

# IEEE 802 and 802.16 Process and Status

*Session #35: Sanya, China*  
*24 January 2005*

Roger Marks  
Chair  
IEEE 802.16 Working  
Group on  
Broadband Wireless Access

Jim Carlo  
Immediate Past President  
IEEE Standards Association



# Broadband Access

- The “last mile” (or the “first few kilometers”)
  - Fast local connection to network
- Business and individual customers demand it
  - Data, Voice, Two-way Video, Gaming, etc.
- Network operators demand it
- Many users are fixed (static)
  - High-capacity cable/fiber to every user is expensive
  - Construction costs do not follow Moore’s Law
  - Most countries lack widespread fixed broadband access
- Many users wish to be mobile

# Universal Access

- Most of the world's population has no access to broadband.
- Access to even telephone service is far from universal.
- Rather than create parallel telephone and broadband networks, a broadband network supporting voice may be more economical to deploy.

# Critical Issues for Broadband Wireless Access

- Access to spectrum on a technology-neutral basis
- Global industry developing technical standards to meet global needs

# Importance of Global Standards for Broadband Wireless Access Systems

- Reduced costs due to mass production
- Reduced operator risk
- Opportunities for roaming
- Stimulate adoption of technology
- Platform for technical innovation
  
- Global standards benefit the users and the producers.

# IEEE Standards Association

- Jim Carlo
- 2004 President, IEEE-SA

# Why IEEE 802<sup>®</sup>?

## Telecom Standardization

- National
- Political

## Datacom Standardization

- Global
- Open
- Industry-Driven
- 802 and IETF set the standards

# Who are the Members?

- Telecom Standardization Bodies
  - Governmental Representatives
  - Companies
  
- IEEE
  - engineers



# Existing IEEE Standards for Broadband Wireless Access

- Institute of Electrical and Electronics Engineers (IEEE): IEEE 802
  - Global, open process
  - Participation by human beings
  - Worldwide participation
  - Producing global standards
- IEEE 802.11™ (short-range: ~100 m):
  - Wireless Local Area Networks
  - Often called “Wi-Fi” for “Wi-Fi Alliance”
- IEEE 802.16™ (long-range: ~10 km):
  - Wireless Metropolitan Area Networks
  - Often called “WiMAX” for WiMAX Forum

# Point-to-Multipoint Wireless MAN: not a LAN

- Base Station (BS) connected to public networks
- BS serves Subscriber Stations (SSs)
- Provide SS with first-mile access to networks
  - SS can serve a building (business or residence)
  - SS can serve a Wireless LAN AP or cell base station
  - SS can serve a PDA, etc.
- Compared to a Wireless LAN:
  - Multimedia QoS, not only contention-based
  - Many more users
  - Much higher data rates
  - Much longer distances

