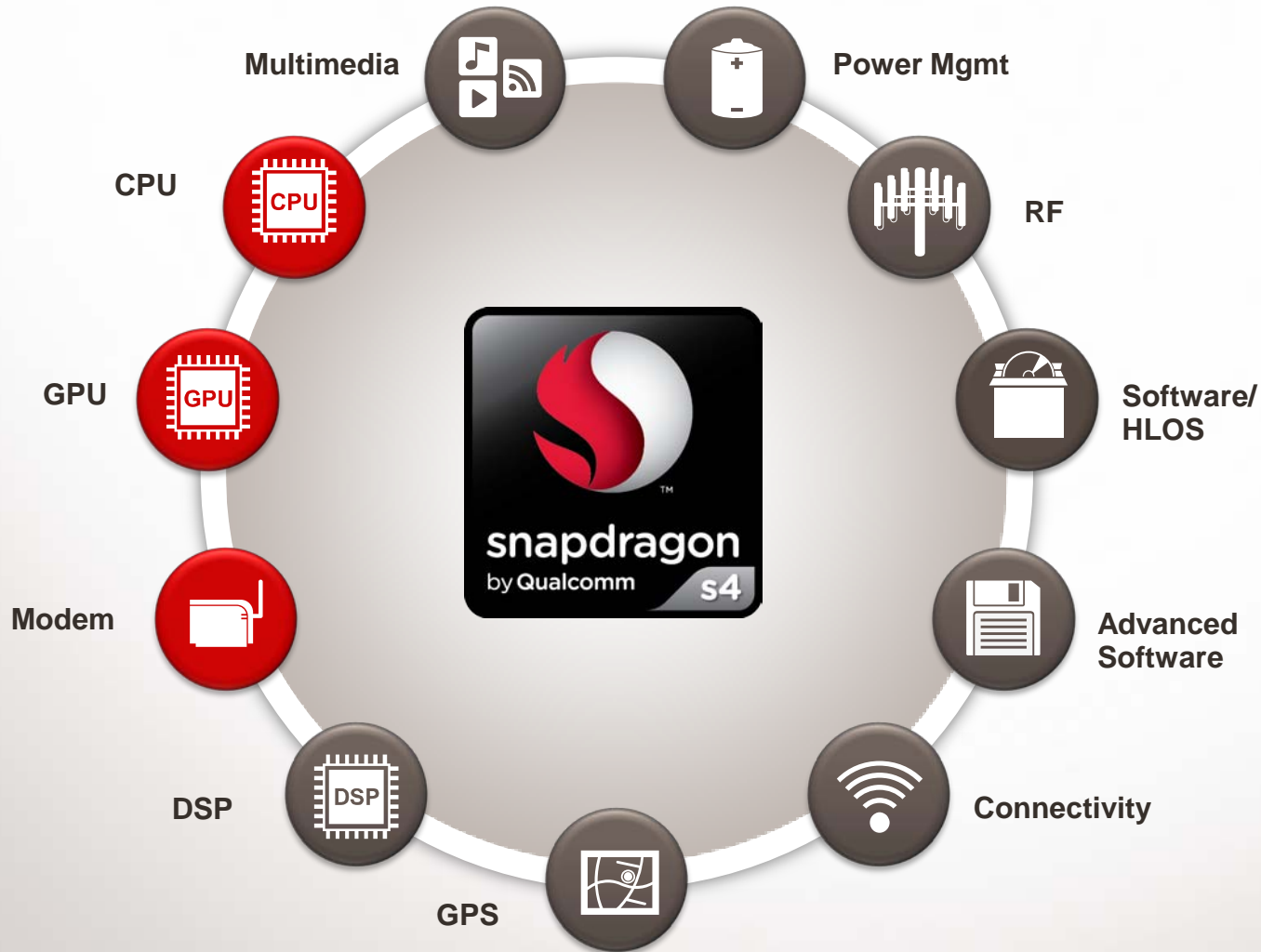# Snapdragon S4
System on Chip

Solutions for a New Mobile Age

Reiner Klement,
VP Product Marketing
October, 2011

Snapdragon Delivers a Complete System Solution

Introducing Snapdragon S4

New Generation with wider range of products

Snapdragon System 1 Processors	Snapdragon System 2 Processors	Snapdragon System 3 Processors	Snapdragon System 4 Processors
For Mass Market Smart Phones	**For High Performance Smart Phones & Tablets**	**For Multi-tasking & Advanced Gaming**	**Next Generation Devices**
S1 Class includes:	S2 Class includes:	S3 Class includes:	S4 Class includes:
