



arm

HPC Tools by Arm

Up, and to the right...

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28th June 2018

An aerial night view of New York City, showing the dense urban landscape with numerous lit-up buildings and streets. Overlaid on the image is a network diagram consisting of several white dots connected by thin white lines, forming a web-like structure that spans across the city. The title 'Arm Technology Already Connects the World' is written in white text across the top of the image.

Arm Technology Already Connects the World

Arm is ubiquitous

21 billion chips sold by partners in 2017 alone

Mobile/Embedded/IoT/
Automotive/Server/GPUs

Partnership is key

We design IP, not
manufacture chips

Partners build products
for their target markets

Choice is good

One size is not always the
best fit for all

HPC is a great fit for
co-design and collaboration

Open source and commercial tools

Arm and partners collaborating to increase end-user performance

Open source

Compiler performance of both GCC and LLVM compilers is enhanced by Arm

OpenHPC 1.3.5 release is now out

- Builds are available for both CentOS and SUSE

Community building for HPC apps porting and performance

- Arm HPC Packages wiki:
<https://gitlab.com/arm-hpc/>

Arm Alinea Studio

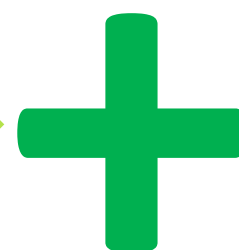
- **Comprehensive and integrated tool suite**
- **Seamless end-to-end workflow** from getting started to advanced optimization of your workloads
- **Commercially supported** by Arm
- **Frequent releases** with continuous performance improvements
- **Ready for current and future generations** of server-class Arm-based platforms

arm

arm ALLINEA STUDIO | Launched at SC17

Meets the requirements of HPC developers on Arm

**Cross-platform debug
and profile tools**



**Arm-only Compiler
and Libraries**

Forge and
Performance Reports
supports server-class
Arm-based platforms
like Cavium ThunderX2

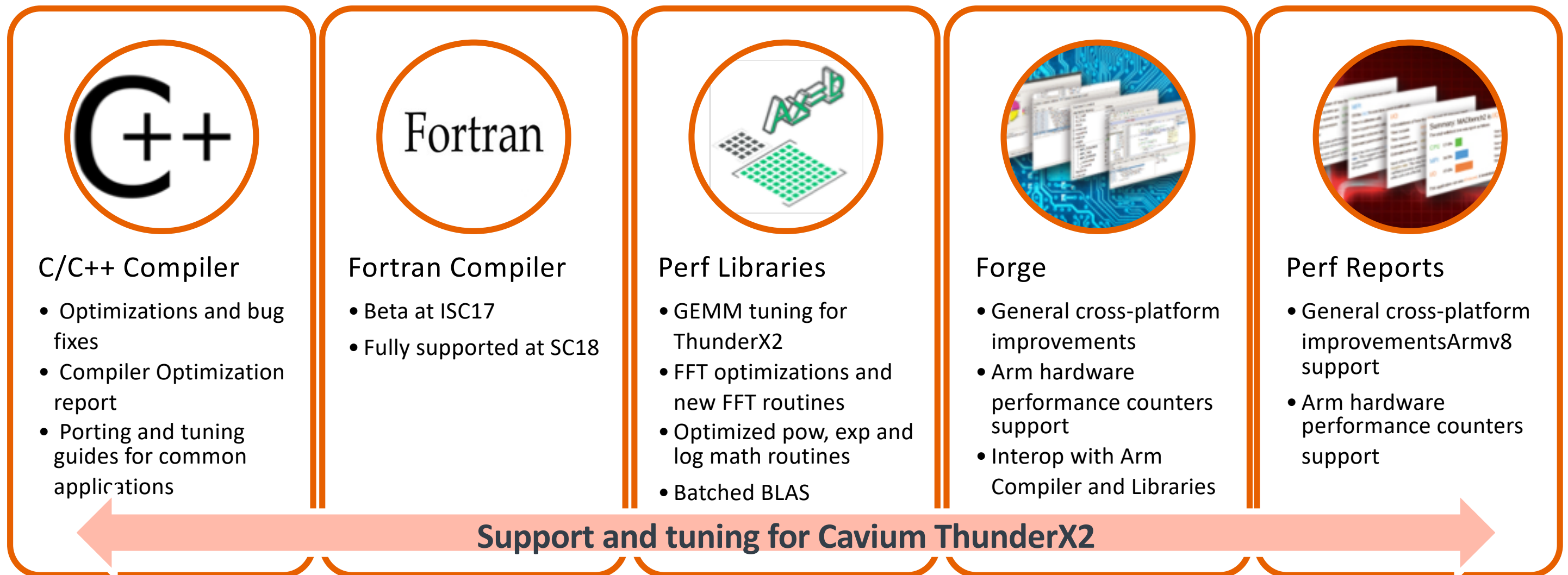
arm ALLINEA STUDIO

- ❖ C/C++ & Fortran Compiler
- ❖ Performance Libraries
- ❖ Forge (DDT and MAP)
- ❖ Performance Reports

