스마트 네트워크 및 실습
(LD02700)

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1주차 강의

휴강 10.2 (추석)

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Chapter 1

Network and Internet -1

1.1 what is the Internet?
1.2 network edge
- end systems, access networks, links

1.3 network core
- packet switching, circuit switching, network structure

1.4 delay, loss, throughput in networks
1.5 protocol layers, service models
1.6 networks under attack: security
1.7 history

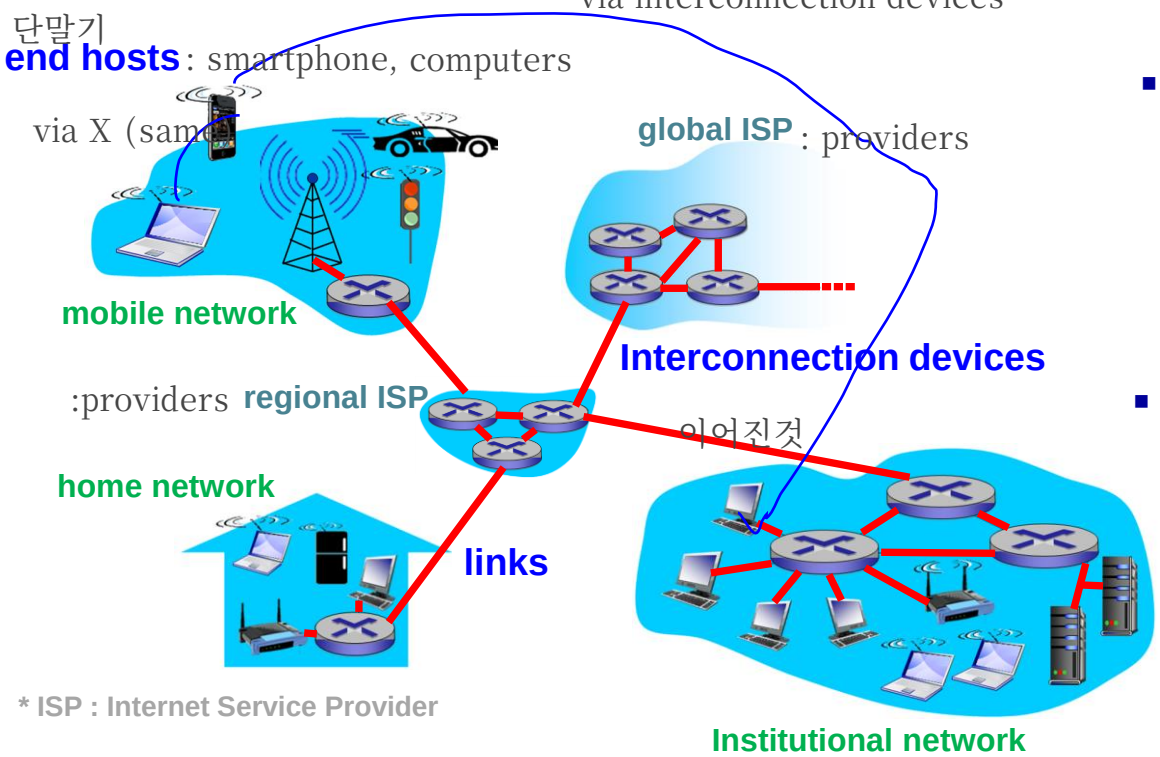
What's the Internet

- **Internet : inter + network**

  : Network of networks

  (네트워크들이 모인 네트워크, 네트워크간의 연결)

