

ID2208 Programming Web Services

Service Discovery UDDI

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Content

UDDI

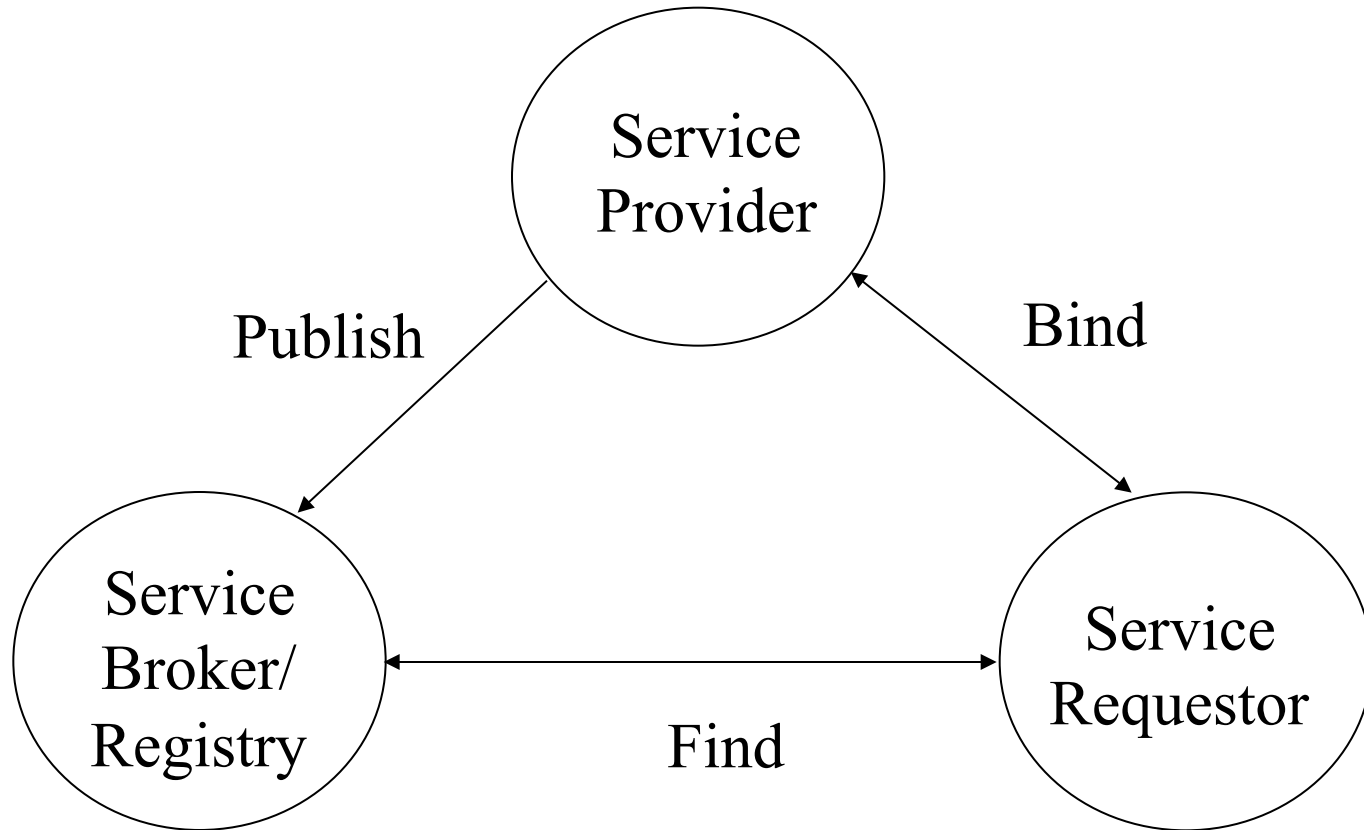
- Introduction
- Discovering mechanisms
- UDDI structure and elements
- UDDI APIs
- Other discovery methods

This lecture reference

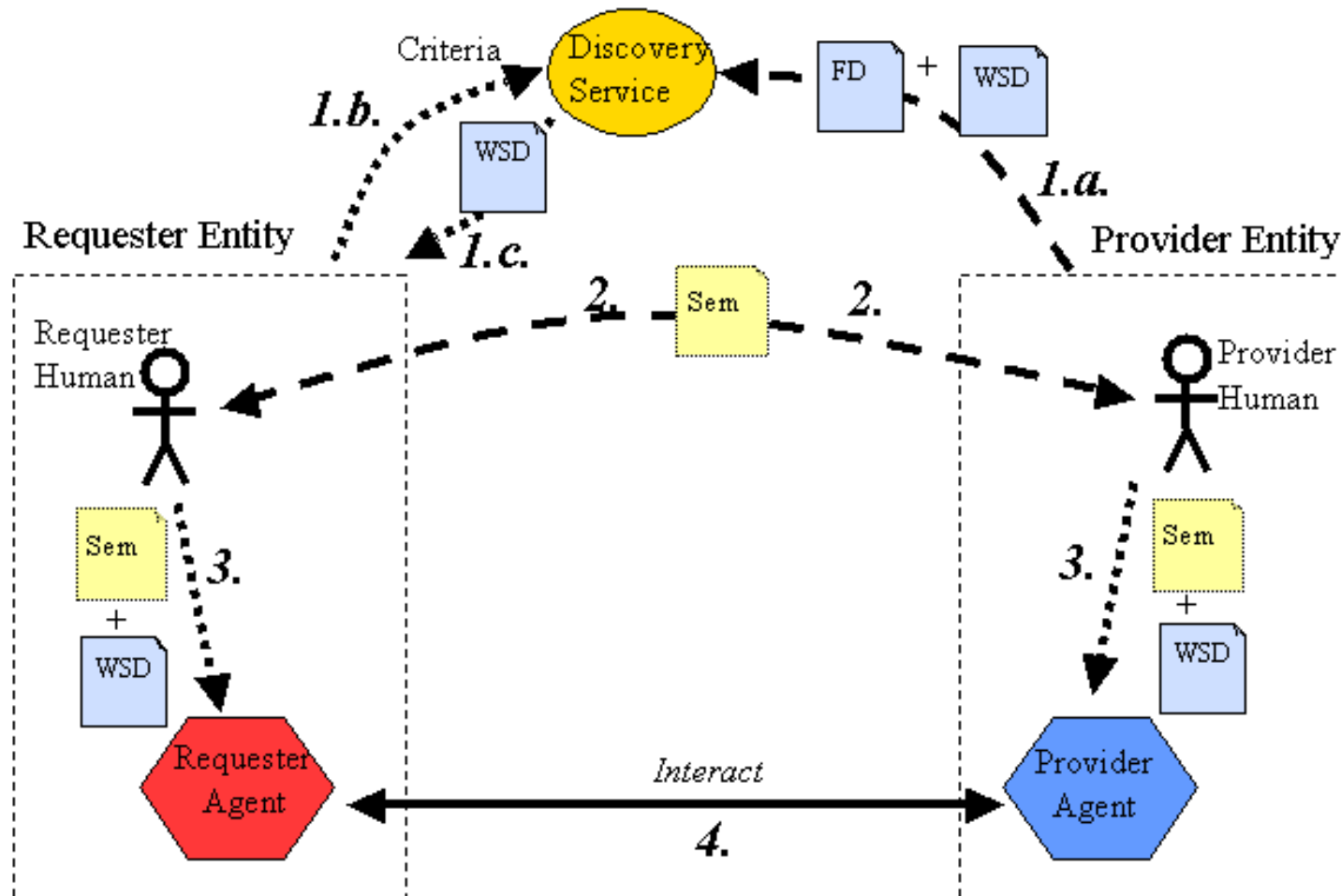
- Text-book **Building Web Services with Java: Making Sense of XML, SOAP, WSDL, and UDDI, 2nd Edition**

Chapter 6

Service Oriented Architecture (individual roles)



Discovery - process of locating services

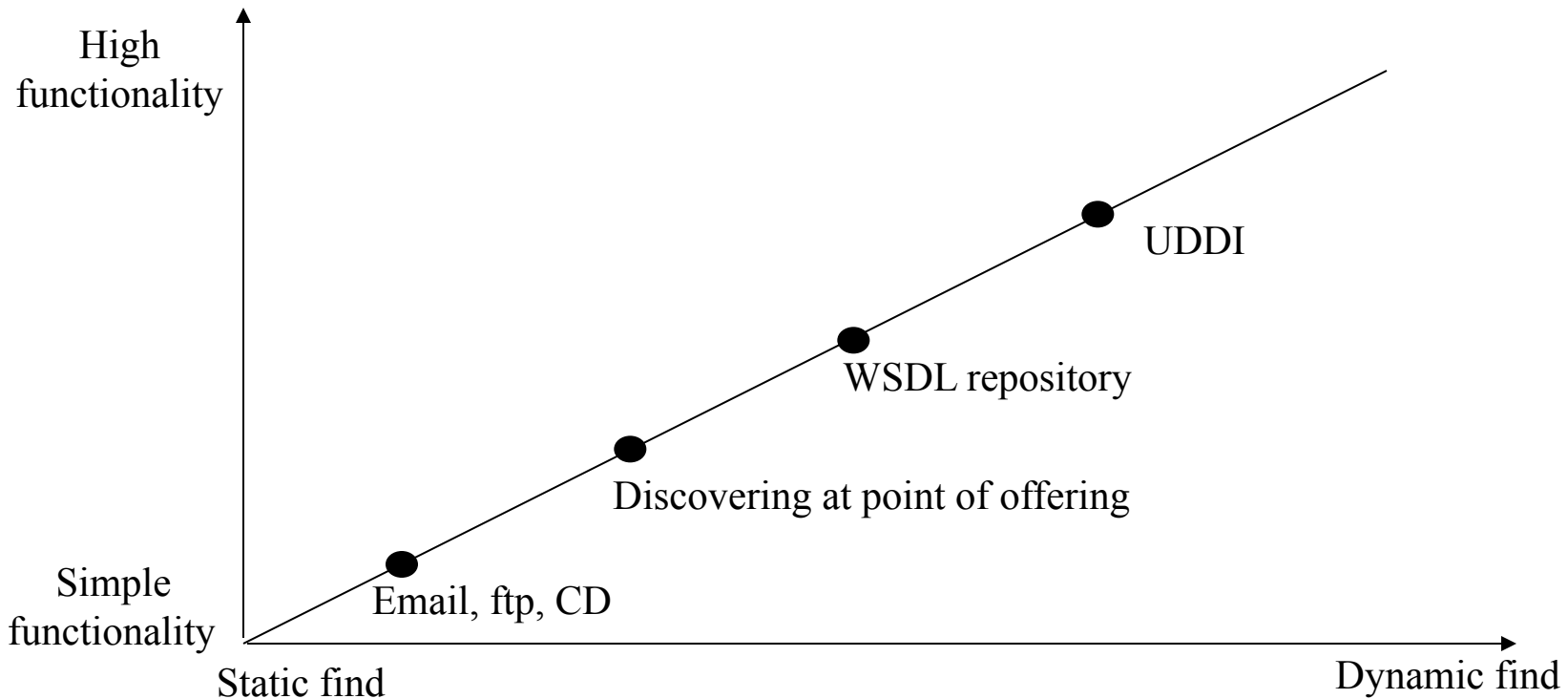


Discovery mechanisms:

- The Registry Approach
- The Index Approach (search)
- Peer-to-Peer (P2P) Discovery

Service registry mechanisms

- Trade-off between simplicity of the registry mechanisms and complexity of publishing/searching techniques



UDDI (Universal Description, Discovery, and Integration)

- First in Sept. 2000 from Ariba and IBM collaboration on B2B, IBM and Microsoft collaboration on XML and SOAP and Microsoft and Ariba collaboration on BizTalk and cXML
- After that combining efforts of more than 300 companies
- After completion of version 3.0 UDDI.org submitted to OASIS to evolve into formal standard
- UDDI version 3.0 has been published as OASIS specifications and it becomes OASIS standard:

<http://www.oasis-open.org/committees/uddi-spec/doc/tcspecs.htm>

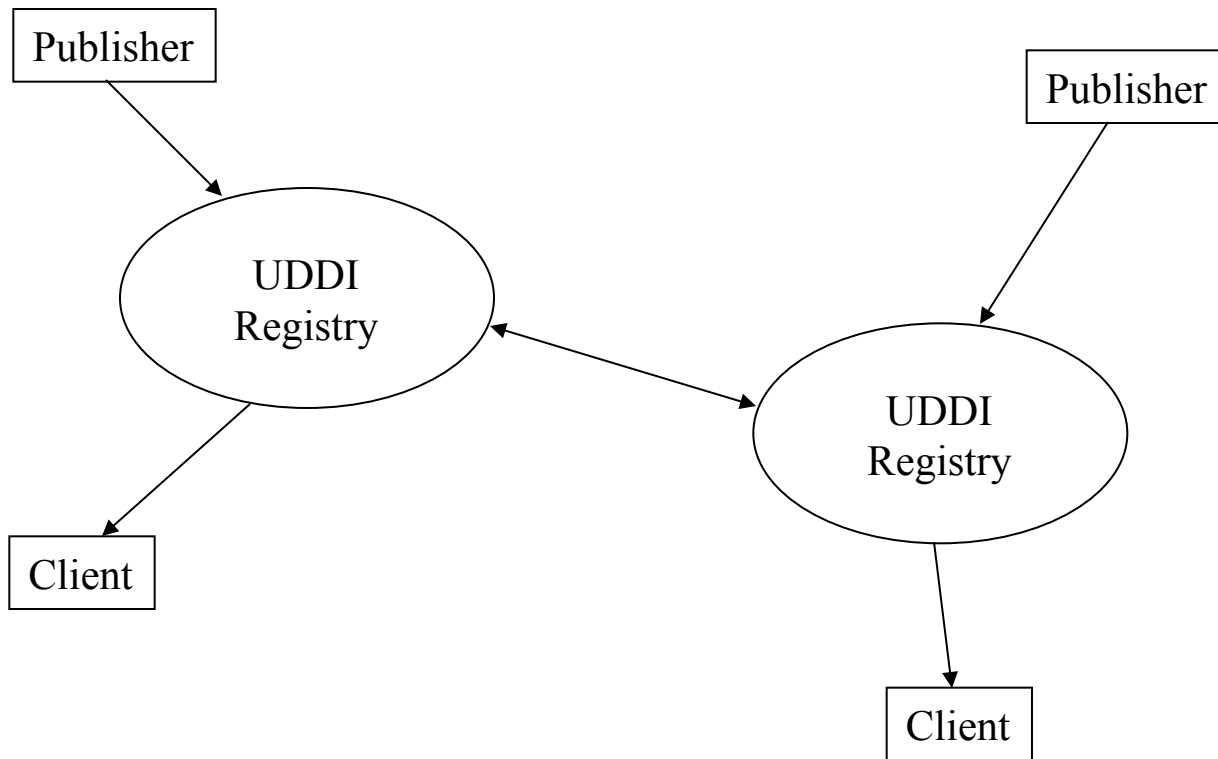
UDDI

- The goal – specification of a framework for describing and discovering Web services
- The core of UDDI revolves around the notion of business registry
- Business registry – a sophisticated naming and directory service
- UDDI defines data structures and APIs for publishing service descriptions in the registry and for querying the registry

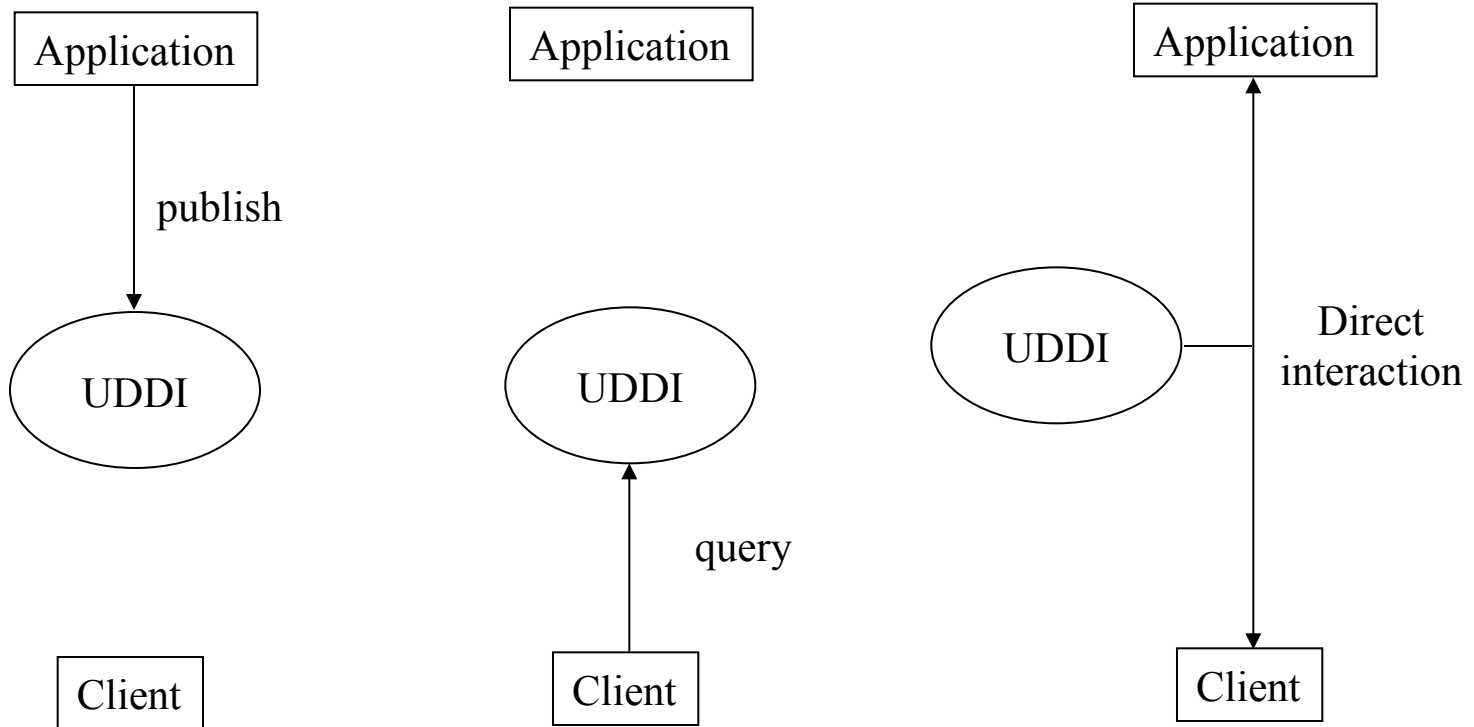
UDDI

- Supports developers in finding information about services
- Enables dynamic binding
- It is not a repository
- Two primary types of registry
 - Public – Universal Business Registry (UBR)
 - Private – can be hosted on the Internet/intranet and has a special purpose

UBR: UDDI



Using UDDI



Registry requirements

- Basic
 - A set of data structure specifications for the metadata to be stored in the registry
 - A set of Create, Read, Update, Delete (CRUD) operations for storing, deleting and querying the data in registry
- Metadata
 - Ownership and containment
 - Categorization
 - A logical referencing mechanism
- Operations
 - Authentication for operations that change information
 - Open access for read and query operations

Discovering Web Services (intermediate summary)

- UDDI – Universal Description Discovery and Integration
- The purpose of UDDI is to facilitate service discovery both at design and dynamically at runtime
- The UDDI Business Registry consists of replicated registries (initially hosted by IBM and Microsoft) called UDDI Operators. The requirement is that different Operator registries should be theoretically indistinguishable
- Private registries are also supported
- UDDI is more than registry – it also defines a set of data structures and API specifications for programmatically registering and finding
- In addition to programmatic API, UDDI registry Operators provide a web-based user interface

