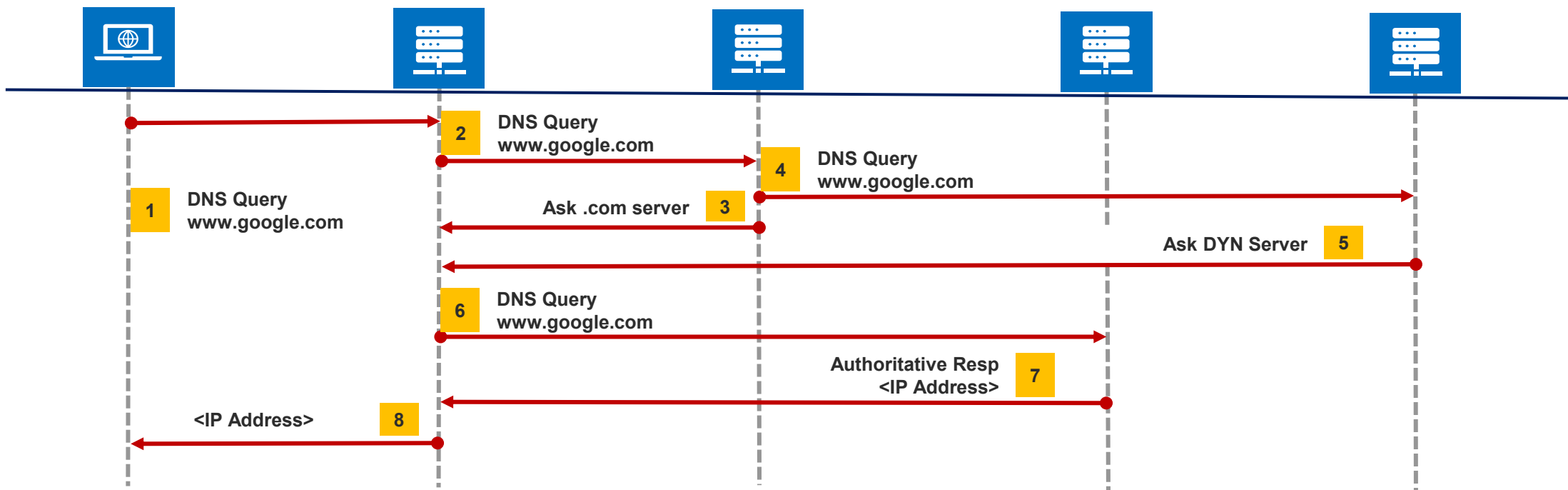
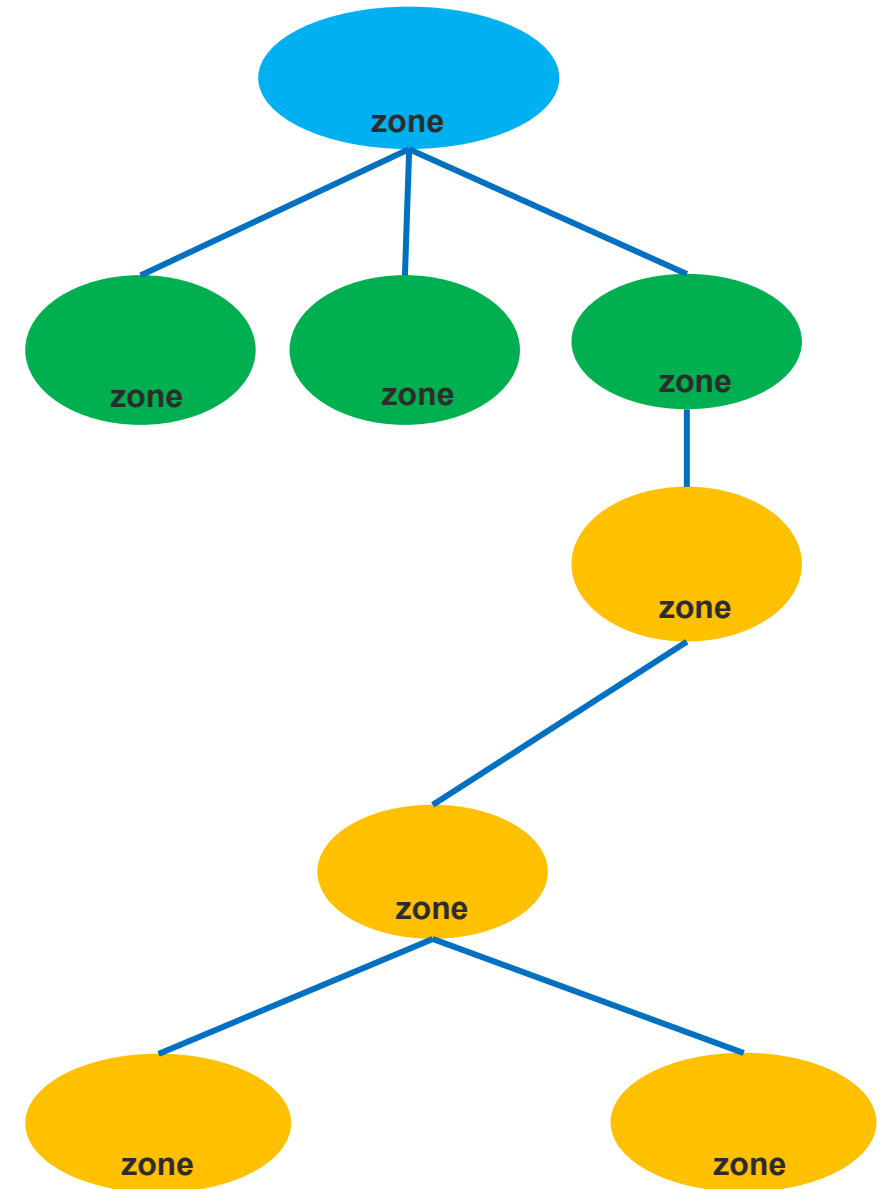






the information for a zone is stored in what's called a DNS zone



1

SOA

2

A and AAAA

3

CNAME

"canonical name" is

4

MX

5

NS

6

PTR

7

CAA

8

TXT

9

SRV

10

CERT

11

DCHID

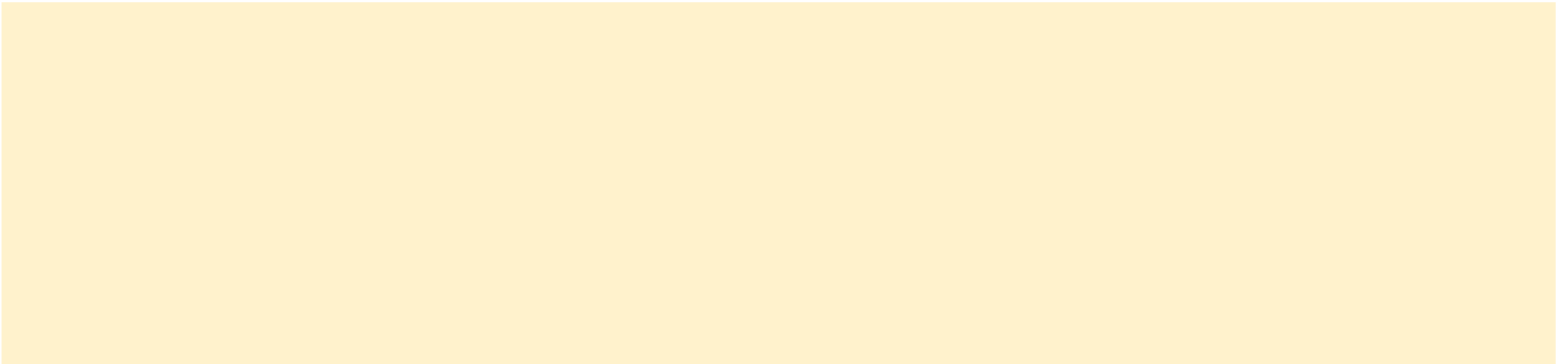
12

DNAME

"delegation name."

SOA Records

- **The Start of Authority (SOA) record is a mandatory record in all zone files.**
- **It must be the first real record in a file (although \$ORIGIN or \$TTL specifications may appear above).**
- **It is also one of the most complex to understand.**
- **Example**



A and AAAA Records

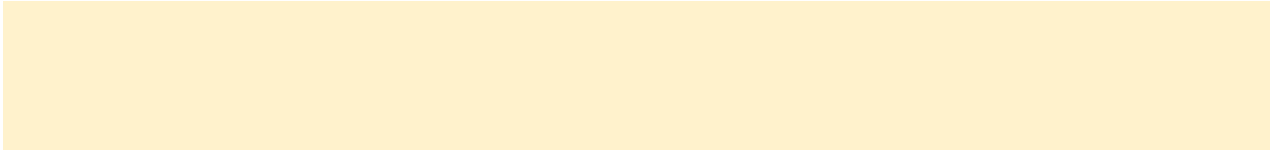
- Both of these records map a host to an IP address.
- The “A” record is used to map a host to an IPv4 IP address, while “AAAA” records are used to map a host to an IPv6 address.
- The general format of these records is this:

▪ host	IN	A	IPv4_address
▪ host	IN	AAAA	IPv6_address
▪ ns1	IN	A	111.222.111.222

▪ ns1.domain.com.	IN	A	111.222.111.222
▪ www	IN	A	222.222.222.222
▪ domain.com.	IN	A	222.222.222.222
▪ @	IN	A	222.222.222.222
▪ *	IN	A	222.222.222.222

CNAME Records

- **CNAME records define an alias for canonical name for your server (one defined by an A or AAAA record).**
- **For instance, we could have an A name record defining the “server1” host and then use the “www” as an alias for this host:**



- **Be aware that these aliases come with some performance losses because they require an additional query to the server.**
- **Most of the time, the same result could be achieved by using additional A or AAAA records.**
- **One case when a CNAME is recommended is to provide an alias for a resource outside of the current zone.**

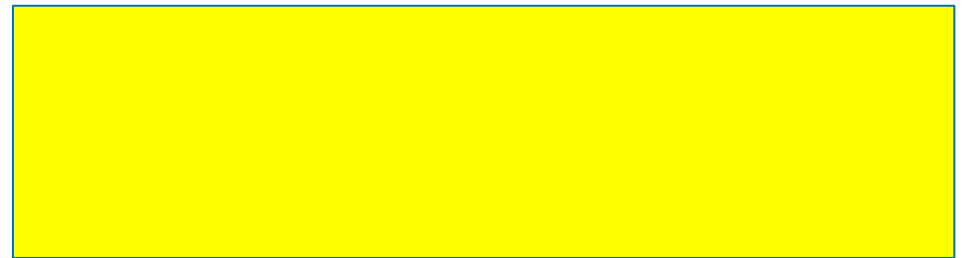
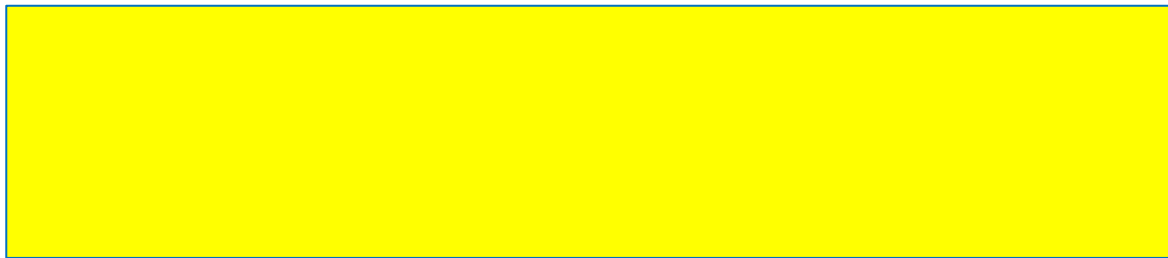
MX Records

- **MX records are used to define the mail exchanges that are used for the domain. This helps email messages arrive at your mail server correctly.**
- **Unlike many other record types, mail records generally don't map a host to something, because they apply to the entire zone. As such, they usually look like this:**



- **Example**

CNAME. So, let's say that we have two mail servers. There would have to be records that look something like



NS Records

- **NS record type defines the name servers that are used for this zone.**

Question : if the zone file resides on the name server, why does it need to reference itself?”. Part of

-

- **Like the MX records, these are zone-wide parameters, so they do not take hosts either. In general, they look like this:**



-

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- **There are quite a few other record types you can use, but these are probably the most common types that you will come across.**

PTR Records

- The PTR records are used to define a name associated with an IP address.
- PTR records are the inverse of an A or AAAA record.
- PTR records are unique in that they begin at the .arpa root and are delegated to the owners of the IP addresses.
- The Regional Internet Registries (RIRs) manage the IP address delegation to organizations and service providers.
- The Regional Internet Registries include APNIC, ARIN, RIPE NCC, LACNIC, and AFRINIC.
- Example of a PTR record for 111.222.333.444 would look like:



- Example of a PTR record for an IPv6 address shows the nibble format of the reverse of Google's IPv6 DNS Server 2001:4860:4860::8888.

PTR Records

- The command line tool dig with the -x flag can be used to look up the reverse DNS name of an IP address.
- An example of a dig command. The +short is appended to reduce the output to the reverse DNS name.
 -
- Servers on the Internet use PTR records to place domain names within log entries, make informed spam handling decisions, and display easy-to-read details about other devices.
- Most commonly-used email servers will look up the PTR record of an IP address it receives email from.
- If the source IP address does not have a PTR record associated with it, the emails being sent may be treated as spam and rejected.
- It is not important that the FQDN in the PTR matches the domain name of the email being sent. What is important is that there is a valid PTR record with a corresponding and matching forward A record.

