Vehicle Event Recording Reference Implementation

Version: 2021.3 Published: 04/12/2021

Last Updated: 12/17/2021

Overview

The Vehicle Event Recording Reference Implementation (RI) applies Artificial Intelligence (AI) to monitor the exterior of a vehicle and send events to the cloud dashboard. This includes event-based recording, remote view, driver coaching, and traffic violation detection features. The information is used for historical analysis, evidence support, and driver coaching by fleet management.

The RI includes an interface for the driver to be able to review events and check camera status on demand when the vehicle is not moving. The RI also sends event notifications and video clips to Amazon Web Services* (AWS*), which can be displayed on the cloud dashboard.

Select **Configure & Download** to download the reference implementation and the software listed below.

Configure & Download

Time to Complete	Approximately 60 minutes
Programming Language	Python*
Available Software	Intel® Distribution of OpenVINO™ toolkit 2020 Release

Recommended Hardware

The below hardware is recommended for use with this reference implementation. See the Recommended Hardware page for other suggestions.

- ADLINK MXE-5500 Series

- NEXCOM VTC 7252-7C4IP

Target System Requirements

- Ubuntu* 18.04.02
- 6th to 10th Generation Intel® Core™ processors with Intel® Iris® Plus graphics or Intel® HD Graphics

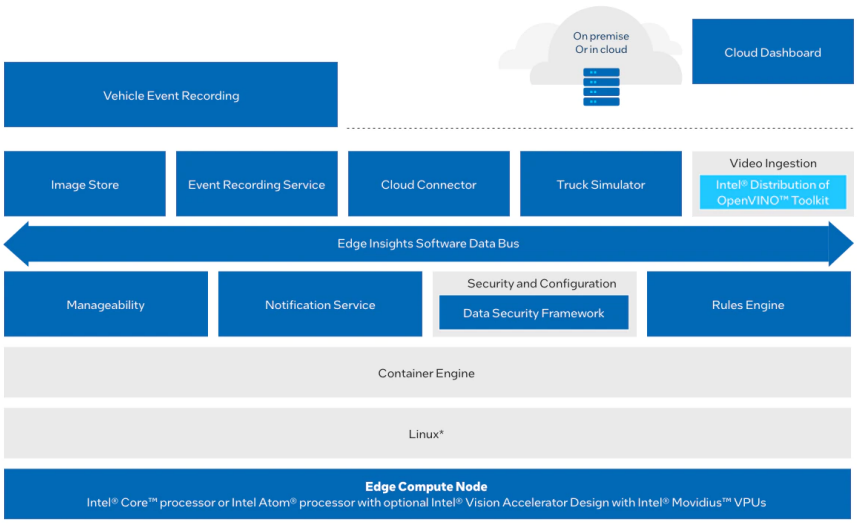
How It Works

Vehicle Event Recording utilizes external facing cameras to detect objects and provide event-based video recording, remote view and driver coaching, and traffic violation detection features.

The RI is used for historical analysis, evidence support and driver coaching by fleet management.

Vehicle Event Recording has an interface for the driver to be able to review events and check camera status on demand when the vehicle is not moving.

The RI sends event notifications and video clips to AWS, which can be displayed on a dashboard.



Get Started

Step 1: Install the Reference Implementation

Select **Configure & Download** to download the reference implementation and then follow the steps below to install it.

Configure & Download

NOTE: If the host system already has Docker images and containers, you might encounter errors while building the reference implementation packages. If you do encounter errors, refer to the Troubleshooting section at the end of this document before starting the reference implementation installation.

1. Open a new terminal, go to the downloaded folder and unzip the downloaded RI package.

```
unzip vehicle_event_recording.zip
```

2. Go to the `vehicle_event_recording/` directory.

```
cd vehicle_event_recording/
```

3. Change permission of the executable `edgesoftware` file.

```
chmod 755 edgesoftware
```

4. Run the command below to install the Reference Implementation.

```
./edgesoftware install
```

5. During the installation, you will be prompted for the **Product Key**. The **Product Key** is contained in the email you received from Intel confirming your download.

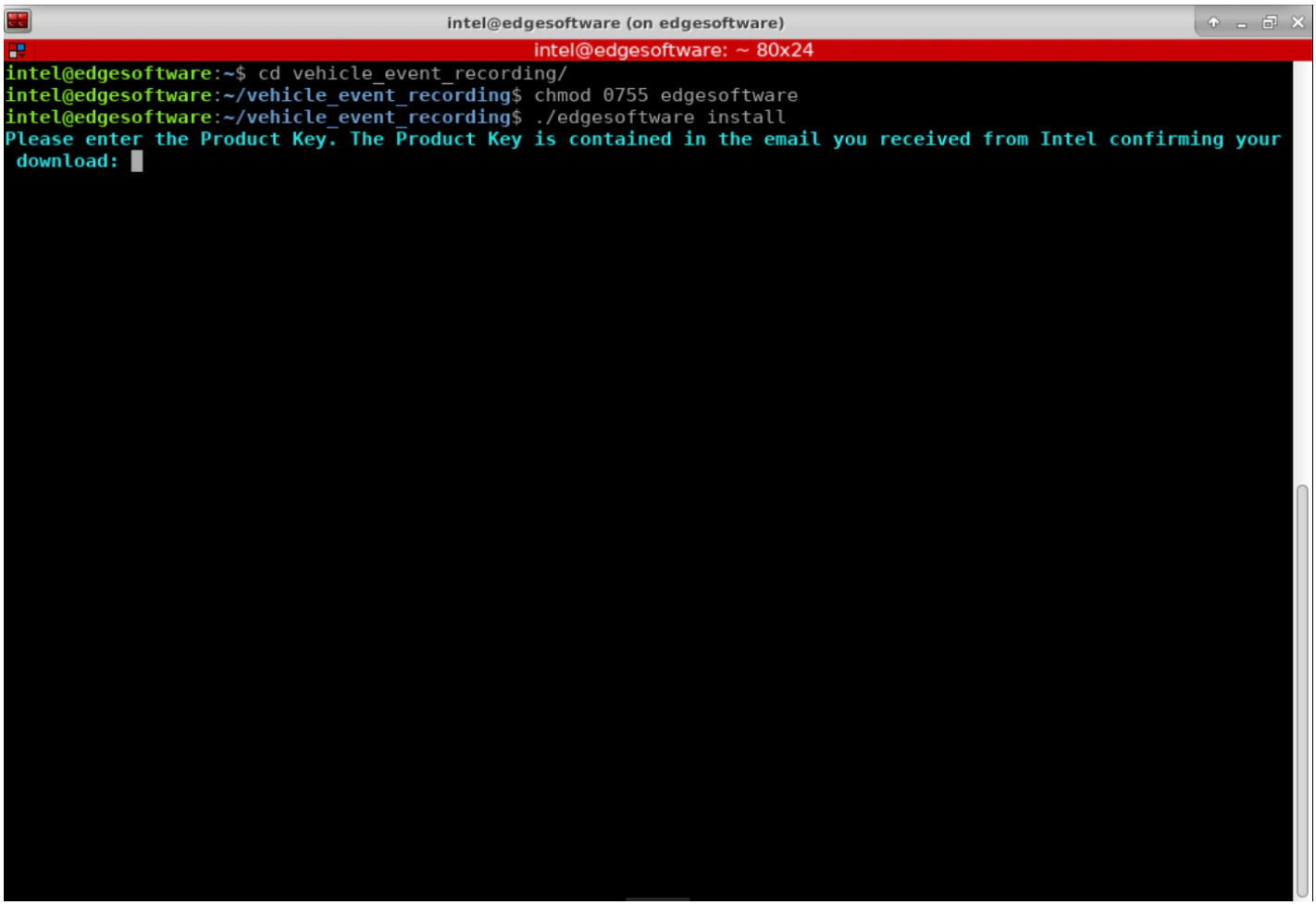


Figure 2: Enter Product Key

6. When the installation is complete, you see the message “Installation of package complete” and the installation status for each module.

