

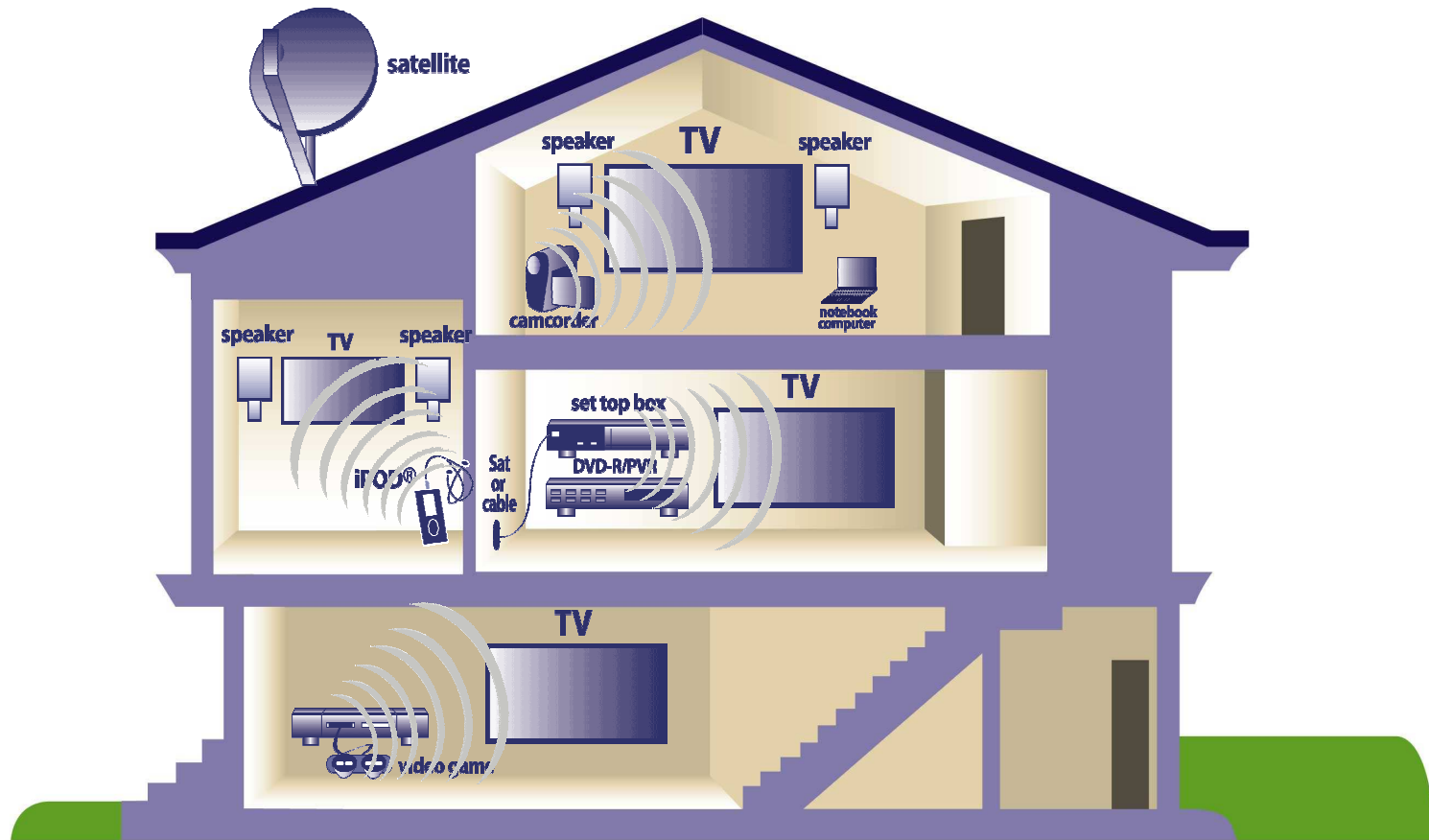
Reliable Ultra Wideband

Multimedia Wireless Networking

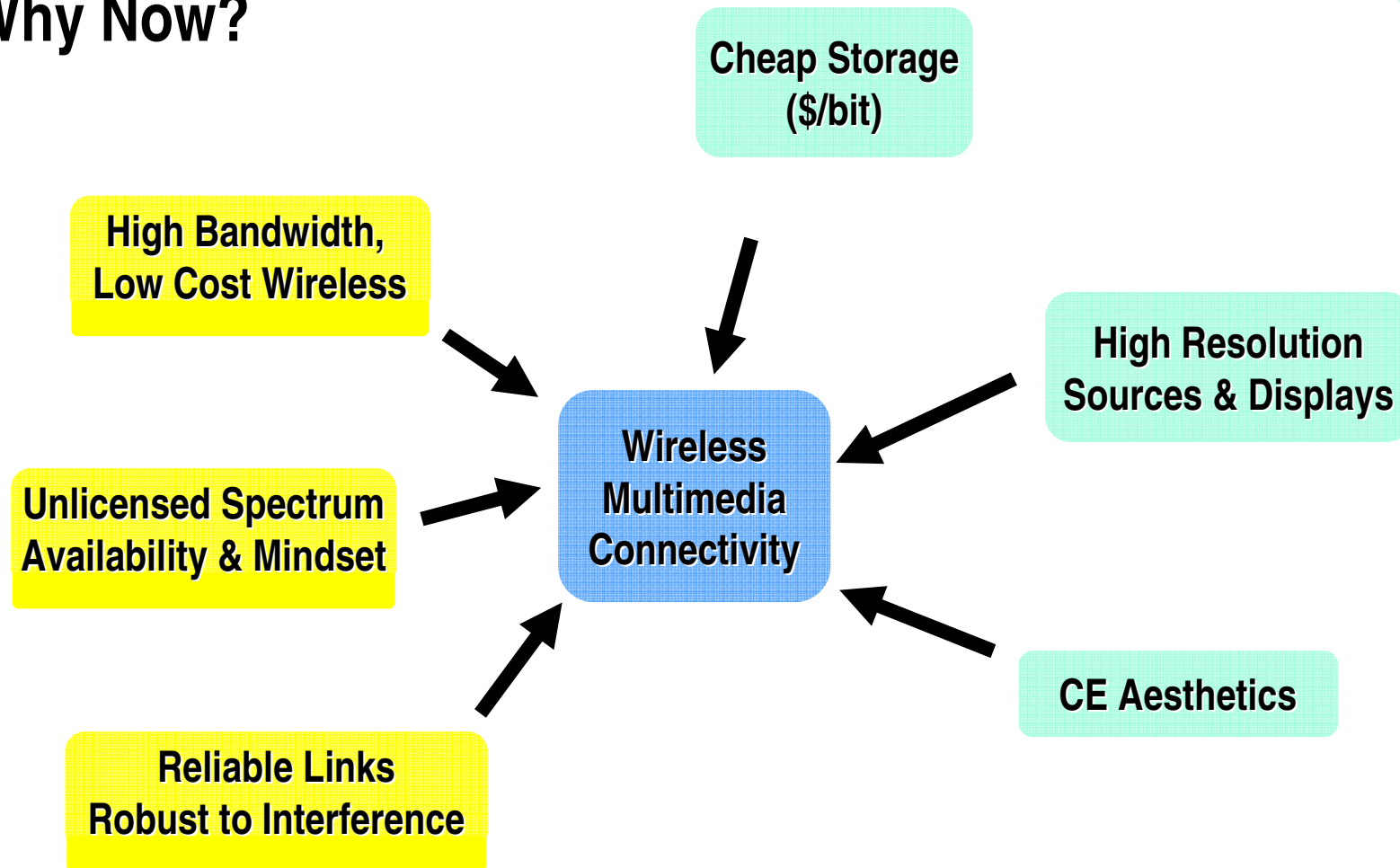


Rajeev Krishnamoorthy

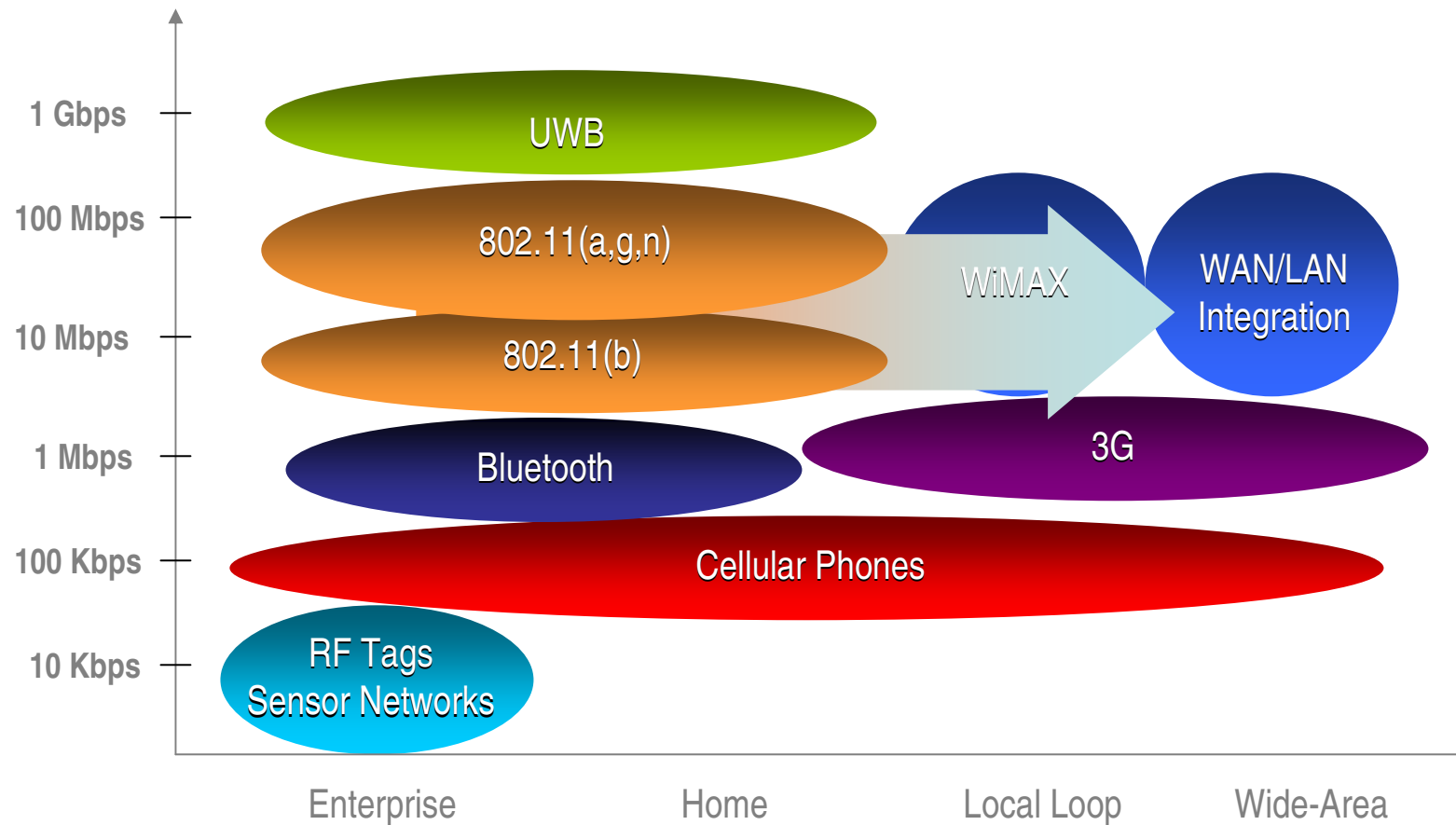
The Vision



