
Module 3. Network Architecture

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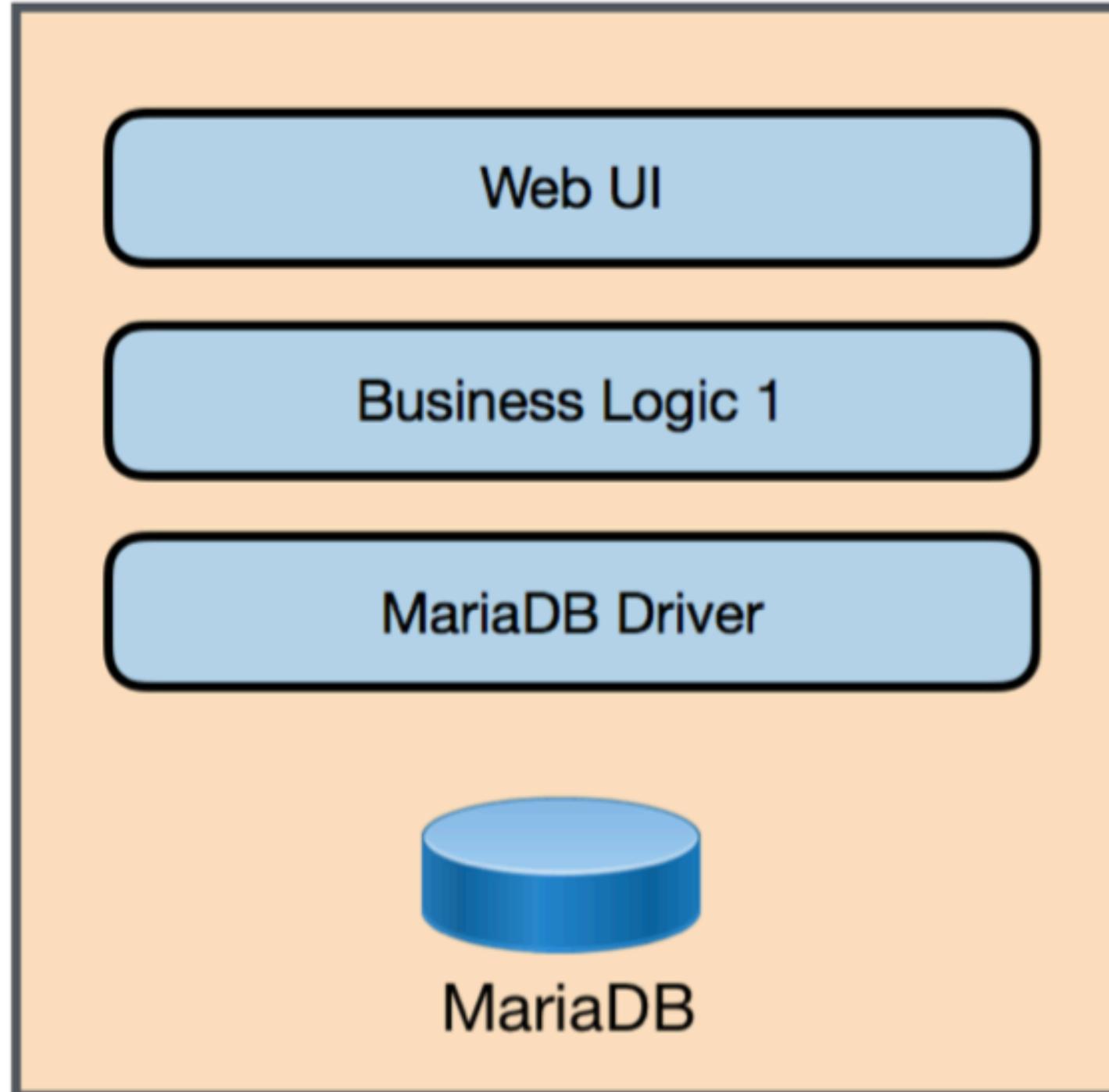
- Layer Architecture
- OSI Model
- TCP/IP Model
 - Network Access Layer
 - Internet Layer

Layer Architecture

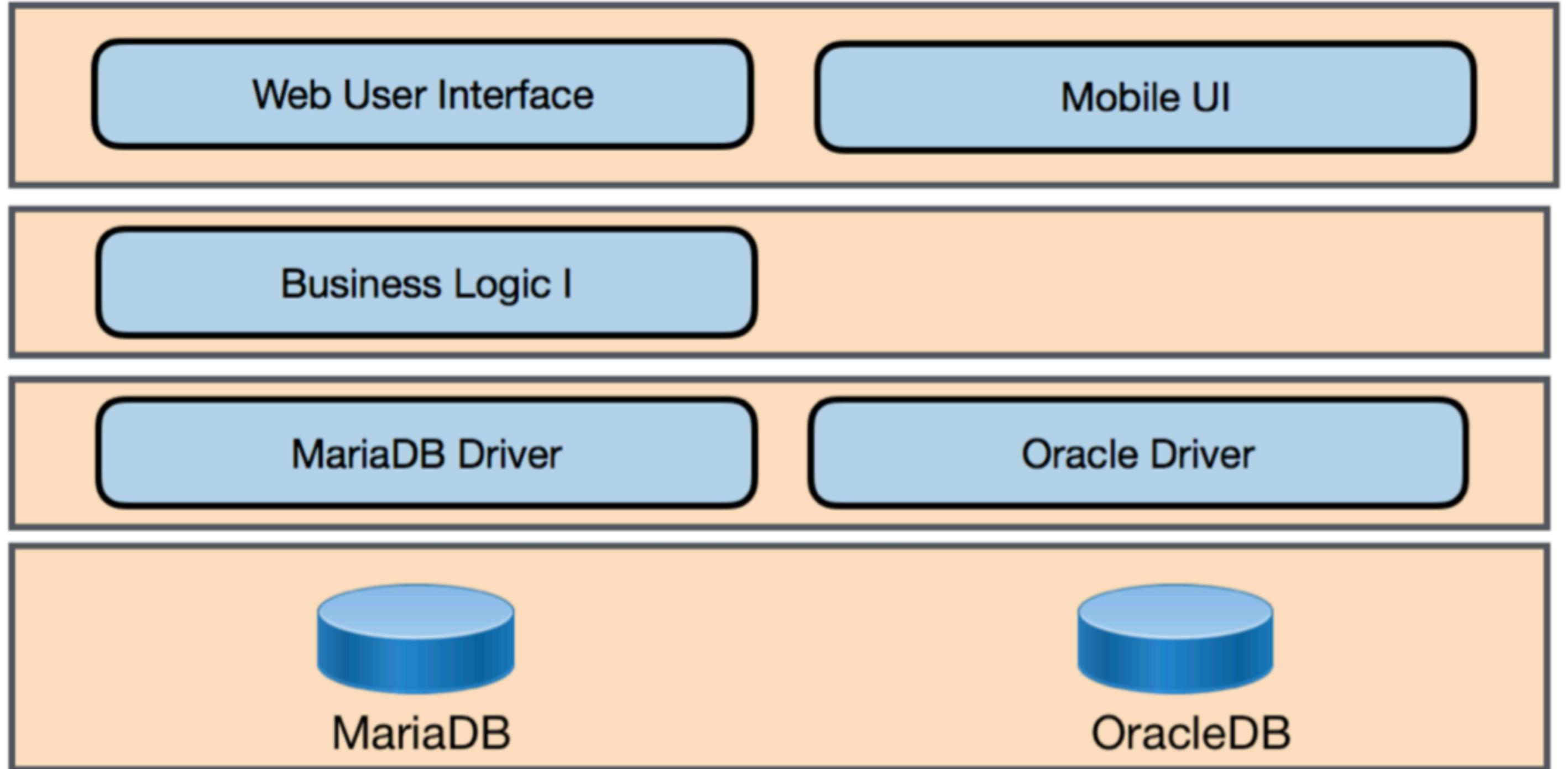
Why we need software architecture **UbIN3\$**

