

Tutorial

Web Services

1. What is a Web Service?
2. An example Web Service
3. Wrapping a text editor into a WS

What is Web Service

- Historic perspectives
 - Centralized versus Distributed Programming Models: Client/Server, Master/Slave, SPMD, etc...
 - Middleware architecture
2-tier, 3-tier, n-tier
 - Technical evolution
 - IPC (inter process call):
RPC, Java RMI, CORBA, DCOM
 - Shared Memory, Distributed Shared Memory and Message Passing
- Interoperability, interoperability, interoperability

What is a Web Service?

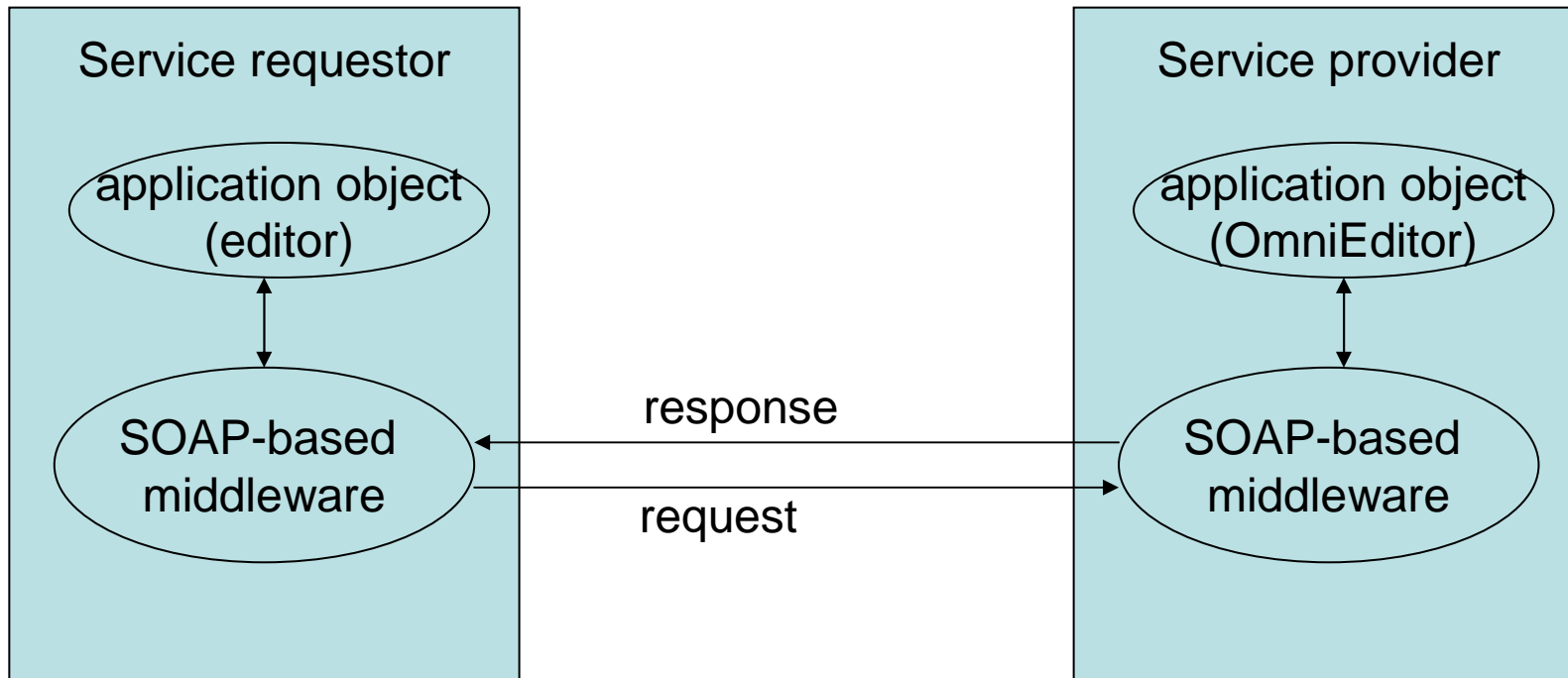
- Web Services Standards (XML-based)
 - SOAP (Simple Object Access Protocol)
 - WSDL (Web Service Description Language)
 - UDDI (Universal Description, Discovery, Integration)
 - WS-I (integration), WS-Policy, WS-Security, etc.
- Chances and Challenges
 - Application Wrappers to WS
 - Web Services Compositions
 - Holy Grail: large reusable library of WS with interoperability:
1,000 public WS ~ 1 Million private WS
 - ROI (Return of Investments): > 10x ?
 - Issues: Privacy, Security, Performance

