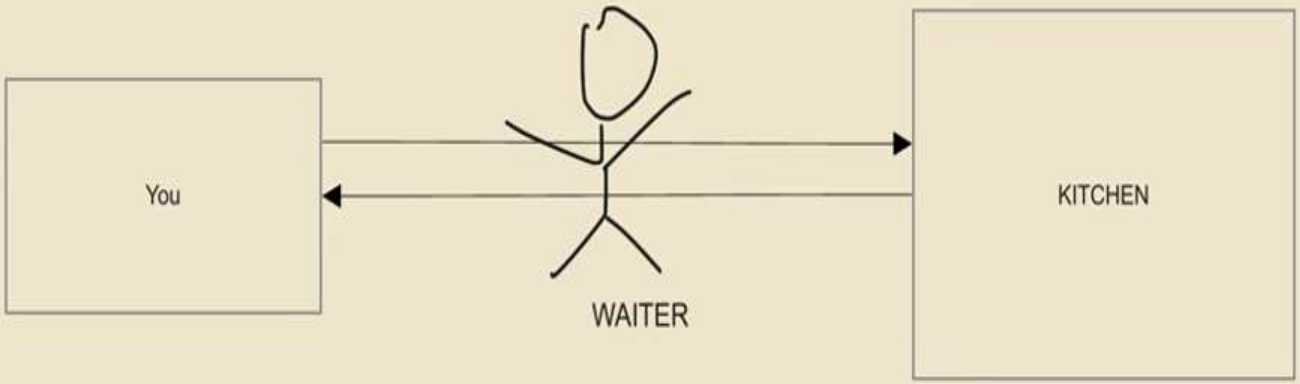
Introduction to Web Services

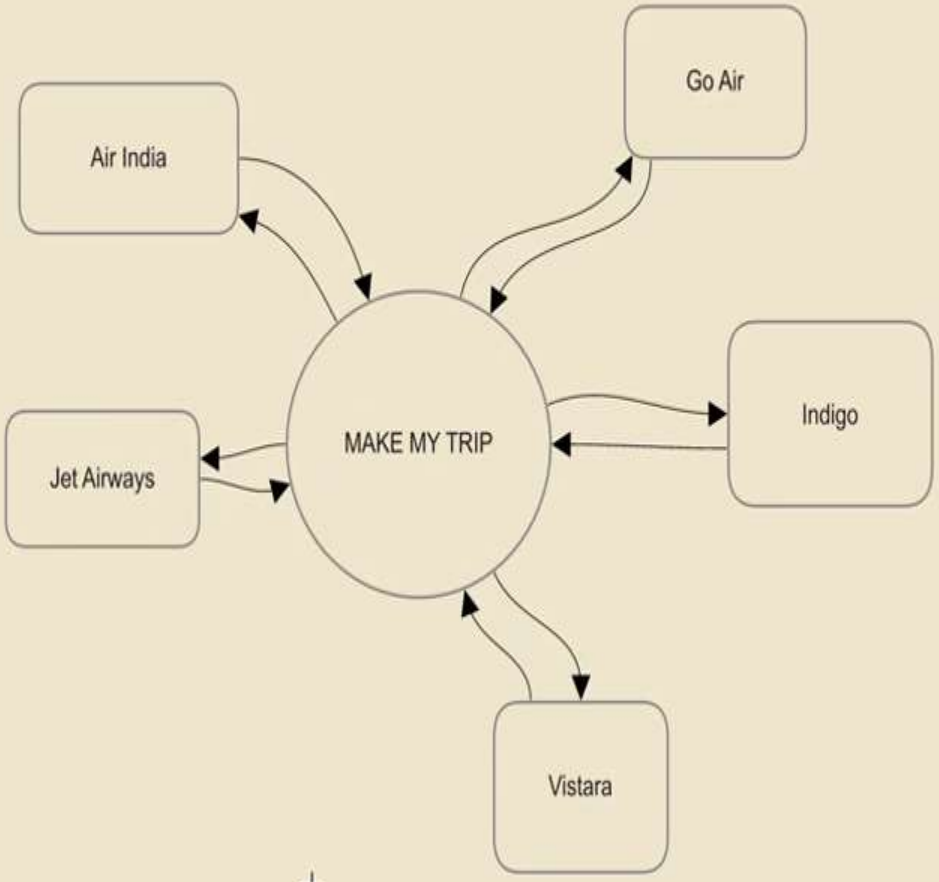
Web Services

- A **Web service** is a method of communication between two electronic devices over the World Wide Web
- In other words, a web service helps to convert your application into a web-based application.

Why web services?

- Your application can publish its function or message to the rest of the world.





WEB SERVICES

Services available over the web

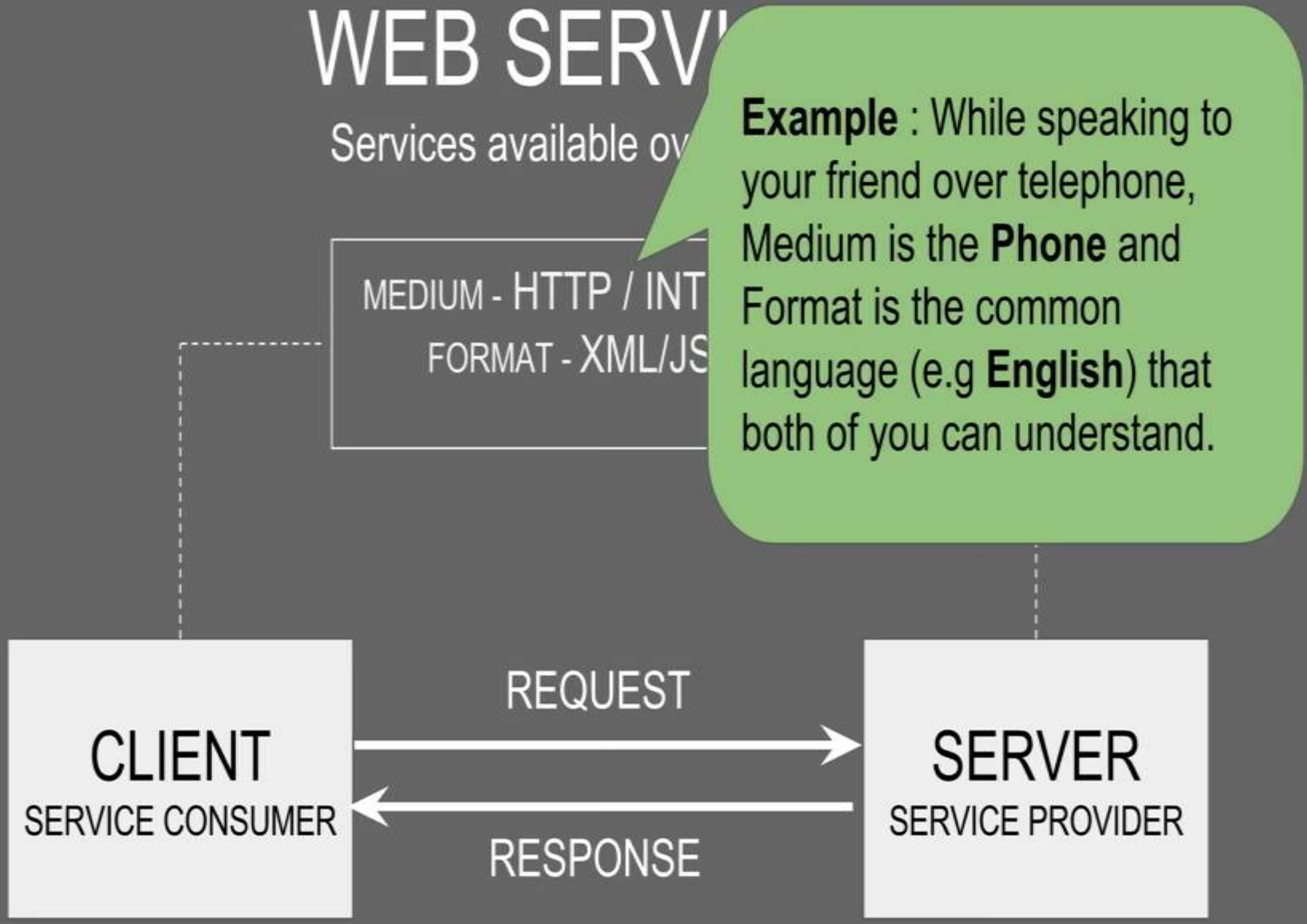
A web service provider develops/implements the application (web service) and makes it available over the internet (web)

