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Tutorial III:

Process Integration and Service Oriented Architectures

Session 15
UDDI

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European Commission

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About

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Project Consortium:

- Birzeit University, Palestine (**Coordinator**)
- Palestine Polytechnic University, Palestine
- Palestine Technical University, Palestine
- Ministry of Telecom and IT, Palestine
- Ministry of Interior, Palestine
- Ministry of Local Government, Palestine
- University of Trento, Italy
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Tutorial Map

Intended Learning Objectives
A: Knowledge and Understanding
3a1: Demonstrate knowledge of the fundamentals of middleware.
3a2: Describe the concept behind web service protocols.
3a3: Explain the concept of service oriented architecture.
3a4: Explain the concept of enterprise service bus.
3a5: Understanding WSDL service interfaces in UDDI.
B: Intellectual Skills
3b1: Design, develop, and deploy applications based on Service Oriented Architecture (SOA).
3b2: use Business Process Execution Language (BPEL).
3b3: using WSDL to describe web services.
C: Professional and Practical Skills
3c1: setup, Invoke, and deploy web services using integrated development environment.
3c2: construct and use REST and SOAP messages for web services communication.
D: General and Transferable Skills
d1: Working with team.
d2: Presenting and defending ideas.
d3: Use of creativity and innovation in problem solving.
d4: Develop communication skills and logical reasoning abilities.

Title	T	Name
Session0: Syllabus and overview	0	Aldasht
Sesson1: Introduction to SOA	2	Aldasht
Session2: XML namespaces & XML schema	2	Aldasht
Session 3: Xpath & Xquery	4	Romi
Session4: REST web services	3	M. Melhem
Session5: Lab2: Practice on REST	3	M. Melhem
Session 6: SOAP	2	Aldasht
Session 7: WSDL	**3**	Aldasht
Session8: Lab 3: WSDL practice	3	Aldasht
Session9: ESB	4	Aldasht
Session10: Lab4: Practice on ESB	4	Aldasht
Session11: integration patterns	4	M. Melhem
Session12: Lab5: integration patterns	4	M. Melhem
Session13: BPEL	3	Aldasht
Session14: Lab6: Practice on BPEL	3	Aldasht
Session15: UDDI	2	Aldasht

Session 15: UDDI.

Session ILOs

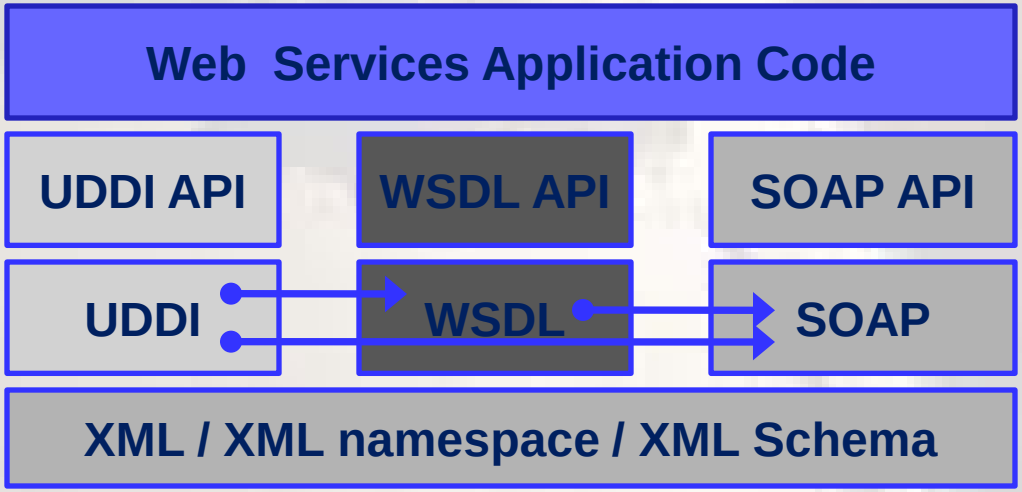
After completing this module students will be understood WSDL service interfaces in UDDI

