Cavium Corporate Overview

XPliant®
Ethernet SDN TOR and Spine Switches

THUNDERX2®
HPC Servers

QLogic®/LiquidIO®
Server Adapters, Ethernet/FC, OVS, IPSec Offload

THUNDERX®
Storage Controllers, Ceph

LIQUID SECURITY™
FIPS HSM Appliance
Key management, Authentication as-a-service

Nitrox®
Security & FIPS Adapters
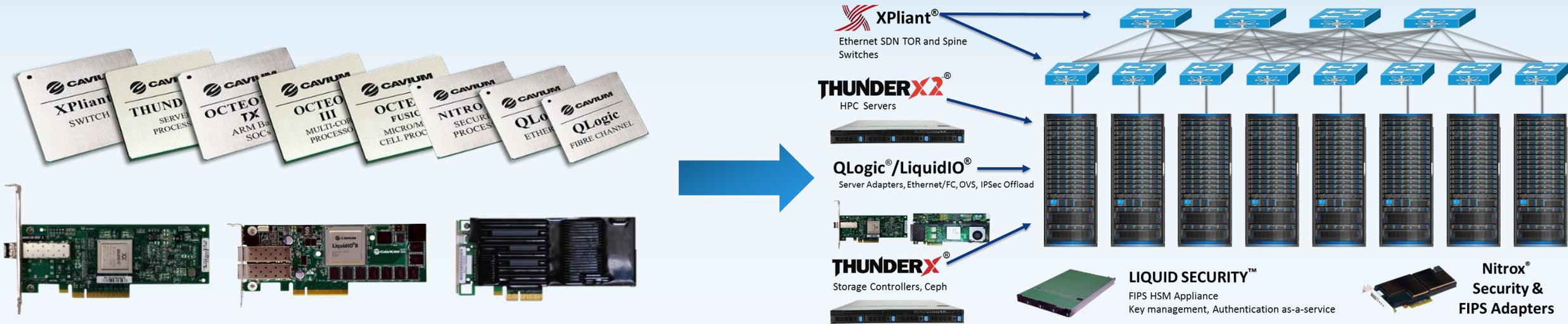
**Enterprise**   **Mobile Infrastructure**   **Data Center and Cloud**   **Service Provider Cloud**

**Multi-Core MIPS, ARM Processors, Security, SDN Switch and Server/Storage Connectivity ~$10B TAM**

Cavium's Proven Leadership in Silicon Design

Multicore CPU Expert

Performance 2S Config

THE CPU company for Infrastructure

High Perf Custom Cores

Complete Portfolio

#1 in Security & Wireless Infrastructure,#2 in Embedded

Highest performance, most widely supported, dual socket ARMv8 servers in production

