

ITU-D Regional Development Forum for the Asia Pacific Region

**“NGN and Broadband, Opportunities and Challenges”
Yogyakarta, Indonesia, 27 – 29 July 2009**

The Challenges of Wireless Broadband in Emerging Markets

Dirk Wolter

CTO S&SEA Region

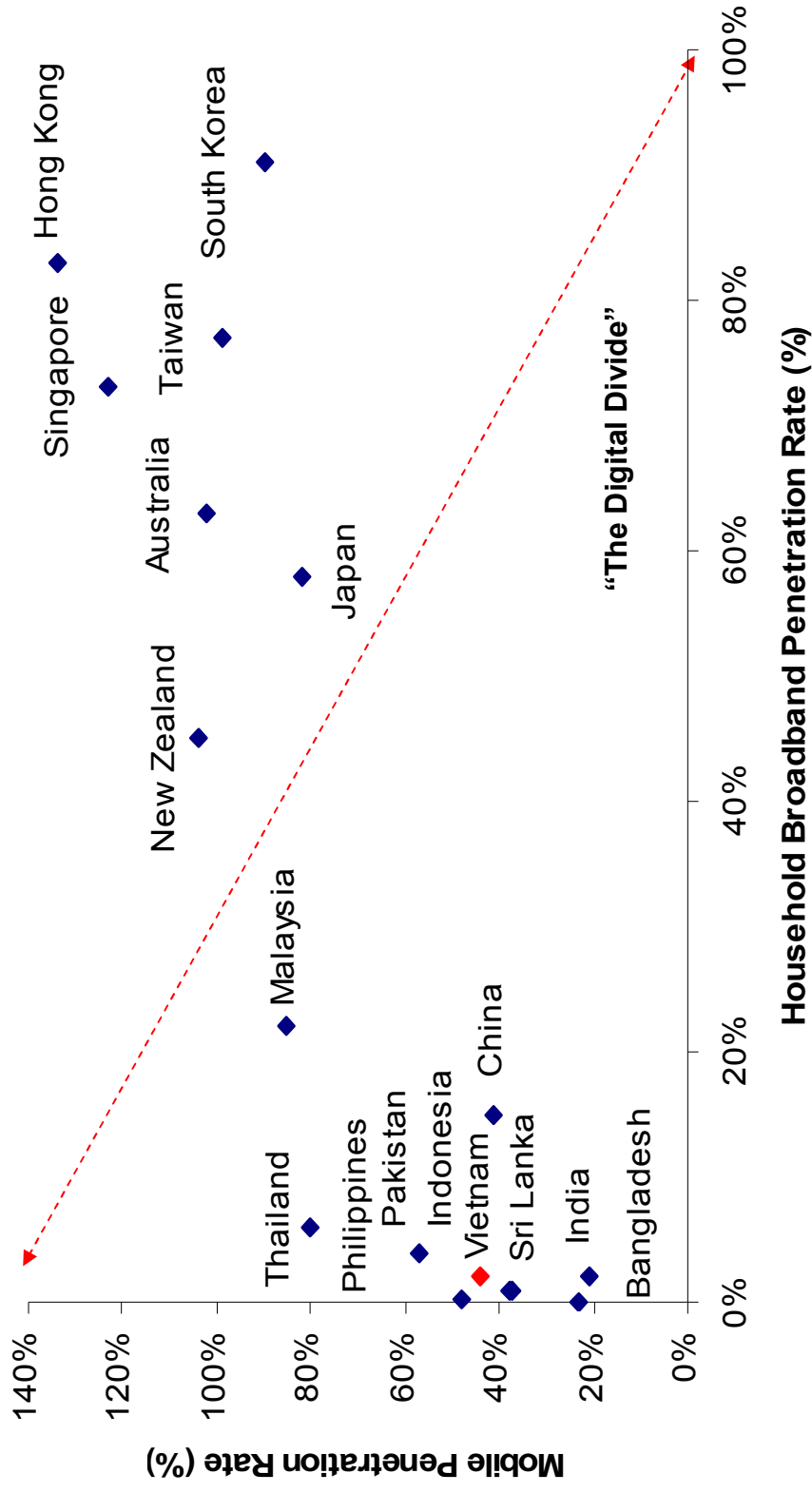
Alcatel-Lucent



Broadband in APAC

Yogyakarta, Indonesia, 27-29 July 2009

Broadband vs Mobile Penetration in APAC



Source: Frost & Sullivan 5/10/2008

Two different broadband trends

HIGH INCOME ECONOMIES

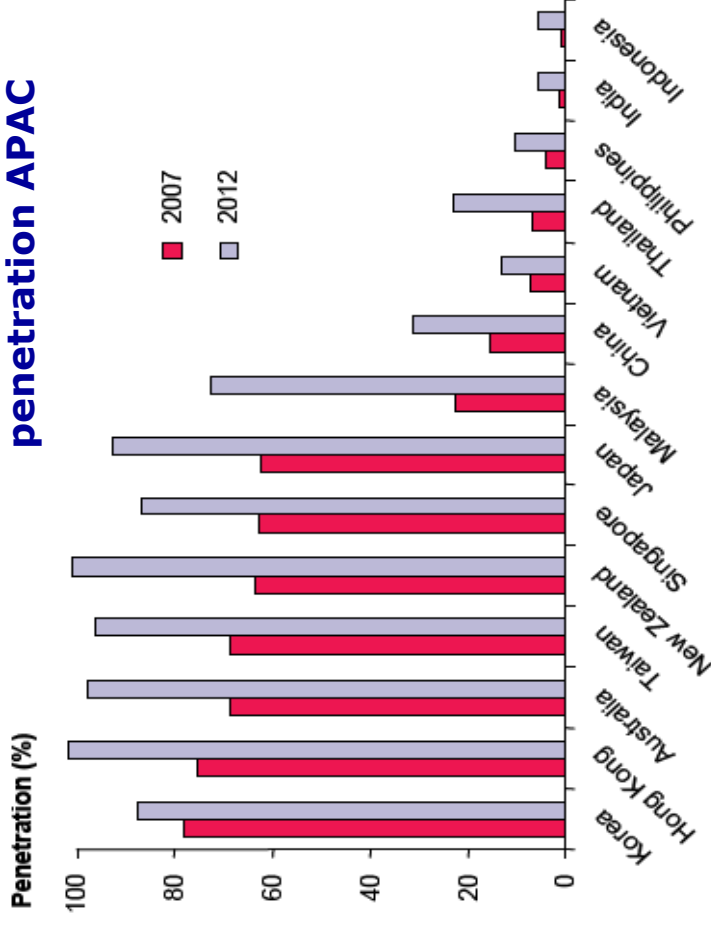
- Race to provide ever **faster** fixed **broadband** speed; deployment of mobile broadband at ever lower price
- **Broadband has become an commodity**, fiber deployment, IP-based voice, video applications and 3G mobile use
- **Fixed and mobile** technologies complement each other

