Network Architecture and Security

ECAM STRASBOURG-EUROPE 2018-2019

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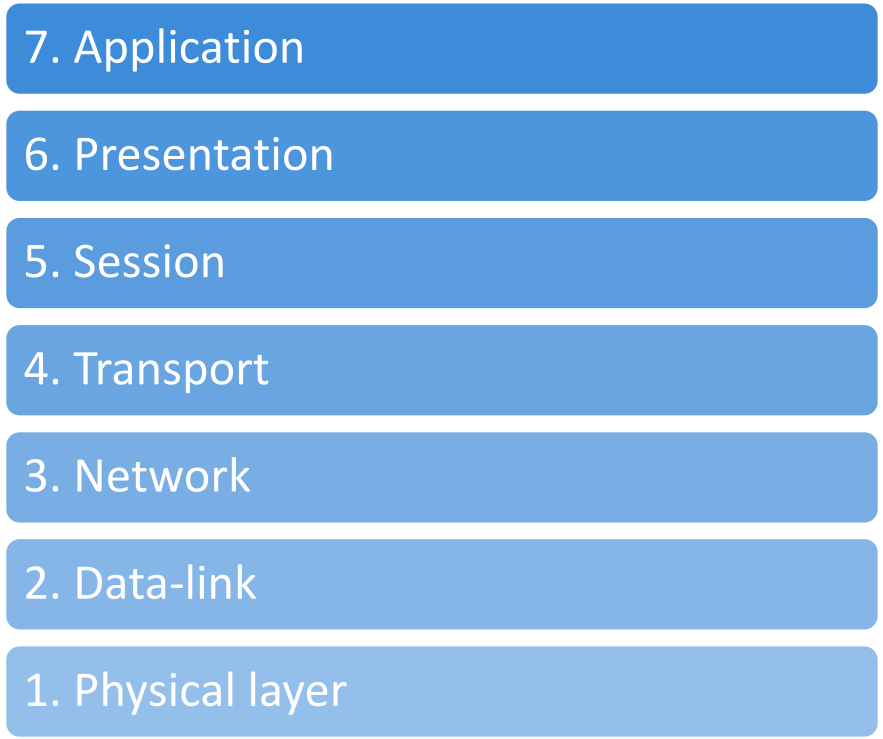
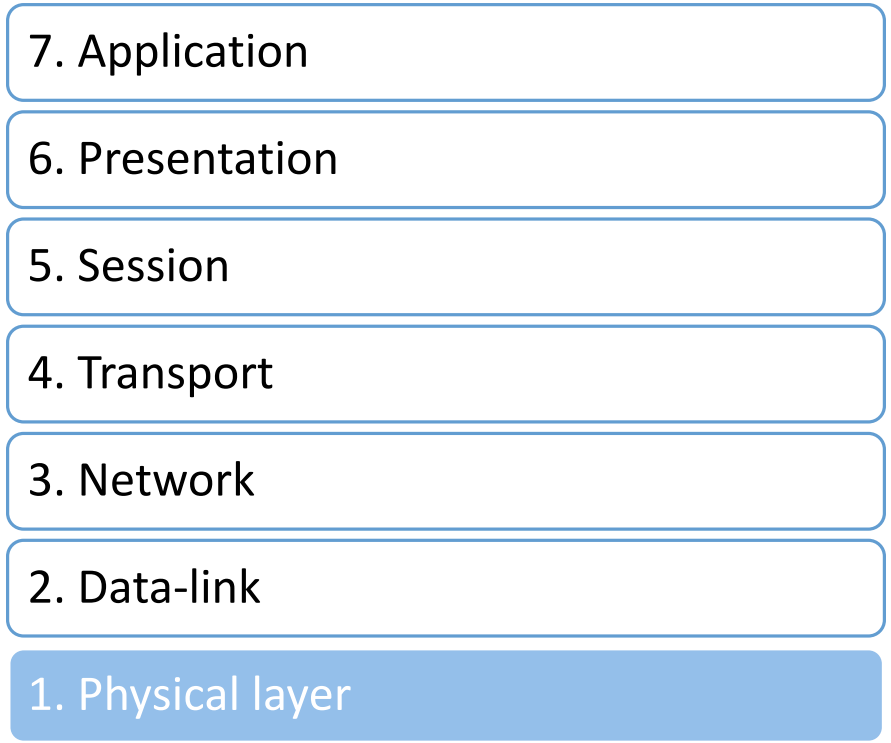
OSI Model, DHCP and DNS

OSI Model

The **Open Systems Interconnection model** is a conceptual model that **characterizes and standardizes** the different abstraction layers required for enabling communication between computers over a network.



OSI Model – The layers in detail



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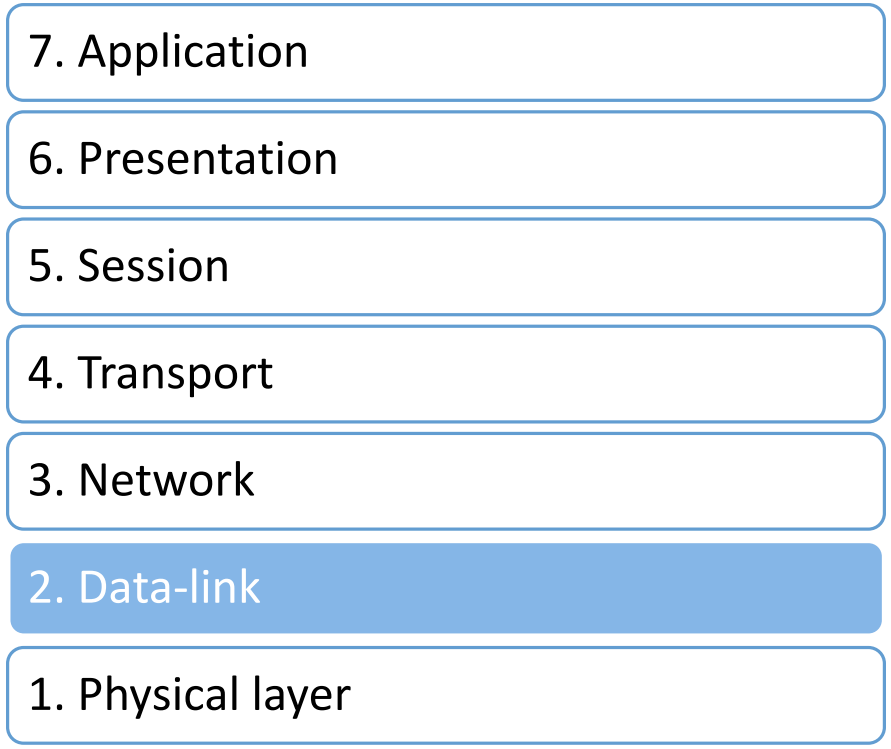

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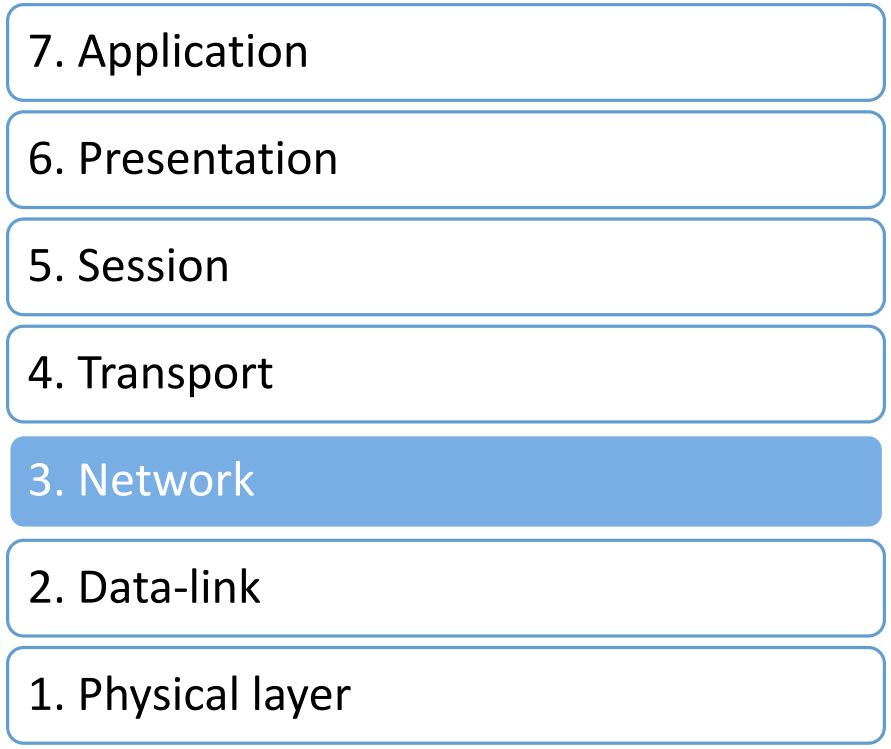