CAA Records

- **CAA records are used to specify which Certificate Authorities (CAs) are allowed to issue SSL/TLS certificates for your domain.**

-

-

- **An example CAA record**

```
example.com. 3600 IN CAA 0 issuewild *;
```

-

- Flags are an integer which indicates how a CA should handle tags it doesn't understand. If the flag is 0, the record

-

- Values are a string associated with the record's tag. For issue and you're granting the permission to. For

- **You may use dig to fetch CAA records using the following options:**

```
dig CAA example.com
```

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Week 12

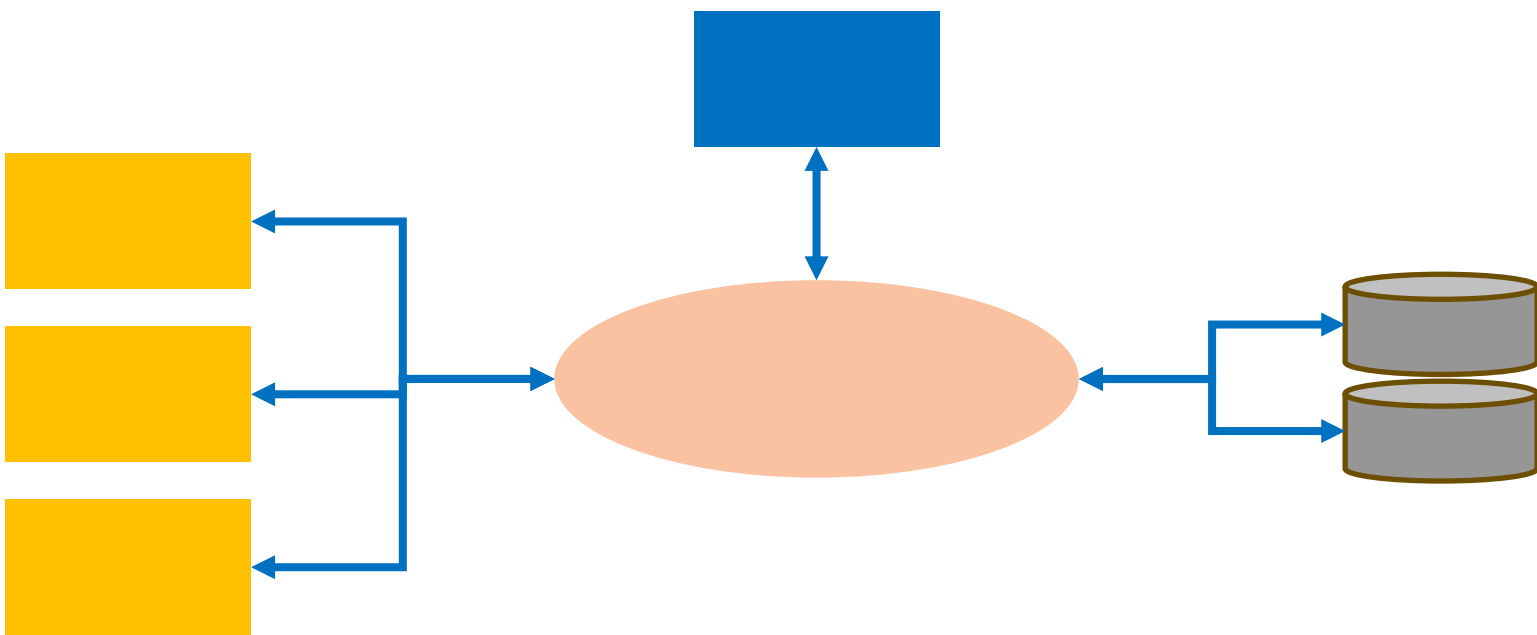
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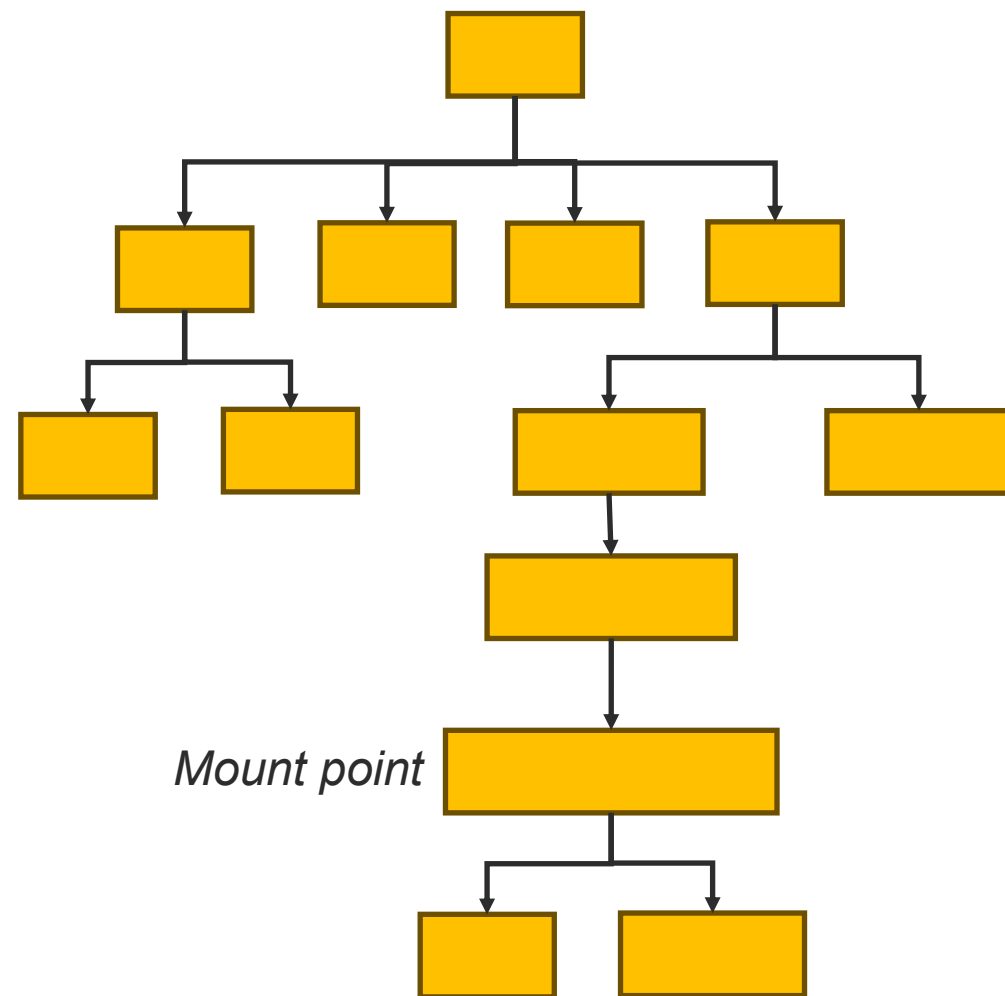


- **A volume is a set of directories and files; a host's file tree is the set of directories and files visible to processes on a given host.**

-

► Mounting volumes

- ☐
☐
☐



➤ **Each file volume (filesystem) has a type, determined by its disk layout or the network protocol used to access it.**

-

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➤ **Modern systems also include “logical” pseudo-filesystems in the naming tree, accessible through the file syscalls.**

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-

➤ **Processes access filesystems through common system calls.**

- **Sun Microsystems introduced the virtual file system interface in 1985 to accommodate diverse filesystem types cleanly.**

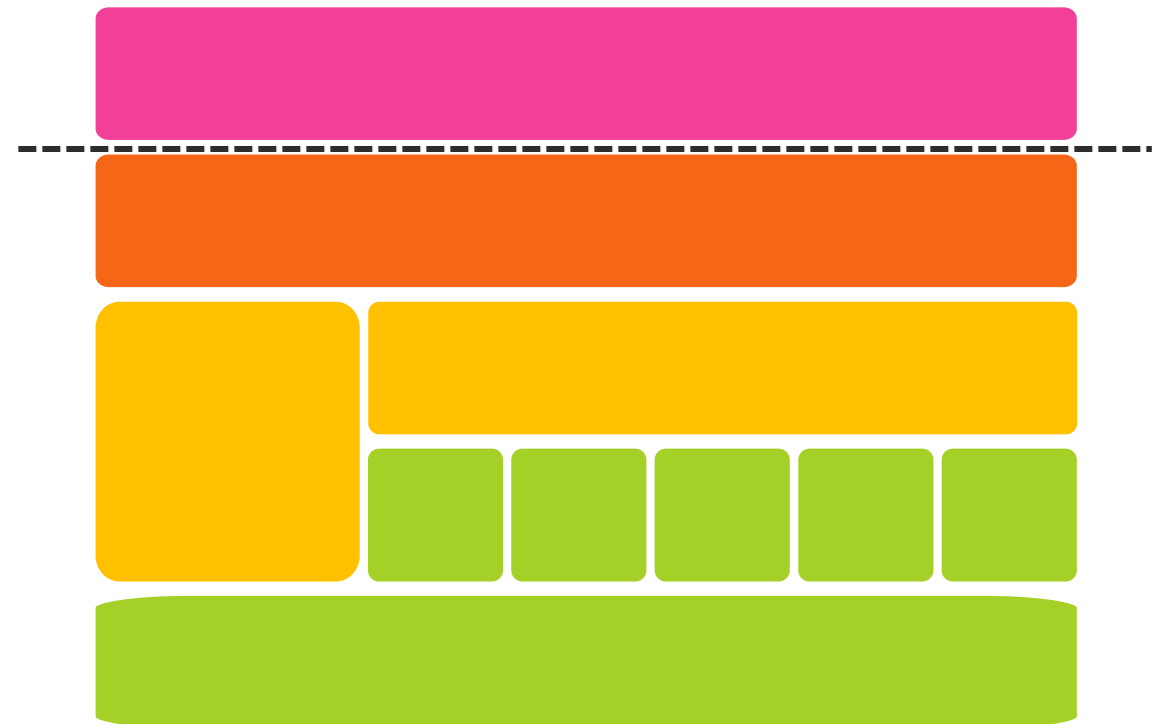
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➤ The operating system (OS) has three kinds of data structures for files:



File table entry

▪

▪

▪

▪



vnode

▪

▪



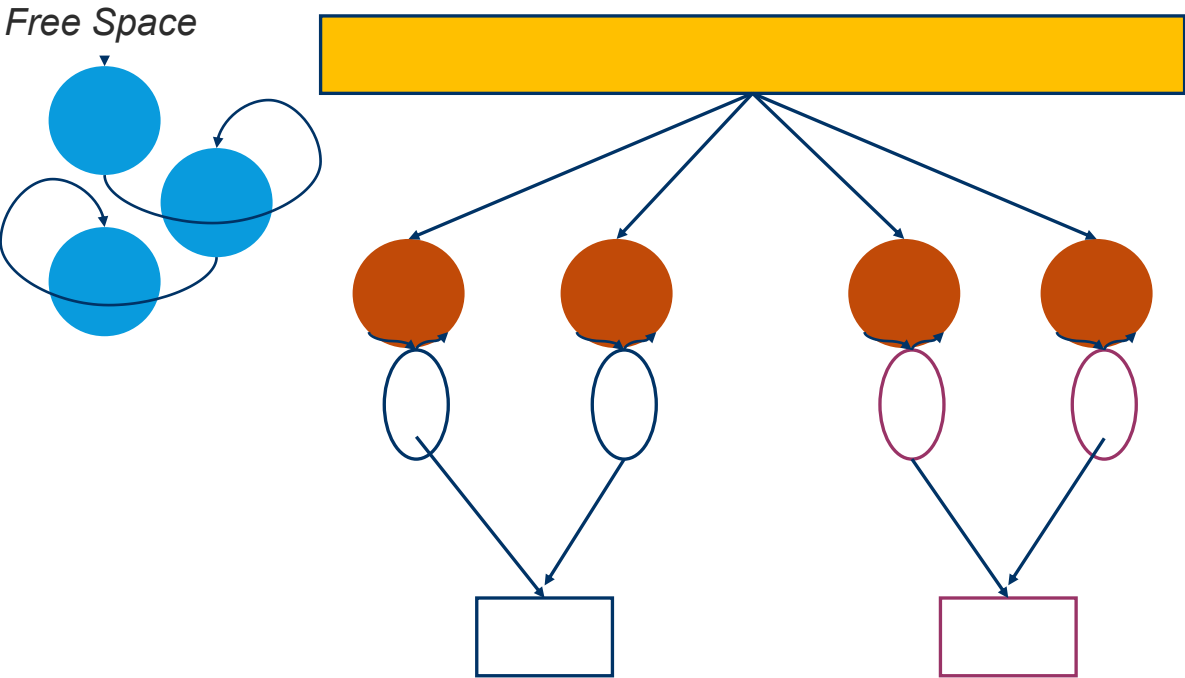
inode

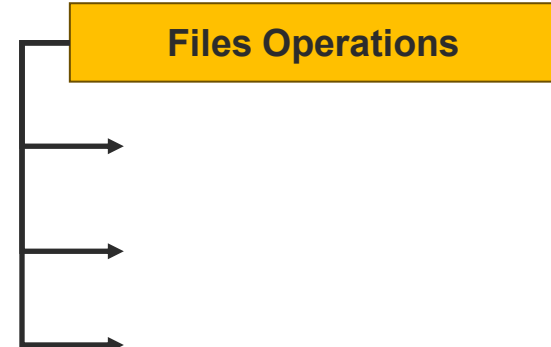
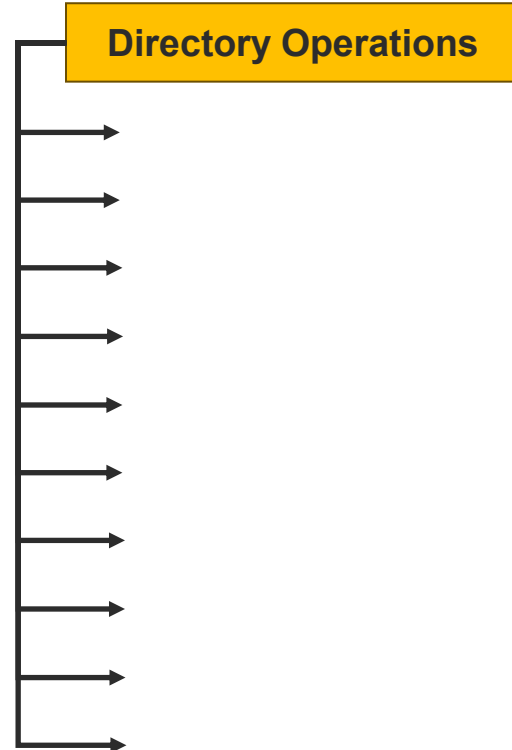
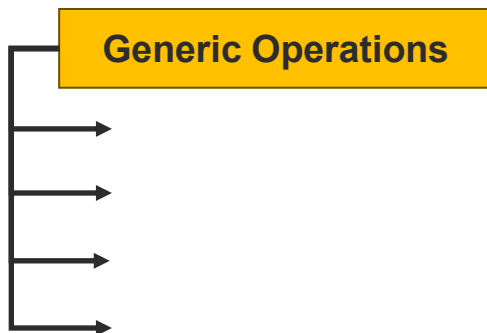
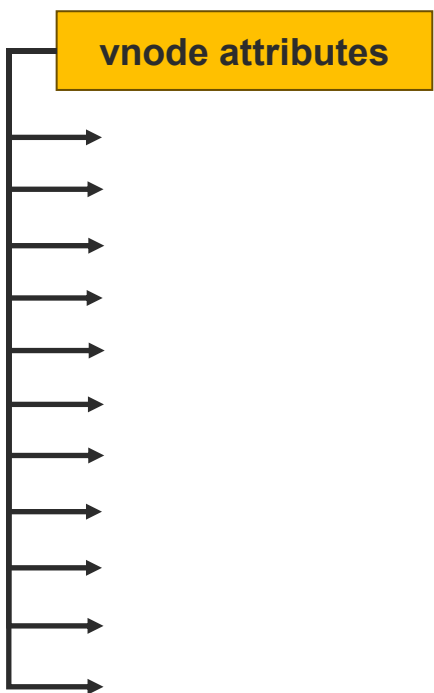
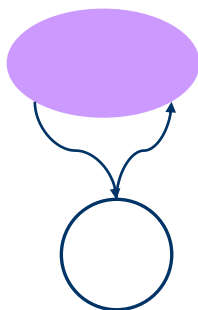
▪

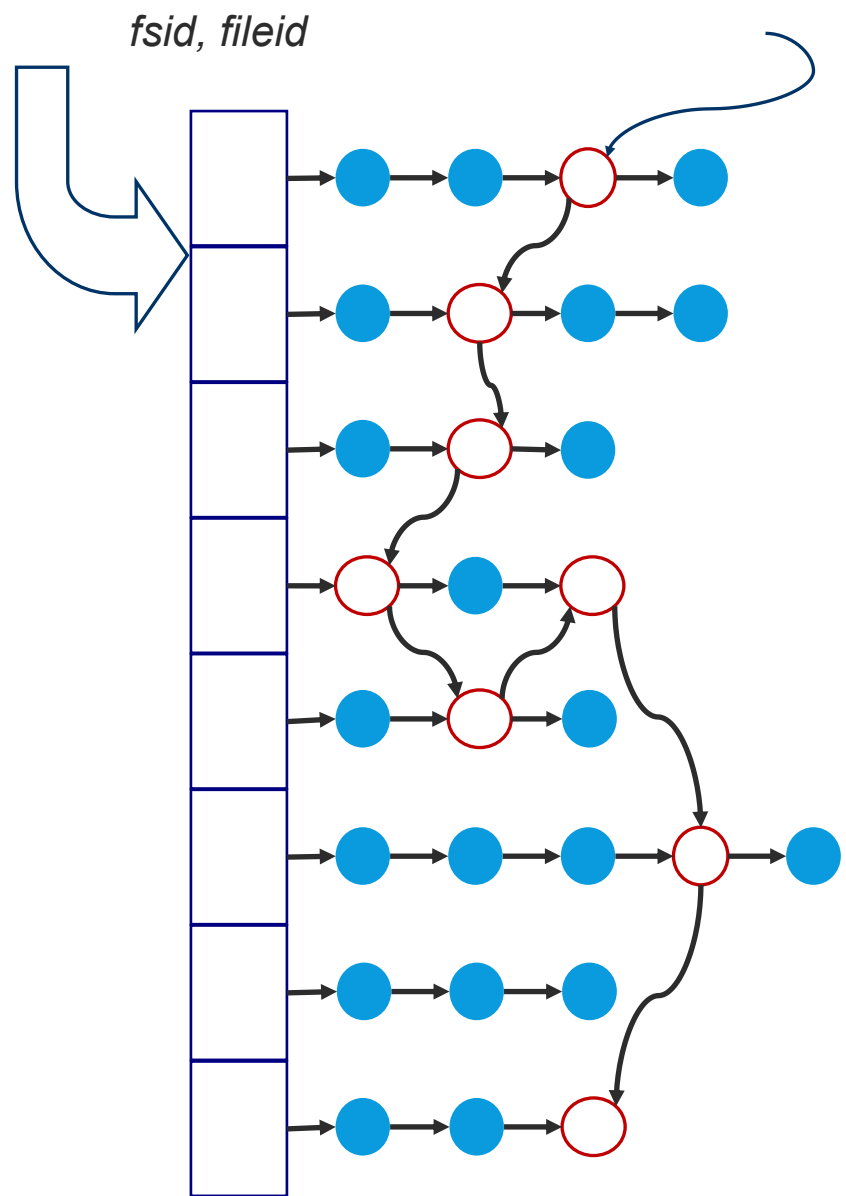
▪

➤ In the VFS framework, every file or directory in active use is represented by a vnode object in kernel memory.

