ITU/BDT Regional Seminar on Mobile and Fixed Wireless Access for Broadband Applications for the Arab Region

"WiMAX Wireless Networks in rural area "

Algiers (Algeria)
19-22/06/2006
Roland THIES

ARCHITECTS OF AN INTERNET WORLD ALCATEL

Presentation Outline

- **Market Drivers**
- WiMAX Technology
- The Operator Opportunities
- Conclusion

Boost BroadBand penetration
Meet Operators' business opportunities

Respond to end users' unmet needs	■ Rural users & low ARPU users do not have access to BB access yet ■ = Address broadband data users in areas that are not covered with ADSL
Select & combine the right technologies	■ Optimization between throughput – coverage – mobility ■ CPE/performance/volume ■ Secure appropriate spectrum
Deliver cost-effective access	■ Spectrum efficiency ■ Availability, cost, coverage, mobility
Enabler of new services revenues	■ WiMAX enables "new usages" (both BB and nomadic) ■ Maximize revenues with embedded chipset (no subsidy) ■ Deliver unprecedented QoS for wireless data/IP services

Need to address…
multiple usages with dedicated applications

LOW INCOME → HIGH INCOME

e-learning "Double play"

Phone shop

e-Government e-trade

Internet shop

Broadband shop

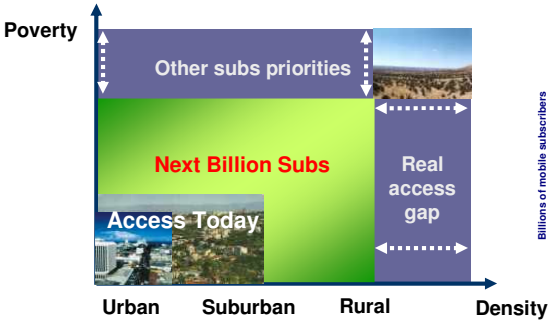
Personal phone

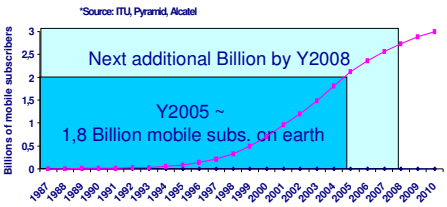
Mature, personal & business phone & broadband

Triple Play

Managed services

How to connect the Next Billion Subs?



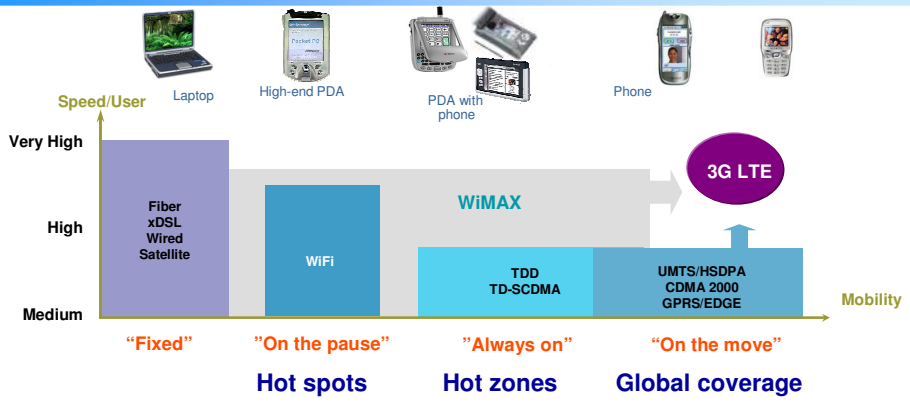


WiMAX is the way to connect the next billions

"WiMAX is to Broadband what GSM is to Telephony"

