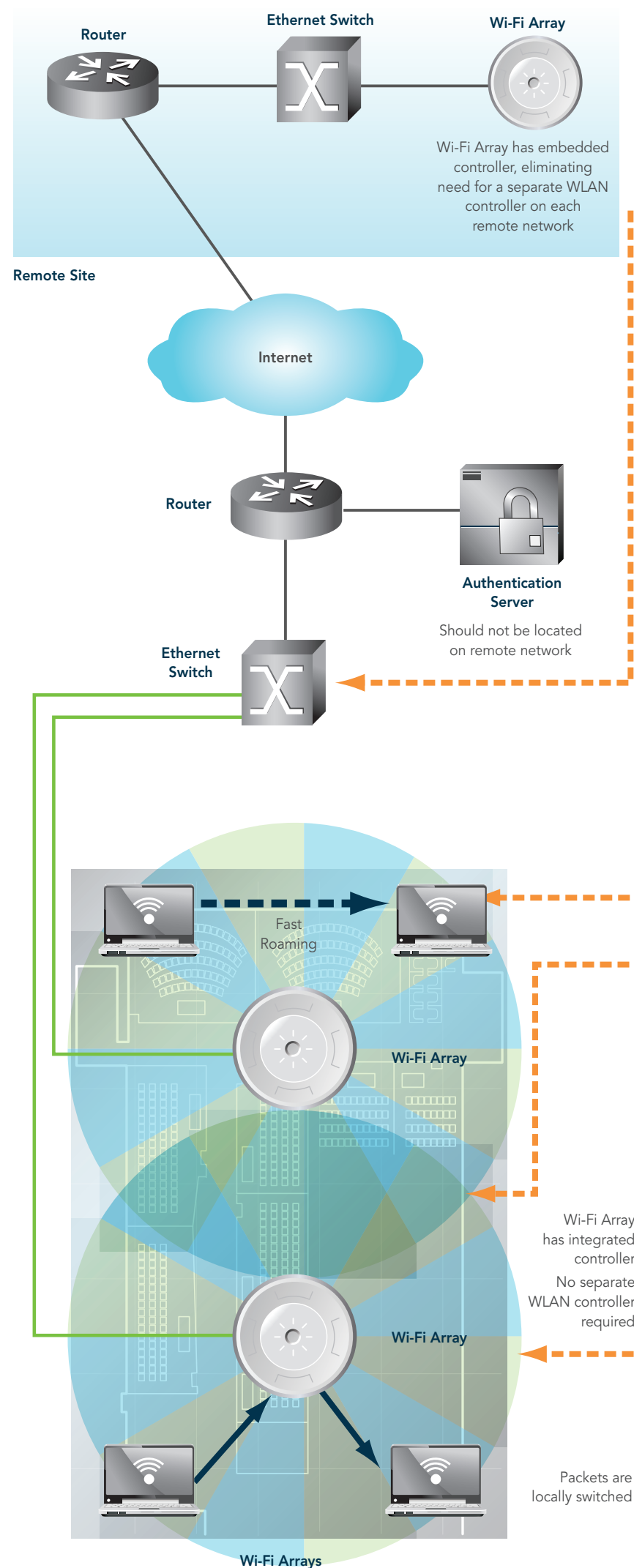


## Wi-Fi ARCHITECTURE

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## APPLICATION LAYER PERFORMANCE

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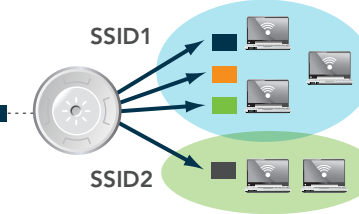
### Voice

- Infrastructure must identify and prioritize voice traffic over background data traffic
- Recommendation:** Use 802.11e (Wireless Quality of Service) and 802.1p tagging at the Access Point on the wired network for end-to-end Quality of Service to reduce latency and jitter

- Recommendation:** Use call Admission Control to deny handsets from associating to a radio that is already at capacity
- Recommendation:** Use 5GHz (802.11a/n) Handsets to improve call handling capacity and reduce interference

