

Converging LTE networks

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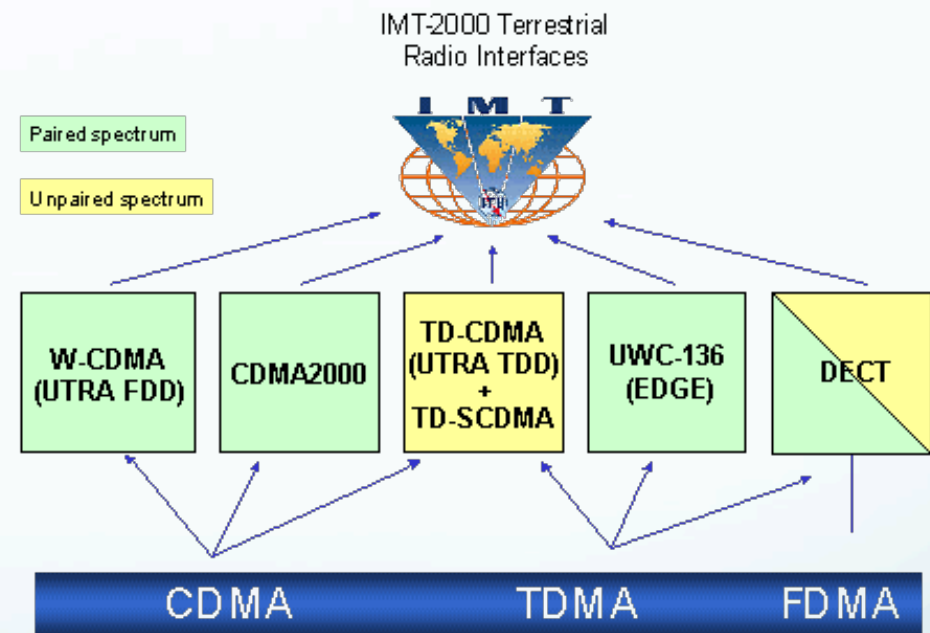
Research Director, Maravedis-Rethink

Agenda

- The emergence of TD-LTE
- From WiMAX migration to FD integration
- The race for spectrum capacity
- TDD milestones and business benefits
- Global case studies
- Devices and other challenges
- Forecasts

