



Mobile Executive Seminar

Where are the LTE deployments ?

Jean-Pierre Bienaimé
SVP Strategy & Communications Wholesale, Orange
& Chairman, UMTS Forum



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Digiworld Summit 2011
16-17 November 2011
Montpellier, France



Summary

- (1) Mobile broadband/LTE is now the established enabler of future growth**
- (2) LTE deployment drivers and business models**

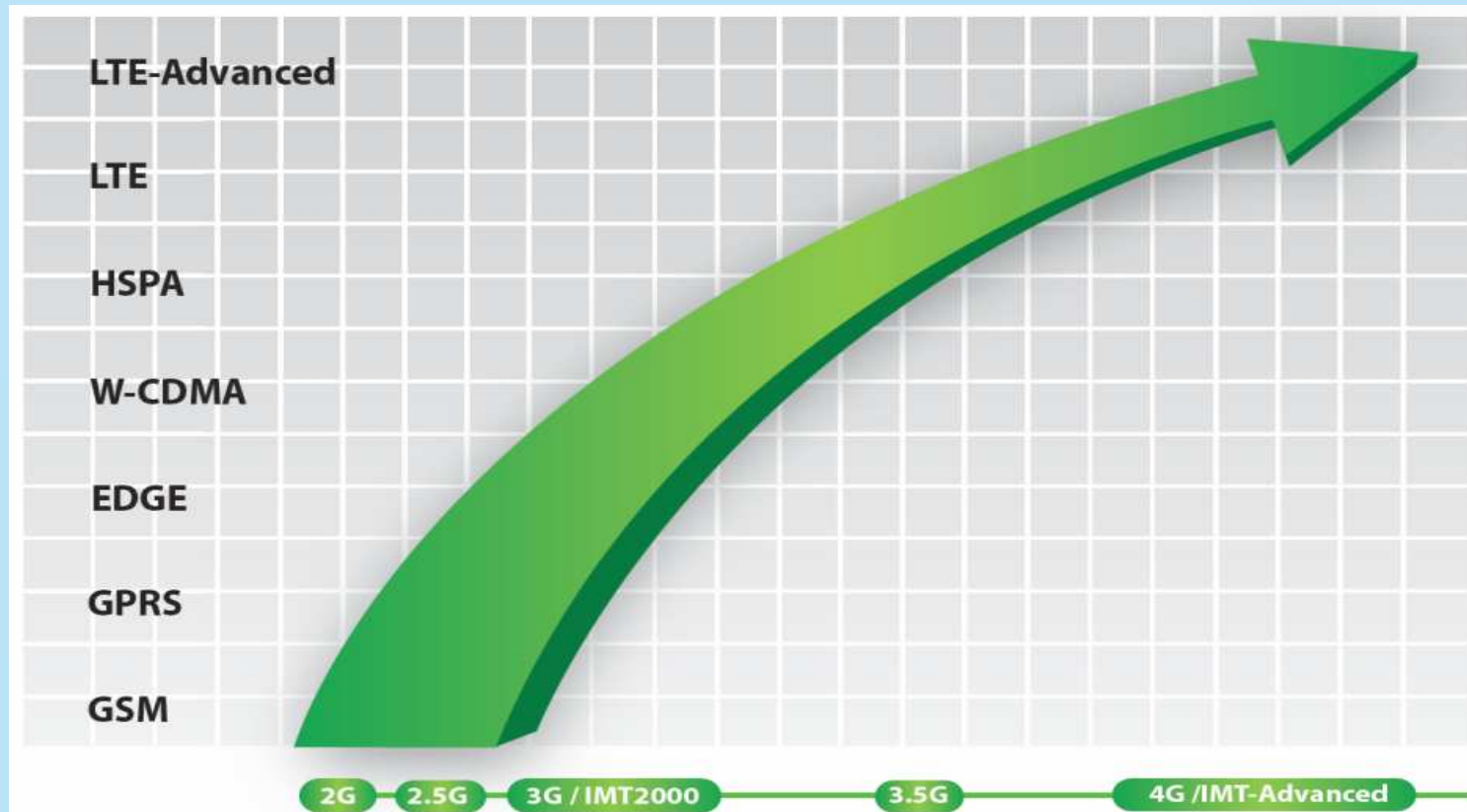


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3GPP Mobile broadband is an evolutionary process to optimise current assets, before moving towards new systems, network radio interfaces and spectrum



