

# Calytrix 3D Model Design Brief v1.0

- [Introduction](#)
  - [Workflow](#)
  - [Software](#)
  - [Folder Structure](#)
  - [Filenames](#)
  - [HD & Game Ready Blender File](#)
  - [Blender Project Settings](#)
  - [Blender Collections](#)
  - [Blender Naming Conventions](#)
  - [Modelling with Quads](#)
  - [Tri Count Soft Limit](#)
  - [Fix up Bad Geometry](#)
  - [Reset Scale & Rotations](#)
  - [Set Logical Origins](#)
  - [UV Mapping](#)
  - [Vertex Paint](#)
  - [Texturing](#)
  - [Calytrix Specific Thermal Texture](#)
  - [Rigging](#)
  - [Create Collision Volumes](#)
  - [Generate LODs](#)
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## Introduction

This design brief details the specific requirements in brief of 3D modelling work for Calytrix. It is designed to be a brief overview and assumes a foundational level of 3D modelling knowledge on the part of the reader. Please ask if you would like further detail about any section.

Please read the document from start to finish before carrying out 3D modelling work for Calytrix. The sections are roughly in linear order for a 3D workflow and so can be referred back to as you step through the 3D work process.

## Workflow

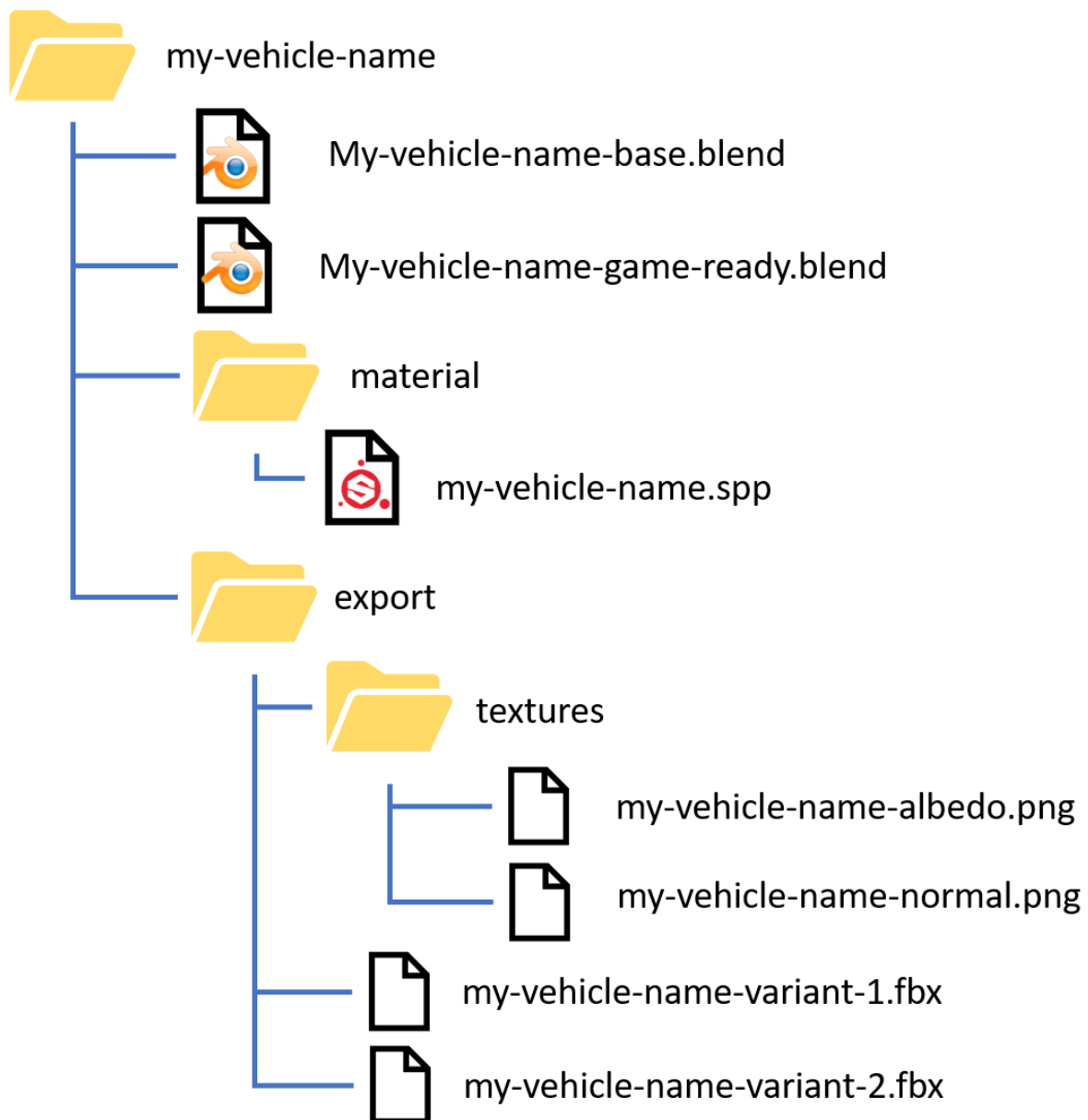
1. Build HD Model
2. UV Unwrapping
3. Texturing in Substance Painter
4. Create Game Ready Blender File
5. Setup Rigging
6. Create Collision Volumes
7. Create LODs