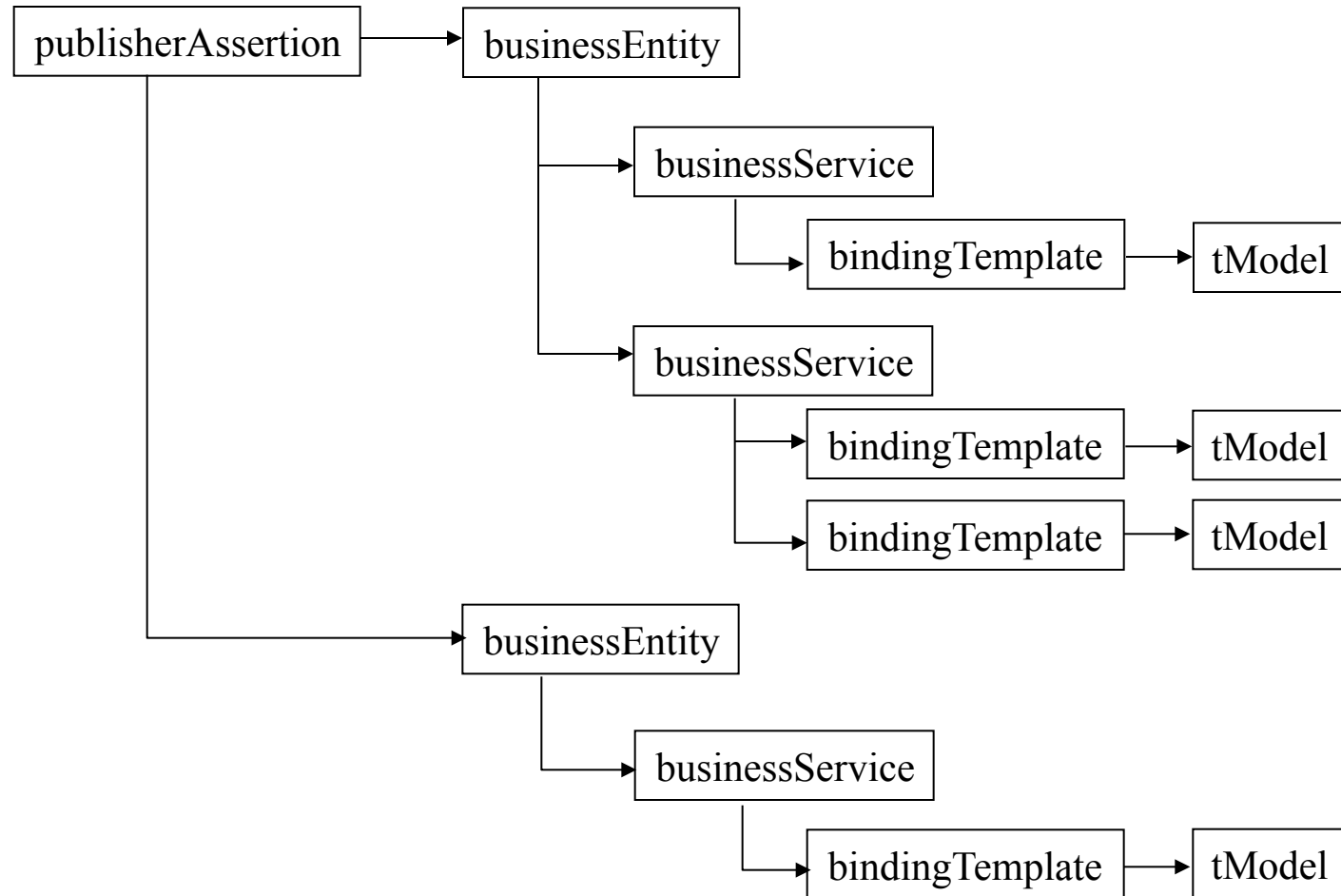
Information in UDDI

- White pages contain general contact information about the entity
- Yellow pages contain classification information about the types and location of the services the entry offers
- Green pages contain information about the details of how to invoke the offered services (technical data regarding the service)

UDDI data structures

- *businessEntity* – it describes an organization that provides Web services (refers to *businessService*)
- *businessService* – describes a group of related Web services offered by a *businessEntity*
- *bindingTemplate* – describes a technical information necessary to use a particular Web service
- *tModel* – a generic container for any kind of specification
- *publisherAssertion* – defines a relationship between two or more *businessEntity* elements
- *subscription* - describes a standing request to keep track of changes to the entities described by the subscription (introduced in 3.0)

UDDI data structures



UDDI

```
<?xml version="1.0" encoding="utf-8" ?>
<businessDetail generic="2.0" xmlns="urn:uddi-org:api_v2" operator="www.ibm.com/services/uddi" truncated="false">
  <businessEntity businessKey="BA744ED0-3AAF-11D5-80DC-002035229C64" operator="www.ibm.com/services/uddi" authorizedName="0100001Qs1">
    <discoveryURLs>
      <discoveryURL useType="businessEntity">http://www.ibm.com/services/uddi/uddiget?businessKey=BA744ED0-3AAF-11D5-80DC-002035229C64
    </discoveryURL>
    </discoveryURLs>
    <name xml:lang="en">XMethods</name>
    <description xml:lang="en">Web services resource site</description>
    <contacts>
      <contact useType="Founder">
        <description xml:lang="en" />
        <personName>Tony Hong</personName>
        <phone useType="Founder" />
        <email useType="Founder">thong@xmethods.net</email>
        <address>
          <addressLine />
          <addressLine />
          <addressLine />
          <addressLine />
          <addressLine />
        </address>
      </contact>
    </contacts>
    <businessServices>
      <businessService serviceKey="D5B180A0-4342-11D5-BD6C-002035229C64" businessKey="BA744ED0-3AAF-11D5-80DC-002035229C64">
        <name xml:lang="en">XMethods Barnes and Noble Quote</name>
        <description xml:lang="en">Returns book price from Barnes and Noble online store, given ISBN</description>
        <bindingTemplates>
          <bindingTemplate bindingKey="D5B61480-4342-11D5-BD6C-002035229C64" serviceKey="D5B180A0-4342-11D5-BD6C-002035229C64">
            <description xml:lang="en">SOAP Binding for tmodel:XMethods Book Quote</description>
            <accessPoint URLType="http">http://services.xmethods.net:80/soap/servlet/rpcrouter</accessPoint>
            <tModelInstanceDetails>
              <tModelInstanceInfo tModelKey="UUID:26D3ABD0-433D-11D5-BD6C-002035229C64" />
            </tModelInstanceDetails>
          </bindingTemplate>
        </bindingTemplates>
      </businessService>
```

UDDI

```
<businessService serviceKey="ED85F000-4345-11D5-BD6C-002035229C64" businessKey="BA744ED0-3AAF-11D5-80DC-002035229C64">
  <name xml:lang="en">XMethods Pacific Bell SMS Service</name>
  <description xml:lang="en">Sends a text message to a subscriber on the PacBell SMS network</description>
  <bindingTemplates>
    <bindingTemplate bindingKey="ED8D1BF0-4345-11D5-BD6C-002035229C64" serviceKey="ED85F000-4345-11D5-BD6C-002035229C64">
      <description xml:lang="en">SOAP Binding for tmodel:XMethods SMS</description>
      <accessPoint URLType="http">http://services.xmethods.net:80/perl/soaplite.cgi</accessPoint>
      <tModelInstanceDetails>
        <tModelInstanceInfo tModelKey="UUID:33F24880-433D-11D5-BD6C-002035229C64" />
      </tModelInstanceDetails>
    </bindingTemplate>
  </bindingTemplates>
</businessService>
<businessService serviceKey="D5921160-3E16-11D5-98BF-002035229C64" businessKey="BA744ED0-3AAF-11D5-80DC-002035229C64">
  <name xml:lang="en">XMethods Delayed Stock Quotes</name>
  <description xml:lang="en">20-minute delayed stock quotes</description>
  <bindingTemplates>
    <bindingTemplate bindingKey="D594A970-3E16-11D5-98BF-002035229C64" serviceKey="D5921160-3E16-11D5-98BF-002035229C64">
      <description xml:lang="en">SOAP binding for delayed stock quotes service</description>
      <accessPoint URLType="http">http://services.xmethods.net:80/soap</accessPoint>
      <tModelInstanceDetails>
        <tModelInstanceInfo tModelKey="UUID:0E727DB0-3E14-11D5-98BF-002035229C64" />
      </tModelInstanceDetails>
    </bindingTemplate>
  </bindingTemplates>
</businessService>
<businessService serviceKey="618167A0-3E64-11D5-98BF-002035229C64" businessKey="BA744ED0-3AAF-11D5-80DC-002035229C64">
  <name xml:lang="en">XMethods Currency Exchange Rates</name>
  <description xml:lang="en">Returns exchange rates between 2 countries' currencies</description>
  <bindingTemplates>
    <bindingTemplate bindingKey="618474E0-3E64-11D5-98BF-002035229C64" serviceKey="618167A0-3E64-11D5-98BF-002035229C64">
      <description xml:lang="en">SOAP binding for currency exchange rates service</description>
      <accessPoint URLType="http">http://services.xmethods.net:80/soap</accessPoint>
      <tModelInstanceDetails>
        <tModelInstanceInfo tModelKey="UUID:E092F730-3E63-11D5-98BF-002035229C64" />
      </tModelInstanceDetails>
    </bindingTemplate>
  </bindingTemplates>
</businessService>
</businessServices>
</businessEntity>
</businessDetail>
```

UDDI

- Unique identifier upon registration
- Identifiers are Universal Unique Identifiers (UUID) that follow the OSF Distributed Computing Environment conventions
- Private UDDI registries are able to extend data structure for own purposes via extensions

Private UDDI keys

- The conceptual space of **uddiKeys** is divided into non-overlapping, hierarchically arranged partitions, each of which can be associated with a publisher.
- Only the publisher associated with a particular partition is given the authority to assign keys within the partition.
- The publisher with authority for a given partition may designate any publisher it chooses for any partition directly below the partition it manages, provided it has not already designated a publisher to that partition.
- The publisher with authority for a partition may transfer its authority to another publisher.
- Initially, the registry itself has authority for the root partition of the hierarchy.
- Each node of a registry is a generator of keys.

UDDI keys in 3.0

The following are examples of legal domainKeys.

`uddi:tempuri.com`

`uddi:us.tempuri.com`

The following is an example of a legal uuidKey.

