CSCI 446 Introduction to Computer Networks

Zhaohong Wang
Department of EECE
California State University, Chico

Topic

The Architecture of Internet

Internet Structure: Network of Networks (1 of 10)

End systems connect to Internet via **access ISPs (Internet Service Providers)**

- residential, company and university ISPs

Access ISPs in turn must be interconnected.

- so that any two hosts can send packets to each other

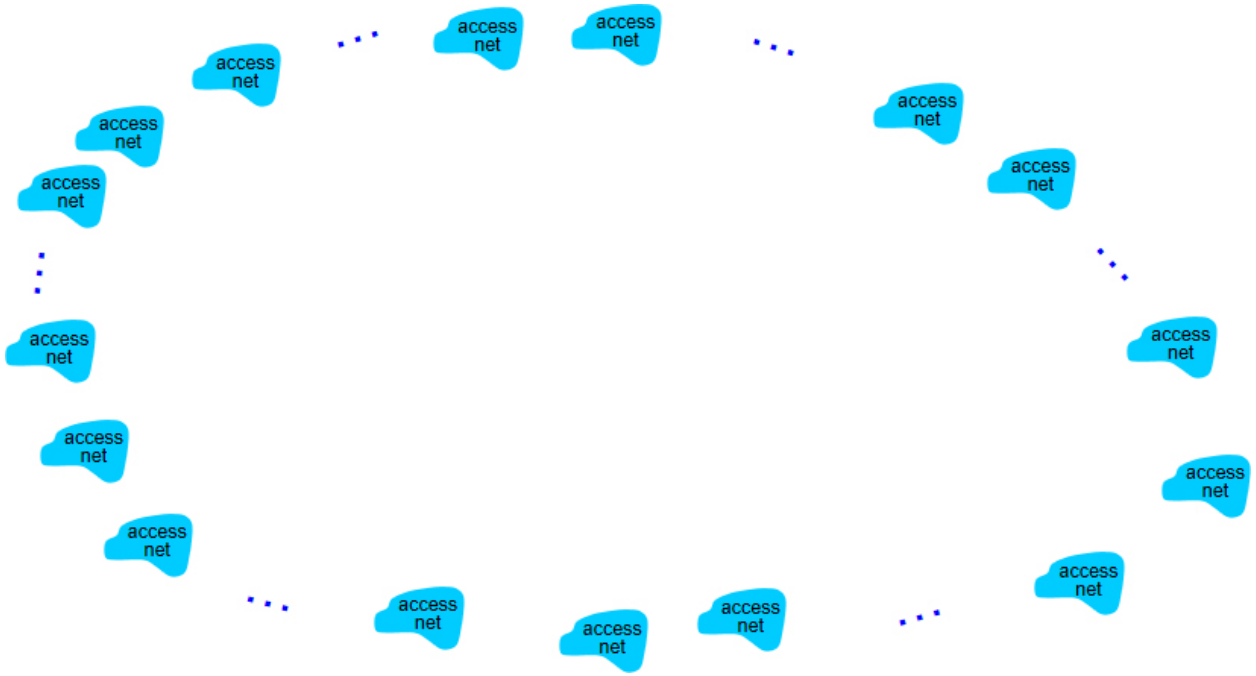
Resulting network of networks is very complex

