MRP Report to 3GPP

Chris Pearson
President, 5G Americas

Mumbai, India
April 28-29, 2016

www.5gamericas.org

Mission and Membership

5G Americas

will advocate for and foster the advancement and full capabilities of LTE wireless technologies, including LTE-Advanced and beyond to 5G, throughout the ecosystem's networks, services, applications and wirelessly connected devices in the Americas.

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Global Mobile Subscribers and Market Share by Technology

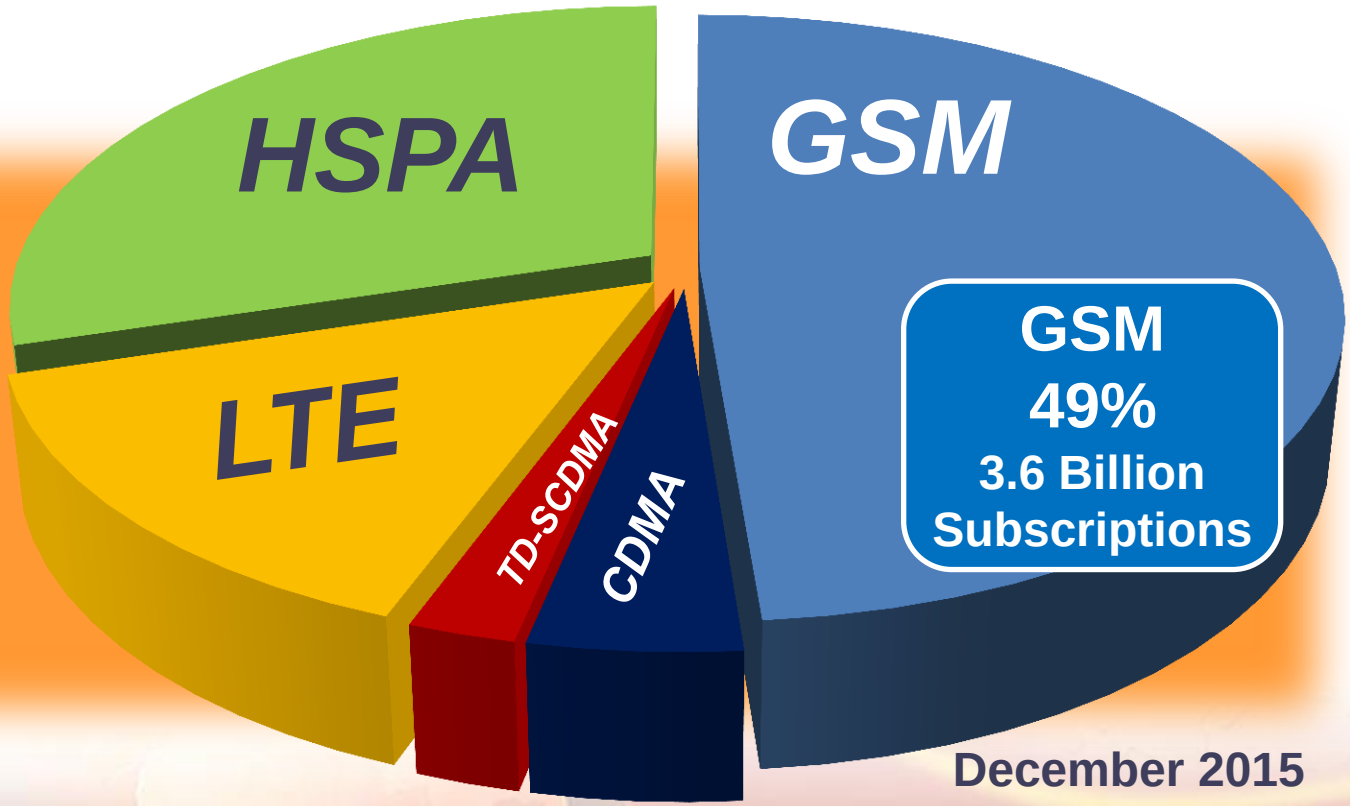
