WiMAX Forum
Working Group Status Updates

Today's Focus: Certification, Technical, Network & Applications Working Groups

Ellen Lee, Huawei Tech Co. Ltd

ITU Regional Seminar on Broadband Wireless Access (BWA) for Rural and Remote Areas for the Asia-Pacific Region
Shenzhen (P.R. China)
1-2 September 2005

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WiMAX Forum™

- The WiMAX Forum, founded in April 2001, brings together leaders in the communications and computing industries to drive a common platform for the global deployment of IP-based broadband wireless services.
- The WiMAX Forum will certify broadband wireless access products for conformance and interoperability
  - For IEEE 802.16, ETSI HiperMAN and other interoperable standards

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WiMAX Forum Vision

- Create a global mass market for deployments of broadband wireless networks that will enable fixed, portable and mobile users to maintain high-speed connectivity wherever they go.
- Lead “access anywhere” revolution supporting delivery of data, voice & video applications at home, in the office and on the go.

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WiMAX as a Global Standard

Unprecedented Global Cooperation!

- After more than 4 years of global industry collaboration, the base standard – IEEE 802.16-2004 – is stable and the WiMAX Forum* Certification lab is open for business!
- Amendment for mobile enhancements – 802.16e – is expected to be ratified by the IEEE Standards Association this month!
- Unanimous support from Korea’s leading operators & telecom equipment manufacturers for WiMAX
  - Expectation that products sold as part of the Korea WiBRO service model will be WiMAX Forum Certified*
- Formalized relationship with ETSI
  - ETSI contributing its radio & testing expertise to ensure harmonization of conformance specifications for wireless MAN technology based on the IEEE 802.16-2004 & ETSI BRAN HiperMAN standards
- Liaisons being established with IETF and 3GPPx

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WiMAX Forum Membership
August 12, 2005

343 Members Total (includes in processing)

72	*System Manufacturers*	*(5 processing)*
	66 Principal	
122	*Operators*	*(29 processing)*
	16 Principal	
70	Components	(13 processing)
	18 Principal	
77	Eco-system Members	(21 processing)
	2 Principal	

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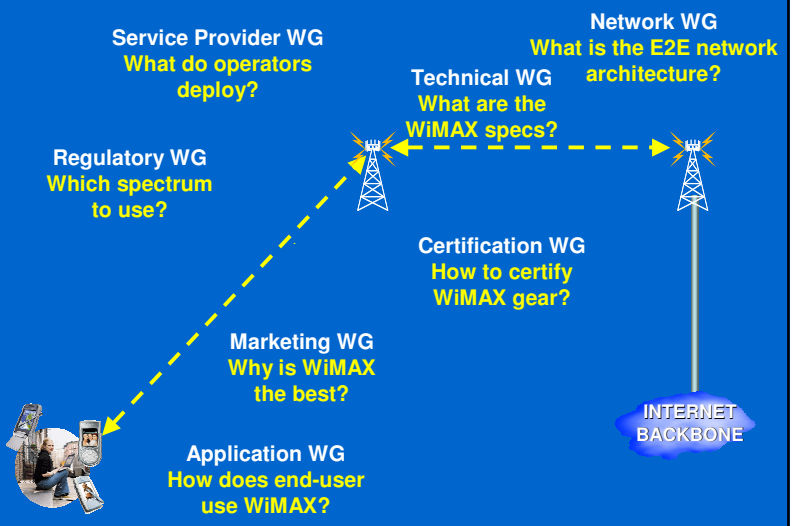
7 Working Groups (WGs)



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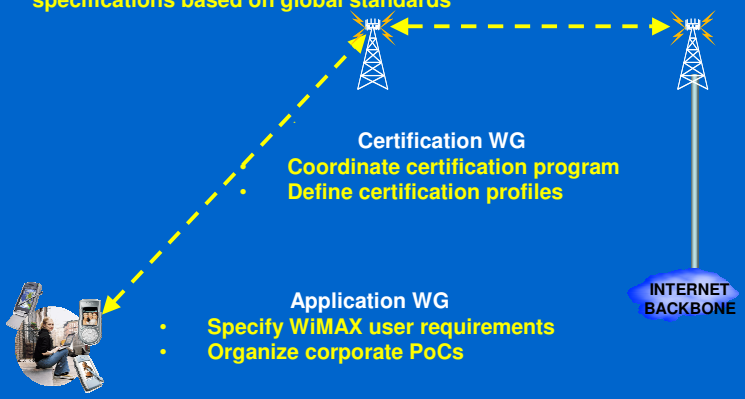
Today's Focus