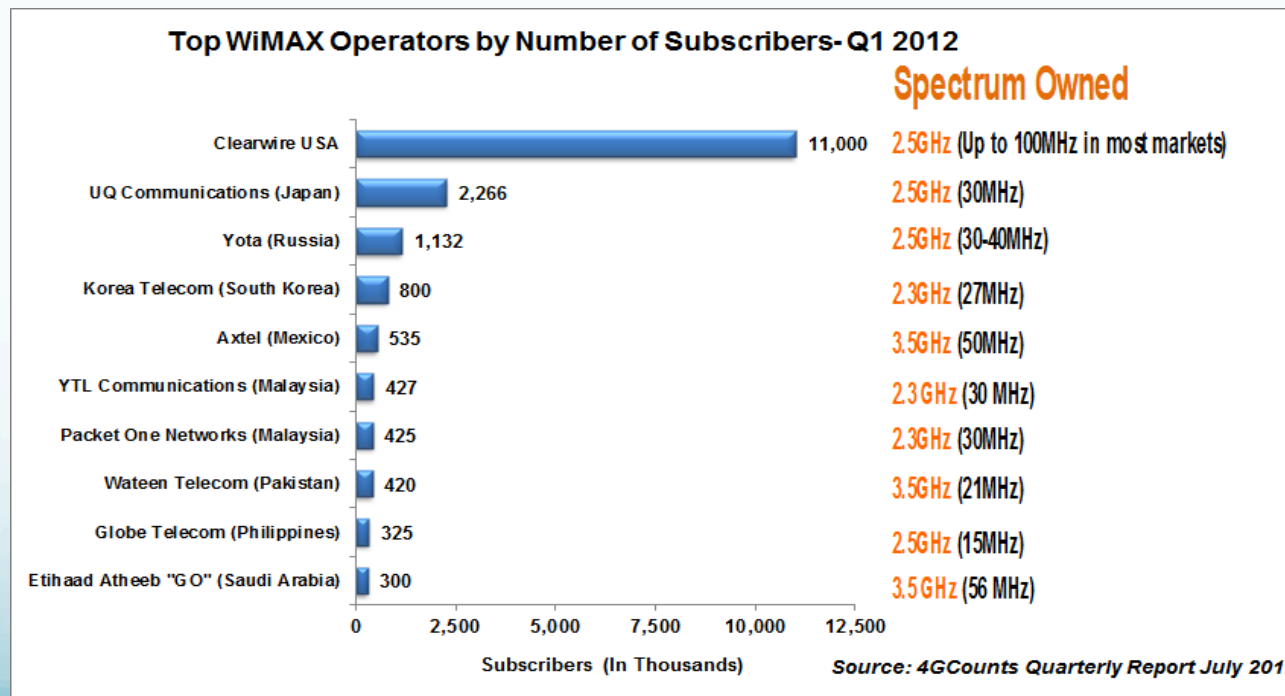
TDD context

- Unpaired asymmetric spectrum
- Small role in 3G, except China
- Main functions
 - TD-SCDMA
 - Broadcasting
- Few devices, limited business case



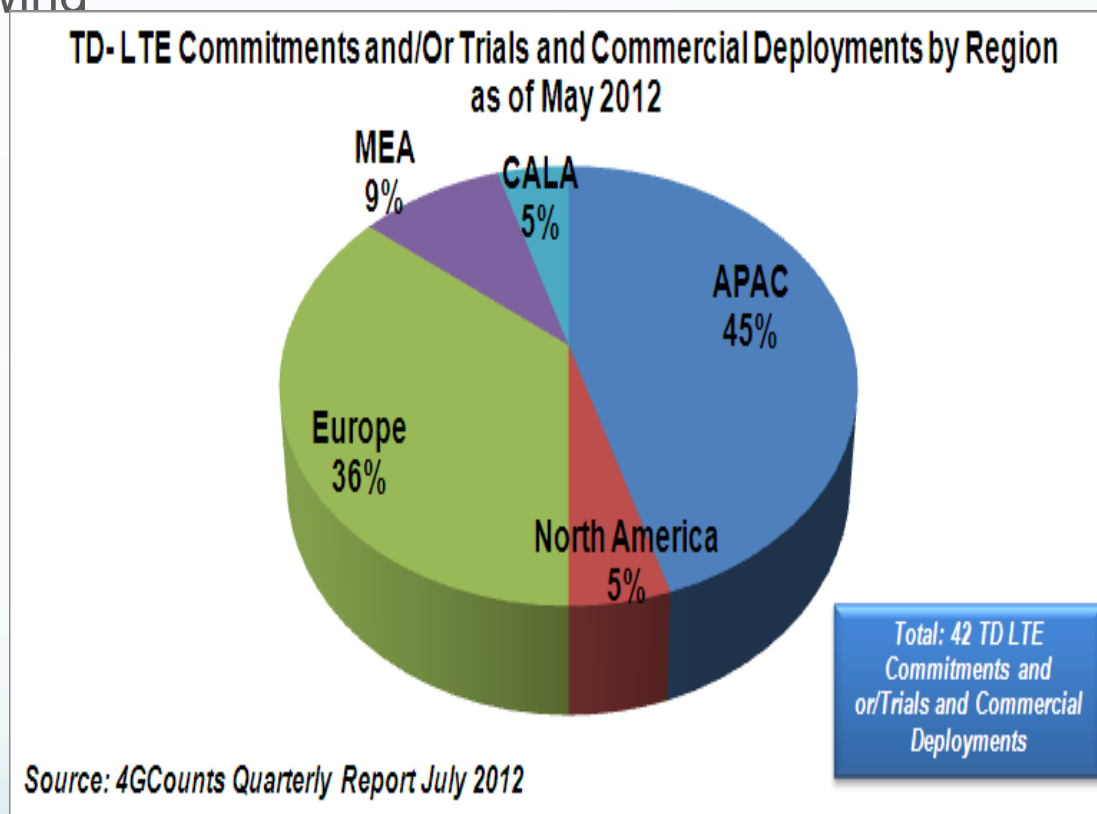
TDD breakthrough

- Data models – TDD more relevant
- Parallel though competing trends
 - Chinese efforts for TDD roadmap
 - WiMAX – the PC industry fights back



