



Linux Future Committee #5

2022-03-23

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On behalf of CERN IT

IT-CM-LCS

Agenda

- Situation today
- CentOS Stream 9
- Red Hat site-license
 - Overview
 - VM / bare-metal installations
 - Containers
- ATS-IT Technical Committee
- Current Linux Roadmap
- WLCG GDB recommendations
- Linux Future Committee's future ... ?
- Questions

Situation today

- **CC7** (CERN CentOS 7) remains a supported operating system until 30.06.2024
 - More on this later
- **C8** (CentOS Linux 8) retired 31.12.2021
- **CS8** (CentOS Stream 8) is supported until 31.05.2024
 - Current host count is ~1900
- **CS9** (CentOS Stream 9) is supported (since 09.02.2022), end-of-life ~12.2026
 - Current host count is ~150
- **RHEL7/8** (Red Hat Enterprise Linux) is available for use at CERN via a site-license agreement (since 16.03.2022)
 - More on this later

CentOS Stream 9

- Released upstream 03.12.2021
- Testing available at CERN from even before this date (beta content used)
- Production available at CERN from 09.02.2022
 - OpenStack (CS9 - x86_64 [2022-03-02])
 - Docker (<https://gitlab.cern.ch/linuxsupport/cs9-base>)
 - AIMS (CS9_X86_64, CS9_AARCH64)
 - locmap (see below)
 - `ai-bs --cs9`
 - `ssh lxplus9-future.cern.ch`
- Currently missing features
 - cvmfs
 - eosclient
 - Some epel9 packages (`kstart`, `python3-pylint`, etc)

Red Hat site-license

- Through significant deliberation and negotiation, CERN IT have managed to secure a full site-wide license for the use of Red Hat Enterprise Linux (RHEL) at CERN
 - The contract was signed on the 16th March 2022, for an initial contract duration of 7 years (future potential for renewal)
 - Unlimited use of RHEL (within CERN) is permitted with no requirement for host registration
 - Access to any version (RHEL7,RHEL8,RHEL9 – once released)

RHEL at CERN: License overview

	Old RHEL contract	New RHEL contract
Licensed hosts	~700 (full support)	Unlimited (self support only) Limited number (full support)
Contract duration	3 years, renewable	7 years, renewable
Access to RHEL content on http://linuxsoft.cern.ch	Manually controlled via landb sets	Open to all .cern.ch IP addresses
Access to RHEL VM images (openstack.cern.ch)	Manually shared with specific OpenStack projects	<ul style="list-style-type: none">• RHEL images converted to 'community'• Notification of UUIDs controlled via an egroup
Ability to raise support cases	Yes (IT Linux team)	Yes (IT Linux team)
Access to kb.redhat.com (any CERN user)	Yes (request via a SNOW ticket to the Linux team)	Yes (request via a SNOW ticket to the Linux team)

RHEL at CERN: Where can it be used?

- CERN is committed to work with the both the HEP community as well as the open-source CentOS eco system. For these reasons we promote the use of CentOS Stream as a 'default' operating system and strongly encourage all users to use CentOS Stream
- RHEL can be used for use cases that cannot be satisfied with CentOS Stream
 - life cycle
 - enterprise software incompatibilities

Reference: <https://linux.web.cern.ch/#update-on-centos-linux-strategy>

RHEL at CERN: Bare metal & VMs

- OpenStack RHEL images (VMs and Ironic bare metal) are now marked as '**community**' images
 - This means that if you know the image UUID of a RHEL image, you can spawn a RHEL virtual machine in any OpenStack project
 - AIMS can also optionally be used with the RHEL_8_5_X86_64 (or similar) target

Reference: <https://linux.web.cern.ch/#update-on-centos-linux-strategy>

RHEL at CERN: Bare metal & VMs (continued)

How do you know the UUID of RHEL images?

We have an automatic process that uploads RHEL images (from Red Hat) to openstack.cern.ch. This process will also inform via email the linux-announce-rhel@cern.ch of the UUID

For the initial population of this egroup, please self subscribe <https://e-groups.cern.ch/e-groups/Egroup.do?egroupId=10430752>

- Users on this list will be manually emailed the current RHEL images UUIDs **tomorrow morning**
- This self-subscription process is for **today only** (23.03.2022)

The standard process to be added to the linux-announce-rhel@cern.ch involves submitting a SNOW request to the Linux team

- Upon receipt of the ticket we will assess, and add your details to the linux-announce-rhel@cern.ch egroup

RHEL at CERN: Container images

Is a "RHEL" container image available ?

