# Snapdragon S4 System on Chip

Analyst Webinar
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# Qualcomm
# Introduction

**Michelle Leyden Li**
**Sr. Director, Marketing**

# New Snapdragon Brand and Roadmap

## Features Overview

### Snapdragon System 1 Processors

For Mass Market Smart Phones

S1 Class includes:

- 65 nm
- Up to 1GHz CPU
- Up to Adreno 200 GPU
- Up to 3G HSPA

### Snapdragon System 2 Processors

For High Performance Smart Phones & Tablets

S2 Class includes:

- 45 nm
- Up to 1.4GHz CPU
- Adreno 205 GPU
- 3G HSPA+
- 1024x768 display
- 720p/Dolby 5.1
- Stereoscopic 3D

### Snapdragon System 3 Processors

For Multi-tasking & Advanced Gaming

S3 Class includes:

- 45 nm
- Up to 1.5GHz Dual-CPUs
- Adreno 220 GPU
- 3G HSPA+
- 1440x900 display
- 1080p HD/Dolby 5.1
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### Snapdragon System 4 Processors

Next Generation Devices

S4 Class includes:

- 28nm
- Up to 2.5GHz next gen CPU single/dual/quad
- Adreno next gen GPU dual/quad
- 3G/LTE multimode

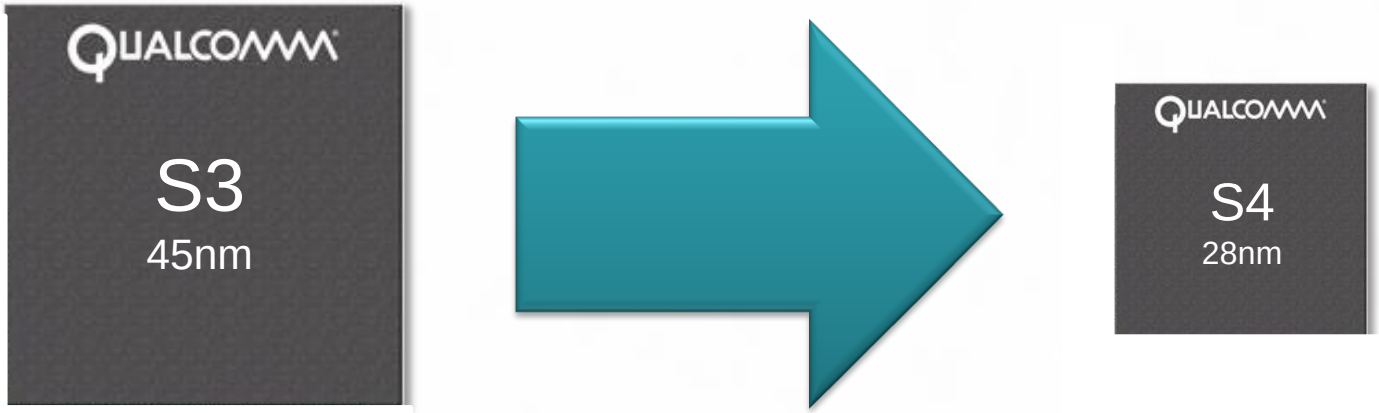
# Krait
# CPU


## Travis Lanier
## Director, Product Management

# MSM8960 CPU Key features and advantages

| | |
|---|---|
| Best in Class Processor | • MSM 8960 features Qualcomm second generation “Krait” CPU<br>• Krait outperforms current ARM CPUs on a core-to-core basis.<br>• Uses ARM instruction set, software and eco-system |
| First to Market | • Provides performance headroom for new generation devices<br>• First to market with this class of performance and power efficiency |
| Best in Energy Efficiency | • Krait features innovative power saving techniques like aSMP and custom circuit designs<br>• Independent Voltage and Frequency control<br>• Efficient frequency and voltage scaling |
| Next generation Process Technology | • Krait CPU is designed in the latest 28nm process technology<br>• Process scaling provides for better performance and power |

