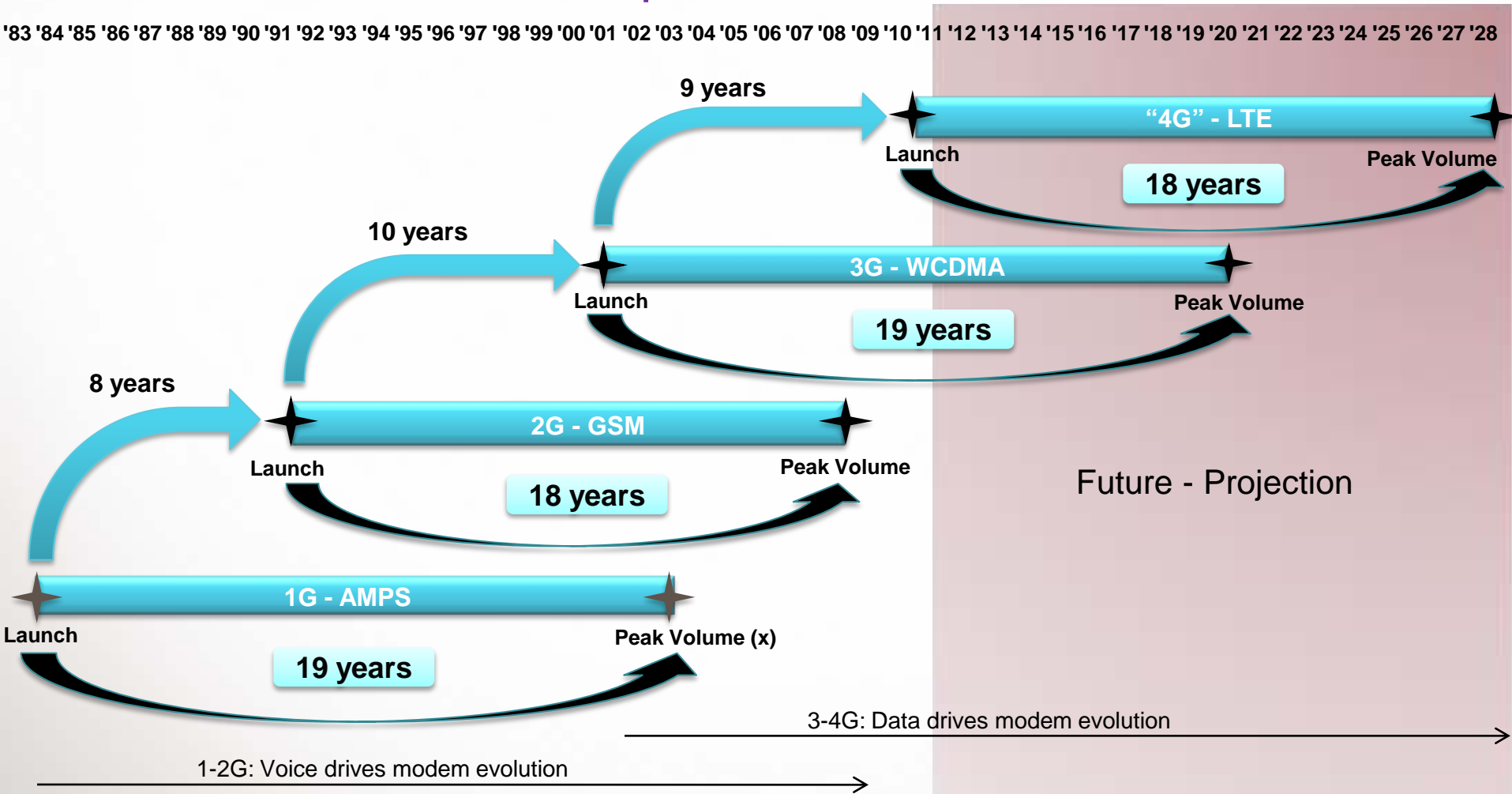


3G-4G Evolution Multimode Modems

4G World, Chicago
24-Oct-2011



Modem Evolution and Adoption Trends



18-20 years from first launch of new generation to peak device volume
Each generation produces significantly higher volume than previous

