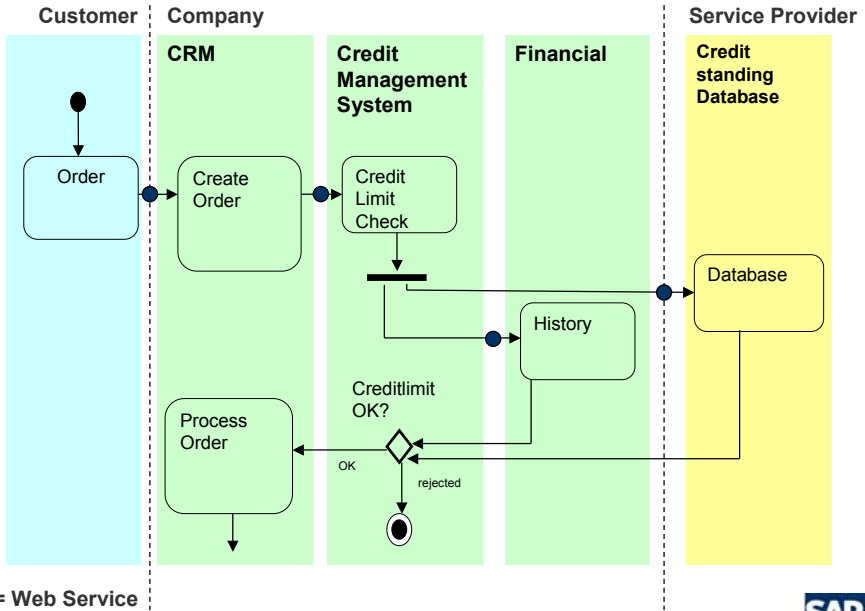
Web Service Example

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Example: Web Service Szenario Credit Limit Check

