P802.11bn

Type of Project: Amendment to IEEE Standard 802.11-2020
Project Request Type: Initiation / Amendment
PAR Request Date:
PAR Approval Date:
PAR Expiration Date:
PAR Status: Draft
Root Project: 802.11-2020

1.1 Project Number: P802.11bn
1.2 Type of Document: Standard
1.3 Life Cycle: Full Use

2.1 Project Title: IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks--Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment: Enhancements for Ultra High Reliability

3.1 Working Group: Wireless LAN Working Group(C/LAN/MAN/802.11 WG)
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4.1 Type of Ballot: Individual
4.2 Expected Date of submission of draft to the IEEE SA for Initial Standards Committee Ballot: Jul 2026
4.3 Projected Completion Date for Submittal to RevCom: Mar 2027

5.1 Approximate number of people expected to be actively involved in the development of this project: 200
5.2.a Scope of the complete standard: The scope of this standard is to define one medium access control (MAC) and several physical layer (PHY) specifications for wireless connectivity for fixed, portable, and moving stations (STAs) within a local area.
5.2.b Scope of the project: This amendment defines modifications to both the IEEE Std 802.11 physical layer (PHY) and the IEEE Std 802.11 Medium Access Control (MAC). The amendment adds an Ultra High Reliability capability to a Wireless Local Area Network (WLAN). The Ultra High Reliability capability is defined for both an isolated Basic Service Set (BSS) and overlapping BSSs as:

- at least one mode of operation capable of increasing throughput by 25%, as measured at the MAC data service Access Point, in at least one Signal to Interference and Noise Ratio (SINR) level (Rate-vs-Range), compared to the Extremely High Throughput MAC/PHY operation, and
- at least one mode of operation capable of reducing latency by 25% for the 95th percentile of the latency distribution compared to the Extremely High Throughput MAC/PHY operation and
- at least one mode of operation capable of reducing MAC Protocol Data Unit (MPDU) loss by 25% compared to the Extremely High Throughput MAC/PHY operation for a given scenario, especially for transitions between BSSs.

This amendment provides a mechanism to reduce power consumption for Access Points (APs) (including

mobile APs) and improved Peer-to-Peer (P2P) operation compared to the Extremely High Throughput MAC/ PHY operation.
This amendment applies to carrier frequency operation between 1 GHz and 7.250 GHz.
This amendment shall ensure backward compatibility and coexistence with legacy IEEE 802.11 devices in the 2.4 GHz, 5 GHz and 6 GHz unlicensed bands.

5.3 Is the completion of this standard contingent upon the completion of another standard? Yes
Explanation: The P802.11be amendment is in progress and this amendment will enhance P802.11be base functionalities.
5.4 Purpose: The purpose of this standard is to provide wireless connectivity for fixed, portable, and moving stations within a local area. This standard also offers regulatory bodies a means of standardizing access to one or more frequency bands for the purpose of local area communication.
5.5 Need for the Project: Use of WLANs based on IEEE 802.11 technology continues to grow and diversify over many market segments including residential, enterprise, industrial and agriculture. More stringent requirements are needed to meet the demands of new applications (including metaverse [1], augmented and virtual reality [2], robotics, industrial automation for industrial IoT, logistics and smart agriculture [3]).
WLAN devices that support data rates in the range of a few gigabits per second (Gb/s) are already available. The technology needs to further evolve to increase throughput at different SINR levels.
Use of WLAN P2P communications is increasing in a wide range of deployment scenarios, which are competing with infrastructure WLAN usage for the same medium resources. This requires better coordination between neighboring APs and between P2P networks.
Reducing power consumption of WLAN devices is required to prolong the battery life of untethered devices (e.g., non-AP STA, Mobile APs), reduce device cost, and lower energy bills of customers deploying non-AP and AP STAs in most scenarios (e.g., residential, enterprise, industrial, venues).
5.6 Stakeholders for the Standard: Manufacturers, developers, and users of WLAN enabled devices including wireless network access service providers, health care workers, retail service providers, consumers and many others.

6.1 Intellectual Property

6.1.1 Is the Standards Committee aware of any copyright permissions needed for this project?
No

6.1.2 Is the Standards Committee aware of possible registration activity related to this project?
No

7.1 Are there other standards or projects with a similar scope? No
7.2 Is it the intent to develop this document jointly with another organization? No

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8.1 Additional Explanatory Notes: 2.1: Ultra High Reliability (UHR)
In the context of this PAR, reliability focuses on MPDU transfer and is comprised of throughput, latency and MPDU loss (see 5.2b).
For a given scenario, implementations of the IEEE 802.11 standard today achieve multi-Gbps throughout, sub-10 ms latency and packet losses lower than 0.1%. Per our definition of reliability, we consider this as high reliability. The term Ultra High indicates the improvement quantified in 5.2b over the current high reliability baseline standard.

5.2b and 5.3
Extremely High Throughput operation is defined in IEEE P802.11be Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment: Extremely High Throughput.
Measurements of comparison with Extremely High Throughput MAC/PHY operation will follow a similar approach as used in previous amendments (see https://mentor.ieee.org/802.11/dcn/14/11-14-0980-16-00ax-simulation-scenarios.docx).

5.5
References:
[1] https://circleid.com/posts/20220312-network-requirements-for-the-metaverse
[2] https://mentor.ieee.org/802.11/dcn/18/11-18-2009-06-0rta-rta-report-draft.docx
[3] https://mentor.ieee.org/802.11/dcn/22/11-22-1919-05-0uhr-considerations-on-uhr-par-and-kpis.pptx

5.5 Additional information
WLANs based on the IEEE 802.11 standard have already experienced a steady rise in achievable data rates. Cutting-edge applications offer a wide range of digitally enhanced worlds, realities, and business models that have the potential to revolutionize both personal and enterprise activities in the next decade. These applications require large throughput combined with reduced and predictable worst-case delay and jitter, high reliability, and improved power efficiency [1].

Technical solutions to meet the needs of cutting edge applications should address both deployments with a single

isolated BSS and deployments with multiple non-collocated BSSs in dense environments where in-band and optionally out-of-band (including via IEEE 802.3) AP coordination can be available (e.g., enterprise, residential). The latter type of deployment also requires seamless mobility to ensure reliable connectivity and quality of experience for mobile users.
Power saving mechanisms also decrease the carbon footprint of WLAN technology, reduce greenhouse gas emissions and conform to energy regulatory requirements worldwide. AP Power Save encompasses different scenarios, including periods of low utilization while minimizing the impact on the service.

IEEE Std 802.3-2022 IEEE Standard for Ethernet