

Perspectives on LTE for CDMA2000 operators

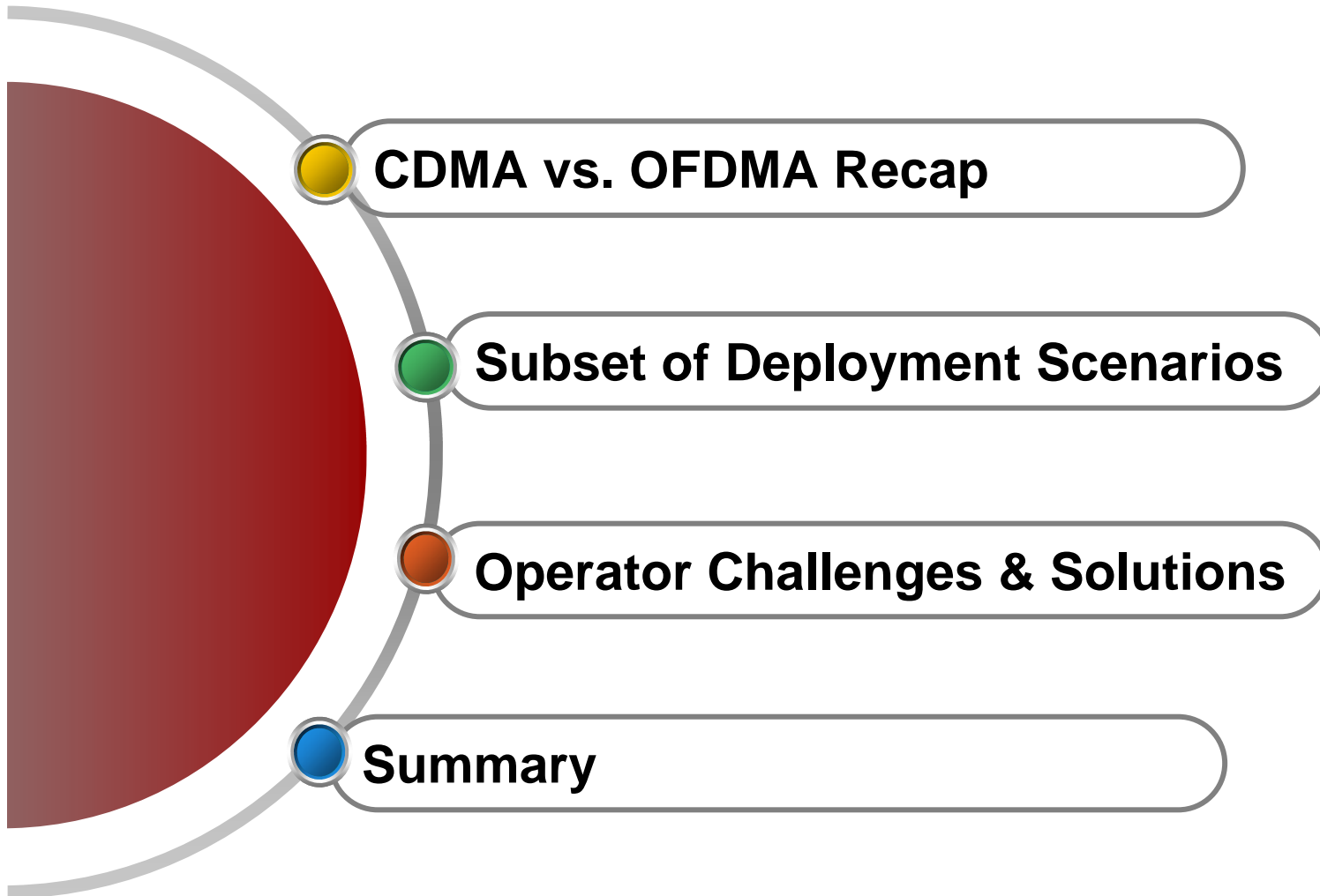
CDMA Development Group
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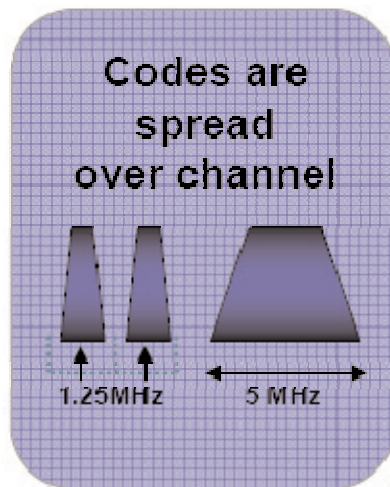


