

The Digital Dividend

Technological Perspective

Geraldo Neto, Manager Government Affairs
Montevideo, June 1st 2012.



Fortune 500 Company

Celebrating more than 25 years of driving the evolution of wireless communications

Making wireless more personal, affordable and accessible to people everywhere

World's largest fabless semiconductor company, #1 in wireless

Member of the S&P 100 & 500 Indexes



Institutional Investor
2011 All-America Executive Team Award Winner





Enhancing User Experience

Snapdragon Processors Are Complete

Built Smarter to Work Smarter





50+

Manufacturers Shipping with Qualcomm

340+

Designs Launched with Qualcomm

400+

Snapdragon Designs in Development



Source: Qualcomm data.

5

Bridging the Digital Divide in Emerging Regions



12%

PC Installed Base



5%

Fixed Internet Penetration



78% Mobile Penetration

6

Connecting Places, People and Things

Calling Places

e.g. Calling home
"Are you there?"

Connecting People

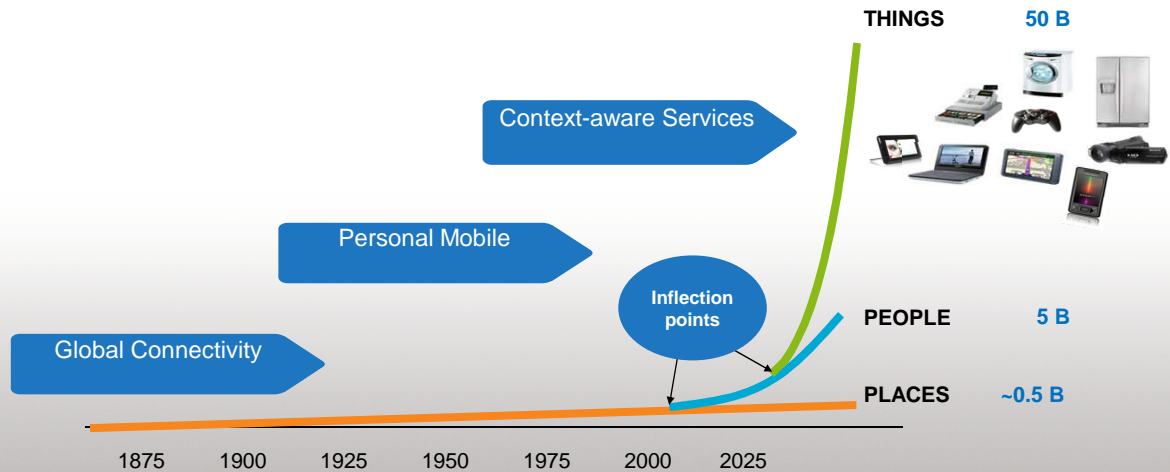
e.g. Calling friends
"Where are you?"

Internet in Your Pocket

e.g. Informed Social Network
"What's up?"

