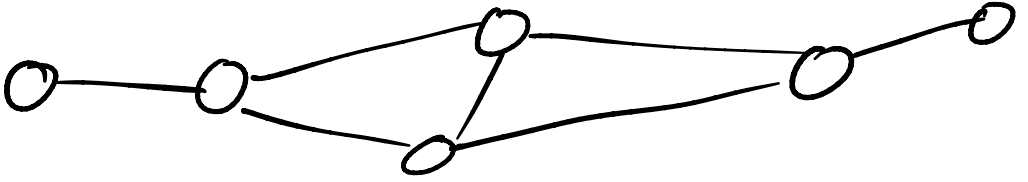
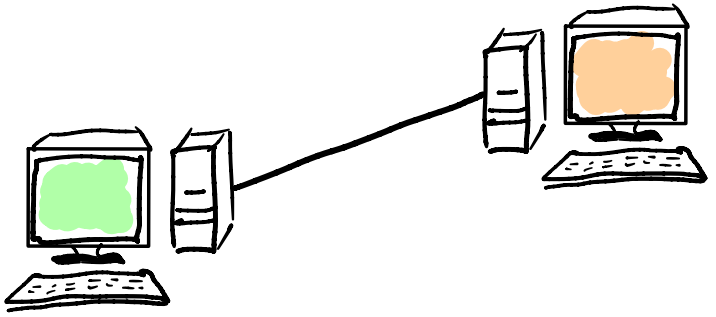
Lecture 1

Internet

as an infrastructure

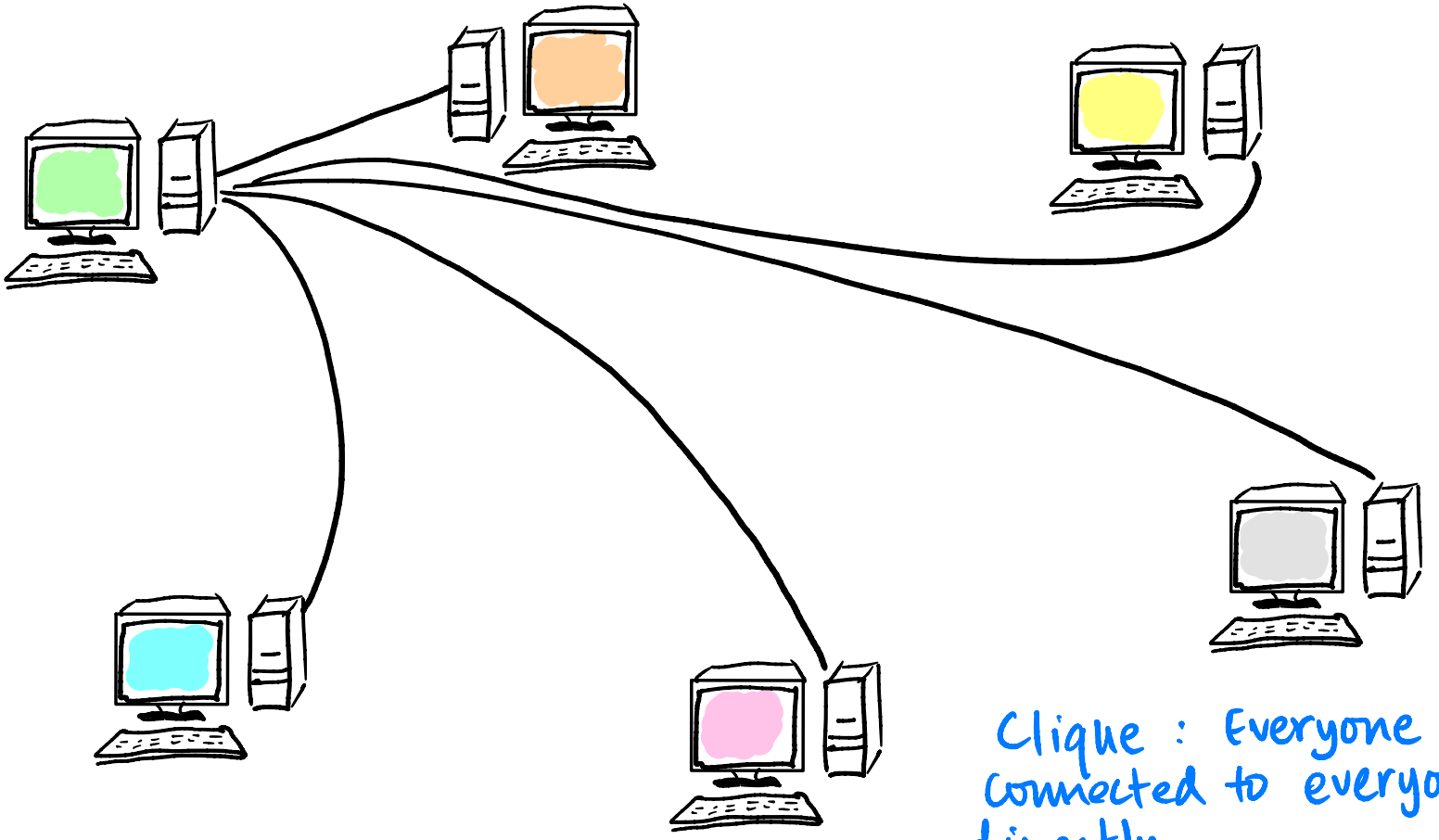


From computing to communication (connecting you and me)



But connecting everyone → how many connections ?

