

## Test report – Run AW.universe with k3s and podman

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### System information

#### OS version

```
$ uname -a
Linux miivii-tegra 5.10.104-tegra #1 SMP PREEMPT Thu Sep 8 16:22:59 CST
2022 aarch64 aarch64 aarch64 GNU/Linux
```

#### K3s version

```
$ k3s -v
k3s version v1.25.3+k3s1 (f2585c16)
go version go1.19.2
```

#### podman version

```
$ podman -v
podman version 4.3.0-dev
```

#### catatonit version

```
$ catatonit --version
tini version 0.1.7+dev_catatonit
```

#### Docker image

Autoware Universe for arm64

[ghcr.io/autowarefoundation/autoware-universe:galactic-20220728-prebuilt-cuda](https://ghcr.io/autowarefoundation/autoware-universe:galactic-20220728-prebuilt-cuda)

Scenario simulator for x86\_64

ghcr.io/tier4/scenario\_simulator\_v2:galactic

## Run Autoware with K3s (on PCU/Orin/Xavier)

### Installation

- **Install k3s**

ref: <https://docs.k3s.io/quick-start>

```
$ curl -sfL https://get.k3s.io | sh -  
$ mkdir ~/.kube/  
$ sudo cp /etc/rancher/k3s/k3s.yaml ~/.kube/config  
$ export KUBECONFIG=~/.kube/config
```

### Preparation

- **Download kubernetes yaml files**

```
$ wget https://raw.githubusercontent.com/autowarefoundation/open-ad-kit-docs/main/docs/version-2.0/start-guide/installation/deployments/comhpc-deployments.zip  
$ unzip comhpc-deployments.zip -d comhpc-deployments
```

In this report modify path in `~/comhpc-deployments/comhpc-persistent-volume.yaml` to the right path.

- **Download map files**

```
$ wget "https://drive.google.com/uc?export=download&id=1vWMLbmwJJE5tYO40ypCMxqtmgQPQxhiw&confirm=t&uuid=3d84d854-3dd2-4950-8cc8-248feeab547d" -O sample_data.zip  
$ unzip sample_data.zip  
$ mv sample_data/map/ ~/
```

- **Download kernel configuration file for tuning kernel parameters**

```
$ wget -P /etc/sysctl.d https://raw.githubusercontent.com/autowarefoundation/open-ad-kit-docs/main/docs/version-2.0/start-guide/installation/sysctl.d/60_cyclonedds.conf  
$ sysctl -p /etc/sysctl.d/60_cyclonedds.conf
```

- **Download configuration file of Cyclone DDS**

```
$ wget -P ~/cyclonedds https://raw.githubusercontent.com/autowarefoundation/open-ad-kit-docs/main/docs/version-2.0/start-guide/installation/cyclonedds/cyclonedds.xml
```

In this report, modify `NetworkInterfaceAddress` in `~/cyclonedds/cyclonedds.xml` to your network interface.

Create and run pod

- **Deploy kubernetes cluster for Autoware**

```
kubectl apply -f comhpc-deployments
```

- **Make sure deployments are deployed**

```
nvidia@miivii-tegra:~$ kubectl get deploy -o wide
NAME                                READY    UP-TO-DATE    AVAILABLE    AGE    CONTAINERS
IMAGES
SELECTOR
comhpc-control                      1/1      1              1            31s    comhpc
registry.autocore.ai/autocore.docker/library/autoware-universe:galactic-20220728-prebuilt-cuda    io.kompose.service=comhpc
comhpc-api                          1/1      1              1            31s    comhpc
registry.autocore.ai/autocore.docker/library/autoware-universe:galactic-20220728-prebuilt-cuda    io.kompose.service=comhpc
comhpc-map                          1/1      1              1            31s    comhpc
registry.autocore.ai/autocore.docker/library/autoware-universe:galactic-20220728-prebuilt-cuda    io.kompose.service=comhpc
comhpc-planning                    1/1      1              1            31s    comhpc
registry.autocore.ai/autocore.docker/library/autoware-universe:galactic-20220728-prebuilt-cuda    io.kompose.service=comhpc
comhpc-system                      1/1      1              1            31s    comhpc
registry.autocore.ai/autocore.docker/library/autoware-universe:galactic-20220728-prebuilt-cuda    io.kompose.service=comhpc
comhpc-simulator                   1/1      1              1            31s    comhpc
registry.autocore.ai/autocore.docker/library/autoware-universe:galactic-20220728-prebuilt-cuda    io.kompose.service=comhpc
comhpc-vehicle                     1/1      1              1            31s    comhpc
registry.autocore.ai/autocore.docker/library/autoware-universe:galactic-20220728-prebuilt-cuda    io.kompose.service=comhpc
```

