SIMPLE OBJECT ACCESS PROTOCOL(SOAP)

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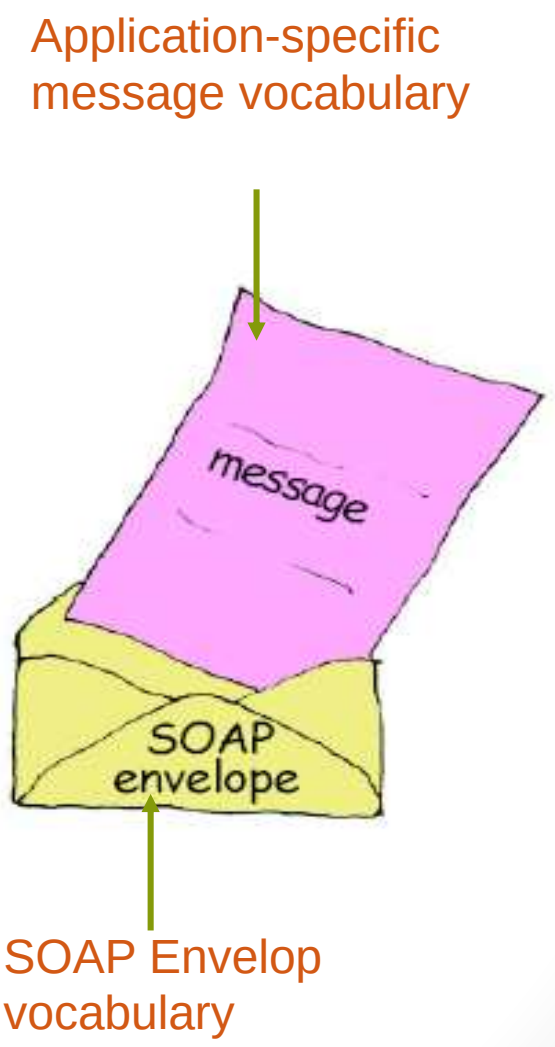
What is SOAP?

- What is SOAP?
  - SOAP is a **communication protocol**
  - SOAP is **for communication between applications**
  - SOAP is **a format for sending messages**
  - SOAP **is designed to communicate via Internet**
  - SOAP is **platform independent**
  - SOAP is **language independent**
  - SOAP is **based on XML**
  - SOAP is **simple and extensible**



Why SOAP?

- Other distributed technologies failed on the Internet
  - Unix RPC – requires binary-compatible Unix implementations at each endpoint
  - CORBA – requires compatible ORBs
  - RMI – requires Java at each endpoint
  - DCOM – requires Windows at each endpoint
- SOAP is the platform-neutral choice
  - Simply an XML wire format
  - Places no restrictions on the endpoint implementation technology choices

INTRO TO SOAP

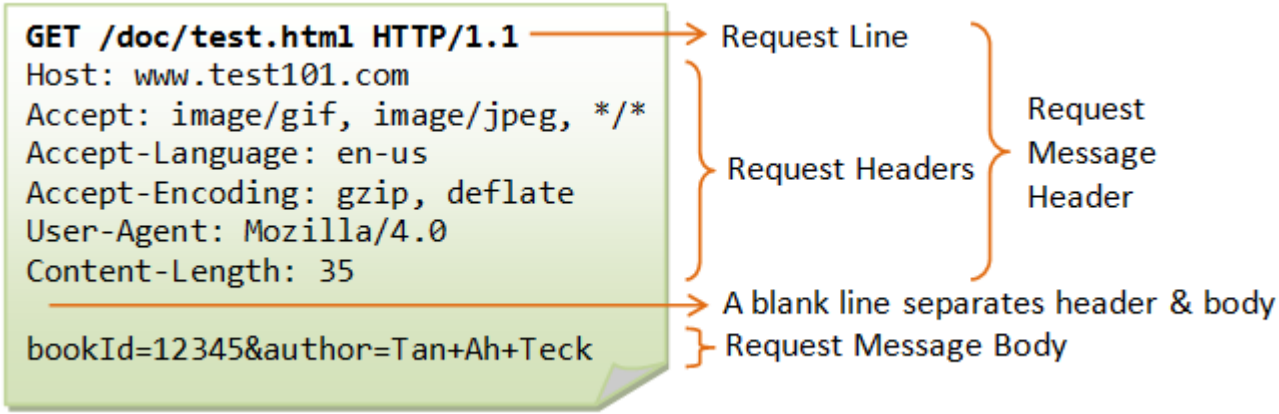
- SOAP is a simple and flexible messaging framework for transferring information specified in the form of an XML infoset between an initial SOAP sender and ultimate SOAP receiver