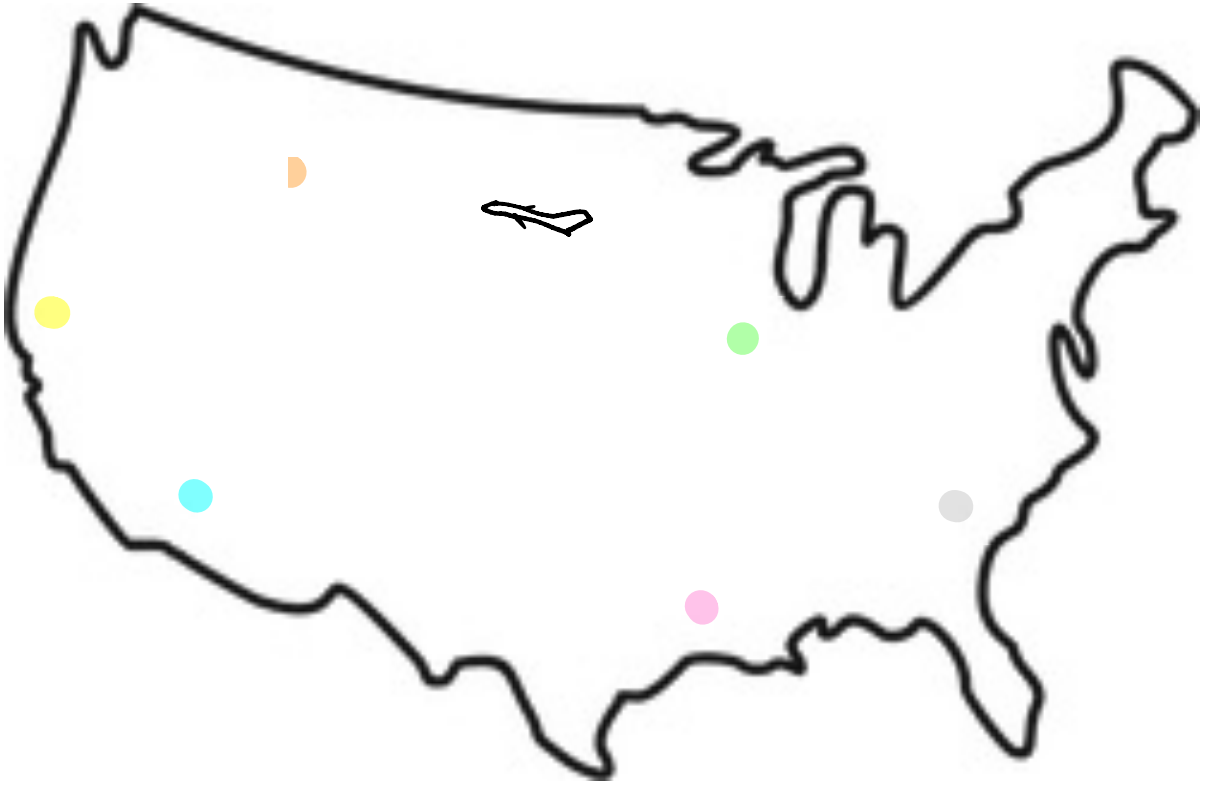
- Clique
- $N C_2$
- Ports
- cost



Clique : Everyone connected to everyone directly

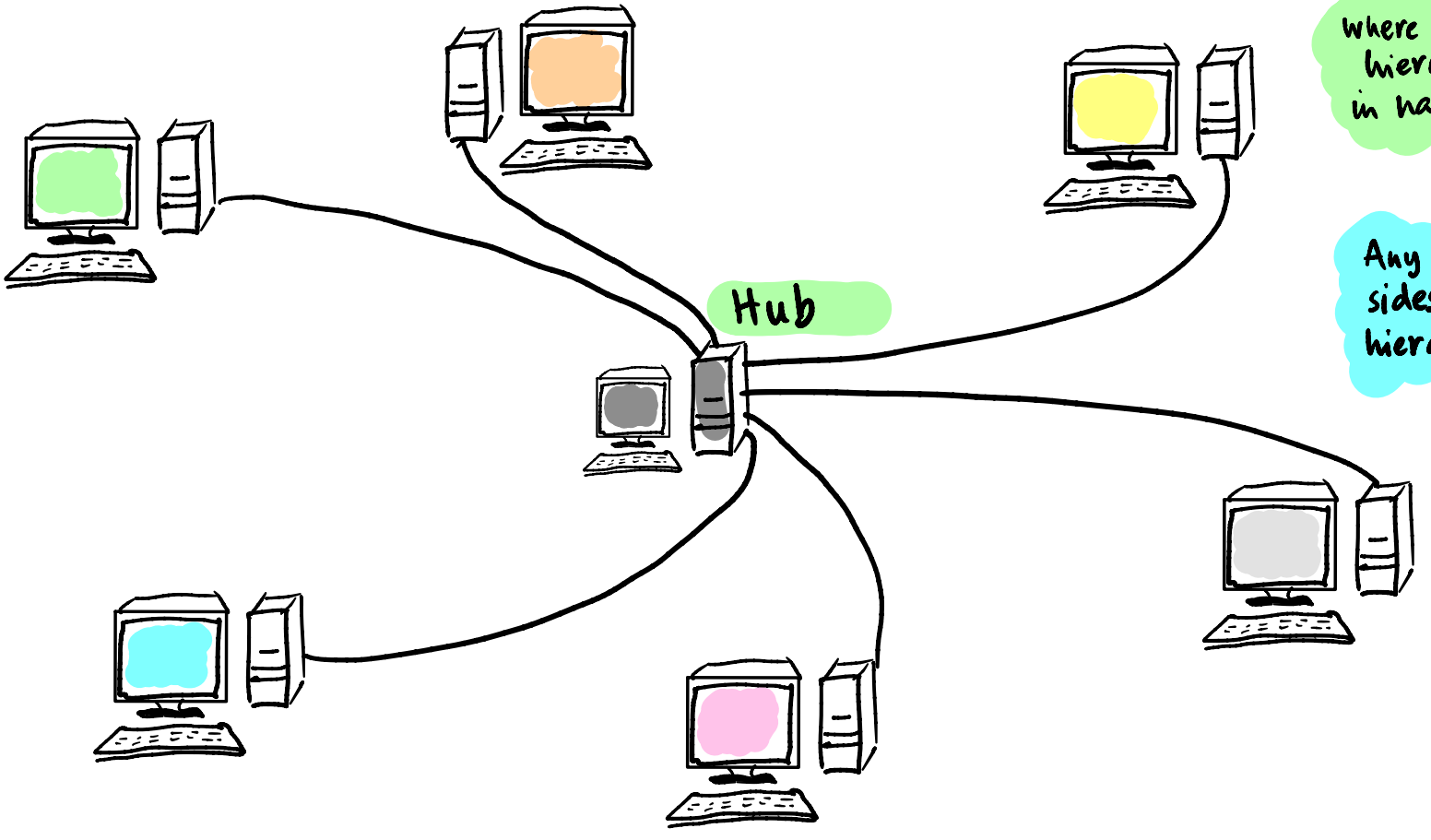
Similar Problems in other walks of life ?

What's the solution?



Hierarchy

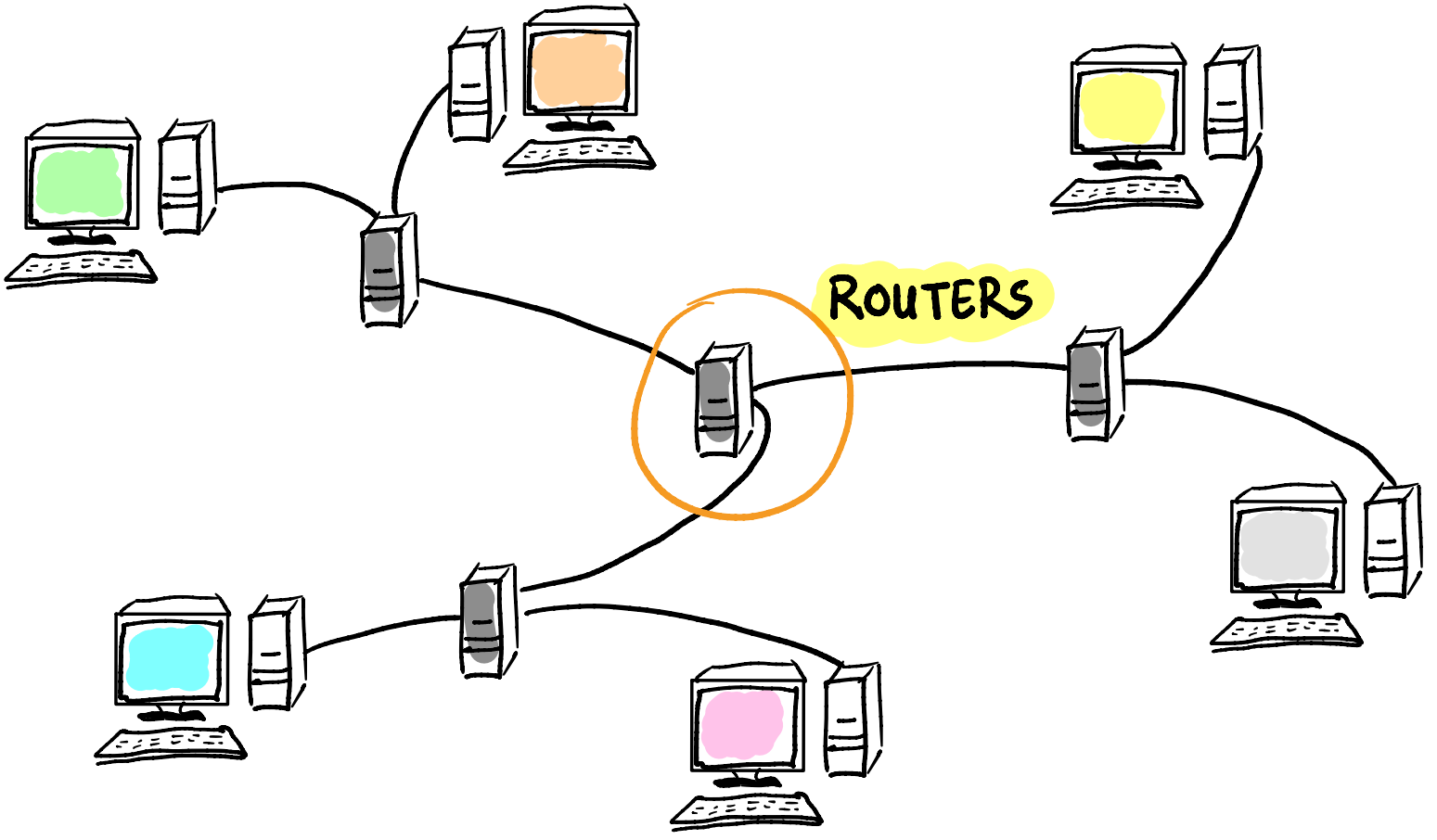
Hierarchy → Permeates natural & man-made efficiency

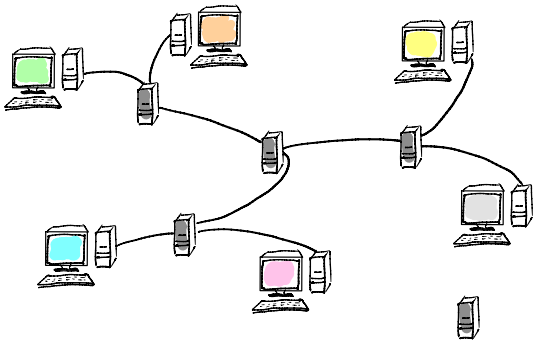


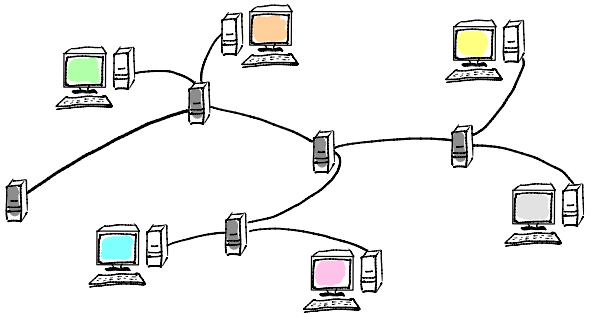
where is hierarchy in nature?