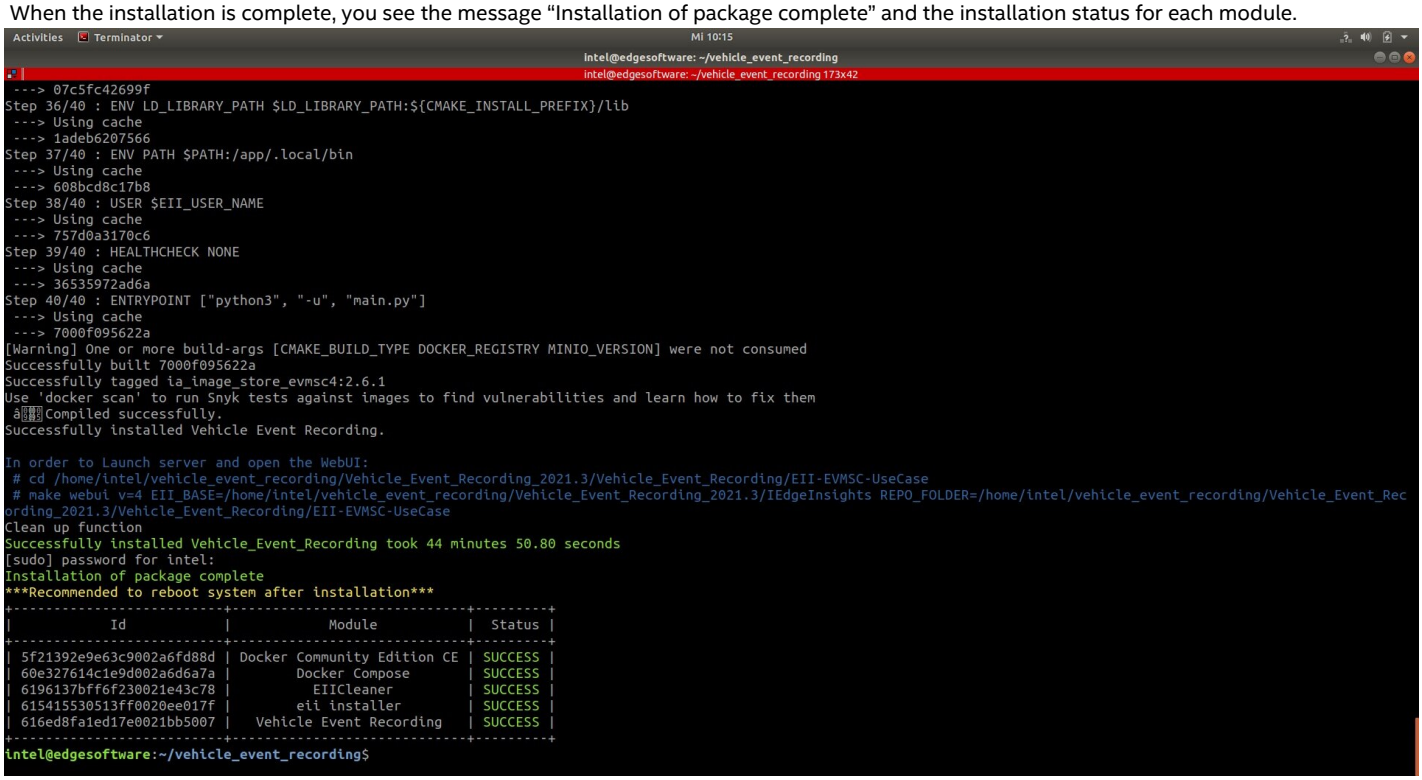


Figure 3: Installation Success

NOTE: If you encounter any issues, refer to the Troubleshooting section at the end of this document.
Installation failure logs are available at this path: `/var/log/esb-cli/Vehicle_Event_Recording_2021.3/output.log`

7. In order to start the application, change the directory using the cd command printed at the end of the installation process:

```
cd <INSTALL_PATH>/vehicle_event_recording/Vehicle_Event_Recording_2021.3/Vehicle_Event_Recording/EII-EVMSC-UseCase
```

Step 2: Run the Application

Prerequisites

- Set Up ThingsBoard* Local Cloud Data
- Set Up Amazon Web Services* Cloud Storage

1. Run the application. Copy and run the `make webui` command from the end of the installation log:

```
make webui v=4 EII_BASE=<INSTALL_PATH>/vehicle_event_recording/Vehicle_Event_Recording_2021.3/IEdgeInsights
REPO_FOLDER=<INSTALL_PATH>/vehicle_event_recording/Vehicle_Event_Recording_2021.3/Vehicle_Event_Recording/EII-EVMSC-
UseCase
```

For example:

```
make webui v=4 EII_BASE=/home/intel/vehicle_event_recording/Vehicle_Event_Recording_2021.3/IEdgeInsights
REPO_FOLDER=/home/intel/vehicle_event_recording/Vehicle_Event_Recording_2021.3/Vehicle_Event_Recording/EII-EVMSC-
UseCase
```

2. Open the Web UI and go to **127.0.0.1:9091** on your web browser.

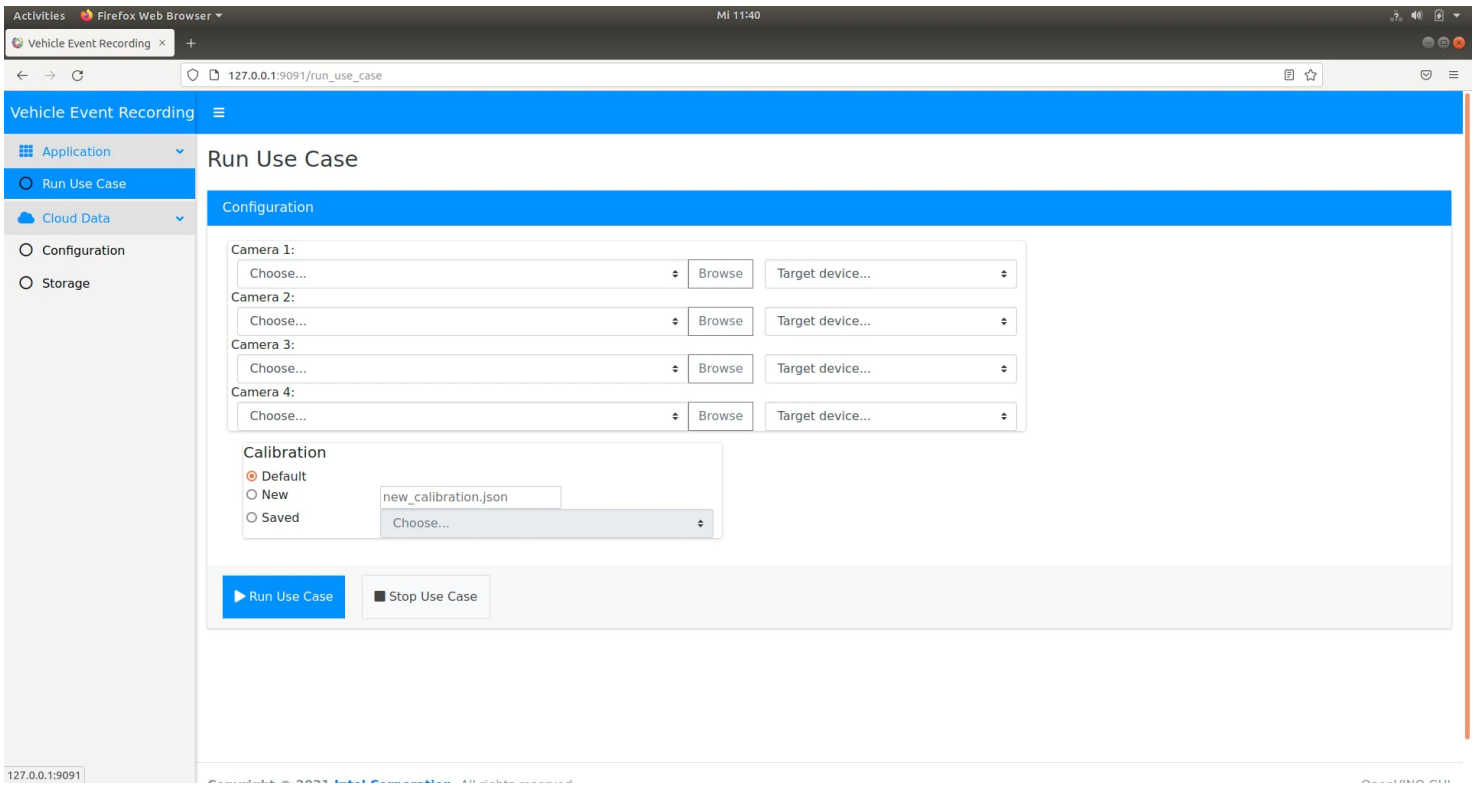


Figure 4: Web UI

3. If you installed your ThingsBoard Local Cloud Server and you have enabled S3 Bucket Server on your AWS account, you can provide your configured **AWS Access Key ID**, **AWS Secret Access Key**, **Thingsboard IP**, **Thingsboard Port** and **Thingsboard Device token** on the **Cloud Data Configuration** tab. After you complete the Cloud configuration, make sure you click on the **Save Credentials** and **Save Token** buttons. Now you can import the ThingsBoard dashboard as described at the end of the Set Up ThingsBoard* Local Cloud Data

to enable all dashboard features, including the cloud storage.