- Developed by the World-Wide-Web Consortium (W3C)

  - Encoded in XML, transported over HTTP
    - Data encoding described in XML-Schema
    - Can use any transport mechanism
  - Stateless (request/response)

INTRO TO SOAP…

- The client sends the message to a SOAP server in the body of an HTTP request



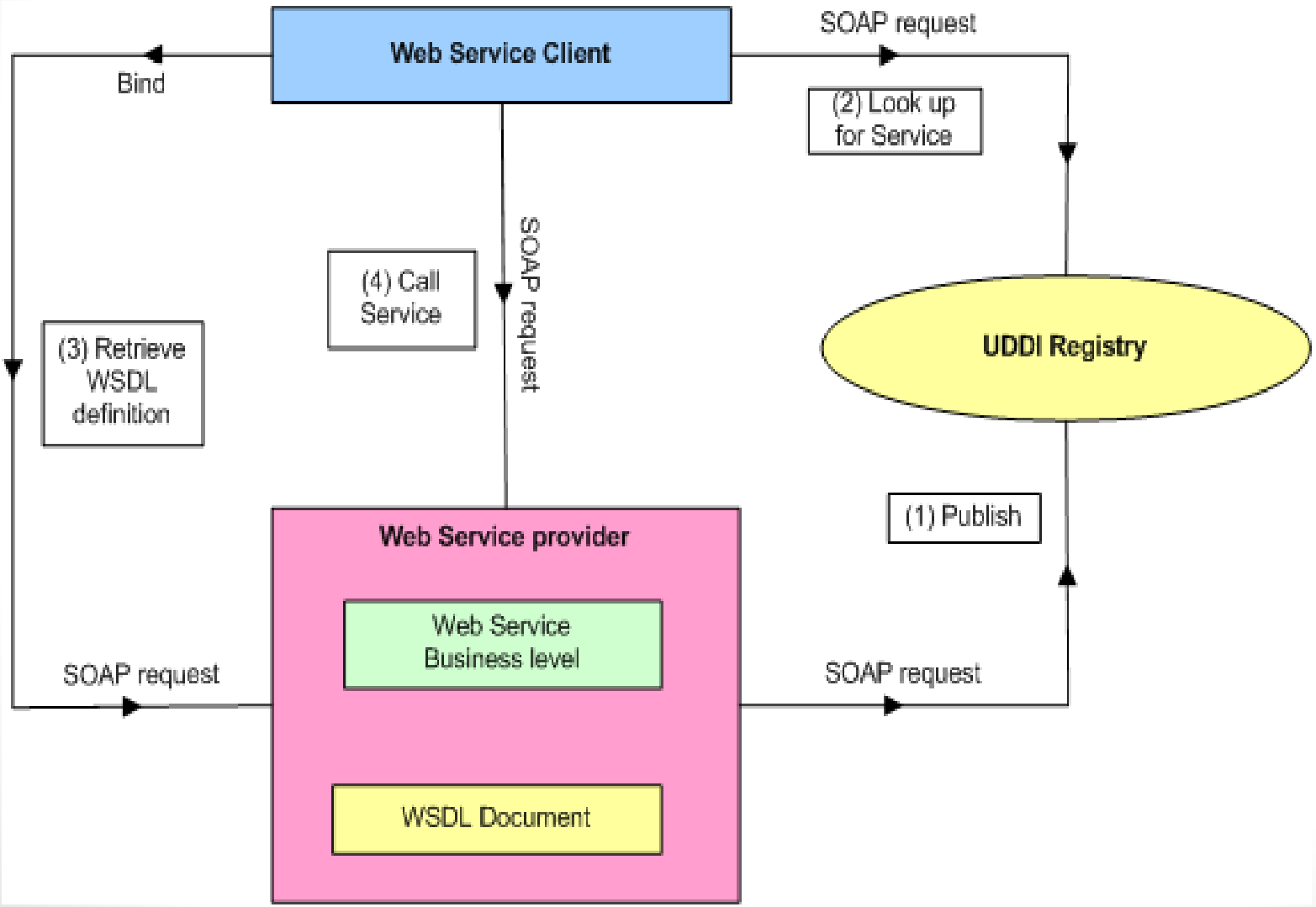
- The server determines whether the message is valid and supported