Internet of Things

e.g. Fridge tells you
you are out of milk

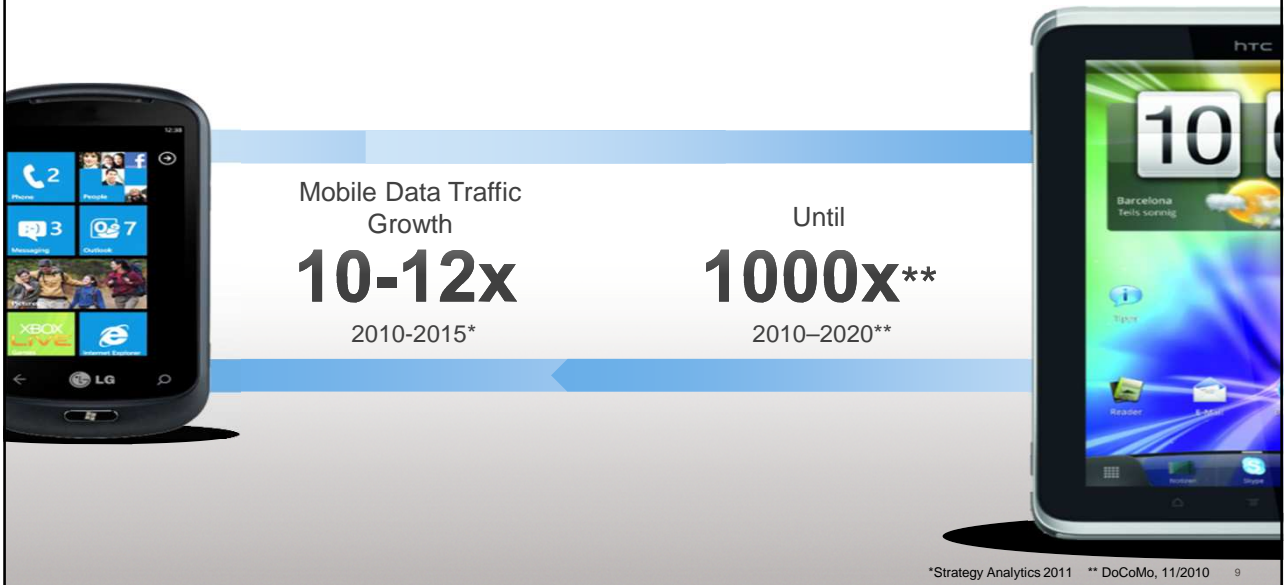


Source: Ericsson

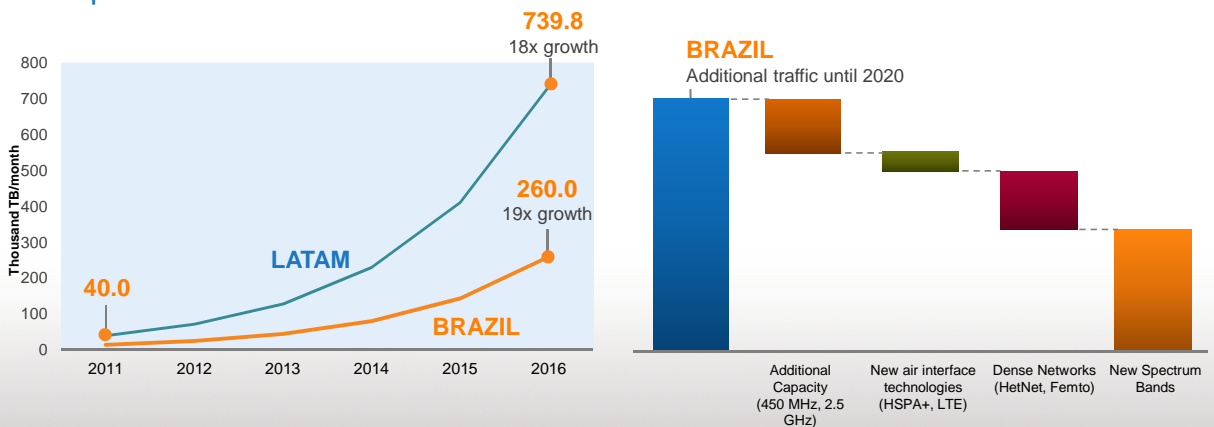
1000x Data Challenge

Spectrum is key to solve it

Growth in Data Traffic



Mobile Data Traffic Demand Example

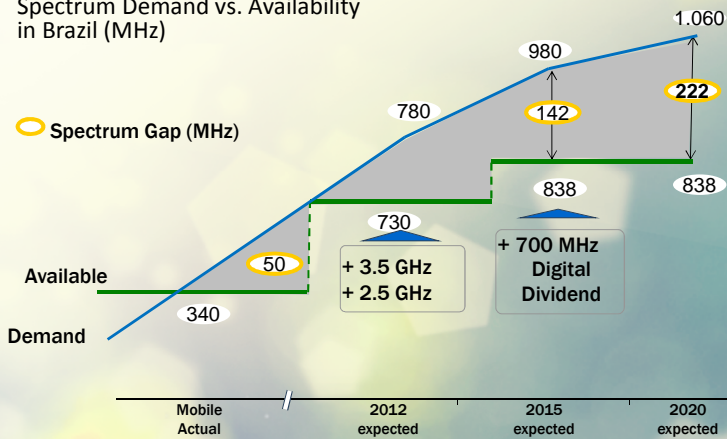


BRAZIL NEEDS 1060 MHZ OF SPECTRUM UNTIL 2020

Source: Cisco Visual Networking Index, ITU, Anatel. 10

New Spectrum Bands are Needed

Spectrum Demand vs. Availability in Brazil (MHz)