Arm Compilers
fully integrated and
tested with
Forge and
Performance Reports

Progress in the last year

A fully integrated tools suite for deployment on Arm systems



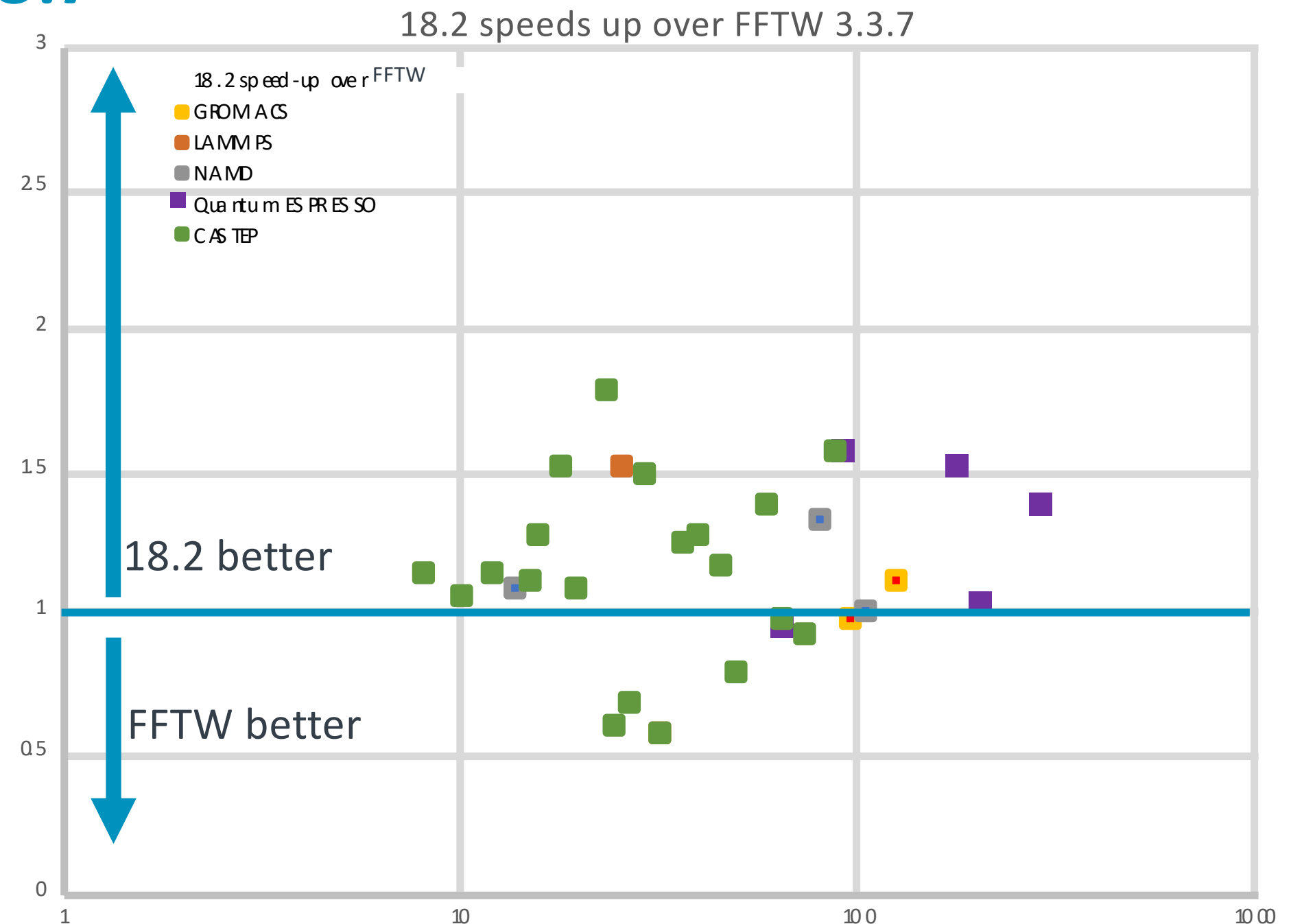
18.2 release vs FFTW 3.3.7

FFT timings on CTX2

- 1-d complex-complex double precision
- Higher means new Arm Performance Libraries FFT implementation better than FFTW

Results show:

- Average about 30% faster than FFTW
- Lots of this comes from better usage of vectors on CTX2
- Cases where we are still slower are:
 - Very small (no major issue)
 - Powers of primes
 - 143, 187 and 198 times tables



