



ZOOM OUT BREW 2008 CONFERENCE

Introduction to Adreno Tools

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Qualcomm® HW Accelerated 3D: Adreno

- Moving content-quality forward requires hardware acceleration
 - Up to 1024x768 screen-resolution by mid-2009
 - Blend effects and composition of 3D with other media types
 - Multiple texture support with combiners
- **Qualcomm is enabling Hardware 3D on all its chipset tiers**

Adreno Product Family

- **OpenGL-ES 1.0**
 - Adreno 100 and Adreno 110
 - Commercial for 3 years, high volumes
 - Entry-level hardware acceleration
- **OpenGL-ES 1.0+ / OpenGL-ES 1.1**
 - Adreno 120 and Adreno 130
 - Commercial now in Asia, entering US by July
 - High performance fixed function pipeline with texture combiners and matrix palette extensions
- **OpenGL-ES 2.0**
 - Adreno 200, Adreno 210 and Adreno 220
 - Commercial end of this year
 - High performance, flexible shader pipeline



Adreno Graphics Platform



So many devices



Challenge for developers

Current HW accelerated 3D Content

- Main SKU is Software
- HW is treated as an incremental feature: e.g. bilinear filtering, marginally higher-res textures
- Engines that do support HW do so with orthogonal render paths

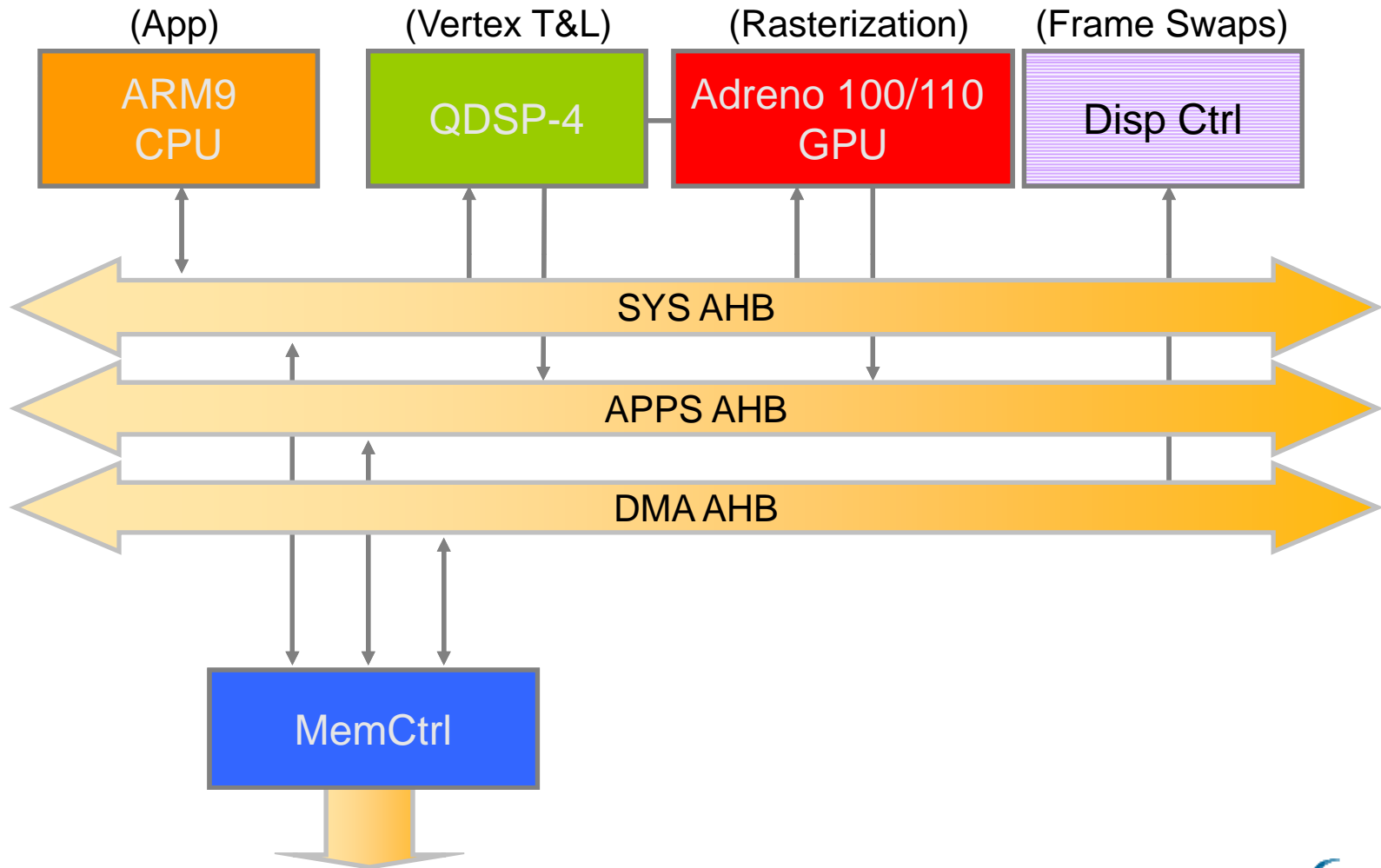
Market is shifting, will you be able to make the transition from incremental hardware support, to full support?

