CSC 406: Net-Centric Computing

Lecture 6

Web Services

2nd Semester (2017/2018 session) 1439h

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Service-Oriented Architecture

- SOA is a way of designing a software system to provide services to either end-user applications or other services through *published* and *discoverable* interfaces.
- Applications are developed as independent sets of interacting services offering *well-defined interfaces* to their potential users.
  - In many cases, services provide a better way to expose *discrete business functions* and therefore an excellent way to develop applications that support business processes

Web Service

- Generally, a **service** is implemented as a coarse-grained, discoverable software entity that interacts with applications and other services through a loosely coupled (often asynchronous), message-based communication model.
- When the services interact using public (unsecured) Internet protocols it is called *Web Service*.
- Web service applications use XML as the common messaging language.
- Web services are independent from transport protocols
  - the same XML message can be transferred via more than one transport protocol. The term web services implies this protocol is HTTP, but other protocols such as the SMTP can also be used.

Web Services Architecture

Roles in a Web Services Architecture

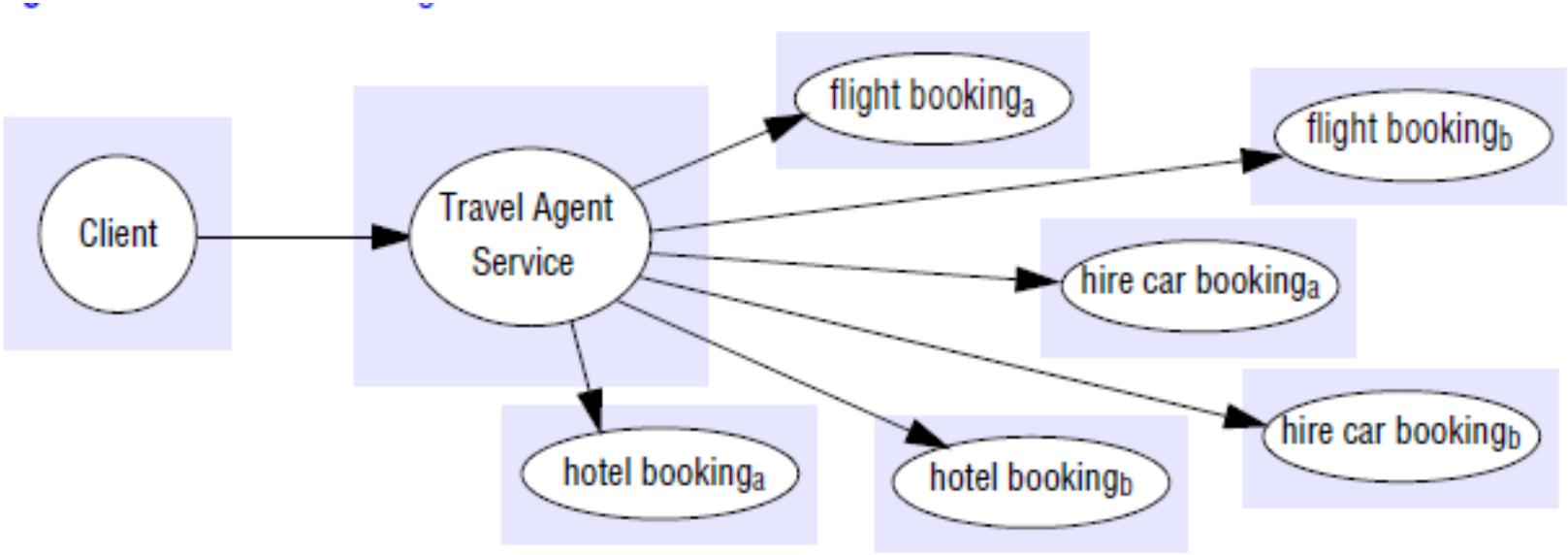
- Service provider.
  - From a business perspective, this is the owner of the service.
  - From an architectural perspective, this is the platform that hosts access to the service (server).
- Service requestor.
  - From a business perspective, this is the business that requires certain functions to be satisfied.
  - From an architectural perspective, this is the application that is looking for and invoking or initiating an interaction with a service (client). The service requestor role can be played by a browser driven by a person or a program without a user interface, for example another Web service.
- Service registry.
  - This is a searchable registry of service descriptions where service providers publish their service descriptions and
  - Service requestors find services and obtain binding information from this registry.