Qualcomm Supporting LTE Launches Globally

US/CANADA

700, 850 MHz
1.7/2.1, 1.9, 2.5 GHz



LATIN AMERICA

450, 700, 850, 900 MHz
1.7/2.1, 1.8, 1.9, 2.5 GHz

EUROPE

800, 900 MHz
1.8, 1.9/2.1, 2.5 GHz



AFRICA & MIDDLE E.

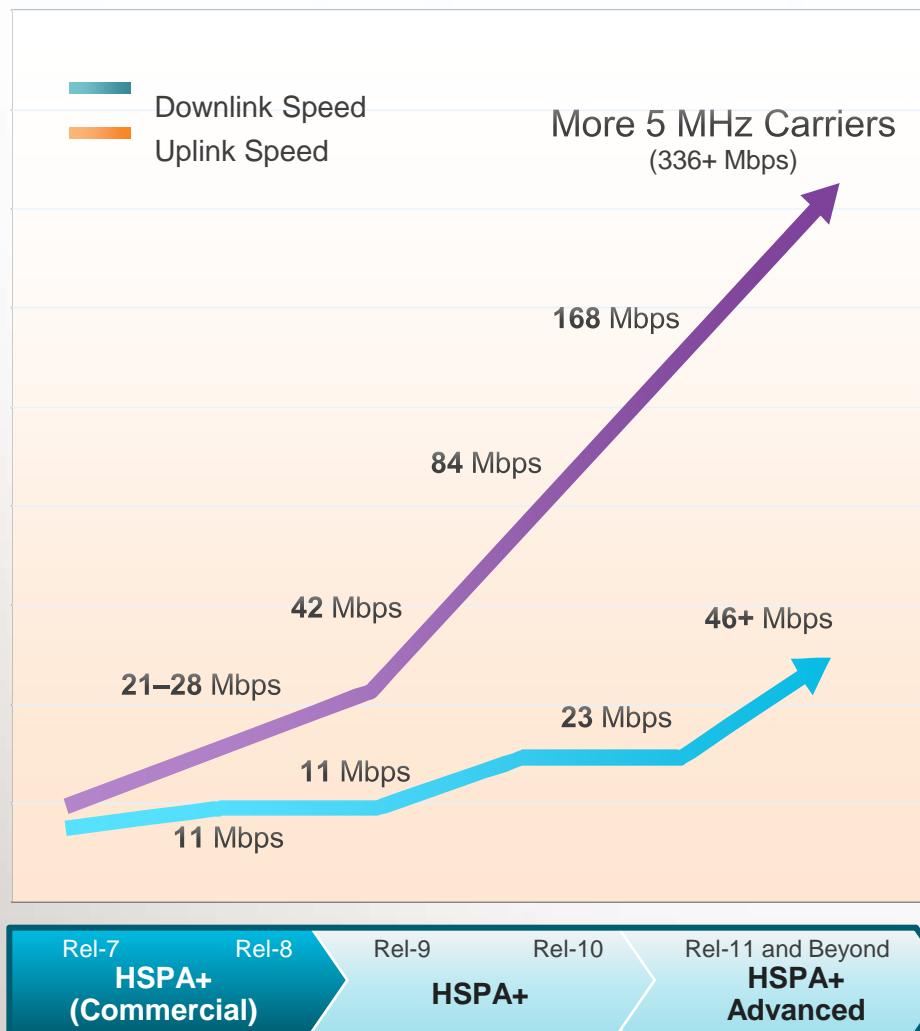
450, 800, 850, 900 MHz
1.8, 1.9/2.1, 2.5 GHz

