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Certified Wireless Network Administrator (CWNA)
PW0-106

Chapter 10
WLAN Architecture

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Chapter 10 Overview

- Wireless LAN client devices
- WLAN architecture
- Specialty WLAN infrastructure

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Wireless LAN Client Devices

Radio Card Formats (form factors)

- External Wi-Fi radios
  - PCMCIA adapter (PC Card)
  - ExpressCard
  - Secure Digital (SD)
  - CompactFlash (CF)
  - USB

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PCMCIA adapter/PC card

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ExpressCard radio

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USB NIC

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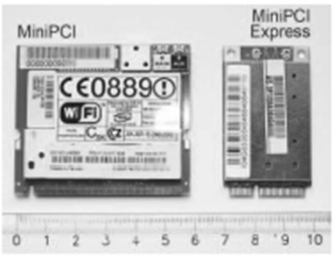
Wireless LAN Client Devices

Radio Card Formats (form factors)

- Internal Wi-Fi Radios
  - Mini PCI
  - Mini PCI Express
  - Half Mini PCI Express



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Wireless LAN Client Devices

Mobile Internet Devices (Use embedded NICS)

- Barcode scanner
- VoWiFi phones
- Gaming devices
- Stereo systems
- Video cameras
- Washing machines
- Refrigerators
- Autos

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Wearables and the Internet of Things

- Theory of Internet of Things is that in the future, the bulk of the data generated on the Internet might be created by sensors, monitors, and machines

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Chipsets

- Group of integrated circuits designed to work together
- Determines the features supported by the device
- Chipset manufacturers incorporate newer 802.11 technologies as they develop
- Many proprietary technologies turn up in the individual chipsets

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Client Utilities

- Software interface between the radio NIC and you
- Three major types
  - Integrated operating system client utilities
  - Vendor specific client utilities
  - Third-party client utilities

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Integrated OS client utilities for Windows 8.1

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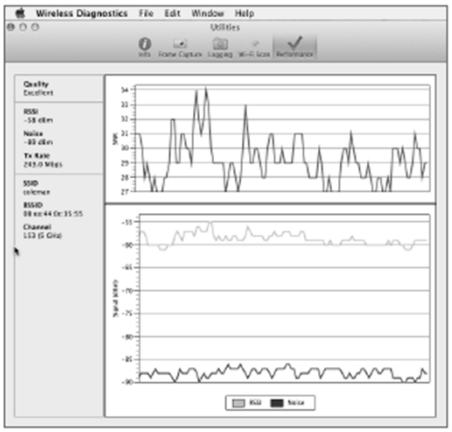
Wi-Fi diagnostic tool for Mac OS 10.8



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Integrated OS client utility for iOS 7.0

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Enterprise-class client utility

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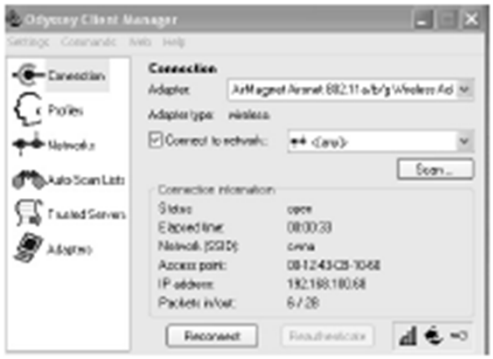
Third-party client utility



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Management, Control, and Data Planes

- Management plane - defined by administrative network management, administration, and monitoring
- Control plane - consists of control or signaling information and is often defined as network intelligence or protocols
- Data plane, - also known as the user plane, is the location in a network where user traffic is actually forwarded
- Where these three logical planes of operation function is different depending on the type of WLAN architecture

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802.11 Management plane

Functions

- WLAN Configuration
- WLAN Monitoring and Reporting
- WLAN Firmware Management

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802.11 Control plane

Functions

- Dynamic RF
- Roaming Mechanisms
- Client Load Balancing
- Mesh Protocols

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802.11 Data plane

Functions

- Where user data is forwarded
- Devices that usually participate in the data plane are the AP and a WLAN controller
- Each vendor has a unique method and recommendations for handling data forwarding.