`uddi:4CD7E4BC-648B-426D-9936-443EAAC8AE23`

The following are examples of legal derivedkeys

`uddi:AC104DCC-D623-452F-88A7-F8ACD94D9B2B:xyzzzy`

`uddi:tempuri.com:fish:buyingservice`

publisherAssertions components

- **fromKey** – a required element that uniquely identifies the business that instantiates the relationship
- **toKey** – a required element that identifies the business that accepts the relationship
- **keyedReference** – a required element that identifies the type of the reference

publisherAssertion

```
<publisherAssertion>  
  <fromKey>  
    78937HD8-8093-AD83-89D8-273977721BCB  
  </fromKey>  
  <toKey>  
    36782168-CDA7-G54H-7262-DE43637838618  
  </toKey>  
  <keyedReference keyName="subsidiary"  
    keyValue="parent-child"  
    tModelkey="uuid:32667826-AD78-8372-GH37-3862868GHA67"/>  
</publisherAssertion>
```

UDDI data structures

- *businessEntity* – it describes an organization that provides Web services (refers to *businessService*)
- *businessService* – describes a group of related Web services offered by a *businessEntity*
- *bindingTemplate* – describes a technical information necessary to use a particular Web service
- *tModel* – a generic container for any kind of specification
- *publisherAssertion* – defines a relationship between two or more *businessEntity* elements
- *subscription* - describes a standing request to keep track of changes to the entities described by the subscription (introduced in 3.0)

businessEntity components

- **businessKey** – a required attribute that contains a unique hexadecimal identifier (UUDI) for the business. The identifier is assigned by the custodian upon registration
- **authorizedName** – an optional attribute that contains the name of the person who published the information
- **operator** – an optional attribute that contains the name of the operator node with which the business registered
- **discoveryURLs** – an optional element contains URLs to discovery documents
- **name** – a required element that contains name of the business
- **description** – an optional element that contains a brief description of the business
- **contacts** – an optional element that contains the business' s contact information
- **businessServices** – an optional element that lists the services offered by the business
- **identifierBag** – an optional element that contains a list of unique identifiers (stock symbol etc) associated with the business
- **categoryBag** – an optional element that contains a list of industry, product or geographic classification

businessEntity

```
<?xml version="1.0" encoding="utf-8" ?>
<businessEntity xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  businessKey="518f01a3-6750-4e36-969e-d3a39c25609b"
  operator="Microsoft Corporation" xmlns="urn:uddi-org:api_v2"
  authorizedName="Adventures Unlimited Travel">
  <discoveryURLs>
    <discoveryURL useType="businessEntity">
      http://uddi.microsoft.com/discovery?businesskey =518f01a3-6750-4e36-969e-d3a39c25609b
    </discoveryURL>
  </discoveryURLs>
  <name xml:lang="en-gb">Travel Adventures Unlimited</name>
  <description xml:lang="en">
    Have unlimited enjoyment and adventure with us on an economical budget.
  </description>
  <contacts>
    <contact>
      <personName>(New Contact Name)</personName>
      <email useType="">UnlimitedTravelAdventures@hotmail.com</email>
    </contact>
  </contacts>
  <businessServices>
    . . . . .
  </businessServices>
</businessEntity>
```

businessEntity

```
<?xml version="1.0" encoding="utf-8" ?>
<businessEntity xmlns:xsd= http://www.w3.org/2001/XMLSchema
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  businessKey="a7497125-ee54-425a-be1e-caaaa3a7e27b" operator="Microsoft Corporation"
  authorizedName="Alessandro Capra" xmlns="urn:uddi-org:api_v2">
  <discoveryURLs>
    <discoveryURL useType="businessEntity"> http://uddi.microsoft.com/discovery?businesskey=
      a7497125-ee54-425a-be1e-caaaa3a7e27b</discoveryURL>
  </discoveryURLs>
  <name xml:lang="en">Travel Net Solution SPA</name>
  <description xml:lang="en">Travel Net Solution SPA</description>
  <contacts>
    <contact useType="">
      <description xml:lang="en">Travel Net Solution SPA</description>
      <personName>Alessandro Capra</personName>
      <phone useType="Office">+39 2 81838404</phone>
      <email useType="">a.capra@travelnetsolution.it</email>
      <address sortCode="" useType="">
        <addressLine>Via A Binda,21</addressLine>
        <addressLine>20143 Milano</addressLine>
      </address>
    </contact>
  </contacts>
  <businessServices>
    . . .
  </businessServices>
  <categoryBag>
    <keyedReference tModelKey="uuid:a035a07c-f362-44dd-8f95-e2b134bf43b4"
      keyName="Travel" keyValue="Travel Net Solution" />
  </categoryBag>
  <identifierBag >
    <keyedReference tModelKey="uuid:c0b9fe13-179f-413d-8a5b-5004db8e5bb2"
      keyName="Scheduled Passenger Air Transportation" keyValue="481111" />
  </identifierBag>
</businessEntity>
```

businessService components

- **serviceKey** – a required attribute that contains a unique, hexadecimal identifier for a service
- **businessKey** – attribute that references the **businessKey** of the **businessEntity** structure
- **name** – a required element that contains the name(s) of a service
- **description** – an optional brief description of the service
- **bindingTemplate** – a required structure that contains technical information about a service
- **categoryBag** – optional element that contains a list of industry, product or geographic classifications

businessService

```
<businessService
  serviceKey="30ae4249-900f-4ab2-bfa6-c347212853a1"
  businessKey="518f01a3-6750-4e36-969e-d3a39c25609b">
  <name xml:lang="en-gb">
    Travel Service
  </name>
  <description xml:lang="en">
    Have unlimited enjoyment and adventure with us on an
    economical budget.
  </description>
  <bindingTemplates>
    .
    .
    .
  </bindingTemplates>
</businessService>
```

bindingTemplate components

- **bindingKey** – a required attribute that contains a unique identifier that is assigned by the operator node upon registration
- **serviceKey** – an attribute that references the **serviceKey** of the **businessService** element.
- **description** – an optional element that contains brief descriptions of Web services
- **accessPoint** – an element that states *where* to access Web service. Required if **hostingRedirector** is not specified.
 - Valid types: **mailto**, **http**, **https**, **ftp**, **fax**, **phone**, ...
- **hostingRedirector** – an element contains a link to another **bindingTemplate** structure, which contains the description of a particular service. This element is required if **accessPoint** is not specified
- **tModelInstanceDetails** – a list of one or more **tModelInstanceInfo** elements. The collection of **tModelKey** attributes found in the **tModelInstanceInfo** elements together form the "technical fingerprint" of a Web service that can be used to identify compatible services.

bindingTemplate

```
<bindingTemplate
  bindingKey="5d2e9262-ed3f-4fa9-8a3f-62b0df61cb4b"
  serviceKey="30ae4249-900f-4ab2-bfa6-c347212853a1">
  <accessPoint URLType="http">
    http://202.166.63.228/WSCAProvider3/P3Service.asmx
  </accessPoint>
  <tModelInstanceDetails />
</bindingTemplate>
```

bindingTemplate

```
<bindingTemplates>
  <bindingTemplate bindingKey="b2aa5fc6-076a-42d4-ba02-88f7d23e37cd"
    serviceKey="d08fadb4-a8c5-4ae9-96d7-71dafb0a1149">
    <description xml:lang="en">Travel Web Service</description>
    <accessPoint URLType="http">
      http://wse.biztravel.it
    </accessPoint>
    <tModelInstanceDetails />
  </bindingTemplate>
  <bindingTemplate bindingKey="6867633e-761d-4652-9518-30fa0f8e2376"
    serviceKey="d08fadb4-a8c5-4ae9-96d7-71dafb0a1149">
    <description xml:lang="it">
      Servizi Web per Voli Aerei
    </description>
    <accessPoint URLType="http">
      http://wse.biztravel.it/Air/Air.asmx?WSDL
    </accessPoint>
    <tModelInstanceDetails>
      <tModelInstanceInfo tModelKey=
        "uuid:68DE9E80-AD11-469D-8A37-088422BFBC36" />
    </tModelInstanceDetails>
  </bindingTemplate>
</bindingTemplates>
```

tModel

- Reusable abstractions are referred as technological modes and their corresponding UDDI structure is **tModel**
- **tModel** allows to specify abstract definitions of service types that can be used and combined in creating own services
- **tModel** refers to any technical specification or prearranged agreements on how to conduct business.
- **tModel** can define a namespace that is used to identify business entities or classify entities, services and **tModels**

tModel components

- **tModelKey** – a required attribute that identifies the **tModel**. The identifier is assigned by the custodian upon registration.
- **authorizedName** – an optional attribute that contains the name of the individual who published the information
- **operator** – an optional attribute that contains the name of the custodian
- **name** – a required element that contains a descriptive identifier for the **tModel**. Service consumer can use name to perform a search for a given **tModel**
- **description** – an optional element that describes the **tModel**
- **overviewDoc** – an optional element that redirects users to additional references (F/E WSDL document). Includes: **description** and **overviewURL**
- **identifierBag** – an optional element containing a list of unique identifiers associated with the business. Has **keyedReference** element
- **categoryBag** – an optional element that contains a list of industry, product or geographic classifications

UDDI Usage Model (Data Structures)

tModel: Primary used to provide pointers to external technical specifications.

```
<tModel
  tModelKey="UUID:0E727DB0-3E14-11D5-98BF-002035229C64"
    operator="www.ibm.com/services/uddi"
      authorizedName="0100001QS1">
  <name>XMethods Simple Stock Quote</name>
  <description xml:lang="en">
    Simple stock quote interface
  </description>
  <overviewDoc>
    <description xml:lang="en">wsdl link</description>
    <overviewURL>
      http://www.xmethods.net/tmodels/SimpleStockQuote.wsdl
    </overviewURL>
  </overviewDoc>
</tModel>
```

tModel for SkateTown

```
<tModel tModelKey="uuid:7B581129-7926-5202-AB17-74A234F21BA5">
  <name>Purchase order submission service</name>
  <description xml:lang="en">Interface for purchase order submission service</description>
  <overviewDoc>
    <description xml:lang="en">Reference to the WSDLdocument that contains the
      PO definition </description>
    <overviewURL>
      http://www.skatestown.com/services/poSubmissionInterface.wsdl
    </overviewURL>
  </oveviewDoc>
  <identifierBag>
    <keyReference keyName="DUNS" keyValue="00-111-1111"
      tModelKey="uuid:5483FGJ-8373-ADR2-89TR-YT26782UOK48"/>
  </identifierBag>
  <identifierBag>
    <keyReference keyName="DUNS" keyValue="00-222-2222"
      tModelKey="uuid:5483F76-8373-AD12-8932-HD2678276548"/>
  </identifierBag>
  <categoryBag>
    <keyReference keyName="uddi-org:types:soap" keyValue="soapSpec"
      tModelKey="uuid:C1ACF26D-9672-4404-9D70-39B756E62AB4"/>
    <keyReference keyName="uddi-org:types:wsdl" keyValue="wsdlSpec"
      tModelKey="uuid:C1ACF26D-9672-4404-9D70-39B756E62AB4"/>
    <keyReference keyName="Sport equipment and accessories" keyValue="49221500"
      tModelKey="uuid:54245FGH-8273-AD12-8935-122634576833"/>
  </categoryBag>
</tModel>
```