Agenda

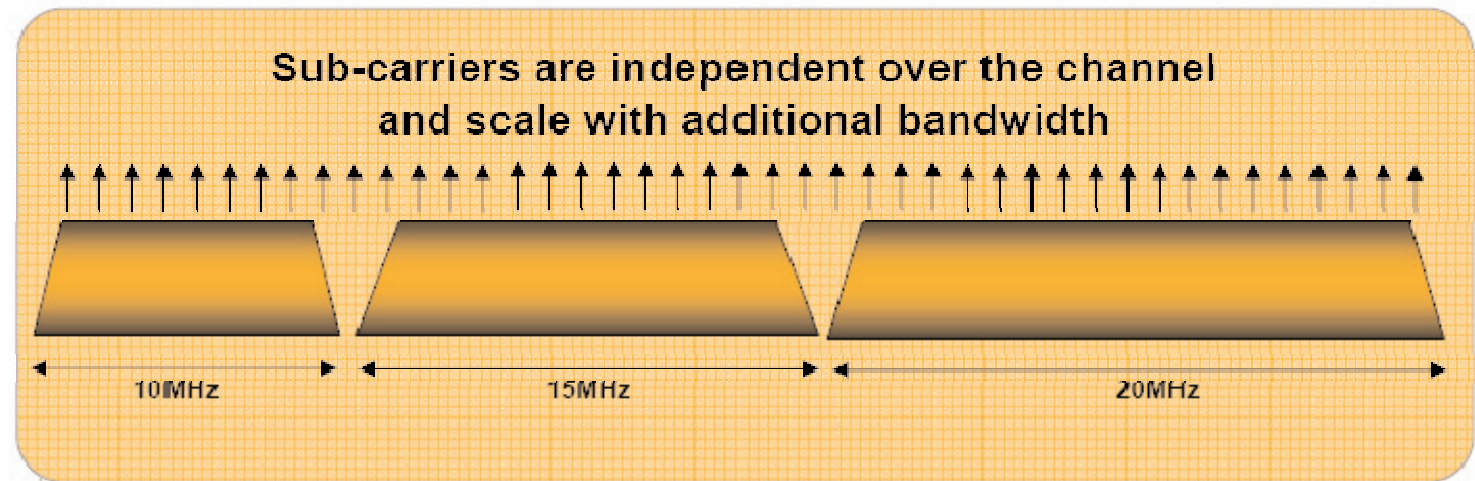


CDMA vs. OFDMA

CDMA



OFDM-Based Technologies



CDMA and OFDMA are different technologies with different capabilities

- CDMA2000 1X and EV-DO are more efficient in bandwidths up to 5 MHz
- OFDMA-based solutions offer a simpler implementation in bandwidths greater than 10 MHz

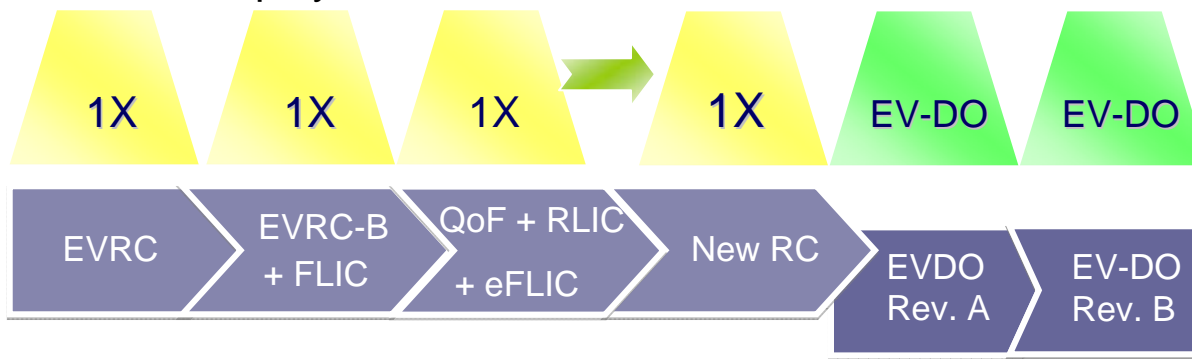
Technology Choice is a Business Decision