Ubiquitous Networked Embedded System

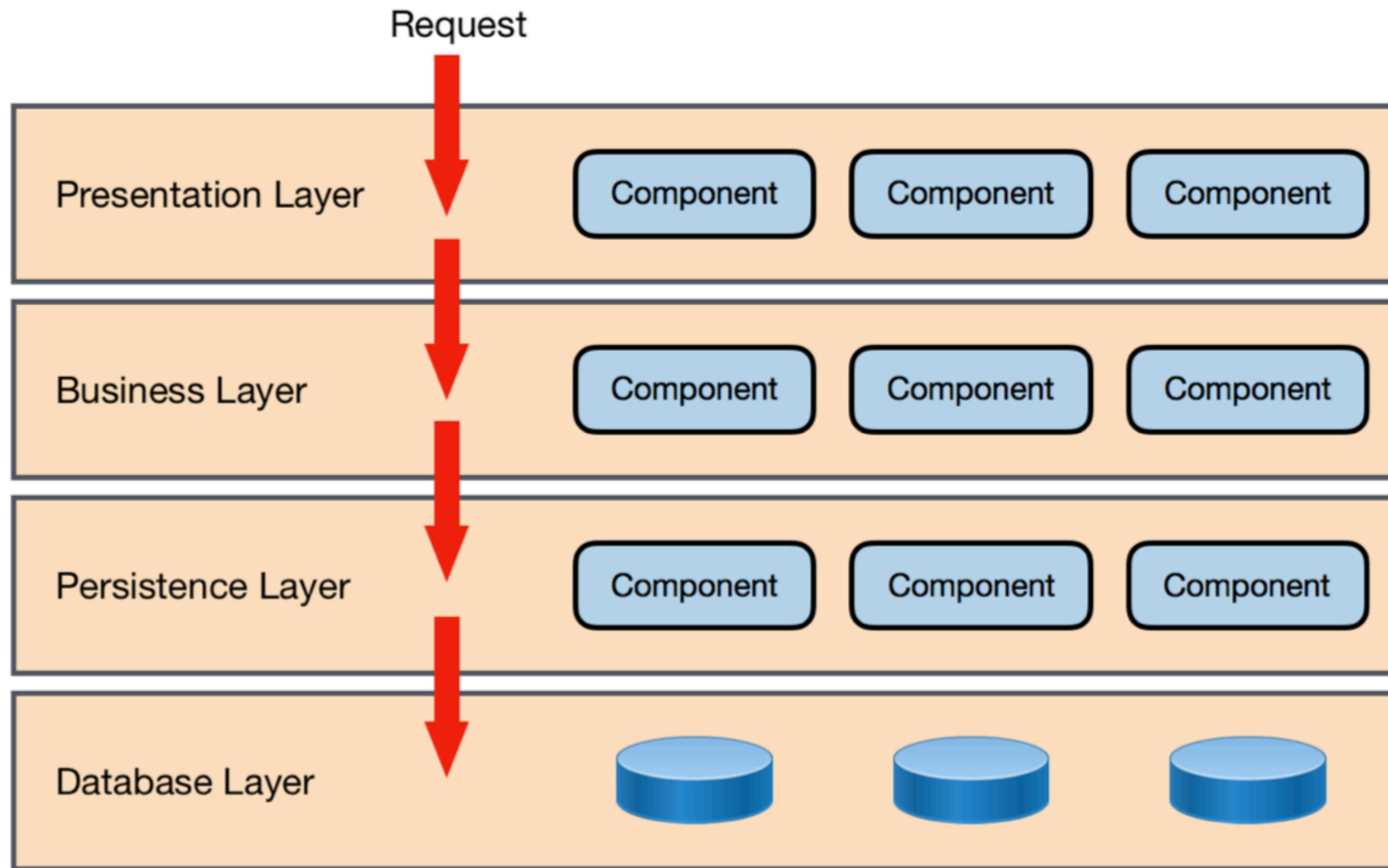
Application A



Application B

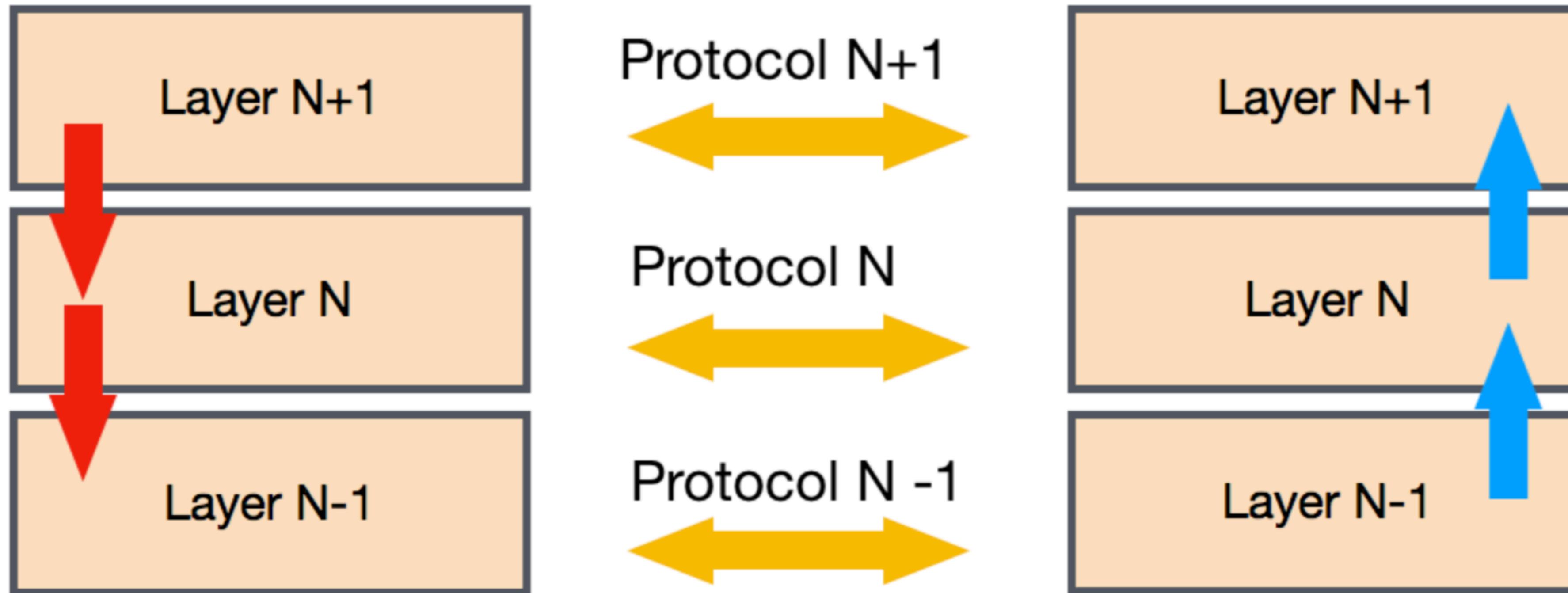


Layer Architecture



Component of Layer Architecture

UbIn3\$
Ubiquitous Networked Embedded System



Layer Architecture

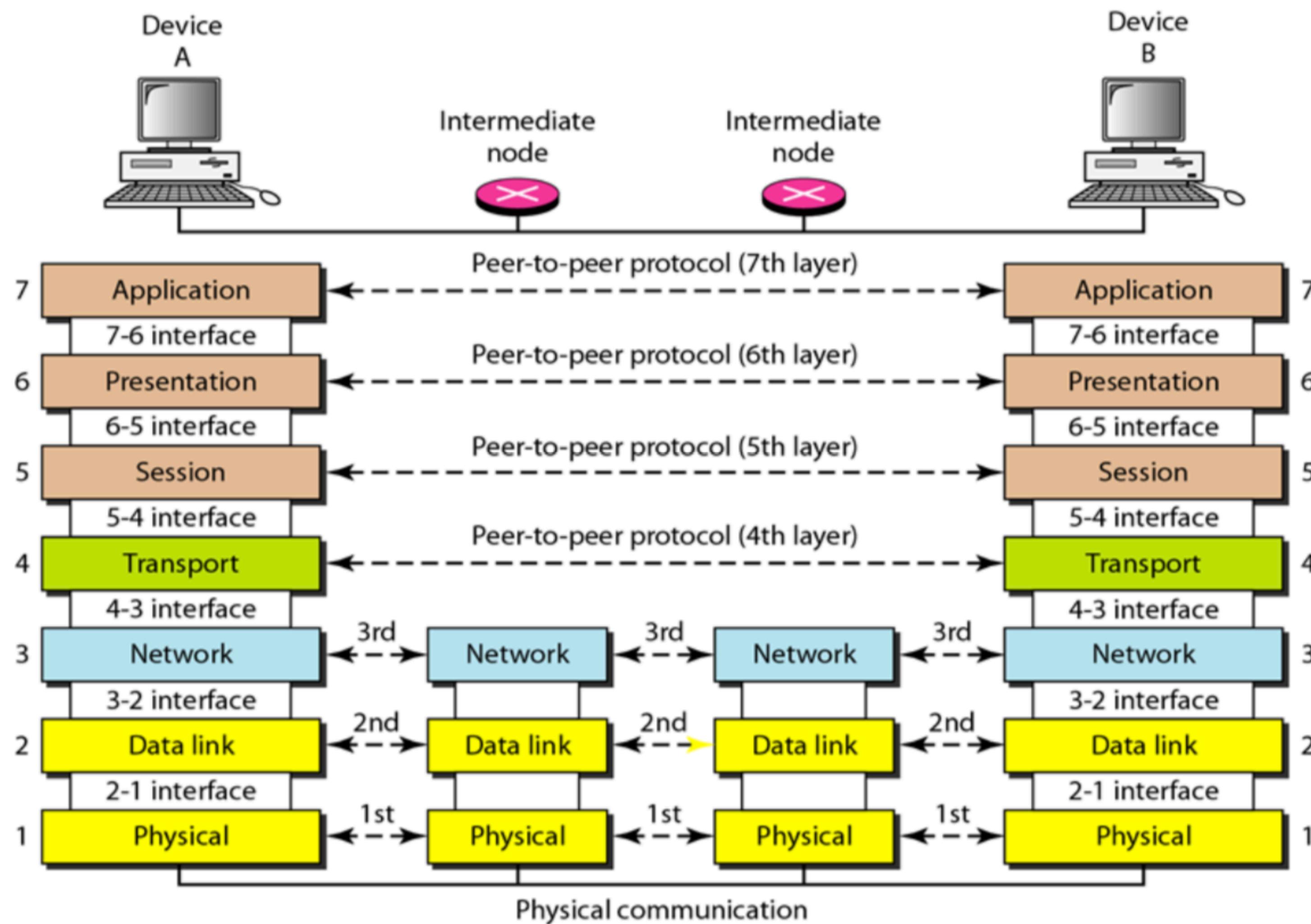
UbiN3\$
Ubiquitous Networked Embedded System



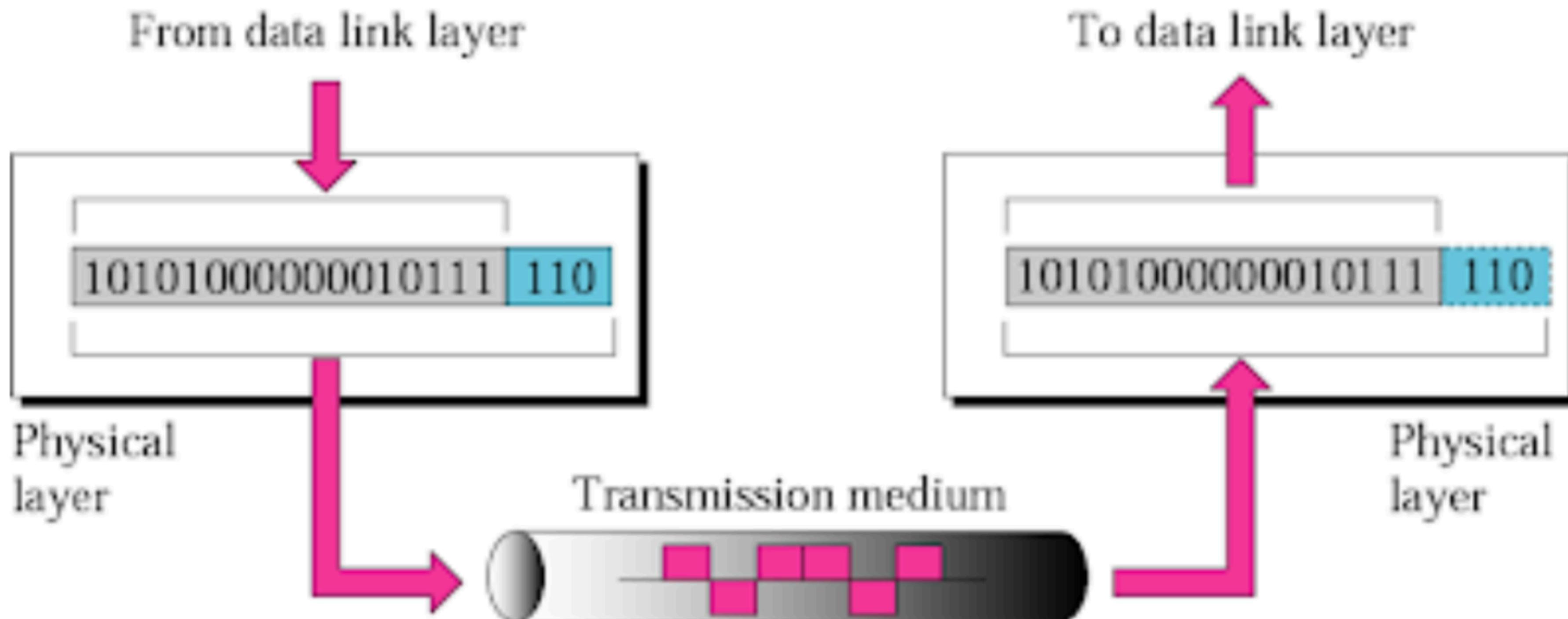
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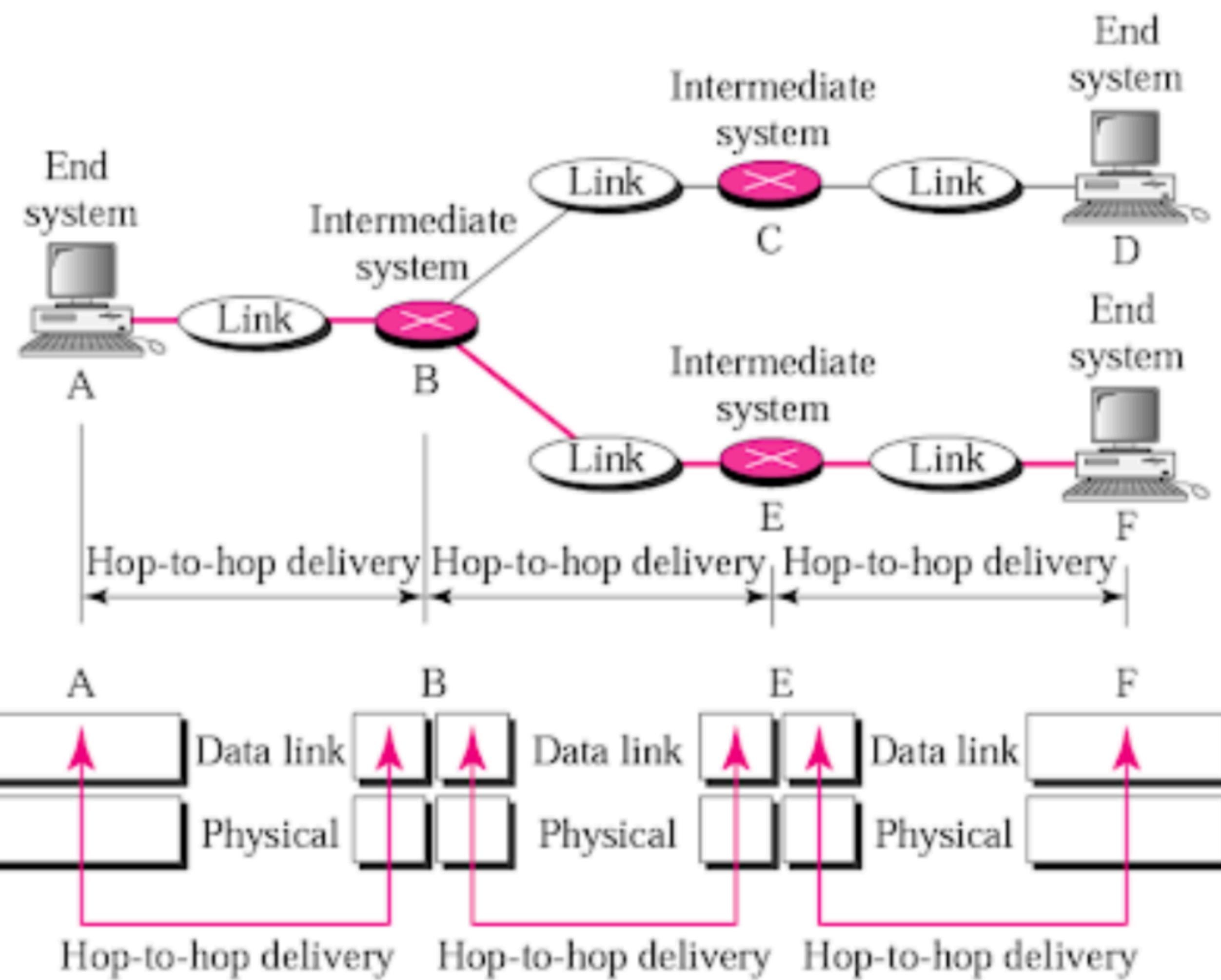
OSI Model