▪ 65 nm ▪ Up to 1GHz CPU ▪ Up to Adreno 200 GPU ▪ Up to 3G HSPA	▪ 45 nm ▪ Up to 1.4GHz CPU ▪ Adreno 205 GPU ▪ 3G HSPA+ ▪ 720p/Dolby 5.1 ▪ Stereoscopic 3D	▪ 45 nm ▪ Up to 1.5GHz Dual-CPUs ▪ Adreno 220 GPU ▪ 3G HSPA+ ▪ 1080p HD/Dolby 5.1 ▪ Stereoscopic 3D	▪ **28nm** ▪ **Next gen CPU up to 2.0GHz** ▪ **Dual/ Quad CPU** ▪ **Adreno next gen GPU** ▪ **Fully Integrated Connectivity Solution** ▪ **First Integrated LTE World multimode Modem**

Snapdragon S4 leading transition to 28nm

S3
45nm

S4
28nm
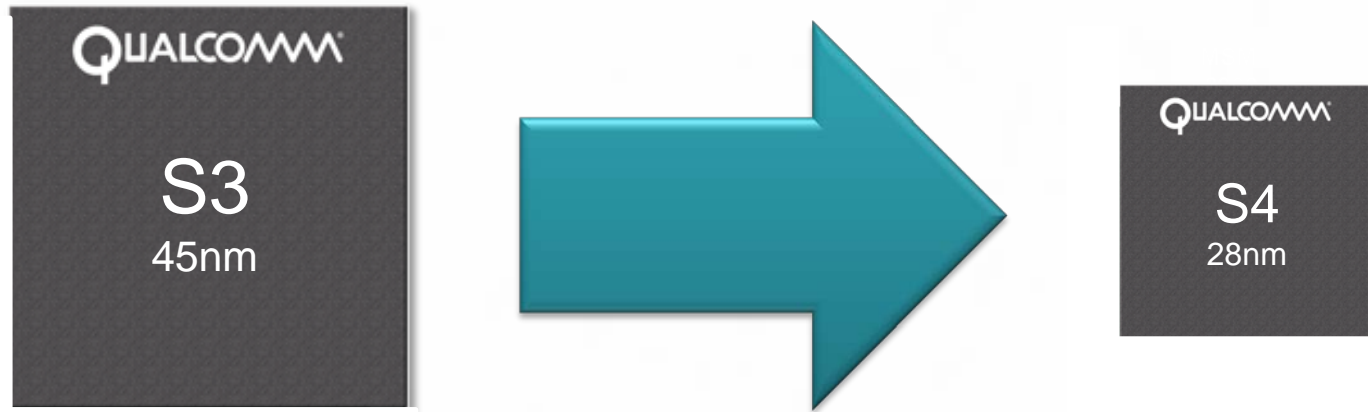
Qualcomm process technology leadership enables:

- Higher performance
- Lower power
- More Functionality
- More Efficient Development Process
- First fully integrated LTE world/multimode modem
- Plus latest high performance CPU/GPU/DSP/video…all on a single chip