## Software

Calytrix requires 3D models in .blend files. The main software pipeline involves Blender & Substance Painter. Image editors such as Photoshop, Affinity or GIMP can be required at times.

## Folder Structure

Create a folder structure like so:



## Filenames

Use hyphens instead of spaces in filenames. All names should be lowercase.

### Examples

unimog-ul700l-base.blend

abrams-m1-game-ready.blend

toyota-yaris-albedo.png

## HD & Game Ready Blender File

If creating a new model from scratch then start with a new HD blender file `my-vehicle-base.blend`. This file can have a very high resolution mesh. A game ready (lower resolution) blend file should be created once the HD mesh is complete. The game ready blend file is where you should do rigging, collision volumes & LODs.

## Blender Project Settings

All models should be centred at world origin (X,Y) and facing forward according to blender's default coordinate space (Y+ is forward, Z+ is up, X+ is right). This means a car for example would be facing forwards towards Y+. The model should be lifted up to have it's lowest mesh faces (what would be touching the ground) resting at Z 0.

The blender project should have it's units set to 1 metre = 1 blender unit scale.

## Blender Collections

Different component groups and LODs should be stored in the appropriate *Blender Collection*. Eg bones, collision, meshes etc. Additional nested collections can be used for common components, for example weapons, wheels etc.

## Blender Naming Conventions

Please ensure all blender objects are named with a meaningful name.

Use hyphens instead of spaces in blender object names.

Use the following prefixes for:

Bones `BONE_turret`

Collision Volumes `COL_BOX_turret` (see Collision Volumes section below)