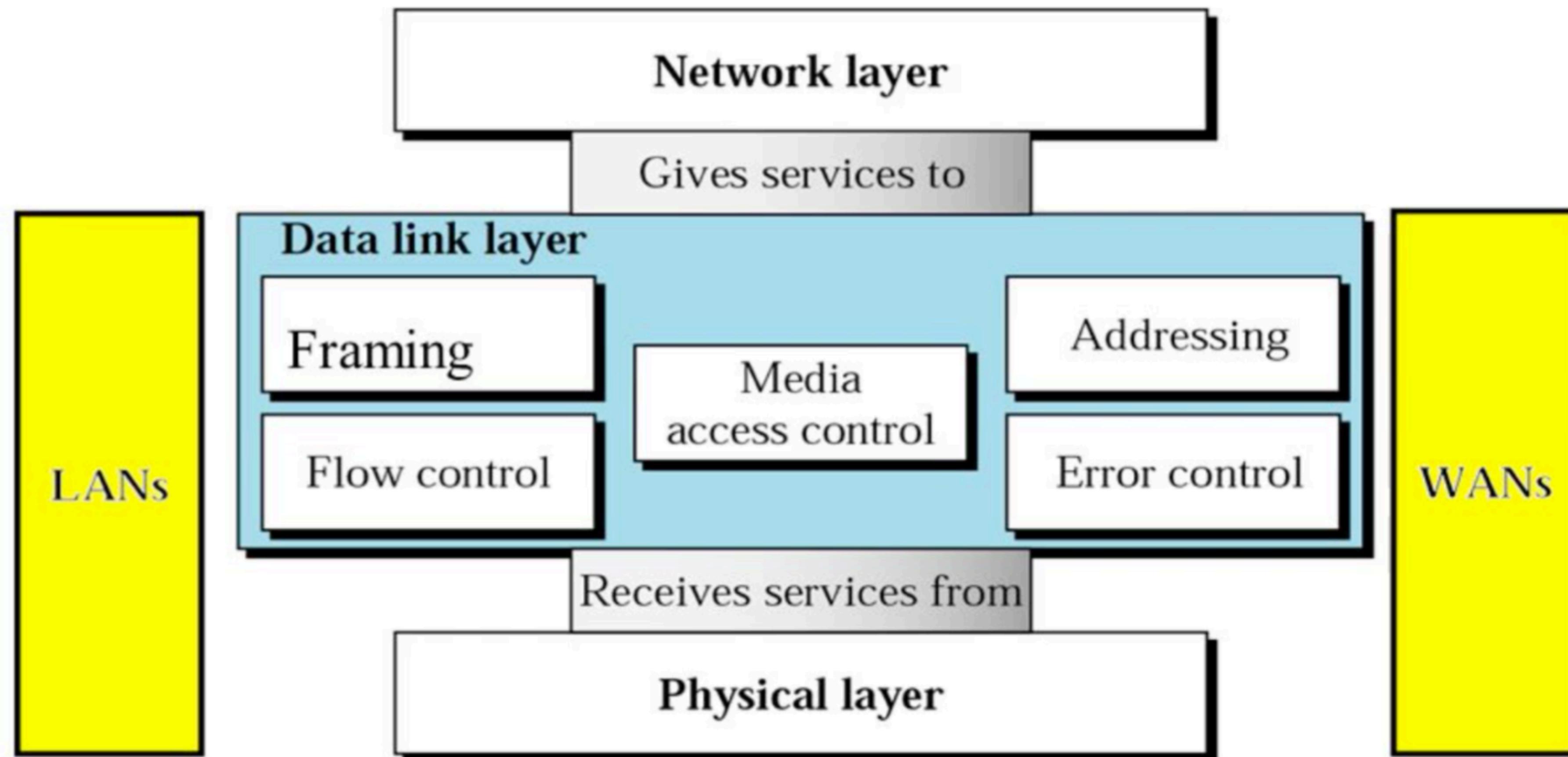
Physical Layer



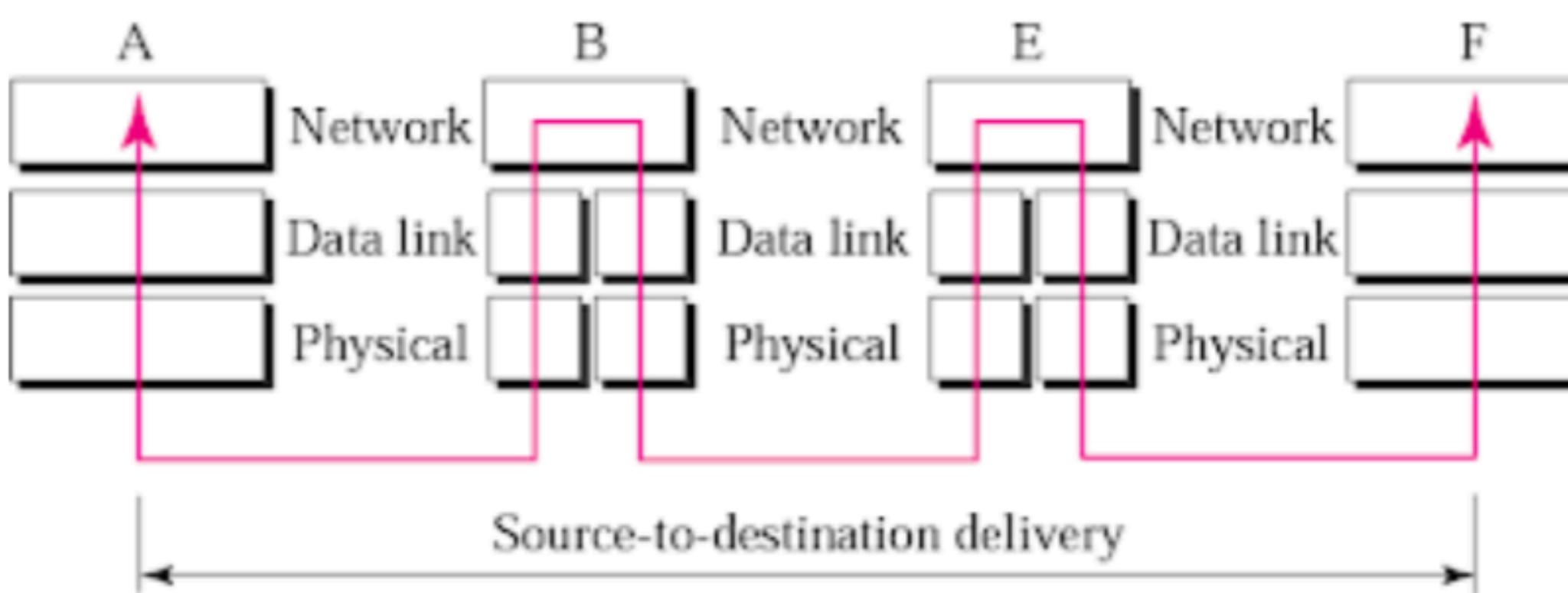
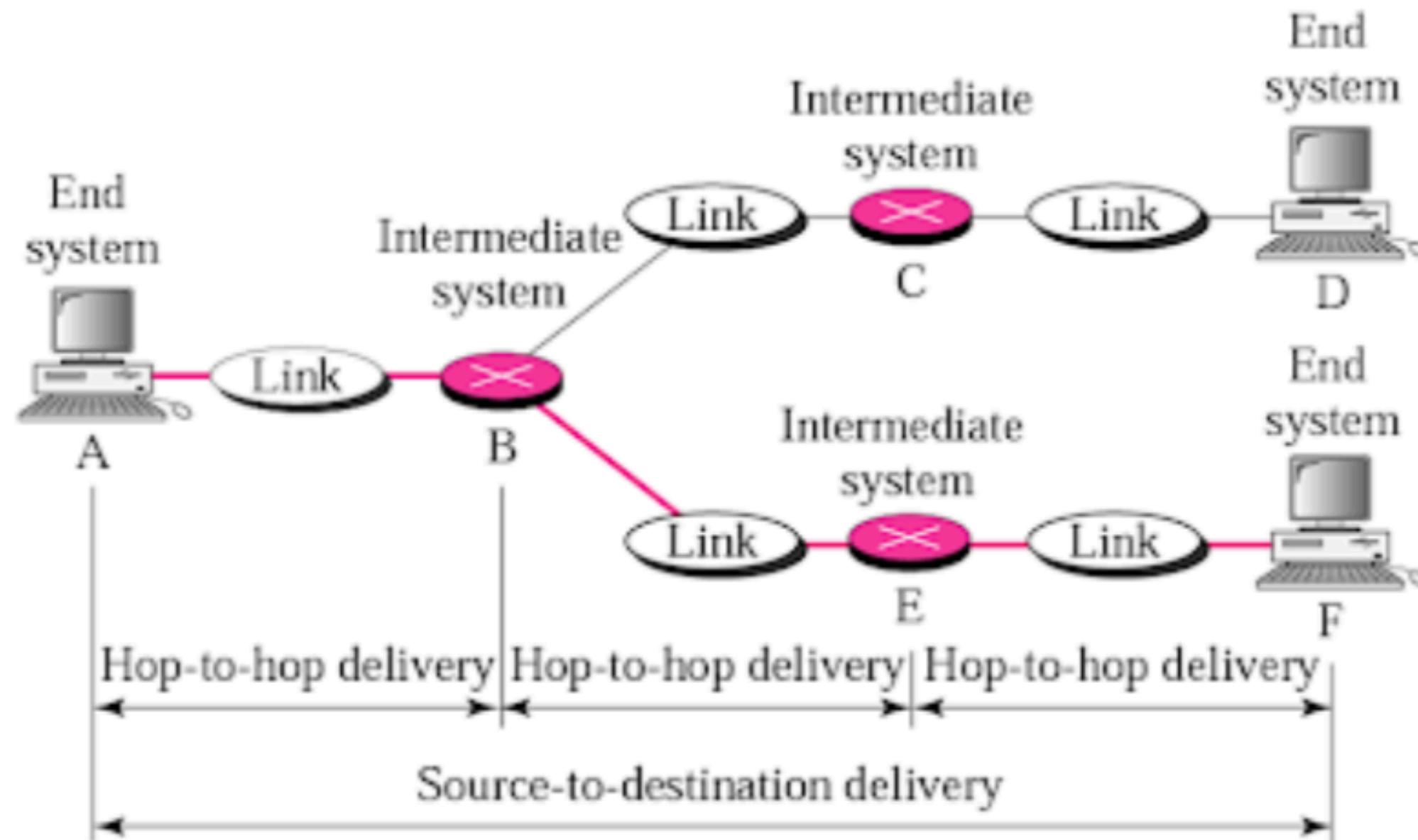
Data Link layer