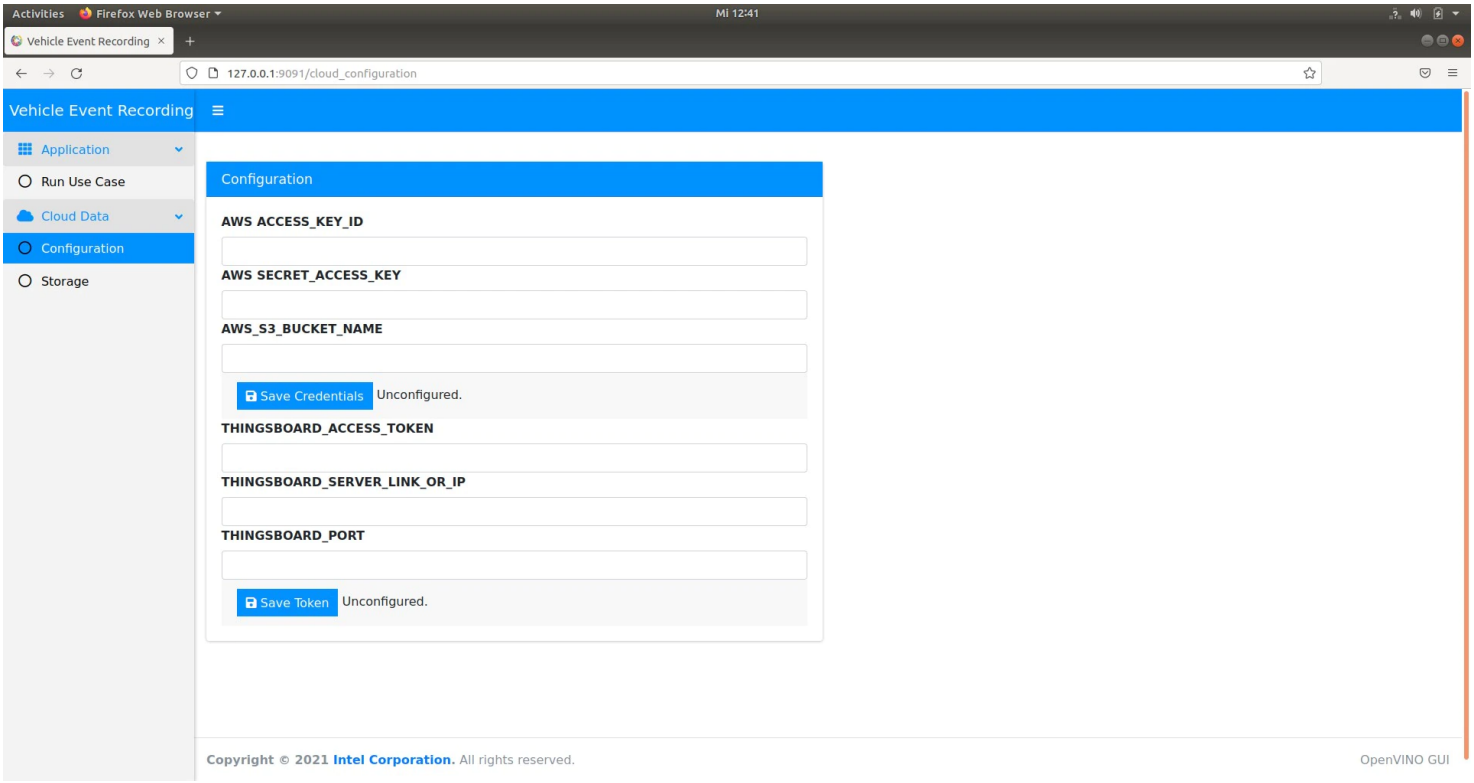


Figure 5: Configure AWS Login Information

> **NOTE:** If you don't have an AWS account, you can still enable the ThingsBoard Cloud Data.

4. Access the Video Event Recording Dashboard with the following steps:

- Go to sidebar and select **Run Use Case**.

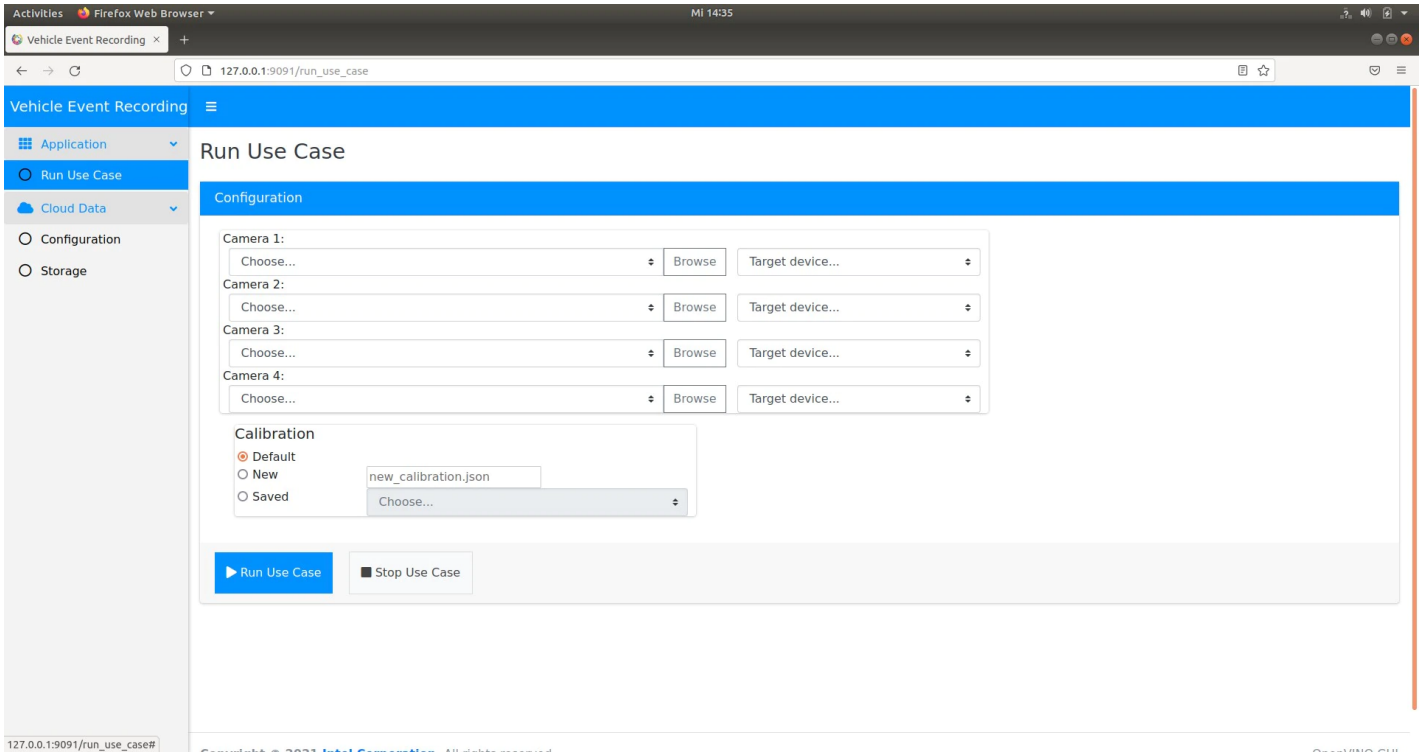


Figure 6: Select Use Case

- Configure the use case. Select video sample or multiple video samples and check CPU or GPU device to run the use case on it.