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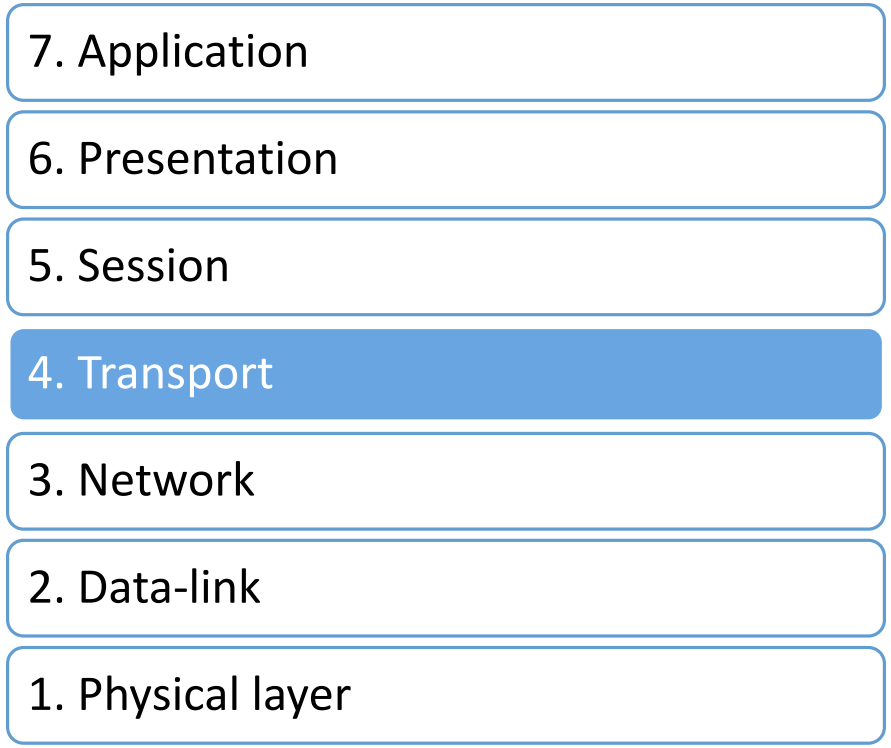

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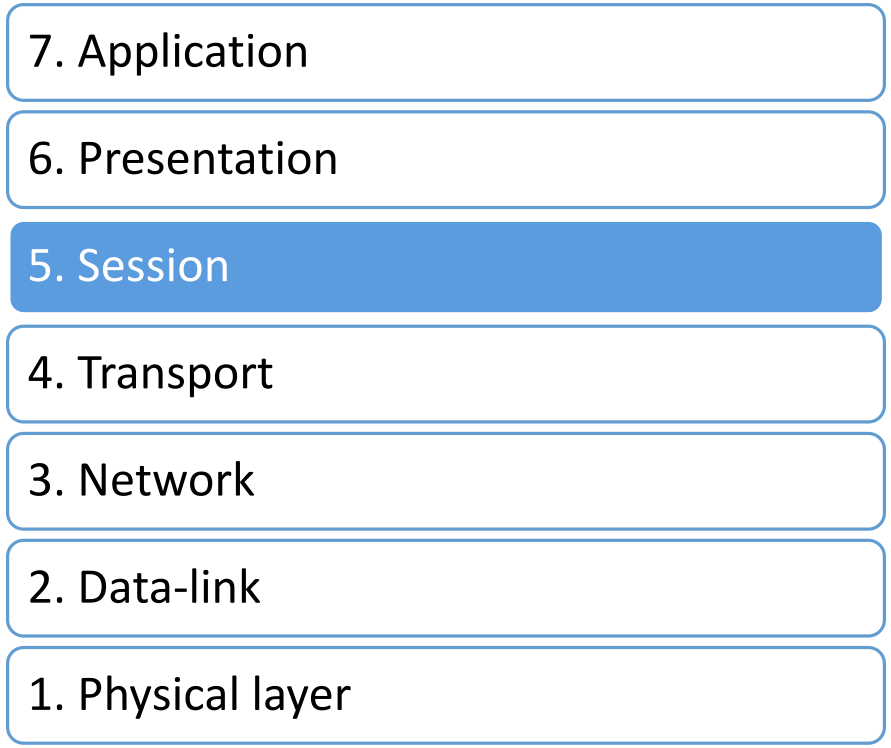

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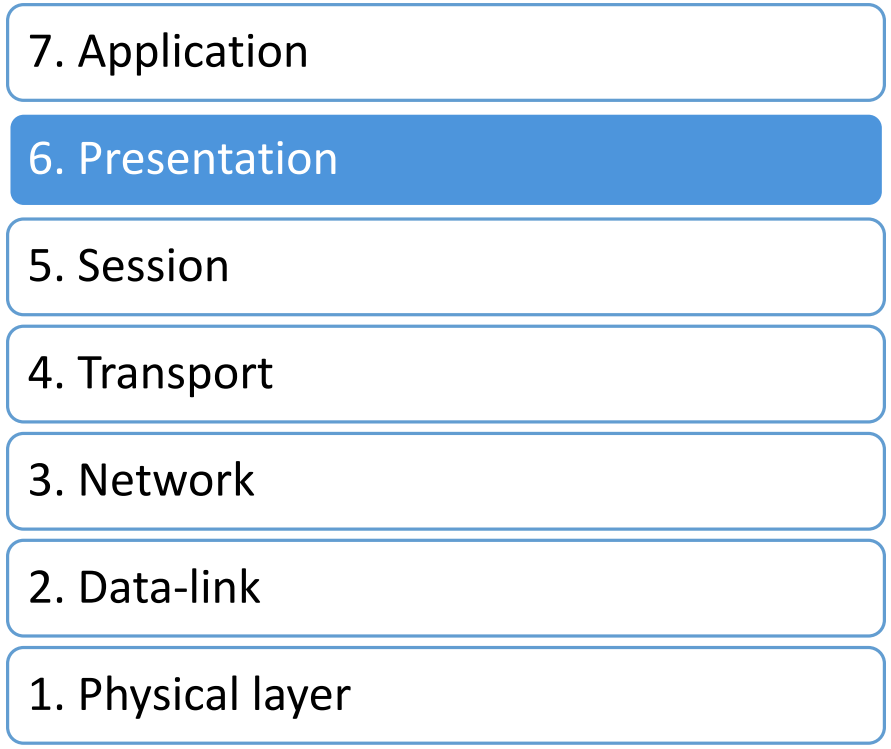

