

An Introduction of IEEE 802.11 TGbd for CITS

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IEEE 802.11 TGbd Chair

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Background

- **IEEE 802.11p is a matured and robust technology for DSRC applications. However, 802.11 PHY and MAC has evolved after 802.11p amendments with many mature technologies (e.g. LDPC, STBC etc). There is a requirement to adopt recent 802.11 technologies for new V2X applications, e.g. for higher throughput applications, and/or better reliability/efficiency, and/or extended range.**
- **NGV means Next Generation V2X.**
- **All information in this document can be obtained from public sources and the document should be understood with the author's personal view.**

Note: “At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position, explanation, or interpretation of the IEEE.” IEEE-SA Standards Board Operation Manual (subclause 5.9.3)

IEEE 802.11 NGV SG

- **Formed in Mar 2018**
 - http://standards.ieee.org/news/2018/ieee_802-11_study_groups.html
- **Leadership:**
 - Chair: Bo Sun;
 - Vice Chair: Hongyuan Zhang
 - Secretary: Amelia Andersdotter
- **Target:**
 - Develop Project Authorization Request (PAR), and;
 - Develop Criteria for Standard Development (CSD)
- **SG Duration: Mar 2018 ~ Dec 2018, 4 f2f meetings**
- **NGV SG was closed in Nov 2018 with the PAR and CSD approved by IEEE-SA EC and followed by the formation of TGbd**
- **Workout:**
 - PAR
 - <https://mentor.ieee.org/802.11/dcn/18/11-18-0861-09-0ngv-ieee-802-11-ngv-sg-proposed-par.docx>
 - CSD
 - <https://mentor.ieee.org/802.11/dcn/18/11-18-0862-03-0ngv-ieee-802-11-ngv-sg-proposed-csd.docx>
 - Use cases
 - <https://mentor.ieee.org/802.11/dcn/18/11-18-1323-02-0ngv-ngv-sg-use-cases.pptx>
 - Liaisons to relevant organizations, including ETSI ITS, Car2Care Consortium, SAE, WFA, IEEE 1609, etc.

Scope of IEEE P802.11bd

- **As in the PAR document (11-18/0861r9), the scope of the project include:**
 - This amendment defines modifications to both the IEEE 802.11 Medium Access Control layer (MAC) and Physical Layers (PHY) for Vehicle-to-Everything (V2X) communications for 5.9 GHz band as defined in clauses E.2.3 and E.2.4 of IEEE Std 802.11™-2016; and, optionally, in the 60 GHz frequency band (57 GHz to 71 GHz) as defined in clause E.1 of IEEE Std 802.11™-2016.
 - This amendment defines at least one mode that achieves at least 2 times higher throughput (measured at the MAC data service access point) than as in IEEE Std 802.11™-2016 operating at maximum mandatory data rate as defined in the 5.9 GHz band (12 Mb/s in a 10 MHz channel), in high mobility channel environments at vehicle speeds up to 250 km/h (closing speeds up to 500 km/h); this amendment also defines at least one mode that achieves at least 3dB lower sensitivity level (longer range), than that of the lowest data rate defined in IEEE Std 802.11™-2016 operating in 5.9 GHz band (3 Mb/s in a 10 MHz channel); and this amendment defines procedures for at least one form of positioning in conjunction with V2X communications.
 - This amendment shall provide interoperability, coexistence, backward compatibility, and fairness with deployed OCB (Outside the Context of a BSS) devices.

Need for the Project

- **As in the PAR document (11-18/0861r9), the need for the project includes:**
 - Current IEEE 802.11 wireless access in vehicular environments (WAVE) technology for V2X applications is based on IEEE Std 802.11TM-2016 operating in 5.9 GHz band, which was originally standardized as IEEE Std 802.11pTM-2010, and which, in turn, derived from the OFDM PHY as defined in clause 17 of IEEE Std 802.11TM-2016 (a.k.a. IEEE Std 802.11aTM -1999). WAVE technology has been available for almost a decade, and has been extensively tested and is a proven, mature technology.
 - During the past decade, IEEE 802.11 technology has improved, from IEEE Std 802.11aTM-2009, to IEEE Std 802.11nTM-2009, IEEE Std 802.11acTM-2013 and the ongoing IEEE P802.11axTM amendment, with supported throughput increasing from 54 Mbps to close to 10 Gbps, as well as higher reliability and improved range. To address future needs for V2X communication technology and provide 802.11-based future-proof technology for V2X applications, the definition of new V2X mechanisms based on new and existing, proven IEEE 802.11 WLAN PHY/MAC technologies, are needed

NGV Use Cases

- **Basic safety message (safety, range, backward compatibility, fairness)**
- **Sensor sharing (throughput)**
- **Multi-channel operation (safety channel + other channels)**
- **Infrastructure applications (throughput)**
- **Vehicular positioning & location (LoS and NLoS positioning accuracy)**
- **Automated driving assistance (safety, throughput)**
- **Aerial vehicle ITS application (video)**
- **Train to train (high speed)**
- **Vehicle to train (high speed, long range)**

IEEE 802.11 TGbd Progress

- **Formed in Dec 2018**
- **Leadership:**
 - Chair: Bo Sun;
 - Vice Chair: Hongyuan Zhang; Joseph Levy
 - Tech Editor: Bahar Sadeghi
 - Secretary: James Lepp
- **Target:**
 - Develop IEEE P802.11bd amendment standard
- **PAR Duration: Dec 2018 ~ Sep 2021**
- **First meeting: Jan 2019, St. Louis, USA**
- **Public website:**
 - http://www.ieee802.org/11/Reports/tgbd_update.htm
- **Public contributions server:**
 - https://mentor.ieee.org/802.11/documents?is_group=0ngv

IEEE P802.11bd Timeline

- **PAR approved** Dec 2018
- **First TG meeting** Jan 2019
- **D0.1** Sept 2019
- **D1.0 Letter Ballot** Nov 2019
- **D2.0 LB recirculation** Mar 2020
- **Form Sponsor Ballot Pool** May 2020
- **D3.0 LB recirculation** May 2020
- **D3.0 unchanged recirculation** July 2020
- **Initial Sponsor Ballot (D4.0)** Sept 2020
- **Final 802.11 WG approval** July 2021
- **802 EC approval** July 2021
- **RevCom and SASB approval** Sept 2021

Future Meeting Plan

- **IEEE 802.11 #174, plenary meeting, Mar 10~15, Vancouver, Canada**
- **IEEE 802.11 #175, interim meeting, May 12~17, Atlanta, USA**
- **IEEE 802.11 #176, plenary meeting, Jul 14~19, Vienna, Austria**
- **IEEE 802.11 #177, interim meeting, Sep 15~20, Hanoi, Vietnam (TBC)**
- **IEEE 802.11 #178, plenary meeting, Nov 10~15, Kona, HI, USA**

Thank You!