Global Deployments of Technologies Utilizing IMT Specifications and Standards

WP5A-WP5B-WP5C Discussion on the Preparations for WRC-15

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Chairman Working Party 5D

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Ver. 6 (5-3-2012)

The Technologies of IMT

The Technologies of IMT

IMT-2000 Technologies:

- **Recommendation ITU-R M.1457-10, *Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)***
  - *First Released in year 2000*
  - *Updated approximately annually to accommodate the continuous improvement/evolution of the technology - Revision 11 in progress*
- ***Six Technologies in IMT-2000 today***
  - IMT-2000 CDMA Direct Spread
  - IMT-2000 CDMA Multi-Carrier
  - IMT-2000 CDMA TDD
  - IMT-2000 TDMA Single-Carrier
  - IMT-2000 FDMA/TDMA
  - IMT-2000 OFDMA TDD WMAN.
- **Market dominant IMT-2000 technologies based on 2012 deployments & future projections**
  - IMT-2000 CDMA Direct Spread *(also known as UTRA FDD, WCDMA, or UMTS/HSPA developed by 3GPP partnership project)*
  - IMT-2000 CDMA Multi-Carrier *(also known as cdma2000 developed by 3GPP2 partnership project)*
  - IMT-2000 CDMA TDD (*also known as TD-SCDMA)*

The Technologies of IMT

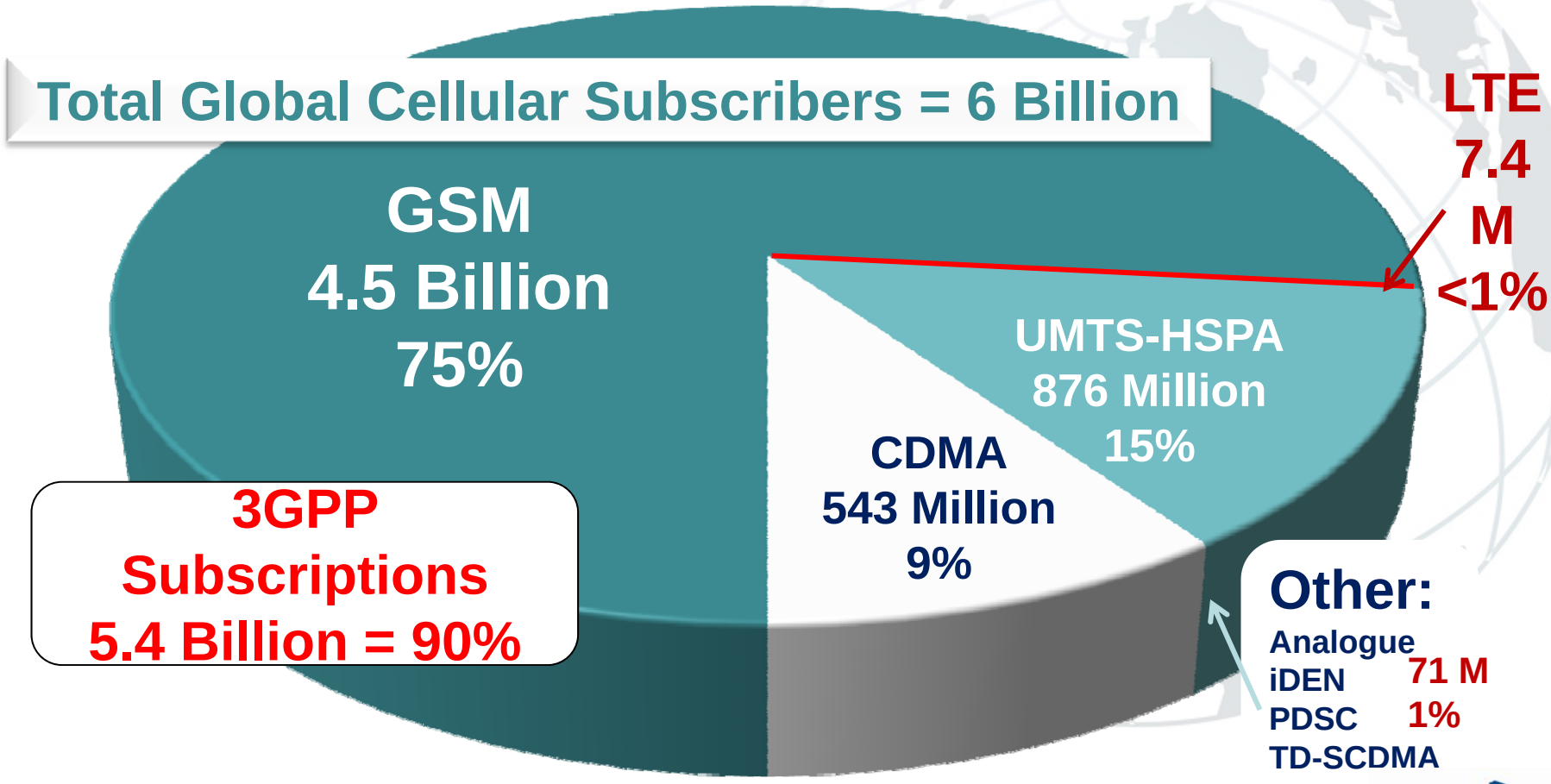
IMT-Advanced Technologies:

