openHPC
https://openhpc.community

OpenHPC Community BoF

Karl W. Schulz, Derek Simmel, Eric Coulter, Jason Wells, Chris Simmons, and David Brayford

OpenHPC Technical Steering Committee (TSC) Members

November 17, 2021 • St. Louis, MO (Virtual Presentation)

Live Question Tool
https://meet.ps/openhpc-sc21

Outline

- Part I: Presentation (~30 min)
  - Community members and growth snapshots
  - CentOS8 EOL announcement
  - Latest release

- Part II: Open Forum (~30 min)

Live Question Tool
https://meet.ps/openhpc-sc21

SUBMIT NEW QUESTION

Q&A PULSE ABOUT

Current Project Members

OpenHPC TSC – Individual Members

- Reese Baird, SpaceX (Maintainer)
- David Brayford, LRZ (Maintainer)
- Eric Coulter, Indiana University (End-User/Site Representative)
- Chris Downing, Amazon Web Services (Maintainer)
- Richard Henwood, Arm (Maintainer)
- Caetano Melone, Stanford (Maintainer)
- Amarpal Kapoor, Intel (Maintainer)
- Michael Karo, Altair (Component Development Representative)
- Cyrus Proctor, Speqtral Quantum Tech. (Maintainer)
- Adrian Reber, Red Hat (Maintainer)
- Karl W. Schulz, UT Austin (Project Lead, Testing Coordinator)
- Jeremey Siadal, Intel (Maintainer)
- Derek Simmel, Pittsburgh Supercomputing Center (End-User/Site Representative)
- Chris Simmons, UT Dallas (Maintainer)
- Caeser Stoica, Lenovo (Maintainer)
- Nirmala Sundararajan, Dell (Maintainer)
- Jason Wells, Bentley University (End-User/Site Representative)

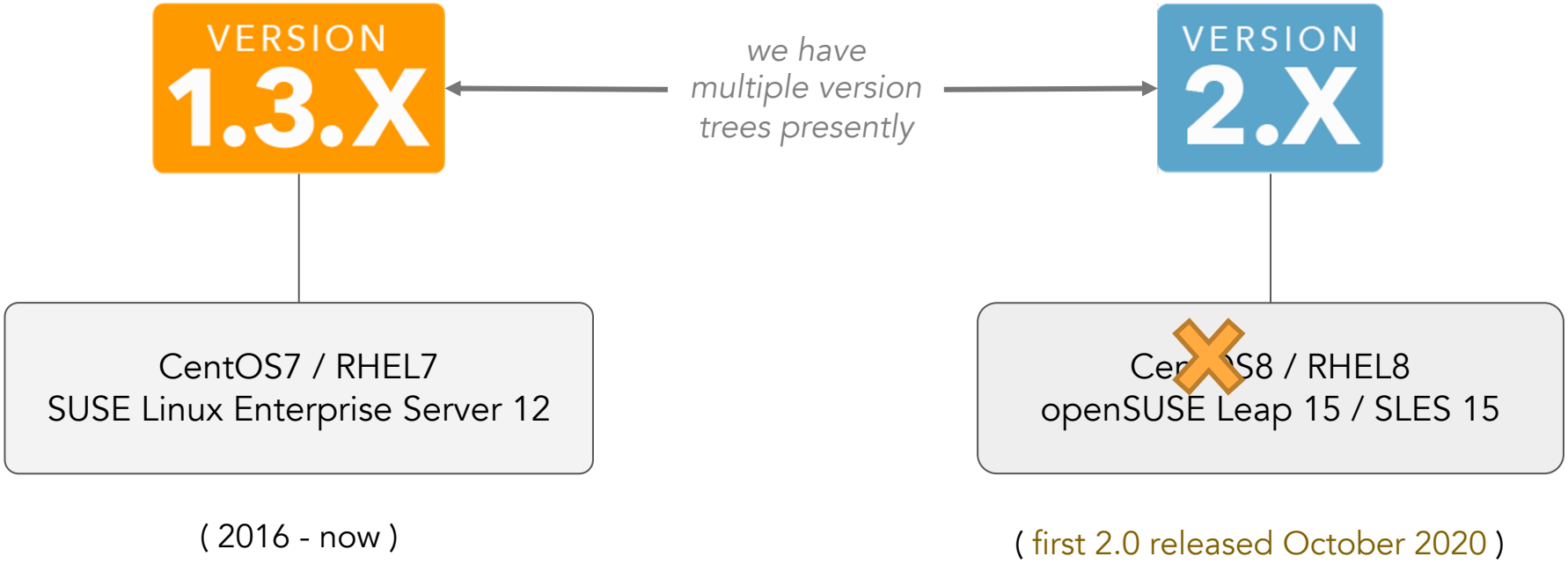
https://github.com/openhpc/ohpc/wiki/Governance-Overview

