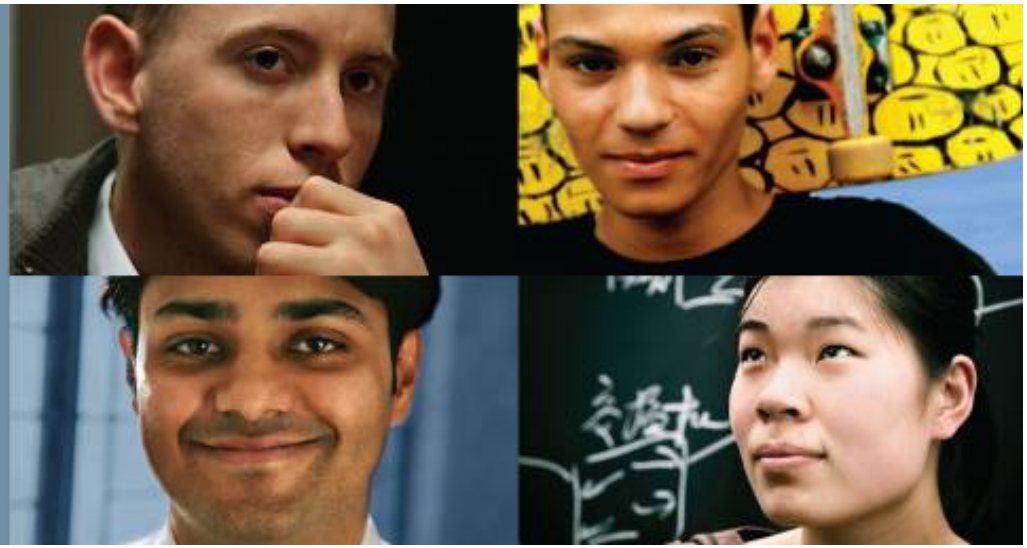
TNE10006/TNE60006: Networks and Switching



Wireless Networks

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Mind Wide Open™

Outline

- The Hidden Node Problem
- CSMA/CA
