

Instructions for running openpilot and Carla.

Follow the instruction provided to run the comma.ai simulation

Install Drivers and Software

The simulation runs on Ubuntu Platform Ubuntu 18 or above is preferred.

Install Docker

```
sudo apt install curl
```

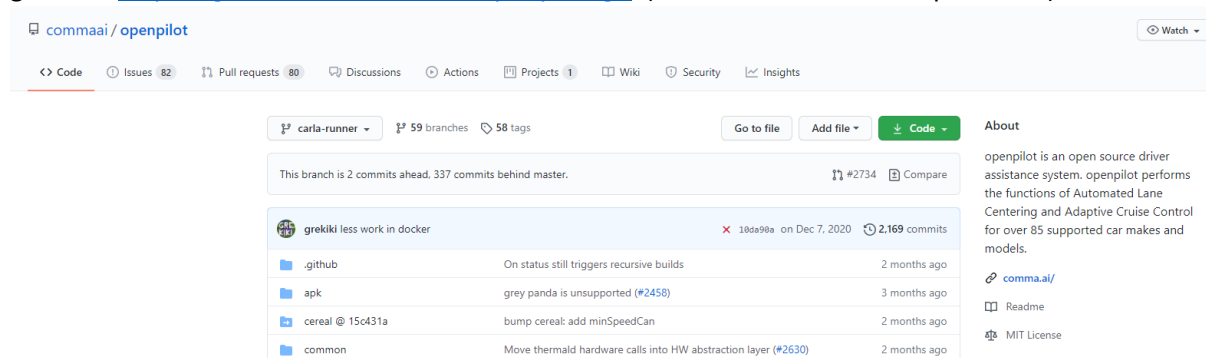
```
curl https://get.docker.com | sh \  
&& sudo systemctl start docker \  
&& sudo systemctl enable docker
```

```
sudo docker run hello-world
```

Install openpilot and carla

```
sudo apt install git
```

git clone <https://github.com/commaai/openpilot.git> (Carla- runner branch is preferred)



which can be found in this link <https://github.com/commaai/openpilot/tree/carla-runner>

```
cd openpilot/tools/sim
```

```
./install_carla.sh
```

Install drivers and start carla

```
sudo INSTALL=1 ./start_carla.sh
```

This should start the Carla and show result as shown in figure 1 (for first time Pulling of required files will happen)

The simulation can be performed in two ways

- Running the Simulation in Local host of PC with GPU
- Running the simulation completely in Docker

The First method is preferred which is will work properly rather than running it in docker.

Running the Simulation in Local host of PC with GPU

For running the simulation on PC the following have to be verified

- The Ubuntu_setup file in 'tools' folder has to be installed
- Compile openpilot by running scons in the openpilot directory

For video demo: <https://youtu.be/i394nQOBS2U>

For proper functioning of simulation, CUDA, Cudnn, and onnxruntime-gpu have to be installed

