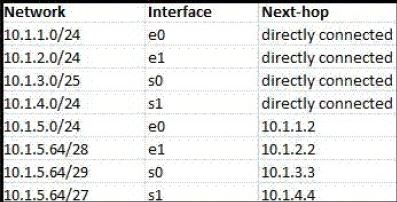
**Question 1:**



According to the routing table, where will the router send a packet destined for 10.1.5.65? Why?

10 – 0000 1010

1 - 0000 0001

5 - 0000 0101

65 - 0100 0001

10.1.5.64/29 is the answer

|  |  |
| --- | --- |
| 10 | 0000 1010 |
| 1 | 0000 0001 |
| 1 | 0000 0001 |
| 0 | 0000 0000 |

|  |  |
| --- | --- |
| 10 | 0000 1010 |
| 1 | 0000 0001 |
| 2 | 0000 0010 |
| 0 | 0000 0000 |

|  |  |
| --- | --- |
| 10 | 0000 1010 |
| 1 | 0000 0001 |
| 3 | 0000 0011 |
| 0 | 0000 0000 |

|  |  |
| --- | --- |
| 10 | 0000 1010 |
| 1 | 0000 0001 |
| 4 | 0000 0100 |
| 0 | 0000 0000 |

|  |  |
| --- | --- |
| 10 | 0000 1010 |
| 1 | 0000 0001 |
| 5 | 0000 0101 |
| 0 | 0000 0000 |
| 10 | 0000 1010 |
| 1 | 0000 0001 |
| 5 | 0000 0001 |
| 64 | 0100 0000 |

BEST

|  |  |
| --- | --- |
| 10 | 0000 1010 |
| 1 | 0000 0001 |
| 5 | 0000 0101 |
| 64 | 0100 0000 |

|  |  |
| --- | --- |
| 10 | 0000 1010 |
| 1 | 0000 0001 |
| 5 | 0000 0101 |
| 64 | 0100 0000 |

**Question 2:**

Classless Inter-domain Routing (CIDR) receives a packet with address 131.23.151.76. The router’s routing table has the following entries:

Prefix Output Interface Identifier

131.16.0.0/12 3

131.28.0.0/14 5

131.19.0.0/16 2

131.22.0.0/15 1

The identifier of the output interface on which this packet will be forwarded is **2**

Why? Because it closest matches the packet address

|  |  |
| --- | --- |
| 131 | 0000 1000 0011 |
| 23 | 0000 0001 0111 |
| 151 | 0000 1001 0111 |
| 76 | 0000 0100 1100 |

3

|  |  |
| --- | --- |
| 131 | 0000 1000 0011 |
| 16 | 0000 0001 0000 |
| 0 | 0000 0000 0000 |
| 0 | 0000 0000 0000 |

5

|  |  |
| --- | --- |
| 131 | 0000 1000 0011 |
| 28 | 0000 0001 1100 |
| 0 | 0000 0000 0000 |
| 0 | 0000 0000 0000 |

2

|  |  |
| --- | --- |
| 131 | 0000 1000 0011 |
| 19 | 0000 0001 0011 |
| 0 | 0000 0000 0000 |
| 0 | 0000 0000 0000 |

**1**

|  |  |
| --- | --- |
| 131 | 0000 1000 0011 |
| 22 | 0000 0001 0110 |
| 0 | 0000 0000 0000 |
| 0 | 0000 0000 0000 |

**Question 3:**

Consider the following routing table of a router.

| **PREFIX** | **NEXT HOP** |
| --- | --- |
| 192.24.0.0/18 | D |
| 192.24.12.0/22 | B |

Consider the following three IP addresses, what their next hop will be? B

|  |  |
| --- | --- |
| D / 18 | B / 22 |
| |  |  | | --- | --- | | 192 | 0000 1100 0000 | | 24 | 0000 0001 1000 | | 0 | 0000 0000 0000 | | 0 | 0000 0000 0000 | | |  |  | | --- | --- | | 192 | 0000 1100 0000 | | 24 | 0000 0001 1000 | | 12 | 0000 0000 1100 | | 0 | 0000 0000 0000 | |

1. 192.24.6.0
2. 192.24.14.32
3. 192.24.54.0

**1:**

|  |  |
| --- | --- |
| 192 | 0000 1100 0000 |
| 24 | 0000 0001 1000 |
| 6 | 0000 0000 0110 |
| 0 | 0000 0000 0000 |

**2:**

|  |  |
| --- | --- |
| 192 | 0000 1100 0000 |
| 24 | 0000 0001 1000 |
| 14 | 0000 0000 1110 |
| 32 | 0000 0010 0000 |

**3:**

|  |  |
| --- | --- |
| 192 | 0000 1100 0000 |
| 24 | 0000 0001 1000 |
| 54 | 0000 0011 0110 |
| 0 | 0000 0000 0000 |

**Question 4:**

Draw an TCP header. Capture packets using wireshark and explain the fields for a particular TCP packet captured. Try to explain the purpose of each field.

A diagram of a network model

Description automatically generated

OR

0 1 2 3

0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| Source Port (16 bits) | Destination Port (16 bits) |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

| Sequence Number (32 bits) |

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| Acknowledgment Number (32 bits) |

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| Data | Rese-|C|E|U|A|P|R|S|F| |

| Offset| rved |W|C|R|C|S|S|Y|I| Window |

| (4 bits) | |R|E|G|K|H|T|N|N| |

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| Checksum (16 bits) | Urgent Pointer (16 bits) |

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| Options and Padding (variable) |

+---------------------------------------------------------------+

| Data (variable length) |

: :

1. Source Port (16 bits): This field indicates the sender's port number, identifying the application or process on the sender's side.

2. Destination Port (16 bits): This field indicates the receiver's port number, identifying the application or process on the receiver's side.

3. Sequence Number (32 bits): This field is used for sequencing the TCP segments to ensure they are received in the correct order.

4. Acknowledgment Number (32 bits): If the ACK flag is set (1) in the control flags field, this field contains the next sequence number that the sender expects to receive.

5. Data Offset (4 bits): This field specifies the size of the TCP header in 32-bit words, indicating where the data begins.

6. Reserved (6 bits): These bits are reserved for future use and should be set to zero.

7. Control Flags (9 bits): These bits include control flags like URG, ACK, PSH, RST, SYN, and FIN, which are used to manage the connection and control the flow of data.

8. Window (16 bits): This field represents the size of the sender's receive window, indicating how much data the receiver is willing to accept.

9. Checksum (16 bits): A checksum of the header and data to verify the integrity of the packet.

10. Urgent Pointer (16 bits): Used when the URG flag is set to indicate the location of urgent data within the packet.

11. Options and Padding (variable): This field can contain various options and padding, such as Maximum Segment Size (MSS), Timestamps, and more.

12. Data (variable length): The actual application data being transmitted.

**Question 5:**

Draw an UDP header. Capture packets using wireshark and explain the fields for a particular UDP packet captured. Try to explain the purpose of each field.

