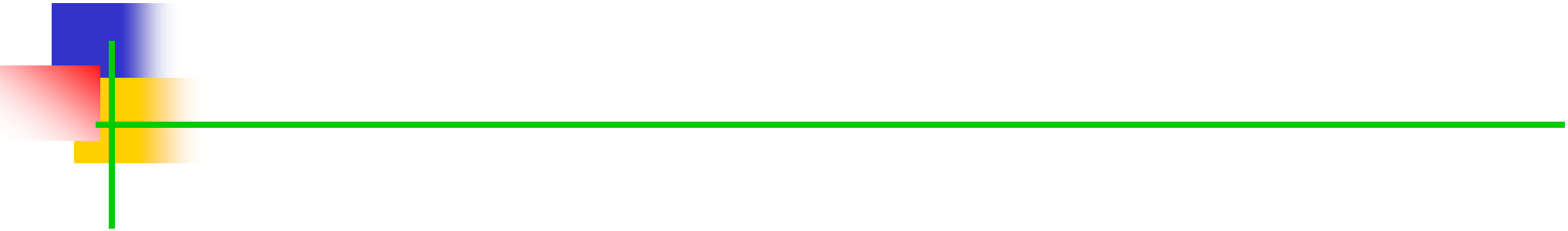
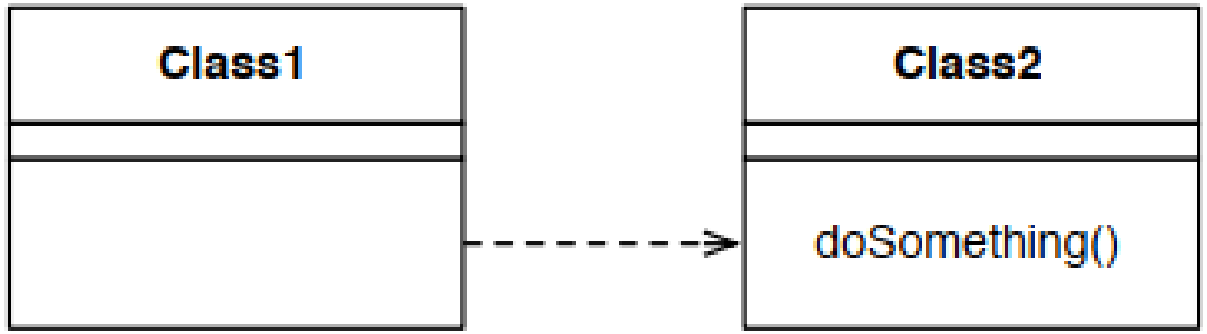
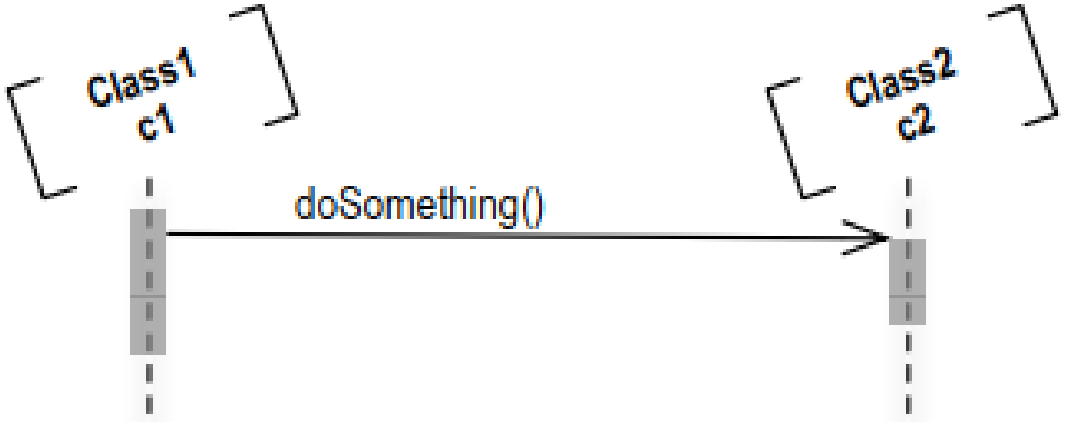
# Web Services



# Web Services?

## A quick look at Classes, and how they "talk" to each other

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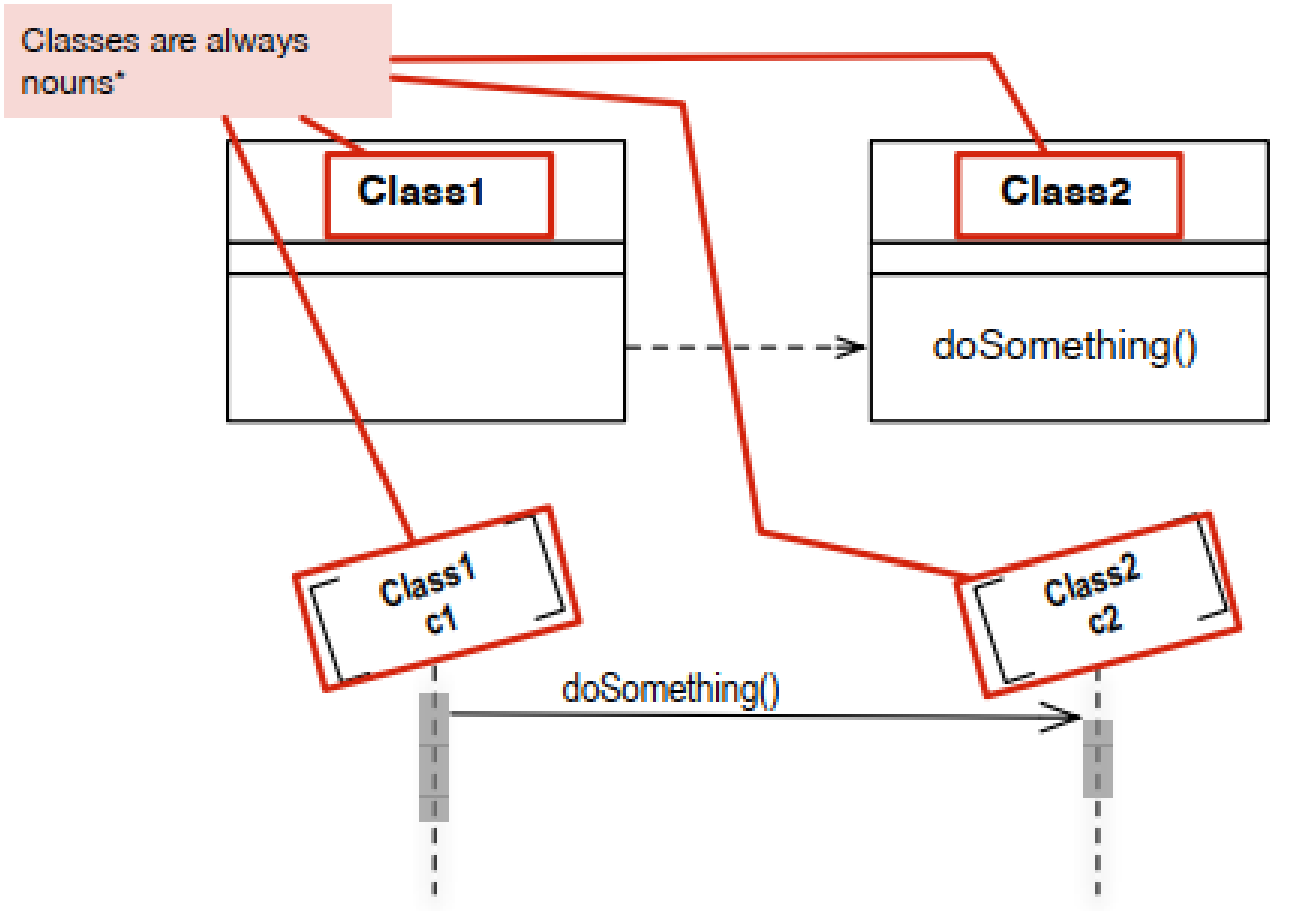
# A quick look at Classes, and how they “talk” to each other