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layer must “convert it to a”.

- o `open("/zot")`
- o
- o `, “ ”);`
- o
- o `, “zot”);`





➤ Called “raw” or “block”, “storage volumes” or just “SAN”.

➤ **Network Attached Storage (NAS)**

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➤ **Storage Area Network (SAN)**

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➤ **There has been some debate over whether NAS and SAN is good for enterprises.**

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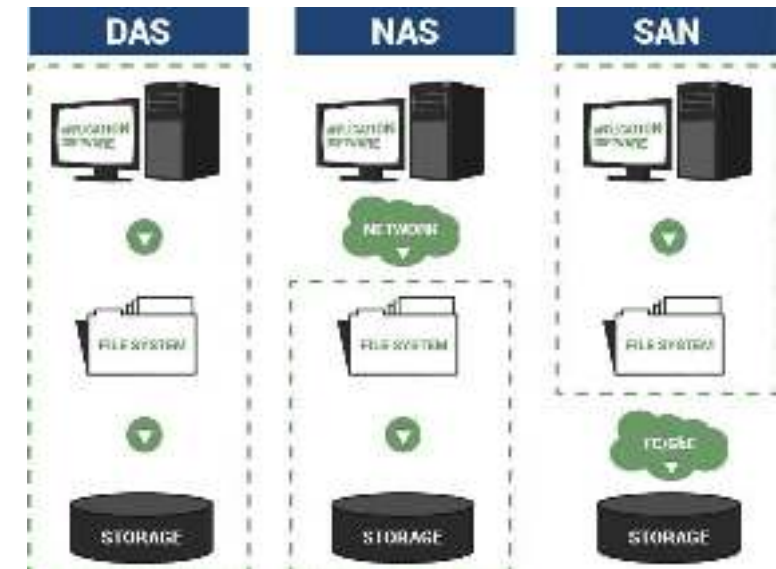
➤ **FibreChannel (FC) SAN is considered to be fundamentally faster way to access shared storage.**

-

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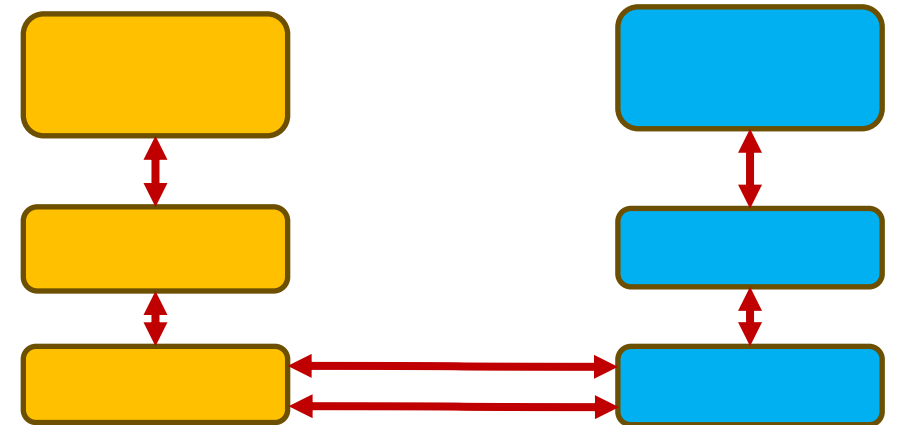
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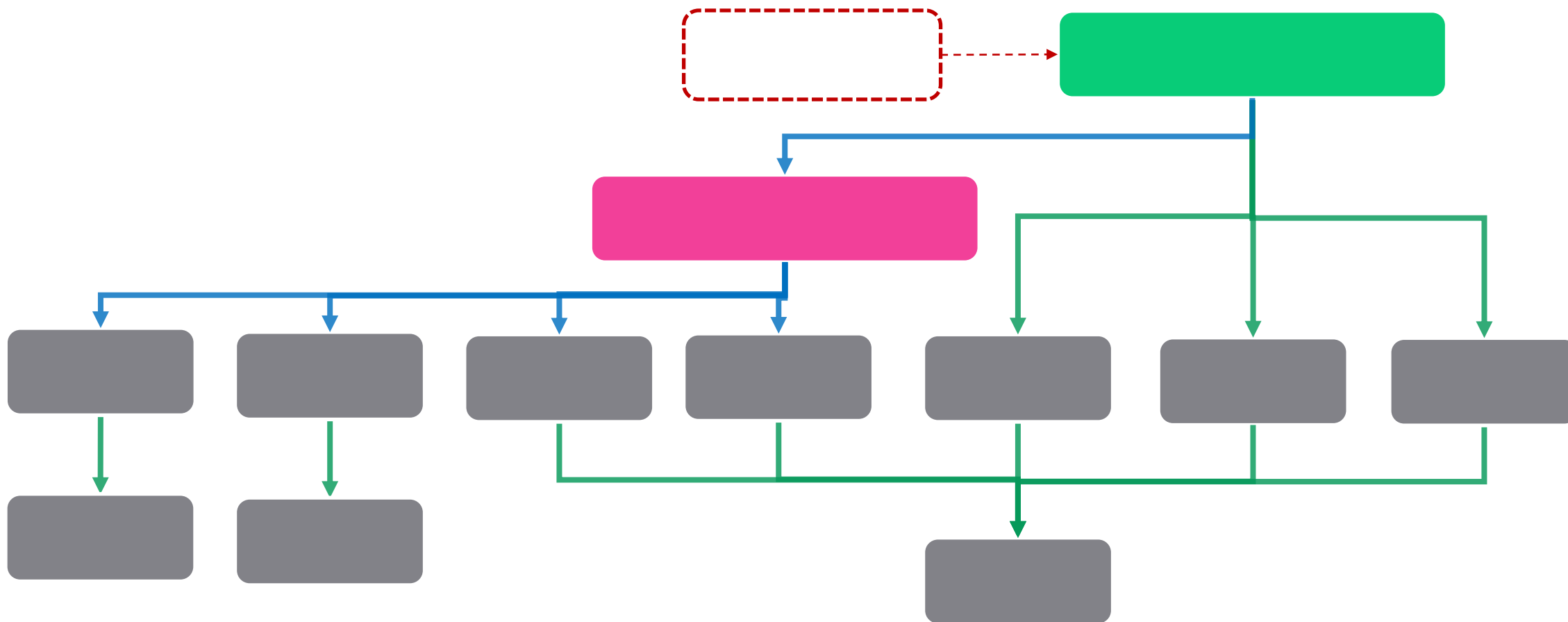


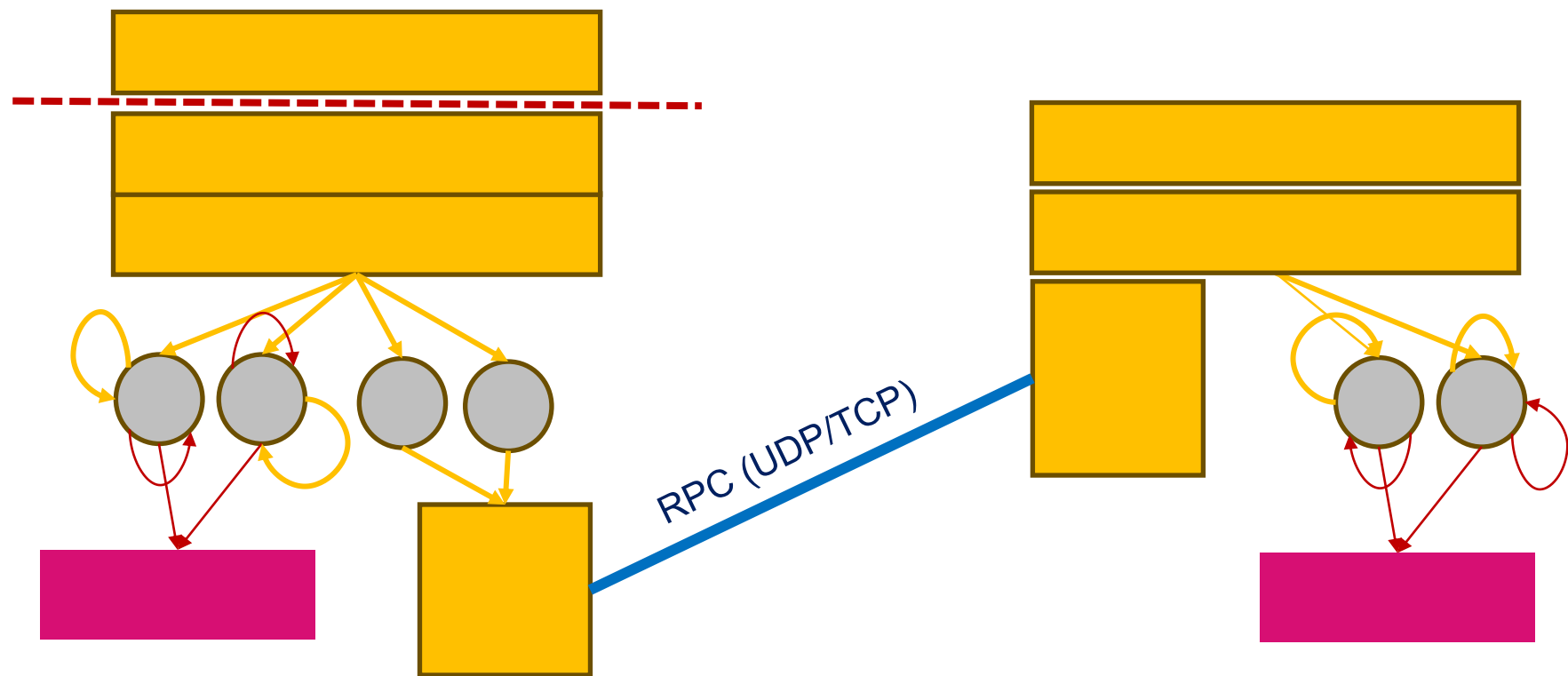




by the client's operating









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➤ **Stateful behavior vs Stateless Services**

➤ **A classical NFS server maintains no in-memory hard state.**



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➤ **Stateless behavior of NFS makes failure recovery simple and efficient.**

➤ Recovery in Stateless NFS

Server Restart

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-

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Connectionless

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Error Masking

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Constrained interface

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semantics (“send and pray”), which

Update Operations

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Inconsistency

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Retransmissions and Idempotency	Synchronous Writes	File Cache Consistency
▪ Hope for the best and smooth over non-idempotent requests. ○	▪ Delay the response until convenient for the server. ○ <i>write-gathering</i> <i>group</i> ○ <i>commit</i> ○ <i>iods</i>	▪ Timestamp invalidation (NFS). ○ query the server: “has <i>t?</i>”; invalidate
▪ Use TCP or some other transport protocol that produces reliable, in-order delivery. ○	▪ Throw hardware at it: non-volatile memory (NVRAM) ○ ○	▪ Callback invalidation (AFS, Sprite, Spritely NFS). ▪
▪ Implement an execute-at-most once RPC transport. ○		
▪ Keep a <i>retransmission cache</i> on the server. ▪	▪ Replicate server and buffer in memory (e.g., MIT Harp).	▪ Leases (NQ-NFS) Later: distributed shared memory

➤ **NFS V3 sidesteps the synchronous write problem by adding a new asynchronous write operation.**

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➤ **NFS V3 adds a new commit operation to go with async-write.**

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State-fullness



Byte-range locking and share modes



Compound request format



improved security

➤

➤

➤

standardizes the representation of string data

➤

➤

➤

Unification

➤

➤

RPC Over TCP

➤

➤

➤ **Install the nfs-kernel-server software package.**

-

➤ **Start the NFS server**

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➤ **Configure the directories to be exported by adding them to the /etc/exports file.**

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-
-

➤ **Apply the new config via**

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➤ **Check status or restart service**

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- **rw**

-

- **sync**

-

- **no_subtree_check**

-

- **no_root_squash**

-

➤ **To enable NFS support on a client system**

-

➤ **Use the mount command to mount a shared NFS directory from another machine**

-
-

➤ **The general syntax for the line in /etc/fstab file is as follows:**

-

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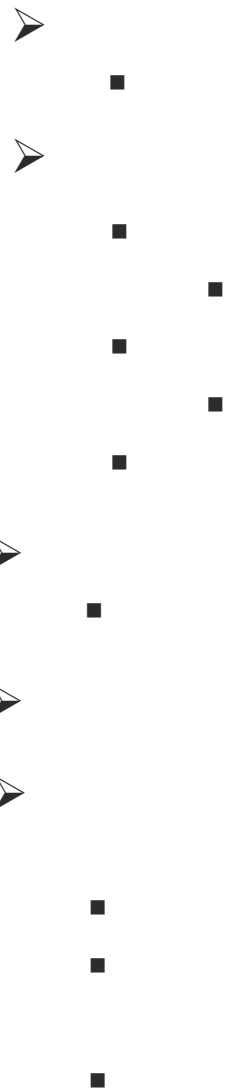
Server Message Block SMB



- The SMB protocol operates in “request response” mode—

—

History



➤ **Commonly used versions of SMB are**

CIFS
• • •

SMB 2.0
• •

SMB 3.0
•

➤ **Older versions of SMB**

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SMB Security Threats

EternalBlue

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WannaCry

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Nyetya

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SMB Encryption

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Secure Dialect Negotiation

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New Signing Algorithm

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Versions and implementations

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Versions and implementations



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File Transfer Protocol (FTP)

- **FTP allows user to install and transfer files or folders from one system to the other.**
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- **The term FTP is owned by Apache**
- **Required FTP software to be installed on both machines involved in transferring file**
- **Different software implementations are available, some are paid and some are free to use.**



