Headlights tutorial

Samples Pack 2021

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AVSIMULATION

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Presentation

- This tutorial explains how to develop and use an Adaptive Front light System –AFS– strategy (ADAS) using SCANeR™studio simulation engine.
- The workflow of the sample is:
  - An EGO vehicle is equipped with 1 camera sensor
  - A headlights configuration (set of LEDs on each beam, each LED is equipped with an AFS strategy) is applied to the EGO vehicle.
  - The AFS strategy reads the camera sensor outputs, if a surrounding vehicle is into the camera sensor beam and enlightened by LED then the strategy force the relative LED(s) to be turned off in order not blind the vehicle in front.

The AFS strategy used into this tutorial works on the 1st detected vehicle by the camera sensor, other vehicles are not taken into account

Environment

- SCANeR™studio
  - Version: 2021.1
  - Configuration: EVAL_HEADLIGHTS
  - Specific modules:
    -  NightTestManager: Create, manage, study and compare in real time vehicle lights. The Visual module shows the manipulation effects.
    -  AFSManager: Tool of the NightTestManager used to “run” AFS Strategies.
    -  Visual: Display the simulation 3D environment for headlights (needs to be setup with the specific lighting rendering mode).
  - Studio SDK:
    - AFS API: Interface to manage vehicle’s Headlights.
    - SCANeR API: Interface to Read/Write simulation data.
- Matlab / Simulink
  - Version: R2013

For headlights simulation the optional simulation package “ADVANCED HEADLIGHT SIMULATION” is required.

To evaluate it please feel free to contact us at sales@avsimulation.fr

Use EVAL_HEADLIGHTS configuration

Use EVAL_HEADLIGHTS configuration

1. Download the evaluation data pack: Samples Pack.
2. Unzip the content of the Evaluation data pack under "…\AVSimulation\SCANeRstudio_2021".
3. Edit the following configuration file "…\AVSimulation\configurations.cfg" and copy/paste at the end of the file lines below:

```
SAMPLE_2021_HEADLIGHTS = ${STUDIO_PATH}/SCANeRstudio_2021/config/SAMPLE_HEADLIGHTS
```

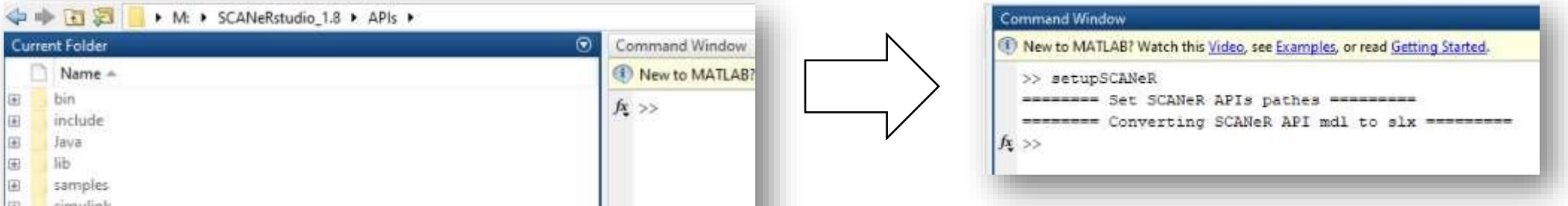
Use EVAL_HEADLIGHTS configuration

4. Start and setup Matlab to use Studio SDK

Once Matlab is running, go to the folder "…\AVSimulation\SCANeRstudio_2021\APIs\"