Network WG
Establish a end-to-end IP WiMAX network architecture

Technical WG
Develop conformance & interoperability specifications based on global standards



Certification WG
- **Coordinate certification program**
- **Define certification profiles**

Application WG
- **Specify WiMAX user requirements**
- **Organize corporate PoCs**

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Certification Working Group
Status – August 2005

Chair
Aditya Agrawal aagrawal@beceem.com

Co-Chair
Ed Agis ed.agis@intel.com

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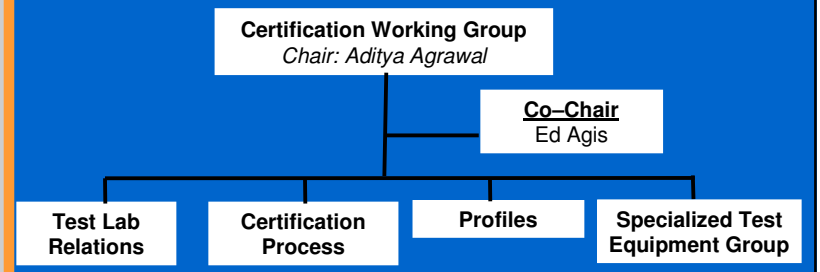
CWG Organization & Charter



Charter

- Manage Conformance, Interop, and Certification Process
- Responsible for lab relationships and quality of testing

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What does the Forum certify?

- Equipment designed for System Profiles is certified for conformance & interoperability
- Certification profiles based upon member surveys
  - Most common profiles are certified first
  - Each profile requires significant investment for test development, lab setup & maintenance
- Certification profiles defined by
  - Frequency (e.g., 3.5 GHz, 5.8 GHz, etc.)
  - Duplexing (TDD or FDD)
  - Channel bandwidths (3.5 MHz, 7 MHz, 10 MHz, etc.)
- 3.5 GHz system profiles scheduled for 1st wave of certification

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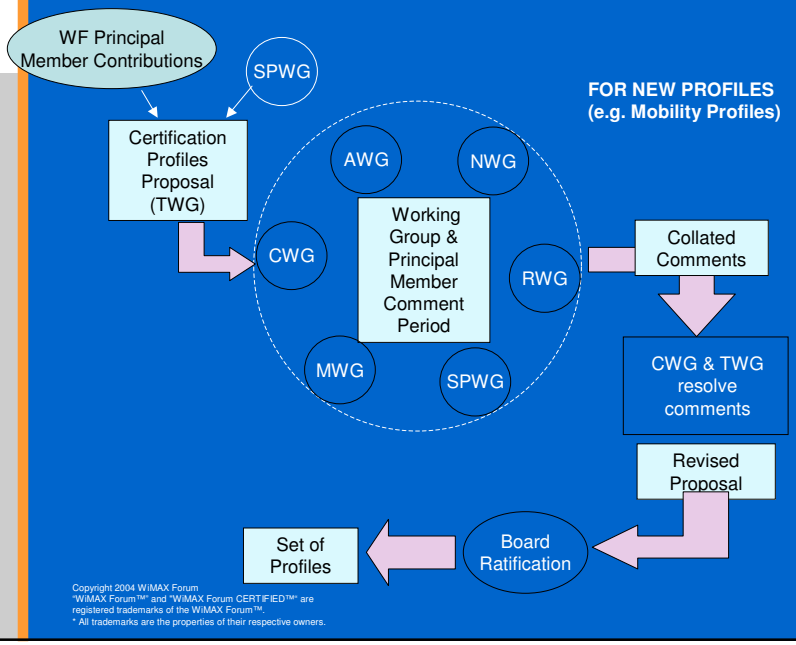
Certification Profiles - Process Flow



