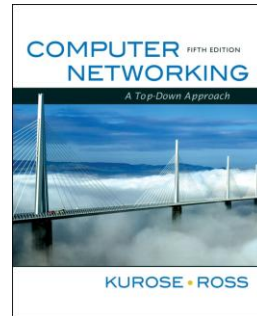


RSC

Part I: Introduction



Redes y Servicios de Comunicaciones Universidad Carlos III de Madrid

These slides are, mainly, part of the companion slides to the book "Computer Networking: A Top Down Approach" generously made available by their authors (see copyright below). The slides have been adapted, where required, to the teaching needs of the subject above.

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

*Computer Networking:
A Top Down Approach
5th edition.*

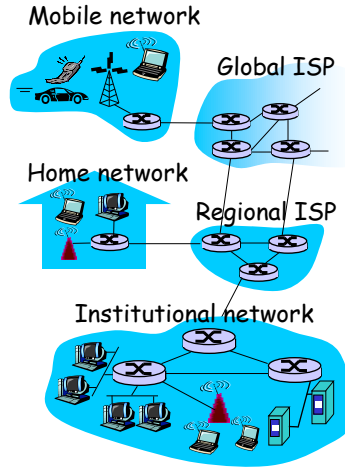
Jim Kurose, Keith Ross
Addison-Wesley, April
2009.

RSC Part I: Introduction

- ❑ Circuit switching vs packet switching
- ❑ Protocols and protocols stacks
- ❑ What is the Internet
- ❑ Network structure
- ❑ ISPs and Internet Backbones

What's the Internet: "nuts and bolts" view

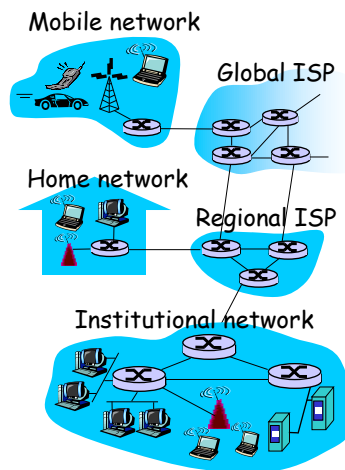
-  PC
 - millions of connected computing devices: *hosts = end systems*
 - ❖ running *network apps*
-  server
 - *communication links*
 - ❖ fiber, copper, radio, satellite
 - ❖ transmission rate = *bandwidth*
-  wireless laptop
 - *routers*: forward packets (chunks of data)
-  cellular handheld
 - ❖ access points
 - ❖ fiber, copper, radio, satellite
 - ❖ transmission rate = *bandwidth*
-  access points
 - ❖ fiber, copper, radio, satellite
 - ❖ transmission rate = *bandwidth*
-  wired links
 - ❖ fiber, copper, radio, satellite
 - ❖ transmission rate = *bandwidth*
-  router
 - *routers*: forward packets (chunks of data)



Introduction 1-3

What's the Internet: "nuts and bolts" view

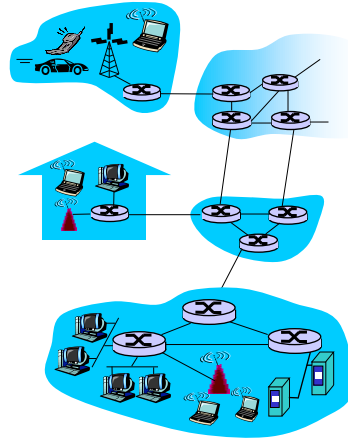
- *protocols* control sending, receiving of msgs
 - ❖ e.g., TCP, IP, HTTP, Skype, Ethernet
 - *Internet: "network of networks"*
 - ❖ loosely hierarchical
 - ❖ public Internet versus private intranet
 - Internet standards
 - ❖ RFC: Request for comments
 - ❖ IETF: Internet Engineering Task Force



Introduction 1-4

What's the Internet: a service view

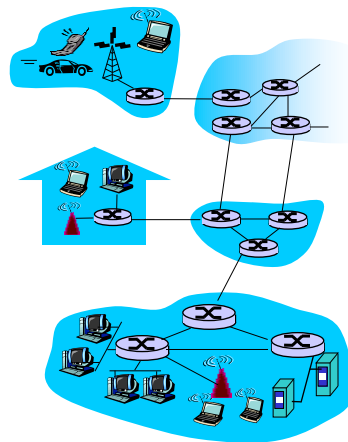
- **communication infrastructure** enables distributed applications:
 - ❖ Web, VoIP, email, games, e-commerce, file sharing
- **communication services provided to apps:**
 - ❖ reliable data delivery from source to destination
 - ❖ "best effort" (unreliable) data delivery