Verify the installations using following commands

- nvidia-smi ~ This shows the GPU and CUDA version
- dpkg -l | grep cudnn ~ This shows Cudnn version
- pip show will show the package version
eg: pip show onnxruntime-gpu

```
seenu@seenu-Ubuntu:~$ nvidia-smi
Fri Jan  8 14:36:14 2021

+-----+
| NVIDIA-SMI 455.45.01    Driver Version: 455.45.01    CUDA Version: 11.1    |
+-----+-----+
| GPU   Name           Persistence-M| Bus-Id        Disp.A    Volatile Uncorr. ECC  |
| Fan  Temp  Perf    Pwr:Usage/Cap|  Memory-Usage  GPU-Util  Compute M. |
|-----+-----+
| 0  GeForce GTX 1060  On           | 00000000:01:00.0  On           N/A           |
| N/A   41C    P8     7W /  N/A     | 306MiB /  6075MiB      0%          Default |
+-----+-----+

Processes:
+-----+
| GPU   GI    CI          PID    Type   Process name          GPU Memory |
| ID   ID   ID           |              |           Usage       |
+-----+-----+
| 0  N/A  N/A         4526     G   /usr/lib/xorg/Xorg      18MiB |
| 0  N/A  N/A         4600     G   /usr/bin/gnome-shell    49MiB |
| 0  N/A  N/A         5314     G   /usr/lib/xorg/Xorg      114MiB |
| 0  N/A  N/A         5443     G   /usr/bin/gnome-shell    115MiB |
| 0  N/A  N/A         8031     G   ...AAAAAAAA== --shared-files  2MiB |
+-----+-----+

seenu@seenu-Ubuntu:~$ dpkg -l | grep cudnn
ii  libcudnn8      8.0.5.39-1+cuda11.1  amd64  cuDNN runtime libraries
ii  libcudnn8-dev  8.0.5.39-1+cuda11.1  amd64  cuDNN development libraries and headers
ii  libcudnn8-samples  8.0.5.39-1+cuda11.1  amd64  cuDNN documents and samples
seenu@seenu-Ubuntu:~$
```

*If all these are verified then the simulation is will work properly

For running simulation on PC

```
cd openpilot/tools/sim
```

```
sudo ./start_carla.sh
```

will start the CARLA which will pull required files and run-on Docker (the server can be hosted from the docker or it can be installed locally and configured, here docker is used). This part will be same for both running methods.

```
seenu@seenu-Ubuntu:~$ sudo ./start_carla.sh
[sudo] password for seenu:

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

0.9.7: Pulling from carlasim/carla
Digest: sha256:0828ebcd3bd6c38e2fe27f93cb0b36e4342fa241407d1f64d1c18ac4b04aa201
Status: Image is up to date for carlasim/carla:0.9.7
docker.io/carlasim/carla:0.9.7
4.22.1-0+++UE4+Release-4.22 517 0
Disabling core dumps.
sh: 1: xdg-user-dirs: not found
```

Open a new tab in the same terminal

`./launch_openpilot.sh`

```
seenu@seenu-Ubuntu: ~/openpilot/tools/sim
File Edit View Search Terminal Tabs Help
seenu@seenu-Ubuntu: ~/openpilot/tools/sim x seenu@seenu-Ubuntu: ~/openpilot/tools/sim x
seenu@seenu-Ubuntu:~/openpilot/tools/sim$ ./launch_openpilot.sh
selfdrive/controls/controlsd.py: needs update
tools/sim/bridge.py: needs update
tools/sim/install_carla.sh: needs update
tools/sim/start_carla.sh: needs update
tools/ubuntu_setup.sh: needs update
{"event": "dirty comma branch", "version": "0.8.2", "dirty": true, "origin": "https://github.com/commaai/openpilot.git", "branch": "origin/master", "dirty_files": ":100755 100755 a09ba171df51889047a11f02fbab12b031e6dba9 00000000000000000000000000000000 M\\tselfdrive/controls/controlsd.py\\n:100755 100755 cb823c9a18966349e3c769e6ceb2c195029a9162 00000000000000000000000000000000 M\\ttools/sim/bridge.py\\n:100755 100755 6b661e8dbb4c1d5916d7849896ac4aace525c1c0 00000000000000000000000000000000 M\\ttools/sim/install_carla.sh\\n:100755 100755 2be3d0cc3801e0dd1e6daf3d6aa9f20251b15799 00000000000000000000000000000000 M\\ttools/sim/start_carla.sh\\n:100755 100755 453395a93ba8f102868d0d12ea3b88d0b39f341c 00000000000000000000000000000000 M\\ttools/ubuntu_setup.sh", "commit": "61bc7f73faf70522dd2c3177d6f53ed3ff3e1af4", "origin_commit": "61bc7f73faf70522dd2c3177d6f53ed3ff3e1af4"}
scons: Reading SConscript files ...
scons: done reading SConscript files.
scons: Building targets ...
scons: `.` is up to date.
scons: done building targets.
getting pilotauth
preimporting selfdrive.thermal.thermal
Building panda firmware
```