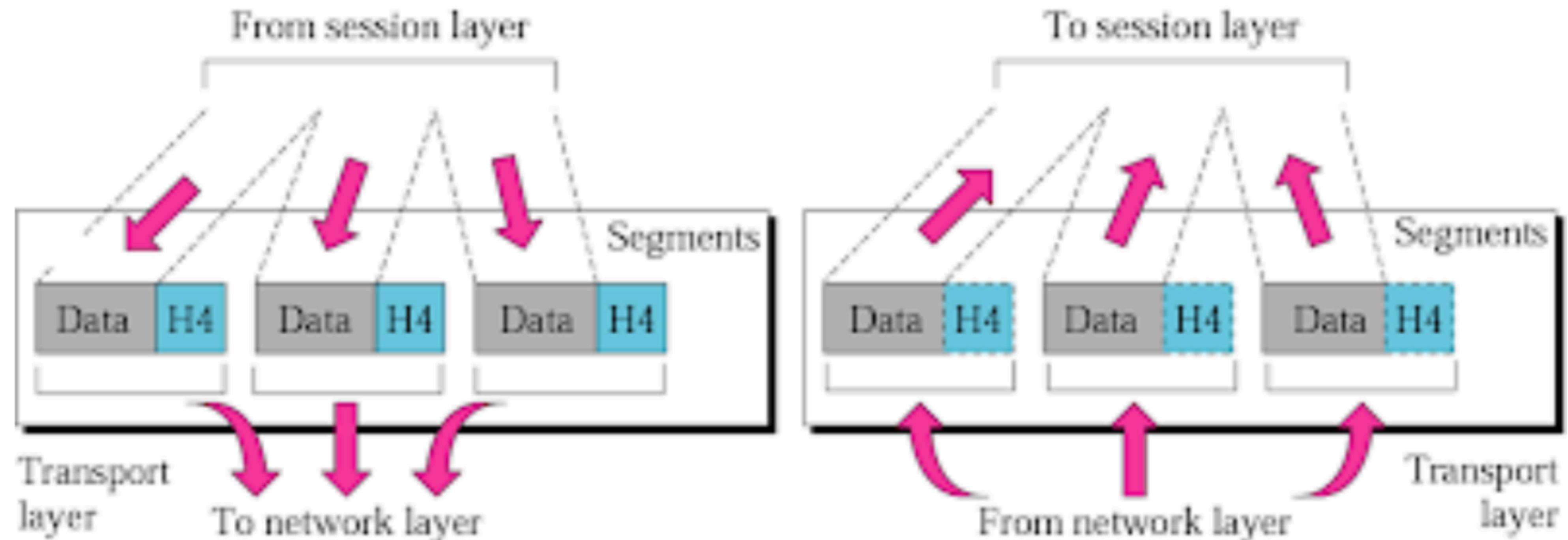
Data Link layer



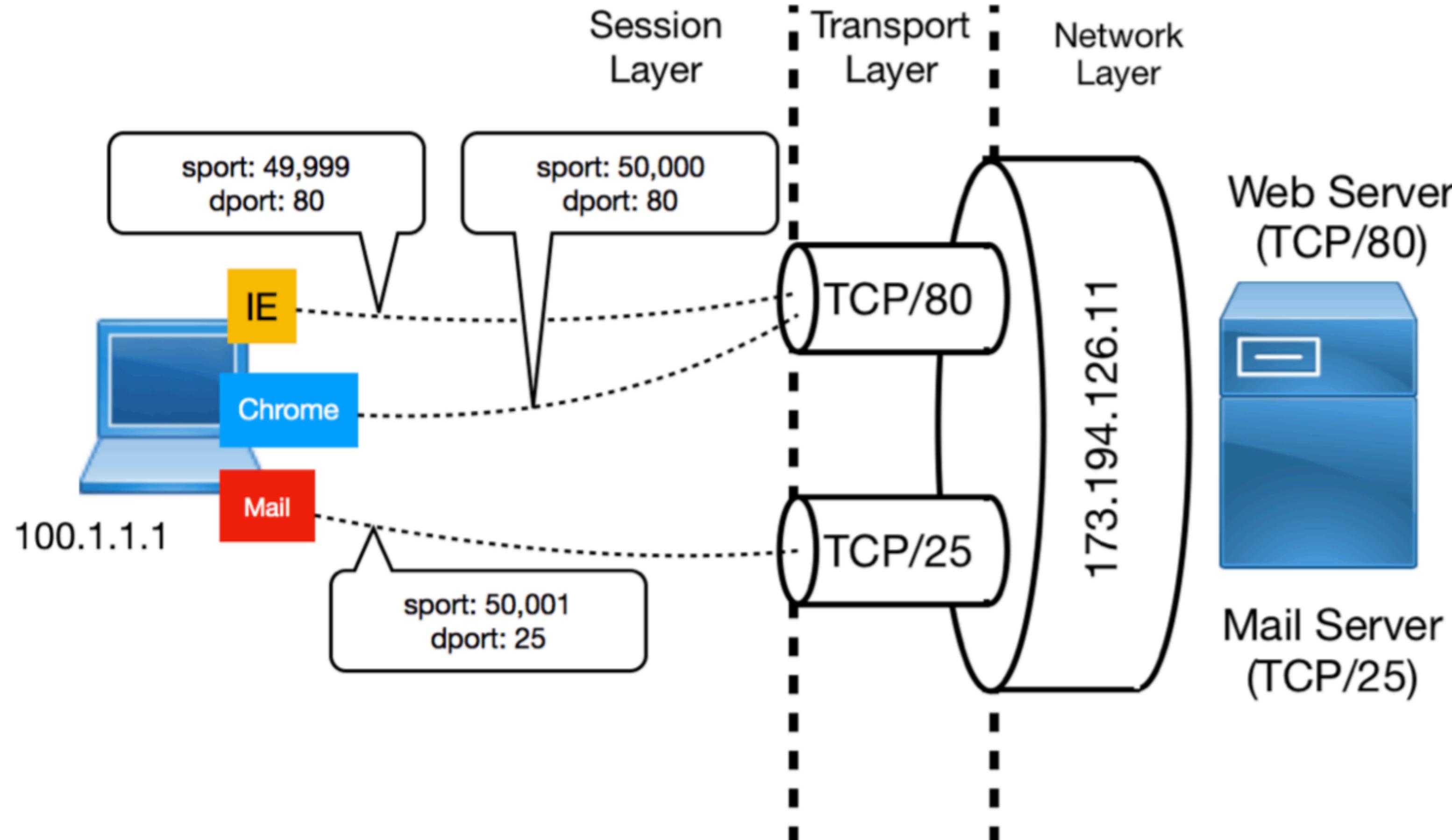
Network Layer



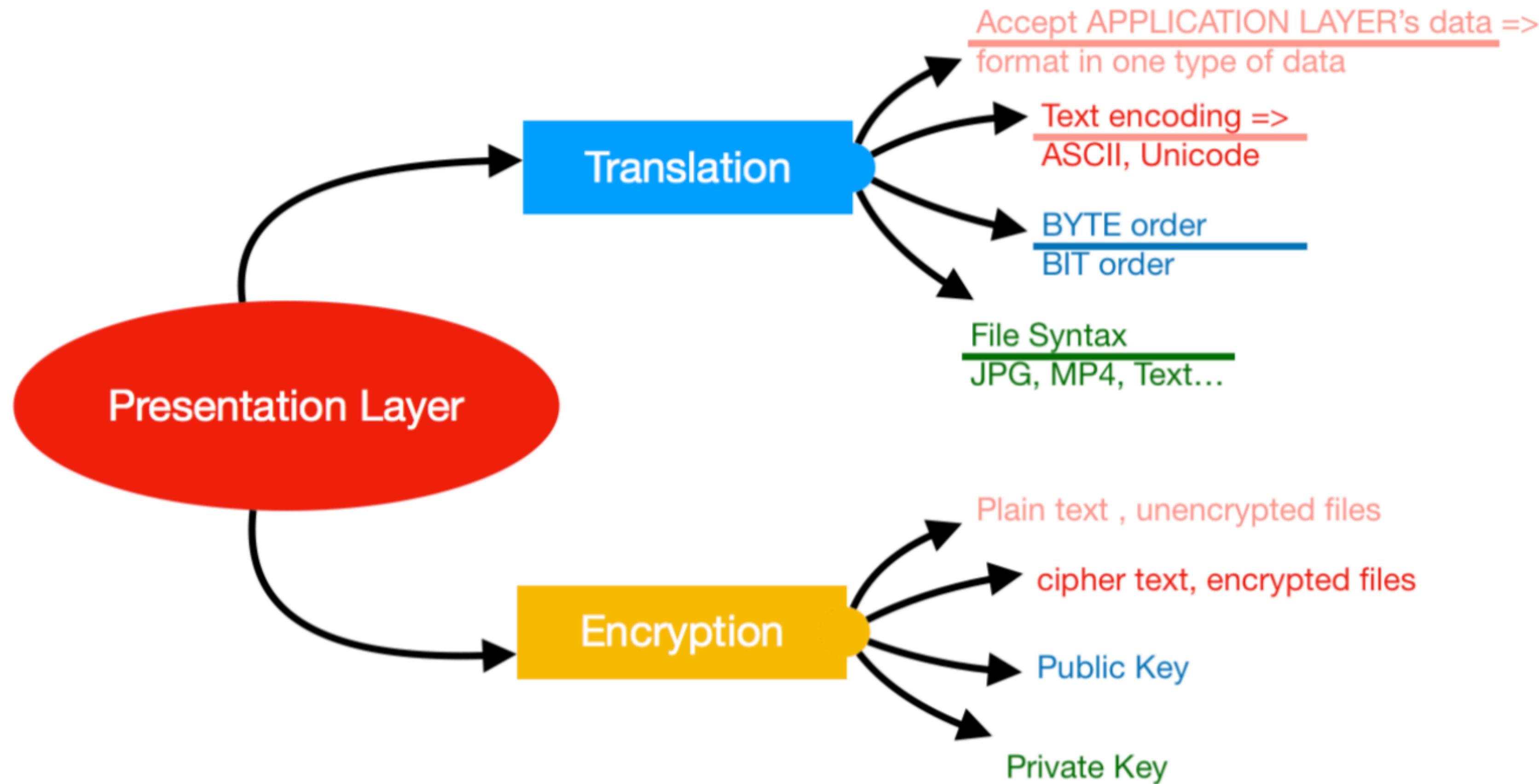
Transport Layer



Session Layer



Presentation Layer



Application Layer

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Ubiquitous Networked Embedded System



OSI Model

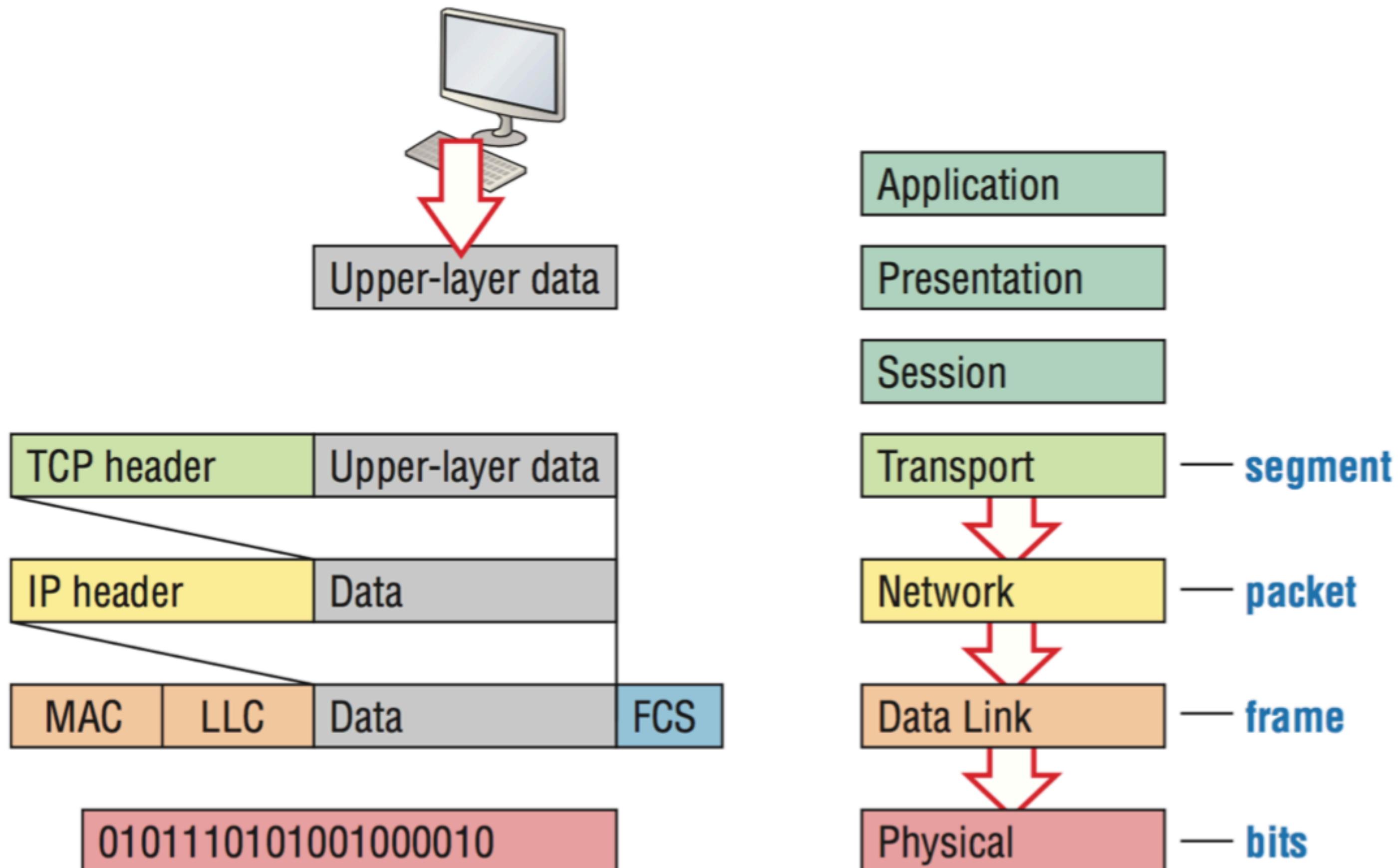
Layer	Application/Example
Application (7) <small>Serves as the window for users and application processes to access the network services.</small>	End User layer Program that opens what was sent or creates what is to be sent Resource sharing • Remote file access • Remote printer access • Directory services • Network management
Presentation (6) <small>Formats the data to be presented to the Application layer. It can be viewed as the "Translator" for the network.</small>	Syntax layer encrypt & decrypt (if needed) Character code translation • Data conversion • Data compression • Data encryption • Character Set Translation
Session (5) <small>Allows session establishment between processes running on different stations.</small>	Synch & send to ports (logical ports) Session establishment, maintenance and termination • Session support - perform security, name recognition, logging, etc.
Transport (4) <small>Ensures that messages are delivered error-free, in sequence, and with no losses or duplications.</small>	TCP Host to Host, Flow Control Message segmentation • Message acknowledgement • Message traffic control • Session multiplexing

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OSI Model

Layer	Application/Example
Network (3) <small>Controls the operations of the subnet, deciding which physical path the data takes.</small>	Packets ("letter", contains IP address) <small>Routing • Subnet traffic control • Frame fragmentation • Logical-physical address mapping • Subnet usage accounting</small>
Data Link (2) <small>Provides error-free transfer of data frames from one node to another over the Physical layer.</small>	Frames ("envelopes", contains MAC address) <small>[NIC card — Switch— NIC card] (end to end) Establishes & terminates the logical link between nodes • Frame traffic control • Frame sequencing • Frame acknowledgment • Frame delimiting • Frame error checking • Media access control</small>
Physical (1) <small>Concerned with the transmission and reception of the unstructured raw bit stream over the physical medium.</small>	Physical structure Cables, hubs, etc. <small>Data Encoding • Physical medium attachment • Transmission technique - Baseband or Broadband • Physical medium transmission Bits & Volts</small>