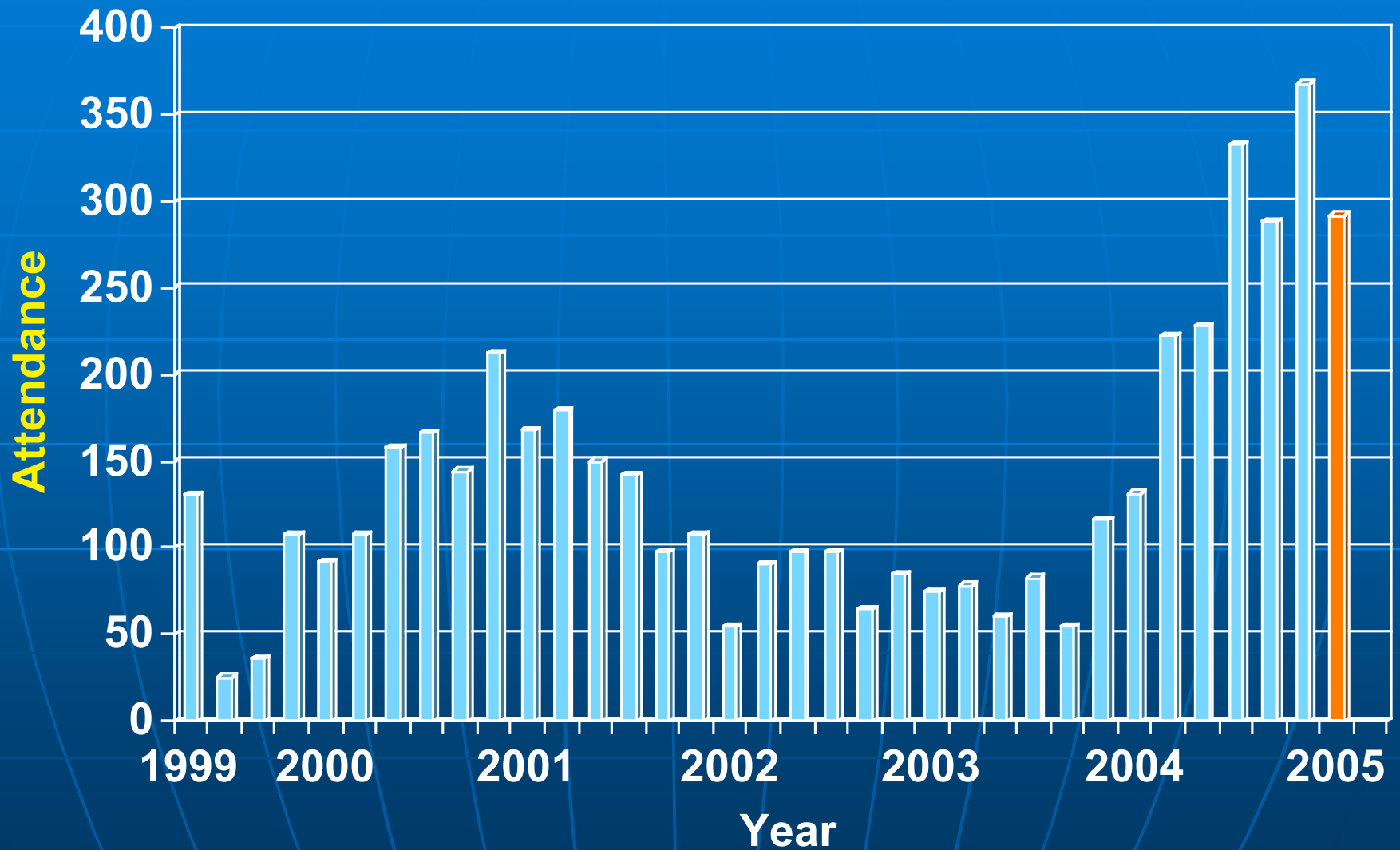
# Properties of IEEE Standard 802.16™

- Broadband
  - Up to 134 Mbit/s in 28 MHz channel (in 10-66 GHz air interface)
- Supports multiple services simultaneously with full QoS
  - Efficiently transport IPv4, IPv6, ATM, Ethernet, etc.
- Bandwidth on demand (frame by frame)
- MAC designed for efficient use of spectrum
- Comprehensive, modern, and extensible security
- Supports multiple frequency allocations up to 66 GHz
  - OFDM and OFDMA for non-line-of-sight applications
- TDD and FDD
- Link adaptation: Adaptive modulation and coding
  - Subscriber by subscriber, burst by burst, uplink and downlink
- Point-to-multipoint topology, with mesh extensions
- Support for adaptive antennas, space-time coding, MIMO
- Extensions to mobility (nearly finished)
- An element of 4G wireless.

# IEEE 802.16 History

- Aug/Nov 1998, Jan/Mar/May 1999: development mtgs
- **1999: July (#1) Montreal Canada**
- ...
- **2004: May (#31) Shenzhen China**
- **Jul (#32) Portland USA**
- **Sep (#33) Seoul Korea**
- **Nov (#34) San Antonio USA**
- **2005:**
- **Jan (#35) Sanya China**
- **Mar (#36) Atlanta USA**
- **May (#37) Sorrento Italy**
- **Jul (#38) San Francisco USA**
- **Sep (#39) Taipei Taiwan**
- **Nov (#40) Vancouver Canada**

# IEEE 802.16 Session Attendance



[Note: Red = preregistration of 292 for Jan 2005]

# The World Wants 802.16 WirelessMAN<sup>®</sup> Standards

- Attendees from Australia, Belgium, Brazil, Canada, China, Finland, France, Germany, Greece, Hong Kong, India, Ireland, Israel, Italy, Japan, Korea, Netherlands, Norway, Pakistan, Russia, Singapore, Spain, Sweden, UK, USA
- Regional coordination
  - Mainly Europe, Korea, China (so far)
- International coordination with ITU

# 802.16 and ETSI

- Over 50 liaison letters between 802.16 and ETSI
  - (European Telecom Standards Institute)
- ETSI HiperMAN
  - Below 11 GHz
  - IEEE began first
  - Healthy cooperation
  - Harmonized with 802.16 OFDM
- Cooperation on conformance tests
- Cooperation on ITU-R interactions

# 802.16 and Korea

- Several liaison letters between 802.16 and TTA (Telecommunication Technology Association)
- 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.”