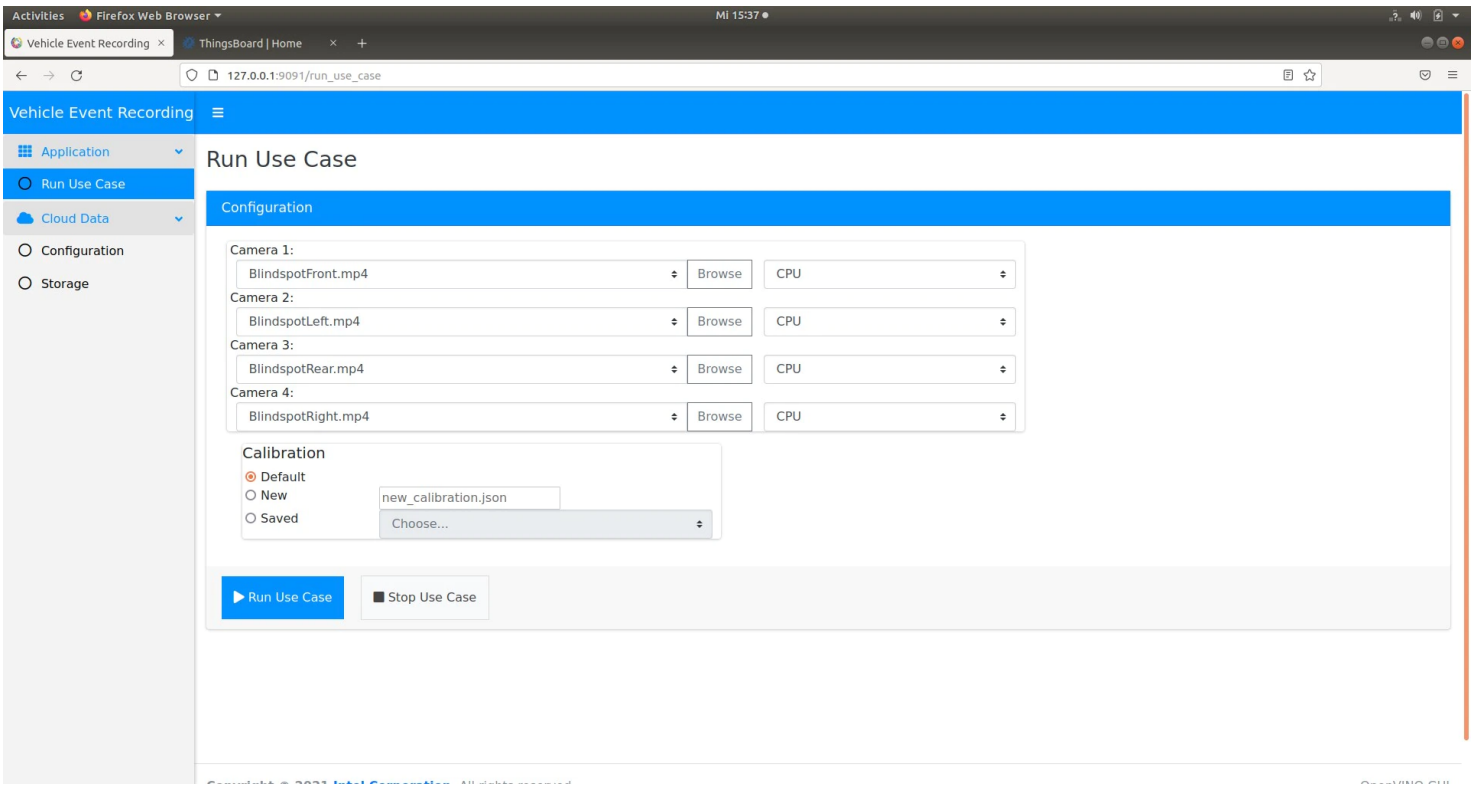
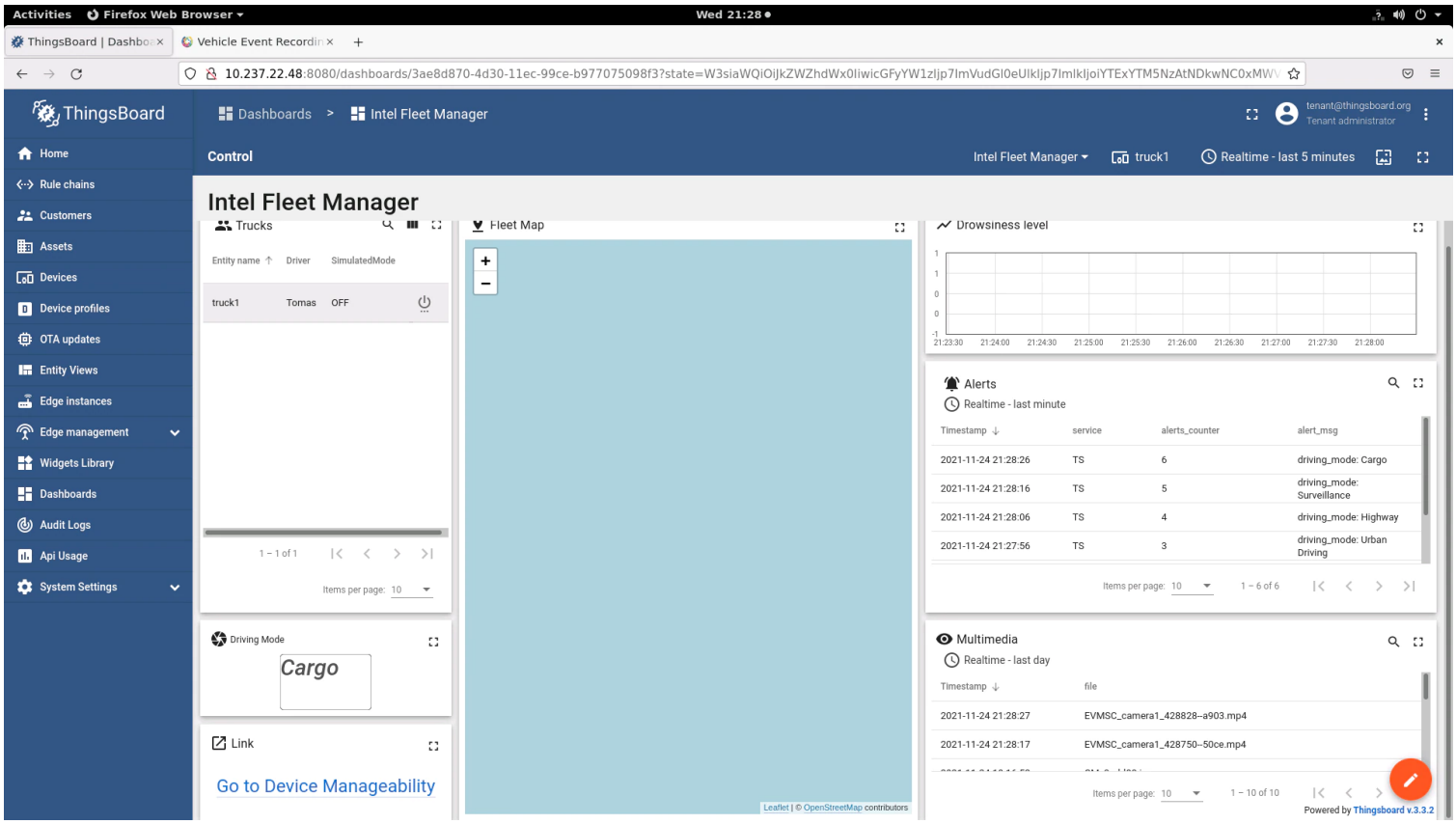