HSPA
30%
2.2 Billion Subscriptions

LTE
15%
1 Billion Subscriptions

TD-SCDMA
2%
169 Million Subscriptions

CDMA
4%
332 Million Subscriptions

7.3 Billion mobile subscriptions worldwide



December 2015

Source: OVUM Dec 2015

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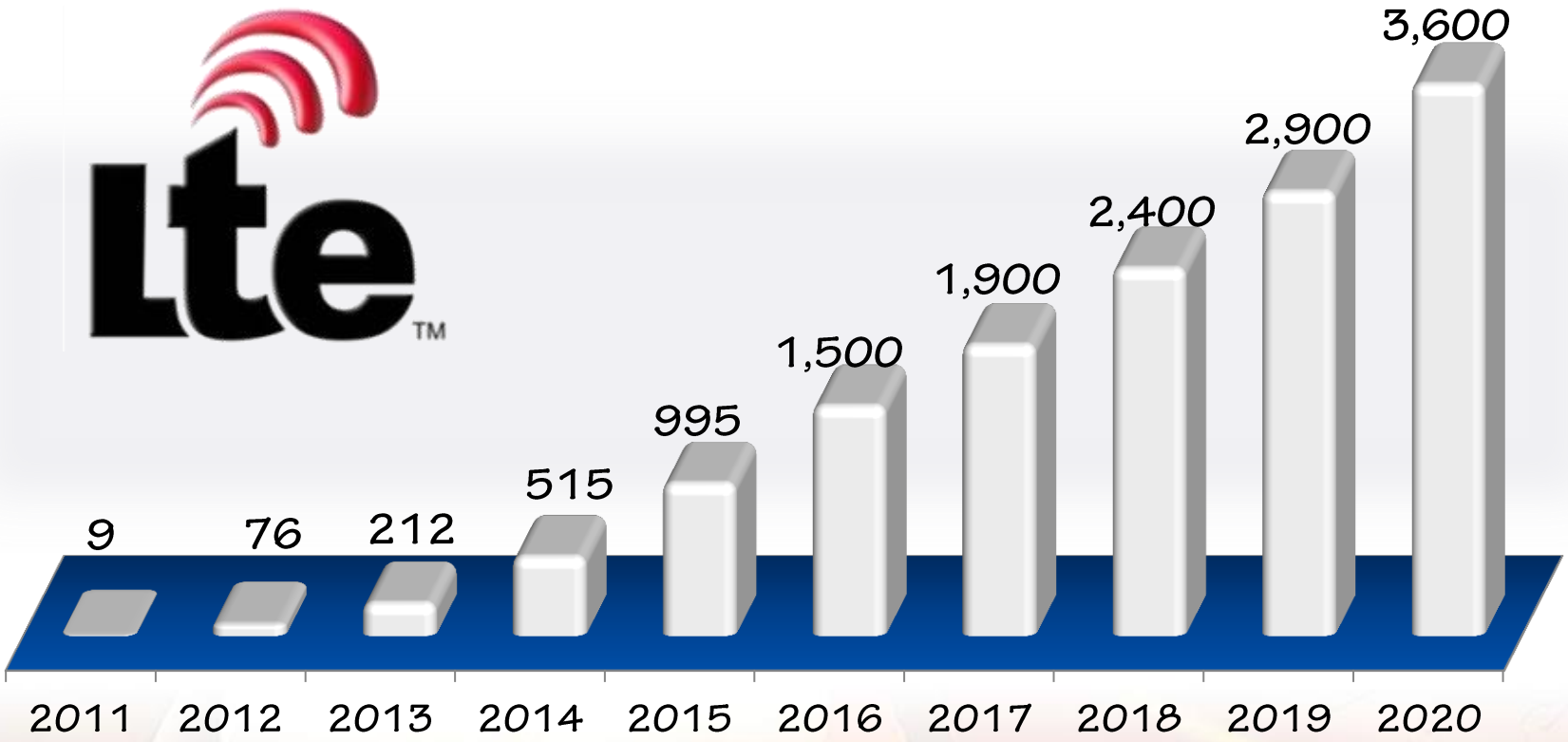
Global LTE Subscription Growth Forecast



Sources: Ovum, December 2015

Note: Forecast does not include M2M

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Global Mobile Broadband Deployments