Why Now?



Wireless Landscape



Drivers

Regulations

Technology

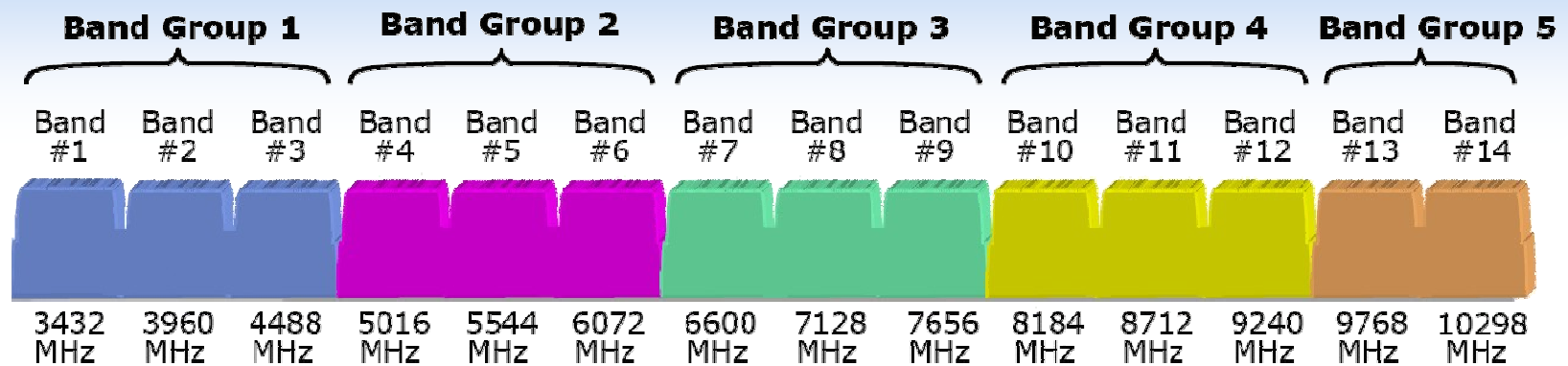
Economics

Market Dynamics

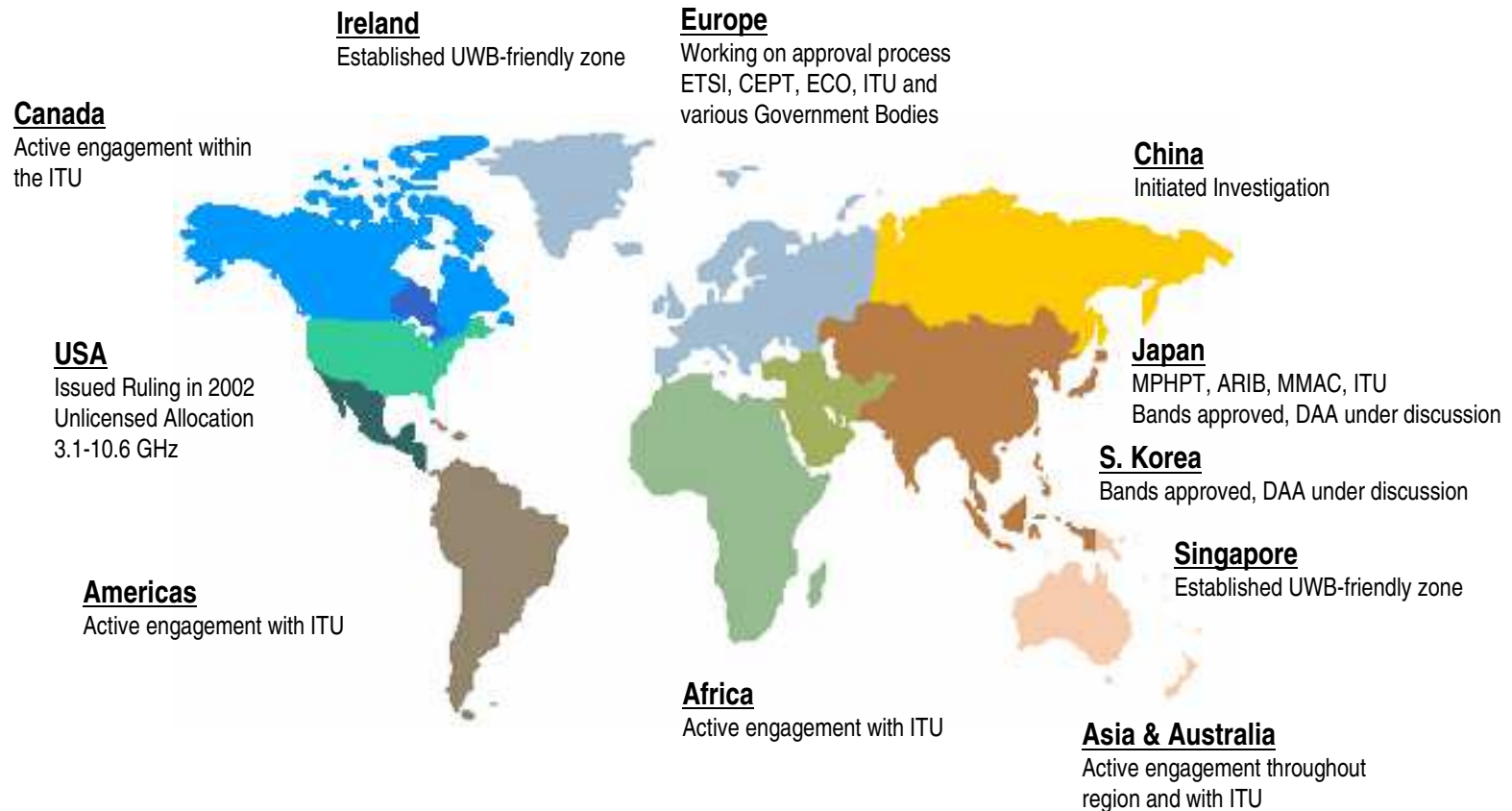
What's Interesting about UWB?

