Introduction to
IEEE 802.16 Working Group
and IEEE Std 802.16

IP-OFDMA Evaluation Group Coordination Meeting
13-14 March 2007 • Orlando, Florida, USA
IEEE 802.16 Session #48

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Institute of Electrical and Electronics Engineers, Inc.

“The IEEE, a non-profit organization, is the world's leading professional association for the advancement of technology.”

Global scope and membership

>370,000 Members
IEEE-SA

- IEEE Standards Association
- “For over a century, the IEEE-SA has offered an established standards development program that features balance, openness, due process, and consensus.”
- Global scope and membership
- over 800 active IEEE standards and more than 400 in development
IEEE 802

- LAN/MAN Standards Committee
- Since 1980
- Members: human beings
  - mainly engineers
- e.g. 802.16: 212 Members
  - 134 more eligible at this session
  - peak: 309 members
Scope of 802 Standards

OSI Reference Model
- Application
- Presentation
- Session
- Transport
- Network
- Data Link
- Physical

IEEE 802 Reference Model
- Upper Layer Protocols
  - Logical Link Control
  - Medium Access Control
- Physical

Medium

LLC Service Access Point (LSAP)

Scope of IEEE 802 Standards
IEEE 802 Standard Activities for (Mainly) Wired Access

- IEEE 802.1 Working Group
  - Upper layers
- IEEE 802.3 Working Group
  - Ethernet
- IEEE 802.17 Working Group
  - Resilient Packet Ring (MAN)
IEEE 802 Standards for Broadband Wireless Access

- **IEEE 802.15** (personal range: \( \sim 10 \) m):
  - Wireless Personal Area Networks
  - Several standards defined
- **IEEE 802.11** (building range: \( \sim 100 \) m):
  - Wireless Local Area Networks
- **IEEE 802.16** (metro range: \( \sim 10 \) km):
  - Wireless Metropolitan Area Networks
Related IEEE 802 Activities

- WGs without standards
  - 802.20: “Mobile Broadband Wireless Access”
  - 802.21: “Media-Independent Handover”
  - 802.22: “Wireless Regional Area Networks”

- Technical Advisory Groups (TAGs)
  - 802.18: Radio Regulatory
  - 802.19: Coexistence
802.16 Members by Home Address

212 Total (recent statistics)

- 92 USA
- 38 Korea
- 18 Canada
- 12 Japan
- 11 Israel
- 11 Taiwan
- 6 China (mainland)
- 6 UK

- 3 Finland
- 3 France
- 3 Germany
- 3 Netherlands
- 3 Sweden
- 1 France
- 1 Italy
- 1 Singapore
IEEE 802 Process (typical)

- Call for Contributions
  - Specific topics for discussion at next meeting
- Receive and post written contributions
- Discuss and debate at meeting
- Create draft by 75% vote
- Working Group Ballot
- IEEE "Sponsor Ballot"
- Ballot Responses:
  - "Approve" (can include comments)
  - "Disapprove": indicate what needs to be changed to bring about an "Approve" vote
Participation in IEEE 802.16

- Open process and open standards
- Anyone can participate in meetings
  - Anyone can participate outside of meetings
    - Subscribe to mailing lists and read list archives
    - Post to mailing lists
    - Examine documents
    - Contribute and comment on documents
    - Join the Sponsor Ballot Pool
      - Vote and comment on draft standards
      - Must join the IEEE Standards Association to vote
      - Producers and Users must both be in ballot group
802.16 Foundations: 1998

- Telecom vs. Datacom: distinct
- 3G discussions unsettled
- Broadband access expanding slowly
  - cable modem networks & DSL
- IEEE 802
  - Data networks dominated by Ethernet (802.3)
  - New 802.11 Wireless LAN standard
    - approved in 1997 (802.11a/b in 1999)
First 802.16 Project (1999)

- **Scope:** Physical and MAC layer of the air interface of interoperable fixed point-to-multipoint broadband wireless access systems. The specification enables transport of data, video, and voice services. It applies to systems operating in the vicinity of 30 GHz but is broadly applicable to systems operating between 10 and 66 GHz.