Universal Broadband Wireless Access & Mobility

Complementary access solutions for different mobility and nomadic needs



Answer to end user and operator's expectations

> End-user expectations are high

- Access from **any device and location**
- **Single bill** and authentification
- Not only throughput but **QoS**
- New **multimedia services**
- Mobile Triple play (VoD, PVNS, iPTV, …)
- Mobile Office / business, Push Mail
- Presence, Communities
- SME **VPN**
- **Push to talk**
- Mobile network **Gaming**
- Specific Vertical markets (Airports, transports, …)

… At the lowest price

> Operators look for solutions enabling

- **"Unlimited" voice**
- High Throughput on the move
- Mobile TV
- **Low latency**
- **End-2-End QoS**
- Simplified / flat Architecture (IP Based)
- Affordable (like DSL)
- Efficient Backhauling
- **Maximize Site Reuse**

Expectations accelerated by demand for Multi-Media Content Delivery and IMS

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What is WiMAX (Worldwide Interoperability for Microwave Access) ?

- It's Broadband : typically 25 Mbps/cell
- It's IP native
- It's Point-to-Multipoint Microwave : up to 15km
- It's Non Line of Sight
- It's like Cellular coverage design
- It's Standard-based : IEEE 802.16
- It's cost-effective : CPE below $300
- It's supported by more than 370 industry players to make it interoperable

Why 16e ?

- Higher performances than 16d
  - The right technology for BWA
    - Flexibility & Allocation
    - Radio Performances
- Mobility mechanisms only with 16e
- Smart Devices (PCMCIA etc..) : only 16e
  - Mass Market only compatible with 16e
- Radio Features making Indoor CPE & PCMCIA deployment feasible developed only in 16e
  - Smart Antennas, Sub-channelisation
- Only 16e permits innovative offers based on nomadicity and Wireless DSL
  - Common network for large & innovant end user offer
- 16e & 16d air interfaces are NON COMPATIBLE
  - 2 layers network (1 carrier 16d, 1 carrier 16e) required for adressing CPE 16d and CPE 16e
- Interoperability is driven by Nomadism & Roaming requirements, therefore 16e
  - 16d will likely remain proprietary or with reduced interoperability

Positioning vs. other technologies… Network design values

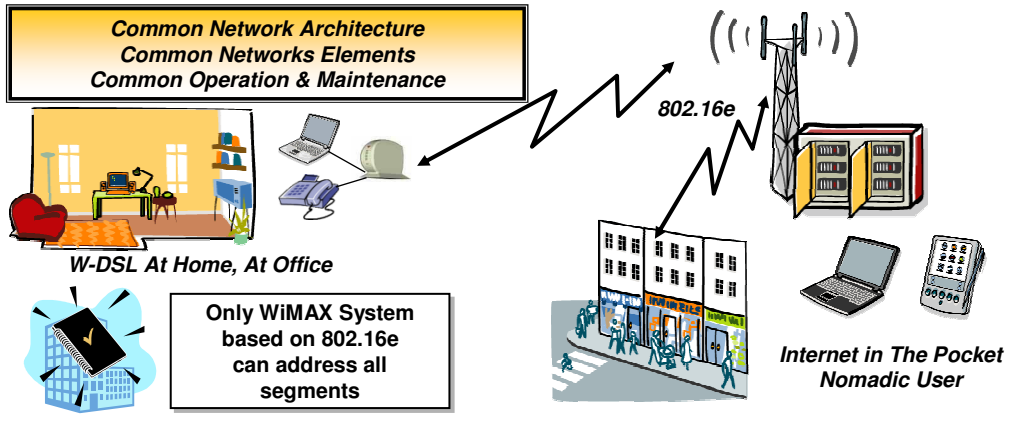
- **Flash-OFDM @ 2,5 GHz**
  - Peak rate DL/UL: 5.3 Mbps / 1.8 Mbps
  - Cell edge rate DL/UL : 300 Kbps / 50 Kbps
- **WiMAX @ 2,5 GHz**
  - Peak rate DL/UL : 22 Mbps / 10Mbps
  - Cell edge rate DL/UL : 6 Mbps / 128Kbps
- **HSDPA FDD @ 2.1 GHz**
  - Peak rate DL/UL : 11 Mbps / 128 Kbps
  - Cell edge rate DL/UL : 128 Kbps / 128 Kbps
- **CDMA EV-DO @ 2GHz**
  - Peak rate DL/UL : 2,4 Mbps
  - Cell edge rate DL/UL : 40 Kbps / 10 Kbps
- **TDD @ 2,5 GHz**
  - Peak rate DL/UL : 15 Mbps / 150 Kbps
  - Cell edge rate DL/UL :128 Kbps / 64 Kbps

