

P802.16q

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Type of Project: Amendment to IEEE Standard 802.16-2009

PAR Request Date: 20-Jul-2012

PAR Approval Date: 30-Aug-2012

PAR Expiration Date: 31-Dec-2016

Status: PAR for an Amendment to an existing IEEE Standard

Root Project: 802.16-2009

1.1 Project Number: P802.16q

1.2 Type of Document: Standard

1.3 Life Cycle: Full Use

2.1 Title: IEEE Standard for Air Interface for Broadband Wireless Access Systems
Amendment for Multi-tier Networks

3.1 Working Group: Broadband Wireless Access Working Group (C/LM/WG802.16)

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None

3.2 Sponsoring Society and Committee: IEEE Computer Society/LAN/MAN Standards Committee (C/LM)

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3.3 Joint Sponsor: IEEE Microwave Theory and Techniques Society/Standards Coordinating Committee (MTT/SCC)

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4.1 Type of Ballot: Individual

4.2 Expected Date of submission of draft to the IEEE-SA for Initial Sponsor Ballot: 03/2014

4.3 Projected Completion Date for Submittal to RevCom: 02/2015

5.1 Approximate number of people expected to be actively involved in the development of this project: 30

5.2.a. Scope of the complete standard: This standard specifies the air interface, including the medium access control layer (MAC) and physical layer (PHY), of combined fixed and mobile point-to-multipoint broadband wireless access (BWA) systems providing multiple services. The MAC is structured to support the WirelessMAN-SC, WirelessMAN-OFDM, and WirelessMAN-OFDMA PHY specifications, each suited to a particular operational environment.

Changes in scope: This standard specifies the air interface, including the medium access control layer (MAC) and physical layer (PHY), of combined fixed and mobile point-to-multipoint broadband wireless access (BWA) systems providing multiple services. The MAC is structured to support ~~multiple~~ the **WirelessMAN-SC, WirelessMAN-OFDM, and WirelessMAN-OFDMA** PHY specifications, each suited to a particular operational environment.

5.2.b. Scope of the project: This amendment specifies MAC/PHY protocol enhancements for cooperation among base stations in multi-tier networks to enhance interference mitigation, mobility management, and base station power management. Enhanced base stations shall support legacy mobile stations. PHY changes to any mobile stations are out of scope.

In addition, these protocol enhancements include management messaging between base stations, and between base stations and mobile stations.

This amendment shall comply with IEEE Std 802, IEEE Std 802.1D, and IEEE Std 802.1Q.

5.3 Is the completion of this standard dependent upon the completion of another standard: No

5.4 Purpose: This standard enables rapid worldwide deployment of innovative, cost-effective, and interoperable multivendor broadband wireless access products, facilitates competition in broadband access by providing alternatives to wireline broadband access, encourages consistent worldwide spectrum allocation, and accelerates the commercialization of broadband wireless access systems.

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5.5 Need for the Project: As the spectral efficiency of wireless links approaches its theoretical limits, and with the data traffic requirements continuing to grow rapidly, cell density and cooperation among base stations must increase in order to further improve network capacity and efficiently manage radio resources. Multi-tier access network architecture consisting of macrocells and a variety of overlaid smaller cells provides an approach towards solving the problem, allowing low cost per bit and efficiently utilizing all spectral resources in the system. The current IEEE Std 802.16 and the amendments under development do not address the requirements for radio resource management based on cooperation among base stations in a multi-tier access network architecture. This project will address these needs, enabling cost-effective improvements in system capacity and user quality of service with interoperable and efficient management of network resources, mobility, and spectrum.

5.6 Stakeholders for the Standard: Vendors developing IEEE 802.16 products, carriers using IEEE 802.16 products, the WiMAX Forum(TM), ARIB, TTA, and participants in ITU-R Working Party 5D.

Intellectual Property

6.1.a. Is the Sponsor aware of any copyright permissions needed for this project?: No

6.1.b. Is the Sponsor aware of possible registration activity related to this project?: No

7.1 Are there other standards or projects with a similar scope?: No

7.2 Joint Development

Is it the intent to develop this document jointly with another organization?: No

8.1 Additional Explanatory Notes (Item Number and Explanation): [5.5] The "variety of overlaid smaller cells" includes micro cells, pico cells, and femto cells.

[5.2.b] A "multi-tier network" is a wireless Metropolitan Area Network (MAN) comprised of macro cells, micro cells, pico cells, and femto cells, typically controlled by the same operator.

