

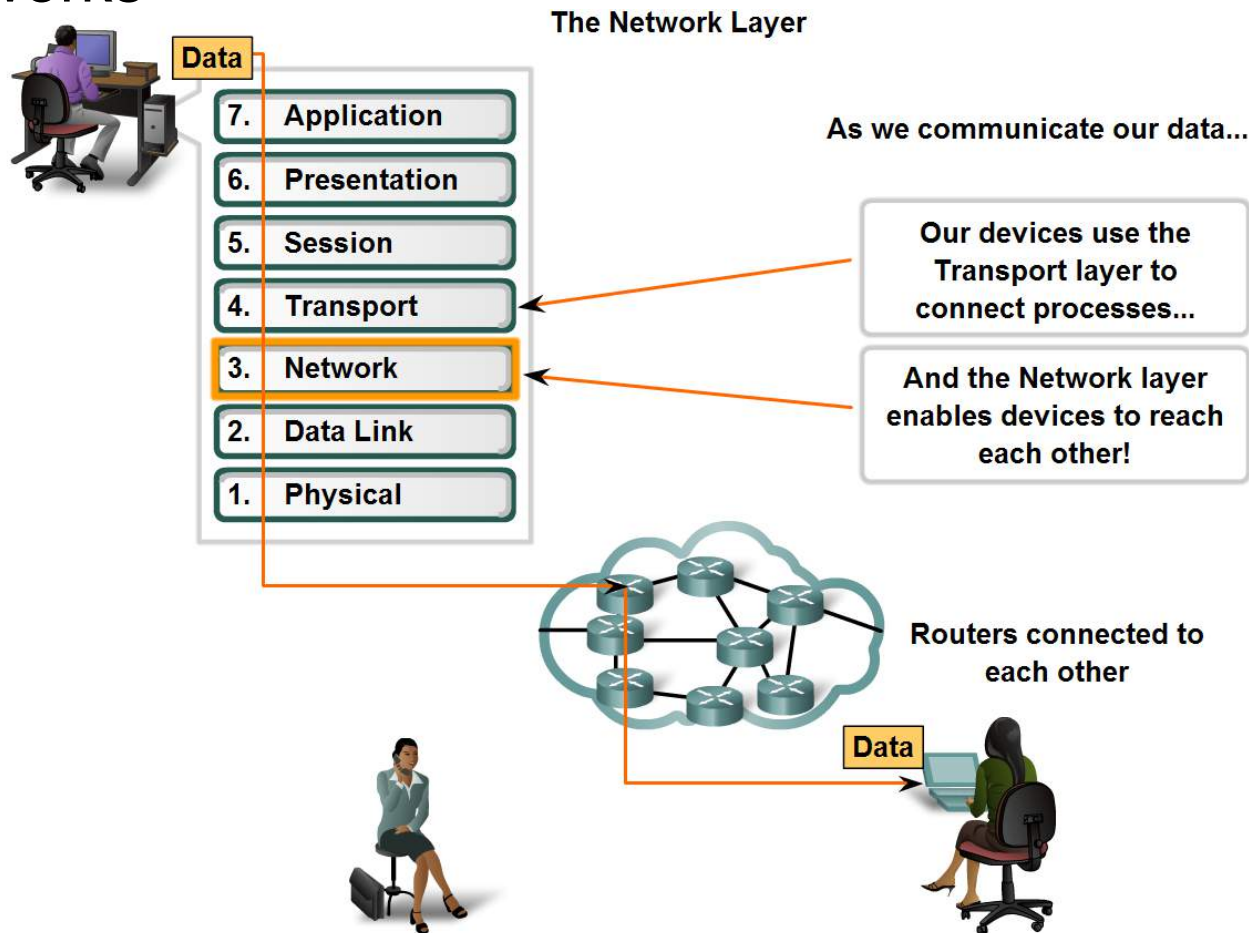
OSI Network Layer



Network Fundamentals

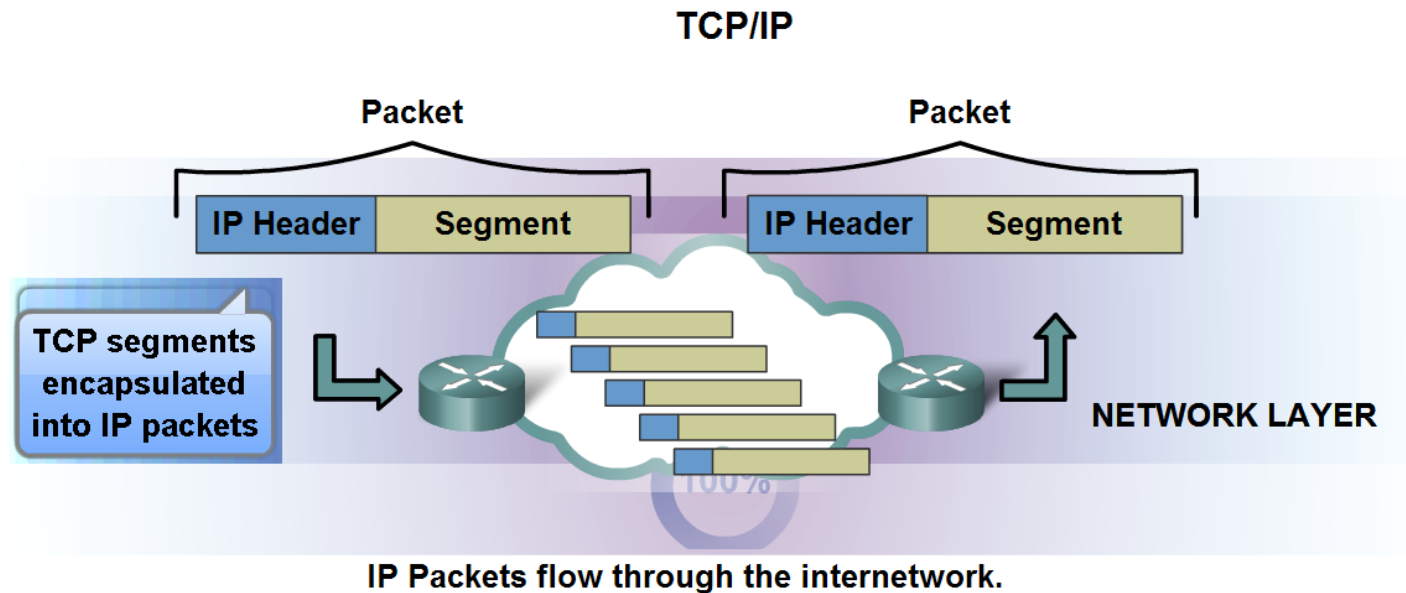
Network Layer Protocols and Internet Protocol (IP)

- Define the basic role of the Network Layer in data networks



Network Layer Protocols and Internet Protocol (IP)

- Identify the basic characteristics and the role of the IPv4 protocol

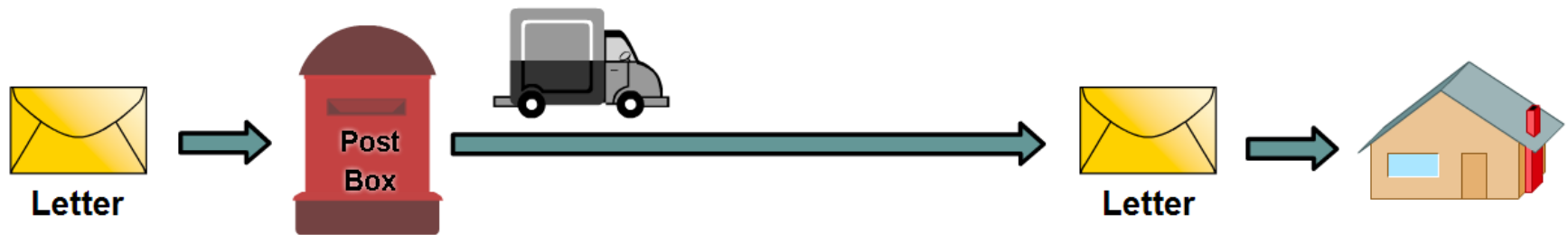


- **Connectionless** - No connection is established before sending data packets.
- **Best Effort (unreliable)** - No overhead is used to guarantee packet delivery.
- **Media Independent** - Operates independently of the medium carrying the data.

Network Layer Protocols and Internet Protocol (IP)

- Describe the implications for the use of the IP protocol as it is connectionless

Connectionless Communication



A **letter** is sent.

The sender doesn't know:

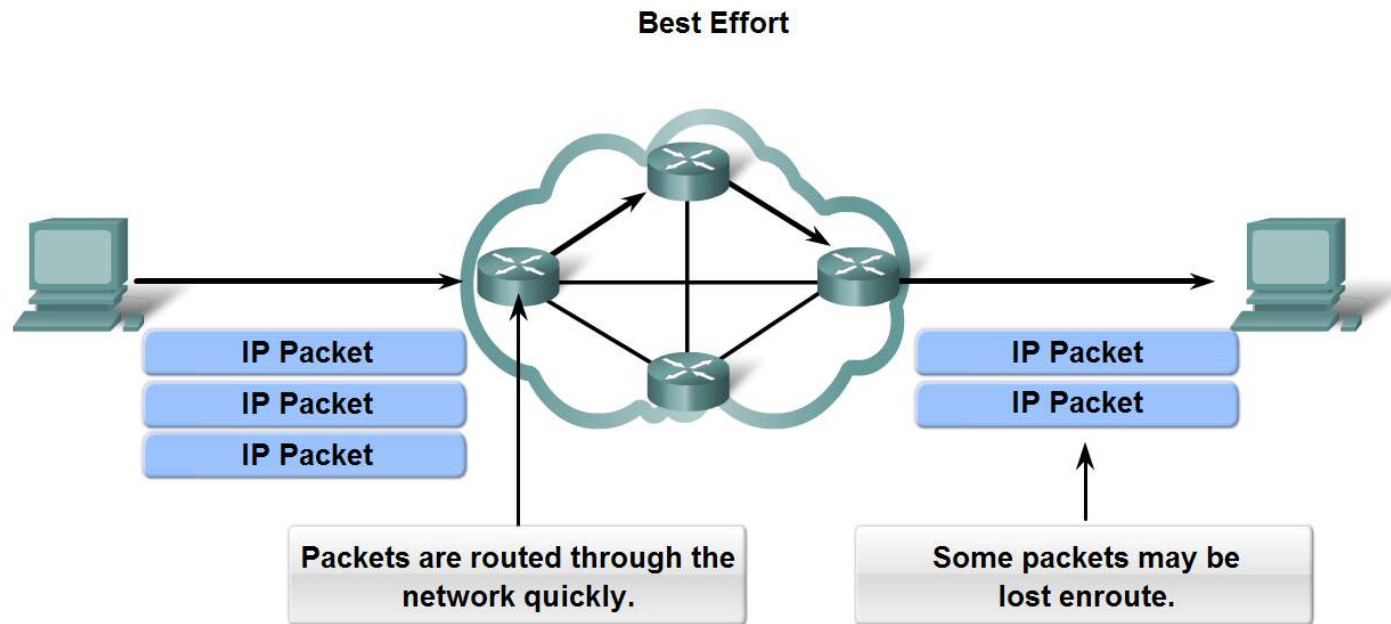
- if the receiver is present
- if the letter arrived
- if the receiver can read the letter

The receiver doesn't know:

- when it is coming

Network Layer Protocols and Internet Protocol (IP)

- Describe the implications for the use of the IP protocol as it is considered an unreliable protocol



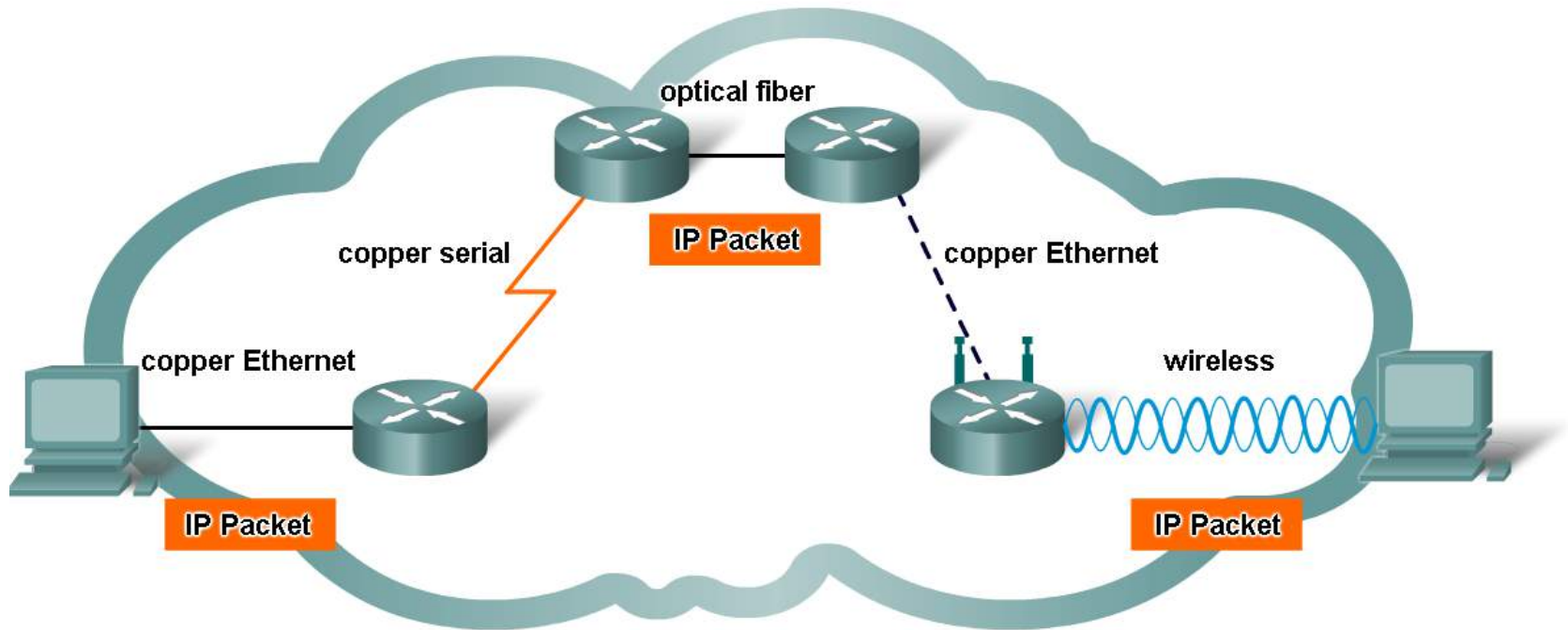
As an unreliable Network layer protocol, IP does not guarantee that all sent packets will be received.