ASIA-PACIFIC

450, 700, 850, 900 MHz
1.7, 1.8, 1.9/2.1, 2.3, 2.5 GHz



HSPA+ Has a Strong Evolution Path



R11 and Beyond: HSPA+ Advanced

- Expands HSPA+ to 40 MHz deployments
- Further leverages multiple antennas (UL MIMO/Beamforming)
- Exploits smart networks (multipoint) and HetNet enhancements

R10: 20 MHz Multicarrier

- Expands HSPA+ to 20 MHz deployments
- Evolution to femtocell networks

R9: Expands Dual-Carrier

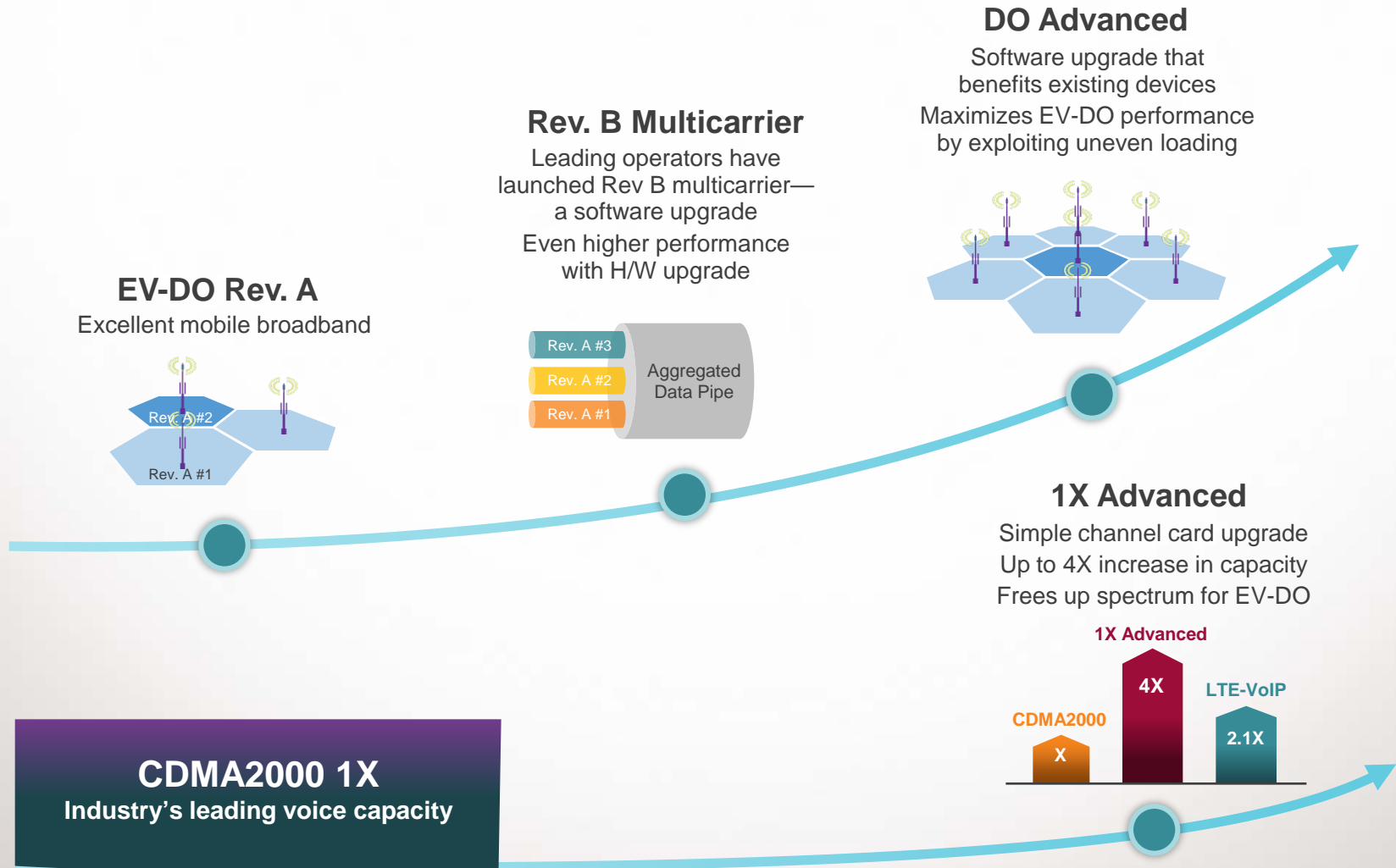
- 10 MHz dual-carrier in uplink
- Combination of MIMO and dual-carrier in downlink
- Aggregation across spectrum bands
- Femtocell enhancements: active mobility

