New technologies for an augmented mobile experience

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A global leader in wireless technologies

Joint venture between Ericsson AB and STMicroelectronics

Leading supplier of platforms for wireless devices

Fabless company supported by extensive semiconductor manufacturing experience and telecom heritage

Truly global with a workforce of more than 85% of employees in R&D
Investing to win

- True multimode RF
- Architecture & System level power design

- Latest ARM cores
- Optimized process technologies

- 40nm Combos
- Integrated
- Interoperability

- Leading GPUs
- Power-optimized multimedia
- Lowest power audio

- A complete portfolio with multimode modems, flexible and scalable solutions

- Analog & Power
  - Power management and RF
- Multimedia
  - 3D Graphics, HD video, audio, imaging
- Processors
  - Multi-core architectures, Low power consumption
- Modem
  - 2G, EDGE, WCDMA, TD-SCDMA, HSPA, HSPA+, LTE
- Connectivity
  - GPS, Bluetooth, HDMI, Wi-Fi, USB, FM
- Software
  - Open OS, Frameworks
Leading platform solutions

The most advanced and complete integrated application processor and modem platform family for smartphones and tablets.
Why invest in Augmented Reality?

Modern smartphone chipsets are very powerful

However

AR use cases expose bottlenecks even in the best
AR applications stress the whole system

Video & Graphics

Camera Processing

Network connection

CPU

Video streaming

Video recording

Mobile gaming

Mobile AR

Bar length indicates relative computational load
Key AR algorithms

3D scene composition
Sensor fusion
Face detection

Camera compensation
Video stabilization
Depth extraction
3D rectification

Pose extraction
Feature extraction
Feature tracking
Feature matching

Huge potential in acceleration
Need standard APIs
The key technologies for mobile AR

- Multi-core computing
- Programmable GPU – GPGPU
- Sensor fusion
- Heterogeneous architectures
- Stereoscopic imaging
- LTE
LTE and CPU/GPU will make a difference

- Mobile AR usually implemented through **Web Applications**
  - Local functionality via Web Browser + remote cloud services

- Mobile AR-capable terminal => **Good Web Browser + Wireless Access**
  - Even if part of the computation will be done in the cloud, the current trend is going to push further CPU, GPU requirements
  - Web Browser is already the main CPU driver

- Increased interactivity with remote cloud will drive wireless access requirements
  - Both latency and bandwidth
  - LTE as a game changer
Mobile computing evolution

Yesterday
- CPU
- DSP
- HW Acc.

Today
- CPU
- DSP
- Graphics
- HW Acc.

Tomorrow
- CPU
- Prog. Multimedia
- Reconfig HW Acc.
- Graphics

Key drivers
- Heterogeneous CPU clusters for browsing, logic and data management
- Programmable arrays for multimedia
General purpose GPU – GPGPU

- A new class of programmable multiprocessors sprung out of graphics processing
- Programming a engine with 100’s of cores requires completely new programming models:
  - OpenCL, CUDA, C99 (Renderscript)
Sensors, sensors and sensors

The concept of Sensor Fusion has been used for years in robotics.

Advances in MEMS technology has enabled sensor cost and size revolution.

A modern Smartphone has 12+ sensors.

Multidimensional, non-linear mathematics.
CPU and GPU roadmap

A9500
- Dual-core ARM® Cortex™-A9 @1.85GHz
- Imagination PowerVR™ SGX544 GPU
- Next level of power innovation

A9540
- Dual-core ARM® Cortex™-A9 @1.85GHz
- Imagination PowerVR™ SGX544 GPU

A9600
- ARM® Cortex™ A15 Multicore-core @ 2.5GHz
- Imagination Rogue GPU

A9500
- Dual-core ARM® Cortex™-A9 @1.2GHz
- ARM® Mali-400 GPU

CPU and GPU roadmap
Thor™ M7400 LTE/HSPA+

Smallest LTE/HSPA+ two-chip thin modem enabling tight application processor integration

8 band WCDMA /LTE with small RF footprint

Power efficient LTE multimode smartphone solution incl. CS Fallback and VoLTE

Reference designs for multiple markets

Global verification programs

Industry leading production support
NovaThor™ L9540 LTE Platform

Complete LTE integrated platform
- Dual ARM Cortex™ A9 @ 1.85GHz
- Imagination PowerVR™ SGX544 GPU
- LTE multimode modem and full set of connectivity

Best multimedia experience in integrated platform
- 1080p30 3D video capture, play-back and display
- Multi standard video codecs up to 60 fps
- State of the art 3D graphics

Extreme power efficiency for real-life usage

Global 4G mobile broadband
- LTE 100/50Mbps, HSPA+ 42/11Mbps, TD-SCDMA
- Worldwide coverage with up to 8 bands
ST-Ericsson’s commitment to AR

- Powerful platforms in the making
- More MIPS, less mW innovation in CPU and process
- Sensors and LTE will drive apps innovation
- Strong support for open standards and ecosystem
THANK YOU