# IEEE 802.16 History in China



- "IEEE 802.16a Broadband Wireless Access (BWA) Standard Development and Internet Application": conference sponsored by BUPT and MII on 24 August 2001 in Beijing "on the specific topic of whether to use 802.16a as the Chinese national standard for fixed broadband wireless access at 3.5 GHz"

# IEEE Standards & China

- Delegation of IEEE Standards Association Met with leaders of Standards Administration of China (Beijing, 18 May 2004)
- Met with leaders in Ministry of Information Industry (MII) and China Communications Standards Association (Shenzhen, 19 May 2004)
- Meeting with MII in Sanya (Jan 2005)



# 802.16 and ITU

## ■ ITU-T:

- SG15: network access technologies
  - Leadership meeting
  - Liaison letters
- SG9: cable television networks
  - Leadership visits
  - Liaison letters
  - PDNR underway: broadband wireless extensions
    - 802.16 invited to contribute

## ■ ITU-R:

- IEEE is a member (as an international body)
- WP 9B: fixed wireless access
  - Liaison exchanges
  - PDNR: broadband wireless recommendations
    - Based on 802.16+ETSI's invited input
- Recent contributions to WP 8F and JTG 6-8-9

# Published 802.16 Standards

Air Interface

Conformance

Coexistence

**802.16-2001**  
MAC  
10-66 GHz PHY  
Apr 2002

**802.16/Conf01**  
>10 GHz PICS  
Aug 2003

**802.16.2-2001**  
Coexistence  
Sep 2001

**802.16c**  
>10 GHz Profiles  
Jan 2003

**802.16/Conf02**  
>10 GHz TSS&TP  
Feb 2004

**802.16a**  
2-11 GHz PHY  
Apr 2003

**802.16/Conf03**  
>10 GHz RCT  
Jun 2004

**802.16-2004**  
(Revision)  
Oct 2004

**802.16.2-2004**  
(Revision)  
Mar 2004



# Active 802.16 Projects

Air Interface

Conformance

Management

**P802.16e**  
Mobile  
Start: Dec 2002

**P802.16/Conf04**  
<11 GHz PICS  
Start: March 2004

**P802.16f**  
MIB (fixed only)  
Start: Aug 2004

**P802.16/Cor 1**  
Maintenance  
Start: Sep 2005

**P802.16h**  
LE Coexistence  
Start: Dec 2004

**P802.16g**  
Management  
Procedures &  
Services  
Start: Aug 2004

# IEEE 802 Process

- 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

# Membership

- See <<http://WirelessMAN.org/membership.html>>
- **220 Members**
- **83 Potential Members**
- **101 Observers**
- **Working Group and Task Groups**
  - **Formal votes are by Members only**
    - **Member badge = Voting Token**
- **Registration for this session**
  - **310 by Sunday**



# Attendance Tracking

- **“participation” credit: 7 intervals**
- **Sign in at each interval using Web-based process**

# Contribution Procedures

<http://WirelessMAN.org/submit.html>

Submittals that violate the procedures will not be accepted!

# Comment Resolution

- 802.16 uses the free, standalone database application *Commentary*

# IEEE 802 Rules: WG Operation

## 5.1.4 Operation of the Working Group

- **The operation of the Working Group has to be balanced between democratic procedures that reflect the desires of the Working Group members and the Working Group Chair's responsibility to produce a standard, recommended practice, or guideline, in a reasonable amount of time.**
- Robert's Rules of Order shall be used in combination with these operating rules to achieve this balance.

# IEEE 802 Rules: Chair's Role

## 5.1.4.1 Chair's Function

- **The Chair of the Working Group decides procedural issues. The Working Group members and the Chair decide technical issues by vote. The Working Group Chair decides what is procedural and what is technical.**
- **Note: 802.16 Chair delegates the power to make procedural decisions to the presiding Task Group Chair**

# IEEE 802 Rules: WG Domination

The Working Group Chair has the authority to determine if the Working Group is dominated by an organization, and, if so, treat that organizations' vote as one (with the approval of the Executive Committee).

# Free IEEE 802 Standards

- Since May 2001, IEEE 802 standards have been available for free download, beginning six months after publication.

- See:

<http://WirelessMAN.org>

- You will find:

- IEEE Std 802.16-2001, 802.16a, 802.16c
  - IEEE Std 802.16-2004 by April 2005
- IEEE Std 802.16.2-2004
- IEEE Std 802.16/Conformance 01 & 02
  - IEEE Std 802.16/Conformance 03 in Jan 2005

# IEEE Standard 802.16: Tutorial

*IEEE Communications Magazine*, June 2002  
(available on 802.16 web site)

TOPICS IN BROADBAND ACCESS

## **IEEE Standard 802.16: A Technical Overview of the WirelessMAN™ Air Interface for Broadband Wireless Access**

*Carl Eklund, Nokia Research Center*

*Roger B. Marks, National Institute of Standards and Technology*

*Kenneth L. Stanwood and Stanley Wang, Ensemble Communications Inc.*



# IEEE 802.16 Resources

IEEE 802.16 Working Group on Broadband  
Wireless Access

info, documents, tutorials, email lists, etc:

<http://WirelessMAN.org>