# Krait: First Mobile Processor in 28nm

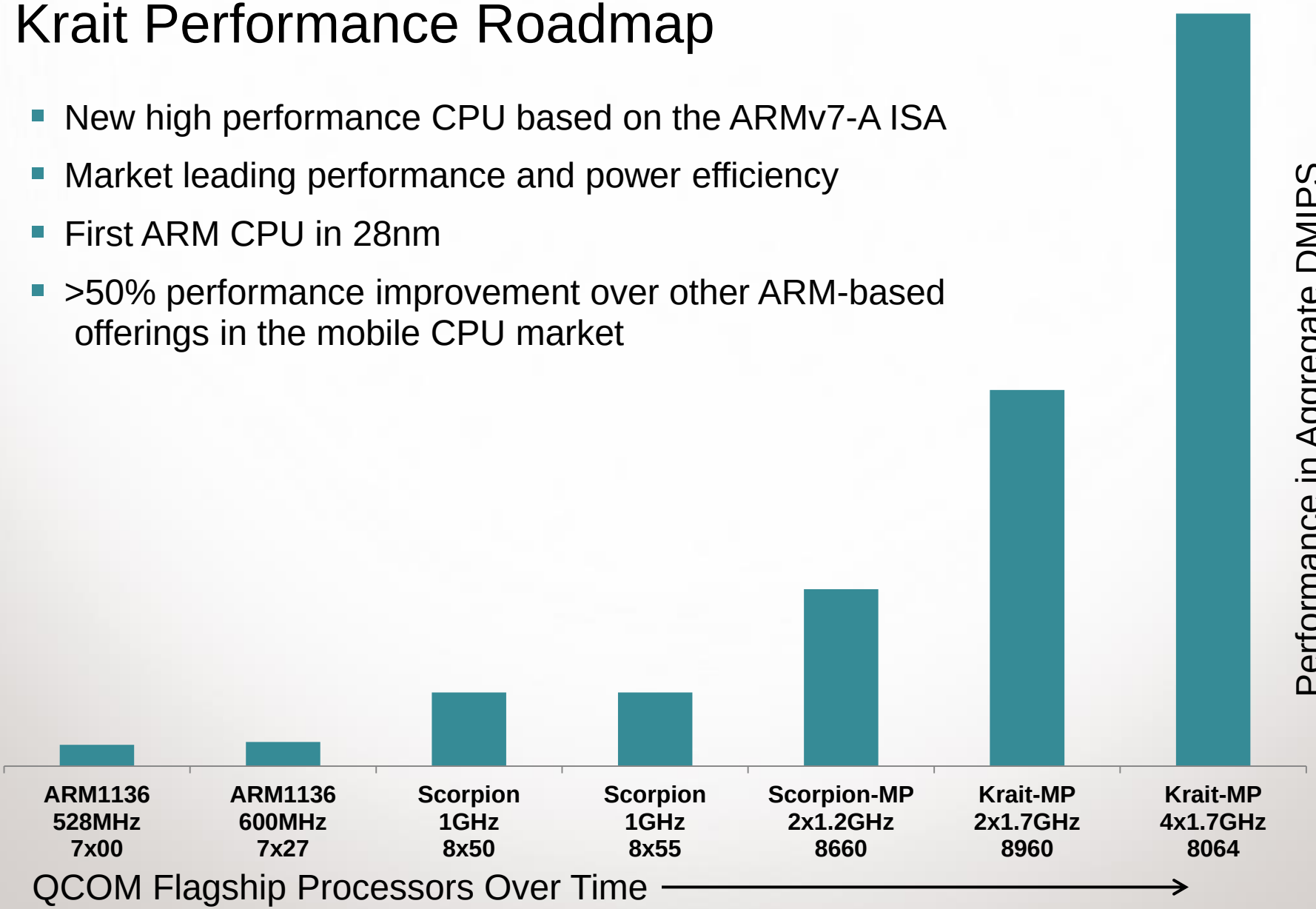



Qualcomm process technology leadership enables:

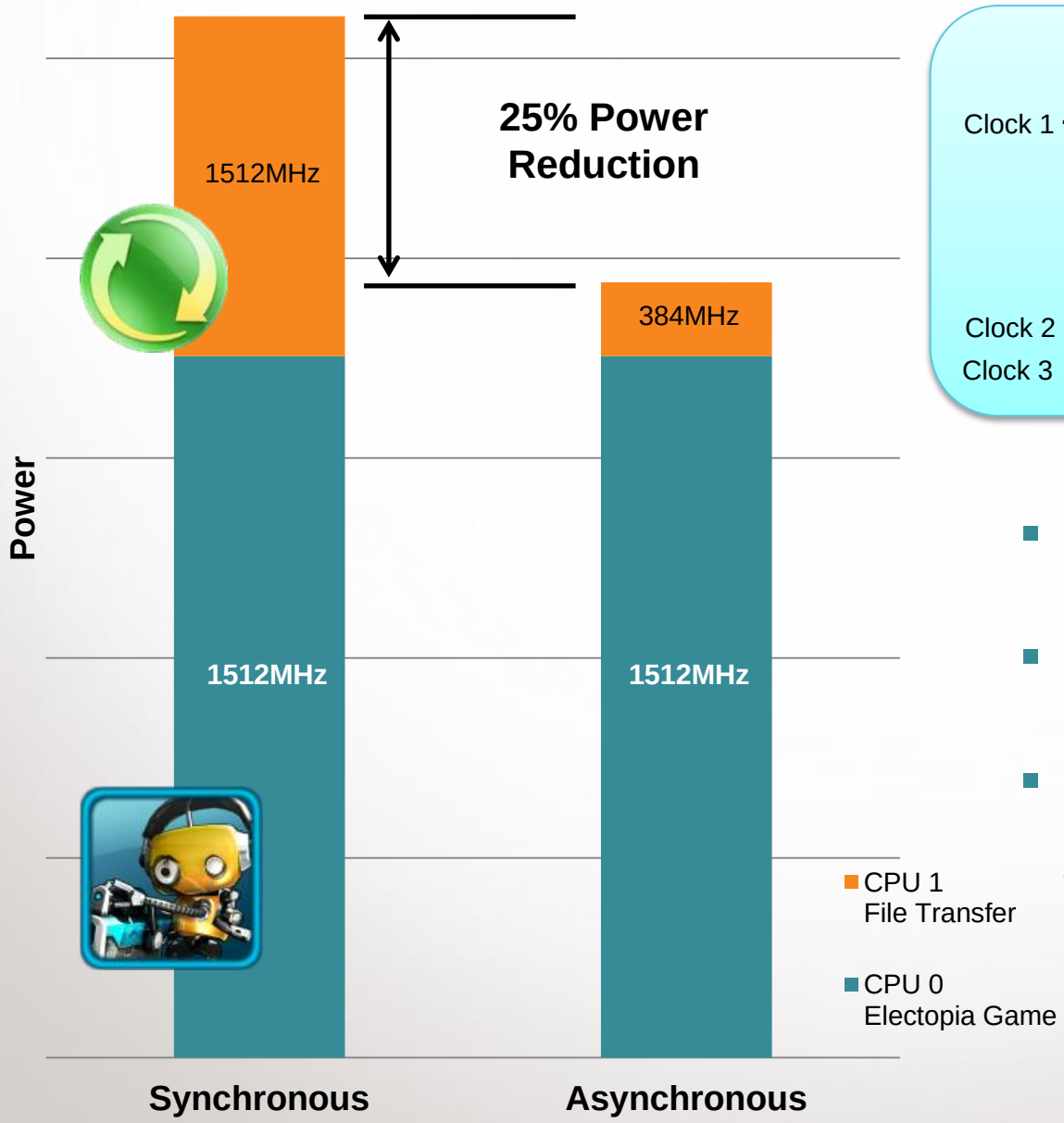
- More performance
- Lower power
- Lower manufacturing costs
- More room for single chip SoC integration
- First fully integrated LTE world/multimode modem…
  - Plus latest high performance CPU/GPU/DSP/video…
  - …all on a single chip!

