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
- Stereoscopic 3D
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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
MSM8960 CPU Key features and advantages

Best in Class Processor
- MSM 8960 features Qualcomm second generation “Krait” CPU
- Krait outperforms current ARM CPUs on a core-to-core basis.
- 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 Voltage and Frequency control
- Efficient frequency and voltage scaling

Next generation Process Technology
- Krait CPU is designed in the latest 28nm process technology
- 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

<table>
<thead>
<tr>
<th>User Interfaces</th>
<th>Web Browsers</th>
<th>Games</th>
<th>Navigation</th>
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Adreno GPU Architecture Advantage

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

ADRENO Auto-Balancing Unified Shader (ALUs shared)

Independent Vertex & Fragment Shader (ALUs not shared)
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
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

Integrated single-chip multimode (includes QB GERAN)

Mbps

2005 2008 2011

TD-SCDMA
CDMA
WCDMA
LTE

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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™ 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
Hexagon v3 (measured): Performance & Power
(One through six concurrent threads active)

SPECint tests measured on Linux on Hexagon v3.

- 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*

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<th>Year</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
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<th>2012</th>
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<td>3 DMIPs/mW</td>
<td>5 DMIPs/mW</td>
<td>10 DMIPs/mW</td>
<td>500Mhz</td>
<td>16K/256K</td>
<td>20 DMIPs/mW</td>
<td>Snapdragon S4</td>
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**Legend**
- 28LP
- 45nm
- 65nm

Increasing Power Efficiency

Increasing Performance
Questions and Answers

Mark Shedd
Staff Manager, Marketing
Thank You

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