

SIMPLYGON

Car LOD research FINDINGS

Reduction PROCESSOR

- FOR_Pheonix and ARI_Atom – primary cars used for testing
- Two version of the LOD process is used
 - Reduction Tool and Remesher
- Reduction Tool :
 - ✓ Maintains Uvs - Materials can be remapped without much change
 - ✓ LOD 1 & LOD 2 look good
 - Lods 3-5 have subpar results

REDUCTION LOD 1

122 Objects Sel

Polys: 36,978

Tris: 67,947

Edges: 76,647

Verts: 39,999

FPS: 48.710

113 Objects Sel

Polys: 54,907

Tris: 61,896

Edges: 91,572

Verts: 37,936

FPS: 70.712

Settings:

Ratio: **0.23**

Max Deviation: **1.5**

Stop condition: all

Heuristics: **consistent**

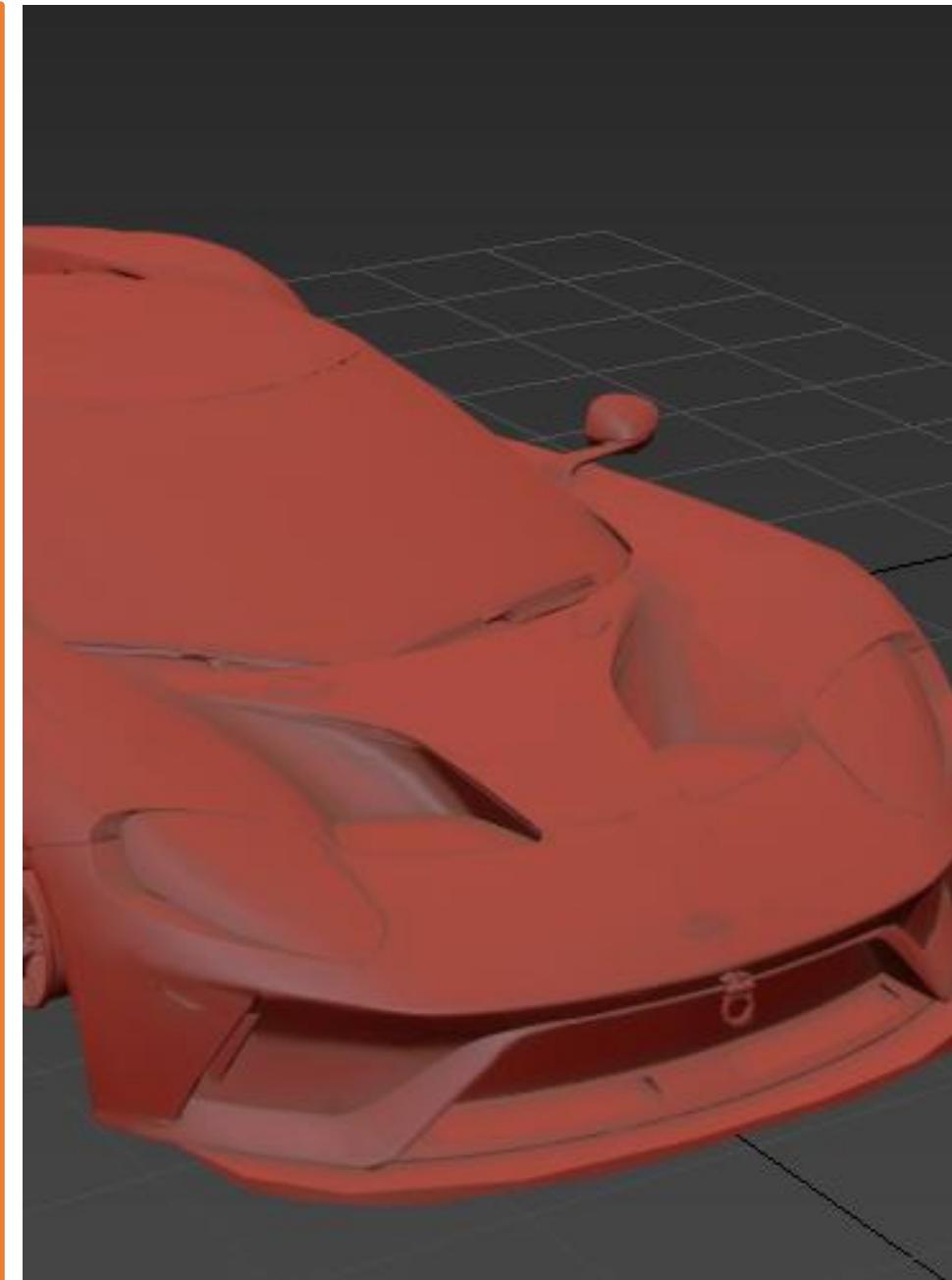
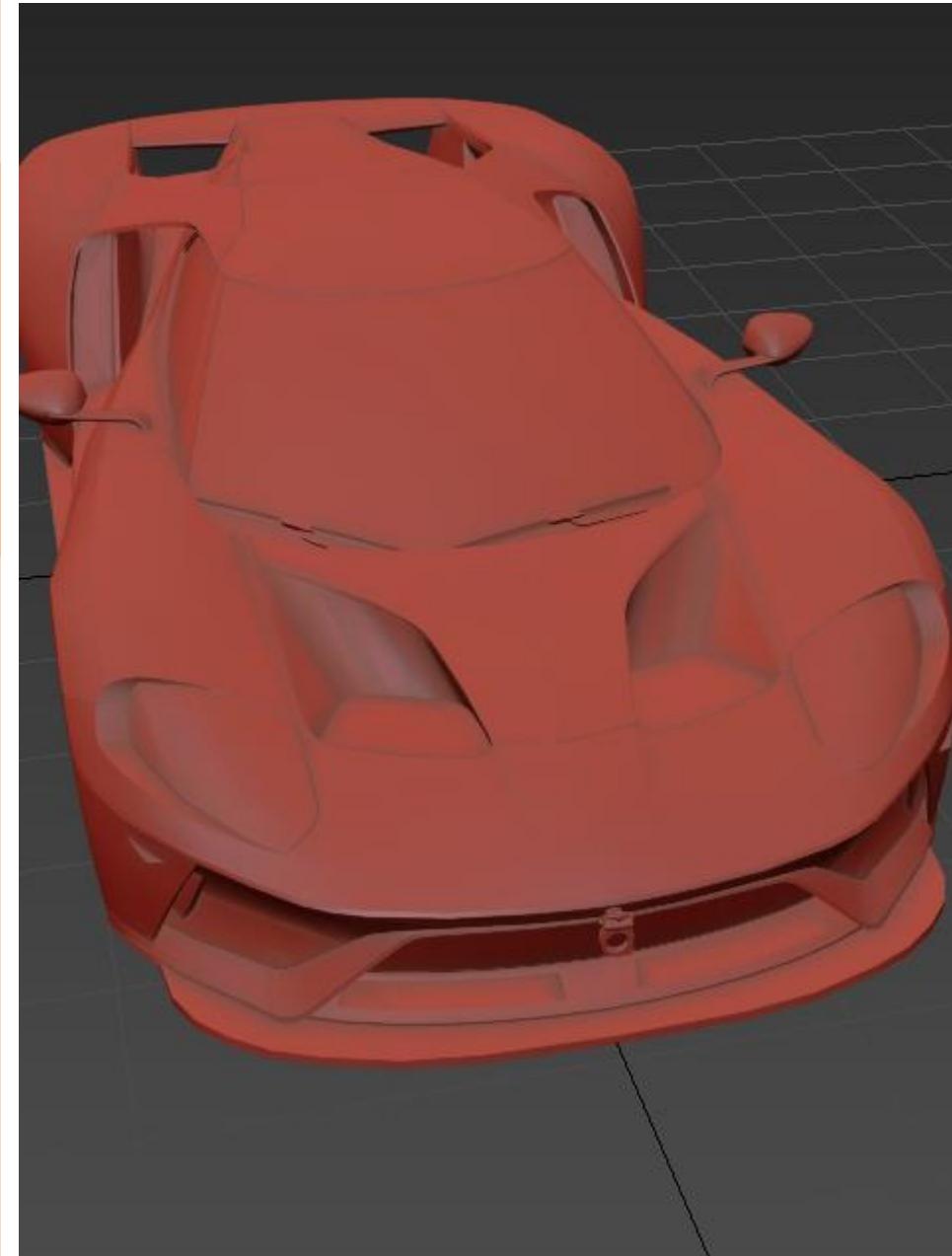
Geo Importance: **9**

Shading Importance: **9**

Symmetry: **on**

Symmetry axis: **z**

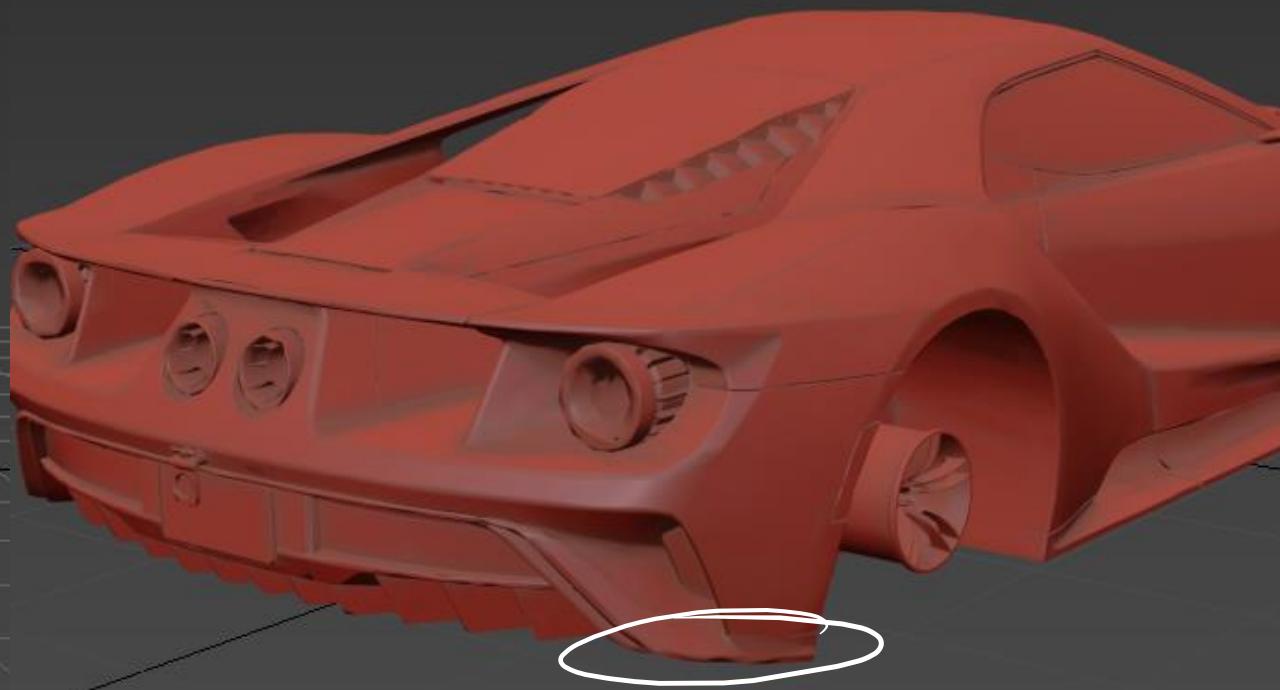
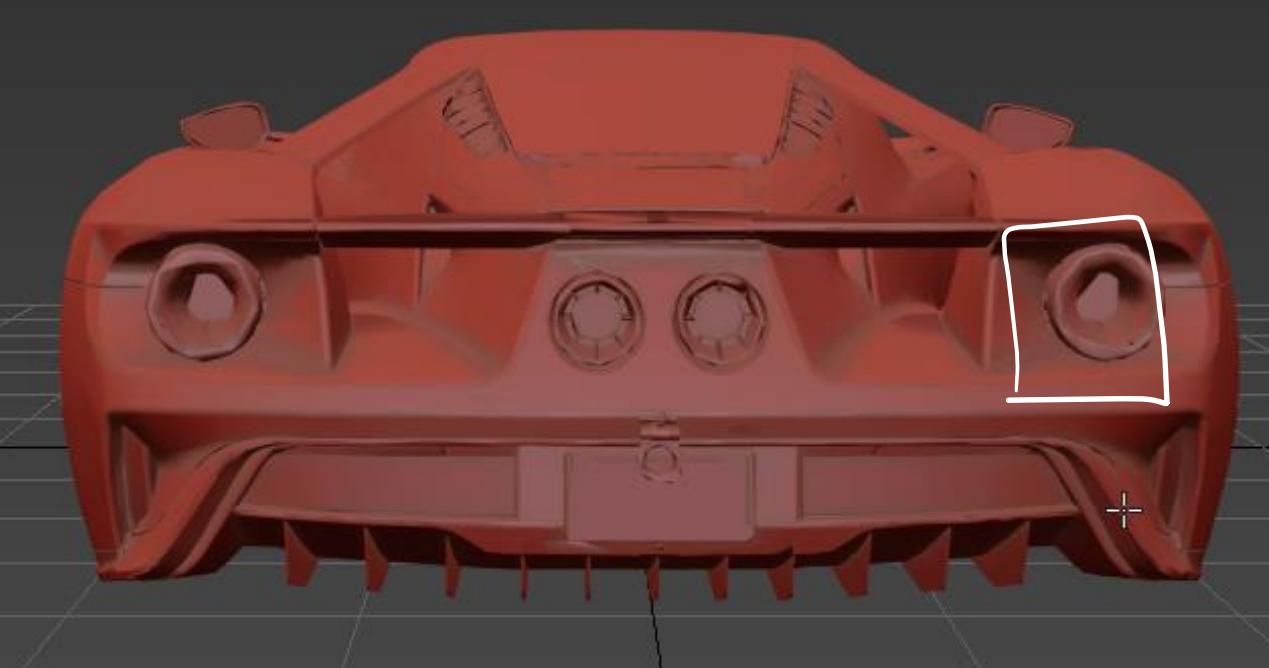
Hard Edge Angle: **0**



HAND RENDERED



REDUCTION LOD1



REDUCTION LOD 2

116 Objects Se

Polys: 18,377

Tris: 32,735

Edges: 38,055

Verts: 19,946

FPS: 53.294

104 Objects Se

Polys: 26,598

Tris: 29,454

Edges: 45,895

Verts: 20,660

FPS: 93.593

Cascade Reduc Settings:

Ratio: **0.50**

Max Deviation: **3**

Stop condition: **all**

Heuristics: **consistent**

Geo Importance: **9**

Shading Importance: **9**

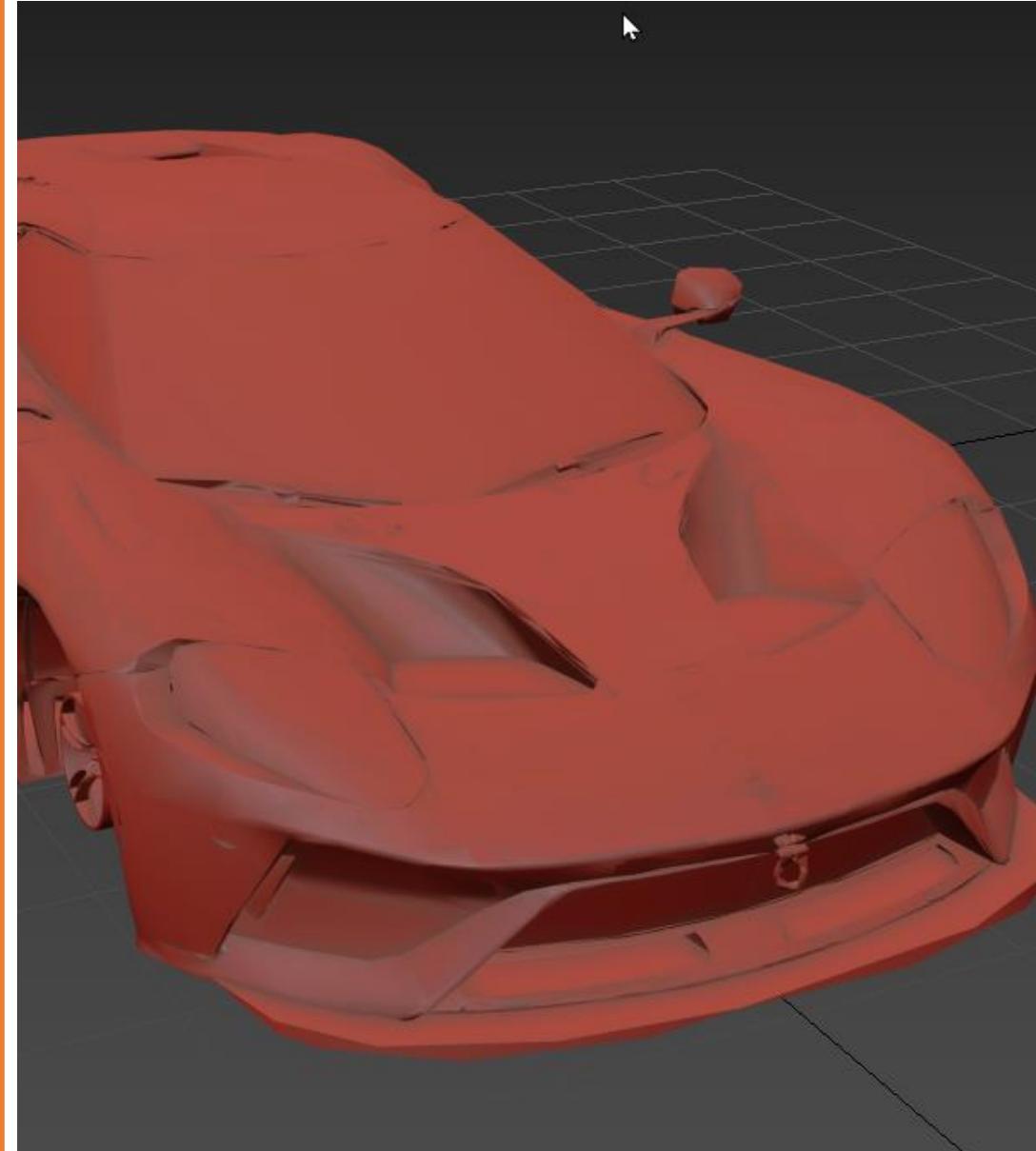
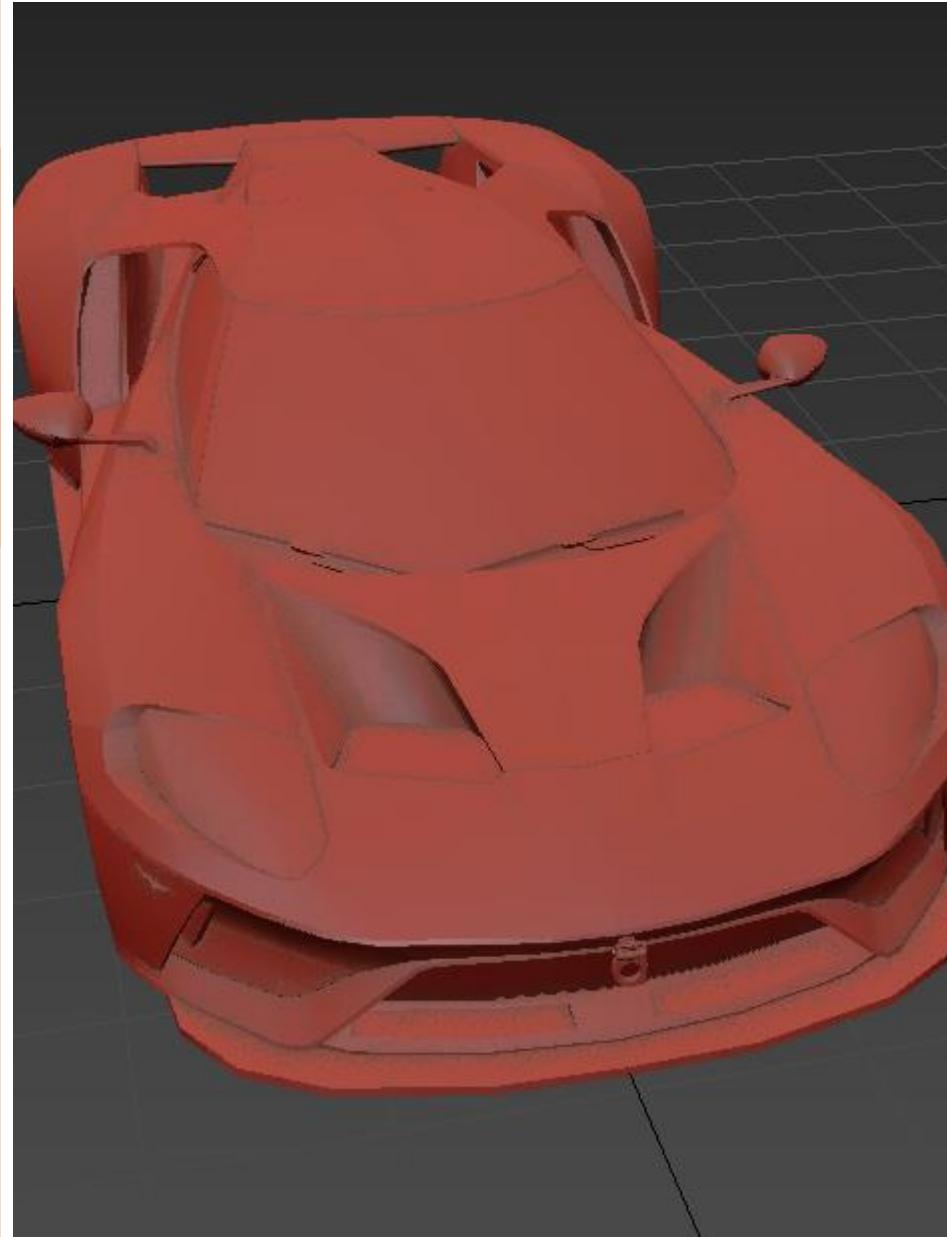
Symmetry: **on**

Symmetry axis: **z**

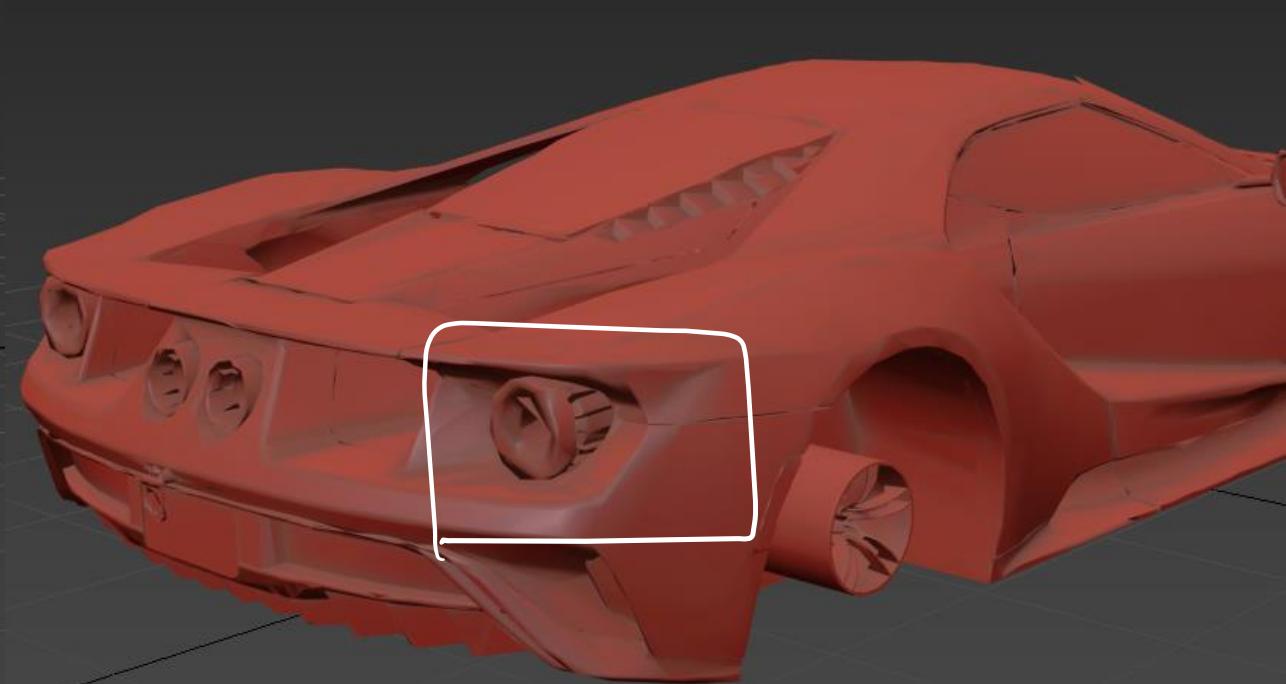
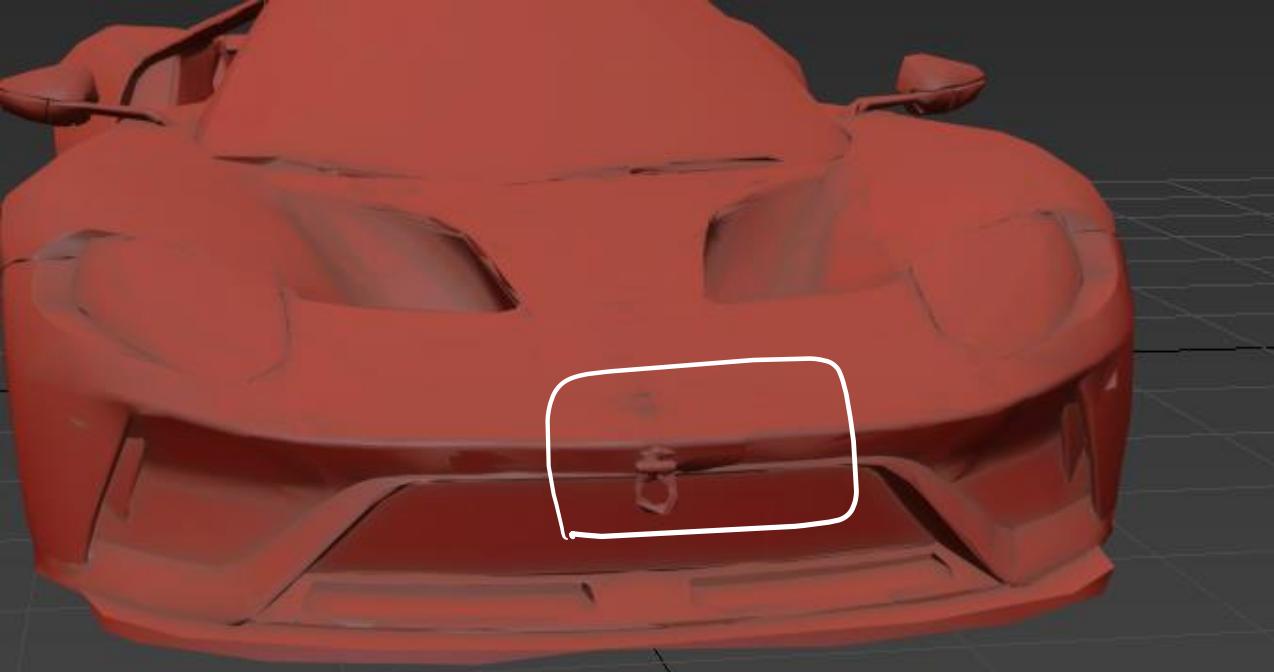
Tjunc Dixt: **0.10**

Weld Dist : **0.10**

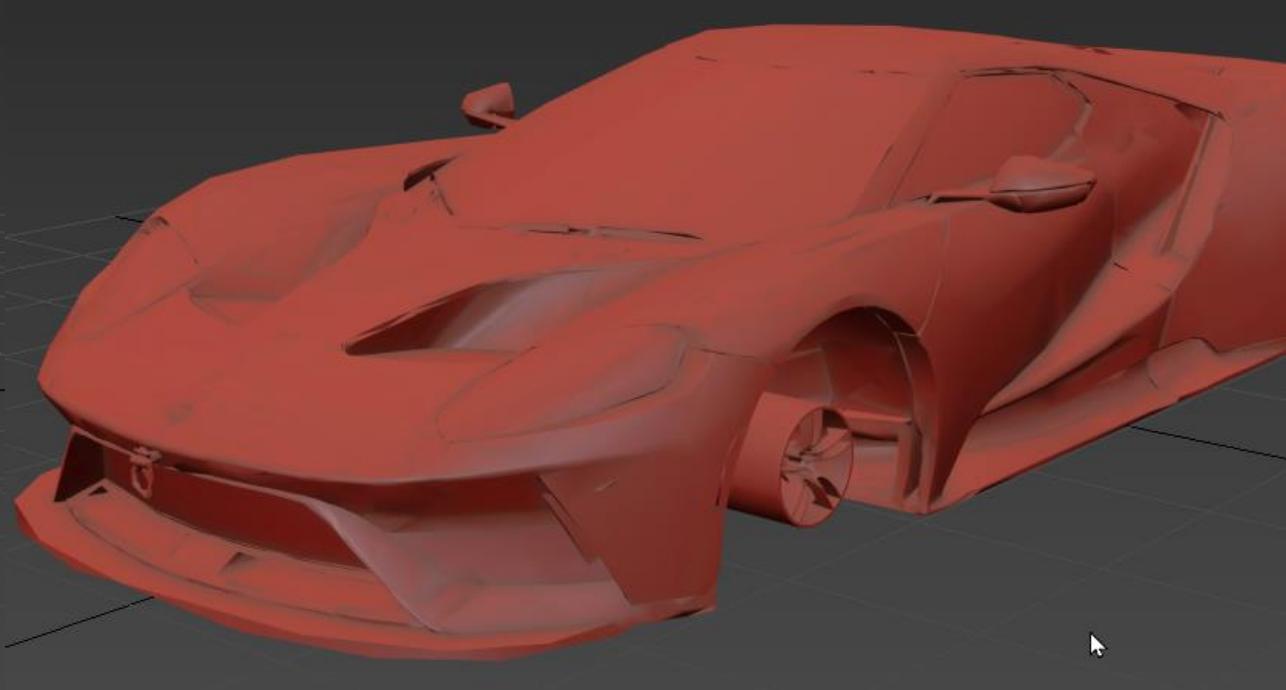
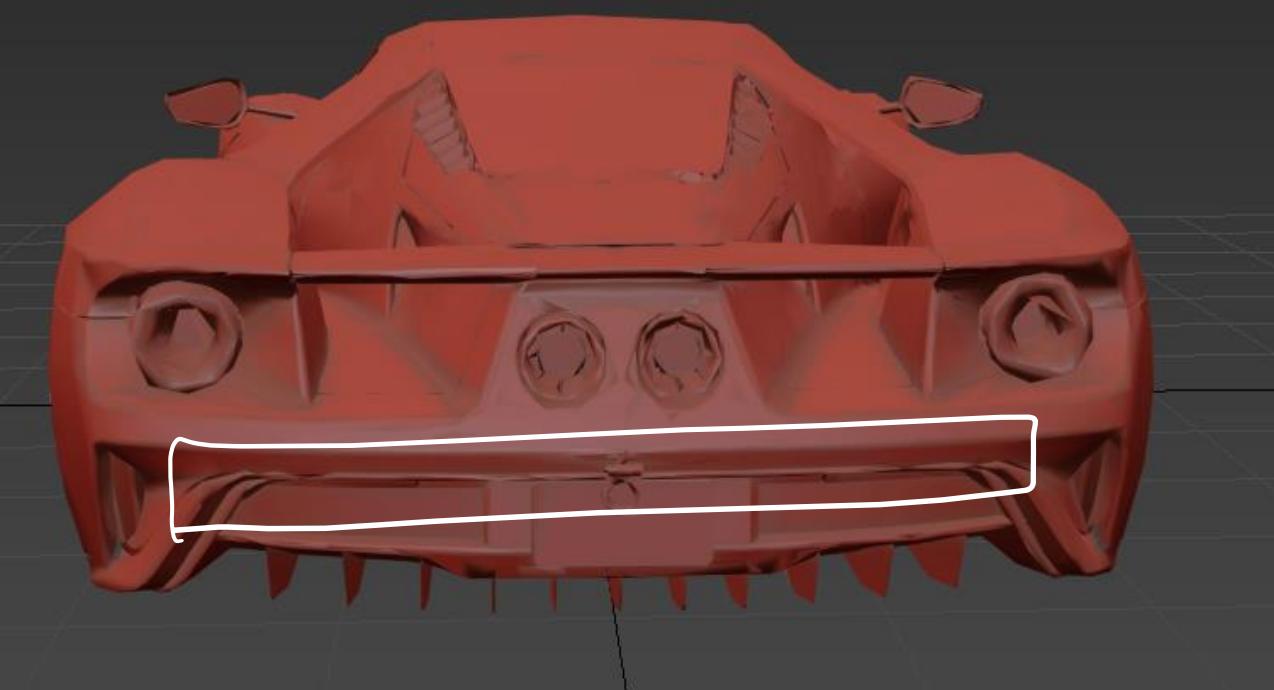
Hard Edge Angle: **0**



HAND RENDERED



REDUCTION LOD2



REDUCTION LOD 3

107 Objects Sel
Polys: 11,628
Tris: 20,383
Edges: 24,335
Verts: 12,902

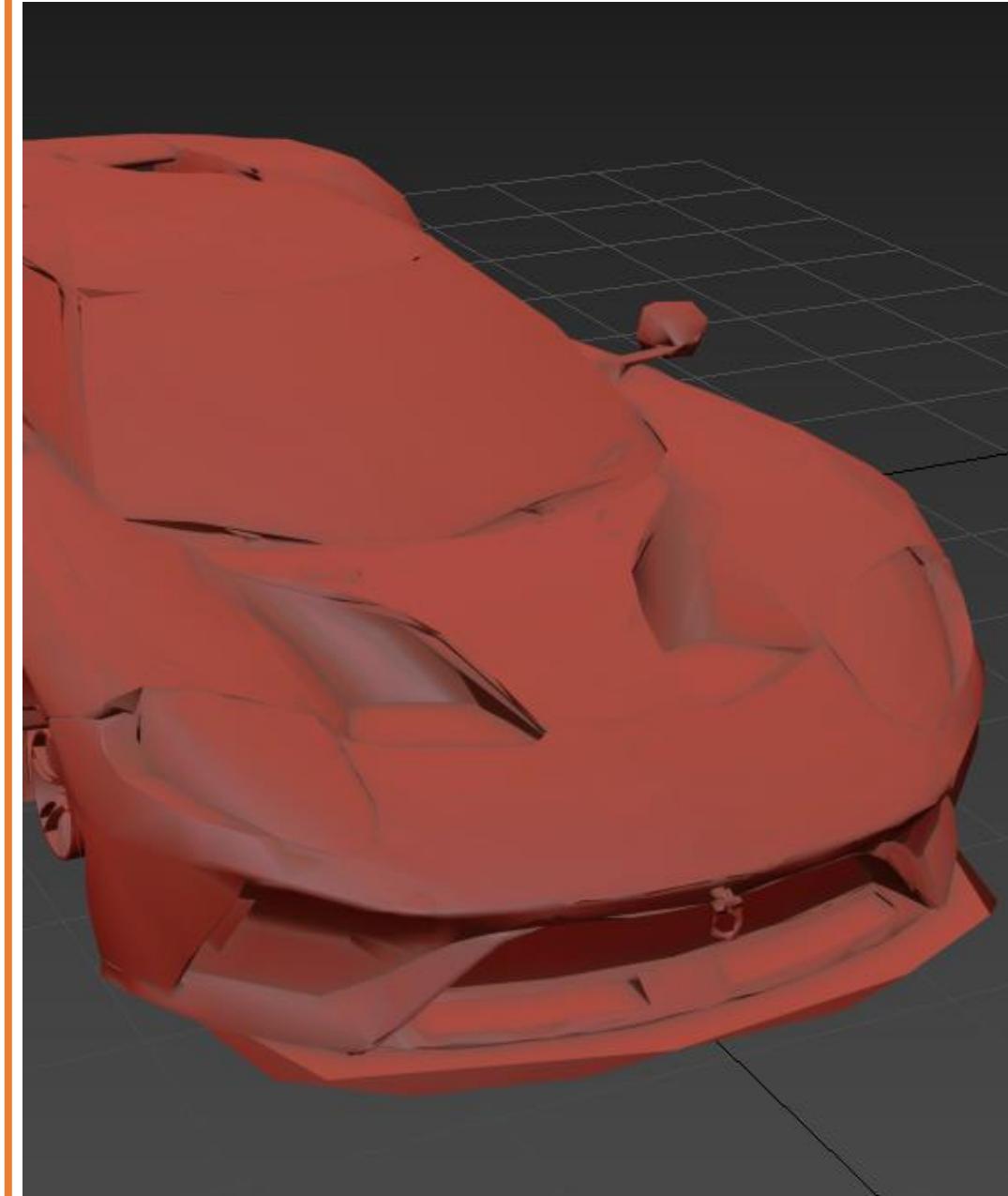
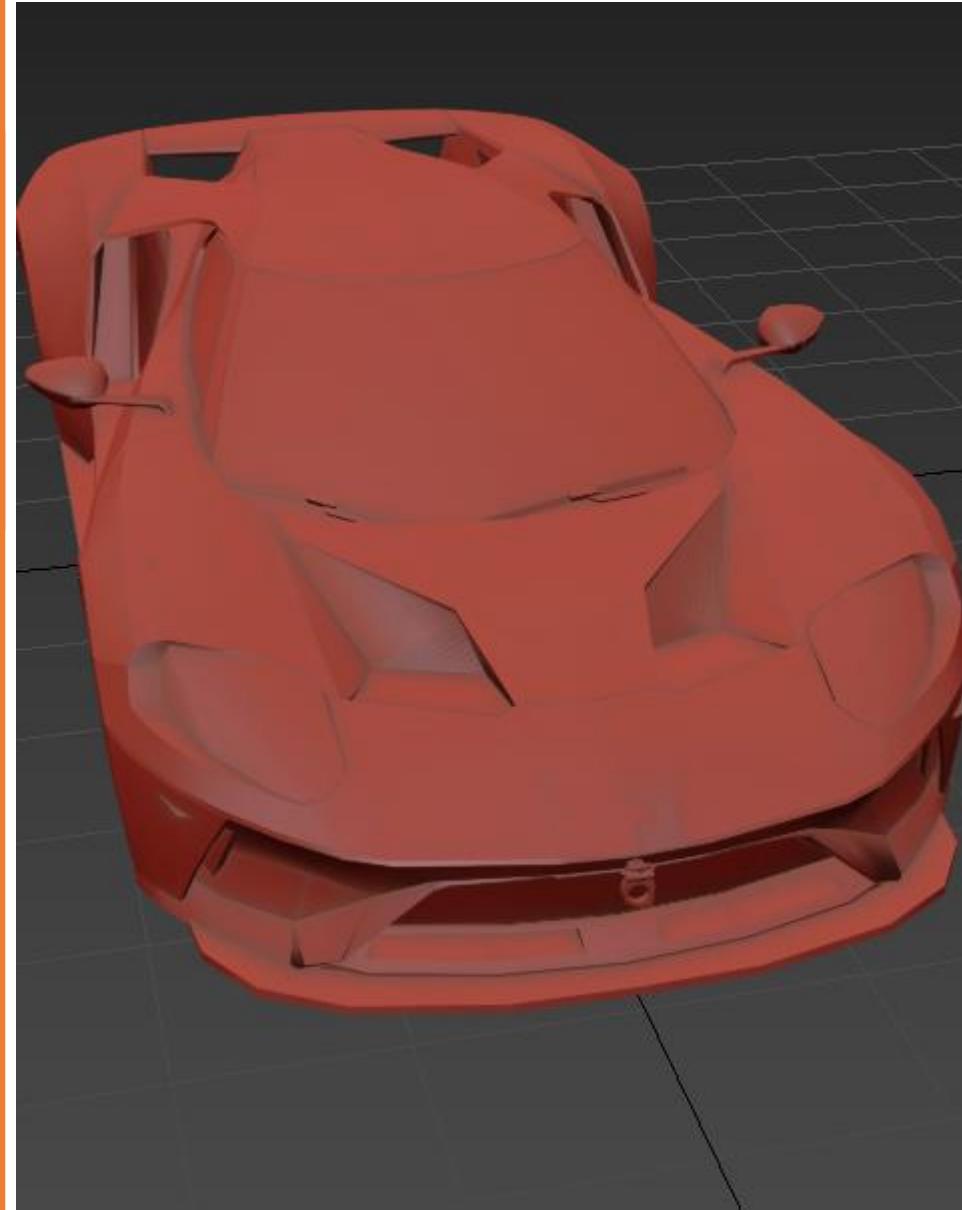
FPS: 67.601

104 Objects Sel
Polys: 15,451
Tris: 16,925
Edges: 27,665
Verts: 13,617

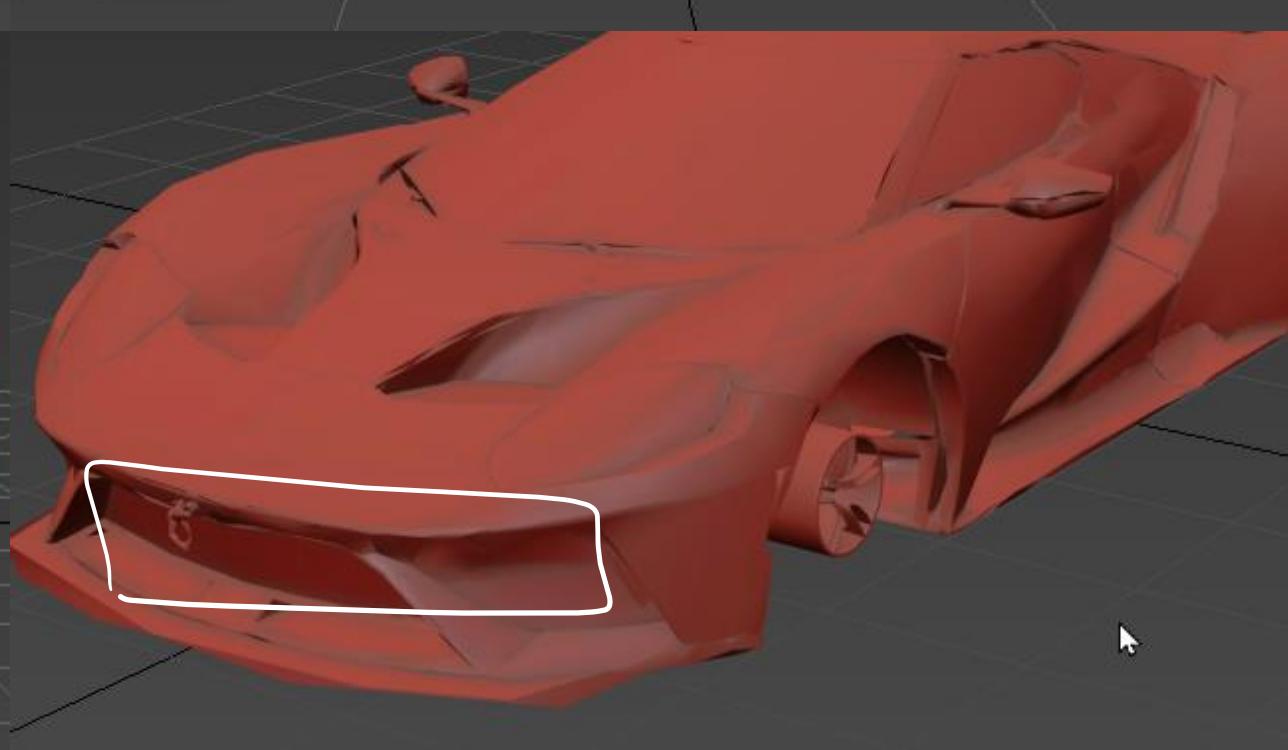
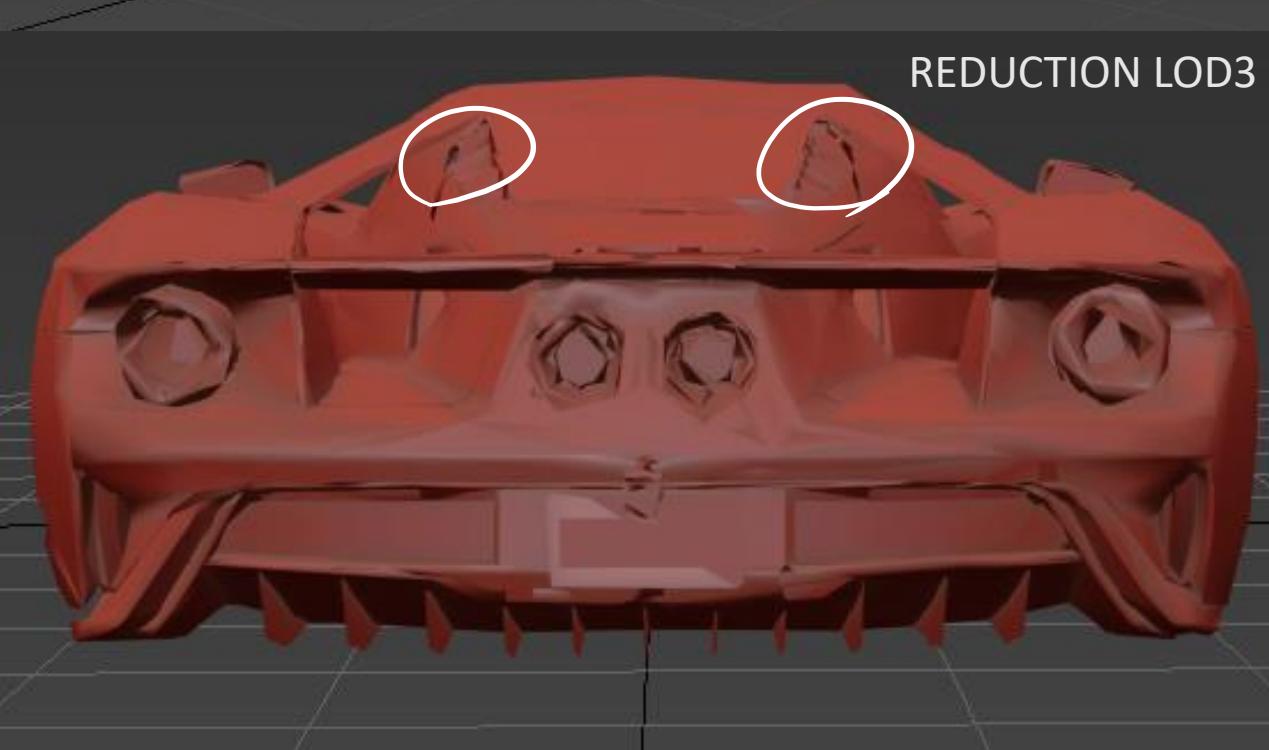
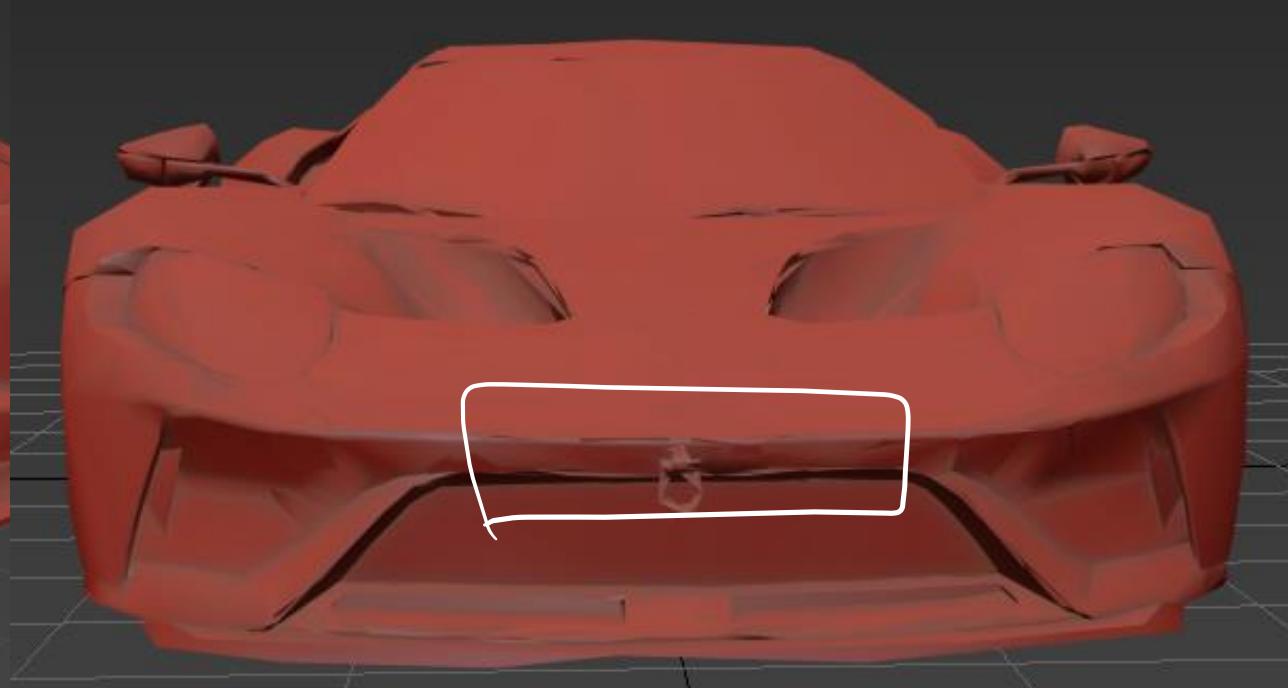
FPS: 83.779

