

Planning and Deploying Broadband Wireless



A WiMAX Case Study

QuestNet 14th July 2006
Mark Barnett – ATI Australia Pty Limited

Topics for Discussion

- WiMAX Standards and Organisation
- Interoperability & Certification
- Technical Features
- Simulated Deployment Advantages
- Competing & Complimenting Technologies
- Regulatory Issues
- Applications in an Academic environment
- Questions

World Wide Interoperability for Microwave Access WiMAX

- What is WiMAX?
- Who is the WiMAX Forum?
- When will we have WiMAX?
- Why WiMAX?

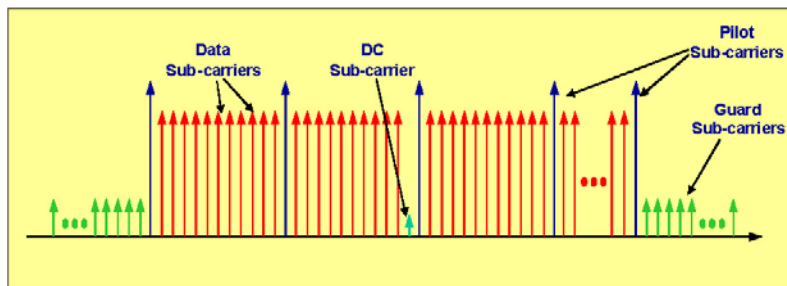
Interoperability and Compliance

- 802.16 Compliant vs WiMAX Certified
- WiMAX System Profiles
 - Fixed WiMAX Air Interface (802.16-2004)
 - Mobile WiMAX Air Interface (802.16e-2005)
- WiMAX Certification Profiles
 - Release-1 – Fixed, Jan 2006
 - Release-2 – Fixed, Q3 2006
- Other Related 802.x Efforts
- Plug-fests
- Backward Compatibility
- Goal is Interoperability

802.16e Technical Features

■ Physical Layer

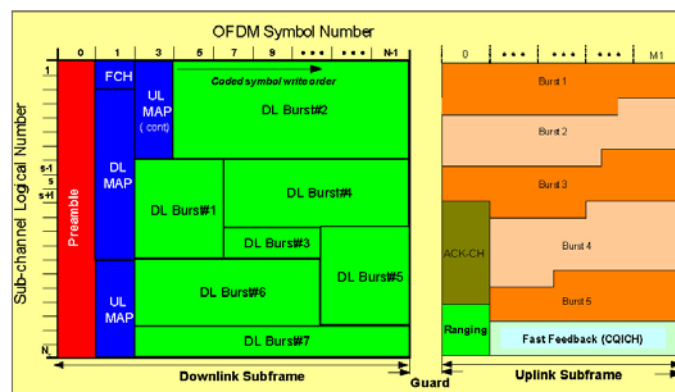
- OFDMA
- Sub-Channelisation
- S-OFDMA



802.16e Technical Features

■ Physical Layer (Cont')

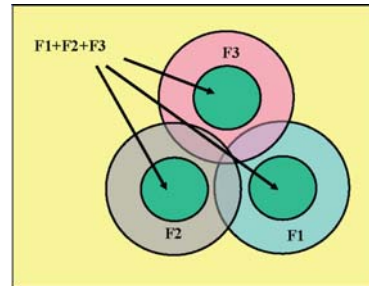
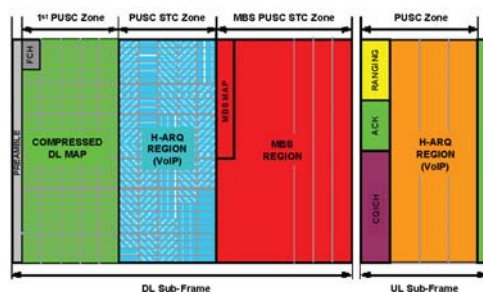
- TDD and FDD Frame Structures
- Adaptive Modulation and Coding
- Hybrid Automatic Repeat Request
- Fast Channel Feedback



