ARM based Data Center

Andrew Wafaa
Principal Engineer, Open Source

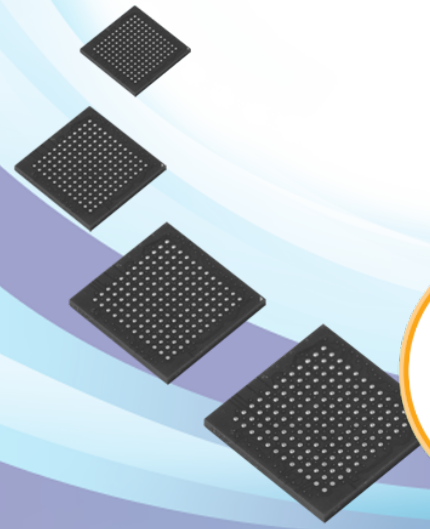
From Sensors to Servers and Everything In-between

The ARM Ecosystem, YOU are transforming how we work, play, and learn

Working in Partnership to Transform the Network and Data Center

ARM

Innovation Shared is Innovation Amplified



1000+ Ecosystem Partners

290 Silicon Partners

OEM Partners

40B+ ARM-based chips

Software Partners

Linaro

OPEN Compute Project

Xen

openstack

Innovation

Choice

TCO Advantage

Invest with ARM to enable choice and innovation

ARM

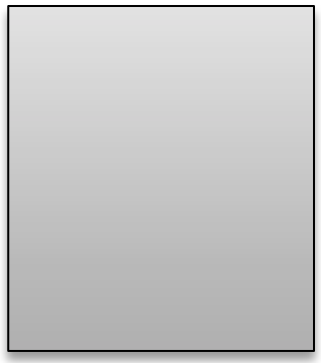
Data Center Workload Characteristics are Evolving

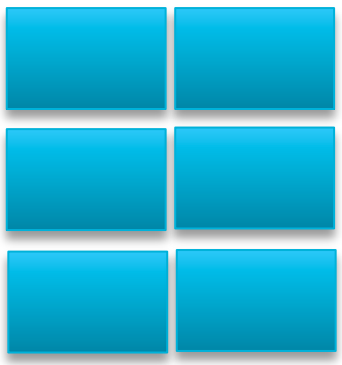
Data center workload characteristics are scaling out

