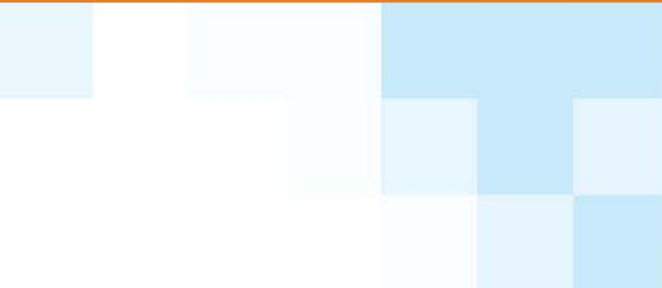


Mobile Broadband for Public Safety

August 2009



3G Supports Today the Entire Range of IP Services Needed to provide Public Safety Applications



Initial LTE will focus on data while leveraging 3G for voice

LTE: An Optimized OFDMA Solution

L
T
E

Boosts Data Capacity in Dense Urban Areas

*Seamless Interoperability with 3G
Extra Capacity where Public Safety Utilization will be Highest*

Leverages New, Wider and TDD Spectrum

Best suited in 10 MHz and beyond

A Parallel Evolution Path to 3G

Smooth Migration Path will Make Public Safety Deployment and Roaming Easier

Qualcomm: Industry's First LTE/3G Multimode Chipsets

3G multimode required for ubiquitous data coverage

Recommendations for Public Safety Use of Commercial Mobile Broadband

➤ **Focus on Policy and Operational issues**

- Commercial 3G/4G standards have the underlying technology you need
- Use of open IP standards will allow Public Safety unique applications to be built on top of the underlying commercial technology rather than requiring modifying it

➤ **Mission critical usage can be supported with appropriate build-out and equipment choices**

➤ **Decisions on VoIP and interoperability with legacy systems can be deferred**

- Commercial industry is first deploying LTE for data – VoIP is being added shortly thereafter
- Public Safety can follow same model – start with data, and follow with other services as needs dictate