- The server formats its response in XML and sends it to the client in the body of an HTTP response

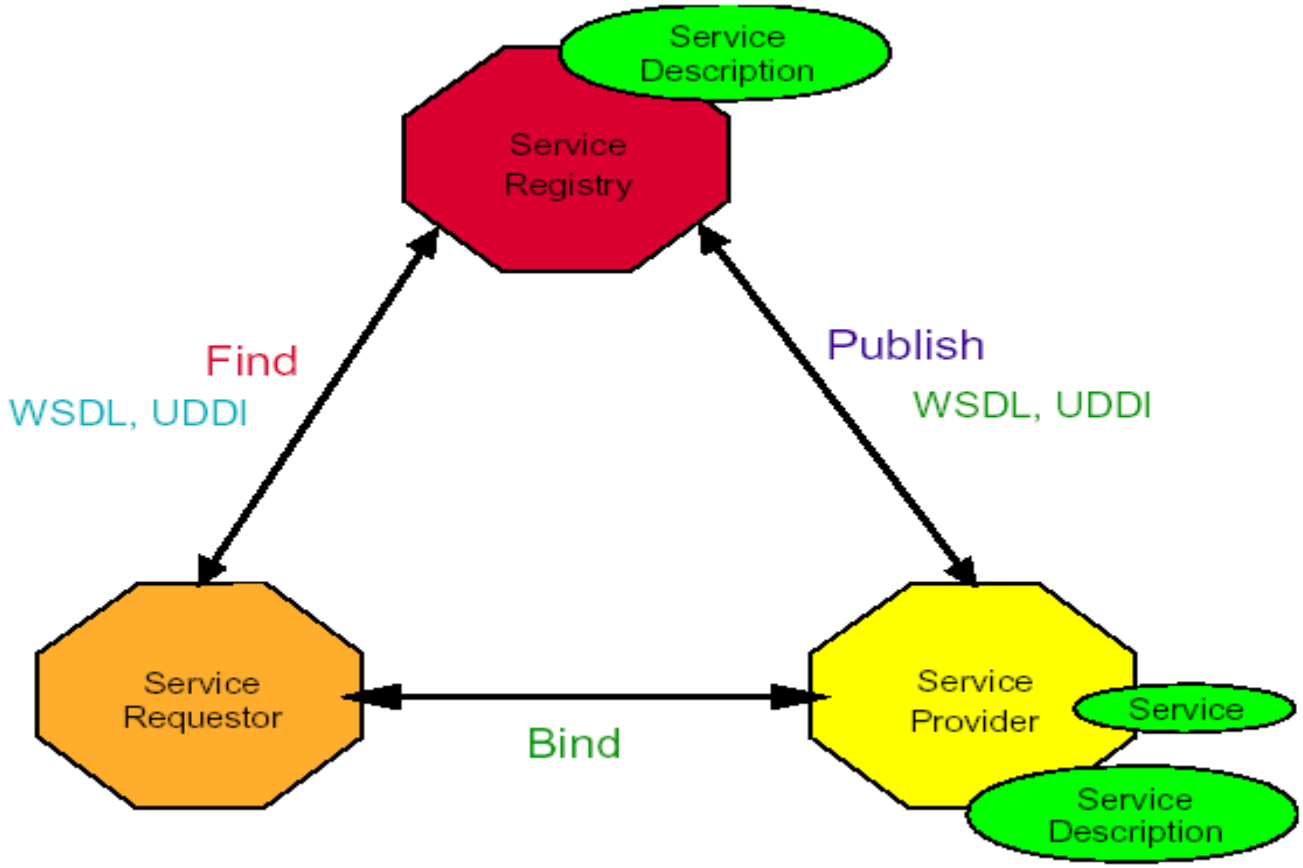
Web service layer

Layer	Example
Service Negotiation	Treading partner agreement
Workflow, discovery and Register	UDDI (**U**niversal **D**escription, **D**iscovery & **I**ntegration)
Service description language	WSDL (**W**eb **S**ervices **D**efinition **L**anguage)
Messaging	SOAP
Transport protocol	HTTP, HTTPS, SMTP
Business Issues	Management, Quality of service, Security, Open standards