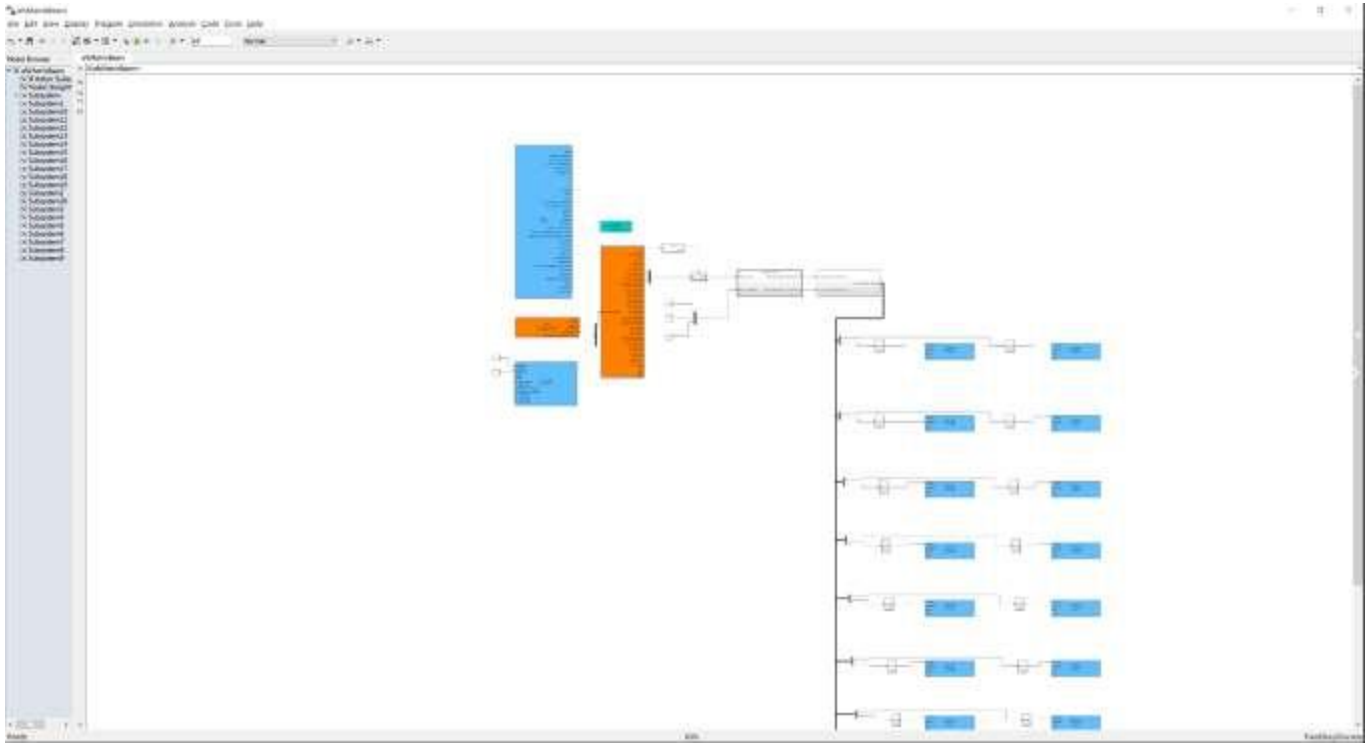
Run the file setupSCANeR.m" (right click on it and select Run).

This will add the AFS API pathes and the SCANeR API to Matlab path.



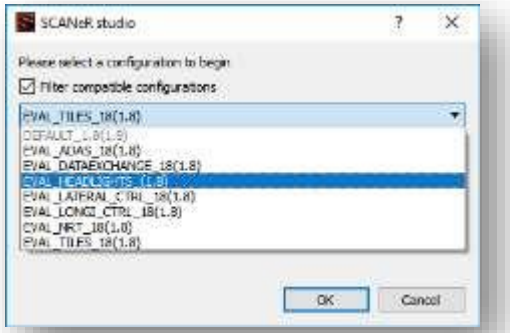
Use EVAL_HEADLIGHTS configuration

5. Open the delivered Simulink model “**afsMatrixBeam.slx**”



“…\AVSimulation\SCANeRstudio_2021\APIs\samples\AFS_API\Simulink\MatrixBeam10_Dual\”

Use EVAL_HEADLIGHTS configuration



6. Start SCANeR™studio.

   If you start SCANeR™studio for the 1st time then Studio will ask to select a configuration to begin, in this case select from the list EVAL_HEADLIGHTS.

   Otherwise go to next step.

7. Go to menu “CONFIGURATION\Configuration Manager…”, on the left column, select an “EVAL_HEADLIGHTS” configuration and click on “OK”.

