EV-DO Rev. B

October 2011

EV-DO Rev. B: Natural Evolution from Rev. A

EV DO Rev B

Multicarrier Enhances Broadband Experience

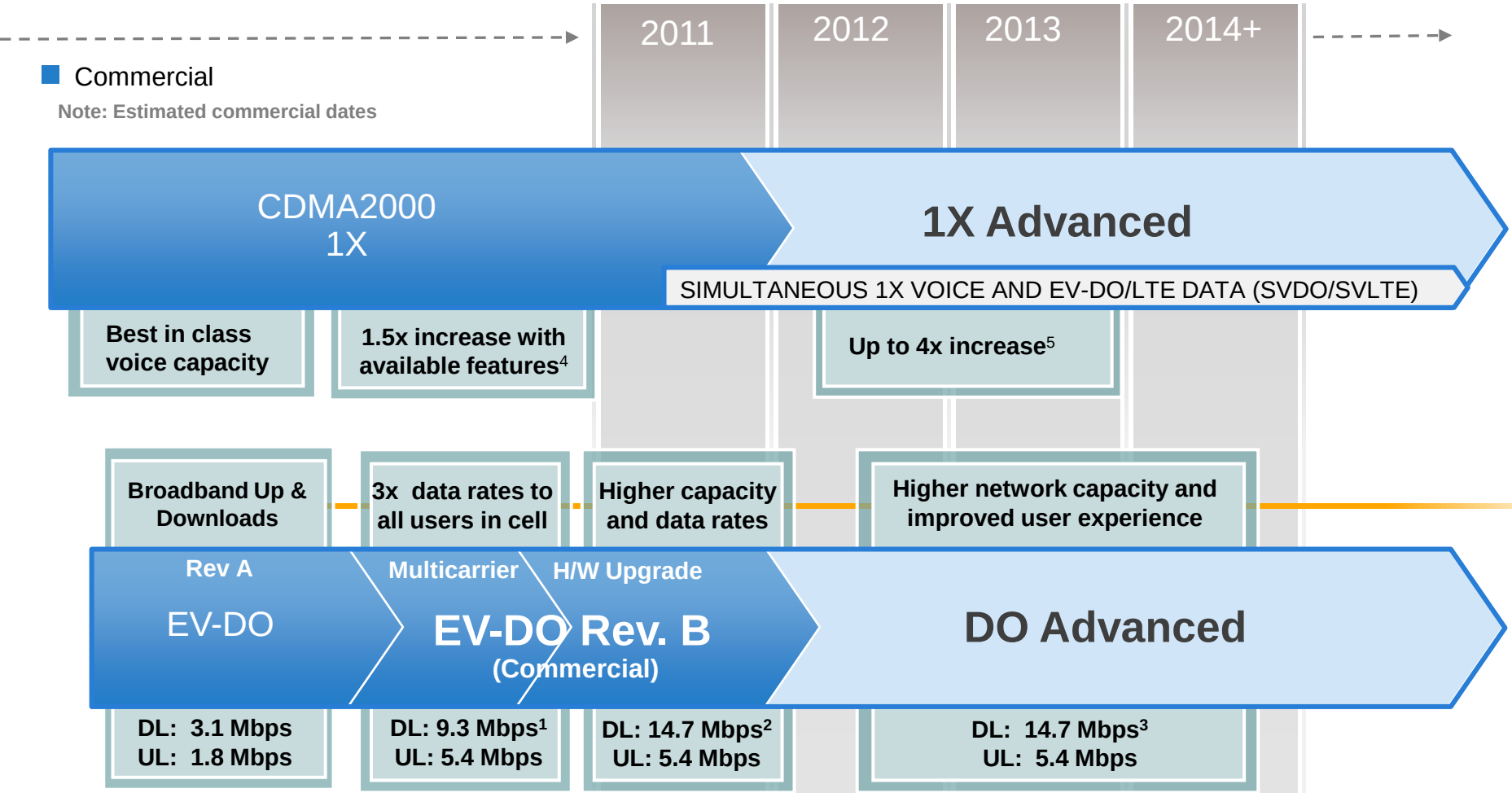
Higher data rates and lower latency for all users in the cell

Multicarrier Doubles Capacity for Bursty Applications

Cost-Effective Software Upgrade to Multicarrier

Even Higher Capacity & Data Rates with CSM6850 Upgrade

1X and EV-DO Have Strong Evolution Paths



[1]Peak rate for 3 EV-DO carriers supported by initial implementation.
[2]Peak rate for 3 EV-DO carriers with 64QAM in the DL. Rev. B standard supports up to 15 aggregated Rev. A carriers.
[3] Same peak rates as Rev. B, but with new dimension of enhancements
[4]Capacity increase possible with new codec (EVRC-B) and handset interference cancellation (QLIC). [5]4x increase with receive diversity; 3x without

