IEEE P802.11  
Wireless LANs

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| IEEE 802.11 NG60 SG Proposed CSD | | | | |
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Abstract

This is the IEEE 802.11 NG60 SG proposed 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**
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? **YES**
2. If not, explain why the CA document is not applicable.

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## 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 ABI Research, worldwide Wi-Fi IC sales are expected to exceed 2 billion units per year in 2015. Still according to ABI Research, in 2016 two thirds of the WLAN ICs will include 60 GHz. The 60 GHz market is expected to be worth about $10.5 billion by 2019 [1].

There are several market drivers for higher throughput wireless LAN, including:

* Never ending quest for higher performance computing drives higher processing power. IO and network speeds needs to grow proportionally to maintain comparable system level performance and cater to a positive user experience.
* Media appliances are moving to UHD content, driving a ten fold increase in storage capacity and bandwidth requirements. Therefore, wireless LAN throughput must grow in order to serve those media links at home and in the office.
* Mainstream wired LAN products have shifted to gigabit, and some to one hundred gigabit, per second speeds. The trend for a purely wireless campus drives the need for wired equivalent multi-gigabit per second wireless solutions.
* As wireless network density grows, there exists an increasing need for additional capacity and reduced cell sizes. Cisco’s market forecast predicts that Internet traffic will reach zettabytes by the end of 2016. By 2017 traffic of end stations that connect over wireless links will reach 51% of the total internet traffic. New uses such as video streaming, simultaneous transmission of multiple high rate video streams, on-line gaming, and cloud access will drive the need for improving system level performance and user experience in the home, enterprise, and outdoor environments. Wide bandwidth channels available in and around the 60 GHz frequency band can be used to support such high throughput usages.
* Corporate computing is shifting to a centralized processing model with lower cost “thin” clients that act as “semi-dumb terminals”. With a motivation to reduce Capital and Operational Expenditures, this new model changes the nature of network traffic and drives much higher KVM (Keyboard, Video, Mouse) content, which in turn drives increases in bandwidth and reduction in latencies.
* Enterprises, such as small and medium businesses, are increasingly dependent on Wi-Fi (802.11 based) technology as their main access networking infrastructure. Network Barometer 2013 report predicts that in the next few years an Enterprise network will be composed of 80% wireless ports and 20% wired ports reversing the current ratio. Improved system performance is critical for enterprises to migrate to Wi-Fi technology and to achieve the expected cost savings.
* As the need for wireless data grows, small cells will provide a means to increase capacity in dense environments, both indoors and outdoors. The backhaul for these small cells is seen as the biggest challenge for small cell deployments. As the number of cell sites multiply to keep with capacity demand, so can the cost of the operator’s backhaul network. While fiber is widely used for macro-cell backhaul, the high cost of fiber installation and leasing fees will severely limit the growth of small cell business case. Instead, operators are estimating that 80% of the small cells will be connected with wireless backhaul [2]. Hence, there is a need for cost-effective, high-performance, wireless backhaul.

Such usage models are described in:

11-14/0606r0 Next Generation 802.11ad: 30+ Gbps WLAN

11-14/1160r0 Ultra Short Range (USR) Communications Usage Models for NG60

11-14/1386r1 NG60 Usage Models

11-14/1166r0 NG60 Use Cases

11-14/1185r0 NG60 Usage Scenarios

11-14/1249r1 Backhaul Support in NG60

11-07/2988r4 Wi-Fi Alliance (WFA) VHT Study Group Usage Models

11-09/0583r0 Amendment to WFA Usage Models

11-07/2587r0 VHT Applications

b) Multiple vendors and numerous users.

A wide variety of vendors currently build numerous products for the WLAN marketplace. According to Dell’Oro Group, overall Wireless LAN market revenues are forecast to exceed $11 billion in 2017, nearly 50% greater than 2012 revenues. It is anticipated that the majority of those vendors, and others, will participate in the standards development process and subsequent commercialization activities.

ABI Research estimated that 25% of homes around the world used Wi-Fi in year 2012. Moreover, according to ABI Research, worldwide Wi-Fi IC sales are expected to exceed 2 billion units per year in 2015.