LTE-Advanced
118 Networks
57 Countries

LTE
480 Networks
157 Countries
1 Billion Connections

Source: 5GAmericas, April 2016

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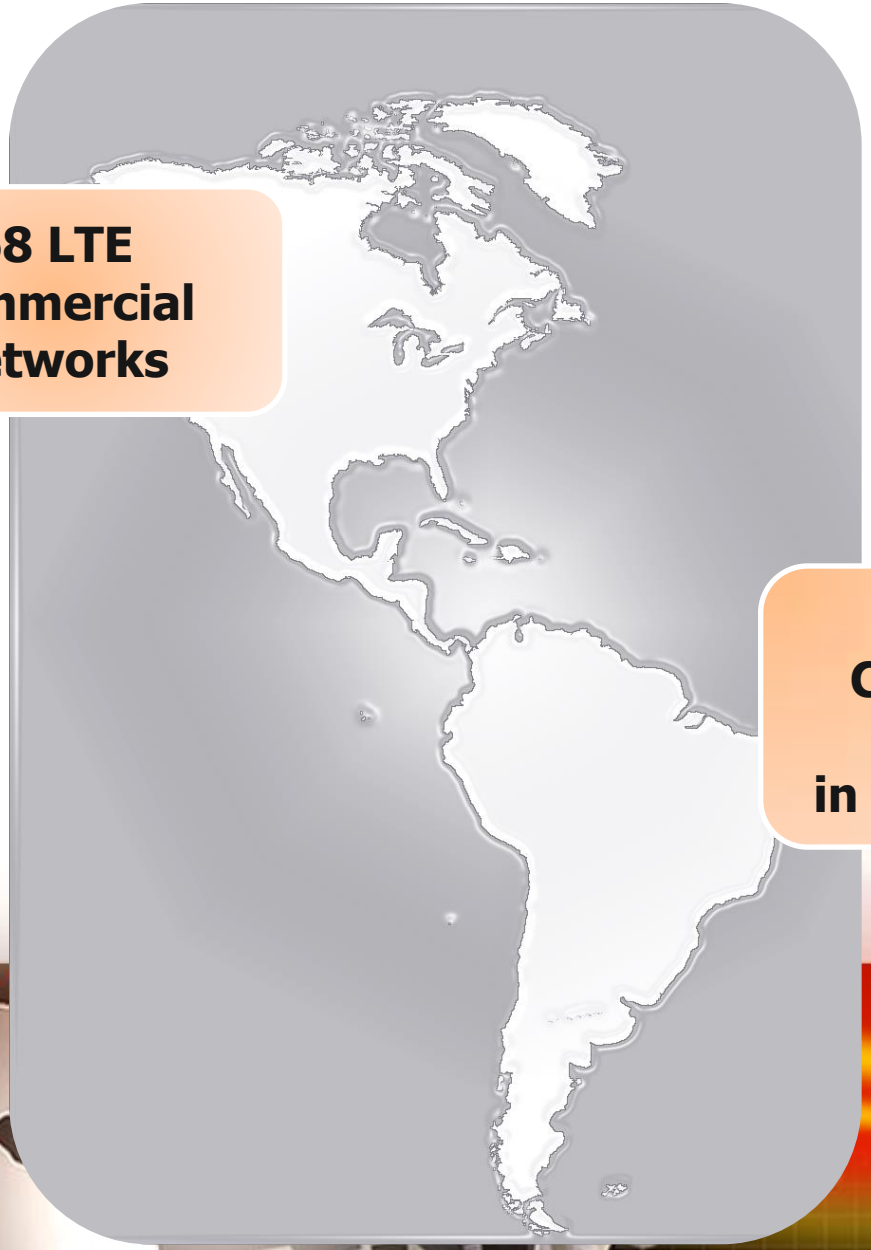
Americas Region Market Update

