

# Qualcomm Comments to FCC

Regarding Future National Broadband Plan



# What we think...

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Unlicensed spectrum is unsuitable for mobile broadband coverage

- (Not just in theory, but in practice so far. If this assertion is incorrect, prove it wrong in practice)

Information Theory shows there is not enough licensed spectrum available

- All technologies converging towards Shannon Capacity limits

→ More licensed spectrum is required

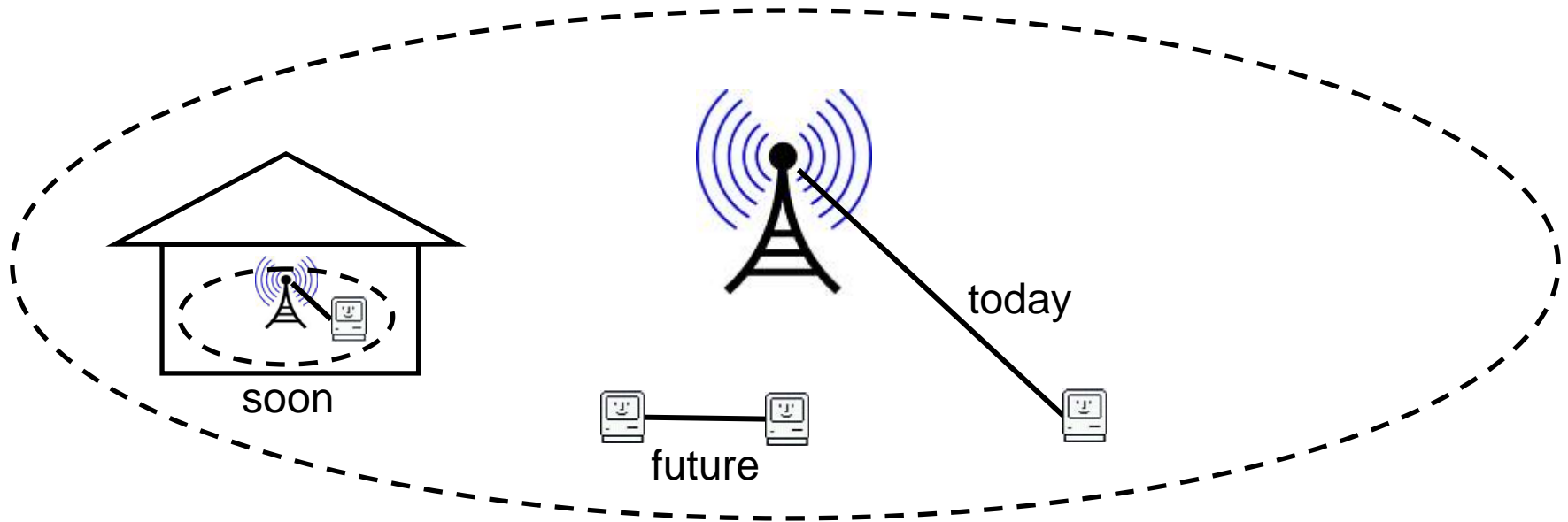
→ More efficient spectrum reuse is required

The latter suggests use of *smaller* transmission powers:

→ Smaller cells (e.g. Pico/Femto-cells in nearer term)

→ Inter-device communications (longer term goal)

# What this means...



# What we want...

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1. More Licensed Spectrum via Auction
  - Meanwhile 3G+ (DOrevB and HSPA+) can be rolled out now
  - LTE is coming, and will help too
2. Universal Mobile Broadband Coverage Sponsorship
  - Spend Stimulus Funds towards this end
  - E-rate, Lifeline and LinkUp can be so amended
3. Technology Neutrality
  - Key to sustaining Innovation