ARMv8 architectural licensee

Power, Perf, Area Optimized

2 core to 48 core, variety of price points, TDP

Common SW architecture

OPTIMIZING ARM64 SERVERS FOR HPC & CLOUD DATA CENTER

# Comprehensive Portfolio of ARM Server Offerings
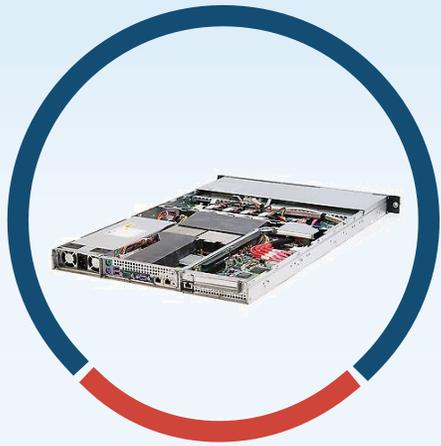
Cloud Compute

Telco

HPC

Storage
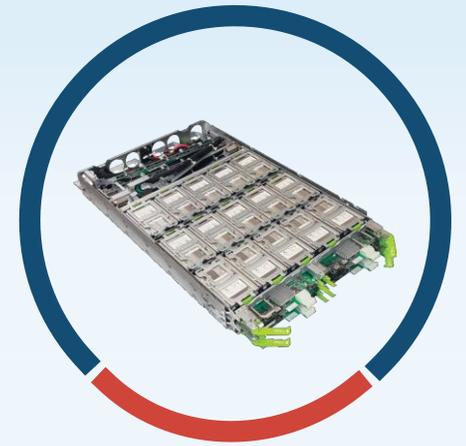
OCP
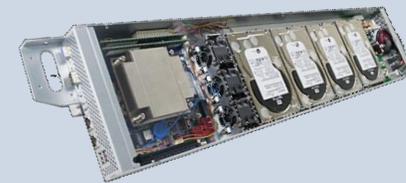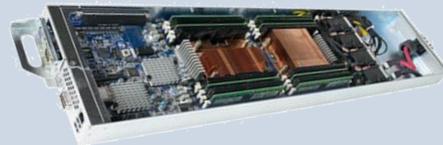
Packet.net – Bare Metal Hosting on ThunderX

BUILD A BETTER INTERNET

INTRODUCING

The Type 2A

The ARMv8 Beast

- 2 x Cavium ThunderX ARMv8 SoC's
- 96 Physical Cores @ 2.0 GHz
- 340 GB Intel M.2 SSD
- 20 Gbps Bonded Network
- Provision in Under 10 Minutes
- Available only at www.packet.net

packet
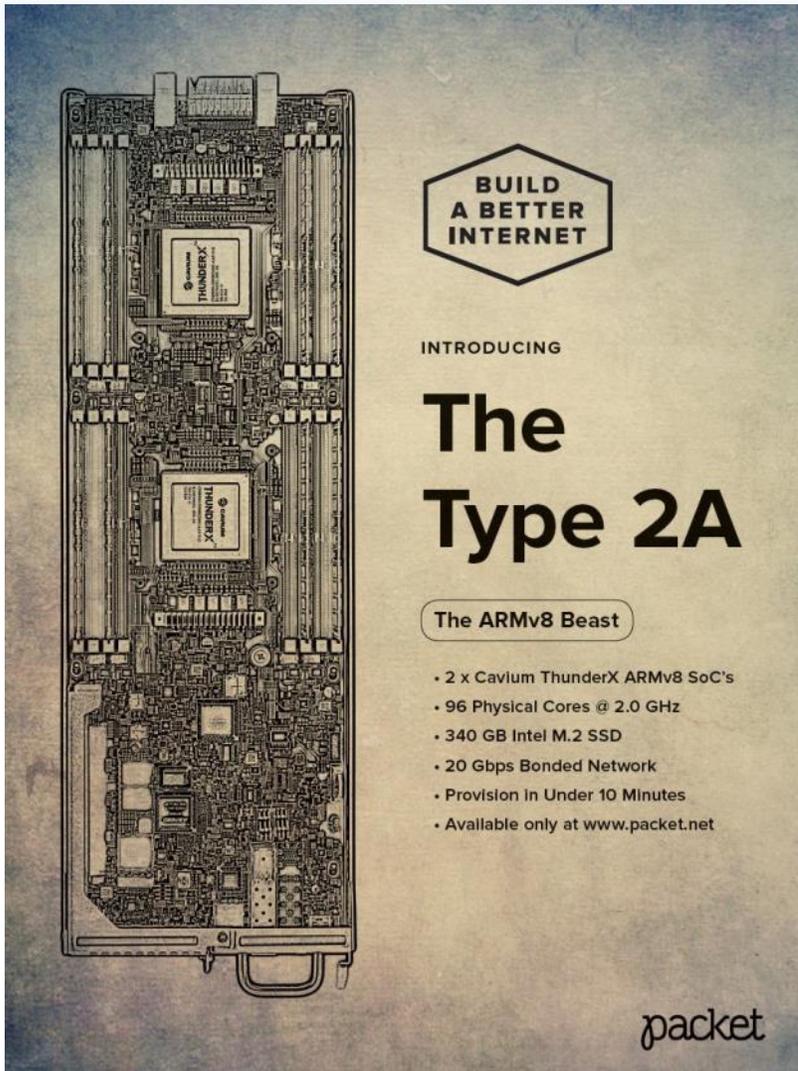
- **Aggressive ramp for hosting resource on ARMv8**