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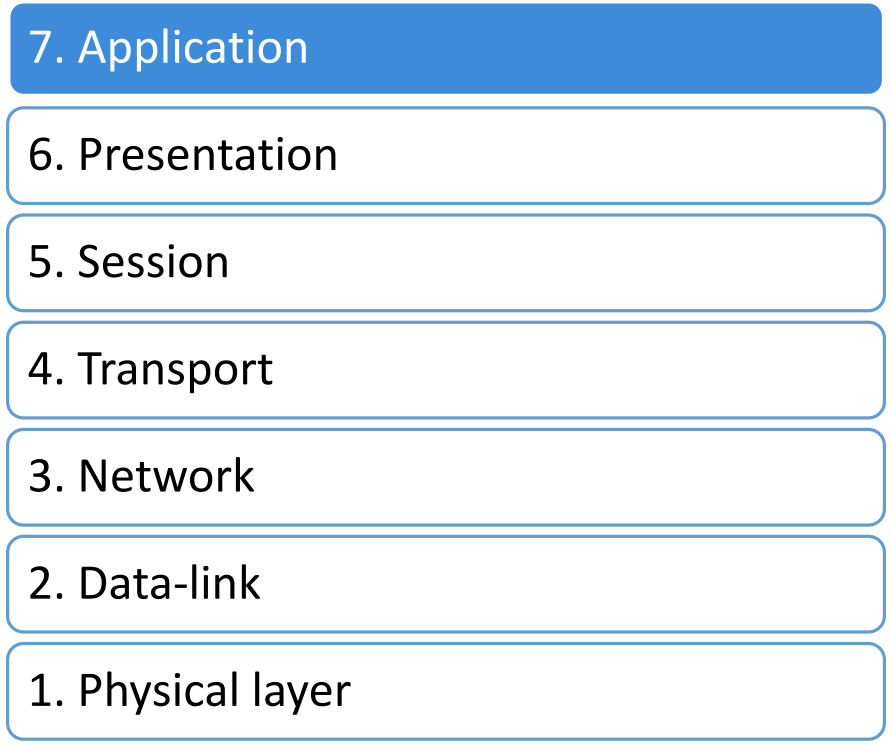
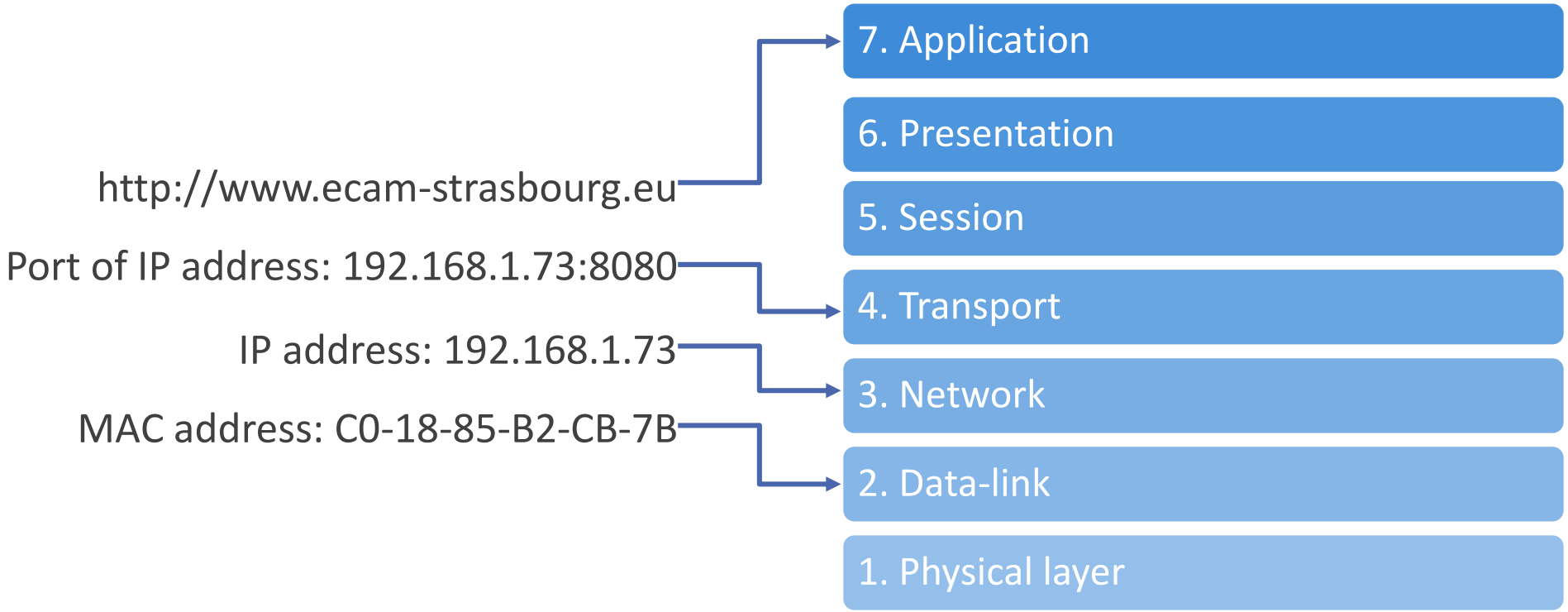
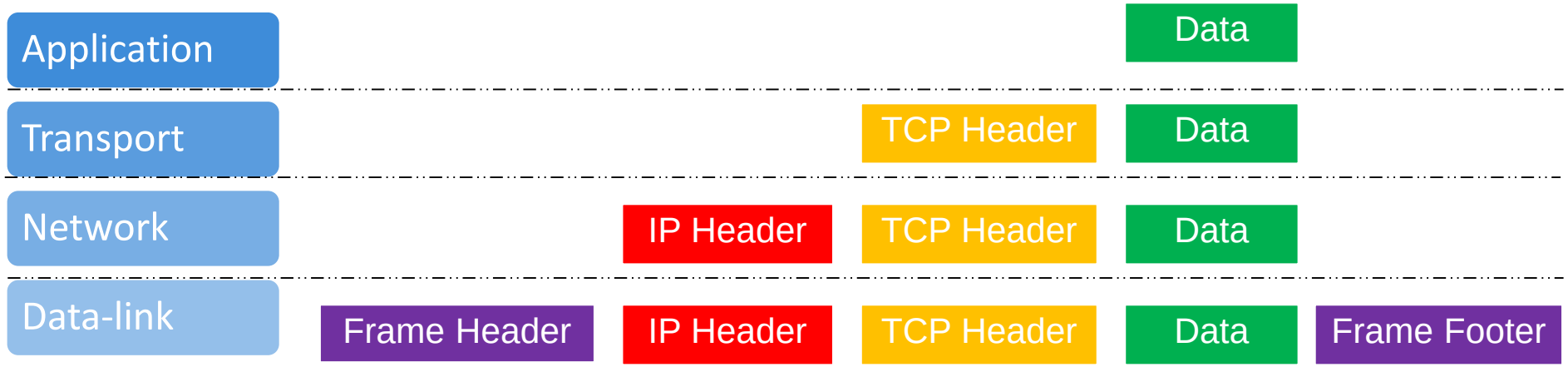