Open the third tab in the same terminal

`./bridge.py`

```
seenu@seenu-Ubuntu: ~/openpilot/tools/sim
File Edit View Search Terminal Tabs Help
seenu@seenu-Ubuntu: ~/openpilot/tools/sim x seenu@seenu-Ubuntu: ~/openpilot/tools/sim x seenu@seenu-Ubuntu: ~/openpilot/tools/sim x
seenu@seenu-Ubuntu:~/openpilot/tools/sim$ ./bridge.py
ECU Camera Simulated: True
ECU Gas Interceptor: True
selfdrive/controls/controlsd.py: needs update
tools/sim/install_carla.sh: needs update
tools/sim/start_carla.sh: needs update
tools/ubuntu_setup.sh: needs update
{"event": "dirty comma branch", "version": "0.8.2", "dirty": true, "origin": "https://github.com/commaai/openpilot.git", "branch": "origin/master", "dirty_files": ":100755 100755 a09ba171df51889047a11f02fbab12b031e6dba9 00000000000000000000000000000000 M\\tselfdrive/controls/controlsd.py\\n:100755 100755 6b661e8dbb4c1d5916d7849896ac4aace525c1c0 00000000000000000000000000000000 M\\ttools/sim/install_carla.sh\\n:100755 100755 2be3d0cc3801e0dd1e6daf3d6aa9f20251b15799 00000000000000000000000000000000 M\\ttools/sim/start_carla.sh\\n:100755 100755 453395a93ba8f102868d0d12ea3b88d0b39f341c 00000000000000000000000000000000 M\\ttools/ubuntu_setup.sh", "commit": "61bc7f73faf70522dd2c3177d6f53ed3ff3e1af4", "origin_commit": "61bc7f73faf70522dd2c3177d6f53ed3ff3e1af4"}
frame: engaged: False ; throttle: 0.0 ; steer(c/deg): -0.0 0.0 ; brake: 0.0
./bridge.py:65: DeprecationWarning: tostring() is deprecated. Use tobytes() instead.
"image": img.tostring(),
frame: engaged: False ; throttle: 0.0 ; steer(c/deg): -0.0 0.0 ; brake: 0.0
frame: engaged: False ; throttle: 0.0 ; steer(c/deg): -0.0 0.0 ; brake: 0.0
```

The screen on right should appear

In the bridge.py terminal press 1 to engage and increase speed

Press 2 to lower the speed

Press 3 to disengage the openpilot

Video Demo: https://youtu.be/_bZ5OLtvbhk



Running openpilot on Docker

Follow the following commands for running simulation on Docker

```
cd openpilot/tools/sim
```

```
sudo ./start_carla.sh
```

