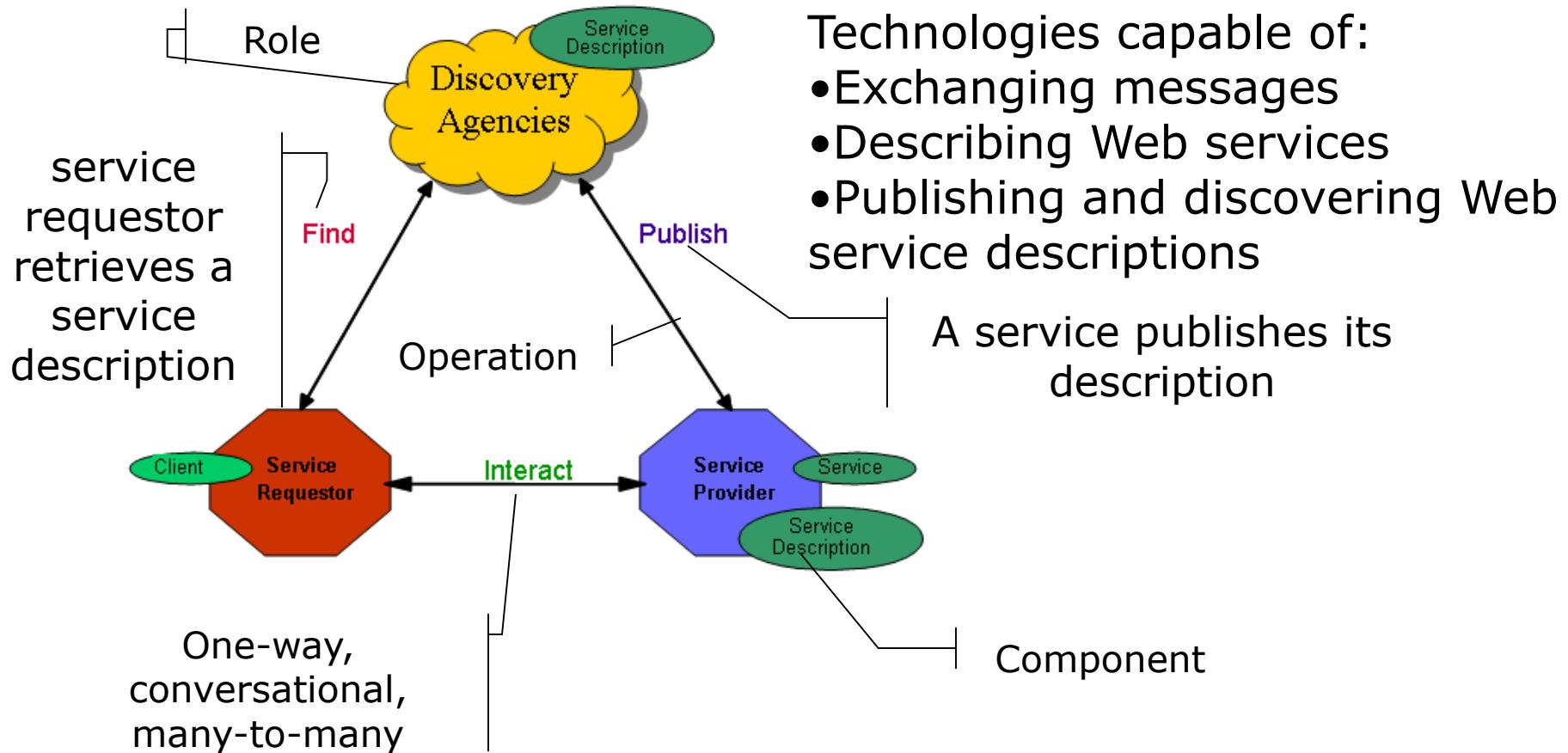


Web Services - Definition from W3C

“ A Web service is a software system identified by a URI, whose public interfaces and bindings are defined and described using XML. Its definition can be discovered by other software systems. These systems may then interact with the Web service in a manner prescribed by its definition, using XML based messages conveyed by internet protocols.”