- evolution was driven by **economics** and **national policies**

Let's take a stepwise approach to describe current Internet structure

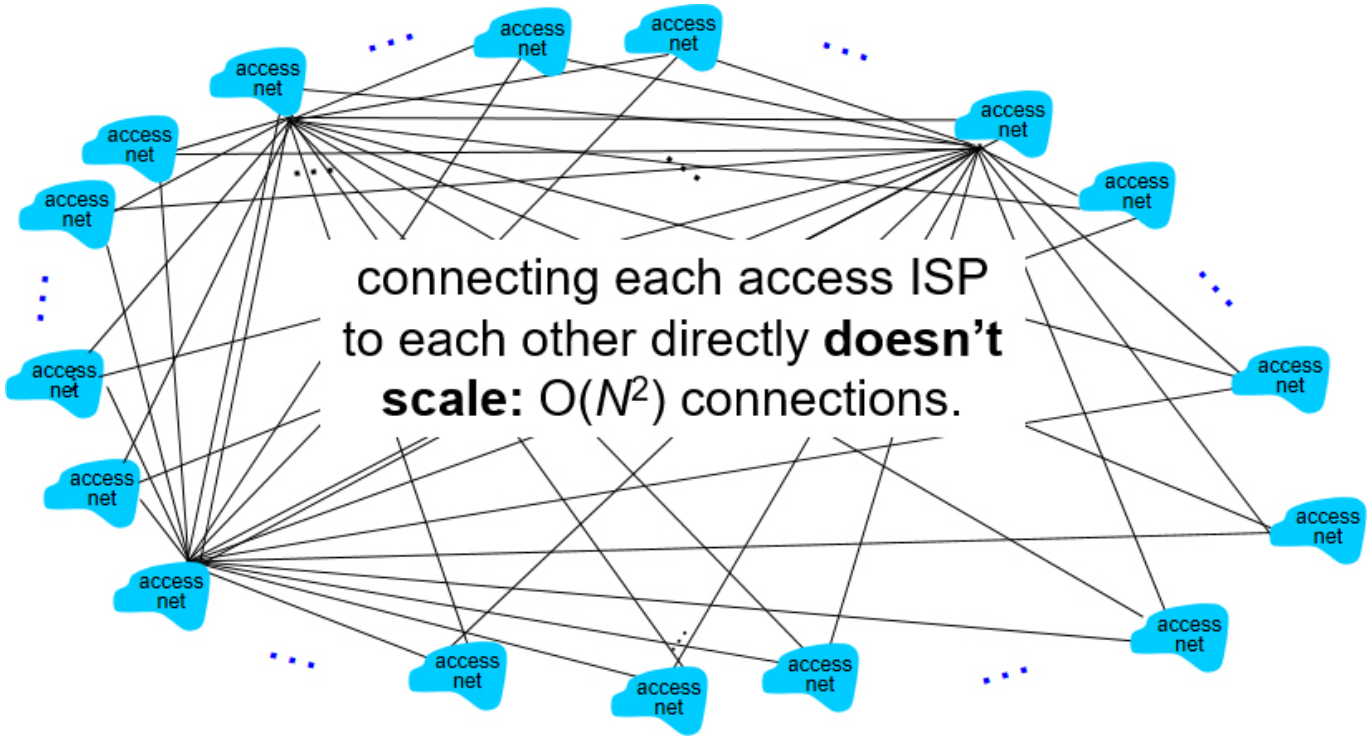
Internet Structure: Network of Networks (2 of 10)

Question: given millions of access ISPs, how to connect them together?



