# Container in Maxwell

Scientific Workload

# Topics

1. Container Technology
2. Harbour
3. Slurm Integration

# Container Technology

- Docker
  - On worker nodes until 2024
  - Only on Compute Nodes
    - Security Concerns on Shared Nodes
  - Complicated setup to ensure namespace
    - User certificates

# Container Technology

- SingularityCE/Apptainer
  - SingularityCE ~ Apptainer
  - Containers and reproducibility to scientific computing and the HPC world.
  - support natively Infiniband and Open MPI library
  - Can run OCI / Docker container
    - better support in singularity
  - Run in User Namespace

# Container Technology


- Podman
  - The RHEL native container solution
  - No experience as runtime environment
  - Can run/build OCI / Docker container
  - Run in User Namespace

# Container Technology


- Kubernetes
  - Use the Container Runtime Interface (CRI)
    - containerd, crio-o
  - Docker is deprecated
    - The runtime not the image format
  - Solution for user namespace is not ready
  - Host mounts without user namespace is a major showstopper

# Harbour

- Harbor is an open-source cloud-native registry project
- store, sign, and scan container images.
- Work with Kubernetes
- Harbor is a CNCF (Cloud Native Computing Foundation) project
- DESY instance: https://tollerort.desy.de

# Slurm integration

- You can use start container with singularity, apptainer or podman on maxwell compute node
- Technical details:

  https://docs.desy.de/maxwell/documentation/container/#singularity-apptainer
- Advanced integration
  - Have no use case. So not configured yet.
  - https://slurm.schedmd.com/containers.html
- Slinky := Run a Slurm cluster in K8s
- Cloud Computing
  - Support hybrid clusters to dynamically offload jobs using auto-scaling functionality