tModel for e-Torus marketplace

```
<tModel tModelKey="uuid:54872739-243I-34HG-76H2-947ABH870948">
  <name>e-Torus purchase order submission service</name>
  <description xml:lang="en">This is a standard interface for purchase
    order submission service</description>
  <overviewDoc>
    <description xml:lang="en">Reference to the WSDLdocument that
      contains the e-Torus standard service definition </description>
    <overviewURL useType="wsdlInterface">
      http://www.e-Torus.com/services/poSubmission.wsdl
    </overviewURL>
  </oveviewDoc>
  <identifierBag>
    <keyReference keyName="DUNS" keyValue="00-222-2222"
      tModelKey="uuid:5483F76-8373-AD12-8932-HD2678276548"/>
  </identifierBag>
  <categoryBag>
    <keyReference keyName="uddi-org:types:soap" keyValue="soapSpec"
      tModelKey="uuid:C1ACF26D-9672-4404-9D70-39B756E62AB4"/>
    <keyReference keyName="uddi-org:types:wsdl" keyValue="wsdlSpec"
      tModelKey="uuid:C1ACF26D-9672-4404-9D70-39B756E62AB4"/>
    <keyReference keyName="Sport equipment and accessories"
      keyValue="49221500"
      tModelKey="uuid:54245FGH-8273-AD12-8935-122634576833"/>
  </categoryBag>
</tModel>
```

Changes in Binding Templates for Skates Town

```
<bindingTemplate bindingKey="3F7ABC88-14F2-AEF2-41AE-F86E52908A11"
  serviceKey="4C379407-3E1E-DC97-B1C7-F68597DA4ADB">
  <description>SOAP based purchase order submission service.</description>
  <accessPoint URLType="http">
    http://www.skatestown.com/services/poSubmission
  </accessPoint>
  <tModelInstanceDetails>
    <tModelInstanceInfo tModeKey="uuid:7B581129-7926-5202-AB17-74A234F21BA5">
      <description>Reference to tModel Web service interface definition
    </description>
    </tModelInstanceInfo>
  </tModelInstanceDetails>
</bindingTemplate>
```

```
<bindingTemplate bindingKey="3F7ABC88-14F2-AEF2-41AE-F86E52908A11"
  serviceKey="4C379407-3E1E-DC97-B1C7-F68597DA4ADB">
  <description>SOAP based purchase order submission service.</description>
  <accessPoint URLType="http">
    http://www.skatestown.com/services/poSubmission
  </accessPoint>
  <tModelInstanceDetails>
    <tModelInstanceInfo tModeKey="uuid:54872739-243I-34HG-76H2-947ABH870948">
      <description>Reference to tModel Web service interface definition
    </description>
    </tModelInstanceInfo>
  </tModelInstanceDetails>
</bindingTemplate>
```

tModel for UDDI

```
<tModel tModelKey="uuid:5468ASDE-22II-34KI-76H2-9474JJYKJ0948">
  <name>uddi-org:publication_v3</name>
  <description>UDDI Publication API V3.0</description>
  <overviewDoc>
    <overviewURL useType="wsdlInterface">
      http://uddi.org/wsdluddi_api_v3_binding.wsdl#UDDI_Publication_SoapBinding
    </overviewURL>
  </overviewDoc>
  <overviewDoc>
    <overviewURL useType="text">
      http://uddi.org/pubs/uddi_v3.htm#pubV3
    </overviewURL>
  </overviewDoc>
  <categoryBag>
    <keyReference keyName="uddi-org:types:wsdl" keyValue="wsdlSpec"
      tModelKey="uuid:C1ACF26D-9672-4404-9D70-39B756E62AB4"/>
    <keyReference keyName="uddi-org:types:soap" keyValue="soapSpec"
      tModelKey="uuid:C1ACF26D-9672-4404-9D70-39B756E62AB4"/>
    <keyReference keyName="uddi-org:types:xml" keyValue="xmlSpec"
      tModelKey="uuid:C1ACF26D-9672-4404-9D70-39B756E62AB4"/>
    <keyReference keyName="uddi-org:types:specification"
      keyValue="specification"
      tModelKey="uuid:C1ACF26D-9672-4404-9D70-39B756E62AB4"/>
  </categoryBag>
</tModel>
```

Categorization and identification

- Categorization – process of creating categories
- Classification – process of assigning objects to the predefined categories
- UDDI provides a method for performing intelligent search through taxonomic categorization and classification
- UDDI defines built-in classification schemas:
 - Classifying businesses by industry – the North American Industry Classification System (NAICS)
 - Products and services classification – the Universal Standard Products and Services Classification (UNSPSC)
 - Geographic location specification – the ISO 3166

Using classification

```
<categoryBag>
  <keyedReference keyName="Sporting and Athletic Goods
    Manufacturing"
    keyValue="33992"
    tModelKey="uuid:C0B9FE13-179F-413D-8A5B-5004DB8E5BB2" />
  <keyedReference keyName="New York"
    keyValue="US-NY"
    tModelKey="uuid:4E49A8D6-D5A2-4FC2-93A0-0411D8D19E88" />
</categoryBag>
```

Defining classification

```
<tModel tModelKey="uuid:3D4EC875-E54F-4D8D-9CBF-346D48BCAD9C">
  <name>Yahoo! Business taxonomy</name>
  <description xml:lang="en">Yahoo! Business taxonomy</description>
  <categoryBag>
    <keyedReference keyName="uddi-org:Yahoo! Category"
      keyValue="categorization"
      tModelKey="uuid:C1ACF26D-9672-4404-9D70-39B756E62AB4" />
  </categoryBag>
</tModel>
```

```
<categoryBag>
  <keyedReference keyName="Sporting and Athletic Goods Manufacturing"
    keyValue = "33992"
    tModelKey="uuid:C0B9FE13-179F-413D-8A5B-5004DB8E5BB2" />
  <keyedReference keyName="New York"
    keyValue = "UN-NY"
    tModelKey="uuid:4E49A8D6-D5A2-4FC2-93A0-0411D8D19E88" />
  <keyedReference keyName="Yahoo! Business taxonomy"
    keyValue = "Business_and_Economy/Shopping_and_Services/Sports/
      Skateboarding/Deck_and_Truck_Makers/"
    tModelKey="uuid:3D4EC875-E54F-4D8D-9CBF-346D48BCAD9C" />
</categoryBag>
```

Using identification

```
<identifierBag>  
  <keyedReference keyName="DUNS"  
    keyValue="00-111-1111"  
    tModel=  
      "uuid:8609C81E-EE1F-4D5A-B202-3EB13AD01823" />  
</identifierBag >
```

Defining identification

```
<tModel tModelKey="uuid:F2390501-A240-4470-8A5A-6088EE5B1A14">
  <name> e-Torus registry</name>
  <description xml:lang="en"> e-Torus registry Number
    </description>
  <categoryBag>
    <keyedReference keyName="Unique identifier for member
      companies"
      keyValue="identifier"
      tModelKey="uuid:C1ACF26D-9672-4404-9D70-39B756E62AB4" />
  </categoryBag>
</tModel>
```

```
<identifierBag>
  <keyedReference keyName="DUNS"
    keyValue = "00-11-1111"
    tModel="UUID:8609C81E-EE1F-4D5A-B202-3EB13AD01823" />
  <keyedReference keyName="eTorus Registry"
    keyValue = "12345"
    tModel="uuid:F2390501-A240-4470-8A5A-6088EE5B1A14" />
</identifierBag>
```

Usage UDDI Registry

- UDDI is an instance of Web service
- Its entries can be published and queried using SOAP-based interface
- SOAP-based messages are used for publishing and query operations
- Three main type of users:
 - Service providers
 - Service requesters
 - Other registries

UDDI APIs

- The SOAP body of API messages and responses are XML structures defined in the UDDI specification
- UDDI operations can be applied to
 - businessEntity – business
 - serviceBusiness – service
 - bindingTemplate – binding
 - tModel – tModel
 - publisherAssertions
- UDDI provides 2 basic types of API operations applied to basic components:
 - UDDI Inquiry API – find registry entries (find_) or provide details (get_)
 - UDDI Publishers API – enables add, modify and delete entries (save_ and delete_)

UDDI APIs

- UDDI also defines general purpose operations types:
 - UDDI Security API – allows to get and discard authentication tokens (get_authToken, discard_authToken)
 - UDDI Custody and Ownership Transfer API – enables registries to transfer the custody of information among themselves and to transfer ownership of these structures from one to another (transfer_entities, transfer_custody)
 - UDDI Subscription API enables monitoring of changes in a registry by subscribing to track new, modified and deleted entries (delete_subscription, get_subscriptionResults, get_subscriptions, save_subscriptions)
 - UDDI Replication API – supports replication of information between registries that different registries can be kept synchronized

UDDI API

- The main APIs define a set of SOAP messages that must be understood by any UDDI-conformant registry

	Business	Service	Binding	tModel
Save/Update	<code>save_business</code>	<code>save_service</code>	<code>save_binding</code>	<code>save_tModel</code>
Delete	<code>delete_business</code>	<code>delete_service</code>	<code>delete_binding</code>	<code>delete_tModel</code>
Find	<code>find_business</code>	<code>find_business</code>	<code>find_binding</code>	<code>find_tModel</code>
GetDetail	<code>get_businessDetail</code>	<code>get_serviceDetail</code>	<code>get_bindingDetail</code>	<code>get_tModelDetail</code>

Authentication tokens

- To use publisher's API authentication token is required. It is obtained by **get_authToken**

```
<get_authToken generic="2.0"  
  xmlns="urn:uddi-org:api_v2"  
  userID="userid"  
  cred="password"/>
```
- Authentication token represents an active session with registry – they are usually valid for a defined period of time
- Termination session by **discard_authToken**

