

Future HPCC Computational Resources

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My Spiel

- Plans for 2016
 - Compute
 - Storage
 - Network
 - Services
- Future HPC platforms
- Long term planning

About Me

- Long time HPC practitioner, passionate teacher
- Cray Research Inc, SGI, General Motors, KAUST, Intel, UberCloud, Fermi Lab
- <http://www.linkedin.com/sharankalwani>
- Active Discussion Groups:
 - Innovative Uses of HPC
 - IDC HPC User Forum

Cluster 2016

- Started active planning
- Intensively Data Driven
- Organically grow this
- Bring innovative approaches
- Goal: help propel MSU higher up the Research Computing landscape

Cluster 2016

- Considering all aspects
- Diverse needs:
 - GPGPUs,
 - Classical cluster
 - Large Memory needs
 - High Core counts
 - Fast access to primary memory
 - Ubiquitous access to storage/data

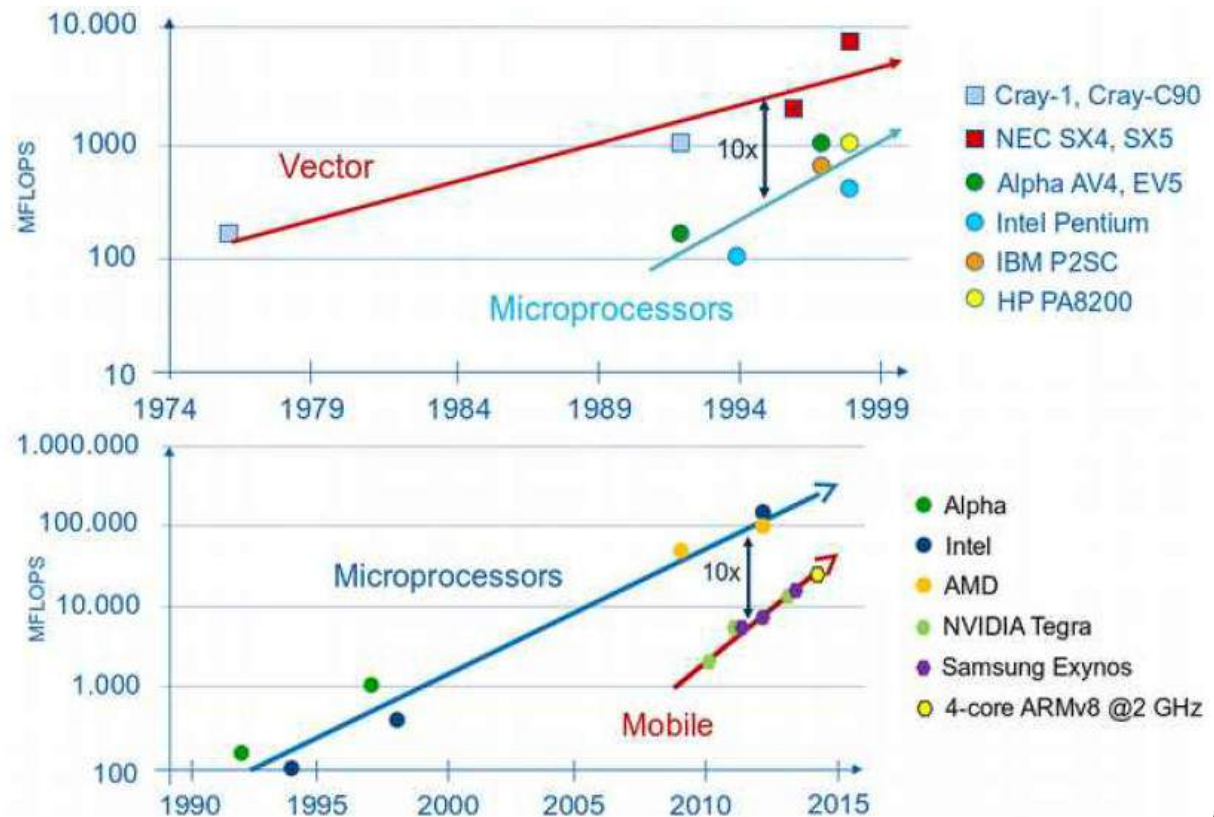
Cluster 2016

- Very data driven
- *“If we can measure it, we can improve it”!*
- Process similar to Formula 1



