IEEE 802.16 WirelessMAN Standard: Myths and Facts
[Presentation from 2006 Wireless Communications Conference]

Document Number:
IEEE C802.16-06/007r1
Date Submitted:
2006-09-02
Source:
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Venue:
Presented at Wireless Communications Conference, Washington, DC, USA, 29 June 2006.
Base Document:
None.
Purpose:
No action required. For information only, to inform the WG regarding a presentation by the Chair on a WG topic.
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IEEE 802.16 WirelessMAN® Standard: *Myths and Facts*

WCA 2006

Washington, DC, 29 June 2006

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Myth #1: An IEEE Standard Project Turns into an IEEE Standard

Reality:

- The identification "IEEE Standard" needs to be earned.
- IEEE assigns a project number to a new project (e.g., P802.16j). If the project is successful, an approved standard results (e.g., IEEE 802.16e). This requires many steps, including:
  - Agreement on an initial draft
  - Consensus development during balloting
  - Demonstrable completion of consensus requirements
- Not every standards project leads to a standard; e.g. P802.14
- 12 projects from IEEE 802.16 have been approved
  - 6 more are in development.

Myth #2: IEEE 802.16 rubberstamps *Company X*'s technology

Reality:

- Standards-development efforts conducted under the auspices of the IEEE must be conducted in a manner consistent with the principles of openness, balance, and the absence of domination.
- The IEEE 802 Executive Committee and the IEEE Standards Association's Standards Board ensure that standards meet the conditions.
- Like other IEEE 802 standards, IEEE 802.16 are broadly developed, with the participation of many individuals from many companies.
  - Membership peaked at 310 people last autumn.
- Domination by an organization is not permitted.

Myth #3: IEEE 802.16 is "The WiMAX Standard"

Reality:

- The WiMAX Forum is a private entity, independent of IEEE, that supports certification of compliance to IEEE 802.16, with demonstrated interoperability.
- The WiMAX Forum certifies compliance based on "profiles" that specify mandatory and optional features as subsets of IEEE 802.16.
- IEEE 802.16 does not "ratify the WiMAX standard". IEEE 802.16 develops standards that are used by the WiMAX Forum.
- The scope of IEEE 802 is limited to network layers 1 (physical) and 2 (medium access control), to support any higher network. The WiMAX Forum is developing higher-layer specs.
- The WiMAX Forum is a "user" of IEEE 802.16 standards
  - Other compliant implementations and other uses are possible.

Myth #4: IEEE 802.16 is the "home-grown" technology of *Country Y*

Reality:

- In the IEEE 802.16 Working Group, we have made a conscious effect to be applicable worldwide.
- Therefore, we made a conscious effect to attract worldwide participation. Attendees from Australia, Belgium, Brazil, Canada, China, Finland, France, Germany, Greece, Hong Kong, India, Ireland, Israel, Italy, Japan, Korea, Netherlands, Norway, Pakistan, Romania, Russia, Singapore, Spain, Sweden, Taiwan, Thailand, USA, UK.
- Major regional coordination efforts:
  - Europe, Korea, China
  - Japan may be next

Myth #5: The Korean "WiBro Standard" competes with 802.16

Reality:

- Korean Ministry of Information and Communication announced (29 July 2004) that Portable Internet Service (WiBro) using the 2.3 GHz spectrum "must comply with IEEE 802.16-2004 and IEEE 802.16e/Draft3 or later versions."

- WiBro is a service
  - WiBro is not a technology
  - WiBro is not a standard

Myth #6: IEEE 802.16 is not a proper "International" Standard

Reality:

- IEEE 802 standards are developed by individual people, not by nations, so are not "Inter-National".
- The WTO refers to "appropriate international standardizing bodies" but does not restrict the definition to organizations that are "one country, one vote".
- IEEE is a member of ITU-R (a UN organization).
- ITU-R Recommendation F.1763 (as of 27 April 2006) recommends IEEE Std 802.16-2004 for BWA "in the fixed service operating below 66 GHz".
- ITU-R Working Party 8A is considering recommendation of IEEE 802.16 in the mobile service.