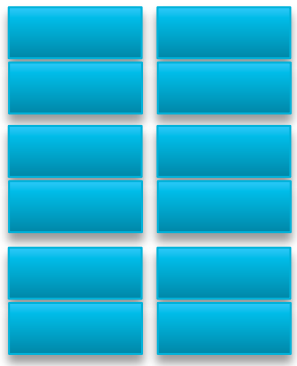
Throughput

Workload optimized

Total cost of ownership

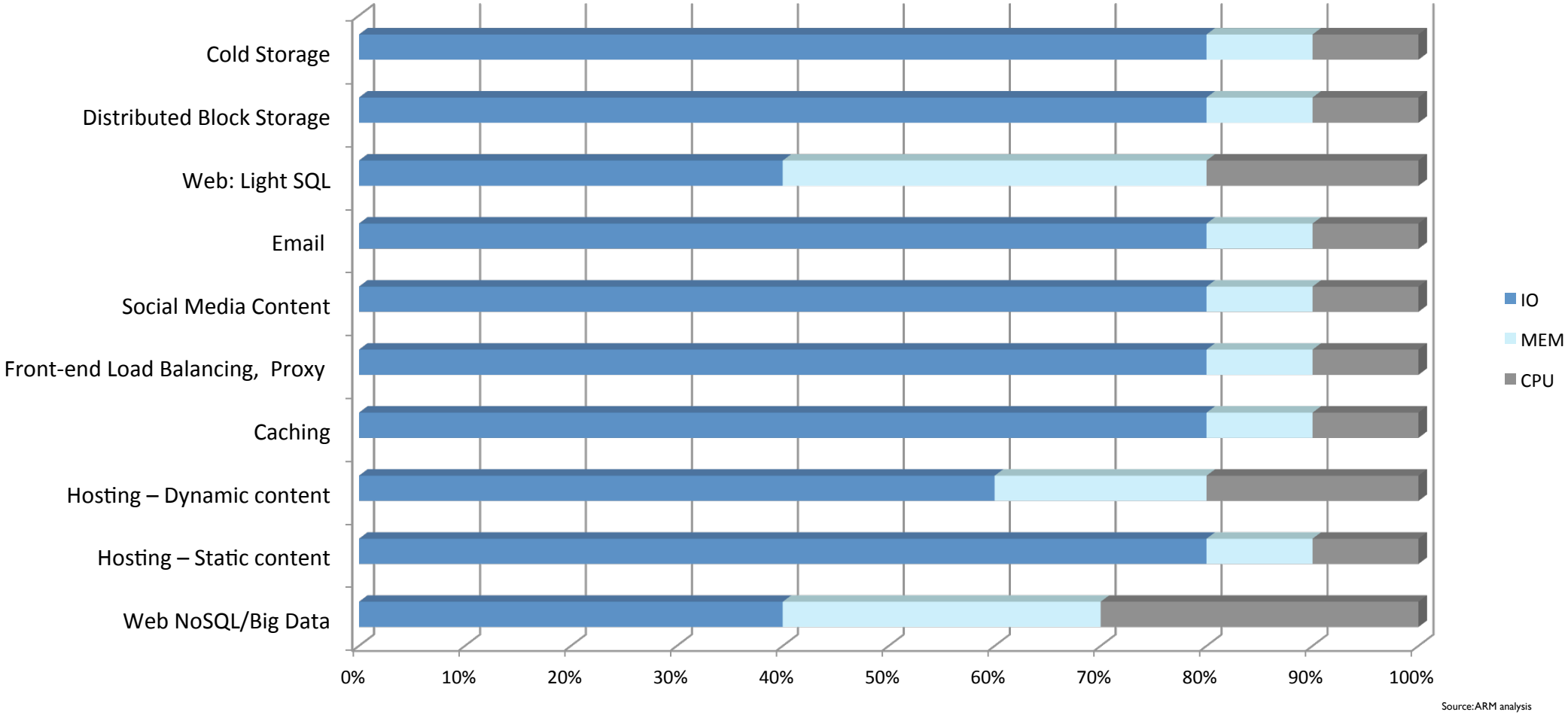






ARM

Web-scale workloads ideal for ARM



Source: ARM analysis

SoC approach from ARM partners ideal

ARM

Server Platform Standardization Goal

Goal: Minimize ecosystem fragmentation while allowing sufficient degrees of freedom to innovate & differentiate

Corollary: Not to reduce or eliminate innovation but to identify, define, prioritize and address common pain points that left unchecked would delay or potentially eliminate successful realization of ARM based servers

Collaborative Approach: Spec developed with input from OEMS, OS vendors and Silicon Partners