*"note - they're often also "doers", or "responsibilities" but we'll think of them this way for now*

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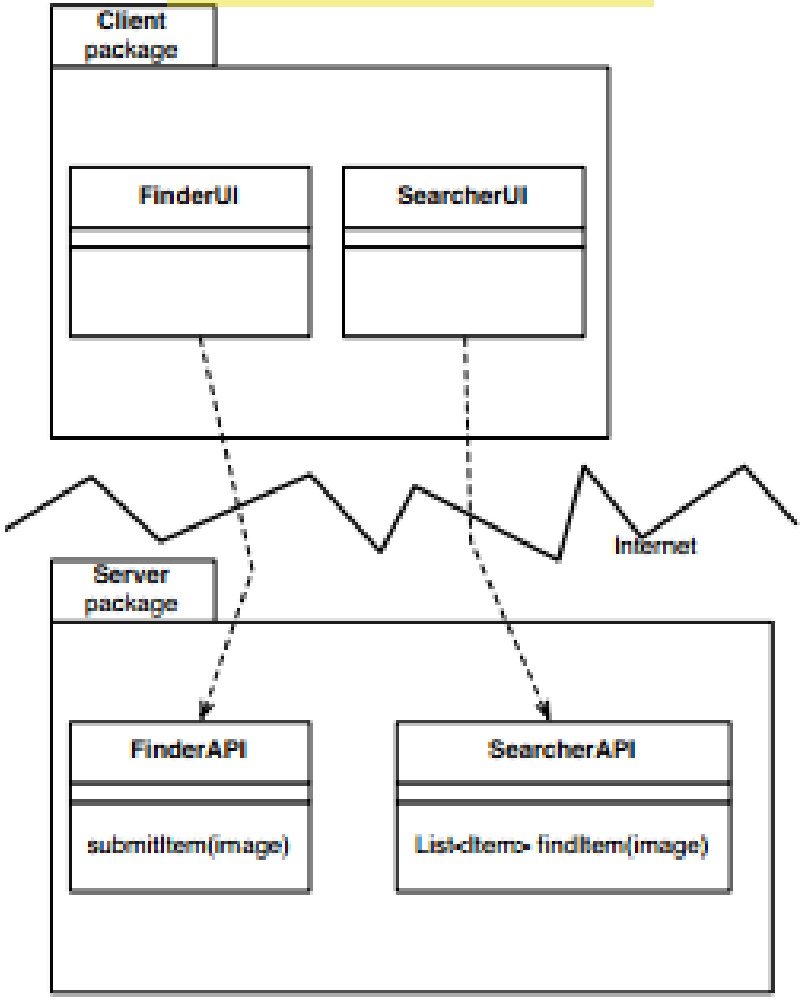
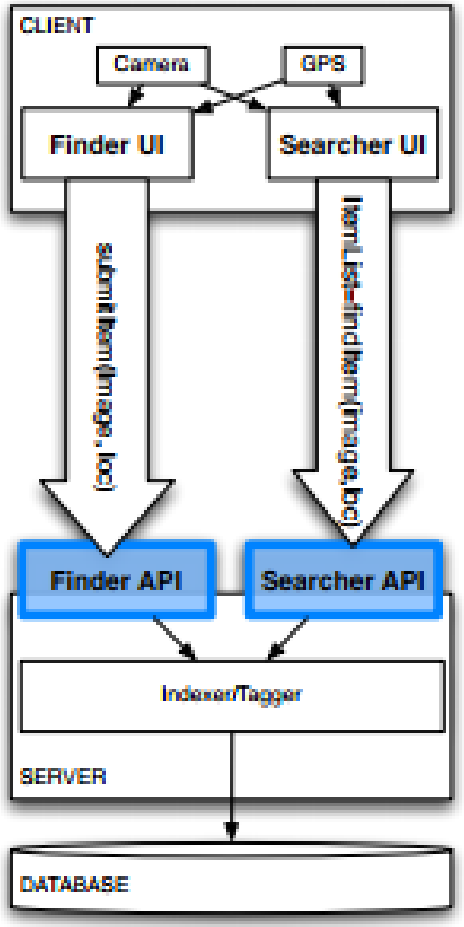
# This design arrangements holds for client-server behaviour in an **RPC** architecture

*Object-Oriented view*




- This approach involves Remote Procedure Calls (**RPC**)
- Note that the **calls** are specialised **verbs** (submitImage( ), find( ))
- The data must be pre-defined, meaning we both the client and the server must agree on data types.