- **Make sure all pods are running**

```
nvidia@miivii-tegra:~$ kubectl get pod -o wide
NAME                                READY   STATUS    RESTARTS   AGE
IP                                  NODE                                NOMINATED NODE   READINESS GATES
comhpc-control-67946dbf64-q5tzb    1/1    Running   0           74s
192.168.50.190    miivii-tegra    <none>         <none>
comhpc-api-589bc96f9b-t5tt8       1/1    Running   0           74s
192.168.50.190    miivii-tegra    <none>         <none>
comhpc-map-9c4c89c7d-h97f2        1/1    Running   0           74s
192.168.50.190    miivii-tegra    <none>         <none>
comhpc-planning-686c66df66-g57bp   1/1    Running   0           74s
192.168.50.190    miivii-tegra    <none>         <none>
comhpc-system-6f67dcb696-xqptp     1/1    Running   0           74s
192.168.50.190    miivii-tegra    <none>         <none>
comhpc-simulator-8679cbc874-rb8z5  1/1    Running   0           74s
192.168.50.190    miivii-tegra    <none>         <none>
comhpc-vehicle-6d9c46c668-966m5    1/1    Running   0           74s
192.168.50.190    miivii-tegra    <none>         <none>
```

Result

All pods successfully running.

Run Autoware with podman (on PCU/Orin/Xavier)

Installation

- **Install podman**

ref: <https://podman.io/getting-started/installation>

```
$ sudo apt-get -y install podman
```

- **Install catatonit**

ref: <https://github.com/openSUSE/catatonit>

```
$ git clone <https://github.com/openSUSE/catatonit.git>
$ cd ./catatonit
$ ./autogen.sh
$ ./configure
$ make
$ sudo make install
```

Preparation

- Download kubernetes yaml files

```
$ wget https://raw.githubusercontent.com/autowarefoundation/open-ad-kit-docs/main/docs/version-2.0/start-guide/installation/deployments/comhpc-deployments.zip
$ unzip comhpc-deployments.zip -d comhpc-deployments
```

- Download kernel configuration file for tuning kernel parameters

```
$ wget -P /etc/sysctl.d https://raw.githubusercontent.com/autowarefoundation/open-ad-kit-docs/main/docs/version-2.0/start-guide/installation/sysctl.d/60_cyclonedds.conf
$ sysctl -p /etc/sysctl.d/60_cyclonedds.conf
```

- Create volume

```
$ cd ~/comhpc-deployments
$ podman kube play comhpc-persistent-volume-claim.yaml
```

- Check the data storage path

```
$ podman volume inspect comhpc-pvc |grep Mountpoint
"Mountpoint": "/var/lib/containers/storage/volumes/comhpc-pvc/_data"
```

- Download map and DDS files to data storage path

```
$ wget "https://drive.google.com/uc?export=download&id=1vWMLbmwJJE5tYO40ypCMxqtmgQPQxhiw&confirm=t&uuid=3d84d854-3dd2-4950-8cc8-248feeab547d" -O sample_data.zip
$ unzip sample_data.zip
$ mv sample_data/map/* /var/lib/containers/storage/volumes/comhpc-pvc/_data
```

```
$ wget -P /var/lib/containers/storage/volumes/comhpc-pvc/_data https://raw.githubusercontent.com/autowarefoundation/open-ad-kit-docs/main/docs/version-2.0/start-guide/installation/cyclonedds/cyclonedds.xml
```

In this report, modify `NetworkInterfaceAddress` in `/var/lib/containers/storage/volumes/comhpc-pvc/_data/cyclonedds.xml` to your network interface.