Introduction 1-5

A closer look at network structure:

- **network edge:** applications and hosts
- **access networks, physical media:** wired, wireless communication links
- **network core:**
 - ❖ interconnected routers
 - ❖ network of networks



Introduction 1-6

The network edge:

□ end systems (hosts):

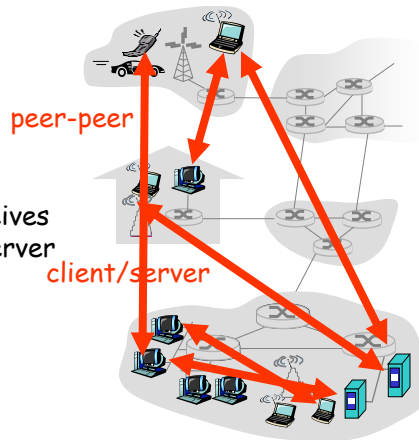
- ❖ run application programs
- ❖ e.g. Web, email
- ❖ at "edge of network"

□ client/server model

- ❖ client host requests, receives service from always-on server
- ❖ e.g. Web browser/server; email client/server

□ peer-peer model:

- ❖ minimal (or no) use of dedicated servers
- ❖ e.g. Skype, BitTorrent



Introduction 1-7

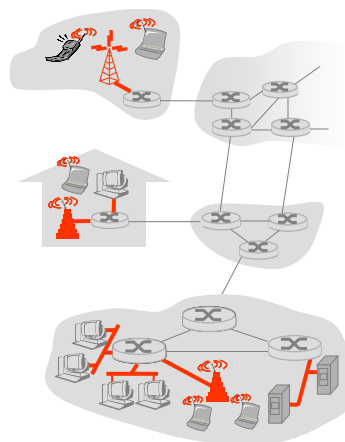
Access networks and physical media

Q: How to connect end end systems to edge router?

- residential access nets
- institutional access networks (school, company)
- mobile access networks

Keep in mind:

- bandwidth (bits per second) of access network?
- shared or dedicated?

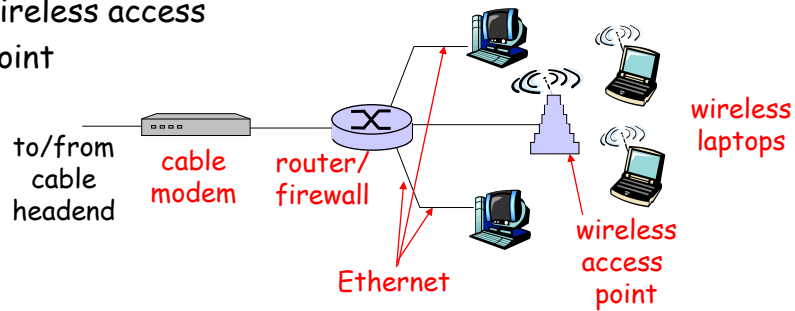


Introduction 1-8

Home networks

Typical home network components:

- ❑ DSL or cable modem
- ❑ router/firewall/NAT
- ❑ Ethernet
- ❑ wireless access point



Introduction 1-9

Internet structure: network of networks

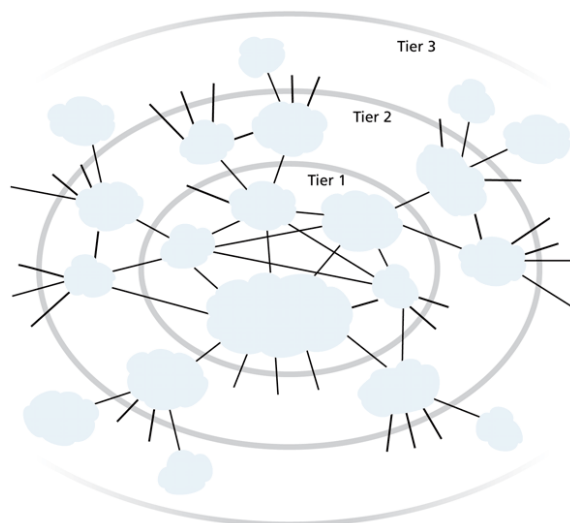
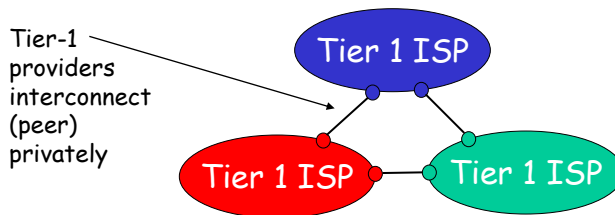


