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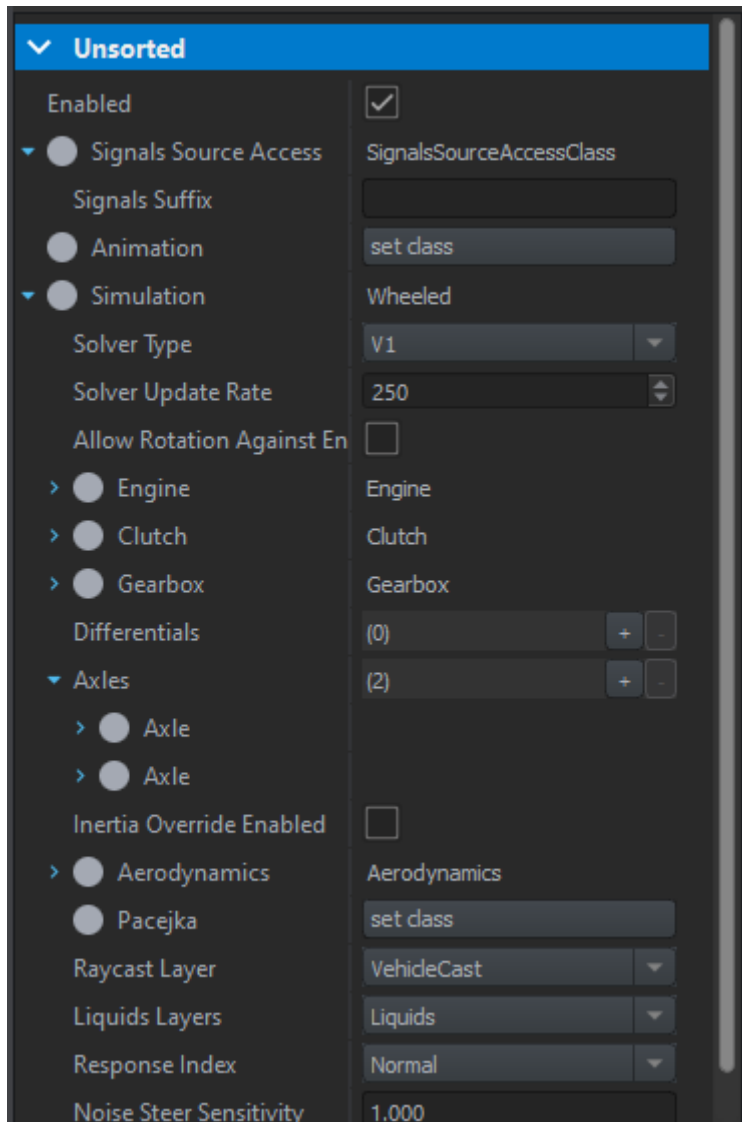
Simulation Parameters

(Brouillon, ne pas supprimer)

Learning to configure the simulation, which includes engine parameters, wheel simulation, suspension, and various other settings.

Some sections in this category are not covered due to limited knowledge and are marked **(Not covered in this tutorial)**. For any parameter with this note, leave it at default for now unless otherwise indicated. If someone with expertise wants to share their knowledge, please submit a ticket on Discord.

The component managing the simulation is *VehicleWheeledSimulation_SA*, which is divided into several areas:



- **Animation:** We won't use this for animations.
- **Simulation:**
 - **Engine:** All engine-related settings.
 - **Clutch:** Clutch parameters (**Not covered in this tutorial**).
 - **Gearbox:** Transmission parameters (**Not covered in this tutorial**).
 - **Axles:** This is the wheel system, with one for the front and one for the rear.
 - **Aerodynamics:** Aerodynamics (**Not covered in this tutorial**).
 - **Pacejka:** Unsure of its purpose, but it's quite complex, so we'll use Bohemia Interactive's default values.
 - **Others:** (**Not covered in this tutorial**).

