Data and Computer Communications

Chapter 1 – Data Communications, Data Networks, and the Internet

Ninth Edition

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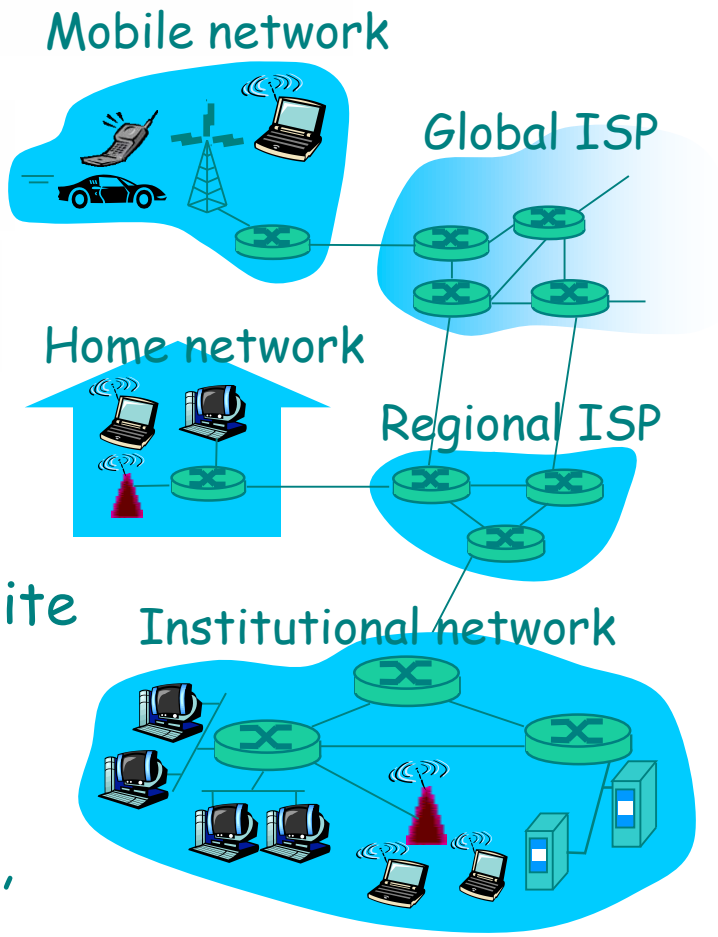
What's the Internet

- millions of connected computing devices: *hosts = end systems*
  - running *network apps*



- *communication links*
  - Wired: fiber, copper
  - Wireless: radio, satellite
- *routers:* forward packets (chunks of data)
- *protocols* control sending, receiving of messages
  - e.g., TCP, IP, HTTP, Ethernet
- *Internet:* "network of networks"

Network edge

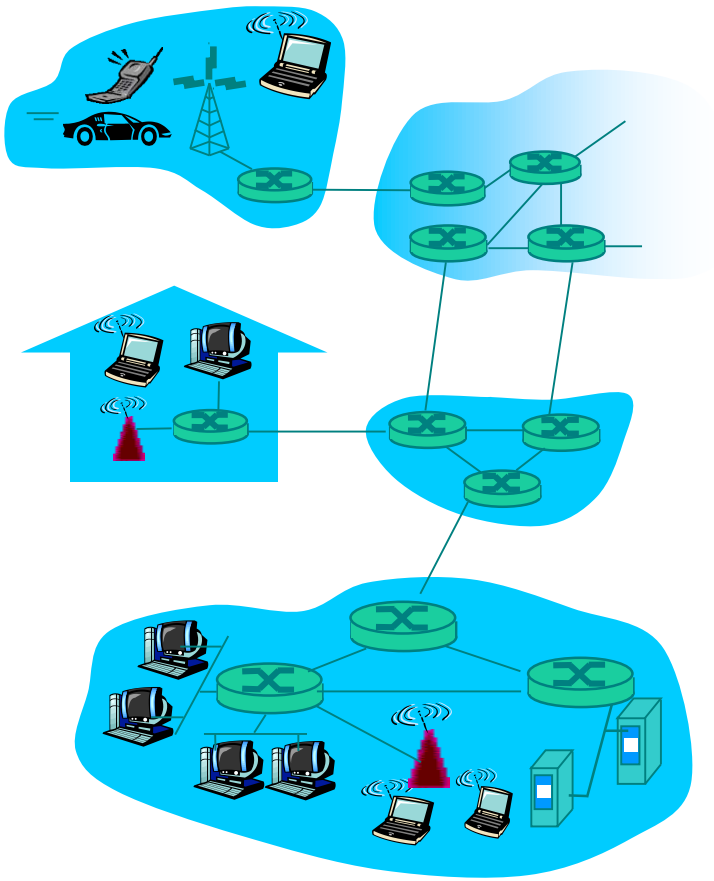
- end systems (hosts):

  run application programs e.g. Web, email

- access networks:

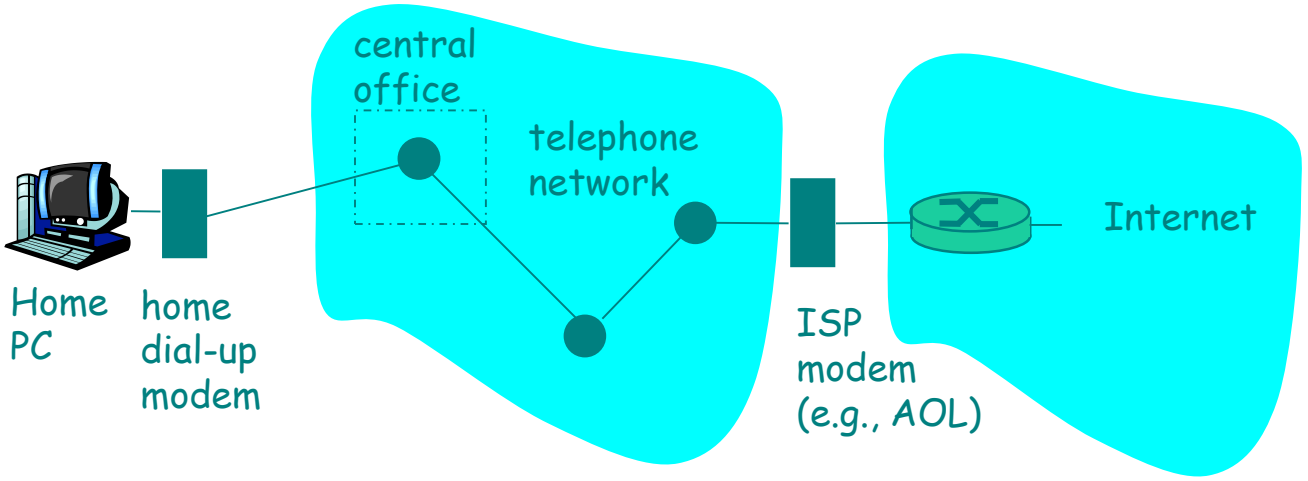
- physical media:

  wired, wireless communication links



Access Networks

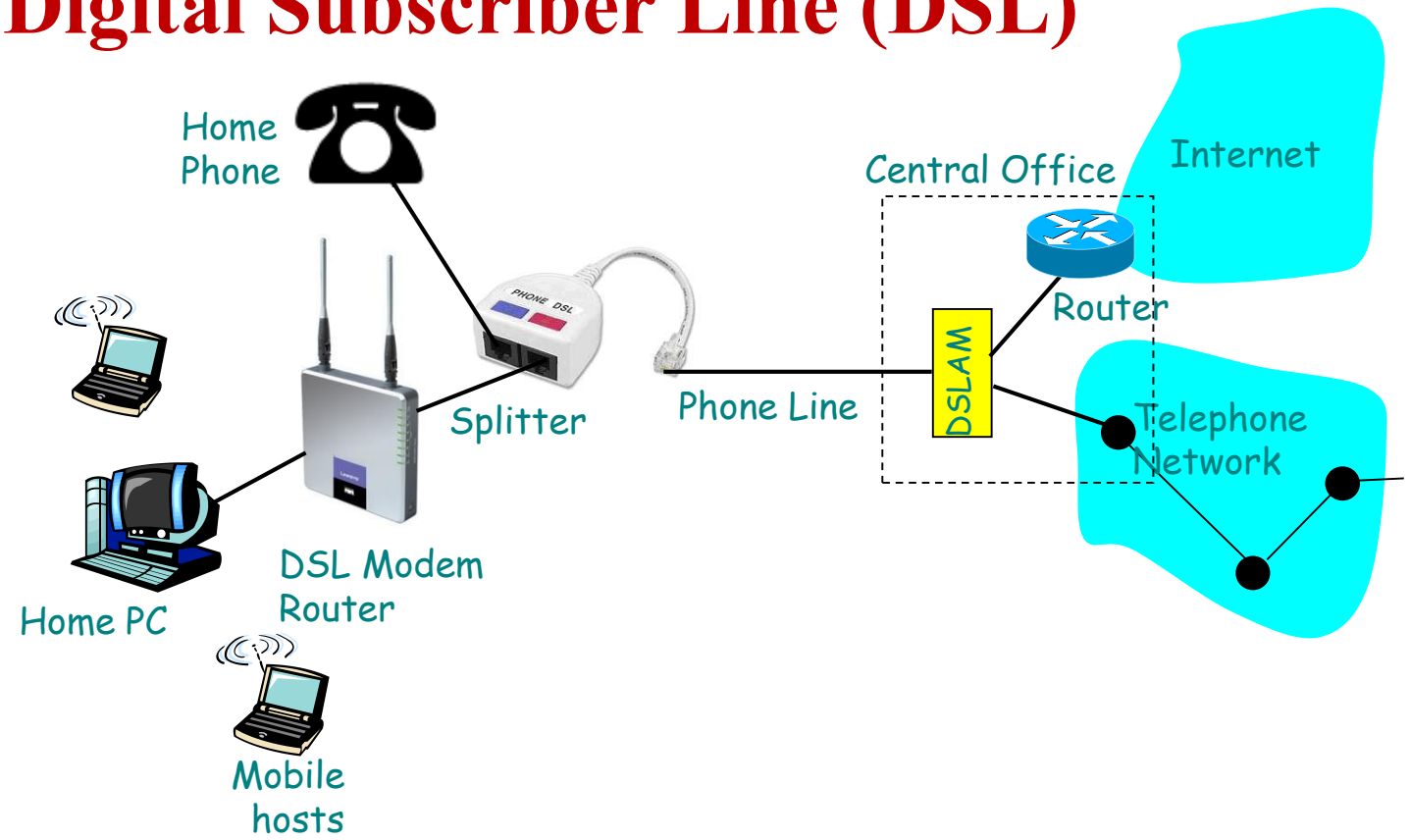
1. Dial-up Modem



- Uses existing telephony infrastructure
  - Home is connected to central office
- up to 56Kbps direct access to router (often less)
- Can't surf and phone at same time.