  * H/W : PC, Server, Router, fiber, copper…
  * S/W : OS, App, Protocols …



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

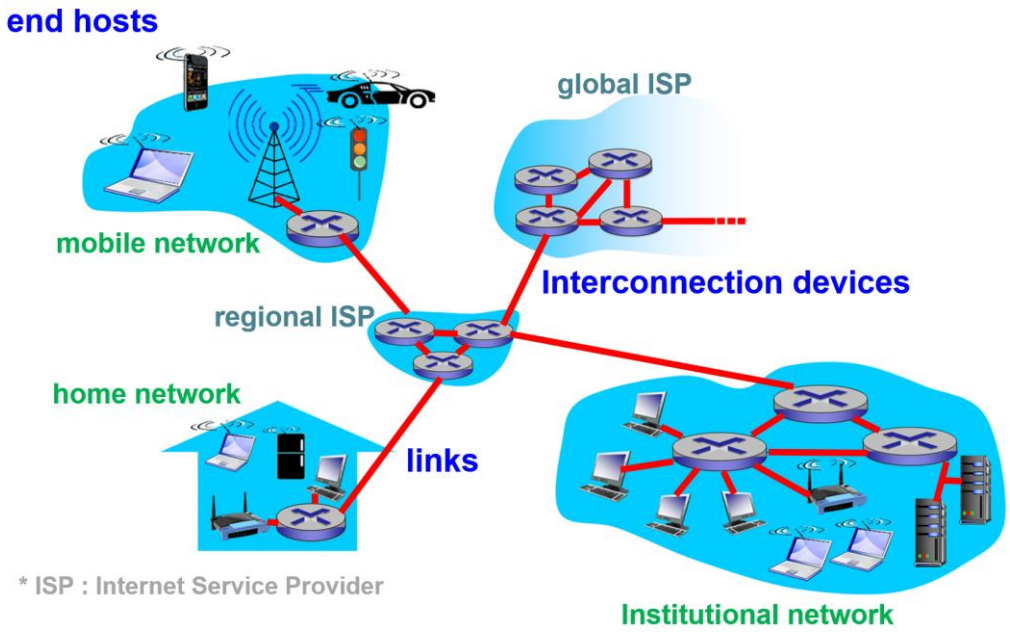
- *packet switches:*
  packet들을 다음 device로 전송
  - *routers* and *switches*

- *communication links*
  - fiber, copper, 무선
  - transmission rate
    (= *bandwidth*, 대역폭)

속도 up

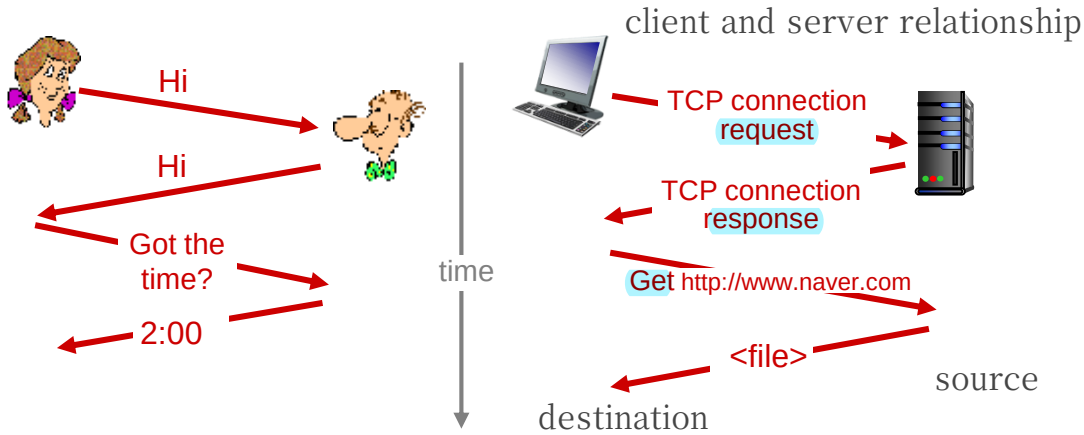
What's the Internet

- H/W component
  - end hosts(systems)
  - interconnection devices
    - router, switch, repeater
  - links
    - copper, fiber, radio
- S/W component
  - operating software
  - application programs
  - protocols rules



