Technical White Paper

IEEE 802.11ac

Next Generation Wireless

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Introduction

This Technical White Paper describes the emerging wireless standard: IEEE 802.11ac. The intended audience for this white paper is HP Solution Architects and HP Technical Consultants, HP certified partners, and customers.

About the Standard

IEEE 802.11ac is the latest wireless technology, currently under development. It is anticipated that this specification will enable multi-station WLAN throughput of at least 1 Gigabit per second, support additional MIMO spatial streams (up to 8), multi-user MIMO, wider RF bandwidth (up to 160 MHz), and high-density modulation (up to 256 QAM).

Finalization of the standard is expected in late 2013, with final 802.11 Working Group approval in 2014[1].

Technology/Feature	Expected Specifications
Wider channel bandwidths	80 MHz and 160 MHz channel bandwidths
MIMO spatial streams	Support for up to 8 spatial streams
Multi-user MIMO (MU-MIMO)	• Multiple stations, each with one or more antennas, transmit or receive independent data streams simultaneously • Downlink MU-MIMO (one transmitting device, multiple receiving devices) included as an optional mode
Modulation	256-QAM, rate 3/4 and 5/6, added as optional modes
Other	• Single sounding and feedback format for beamforming • MAC modifications (mostly to support above changes) • Coexistence mechanisms for 20/40/80/160 MHz channels, .11ac and .11a/n devices

[1] Official IEEE 802.11 Working Group Project Timelines- 2012-08-10

Benefits of IEEE 802.11ac

Wider Channel Bandwidths

IEEE 802.11ac supports 20, 40 and 80 MHz channels, with optional support for contiguous 160 MHz channels or non-contiguous 80+80 MHz channels.

80 MHz systems can use fewer antennas than a 40 MHz system, while still providing the same performance. Additionally, the use of fewer antennas eliminates diversity and reduces transmission strength. Doubling the bandwidth from 40 MHz to 80 MHz allows for each spatial stream to support roughly twice the number of bits per symbol. As a result, it only takes an 80 MHz single stream transmission to provide the same performance as a two stream 40 MHz transmission.

MIMO Spatial Streams

IEEE 802.11ac supports up to 8 spatial streams. Each spatial stream supports up to 433 Mbps.

Spatial Streams	Theoretical Data Rate
1	433 Mbps
2	866 Mbps
3	1.3 Gbps
4	1.7 Gbps
5	2.2 Gbps
6	2.6 Gbps
7	3.0 Gbps
8	3.5 Gbps

MU-MIMO

MU-MIMO allows for the AP to transmit independent data streams to several wireless clients at once. The streams are preprocessed which result in interference from streams not intended for a particular client being removed at the receiver of each client.

In theory, each client should receive its data interference free.

Note: MU-MIMO is not anticipated to be available in first generation chip sets.

Modulation

IEEE 802.11ac uses Orthogonal Frequency-Division Multiplexing (OFDM) to modulate bits for transmission. While the modulation method is the same as that used in 802.11n, 802.11ac optionally allows the use of 256 QAM. This increases the number of bits per sub-carrier from 6 to 8, resulting in up to a 33% increase in PHY rate (data rate).

5GHz wireless spectrum

IEEE 802.11ac is positioned to operate in the 5GHz wireless spectrum. This spectrum, which is less prone to interference, offers 23 non-overlapping channels versus the 3 over-lapping channels in the 2.4GHz spectrum. By using the 5GHz spectrum, 802.11ac will be more suitable for applications sensitive to packet loss and delay and requiring high performance and throughput, such as voice and video.

Beamforming

Tx beamforming can be used to help increase throughput by improving the quality of the signal sent to wireless clients When this option is enabled, APs use beamforming techniques to optimize the signal strength for each individual wireless client station. Beamforming works by changing the characteristics of the transmitter to create a focused beam that can be more optimally received by a wireless station.

With previous standards, such as 802.11n, APs can only transmit and receive omnidirectional signals, which are susceptible to interference. IEEE 802.11ac will support improved beamforming, which provide directional signal reception and transmission.

HP's Position

HP is working to bring this new technology to market. HP expects to release IEEE 802.11ac enterprise class access points after the Wi-Fi Alliance has begun certification to ensure we are bringing a tested and standardized Wi-Fi certified product to market.

HP anticipates that IEEE 802.11n two and three stream products will be the technology of choice for the next 18 to 24 months and will continue to be the choice for many customers for the next 2-3 years.

For more information

HP is happy to share its wireless roadmap in a face to face meeting under a Non-Disclosure Agreement (NDA). Please contact your HP Sales Representative.

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