Source: 3GPP



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2G/3G/4G Technologies compared

	Technology	Carrier BW	UL Peak Data Rate	DL Peak Data Rate	Latency	Spectrum (MHz)	Peak Spectral Eff. (Bit/s/Hz)
2G	GSM / GPRS EDGE (MCS-9)	200 kHz	56 Kbps 118 Kbps	114 Kbps 236 Kbps	500 ms 300 ms	900/1800	0.17 0.33 EDGE
	W-CDMA	5 MHz	384 Kbps	384 Kbps (2 Mbps)	250 ms	900/1800/ 2100/2600	0.51
	HSPA	5 MHz	5.7 Mbps	14 Mbps	~70 ms	DD/900/ 2100/2600	2.88
3G	HSPA+ (16 QAM) (64 QAM + Dual)	5 MHz	11.5 Mbps	~28 Mbps (42 Mbps)	~30 ms	DD/900/ 2100/2600	12.5
	LTE (Rel.8) (2x2 MIMO)	var. up to 20 MHz	~75 Mbps	~150 Mbps (@20 MHz)	~10 ms	DD/900/1800/ 2100/2600	16.32
	WiMax IEEE 802.16e	10 MHz	70 Mbps	70 Mbps 134 Mbps	~50 ms	2600/3500	3.7
4G	LTE- Advanced*	var. up to 100 MHz	>500 Mbps	>1 Gbps	<5 ms	IMT	DL: >30 UL: >15
	"IMT- Advanced"	var. up to 100 MHz	270 Mbps 675 Mbps	600 Mbps 1.5 Gbps	<10 ms	IMT	DL: >15 UL: >6.75

Source: UMTS Forum



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3G/UMTS mobile broadband: a global mass market

- Almost **1.2Bn 3G subscribers** (UMTS + EVDO + TD-SCDMA)

worldwide...in which some **950m 3G/UMTS** subs (inc. around 645m HSPA), over 180m CDMA2000 EV-DO and 40m TD-SCDMA subs.

- Over 390 WCDMA networks (inc. 160 in Europe) in 150+ countries...

...in which over 370 HSPA networks,

and over **120 HSPA+** networks launched

- Over 30 UMTS 900 networks launched

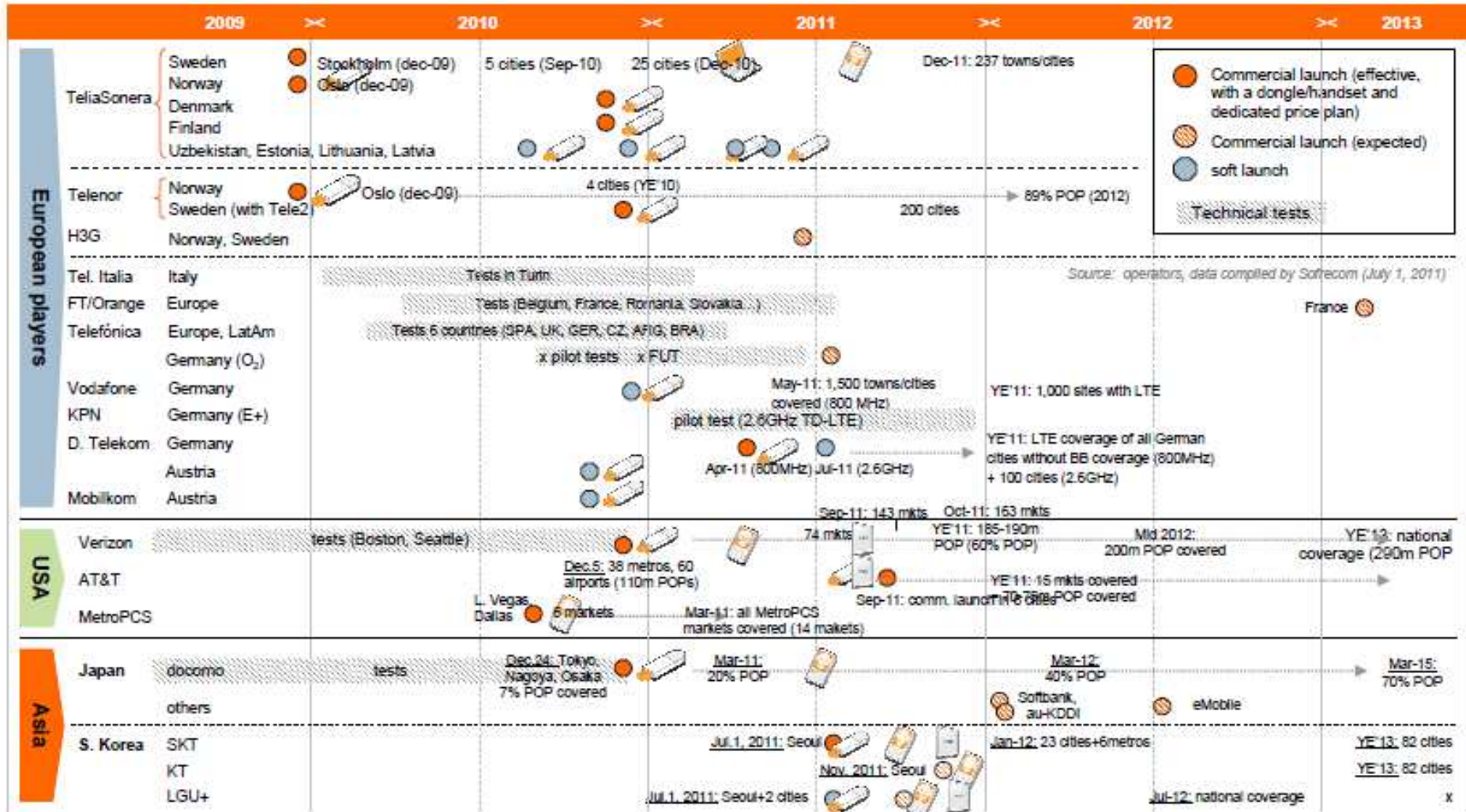
- And almost **35 LTE networks** commercially launched in 22 countries



