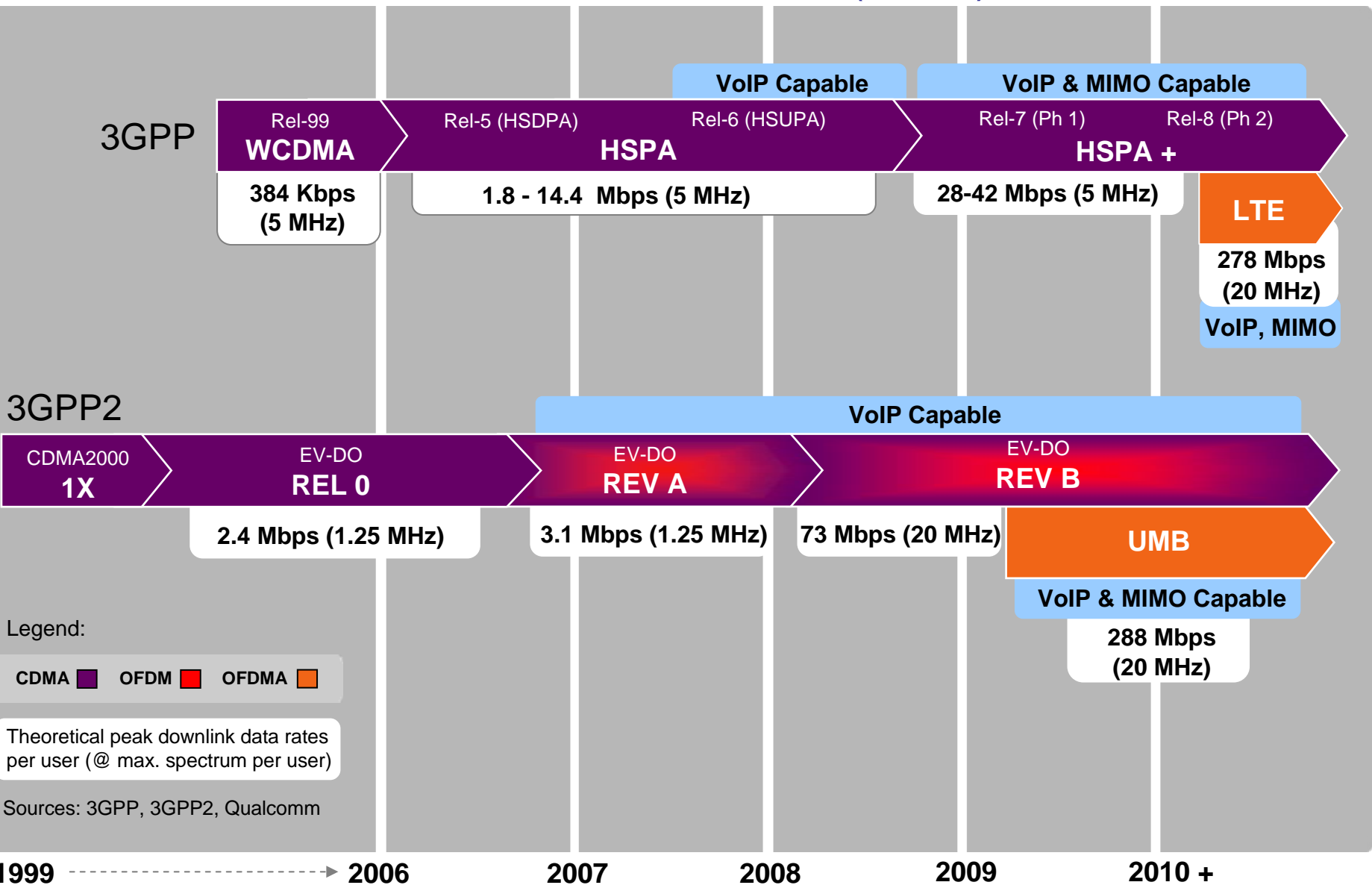


Mobile Broadband Evolution Device Perspective

Peter Carson
Senior Director, Product Management
Qualcomm CDMA Technologies

Interop 2007, Las Vegas, May 22, 2007

