

# DE050 Computer Network and Security

H. Anthony Chan

<https://cis.cihe.edu.hk/Anthony-Chan/index.html>

What I have is only borrowed from God so that I may serve others. H. Anthony Chan

The ability to communicate with high speed network at affordable price is important to the people, business, and industry in every country to compete in the global market in the Information Age.

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## Communication Networks Overview

- ♦ What is the Internet?
- ♦ What's a protocol?
- ♦ Network structure, network edge
- ♦ Network core
- ♦ Access network
- ♦ LAN topology
- ♦ Physical media
- ♦ Internet structure and ISPs
- ♦ Performance: loss, delay
- ♦ Protocol layers, service models
- ♦ History

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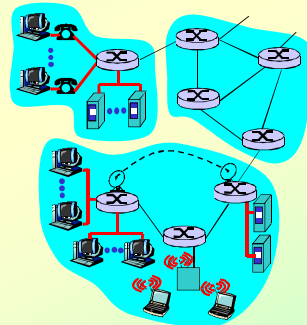
## Access networks and physical media

Q: How to connect 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?



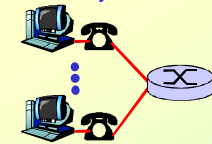
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## Residential access: point to point access

- ♦ **Dialup via modem**
  - up to 56Kbps (often less) direct access to router
  - Cannot surf and phone at the same time: cannot be "always on"
- ♦ **ADSL: asymmetric digital subscriber line**
  - up to 1 Mbps upstream (typically < 256 kbps)
  - up to 8 Mbps downstream (typically < 1 Mbps)
  - FDM:
    - 50 kHz – 1 MHz for downstream;
    - 4 kHz-50 kHz for upstream;
    - 0-4kHz for ordinary telephones



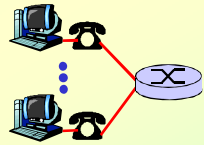
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## Residential access: point to point access

- ♦ **ISDN**: integrated services digital network: 128Kbps all-digital connect to router



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## Residential access: cable modems

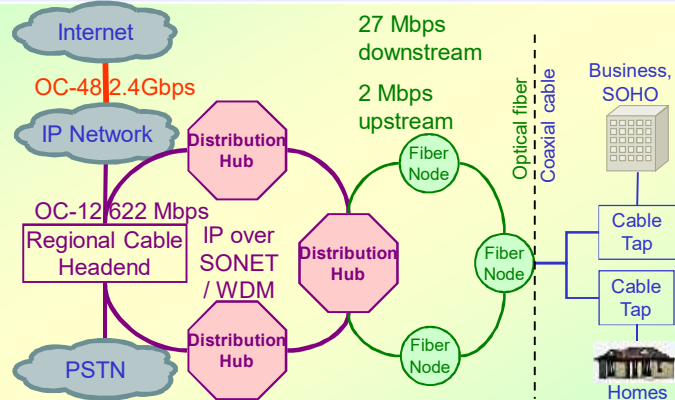
- ♦ **HFC**: hybrid fiber coax
  - asymmetric: up to 30Mbps downstream, 2 Mbps upstream
- ♦ **network** of cable and fiber attaches homes to ISP router
  - Homes share access to router
  - issues: congestion, dimensioning
- ♦ deployment: available via cable TV companies

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## Optical / Cable Network



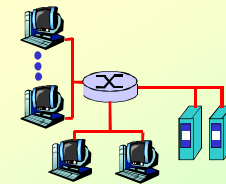
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## Institutional access: local area networks

- ♦ company/univ **local area network** (LAN) connects end system to edge router
- ♦ **Ethernet**:
  - shared or dedicated link connects end system and router
  - 10 Mbs, 100Mbps, Gigabit Ethernet
- ♦ LANs: chapter 5



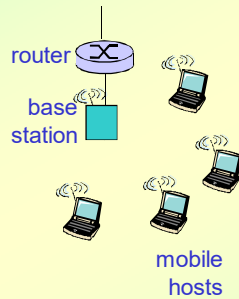
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## Wireless access networks

- ◆ shared *wireless* access network connects end system to router



- ◆ **wireless LANs:**

- 802.11b: 11 Mbps
- 802.11g: 54 Mbps
- 802.11n: > 100 Mbps

- ◆ **Wireless WAN**

- 2.5G/3G: wireless access to ISP router via cellular network

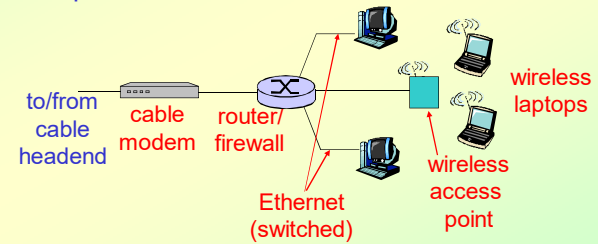
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## Home networks Typical home network components:

- ◆ ADSL or cable modem
- ◆ router/firewall/NAT
- ◆ Ethernet
- ◆ wireless access point



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