ITU-D Regional Development Forum for the Asia Pacific Region

"NGN and Broadband, Opportunities and Challenges"

Yogyakarta, Indonesia, 27 – 29 July 2009

Mobile broadband technology opportunities in emerging markets

Alex Orange

for UMTS Forum

promoting mobile broadband evolution

Outline

1. Introduction – UMTS Forum & 3G
2. Challenge: Access to Spectrum
3. Challenge: Supporting Regulation
4. Opportunity: Benefits of mobile Broadband

1. Introduction

UMTS Forum 2009 key focus areas

Communication and Promotion	
Visibility and participation at conferences, exhibitions, seminars and workshops	Relationships with international media and financial community
Key focus Areas	
Spectrum & Regulation	Global Mobile Broadband/LTE Ecosystem
Advice to industry and administrations on 3G/LTE licensing & regulation	Roadmap and competitive benefits for HSPA, LTE and beyond
Global spectrum and spectrum arrangements for UMTS/IMT-2000 and IMT-Advanced	
Key Growth Markets Action Plan	
Contributions to international organisations (ITU, EC, CEPT/ECC, 3GPP)	
Partnerships with international bodies (ETSI, NGMN, GSMA, ICU, COAI, APT, 3GAs...)	

Broadband Opportunity

"Broadband networks are increasingly recognized as fundamental for economic and social development."

OECD – The Role of Communication Infrastructure investment in Economic Recovery 19 May 2009
Document: DSTI/ICCP/CISP(2009)1/FINAL

the comparative GDP growth rate of a developing country can be boosted by 0.59 percent per annum for every 10 mobile telephones added per 100 inhabitants.

Melvyn Fuss, Meloria Meschi and Leonard Waverman, "The Impact of Telecoms on Economic Growth in Developing Countries in Africa: The Impact of Mobile Phones." Vodafone Policy Paper Series 2, 2005

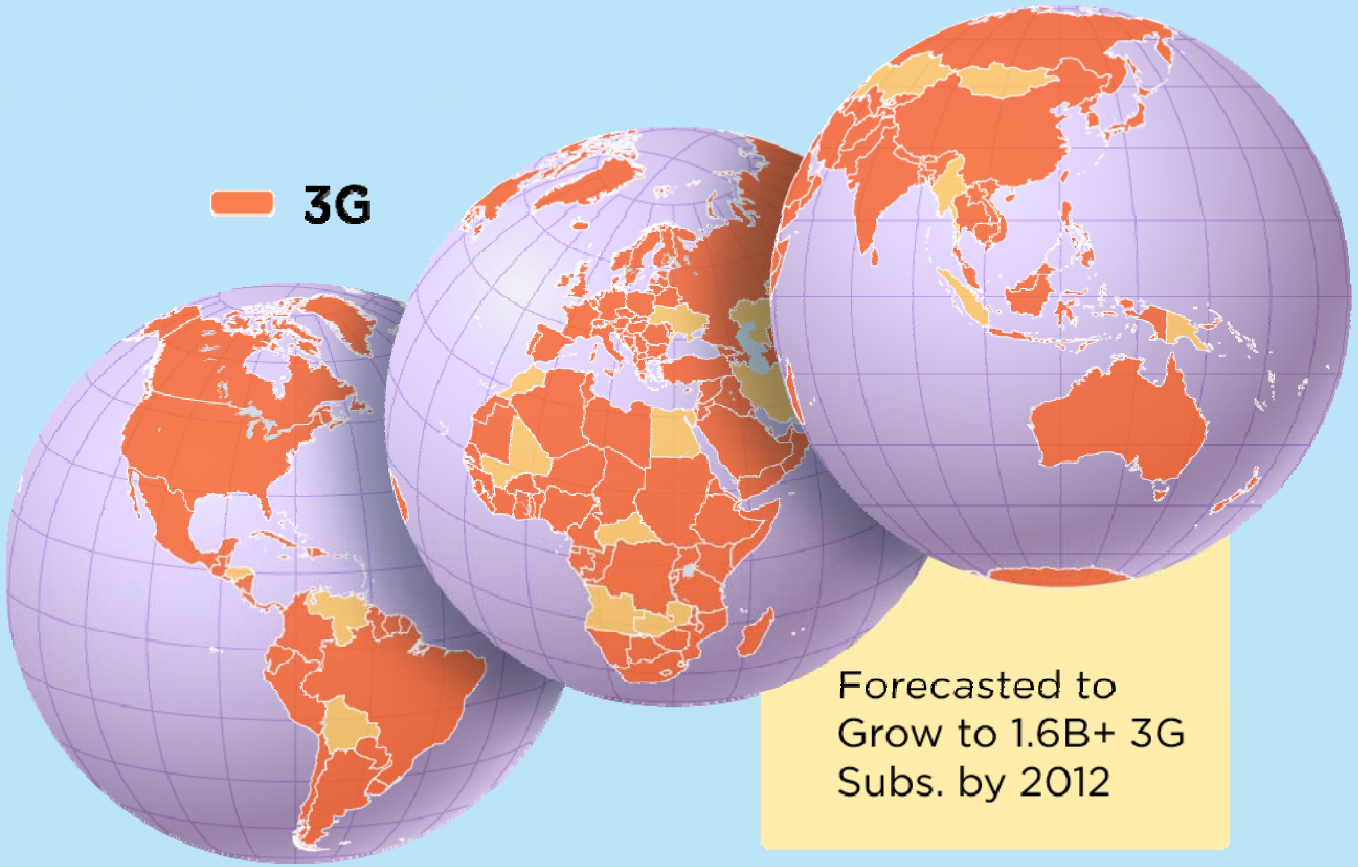
When Internet penetration rises by 10 percent in emerging economies, it correlates with an incremental GDP increase of one to two percent.