## 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 amendment will focus on enabling at least one mode of operation capable of supporting a maximum throughput of at least 20 gigabits per second (measured at the MAC data service access point), while maintaining or improving the power efficiency per station. Other than this amendment, there is no other WLAN standard focusing on increasing the maximum throughput at the MAC data service access point to at least 20 gigabits per second.

This amendment will ensure the coexistence and backwards compatibility with IEEE 802.11ad, thus creating a solution compatible with existing IEEE 802.11 deployments.

## 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 are already IEEE 802.11ad devices operating in the 60 GHz frequency band available in the market. The standard will add refinements to IEEE 802.11ad to further increase the average throughput per station. In addition, the IEEE 802.11 NG60 SG has reviewed many presentations indicating that the proposed functions are technically feasible. For example, please refer to:

<https://mentor.ieee.org/802.11/dcn/14/11-14-0606-00-0wng-next-generation-802-11ad.pptx>

<https://mentor.ieee.org/802.11/dcn/14/11-14-0652-01-0wng-wng-beyond-802-11ad-a-ultra-high-capacity-and-tpt-wlan-3rd.pptx>

<https://mentor.ieee.org/802.11/dcn/14/11-14-0136-03-0wng-beyond-802-11ad-a-ultra-high-capacity-and-tpt-wlan-2nd.pptx>

<https://mentor.ieee.org/802.11/dcn/13/11-13-1408-01-0wng-beyond-802-11ad-ultra-high-capacity-and-tpt-wlan.pptx>

<https://mentor.ieee.org/802.11/dcn/14/11-14-1378-03-ng60-phy-rate-for-ng60.pptx>

<https://mentor.ieee.org/802.11/dcn/14/11-14-1486-00-ng60-channel-models-in-ng60.pptx>

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 principle of scaling the IEEE 802.11 PHY and MACs to higher throughput is also well established by previous amendments within IEEE 802.11, e.g., IEEE 802.11ac-2014 and IEEE 802.11ad-2012.

This project builds on the broad knowledge base and system design experience of available IEEE 802.11ad devices, which serve to prove the existence of similar technologies. The experience gained in the development and deployment of IEEE 802.11ac and IEEE 802.11ad devices are applicable to the development of this project. For example, channel bonding and multiple-input multiple-output technologies allow reuse of IEEE 802.11ac and IEEE 802.11ad technologies and testing (for example, see <https://mentor.ieee.org/802.11/dcn/14/11-14-0606-00-0wng-next-generation-802-11ad.pptx>).

Lastly, the increased capabilities envisioned for the baseband and RF parts necessary to implement the amendment are in line with the current progress in technology, particularly those based on existing IEEE 802.11ad devices, and are 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:*

a) Balanced costs (infrastructure versus attached stations).

1. WLAN equipment is accepted as having balanced costs. The development of wireless capabilities to enhance the efficiency of WLAN network deployments and improve system level performance will not disrupt the established balance.
2. b) Known cost factors.

Support of the proposed standard will likely require a manufacturer to develop a modified radio, modem and firmware. This is not expected to be nearly as complex as the development of IEEE 802.11ad devices, which are becoming available in large volumes from different vendors. Therefore, the cost factors for this transition 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 benefit. This amendment is not expected to change today’s operation costs.

This amendment is targeting improved power saving per device as specified in the PAR.

e) Other areas, as appropriate.

None.

**References:**

[1] <https://www.google.com/url?q=http://www.broadwayworld.com/bwwgeeks/article/Wireless-Gigabit-WiGig-Market-worth-1053-Billion-by-2019-20140410&ct=ga&cd=CAEYACoTNzAyNzUzNTk4NTkyNjEyODc2OTIaMjUyYjFkNmZmYmZmNGI0Mzpjb206ZW46VVM&usg=AFQjCNHTNtZ-K5KC8bNkdK_7djhjsuGhmQ>

[2] T. Parker. (2012, September) Fierce Broadband Wireless. [Online]. <http://www.fiercebroadbandwireless.com/story/abi-ofdm-non-line-sight-dominate-small-cell-backhaul-2017/2012-09-12?utm_medium=nl&utm_source=internal>