Service Oriented Architectures

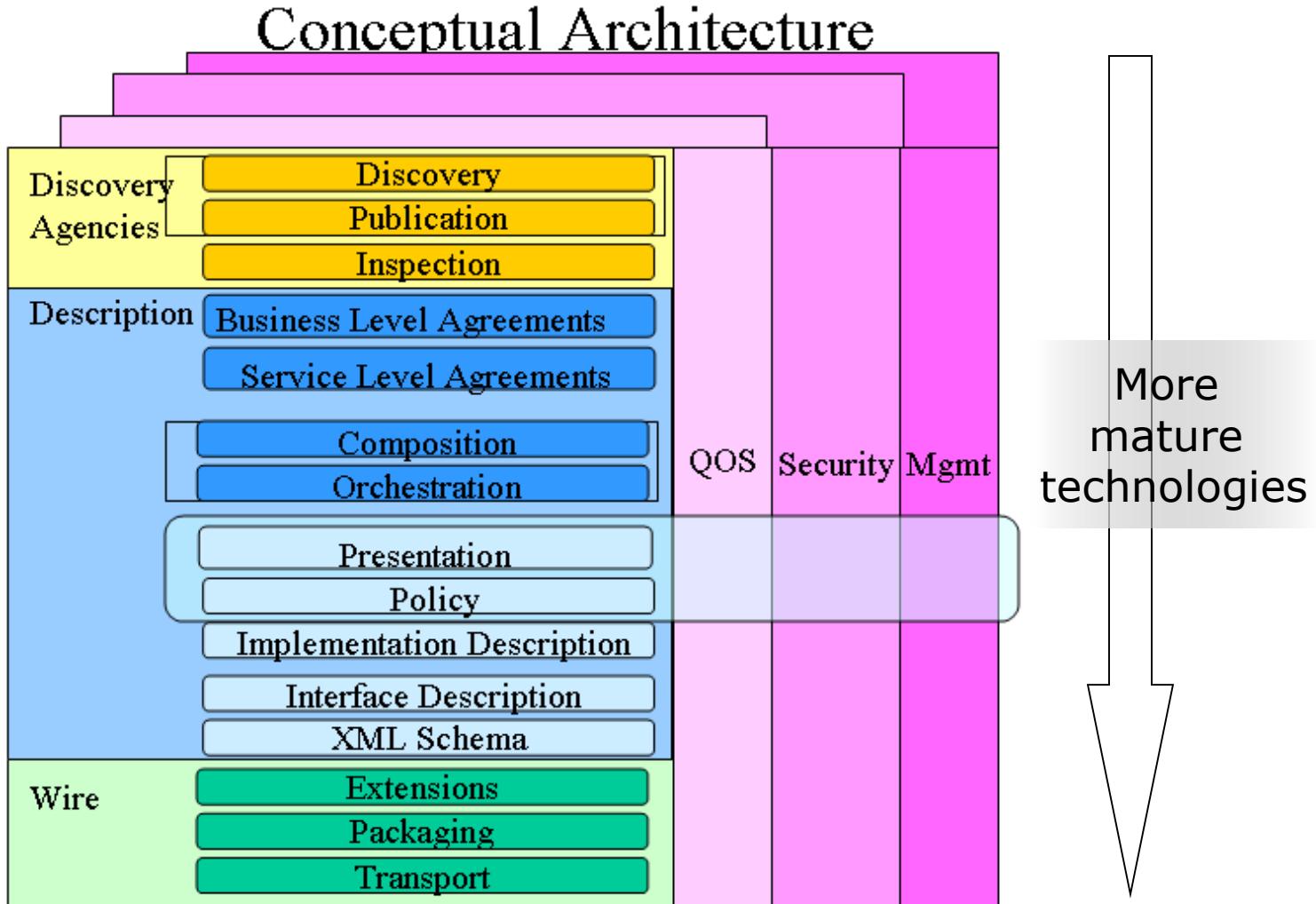
Service Oriented Architecture



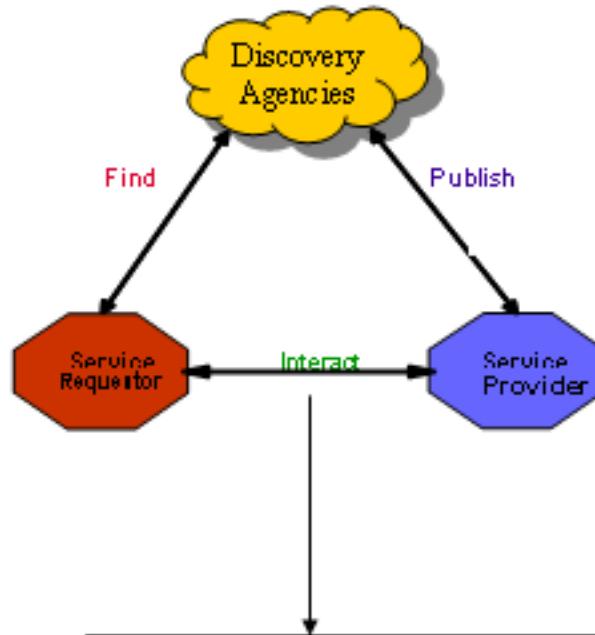
Web Services – Architectural Extensions

- Incorporates additional features and functionality by extending technologies and components defined within the basic architecture, such as:
 - Asynchronous messaging
 - Attachment – typical usage : associating binary data with SOAP messages.
 - Caching
 - Message exchange pattern (MEP) - Describes a generalized pattern of message exchange between two services. e.g. : one-way, request/response, publish/subscribe, and broadcast.
