For our imaginary networks we would have three networks; Network A, Network B and Network C. Network A would have the address space of 10.1.1.0/24 while network B would have the address space of 192.168.1.0/24 and network C would have the network space of 172.168.1.0/24.

The networks are connected via two routers; Router A and Router B. Router A connects Network A and B together and has an IP address of 10.1.1.100 on network A and 192.168.1.100 on network B while network B has an IP address of 172.168.1.1 on network C. A computer (OLAOLU COMPUTER) with an IP address of 10.1.1.1 on network A requests to get a page on its browser from a server (SERVER 1) which is part of network C and has an IP address of 172.168.1.1 and listens on port 80.

The web browser communicates with its web browsing stack to tell it that a wants to establish a TCP connection to 172.168.1.1 port 80. The network stack checks to see if 172.168.1.1 is on its network Since 172.16.1.1 is on is not on its network the network stack looks for the outboard MAAC address for its configured gateway. Using this MAC address the computer chooses an outbound port of 40000 and opens a socket there to the Web browser.

The networking stack then builds up a TCP segment with source port of 40000 and destination port of 80. A sequence number is chosen and used to fill the sequence number field. The SYN flag is set and a checksum for the data is calculated. The TCP segment is then passed to the IP layer of the networking stack. This layer constructs an IP datagram with a header filled with the source IP, the destination IP and a TTL of 64. The TCP segment is then inserted into the payload of the of the IP datagram and the checksum is calculated. This datagram is then inserted into an Ethernet frame which has a destination MAC address off 00.11.22.33.44.55 which is the MAC address of Router A.

The IP datagram is inserted as the data payload of the Ethernet frame and another checksum is calculated. The Ethernet frame is then sent to router A using voltage modulation of a cat-6 cable that’s connected between OLAOLU COMPUTER and the router. The switch checks the destination MAC address of the Ethernet frame and forwards the Ethernet datagram to the Destination MAC address. The router receives the packet checks the destination MAC of the Ethernet frame and recognizes it as its own, it then calculates a checksum for the datagram and compares it with the value in the checksum field of the datagram. It then strips away the Ethernet frame leaving it with just the IP datagram. It then performs a checksum check on the IP data and finds that they match. It inspects the destination IP address and realizes that the destination address is one hop way via router B which has an IP address of 192.168.1.1 on Network B. Router A then decreases the TTL field by one and calculates a new checksum field. Router A then looks at its ARP table and find the MAC address for router B. this Mac address is used to create an Ethernet frame with router A Mac address as the source Mac address and Router B Mac address as the destination Mac address.

This Ethernet data is then sent to router B, router B does the necessary checks removes the Ethernet frame and performs a checksum check, after which it examines the destination IP address. Router B sees that the destination address is on a locally connected network and decrements the TTL by 1, calculates a new checksum and creates a new IP datagram. This new datagram is then encapsulated in an Ethernet frame which has router B Mac address as the source MAC address and SERVER 1 MAC address as the destination Mac address. The Ethernet frame is then sent out to network C where a switch ensures that then Ethernet frame gets to SERVER 1. Server 1 receives the frame examines it MAC address and confirms that it’s the same with its own. It then strips away the Ethernet frame examines the datagram and performs a checksum check and ensures that the data is intact. It then examines the destination IP address recognizes the destination IP as its own. The computer then strips the IP datagram and is left with the TCP datagram. The checksum is examined to ensure that the data is intact, the computer then examines the destination port and checks to see if the destination port and checks to see if the destination port. Port 80 is open and listening. SERVER 1 then sees that the packet has SYN flag set it then examines the sequence number and stores that. The computer then crafts the returning SYN/ACK response to the other computer OLAOLU COMPUTER which follows the same routine.