



# arm

## HPC @ Arm

Growing momentum in the ecosystem



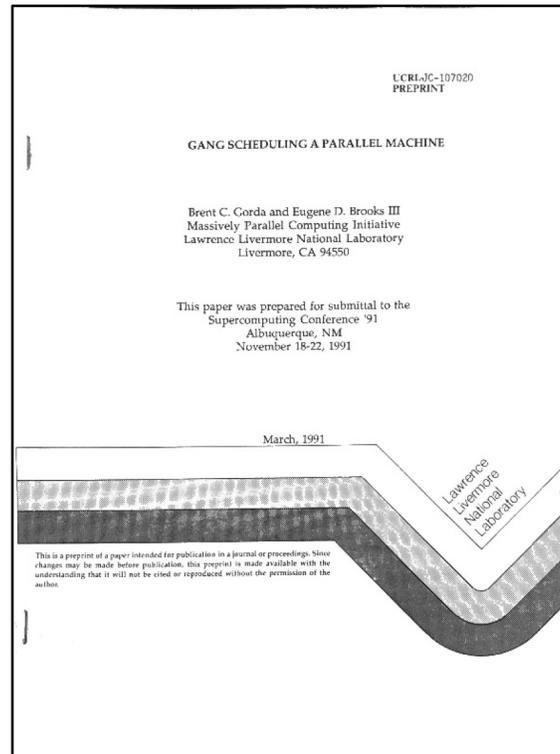
# My Background

Transitioning from Vector -> Parallel in HPC

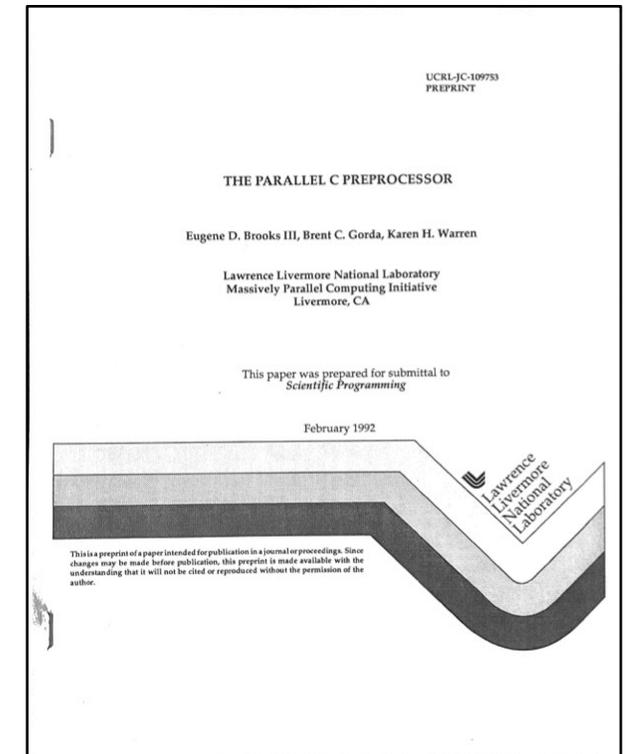
## Attack of the Killer Micros



## Gang Scheduler (SLURM)



## Parallel C (UPC)



# More

## Scaling up

### IBM BlueGene

**Rack**  
1,024 compute nodes  
Up to 512 GB memory  
Up to 128 I/O nodes  
Up to 5.6 TFLOPS

**System**  
Up to 64 racks  
Up to 65,536 compute nodes with 32 TB memory (64x32x32 torus)  
Up to 360 TFLOPS

**Compute card**  
2 BGL chips  
Up to 1 GB memory (512 MB per node)  
Up to 11.2 GFLOPS

**Node card**  
16 compute cards (32 compute nodes)  
Up to 16 GB memory  
Up to 2 I/O cards (4 I/O nodes)  
Up to 180 GFLOPS