- Huge amount of Spectrum
 - 10-100x previous allocations
- Very high data rates
 - Starts out around 500 Mbps, will go up
- Very high capacity
 - Low transmit power level and interference management → enormous number of colocated devices
- Very good Power/Data Rate tradeoffs
 - Joules/Bit excellent for high and low data rate solutions
- Cost-Effective and Good Propagation
 - Low carrier frequencies (< 10 GHz) enable good propagation

Ultra Wideband Spectrum



Worldwide Regulatory Status



WiMedia & Bluetooth



- 100's of members, including:

SONY



PHILIPS

SHARP



Microsoft



tzero



NEC



- 1000's of members, including:

agere systems



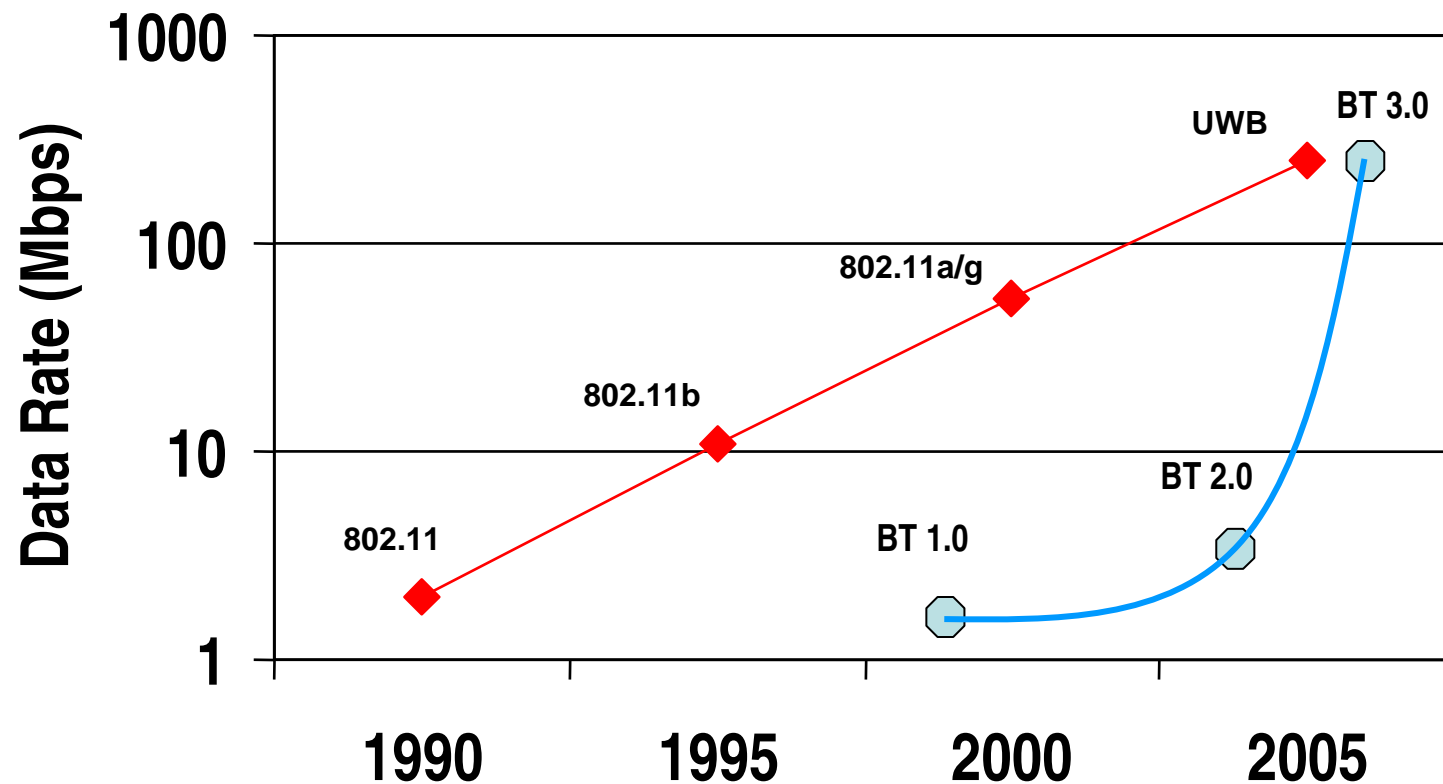
Microsoft



NOKIA

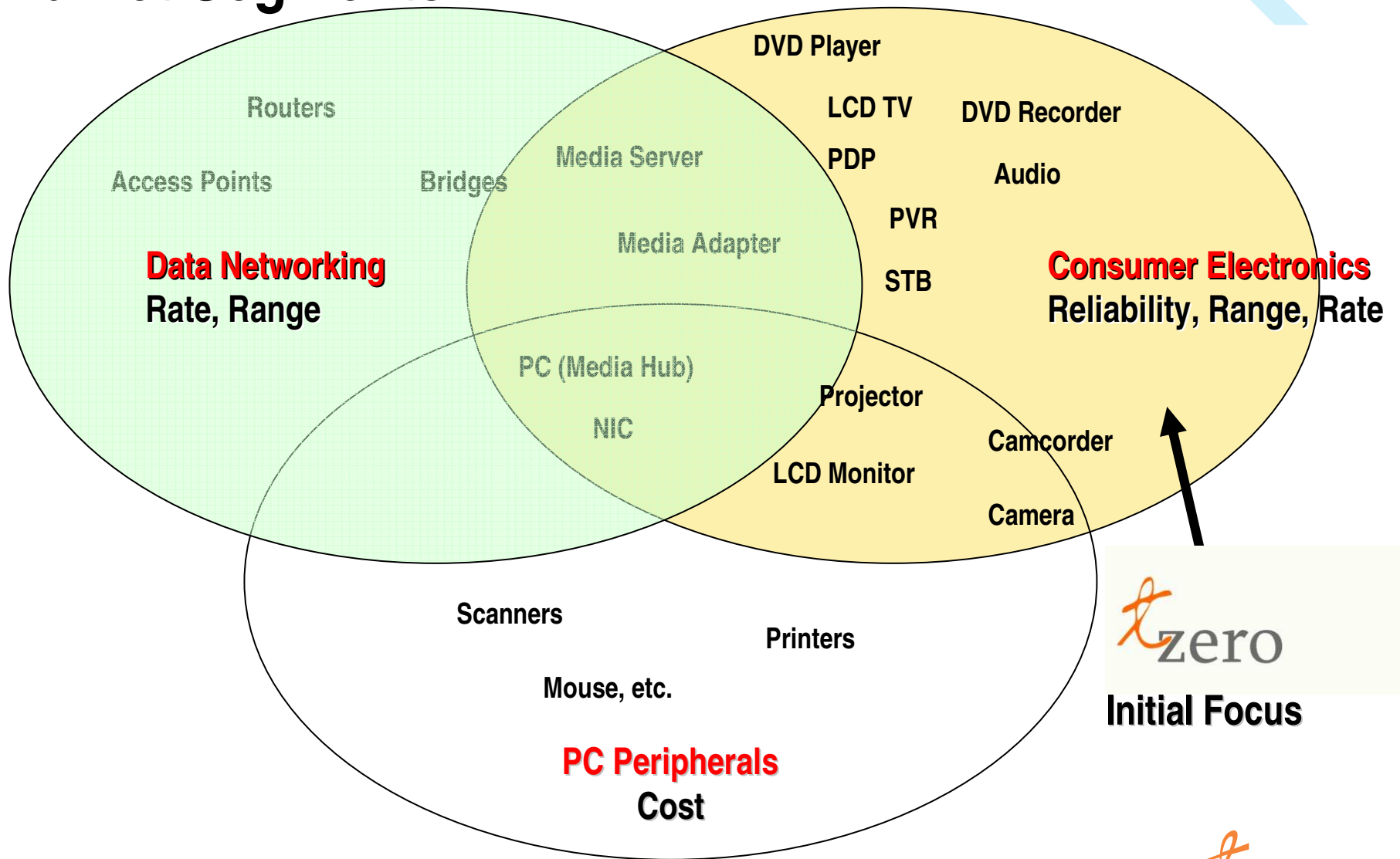
TOSHIBA

Trend

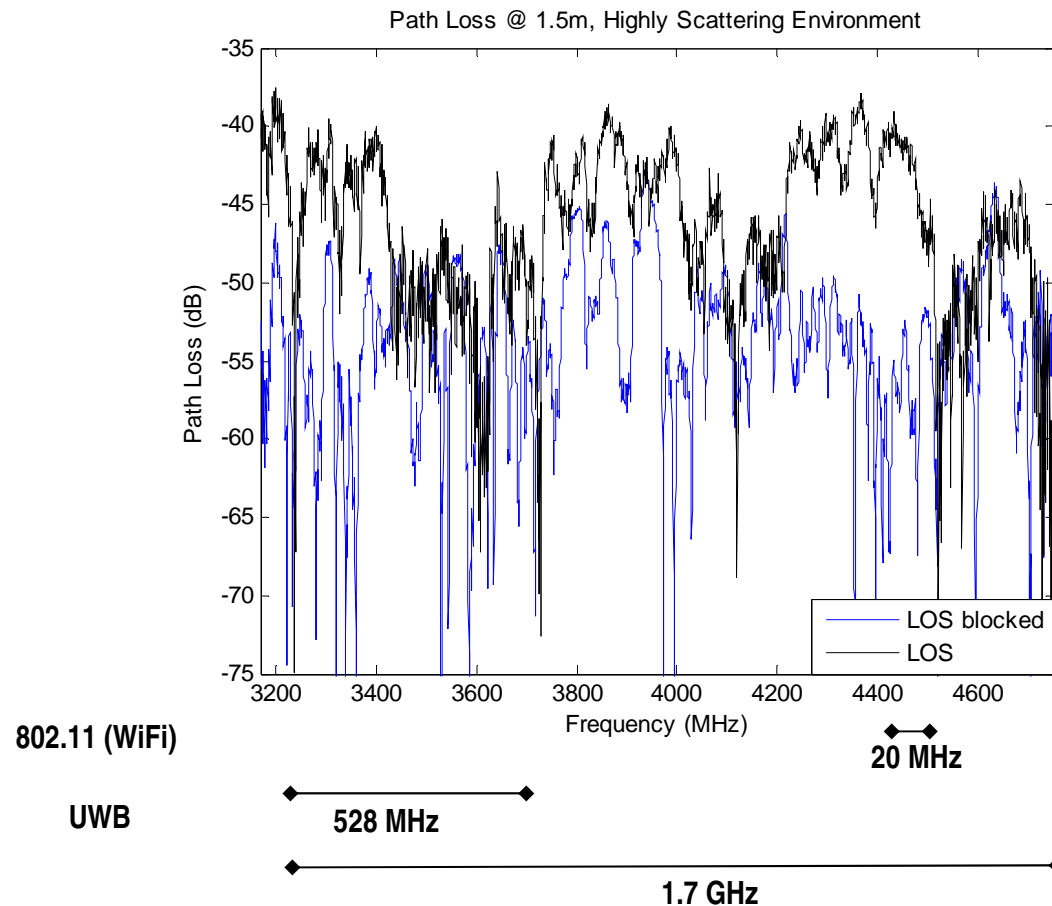


Exponential Increase: follows content and storage growth rates

Market Segments



Frequency (lots of it) Diversity: The Inherent Advantage

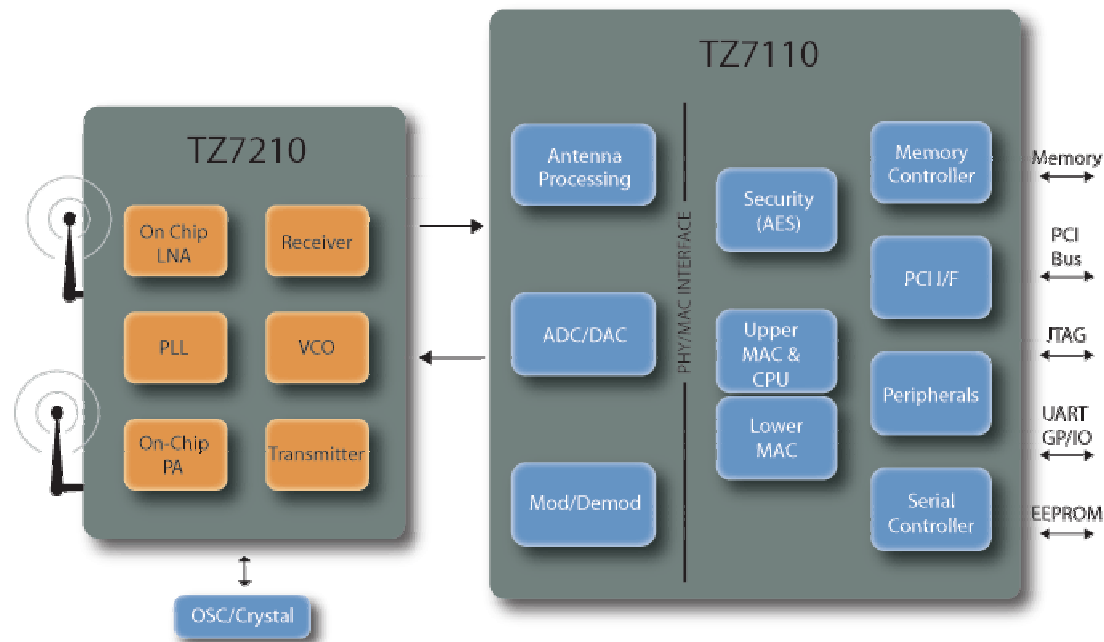


Large Bandwidth reduces signal level variation (by averaging): reliability & range

