جامعة الأهرام الكندية
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Lecture (07)
Additional Wireless Technologies

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Agenda

- Other wireless technologies
- Cordless Phone
- Bluetooth
- ZigBee
- WiMax
- Other Types of Interference

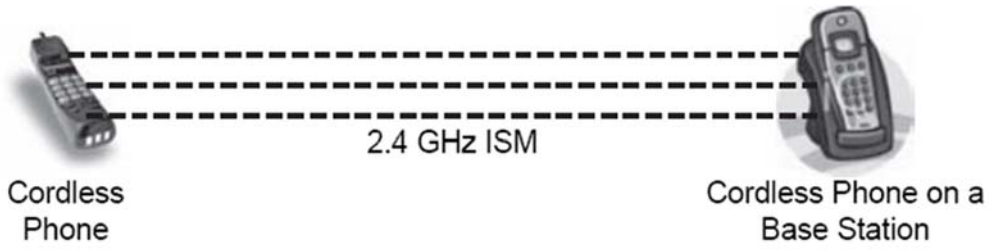
Other wireless technologies

- Although the 802.11 wireless spectrum is the best-known technology, others are in use
- These technologies include cordless phone technology, Bluetooth, ZigBee, WiMax, and some other odds and ends.

Cordless Phone

- Cordless phones sometimes operate in the wireless spectrum as WLANs, which can cause interference issues.
- some phones that operate at 2.4 GHz and others that operate at 5.8 GHz.
- This should be a consideration when you purchase cordless phones.
- If you have 802.11a deployed, a 2.4-GHz phone should suffice.
- If you have 802.11b/g, you should avoid a phone that operates in the 2.4-GHz range and go with a 5.8-GHz phone.

- To begin with, cordless phones can use *Time DivisionMultiple Access (TDMA) or Frequency DivisionMultiple Access (FDMA).*
- *TheMultiple Access technology is used* to allow more than one handset to access the frequency band at the same time, as shown in Figure
- As you can see, a cordless phone communicates with the base station.
- Multiple cordless phones can use the same base station at the same time by using TDMA or FDMA.



Standards

ETSI

- cordless phones to use the *Digital Enhanced Cordless Telecommunications (DECT) standard.*
- *DECT is an ETSI standard for digital portable phones and is found* in cordless technology that is deployed in homes and businesses.
- DECT standard is a good alternative for avoiding interference issues with any 802.11 technologies.
- The original DECT frequency band was 1880 to 1900 MHz.
- It's used in all European countries.
- It is also used in most of Asia, Australia, and South America.

FCC

- In 2005, the FCC changed channelization and licensing costs in the 1920 to 1930 MHz, or 1.9 GHz, band.
- This band is known as Unlicensed Personal Communications Services (UPCS).
- This change by the FCC allowed the use of DECT devices in the U.S. with few changes.
- The modified DECT devices are called DECT 6.0.