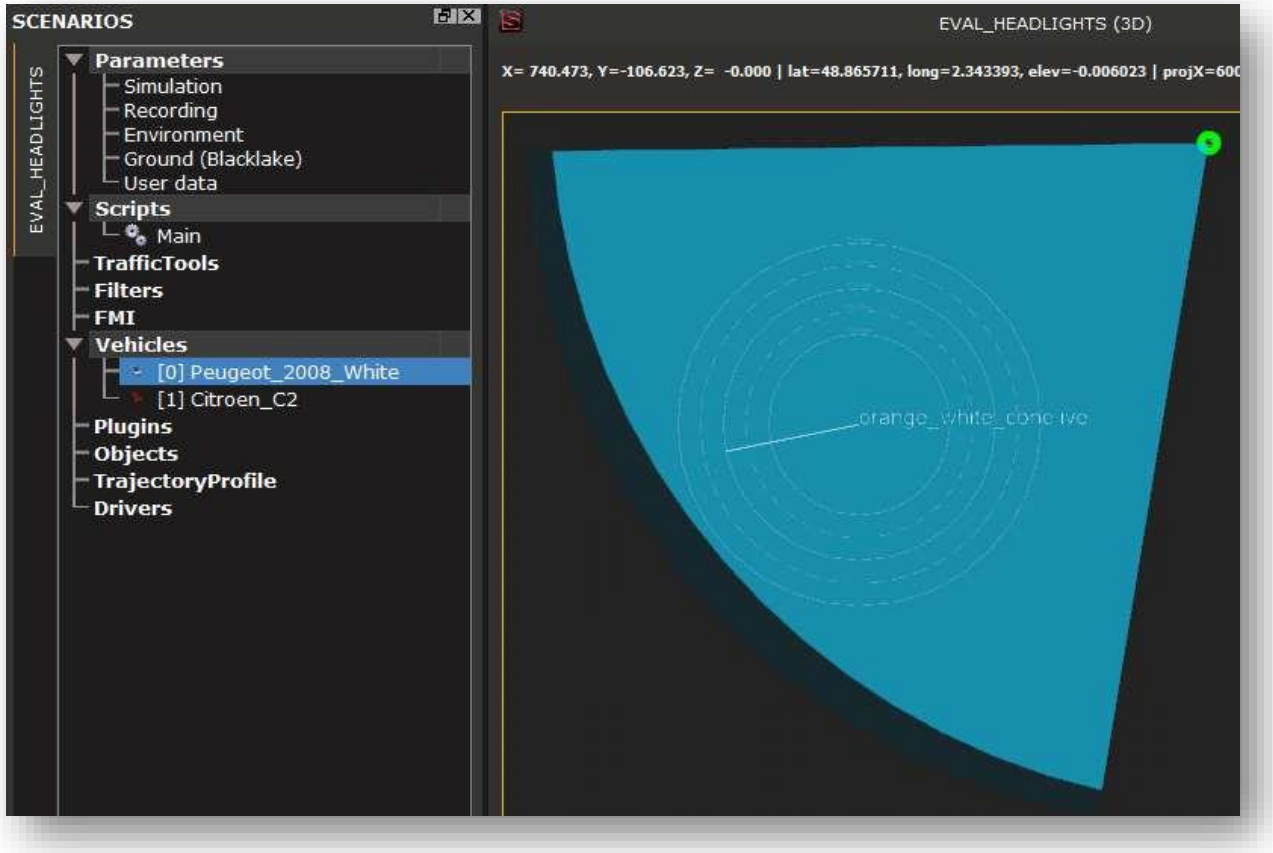
   When the EVAL_HEADLIGHTS configuration is loaded the following modules will automatically start:

   - ✓ACQUISITION
   - ✓AFSMANAGER
   - ✓MODELHANDLER
   - ✓NIGHTTESTMANAGER
   - ✓TRAFFIC
   - ✓SENSORS
   - ✓VISUAL_HL

EVAL_HEADLIGHTS configuration overview

EVAL_HEADLIGHTS configuration overview

1. Open the scenario EVAL_HEADLIGHTS, from menu FILE\Open Scenario…



Scenario overview

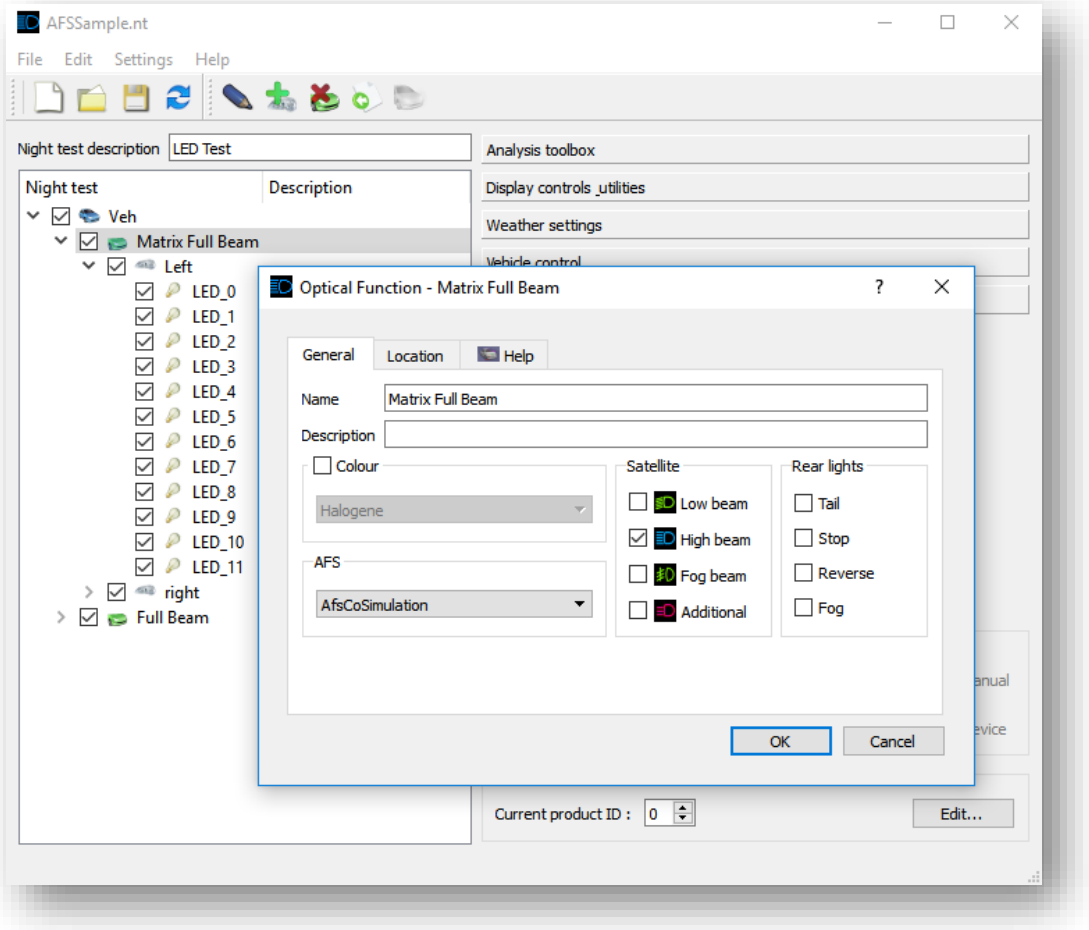
The vehicle 0 is the EGO vehicle, it is equipped with a camera sensor and an AFS strategy. The camera sensor beam is represented here in blue. For this demo this vehicle is static.

The vehicle 1 is a surrounding vehicle, driving in a loop.

