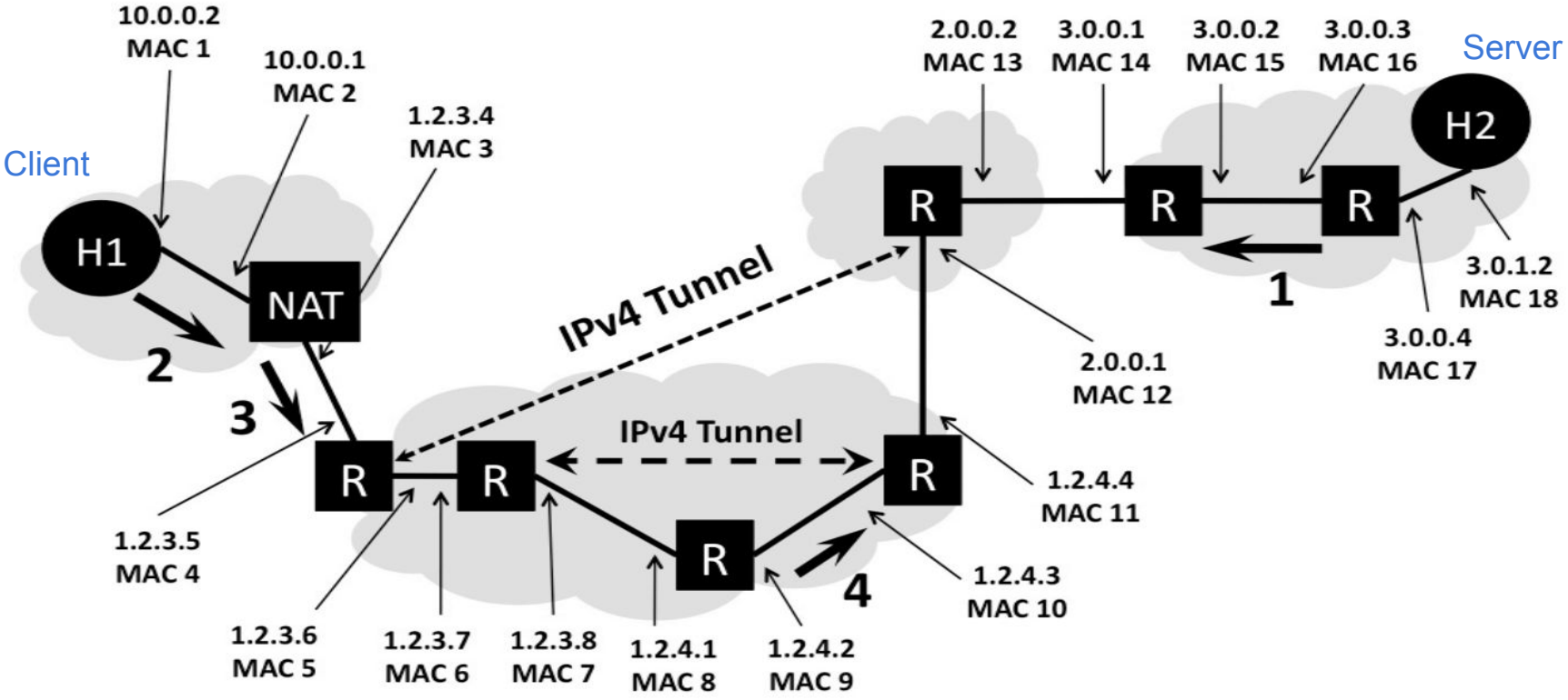
Problem Solving Session

Network

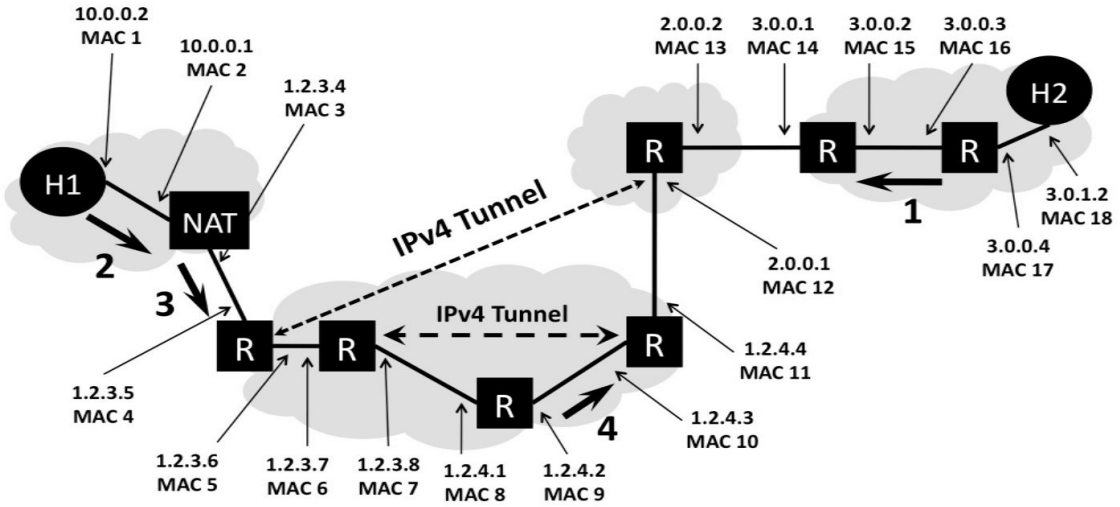
Prepared by Yue Guo

Routing, Addressing and Tunneling