**BGL chip**  
Dual 700 MHz CPUs  
4 MB L3  
Up to 5.6 GFLOPS

Figure 1 | The Blue Gene/L supercomputer architecture. Blue Gene/L is built using system-on-a-chip

### Student Cluster Competition

**SC18 Student Cluster Competition**

**2018 Student Cluster Competition**

Once again, the SC Conference series is pleased to host the Student Cluster Competition (SCC), now in its twelfth year, at SC18. The SCC is an opportunity for students to showcase their expertise in a friendly, yet spirited, competition. Held as part of the Students@SC program, the SCC is designed to introduce the next generation of students to the high-performance computing community. The competition draws teams of undergraduate students from around the world.

The application reviews have been completed and the SC18 Student Cluster Competition (SCC) committee has invited 15 teams to compete in this year's event in Dallas, Texas. One extra slot is reserved for the winner of the ISC 2018 Student Cluster Competition. The teams hail from across the U.S., and from Asia, Europe, and Australia.

**SCC Winners**

- SC17: Denver, CO**  
Overall: Nanyang Technological University (91.5 Teraflops)  
Linpack: Nanyang Technological University (31.15 Teraflops)
- SC16: Salt Lake City, UT**  
Overall: University of Science and Technology of China (31.15 Teraflops)  
Linpack: National Tsing Hua University (7.134 Teraflops)
- SC15: Austin, TX**  
Overall: Tsinghua University (7.134 Teraflops)  
Linpack: Technische Universität München (10.07 Teraflops)
- SC14: New Orleans, LA**  
Overall: University of Texas at Austin (10.07 Teraflops)  
Linpack: National Tsing Hua University (10.07 Teraflops)
- SC13: Denver, CO**  
Overall: University of Texas at Austin (8.224 Teraflops)  
Linpack: Nat. Univ. of Defense Tech. (8.224 Teraflops)  
Commodity: Bentley University and

### Whamcloud & Lustre

**The Register**  
Biting the hand that feeds IT

DATA CENTRE SOFTWARE SECURITY DEVOPS BUSINESS PERSONAL TECH SCIENCE

LECTURES

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Data Centre > Storage

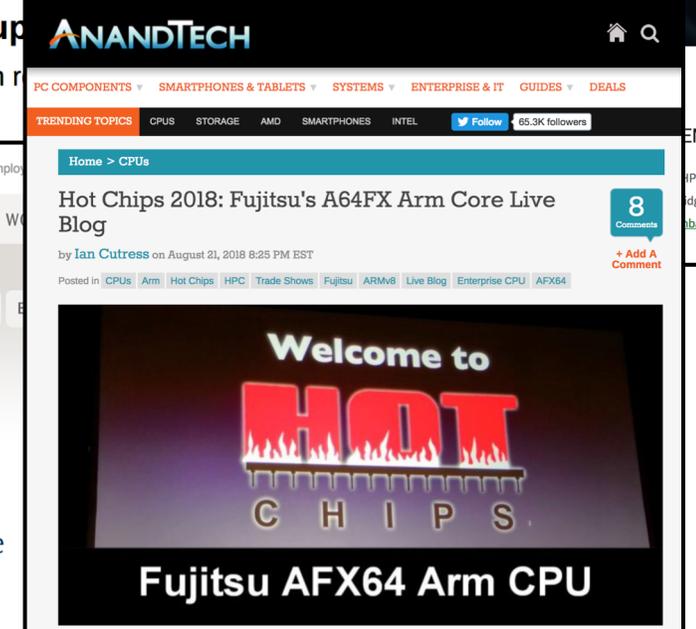
## Whamcloud flogs wild Lustre pig into obedience with data whip

It's the only language these open brutes understand

By Chris Mellor 21 Jun 2012 at 07:02 SHARE

# Building HPC Momentum with Arm

- MontBlanc
- Catalyst Programme
  - Leading-edge Marvel/ThunderX2 systems
  - Partnership with HPE/Universities in UK
- Publicly announced systems:
  - Isambard (Cray @ Bristol)
  - Astra (HPE @ SNL)
  - Wombat (@ORNL)
- Fujitsu AFX64 Arm CPU @ HotChips
- More to come – exciting times



# The Maturing Software Environment

Job schedulers and Resource Management: SLURM, IBM LSF, Altair PBS Pro, etc.