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WLAN Architecture

Three primary WLAN architectures

- Autonomous WLAN architecture
- Centralized WLAN architecture
- Distributed WLAN architecture

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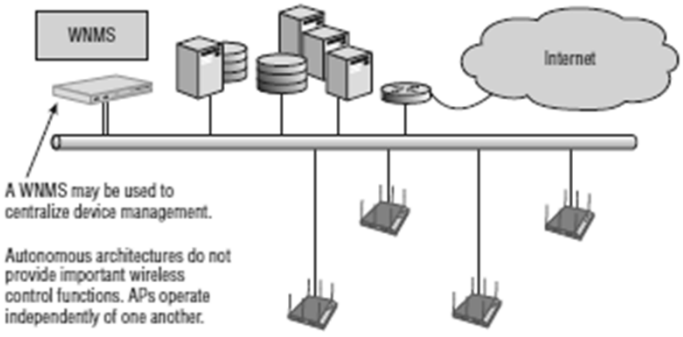
Autonomous WLAN Architecture



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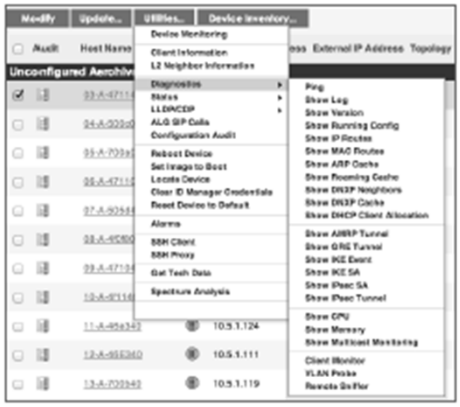
NMS diagnostic utilities



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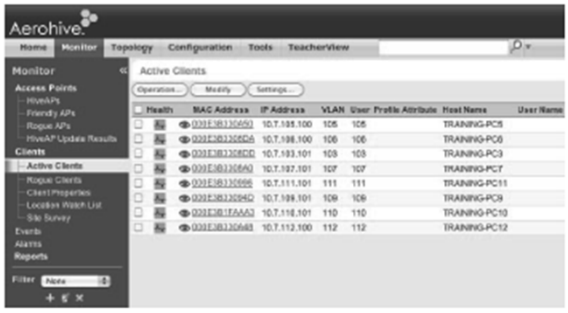
Wireless Network Management System

- Moves the management plane out of the autonomous access points
- Provides a central point of management to configure and maintain thousands of autonomous access points



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Cloud Networking

- Two most common cloud networking models
  - Cloud-Enabled Networking
  - Cloud-Based Networking

Centralized WLAN Architecture

- Management Plane - Access points are configured and managed from the WLAN controller
- Control Plane - Dynamic RF, load balancing and other mechanisms exist in the WLAN controller.
- Data Plane - The WLAN controller exists as a data distribution point for user traffic. Access points tunnel all user traffic to a central controller.

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WLAN Controller

Features

- AP Management
- 802.11 Traffic Tunneling
- AP Group Profiles
- WLAN Profiles
- Virtual BSSIDs
- User Management
- Layer 2 Security Support
- Layer 3 and 7 VPN Concentrators

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WLAN Controller

Features

- Captive Portal
- Automatic Failover and Load Balancing
- Internal Wireless Intrusion Detection Systems
- Dynamic RF Spectrum Management
- Bandwidth Management
- Firewall Capabilities
- Power over Ethernet (PoE)
- Management Interfaces

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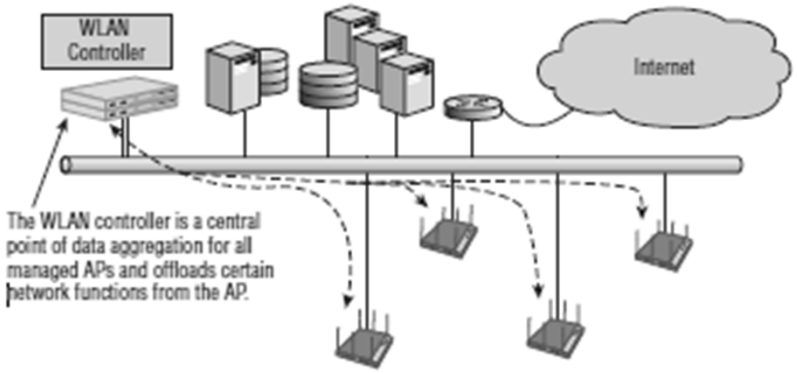
WLAN Controller

Centralized WLAN architecture



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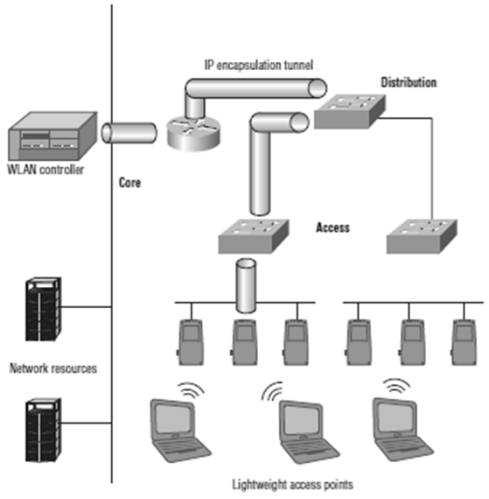
WLAN Controller