Created 06/20/2011

EV-DO Rev. B is Growing

GROWING OPERATOR COMMITMENT

10 LAUNCHES

10 COMMITMENTS

DEVICES ACROSS ALL SEGMENTS

~30 DEVICES

~15 VENDORS

ALL MAJOR EV-DO INFRA VENDORS SUPPORT REV. B

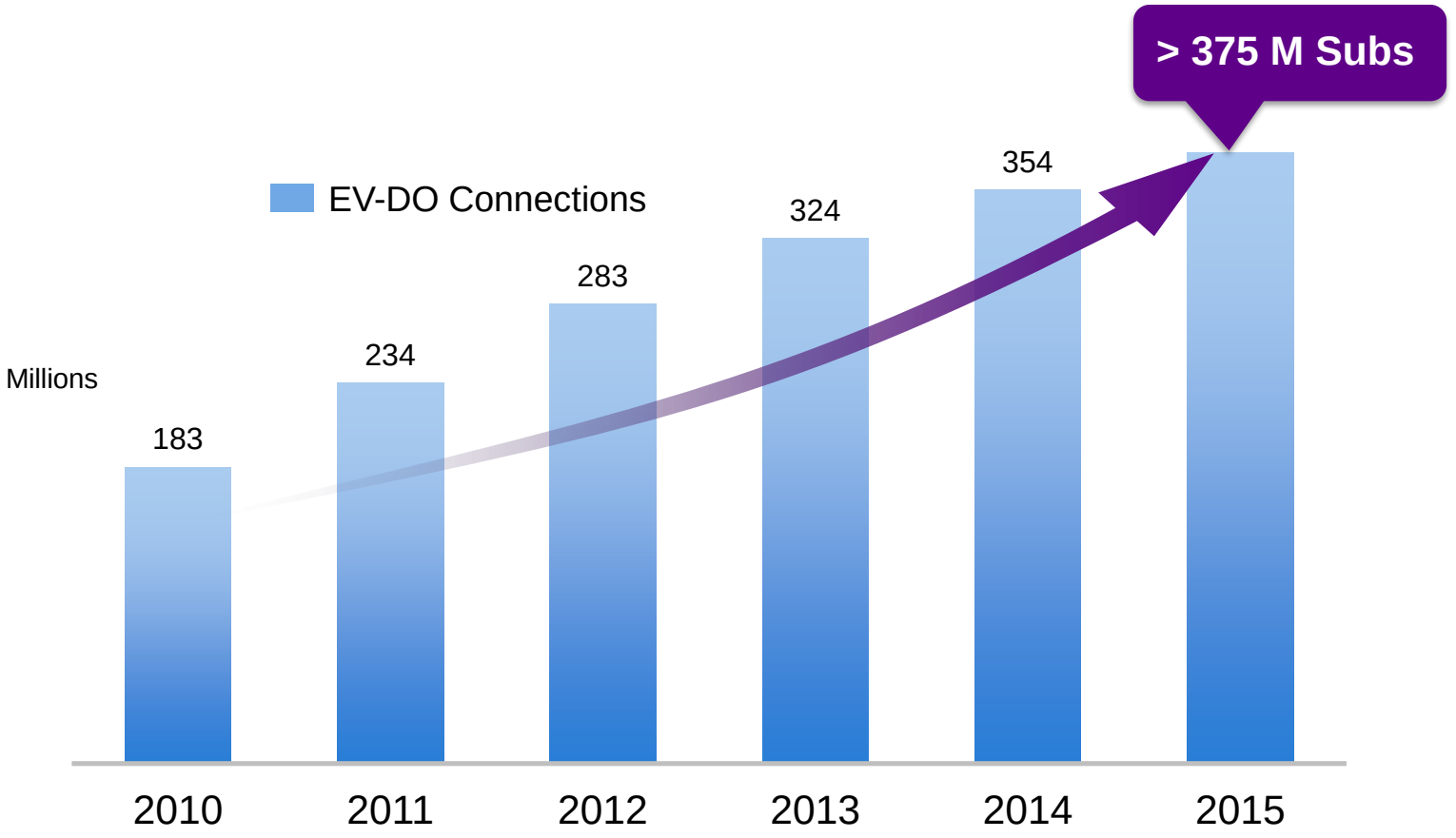
Source: CDG, Oct 2011

Expanding EV-DO Ecosystem

>534M CDMA 2000 SUBSCRIPTIONS	**~ 209 Million** EV-DO	**~ 88 Million** Rev. A	
>325 CDMA OPERATORS	**~ 121** EV-DO	**~123** Rev. A	**7** Rev. B
>2,733 CDMA 2000 DEVICES	**~ 612** EV-DO	**~423** Rev. A	

Sources: Subscriber Information : Wireless Intelligence estimates as of Jul 18th, 2011 for quarter ending Jun 30th , 2011, not including WLL; Operators, devices, vendors related information : CDG. Jul 2011