Solution

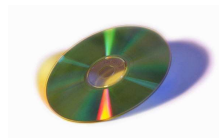
RF (0.18 μ CMOS)

SOC – Baseband/MAC (0.13 μ CMOS)



Chipset

+



Software

+



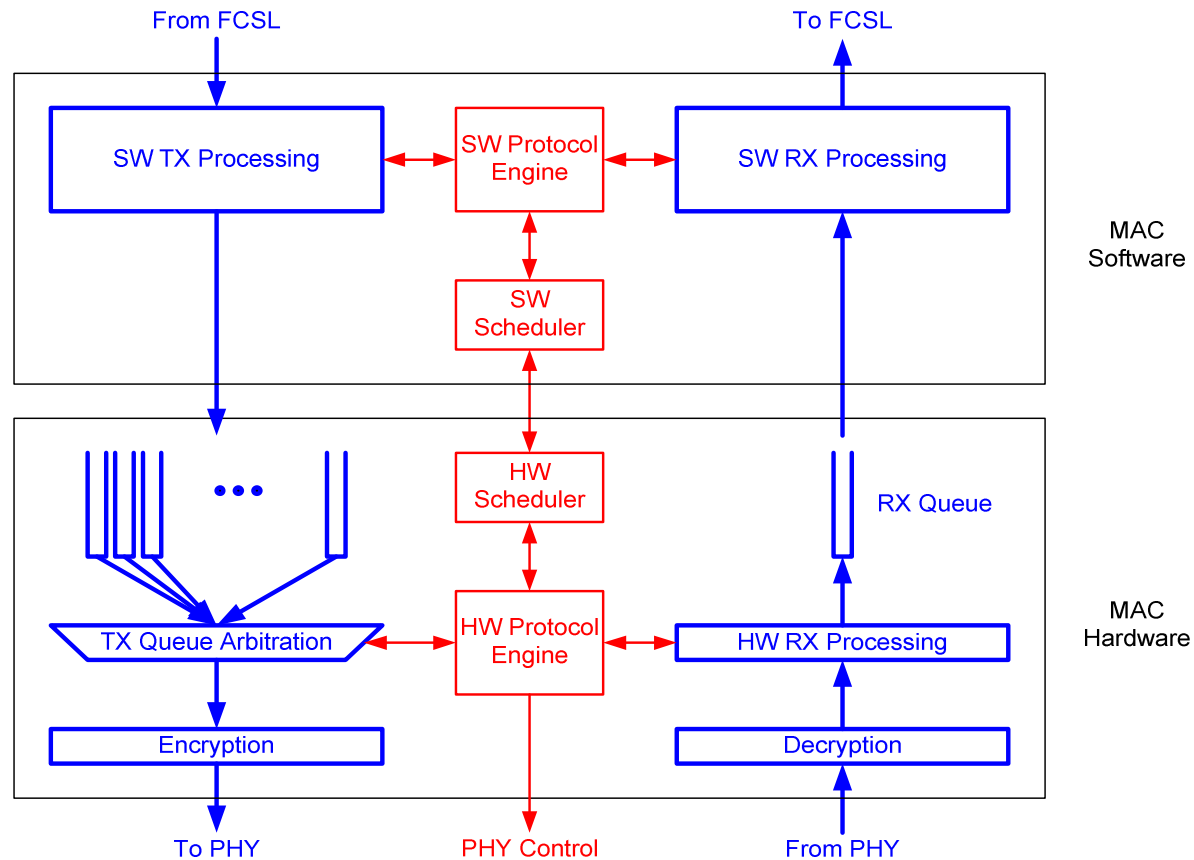
Antenna

=

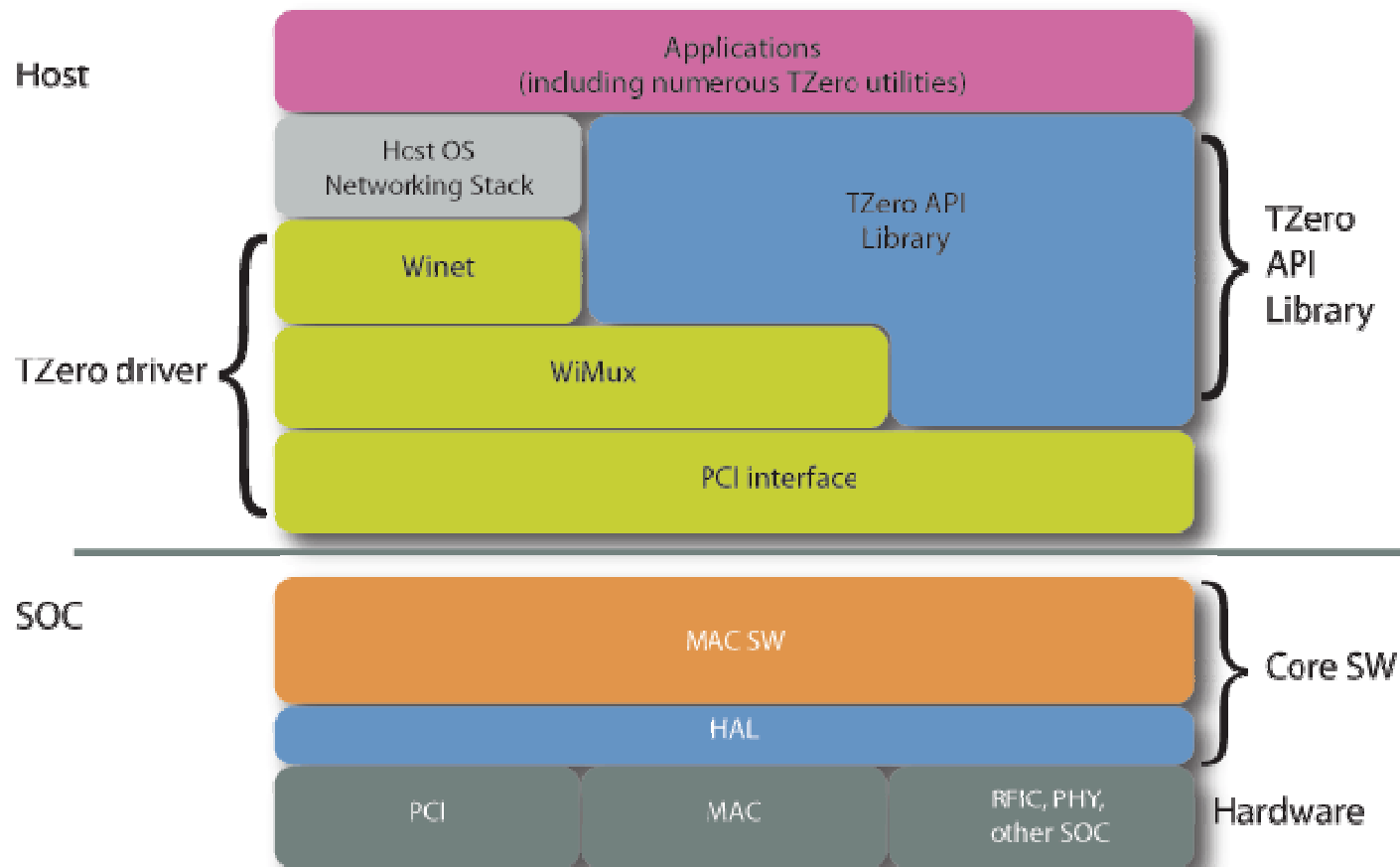


Reference Design

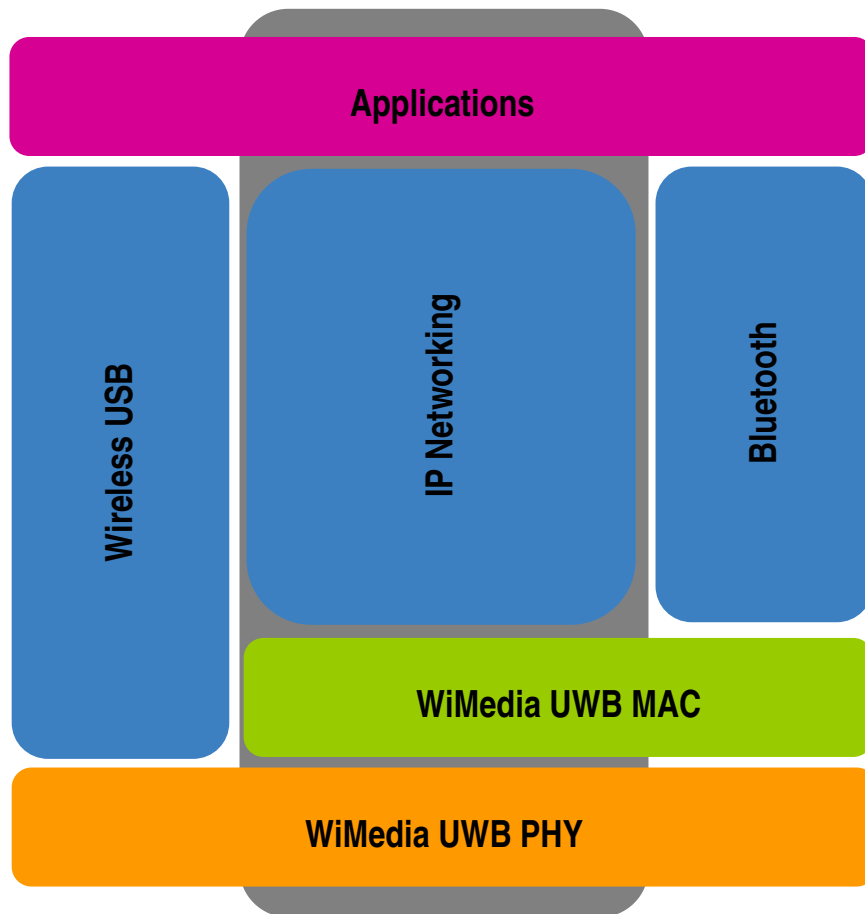