WEB SERVICES

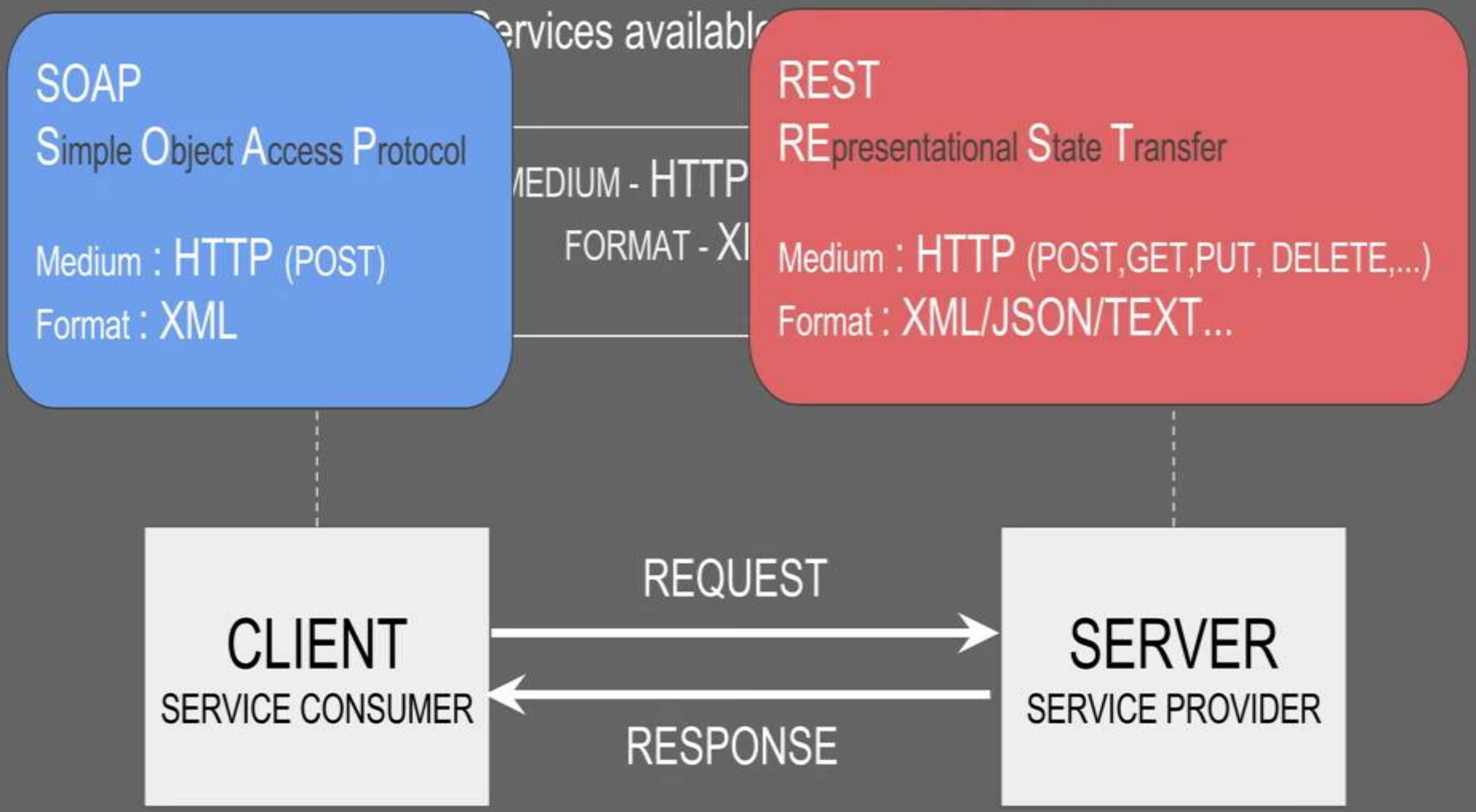
Services available over the web

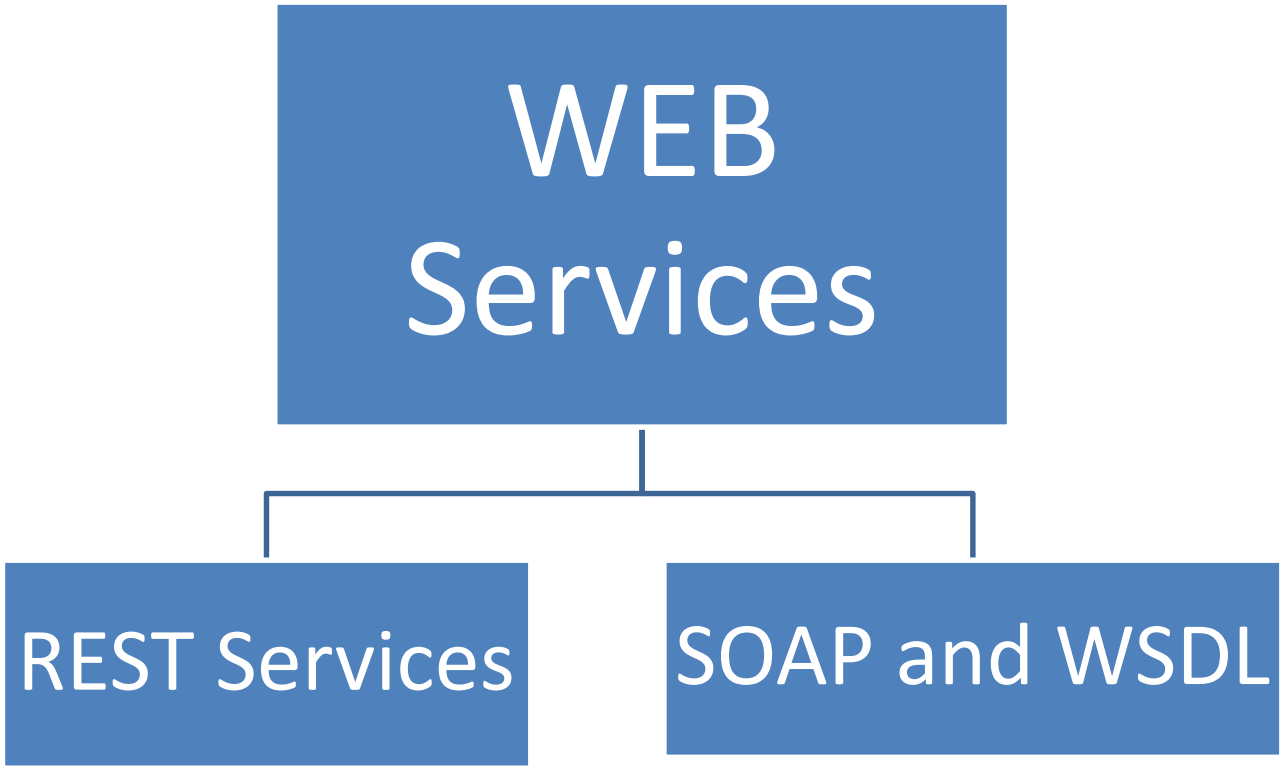
CLIENT
SERVICE CONSUMER

SERVER
SERVICE PROVIDER

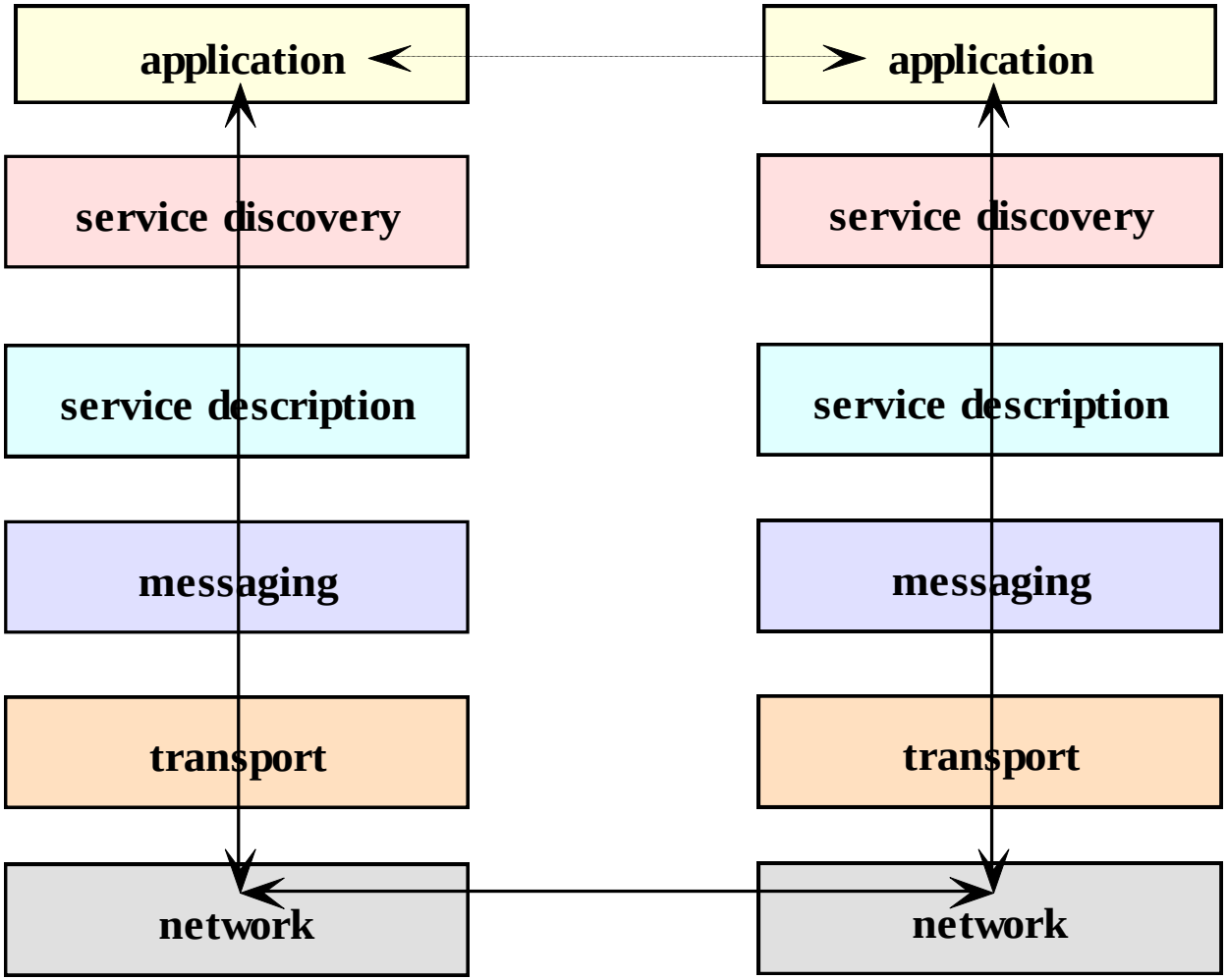

WEB SERV
Services available ov
MEDIUM - HTTP / INT
FORMAT - XML/JS
Example : While speaking to your friend over telephone, Medium is the Phone and Format is the common language (e.g English) that both of you can understand.
CLIENT
SERVICE CONSUMER
REQUEST
RESPONSE
SERVER
SERVICE PROVIDER

WEB SERVICES




WEB
Services
REST Services
SOAP and WSDL

Web service protocol stack



WEB SERVICES

Services available over the web

WSDL

UDDI

Consumer needs to know:

What are the services available?

What are the request and response parameters ?

How to call the web service ?

WEB SERVICES

WSDL

UDDI

Service Provider publishes an interface for his web services that describes all attributes of the web services.

This is XML based interface and is called -
Web **S**ervices **D**escription **L**anguage - **WSDL**

WSDL

UDDI

WEB SERVICES

Services available over the web

WSDL

Web Services Description Language

Is an XML based interface that is used to describe the functionalities of the Web Services