Problems

- It's an embedded device, you get the best performance from coding to the hardware
- **But:** HW manufacturers don't make it easy

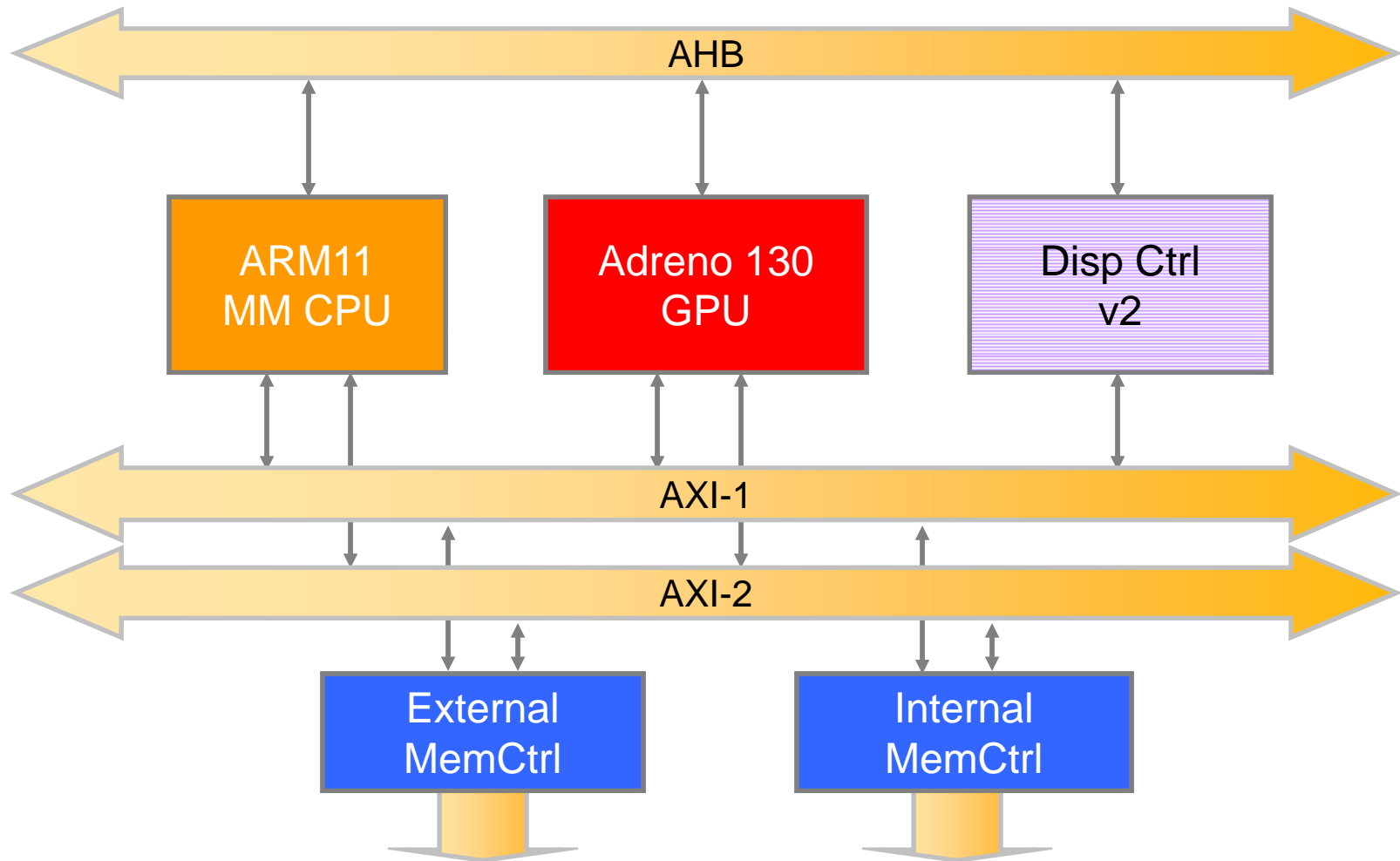
Architecture of one platform...

Adreno 100, 110



Another platform...