MAC HW/SW Partition



Software Stack & Interfaces



WiMedia System



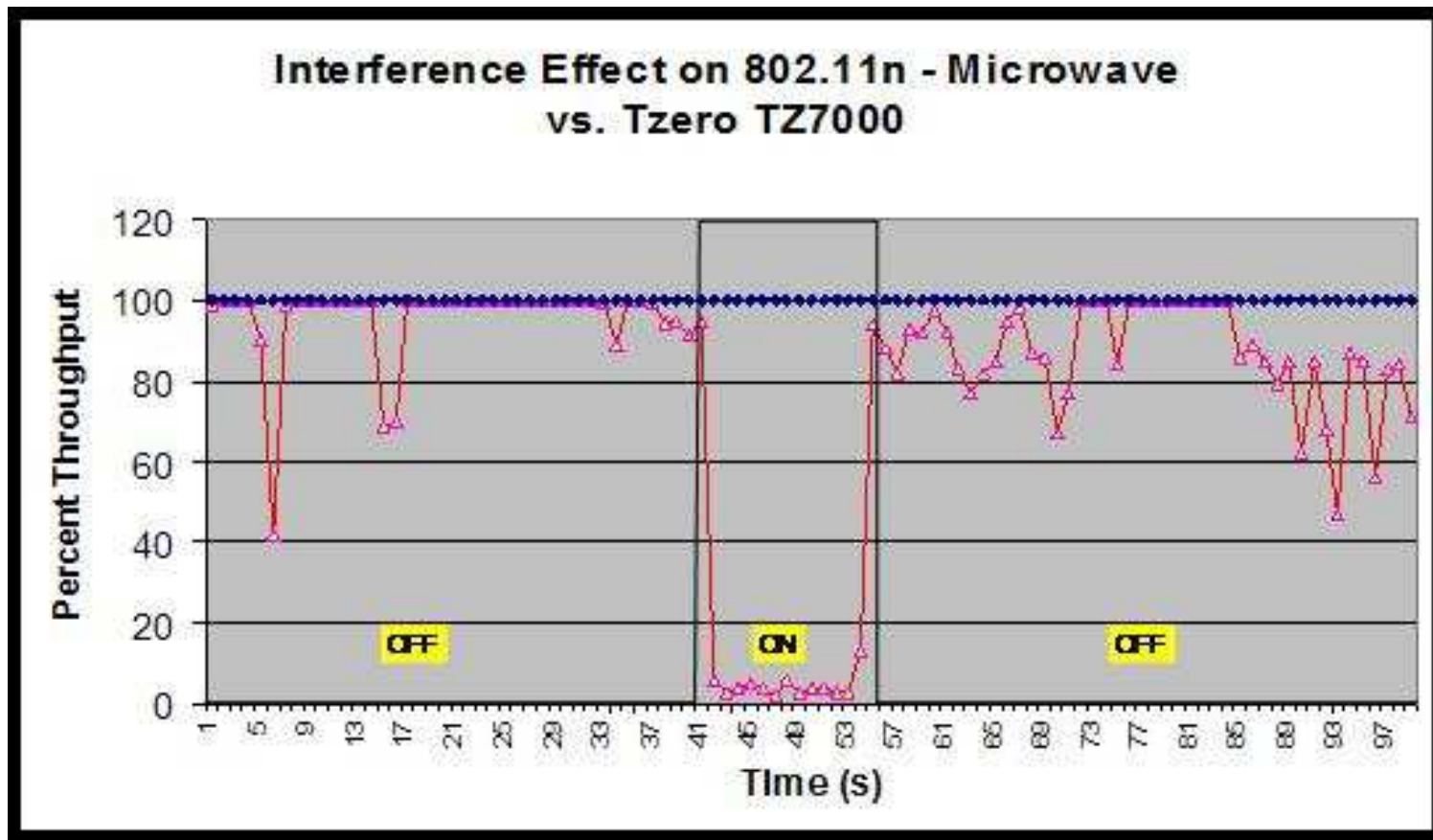
Tzero provides:

- ✓ Complete solution for maximum performance
- ✓ IP network enabled
- ✓ Broadcast quality (10^{-8} Packet Error Rate)
- ✓ Non line-of-sight (3+ walls)
- ✓ Decoding at S/I > -10 dB

