



CMJ251-Manajemen Jaringan Mobile

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Dosen Pengampu :

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Pertemuan 4

Wireless Fidelity

What is Wi-Fi?

- ▶ Short for *wireless fidelity*.
- ▶ It is a wireless technology that uses **radio frequency** to transmit data through the air.
- ▶ Wi-Fi is based on the 802.11 standard:
 - 802.11a
 - 802.11b
 - 802.11g

Wi-Fi Alliance

- ▶ Non-profit standards organization.
- ▶ Global organization that created the Wi-Fi brand name.
- ▶ Formerly the Wireless Ethernet Compatibility Alliance.
- ▶ Logo:



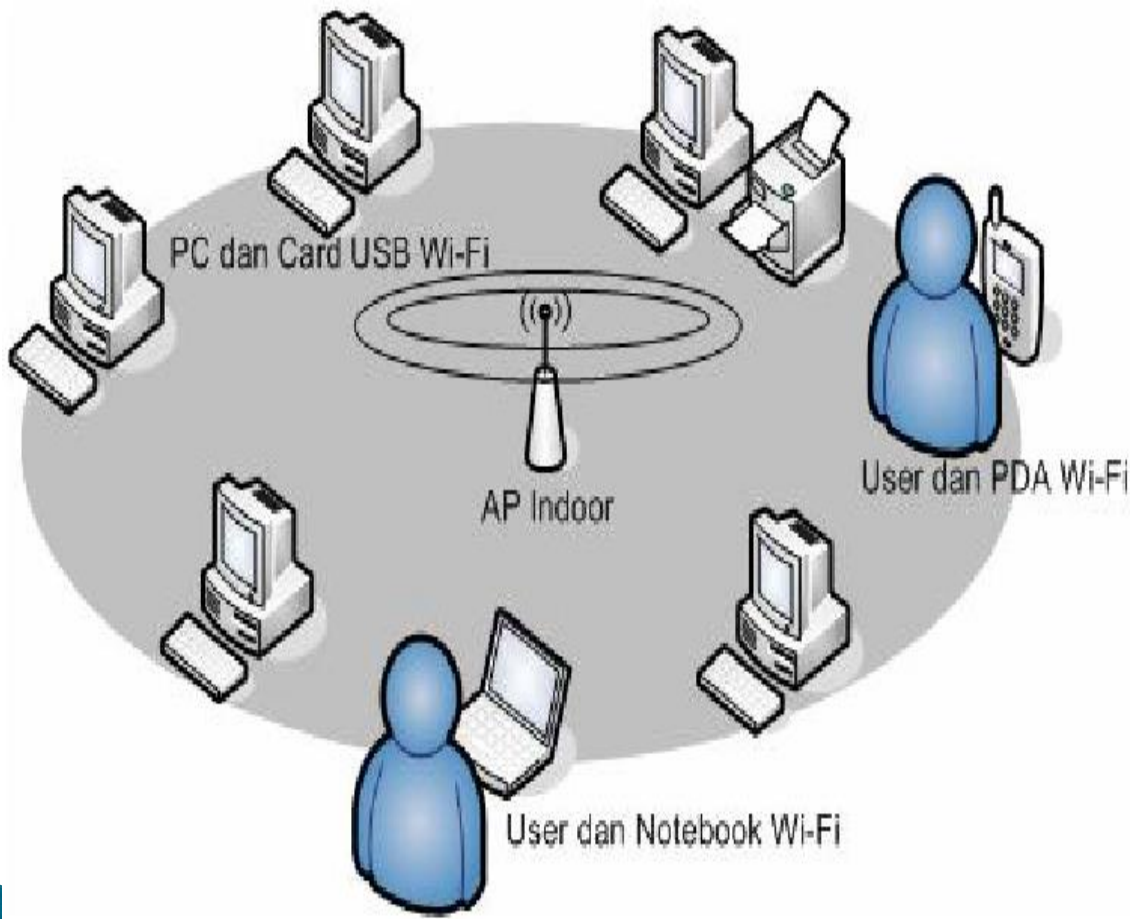
Konsorsium WiFi



Brief History

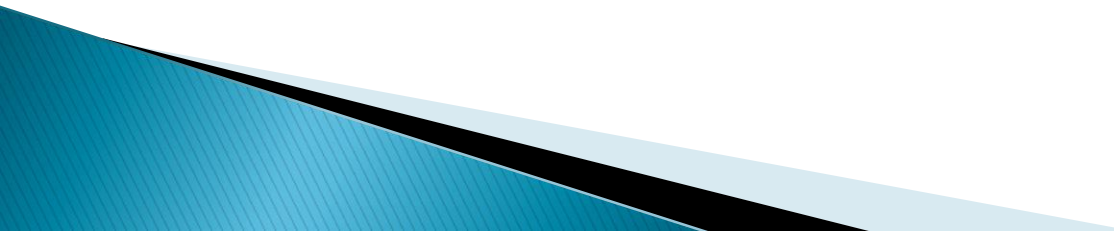
- ▶ IEEE (Institute of Electrical and Electronics Engineers) established the 802.11 Group in 1990. Specifications for standard written in 1997.