EV-DO's Strong Growth Continues

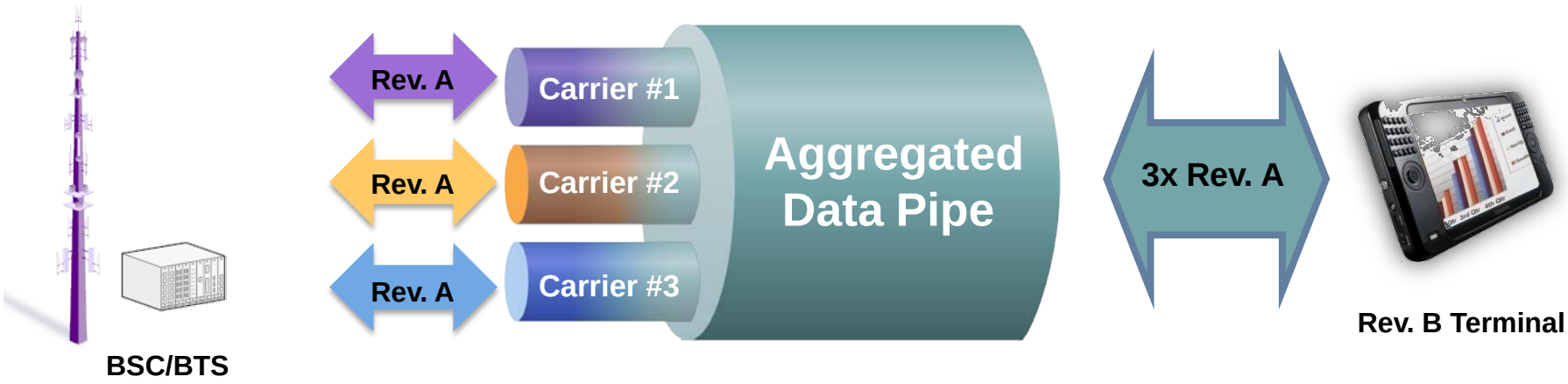


Source: Wireless Intelligence estimates as of July 18, 2011 for the quarter ending June 30, 2011 ; not including WLL connections

EV-DO Supports Entire Range of IP Services

- Video/Music
- Service Tiering
- Streaming/Downloads
- High Speed Web Browsing
- Multimedia Upload/Exchange
- Push to Talk / Push to Media
- Low Latency Gaming
- Telco quality VoIP
- Video Telephony
- Multicasting

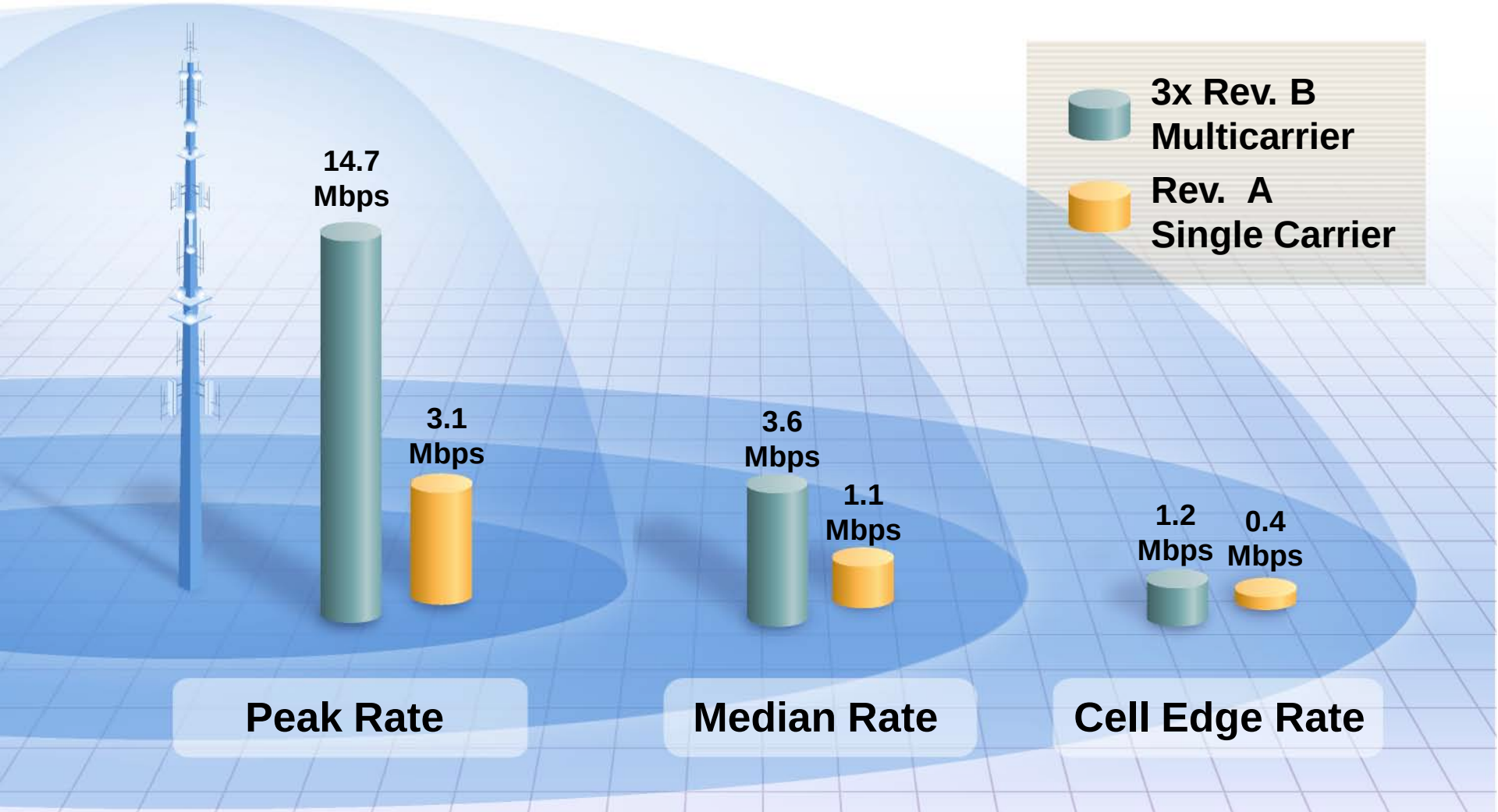
Multicarrier Enhances Broadband Experience