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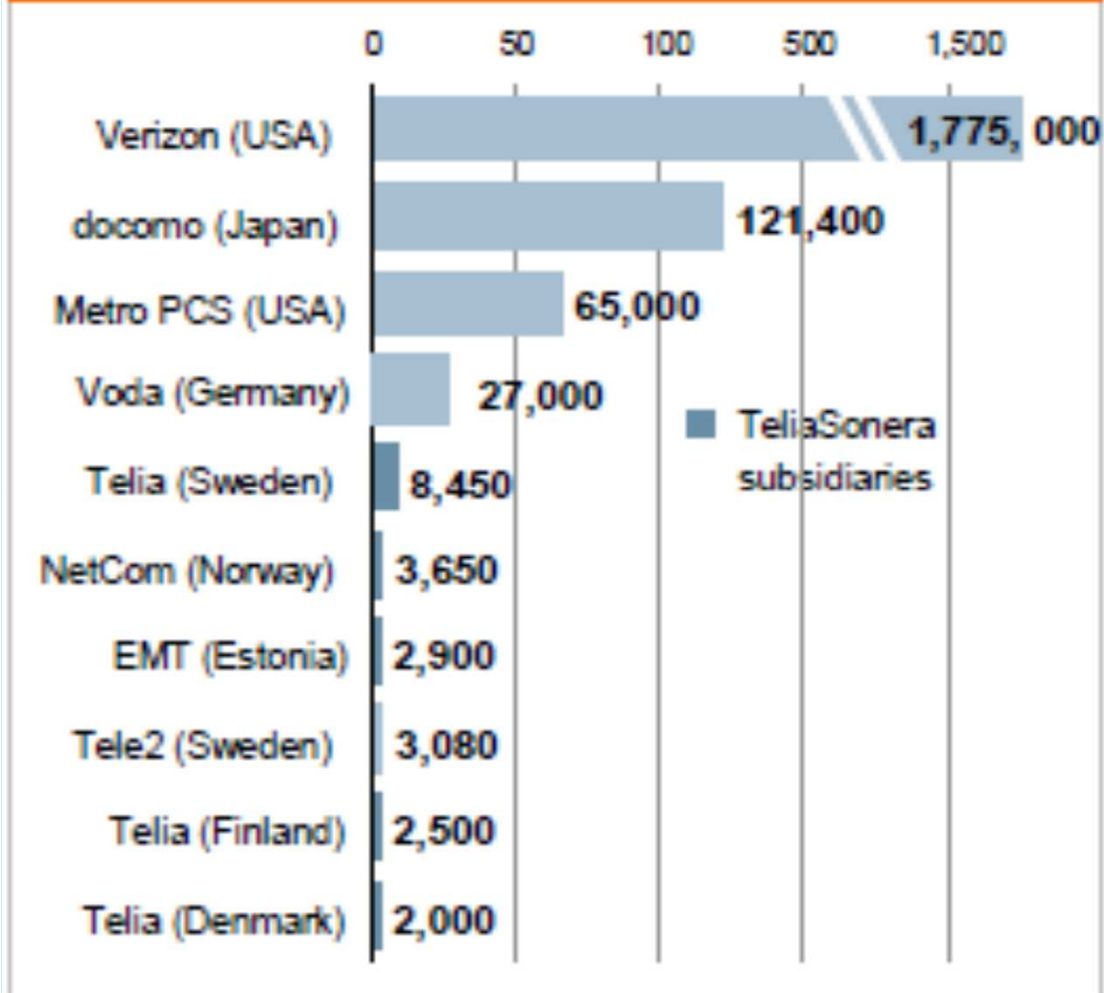