When the vehicle 1 is in the camera sensor beam + in a LED beam, the AFS strategy attached to the vehicle 0 turns off the LED(s) to avoid blinding the vehicle 1

EVAL_HEADLIGHTS configuration overview

2. Start NightTestManager process and open the file **AFSSample.nt** from menu FILE\Open…



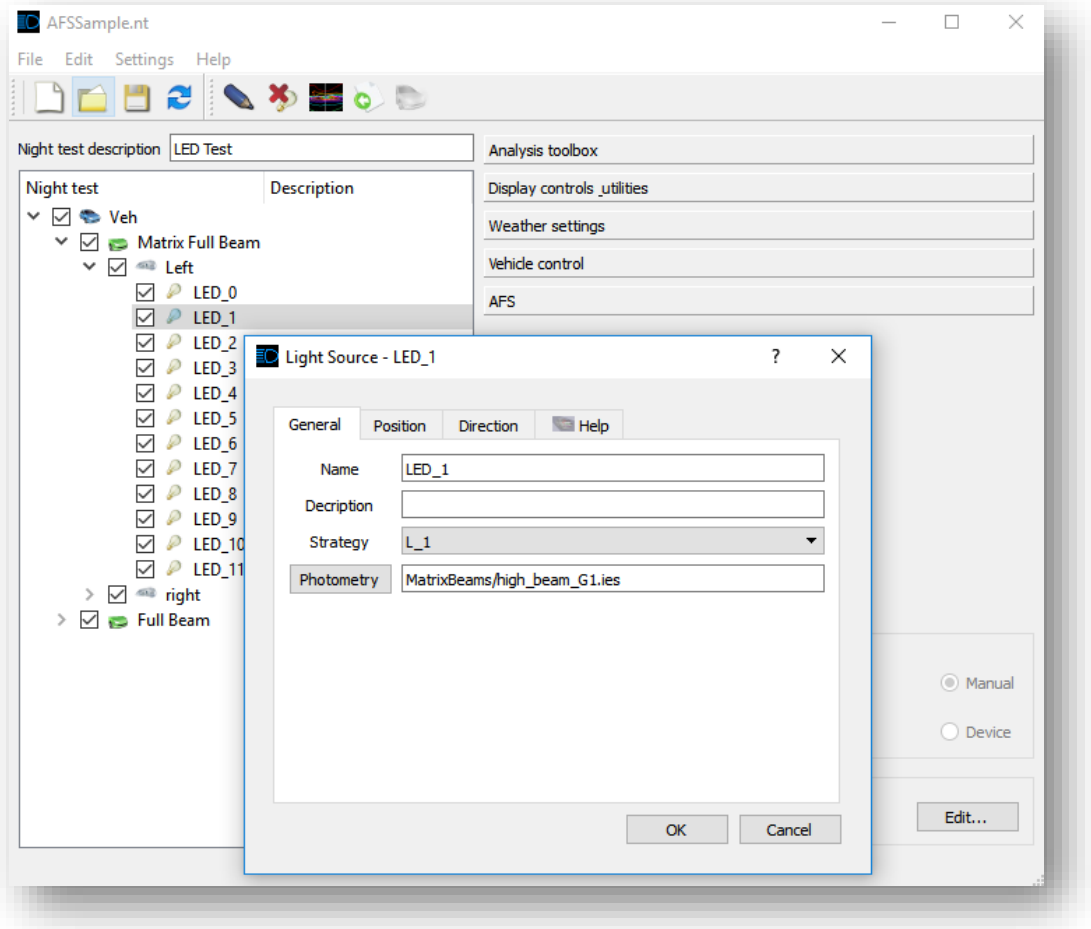
Headlight overview

The optical function, Matrix Full Beam, uses 1 AFS strategy named AfsCoSimulation.

It is used to allow cosimulation between SCANeR™studio simulation engine and Simulink.

EVAL_HEADLIGHTS configuration overview

2. Start NightTestManager process and open the file **AFSSample.nt** from menu FILE\Open…



Headlight overview

The light sources, LED_N, uses 1 AFS strategy named L_N.
It is controlled by Simulink.