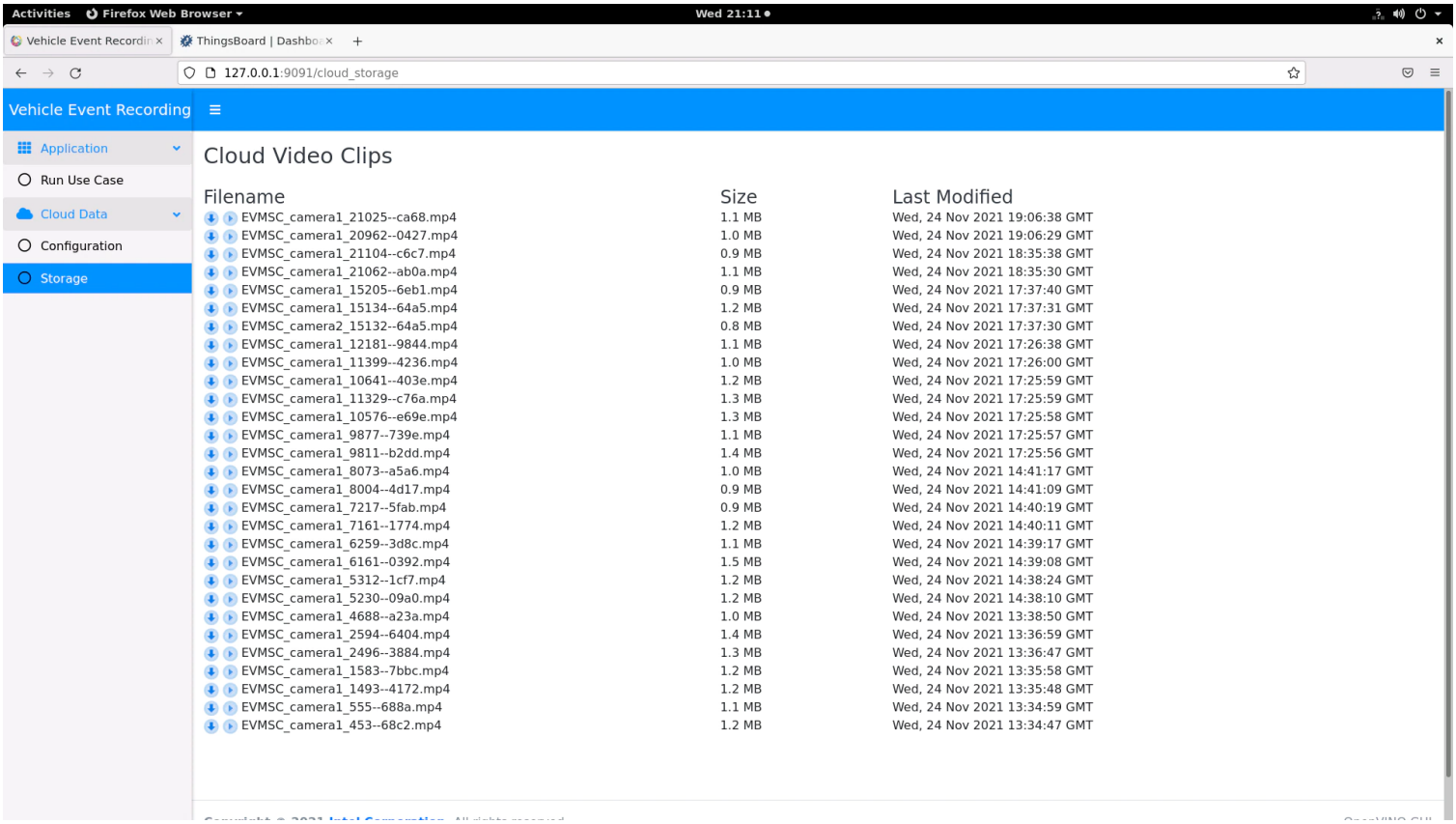
Figure 7: Configure Use Case

- Click on the **Browse** button and search for one of the sample videos delivered with the application at the following path: `<INSTALL_PATH>/vehicle_event_recording/Vehicle_Event_Recording_2021.3/Vehicle_Event_Recording/EII-EVMSC-UseCase/config/VideoIngestion/test_videos/`
- Select one of the available videos.
- After you configure all four videos, select the target CPU or GPU for all available options. Click on **Run Use Case**.

5. After the visualiser starts, you can go to the ThingsBoard link and check the alerts sent by the reference implementation. If you configured the AWS credentials, you will also have access to video snapshots taken by the application on the video stream.



6. You can also check the cloud storage from the Reference Implementation **Storage** tab.



Use Case Running

Depending on the number of cameras configured, the application will start the Visualizer App that will analyze the video sample or video samples selected.

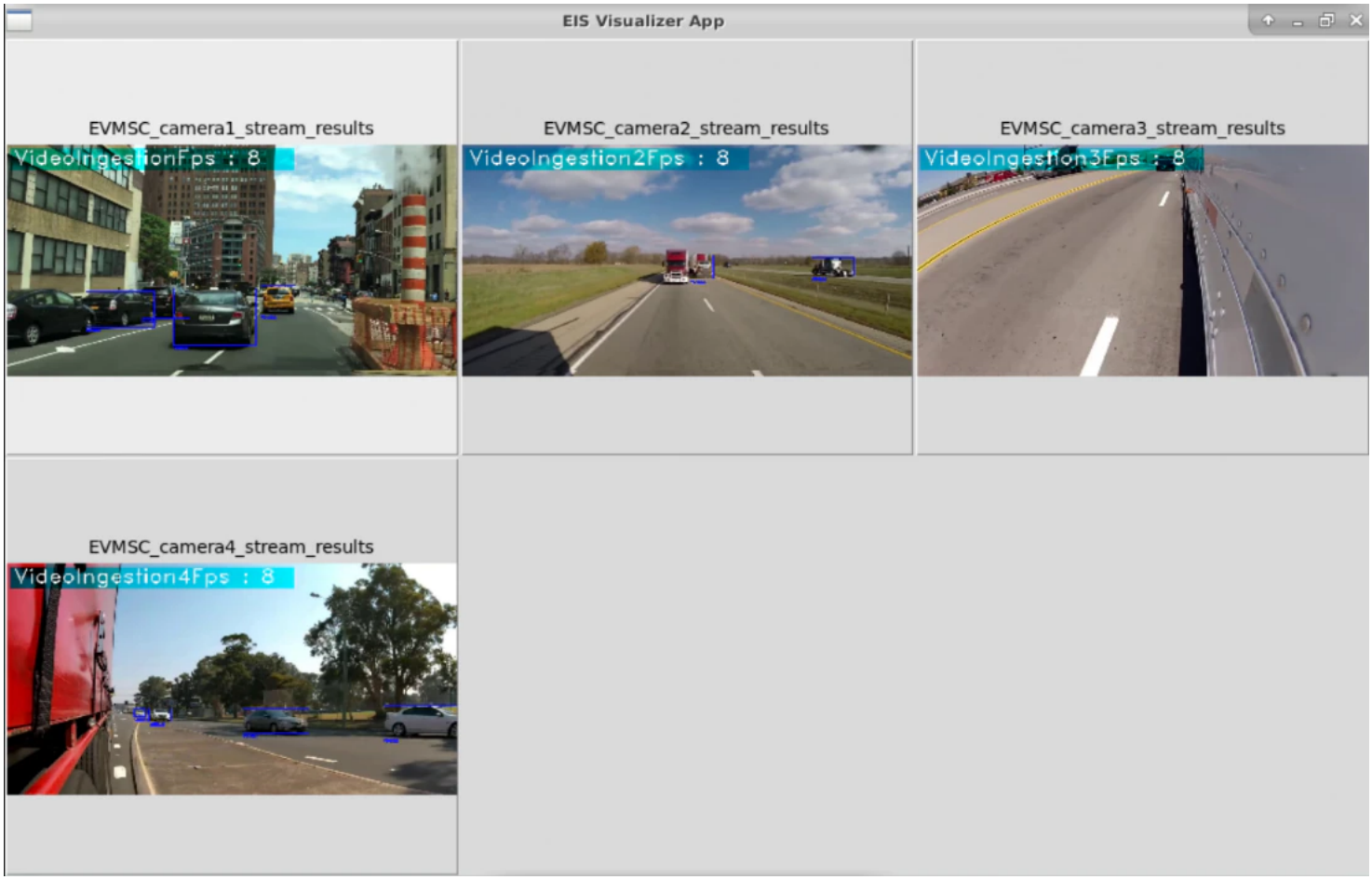


Figure 8: Use Case Analysis Results

At this point, you can see that the algorithm is analyzing the traffic from the video streams.