Other protocols manage the process of tracking packets and ensuring their delivery.

Network Layer Protocols and Internet Protocol (IP)

- Describe the implications for the use of the IP as it is media independent

Media Independence



IP packets can travel over different media.

Network Layer Protocols and Internet Protocol (IP)

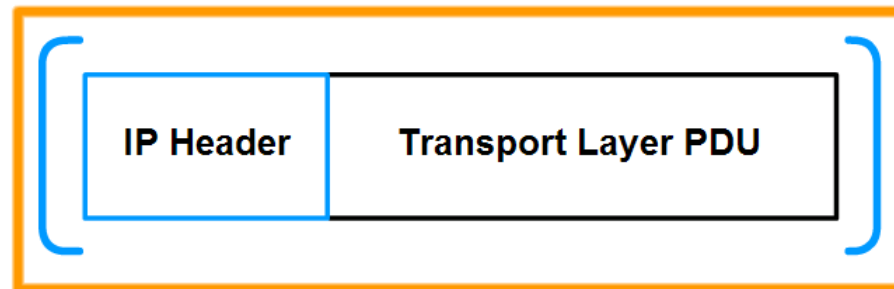
- Describe the role of framing in the Transport Layer and explain that segments are encapsulated as packets

Generating IP Packets

Transport Layer Encapsulation



Network Layer Encapsulation



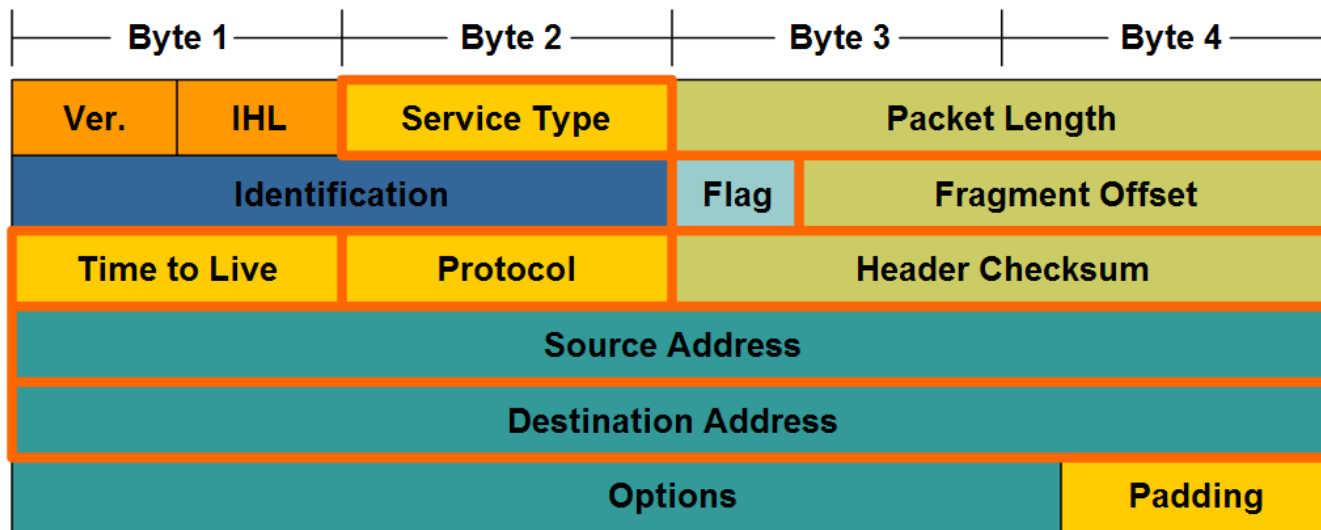
IP Packet

In **TCP/IP based networks**, the Network layer PDU is the **IP packet**.

Network Layer Protocols and Internet Protocol (IP)