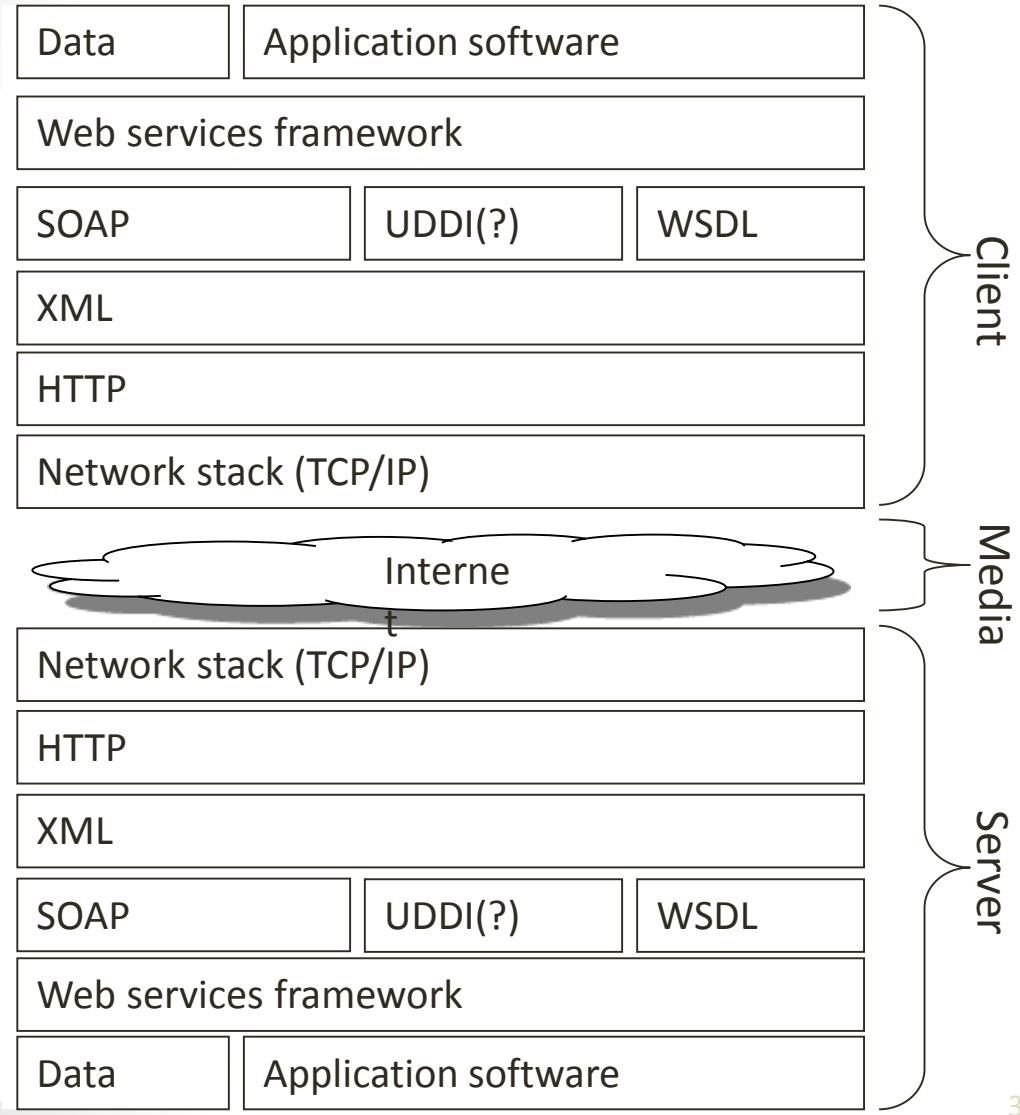
Accessing & publication



Web service model



Web service layered architecture

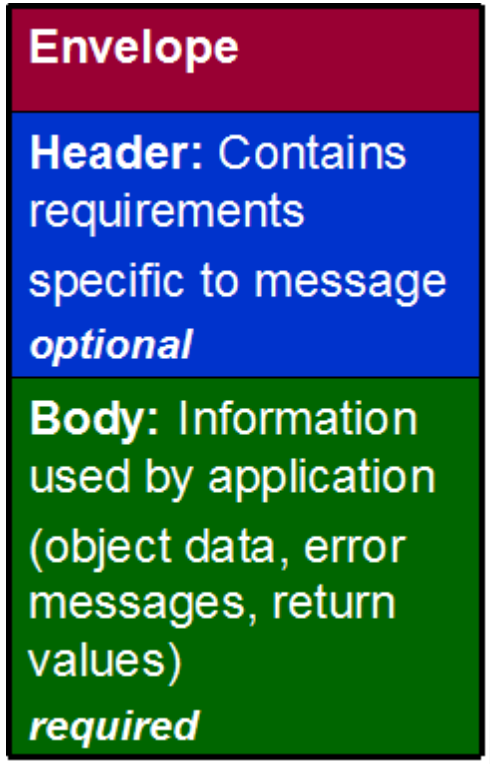


- Each layer 'wraps' the functionality of the previous one adding features and improving reliability
- The client software stack is the mirror image of the server's stack (generally)
- UDDI is optional but included for completeness
- The client doesn't generate a WSDL, it just obtains one from the server

Soap-Message format

Standard SOAP message:

```
<?xml version="1.0"?>
<soap:Envelope
    xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/>
    <soap:Header> <!-- optional -->
        <!-- header blocks go here... -->
    </soap:Header>
    <soap:Body>
        <!-- payload or Fault element goes here-->
    </soap:Body>
</soap:Envelope>
```



Soap example-**SOAP request**

Example of the SOAP message that represents a request to transfer funds between bank accounts:

```
<?xml version="1.0"?>
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
        <soap:Body>
                <x:TransferFunds xmlns:x="urn:examples-org:banking">
                        <from>22-342439</from>
                        <to>98-283843</to>
                        <amount>100.00</amount>
                </x:TransferFunds>
        </soap:Body>
</soap:Envelope>
```

Soap example-**SOAP response**

Response :

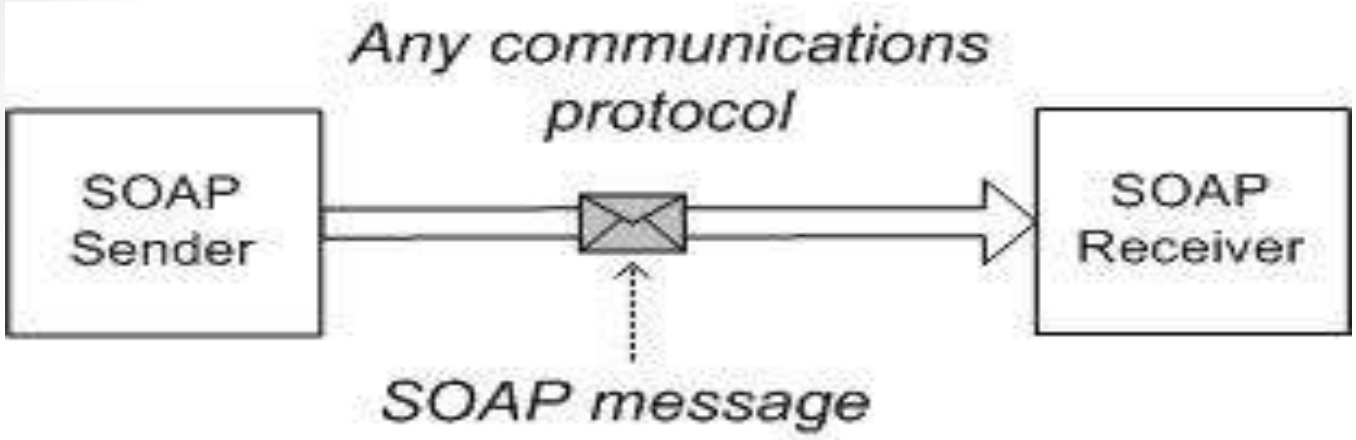
```
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
<soap:Body>
 <x:TransferFundsResponse xmlns:x="urn:examples-org:banking">
    <balances>
        <account>
          <id>22-342439</id>
          <balance>33.45</balance>
        </account>
        <account>
          <id>98-283843</id>
          <balance>932.73</balance>
        </account> </balances>
  </x:TransferFundsResponse>
</soap:Body> </soap:Envelope>
```