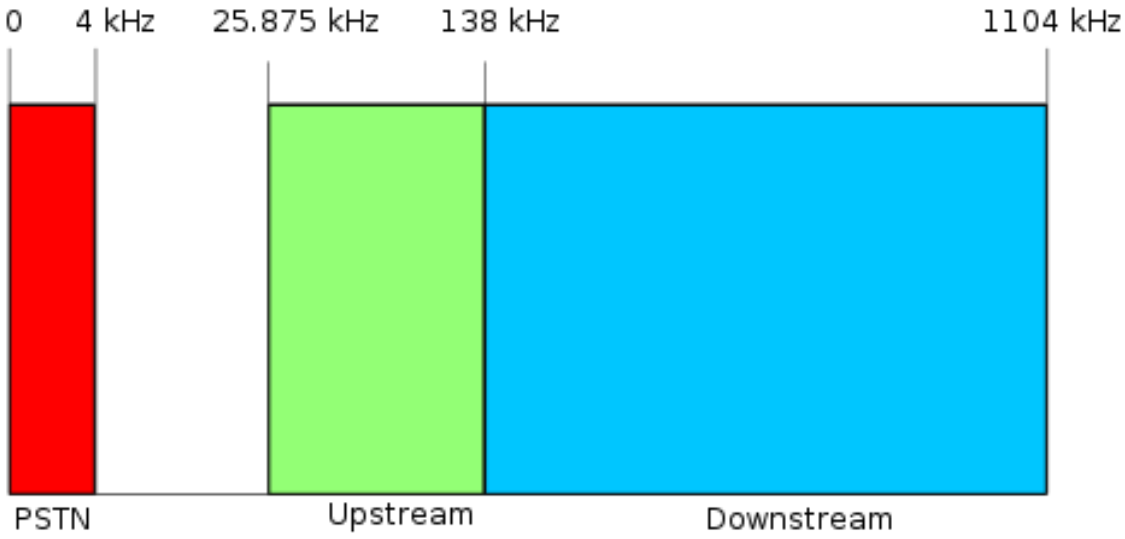
Access Networks

2. Digital Subscriber Line (DSL)



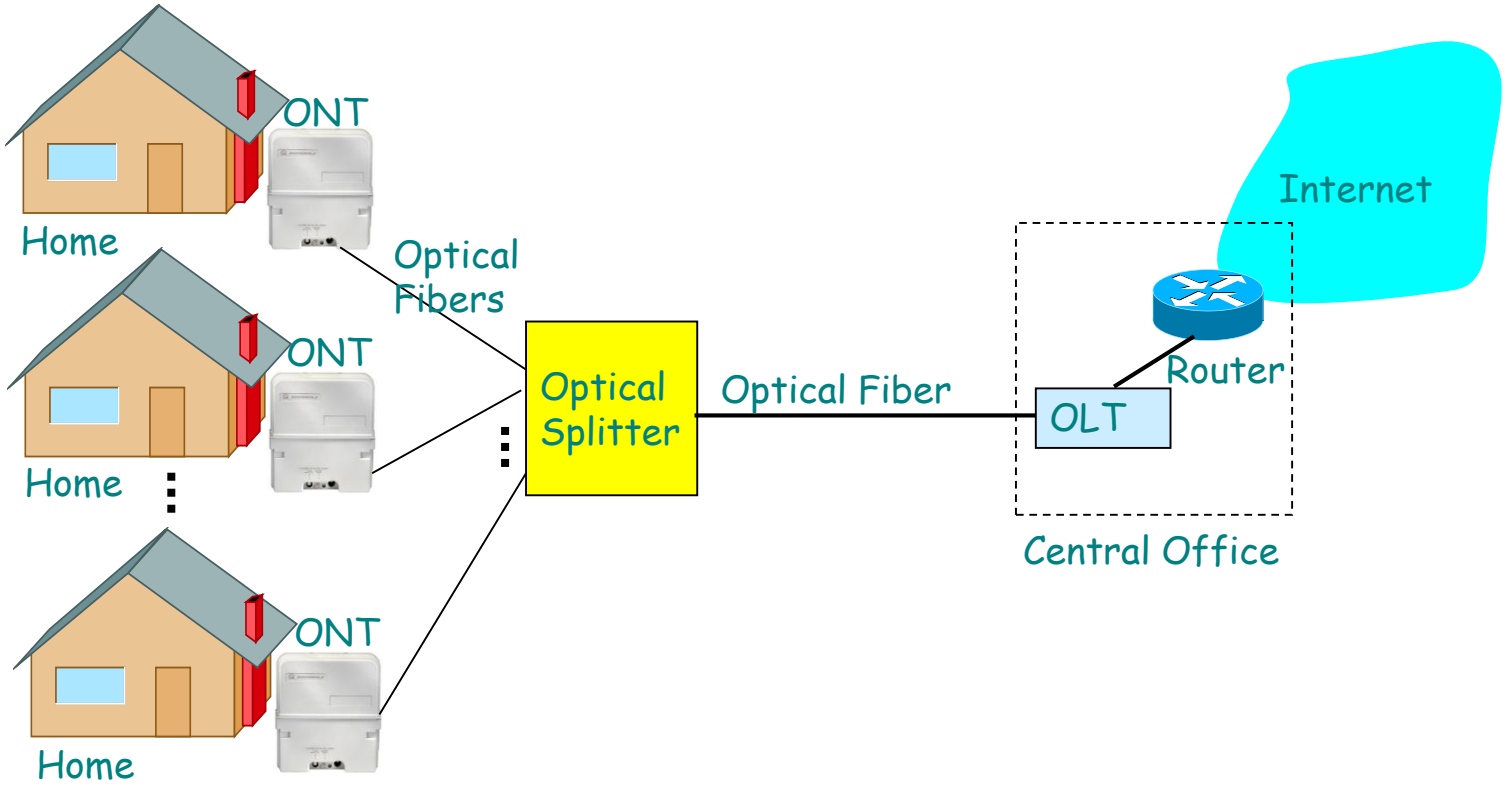
- Also uses existing telephone infrastructure