- Aggregating multiple Rev. A carriers creates a bigger data pipe
- Up to 3x user data rates and lower latency throughout the cell
- Dynamic bandwidth allocation

Cost-effective software upgrade to multicarrier

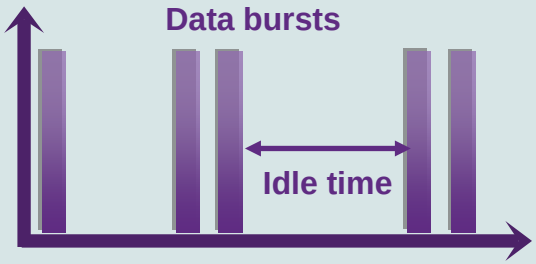
Multicarrier Triples Data Rates to *All* Users

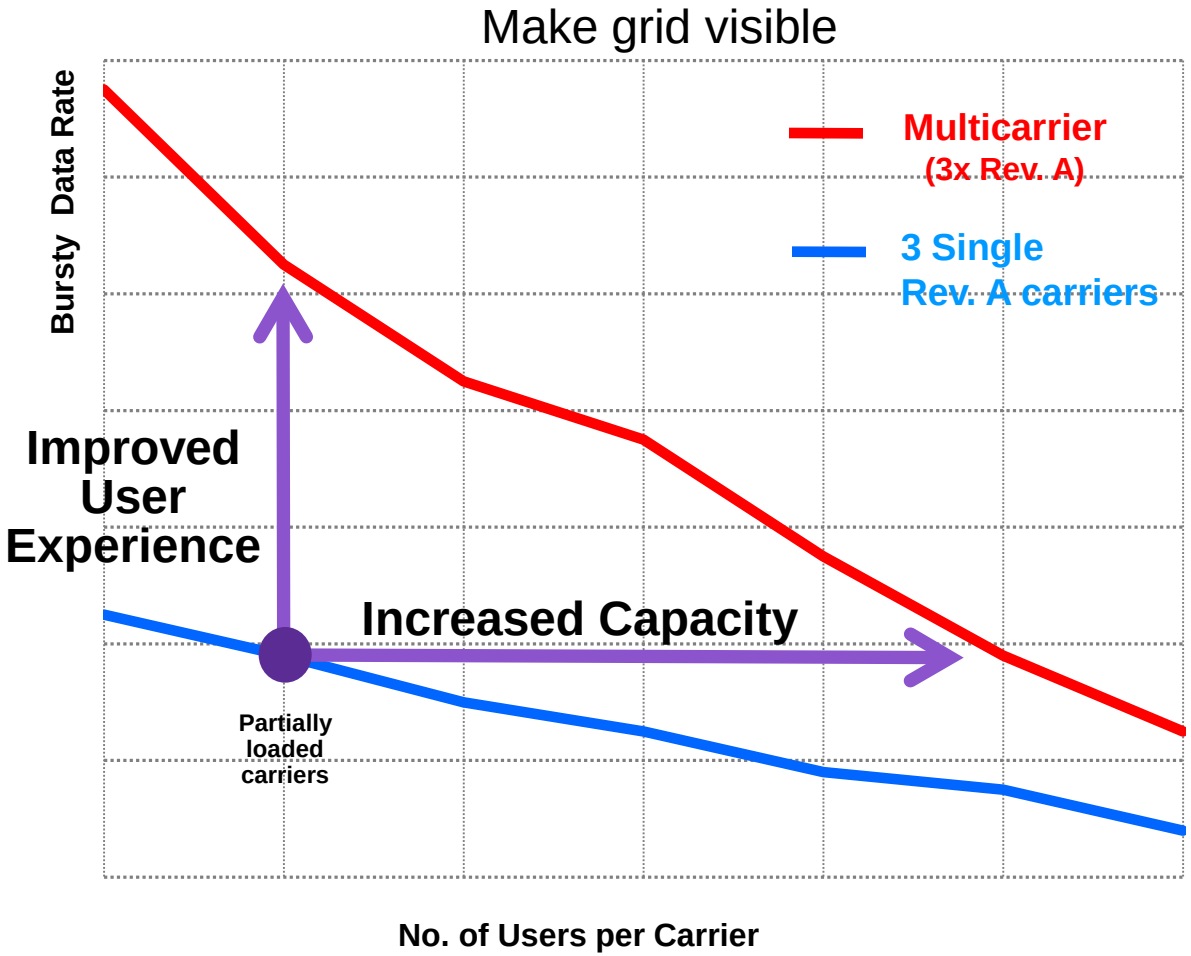


Source: Peak rates are as defined in standards. The median and cell edge rates are based on Qualcomm simulations, using mixed channel model with Rev. B Phase-II devices supporting 64 QAM

