

## HW #3: Networking Questions

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### Bit Stuffing.

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(a) A bit string, 100111110010111100011, needs to be transmitted at the data link layer. What is the string transmitted across the Link after bit stuffing by the sender, assuming the bit stuffing scheme shown in the lecture slides?

**My answer:**

01111110 1001111101001011111000011 01111110

(b) A frame is received by the data link layer, which was transmitted using bit stuffing: 011111100011111011001111100110111110. What is the bit string that the link layer passes up the stack to the network layer after bit de-stuffing, assuming the bit stuffing scheme shown in the lecture slides?

**My answer:**

~~01111110~~ 001111101100111110011 ~~01111110~~ => 001111110011111011

### Link Layer Protocols.

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A channel has a bit rate of 4 kilobits per second and a propagation delay of 20 milliseconds. For what range of frame sizes does stop-and-wait give a link utilization efficiency of at least 50%?

**My answer:**

Bit rate = 4 kbps

Propagation delay = 20 ms

$$efficiency = \frac{transmission\_time\_of\_packet}{transmission\_time\_of\_packet + 2 * propagation\_delay}$$

$$0.5 = \frac{xsec}{xsec + 2 * 20 * 10^{-3}sec} \Rightarrow x = 40 * 10^{-3}sec$$

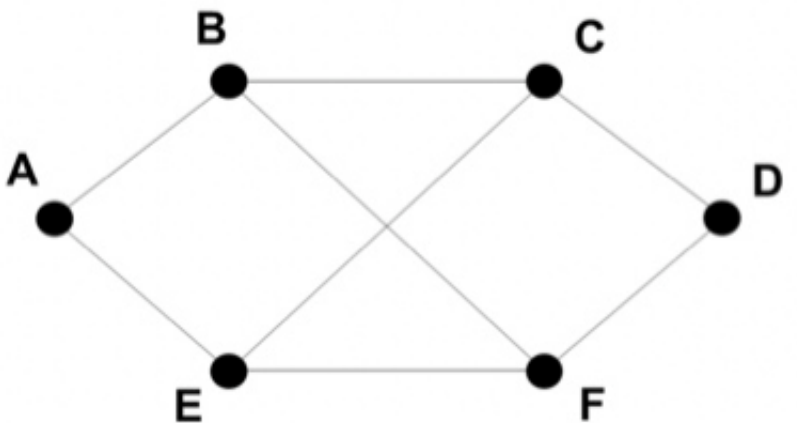
$$\frac{minimum\_frame\_size}{bit\_rate} = 40 * 10^{-3}sec$$

$$minimum\_frame\_size = 40 * 10^{-3}sec \cdot 4 * 10^3bits/sec = 160bits$$

Therefore, when the frame sizes is greater than **160bits**, stop-and-wait give a link utilization efficiency of at least **50%**.

## Distance Vector Routing.

Consider the subnet shown below. Distance vector routing is used, and the following vectors (showing the cost from each node) have just come in to router C: from B: (5, 0, 9, 12, 6, 2); from D: (16, 12, 6, 0, 9, 10); and from E: (7, 6, 3, 9, 0, 4). The measured delays from C to B, D, and E are 6, 6, and 3, respectively. What will C's new routing table be after this update? Show both the outgoing line to use and the expected delay.



My answer:

Destination	Cost	Next Hop
A	10	E
B	6	B
C	0	/

D	6	D
E	3	E
F	7	E

## TCP Sequence Numbers.

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To get around the problem of sequence numbers wrapping around while old TCP packets still exist, TCP could use 64-bit sequence numbers instead of 32 bits. However, theoretically an optical fiber can run at 75 Terabits per second. What maximum packet lifetime would be required to prevent sequence number wrap-around even with 64-bit sequence numbers? Assume that each byte of a packet has its own sequence number (as TCP does).

**My answer:**

The size of data is:  $2^{64} \text{ bytes}$ , which is  $2^{64} * 8 = 2^{67} \text{ bits}$

The optical fiber run at  $75 \text{ Tbps}$ , that is  $75 * 2^{40} \text{ bits/sec}$

The time to transmit the data would spend

$$\frac{2^{67} \text{ bits}}{75 * 2^{40} \text{ bits/sec} * 86400 \text{ sec/day}} = 20.7 \text{ days}$$

The maximum packet lifetime would be  $20.7 \text{ days}$ .

## DNS.

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Using an online whois lookup service like whois.net, look up duke.edu. On what date was the domain registered? When does it expire? What are the DNS servers for this domain? Include a screenshot of your source.

**My answer:**

- Creation Date: 1986-06-02T04:00:00Z
- Registry Expiry Date: 2021-07-31T11:59:59Z
- Name Server
  - DNS-AUTH-01.OIT.DUKE.EDU

- DNS-AUTH-02.OIT.DUKE.EDU
- DNS-NC1-01.OIT.DUKE.EDU



## WHOIS LOOKUP



**duke.edu is already registered\***

Domain Name: DUKE.EDU  
Registry Domain ID: 5059\_DOMAIN\_EDU-VRSN  
Registrar WHOIS Server: whois.educause.net  
Registrar URL: <http://www.educause.edu/edudomain>  
Updated Date: 2018-06-08T13:57:29Z  
Creation Date: 1986-06-02T04:00:00Z  
Registry Expiry Date: 2021-07-31T11:59:59Z  
Registrar: Educause  
Registrar IANA ID: 365  
Registrar Abuse Contact Email:  
Registrar Abuse Contact Phone:  
Domain Status: clientDeleteProhibited <https://icann.org/epp#clientDeleteProhibited>  
Domain Status: clientTransferProhibited <https://icann.org/epp#clientTransferProhibited>  
Domain Status: clientUpdateProhibited <https://icann.org/epp#clientUpdateProhibited>  
Name Server: DNS-AUTH-01.OIT.DUKE.EDU  
Name Server: DNS-AUTH-02.OIT.DUKE.EDU  
Name Server: DNS-NC1-01.OIT.DUKE.EDU  
DNSSEC: unsigned

## Internet Services.

Using netcat (the 'nc' command) in a terminal, manually display the following URL to the console.

<http://rabihyounes.com/awesome.txt>

**My answer:**

```
nc rabihyounes.com 80
```

```
GET /awesome.txt HTTP/1.1  
Host: rabiyounes.com
```

Output:

```
~ nc rabiyounes.com 80  
GET /awesome.txt HTTP/1.1  
Host: rabiyounes.com  
  
HTTP/1.1 200 OK  
Server: nginx/1.14.1  
Date: Mon, 25 Feb 2019 02:15:24 GMT  
Content-Type: text/plain  
Content-Length: 2360  
Connection: keep-alive  
Last-Modified: Fri, 08 Feb 2019 18:43:41 GMT  
Accept-Ranges: bytes  
Cache-Control: max-age=604800  
Expires: Mon, 04 Mar 2019 02:15:24 GMT  
Vary: Accept-Encoding  
X-Endurance-Cache-Level: 4
```