Deployment Scenario 1:

5 MHz Spectrum with no additional spectrum available

Carriers with limited spectrum on hand

- Voice is primary service, but have plans to offer packet data
- Leverage capacity enhancements to 1X technology to free up spectrum for EV-DO deployment



- EV-DO Rev. A offers competitive performance, as will EV-DO Rev. B and EV-DO Enhancements
- In future, if business case justifies an LTE deployment an EV-DO carrier can optionally be replaced with a 1.4 MHz LTE carrier
 - CDMA/LTE can complement each other and co-exist to maximize revenue streams
 - Contingent on device availability in the spectrum band



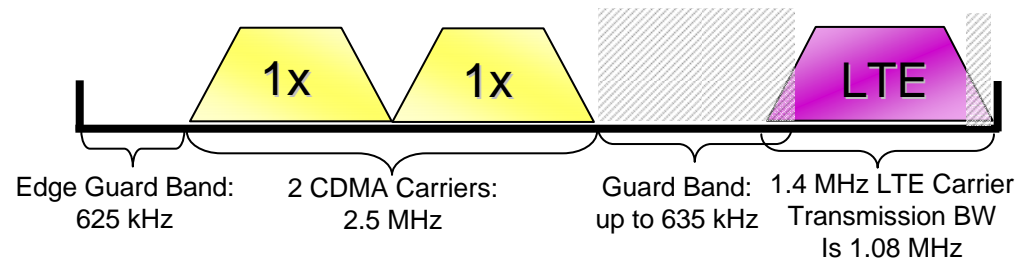
CDMA offers spectrum flexibility for co-existence with LTE

Deployment Scenario 1: (cont'd)

5 MHz Spectrum CDMA/LTE deployment

Guard Band Considerations

- LTE carrier's specified bandwidths include guard bands
- In a 5MHz spectrum using 2 CDMA carriers and 1.4MHz LTE carrier, a CDMA operator can afford adequate guard band
 - Edge guard band for LTE can be as low as 160kHz for the 1.4MHz LTE carrier, if it is pushed to the edge
 - The inter-technology guard band can be up to 635 kHz with 625 kHz of edge guard band
 - Inter-technology guard band could be varied by adjusting the placement of the 1.4 MHz LTE carrier and/or taking from the edge guard band



Interference Considerations

- Wideband aspects of CDMA alleviate any performance impacts of slow roll off of the LTE carrier into the CDMA band
- CDMA spurious emission requirement meets the LTE ACLR requirement