Run in Parallel with Driver Behavior Analytics Reference Implementation

To run this task, you will need to download and install the Driver Behavior Analytics Reference Implementation.

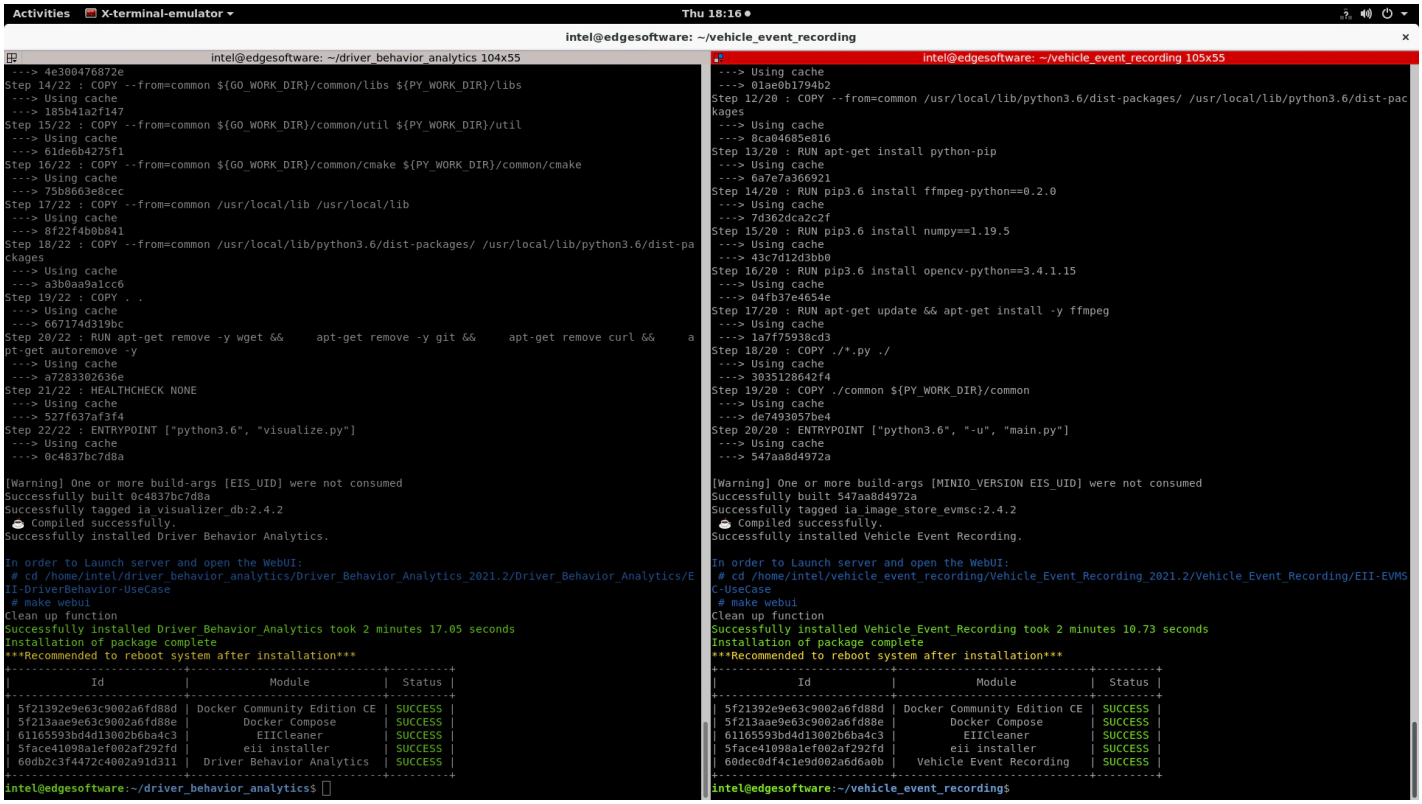
Prerequisites

- Two terminals
- Follow the steps to install Driver Behavior Analytics after installing Vehicle Event Recording

Steps to Run the Application

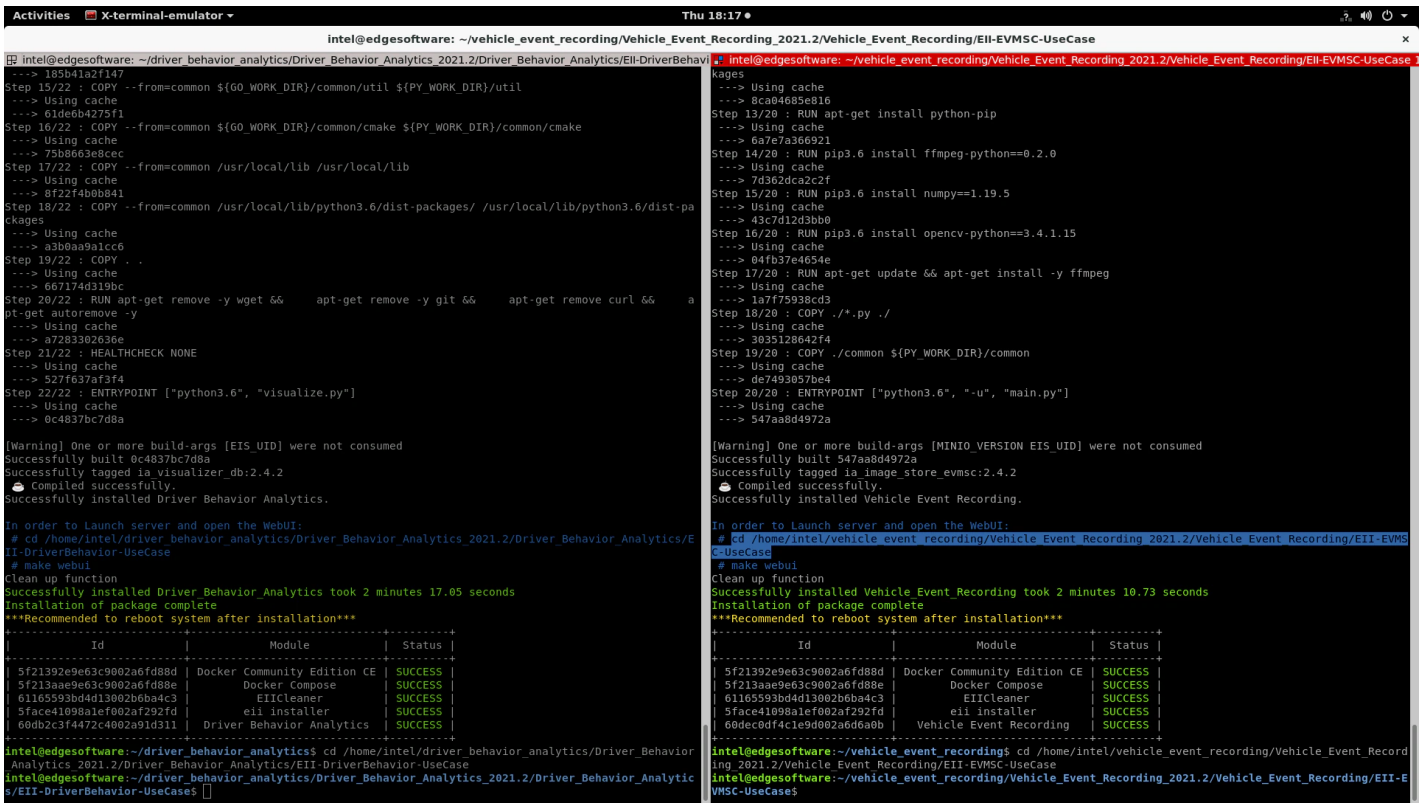
1. Change directory to **Vehicle Event Recording Use Case** path on terminal 1:

```
cd <INSTALL_PATH>/vehicle_event_recording/Vehicle_Event_Recording_2021.3/Vehicle_Event_Recording/EII-EVMSC-UseCase
```



