Apptainer: Easy Containerization for Robotics

FOSDEM 2026: Malte Schrader

ROS 2 Targeted Platforms

ROS 2 Humble → Ubuntu 22.04

ROS 2 Jazzy → Ubuntu 24.04

Dual Boot

ROS 2 Humble

Ubuntu 22.04

Dual Boot

ROS 2 Humble

Ubuntu 22.04

But what about ROS 2 Jazzy?

Triple Boot!

ROS 2 Humble

Ubuntu 22.04

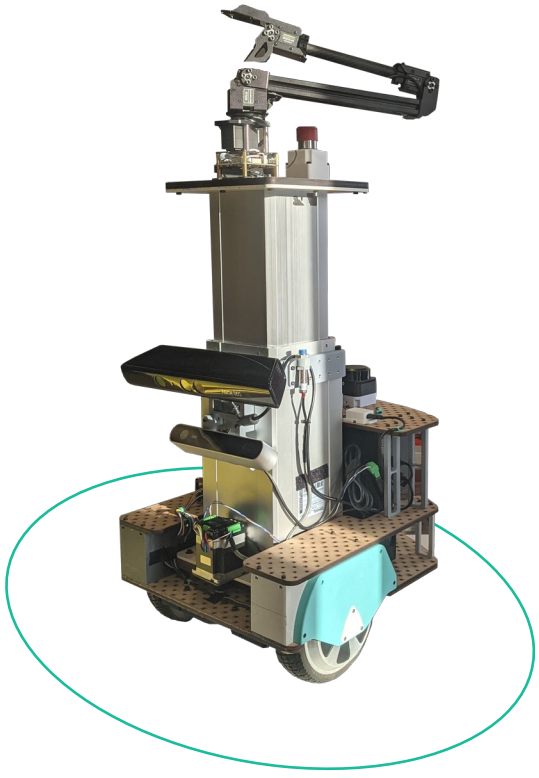
ROS 2 Jazzy

Ubuntu 24.04

Robotics Club at University of Oslo

Klaus: mobile robot

- **Nvidia Jetson Orin nano**
  - only Ubuntu 22.04!



Running ROS 2 with Docker

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- Images available from OSRF
- Getting GUI programs to work is hard
- Connecting to a robot/sensors is even harder!

Are containers in robotics about sandboxing software or packaging environments?

APPTAINER to the rescue!

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Apptainer's Philosophy

Integration over isolation

by default

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`$HOME`	`/proc`
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`rviz2, rqt` just work!

Apptainer: Integration over isolation

From:

```
docker run -it –rm
    --privileged \
    --ipc=host   \
    --network host \
    --env DISPLAY=$DISPLAY \
    --volume "$HOME:$HOME" \
    osrf/ros:humble-desktop
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To:

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Apptainer: Key Takeaways

- **compatible with OCI images**
- **Integration over Isolation by default**
  - Same device permission inside Container as outside

Pixi

prefix.dev

Fast conda & PyPI Package Manager

Reproducible workflows & lockfiles

Replace apt-get, brew, and winget on Windows, macOS and Linux

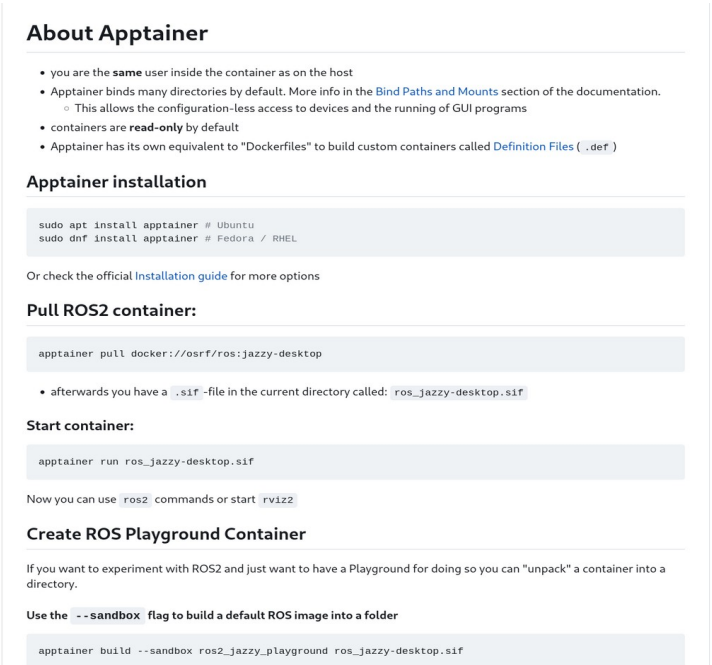
LICENSE BSD-3

FOSDEM26 Talk

Simple, Safe, Open: Building Your First ROS 2 Rover with Rust and Pixi (15:25)

Thanks!

Apptainer Robotics Guide:



About Apptainer

- you are the **same** user inside the container as on the host
- Apptainer binds many directories by default. More info in the Bind Paths and Mounts section of the documentation.
  - This allows the configuration-less access to devices and the running of GUI programs
- containers are **read-only** by default
- Apptainer has its own equivalent to "Dockerfiles" to build custom containers called Definition Files (`.def`)

Apptainer installation

```
sudo apt install apptainer # Ubuntu
sudo dnf install apptainer # Fedora / RHEL
```

Or check the official Installation guide for more options

Pull ROS2 container:

```
apptainer pull docker://osrf/ros:jazzy-desktop
```

- afterwards you have a `.sif` -file in the current directory called: `ros_jazzy-desktop.sif`

Start container:

```
apptainer run ros_jazzy-desktop.sif
```

Now you can use `ros2` commands or start `rviz2`

Create ROS Playground Container

If you want to experiment with ROS2 and just want to have a Playground for doing so you can "unpack" a container into a directory.

Use the `--sandbox` flag to build a default ROS image into a folder

```
apptainer build --sandbox ros2_jazzy_playground ros_jazzy-desktop.sif
```

https://codeberg.org/MS9382/apptainer_ros_guide

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