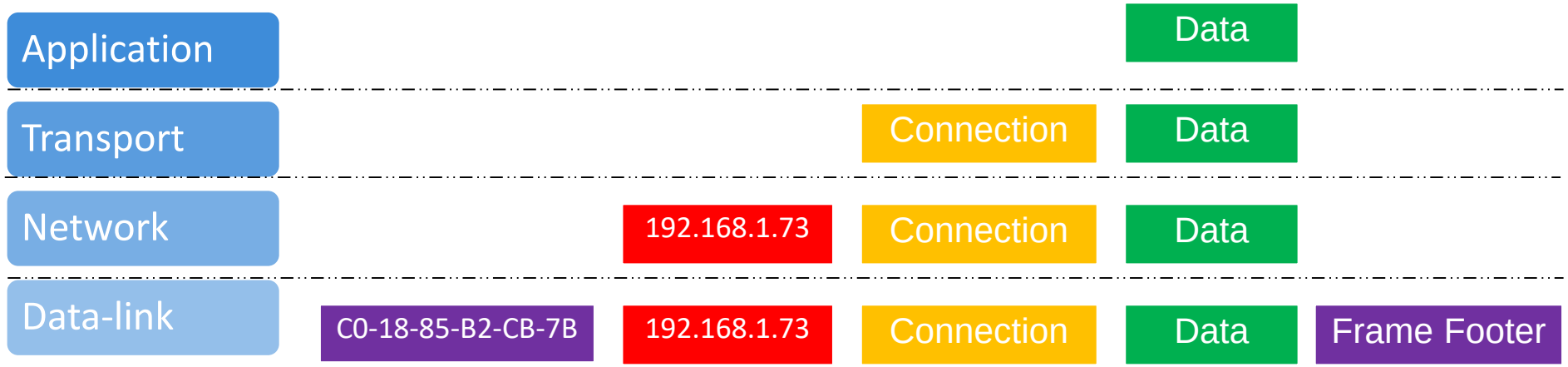
OSI Model and Addressing



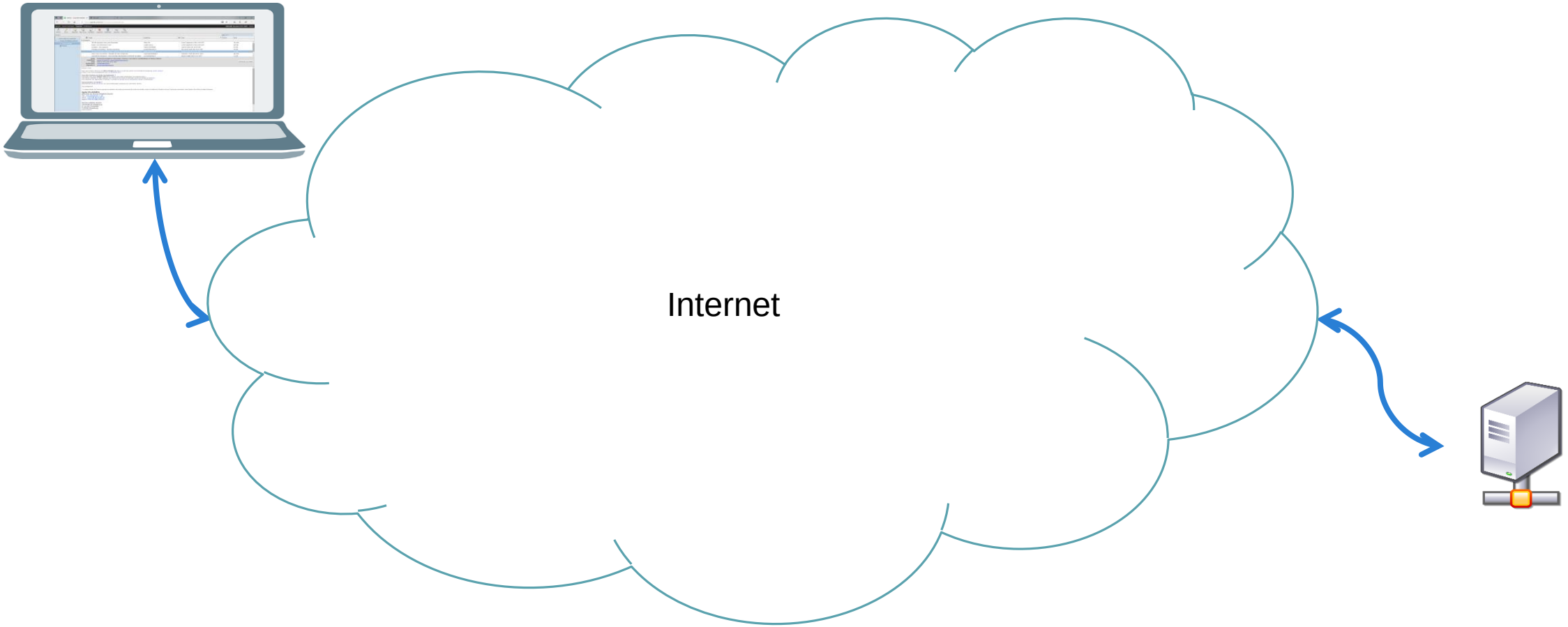
Encapsulation



Encapsulation – dealing with addresses



Internet – A Little Reminder



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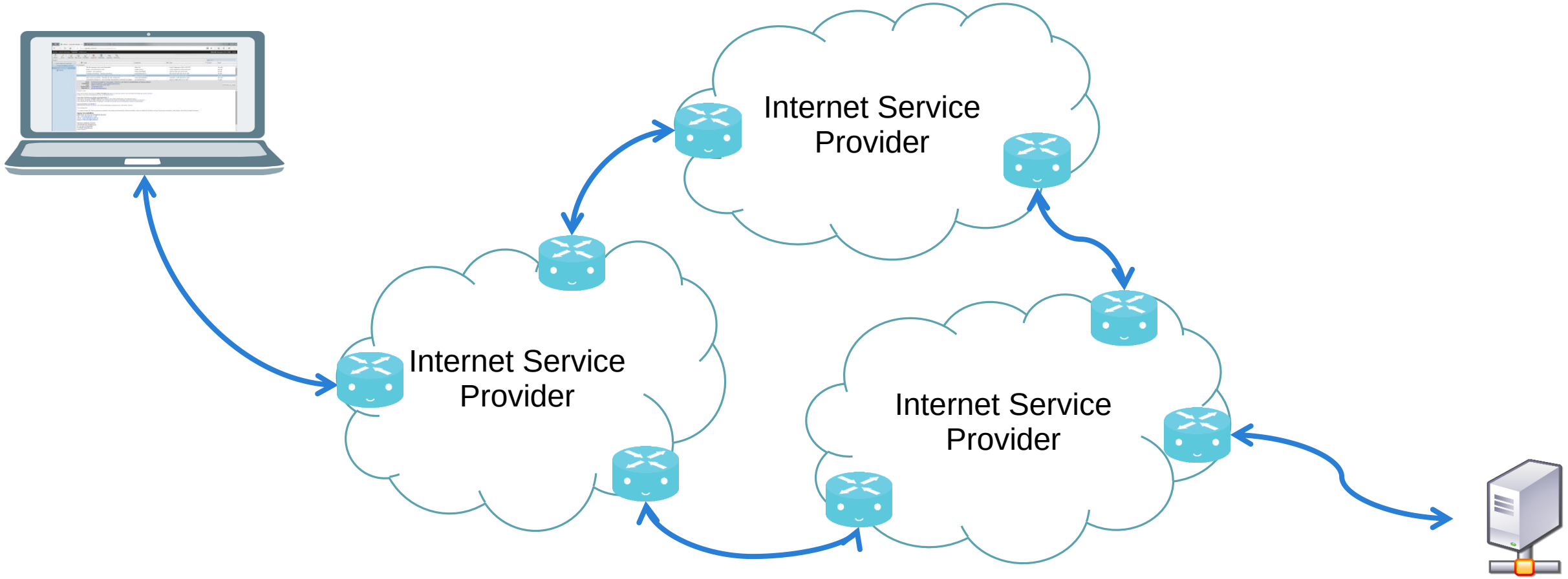
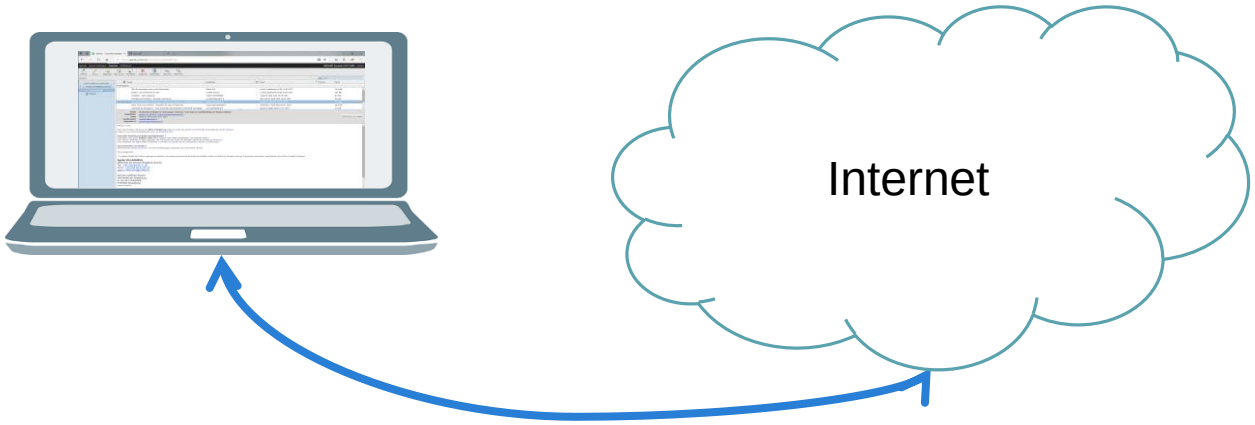


Remember « I want to read my mails ? » use case

OKAY, SO KEEP ALSO IN MIND THE OSI LAYERS ;)

HTTP



We need to retrieve a web page. So we will use the **Hypertext Transfer Protocol** (HTTP).

Some request methods : GET, POST, PUT, DELETE, …

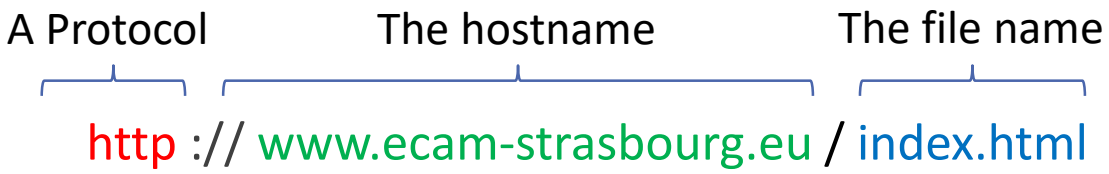
Example : GET http://www.ecam-strasbourg.eu/ HTTP/1.1

Domain Name Service

The DNS protocol **enables to retrieve the IP address** of machine, **given its hostname**.

Given this URL from the previous example, http://www.ecam-strasbourg.eu/

We can divide it in :