The Boston Consulting "Socio-economic Impact of Internet in Emerging and Developing Economies" (2009).

IMT/3G is mobile Broadband

- ITU-R Recommendation M.1801 “Radio interface standards for broadband wireless access systems, including mobile and nomadic operations, in the mobile service operating below 6 GHz”
- Annex 2: “IMT-2000 terrestrial radio interfaces”

500 Million+ IMT/3G Subscribers Today



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Source: Wireless Intelligence

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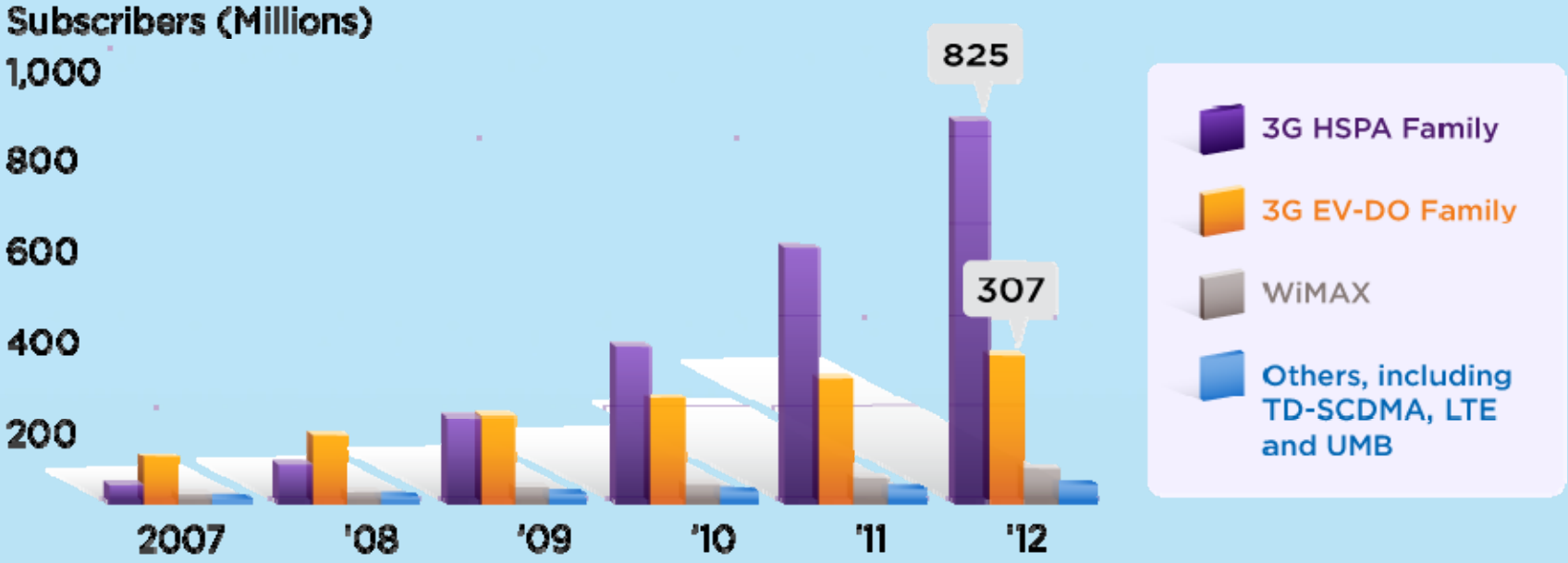
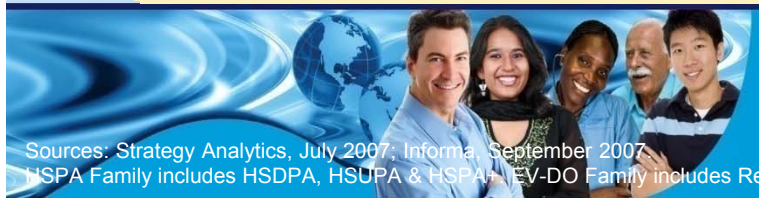
IMT/3G Will Drive Mobile Broadband Connections Into the Next Decade