Any down sides of hierarchy?

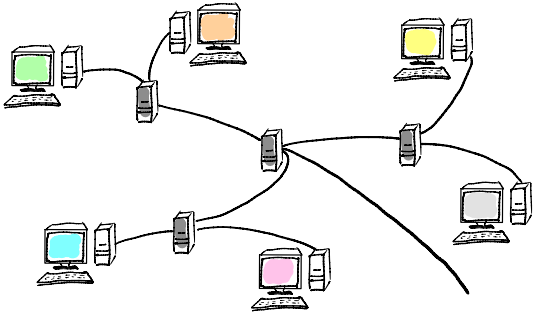
Hierarchy of Hierarchy → Why not Keep going?

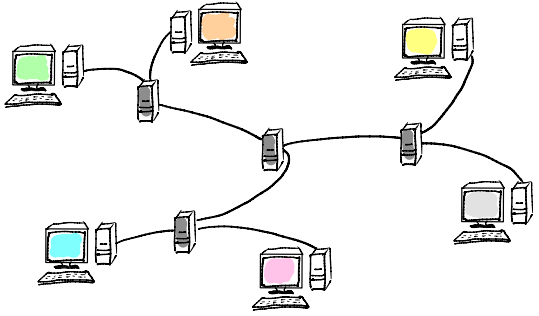


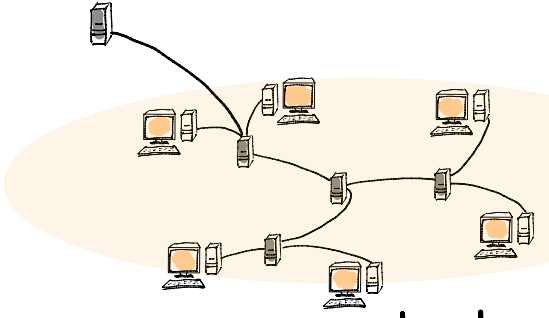




can UIUC join the hierarchy?



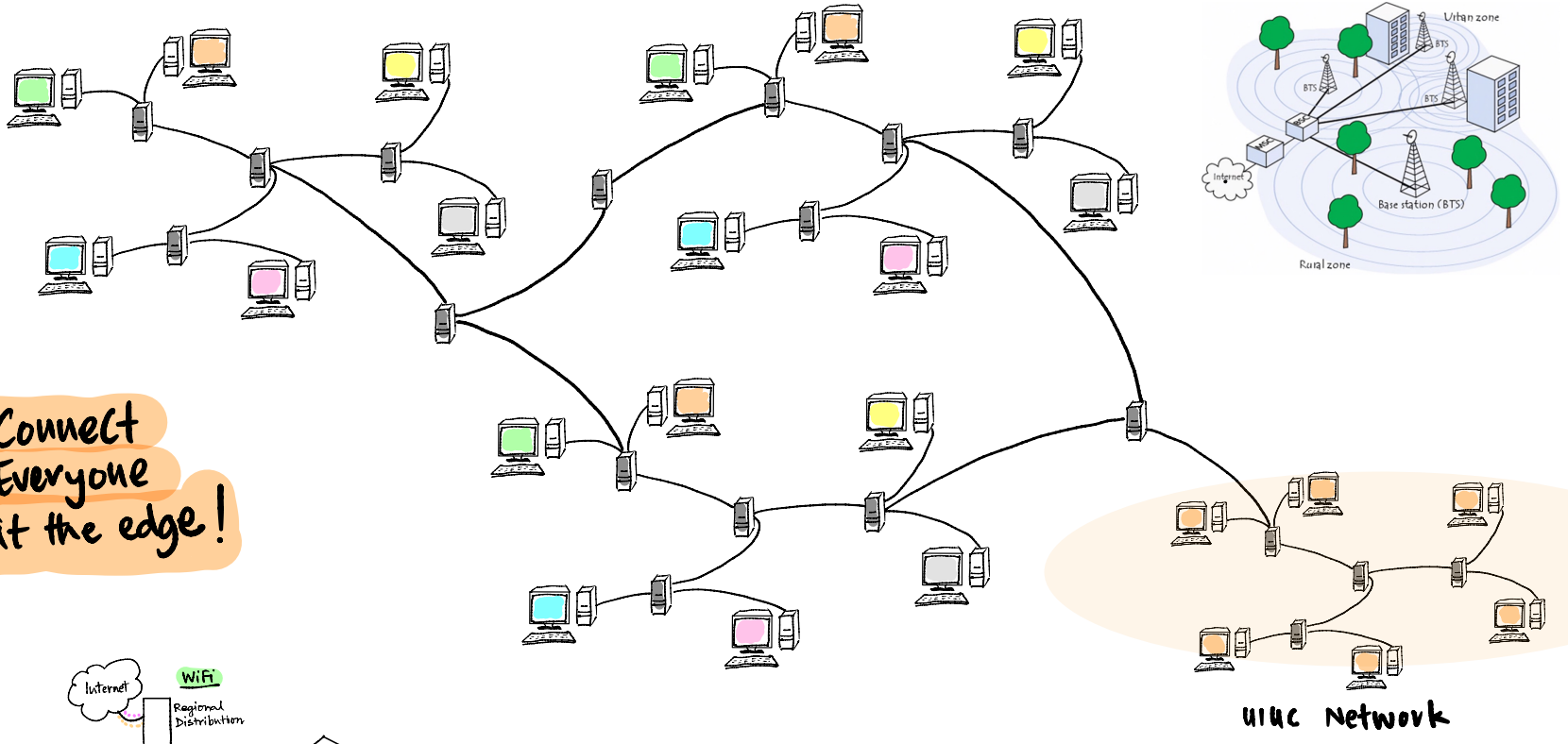




UIUC network

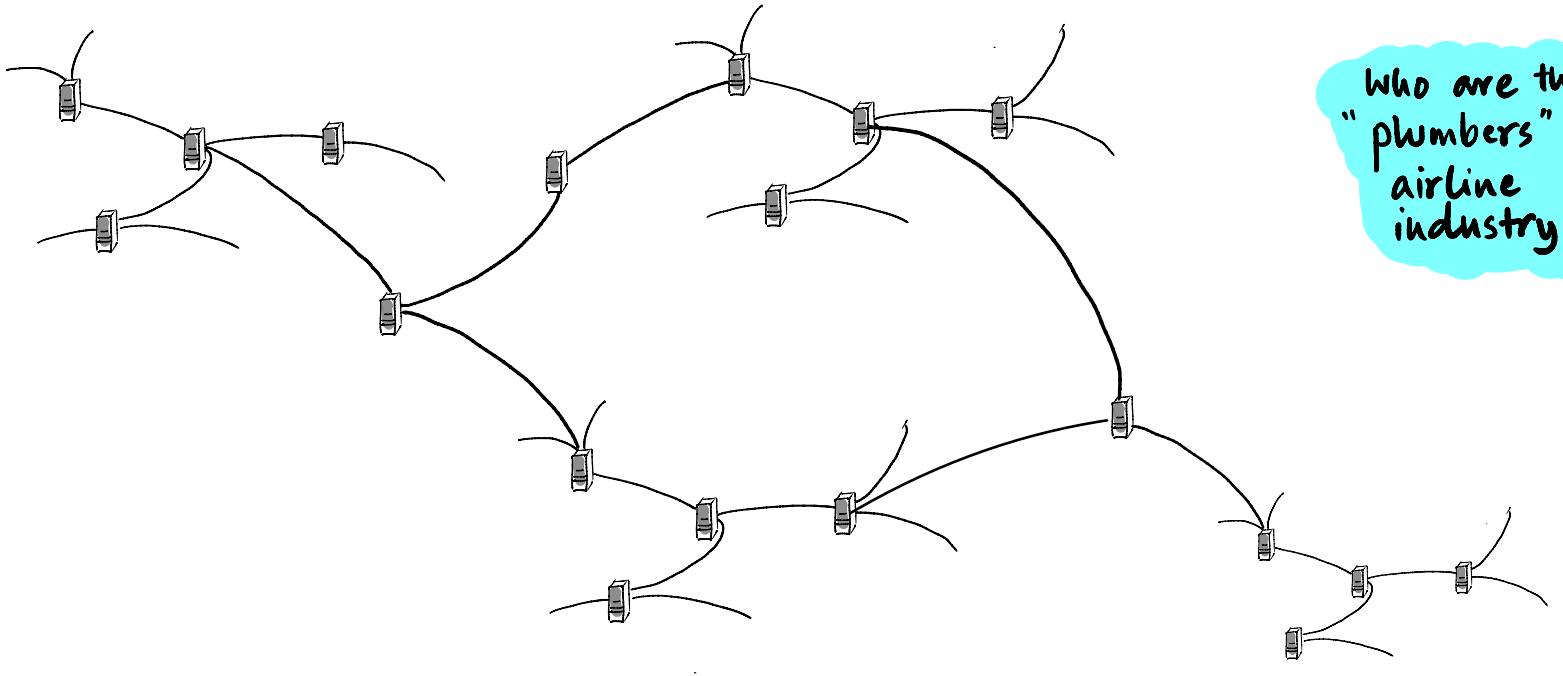
Topology Design to prevent network disconnections.

what about failure, disconnection?


