Course Title
IoT Wireless & Cloud Emerging Technologies

❖ **Modules**

- 1. IoT Business & Products
- 2. IoT Architecture & Technologies
- 3. IoT Networks
- 4. **Wi-Fi & Bluetooth**
- 5. Cloud Technology
- 6. IoT Bluetooth & Wi-Fi and EC2 Cloud Projects

Wi-Fi & Bluetooth
Wi-Fi

Wi-Fi

❖ WLAN (Wireless Local Area Network)

- WLAN is a wireless networking technology that links two or more computing devices using a wireless distribution system within a limited local area (approx. 30 m)

- Applications Areas
 - Home, School, Computer Laboratory, Office Building, etc.

Wi-Fi

❖ WLAN Market

- Consists of WLAN consumers and enterprise market segments
  - Cisco, HPE (Hewlett-Packard Enterprise), Huawei, and Ubiquiti are the major WLAN enterprises

- In 2016, the overall market size reached $9.38 billion

Wi-Fi

❖ **WLAN Market**

- Cisco leads with an earning of $537.39 M
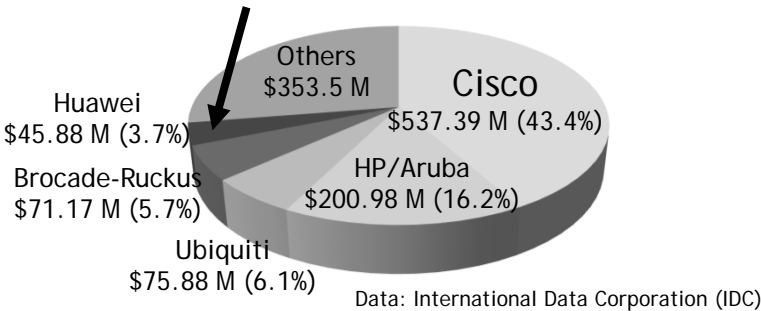 holding a 43.4% share of the market

Data: International Data Corporation (IDC)
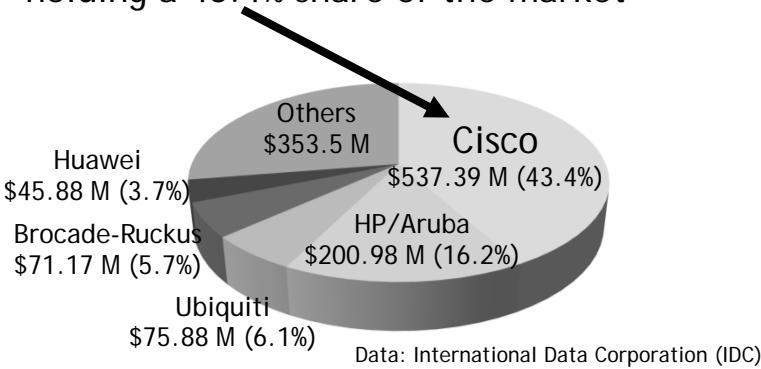
Enterprise WLAN vendors Market Revenues in Q1 of 2017

Wi-Fi

❖ **WLAN Market**

- Huawei has shown strong growth
  by increasing 229.7% over a year
  to claim a 3.7% share of the market

Data: International Data Corporation (IDC)

Enterprise WLAN vendors Market Revenues in Q1 of 2017

Wi-Fi

❖ **Wi-Fi or WiFi**

- Representative WLAN technology that allows electronic devices to network mainly using the unlicensed ISM radio bands

- ISM (Industrial, Scientific, and Medical) frequency bands
  - 2.4 GHz UHF (Ultra High Frequency)
  - 5 GHz SHF (Super High Frequency)

Wi-Fi

❖ **Wi-Fi Transmission**

- 5 GHz offers higher throughput at shorter distances

- 2.4 GHz provides increased coverage and improved solid object penetration

- Beamforming and other multiple antenna technologies like MIMO are used to increase the date rate and QoS
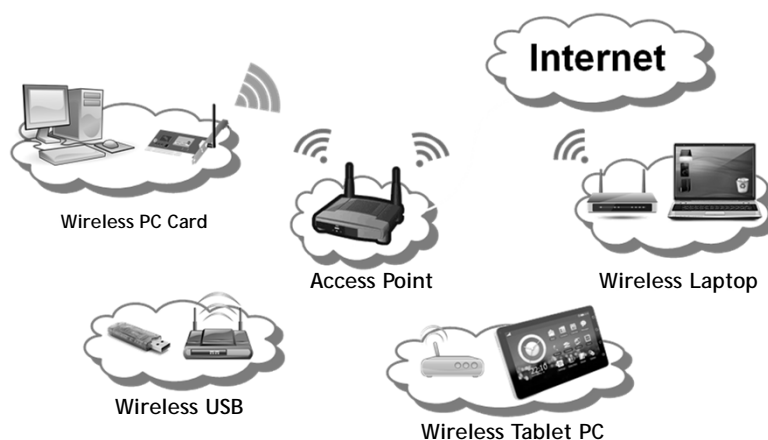
Wi-Fi

❖ **Wireless AP (Access Point)**

- A device that allows Wi-Fi devices to connect to a wired network
  - Wi-Fi Devices: Smartphones, Smart Devices, Laptop & Tablet Computers, PCs, etc.