R8: 10 MHz Dual-Carrier

- Enhances broadband—doubled data rates to all users
- Introduction to femtocell support
- Alleviates signaling traffic, e.g., from smartphones

Created February 8, 2011.
Notes: R8 reaches 42 Mbps by combining 2x2 MIMO and HOM (64QAM) in 5 MHz, or by utilizing HOM (64QAM) and multicarrier in 10 MHz. R9 combines multicarrier and MIMO in 10 MHz to reach 84 Mbps peak rates. Uplink multicarrier doubles the uplink peak data rate to 23 Mbps in 10 MHz in R9. R10 expands multicarrier to 20 MHz to reach 168 Mbps. R11 expands multicarrier to 40MHz to reach 336 Mbps.

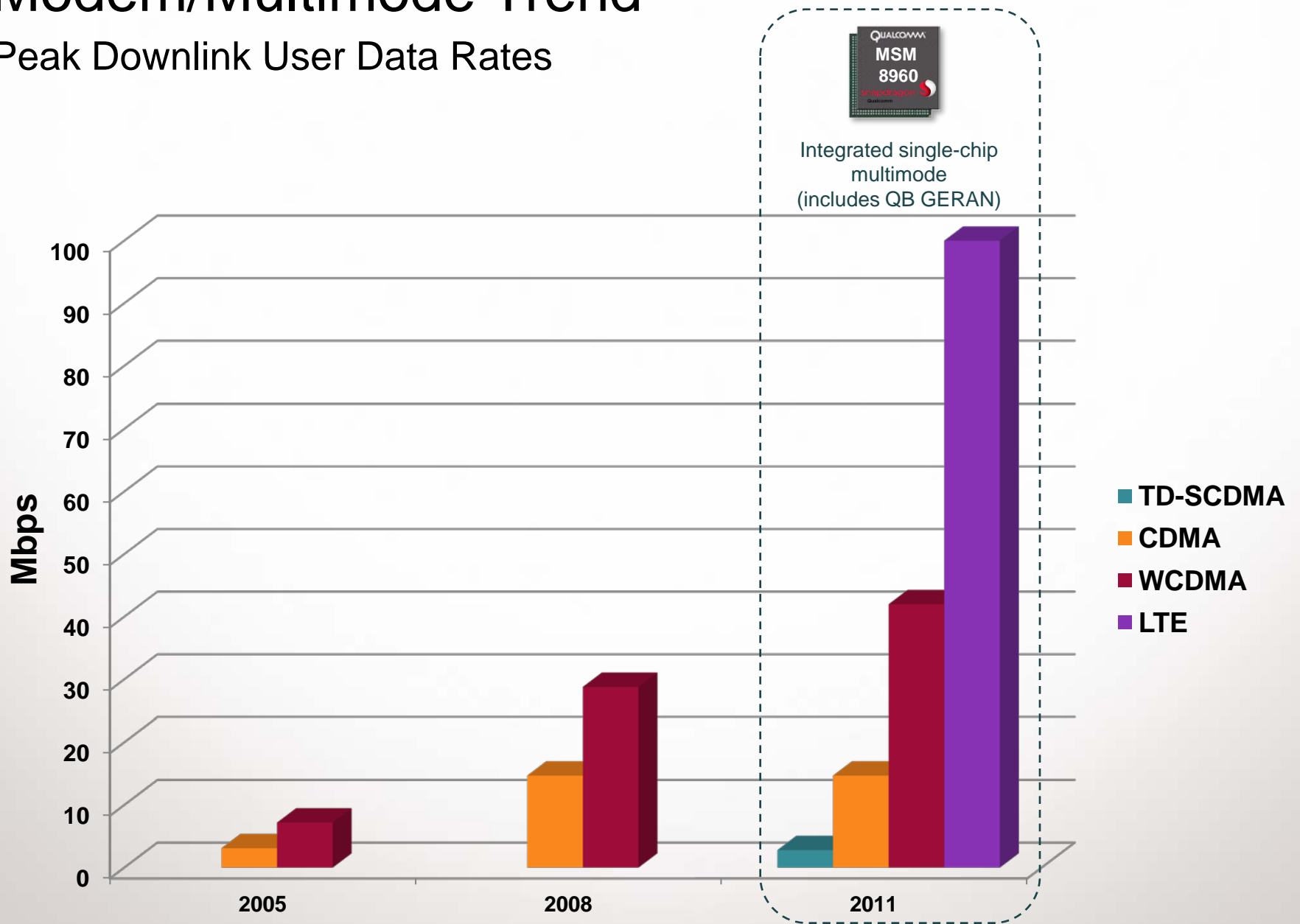
1X and EV-DO Have Strong Evolution Paths