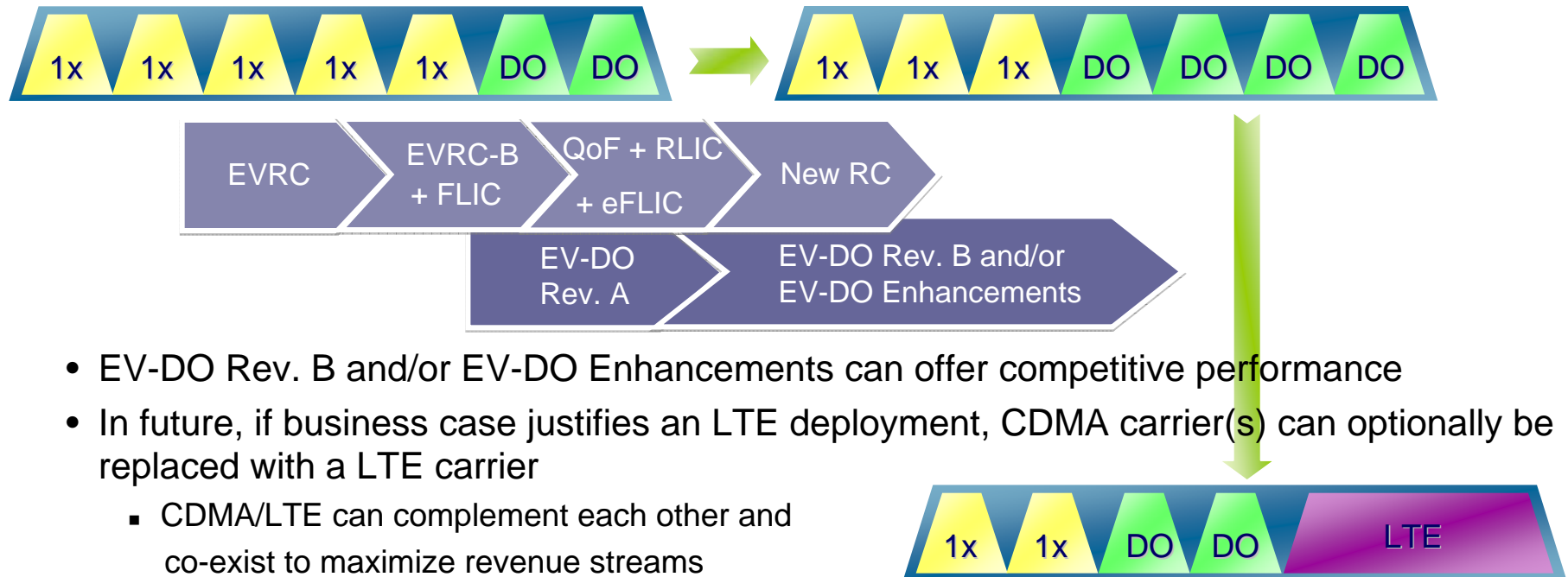
Conclusion – No significant impact on LTE or CDMA performance

Deployment Scenario 2:

10 MHz Spectrum with no additional spectrum available

Carriers with adequate spectrum on hand

- Voice is primary service, but have plans to grow packet data service as well as offer VoIP
- Leverage capacity enhancements to 1X technology to free up spectrum for EV-DO deployment



- EV-DO Rev. B and/or EV-DO Enhancements can offer competitive performance
- In future, if business case justifies an LTE deployment, CDMA carrier(s) can optionally be replaced with a LTE carrier
 - CDMA/LTE can complement each other and co-exist to maximize revenue streams
 - Contingent on device availability in the spectrum band

Deployment Scenario 3:

No issues with spectrum availability

Carriers with strong spectrum portfolio

- Voice is primary service but have plans to grow packet data service as well as offer VoIP
- If business case justifies LTE deployment utilize the spectrum available to deploy LTE in the desired bandwidth
 - Ideally, at least 10 MHz of additional free contiguous spectrum should be available
 - Contingent on device availability in the spectrum band

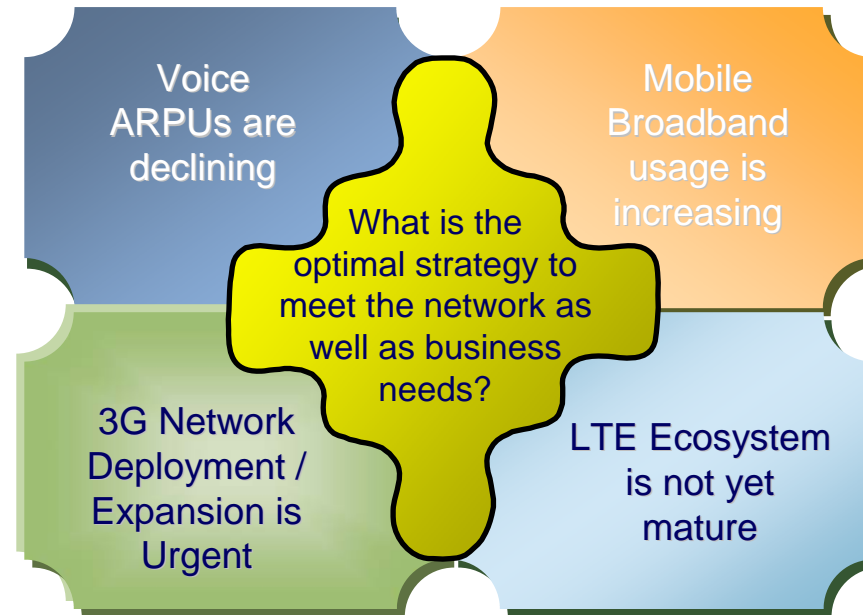


- If needed, leverage capacity enhancements to 1X technology to free up spectrum for increasing EV-DO deployment within existing CDMA spectrum
- EV-DO Rev. B and/or EV-DO Enhancements can offer competitive performance to support IRAT handovers in non-LTE coverage areas