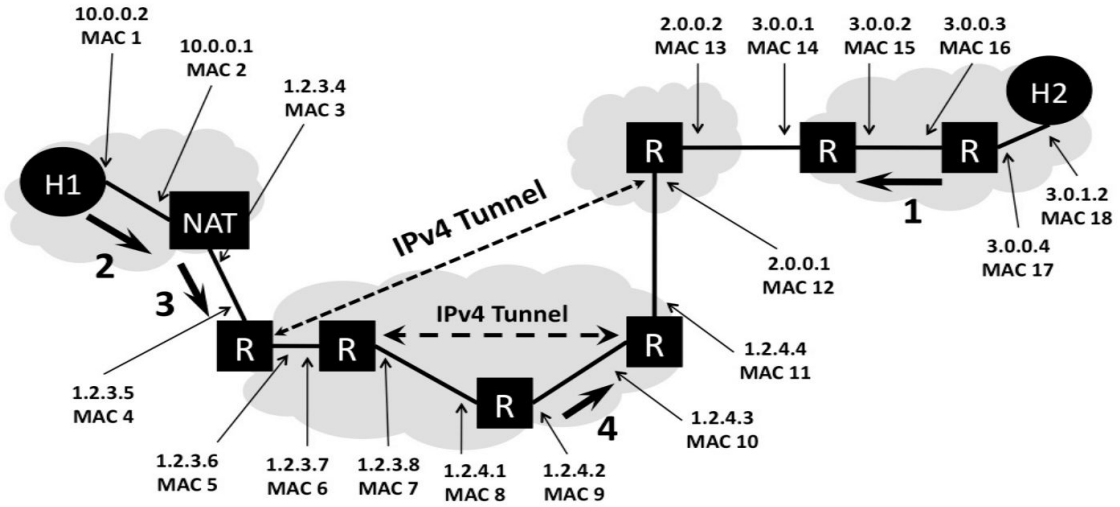
Routing, Addressing and Tunneling

H1 has established an HTTP session with web server H2 and data packets are flowing between the two machines.