Adreno 130

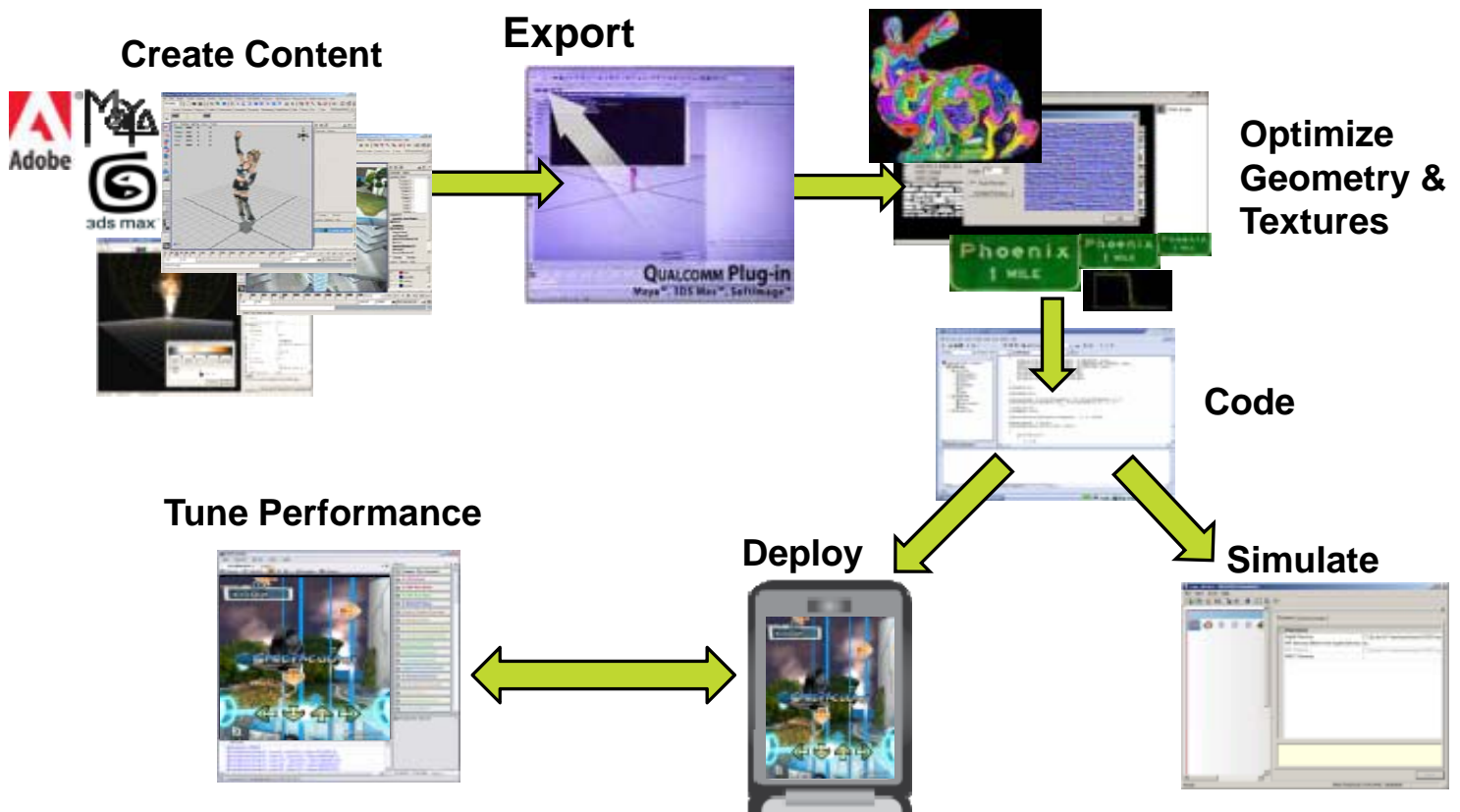


Problem: Doing R&D for each platform is way too expensive

Qualcomm's Adreno Tools

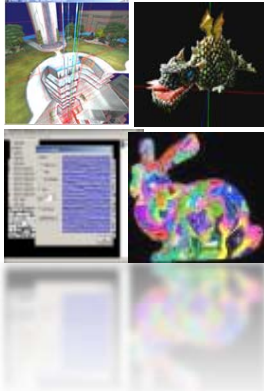
Adreno tools

- Lowering cost of tuning content for HW
- All the tools necessary to create cutting-edge 3D content for Adreno platforms



Adreno Tool Packages

- Developed alongside the hardware: brought up alongside drivers, and system



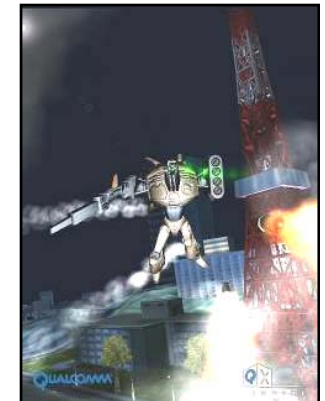
QX Engine™ SDK

- Maya, 3DS Max Exporters
- Particle System Editor
- QStrip Triangle Stripper
- QXTextureBuilder texture optimizer
- Full rendering and animation engine
- **Full Source Code**



Adreno Profiler

- On-Device profiling
- Directed analysis
- Hardware metric access
- API Traces
- Powerful debugging features





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Performance optimization using Adreno Tools