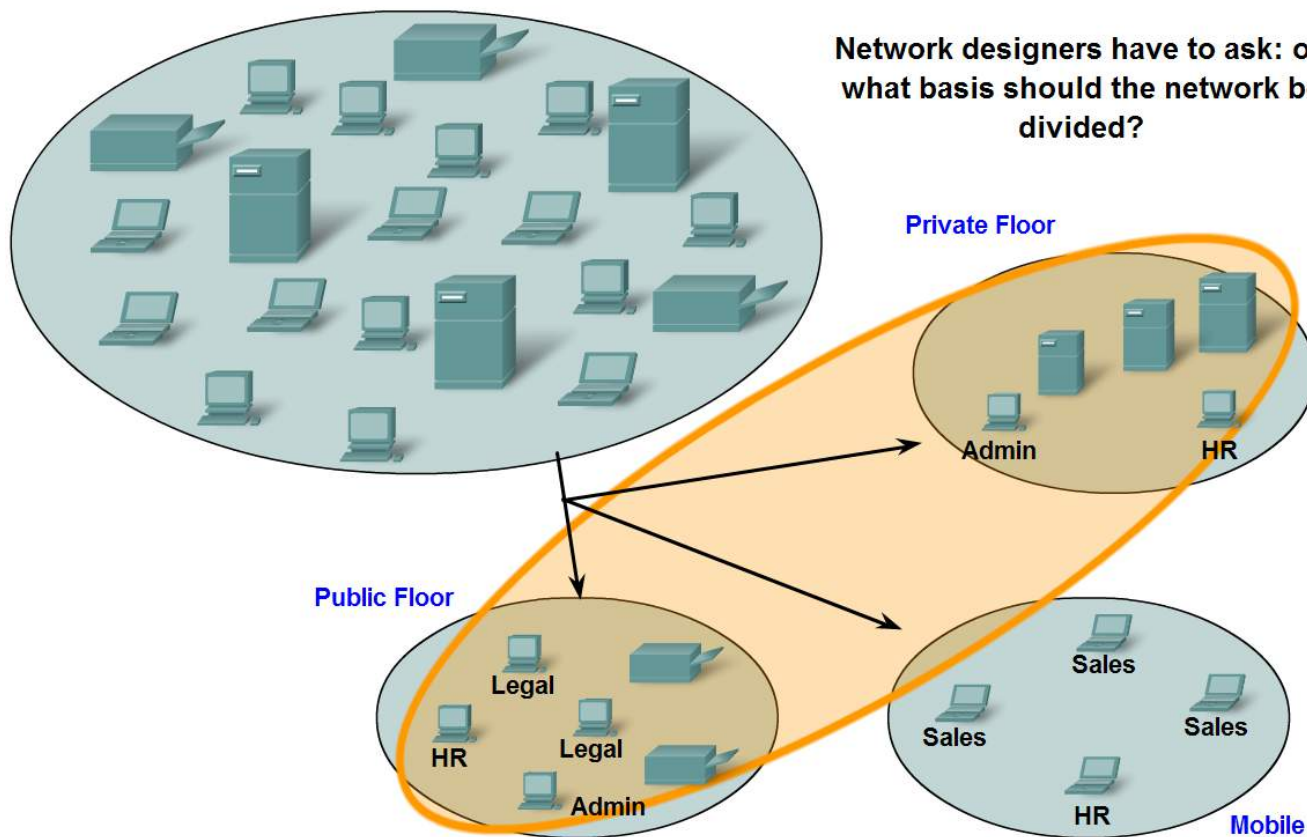
- Identify the major header fields in the IPv4 protocol and describe each field's role in transporting packets

IPv4 Packet Header Fields



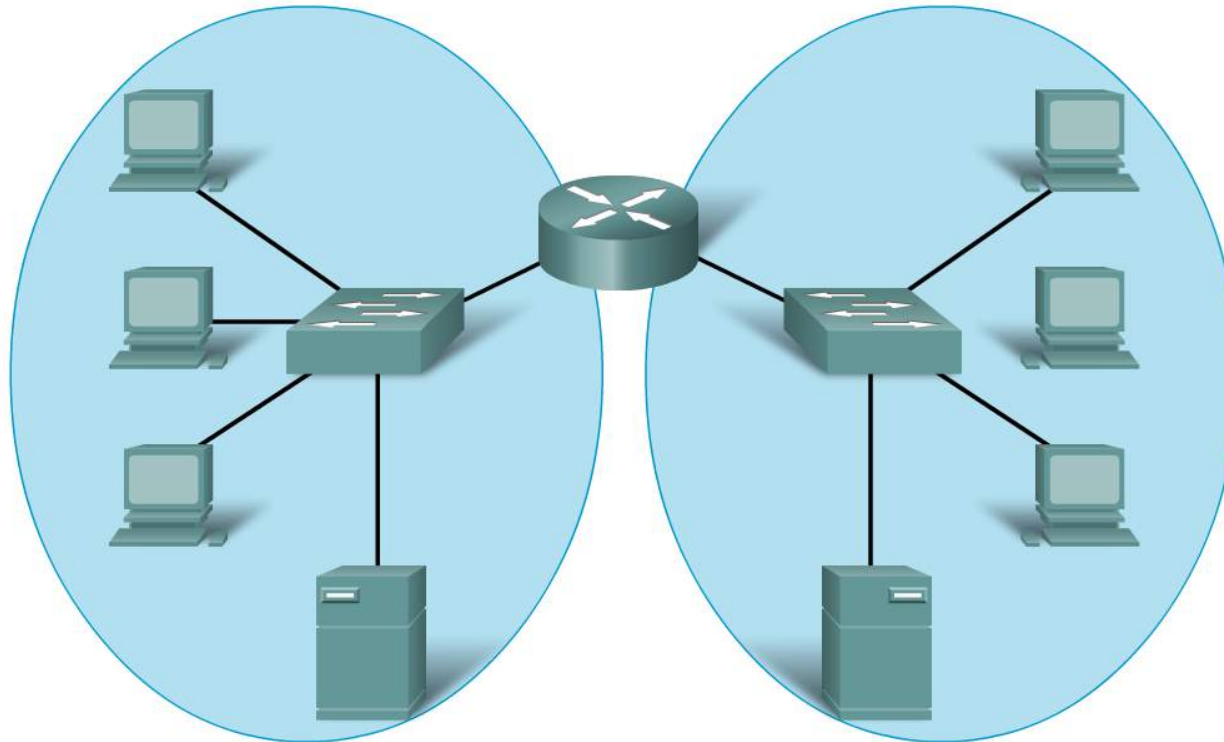
Grouping Devices into Networks and Hierarchical Addressing