- ▶ Initial speeds were 1 and 2 Mbps.
- ▶ IEEE modified the standard in 1999 to include:
 - 802.11b
 - 802.11a
 - 802.11g was added in 2003.
- ▶ IEEE created standard, but Wi-Fi Alliance certifies products

Hotspot



HotSpot adalah definisi untuk daerah yang dilayani oleh satu Access Point Wireless

LAN standar 802.11a/b/g, dimana pengguna (user) dapat masuk ke dalam Access Point secara bebas dan mobile menggunakan perangkat sejenis notebook, PDA atau lainnya

- ▶ Pada wireless semakin **tinggi** gelombang radio maka semakin **tinggi** bandwidth tetapi jarak semakin **pendek**
 - ▶ 802.11.x menggunakan frekuensi 900, 2.4 dan 5 Ghz (Free)
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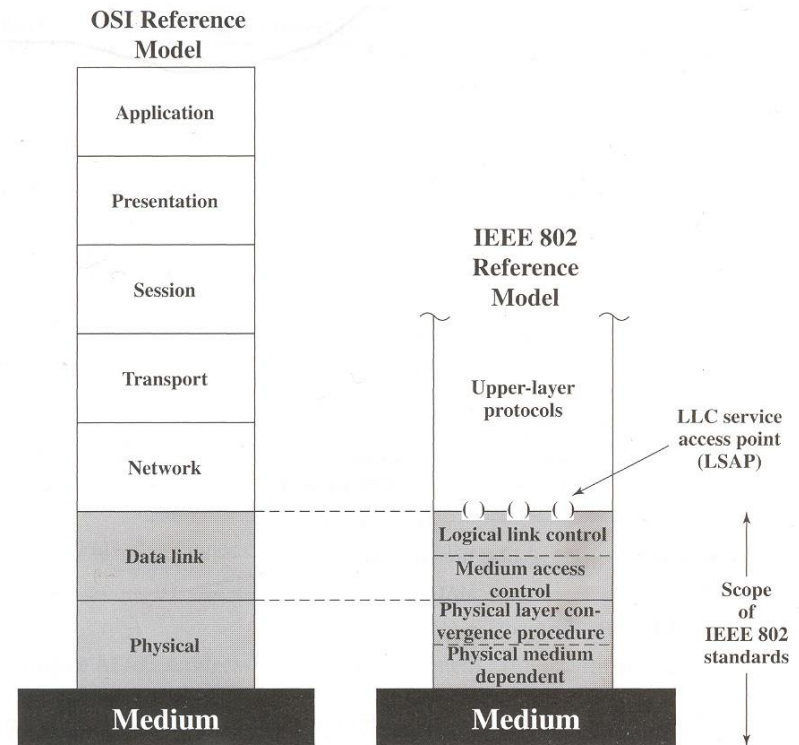
HotSpot