LOW INCOME ECONOMIES

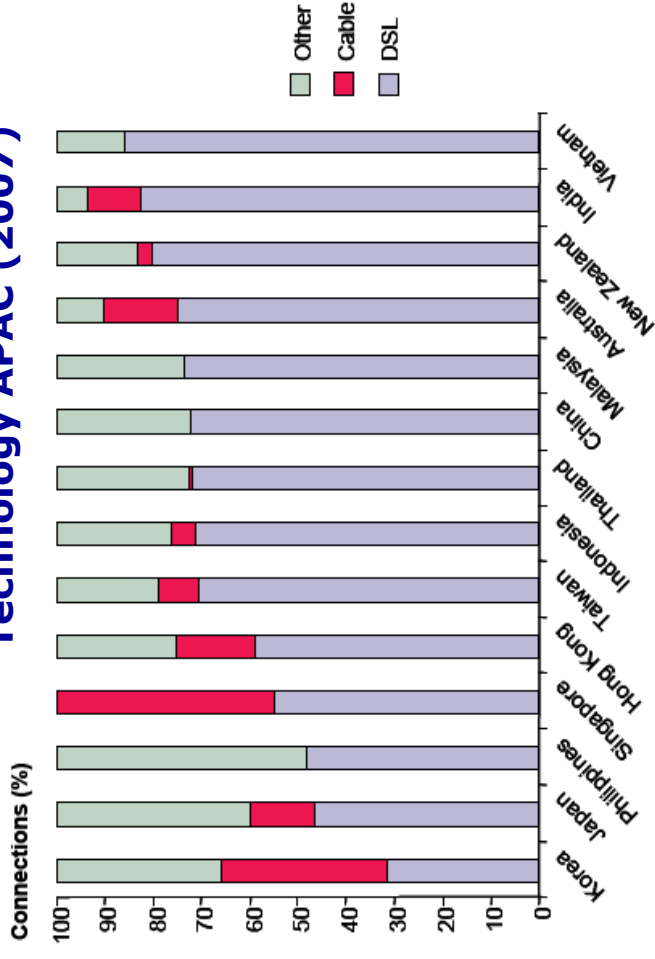
- Mobile phones have become a **substitute for fixed line and fixed broadband** access
- **The mobile phone** is often the primary internet device
- **Disparity between Internet user and internet subscriber count**, Internet connections are often shared (eg internet cafes)

Broadband Market Penetration

Total broadband household penetration APAC



Broadband Connections by Technology APAC (2007)



Note: 'Other' includes FWA, FTTB+LAN and FTTH, as well as business Ethernet services, leased lines and other forms of access

Source: Ovum, Apr'09

- DSL is main broadband technology in APAC but remains flat over the coming years
- Wireless broadband (HSPA, WiMAX, Ev-DO) continues to grow rapidly

The Market Trends

Elements	Technological Base	Material Reality 2000	Material Reality 2009
Terminals	Microelectronics batteries	Desktop PC, playstation, catalytic converter Mobile phone, Voice SMS photo the Kodak/Fuji way	Blackberry, tablet PC, PDA, GPS, laptop mobile, iPod, digital photo 3.1 megapixels, Nintendo DS, BlueRay
Applications	Java data bases web	Internet at 50kbit/sec MP4, MPEG4, office Google, YouTube	Broadband, Rich Internet Internet IPv6, office collaboration security, YouTube, Ebay, Google Maps, facebook
Networks	Mobile Networks Fixed Networks	GSM, GPRS, free	GPON, FTTH, ADSL2, WiFi, Bluetooth, 3G HSPA, WiMAX

The Market Trends

Elements	Technological Base	Material Reality 2000	Material Reality 2009
Terminals	Microelectronics batteries	fixed	mobile
Applications	Java data bases web	modest	rich
Networks	Mobile Networks Fixed Networks	slow	fast



Broadband Wireless Evolution and challenges in Emerging Markets

Yogyakarta, Indonesia, 27-29 July 2009



Broadband ?
Poor competition & Offers



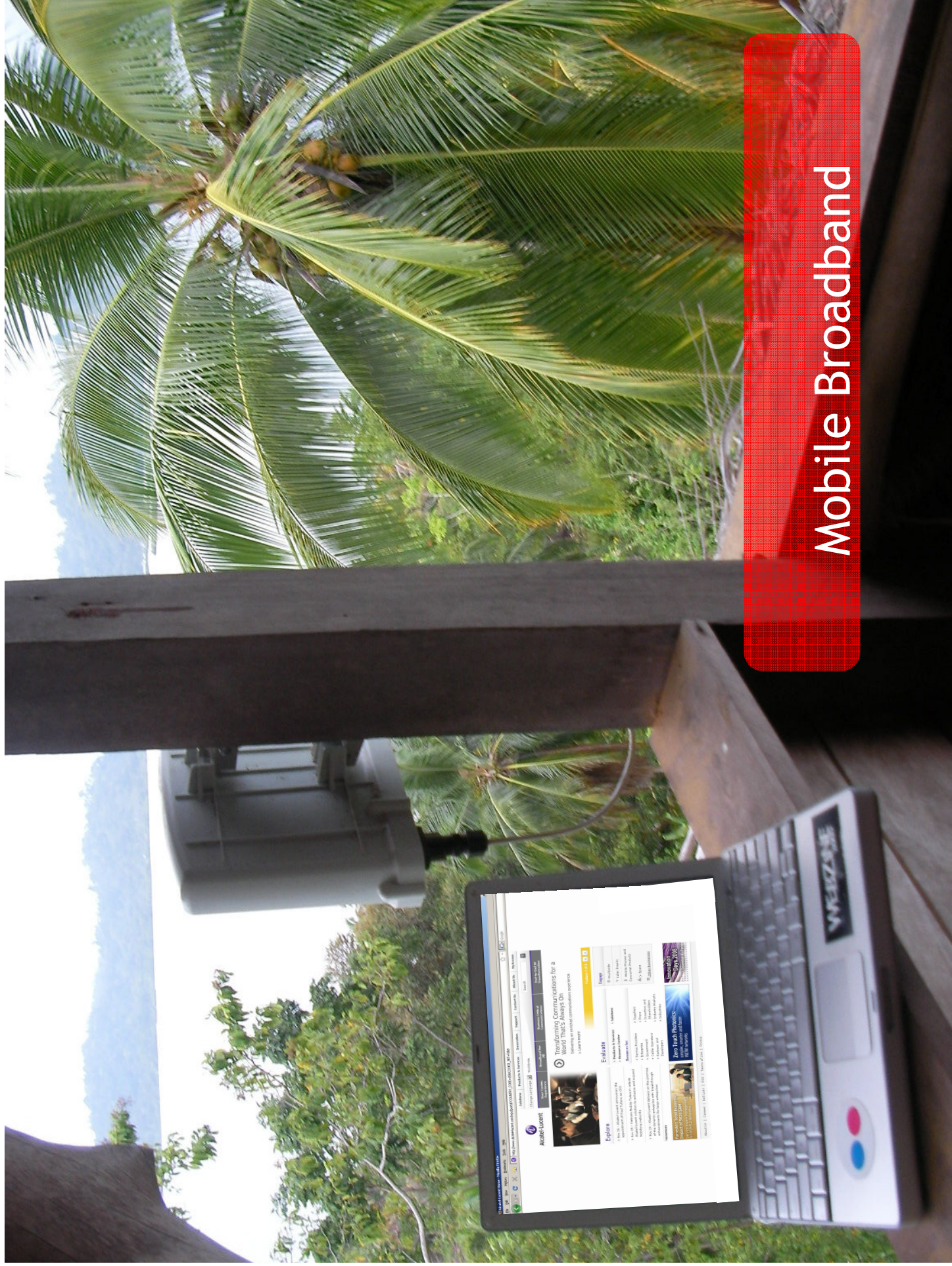
Market demand

Fixed Infrastructure





Mobile...