 - Reliable message - implementation of Reliable Messaging one MEP is a series of requests between two nodes with an acknowledgement SOAP Module.
 - Message confidentiality – Can transmit the message via SSL or TLS, or have a SOAP Module provides for encryption and decryption.
 - Message integrity – Can have a SOAP Module use digital signature.
 - Session

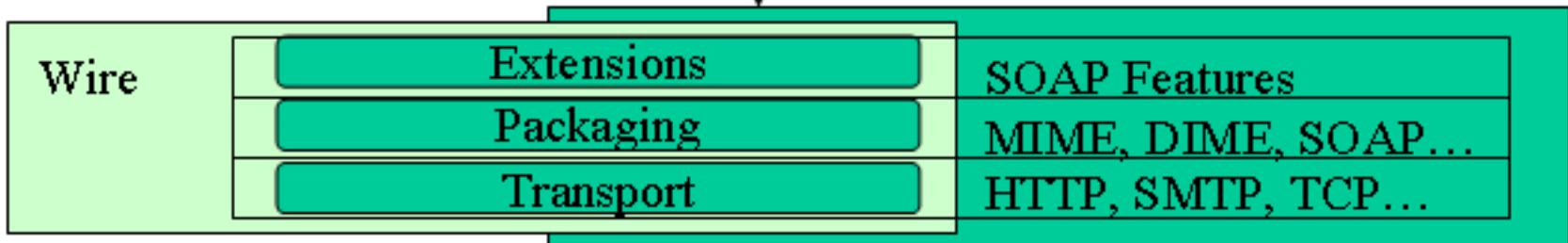
The Complete Web Services "Stack"



The Wire Stack



- Transport: HTTP is the de facto, other may be supported.
- Packaging: SOAP is the de facto standard for XML messaging.
- Extensions :
Additional information attached to web services messages.