Protocol computer communication rules

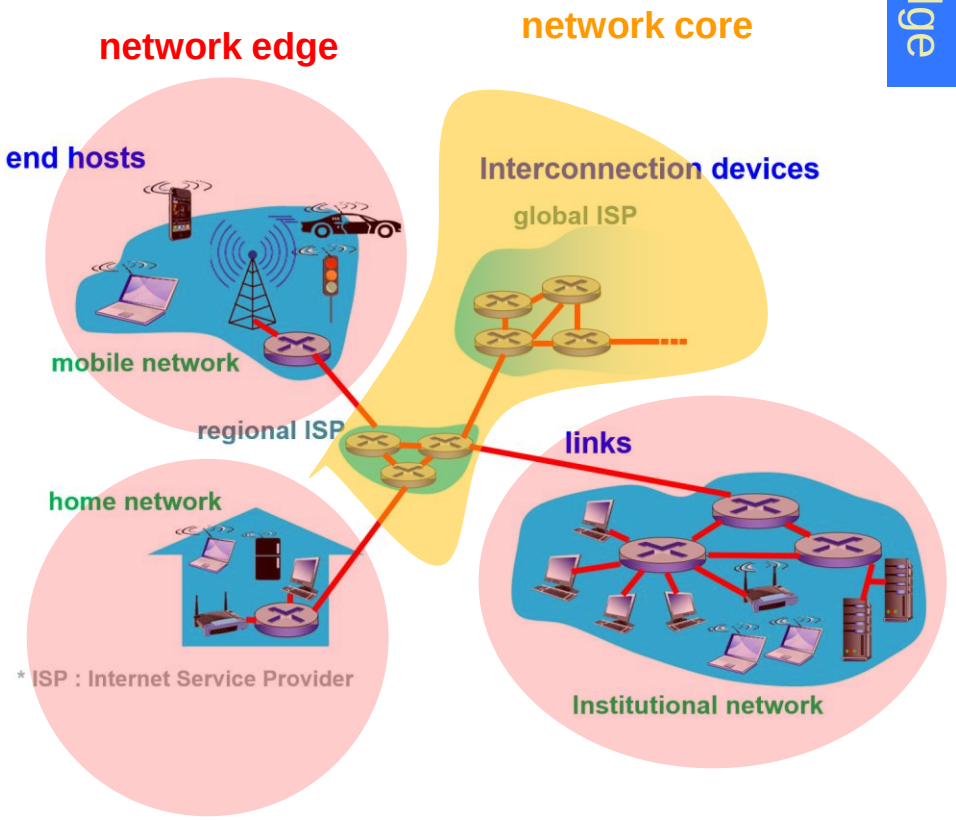
- **a human protocol and a computer network protocol:**
  - **Internet**에서 이루어지는 **communication**들은 모두 **protocol**에 의해 결정됨



  - **Protocol**에 정의되어 있는 것들
    - **message format**
    - **network**에서 **message**를 주고(send) 받는(receive) 순서(order)
    - **communication**을 하는데 필요한 행위(action) how many packets to be delivered

A closer look at network structure:

- **network edge** – 네트워크의 종단부
  - host들로 구성
    (clients and servers)
- **network core** - edge들을 연결
  - interconnected routers
    (switches)