Cascade Reduc Settings:

Ratio: 0.60
Max Deviation: 4
Stop condition: all
Heuristics: consistent
Geo Importance: 9
Shading Importance: 9
Symmetry: on
Symmetry axis: z
Tjunc Dixt: 0.25
Weld Dist : 0.25
Hard Edge Angle: 15



HAND RENDERED



REDUCTION LOD 4

85 Objects Sel

Polys: 5,103

Tris: 9,075

Edges: 11,203

Verts: 6,321

FPS: 24.796

74 Objects Sel

Polys: 8,717

Tris: 8,820

Edges: 15,793

Verts: 8,255

FPS: 108.576

Cascade Reduc Settings:

Ratio: **0.70**

Max Deviation: **5.2**

Stop condition: **all**

Heuristics: **consistent**

Geo Importance: **9**

Shading Importance: **9**

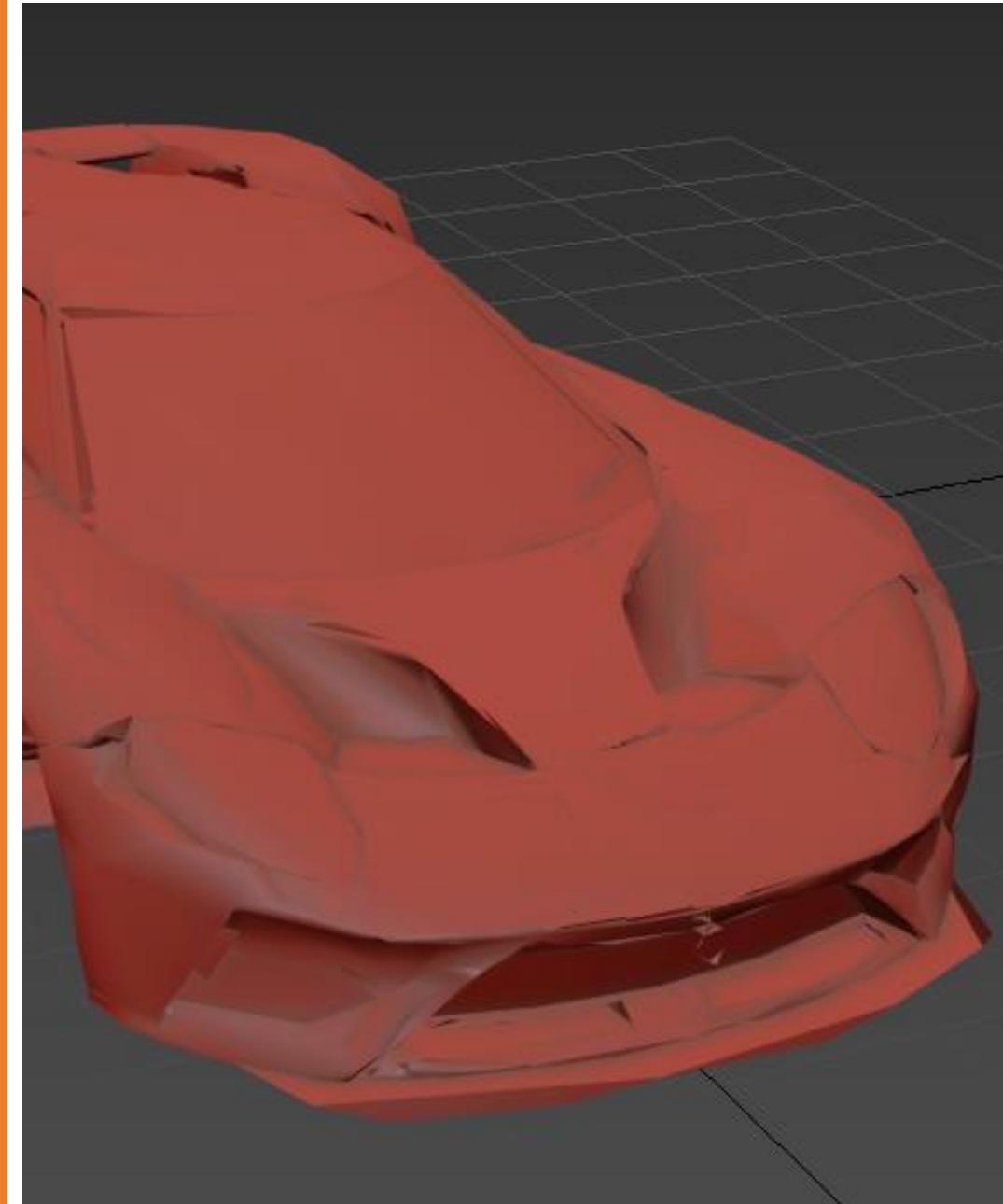
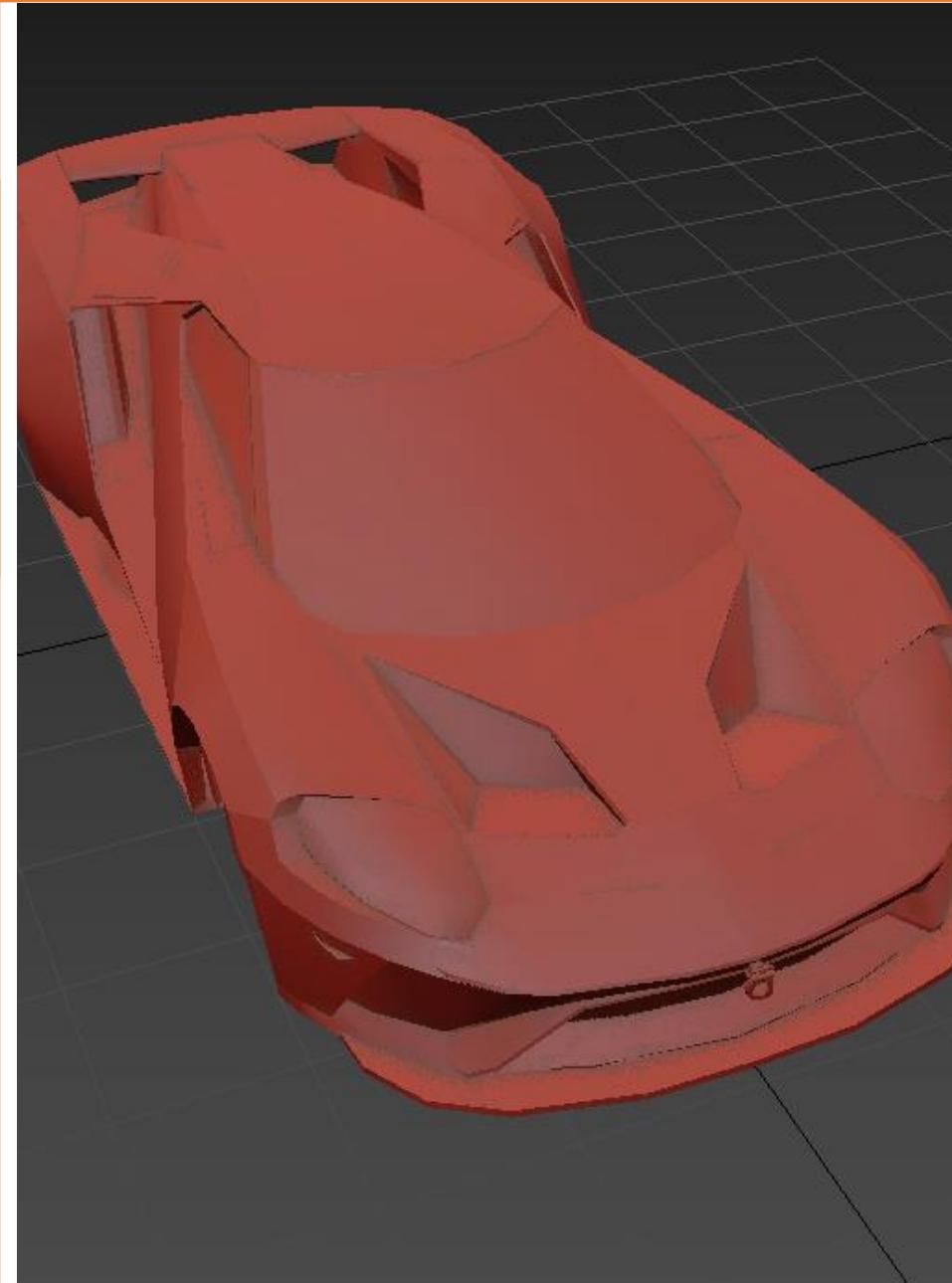
Symmetry: **on**

Symmetry axis: **z**

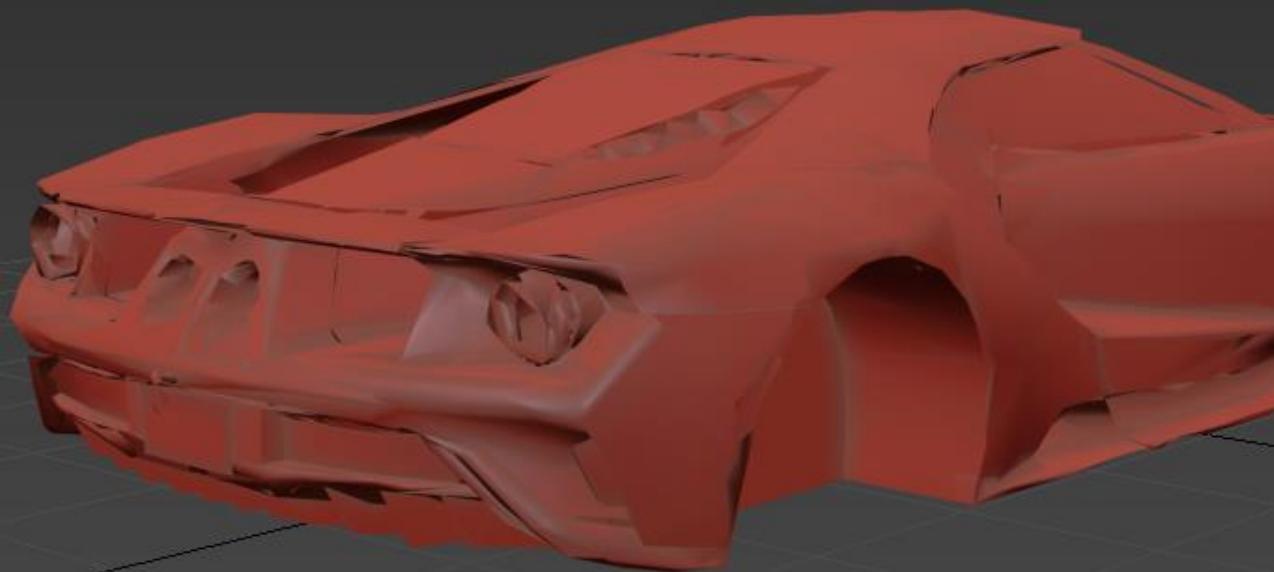
Tjunc Dixt: **0.4**

Weld Dist : **0.4**

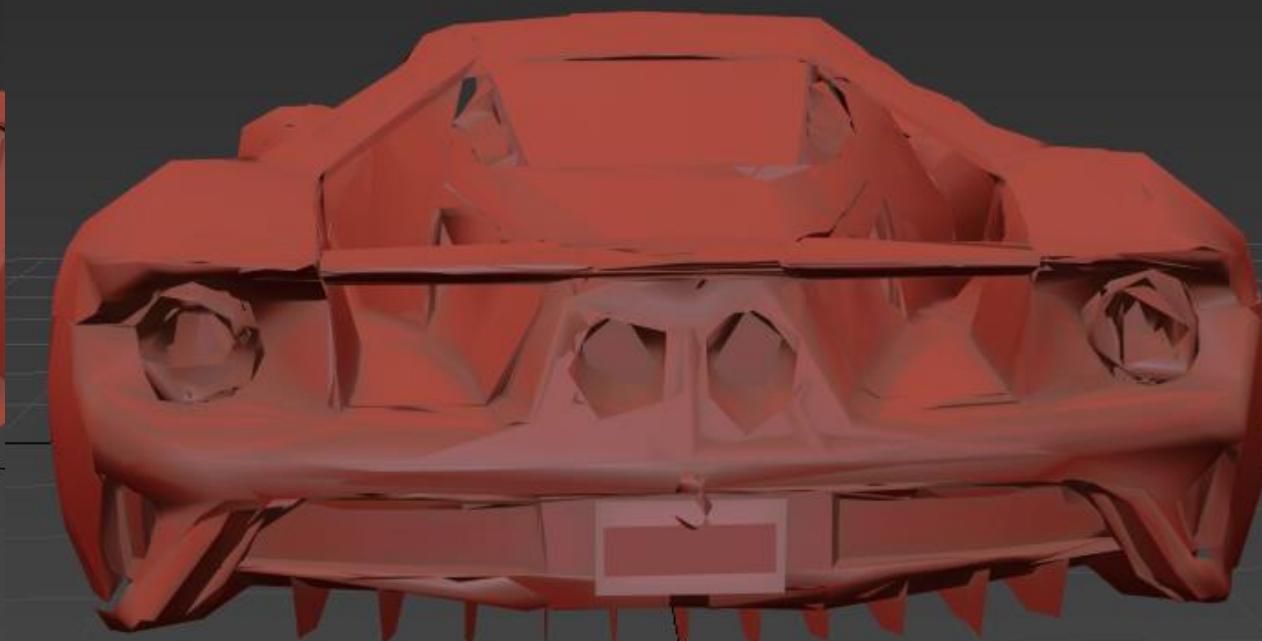
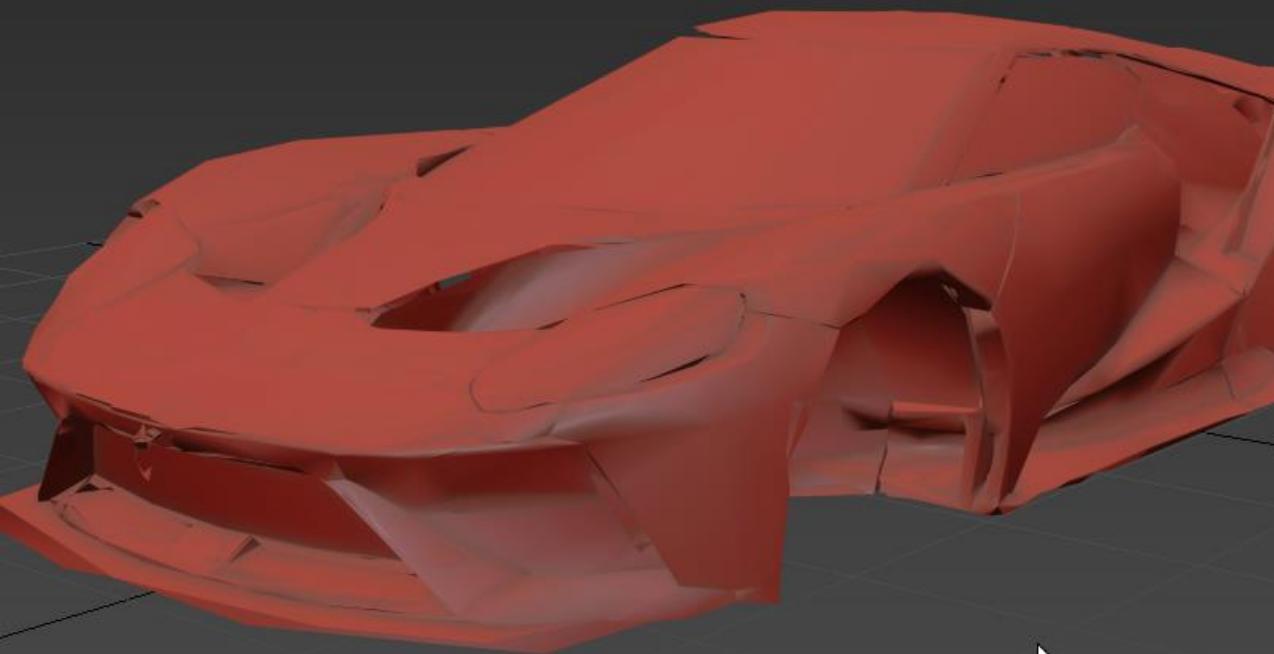
Hard Edge Angle: **25**



HAND RENDERED



REDUCTION LOD4



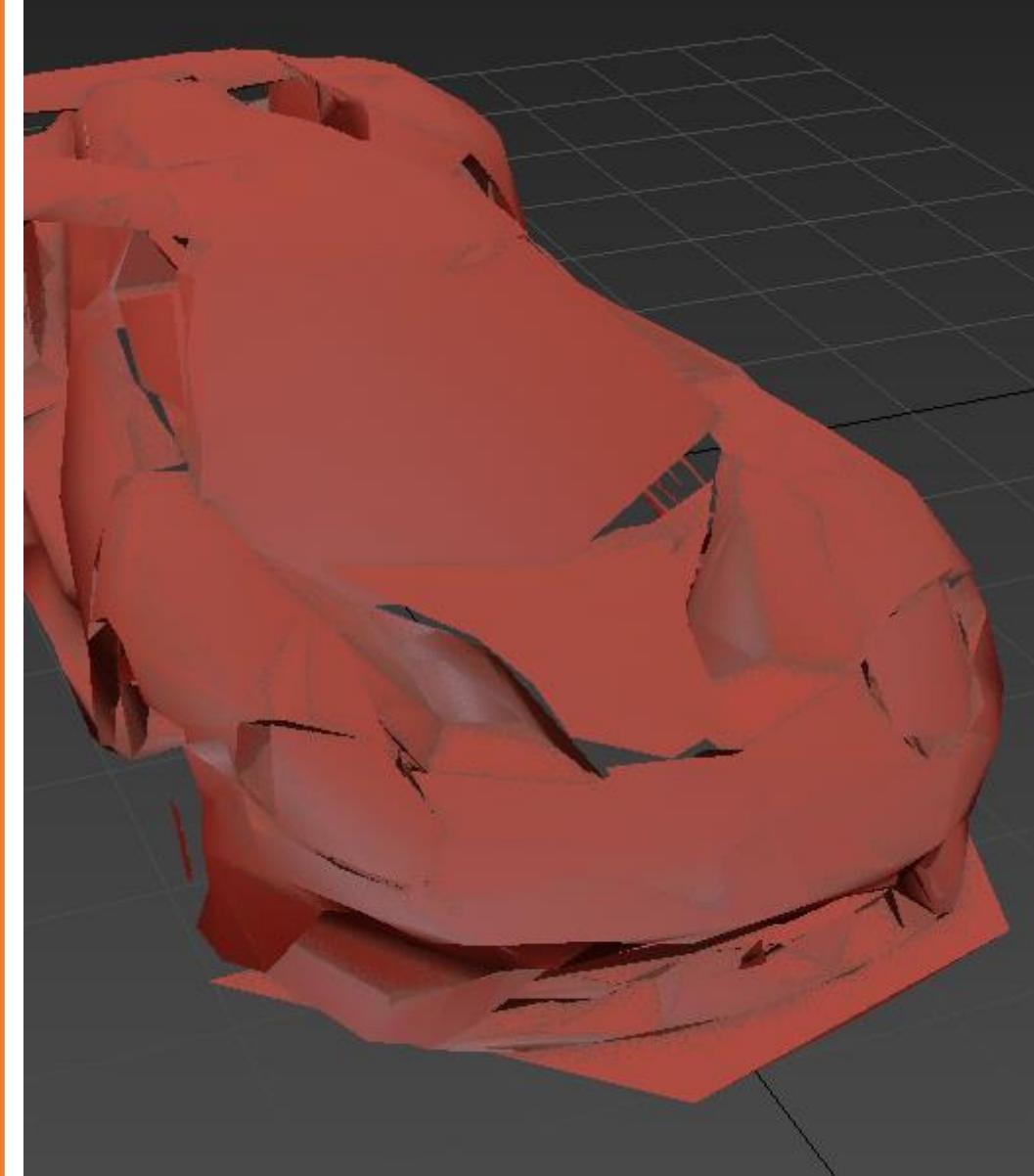
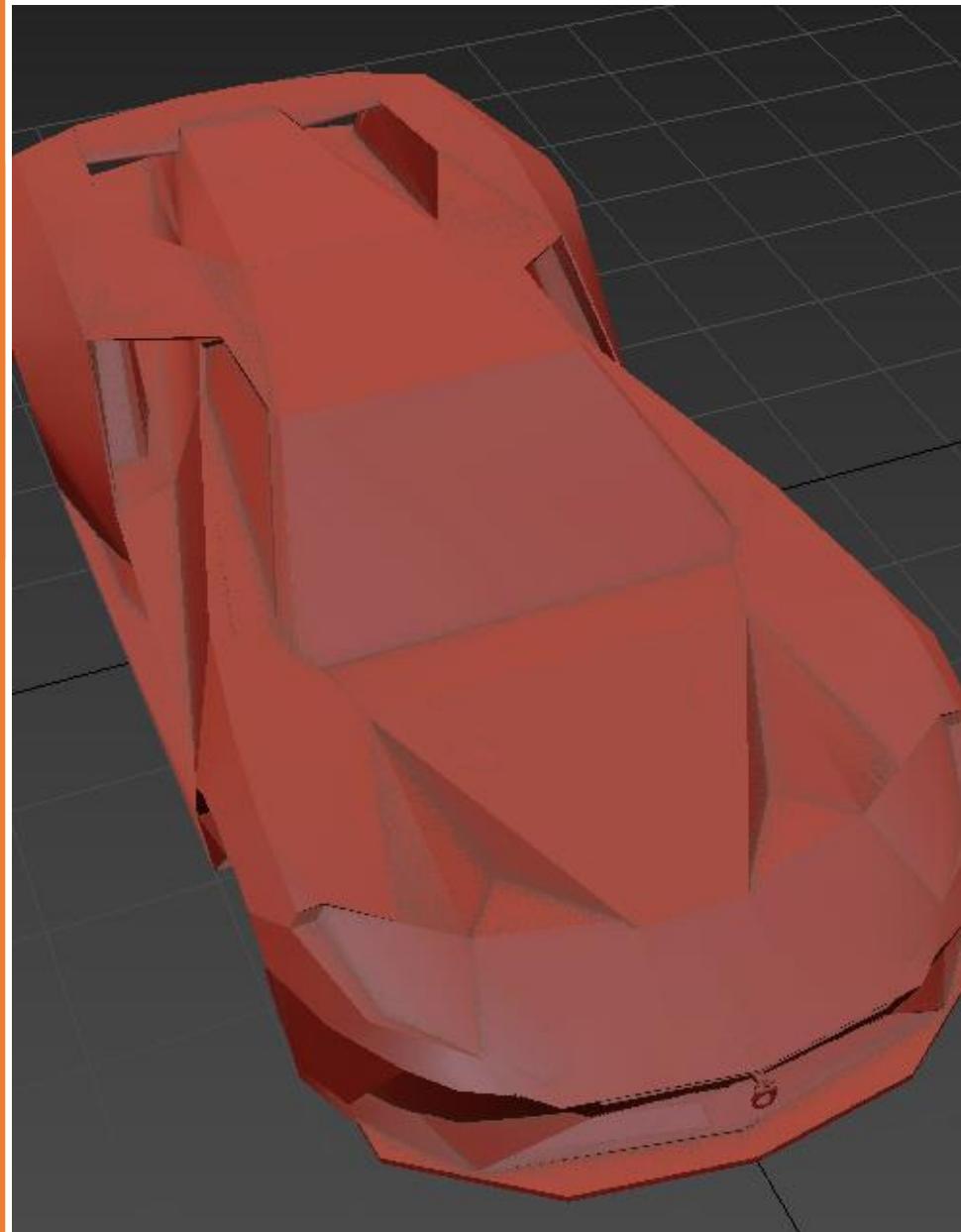
REDUCTION LOD 5

75 Objects Selected
Polys: 2,240
Tris: 3,796
Edges: 5,029
Verts: 2,945
FPS: 29.948

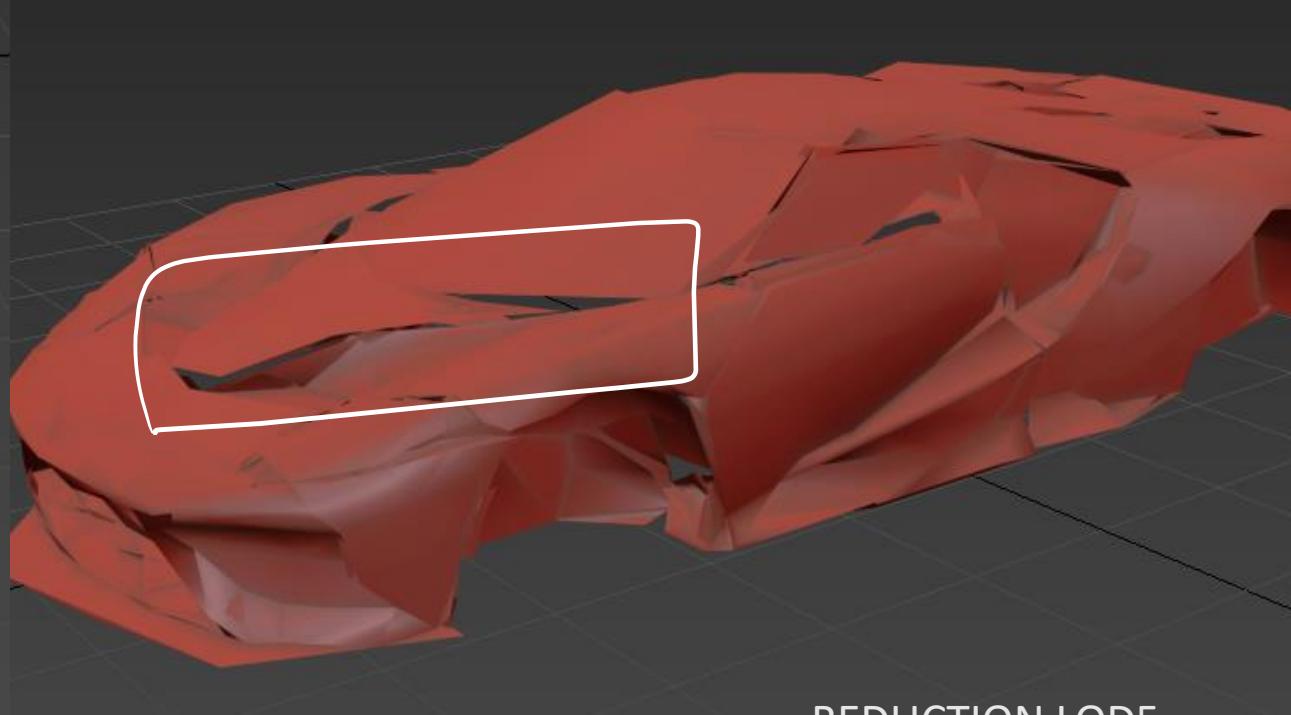
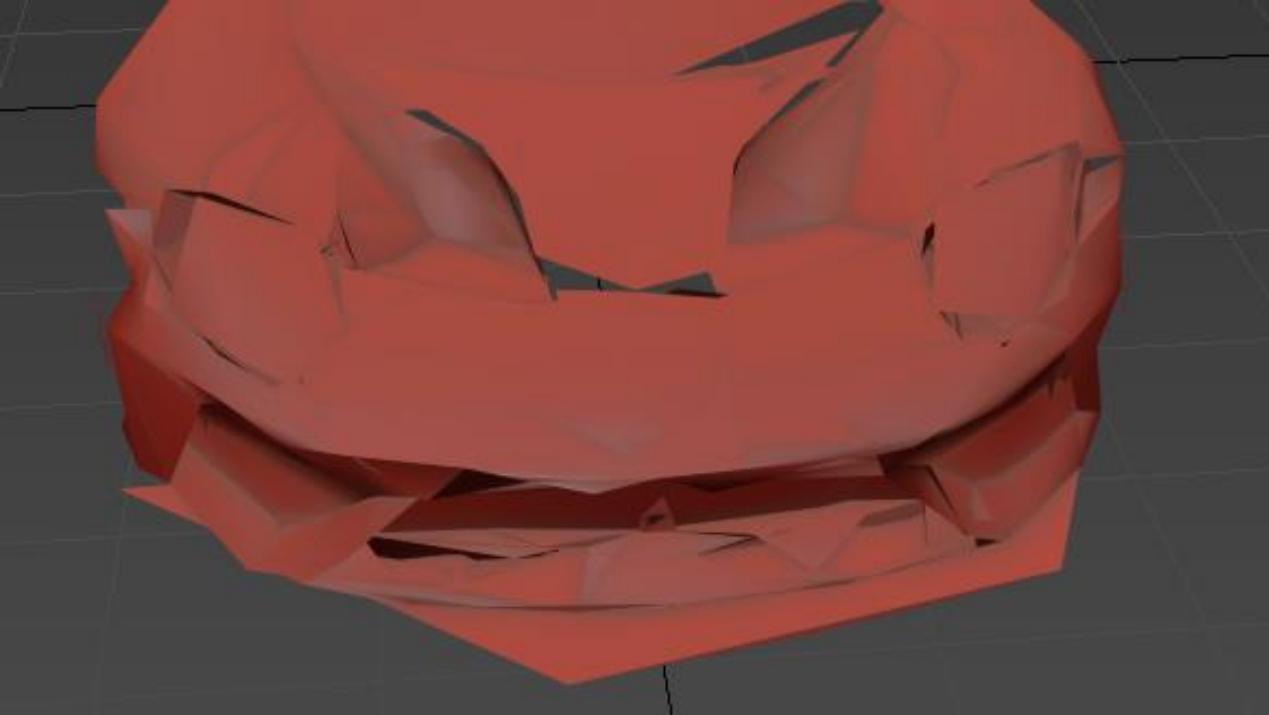
72 Objects Selected
Polys: 3,433
Tris: 3,444
Edges: 6,345
Verts: 3,497
FPS: 106.547

Cascade Reduc Settings:

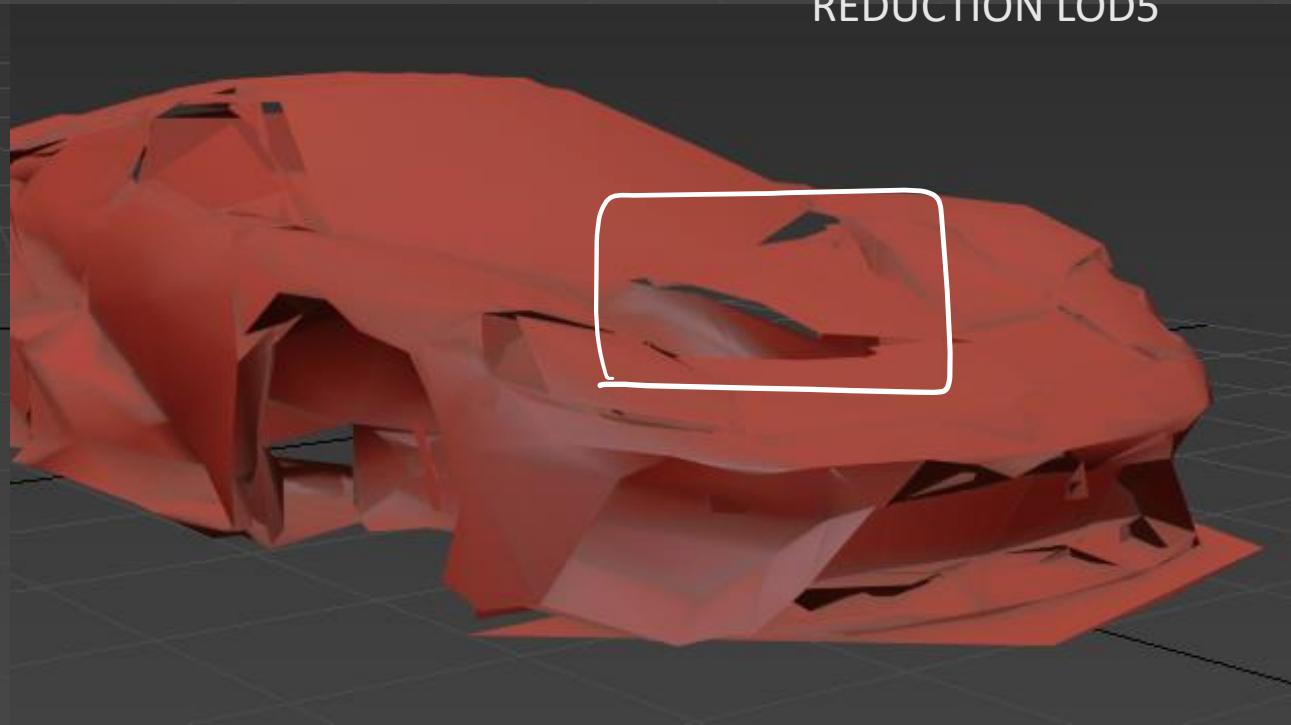
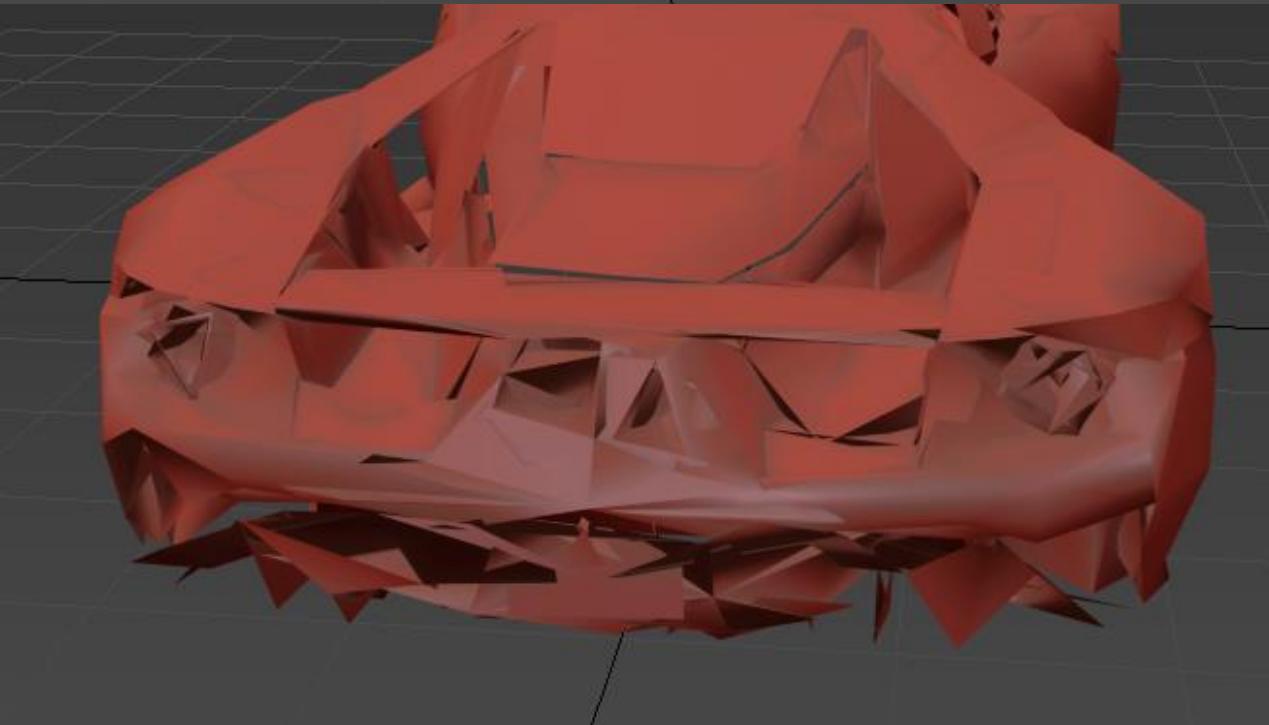
Ratio: 0.5
Max Deviation: 6.5
Stop condition: all
Heuristics: consistent
Geo Importance: 9
Shading Importance: 9
Symmetry: on
Symmetry axis: z
Tjunc Dixt: 1.3
Weld Dist : 1.3
Hard Edge Angle: 75



HAND RENDERED



REDUCTION LOD5



Possible next steps - Reduction version

- ✓ Reduction version can be used immediately.
- ✓ Slight shader malfunction for glass-other than that no issues
- ✓ LOD1 and 2 are usable
- ✓ Using as is won't disrupt the pipeline

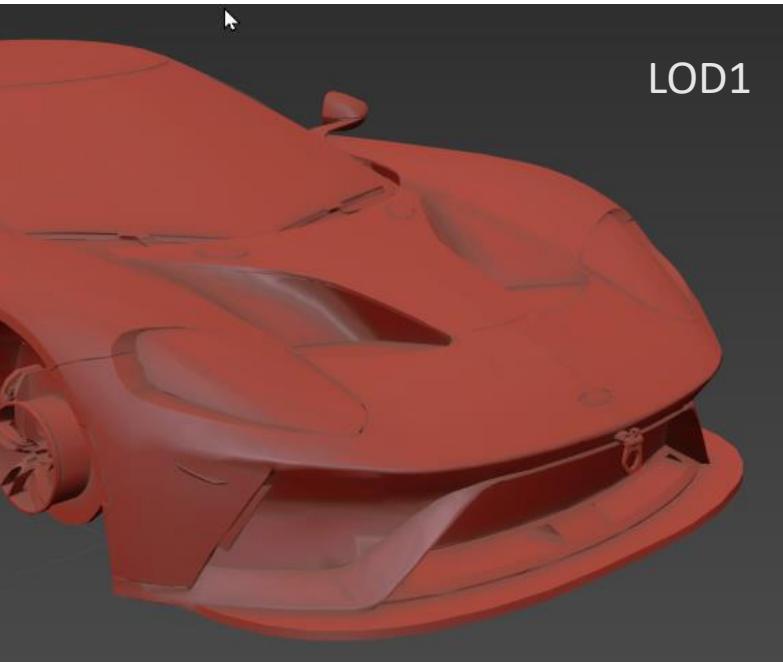
Cons:

- LOD 3, 4 and 5 fall apart when processed separately.
- Processed together – better result
- Needs to be integrated into the build process.

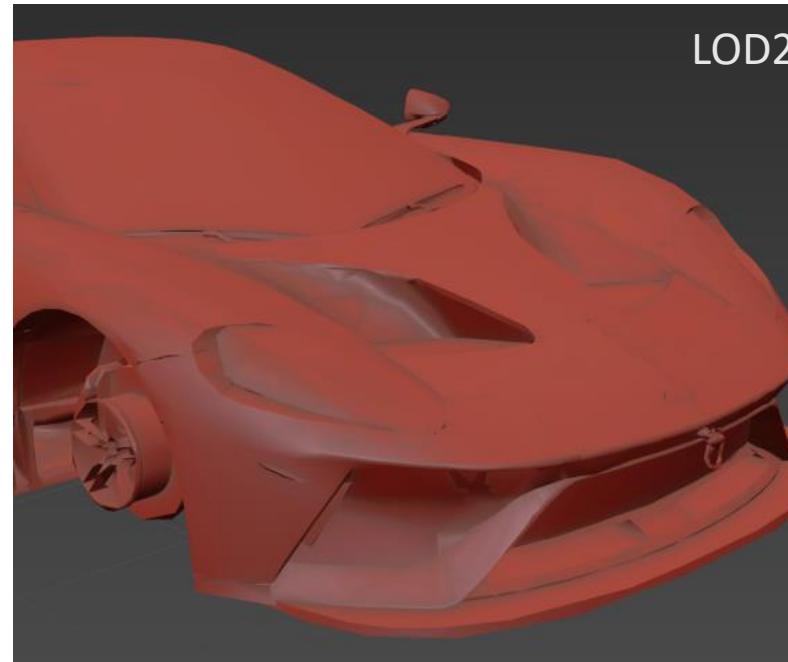
Problem areas: closer look

Whole car lod's better than parts put together

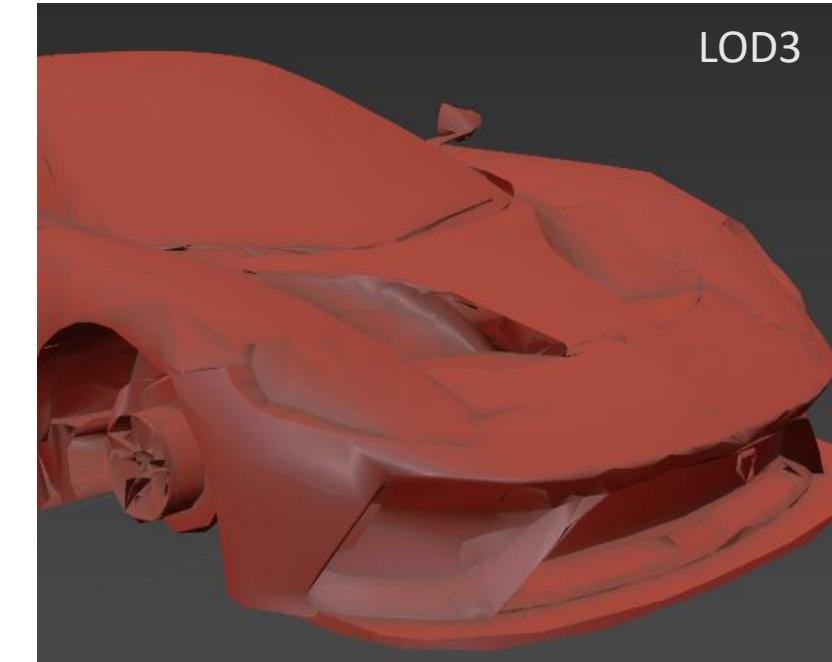
- same reduction settings
- LOD1 & LOD2 have very similar results
- LOD3 LOD4 LOD5 look better put together
- Sometimes can **have higher TRI count** because the whole car will be LODded as opposed to choosing the part that can have all lod's



LOD1

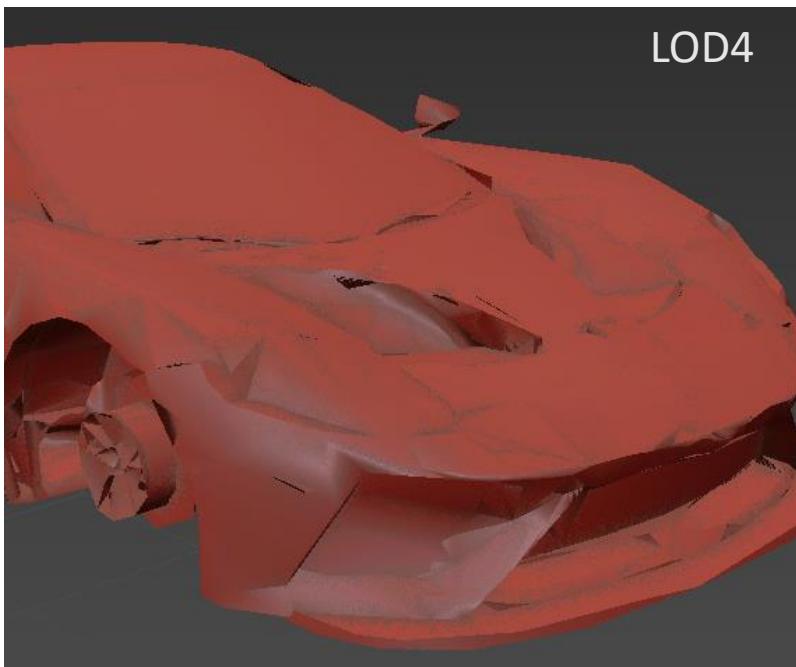


LOD2

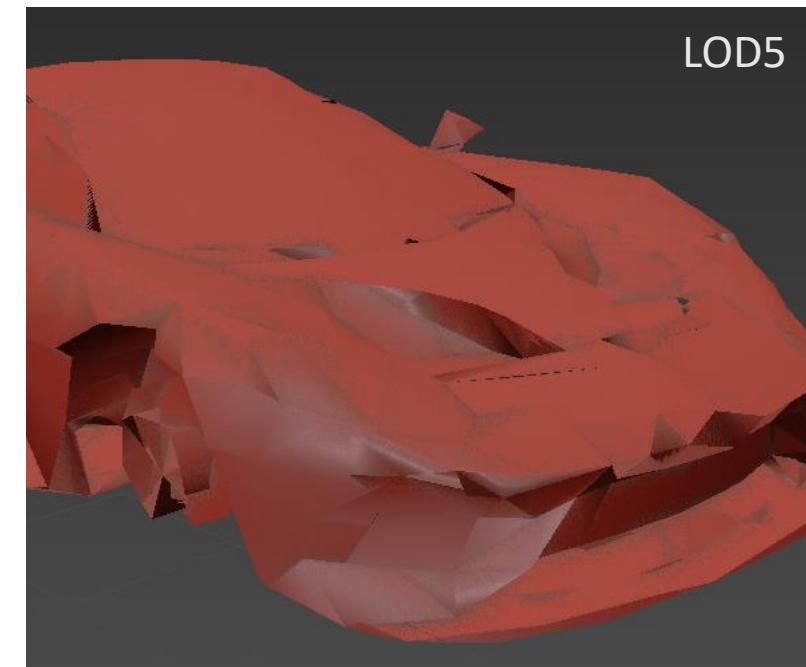


LOD3

LOD result
when the car
is assembled
before
processing



LOD4



LOD5

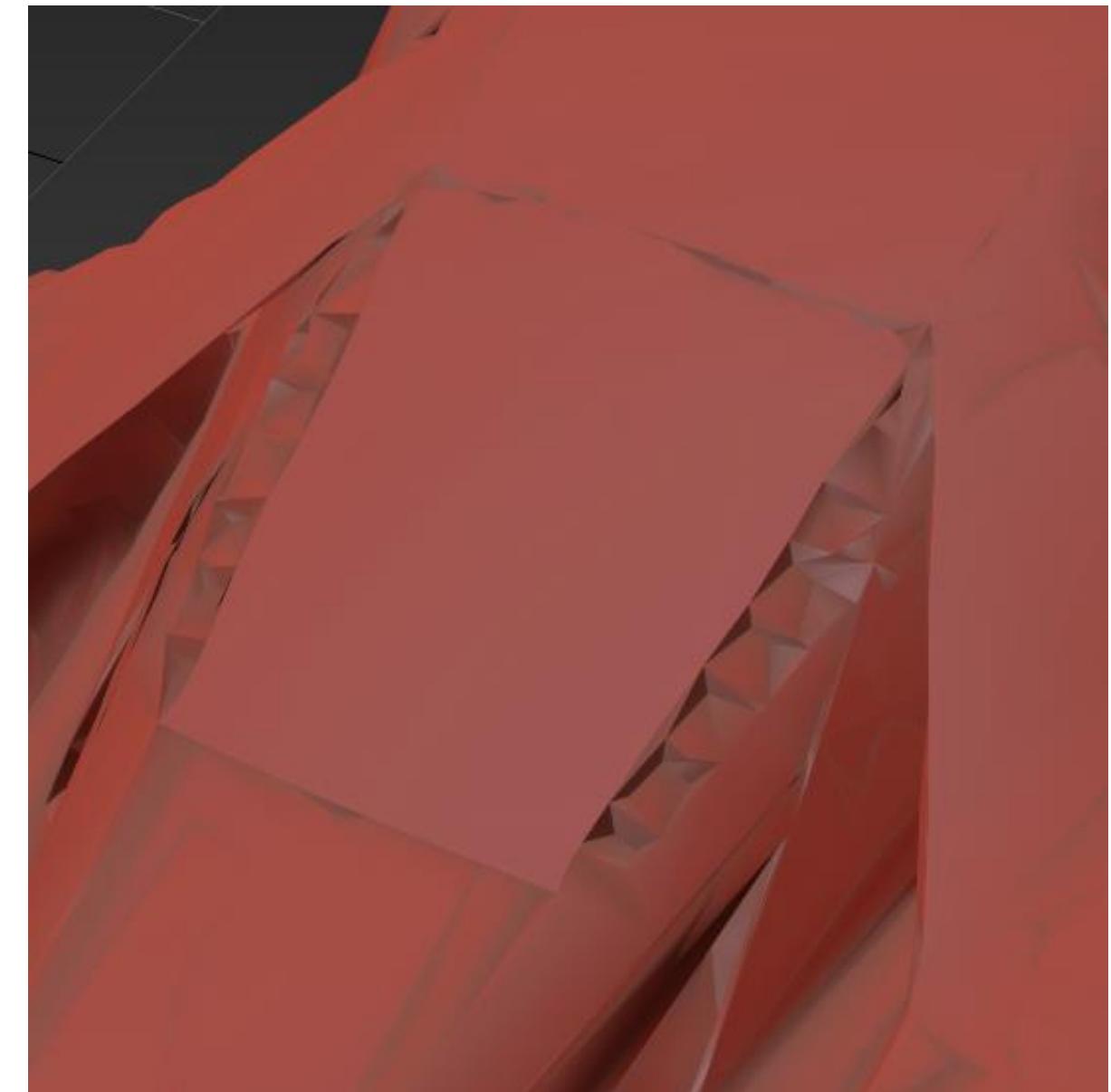
GENERAL recommendation:
Car may need to be
assembled before LODing.