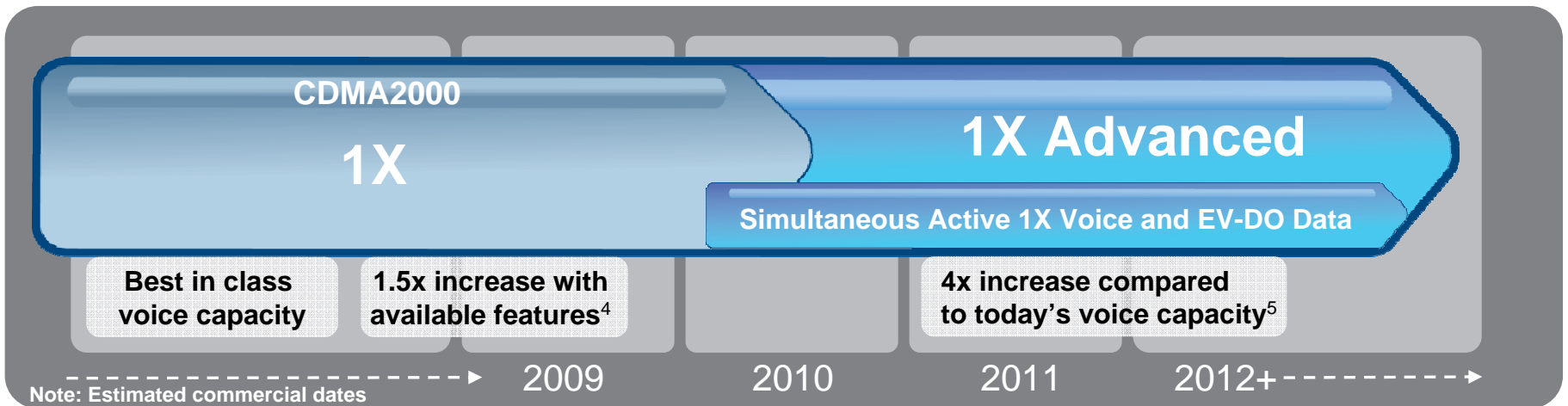
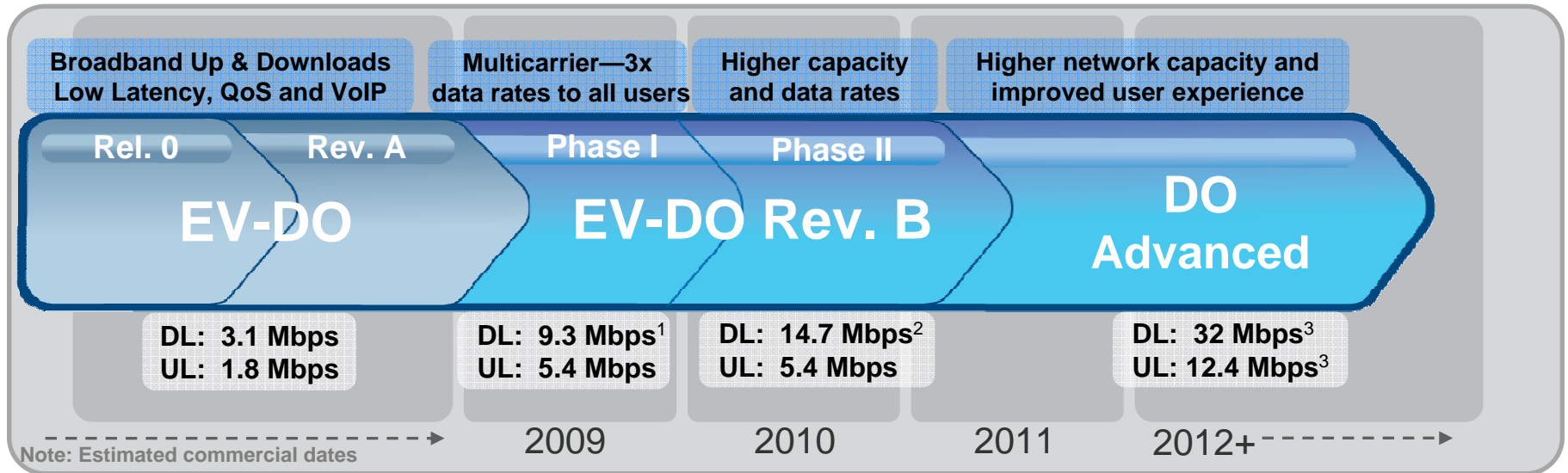
# Backup...

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# The 1X and EV-DO Paths



<sup>1</sup>Peak rate for 3 EV-DO carriers supported by initial implementation.

