



# Distribution and Containers for CORSIKA 8

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# CI container

- docker container
- build guided by Dockerfile
  
- Base container for many distributions
  - install of build tools
  - diagnostic and analysis tools
  - depends on distribution specific package manager
  
- CORSIKA 8 development containers
  - Use one base containers
  - Install additional tools: conan, pythia, ...
  - Distribution agnostic, only standard build and install tools
  
- Reasonably easy to upgrade for current development

# what to do about clang-format?

- Question: how version dependent is clang-format
  - Currently use clang 8
- Some comments in CI suggest we have to use a fixed version of clang
  - not future proof: New distributions do not ship clang 8
- We currently keep a clang-8 container based on ubuntu 18.04
- Would like to update to ubuntu 22.04, clang 14

# Updated container build chain: buildah (+ podman)

- RedHat container tools: podman, **buildah**, skopeo
  - For root-less containers
  - Designed as alternative kubernetes runtime
- Use **buildah** to construct containers
- Keep structure:
  - base container with tools
    - customizable
  - project specific developer container
    - externals
    - additional tools

# Buildah advantage

- Direct access to container filesystem possible

  - work in user account

    - regular environment

    - host tools

- Mount file system from host

  - git

    - check out on host

    - build from repo in container

  - Install restricted code

    - download and unpack on host

    - install in container

    - Avoids **copy, use, delete** workflow in Dockerfiles

- Container layers created on **buildah commit** to podman container

# Format conversion

- Buildah creates podman container when committing
  - standard meta data supported
  - including entry points scripts or commands
- Podman likes OCI containers
- Can export OCI image
  - as tar
  - in directory
- Direct conversion to docker possible
  - used for CI containers (not yet for C8)

# Distribution: apptainer

- Default: non root
  - kernel not too old (true for CentOS 7 and newer)
  - might have to set up or enable user namespaces
    - Done in recent distributions
    - instructions in documentation
- Automatic mounting of /home
- Best to mount `$(pwd)` manually, too
  - and maybe storage hierarchy
- Fix install hierarchy: install in `/opt`
  - Should never mount from host
  - avoid installation into fs root or `/home`

# apptainer use study: CORSIKA 7

- One as demonstrator for container use in UNAM campus grid
  - CORSIKA 7 shower production for SWGO
  - no thinning, different interaction models
- Successfully executed over 2000 jobs in one week on two different clusters
  - Failures on some host
- 2.6 TB of data generated
- Size: 1.5 GB
  - tables affect size of container
  - So far: build tools left in container

```
apptainer run --bind $(pwd) c7.sif fluka \  
< proton_000143.inp > proton_00143.log 2>&1
```



# Container build chain repositories

- Base containers

- <https://gitlab.com/lukasnellen/container-base>

- CORSIKA 7 and apptainer

- <https://gitlab.com/lukasnellen/corsika7-container>