Future opportunities and challenges using OpenPOWER

European OpenPOWER Summit (ADG Session)
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Piz Daint (5272 Intel Xeon & Nvidia K20X GPU nodes)
MeteoSwiss New Weather Supercomputer

World’s First GPU-Accelerated Weather Forecasting System


2x Racks

48 CPUs

192 Tesla K80 GPUs

> 90% of FLOPS from GPUs

Operational in 2016
Cray XC30
Cray XC30 (with K20X GPUs)
Cray XK6
Cray XK7 (with K20X GPUs)
Prototypes with accelerator devices
GPU nodes in a viz cluster
GPU cluster
Collaborative projects
HP2C training program
PASC conferences & workshops
High Performance High Productivity Computing (HP2C)
Platform for Advanced Scientific Computing (PASC)

2009 2010 2011 2012 2013 2014 2015 2016 ...

Application Investment & Engagement
Training and workshops
Prototypes & early access parallel systems
HPC installation and operations

* Timelines & releases are not precise
GPU-enabled MPI & MPS

- GPUDirect
- GPUDirect-RDMA
- OpenCL 1.0
- OpenCL 1.1
- OpenCL 1.2
- OpenCL 2.0
- OpenCL 2.x
- CUDA 2.x
- CUDA 3.x
- CUDA 4.x
- CUDA 5.x
- CUDA 6.x
- CUDA 7.x
- CUDA B.x
- Cray CS-Storm (dense K80)

- Cray XK6
- Cray XK7
- Cray XC30 & hybrid XC30

X86 cluster with C2070, M2050, S1070
iDataPlex cluster M2090
Testbed with Kepler & Xeon Phi

2009  2010  2011  2012  2013  2014  2015  2016  ...

Requirements analysis
Applications development and tuning

24/7 monitoring & troubleshooting

* Timelines & releases are not precise
Opportunities (Performance)

Source: Cray Inc.

Source: Microway
Opportunities (Monitoring)

Detecting and Managing GPU Failures, Nick Cardo, CUG, 2015

Challenges (accessibility, commodity & community)

- CSCS GPU based systems
  - X86 based (AMD & Intel)
  - Commodity (InfiniBand) plus proprietary (Cray)
  - Lustre
  - ... single node environment typically identical to a laptop

- Code development environment and tools
  - Similar on clusters, Cray, laptop, ...
  - Containers with GPUs

- Leveraging community solutions and connecting with widely accessible platforms
  - Connecting bottom up and top down
Challenges (interoperability)

- There are many many logos on the foundation 😊
- A user concerns
  - Most already mentioned related to performance portability and interoperability
  - Resource management systems
- An operational concern aka operational management
  - Resource management
  - Scheduling systems
  - Log analysis
  - Performance analysis
  - Provisioning
  - …
Thank you for your attention.