

Lecture (05)

1. WLAN Technologies and Topologies (II) 2. Antenna Communication (I)

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Agenda

WLAN Technologies and Topologies

- Vendor-Specific Topology Extensions

Antenna Communication

- Principles of Antennas

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Vendor-Specific Topology Extensions

- The vendor-specific topology extensions are an enablement of additional network functionality by way of vendor-defined protocols, devices, and topologies.
 1. workgroup bridges,
 2. wireless repeaters,
 3. outdoor wireless bridges, and
 4. Wireless mesh networks

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Vendor-Specific Topology Extensions (2)

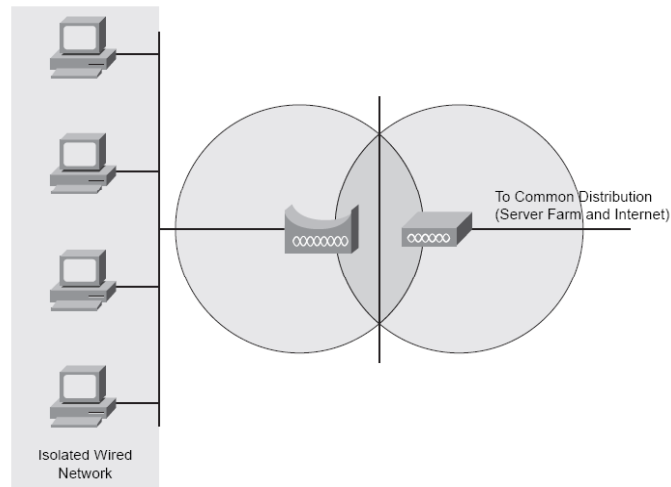
Workgroup Bridges

- You will most likely have times when you have an isolated network that needs access to the rest of the network for access to the server farm and the Internet.
- You might not be able to run an Ethernet cable to the isolated network, or you might not own the property so you can't drill holes in the walls, and so on.
- In this scenario, you would use a WGB topology

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Vendor-Specific Topology Extensions (3)



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Workgroup Bridge Topology

Vendor-Specific Topology Extensions (4)

- Notice that the WGB is used to bridge a wired network to an AP that connects to a distribution system.
- There are two type of two types of workgroup bridges:
 - **Autonomous Workgroup Bridge (aWGB):**
- The aWGB was originally just called a workgroup bridge, but Cisco later changed the name when it introduced the Universal WGB.
- The aWGB connects only to upstream APs, and the AP sees multiple Ethernet clients.
- Each AP appears as separate chain of Ethernet client, the chain ends with another Ethernet network

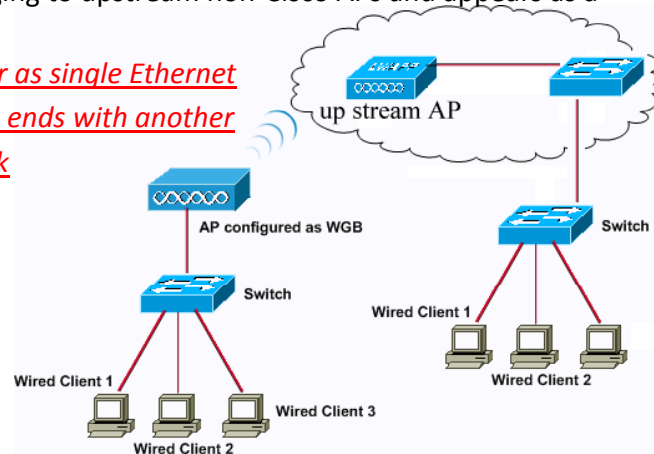
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Vendor-Specific Topology Extensions (5)

■ Universal Workgroup Bridge (uWGB):

- It allows bridging to upstream non-Cisco APs and appears as a single client.
- All APs appear as single Ethernet Client, the chain ends with another Ethernet network

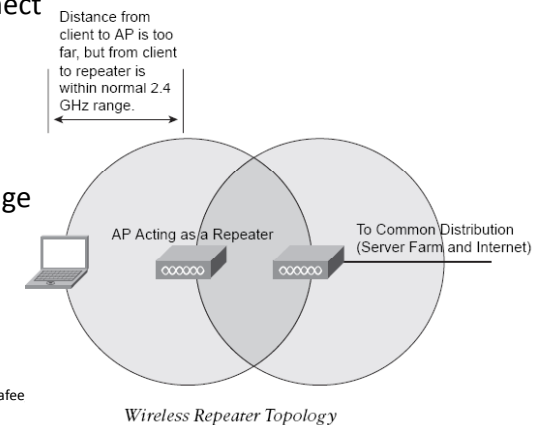


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Vendor-Specific Topology Extensions (6)

Wireless Repeaters

- in an Extended Service Set (ESS), multiple APs connect clients.
- This is all well and good until you have clients roaming about who get into areas where coverage is necessary but not possible.