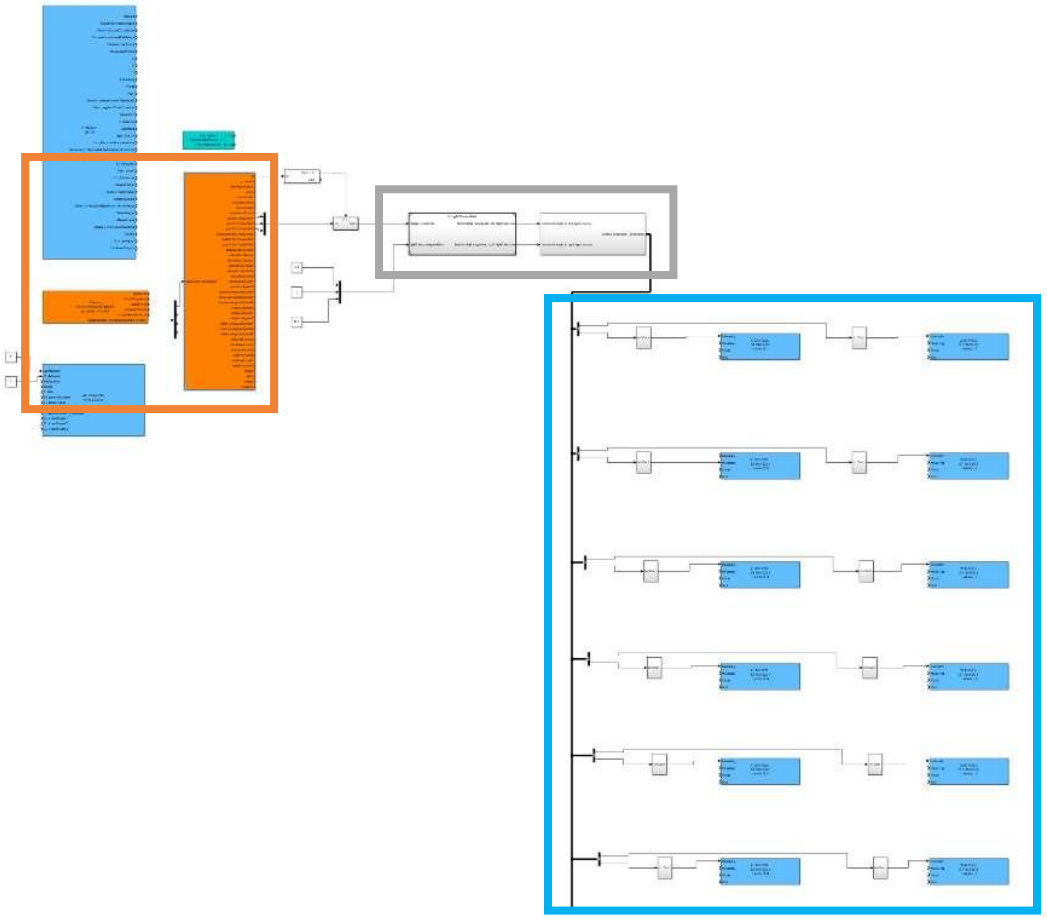
Each LED has a specific photometry.

LED_0 and LED_11 are ends (edge).
The field of view is 50 degrees.
These do not use a strategy.

Each LED, from LED_1 to LED_10, has a beam of 5 degrees.
Each of these has a strategy.

Simulink model overview

Simulink model overview



Headlight overview

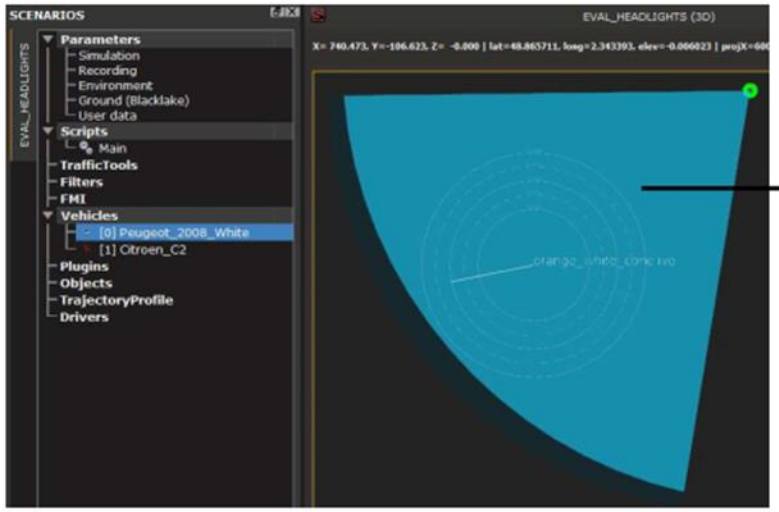
With the 2 orange blocks read the camera sensor outputs.