Akses HotSpot



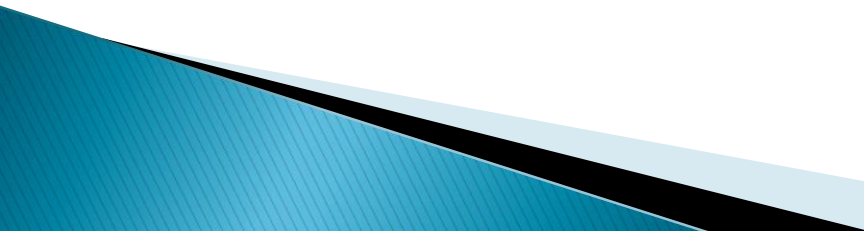
802.11 Standard

- ▶ 802.11 is primarily concerned with the **lower layers** of the OSI model.
- ▶ Data Link Layer
 - Logical Link Control (LLC).
 - Medium Access Control (MAC).
- ▶ Physical Layer
 - Physical Layer Convergence Procedure (PLCP).
 - Physical Medium Dependent (PMD).



IEEE 802 Protocol Layers Compared to OSI Model

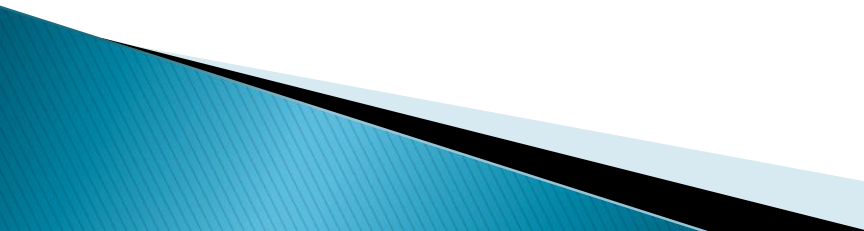
802.11b Standard

- ▶ Well-supported, stable, and cost effective, but runs in the 2.4 GHz range that makes it prone to interference from other devices (microwave ovens, cordless phones, etc) and also has security disadvantages.
 - ▶ **Limits** the number of access points in range of each other to three.
 - ▶ Has 11 channels, with 3 non-overlapping, and supports rates from 1 to 11 Mbps, but realistically about 4–5 Mbps max.
 - ▶ Uses **direct-sequence spread-spectrum** technology.
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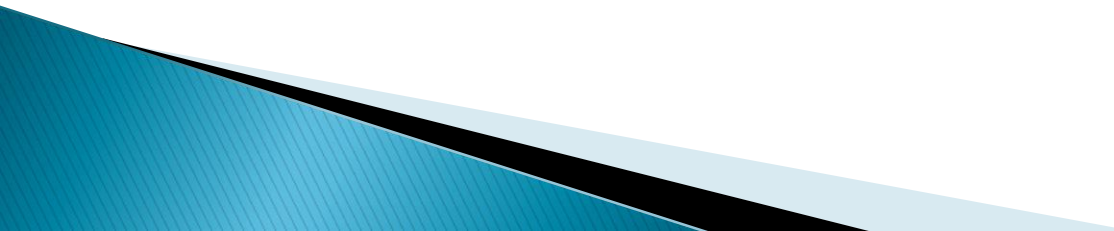
802.11g Standard

- ▶ **Extension of 802.11b**, with the same disadvantages (security and interference).
- ▶ Has a **shorter** range than 802.11b.
- ▶ Is **backwards compatible** with 802.11b so it allows for a smooth transition from 11b to 11g.
- ▶ **Flexible**, because multiple channels can be combined for faster throughput, but limited to one access point.
- ▶ Runs at 54 Mbps, but realistically about 20–25 Mbps and about 14 Mbps when b associated
- ▶ Uses **frequency division multiplexing**

802.11a Standard

- ▶ Completely **different** from 11b and 11g.
 - ▶ **Flexible**, because multiple channels can be combined for faster throughput and more access points can be co-located.
 - ▶ **Shorter range** than 11b and 11g.
 - ▶ Runs in the 5 GHz range, so less interference from other devices.
 - ▶ Has 12 channels, 8 non-overlapping, and supports rates from 6 to 54 Mbps, but realistically about 27 Mbps max
 - ▶ Uses **frequency division multiplexing**
- 