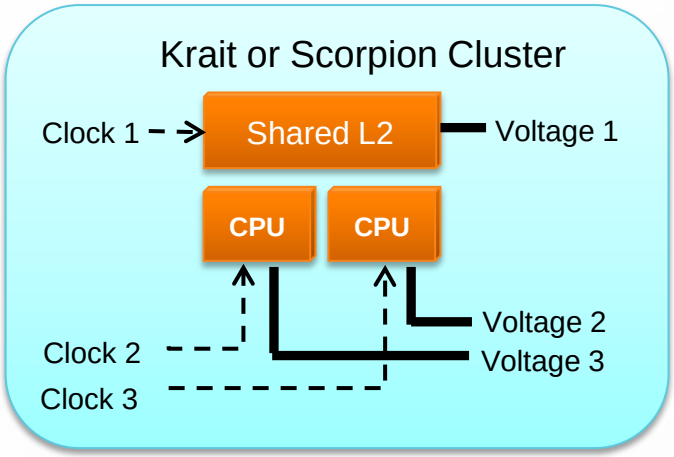
# Krait Performance Roadmap

- New high performance CPU based on the ARMv7-A ISA
- Market leading performance and power efficiency
- First ARM CPU in 28nm
- >50% performance improvement over other ARM-based offerings in the mobile CPU market



# Asynchronous CPU Power Savings Proven in Market




- 25-40% power reduction depending on workload
- Other ARM solutions are on/off per CPU
- QCOM's unique ability to run each CPU at the appropriate frequency & voltage increases power efficiency

*Tested on 8660 FLUID*
*Measured at CPU power rail*

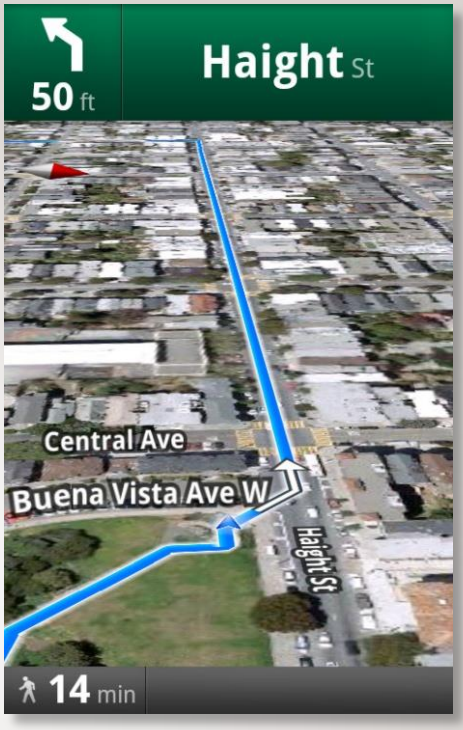
# Adreno
# Graphics


## Tim Leland
## Director, Product Management

# Mobile Apps that Benefit from **Graphics** Acceleration

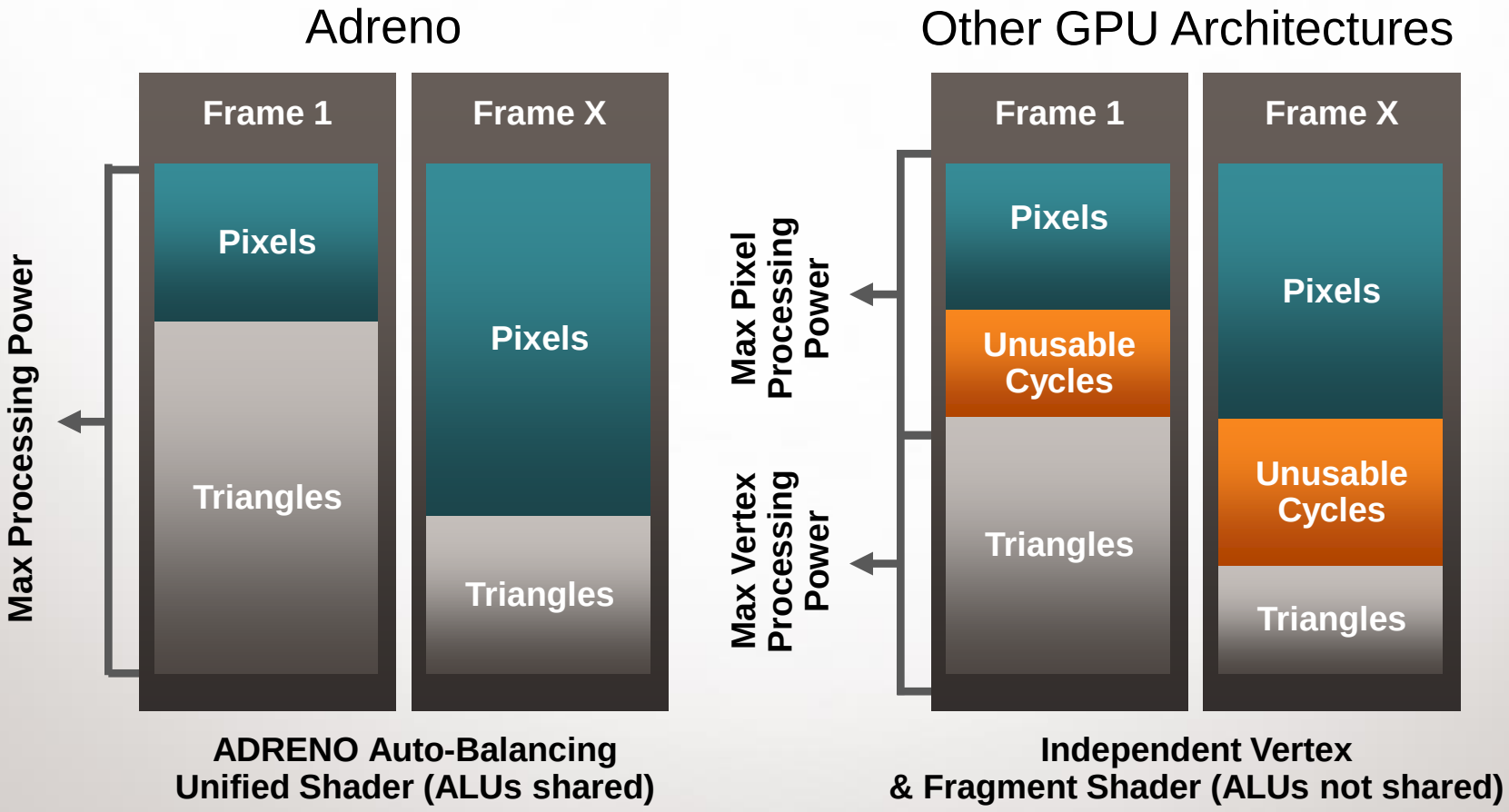
| User Interfaces | Web Browsers | Games | Navigation |
|---|---|---|---|