IP tunneling core layer



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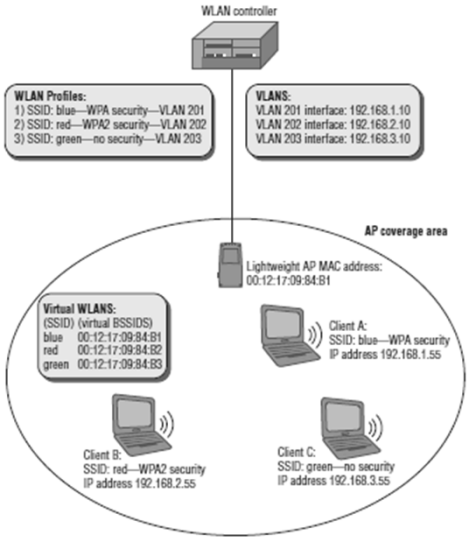
WLAN Controller

Virtual WLANs, virtual BSSIDs, and VLANs



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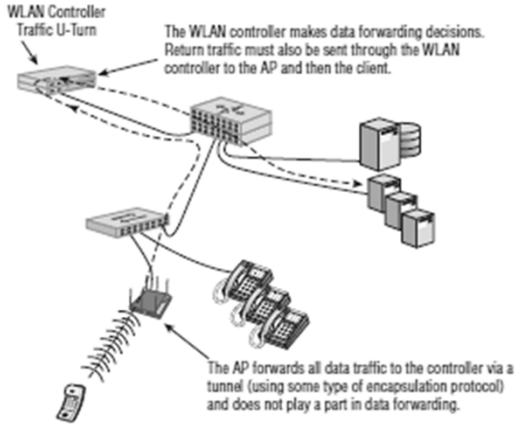
Controller Data Forwarding Models

Centralized Data Forwarding



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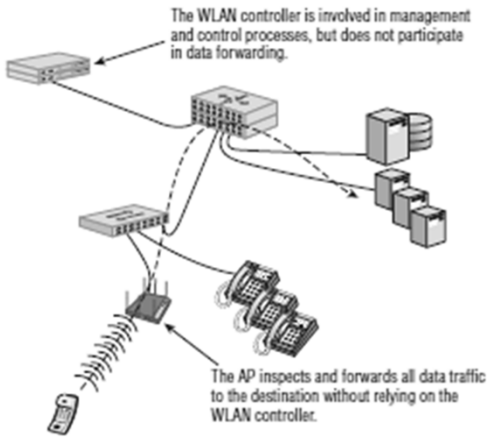
Controller Data Forwarding Models

Distributed Data Forwarding



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Remote Office WLAN Controller

- Has much less processing power than a core WLAN controller and is also less expensive
- Typically communicate with a central WLAN controller across a WAN link
- Through a VPN tunnel, the central controller will download the network configuration settings to the remote WLAN controller, which will then control and manage the local APs.

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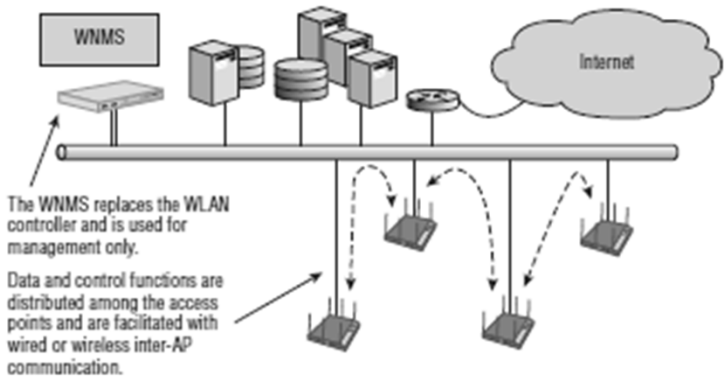
Distributed WLAN Architecture



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Unified WLAN Architecture

- Fully integrates WLAN controller capabilities into wired network infrastructure devices
- Wired switches and routers at both the core and the edge would also have WLAN controller capabilities, thereby allowing for the combined management of the wireless and wired networks

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Hybrid Architecture

- Many hybrids of these WLAN architectures exist
- WLAN controller vendors are pushing some of the control plane intelligence back into the access points
- One WLAN controller vendor has a cloud-based controller where much of the control plane intelligence exists in the cloud

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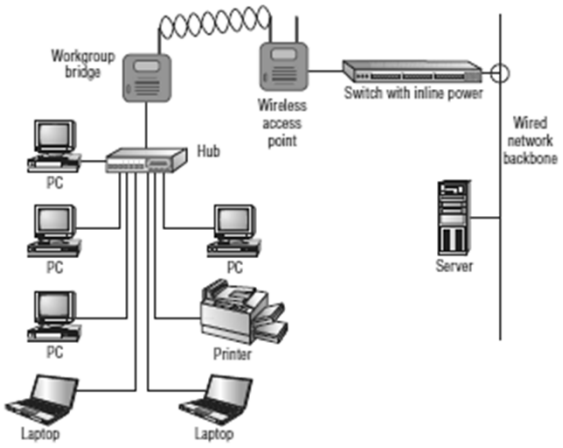
Specialty WLAN Infrastructure