- **Recommendation ITU-R M.2012, *Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications Advanced (IMT-Advanced)***
  - *Call for technology proposals in March 2008 (5/LCCE/2)*
  - *Candidate Technology Proposals Received in October 2009 & Evaluation/Selection of Technologies for IMT-Advanced completed in December 2010*
  - *First Release of M.2012 in year 2012 - Revision 1 in progress to accommodate the underway improvement/evolution of the technology*
- **Two Technologies in IMT-Advanced today**
  - "LTE-Advanced" - Developed by 3GPP as LTE Release 10 and Beyond (*LTE-Advanced*).
  - "WirelessMAN-Advanced" -Developed by IEEE as the WirelessMAN-Advanced specification incorporated in IEEE Std 802.16 beginning with approval of IEEE Std 802.16m.
- **Market dominant IMT-Advanced technologies based on 2012 deployments & future projections**
  - LTE based technology from 3GPP

Dominant IMT Technology Demographics (2011 & beyond view)

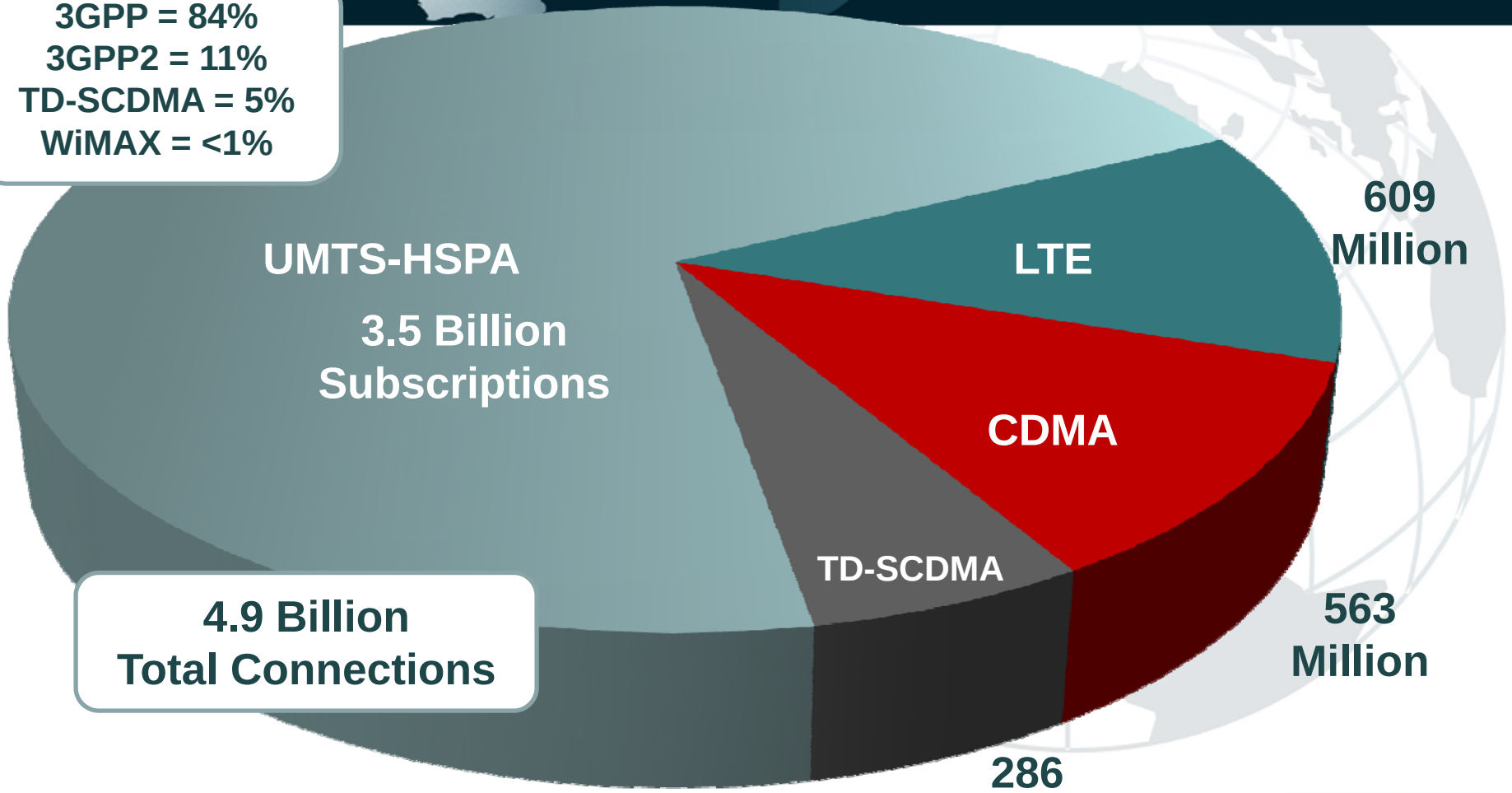
An overwhelming presence for mobile telecommunications in the global voice & mobile broadband marketplace ….