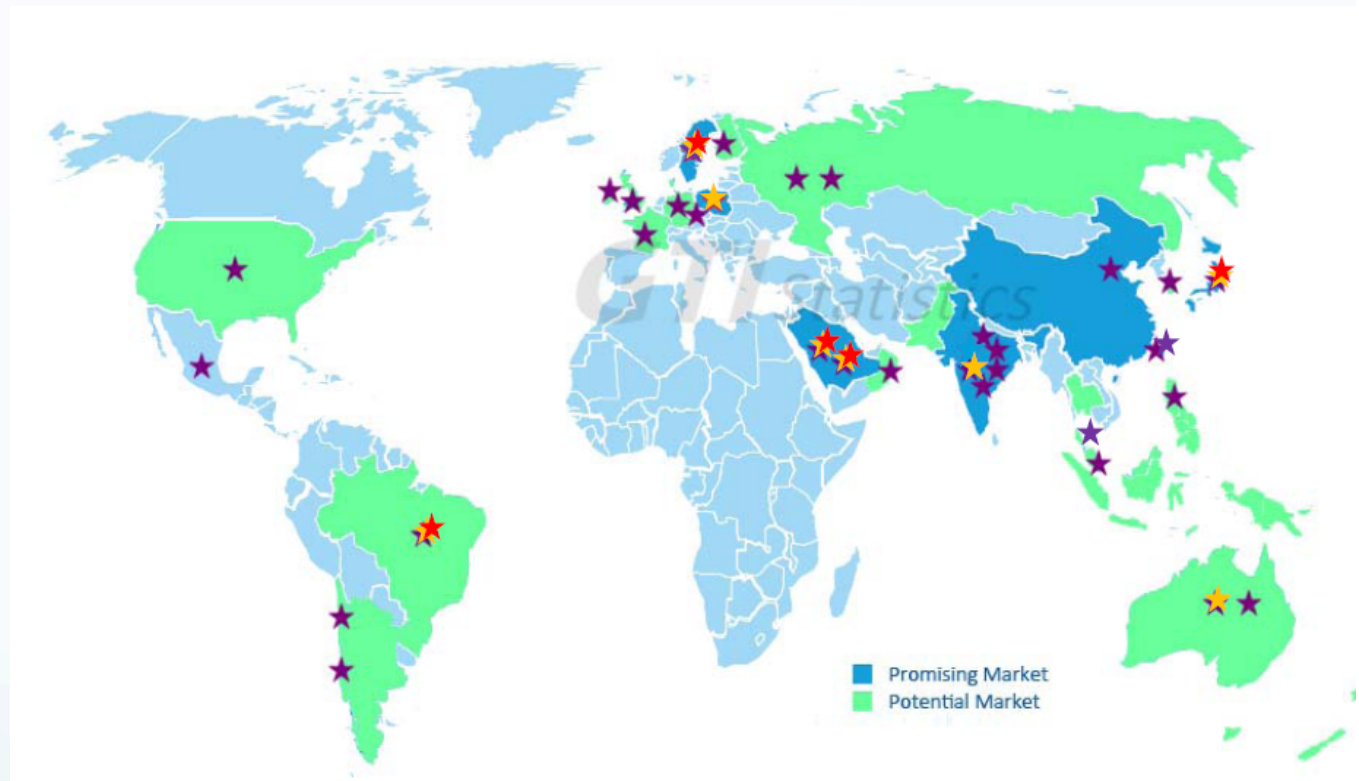
TD-LTE progress

- Standard maturing, narrowing gap
- China and India
- April: 35 commitments, 21 contracts 8 commercial networks
 - Aero2 (Poland)
 - STC (Saudi Arabia)
 - Mobily (Saudi Arabia)
 - Bharti Airtel (India)
 - Softbank Mobile (Japan)
 - 3 (Sweden)
 - SKY (Brazil)
 - NBN (Australia)



Just WiMAX escape route?

- Initial drivers
 - WiMAX migration
 - China
- Epitomy – Clearwire/
China Mobile alliance
- BUT
 - Initial deployments
non-WiMAX carriers



Source: GTI

Converged networks

Key driver – more capacity for new services

Key challenge – capacity outruns spectrum

Available TDD spectrum = headstart (or desperation)