Mobile Broadband

Growth Areas for mobile operators

Three key market segments for growth:

1. Lower ARPU, <5 US\$ ARPU

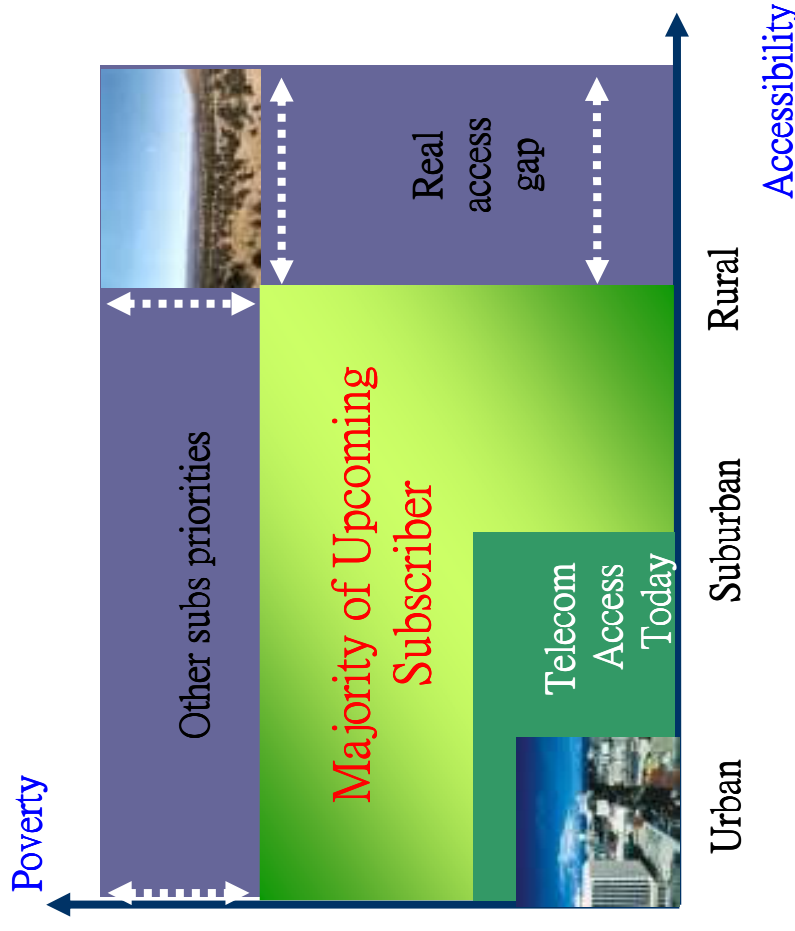
- Potential subscribers already covered but can't afford the service

2. Rural

Potential subscribers outside network reach

3. Advanced / broadband users

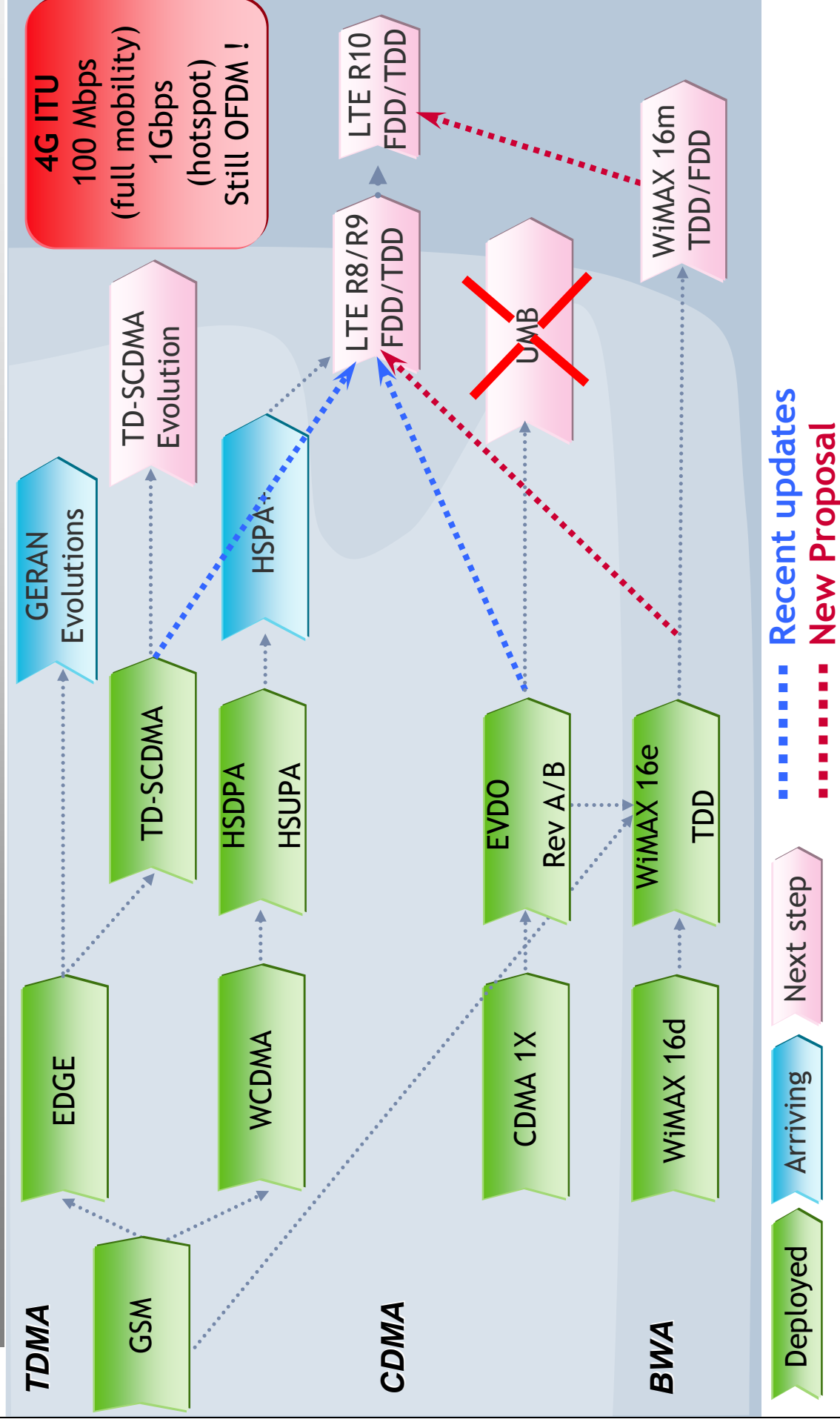
Affluent urban subscribers demanding richer services (broadband, entertainment, personalised services)