Digital Subscriber Line (DSL)



Access Networks

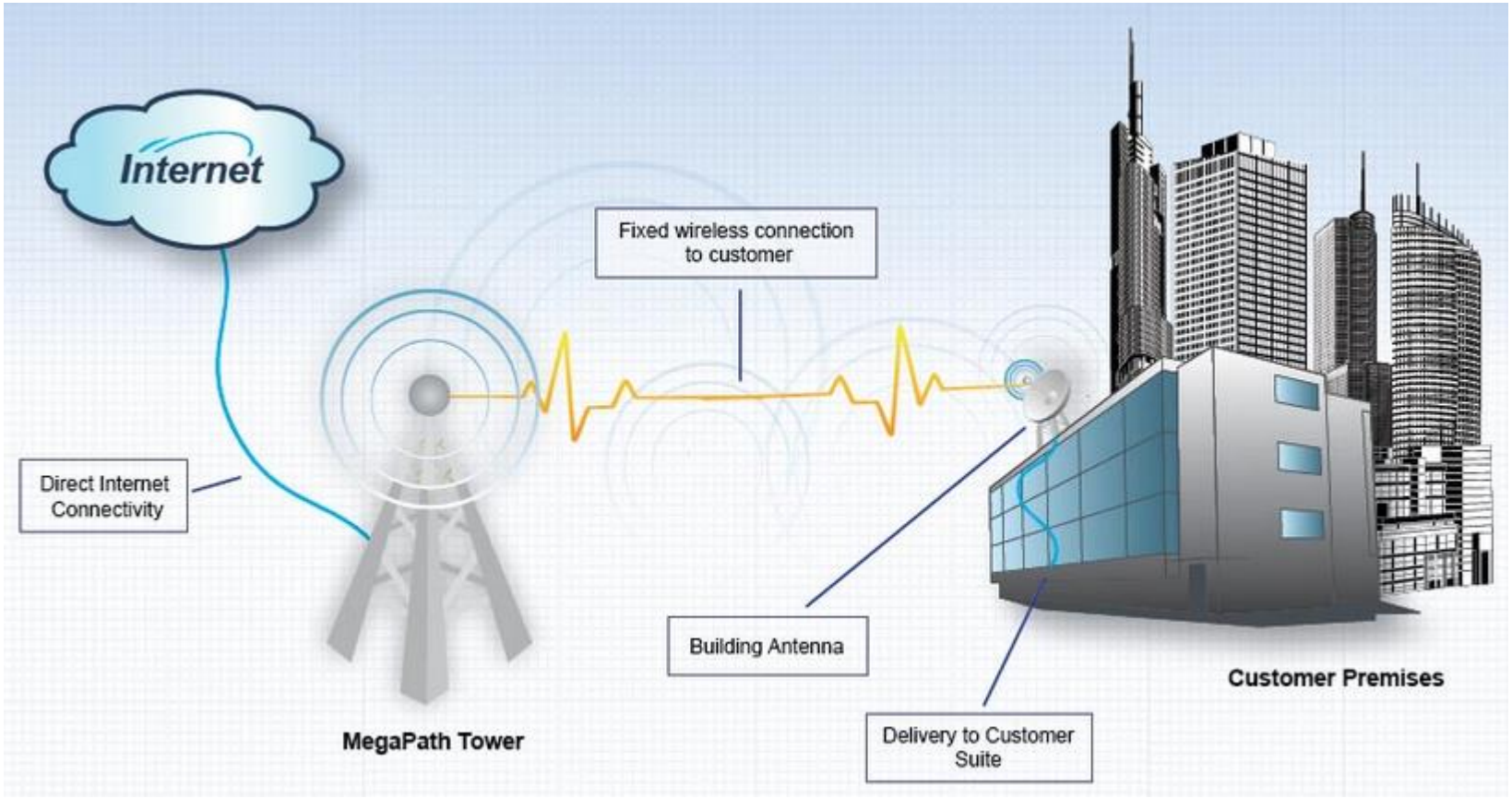
3. Fiber To The Home (FTTH):



- Optical links from central office to the home
- Much higher Internet rates; fiber also carries television and phone services