Bluetooth

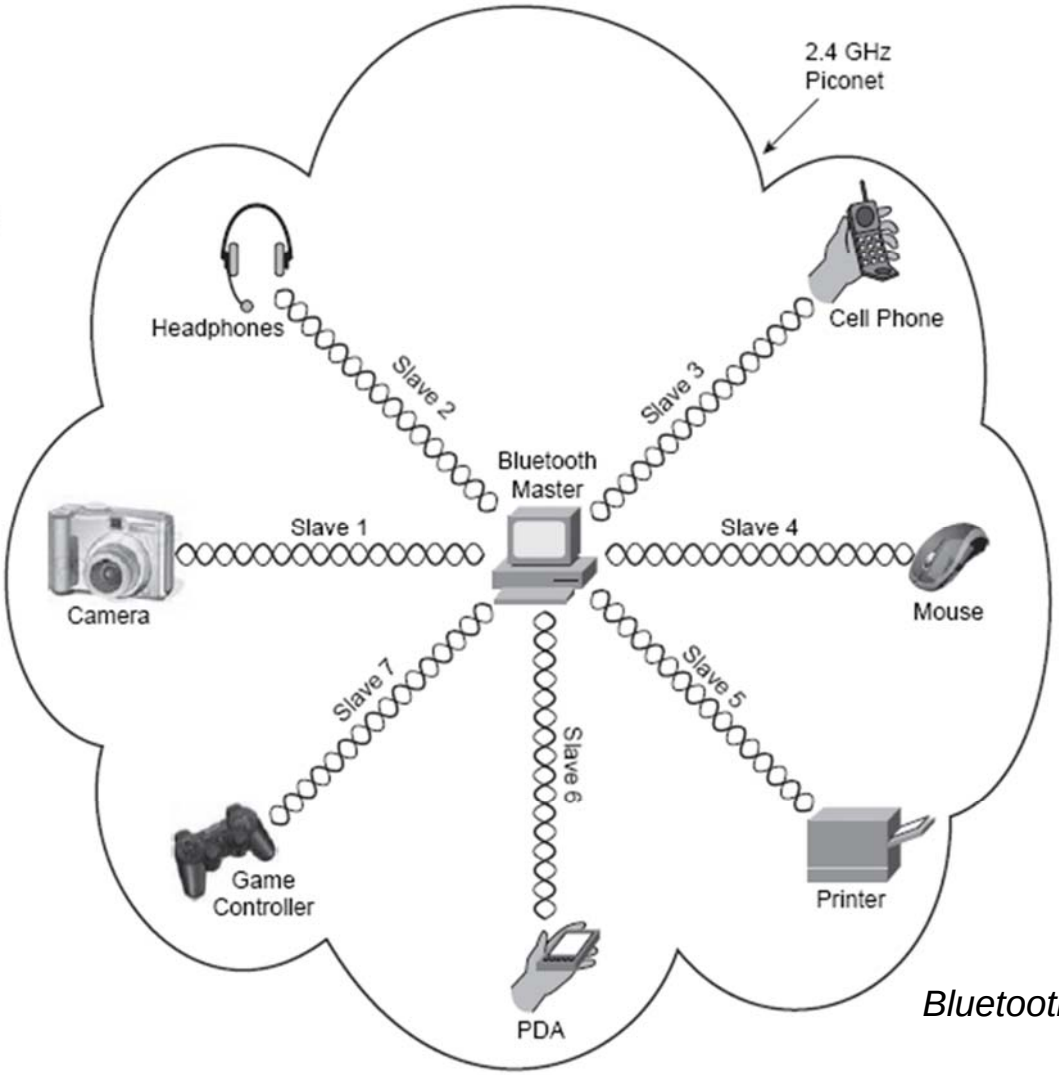
- Bluetooth is a personal-area technology that was named after a king of Denmark, Harald “Bluetooth” Gormson.
- It is said that the use of his name is based on his role in unifying Denmark and Norway.
- Bluetooth technology was intended to unify the telecom and computing industries.
- Today, Bluetooth can be found integrated into cell phones, PDAs, laptops, desktops, printers, headsets, cameras, and video game consoles.
- Bluetooth has low power consumption, making it a good choice for mobile, battery-powered devices.

Standards

Date	Details
1998,	•The Bluetooth Special Interest Group (SIG) was formed, the name "Bluetooth" was officially adopted
1999	•Bluetooth 1.0 and 1.0b were released, although they were pretty much unusable.
	•Bluetooth 1.1 followed and was much more functional. •Bluetooth 1.1, the 802.15.1 specification was approved by the IEEE to conform with Bluetooth technology.
2003	•Bluetooth 1.2 was then adopted, uses adaptive Frequency Hopping Spread Spectrum technology •The IEEE followed with 802.15.1-2005, which is the specification •that relates to Bluetooth 1.2

Date	Details
2004,	•Bluetooth 2.0 + *Enhanced Data Rate (EDR), supporting speeds up to 2 Mbps, was* adopted by the Bluetooth SIG
2007,	•Bluetooth SIG is Bluetooth 2.1 + EDR. •One of the key features of the 2.1 standard is an improved quick-pairing process, in which you simply hold two devices close together to start the quick-pairing process. •Also, a new technology called "sniff subrating" increases battery life up to five times. •Bluetooth 2.1 + EDR is backward-compatible with Bluetooth 1.1.