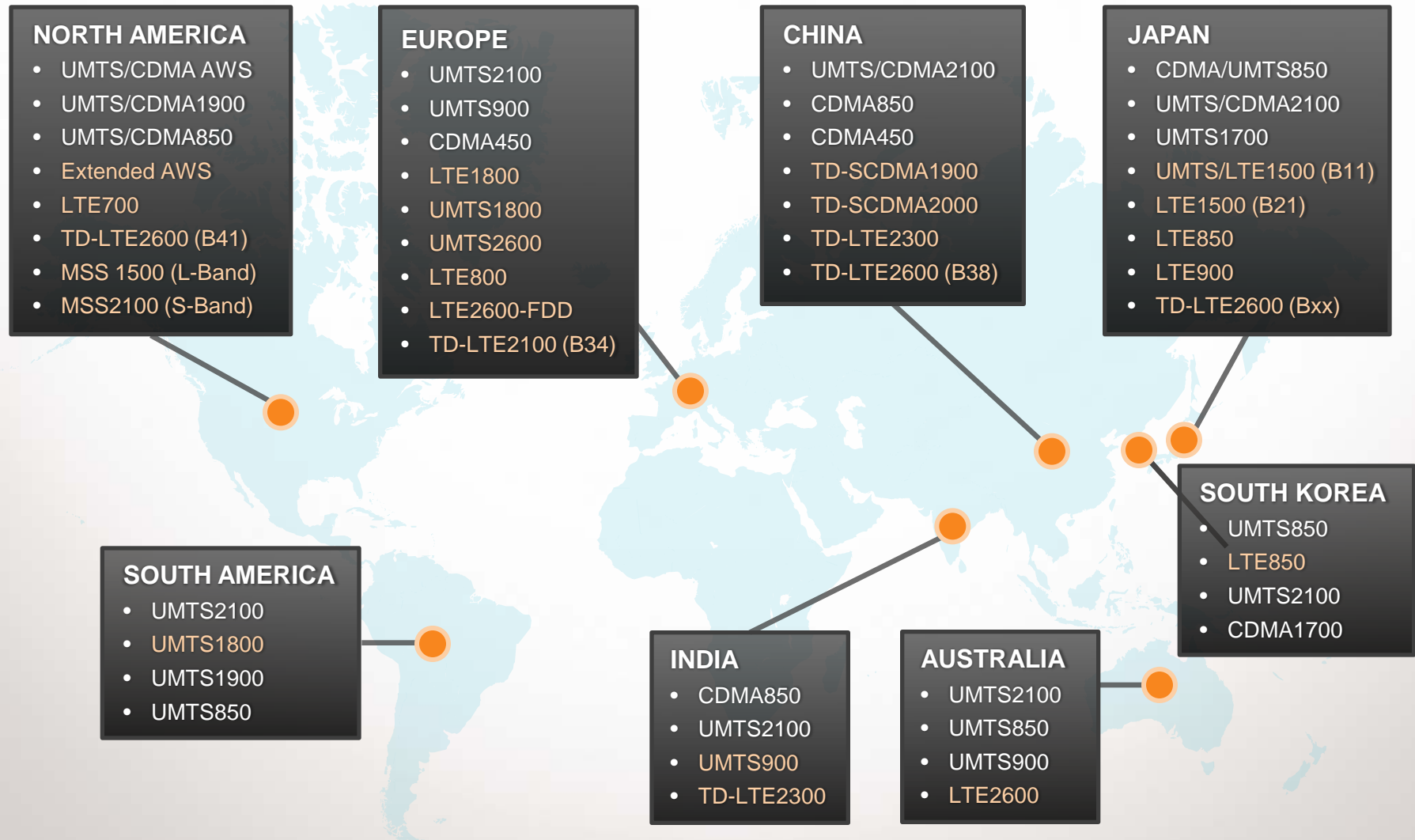
Created February 8, 2011.

