



CernVM/-FS Technology for Long-Term Software Preservation

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CernVM-FS
CernVM File System

Software and OS distribution to globally distributed HEP infrastructures



CernVM
Software Appliance

Portable VM/container for running and building LHC applications

- Software development team in the CERN EP-SFT group, operations teams at large Tier 1 sites
- Two products of the team: CernVM File System and CernVM Virtual Appliance

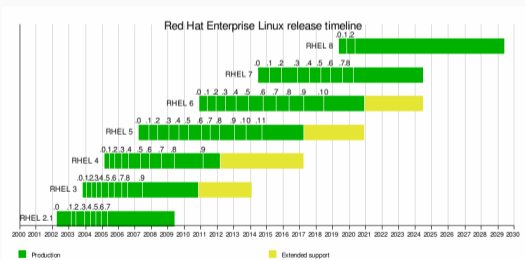
We have some experience in preserving legacy software stacks: e. g. ALEPH, NA48, CMS run 1

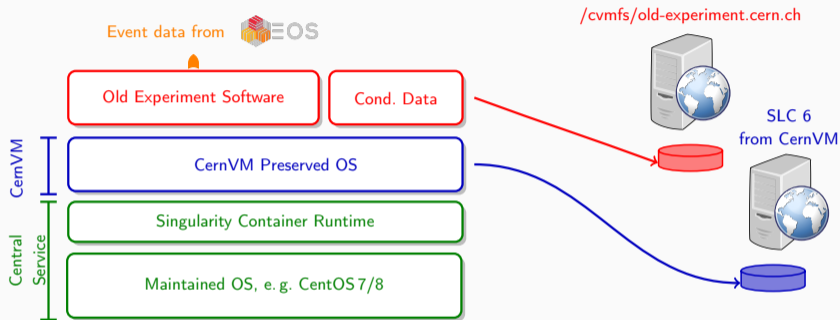


- Our standard Linux platform, Red Hat Enterprise Linux (aka Scientific Linux, CentOS), has a life time of ~ 10 years per release
- No security updates once out of maintenance, hence availability on central services stops (lxbatch, lxbatch, ...)

Two options for experiment application software to manage the operating system change

1. **Porting & validation**
can be challenging wrt. legacy dependencies such as CERNLIB
2. **Freezing & sandboxing**
Captures legacy software plus OS and compilers using virtualization technology





```
[jblomer@lxplus7] singularity exec -B /cvmfs -B /eos \  
> /cvmfs/cernvm-prod.cern.ch/slc6 /cvmfs/old-experiment.cern.ch/application
```



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```

What it means

“On the central lxplus7 service

1. start a Linux container (sandbox) using singularity
2. map /cvmfs and /eos from lxplus7 into the container
3. as a container operating system, use SLC6 provided by the CernVM repository
4. within this SLC6 sandbox, run preserved 'application' binary

Note: no proper network connectivity from within the sandbox, all input data must come from a file system (CernVM-FS or EOS)



It is of course possible to freeze and sandbox with standard container/VM technology. We think, however, that there are certain benefits in following the CernVM approach.

CernVM File System

- Production system for distribution of experiment software and conditions data, i. e. available on all CERN central services, the grid, most institutes
- Workflow for publishing identical between production and preserved software stacks
- Versioning is built-in, preservation part of regular software releasing

CernVM OS Container

- Curated Linux platform with all dependencies to run LHC applications
- Frozen environments available for RHEL 4–6 platforms

Long-Term Preservation Links



- CernVM software preservation in action: CMS run 1 software for SLC6
<http://opendata.cern.ch/record/252>
- Paper: “CERN Services for Long Term Data Preservation” (2016) [Download](#)

```

File Edit View Terminal Tabs Help
Probing /cvmfs/cms.cern.ch... OK
Probing /cvmfs/cms-opendata-condldb.cern.ch... OK
Starting up CMS shell...
WARNING: underlay of /etc/cms required more than 50 (308) bind mounts
WARNING: container does not have /.singularity.d/actions/exec, calling /bin/bash
directly
CMS Shell > lsb_release -a
LSB Version:      :base-4.0-amd64:base-4.0-noarch:core-4.0-amd64:core-4.0-noarch:
graphics-4.0-amd64:graphics-4.0-noarch:printing-4.0-amd64:printing-4.0-noarch
Distributor ID: Scientific
Description:     Scientific Linux release 6.9 (Carbon)
Release:         6.9
Codename:        Carbon
CMS Shell >

```