WSDL

- WSDL stands for **Web Services Description Language**
- It is an XML-based language that is used for describing the functionality offered by a Web service.
- WSDL file contains info about
  - How the service can be called
  - What parameter it expects
  - What data structure it returns
  - Which port the application uses
  - Which protocol the web service uses (like *https*)

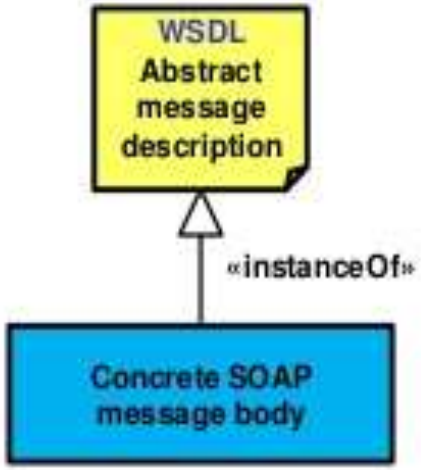
5. WSDL 2.0 (1/12)

A WSDL (Web Service Description Language) document has basically 3 purposes with regard to a web service:

1. Describe the "What"
   - → XML-based abstract definition of a web service comprising:
     a. Type system used to describe the service meta model
     b. Messages / data types involved in the interaction with the web service
     c. Message exchange pattern(s) used in the interaction with the web service

2. Describe the "How"
   - → Define „how" to access the abstract web service through a transport binding

3. Describe the "Where"
   - → Definition of location(s) where the abstract web service can be accessed.

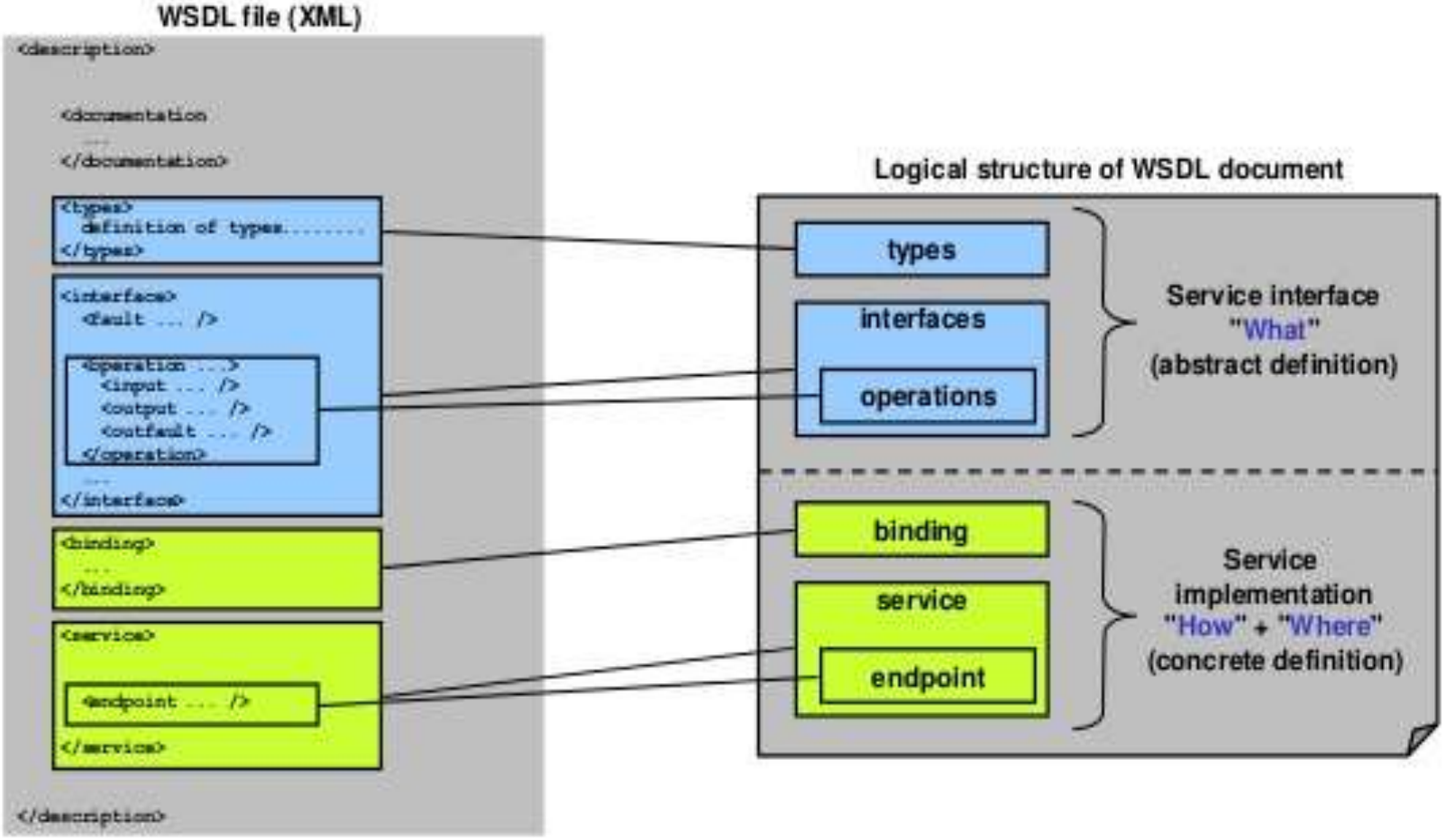


WSDL defines the schema while a SOAP message is an instance of the WSDL schema.