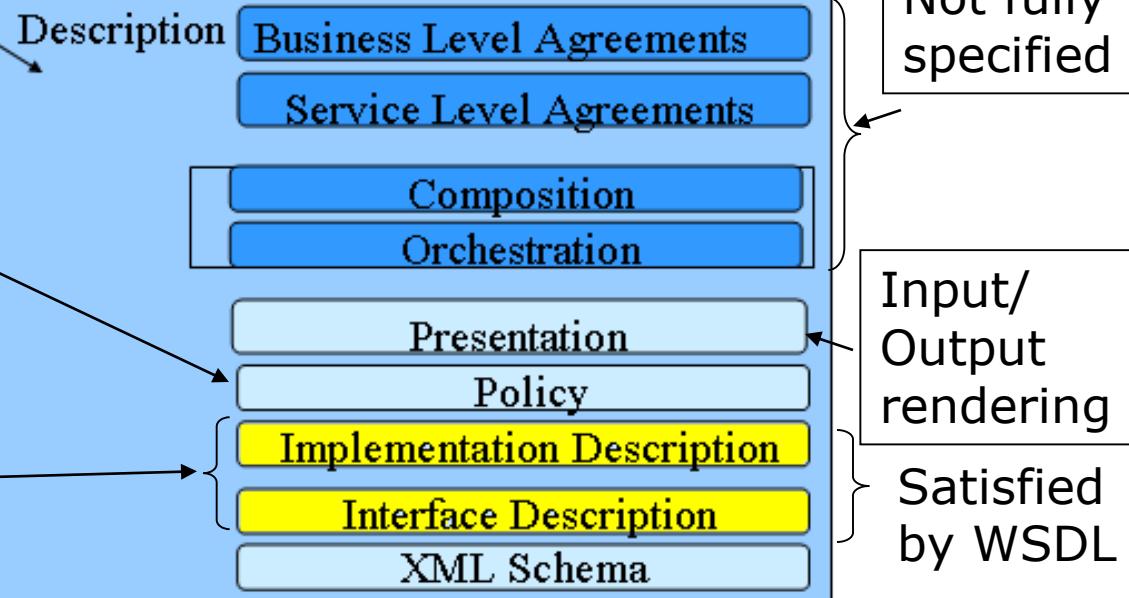


The Description Stack



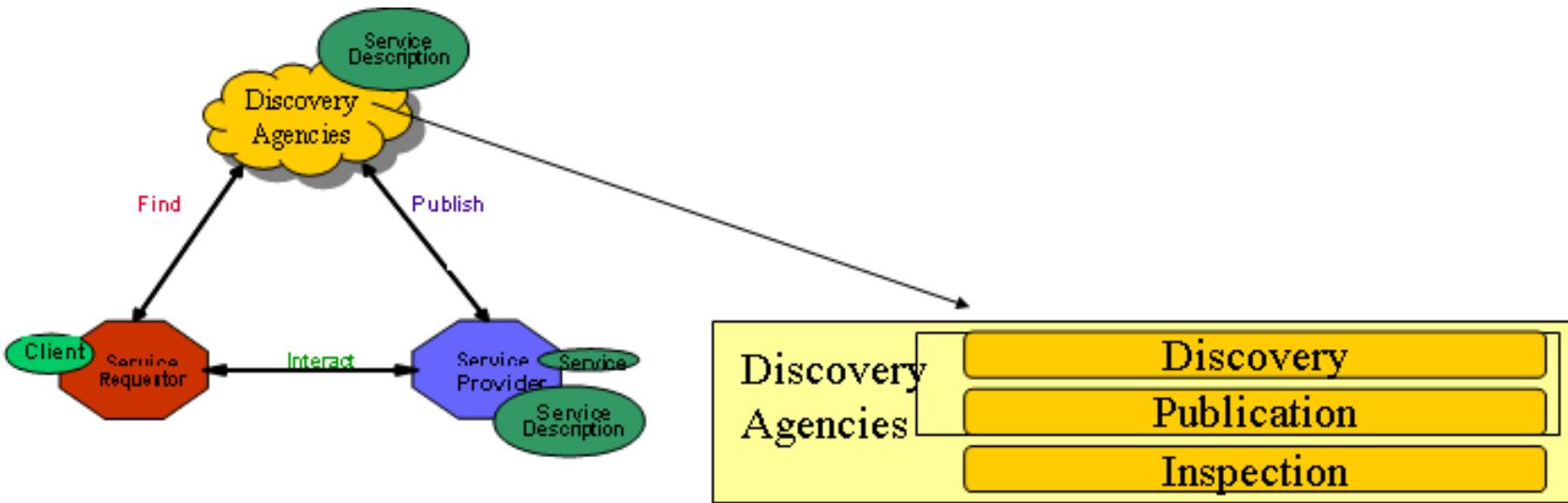
It is actually a stack of description documents defined using XML Schema.

facts, or assertions, and rules that apply to a particular Web service



minimum service description necessary to support interoperable Web services.