Multicarrier More Than Doubles Capacity for Bursty Applications

Bursty Data Application (e.g. browsing)

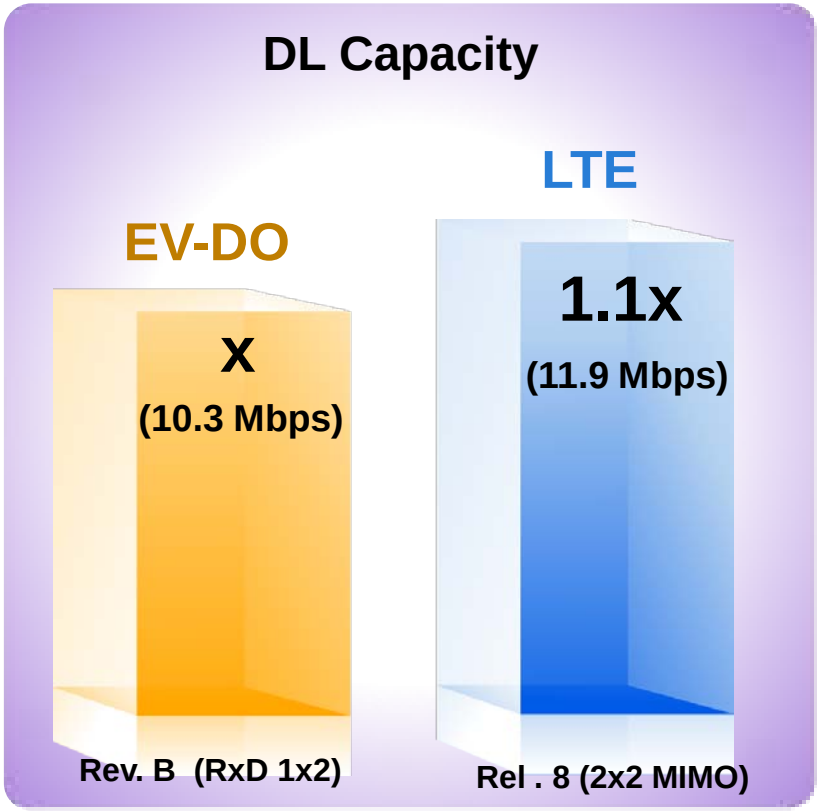


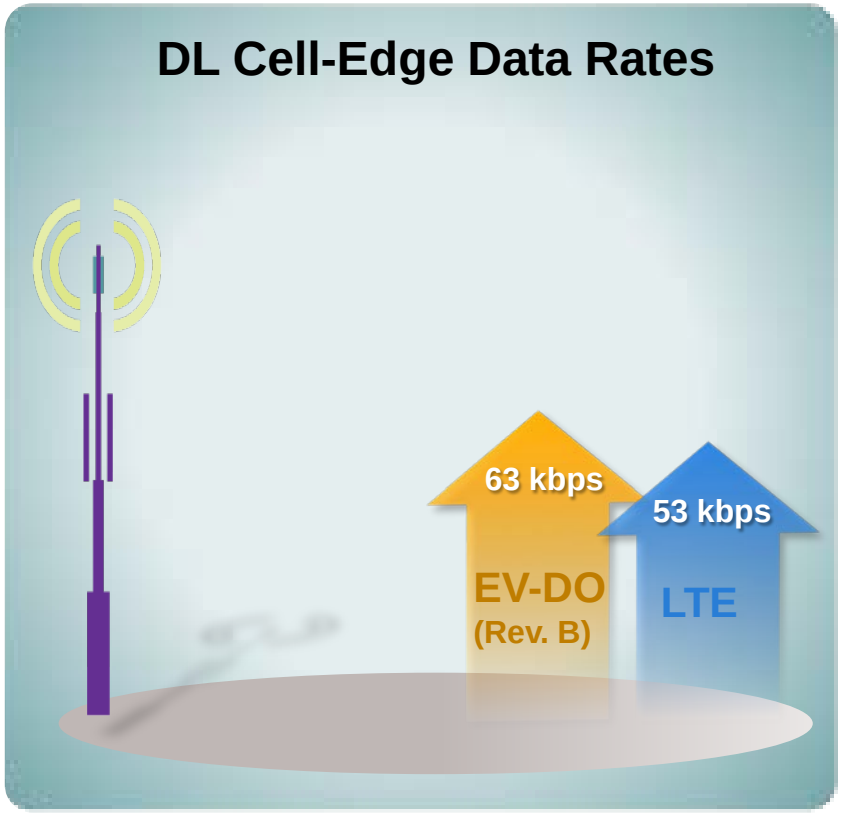


Note: Based on lab measurements using realistic traffic models from the web. The average burst download time (over the air) is reduced ~ 66%. The capacity gain depends on the sector load which in this case is typical for a EV-DO Rev. A system.