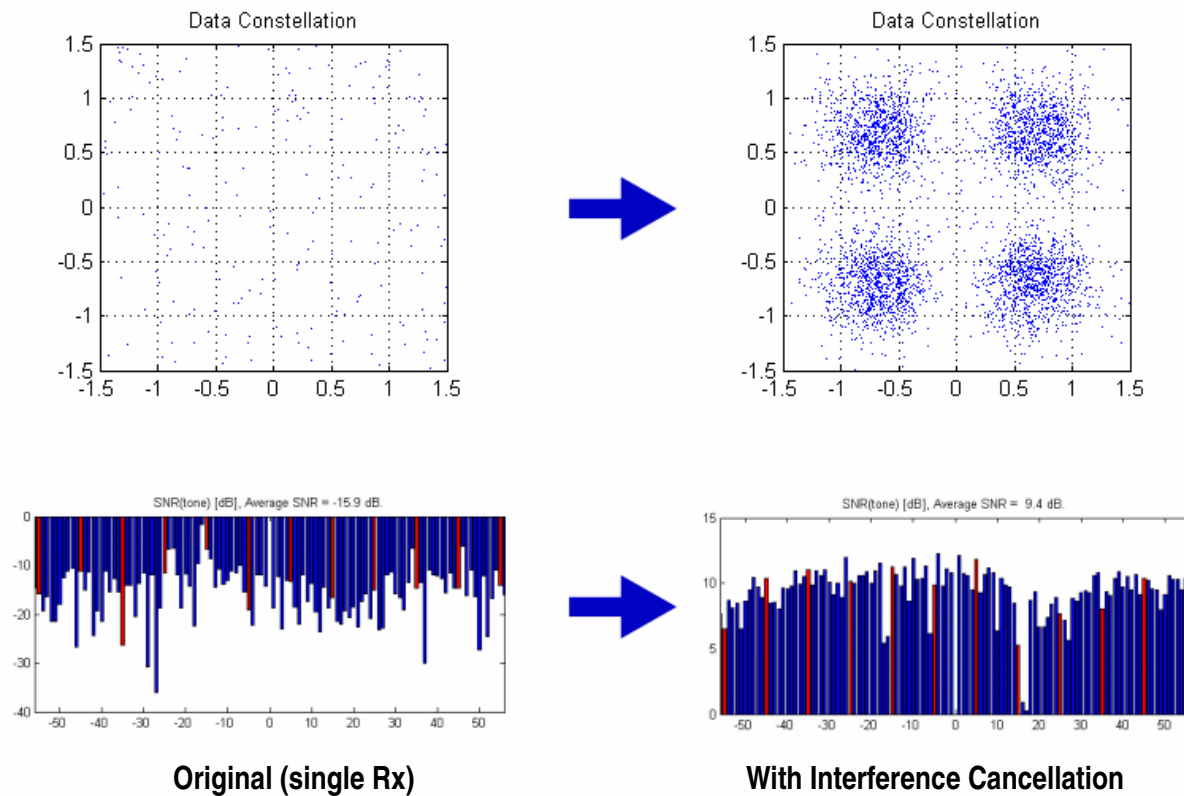
MAC and PHY hardware offers:

