
P802.11ax

This PAR is valid until 31-Dec-2020. The original PAR was approved on 27-Mar-2014. It was modified on 06-Dec-2017 and then extended on 27-Sep-2018.

PAR Extension Request Date:
PAR Extension Approval Date:
Extension Request Submitter Email:
Number of Previous Extensions Requested: 1

- 1. Number of years that the extension is being requested:** 1
- 2. Why an Extension is Required (include actions to complete):** An extension is needed to complete IEEE-SA balloting of the draft amendment. P802.11ax D6.0 completed the initial IEEE-SA ballot on January 24, 2020, with 82% approval and 569 technical and editorial comments. Comment resolution is underway. The plan is to have the draft standard approved by the end of 2020. This extension request is a precautionary measure to account for any unforeseen circumstances and delays.
- 3.1. What date did you begin writing the first draft:** 15 Mar 2016
- 3.2. How many people are actively working on the project:** 250
- 3.3. How many times a year does the working group meet?**
 - In person:** 6
 - Via teleconference:** 15
- 3.4. How many times a year is a draft circulated to the working group:** 3
- 3.5. What percentage of the Draft is stable:** 99%
- 3.6. How many significant work revisions has the Draft been through:** 6
- 4. When will/did initial Standards Association Balloting begin:** Dec 2019

When do you expect to submit the proposed standard to RevCom: Oct 2020
Has this document already been adopted by another source? (if so please identify) No

For an extension request, the information on the original PAR below is not open to modification.

Submitter Email: jrosdahl@ieee.org
Type of Project: Amendment to IEEE Standard 802.11-2012
Project Request Type: Modify / Amendment
PAR Request Date: 13 Jul 2017
PAR Approval Date: 06 Dec 2017
PAR Expiration Date: 31 Dec 2020
PAR Status: Active
Root PAR: P802.11ax
Root PAR Approved on: 27 Mar 2014
Root Project: 802.11-2012

- 1.1 Project Number:** P802.11ax
 - 1.2 Type of Document:** Standard
 - 1.3 Life Cycle:** Full Use
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2.1 Project Title: 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 High Efficiency WLAN

Change To Title: Standard for Information ~~technology~~ Technology -- Telecommunications and information ~~Information~~ Exchange ~~Exchange~~ between ~~Between~~ systems ~~Systems~~ Local and metropolitan ~~Metropolitan~~ Area Networks ~~networks~~ -- Specific requirements Requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment Enhancements for High Efficiency WLAN

- 3.1 Working Group:** Wireless LAN Working Group(C/LM/802.11 WG)
 - 3.1.1 Contact Information for Working Group Chair:**
 - Name:** Dorothy Stanley
 - Email Address:** dstanley1389@gmail.com
 - 3.1.2 Contact Information for Working Group Vice Chair:**

Name: Jon Rosdahl

Email Address: jrosdahl@ieee.org

3.2 Society and Committee: IEEE Computer Society/LAN/MAN Standards Committee(C/LM)

3.2.1 Contact Information for Standards Committee Chair:

Name: Paul Nikolich

Email Address: p.nikolich@ieee.org

3.2.2 Contact Information for Standards Committee Vice Chair:

Name: James Gilb

Email Address: gilb@ieee.org

3.2.3 Contact Information for Standards Representative:

Name: James Gilb

Email Address: gilb@ieee.org

4.1 Type of Ballot: Individual

4.2 Expected Date of submission of draft to the IEEE SA for Initial Standards Committee Ballot:

Nov 2018

Change to Expected Date of submission of draft to the IEEE SA for Initial Standards Committee

Ballot: ~~Jul Nov 2017~~ 2018

4.3 Projected Completion Date for Submittal to RevCom: Aug 2019

Change to Projected Completion Date for Submittal to RevCom: ~~Mar Aug 2018~~ 2019

5.1 Approximate number of people expected to be actively involved in the development of this project: 250

Change to Approximate number of people expected to be actively involved in the development of this project: ~~200~~ 250

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 standardized modifications to both the IEEE 802.11 physical layers (PHY) and the IEEE 802.11 Medium Access Control layer (MAC) that enable at least one mode of operation capable of supporting at least four times improvement in the average throughput per station (measured at the MAC data service access point) in a dense deployment scenario, while maintaining or improving the power efficiency per station.

