IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IEEE 802.11 WLAN sensing SG Proposed CSD | | | | |
| Date: 2019-11-19 | | | | |
| Author(s): | | | | |
| Name | Affiliation | Address | Phone | email |
| Tony Xiao Han | Huawei Technologies Co., Ltd. |  |  | Tony.hanxiao@huawei.com |
|  |  |  |  |  |

Abstract

This is the IEEE 802.11 WLAN sensing (SENS) Study Group (SG) proposed Criteria for Standards Development (CSD).

# 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**

1. The definitions will be part of a different project and provide the plan for that project or anticipated future project.
2. 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?

**YES**

1. 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:

a) Broad sets of applicability.

According to the research in [1], the global estimation of Wi-Fi economy will increase from 1.96 trillion to 3.46 trillion. And as of 2018, there are more than 340,846,887 Wi-Fi hotspots worldwide. Status of Wi-Fi market above can pave a broad way for WLAN sensing applicatios since the adoption of many applications are hindered by expensive hardware, such as indoor location, home security systems and so on.

There are several market drivers for WLAN sensing, including:

* According to the report released by MarketandMarkets, the indoor location market is expected to grow from $7.1 billion in 2017 to $41.0 billion by 2022, at a Compound Annual Growth Rate (CAGR) of 42.0% during forecast period [2]. And Radio Frequency (RF)-based technology as a key solution is proposed in this report.
* According to another report [3], the global market for home security system market was valued at $40.66 billion in 2017 and is expected to reach $74.75 billion by 2023, at a CAGR of 10.40% during the forecast period. What’s more, the report pointed out the growth of the market can be attributed to the emergence of wireless technologies, and increasing custome awareness.
* According to the report [4], Gesture Recognition and Touchless Sensing Market worth 34.25 Billion USD by 2022 where the touchless sensing market including gesture-enabled products, such as smartphone, laptops and tablets, smart TVs, and so on, is expected to be worth USD 15.27 Billion by 2022, growing at a CAGR of 17.44% between 2017 and 2022.
* According to the MarketandMarkets.com in their latest report [5], the smart home market including lighting controls, home healthcare, entertainment and other controls is expected to grow from USD 76.6 billion in 2018 to USD 151.4 billion by 2024, at a CAGR of 12.02%.

b) Multiple vendors and numerous users.

A wide variety of vendors currently build numerous products for WLAN sensing marketplace. According to the same reports above [2-5], many of the current player in the sensing applications market are also vendors for the WLAN sensing and thus it is anticipated that a substantial proportion of those vendors, and others, will participate in the standards development process and subsequent commercialization activities for WLAN sensing.

### 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

1. 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 a WLAN that can efficiently support sensing capability.

There is no other WLAN standard focusing on efficiently supporting sensing capability.

### 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.

There’re already some WLAN based sensing products available in the market. The WLAN sensing project is focusing on improving the performance of WLAN sensing capability.

The IEEE 802.11 WNG and SENS TIG/SG has reviewed many presentations indicating that the proposed functions are technically feasible. For example, please refer to [6-17]

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

IEEE Std. 802.11 technology is very mature and has a wide variety of legacy devices and a proven track record, with several billions of devices shipping each year. The increased capabilities 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.

The amendment will use modeling and simulation, based on real world deployment, as a tool for evaluating performance metrics.

### 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).

WLAN equipment is accepted as having balanced costs. The development of Wireless capabilities to support sensing capability of WLAN network deployments will not disrupt the established balance.

b) Known cost factors.

Support of the proposed standard will likely require a manufacturer to develop a modified radio, modem and firmware. The cost factors for these transitions are well known and the data for this is well understood.

c) Consideration of installation costs.

The proposed amendment has no known impact on installation costs.

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 not expected to change today’s operation costs.

e) Other areas, as appropriate.

None.

**References:**

[1] The Economic Value of Wi-Fi: A Global View (2018 and 2023), October 2018

[2] Indoor Location Market by Component, Deployment Mode, Application, Vertical, and Region - Global Forecast to 2022, [Indoor Location Market by Technology, Software Tools, Service Global Forecast to - 2022 | MarketsandMarkets](https://www.marketsandmarkets.com/Market-Reports/indoor-location-market-989.html)

[3] Home Security System Market by Home Type, <https://www.marketsandmarkets.com/Market-Reports/home-security-system-market-205573901.html>

[4] Gesture Recognition and Touchless Sensing Market, <https://www.marketsandmarkets.com/Market-Reports/touchless-sensing-gesturing-market-369.html>

[5] The smart home market, <https://www.marketsandmarkets.com/Market-Reports/smart-homes-and-assisted-living-advanced-technologie-and-global-market-121.html>

[6] <https://mentor.ieee.org/802.11/dcn/19/11-19-1293-00-0wng-wi-fi-sensing-usages-requirements-technical-feasibility-and-standards-gaps.pptx>

[7] <https://mentor.ieee.org/802.11/dcn/19/11-19-1500-00-0wng-wi-fi-sensing-follow-up.pptx>

[8] <https://mentor.ieee.org/802.11/dcn/19/11-19-1416-00-0wng-wi-fi-sensing-cooperation-and-standard-support.pptx>

[9] <https://mentor.ieee.org/802.11/dcn/19/11-19-1551-01-0wng-wi-fi-sensing-in-60ghz-band.pptx>

[10] <https://mentor.ieee.org/802.11/dcn/19/11-19-1745-00-SENS-wireless-sensing-use-cases-feasibility-and-standardization.pptx>

[11] <https://mentor.ieee.org/802.11/dcn/19/11-19-1726-00-SENS-discussion-of-market-potential-and-technical-feasibility-about-wlan-sensing.pptx>

[12] <https://mentor.ieee.org/802.11/dcn/19/11-19-1769-01-SENS-csi-based-wi-fi-sensing-results-and-standardization-challenges.pptx>

[13] <https://mentor.ieee.org/802.11/dcn/19/11-19-1850-00-SENS-wi-fi-sensing-technical-feasibility-standardization-gaps.pptx>

[14] <https://mentor.ieee.org/802.11/dcn/19/11-19-1852-00-SENS-in-car-sensing-a-60ghz-usage-example.pptx>

[15] <https://mentor.ieee.org/802.11/dcn/19/11-19-1854-00-SENS-wlan-based-radars-in-the-60ghz-band.pptx>

[16] <https://mentor.ieee.org/802.11/dcn/19/11-19-1885-00-SENS-passive-radar-a-potential-solution-for-wlan-sensing.pptx>

[17] <https://mentor.ieee.org/802.11/dcn/19/11-19-1886-00-SENS-indoor-sensing-with-fmcw-radar.pptx>

[18] <https://mentor.ieee.org/802.11/dcn/19/11-19-1897-00-SENS-wi-fi-sensing-with-doppler-measurement-in-60ghz-band.pptx>