RHEL at CERN: Container images

Is a "RHEL" container image available ?

No*

RHEL at CERN: Container images

No*

Why?

- The RHEL end user license agreement (EULA) does not permit the distribution of RHEL content (RPMs and or container/vm images)
- Running RHEL containers at sites that do not hold a RHEL subscription is a breach of the Red Hat license agreement

RHEL at CERN: Container images (UBI)

What is the solution?

Red Hat Universal Base Image (UBI)

UBI has a different EULA which permits unrestricted distribution of content

RHEL at CERN: Container images (UBI)

Wait, what actually is UBI?

- Red Hat provided base container image
 - Updated on a 6 weekly cadence, or sooner if triggered by the release of a CVE rated as Critical or Important
- Based on RHEL, containing a *subset* of RHEL packages
- Available for EL7, EL8 – and will be supported for EL9 as well
- Tied to the life cycle of the RHEL product
- Freely distributable

Additional details:

- Introducing the Red Hat UBI: <https://www.redhat.com/en/blog/introducing-red-hat-universal-base-image>
- What is the Red Hat UBI?: <https://developers.redhat.com/blog/2019/10/09/what-is-red-hat-universal-base-image>

RHEL at CERN: Container images (UBI)

A subset of RHEL packages?

- As UBI is designed for running containers, the missing packages are generally packages that are not relevant in a container context. For example, packages pertaining to file systems, hardware, kernel, graphical user displays, or system management
- However, included packages are the same as RHEL

```
[~]$ podman run -it gitlab-registry.cern.ch/linuxsupport/ubi8/ubi
[root@f4d064dc890b /]# cat /etc/redhat-release
Red Hat Enterprise Linux release 8.5 (Ootpa)
[root@f4d064dc890b /]# rpm -q dnf
dnf-4.7.0-4.el8.noarch
```

```
[~]$ ssh root@lxvmrh8
Last login: Tue Feb  1 09:44:55 2022
[root@lxvmrh8 ~]# cat /etc/redhat-release
Red Hat Enterprise Linux release 8.5 (Ootpa)
[root@lxvmrh8 ~]# rpm -q dnf
dnf-4.7.0-4.el8.noarch
```

Full analysis: https://codimd.web.cern.ch/2WYY9cWNREO4_L2ukGergg#

RHEL at CERN: Container images (UBI)

What UBI images are available?

	Minimal	Standard	Multi-Service
Image name	ubi-minimal	ubi	ubi-init
Features	<ul style="list-style-type: none">• minimal install• microdnf	<ul style="list-style-type: none">• OpenSSL crypto stack• Full dnf stack• basic OS tools (tar, gzip, vi, etc.)	<ul style="list-style-type: none">• Same packages as 'standard'• Configured to run systemd on start
Access to UBI packages	Yes — fully redistributable	Yes — fully redistributable	Yes — fully redistributable

RHEL at CERN: Container images (UBI)

UBI at CERN

- UBI images mirrored from Red Hat to gitlab-registry.cern.ch
 - <https://gitlab.cern.ch/linuxsupport/ubi7/>
 - <https://gitlab.cern.ch/linuxsupport/ubi8/>
- UBI repository content mirrored to <http://linuxsoft.cern.ch/cdn-ubi.redhat.com/>
- UBI repository content added to daily yumsnapshots (<http://linuxsoft.cern.ch/internal/yumsnapshot/20220131/cdn-ubi.redhat.com/>)

Formation of the ATS-IT Technical Committee

- To strengthen and reinforce the collaboration between IT and the A&T Sector, a new initiative was born – "ATS-IT Technical Committee"
 - The first committee took place on 09.02.2022 (<https://indico.cern.ch/event/1112774>)
 - The outcome from this first meeting were 10 initiatives selected as initial projects, 2 of which pertain to Linux
 - "CC7 support for Accelerator Front-end Platforms"
 - "Operating System choice for Accelerator Back-end Platforms"
 - Resources are actively being assigned to work on these projects

CC7 support for Accelerator Front-end Platforms (CC7 Extended Lifecycle Support)

