Introduction to Web Services

Prof. Anand Dave

Department of Information Technology

Dharmsinh Desai University, Nadiad

Introduction To Web Service

- Before we jump into the web service, we have to under stand the term Service Oriented Architecture (SOA).
- SOA consist of Service, Service Orientation and Architectural style.
- What is Service ?
- A service is a ***repeatable business task***. Services are used to ***encapsulate*** the ***functional units*** of an application by providing an ***interface*** that is ***well defined*** and ***implementation independent***.
- Services can be invoked (consumed) by other services or client application
  E.g. : updating cricket scores, stock price etc...

Introduction To Web Service

- What is Service Orientation?
- Service orientation defines a ***method of integrating business applications and processes as linked services***. Here the focus is technology independent concept. (a ***thought process*** and a ***business philosophy).***
- E.g : Amazon, : one can buy an item from any available vendor, irrespective of buyer's location and seller's location. Still a seller can sell a product and buyer can buy a product.
- It includes the product pick up from seller and delivery to buyer.

Introduction To Web Service

- What is Service oriented architecture?
- It is An IT architectural style that supports **service orientation** from the following perspectives:
- Business Perspective : SOA defines a set of business services composed to capture the business design that the enterprise wants to expose internally, as well as its customers and partners.
- Architecture Perspective : SOA is an architectural style that supports service orientation. Architecture is an investment in process, technology, and interface standard for the purpose of improving the organization's capabilities, maximizing business agility, or reducing the cost of IT development and operations

Introduction To Web Service

- What is Service oriented architecture?
- Operational Perspective : SOA includes a set of agreements between service consumers and providers that specify the quality of service, as well as reporting on the key business and IT metrics.

- The Web Service is an implementation of Service Oriented Architecture.

Introduction To Web Service

- What is Web Service ? [A Formal Definition][1]
- A Web Service is a standards-based, language independent software entity, that accepts specially formatted requests from other software entities on remote machines via vendor and transport neutral communication protocols, producing application specific responses.

Introduction To Web Service

- What is Web Service ? [A Formal Definition][2]
- A web service is a collection of open protocols and standards used for exchanging data between applications or systems over the network or Internet.
- Software applications written in various programming languages and running on various platforms can use web services to exchange data over computer networks like the Internet in a manner similar to inter-process communication on a single computer.
- This interoperability (e.g., between Java and Python, or Windows and Linux applications) is due to the use of open standards.

Introduction To Web Service

- Key Terms to look into from the definition of Web Service:
- Standard Based : [Use of standard protocol i.e. HTTP,SOAP,WSDL etc..]
- Language Independent : [In context of data exchange between the requestor and provider i.e. use of XML and implementation]
- In case of RMI requestor and service provider must have access to stub and skeleton, which are again Language dependent [Java] in case of RMI.
- This stub is the standard interface which allows the requestor to make the request to the server [or service provider].
- This stub is acquired by requesting to the RMI registry.
- Service requestor (Client) and Service Provider (Server) must be implemented in Java Only
- This is not the case for the Web Service.
- However, the implementation architecture [components] is more or less similar to RMI.