Urban zone
BTS
BTS
BTS
Internet
Base station (BTS)
Rural zone
Connect Everyone at the edge!
Internet
WiFi
Regional Distribution
Distribution hub
UHC Network
Iss

Who is doing the "plumbing", maintaining, managing? ISPs

Who owns routers?

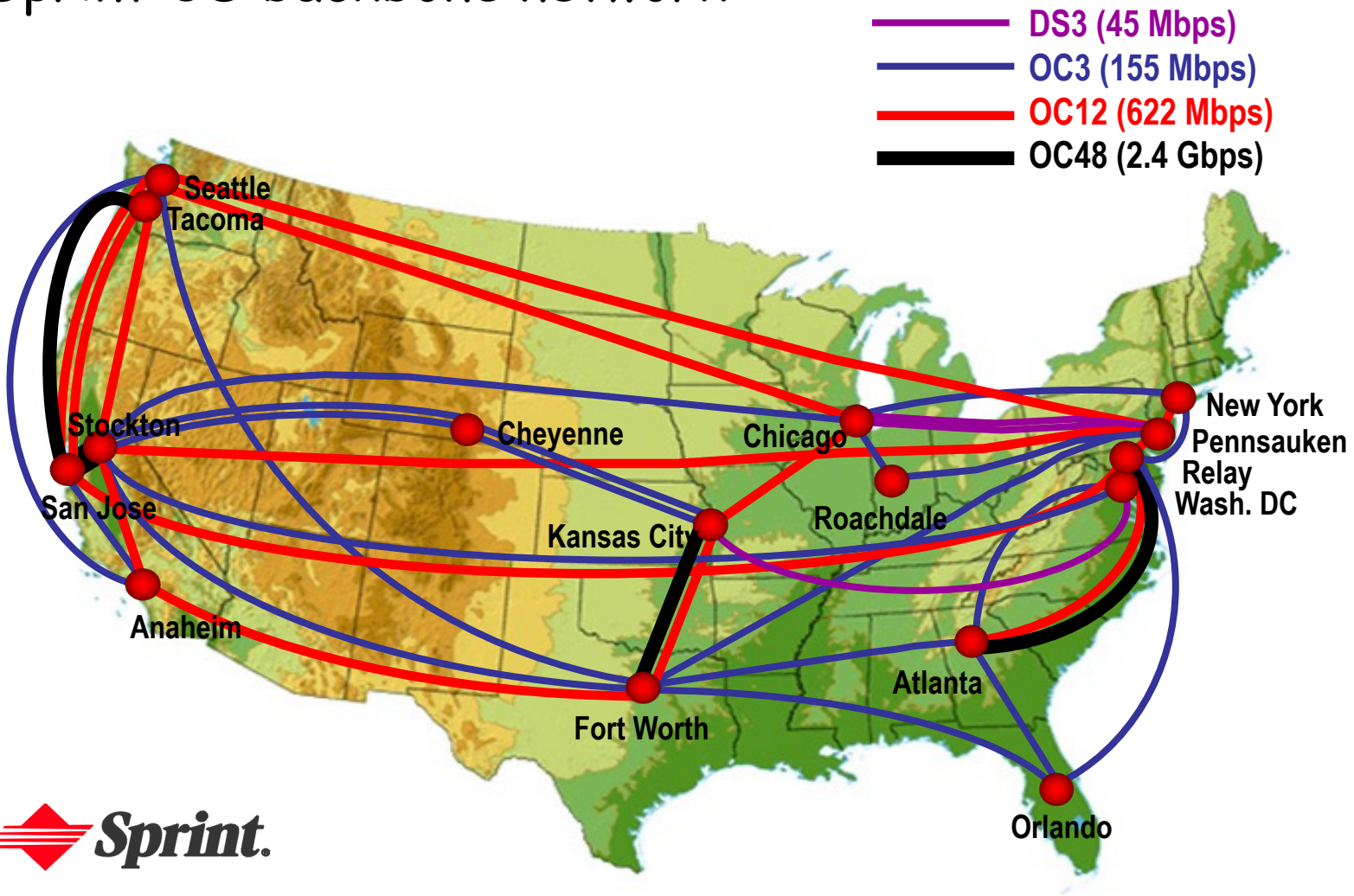


Who are the "plumbers" in airline industry?

Can 1 ISP cover the whole world?

