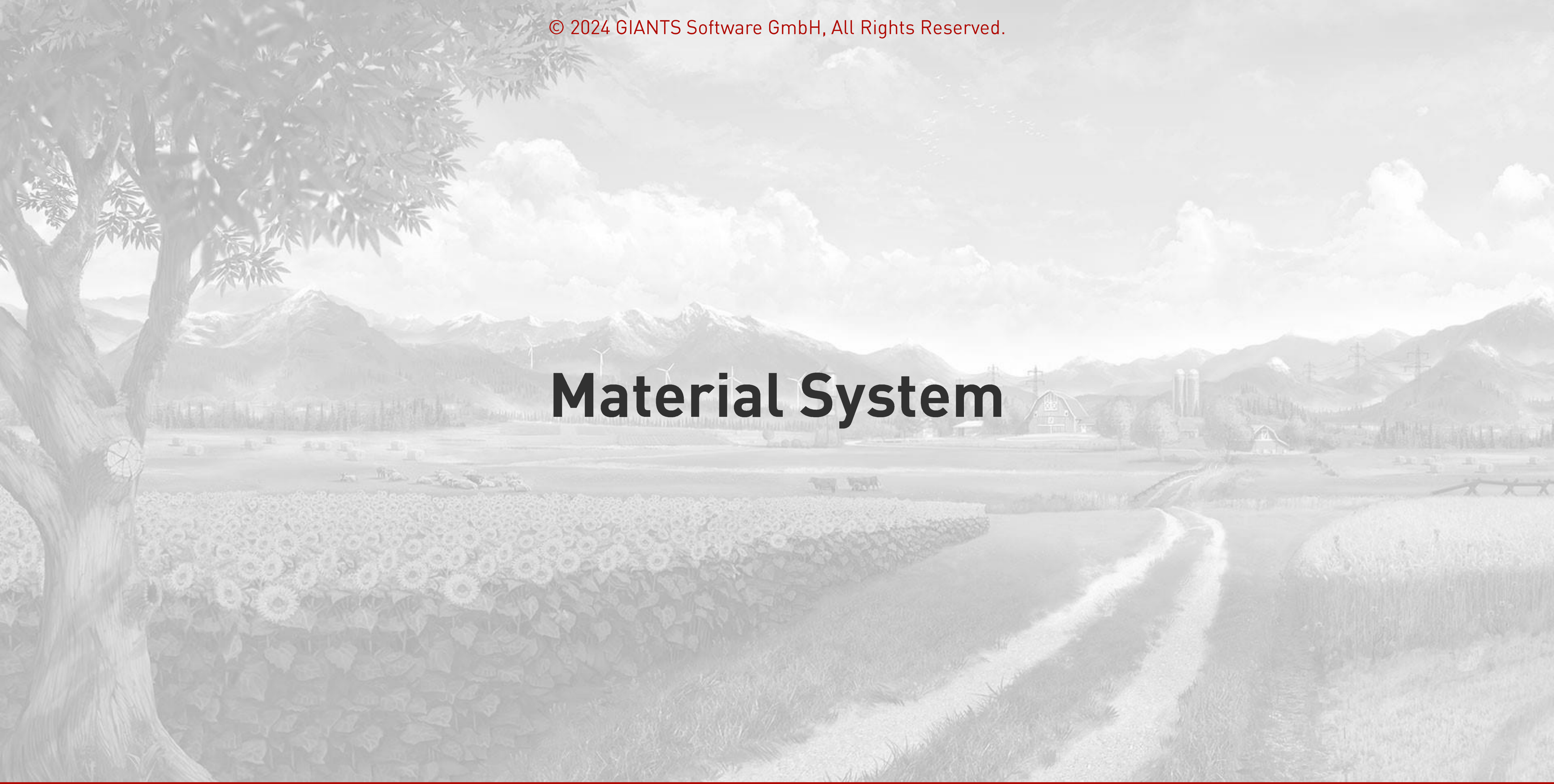
Vehicle Integration

Conversion of FS22 vehicle to FS25

Version 1.0.0 – 05/11/2024

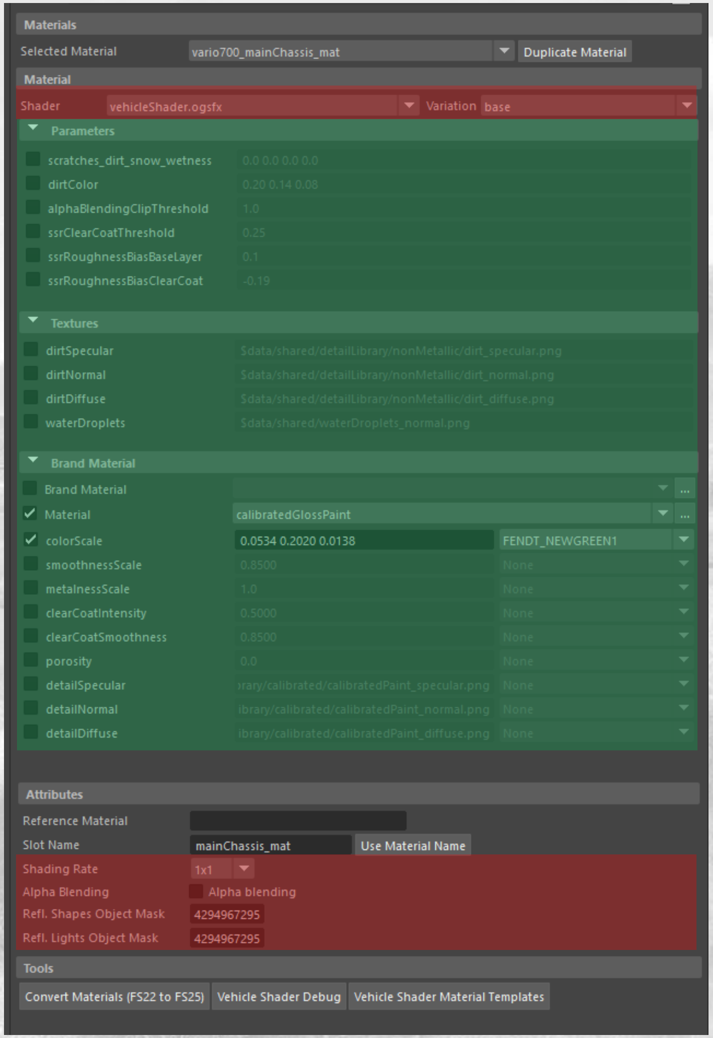


Material System

Material System – Changes

Starting from Farming Simulator 25, there is no longer the material setup via UV slots as it was present since FS19. We now use a **multi material setup**, which is more flexible and not limited.

- Multiple materials on one mesh are now allowed IF the base shader attributes are the same. Marked in red on the right side. All green attributes can be different for each material that is assigned on one mesh. This applies also the merge groups.



Materials

Selected Material: vario700_mainChassis_mat

Material

Shader: vehicleShader.ogsfx   Variation: base

Parameters

- □ scratches_dirt_snow_wetness: 0.0 0.0 0.0 0.0
- □ dirtColor: 0.20 0.14 0.08
- □ alphaBlendingClipThreshold: 1.0
- □ ssrClearCoatThreshold: 0.25
- □ ssrRoughnessBiasBaseLayer: 0.1
- □ ssrRoughnessBiasClearCoat: -0.19

Textures

- □ dirtSpecular: $data/shared/detailLibrary/nonMetallic/dirt_specular.png
- □ dirtNormal: $data/shared/detailLibrary/nonMetallic/dirt_normal.png
- □ dirtDiffuse: $data/shared/detailLibrary/nonMetallic/dirt_diffuse.png
- □ waterDroplets: $data/shared/waterDroplets_normal.png

Brand Material

- □ Brand Material:
- ☑ Material: calibratedGlossPaint
- ☑ colorScale: 0.0534 0.2020 0.0138 — FENDT_NEWGREEN1
- □ smoothnessScale: 0.8500 — None
- □ metalnessScale: 1.0 — None
- □ clearCoatIntensity: 0.5000 — None
- □ clearCoatSmoothness: 0.8500 — None
- □ porosity: 0.0 — None
- □ detailSpecular: rary/calibrated/calibratedPaint_specular.png — None
- □ detailNormal: ibrary/calibrated/calibratedPaint_normal.png — None
- □ detailDiffuse: ibrary/calibrated/calibratedPaint_diffuse.png — None

Attributes

Reference Material:

Slot Name: mainChassis_mat

Shading Rate: 1x1

Alpha Blending: □ Alpha blending

Refl. Shapes Object Mask: 4294967295

Refl. Lights Object Mask: 4294967295

Tools

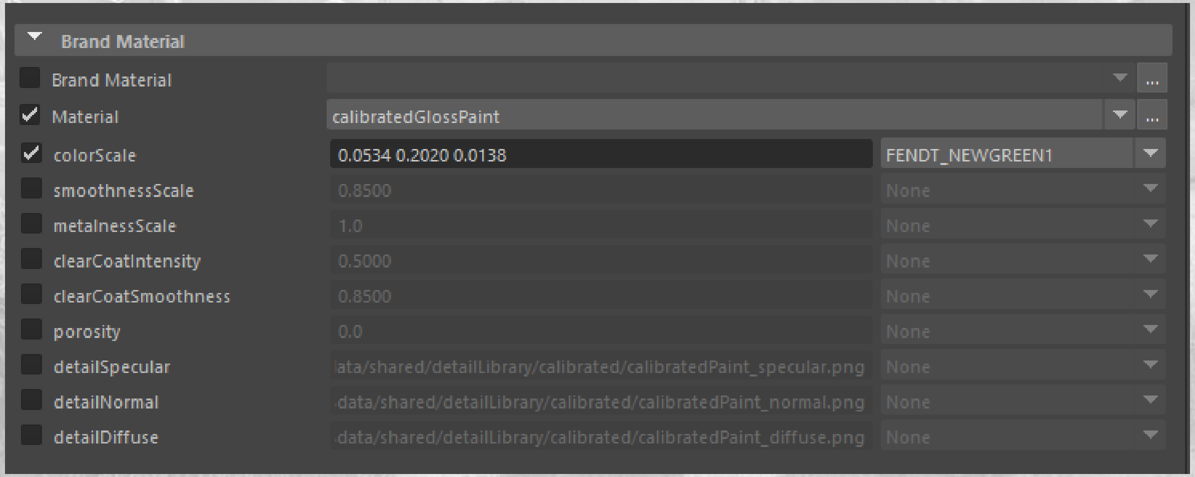
Duplicate Material
Use Material Name
Convert Materials (FS22 to FS25)
Vehicle Shader Debug
Vehicle Shader Material Templates

Material System – Colors

The old brandColors library has now be renamed to brandMaterialTemplates. The material templates can contain more attributes than just the RGB color as in FS22.

Attributes:

- Color
- Smothness Scale
- Metallness Scale
- Clear Coat Smoothness
- Clear Coat Intensity
- Porosity
- Detail diffuse/normal/specular

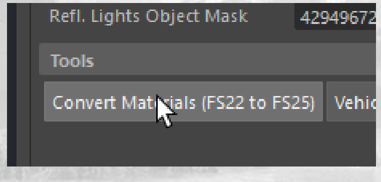


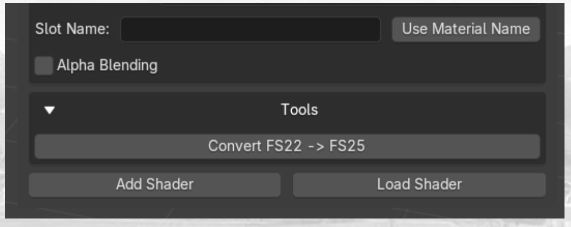
Brand Material

□	Brand Material		
☑	Material	calibratedGlossPaint	
☑	colorScale	0.0534 0.2020 0.0138	FENDT_NEWGREEN1
□	smoothnessScale	0.8500	None
□	metalnessScale	1.0	None
□	clearCoatIntensity	0.5000	None
□	clearCoatSmoothness	0.8500	None
□	porosity	0.0	None
□	detailSpecular	ata/shared/detailLibrary/calibrated/calibratedPaint_specular.png	None
□	detailNormal	data/shared/detailLibrary/calibrated/calibratedPaint_normal.png	None
□	detailDiffuse	data/shared/detailLibrary/calibrated/calibratedPaint_diffuse.png	None

Material System – Conversion

To convert the materials to the new system, there is a function in the Exporter, that handles this fully automatically. This function is available in Maya and Blender.

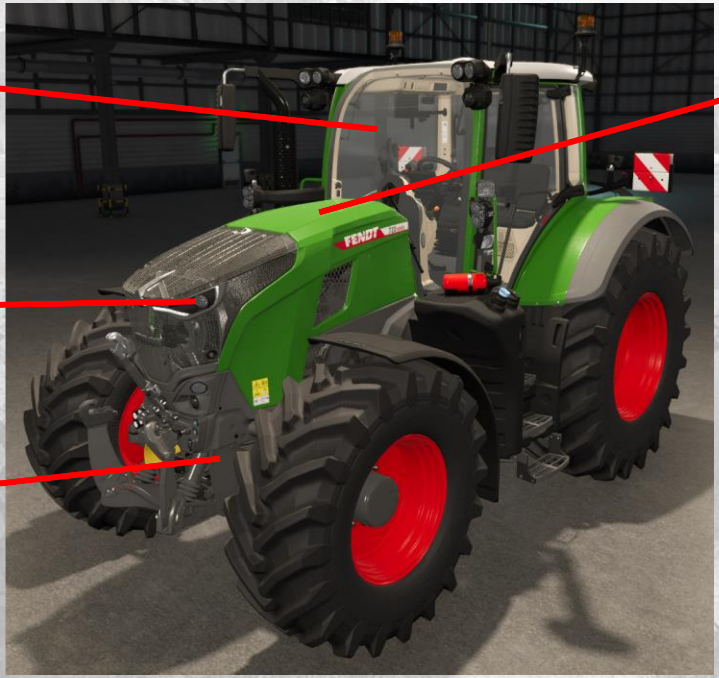




Decals/Alpha parts which have only one color should be changed to white on the diffuse texture and be colored via colorScale in Maya. E.g. screws, grids, ..

Material System – Conventions

The following material templates are used on the standard parts of a tractor and should be applied during conversion.



Template: **glassWindow**
Tex: window_diffuse

Template: **glassHeadlight**
Tex: window_diffuse

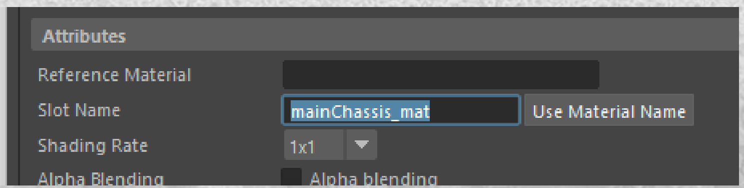
Template: **calibratedCastIron**

Template: **calibratedGlossPaint**

Material System – XML File

- All color attributes inside the vehicleXML file have been adjusted to use the material template name instead.
- baseMaterial entries in the XML have been remove
- Color configuration now use the material slot name to change the color of a material.

Maya/Blender



Attributes

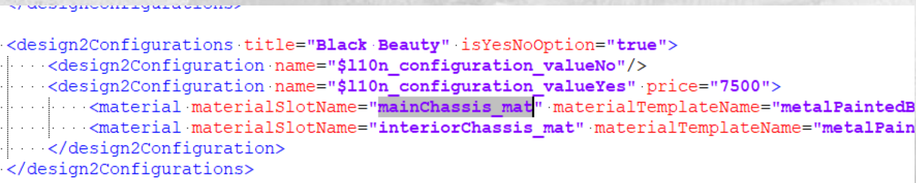
Reference Material

Slot Name: mainChassis_mat

Shading Rate: 1x1

Alpha Blending: Alpha blending

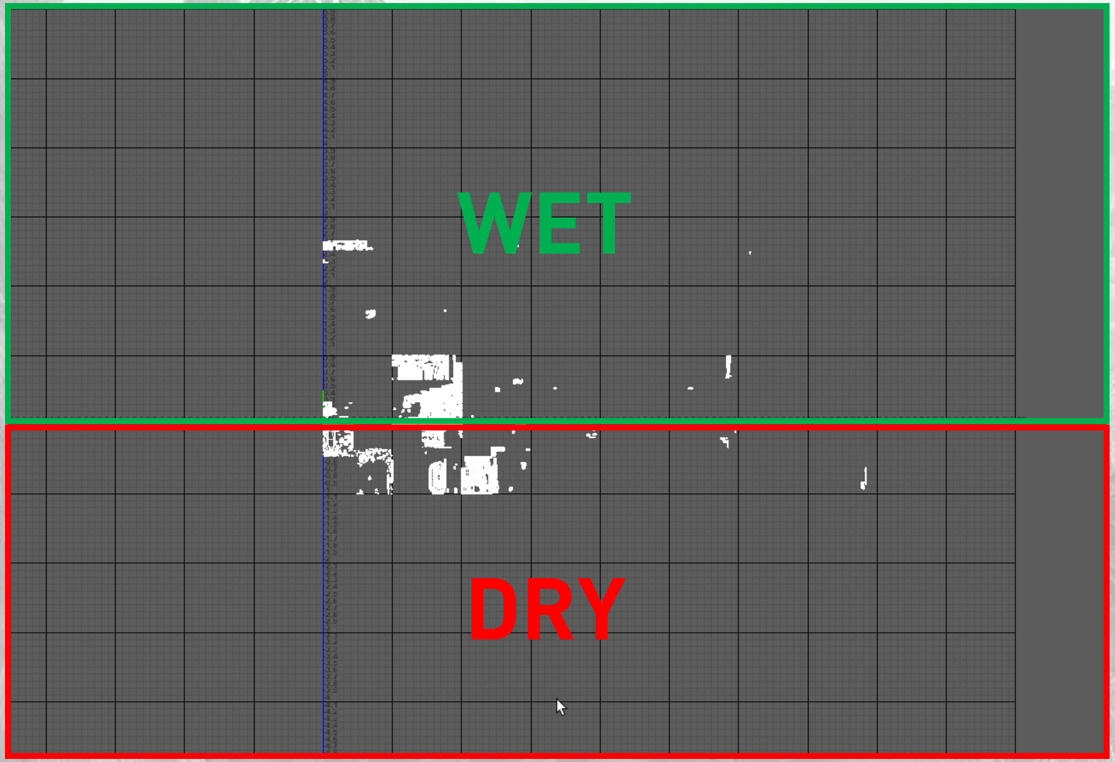
XML File



```
</designConfigurations>

<design2Configurations title="Black Beauty" isYesNoOption="true">
    <design2Configuration name="$l10n_configuration_valueNo"/>
    <design2Configuration name="$l10n_configuration_valueYes" price="7500">
        <material materialSlotName="mainChassis_mat" materialTemplateName="metalPaintedB
        <material materialSlotName="interiorChassis_mat" materialTemplateName="metalPain
    </design2Configuration>
</design2Configurations>
```