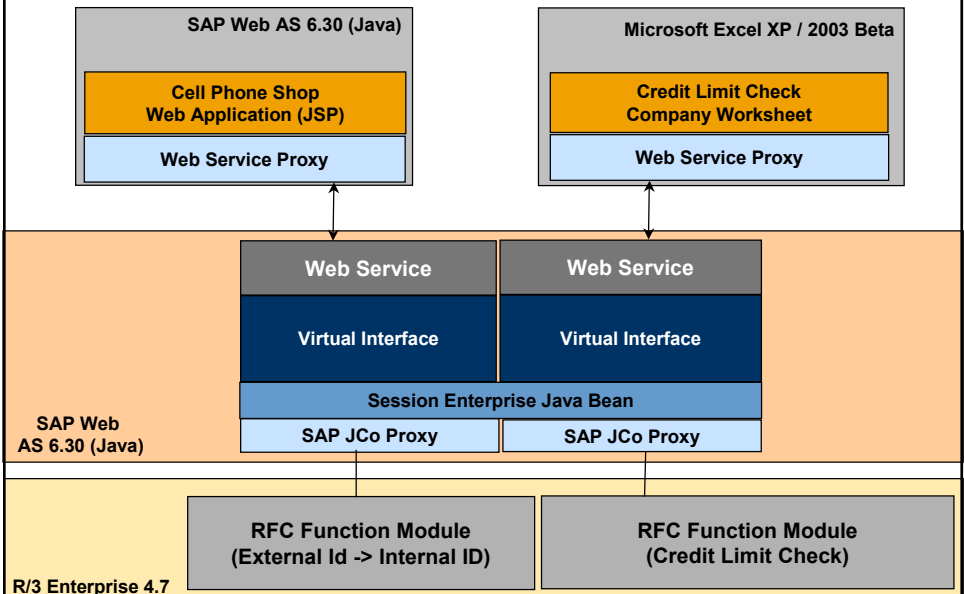


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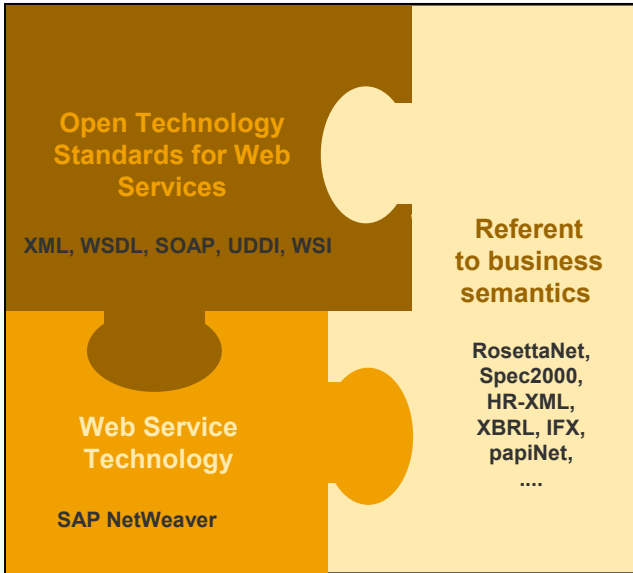
Credit Limit Check Example: Architecture



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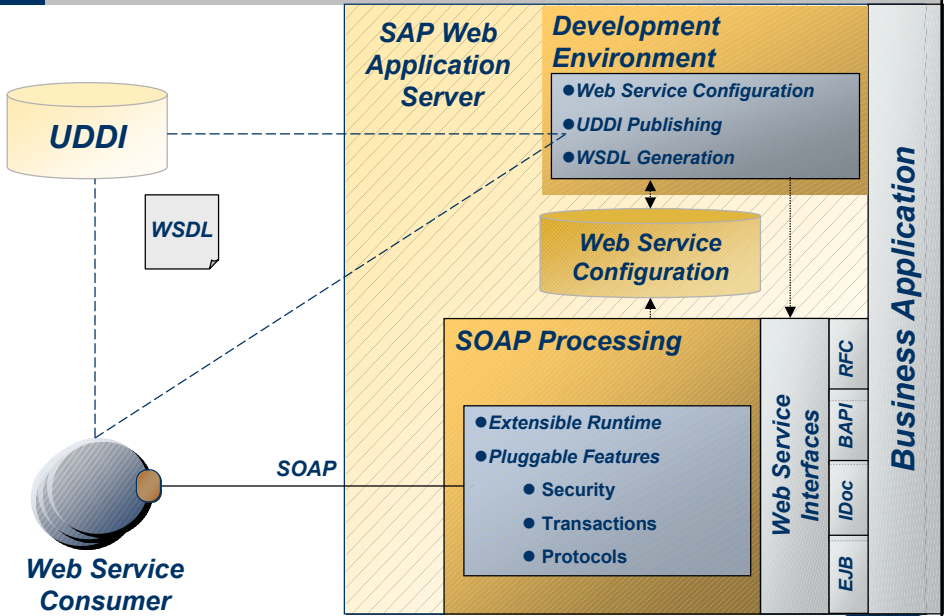
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Providing Web services based on Open Standards

