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## How to Monitor and Control Your Own CarMaker UAQs in NI VeriStand Environment?

*In case of using different Simulation tools, it's important to monitor or control specific quantities. Today, I want to share an example on how to create a user defined quantity (UAQ) in CarMaker which will then be used in the VeriStand Environment with other monitoring and controlling tools.*

### Technical Background

VeriStand is an integration platform for Real-Time applications. VeriStand is able to monitor and control quantities of the CarMaker Custom Device which includes in and outputs. If you want to monitor a UAQ from CarMaker the quantity must be defined with a C-Code extension beforehand.

The following shows an example of creating a UAQ which will be calculated in a mini-maneuver and monitored in VeriStand. For convenience the speed of the ego-vehicle will be converted from meters per second to kilometers per hour. The operation of the indicators serves as a control example.

**Step 1:** Declare the following C variables at the beginning of the User.c file

```
1: Double My_Variable=0;
```

**Step 2:** Create a new UAQ "MyVelocity" under the function User\_DeclQuants (void):

```
2: DDefDouble (NULL, "MyVelocity", "km/h", &My_Variable, IO Out)
```

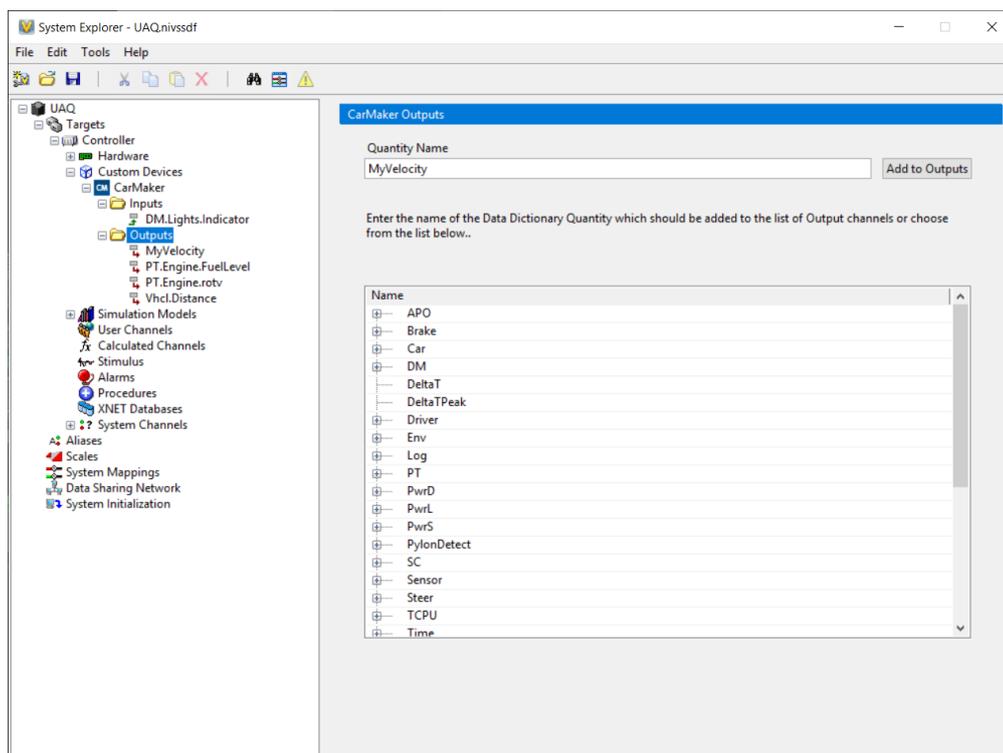
**Step 3:** Build a new CarMaker.lvrtdll (In case of some missing libraries you need to specify the paths to these specific folders in the Makefile which is located in the <Projectfolder>/src/Makefile). If the build was successful, the new executable must be included to the CarMaker Custom Device in your VeriStand project.

**Step 4:** Define the Inputs and Outputs of the CarMaker Custom Device. In the VeriStand System Explorer, navigate to the CarMaker Custom Device: Targets > Controller > Custom Devices > CarMaker. Please note that under "Inputs" and "Outputs" only general and no user-defined CarMaker UAQs are listed. For adding your own quantity, you need to type the Quantity Name ("MyVelocity") into the required field and click on "Add to Outputs". The same can be done for other quantities:

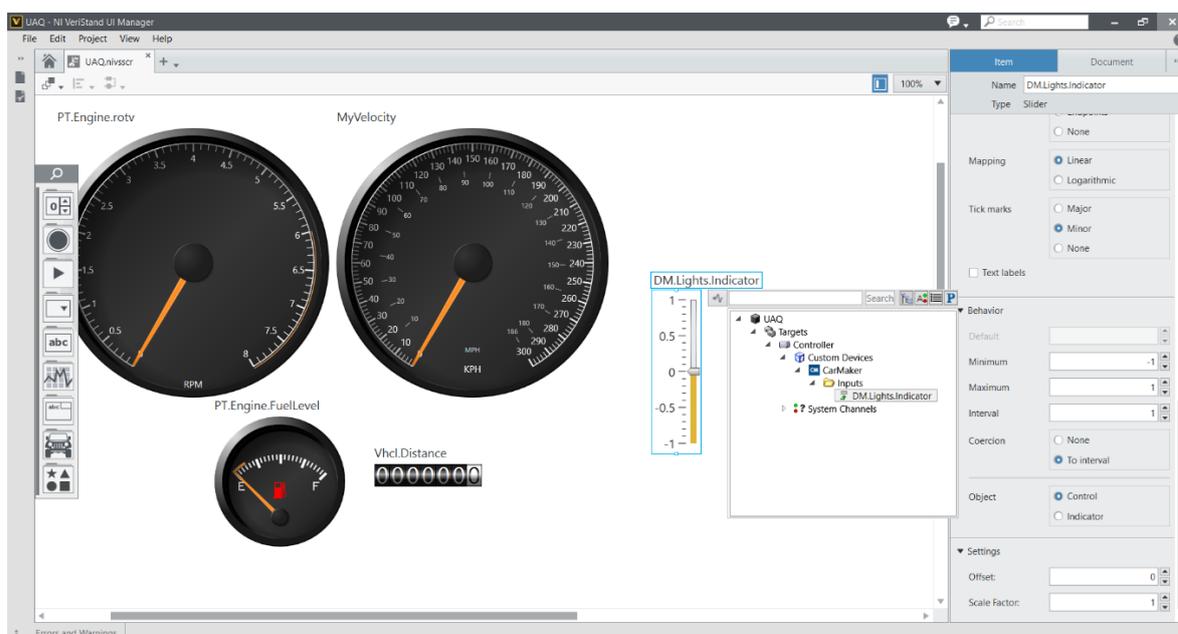
Output: PT.Engine.FuelLevel, PT.Engine.rotv, Vhcl.Distance (these are all necessary for the instruments panel in car which will be monitored in VeriStand UI Manager)

Inputs: DM.Lights.Indicator

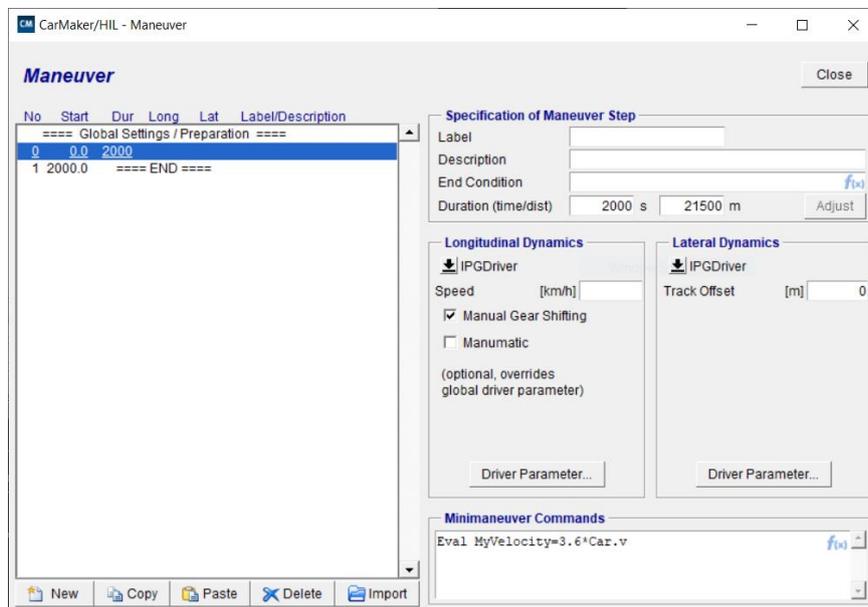
(Please refer to the Reference Manual for the meaning of these quantities)



**Step 5:** Map the signals to dashboards in the NI VeriStand UI Manager. The NI VeriStand UI Manager is a tool for monitoring and control specific signals. Some example car dashboards already exist (tachometer, speedometer, odometer and fuel gauge). For the indicator signal I chose the “Vertical Slider” with an interval from -1 to 1 with stepsize 1 because DM.Lights.Indicator can have the values -1 (right indicator on), 0 (both indicators off) and 1 (left indicator on).



**Step 6:** Deploy the Project on your NI system. Connect the CarMaker application to the real time system. Chose the TestRun example “Racetrack\_Nurburgring”. Convert the velocity from m/s to km/h, which can be done using a Realtime Expression in the Minimanuever Commands as shown below:



Now you can start the simulation and have a look at the quantities in the VeriStand UI Manager. You can also manipulate the signal for the indicators by clicking on the specific dashboard. The result will be shown immediately in IPGMovie.