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Wireless Repeater Topology

Vendor-Specific Topology Extensions (7)

- An example is a worker at a warehouse who carries a barcode scanner or even a wireless IP Phone.
- The solution of a WGB doesn't work, because a WGB connects users who are wired.
- There are scenarios where you can't run a cable into a location to install an AP.
- This is where you want to use a *wireless repeater*.
- A *wireless* repeater is simply an AP that doesn't connect to a wired network for its connectivity to the distribution network.
- Instead, it overlaps with an AP that does physically connect to the distribution network.
- The overlap needs to be 50 percent for optimal performance.

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Vendor-Specific Topology Extensions (8)

- The catch is that you need a AP as the upstream "root" device, and only one SSID is supported in repeater mode.
- Additionally, the overall throughput is cut in half for each repeater hop.
- Acts as repeater and AP

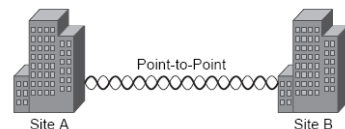
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Vendor-Specific Topology Extensions (9)

Outdoor Wireless Bridges

- When you have two or more LANs within a few miles of each other and you want to link them, you can use a wireless bridge.
- Because you are "bridging," the technology works at Layer 2.
- This means that the LANs do not route traffic and do not have a routing table.
- You can connect one LAN directly to another in a point-to-point configuration



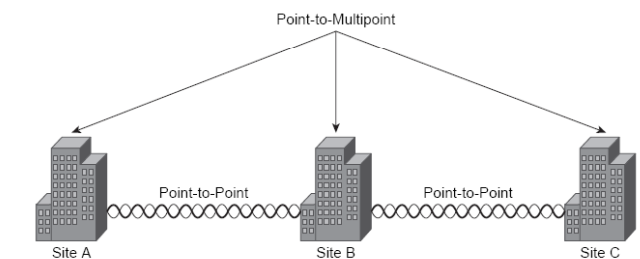
Point-to-Point Wireless Bridge Topology

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Vendor-Specific Topology Extensions (10)

- Each end of a point-to-multipoint topology would have to communicate through the hub if it wanted to communicate with the others.



Point-to-Multipoint Wireless Bridge Topology

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Vendor-Specific Topology Extensions (11)

Outdoor Mesh Networks

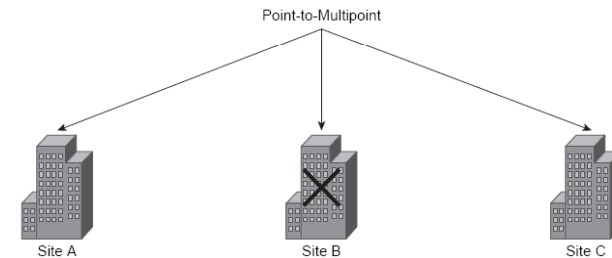
- As you can see, bridges are a good way to connect remote sites.
- However, suppose that you are operating in a point-to-multipoint topology, and the central site experiences congestion.
- Who suffers? Just the central site? Just the remote site? No; the answer is everyone.
- When two remote sites communicate through a central site, the central site makes all the difference

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Vendor-Specific Topology Extensions (12)

- Now the remote sites can't communicate with each other or the central site.
- This can be a major issue to contend with.
- The solution is to deploy a mesh network such as the one illustrated in Figure

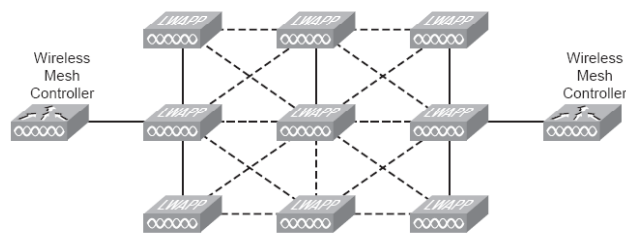


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Wireless Bridge Issues

Vendor-Specific Topology Extensions (13)

- The mesh solution is appropriate when connectivity is important, because multiple paths can be used.
- The IEEE is currently working on a mesh standard (802.11s).



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Wireless Mesh Solution

Vendor-Specific Topology Extensions (14)

- When you have a mesh network, some *nodes* (another term for APs in a mesh network) are connected to a wired network. Some nodes simply act as repeaters.
- A mesh node repeats data to nearby nodes.
- More than one path is available, so a special algorithm is used to determine the best path.
- The alternative paths can be used when there is congestion or when a wireless mesh node goes down.