US
Canada

68 LTE Commercial Networks

7 LTE-Advanced Commercial Networks



Latin America
Caribbean

75 LTE Commercial Networks in 30 countries

Source: 5GAmericas, April 2016

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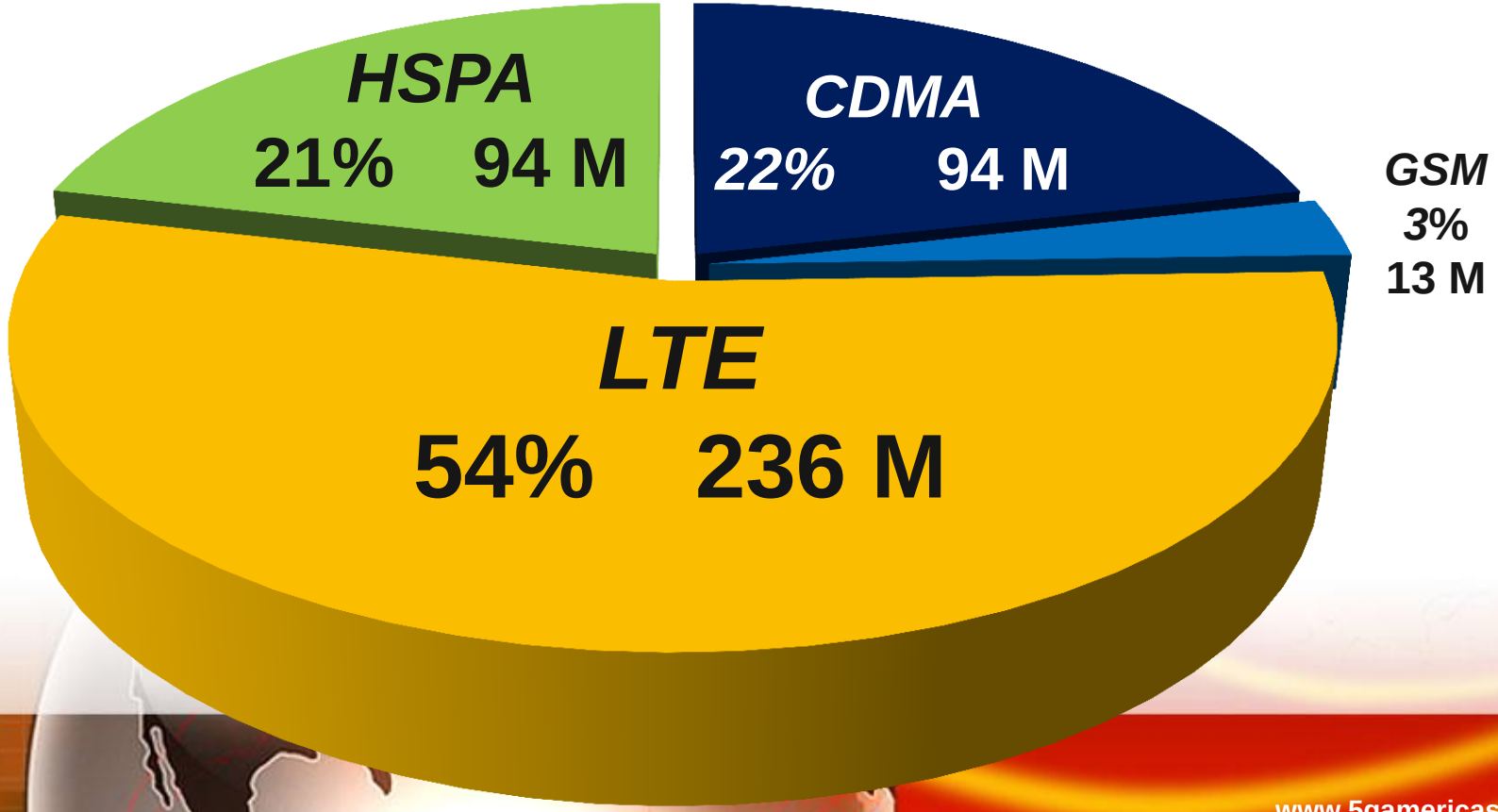
Mobile Subscribers and Market Share by Technology – US and Canada

438 Million Total Subscriptions

December 2015



Source: OVUM December 2015

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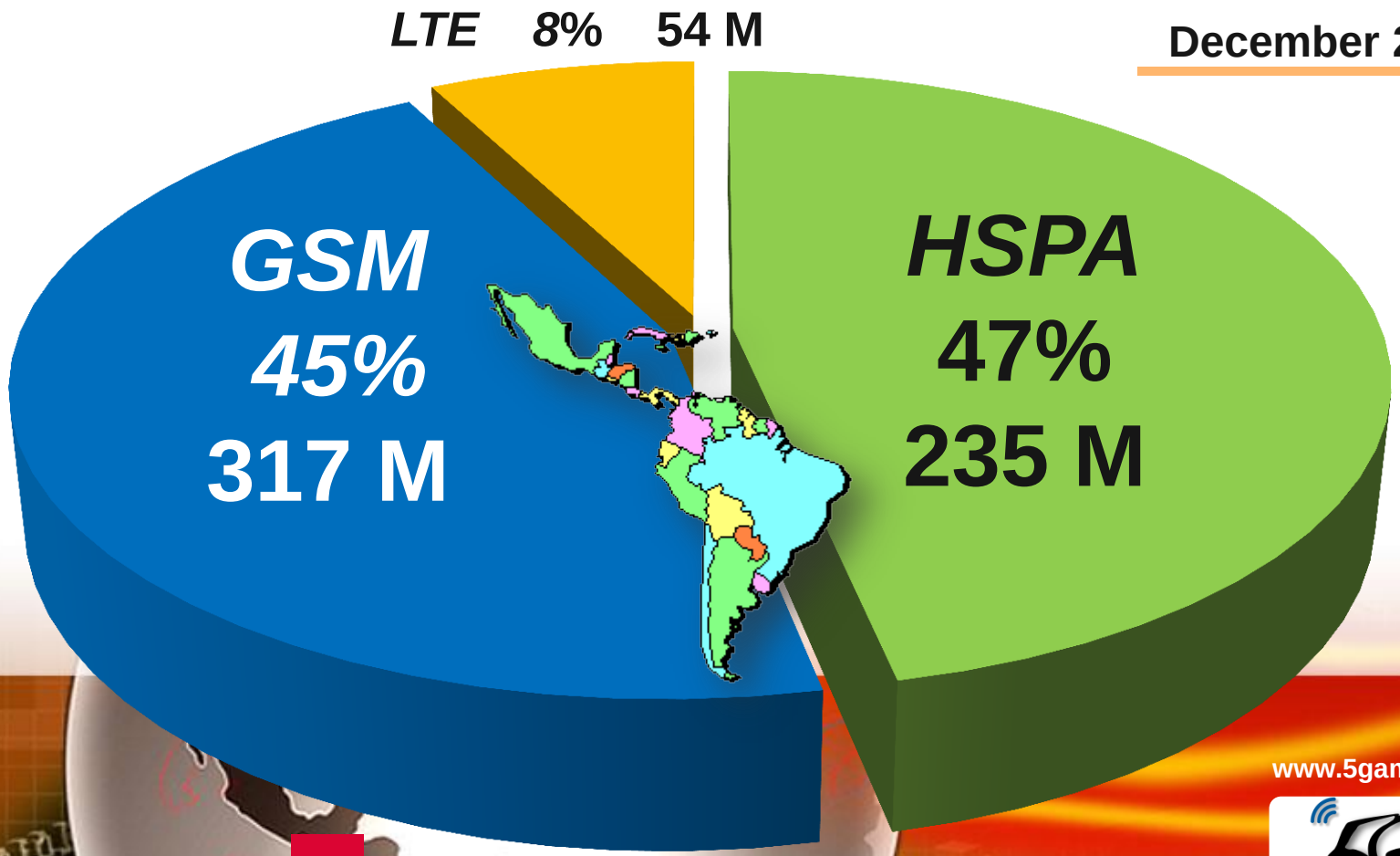
Mobile Subscribers and Market Share by Technology
Latin America & Caribbean