### Video

- Multicast traffic must be re-broadcast once for each SSID and again for every encryption type used per SSID
- Recommendation:** Use multicast-to-unicast conversion to improve performance
- Recommendation:** Use IGMP multicast pruning to improve performance
- Recommendation:** Use 802.11e WMM (Wi-Fi Multimedia) to accelerate priority packets to reduce latency



## WIRED AND WIRELESS SWITCHING

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### Wired Network Performance

- 802.11n Access Points require Gigabit Ethernet interfaces
- Design for 802.11n speeds with Gigabit wired network switching at the edge

- Recommendation:** Map wired QoS to Wireless QoS

- Recommendation:** Use Access Points that support 802.1p and 802.1Q tagging at the Access Point to support end-to-end QoS (some vendors only tag at the Wireless LAN controller in the closet)

### Wireless Network Switching

- WLAN controllers that are remote or deep in the network core will induce latency and jitter
- Remote locations require a separate WLAN controller at the remote site for local packet switching

- Recommendation:** Packets should be locally switched in the Access Point

- Recommendation:** WLAN controllers should be integrated or local to the Access Point

- Recommendation:** Create filters to drop unneeded traffic from wired to wireless network

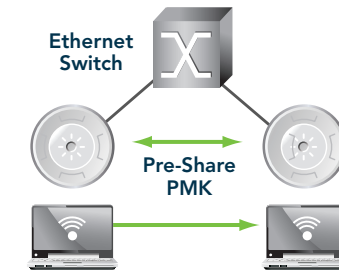
## MOBILITY AND SECURITY PERFORMANCE

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### Fast Roaming

- Recommendation:** Use infrastructure that can preserve user sessions as stations roam from network to network

- Recommendation:** Use infrastructure that can share PMK (Pairwise Master Keys) between Access Points to reduce authentication time and allowing for faster roaming



### Security

- Hardware-based encryption improves performance
- Access Points should share encryption keys (per 802.11i) for fast roaming
- Time sharing of radios reduces performance, especially for voice

- Recommendation:** Use WPA2 (AES) encryption for best security & performance
- Recommendation:** Use dedicated radios for RF monitoring for intrusion detection and intrusion prevention (IDS/IPS)
- Recommendation:** Authentication Servers should be local and not located across a WAN to reduce authentication time

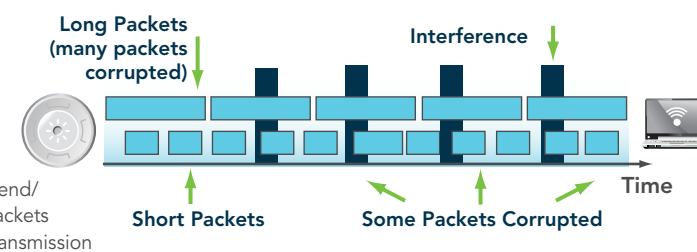
## MAC LAYER PERFORMANCE

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### Recommendation:

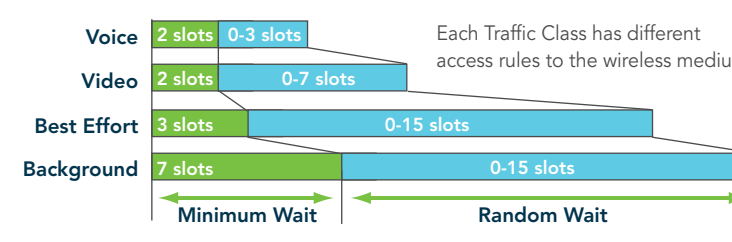
- Use shorter packets in the presence of interference

- Recommendation:** Use RTS/CTS (Request to Send/Clear to Send) with large packets to help ensure successful transmission



### Wireless QoS

- Low priority packets wait longer
- Recommendation:** Use 802.11e wireless QoS to accelerate priority packets