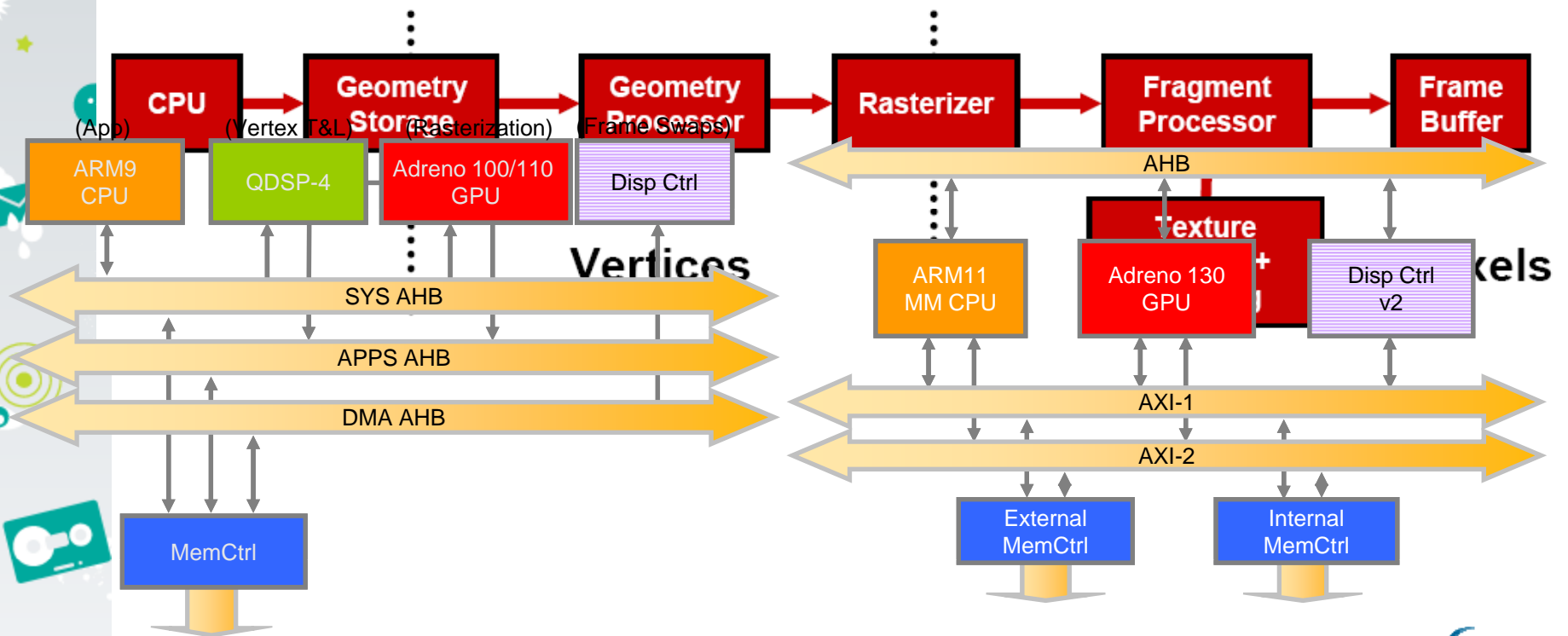
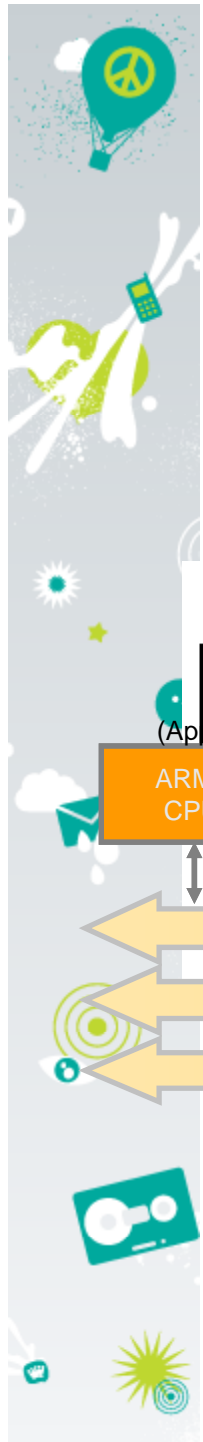
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First Prototype Woes

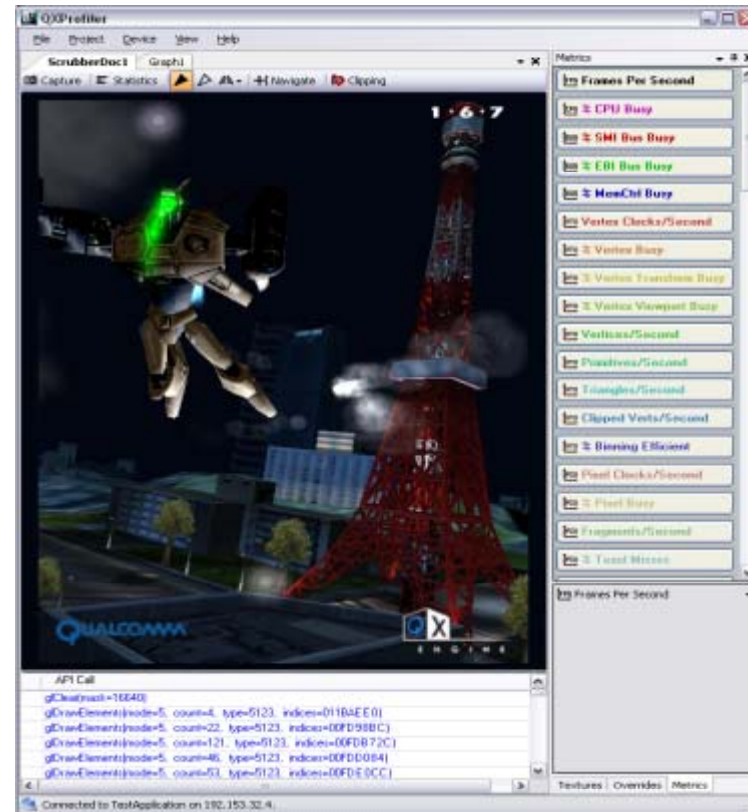


‘After porting, I’m getting 5 FPS?!’