708 million total subscriptions

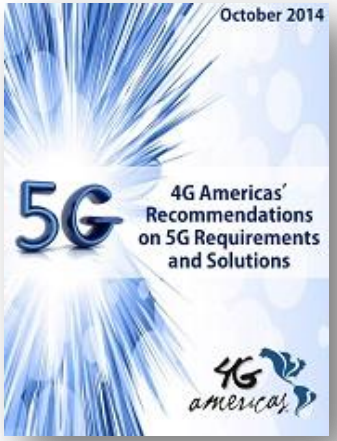
December 2015



Source: OVUM December 2015

Toward 5G in 2020

5G Americas White Papers



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5G Americas 5G Requirements

- Battery Life
- Per-user Data Rate and Latency
- Robustness and Resiliency
- Mobility
- Seamless User Experience
- Context Aware Network

- Scalability
- Network Capacity
- Cost Efficiency
- Automated System Management & Configuration
- Network Flexibility
- Energy Efficiency
- Coverage
- Security
- Diverse Spectrum Operation
- Unified System Framework

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5G Americas Performance Requirements

Scenario	End-to-End Latency	Mobility	Data Rate		Battery Life	Reliability
			DL	UL		
Dense Urban	Medium	Low	High	Medium	Short	Medium
Urban	Medium	Low	High	Medium	Short	Medium
Suburban	Medium	High	Medium	Low	Short	Medium
Rural	Medium	High	Medium	Low	Short	Medium
Remote[1]	Low	Low	High	Medium	Short	Medium
Automotive (section 2.1.4)	Low	High	Medium	Medium	Medium	High
Extreme Video, Virtual Reality and Gaming Applications (section 2.2)	Low	Low	High	Medium	Short	Medium
Public Safety (section 2.4)	Medium	High	High	Medium	Medium	High
PSTN Sunset (section 2.5)	Medium	Low	Low	Low	Medium	Medium
M-Health and Telemedicine (section 2.1.3)	Medium	Low	High	Medium	Medium	High
Smart Cities (section 2.1.2)	Medium	Low	Medium	Medium	Long	Medium
Sports and Fitness (section 2.1.5)	Medium	Low	Low	Low	Short	Low
Increased Density of Data Usage (section 2.3)	Medium	No	High	Medium	N/A	Medium

Performance Table Legend:

End-to-End Latency	High (> 100 ms)
Mobility	No: 0 m/s (static / nomadic)
DL/UL Data Rate	Low: < 25 Mbps
Battery Life	Long: Years
Reliability	High: > Five 9's

End-to-End Latency	Medium (10 - 100 ms)
Mobility	Low: ~1 m/s (pedestrian)
DL/UL Data Rate	Medium: 25 – 200 Mbps
Battery Life	Medium: Weeks
Reliability	Medium: Four 9's

End-to-End Latency	Low (< 10 ms)
Mobility	High: ~>10 m/s (mobile)
DL/UL Data Rate	High: > 200 Mbps
Battery Life	Short: Days
Reliability	Low: < Four 9's

[1] While it may not be feasible or practical for commercial deployment of 5G networks in remote locations, the availability of 5G networks in remote locations for Public Safety could be critical. Establishment of 5G networks in remote environments may be performed on an as-needed basis using deployable network equipment. Such deployable network equipment may be vehicular based, aircraft based, air-dropped containers, etc.