*Architectural view*

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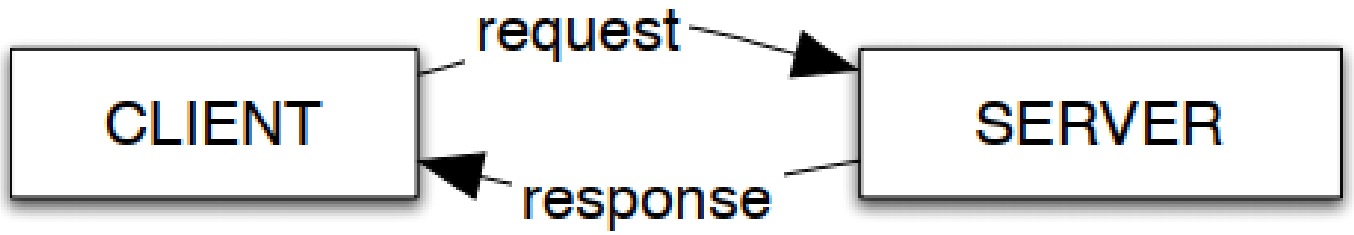
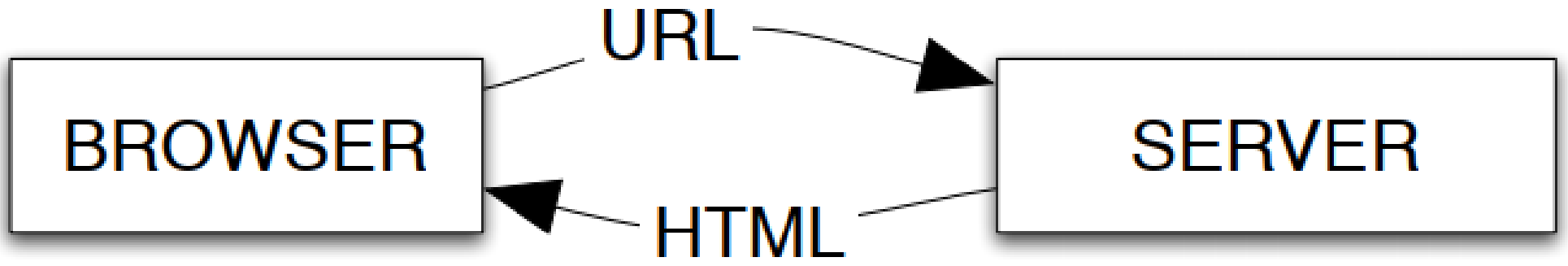
# If your Client is a browser





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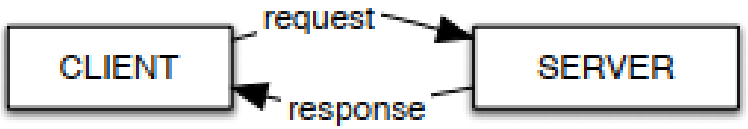
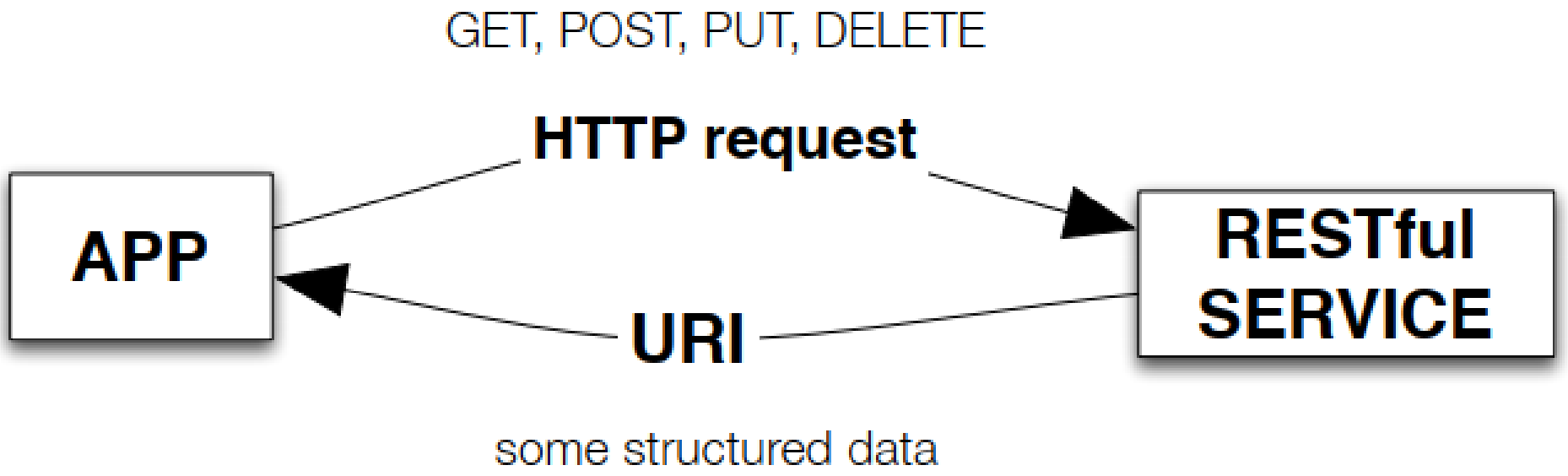
# If your Client is an Application





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# Web Service Example: Waldo

- Consider an Android application called Waldo.
- The Waldo application lets you:
  - (1) track other users of the Waldo application within a certain geographic area
  - (2) plots your location and the locations of other users on a map
  - (3) uses live bus information from Translink to determine the best bus to use to reach a selected user's location from your current location.





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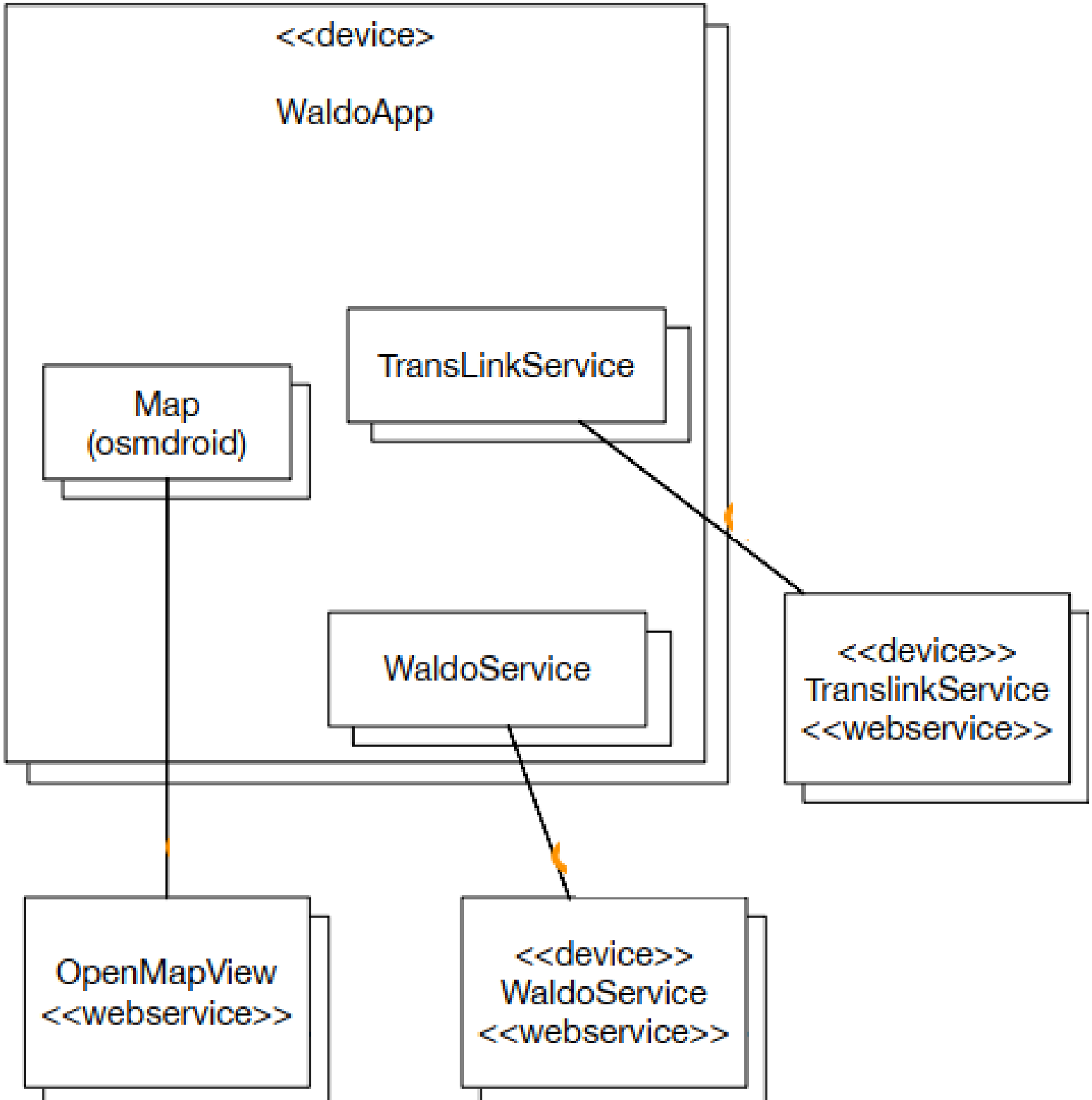