Graphics Pipeline

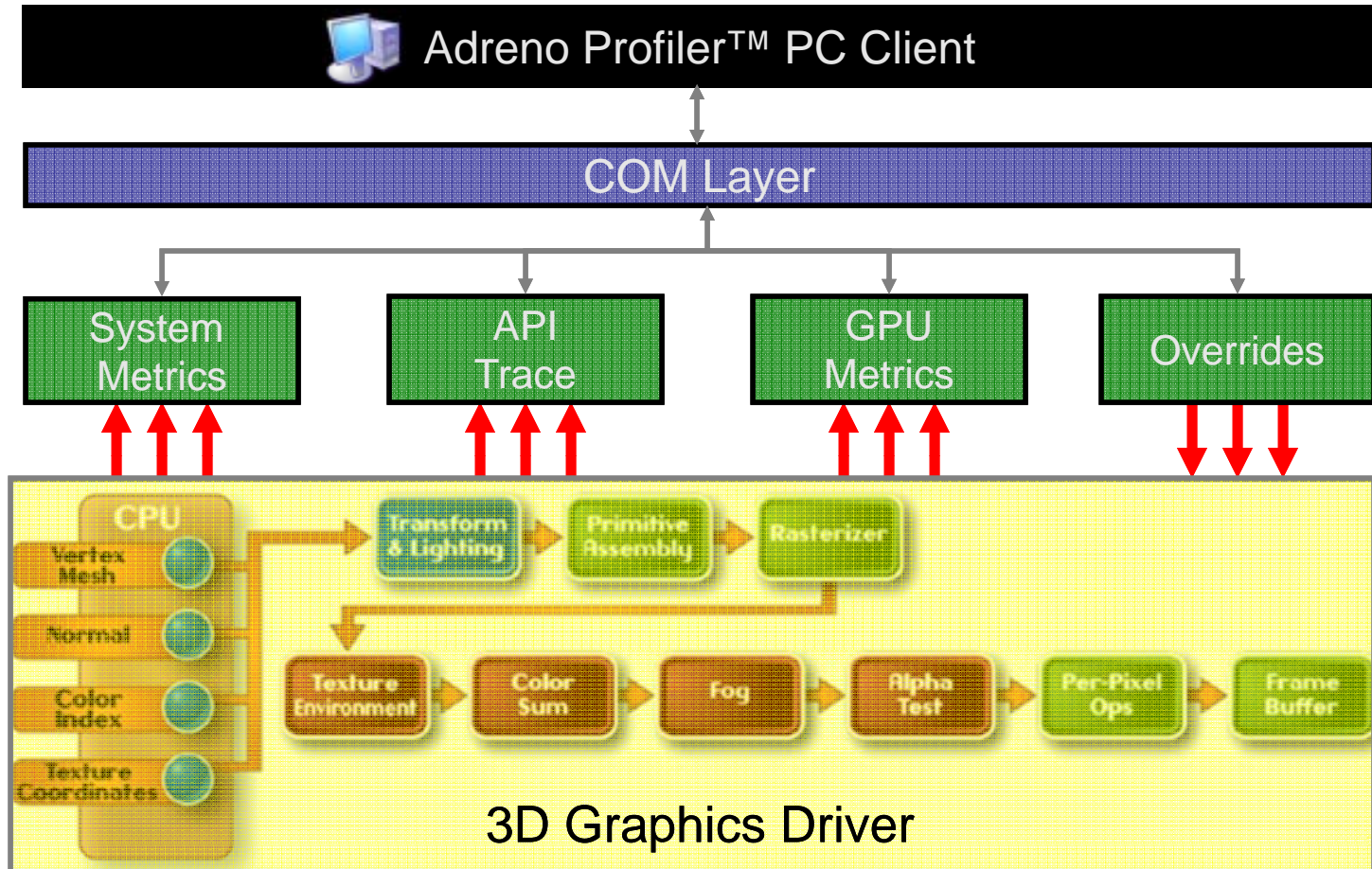


Introducing Adreno Profiler



- **Quickly identify and analyze bottlenecks on multiple platforms**

Driver Instrumentation



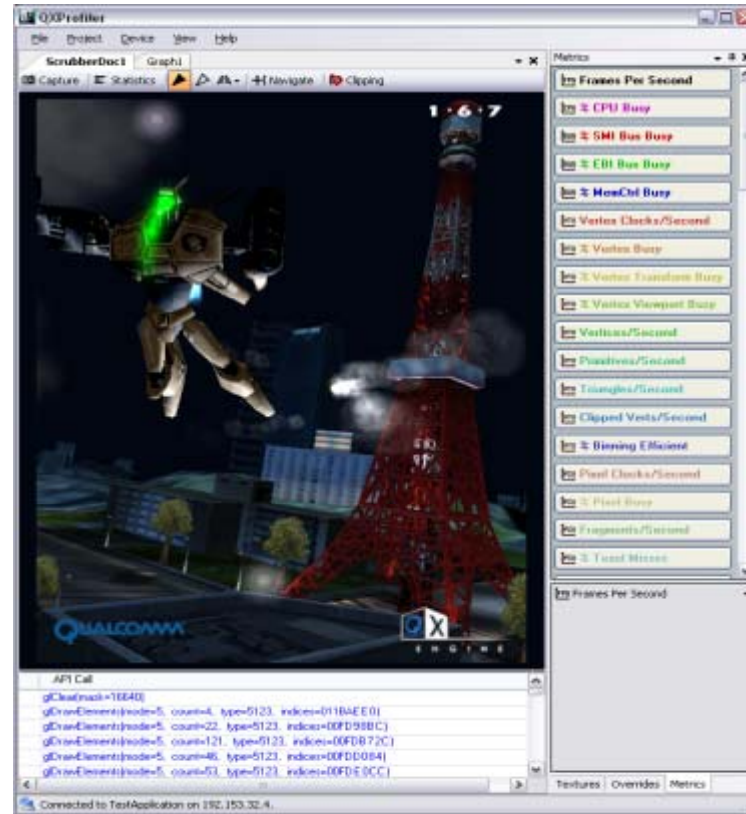
- Graphics driver is extensively instrumented
- No application changes required
- Available on commercial devices