An example web service

xmethods provides a web services to get the stock price

- Example SOAP messages
- Structure of WSDL descriptions
- A program that invokes the web service

SOAP architecture



Example

SOAP message: request

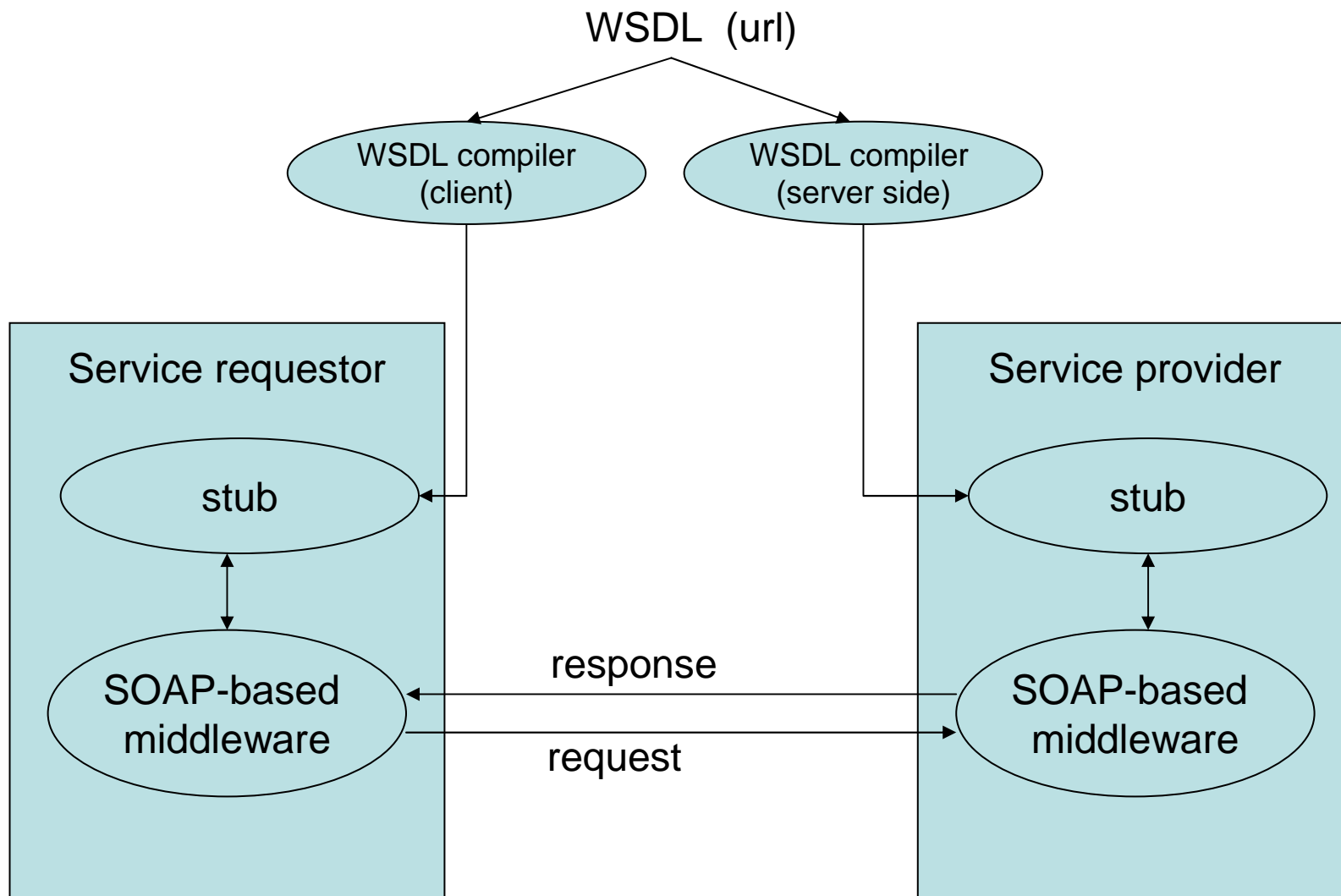
```
<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:ns="urn:xmethods-delayed-quotes">
  <SOAP-ENV:Body SOAP-
    ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">
    <ns:getQuote>
      <symbol>IBM</symbol>
    </ns:getQuote>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

Example

SOAP message: response

```
<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:ns="urn:xmethods-delayed-quotes">
  <SOAP-ENV:Body SOAP-
    ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">
    <ns:getQuoteResponse>
      <Result>86.05</Result>
    </ns:getQuoteResponse>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