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CWG Status for Fixed-Nomadic WiMAX (IEEE 802.16-2004*)

- **WiMAX Forum Certification lab (Cetecom Spain) accepting equipment for testing**
- **1st Plugfest held in Malaga, Spain**
  - **August 1st - August 6th**
- **Planning for Plugfest in Beijing**
  - **October 30th - November 6th**

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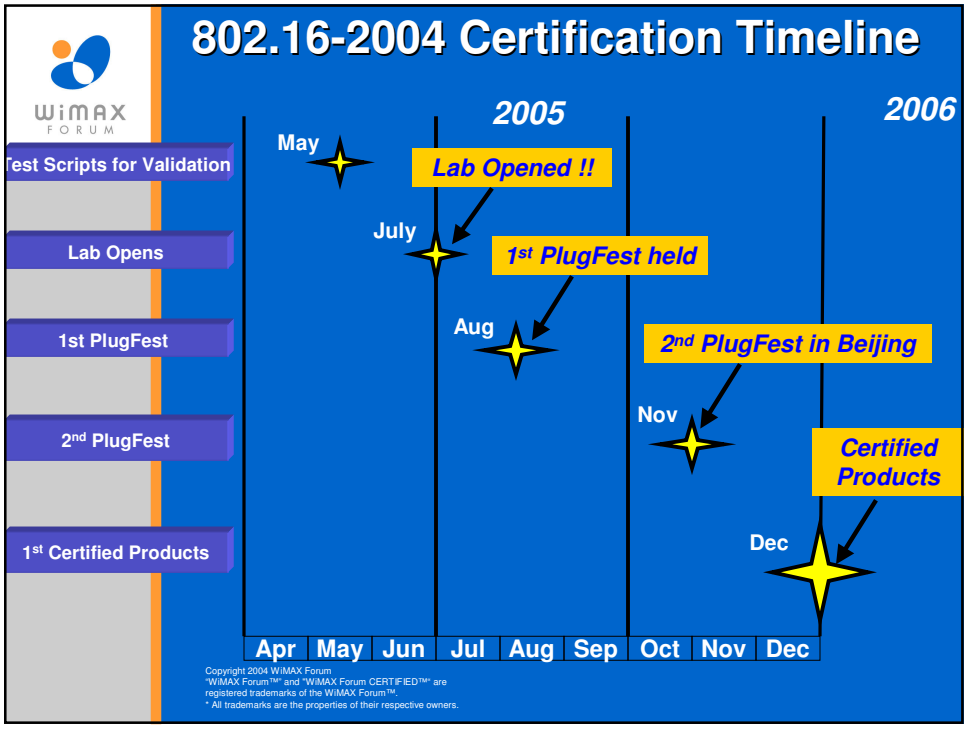
802.16-2004 Certification Timeline
2005
2006
May
July
Aug
Nov
Dec
Lab Opened !!
1st PlugFest held
2nd PlugFest in Beijing
Certified Products
Test Scripts for Validation
Lab Opens
1st PlugFest
2nd PlugFest
1st Certified Products
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
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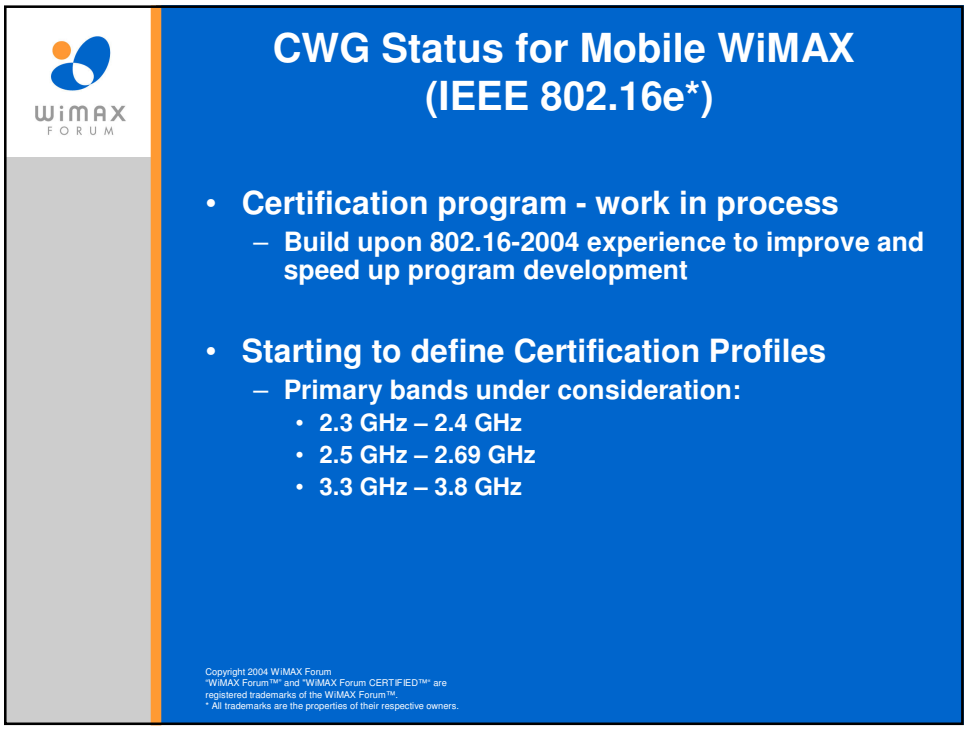
CWG Status for Mobile WiMAX (IEEE 802.16e*)
• Certification program - work in process
