



The Next Killer App: Voice over Wireless LAN

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State of the Industry

Technology

- Widespread voice application support by Wi-Fi infrastructure providers
- Emphasis on QoS, capacity, and roaming solutions
- Strategic component of PBX vendor's IP telephony solutions

Markets

- Most success in traditional vertical markets
 - Healthcare
 - Industrial
 - Retail
- General office market starting to develop
 - Cost competitive at low end
 - Large enterprise adoption stalled by security, architecture concerns

Players

- Established enterprise providers
- Newly announced consumer products

Wi-Fi Quality of Service

Original 802.11 standards did not include practical QoS solution

Unique challenges of Wi-Fi

- Access points act like wireless Ethernet hubs – not switches
- Wi-Fi uses collision avoidance – not collision detection
- Data rates can drop to deal with poor signal quality – as low as 1 Mb/s

Why QoS Matters for Wi-Fi Telephony

Voice quality

- Enterprise telephone applications have high standards for consistent and reliable voice quality

Capacity

- Limited, shared AP bandwidth requires efficient utilization to support anticipated telephone traffic

Handheld devices

- Radio utilization reduces battery life

QoS Components

Prioritization

- Identify and recognize different priority levels for different applications
- Higher priority packets are sent before lower priority packets

Scheduling

- Predictable channel utilization improves efficiency of radio resources
- Real-time applications like voice use fixed sampling rates

Wi-Fi QoS Standards

Wi-Fi Alliance

- Wireless Multimedia Extensions (WME)
- Wireless Scheduled Multimedia (WSM)

IEEE

- 802.11e

Wi-Fi Alliance QoS Mechanisms

WME	WSM
Based on 802.11e draft	Based on 802.11e draft, includes WME
Based on EDCA (Enhanced Distributed Coordination Access)	Based on HCCA (HCF Coordinated Channel Access)
EDCA provides priority classes of service	HCCA 'reserves' bandwidth based on traffic specifications from client devices
Best suited for one way audio applications	Best suited for two way streaming media (voice, video)
Triggered APSD Optional	Uses Scheduled APSD- suitable for power save

Wi-Fi Alliance QoS Progress

WME

- Have completed test plan and informal interoperability testing is in progress
- Certification testing will begin September 2004

WSM

- Test plan being finalized
- First of 3 “plugfests” to be held in June
- Certification testing scheduled to begin in December

Proprietary QoS Approaches

SpectraLink Voice Priority (SVP)

- Priority queuing and channel access
- Timed packet delivery

Symbol & Cisco voice prioritization

WLAN switches and middleware

- Priority users
- Priority applications

QoS Implementation Comparison

QoS Implementation	Description
WME	<ul style="list-style-type: none">▪ Probable priority▪ Requires external timing mechanism to conserve battery life▪ Fewer calls per AP
WME w/ Triggered APSD	<ul style="list-style-type: none">▪ Probable priority▪ No external timing required▪ Reduced battery life▪ Fewer calls per AP
WSM	<ul style="list-style-type: none">▪ Standardized solution▪ Good battery life▪ Optimal capacity
Proprietary	<ul style="list-style-type: none">▪ Strict priority▪ Requires proprietary hardware▪ Maximum number of calls per AP▪ No support for other client devices