1. List the basic components of Internet stack.

> - hosts = end systems
> - communnication links
> - routers

2. List the types of access networks. At least five types.

> Digital Subscriber Line (DSL), cable modems, Fiber to the home, Ethernet internet access, Wireless access networks.

3. What is Protocol? (很重要！！)

> Protocols define format, order of messages sent and received among network entities, and actions taken on message transmission, receipt

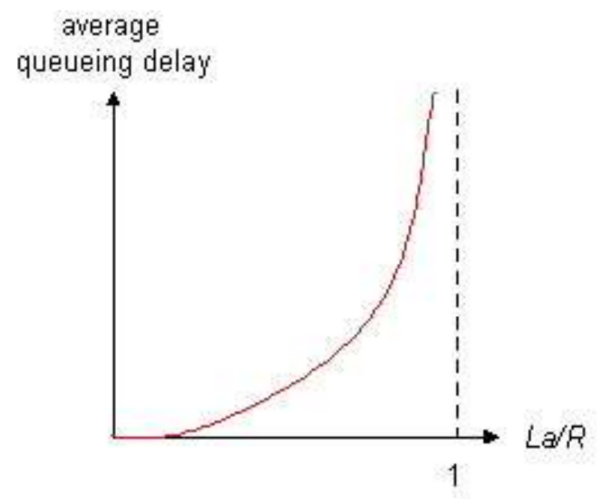
4. What is packet switching?

> Each end-end data stream divided into packets
>
> > - User A, B packets share network resources
> > - Each packet uses full link bandwidth
> > - Resources used as needed
>
> Sequence of A & B packets does not have fixed pattern, bandwidth shared on demand -> statistical multiplexing
>
> store and forward: entire packet must arrive at router before it can be transmitted on next link

5. What is Nodal Delay Mode? (很重要！！)

> Nodal Delay is the summation of processing delay, queuing delay, transmission delay, propagation delay
>
> $$d_{nodal} = d_{porc} + d_{queue} + d_{trans} + d_{prop}$$

6. What is the delay that can be very large, and why it is?

> Queuing delay can be very large
>
> If its traffic intensity La/R is larger than 1, average queuing delay can reach infinite
>
> When $La/R < 1$, queuing delay is calculated as $I(L/R)(1-I)$ and $I = La/R$
>
> 所以 average queuing delay 呈平方成長
>
> 
>

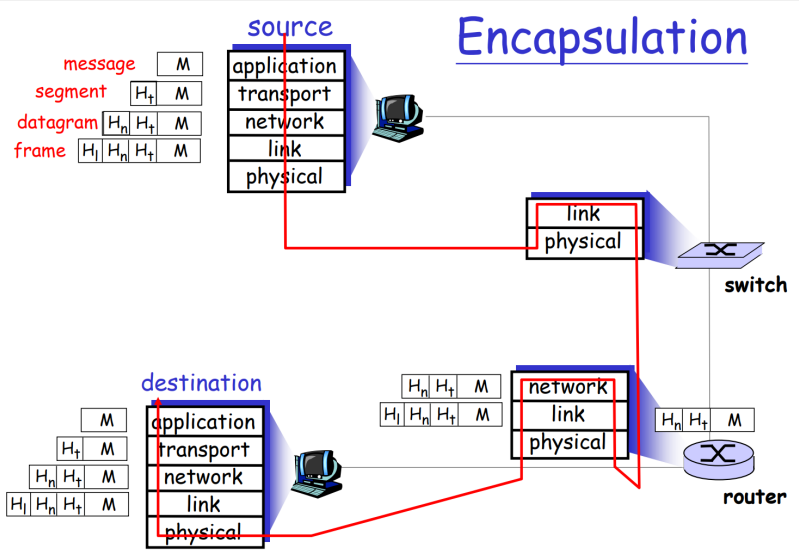
7. What are the five layers of Internet Protocol stack and their functionalities? (很重要！！)

> application: supporting network applications
>
> - FTP, SMTP, HTTP
>
> transport: process-process data transfer
>
> - TCP, UDP
>
> network: routing of datagrams from source to destination
>
> - IP, routing protocols
>
> link: data transfer between neighboring network elements
>
> - PPP, Ethernet
>
> physical: bit "on the wire"

8. What is the characteristics of layering design in Internet Protocol stack?

> Explicit structure allows identification, relationship of complex system's pieces
>
> Modularization eases maintenance, updating of system

9. How does encapsulation work in internet protocol stack?

> 是一種通訊協定的設計方法，將網路功能抽象出來，對高層功能隱藏底層功能的資訊。
>
> 封包在傳遞的過程中，所經過的layer並不相同，如下圖所示，在link-layer switch以及router裡面，packet作用的service在後面三層，而在end system才有到頭兩層，在層數往下的過程中，都會加入header information作為保護的手段，如圖中的Ht、Hn，因此我們可以依圖所例，得知每個層級都會有兩個type of fields，一者為前一層帶下來的packet，一者為每層級的header information。
>
> 在每個層級都會在封裝前個層級的封包，這就是封裝的概念。
>
> 
>

10. What are the layers that the hub, switch and router handle the packets?

> network, link, physical