will start the CARLA which will pull required files and run-on Docker

```
seenu@seenu-Ubuntu:~/openpilot/tools/sim$ sudo ./start_carla.sh
[sudo] password for seenu:

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

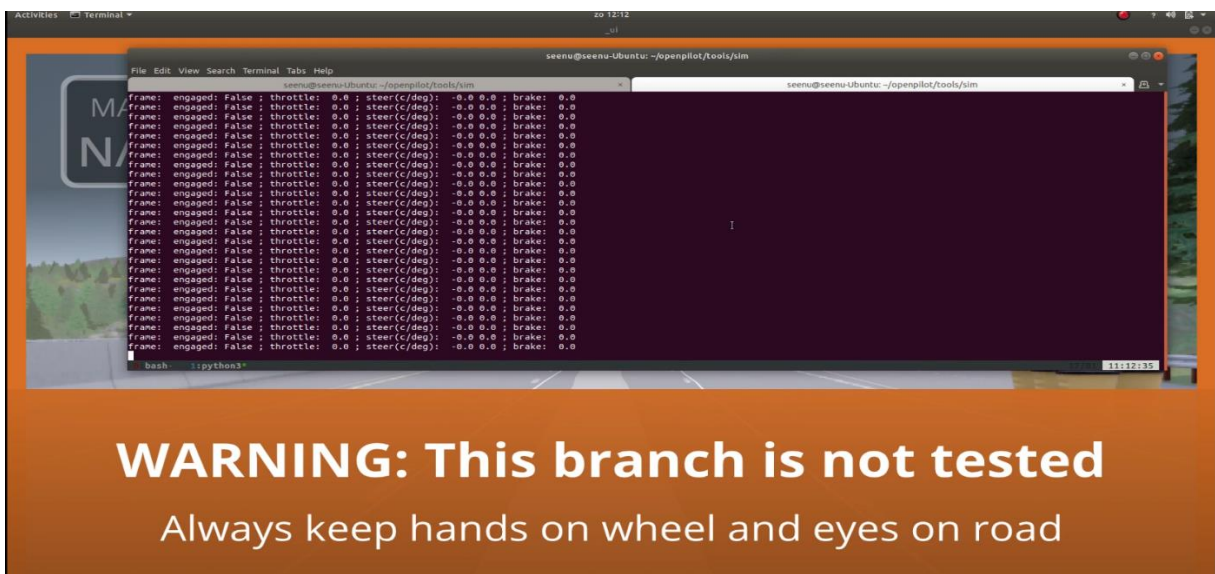
0.9.7: Pulling from carlasim/carla
Digest: sha256:0828ebd3bd6c38e2fe27f93cb0b36e4342fa241407d1f64d1c18ac4b04aa201
Status: Image is up to date for carlasim/carla:0.9.7
docker.io/carlasim/carla:0.9.7
4.22.1-0+++UE4+Release-4.22 517 0
Disabling core dumps.
sh: 1: xdg-user-dir: not found
```

Open a new tab in the same terminal

```
sudo ./start_openpilot_docker.sh
```

```
seenu@seenu-Ubuntu:~/openpilot/tools/sim$ sudo ./start_openpilot_docker.sh
[sudo] password for seenu:
non-network local connections being added to access control list
latest: Pulling from commaai/openpilot-sim
Digest: sha256:ab0c957a19c7d0cacb0b4aaafba4f441d363b76f515e7de748e7174850a22455
Status: Image is up to date for commaai/openpilot-sim:latest
docker.io/commaai/openpilot-sim:latest
```

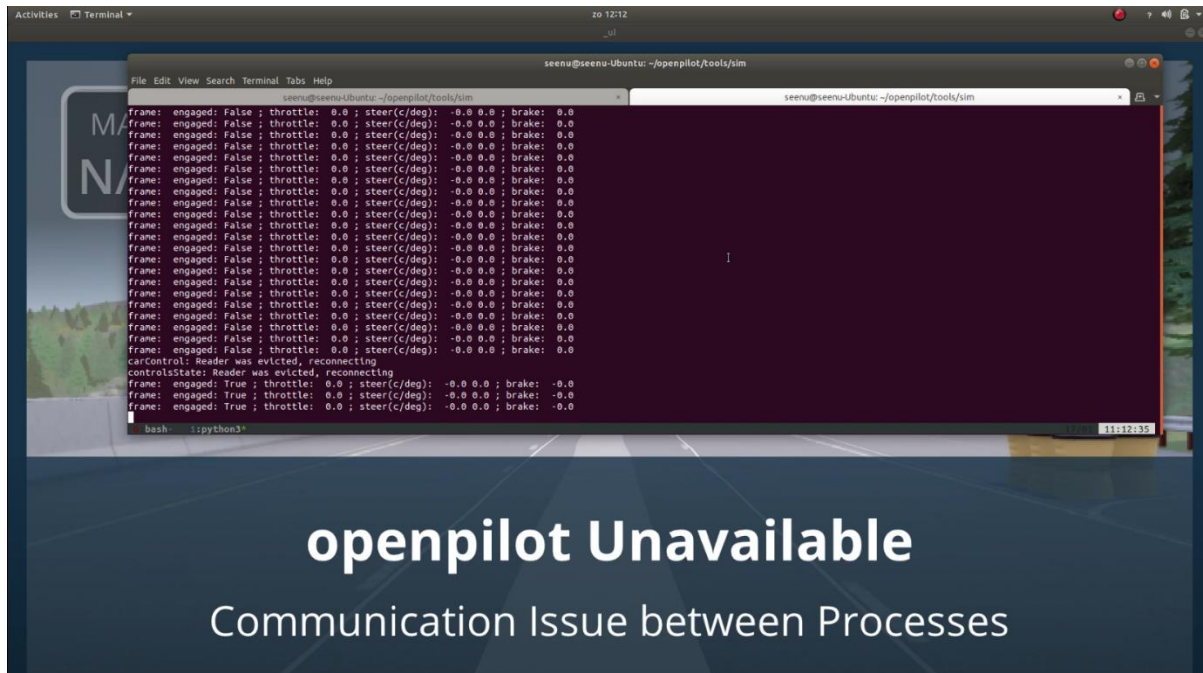
will start the Comma.ai simulation. Press 1 in terminal to engage.