TDD suits some business models

Parallel networks

Offload eg KDDI, Optus

Dedicated eg utility

Partnership eg Sprint,

Softbank

Full convergence/roaming

Hi 3G

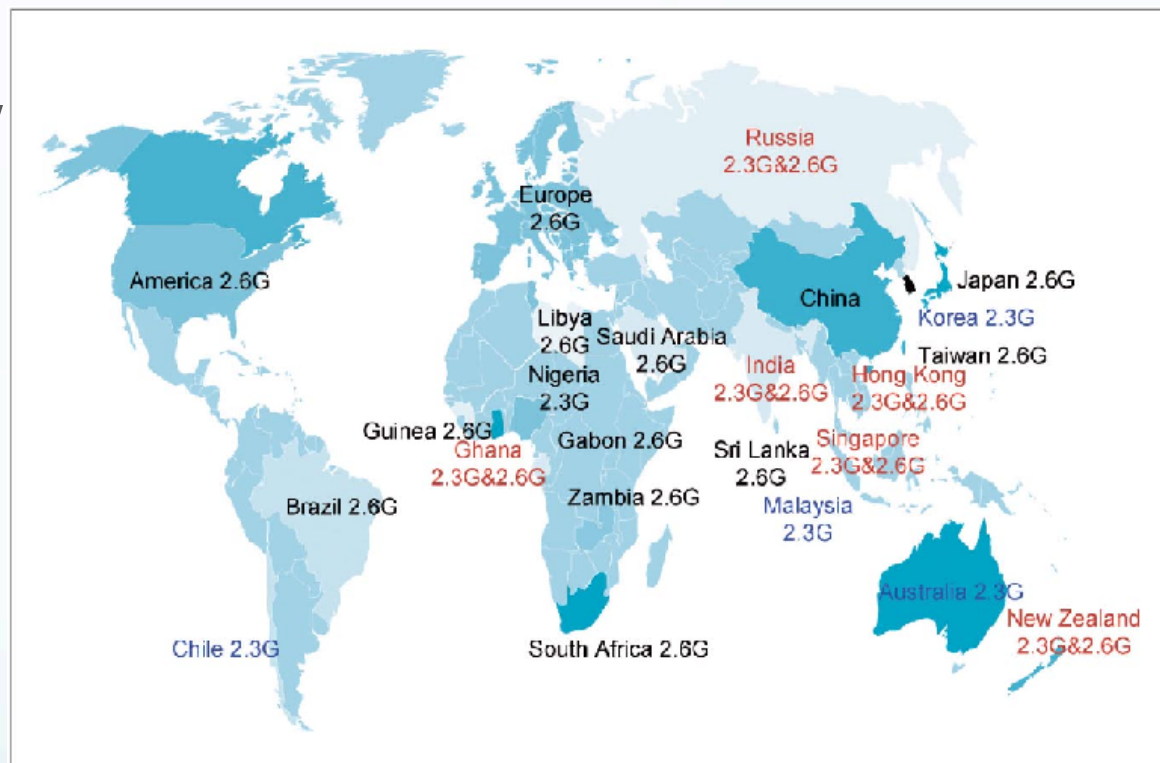
China Mobile HK

Supplementary eg AT&T

Broadcasters eg Sky

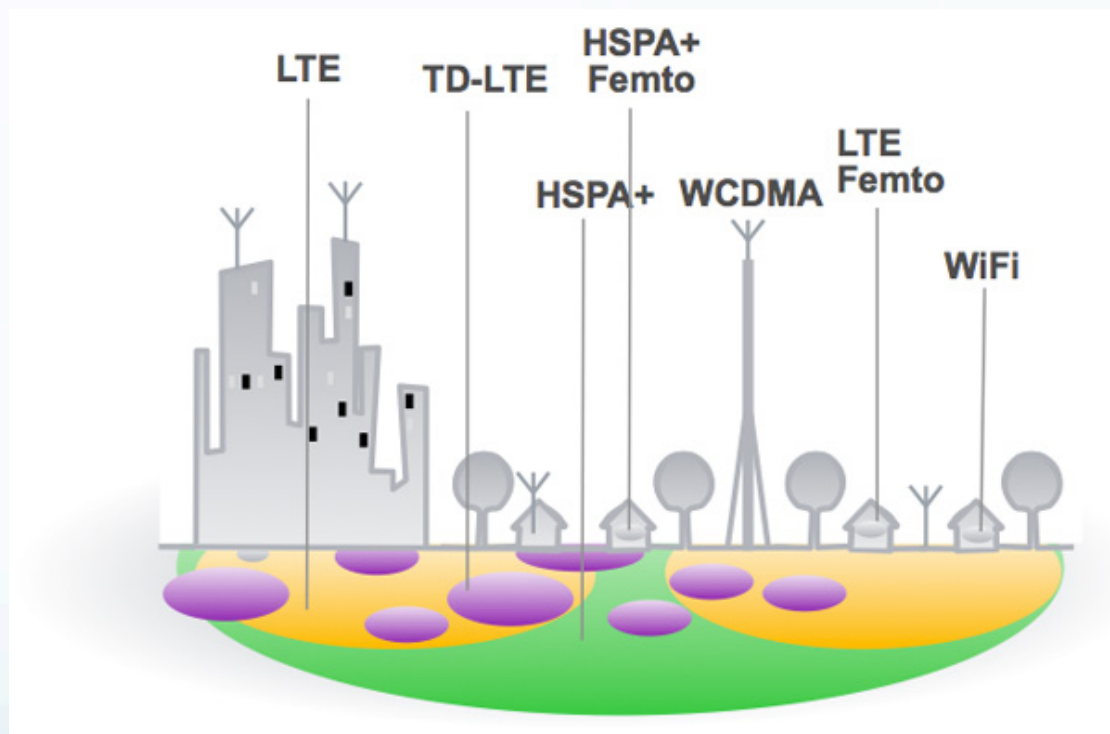
Spectrum: key factor

- Race for spectrum
- Some available and low cost
- Carriers look to unlikely bands
 - 2.5GHz
 - 3.5GHz
 - WCS
 - 1.4GHz
 - 700MHz
- High bands – but aggregation, small cells