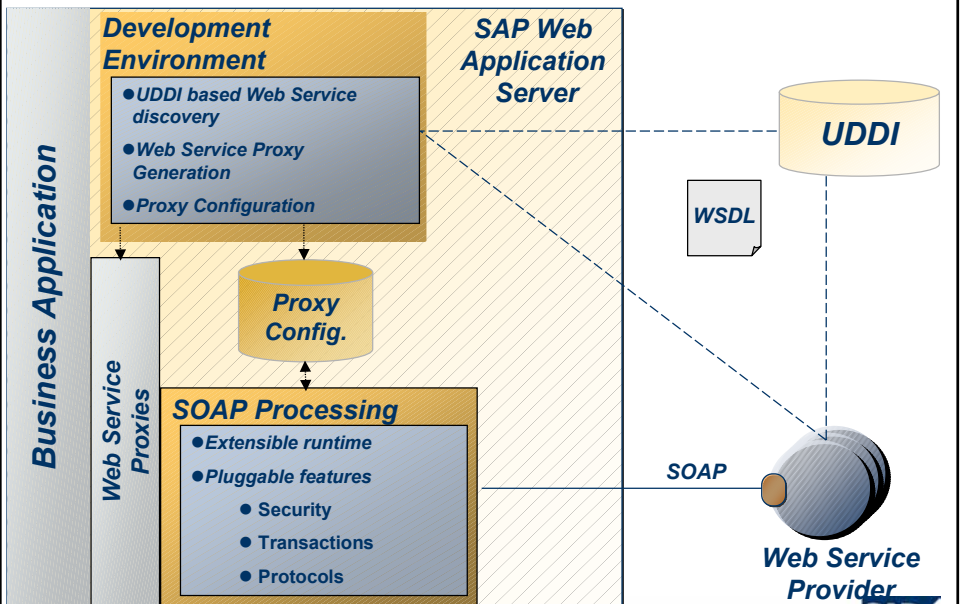


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Consuming Web services based on Open Standards



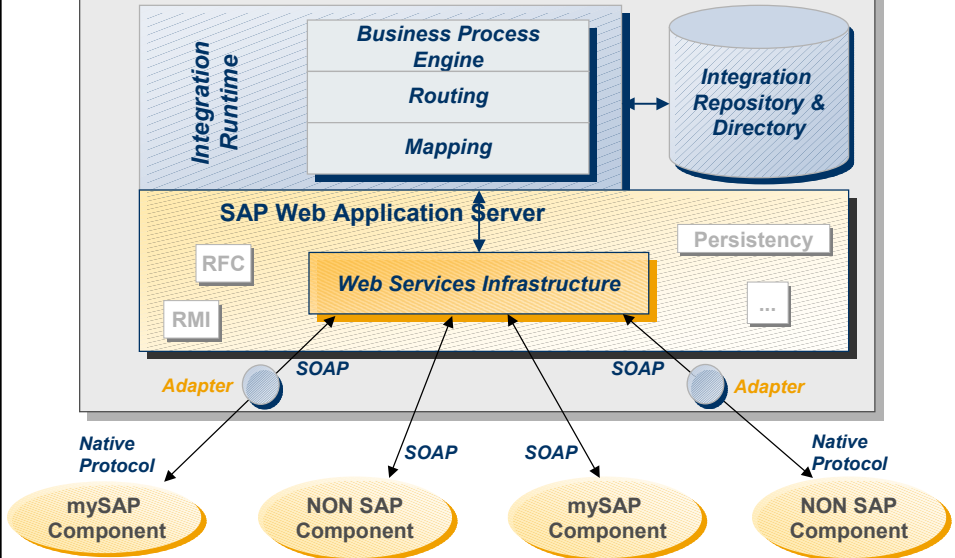
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Exchange Infrastructure & Web Services

Exchange Infrastructure



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Web Service within SAP Web Application Server

The Web Service capability within SAP Web AS is

- the foundation for all mySAP.com solutions
- a scalable, reliable Web application infrastructure that delivers high-performance Web Services
- offering Web Service functionality for the ABAP and J2EE personality with a common architecture
- allowing to expose existing functionality (BAPIs, RFMs, IDOCs, EJBs, Java Classes, XI Server Proxies) as Web Service
- easily allowing to consume Web Service from any source
- requiring only configuration (no coding)



Benefits

- Web Service interfaces provide a ,virtual' abstraction from the implementation layer
- Fully integrated into development environment
- Full fledged UDDI capabilities
 - ◆ UDDI server implementation
 - ◆ UDDI client functionality
- Standard compliant WSDL generation
- Support of client proxy generation for ABAP and J2EE
- Extensible SOAP Runtime
- Pluggable Features
 - ◆ Security
 - ◆ Protocols
 - ◆