Operations in a Web Service Architecture

- Publish.
  - To be accessible, a service description needs to be published so that the service requestor can find it.
- Find.
  - The service requestor retrieves a service description directly or queries the service registry for the type of service required.
  - The *find* operation can be involved in two different lifecycle phases for the service requestor: at design time to retrieve the service's interface description for program development, and at runtime to retrieve the service's binding and location description for invocation.
- Bind.
  - The service requestor invokes or initiates an interaction with the service at runtime using the binding details in the service description to locate, contact and invoke the service.

Combination of web services

- The ‘travel agent service’ combines other web services



Core Web Service Technologies

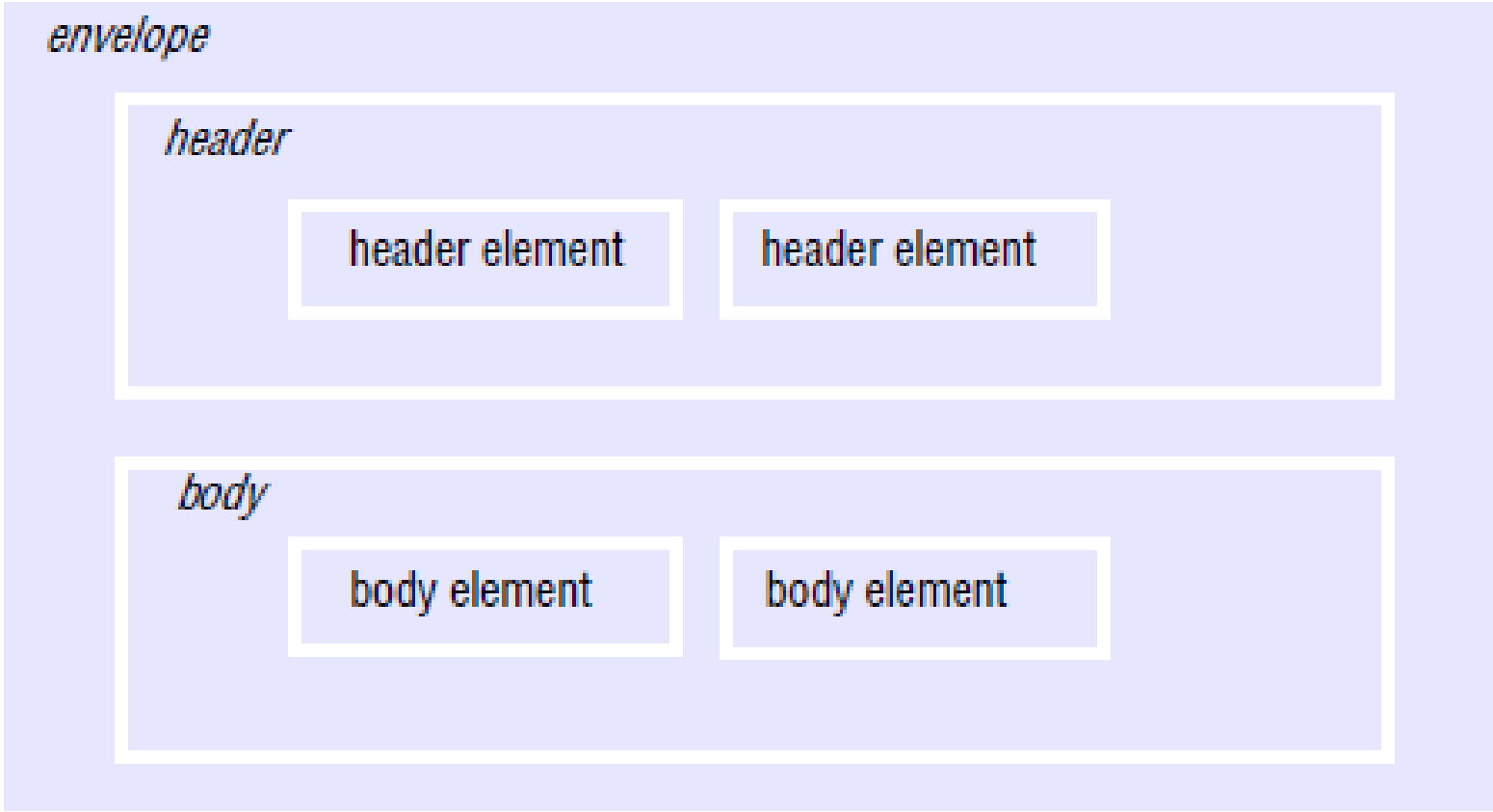
- Web service use XML-based protocols and messages. Using XML has many benefits:
  - Extensible
  - Standardized
  - Platform independent.
  - Programming language independent.
- Three core XML-based technologies are used:
  - SOAP (Simple Object Access Protocol)
  - WSDL (Web Service Description Language)
  - UDDI (Universal Directory, Discovery and Integration)