Case Study: Neocore Optimization

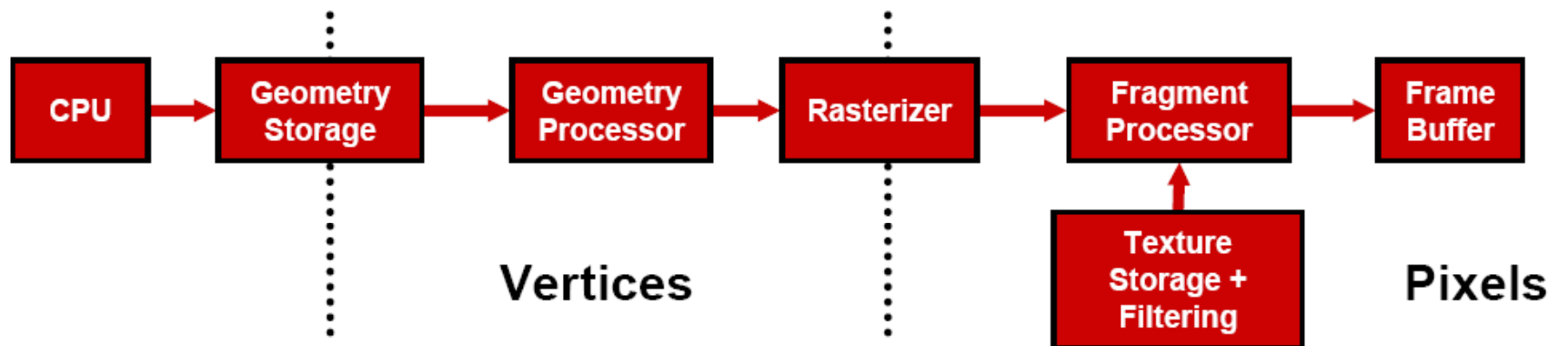
- **Platform: Q3Dimension R4.0 (MSM7201)**
- **Initial performance: 5-10fps**
- **After optimization: 30fps**



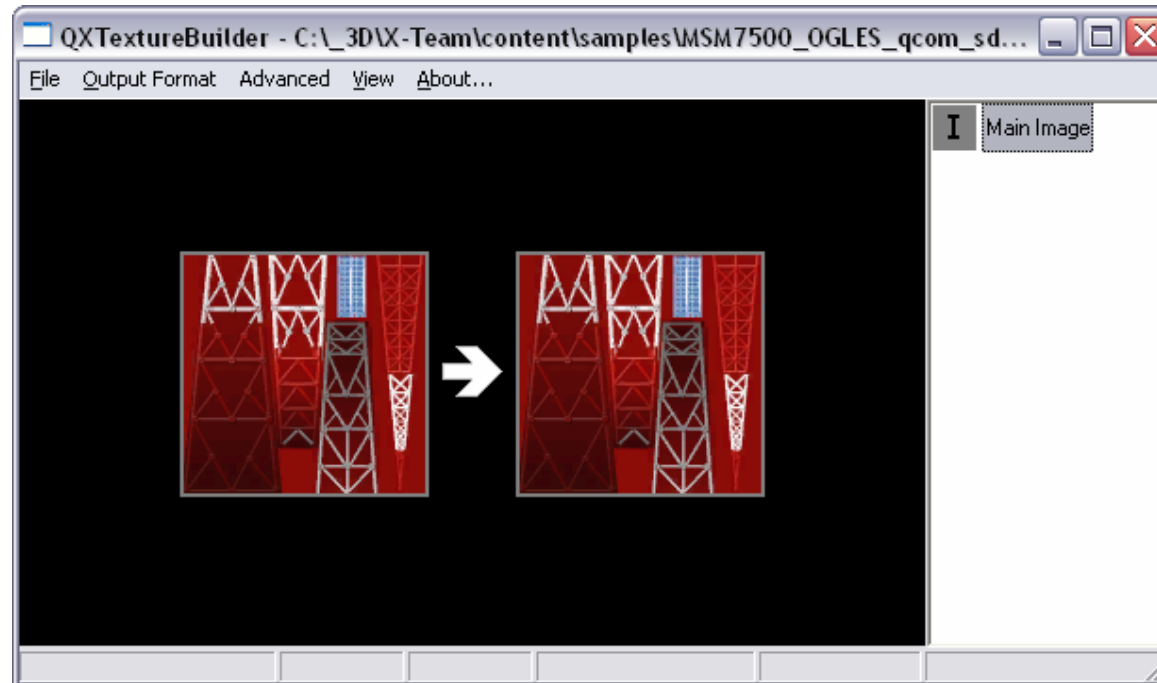
Demo



Graphics Pipeline



QXTextureBuilder Tool



- **Easily converted all textures to mipmapped + ATITC**
 - **Memory footprint reduced by 75%**
- **Huge GPU caching benefit**