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Procedure to used



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ADVANTAGES OF FTP

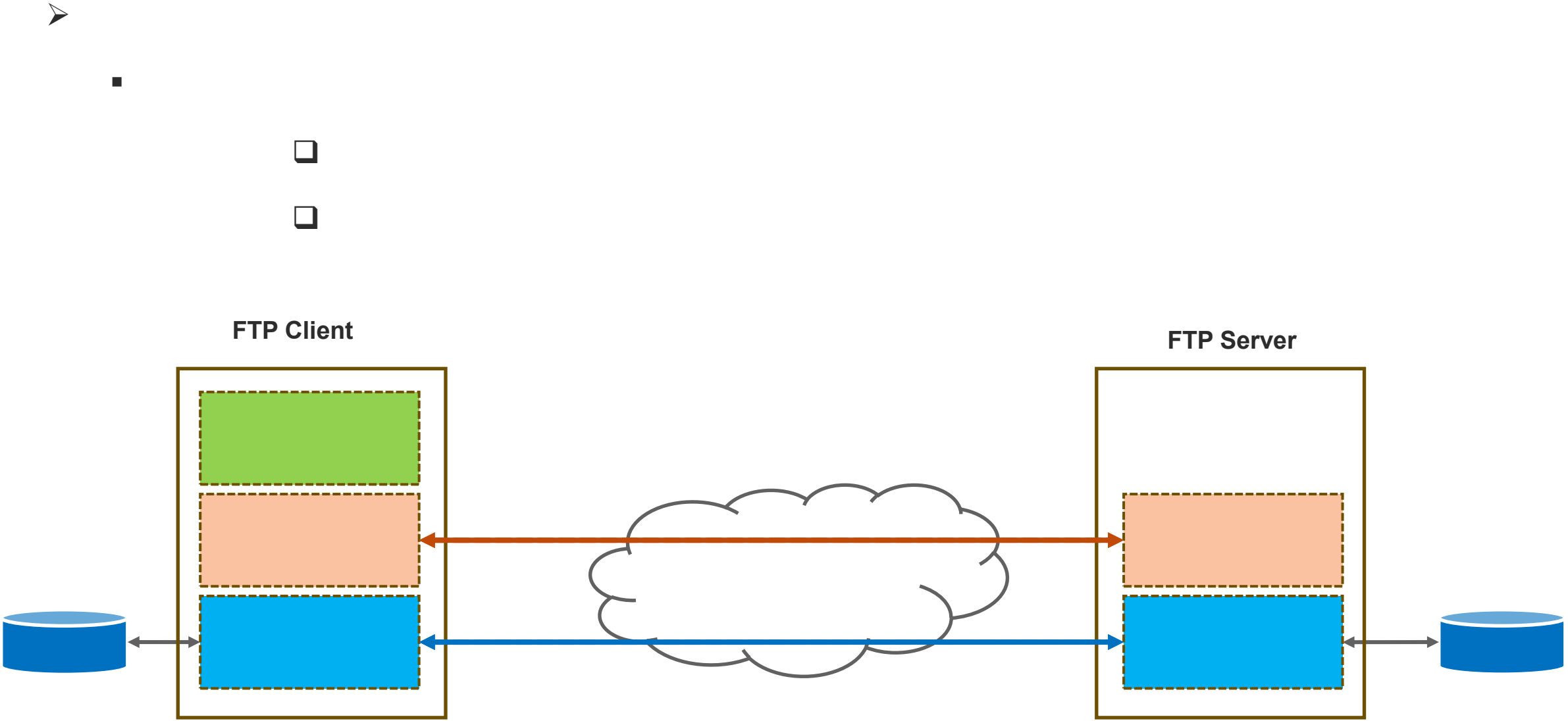


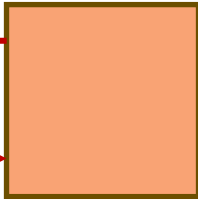
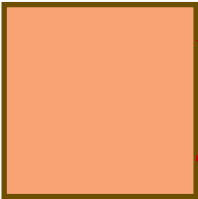
Disadvantages of File Transfer Protocol

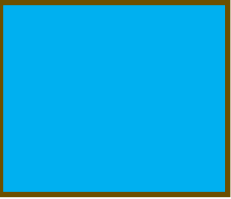
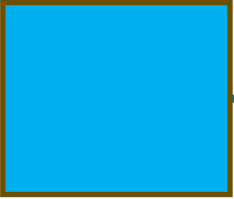


The problems FTP can solve









- **Control communications takes place using NVT ASCII**



- **Client defines the transmission mode along with file types and related data structure**



- **Client Sends commands and Server replies with responses**





USER



PASS



ACCT



REIN

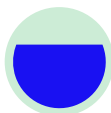


QUIT



ABOR







Initial Reply

Completion Replies

Immediate Replies

Transient Negative Replies

Negative Completion Replies

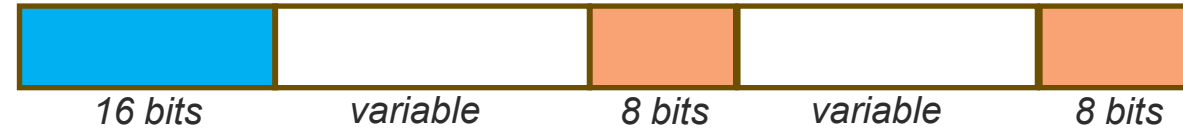
- **There are occasions when we need to simply copy a file without the need for all of the features of the FTP protocol.**

-

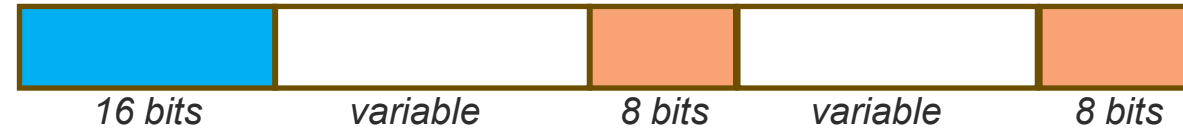
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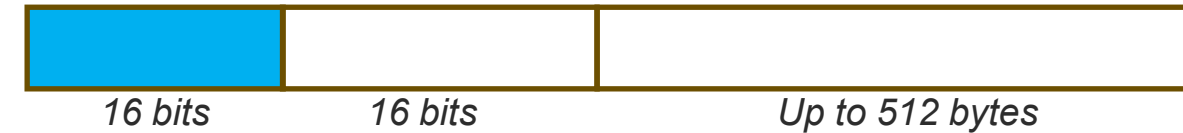
RRQ Message



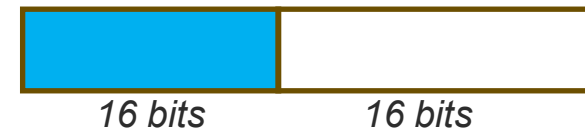
WRQ Message



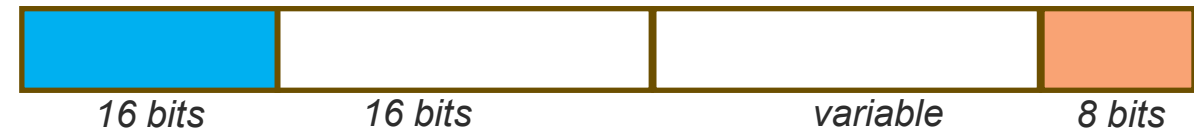
Data Format



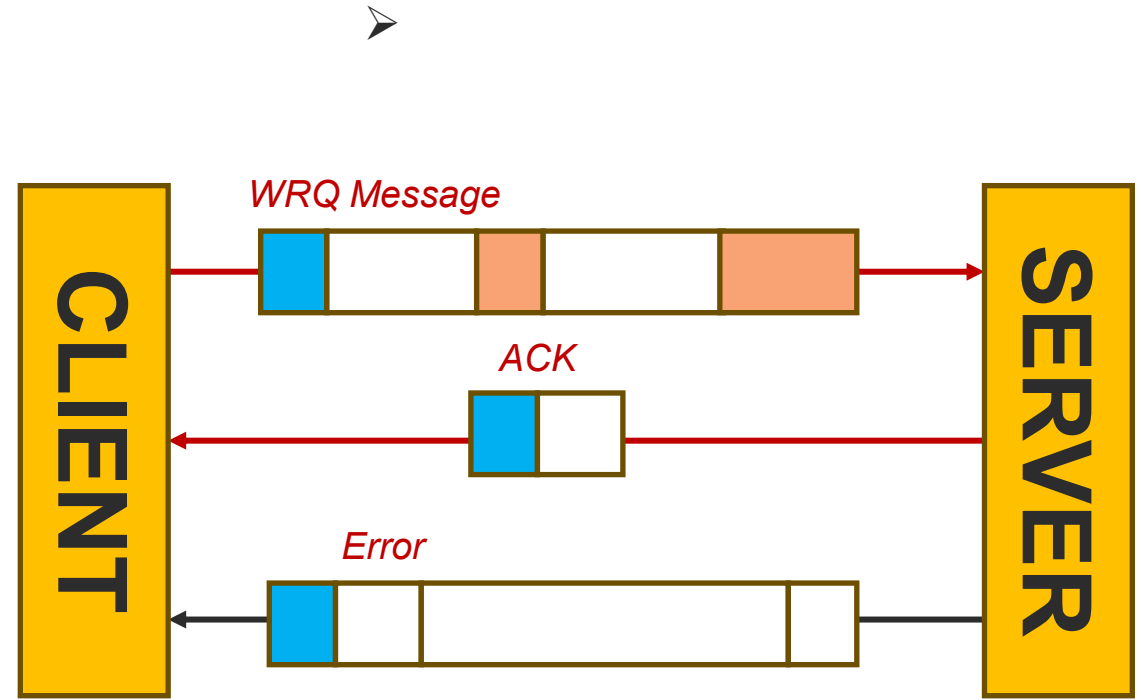
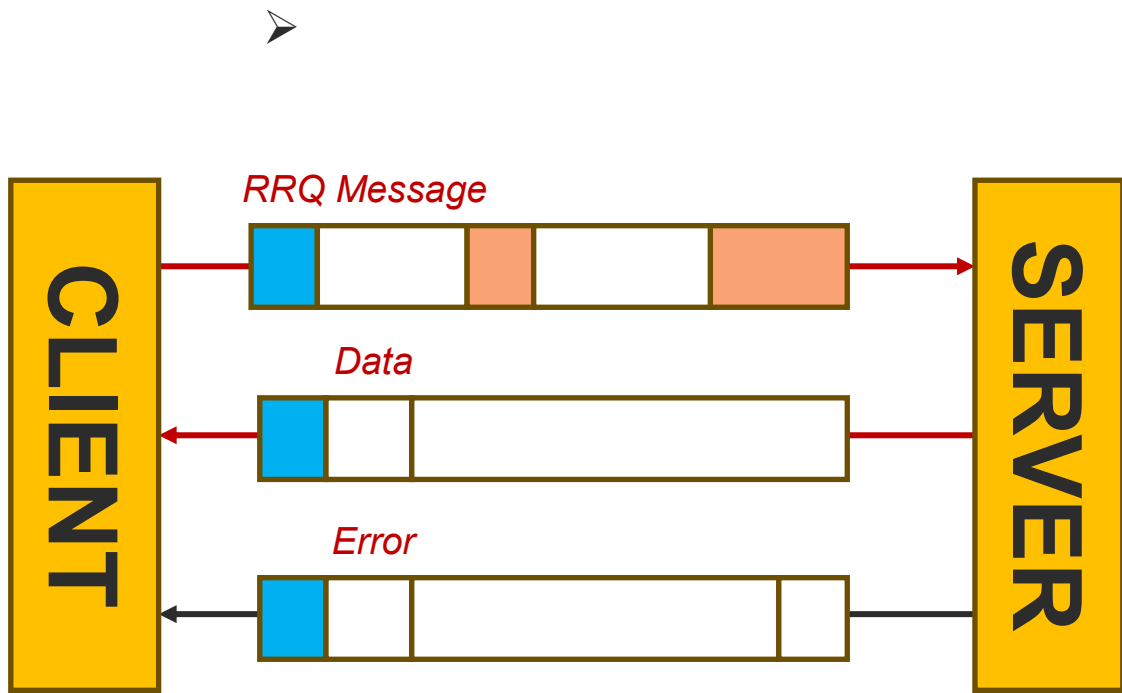
ACK Message



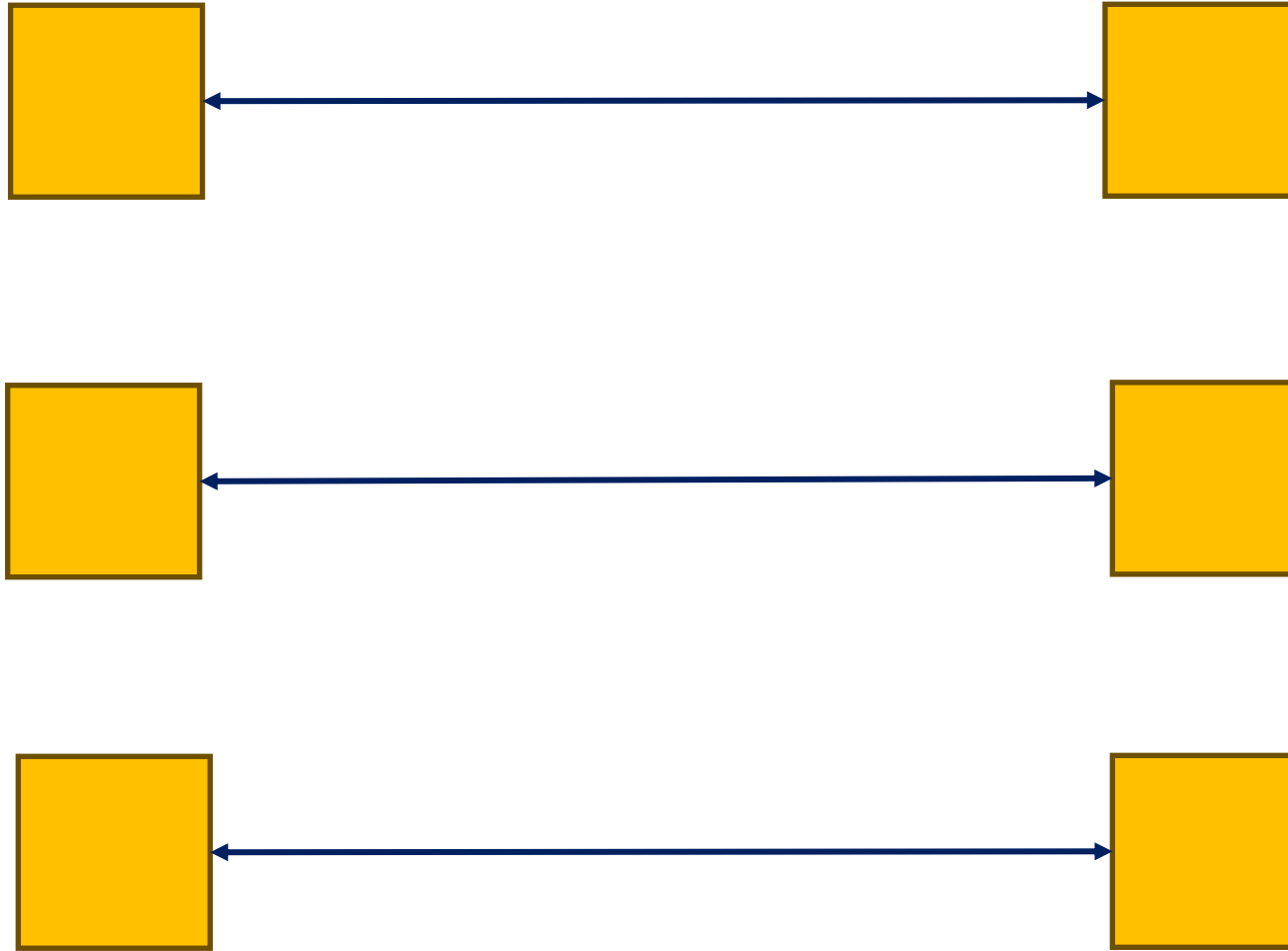
Error Message







UDP port numbers used by TFTP

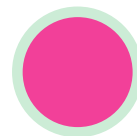


Week 13 (Part 1)

Addressing



MAC Address...