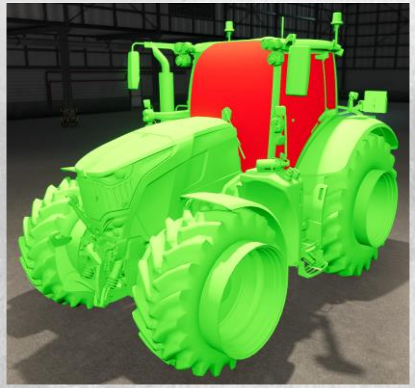
Material System – Wetness

The Farming Simulator 25 has introduced a wetness layer on top of the vehicle materials in case it rains, or you drive through water. The specify which parts of the vehicle are getting wet, we use the UV position of uvSet1/map1 to define that. All UVs that are above 0 in Y are getting wet, all below 0 are not getting wet

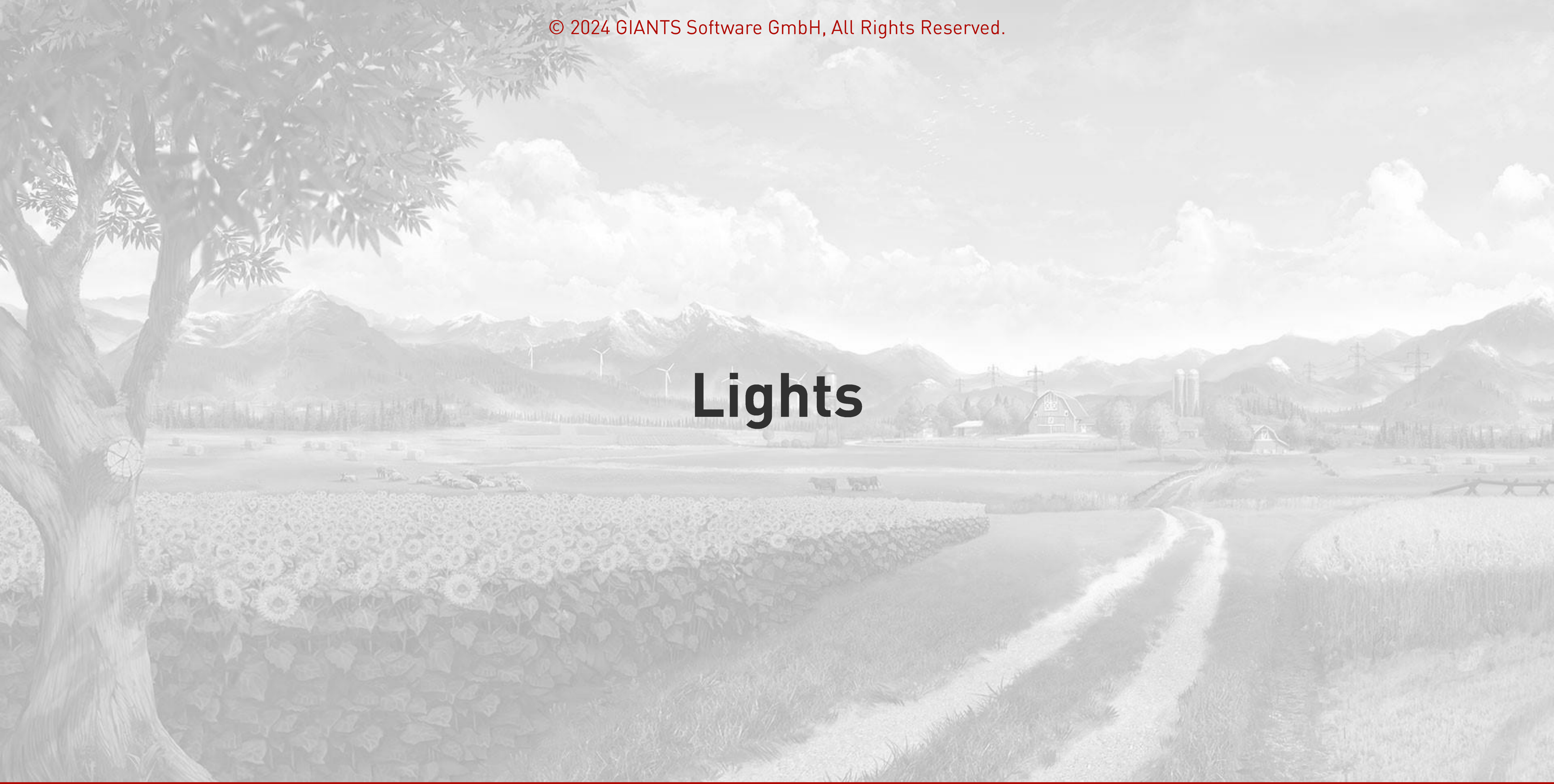


Notes:

- Inside the washable tag you can define "**wetnessIgnoreNodes**" which are not getting wet at all, including the children. (e.g. shared asset loaded in the interior instead of the exterior)
- **Windows** and the **Interior** should not get wet at all.
- The console command **gsVehicleDebugWetness** can be used for ingame visualization of the wetness.



Red: Dry Green: Wet



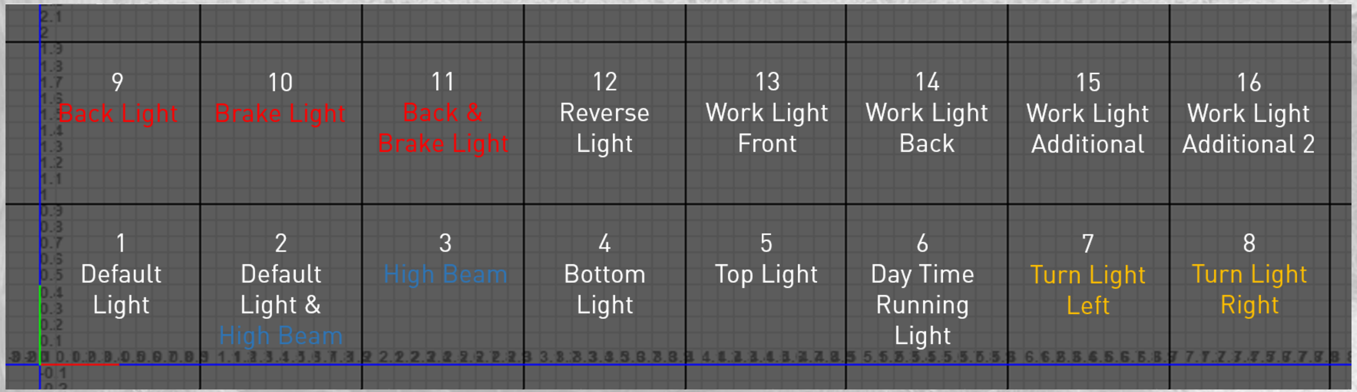
Lights

Lights – Statics

The static light shader variation has been adjusted with two major changes. First the shader does support **multiple light functions on one mesh** and second is the addition of **emissive maps** to get more detail info the light.