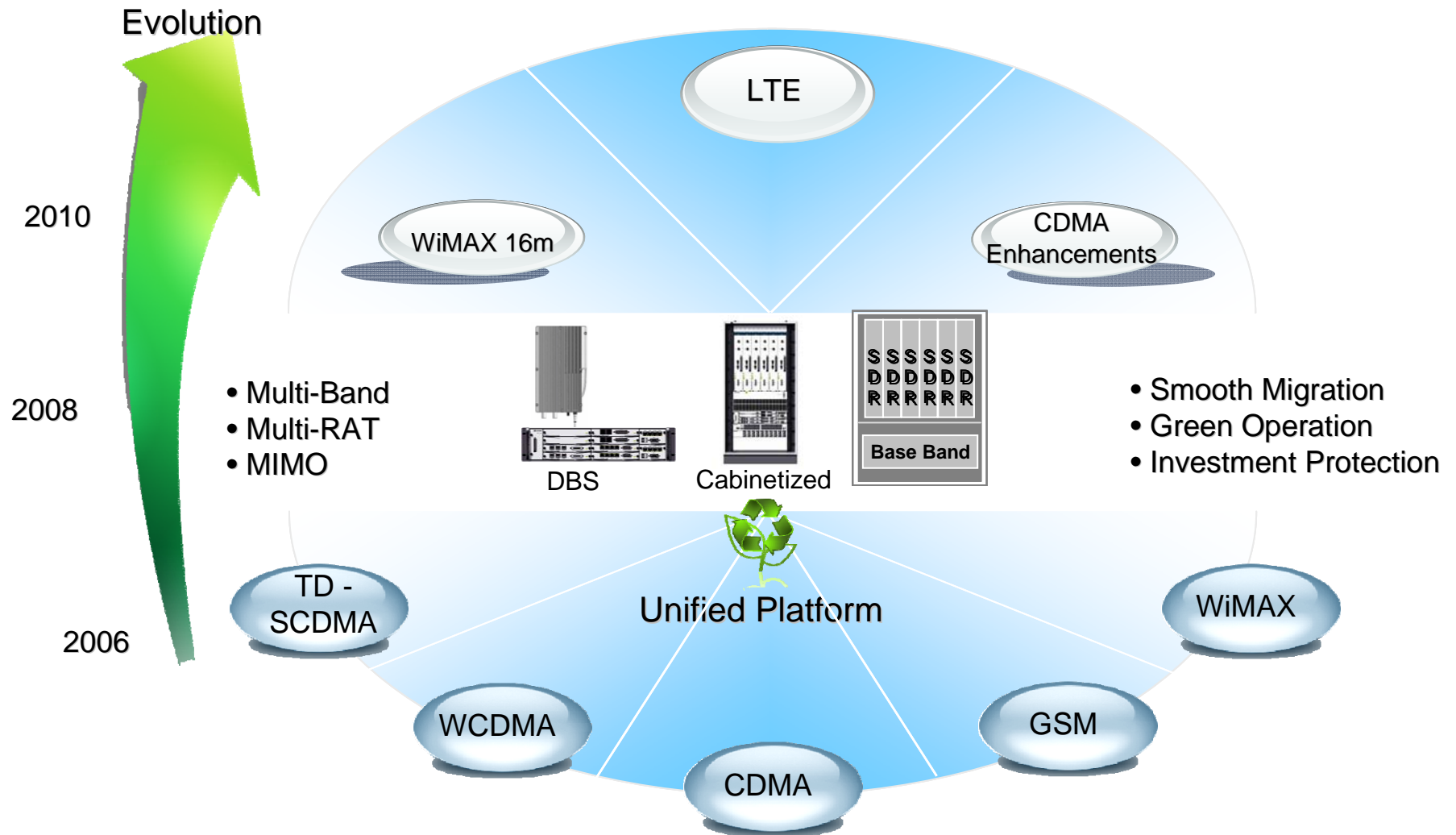
CDMA & LTE complement each other and will coexist to maximize revenue streams

