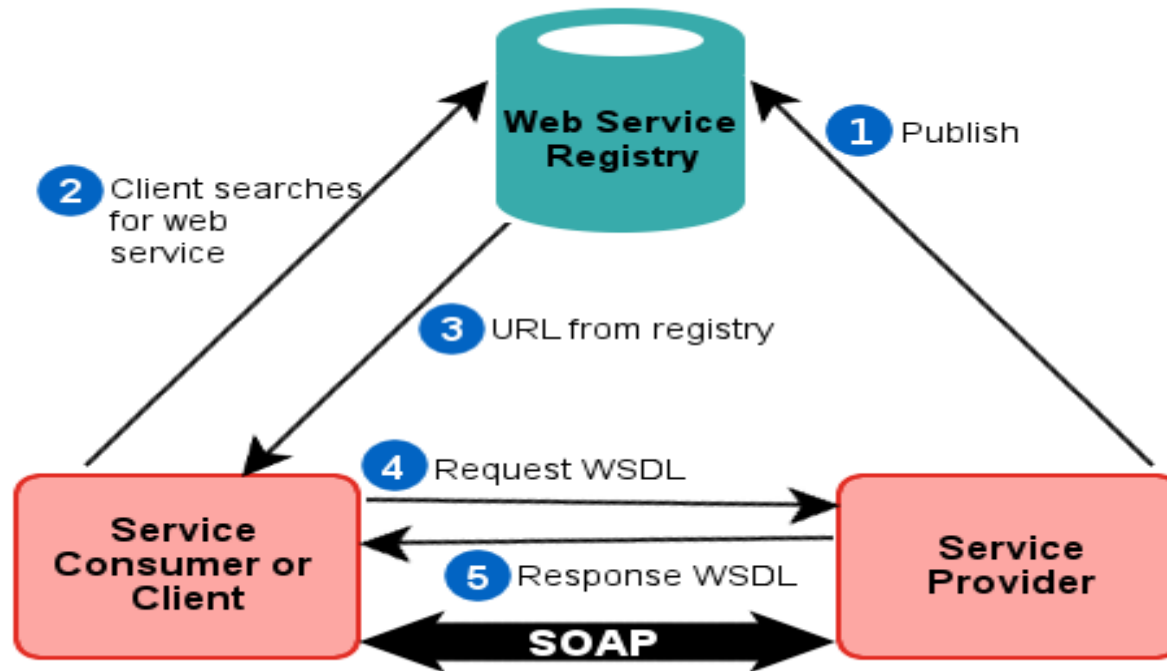




School of Computing & Information Technology
Department of Networks
MSC Data communication & software engineering
Course: Service Oriented Architecture

Different Approaches of Service Discovery



Summary of items

- Web services
 - Registry
 - Discovery
- Service Discovery Approaches
 - Keyword based
 - Ontology based
 - Hybrid approach
 - Context aware approach
 - Semantic web service discovery
 - Web service indexing
 - QoS based approach
 - Collaborative tagging approach
 - Web service Indexing approach

Web Service

A web service is a network accessible interface to application functionality, built using standard Internet technologies XML making it usable by any application irrespective of platform it is developed on.

- It is identified by a URI
- Systems may interact with the service in the manner described by its definition through XML based messages over internet protocols like SOAP
- Requestors of web services dont need to know how it is implemented.

Service Registry

- Based on the UDDI specification
- Stores information about services published by service providers
- Services are published with a description stored using Web Service Description Language WSDL and Uniform resource locator information URL that points to where the service is located
- The service details are stored in a registry

Service Discovery

Is a process of finding a service for a given task over a network by retrieving its web service descriptions previously published

- The WSIL is used to query against a registry for matching services
 - A query has a search criteria followed eg type of service, preferred price, number of returned results
 - The discovery process is also dependent on the architecture of the registry
- After discovery process the service provider/requestor should be able to know
 - Its URI Universal Resource Identifier
 - Its capabilities
 - How to connect and use it

Types of Service Discovery

Static

- Service implementation details are bound at design time and service retrieval is performed on the registry
- Results of the retrieval are examined by a human designer and the returned description is added into the application logic

Dynamic

- The service implementation details are left unbound at design time so that they are determined at runtime
- The requestor has to specify preferences to enable the application to find out which service the requester will want to invoke
- Based on the applications logic QoS considerations the eg best price, performance, security certificates the application chooses the most fit service binds and invokes it