SOAP (2)

SOAP specification define each of the following:

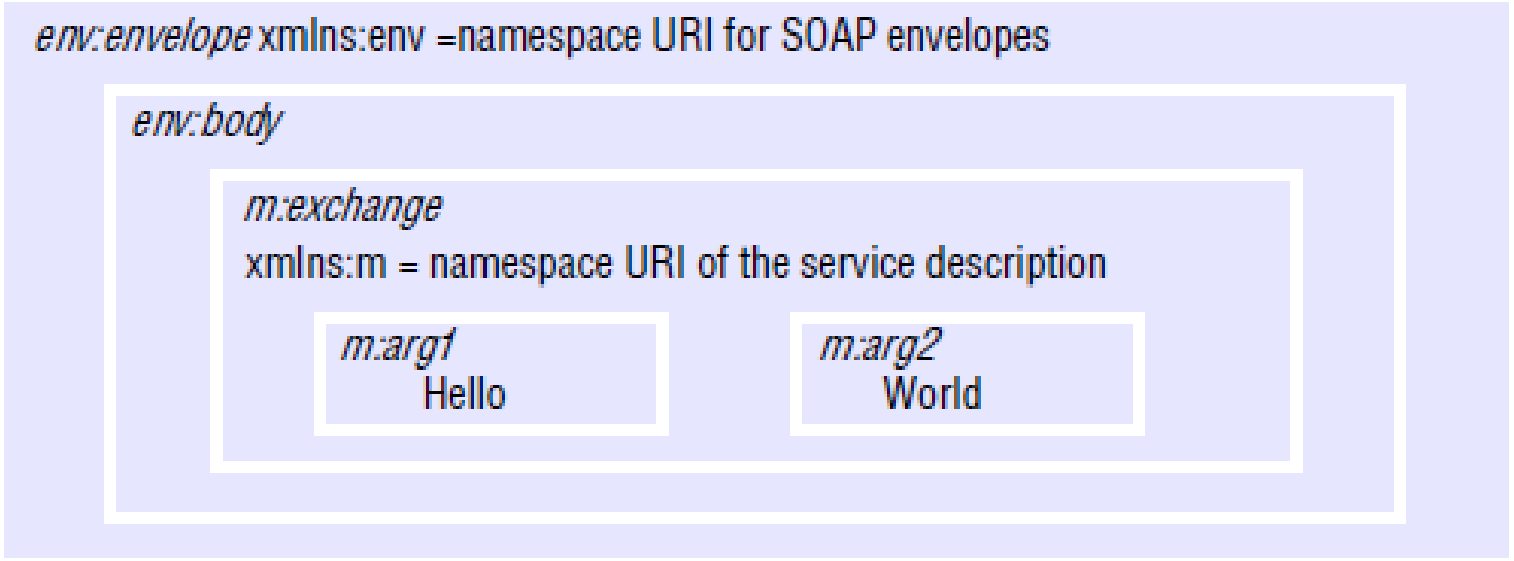
- Syntax for defining messages
  - Define XML syntax for building a SOAP message and a model for exchanging them.
- RPCs convention
  - A model for representing both parts (request-reply) of an RPC as a SOAP message.
- Rules for SOAP encoding
  - Define all XML built-in data type and standard schemas
- Guideline for transport layer protocol usage (HTTP)
  - Recommendations and hints for using SOAP over HTTP.

