IEEE P802.11
Wireless LANs

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| IEEE 802.11 AMP SG Proposed CSD |
| Date: 2023-03-14 |
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Abstract

CSD document for AMP

Rev 0: initial draft framework

Rev 1: update based on proposed modification by 11-23/1287r1

# 1. IEEE 802 criteria for standards development (CSD)

The CSD documents an agreement between the WG and the Sponsor that provides a description of the project and the Sponsor's requirements more detailed than required in the PAR. The CSD consists of the project process requirements, 1.1, and the 5C requirements, 1.2.

## 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 prepare a Coexistence Assessment (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? YES
2. If not, explain why the CA document is not applicable.

## 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:

1. Broad sets of applicability.

*IoT network has spread into nearly every aspect of life, and, as such, is a driver for economic growth, social cohesion/inclusion, and for the improvement of welfare and well-being. Disruptive solutions are however required to sustain this evolution. In this regard, explosive market growth is predicted for battery-free tags and sensors. AMP IoT WLAN tackles all the main challenges, in order to create battery-free via energy harvesting and thus maintenance free and sustainable networks, enabling IEEE 802.11based WLAN to strengthen the position in the field and remain at the forefront of the evolution.*

*AMP IoT capability could enhance WLAN network with at least 3 main functions: identification, sensor data transmission, and positioning [1].*

*Nowadays, the market for object identification is projected to reach USD 35.6 billion by 2030 from USD 14.5 billion in 2022 and it is expected to grow at a CAGR of 11.9% from 2022 to 2030 [2] . The market is expected to expand from an output of 18,836.5 million units in 2021 and surpass 49,116.4 million units by 2031 [3] . AMP IoT is a promising candidate technology to play a critical role in the market of object identification by potentially providing remote, automatic, omni-directional, highly efficient and reliable object identification. With these new characteristics, AMP IoT WLAN can be further applied in asset management in new market such as smart agriculture where the coverage requirement is beyond the capability of current technologies.*

*AMP IoT WLAN can also be used for positioning, e.g., for positioning in manufacturing, establishing an indoor positioning and navigation system etc. The global Indoor positioning and navigation market was valued at $6.92 billion in 2020 and is projected to grow to $23.6 billion in 2025 at a CAGR of 27.9% [4] . Unlike the outdoor use cases where Global Navigation Satellite System can be used, it calls for much more efficient indoor positioning and navigation technologies for indoor use cases. AMP IoT WLAN based indoor positioning and navigation system can be easily deployed with low cost and can be easily used by the verticals and individual customer.*

*AMP IoT WLAN can be used for sensor networks [5] . The global industrial wireless sensor network market size is expected to reach USD 8,669.8 million by 2025, growing at a CAGR of 15.2% from 2019 to 2025, according to this study. The benefits offered by IWSN over wired networks, such as mobility, self-discovery capability, compact size, cost-effectiveness, and reduced complexity, are anticipated to play a significant role in increasing global demand. For example, the development of smart grid requires the sensor network to realize intelligent perception and data fusion. The combination of communication network and sensing technology applied in the power grid will develop towards the deep integration of sensing and communication. China’s State Grid plans to invest more than 150 billion yuan ($22 billion) in the second half of 2022 in ultra-high voltage (UHV) power transmission lines. Millions of sensors and meters need to be deployed along these UHV power transmission lines to monitor temperature, humidity, etc., and detect fault operations, which creates a huge market for AMP IoT devices with unique features such as maintenance-free and battery-less.*

*Therefore, the AMP IoT WLAN will pave the way for the deployment of new sensors by significantly reducing both CapEx including deployment cost and OpEx including operation cost. In this regard, the largest growth of future AMP IoT is foreseen in the next decade attending to the expected growth of number of devices, the wish of long term and maintenance-free connection and the rise of new services and applications.*

1. Multiple vendors and numerous users.

*A wide variety of vendors currently build numerous products for the Wireless Local Area Network (WLAN) marketplace and setup plans for more extensive IoT marketplace. It is anticipated that most of those vendors, and others, will participate in the standards development process and subsequent commercialization activities.*

*The numbers of annual shipment and the diversity of devices and usages illustrate the number of users that are relying on IoT marketing extension and penetration with AMP WLAN technology.*

### 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.

*This project will focus on enabling ambient power communication in WLAN with acceptable data rate by supporting at least one mode of data communication link for ultra-low power device which is only powered with extremely low power density (e.g. radio waves with power density of several uW or evern lower, etc.).*

*This project will also provide mechanisms for positioning function conjunctioned with ambient power communication.*

*There is no other WLAN standard focusing on enabling ambient power communication in WLAN, and providing mechanisms for positioning function with ambient power communication other than this amendment.*

### 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:

1. a) Demonstrated system feasibility.

*The AMP TIG/SG and WNG has reviewed many presentations listing candidate features, technical feasibility analysis, and prototypes presentations which indicate that the proposed solutions are technically feasible. And AMP TIG has developed a technical report on supporting AMP devices in WLAN in [1] to demonstrate the system feasibility.*

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

*IEEE 802.11 is a mature technology which has a wide variety of legacy devices and a proven track record, with several billions of devices shipping each year. The AMP function has been analyzed in [1]. The increased capabilities of IEEE 802.11 envisioned for the baseband and RF parts necessary to implement the proposed amendment are in line with the current progress in technology and not expected to impinge testability.*

### 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:

1. a) Known cost factors.

*WLAN equipment and AMP devices are accepted by marketing as having balanced costs. The development of supporting AMP communication in WLAN entends the WLAN network deployment scenario and will not disrupt the established balance.*

1. b) Balanced costs.

*Support of the proposed standard will likely require a manufacturer to develop a modified radio, modem and firmware. This is similar in principle to the case of IEEE 802.11ba as well as in previous extended capabilities of IEEE Std. 802.11 enhancements. The cost factors for these enhancements are well known and the data for this is well understood.*

1. c) Consideration of installation costs.

*The WLAN industry has been taking efforts to extend WLAN implementation in IoT marketing for many years. The focus of this amendment is mostly on enabling AMP communication operation in WLAN. Thus, for venues following this advice, the proposed amendment has no known extra impact on installation costs for AMP WLANs.*

*In cases of WLAN devices with AMP capability only, the proposed amendment is not expected to impact installation costs either.*

*In some cases, AMP capability is supported on a legacy IEEE 802.11 device. The total cost is balanced and comparable to the cost of an initial IEEE Std. 802.11 WLAN installation.*

1. 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 benefits. This amendment is focusing on enabling AMP communication in WLAN which allows ultra low energy consumption and long life-cycle IoT applications which can use battery-free AMP devices by exploring ambient power sournces and enable maintenance-free IoT network to reduce/avoid the human intervention. The AMP communication in WLAN also benefits the environments protection via reducing the usage of conventional battery. Therefore, this amendment is not expected to change markedly today’s operation costs and indeed a goal is to improve the TCO via enabling reduced device energy consumption.*

1. e) Other areas, as appropriate.

None.

**References:**

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2. 11-22-0645-02-0wng-ambient-power-enabled-iot-for-wi-fi.pptx

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