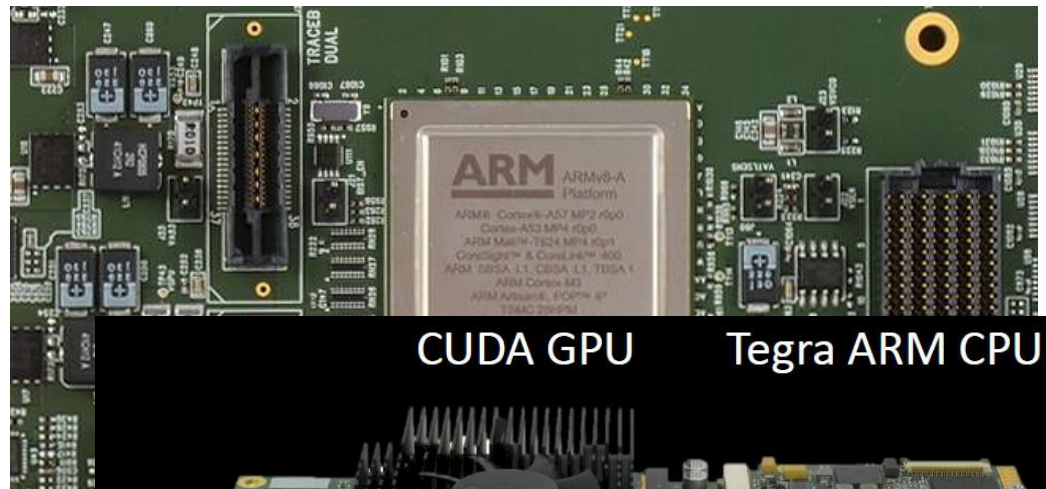
Future Possible Platforms

- ARM



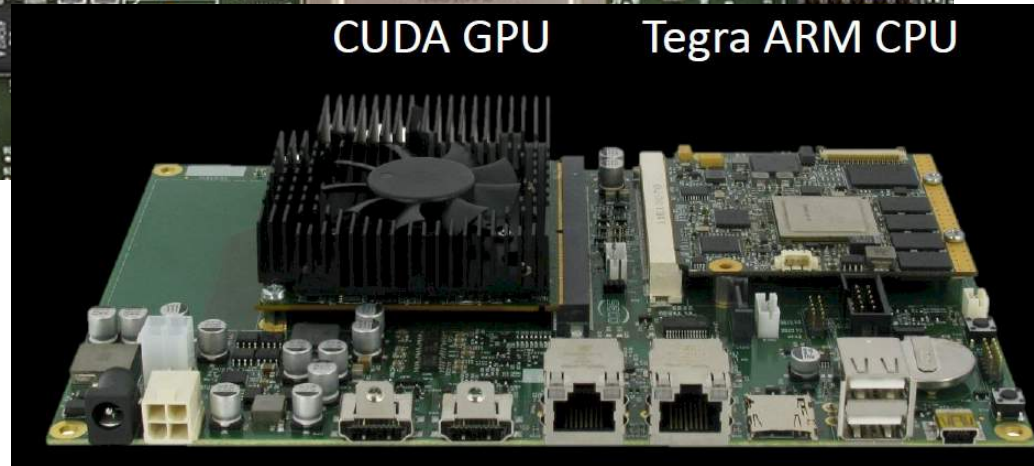
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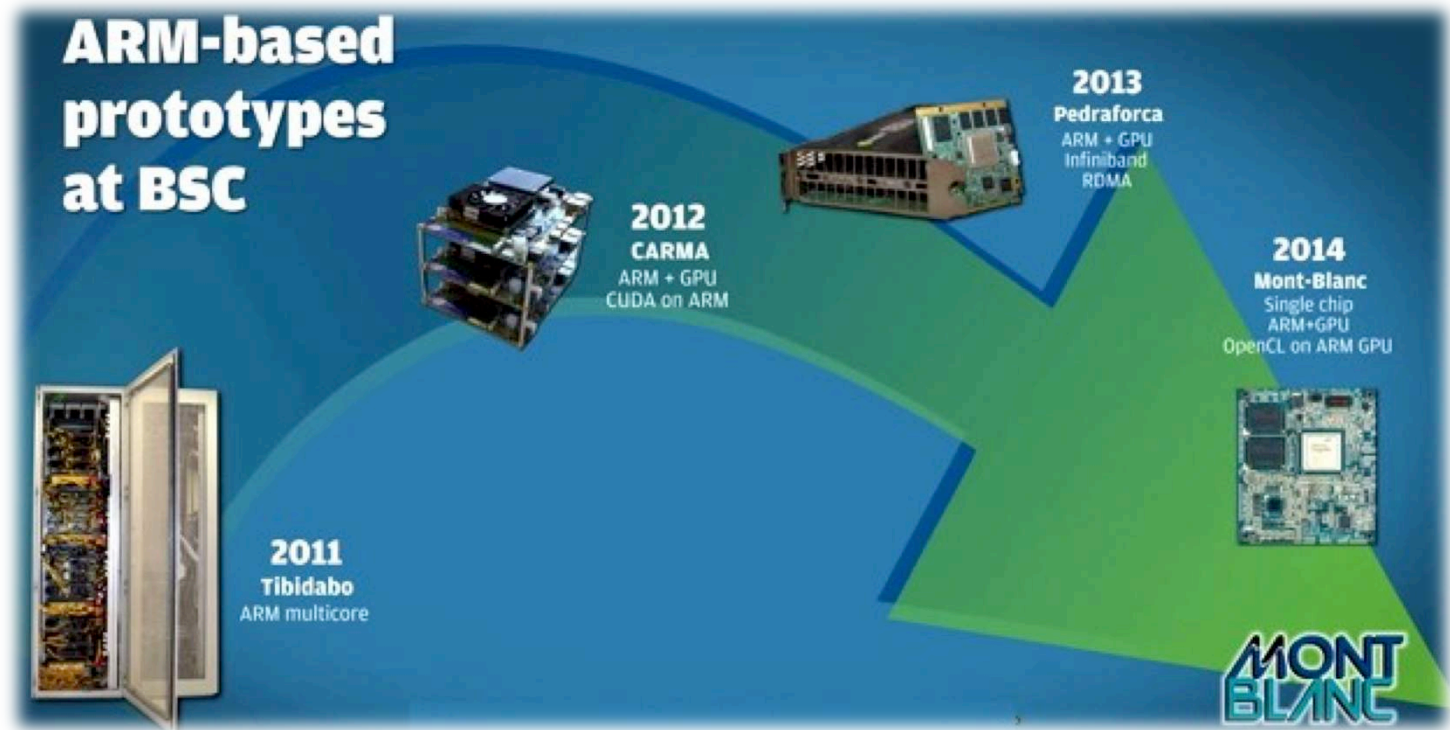
CUDA GPU

