Linaro HPC SIG Ecosystem

Accelerating deployment of Arm-based solutions

Paul Isaac’s, HPC Technical Lead
SC’19 Arm HPC User Group Session
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Linaro Enables Open-Source Solutions on Arm technology

- SVE support
- Optimised libraries
- OpenHPC CI / CT / CD

Data Center & Cloud

- Bootloader and kernel
- IaaS, PaaS, Big Data

High Performing Computing

- Deep Learning at the edge
- Arm NN and Arm CL

Artificial Intelligence

- Time Sensitive Networking
- Dependable Boot
- Edge Reference Platform

Edge & Fog Computing

- Smart Sensors & IoT Devices
- Open Source RTOS
- Security & Trusted Firmware

IoT & Embedded

- Android Common Kernel Upstreaming
- AOSP Reference Boards

Consumer

- Secure Software for Vehicles & Transportation Systems

Autonomous Vehicles

- IoT & Edge
- Computing

Open-Source Solutions

- Consumer
- Autonomous Vehicles
- Data Center & Cloud
- Edge & Fog Computing
- IoT & Embedded
- Open-Source Solutions

For more info visit linaro.org/hpc
LDCG High Performance Computing (HPC) SIG

Collaborative project building on the success of the Linaro Datacenter & Cloud Group

Driving datacenter-class, open-source HPC development on Arm
Identify and adopt standards to make HPC deployment on Arm a commercial imperative. Develop real-world use cases that reap the benefits of Arm while ensuring interoperability, modularization, orchestration

Lower deployment & management barriers
Leverage the Linaro Developer Cloud and other services to develop cost-effective Cloud-integrated HPC development frameworks and generate reference implementations to accelerate

Member-driven with Advisory Board
Members determine work completed by engineering resources while advisory board provides subject matter expertise on HPC requirements and guidance and feedback on ongoing HPC SIG strategic direction and roadmap

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HPC SIG 2018~2019 Key Highlights

- Finished GCC 8 SVE support (including vectorisation)
- Demonstrated QEMU SVE support at HKG18
- Presented & published automation of HPC Lab with Ansible, ISC’18
- HCQC found a number of core problems in LLVM and started fixing
- Community: HPC workshop Santa Clara, Jul.’18; HPC ASIA workshop, Jan.’19
- Dedicated Systems
  - Cavium TX2  4 (+6 for openHPC)
  - Qualcomm QDT  5
  - Huawei D05  2
  - Huawei D03  4
- Automatically deploying 2 clusters + OpenHPC and 3 benchmark machines
  - With CentOS, OpenSUSE, Debian, ERP
- Access to MLAB and Developer Cloud
- Partnership for Dedicated OpenHPC CI/CT/CD

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OpenHPC Partnership

- OpenHPC TSC 2017~2019:
  - Arm Testing Coordinator
- Deployed OpenHPC packages locally and provide feedback to the community
- OpenHPC Automation
- Ansible playbook for OpenHPC installation
- Linaro hosts Arm servers for build and test infrastructure
- 6 Cavium Thunder X2’s setup for exclusive CI/CT/CD for TACC
HPC SIG 2019~2020 Projects

- Started Lustre testing and will be expand to provide a community CI
- Valgrind ARMv8.x-A support, including SVE
- SVE support in LLVM Debugger
- Testing will be expanded to Fugaku soon
- AI on Supercomputers
  - Tensorflow
  - AI/ML workloads
Long Term Strategic Scope

**HPC**
- OpenHPC - ARM enablement, Cloud CI
- Scalable Vector Extension (SVE) for ARMv8-A
- Dev Tools
  - Compiler optimisations
    - LLVM and GCC for Fortran and C optimisations
  - openMP
  - Standardised profilers and debuggers
- HPC Orchestration
  - OpenHPC
  - Other OS Packages (SLURM)
- Runtime auto detection of micro arch.
- Application Libraries
  - Math and scientific libraries optimised for ARMv8-A
  - MPICH, FFTW, BLAS, cuBLAS, LAPACK, openBLAS, MPI, ScALAPACK And more.....
- Hardware acceleration
  - CCIX, CXL, GPGPU, FPGA
- Schedulers
- Power Management
- Security
- Artificial Intelligence

**HPDA**
- Mapping key algorithms to a specific industry
- Library optimisations
- Datasets
- Network I/O feeds

**Machine Learning**
- MLDM algorithms
- Research emerging ML projects
- FPGA
Accelerate Deployment of ARM into Data Centers

The Linaro Developer Cloud provides open-source developers and commercial ISVs access to the latest ARM-based, server-class hardware running mainstream environments, to enable the IoT, Edge and Cloud ecosystem to develop, port, test and enable CI/CD for the ARM architecture.

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Why Join Linaro?

- Engineering collaboration with industry leaders on the latest ARM technology
- Scale across multiple processors, platforms and projects
- Test and validation
- Ensure equal representation of community and commercial distros
- Neutral representation with upstream maintainers
- Shared development effort between silicon vendors, distros, OEM/ODMs,...

- Goals
  - Ensure parity with other architectures
  - Accelerate time to market
  - Reduce ongoing maintenance costs
Thank you

Join Linaro to accelerate deployment of your ARM-based solutions through collaboration

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