Create and run pod

- **Method 1: run all pods in batch**

```
$ cd ~/comhpc-deployments
$ for i in `ls -al |grep comhpc |grep -v persistent | awk -F " "
'{print $9}'`;do podman kube play $i;done
```

- **Method 2: run all pods individually and sequentially**

```
$ cd ~/comhpc-deployments
$ podman kube play comhpc-api-deployment.yaml
$ podman kube play comhpc-map-deployment.yaml
$ podman kube play comhpc-simulator-deployment.yaml
$ podman kube play comhpc-vehicle-deployment.yaml
$ podman kube play comhpc-control-deployment.yaml
$ podman kube play comhpc-planning-deployment.yaml
$ podman kube play comhpc-system-deployment.yaml
```

- **Check pod status**

```
$ podman pod ls
      POD ID          NAME                STATUS      CREATED
INFRA ID    # OF CONTAINERS
    4cff1b7f2e22  comhpc-api-pod-0    Running     2 hours ago
26ed9b691e81  2
    62481e933138  comhpc-planning-pod-0  Running     2 hours ago
65261c04e590  2
    44166695116c  comhpc-vehicle-pod-0  Running     2 hours ago
2048f8904f62  2
    cdalefc6e74e  comhpc-map-pod-0     Running     2 hours ago
f4272469d568  2
    6acd22407e1e  comhpc-system-pod-0  Running     2 hours ago
ae6677331759  2
    7cd8a7967729  comhpc-control-pod-0  Running     2 hours ago
40538f6d0591  2
    18dc79537949  comhpc-simulator-pod-0  Running     2 hours ago
d22d19766e16  2
```

- **Check container status**

```

$ podman ps
CONTAINER ID
IMAGE
COMMAND          CREATED          STATUS          PORTS          NAMES
d22d19766e16    localhost/podman-pause:4.3.0-dev-
1665398570
2 hours ago Up 7 minutes ago          18dc79537949-infra
a41afea56f23    registry.autocore.ai/autocore.docker/library/autoware-
universe:galactic-20220728-prebuilt-cuda source install/se... 2 hours
ago Up 7 minutes ago          comhpc-simulator-pod-0-comhpc
40538f6d0591    localhost/podman-pause:4.3.0-dev-
1665398570
2 hours ago Up 7 minutes ago          7cd8a7967729-infra
524a54c57a07    registry.autocore.ai/autocore.docker/library/autoware-
universe:galactic-20220728-prebuilt-cuda source install/se... 2 hours
ago Up 7 minutes ago          comhpc-control-pod-0-comhpc
ae6677331759    localhost/podman-pause:4.3.0-dev-
1665398570
2 hours ago Up 7 minutes ago          6acd22407e1e-infra
4d1a7b2b5940    registry.autocore.ai/autocore.docker/library/autoware-
universe:galactic-20220728-prebuilt-cuda source install/se... 2 hours
ago Up 7 minutes ago          comhpc-system-pod-0-comhpc
f4272469d568    localhost/podman-pause:4.3.0-dev-
1665398570
2 hours ago Up 7 minutes ago          cdalefc6e74e-infra
2e8b2c70dd3b    registry.autocore.ai/autocore.docker/library/autoware-
universe:galactic-20220728-prebuilt-cuda source install/se... 2 hours
ago Up 7 minutes ago          comhpc-map-pod-0-comhpc
2048f8904f62    localhost/podman-pause:4.3.0-dev-
1665398570
2 hours ago Up 7 minutes ago          44166695116c-infra
53d2d6b2c04d    registry.autocore.ai/autocore.docker/library/autoware-
universe:galactic-20220728-prebuilt-cuda source install/se... 2 hours
ago Up 7 minutes ago          comhpc-vehicle-pod-0-comhpc
65261c04e590    localhost/podman-pause:4.3.0-dev-
1665398570
2 hours ago Up 7 minutes ago          62481e933138-infra
5f0dd10b9863    registry.autocore.ai/autocore.docker/library/autoware-
universe:galactic-20220728-prebuilt-cuda source install/se... 2 hours
ago Up 7 minutes ago          comhpc-planning-pod-0-comhpc
26ed9b691e81    localhost/podman-pause:4.3.0-dev-
1665398570
2 hours ago Up 7 minutes ago          4cff1b7f2e22-infra
9fef941e37d6    registry.autocore.ai/autocore.docker/library/autoware-
universe:galactic-20220728-prebuilt-cuda source install/se... 2 hours
ago Up 7 minutes ago          comhpc-api-pod-0-comhpc

```

## Result

All pods successfully running.