■ **Provider-side**

◆ **Web Service Developer**

- defines design time information of a Web Service

◆ **Web Service Configurator**

- defines runtime information of a Web service

■ **Consumer-side**

◆ **Web Service Client Developer**

■ **Agenda**



Web Service Overview

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

Summary

Creating a Web Service in less than 1 minute

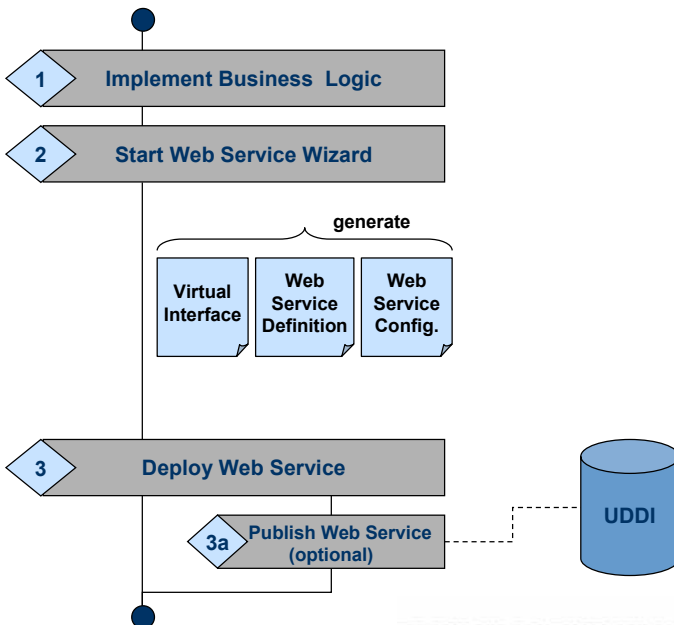


- The Web Service Creation wizard

- proves that Web services are easy and out-of-the-box
- allows to expose an existing endpoint as a Web Service with few mouse-clicks
- Only shows the most important settings in the wizard
 - ◆ Default values for other settings
- hides technical details
- implicitly creates all necessary objects



Steps for the Web Service Wizard





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)



The Web Service Homepage

- is available for each deployed Web Service
- shows the documentation for the Web Service
- allows to retrieve WSDL descriptions in different styles
- allows to generate standalone proxies
- offers testing capabilities

The Web Service Explorer

- is part of SAP NetWeaver Developer Studio
- shows deployed Web services from different servers (SAP and Non SAP)
- is the starting point for the Web Service Homepage
- is the starting point for Web Service Proxy generation



Demo



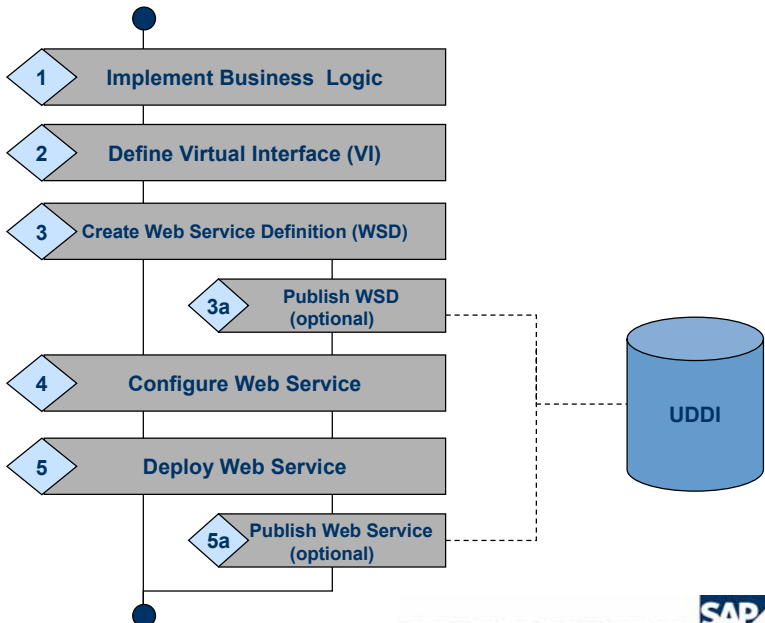
Web Service Homepage & Explorer

The Web Service Creation Wizard - Background -

The Step-by-Step approach

- Create all objects by hand
- Full flexibility and options
- More expenses
- ... but still configuration only

The Step by Step Approach



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Support for Web Service Developers (1) - Background -