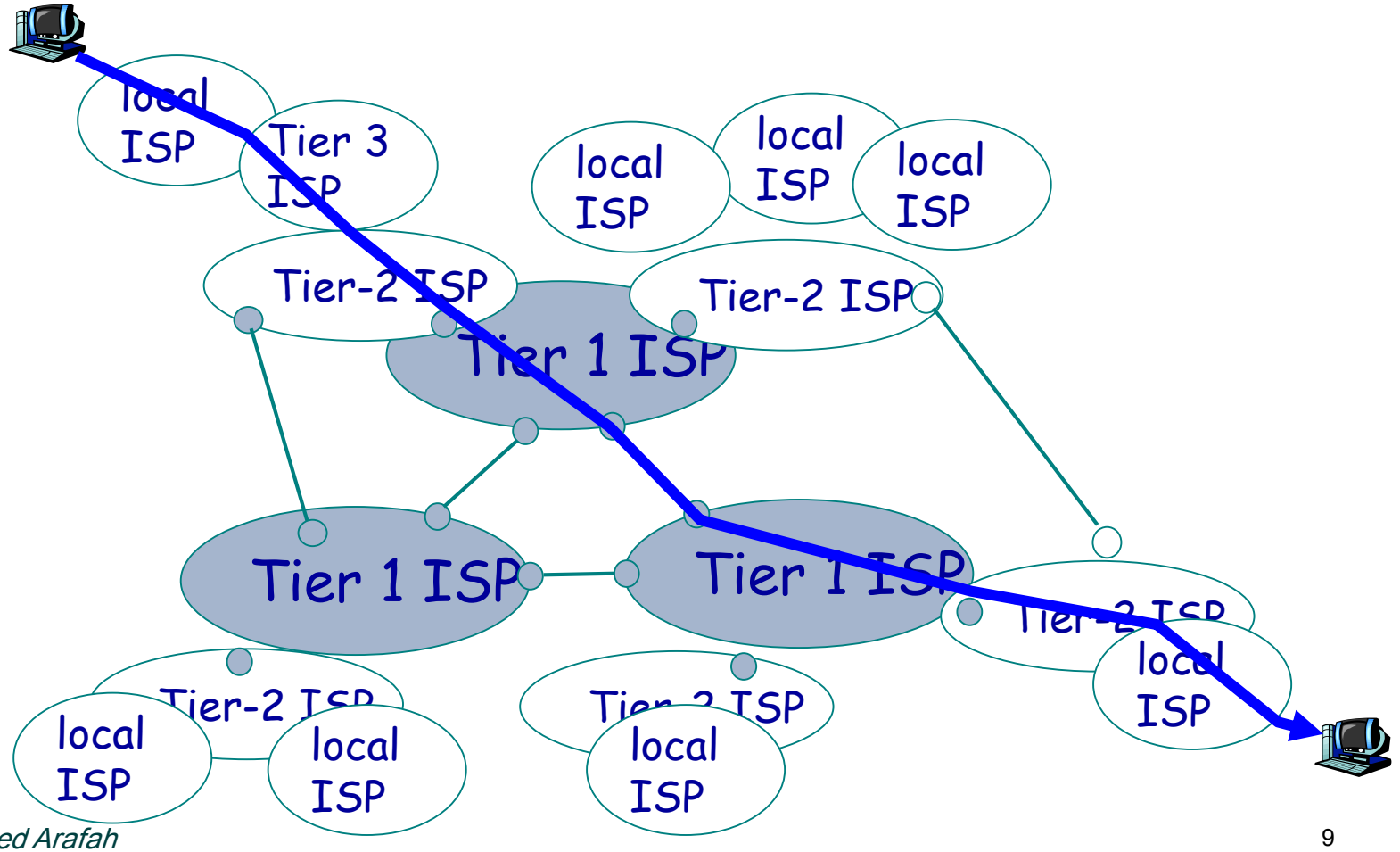
Access Networks

4. WiMAX:

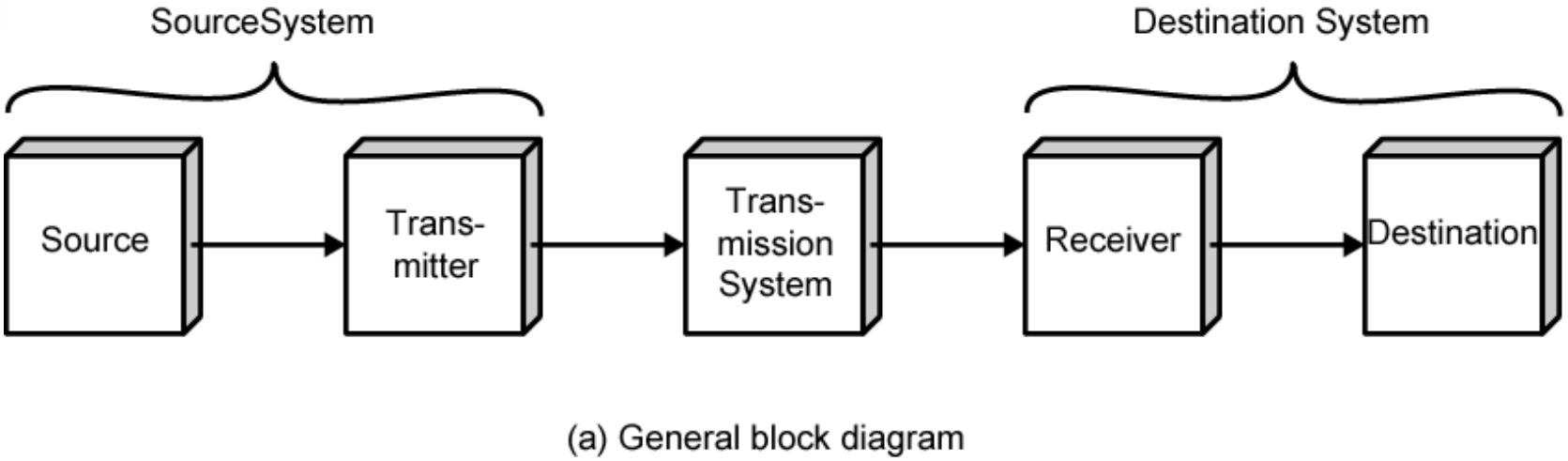


Internet Structure: Network of Networks

- A packet passes through many networks!