WSDL architecture



Example

WSDL structure: message

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="quote"
  xmlns:tns="urn:xmethods-delayed-quotes"
  ... name spaces ...>
  ... types ...
  <message name="getQuoteRequest">
    <part name="symbol" type="xsd:string"/>
  </message>
  <message name="getQuoteResponse">
    <part name="Result" type="xsd:float"/>
  </message>
  ... portType, binding, service ...
</definitions>
```

Example

WSDL structure: portType

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="quote"
  ... name spaces ...>
  ... types, messages, ...
  <portType name="quotePortType">
    <operation name="getQuote">
      <input message="tns:getQuoteRequest"/>
      <output message="tns:getQuoteResponse"/>
    </operation>
  </portType>
  ... binding, service ...
</definitions>
```

Example

WSDL structure: binding

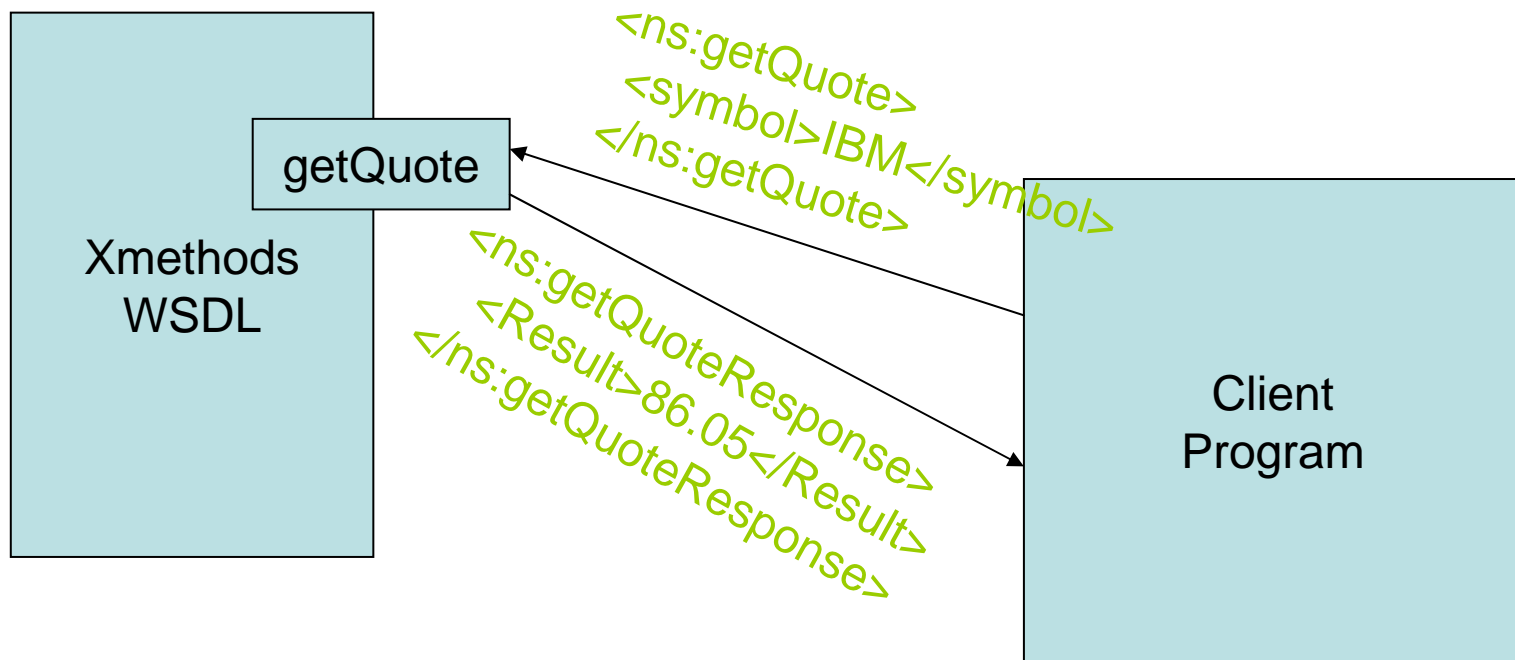
```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="quote"
  ... name spaces ...>
  ... types, messages, portType ...
  <binding name="quote" type="tns:quotePortType">
    <SOAP:binding style="rpc" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="getQuote">
      <SOAP:operation soapAction=""/>
      <input>
        <SOAP:body use="encoded" namespace="urn:xmethods-delayed-quotes"
          encodingStyle="http://schemas.xmlsoap.org/soap/encoding"/>
      </input>
      <output>
        <SOAP:body use="encoded" namespace="urn:xmethods-delayed-quotes"
          encodingStyle="http://schemas.xmlsoap.org/soap/encoding"/>
      </output>
    </operation>
  </binding>
  ... service ...
</definitions>
```