Routing, Addressing and Tunneling

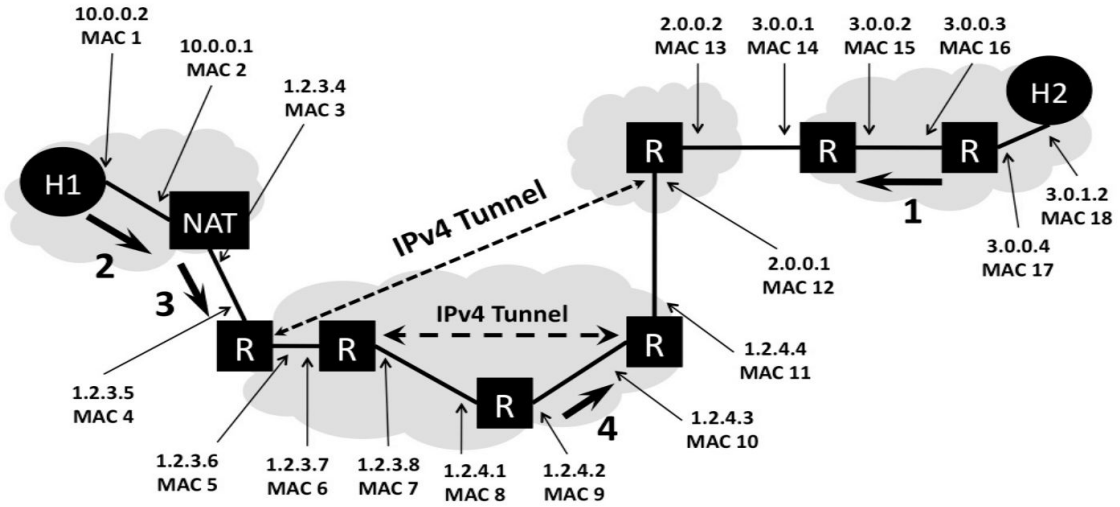
Note that you should order your headers from “outermost” in, as shown: Ethernet should be listed before IP, because the Ethernet packet exists first on the wire.



Routing, Addressing and Tunneling

For packet 1:

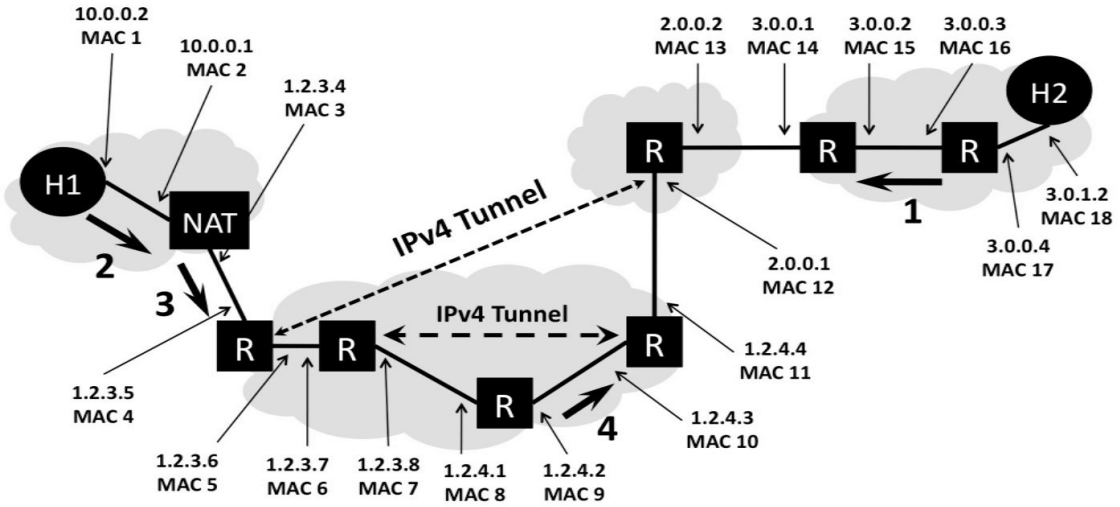
Header Type	Source	Destination
Ethernet	MAC 16	MAC 15
IP	3.0.1.2	1.2.3.4



Routing, Addressing and Tunneling

Fill in the header type, the source and destination address for the network and datalink layer headers for packets 2, 3, and 4.