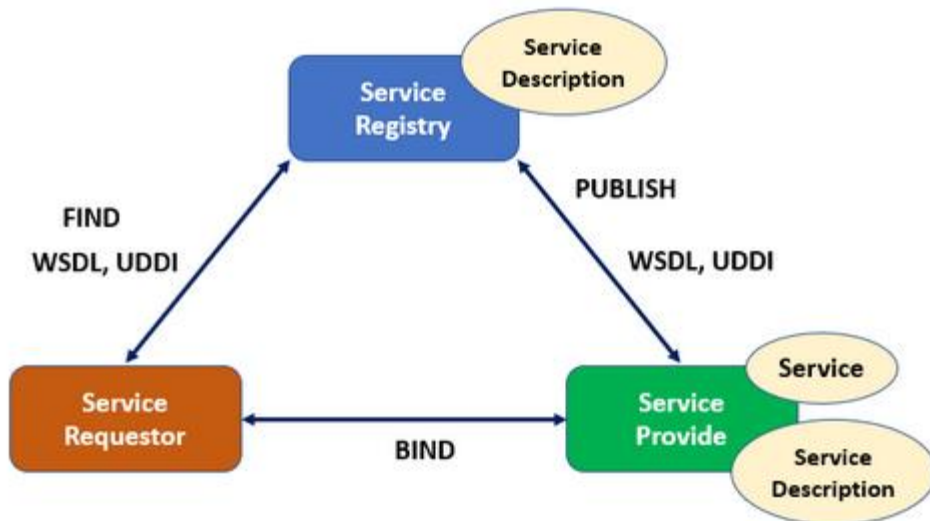
Discovery process actor interaction

1. Registration request for a service description
2. Query for all matching services in the registry
3. Discovery results
4. Request for selected service information
5. Service information of selected service
6. Invocation request including possible inputs
7. Invocation results

Publish – 1

Find – 2, 3, 4 & 5

Bind – 6 & 7



Service Discovery Approaches

Keyword based approach

UDDI - Universal **D**escription **D**iscovery Integration

Is a traditional registry standard for web service description and discovery has a registry facility that supports web service publishing and discovery processes

- It uses a keyword matching based search approach
- It enables a business to
 - Describe its business and its services
 - Discover other businesses that offer required services
 - Integrate with those other businesses
- UDDI registration has
 - White pages – address, contact, other types of contact
 - Yellow pages – classification info based on standard industry taxonomies
 - Green pages – technical capabilities and information about the service

UDDI

- UDDI provides APIs for access to the UDDI system
 - UDDI inquiry – locate and find details about registry entries
 - UDDI publication – publish and modify information in the registry
 - UDDI subscription – subscribe to changes of the registry information
 - UDDI security – for access control to UDDI registry its token based
 - UDDI replication – replication across nodes in a registry
 - UDDI custody and ownership transfer – change owner/publisher of information
- UDDI provides APIs for clients of a UDDI system
 - UDDI subscription listener – client side of the subscription API
 - UDDI value set – validate information provided to the registry
- UDDI enquiry API – used to query for information from the registry to meet the required criteria

Ontology based approach

Ontology is a way of showing the properties of a given subject area and how they are related by defining a set of concepts and categories that represent the subject

- Ontology is built to describe both function and non function attributes of the services and similarity matching based on the ontology is used to discover the web services that are required by the users

Hybrid approach

Service discovery has two main approaches Keyword based and Ontology based where both are used to find a matching web service

- Considers service providers information, service descriptions by providers, service descriptions by users, operation descriptions by providers, tags , categories and QoS attributes
- To find the similarity between query and candidate service the similarity between two operations is calculated first and the similarity between input/output query and web service is calculated using ontology of the web service
- For an operation, input/output each of its message part is mapped to a concept in an ontology

Context aware web discovery approach

This allows for services to be discovered through a context that can either be domain or problem oriented. The context is any information that can implicitly and explicitly affect the users service request

- Explicit - information is provided by the user during matchmaking
- Implicit context – is applicable to a web service discovery as a user is not directly involved

Semantic web discovery approach

Semantic languages eg WSMO WSMO-Lite OWL-S have been created to aid machines in processing web service information and rely on ontologies for reasoning

- Ontologies are created by humans so they contain
 - Machine interpretable relations and concepts
 - Human interpretable meta-data in natural language
- Natural language processing techniques are used to help overcome ambiguity problems between multiple ontologies

Steps

1. Users search with keywords for existing web services described by the semantic web language service annotation
2. Information extraction, word sense disambiguation and matching user search context with web service context means of a similarity measure
3. Results are ranked in a list of web services matching the search criteria

QoS based approach

In Quality of Service QoS approach several services might have the same kind of functionality where the best one fit for purpose should be selected. This can be achieved by using QoS parameters which are ranked based on the QoS certificates got from service publishers

- The main functionality of this approach is a verifier and a certifier which verifies and certifies QoS of a published service
- A service publisher component is responsible for registration, updating and deletion of web service related information in UDDI
- The service publisher is supplied with business specific and performance QoS property values of web services by service providers
- Verification and certification of these properties is then done by a web service discovery agent
- After the service publishes its service functionality to UDDI registry through a service publisher

Collaborative tagging approach

Tags are labels that a user can associate to a specific web service using different keywords provided by different users

- Each tag is assigned a weight which is account of occurrences of a specific tag associated with a web service
- All entered tags are collected in a collection where each tag in a collection is associated with a number of web services forming a resource vector
- The tags are visible to all users who want to access web services
- When a query for a keyword based discovery is sent a matching web service is found by checking whether there is an existing web service having a tag matching exactly the user input

Web service indexing approach

Indexing through one of its mechanisms like inverted indexing, latent inverted indexing and using hashtables can be used to improve service discovery speeds for accurate and efficient web service discovery.

- A request is matched using OWL-S description where the given Id contains the term
- The index will contain a list of key words and the frequency of the keywords in the OWL-S documents
- Every word is connected to a list of document Ids in which that key word occurs

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