- Official CentOS7 support ends in June 2024
- LHC Run3 has been extended until end 2025 and LS3 until end 2028
- It is not feasible to change the front-end operating system version during Run3
- Some front-end systems must be kept operational 1 year after the end of Run3
- A strategy must be put in place to ensure the secure and reliable functioning of operational front-end systems until the end of RUN3 + 1Y
- Foreseen stakeholders: BE-CSS, BE-CEM, IT-CM, IT-CDA, Computer Security

CC7 support for Accelerator Front-end Platforms (CC7 Extended Lifecycle Support – **IT perspective**)

- Red Hat provides a paid add-on product titled 'Extended Lifecycle Support' (ELS) which will be able to use for RHEL7 at it's end-of-life (30.06.2024), for a period of 2 years (maximum 30.06.2026)
 - This product provides ***critical*** security fixes, but does not include bug fixes or new functionalities
 - Whilst CERN will have access to this product, we cannot freely distribute it
 - CERN IT can however rebuild a limited set of packages from RHEL7 ELS source code and make them available for a subset of CC7 hosts

CC7 support for Accelerator Front-end Platforms (CC7 Extended Lifecycle Support – **IT perspective**)

- Apart from security updates, CERN IT will also need to:
 - Ensure that CC7 hosts can continue to interoperate with other centralised IT services (Active Directory, LDAP, SSO, SSL ciphers, etc)

Operating System choice for Accelerator Back-end Platforms

- Official CentOS7 support ends in June 2024
- Red Hat announced a major change in support model for CentOS in 2021
- LHC RUN3 has been extended until the end of 2025 and LS3 until the end of 2028
- A clear Operating System roadmap must be established for the accelerator control system back-end platforms (data centre servers and CCC consoles) for the period containing Run3 and LS3
- Foreseen stakeholders: BE-CSS, BE-ICS (for WinCC OA), IT-CM

Operating System choice for Accelerator Back-end Platforms (IT perspective)

- "Extended Lifecycle Support" will be provided for CC7 (through the "CC7 support for Accelerator Front-end Platforms" working group)
 - This will effectively extend the end-of-life of CC7 for eligible hosts until 30.06.2026
 - Note: this solution is suited only for systems that cannot upgrade (Front-end systems)
- Red Hat Enterprise Linux 8 (RHEL8) is now available (via the site-license agreement) through the duration of Run3 (and LS3) with an end-of-life of 31.05.2029
- Red Hat Enterprise Linux 9 (RHEL9) has a BETA release and is expected to be released during 2022 H2. The end-of-life will be 2032 H2
- CentOS Stream 9 (CS9) is available (at CERN since 09.02.2022) through the duration of Run3, with an end-of-life of 12.2026

Current Linux roadmap



Proposal recommended by the GDB

GDB recommends

- Red Hat Enterprise Linux, CentOS Stream and Enterprise Linux Clones should be treated equally
 - ELCs defined as 100% functionally equivalent to RHEL such as Rocky or Alma
- Application workloads and middleware can and should be made to work on any of these (see [HEPiX talk](#)) using techniques such as containerization or ABI/API compatibility
 - If there are issues, these should be reported to the authors (distributions, experiments or middleware)
- WLCG sites should plan migrations before 7 EOL (mid 2024)
 - From 7 to 9 seems promising during the period 2H 2022-2023 subject to middleware availability
 - CentOS Stream 9 already available, RHEL/ELC 9s coming in the next few months
 - 8 may also be used already as needed for hardware compatibility or functionality
- Reference: <https://indico.cern.ch/event/958643/>
 - Based on DESY's suggestion at the last GDB following HEPiX: <https://indico.cern.ch/event/876795/>
 - Initially proposed to the GDB on December 8th 2021: <https://indico.cern.ch/event/876796/>

Linux Future Committee's future

- We've made it through the turbulent year that 2021 was 🎉
- The path for Linux at CERN is clearer now that we:
 - have production CS8 experience
 - CS9 is available with a supported life that covers Run3
 - RHEL is now also available via the site-license for use-cases that require it
- It's not expected to have Linux Future Committee meetings with the same frequency that we did in 2021
 - LFC meetings will continue ad-hoc, based on the continued evolving requirements of Linux stakeholders at CERN

Questions ?





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