# Adreno GPU Architecture Advantage

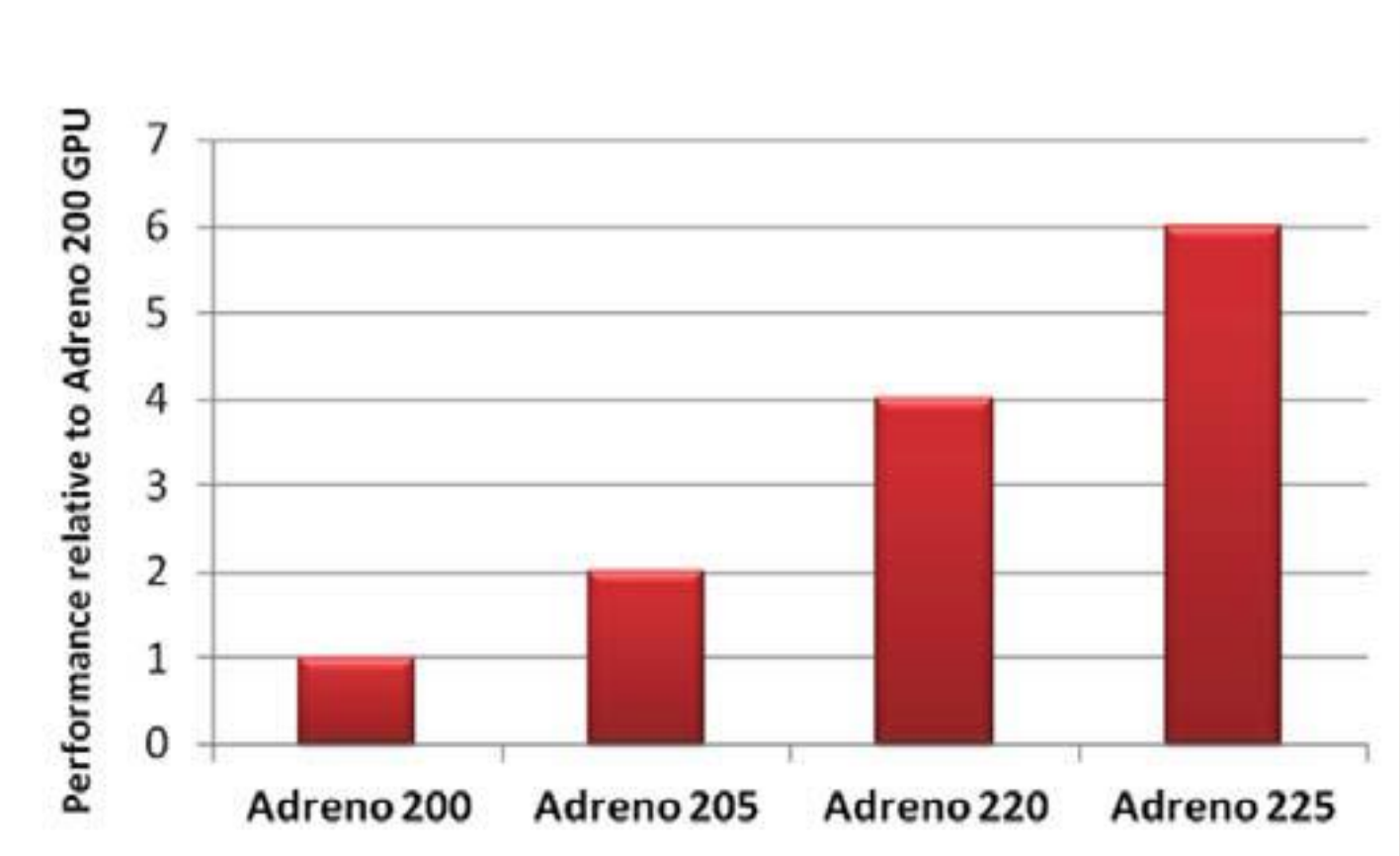
- Similar Shader Architecture as XBOX 360 console
- Adreno GPU shader elements adjust dynamically
- Maximizes processing power and application performance



# Enhancements in the **Adreno 225 GPU**

- 50% faster than Adreno 220
- More features, primarily to support DirectX 9.3 (Shader Model 3):
  - Shaders
    - Increased the sizes of various memories used by shaders to be able to store more instructions, etc.
  - Textures
    - sRGB Texture Support
  - Render Targets
    - Support of Multiple Render Targets (4 simultaneous MRTs)
  - Rasterization & Misc.
    - Support of up to 6 User Clip Planes
    - Improvements to BLTs (greater DRAM efficiency)
    - Instancing Support
    - More efficient interrupts