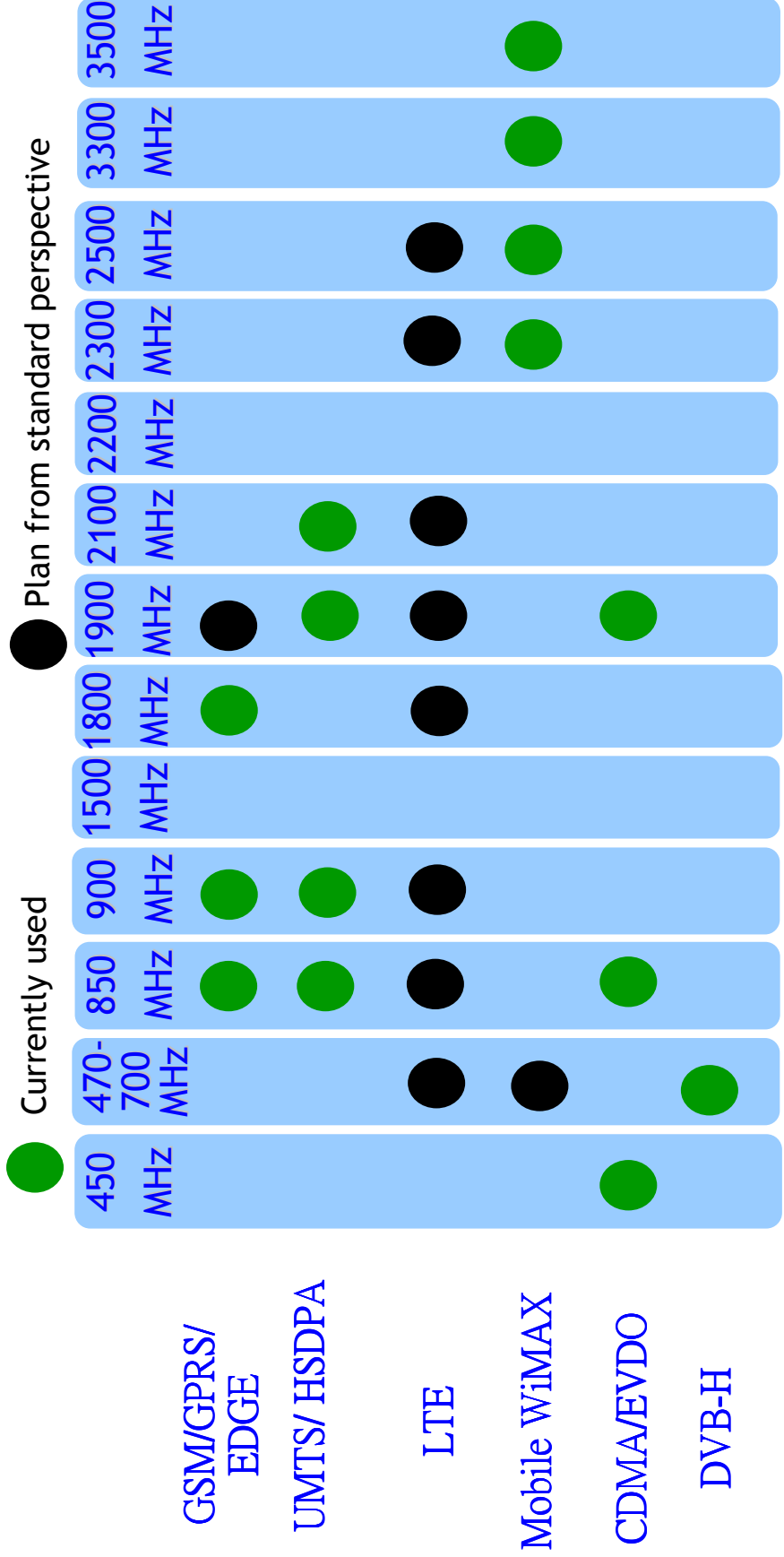
Key challenges for the network:
TCO, Coverage, Broadband / Multimedia

Air Interface / Standards evolutions

All technologies have NOW an upgrade path to LTE



Flexible Spectrum Bands



- New spectrum in 2/3 GHz bands for capacity, lower sub 1 GHz bands for coverage
- Re-farming legacy spectrum cellular bands for new technologies
- Re-farming from Broadcast to Telco spectrum

Comparing Wireless Technologies

	UMTS (R.99)	HSPA	HSPA+	WiMAX	LTE
Radio Access	W-CDMA	W-CDMA	W-CDMA	sOFDMA	OFDMA DL SC-FDMA UL
Bandwidth	5MHz	5MHz	5MHz	5MHz, 10MHz	Scaleable 1.4 - 20MHz
DL Modulation	QPSK	QPSK/16QAM	QPSK/16QAM/64 QAM	QPSK/16QAM/ 64QAM	QPSK/16QAM/6 4QAM
UL Modulation	BPSK	QPSK	QPSK/16QAM	QPSK/16QAM	QPSK/16QAM
Antenna Systems	Rx Diversity	Rx Diversity	2x2 MIMO	BF, 2x2 MIMO	2x2 - 4X4 MIMO
Network Structure	Node B + RNC	Node B + RNC	Node B + RNC Or eHSPA Node B	WBS to HA	eNode B to ePC
Services	CS & PS	CS & PS	PS but Compatible to CS	PS only	PS Only
Transport	ATM/ Mixed ATM & IP	ATM/ Mixed ATM & IP	Possibly All IP	All IP	All IP

Higher Spectrum Efficiency

	<u>Throughput</u>	<u>Latency</u>	<u>Average Spectral efficiency</u> (<i>bps/Hz/cell</i>)	<u>Voice Capacity</u> (<i>Erlangs/MHz/cell</i>)
LTE	173 Mb/s DL 86 Mb/s UL	<10ms	2.1 DL 1.6 UL	45-55
WiMAX	48 Mb/s DL 7 Mb/s UL	60ms	1.9 DL 0.8 UL	32-47
HSPA +	28.8 / 43 Mb/s DL 11.5Mb/s UL	30ms	1.5 DL 0.6 UL	26-32
HSPA	14.4 Mb/s DL 5.7Mb/s UL	60ms	0.75 DL 0.25 UL	14-17
UMTS	2Mbps DL 768 kbps UL	120ms	0.25 DL 0.1 UL	10-17

New wireless standards offer significantly better performance, thus improving network economy and end-user experience



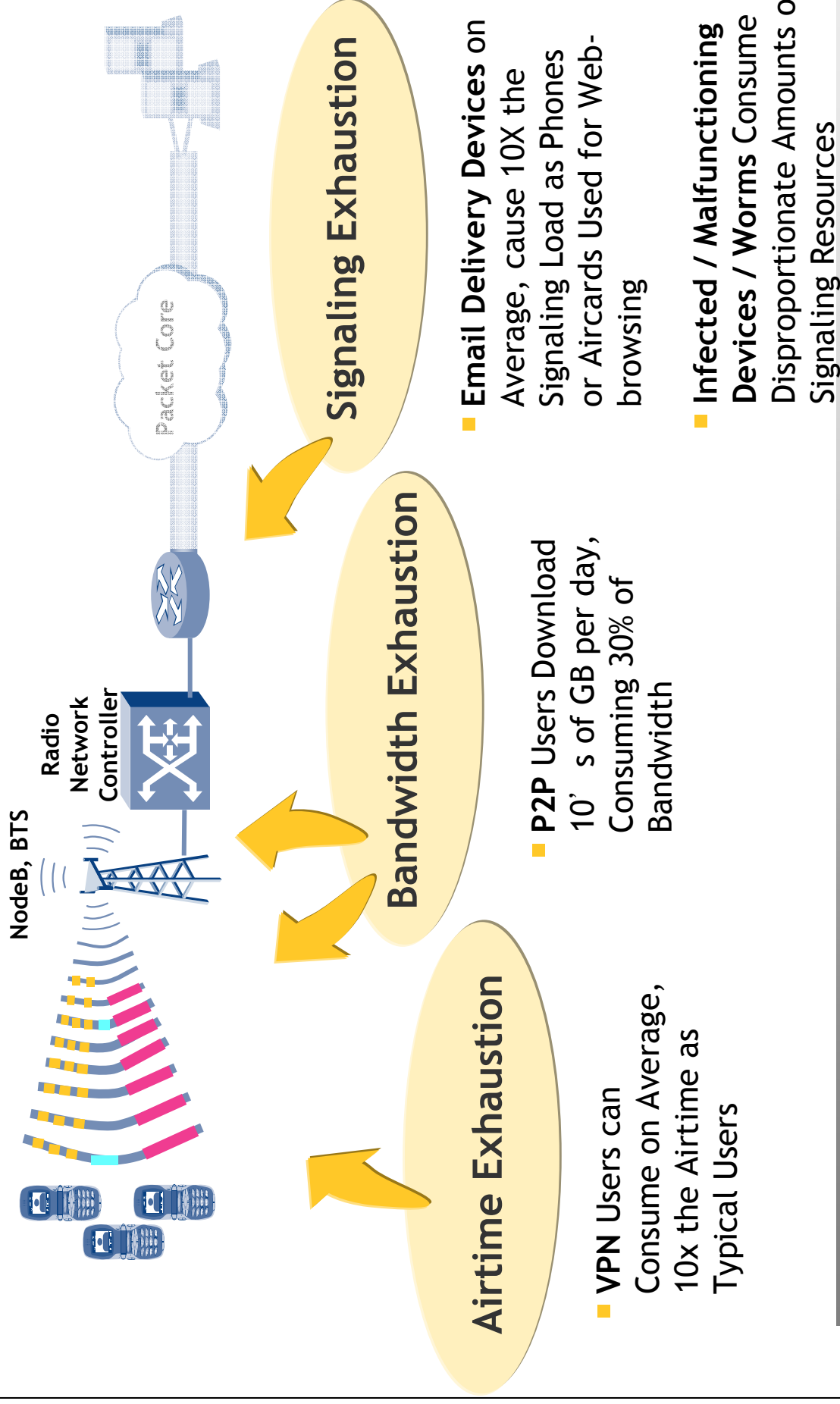
Wireless Broadband Service A Realty Check

