



Networks and Internet Applications

Activity: CA1 – First Continuous Assessment Test

- The solution must be submitted in a PDF file in the subject classroom .
- You must include references to the resources you have consulted to answer the questions.
- The deadline for submission is **March 30th, 2025**

Questions

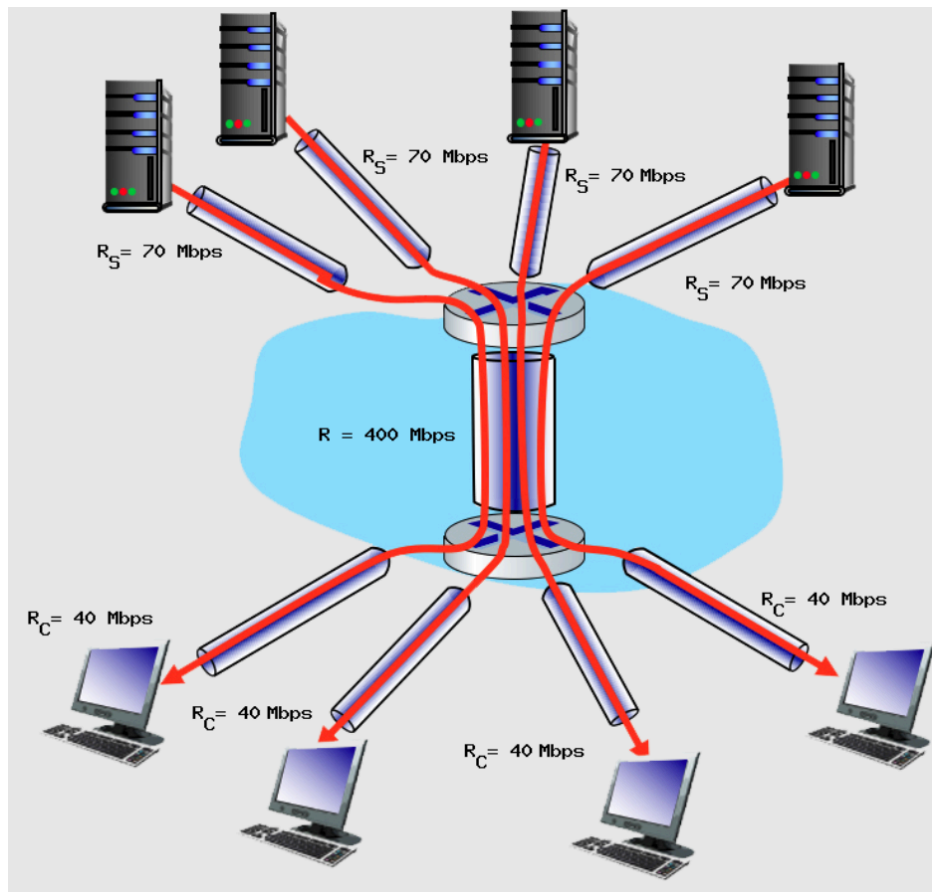
1. Find some graphic material (video, infographic, etc.) that briefly explains the history of the Internet. View it and share it through the classroom forum, briefly explaining why you chose it.
2. Answer the following questions about IP addressing:
 - a. For the address: 148.83.98.65/22 calculate the network, the broadcast address and the range of hosts.
 - b. In a network with 1000 hosts, what is the minimum netmask that would support that number of hosts?
 - c. The network to which the address 148.83.98.65/22 belongs needs to be segmented into at least 42 subnets. Calculate the required subnet mask, and the first five resulting subnets.
3. Make a diagram of your home Internet connection, including all the main elements, such as hosts, routers, switches, access points, and IoT devices. Answer the following questions:
 - a. What type of Internet access do you have (fiber optics, ADSL, etc.)? Explain its main characteristics (bandwidth, latency, etc.) and include a technical comparison between your type of access and another, such as 5G connections.
 - b. Identify any security device or mechanism on your network (such as a firewall, VPN, etc.) and explain how it protects your network (packet filtering rules, user authentication, etc.).
 - c. What is the model of your router, and what is its default password? Explain the security implications of keeping the default password.
4. In the following link you can see the transoceanic cables that support Internet communications: <https://www.submarinecablemap.com/>. Choose one and find out its technical specifications (bandwidth, physical medium, etc.)

