

CVMFS on Microsoft Azure

September 2022, hugo.meiland@microsoft.com

Who am I?

- Supported HPC and research IT for ~10 years at Dutch University in chemistry and biosciences
- Supported National Research Supercomputer and Meteo (and others) for ~5 years
- At Microsoft from TSP in the field to Azure Engineering HPC
 - Working with customers to unblock/progress
 - Bringing back feedback and learnings on how to improve
 - Educating internal teams on HPC requirements

HPC at Microsoft

- From explaining we actually run Linux to
 - #10 in Top500 (Nov 2021)
 - #26,27,28,29 in Top500 (June 2021)
 - Supercomputers for UK Met Office and Meta/Facebook
- Specialty HPC SKU's
 - 5/6 generations of CPU, 7-9 generations of GPU
 - Nvidia/Mellanox InfiniBand in most of these VM's
- 2 main scenarios:
 - Lift & shift: traditional schedulers Slurm, PBS, LSF & posix filesystems
 - Cloud native: serverless & object/blob storage

CVMFS client

- Client (with EESSI config)
 - Integrated into Az-HOP (HPC Ondemand Platform)
 - Testing in WSL2, lack of automount is still a gap

```
hpcadmin@hc44rs-1:~  
----- /cvmfs/pilot.eessi-hpc.org/versions/2021.12/software/linux/x86_64/intel/skylake_avx512/modules/all -----  
ant/1.10.8-Java-11  
Arrow/0.17.1-foss-2020a-Python-3.8.2  
Bazel/3.6.0-GCCcore-9.3.0  
Bison/3.5.3-GCCcore-9.3.0  
Boost/1.72.0-gompi-2020a  
cairo/1.16.0-GCCcore-9.3.0  
CGAL/4.14.3-gompi-2020a-Python-3.8.2  
CMake/3.16.4-GCCcore-9.3.0  
CMake/3.20.1-GCCcore-10.3.0 (D)  
code-server/3.7.3  
DB/18.1.32-GCCcore-9.3.0  
DB/18.1.40-GCCcore-10.3.0 (D)  
double-conversion/3.1.5-GCCcore-9.3.0  
Doxygen/1.8.17-GCCcore-9.3.0  
EasyBuild/4.5.0  
EasyBuild/4.5.1 (D)  
Eigen/3.3.7-GCCcore-9.3.0  
Eigen/3.3.9-GCCcore-10.3.0 (D)  
ELPA/2019.11.001-foss-2020a  
expat/2.2.9-GCCcore-9.3.0  
expat/2.2.9-GCCcore-10.3.0 (D)  
Java/11.0.2 (11)  
jbigkit/2.1-GCCcore-9.3.0  
JsonCpp/1.9.4-GCCcore-9.3.0  
LAME/3.100-GCCcore-9.3.0  
libarchive/3.5.1-GCCcore-10.3.0  
libcerf/1.13-GCCcore-9.3.0  
libdrm/2.4.100-GCCcore-9.3.0  
libevent/2.1.11-GCCcore-9.3.0 (L)  
libevent/2.1.12-GCCcore-10.3.0 (D)  
libfabric/1.11.0-GCCcore-9.3.0 (L)  
libfabric/1.12.1-GCCcore-10.3.0 (D)  
libffi/3.3-GCCcore-9.3.0  
libffi/3.3-GCCcore-10.3.0 (D)  
libgd/2.3.0-GCCcore-9.3.0  
libGLU/9.0.1-GCCcore-9.3.0  
libglvnd/1.2.0-GCCcore-9.3.0  
libiconv/1.16-GCCcore-9.3.0  
libjpeg-turbo/2.0.4-GCCcore-9.3.0  
libpciaccess/0.16-GCCcore-9.3.0 (L)  
libpciaccess/0.16-GCCcore-10.3.0 (D)  
libpng/1.6.37-GCCcore-9.3.0  
ParaView/5.8.0-foss-2020a-Python-3.8.2-mpi  
PCRE/8.44-GCCcore-9.3.0  
PCRE2/10.34-GCCcore-9.3.0  
Perl/5.30.2-GCCcore-9.3.0  
Perl/5.32.1-GCCcore-10.3.0 (D)  
pixman/0.38.4-GCCcore-9.3.0  
pkg-config/0.29.2-GCCcore-9.3.0  
pkg-config/0.29.2-GCCcore-10.3.0 (D)  
pkgconfig/1.5.1-GCCcore-9.3.0-Python-3.8.2 (L)  
PMIX/3.1.5-GCCcore-9.3.0 (D)  
PMIX/3.2.3-GCCcore-10.3.0 (D)  
poetry/1.0.9-GCCcore-9.3.0-Python-3.8.2  
protobuf-python/3.13.0-foss-2020a-Python-3.8.2  
protobuf/3.13.0-GCCcore-9.3.0  
pybind11/2.4.3-GCCcore-9.3.0-Python-3.8.2  
pybind11/2.6.2-GCCcore-10.3.0 (D)  
Python/2.7.18-GCCcore-9.3.0  
Python/3.8.2-GCCcore-9.3.0  
Python/3.9.5-GCCcore-10.3.0-bare (D)  
Python/3.9.5-GCCcore-10.3.0 (D)
```

CVMFS repo

- Several tries based on EasyBuild: arch vs skus? which OS? which compilers?
 - Our team can only run “best effort” services
 - Figuring out customer expectations
 - Do you really need compiler XYZ / flag PQR?
 - Or is `ml load <application>`, `mpirun <application>` compelling enough?
 - Better to build containers?
- Tracking / (working on) EESSI:
 - Integrated into Az-HOP today
 - Need to double down on GPU and end-2-end runs (upcoming hackathon!)






CVMFS code

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<input type="checkbox"/>  cvmfs	Storage account	West Europe
<input type="checkbox"/>  cvmfs-kv	Key vault	West Europe
<input type="checkbox"/>  cvmfseastus	Storage account	East US
<input type="checkbox"/>  cvmfssouthcentral	Storage account	South Central US

- Added support for Azure Blob next to S3 (okt 2021?)
- Cvmfs_server can build stratum0 directly on Azure Blob
 - With keys in keyvault, build machine is expandable
- Using traffic manager i.s.o. geo-ip
- Sync containers i.s.o. stratum0 -> stratum1

Next steps

- Extending work with/on EESSI with focus on WRF & MD
 - To better support end-to-end in Az-HOP
- Dive deeper and pick up learnings on container deployments
 - As alternative to container registry for HPC
- Happy to discuss/test/extend serverless CVMFS

Thank you!

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