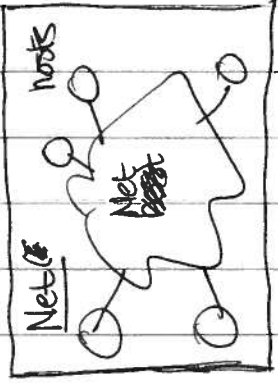


(start with slides)

Universality (E): (everyone sees net as all apps)
 value of net to me $\approx O(N)$
 value of net $\approx O(N^2)$
 \Rightarrow interoperability \Rightarrow standards
 \Rightarrow Net is black box



\rightarrow look inside cloud.

Utilization (E)

- Overprovision -> expensive
- Feedback w. feedback interface to cloud
- Throwaway

retransmit at hosts/net
 \downarrow
 dumb vs. smart net

peak to valley high (slide?)

Errors (P+G)

- analog
- backhoes
- switch failures
- operational errors
- deliberate

Expensive to repair

Topology (E) -> perfect cost

- N^2 wires
- star/hub (airlines) reliability bad.
- mesh \Rightarrow finding paths \Rightarrow shortest switching \Rightarrow shortest path

slide MIT topology?
 fix picture of net \rightarrow No N^2 wires.

Addressing (G)

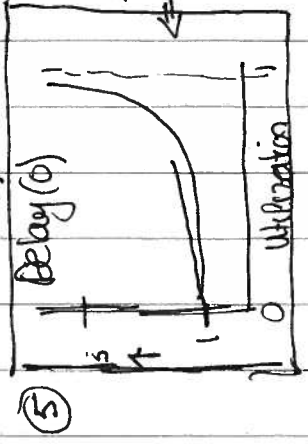
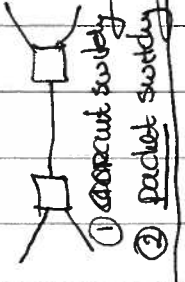
Ideal: no structure
 routing on flat ID open problem
 Problem: addresses hints
 at location 18.x.x.x

Application independent

Sharing (E)

- ① circuit switch \Rightarrow synchronous
- ② packet switch \Rightarrow asynchronous

slides \Rightarrow remain for some out
 \Rightarrow in and out may differ greatly.



Speed of Light

foot/ns \Rightarrow cost 14 msec
 300m per usec
 \Rightarrow challenge control algorithms