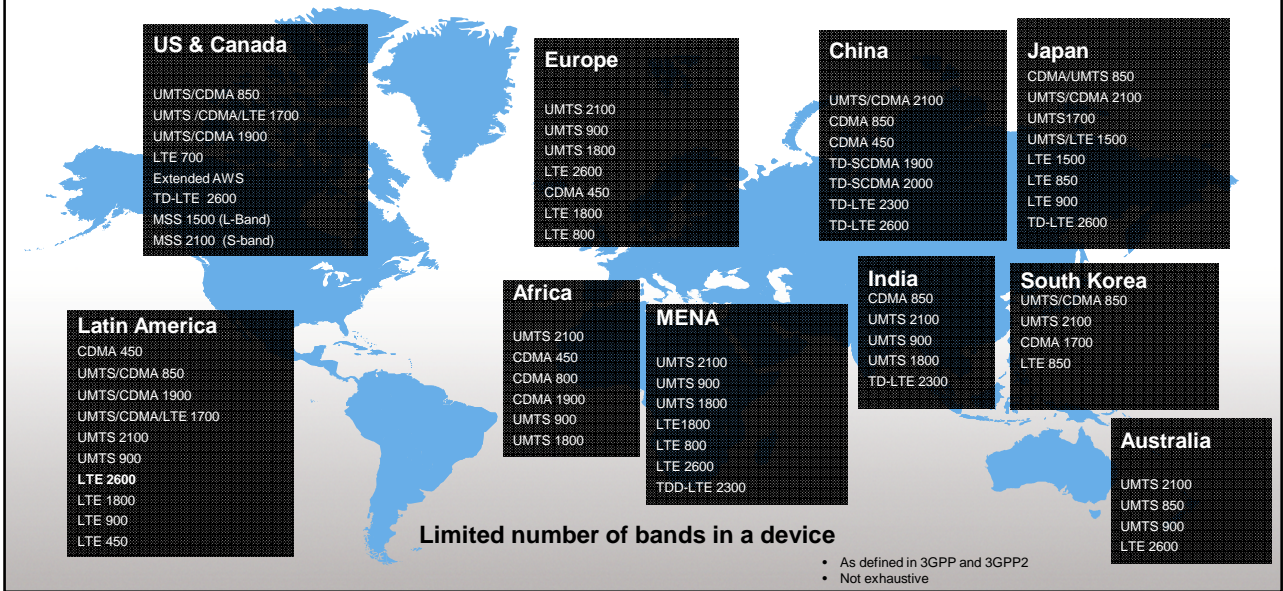


All international studies (i.e ITU, GSMA, Anatel) indicate the need for more spectrum for mobile services in Brazil