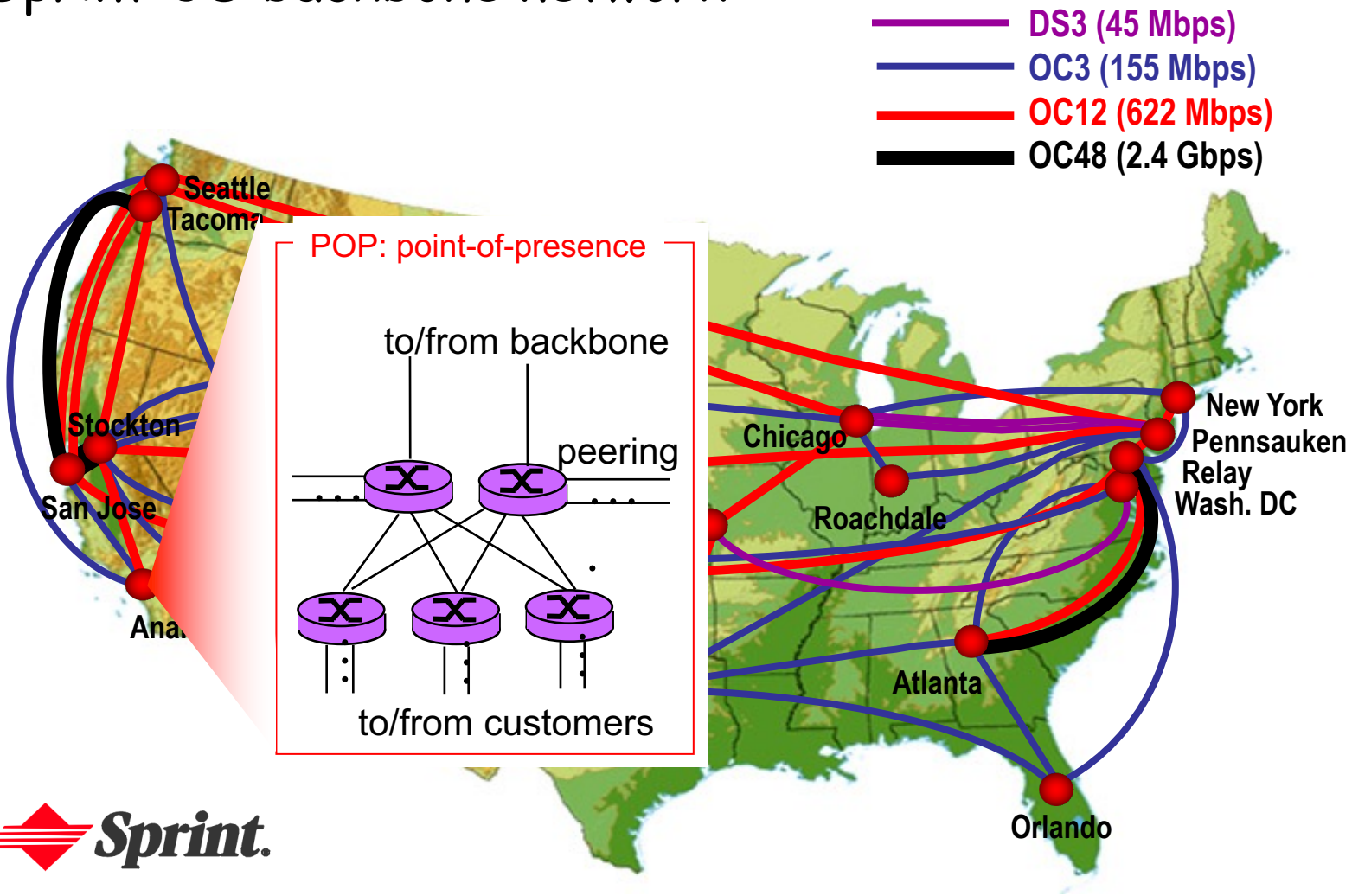
Tier-1 ISP: e.g., Sprint

Sprint US backbone network

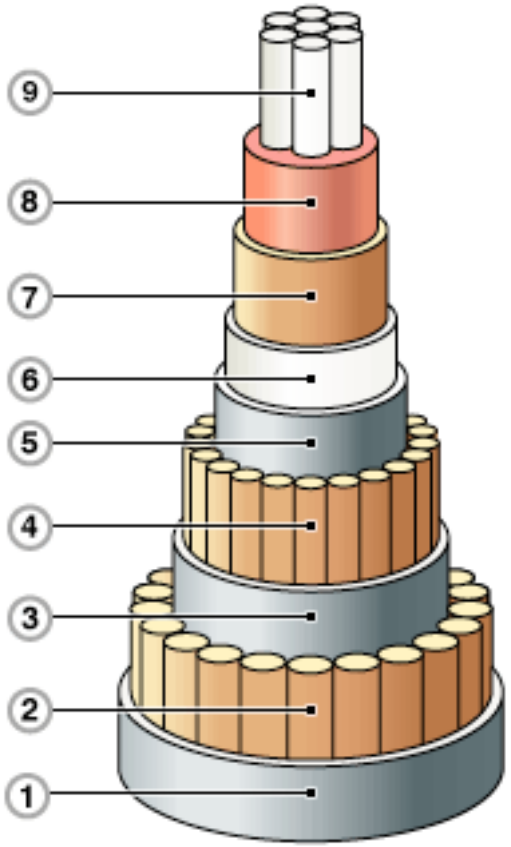


Tier-1 ISP: e.g., Sprint

Sprint US backbone network

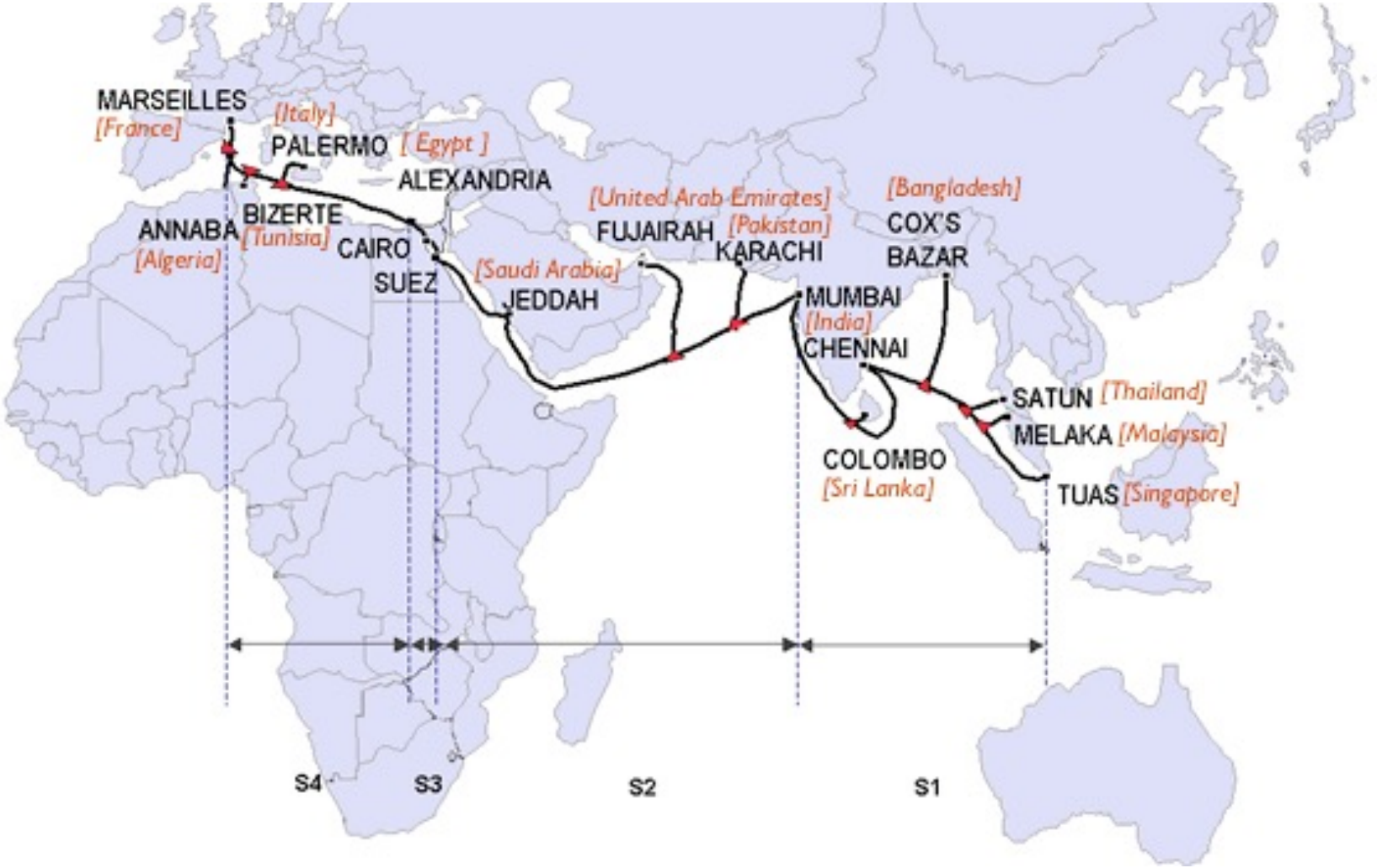


Cables Laid Out in the Oceans

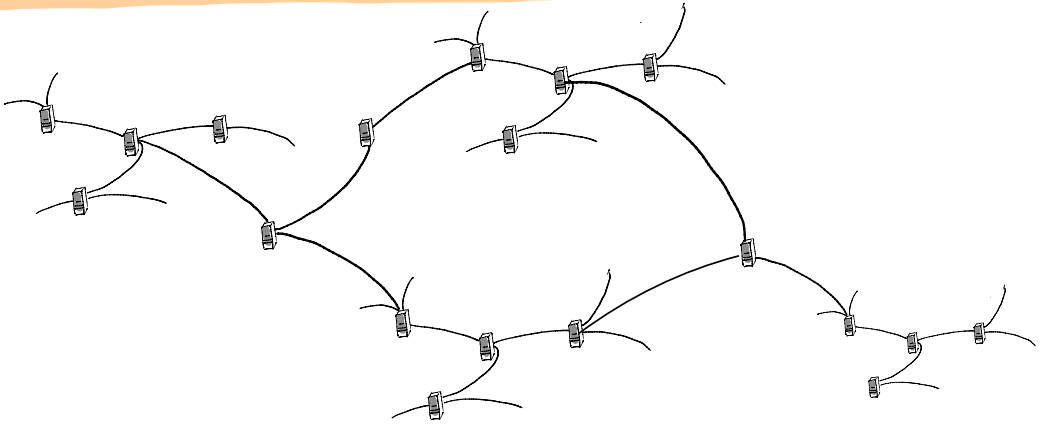


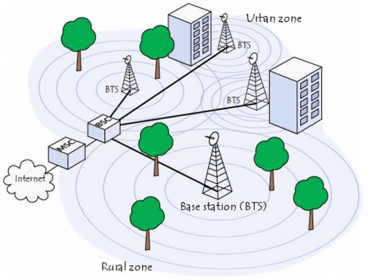
Optical Fiber cross-section

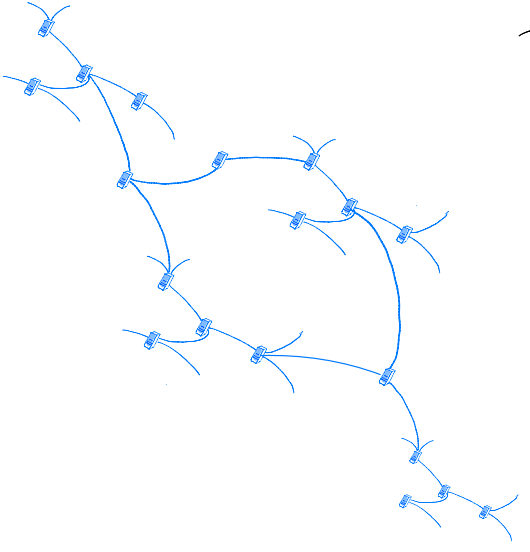
Cable Connections carry 95% traffic (rest?)