Similar Rev. B and LTE Cell Edge Performance using Fair Comparison

When using same amount of spectrum

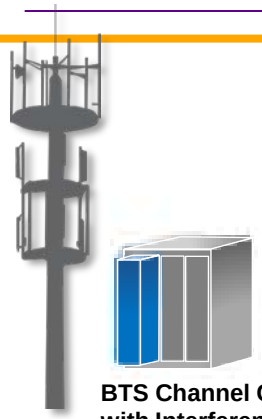




Cell edge performance can be traded for even higher cell capacity at the expense of fairness

Source: Qualcomm Simulations for 10 MHz FDD: 3GPP2 methodology - 2km site-to-site dist., embedded sector, mixed channel, full buffer traffic, proportional-fair scheduler ; 7 carrier considered for Rev. B . Cell-edge rates are the worst 5 percentile of the over all data rate distribution in the cell, 64 QAM not considered for Rev. B

Even Higher Capacity and Data Rates with CSM6850 Upgrade



BTS Channel Card upgrade with Interference Cancellation.

No device impact

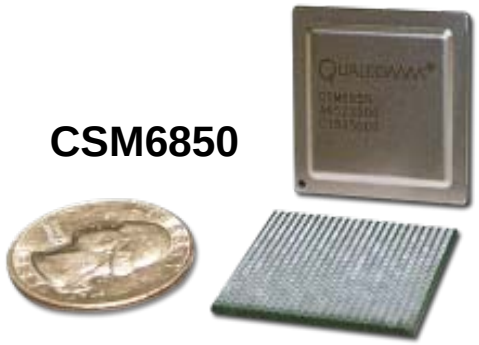
Up to 14.7 Mbps forward link peak data rates[1]

~ 65% higher uplink data capacity[2]

~ 45% higher VoIP capacity[3]

- Cost-Effective – Supports 4 carriers on a single card
- Provides gains for multicarrier or single carrier Rev. A/B networks
- First commercial chipset to support total interference cancellation[2]
  - Traffic, Overhead and Pilot IC

CSM6850



CSM6850 is Commercial

[1]Peak rate increased through Higher order modulation (64QAM). [2]Through total Interference Cancellation, also benefits existing devices, CSM6800 with Pilot IC is already commercial [2,3] Gain compared to CSM6800 without IC.

Standardized Femtocell Support— Cost-effectively Enhance Coverage and Capacity

Operator Benefits:

***Enhanced* Coverage and Capacity**
Bring network to user—offload macro network

***Reduced* Churn and Cost**
Indoor coverage main churn reason. Reduce backhaul, site cost

***New* Revenue and Services**
Additional ARPU—home tariffs, bundles, home zone services

Femtocell
Your personal 3G access

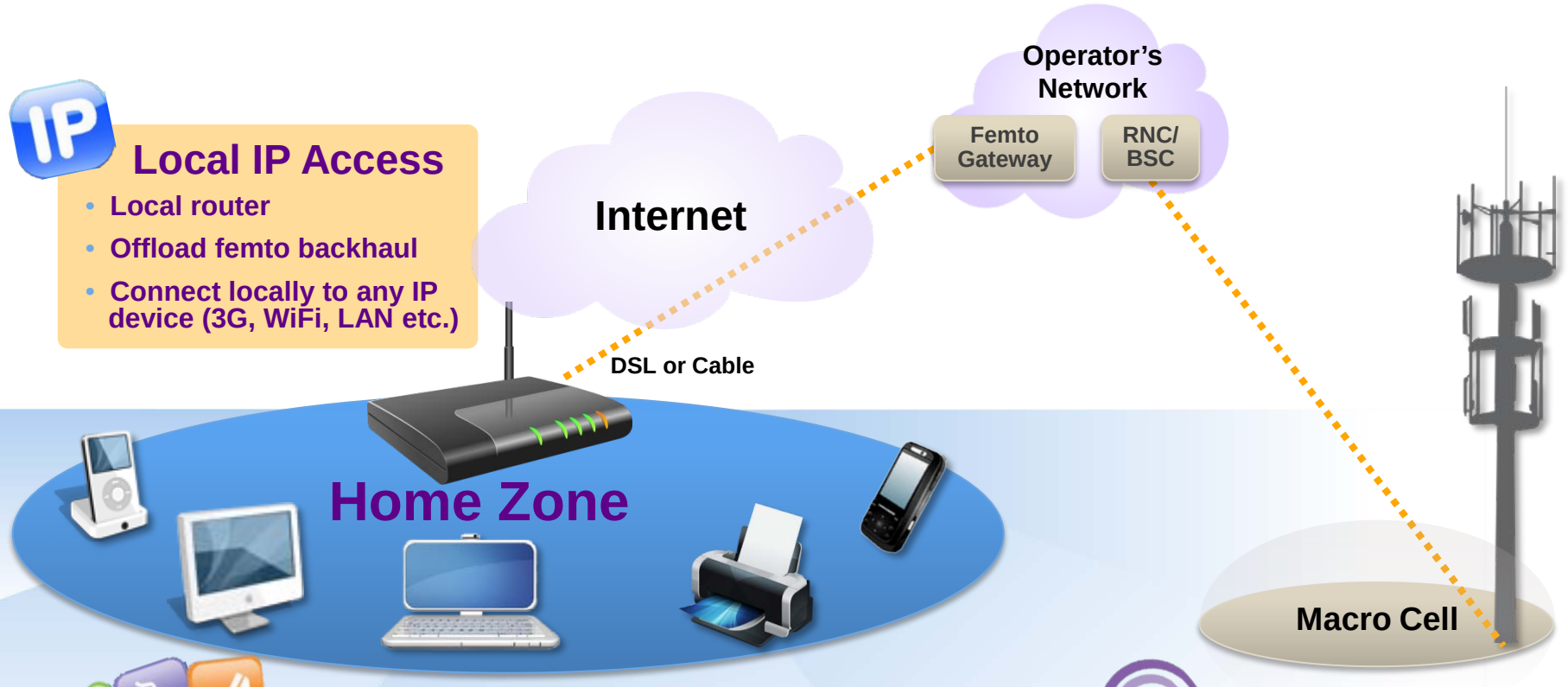
End-User Benefits:

***Enhanced* User Experience**
Better voice quality and higher data rates with existing devices

***Attractive* Home Zone Plans and Bundles**
Wireless substitution, one gateway for all home entertainment

***New* Home Zone Services**
Based on location, interaction with home media, etc…

New Femtocell Home Zone Services —Access Locally or Remotely



Local IP Access

- Local router
- Offload femto backhaul
- Connect locally to any IP device (3G, WiFi, LAN etc.)

New Home Zone Services

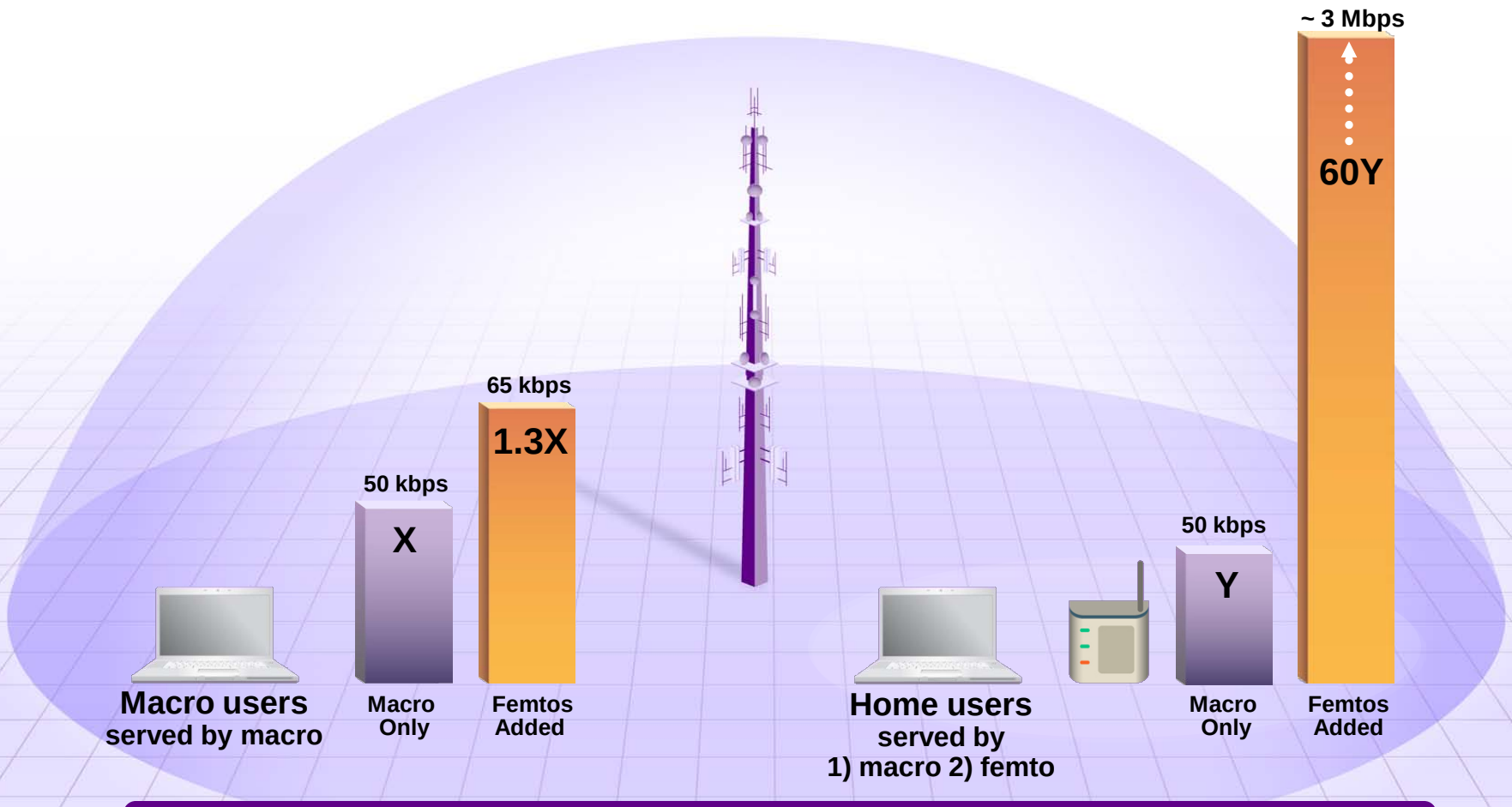
- Leverage location, relationship etc. for new services
- Synch with local media servers (music, videos, data)
- Stream to/from local media servers, screens, printers
- Push services to home zone, Remote control

Remote Access

- Access home zone remotely
- Remotely control media servers, appliances, house..