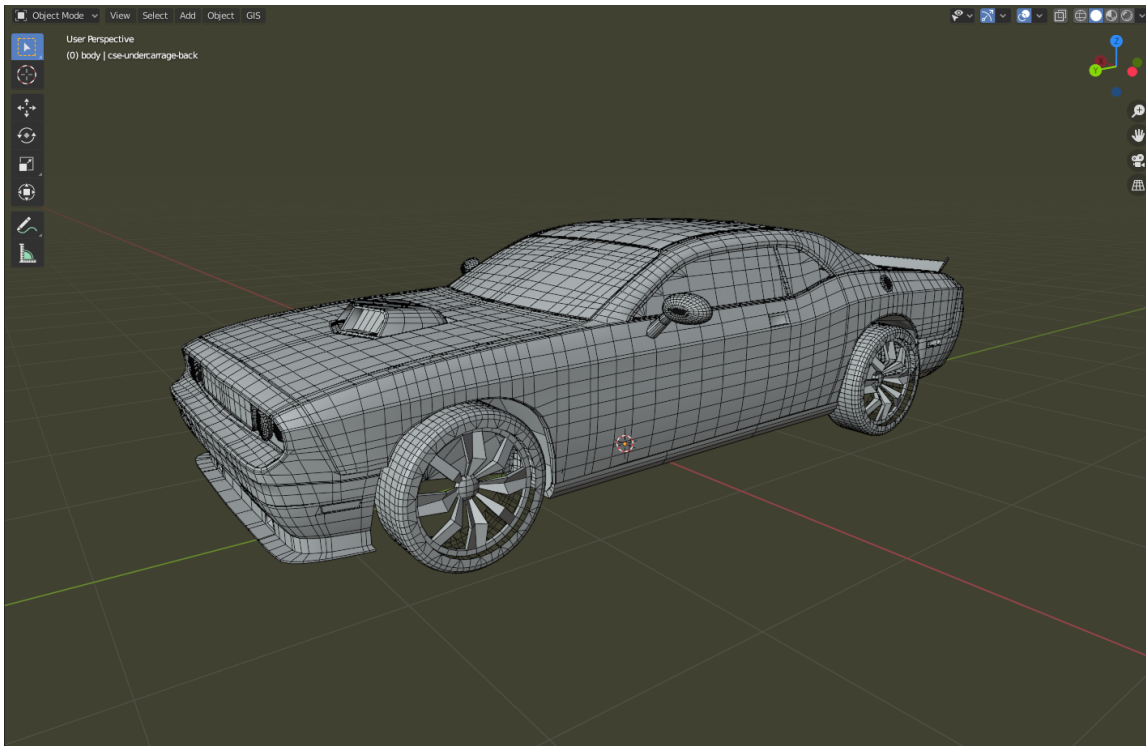
Level of Detail Meshes `LOD0_turret`

All names should be lowercase except as described in prefixes.

## Modelling with Quads

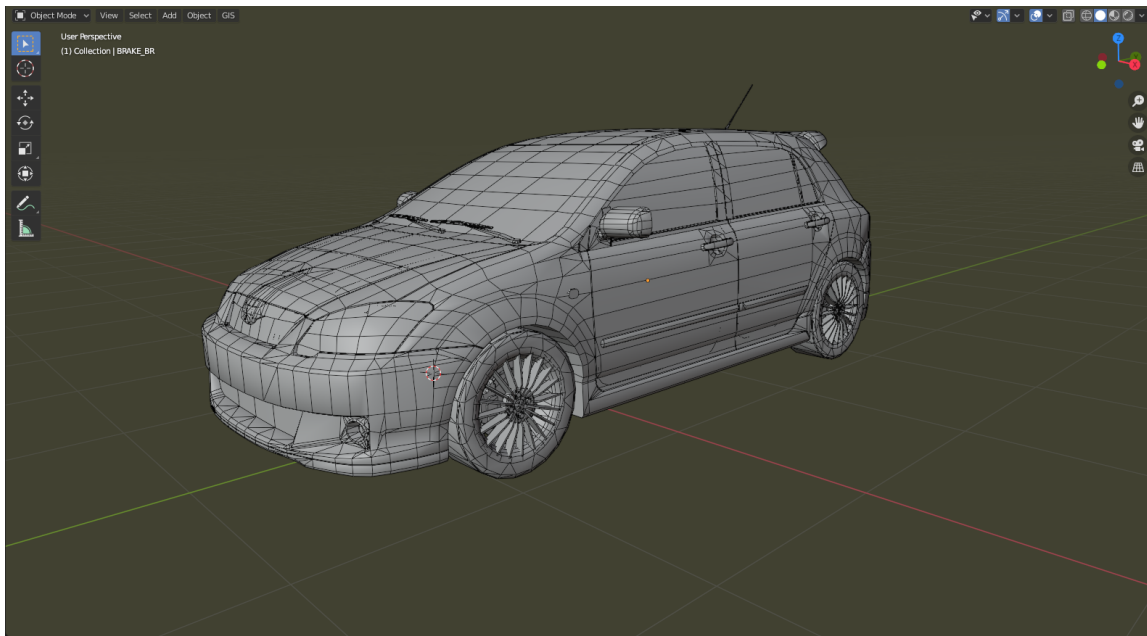
Please use quads as much as possible to maintain clean topology. Small amounts of triangles are acceptable in areas with tight curves.

### Good Topology



This asset contains clean quads, evenly sized and following the natural curve of the vehicle. Note the curves of the tire bays and windows. These areas utilize triangles, to provide curves, without increasing the overall face count considerably. This is acceptable use of triangles.