The Web Service developer

- knows/defines the application logic
- knows/defines the Web Service Interface
 - ◆ which should be accessible for clients
- knows/defines the “behavior” of the Web Service
 - ◆ e.g. “Stateless / Stateful”, Security requirements, etc.
- does not need to have detailed knowledge about
 - ◆ technical protocols which implement abstract behavior
 - ◆ concrete application servers on which the Web Service will be running

→ **Defines Design-Time information of a Web Service**

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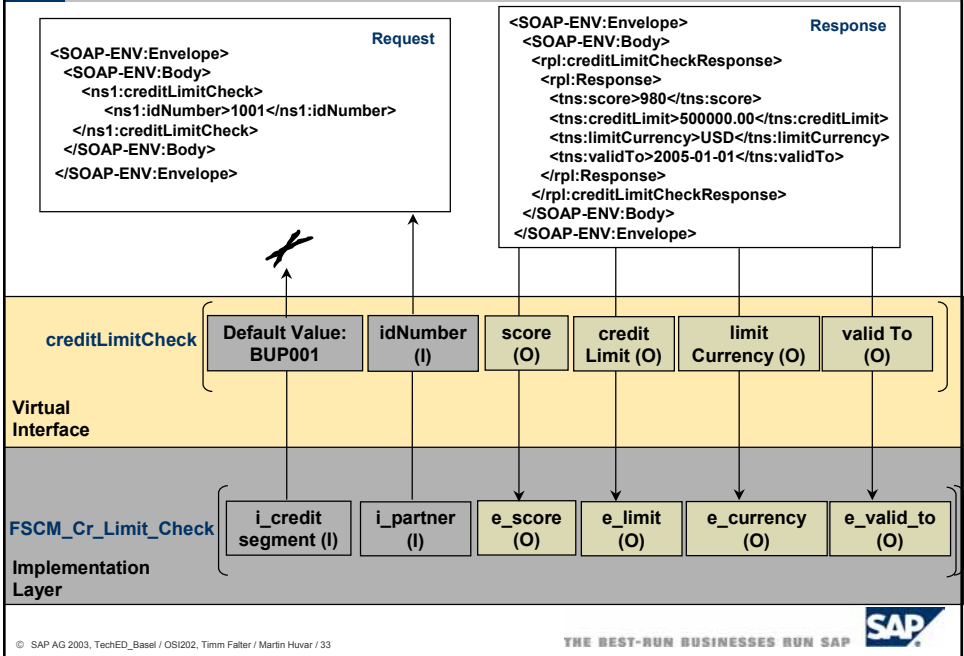
Step 1: Implementing the business logic

- Supported by the standard IDE
- Takes place in “Endpoint-specific” standard Tools
 - ◆ Java: SAP NetWeaver Developer Studio
 - ◆ ABAP: SE80