Myth #7: 802.16 is "Wi-Fi on steroids"

Reality:

- 802.16 and 802.11 technologies are completely different, by design.
- IEEE 802 technologies are distinguished by medium access control (MAC).
- The 802.11 MAC uses CSMA ("listen before talk")
  - Connectionless
- The carrier-class 802.16 MAC is:
  - Full QoS, bandwidth-on-demand (since Day 1)
  - Connection-oriented
  - Centralized controlled and scheduled
  - Multimedia: Voice, data video; ATM and IP
- No regimen of steroids would grow 802.11 into 802.16.

Myth #8: 802.16 was Originally Point-to-Point

Reality:

- IEEE 802.16-2001 included the basic 802.16 medium access control (MAC) and a physical layer for 10-66 GHz.
- Due to these high frequencies, the physical layer assumed line-of-sight propagation.
- The original standard specified a point-to-multipoint system.
- Subsequent changes have not altered this topology, but:
  - A mesh-mode option was added for WirelessMAN-OFDM.
  - P802.16j is a mobile multihop relay project.

Myth #9: The IEEE 802.16 Standard for fixed BWA is called 802.16d

Reality:

- IEEE 802.16 is an evolving standard. Changes come by:
  - Amendment (change document); e.g. IEEE 802.16a
  - Revision (consolidated updated document)
- IEEE 802.16-2001 came first (followed by amendments)
- IEEE 802.16-2004 (revision) addresses fixed BWA
  - "802.16d" has never been used, and never will be.
- Two amendments (802.16e and 802.16f) have since been approved, plus Corrigendum 1 (published along with 802.16e)
- The current version of IEEE Std 802.16 is IEEE 802.16-2004, as amended by IEEE 802.16e and 802.16f and by Corrigendum 1

Myth #10: The 802.16 Standard for mobile BWA is called 802.16e

Reality:

- IEEE 802.16e-2005 (802.16e, for short) is called "Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands"
- IEEE 802.16e changes the title of IEEE Std 802.16 to "… Air Interface for Fixed and Mobile Broadband Wireless Access Systems"
- Compliant to 802.16e alone is impossible, since it's just an amendment.
- Note: There is no "802.16-2005", and there never will be. However "802.16, as of the end of 2005" is a reasonable shorthand way to describe the standard following the approval of the 802.16e amendment.

Myth #11: 802.16 was originally for License-Exempt Bands Only

Reality:

[*Other versions of this myth:*

- *802.16 was originally for licensed bands only*
- *802.16 is only for license-exempt bands*
- *802.16 is only for licensed bands*]

- 802.16 was originally for 10-66 GHz (licensed or not)
- 802.16a added frequencies below 10 GHz, mainly for licensed bands but with some special features specified for LE bands
- The mobile enhancements in 802.16e are specified for licensed bands below 6 GHz.
- The current P802.16h project is working to specify “Improved Coexistence Mechanisms for License-Exempt Operation”.

Myth #12: 802.16e is not backward-compatible with “802.16d” (“.16d is OFDM; .16e is OFDMA”)

Reality:

- 802.16a-2003 includes three modes for < 11 GHz:
  - WirelessMAN-OFDM
  - WirelessMAN-OFDMA
  - WirelessMAN-SCa (single-carrier)
- All three modes still exist.
- Mobile specifications are all backward compatible*

*IEEE 802.16e introduces additional WirelessMAN-OFDMA FFT sizes that do not exist in IEEE 802.16-2004

Myth #13: 802.16e will evolve

Reality:

- IEEE Std 802.16 is evolving and will continue to evolve.
- There can never be a new version of IEEE 802.16e
- Five amendment projects are in progress:
  - P802.16g, P802.16h, P802.16i, P802.16j, P802.16k
- The IEEE 802.16 air interface will evolve with new standardization projects.
- I personally expect IEEE 802.16 to develop an extension suitable for inclusion in ITU-R's "IMT-Advanced" standard.

Myth #14: 802.16 has range of "31 miles"

Reality:

- Q: What is the range of an 802.16 base station?
- A: What range do you want to service? And what spectrum do you have?
- Cells supporting mobile broadband in a metro area will be limited in practice, in most cases, to around a mile.

Resources

IEEE 802.16 Working Group

- http://WirelessMAN.org

WirelessMAN: Inside the IEEE 802.16 Standard for Wireless Metropolitan Area Networks

- Carl Eklund, Roger Marks, Subbu Ponnuswamy, Ken Stanwood, and Nico van Waes
- IEEE Press, May 2006