## Bad Topology



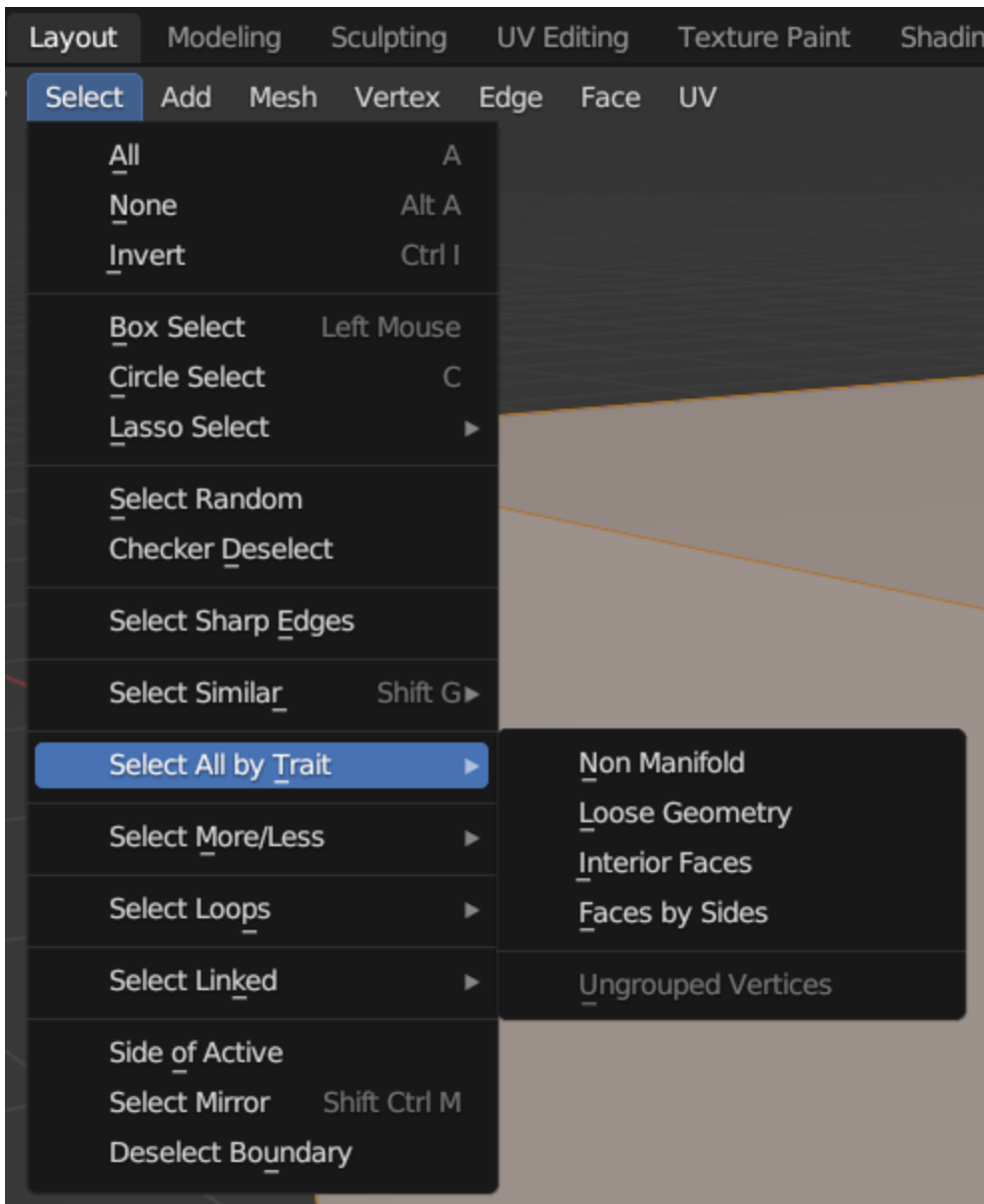
This asset contains many n-gons, and an irratic mix of quads and triangle polgons. Note the areas around the wheels, front spoiler and bonnet. This kind of topology should be avoided at all costs.

## Tri Count Soft Limit

Keep tri counts under 100k for huge vehicles (ships) and below 30k for car sized vehicles. If you believe the complexity or the size of the object requires a higher tri count than this please discuss this with the art lead.