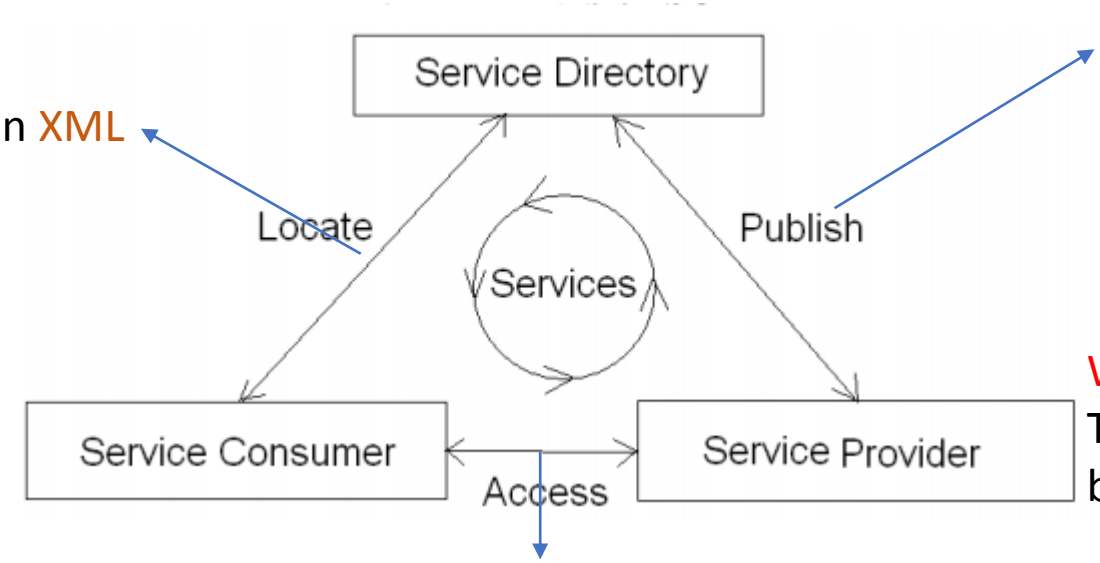
Introduction To Web Service

- Formatted Requested : [SOAP and WSDL both of these are based on XML]
- Remote Accessible : HTTP request-response
- Application Specific Response : SOAP , WSDL and XML

Introduction To Web Service

- Components of the Web Service

Blue Arrow defines the communication



SOAP based on XML

SOAP is based on XML

WSDL : responsible for achieving the Technology Independent Communication based on XML Only

SOAP based on XML

Introduction To Web Service

- What is SOAP and WSDL ?
- SOAP : Simple Object Access Protocol
- WSDL : Web Service Definition Language
- Both of these are using the XML, which actually the driving factor to achieve the language independency and formatted request.

Introduction To Web Service

- What is XML ?
- The eXtensible Markup Language (XML) is a W3C recommendation for creating special-purpose markup languages that enable the structuring, description and interchange of data.
- As the XML it self is Platform and Technology independent language. Exchanging the data with help of the XML is way to achieve the platform and language independency in case of data exchange.

- Documents (xml documents / schema documents) or Data prepared with use of XML documents which are self explained documents.

Introduction To Web Service

- Consider the following XML Document.

<Student>

</Student>

Whenever we want provide the meaning to the data , which we can exchange over the network we have to use the Markup Language which is Platform and Technology Independent.

Introduction To Web Service

- Generally these markup languages are of type key value pair.
- Markup are the Keys and Data is the value of Key
- These key provides the meaning to the data that we store or exchange.
- E.g. are
- Json [“Name:Anand, CPI:8.8..”;”next set and so on..”]
- XML we have already seen.
- Both of above data exchange format uses the plain text during the communication so, the overhead of serialization [Marshaling and Un-Marshaling] is less.
- Later in the course we also look into this.

Introduction To SOAP

- How to get the Formatted Message Structure by which we can exchange the data ?

- Answer : SOAP : Simple Object Access Protocol provides the standard structure of message which are exchanged over the network or in case of web service communication.

Introduction To SOAP

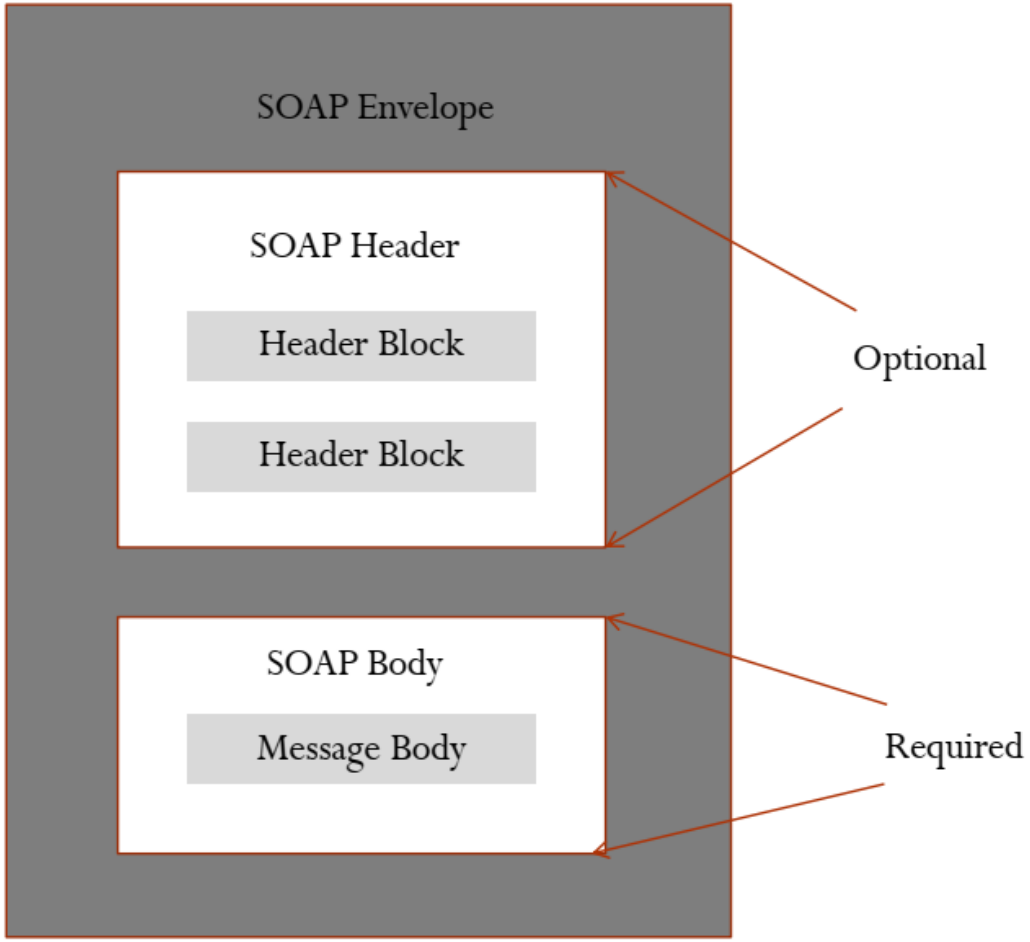
- What is SOAP ?
- SOAP is a lightweight protocol intended for exchanging structured information in a decentralized, distributed environment.
- SOAP uses XML technologies to define an extensible messaging framework, which provides a message construct that can be exchanged over a variety of underlying protocols.
- The framework has been designed to be independent of any particular programming model and other implementation-specific semantics.
- SOAP is a protocol for accessing a Web Service.