Evolution of Mobile Wide Area Network (WAN) Standards

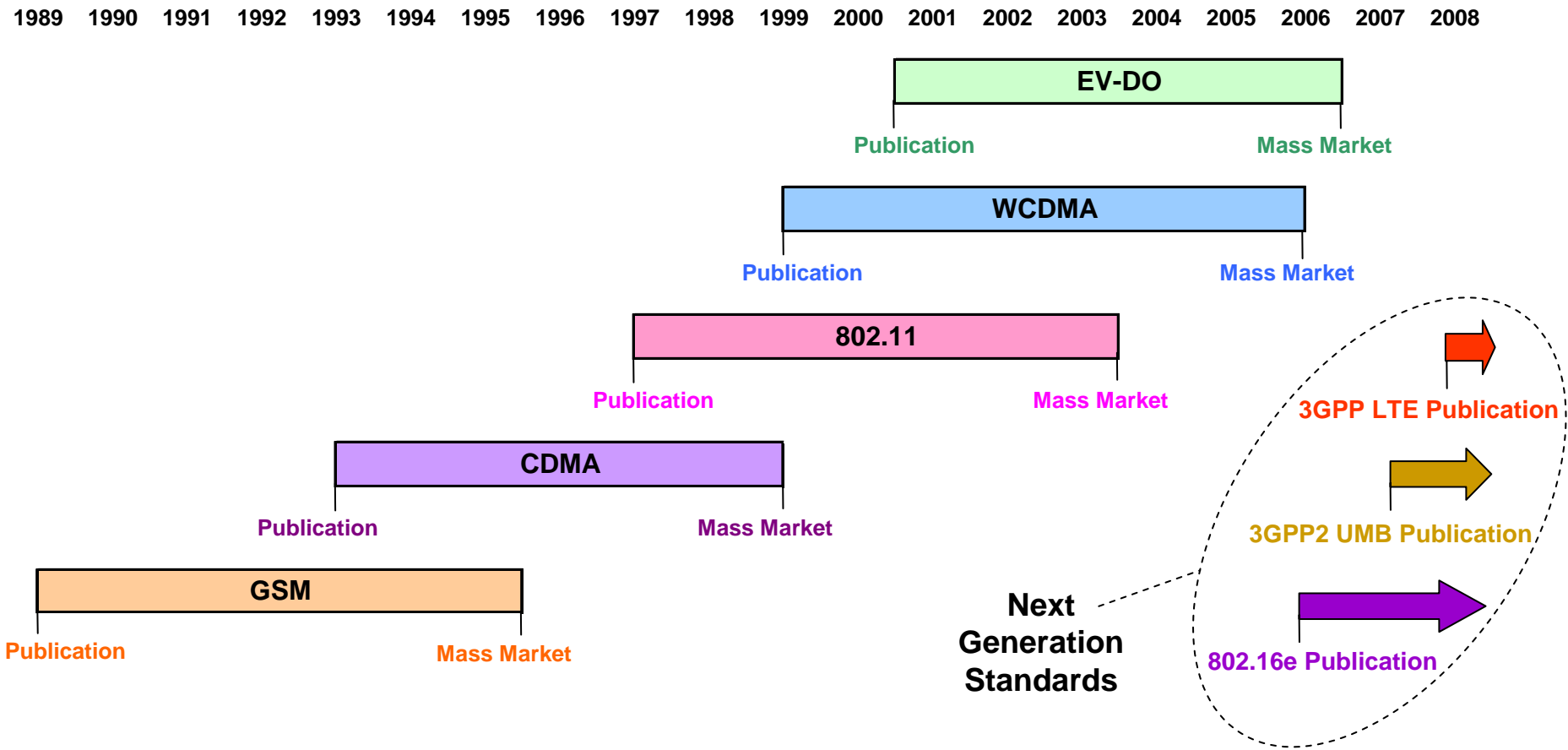


Legend:
 CDMA ■ OFDM ■ OFDMA ■

Theoretical peak downlink data rates per user (@ max. spectrum per user)