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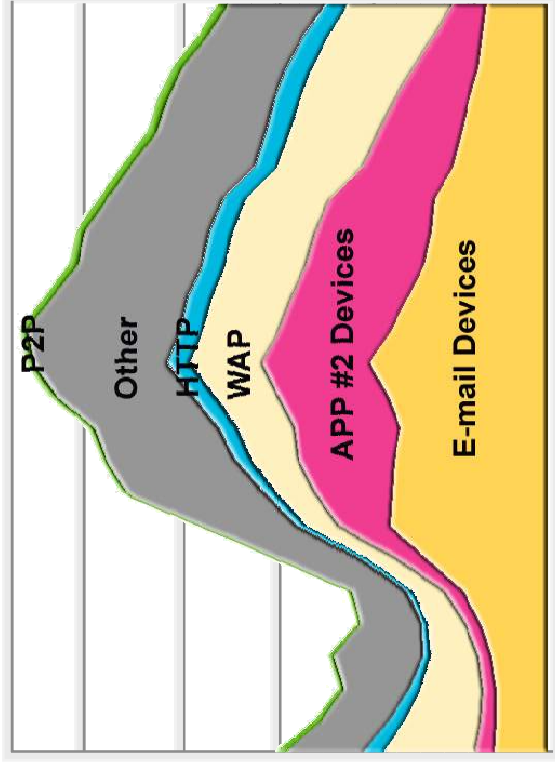
Wireless Broadband in Emerging Markets

- Urban areas: Wireless Network with poor Service Quality
 - Disparity between advertised speeds and experienced speeds
 - Networks - designed for mobile data – are also used for residential broadband
 - Multiple Networks available but often congested
- Rural areas: Coverage problem
 - UMTS/HSPA and EVDO service limited to cities
 - Network economy challenge

IP Wireline Applications People Use Every Day ... Have VERY Different Impacts on the Wireless Data Network

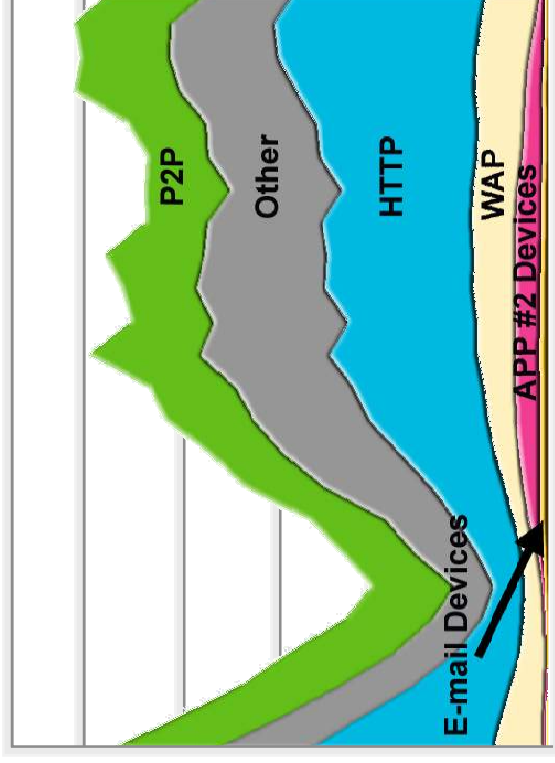


IP Traffic Looks Very Different When Viewed by How It Consumes Resources in the Radio Access Network



“Cost per Minute”

New Management Paradigm:
Evolving IP Traffic Impact on
Wireless Network Resources



“Cost per Bit”

Most Common Framework for
Designing/Managing/Pricing
Networks Today

IP Applications Consume Widely Different Loads on the Wireless Network

Each Subscriber Running Each Application Consumes	Volume	Total Airtime Consumed	Signaling Events
Mobile Web	1 MB	20 minutes	100
P2P	1 MB	30 seconds	0.3
Email Devices	1 MB	2 hours	1500
MSN Spam	1 MB	2 hours	1400

P1 WIMAX makes your life easier with:

Portable Modem WIGGY

Made for quickies
WIGGY promises instant satisfaction with up to **10Mbps speed!**

Pocketsize
Ultra small & ultra light, use it, wear it or put it in your pocket.

Not just for looks
An advanced MIMO antenna design means WIGGY is tiny in size but big on performance.

better speed for less BROADBAND DONE RIGHT

For as little as RM58, you get consistent speed with our advanced 14.4Mbps F-SPA network and generous usage volume. So you can keep on smiling. Just some of the things that make our broadband a little nicer.

Discover
RM58
> more

Explore
RM108
> more

Extreme
RM188
> more

I'm Interested



Youth Plan is only available for...

ここからスタート

画期的な高速モバイル通信とその技術

UQ WIMAXは下り最大40Mbps※1
大容量データもストレスなくダウンロード、アップロードが可能になります。

40 [下り最大] Mbps ※1

10 [上り最大] Mbps ※1

□ 最大通信速度(下り)比較

他社データ通信カード

7.2Mbps ※2

UQ WIMAX

40Mbps! ※1

close

For Students & NSFs

Youth	2000	4000	7200	PAY-PER-USE
	1.5Mbps 384kbps	4Mbps 1Mbps	7.2Mbps^ 1.5Mbps^A	\$0.01/2KB (min. of \$0.05/session) capped at \$319.93
	\$29.00	\$37.00	\$51.00	
			\$72.76	

\$0.001/2KB (min. of \$0.005/session)