This may bring other
problems top issue is
1. Complete disruption
of existing pipeline.

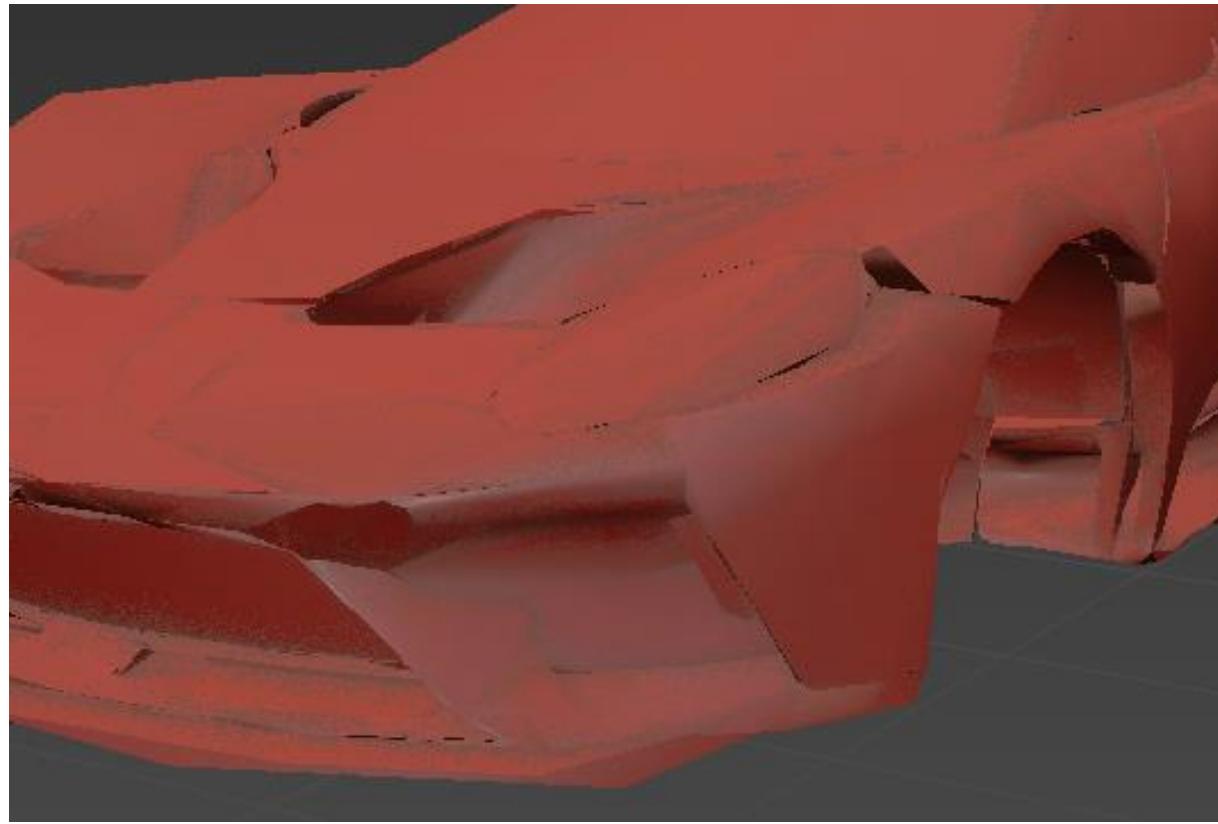
Car assembled **after reduction**

Car assembled **before reduction**

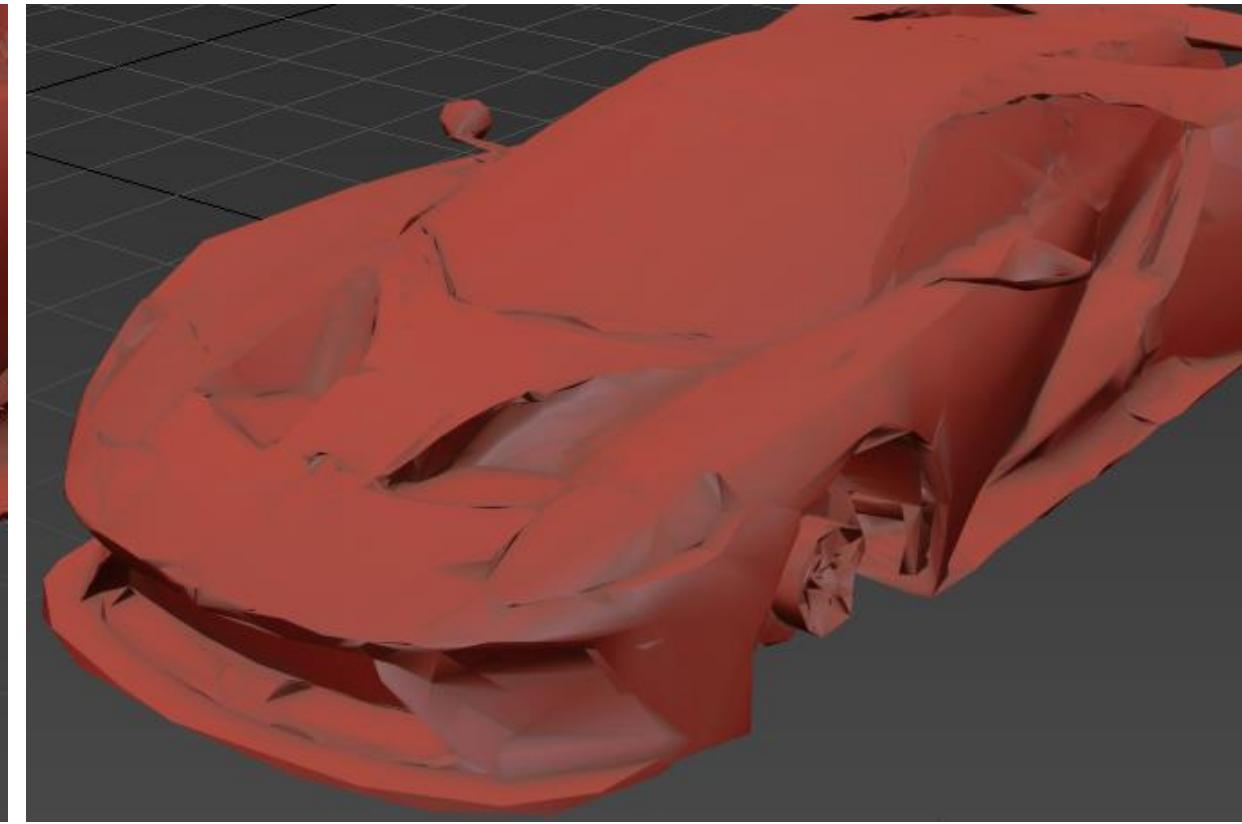
LOD3



Car assembled **after reduction**

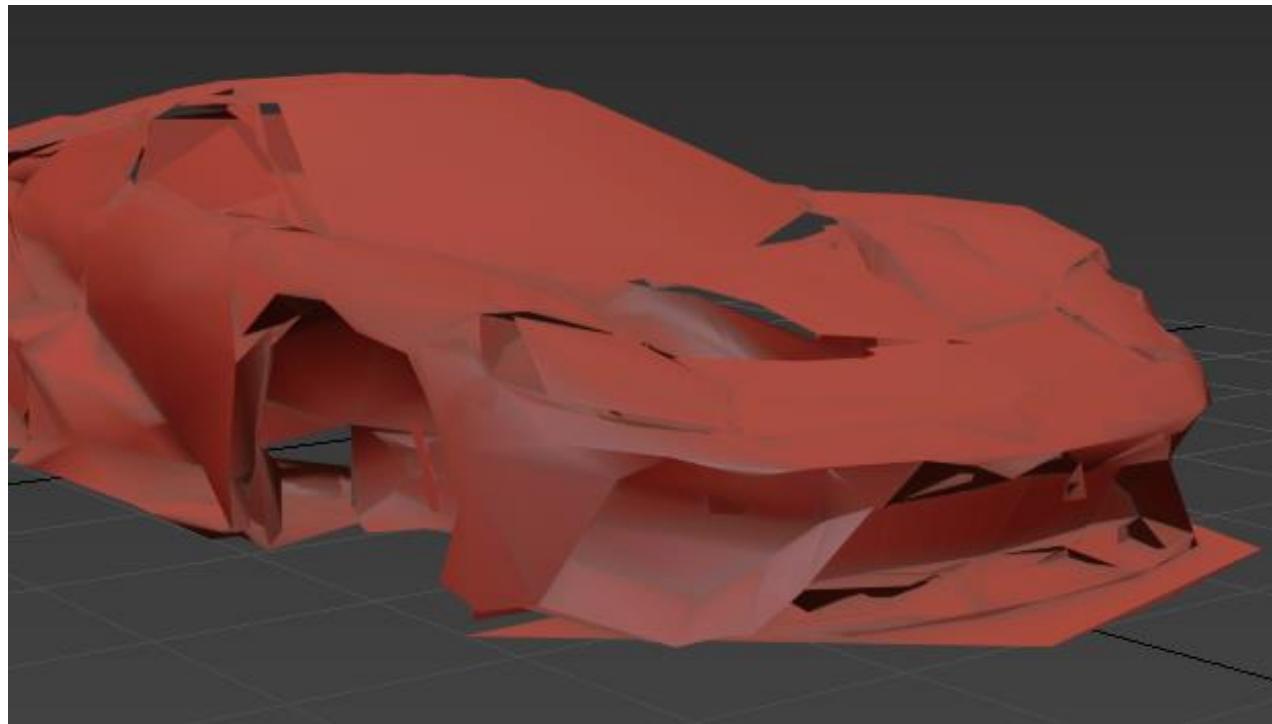


Car assembled **before reduction**

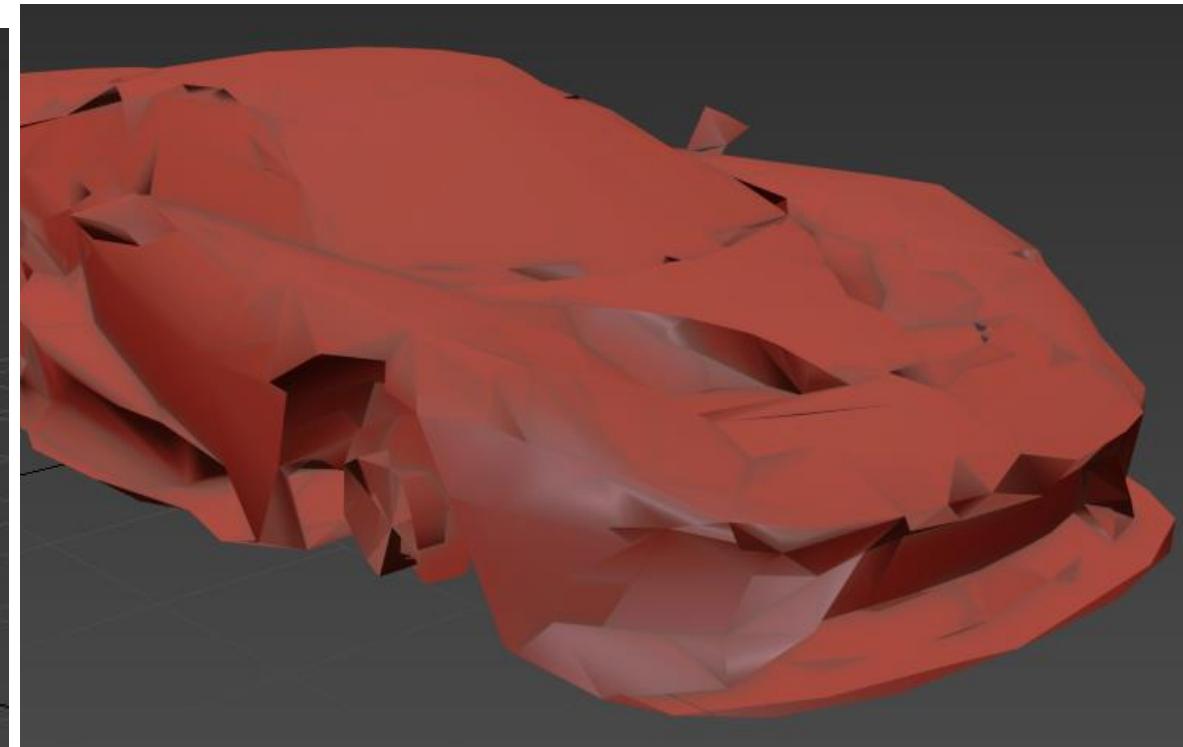


LOD4

Car assembled **after reduction**



Car assembled **before reduction**



LOD5

Remesh PROCESSOR

- Remesher
 - Processes the whole car
 - Doesn't maintain uv's
 - Doesn't have ratio or triangle count in the settings

✓ Better results overall

✓ Better Tri count

Solved the ratio problem by looking at the volume of the individual parts and changing the setting for each part.

REMESHER LOD 1

122 Objects Se

Polys: 36,978

Tris: 67,947

Edges: 76,647

Verts: 39,999

FPS: 48.710

114 Objects Sel

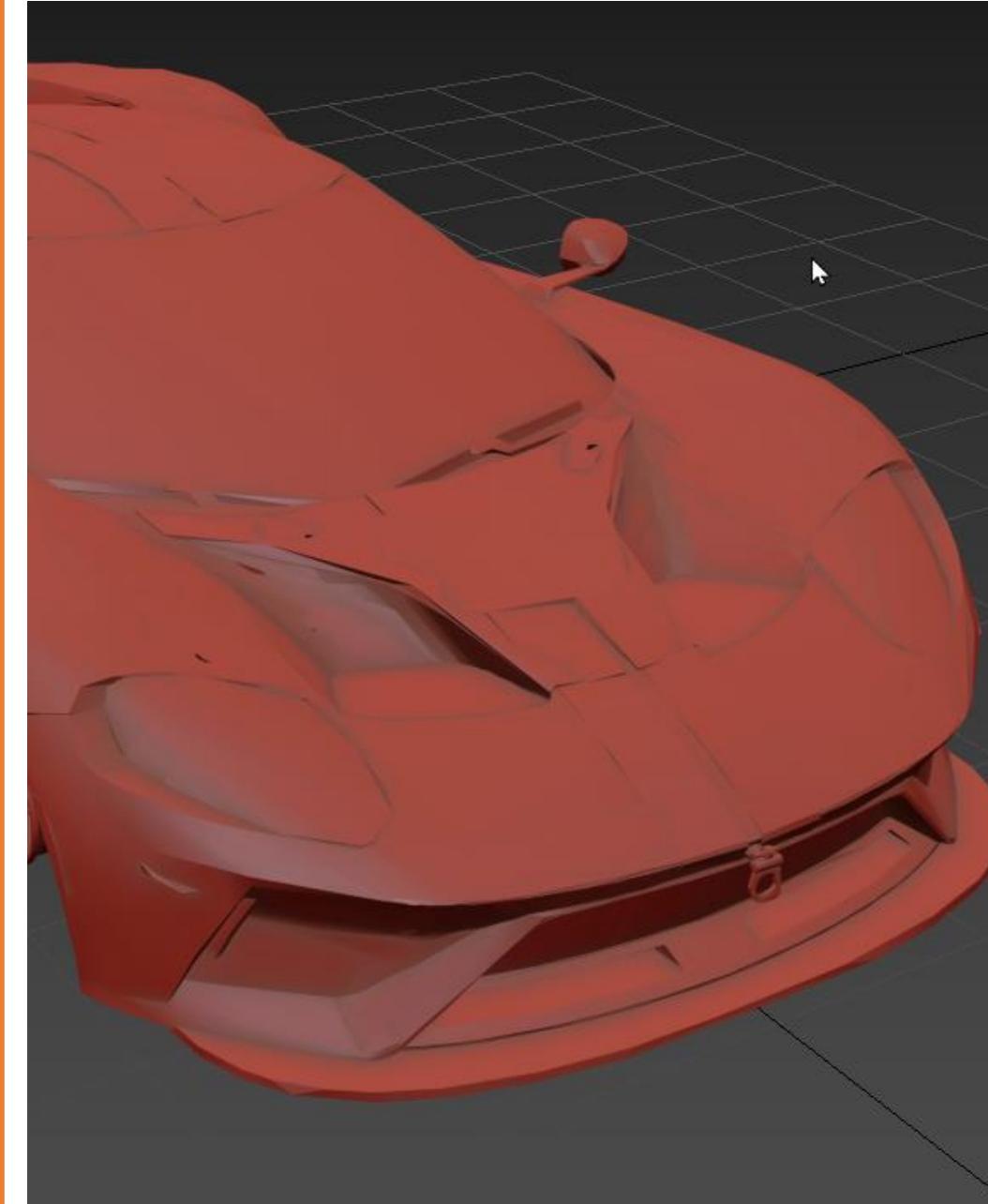
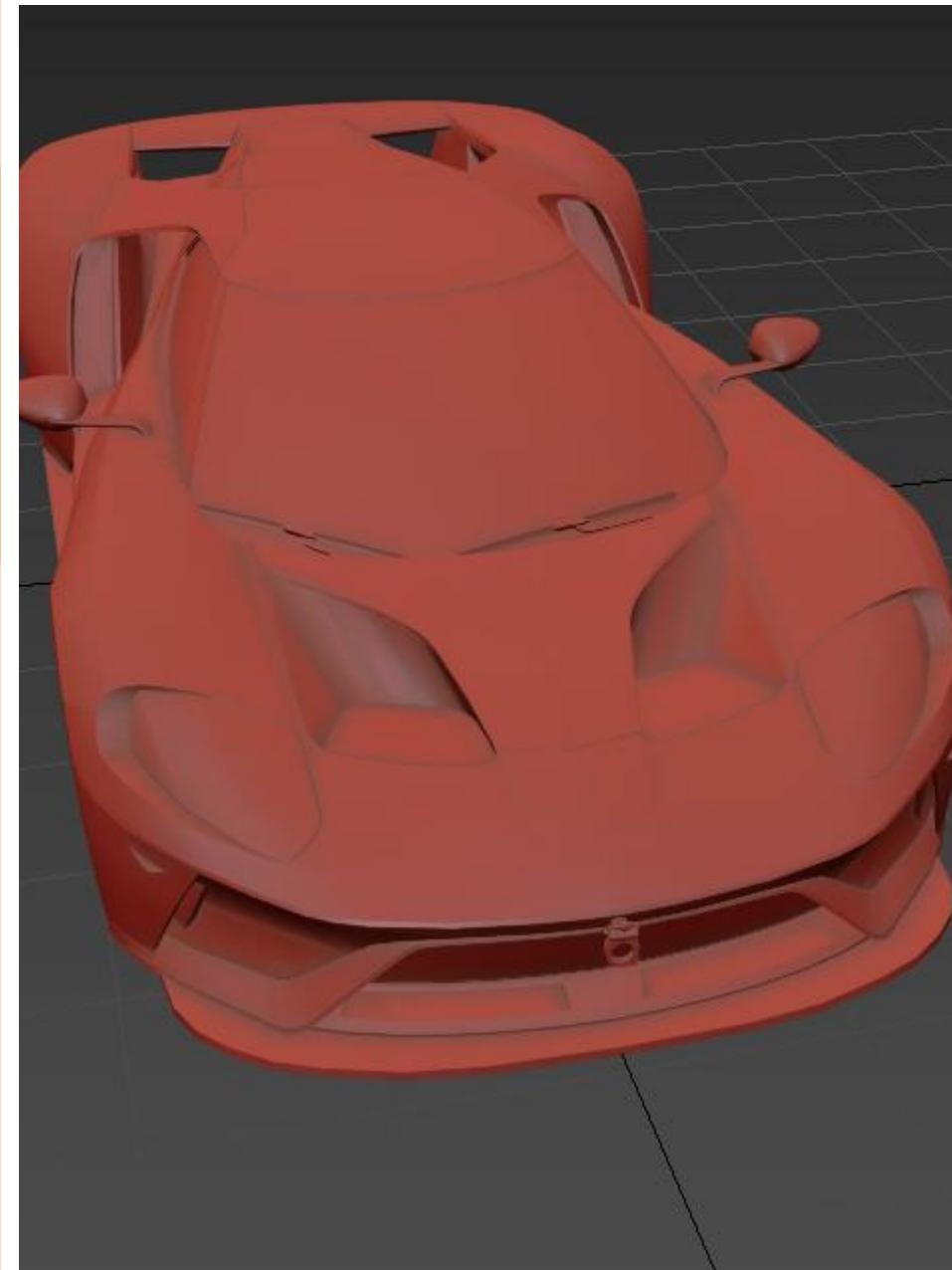
Polys: 59,340

Tris: 66,329

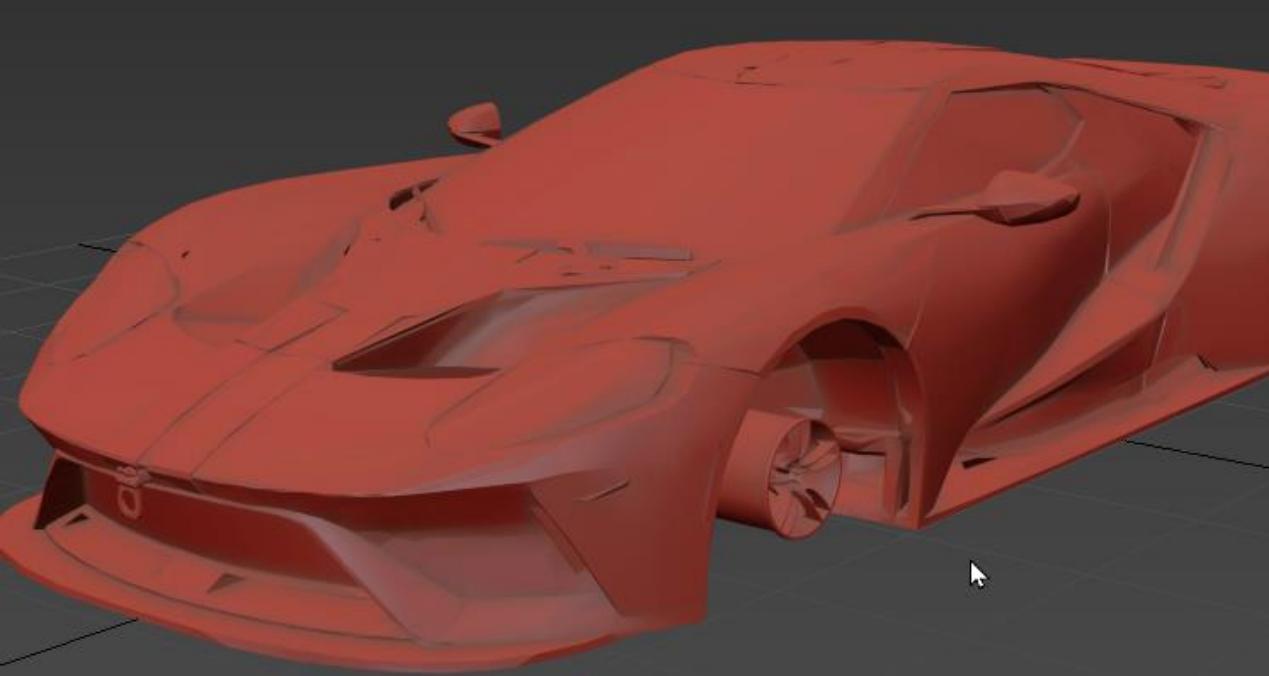
Edges: 93,104

Verts: 33,103

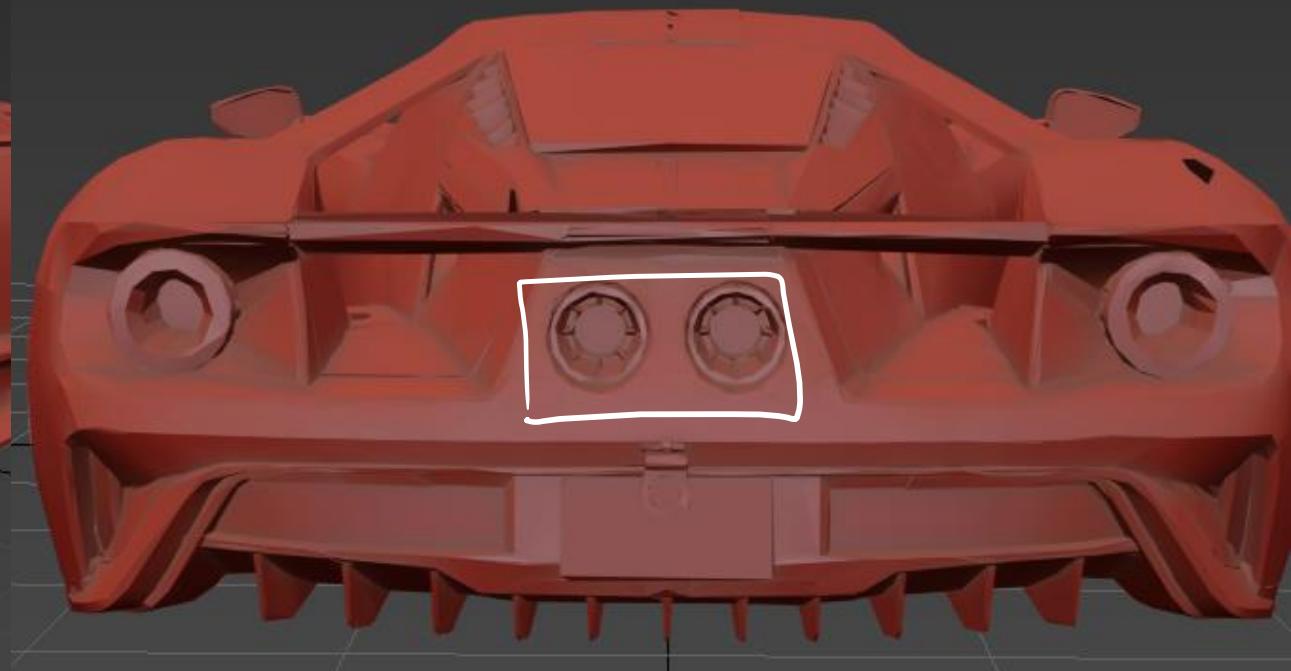
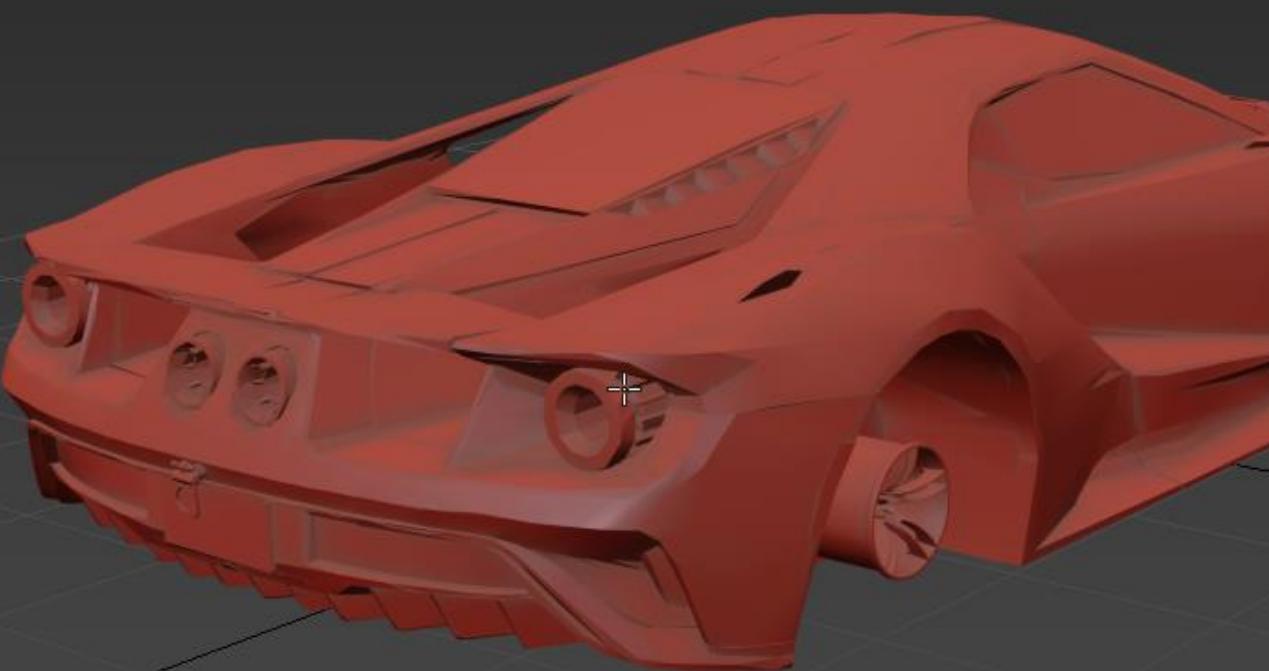
FPS: 79.434



HAND RENDERED

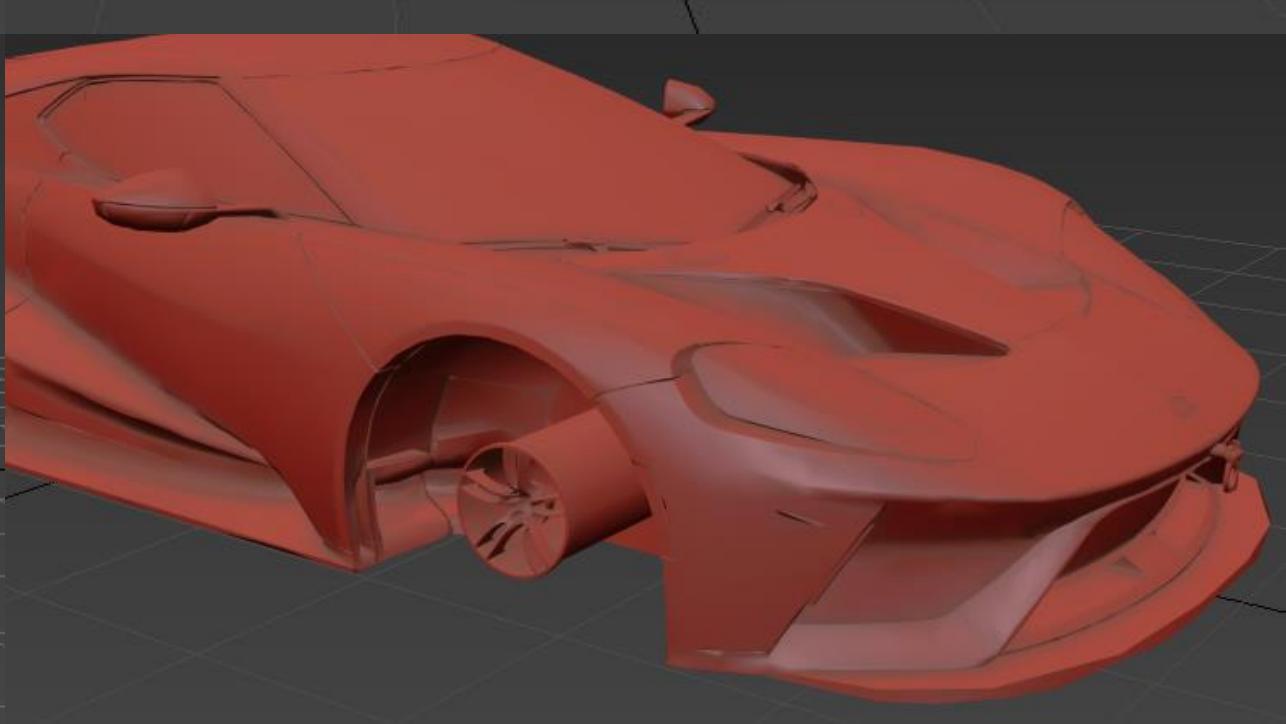
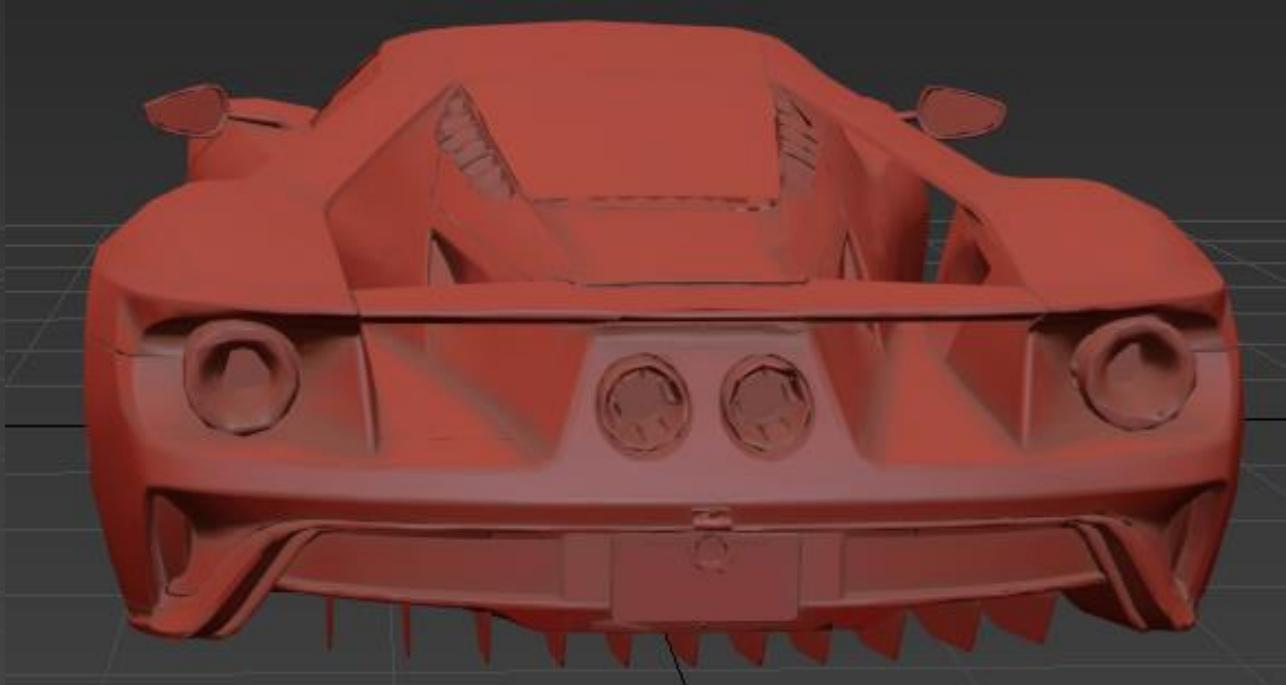


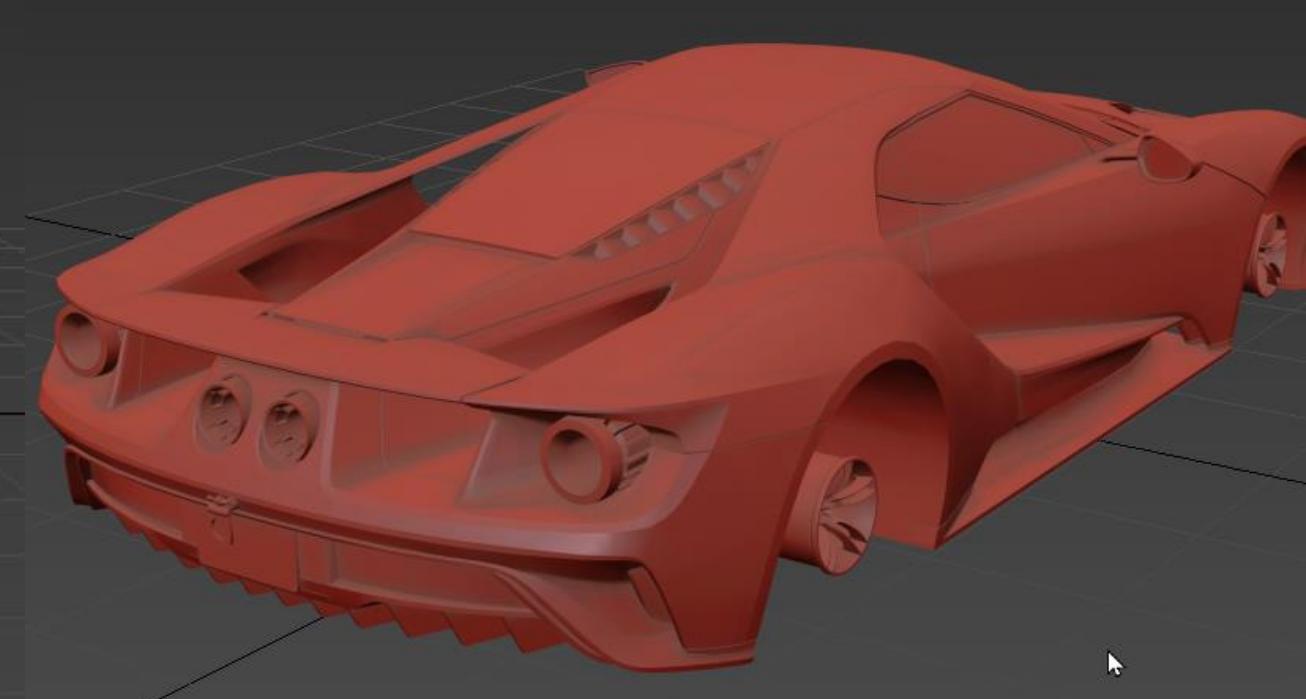
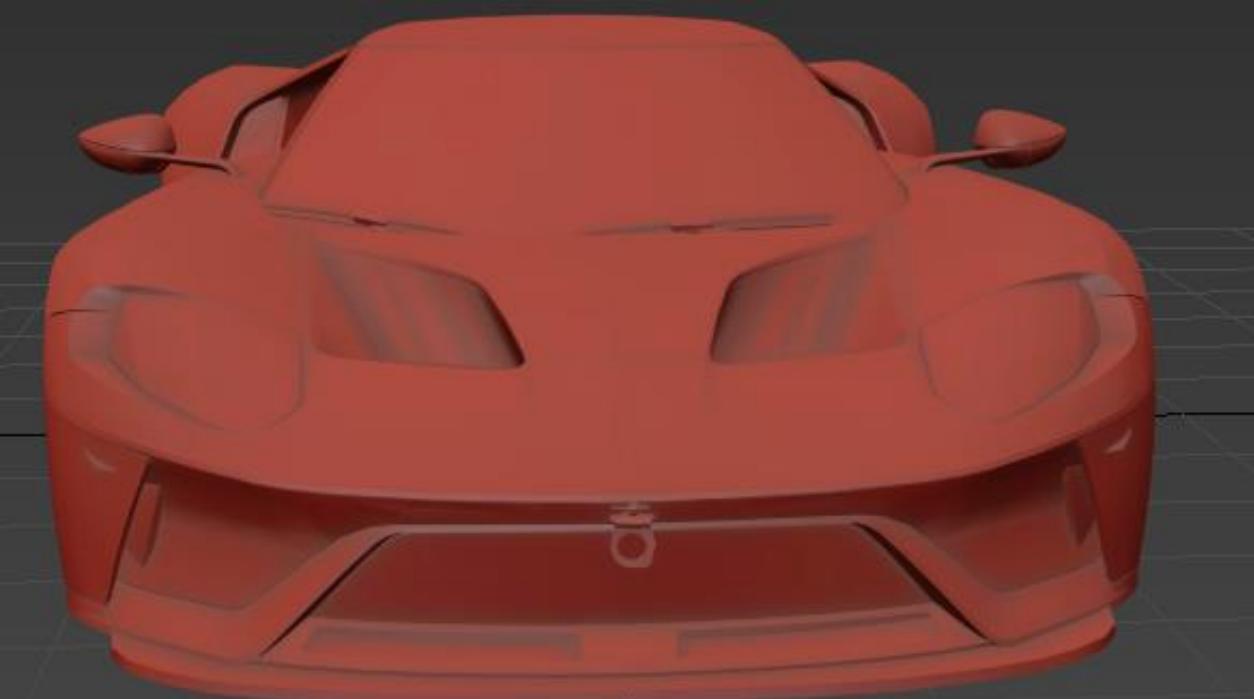
REMESHER LOD1