- Wireless LAN Topologies
- Infrastructure Mode Settings
- Association Process

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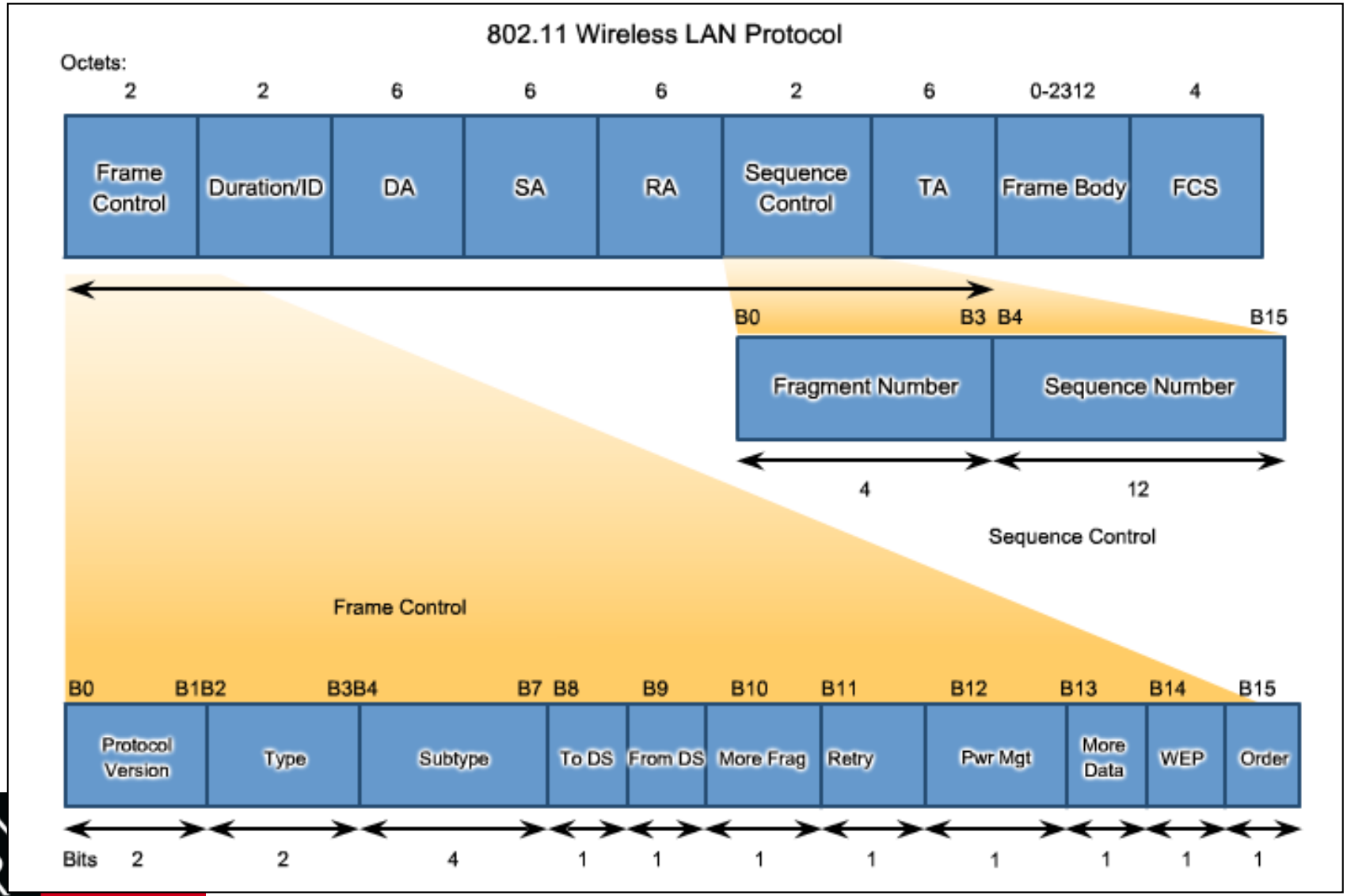
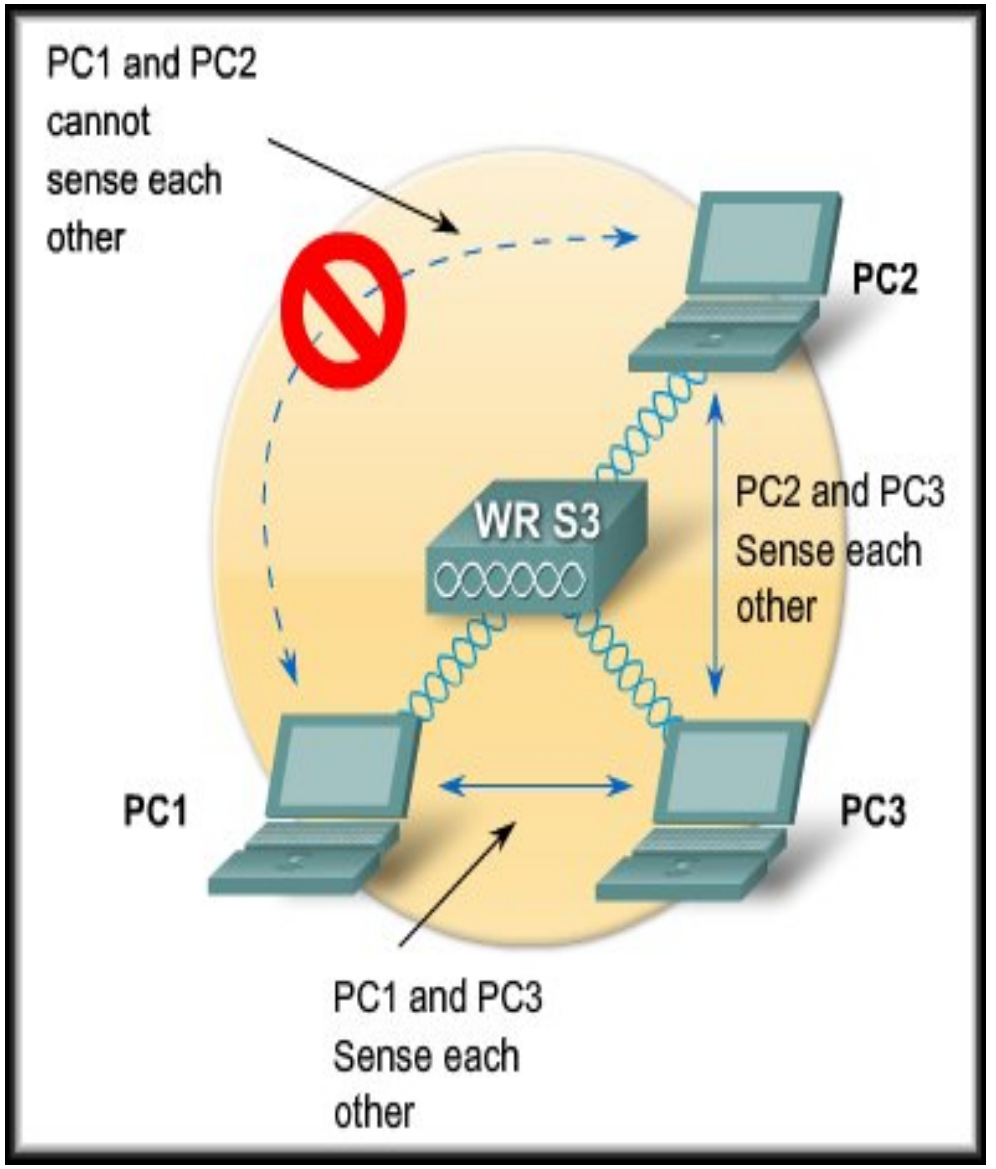
802.11 Wireless Frame