Krait
CPU

Krait CPU

Key Benefits

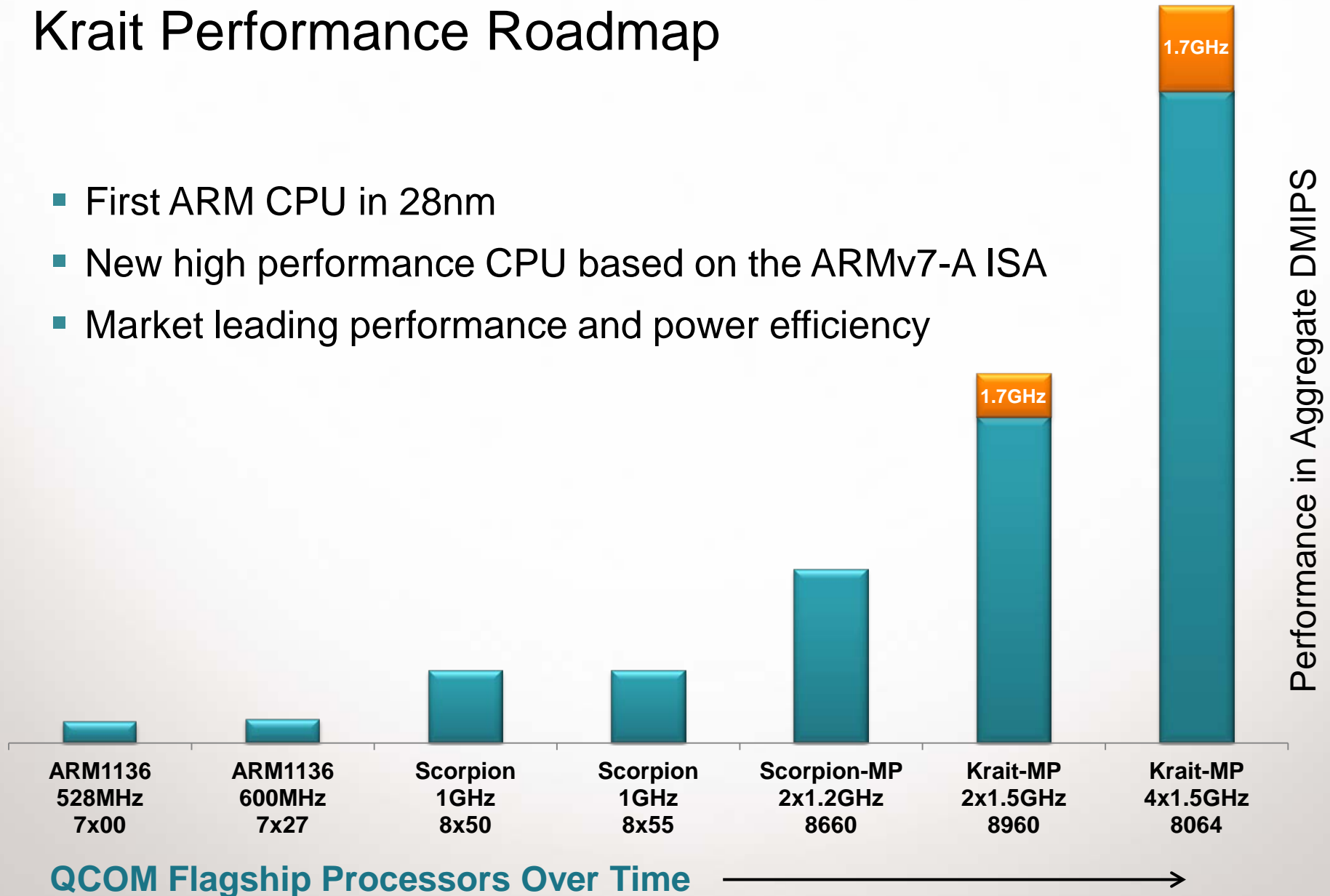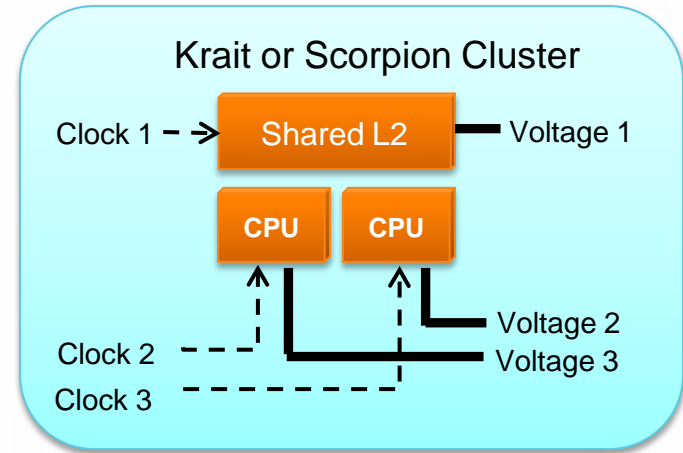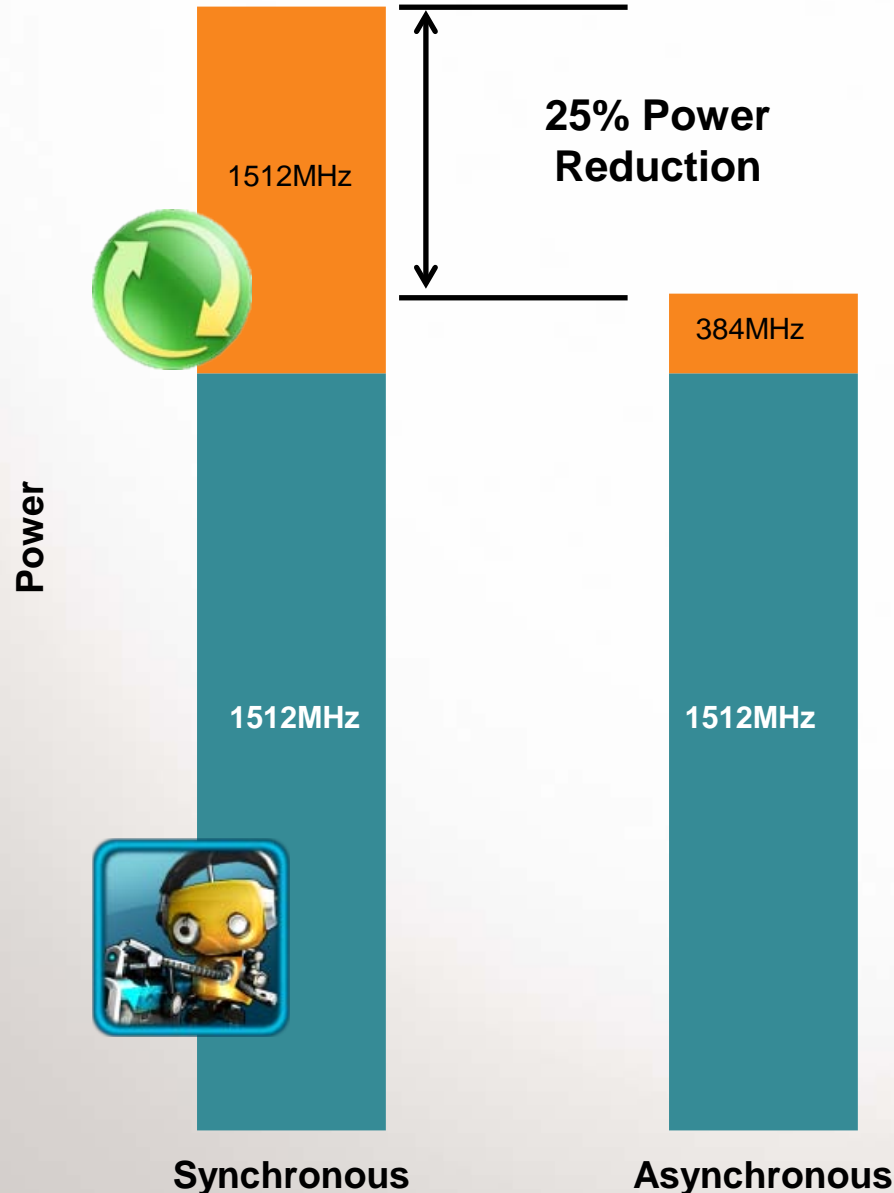| Best in Class Processor	• MSM 8960 features Qualcomm second generation "Krait" CPU • Krait provides energy efficient and higher performance design • Uses ARM instruction set, software and eco-system
First to Market	• Provides performance headroom for new generation devices • First to market with this class of performance and power efficiency
Best in Energy Efficiency	• Krait features innovative power saving techniques like aSMP and custom circuit designs • Independent & efficient voltage and frequency control & scaling
Next Generation Process Technology	• Krait CPU is designed in the latest 28nm process technology • New process provides for better performance and power