*** Access network :**

end host(사용자, network edge)들을 network(internet)에 access(접속) 가능하게 하는 network

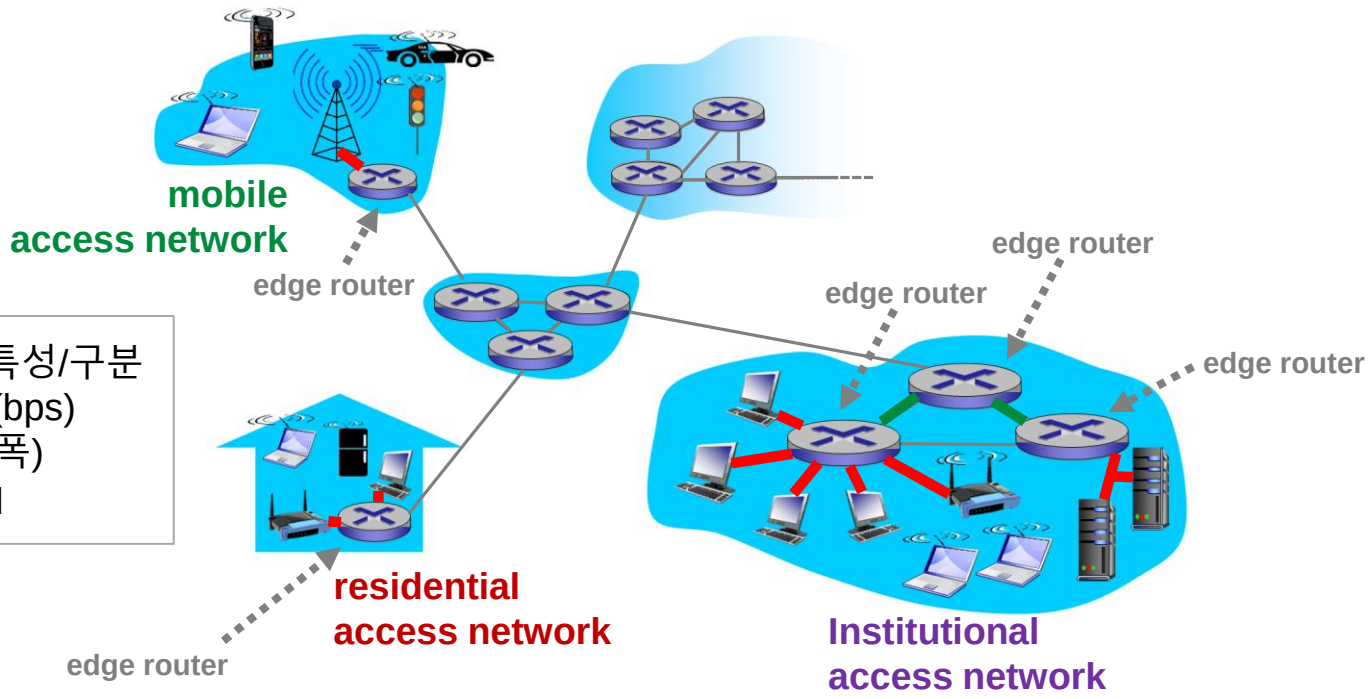
*** physical media :**

wired, wireless communication links

Access Network

- **Access network :** **end host(사용자, network edge)들을 network(internet)에 access(접속) 가능하게 하는 network**
  - **end host가 자신의 컴퓨터를 가지고 network에 access하는 최초의 접속 network**
  - **end host들을 연결하기 위해서 edge router와 연결하는 network**

(예) mobile access network, residential access network, institutional access network

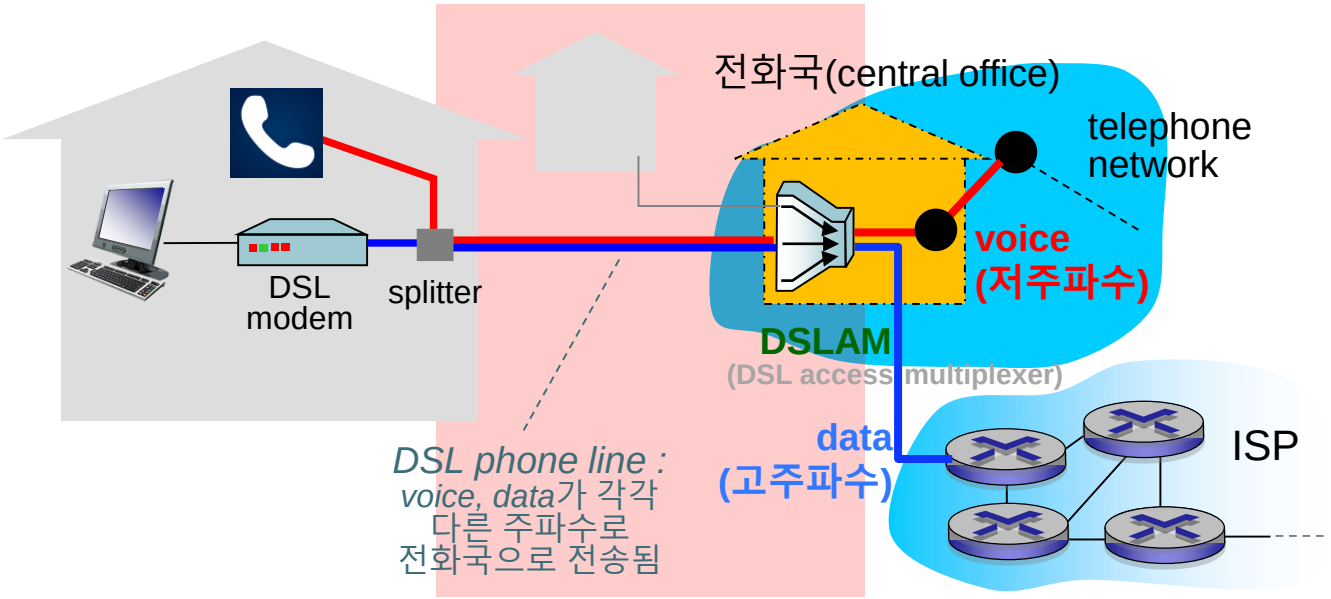


• Access network의 특성/구분
- transmission rate (bps)
(= *bandwidth*, 대역폭)
- shared / dedicated