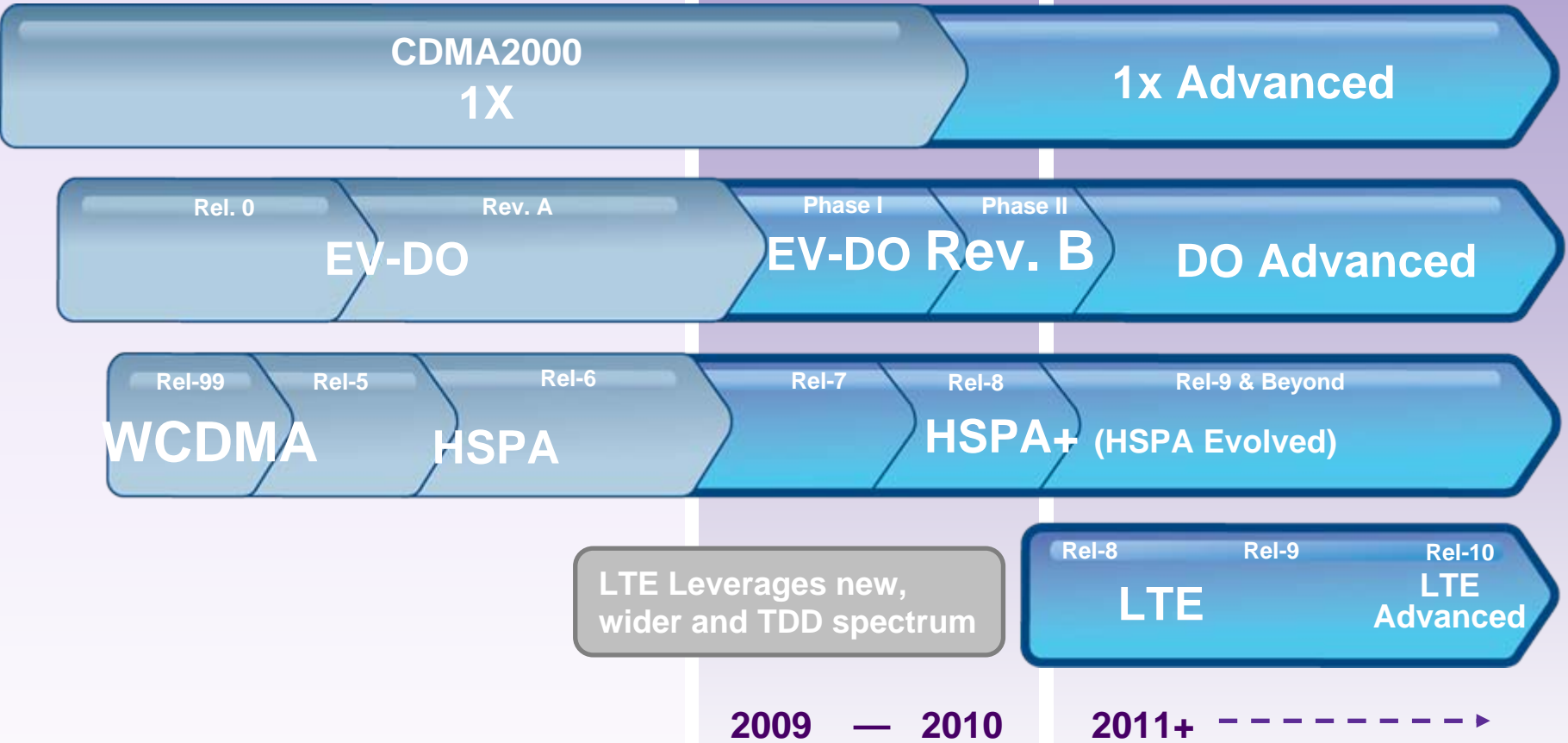
Thank You

(Backup Slides Follow)

3G and LTE Roadmap

Excellent Mobile Broadband Today
Voice and Full Range of IP Services

Enhanced User Experience
Improved voice and data capacity



3G and LTE Roadmap

Excellent Mobile Broadband Today
Voice and Full Range of IP Services

Enhanced User Experience
Improved voice and data capacity

CDMA2000
1X

Best in class voice capacity

1.5x increase with available features⁴

1x Advanced

4x increase compared to today's voice capacity

Rel. 0

Rev. A

EV-DO

DL: 2.4 Mbps
UL: 153 kbps

DL: 3.1 Mbps
UL: 1.8 Mbps

Phase I

Phase II

EV-DO Rev. B

DL: 9.3 Mbps¹
UL: 5.4 Mbps

DL: 14.7 Mbps²
UL: 5.4 Mbps

DO Advanced

DL: 32 Mbps³ and beyond
UL: 12.4 Mbps³ and beyond

Rel-99

Rel-5

Rel-6

WCDMA

DL: 384 kbps
UL: 384 kbps

DL: 1.8-14.4 Mbps
UL: 384 kbps

HSPA

DL: 1.8-14.4 Mbps
UL: 5.7 Mbps

Rel-7

Rel-8

HSPA+

DL: 28 Mbps
UL: 11 Mbps

DL: 42 Mbps⁵
UL: 11 Mbps

(HSPA Evolved)

DL: 84 Mbps⁶ and beyond (10 MHz)
UL: 23 Mbps⁶ and beyond (10 MHz)

Rel-9 & Beyond

LTE Leverages new, wider and TDD spectrum

Rel-8

Rel-9

Rel-10

LTE

LTE Advanced

DL: 73 – 150 Mbps⁷ and beyond⁸ (10 MHz – 20 MHz)
UL: 36 – 75 Mbps⁷ and beyond⁸ (10 MHz – 20 MHz)

2009 — 2010

2011+ - - - - - >

¹Peak rate for 3 EV-DO carriers supported by initial implementation. ²Peak rate for 3 EV-DO carriers with 64QAM in the DL. Rev. B standard supports up to 15 aggregated Rev. A carriers.

³DO Advanced peak rate for 4 EV-DO carriers, assumes 2x2 MIMO and 64QAM in the DL and 16 QAM in the UL.