- ✓ Integrated MAC/PHY
 - Full WiMedia MAC & PHY
- ✓ CMOS RFIC

Fading and Interference – Impact on Throughput

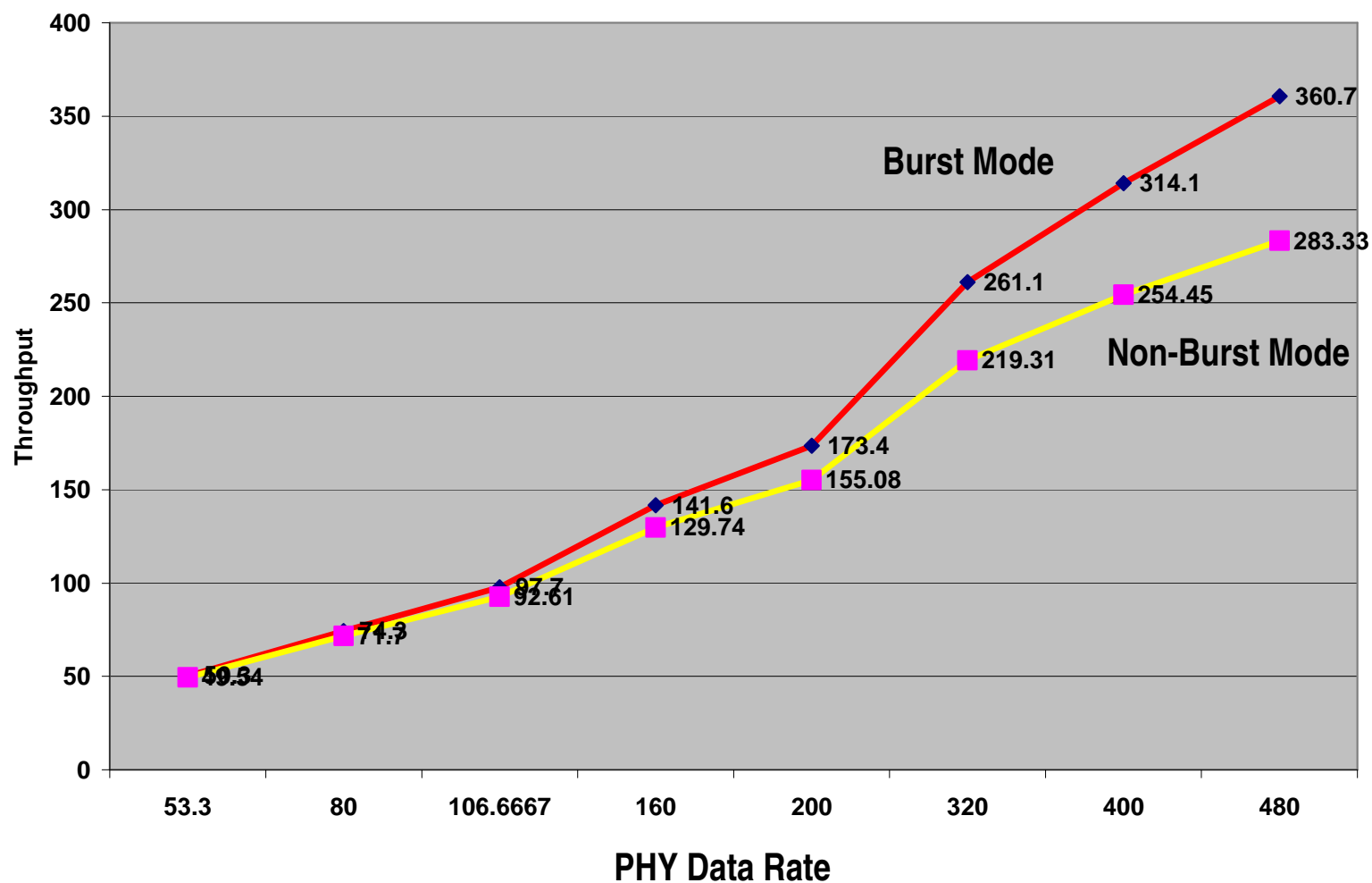


Interference Cancellation Example

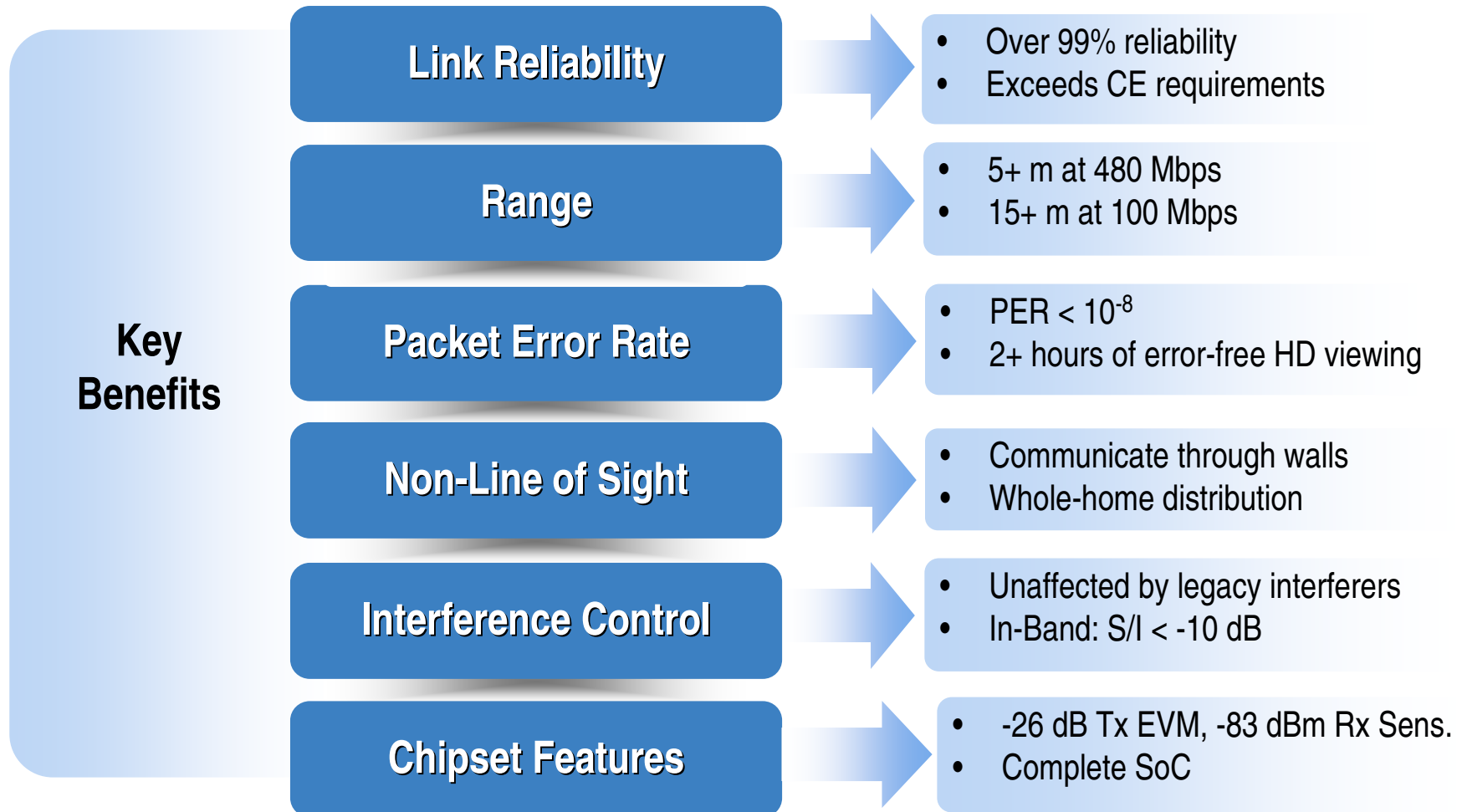


- Desired UWB Band 1 @ -70dBm, RX set to max gain
- 3.5GHz Narrowband Interferer @ -57dBm

Throughput



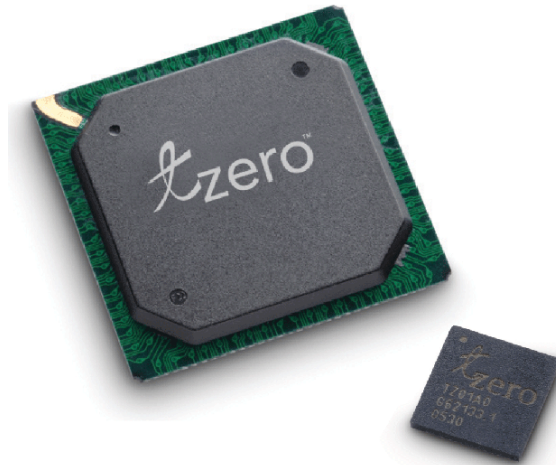
UltraMIMO™ Architecture & Performance



Products



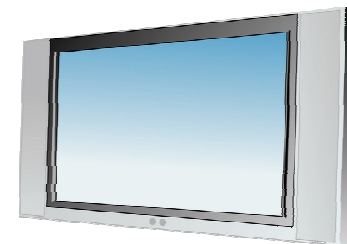
Hand-held Devices



Static Consumer
Electronics Devices



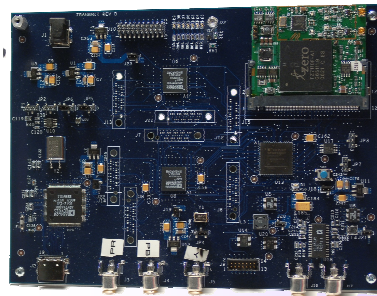