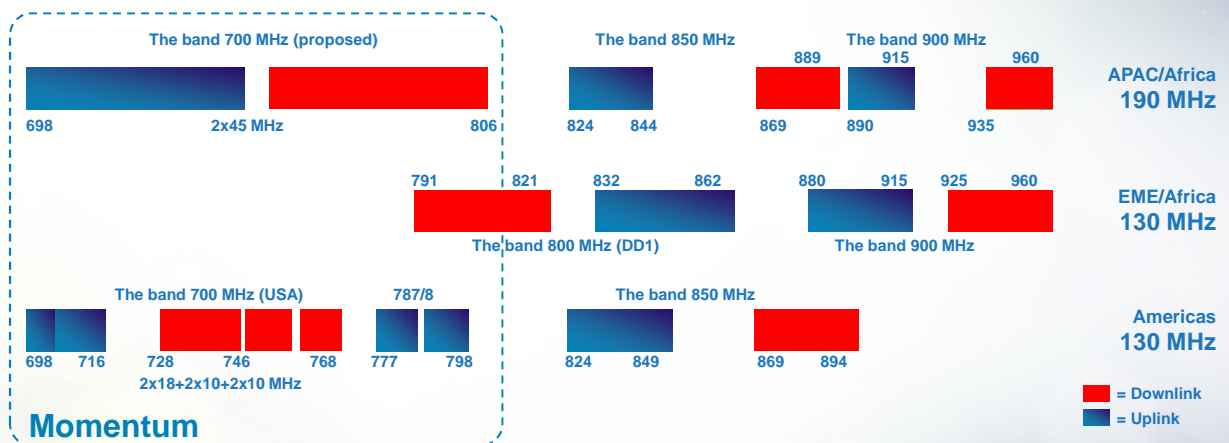
IMT (3G/4G) Bands

Frequency Band	Specific Band Pairing (MHz)	Common Names (not official names)
450 MHz	450 - 470	450 MHz
700 MHz	698 – 862 (varies)	Various
800 MHz	824 - 849 / 869 - 894	800 MHz or cellular band
900 MHz	890 - 915 / 935 - 960	900 MHz or GSM 900
1700 MHz	1750 - 1780 / 1840 - 1870	Korean PCS band
1800 MHz or 1.8 GHz	1710 - 1785 / 1805 - 1880	DCS 1800 band
1900 MHz or 1.9 GHz	1850 - 1910 / 1930 - 1990	PCS band
2.1 GHz	1920 - 1980 / 2110 - 2170	UMTS band
1.7 GHz / 2.1 GHz	1710 - 1770 / 2110 - 2170	AWS Band
2.3 GHz	2300 - 2400	
2.5 GHz	2500 - 2570 / 2620 - 2690	MMDS band
3.4 GHz	3400 – 3700 (varies)	WiMAX band