- **Standard SW infrastructure and stacks enabled**

- **https://www.worksonarm.com/**

- **Perfect resource for Developer Communities (such as Apache) to develop, test and optimize**

- **Indication of improving ARMv8 maturity**

https://www.packet.net/blog/arming-the-world-with-an-arm64-bare-metal-server/

Why ARM for HPC ....

- HPC community wants multivendor options

  - Strategic requirement

  - ARM ecosystem brings choice and a path to better optimized solutions

- Why Now ? – Exascale is a compelling event

  - Massive parallelism is requiring changes to software, this opens the door for a new ISA

  - ARM HPC projects are active in multiple regions across the globe

  - HPC has a large open source component supportive of ARM architecture

  - ARM investment for HPC

    - Commercial tool chains, Apps , Math Libraries , Debuggers and profilers are all now available
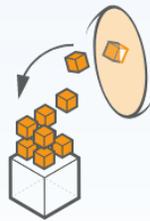
ARM Compiler for HPC   ARM SVE Compiler for HPC   ARM Performance Libraries   User Forum
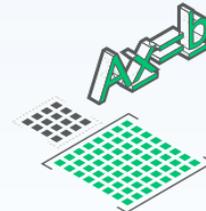
CAVIUM

THUNDER X2™ : On the road to HPC

- Accelerating ARM adoption in High Performance Computing

High Performance Compute Architecture

Energy Efficient Solution

Heterogeneity & Demanding Scientific Applications

Growing Eco-System & Readiness
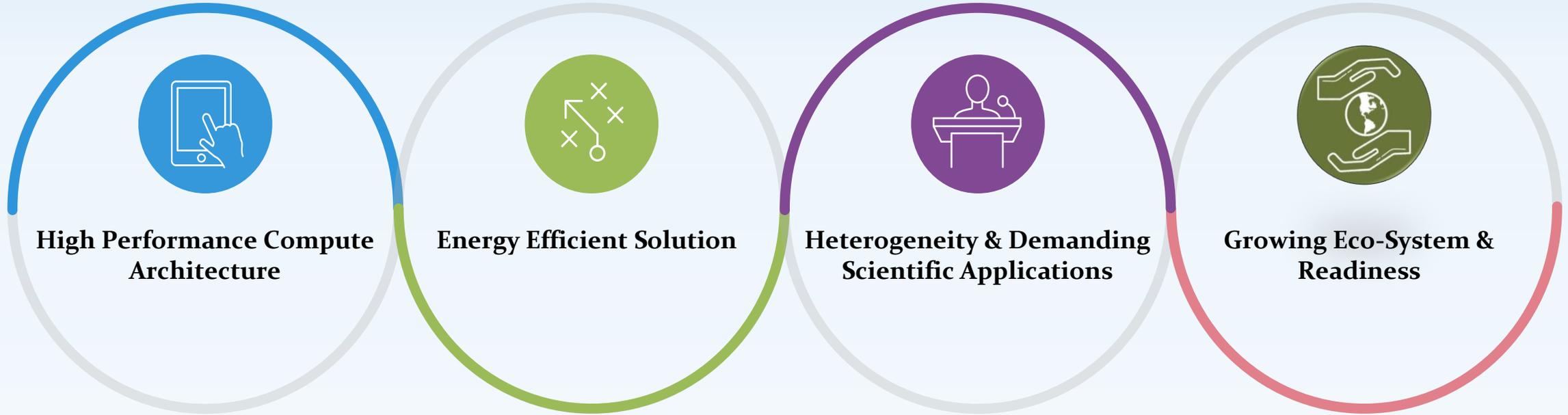
01 Cutting-edge ISA optimized for a wide range of HPC applications

02 Optimized Design offering with high level of SoC integration & power efficiency

03 Support for heterogeneous device integration & support for modern data structure needs for parallelism & virtualization.