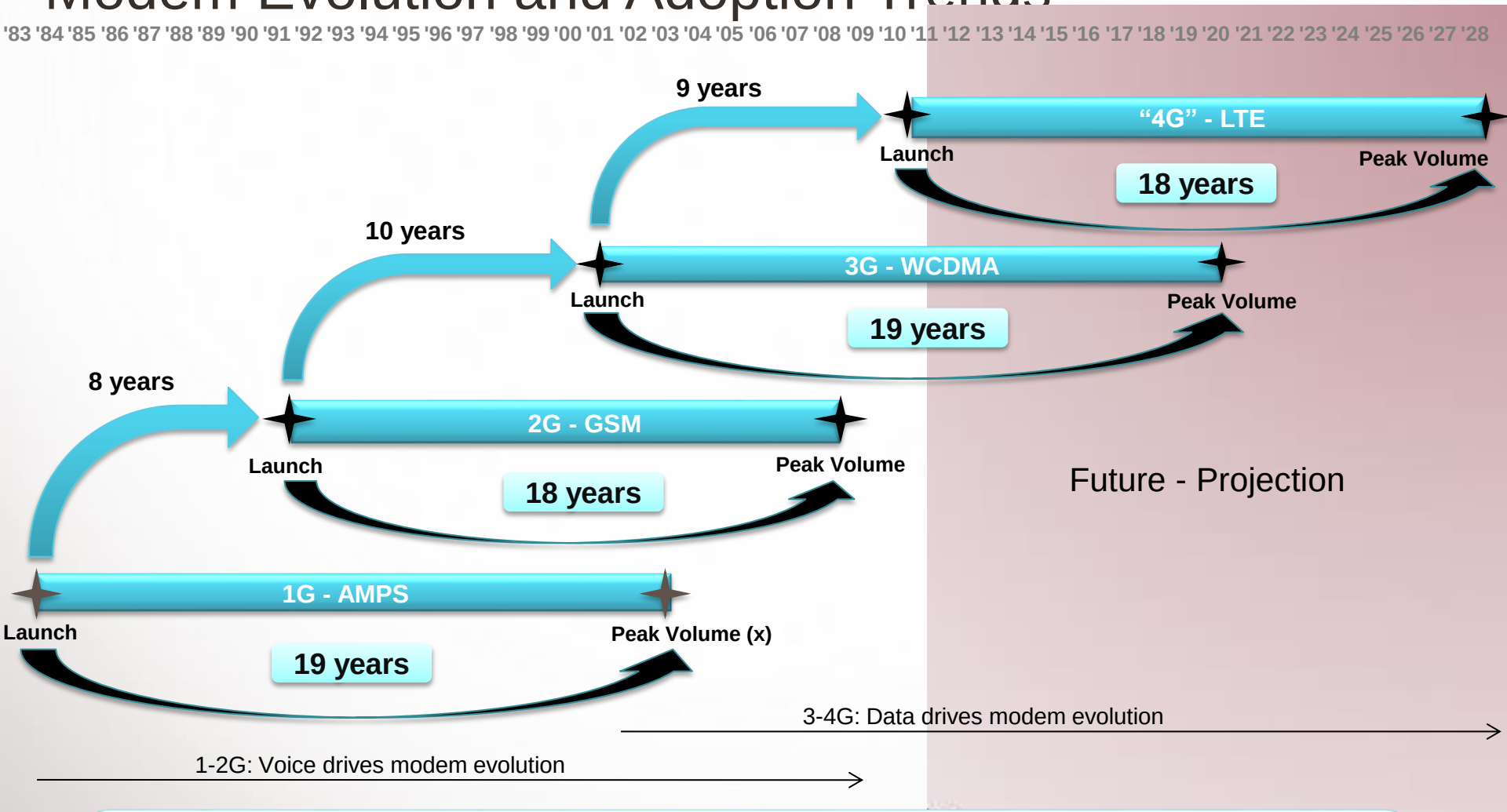
# Adreno Performance Roadmap



# LTE
# World Modem


## Peter Carson
## Sr. Director, Product Management

# Modem Evolution and Adoption Trends

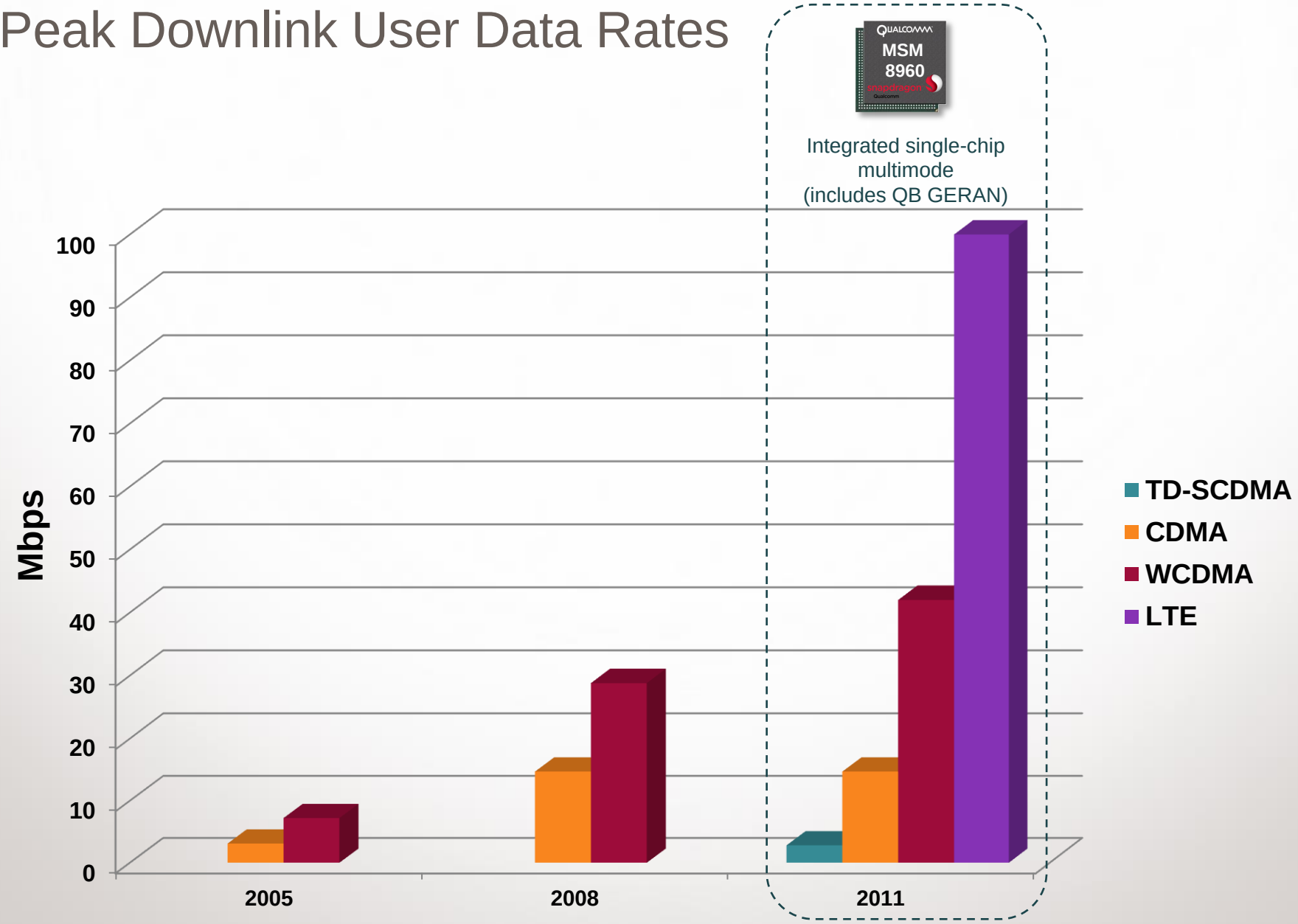



**18-20 years from first launch of new generation to peak device volume**

**Each generation produces significantly higher volume than previous**

# Modem Performance Roadmap

## Peak Downlink User Data Rates



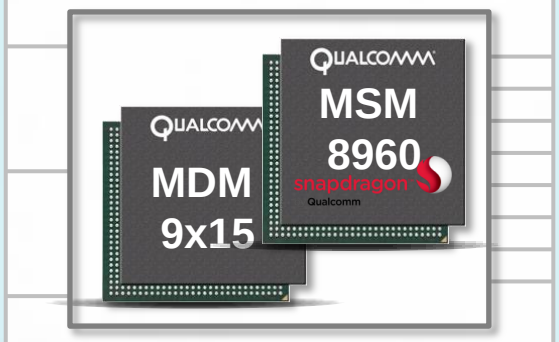
# Next Generation Integrated LTE/3G Multimode

**Multimode Mobility**
LTE FDD/TDD, UMTS, CDMA, TD-SCDMA, GERAN

**Data Continuity**
Reselection, Redirection, PS Handover, IP continuity, QoS

**LTE Voice**
CS Fallback and SVLTE
VoLTE, SR-VCC

**Integrated Connectivity**
Bluetooth, GPS, GNSS, WLAN




LTE FDD (100 Mbps DL / 50 Mbps UL)

LTE TDD (68 Mbps DL / 17 Mbps UL)*

eMBMS

DC-HSPA+ (42 Mbps UL / 11 Mbps DL)

DO Rev. B (14.7 Mbps DL / 5.4 Mbps UL)

1X Advanced

TD-SCDMA

GSM/GPRS/EDGE

Supports over 40 LTE bands for true Worldwide Coverage

*Data rates depend on TDD partitioning.

# Q-ICE™, QLIC, gRICE: Advanced Receivers Increase Capacity, Coverage, and User Experience

## Advanced Receivers

### DEVICE

Receive Diversity | Equalizer | Interference Cancellation | etc.

### BASE STATION

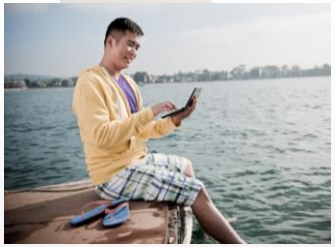
Receive Diversity | Interference Cancellation | etc.