Access network: Digital Subscriber Line (DSL)

DSL: digital subscriber line

Access network – DSL의 물리적 구성



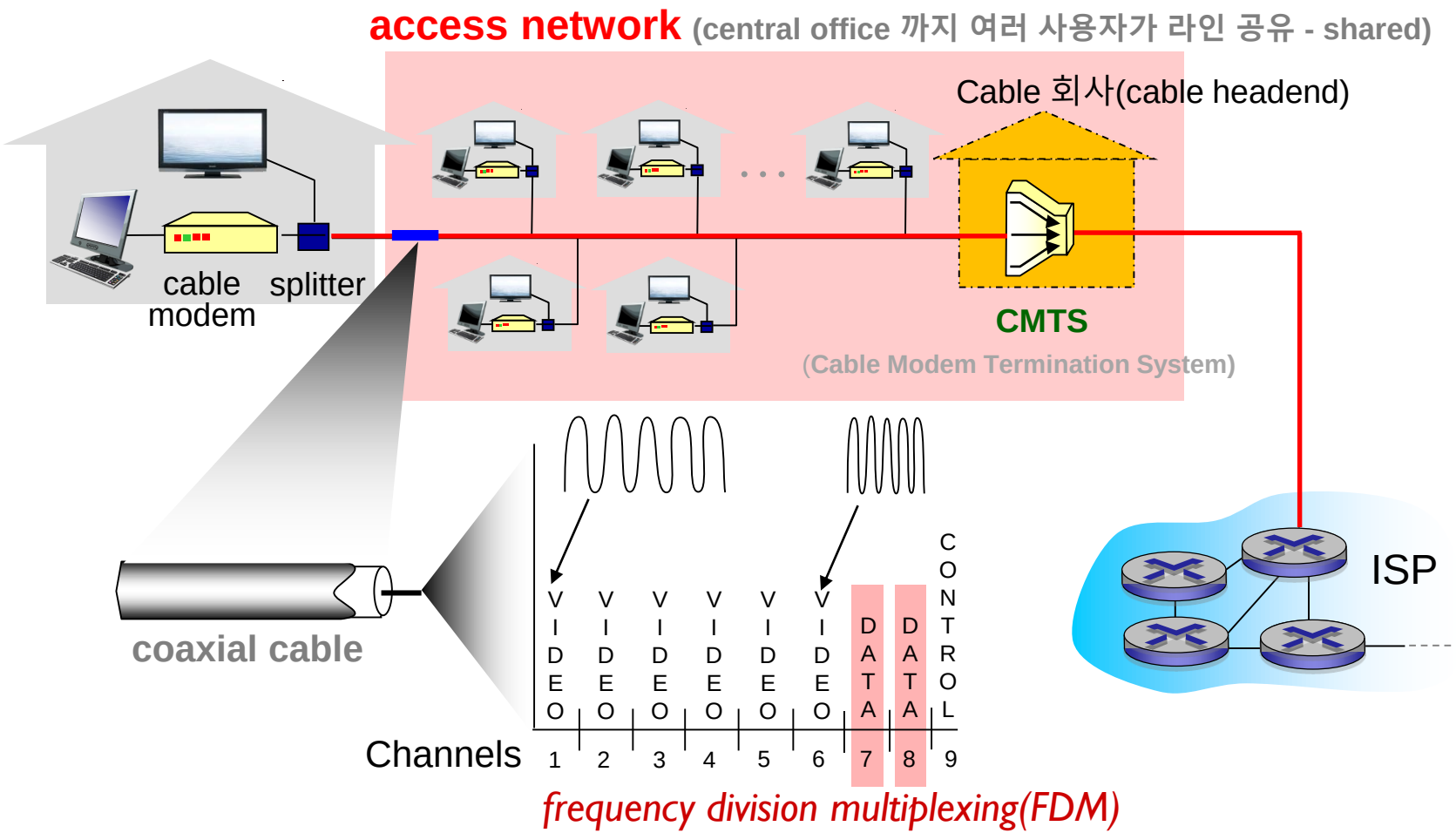
access network (central office 까지 한 사용자가 라인 독점 - dedicated)