**04** Software Stack Readiness – Compilers, Performance Libraries & Performance Analysis Tools

CAVIUM

World's Highest Performance Xeon Class ARM Server – 2nd generation product from Cavium

ARM Leadership –ThunderX2 FIRSTS for ARM Processors

- Multi threaded, fully out of order high performance ARMv8 custom cores
- Single and dual socket support
- Highest memory bandwidth & capacity
- Server class virtualization
- Server class RAS

- Extensive power management
- Rich IO configurations
- Extensive Power management
- Core and Socket level performance competitive with next gen incumbent server CPUs
- Comprehensive hardware and software ecosystem
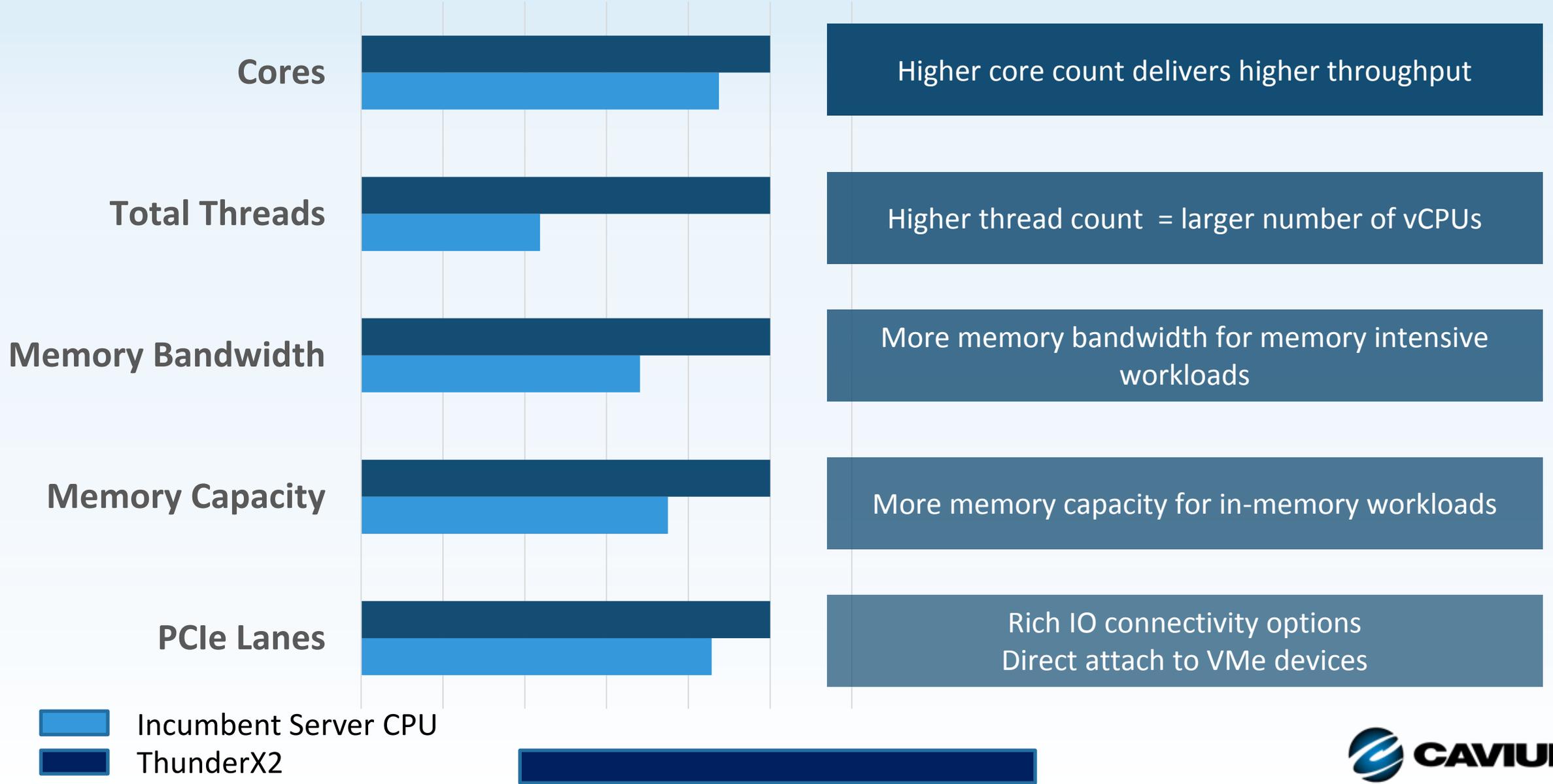
The Advanced Tech Demo Motherboard