Effective throughput per sector	Nb of carriers per sector	Throughput per sector/carrier (DL)	Througput per site (DL)
FlashOFDM (2.5GHz)	3	2 500 Kb/s*	22 500 kb/s
WiMax (2.5GHz)	1	12 400 Kb/s	37 200 Kb/s
CDMA 2000 EV/DO	5 (n voice)	800 Kb/s	12 000 Kb/s
TDD (2.5 GHz)	1	5 600 Kb/s	16 800 Kb/s
HSDPA	2 (+1 voice)	2 000 Kb/s	12 000 Kb/s

(*): performances given by the vendors

Cellular grid re-use

WiMAX Right Air Interface for a Common Architecture

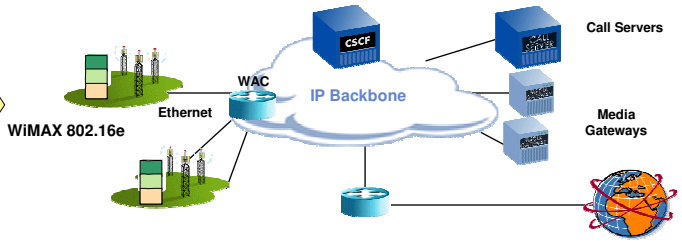


802.16 e (WiMAX) the Standard for all BWA
Fixed , Nomadic & Mobile Applications

Mobile WiMAX/IEEE802.16e solution
IP/IT based flat architecture / End to end IP

IP/IT based flat architecture

- Reduced network complexity and number of nodes
- Better latency
- Easier e2e QoS
- IP broadcast & unicast/multicast



WiMAX as the First Full IP Standard Radio Access System

WiMAX Deployments

Coverage Driven Network

Capacity Driven Network

Main Concern : *Sufficient Spectrum Resources For capacity & multiple operators*	**Answer :** *2.5 and 3.5GHz bands*
Main Concern : *Frequency Band*	**Answer :** *700MHz Band*

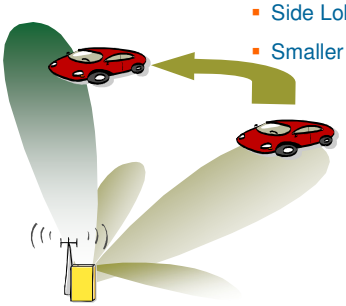
WiMAX Base Station
Smart Antenna – The Three Virtues

Increased Capacity

- Better Link Quality
- Adapted modulation scheme
- Capacity increase
- Up to 40 % throughput gain

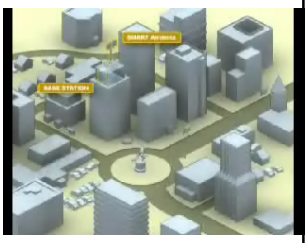
Enhanced Coverage

- Improved coverage by 20%
- More robust radio link
- Cell site number divided by 2



Reduced Interference

- Interference reduction & cancellation
- Side Lobe suppression
- Smaller frequency reuse distances



Adaptive Antenna System
Beam forming

USER CENTRIC BROADBAND EXPERIENCE

- Growing diversity of Services, Devices & Connectivity
- Users demand **SIMPLICITY**

