

IEEE Conference on WiMaX Technology and Challenges in India:

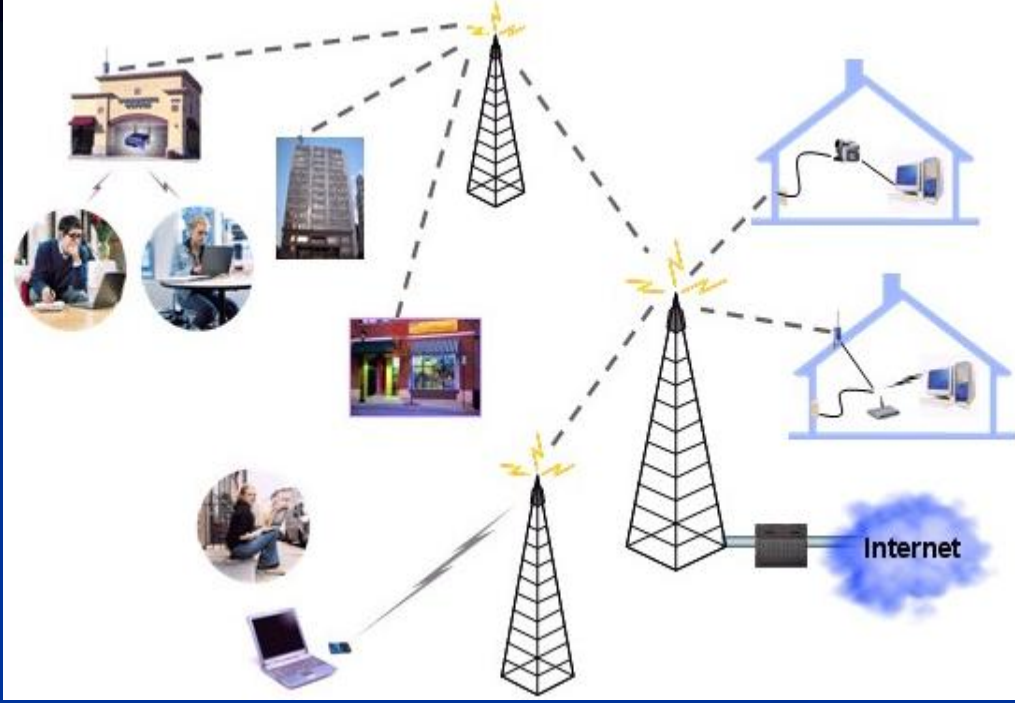
WiMAX Technology and Challenges (Worldwide Interoperability for Microwave Access)