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# Waldo Web Service

- The Waldo web service will let you query to:
  - find Waldos to plot on your map and for which you can search for routes to, and
  - receive messages sent to you from Waldos





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# Waldo Web Service

- The waldo service is a web-service that is deployed on server. It:
  - tracks the names of users, or waldos, who are using the service
  - allows waldos to notify the service of their current location
  - permits waldos to retrieve the locations of other waldos
  - permits waldos to exchange messages in a limited fashion




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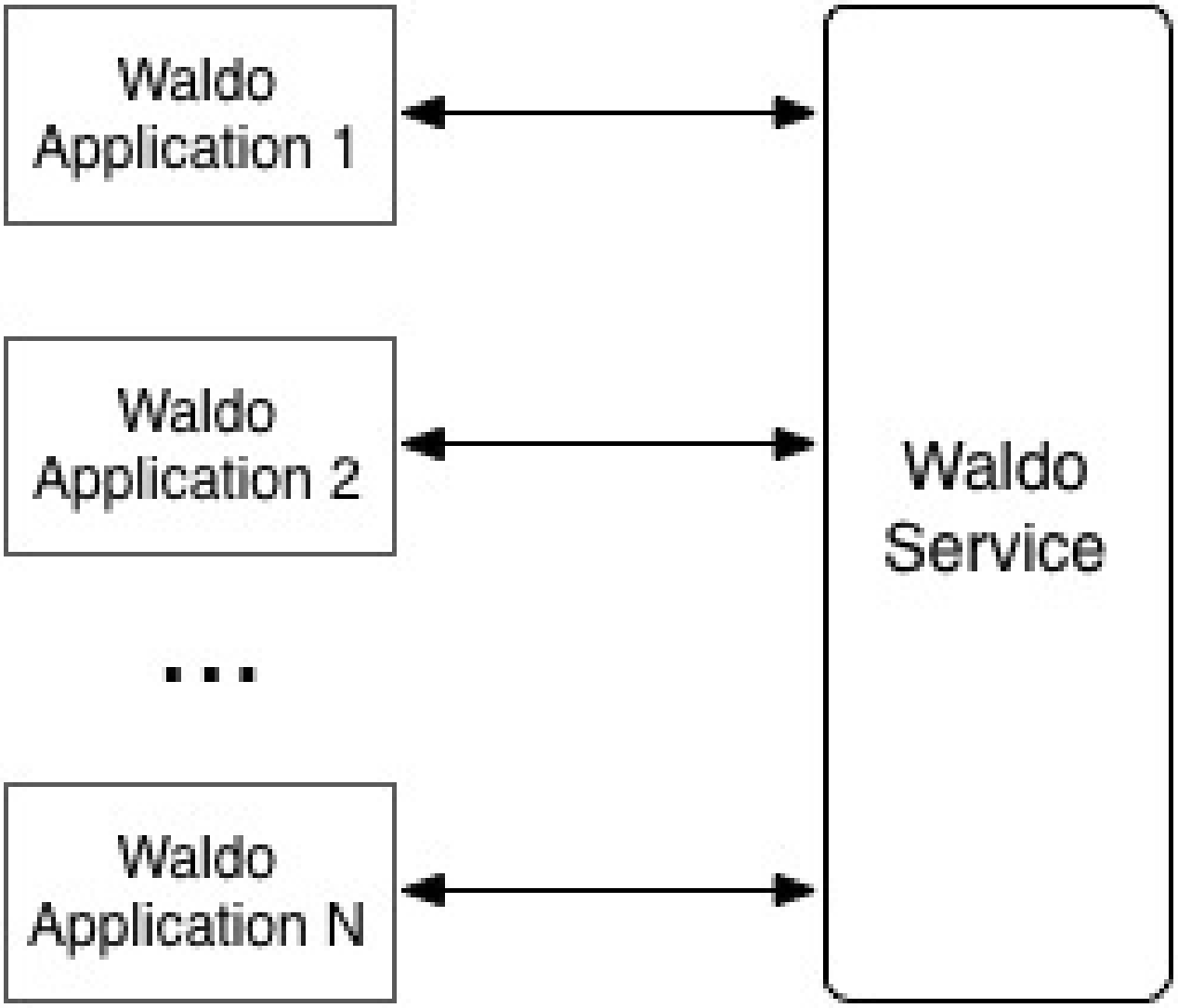
# Waldo Web Service Architecture





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# What API is provided by Waldo Service?

- Waldo service API
  - 1 initSession
  - 2 getWaldos
  - 3 getWaldoByName
  - 4 postLocation
  - 5 sendMsg
  - 6 getMsgs
  - 7 Error codes
  - 8 Notes





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# What API is provided by Waldo Service?

- Waldo service API
  - **getWaldos**
- Description:
  - Retrieve the location records for num number of waldos who have most recently updated their locations.
- Signature:
  - {ErrorNumber,ErrorString} | [{Name,Loc}, ... , {Name,Loc}] = getWaldos(key, num)





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# What API is provided by Waldo Service?