UDDI APIs (some specs)

```
<save_business generic="2.0" xmlns="urn:uddi-org:api_v2">
  <authInfo/>
  <businessEntry/> [<businessEntry/> ...] | <uploadRegister/>
    [<uploadRegister/> ...]
</save_business>
```

```
<save_tModel generic="2.0" xmlns="urn:uddi-org:api_v2">
  <authInfo/>
  <tModel/> [<tModel/> ...] | <uploadRegister/> [<uploadRegister/> ...]
</tModel>
```

```
<save_binding generic="2.0" xmlns="urn:uddi-org:api_v2">
  <authInfo/>
  <bindingTemplate/> [<bindingTemplate/> ...]
</save_binding>
```

```
<delete_service generic="2.0" xmlns="urn:uddi-org:api_v2">
  <authInfo/>
  <serviceKey/> [<serviceKey/> ...]
</delete_service>
```

Publishing API (save_business)

```
<save_business generic="2.0" xmlns:"urn:uddi-org:api_v2">
  <authInfo>65EC92F4-21C4-4EA6-B438-9994C4BD24CB</authInfo>
  <businessEntity>
    <name>SkatesTown</name>
    <description xml:lang:"en">
      Provides the best skate products in the world
    </description>
    <contacts>
      <contact useType="Technical Information">
        <description>CTO fro technical information </description>
        <personName>Dean Carrol</personName>
        <phone useType="Main Office">1.212.555.0001</phone>
        <email useType="CTO">dean.carrol@SkatesTown.com</email>
        <email useType="General Information">info@SkatesTown.com</email>
      </contact>
    </contacts>
    <categoryBag>
      <keyedReference keyName="Sporting and Athletic Goods Manufacturing"
        keyValue ="33992"
        tModel="uuid:C0B9FE13-179F-413D-8A5B-5004DB8E5BB2" />
      <keyedReference keyName="New York" keyValue ="UN-NY"
        tModel="uuid:4E49A8D6-D5A2-4FC2-93A0-0411D8D19E88" />
    </categoryBag>
    <identifierBag>
      <keyedReference keyName="DUNS"   keyValue ="00-11-1111"
        tModel="UUID:8609C81E-EE1F-4D5A-B202-3EB13AD01823" />
    </identifierBag>
  </businessEntity>
</save_business>
```

Save business response

```
<businessDetail generic="2.0" operator="UDDIOperator" truncated="false">
  <businessEntity businessKey="uddi:D7B8D630-59E7-11D5-9675-95373BEF0080"
    operator="UDDIOperator" authorizedName="Dean Carrol">
    <discoverURLs>
      <discoverURL>http://www.UDDIOperator.com?businessKey=
        55BB30DA-565A-4EF9-BA2E-83432DFS987S</discoverURL>
    </discoverURLs>
    <name>SkatesTown</name>
    <description xml:lang="en">Provides the best skate products in the world
    </description>
    <contacts>
      <contact useType="Technical Information">
        <description>CTO fro technical information </description>
        <personName>Dean Carrol</personName>
        <phone useType="Main Office">1.212.555.0001</phone>
        <email useType="CTO">dean.carrol@SkatesTown.com</email>
        <email useType="General Information">info@SkatesTown.com</email>
      </contact>
    </contacts>
    <categoryBag>
      <keyedReference keyName="Sporting and Athletic Goods Manufacturing"
        keyValue="33992" tModel="uuid:C0B9FE13-179F-413D-8A5B-5004DB8E5BB2" />
      <keyedReference keyName="New York" keyValue="UN-NY"
        tModel="uuid:4E49A8D6-D5A2-4FC2-93A0-0411D8D19E88" />
    </categoryBag>
    <identifierBag>
      <keyedReference keyName="DUNS" keyValue="00-11-1111"
        tModel="UUID:8609C81E-EE1F-4D5A-B202-3EB13AD01823" />
    </identifierBag>
  </businessEntity>
</businessDetail>
```

Save business update

```
<save_business generic="2.0" xmlns:"urn:uddi-org:api_v2">
  <authInfo>87CD1C7F-2D23-4324-A927-82B557134DF8</authInfo>
  <businessEntity businessKey="uddi:D7B8D630-59E7-11D5-9675-95373BEF0080"
    operator="UDDIOperator" authorizedName="Dean Carrol">
    <discoverURLs> <discoverURL>http://www.UDDIOperator.com?businessKey=
      55BB30DA-565A-4EF9-BA2E-83432DFS987S</discoverURL>
    </discoverURLs>
    <name>SkatesTown</name>
    <description xml:lang:"en">Provides the best skate products in the world
    </description>
    <contacts>
      <contact useType="Technical Information">
        <description>CTO fro technical information </description>
        <personName>Dean Carrol</personName>
        <phone useType="Main Office">1.212.555.0001</phone>
        <email useType="CTO">dean.carrol@SkatesTown.com</email>
        <email useType="General Information">info@SkatesTown.com</email>
      </contact>
    </contacts>
    <categoryBag>
      <keyedReference keyName="Sporting and Athletic Goods Manufacturing"
        keyValue ="33992" tModel="uuid:C0B9FE13-179F-413D-8A5B-5004DB8E5BB2" />
      <keyedReference keyName="New York" keyValue ="UN-NY"
        tModel="uuid:4E49A8D6-D5A2-4FC2-93A0-0411D8D19E88" />
    </categoryBag>
    <identifierBag>
      <keyedReference keyName="DUNS" keyValue ="00-11-1111"
        tModel="UUID:8609C81E-EE1F-4D5A-B202-3EB13AD01823" />
    </identifierBag>
  </businessEntity>
</save_business>
```

Save_business - Java

```
...
public class PublishBusinessEntity {
    // Location of UDDI registry
    String publishURL = "https://uddi.ibm.com/testregistry/publishapi";
    // Create the businessEntity and then process the save_business operation.
    protected void saveBusiness(String userid, String password) throws Exception {
        UDDIProxy uddiProxy = null;
        // Add SSL support (this is IBM's SSL support but it can be replaced with other
        System.setProperty("java.protocol.handler.pkgs", "com.ibm.net.ssl.internal.www.protocol");
        java.security.Security.addProvider(new com.ibm.jsse.JSSEProvider());
        // Create UDDI proxy
        uddiProxy = new UDDIProxy();
        uddiProxy.setPublishURL(publishURL);
        // Create businessEntity
        BusinessEntity businessEntity = new BusinessEntity();
        businessEntity.setBusinessKey("");
        // Set name and description
        businessEntity.setDefaultNameString("SkatesTown", "en");
        Vector description = new Vector();
        description.add(new Description("UDDI businessEntity for SkatesTown.", "en"));
        businessEntity.setDescriptionVector(description);
        // Create contact
        Contact ctoContact = new Contact("Dean Carroll");
        ctoContact.setUseType("Technical Information");
        ctoContact.setDefaultDescriptionString("CTO for technical information");
        Vector phoneList = new Vector();
        Phone mainPhone = new Phone("1.212.555.0001");
        mainPhone.setUseType("Main Office");
        phoneList.add(mainPhone);
        ctoContact.setPhoneVector(phoneList);
        Vector emailList = new Vector();
        Email email = new Email("dean.carroll@SkatesTown.com");
        email.setUseType("CTO");
        emailList.add(email);
        email = new Email("info@SkatesTown.com");
        email.setUseType("General Information");
        emailList.add(email);
        ctoContact.setEmailVector(emailList);
    }
}
```

Save_business – Java (cont.)

```
// Set contacts
contacts.add(ctoContact);
contacts.add(salesContact);
businessEntity.setContacts(contacts);

// Set identifierBag
IdentifierBag identifierBag = new IdentifierBag();
Vector keyedReferenceList = new Vector();
keyedReferenceList.add(new KeyedReference("DUNS", "00-111-1111", "uuid:8609C81E-EE1F-4D5A-B202-3EB13AD01823"));
identifierBag.setKeyedReferenceVector(keyedReferenceList);
businessEntity.setIdentifierBag(identifierBag);

// Set categoryBag
CategoryBag categoryBag = new CategoryBag();
keyedReferenceList = new Vector();
keyedReferenceList.add(new KeyedReference("Sporting and Athletic Goods
    Manufacturing", "33992", "uuid:C0B9FE13-179F-413D-8A5B-5004DB8E5BB2"));
keyedReferenceList.add(new KeyedReference("New York", "US-NY", "uuid:4E49A8D6-D5A2-4FC2-
    93A0-0411D8D19E88"));
categoryBag.setKeyedReferenceVector(keyedReferenceList);
businessEntity.setCategoryBag(categoryBag);

// Obtain authToken using get_authToken UDDI API
AuthToken authToken = uddiProxy.get_authToken(userid, password);

// Save businessEntity
Vector businessEntityList = new Vector();
businessEntityList.add(businessEntity);
BusinessDetail businessDetail = uddiProxy.save_business(authToken.getAuthInfoString(),
    businessEntityList);

// Get businessKey for published businessEntity
String businessKey = ((BusinessEntity)
    businessDetail.getBusinessEntityVector().elementAt(0)).getBusinessKey();

// Display businessKey
System.out.println("Published businessEntity key: " + businessKey + ".");
}
```

publisherAssertions

- Set of APIs in UDDI:
 - `add_publisherAssertions,`
 - `delete_publisherAssertions,`
 - `get_publisherAssertions...`
- Publishers of both **businessEntity** have to make the same assertion in order to complete the assertion

Find APIs

```
<find_business generic="2.0" [maxRows="nn"] xmlns="urn:uddi-org:api_v2">
  [<findQualifiers/>
  <name/> | <identifierBag/> | <categoryBag/> | <tModelBag/> |
  <discoveryURLs/>
</find_business>
```

```
<find_service generic="2.0" [maxRows="nn"] businessKey="uuid_key"
  xmlns="urn:uddi-org:api_v2">
  [<findQualifiers/>
  <name/> | <categoryBag/> | <tModelBag/>
</find_service>
```

```
<find_tModel generic="2.0" [maxRows="nn"] xmlns="urn:uddi-org:api_v2">
  [<findQualifiers/>
  <name/> | <identifierBag/> | <categoryBag/>
</find_tModel>
```

```
<find_binding generic="2.0" serviceKey=uuid_key" [maxRows="nn"]
  xmlns="urn:uddi-org:api_v2">
  [<findQualifiers/>
  <tModelBag/>
</find_binding>
```