The Hidden Node Problem

- PC1, PC2 and PC3 sense WRS3
- PC1 and PC2 cannot sense each other
- PC1
  - does not detect PC2 activity on the channel
  - sends data while PC2 is transmitting
  - A collision occurs
- PC3 is sensed by both PC1 and PC2, so there are no collisions involving PC3



The Hidden Node Problem

- The means of resolving the hidden node problem is a feature of CSMA/CA called request to send/clear to send (RTS/CTS)
- RTS/CTS was developed to allow a negotiation between a client and an access point
- When RTS/CTS is enabled in a network, access points allocate the medium via CTS to the requesting station for as long as is required to complete the transmission
- When the transmission is complete, other stations can request the channel via RTS

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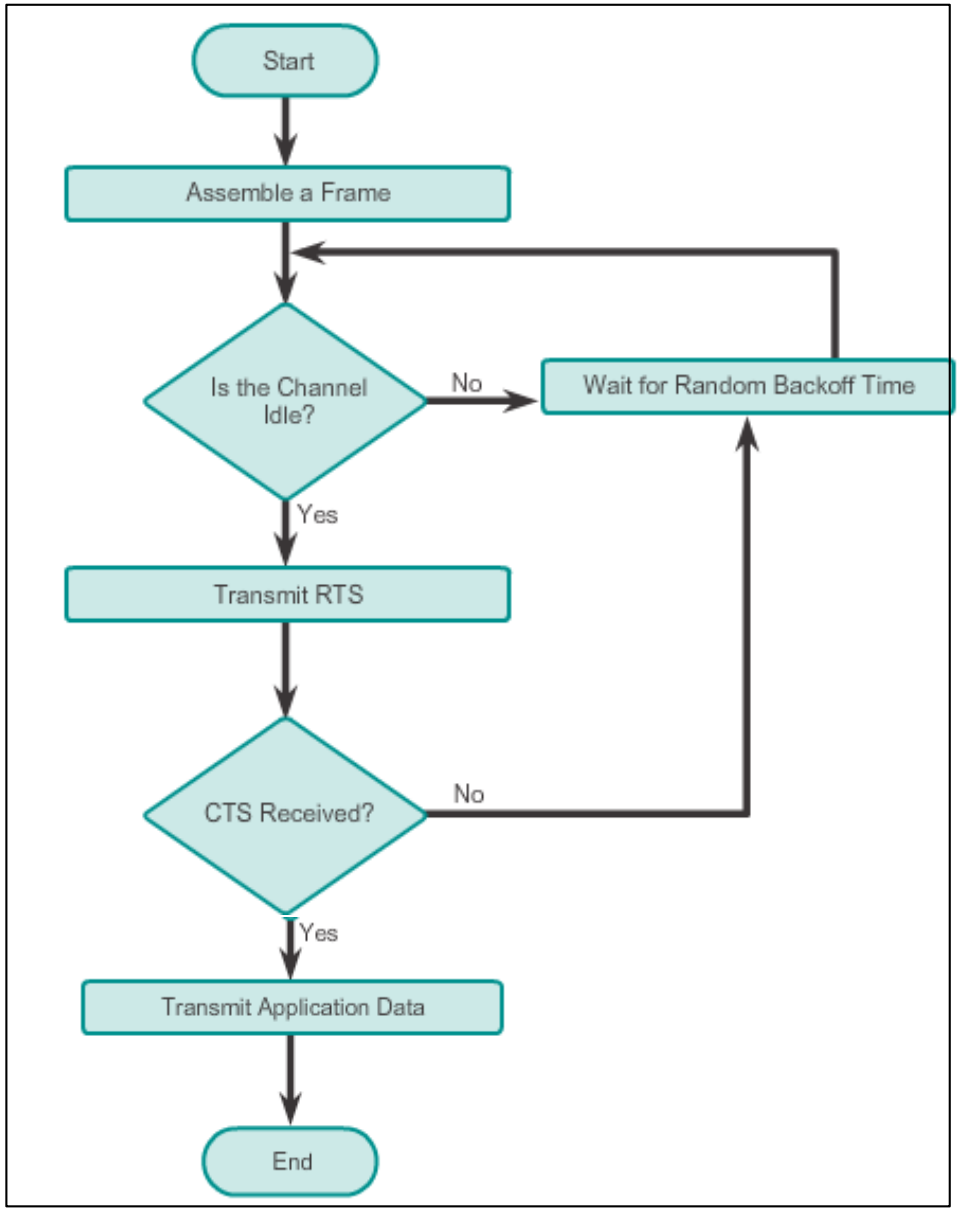
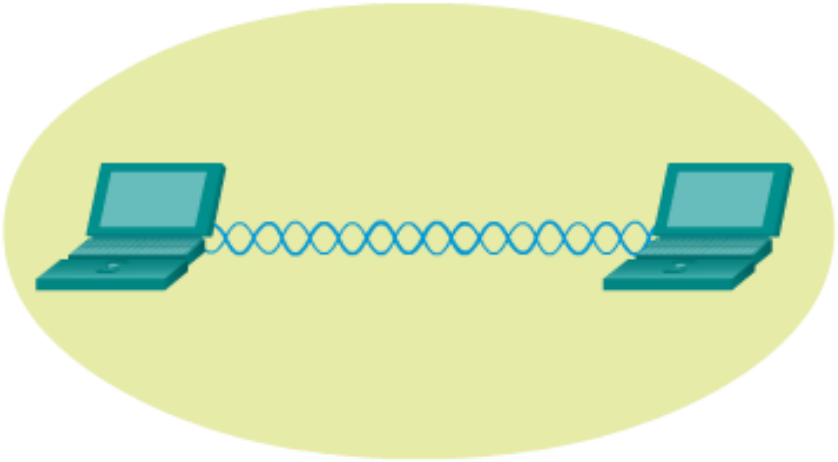
CSMA/CA