3G will command **92%** of the Mobile Broadband market in 2012



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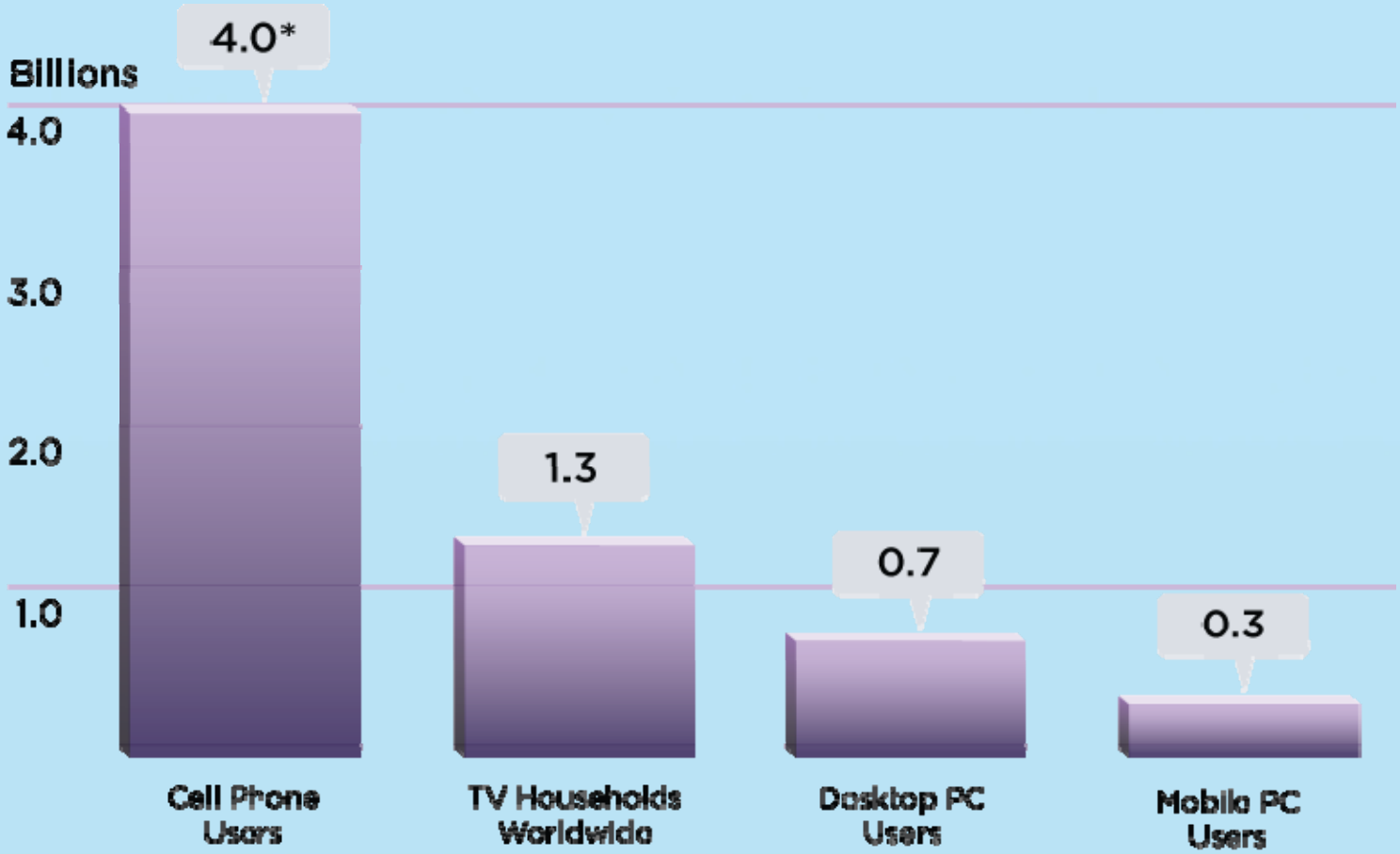
Sources: Strategy Analytics, July 2007; Informa, September 2007
HSPA Family includes HSDPA, HSUPA & HSPA+; EV-DO Family includes Rel. 0, Rev. A and Rev. B.