- **Purpose:** To enable rapid worldwide deployment of innovative, cost-effective, and interoperable multivendor broadband wireless access products. To facilitate competition in broadband access by providing alternatives to wireline broadband access. To facilitate coexistence studies, encourage consistent worldwide allocation, and accelerate the commercialization of broadband wireless access spectrum.
IEEE 802.16 since 1998: Principle #1

Carrier-class wireless access

- Provide service competitive with wired broadband access
- Full QoS for full multimedia
  - From the ground up
- Fully support for IP and ATM
IEEE 802.16 since 1998: Principle #2

Fully exploit spectrum

- Spectrum is the most valuable resource
- Use every technological trick to maximum spectrum use
- Flexible support for multiple allocations
  - TDD, FDD, Half-duplex FDD, etc.
  - Multiple frequencies and bandwidths
IEEE 802.16 since 1998: Principle #3

Evolve

• Ethernet (802.3) development model
• Ethernet had evolved into 802.11
• Carry on that tradition (LAN -> MAN)
• Evolve for an evolving user base
  ■ Begin with fixed, line-of-sight antennas
  ■ Move to non-line-of-sight, portable, mobile
  ■ Support evolution of customer systems
IEEE 802.16 since 1998: Principle #4

Network model: open

- Specify Layers 1&2 only
- Open interface to support any higher-layer network
- Stimulates innovation
- Highly beneficial to users
IEEE 802.16 since 1998: Principle #5

Standards model: global & open

- Seek global applications
- Single global technical project
  - Balance technical and business needs
    - Success requires both
- Open forum
  - No dominance; many contributors
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802.16 Liaisons

- ETSI
- TTA
- CCSA
- 3GPP
- 3GPP2
- IETF
- ARIB (starting)
802.16 and ITU

- **IEEE**: Sector Member of ITU-R
  - “Regional and other International Organizations”

- **ITU-R**:
  - WP 9B: fixed wireless access
    - ITU-R Recommendation F.1763 (published 4 Sept 2006) recommends the use of IEEE 802.16-2004 for broadband wireless access systems in the fixed (stationary) service
  - WP 8A: land mobile radio:
    - M.[BWA] approved 8 March 2007
  - WP 8F:
    - IMT-2000: contribution
    - IMT-Advanced: initiation
Recent & Active 802.16 Projects

**Air Interface**

- **802.16e**
  - Mobile
  - Pub: Feb 2006

- **802.16/Cor 1**
  - Maintenance
  - Pub: Feb 2006

**Conformance**

- **802.16/Conf04**
  - <11 GHz PICS
  - Pub. Jan 2007

**Management**

- **802.16f**
  - MIB (fixed)
  - Pub: Dec 2005

- **P802.16g**
  - Management in ballot

- **P802.16i**
  - MIB (mobile) in ballot

- **P802.16j**
  - Relay
  - PAR: Mar 2006

- **P802.16k**
  - Bridging
  - ballot complete
New amendment project, as of 6 December 2006

Scope:
- amend the IEEE 802.16 WirelessMAN-OFDMA specification to provide an advanced air interface for operation in licensed bands
- meet the cellular layer requirements of IMT-Advanced next generation mobile networks... with continuing support for legacy WirelessMAN-OFDMA equipment

Purpose:
- to provide performance improvements necessary to support future advanced services and applications, such as those described by the ITU in Report ITU-R M.2072

intended as a candidate for IMT-Advanced
Free IEEE 802 Standards

- Since May 2001, IEEE 802 standards have been available for free download, beginning 12 months after publication.
- See: http://WirelessMAN.org

- You will find:
  - IEEE Std 802.16-2004, 802.16f, 802.16e
  - IEEE Std 802.16.2-2004
  - IEEE Std 802.16/Conformance 01 & 02 & 03
IEEE 802.16 Working Group

http://WirelessMAN.org