1 HPE Proto-type PCA

2 Cavium Pre-Production SoCs

Optional Slot for GPU

Dedicated 1GbE Mgmt Port

THUNDER X2

THUNDER X2
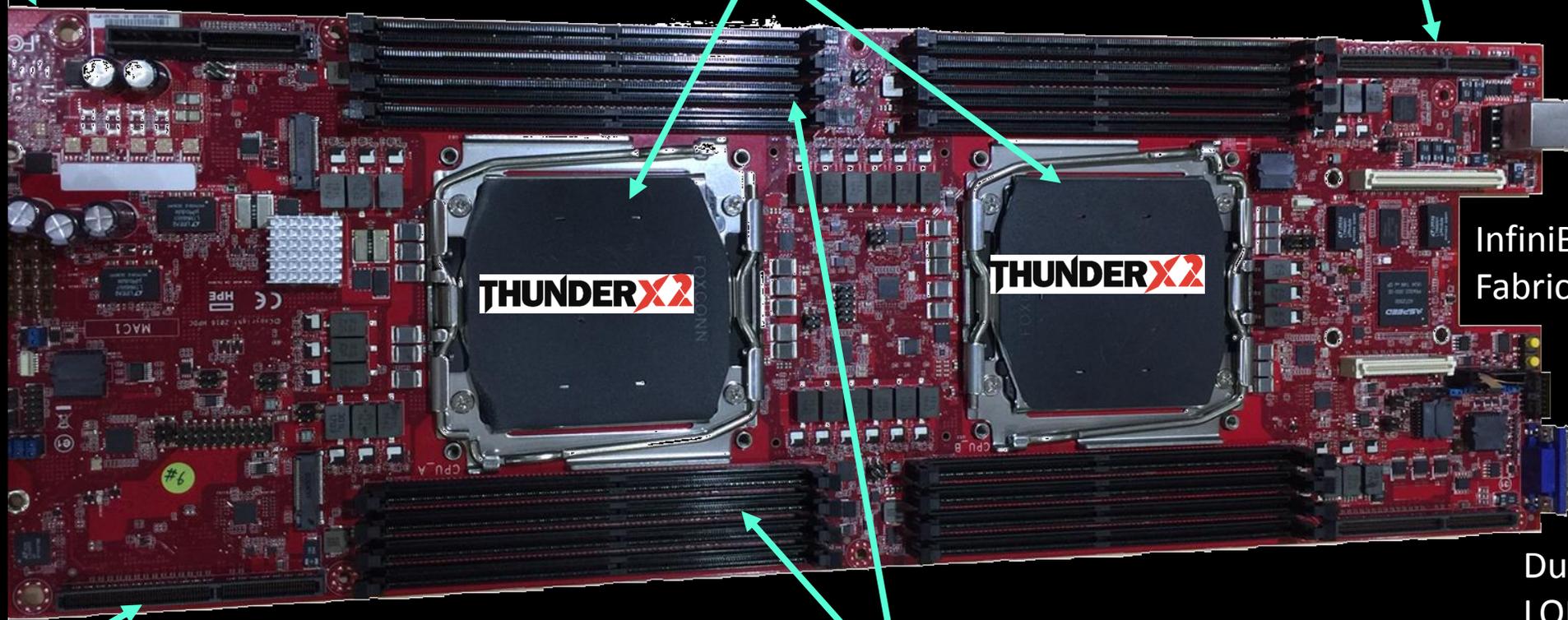
InfiniBand EDR Fabric Option (OCP)