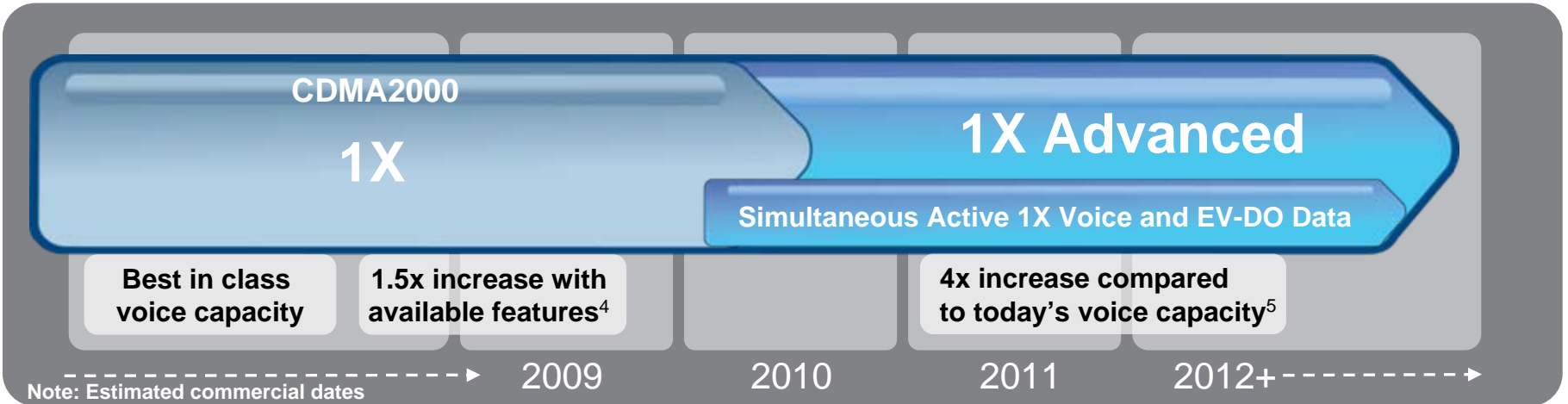
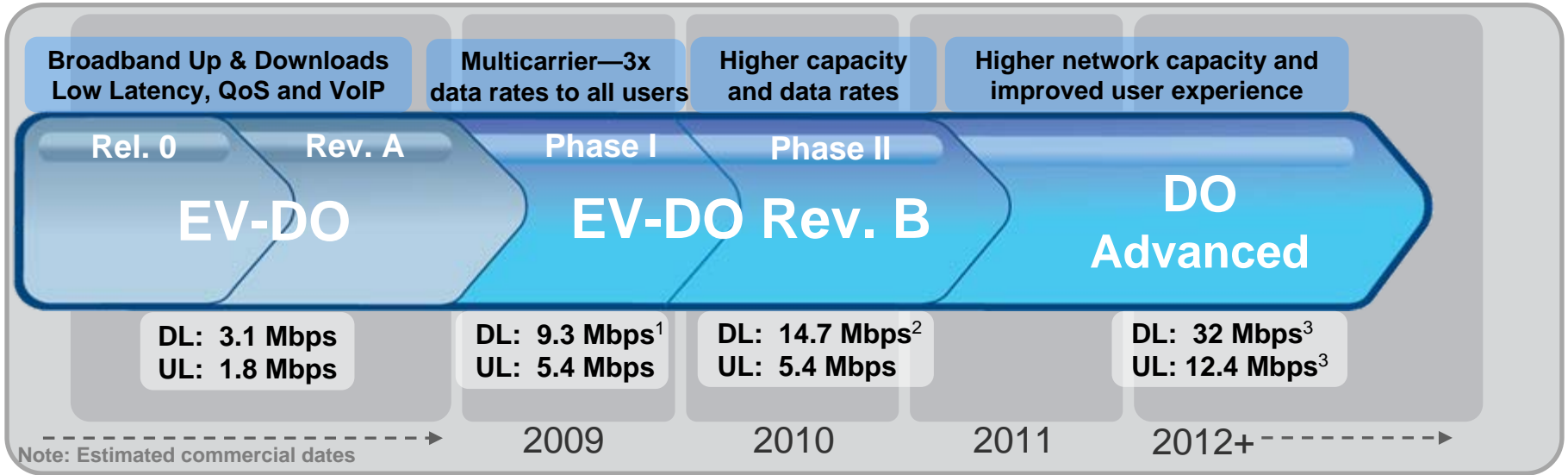
⁴Capacity increase possible with new codec (EVRC-B) and handset interference cancellation (QLIC). ⁵4x increase with receive diversity; 3x without

⁶R8 will reach 42 Mbps by combining 2x2 MIMO and 64QAM in 5MHz, or by utilizing 64QAM and multicarrier in 10 MHz. ⁷R9 and will utilize combinations of multicarrier and MIMO to reach 84 Mbps peak rates and beyond. Similarly, uplink multicarrier can double the uplink data rates.

⁸Peak rates for 10 and 20 MHz FDD using 2x2 MIMO; standard supports 4x4 MIMO enabling peak rates of 300 Mbps. TDD rates are a function of up/downlink asymmetry.

⁹Peak rates can reach or exceed 300 Mbps by aggregating multiple 20 MHz carriers as considered for LTE Advanced (LTE Rel-10).