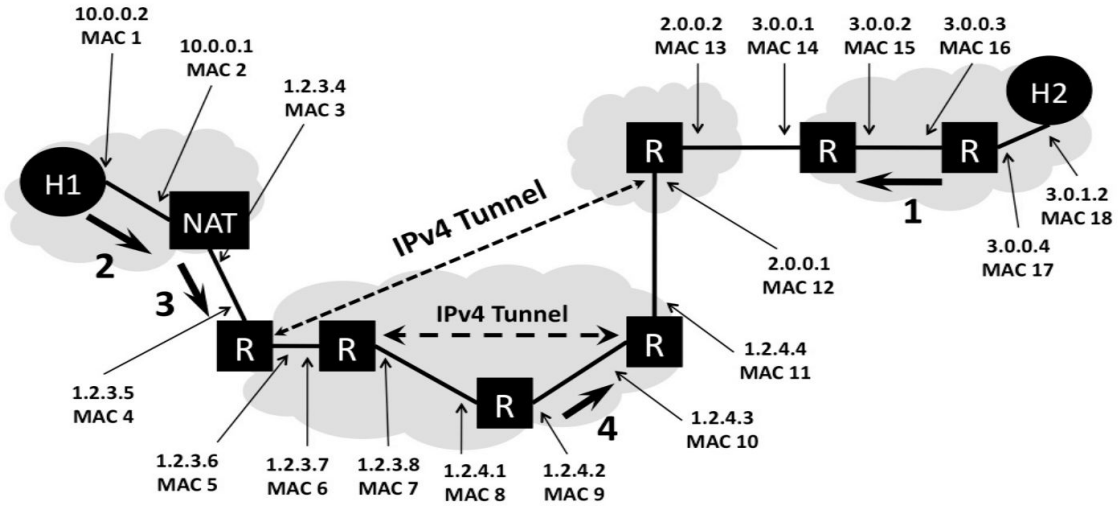
Header Type	Source	Destination



Answers

For packet 2:

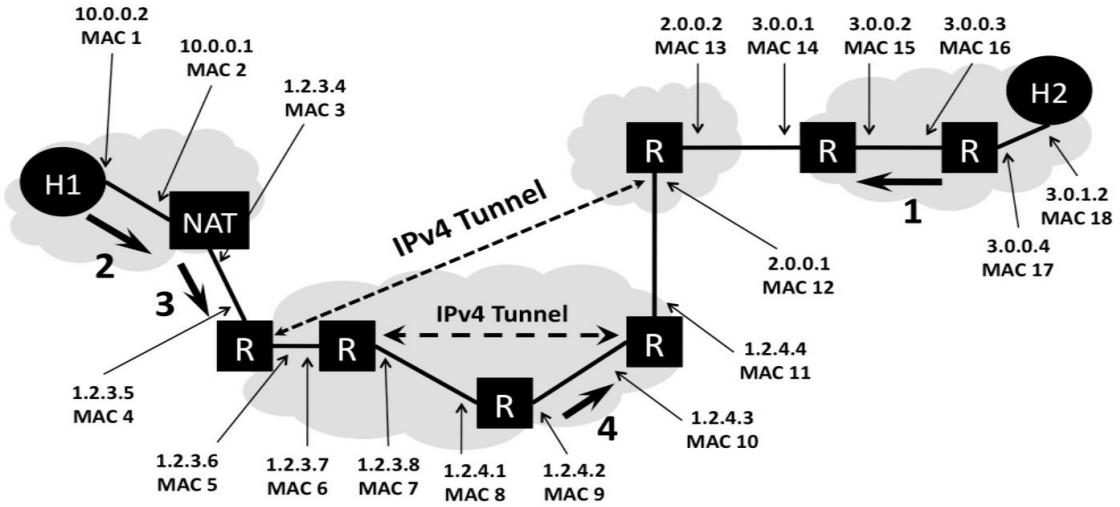
Header Type	Source	Destination
Ethernet	MAC 1	MAC 2
IP	10.0.0.2	3.0.1.2



Answers

For packet 3:

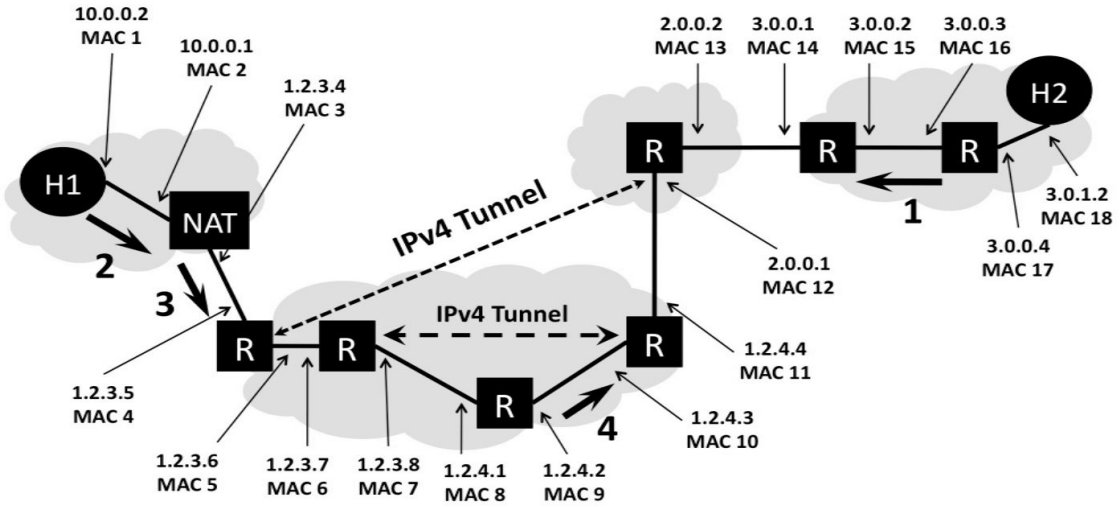
Header Type	Source	Destination
Ethernet	MAC 3	MAC 4
IP	1.2.3.4	3.0.1.2



Answers

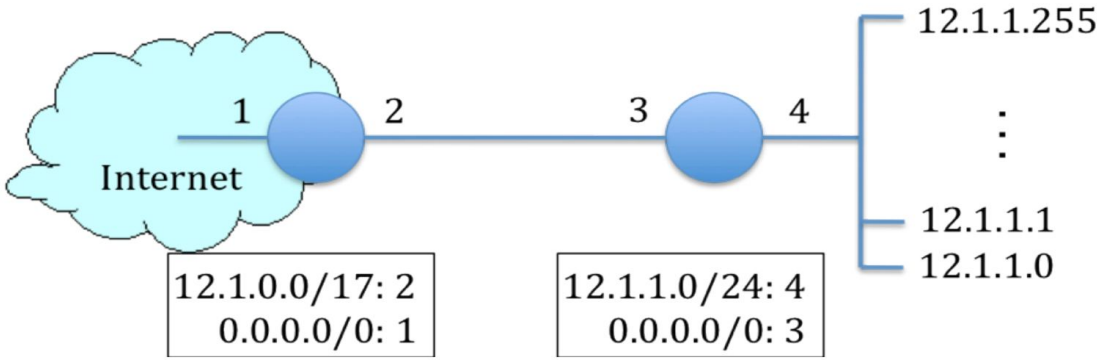
For packet 4:

Header Type	Source	Destination
Ethernet	MAC 9	MAC 10
IP	1.2.3.8	1.2.4.3
IP	1.2.3.6	2.0.0.1
IP	1.2.3.4	3.0.1.2



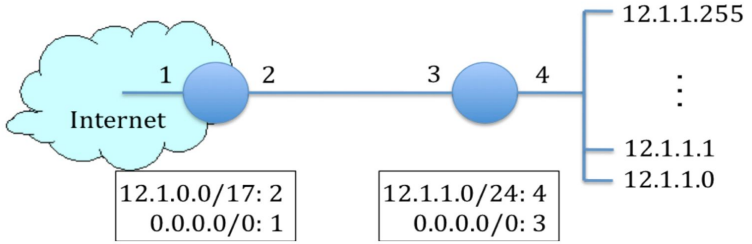
Defaulting

A small university campus is assigned a large address block 12.1.0.0/17, but is only using a portion of these addresses (in 12.1.1.0/24) to number its computers. The campus uses a single Internet Service Provider (ISP) to reach the rest of the Internet. This picture shows the forwarding tables on the ISP's router (on the left) and the campus edge router (on the right):