– Build upon 802.16-2004 experience to improve and speed up program development
• Starting to define Certification Profiles
– Primary bands under consideration:
• 2.3 GHz – 2.4 GHz
• 2.5 GHz – 2.69 GHz
• 3.3 GHz – 3.8 GHz
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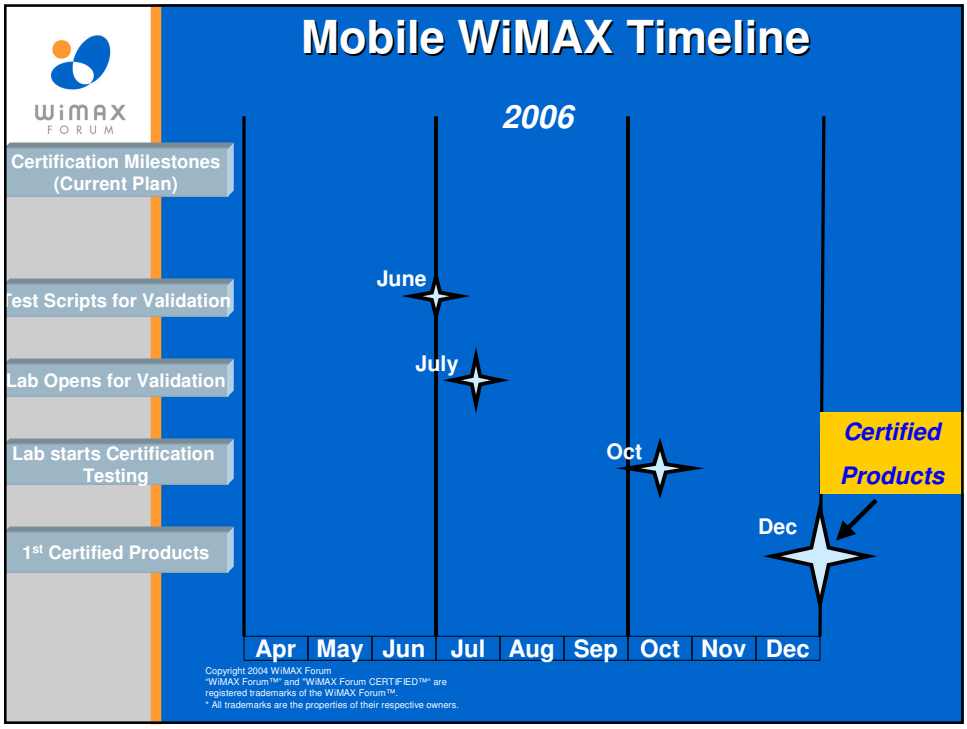
Mobile WiMAX Timeline
2006
Certification Milestones (Current Plan)
Test Scripts for Validation
Lab Opens for Validation
Lab starts Certification Testing
1st Certified Products
June
July
Oct
Dec
Certified Products
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
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Technical Working Group
Status – August 2005
Chair
Gordon Antonello gantonello@Wi-Lan.com
Secretary
Hassan Yaghoobi hassan.yaghoobi@intel.com
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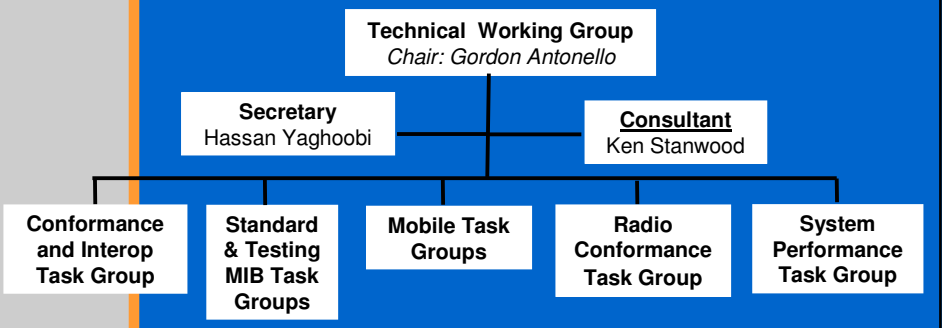
Technical Working Group