Find_business by name

```
<find_business generic="2.0" maxRows="2" xmlns="urn:uddi-org:api_v2">
  <findQualifiers>
    <findQualifier>SortByDateDesc</findQualifier>
  </findQualifiers>
  <name>S</name>
</find_business>
```

```
<businessList generic="2.0" operator:"UDDIOperator"
  truncated="false" xmlns="urn:uddi-org:api_v2">
  <businessInfos>
    <businessInfo businessKey="0B345610-57A4-11D5-A554-AB7D0DF538B6">
      <name>SEMC</name>
      <description> Sport Equipment Manufacturing Consortium
    </description>
      <serviceInfos> . . .</serviceInfors>
    </businessInfo>
    <businessInfo businessKey="D7B8D630-59E7-11D5-9675-95373BEF0080">
      <name>SkateTown</name>
      <description>Provides the best skate products in the world
    </description>
      <serviceInfos>. . .</serviceInfors>
    </businessInfo>
    . . .
  </businessInfos>
</businessList>
```

Find_business by category

```
<find_business generic="2.0" maxRows="2" xmlns="urn:uddi-org:api_v2">
  <findQualifiers>
    <findQualifier>SortByDateDesc</findQualifier>
  </findQualifiers>
  <categoryBag>
    <keyedReference keyName="Sporting and Athletic Goods Manufacturing"
      keyValue="33992"
      tModel="uuid:C0B9FE13-179F-413D-8A5B-5004DB8E5BB2" />
  </categoryBag>
</find_business>
```

```
<businessList generic="2.0" operator="UDDIOperator"
  truncated="false" xmlns="urn:uddi-org:api_v2">
  <businessInfos>
    <businessInfo businessKey="D7B8D630-59E7-11D5-9675-95373BEF0080">
      <name>SkateTown</name>
      <description>Provides the best skate products in the world
      </description>
      <serviceInfos>. . . </serviceInfos>
    </businessInfo>
    . . .
  </businessInfos>
</businessList>
```

Find_business by identifier

```
<find_business generic="2.0" maxRows="2" xmlns="urn:uddi-org:api_v2">
  <findQualifiers>
    <findQualifier>SortByDateDesc</findQualifier>
  </findQualifiers>
  <identifierBag>
    <keyedReference keyName="DUNS"
      keyValue="00-11-1111"
      tModel="UUID:8609C81E-EE1F-4D5A-B202-3EB13AD01823"/>
  </identifierBag>
</find_business>
```

```
<businessList generic="2.0" operator="UDDIOperator"
  truncated="false" xmlns="urn:uddi-org:api_v2">
  <businessInfos>
    <businessInfo businessKey="D7B8D630-59E7-11D5-9675-95373BEF0080">
      <name>SkateTown</name>
      <description>Provides the best skate products in the world
      </description>
      <serviceInfos> . . . </serviceInfos>
    </businessInfo>
    . . .
  </businessInfos>
</businessList>
```

Find_business and Java

```
public class FindBusinessEntity {  
    // Location of UDDI registry  
    String inquiryURL = "http://uddi.ibm.com/testregistry/inquiryapi";  
    // Find the businessEntity and then get its details.  
    protected void getBusinessDetail() throws Exception {  
        UDDIProxy uddiProxy = null;  
        // Create UDDI proxy  
        uddiProxy = new UDDIProxy();  
        uddiProxy.setInquiryURL(inquiryURL);  
        // Create identifierBag  
        IdentifierBag identifierBag = new IdentifierBag();  
        Vector keyedReferenceList = new Vector();  
        keyedReferenceList.add(new KeyedReference("DUNS", "00-111-1111",  
            "uuid:8609C81E-EE1F-4D5A-B202-3EB13AD01823"));  
        identifierBag.setKeyedReferenceVector(keyedReferenceList);  
        // Find the businessEntity using just the identifierBag as a search criteria  
        BusinessList businessList = uddiProxy.find_business((Vector) null,  
            (DiscoveryURLs) null, identifierBag, null, (TModelBag) null,  
            (FindQualifiers) null, 10);  
        // Get businessKey for the first businessEntity found  
        String businessKey = ((BusinessInfo)  
            businessList.getBusinessInfos().get(0)).getBusinessKey();  
        // Display businessKey  
        System.out.println("Key for businessEntity found: " + businessKey + ".");  
        // Get the businessEntity details  
        BusinessDetail businessDetail = uddiProxy.get_businessDetail(businessKey);  
        // Get first business name  
        Name businessName = (Name) ((BusinessEntity)  
            businessDetail.getBusinessEntityVector().elementAt(0)).getNameVector().get(0);  
        // Display business name  
        System.out.println("Name of businessEntity found: " + businessName.getText()  
            + ".");  
    }  
}
```

...

Find_service

```
<find_service generic="2.0" maxRows="10"  
  businessKey="D7B8D630-59E7-11D5-9675-95373BEF0080"  
  xmlns="urn:uddi-org:api_v2">  
  <name>Check Order Status</name>  
</find_service>
```

```
<serviceList generic="2.0" operator:"UDDIOperator"  
  truncated="false" xmlns="urn:uddi-org:api_v2">  
  <serviceInfos>  
    <serviceInfo  
  
      businessKey="D7B8D630-59E7-11D5-9675-95373BEF0080"  
      serviceKey="BFEF1360-5A1F-11D5-8DC6-B0C1144E197E">  
        <name>Check Order Status</name>  
      </serviceInfo>  
    </serviceInfos>  
  </businessList>
```

Find_binding

```
<find_binding generic="2.0" maxRows="10"  
  serviceKey="BFEF1360-5A1F-11D5-8DC6-B0C1144E197E"  
  xmlns="urn:uddi-org:api_v2">  
  <tModelBag>  
    <tModelKey>  
      uuid:68DE9E80-AD09-469D-8A37-088422BFBC36  
    </tModelKey>  
  </tModelBag>  
</find_binding>
```

get_detail APIs

```
<get_businessDetail generic="2.0" xmlns="urn:uddi-org:api_v2">  
  <businessKey/> [<businessKey/> ...]  
</get_businessDetail>
```

```
<get_serviceDetail generic="2.0" xmlns="urn:uddi-org:api_v2">  
  <serviceKey/> [<serviceKey/> ...]  
</get_serviceDetail>
```

```
<get_bindingDetail generic="2.0" xmlns="urn:uddi-org:api_v2">  
  <bindingKey/> [<bindingKey/> ...]  
</get_bindingDetail>
```

```
<get_tModelDetail generic="2.0" xmlns="urn:uddi-org:api_v2">  
  <tModelKey/> [<tModelKey/> ...]  
</get_tModelDetail>
```

get_detail and other

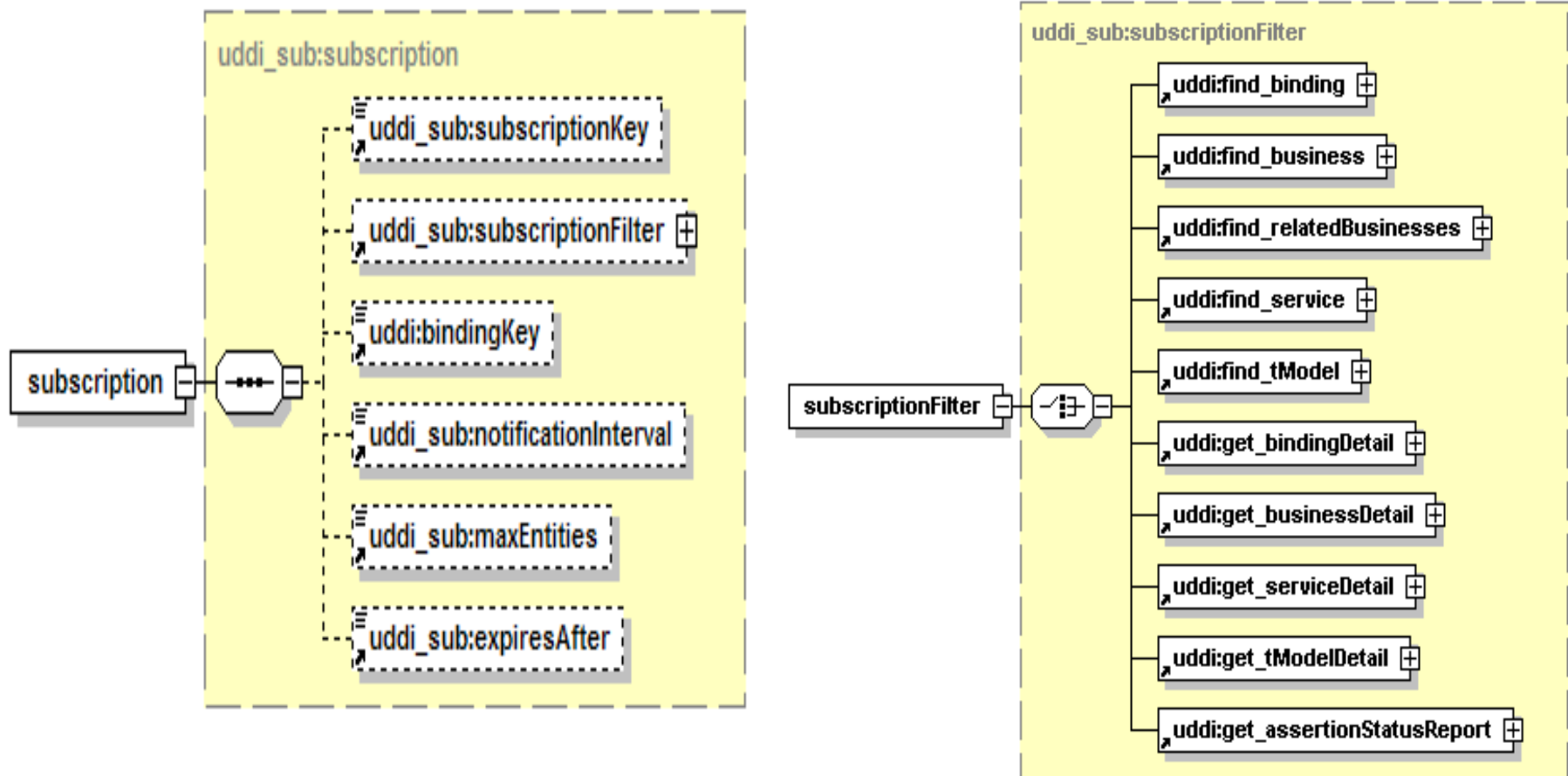
```
<?xml version="1.0" encoding="UTF-8"?>
<get_businessDetail generic="2.0" xmlns="urn:uddi-org:api_v2">
  <businessKey>0B345610-57A4-11D5-A554-AB7D0DF538B6
</businessKey>
</get_businessDetail>
```