Dual-Port 10GbE LOM

8 DIMMs per SoC (16 DIMMs total)

Optional Slot for GPU

Hewlett Packard Enterprise

The Advanced Tech Demo Chassis

2U Industry Standard Form Factor using HPEs scalable HPC enclosures

Hot pluggable trays, HPE Gen-10 Power supplies.
Reliable and proven infrastructure.

Hewlett Packard Enterprise

1U Tray for highest compute density
(4x 2P Nodes per Enclosure)

2U Tray for addition of acceleration
(2x 2P + 2GPU Nodes Per Enclosure)

ThunderX Momentum in HPC Continues to Grow...

2.2X — Memory Bandwidth
2.5X — Floating Point
3X — Integer
4X — Vectors
1.0 — THUNDERX
THUNDERX2
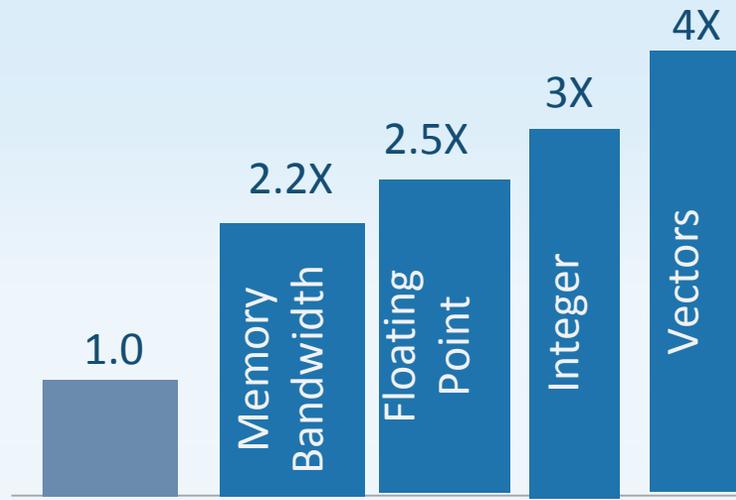
2-4X better HPC performance

THUNDERX

Barcelona Supercomputing Center — Centro Nacional de Supercomputación (BSC)