## Scenario simulator(on PC)

 Scenario simulator runs on x86\_64 PC which is connect to the Orin via network

### Installation

- **Install docker**

ref: <https://docs.docker.com/engine/install/ubuntu/>

- **Install rocker**

```
$ sudo apt install python3-rocker
```

### Preparation

- **Downloads map and scenario files**

```
$ wget "https://drive.google.com/uc?
export=download&id=1vWMLbmwJJE5tYO40ypCMxqtmgQPQxhiw&confirm=t&uuid=3d84
d854-3dd2-4950-8cc8-248feeab547d" -O sample_data.zip
$ unzip sample_data.zip
```

In this report, modify map path in `~/Downloads/sample_data/t4v2.yaml` to the right path.

- **Download kernel configuration file for tuning kernel parameters**

```
$ wget -P /etc/sysctl.d https://raw.githubusercontent.com
/autowarefoundation/open-ad-kit-docs/main/docs/version-2.0/start-guide
/installation/sysctl.d/60_cyclonedds.conf
$ sysctl -p /etc/sysctl.d/60_cyclonedds.conf
```

- **Download configuration file of Cyclone DDS**

```
$ wget -P ~/cyclonedds https://raw.githubusercontent.com
/autowarefoundation/open-ad-kit-docs/main/docs/version-2.0/start-guide
/installation/cyclonedds/cyclonedds.xml
```

In this report, modify `NetworkInterfaceAddress` in `~/cyclonedds/cyclonedds.xml` to your network interface.