Krait Performance Roadmap

- First ARM CPU in 28nm
- New high performance CPU based on the ARMv7-A ISA
- Market leading performance and power efficiency

Performance in Aggregate DMIPS

ARM1136 528MHz 7x00	ARM1136 600MHz 7x27	Scorpion 1GHz 8x50	Scorpion 1GHz 8x55	Scorpion-MP 2x1.2GHz 8660	Krait-MP 2x1.5GHz 8960	Krait-MP 4x1.5GHz 8064

1.7GHz

1.7GHz

QCOM Flagship Processors Over Time →

Asynchronous SMP: Demonstrated Power Savings

Power

25% Power Reduction

1512MHz

1512MHz

Synchronous

384MHz

1512MHz

Asynchronous

Krait or Scorpion Cluster

Clock 1 → Shared L2 — Voltage 1

CPU   CPU

Clock 2

Clock 3

Voltage 2
Voltage 3

- 25-40% power reduction
  - Total reduction dependent on workload
- Other SMP solutions are on/off per CPU
- aSMP allows each CPU to run at the appropriate frequency & voltage

■ CPU 1
File Transfer

■ CPU 0
Electopia Game

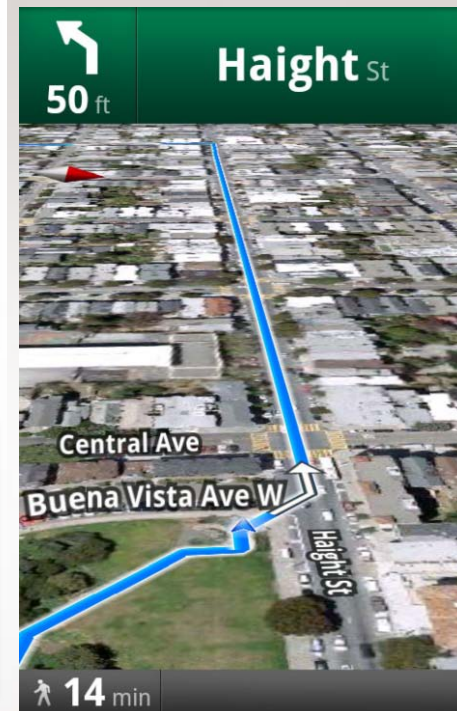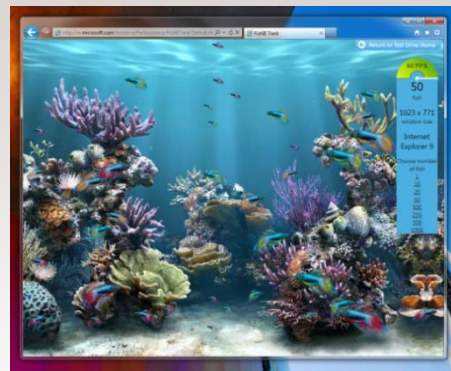*Tested on 8660 FLUID*
Measured at CPU power rail