First public release & announcement Jan 29th 2014 @ OCP Summit

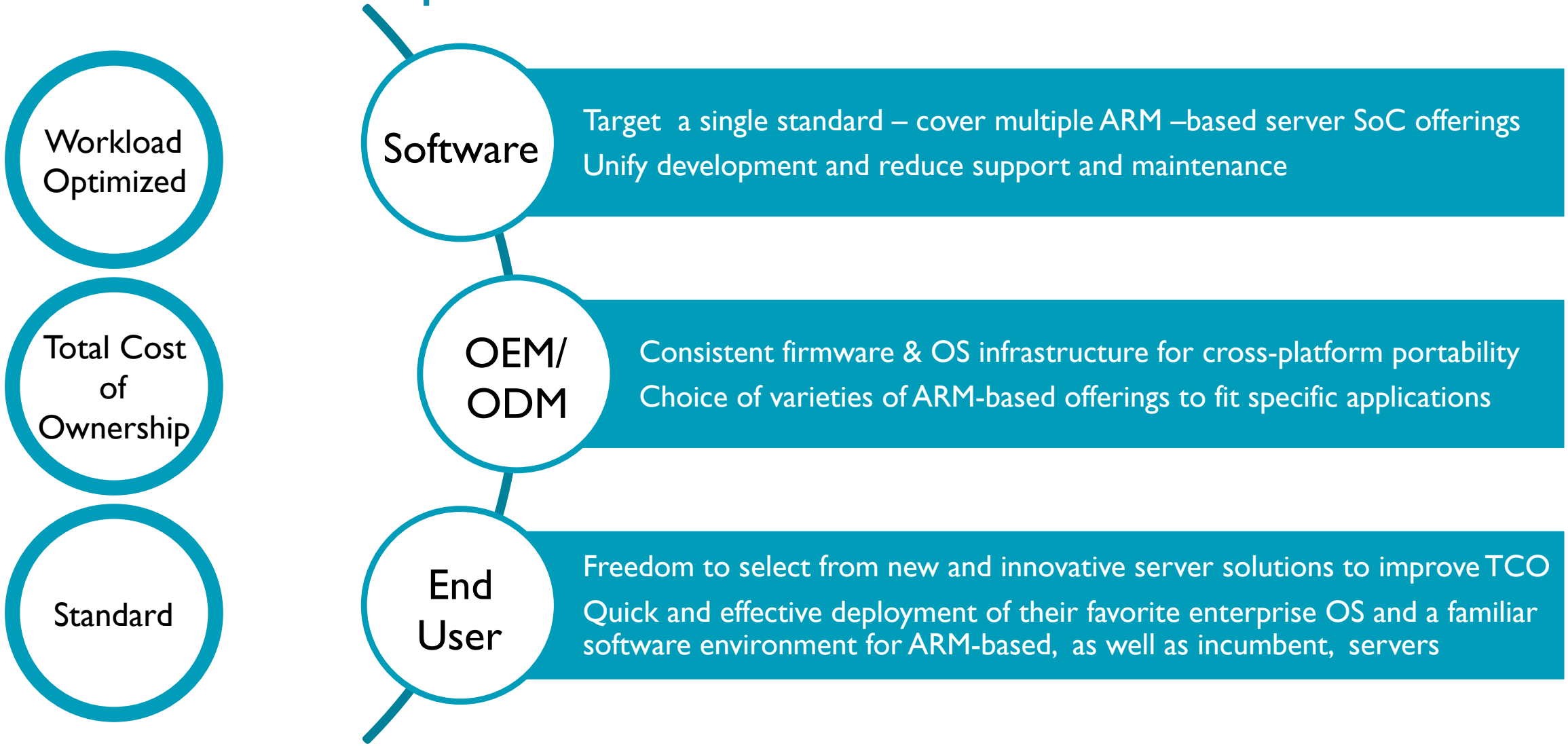
ARM

Why is Standardization Important?

- As datacenter customers are adapting to the shifting characteristics of hyperscale workloads the need for **workload optimized solutions, software portability and standardization** are key considerations for deployment
- **Standards based platforms enable efficient software development** and **cross platform portability** for ARMv8 based servers
- **Standards are essential - Datacenters will not accept custom OS builds and proprietary deployment methods**
  - **A single OS image must be capable of running across all ARMv8 servers**