Session Outlines

- **Introduction**
- UDDI registry structure
- Linking WSDL documents to a UDDI registry
- Private versus public UDDI registers

Overview

- A service discovery platform UDDI, offers a global repository containing [2]:
  - Service endpoint implementation.
  - Interface information
  - Business-level information.
- A UDDI registry may refer to WSDL document



Source, [2]

Introduction

- **Universal Description, Discovery and Integration** (**UDDI**) is a platform-independent, (XML)-based registry for businesses worldwide to list themselves on the Internet [1].
- UDDI is an open industry initiative, sponsored by the Organization for the Advancement of Structured Information Standards (OASIS).
- UDDI originally proposed as a core Web service standard.
- UDDI provides a mechanism to register and locate web service applications.

Introduction, cont.

- UDDI is designed to be interrogated by SOAP messages and to provide access to WSDL documents.
- UDDI registry may offer [2]:
  - Info about businesses and organizations offering web services.
  - Descriptions of web services that these organizations provide.
  - Info about technical interfaces to these web services.

Session Outlines

- Introduction
- **UDDI registry structure**
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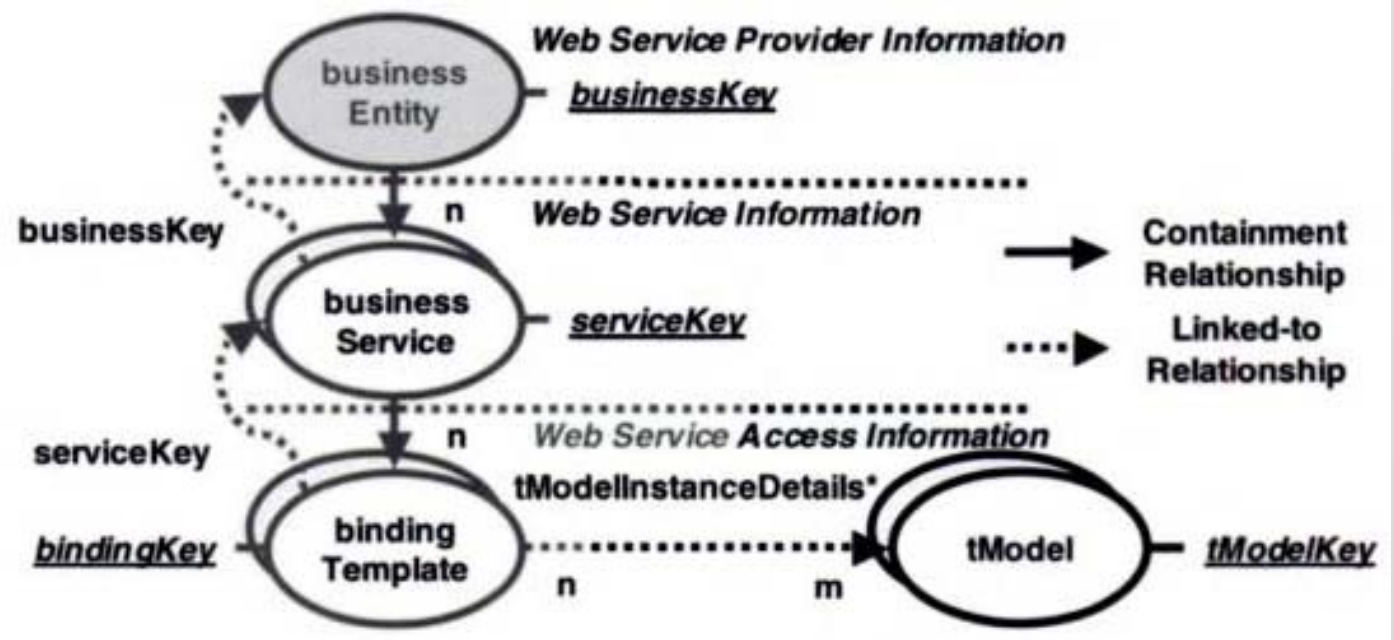
- Private versus public UDDI registers

UDDI registry structure

- UDDI service registry data model provides two types of info:
  - Business info about web services and provider.
  - Technical info about web service binding.
- It is composed of 5 hierarchically organized data types:
  - `business entity`: a top object contains info about web service provider, like name.
  - `business service`: a data structure to represent a collection of correlated web services.
  - `binding template`: exposes a service endpoint address to access a distinct web service.
  - `tModel`: exposes web service interface information.
  - `publisher assertion`: supports publishing of business relationships between business entities.

