IEEE P802.11
Wireless LANs

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| IEEE 802.11bk CSD  |
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Abstract

This document contains the Criteria for Standards Development (CSD) for the IEEE 802.11bk 320 MHz positioning project.

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| Revision | Summary |
| 01 | Incorporating feedback post the TGaz Aug. 24th telecon. |
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# 1. IEEE 802 criteria for standards development (CSD)

The CSD documents an agreement between the WG and the Standards Committee that provides a description of the project and the Standards Committee requirements more detailed than required in the PAR. The CSD consists of the project process requirements, and the 5C requirements.

## 1.1 Project process requirements

### 1.1.1 Managed objects

Describe the plan for developing a definition of managed objects. The plan shall specify one of the following:

1. The definitions will be part of this project.
**Yes.**
2. The definitions will be part of a different project and provide the plan for that project or anticipated future project.
3. The definitions will not be developed and explain why such definitions are not needed.

### 1.1.2 Coexistence

A WG proposing a wireless project shall demonstrate coexistence through the preparation of a Coexistence Assurance (CA) document unless it is not applicable.

1. Will the WG create a CA document as part of the WG balloting process as described in Clause 13?
**No.**
2. If not, explain why the CA document is not applicable.

This amendment will use the same channel assessment methods, modulation, protection and reservation methods and same spectral mask as the P802.11be PHY that it is based on.

## 1.2 5C requirements

### 1.2.1 Broad Market Potential

Each proposed IEEE 802 LMSC standard shall have broad market potential. At a minimum, address the following areas:

a) Broad sets of applicability.

There are several market segments that are applicable to IEEE 802.11 based positioning systems, including indoor navigation, proximity services, asset tracking, personal tracking, and emergency services.

According to the ABI market forecast1 (ABI Indoor Location/RTLS Market Data Apr. 18 2022) for the Real Time Location Services (RTLS) market, the total number of RTLS implementations in 2021 was 592,543 with forecast for compound annual growth rate (CAGR) of 14.6% till 2030.

During this time, the total number of shipped anchor point devices (such as IEEE 802.11 based Access Points (APs) and Bluetooth Low Energy Beacon devices) is forecast to increase from 3.37M in 2021 to 22.33M in 2030 which represents a CAGR of 25%.

In terms of market revenue, the RTLS hardware market is expected to grow from 2.716B USD in 2021 to 16.53B USD in 2030, representing a CAGR of 22.3%. The market revenue of associated RTLS services is expected to grow from 2.472B USD in 2021 to 24.874B USD in 2030, representing a CAGR of 26.8% over that period.

b) Multiple vendors and numerous users.

A wide variety of vendors currently build numerous products for the Wireless Local Area Network (WLAN) marketplace and there is a wide adoption of the Fine Timing Measurement (FTM) protocol within that market segment.

### 1.2.2 Compatibility

Each proposed IEEE 802 LMSC standard should be in conformance with IEEE Std 802, IEEE 802.1AC, and IEEE 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1 WG prior to submitting a PAR to the Sponsor.

1. Will the proposed standard comply with IEEE Std 802, IEEE Std 802.1AC and IEEE Std 802.1Q?
**Yes**
2. If the answer to a) is no, supply the response from the IEEE 802.1 WG.

The review and response is not required if the proposed standard is an amendment or revision to an existing standard for which it has been previously determined that compliance with the above IEEE 802 standards is not possible. In this case, the CSD statement shall state that this is the case.

### 1.2.3 Distinct Identity

Each proposed IEEE 802 LMSC standard shall provide evidence of a distinct identity. Identify standards and standards projects with similar scopes and for each one describe why the proposed project is substantially different.

The proposed P802.11bk project focuses on adaptation of the 320 MHz sounding waveform defined in the IEEE P802.11be amendment to the Fine Timing Measurement (FTM) procedure, to support the positioning services and measurement protocol sequences defined by the IEEE P802.11az amendment, with and without secure Long Training Field (LTF) mode.