Software Ecosystem – HPC Applications Porting

GROMACS

LAMMPS

CESM

MrBayes

Bowtie

NAMD

AMBER

Paraview

SIESTA

VMD

WRF

Quantum
ESPRESSO

CP2k

MILC

GEANT4

OpenFOAM

GAMESS

VisIT

DL_POLY

NEMO

BLAST

NWCHEM

Abinit

BWA

QMCPACK

Build recipes online at <https://gitlab.com/arm-hpc/packages/wikis/home>

Chem/Phys

Weather

CFD

Visualization

Genomics

Arm-HPC GitLab site : Recipes for how to compile things

https://gitlab.com/arm-hpc/packages/wikis/home

Dynamic list of common HPC applications

- Provides focus for porting progress
- Community driven
- Maintained by Arm, but anyone can join and contribute.
- Allows developers to share recipes, and learn from progress on other applications
- Provides a mechanism for tracking status of applications and package sets (e.g. OpenHPC packages, Mantevo, etc.)

Up-to-date summary of package status

Package	External URL	Last Wiki Update	BuildMaturity	CompilesARMCompiler	CompilesGCC	NEONOptimized
EPOCH	http://www.ccpp.ac.uk	19/10/17 22:10:20	NeedsPatch	Yes	Yes	-
SDF	https://github.com/keithbennett/SDF	20/10/17 00:13:45	NeedsPatch	Yes	Yes	-
VPIC	https://github.com/lanl/vpic	19/10/17 22:10:20	-	Yes	Yes	-
adios	http://www.olcf.ornl.gov/center-projects/adios/	17/07/17 23:33:11	-	Yes	Yes	-
arpack	http://www.caam.rice.edu/software/ARPACK/	17/07/17 23:33:11	-	Yes	-	-
autoconf	http://www.gnu.org/software/autoconf/autoconf.html	01/08/17 21:48:30	-	Yes	Yes	-
automake	http://www.gnu.org/software/automake	18/07/17 13:41:43	-	Yes	Yes	-
bookleaf	https://uk-mac.github.io/BookLeaf/	17/07/17 23:33:11	-	Yes	Yes	-
boost	http://www.boost.org	18/07/17 11:29:00	-	Yes	Yes	-
ccs-qcd	https://github.com/fiber-miniapp/ccs-qcd	01/08/17 21:43:40	-	Yes	-	-
cloverleaf	http://uk-mac.github.io/CloverLeaf/	19/10/17 22:10:20	Upstream	Yes	Yes	-
cloverleaf3d	http://uk-mac.github.io/CloverLeaf3D/	24/07/17 21:41:31	Upstream	Yes	Yes	-
comd	http://exmatex.github.io/CoMD	24/07/17 21:36:31	Upstream	Yes	Yes	-
dgemm	http://www.nersc.gov/research-and-development/apex/apex-bench	24/07/17 21:36:31	NeedsPatch	Yes	Yes	-
ffb	http://www.ciss.iis.u-tokyo.ac.jp/riss/english/project/fluid/	24/07/17 21:36:31	-	Yes	-	-
fftw	https://github.com/FFTW/fftw3	17/07/17 23:33:11	-	Yes	Yes	Yes
gnu-scientific-library	http://www.gnu.org/software/gsl/	18/07/17 07:08:24	-	Yes	Yes	-
gromacs	http://www.gromacs.org/	24/07/17 21:36:31	-	Yes	Yes	-
hdf5	http://www.hdfgroup.org	17/07/17 23:33:11	-	Yes	Yes	-
hpc-challenge	http://icl.cs.utk.edu/hpcc/index.html	24/07/17 21:36:31	Upstream	Yes	Yes	-
hpccg	http://mantevo.org/downloads/HPCCG-1.0.html	24/07/17 21:36:31	Upstream	Yes	Yes	-
hpcg	http://www.nersc.gov/research-and-development/apex/apex-bench	24/07/17 21:48:22	Upstream	Yes	Yes	-
hybre	https://computation.llnl.gov/project/linear_solvers/software.php	17/07/17 23:33:11	-	Yes	Yes	-
imb		17/07/17 23:33:11	-	Yes	Yes	-
lammps	http://lammps.sandia.gov/	19/10/17 22:10:20	-	Yes	Yes	-
libtool		18/07/17 13:41:43	-	Yes	Yes	-
lulesh	https://codesign.llnl.gov/lulesh.php	17/07/17 23:33:11	-	Yes	-	-
metis		17/07/17 23:33:11	-	Yes	Yes	-
minizero	http://mantevo.org/downloads/minizero_1.0.html	24/07/17 21:36:31	NeedsPatch	Yes	Yes	-



Arm Instruction Emulator

Run 64-bit user-space Linux code that uses new hardware features on current Arm hardware

- SVE support available now.