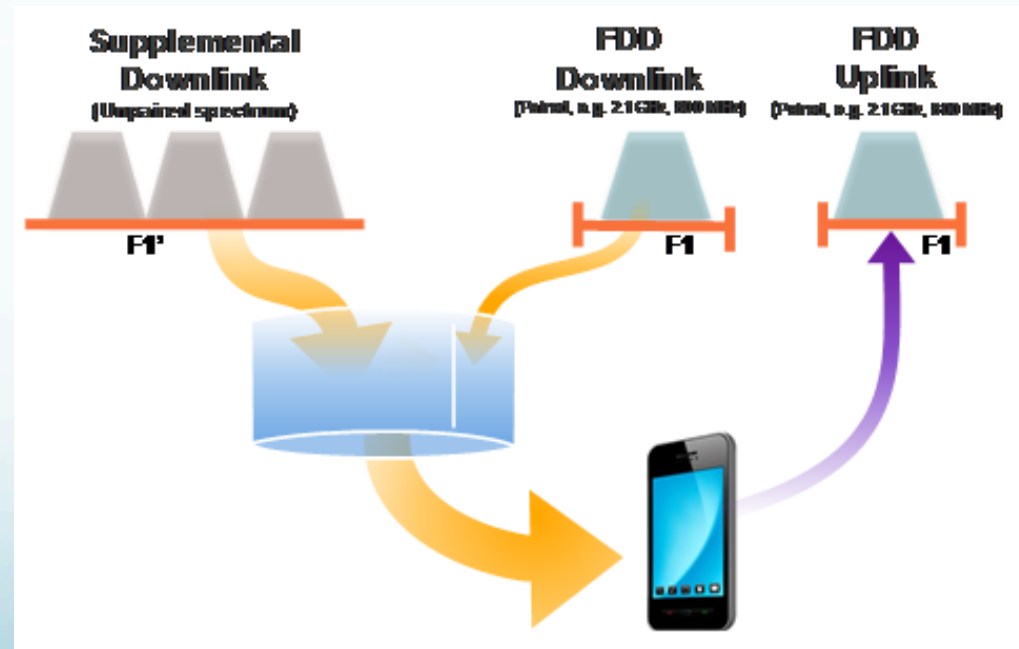
3.5GHz

- Global band, TDD everywhere
- FCC considering 100MHz
- Small cell roaming layer
 - HetNet
 - TD-LTE as backhaul
- UK Broadband
- ZTE influence
- Semi-licensed



Supplementary downlink

- Carrier aggregation makes TD/FD more usable
- Enhanced in LTE-A
- AT&T/Qualcomm example
- Orange trials
 - Future use of L-band
 - 40MHz of 1.4GHz free