Basic Security Strategies

- ▶ Block your Service Set Identifier (SSID) from being broadcast.
 - ▶ Change the default network name in the access point.
 - ▶ Change the default access point password.
 - ▶ Center the access point in the middle of the building/house.
- 

Media Access Control (MAC) Filtering

- ▶ Every network device has a unique MAC address
 - Allocated by the manufacturer.
- ▶ MAC Filtering only allows certain addresses access.
- ▶ Mostly for home use.
 - Tedious to implement on a large scale

Wired Equivalency Protocol (WEP)

- ▶ Basic encryption technology.
 - Uses an RC4 stream cipher.
 - Pseudo-random bytes.
 - Two versions: 64-bit and 128-bit versions.
- ▶ Built into Wi-Fi certified equipment.
 - Implemented at the MAC level.
- ▶ Protects radio signal between device and access point.
 - Does not protect data beyond the access point.
- ▶ Uses static encryption keys.
 - Easy to crack.
 - Still better than nothing.

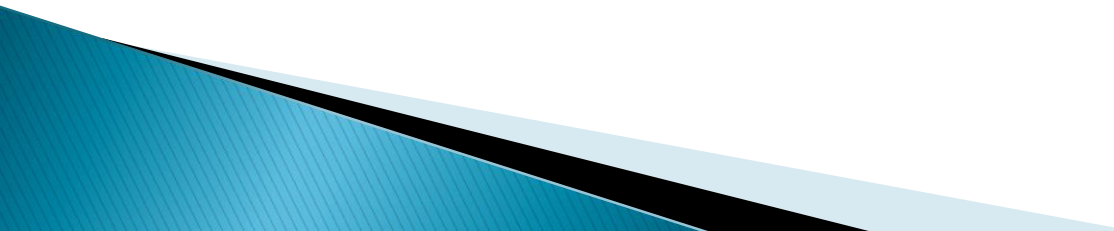
Wi-Fi Protected Access (WPA)

- ▶ Designed to replace WEP.
 - Firmware update.
 - 128-bit Temporal Key Integrity Protocol (TKIP) encryption.
 - Uses a master key that is regularly changed.
 - User authentication.
 - Data Integrity.
- ▶ Protects radio signal between device and access point.
- ▶ Built into Wi-Fi certified equipment.
 - Implemented at the MAC level.
- ▶ Available in two versions:
 - WPA2 Personal.
 - WPA2 Enterprise.

Wi-Fi Protected Access 2 (WPA2)

- ▶ Designed to replace WEP.
 - 128-bit Advanced Encryption Standard (AES).
- ▶ Based on the IEEE 802.11i standard.
- ▶ Provides government level security.
- ▶ Also available in two versions:
 - WPA2 Personal.
 - WPA2 Enterprise.