Charter

- Develop conformance and interoperability test specs
- Develop applications layer and network infrastructure requirements for future services and interoperability

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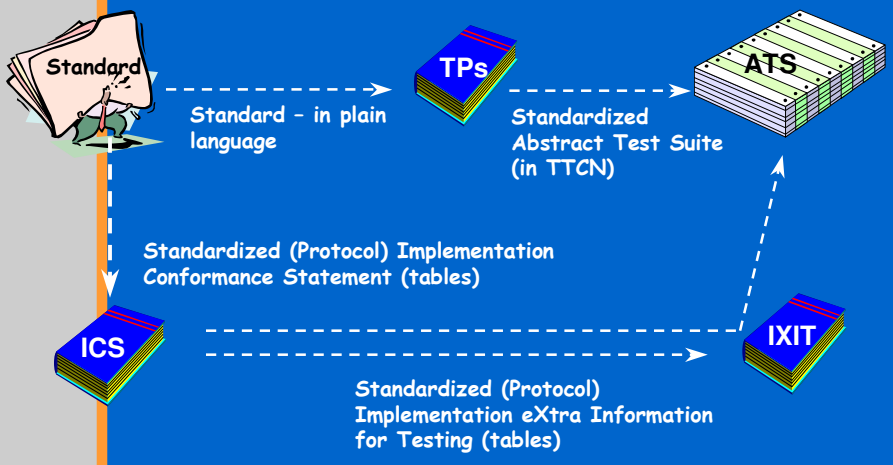
Test Specifications - Nomenclature



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Fixed-Nomadic Conformance Test Specifications Status

- Radio Conformance Test specification
  - Approved Jun '05
- Protocol Implementation Conformance Statements
  - In final review
- Test Suite Structure &Test Purposes
  - Certification wave 1 Test Purposes completed
  - Certification wave 2 Test Purposes scheduled by Oct '05
- Abstract Test Suite
  - Certification wave 1 Test Purposes validation Aug '05
  - Certification wave 2 Test Purposes validation Mar '06

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Mobile Conformance Test Specifications Status

- Currently defining Mobile System Profiles
  - MAC/PHY/RF profiles
- Tentative Test Development Schedule
  - System Profiles
    - 3rd Quarter 2005
  - Protocol Implementation Conformance Statement
    - 4th Quarter 2005
  - Test Suite Structure & Test Purposes
    - 2nd Quarter 2006
  - Interoperability Guide
    - 2nd Quarter 2006

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Task Group - OFDM

- Modifying/evolving current System Profiles to reflect updates in base standard
  - Improvements, corrections
- Tentative Schedule
  - System profiles
    - 3rd Quarter 2005
  - Protocol Implementation Conformance Statement
    - 4th Quarter 2005
  - Test Suite Structure & Test Purposes
    - 1st Quarter 2006
  - Radio Conformance Test specification
    - 1st Quarter 2006