802.16e Technical Features

Advanced Features of Mobile WiMAX

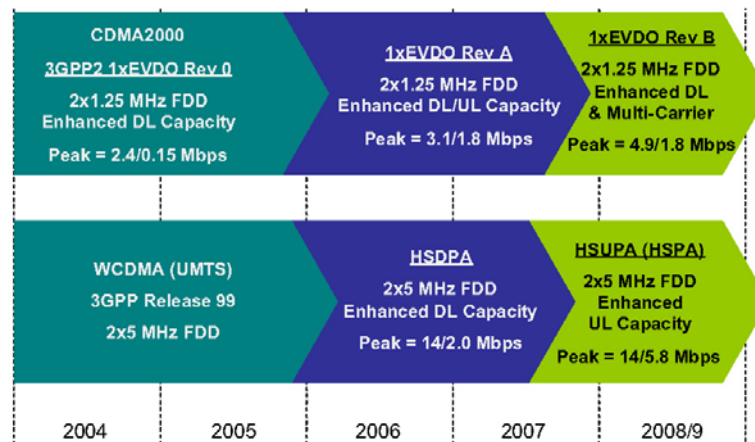
- Fractional Frequency reuse



- Multicast and Broadcast Service

Competing Technologies

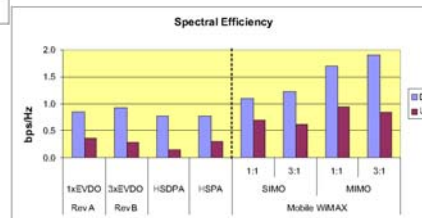
3G CDMA Systems



Competing Technologies

3G CDMA Systems Performance Comparison

Parameter		1x EVDO Rev A	3x EVDO Rev B	HSDPA	HSPA	Mobile WiMAX
Duplex		FDD	FDD	FDD	FDD	TDD
Occupied Spectrum (MHz)		2.5	10	10	10	10
Channel BW (MHz)	DL	1.25	5	5	5	DL/UL=3
	UL	1.25	5	5	5	
Spectral Efficiency (bps/Hz)	DL	0.85	0.93	0.78	0.78	1.91
	UL	0.36	0.28	0.14	0.30	0.84
Net Information Through-put per Channel Sector (Mbps)	DL	1.06	4.65	3.91	3.91	14.1
	UL	0.45	1.39	0.70	1.50	2.2



Regulatory Arrangements & Spectrum Availability

ACMA vs International

Potential Licensed Bands for Mobile WiMAX

- 1.8GHz (CDMA/CDMA2000)
- 1.8GHz 2000 (CDMA2000)
- 2010-2025MHz (Dec'06)
- 2.0GHz Lower (iBurst)
- 2.0GHz Upper (WCDMA)
- 2.3GHz MDS B (TDD)
- 2.5GHz ? TBA
- 3.4GHz Bands (Unwired)
- Retired Analogue TV
- Spectrum OR Apparatus

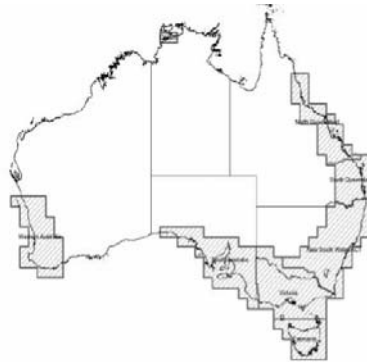
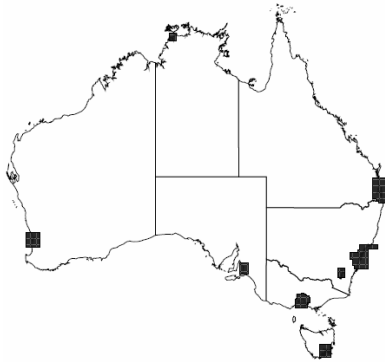
Unlicensed

- 900MHz Band
- 2.4GHz Band
- 5GHz Band
- Other



Spectrum Licensed Areas

"Metro" Spectrum Licensed Area
for BWA 1900-1920MHz



"Metro & Regional" Spectrum Licensed
Area for BWA 2010-2025MHz

Existing Deployments

▣ Fixed

- ▣ 150 trials underway world wide
- ▣ Certified Fixed WiMAX Equipment 3.5GHz

▣ Commercial Mobile

- ▣ Pre-Certification
- ▣ WiBro in South Korea, Italy, Venezuela



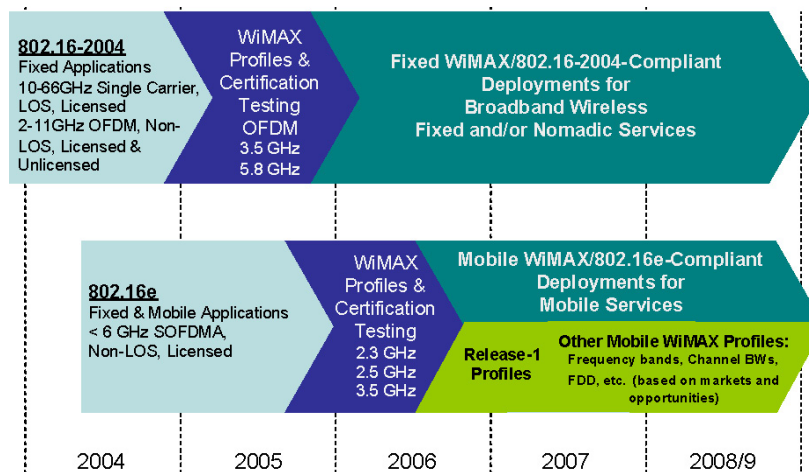
Applications in Australia

- ▣ Fixed broadband to remote areas
- ▣ Triple Play in remote locations
- ▣ Quad Play in High Density Areas where business case exists
- ▣ Improved coverage and performance over existing wireless technologies
- ▣ WiFi backhaul

University and Academic Applications

- ▣ Remote Campus wireless connection for Broadband Services
- ▣ Enhances fixed wireless networks on and off campus
- ▣ Campus WiFi backhaul using unlicensed WiMAX
- ▣ Backup to Fibre and Cabled Campus Networks
- ▣ Quick deployment networks for ad-hoc on and off campus applications.
- ▣ Mobile WiMAX for high quality mobile remote IP connection?

Timeline for WiMAX



Questions