



Alcatel-Lucent in brief The Markets We Serve

#### **Service Providers**





## Strategic Industries



# Enterprises

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Public Safety organisations benefits from Alcatel-Lucent leadership in Networks, Applications, Services and Innovation

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#### How broadband enriches Public Safety?

#### The usage / bandwidth gap...



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# How broadband enriches Public Safety? Improving mission efficiency with additional services



Video Situational Awareness Throughput Requirements: Static Cameras: 100-150 kbps Nomadic Cameras: 200 kbps Road Chase: 400 kbps Remote Assessment by Subject Matter Expert: 500 kbps Remote Tactical Decision-making: 800 kbps







\*"Statement of Requirements for Public Safety Communications & Interoperability," SAFECOM Program, Department of Homeland Security, Version 1.1, January 26, 2006



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# Which Broadband technology? LTE! LTE is the technology of choice for mobile broadband applications



#### Which Broadband technology? LTE! LTE in a nutshell

#### A common evolution ...

#### ...introducing highly efficient technologies



# Which Broadband technology? LTE! Performance compared - Transfer of Picture

LTE provides

High throughput for very fast transfer

Transfer delay	Low res. picture (10 KB)	Mid res. picture (60 kB)	High res picture (2MB)		
TETRA Packet Data	~ 35"	~ 3'25"	~113'45"		
TEDS (50 kHz)	~2"	~6"	~3'40"		
LTE (5 MHz)	<< 1"	<< 1"	~3"		
LTE (10 MHz)	<< 1"	<< 1"	~1.5"		

Low latency (10 to 20 ms) for very fast access

LTE ensures real-time transfer of data and video



#### Which Broadband technology? LTE! An All-IP Architecture



#### eUTRAN: Evolved UMTS Radio Access Network

- eNode B
- EPC: Evolved Packet core
  - S-GW: Serving Gateway
  - PDN-GW: Packet Data Network Gateway
  - MME: Mobility Management Entity
  - PCRF: Policy Control and Rating Function
  - HSS: Home Subscriber Server

#### Multi-homing

#### Roaming

Interworking with legacy networks

• 3GPP, 3GPP2

#### Open, Flexible, E2E QoS, Interoperable, Highly resilient

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# Which Broadband technology? LTE!

#### Frequency

Bandwidth options



Spectrum

• 3GPP TS 36.201 (Release 9)

E-UTRA Operating Comm Band	Common Name	Uplink (UL) operating band	Downlink (DL) operating band	Duplex	3GPP	GSM Frequency	UMTS Frequency	CDMA Frequency	WiMAX Frequency
		$F_{UL_{low}} - F_{UL_{high}}$	F <sub>DL_low</sub> – F <sub>DL_high</sub>	Wode	Release				
1	IMT	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz	FDD	Rel 8		Y	Y	
2	PCS-1900	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz	FDD	Rel 8	Y	Y	Y	
3	DCS-1800	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz	FDD	Rel 8	Y		Y	
4	AWS	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz	FDD	Rel 8		Y	Y	
5	850 USA	824 MHz – 849 MHz	869 MHz – 894MHz	FDD	Rel 8	Y	Y	Y	
6 (a)	850 Japan	830 MHz – 840 MHz	875 MHz – 885 MHz	FDD	Rel 8	Y		Y	
7	IMT-E	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz	FDD	Rel 8				Y
8	E-GSM 900	880 MHz – 915 MHz	925 MHz – 960 MHz	FDD	Rel 8	Y	Y	Y	
9	1800 Japan	1749.9 MHz – 1784.9 MHz	1844.9 MHz – 1879.9 MHz	FDD	Rel 8		Y		
10	W-CDMA US	1710 MHz – 1770 MHz	2110 MHz – 2170 MHz	FDD	Rel 8		Y		
11	1500 Japan	1427.9 MHz – 1452.9 MHz	1475.9 MHz - 1500.9 MHz	FDD	Rel 8				
12	Lower 700 US	698 MHz – 716 MHz	728 MHz – 746 MHz	FDD	Rel 8				
13	Upper C US	777 MHz – 787 MHz	746 MHz – 756 MHz	FDD	Rel 8				
14	Public Safety US	788 MHz – 798 MHz	758 MHz – 768 MHz	FDD	Rel 8				
15		Reserved	Reserved	FDD	Rel 8				
16		Reserved	Reserved	FDD	Rel 8				
17		704 MHz – 716 MHz	734 MHz – 746 MHz	FDD	Rel 9				
18		815 MHz – 830 MHz	860 MHz – 875 MHz	FDD	Rel 9				
19		830 MHz – 845 MHz	875 MHz – 890 MHz	FDD	Rel 9				
33		1900 MHz – 1920 MHz	1900 MHz – 1920 MHz	TDD	Rel 8				
34		2010 MHz – 2025 MHz	2010 MHz – 2025 MHz	TDD	Rel 8				
35		1850 MHz – 1910 MHz	1850 MHz – 1910 MHz	TDD	Rel 8				
36		1930 MHz – 1990 MHz	1930 MHz – 1990 MHz	TDD	Rel 8				
37		1910 MHz – 1930 MHz	1910 MHz – 1930 MHz	TDD	Rel 8				
38		2570 MHz – 2620 MHz	2570 MHz – 2620 MHz	TDD	Rel 8				Y
39		1880 MHz – 1920 MHz	1880 MHz – 1920 MHz	TDD	Rel 8				
40		2300 MHz – 2400 MHz	2300 MHz – 2400 MHz	TDD	Rel 8				Y

LTE can use low to large channelization and can be deployed in existing / new bands.



# Lessons learnt from US *Dedicated spectrum*

Dedicated Public Safety Spectrum for BB applications (2x5 MHz)

Extension to D block under discussion (2x5 MHz)

Technology of choice is LTE

• Ecosystem, possibility to roam to commercial network too

First waivers granted (21)

Commercial auctions lead to \$19 billions







# Lessons learned from US LTE Network Architecture for Public Safety



Starting with a multi-jurisdiction broadband overlay network that provides interoperable access to information anywhere, anytime

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# Concluding remarks E2E LTE solution from Alcatel-Lucent



# Concluding remarks Challenges ahead in Europe

# Spectrum???

- Dedicated spectrum but where?
- Digital dividend auctions are starting and are juicy

# Business model and process???

- Owned vs. Leased capacity
- Operations outsourcing
- Managing massive multimedia information
- Interworking with TETRA

# Some more lessons to be learnt from the US

# Broadband Access to Incident area now with RDN



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