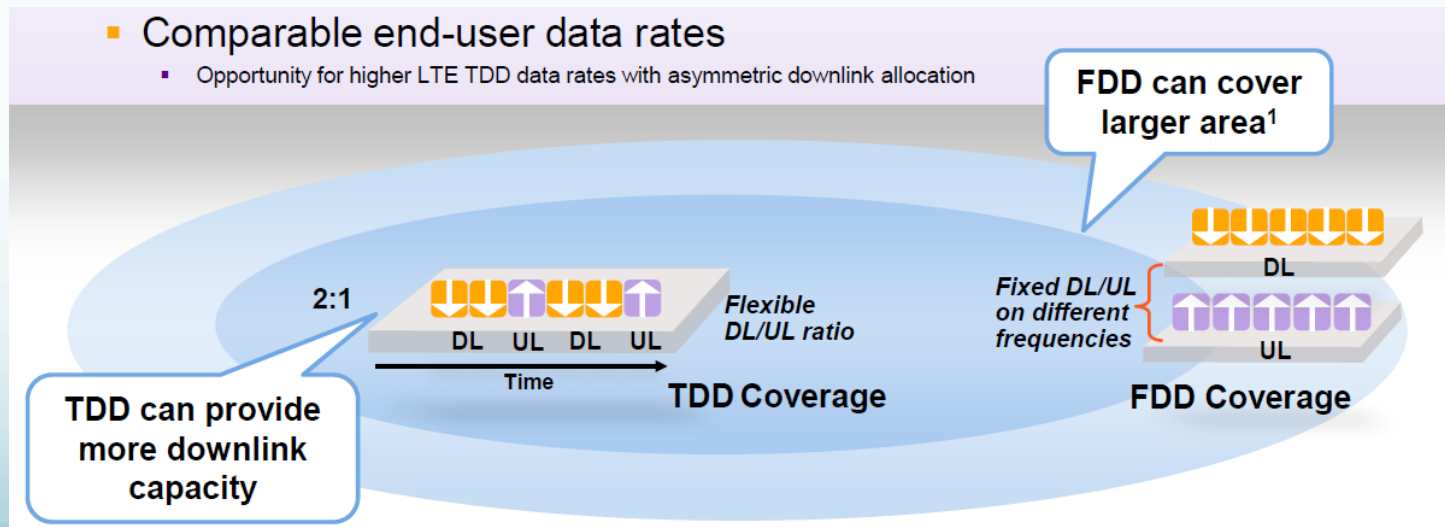


Other advantages

- Suited to download heavy applications
- Dynamic allocation
- No UL/DL guard band
- Better beamforming
- Integrated backhaul