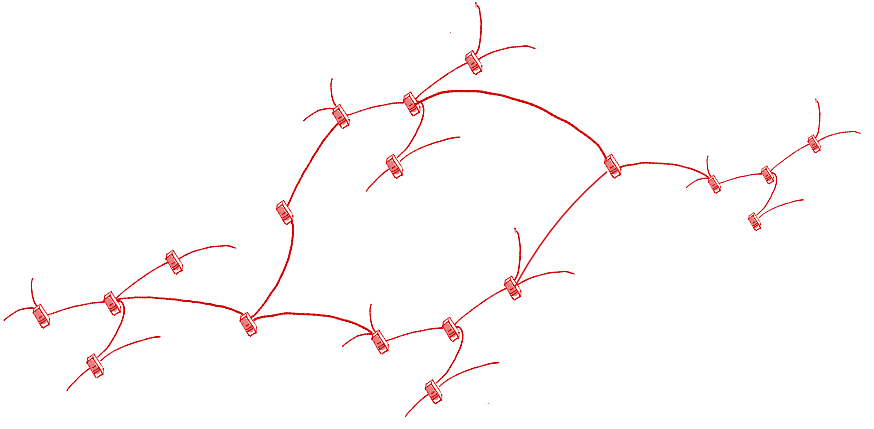


Tier 1, 2, 3 Service Providers



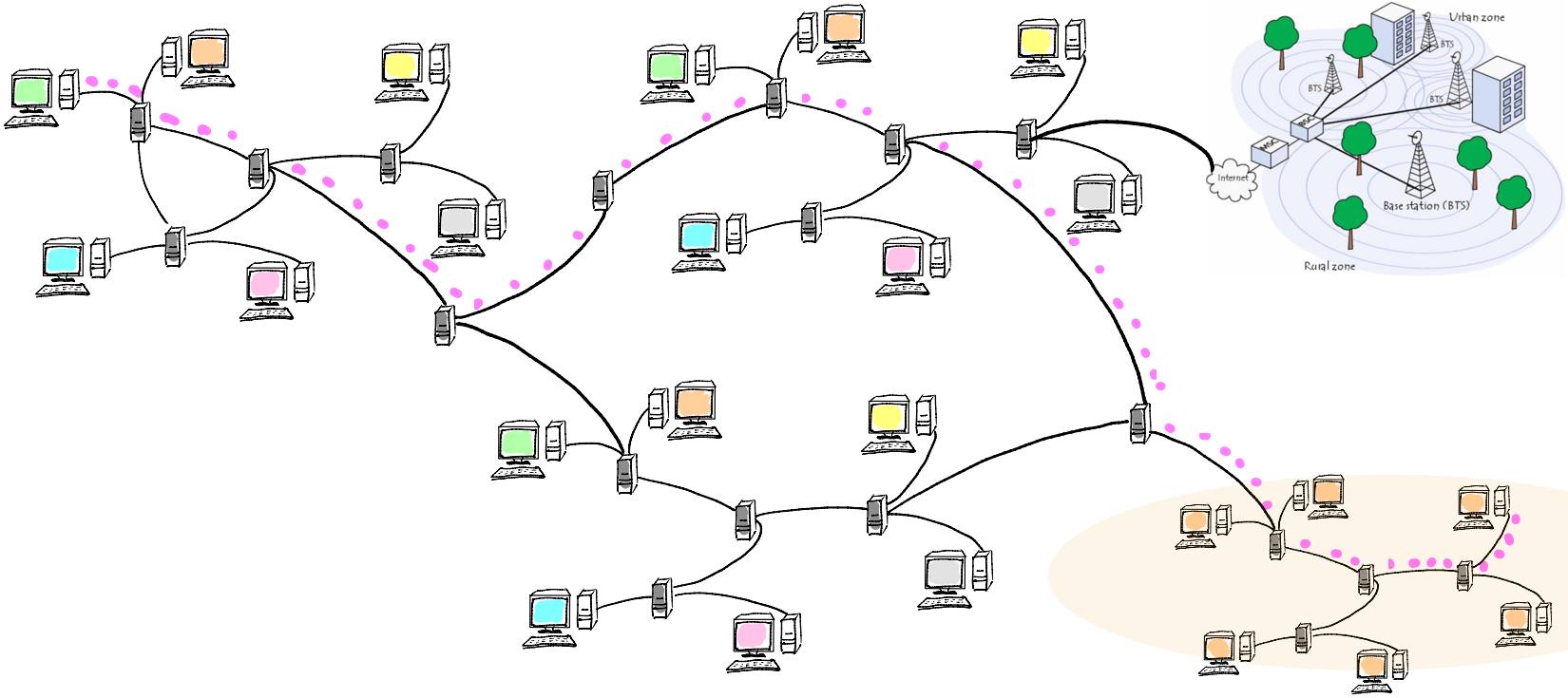






Infrastructure Ready !! Now communicate . . . but wait !

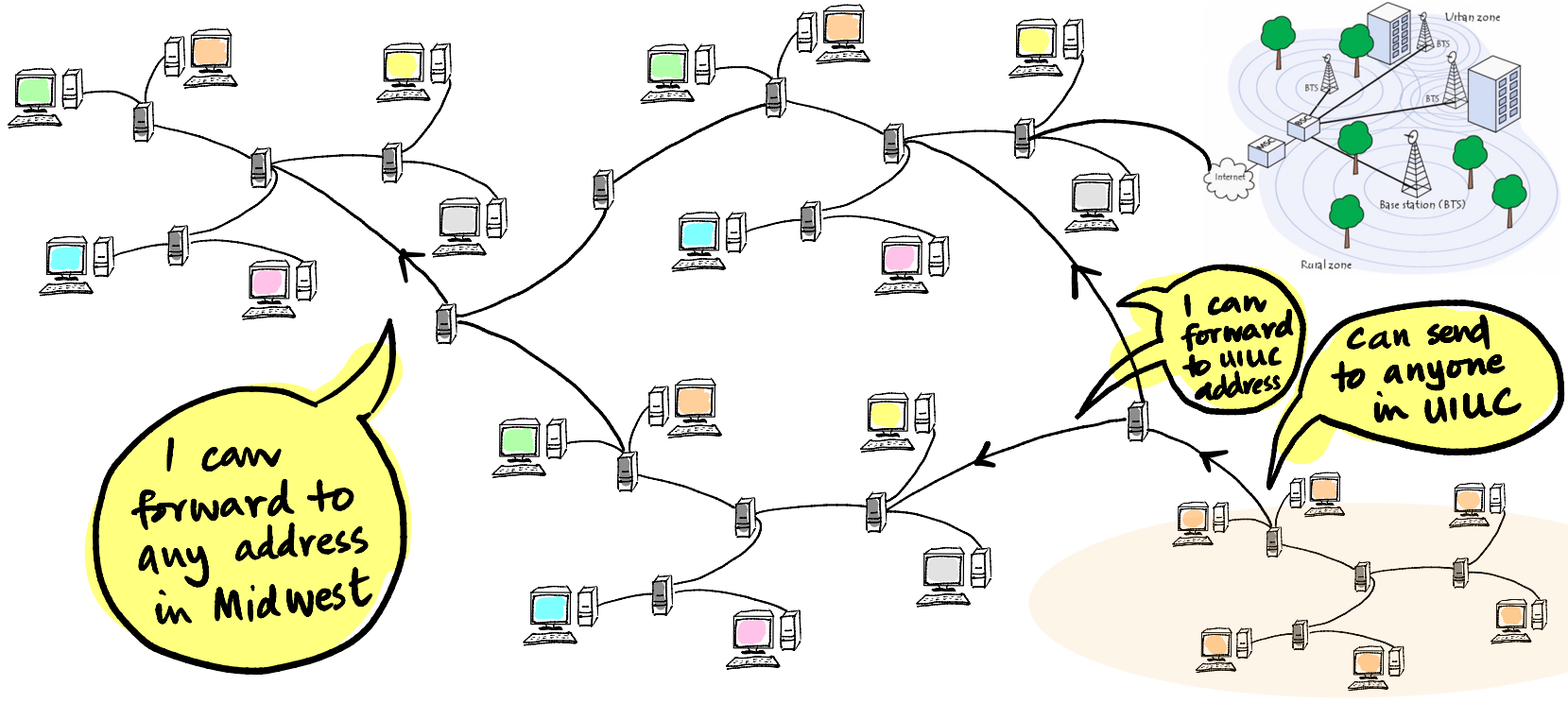
To whom ? which address ?