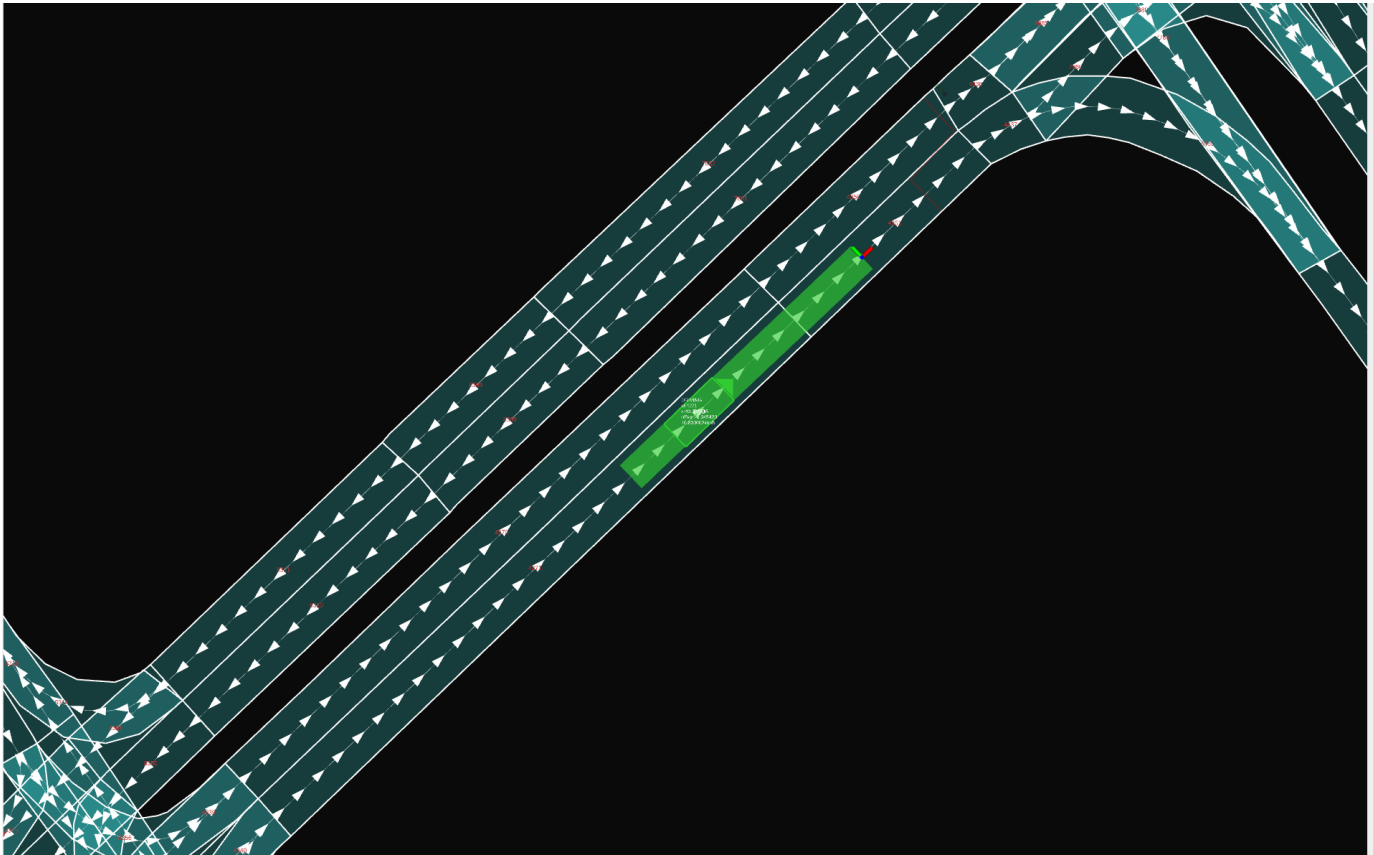
Launch Autoware scenario simulator

```
rocker --x11 --home --network host --privileged ghcr.io/tier4
/scenario_simulator_v2:galactic ros2 launch scenario_test_runner
scenario_test_runner.launch.py scenario:=$HOME/Downloads/sample_data
/t4v2.yaml architecture_type:=awf/universe launch_rviz:=true
launch_autoware:=false record:=false timeout:=60.0
```

Result

Scenario simulation succeeded and the vehicle runs from the starting point to the destination.

Screenshots:



Log:

```
lc@cynthia-liu:~$ rocker --x11 --home --network host --privileged
registry.autocore.ai/autocore.docker/library/scenario_simulator_v2:
galactic ros2 launch scenario_test_runner scenario_test_runner.launch.
py scenario:=$HOME/Downloads/sample_data/t4v2.yaml architecture_type:
=awf/universe launch_rviz:=true launch_autoware:=false record:=false
timeout:=60.0
Extension volume doesn't support default arguments. Please extend it.
Active extensions ['home', 'network', 'privileged', 'x11']
Writing dockerfile to /tmp/tmp4hy1918q/Dockerfile
```

```
vvvvvvv
# Preamble from extension [home]

# Preamble from extension [network]

# Preamble from extension [privileged]

# Preamble from extension [x11]

FROM registry.autocore.ai/autocore.docker/library/scenario_simulator_v2:
galactic
USER root
# Snippet from extension [home]

# Snippet from extension [network]

# Snippet from extension [privileged]

# Snippet from extension [x11]

^^^^^^
Building docker file with arguments: {'path': '/tmp/tmp4hy19l8q',
'rm': True, 'nocache': False, 'pull': False}
building > Step 1/2 : FROM registry.autocore.ai/autocore.docker/library
/scenario_simulator_v2:galactic
building > ---> 94fe590a8997
building > Step 2/2 : USER root
building > ---> Running in 2ebc1edc228f
building > Removing intermediate container 2ebc1edc228f
building > ---> b1d1a7945f7a
building > Successfully built b1d1a7945f7a
Executing command:
docker run --rm -it -v /home/lc:/home/lc --network host --privileged
-e DISPLAY -e TERM -e QT_X11_NO_MITSHM=1 -e XAUTHORITY=/tmp/.
dockerf17j5u42.xauth -v /tmp/.dockerf17j5u42.xauth:/tmp/.dockerf17j5u42.
xauth -v /tmp/.X11-unix:/tmp/.X11-unix -v /etc/localtime:/etc
/localtime:ro b1d1a7945f7a ros2 launch scenario_test_runner
scenario_test_runner.launch.py scenario:=/home/lc/Downloads/sample_data
/t4v2.yaml architecture_type:=awf/universe launch_rviz:=true
launch_aware:=false record:=false timeout:=60.0
[INFO] [launch]: All log files can be found below /root/.ros/log/2022-
12-15-14-02-03-492098-cynthia-liu-1
[INFO] [launch]: Default logging verbosity is set to INFO
architecture_type      := awf/universe
aware_launch_file      := planning_simulator.launch.xml
aware_launch_package   := aware_launch
global_frame_rate      := 30.0
global_real_time_factor := 1.0
```



clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] Could not find valid vertex for ear  
clipping triangulation. Triangulation result might be invalid  
[openscenario\_interpreter\_node-3] [ERROR] [1671084130.462933688]  
[simulation.concealer]: /api/autoware/set/velocity\_limit service  
request was accepted, but ResponseStatus is FAILURE (It is not ready  
to set velocity.)  
[openscenario\_interpreter\_node-3] [ERROR] [1671084130.466120980]  
[simulation.concealer]: /api/autoware/set/velocity\_limit service  
request was accepted, but ResponseStatus is FAILURE (It is not ready  
to set velocity.)  
[openscenario\_interpreter\_node-3] [ERROR] [1671084131.467811979]  
[simulation.concealer]: /api/autoware/set/velocity\_limit service  
request was accepted, but ResponseStatus is FAILURE (It is not ready  
to set velocity.)  
[openscenario\_interpreter\_node-3] [ERROR] [1671084132.469278970]  
[simulation.concealer]: /api/autoware/set/velocity\_limit service  
request was accepted, but ResponseStatus is FAILURE (It is not ready  
to set velocity.)  
[openscenario\_interpreter\_node-3] [INFO] [1671084133.472479413]

```
[simulation.concealer]: /api/autoware/set/velocity_limit service
request has been accepted .
[openscenario_interpreter_node-3] [INFO] [1671084133.472533524]
[simulation.concealer]: Autoware is INITIALIZING now.
[openscenario_interpreter_node-3] [INFO] [1671084133.472571305]
[simulation.concealer]: Simulator waiting for Autoware state to be
WaitingForRoute (remain: 24).
[openscenario_interpreter_node-3] [INFO] [1671084134.472626117]
[simulation.concealer]: Simulator waiting for Autoware state to be
WaitingForRoute (remain: 23).
[openscenario_interpreter_node-3] [INFO] [1671084135.472613349]
[simulation.concealer]: Autoware is WAITING_FOR_ROUTE now.
[openscenario_interpreter_node-3] [INFO] [1671084135.472666980]
[simulation.concealer]: Autoware is WAITING_FOR_ROUTE now.
[openscenario_interpreter_node-3] [INFO] [1671084135.472704789]
[simulation.concealer]: Simulator waiting for Autoware state to be
Planning (remain: 22).
[openscenario_interpreter_node-3] [INFO] [1671084136.472765007]
[simulation.concealer]: Autoware is PLANNING now.
[openscenario_interpreter_node-3] [INFO] [1671084136.472825725]
[simulation.concealer]: Simulator waiting for Autoware state to be
WaitingForEngage (remain: 21).
[openscenario_interpreter_node-3] [INFO] [1671084137.472893167]
[simulation.concealer]: Simulator waiting for Autoware state to be
WaitingForEngage (remain: 20).
[openscenario_interpreter_node-3] [INFO] [1671084138.472916737]
[simulation.concealer]: Simulator waiting for Autoware state to be
WaitingForEngage (remain: 19).
[openscenario_interpreter_node-3] [INFO] [1671084139.472891247]
[simulation.concealer]: Simulator waiting for Autoware state to be
WaitingForEngage (remain: 18).
[openscenario_interpreter_node-3] [INFO] [1671084140.472887772]
[simulation.concealer]: Autoware is WAITING_FOR_ENGAGE now.
[openscenario_interpreter_node-3] [INFO] [1671084140.474839891]
[simulation.concealer]: /api/autoware/set/velocity_limit service
request has been accepted .
[openscenario_interpreter_node-3] [INFO] [1671084140.578043794]
