A Scalable and Flexible GPU Architecture for OpenGL | ES 2.0

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Motivation

- Mobile devices are widely used all over the world.
- Application Processor (AP) is a core component for multimedia processing.
- The cost of ASIC is gradually increasing.
  - Requirements for high performance, low power, area and shorter time-to-market.
  - Industry standard changes very fast!
- We need a more flexible solution.
SAMSUNG Reconfigurable Processor

- A flexible architecture template.
- Application kernels can configure the internal structures in the run-time.
Multi-Core SRP based GPU

- 5 SRP based GPU (1 vertex, 4 pixel shader, dedicated H/W acceler.)
- Effective parallel rendering
  - SRP & HWA are processed in fully pipelined manner.
  - Load balancing can be done by TDU.
Prototyping & Evaluation

- Xilinx Virtex5 FPGA board running at 25 MHz for functional verification
- Verilog RTL simulation for performance evaluation
- Test apps: 3D Mark Mobile 1.0/2.0 and GLBenchmark
Commodity OpenGL|ES application & GLSL program can be used without any modification.

Software Architecture.
- Device driver, rendering engine, RTOS
- SRP tool-chain (compiler, simulator, profiler)

System architecture. (ARM + SRP)
Future Work & Vision

• Short- & long-term goal
  - Redesigning the architecture. (e.g. unified shader, multithreading)
  - Being a complete IP for future SAMSUNG's AP.
  - Presenting a full SRP environment to mobile app developer.

• SRP based multimedia platform
  - SRP-based audio is already shipped into SAMSUNG Exynos. (Gallexy S2)
  - Video/image apps are successfully mapped in the lab.