Key Developments for 5G Wireless Networks

Enhanced Mobile Broadband
Massive Machine Type Communications
Ultra-reliable and Low Latency Communications

Capacity

Latency

Speed

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Mobile Broadband Considerations for 5G

Industry Trends → **New Use Cases** → **New Requirements**

Data traffic explosion
1000x capacity

Massive connections
10x-100x increase in the number of devices

Achievable data rate
100x increase

Latency
5x to 10x reduction

Density
10x user density

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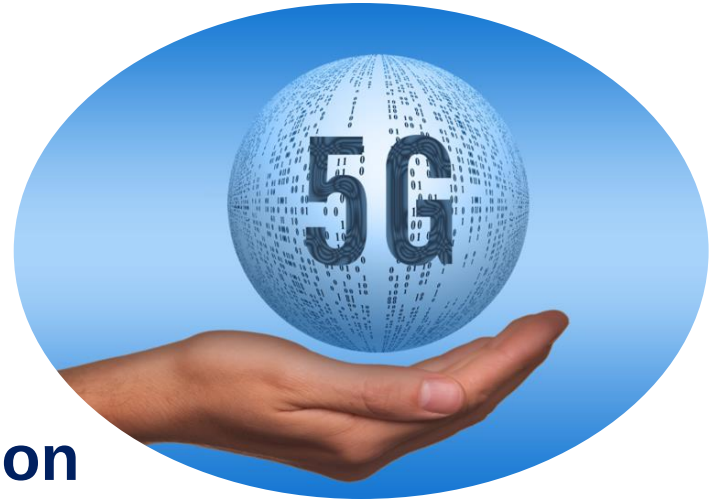
Recommended Potential 5G Technologies (1)

- Massive MIMO
- RAN Transmission – Centimeter and Millimeter Waves
- New Waveforms
- Shared Spectrum Access
- Advanced Inter-Node Coordination
- Simultaneous Transmission Reception
- Multi-RAT Integration & Management

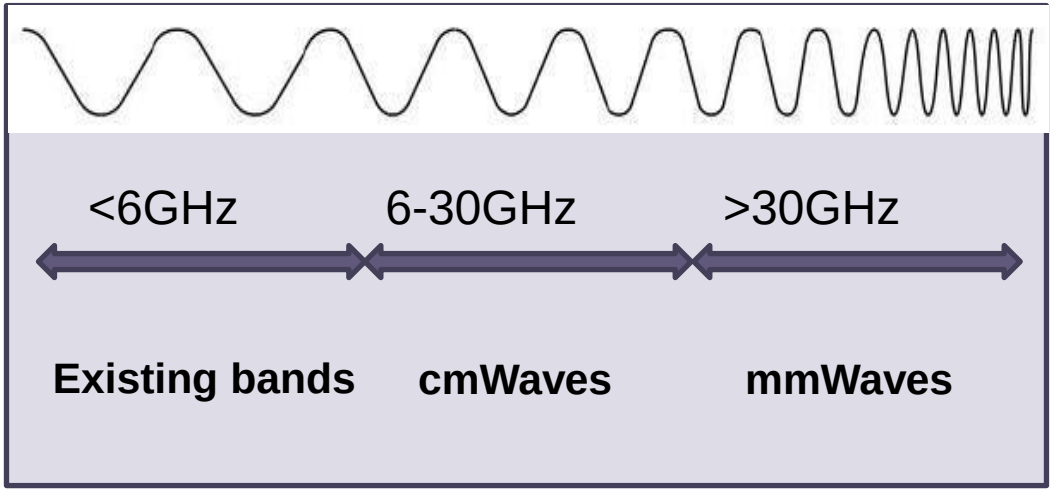


Recommended Potential 5G Technologies (2)

- D2D Communications
- Efficient Small Data Transmission
- Wireless Backhaul / Access Integration
- Flexible Networks
- Flexible Mobility
- Context Aware Networking
- Information Centric Networking
- Moving Networks

Spectrum and 5G

Spectrum and the Evolution to 5G



Licensed	**Exclusive rights granted to an operator by regulator**	**Provides reliable, secured spectrum for predictable quality/capacity**	**Critical part of LTE Evolution and 5G deployments**
Shared	Shared with incumbents	Coordinated access when/where not used by incumbents.	Facilitates timely access to spectrum in shared bands
Unlicensed	No registration or individual permission	Rules established to avoid interference	Complement for LTE & 5G, e.g. in small cell deployment