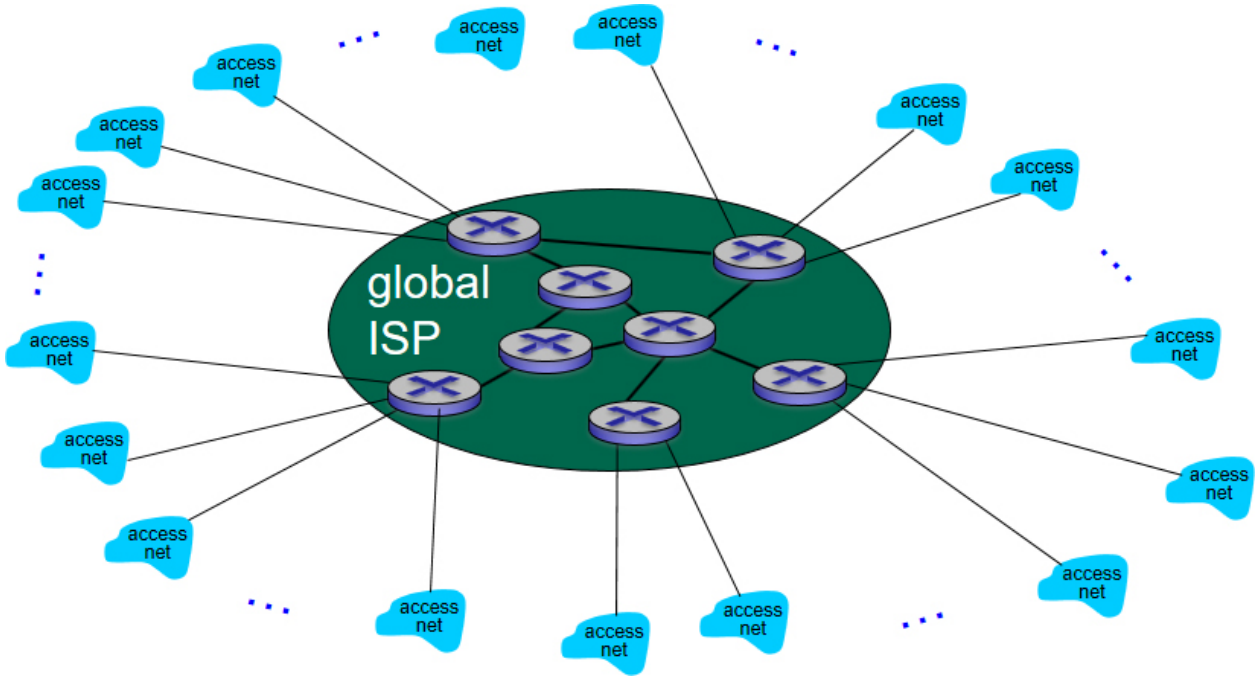
Internet Structure: Network of Networks (3 of 10)

Option: connect each access ISP to every other access ISP?



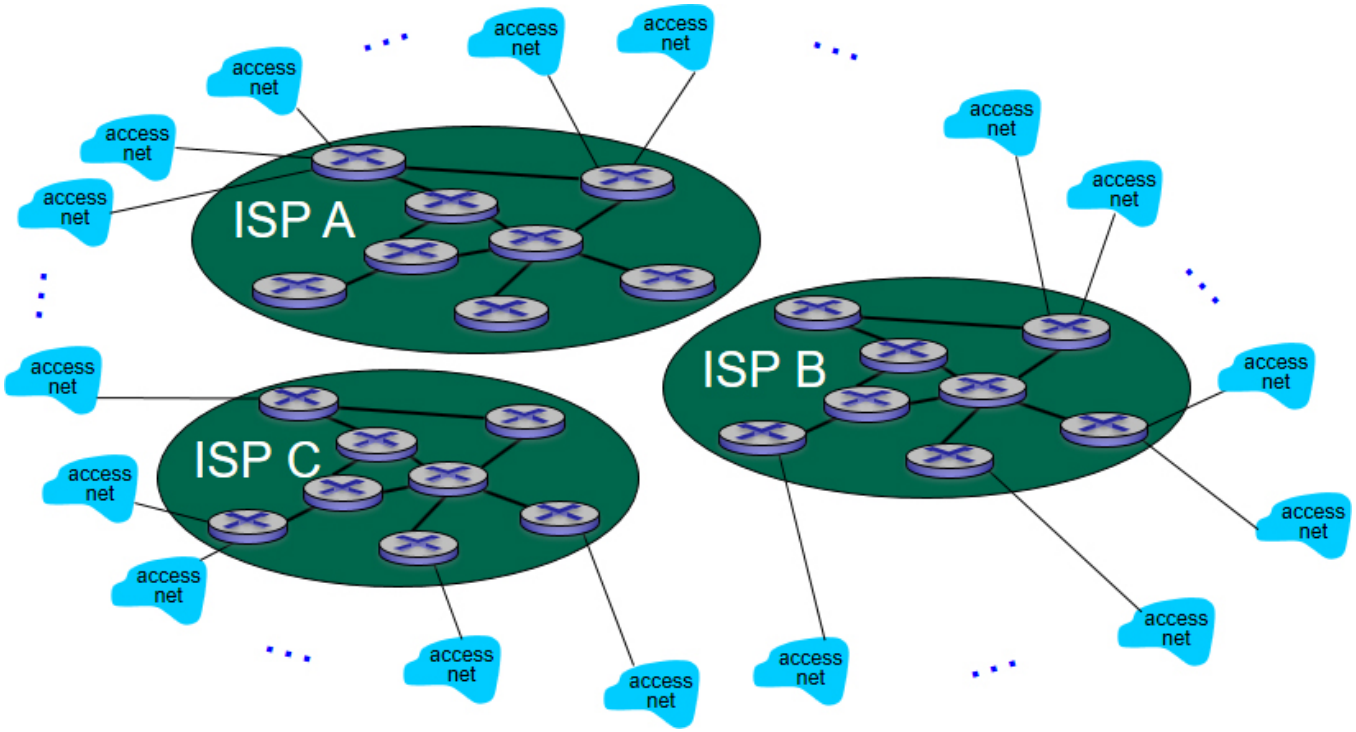
Internet Structure: Network of Networks (4 of 10)