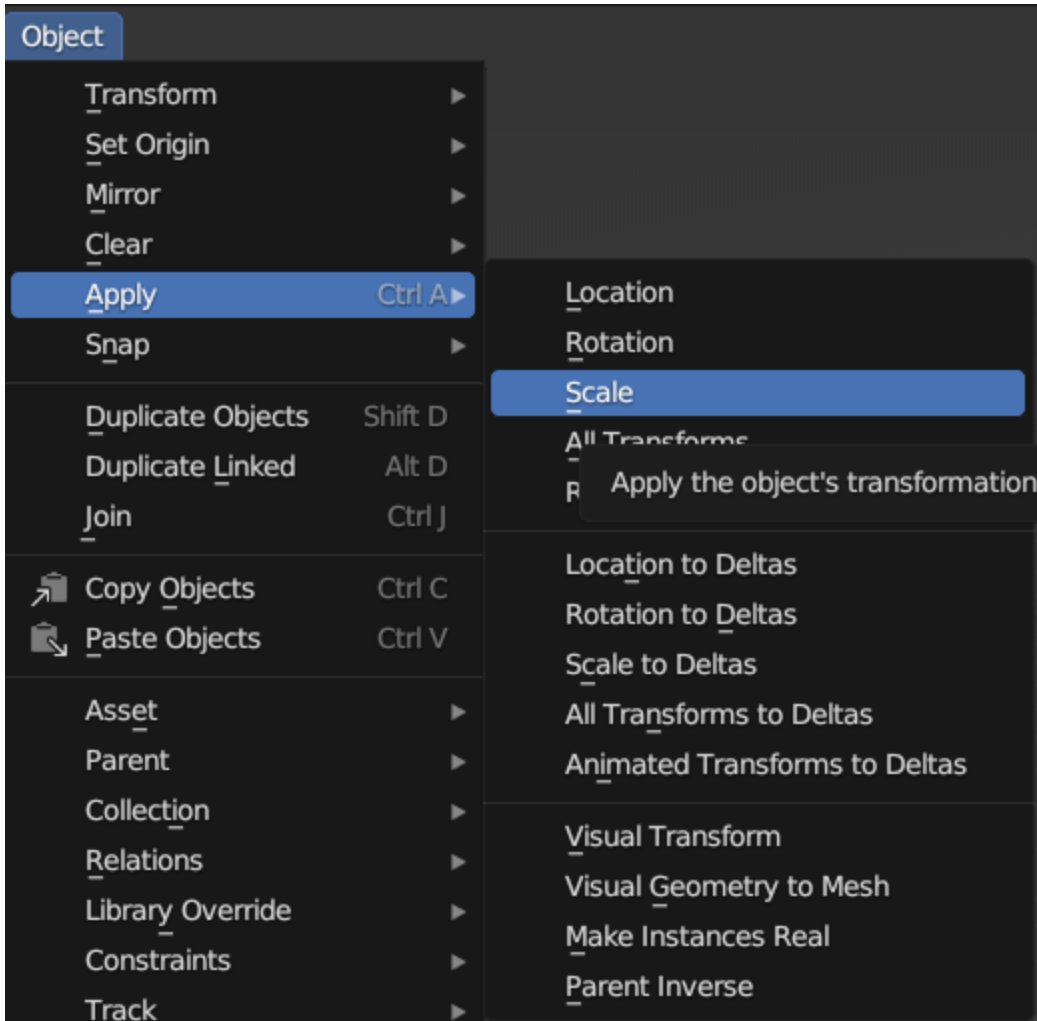
## Fix up Bad Geometry

Use the following features of blender to find and fix up bad geometry. Meshes should not contain non manifold geometry, loose geometry or faces with more than 4 sides (n-gons).