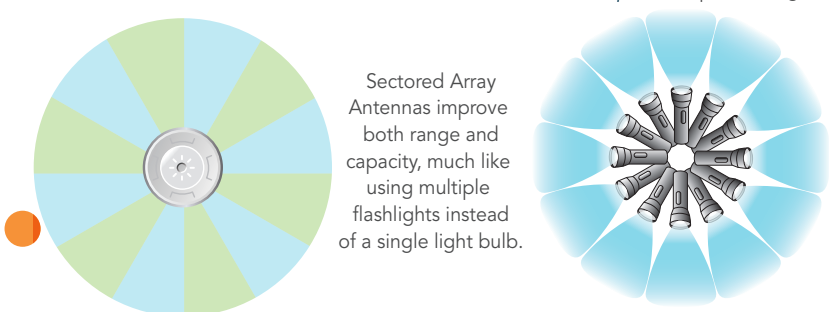
## PHYSICAL LAYER PERFORMANCE

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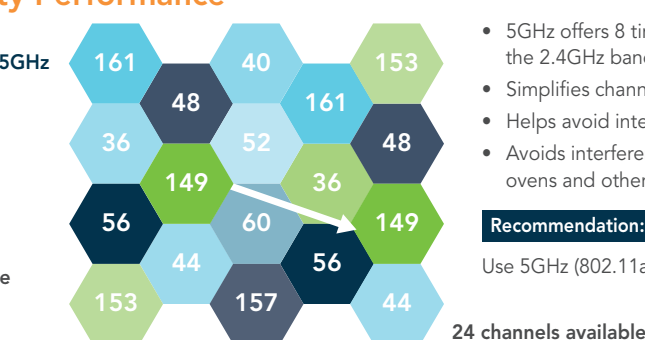
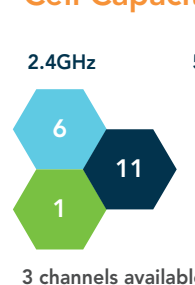
### Sectorized Architecture Boosts Performance

High Gain, Directional Multi-sector Antennas

Example: Multiple Flashlights



### Cell Capacity Performance

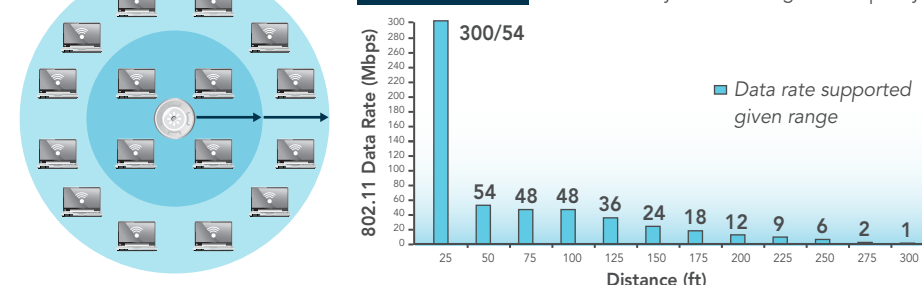


- 5GHz offers 8 times the capacity of the 2.4GHz band
- Simplifies channel planning
- Helps avoid interference from other cells
- Avoids interference from Bluetooth, microwave ovens and other devices in 2.4GHz band

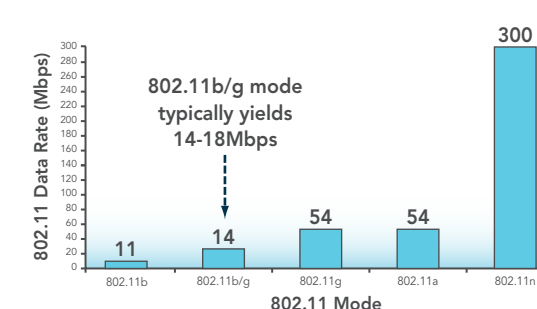
- Recommendation:** Use 5GHz (802.11a/n) whenever possible

### Physical Layer

- Larger cells cover more users = lower capacity per user
- Larger cells must use lower data rates at edge
- Recommendation:** Use Wi-Fi Array for both range and capacity



### 802.11 Modes & Data Rates



- 802.11n provides data rates up to 300Mbps today and up to 600Mbps tomorrow
- Phase out usage of 802.11b/g as it greatly slows down 802.11g and 802.11n

- Recommendation:** Use 5GHz (802.11a/n) whenever possible

## THIN AP ARCHITECTURE

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