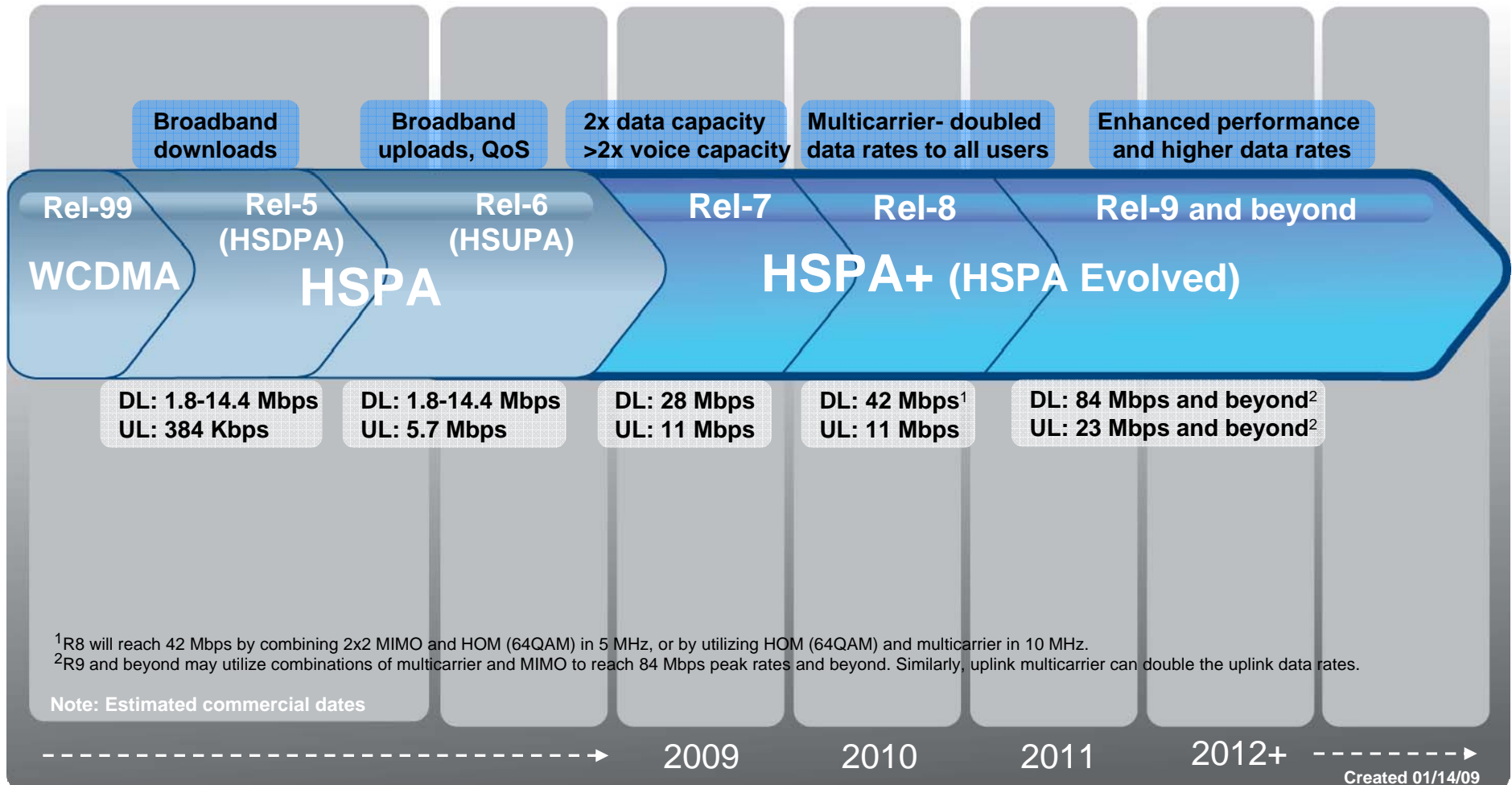
<sup>2</sup>Peak rate for 3 EV-DO carriers with 64QAM in the DL. Rev. B standard supports up to 15 aggregated Rev. A carriers.