NETWORK ORCHESTRATES for SIMPLE USER EXPERIENCE

- **Any device, Any broadband**
- **Single Authentication**
- **Consistent Personalization**
- **Transparent Synchronization**
- **Seamless Service Continuity**
- **Value-based billing**

USER-CENTRIC BROADBAND EXPERIENCE

WiMAX for High Speed Internet in Your Pocket

High Performance

DSL experience
> 1 Mbps / user
Low Latency
Managed QoS

Anywhere Anytime

Cellular experience
Cellular grid reuse
Outdoor / Indoor
Urban / Rural

Low Cost

Internet experience
Low Cost per byte
Flat fee
Standard -> Volume
Small Form Factor

For all types of end-user Devices


PC card


Entertainment centric devices


Mobile phones

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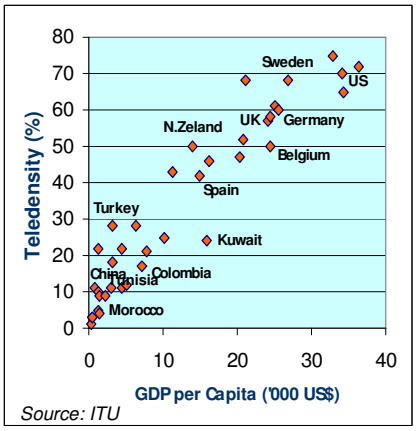
Developing Country Challenge: **Access to Information**

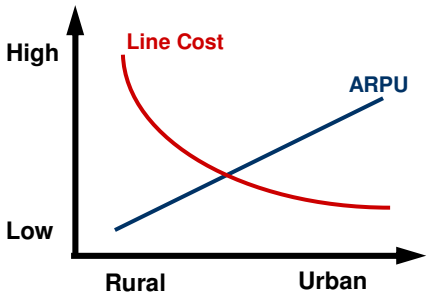
- **How Teledensity and economic growth are linked together?**
  - A key issue for economic and social development?
  - … to be urgently addressed, especially in rural (isolated) areas?
- **What kind of services?**
  - Telephone, Internet, …
  - Individual or community access
  - Prerequisites



Source: ITU

Universal Access to Telecom services

The famous dilemma!



How to take up the challenge?
- "Dream solution" for Rural Telephony
- dedicated subsidies
- obligation of services (incumbent operator)

Rural Telecom is not as unprofitable as … it is said !

- **Incoming call revenues** are not taking into consideration in the business model
- **Profitability issue must be reconsidered**, taking advantage of potential service Internet revenues
- **Population solvency** is much better than foreseen
  - Community Access, Prepaid will improve population solvency
  - Real population income is much higher than GDP (--> PPP)

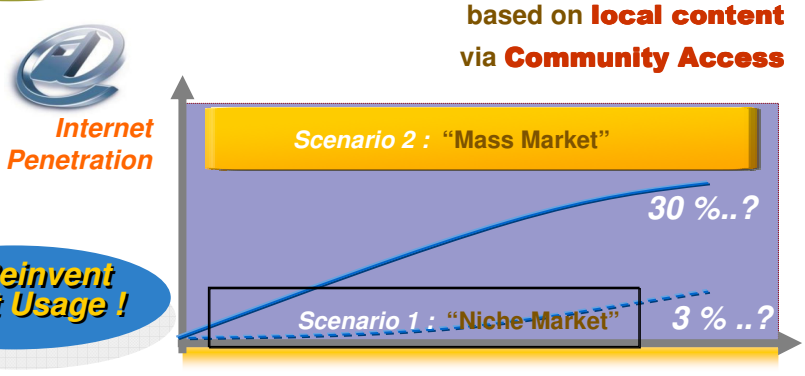
Still operator approach is ….

- **too much individual access oriented**
- **forgetting Internet opportunities**

Internet can leapfrog development, if ...

INTERNET, as Public Utility

Internet is seen as a prime **Communication Tool** offering **useful end-user services** based on **local content** via **Community Access**



… to Reinvent Internet Usage !