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Network Working Group

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Chair	Prakash Iyer, Intel
Co-Chair	Max Riegel, Siemens
Co-Chair	Junhyuk Song, Samsung
Editor	Mark Lipford, Sprint
Secretary	Ron Smith, Intel Corporation

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NWG Charter

Establish a Network Architecture framework for WiMAX ecosystem

- Deliver end-to-end network specifications for WiMAX networks supporting fixed, portable and mobile usage consistent with next generation network architectures
- Develop a flexible all-IP architecture framework that supports economies of scale & interoperability leading to lower CapEx/OpEx compared to traditional wide-area wireless networks
- Membership (as of August 2005):
  - 135 companies
  - 782 individuals registered (active or observer status)

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Key Architecture Tenets

- Flexible all-IP architecture framework
  - Support evolution of usage and deployment models
- Based on end-to-end functional decomposition
  - Can accommodate a number of different WiMAX access network topologies
  - Interoperability based on reference points not interfaces or network entities
- Operator-type agnostic access service network architecture
  - Based on IEEE 802.16 and IETF protocols and procedures
  - Consistent subscriber reference point independent of access network topologies
- Loosely-coupled, all-IP Interworking in overlay deployment scenarios

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Status Update

- SPWG (Service Provider WG) finalizing Stage 1 Requirements document
- NWG working on Stage 2 architecture framework document
  - Expects to be ready to ballot by mid-September
- Ready to start Stage 3 document
  - Detailed protocols and procedures building on Stage 2 primitives
- Process in place to coordinate with related & dependent efforts
  - Mobility Profiles group in WiMAX Forum
  - IETF, 3GPP, IEEE 802.16

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Applications Working Group (AWG)

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Chair Tom Tofigh, AT&T
Co-Chair Howard Liu, Disney

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Applications WG Charter

- Identify key applications for WiMAX
- Define & prioritize service models with associated requirements to optimize WiMAX network performance
- Facilitate Proof of Concept demos
- Characterize key applications
  - Performance guidelines & measurement
  - Benchmark definition
- Publish Best Common Practices (BCPs)
- Provide feedback to other WGs

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Five Classes of WiMAX Applications

1. Multi-player Interactive Gaming

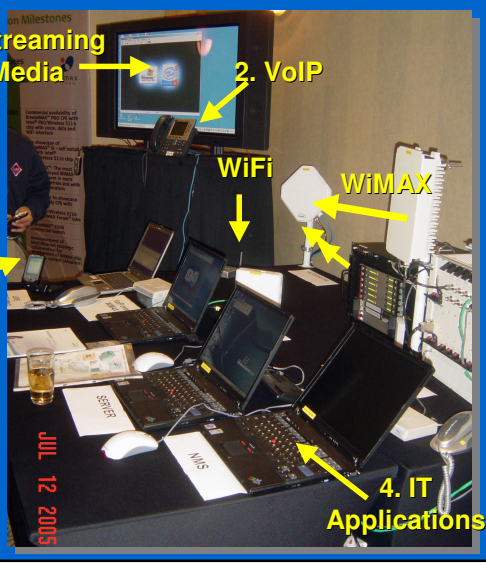
3. Streaming Media

2. VoIP

WiFi

WiMAX

5. Media Contents Downloads



4. IT Applications

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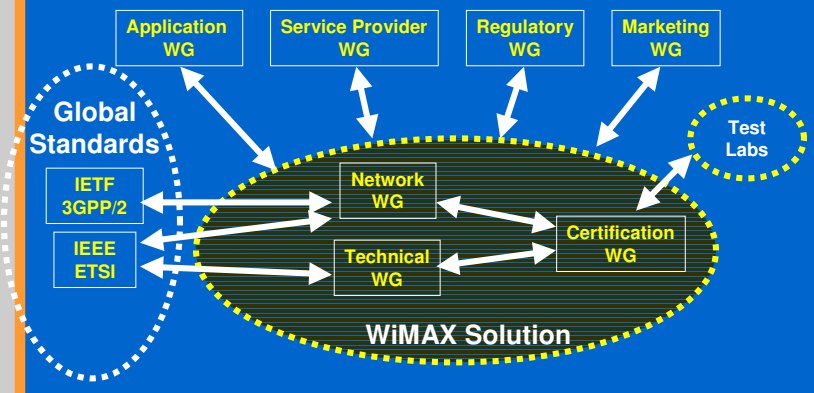
AWG Performance Guidelines