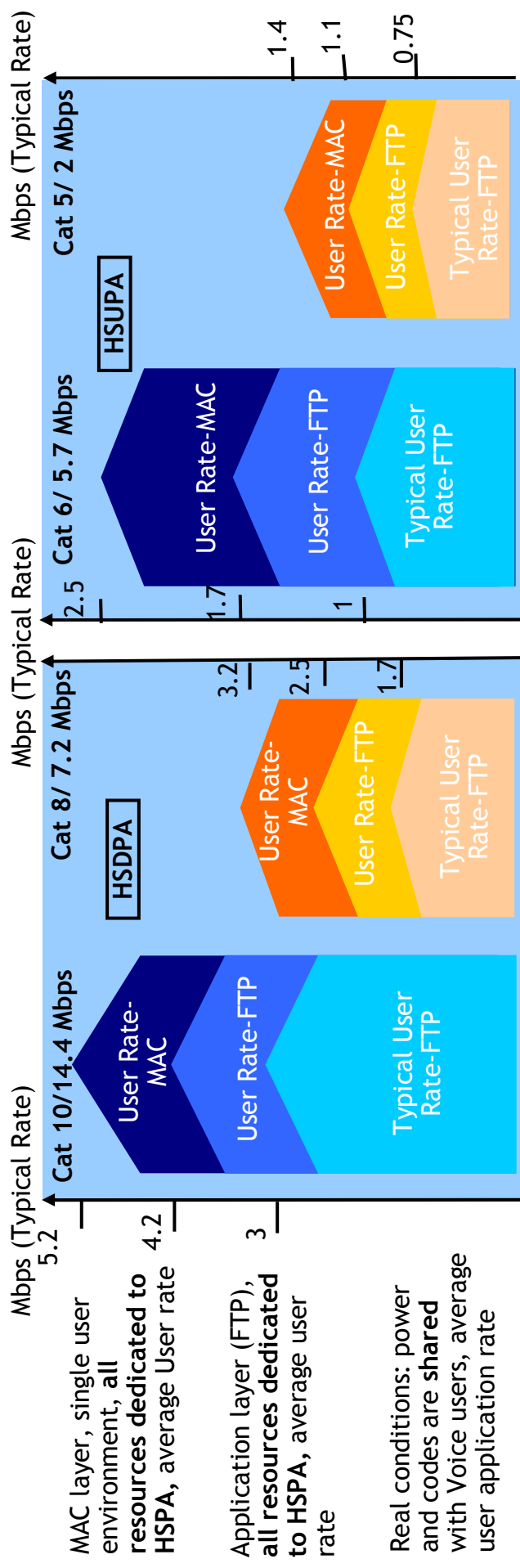
Check Out The Latest Promotions!

Which Plan Should I Take?

HSPA Field Performances

- “Real” speed is much below peak rate
- End user performance depends on:

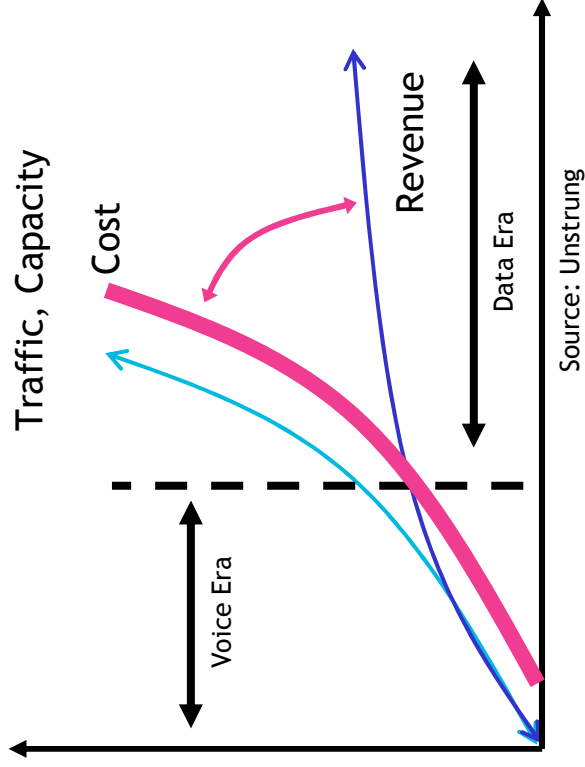
- ➡ UE category
- ➡ Location (lower rate at the cell edge)
- ➡ Network load



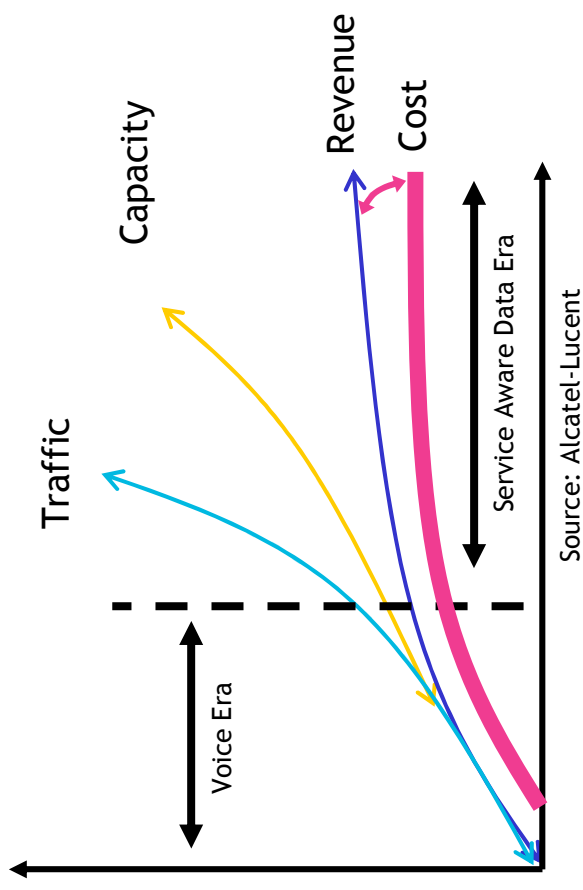
Backhaul to cope with traffic growth

- Conventional TDM based backhauling doesn't scale for data traffic
- Migration to packet transport

The limit of TDM Backhauling:



A cost effective Packet Transport



Challenges of Wireless Broadband in Emerging Markets and Technology Response

Market Key Challenge #1: **Affordability**

How to serve <US\$5 ARPU
profitably?

Improved network economy (TCO)

- Multi-standard solutions, converged RAN
- Reduced power consumption and foot print
- NGN core / IP transport (META)
- Infrastructure sharing
- Flat IP centric, higher capacity RAN, self optimization

Market Key Challenge #2: **Accessibility**

How to extend coverage into rural
areas?

Solutions for wider coverage in rural areas

- Low frequency bands: 450/700/850/900 MHz
- Digital dividend, LTE 700 MHz
- Refarming (e.g. UMTS900)
- Low power consumption and alternative power solutions
- Satellite backhaul or long range microwave solutions

Market Key Challenge #3: **Broadband Performance**

How to optimize the network for a
better broadband experience?

Broadband optimised radio networks

- EVDO, HSPA/HSPA+, LTE, WiMAX
- HOF (16QAM, 64QAM), MIMO
- Optimized, “flat” architecture reduces latency
- Multiple (EVDO, HSPA) and wider carrier (WiMAX, LTE)
- Data centric (IP) backhauling