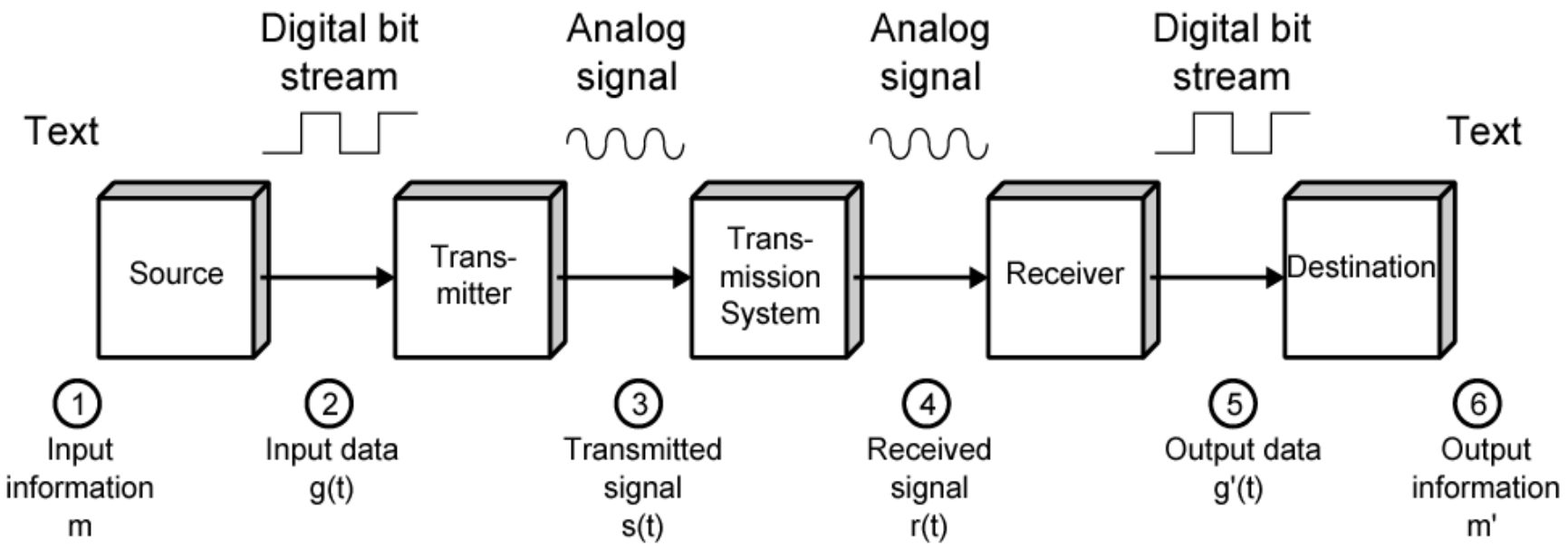
A Communications Model



(a) General block diagram

(b) Example

Data Communications Model



Communications Tasks

Transmission system utilization
Interfacing
Signal generation
Synchronization
Error detection and correction
Flow control
Addressing
Routing
Recovery
Message formatting
Security
Network management

→ Data exchange can involve complex procedures.

→ Next lecture: ISO/OSI Reference Model

Transmission Medium

- selection is a basic choice
  - internal use entirely up to business
  - long-distance links made by carrier
- rapid technology advances change mix
  - Wired: copper, fiber optic
  - Wireless