- 기존 전화선을 이용하여 전화국의 DSLAM에 연결 (**DSLAM**: DSL access multiplexer)
  - DSL의 **data**는 Internet 으로 연결
  - DSL의 **음성(voice)**은 telephone net으로 연결

(예) ADSL (Asymmetric DSL)

Access network: cable network

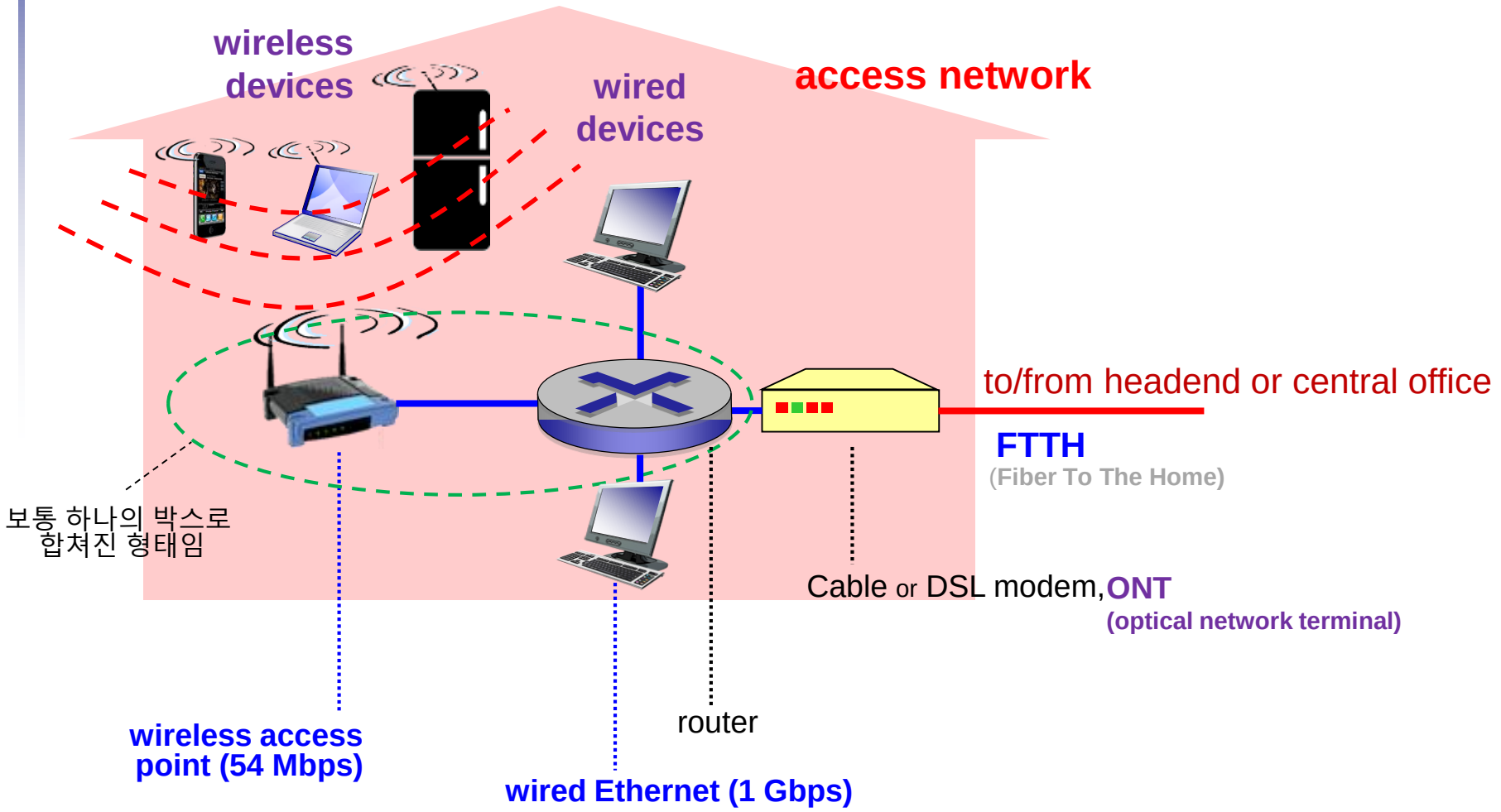
Access network – cable network의 물리적 구성



- HFC (Hybrid Fiber Coax)