The 1X and EV-DO Paths



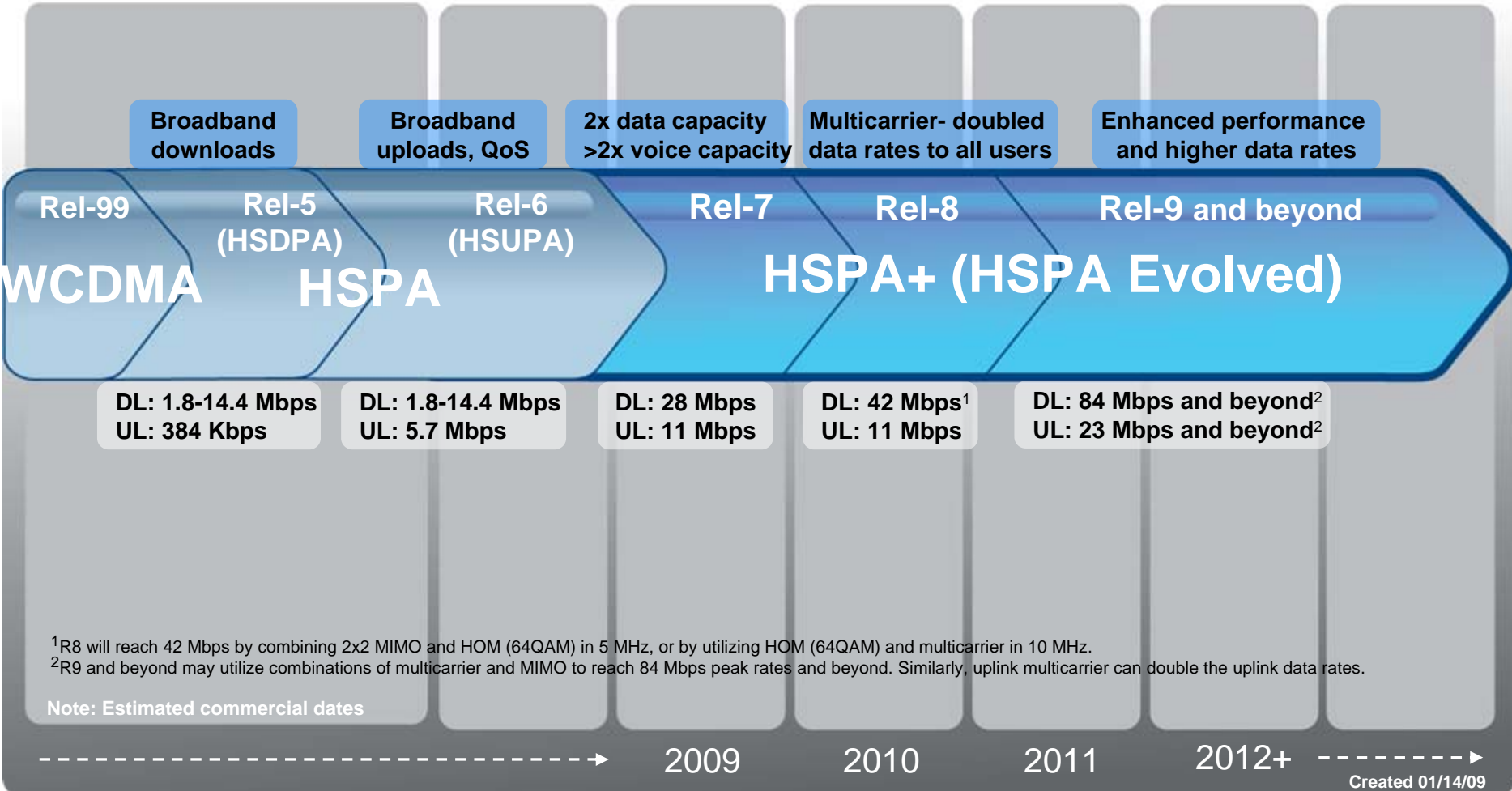
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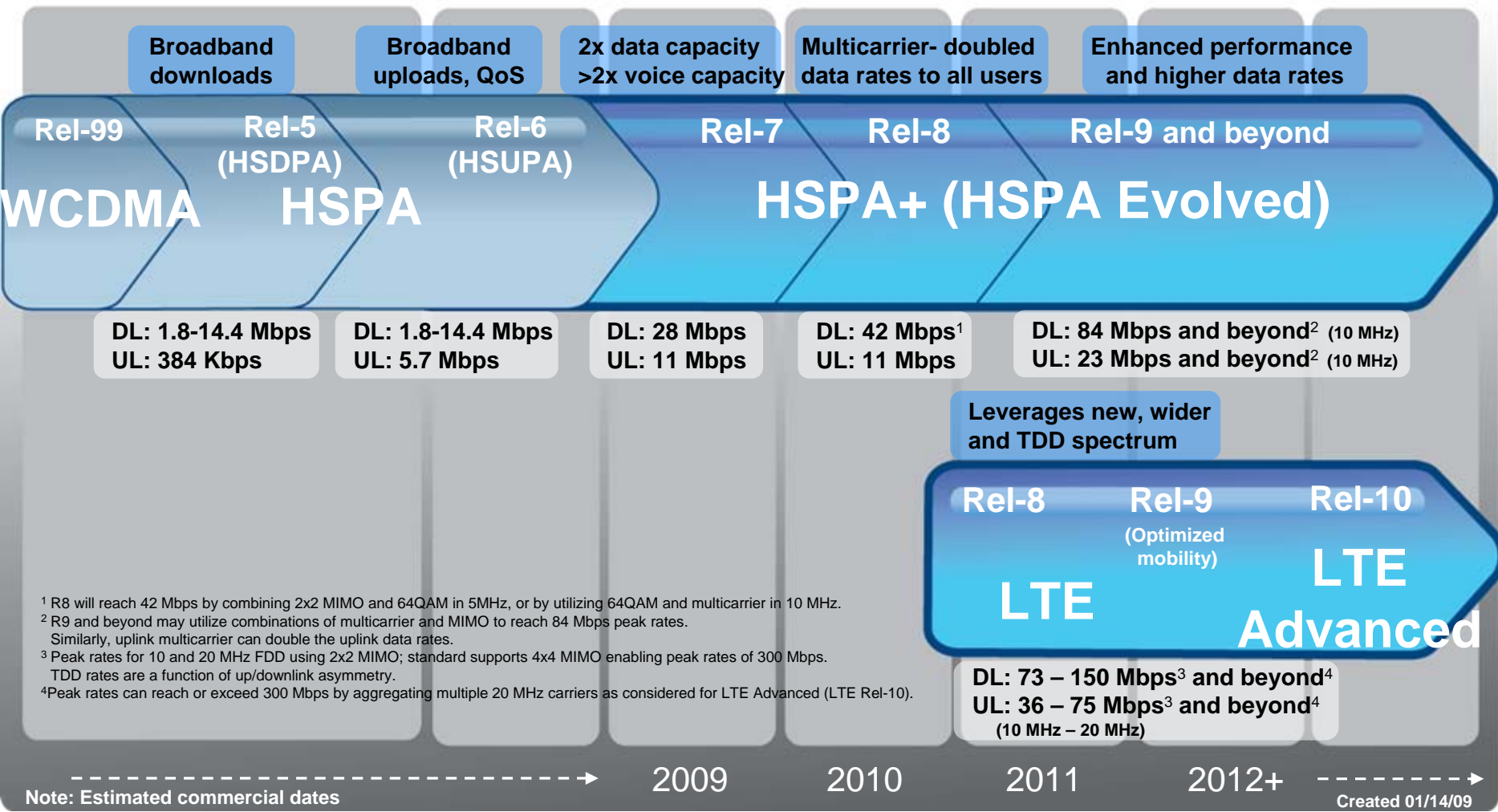
The HSPA+ Path



¹R8 will reach 42 Mbps by combining 2x2 MIMO and HOM (64QAM) in 5 MHz, or by utilizing HOM (64QAM) and multicarrier in 10 MHz.

²R9 and beyond may utilize combinations of multicarrier and MIMO to reach 84 Mbps peak rates and beyond. Similarly, uplink multicarrier can double the uplink data rates.

The LTE Path



¹ R8 will reach 42 Mbps by combining 2x2 MIMO and 64QAM in 5MHz, or by utilizing 64QAM and multicarrier in 10 MHz.
² R9 and beyond may utilize combinations of multicarrier and MIMO to reach 84 Mbps peak rates. Similarly, uplink multicarrier can double the uplink data rates.
³ Peak rates for 10 and 20 MHz FDD using 2x2 MIMO; standard supports 4x4 MIMO enabling peak rates of 300 Mbps. TDD rates are a function of up/downlink asymmetry.
⁴ Peak rates can reach or exceed 300 Mbps by aggregating multiple 20 MHz carriers as considered for LTE Advanced (LTE Rel-10).

Note: Estimated commercial dates

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