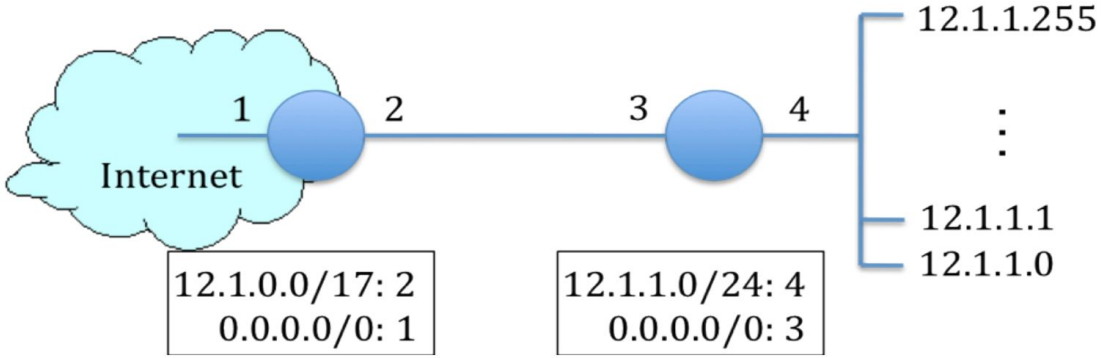


Defaulting

1. How many IP addresses does the campus “own” in its 12.1.0.0/17 block?
2. What are the smallest and largest IP addresses that the campus “owns”, whether or not the campus is currently using the address?
3. Suppose the ISP router receives a packet with destination IP address 12.1.1.1? What path does this packet follow?
4. Suppose the ISP router receives a packet with destination IP address 12.1.20.1? What path does this packet follow?
5. What ultimately happens to a packet with destination IP address 12.1.20.1? Where does it go?



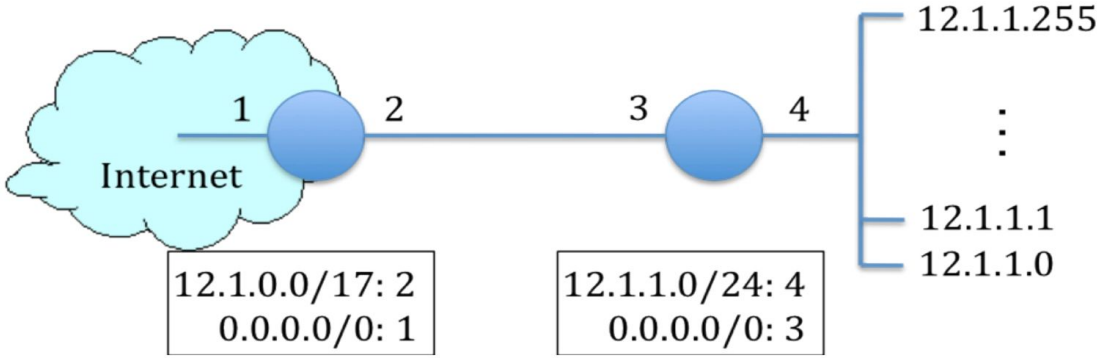
Answers



1. How many IP addresses does the campus “own” in its 12.1.0.0/17 block?

The 17-bit mask leaves 32-17, or 15 bits to identify the addresses within the block. As such, the block contains 2^{15} or 32,768 addresses.