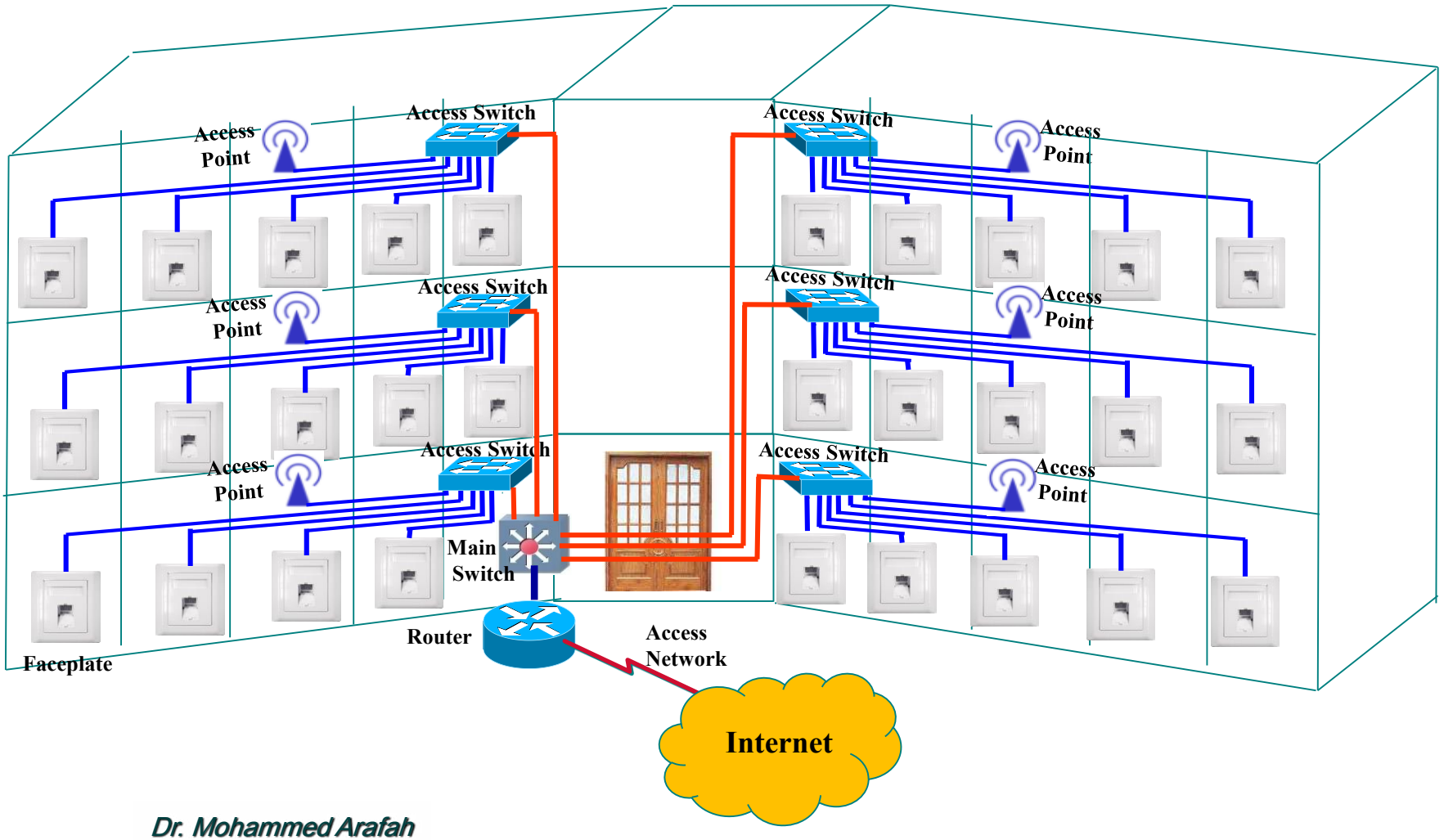
Networking

- growth of number & power of computers is driving need for interconnection
- also seeing rapid integration of voice, data, image & video technologies
- two broad categories of communications networks:
  - Local Area Network (LAN)
  - Wide Area Network (WAN)

Local Area Networks

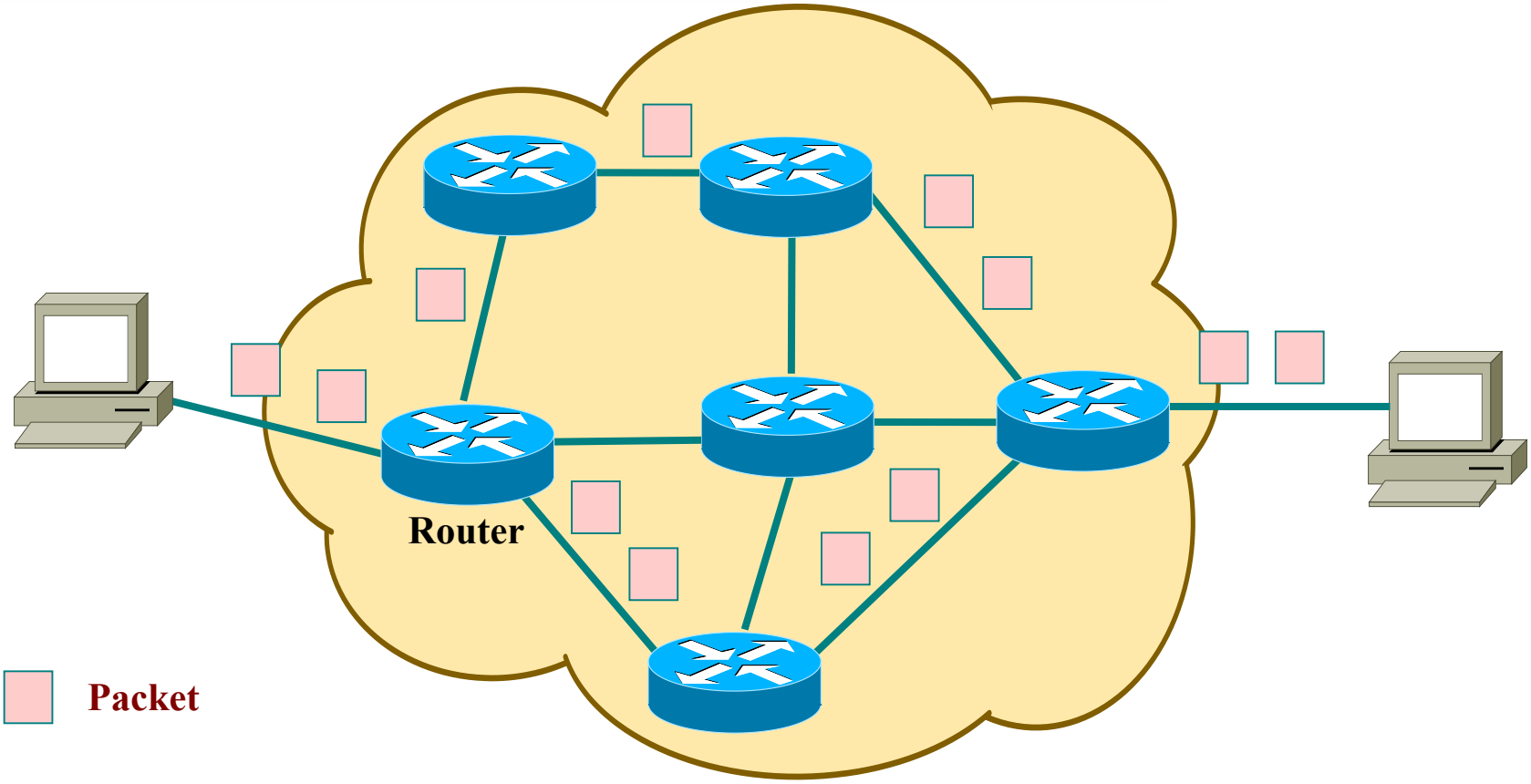
- smaller scope
  - Building or small campus
- usually owned by same organization as attached devices
- data rates much higher
- switched LANs, eg Ethernet
- wireless LANs, eg Wi-Fi

