Introduction to IEEE 802.16 Working Group and IEEE Std 802.16

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Base Document:

[none]

Purpose:

Informative tutorial overview.

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IP-OFDMA Evaluation Group Coordination Meeting
13-14 March 2007 • Orlando, Florida, USA
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Roger Marks

IEEE

- 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

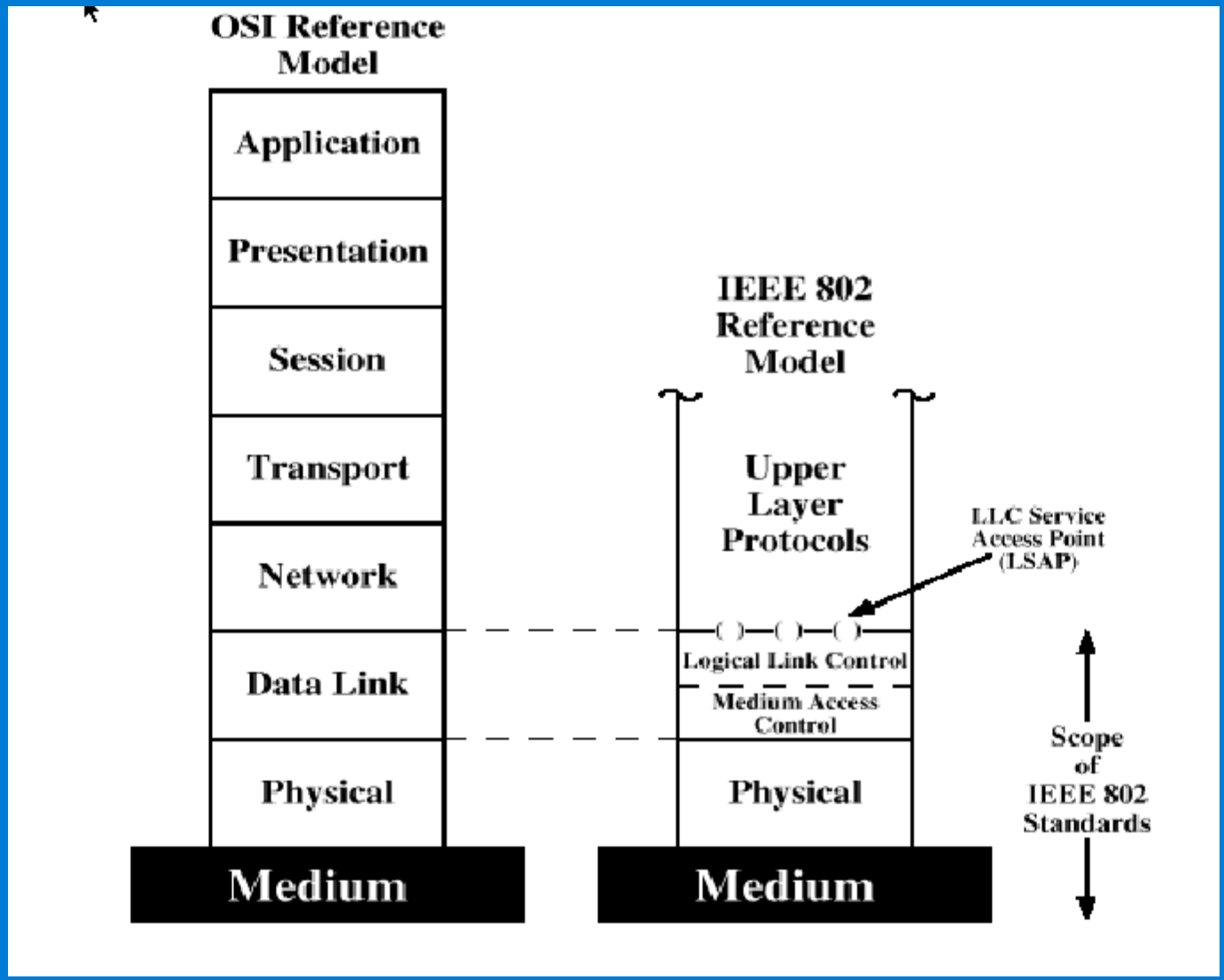
IEEE-SA

- 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



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: ~10 m):
  - Wireless Personal Area Networks
  - Several standards defined
- IEEE 802.11 (building range: ~100 m):
  - Wireless Local Area Networks
- IEEE 802.16 (metro range: ~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)
- 1998: IEEE 802 Study Group (SG) on Broadband Wireless Access (BWA)