Tegra ARM CPU



Future Possible Platforms

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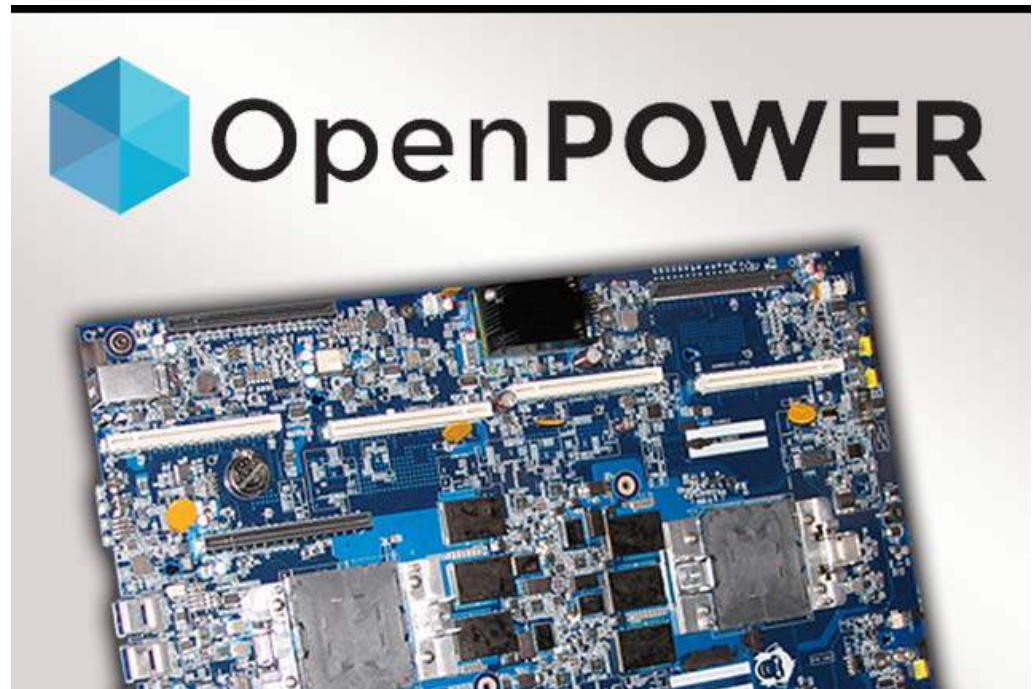
Future Possible Platforms