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World: Ranking of LTE operators – June 11 ('000)



Source: Informa WCIS (September 2011)

→ over 3m LTE subscribers worldwide

→ over 20,000 LTE subs for TeliaSonera so far

→ new forecast consensus around 10m LTE connections at YE'2011

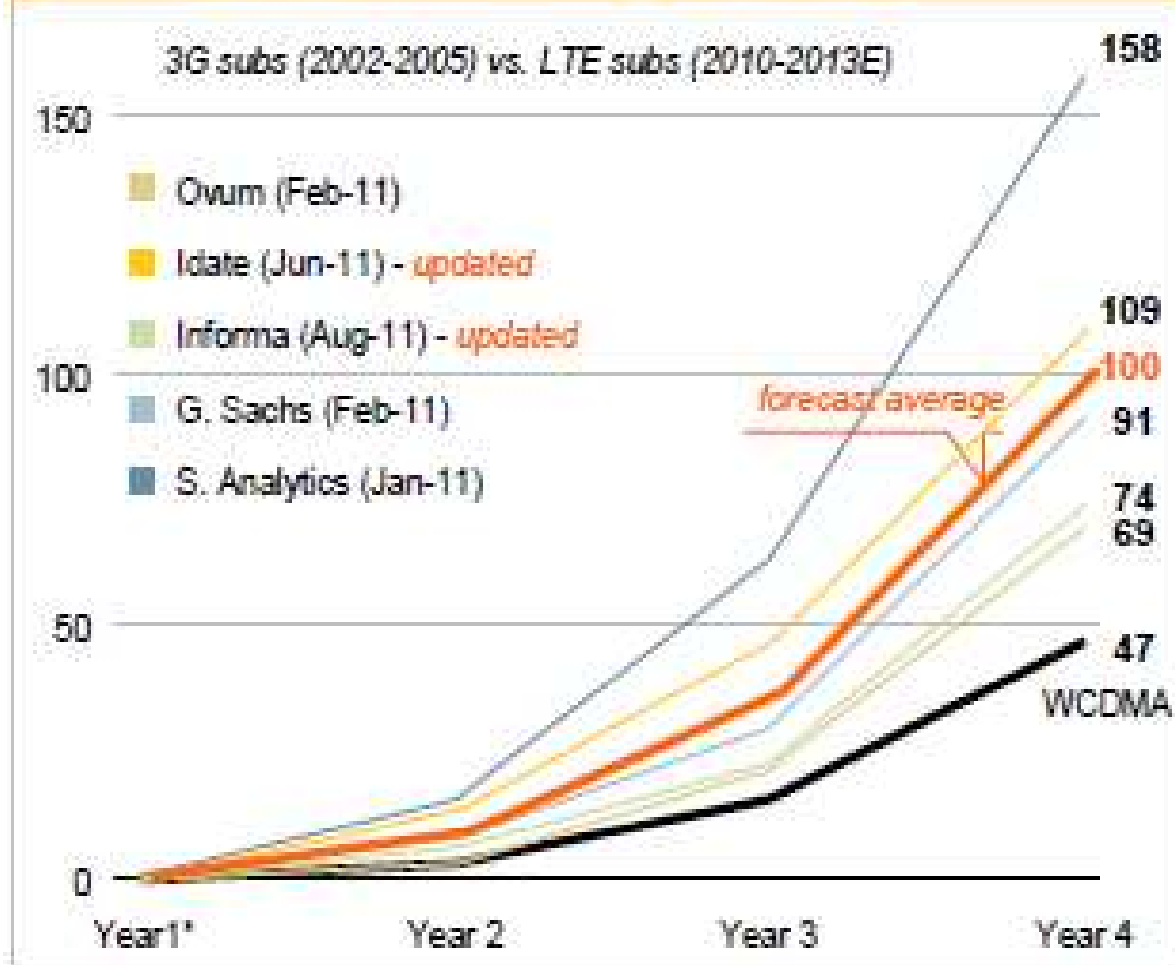


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World: Will LTE subscribers ramp faster than 3G?



* W-CDMA Year1 is 2002 and LTE Year1 is 2010. Source: see graph (2011)

→ LTE subscribers poised to ramp faster than 3G in its early days

→ The real ramp will begin at YE'12 and above all in 2013, when first handsets will be available at lower price points and with better autonomy.



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Subscribers & Forecasts (thousand)

		2009	2010	2011	2012	2013	2014	2015
Asia-Pacific	LTE Subscribers	-	-	1 670	13 763	43 724	96 399	173 004
	Aggregate Growth Rate	-	-	-	724%	218%	120%	79%
Australia	LTE Subscribers							
	Aggregate Growth Rate							
China	LTE Subscribers							
	Aggregate Growth Rate							
Hong Kong	LTE Subscribers							
	Aggregate Growth Rate							
India	LTE Subscribers							
	Aggregate Growth Rate							
Japan	LTE Subscribers							
	Aggregate Growth Rate							
New Zealand	LTE Subscribers							
	Aggregate Growth Rate							
Philippines	LTE Subscribers							
	Aggregate Growth Rate							
South Korea	LTE Subscribers							
	Aggregate Growth Rate							
Taiwan	LTE Subscribers							
	Aggregate Growth Rate							
Western Europe	LTE Subscribers	-	121	588	3 394	14 439	44 718	82 427
	Aggregate Growth Rate	-	-	385%	580%	262%	210%	84%
