Assignment 3:

Get ready to embark on this exhilarating treasure hunt. You have uncovered a magic ancient scroll that has the following crossword puzzle. Solve the crossword puzzle to find clues. These clues will then have to be used along with the Wireshark capture given to you to find mystical paths hidden on the Internet. There are totally 4 paths, each hidden with a treasure- which are questions on networking. If you answer these questions, you'll obtain the invaluable treasure of knowledge along with assignment points.

**Objective 1:**

Complete the crossword puzzle below to retrieve the hints required to complete Objective 1. Use these hints to direct yourself to the paths containing the questions. These paths are hidden in the Wireshark file uploaded on canvas (assignment3\_wireshark\_capture.pcap). Use the hints from the crossword to retrieve the paths to your assignment questions.

Path 1: **[15 Points + 5 Extra Credit]**

Hint: 14 Down

Q1:

1. If we assume that we are working with a router on a stick topology, then, we will need to first enable a trunk port on the switch connecting to the router, and access ports to the hosts. The VLANs would need to be declared on the switch. Next, the router would need to be configured for inter-VLAN routing. This is done by going into a sub interface on the router and assigning it a network and enabling encapsulation. When both sub interfaces are set up correctly, VLAN 10 hosts and VLAN 20 hosts should be able to communicate with each other.

Q2:

TCP:

* Connection-oriented
* During data transfer, error checking will occur
* Operates in full-duplex mode in which data moves bidirectionally

UDP:

* Connectionless
* Instant access to the network layer without overhead
* Data cannot be recovered, but provides a faster delivery medium

(Taken from my discussion post listing differences between TCP and UDP).

<https://canvas.colorado.edu/courses/96479/discussion_topics/1196592>

Q3:

* A broadcast domain is where devices can communicate directly with each other. A collision domain is when two devices can collide data when trying to send signal at the same time.
* Collision domains: 0
* Broadcast domains: 2

Path 2: **[20 Points]**

Hint: 4 Down

Q4:

Discover: A host sends a broadcast to the network trying to find a DHCP server

Offer: DHCP server gets discover and sends information of the wanted IP address.

Request: The host gets the offer, and sends a broadcast request saying it accepts the IP

Acknowledge: The server will now send back the rest of the needed IP info like subnet, dns ,etc.

Q5:

Distance Vector routing protocols learn by rumor, they add directly connected routes to their table. It uses broadcast and multicast for updates and is always listening for routing updates.

Ex:

* RIPv1
* RIPv2
* IGRP

Link State routing protocols also add directly connected routes to their table but learns a complete map of the network. It uses Dijkstra’s algorithm to determine the best routes.

Ex:

* OSPF

Path 3: **[15 Points + 10 Extra Credit]**

Hint: 3 Down

Q5:

My PC sends a SYN packet to open the other host or the website.

When the website host receives it, it sends a SYN acknowledgement, also known as a SYN ACK

Then my PC sends an ACK back to acknowledge the SYN ACK.

Q6:

Routers: Connects networks and routes data between them

Hubs: Connect multiple devices in a network, but broadcasts all data to all connected devices

Switches: Connects multiple devices in a network together, but directs data to only the specific device its intended for.   
Bridges: Filters traffic between two or more network segments at the Layer 2

Firewalls: A security barrier between an internal and external network that can block or allow certain types of traffic through a network.

Path 4: **[20 Points + 5 Extra Credit]**

Hint: 9 Across

Q7:

* 1. When the user types in facebook.com, it first checks its local DNS cache to see if it has the DNS resolution on the device itself. If it doesn’t, it needs to send a DNS request to facebook’s DNS server.
  2. It realizes that the DNS record is not in network and conducts an ARP to resolve the MAC address of the router.
  3. The router receives the DNS request and sends it to the DNS servers via UDP.
  4. The DNS server accepts the request and sends back a packet containing the IP of Facebook
  5. The router receives this and sends it to the host with the associated destination IP.
  6. The host can now resolve the IP of facebook and starts a TCP handshake with the facebook web server. It initializes the handshake with a SYN packet to the web server, the web server sends back a SYN/ACK packet, and finally the connection is established with a receiving ACK packet.
  7. With the TCP handshake complete, the host sends a HTTP request for the web page and the server sends back a HTTP response with the contents of the web page.

**Crossword** **[30 points]**

A crossword puzzle with letters

Description automatically generated

**Hints for completing the crossword:**

**Across**

**2** Avoids layer-2 loops

**5** PDU of the transport layer

**7** Networking device that operates at the data- link layer of the protocol stack

**9** Uses two TCP ports for communication

**11** DHCP discover is a \_\_\_\_\_\_ message

**15** Field in an IP header that prevents L3 loops

**16** Most preferred routes in the routing table (2 words)

**18** Glues the internet together

**19** DNS message for converting a domain-name to IP address

**Down:**

**1** Protocol used to obtain the MAC address

**3** Uses port 23

**4** Uses port 53

**6** Wireshark was earlier known as?

**8** Separates broadcast on a switch

**10** Utility that records route from source to destination

**12** Uses a secure, reliable protocol on port 443

**13** Is 48-bits in length

**14** Uses port 80

**17** Routing protocol that uses both link-state and distance-vector algorithm