- Waldo service API
  - **getWaldos**
- Example URL:

http://kramer.nss.cs.ubc.ca:8080/getwaldos/CWejewid/5

key = "CWejewid"

num = 5





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# What API is provided by Waldo Service?

- Waldo service API
  - **getWaldos**
- Example successful return value:

[{"Name":"StationaryEchoBot",
"Loc":{"Lat":49.26612,
"Long":-123.24703,
"Tstamp":1383530259}}
....]





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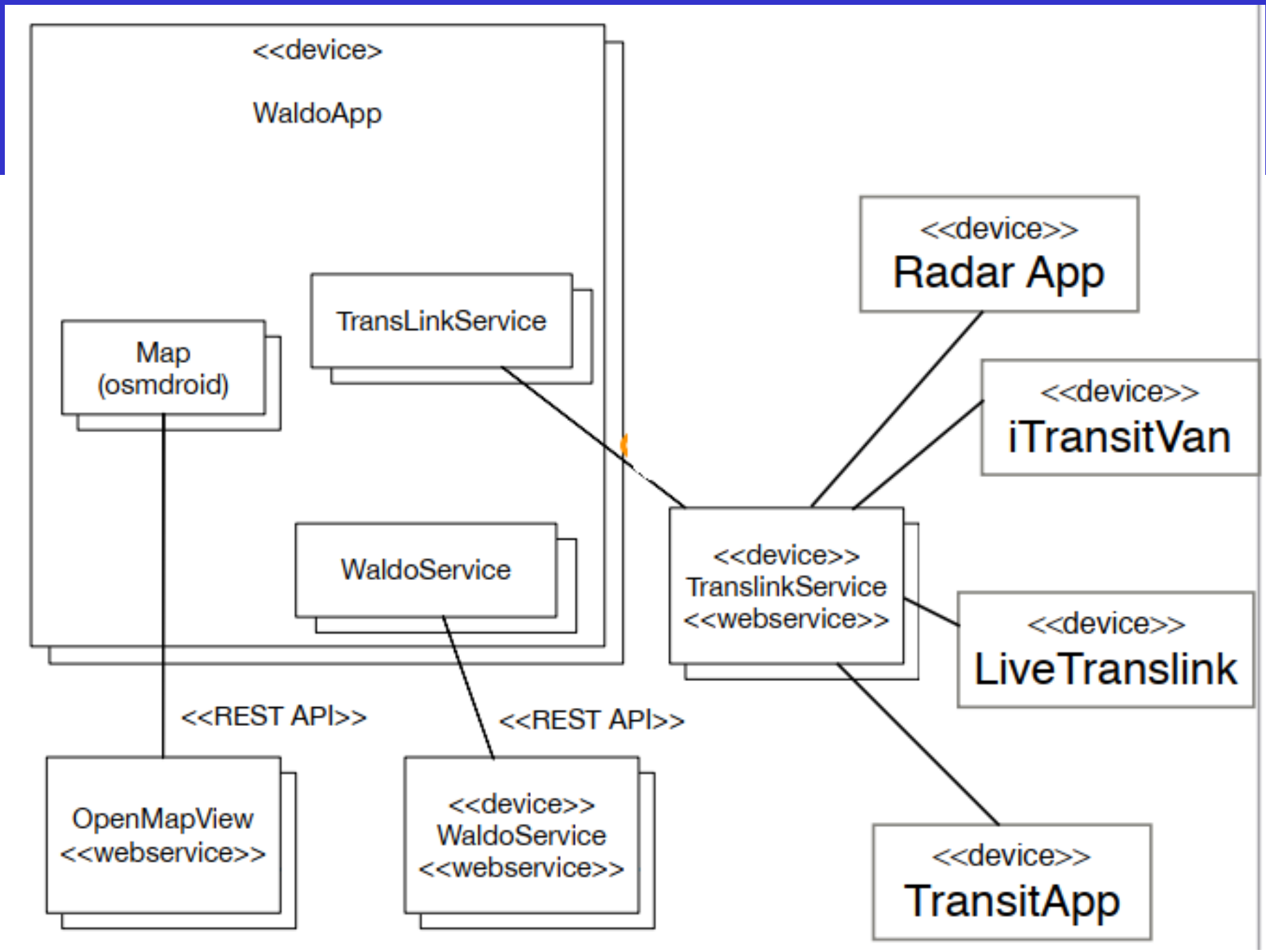


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# Web Services?

- A web service provides a **service interface** enabling clients to interact with servers in a more **general way than web browsers do**.
- Clients access the operations in the interface of a web service by means of requests and replies formatted in XML and usually transmitted over HTTP

# Web services?

- Wikipedia:
  - A **Web service** is a service offered by an electronic device to another electronic device, communicating with each other via the World Wide Web. In a Web service, Web technology such as HTTP, is utilized for machine-to-machine communication, for transferring machine readable file formats such as XML and JSON.
- W3C:
  - A Web service generally is a software system designed to support interoperable machine-to-machine interaction over a network. (**how is interoperability achieved?**)

# Web server versus Web services

- A web server provides basic HTTP services, whereas web services provide services based on the operations defined in their interface. (**Example?**)
- Web services can be provided by web servers therefore they are an extension of the Web.
- Web services servers need not be web servers.
- Application servers vs. web servers?