- **Additional spectrum needed in existing and new bands**
- **High frequencies for ultra-dense 5G small cell deployments**
- **Both licensed and unlicensed exclusive and shared spectrum**

5G High Band Spectrum for Study for WRC-19

24.25 - 27.5 GHz

**31.8 - 33.4 GHz*

37.0 – 40.5 GHz

**40.5 – 42.5 GHz*

42.5 - 43.5 GHz

45.5 – 47 GHz

**47 – 47.2 GHz*

47.2 - 50.2 GHz

50.4 - 52.6 GHz

66 - 76 GHz

81 - 86 GHz

11 Bands

***Not yet allocated for mobile on a primary basis**

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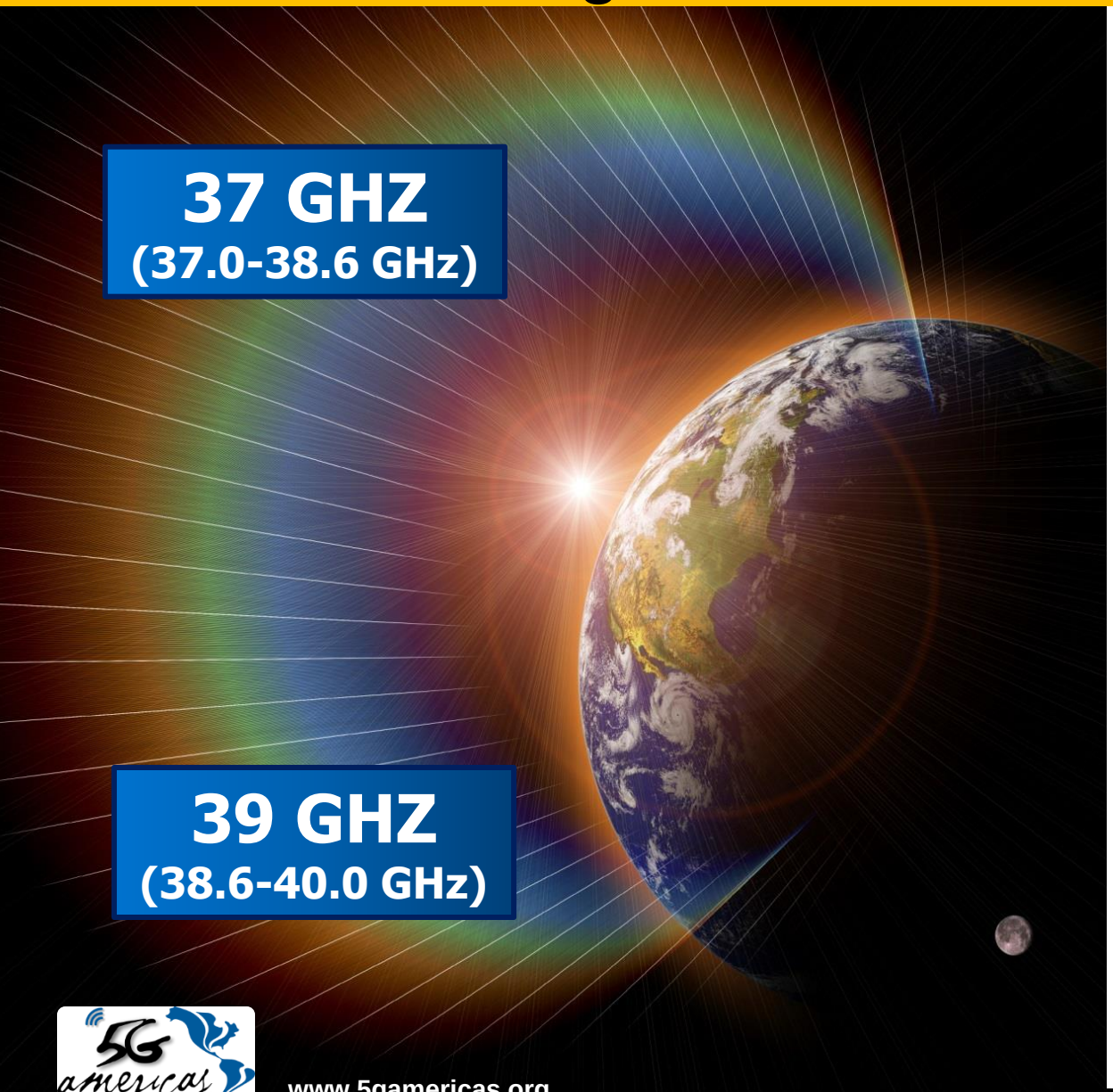
U.S. FCC NPRM Spectrum Frontiers
5G Americas Filing