Global Wireless Landscape 4Q 2011



Source: Informa Telecoms & Media WCIS+, December 2011

Mobile Broadband Market Share 2016



3GPP = UMTS-HSPA-LTE
3GPP2 = EV-DO

Source: Informa Telecoms & Media, Subscription Forecast Tool, Dec 2011

WCDMA FDD
(UMTS/HSPA/HSPA+)

Still expanding its foundational IMT mobile broadband role towards LTE.

457 commercial HSPA operators

❑ commercial HSPA operators per region

www.gsacom.com

HSPA - Key Facts:

* 489 HSPA operator network commitments in 185 countries/territories

* 457 commercial networks launched in 178 countries

* ALL of the world's WCDMA operators have commercially launched HSPA service

* 348 commercial HSDPA networks (76%) support 7.2 Mbps peak or higher downlink speeds

Source: GSA report - HSPA Operator Commitments (April 16, 2012)

HSPA+ commercial network launches

www.gsacom.com

HSPA+ is a mainstream system technology for delivering mobile broadband services across the world

257 operators have committed to **HSPA+** network deployments

202 **HSPA+** systems are in commercial service in 100 countries

44% of HSPA operators have commercially launched **HSPA+**

77 operators have commercially launched 42 Mbps **DC-HSPA+** systems

GSA forecasts that at least one hundred **DC-HSPA+** networks will be in commercial service by end 2012

Source: GSA report – Global HSPA+ Network Commitments and Deployments

HSPA and HSPA+ user devices ecosystem

www.gsacom.com

GSA's database contains over 3,500 HSPA user devices which are launched in the market

Includes over 300 HSPA+ devices (21 Mbps peak downlink or higher).

Increase of > 50% in the last quarter in number of 42 Mbps DC-HSPA+ user devices launched (now over 130 terminals)

200+ user devices combine LTE with HSPA technologies (HSPA, HSPA+ or DC-HSPA+) i.e. for 3G fallback outside LTE coverage areas

Regarding 900 MHz re-farming for HSPA or HSPA+ deployments, over 750 user devices support UMTS900 = mainstream in European and APAC markets