Adreno
GPU

Mobile Apps that Benefit from **Graphics** Acceleration

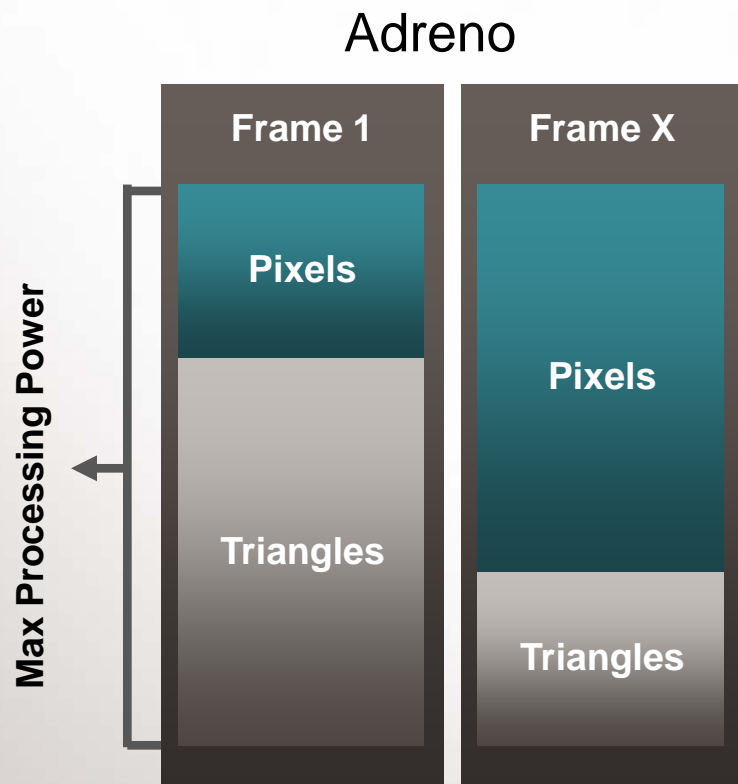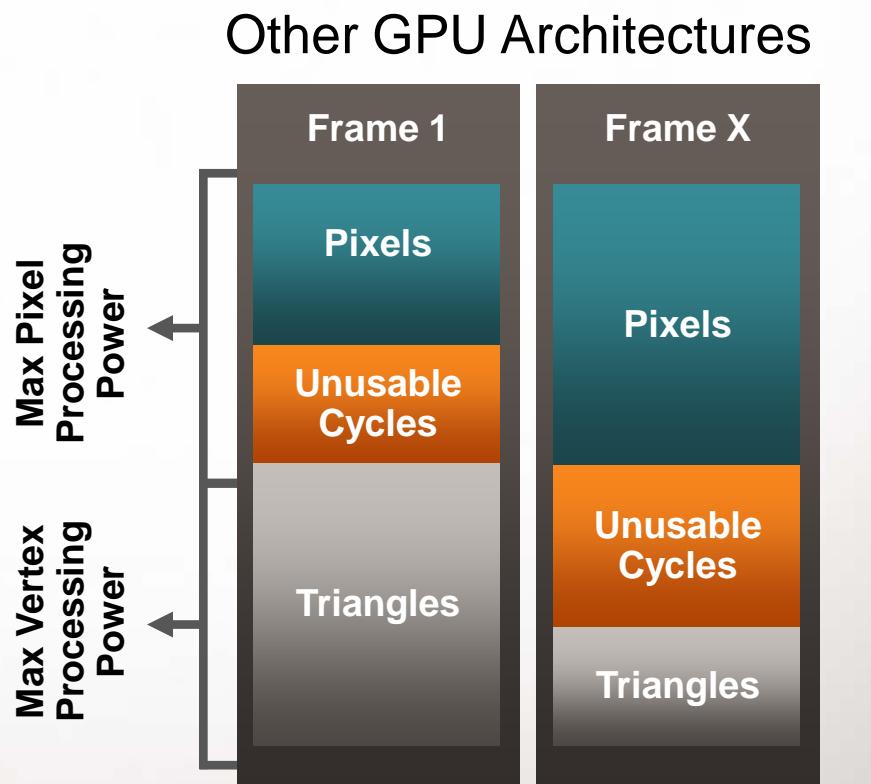| User Interfaces	Web Browsers	Games	Navigation

Next Generation **Adreno GPU** Benefits

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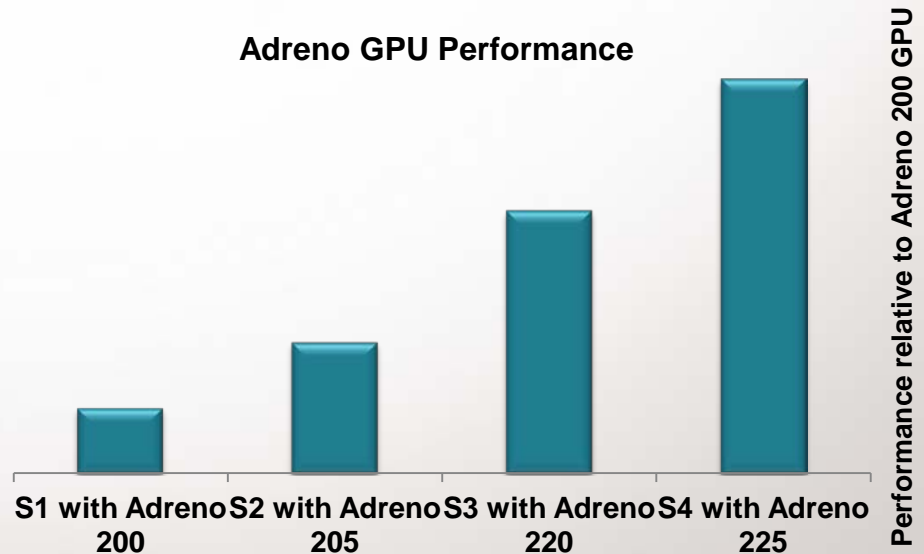- Maximizes processing power and application performance