Engine:

When setting up engine parameters, it is possible to use real life values. Usually it's not that hard to find information about power & torque of engine with RPM data attached to it. Below is table containing example source data which will be used to configure vehicle in Workbench

Engine	Power	Torque
I4 16V	86 kW at 5,800 rpm	155 N?m at 4,400 rpm

Using that data, it is possible to fill following data in **Engine** section of

VehicleWheeledComponent

- **Max Power - 85 kW**
- **Max Torque - 155 N*m**
- **Rpm Max Power - 5800 rpm**
- **Rpm Max Torque - 4400 rpm**

Below is visualization of data <https://www.desmos.com/calculator/j63rwoyvnh>

[armareforger-new-engine-diagram.png](#)

Inertia parameter controls engine moment of inertia. In layman's term, it affects **how fast engine gains or lose rpm**. High inertia results in slower gain of rpm's but it also means that less rpm will be lost during i.e. changing of gears or when releasing thrust. Table below can be used as sort of guidance but it is still recommended to experiment with that value and tweak it till reaches desired state

[armareforger-new-engine-inertia.png](#)

Steepness parameter controls how fast engine can reach max torque. This parameter can be used to i.e. reduce the acceleration of the vehicle or to fine tune torque/rpm graph. Effect of that parameter can be observed below

[armareforger-new-car-steppnes.gif](#)

Rest of the RPM parameters, like **Rpm Idle, Min Clutch, Redline & Max**, can be also directly copied from source data if its available. In this example, following data was used

- **Rpm Idle - 850 rpm**

- **Rpm Min - 600 rpm**
- **Rpm Clutch - 1500 rpm**
- **Rpm Redline - 6500 rpm**
- **Rpm Max - 7000 rpm**

Last but not least, there is **Output** parameter, which controls where power produced by the engine is transferred. In this example **Clutch** is used as a **Output**.

Gearbox & Clutch parameters

[armareforger-new-car-axle-setup.png](#)

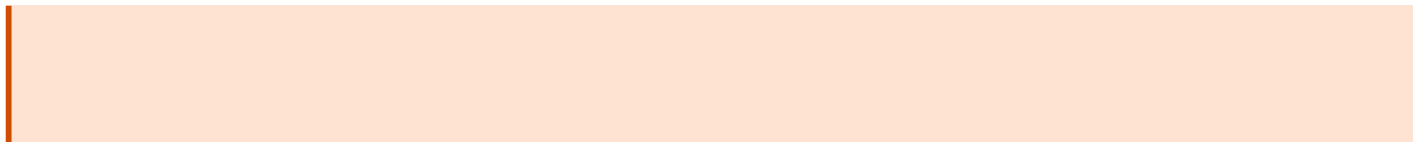
In **Clutch** section of the **VehicleWheeledSimulation** component there are two parameters available. Clutch **Output** should be kept to **Gearbox & Max Clutch Torque** - parameter controlling maximum torque that clutch can provide - should be tweaked. **1.6 * Max Torque** can be a good starting point.

In **Gearbox** section gear that can be filled in. In this example, following data was used as source