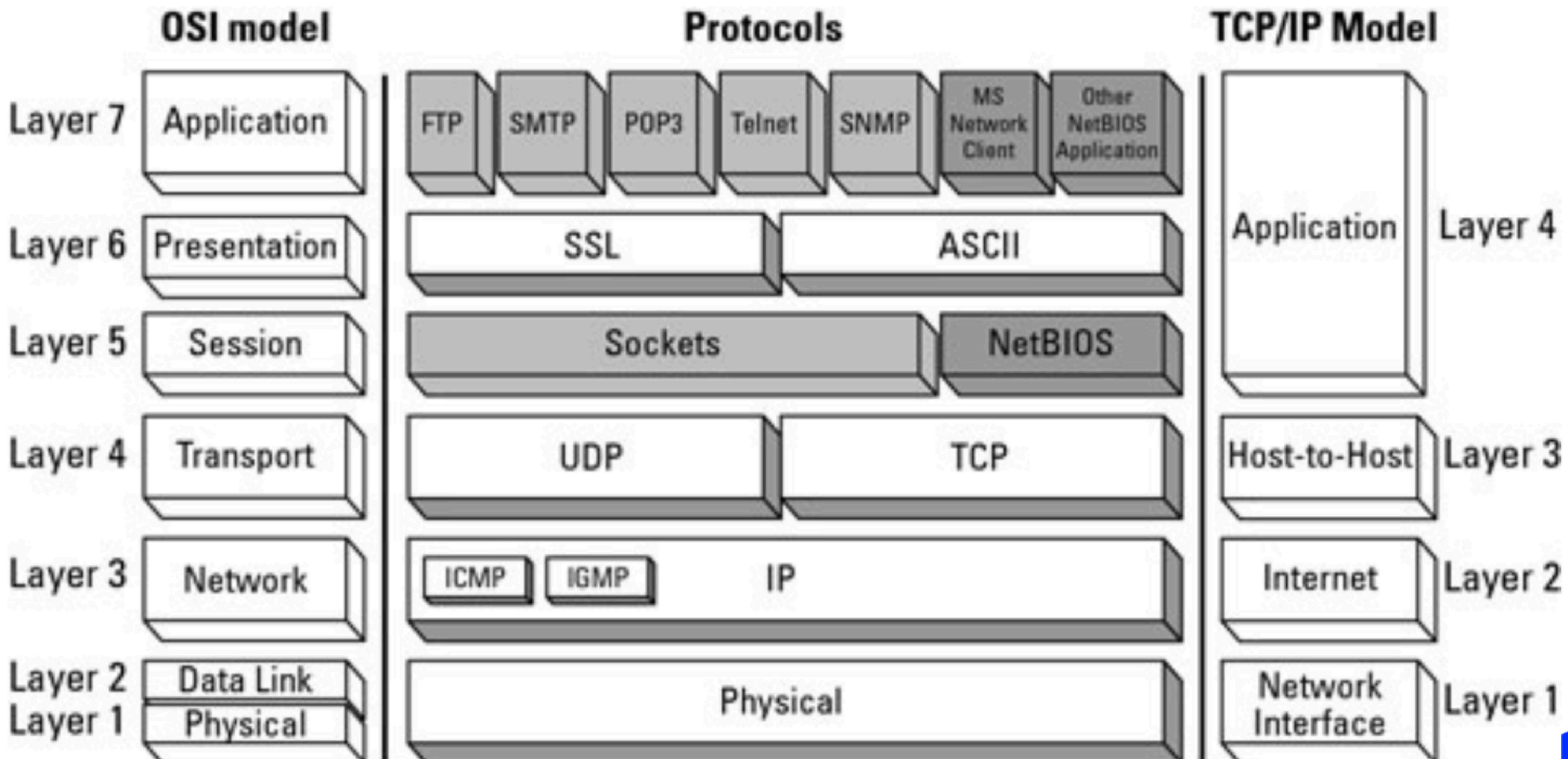
Encapsulation



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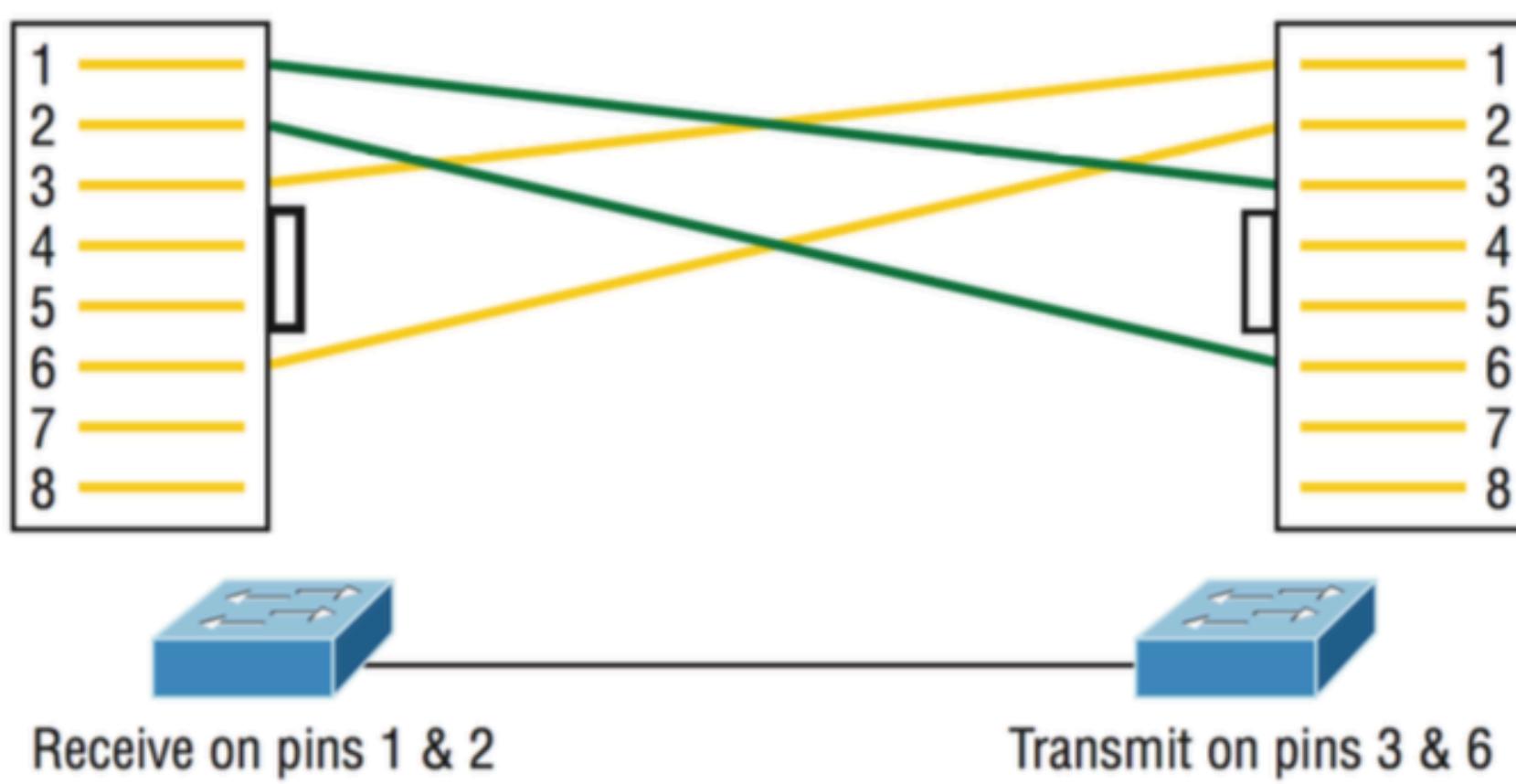
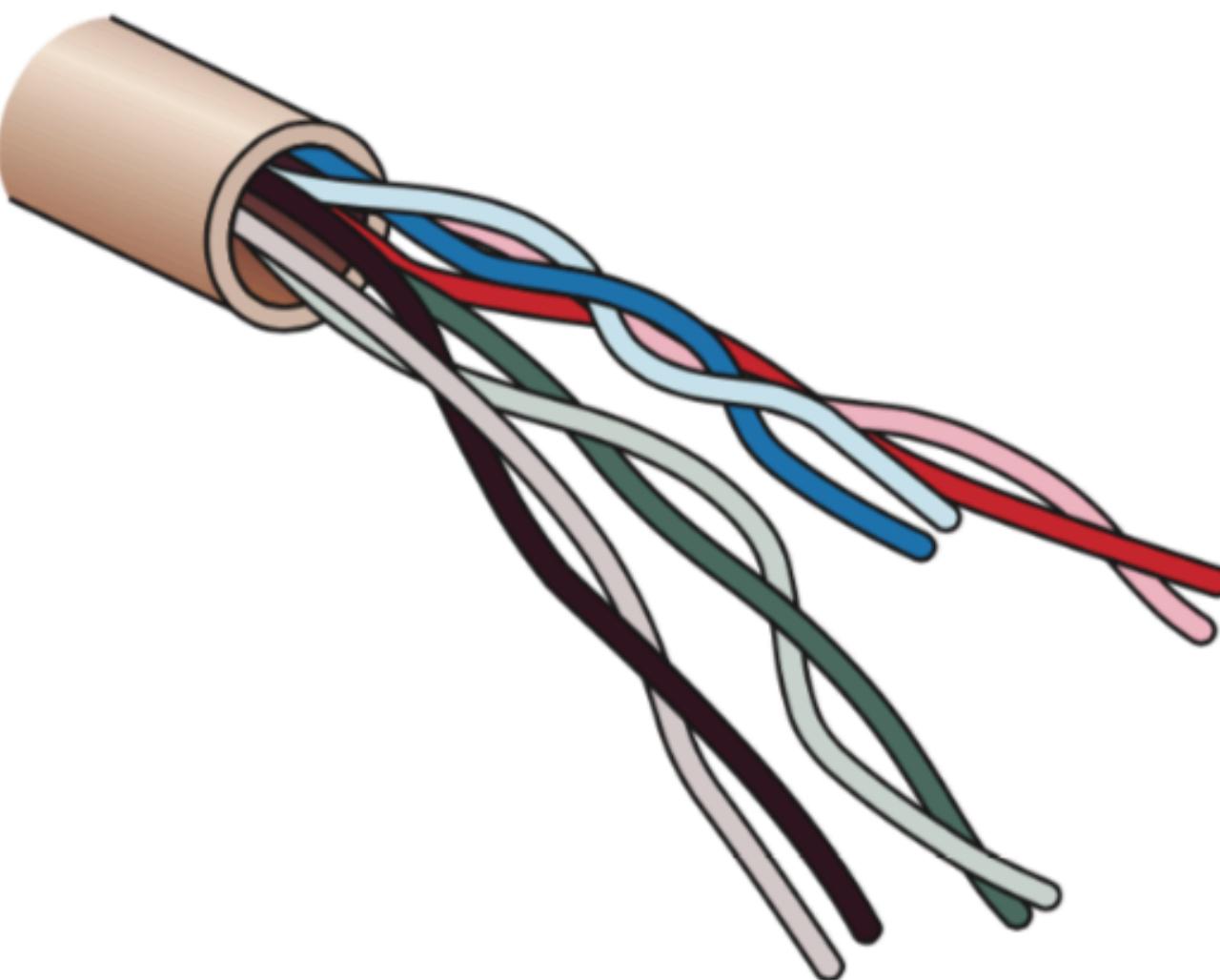
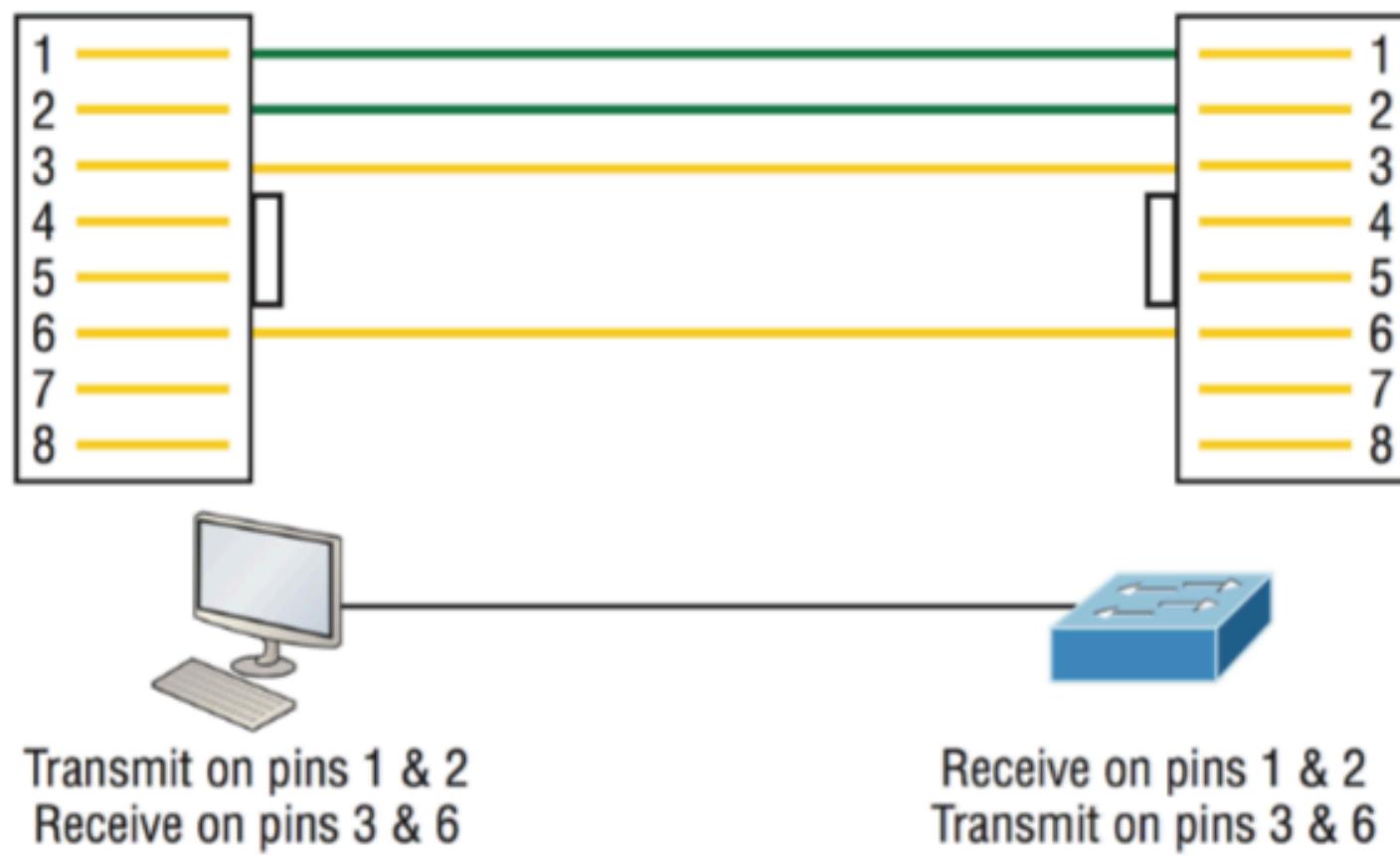
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TCP/IP Model