Sources: 3GPP, 3GPP2, Qualcomm

Wireless Standards Adoption Trends



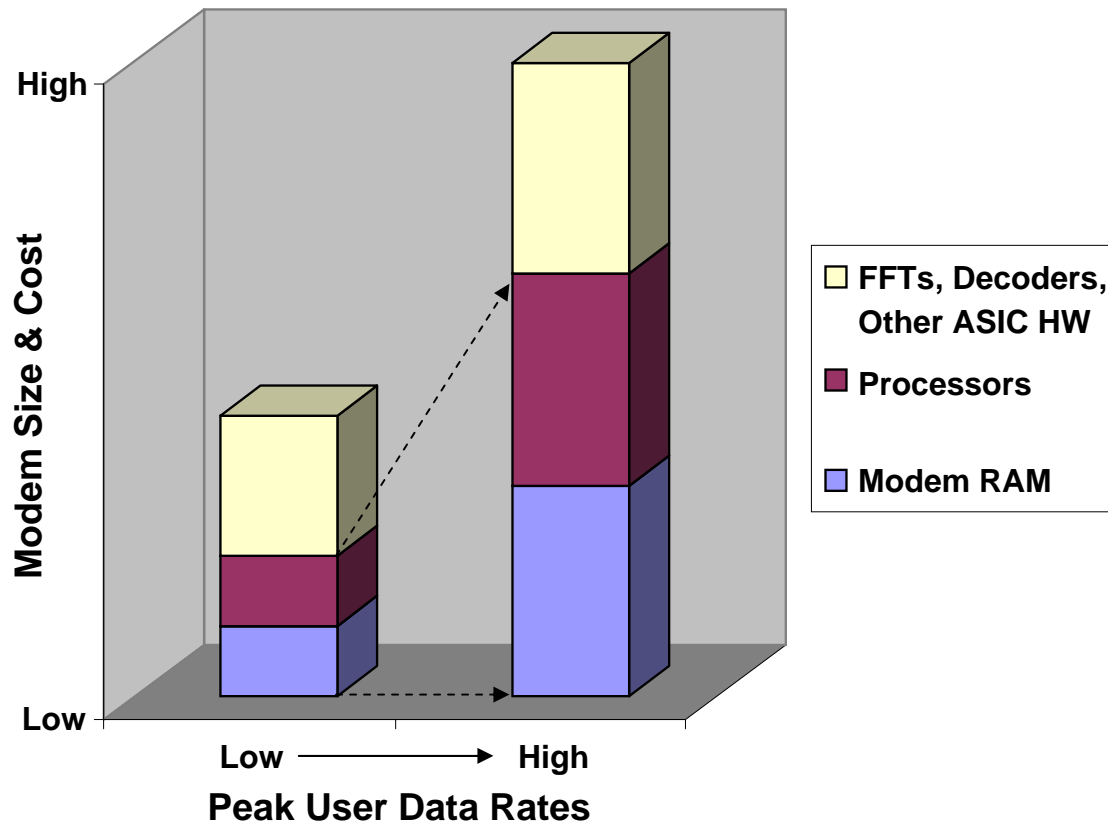
Wireless technologies that “cross the chasm” have taken ~6-7 years from standards publication to mass market.

Sources: CDG, Qualcomm, Ericsson, IEEE, 3GPP2



Mobile WAN Device Trends – Size and Cost

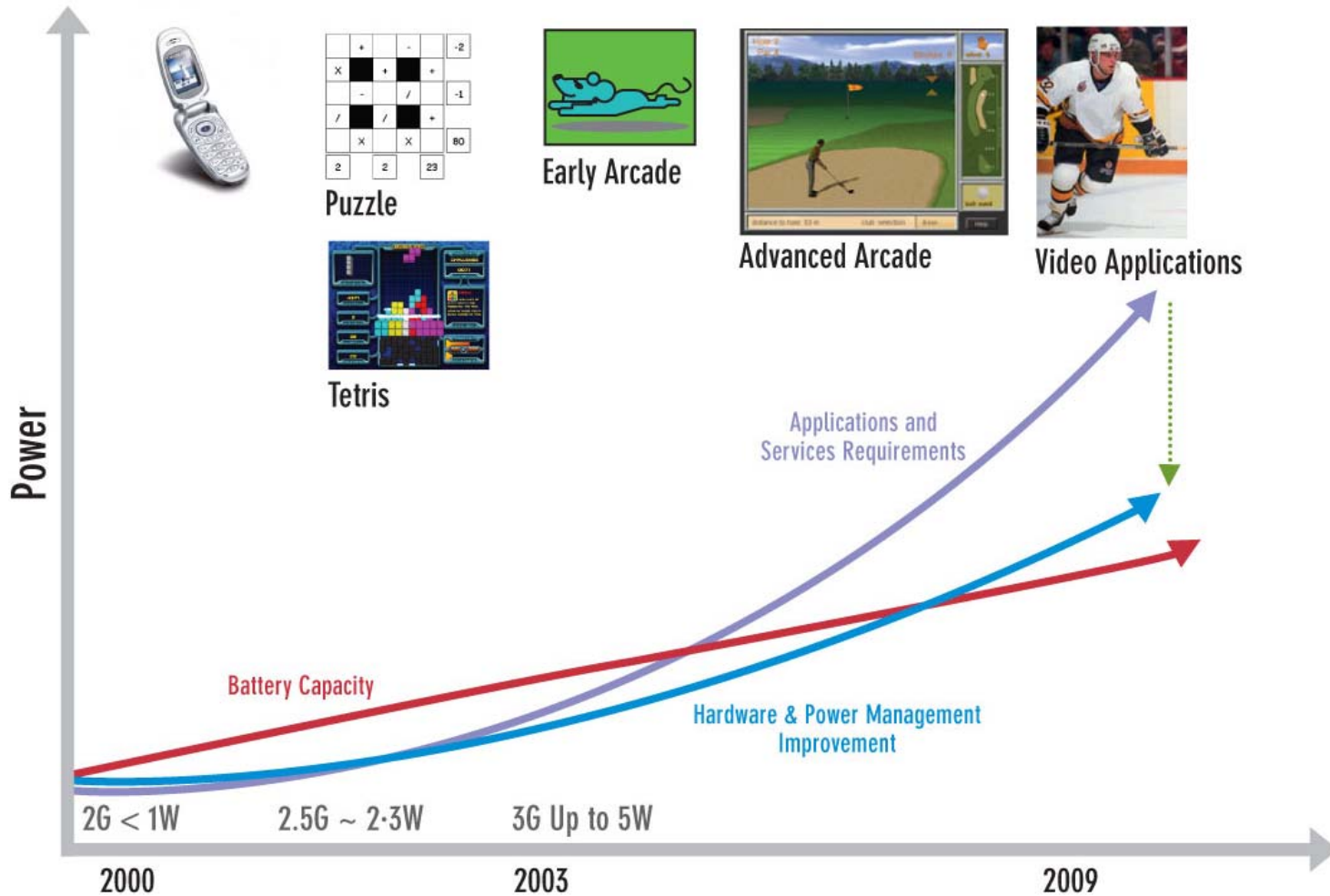
Peak User Data Rates vs. Modem Cost
(illustrative)