New members for 2021-2022

Interested in participating next year?

- *expect call for nominations next summer (June/July)*

OpenHPC: multi distro support

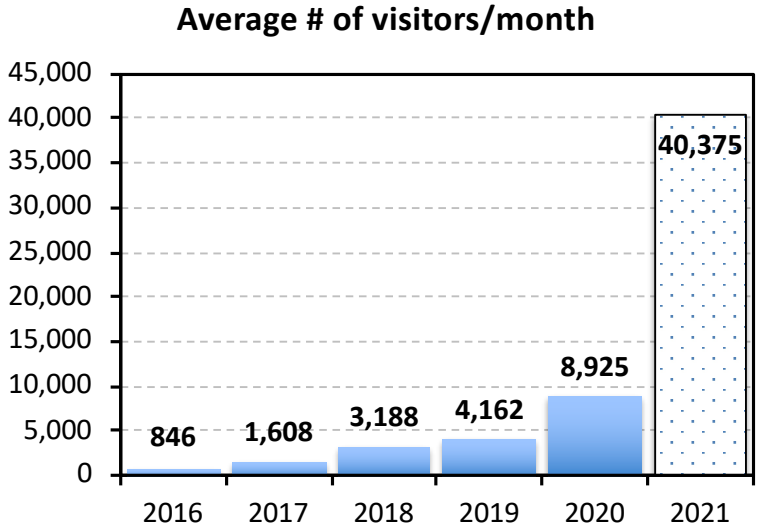


(2016 - now)

(first 2.0 released October 2020)

Community Growth Snapshots

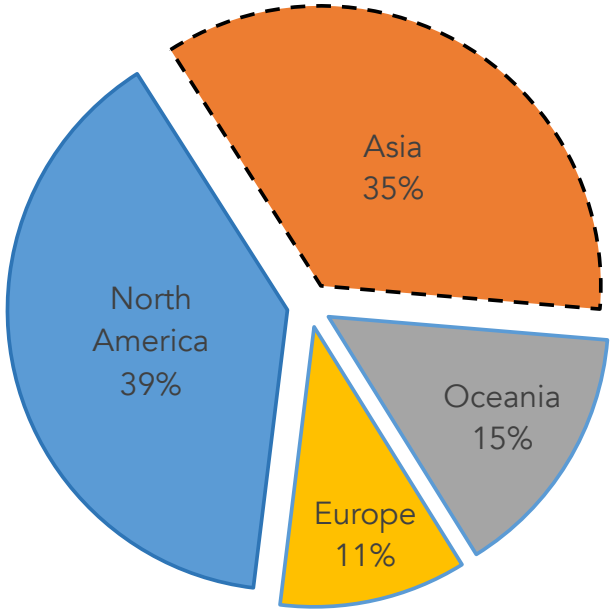
Project Adoption Growth (thru October 2021)



- Summary of access/download growth since initial release at SC'15
- Plots highlight number of unique visitors/month to the OpenHPC build server/repo(s)
- Significant uptake with 2.x releases
- Over **200TB** downloaded in 2021 thus far (more than 2.5X that of 2020)