### Higher Capacity

Data throughput or voice capacity

### Enhanced User Experience

Higher user data rates, improved voice quality



### Extended Coverage

# Hexagon DSP

## Rick Maule
## Sr. Director, Product Management

# Hexagon™ Digital Signal Processors

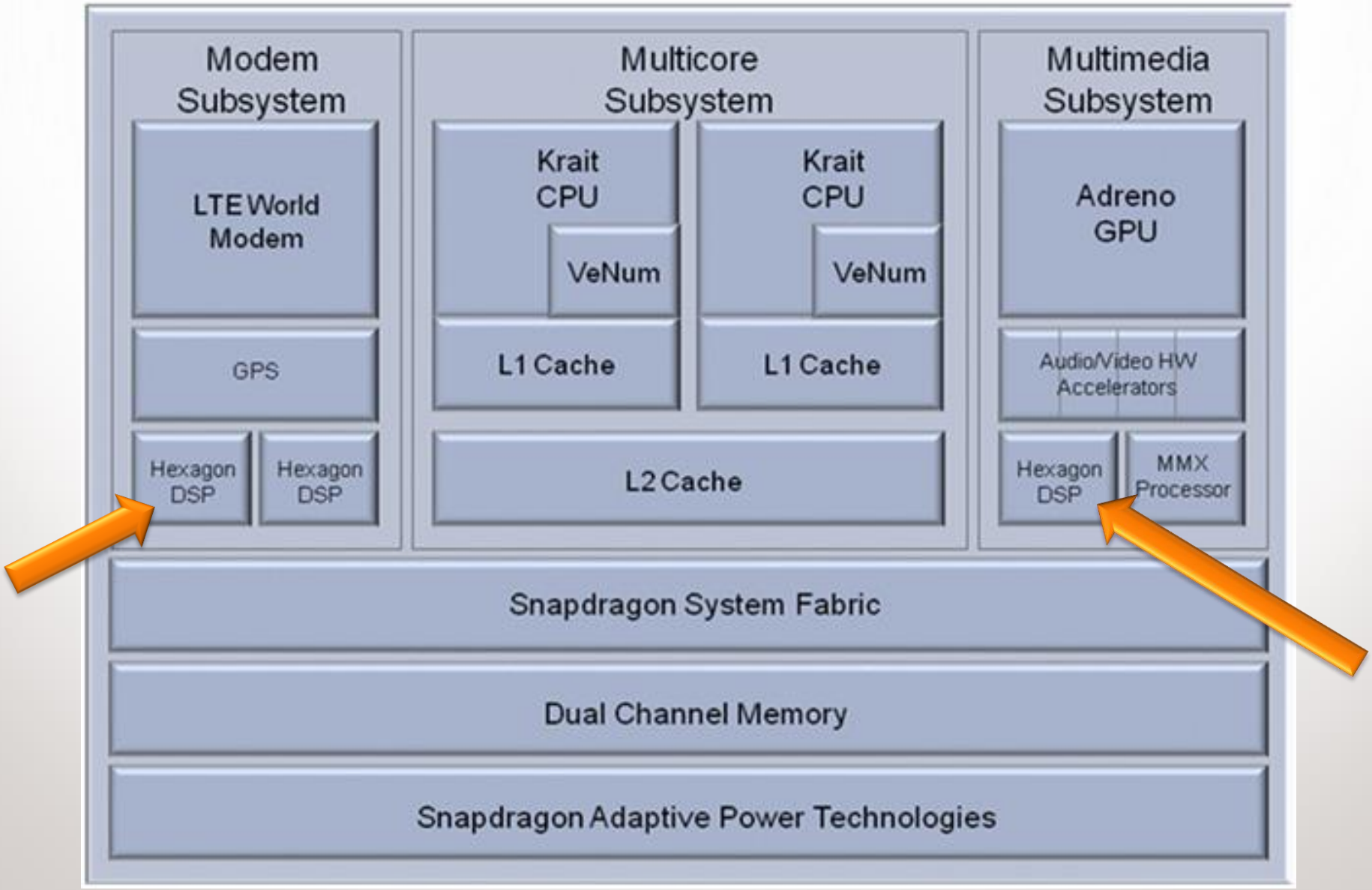
***Arnd Bergmann, Linux Maintainer, New Architecture Ports***
*"The (Qualcomm Hexagon) is quite capable, with support for symmetric multiprocessing, a memory management unit and even a hypervisor.*

# Superior DSP Performance

## Robust Capability + Superior Power Efficiency

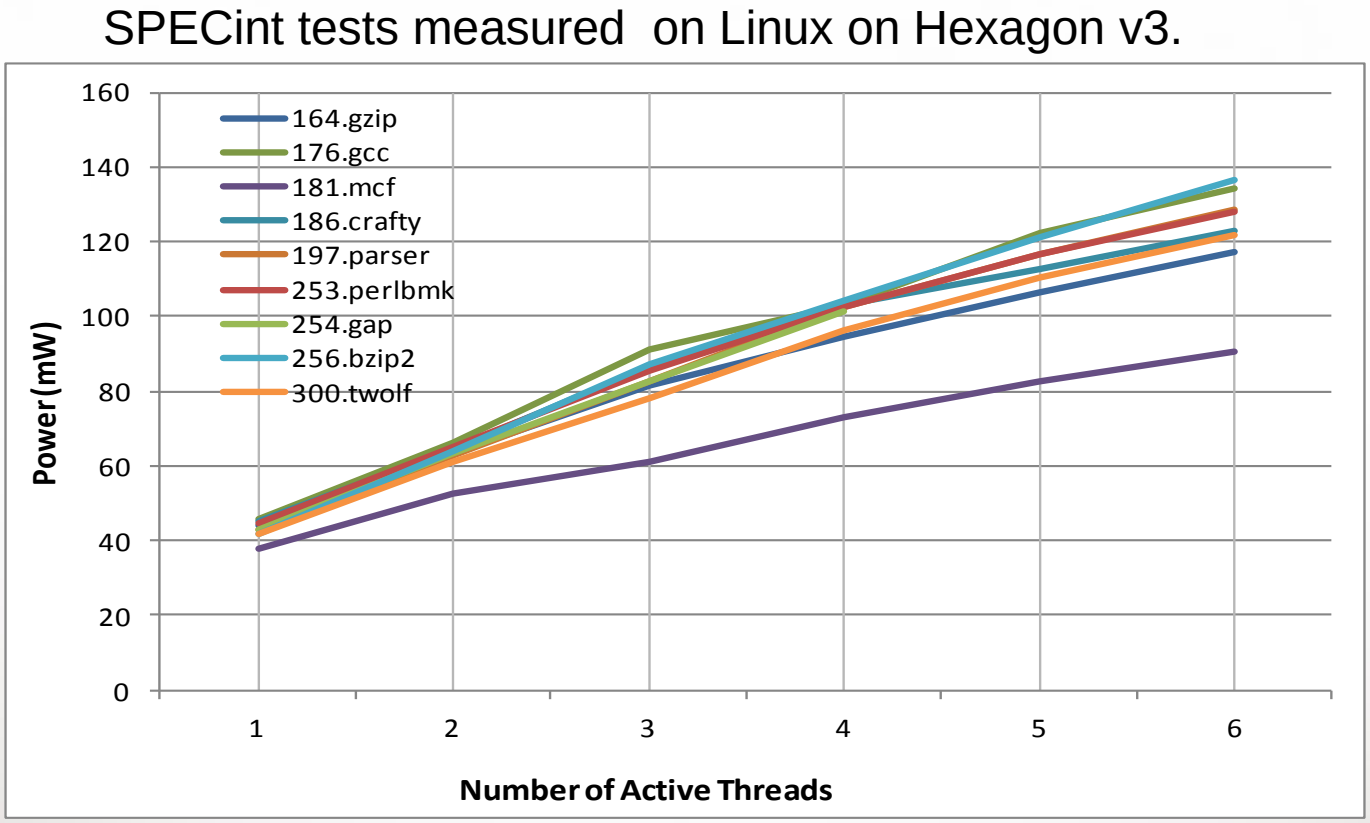
- Optimal mix of DSP and CPU functionality
  - Adding control flow and scalar math to classic DSP functionality
  - Compiler-friendly ISA for robust tools (efficient C/C++ code)
- Efficient offloading of entire tasks from CPU and GPU
- Lower power consumption, higher quality of service for tasks such as:
  - Audio playback
  - Audio effects
  - Noise cancellation
  - HD voice
  - Video functions
  - 2D to 3D auto-convert
  - Augmented reality processing