Example:

07:01:02:01:2C:4B

**A 6-byte (12 hexadecimal digits) physical
address.**







11000000	10101000	00000001	00000001
----------	----------	----------	----------

11111111	11111111	11111111	00000000
----------	----------	----------	----------



Private IP Address

-
-
-
-

-
-
-

Public IP Address

-
-
-
-
-

-
-
-
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[illegible]

➤ In subnetting, a large network is logically or physically divided into multiple small networks or "subnets."

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➤ Fixed vs. Variable Length Masking

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- ❖

- ❖

- ❖

- **128 bits (or 16 bytes) long: four times as long as its predecessor.**

- **2^{128} : about 340 billion billion billion billion different addresses**

- **Colon hexadecimal notation:**

-
-
-

- **IPv6 Zero Suppression**

-

to 0 in the colon hexadecimal format can be compressed to “::”, known as double



-

➤ The prefix is the part of the address that indicates the bits that have fixed values or are the bits of the subnet prefix.

➤ An IPv6 prefix is written in address/prefix-length notation.

-

➤ IPv6 Address Categories

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- ❖

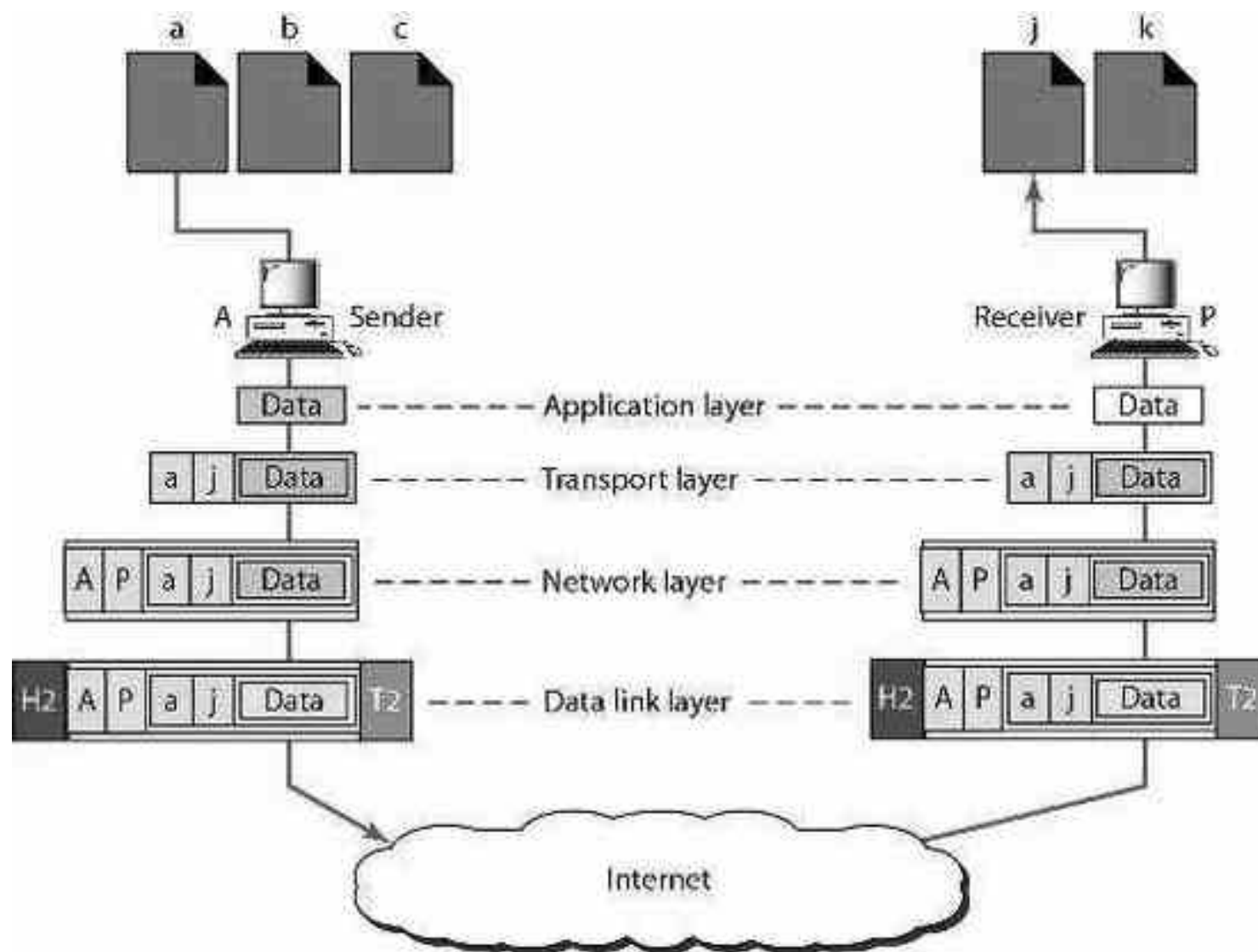
- ❖

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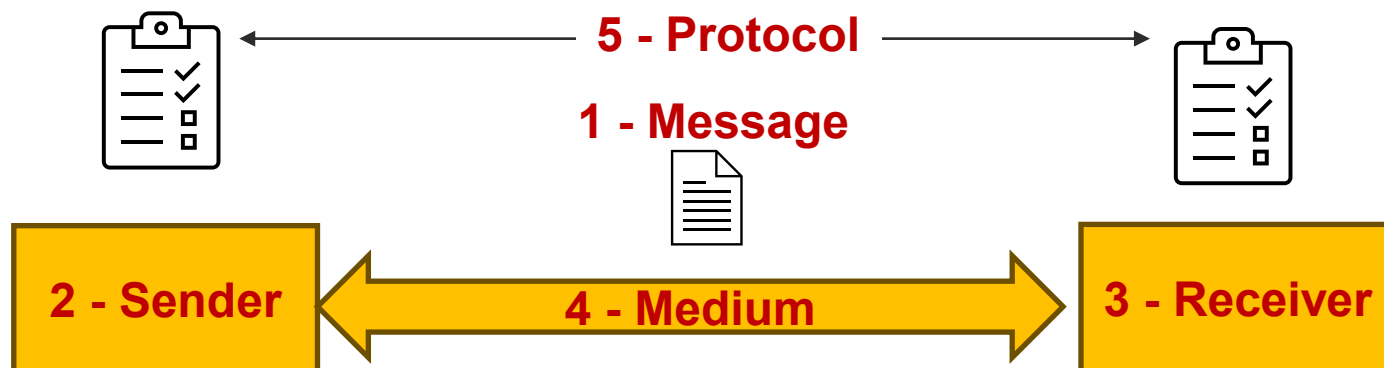


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Week 13 (Part 2)

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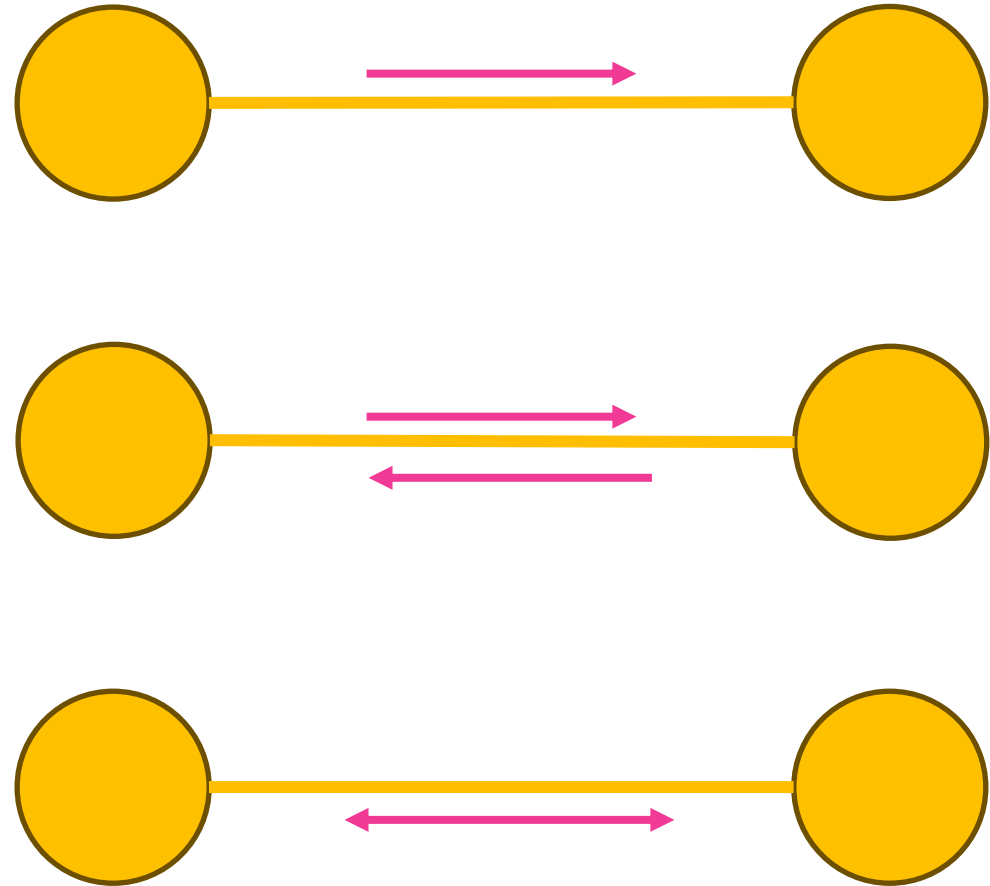


➤ Data Types

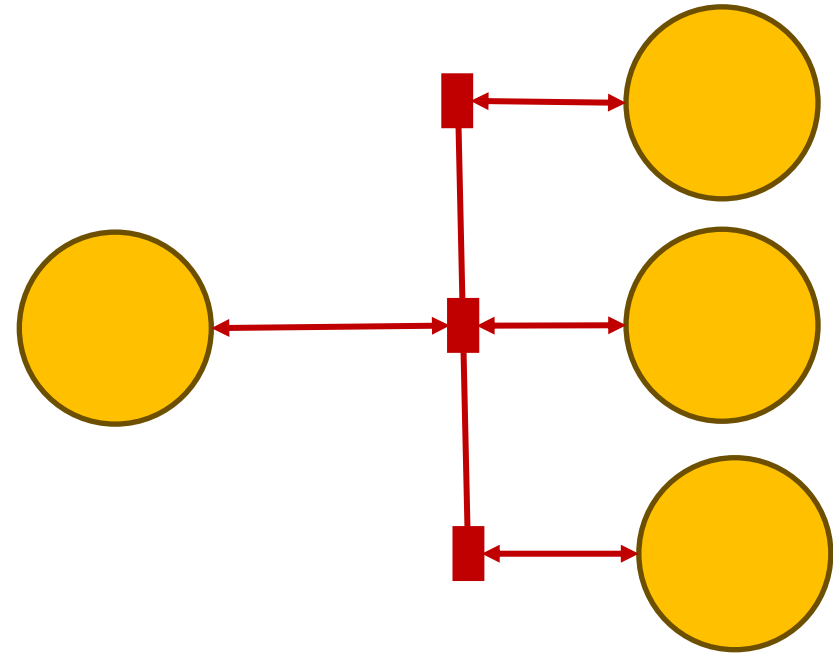
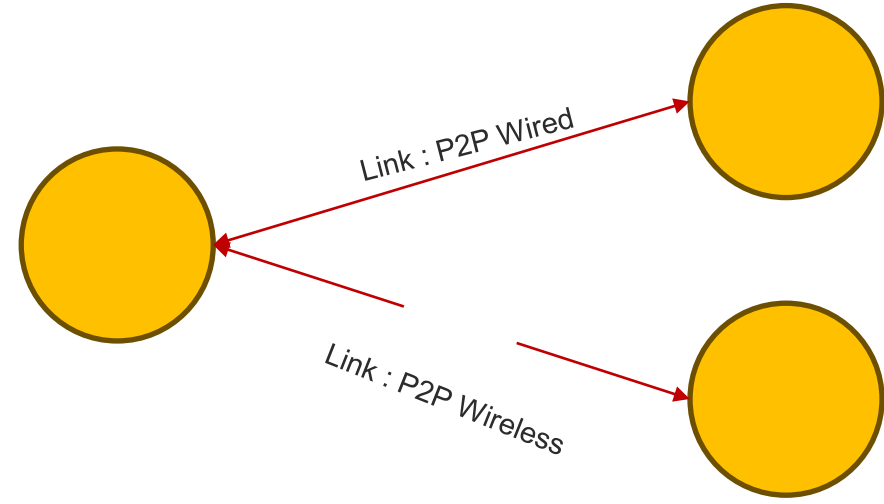
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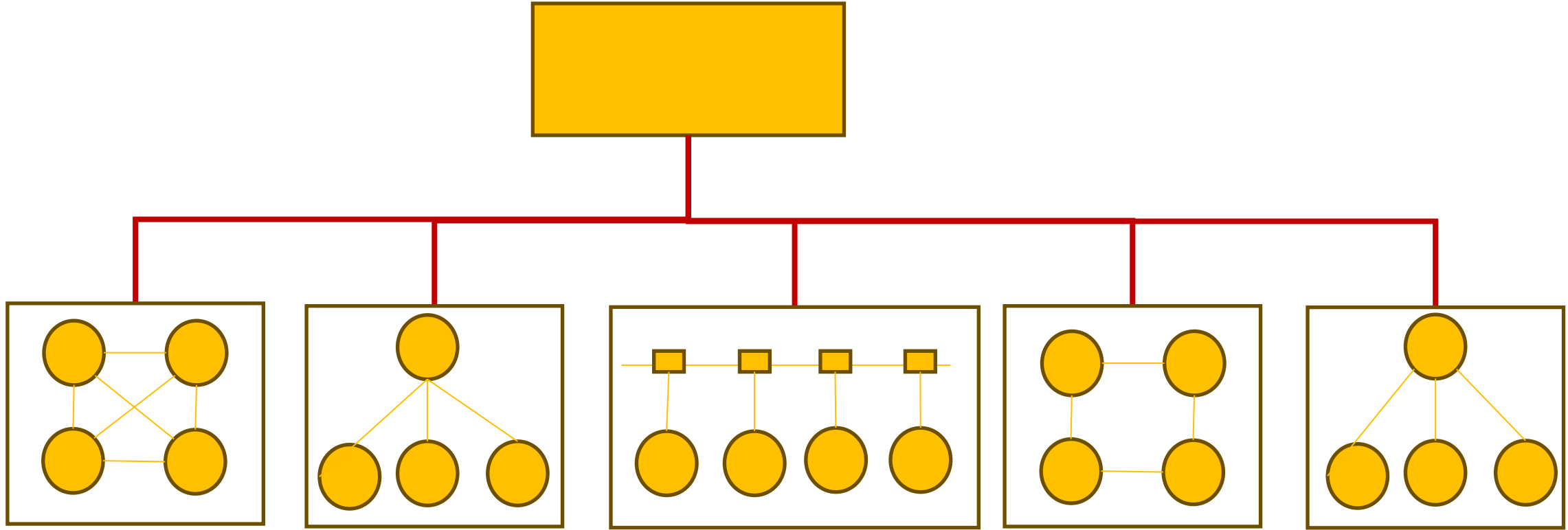
➤ Data flow