Option: connect each access ISP to one global transit ISP?
Customer and provider ISPs have economic agreement.



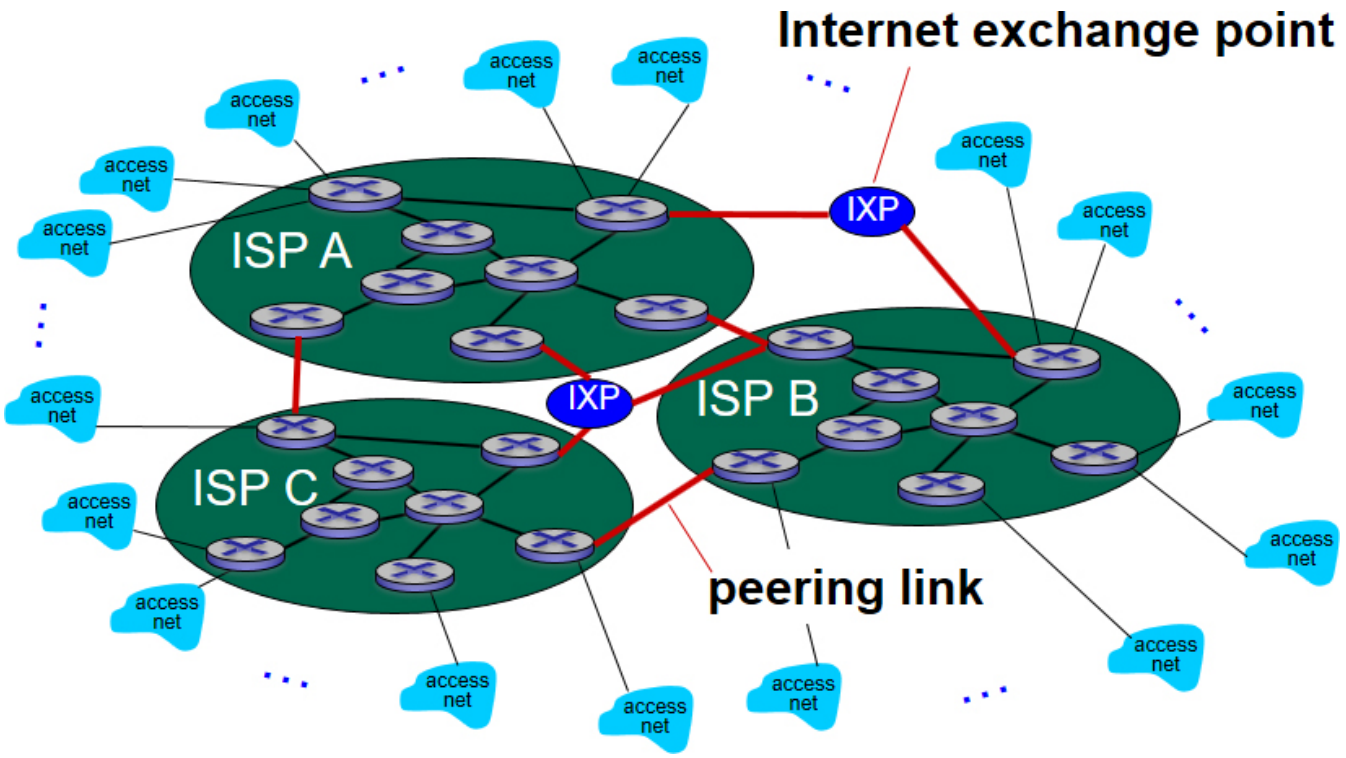
Internet Structure: Network of Networks (5 of 10)