- Peak data rates drive modem memory and processor speed
- Modem processors and memory are key chip size and cost drivers
- Impact is similar among all mobile WAN air interfaces

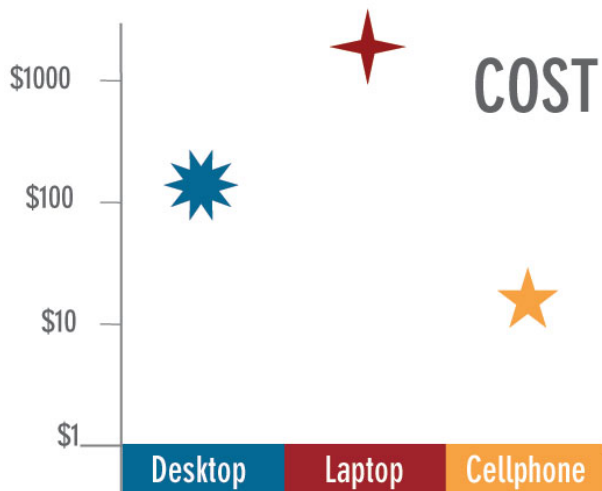
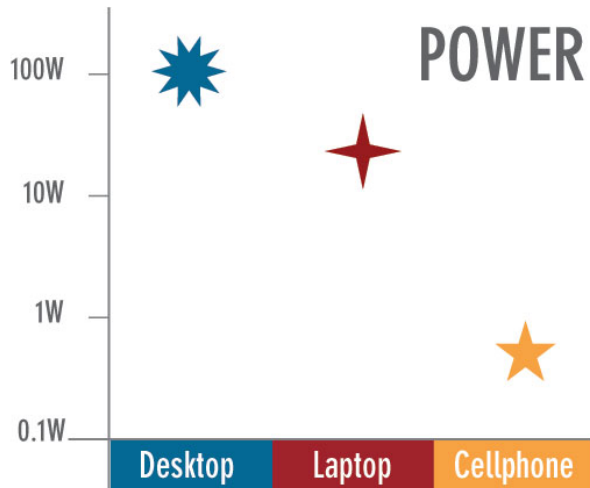
Mobile WAN Device Trends - Power