IP address : ece.illinois

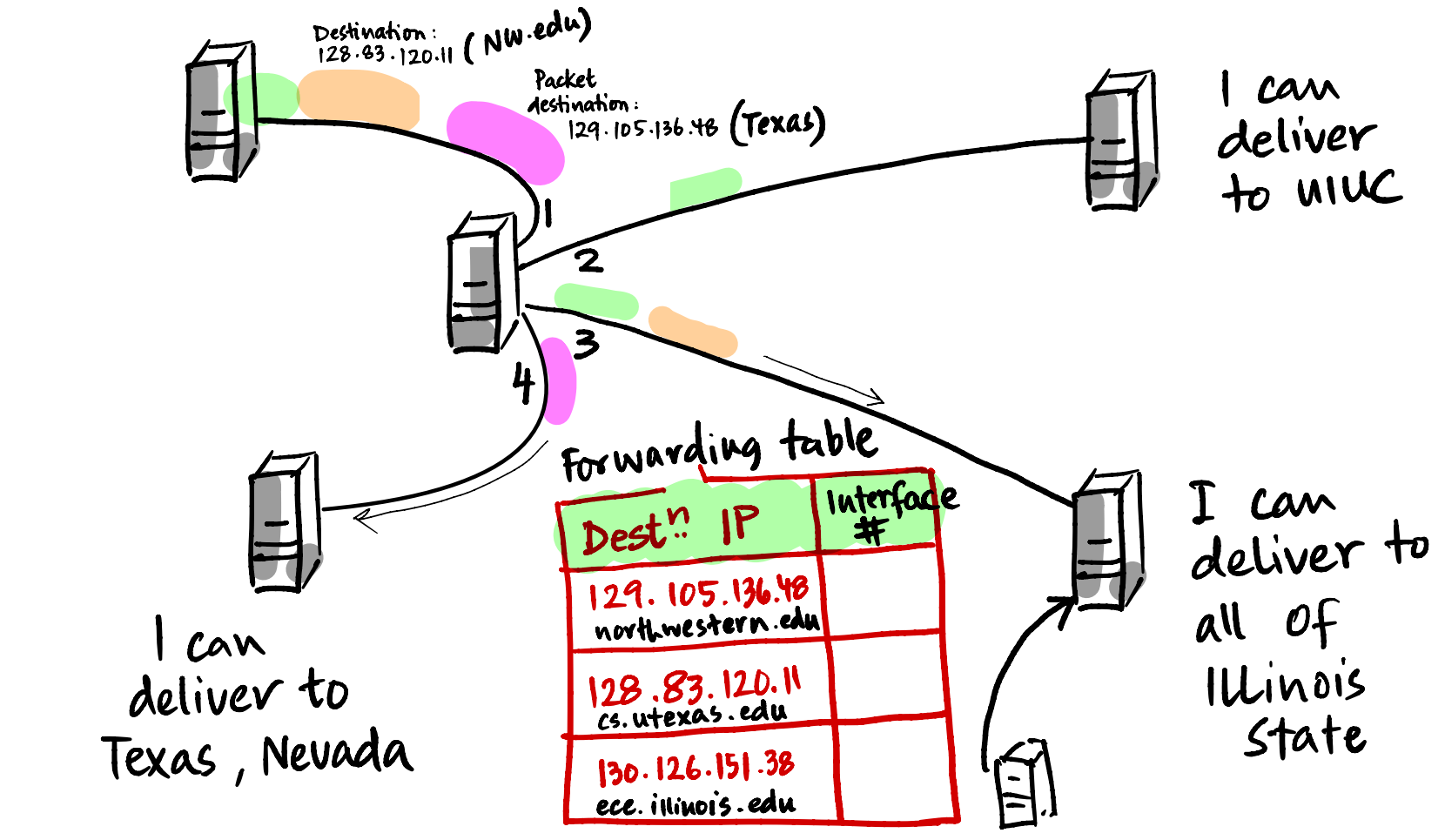
130.126.151.38

Advertising : Who can deliver to which address

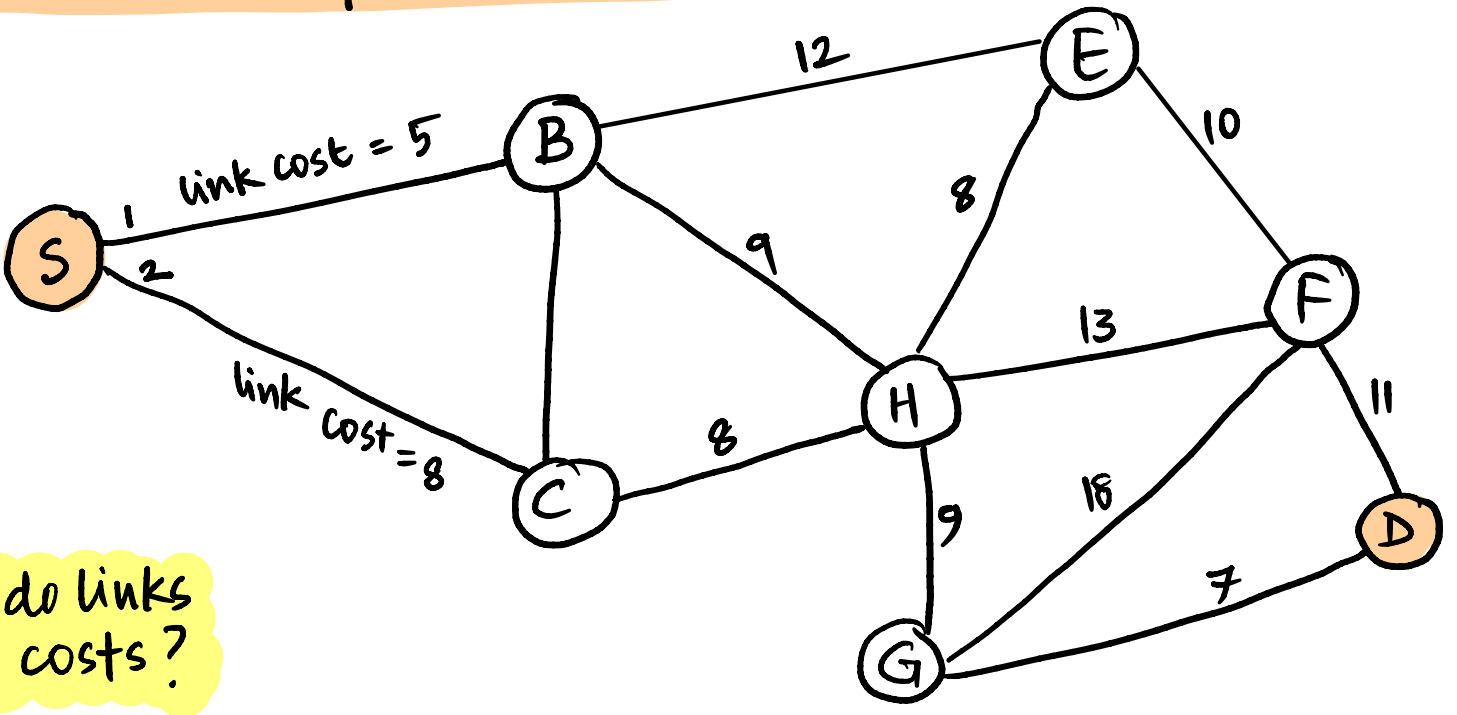


As if Routers are gossiping to figure out who can forward to whom.

Forwarding packets based on Destination Address



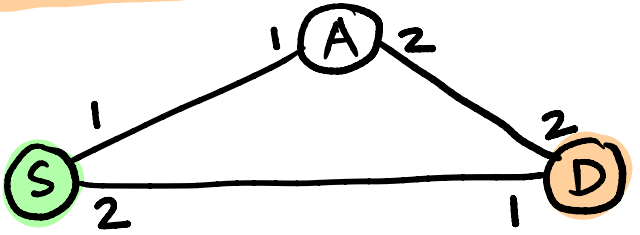
Network Graph → Routing

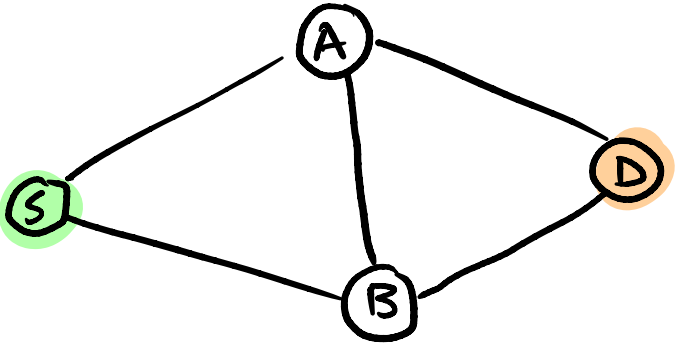


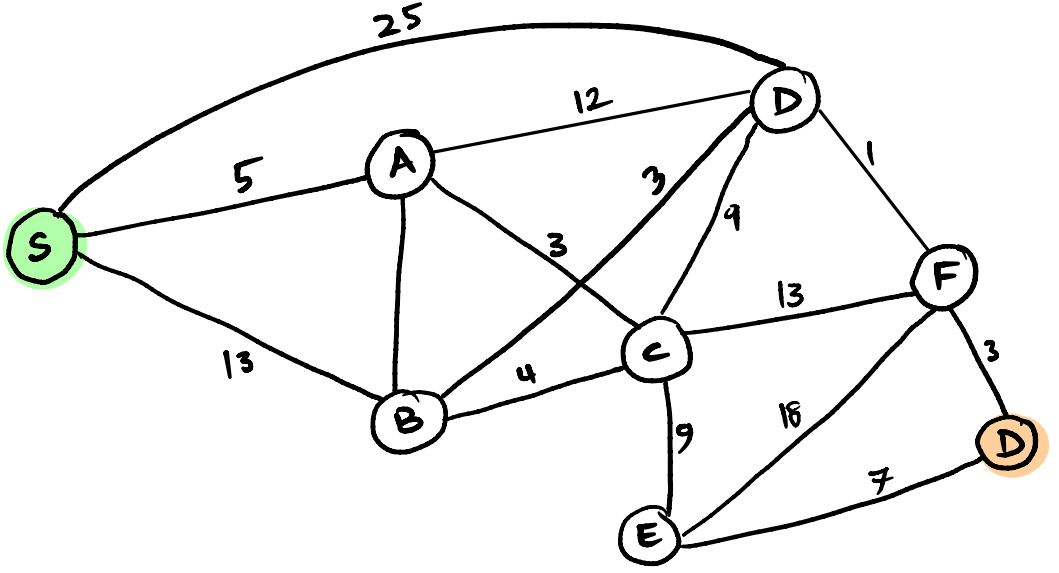
Why do links have costs?