There is no other WLAN standard focusing on adapting the 320 MHz bandwidth channels for use with the FTM procedure and specifically, positioning.

### 1.2.4 Technical Feasibility

Each proposed IEEE 802 LMSC standard shall provide evidence that the project is technically feasible within the time frame of the project. At a minimum, address the following items to demonstrate technical feasibility:

a) Demonstrated system feasibility.

Millions of devices that implement the IEEE 802.11-2016 FTM ranging measurement protocol are available in the market today. Devices implementing the more advanced IEEE P802.11az draft standard are also becoming available.

Supporting bandwidths from 20-160 MHz and with 1 to 4 transmit and receive streams, these devices demonstrate a computation complexity similar to that expected from a 320 MHz waveform with an equivalent number of spatial streams x bandwidth waveforms.

b) Proven similar technology via testing, modeling, simulation, etc.

IEEE 802.11 is a mature technology used by a wide variety of legacy devices and a proven track record with several billions of devices shipping each year. The principle of extending existing IEEE 802.11 PHY and MAC mechanisms with new capabilities is also well established by previous amendments developed within the IEEE 802.11 Working Group. An example of this extension is the IEEE P802.11az project, which defines positioning mechanisms using Downlink and Uplink Multiple Input Multiple Output (DL and UL MIMO) communication with bandwidths up to 160 MHz, and multi-user (MU) operation. Moreover, similar technology exists in the existing commercial market products which also have computation requirements similar to those of the proposed project.

### 1.2.5 Economic Feasibility

Each proposed IEEE 802 LMSC standard shall provide evidence of economic feasibility. Demonstrate, as far as can reasonably be estimated, the economic feasibility of the proposed project for its intended applications. Among the areas that may be addressed in the cost for performance analysis are the following:

a) Balanced costs (infrastructure versus attached stations).

1. WLAN equipment is accepted as having balanced costs. Enhancement of the FTM protocol to support the IEEE P802.11be-defined 320 MHz waveform in WLAN network deployments and the improved system level performance will not disrupt the established balance, as was demonstrated by the addition of FTM specific 20, 40, 80 and 160 MHz waveforms in IEEE 802.11ax™-2021 based devices.
2. b) Known cost factors.

Support of the proposed standard will likely require a manufacturer to do limited development to modify the radio, modem, and firmware to support the 320 MHz waveform for FTM, similar to the FTM specific 20-160 MHz waveforms. This is equivalent in principle to the changes required to support FTM for IEEE 802.11ax-2021 defined PHY mechanisms developed in the IEEE P802. 11az project. The cost factors for these transitions are well known and the data for this is well understood.

c) Consideration of installation costs.

320 MHz ranging enables use cases such as range detection for proximity purposes between two mobile devices, which do not require known location and hence do not have increased associated installation costs. In some use cases where the AP’s geographic and civic locations provides absolute location, improved AP location installation accuracy may be desirable to take full advantage of the increased accuracy of the STA range measurement.

In other use cases, such as Global Navigation Satellite System (GNSS) based self-locating networks, the added accuracy may enable improved placement detection of the APs by improving the constraint setting between APs within the self-locating network, resulting in reduced or no incurred additional installation cost.

d) Consideration of operational costs (e.g., energy consumption).

There are billions of WLAN systems in operation around the world. WLAN systems are recognized to provide a total cost of ownership (TCO) that provides a significant operation cost benefit. This amendment is not expected to change today’s operation costs.

This amendment is targeting to maintain (or reduce) the power consumed by devices executing a smaller number of the positioning protocol measurement exchange messages needed to achieve same or better accuracy, as specified in the PAR.

e) Other areas, as appropriate.

None

## References

1. Market Data Indoor Location/RTLS MD-RTLS-104, Apr. 2022 <https://www.abiresearch.com/market-research/product/1032107-indoor-locationrtls/>
2. 11-22-1070-00 320MHz Ranging, Rolf De Vegt, July 2022

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1. 11-22-1325-01 320MHz PAR, Ali Raisinia et-al, Aug. 2022

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