5. WSDL 2.0 (2/12)

Structure / elements of a WSDL document:

A WSDL 2.0 document is partitioned into an abstract / logical interface description and a concrete interface implementation part.

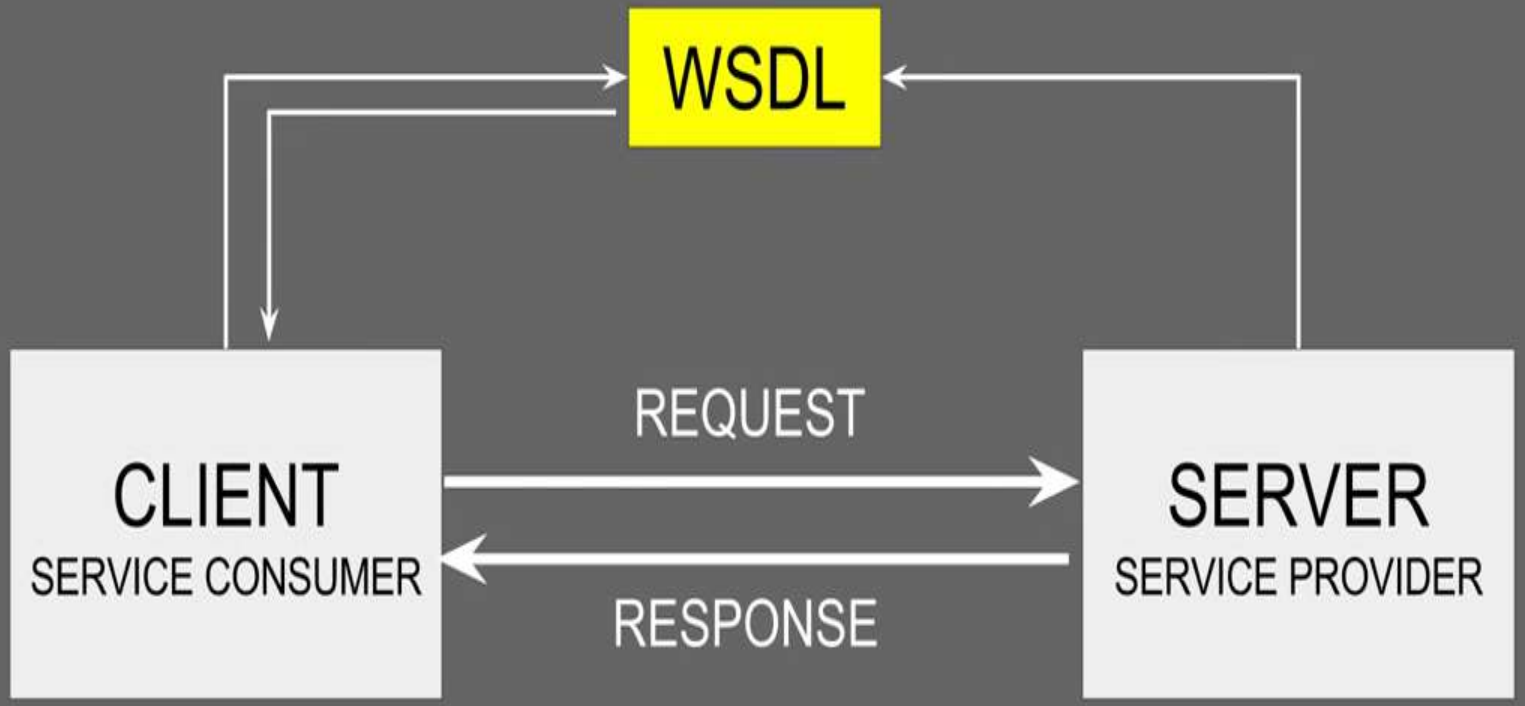


WEB SERVICES

Services available over the web

WSDL

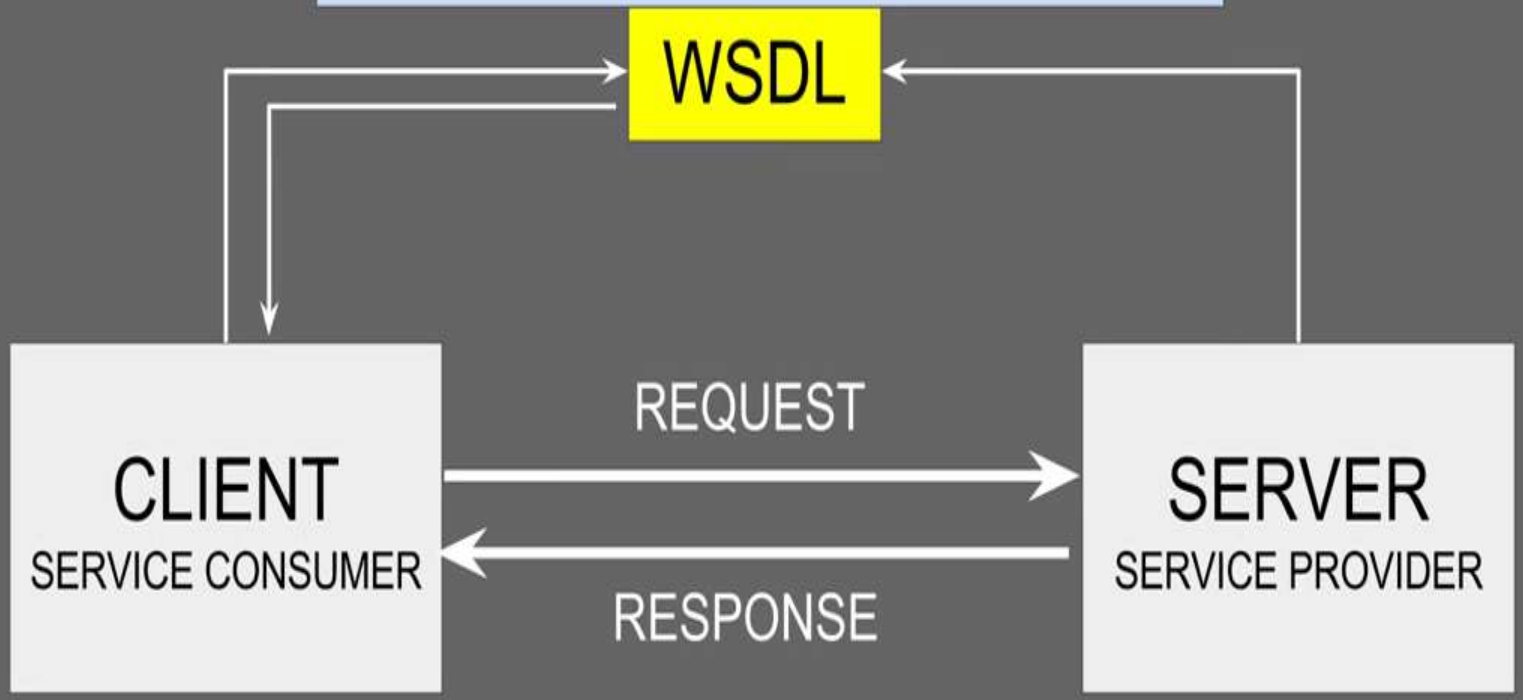
UDDI



WSDL

UDDI

A web service provider publishes his web service (through wsdl) on an online directory from where consumers can query and search the web services. This online registry/directory is called **UDDI**