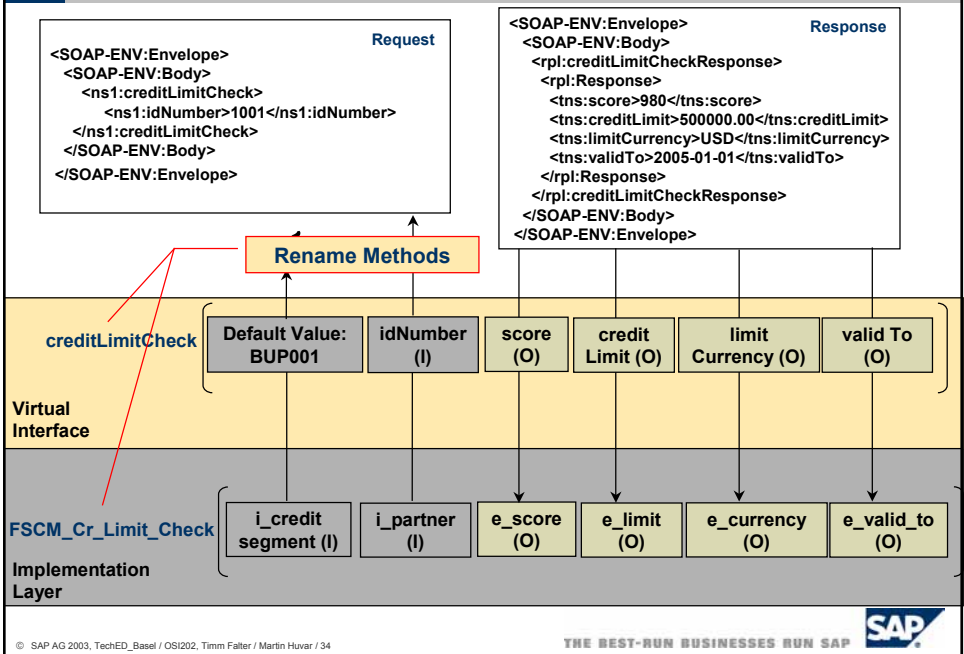
Step 2: Definition of Virtual Interface

- 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

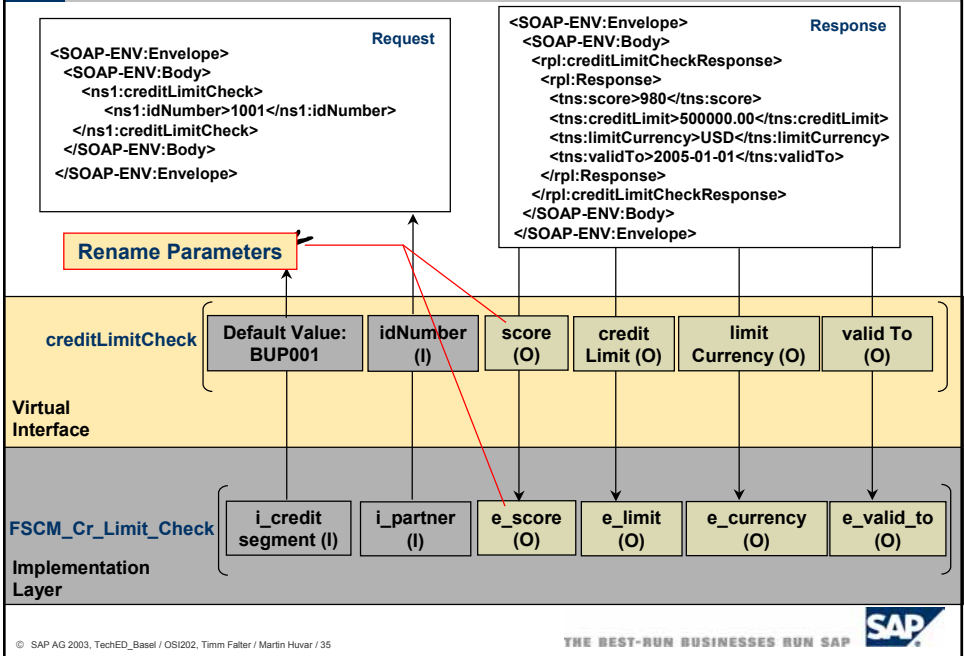
Virtual Interfaces



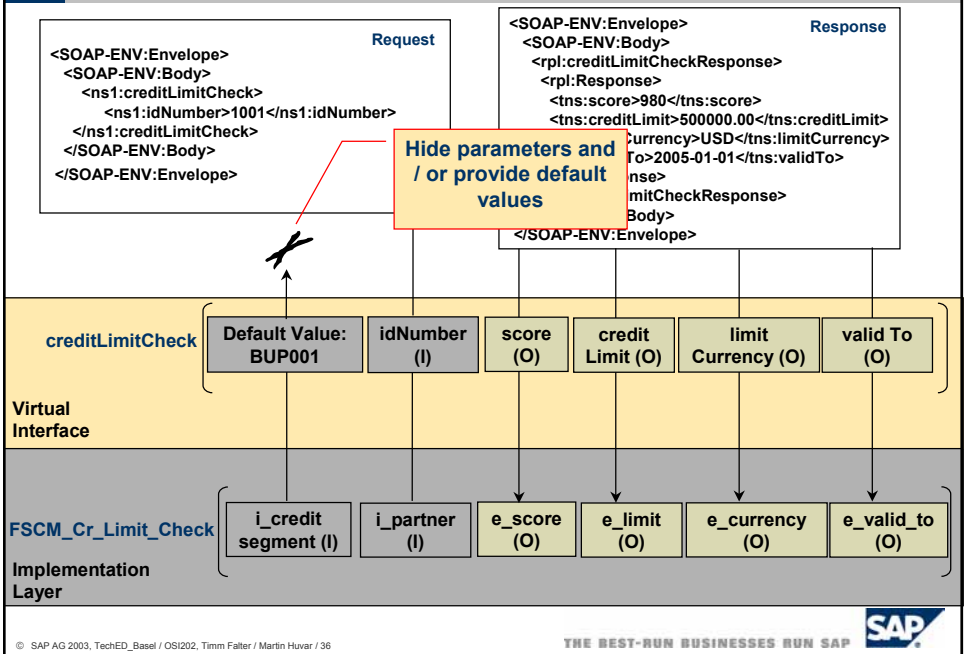
Virtual Interfaces



Virtual Interfaces



Virtual Interfaces





Demo



Virtual Interfaces

Support for Web Service Developers (4) - Tasks of a Web Service Developer -

Step 3: Creation of Web Service Definition

- **Web Service Definition = Assignment of behavior to a Web Service Interface via features**
- **Motivation**
 - ◆ a Web Service is not only described by its interface but also by its behavior with respect to
 - stateless/stateful communication,
 - transactional behavior,
 - security requirements, ...
 - ◆ **Idea:**
 - describe this kind of behavior via abstract features
 - leave it to the Web Service Configurator to assign technical protocols to these abstract features
 - **Example:**
 - **Feature:** Stateful
 - **Technical Protocols:** Stateful via HTTP-Cookies,
Stateful via URL-Extension

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 separately 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



Demo



Demo



**Web Service
Definition**



The Web Service Configurator

- knows the technical protocols which implement the abstract features
- knows the System Landscape
- knows the Web Service capabilities of the single Application Servers

→ Defines Runtime information of a Web Service

Step 1: Technical configuration of a Web Service Definition

- Assignment of technical protocols to the abstract features
 - ◆ based on the Web Service capabilities of the Application Server
- Configuration of additional Web Service Runtime features
 - ◆ Logging, Tracing, Monitoring
 - ◆ Security Roles
 - ◆ ...
- Supported by the Web Service Infrastructure via
 - ◆ Web Service Configuration Editor

Step 2: Deployment of a Web Service

- Deployment of the Web Service archive to a specific application server