- List several different reasons for grouping devices into sub-networks and define several terms used to identify the sub-networks



Grouping Devices into Networks and Hierarchical Addressing

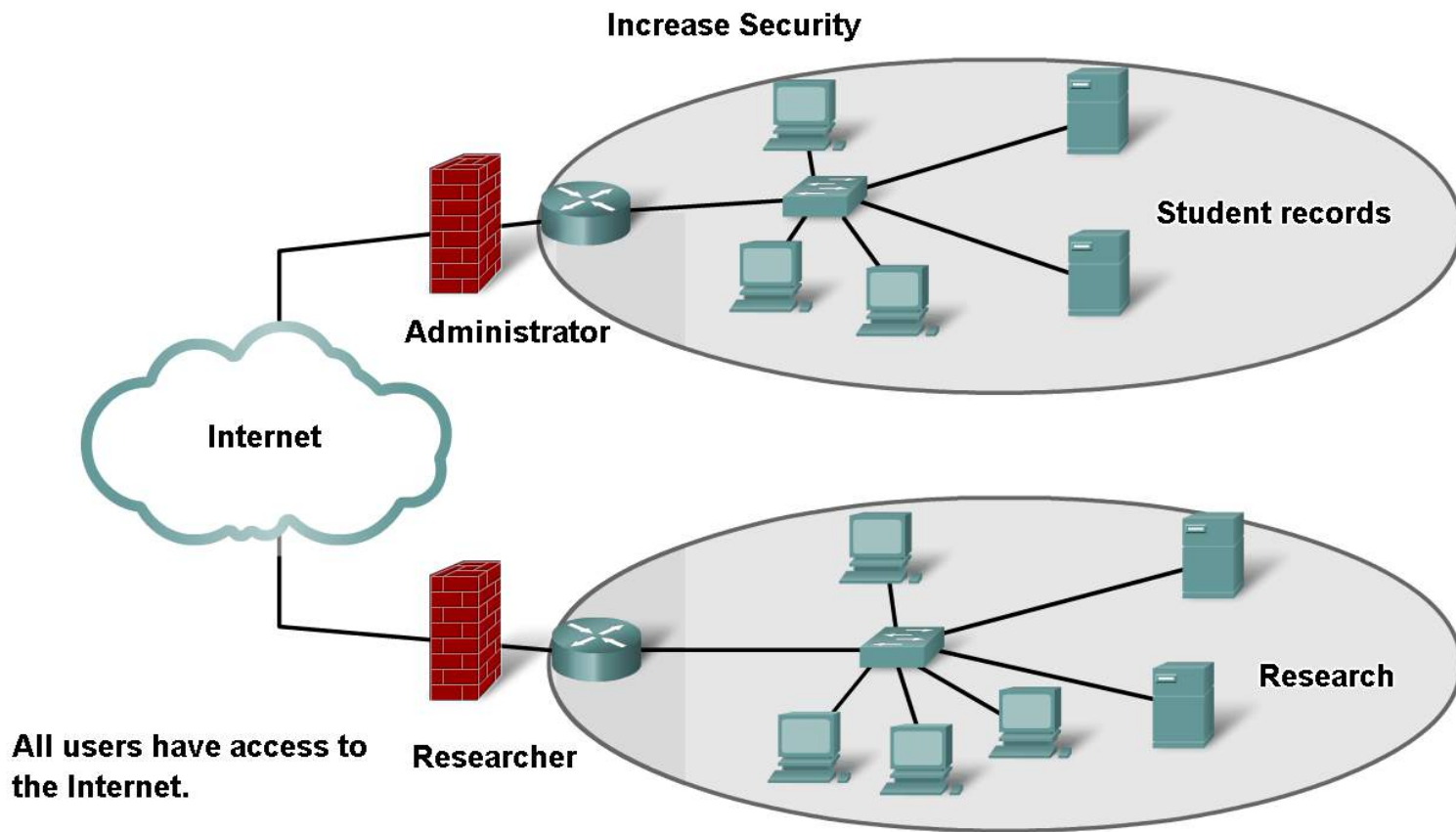
- List several ways in which dividing a large network can increase network performance



Replacing the middle switch with a router creates 2 IP subnets, hence, 2 distinct broadcast domains. All devices are connected but local broadcasts are contained.