Wireless Workgroup Bridge



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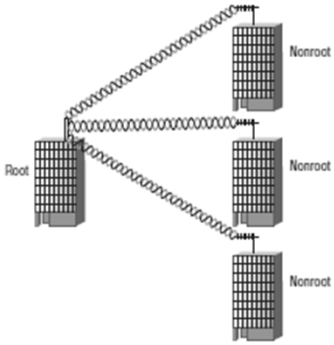
Specialty WLAN Infrastructure

Wireless
LAN
Bridges



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Other vendor configuration modes:

- AP Mode - Converts a bridge into an access point
- WGB Mode -Converts a bridge into a workgroup bridge
- Repeater Mode -Repeats the cell of a root bridge to a nonroot bridge
- Root with Clients -Root bridge that also allows clients to associate
- Nonroot with Clients - Nonroot bridge that also allows clients to associate

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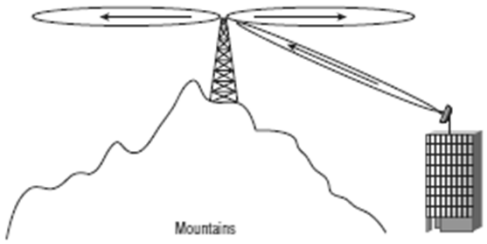
Common bridging challenge



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Enterprise WLAN Routers

- Configurable 802.11 radios
- Multiport Ethernet switch for connecting wired clients
- PoE-enabled Ethernet ports
- Network Address Translation (NAT)
- Port Address Translation (PAT)
- Port forwarding
- Firewall
- VPN client
- DHCP server
- USB support for 3G/4G cellular backhaul

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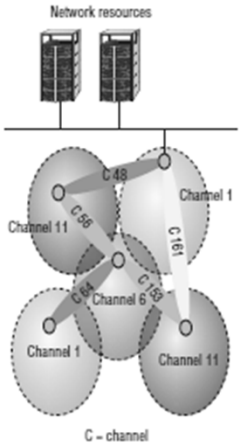
Wireless LAN Mesh Access Points



2.4 GHz channels 1, 6, and 11 used for access coverage

5 GHz channels 48, 56, 64, 153, and 161 used for backhaul

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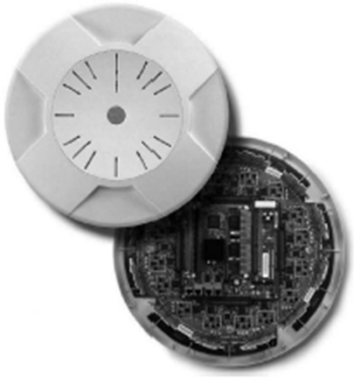
WLAN Array

- Up to 16 access-point radios using sector antennas and an embedded WLAN controller all reside in one device



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Virtual AP System

- Uses multiple access points that all share a single basic service set identifier (BSSID)
- Stations believe they are connected to only a single access point, although they may be roaming across multiple physical APs
- Zero handoff time and many of the latency issues associated with roaming are resolved
- Uses a unique WLAN topology called single-channel architecture (SCA)

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Real-Time Location Systems

- Can track the location of any 802.11 radio device as well as active Wi-Fi RFID tags with much greater accuracy

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- Can track the location of any 802.11 radio device as well as active Wi-Fi RFID tags with much greater accuracy

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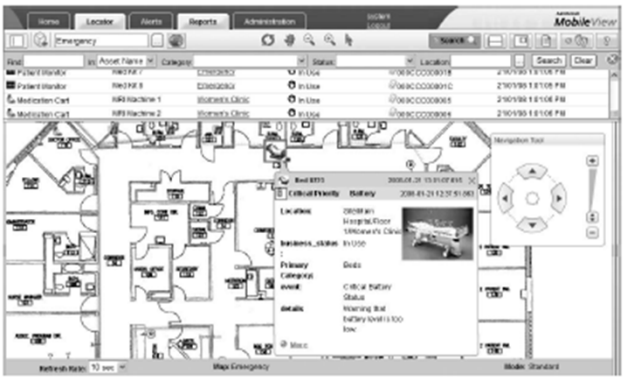
RTLS application



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VoWiFi

Components :

- VoWiFi Telephones
- 802.11 Infrastructure (APs and Controllers)
- PBX
- WMM Support

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Chapter 10 Summary

- Wireless LAN client devices
- WLAN architecture
- Specialty WLAN infrastructure