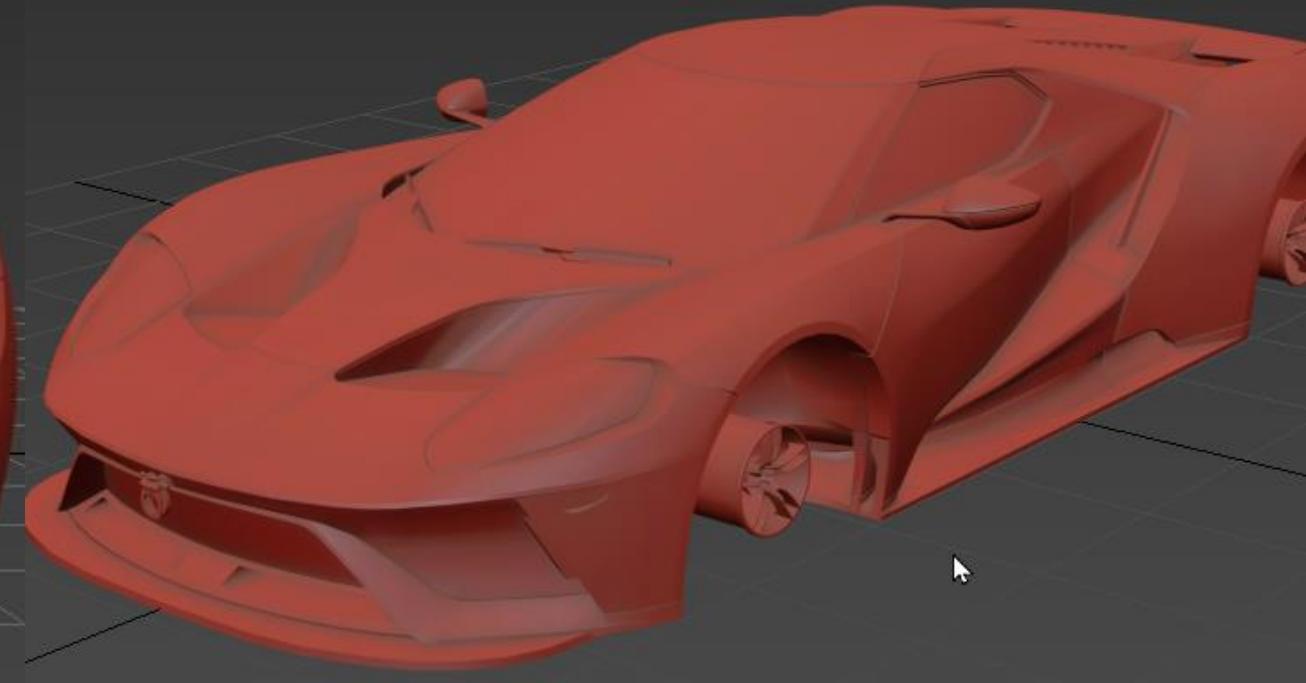
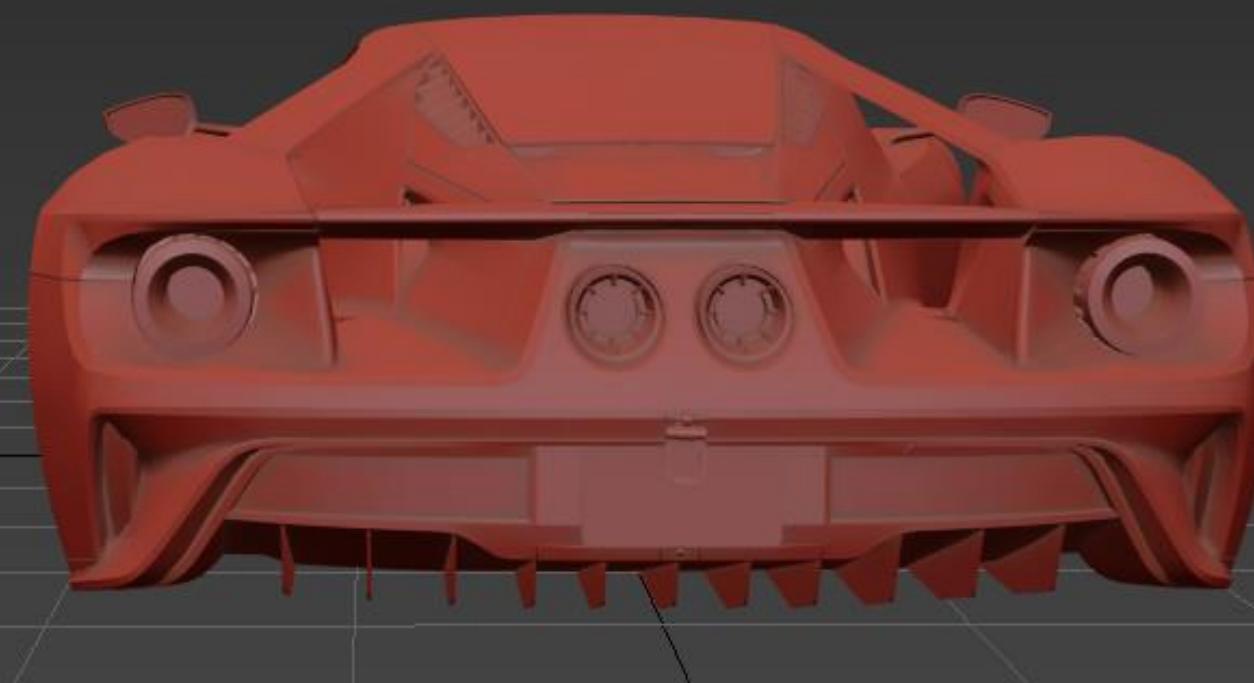


REDUCTION LOD1





HAND LOD1



REMESHER LOD 2

116 Objects Se

Polys: 18,377

Tris: 32,735

Edges: 38,055

Verts: 19,946

FPS: 53.294

104 Objects Se

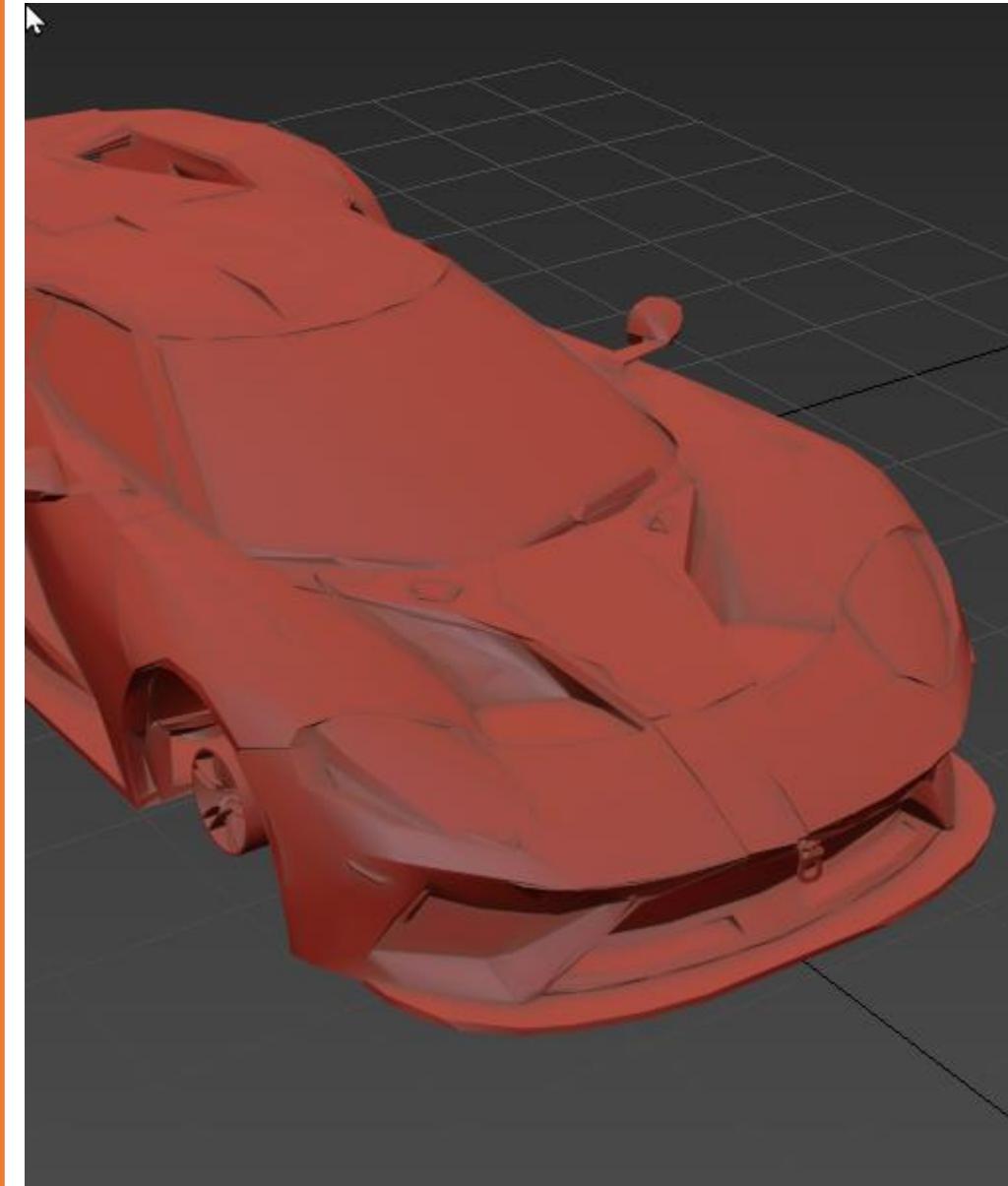
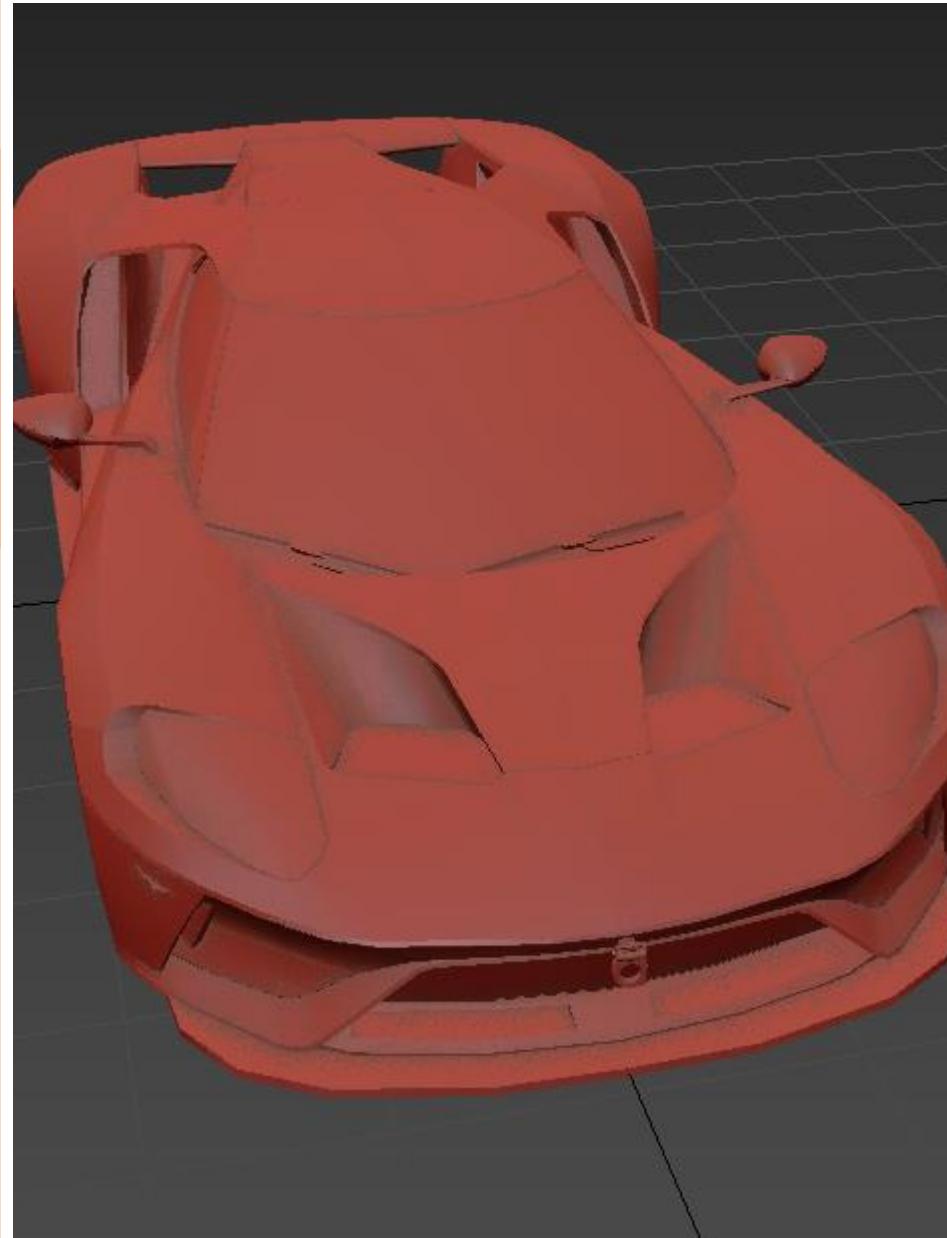
Polys: 27,630

Tris: 30,486

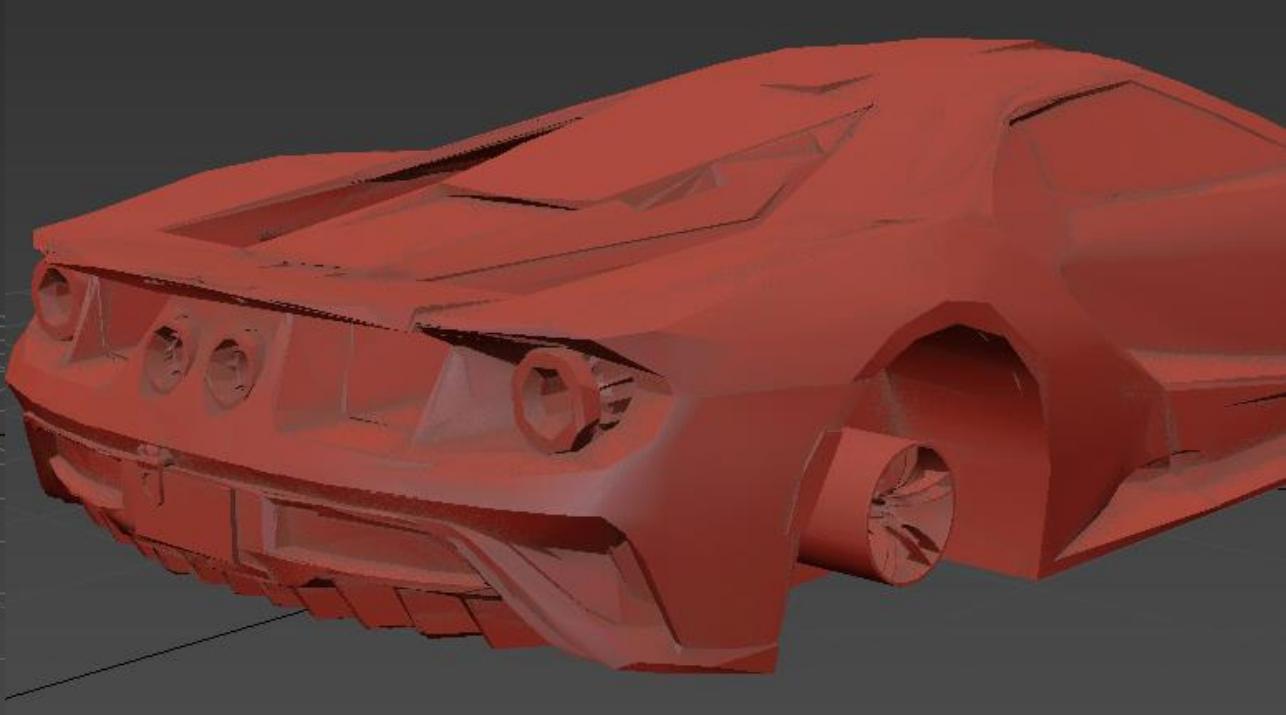
Edges: 43,278

Verts: 15,432

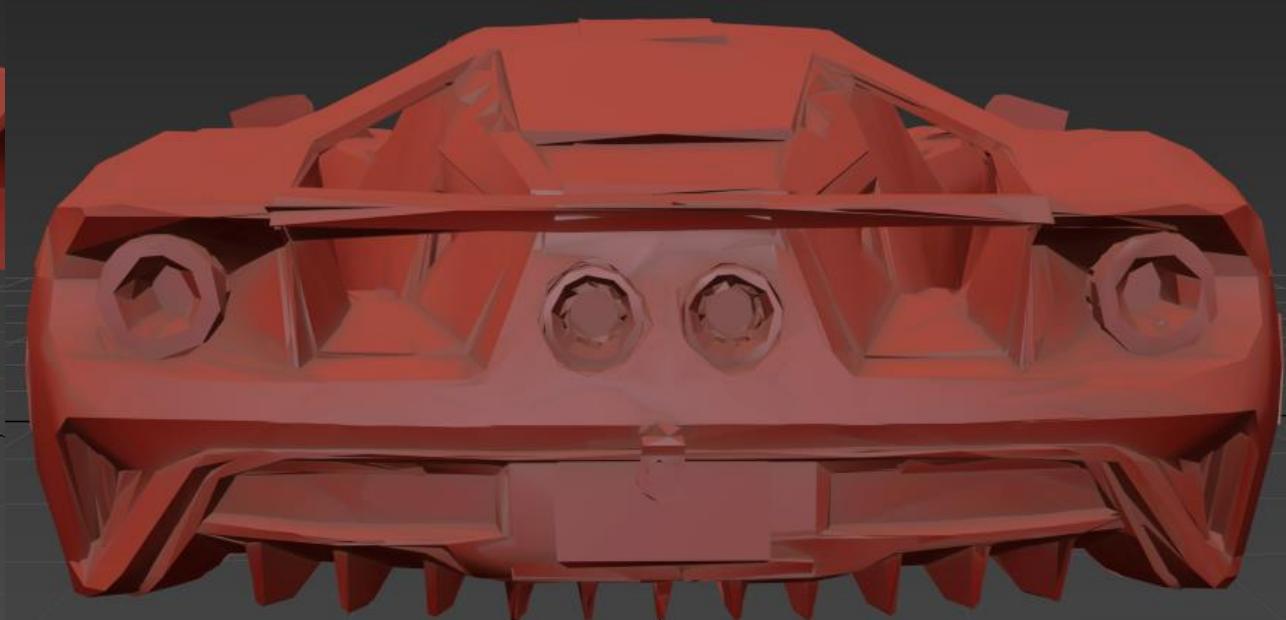
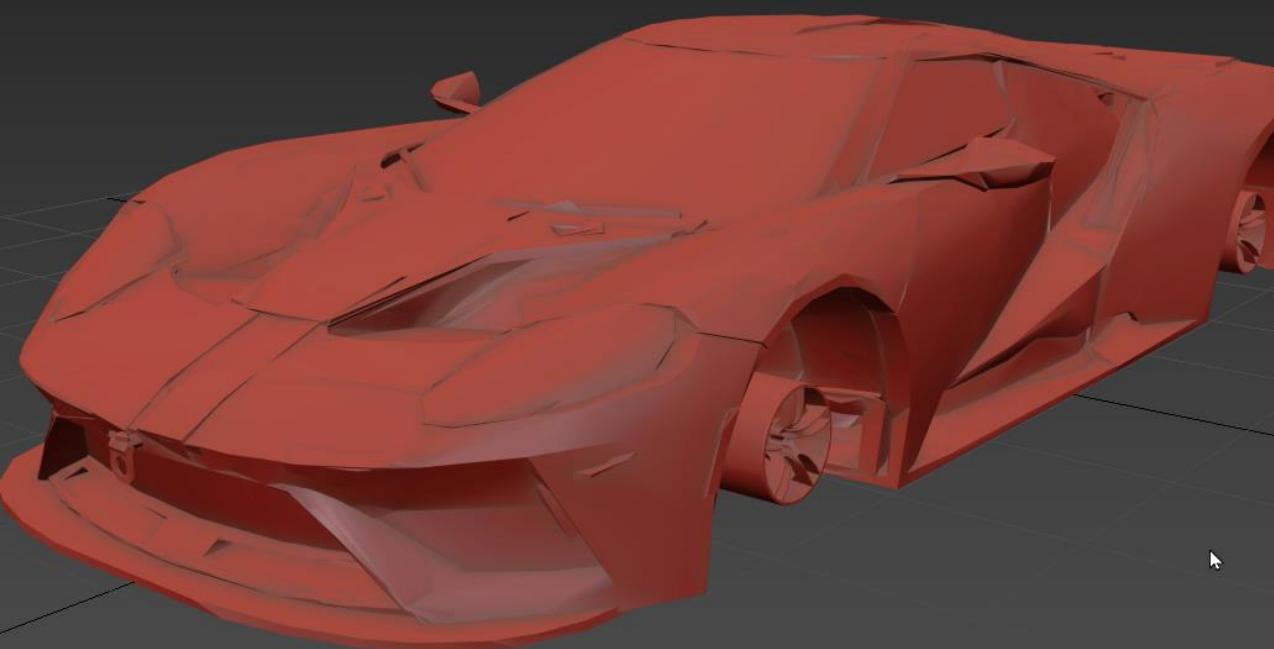
FPS: 86.777

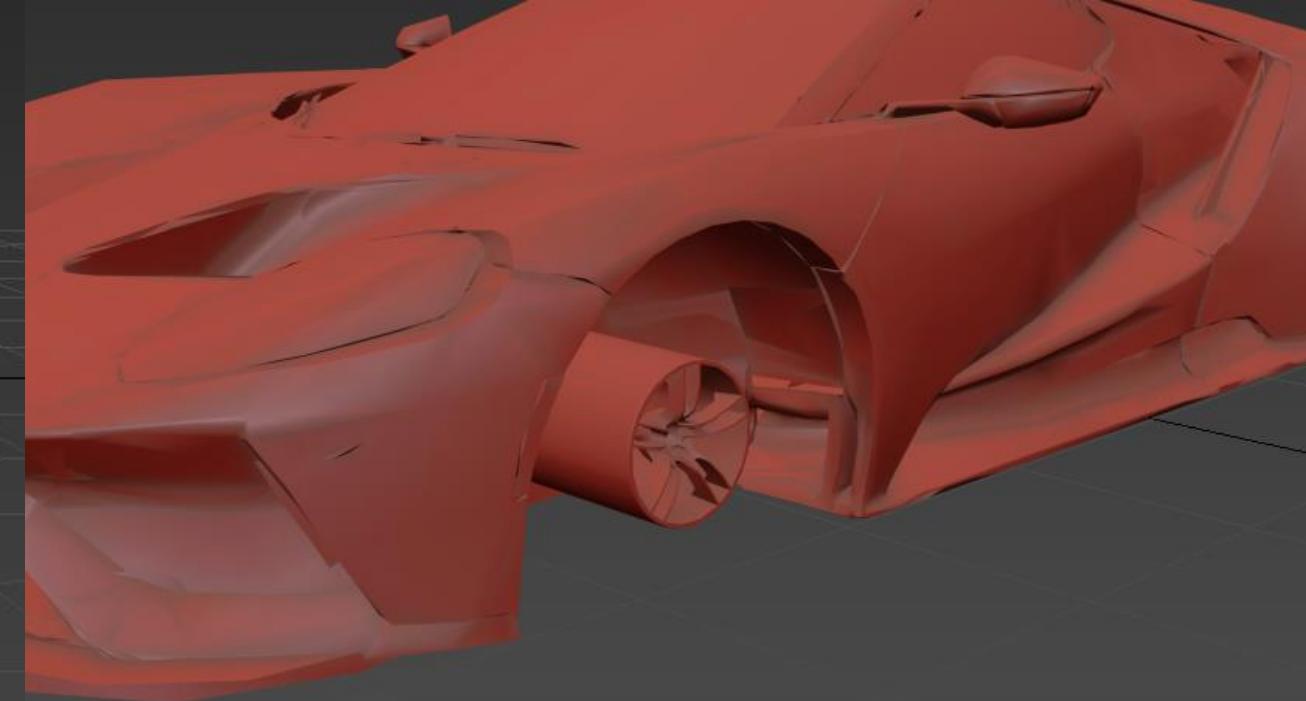
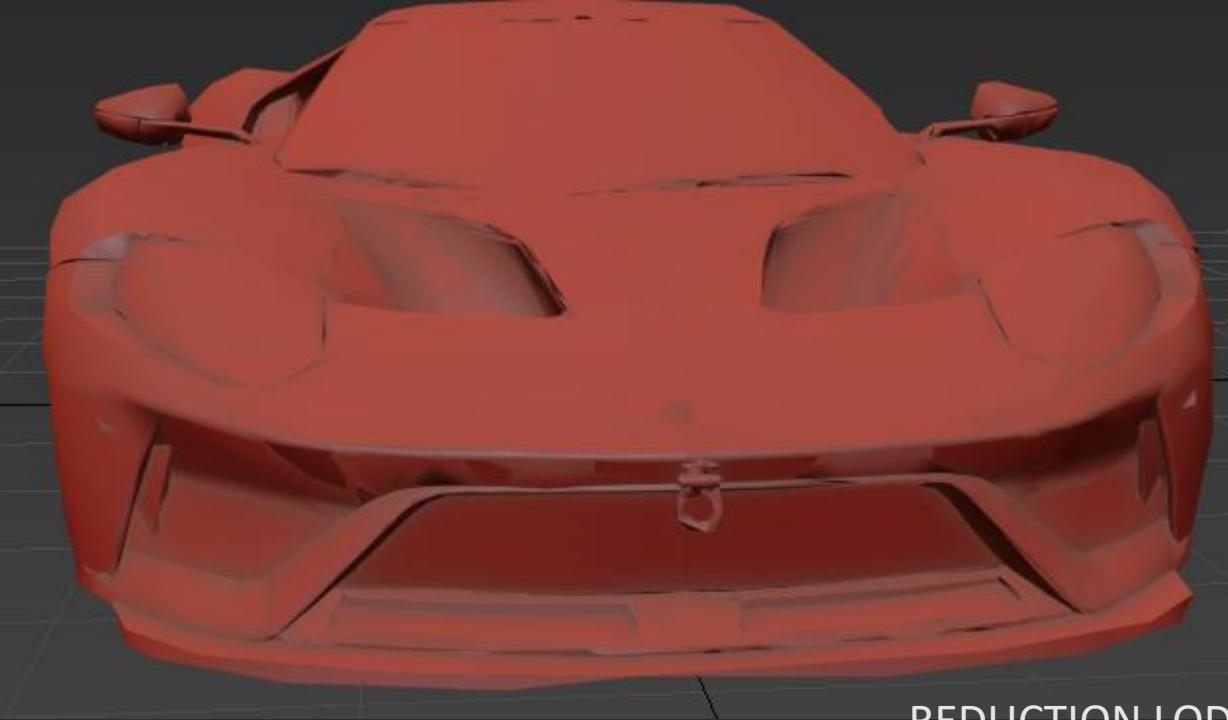


HAND RENDERED

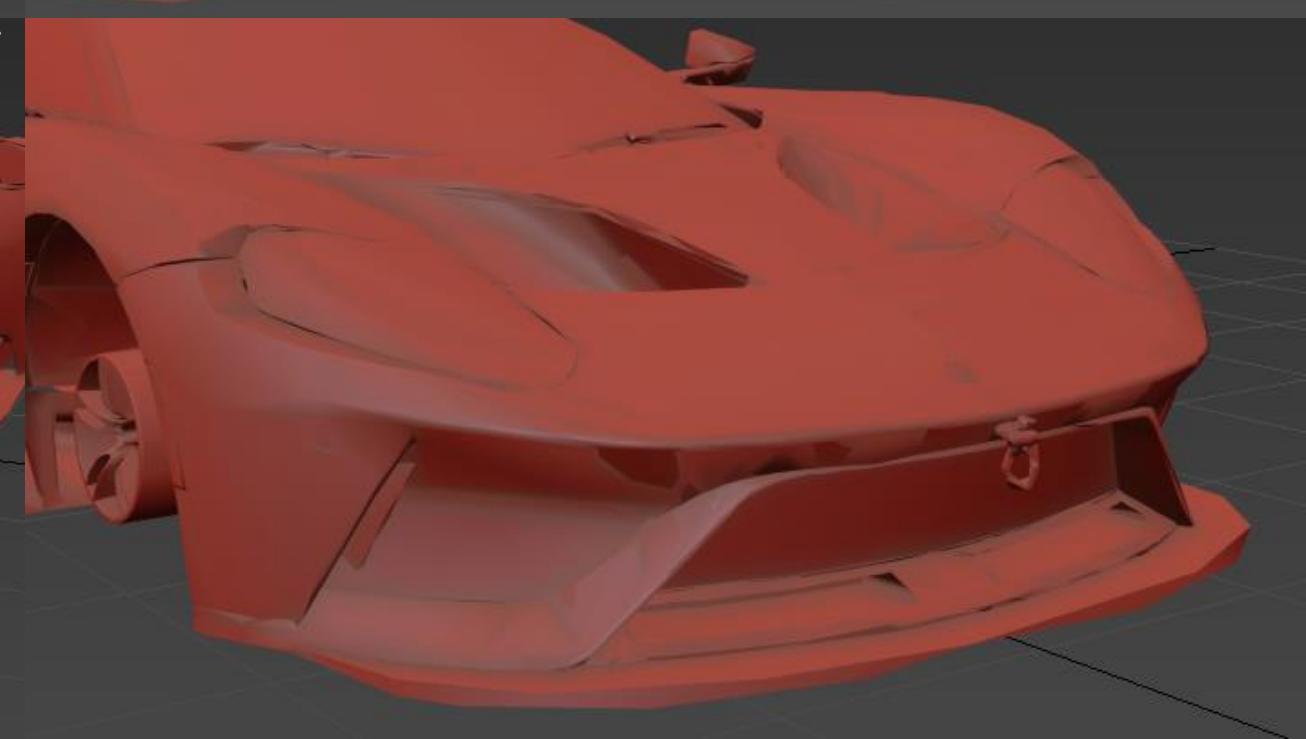
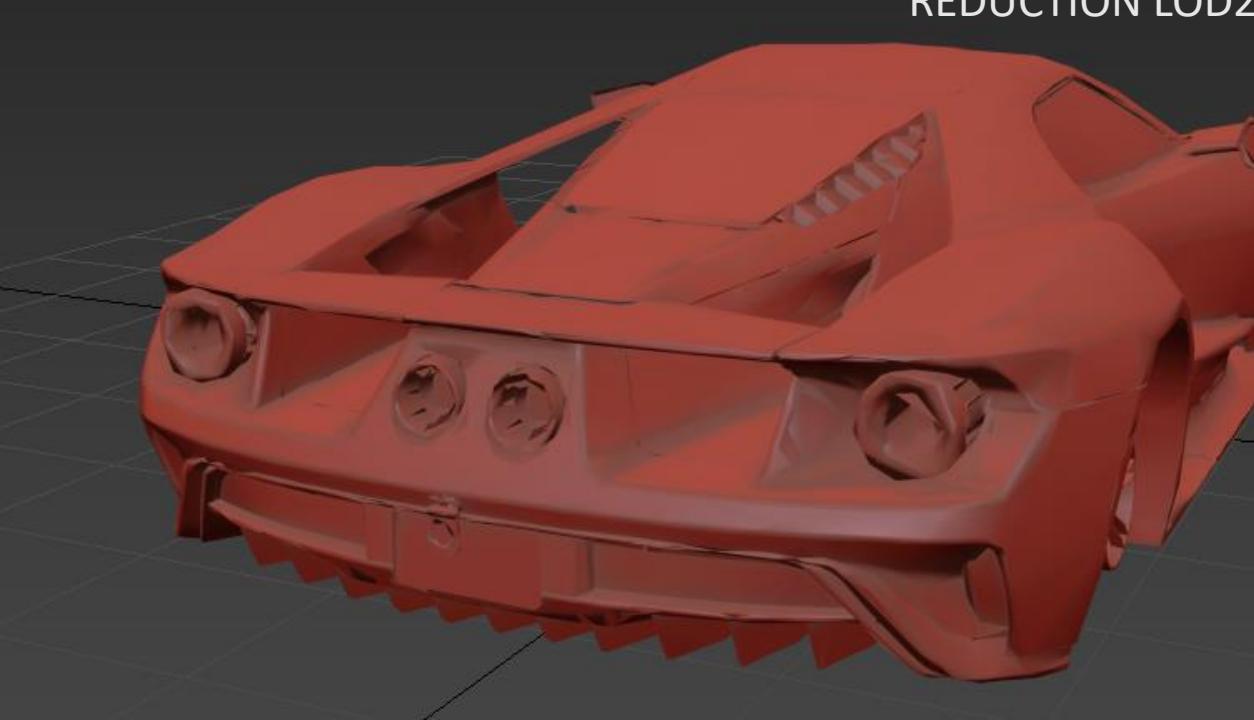


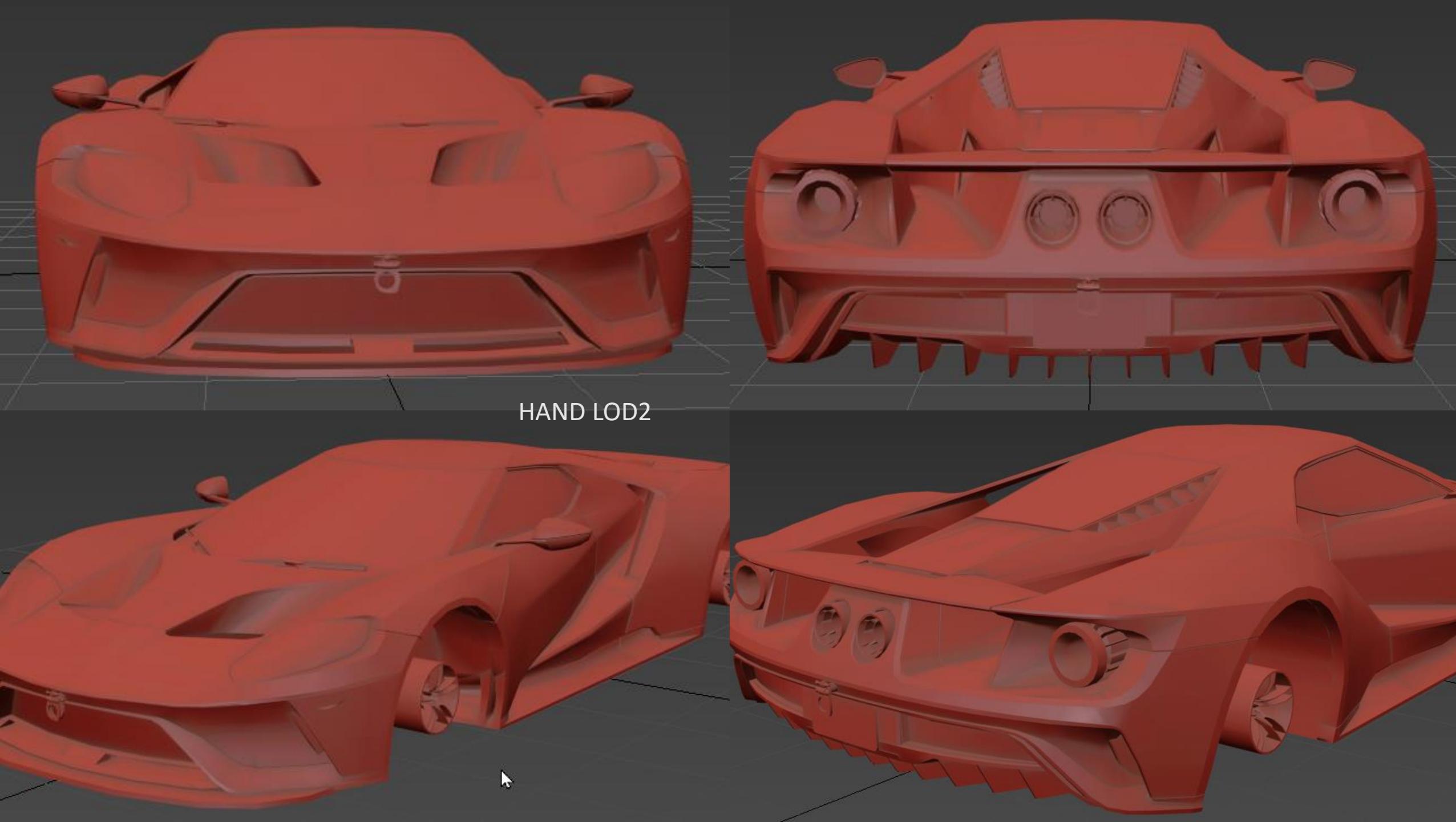
REMESHER LOD2





REDUCTION LOD2





HAND LOD2

REMESHER LOD 3

107 Objects Sel

Polys: 11,628

Tris: 20,383

Edges: 24,335

Verts: 12,902

FPS: 67.601

104 Objects Sel

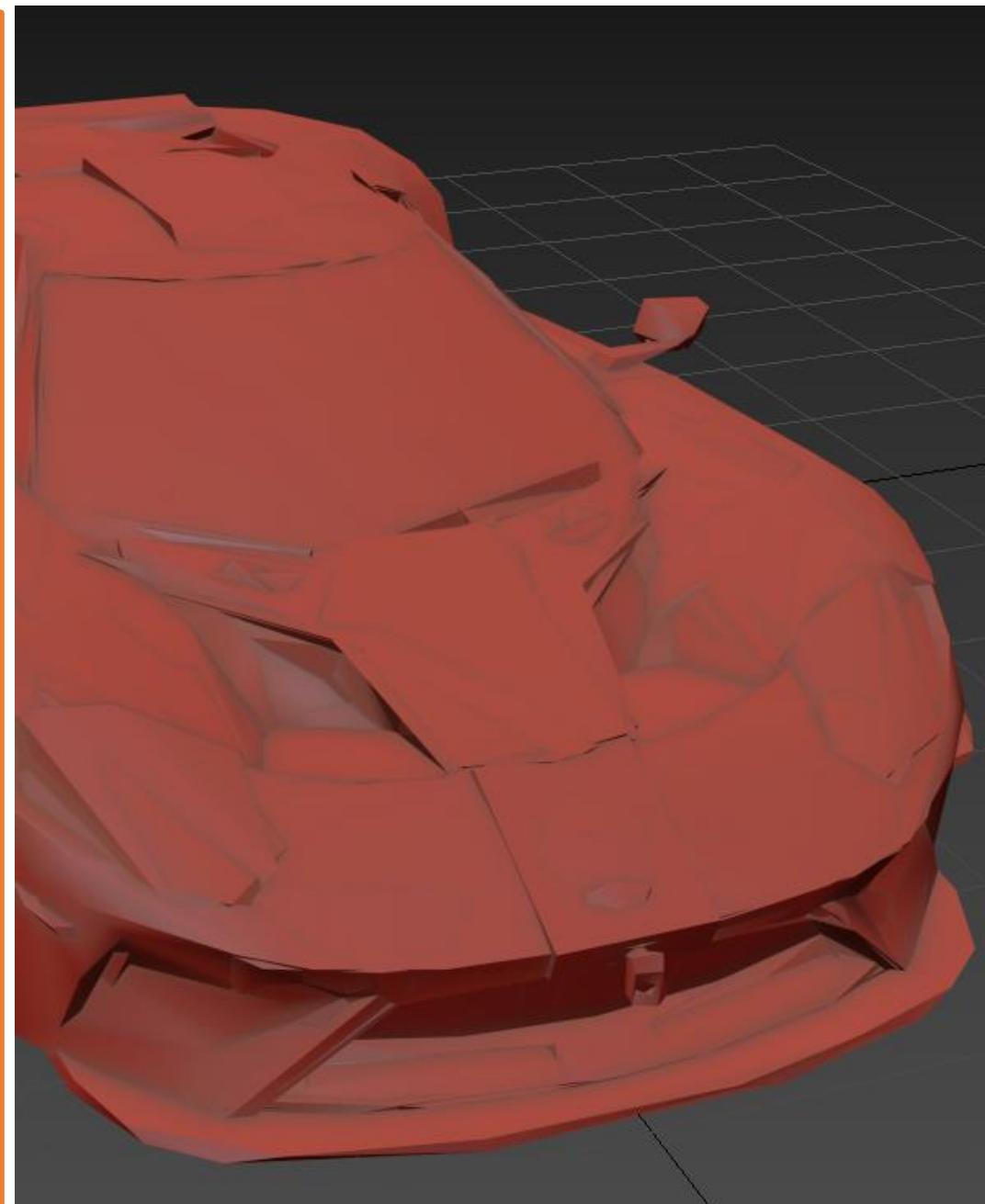
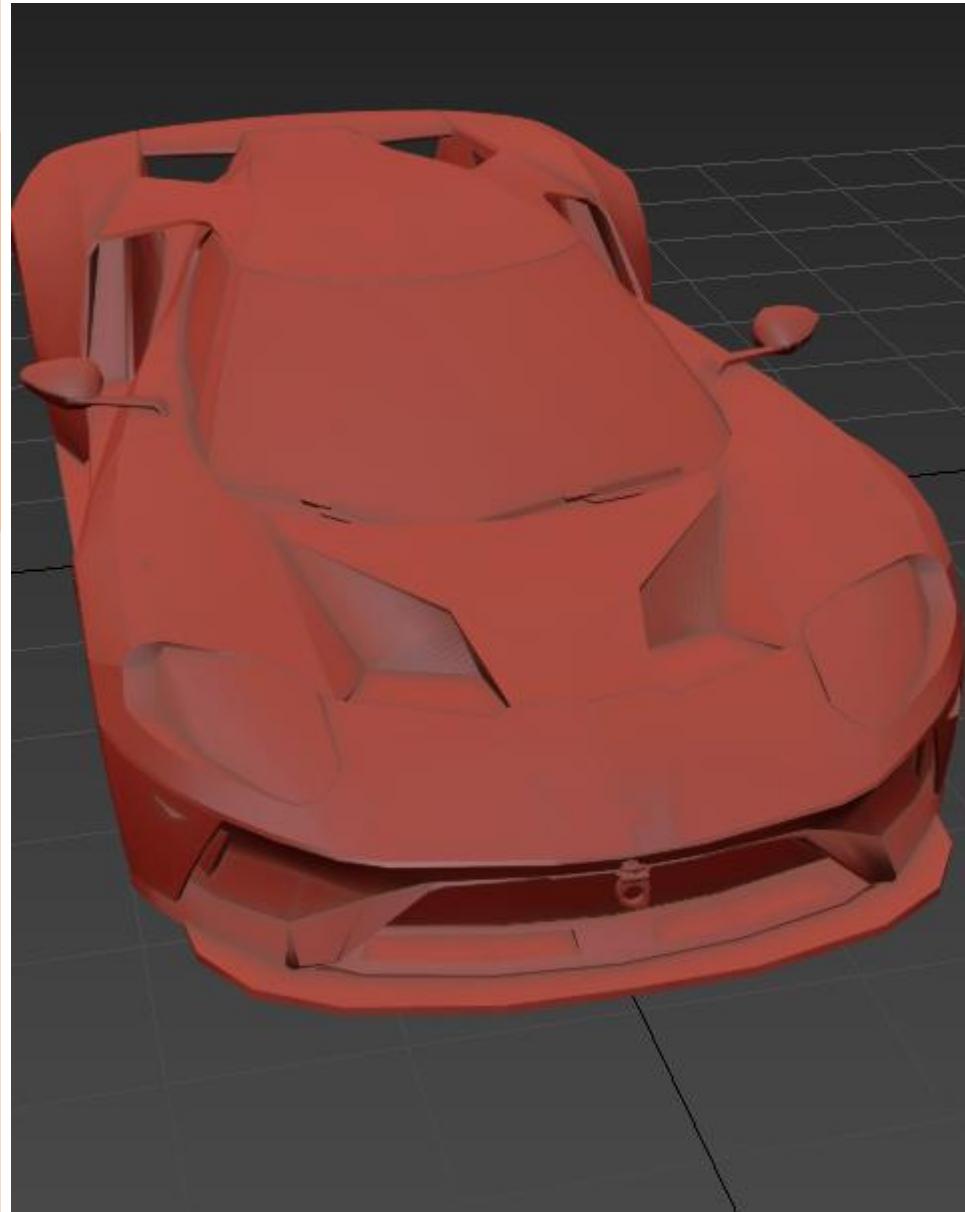
Polys: 12,525

Tris: 13,999

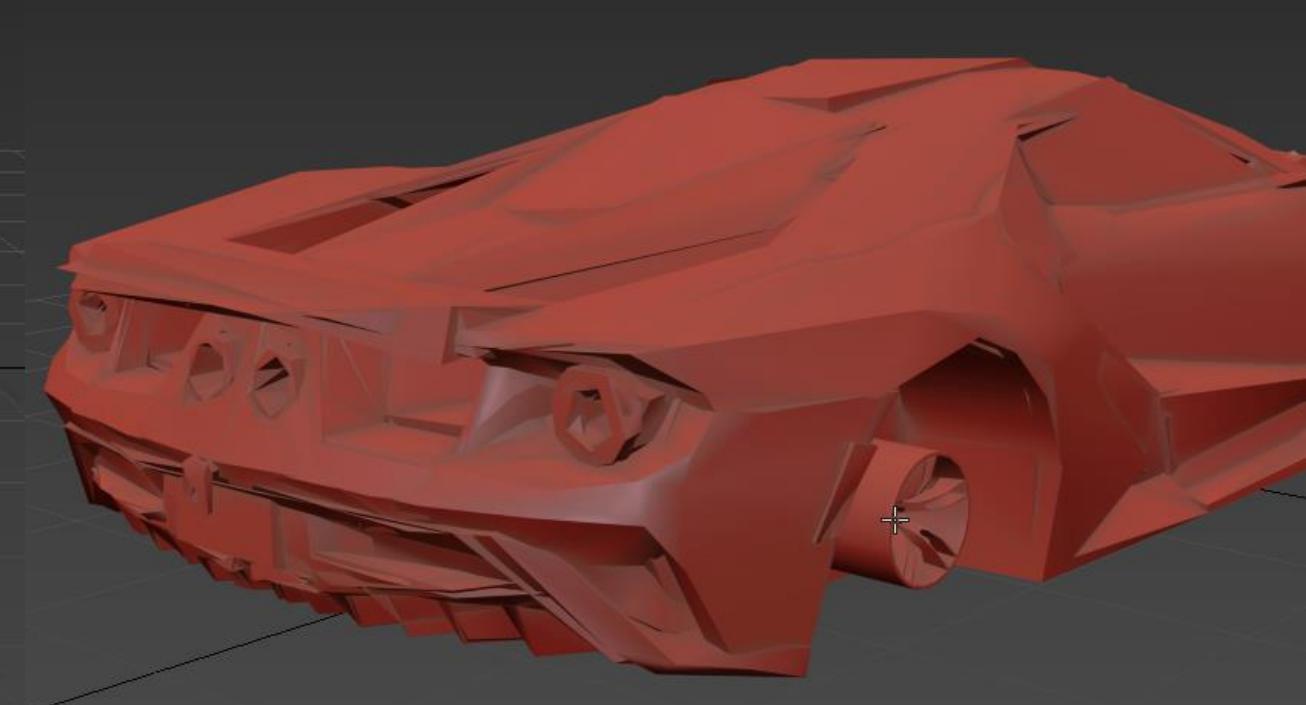
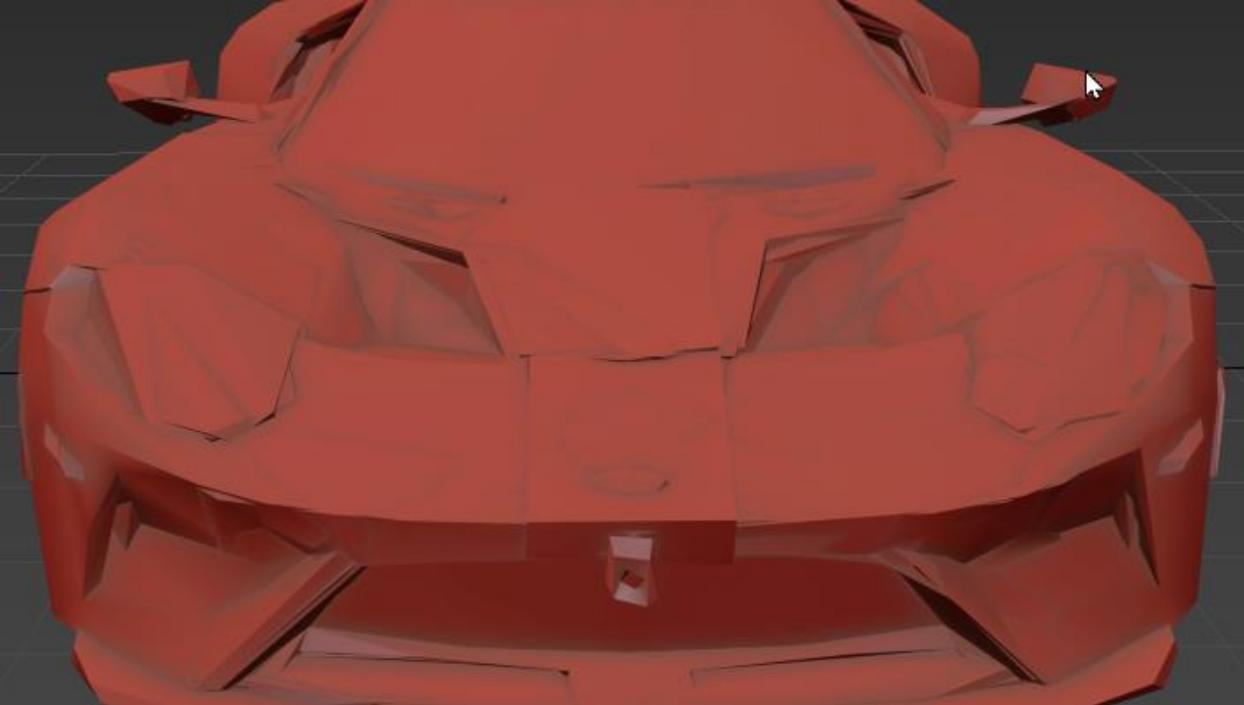
Edges: 19,877