Uday B. Desai

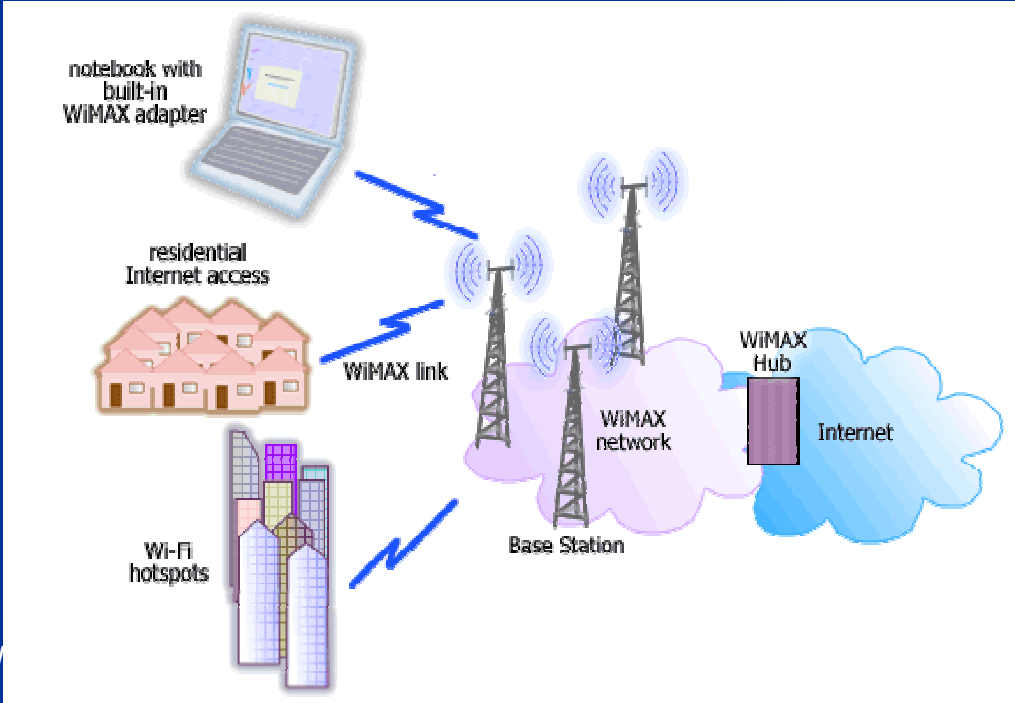
SPANN Lab., Dept. of EE
IIT-Bombay

www.ee.iitb.ac.in/spann/
ubdesai@ieee.org

HOW WiMAX WORKS



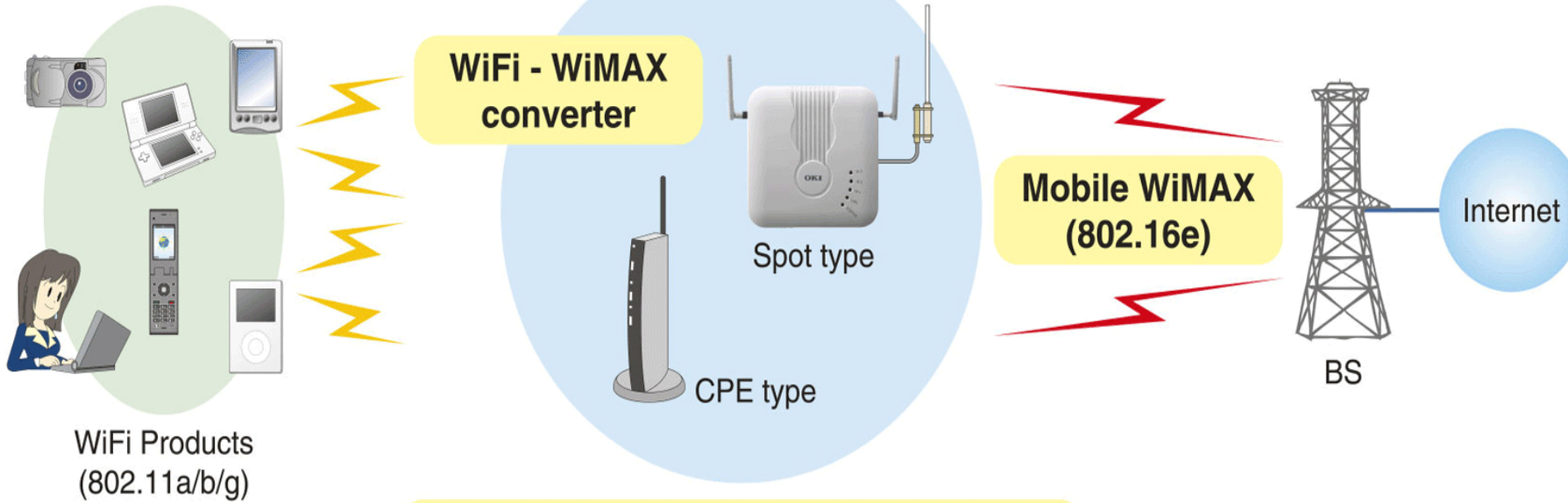
Birdseye view of WiMax



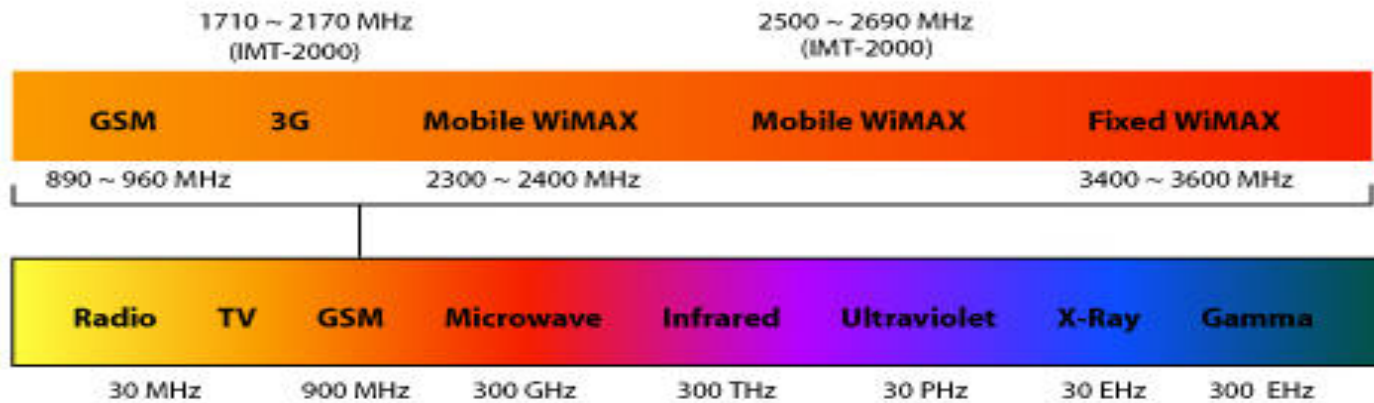
Mobile WiMax 802.16e

Pleasant-to-use and portable multimedia communication