Battery Capacity vs. Mobile Application & Service Demand



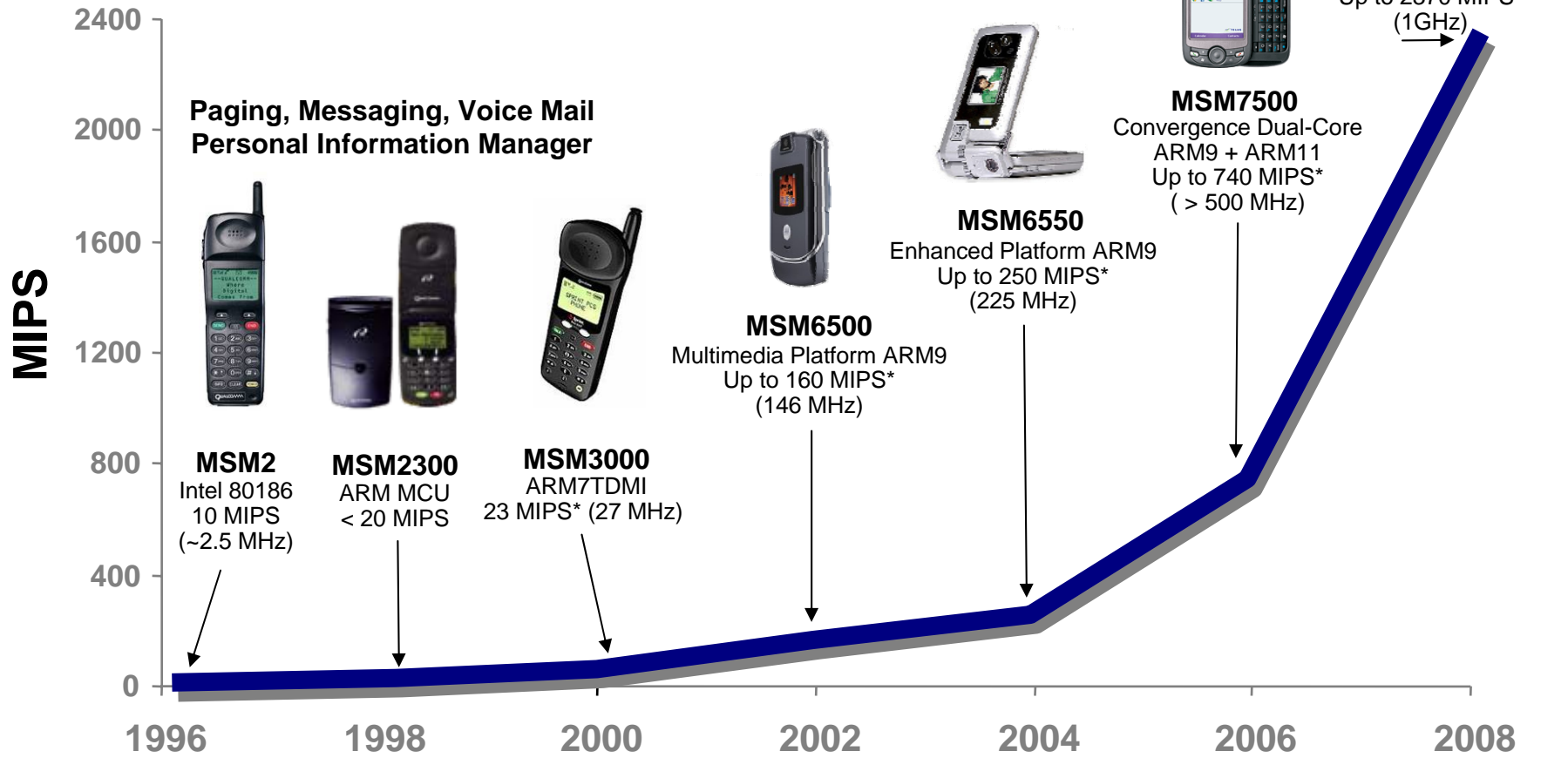
Source: Informa Telecomms & Media

Mobile WAN Device Trends - Contrast with PC Segments

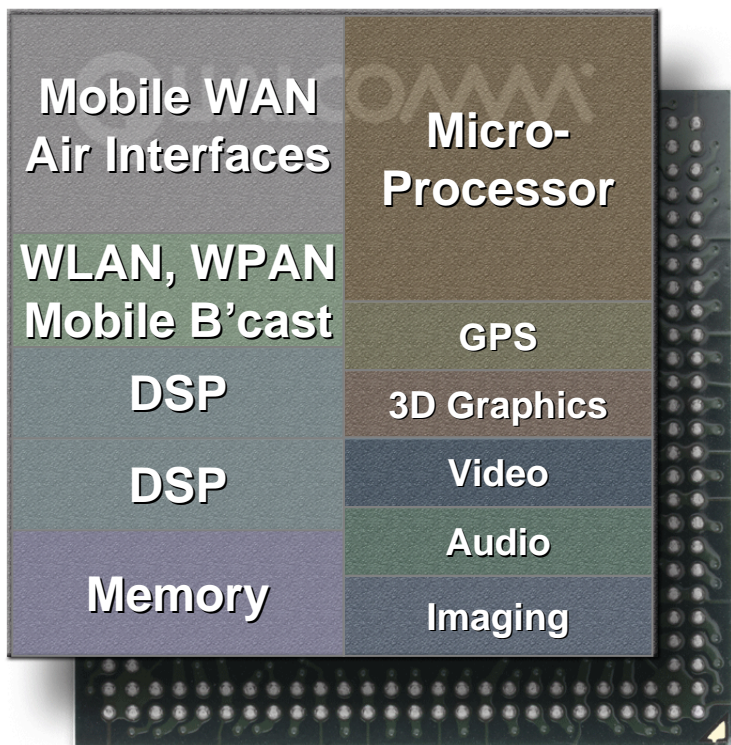


- **Portable wireless semiconductors have the most stringent power consumption and cost constraints**
- **The heritage of the computing semiconductor industry is driven by PC/Laptop applications**
 - **Power constraints are orders of magnitude looser**
 - **Cost point is orders of magnitude higher**