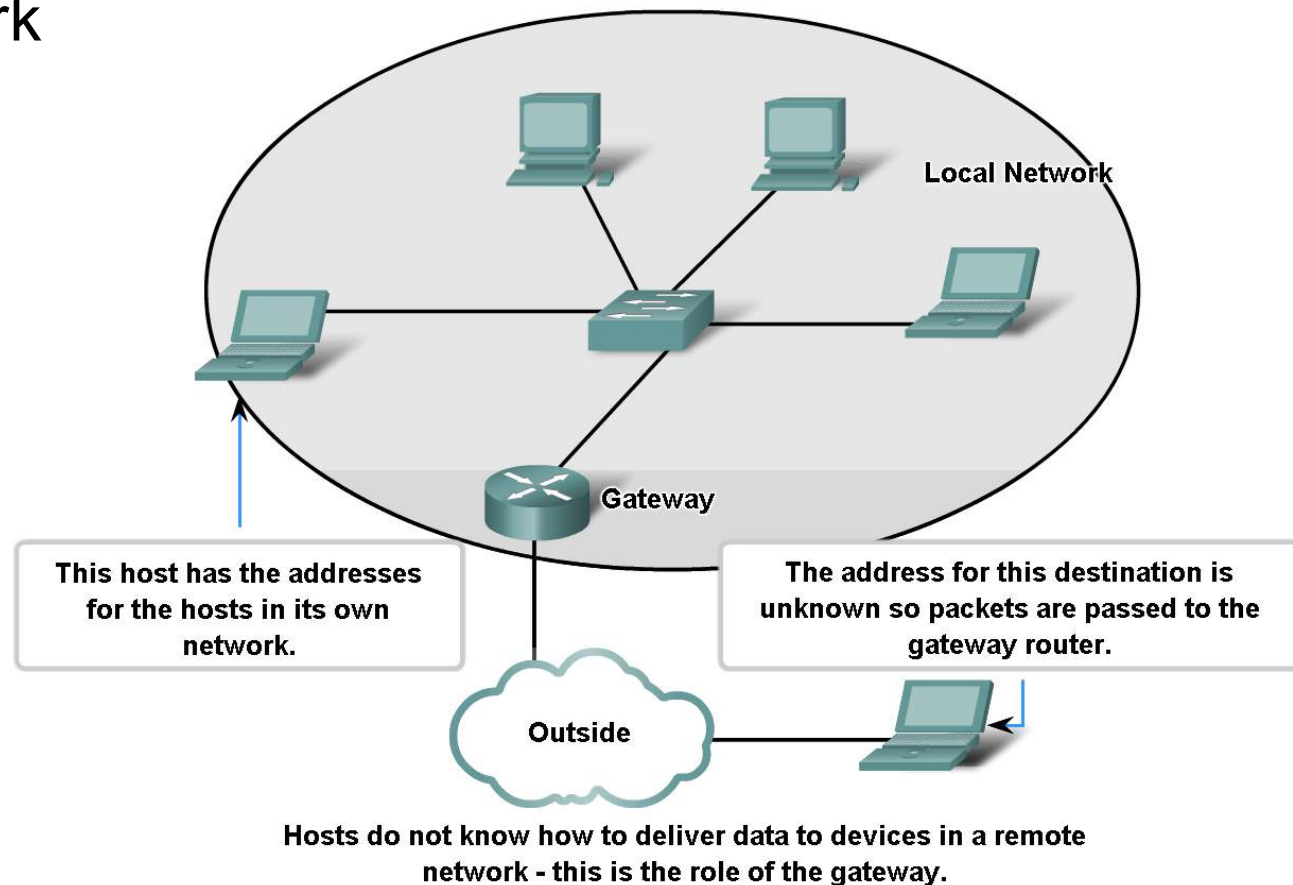
Grouping Devices into Networks and Hierarchical Addressing

- List several ways in which dividing a large network can increase network security



Grouping Devices into Networks and Hierarchical Addressing

- Explain the communication problems that emerge when very large numbers of devices are included in one large network

