**Assignment 3**

**1、Briefly summarize the steps performed by each of the four layers in the TCP/IP hierarchy at the computer at which a message originates.**

**Answer：**

1、Application Layer:This layer interacts with the user or software application.It prepares the data for transmission, formats it, and determines the appropriate protocol (e.g., HTTP, FTP) for communication.

2、Transport Layer:The transport layer is responsible for end-to-end communication between the sender and receiver.It breaks the data into smaller units called segments.It adds header information to each segment, including source and destination port numbers and sequence numbers.The transport layer is typically implemented by protocols such as TCP (Transmission Control Protocol) or UDP (User Datagram Protocol).

3、Internet Layer:The internet layer, also known as the network layer, is responsible for logical addressing and routing of data between different networks.It adds an IP (Internet Protocol) header to the segment, which includes source and destination IP addresses.The internet layer determines the best path for the data to reach its destination using routing algorithms.

4、Link Layer:The link layer is responsible for the physical transmission of data over the local network.It encapsulates the segment into frames and adds a header containing hardware (MAC) addresses.The link layer is closely tied to the specific network technology, such as Ethernet or Wi-Fi.

In summary, the application layer prepares the data, the transport layer segments and adds necessary information, the internet layer handles logical addressing and routing, and the link layer deals with the physical transmission on the local network. Together, these layers ensure reliable and efficient communication across networks using the TCP/IP protocol stack.

**2、For a wireless network, why the CSMA/CD protocol is not applied?**

**Answer：**

1、Hidden Node Problem:In wireless networks, devices may not be able to directly sense the transmission activity of all other devices in the network due to physical obstructions or distance.This can lead to a hidden node problem, where a device may start transmitting, unaware that another device is already transmitting, resulting in collisions.

2、Exposed Node Problem:Conversely, the exposed node problem can occur when a device refrains from transmitting even though it is actually not within range of interfering with ongoing transmissions.CSMA/CD would unnecessarily delay transmissions in such cases, reducing the efficiency of the wireless network.

3、Dynamic Channel Conditions:Wireless channels are subject to dynamic and unpredictable conditions, such as interference and signal fading.CSMA/CD assumes a relatively stable and predictable medium, which is not the case in many wireless environments.

4、Half-Duplex vs. Full-Duplex:CSMA/CD operates in half-duplex mode, meaning devices cannot transmit and receive simultaneously on the same channel.Wireless networks often use full-duplex communication, where devices can send and receive data simultaneously, making CSMA/CD unnecessary.

Due to these challenges, wireless networks typically use protocols like Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) or other contention protocols that are better suited to the characteristics of wireless communication. CSMA/CA includes mechanisms to address the hidden node problem and is designed to improve the efficiency of channel access in wireless networks.

**3、Write the entire URL required to retrieve the Web document named bulldogs.html from the Web server at animals.org assuming that the document is stored in the directory named dogs.**

**Answer：**

<http://animals.org/dogs/bulldogs.html>

**4、What are some distinctions between UDP and TCP?**

**Answer：**

1、Connection-oriented and Connectionless:

TCP: Connection-oriented protocol. It establishes a connection before data exchange and ensures reliable, ordered delivery of data. It uses a three-way handshake to establish a connection and provides error checking and correction mechanisms.

UDP: Connectionless protocol. It does not establish a connection before sending data and does not guarantee reliable delivery. Each UDP packet is treated independently, and there is no acknowledgment of receipt.

2、Reliability:

TCP: Reliable and ensures the delivery of data. If any packets are lost or corrupted during transmission, TCP will retransmit them.

UDP: Unreliable in terms of delivery. It does not provide mechanisms for error recovery or retransmission. Applications using UDP must handle any necessary error checking and recovery.

3、Ordering of Data:

TCP: Ensures the ordered delivery of data. If packets arrive out of order, TCP will reorder them before delivering them to the application.

UDP: Does not guarantee the order of delivery. Packets may arrive out of order, and the application must manage the sequencing if order is important.

4、Flow Control:

TCP: Implements flow control mechanisms to prevent the sender from overwhelming the receiver with data. It uses a sliding window algorithm to adjust the rate of data transmission.

UDP: No inherent flow control mechanisms. The sender can transmit data at its own rate, regardless of the receiver's ability to handle it.

5、Header Size:

TCP: Has a larger header size compared to UDP. The additional header information in TCP includes sequence numbers, acknowledgment numbers, and various control flags.

UDP: Has a smaller header size, which makes it more lightweight. It includes source and destination port numbers, length, and a checksum.

6、Usage:

TCP: Used for applications that require reliable, ordered, and error-checked delivery of data, such as web browsing, file transfers (FTP), and email (SMTP).

UDP: Used for applications where low latency and real-time communication are more critical than reliability, such as online gaming, streaming media (UDP-based protocols like RTP), and DNS.

**5、Draw a sketch showing how the following HTML document would appear on the computer screen when displayed by a browser.**

**Answer：**

This is the title

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Favorite Animals

Of all the animals in the world, the

(pigs.org) pig is perhaps the most charming.

However, the

(hippopotamuscity.org)

hippopotamus is also cute.

**6、Can we use IPv4 when its ip addresses ran out?**

**Answer：**

We can use IPv4 when its ip addresses ran out by following ways:

1、Network Address Translation (NAT): NAT allows multiple devices to share a single public IPv4 address. It extends the lifespan of IPv4 addresses by translating private (local) addresses to a single public address.

2、Private IPv4 Addresses: Reserved ranges of IPv4 addresses are designated for private use within internal networks. These addresses are not routable on the internet but can be used internally within organizations. NAT is often used to allow these private addresses to access the internet.

3、IPv4 Address Trading: In some cases, organizations with surplus IPv4 addresses may sell or lease them to those in need. This has led to the emergence of an IPv4 address market, where organizations can acquire additional addresses through transactions.