- APs usually connect to an Internet Gateway/Router or may have built in Gateway capabilities
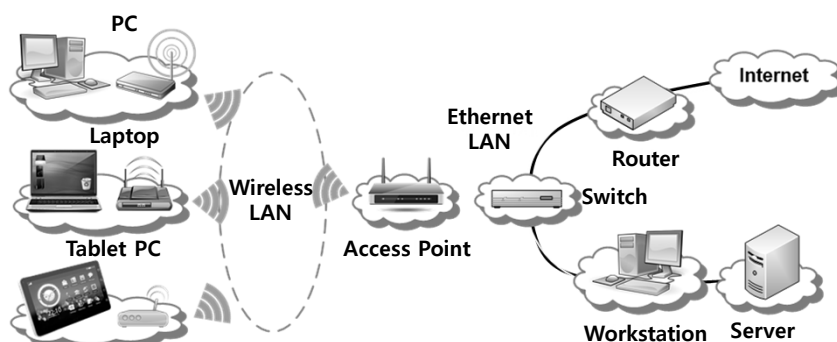
Wi-Fi

❖ **Example of an AP network**

Wireless PC Card

Access Point

Wireless Laptop

Wireless USB

Wireless Tablet PC

Internet

Wi-Fi

❖ **Infrastructure Mode**

- In infrastructure mode, the AP helps the Wi-Fi devices to
  - communicate with each other and
  - communicate with the wired network

- BSS (Basic Service Set)
  - In infrastructure mode, commonly one AP is connected by wire (e.g., Ethernet) to the Internet, and a set of Wi-Fi devices connect to the AP

Wi-Fi
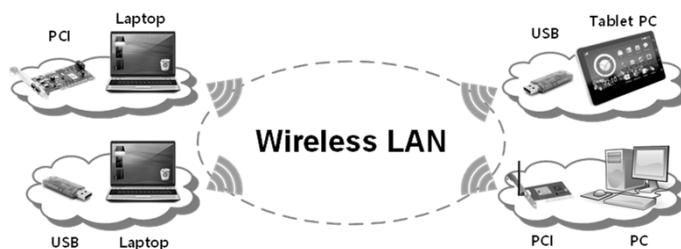
❖ **Example of Infrastructure Mode**

Wi-Fi

❖ Ad-Hoc Mode

- Wi-Fi devices or stations communicate directly with each other, without help from an AP (Access Point)

- Used where Infrastructure Mode network setup is not needed or not possible

- Also referred to as peer-to-peer mode

- IBSS (Independent Basic Service Set)
  - Ad-hoc mode network is referred to as an IBSS

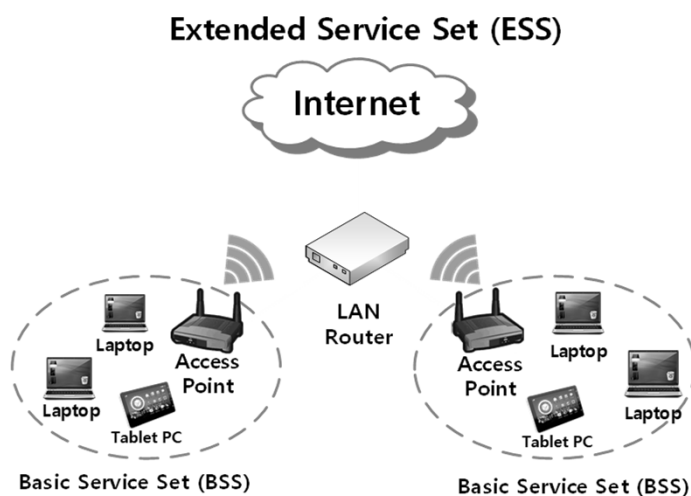## Wi-Fi

❖ Example of Ad-Hoc Mode

Wi-Fi

❖ BSS & ESS

- BSS (Basic Service Set) is the basic building block of an 802.11 WLAN
  - In infrastructure mode, a BSS is formed by a single AP (Access Point) and all associated STAs (Stations)
  - AP acts as a Master and controls all STAs within the BSS
- ESS (Extended Service Set) is a set of two or more BSSs that form a single network
  - Extends the range of Wi-Fi STA mobility

Wi-Fi

❖ Example of ESS

Extended Service Set (ESS)

Internet

LAN Router

Laptop Access Point Tablet PC Laptop
Basic Service Set (BSS)

Access Point Laptop Tablet PC Laptop
Basic Service Set (BSS)

Wi-Fi & Bluetooth

References

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References

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