2. Change directory to **Driver Behavior Analytics Use Case** path on terminal 2:

```
cd <INSTALL_PATH>/driver_behavior_analytics/Driver_Behavior_Analytics_2021.3/Driver_Behavior_Analytics/EII-DriverBehavior-UseCase
```

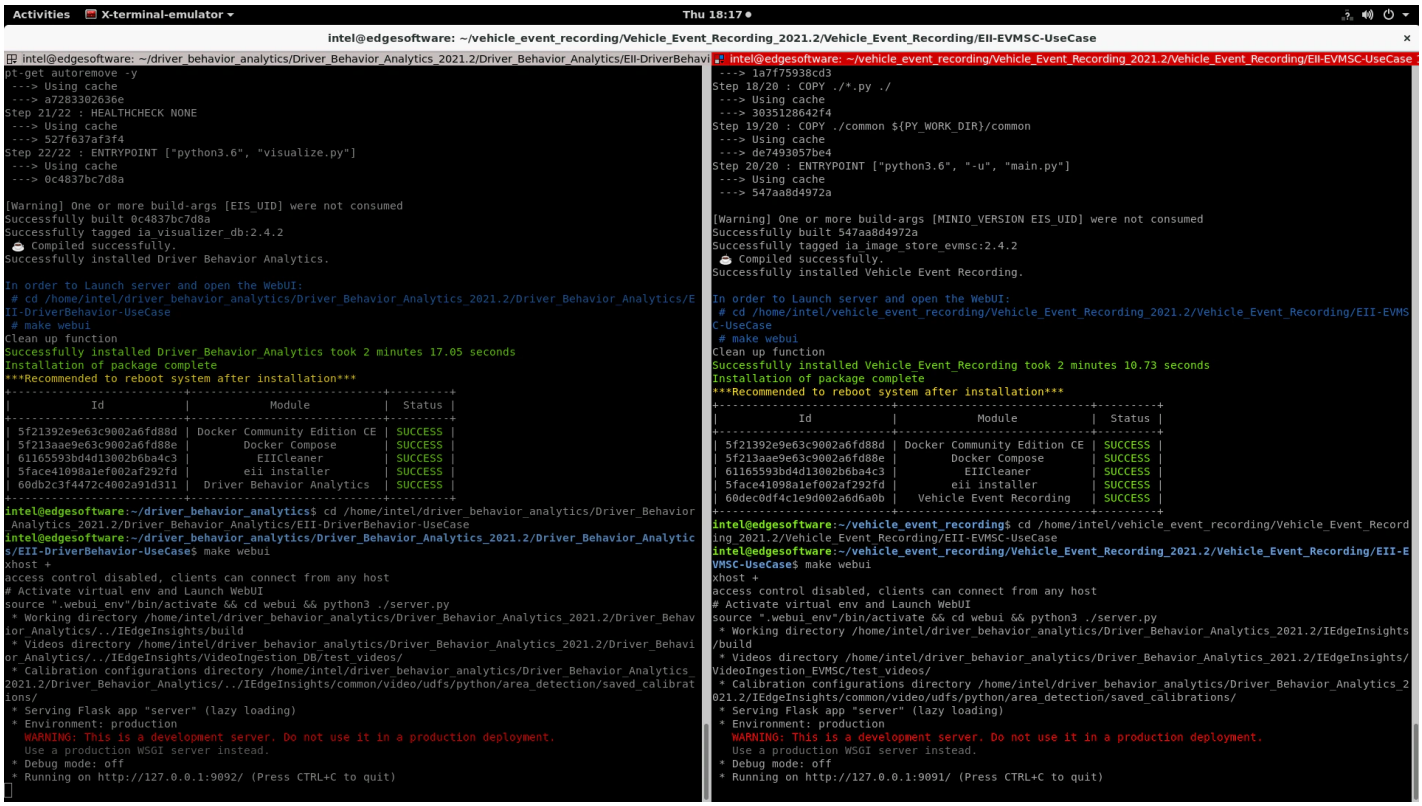


3. Run the following command on terminal 1 to start the webserver application. Copy and run the `make webui` command from the end of the installation log:

```
make webui v=4 EII_BASE=<INSTALL_PATH>/vehicle_event_recording/Vehicle_Event_Recording_2021.3/IEdgeInsights REPO_FOLDER=
<INSTALL_PATH>/vehicle_event_recording/Vehicle_Event_Recording_2021.3/Vehicle_Event_Recording/EII-EVMSC-UseCase
```

4. Run the following command on terminal 2 to start the webserver application. Copy and run the `make webui` command from the end of the installation log:

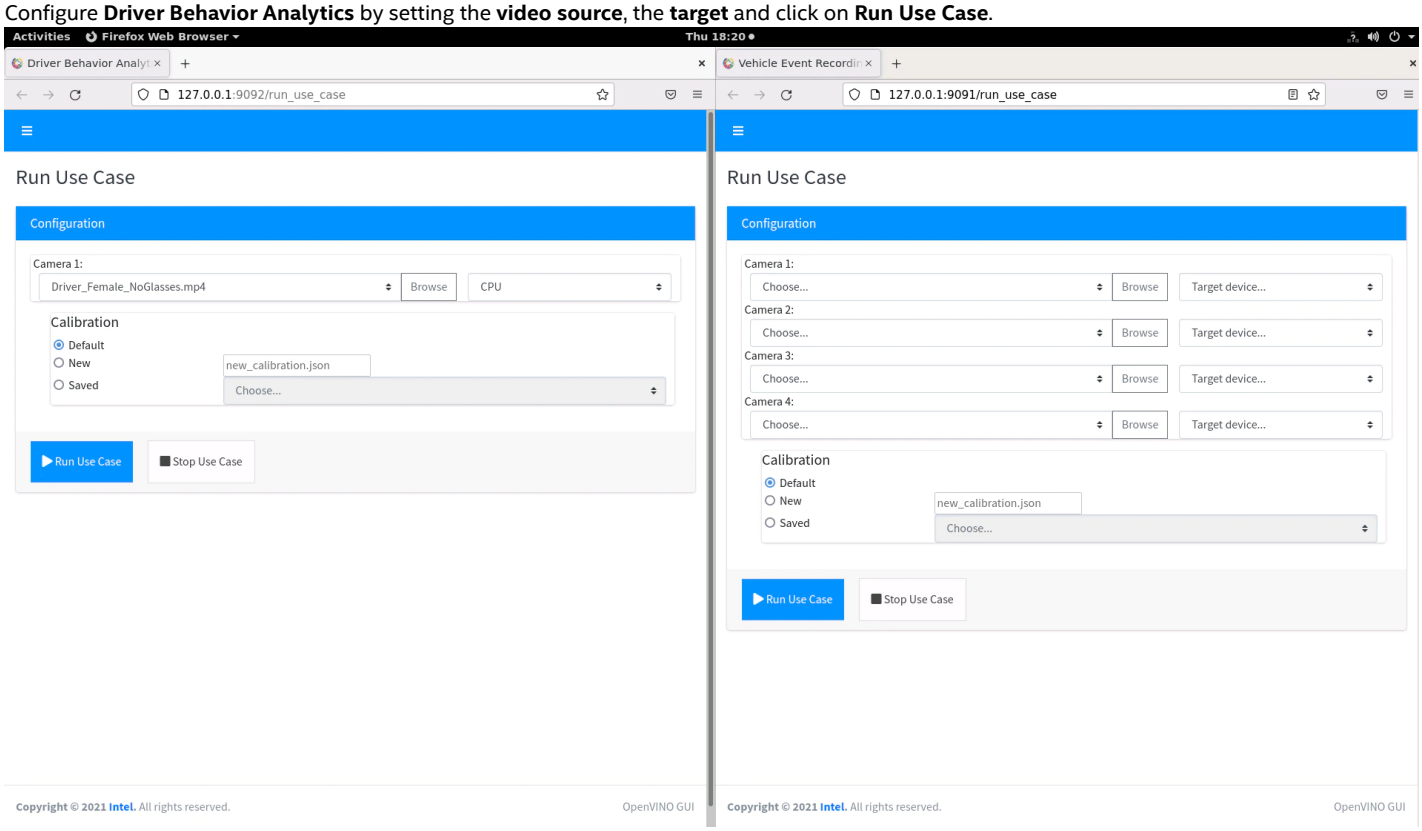
```
make webui EII_BASE=<INSTALL_PATH>/vehicle_event_recording/Vehicle_Event_Recording_2021.3/IEdgeInsights REPO_FOLDER=
<INSTALL_PATH>/driver_behavior_analytics/Driver_Behavior_Analytics_2021.3/Driver_Behavior_Analytics/EII-DriverBehavior-UseCase
```