Introduction To SOAP

- Why one need to use SOAP ?
- It is important for application development to allow Internet communication between programs.
- A better way to communicate between applications is over HTTP, because HTTP is supported by all Internet browsers and servers. SOAP was created to accomplish this.
- SOAP provides a way to communicate between applications running on different operating systems, with different technologies and programming languages.
- SOAP is web-based or “wired” and hence is not subject to firewall restrictions, Language-independent and Can provide just-in-time service integration.

Introduction To SOAP

- Layout of the SOAP Message :



Introduction To SOAP

- For Interoperability SOAP message is encoded in XML containing the following elements:
- An Envelope element that identifies the XML document as a SOAP message
- A Header element that contains header information
- A Body element that contains call and response information
- A Fault element containing errors and status information
- All the elements above are declared in the default namespace for the SOAP envelope:

http://www.w3.org/2001/12/soap-envelope

and the default namespace for SOAP encoding and data types is:

http://www.w3.org/2001/12/soap-encoding

Introduction To SOAP

- Skeleton SOAP Message

```
<?xml version="1.0"?>
<soap:Envelope
xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
soap:encodingStyle="http://www.w3.org/2001/12/soap-encoding">

<soap:Header>
…
</soap:Header>

<soap:Body>
…
  <soap:Fault>
  …
  </soap:Fault>
</soap:Body>

</soap:Envelope>
```

Introduction To SOAP

- SOAP Envelop Element
- The required SOAP Envelope element is the root element of a SOAP message. This element defines the XML document as a SOAP message.
- The xmlns:soap Namespace It should always have the value of:

"http://www.w3.org/2001/12/soap-envelope".

The namespace defines the Envelope as a SOAP Envelope.

- If a different namespace is used, the application generates an error and discards the message.

Introduction To SOAP

- SOAP Envelop Element
- The encodingStyle Attribute

The encodingStyle attribute is used to define the data types used in the document. This attribute may appear on any SOAP element, and applies to the element's contents and all child elements.

- A SOAP message has no default encoding.

Introduction To SOAP

- The SOAP Header Element
- The optional SOAP Header element contains application-specific information (like authentication, payment, etc..) about the SOAP message.
- SOAP defines three attributes in the default namespace ("http://www.w3.org/2001/12/ soap-envelope").
- These attributes are: mustUnderstand, actor, and encodingStyle.
- The attributes defined in the SOAP Header defines how a recipient should process the SOAP message.

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- The SOAP Header Element
- The mustUnderstand Attribute
- The SOAP mustUnderstand attribute can be used to indicate whether a header entry is mandatory or optional for the recipient to process.
- If you add mustUnderstand="1" to a child element of the Header element it indicates that the receiver processing the Header must recognize the element.
- If the receiver does not recognize the element it will fail when processing the Header.

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- The SOAP Header Element
- The actor Attribute
- A SOAP message may travel from a sender to a receiver by passing different endpoints along the message path. However, not all parts of a SOAP message may be intended for the ultimate endpoint, instead, it may be intended for one or more of the endpoints on the message path.
- The SOAP actor attribute is used to address the Header element to a specific endpoint.