# Web Server

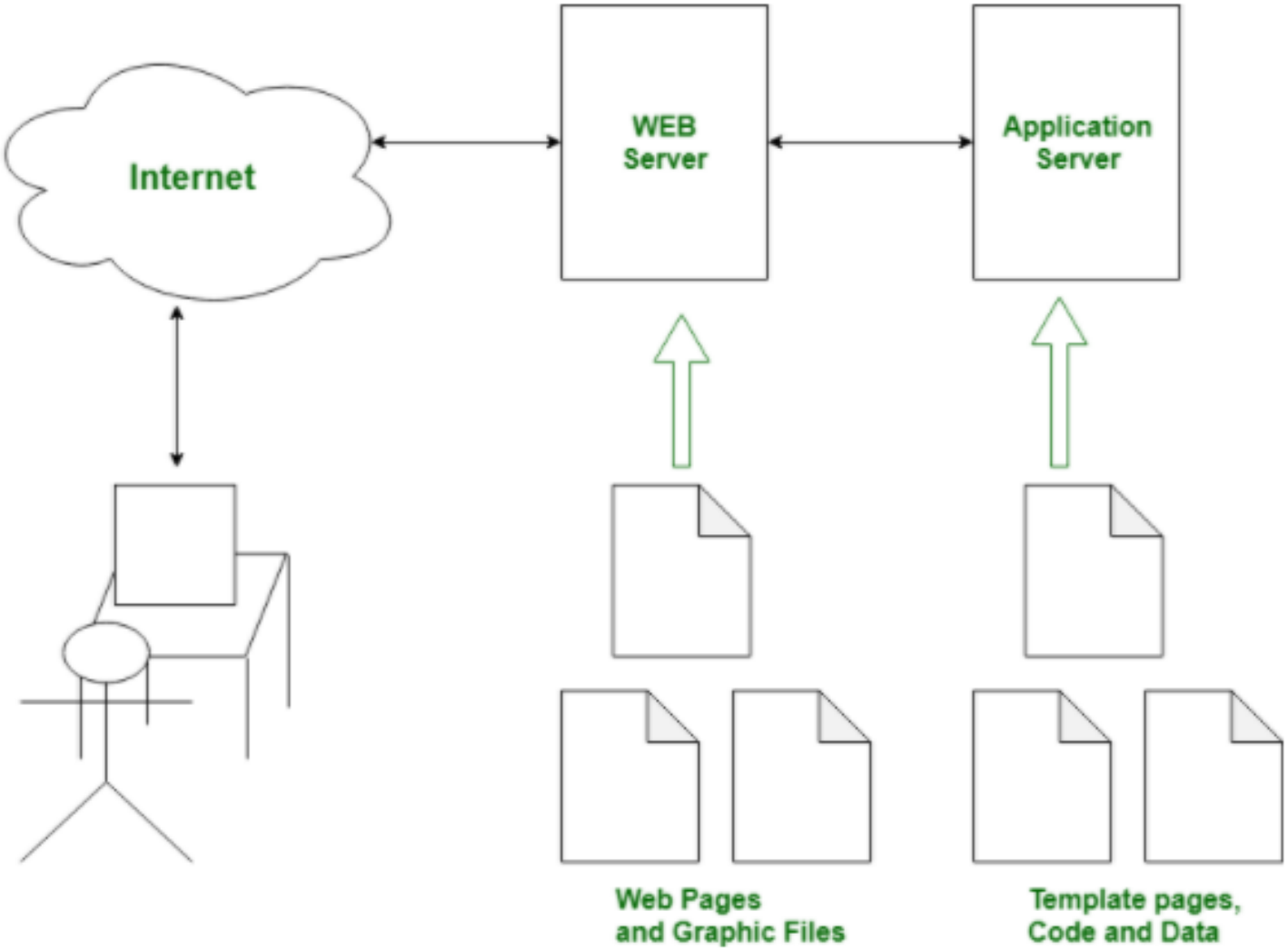
- Definition 1:
- A web server is a service that handles *specifically* requests in the **HTTP** protocol format.
- The server responses to requests made using the HTTP format, and in turn responds using a valid HTTP response.
- Definition 2
- It is a computer program that accepts the request for data and sends the specified documents.

# Web Server

# Application server

- Definition 1
- An application server is a service that handles *specifically* requests for business operations, and performs business logic.
- It is not limited to the **HTTP** protocol, but can operate using that protocol if it fits the business requirements.
- Definition 2
- It encompasses Web container as well as EJB container. Application servers organize the run atmosphere for enterprises applications.