PCs and Peripherals



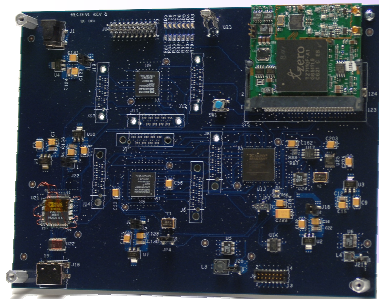
Displays

... and more

Wireless HDMI Product



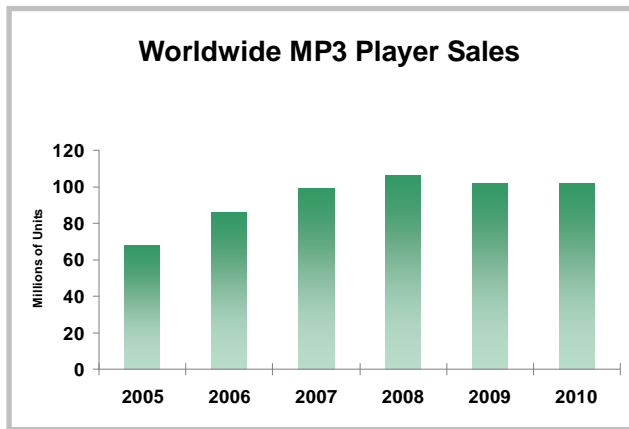
Transmit



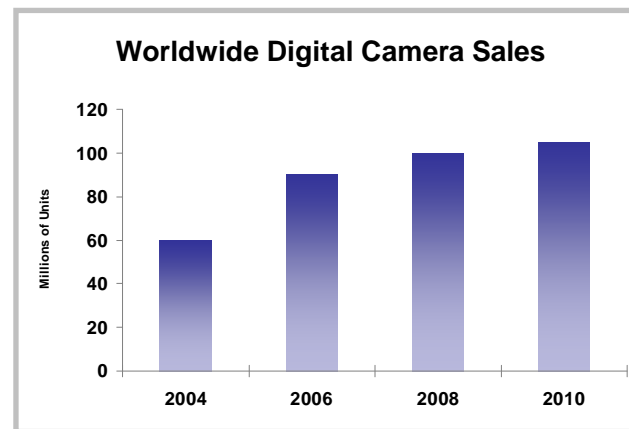
Receive



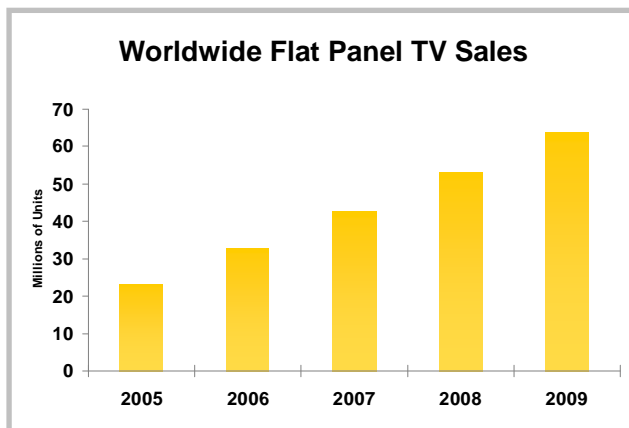
Growing Markets



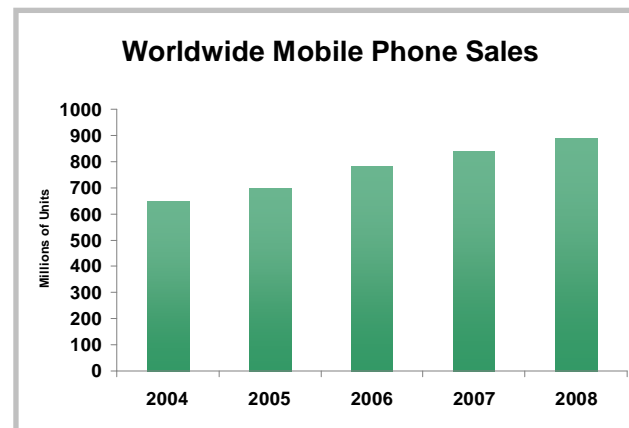
Source: Parks Associates



Source: InfoTrends Research



Source: DisplaySearch



Source: Strategy Analytics

Summary

- Whole-home networked multimedia
- Highest Performance
 - Reliable Links
 - Robust to Interference
 - “Video Quality”
- Standards-based
- Available now