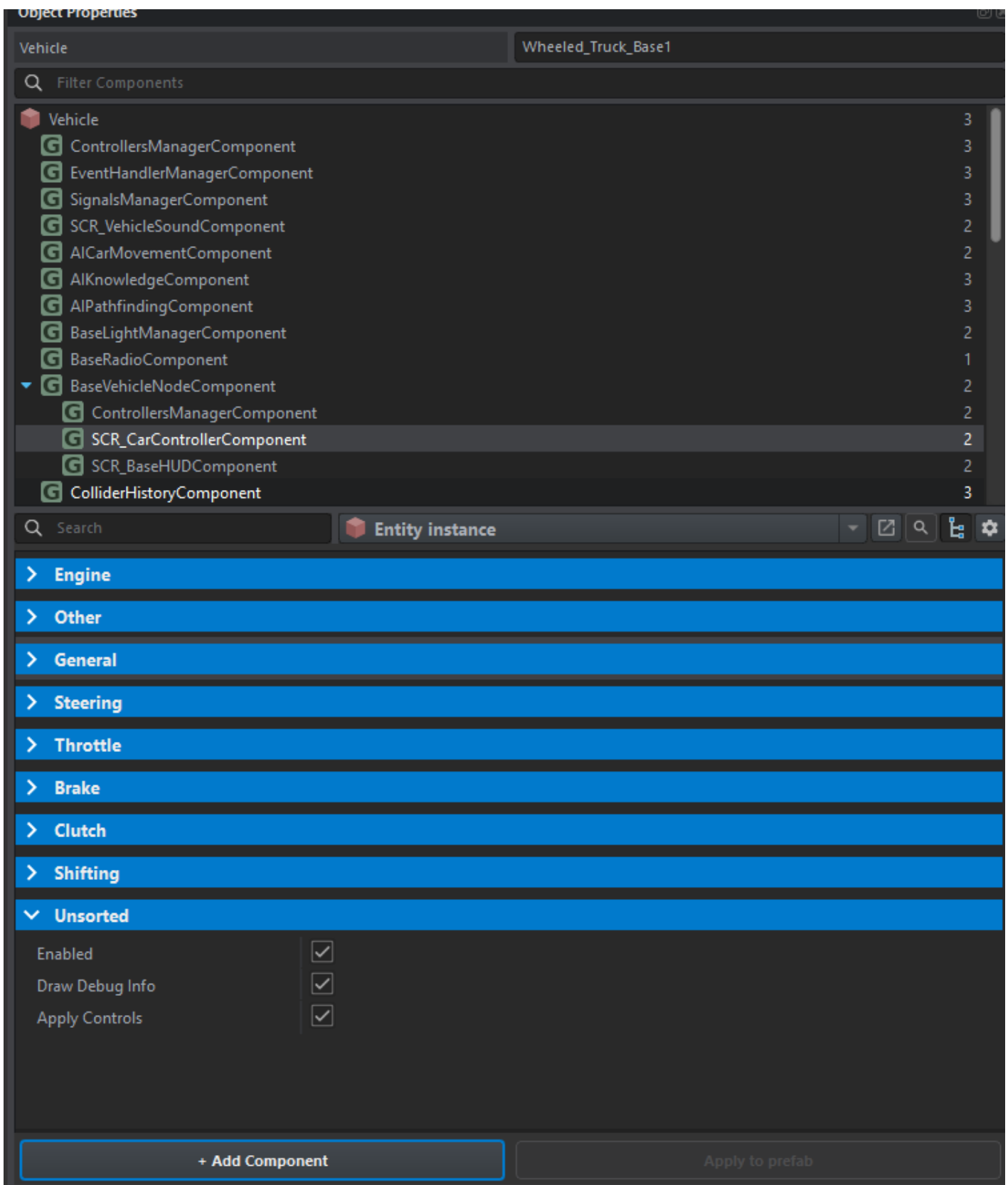
Final drive	68 : 16 = 4.250
1st gear	38 : 11 = 3.455
2nd gear	35 : 18 = 1.944
3rd gear	37 : 27 = 1.370
4th gear	32 : 31 = 1.032
5th gear	34 : 40 = 0.850
Reverse gear	38 : 12 = 3.167

Forward parameter contains array of **forward gears**. New gears can be simply added by clicking on plus sign + on the right side of the parameter. **Reverse** parameter is used for **reverse gear**.

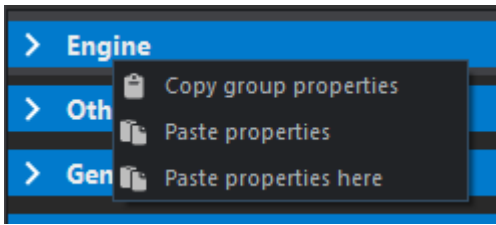
Final drive is defined later in differential which is defined in one of the **Axles**. Depending on the configuration of the vehicle, it is possible to do various types of drive trains. In this example car is using simple **forward wheels drive**.