The Discovery Stack



- Service can be published using a variety of mechanisms:
 - Direct publish: description sent directly to requestor;
 - ***Universal Description, Discovery and Integration*** (UDDI) registries: a Web-based distributed directory.
- Service requestors can retrieve a service description at design time (search by interface) or runtime (by communication and QoS) from a Web page (URL), a service description repository, a simple service registry or a UDDI registry. Discovery depends on how services are published;

The technology so far

The WS technology is completely based on XML. Therefore, both the data format and the interaction protocols are XML-based:

- customized XML -> data format
- SOAP -> communication protocol
- WSDL -> the Interface definition language
- WSIL/UDDI -> standards for services discovery

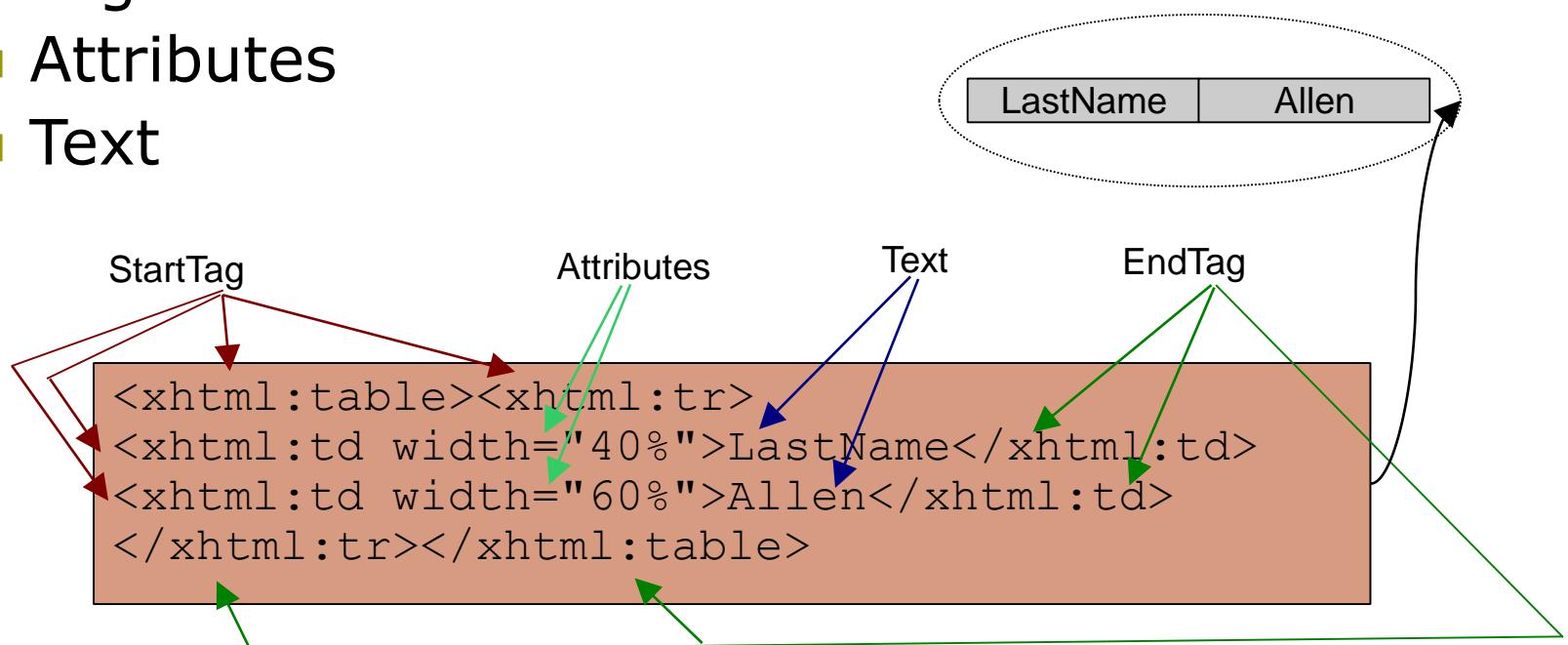
The lowest-level layers (the transport layer) should exploit some existing Internet protocols, like HTTP or SMTP

What is XML

XML is a simple tag-based language for describing information in a structured way.