Containment and reference relationship of UDDI data structures

- In the UDDI data model hierarchy:
  - One binding template may refer to several `tModel` "Technical Model" entities.
  - Different binding templates may refer to the same `tModel` entities



Source, [2]

Identification of Information Entities

- Individual UDDI information entities must be uniquely identified through the value of a key attribute.
- The table below lists the key attribute names for the main UDDI information entities.
- UDDI defines a specific data type for these key attributes.
  - Called Universal Unique Identifier (UUID)

Identification of Information Entities, cont.

- A UUID is basically a hex string [2],
  - Automatically generated by the UDDI server when an entity is saved for the first time.
  - It is a dash-separated character sequence.
  - e.g. “8-4-4-4-12”, the generation algorithm assures uniqueness of these IDs

Information entity	Key attribute name
`businessEntity`	`businessKey`
`businessService`	`serviceKey`
`bindingTemplate`	`bindingKey`
`tModel`	`tModelKey`

The Identifier Bag

- In addition to the descriptive information about businesses and their services, a formal identifiers are needed.
- A formal identification helps a consumer to find out who is offering a service.
- Important for deciding whether to invoke a service or not.
- e.g. on identification systems:
  - Data Universal Numbering System (D-U-N-S): uses 9-unique digits
  - Global Location Numbers (GLNs): uses 13-digit identification sequences.

Examples

e.g. on identifier bag, to be linked to namespace URI `urn:uddi-org:api_v2`:

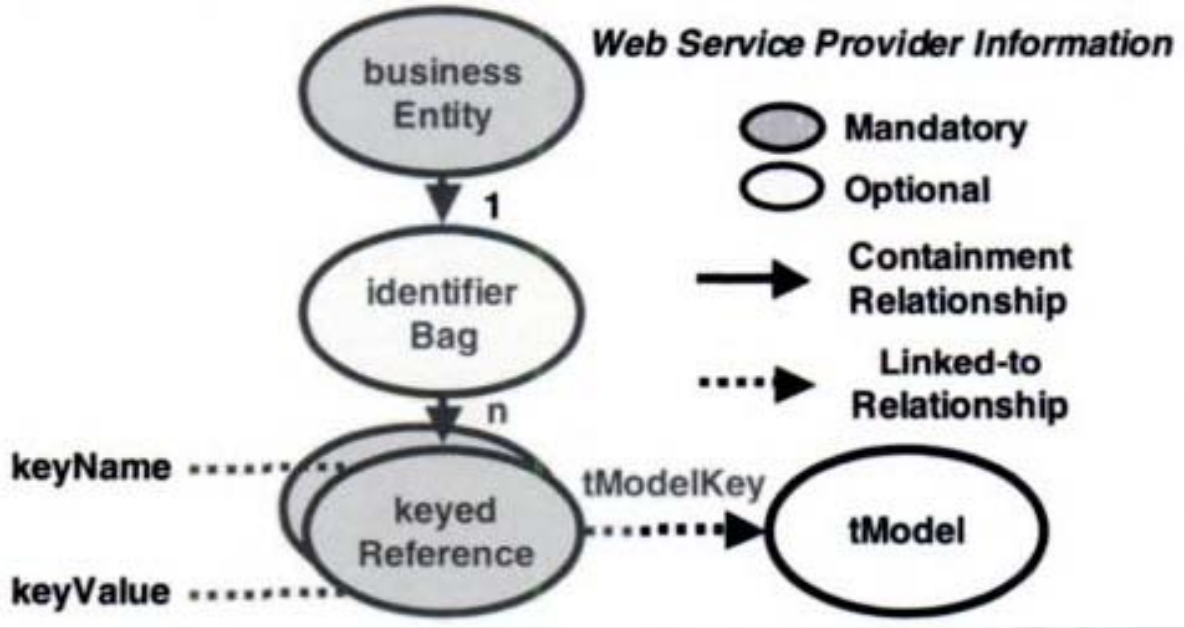
```
<element name="identifierBag" type="uddi:identifierBag" />
<complexType name="identifierBag">
  <sequence>
    <element ref="uddi:keyedReference" maxOccurs="unbounded" />
  </sequence>
</complexType>
```