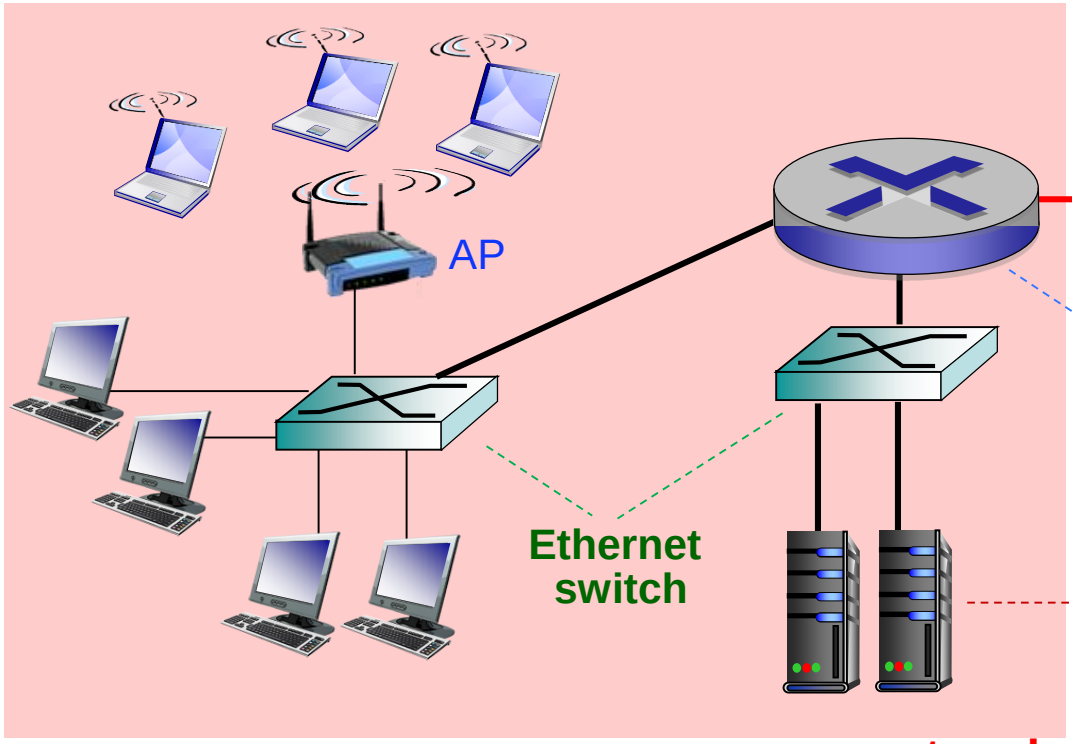
Access network: home network

Access network – home network의 물리적 구성



Access network: Enterprise / Institutional network, Ethernet

Access network – institutional access network의 물리적 구성



- 회사, 대학 등에서 사용
- transmission rates : 10 Mbps, 100Mbps, 1Gbps, 10Gbps
- 회사, 대학안의 end systems들은 대부분 Ethernet switch에 연결됨

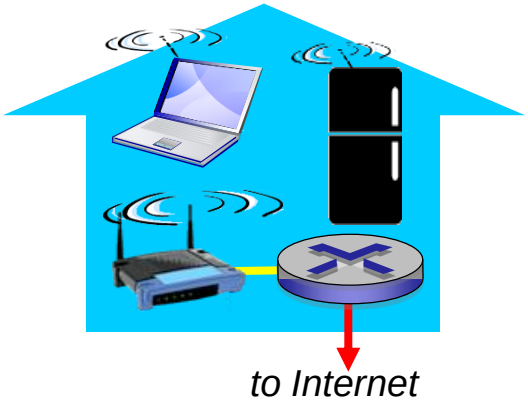
Wireless access networks

- wireless access network는 end system과 router을 연결
  - Ex. Base station(기지국)은 access point

wireless LANs:

- within building (coverage: 35m)
- Wi-Fi (**Wi**reless **Fi**delity) - shared
  - 802.11 b : 11 Mbps
  - 802.11 g : 54 Mbps
  - 802.11 n : 450 Mbps
  - 802.11 ac: 866.7 Mbps (wave1)
    1730 Mbps (wave2)