Bring Network to User—Femtocells Can Provide Next Significant Performance Leap

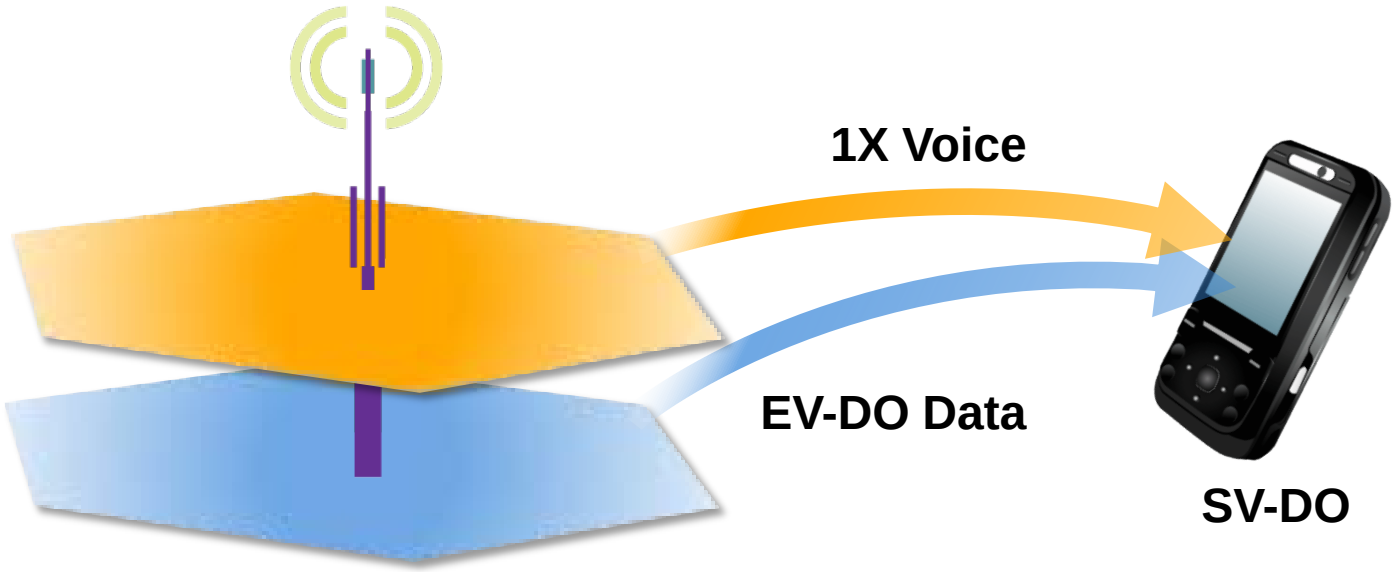
All users improved—home user served by near peak data rates



Macro Network Offloaded—Capacity Gain Can Exceed 10x

Assumptions: Dense urban system EV-DO Rev. A simulation. 22 Users per cell (10 macro users + 12 home users served either by macrocell or added femto cells). Rx diversity and MMSE Equalizer used. The median user data rates are shown.

Simultaneous 1X Voice and EV-DO Data



- Handset feature with no network impact
- Independent of the air link standard
  - Voice using 1X or 1X Advanced
  - EV-DO Rev. A or Rev. B
- Commercial in 2011

1X Advanced and Rev. B: Strong Chipset Support

SMARTPHONES/ TABLETS

- MSM 8660 — Rev. B/1X Adv HSPA+
- MSM 8960 — Rev. B/1X Adv LTE/DC-HSPA+
- QSD 8650 — Rev. B/HSPA

FEATURE PHONES

- QSC 6695 — Rev. B/1XAdv HSPA+
- QSC 6195 — Rev. B/ 1X Adv

MODEMS AND DATA CARDS/DONGELS/ HOTSPOTS

- MDM 6600 — Rev. B/ HSPA+
- MDM 9615 — Rev. B/ LTE/DC-HSPA+

IMPROVING PERFORMANCE OF EXISTING INFRASTRUCTURE

Macro BTS

- CSM 6850 Rev. B
- CSM 6800 Rev. B

DO Advanced (S/W Upgrade)

- CSM 8700 — 1X Advanced

1X Advanced

ENABLING FEMTO SOLUTIONS

Incorporating UltraSON™ Interference Management Techniques

- FSM 98xx Baseband

Pico/Femto

EV-DO Rev. B: Natural Evolution from Rev. A

EV DO Rev B

Multicarrier Enhances Broadband Experience

Higher data rates and lower latency for all users in the cell

Multicarrier Doubles Capacity for Bursty Applications

Cost-Effective Software Upgrade to Multicarrier

Even Higher Capacity & Data Rates with CSM6850 Upgrade

Questions? Connect with Us

www.qualcomm.com/technology

@qualcomm_tech

m.qualcomm.com/technology

http://www.qualcomm.com/blog/contributors/prakash-sangam

Thank You