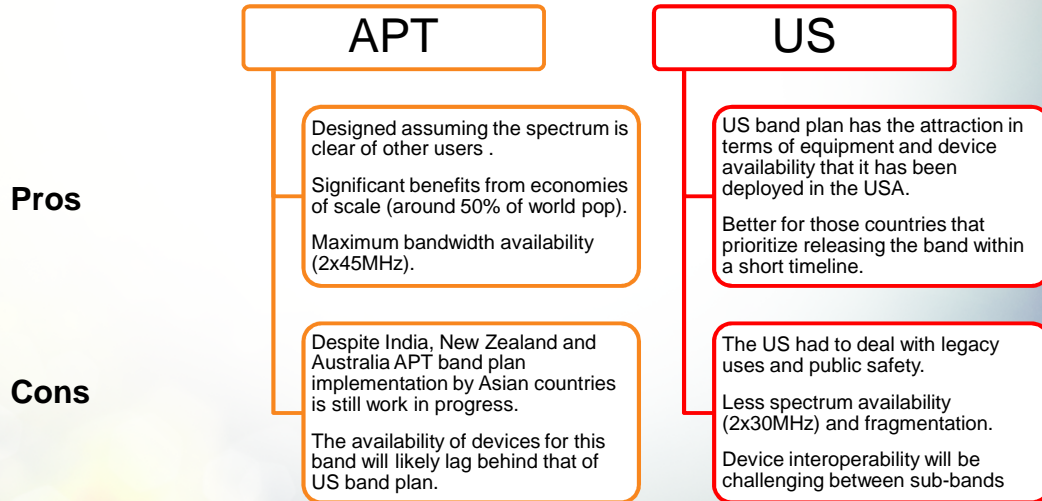
40+ Global Radio Frequency Bands



Band Plans Below 1 GHz



Digital Dividend – Pros and Cons of Band Plans



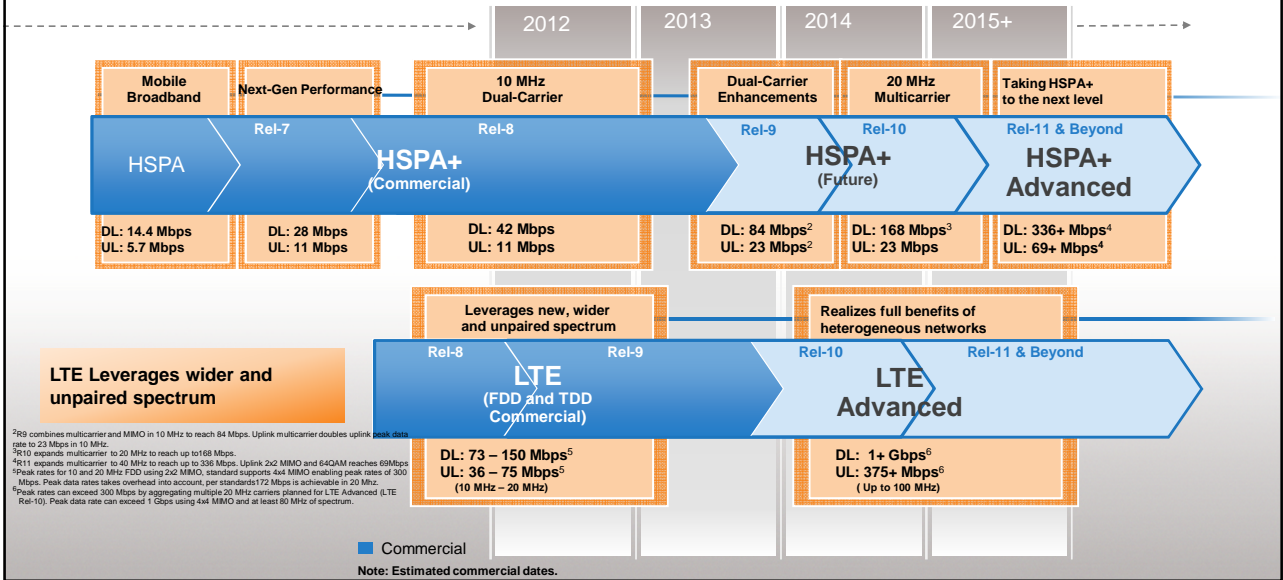
15

Solutions for APT band Plan

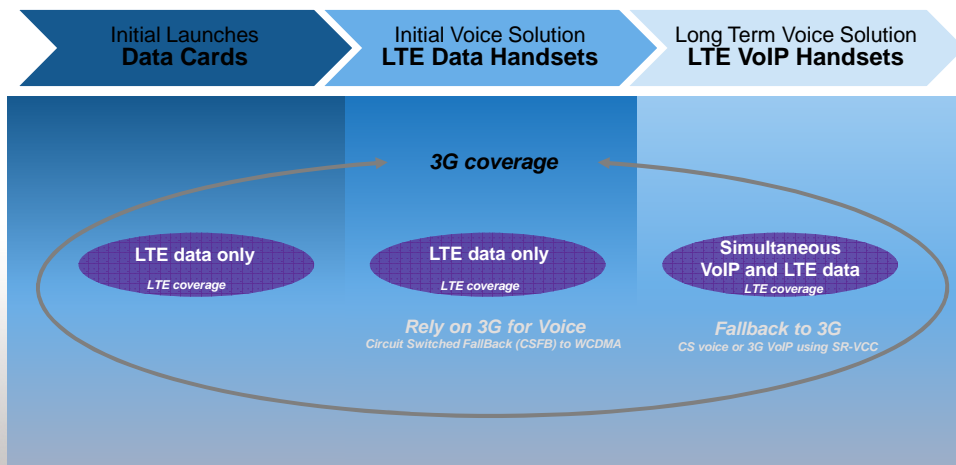
- ▶ Qualcomm's Radio Frequency (RF) chipset portfolio already provides support for the 698-806 MHz frequency range.
- ▶ LTE chipset solutions supporting the APT FDD frequency channel arrangement could be available as early as one year following the completion of standardization within 3GPP.
- ▶ Band 28 was approved at 3GPP RAN4 level this month and is expected to be approved at 3GPP RAN Plenary in June next month.
- ▶ The timeframes for commercial chipset and device availability will depend upon the availability of passive components (e.g., filters, duplexers) and market demand.

16

LTE: A Parallel Evolution Path to HSPA+



LTE Voice Through Fallback to 3G



Superior Modem Performance

Only Global 3G/4G Multimode

- LTE/TD-LTE
- TD-SCDMA
- DC-HSPA+, HSPA
- 1x R99
- 1xDO Rev B
- GERAN

Simultaneous Voice and Data

- First simultaneous CDMA voice and LTE data handset
- First UMTS voice and LTE data handset

Leading Technologies

- Advanced receivers
- 100 Mbps peak LTE rates
- 42 Mbps peak 3G rates

Multimode Is Key for LTE Handsets

Source: Qualcomm data.

19

Leading in LTE Technology Development

First Generation

World's First Integrated LTE/3G Modem Chips



6 modes supported

2010

Second Generation

World's First Mobile Platform (8960) with integrated LTE/3G Multimode



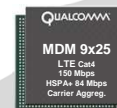
7 modes supported:

LTE FDD, LTE TDD, UMTS, EV-DO, CDMA 1x, TD-SCDMA, GSM/EDGE

2011-12

Third Generation

World's First Integrated LTE/3G Modem with Carrier Aggregation



2013

All Multimode, All Bands, Performance Evolution

Source: Qualcomm data.