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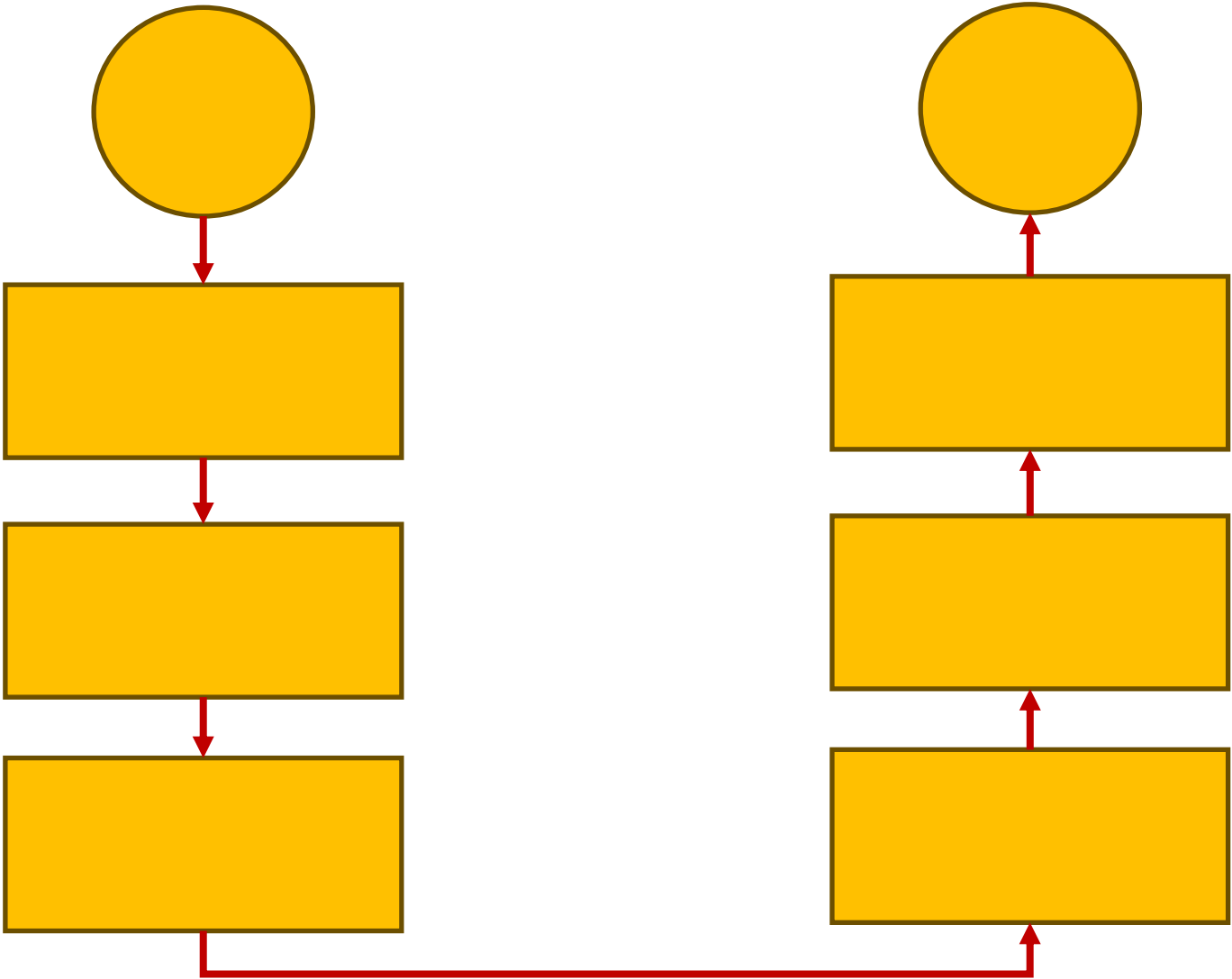
- Syntax → format of the data
- Semantics → meaning of each section
- Timing → when data should be sent and how fast.



- De facto → by fact (not approved as a standard)
- De jure → by Law (approved)

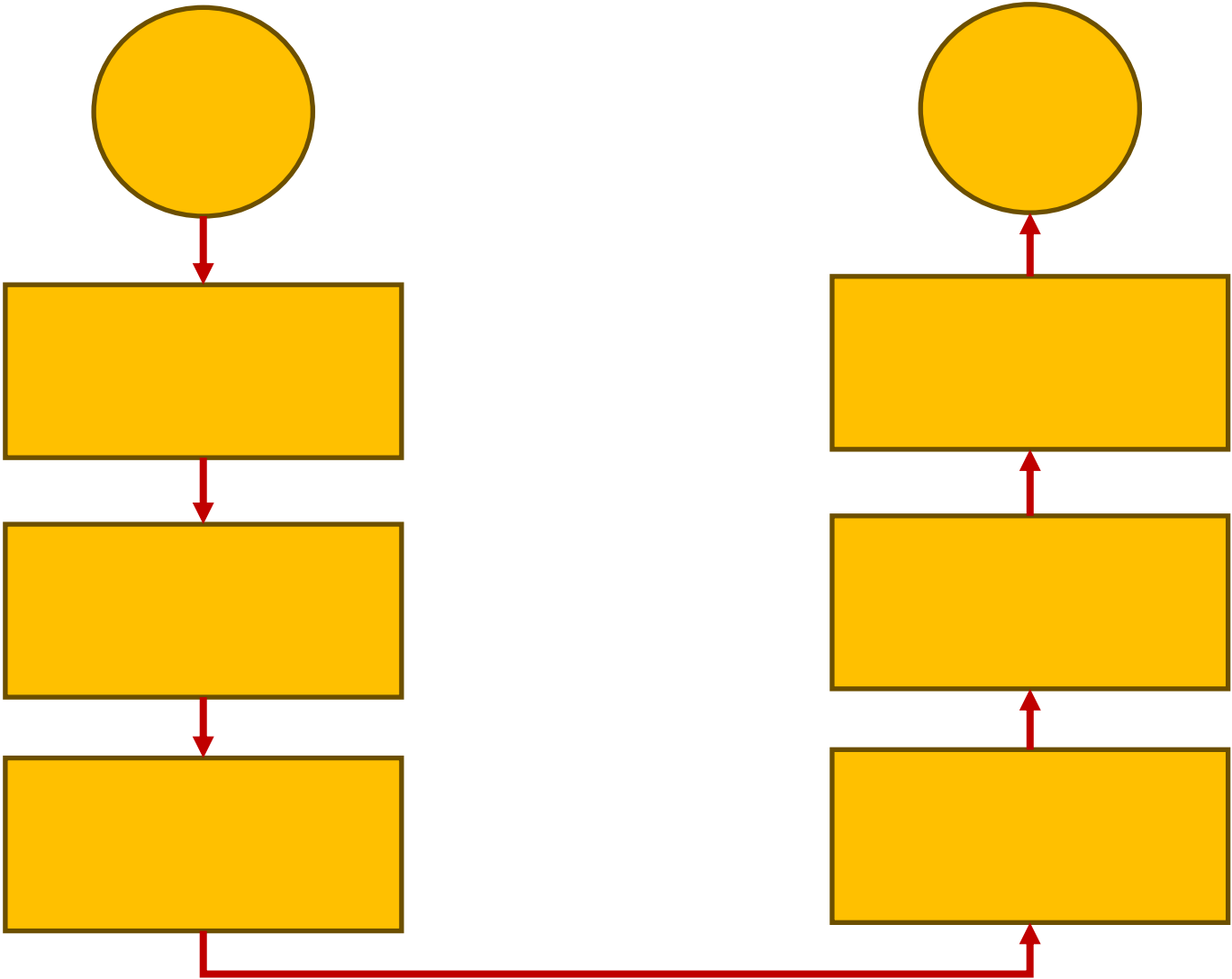


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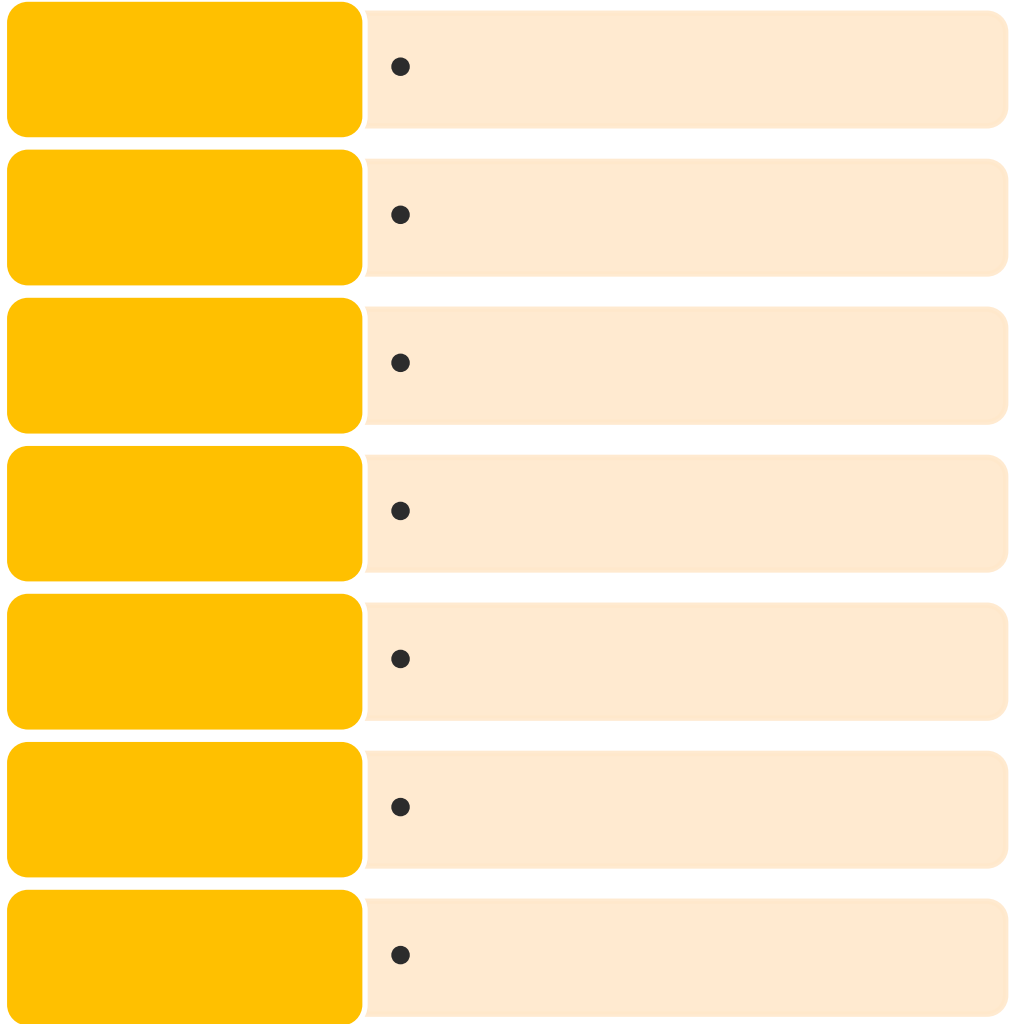


**IT601 – System and Network
Administration**
Week 13 (Part 3)

**Department of Computer Science and Information Technology,
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Sender



Receiver

—

—

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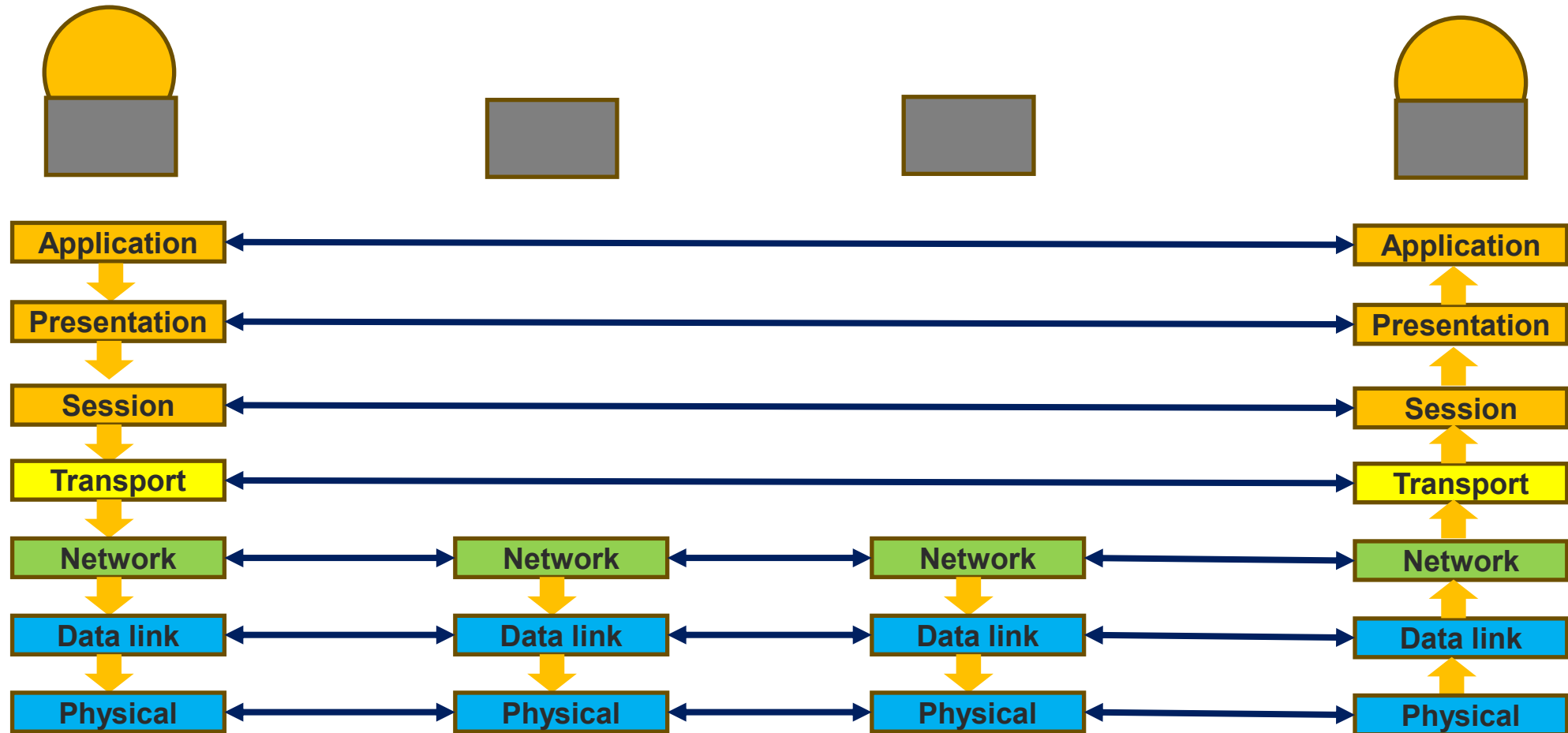
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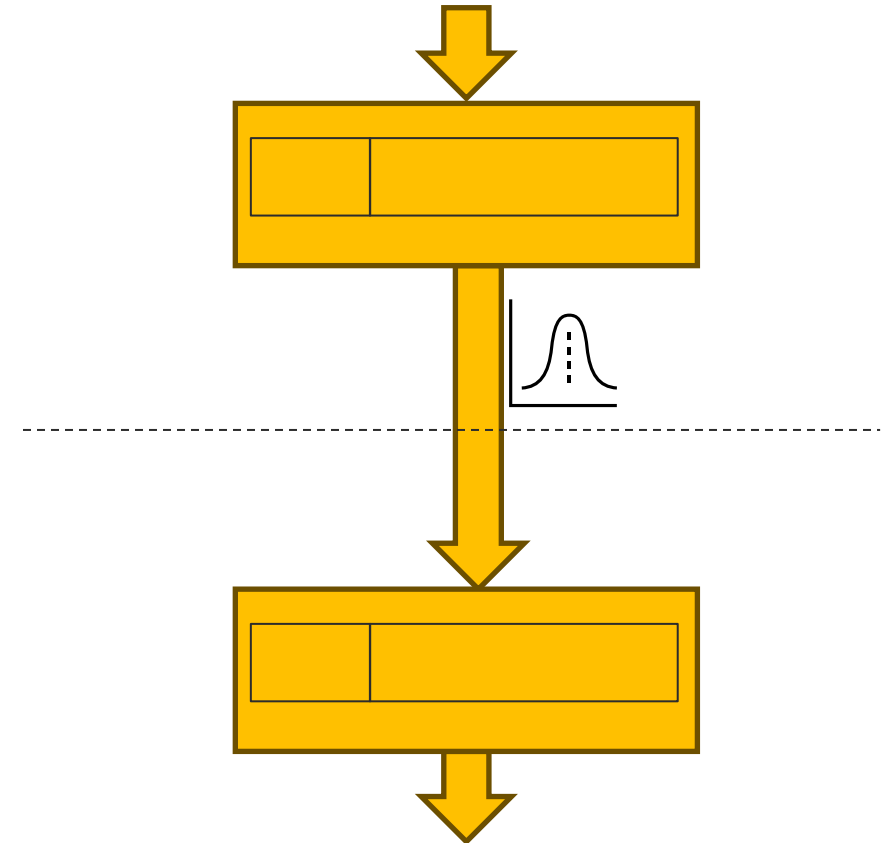
interface



- The physical layer is responsible for movements of individual bits from one hop (node) to the next.