Nearly 2 Billion More Than Any Other Computing or Consumer Electronics Device



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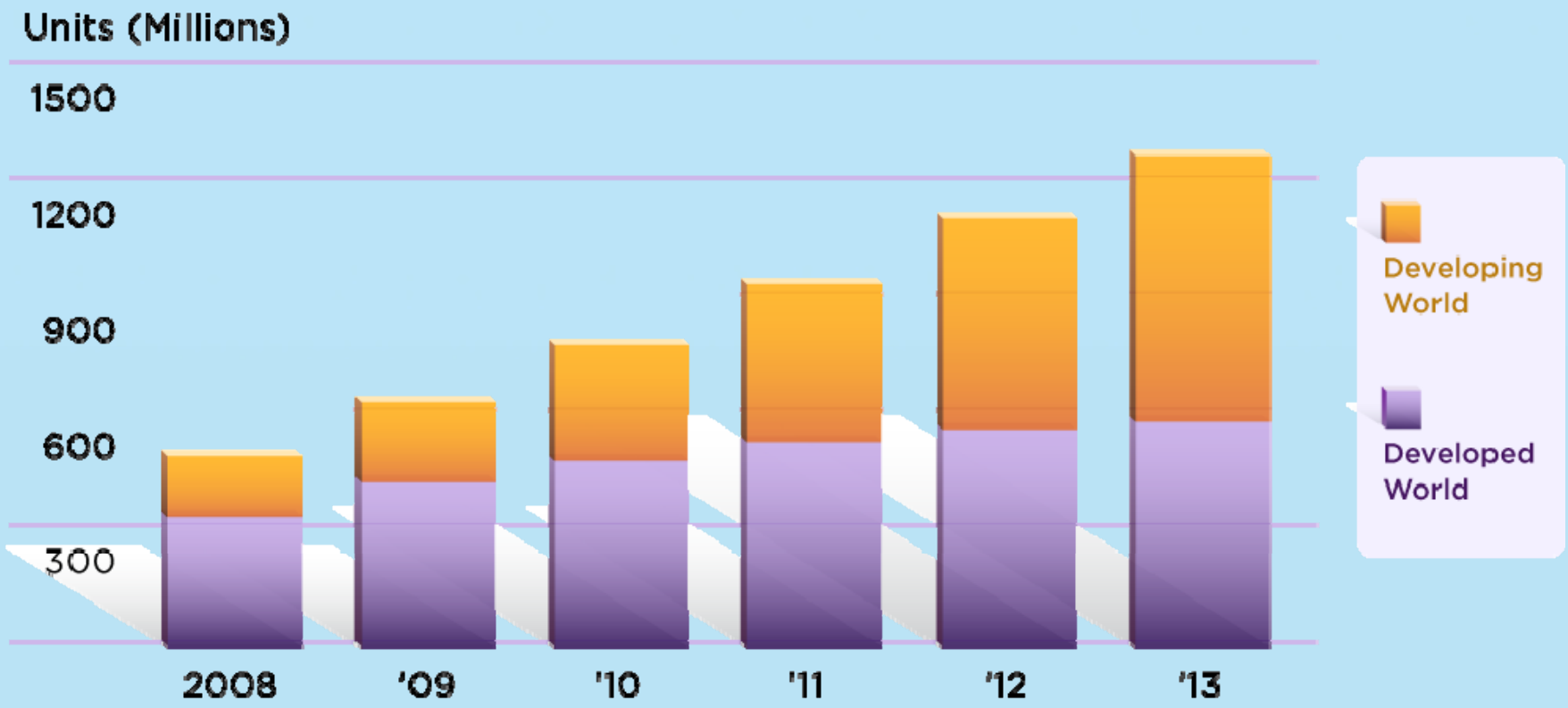
*2008 Estimated