OAK RIDGE National Laboratory

Sandia National Laboratories

Hartree Centre — Science & Technology Facilities Council

Lenovo

CRAY THE SUPERCOMPUTER COMPANY

E4 COMPUTER ENGINEERING

PENGUIN COMPUTING

the MACHINE

MONT BLANC

GW4

Bull atos technologies

PENGUIN COMPUTING

THUNDERX2

Server platforms at World's premier HPC Labs

Significant HPC Engagements
Early Press Announcements

CAVIUM

THUNDERX2 Thriving HPC Ecosystem

Industry Leading Operating Systems

Debuggers, Profilers & Cluster Mgt

Open Source & Community Focus

Standards Based Sys Management & FW

Optimized Compilers & Dev Environments
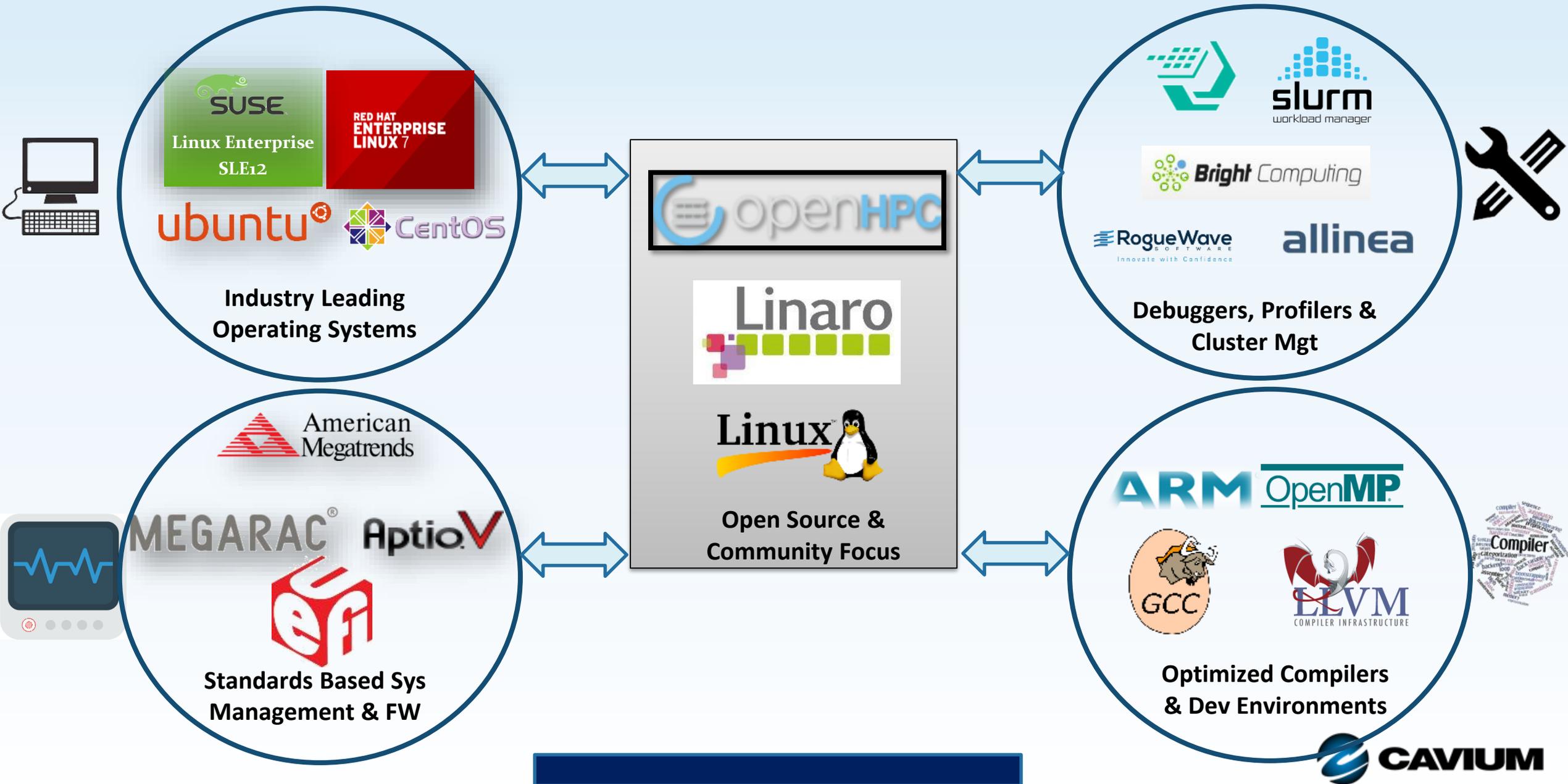
ARM HPC Users Group

Community Resources

- Mailing List
- Community Gitlab Group (Source Code, Wiki, Issue Tracking, etc.)
- Slack Channel

Events

- Going ARM Workshop (ISC 2017)
- Designing, Porting & Optimizing HPC Workloads for ARM Based Systems
- ARM Research Summit (Cambridge, UK) - Sept 2017

ARM Resources

- ARM HPC Developers Site
- ARM Research Gitlab Site

http://arm-hpc.gitlab.io

- Please join Mailing List

- Suggest Monthly Calls to start

- Potential F2F meeting before SC17 – options:
  - HPC Summit – Aug (San Diego)
  - LinaroConnect – Sept (San Fran)
  - ARM Research – Sept (Cambridge)

- SC17 – more formal kickoff

Learn More
@
www.cavium.com