Basic elements:

- Tags
- Attributes
- Text



How to work on XML

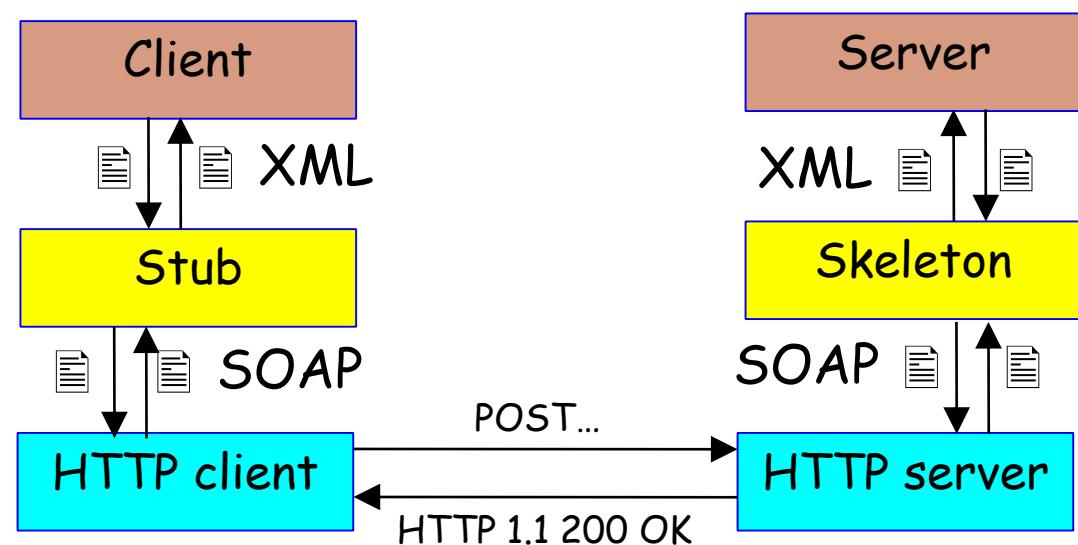
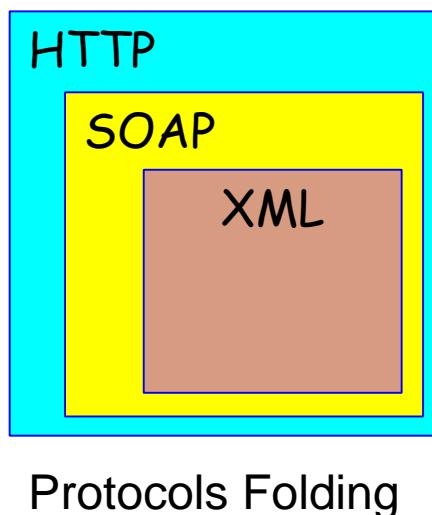
The tree-like structure of XML makes developers life hard.

In practice there is not a standard way for editing and analyzing, but the best method depends on your need. Just choose among:

- SAX -> callback-based parser
- DOM -> tree representation
- XSLT -> “XML to XML” conversion
- XPATH -> queries
- XML Binding -> transparent conversion to objects

Simple Object Access Protocol

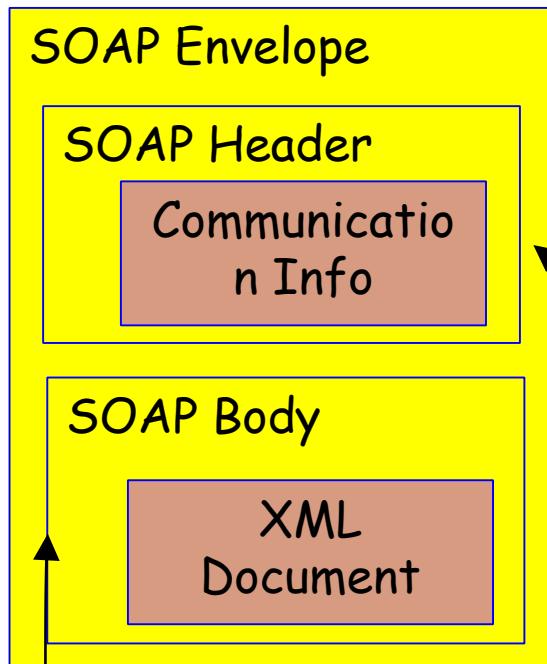
SOAP is a technology to support the exchange of XML-coded messages over a transport protocol, such as HTTP and SMTP. (*wire stack*)