This amendment defines operations in frequency bands between 1 GHz and 7.125 GHz. The new amendment shall enable backward compatibility and coexistence with legacy IEEE 802.11 devices operating in the same band.

Change to scope of the project: This amendment defines standardized modifications to both the IEEE 802.11 physical layers (PHY) and the IEEE 802.11 Medium Access Control layer (MAC) that enable at least one mode of operation capable of supporting at least four times improvement in the average throughput per station (measured at the MAC data service access point) in a dense deployment scenario, while maintaining or improving the power efficiency per station. This amendment defines operations in frequency bands between 1 GHz and ~~6~~ 7.125 GHz. The new amendment shall enable backward compatibility and coexistence with legacy IEEE 802.11 devices operating in the same band.

5.3 Is the completion of this standard contingent upon the completion of another standard? No

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: Wireless LAN (WLAN) devices are currently being deployed in diverse environments. These environments are characterized by the existence of many access points and non-AP stations in geographically limited areas. Increased interference from neighbouring devices gives rise to performance degradation. Additionally WLAN devices are increasingly required to support a variety of applications such as video, cloud access, and offloading. In particular video traffic is expected to be the dominant type of traffic in many high efficiency WLAN deployments. With the real-time requirements of some of these applications, WLAN users demand improved performance in delivering their applications, including improved power consumption for battery-operated devices.

Unlike previous amendments where the focus was on improving aggregate throughput, this amendment focuses on improving metrics that reflect user experience, such as average per station throughput, the 5th percentile of per station throughput of a group of stations, and area throughput. Improvements will be made to support environments such as wireless corporate office, outdoor hotspot, dense residential apartments, and stadiums.

5.6 Stakeholders for the Standard: Manufacturers and users of semiconductors, personal computers, enterprise networking devices, consumer electronic devices, home networking equipment, mobile devices, and cellular operators.

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

8.1 Additional Explanatory Notes : 5.2.b The focus of this amendment is on WLAN indoor and outdoor operation in the 2.4 GHz and the 5 GHz frequency bands. Additional bands between 1 GHz and 7.125 GHz may be added as they become available.

* The increase in average throughput per station is not limited to four times improvement. Improvement values in the range of 5-10 times are targeted, depending on technology and scenario.

* Outdoor operation is limited to stationary and pedestrian speeds.

* Average throughput per station is directly proportional to both aggregate basic service set (BSS) throughput and area throughput. The 5th percentile measure of the per station throughput may be used to determine that the desired distribution of throughput among a number of stations in an area is satisfied. These metrics, along with the satisfaction of the packet delay and the packet error ratio (PER) requirements of applications, will directly correspond to user experience in identified scenarios.

* Since the values of the metrics of interest will depend on the scenario, the focus will be on the relative improvement of these metrics compared to previous IEEE 802.11 amendments (IEEE 802.11n in 2.4 GHz and IEEE 802.11ac in 5 GHz).

* The amendment will be evaluated with a set of typical deployment scenarios representative of the main expected usage models that are likely to suffer bottlenecks in the coming years: residential, enterprise, indoor and outdoor hotspots. High Efficiency WLAN Study Group (HEW SG) has initiated the creation of a high-level simulation scenario working document (ref: 11-13/1001r5) to model these scenarios. The simulation scenarios may include system characteristics extracted from measured IEEE 802.11 operations in the field.

* These scenarios highlight three categories of objectives to improve WLAN efficiency:

o Make more efficient use of spectrum resources in scenarios with a high density of STAs per BSS.

o Significantly increase spectral frequency reuse and manage interference between neighboring overlapping BSS (OBSS) in scenarios with a high density of both STAs and BSSs.

o Increase robustness in outdoor propagation environments and uplink transmissions.

* This project may include the capability to handle multiple simultaneous communications in both the spatial and frequency domains, in both the uplink (UL) and downlink (DL) direction.

* Power efficiency is intended to measure consumption of devices which can reasonably be assumed to be powered by batteries and will take into account average power consumption for a given scenario.

PAR Modification changes:

4.2/4.3 update projected completion dates

5.1 update missing participation number

5.2b change Frequency from 6 GHz to 7.125 GHz due to new band.

Changes to Additional Explanatory Notes : 5.2.b

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