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

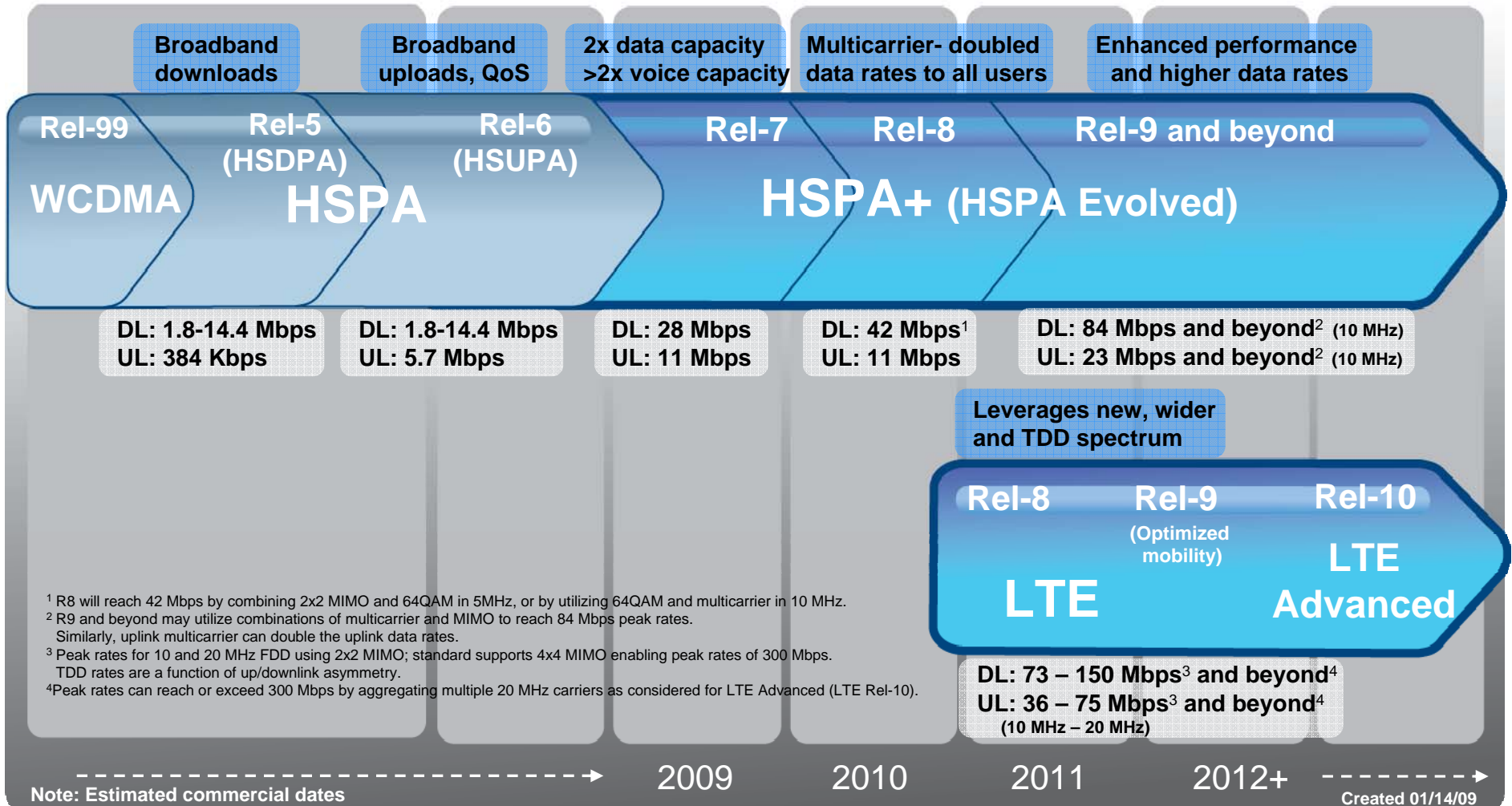
<sup>4</sup>Capacity increase possible with new codec (EVRC-B) and handset interference cancellation (QLIC). <sup>5</sup>4x increase with receive diversity; 3x without



# The HSPA+ Path



# The LTE Path



<sup>1</sup> R8 will reach 42 Mbps by combining 2x2 MIMO and 64QAM in 5MHz, or by utilizing 64QAM and multicarrier in 10 MHz.  
<sup>2</sup> 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.  
<sup>3</sup> 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.  
<sup>4</sup> Peak rates can reach or exceed 300 Mbps by aggregating multiple 20 MHz carriers as considered for LTE Advanced (LTE Rel-10).