A keyed reference data type represents the triplet:

```
<element name="keyedReference" type="uddi:keyedReference" />
<complexType name="keyedReference">
  <attribute name="tModelKey" type="uddi:tModelKey" use="optional" />
  <attribute name="keyName" type="string" use="optional" />
  <attribute name="keyValue" type="string" use="required" />
</complexType>
```

Identifier bag of a business entity

- May contain several keyed references for a business entity.
- Each reference identifies the business entity in a different identifier system.
- `tModels` may have an identifier bag supplement.



Source, [2]

Example on keyed reference identification

- Identifying companyx business entity.
- The `tModelKey` value specifies the identifier system D-U-N-S.
- `keyName` is human readable form of the identifier system together with the identified company.
- `keyValue` holds the nine-digit D-U-N-S identifier of companyx Inc.
  - Assuming the company is listed in the identification system

```
<!--  The keyValue “nn-nnn-nnnn” stands for an appropriate   -->
<!--  D-U-N-S identifier, character ‘n’ represents a digit.  -->
<identifierBag>
  <keyedReference
   tModelKey=“uddi:8609C81E-EE1F-4D5A-B202-3EB13AD01823”
   keyName=“D-U-N-S:companyx Inc.”
   keyValue=“nn-nnn-nnnn” />
</identifierBag>
```

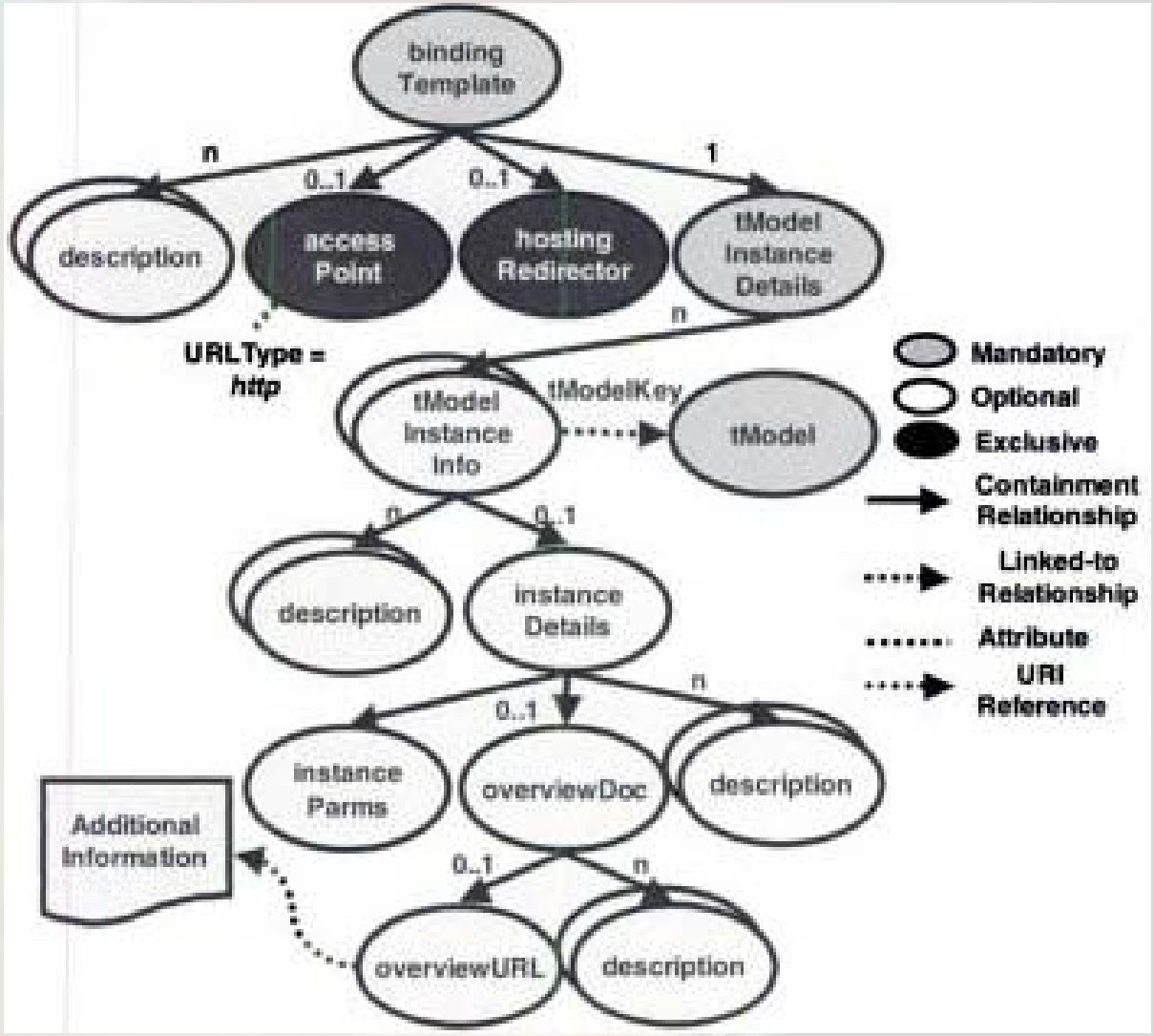
Source, [2]