SOAP basic mechanism

Simple Object Access Protocol

A SOAP runtime engine basically adds a XML envelope to an existing XML document



Document Container

Example

```
<soap:Envelope>
  <soap:Header>
    <axis:SessionKey>
      SDHH37TYEW7R7
    </axis:SessionKey>
  </soap:Header>
  <soap:Body>
    <GetPrice>
      <Item>Apples</Item>
    </GetPrice>
  </soap:Body>
</soap:Envelope>
```

Session, Authentication,
Routing, Security

SOAP Encoding

Dealing directly with XML messages is not easy.
Therefore, SOAP provides a “RPC emulation”
technology

The result: developers work with web services like
with traditional RPC (e.g. CORBA,DCOM,DCE)

The “RPC emulation” is named SOAP encoding.

Fundamentally it is a set of rules to map a
procedure invocation to a XML document.

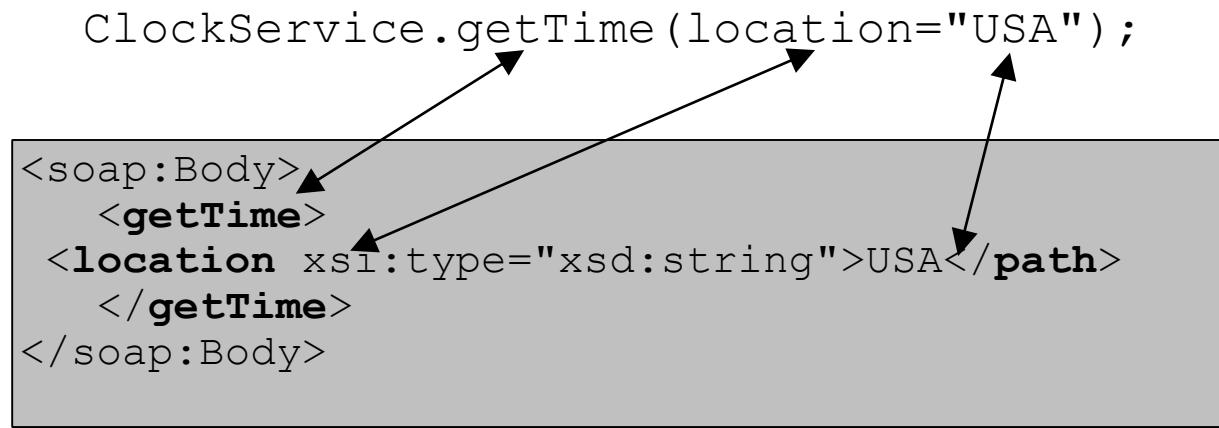
SOAP Encoding

The rules:

- method name -> first level element in the SOAP Body
- arguments identifiers -> second level elements
- arguments values -> third level elements
- arguments types -> attribute xsi:type

Service Request

```
ClockService.getTime(location="USA");  
  
<soap:Body>  
  <getTime>  
    <location xsi:type="xsd:string">USA</path>  
  </getTime>  
</soap:Body>
```



Web Service Description Language

WSDL is a standard format to describe a Web Service (*description stack*)

A WSDL document is composed by two sections:

- An abstract interface section -> like in traditional IDL, it defines the signatures of procedures (RPC-style) or messages (document-style)
- A deployment section -> it defines the service location and the supported transport protocols

Fundamentally a client uses the WSDL to create the stub or to dynamically decode messages.

UDDI

UDDI is a complimentary approach for searching based on a centralized repository.

The repository is an “electronic yellow pages” for firms that offer web services online. Besides the names of services and their WSDL descriptors, firms can add a description of their business, phone numbers, addresses...

UDDI repositories are offered by many agencies - e.g. IBM, Microsoft and HP.