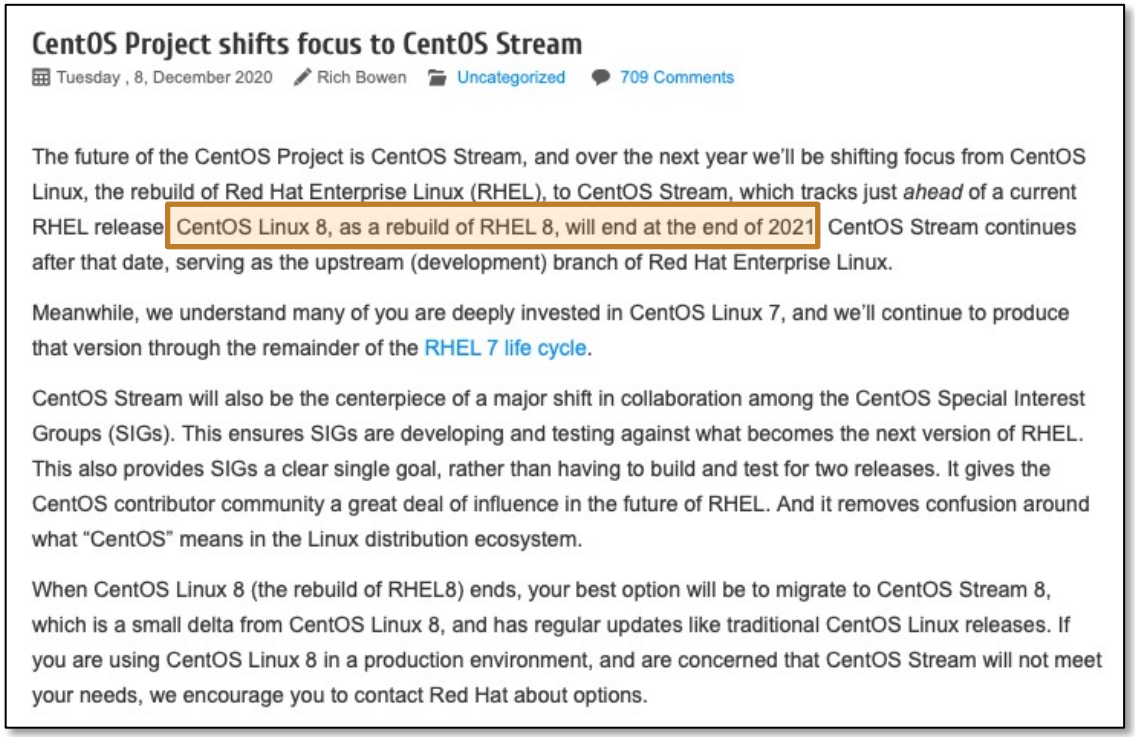
Geographic distribution of 2.x repo access

OpenHPC 2.x repo(s) accessed from over 100 countries worldwide in **Sept. 2021**



CentOS 8 Business

CentOS8 Announcement - Dec 2020



CentOS Project shifts focus to CentOS Stream

Tuesday , 8, December 2020 Rich Bowen Uncategorized 709 Comments

The future of the CentOS Project is CentOS Stream, and over the next year we'll be shifting focus from CentOS Linux, the rebuild of Red Hat Enterprise Linux (RHEL), to CentOS Stream, which tracks just *ahead* of a current RHEL release. CentOS Linux 8, as a rebuild of RHEL 8, will end at the end of 2021. CentOS Stream continues after that date, serving as the upstream (development) branch of Red Hat Enterprise Linux.

Meanwhile, we understand many of you are deeply invested in CentOS Linux 7, and we'll continue to produce that version through the remainder of the RHEL 7 life cycle.