[5.2.b] The enhancements specified by this amendment are limited to licensed-band operation.

Five Criteria Statement for P802.16q

1 Broad Market Potential

A standards project authorized by IEEE 802 LMSC shall have a broad market potential. Specifically, it shall have the potential for:

- (a) Broad sets of applicability.
- (b) Multiple vendors and numerous users.
- (c) Balanced costs (LAN versus attached stations).

(a) The standard will be broadly applicable to IEEE Std 802.16 based systems which have been deployed in the marketplace worldwide.

(b) The technologies specified in the standard can be enabled by a variety of base station and mobile device vendors, and chipsets for base station and mobile stations can also be developed by a variety of vendors.

(c) In this amendment, the primary cost impact would fall on the base station since this amendment addresses base station operation.

2 Compatibility

IEEE 802 LMSC defines a family of standards. All standards should be in conformance with IEEE Std 802, IEEE Std 802.1D, and IEEE Std 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with the IEEE 802.1 Working Group. In order to demonstrate compatibility with this criterion, the Five Criteria statement must answer the following questions:

- (a) Does the PAR mandate that the standard will comply with IEEE Std 802, IEEE Std 802.1D, and IEEE Std 802.1Q?
- (b) If not, how will the Working Group ensure that the resulting draft standard is compliant or, if not, receives appropriate review from the IEEE 802.1 Working Group?

The PAR does mandate that the standard will comply with IEEE Std 802, IEEE Std 802.1D, and IEEE Std 802.1Q.

3 Distinct Identity

Each IEEE 802 LMSC standard shall have a distinct identity. To achieve this, each authorized project shall be: Substantially different from other IEEE 802 LMSC standards.

- (a) One unique solution per problem (not two solutions to a problem).
- (b) Easy for the document reader to select the relevant specification.

(a) This amendment is unique in its objective of providing enhancements for 802.16 multi-tier access networks. Such capabilities are clearly distinct in terms of what is provided in other standards because tight cooperation among enhanced base stations is specified to provide enhanced interference mitigation, mobility management and base station power management.

(b) The title of this amendment and the scope is distinct enough for document readers to discern the application of this standard.

4 Technical Feasibility

For a project to be authorized, it shall be able to show its technical feasibility. At a minimum, the proposed project shall show:

- (a) Demonstrated system feasibility.

The IEEE 802.16 PPC (Project Planning Committee) has reviewed several presentations indicating that the proposed functions are technically feasible. The technical study report on multi-tier networks ([IEEE 802.16-12-0136-00-Gdoc](#)) is available.

(b) Proven technology, reasonable testing.

Several IEEE Std 802.16 based systems have been deployed in the marketplace worldwide

(c) Confidence in reliability.

Reliability has been proven for several IEEE Std 802.16 based systems in the marketplace worldwide. This amendment is expected to be built on those systems to maintain reliability in 802.16 multi-tier networks.

4.1 Coexistence of IEEE 802 LMSC wireless standards specifying devices for unlicensed operation

A WG proposing a wireless project is required to demonstrate coexistence through the preparation of a Coexistence Assurance (CA) document unless it is not applicable.

(a) The WG will create a CA document as part of the WG balloting process.

(b) If the WG elects not to create a CA document, it will explain to the Sponsor the reason the CA document is not applicable.

The Working Group will not create a Coexistence Assurance (CA) document because only licensed band devices will be supported. Hence the co-existence requirement does not apply.

5 Economic Feasibility

For a project to be authorized, it shall be able to show economic feasibility (so far as can reasonably be estimated) for its intended applications. At a minimum, the proposed project shall show:

(a) Known cost factors, reliable data.

The incremental cost of implementing this amendment over systems based on IEEE Std 802.16 is nominal and within the realm of economic feasibility because the solution is expected to be implemented on top of IEEE Std 802.16-based systems.

(b) Reasonable cost for performance.

There is no expectation of significant costs incurred to support multi-tier networks in a device or a base station beyond a reasonable amount. Nevertheless, the project will attempt to minimize the burden on the device and base station, consistent with an overall optimized solution. The standard will provide for control of the tradeoff between cost and performance, so that cost-driven users can reduce the number of functions depending on their requirements

(c) Consideration of installation costs.

The additional installation costs incurred for supporting this standard are within reasonable bounds since this amendment is expected to be implemented on top of IEEE Std 802.16 based systems that have been deployed in the field today.