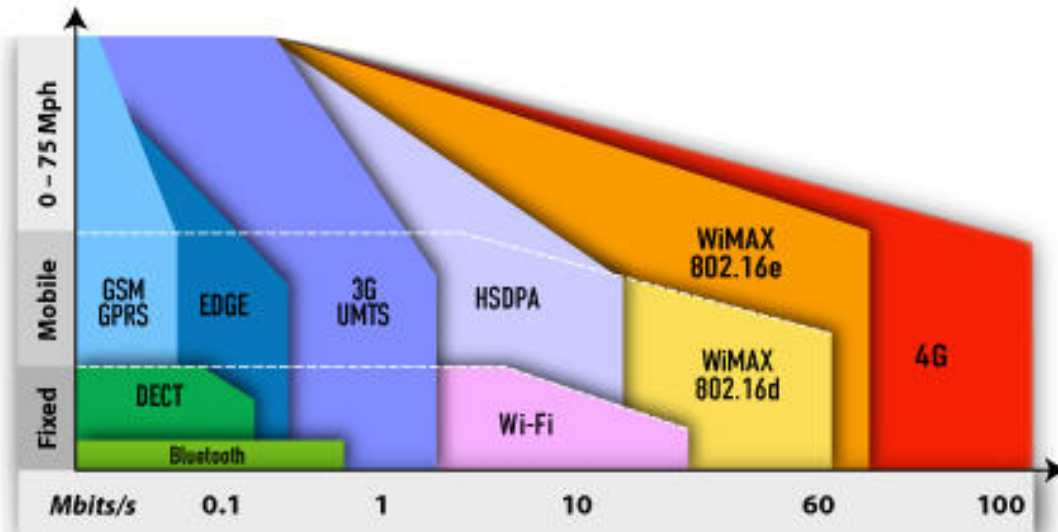
Wireless access point



WiFi - WiMAX linkage security and QoS



Data rates for wireless technologies

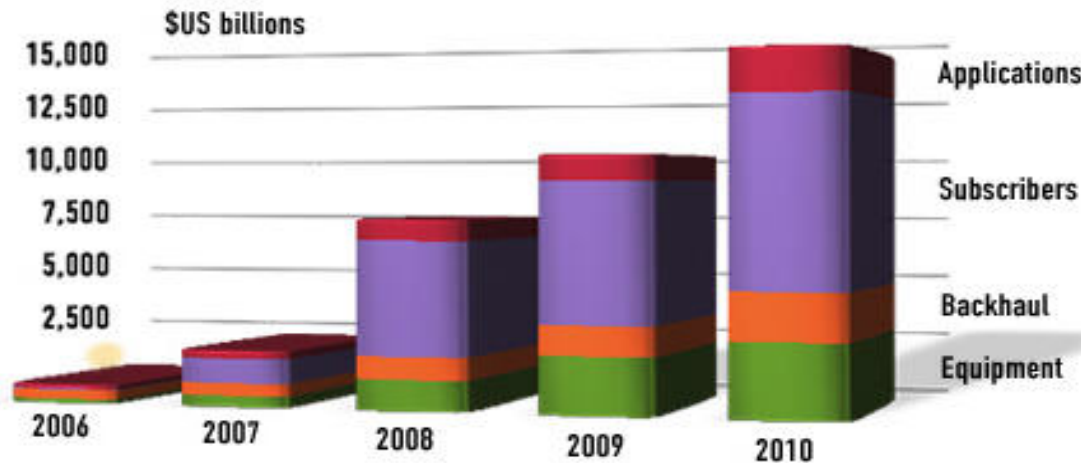


Designed to operate in the 2-11 GHz band

NLOS:
10 km

LOS: 80
km

WiMAX ecosystem performance forecast



Aircel, VSNL, ...