What do they depend on?

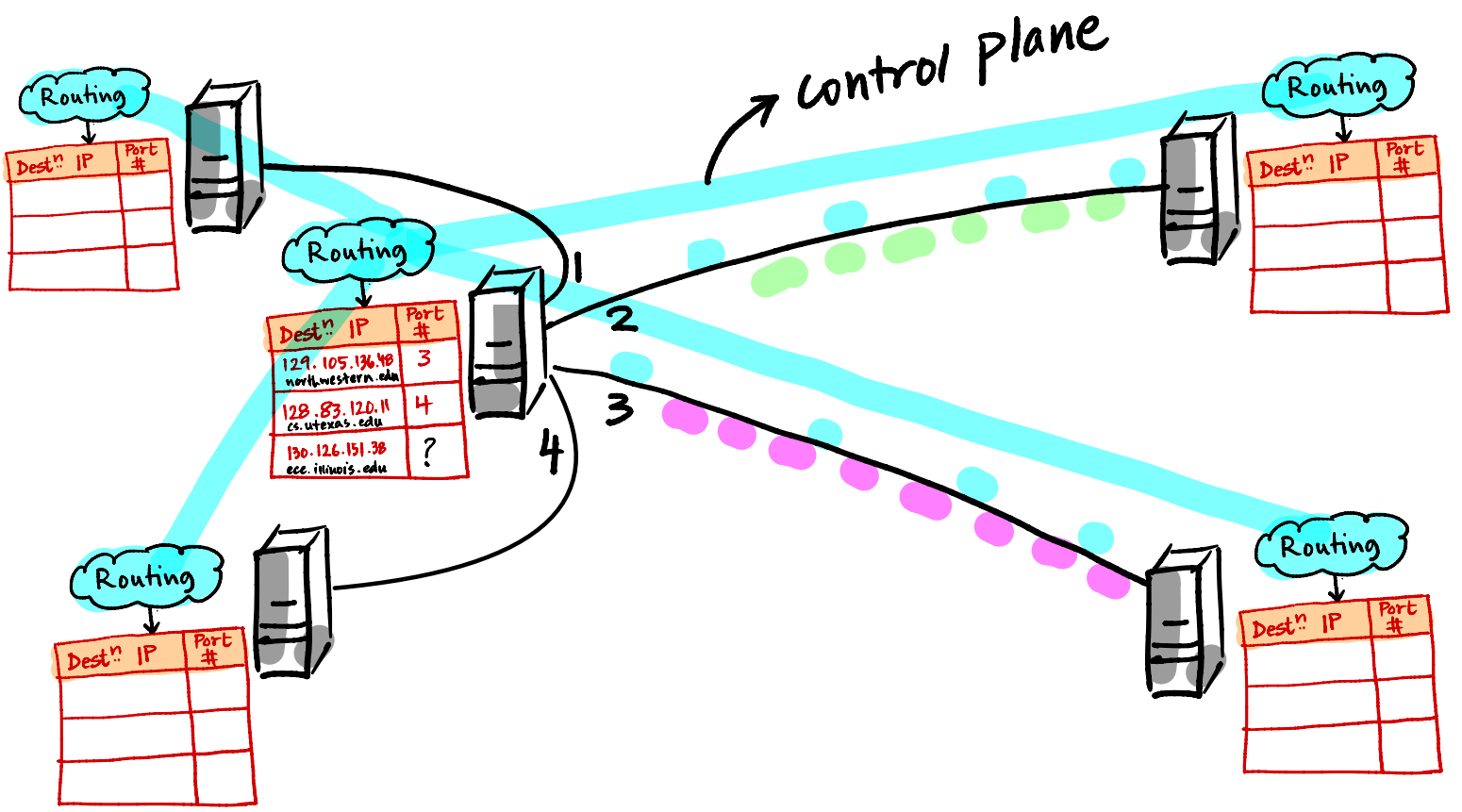
Let's Route





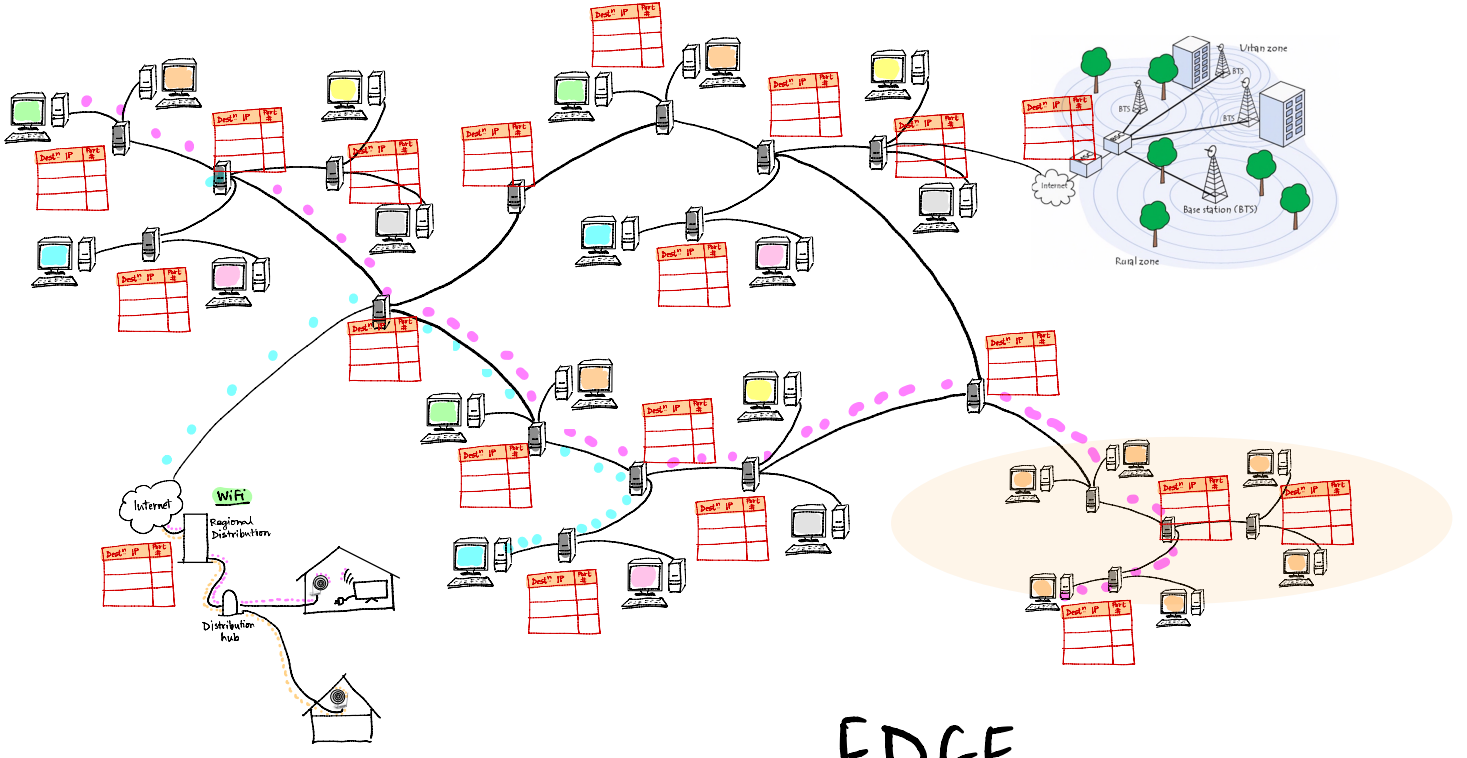


IP Address based Routing : Control plane, Data plane.



Zoom Out

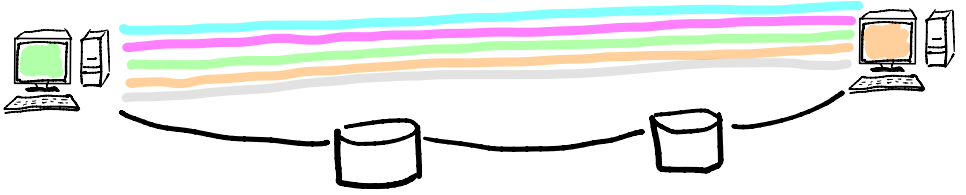
CORE



EDGE

And YOU are here

Questions ?

Lecture 2

Internet as a service