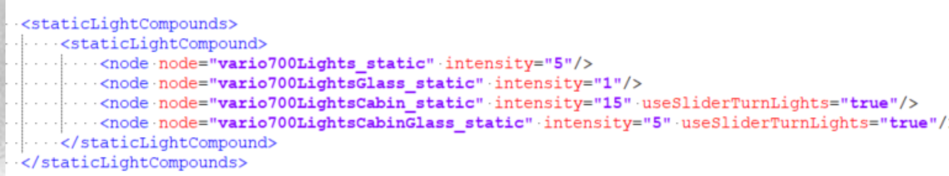
- Create additional emissive texture which defines the color and texture of a static light. The basegame delivers a lot of examples.
- Merge the static lights together to one object (one for the base, one for the glass) and adjust the XML
- The light functions of the merged mesh are defined via UV slot as seen below. If the faces should not light up at all, you can move it to negative X space.
- Static lights should not use decalLayer anymore. Decal layer is only allowed on decals with a surface directly underneath.

Default UV slot mapping



9 Back Light	10 Brake Light	11 Back & Brake Light	12 Reverse Light	13 Work Light Front	14 Work Light Back	15 Work Light Additional	16 Work Light Additional 2
1 Default Light	2 Default Light & High Beam	3 High Beam	4 Bottom Light	5 Top Light	6 Day Time Running Light	7 Turn Light Left	8 Turn Light Right

Vehicle XML



```
<staticLightCompounds>
    <staticLightCompound>
        <node node="vario700Lights_static" intensity="5"/>
        <node node="vario700LightsGlass_static" intensity="1"/>
        <node node="vario700LightsCabin_static" intensity="15" useSliderTurnLights="true"/>
        <node node="vario700LightsCabinGlass_static" intensity="5" useSliderTurnLights="true"/>
    </staticLightCompound>
</staticLightCompounds>
```

Lights – Light Sources

The current standard number of light sources can be seen below. The work lights now allow up to 4 lights sources to the front and back. Additionally the top / bottom light switch has been added with the same setup as the default light.

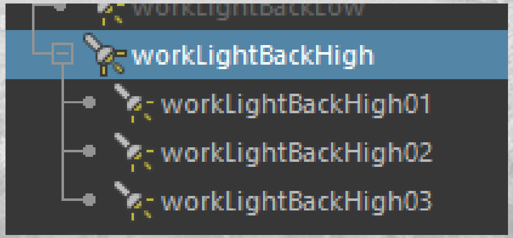
Function	Low Setup	High Setup
Default Light	1	2
High Beam	1	2
Work Light Front	1	2-4
Work Light Back	1	2-4
Top / Bottom Light	✗	Default Light x2
Back Light / Brake Light	✗	2
Turn Light	✗	1 per light
Reverse Light	✗	2

Lights – Merged Lights

When playing on **ULTRA** graphics settings, bigger light sources will automatically receive shadows. If the lights are grouped together, they will use the new merged shadow light function.

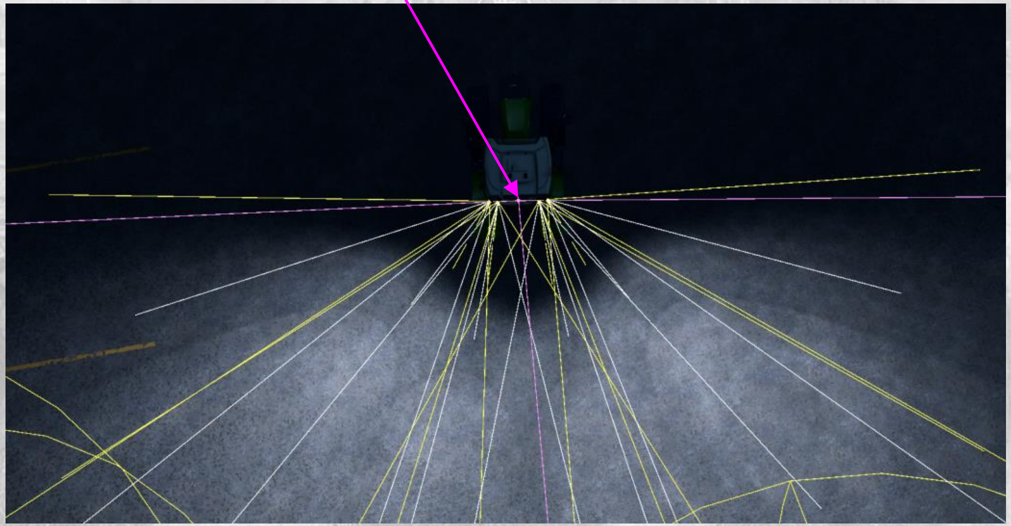
The merged shadow calculation will be based on the individual light orientation. The lights should all point into a similar direction to still receive correct shadows, as the shadows can only be calculated in one direction.

Grouped Lights in Maya/Blender



workLightBackLow
workLightBackHigh
workLightBackHigh01
workLightBackHigh02
workLightBackHigh03

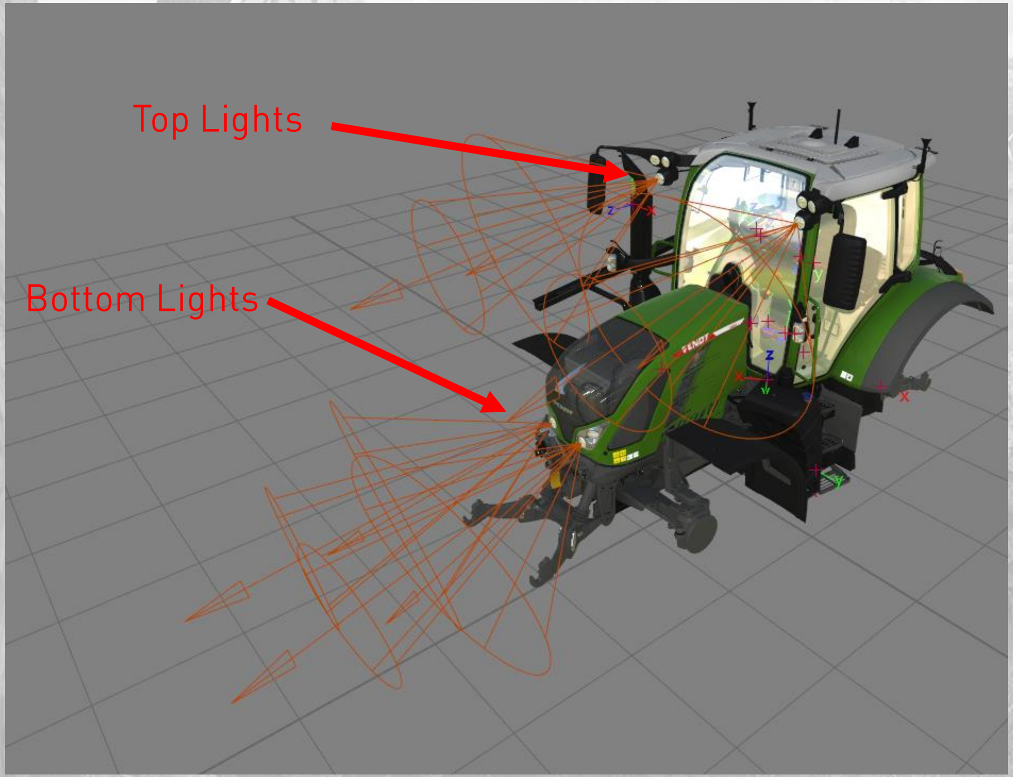
Only one shadow calculation for all 4 lights.



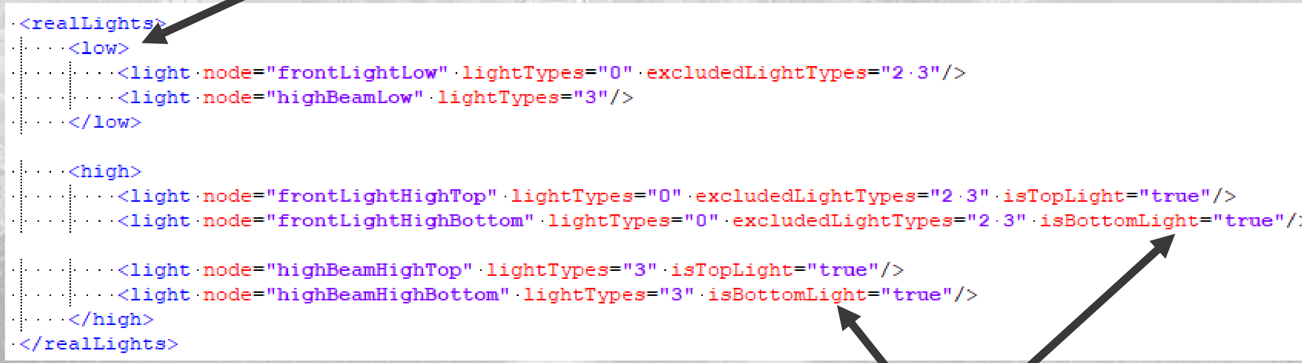
Lights – Top Lights

FS25 has now implemented a switch between top and bottom lights. The lights are automatically switch if a bigger implement is attached to the front.

Feature is optional and should only be added if this switch is available on the real vehicle.