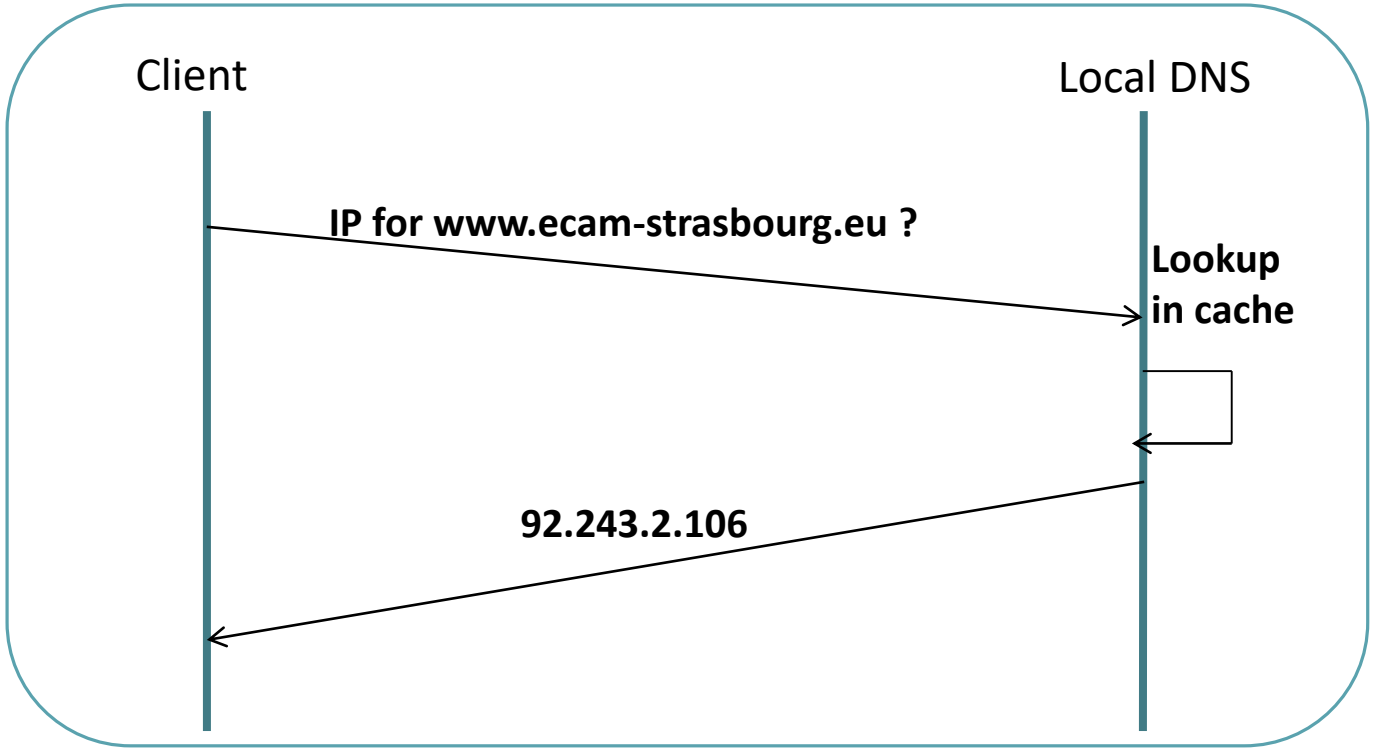


Domain Name Service

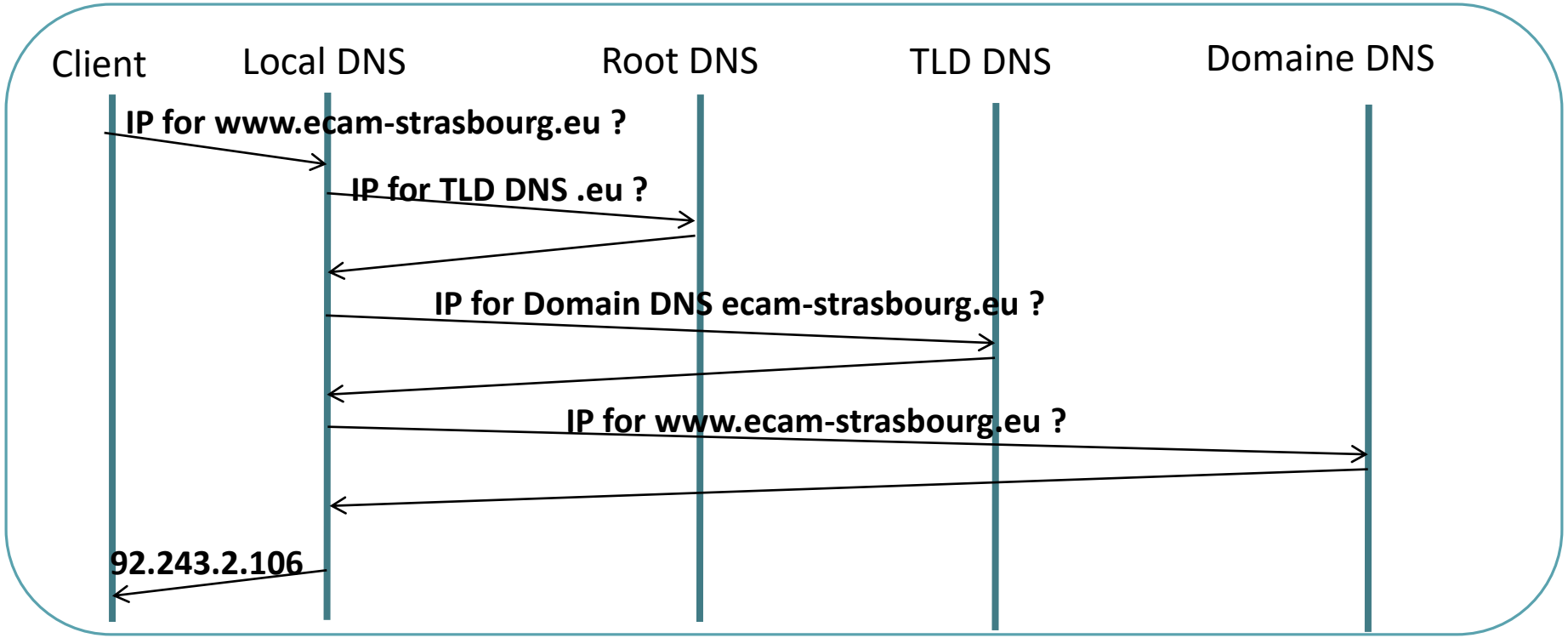
Two types of request :

- Recursive request : request processed by the DNS cache
- Iterative request : request forwarded to the DNS server hierarchy