WEB SERVICES

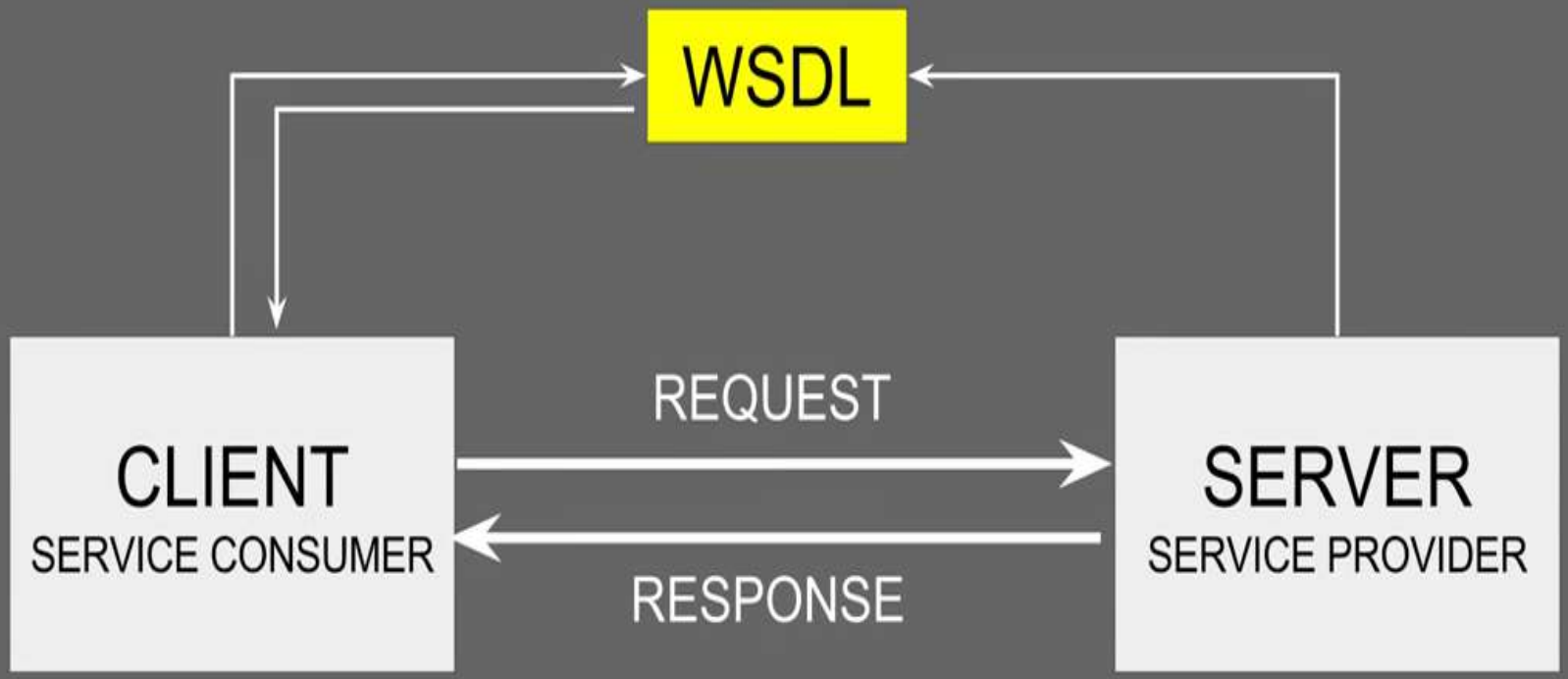
WSDL

UDDI

UDDI

Universal Description, Discovery and Integration

Is an XML based standard for publishing and finding web services.

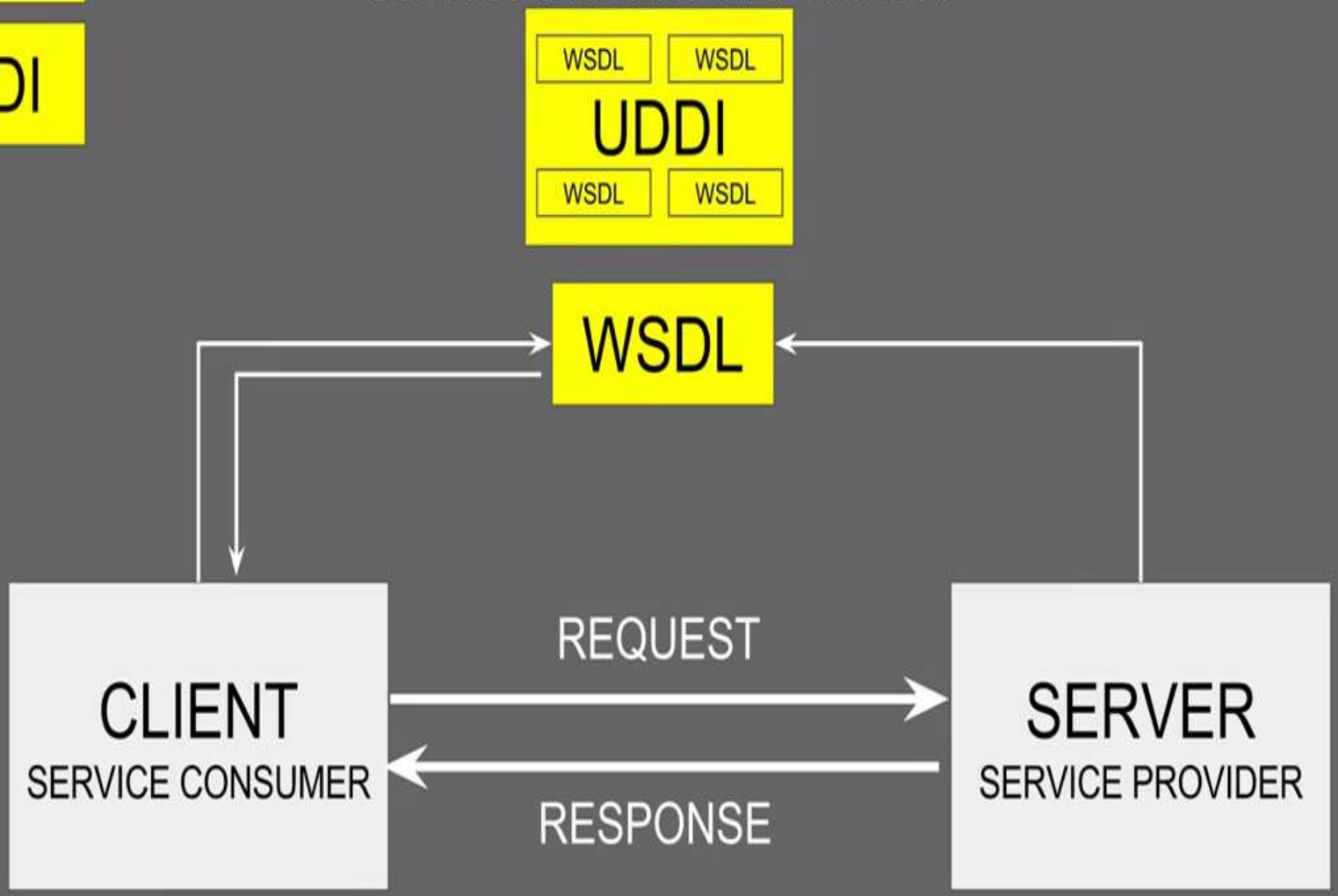


WEB SERVICES

WSDL

UDDI

Services available over the web



SOAP based services

- **S**imple **O**bject **A**ccess **P**rotocol
- Exclusively use **XML** as the data format to exchange info over **HTTP.**
- A service that needs to be used by another service needs to specify its usage through a “Service Description”.
- In this case, we use **WSDL – Web Services Description Language**
- **Ex:** Apache Axis, Apache CXF
- **SOAP** has nothing to do with **SOA – S**ervice **O**riented **A**rchitecture

SOAP

- SOAP is a protocol which applies XML for message exchange in support of remote method calls over the Internet.
- Compared to remote method invocation or CORBA-based facilities:
  - SOAP is web-based or “wired” and hence is not subject to firewall restrictions
  - Language-independent
  - Can provide just-in-time service integration

What are SOAP Web Services ?

A web service that complies to the **SOAP Web Services Specifications** is a SOAP Web Service.

What are these specifications / standards ?

Who defines and dictates these standards ? ➡

W3C
(World Wide Web Consortium)

An international community that develops open standards for world wide web.
https://www.w3.org/

What are SOAP Web Services ?

A web service that complies to the **SOAP Web Services Specifications** is a SOAP Web Service.

SOAP Web Services Specifications

- SOAP
- WSDL
- UDDI

What are SOAP Web Services ?