- ABS (Aircel Business Solutions) has enabled wireless connectivity in Chennai for SMEs and Enterprise clients through WiMAX (fixed) based on 802.16d standards at a speed range of 2 to 10 Mbps (Oct. 2006)
 - http://www.cxotoday.com/India/News/Chennai_Gets_WiMAX_Courtesy_Aircel/551-76481-912.html
 - ABS plans to expand its network to cover 44 cities
- Mobile and broadband player Videsh Sanchar Nigam (VSNL) has set aside a capex of Rs 1,000 crore for its WiMAX services (Oct. 3, 2007)
 - VSNL, already runs a WiMAX service for enterprises in Bangalore and has been allocated spectrum for another 50-60 cities
 - http://www.business-standard.com/common/storypage_c.php?leftnm=10&autono=300060

BSNL, MTNL ...

- BSNL is set to issue tenders for setting up 50,000 Common Service Centres (CSCs) — ICT-enabled kiosks — across the country (Oct. 4, 2007)
 - This will be one of the largest deployment of WiMax in the world
 - BSNL would be allocated spectrum in the 2.5 GHz frequency band for its WiMax deployment
 - The project is expected to be completed by August 08.
 - These CSCs will primarily cater to semi-urban and rural areas across the country
 - http://economictimes.indiatimes.com/News_by_Industry/BSNL_to_invite_tenders_for_setting_up_50K_WiMax_kiosks/articleshow/2426978.cms
- Indian government is planning to set up a national working group on WiMax consisting of all stakeholders — government, service providers, equipment manufacturers and test equipment suppliers. The group will formulate strategy for active participation in the global WiMax forum proceedings.
 - http://economictimes.indiatimes.com/Infotech/Internet_/National_WiMax_group_soon_for_global_reach/articleshow/2421408.cms

Two Big News Item

1. International Telecommunications Union (ITU) has approved a non-cellular telecommunications technology- WiMAX- as part of the union's 3G standards (part of IMT - 2000)
 - Operators with 3G spectrum in the 2.5 GHz bands globally can use WiMAX to build out a network
 - Of course, each country's regulators ultimately decide, the ITU decision does make a difference

ATMEL WiMAX Chipset (Low Cost)

2. The AT86RF535B and the AT86RF525B are fully integrated, low cost, direct conversion (low-IF or zero-IF configurable) transceivers supporting IEEE 802.16-2004 (.16d - fixed) and 802.16-2005 (.16e - Mobile) WiMAX applications

Key features of AT86RF535B MAX-Link Transceiver

- **Single-chip 3.5GHz WiMAX Transceiver**, Low-IF/Zero-IF Transceiver Architecture; Requires No External Filters, **Integrated Self IQ Calibration**, HFDD Support, **Fully Differential Design**, Self Calibration Mode for RX / TX Filters, **Modulation up to 64QAM**, Support Channel Bandwidths of 3.5, 5.0, 7.0, 8.75MHz, and 10MHz, **Ultra-fast Fractional-N Synthesizer**, Phase Noise Synthesizer: 0.8° (-37dBc), Sensitivity < -74 dBm at 64-QAM, CR= $\frac{3}{4}$, 7MHz BW, **Low Supply Voltage: 3.0 V**, RX/TX Operating Current: 270/315mA Typical, TX Output PRF: 0 dBm, -34 dB EVM, **Low Power Off Current: < 20 μ A** Typical, **Low External Component Count**, 56-lead QFN Package
- **Price: \$14.95 each (10K lot qty).**

Great Panel

- Prof. David Koilpillai - IIT Madras
- Prof. Huzur Saran - IIT Delhi
- Dr. Ajay Bakre - Intel

- Key Issues:
 - Spectrum allotment from Govt. of India
 - Range and Power requirements of current WiMAX equipment
 - Cost to client