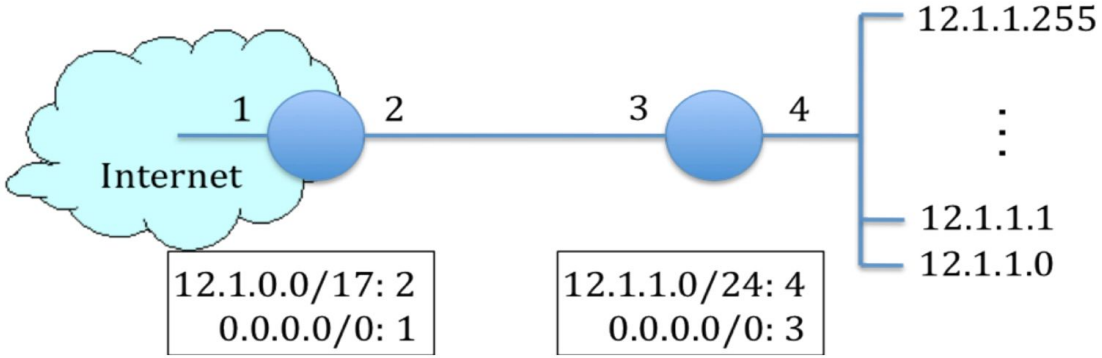
Answers



2. What are the smallest and largest IP addresses that the campus “owns”, whether or not the campus is currently using the address?

12.1.0.0-12.1.127.255

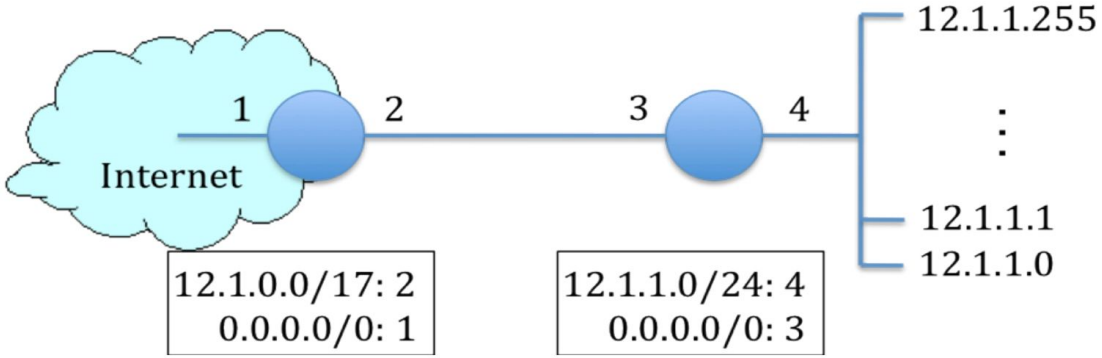
Answers



3. Suppose the ISP router receives a packet with destination IP address 12.1.1.1? What path does this packet follow?

The packet flows over the path 1→2→3→4.

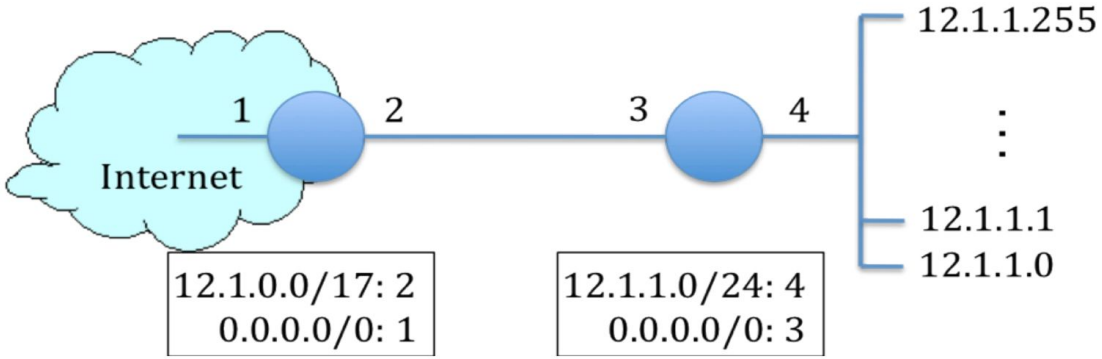
Answers



4. Suppose the ISP router receives a packet with destination IP address 12.1.20.1? What path does this packet follow?

The packet flows over the path 1→2→3→2→3 …

Answers



5. What ultimately happens to a packet with destination IP address 12.1.20.1? Where does it go?

The looping packet is discarded once its IP TTL (Time-To-Live) expires.