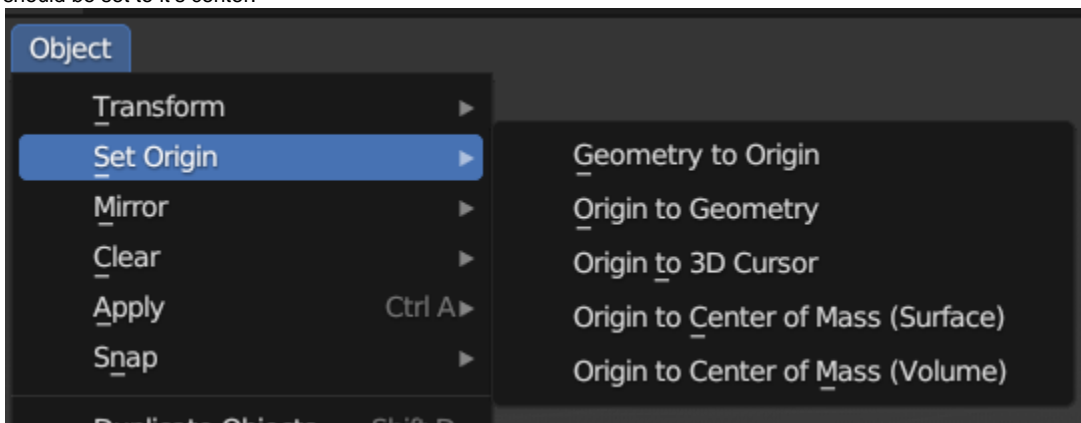
## Reset Scale & Rotations

Apply transformation scale to all meshes. Please ensure that all meshes have scale xyz 1,1,1 and rotations 0,0,0.



## Set Logical Origins

An object's origin (pivot) should be set to a logical position that would allow it to rotate correctly. If the object will not be rotating then it's origin should be set to it's center.

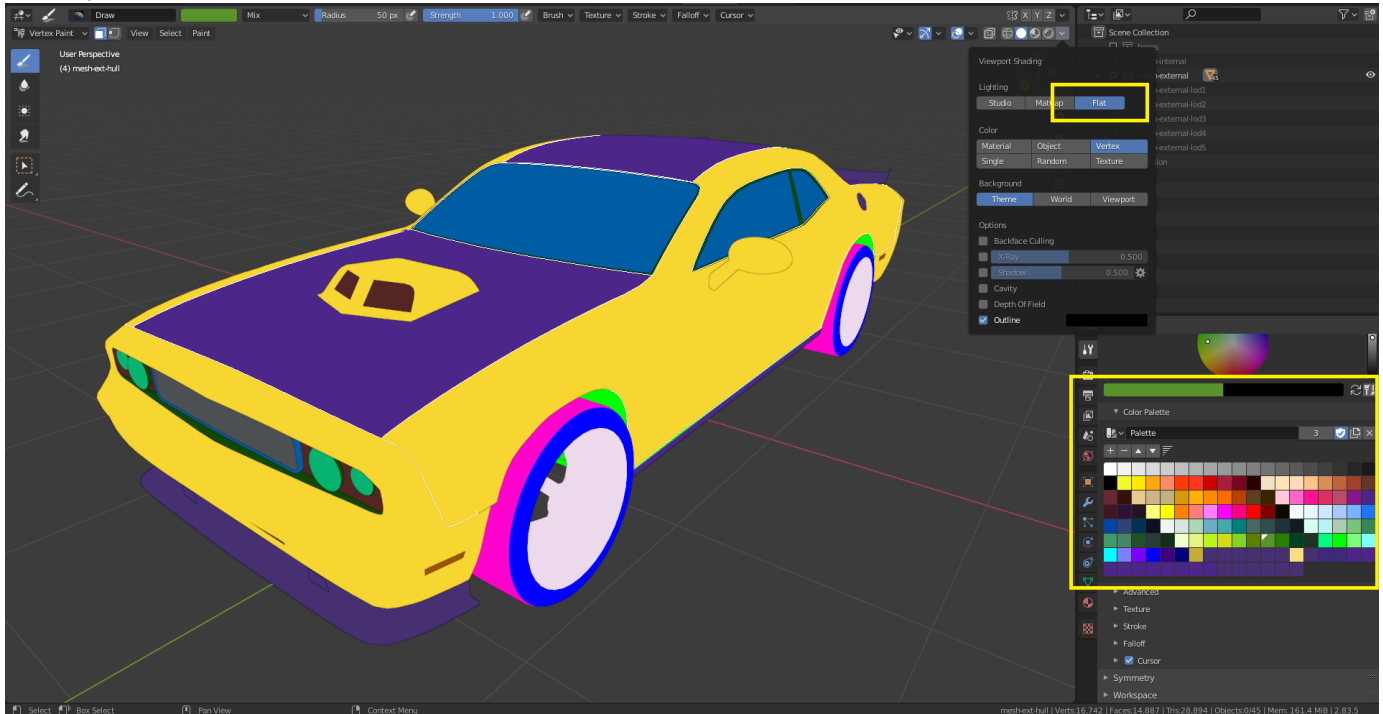


## UV Mapping

The individual model brief will describe the number of UV maps that are required. Most entities will have one UV map. Some entities may have a second interior UV map. Some larger entities will require their mesh is broken up into multiple materials each with a single UV map. Avoid overlapping UVs unless doing so to save on texture space for identical looking components.