CentOS Stream will also be the centerpiece of a major shift in collaboration among the CentOS Special Interest Groups (SIGs). This ensures SIGs are developing and testing against what becomes the next version of RHEL. This also provides SIGs a clear single goal, rather than having to build and test for two releases. It gives the CentOS contributor community a great deal of influence in the future of RHEL. And it removes confusion around what "CentOS" means in the Linux distribution ecosystem.

When CentOS Linux 8 (the rebuild of RHEL8) ends, your best option will be to migrate to CentOS Stream 8, which is a small delta from CentOS Linux 8, and has regular updates like traditional CentOS Linux releases. If you are using CentOS Linux 8 in a production environment, and are concerned that CentOS Stream will not meet your needs, we encourage you to contact Red Hat about options.

- Like most folks, we were caught off guard by this announcement to discontinue CentOS8 on Dec. 31 2021
- Through 2021, CentOS has been the preferred distro in use by OpenHPC users
- Initially considered multiple alternative options:
  - CentOS8 stream
  - RHEL8 proper
  - binary-compatible RHEL8 clones
  - solicited community feedback to help guide our path…

Some Community Polling Results Regarding CentOS8

ISC High Performance
The HPC Event.

OpenHPC Community BoF

Chat | Questions | Polls

If you are currently using CentOS 8, what do you plan to use as a replacement going forward?

2 days ago

9%	CentOS 8 Stream
11%	RHEL 8
13%	AlmaLinux
7%	openSUSE Leap
4%	Oracle Linux
50%	Rocky Linux
7%	Other

If you are currently using CentOS 8, what do you plan to use as a replacement going forward?

Vote submitted. Change poll answer

Poll Results:

14%	CentOS 8 Stream
10%	RHEL 8
0%	AlmaLinux
7%	OpenSUSE Leap
3%	Oracle Linux
55%	Rocky Linux
10%	Other