ARM

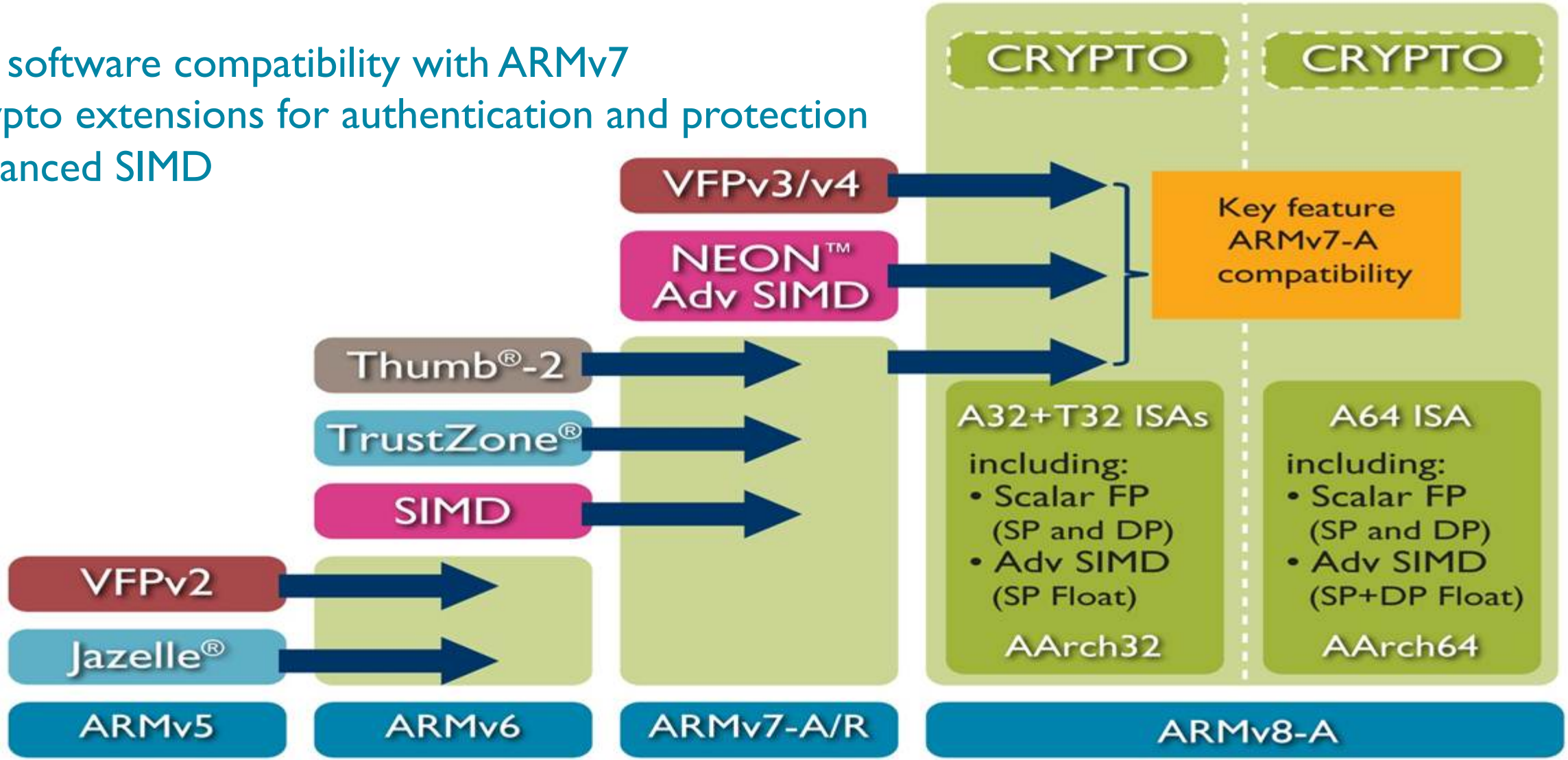
Standardization Amplifies Innovation



ARM

ARMv8: The Next Big Architecture Step

- Full software compatibility with ARMv7
- Crypto extensions for authentication and protection
- Advanced SIMD



ARM

ARMv8: Designed for Efficiency

- Fully compatible with existing ARMv7 32-bit code
- Addressing emerging software trends
- AARCH**32:** Evolution of 32-bit
  - Ideal for concurrent programming
  - C11, C++11 Java5
  - Efficient, high-performance thread-safe software
  - Enhanced security and encryption
- AARCH**64:** Efficient 64-bit execution
  - Clean instruction set
  - Modern compiler & JIT friendly
  - Reduced complexity for operating systems, hypervisors
  - Designed to maximize reuse of existing hardware

ARM

CORE

ARM

HISILICON

CLUB

BROADCOM

FUJITSU

LG Electronics

QUALCOMM

MEDIATEK

SAMSUNG

life.augmented

TEXAS INSTRUMENTS

ZTE中兴

GROUP

Allwinner Technology

AMD

applied micro

CAVIUM

CANONICAL

CISCO

CITRIX

COMCAST

ENEA

facebook

freescale semiconductor

hp

LSI

MARVELL

montavista

nsn

redhat.

COMMUNITY

IBM

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ARM

Linaro Networking Group (LNG)

- Optimized, open-source ***networking platform software for scalable networks***
- Coordinates and multiplies members' efforts, accelerates product TTM
- Enables ARM networking vendors to focus on innovation and differentiated value-add for carrier and enterprise customers

Linaro

ARM

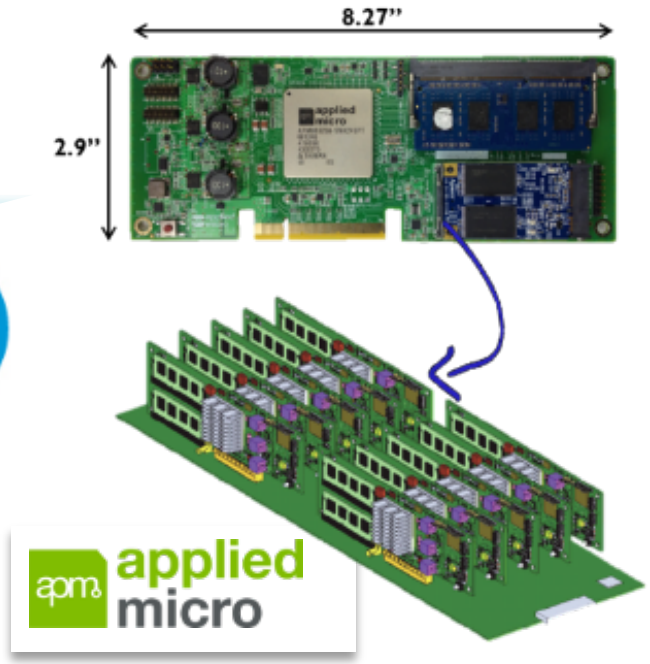
Linaro Enterprise Group (LEG)

- Group of existing and new members to deliver optimized core open-source software for ARM servers
- Reduces costs, eliminates fragmentation, accelerates product time to market
- Enables ARM Server vendors to focus on innovation and differentiated value-add

Linaro

ARM

ARM Server Hardware Overview



AMD OPTERON™ A-SERIES DEVELOPMENT KIT

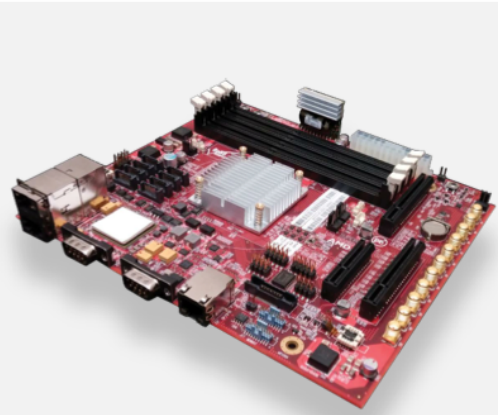
AMD

COMPUTE
- AMD Opteron™ A1100 processor

MEMORY
- DDR-3 registered DIMM slots
- Up to 128 GBytes

I/O
- PCI-e Gen. 3: single x8 or dual x4 slots
- Up to 8 SATA3 hard disk drives

PLATFORM
- MicroATX form factor - Standalone or standard rack chassis mount
- Support for standard power supply