Verts: 7,453

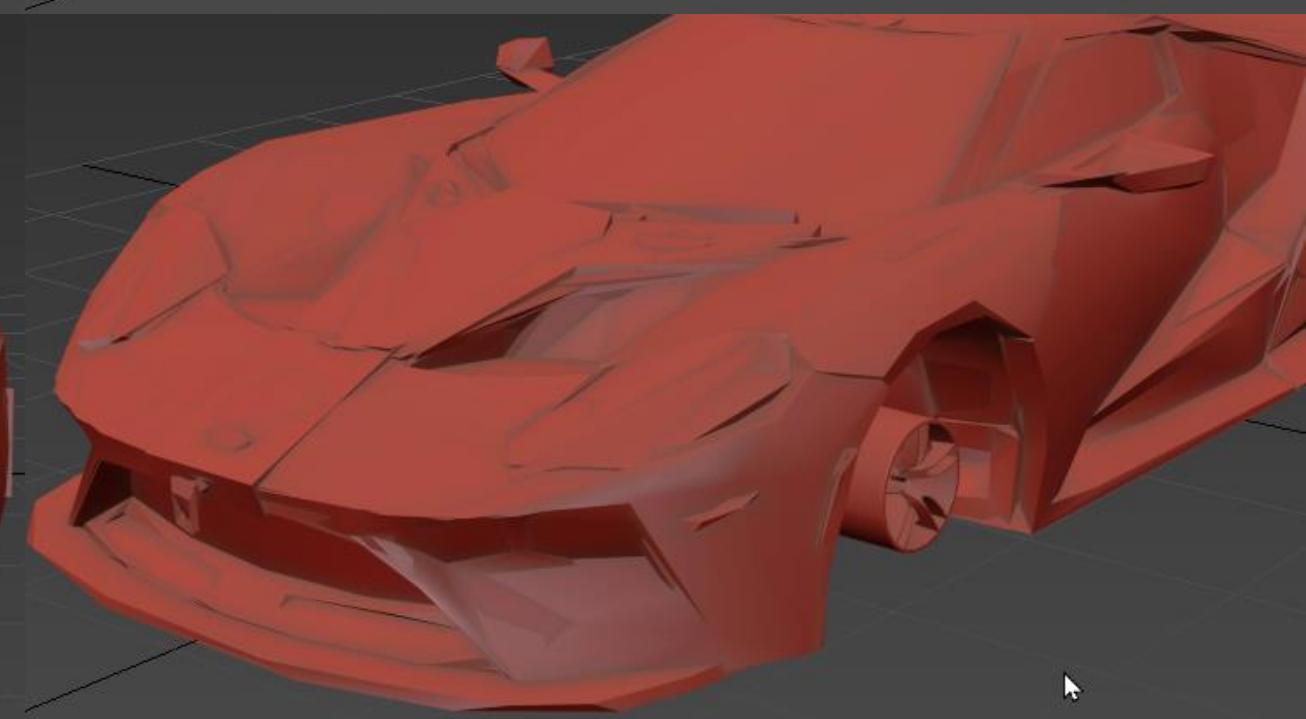
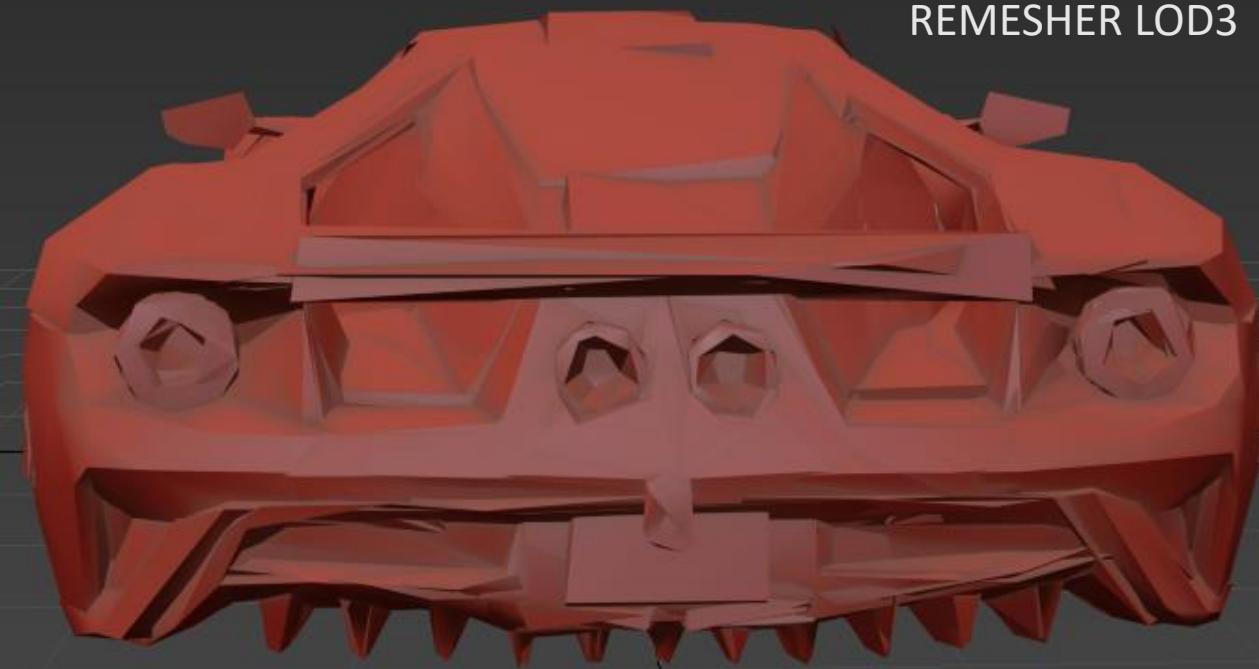
FPS: 90.984

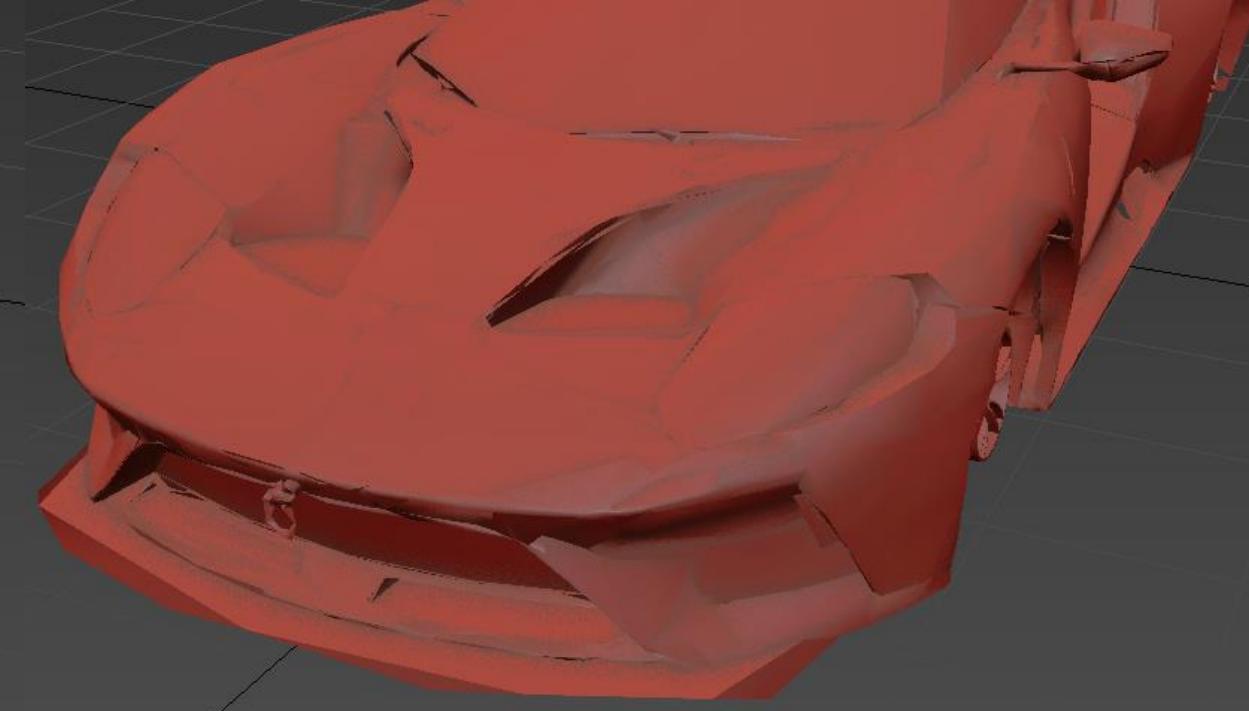
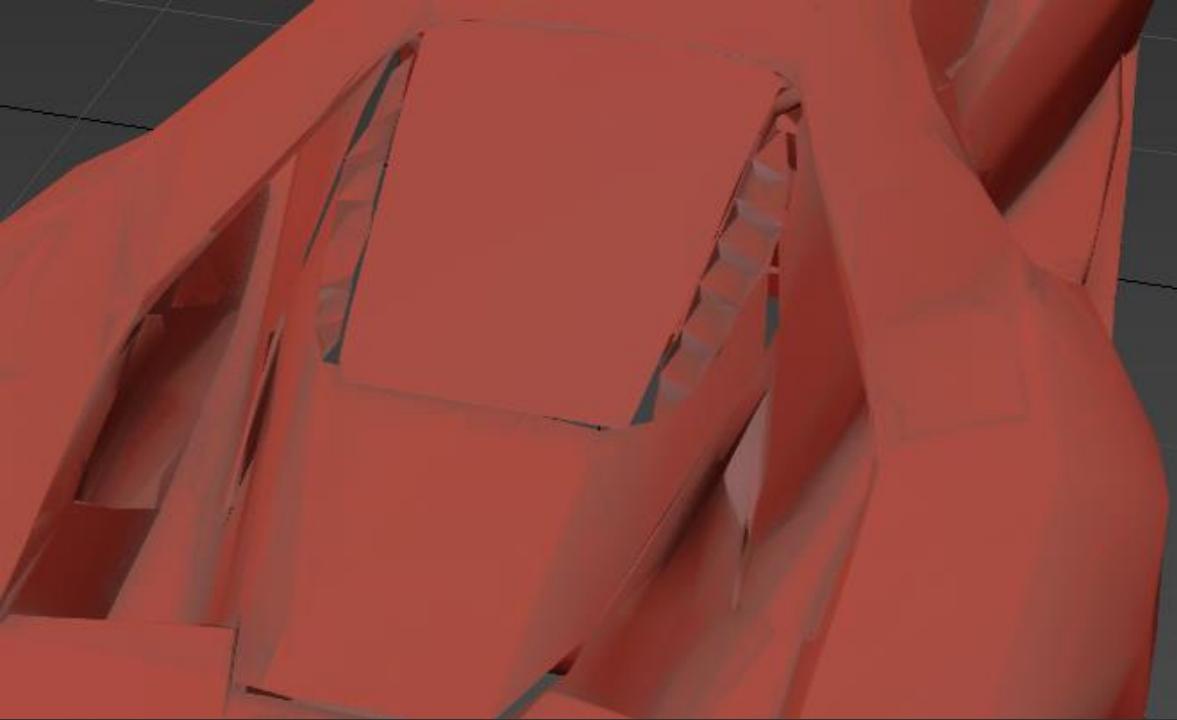


HAND RENDERED

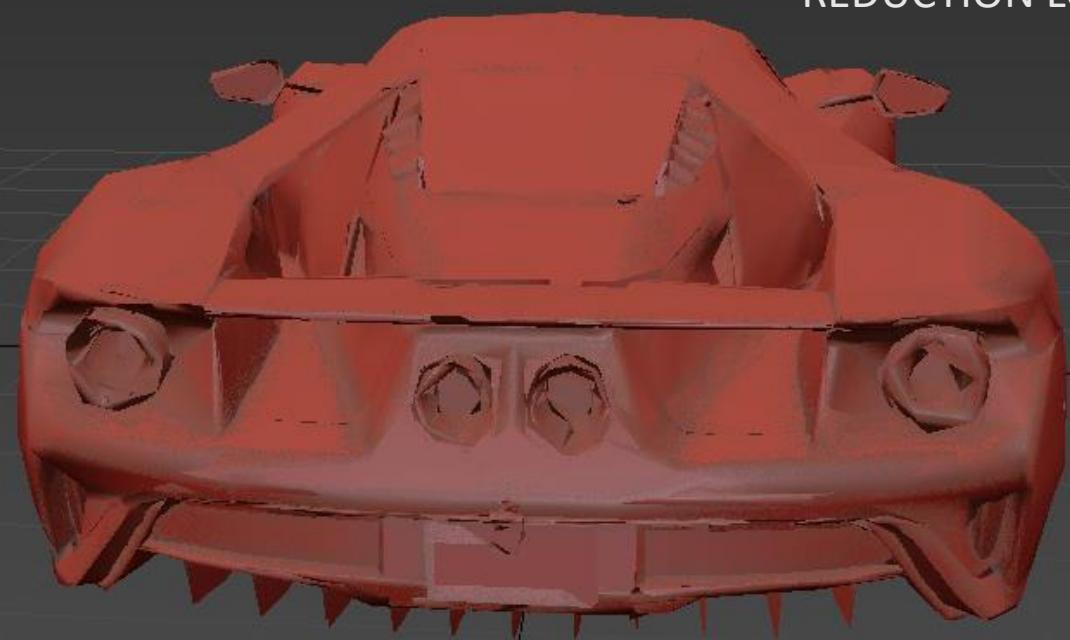


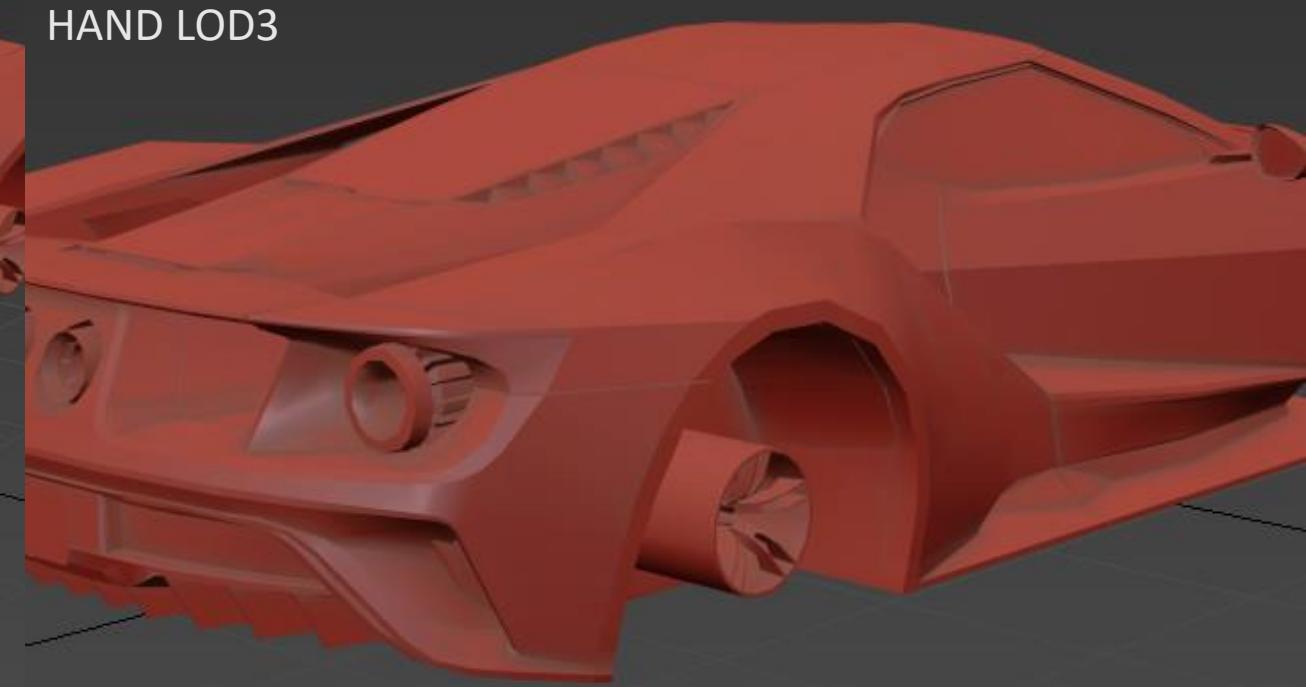
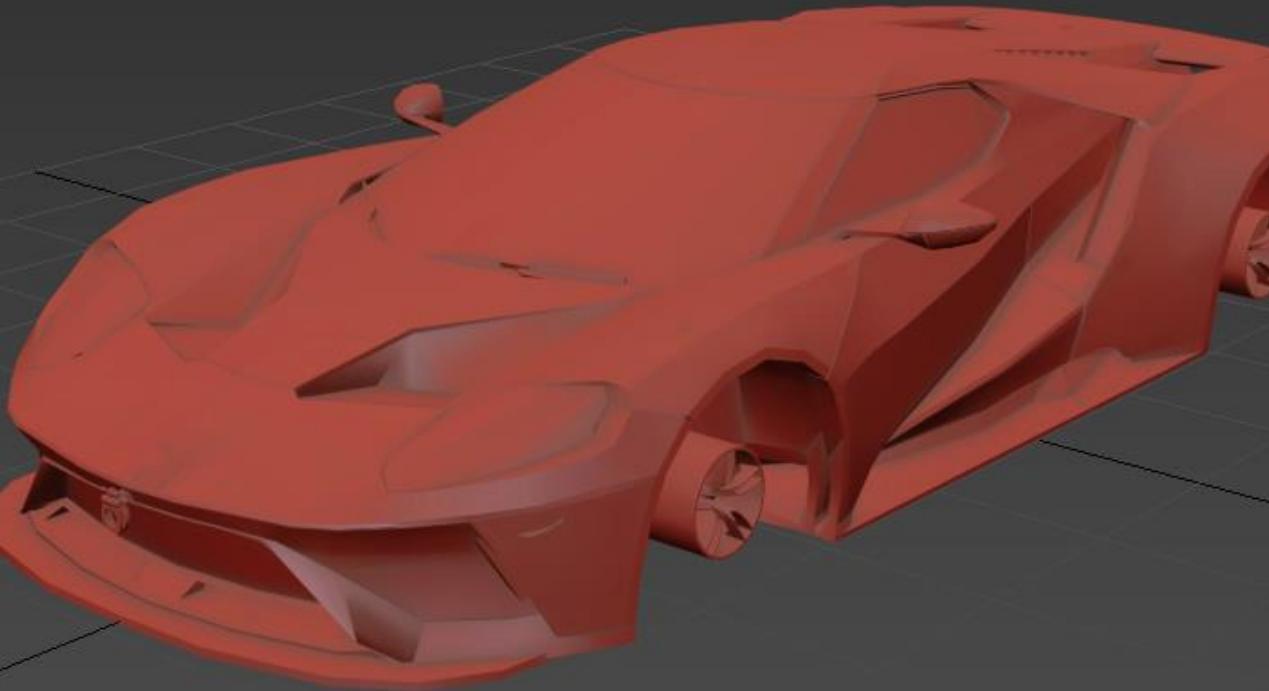
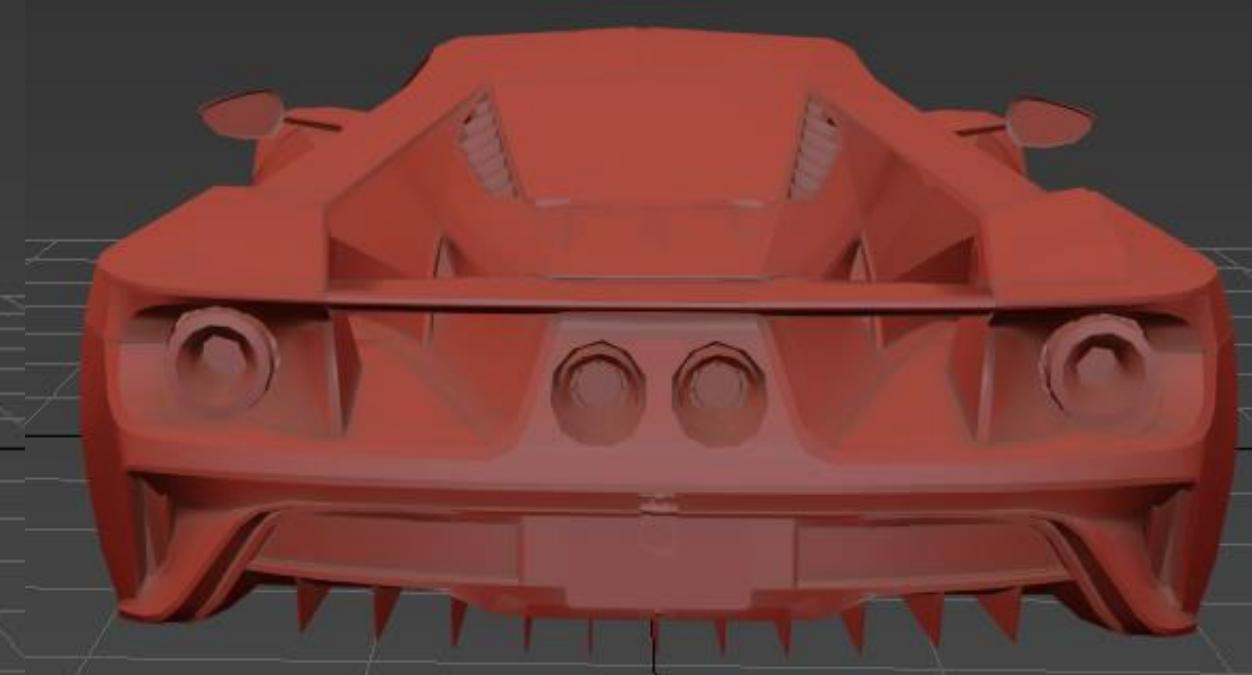
REMESHER LOD3





REDUCTION LOD3





HAND LOD3

REMESHER LOD 4

85 Objects Selected

Polys: 5,103

Tris: 9,075

Edges: 11,203

Verts: 6,321

FPS: 24.796

74 Objects Selected

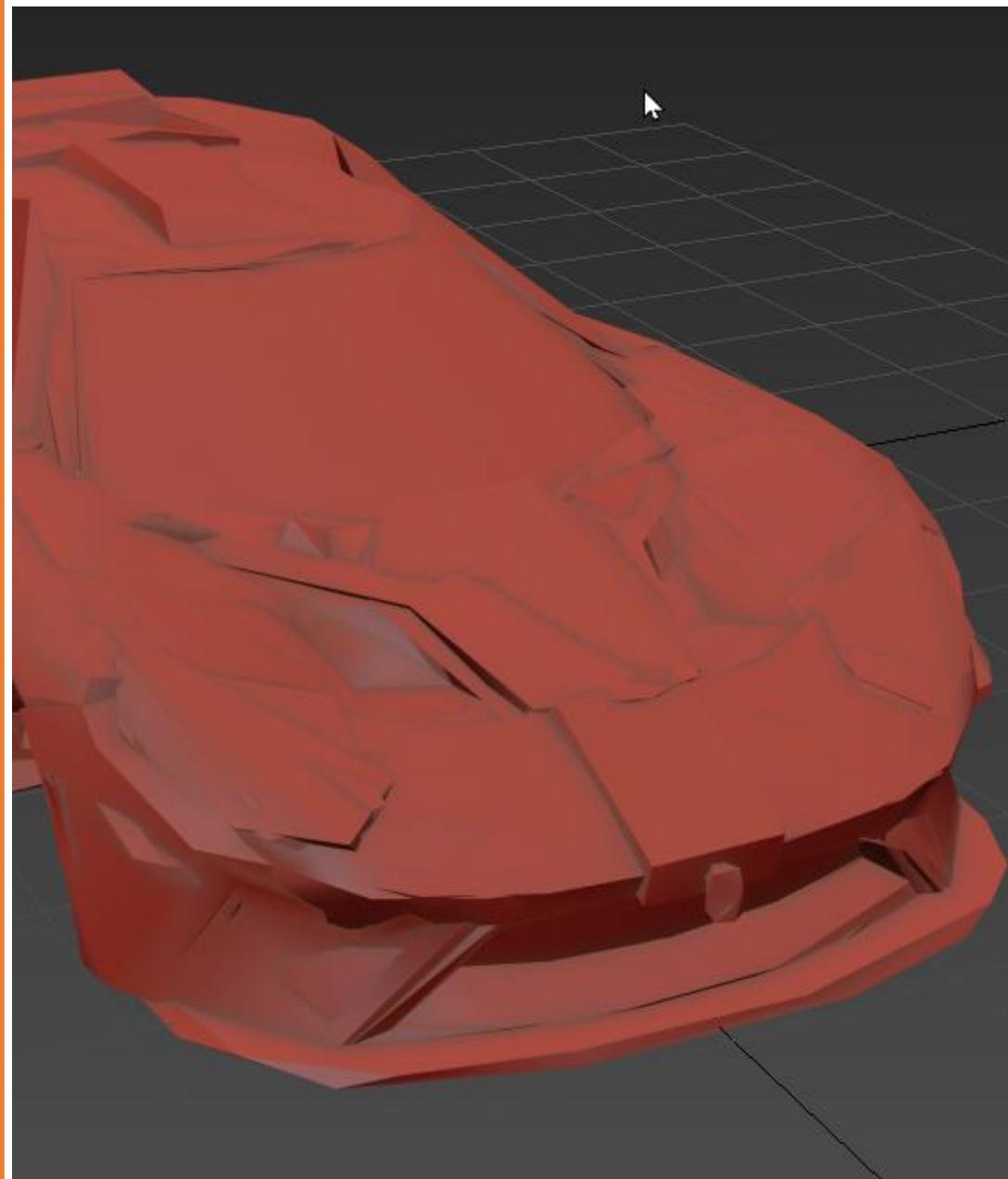
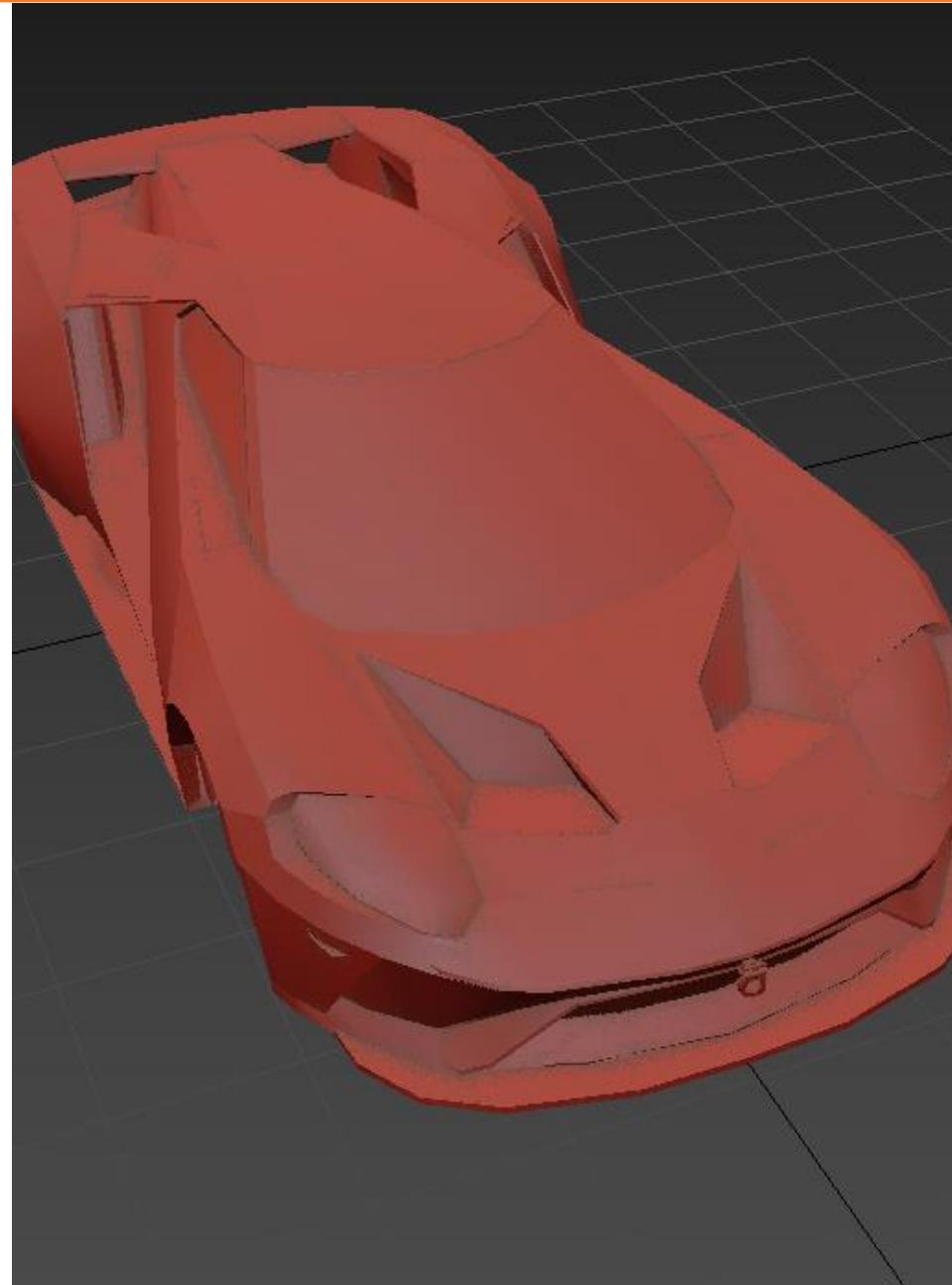
Polys: 6,378

Tris: 6,481

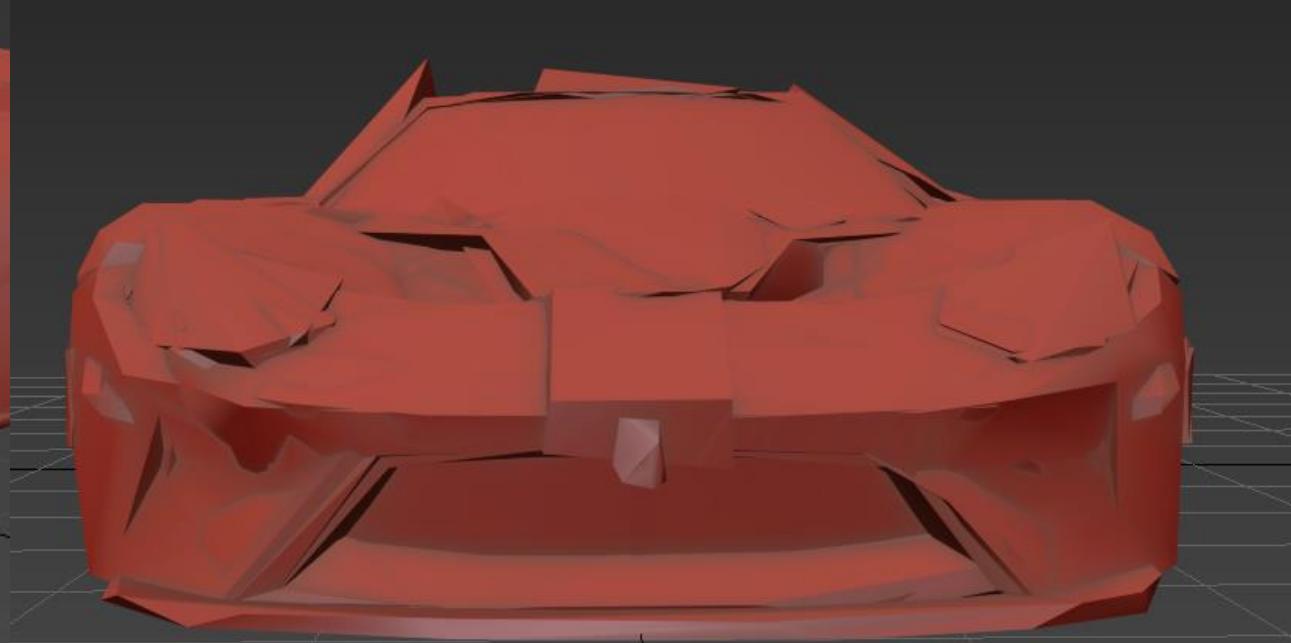
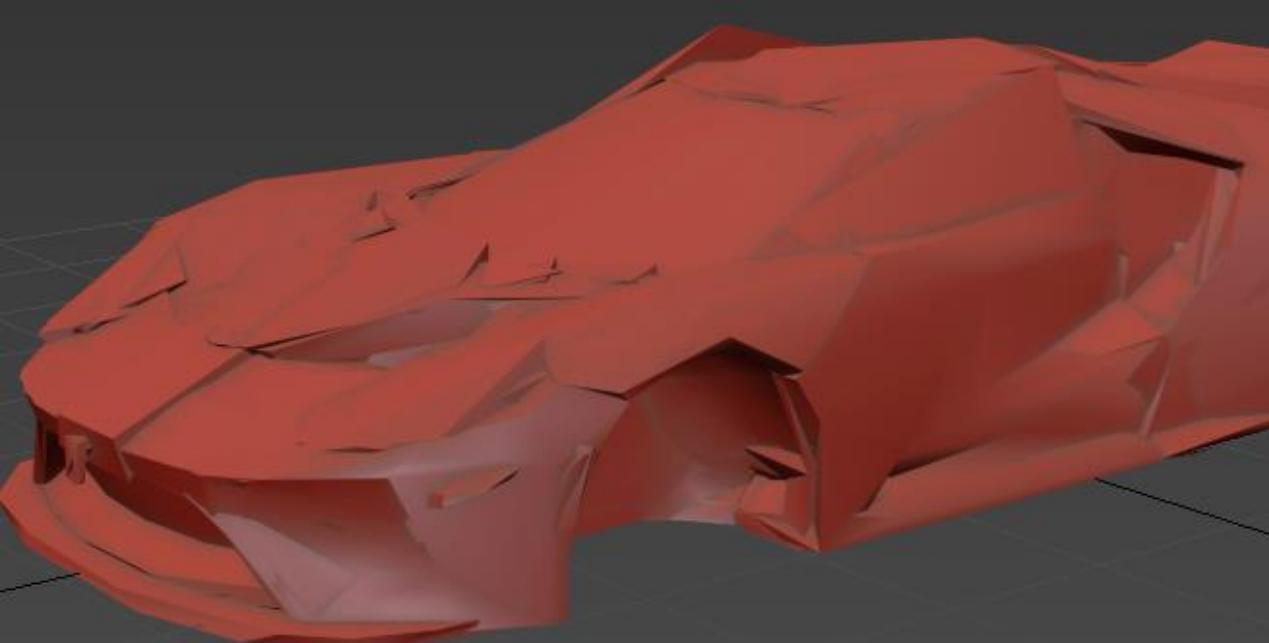
Edges: 9,694

Verts: 3,460

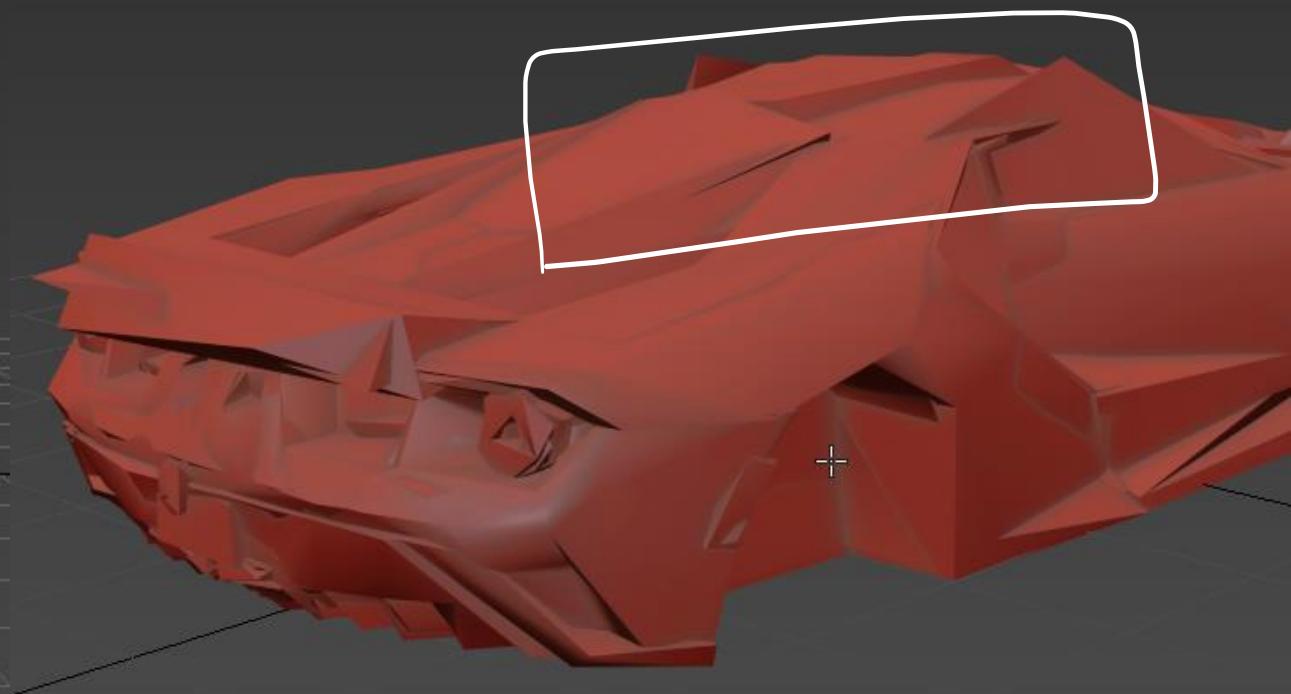
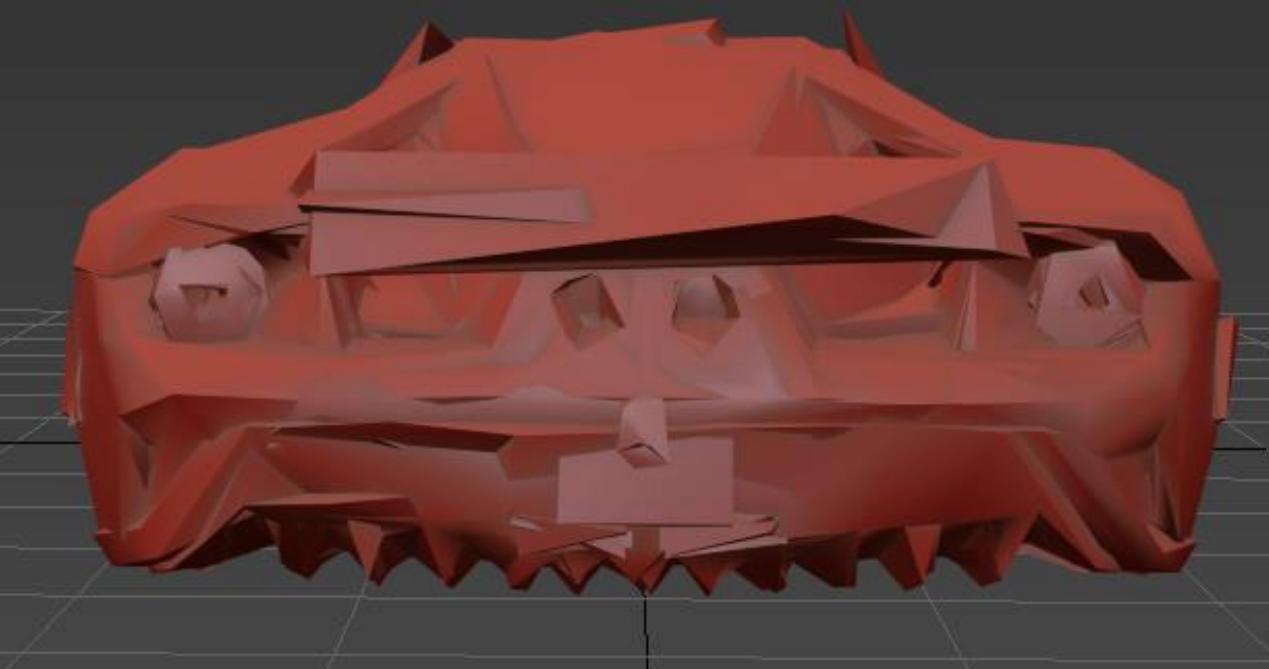
FPS: 107.930

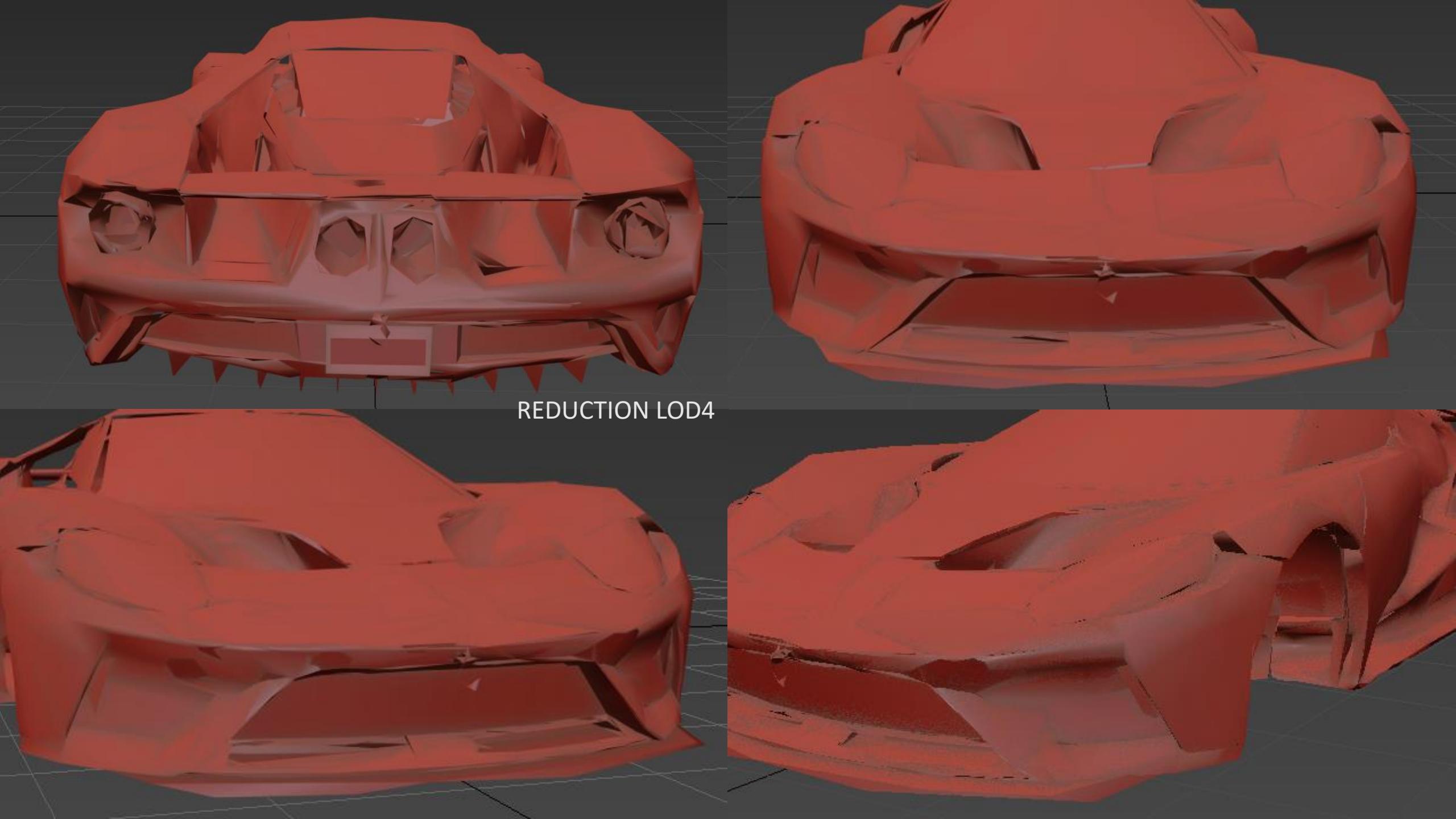


HAND RENDERED

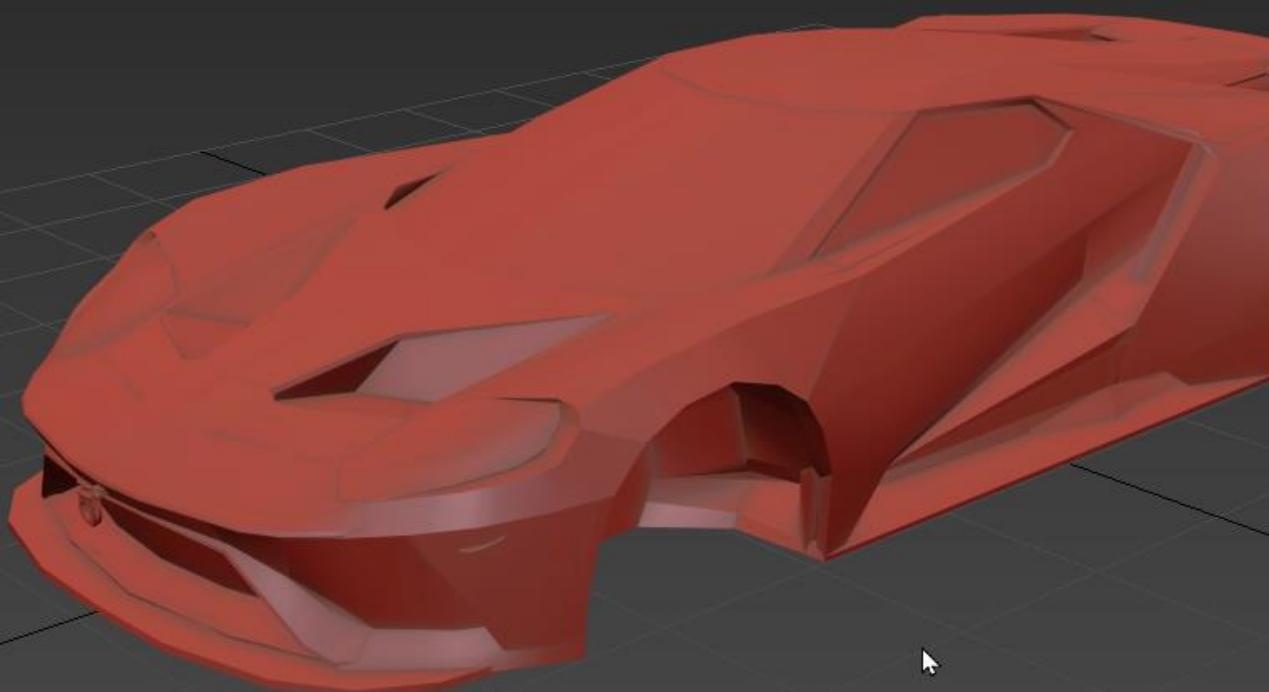


REMESHER LOD4

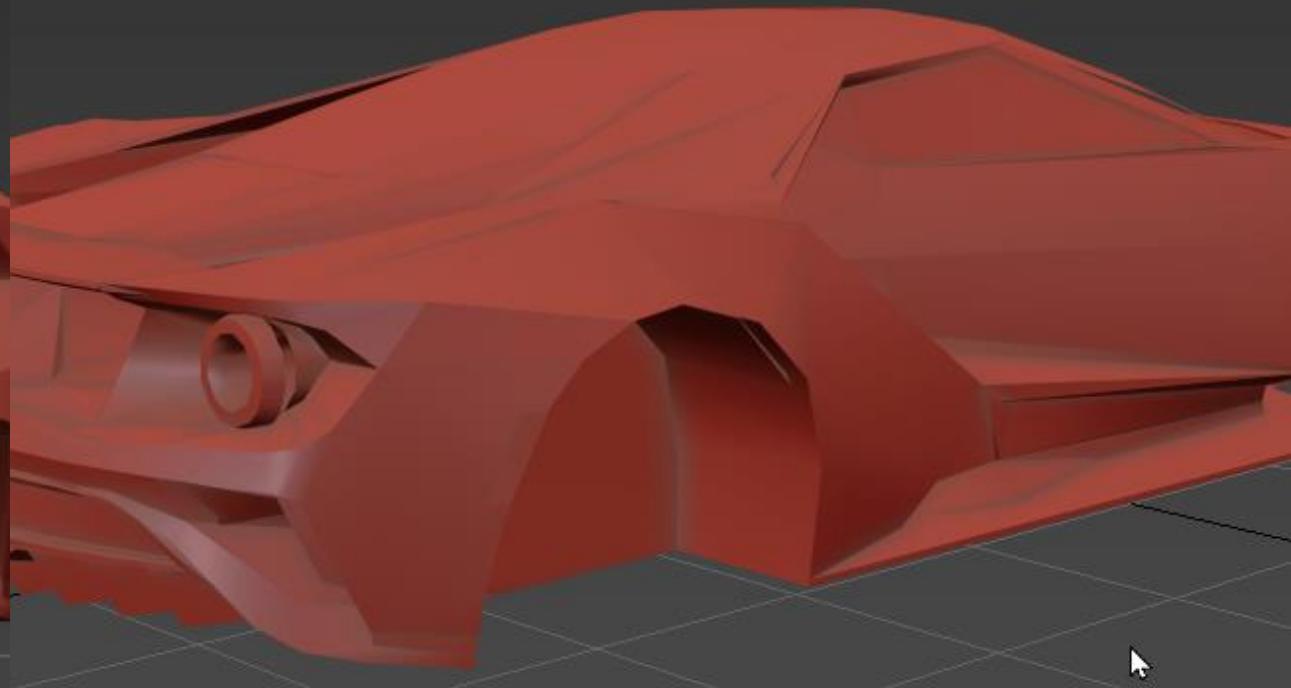
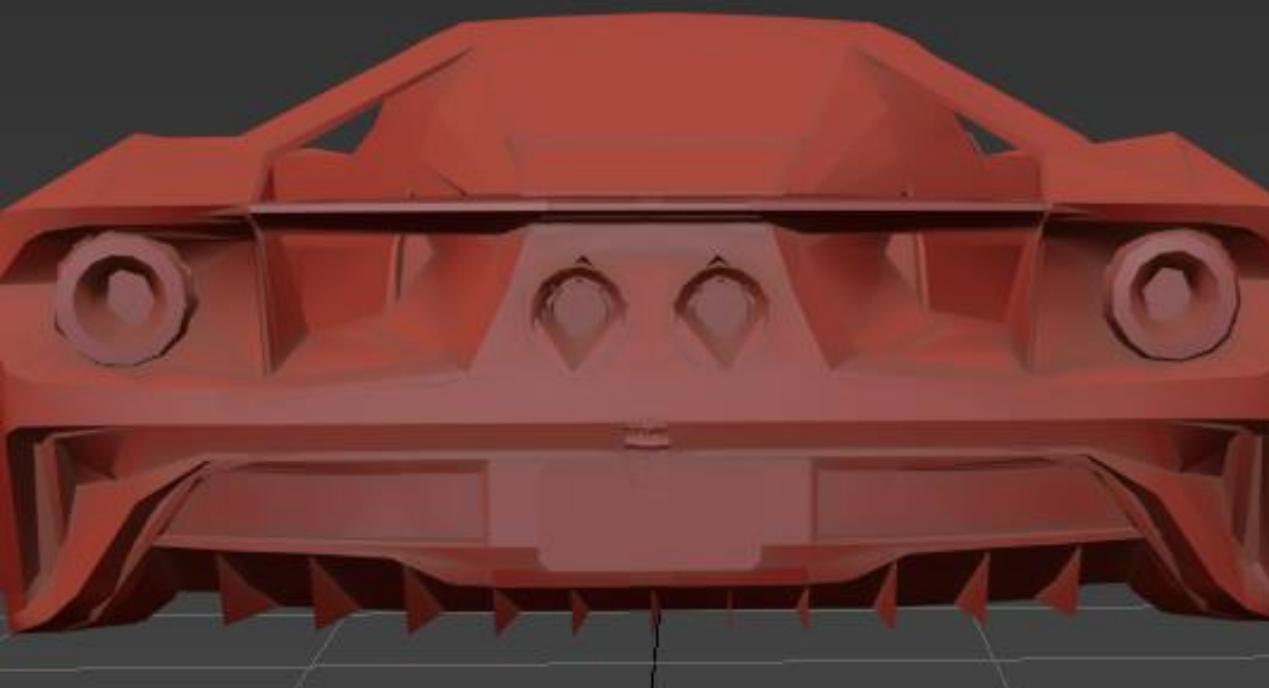


The image displays four perspective views of a low-poly dragon model, rendered in a reddish-orange color. The views are arranged in a 2x2 grid. The top-left view shows the front-left side of the dragon's head and neck, highlighting its mouth with sharp fangs and nostrils. The top-right view shows the back-right side of the dragon's head and neck. The bottom-left view shows the front-right side of the dragon's body, including its wing and tail. The bottom-right view shows the back-left side of the dragon's body. All views are set against a dark gray background.