Figure 1.11 ♦ Interconnection of ISPs

Introduction 1-10

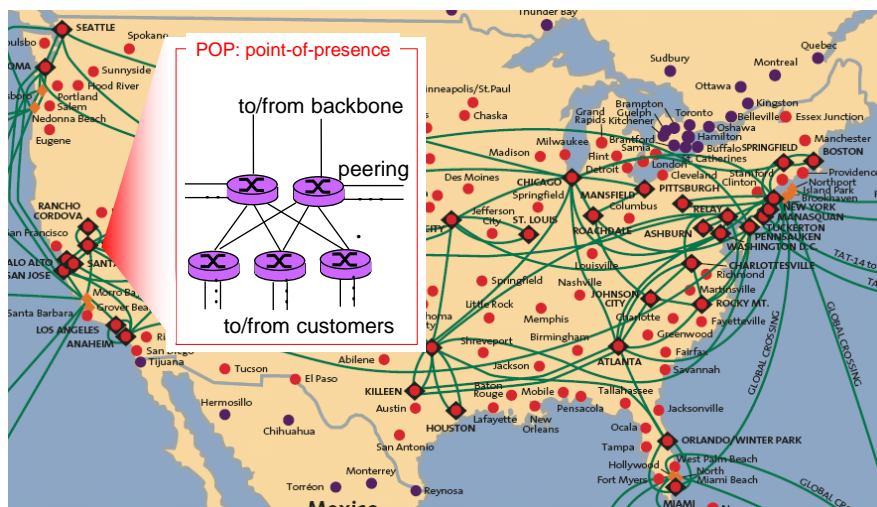
Internet structure: network of networks

- roughly hierarchical
- **at center: "tier-1" ISPs** (e.g., Verizon, Sprint, AT&T, Cable and Wireless), national/international coverage
 - ❖ treat each other as equals



Introduction 1-11

Tier-1 ISP: e.g., Sprint

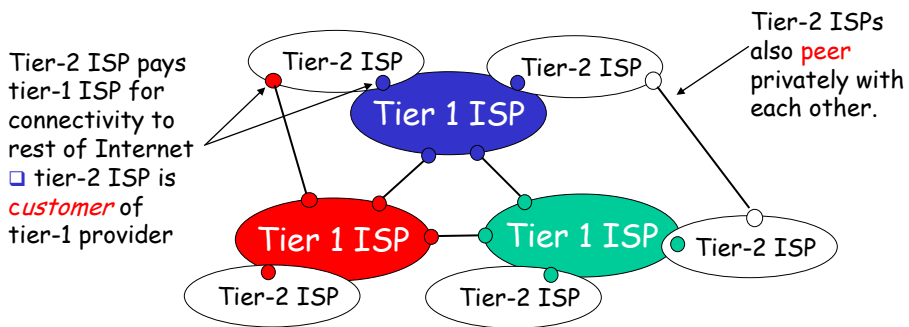


Introduction 1-12

Internet structure: network of networks

□ "Tier-2" ISPs: smaller (often regional) ISPs

- ❖ Connect to one or more tier-1 ISPs, possibly other tier-2 ISPs

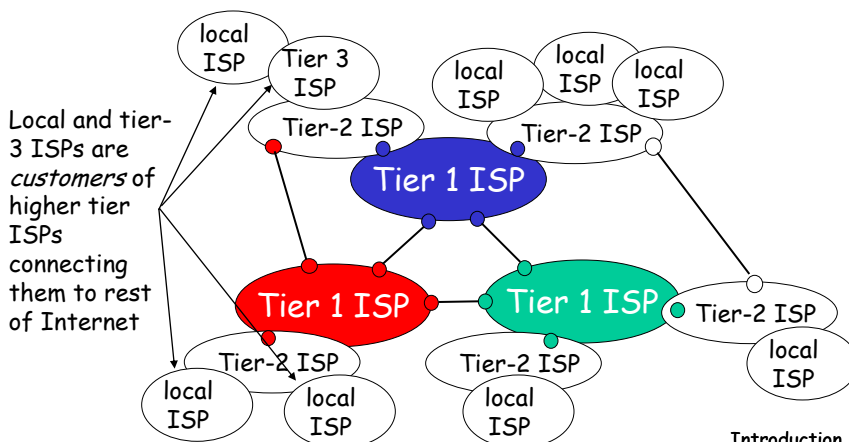


Introduction 1-13

Internet structure: network of networks

□ "Tier-3" ISPs and local ISPs

- ❖ last hop ("access") network (closest to end systems)



Introduction 1-14

Internet structure: network of networks

- a packet passes through many networks!