- Supported by Web Service Infrastructure via
 - ◆ Integration of Web Service deployment in J2EE Deploy Tool
 - ◆ WSDL Generation for deployed Web Services
 - ◆ UDDI Publishing
 - ◆ Web Service Administrator

Demo



Demo



Web Service Configuration and Deployment

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Support for Web Service Consumers (1) - Background -

The Web Service client developer

- implements the client application
 - ◆ knows how to use the Web Service client proxy in the client application
- knows how to get the description of a Web Service (UDDI, WSDL, ...)
- knows how to generate the Web Service client proxy



Support for Web Service Consumers (2)

- Tasks of a Web Service Consumer -

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



Support for Web Service Consumers (3)

- Tasks of a Web Service Consumer -

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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Summary

The Enterprise Service Architecture (ESA), SAP's approach for building services-oriented business applications utilizes Web Services as vital part of its communication and integration strategy

SAP's rich business functionality, in conjunction with state-of-the-art technology, enables you to establish cross-company business processes as an integrated part of your development efforts based on Web Services

SAP Web Application Server 6.40 offers an easy, convenient way to build Web services

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Questions?

Q&A

Feedback



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Thank You !

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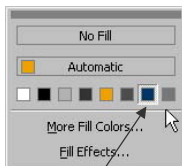
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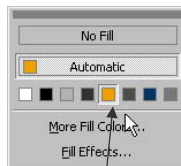
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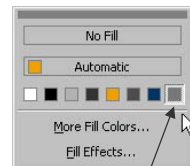
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