HPC Applications:  
Open-source, Owned, and Commercial ISV codes

App/ISA specific optimizations, optimized libs and intrinsics:  
Arm PL, BLAS, FFTW, etc.

Parallelism standards:  
OpenMP (omp / gomp),  
MPI, SHMEM  
(see below)

HPC Programming Languages:  
Fortran, C, C++  
via  
GNU, LLVM, Arm  
& OEMs

Debug and performance analysis tools:  
Arm Forge,  
Rogue Wave,  
TAU, etc.

Filesystems:  
BeeGFS,  
LUSTRE, ZFS,  
HDFS, GPFS

User-space utilities, scripting, container, and other packages:  
Singularity,  
Openstack,  
OpenHPC,  
Python, NumPy,  
SciPy, etc.

Cluster Management Tools:  
Bright, HPE CMU, xCat, Warewulf

Silicon Suppliers:  
Marvell, Fujitsu,  
Mellanox

OEM/ODM's:  
Cray, HPE, ATOS-Bull, Fujitsu,  
Gigabyte, Inventec, Foxconn

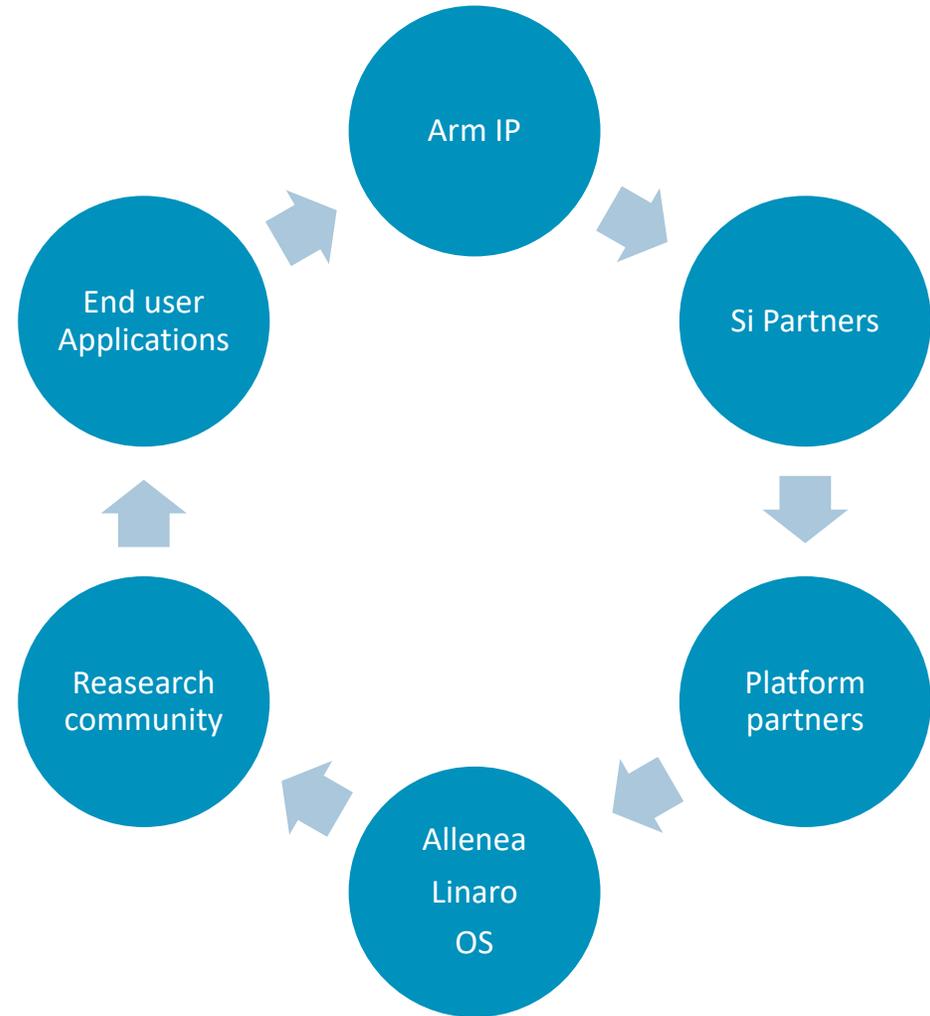
Communication Stacks and run-times:  
Mellanox IB/OFED/HPC-X, OpenMPI, MPICH, MVAPICH2, OpenSHMEM, OpenUCX, HPE MPI