SOAP

All information/message exchange happens over a common format: **XML**

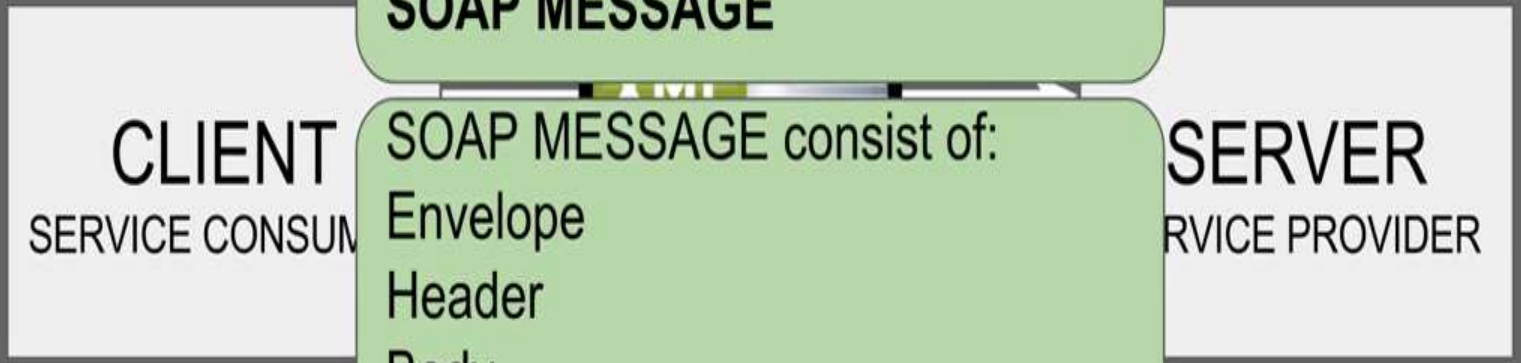
What are SOAP Web Services ?

SOAP

All information/message exchange happens over a common format:
XML

XML messages have a defined structure:
SOAP MESSAGE

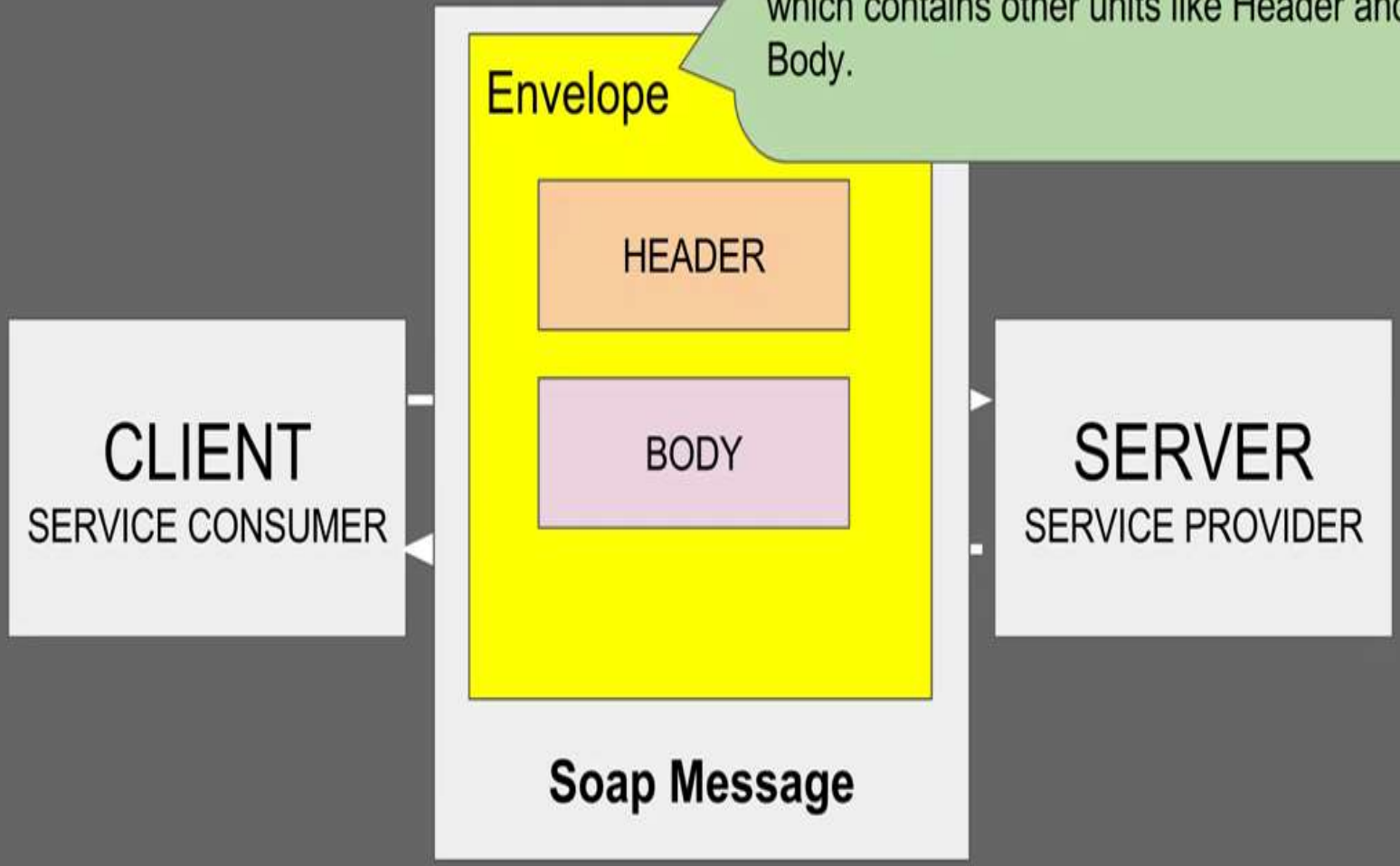
SOAP MESSAGE consist of:
Envelope
Header
Body



What are SOAP W

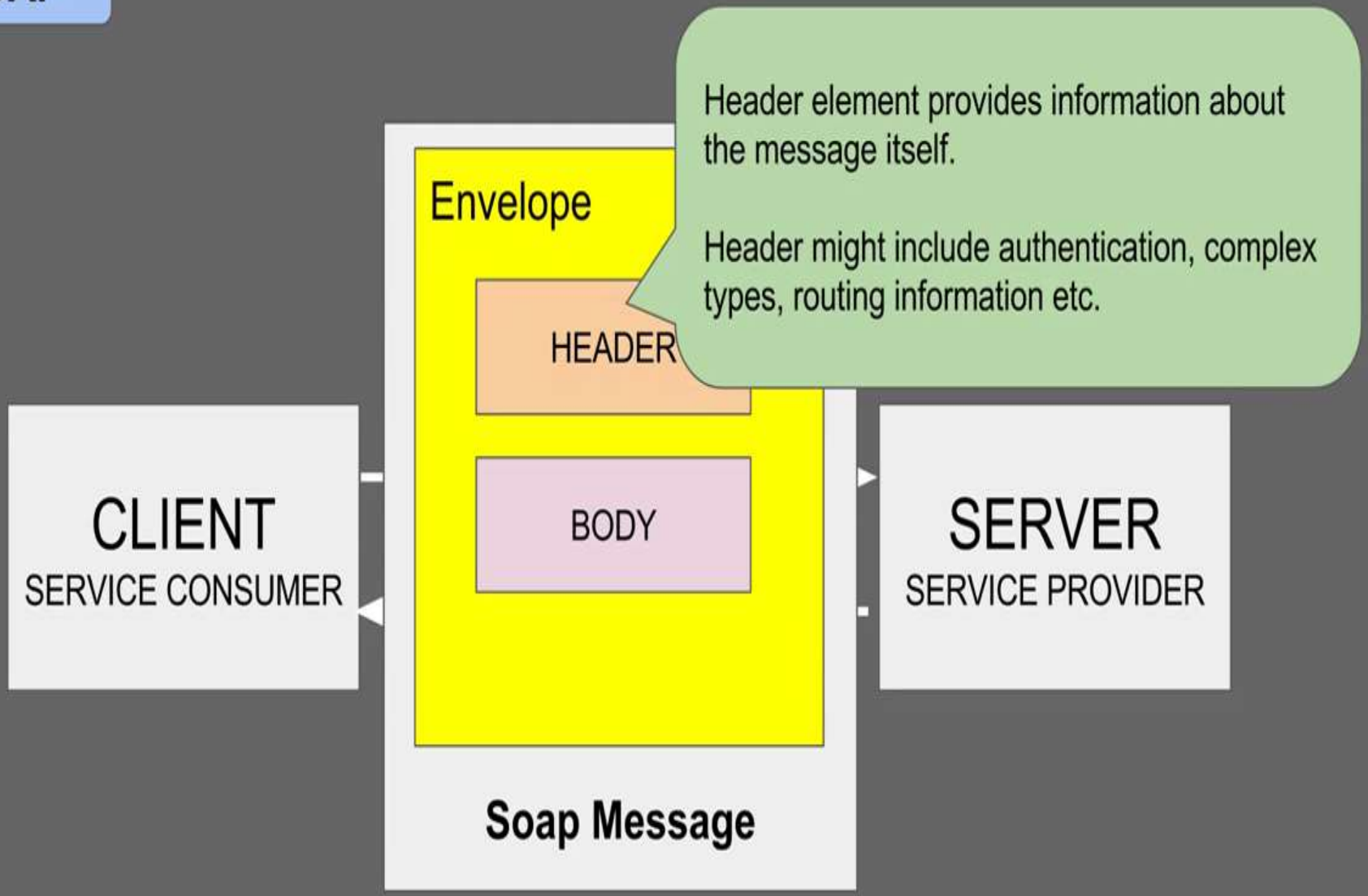
SOAP

Envelope is the root element of a Soap Message.
This is the basic unit of the XML document which contains other units like Header and Body.