But if one global ISP is viable business, there will be competitors ….



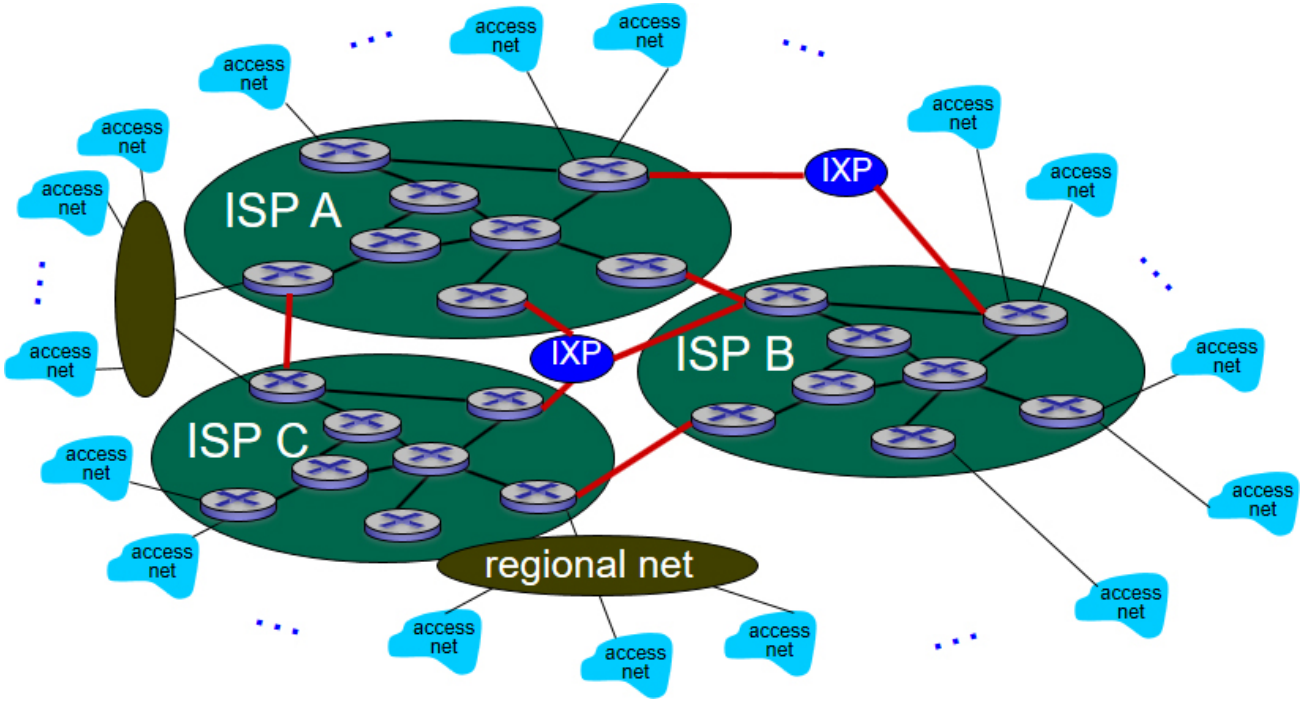
Internet Structure: Network of Networks (6 of 10)