Adreno

Frame 1	Frame X
Pixels	Pixels
Triangles	Triangles

Max Processing Power

**ADRENO Auto-Balancing
Unified Shader (ALUs shared)**

Other GPU Architectures

Frame 1	Frame X
Pixels	Pixels
Unusable Cycles	Unusable Cycles
Triangles	Triangles

Max Pixel Processing Power

Max Vertex Processing Power

**Independent Vertex
& Fragment Shader (ALUs not shared)**

Enhancements in the **Adreno 225 GPU**

- **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.
  - **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
  - **Textures**
    - sRGB Texture Support

- **50% faster than Adreno 220**

Adreno GPU Performance

Performance relative to Adreno 200 GPU

| S1 with Adreno 200 | S2 with Adreno 205 | S3 with Adreno 220 | S4 with Adreno 225 |

LTE World
Modem

S4 Delivers Fully Integrated 3G/4G LTE Multimode

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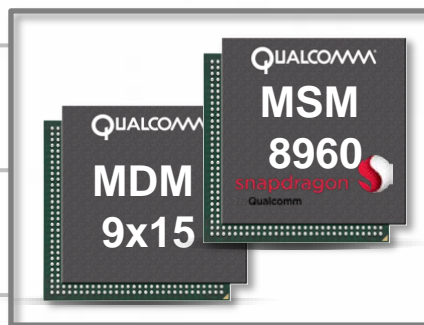LTE FDD/TDD, UMTS, CDMA, TD-SCDMA, GERAN

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

LTE Voice
CS Fallback and SVLTE VoLTE, SR-VCC

Integrated Connectivity
Bluetooth, GPS, GNSS, WLAN

QUALCOMM
MSM 8960 snapdragon Qualcomm

QUALCOMM
MDM 9x15

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.

Advanced
Software
Technology

Snapdragon Advanced Software Technology

Going beyond the BSP

Video and Display

- 1080p Stereoscopic 3D Video playback
- 2D to 3D Video conversion
- Browser with HTML-5 and 1080p Flash video
- Wireless Display

1080p HD Video

Wireless Display

Camera

- Multi-shot / Zero Shutter Lag with Scalado Rewind
- Stereo 3D Video Capture & Playback
- Face detection/recognition, gaze/blink, smile detection & face contour

Stereoscopic 3D Capture

Multi-Shot Zero Shutter Lag

Audio

- Fluence PRO – Dual / Quad Mic Support
- SRS playback
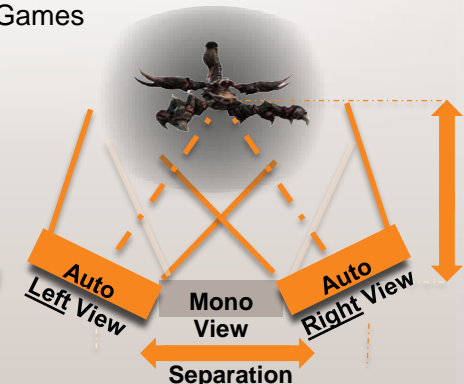- Ultrasound EPOS Pen
- Active Noise Cancellation

SRS⊙

Ultrasound EPOS Pen

Fluence Multi-Mic

Gaming

- HD (720p) Stereoscopic 3D Games
- 2D to 3D Game conversion

Stereoscopic 3D Gaming

2D to 3D Gaming

Auto Left View · Mono View · Auto Right View · Separation

Questions and
Answers

Snapdragon S4 Processors: White Paper
http://www.qualcomm.com/documents/snapdragon-s4-architecture

Document Center

Snapdragon S4 Processors: System on Chip Solutions for a New Mobile Age

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Thank You