Access Network Technologies

Use standard widespread technologies in innovative arrangements

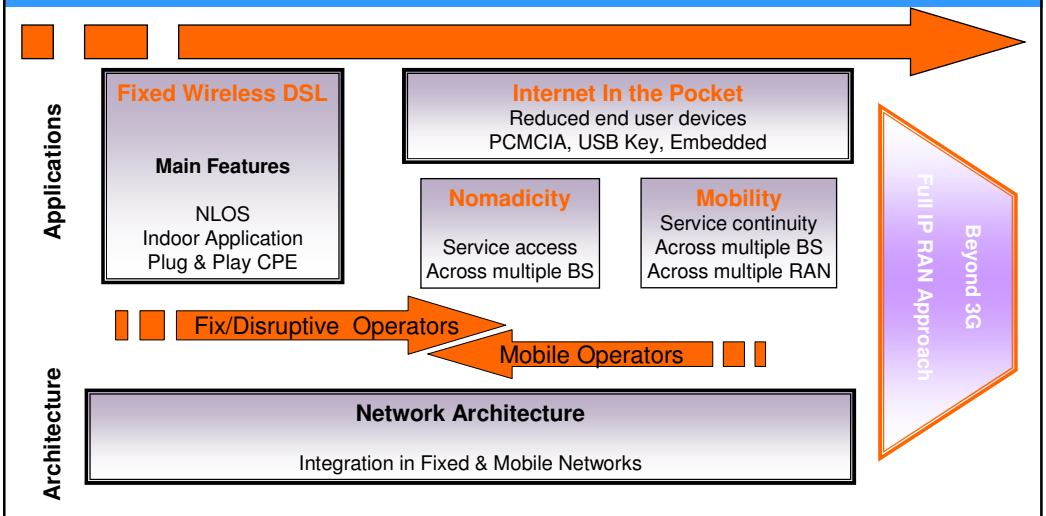
IP/@

B-WLL

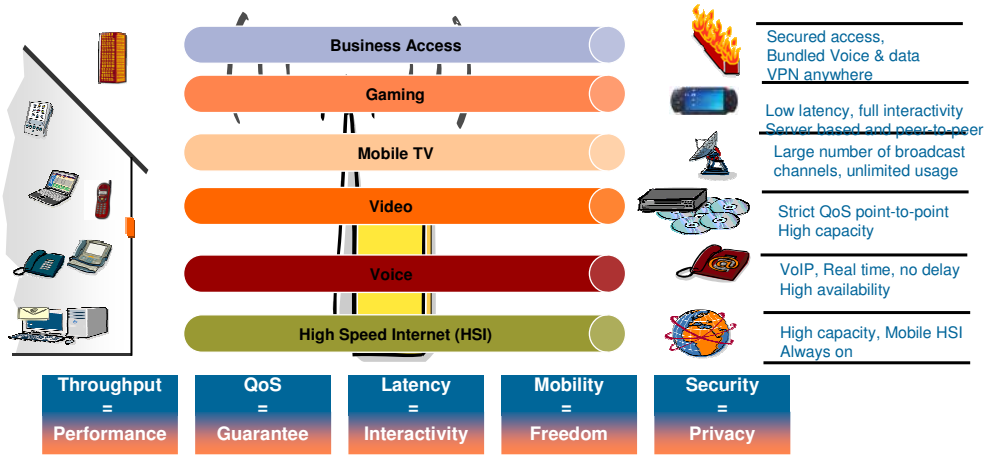
ADSL

- Fixed or Mobile
  - Wireline or Wireless
    - Narrowband or Broadband
      - Voice or Data