Network Access Layer

Physical Layer

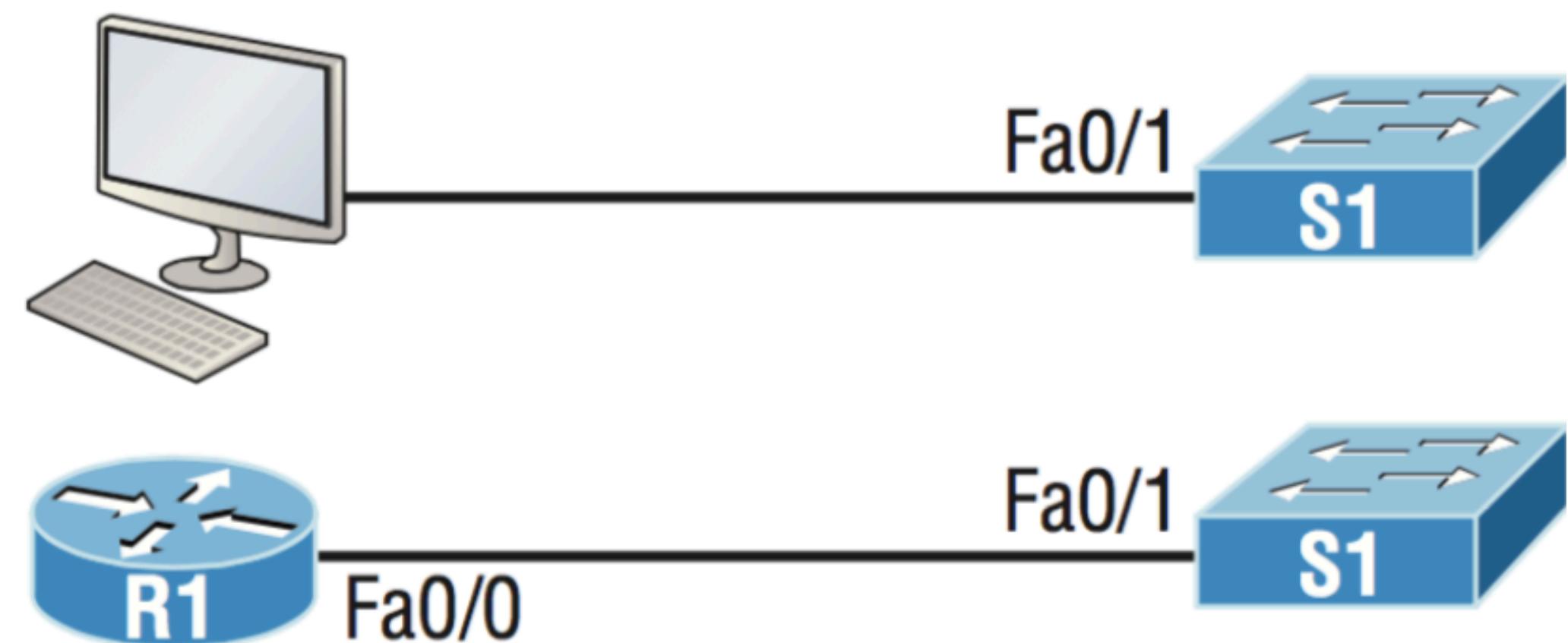


Network Cabling

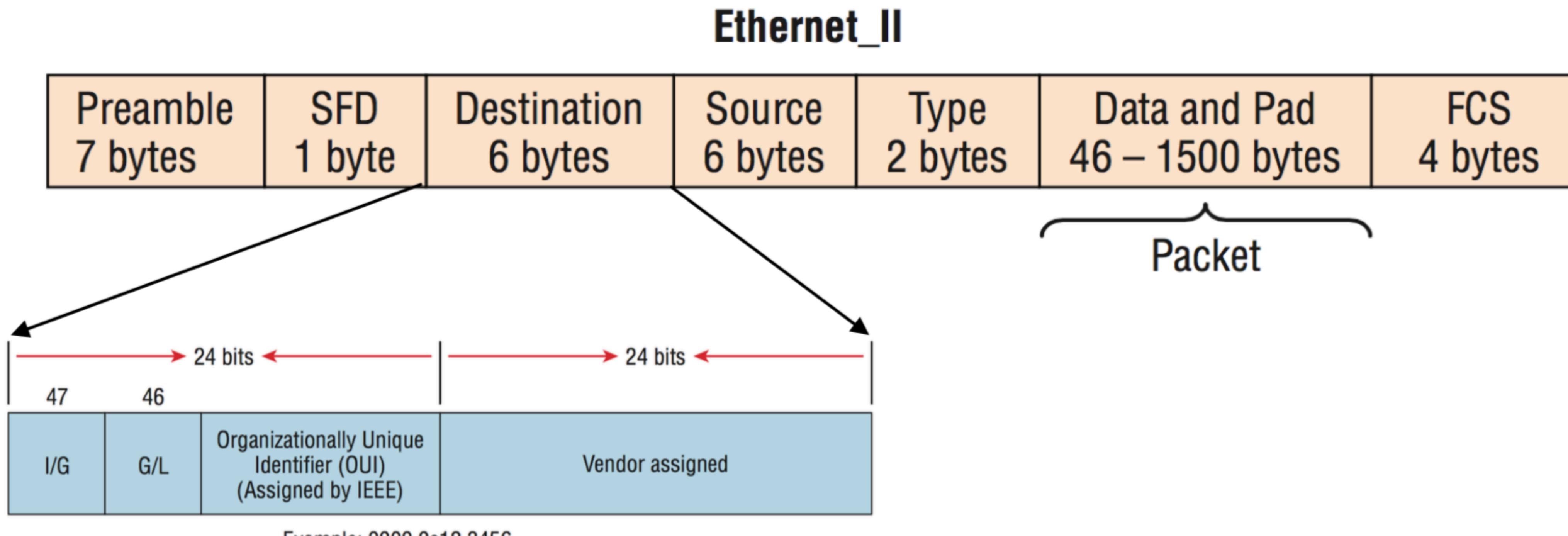
Crossover cable



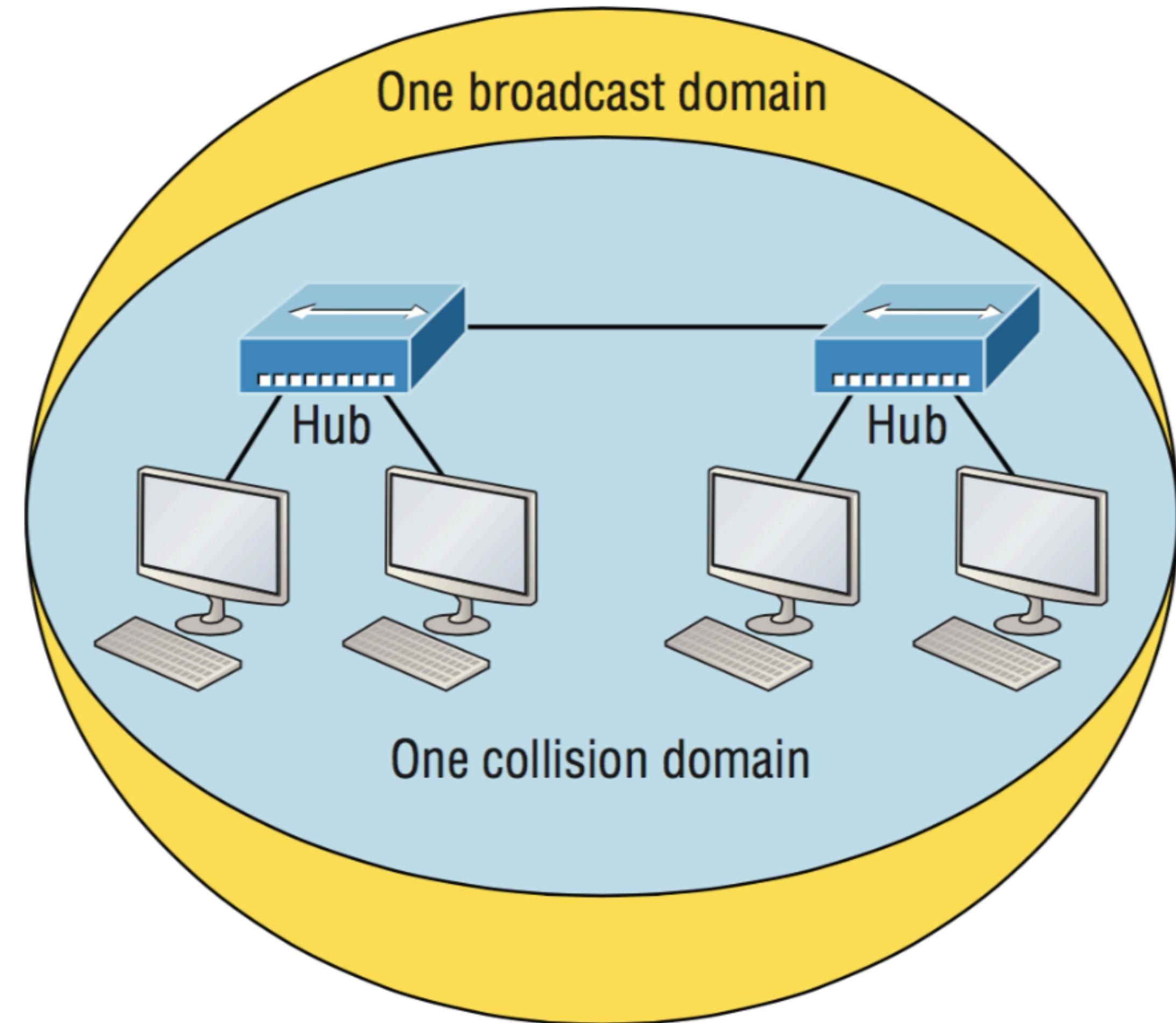
Straight-through cable



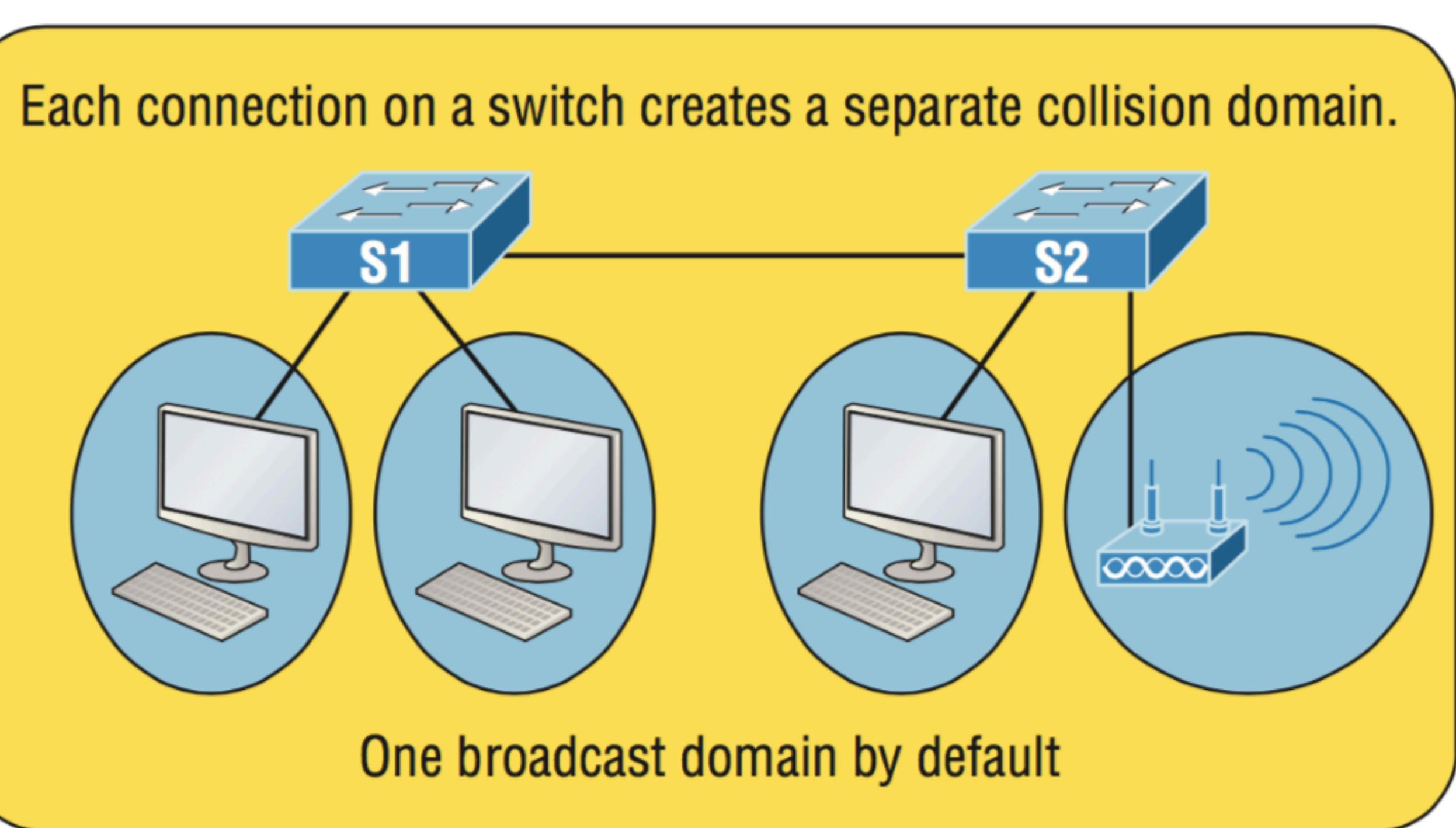
Datalink Layer



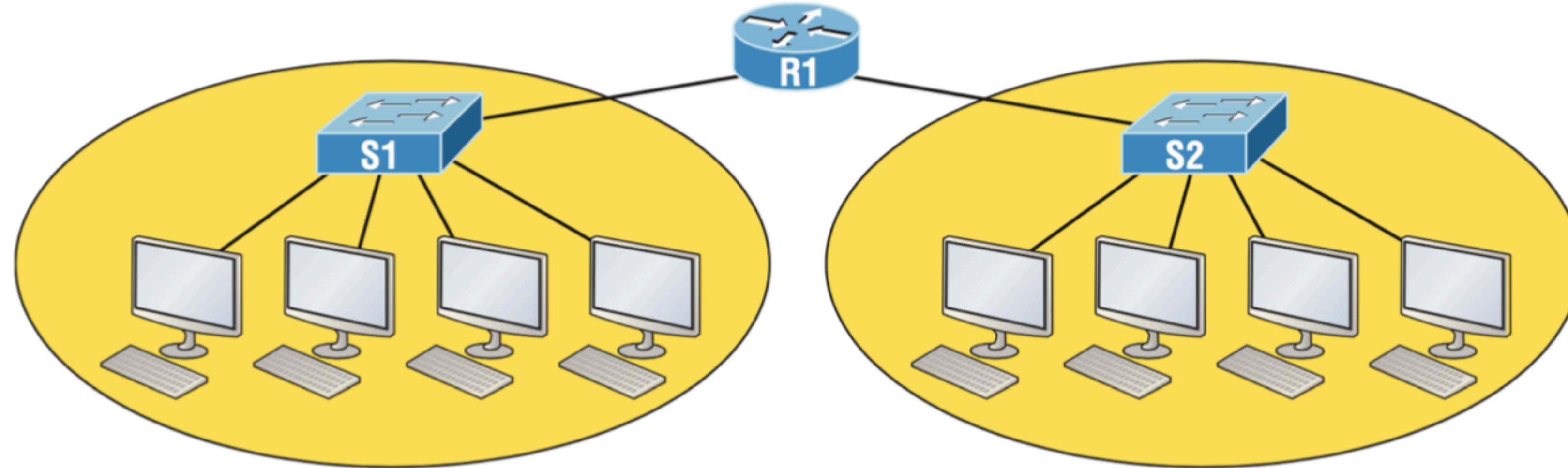
Collision Domain



A typical Network today

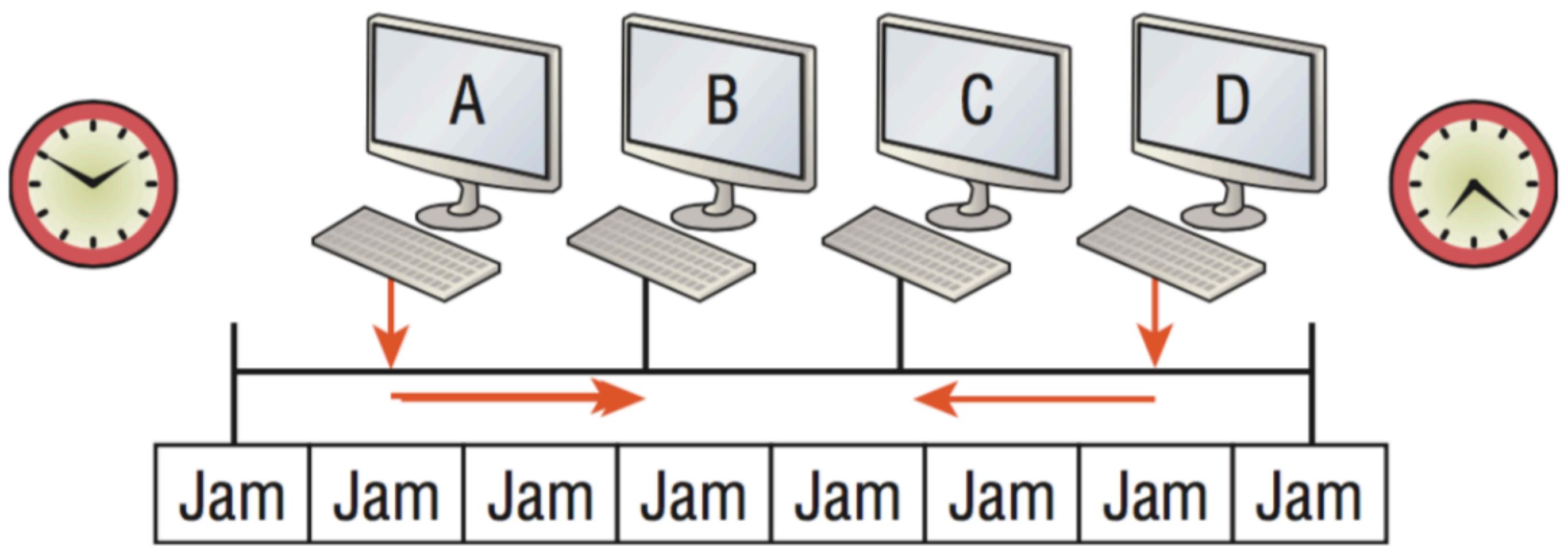
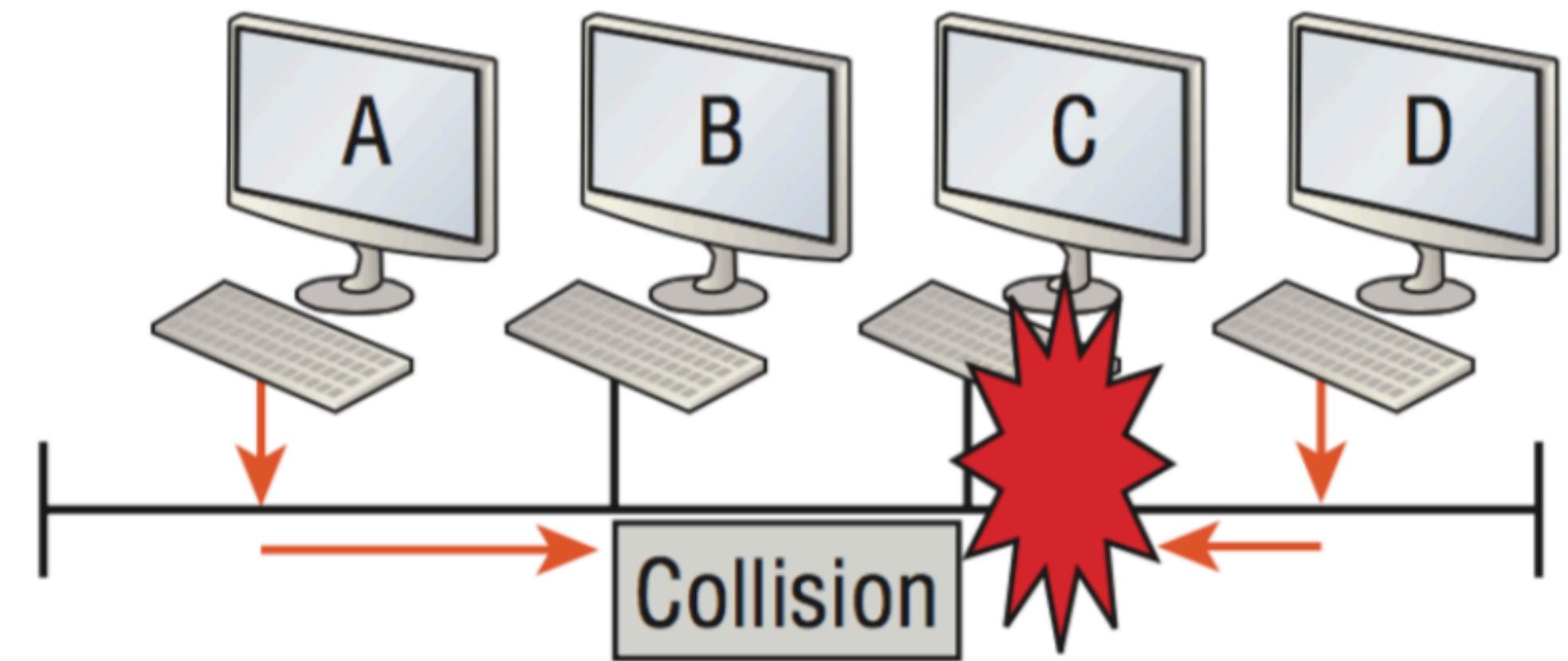


Broadcast Domain



Two broadcast domains. How many collision domains do you see?

CSMA/DD