But:
Latency
Covers smaller areas

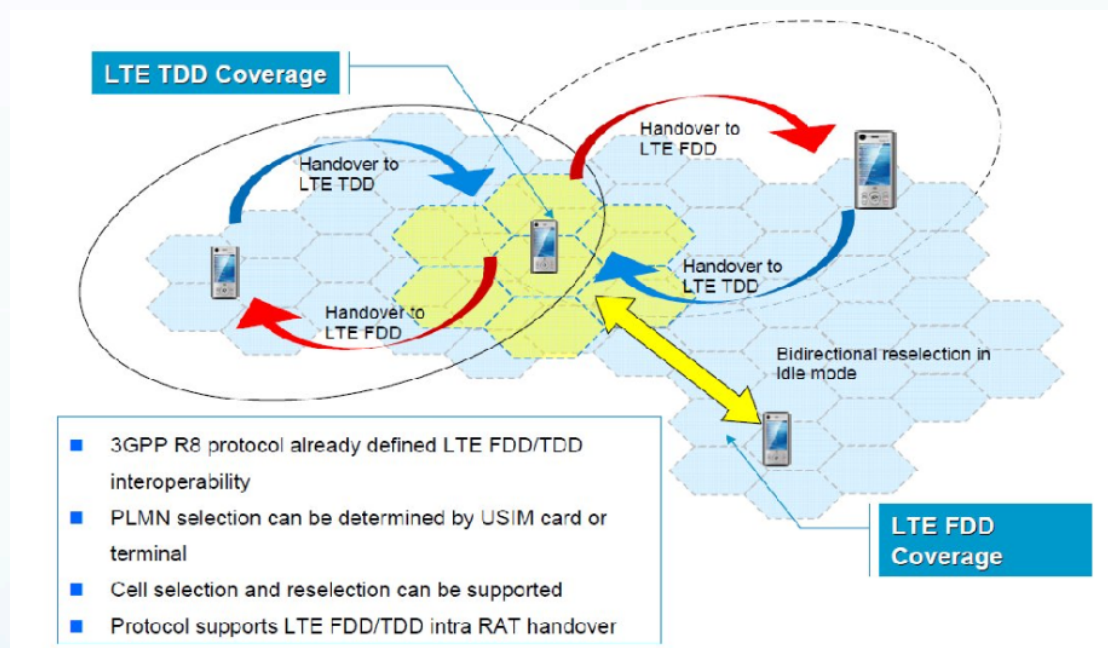
TDD and FDD are complementary



Source: Qualcomm

Convergence milestones

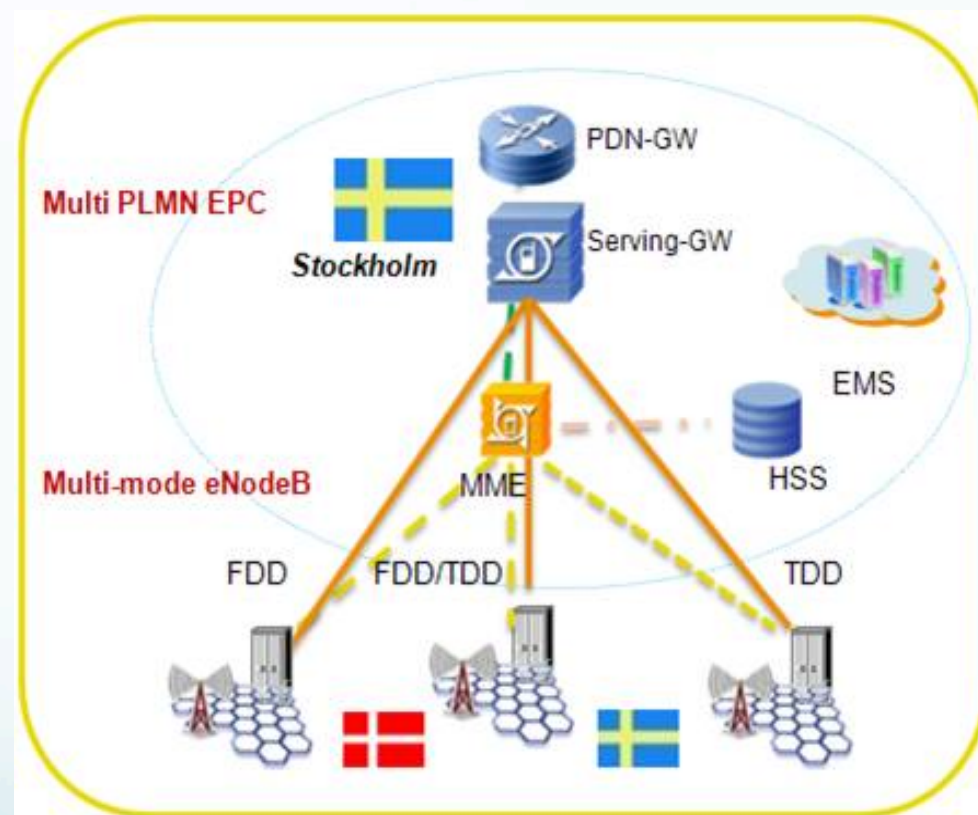
- Standards support common packet core
- Call for common device platform
- 2011:
 - Clearwire alliance
 - First FD/TD roaming demo China
- 2012:
 - First bidirectional handover HK
 - GTI and NGMN
 - Dual-mode device chipsets



Source: ZTE

Hi3G and Europe

- Hi3G first fully converged network
- European 2.6GHz band plan: 50MHz TDD, 20MHz FDD
- TDD neglected except 3
- European carriers – 50% in second wave
- Rise in TDD purchases eg Vodafone Germany, Telia, Telekom Austria
- Broadcasters and wholesalers



China

- 350,000 BTS by 2014
- First terminal tender 2012
- Regulatory issues
- HK roaming with FD-LTE
- Driving standards and roaming
- Interworking issues – domestic, partners



India

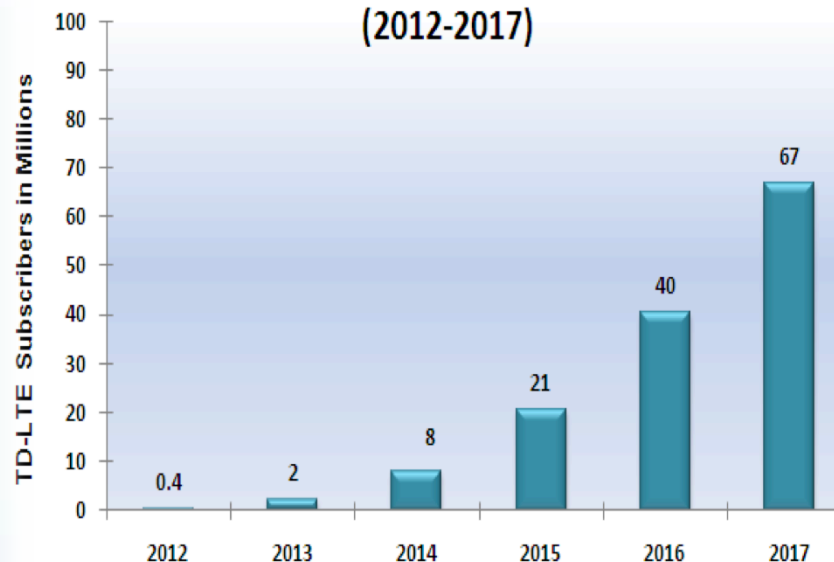
TD-LTE base will reach 67 million by the end of 2017

Multimode smart phones (2G/3G/TD-LTE) to lead the device category with a 45% market share

Multimode (2G/3G/TD-LTE) device price to reach US\$50 may take more than two years

FDD-LTE at 700 MHz spectrum by 2015 in rural areas

TDE-LTE Subscribers Forecast (In Millions) in India (2012-2017)



Source: India 4G and Cellular Market Analysis and Forecasts, 2012-2017 – 6th Edition (June 2012)

Latin America



3.5GHz

Over 70 deployments in Latam. Fixed and nomadic services.