Source: ITU, Informa, Wireless Intelligence, Instat, IDC

Developing Markets Drive YoY 3G Growth

3G Handset Forecast Breakdown



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Ovum, May 2008. Developed world includes W. Europe, North America, and developed APAC (Austr. Japan, Korea, New Zealand). Developing world includes all others.

IMT/3G: Evolution Paths

Excellent Mobile Broadband Today
Voice and Full Range of IP Services

Enhanced User Experience
Improved voice and data capacity

Broadband downloads	Broadband uploads, QoS	2x data capacity >2x voice capacity	Multicarrier- doubled data rates to all users	Enhanced performance and higher data rates
Rel-99 WCDMA	Rel-5 (HSDPA) HSPA	Rel-6 (HSUPA) HSPA	Rel-7 HSPA+ (HSPA Evolved)	Rel-8 HSPA+ (HSPA Evolved)
				Rel-9 and beyond HSPA+ (HSPA Evolved)
DL: 1.8-14.4 Mbps UL: 384 Kbps	DL: 1.8-14.4 Mbps UL: 5.7 Mbps	DL: 28 Mbps UL: 11 Mbps	DL: 42 Mbps[1] UL: 11 Mbps	DL: 84 Mbps and beyond[2] (10 MHz) UL: 23 Mbps and beyond[2] (10 MHz)

Leverages new, wider and TDD spectrum

Rel-8 LTE	Rel-9 (Optimized mobility) LTE	Rel-10 LTE Advanced
		DL: 73 – 150 Mbps[3] and beyond[4] UL: 36 – 75 Mbps[3] and beyond[4] (10 MHz – 20 MHz)

[1] R8 will reach 42 Mbps by combining 2x2 MIMO and 64QAM in 5MHz, or by utilizing 64QAM and multicarrier in 10 MHz.
[2] R9 and beyond may utilize combinations of multicarrier and MIMO to reach 84 Mbps peak rates. Similarly, uplink multicarrier can double the uplink data rates.
[3] Peak rates for 10 and 20 MHz FDD using 2x2 MIMO; standard supports 4x4 MIMO enabling peak rates of 300 Mbps. TDD rates are a function of up/downlink asymmetry.
[4] Peak rates can reach or exceed 300 Mbps by aggregating multiple 20 MHz carriers as considered for LTE Advanced (LTE Rel-10).