PEARC21

Community Plans for supporting RHEL8 Variants

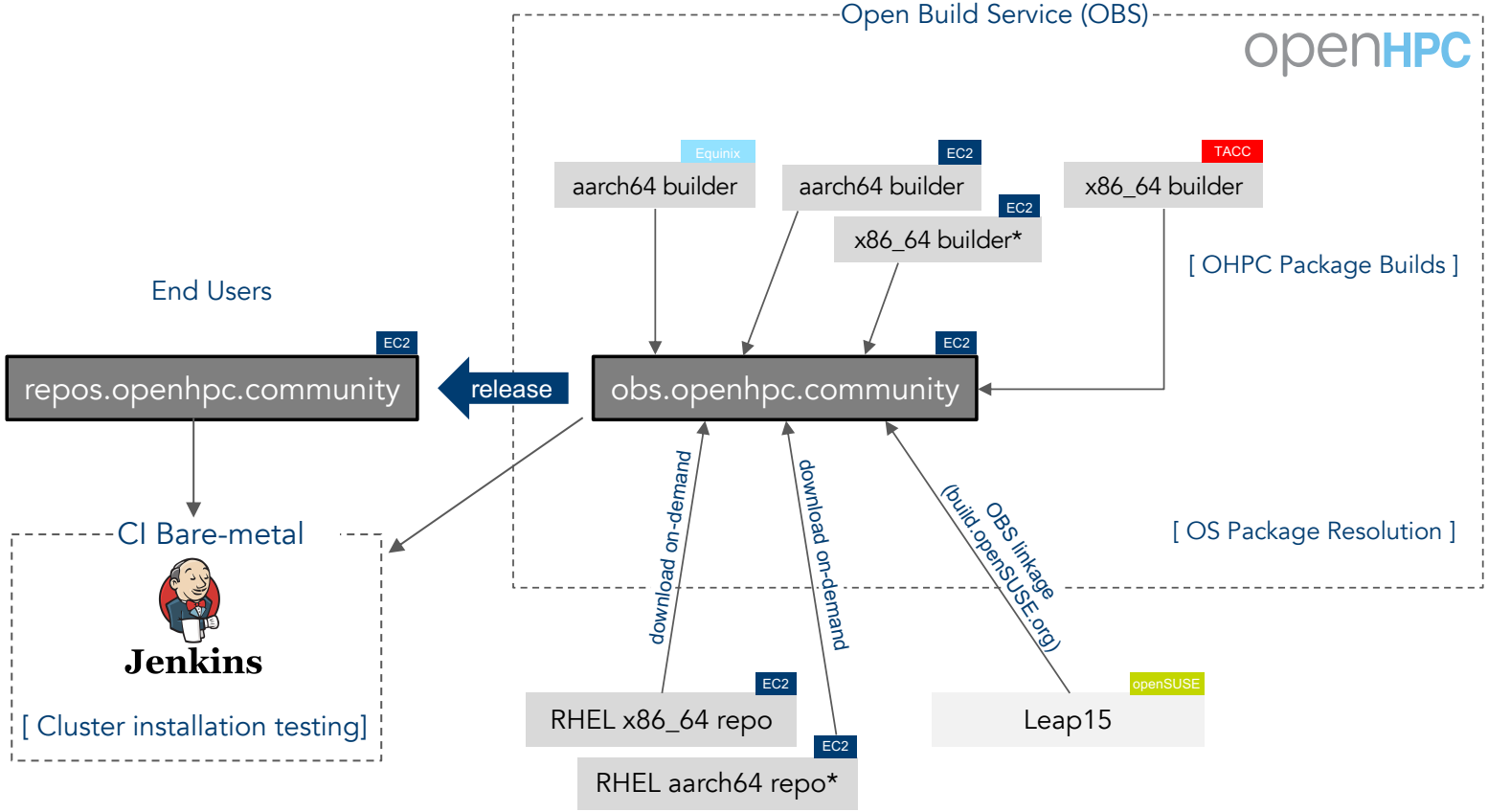
- Based on community feedback and additional infrastructure testing, we have pivoted as follows for RHEL-based usage (starting with the v2.4 release):
  - Build:
    - ohpc packages are built directly against RHEL proper (using community entitlements)
    - OBS-based build system infrastructure updated to support this change
  - Test:
    - example installation recipes for RHEL updated to use a binary compatible clone
    - continuous integration (CI) infrastructure also updated to leverage alternative RHEL clone
    - based on initial community feedback, we chose Rocky8 as the basis for example recipes
      - *Other RHEL8 binary clones should also be compatible*

Rocky Linux™

- Note: we continue to support OpenSUSE Leap 15.x as well

openSUSE

Updated OpenHPC Build/Delivery Architecture (2.4+)



Live Questions: https://meet.ps/openhpc-sc21

Latest Release

VERSION 2.X

OpenHPC v2.4 - Current S/W components

Functional Areas	Components (components available 79)
Base OS	RHEL 8.5, OpenSUSE Leap 15.3
Architecture	x86_64, aarch64
Administrative Tools	Conman, Lmod, LosF, Nagios, NHC, pdsh, pdsh-mod-slurm, prun, EasyBuild, ClusterShell, Genders, Shine, Spack, test-suite
Provisioning	Warewulf, xCAT
Resource Mgmt.	SLURM, Munge, OpenPBS, PMIx, Magpie
Runtimes	Charliecloud, Singularity
I/O Services	Lustre client (community version), BeeGFS client
Numerical/Scientific Libraries	Boost, GSL, FFTW, Hypre, Metis, MFEM, Mumps, OpenBLAS, OpenCoarrays, PETSc, PLASMA, Scalapack, Scotch, SLEPc, SuperLU, SuperLU_Dist, Trilinos
I/O Libraries	HDF5 (pHDF5), NetCDF/pNetCDF (including C++ and Fortran interfaces), Adios
Compiler Families	GNU (gcc, g++, gfortran), Intel oneAPI Toolkit*, ARM Allinea Studio*
Transport Layers	Libfabric, UCX
MPI Families	MVAPICH2, OpenMPI, MPICH, Intel oneAPI HPC Toolkit*
Development Tools	Autotools, cmake, hwloc, mpi4py, R, SciPy/NumPy, Valgrind
Performance Tools	Dimemas, Extrae, GeoPM, IMB, Likwid, msr-safe, OSU Micro-Benchmarks, PAPI, Paraver, pdtoolkit, Scalasca, ScoreP, SIONLib, TAU