2.5GHz

Over 19 deployments in Latam. Nomadic and mobile services. Mobility restrictions in some countries.

LTE

Two of the LTE commitments in Latin America are TD-LTE including SKY Brazil and Movilmax (Venezuela), both in 2.6GHz.

Challenges

- Interference
- Roaming standards
- Interworking
- Key challenge: devices
 - GSA: 68 of 417 TD-capable
 - 18 chip and device firms investing
 - Initial focus on dongles, questions over voice
 - TD iPhone?
- 2017: 83% devices capable of TD/FD (4G Counts)

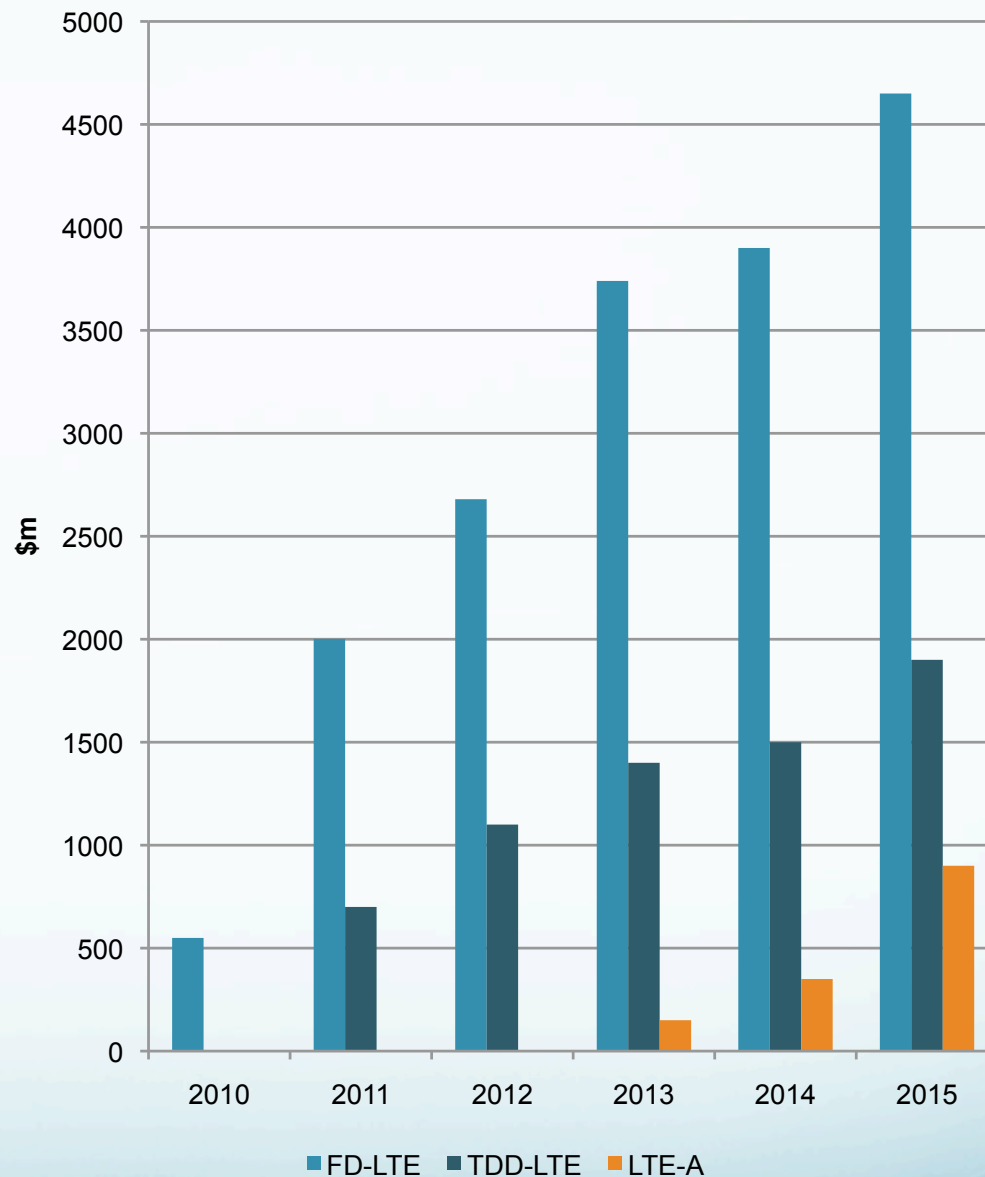


The future

TD-LTE critical mass 2015

Impact of LTE-Advanced

WiMAX3



Source: Maravedis-Rethink