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- SOAP Body Element
- The Request
- The SOAP Body element contains the actual SOAP message.
- SOAP body contains a single element, which represents method call.
- The example above requests the price of apples. Note that the m:GetPrice and the Item elements above are application-specific elements.
- They are not a part of the SOAP namespace

Request

```
<soap:Body>
  <m:GetPrice
xmlns:m="http://www.example.com/prices">
    <m:Item>Apples</m:Item>
  </m:GetPrice>
</soap:Body>
```

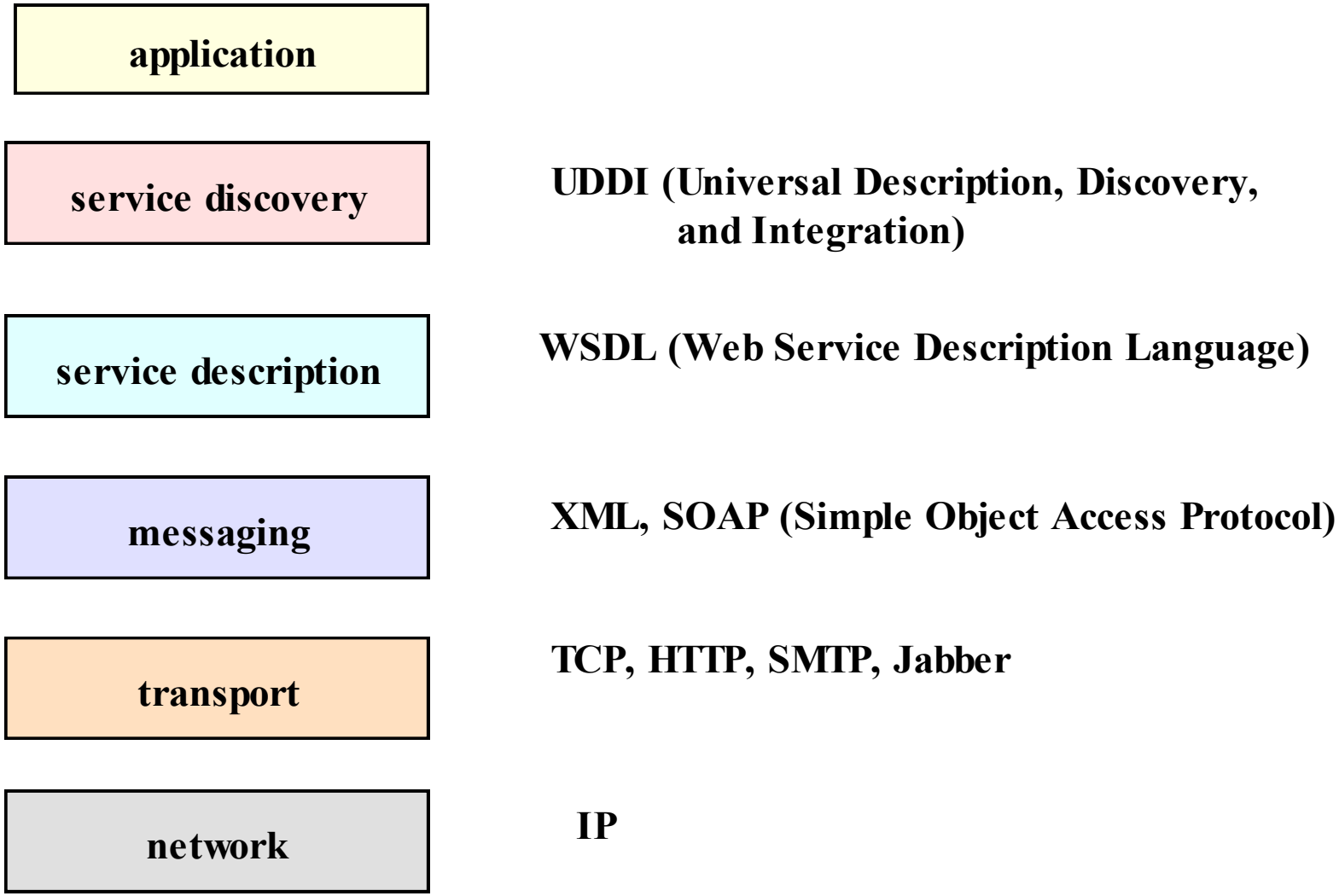
Introduction To SOAP

- SOAP Body Element
- The Response
- The SOAP Body element contains the actual SOAP message.
- SOAP body contains a single element, which represents method call.
- The example above requests the price of apples. Note that the m:GetPrice and the Item elements above are application-specific elements.
- They are not a part of the SOAP namespace

Response

```
<soap:Body>
 <m:GetPriceResponse
xmlns:m="http://www.example.com/prices">
   <m:Price>1.90</m:Price>
 </m:GetPriceResponse>
</soap:Body>
```

Web Service Application Stack



Thank you