QStrip Tool



- **Converted all meshes from discrete triangles to triangle strips**
- **Also enabled frustum culling in QX Engine**

```
/* compute strip */  
Qstrip* pStripify = QstripCreate();  
ushort* dStrip = QstripComputeStrips(pStripify, indexnum, indexdata);  
ulong nStripLen = QstripGetStripLength(pStripify);
```

Adreno Profiler



- HW and system-level real-time performance metrics
- Powerful frame analysis and debugging features
- Supports current and future Qualcomm Adreno platforms, including upcoming OpenGL ES v2-based cores
- **Available Today on commercial devices**



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Thank You!

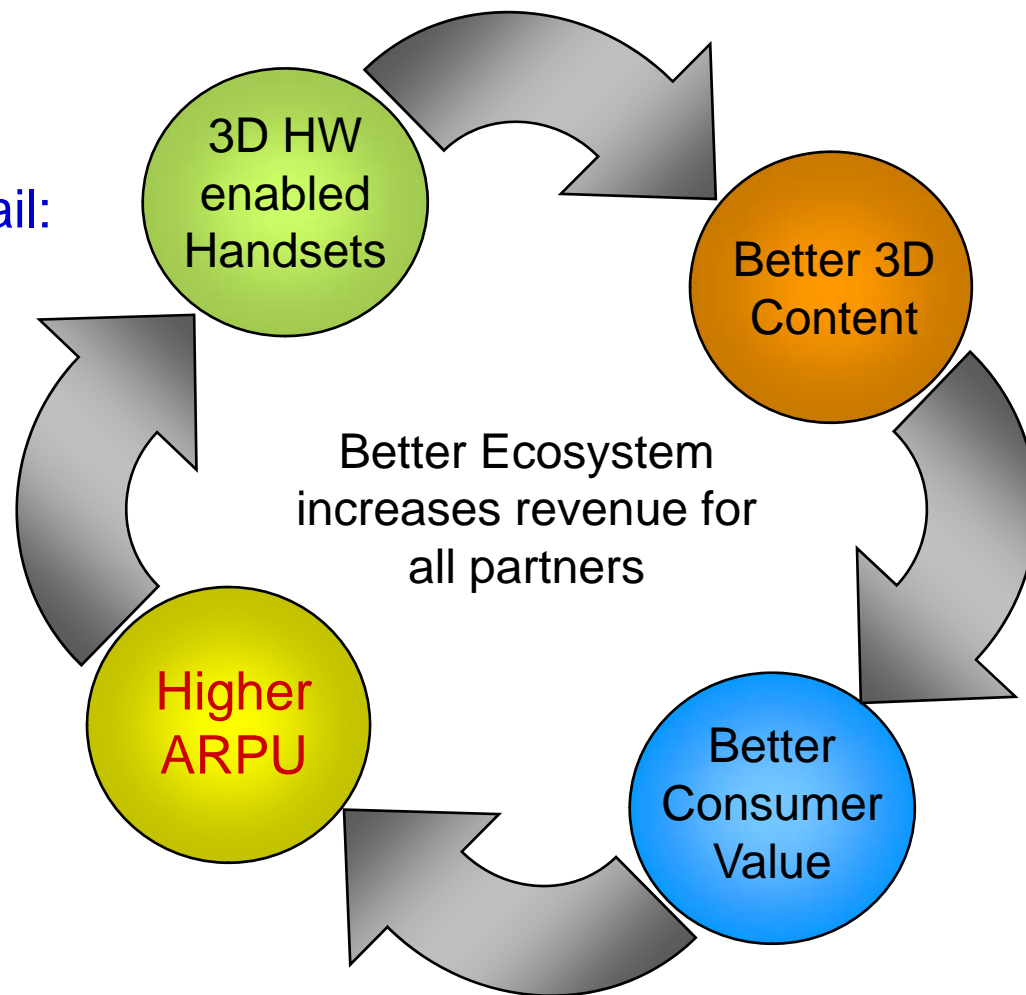


SpeeqG™

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gaming phone alliance

To Join Qualcomm's Adreno
Developer Program, simply email:

Tim Leland
tleland@qualcomm.com

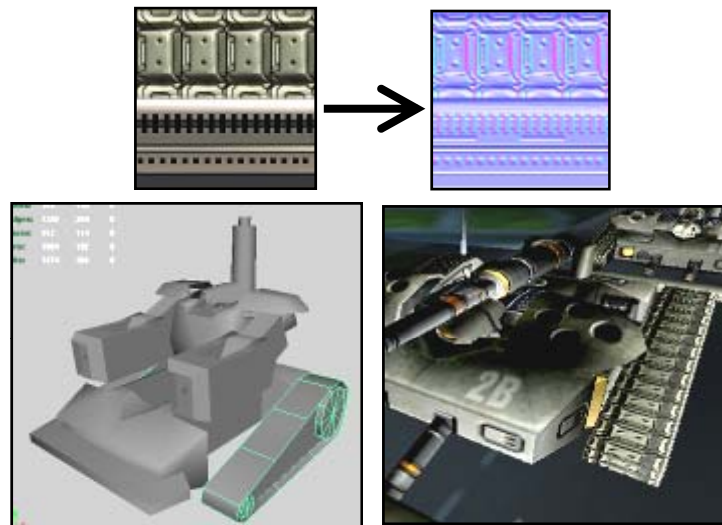


QX Engine 1.2 Features for Adreno 120/130

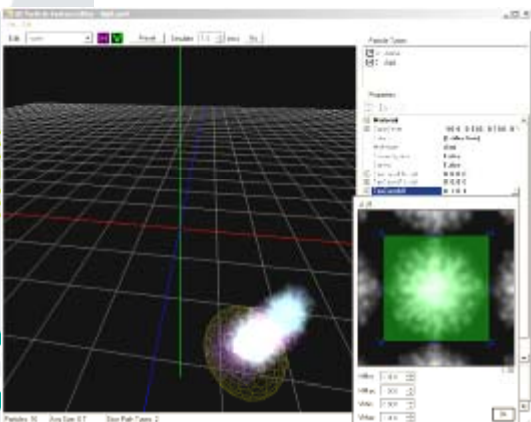
Layered Textures



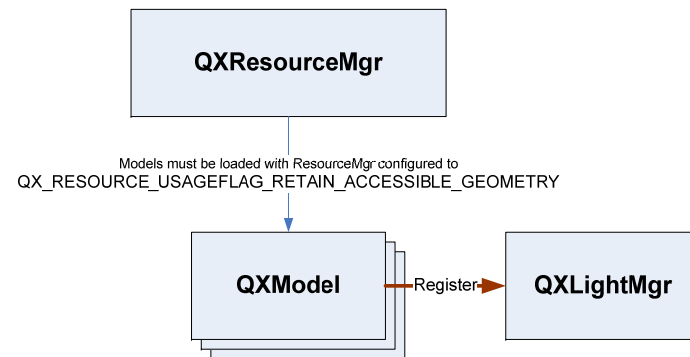
DOT3 Bumpmapping



Specular Mapping



Particle Engine & Authoring System



Choose Load Balancing Mode and Submit to LightMgr

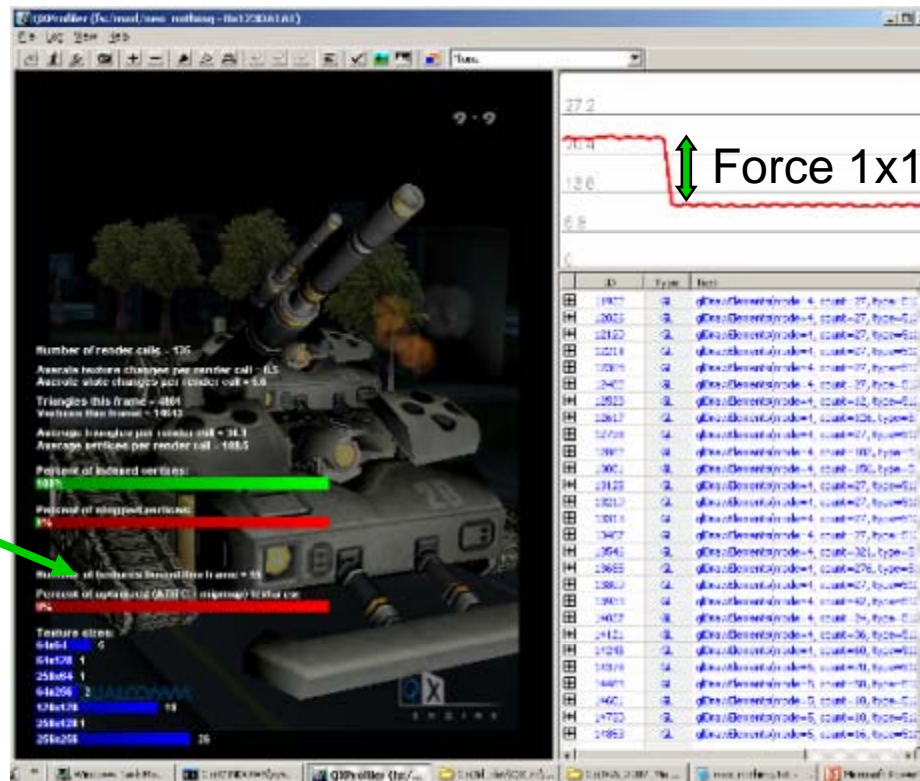
New APIs and utilities

Case Study– Step 1

Neocore Build 1

- Metrics graph: 11 FPS
- Profiler statistics: Statistics show textures are not ideal
- Forcing 1x1 Textures jumps performance to 22 FPS
- **Bottleneck is in the texture fetch stage**

Unoptimized Textures



Case Study– Step 2

Neocore Build 2

- Used QX Texture Converter to create ATI_TC, Mipmapped textures
- Metrics graph: 20 FPS
- We have moved the bottleneck, it is no longer in the texture pipeline
- Statistics gathering hints that triangle-strips are not being used
- Pulling back the camera shows unnecessary off-camera rendering
- **Our bottleneck is in the front-end: too many unnecessary polys + not optimized**

Off-camera geometry

Unoptimized
Triangles