[simulation.concealer]: Simulator waiting for Autoware state to be
Driving (remain: 17).
[openscenario_interpreter_node-3] [INFO] [1671084141.575042435]
[simulation.concealer]: Autoware is DRIVING now.
[openscenario_interpreter_node-3] [INFO] [1671084154.552094895]
[simulation.concealer]: Shutting down Autoware: (1/3) Stop publishing
/subscribing.
[openscenario_interpreter_node-3] [INFO] [1671084158.804076782]
[simulation.openscenario_interpreter]: Passed
[scenario_test_runner-1] [INFO] [1671084159.825421838] [simulation.
scenario_test_runner]: Shutdown interpreter.
[scenario_test_runner-1] /home/lc/Downloads/sample_data/t4v2.yaml
[INFO] [scenario_test_runner-1]: process has finished cleanly [pid 63]
```

```
[INFO] [launch]: process[scenario_test_runner-1] was required: shutting
down launched system
[INFO] [rviz2-6]: sending signal 'SIGINT' to process[rviz2-6]
[INFO] [openscenario_visualization_node-5]: sending signal 'SIGINT' to
process[openscenario_visualization_node-5]
[INFO] [openscenario_preprocessor_node-4]: sending signal 'SIGINT' to
process[openscenario_preprocessor_node-4]
[INFO] [openscenario_interpreter_node-3]: sending signal 'SIGINT' to
process[openscenario_interpreter_node-3]
[INFO] [simple_sensor_simulator_node-2]: sending signal 'SIGINT' to
process[simple_sensor_simulator_node-2]
[openscenario_visualization_node-5] [INFO] [1671084162.044640687]
[rclcpp]: signal_handler(signal_value=2)
[openscenario_preprocessor_node-4] [INFO] [1671084162.045048021]
[rclcpp]: signal_handler(signal_value=2)
[openscenario_interpreter_node-3] [INFO] [1671084162.045442105]
[rclcpp]: signal_handler(signal_value=2)
[simple_sensor_simulator_node-2] [INFO] [1671084162.045843624]
[rclcpp]: signal_handler(signal_value=2)
[INFO] [openscenario_preprocessor_node-4]: process has finished cleanly
[pid 69]
[INFO] [openscenario_visualization_node-5]: process has finished
cleanly [pid 71]
[INFO] [openscenario_interpreter_node-3]: process has finished cleanly
[pid 67]
[INFO] [rviz2-6]: process has finished cleanly [pid 73]
[INFO] [simple_sensor_simulator_node-2]: process has finished cleanly
[pid 65]
```

## Compare k3s and podman

Statistics of the time from Autoware service creation to running.

Shell script `test.sh` for time statistics:

```

#!/bin/bash

FILENAME=autoware-topic
MODULE=(api control planning simulation system vehicle map)
cnt=0
#podman exec -it ee3654b810eb bash -c "source install/setup.bash; ros2
topic list"

for i in {1..100}
do
    podman exec -it ee3654b810eb bash -c "source install/setup.
bash; ros2 topic list" > /tmp/$FILENAME
    for item in ${MODULE[*]}
    do
        echo "try $item"
        if ((`grep $item /tmp/$FILENAME |wc -l` > 0))
        then
            ((cnt++))
            echo "[$item] Found"
        fi
    done

    if (( cnt >= 7))
    then
        echo "All found!"
        exit 0
    fi
    echo "Not ready!"
    sleep 0.1
done

```

Compare the running time of Autoware service between K3s and Podman:

	1st (s)	2st (s)	3st (s)	4st (s)	5st (s)	Average Time(s)
<b>K3s</b>	18.447	5.127	15.123	11.707	9.826	12.046
<b>Podman</b>	8.602	7.488	7.326	7.288	7.787	7.698