- **Number of system applications in handhelds are ballooning to be (almost) like a PC**

Mobile WAN Device Trends – Processing Power



Mobile WAN Device Trends – Mass Integration



- Small Form Factor
- Longer Battery Life
- Lower Costs
- Global roaming
- Economies of scale

Air Interfaces to Consider

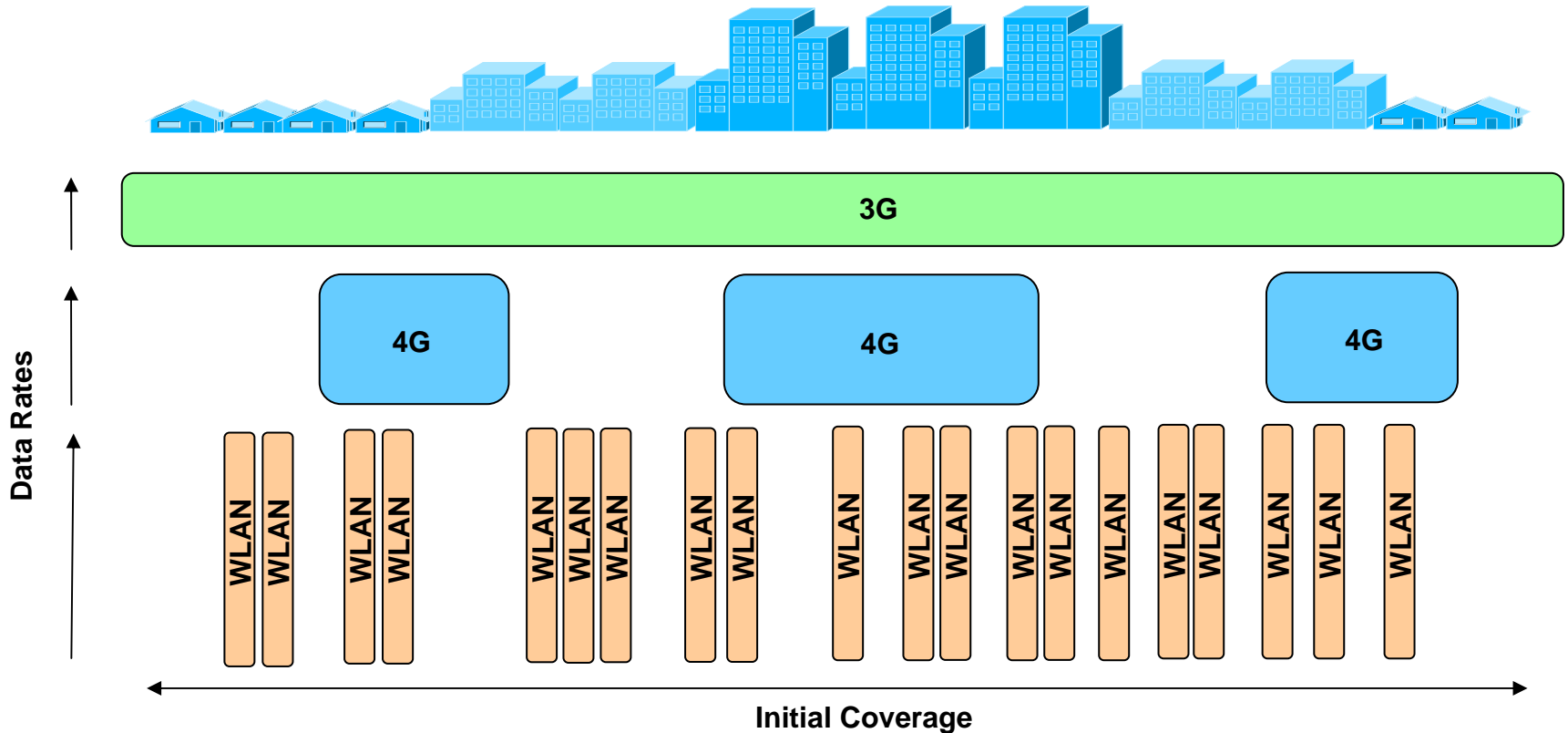
- CDMA IS-95, 1xEV, EV-DO rev 0, A and B, UMB
- GSM, GPRS, EDGE, WCDMA Rel. 99, 5, 6, 7, 8, LTE
- GPS, 802.11 a/b/g/n, BT, UWB, FLO, DVB-H, ISDBT...