The Right Technology Mix

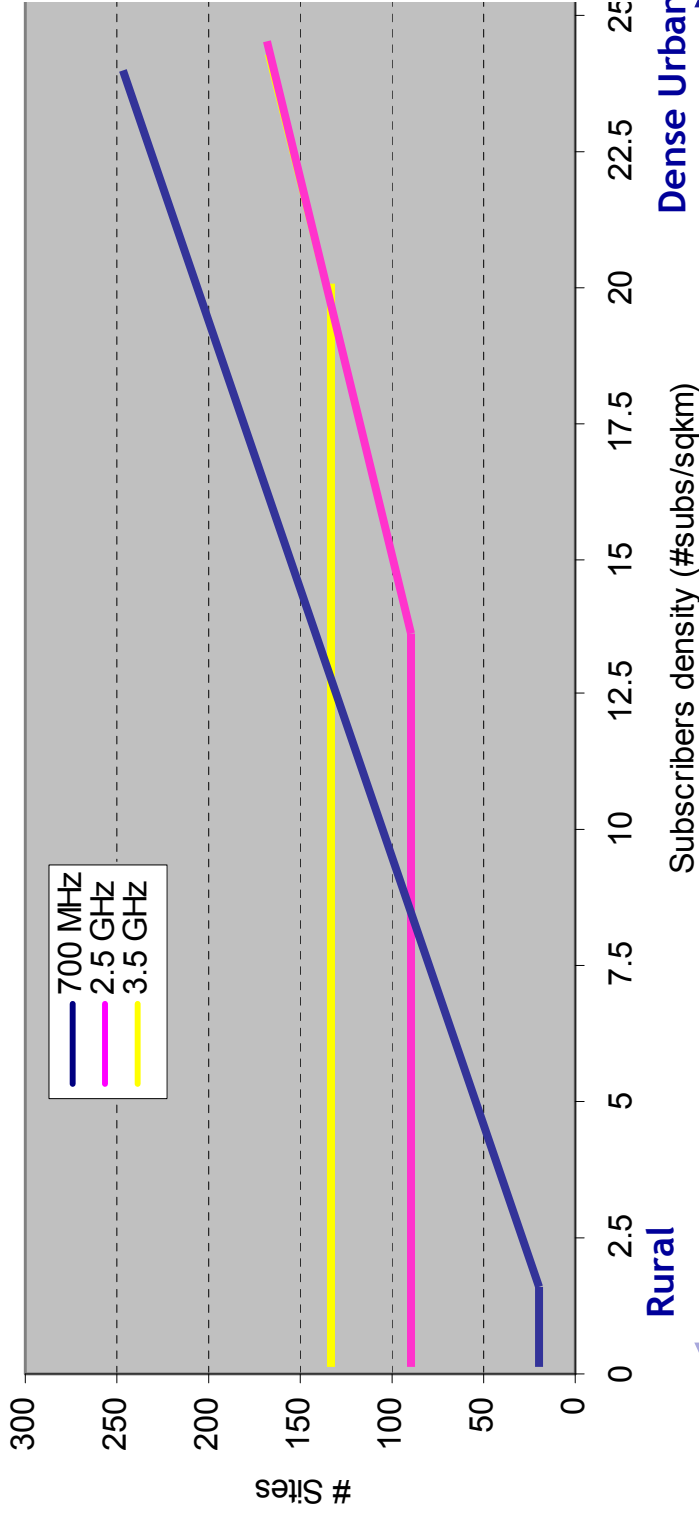
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Which Wireless Technology?

- **Market environment**
 - Demand for services and applications
 - Performance and QoS requirements
 - Competitor environment
- **Availability and Maturity** of the technology
 - Sufficient choice of suppliers
 - Compliant with Industry standards
 - System economy
 - Availability and cost of terminals
- **Availability of Radio Spectrum**
 - What frequency Band and what bandwidth profile ?
 - Paired (FDD) or unpaired (TDD)?
- **Regulatory environment**
 - Infrastructure sharing
 - USO/USF
- **Competition Environment**
 - Existing fixed and mobile services

Frequency Bands, Coverage and Capacity

Sites/Sub density in Rural environment

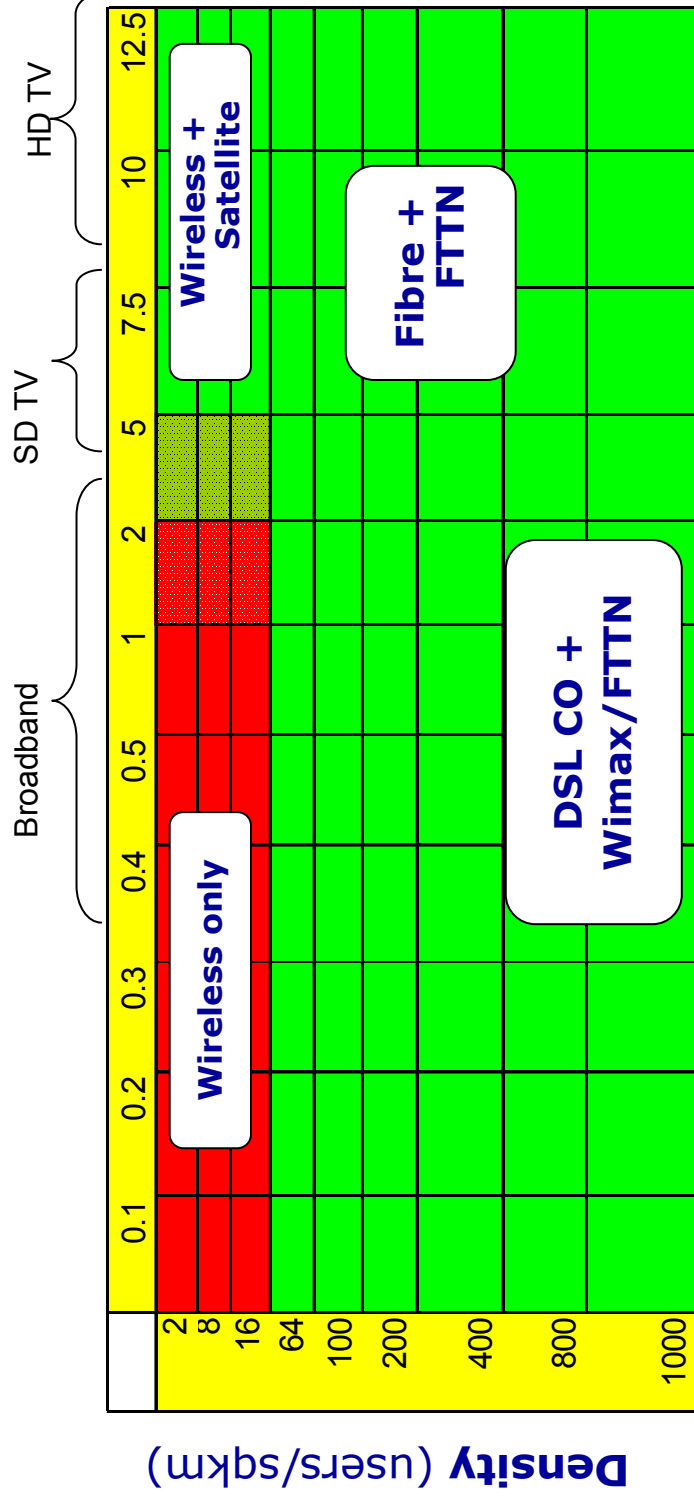


ALU estimates
Assumption:
700MHz@10MHz profile,
2.5GHz/3.5GHz@20MHz profile.
700MHz more prone to inter-cell interference in high interference conditions

- Lower frequencies require less sites, more suitable for rural environments
- Different bands have limitations on amount of BW available, eg. smaller BW typically in low frequencies, larger BW in high frequencies