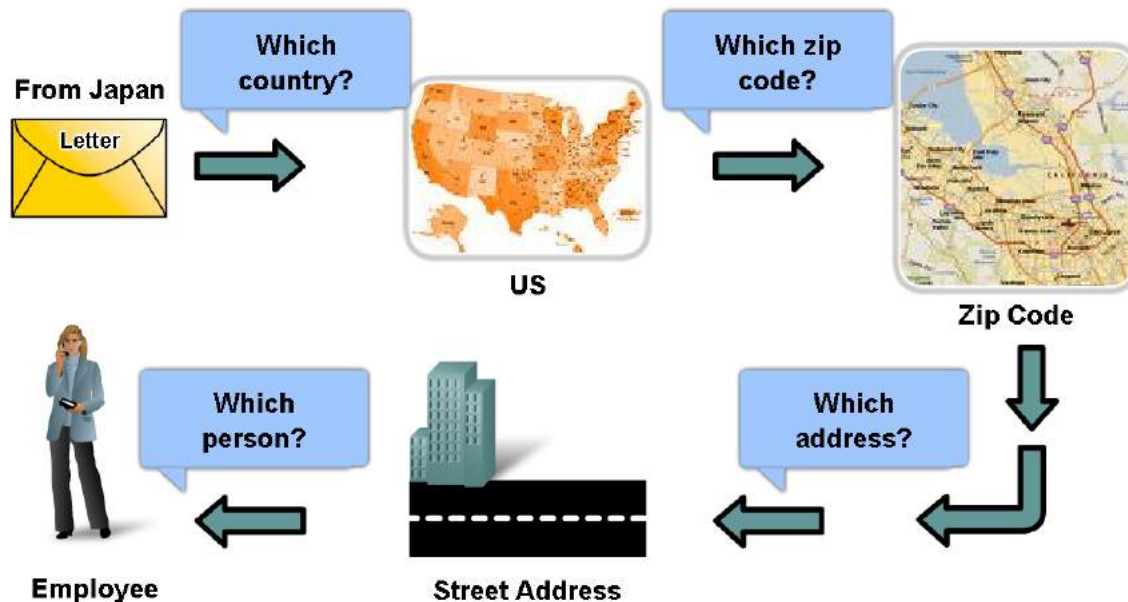


Grouping Devices into Networks and Hierarchical Addressing

- Describe how hierarchical addressing solves the problem of devices communicating across networks of networks

Hierarchical Addressing

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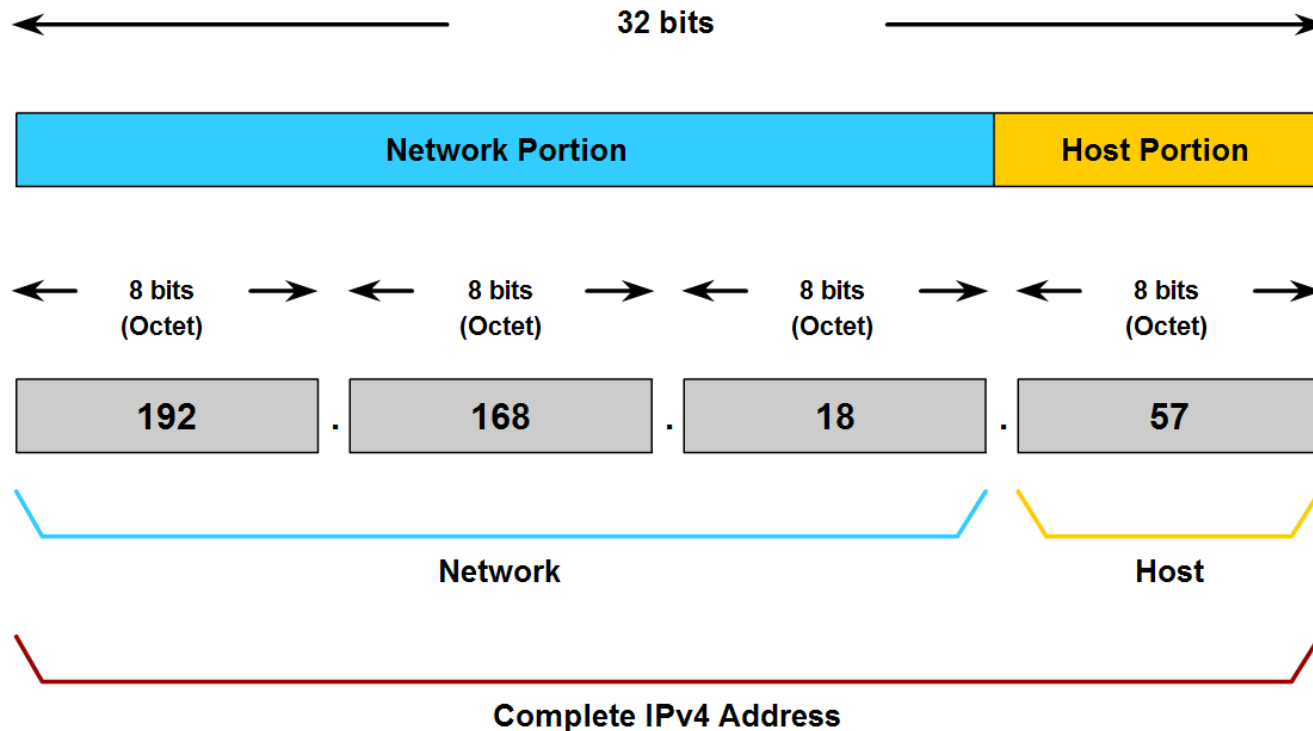


At each step of delivery, the post office need only examine the next hierarchical level.

Grouping Devices into Networks and Hierarchical Addressing

- Describe the purpose of further subdividing networks into smaller networks

Hierarchical IPv4 Address



Fundamentals of Routes, Next Hop Addresses and Packet Forwarding

- Describe the role of an intermediary gateway device in allowing devices to communicate across sub-divided networks

Gateways Enable Communications between Networks