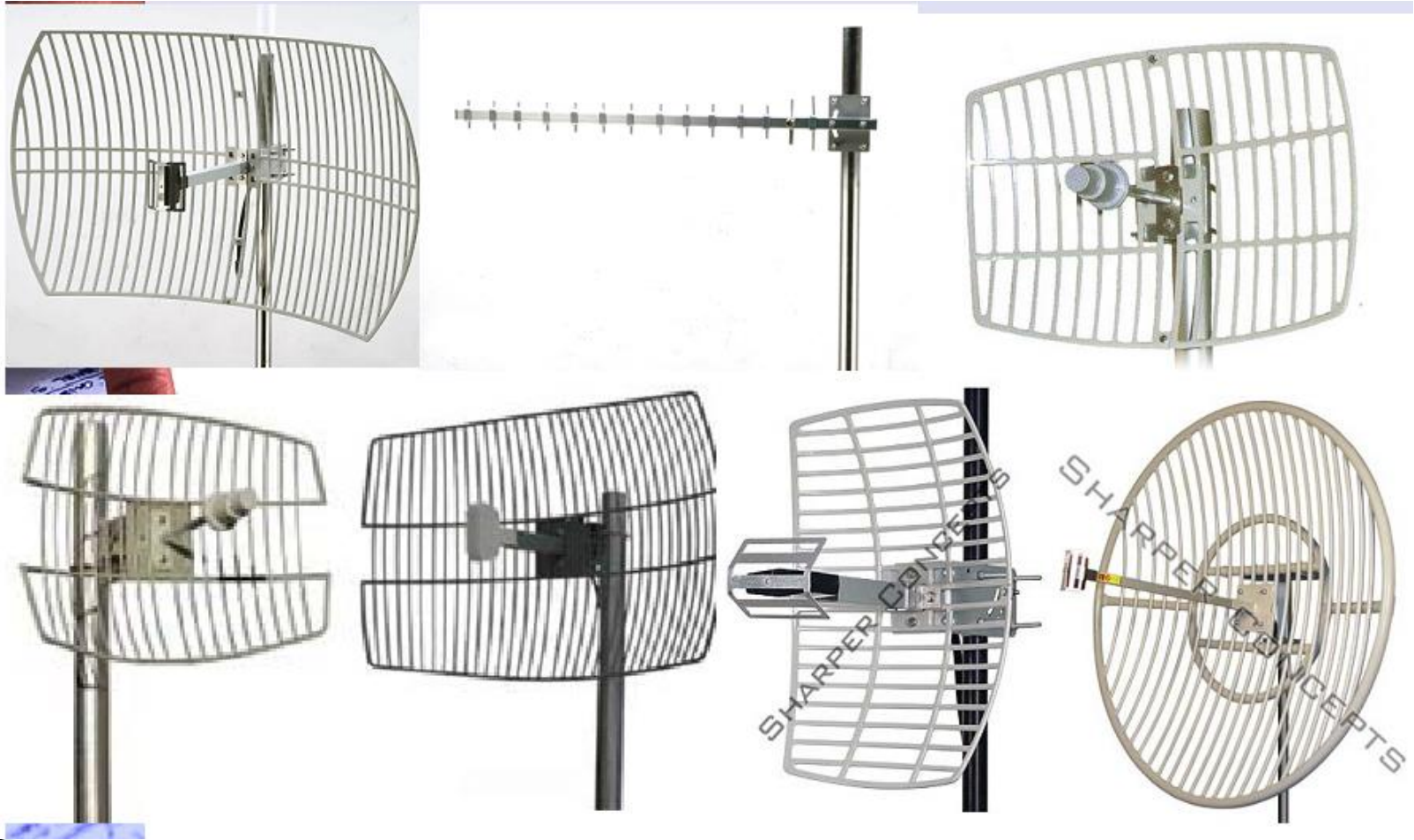
Virtual Private Network (VPN)

- ▶ Creates a secure virtual “tunnel” from remote device to VPN server.
 - Creates an encryption scheme.
 - Requires authentication.
 - ▶ Works across the internet.
 - ▶ Many types and levels of VPN technology.
 - May include hardware and software components.
 - Some very expensive.
 - Windows provides a basic implementation in its server software.
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Firewall

- ▶ Can make the network or computer invisible to the internet.
- ▶ Block unauthorized users.
- ▶ Monitor and control flow of data to/from a network or computer.
- ▶ Many types and levels of firewall technology.
 - Hardware and software combinations
 - Software only versions.
 - ZoneAlarm
- ▶ Many devices provide basic firewall capability.
 - Gateways and access points.
 - Network address translation.
 - Windows XP operating system.

Bentuk antena Wi-Fi (Grid)



Antena Wi-Fi (Panel)



Parabolic dan Yagi



Access Point



Access Point



W-LAN PCMCIA

Ethernet RJ-45

Power DC 5 Volt

Peralatan Client

Client Device



Compact Flash



PCMCIA



Notebook Centrino



PDA



USB



PCI Card



Embedded