13 | CHANGING INFRASTRUCTURE LANDSCAPE | JANUARY 2014 | CONFIDENTIAL

Datacenter Infrastructure – Tomorrow…

One size does not fit all → increased server specialization

Software Defined <X>
Accelerated innovation
Flexibility
Manageability
Scalability
Efficiency
Choice

Network flexibility → SDN / NFV

Traditional 2P 2U server

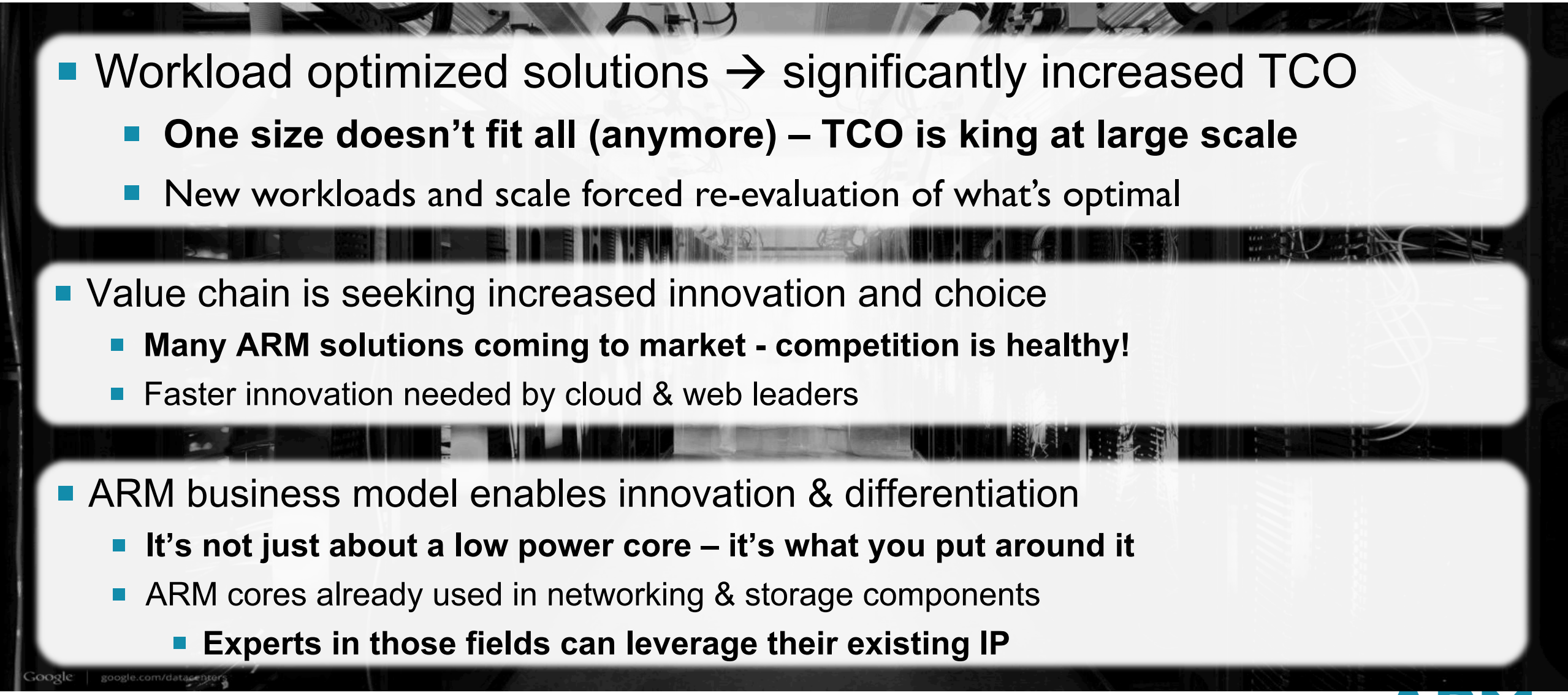
ARM

AMD
applied micro
BOSTON Servers · Storage · Solutions
BROADCOM
CANONICAL
CITRIX
CAVIUM
DELL
LSI
hp
MARVELL
Nokia Siemens Networks
MITAC
OPEN Compute Project
redhat
PENGUIN COMPUTING
TEXAS INSTRUMENTS

Traditional networking equipment

ARM

Why ARM-based Servers? And Why Now?