# Snapdragon S4: MSM8960 Block Diagram



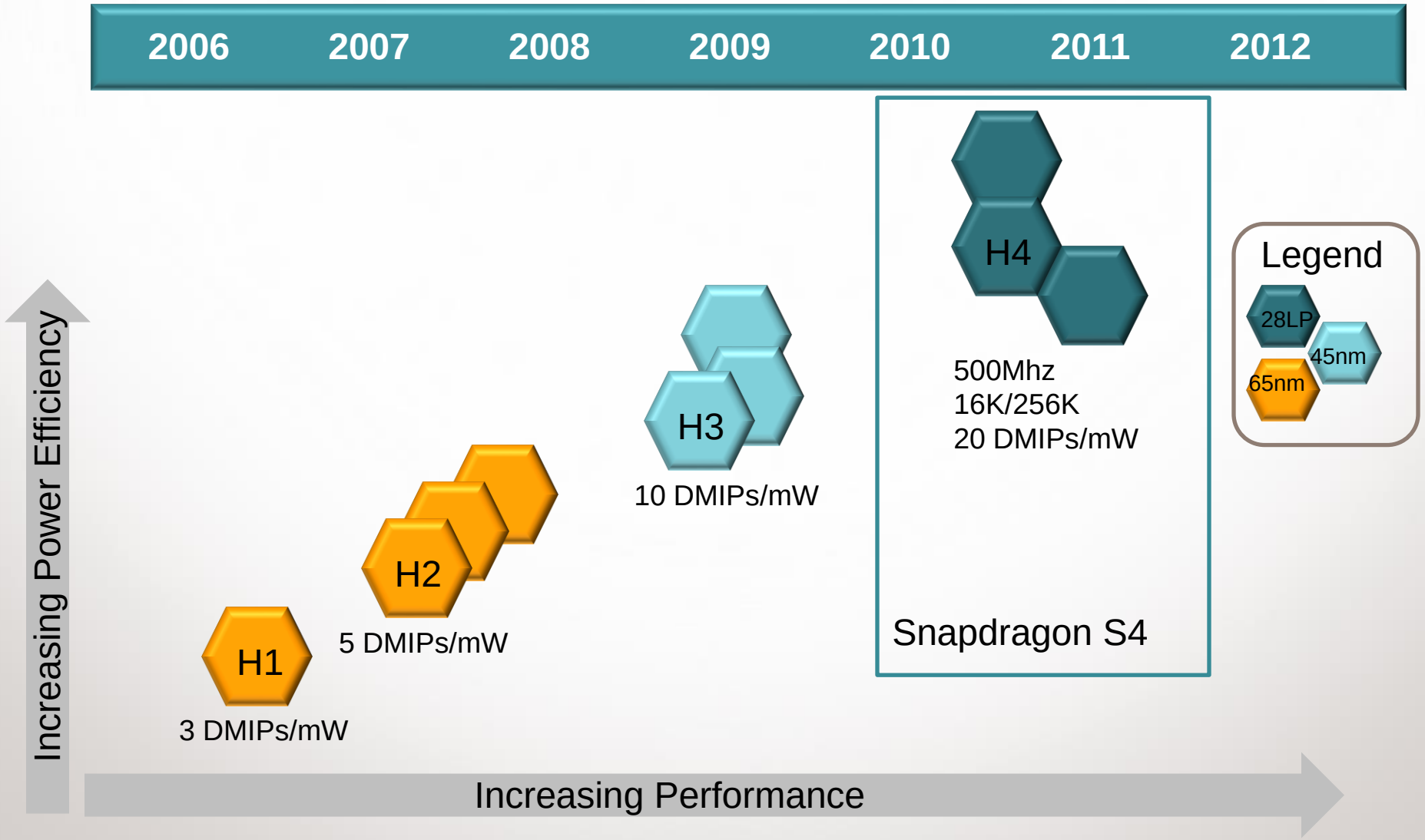
# Hexagon v3 (measured): Performance & Power

(One through six concurrent threads active)




- To obtain multiprocessor data, each test is run as a single thread
- Followed by another test of two copies run concurrently
- Repeated again for each successive number of threads until a final test with six copies run concurrently

# Hexagon DSP Evolution & Roadmap*



Questions and
**Answers**

**Mark Shedd**
**Staff Manager, Marketing**

# Thank You



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