Agenda

- A Brief History of the ARM Architecture
- ARMv8-A Design Requirements
- ARMv8-A Features
- Use Cases
- Performance
- Ecosystem
- Opportunity
At The Heart Of Modern Computing

- ARM’s business model has fostered a wave of innovation in mobile devices
- Advanced personal computers are becoming affordable to all
- Datacentre and network operators are turning to ARM solutions to drive efficiency

Smart Mobile Device Shipments (Smartphones and Tablets)

Global Data Creation (Zetabytes)

ARM and Gartner Estimates, CAGR figures based on 2013

Computer Science Group 2013
Definitions

- **Architecture**
  - A set of rules for building and programming a processor
  - The contract between hardware and software
  - Also known as ‘Instruction Set Architecture’ (ISA)

- **Processor**
  - A processor design that complies with a specific Architecture
  - Examples of processor implementations:
Increasing SoC complexity
Increasing OS complexity
Increasing choice of HW and SW
Architecture Lifecycle

- Early Scoping Studies
- Architecture Specification
- ARM Processor Design
- Partners' Chip Design
- Partners' Chip Production

Years From Architecture Inception

- Architecture Design
- Early Processors
- Later Processors
ARMv8-A Design Requirements

**Entry-level Computing**

- Extend OS capabilities to sub-$100 devices

**‘Desktop Class’ Computing**

- Performance apps
- Enhanced multimedia processing

**High-end Enterprise**

- 64-bit memory addressing
- Virtualisation
- High bandwidth
- Enable innovation for hyperscale operators
ARMv8-A Instruction Set Enhancements

- AArch32
  - ARMv8-A is 100% compatible with 32-bit ARMv7-A software
  - Cryptography support across 32-bit

- AArch64
  - Introduces 64-bit support
  - Faster data manipulation for applications in Cloud and Mobile
  - Improved support for virtualisation
  - Better support for multi-threaded software
## ARMv8-A Designed for Efficiency

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<tr>
<th>Enhancement</th>
<th>Why it Matters</th>
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<tr>
<td>64-bit architecture</td>
<td>Efficient access to large datasets</td>
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<td>Increased number and size of general purpose registers</td>
<td>Gains in performance and code efficiency</td>
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<td>Double the number and size of NEON registers</td>
<td>Enhanced capacity of multimedia engine</td>
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<td>Cryptography support</td>
<td>Over 10x software encryption performance</td>
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<td>New security models for consumer and enterprise</td>
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Desktop-class Apps For All Devices

- Enable new categories of applications
  - ‘Unlimited’ memory addressing
  - Faster number crunching and better gaming
  - Lower power consumption
  - Complex applications for the enterprise

- Enhanced user interaction
  - Gesture and voice recognition

- Enables OEMs to innovate across a broad range of computing platforms
Enhanced Privacy, Security And Personalization

ARM security framework with TrustZone® is available in all ARMv7-A and ARMv8-A processors.
ARM security and virtualization framework is available in ARMv8-A and ARMv7-A processors launched since 2010.
Enhanced Privacy, Security And Personalization

- Separation of consumer and enterprise applications and data
  - Enables enterprise control of enterprise assets
  - Enhanced authentication and electronic payment
  - Headroom for future

- Premium content separated from consumer platform
  - Greater protection for high-value content
  - Complements TrustZone® management of sensitive assets

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ARM security and virtualization framework is available in ARMv8-A and ARMv7-A processors launched since 2010
Significant Performance Uplift

- Existing ARMv7-A 32-bit software runs faster on today’s ARMv8-A processors

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- ARMv8-A 32-bit and 64-bit software will provide additional benefits based on use case

- Expect further improvements
  - Process technology, silicon implementation and improved software tools
ARMv8-A for Software and System Developers

- **DS-5™ for ARMv8-A**
  - Delivers a suite of professional software development tools for ARM processors
  - Includes ARMv8-A cores

- **ARM Fast Model**
  - Platform for early software development

- **Linux Kernel and tools**
  - Open source tools and compilers
  - Linux kernel support

- **SW Evolution**
  - Continued software optimization
  - Test silicon available
  - Server Base System Architecture
Unified and Growing Ecosystem

- Builds on the extensive software assets that already exist in today’s 32-bit ARMv7-A ecosystem
- All of these assets are compatible with ARMv8-A processors
ARMv8-A Everywhere
From entry-level smartphones to high-end servers