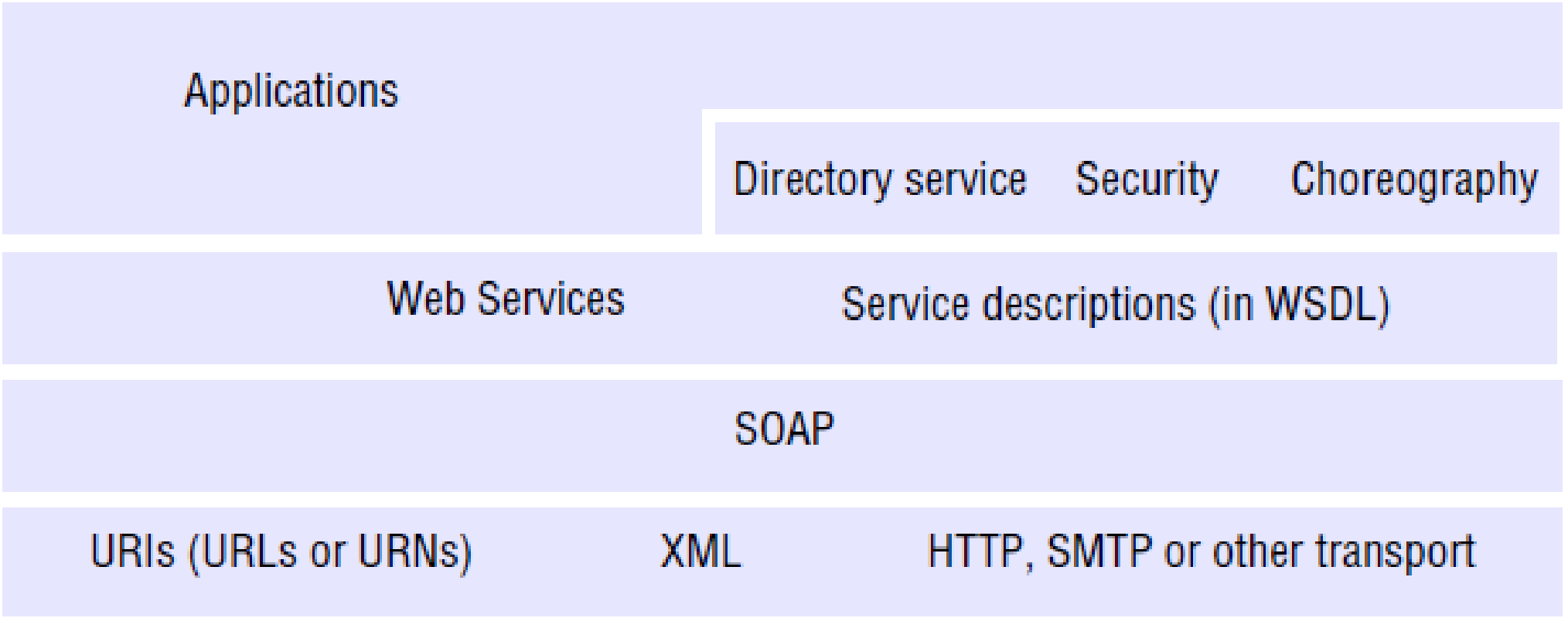
# Application server



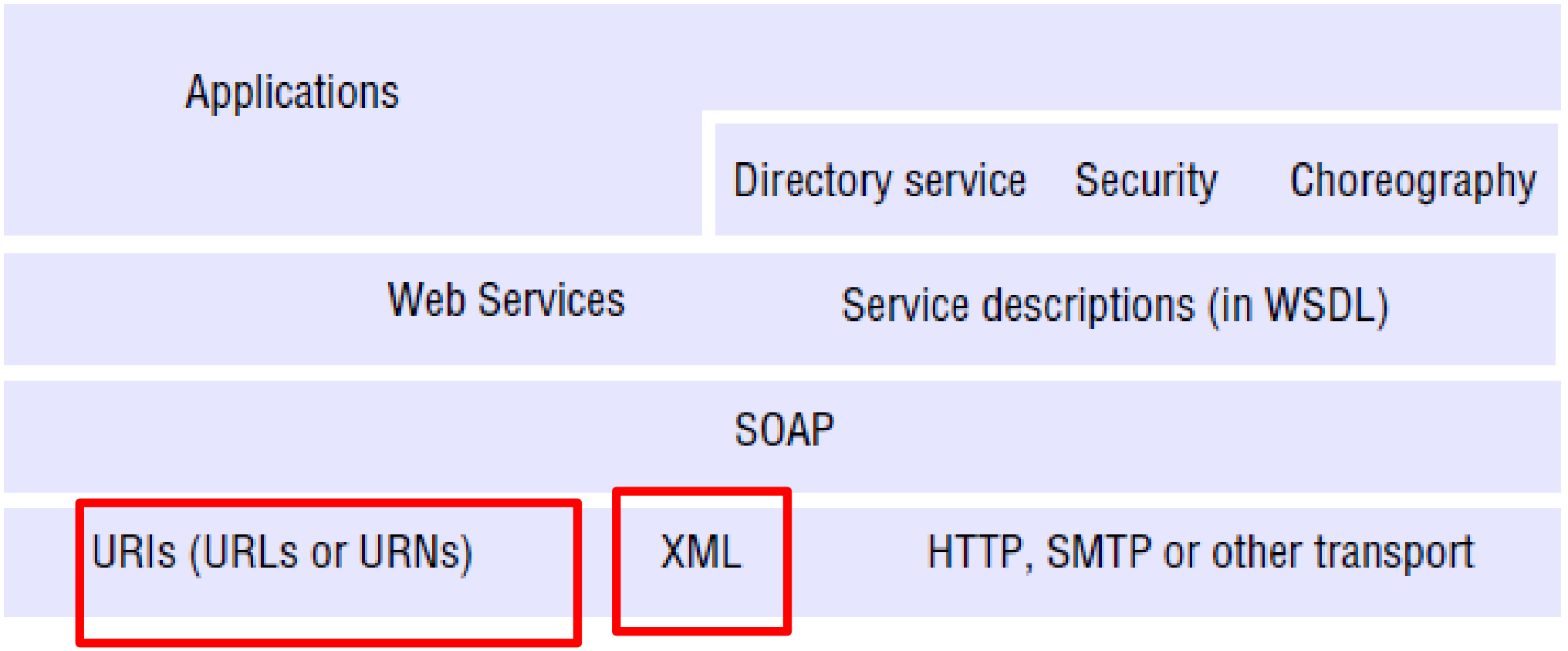
# Web Server vs. Application Server

- Content?
- Application types?
- Multithreading support?
- Supported protocols?

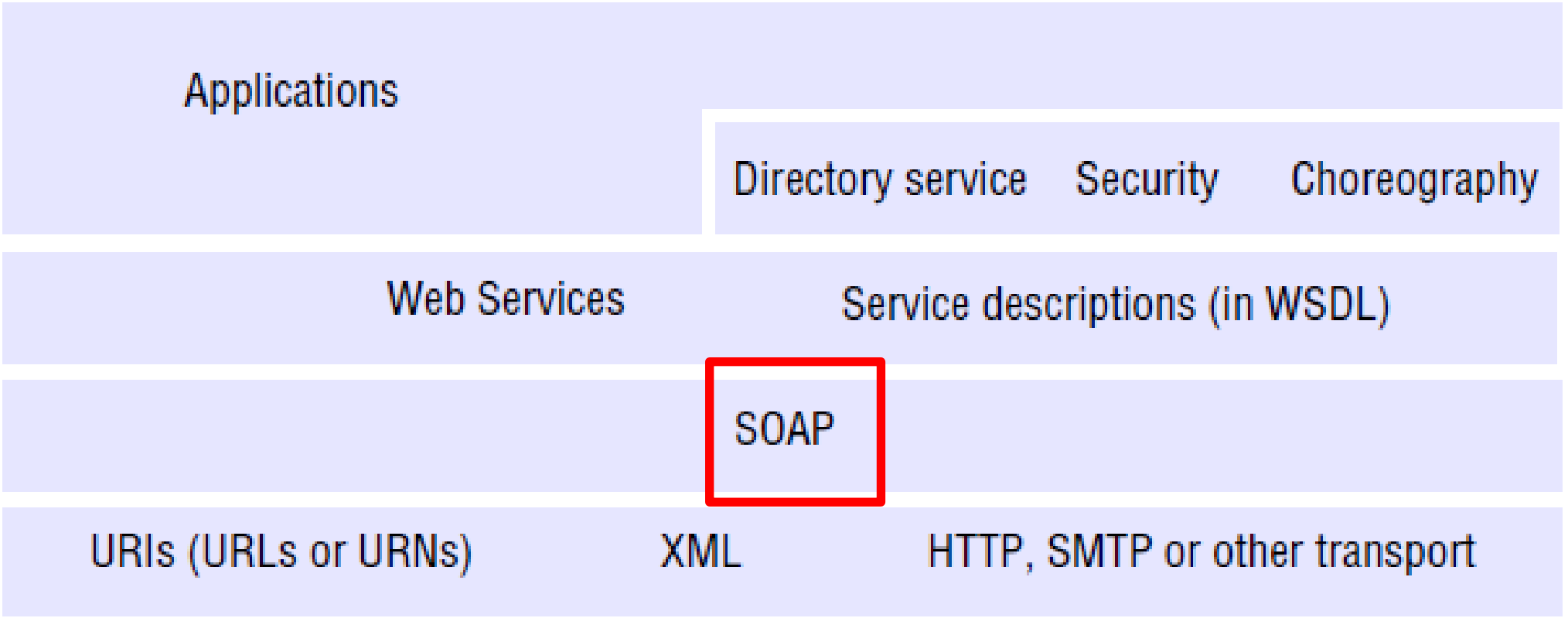
# Web services Infrastructure and Components