- Bluetooth technology might interfere with 802.11 LANs, because it operates in the 2.4- GHz range.
- However, because
  - it is designed for a proximity of about 10 meters, has low transmit power, and
  - uses Frequency Hopping Spread Spectrum, it is unlikely that Bluetooth will interfere.
- Bluetooth is considered a piconet; it allows eight devices (one master and seven slaves) to be paired,



Bluetooth Piconet

ZigBee

- ZigBee was developed by the ZigBee Alliance
- It consists of small, low-power digital radios based on the IEEE 802.15.4 standard for *wireless personal-area networks (WPAN).*
- that ZigBee relates much of its use to control and monitoring. In fact, ZigBee is often used for monitoring, building automation, control devices, personal healthcare devices, and computer peripherals.

The ZigBee website says:

"ZigBee was created to address the market need for a cost-effective, standards-based wireless networking solution that supports low data-rates, low-power consumption, security, and reliability.

"ZigBee is the only standards-based technology that addresses the unique needs of most remote monitoring and control and sensory network applications.

"The initial markets for the ZigBee Alliance include Energy Management and Efficiency, Home Automation, Building Automation and Industrial Automation."

Interference with other wireless technologies

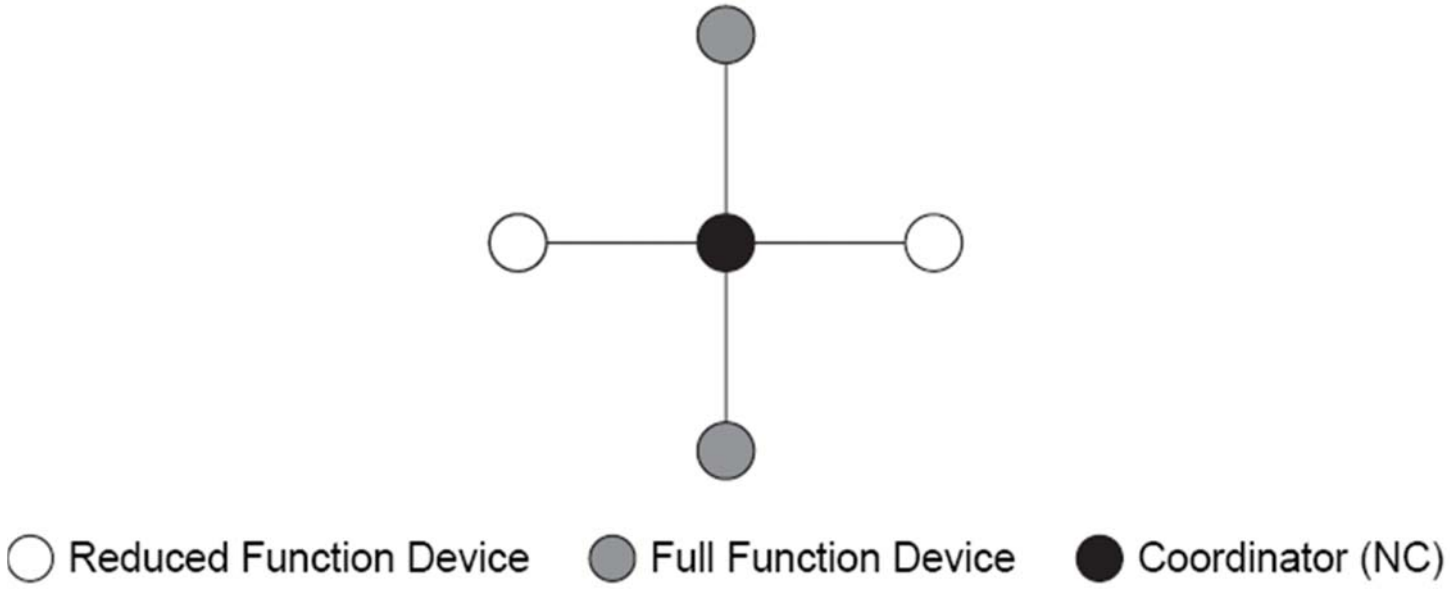
ZigBee operates in the ISM bands:

- 868 MHz in Europe,
- 915 MHz in countries such as the U.S. and Australia,
- 2.4 GHz pretty much everywhere.
- The 2.4 GHz operation range is where the interference lies, because that is the range in which 802.11b/g WLANs operate.

Topologies

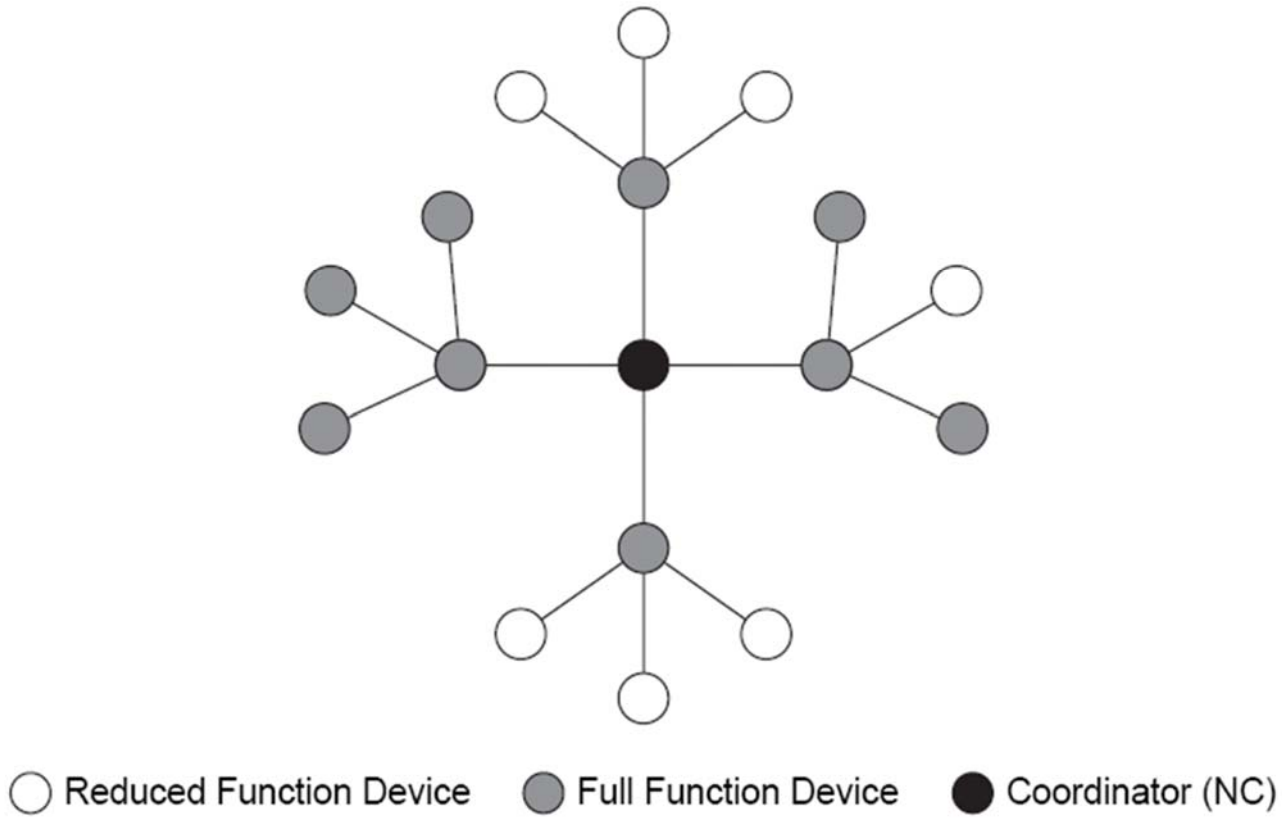
1. Start topology

- The common ZigBee topologies is star topology, in which the center device is a network coordinator (NC).
- Every network has an NC.
- Other devices can be full-function devices, and still others can be reduced function devices.
- Full-function devices can send, receive, and so on.
- A reduced-function device doesn't have as much capability and could do something like report the temperature of a system back to a controller.



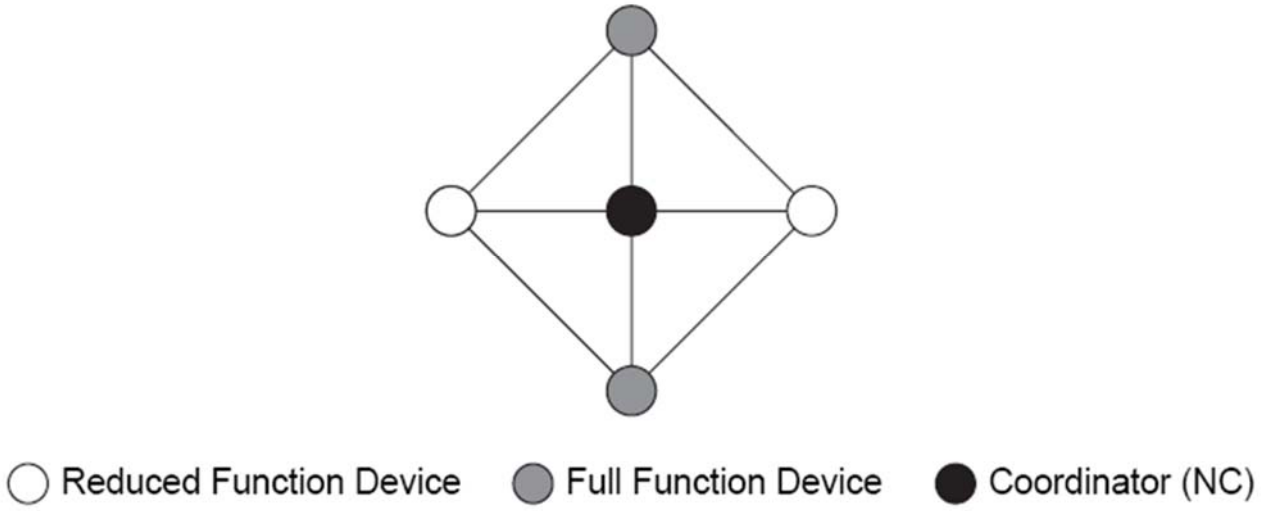
2. The cluster topology

- also has an NC, as well as some full-function devices and reduced-function devices.
- This cluster topology resembles an extended star in LAN terms.



3. Mesh topology

- Certain scenarios call for all devices to communicate with each other in a coordinated effort to provide some sort of information.
- This is where you find a mesh topology, as shown in Figure



WiMax

- Worldwide Interoperability for Microwave Access (WiMax) is defined by the WiMax forum and standardized by the IEEE 802.16 suite.
- The most current standard is 802.16e.
- Considered to be alternative to wired broadband like cable and DSL.
- Provides fixed, nomadic, portable and, mobile wireless broadband connectivity without the need for direct line-of-sight with a base station.
- cell radius deployment of three to ten kilometers,
- deliver capacity of up to 40 Mbps per channel, for fixed and portable access applications.

- Mobile network deployments are expected to provide up to 15 Mbps of capacity within a typical cell radius deployment of up to three kilometers.