Video Demo + Trouble shooting: <https://youtu.be/VuEaiAwoTdY>

Tips and Troubleshooting

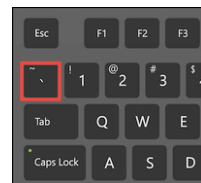
"communication issue between processes"



disable the issue in controlsd.py few lines have to be commented out in the docker container

The file access in Docker will be little different

back tick key (`) will be used for navigating the tabs



- 1) ``+0` this command will switch to `launch_openpilot.sh` tab
ctrl+c to kill process
ctrl +z to stop the execution
ctrl + d to exit the container
- 2) ``+1` will switch to `bridge.py` tab
(q) will quit the process
- 3) ``+c` will add new tab (to access `controls.py`)
`cd`
`cd /openpilot/selfdrive/controls`
`vim controlsd.py` (this will open the file in vim)
- 4) Editing file in vim will be different than other editors type the following command in vim shell to comment out the lines
`:201,225s/^/#` press enter – This will comment out line from 201 to 225
`:wq` press enter – this will save the file in vim
- 5) Navigate back to first tab and execute the `./launch_openpilot.sh` then to second tab and execute `./bridge.py`

This will help to remove all the errors like communication error, planner error, and will enable the simulation on Docker. Note: This will not perform the auto pilot properly the car will move and crash. Running the simulation on local machine with GPU will be proper

Carla scene is slow or fails to load in openpilot ui window

Try setting CARLA to the low quality rendering

Open the file openpilot/tools/sim/start_carla.sh in the ubuntu file explorer

on the last line, add `./CarlaUE4.sh -quality-level=Low` to the end of the docker command. It should look like the following:

```
docker run -it --net=host --gpus all carlasim/carla:0.9.7 ./CarlaUE4.sh -quality-level=Low
```

Docker service error

Every time the docker has to be closed and exited properly, if not it will throw error

```
seenu@seenu-Ubuntu:~/openpilot/tools/sim$ sudo ./start_carla.sh
[sudo] password for seenu:

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

0.9.7: Pulling from carlasim/carla
Digest: sha256:0828ebed3bd6c38e2fe27f93cb0b36e4342fa241407d1f64d1c18ac4b04aa201
Status: Image is up to date for carlasim/carla:0.9.7
docker.io/carlasim/carla:0.9.7
docker: Error response from daemon: could not select device driver "" with capabilities: [[gpu]].
ERRO[0002] error waiting for container: context canceled
```

Sudo docker ps ~ this will list the running dockers images

Sudo docker kill (id) ~ this will kill the running docker containers

Then restart the services again

Video demo: <https://youtu.be/ZilLvPYJ06o>