Radio Frequencies to Consider

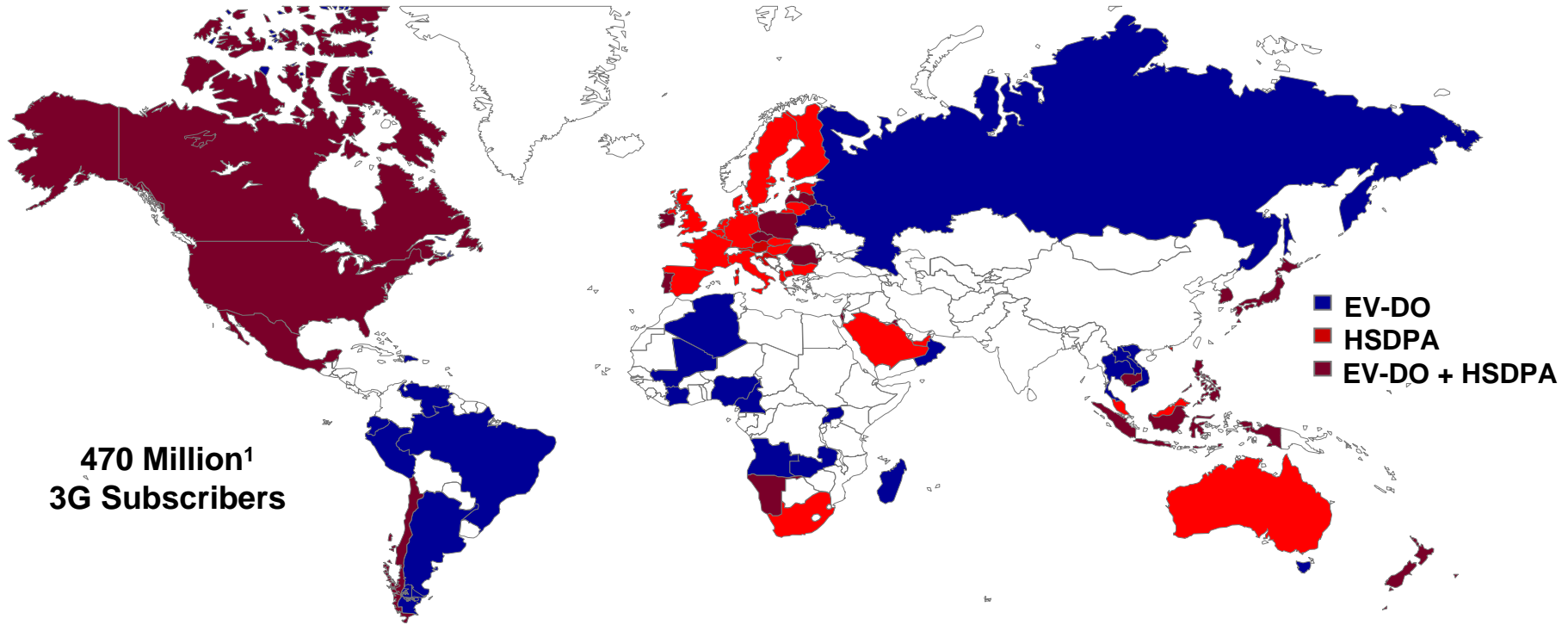
- Bands: 450, 700, 850, 900, AWS, 1800, 1900 MHz, 2.1, 2.4, 2.6, 5.8 GHz +
- Bandwidths: 200 kHz, 1.25, 2.5, 5, 10, 15, 20, 40 MHz
- Duplexing: FDD, H-FDD, TDD

Mobile WAN Device Trends – Enabling Seamless Evolution

- Ubiquitous mobile broadband enabled by 3G coverage
- Multimode device ASICs enable selective 4G investment
- 3G, 4G, WLAN handover enables seamless user experience



Mobile Broadband Today – Driven by 3G Economies of Scale



**470 Million¹
3G Subscribers**

EV-DO (rev 0 and A)

- 128 operators committed to EV-DO
- 62 commercially available networks in 37 countries
- 30+ vendors launched over 433 EV-DO devices
- 55 embedded notebooks