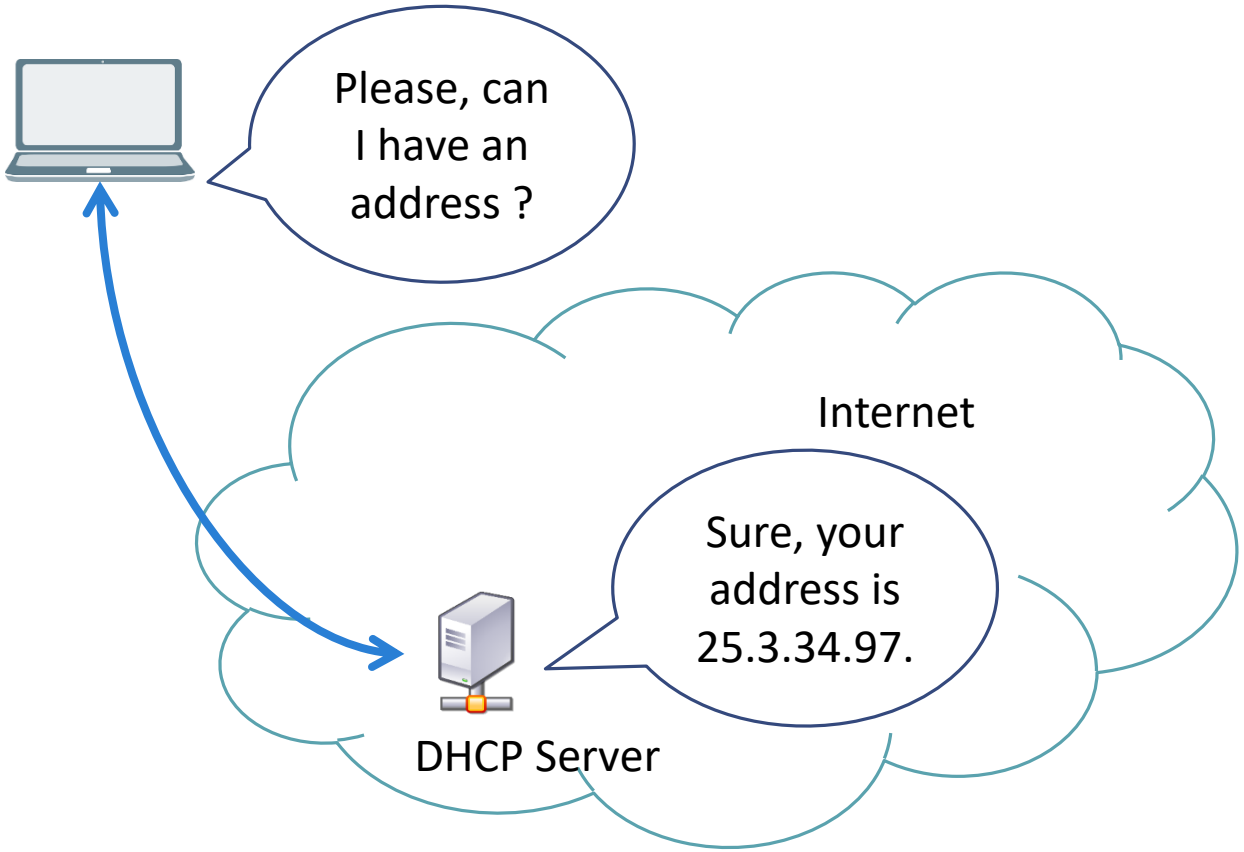
Domain Name Service – Recursive Request



Domain Name Service – Iterative Request

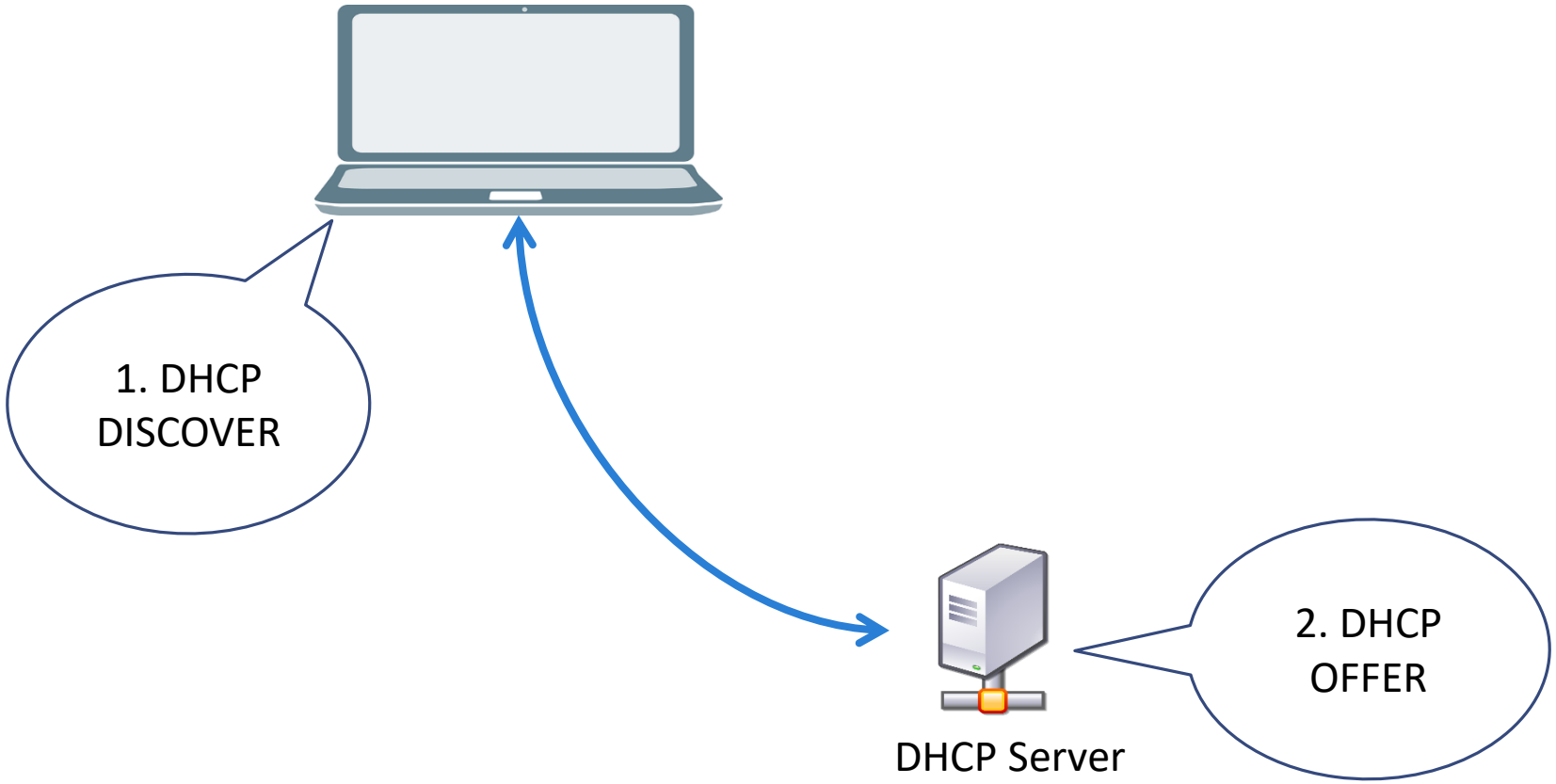


Dynamic Host Configuration Protocol



DHCP is a protocol triggered by client computer **to get an IP address lease** from a computer serving as a DHCP server.

Dynamic Host Configuration Protocol



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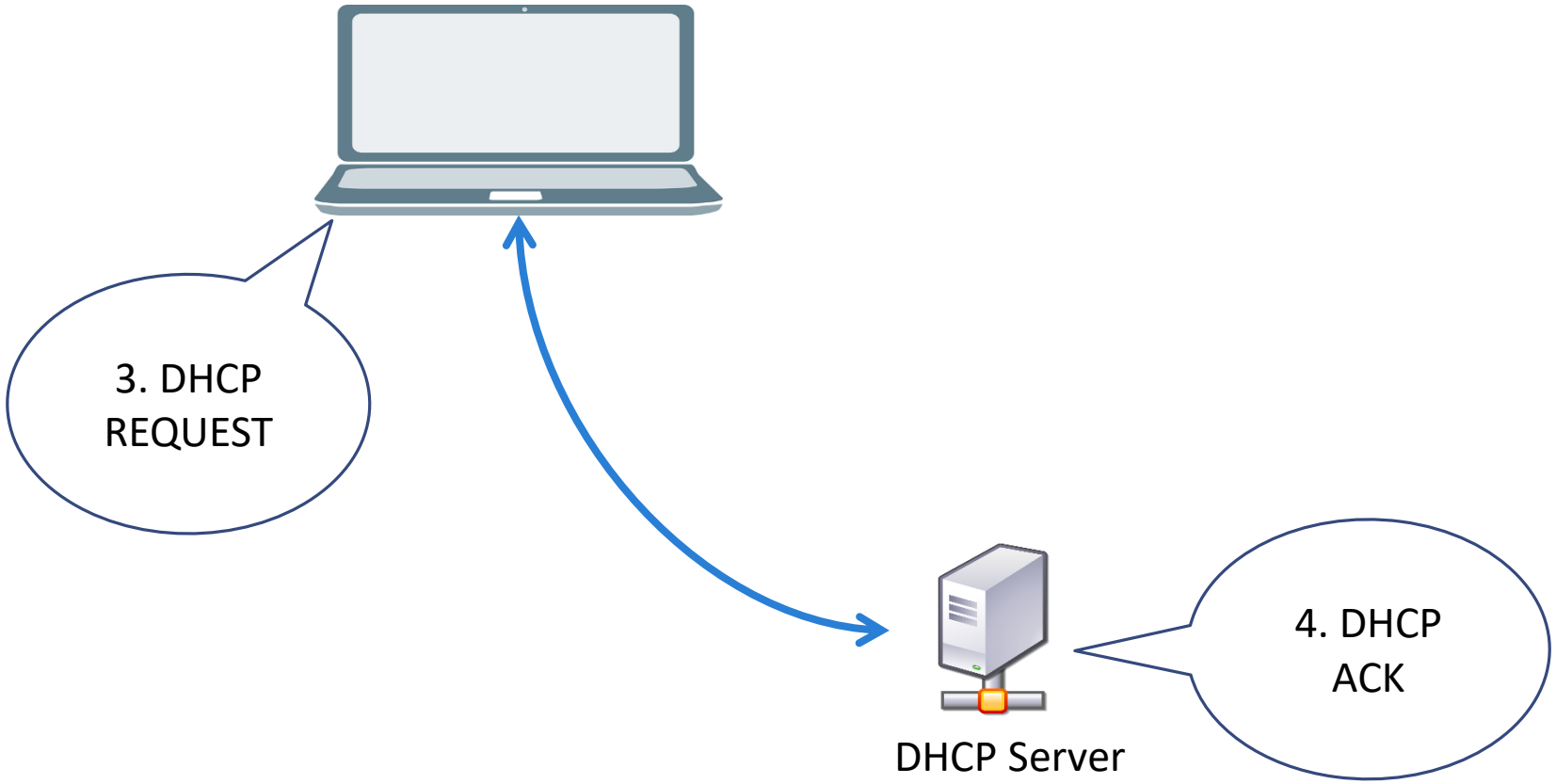