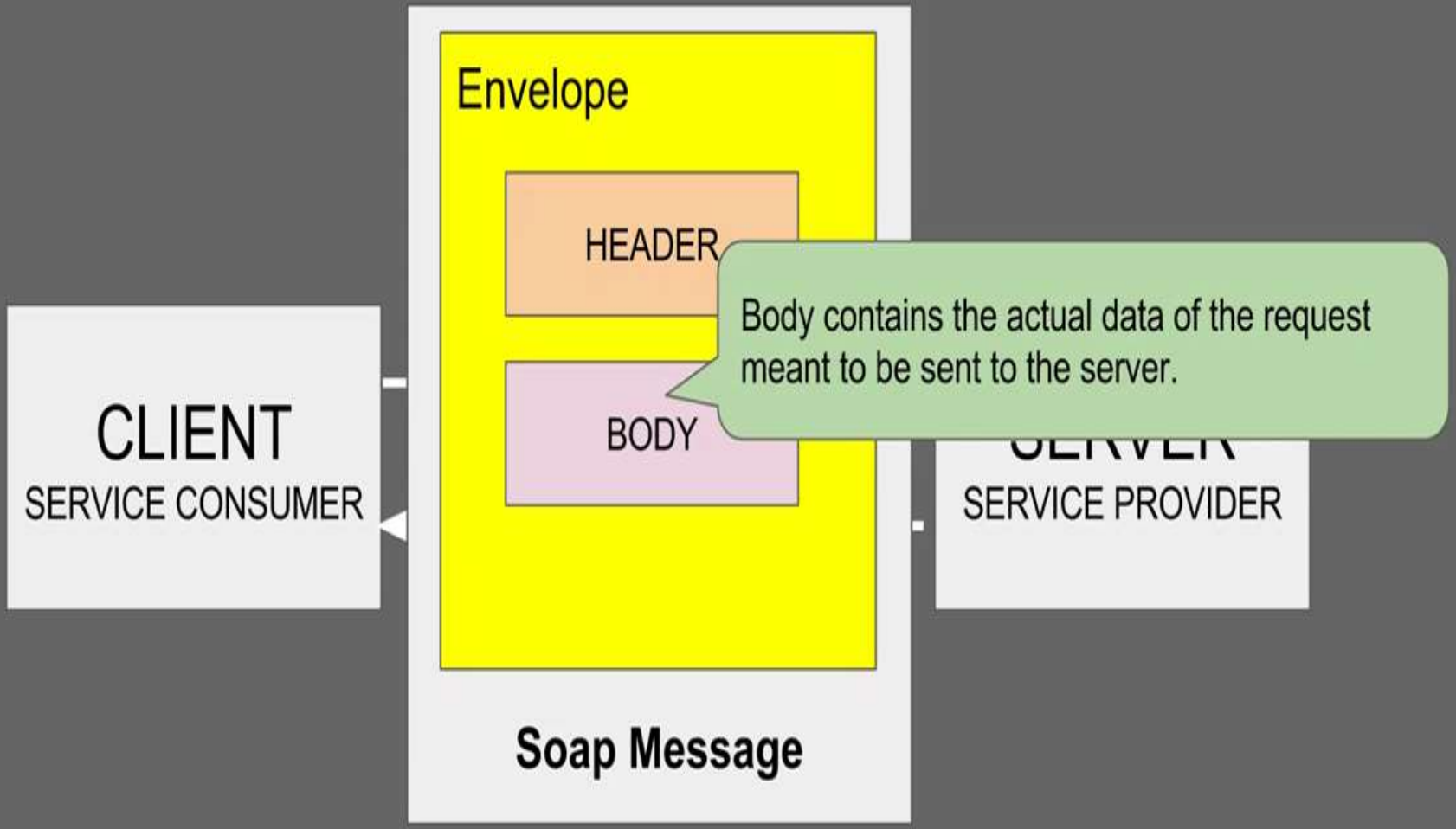
What are SOAP Web Services ?

SOAP

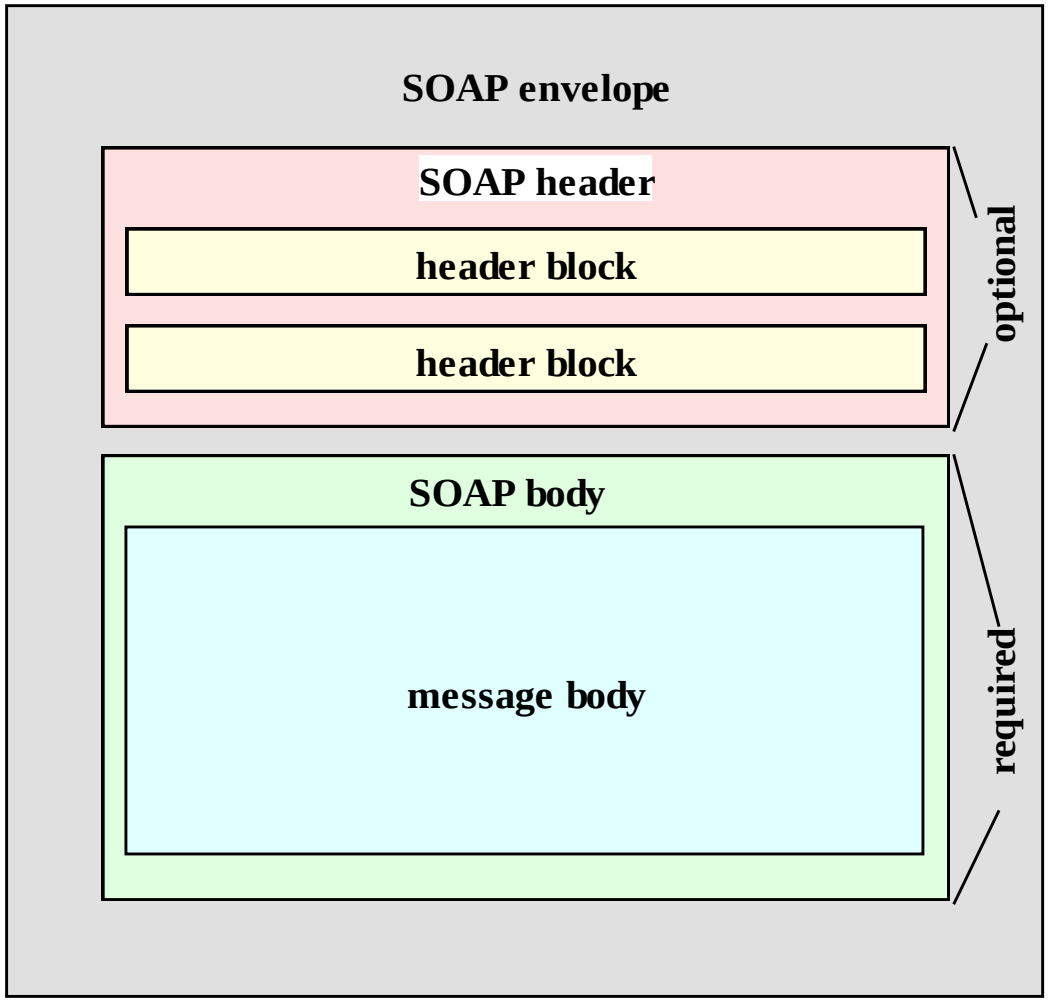


What are SOAP Web Services ?