SOAP fault example

The following sample SOAP message contains Fault element that indicates an "Insufficient Funds" error occurred while processing the previous request:

```
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
<soap:Body>
  <soap:Fault>
    <faultcode>soap:Server</faultcode>
    <faultstring>Insufficient funds</faultstring>
    <detail>
      <x:TransferError xmlns:x="urn:examples-org:banking">
          <sourceAccount>22-342439</sourceAccount>
<transferAmount>100.00</transferAmount>
<currentBalance>89.23</currentBalance>
      </x:TransferError>
    </detail> </soap:Fault>
</soap:Body> </soap:Envelope>
```

SOAP HTTP Bindings




```
POST /path/bank.asmx HTTP/1.1
Content-Type: text/xml
SOAPAction: "urn:banking:transfer"
Content-Length: nnnn

<soap:Envelope...
```

Request

Response

```
HTTP/1.1 200 OK
Content-Type: text/xml
Content-Length: nnnn

<soap:Envelope...
```

```
HTTP/1.1 500 Internal Server Error
Content-Type: text/xml
Content-Length: nnnn

<soap:Envelope…
```

SOAP transport

- Most of SOAP servers currently use HTTP as the transport protocol for the XML payload in SOAP message ‘cause HTTP satisfies a number of requirements:
  - Ubiquity
  - Firewall friendliness
  - Simplicity
  - Scalability
  - Readily capable of being secure
- There are a number of SOAP implementations that support other transport layers, such as
  - HTTPS – using SSL provides security
  - SMTP – enables asynchronous SOAP requests / SOAP report
- It can be expected that other transport protocols, such as MSMQ or FTP, will be supported eventually. IBM has an interesting for HTTPR to provide a reliable transport layer for SOAP messages

SOAP: advantages and disadvantage

Advantages

- Human readable XML
- Easy to debug
- SOAP runs over HTTP
- Firewalls not affected
- Services can be written in any language,platform or operating system

Disadvantages

- XML produces a lot of overhead for small messages
- Web Services speed relies on Internet traffic conditions
- Not strictly-typed XML

Papers…..

[1]. Using SOAP and .NET Web Service to Build SCORM RTE and LMS

Timothy K. Shih et al proposed paper about reuse and integrate all the resource, many distance learning standard come with the tide of fashion. The most famous is Shareable Content Object Reference Model (SCORM) [11]. SCORM is composed of Run-Time Environment (RTE) [13], Content Agreement Model and LMS. SOAP allows objects or code of any kind on any platform, in any language to communicate. .Net Web Service combines XML and some programming IDE to develop a server, which uses SOAP to implement the Launch mechanism and AICC CMI data model [17]. And Java script to implement the client side. “

…[cont.]

Design of a Intelligent SOAP Message Service Processor for Enhancing Mobile Web Service

- In this paper , design Intelligent mobile Web Services middleware that enhance soap message processing by eliminating the Servlet container (Tomcat).
- main contributions are to overcome the latency problem of current Web Services and provide an easy mobile Web service implementation. [main issue of SOAP implementation is the latency of SOAP execution]
- **Advantage of paper:**

❖Support standard Web Services protocol,

❖minimizing communication overhead, message processing time, and server overload.