. . .

get_businessDetailExt

find_relatedBusinesses

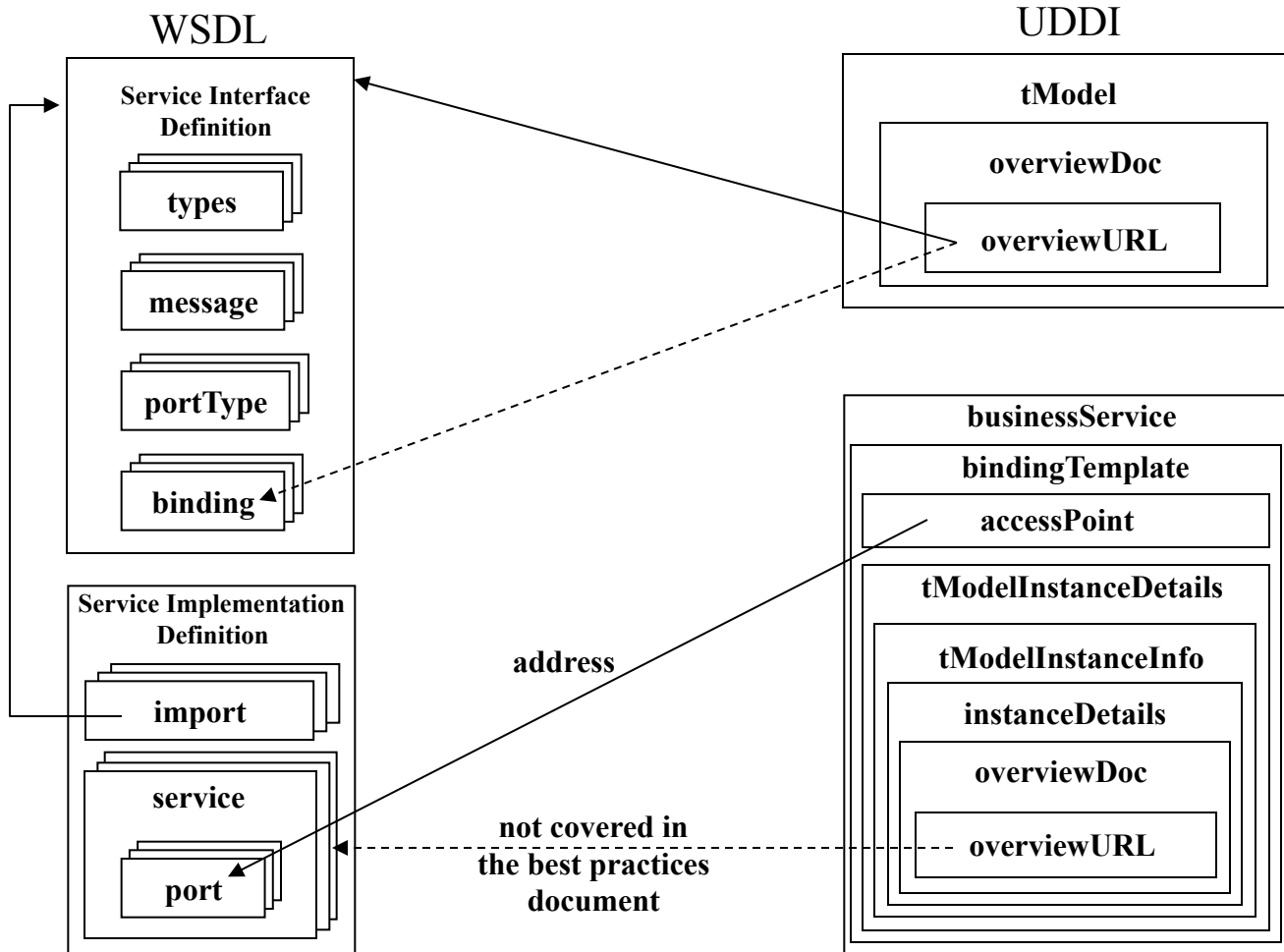
Subscription



Subscription

```
<save_subscription xmlns="urn:uddi-org:sub_v3">
  <authInfo>myAuthCode</authInfo>
  <subscriptions>
    <subscription brief="true">
      <subscriptionFilter>
        <find_service xmlns="urn:uddi-org:api_v3" >
          <findQualifiers>
            . . .
          </findQualifiers>
          <categoryBag>
            <keyedReference
              tModeKey="uddi:uddi.org:ubr:taxonomy:naics"
              keyName="Motor Vehicle Parts" keyValue="42112_" />
          </categoryBag>
        </find_service>
      </subscriptionFilter>
      <bindingKey>
        bindingKeyOfTheClientsNotifySubscriptionListenerService
      </bindingKey>
      <notificationInterval>P5D</notificationInterval>
      <maxEntities>1000</maxEntities>
    </subscription>
  </subscriptions>
</save_subscription>
```

WSDL and UDDI



poSubmission.wsdl (interface definition)

```
<definitions name="poSubmission"
  targetNamespace="http://www.skatestown.com/services/poSubmissionInterface.wsdl"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:po="http://www.skatestown.com/ns/po"
  xmlns:inv="http://www.skatestown.com/ns/invoice" xmlns="http://schemas.xmlsoap.org/wsdl/"
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/">
  . . .
  <!-- Message definitions -->
    <message name="poSubmissionRequest">
      <part name="purchaseOrder" element="po:po"/>
    </message>
    <message name="poSubmissionResponse">
      <part name="invoice" element="inv:invoice"/>
    </message>
  <!-- Port type definitions -->
    <portType name="poSubmissionPortType">
      <operation name="doSubmission">
        <input message="poSubmissionRequest"/>
        <output message="poSubmissionResponse"/>
      </operation>
    </portType>
  <!-- Binding definitions -->
    <binding name="poSubmissionSOAPBinding" type="poSubmissionPortType">
      <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
      <operation name="placePO">
        <soap:operation
          soapAction="http://www.skatestown.com/services/poSubmission/submitPO"/>
        <input>
          <soap:body parts="purchaseOrder" use="literal"/>
        </input>
        <output>
          <soap:body parts="invoice" use="literal"/>
        </output>
      </operation>
    </binding>
  . . .
</definitions>
```

tModel for poSubmission service

```
<tModel tModelKey="uuid:7B581129-7926-5202-AB17-74A234F21BA5">
  <name>Purchase order submission service</name>
  <description xml:lang="en">Interface for purchase order
    submission service</description>
  <overviewDoc>
    <description xml:lang="en">Reference to the WSDLdocument that
      contains the definition </description>
    <overviewURL>
http://www.skatestown.com/services/poSubmissionInterface.wsdl
    </overviewURL>
  </overviewDoc>
  <identifierBag>
    <keyReference keyName="DUNS" keyValue="00-111-1111"
      tModelKey="uuid:7283F314-8373-AD52-891A-CD267826FA48"/>
  </identifierBag>
  <categoryBag>
    <keyReference keyName="uddi-org:types" keyValue="soapSpec"
      tModelKey="uuid:5483F314-8373-AD52-891A-CD267826FA48"/>
    <keyReference keyName="uddi-org:types" keyValue="wsdlSpec"
      tModelKey="uuid:5483F314-8373-AD52-891A-CD267826FA48"/>
    <keyReference keyName="Sport equipment and accessories"
      keyValue="49221500"
      tModelKey="uuid:54245F21-8373-AD32-8911-3226HAC76833"/>
  </categoryBag>
</tModel>
```

poSubmissionImplementation interface

```
<?xml version="1.0" ?>
<definitions name="poSubmissionService"
  targetNamespace=
    "http://www.skatestown.com/services/poSubmissionService.wsdl"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:pop= http://www.skatestown.com/services/interfaces
              /poSubmission.wsdl"
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
  xmlns="http://schemas.xmlsoap.org/wsdl/">

  . . .

<!-- Service definition -->
  <service name="poSubmissionService">
    <port name="poSubmissionSOAPPort"
      binding="pop:poSubmissionSOAPBinding">
      <soap:address location=
        "http://www.skatestown.com/axis/services/submitPO"/>
    </port>
  </service>
</definitions>
```

businessService

```
<businessService serviceKey="4C379407-3E1E-DC97-B1C7-F68597DA4ADB"
  serviceKey="55BB30D8-565A-4EF9-BA2E-83118AED644D"
  <name>Purchase order submission</name>
  <description>SkatesTown purchase order submission service</description>
  <bindingTemplates>
    . . .
    <bindingTemplate bindingKey="3F7ABC88-14F2-!EF2-41AE-F86E52908A11"
      serviceKey="4C370407-3E1E-DC97-B1C7-F68597DA4ADB">
      <description>SOAP based purchase order description service</description>
      <accessPoint URLType="http">
        www.skatestown.com/axis/services/submitPO"
      </accessPoint>
      <tModelInstanceDetails>
        <tModelInstanceInfo
          tModelKey="uuid:7B581129-7926-5202-AB17-74A234F21BA5">
          <description>
            Reference to tModel with Web service interface definition
          </description>
          <instanceDetails>
            <overviewDoc>
              <description>Reference to WSDL service implementation document
              </description>
              <overviewURL>
                http://www.skatestown.com/services/poSubmissionImplementation.wsdl
              </overviewURL>
            </overviewDoc>
          </instanceDetails>
        </tModelInstanceInfo>
      </tmodelInstanseDetails>
    . . .
```

Other discovery methods (WS-Inspection)

- It is developed by IBM and Microsoft.
- It defines how a client application can locate Web services descriptions that reside on a particular Web server
- WS-inspection document is maintained by a service provider's Web server
- If the developer knows the Web server on which a Web service resides the developer can use WS-Inspection to find WSDL document
- If the developer doesn't know the Web server , s/he would use UDDI to locate the service

Other discovery methods (WS-ServiceGroup)

- WS-Resource Framework specification provides the basis for convergence of Web services and Grid worlds
- It defines a method for grouping together Web services and WS-Resources
- Web service is a **Member** which conforms to membership rules and each **Member** is associated with **ServiceGroup**
- **ServiceGroup** can be used to define an aggregation of Web services that form a basic service registry
- The query against a **ServiceGroup** could be used to discover Web services

Next lecture

- WS-Security

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chapter 9