Category Bag

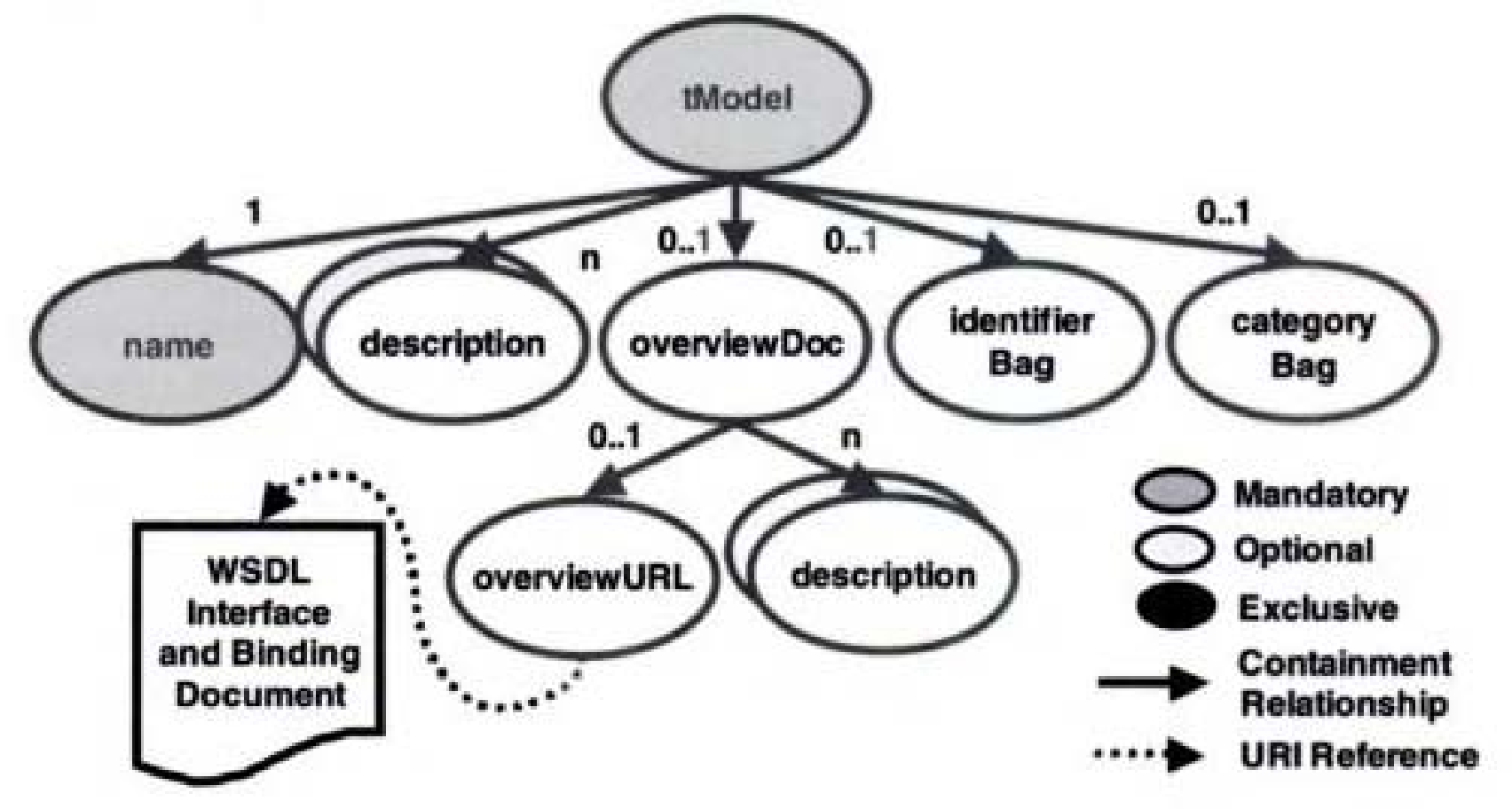
- Consumer must be able to select entities according categories.
  - Helpful, when looking for unknown service.
- Distinct categories like:
  - Region in which the service provider operates.
  - The industry it belongs to.
  - Products it offers to the market.
  - Technical means required to invoke the service.
- Category bag contains: `tModel`, `keyNames` and `keyValues`.
- Some categorization systems:
  - Universal Standard Products and Service Classification system (UNSPSC)
  - North American Industry Classification System (NICS)
  - International Standard for Geographical Regions (ISO 3166)