All transmissions are acknowledged



Ad Hoc Mode

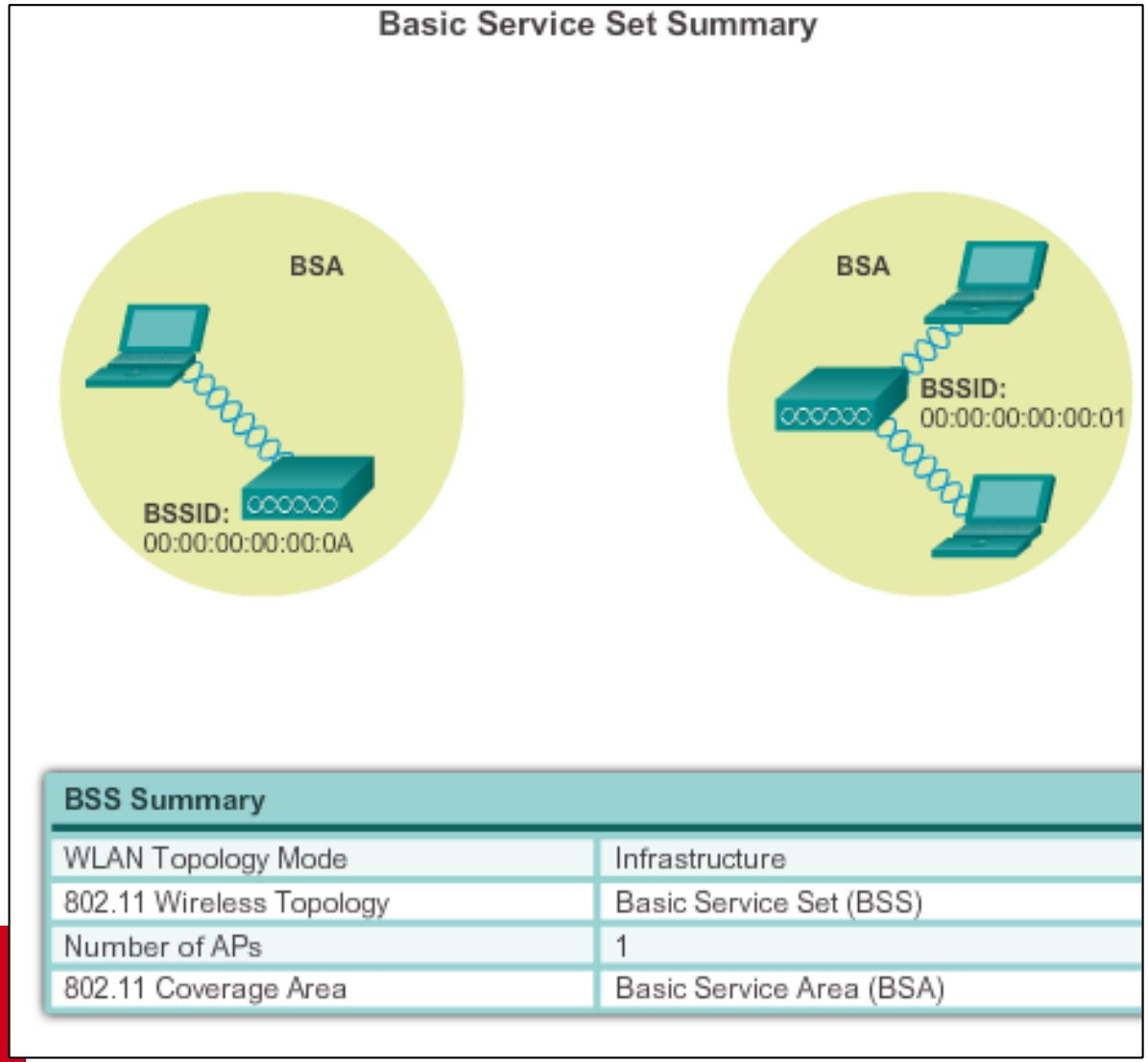


IBSS Summary	
WLAN Topology Mode	Ad Hoc
802.11 Wireless Topology	Independent BSS
Number of APs	None
802.11 Coverage Area	Basic Service Area (BSA)

Tethering (personal hotspot) – Variation of the Ad Hoc topology when a smart phone or tablet with cellular data access is enabled to create a personal hotspot.

802.11 Topologies

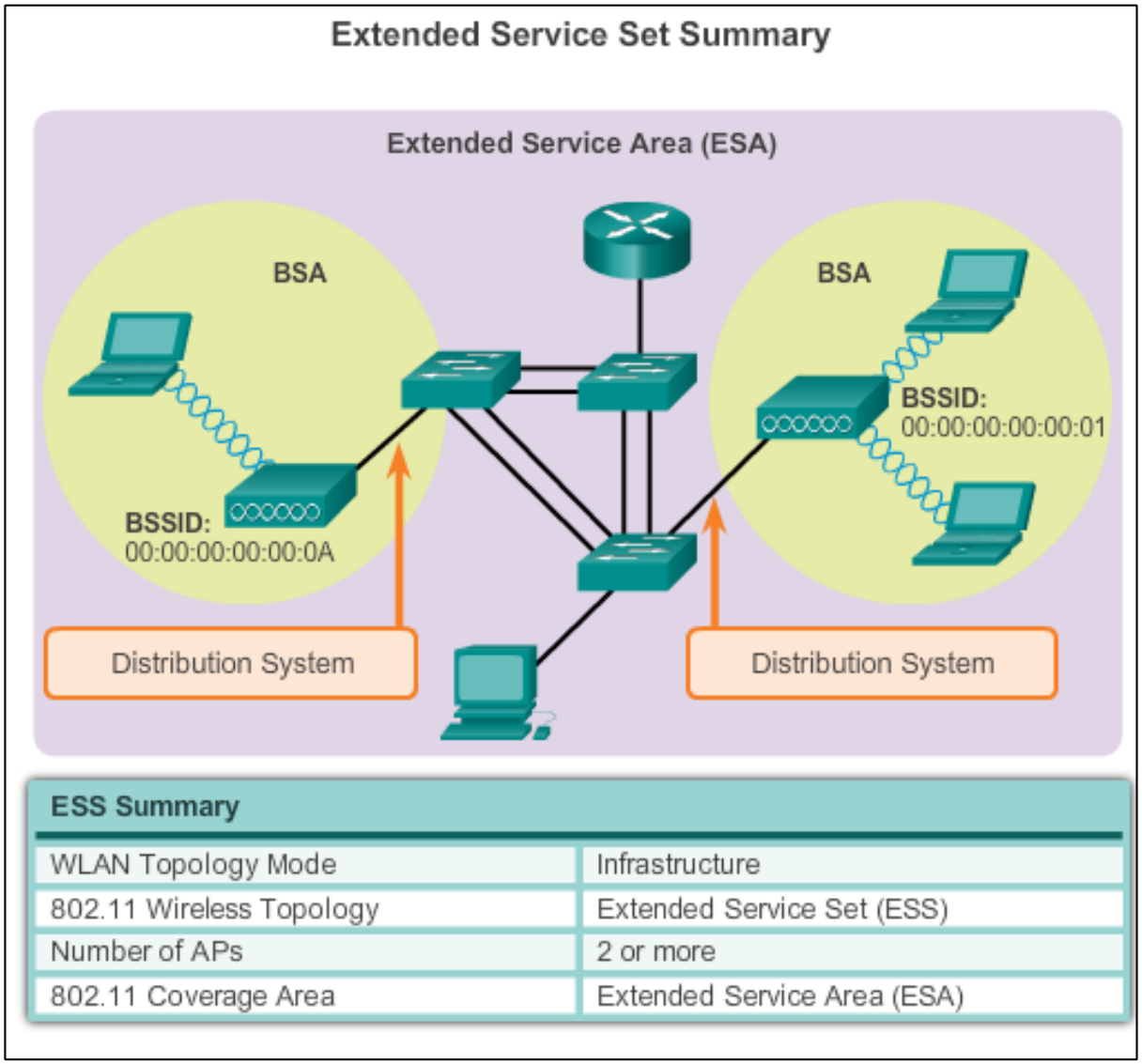
Infrastructure Mode



BSS Summary	
WLAN Topology Mode	Infrastructure
802.11 Wireless Topology	Basic Service Set (BSS)
Number of APs	1
802.11 Coverage Area	Basic Service Area (BSA)

802.11 Topologies

Infrastructure Mode



ESS Summary	
WLAN Topology Mode	Infrastructure
802.11 Wireless Topology	Extended Service Set (ESS)
Number of APs	2 or more
802.11 Coverage Area	Extended Service Area (ESA)

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Infrastructure Mode – ESS

- Extended Service Sets

  When a single BSS provides insufficient RF coverage, one or more can be joined into an extended service set (ESS)

  In an ESS, one BSS is differentiated from another by the BSS identifier (BSSID), which is the MAC address of the access point

  The coverage area is the extended service area (ESA)