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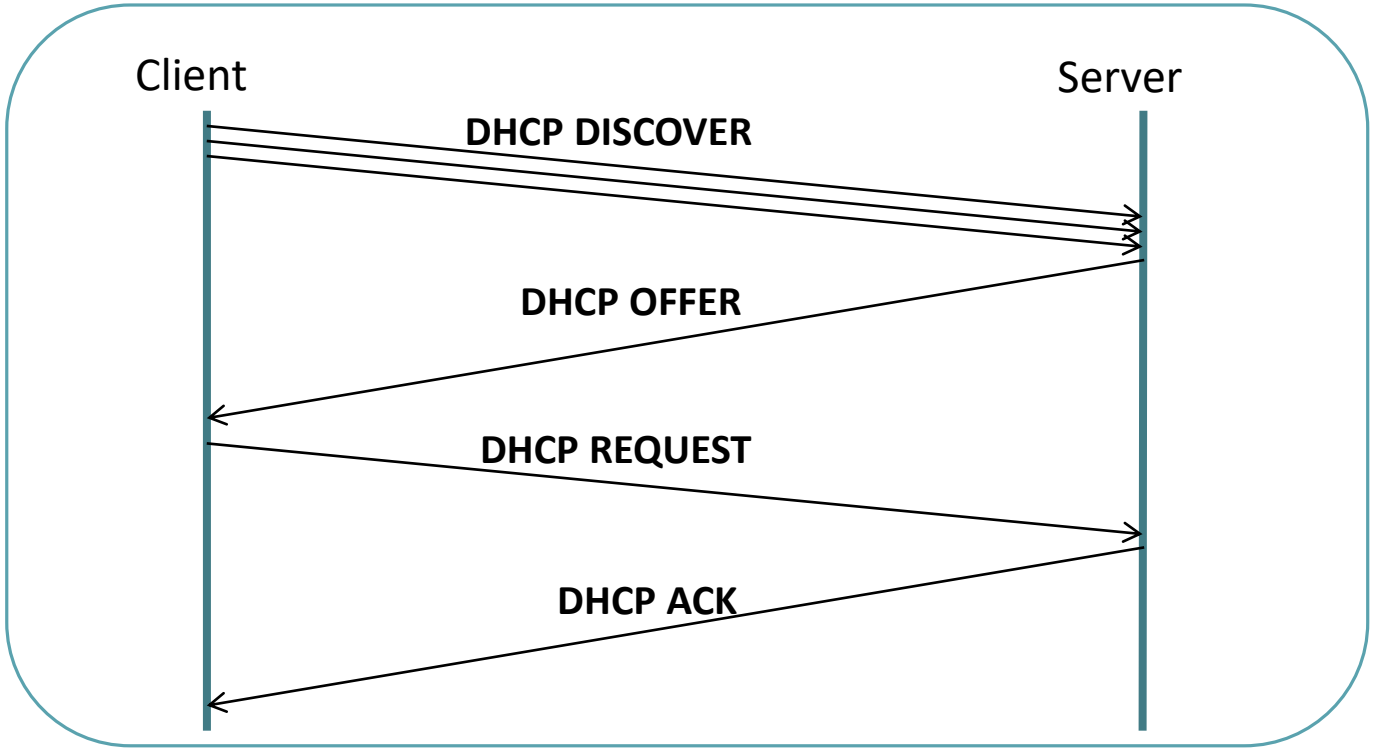
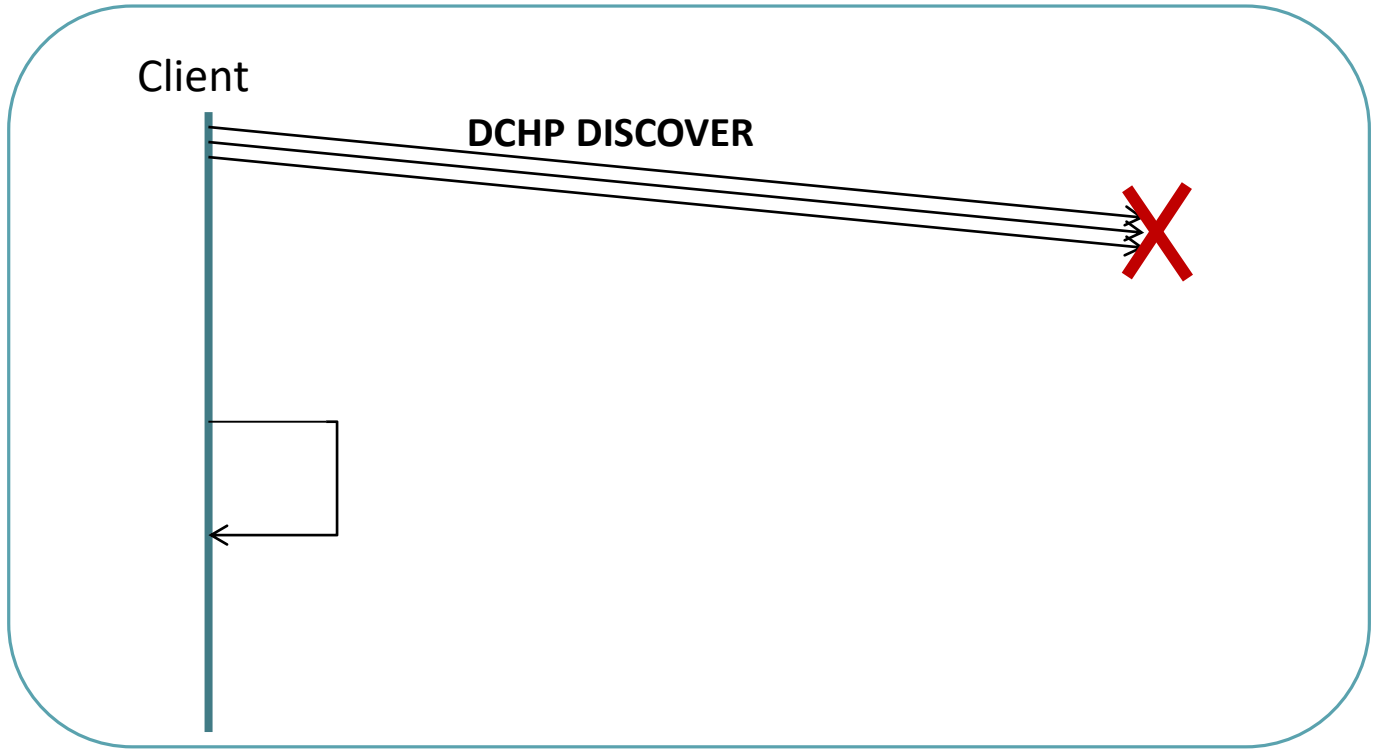


Dynamic Host Configuration Protocol

Automatic Private IP Addressing (APIPA)