#	WiMAX AWG CLASS	REAL TIME	APPLICATION TYPES IN Each Class	PERFORMANCE GUIDELINES BANDWIDTH (Kbps)	JITTER (mSec)	LATENCY (mSec) E2E	APPLICATION RESPONSE TIME (sec)	Info Loss
1	INTERACTIVE GAMING	Yes	INTERACTIVE GAMING	50 - 85 Kbps	NA	< 150 mSec	N/A	No
2	VOIP	Yes	VOIP	8 - 64 Kbps	< 10 mSec	< 150 mSec (ITU G.114)	N/A	< 1%
	VIDEO CONFERENCE		VIDEOPHONE	32 - 384 Kbsp	< 10 mSec	< 150 mSec	N/A	< 1%
3	STREAMING MEDIA (Real Time)	Yes	MUSIC/SPEECH	5 - 128 Kbps	< 2 Sec	N/A	< (2 - 5) Sec	< 1%
			VIDEO CLIPS	20 - 394 Kbps	< 2 Sec	N/A	< (2 - 5) Sec	< 2%
			MOVIE STREAMING	> 2 Mbps	< 2 Sec	N/A	< (2 - 5) Sec	< 5%
4	INFORMATION TECHNOLOGY	No	INSTANT MESSAGING	Best Efforts	N/A	< 30 Sec	N/A	No
			WEB BROWSING	Best Efforts	N/A	< 4 Sec	N/A	No
			Email	Best Efforts	N/A	N/A	N/A	No
5	MEDIA CONTENT DOWNLOADS (Store & Forward)	No	MOVIE DOWNLOADS	> 1 Mbps	N/A	N/A	N/A	No
			P2P	Best Efforts	N/A	N/A	N/A	No

Kim/Liu 7/25/2005

Summary
WiMAX Forum WGs Inter-relationships



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WiMAX FORUM

System Manufacturers (1 of 2)

- Adaptix
- Airnet
- Airspan Networks
- AirTegrity Wireless*
- Alcatel
- Altera Corp. *
- Alvarion
- Aperto Networks
- ArrayComm
- ARRIS
- Audiocodes
- Axxcelera Broadband
- BelAir Networks
- Cambridge Broadband
- C-DOT
- Ceragon
- Chantry
- Chung-Shan Institute
- Cisco
- Colubris Networks
- Comba Telecom
- Ericsson
- ETRI *
- Gemtek Systems
- General DataComm
- GoNetworks
- Huawei Technologies
- Intracom
- Ixia
- Kyocera
- L3 PrimeWave
- LG Electronics
- LOGUS Broadband
- Lucent
- M/A-COM
- Marconi
- MediaRing
- Motorola
- Navini
- NEC Corporation*
- NETGEAR, Inc. *
- Netopia
- Nex-G

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System Manufacturers (2 of 2)

- NextNet Wireless
- Nokia
- Nortel
- Parks
- P-Com
- Posdata
- Proxim
- Radionet
- Radwin
- Redline Comm.
- Samsung
- Sanyo Electric Co.
- Shenzhen Powercom
- SIAE Microelettronica
- Siemens Mobile
- SkyPilot Network
- SOMA Networks, Inc.
- SR Telecom
- Stratex Networks
- Symbol
- Telsima
- Terabeam Wireless
- Trango
- Tropos
- UTStarcom, Inc. *
- VCom Inc.
- Vivato
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Operators (1 of 3)