Elements of a Basic SOAP Message



Example SOAP Message

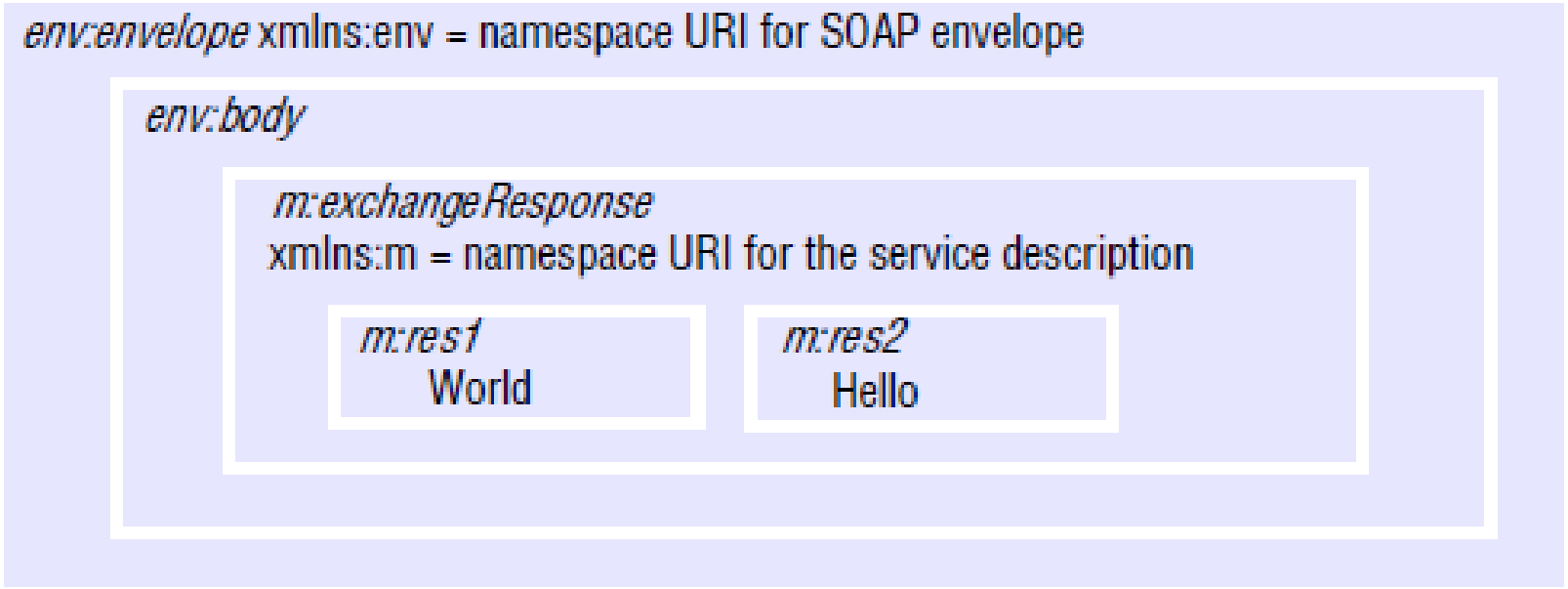
- Example of a simple request without headers



  - In this figure and the next, each XML element is represented by a shaded box with its name in italics, at the top left corner, followed by any attributes and its content

Example SOAP Message

- Example of a reply corresponding to the above request



A directory service for use with web services

- There are many ways in which clients can obtain service descriptions
  - For example, anyone providing a higher-level web service like the travel agent service would almost certainly make a web page advertising the service and potential clients would come across the web page when searching for services of that type.
- However, any organization that plans to base its applications on web services will find it more convenient to use a directory service to make these services available to clients.
  - This is the purpose of the Universal Description, Discovery and Integration service (UDDI) , which provides both a name service and a directory service

How UDDI Works