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- The data link layer is responsible for moving frames from one hop (node) to the next.

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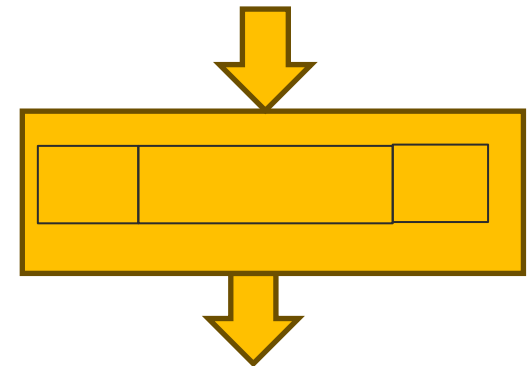
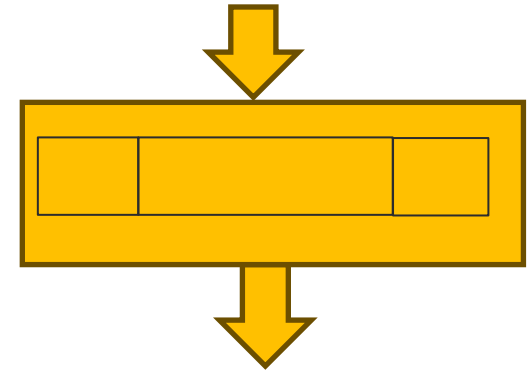
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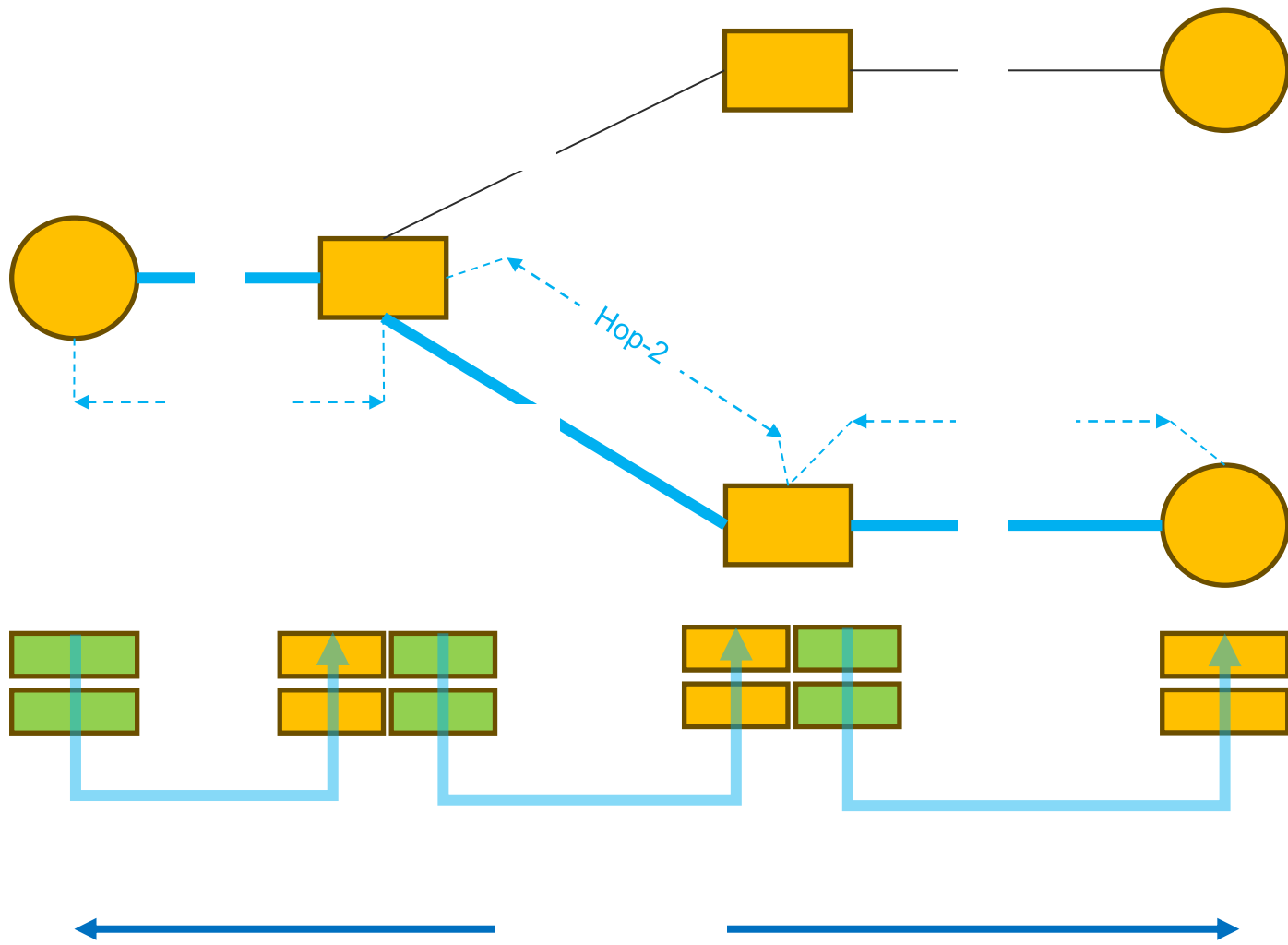
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The network layer is responsible for the delivery of individual packets from the source host to the destination host.

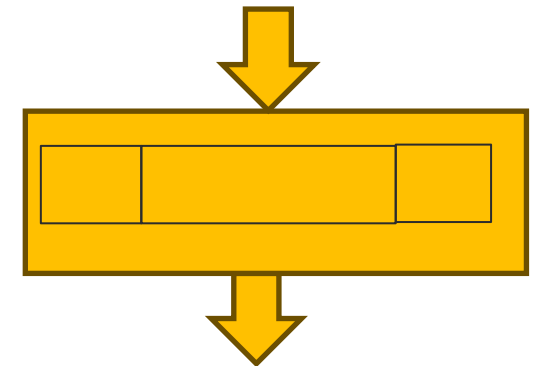
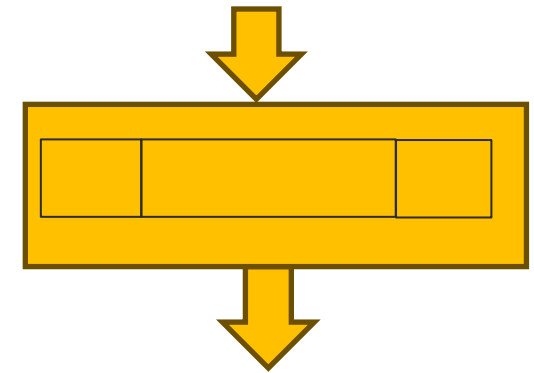
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➤ **The transport layer is responsible for the delivery of a message from one process to another.**

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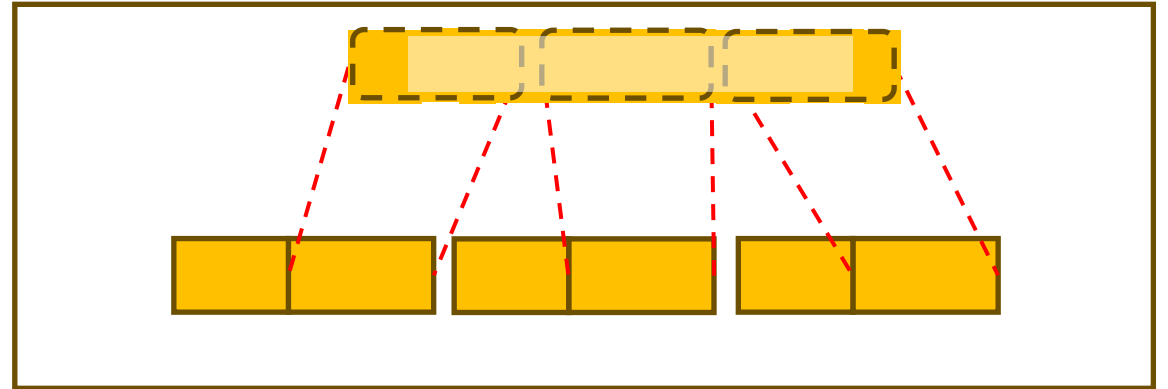
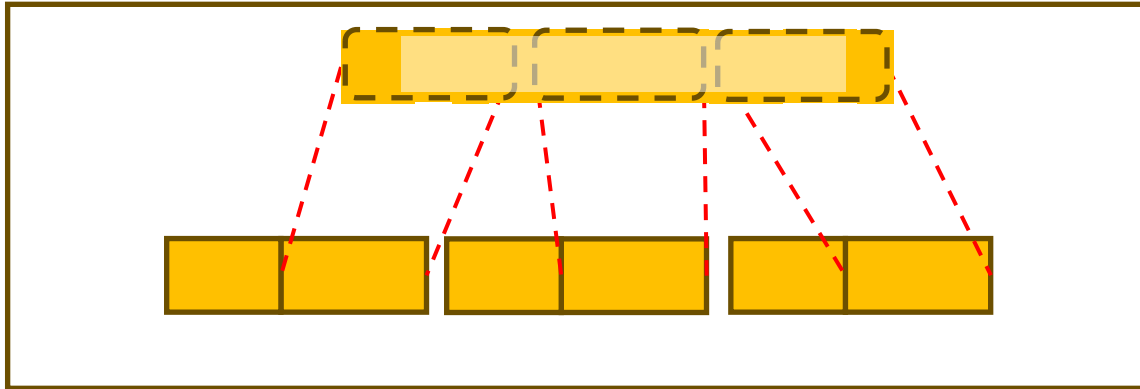
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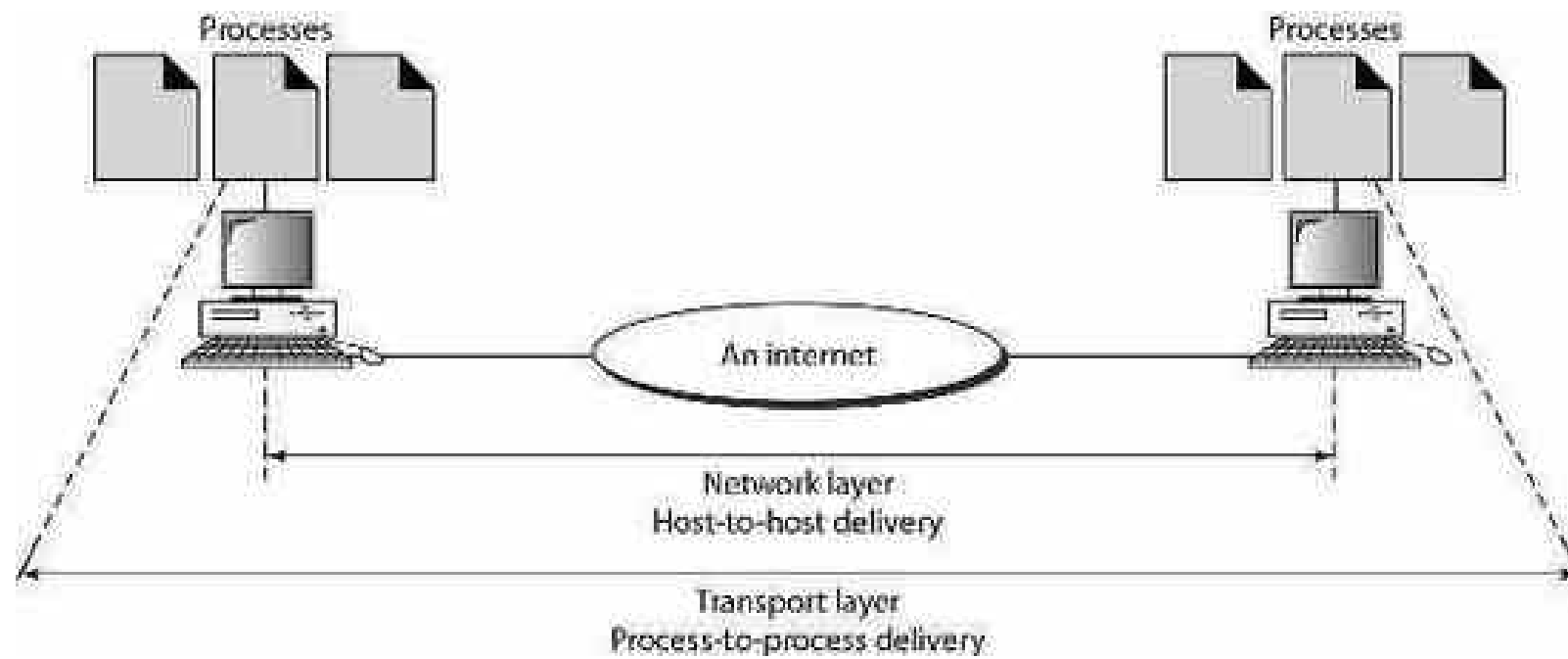
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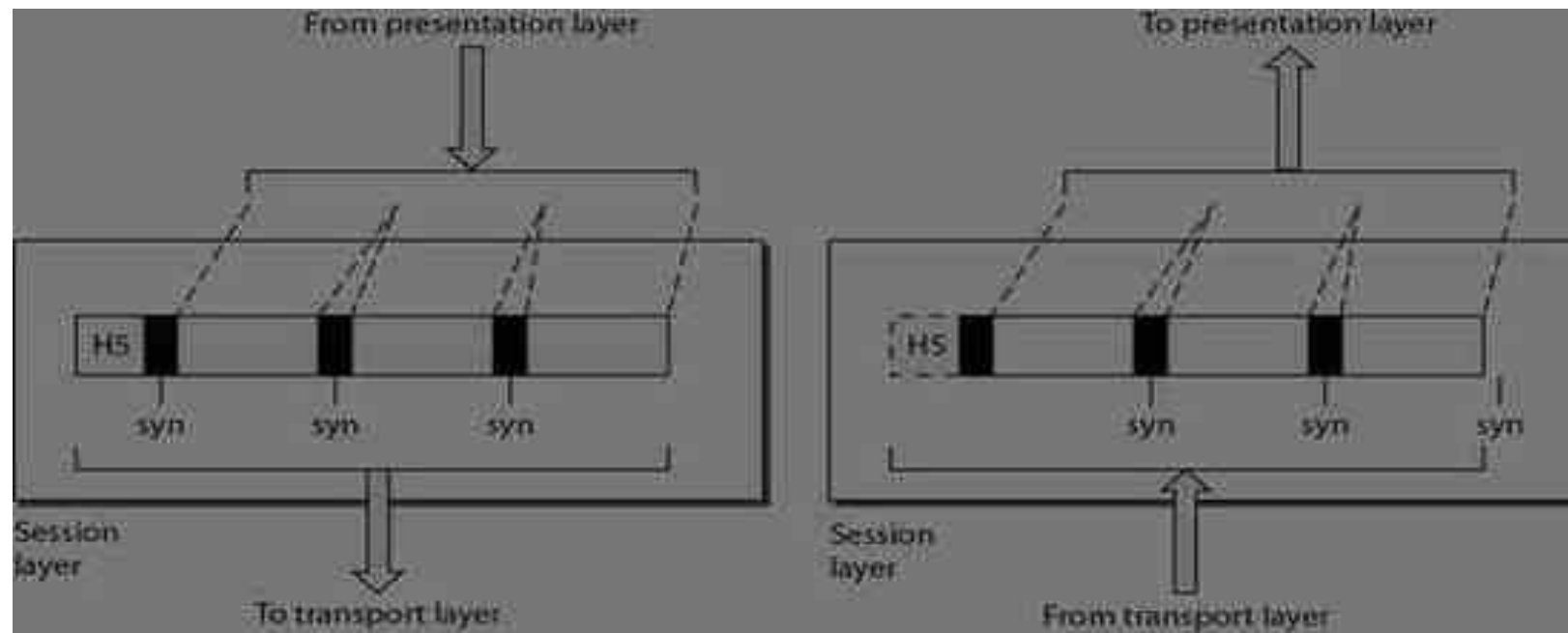
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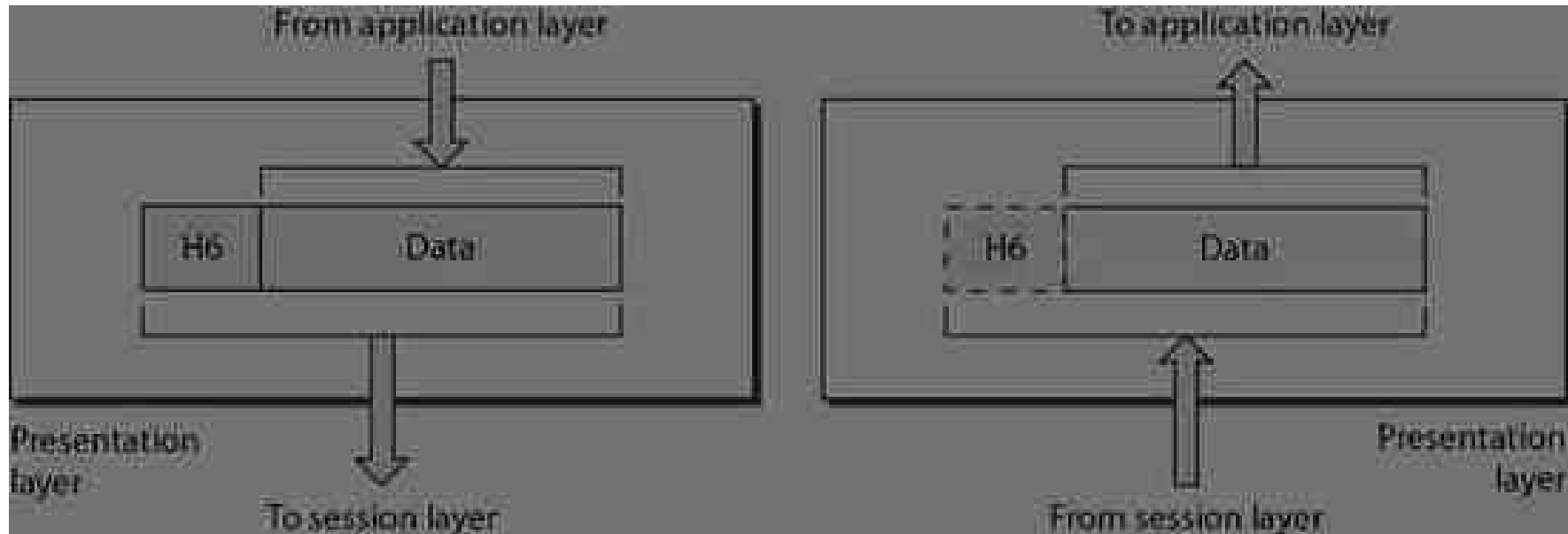