- Workload optimized solutions → significantly increased TCO
  - **One size doesn't fit all (anymore) – TCO is king at large scale**
  - New workloads and scale forced re-evaluation of what's optimal
- Value chain is seeking increased innovation and choice
  - **Many ARM solutions coming to market - competition is healthy!**
  - Faster innovation needed by cloud & web leaders
- ARM business model enables innovation & differentiation
  - **It's not just about a low power core – it's what you put around it**
  - ARM cores already used in networking & storage components
    - **Experts in those fields can leverage their existing IP**

Google | google.com/datacenters

http://www.google.com/about/datacenters/

ARM

Server Ecosystem Developing

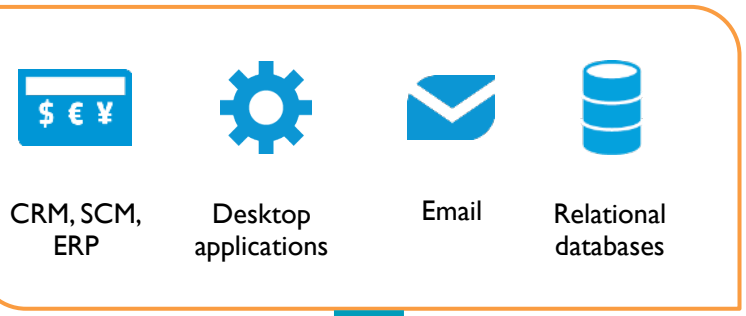
- **ARMv7 systems shipping**
- **ARMv8 systems sampling**
- Software needed for tier one data center in place or in progress

Additional entrants coming in each category – watch this space…

ARM

HP Moonshot System

The traditional enterprise *supports* business functions

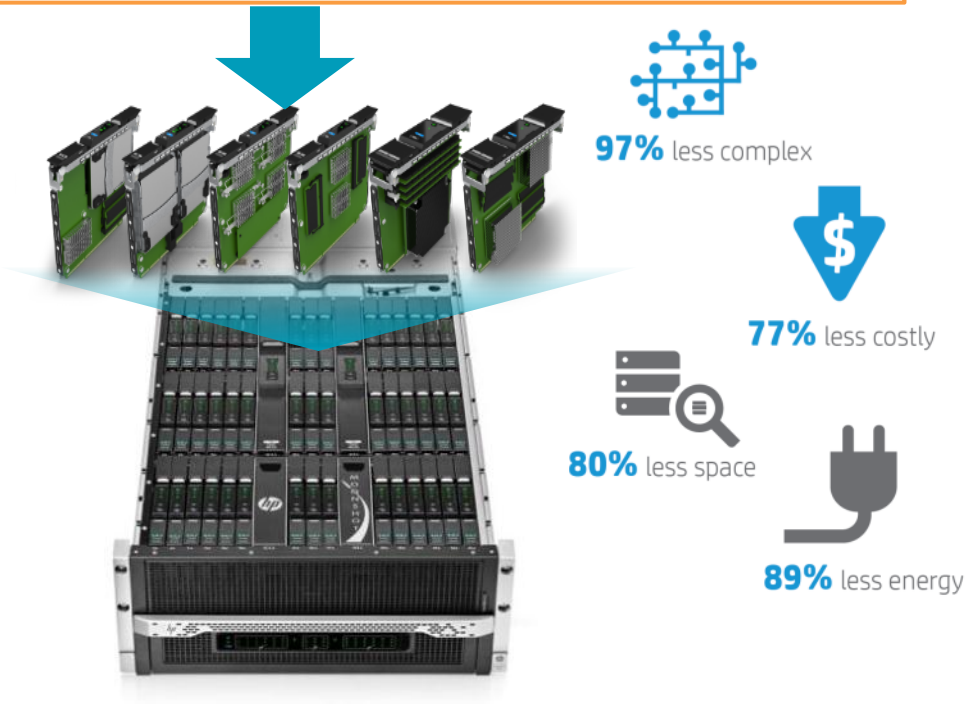


The new style of IT *drives* business revenue

HP Moonshot System

Software defined servers
45 individually serviceable hot-plug cartridges

Moonshot 1500 Chassis
Supports shared components including power, cooling, and management and fabric