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Principles of Antennas

what is the most important part of a wireless network?
the antenna.

Why?

Without it, you have a nice little AP that can offer network services for anyone within about 100 cm.

- You want to make sure that your space is properly covered. You need antennas to do this.
- In fact, you need the *right antennas to do this*.

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Principles of Antennas (cont,..)

Polarization

The goal of an antenna is to emit electromagnetic waves.

The electro portion describes the way of signal movement.

There are three types of polarization:

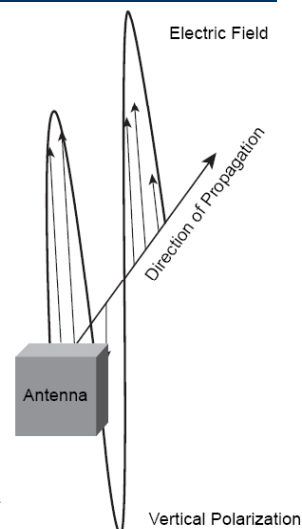
- Vertical
- Horizontal
- Circular

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Principles of Antennas (cont,..)

- **vertical polarization** means that the wave moves up and down in a linear way.

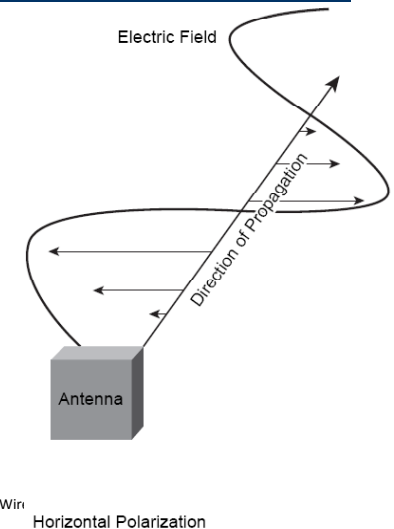


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Principles of Antennas (cont,..)

- **Horizontal polarization** means that the wave moves left and right in a linear way.



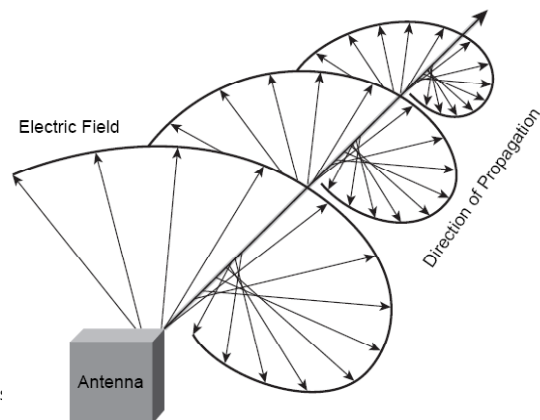
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Horizontal Polarization

Principles of Antennas (cont,..)

- **circular polarization**, indicates that the wave circles as it moves forward



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Principles of Antennas (cont,..)

- The electric field is generated by stationary charges,
- the magnetic field is generated by moving charges.
- The magnetic field is found perpendicular (at a 90-degree angle) to the electric field.
- This magnetic field is generated at the same time as the electric field.

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Principles of Antennas (cont,..)

- Most antennas are always vertically polarized in wireless networks.
- This makes the electric field vertical.
- The importance is that the antenna is designed to propagate signals in a certain direction.
- So you have to take that into consideration in WLAN deployment.

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Principles of Antennas (cont,..)

Diversity

- Multipath fading means, Traffic takes different paths because of the obstacles in the wireless path.
- So the two different signals arrived to the receiver out of phase, and degrade each other.
- If the phase difference equals to half cycle (180), the two signals cancel each other.
- One way to deal with multipath issues is to use two antennas on one AP.
- *That called, Diversity :*
 - *the use of two antennas for each radio*

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Principles of Antennas (cont,..)

- The two antennas are placed one wavelength apart.
- When the AP hears a preamble of a frame, it switches between the two antennas and uses an algorithm to determine which antenna has the better signal.
- After an antenna is chosen, it is used for the rest of that frame.
- AP can switch antennas and listen to the preamble because it has no real data.
- As soon as the real data gets there, it uses only one of the antennas.

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Principles of Antennas (cont,..)

- AP contains one radio connected to two antennas, and cover the same area (not two different areas that will cancel the diversity and effect AP overall performance)
- the antennas need to be the same.
- If you used a weaker antenna on one side versus the other, the coverage area would not be the same.

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Thanks,
See you next Week, isA

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