No top/bottom switch for low profile



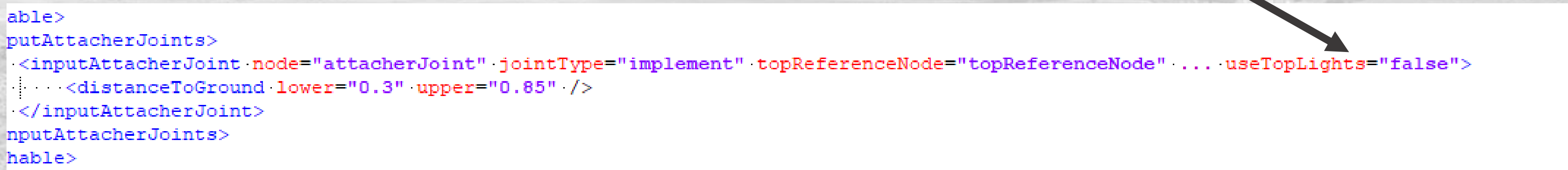
```xml
<realLights>
    <low>
        <light node="frontLightLow" lightTypes="0" excludedLightTypes="2 3"/>
        <light node="highBeamLow" lightTypes="3"/>
    </low>

    <high>
        <light node="frontLightHighTop" lightTypes="0" excludedLightTypes="2 3" isTopLight="true"/>
        <light node="frontLightHighBottom" lightTypes="0" excludedLightTypes="2 3" isBottomLight="true"/>

        <light node="highBeamHighTop" lightTypes="3" isTopLight="true"/>
        <light node="highBeamHighBottom" lightTypes="3" isBottomLight="true"/>
    </high>
</realLights>
```

Additional attributes if the lights should only be active for top or bottom lights

Lights – Top Lights

The top light switch should only be active for implements that block the bottom lights. This is not the case for small implements like weights. Those need an additional attribute to disable the switch.

Additional attribute



```
able>
putAttacherJoints>
 <inputAttacherJoint node="attacherJoint" jointType="implement" topReferenceNode="topReferenceNode" ... useTopLights="false">
 |    <distanceToGround lower="0.3" upper="0.85" />
 </inputAttacherJoint>
nputAttacherJoints>
hable>
```

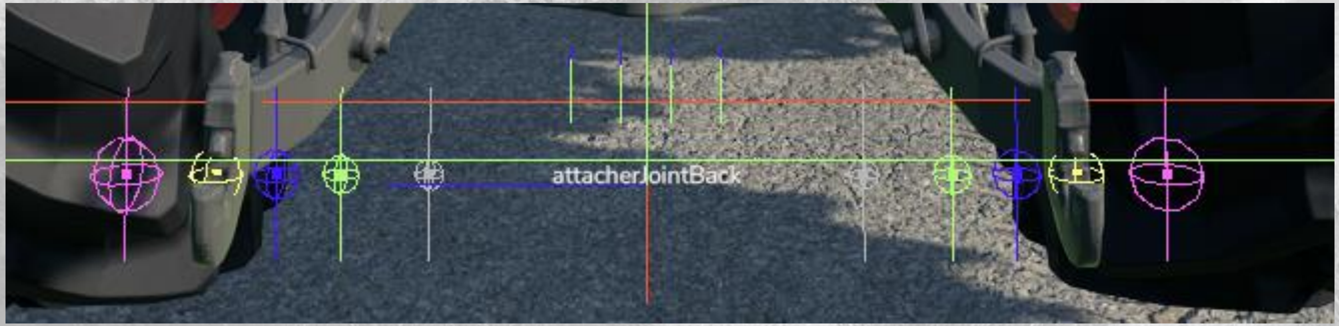
Note: The tractor attacher joints have the same attribute. It is set to "true" automatically if the attached is positioned at the front (detected with Z-translation). Can be overwritten if not wanted.

Attacher Joints

The bottom arms of attacher joints are now separated into two parts, to be able to adjust the width dynamically. The following pages describe how to set this up.

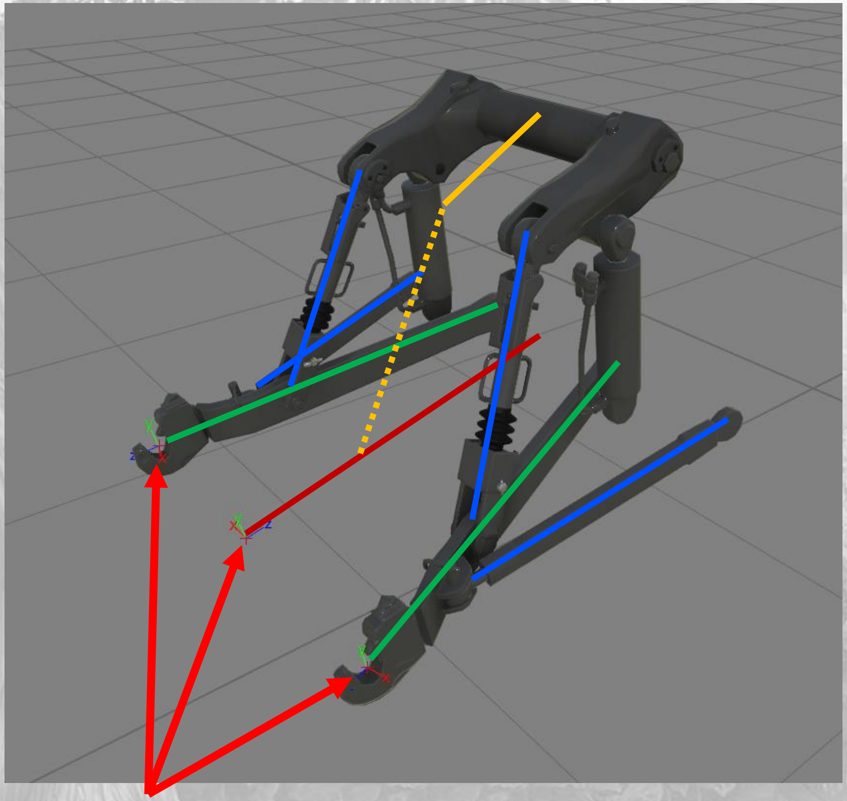
AttacherJoints - Categories

Category	Lower Link Spacing	Ball Diameter
0*	0.510m	3.5cm
1	0.718m	4.4cm
2	0.870m	5.6cm
3	1.010m	6.4cm
4	1.222m	8.5cm



* By default not supported on tractors. And should be avoided if possible.

AttacherJoints - BottomArm



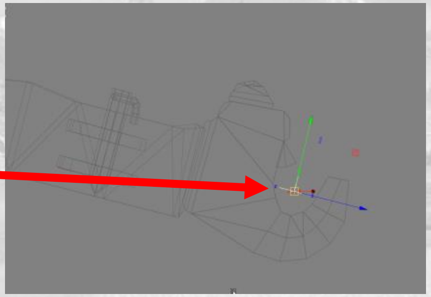
Reference Points

🟥 attacherJointBackArmBottomTrans

Transform group with negative Z aligned to the attacher joint. Including a reference point **referencePointBackBottom** and the two visual bottom arms.

🟩 attacherJointBackArmBottomLeft/Right

Visual bottom arms with Z axis aligned to the back. At the attaching point there should be a reference point named **attacherJointBackArmBottom[Left/Right]Ref.** This reference point needs to be in line with the **referencePointBackBottom** if you look from the side.



🟨 attacherJointBackArmMain

MovingPart with local reference point referring to the **attacherJointBackArmBottomTrans** node. No movingPart for the second part 🟨 is required if it is fully controlled by the individual side moving parts 🟦 .

🟦 movingParts

Stabilizer arms and sub parts of the main arm can be implemented as regular moving parts.

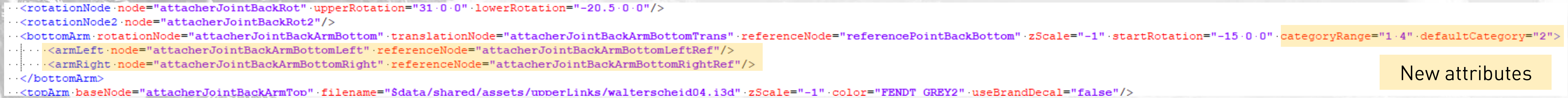
Console command for testing:

```
gsVehicleBottomArmSetWidth [cat] [width]
```

New setup should be added to all vehicles!

AttacherJoints - BottomArm

Tractor



```
  <rotationNode node="attacherJointBackRot" upperRotation="31 0 0" lowerRotation="-20.5 0 0"/>
  <rotationNode2 node="attacherJointBackRot2"/>
  <bottomArm rotationNode="attacherJointBackArmBottom" translationNode="attacherJointBackArmBottomTrans" referenceNode="referencePointBackBottom" zScale="-1" startRotation="-15 0 0" categoryRange="1 4" defaultCategory="2">
      <armLeft node="attacherJointBackArmBottomLeft" referenceNode="attacherJointBackArmBottomLeftRef"/>
      <armRight node="attacherJointBackArmBottomRight" referenceNode="attacherJointBackArmBottomRightRef"/>
  </bottomArm>
  <topArm baseNode="attacherJointBackArmTop" filename="$data/shared/assets/upperLinks/walterscheid04.i3d" zScale="-1" color="FENDT GREY2" useBrandDecal="false"/>
```

New attributes

armLeft/armRight

Visual nodes of left and right bottom arm including the reference nodes that are inside of them. See previous slide.