AMD 'Seattle' @ OCP V – January 2014

"SEATTLE" 64-BIT ARM SERVER PROCESSOR

AMD

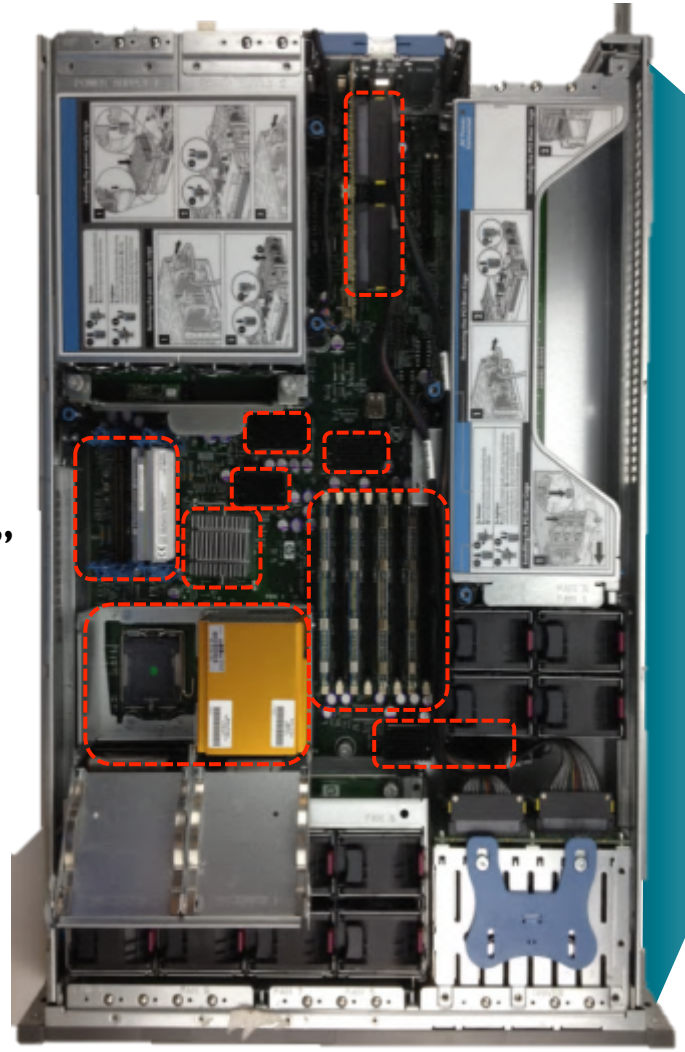
FIRST 28NM ARM SERVER CPU TO SAMPLE IN MARCH

- Industry's only 64-bit ARM Server SoC from a proven server processor supplier
  - The most server experience of any ARM licensee
  - Server class IP blocks–no other competitor has
- CPU code named "Seattle"
  - 2-4x the performance of AMD Opteron™ X-Series with significant improvement in compute per watt[3]
  - 8 core SoCs with 128 GB DRAM support
  - Based on ARM Cortex™-A57 cores at > = 2 GHz
  - Extensive offload engines for better power efficiency and reduced CPU loading
  - Server caliber encryption and compression
  - Legacy Networking: Integrated 10GbE
  - Storage: High port-count storage interfaces optimized for big data

