Redefining User Experiences, from IoT to Smart Mobile Devices

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June 18, 2013
Welcome!

- You have an incredible group of experts assembled in one space

- Walk away with your questions answered
  - OpenGLES, OpenCL, OpenCV, HSA... Which is right for your application?
  - Where is the right application to utilize GPGPU compute functionality?
  - Which processor is right for my application?
  - Which ecosystem partners should I engage with?

- Network: It is a key strength of the ARM Ecosystem. One company cannot do all
Rapid Change in Mobile Computing

In 5 years the ARM Ecosystem has changed the face of computing

- Rise of Superphone
- Tablets Emerge
- 15x Increase in Data Rate
- 15x Increase in Screen Resolution
- 20x increase in Graphics Performance
- 15x Increase in Processor Performance
- Diversity of platforms
- Cloud and Apps
- Support for any content
- Always on, Always Connected

A Mobile Connected World

Your primary compute device

Mobile driving computing

The Architecture for the Digital World® ARM
Smartphone Global Subscriber Rates

% Other countries with >50% Smartphones
- Australia
- Norway
- South Korea
- Sweden
- UK

Sources: KPCB and eMarketer
Mobility is Reshaping Behavior

23% US Adults who consume news from a mobile device

79% iPad users who “always” use tablet for web browsing

71% Enterprises planning to create a corporate mobile store for applications

41% People accessed Olympics on BBC via mobile devices

100% Mobile application revenue growth per year

192% China Mobile Internet Usage increase since 2010

China Mobile Internet Users surpassed Desktop Users in 2012

600M Access Facebook From their Mobile

Sources
Higher-End Features for New Use Cases

**Video editing and effects creation:**
High-performance processor, video and graphics

**Natural language and handwriting recognition:**
High-efficiency processing; GPU compute; security

**Facial recognition:**
High-efficiency processing; GPU compute; security

**Bring Your Own Device, Mobile Payments, and Digital Identity**
Hardware-based security and Virtualization

**Hold Screen ON**
While you are looking on it

**FaceLock**
Face Unlock for both your phone and your apps
Mobile Revolution Built on Diversity
Optimal Solutions For Every Price Point

New suite of IP for Mid-range

Relative SoC Die Sizes

Mixture of ARM and Gartner Estimates

Entry Level  | Mid Range  | Premium

ARM11 | Cortex-A9 | Cortex-A9
Cortex-A8 | Cortex-A9 Mali-400 | Cortex-A9 Mali-T604
Cortex-A5 Mali™-300 | Cortex-A7 Mali-400 | Cortex-A53 Mali-450
Cortex-A57 Mali-T628

The Architecture for the Digital World®
New ARM IP Announced at Computex 2013

System Solution for Mid-range Market:

**ARM Cortex-A12 CPU**

**ARM Mali-T622 GPU**

**ARM Mali-V500 video**

**ARM POP™ IP for CPU and GPU at 28nm**
2013 – Year of Change

- 1B Smartphones will ship
- New capabilities and levels of user experience
  - ARM big.LITTLE technology shipping in 2013
  - Significant increase in GPU capabilities
- 28nm system-on-chips for mass-market smartphones
  - Multiple providers of quad-core Cortex-A7 solutions
  - Year of ‘Great User Experience’ for all
  - 20nm devices sampling
- Continued OS innovation
  - Established players continue to innovate
  - New entrants: BlackBerry10, Firefox OS, Ubuntu and more
## Mobile is Our Interface to the World

### NFC – Touch to connect
- **Touch to share**
- **Touch to pay**

Enables highly secure localized comms

### Bluetooth LE – Personal world
- **Controlling content**
- **Personal notifications**

Personalized ultra low-power comms

### WiGIG – Personal broadband
- **Split screen gaming**
- **HD video streaming**

Enables wireless HD streaming

### LTE – Mobile broadband
- **Low latency data connection**

Permanently connected

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The Architecture for the Digital World®
ARM Extends Beyond Mobile