Additional dependencies not provided by BaseOS or community repos are also included

v2.4: Current installation recipes available

[Key takeaway]

- In addition to being a package repository, OpenHPC provides validated recipes for bare-metal system installs
- Recipes organized by OS, architecture, and key administrative components
- **2.4** release includes **8** different recipes:
  - CentOS8 -> Rocky8
- the **docs-ohpc** RPM installs these recipes (along with shell scripts encapsulating all commands)

Recipes: `/opt/ohpc/pub/doc/recipes`

Rocky8 | Leap 15 | Warewulf | ~~xCAT~~ | PBS | SLURM

x86_64:

- Install_guide-Rocky8-Warewulf-OpenPBS-2.4-x86_64.pdf
- Install_guide-Rocky8-Warewulf-SLURM-2.4-x86_64.pdf
- Install_guide-Leap_15-Warewulf-OpenPBS-2.4-x86_64.pdf
- Install_guide-Leap_15-Warewulf-SLURM-2.4-x86_64.pdf

aarch64:

- Install_guide-Rocky8-Warewulf-PBSPro-2.3-aarch64.pdf
- Install_guide-Rocky8-Warewulf-SLURM-2.3-aarch64.pdf
- Install_guide-Leap_15-Warewulf-PBSPro-2.3-aarch64.pdf
- Install_guide-Leap_15-Warewulf-SLURM-2.3-aarch64.pdf

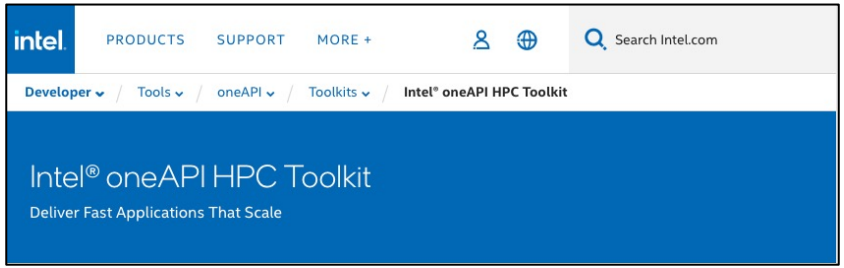
can use these guides as starting point for bare-metal installs

v2.4: Additional Update Highlights

- Refactored our hwloc packaging:
  - now installs into fixed path
  - OpenPBS and SLURM builds updated to use ohpc variant of hwloc
- Compiler update: gcc 9.3 -> gcc 9.4
- RMS updates (both openPBS and SLURM)
- MPI and transport updates:
  - openmpi: 4.0.5 -> 4.1.1
  - mpich: 3.3.2 -> 3.4.2
  - mvapich2: 2.3.4 -> 2.3.6
  - libfabric: 1.11.2 -> 1.13.0
  - ucx 1.9.0 -> 1.11.2
- Updated compatibility package for use with ARM and Intel vendor compilers
- Variety of other component version updates (44% of packages from v2.3)
  - see release notes for specifics
- Caveats:
  - parallel file-system clients not yet available for BeeGFS or Lustre
  - no xCAT recipes for Rocky

2.4 updates (cont.)