2009 2010 2011 2012+

Note: Estimated commercial dates

Created 01/14/09

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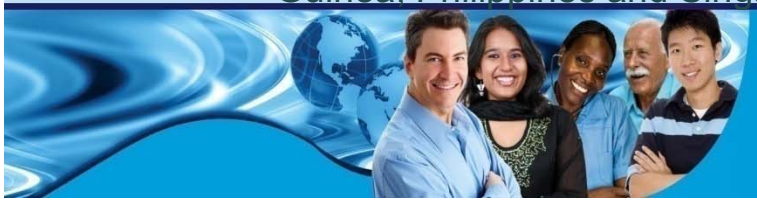
2. Spectrum

International Harmonization

- ITU Radio Regulations 2008: IMT identifications
  - 450 – 470 MHz
  - **698 – 960 MHz Asia Pacific ***
  - 790 – 960 MHz Europe
  - 698 – 862 MHz Americas
  - **1710 - 1885 MHz**
  - **1885 - 2025 & 2110 – 2200 MHz**
  - 2300 – 2400 MHz
  - **2500 – 2690 MHz**
  - 3.4 – 3.6 GHz

* 698 – 806 MHz: Bangladesh, China, Korea (Rep. of), India, Japan, New Zealand, Papua New Guinea, Philippines and Singapore



International Harmonization

- ITU-R M.1036-3: Frequency Plans

Frequency arrangements	Mobile station transmitter (MHz)	Centre gap[(1)] (MHz)	Base station transmitter (MHz)	Duplex separation[(2)] (MHz)
A1	824-849	20	869-894	45
A2	880-915	10	925-960	45

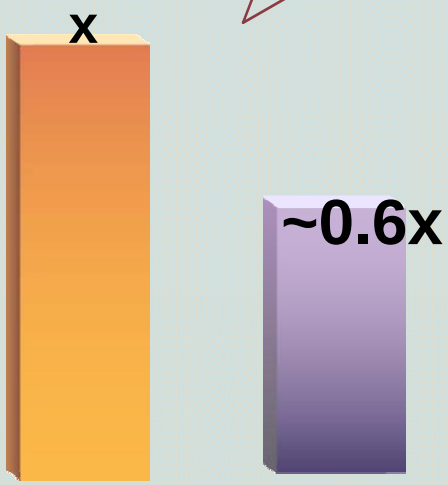
Frequency arrangements	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	Un-paired spectrum (e.g. for TDD) (MHz)
B1	1 920-1 980	130	2 110-2 170	190	1 880-1 920; 2 010-2 025
B2	1 710-1 785	20	1 805-1 880	95	None
B3	1 850-1 910	20	1 930-1 990	80	1 910-1 930
B4 (harmonized with B1 and B2)	1 710-1 785 1 920-1 980	20 130	1 805-1 880 2 110-2 170	95 190	1 900-1 920; 2 010-2 025
B5 (harmonized with B3 and parts of B1 and B2)	1 850-1 910 1 710-1 770	20 340	1 930-1 990 2 110-2 170	80 400	1 910-1 930

Frequency arrangement	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	Centre gap usage
C1	2 500-2 570	50	2 620-2 690	120	TDD
C2	2 500-2 570	50	2 620-2 690	120	FDD DL (external)
C3	Flexible FDD/TDD				

900 MHz

is Cost-Effective for Rural Coverage

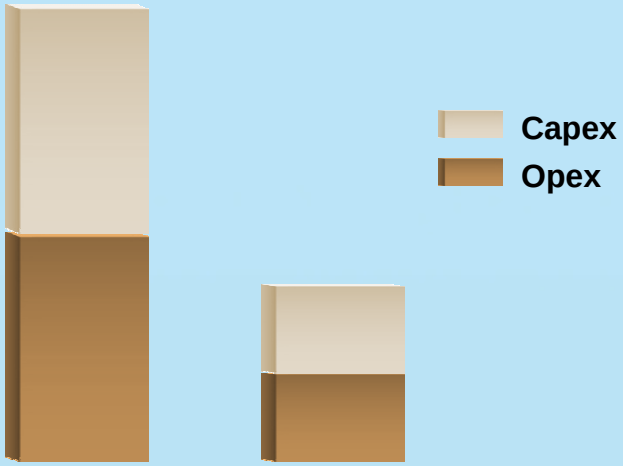
UMTS900 requires ~40% less sites[1]