SOAP



SOAP Messages



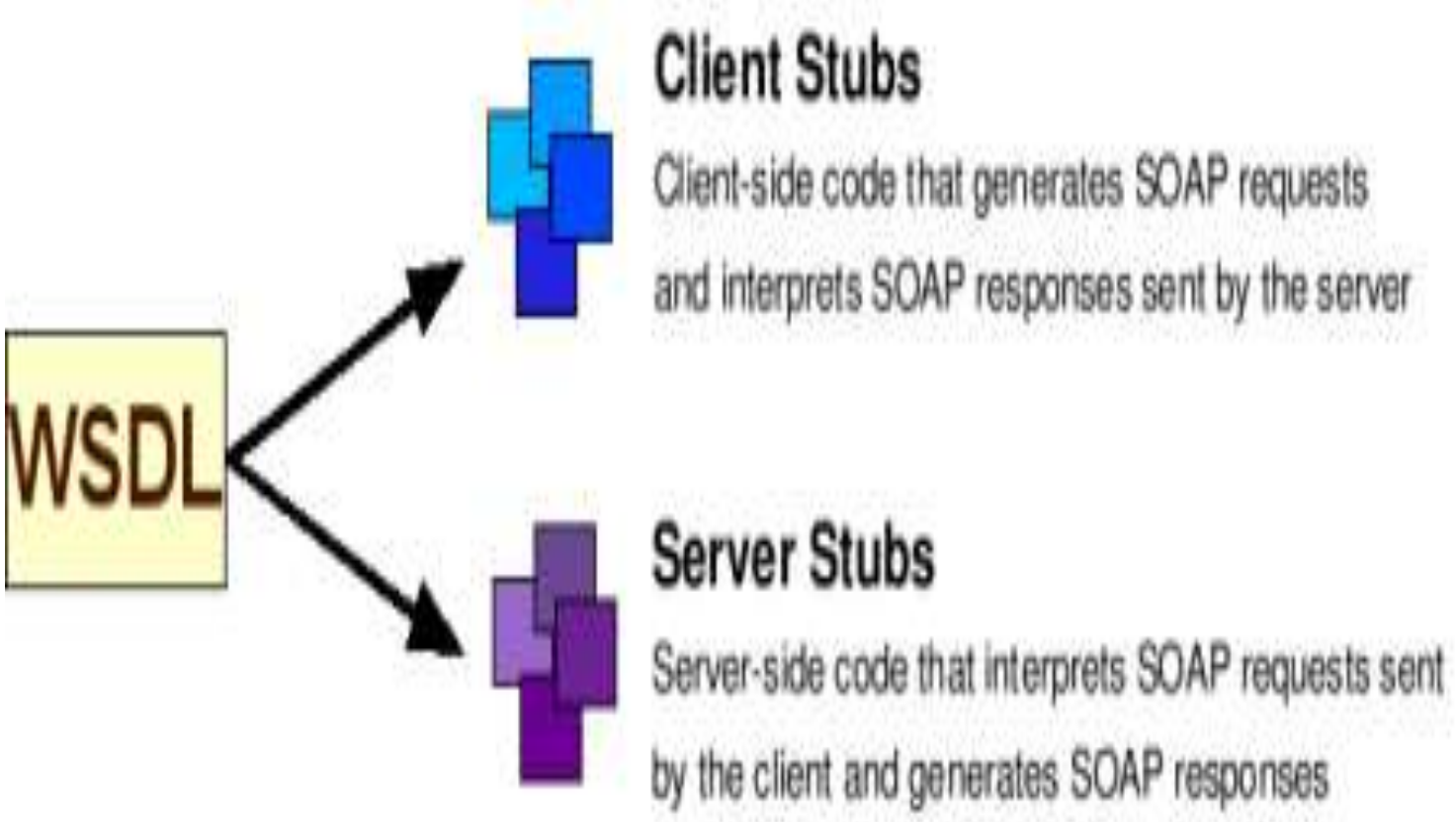
A SOAP message is an **ordinary XML document** containing the following elements:

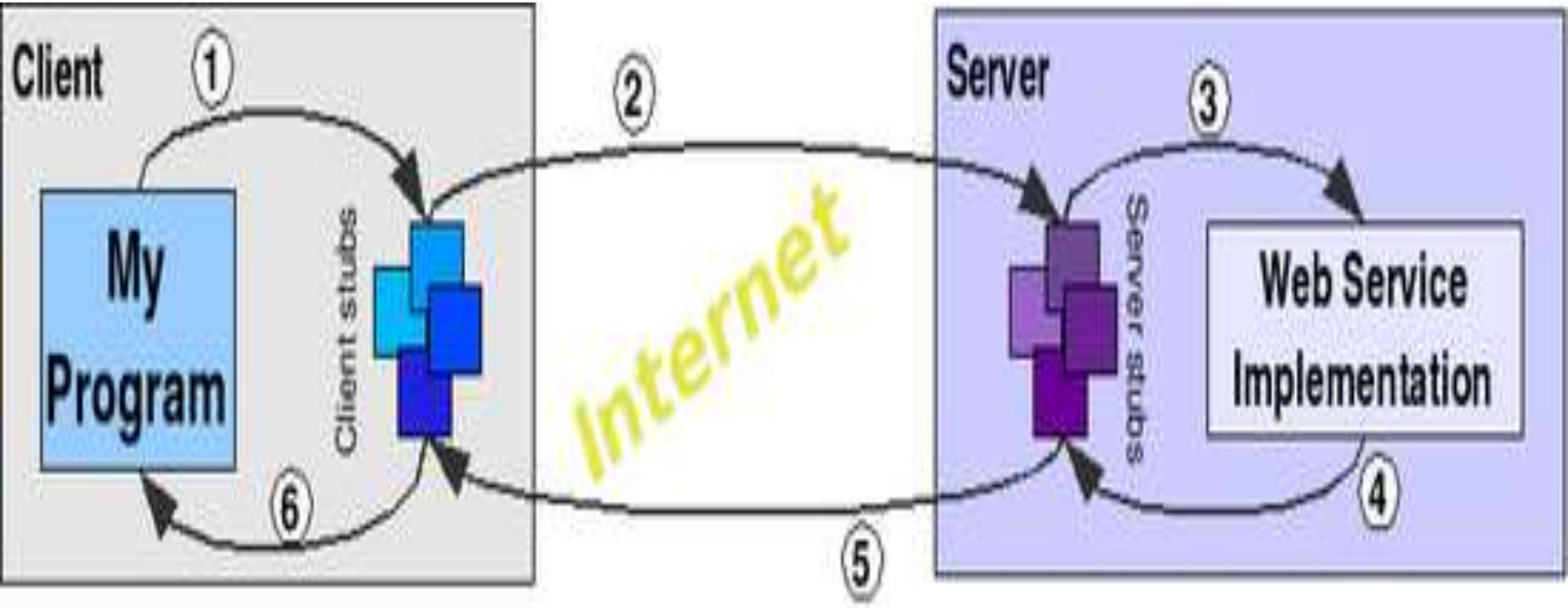
- **Envelope** - identifies the XML document as a SOAP message
  - **Header** - contains information about the request.
  - **Body**
    - **Message data** - contains request and response information itself.
    - **Fault (optional)** - containing errors and status information.

What are SOAP Web Services ?

SOAP

Need for stubs (similar to RMI)




Client
1
My Program
Client stubs
2
Internet
Server
3
Server stubs
Web Service Implementation
4
5
6

SOAP – Pros & Cons

- SOAP Pros
  - Standard protocol for exchanging information in a decentralized and distributed environment.
  - Platform independent & Vendor neutral.
  - Simple compared to RMI, CORBA, and DCOM etc
  - Decouples the encoding and communications protocol.
  - Anything that can generate XML can communicate through SOAP.
  - Additional Security in addition to HTTP authentication or HTTPS.
  - Supported by most languages and tools.

- SOAP Cons
  - Complex compared to RESTful Services
  - Higher learning curve
  - Being protocol heavy may lead to performance issues

Summary

- **SOAP** is a protocol that makes use of HTTP requests and responses to effect remote method calls to web services.
- A SOAP method call is encoded in **XML** and is embedded in an HTTP request
- The return value of a method call is likewise embedded and encoded in an HTTP response
- A number of SOAP APIs are available for programming web services and client method calls. The Apache API was introduced.


THANK YOU