But if one global ISP is viable business, there will be competitors …. which must be interconnected



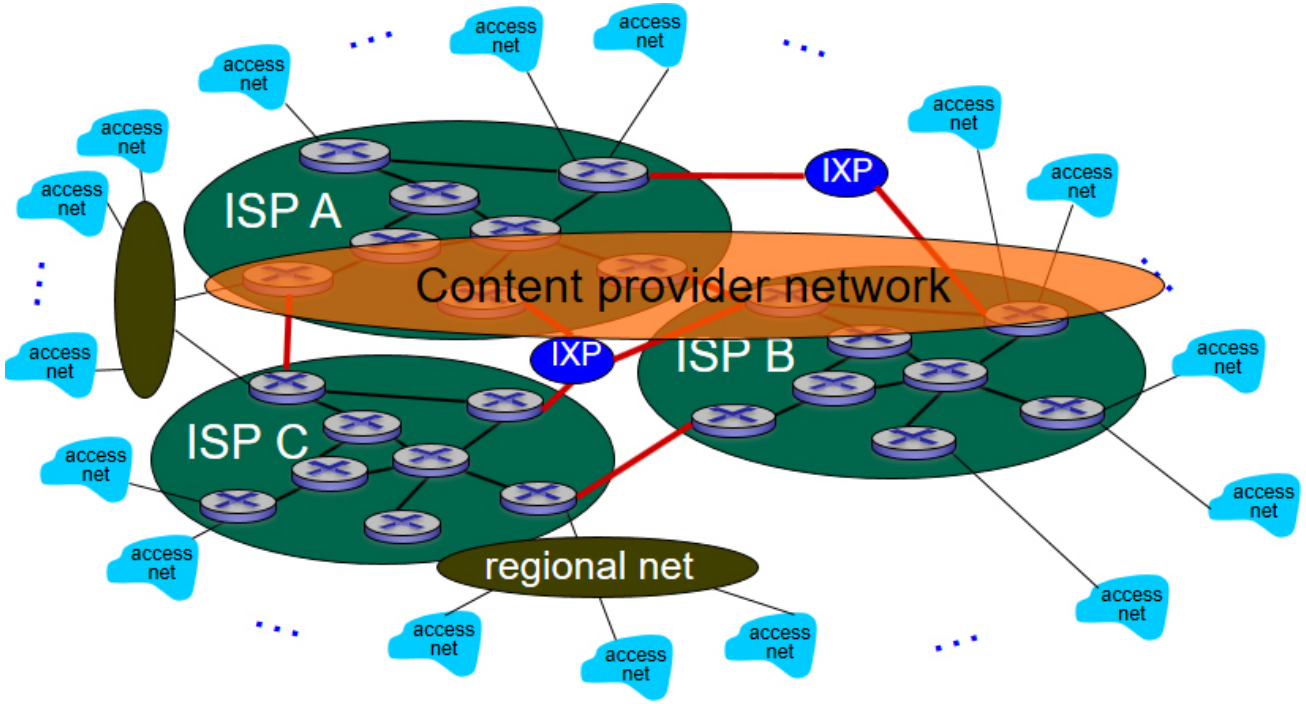
Internet Structure: Network of Networks (7 of 10)