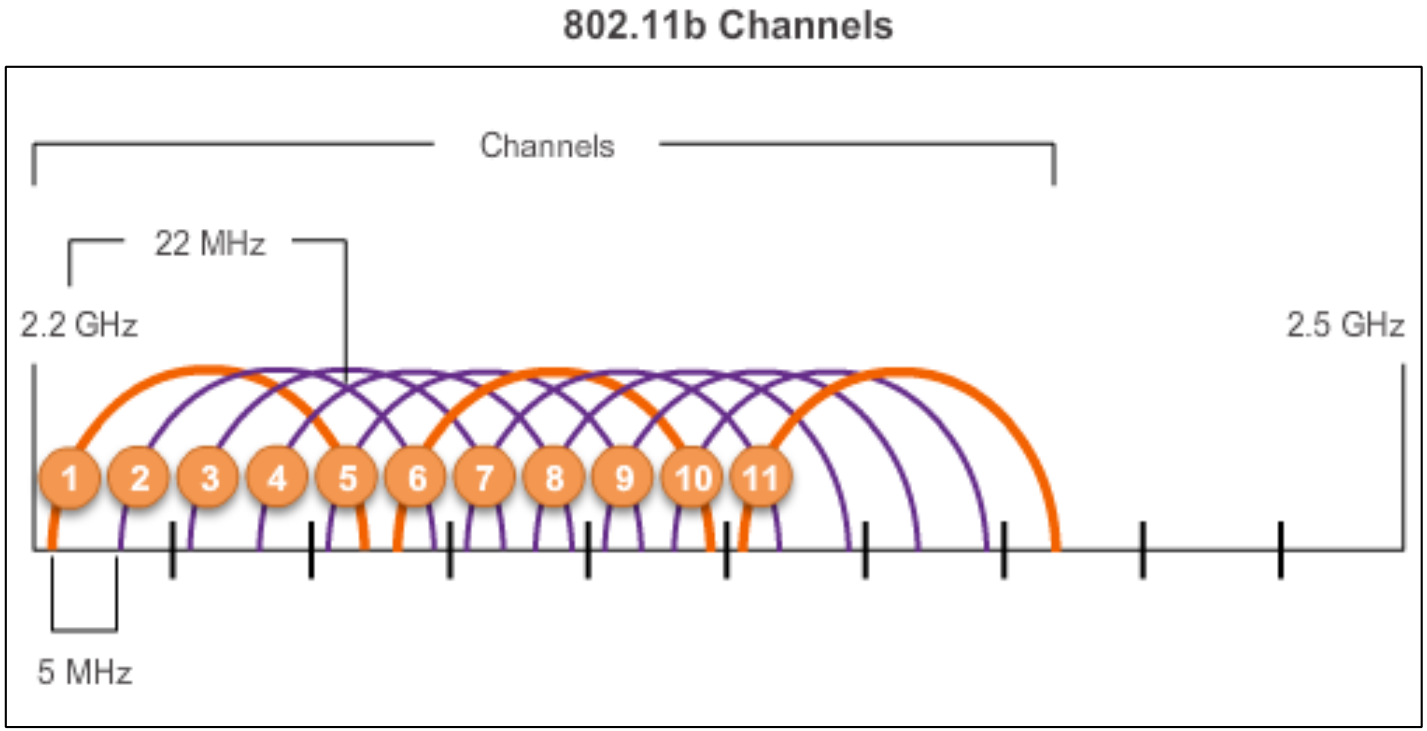
Common Distribution System

Allows multiple access points in an ESS to appear to be a single BSS

An ESS generally includes a common SSID to allow a user to roam from AP to AP

An ESS should have 10 to 15 % overlap between cells in an extended service area

Association Parameters – Channel Usage



The solution to 802.11b interference is to use nonoverlapping channels 1, 6, and 11

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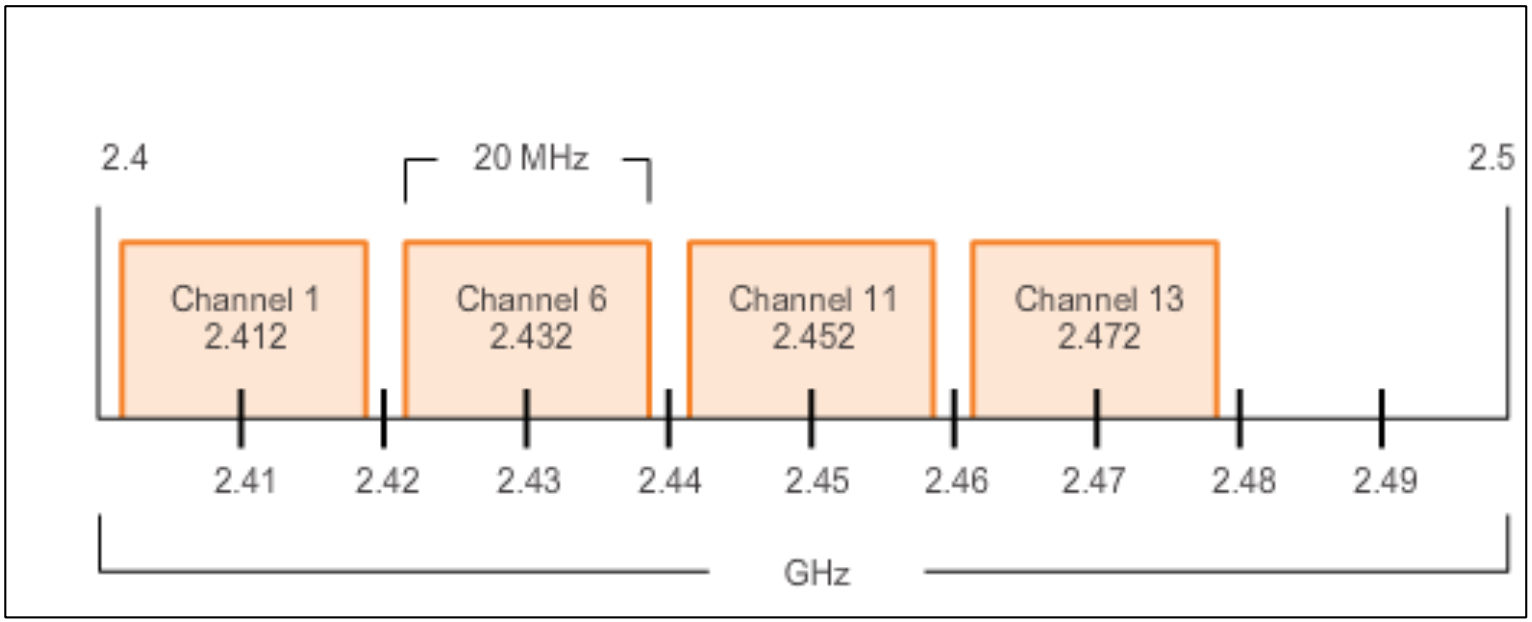
Association Parameters – Channel Usage