Source: GSA

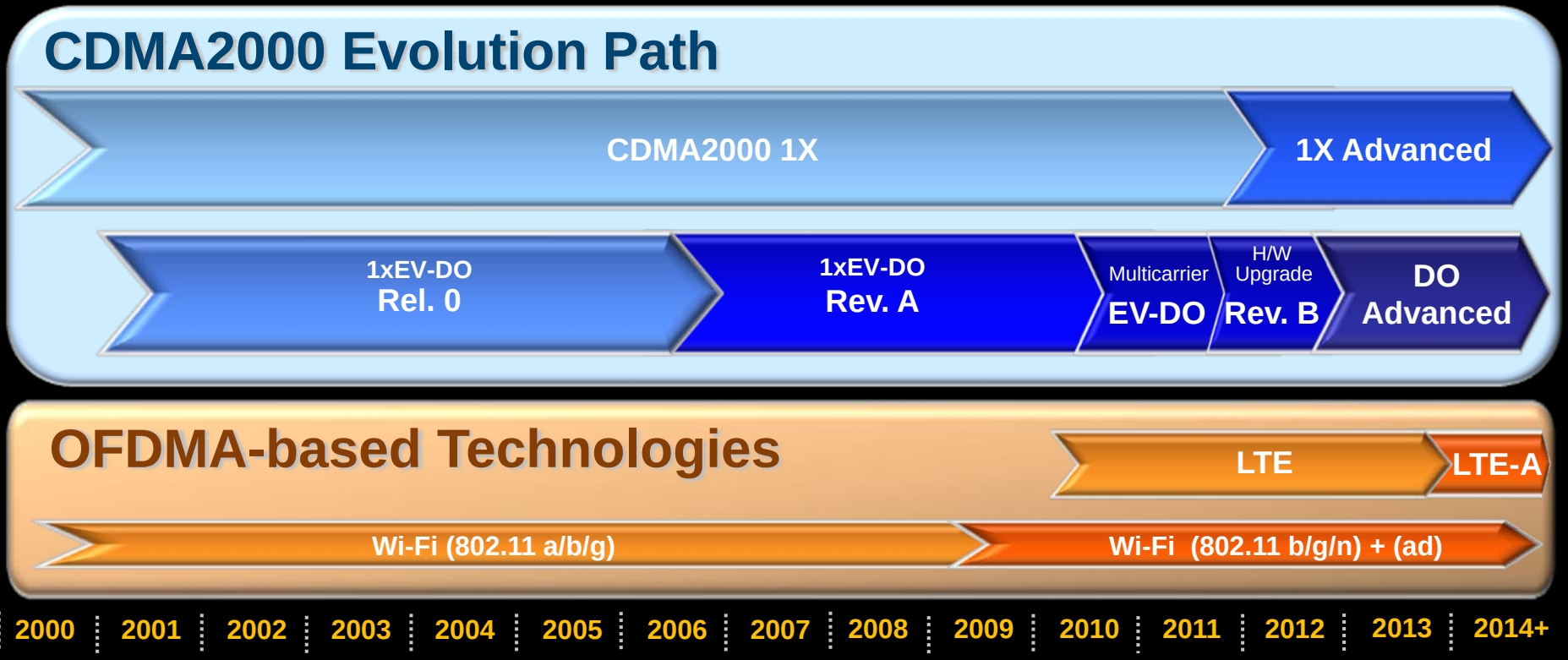
cdma2000

Making a smooth IMT mobile broadband transition.

Evolution Path

Source: CDG January 2012

A long-term roadmap that includes CDMA and OFDM-based technologies



Bridging the mutual interests of:

CDMA2000 (3rd Generation Partnership Project 2 "3GPP2") + LTE (3GPP A Global Initiative)

CDMA2000 and LTE Industry

Source: CDG January 2012

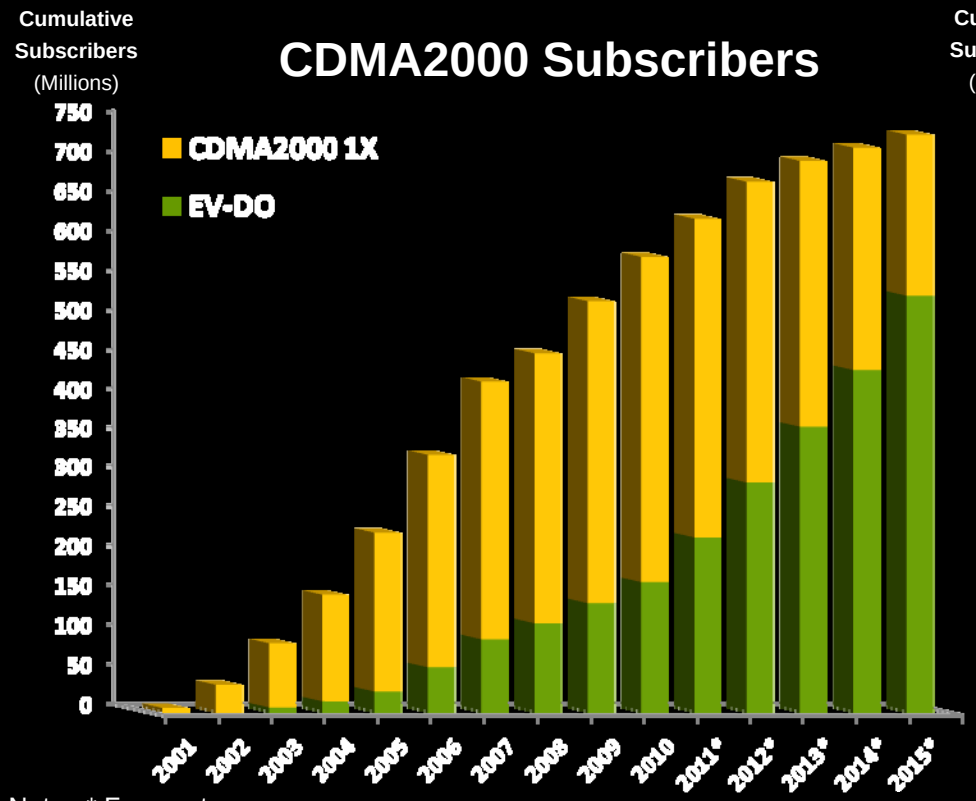
Today, there are 331 CDMA2000 operators in 123 countries