Operators' Business Opportunities with WiMAX rev e

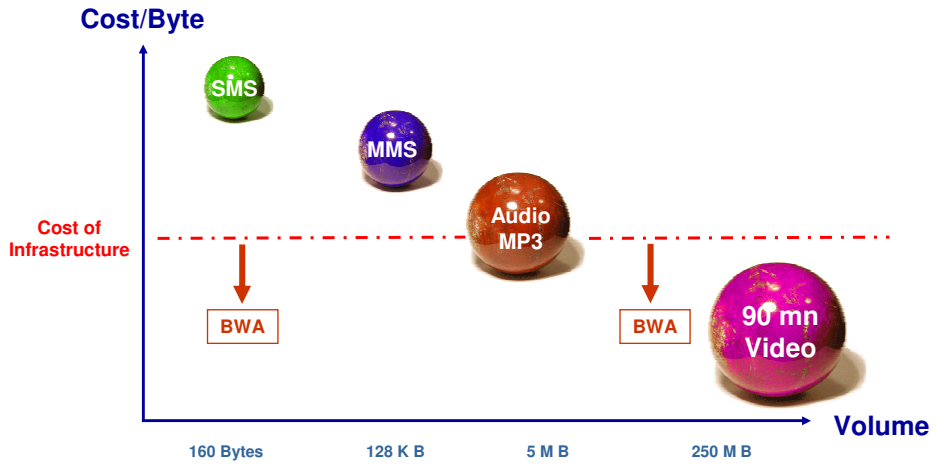


WiMAX…
A Multi-service wireless broadband access technology



WiMAX enables a non limited combination of services

Improve Bandwidth… Reduce Infrastructure Cost



Main advantages for End Users

> **Mobility :** “nomadism”

> **Prepaid :** solvency

> **Virtual leased line to access Internet :** cybercafés

> **Mobile platform services :** added revenue

Main advantages for Operators

> **CAPEX**
- Extension of existing EDGE/3G Network **at marginal cost**

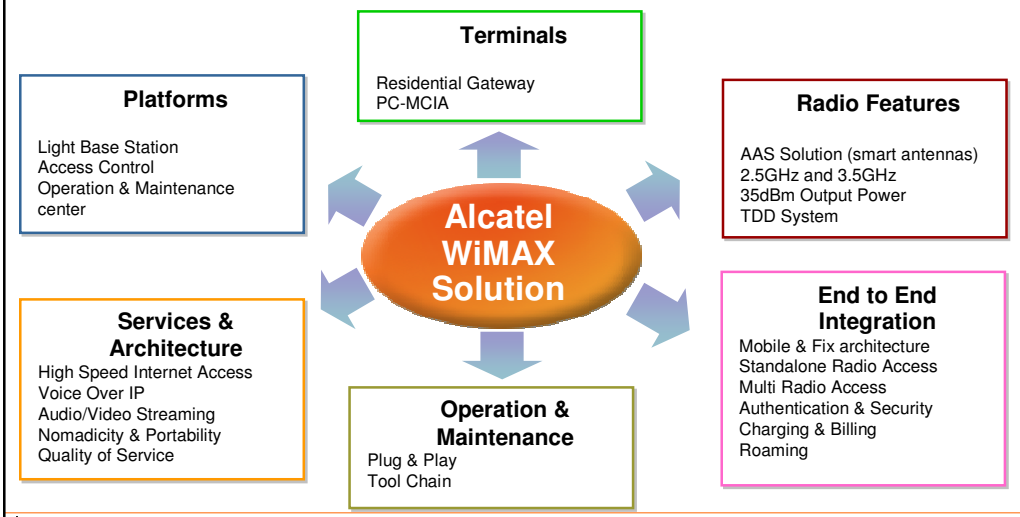
> **OPEX**
- Neither specific operation, nor maintenance, nor training
- No “at home” installation
- No billing, bad debt

> **Revenue**
- significant growth [thanks to increased user base]
- added value services [over a unique infrastructure]

Presentation Outline

- What is FMC?
- Rational
- From an Unsuccessful Past to A Promising Future
- The Operator Opportunities
- **Conclusion**

Alcatel WiMAX Solution



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