802.11g/n (OFDM) Channel Width 20 MHz



- Channels 12-13 not available in all countries
- More (25) non-overlapping (20MHz) channels available in the 5GHz band

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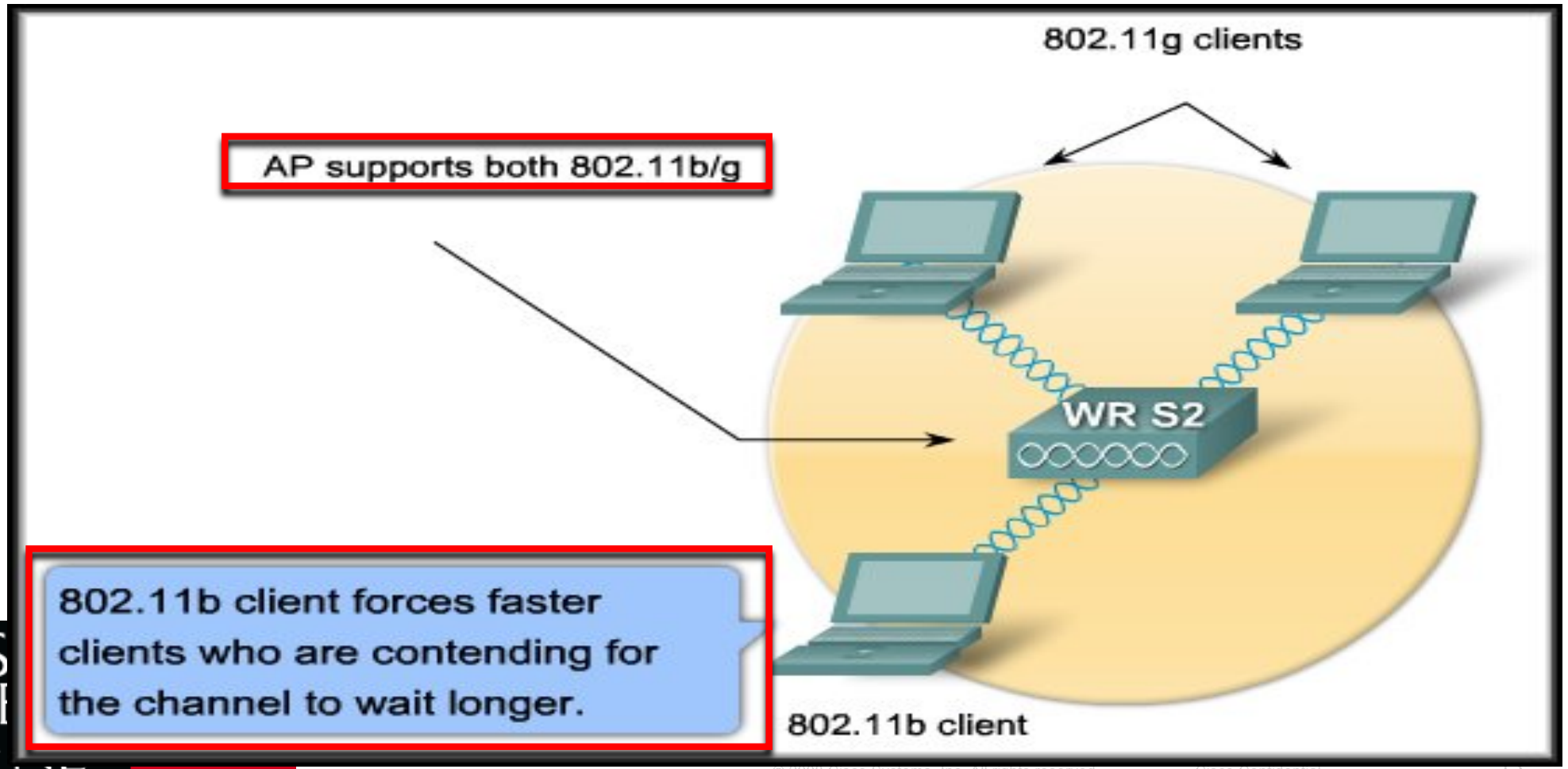
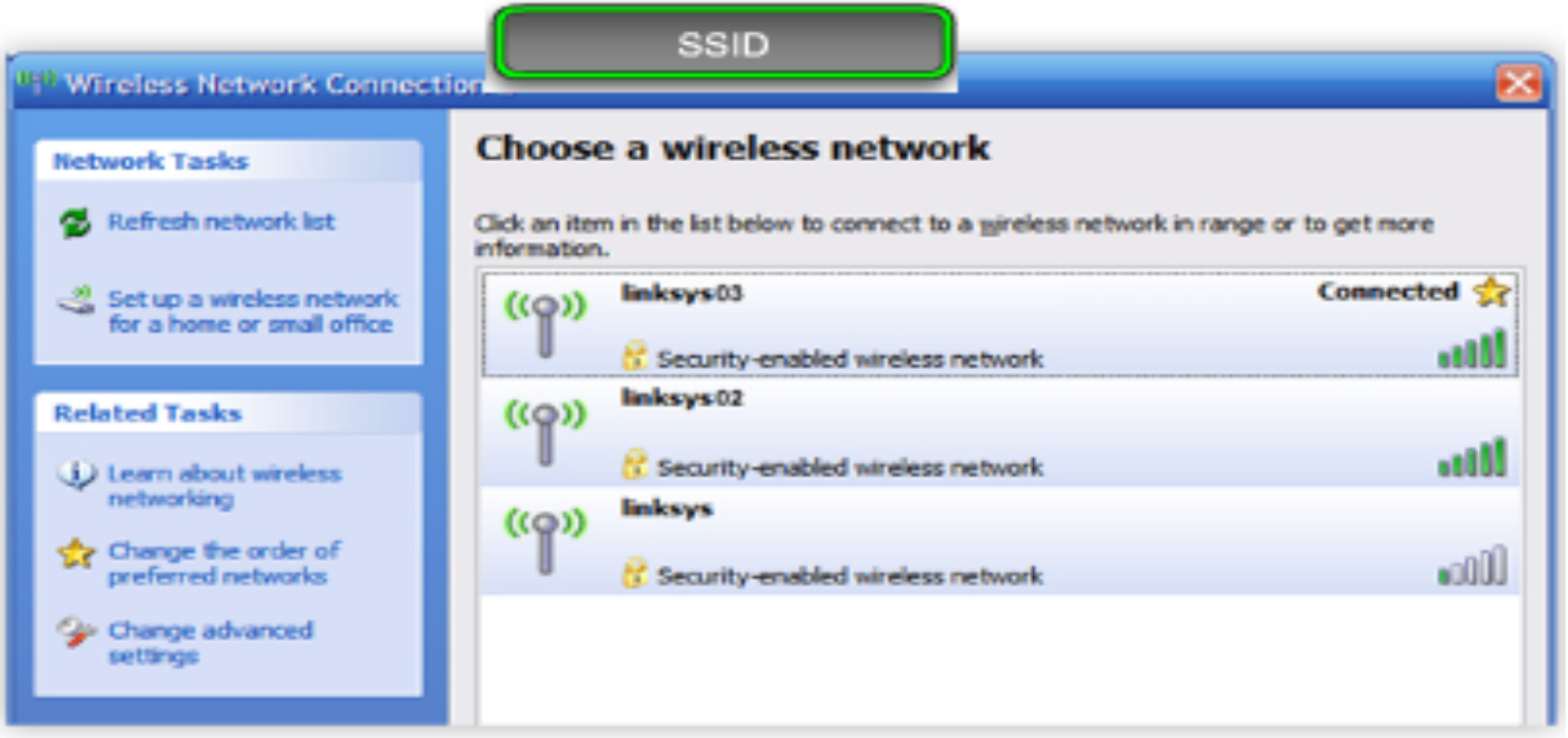
Association Parameters – Network Mode