If you encounter trouble with the speed or the gearshift you need to set up the SCR_CarControllerComponent



You can copy all the parameter from an other prefab in the vanilla game to have something functional jsut right click on the category



and copy from vanilla to paste in your modded car

Suspension parameters

One of the most important part of the vehicle configuration is setting **Axles** & their **Suspension** values. First, it is necessary to add as many **Axles** as vehicle has. This can be done by clicking on **plus +** sign on the right side of the **Axles** property.

[armareforger-new-car-suspension-setup.png](#)

Wheels parameters

Differential and Torque Share

Each vehicle, whether it be FWD, RWD, AWD, or 4WD will have at least one differential on the drive axle. For each drive axle, choose the appropriate **Type** (Closed, Open, or Limited Slip Differential) and the **Ratio** of the differential's gear reduction.

- **Open** differentials will split torque evenly when both tires will have equal traction, but will send all torque to a tire which loses traction. This is not ideal off road, but is the most common consumer car differential.
- **Locked** differentials will ensure both wheels on an axle always rotate at the same speed. This provides great grip but is not ideal for turns, where wheels are meant to rotate at different speeds.
- **LSDs** are not locked but will increase grip between the wheels if one wheel loses traction. This provides a compromise between open and locked differentials. You can set the LSD's clutch grip with the **Strength** parameter.

Once you have set the axle's differential type, set **Output0** and **Output1** to the left and right wheel. If you are making a vehicle with more than 1 drive axle, you will also need to deliver power to each axle with a new differential under **Simulation > Differentials**. Set the outputs of that

differential to each axle's diff, and set the **Torque share** value of each axle to $1/N$ where N is the number of axles. **If you do not change the torque share from 0 for each axle, it will not be used as a drive axle.**

Wheel

Here you can set the **Radius** in meters, **Mass** in kg, and **Brake torque** in N-m.

Tyre

Here you can set the friction coefficient multipliers. **Longitudinal** refers to the tangent direction of the wheel (grip when accelerating) and **lateral** refers to the perpendicular to the car (grip when turning).

Wheel Positions **(to complete)**

Aerodynamics

Aerodynamics affects maximum speed and acceleration of the vehicle. Furthermore, aerodynamics drag is especially noticeable at **higher speeds**, since **drag increases with square of speed**.

Reference Area & **Drag Coefficient** values can be obtained by using values of similar vehicles, which have already those values measured. **Drag Area** (*Reference Area*) & **Typical drag coefficients** (*Drag Coefficient*) sections of Auto mobile drag coefficient wiki page can be used as reference. This page contains data for quite wide array of vehicles and in most cases it is possible to pick data for something similar in size & shape. In this example, **Reference Area** was set to **0.62** & **Drag Coefficient** to **0.31**.

Pacejka **(to complete)**

Debugging

The [Diag Menu](#) is accessible by holding *Windows Key + Left Alt* or *Windows Key + Left Ctrl* and if you are on Windows 11, hold all three keys simultaneously. While holding the aforementioned keys you can navigate the open menu using the **Up** and **Down** arrow keys. To modify the current selected setting use the **Left** and **Right** arrow keys. To enter a submenu use the **Right** arrow key and to leave the submenu use the **Backspace** key.

Name & location		Description
Vehicle s	Show Entry points	
	Enable debugger trace	
	Show stats	
	Show vehicle debug	Need to be activate in order to see any other parameter
	Player vehicle only	
	Show CoM	Toggles Center of Mass debug
	Show inertia	
	Show forces	
	Show engine	
	Show raycast	
	Show suspension	show the travel between up and down position useful to see how their react
	Show swaybar	
	Show wheels	Activate the diameter of the wheel (super useful for configure the radius of them)
	Show bones	Activate the position of the bone
Reset vehicle		

Revision #5

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