169.254.0.0/16

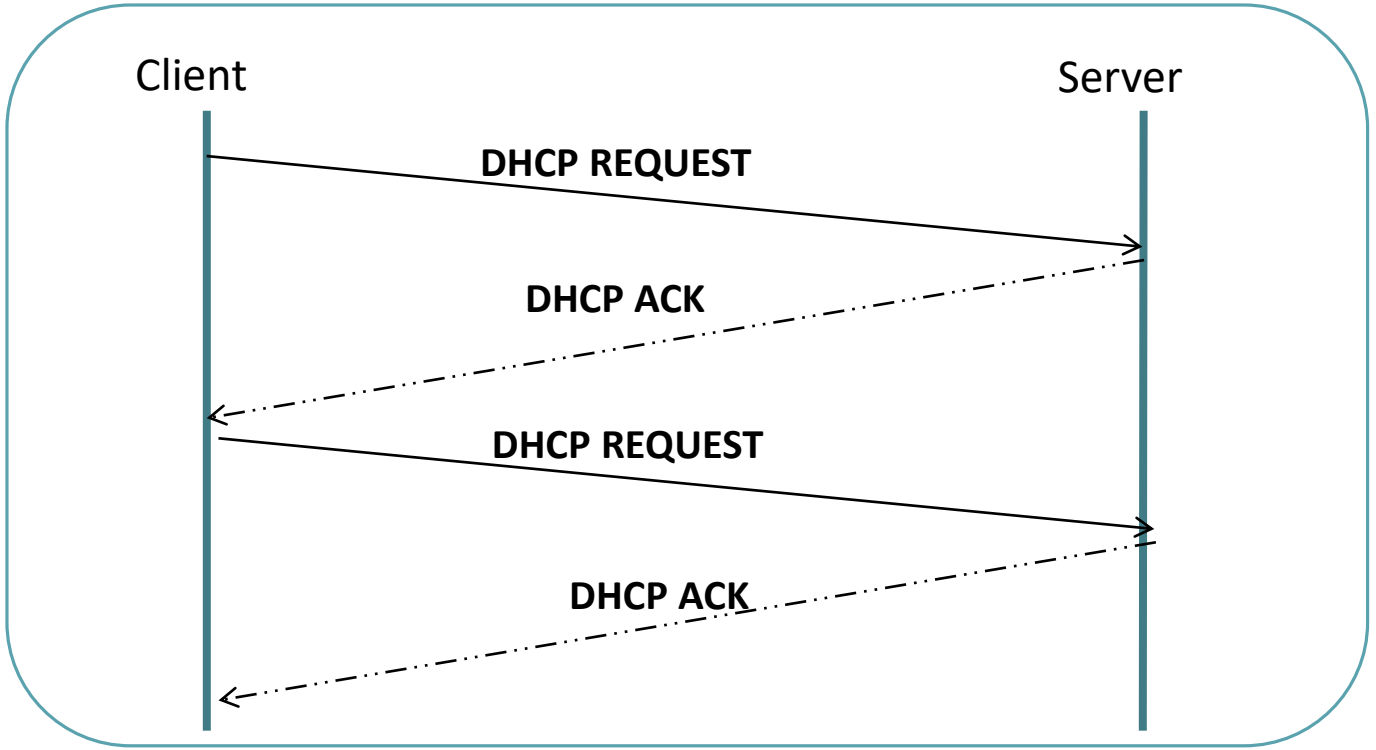


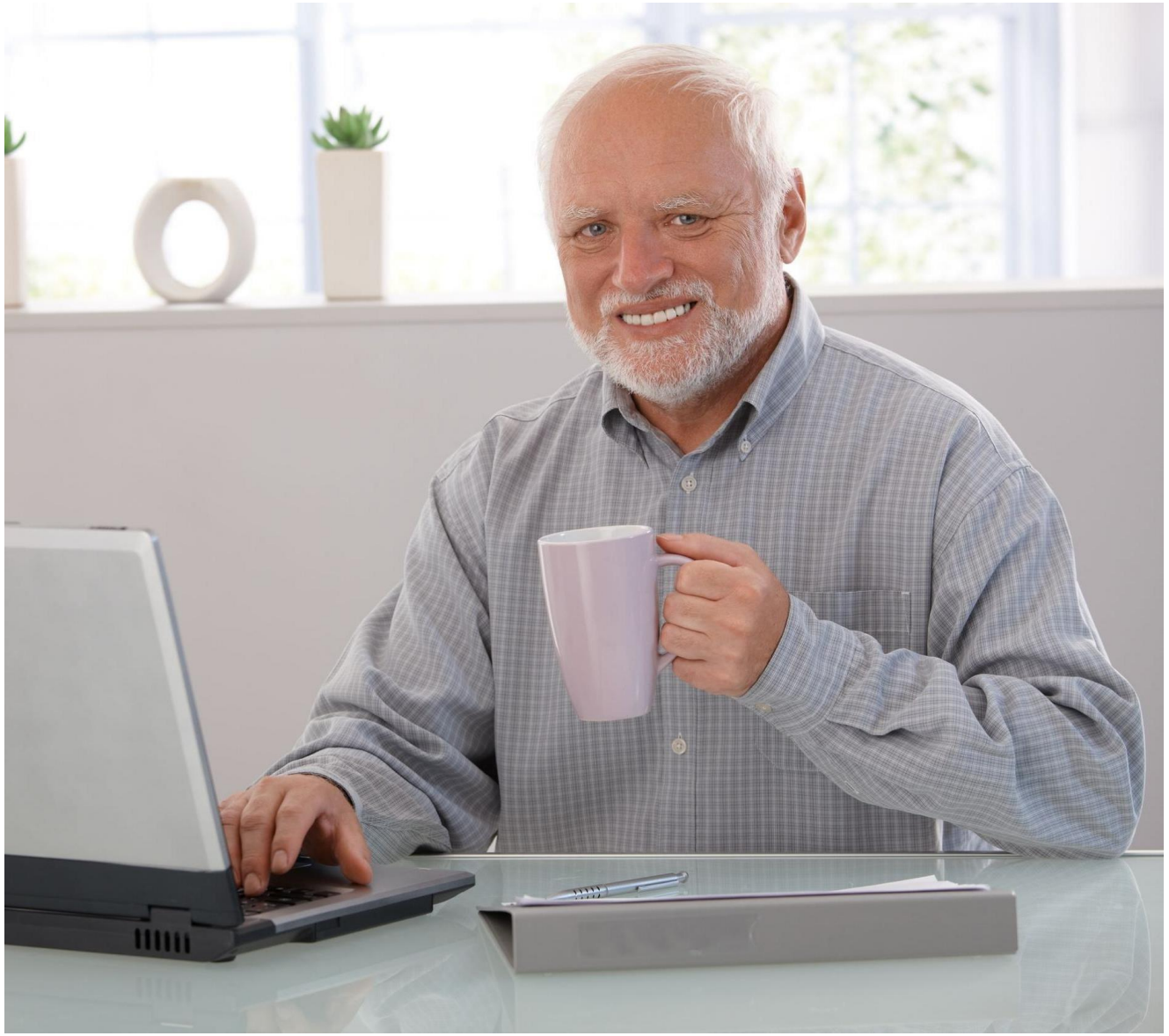
Dynamic Host Configuration Protocol

50% of the lease time

If failure:
87,5% of the lease time

If failure:
At 100% of the lease time, Full DHCP lease process





Any questions ?

Exercice 1

What is the meaning of the OSI acronym? Explain what OSI is.

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The OSI is the Open System Interconnection. It characterizes and standardizes the different abstraction layers required for enabling communication between computers over a network.

Exercice 2

Name the seven layers of the OSI model.

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Application – Presentation – Session – Transport – Network – DataLink - Physical

Exercice 3

Make the bound between the OSI Model and the following devices : a hub, a switch and a router.

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Make the bound between the OSI Model and the following devices : a hub, a switch and a router.

A hub will operate on the Physical layer (first one).

A switch will operate on the DataLink layer (second one).

A router will operate on the Network layer (third one).

Exercice 4

Name and explain the four primitives of a DHCP request.

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DHCP DISCOVER: broadcast message sent by the client to the network to discover DHCP servers

DHCP OFFER: sent by the server to the client to offer its service as a DHCP server

DHCP REQUEST: sent by the client to the server to ask for a DHCP lease

DHCP ACK: confirmation sent by the server to the client to confirm lease is successful and to give the lease IP address to the client.

Exercice 5

What happens when no DHCP server is available at lease time?

Make a paquet-exchange diagram.

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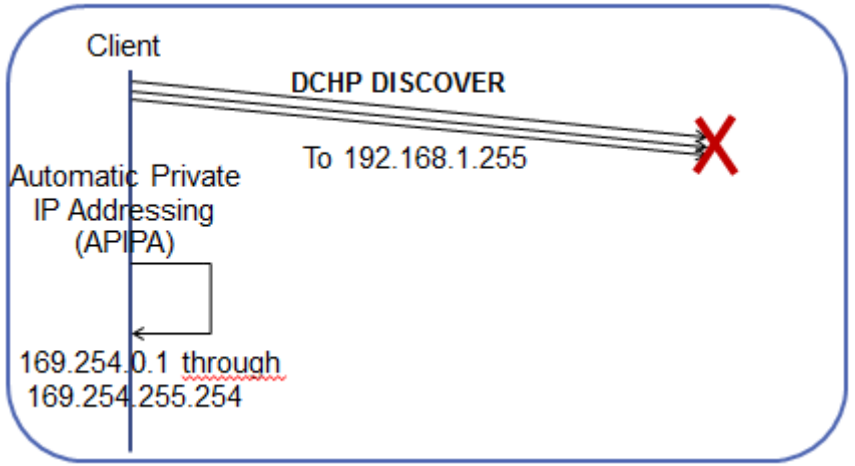


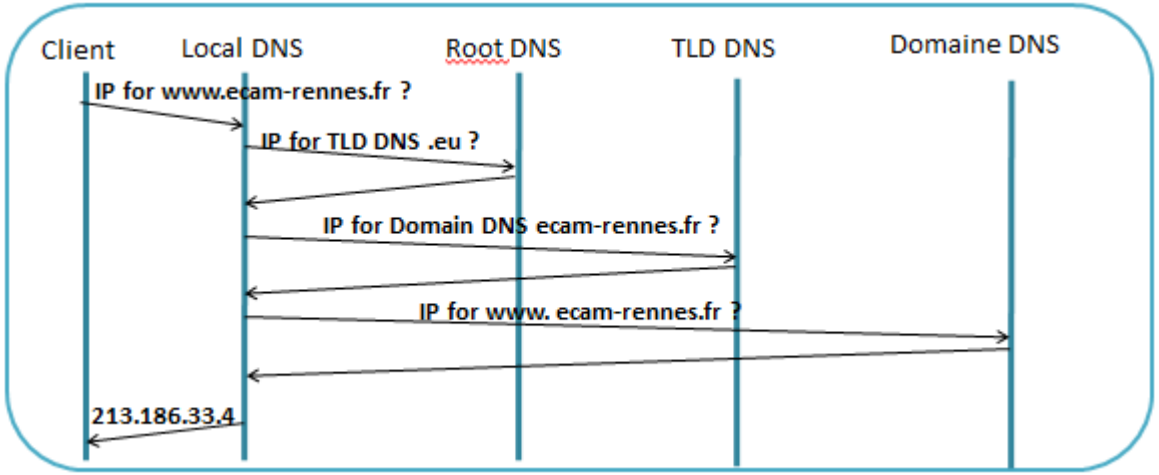
Exercice 6

What happens when a client A requests the IP address for hostname ‘www.ecam-rennes.fr’ ?
Draw the packet-exchange diagram.

Exercice 6

What happens when a client A requests the IP address for hostname ‘www.ecam-rennes.fr’ ? Draw the packet-exchange diagram.

An iterative DNS request is performed.



Exercice 6

Right after request defined just previously, a client B requests for the same hostname.

Draw the packet-exchange diagram.

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Right after request defined just previously, a client B requests for the same hostname.

Draw the packet-exchange diagram.

A recursive DNS request is performed.