Linux OS Distro of choice:  
RHEL, SUSE, CENTOS,...

Arm Server Ready Platform:  
Standard OS compatible FW and RAS features

# The Growing Arm HPC Ecosystem – an expanding story

- The virtuous cycle for HPC with Arm
  - Arm IP -> Si partners -> platform partners
  - Allinea Software + OSS
- Research activity
  - Fundamental to the ecosystem
  - Opportunity for commercialization
- Your role in the success of the community



# How to find information

www.arm.com/hpc

Home / HPC

## Welcome to the Arm HPC Ecosystem

Overview HPC Software ▾ Blog News Events Resources ▾



### Get started

Learn about HPC on 64-bit Arm (AArch64) platforms.

[Get started on Arm](#)



### Develop

Maximum performance for your HPC and scientific codes.

[Learn more](#)



### Run

Build and run common HPC applications on Arm.

[Learn more](#)



### Collaborate

Join and share with a growing community of HPC users.

[Learn more](#)

Software Ecosystem for HPC on Arm

Learn more about commercial and open-source HPC tools.

community.arm.com/tools/hpc/

Communities Blog Forums Activity Support Arm Employees

## High Performance Computing ▾

Blog  
Forums

New

### Arm Alinea Studio 18.4 now available with support...

Arm Alinea Studio 18.4 is now available, with an updated Arm Performance Libraries and improved compilers. In this blog, I have captured the highlights of the release, including new Fortran Directives (IVDEP, OMP SIMD), compiler option updates, new math routines and other performance improvements. New Fortran directives - IVDEP and OMP SIMD IVDEP support Arm Fortran Compiler in 18.4 supports the IVDEP Fortran Directive. You can use this g...

Ashok Bhat

#### Unanswered Questions

Unanswered questions and discussions

By date ▾ Descending ▾

Welcome to the new HPC Community Forum 34 views 0 replies Started 7 days ago by Darren Cepulis

#### Latest Blogs



##### Pulling it all together: The Arm HPC Ecosystem and Community

We provide an overview of the information and collaboration hubs available to the Arm High Performance...

Darren Cepulis



##### Arm Alinea Studio 18.4 now available with support for new Fortran directive and math routines

Arm Alinea Studio 18.4 is now available, with an updated Arm Performance Libraries and improved compilers...

Ashok Bhat



##### Continuous Integration with Arm Forge

Continuous integration (CI) is used to improve software integration and quality. In this article we are...

Florent Lebeau

#### Community Owners

The place for collaboration, information sharing, and feedback in the realm of super-computing and large scale systems.

Feedback

Get email digest

Invite people

Bookmark this community

Community RSS

#### HPC - Most active

Rank Name

1	Darren Cepulis
1	Beau Paisley

#### Resources

- Arm HPC developer
- HPC Packages Wiki

Activity Story Stream

Thank You

Danke

Merci

谢谢

ありがとう

Gracias

Kiitos

감사합니다

धन्यवाद

תודה

**arm**

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[community.arm.com/tools/hpc/](http://community.arm.com/tools/hpc/)

[brent.gorda@arm.com](mailto:brent.gorda@arm.com)