SAMPLING IN A FEW WEEKS

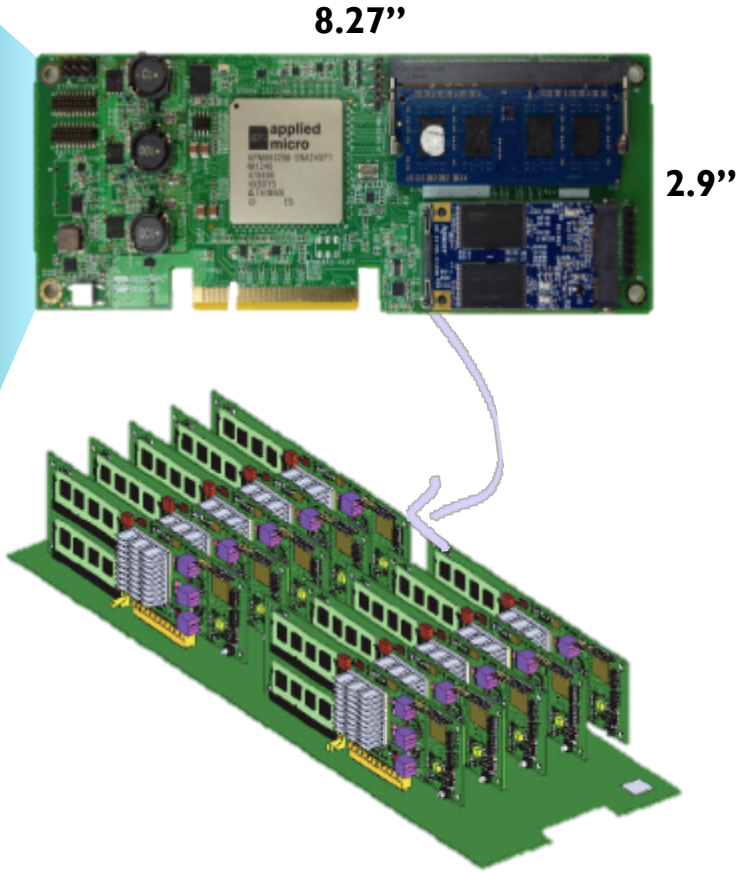
ARM

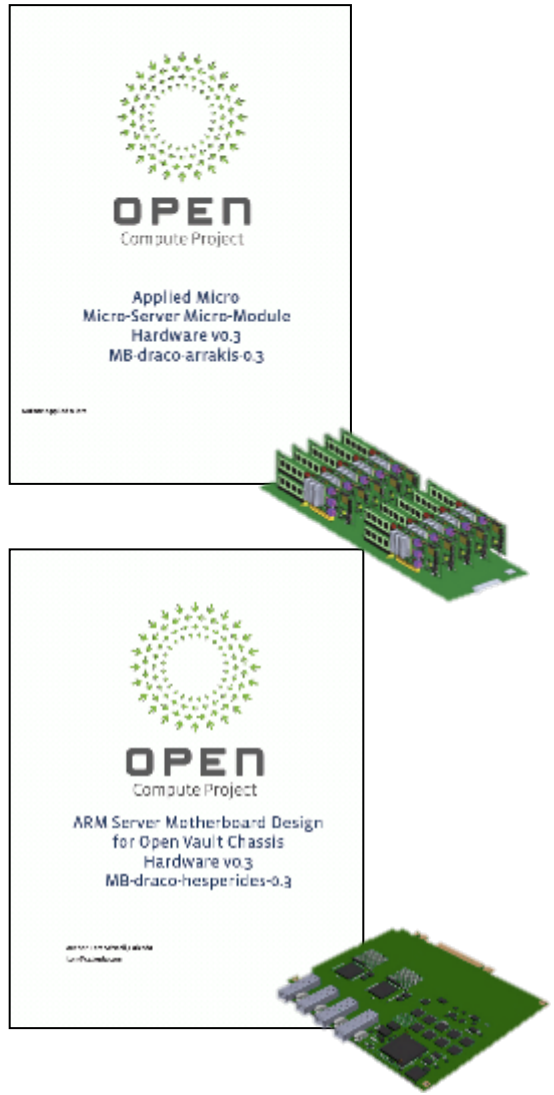
Integration = Increased Density & Reduced TCO



26”

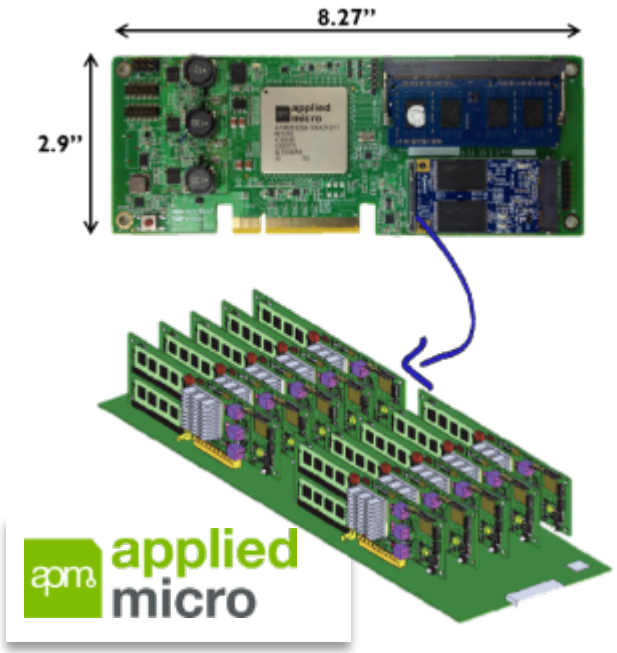
19”





ARM

Systems success in server – recent examples



ARM

Dell Offers 64-bit ARM Microserver PoC For Hyperscale

Dell's ARM Momentum Through the Years

Dell pioneered the 'microserver' in 2007 and has marked a number of milestones in continued investments to enable the growth of this low-power ecosystem:

- We gained great insights into customer workloads when we enabled the Dell "Copper" ARM-based server as part of a seed unit program in May 2012 with customers ranging from hyperscale players to focused web environments.
- Dell donated the Dell "Zinc" ARM-based server concept to the Apache Software Foundation (ASF) in October 2012. This donation included an ARM-based server concept running Calxeda EnergyCore technology as well as hosting and technical support for the ASF community. Dell "Copper" and "Zinc" remain available for remote access via our Dell Austin Solution Center hosting site, and Texas Advanced Computing Center (TACC – UT) for academic developer access.
- Dell first demonstrated 64-bit ARM technology at ARM TechCon in October 2013. We partnered with our ARM ecosystem partners Applied Micro, ARM Holding, PMC and Fedora to demonstrate a 64-bit Dell proof-of-concept server with PMC industry standard storage controller running a Dell JBOD with Fedora Linux OS and Applied Micro 64-bit system-on-a chip solution.
- Today, we're continuing that momentum with a proof-of-concept solution based on Applied Micro's X-Gene 64-bit ARM technology to further accelerate the development of the 64-bit ARM ecosystem and support testing with select customers.

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Summary

- The data center workload shift is underway towards more optimized and diverse solutions
  - ARM partners understand SoC integration and are uniquely positioned to deliver
- First of many industry standards is now available to accelerate development/deployment of ARM-based servers
  - ARM partnership approach is collaborative and supports "one size does not fit all approach"
  - Broad collaboration from silicon to hardware to software to drive the "right standardization framework"
- SBSA is the foundational specification – more to come

ARM