# Web Services

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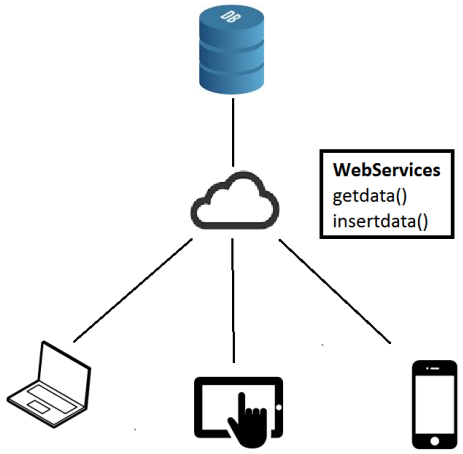
# Definition (I)

- A web service is any piece of software that makes itself available over the internet and uses a standardized XML messaging system. XML is used to encode all communications to a web service.



# Definition (II)

- Web services are self-contained, modular, distributed, dynamic applications that can be described, published, located, or invoked over the network to create products, processes, and supply chains. These applications can be local, distributed, or web-based. Web services are built on top of open standards such as TCP/IP, HTTP, Java, HTML, and XML.
- Web services are XML-based information exchange systems that use the Internet for direct application-to-application interaction. These systems can include programs, objects, messages, or documents.
- A web service is a collection of open protocols and standards used for exchanging data between applications or systems.

# Components of Web Services

- The basic web services platform is XML + HTTP. All the standard web services work using the following components −
  - SOAP (Simple Object Access Protocol)
  - UDDI (Universal Description, Discovery and Integration)
  - WSDL (Web Services Description Language)

# Types of Web Services

- **Web Services with JAX-WS:** is a web service operation invocation is represented by an XML-based protocol, such as SOAP
- **RESTful Web Services:** is well suited for basic, ad hoc integration scenarios. RESTful web services, often better integrated with HTTP than SOAP-based services are, do not require XML messages or WSDL service–API definitions.

# How Does a Web Service Work?

A web service enables communication among various applications by using open standards such as HTML, XML, WSDL, and SOAP.

1. XML to tag the data
2. SOAP to transfer a message
3. WSDL to describe the availability of service.

# XML-RPC

- **XML-RPC** is a remote procedure call (RPC) protocol which uses XML to encode its calls and HTTP as a transport mechanism, It also refers generically to the use of XML for remote procedure call, independently of the specific protocol.
  - XML-RPC is a simple protocol that uses XML messages to perform RPCs.
  - Requests are encoded in XML and sent via HTTP POST.
  - XML responses are embedded in the body of the HTTP response.
  - XML-RPC is platform-independent.
  - XML-RPC allows diverse applications to communicate.
  - A Java client can speak XML-RPC.
  - XML-RPC is the easiest way to get started with web services.

# SOAP

- SOAP is an XML-based protocol for exchanging information between computers.
  - It is a communication protocol.
  - It is for communication between applications.
  - It is a format for sending messages.
  - It is designed to communicate via Internet.
  - It is platform independent.
  - It is language independent.
  - It is simple and extensible.
  - It allows you to get around firewalls.
  - It will be developed as a W3C standard.

# WSDL

- WSDL is an XML-based language for describing web services and how to access them.
  - It stands for Web Services Description Language.
  - It is an XML based protocol for information exchange in decentralized and distributed environments.
  - It is the standard format for describing a web service.
  - It definition describes how to access a web service and what operations it will perform.
  - It is a language for describing how to interface with XML-based services.
  - It is an integral part of UDDI, an XML-based worldwide business registry.
  - It is the language that UDDI uses.

# UDDI

- UDDI is an XML-based standard for describing, publishing, and finding web services.
  - UDDI stands for Universal Description, Discovery, and Integration.
  - UDDI is a specification for a distributed registry of web services.
  - UDDI is platform independent, open framework.
  - UDDI can communicate via SOAP, CORBA, and Java RMI Protocol.
  - UDDI uses WSDL to describe interfaces to web services.
  - UDDI is seen with SOAP and WSDL as one of the three foundation standards of web services.
  - UDDI is an open industry initiative enabling businesses to discover each other and define how they interact over the Internet.

# Example

- http://dev-ag-polaris.xplain.intra:8082/dms/services/dmsWebService?wsdl
  - <wsdl:definitions …>
    - <wsdl:types>
      - <xs:schema xmlns …
        - <xs:element
        - <xs:complexType
    - <wsdl:message …
    - wsdl:portType
      - <wsdl:operation …
    - < wsdl:binding…
      - <wsdl:operation …
    - <wsdl:service …

# Java API for RESTful Web Services

- The Java API for RESTful Web Services (JAX-RS) defines APIs for the development of web services built according to the Representational State Transfer (REST) architectural style. A JAX-RS application is a web application that consists of classes packaged as a servlet in a WAR file along with required libraries.

# RESTful Features

- The web services are completely stateless.
- A caching infrastructure can be leveraged for performance.
- The service producer and service consumer have a mutual understanding of the context and content being passed along.
- Bandwidth is particularly important and needs to be limited.
- Web service delivery or aggregation into existing web sites can be enabled easily with a RESTful style.

# Web Application Description Language (WADL)

- The **Web Application Description Language** (**WADL**) is a machine-readable XML description of HTTP-based web services.
- Given the above definition of a Web application, one can see that the following aspects of an application could be usefully described in a machine processable format:
  - **Set of resources**: analogous to a site map showing the resources on offer.
  - **Relationships between resources**: describing the links between resources, both referential and causal.
  - **Methods that can be applied to each resource**: the HTTP methods that can be applied to each resource, the expected inputs and outputs and their supported formats.
  - **Resource representation formats**: the supported MIME types and data schemas in use.

# Annotations

| Annotatiton | Description |
|---|---|
| @Path | value is a relative URI path indicating where the Java class will be hosted |
| @GET | is a request method. HTTP GET requests |
| @POST | is a request method. HTTP DELETE requests. |
| @PUT | is a request method. HTTP PUT requests. |
| @DELETE | is a request method for the process HTTP DELETE requests. |

# Example

- http://dev-ag-polaris:8082/dms/services/dmsRestService?_wadl
  - <application …
    - <grammars>
      - <xs:schema
        - <xs:element
        - <xs:complexType
      - <resource path="…">
        - <method name="DELETE">

# Testing REST\SOAP Web services

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# First SoapUI Project

- 1.1 Create SOAP Project (In the **Navigator**, which is in the left part of the SoapUI window, right-click **Projects** and select *New SOAP Project*)
- 1.2 Add a WSDL File (In the **WSDL Location** edit box of the dialog, specify the path to the WSDL file or service)
  - http://www.dataaccess.com/webservicesserver/numberconversion.wso?WSDL
  - http://webservices.oorsprong.org/websamples.countryinfo/CountryInfoService.wso?WSDL

# REST project

- 2.1 Create REST Project From URI (In the **Navigator**, right-click **Projects** and select *New REST Project*)
- 2.2. Create REST Project From WADL Definition
  - https://www.soapui.org/getting-started/your-first-soapui-project.html#rest