SOAP

What is SOAP

- Simple Object Access Protocol
- Communication protocol
- Used for communication between applications
- Format for sending messages
- Communicates via Internet
- Platform independent
- Language independent
- Based on XML
- Simple and extensible
- Allows you to get around firewalls
- W3C recommendation

Why SOAP?

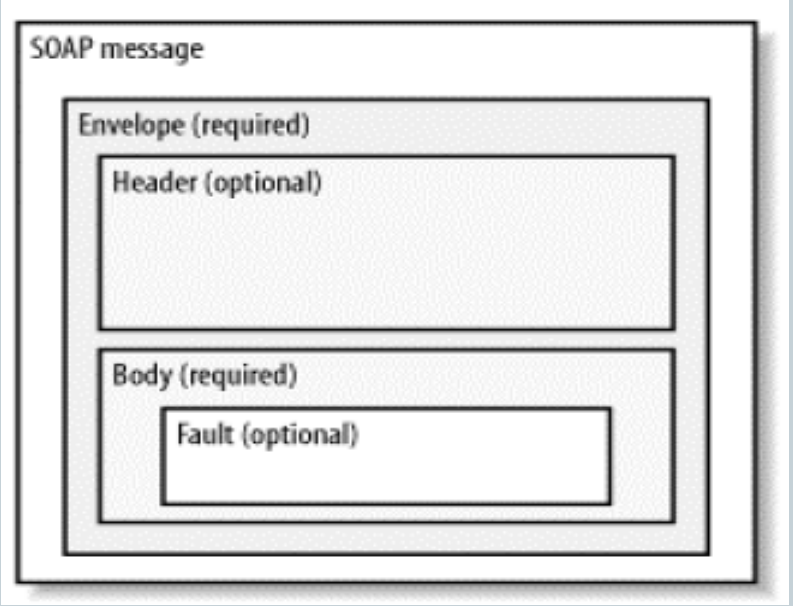
- Applications used to communicate using Remote Procedure Calls (RPC) between objects like DCOM and CORBA, but HTTP was not designed for this. RPC represents a compatibility and security problem; firewalls and proxy servers will normally block this kind of traffic.
- A better way to communicate between 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

SOAP Building Blocks

A SOAP message is an ordinary XML document 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



Syntax Rules

Here are some important syntax rules:

- A SOAP message MUST be encoded using XML
- A SOAP message MUST use the SOAP Envelope namespace
- A SOAP message MUST use the SOAP Encoding namespace
- A SOAP message must NOT contain a DTD reference
- A SOAP message must NOT contain XML Processing Instructions

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>
```

SOAP Envelope Element

```
<?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">
  ...
  Message information goes here
  ...
</soap:Envelope>
```

- Every SOAP message has a root Envelope element.
- SOAP uses XML namespaces to differentiate versions.
- SOAP 1.1 namespace URI is *http://schemas.xmlsoap.org/soap/envelope*
- SOAP 1.2 namespace URI is http://www.w3.org/2003/05/soap-envelope
- If the Envelope is in any other namespace, it is considered a versioning error.
- The encodingStyle attribute can be used to indicate the serialization rules used in a SOAP message.

The SOAP Header Element

- The optional SOAP Header element contains application-specific information (like authentication, payment authorization, transaction management, etc) about the SOAP message.
- If the Header element is present, it must be the first child element of the Envelope element.
- **Note:** All immediate child elements of the Header element must be namespace-qualified.
- SOAP defines four attributes in the default namespace (" http://www.w3.org/2003/05/soap-envelope"). The attributes are: mustUnderstand, role, relay and encodingStyle.

```
<?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>
  <m:Trans xmlns:m="http://www.w3schools.com/transaction/"
  soap:mustUnderstand="1">234
  </m:Trans>
</soap:Header>
...
...
</soap:Envelope>
```

The SOAP Header Attributes

- **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.
- **The role Attribute**
  - A SOAP role is used to indicate the SOAP node to which a particular SOAP header block is targeted.

Table 2: SOAP Roles defined by this specification

Short-name	Name	Description
next	"http://www.w3.org/2003/05/soap-envelope/role/next"	Each SOAP intermediary and the ultimate SOAP receiver MUST act in this role.
none	"http://www.w3.org/2003/05/soap-envelope/role/none"	SOAP nodes MUST NOT act in this role.
ultimateReceiver	"http://www.w3.org/2003/05/soap-envelope/role/ultimateReceiver"	The ultimate receiver MUST act in this role.

The SOAP Header Attributes

- **The relay Attribute**
  - The SOAP relay *attribute information item* is used to indicate whether a SOAP header block targeted at a SOAP receiver must be relayed if not processed.
- **The encodingStyle Attribute**
  - The encodingStyle *attribute information item* indicates the encoding rules used to serialize parts of a SOAP message.

The SOAP Body Element

- The required SOAP Body element contains the actual SOAP message intended for the ultimate endpoint of the message.
- Immediate child elements of the SOAP Body element may be namespace-qualified.

```
<?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:Body>
  <m:GetPrice xmlns:m="http://www.w3schools.com/prices">
    <m:Item>Apples</m:Item>
  </m:GetPrice>
</soap:Body>

</soap:Envelope>
```

Request

```
<?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:Body>
  <m:GetPriceResponse xmlns:m="http://www.w3schools.com/prices">
    <m:Price>1.90</m:Price>
  </m:GetPriceResponse>
</soap:Body>
```

Response

SOAP Fault Element

- The optional SOAP Fault element is used to indicate error messages.
- If a Fault element is present, it must appear as a child element of the Body element. A Fault element can only appear once in a SOAP message.
- The SOAP Fault element has the following sub elements:

Sub Element	Description
<faultcode>	A code for identifying the fault
<faultstring>	A human readable explanation of the fault
<faultactor>	Information about who caused the fault to happen
<detail>	Holds application specific error information related to the Body element

SOAP Fault Codes

- The faultcode values defined below must be used in the faultcode element when describing faults:

Error	Description
VersionMismatch	Found an invalid namespace for the SOAP Envelope element
MustUnderstand	An immediate child element of the Header element, with the mustUnderstand attribute set to "1", was not understood
Client	The message was incorrectly formed or contained incorrect information
Server	There was a problem with the server so the message could not proceed

Self Study

- Soap Attachments
- WebSphere MQ
- Soap Bindings
- Soap 1.1 vs Soap 1.2