REDUCTION LOD4



HAND LOD4



REMESHER LOD 5

75 Objects Sel

Polys: 2,240

Tris: 3,796

Edges: 5,029

Verts: 2,945

FPS: 29.948

72 Objects Sel

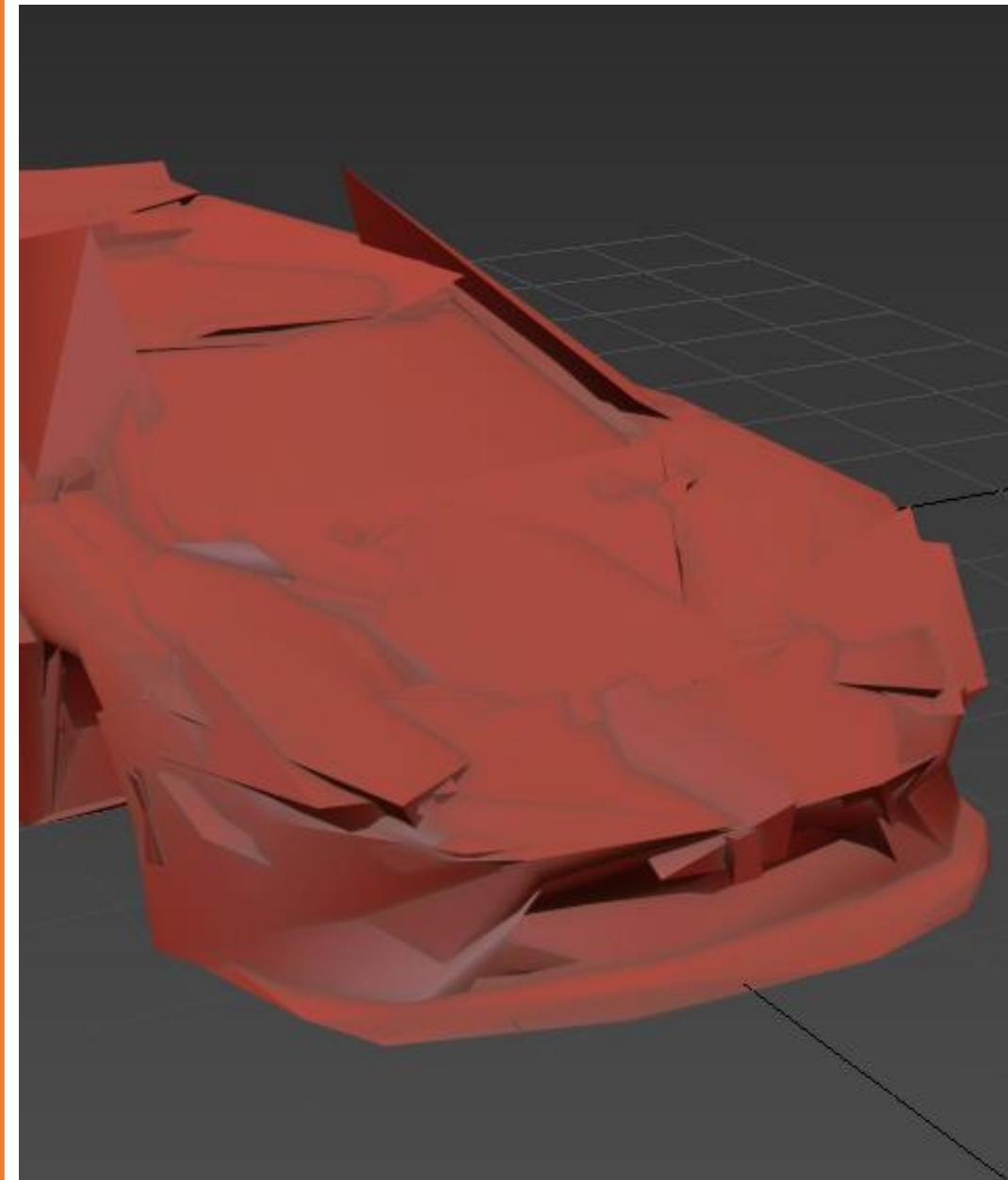
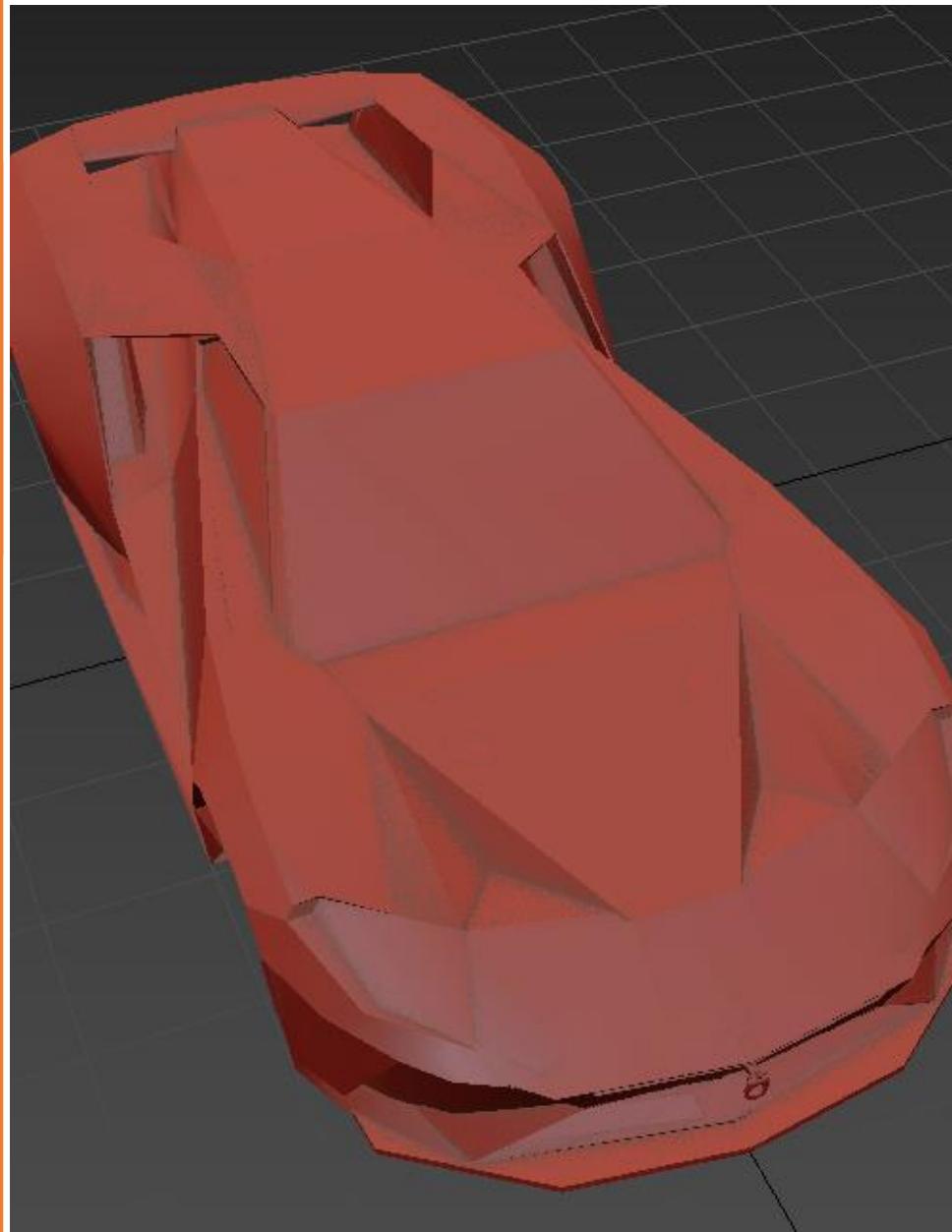
Polys: 3,119

Tris: 3,130

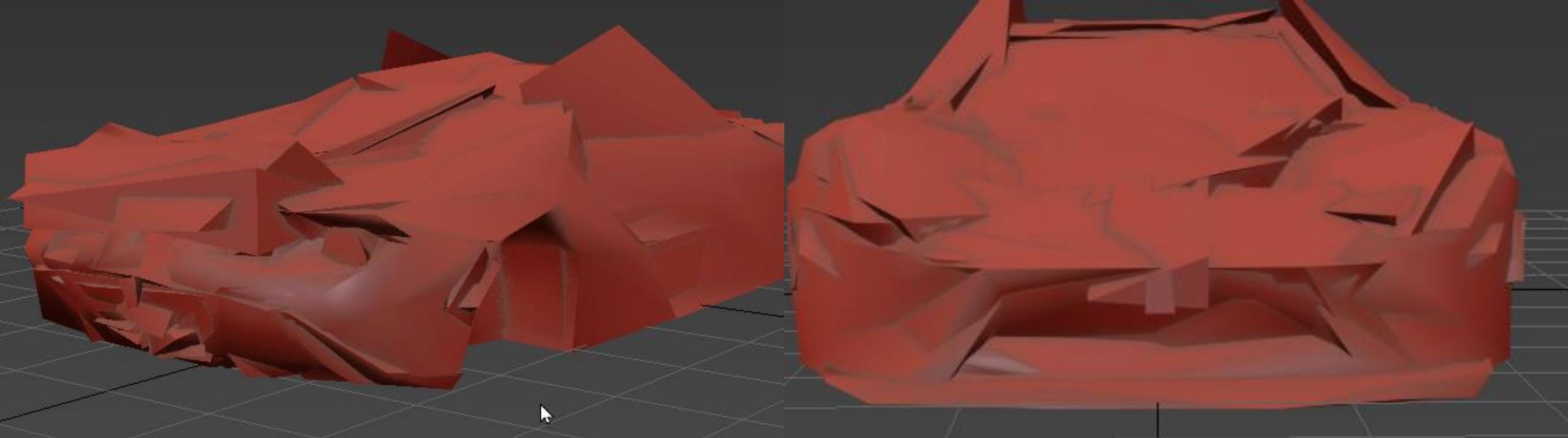
Edges: 4,699

Verts: 1,747

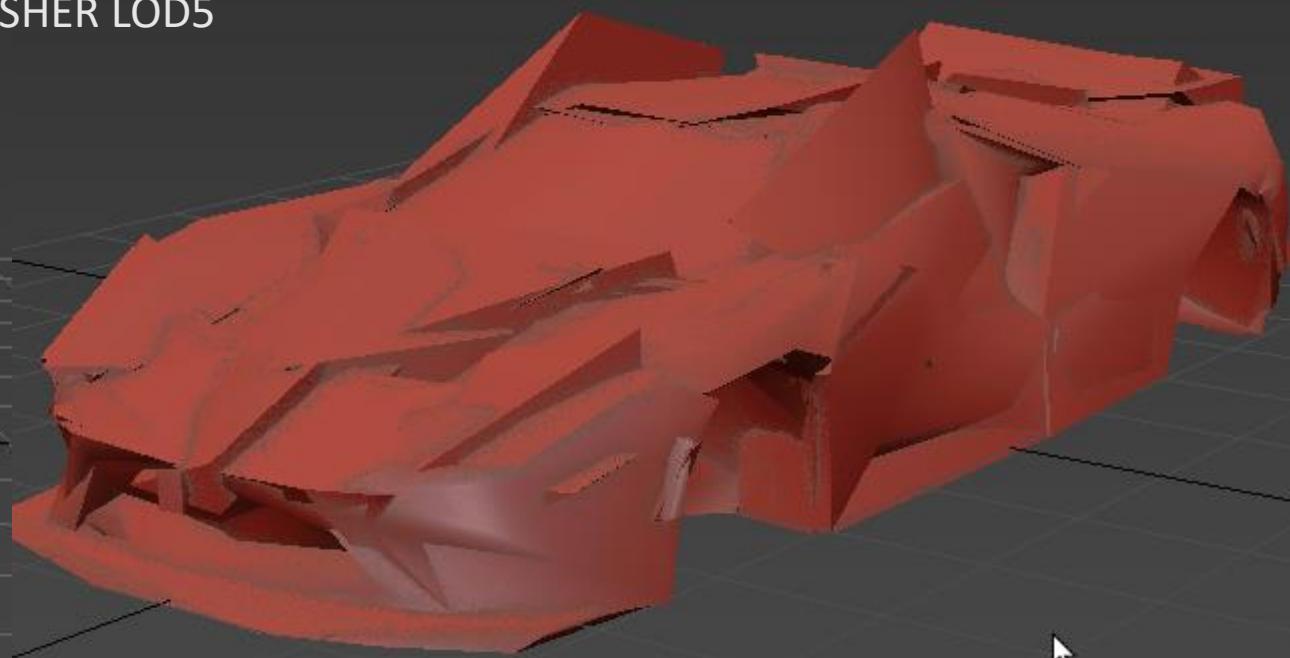
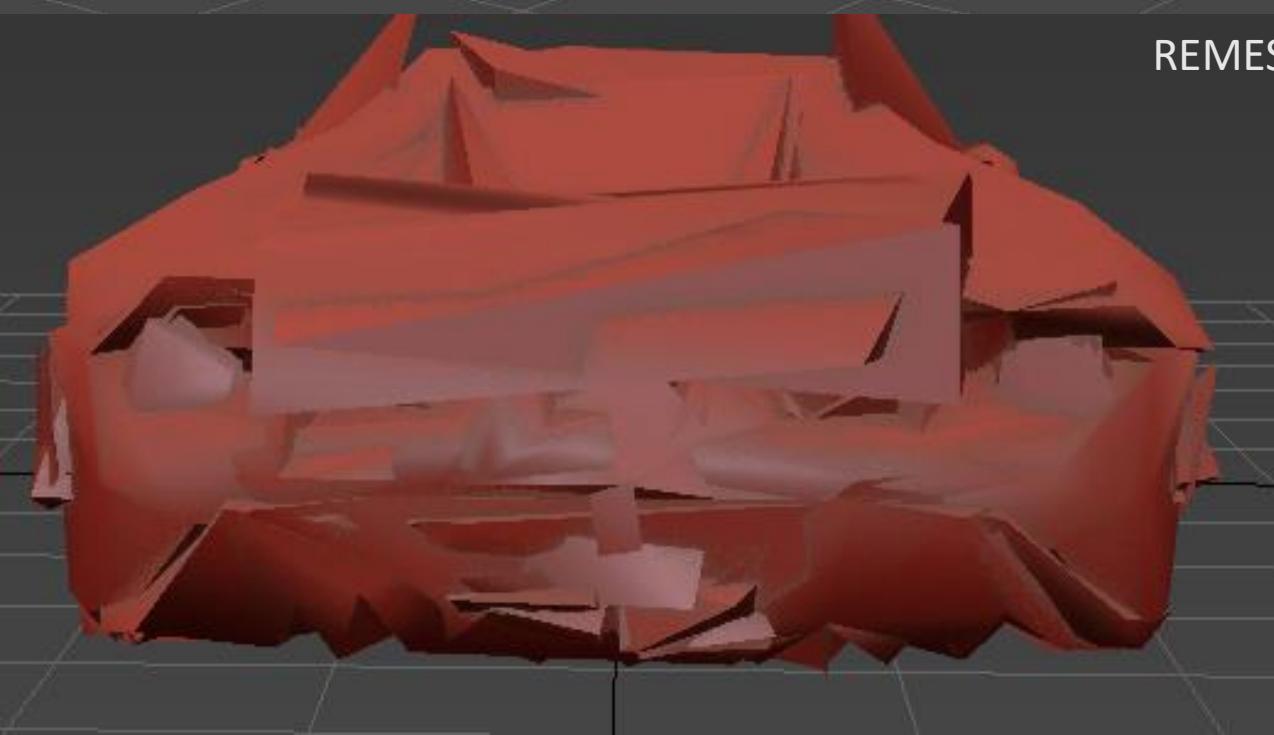
FPS: 101.430

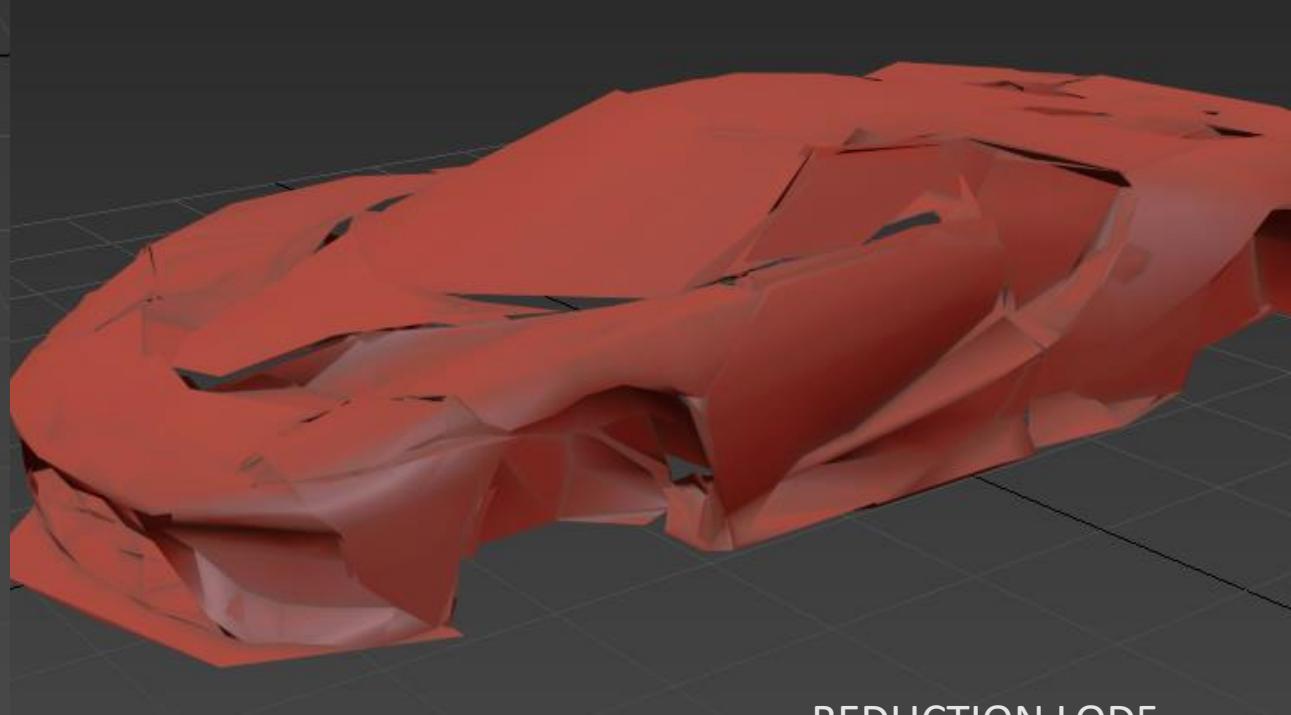
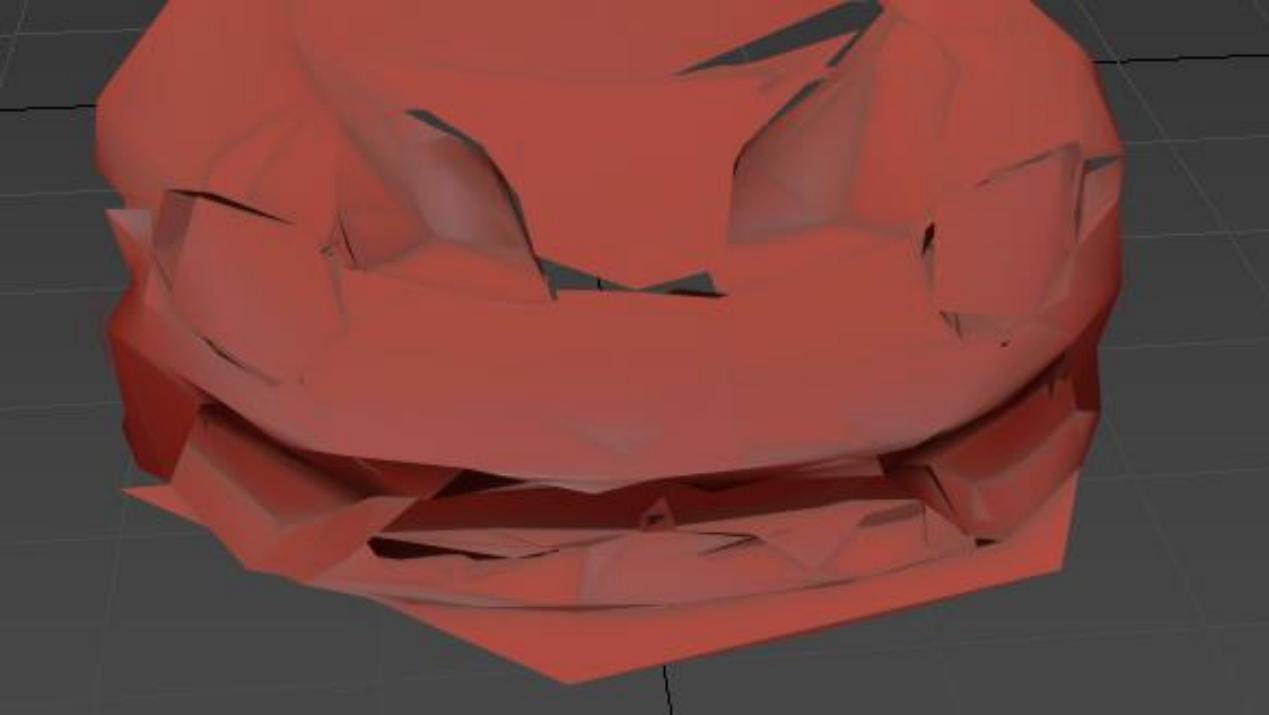


HAND RENDERED

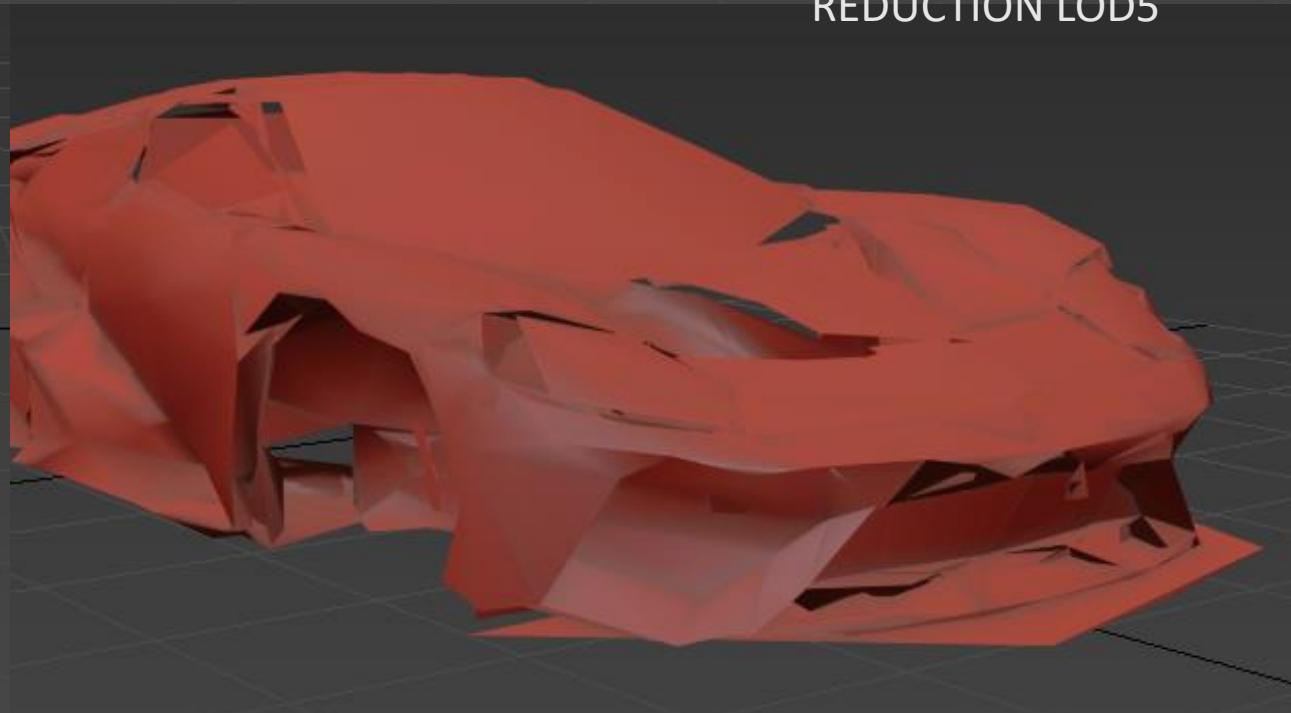
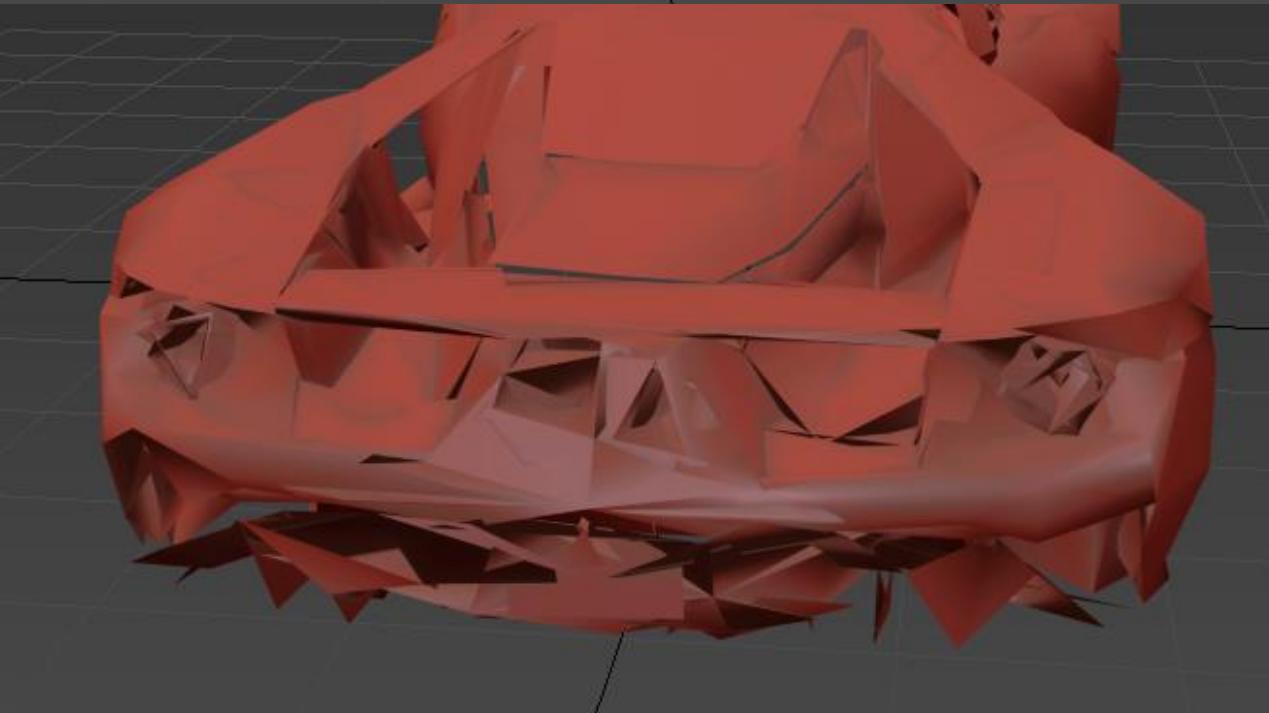


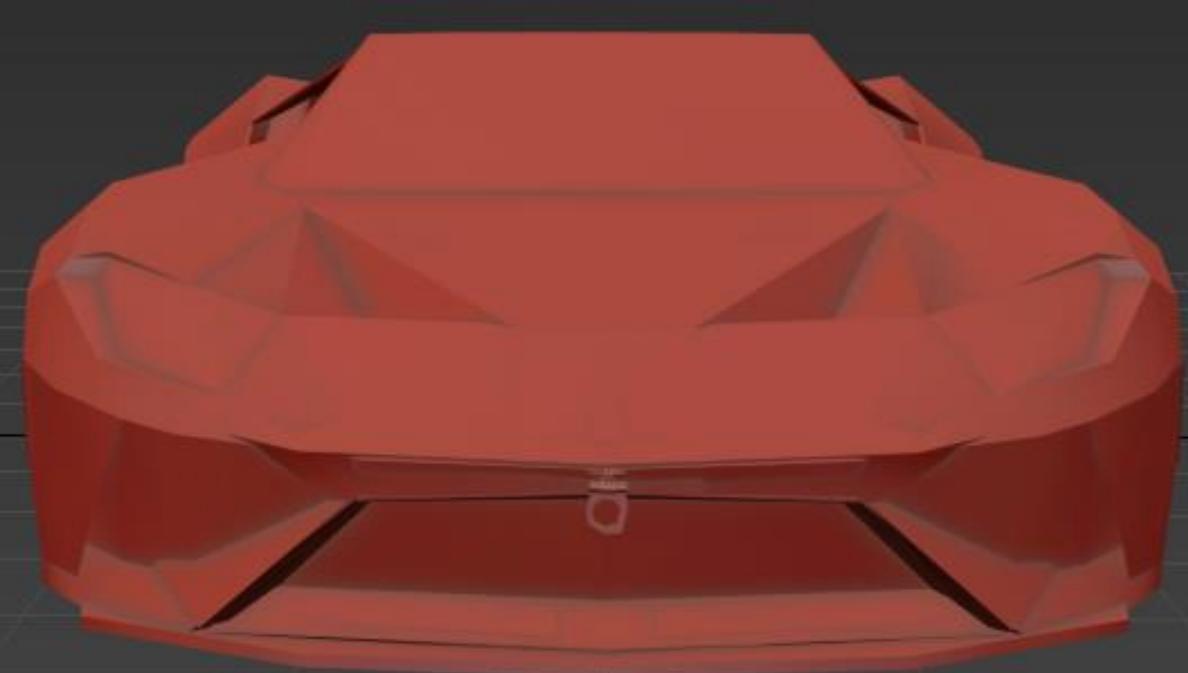
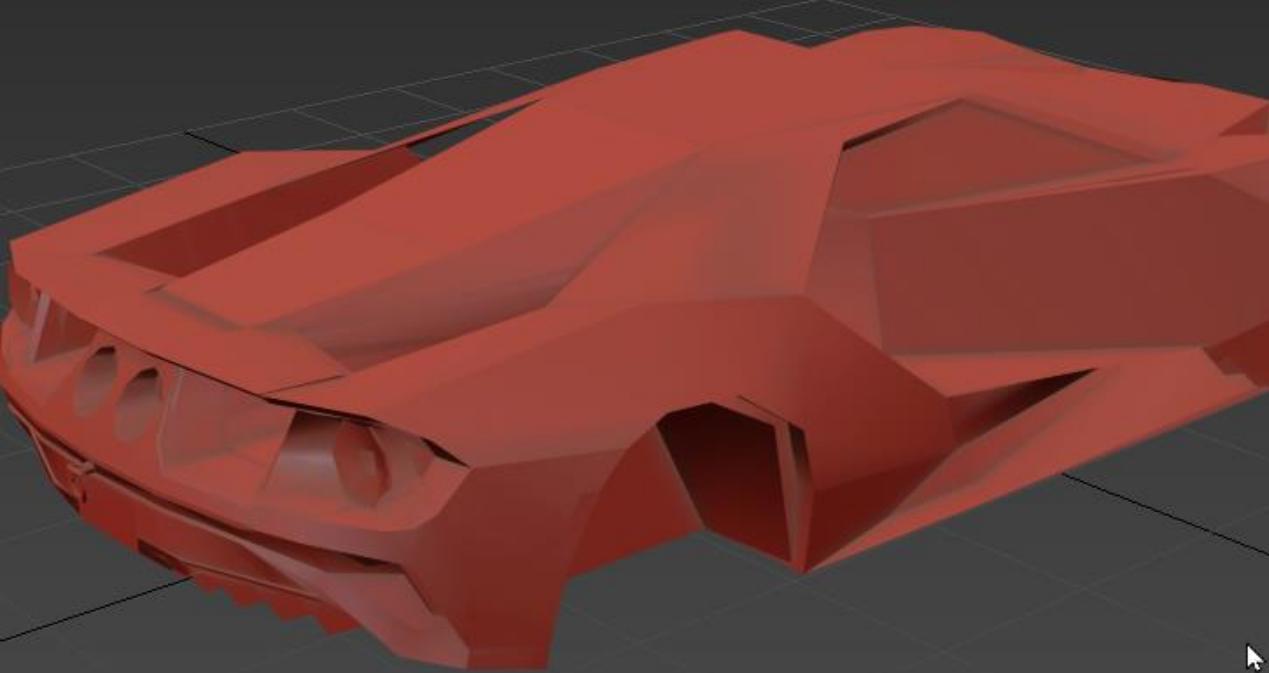
REMESHER LOD5



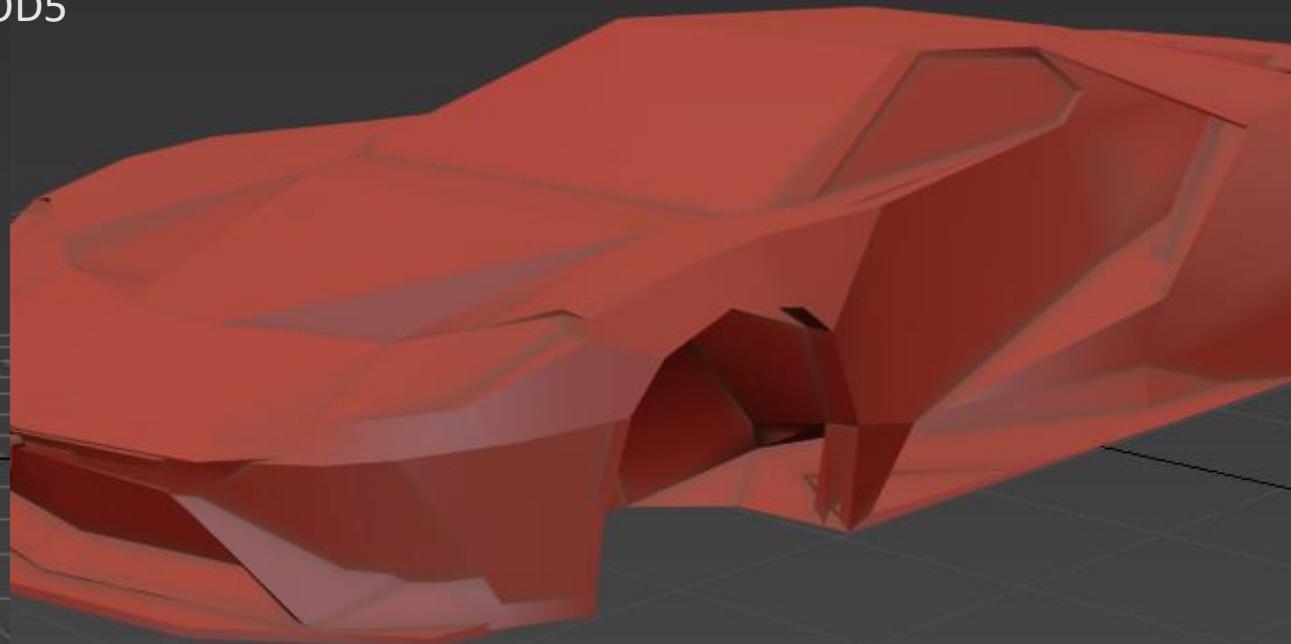
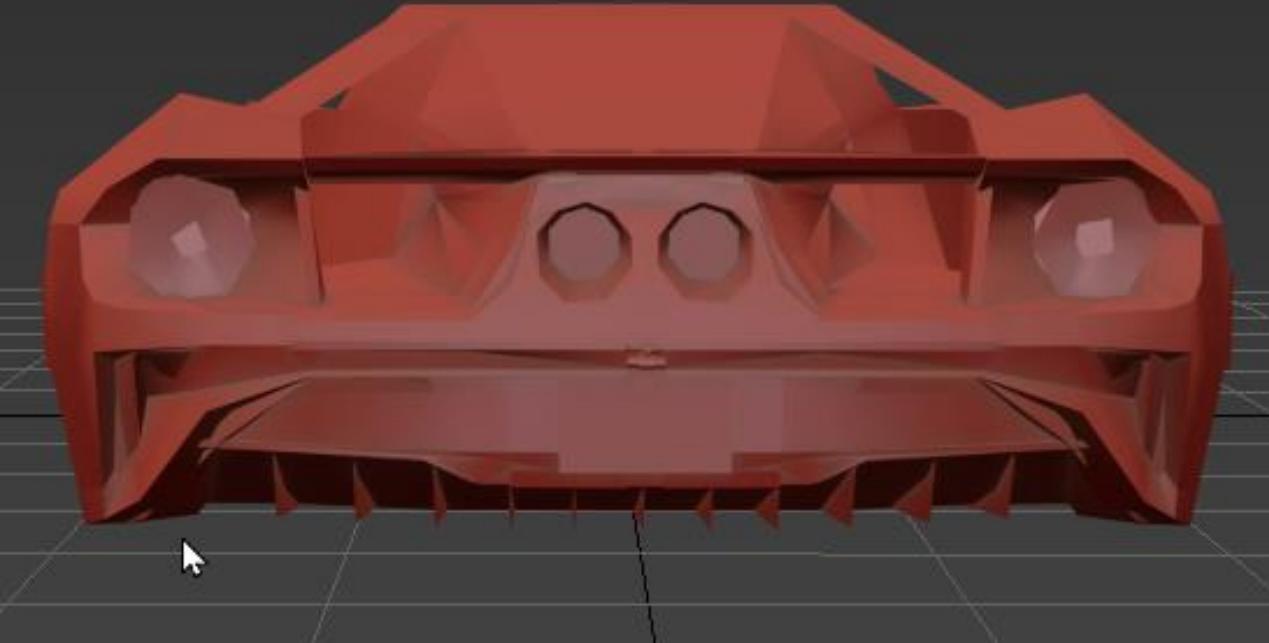


REDUCTION LOD5





HAND LOD5



Possible next steps - REMESHER version

- ✓ LOD1 and 2 have acceptable if not usable results

Cons:

- UV need more research.
- LOD 3, 4 and 5 when processed separately have weird geometry sticking out
- Using as is won't disrupt the pipeline – but in its current state it is not usable
- Processed together – better result
- Needs to be integrated into the build process.

BEST of BOTH - HYBRID

Reduction – LOD1 & LOD2

Remesh - LOD3, LOD4 & LOD5

Why: Simplygon LOD's better as a whole car as opposed to parts.