- Refers to the WLAN protocols: 802.11a, b, g, or n
- Mixed mode refers to stations operating multiple protocols simultaneously
- An AP must have a second radio to operate in two RF bands



Association Parameters – SSID

- Unique identifier that client devices use to distinguish between wireless networks
- Several access points on a network can share an SSID
- SSID can be any alphanumeric, case-sensitive entry from 2 to 32 characters long



Infrastructure Mode

Access Point Discovery

Passive Mode

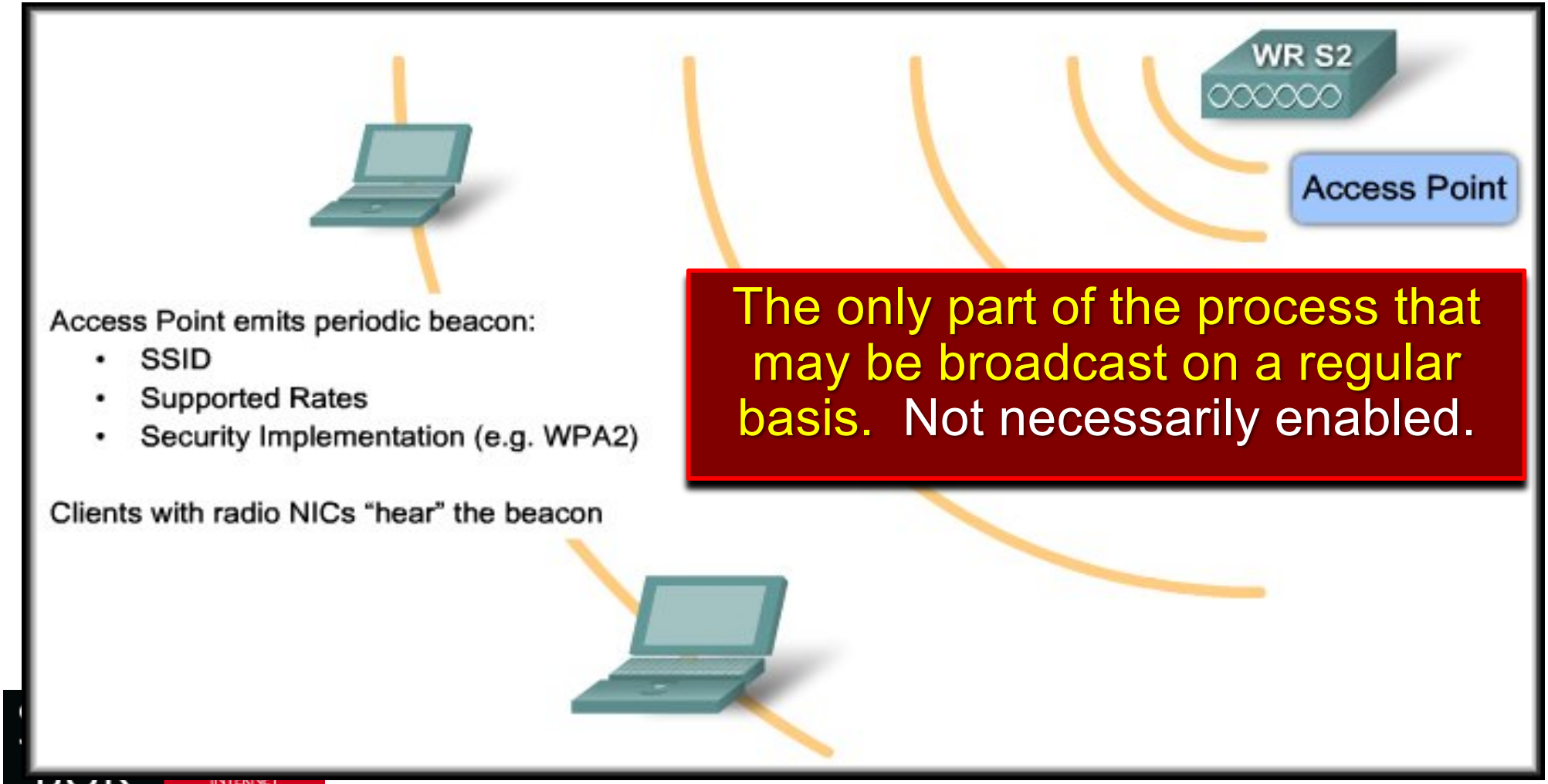
- AP advertises its SSID via broadcast beacon frames
- Contains the SSID, supported standards, and security settings
- Allows wireless clients to learn which about networks servicing the local area

