Q1 **Longest Prefix Match in CIDR** Ch. 4 slides 17–22, 50, 58–61

Name: _____

A router uses **longest prefix match** with this forwarding table. The block-size table beside it says how far each prefix reaches: a block starts at the third byte in its prefix and covers that many third-byte values. For example, 10.1.16.0/20 covers 16 values, so it runs from 10.1.16.0 to 10.1.31.255.

Forwarding table

Destination prefix	Link interface
`128.64.0.0/16`	**0**
`128.64.32.0/20`	**1**
`128.64.40.0/23`	**2**
`128.64.41.0/24`	**3**
`otherwise`	**4**

Block sizes

Prefix length	Third-byte values covered	Addresses
/16	**256 (all)**	**65,536**
/20	**16**	**4,096**
/21	**8**	**2,048**
/22	**4**	**1,024**
/23	**2**	**512**
/24	**1**	**256**

1. How many addresses does 128.64.40.0/23 cover? What are its first and last addresses?

Addresses: _____ First: _____ Last: _____

2. For each destination, list the interfaces whose entries match, then give the interface the datagram leaves on. Row a is filled in as an example.

	Destination address	Entries that match	Interface
a	*`128.64.41.200`*	*0, 1, 2, 3*	*3*
b	`128.64.40.9`		
c	`128.64.43.5`		
d	`128.64.48.3`		
e	`128.65.41.200`		

3. The operator wants every address from **128.64.48.0** to **128.64.48.255** to leave on interface **5**. Write the entry to add, in CIDR form.

Entry: _____ → 5

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Q2 **DHCP on a Timeline** Ch. 4 slides 52–54

A laptop joins a LAN that has **two DHCP servers**: server A at **10.0.0.1** and server B at **10.0.0.2**. Both answer the laptop. A offers **10.0.0.57** and B offers **10.0.0.99**. A's offer reaches the laptop first, and the laptop takes it.

DHCP reference, alphabetical

ACK: the chosen server confirms that the address now belongs to the client.

DISCOVER: a client looks for any DHCP server on the LAN.

OFFER: a server proposes an address the client could use.

REQUEST: the client says which offer it accepts, naming the server that made it.

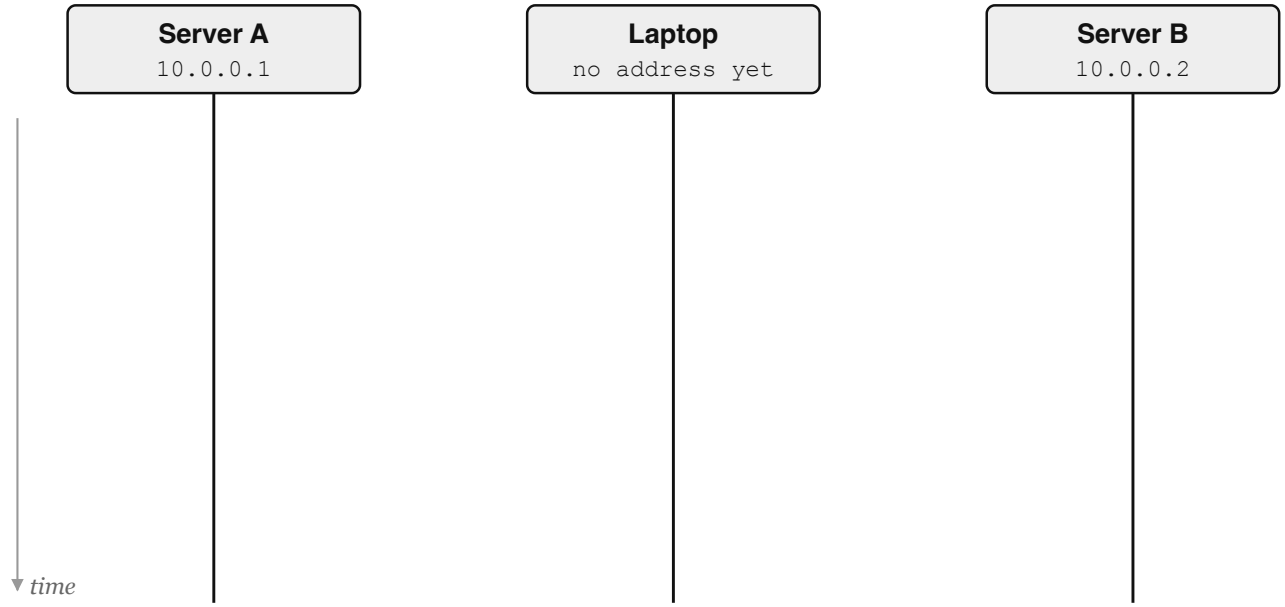
DHCP servers listen on UDP port **67**; DHCP clients listen on UDP port **68**.

A machine with no IP address sends from **0.0.0.0**.

A datagram to **255.255.255.255** reaches every machine on the LAN, but only a program listening on its destination port receives it.

A machine accepts a datagram sent to a specific IP address only if that address is its own.

1. Draw the whole exchange. Draw each message as an arrow from its sender to every machine whose DHCP program receives it. Number the arrows in the order they are sent and label each with its message name, e.g. "1 DISCOVER".



2. Fill in the addresses.

Message	Source IP : port	Destination IP : port
A's OFFER		
REQUEST		
ACK		

3. When can the laptop first send a datagram from 10.0.0.57?