When referenceNode is not defined, the arm nodes are translated on the X axis to the target width.

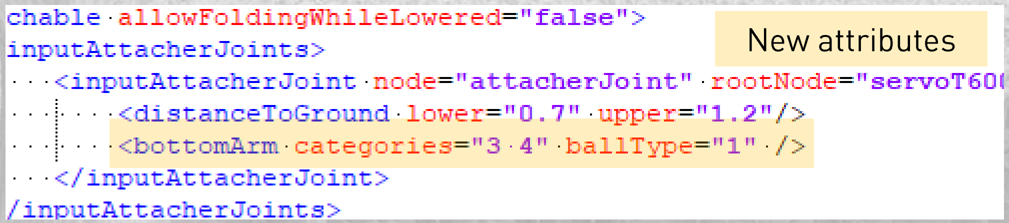
categoryRange

Min. and max. supported lower link categories. For more detailed control of the width there is also a "widthRange" attribute including the min. and max. width in meters. (By default all categories are support -> "1 4")

defaultCategory/defaultWidth

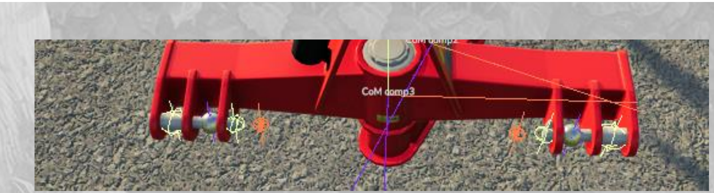
Defines the default width that is used when nothing is attached. tractorS should have **category** 2 and bigger tractors **category** 3.

Tool



```
chable allowFoldingWhileLowered="false">
inputAttacherJoints>
   <inputAttacherJoint node="attacherJoint" rootNode="servoT60
       <distanceToGround lower="0.7" upper="1.2"/>
       <bottomArm categories="3 4" ballType="1" />
   </inputAttacherJoint>
/inputAttacherJoints>
```

New attributes



categories

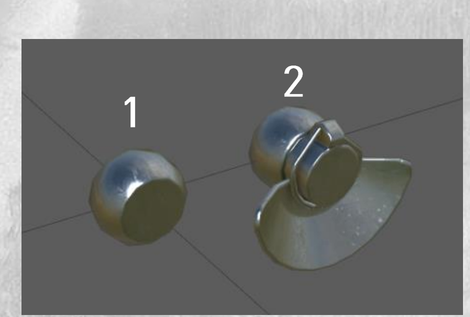
Defines the supported categories. The sample vehicle has a attacher for category 3 & 4, but can also be just a single category. Alternative is the "widths" attribute to define the supported widths manually.

ballDefaultVisibility

True/false defines if the ball is shown if no tool is attached or not. Default is "true".

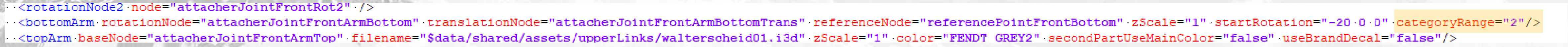
ballType

Type of ball that is used.



AttacherJoints - BottomArm

Tractor Front

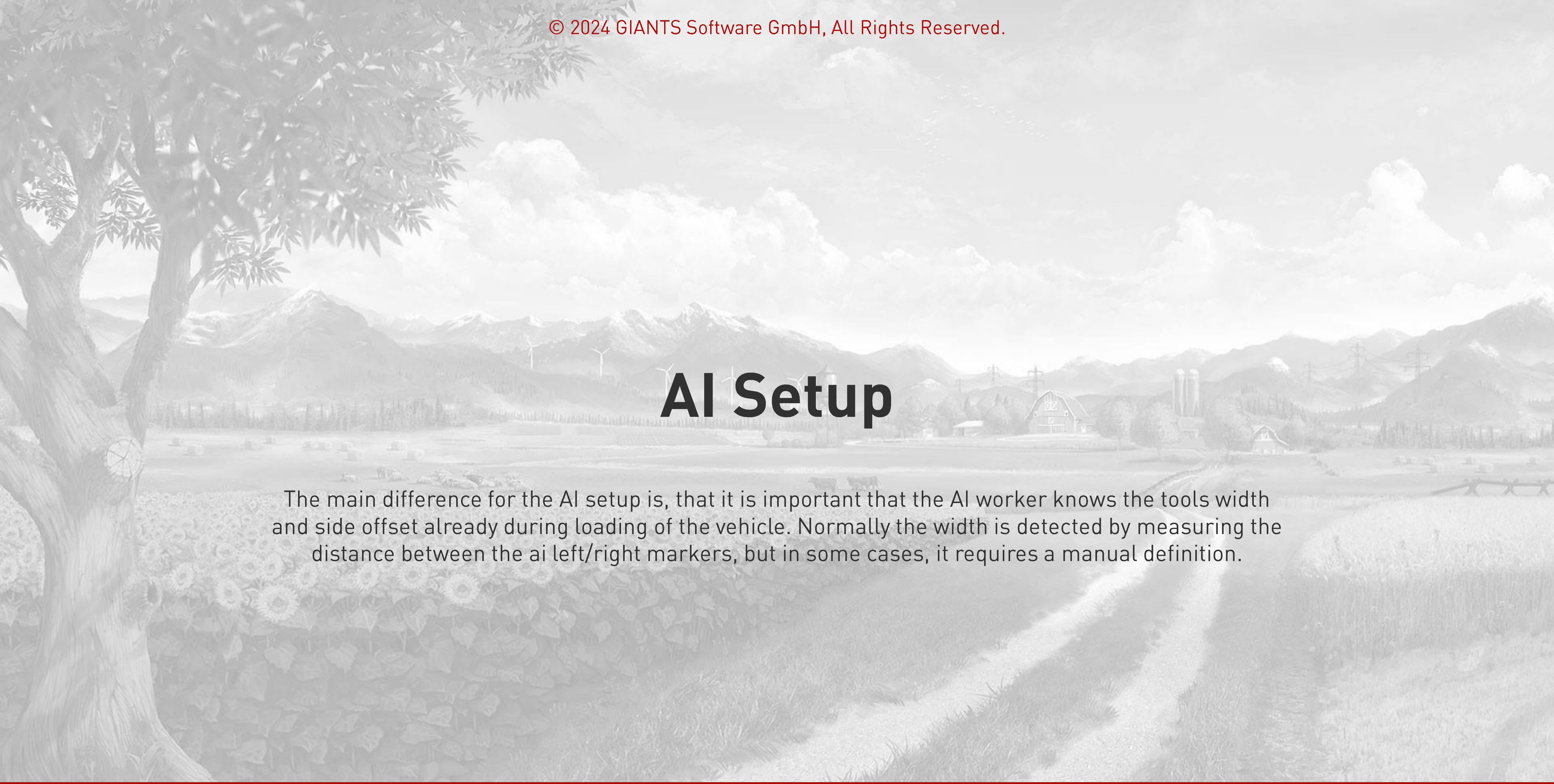


```
  <rotationNode2 node="attacherJointFrontRot2" />
  <bottomArm rotationNode="attacherJointFrontArmBottom" translationNode="attacherJointFrontArmBottomTrans" referenceNode="referencePointFrontBottom" zScale="1" startRotation="-20 0 0" categoryRange="2"/>
  <topArm baseNode="attacherJointFrontArmTop" filename="$data/shared/assets/upperLinks/walterscheid01.i3d" zScale="1" color="FENDT GREY2" secondPartUseMainColor="false" useBrandDecal="false"/>
```

New attributes

Category of the front attacher should be defined as well. Even if the width cannot be controlled.

Visual offsets if the category does not match are ignored.