Mobililty in WiMax

- WiMax mobility is more like the ability to travel and then set up shop temporarily.
- When you are done, you pack up and move on.

Line of sight (LOS) and non Line Of Sight (N-LOS)

- LOS scenario signal range is about 3 to 10 KMeters, and data rates at 30 - 40 Mbps,
- Non-LOS scenario signal range is about 3 KMeters—and data rate is 15 Mbps.

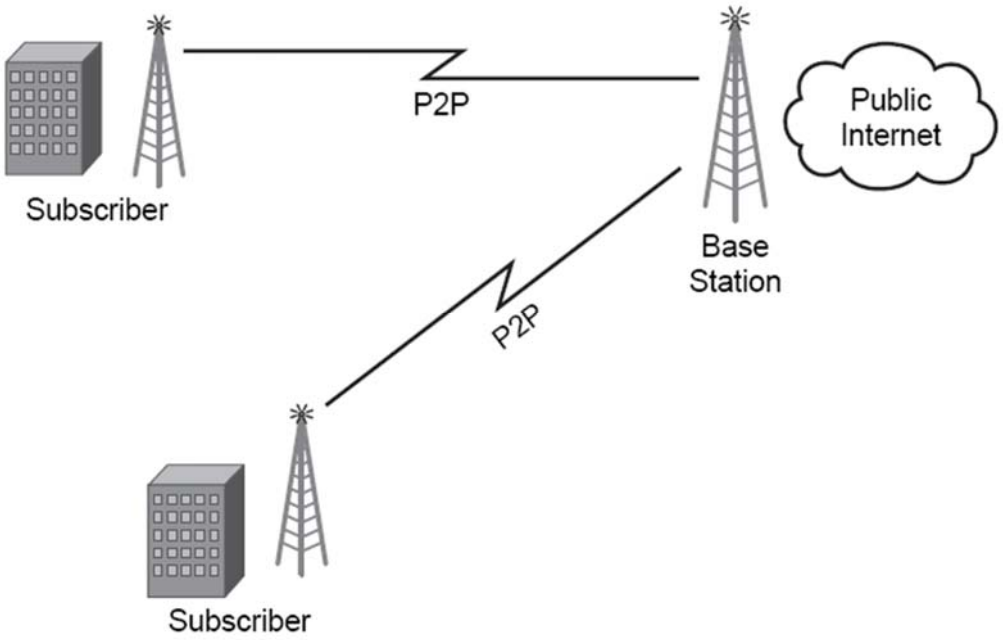
Standards

- As the IEEE standardizes WiMax technology, it has progressed from the original 802.16
- to 802.16a, c, d, and finally 802.16e.

WiMax Deployment

- Next Figure shows a sample topology in which subscribers have a point-to-point connection back to a service provider and from there have access to the public Internet.

WiMax Deployment



Operating frquency

- WiMax operates on the 10- to 66-GHz frequency band, so it doesn't interfere with 802.11 LANs.
- With some planning, a device acting as a gateway can be deployed offering 802.11 LAN access with 802.16 last-mile access or upstream access to a service provider, thus removing the need for wires.

Other Types of Interference

- Other types of interference can occur in the same frequency ranges. These devices might not be the most obvious, but they should be considered. They can include the following:

■ Microwaves (operate at 1 to 40 GHz)

■ Wireless X11 cameras (operate at 2.4 GHz)

■ Radar systems (operate at 2 to 4 GHz for moderate-range surveillance, terminal traffic control, and long-range weather and at 4 to 8 GHz for long-range tracking and airborne weather systems)

■ Motion sensors (operate at 2.4 GHz)

■ Fluorescent lighting (operates at 20000 Hz or higher)

■ Game controllers and adapters (usually operate at 2.5 GHz)

- When dealing with wireless deployments, you can use tools to determine signal strength and coverage, but just knowing about these additional sources of interference will save you some time in determining where to place APs and clients.

Thanks,

C U Next week isA