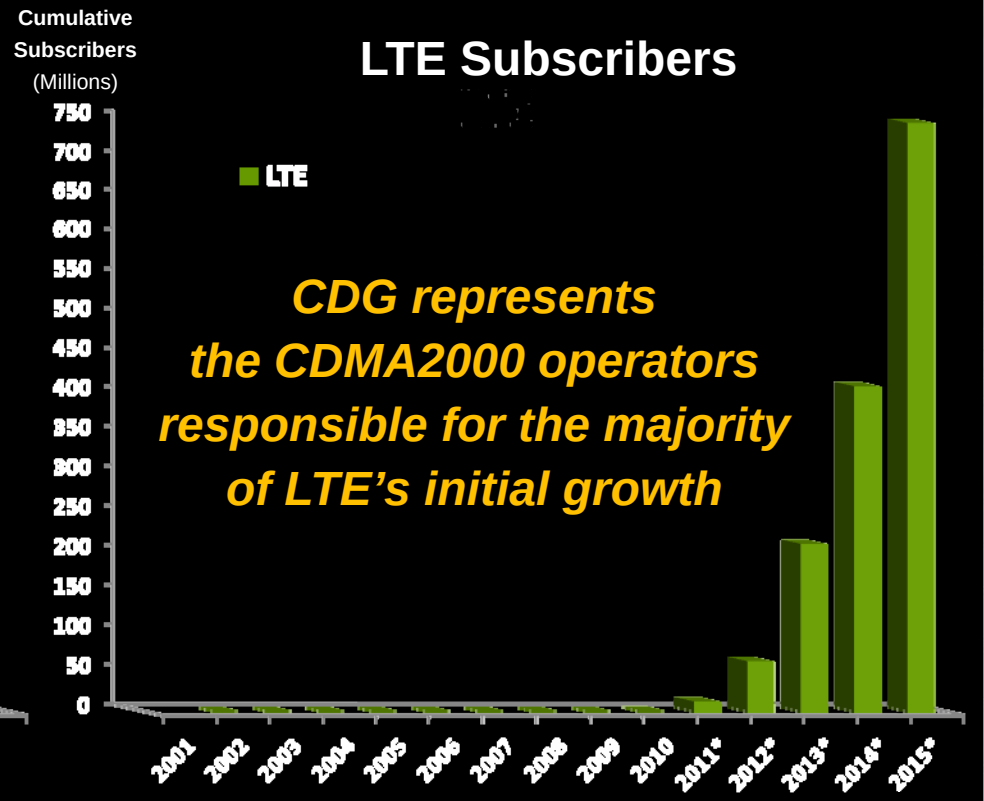
More than 210 EV-DO operators; with more deployments planned

8 LTE operators in 3 countries

614M+ CDMA2000 subscribers worldwide as of Jun 2011

More than 15M LTE subscribers worldwide Mar 2012





CDG represents the CDMA2000 operators responsible for the majority of LTE's initial growth

Note: * Forecast

Sources: Informa WCIS+, Global Mobile Daily, CDG, Deutsche Bank, operator data

Source: IHS iSuppli Research, November 2011

LTE/LTE Advanced

The advanced future of IMT as the next generation mobile broadband solution is happening now and happening rapidly!

Next Generation Global Standard

- Technology platform of choice for GSM-HSPA, Greenfield, WiMAX and EV-DO operators
- Available in both FDD and TDD modes and supported by numerous frequency bands
- Offers capacity and speed to handle a rapid increase in data traffic

63
LTE commercial networks launched in 37 countries

>100
LTE Networks expected by YE 2012

8 Million
LTE subscriptions

280
operator commitments worldwide

Source: 4G Americas, Informa Telecoms & Media, March 2012 Estimates

LTE networks and trials

www.gsacom.com

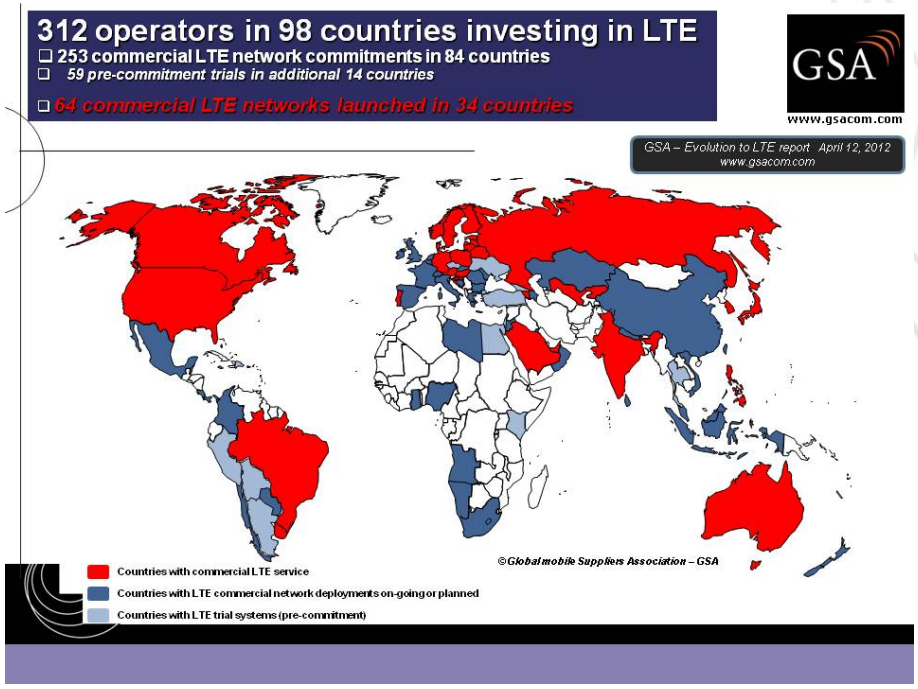
312 operators are investing in LTE in 98 countries

