IEEE P802.11
Wireless LANs

IEEE 802.11 NGV Proposed CSD

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Abstract

This is the IEEE 802.11 Next Generation V2X (NGV) 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, see 1.1, and the 5C requirements, see 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:

  a) The definitions will be part of this project. YES
  b) The definitions will be part of a different project and provide the plan for that project or anticipated future project.
  c) 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.

  a) Will the WG create a CA document as part of the WG balloting process as described in Clause 13? YES
  b) 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.
Vehicle-to-everything (V2X) communication technology has become one of the fastest growing segments of the telecommunication and automotive industry today. The use of V2X communications is extremely important for safe automotive driving and traffic congestion control, which results in reduced transport time, fuel consumption and thus contributing to improving the environment [1]. Another advantage of V2X communication is to provide an enhanced driving experience, including enhanced safety features, assisting autonomous driving, high accuracy positioning, data sharing, mobile entertainment and personal applications.

The global Vehicle-to-Vehicle/Vehicle to Infrastructure (V2V)/(V2I) market size is rapidly growing due to developments in wireless technology, increasing roadway communication infrastructure, sharing of vehicle information and growing awareness for driver safety. "The global automotive V2X communication market is expected to grow at a CAGR of 29% during the period 2018-2022", according to a new market research study by Technavio[2]. The report also states that "The advent of new mobility modes and rising inter-

city commutes, such as long-distance carpooling and car sharing, has led to travelers commuting for 124-186 miles per day. These trips are offered at a discounted price per seat as compared with public transports. This makes them preferable, thus fueling the demand for V2X communication. A crucial driver for the global automotive V2X communication market is the increasing use of personal vehicles for long-distance travel."[2]

b) Multiple vendors and numerous users.

IEEE Std 802.11p™-2010, currently included in IEEE Std 802.11™-2016 as communication Outside the Context of a Basic Service Set (OCB), as the basis of Dedicated Short Range Communications (DSRC) and of the ETSI ITS-G5 European standard for vehicular communication. The technology supports Intelligent Transportation Systems (ITS) for V2I and V2V communication. The United States Department of Transportation (USDOT) assessment also proved that DSRC is ready for deployment and that DSRC-based technologies and applications offer a path to a safer and more efficient surface transportation system for America [3].

Next generation V2X will provide support for more applications. It is expected that various entities will paticipate in next generation V2X standardization, including chipset vendors, system integrators, automotive industry companies, telecom operators, telecom device manufacturers, Internet Service Providers (ISPs), and other transportation industry participants.

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.

   a) Will the proposed standard comply with IEEE Std 802, IEEE Std 802.1AC and IEEE Std 802.1Q? YES
   b) 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 deployments for communications between vehicles and between vehicles and roadside infrastructure. This project will focus on improved MAC/PHY technology based on IEEE Std 802.11p™-2010, providing higher data

rates, improved link reliability and longer range.

There are no other 802 projects focusing on significantly improving WLAN efficiency and system level performance in V2X communication.

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's already IEEE 802.11p^{TM}-2010 compliant devices available in the market. The NGV project is focusing on improving the throughput, coverage and reliability of DSRC based systems by using mature IEEE 802.11 technologies that have been deployed since 2010. The IEEE 802.11 NGV Study Group has reviewed presentations indicating that the proposed functions are technically feasible. The following list shows key topics that have been considered:

Backward capatibility

https://mentor.ieee.org/802.11/dcn/18/11-18-1214-00-0ngv-backward-compatible-phy-feasibility.pptx

PHY feasiblity
https://mentor.ieee.org/802.11/dcn/18/11-18-1553-00-0ngv-doppler-impact-on-ofdm-numerology-for-ngv.pptx
https://mentor.ieee.org/802.11/dcn/18/11-18-1186-00-0ngv-interoperable-ngv-phy-improvements.pptx
https://mentor.ieee.org/802.11/dcn/18/11-18-0860-03-0ngv-ngv-phy-feasibility-discussions.pptx
https://mentor.ieee.org/802.11/dcn/18/11-18-1187-03-0ngv-mmw-for-v2x-use-cases.pptx

MAC feasibility
https://mentor.ieee.org/802.11/dcn/18/11-18-1249-01-0ngv-ngv-mac-discussion.pptx
https://mentor.ieee.org/802.11/dcn/18/11-18-1535-00-0ngv-error-correction-message.pptx

System feasibility
https://mentor.ieee.org/802.11/dcn/18/11-18-1480-00-0ngv-v2x-simulation-model.pptx
https://mentor.ieee.org/802.11/dcn/18/11-18-1216-02-0ngv-vehicular-to-pedestrian-channel-models.pptx
https://mentor.ieee.org/802.11/dcn/18/11-18-1217-02-0ngv-some-measured-characteristics-of-v2v-channels.pptx
https://mentor.ieee.org/802.11/dcn/18/11-18-1250-00-0ngv-ngv-ranging-discussion.pptx
https://mentor.ieee.org/802.11/dcn/18/11-18-0924-01-0ngv-time-variant-non-stationary-v2v-channel-model.pptx
https://mentor.ieee.org/802.11/dcn/18/11-18-0858-00-0ngv-c2c-channel-model-overview.pptx
https://mentor.ieee.org/802.11/dcn/18/11-18-0821-00-0ngv-ngv-channel-models.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 increased capabilities envisioned for the baseband and RF 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 enhance the efficiency of WLAN network deployments and improve system level performance 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. ~~This is similar in principle to the transition between IEEE 802.11n and IEEE 802.11ac as well as in previous iterations of IEEE 802.11 enhancements.~~ The cost factors for ~~these~~ transitions between different amendments of IEEE 802.11 standard 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).

The IEEE 802.11p^{TM}-2010 (currently included in IEEE 802.11^{TM}-2016) based systems have been tested and deployed around the world. These sytems are recognized to provide a Total Cost of Ownership (TCO) with significant operational cost benefits. The technologies introduced in this amendment are not expected to change today's overall equipment costs. By improving system performance and supporting additional applications, the technologies defined in the proposed amendment are expected to reduce the per-bit operational costs for information transfer.

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

e) Other areas, as appropriate.

None.

References:

[1]   Global Market Insights,Vehicle To Vehicle (V2V) Communication Market Size, Industry Outlook Report, Regional Analysis , Technology Development, Competitive Landscape & Forecast, 2016 – 2023,https://www.gminsights.com/industry-analysis/vehicle-to-vehicle-v2v-communication-market

[2]   MarketWatch, "Global Automotive V2X Communication Market - Trends, Drivers, and Challenges", https://www.marketwatch.com/story/global-automotive-v2x-communication-market---trends-drivers-and-challenges-technavio-2018-04-02

[3]   Status of the Dedicated Short-Range Communications Technology and Applications,www.its.dot.gov