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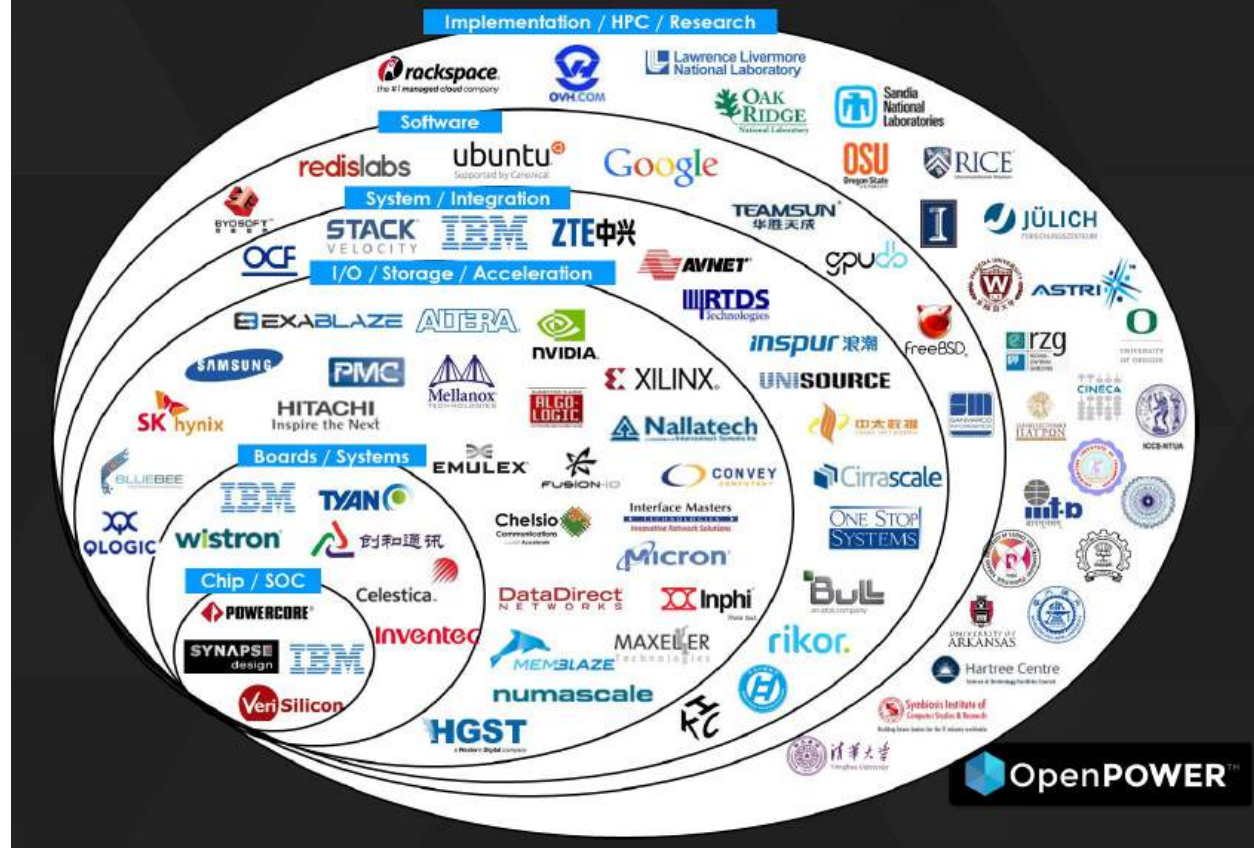
Future Possible Platforms

- OpenPOWER



Future Possible Platforms

The Community



Reasons for OpenPOWER

HARDWARE STACK

MECHANICAL

ELECTRICAL

DEVICE INTERFACES
(Sockets, Slots, etc.)

BOARD WIRING LAYOUTS &
BILL OF MATERIALS

FIRMWARE
(BIOS, BMC, Peripherals)

PROCESSOR & INTERCONNECT
(CPU, Coherency, FPGA, ASIC)

CHIP & CONTROLLER DESIGNS
(Licensing, Designs, Fabrication)

HOW OPEN?

OPEN
(Open Compute)

OPEN
(Open Compute)

LIMITED BUT GROWING
(Open Compute & OpenPOWER)

LIMITED BUT GROWING
(Open Compute & OpenPOWER)

MORE WITH OPENPOWER
(BIOS, other firmware)

MORE WITH OPENPOWER
(CAPI, more to come)

MORE WITH OPENPOWER
(more to come)

In between?

- NVlink

Rich Design Options for Next-Gen Servers

Over 2x Application Performance Speedup
When Next-Gen GPUs Connect via NVLink Versus PCIe

2 GPU speedup vs
PCIe based Server



Oct 22, 2015

ICER

Future (2018-)

- Data Center planning
- iCER/HPCCC key part
- Helping drive our needs strategically & tactically
- Innovative approaches across the spectrum
- Talent Development (lynchpin)

Future (2018-)

- Cloud?
 - Virtualization
 - Containers
 - Bottlenecks ~ straw in between!
 - Certain use cases
 - Public vs Private vs Hybrid ←

Questions?