253 operator commitments in 84 countries
59 pre-commitment trials in 14 more countries

64 commercial networks in 34 countries

GSA forecasts 129 commercial LTE networks in 57 countries by end 2012

The number of commercial LTE networks is set to double by the end of 2012. GSA forecasts there will be 129 commercial LTE networks by December 31, 2012



Global LTE commitments *(to April 12, 2012)*

GSA

312 operators are investing in LTE in 98 countries

253 firm operator commitments to deploy LTE in 84 countries

59 pre-commitment trials in another 14 countries

64 commercial networks launched in 34 countries

Country	Operator	Launch
Norway	TeliaSonera	14.12.09
Sweden	TeliaSonera	14.12.09
Uzbekistan	MTS	28.07.10
Uzbekistan	UCell	09.08.10
Poland	Aero2/Mobyland/CenterNet (LTE TDD from 10.05.11)	07.09.10
USA	MetroPCS	21.09.10
Austria	A1 Telekom	05.11.10
Sweden	TeleNor Sweden	15.11.10
Sweden	Tele2 Sweden	15.11.10
Hong Kong	CSL Limited	25.11.10
Finland	TeliaSonera	30.11.10
Germany	Vodafone	01.12.10
USA	Verizon Wireless	05.12.10
Finland	Elisa	08.12.10
Denmark	TeliaSonera	09.12.10
Estonia	EMT	17.12.10
Japan	NTT DoCoMo	24.12.10
Germany	Deutsche Telekom	05.04.11
Philippines	Smart Communications	16.04.11
Lithuania	Omnitel	28.04.11
Latvia	LMT	31.05.11
Singapore	M1	21.06.11
South Korea	SK Telecom	01.07.11
South Korea	LG U+	01.07.11
Germany	O2	01.07.11
Canada	Rogers Wireless	07.07.11
Austria	T-Mobile	28.07.11
USA	Mosaic Telecom	July 2011
Canada	Bell Mobility	14.09.11
Saudi Arabia	Mobily (LTE TDD)	14.09.11
Saudi Arabia	STC (LTE TDD)	14.09.11
Saudi Arabia	Zain	14.09.11
USA	AT&T Mobility	18.09.11
UAE	Etisalat	25.09.11
Australia	Telstra	27.09.11
Denmark	TDC	10.10.11
Austria	3	18.11.11
Puerto Rico	AT&T Mobility	20.11.11
Puerto Rico	Claro	24.11.11
Kyrgyzstan	Saima Telecom	09.12.11
Brazil	Sky Brazil (LTE TDD)	13.12.11
Finland	DNA	13.12.11
Uruguay	Antel	13.12.11
USA	Cricket	21.12.11
Singapore	SingTel	22.12.11
Kuwait	Viva	27.12.11
Armenia	Vivacell-MTS	28.12.11
Bahrain	Viva Bahrain	01.01.12
Hungary	T Mobile	01.01.12
South Korea	KT	03.01.12
Russia	Yota	15.01.12
Canada	TELUS	10.02.12
USA	Peoples Telephone Co-op	14.02.12
Japan	Softbank (LTE TDD)	24.02.12
Portugal	TMN (Portugal Telecom)	12.03.12
Portugal	Vodafone Portugal	12.03.12
Portugal	Optimus	15.03.12
Japan	eMobile	15.03.12
USA	US Cellular	22.03.12
Croatia	T Mobile/T-Hrvatski Telekom	23.03.12
Croatia	VIPNet	23.03.12
USA	Panhandle (PTCI)	March 2012
Belarus	Yota Bel	01.04.12
India	Bharti Airtel (LTE TDD)	10.04.12

GSA

Evolution to LTE report - April 12, 2012
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17

GSA report – Evolution to LTE report (April 12, 2012)

LTE TDD is market reality

www.gsacom.com

LTE TDD: Global network commitments, trials, deployments, commercial launches

JOIN GSA's LTE TDD LINKEDIN GROUP
www.linkedin.com/groups?gid=3978061
(1,000+ Members)

Global TD-LTE Initiative

The Global TD-LTE Initiative (GTI) aims to bring together leading industry partners to steer the TD-LTE ecosystem as a major standard in mobile broadband technology & drive the development of next generation mobile broadband networks.