20

Snapshot on LTE Device Availability

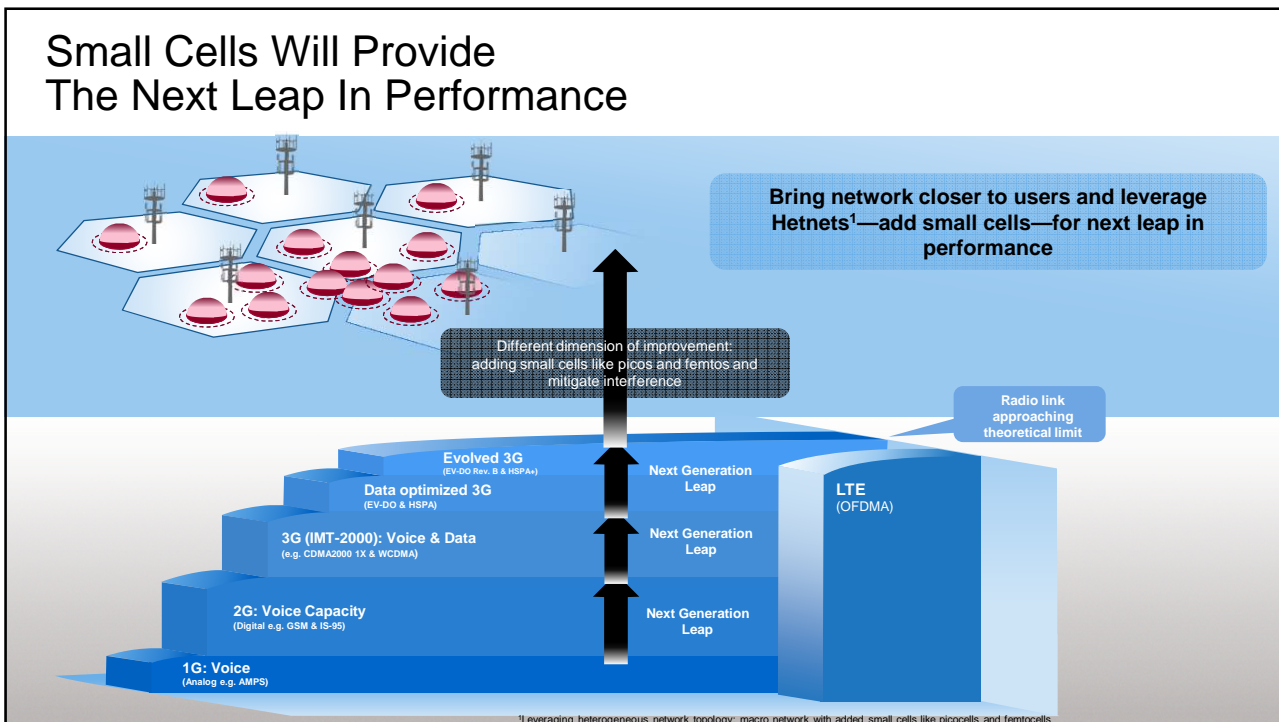
▶ Snapshot from GSA's on LTE device availability on different bands

LTE FDD	
700 MHz	170 devices
800 MHz <i>Band 20</i>	72 devices
1800 MHz <i>Band 3</i>	75 devices
2600 MHz <i>Band 7</i>	94 devices
800/1800/2600 MHz	57 devices
AWS <i>Band 4</i>	72 devices

LTE TDD	
2300 MHz <i>Band 40</i>	43 devices
2600 MHz <i>Band 38</i>	45 devices
2600 MHz <i>Band 41</i>	5 devices

Source: GSA (www.gsacom.com), April 2012

Small Cells Will Provide The Next Leap In Performance





Conclusions

- ▶ Mobile Broadband needs more spectrum to address data demand growth
- ▶ Regional and global spectrum harmonization will continue to be important, only a limited number of frequency bands in devices
- ▶ Smartphone expansion into new mobile segments is accelerating data traffic growth
- ▶ Snapdragon family is enabling smarter connected devices
- ▶ The 2G to 3G migration is important for a more efficient use of spectrum
- ▶ With larger frequency blocks for LTE, it is possible to boost data capacity
- ▶ It is necessary to bring network closer to the user — add femtocells



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