UDDI Binding Template

A `bindingTemplate` represents the technical description of a web service and exposes its access point information. Source, [2]



The UDDI tModel



Source, [2]

Session Outlines

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- **Linking WSDL documents to a UDDI registry**
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Linking WSDL documents to a UDDI registry

- A web service consumer navigating through the UDDI business entities and services, must:
  - Discover service network address, and
  - Be delegated to an associated WSDL document describing the technical conditions for calling the service.
- UDDI `bindingTemplates` and `tModels` may implement this delegation mechanism.

WSDL authoring for UDDI registers

- WSDL `import` element supports an arbitrary breakup of individual WSDL information entities into separate files.
- The term WSDL *interface and binding* file is used to refer to the file containing the `portType` and `binding` elements.
- The term WSDL *implementation* file indicates the file holding the `service` and `port` elements.
- WSDL implementation file imports the interface and binding file
- The syntax of XML schema `import` element is semantically equivalent to the WSDL `import` element.

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Private versus public UDDI registries

Private UDDI registries

- Have a limited reach, e.g. within a company's intranet or extranet.
- Cann't publish or retrieve information from outside these UDDI registries.

Public UDDI registries

- Also known as *public cloud*.
- Accessible from the Internet.
- Any other company can publish or get information in/from the cloud
- Use a replicated UDDI nodes.
- e.g. IBM, Microsoft, ...etc.
- http://www.uddi.org/register.html`

Summary

During this session we have discussed how to publish WSDL service interfaces in UDDI; So, the following subjects have been covered:

1. UDDI registry structure
2. Linking WSDL documents to a UDDI registry
3. Private versus public UDDI registers

References

1. Extracted from: http://en.wikipedia.org/wiki/UDDI, August 2011.
2. Olaf Zimmermann, Mark Tomlinson, Stefan Peuser, “Perspectives on Web services-Applying SOAP, WSDL and UDDI to real-world projects, 2nd edition, Springer, 2005

Thanks

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