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Internet Layer

Addressing

- bit
- byte
- octet
- Network Address
- Broadcast Address

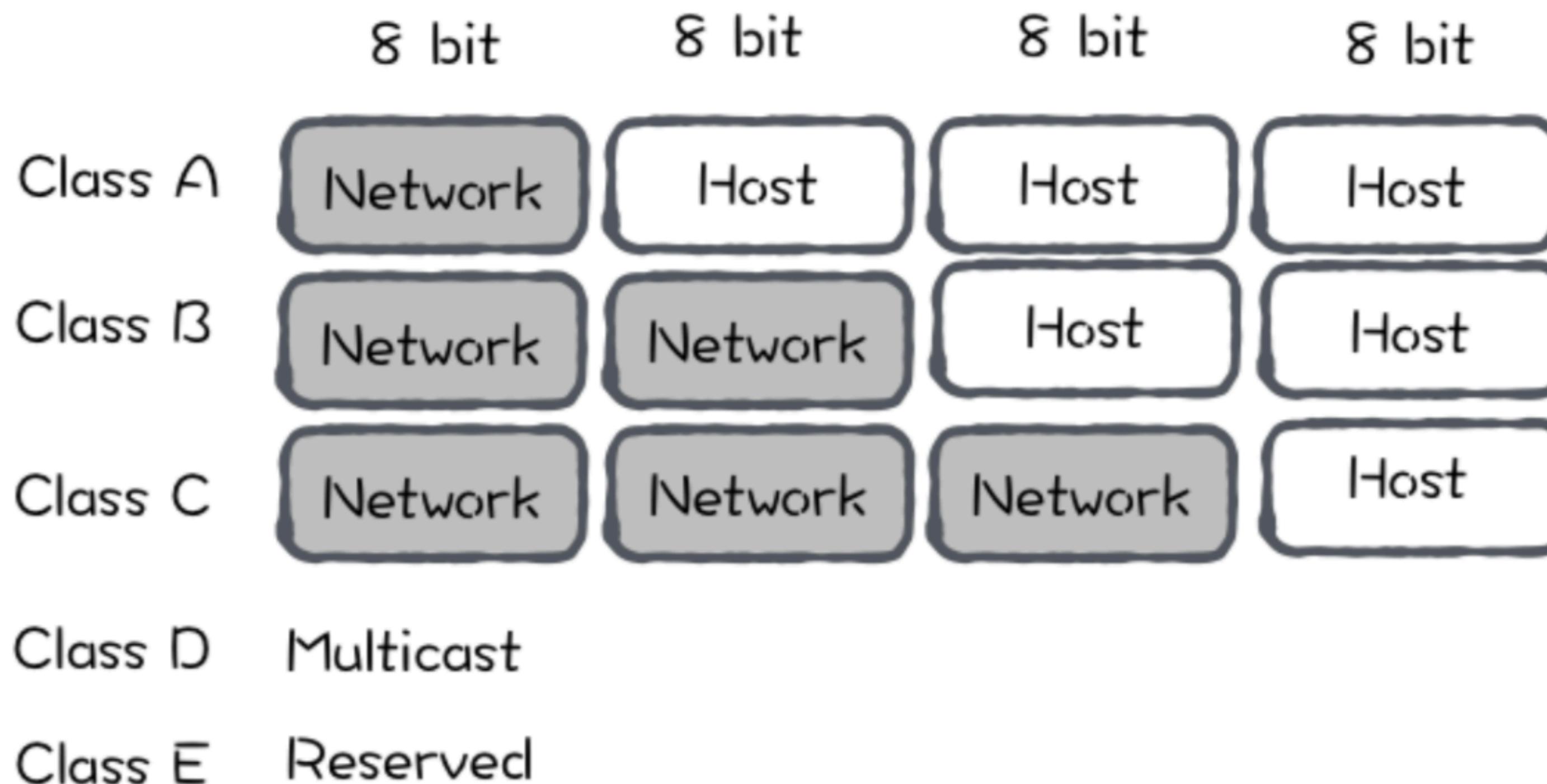
IP address

1000 0000 0000 1011 0000 0011 0001 1111

128.11.3.31

Classful Address

1000 0000 0000 1011 0000 0011 0001 1111



Classful Address

Class	Start Bit	CIDR	Possible Address Values
A	0xxx	/8	0.0.0.0 - 127.255.255.255
B	10xx	/16	128.0.0.0 - 191.255.255.255
C	110x	/24	192.0.0.0 - 223.255.255.255
D	1110	/32	224.0.0.0 - 239.255.255.255
E	1111	Undefined	240.0.0.0 - 255.255.255.255