HSDPA Coverage
(Rural Morphology)

elisa

UMTS900 offers same coverage with 50-70% less cost[2]



UMTS Forum White Paper

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[1] Hata Model for 900 MHz, COST-Hata Model for 2.1 GHz (1.9 GHz uplink), 30m effective antenna height for urban and suburban, 50m effective antenna height for rural. Site count based on uplink limited scenario

[2]Source: UMTS Forum White Paper: "UMTS/HSPA broadband services in the 900 MHz band: Strategy and Deployment", 2009

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900 + 2100 MHz

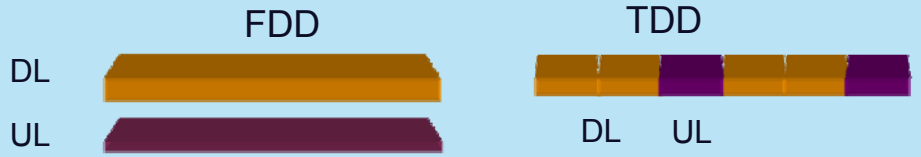
- 900 MHz Significantly improved in-door coverage because of excellent RF propagation
- 900 MHz Augments capacity of 2.1 GHz network

LTE Leverages New and Wider Spectrum

3G and its evolution
Similar LTE and HSPA+/EV-DO performance in smaller bandwidths

LTE
Leverages wider bandwidths and TDD spectrum

LTE Supports FDD, TDD &



Note: LTE also supports 1.4 MHz and 3 MHz bandwidths
TDD 2:1 shown as an example, LTE also supports Half Duplex

2500 - 2690 MHz and UHF

- First LTE deployments expected in:
  - 2500 – 2690 MHz spectrum
  - UHF digital dividend spectrum

LTE Boosts Data Capacity in Dense Urban Areas

- LTE boosts data capacity in dense urban areas
- 3G provides ubiquitous data coverage and voice services
- Seamless service continuity with 3G using multimode devices

LTE

3G Coverage

Evolved 3G ensures similar user experience outside the LTE coverage

3. Supporting Regulation

For spectrum used commercially

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Intl. Best Practice

- Spectrum Harmonization
- Technology Neutrality
- Spectrum Licensing
- Transparent Allocation/Trading
- Public Access to Licence Database
- Sustainable

Spectrum Harmonization

- Maximizes equipment availability and choice;
- Ensures efficient vendor competition → lower equipment costs;
- Maximizes economies of scale → minimizes equipment cost;
- Facilitates global roaming;

Spectrum Harmonization (2)

- Assists the mitigation of interference;
- Allows for easier evolution of 3G to provide for future broadband capability e.g. HSPA+/LTE

Spectrum Licensing

- Right to use spectrum based on boundaries (freq. pwr, space, time)
- Advantages:
  - Spectrum exclusivity allows QoS;
  - Distinct legal rights;
  - Assists application of other regulatory goals e.g. technology neutrality;
  - Lowers administrative overhead;
- Security of tenure → investment

Technology Neutrality

- Implicitly enables spectrum re-farming;
- Assists licence flexibility for licensee to;
  - Choose most applicable technology;
  - Time migration from one technology to another;
  - Choose method of migration.
- Creates opportunity for technology investment

Transparent Allocation and Trading

- Assists confidence in allocation decisions and valuation;
- Trading allows valuation and usage to be re-adjusted over time;
- Can Incentivize spectrum efficiency, utilization and innovation.

Sustainable Regulation

- Upfront Fee
  - Resource charge
  - May be set competitively
- Annual Fee
  - Reflects ongoing administrative cost of regulating spectrum licence

"Governments generally do best when they help facilitate environments that support an innovative and robust participation by the private sector."

OECD – The Role of Communication Infrastructure investment in Economic Recovery 19 May 2009
Document: DSTI/ICCP/CISP(2009)1/FINAL

4. Summary

- 3G mobile broadband assists social and economic development;
- Requires timely access to complementary spectrum, and
- Technology evolution, which is
- Assisted by best practice regulation.

Thank you

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