Finland	LTE Subscribers							
	Aggregate Growth Rate							
France	LTE Subscribers							
	Aggregate Growth Rate							
Germany	LTE Subscribers							
	Aggregate Growth Rate							
Italy	LTE Subscribers							
	Aggregate Growth Rate							
Norway	LTE Subscribers							
	Aggregate Growth Rate							
Spain	LTE Subscribers							
	Aggregate Growth Rate							
Sweden	LTE Subscribers							
	Aggregate Growth Rate							
UK	LTE Subscribers							
	Aggregate Growth Rate							
Eastern Europe	LTE Subscribers	-	-	-	114	494	4 027	15 298
	Aggregate Growth Rate	-	-	-	-	334%	715%	280%
Rest of Eastern Euro	LTE Subscribers							
	Aggregate Growth Rate							
Russia	LTE Subscribers							
	Aggregate Growth Rate							
North America	LTE Subscribers	-	-	2 316	10 485	32 030	59 086	91 079
	Aggregate Growth Rate	-	-	-	260%	206%	84%	54%
Canada	LTE Subscribers							
	Aggregate Growth Rate							
USA	LTE Subscribers							
	Aggregate Growth Rate							
Latin America	LTE Subscribers	-	-	-	143	783	2 789	9 673
	Aggregate Growth Rate	-	-	-	-	446%	256%	247%
Brazil	LTE Subscribers							
	Aggregate Growth Rate							
Rest of Latam	LTE Subscribers							
	Aggregate Growth Rate							
Total	LTE Subscribers	-	121	5 173	28 439	91 471	207 019	371 481
	Aggregate Growth Rate	-	-	4167%	451%	221%	126%	79%

LTE 2015 Forecasts

By the end of 2015, we forecast around 400m LTE subscribers worldwide, with around 180m in Asia-Pacific, 95m in North-America, 85m in Western Europe and 20m in Eastern Europe.

In Asia, Japan and South Korea, leaders in terms of 3G penetration, will dominate in LTE subs, whereas China will drive the TD-LTE market.