White blocks are the Strategy definition (ADAS): If a vehicle is inside a beam we turn it off to avoid blinding the front vehicle.

With the blue blocks write LED state (ON/OFF).

Simulation workflow overview

Simulation workflow overview



Simulink model
(AFS + SCANeR APIs)

SCANeR API
Read camera sensor outputs

Strategy (ADAS)
If a surrounding vehicle is in the camera beam + in a LED(s) beam then turn off the LED(s) to not blind the front vehicle.

AFS API
Control beams

A vehicle is inside the beam so a LED is off.

Run in Cosimulation with Simulink

Run in Cosimulation with Simulink

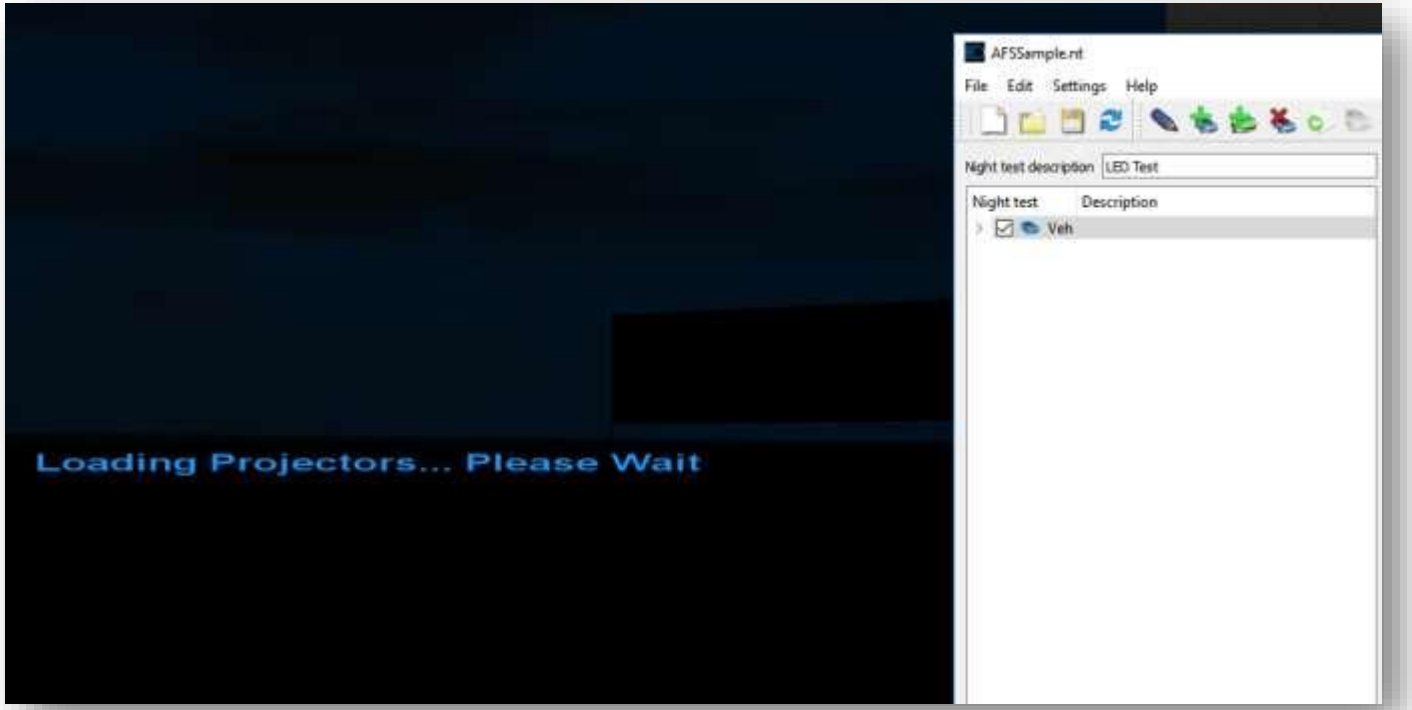
1. Run the Simulink model.
2. Make sure that the following modules are started:
    - ✓ACQUISITION
    - ✓AFSMANAGER
    - ✓MODELHANDLER
    - ✓NIGHTTESTMANAGER
    - ✓TRAFFIC
    - ✓SENSORS
    - ✓VISUAL_HL
    - ✓SIMULINK