BANDWIDTH vs DENSITY

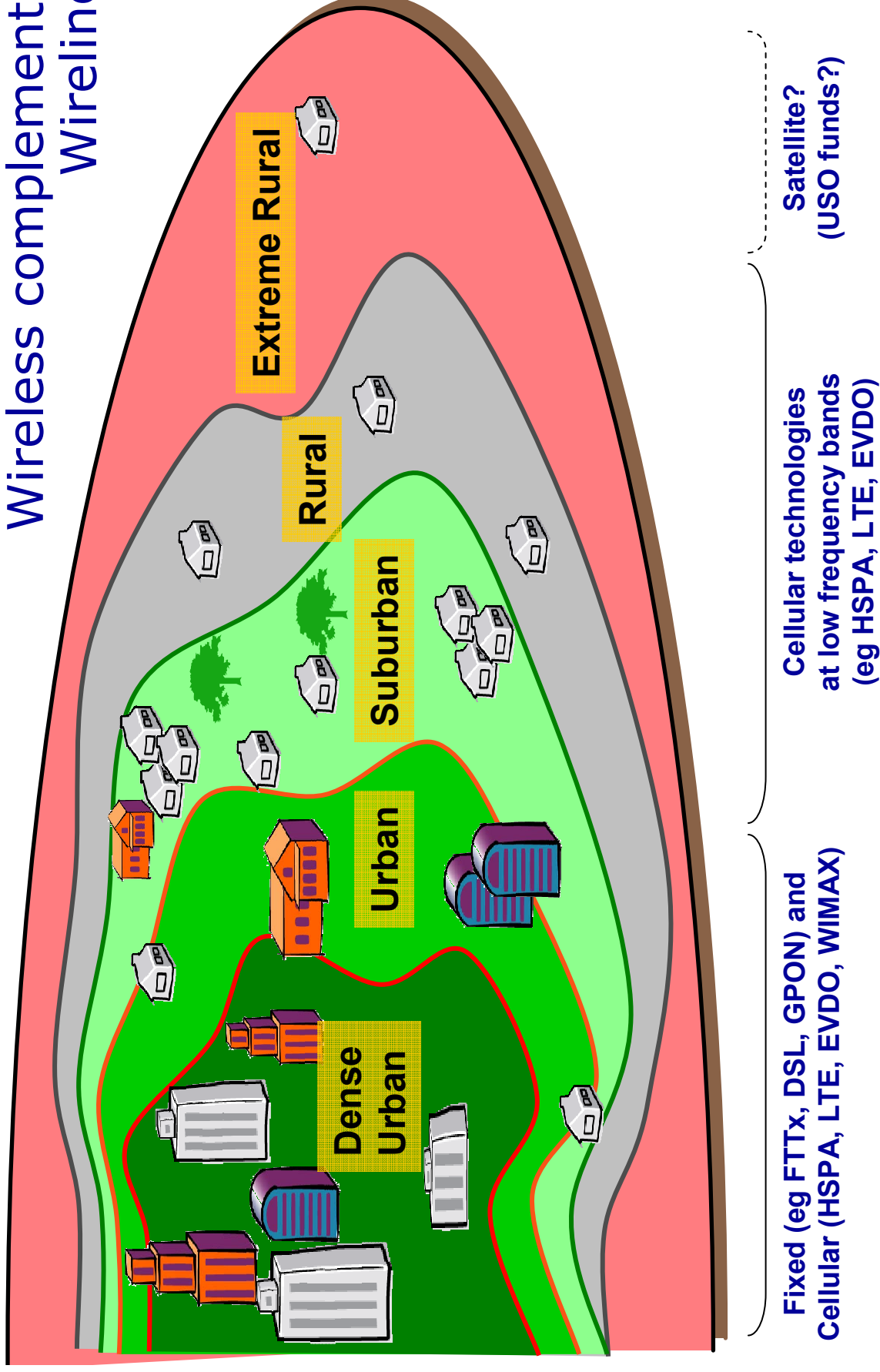
■ Bandwidth per user (Mbps)



- Mobile Broadband is quick and easy approach to address broadband demand
- Fixed technologies scale better for high density areas and greater bandwidth demand

Summary - The Right Technology Mix

Wireless complements
Wireline

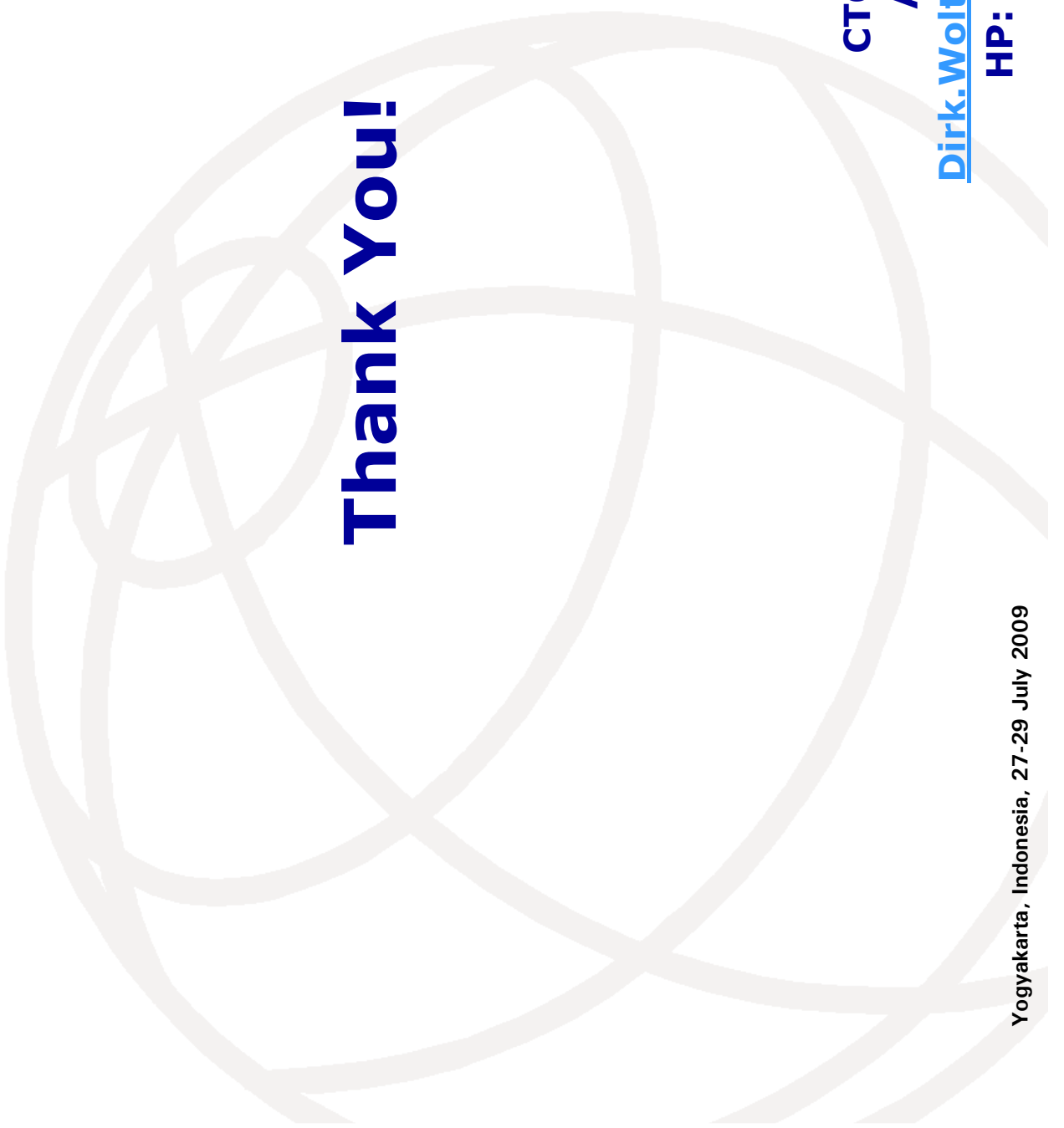




Conclusion

Conclusion

- In Emerging markets, broadband penetration lags behind mobile penetration, wireless broadband serves also residential users (substitute for fixed networks)
- Wireless broadband networks often don't cover rural areas and are congested in dense urban areas
- Stakeholders to improve wireless broadband service:
 - ◆ Equipment suppliers → Technology provider
 - ◆ Operators → Rollouts, service provider, tariffs
 - ◆ Regulator → Facilitator: USF, spectrum, digital dividend
- Broadband wireless has its limits...
 - ◆ “real” performance much lower than advertised peak rates. Bottlenecks mostly in the radio access
 - ◆ Need to be complemented with fixed technologies (eg DSL, PON) to meet demand in dense urban areas
 - ◆ Lower frequency technologies (UMTS 900, LTE 700) for rural areas



Thank You!

Dirk Wolter
CTO S&SEA Region
Alcatel-Lucent
Dirk.Wolter@alcatel-lucent.com
HP: +62 816 91 0849