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CernVM 5: a versatile container-based platform to run HEP applications

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Since its inception, the minimal Linux image CernVM provides a portable and reproducible runtime environment for developing and running scientific software. Its key ingredient is the tight coupling with the CernVM-FS client to provide access to the base platform (operating system and tools) as well as the experiment application software. Up to now, CernVM images are designed to use full virtualization. The goal of CernVM 5 is to deliver all the benefits of the CernVM appliance and to be equally practical as a container and as a full VM. To this end, the CernVM 5 container image consists of a “Just Enough Operating System (JeOS)”, with its contents defined by the HEP_OSlibs meta-package commonly used as a base platform in HEP. CernVM 5 further aims at smooth integration of the CernVM-FS client in various container environments (such as Docker, kubernetes, podman, apptainer). Lastly, CernVM 5 uses special build tools and post-build processing to ensure that experiment software stacks using their custom compilers and build chains can co-exist with standard system application stacks. As a result, CernVM 5 aims at providing a single, minimal container image that can be used as a virtual appliance for mounting the CernVM-FS client and for running and developing HEP application software.

Significance

Unlike previous versions, the CernVM 5 appliance works equally well as a container and as a virtual machine. To achieve this novelty, special build methods had to be evaluated and implemented. The CernVM 5 container image can be deployed in various container runtimes such as Docker, kubernetes, podman or apptainer. In addition, the image can be used as a base layer for custom images built with standard tools such as Docker build or buildah.

References

Experiment context, if any

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