## Vertex Paint

To speed up the material creation process you can apply vertex paint to all mesh objects. In Substance Painter, the vertex paint is used to generate the *Colour Map*. The *Colour Map* is used as a mask to rapidly apply textures to different meshes. A simple example of this can be found in this [Jayanam YouTube video](#).



In the image above each of the different colours is used to represent a different material in Substance Painter. For example, Yellow for paint, brown for mesh, pink for tire tread, etc.

## Texturing

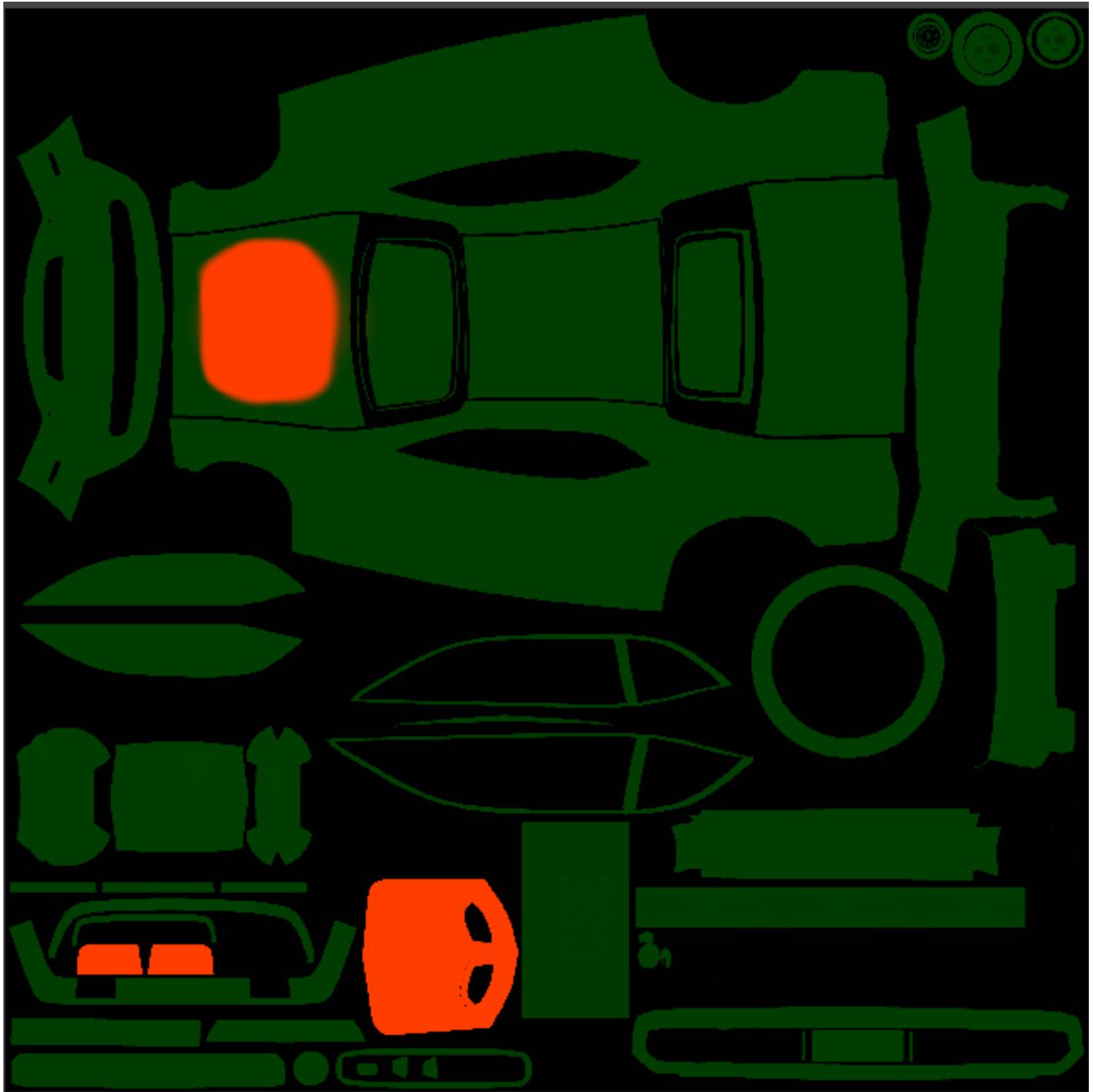
Use Substance Painter to generate PBR texture set including Color, Roughness, Metal & Normal textures. Additionally if required an Emissive texture.