Link Transmission Rate

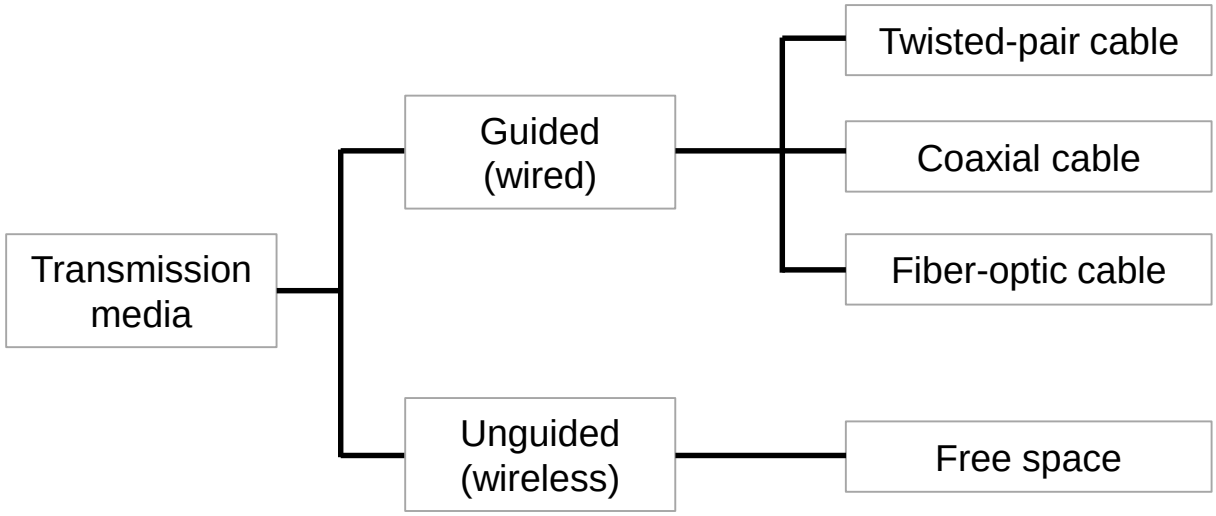


wide-area wireless access (cellular network)

- 3G, 4G(LTE), 5G - shared
- provided by cellular operator (coverage: 수 km)
- between 1 and 100 Mbps

Physical media

- physical media: 신호(에너지)를 전달하는 매체(물질)
  transmitter와 receiver사이의 link에 사용
  - guided media:
    - signals propagate in solid media: copper, fiber, coax
  - unguided media:
    - signals propagate freely, e.g., radio

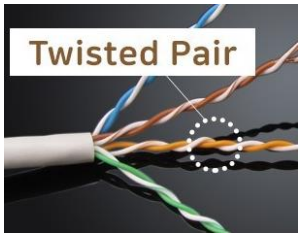


Physical media: TP, coax, fiber

1. guided media

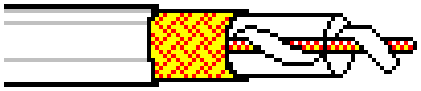
(1) *TP(twisted pair)*

- two insulated copper wires
  - 100 Mbps, 1Gbps, 10Gbps



(2) *coaxial cable:*

- 중심: copper conductor
  겉면: conductor로 둘러 쌈
- 광대역 특성(broadband):
  - multiple channels on cable
  - HFC(hybrid fiber coax)



(3) *fiber optic cable:*

- 빛 pulse를 전달하는 유리섬유
  (glass fiber)
- high-speed operation:
  - **high-speed** point-to-point transmission
    (e.g., 수십10-수백 Gbps transmission rate)
- low error rate:
  - **electromagnetic noise에 강함**

Physical media: radio

2. Unguided media

- **electromagnetic wave**로 signal 전송
- 물리적인 wire가 없음
- 주변환경에 영향을 받음:
  - reflection
  - obstruction by objects
  - interference

radio link types:

- terrestrial microwave
  - e.g. up to 45 Mbps channels
- Wireless LAN (e.g., WiFi)
  - 54 Mbps
- wide-area wireless network (e.g., cellular)
  - 4G: 10 Mbps 내외
  - 3G: ~ few Mbps
- satellite
  - Kbps to 45Mbps channel (or multiple smaller channels)

감사합니다.