5. The Internet is a network of networks structured in layers (*tiers*) where several ISPs (Internet Service Providers) are interconnected with each other.
 - a. Comment on the different types of ISPs that can be found and what role they play.
 - b. What types of technologies and techniques do Tier 1 ISPs use to interconnect with each other?
 - c. Consult the following web address and locate an IXP in Spain: <https://www.internetexchangemap.com/>. Connect to their website and indicate what peak traffic can be reached in a day.
6. The Internet is based on a protocol stack, so that each layer is seen as a service that is offered to the higher level, and takes advantage of the services of the lower level (vertical communication). At the same time, each layer communicates following a protocol with its counterpart on another machine (horizontal communication).

In the late 1970s, the ISO (International Organization for Standardization) proposed the OSI stack as a model to follow when designing communications networks.

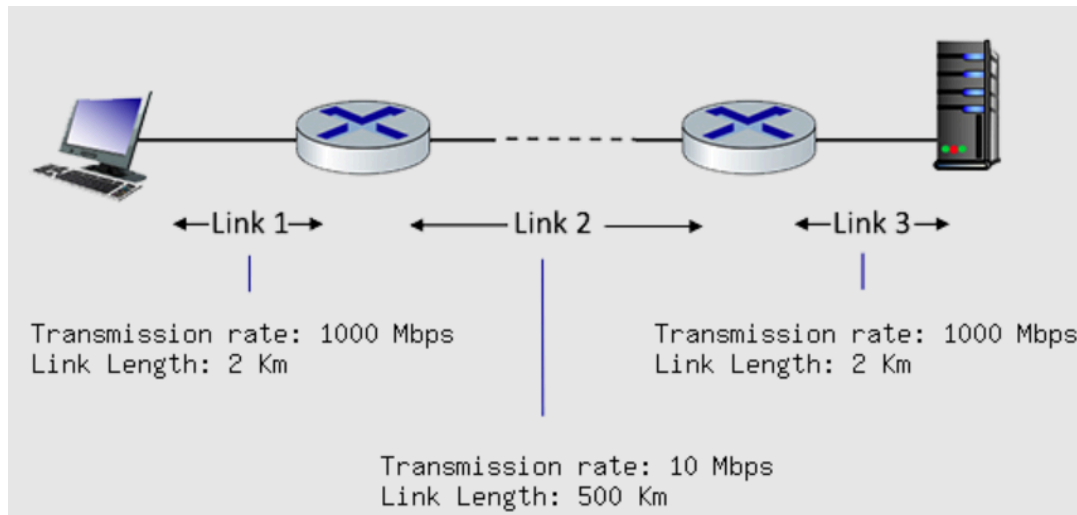
- a. Find information about the OSI model and make a diagram of the two (Internet and OSI) where the similarities and differences are seen.
- b. Briefly explain them.
- c. Find out if there are currently any products or systems that follow the OSI model.

7. In the following figure, four servers are connected to four clients by four three-hop paths. They all share a common link with a transmission capacity of $R = 400$ Mbps. The four links from the servers to the shared link have a transmission capacity of $R_S = 70$ Mbps. Each of the four links from the intermediate shared link to a client has a transmission capacity of $R_C = 40$ Mbps.



- What is the maximum end-to-end throughput, in Mbps, for each of the four client-to-server pairs, assuming the intermediate link is equally shared (divides its transmission rate equally)?
- Which link of all, R_C , R_S , or R is the bottleneck?
- Assuming the servers are transmitting at their maximum possible speed, what is the percentage utilization of the R_S links?
- Assuming the servers are transmitting at their maximum possible speed, what is the percentage utilization of the R_C links?
- Assuming the servers are transmitting at their maximum possible speed, what is the percentage utilization of link R ?

8. In the following figure we see three links, each with the specified transmission rate and length. Assuming that the length of a packet is 4000 bits and that the speed of light propagation delay on each link is 3×10^8 m/s, answer the following questions:



- What is the transmission delay and propagation delay for each link?
 - What is the total delay?
9. The ping command is a network diagnostic tool used to verify connectivity between two hosts. Run a ping against any machine on the Internet and answers the following questions (attach a screenshot of the command output):
- What is the destination IP address?
 - What is icmp_seq ?
 - What is TTL and what does it mean?
 - What does the time field indicate ?
 - Has there been any packet loss?
 - What percentage of packet loss can be considered acceptable in a network?
 - What was the average propagation delay and in what unit of time is it measured?
Depending on what factors can it vary?
10. Find a news story about cybersecurity. Choose one published in the last month (include the date) and detail which concepts from the "*Networks under attack*" section of Kuroses's book are covered in it.