- **5G Americas proposes that the FCC combine the 37 and 39 GHz bands to make a single contiguous band of 3 GHz**
- **5G Americas proposes that the Commission consider any combinations of 500/200 MHz blocks for this band**

U.S. FCC NPRM Spectrum Frontiers / 5G Americas Filing

- Currently licensed as LMDS license A1 sub block on a BTA basis
- FCC proposes to expand the LMDS authorization for Fixed Service to include Mobile Service
- Currently, licenses are single 850 MHz license blocks
- 5G Americas proposes that all remaining unassigned licenses in this band be awarded as three 200 MHz and one 250 MHz blocks

28 GHZ

(27.5-28.35 GHz)

End-to-End 5G Ecosystem

REGULATORY

Spectrum
Resiliency
Lawful Intercept
Spectrum Sharing
Emergency Services

RADIO

Advanced Interference Management
Massive MIMO
Security
Modulation
Millimeter Wave

Mesh Networks
Flexible Networks
Cloud RAN
M2M/IoT

CORE

NFV
Security
M2M/IoT
Ubiquitous
Storage & Computing

M2M/IoT
World Wide Wireless Web
Cloud

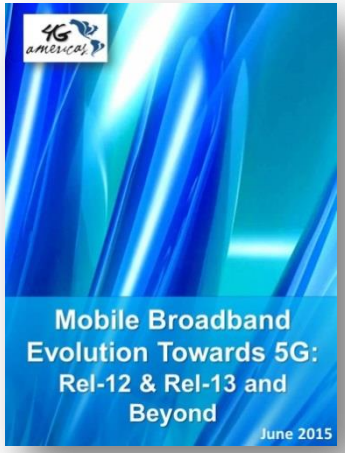
APPLICATIONS

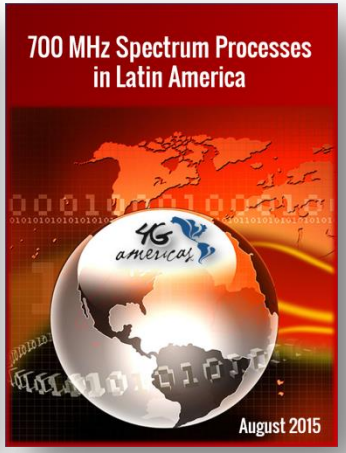
Security
Context Aware Networking
M2M/IoT
D2D Apps

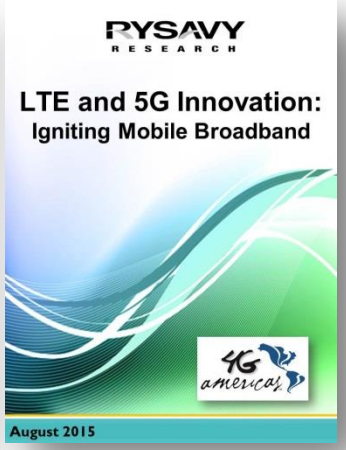
DEVICES

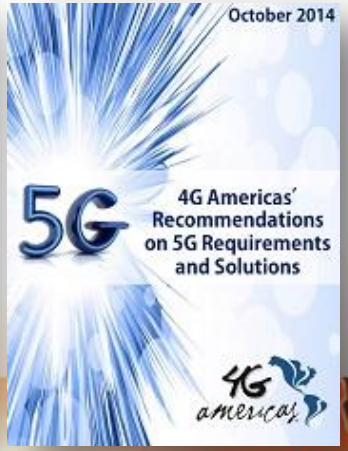
Mesh Networks
D2D
Modulation
Context Aware Networking

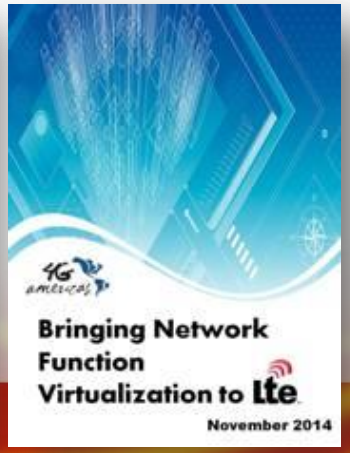
5G Americas Technical Publications











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5G Americas Towards…….2020

5G Americas publicizes 5G work and is willing to embrace the 5Cs with organizations around the world.

5G and the 5Cs

Connect

Communicate

Collaborate

Cooperate

Contribute

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Thank you!

Chris Pearson, President

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