Modem/Multimode Trend

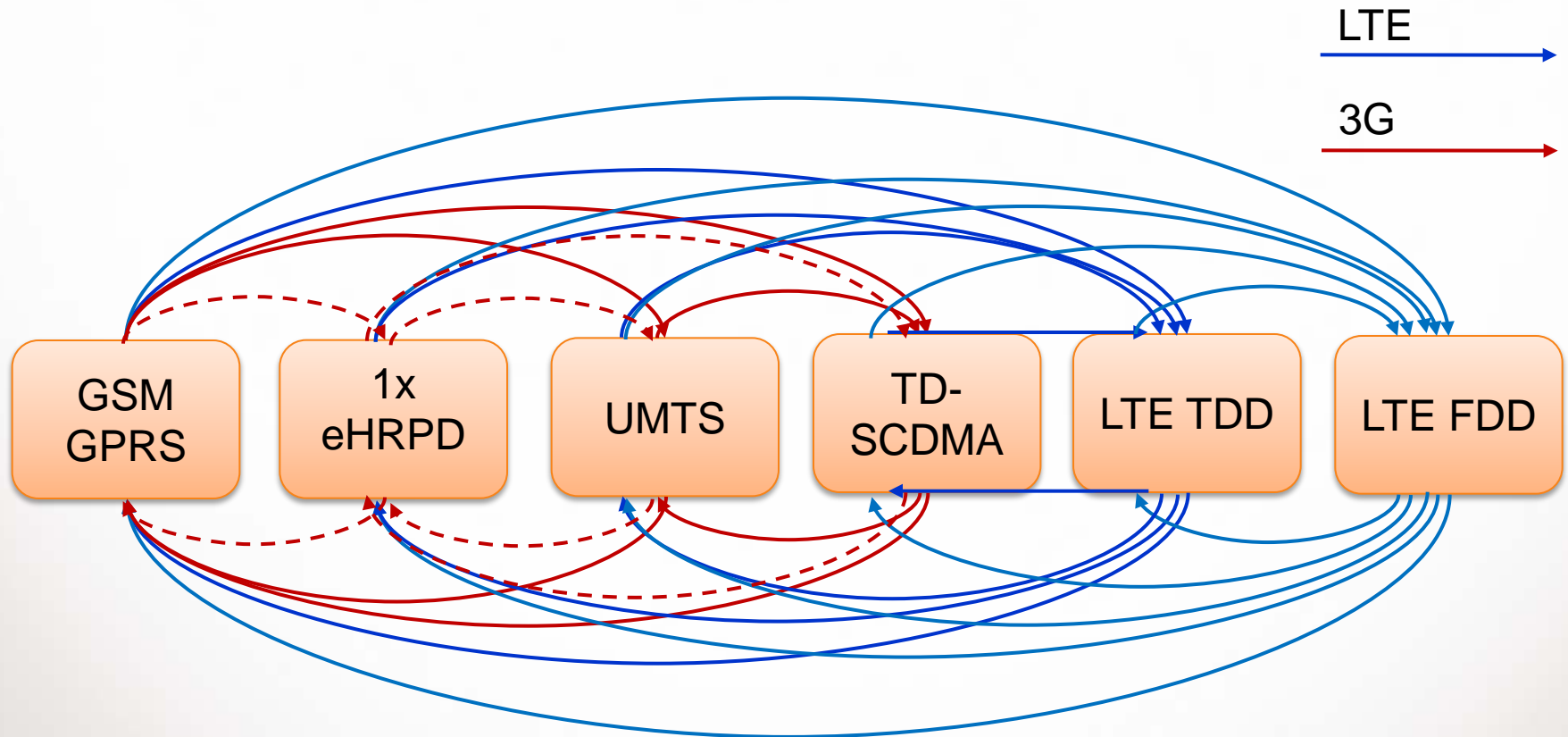
Peak Downlink User Data Rates



Support for Over 40 RF Bands Required



Handover - InterRAT Combinations



Selected iRAT Procedures

OOS	PS Handover
Blind Redirection	CSFB
Redirection w/ meas.	CSFB w/ SI Tunnel
Reselection	SR-VCC