Active Mode

- Wireless clients must know the name of the SSID
- Wireless client initiates the process by broadcasting a probe request frame on multiple channels
- May be required if an AP or wireless router is configured to not broadcast beacon frames
- Does **NOT** constitute network security

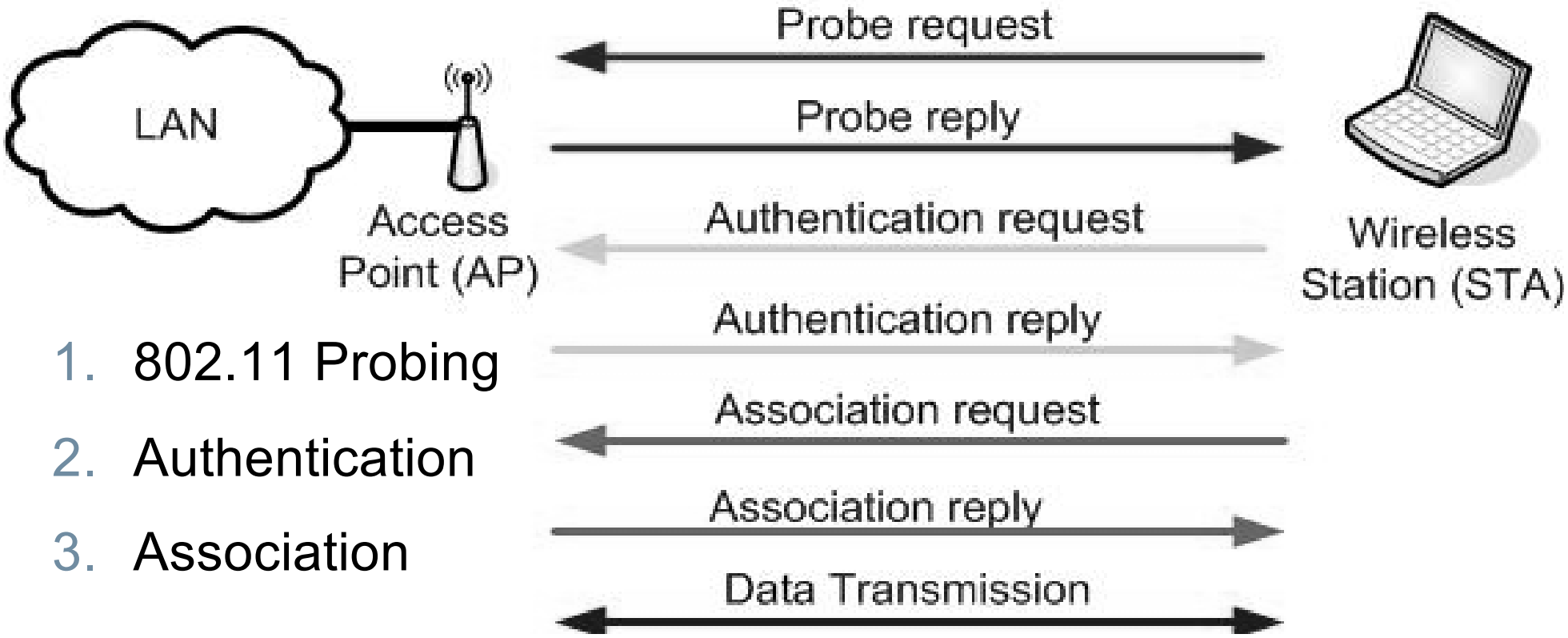
Beacon Frames

Frames used by the WLAN network to advertise its presence



AP Association

Three-Stage Association Process



1. 802.11 Probing
2. Authentication
3. Association

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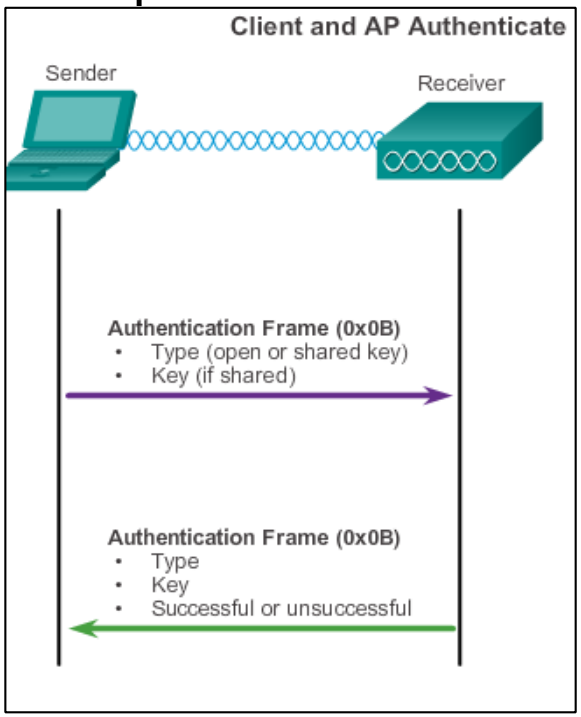
Three-Stage Association Process

Step 1 – Probing

- Clients can either search for a specific network or attempt to discover available WLANs



Step 2 – Authentication

- OPEN means no password, always authenticated
- Shared Key involves pre-shared knowledge

Step 3 – Association

- Finalize security and bitrate options
- Establish data link
- AP maps association identifier (AID) to the WLAN client, equivalent to a port on a switch

Summary

In this lecture, we covered:

- The Hidden Node Problem
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- Wireless LAN Topologies
- Infrastructure Mode Settings
- Association Process