Solutions Networking 1

R1,R19, R23, R24

R1

There is no difference. Throughout this text, the words “host” and “end system” are used interchangeably. End systems include PCs, workstations, Web servers, mail servers, PDAs, Internet-connected game consoles, etc

R19

19. a) 500 kbps
b) 64 seconds
c) 100kbps; 320 seconds

R23

The five layers in the Internet protocol stack are – from top to bottom – the application layer, the transport layer, the network layer, the link layer, and the physical layer. The principal responsibilities are outlined in Section 1.5.1.

R24

Encapsulation is the process of passing a packet from a higher layer to a lower layer. In the simplest case, it simply appends additional information (i.e., a *header*) to the source packet. In more complicated scenarios, the original packet can be split into multiple packets, each carrying its own header. Decapsulation is the opposite process of encapsulation. It extracts the header from a source packet from a lower layer and passes the payload to the higher layer. If lower layer packets are part of a sequence, the corresponding payloads are put together before they are passed to the higher layer. Each protocol in a layer of a protocol stack relies on the services of the lower layers but not on their information. Thus, the information a protocol needs to process a packet should entirely be contained in the header of that protocol. Encapsulation and decapsulation are flexible mechanisms to allow each protocol to operate independently from others while being able to interface with each other.

Øvelser

1) http://gaia.cs.umass.edu/kurose_ross/interactive/end-end-delay.php

   (finds online på siden)

2) http://gaia.cs.umass.edu/kurose_ross/interactive/end-end-throughput.php

   (finds online på siden)

3)

Problem 6

a) $d_{prop} = m/s$ seconds.

b) $d_{trans} = L/R$ seconds.

c) $d_{end-to-end} = (m/s + L/R)$ seconds.

d) The bit is just leaving Host A.

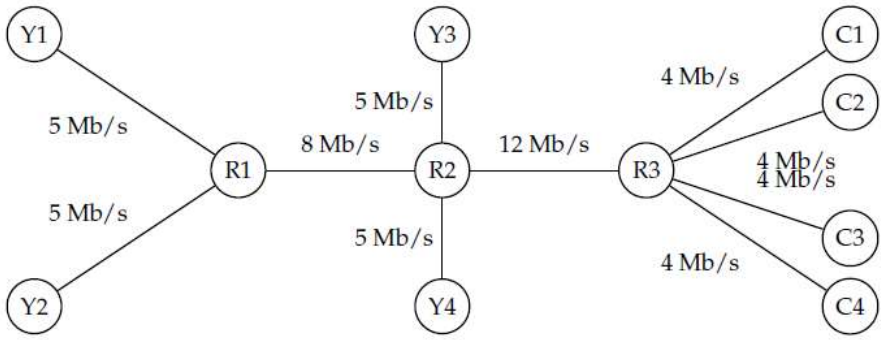
e) The first bit is in the link and has not reached Host B.

f) The first bit has reached Host B.

g) Want

$$m = \frac{L}{R}s = \frac{120}{56\times10^3}\left(2.5\times10^8\right) = 536\,\text{km}.$$

4)



The network shows four servers Y1 to Y4 which host video content and four clients C1 to C4 who are concurrently downloading the video content using FTP from each of these servers (C1 from Y1, C2 from Y2, C3 from Y3 and C4 from Y4). The network is connected using routers R1, R2 and R3 and the transmission rates of the individual links have been outlined in the figure. The end to end throughput experienced by the clients for their download is

- ☐ a) 2 Mb/s
- ☐ b) 3 Mb/s
- ☐ c) 4 Mb/s
- ☐ d) 5 Mb/s

Solution: B)

5)

Problem 25

a) 160,000 bits
b) 160,000 bits
c) The bandwidth-delay product of a link is the maximum number of bits that can be in the link.
d) the width of a bit = length of link / bandwidth-delay product, so 1 bit is 125 meters long, which is longer than a football field
e) s/R

6) Et streaming firma skal have uploadet et ny datasæt på 40 terabytes til en server, der er placeret tæt hos forbrugerne, men et stykke væk fra firmaet. Deres Internet forbindelse til serveren tillader en gennemsnitlig upload hastighed på 100 Mbps. Hvor lang tid tager det? Sammenlig tid og pris med at sende en fysisk pakke med et speditionsfirma med næste-dags levering. Antag firmaet køber en dedikeret forbindelse til serveren, med 10 gange højere kapacitet. Hvor lang tid tager det så? Hvad bliver den gennemsnitlige udnyttelsesgrad af denne, under antagelse af at et nyt datasæt uploades en gang om måneden, og den daglige trafik (email, web-surfing, etc) udgør 20 Mbps i gennemsnit. Overvej de praktiske konsekvenser i scenariet.

40 terabytes = 40 * 10^{12} * 8 bits. So, if using the dedicated link, it will take 40 * 10^{12} * 8 / (100 *10^{6}) =3200000 seconds = 37 days.

1GB forbindelse 3.7 dage.

Udnyttelsesgrad (ex måned): 3.7 dage med 100% + 30 dage med 20Mbps/1Gbps % / 30dage) = 4.3/30% = 14%

Med fysisk forsendelse med næste-dag-levering, kan du garantere at data er klar næste dag til en pris (for international forsendelse) på 500Kr. Send så store data-mængder i en kasse med harddiske vha. et shipping firma!

https://what-if.xkcd.com/31/

Praktiske

- P105 Wireshark Lab.
- Nedenfor har jeg opsnappet en kommunikation til http://www.cs.aau.dk (GET). Reponset på dette er en kode ”301” (Redirect) som fortæller at dokumentet er flyttet til et andet URL, som angiver at HTTPS protokollen skal anvendes. Browserens reaktion er at genindlæse dokumentet ved brug af den nye URL.

  I det midterste vindue er det muligt at udfolde og se headerne på alle niveauer i stakken; her: Ethernet, IP, TCP, http. Prøv at bemærke ”enveloping”/”encapsulation” (I skal ikke forstå indholdet af headerne endnu).

Bemærk at der bliver sendt og modtaget ganske mange pakker selv i et kort scenarie, så det er normal nødvendigt at sætte filtre op, så man kun får vist de pakker der er interessante for det I kigger efter.