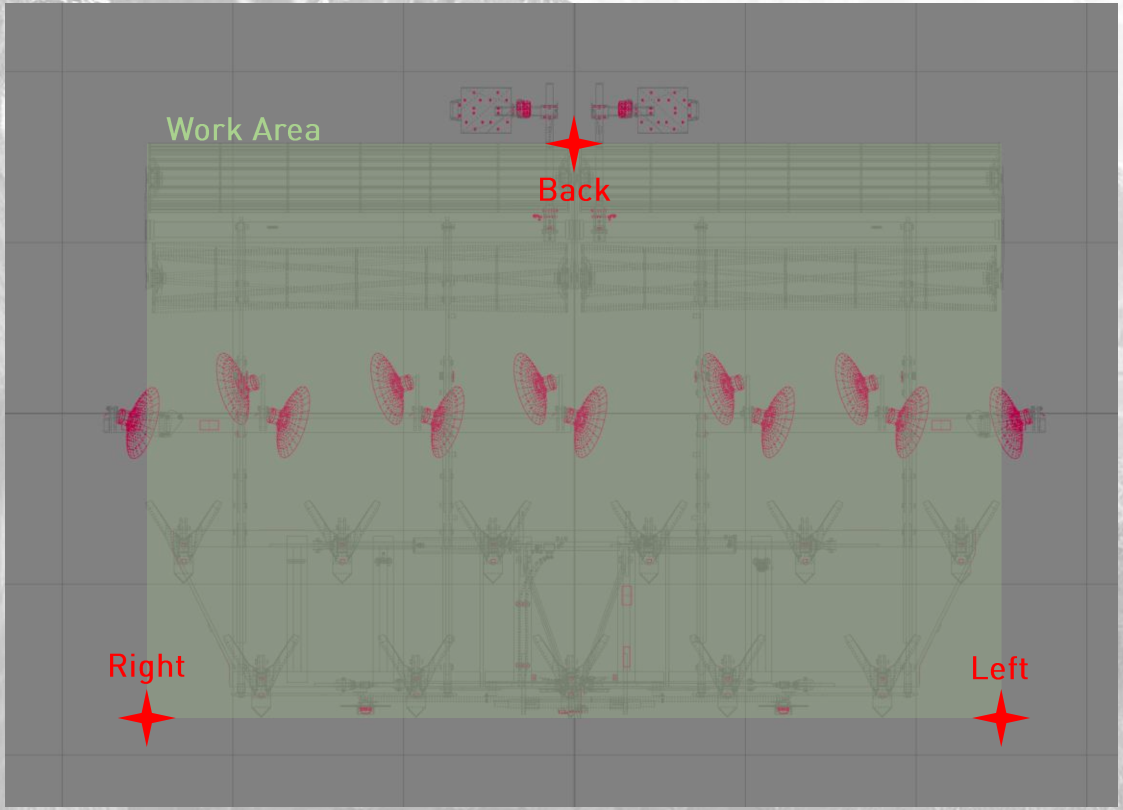


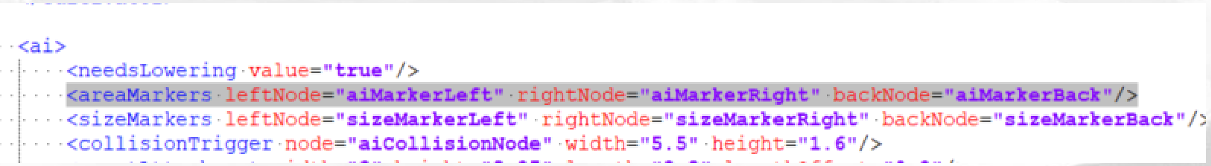
AI Setup

The main difference for the AI setup is, that it is important that the AI worker knows the tools width and side offset already during loading of the vehicle. Normally the width is detected by measuring the distance between the ai left/right markers, but in some cases, it requires a manual definition.

AI Setup

Area Markers

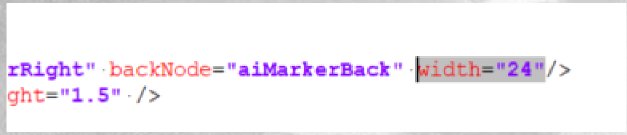




```
<ai>
    <needsLowering value="true"/>
    <areaMarkers leftNode="aiMarkerLeft" rightNode="aiMarkerRight" backNode="aiMarkerBack"/>
    <sizeMarkers leftNode="sizeMarkerLeft" rightNode="sizeMarkerRight" backNode="sizeMarkerBack"/>
    <collisionTrigger node="aiCollisionNode" width="5.5" height="1.6"/>
```

The area markers should exactly match the work area of the tool. The back marker is centered at the back of the work area.

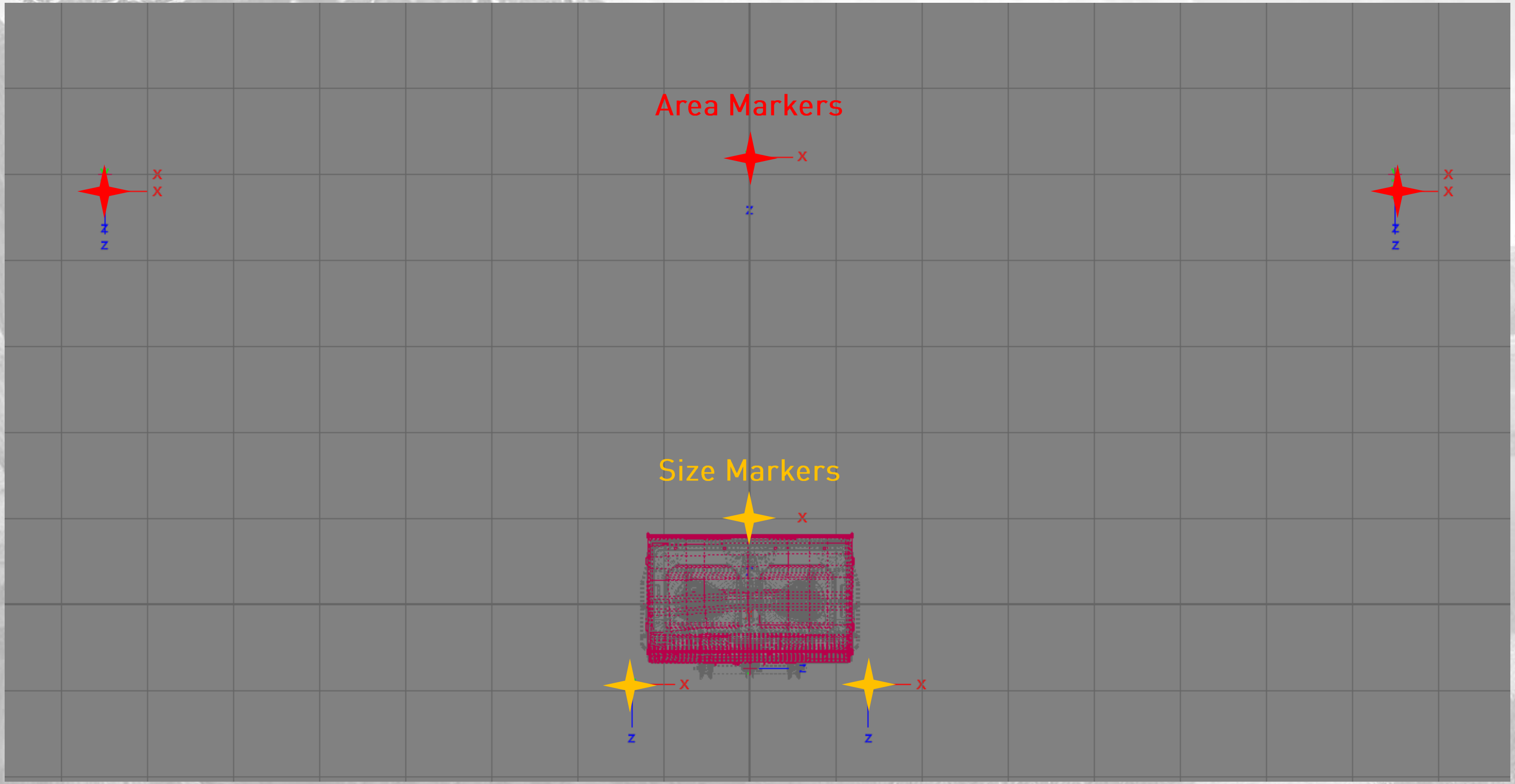
Note: The working width is automatically calculated from those markers. If the state of the tool in the i3d file does not match the working state, you can define the working width manually. The areaMarkers tag offers a “width” attribute for that.



```
rRight" backNode="aiMarkerBack" width="24"/>
ght="1.5" />
```