Source: UMTS Forum/Idate



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LTE drivers for Mobile Network Operators

- **Increase ARPU:** with higher monthly caps and DL data rates, MNOs should generate higher data ARPU
 - Gain additional **capacity** and higher **throughput**
 - **Change technology path:** CDMA2000 and Mobile WiMAX operators are converging towards 3GPP LTE...
 - **Reduce the data cost structure** for operators already facing an explosion in mobile data traffic, especially owing to flat-rate or unlimited packages (this was the case for Telia in Sweden, in particular);
 - **Opt for a completely new network** when the age and capacity of the core mobile networks would make expensive upgrades necessary;
 - **Differentiation from the competition** on very active markets, rather like Verizon (USA), a CDMA EV-DO operator which needed to respond to competition from 3G+/UMTS (HSPA and HSPA+)
- Sources: Orange, Idate, UMTS Forum*



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A growing TD-LTE Ecosystem

- TDD & FDD versions of 3GPP LTE have strong similarities, and some manufacturers are building common FDD/TDD chipset platforms
- There is a global availability of TDD spectrum: 2.3GHz was recently allocated for BWA in India
- Strong support of TD-LTE from leading mobile operators, of which China Mobile is a big promoter (Shanghai World Expo first demos in June 2010), recently joined by Yota (Russia) and by Sprint/Clearwire (USA) as well as significant BWA actors in India



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LTE adopted Business Models

- « **Classic** » **LTE model** - offloading/capacity requirement: *JV « Net4Mobility » Tele2 / Telenor*: expanding network capacity
- **Mobile broadband centric solution** - *Telia Sonera, Telekom Austria, Verizon*: offering high speed mobile BB services
- **FWA and substitution of Unbundling Local Loop** - *Vodafone Germany, O2 Germany*: offering stationary BB via LTE modems (FWA)
- **Phasing out DSL via more efficient networks** - *Deutsche Telekom*: providing BB services in rural areas / small cities
- **Niche services / Targeted B2B2C** - WAN for backhaul solutions /offload data; solutions for automotive industry, travel & transportation,...
- **Wholesale LTE model** – for MNOs and SPs: *Lightsquared (USA: LTE/satellite), Yota (Russia), Clearwire (USA)*: reselling data traffic to interested parties via LTE network; solutions for MNOs for access to rural areas and lower Capex, MVNOs, Service providers

Source: Sofrecom



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LTE technology is ready to be deployed and is compliant with the 3GPP requirements

→ Orange LTE deployment strategy

LTE / EPC is the new horizon for mobile technology

Commercial launch when LTE end to end customer experience superior to the one with HSPA+

on going efforts to resolve outstanding issues

- Higher spectrum efficiency
- Reduced latency
- Compatibility with the GSM/UMTS family
- Gradual roll out taking advantage of the HSPA+/LTE multimode operations
- Technology adopted by both GSM/UMTS and EVDO worlds
- Multimode and multiband device availability
- LTE Performance in the DD band
- Open interfaces
- SON features availability
- Easy roll-out of network equipment



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4G/LTE auctions: ARCEP first regulator in Europe to impose partnerships instead of free commercial agreements

Joint Venture 3GIS between Telenor and H3G

Ran-sharing 2G-3G on active infrastructures between Orange UK et T-mobile → new operator 'Everything Everywhere'
 new alliance Vodafone – Telefonica
 subsidiary 'Mobile Broadband Network Ltd' between 3UK and T-mobile UK

Europe: regulatory situation for 800MHz and 2.6GHz

- Auction expected in 2011 and after
- Licences awarded

Joint Venture « Net4mobility » between Telenor and Tele2
 Spectrum sharing 900MHz GSM and 2.6 GHz LTE

Roaming agreement between Telia Sonera and Tele2
 Tele2 brings his frequencies to Telia Sonera

Ran-sharing 3G between 3 or 4 operators, roaming agreement between Free and Orange France

unique country where regulator imposes LTE partnerships to obtain licences

Discussions between Deutsche Telekom, Telefonica O2 and Vodafone to deploy together the LTE 800 MHz, linked to rural areas coverage obligations.

Ran-sharing 2G-3G between Vodafone – Orange Spain
 New alliance Vodafone-Telefonica

Joint Venture between PTK Centertel (Orange) and P4 (Play)

TGV lines shared between Orange, Vodafone and Telefonica



Source: Orange, based on public announcements, commitment or updated information



Source: Orange, based on public announcements, commitment or updated information
 Alliance LTE 2G-3G
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