Example

WSDL structure: service

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="quote"
  ... name spaces ...>
  ... types, messages, portType, binding ...
  <service name="quote">
    <port name="quote" binding="tns:quote">
      <SOAP:address location="http://services.xmethods.net/soap"/>
    </port>
  </service>
</definitions>
```

Web Services Invocation



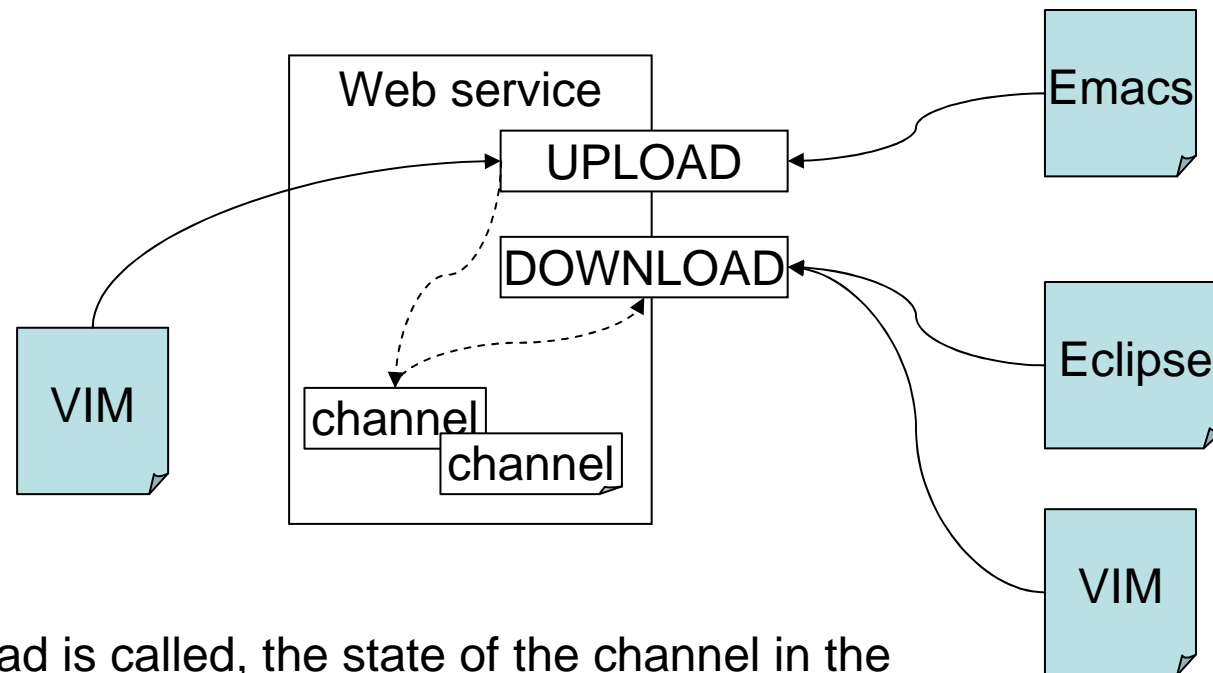
Invoking the web service

gsoap/soapcpp2/samples/quote

```
int ns__getQuote(char *symbol, float *Result); /* quote.h */
/* quote.c */
int main(int argc, char **argv)
{ struct soap soap;
  float q;
  char *sym;
  if (argc > 1)
    sym = argv[1];
  else
  { fprintf(stderr, "Usage: quote <ticker>\n");
    exit(1);
  }
  soap_init(&soap);
  if (soap_call_ns__getQuote(&soap, "http://services.xmethods.net/soap", "", sym, &q) == 0)
    printf("\nCompany - %s    Quote - %f\n", sym, q);
  else
    soap_print_fault(&soap, stderr);
  soap_end(&soap);
  soap_done(&soap);
  return 0;
}
```

```
%> quote IBM
Company - IBM    Quote - 86.269997
%>
```

Reference Architecture 1



Whenever upload is called, the state of the channel in the server is updated or a new channel is created, and only when the editors need to refresh the buffer, they pull the information (downloading). Make sure the difference between downloaded buffer and the current buffer can be displayed.

Reference Architecture 2