Several network operators mentioned on this page are GTI members Website: www.lte-tdd.org

Australia	WiMAX™ operator Vivid Wireless trialled LTE TDD in Sydney Commercial launch is expected by 2012. NBN Co is deploying a 2.3 GHz fixed-wireless LTE TDD network to serve rural areas
Brazil	Sky Brazil launched a commercial LTE TDD network in December 2011
Canada	WiMAX™ operator Xplornet trialled LTE TDD in 2.5 GHz and 3.5 GHz spectrum
China	China Mobile launched large-scale LTE TDD trials to be extended in 2012 to 20,000 base sites. Commercial services expected in 2013
Denmark	3 acquired 2.6 GHz TDD spectrum and is deploying a combined LTE FDD/TDD network
France	Orange has deployed a trial LTE network in Paris supporting FDD and TDD modes. Bollore Tel. plans to deploy 3.5 GHz LTE TDD
Germany	E-Plus is trialling LTE TDD in 2.6 GHz
Hong Kong	BWA spectrum won by China Mobile, 21 Vianet Group, and Hutchison 3 HK. China Mobile and Hutchison 3 will each deploy combined LTE FDD/TDD networks
India	• Bharti Airtel commercially launched LTE TDD service on April 10, 2012 • RIL is deploying LTE TDD • Qualcomm India LTE Venture is committed to LTE TDD deployment. • Tikona Digital will deploy LTE TDD • Aircel is trialling LTE TDD • Augere is deploying LTE TDD • BSNL may introduce LTE TDD • MTNL may introduce LTE TDD
Ireland	LTE TDD testing was completed June 2010
Japan	SoftBank Mobile commercially launched its XGP/LTE TDD network in February 2012
Malaysia	WiMAX™ operator Packet Networks (P1) is planning to deploy LTE TDD on existing sites as an overlay network. WiMAX™ operator Asiaspace is planning to deploy 2.3 GHz LTE TDD
Nepal	Nepal Tel. is deploying 2.3 GHz LTE TDD
Nigeria	Zoda Fones is deploying LTE TDD in 3.5 GHz
Oman	Omantel showcased LTE TDD and plans deployment
Poland	Aero2 launched LTE TDD in Band 38 (2.6 GHz), part of Aero2's dual LTE network (LTE TDD and LTE1800 FDD)
Russia	• Rostelecom is reported to have approval to deploy LTE TDD network in 2.3 GHz spectrum • Voentelecom is trialling LTE TDD • MTS is deploying 2.6 GHz LTE TDD • Base Tel. plans LTE TDD network
Saudi Arabia	Etisalat Mobily launched a commercial LTE TDD network in September 2011 STC launched a commercial LTE TDD network in September 2011
Singapore	IDA plans to auction BWA spectrum suitable for LTE TDD
Sweden	3 Sweden is deploying a combined LTE FDD/TDD network (TDD in 2.6 GHz)
Taiwan	CHT has completed LTE tests on the high-speed rail system using TDD and FDD modes in 2.6GHz spectrum FarEasTone and China Mobile are co-operating on an LTE TDD trial in Taipei The National Chiao Tung University conducted a trial of LTE TDD in 2010 WiMAX™ operator Global Mobile Corp will seek approval to switch to LTE TDD once WiMAX coverage hits 70% of the population Fitel (PHS, WiMAX™) trialling LTE TDD
Thailand	AIS – TOT joint trial in 2.3 GHz band
UK	UK Broadband is deploying 3.5 GHz LTE TDD
Uruguay	Dedicado is planning 3.5 GHz LTE TDD deployment
USA	Clearwire announced plans to deploy Band 41 LTE TDD overlay to existing network WiMAX™ operator Xplornet Communications successfully trialled LTE TDD
Various	US-based VelaTel Global Communications has BWA projects in various markets including in China e.g via its JV with Aerostrong