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

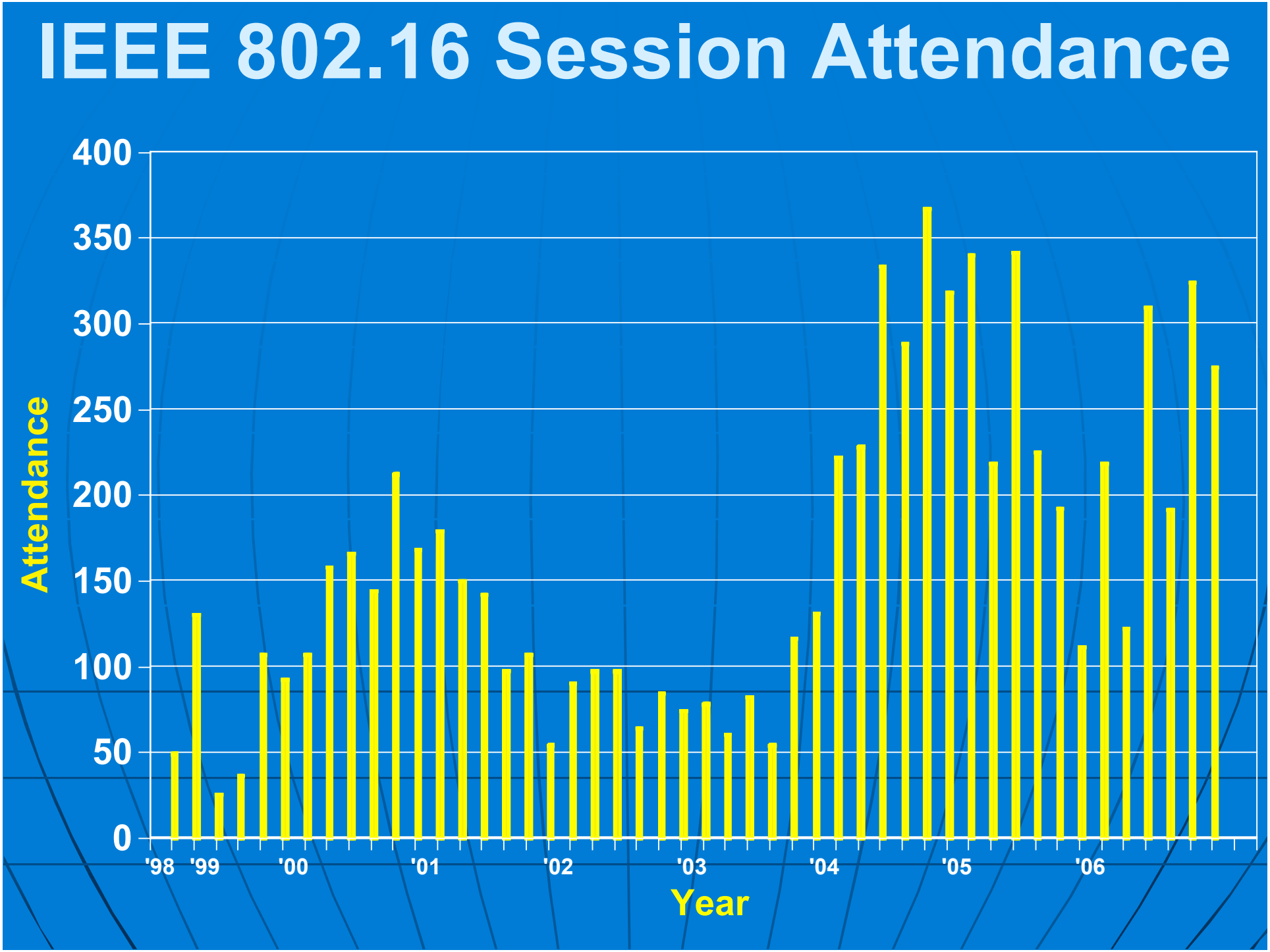
- Specify Layers 1&2 only
- Open interface to support any higher-layer network
- Stimulates innovation
- Highly beneficial to users

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

IEEE 802.16 Session Attendance



IEEE 802.16 Session History

#0/May'99:	Boulder	USA	49 people
...			
#31/May'04:	Shenzhen	China	228
#32/Jul'04:	Portland	USA	332
#33/Sep'04:	Seoul	Korea	287
#34/Nov'04:	S. Antonio	USA	367
#35/Jan'05:	Sanya	China	313
#36/Mar'05:	Atlanta	USA	330
#37/May'05:	Sorrento	Italy	218
#38/Jul'05:	San Fran.	USA	341
#39/Sep'05:	Taipei	Taiwan	225
#40/Nov'05:	Vancouver	Canada	225
#41/Jan'06:	New Delhi	India	111
#42/Mar'06:	Denver	USA	218
#43/May'06:	Tel Aviv	Israel	122
#44/Jul'06:	San Diego	USA	309
#45/Sep'06:	Mt Tremblant	Canada	191
#46/Nov'06:	Dallas	USA	324
#47/Jan'07:	London	UK	274