Netmask

Class	Binary	Decimal	CIDR
A	1111 1111 0000 0000 0000 0000 0000 0000	255.0.0.0	/8
B	1111 1111 1111 1111 0000 0000 0000 0000	255.255.0.0	/16
C	1111 1111 1111 1111 1111 1111 0000 0000	255.255.255.0	/24

Private IP

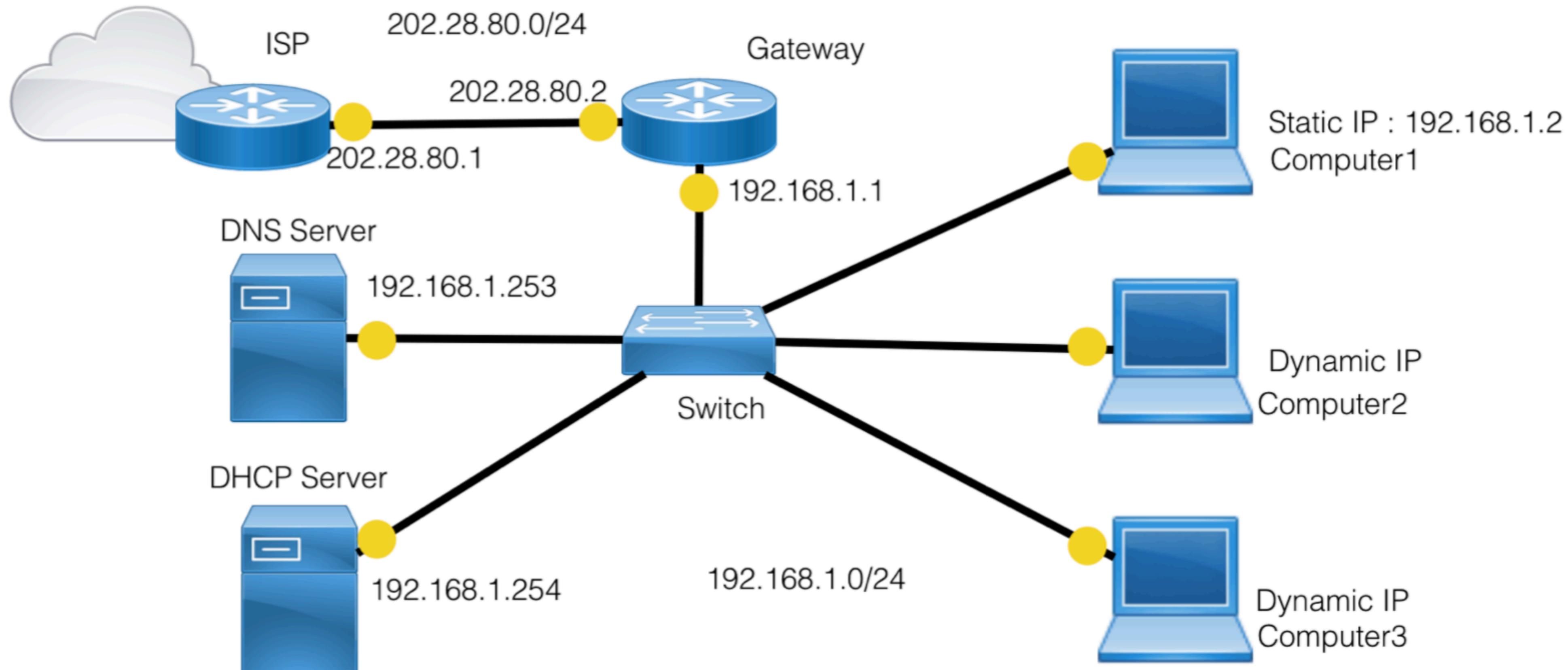


Address Class	Reserved Address Space
Class A	10.0.0.0 through 10.255.255.255
Class B	172.16.0.0 through 172.31.255.255
Class C	192.168.0.0 through 192.168.255.255

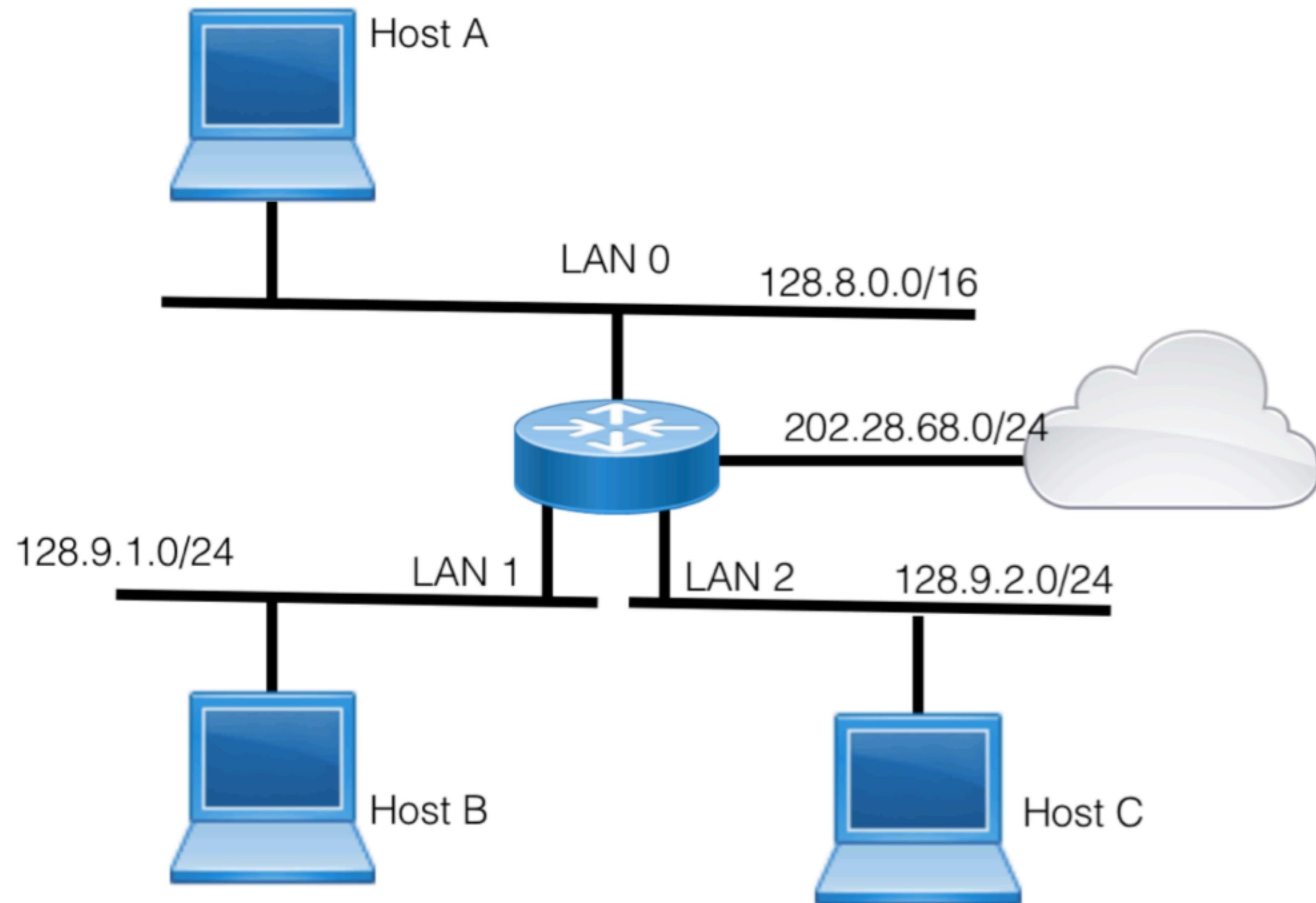
Valid IP address

Address	Function
Network address of all 0s	Interpreted to mean “this network or segment.”
Network address of all 1s	Interpreted to mean “all networks.”
Network 127.0.0.1	Reserved for loopback tests. Designates the local node and allows that node to send a test packet to itself without generating network traffic.
Node address of all 0s	Interpreted to mean “network address” or any host on a specified network.
Node address of all 1s	Interpreted to mean “all nodes” on the specified network; for example, 128.2.255.255 means “all nodes” on network 128.2 (Class B address).
Entire IP address set to all 0s	Used by Cisco routers to designate the default route. Could also mean “any network.”
Entire IP address set to all 1s (same as 255.255.255.255)	Broadcast to all nodes on the current network; sometimes called an “all 1s broadcast” or local broadcast.

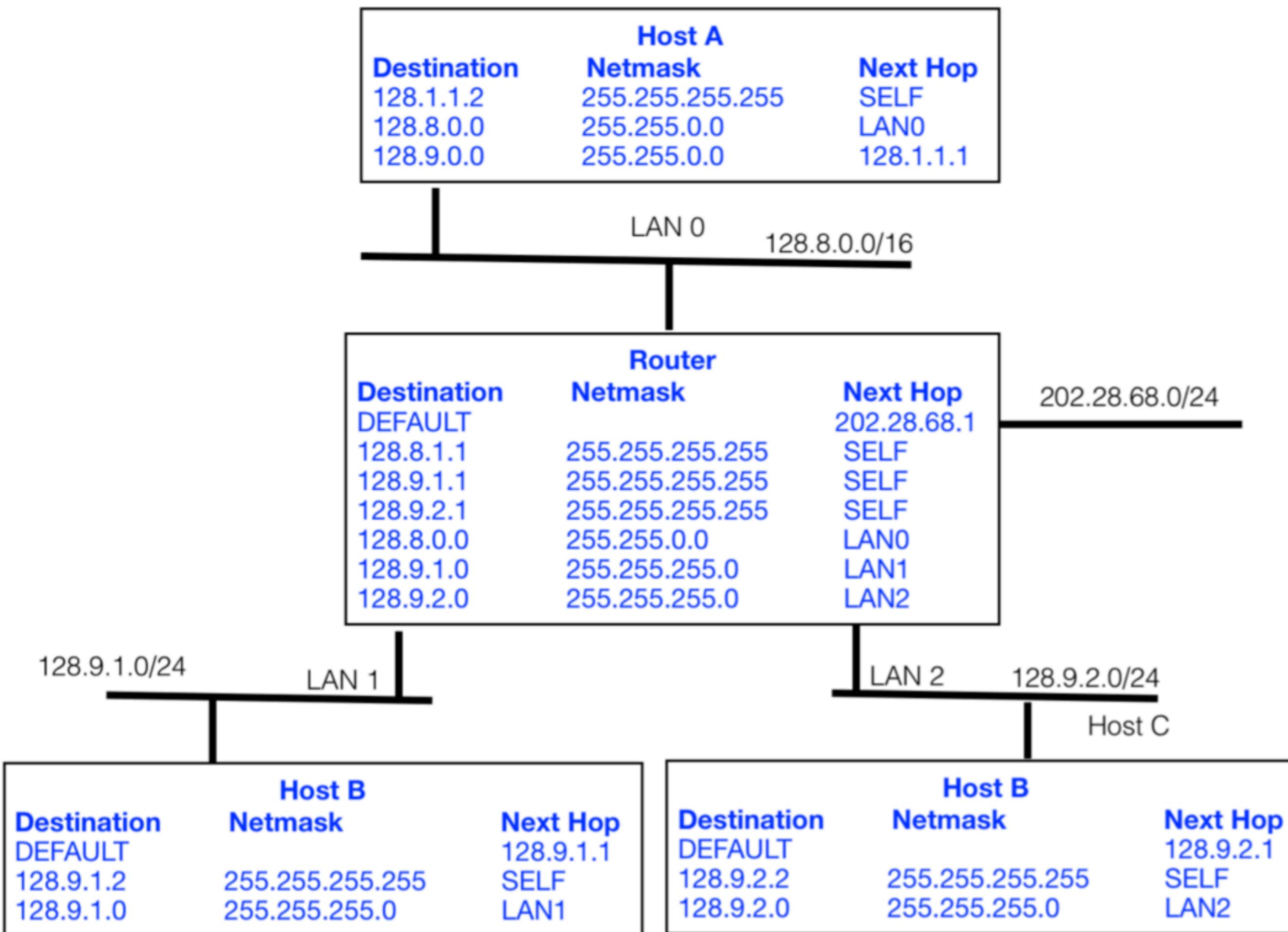
Components of Networks



Routing



Routing



Routing Protocol