LOD 1

122 Objects Selected

Polys: 36,978

Tris: 67,947

Edges: 76,647

Verts: 39,999

FPS: 48.710

174 Objects Selected

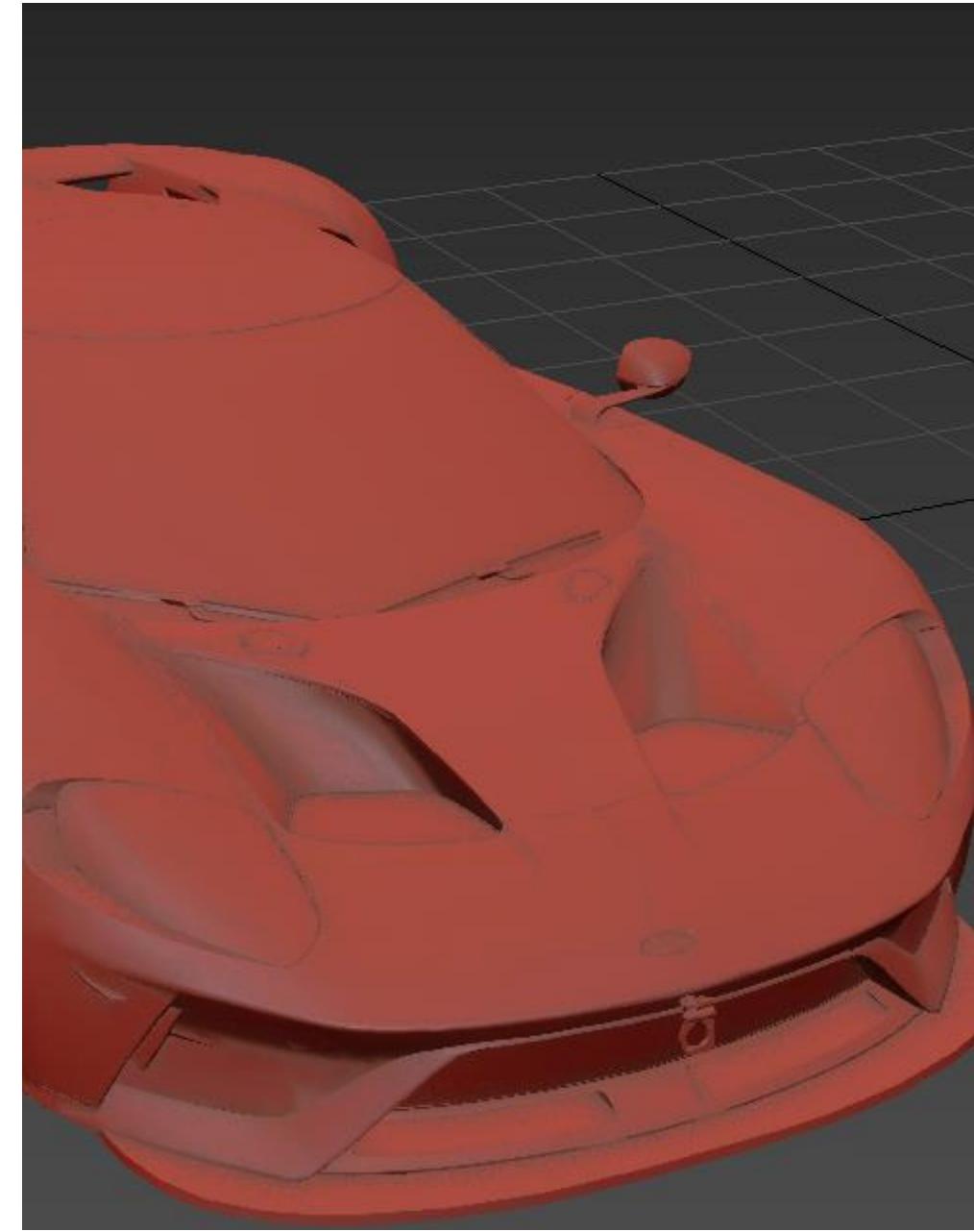
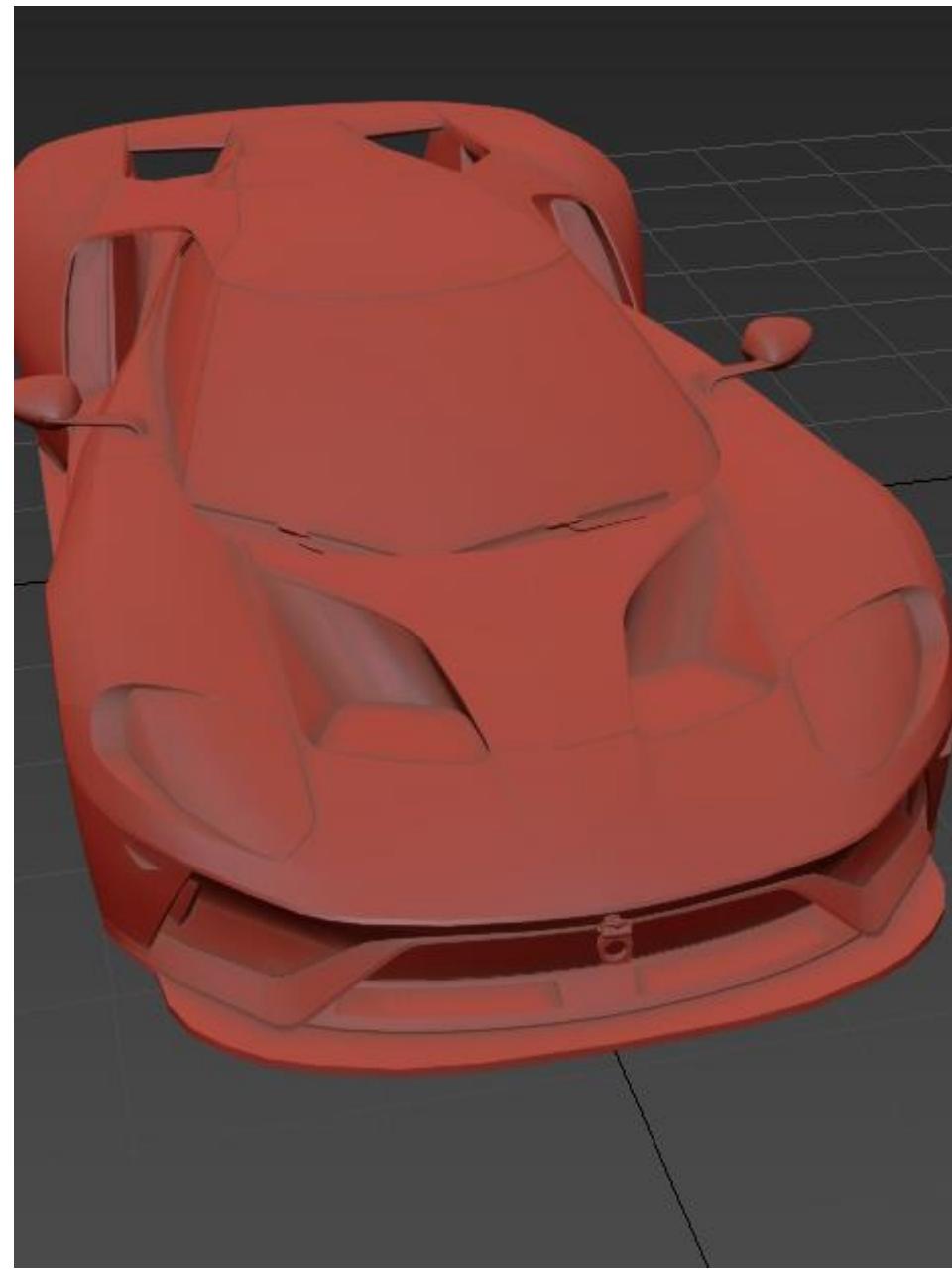
Polys: 63,419

Tris: 63,419

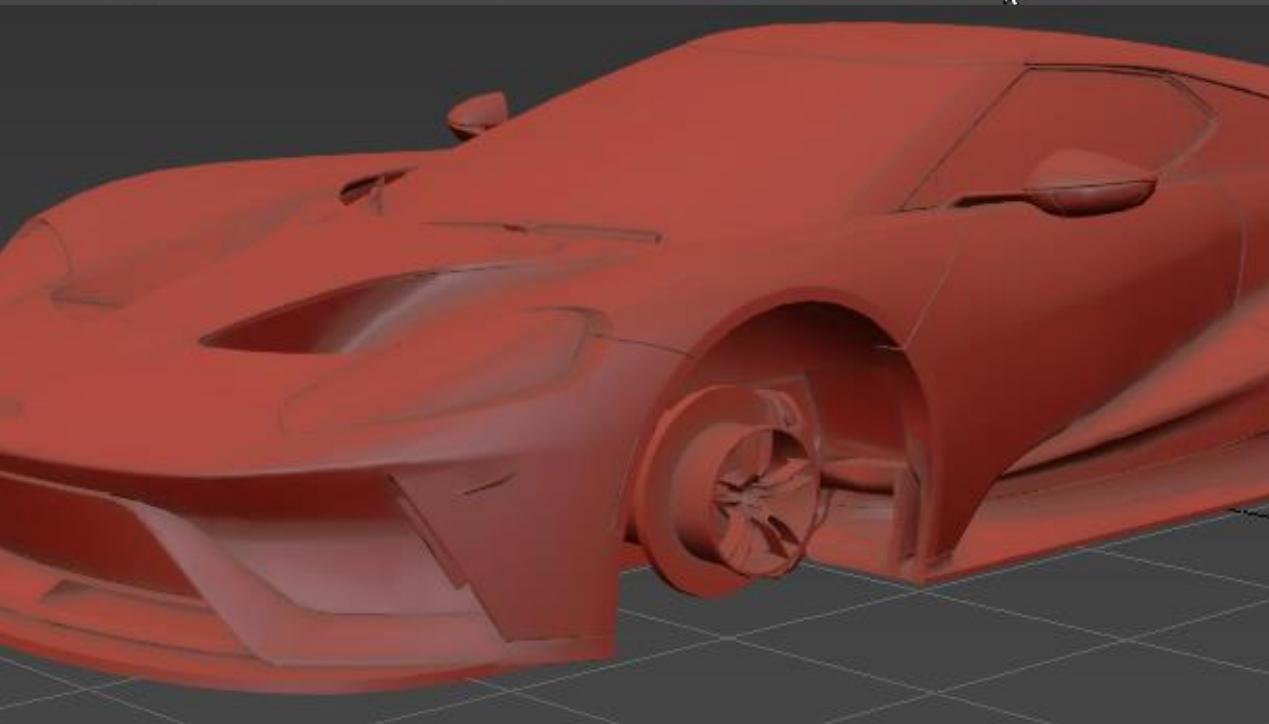
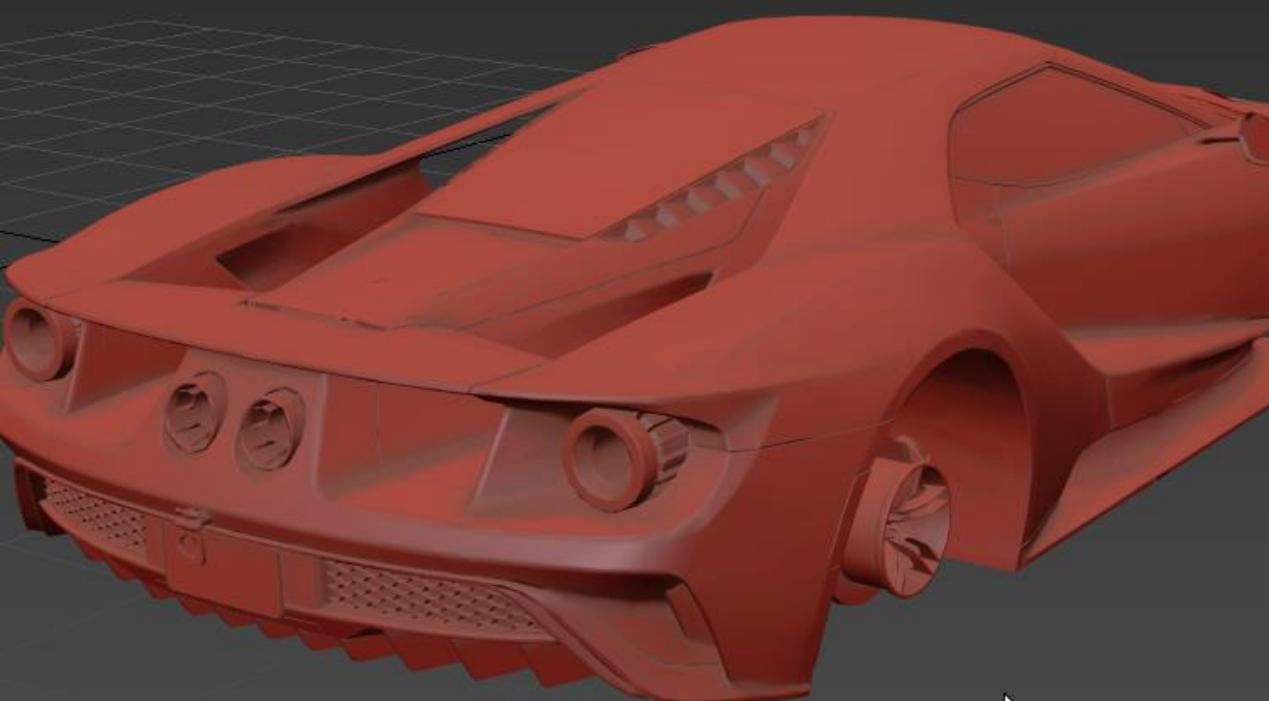
Edges: 190,257

Verts: 41,703

FPS: 229.959



HAND RENDERED



LOD 2

116 Objects Selected

Polys: 18,377

Tris: 32,735

Edges: 38,055

Verts: 19,946

FPS: 53.294

174 Objects Selected

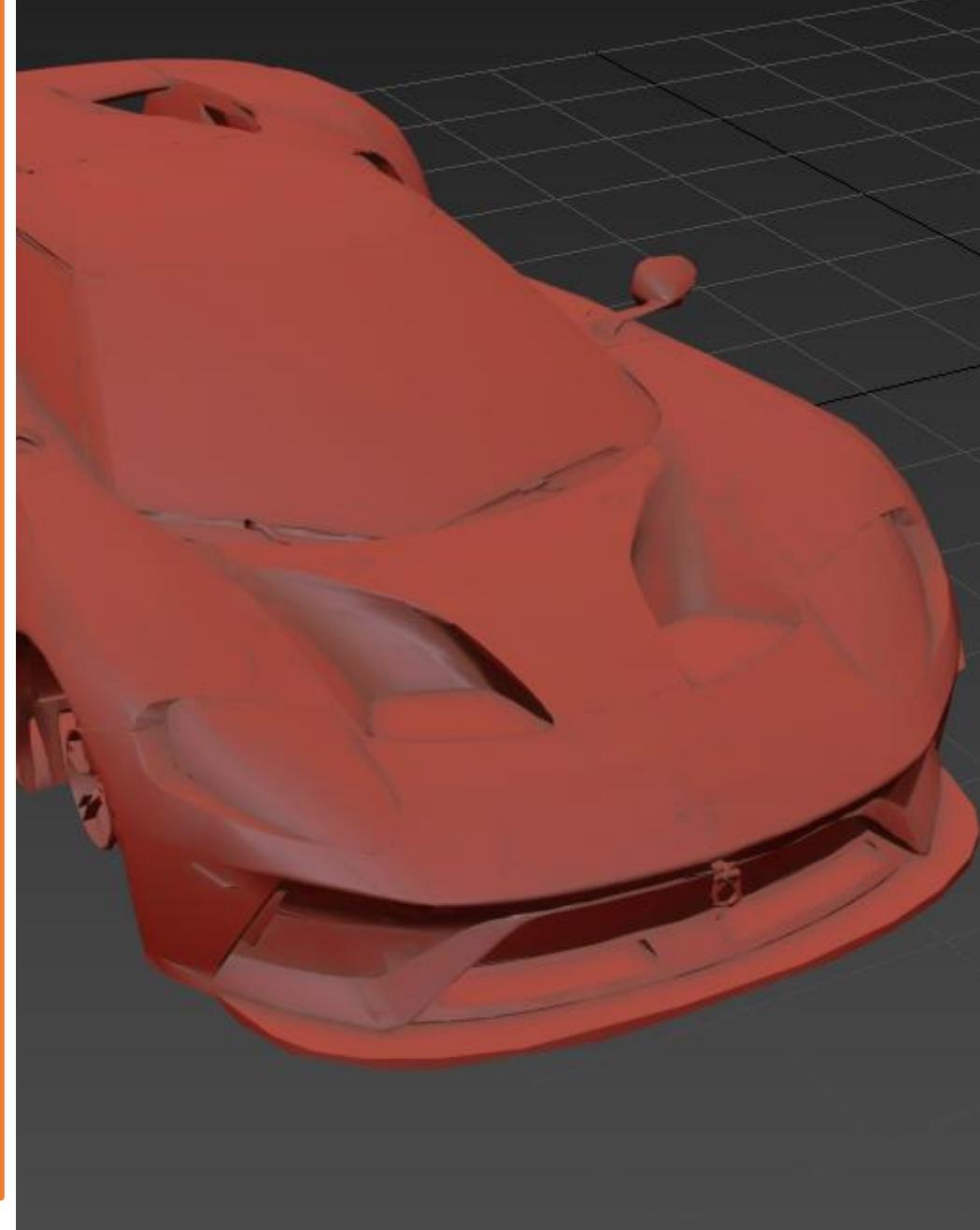
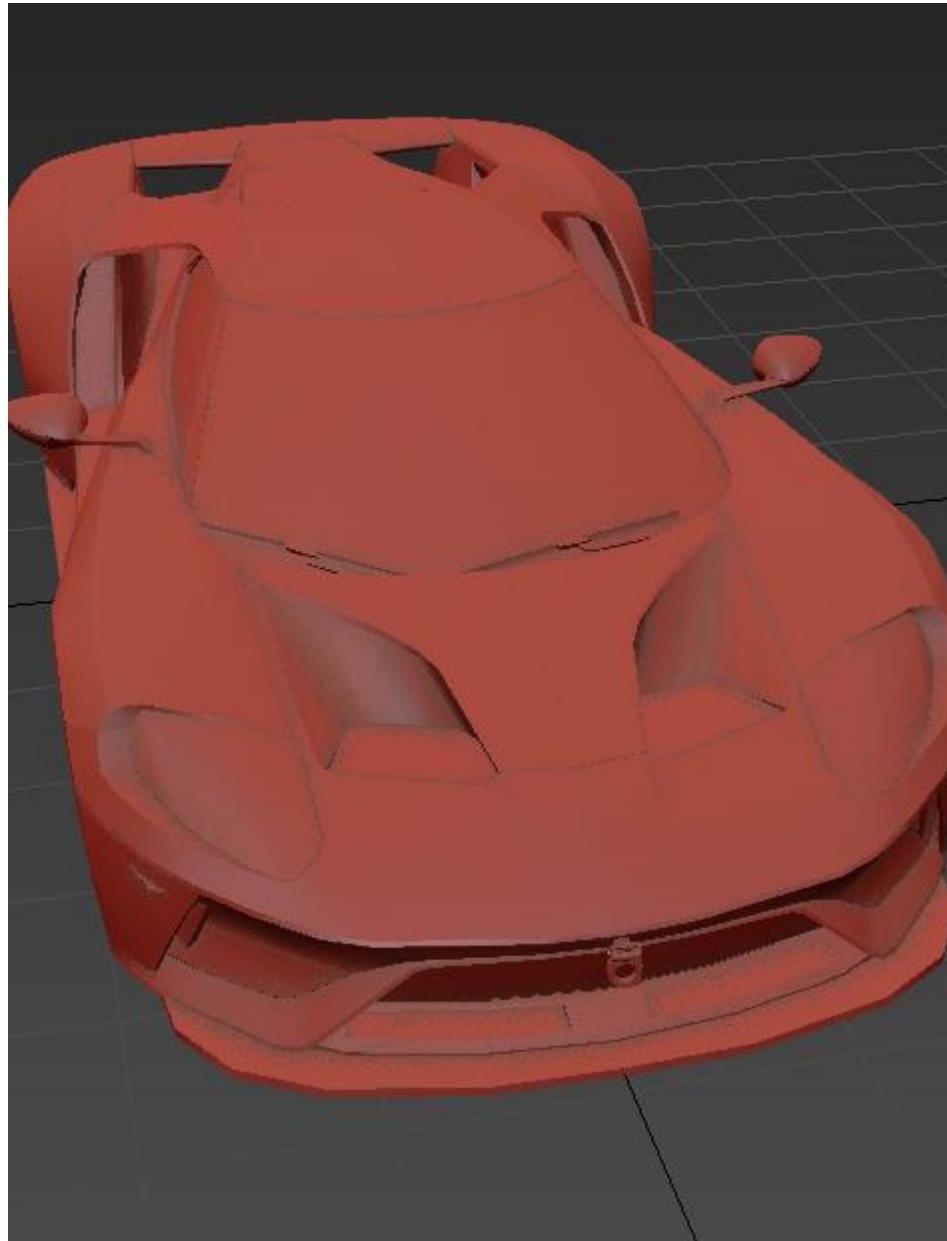
Polys: 31,703

Tris: 31,703

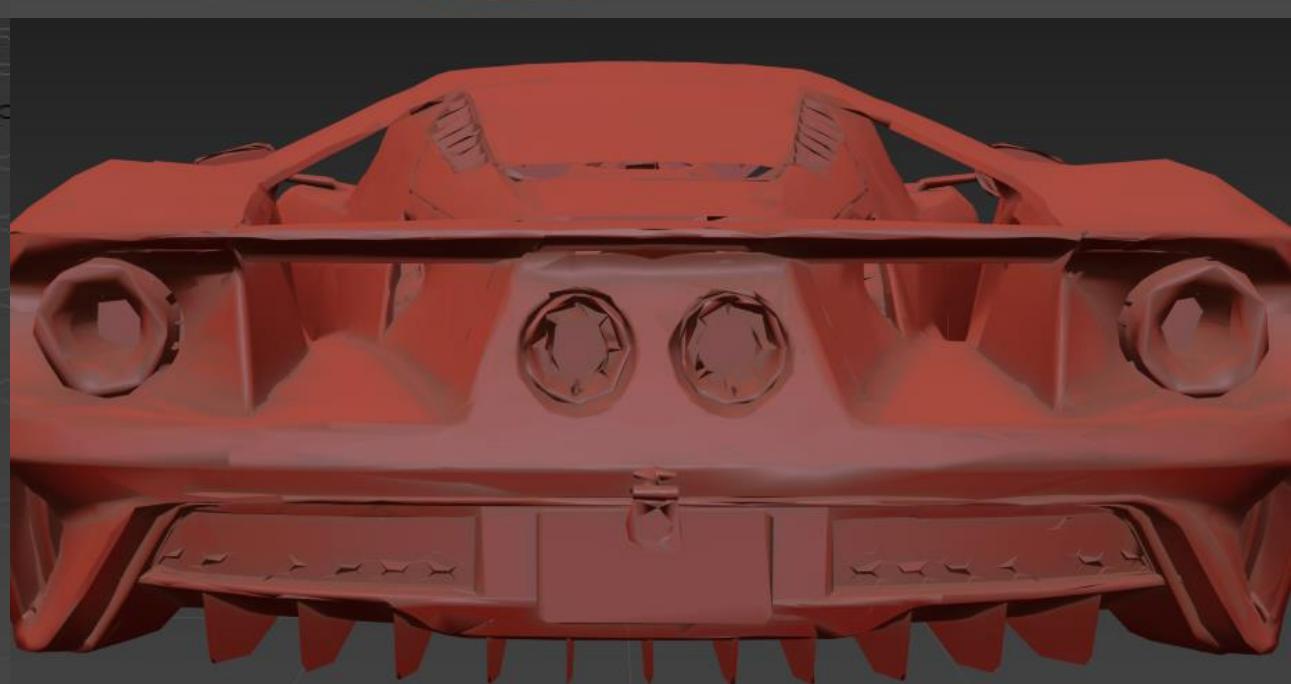
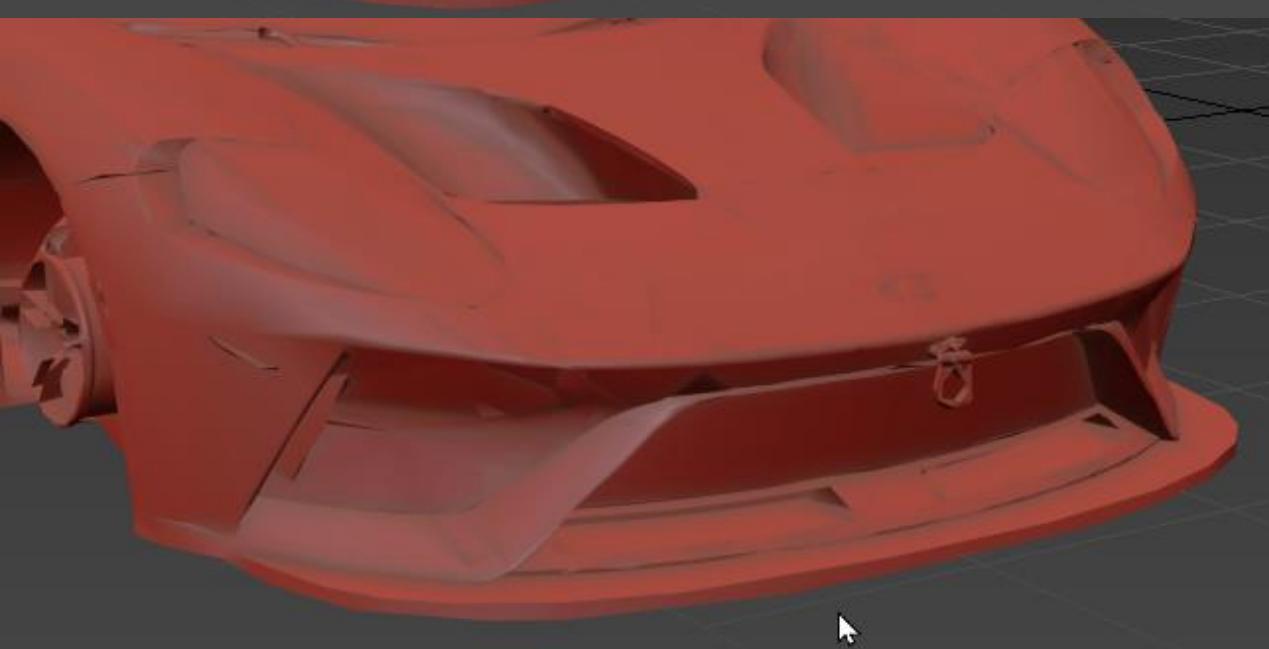
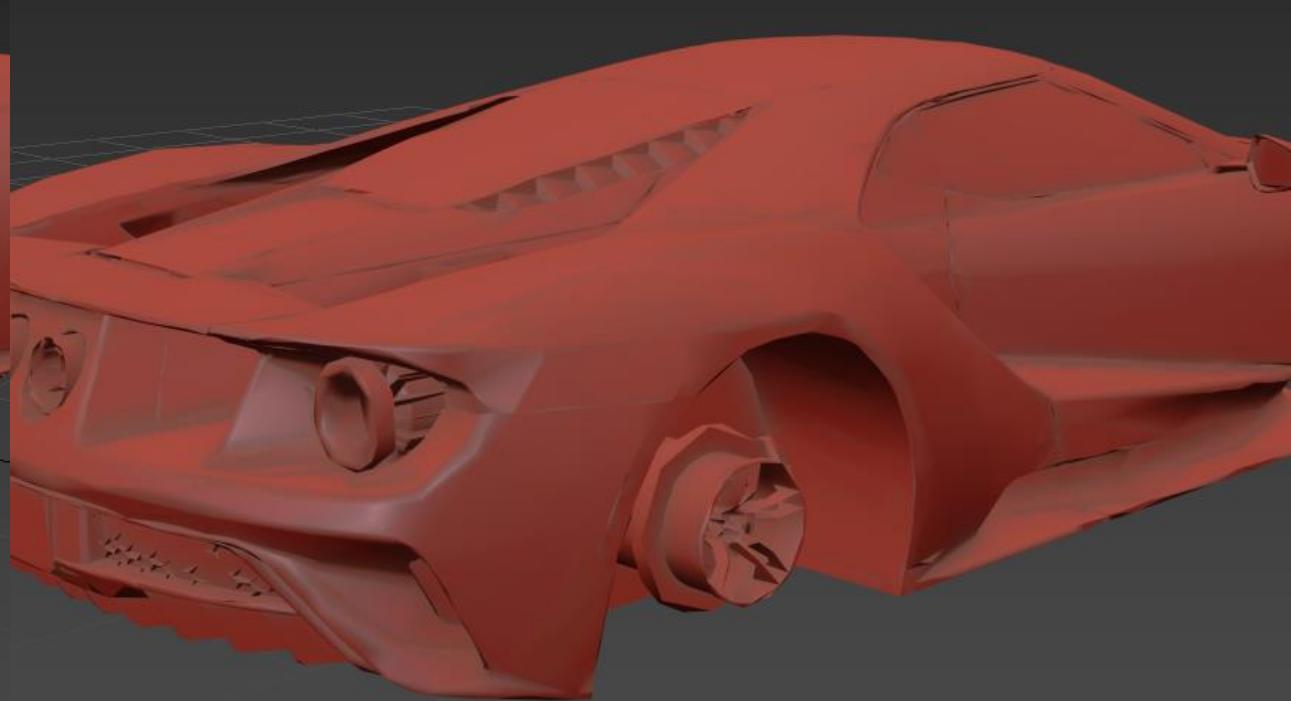
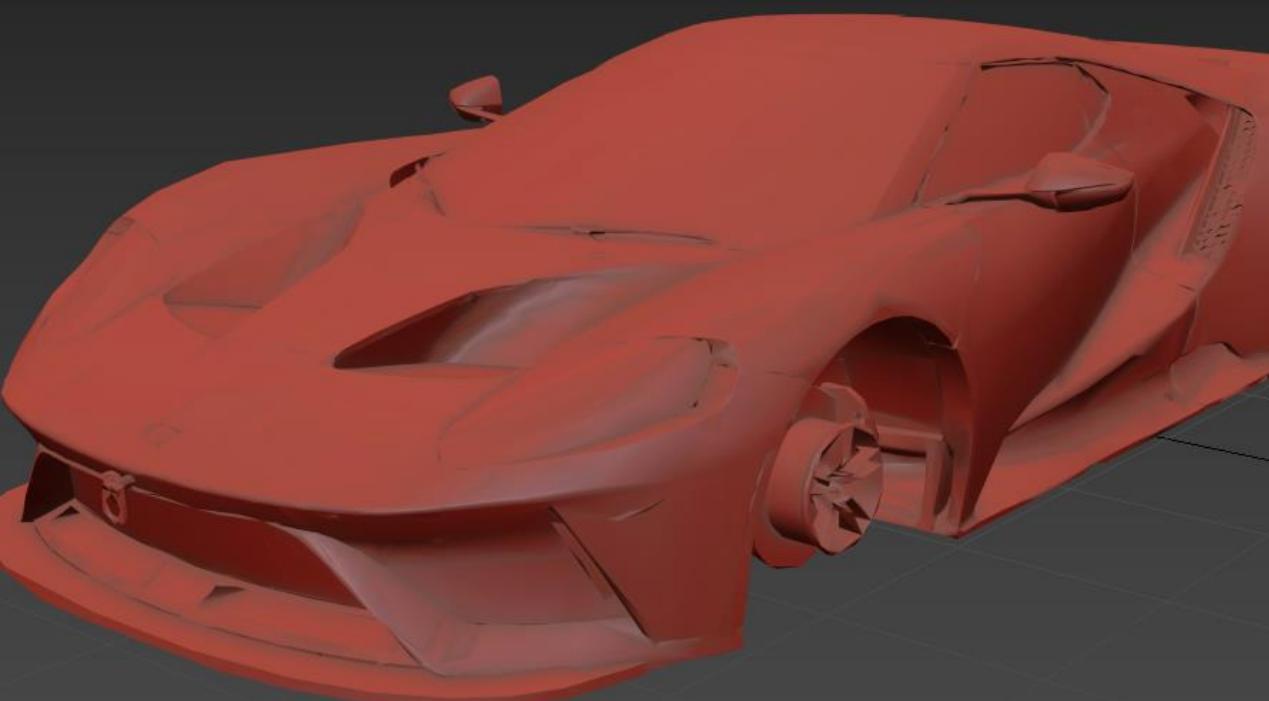
Edges: 95,109

Verts: 20,116

FPS: 50.830



HAND RENDERED



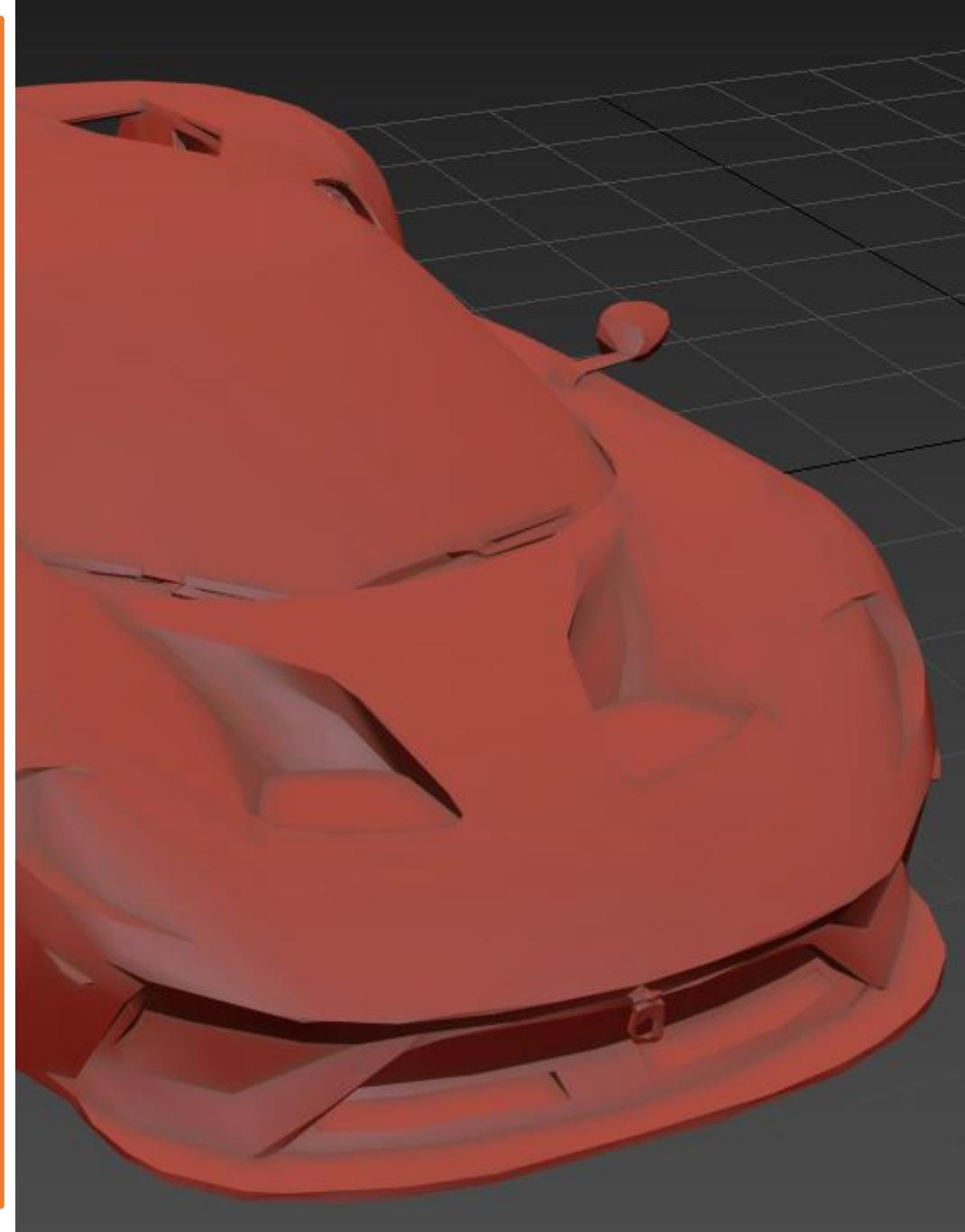
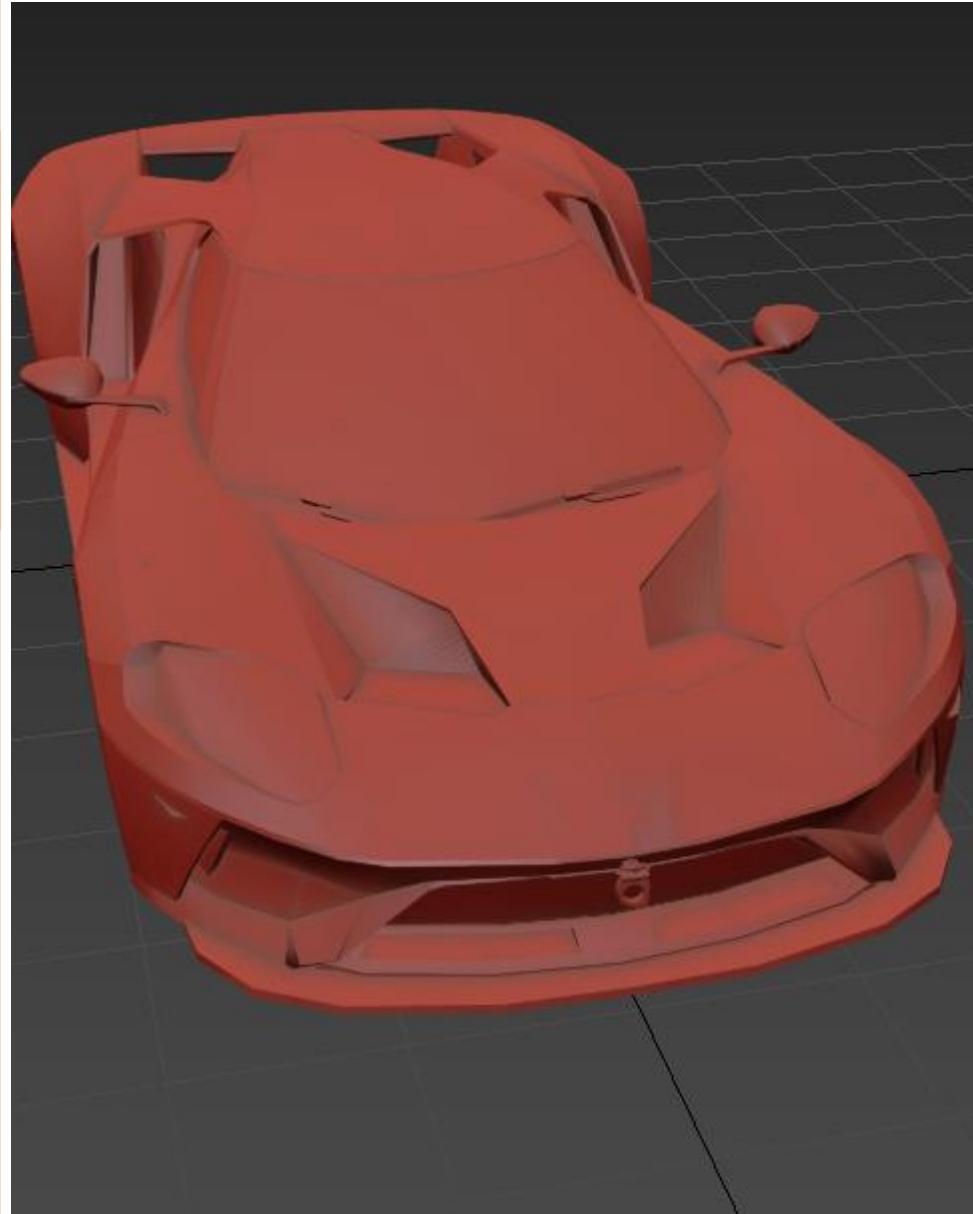
LOD 3

107 Objects Sel
Polys: 11,628
Tris: 20,383
Edges: 24,335
Verts: 12,902

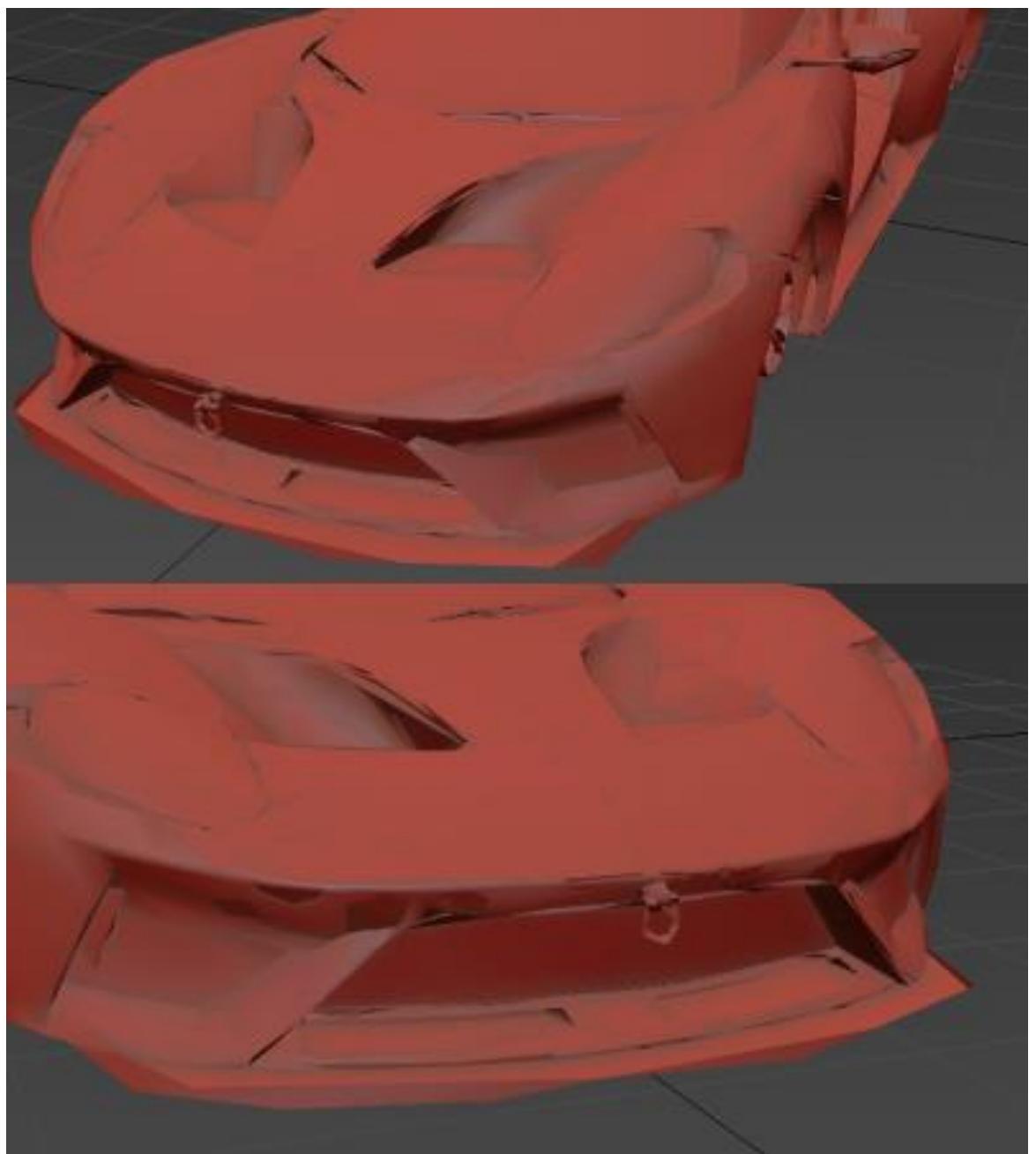
FPS: 67.601

RemeshedGeometry
Polys: 13,364
Tris: 13,364
Edges: 40,092
Verts: 6,340

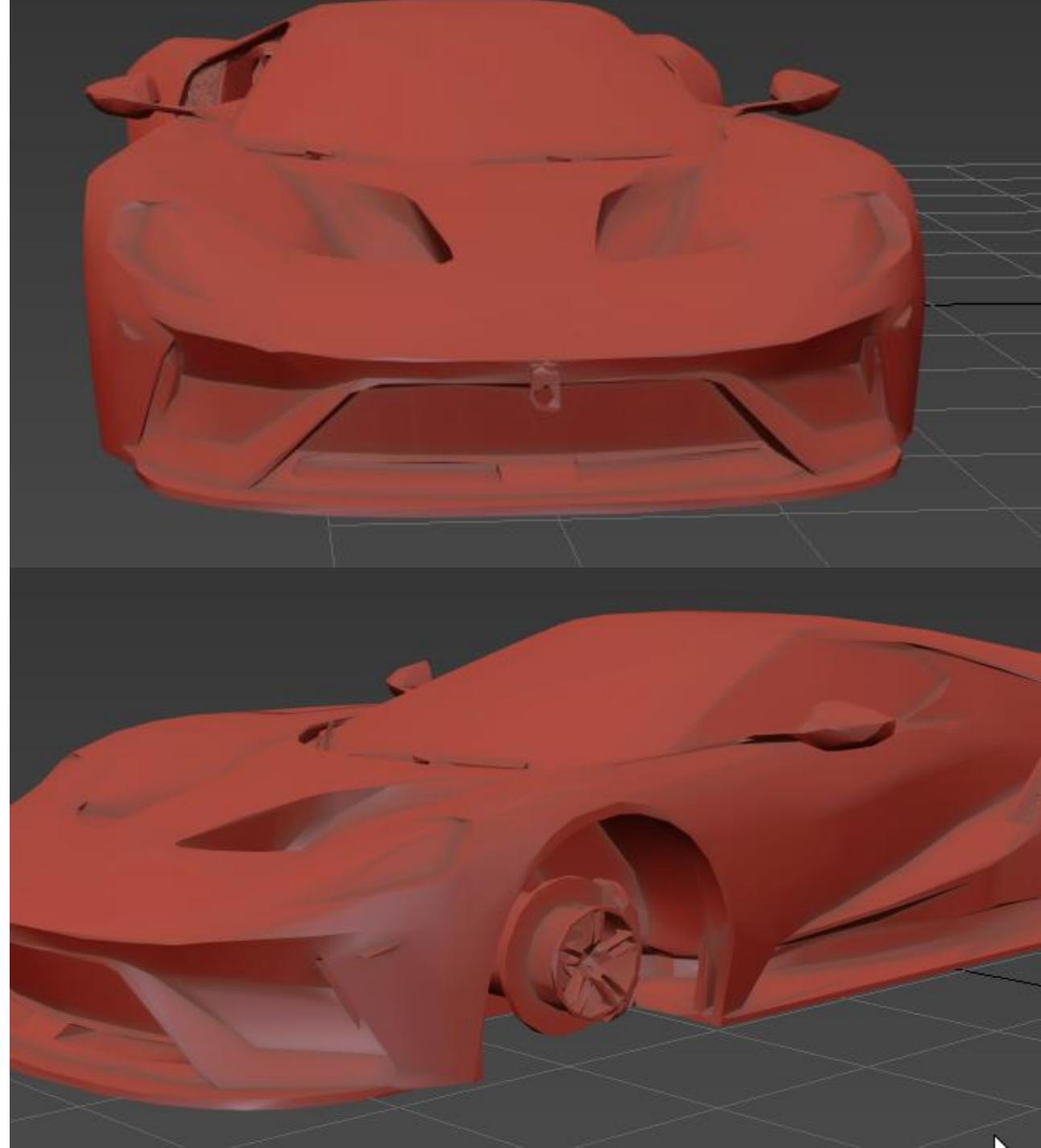
FPS: 340.553

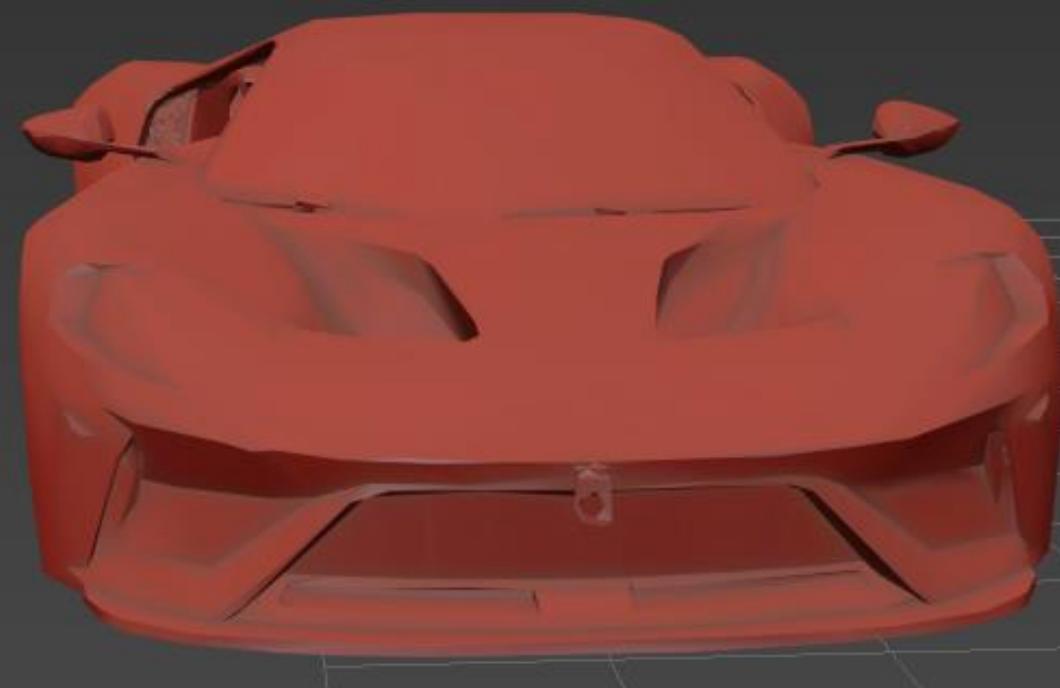
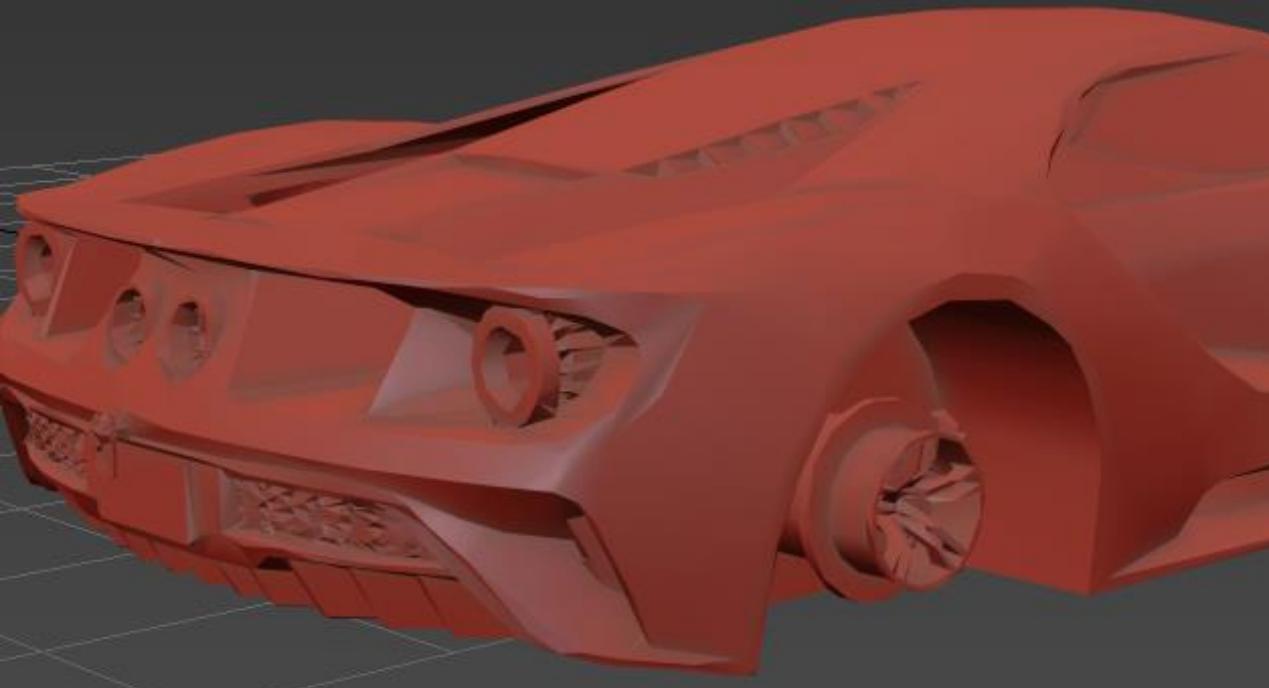