Operator Challenges



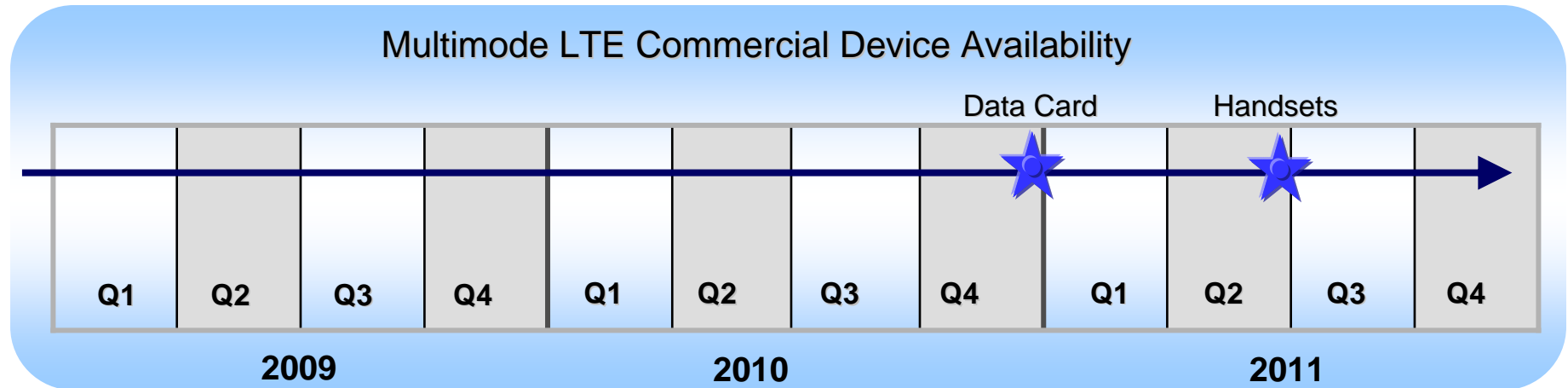
- Plan for introduction of new broadband technologies such as LTE
 - Need to clear/re-farm spectrum?
 - Infrastructure and device availability in the desired spectrum bands?
- Address network performance and service quality in a dual-technology network
 - Seamless mobility and coverage between LTE islands and ubiquitous CDMA2000 coverage?
- Develop strategy for supporting Voice service
 - 1X for CS voice and EV-DO\LTE for PS data, 1X for CS voice and EV-DO\LTE for VoIP + PS data,?
 - Support for CS voice handback?
 - IMS network for supporting VoIP over PS Data?

SingleRAN as an Enabler



WorldMode™ LTE Device Availability

CDMA industry is developing CDMA2000 / LTE multimode/multiband chipsets



Modes:

- LTE
- CDMA2000 1X
- EV-DO Rev. A
- EV-DO Rev. B
- WCDMA
- HSPA+

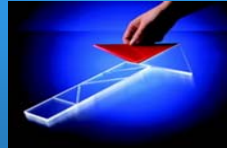
Key Features:

- LTE Peak Data Rates (20 MHz):
 - DL: 50 Mbps
 - UL: 25 Mbps
- Concurrent Voice & Data services

Supported FDD Bands (under consideration):

- CDMA2000 Multi-mode
 - 450, 700, 800, 1700, 1800, 1900, 2100, 2500 MHz
- WCDMA\GSM Multi-mode
 - 700, 800, 850, 900, 1700, 1900, 2100, 2600 MHz

Summary



1X and EV-DO enhancements are better evolution path for operators with limited spectrum



LTE will provide additional broadband capacity for operators with access to 10MHz or more of clear and contiguous spectrum



1X and EV-DO will continue to be enhanced while LTE is deployed