AI Setup

Size Markers

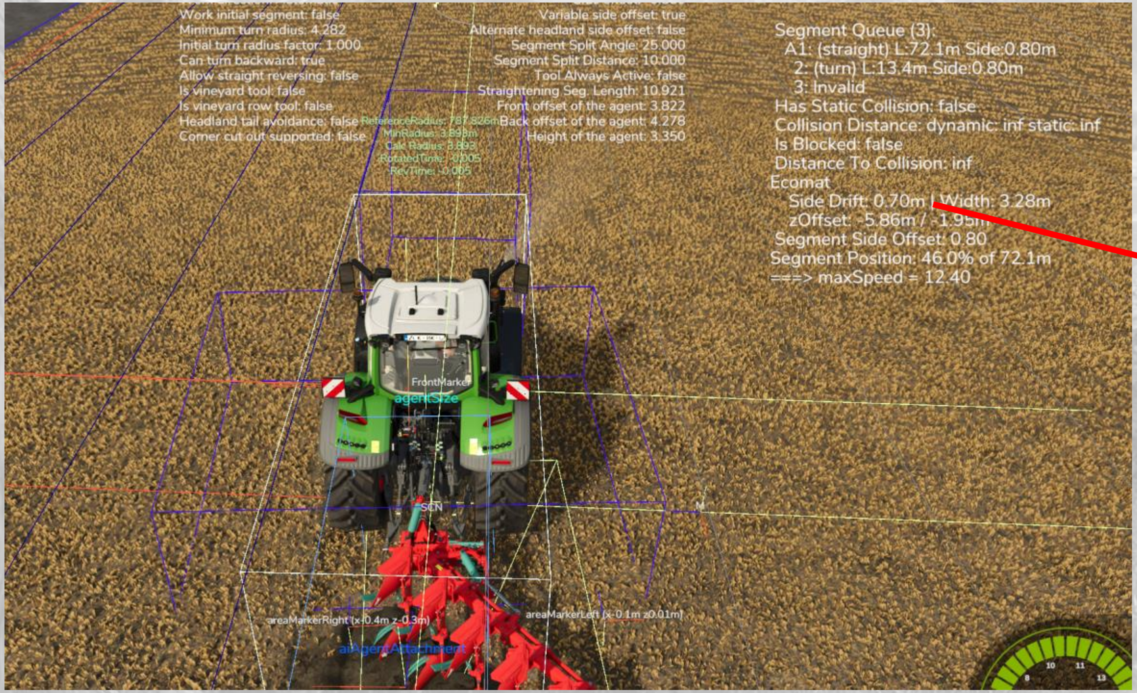


The size markers should be added when the actual size of the tool is much different compared to the work area. This is the case for example on a fertilizer spreader, as you can see on the left side.

AI Setup

Side Offset

gsVehicleDebug ai



```
Work initial segment: false                          Variable side offset: true
Minimum turn radius: 4.282                  Alternate headland side offset: false
Initial turn radius factor: 1.000                    Segment Split Angle: 25.000
Can turn backward: true                          Segment Split Distance: 10.000
Allow straight reversing: false                      Tool Always Active: false
Is vineyard tool: false                      Straightening Seg. Length: 10.921
Is vineyard row tool: false                    Front offset of the agent: 3.822
Headland tail avoidance: false ReferenceRadius: 787.826m Back offset of the agent: 4.278
Corner cut out supported: false  MinRadius: 3.898m   Height of the agent: 3.350
                                 Calc Radius: 3.893
                                 RotatedTime: -0.005
                                 RevTime: -0.005
```

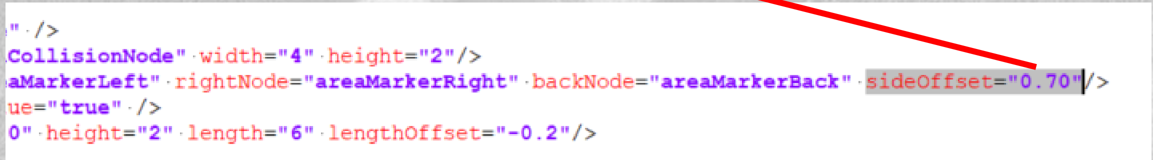
```
Segment Queue (3):
  A1: (straight) L:72.1m Side:0.80m
    2: (turn) L:13.4m Side:0.80m
    3: Invalid
 Has Static Collision: false
 Collision Distance: dynamic: inf static: inf
 Is Blocked: false
 Distance To Collision: inf
Ecomat
   Side Drift: 0.70m | Width: 3.28m
   zOffset: -5.86m / -1.95m
 Segment Side Offset: 0.80
Segment Position: 46.0% of 72.1m
===> maxSpeed = 12.40
```

FrontMarker
agentSize
SCN
areaMarkerRight (x-0.4m z-0.3m)
areaMarkerLeft (x-0.1m z0.01m)
aiAgentAttachment

Some tools like plows are not centered behind the tractor. For those the AI requires a sideOffset attribute that defines that.

Best approach to get the side offset:

- **Remove** any sideOffset from the XML
- Start the game and the AI worker on a field
- Enable AI debug with "gsVehicleDebug ai" command
- Read the **Side Drift** value and enter it in the XML

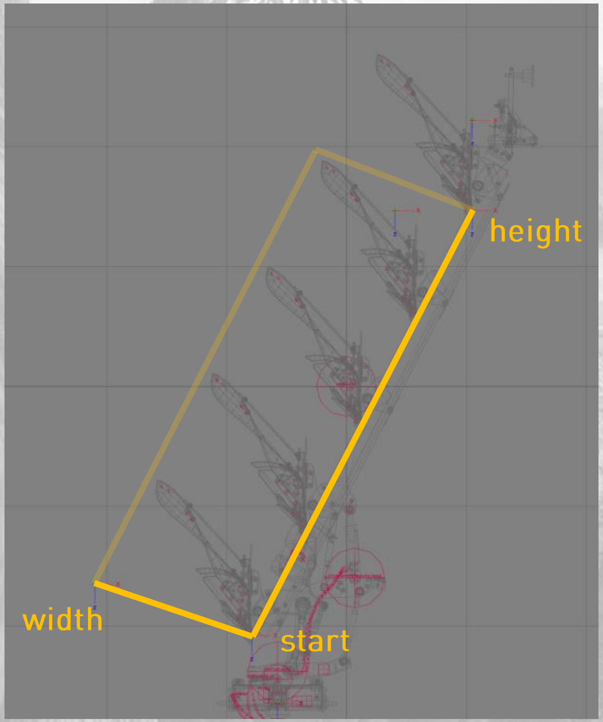


```
" />
CollisionNode" width="4" height="2"/>
aMarkerLeft" rightNode="areaMarkerRight" backNode="areaMarkerBack" sideOffset="0.70"/>
ue="true" />
0" height="2" length="6" lengthOffset="-0.2"/>
```

Plow Work Areas

Main Work Area

Type: “**plow**”

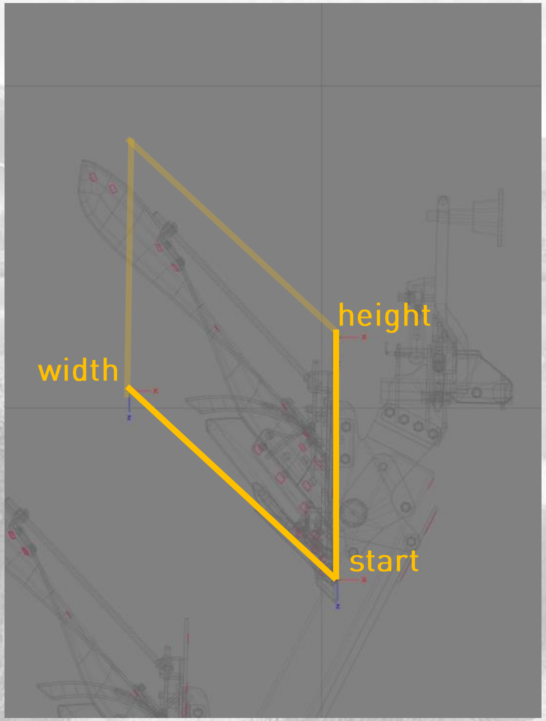


Start: At the tip of first share
Width: Offset to the side, so it covers the last furrow.
Height: Tip of the last share

The nodes should be place **inside** the shares in hierarchy.

Furrow Area

Type: “**plowShare**”



Start: At the tip of last share
Width: Offset to the side, so it covers about 75% of the share.
Height: At the end of the last share

The nodes should be place **inside** the last share in hierarchy.

Misc

- Some **shared light pivots** have been adjusted to have a unified setup across all lights. Might need adjustment of vehicle link nodes.
- Attacher joint **top arms** are now defined with an XML instead of i3d path and have been renamed. A warning is present.
- All shader parameters that contain "position" have been renamed to "pos". E.g. on crawlers from **scrollPosition** to **scrollPos**.
- **Character targets** have been adjusted slightly due to the new player. Make sure they still fit.
- **aiCollisionNode** can now be defined without the size, using the vehicle size (see useSize attribute)
- **Front axle suspensions** have been reworked with a different setup. See existing tractors for reference.
- **Collision masks** have been split into filter mask and group mask. Exporters will automatically convert the masks. The editor can also be used to apply the new masks.
- An exact fill root node is now required for **fuel tanks**, otherwise you cannot refuel the vehicle.
- For some brands there are **shared dashboards** available. Replace the ones in the vehicle if possible.
- I3D reference system is now supporting **runtime loaded references** (So, they are loaded ingame as well). Parts without function can use this new system. (e.g. reflectors, fire extinguisher)
- **Additional tool connection** for side mount has to be added (For mounting the Dewulf P3 Profi on small and medium tractors)