- Intel repackaged the previous PSXE compiler variants within the oneAPI Toolkit (also introduced new clang based variants)
- Have introduced updated compatibility packages that enables usage with oneAPI classic compiler variants: icc, icpc, ifort (we tested with v2021.4.0)
- Usage is similar to previous releases, but made easier now by the fact that the compiler can be installed directly from an online repository
  - new convenience package introduced which will setup the oneAPI repository locally: intel-oneapi-toolkit-release-ohpc




```
# Enable Intel oneAPI and install OpenHPC compatibility packages
[sms]# yum -y install intel-oneapi-toolkit-release-ohpc
[sms]# yum -y install intel-compilers-devel-ohpc
[sms]# yum -y install intel-mpi-devel-ohpc
```

```
[sms]# rpm -ql intel-oneapi-toolkit-release-ohpc
/etc/yum.repos.d/oneAPI.repo
```

2.4 updates (cont.)

- Note: the newer compatibility package relies on a utility shipped with oneAPI packages to generate modulefiles for locally installed versions
  - e.g. /opt/intel/oneapi/modulefiles-setup.sh

```
$ module swap gnu9 intel
Loading compiler version 2021.4.0
Loading tbb version 2021.4.0
Loading compiler-rt version 2021.4.0
Loading debugger version 10.2.4
Loading mkl version 2021.4.0
```

- You will thus see more module dependencies that get loaded
- Additional note: if installing oneAPI compilers via package managers, these will land in /opt/intel
  - need to make this path available on computes in example installation recipes
  - 2.4 variants updated to call out sharing over NFS directly

2.4 updates (cont.)

- Compatibility package for Arm compiler has also been updated to work with newer release
- In this case, need to download install package separately and install the compilers first locally

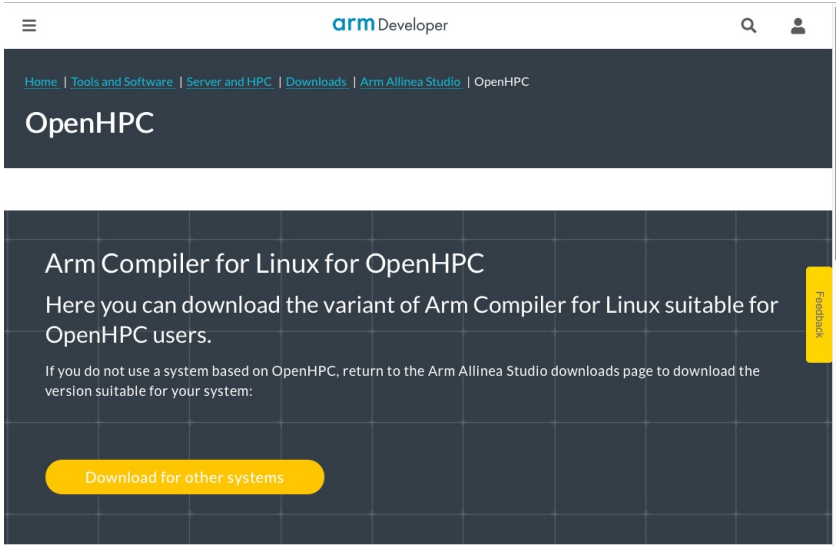
```
# Install OpenHPC compatibility packages
[sms]# zypper install arm1-compilers-devel-ohpc
```

```
$ module swap gnu9 arm1
$ which armclang
/opt/ohpc/pub/arm/arm-linux-compiler/bin/armclang
```

```
$ module list

Currently Loaded Modules:
  1) autotools         5) clang-autocomplete/21.1   9) ucx/1.11.2
  2) prun/2.2          6) arm21/21.1               10) libfabric/1.13.0
  3) ohpc              7) arm1/compat
  4) binutils/10.2.0   8) hwloc/2.5.0
```

https://developer.arm.com/tools-and-software/server-and-hpc/downloads/arm-allinea-studio/openhpc



Additional Future Items

- one final 1.3.x release
  - updating resource managers, test against newer minor distro versions
- 2.x items:
  - addition of new component: hpc-workspace
  - Warewulf4
  - xCAT with Rocky8
  - job launch support with PMIx
  - component packaging for use with Arm Compiler
  - ???? <your input here>
- 2022 Summer mentorship program

Open Discussion