In this tutorial we consider that SCANeR™studio and Matlab are running on the same machine.

If it is not the case, then make sure that the AFSManager module is executed on the same machine as Simulink (since they use Shared Memory data exchange).

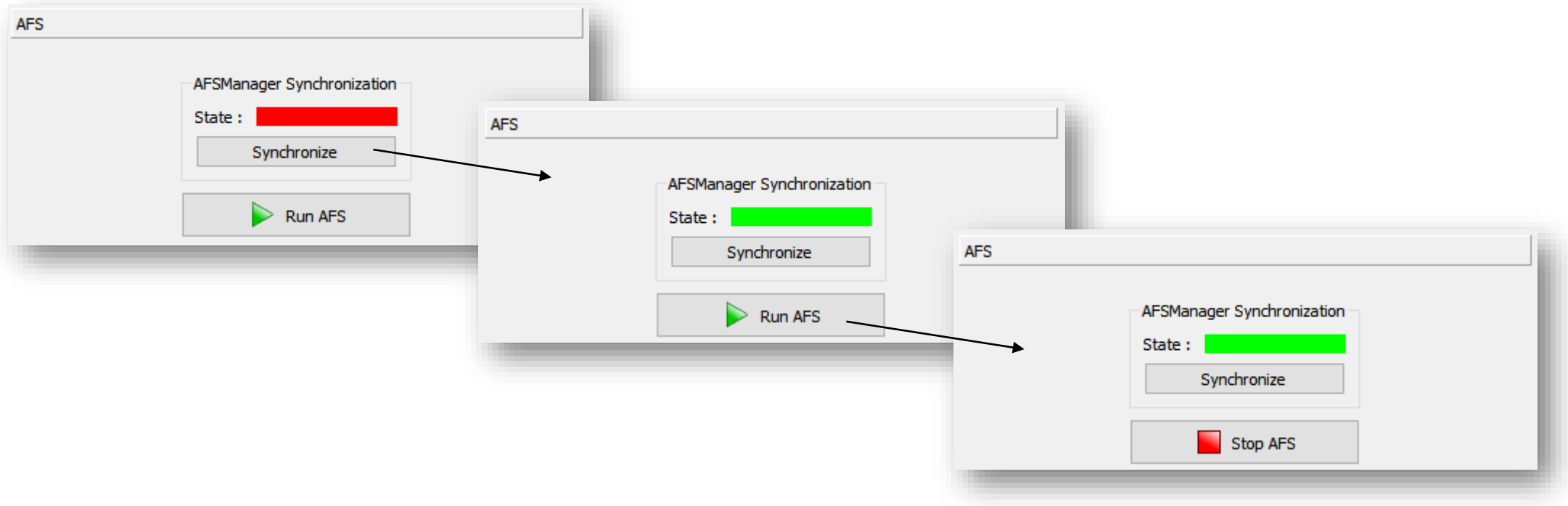
Run in Cosimulation with Simulink

1. Run the simulation by pressing the Play scenario button ( ).
2. When the simulation is running, in NightTestManager, press the Reload night test configuration file button ( ) to use it into Studio visual



Run in Cosimulation with Simulink

3. To synchronise the Simulink strategy model with the Night Test Manager module, go to AFS tab, click on Synchronize button and then click on Run AFS. The strategy is now running and control the LEDs depending of the camera sensor.



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