HSDPA

- 147 operators committed to HSDPA in 67 countries
- 100 commercially available networks in 54 countries
- 50 suppliers launched over 209 HSDPA devices
- 43 embedded notebooks

Sources: CDMA Development Group (cdg.org), GSMA (gsmworld.com), GSA (gsacom.com) and Informa

¹ Paying subscribers on commercial CDMA2000 and WCDMA (UMTS) networks as of April 30, 2007. Source: Wireless Intelligence

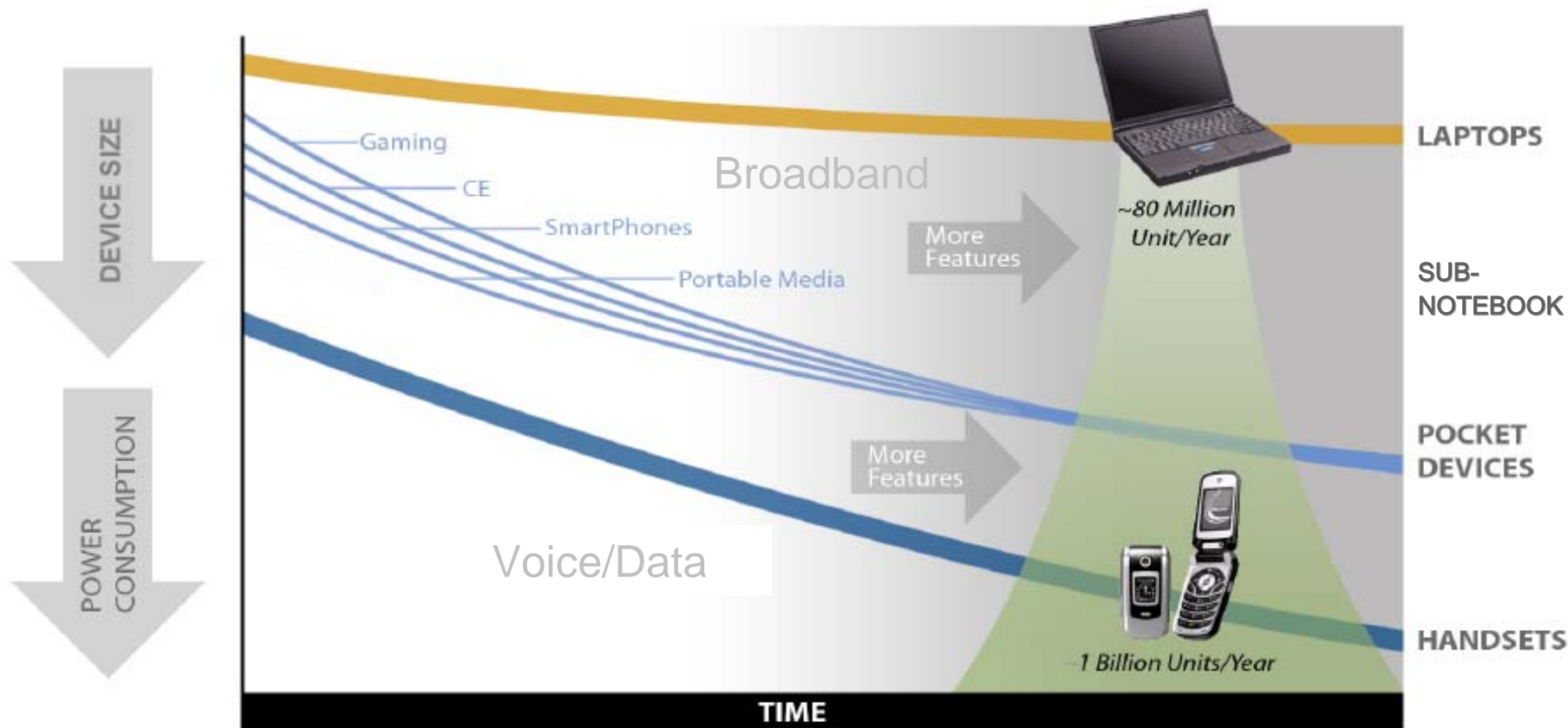
Many Embedded Mobile Broadband Solutions Today

March 2006	March 2007
21	98*
Launched NB Offerings	
11	45
Launched NB Models	
5	16
Notebook Manufacturers	
4	17
3G Embedded Carriers	

*Sum of individual notebooks certified per carrier network



Mobile Broadband Evolution - Enabling New Device Classes



- Technology drives down chip size and power consumption
- More integrated features supporting wider range of applications
- Enables new enterprise and consumer device classes



Thank You!

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