6 commercial LTE TDD services launched

Source: GSA's Evolution to LTE report
April 12, 2012

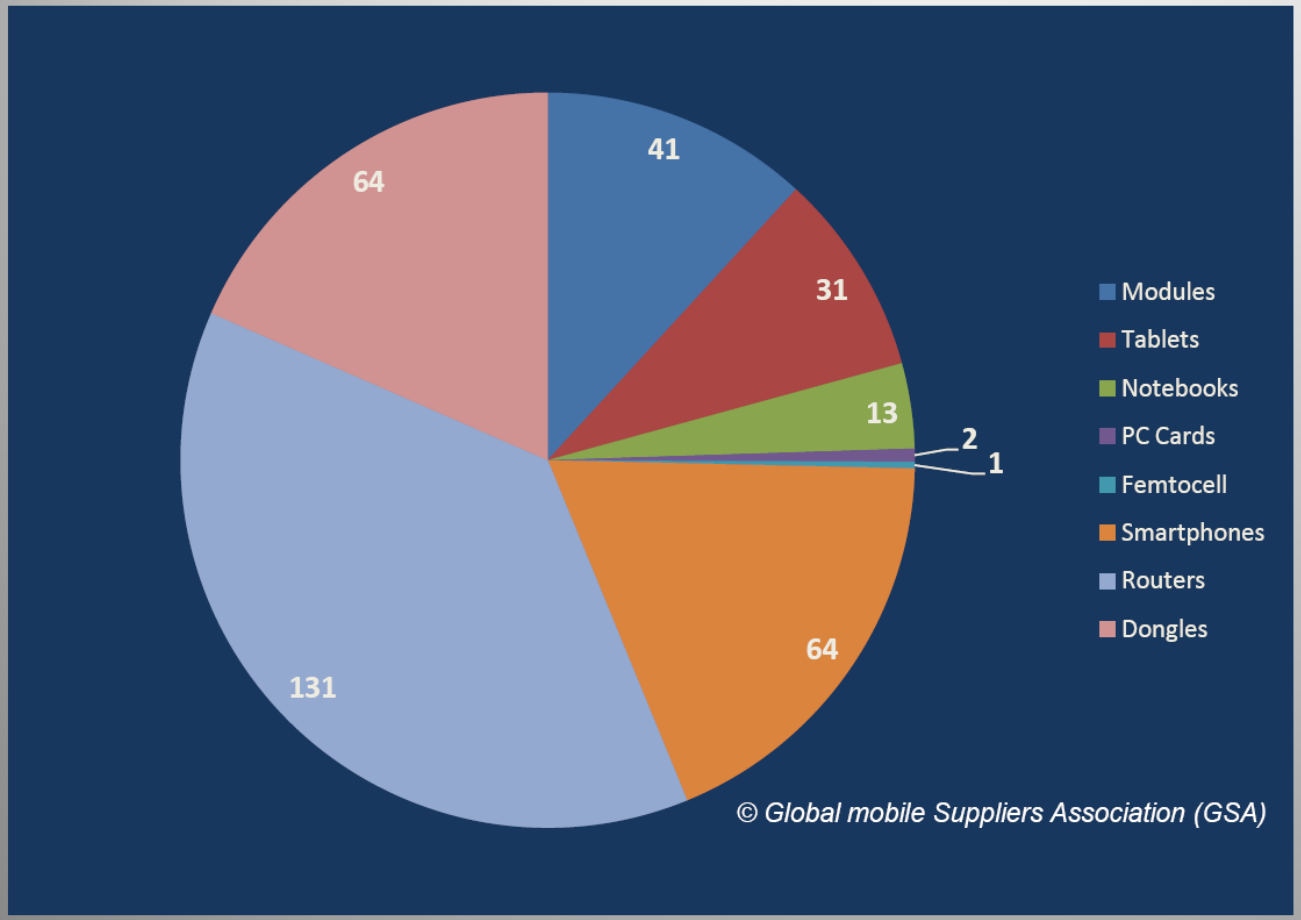
LTE TDD	
2300 MHz *Band 40*	43 devices
2600 MHz *Band 38*	45 devices
2600 MHz *Band 41*	5 devices

LTE TDD LinkedIN Group:
www.linkedin.com/groups?home=&gid=3978061

LTE Devices: 347 products launched

www.gsacom.com

63 manufacturers



76% increase in LTE devices announced since October 2011*

150 LTE user devices launched since October 2011*

Number of LTE smartphones grew 33% since January 2012**

LTE-enabled tablets jumped 72% since January 2012**

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

LTE TDD	
2300 MHz *Band 40*	43 devices
2600 MHz *Band 38*	45 devices
2600 MHz *Band 41*	5 devices

Source : Status of the LTE Ecosystem report
© GSA - April 3, 2012
www.gsacom.com

** As reported in Status of the LTE Ecosystem report - 28.10.11*
*** As reported in Status of the LTE Ecosystem report - 20.01.12*

Conclusion:

IMT based terrestrial technologies form the dominant foundation of terrestrial mobile broadband deployments around the world and continue to expand their presence and their capabilities.

IMT-2000 terrestrial technologies are a strong and still increasing part of the foundation and continue to be enhanced as evidenced by Rec. ITU-R M.1457-10.

IMT-Advanced technologies have recently entered the mainstream as the next generation of technology capabilities as delineated in Rec. ITU-R M.2012.

The service capabilities and spectrum efficiencies offered by the IMT terrestrial technology portfolio are unmatched by any other technology family whether utilized in wide area high mobility outdoor situations or low mobility/fixed indoor scenarios.

Deployment demographics of these technologies reveal the IMT impact and importance across the world. The projections show that the market demand for terrestrial mobile broadband is unceasing in all deployment environments and that IMT terrestrial technologies are the preferred solutions for meeting this demand.

Acknowledgements:

Slides used by permission from:

4G Americas
http://www.4gamericas.org/

CDMA Development Group (CGD)
http://www.cdg.org/

Global Suppliers Assocaition (GSA)
http://www.gsacom.com/

Further information on the technology and market demographics may be found on the websites of these organizations.