DynamoRIO DBT framework ported to AArch64

Arm Instruction Emulator (ArmlE) 18.1 released, based on DynamoRIO

- Run SVE apps on AArch64 servers
- In beta, available for free download

<https://developer.arm.com/products/software-development-tools/hpc/arm-instruction-emulator/download>

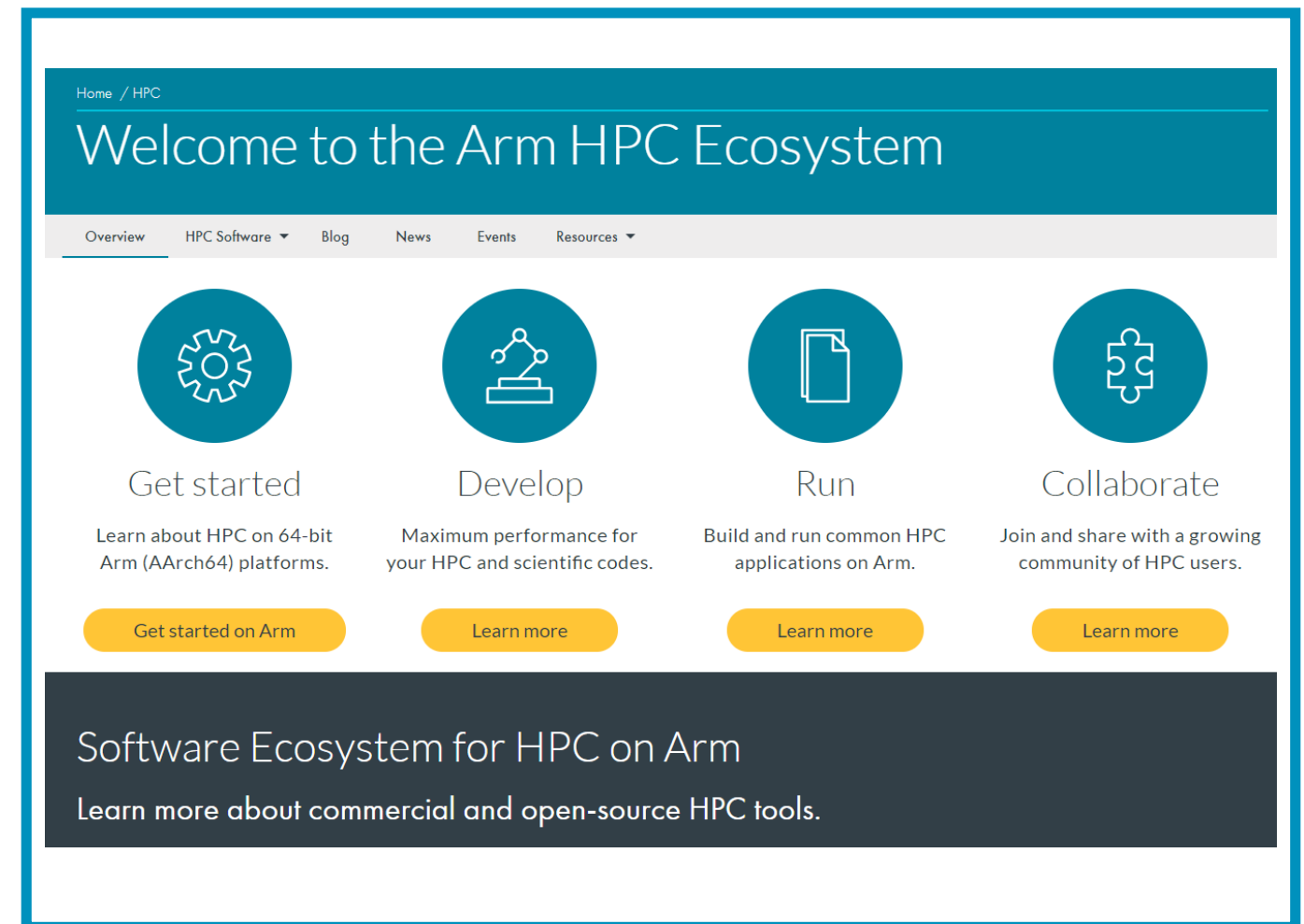
<https://developer.arm.com/products/software-development-tools/hpc/arm-instruction-emulator/get-started>



Arm HPC Ecosystem website: www.arm.com/hpc

Clearinghouse for Arm's HPC ecosystem, information channels, and collaboration

- Latest events, news, blogs, and collateral including whitepapers, webinars, and presentations
- Links to HPC open-source & commercial SW packages
- Recipes for porting HPC apps
- New Arm HPC User Group Forum
- Curated and moderated by Arm



Participate, share progress, and expertise

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