**Infrastructure**
Servers, network infrastructure
ARM Cortex-A processors

**Gateways**
Cell modems & rich edge products
ARM Cortex-R & Cortex-A processors

**Smart sensor nodes**
Microcontroller + sensors + RF
ARM Cortex-M

8.7 billion
ARM processor-based chips shipped in 2012

4.8bn Mobile
2.2bn Embedded
1.3bn Enterprise
0.4bn Home
ARM Sensors

- Bringing context awareness to products
  - Requires intelligence at the node
  - Awareness of user Identity, location, time, activity
  - Bringing context to otherwise ‘flat’ big-data

- More efficient systems, more accurate data
  - Corroboration of multiple sensor sources
  - Digital pre-processing and communication
  - Minimize communication activity and bandwidth
  - Wake host processor only when necessary

Sensor fusion based systems set to grow from 400M units in 2012 to over 2.5 billion units in 2016 – Semico Research
Operators Turning Focus to Enabling M2M

**Problem:** enable IoT device prototyping & development

**Solution:** 3G connected mbed

Connected mbed-powered door and streetlight at MWC

ARM won at EW in the software category with “mbed IoT Rapid Prototyping Platform”

Finnish customer doing logistics tracking

**Next steps**
- Prototype-to-product through module integration
- OMA device management client integration

The Architecture for the Digital World®
Services Driving Home Evolution

- Broadband Access providers driving flexible platforms needed to support multiple business models
- Home networks and devices are rapidly evolving
- Service providers, OEMs, OTT vendors, and others making plays to retain, grow or expand value
Home Networking In 5 Years

Today
- Best effort wireless, wire line for TV
- Fixed functionality gateway
- No redundancy
- Minimal security

Future
- Wireless for everything
- Multiple service offerings
- Home gateway as a software platform
- Fully secure platform & redundant

Key Enablers Needed
- 1Gbps performance on WiFi (802.11ac)
- Bonded media channels (P.1905+)
- Many-core gateways (4+ cores)
- Security: Root of trust / Trustzone

Internet
PON (+ LTE)
Home Gateway
ENET
WIFI
Zigbee
DECT
TPM/TZ
Battery
Core
Core
Core
Core
PON/LTE
High-Power Wireless (WiFi 5 / 2.4 Ghz)
Low-Power Wireless (Zigbee/6LoPAN, ZWave, DECT ULE)
Wireline (MoCA, Ethernet, G.Hn, Power Line)
Appliances
Automation
4K STB/DTV
Case Study - Home Health Care

Capabilities Needed
- Home entry management
- Tele-presence
- Vitals / Emergency Sensors

Networking Requirements
- Reliable/QoS network & uplink
- Robust gateway SW platform
- Battery back-up

Application Needs
- Mobilize care team – monitoring at home
- Reliability & security
- Flexible software platform
Evolving STB Deployment Models

Broadcast STB Appliance
- Developing world focus
- User interface in STB

Broadcast STB
- QAM Phy
- Video I/F
- CA
- HDMI/Analog

Media Gateway Model
- Phy
- Video I/F
- Data Gateway
- CA
- DTCP
- WIFI
- MoCA
- HTML5 Rx/Browser
- DLNA
- HDMII

All IP Model
- Phy
- Data Gateway
- WIFI
- G.Hn
- ENET
- HTML5 Rx/Browser
- Android/GoogleTV
- DRM plugin

Residential Gateway

Media Gateway w/ managed CE devices
- Developed world focus
- Managed clients use operator SW
- HTML5 RUI for IP Client devices

Broadcast STB
- WIFI
- MoCA
- HTML5
- Rx/Browser
- DRM plugin

Evolving STB Deployment Models
- HTML5
- Rx/Browser
- Browser

The Architecture for the Digital World®
- Opportunity to optimize at a system level: GPU + Video + CPU + Security
- Conditional Access secure video path is mandated for premium content
Summary

- The penetration and pace of innovation inside the mobile industry has an ever broadening spectrum of influence.

- Mass of connected devices, many with screens will bring market disruption and opportunity.

- One company cannot do everything – ARM’s business model is about shared reward.