… and regional networks may arise to connect access nets to ISPs

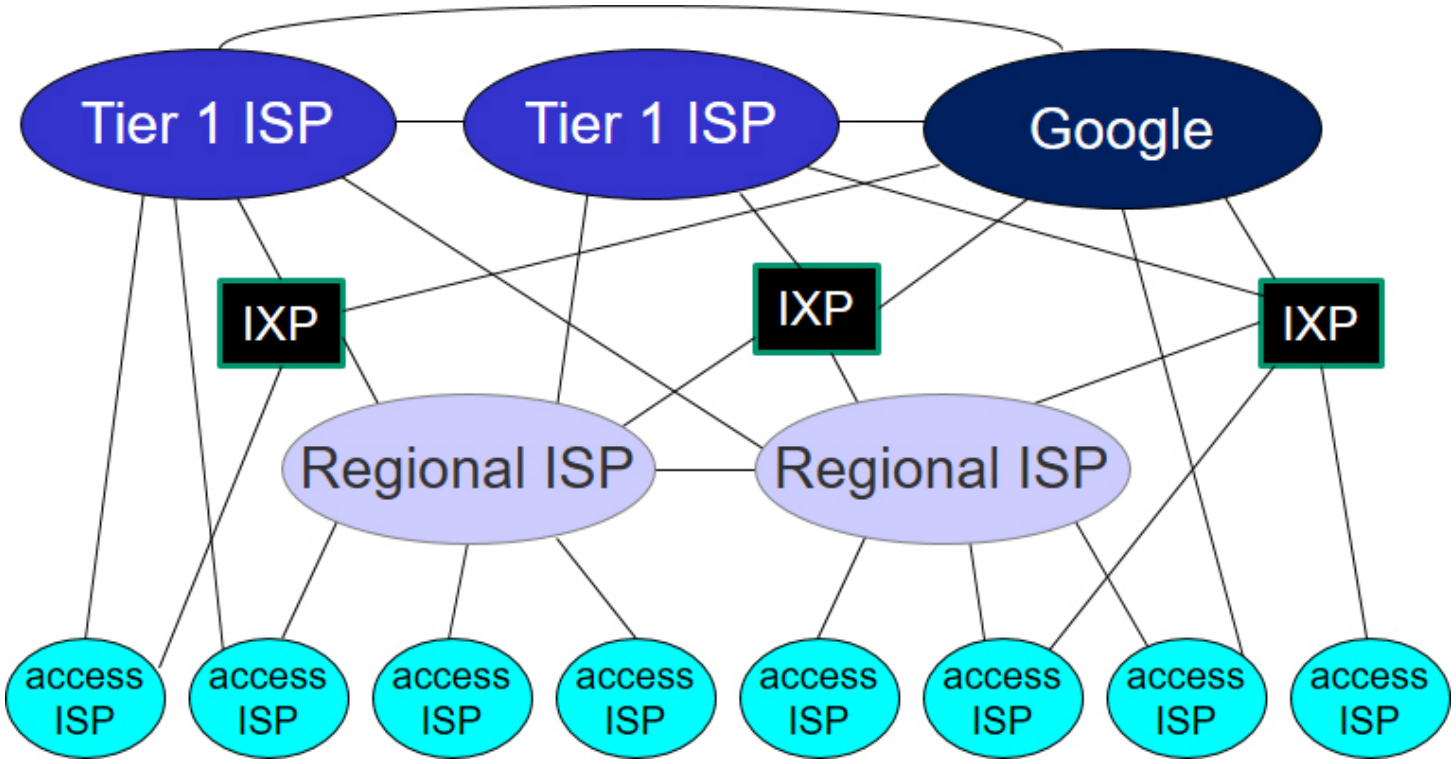


Internet Structure: Network of Networks (8 of 10)

… and content provider networks (e.g., Google, Microsoft, Akamai) may run their own network, to bring services, content close to end users



Internet Structure: Network of Networks (9 of 10)