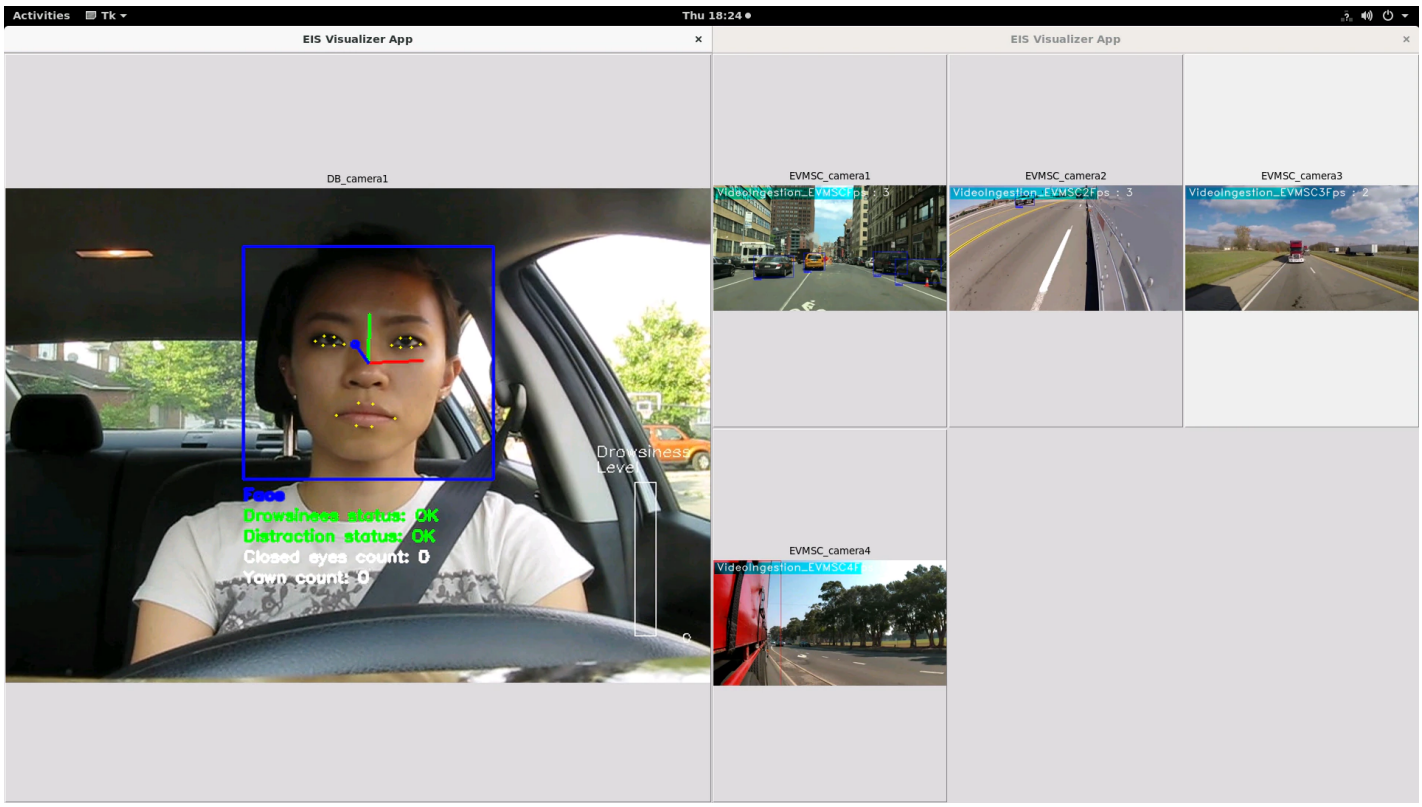
5. Open your browser and go to **127.0.0.1:9091.**

6. Configure all available cameras with the desired videos and set the target for each one (**CPU** or **GPU**) and click **Run Use Case.**
7. Wait for Visualizer to run.
8. Open the **Driver Behavior Analytics** page by going to address **127.0.0.1:9092.**

9. Configure **Driver Behavior Analytics** by setting the **video source**, the **target** and click on **Run Use Case**.



At this point, Vehicle Event Recording will close and then both use cases will start.



> **NOTE:** If you reinstall the first reference implementation, you must also reinstall the second reference implementation.

Summary and Next Steps

This reference implementation successfully implements Intel® Distribution of OpenVINO™ toolkit plugins for detecting objects and provides event-based video recording. It uses Edge Insights for Fleet framework to cover historical analysis, evidence support, driver coaching, remote view, and traffic violation detection.

As a next step, try one of the following:

- Use deep learning models, Edge Insights for Fleet framework and a live external video camera stream to capture evidence support, remote view, traffic violations and coach the decisions that must be made by the algorithm.
- This reference implementation uses Intel® Distribution of OpenVINO™ toolkit Open Model Zoo pre-trained models and 3rd party models, but you can extend it to use your own models.

Learn More

To continue learning, see the following guides and software resources:

- Intel® Distribution of OpenVINO™ toolkit documentation

Known Issues

Uninstall Reference Implementation

If you uninstall one of the reference implementations, you need to reinstall the other reference implementations because the Docker images will be cleared.

Troubleshooting

Installation Failure

If host system already has Docker images and its containers running, you will have issues during the RI installation. You must stop/force stop existing containers and images.

- To remove all stopped containers, dangling images, and unused networks:

```
sudo docker system prune --volumes
```

- To stop Docker containers:

```
sudo docker stop $(sudo docker ps -aq)
```

- To remove Docker containers:

```
sudo docker rm $(sudo docker ps -aq)
```

- To remove all Docker images:

```
sudo docker rmi -f $(sudo docker images -aq)
```

Docker Image Build Failure

If Docker image build on corporate network fails, follow the steps below.

1. Get DNS server using the command:
```
nmcli dev show | grep 'IP4.DNS'
```
2. Configure Docker to use the server. Paste the line below in the `/etc/docker/daemon.json` file:
```
{
    "dns": ["<dns-server-from-above-command>"]
}
```
3. Restart Docker:
```
sudo systemctl daemon-reload && sudo systemctl restart docker
```

Installation Failure Due to Ubuntu Timezone Setting

While building the reference implementation, if you see `/etc/timezone && apt-get install -y tzdata && ln -sf /usr/share/zoneinfo/${HOST_TIME_ZONE} /etc/localtime && dpkg-reconfigure -f noninteractive tzdata' returned a non-zero code: 1 make: *** [config] Error 1`

Run the following command in your terminal:

```
sudo timedatectl set-local-rtc 0
```

Installation Encoding Issue

While building the reference implementation, if you see `ERROR: 'latin-1' codec can't encode character '\u2615' in position 3: ordinal not in range(256)`

Run the following command in your terminal:

```
export LANG=en_US.UTF-8
```

Can't Connect to Docker Daemon

If you can't connect to Docker Daemon at http+docker://localhost, run the following command in your terminal:

```
sudo usermod -aG docker $USER
```

Log out and log in to Ubuntu.

Check before retrying to install if group Docker is available for you by running the following command in a terminal:

```
groups
```

The output should contain **Docker**.

Support Forum

If you're unable to resolve your issues, contact the Support Forum .

Product and Performance Information

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