You can also use Substance Painter to Bake Mesh Maps of high detail onto lower detail.

After creating and exporting Substance Textures create the matching materials inside Blender and hookup the texture files.

## Calytrix Specific Thermal Texture

Calytrix requires a specific unique type of texture for thermal imaging. This texture can be created in blender using the Texture Paint Mode. We use RGB colour space to determine three different types of heat (green: body heat, red: engine heat, blue: weapon heat). There is a separate more detailed guide that will be provided on how to do this.



## Rigging

Where bones have been asked for in the model brief use blender empties with the prefix BONE\_ rather than actual bones from an armature.

Set the logical parent of mesh objects to either the BONE\_ or another mesh object that it should be connected to.

Remember to parent collision meshes to bones (empties) if it makes sense to do so.

The forward direction (y+) of a bone (empty) matters in some cases, such as a headlights of a car. Please ensure the direction of the bone makes logical sense.

## Create Collision Volumes

Create COL\_ volumes for all the parts of the model that require it. Try to use the least complex primitives first (COL\_BOX\_) before resorting to COL\_CONVEX. Please ensure the origin point of all collision volumes is at their center except for the COL\_CONE\_ volume where it must be at the center base of the cone.



The geometry types supported by the CSE collision system include:

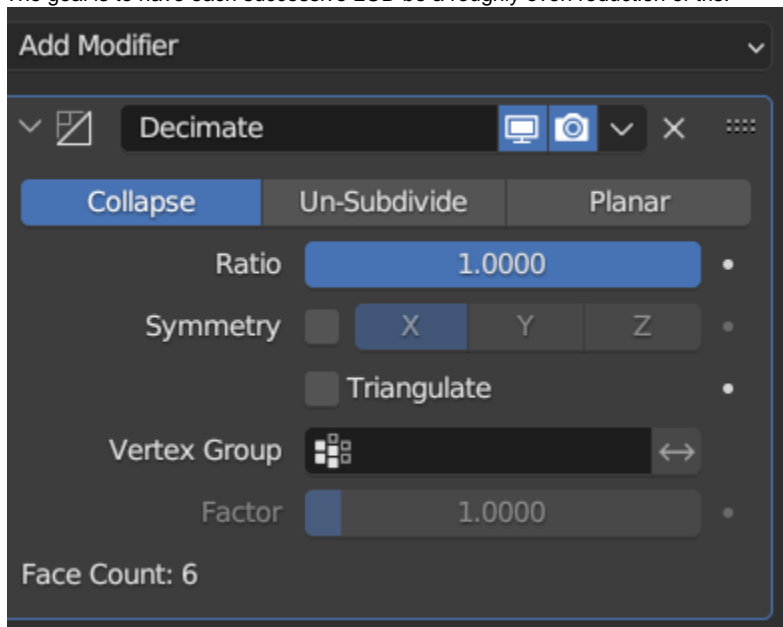
- COL\_BOX\_
- COL\_CONE\_
- COL\_CONVEX\_
- COL\_CAPSULE\_
- COL\_CYLINDER\_
- COL\_SPHERE\_

## Generate LODs

The model brief will list the number of LODs required for the model. Generally this will be between 3-6. The prefix LOD0\_ LOD\_1 LOD2\_ etc should be used in front of ALL meshes.

Once all the modelling and texturing work has been done in the HD blender file the next step is to generate LODs in the game ready blender file.

We can use the decimate modifier to achieve this and maintain UV space. Alternatively each LOD level can be created manually if you prefer. The goal is to have each successive LOD be a roughly even reduction of tris.



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Questions or Queries about this document can be directed to [cse.art@calytrix.com](mailto:cse.art@calytrix.com)

This document was last updated on the 4th April 2023.

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