- The session layer is responsible for dialog control and synchronization.
- It establishes, maintains and synchronize the interaction between communicating system
- **Function**
 - Dialog control
 - Synchronization (checkpoints)

Synchronization



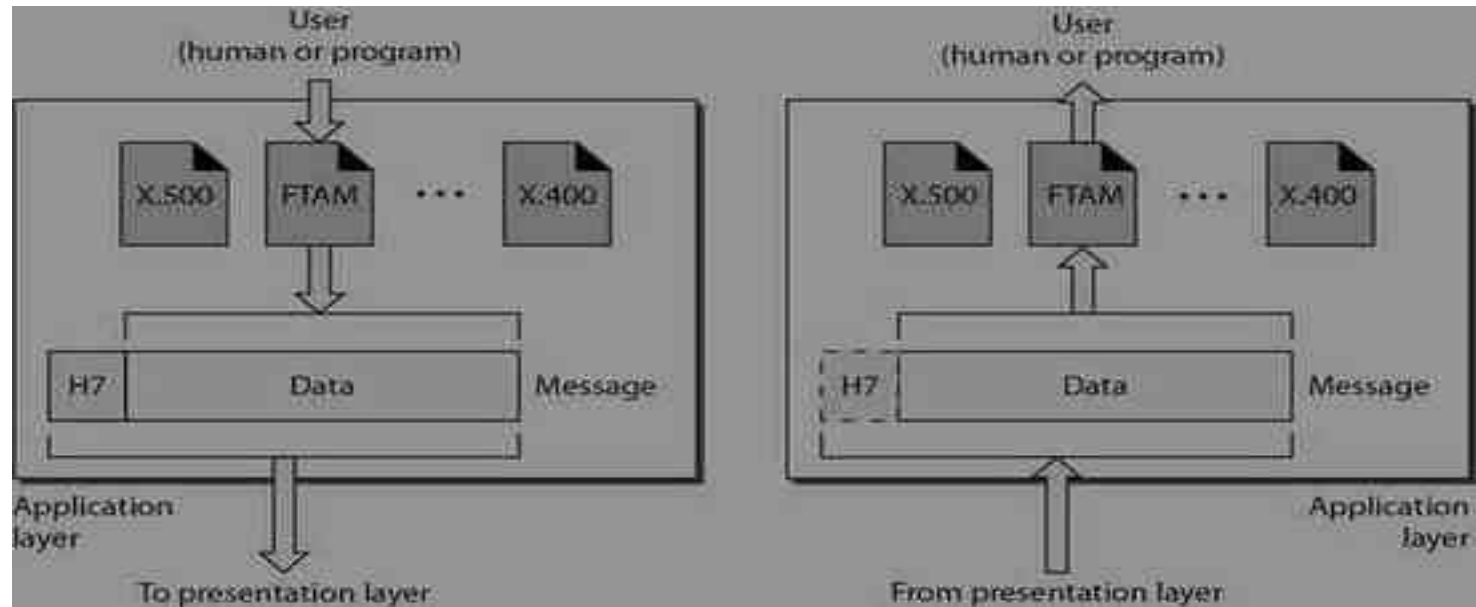
- The presentation layer is responsible for translation, compression, and encryption.
 - Concerned with the syntax and semantics of the information exchanged between two system
 - **Functions**
 - Translation →
 - Encryption and Decryption
 - Compression



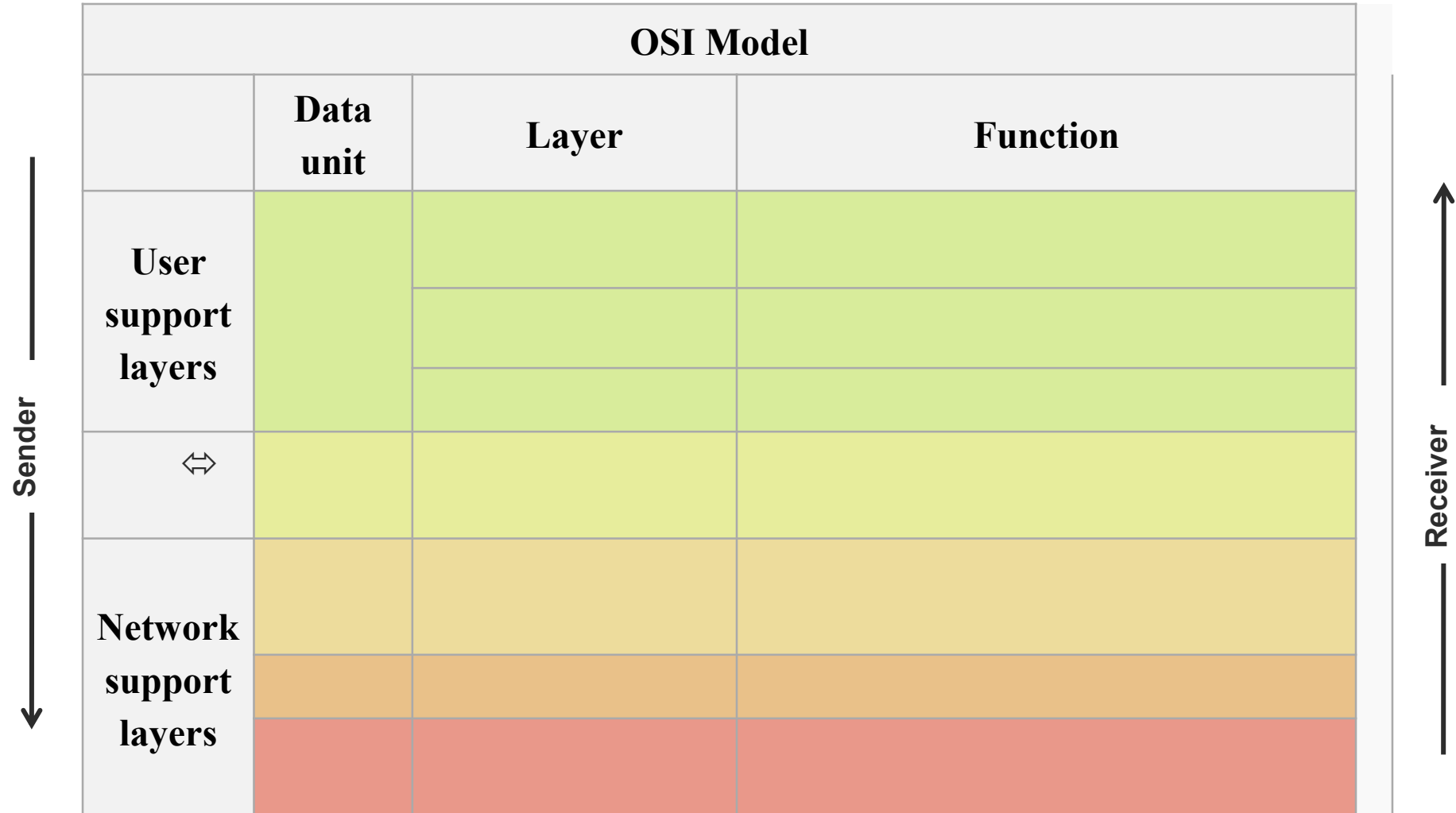
The application layer is responsible for providing services to the user.

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IT601 – System and Network Administration

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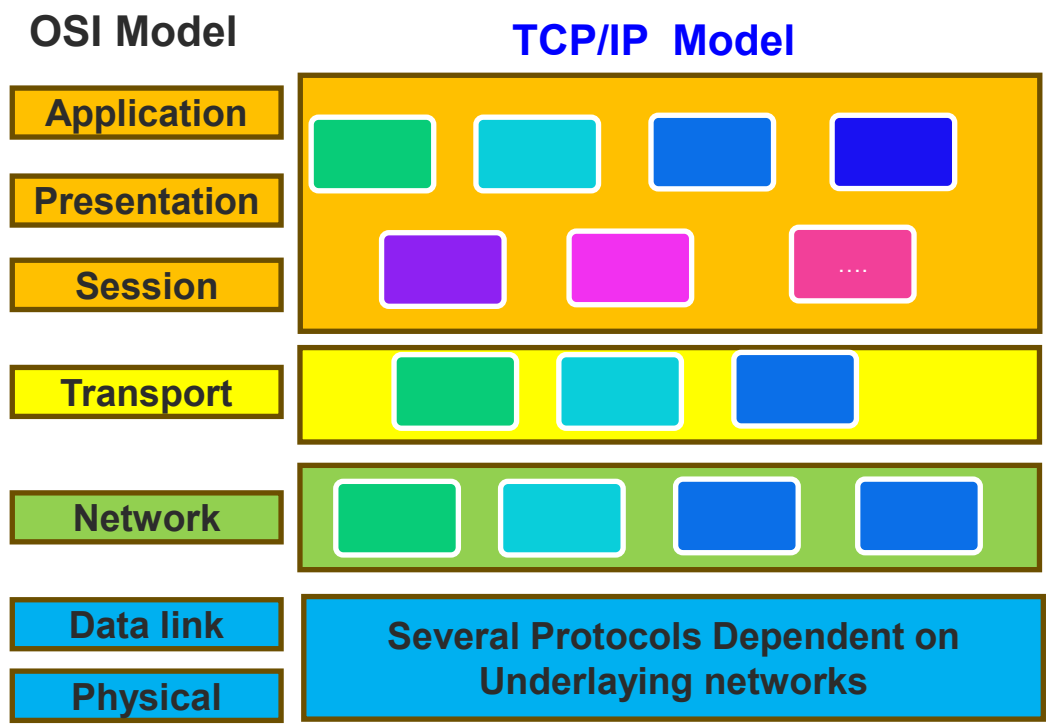


➤ Internet Layer

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➤ Transport Layer

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IT601 – System and Network Administration

Week 14



**Department of Computer Science and Information Technology,
Virtual University of Pakistan**

➤ Collision Domains

➤ Broadcast Domains

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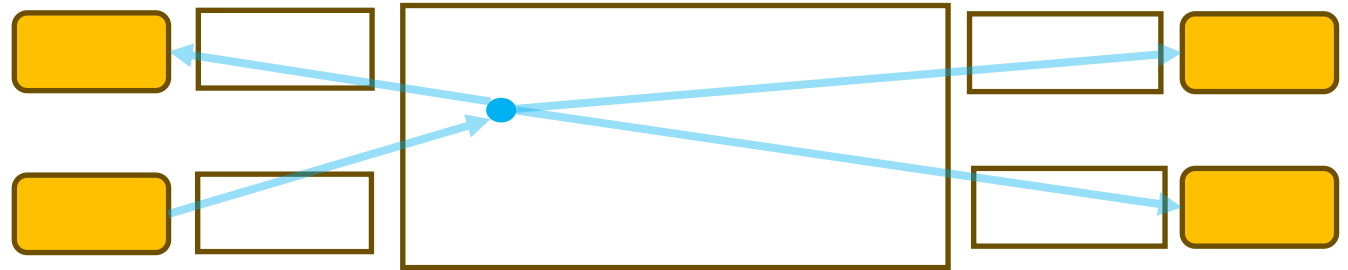
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➤ Hub, Bridge, Switch and Router

➤ Broadcast Domain

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➤ Collision Domain

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