802.16 Liaisons

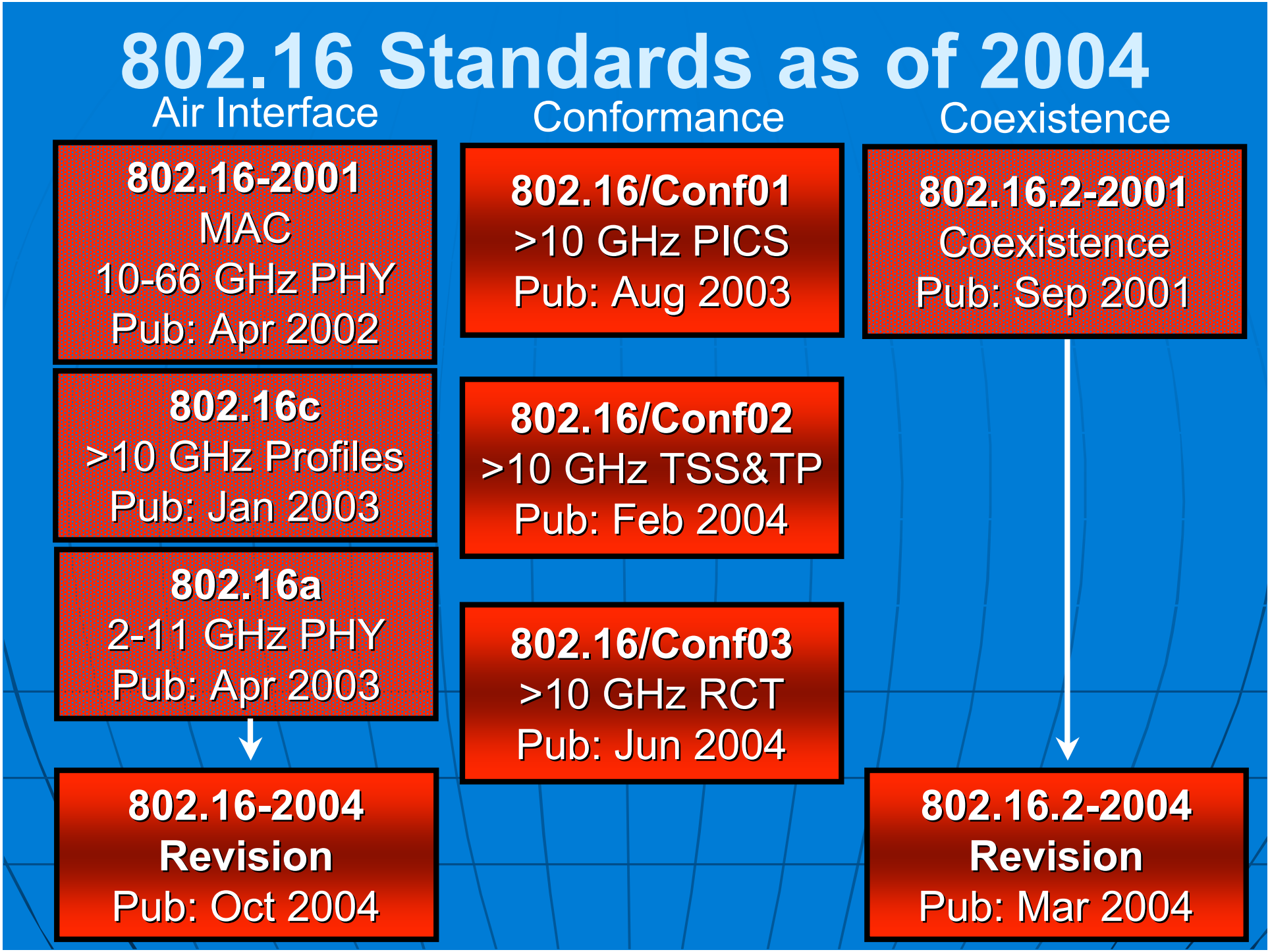
- ETSI
- TTA
- CCSA
- 3GPP
- 3GPP2
- IETF
- ARIB (starting)

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

802.16 Standards as of 2004



Recent & Active 802.16 Projects

Air Interface	Conformance	Management
802.16e Mobile Pub: Feb 2006	**802.16/Conf04** <11 GHz PICS Pub. Jan 2007	**802.16f** MIB (fixed) Pub: Dec 2005
802.16/Cor 1 Maintenance Pub: Feb 2006		**P802.16g** Management in ballot
P802.16h LE Coexistence in ballot		**P802.16i** MIB (mobile) in ballot
P802.16j Relay PAR : Mar 2006		**P802.16k** Bridging ballot complete

P802.16m

- 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

Resources

IEEE 802.16 Working Group

- http://WirelessMAN.org