# Web services Infrastructure and Components



# Web services Infrastructure and Components



# Web services Infrastructure and Components

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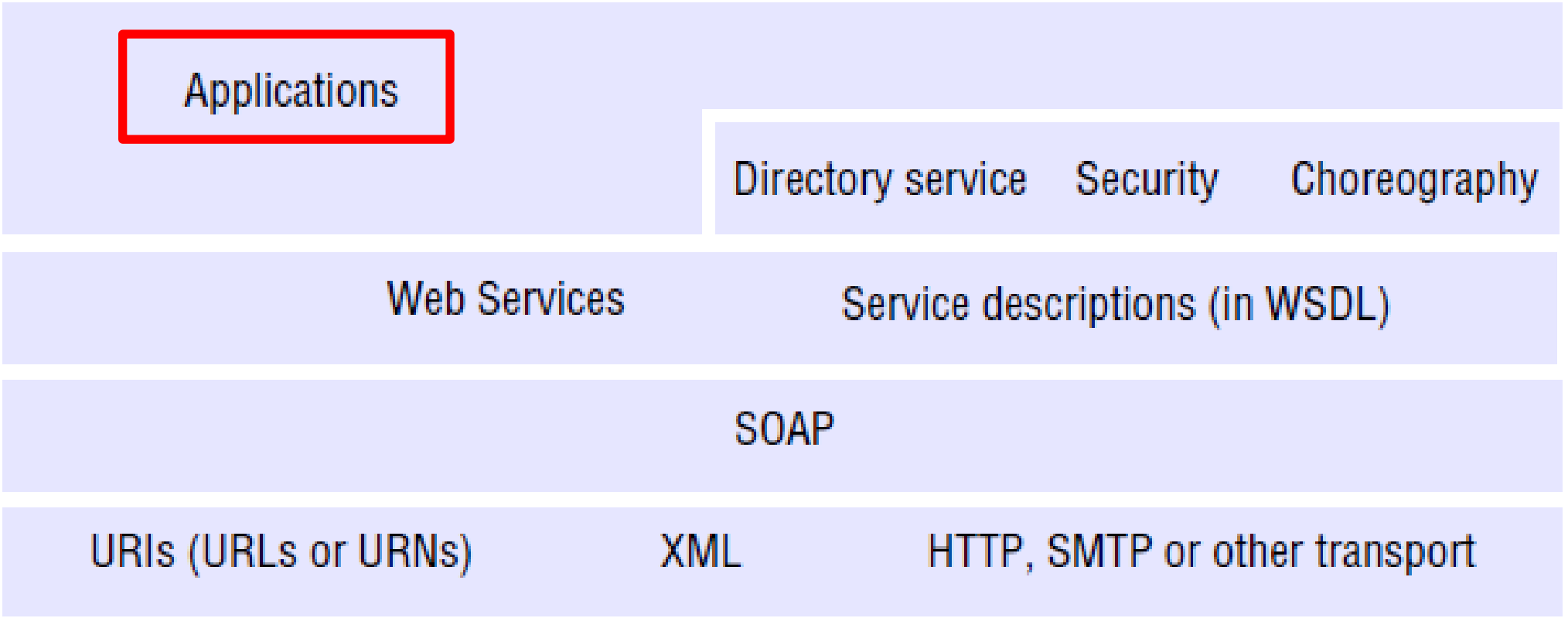


# Web services Infrastructure and Components

# Web services infrastructure and components III

- Some particular web services provide general functionality required for the operation of other web services.
- They include directory services, security and choreography
  - a naming or directory service allow clients to find out about services
  - XML Documents or parts of documents may be signed or encrypted.
  - choreography of web services allows one web service to use predefined patterns of access to a set of other web services.

# Web services infrastructure and components IV

- Service choreography is a form of service composition in which the interaction protocol between several partner services is defined from a global perspective.

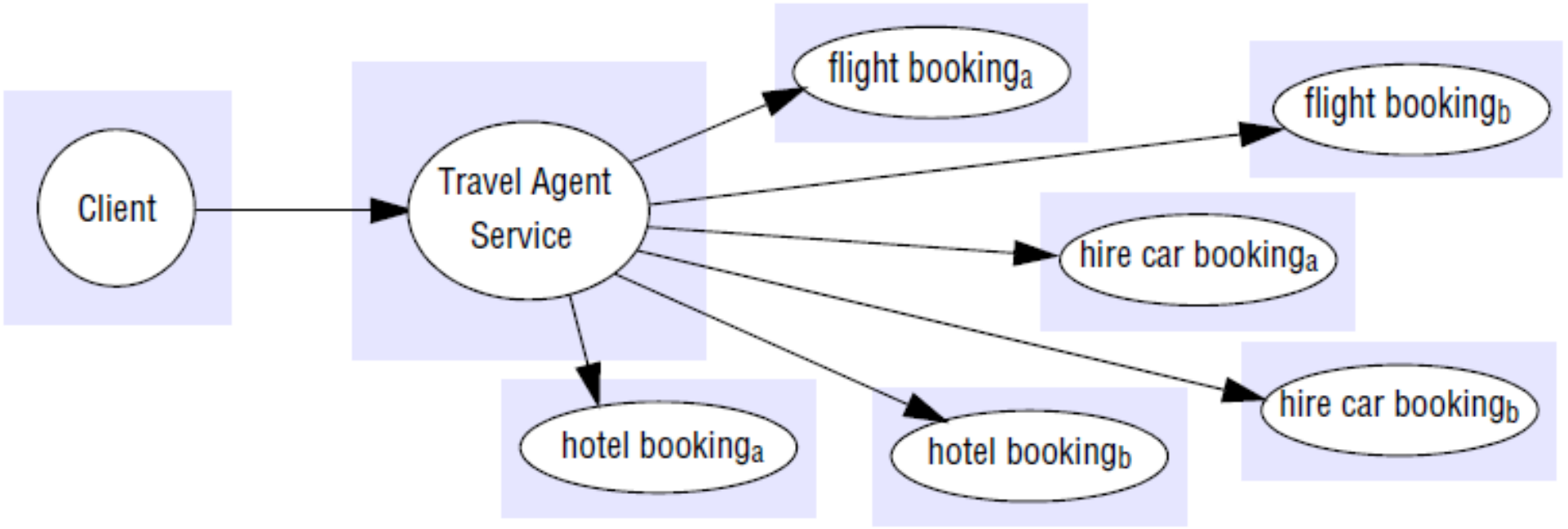
  "Dancers' dance follow a global scenario without a single point of control"

- At run-time each participant in a service choreography executes its part of it (i.e. its role) according to the behaviour of the other participants.

# Web services infrastructure and components V

- A web service generally provides a service description, which includes an interface definition and other information, such as the server's URL.
- This is used as the basis for a common understanding between client and server as to the offered service.
- *Web Services Description Language (WSDL)* is used to describe a service interface.

# Travel Agent Service



# Required Readings

- Chapter 9: **Distributed Systems**: **Concepts and Design**, 5th Edition. George **Coulouris**, Cambridge University. Jean Dollimore, Formerly of Queen Mary, University of London.
- https://www.geeksforgeeks.org/difference-between-web-server-and-application-server/

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- http://en.wikipedia.org/wiki/Web_service