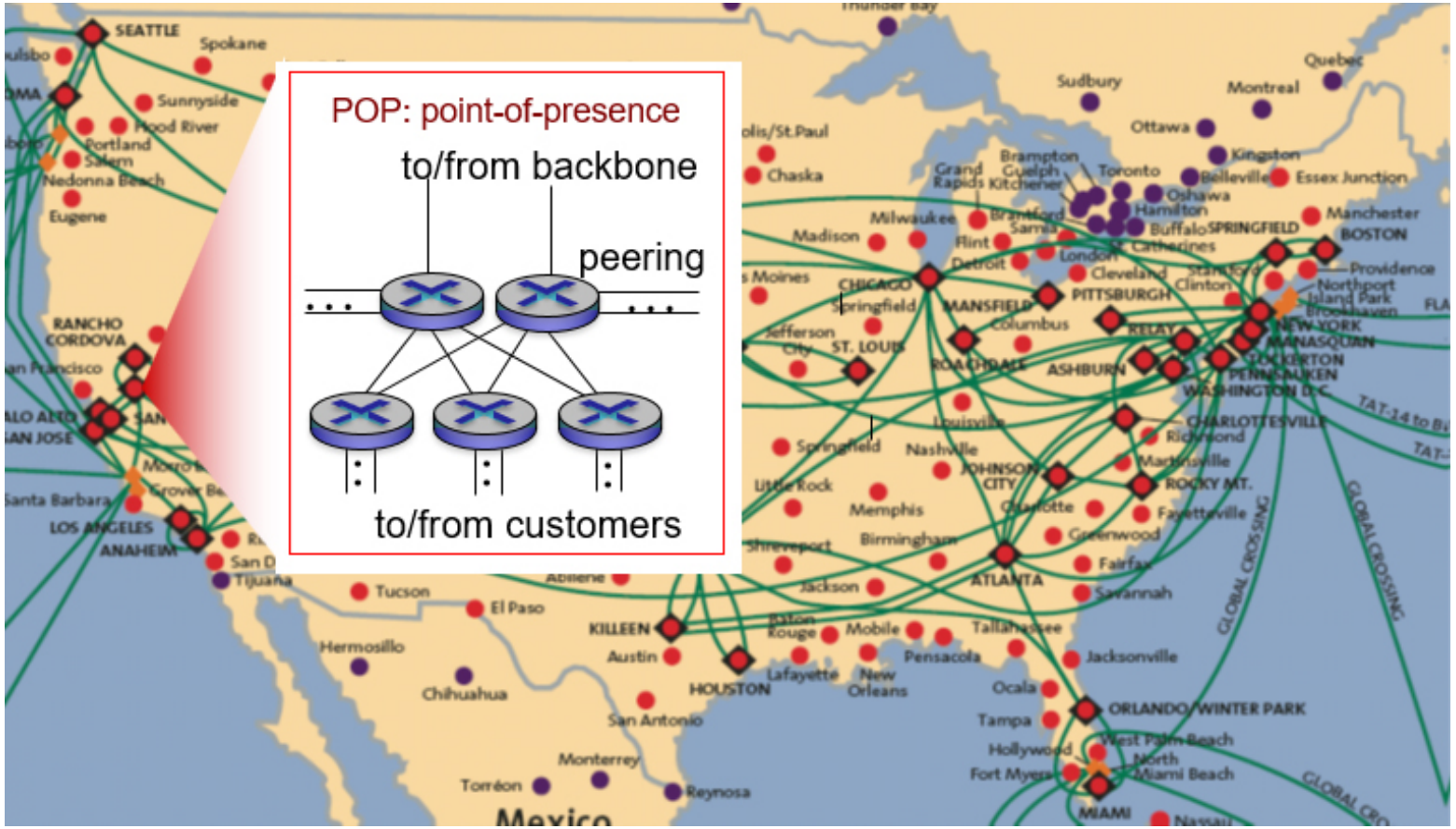


Internet Structure: Network of Networks (10 of 10)

at center: small # of well-connected large networks

- **"tier-1" commercial ISPs** (e.g., Level 3, Sprint, AT&T, NTT), national & international coverage
- **content provider network** (e.g., Google): private network that connects it data centers to Internet, often bypassing tier-1, regional ISPs

Tier-I ISP: e.g., Sprint



Thank you!