NETWORKS 2017 VİZEDE ÇIKABİLECEK PROBLEMLER
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Şu formülleri ezberle

d_{prop} = length of link/speed over link = m/s seconds.

d_{trans} = packet length/link bandwidth = L/R seconds.

$d_{\text{end-to-end}} = d_{\text{prop}} + d_{\text{trans}} = m/s + L/R$ seconds.

$$1 \text{ Byte} = 8 \text{ bits}, 1 \text{ Mbps} = 10^6 \frac{\text{bits}}{\text{sec}}, 1 \text{ Gbps} = 10^9 \frac{\text{bits}}{\text{sec}}, 1 \text{ ms} = 10^{-3} \text{ sec}.$$

P25. Suppose two hosts, A and B, are separated by 20,000 kilometers and are connected by a direct link of *R* = 2 Mbps. Suppose the propagation speed over the link is 2.5 x10^8 meters/sec.

a. Calculate the bandwidth-delay product, *R* x *d*prop.

b. Consider sending a file of 800,000 bits from Host A to Host B. Suppose the file is sent continuously as one large message. What is the maximum number of bits that will be in the link at any given time?

c. Provide an interpretation of the bandwidth-delay product.

d. What is the width (in meters) of a bit in the link? Is it longer than a football field?
(Bağlantıdaki bir bit genişliği (metre cinsinden) nedir? Bir futbol sahasından daha mı uzun sürüyor?)

e. Derive a general expression for the width of a bit in terms of the propagation speed *s,* the transmission rate *R,* and the length of the link *m*.

Answer:

a) (dprop=Propagation Delay demek)
Km' yi metre' ye çevir. 20,000 km=20,000,000 m
dprop=distance/speed
dprop=(20,000,000)/2.5x10^8=0.8
Rxdprop=2x0,8=1,6 Mbps =160,000 bits

b) Min(bandwidth delay product, packet size) = Min(160,000 , 800,000)=160,000 bits

c) The bandwidht-delay product of a link is the maximum number of bits that can be in the link. *(Bir bağlantının bant genişliği gecikmesi ürünü, ağda bulunabilen maksimum bit sayısıdır)*

d) The widht of a bit=lenght of link / bandwidth-delay product, so 1 bit is 125 meters long, which is longer than a football field
Bit genişliği = bağlantı uzunluğu veya bant genişliği gecikmeli ürün olduğundan bu yüzden bit 125 metre uzunluğunda, bu da bir futbol sahasından daha uzun

e) m/((m/s)*R) = s/R

P26. Referring to problem P25, suppose we can modify *R*. For what value of *R* is the width of a bit as long as the length of the link?

Answer:

Kilometre' yi metre' ye çevir 20,000 km=2x10^7 m

s/*R*=20000km, then *R*=*s*/20000km= $2.5*10^8/(2*10^7)$= 12.5 bps

P27. Consider problem P25 but now with a link of *R* = 1 Gbps.

a. Calculate the bandwidth-delay product, *R* x *d*prop.

b. Consider sending a file of 800,000 bits from Host A to Host B. Suppose the file is sent continuously as one big message. What is the maximum number of bits that will be in the link at any given time?

c. What is the width (in meters) of a bit in the link?

Answer:

a) (dprop=Propagation Delay demek)
   Km' yi metre' ye çevir. 20,000 km=20,000,000 m
   R=1 Gbps=1024 Mbps (1000 olarak aldım)
   dprop=distance/speed
   dprop=(20,000,000)/2.5x10^8=0.8
   Rxdprop=1000x0,8=800 Mbps =800,000,000 bits
b) 800,000 bits, this is because that the maximum number of bits that will be in the link at any given time = Min(bandwidth delay product , packet size) = 800,000 bits.
c) 125 meters

P28. Refer again to problem P25.

a. How long does it take to send the file, assuming it is sent continuously?

b. Suppose now the file is broken up into 20 packets with each packet containing 40,000 bits. Suppose that each packet is acknowledged by the receiver and the transmission time of an acknowledgment packet is negligible. Finally, assume that the sender cannot send a packet until the
preceding one is acknowledged. How long does it take to send the file?

c. Compare the results from (a) and (b).

Answer:

ttrans=tranmission delay , tprop=propagation delay

a) $t_{trans} + t_{prop}$ = 400 msec + 80 msec = 480 msec.
b) 20 * ($t_{trans} + 2\ t_{prop}$) = 20*(20 msec + 80 msec) = 2 sec.
c) Breaking up a file takes longer to transmit because each data packet and its corresponding acknowledgement packet add their own propagation delays.

c) (Bir dosyanın parçalanması daha uzun iletilir, çünkü her veri paketi ve karşılık gelen onaylama paketi kendi yayılım gecikmelerini ekliyor.)

P29. Suppose there is a 10 Mbps microwave link between a geostationary satellite and its base station on Earth. Every minute the satellite takes a digital photo and sends it to the base station. Assume a propagation speed of 2.4 x 10^8 meters/sec.The distance between earth and geostationary satellite approach to 3.6 x10^7m.

a. What is the propagation delay of the link?
b. What is the bandwidth-delay product, $R \cdot d$prop?
c. Let x denote the size of the photo. What is the minimum value of x for the microwave link to be continuously transmitting?

Answer:

Recall geostationary satellite is 36,000 kilometers away from earth surface.

a) 150 msec
b) 1,500,000 bits
c) 600,000,000 bits

(a)$dprop = 3.6 \cdot 10^7 / (2.4 \cdot 10^8) = 0.15$ s

(b) $R \cdot dprop = 10^7 \cdot 0.15 = 1.5 \cdot 10^6$ bits

(c)$X = 10^7 \cdot 60 = 6 \cdot 10^8$ bits

CHAPTER II

P22. Consider distributing a file of $F = 25$ Gbits to N peers. The server has an upload rate of $us = 30$ Mbps, and each peer has a download rate of $di = 2$ Mbps and an upload rate of u. For $N = 10$, 100, and 1,000 and $u = 300$ Kbps, 700 Kbps, and 2 Mbps, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both client-server distribution and P2P distribution.

Answer:

For calculating the minimum distribution time for client-server distribution, we use the following formula:

$D_{cs} = max\ \{NF/u_s, F/d_{min}\}$

Where, $F = 25\ Gbits = 25 * 1024\ Mbits = 25{,}600\ Mbits$
$u_s = 30\ Mbps$
$d_{min} = d_i = 2\ Mbps$

Note, 300Kbps = 300/1024 Mbps.

Client Server

	10	100	1000
300	12800	85333.33333	853333.3333
700	12800	85333.33333	853333.3333
2000	12800	85333.33333	853333.3333

Peer to Peer
Similarly, for calculating the minimum distribution time for P2P distribution, we use the following formula:

$$D_{P2P} = max\{F/u_s, F/d_{min}, NF/(u_s + \sum_{i=1}^{N} u_i)\}$$

	10	100	1000
300	12800	43172.59552	79264.63474
700	86687.83069	87174.56616	87268.59322
2000	87278.23592	87278.81088	87278.92121