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- airBand
- Air Communications Pty (LTD)*
- Airtel Polska SP.Zoo*
- Airzed
- Aloha Partners
- Altitude
- AOL
- Arab Telecom. Co. (K.S.C.)*
- Areva T&D*
- ARL Home Comm
- AT&T
- Axtel
- BandWidth.com
- BARIK
- Bell Canada
- Bell South Corp.
- British Telecom
- butlerNetworks A/S
- Cellcom
- Cellular South*
- China Motion Telecom
- Clear Channel Broadcasting*
- Clearwire
- Comcast Cable Comm. *
- Covad Communication
- Deutsche Telekom
- Digiweb
- DishnetDSL
- Distributel
- eAccess Ltd.
- Eircom
- Enertel
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- Firstserver, Inc. *
- FON
- France Telecom
- Fusion Communication
- Globalcom, Inc
- GloBul
- Golden Telecom *
- ➢Hanarotelecom, Inc.
- HCL. INFINET Ltd. *
- ➢Iberbanda
- IDEA Cellular Limited *
- IDT Telecom
- Info Quest
- Iqara Telecom
- Irish Broadband
- ➢ KDDI
- ➢ KT Corp
- LightCore
- LLC *
- MCI*
- MetroBridge Networks
- Midwest Wireless *
- Millicom Argentina S/A*
- MobilePro
- M-Web
- MPower
- ➢Nextel
- Nextel de Mexico
- NextGenTel
- NextPhase Wireless, Inc.
- NextWave
- NextWeb
- Nozema
- NTT
- PanAmSat Corp*
- PCCW
- Pegasus Comm.
- ➢Pipex
- Portugal Telecom
- PowerNet Global
- Pronto Networks

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- PT Telekomunikasi Indonesia
- Qwest
- Reliance
- RemotePipes, Inc.*
- Rogers Communications *
- Samora Digital
- Saudi Aramco*
- SBC
- SC Lithuanian Radio & TV Center
- SES Americom
- Semino Communications *
- Sify Limited
- SingTel
- ➢SK Telecom
- SkyTel
- Speakeasy
- ➢Sprint
- Start Telecom
- ➢Standard Communications*
- StoneBridge
- Synetrix Holding Ltd. *
- TATA
- TDC Solutions
- TDF
- Telabria
- Telecom Italia S.P.A
- Telefonica De Espana S.A.U*
- Telelink AD *
- ➢Telemar Norte Leste S/A*
- Telenor
- TeliaSonera AB
- Telus
- The Cloud Networks, Ltd
- Time Warner
- Towerstream
- Trillion
- Tulip IT Services Ltd*
- Unitline
- Unwired Australia
- WFI – Wireless
- WiMAX Telecom AG
- ➢Yozan

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Components (1 of 2)

- Alpha Tech.
- Altera
- Alps Electric North America*
- Andrew Corp.
- Aphelion Comm.
- Arcadia Design Systems*
- ➢Atheros
- ➢Atmel
- Azimuth Systems
- ➢Beceem
- COM DEV
- Comtech AHA
- Cushcraft Corp.
- ➢Cygnus
- European Antennas
- Filtronics
- Firetide
- ➢Fujitsu
- Goodwin+*
- Hopling
- Huber+Suhner.
- InfiNet Wireless Ltd
- Inovaware
- ➢Integrated Devices
- ➢Intel
- ➢Iskra Transmission
- K & L Microwave
- KenCast
- Kapsch
- Kathrein Werke
- Maxim Integrated Prod.*
- Merrimac Industries
- Microelectonics Tech.
- Mitsubishi Electric
- Mobile Mark, Inc. *
- MTI Wireless
- Panasonic Electronic Devices Europe GmbH
- ➢PicoChip
- ➢PMC Sierra, Inc. *
- Powerwave*
- Reigncom
- RF Integration

* new applicants in processing

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Components (2 of 2)

- Rohde & Schwartz
- ➢Runcom
- ➢SEQUANS
- Sierra Monolithics
- Sierra Wireless *
- SiGe Semiconductor
- ➢Skyworks Solutions
- Stealth Microwave
- Sterlite Optical
- Stretch, Inc*
- Symmetricom
- Syntronic AB*
- TDK Corporation
- TelASIC Comm.
- ➢Telecis Wireless
- TeleSym
- Telrad*
- Theta Microelectronics
- ➢Tollgrade*
- Trackwise
- TRDA
- TriQuint
- Urmet
- Vectron
- Venturi Wireless
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