

Approved IEEE 802 Criteria for Standards Development (CSD):

P802.16s Amendment for Fixed and Mobile Wireless Access in Channel Bandwidth up to 1.25 MHz

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.
- 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.
No new definitions are anticipated, although existing ones may require amendment.

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/no)
No
- b) If not, explain why the CA document is not applicable.
The scope is to support operation in exclusively licensed spectrum.

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.

This proposal addresses the multi-industry, multi-billion dollar worldwide market for private mission-critical data networks to support the Industrial Internet of Things (IIoT). This includes private licensed wireless networks for electric and natural gas utilities, oil and gas companies, commercial and public rail systems, and federal, state and local agencies for security and monitoring needs.

According to ABI Research, a leading information technology research and advisory company, the installed base of active wireless connected devices will grow from approximately 20 billion units today to 41 billion by 2020. The industrial vertical market, which includes utilities, manufacturing, and government, is forecasted to represent 12% of the devices or approximately 5 billion devices by 2020.

- b) Multiple vendors and numerous users.

There is identified interest and support for the outcome of this project from individuals affiliated with the following: 1) leading industry support and research groups including the Utilities Telecom Council (UTC), the WiMAX Forum, and the Electric Power Research

Institute (EPRI), 2) system integrators, 3) chip suppliers, 4) equipment manufacturers, 5) licensed spectrum holders, and 6) US electric utilities. At least eight posts expressing support for this standardization activity have been posted to 802.16 Mentor and the 802.16 reflector. See document 802.16-16-0009-00-Gcon for further details on participation and industry support for this project.

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.

Existing IEEE 802.16 profiles address wide channels of 1.25-20 MHz. This new project provides support for exclusively-licensed spectrum with channel bandwidth less than the existing minimum channel bandwidth of 1.25 MHz.

Other standards and projects, including LTE Cellular IoT and IEEE 802.20, exhibit surface similarities to this focused amendment project, but are technically quite different.

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.
A proprietary system based on a variation of IEEE 802.16 technology has already been deployed successfully with various US utilities in channel bandwidth 1 MHz and smaller. See 802.16 contribution 802.16-15-0035-00-Gcon for further details.
- b) Proven similar technology via testing, modeling, simulation, etc.
At least five utilities in the US have either deployed or are testing a proprietary system based on a variation of IEEE 802.16 technology.

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).**

The proposed modifications, which include licensed VHF/UHF frequencies in narrower channels than currently specified in IEEE 802.16, allow many end users to leverage their existing Land Mobile Radio (LMR) infrastructure. This minimizes the investment in incremental tower and backhaul infrastructure for private wide areas networks. The type of applications that this amendment is intended to support have relatively low bandwidth requirements, and the networks are normally range-limited, not capacity-limited. The reduction in capacity resulting from the narrower channel bandwidth does not require a higher density of base stations to compensate. The cost balance between the Base Station and the Subscriber Station is therefore unaffected by the changes in this amendment for this application set.
- b) **Known cost factors.**

Costs include licensed spectrum, base stations and remote stations and their associated antenna systems, and network management systems. VHF/UHF licensed channels narrower than 1.25 MHz are readily available in the secondary markets at a lower cost than commercial wideband channels.
- c) **Consideration of installation costs.**

Many utilities and mission critical entities already have existing LMR and backhaul infrastructure. Remote radios are typically co-located with existing assets (e.g. substations, utility poles, customer premises equipment). Licensed VHF/UHF frequencies enable non-line-of-sight installations below the clutter. As these users consider the installation of broadband networks to support multiple applications, the cost factors for IEEE 802.16 are superior to other alternatives. For example, deploying an LTE based infrastructure requires a very costly Evolved Packet Core functionality, which is not necessary for IEEE 802.16.
- d) **Consideration of operational costs (e.g., energy consumption).**

Most mission critical entities already have infrastructure assets for both base stations and remotes and support teams to run these networks.
- e) **Other areas, as appropriate.**