LTE Device and Voice Evolution

Initial Launches
Data Devices

Initial Voice Solution
LTE Data Handsets

Long Term Voice Solution
LTE VoIP Handsets

LTE coverage
LTE for data only

**Multimode Data
interRAT handover**

2G/3G coverage

LTE coverage
LTE for data only

**Simultaneous 3G
Voice/LTE Data (SVLTE)**

**Circuit Switched
Fallback (CSFB) to
2G/3G voice**

LTE coverage
**Simultaneous
VoIP and LTE data**

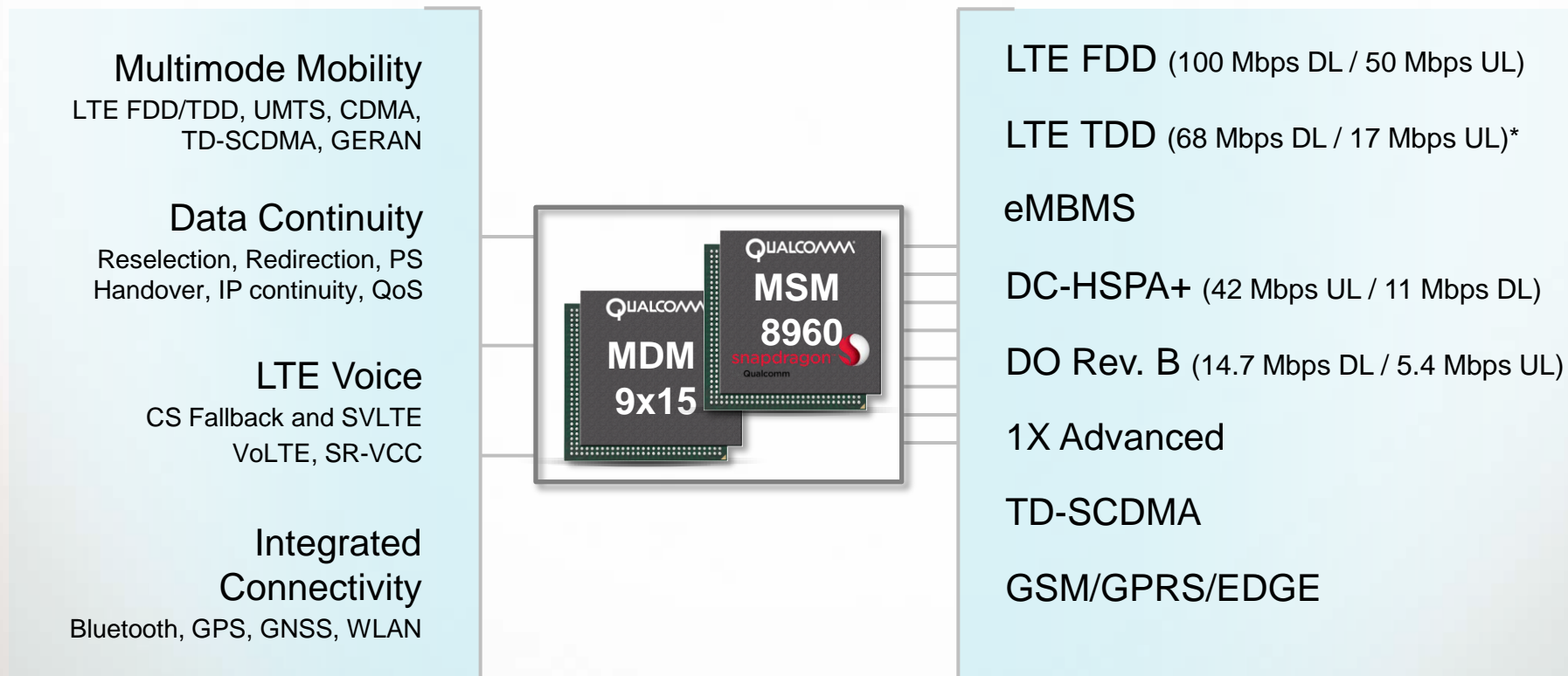
**VoLTE with SR-VCC or
3G VoIP Handover**

**CSFB Support for
Roaming**

**3G DATA
COVERAGE/
ROAMING**

3G VOICE COVERAGE/CONTINUITY AND ROAMING

Next Generation Integrated LTE/3G Multimode



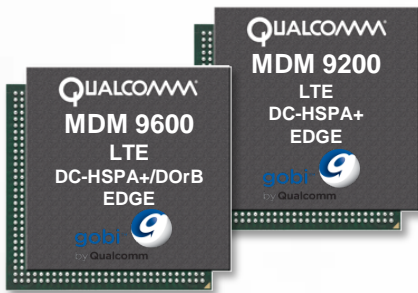
Supports over 40 bands for true worldwide coverage, with:

- Concurrent multiband 3G/LTE + Quad-band GSM
- RxD/MIMO support on 3G/LTE bands

*Data rates depend on TDD partitioning.

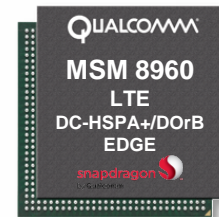
Common LTE FDD and TDD Chipset Platforms

MODEMS AND DATA CARDS



- 50+ designs by 25+ OEMs
- Commercial Q4 2010
- 100 Mbps DL/ 50 Mbps UL

SMARTPHONES AND TABLETS



- Dual-core CPU (28nm)
- Superior graphics and multimedia
- Integrated connectivity (WLAN, GPS, Bluetooth, FM)
- MSM8960 launches in 2012
- Handset and tablet launches in 2011 based on (MDM9x00=MSM)



INDUSTRY'S FIRST LTE/3G MULTIMODE CHIPSETS

Qualcomm: Industry Leading Modem Supplier

Only complete multimode
modem solution with
integrated 4G LTE/3G

#1 supplier of 3G
modems worldwide

#1 in integrated
multimode LTE+3G
modems



Source: iSource, Q2 2011, QCT.

Questions and **Answers**

Peter Carson
Senior Director,
Product Management



Thank You

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