Local Area Networks - Example



Wide Area Networks

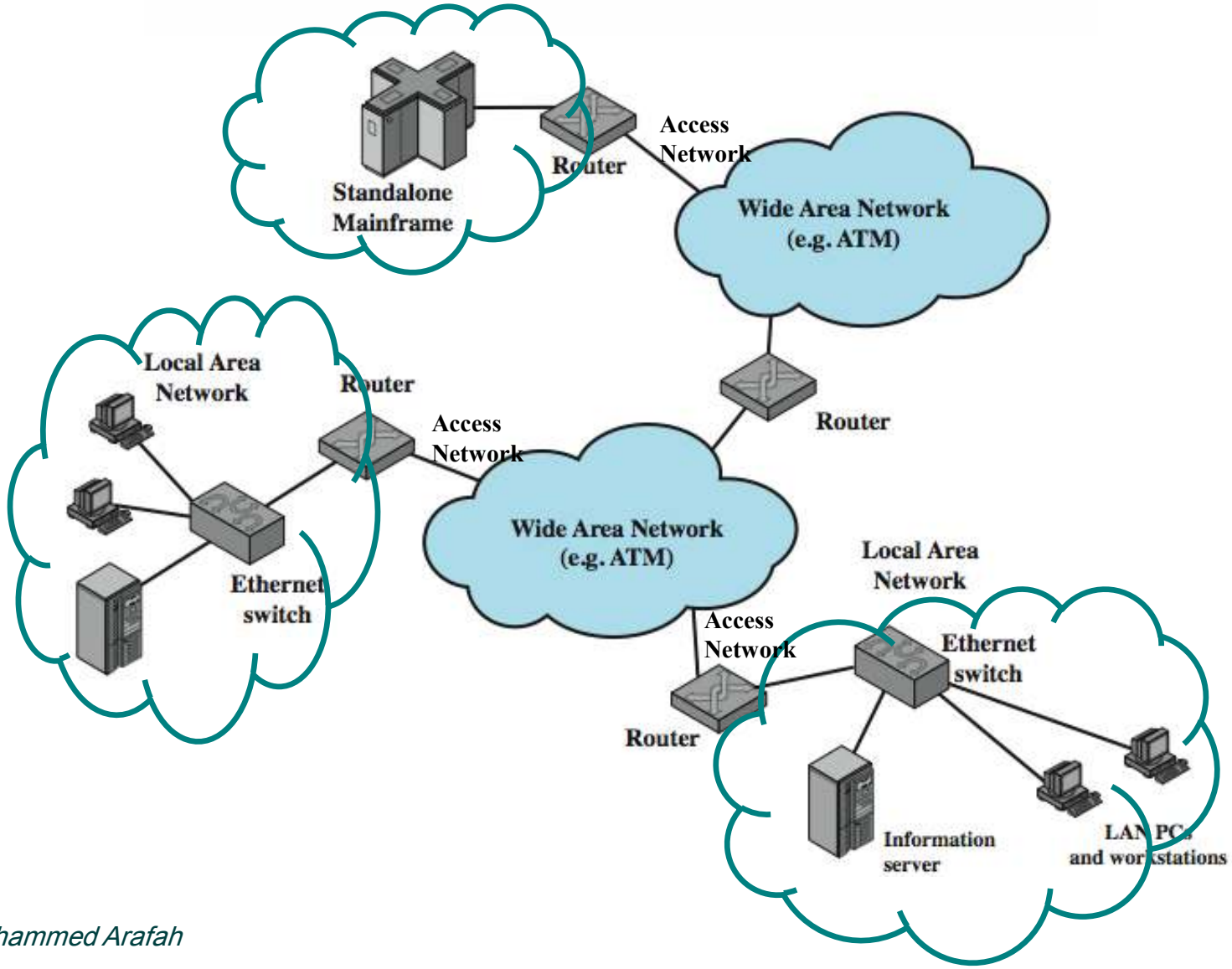
- span a large geographical area



The Internet

- Internet evolved from ARPANET
  - first operational packet network
  - applied to tactical radio & satellite nets also
  - had a need for interoperability
  - led to standardized TCP/IP protocols

Internet Elements



Summary

- introduced data communications needs
- communications model
- defined data communications
- overview of networks
- introduce Internet