HAND RENDERED

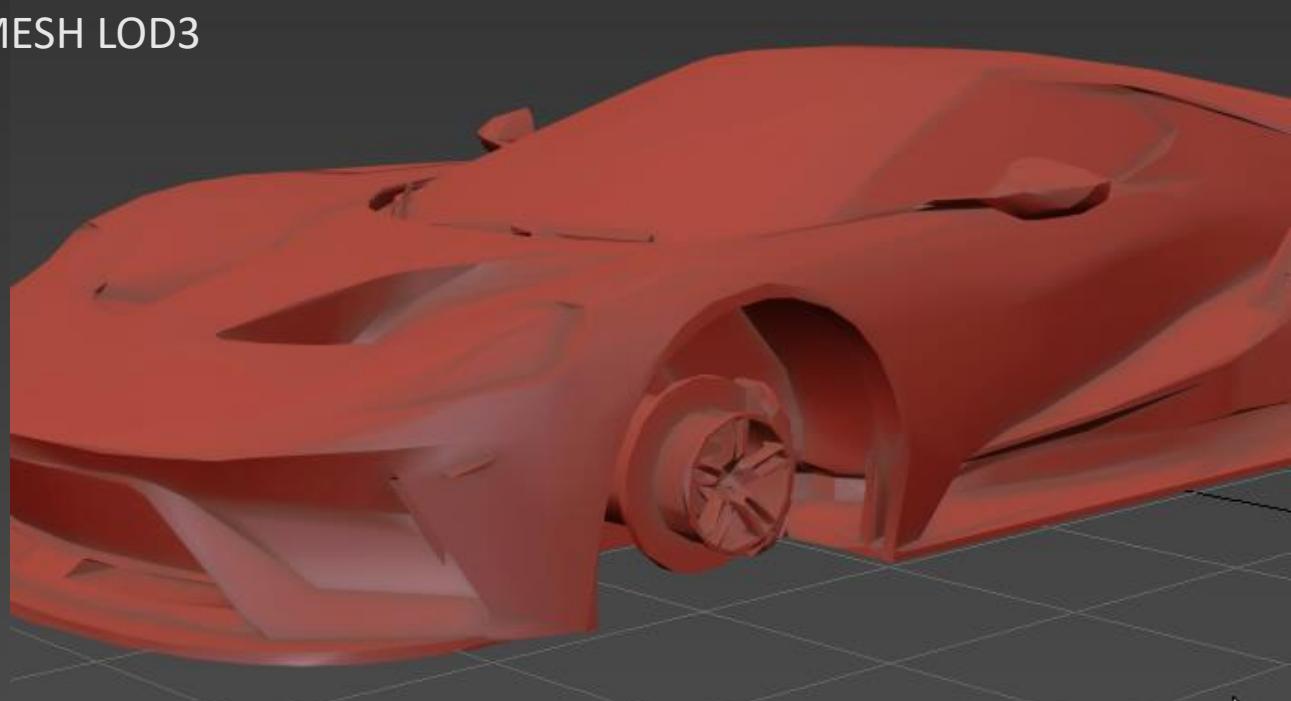
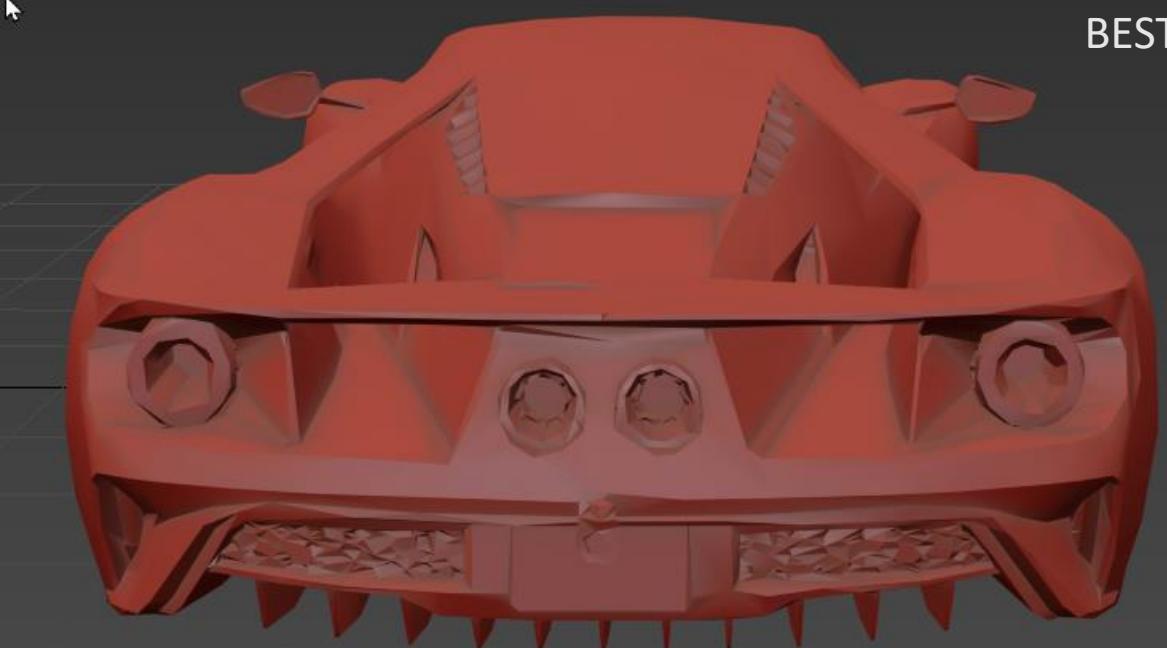


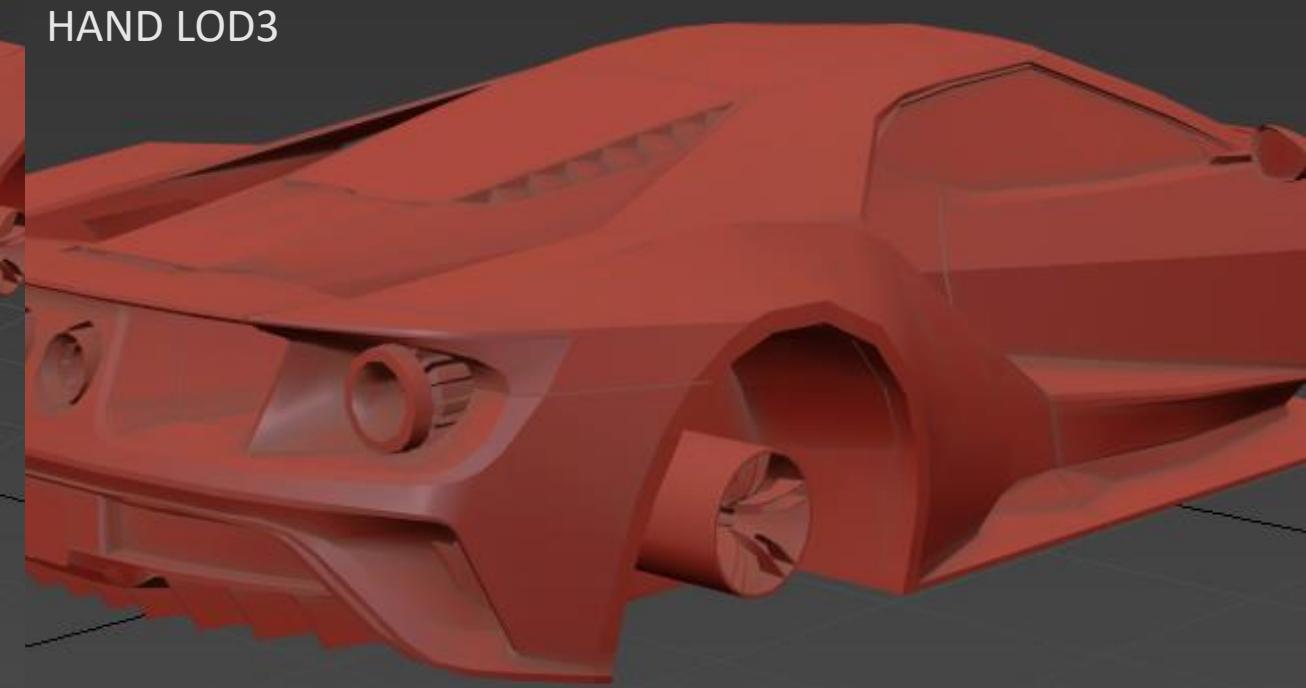
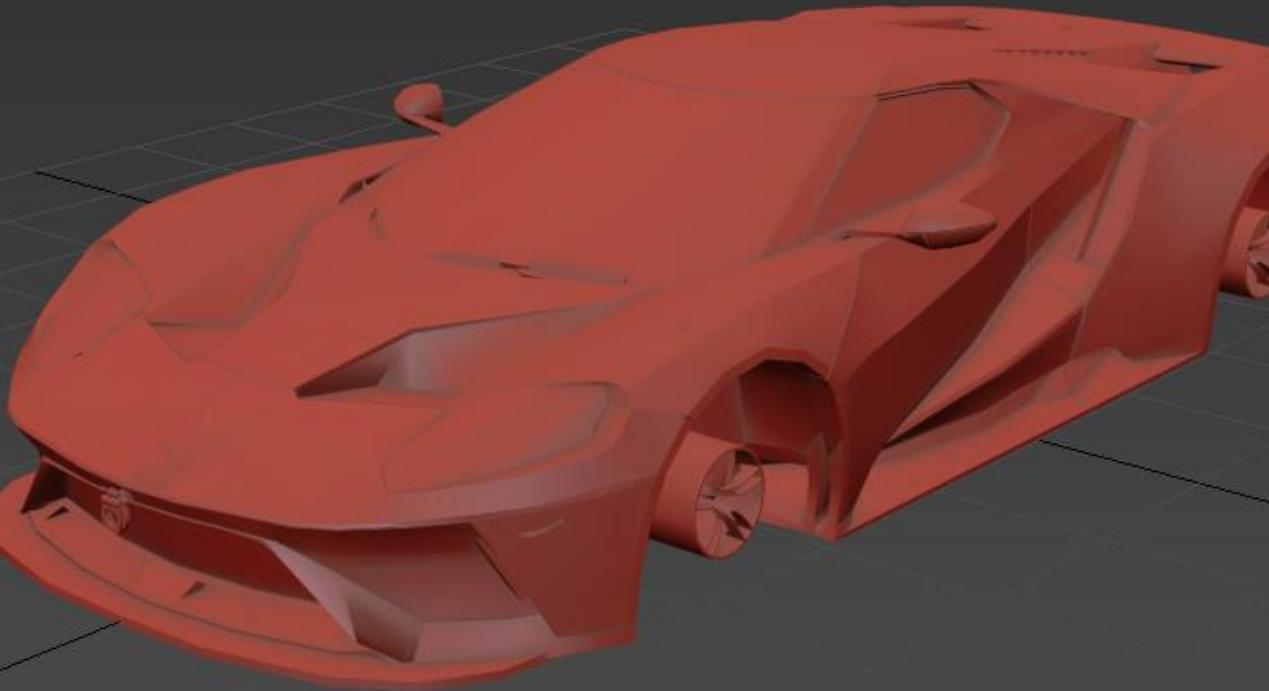
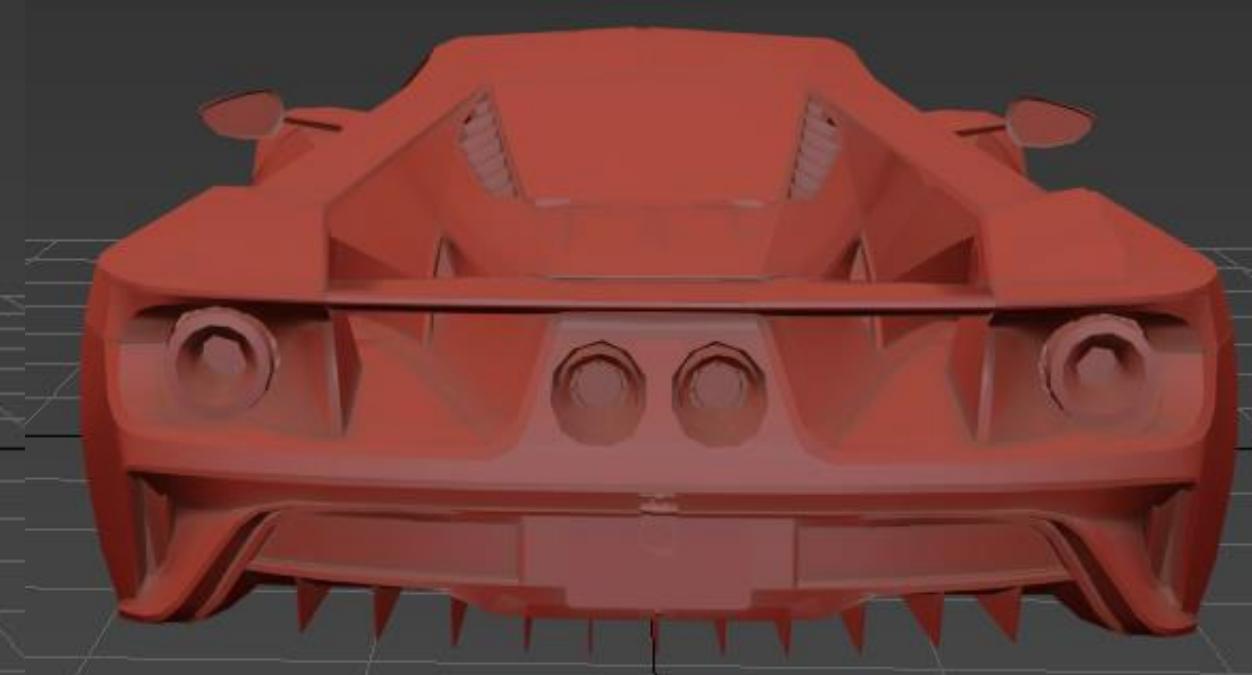
REDUCTION VERSION





BEST REMESH LOD3





HAND LOD3

LOD 4

85 Objects Selected

Polys: 5,103

Tris: 9,075

Edges: 11,203

Verts: 6,321

FPS: 24.796

RemeshedGeometry_L

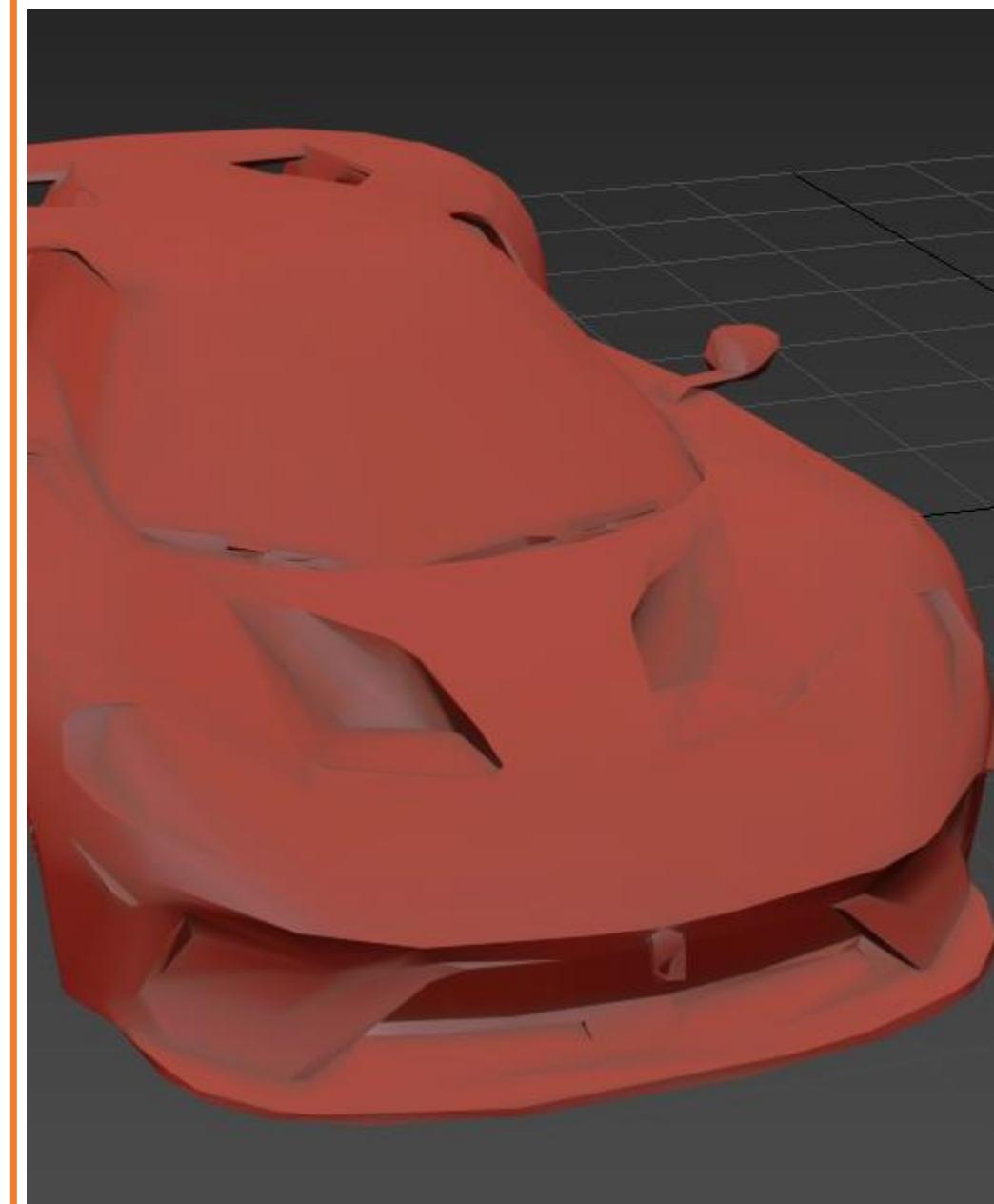
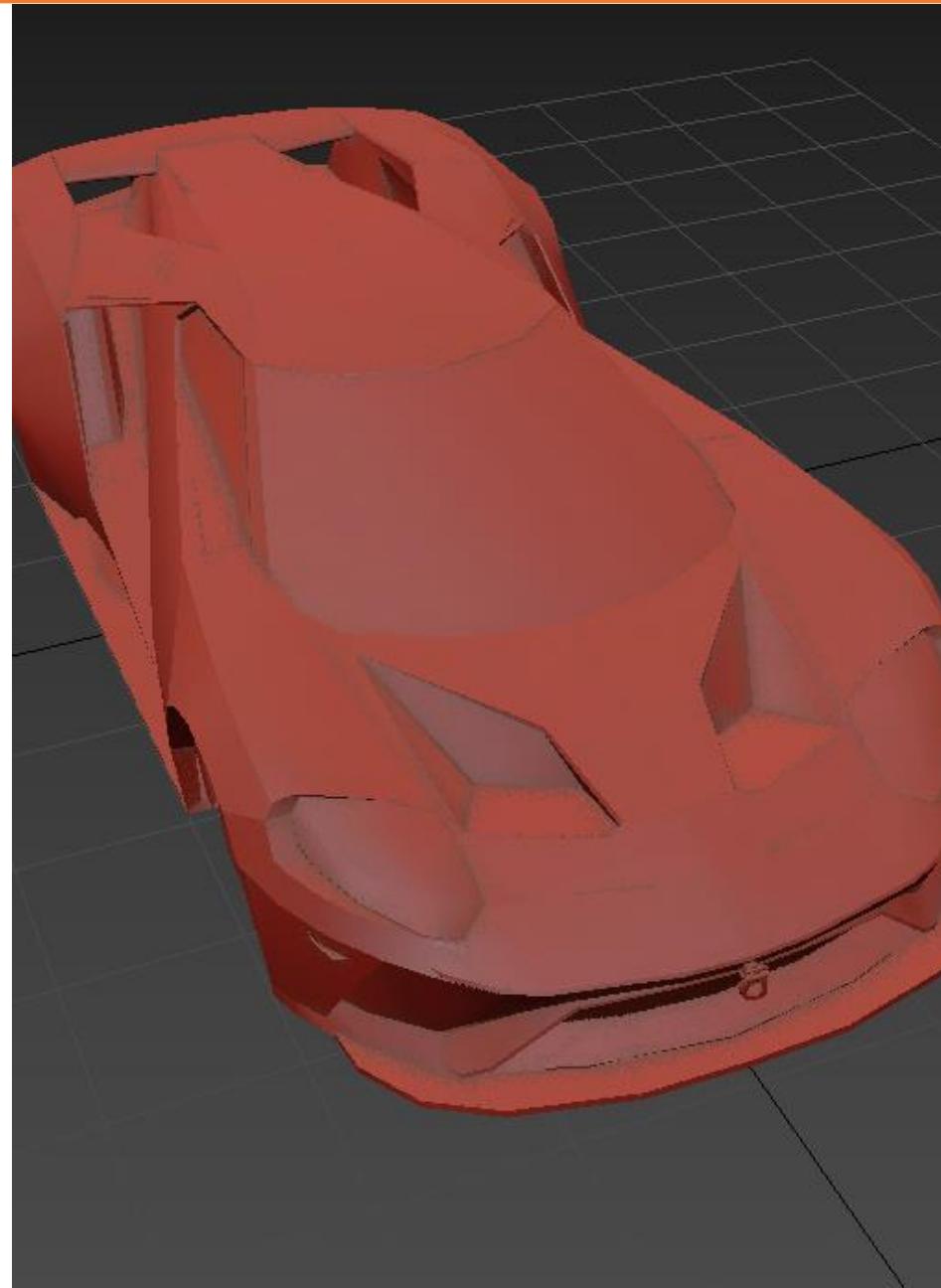
Polys: 6,070

Tris: 6,070

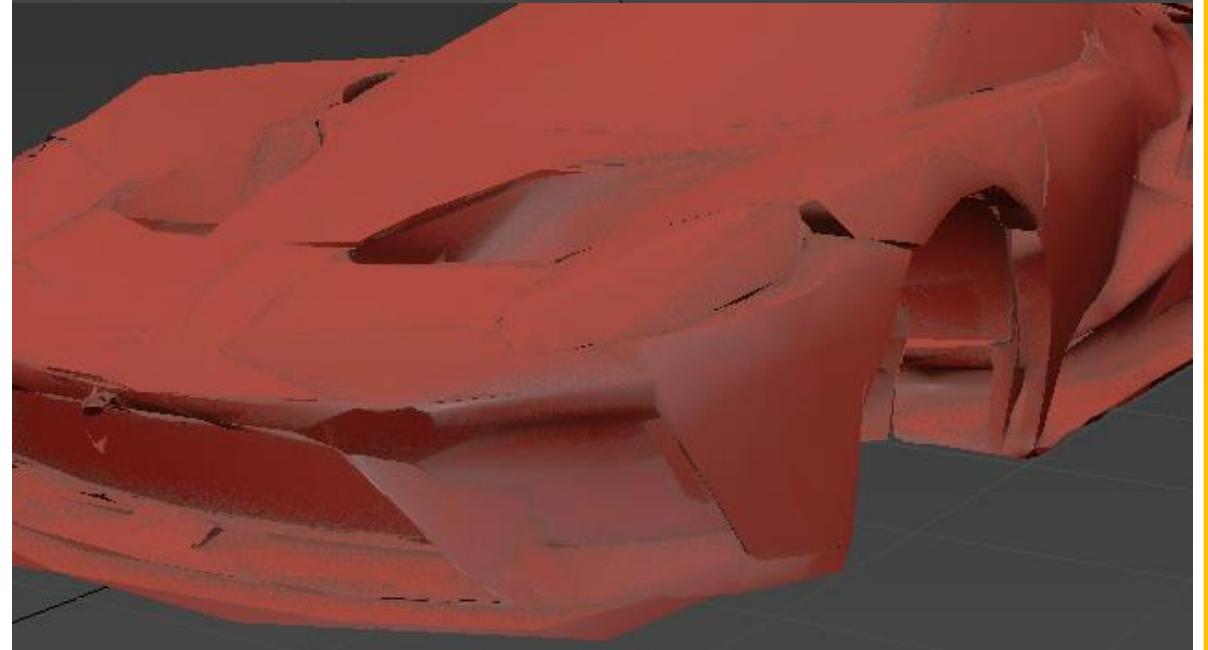
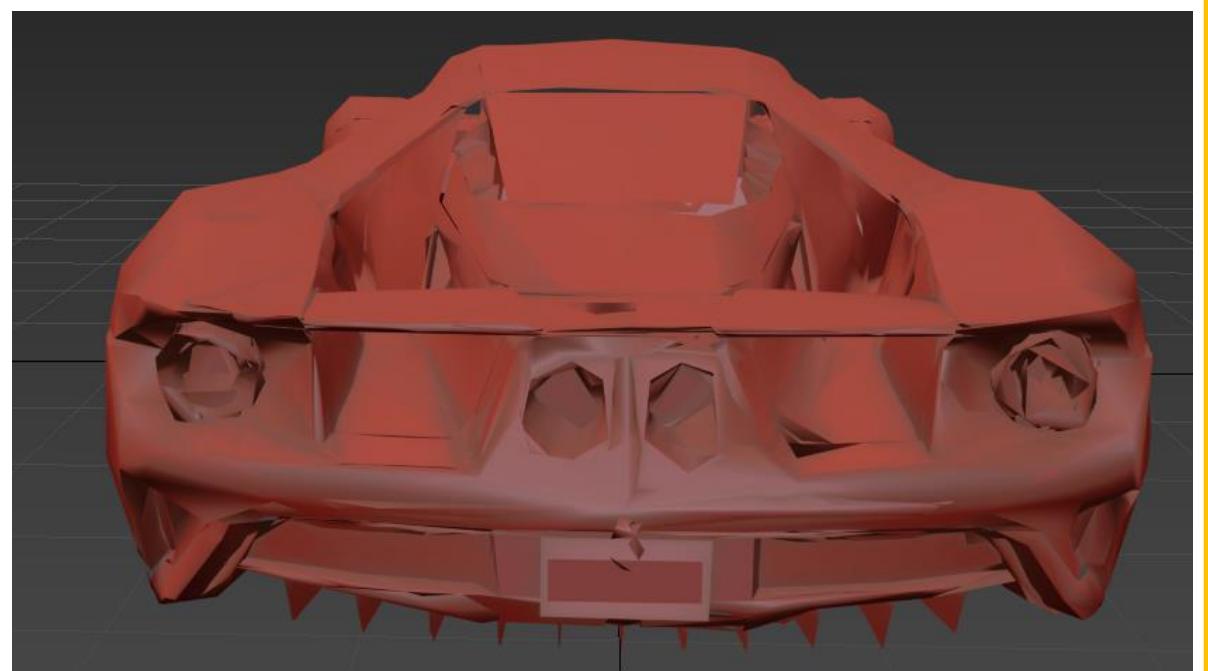
Edges: 18,210

Verts: 2,925

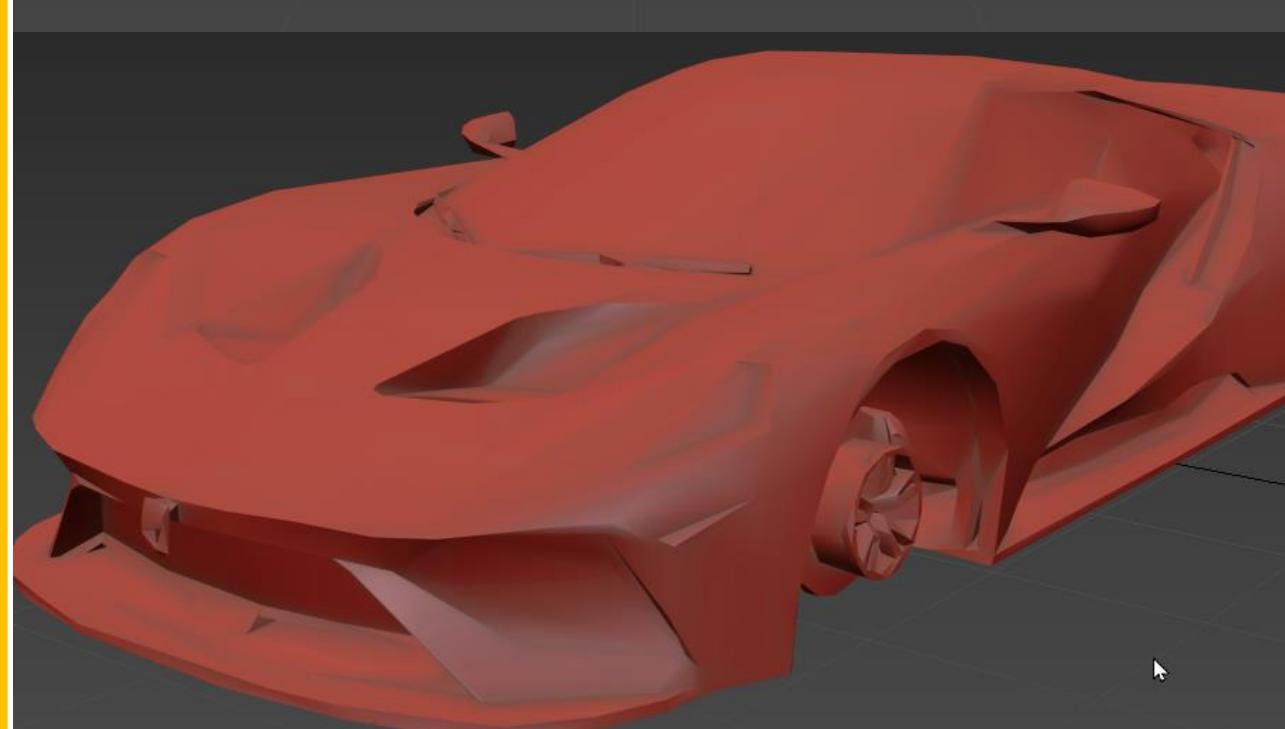
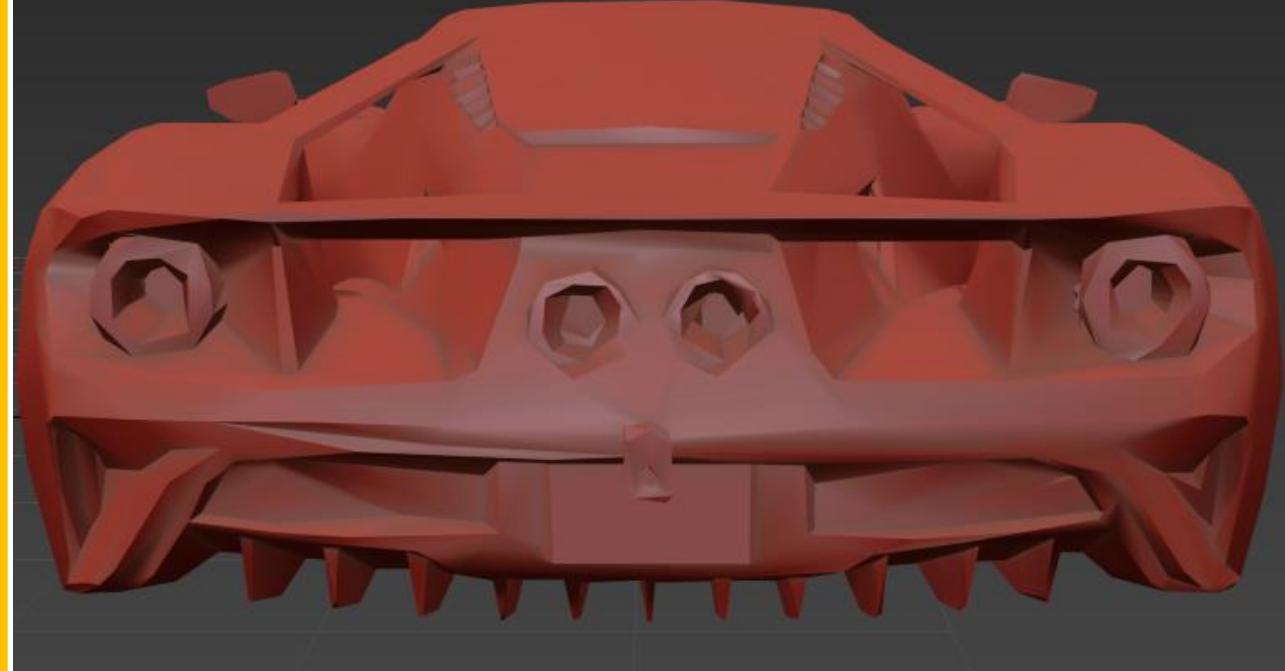
FPS: 257.918

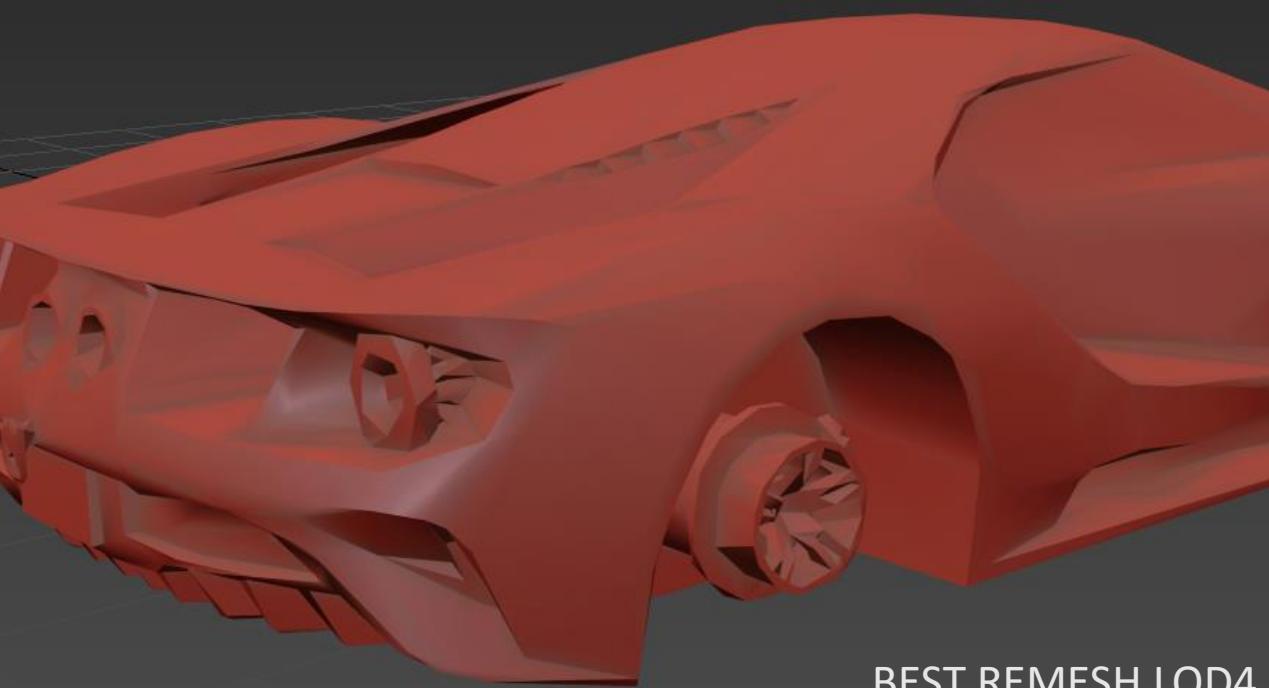


HAND RENDERED

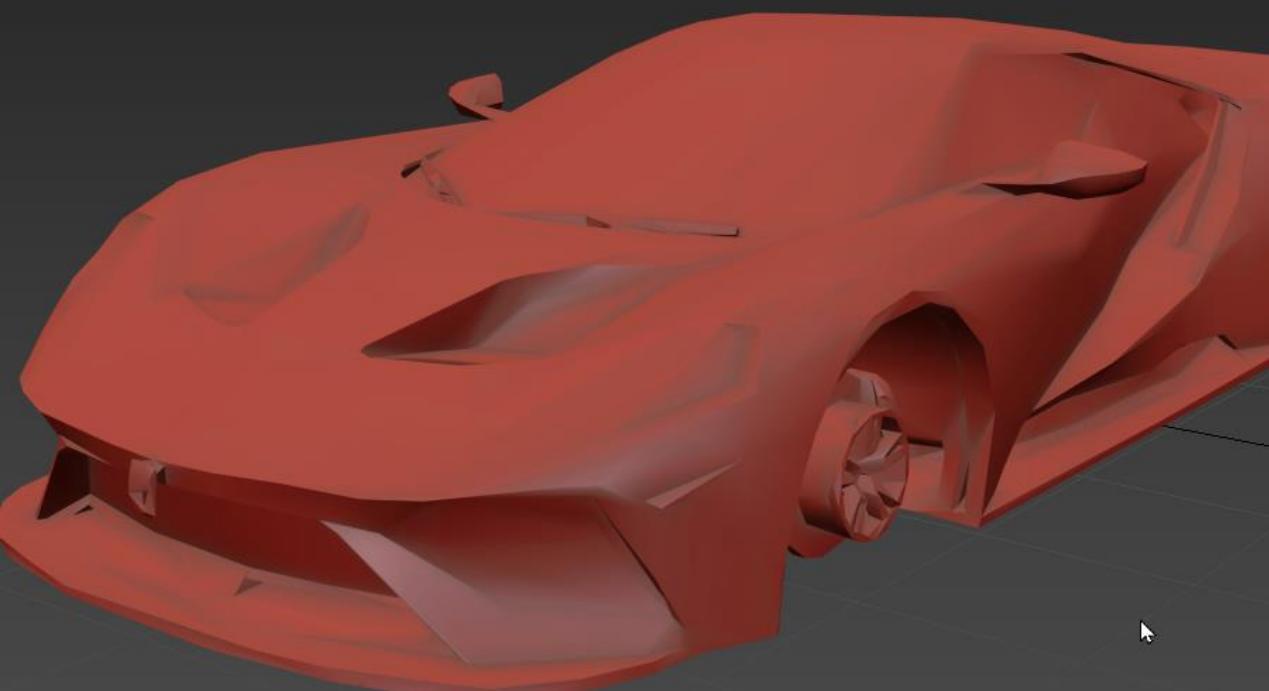
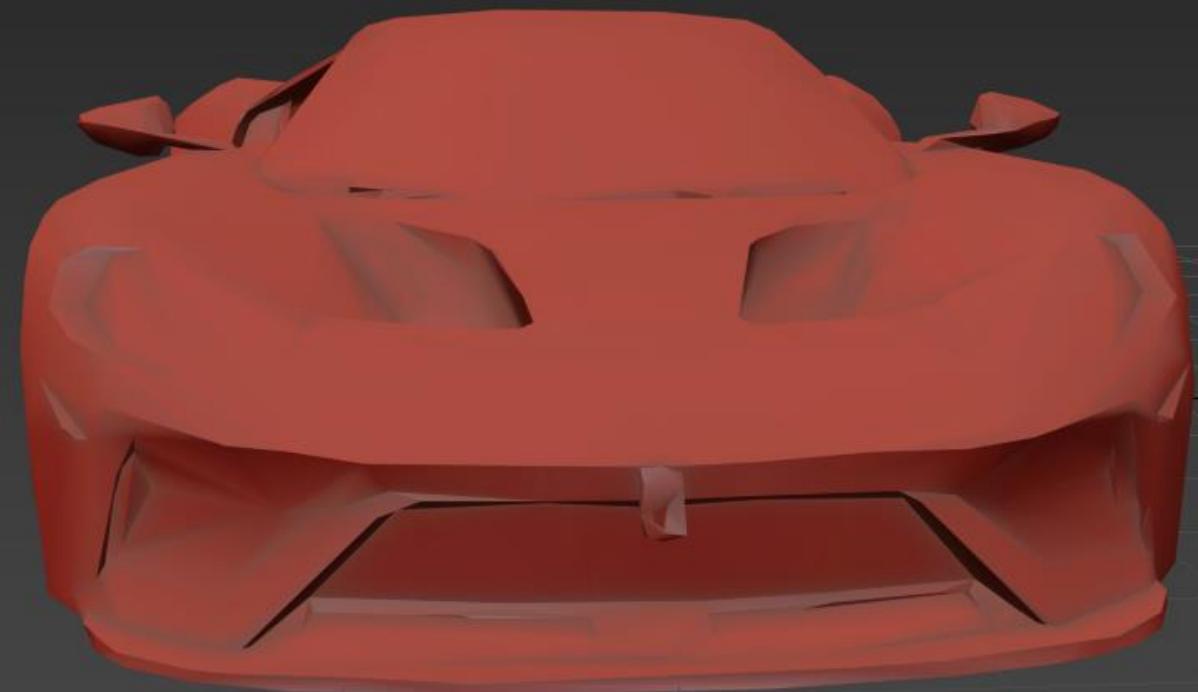


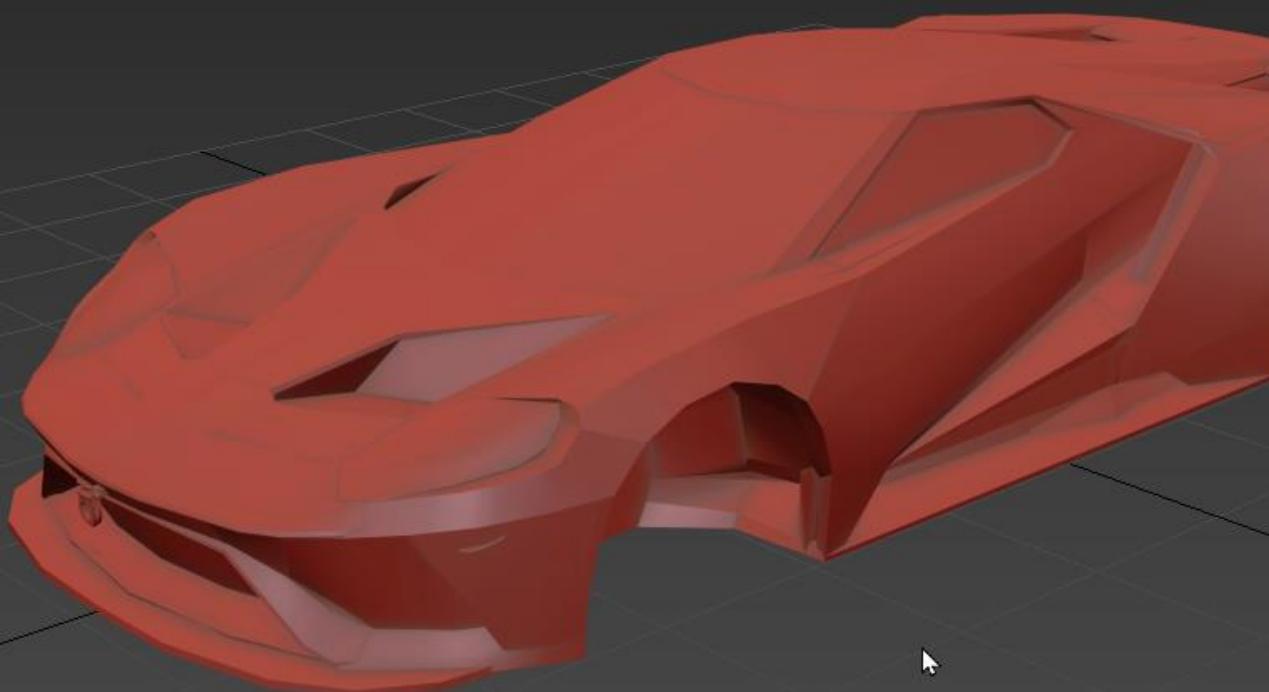
REDUCTION VERSION



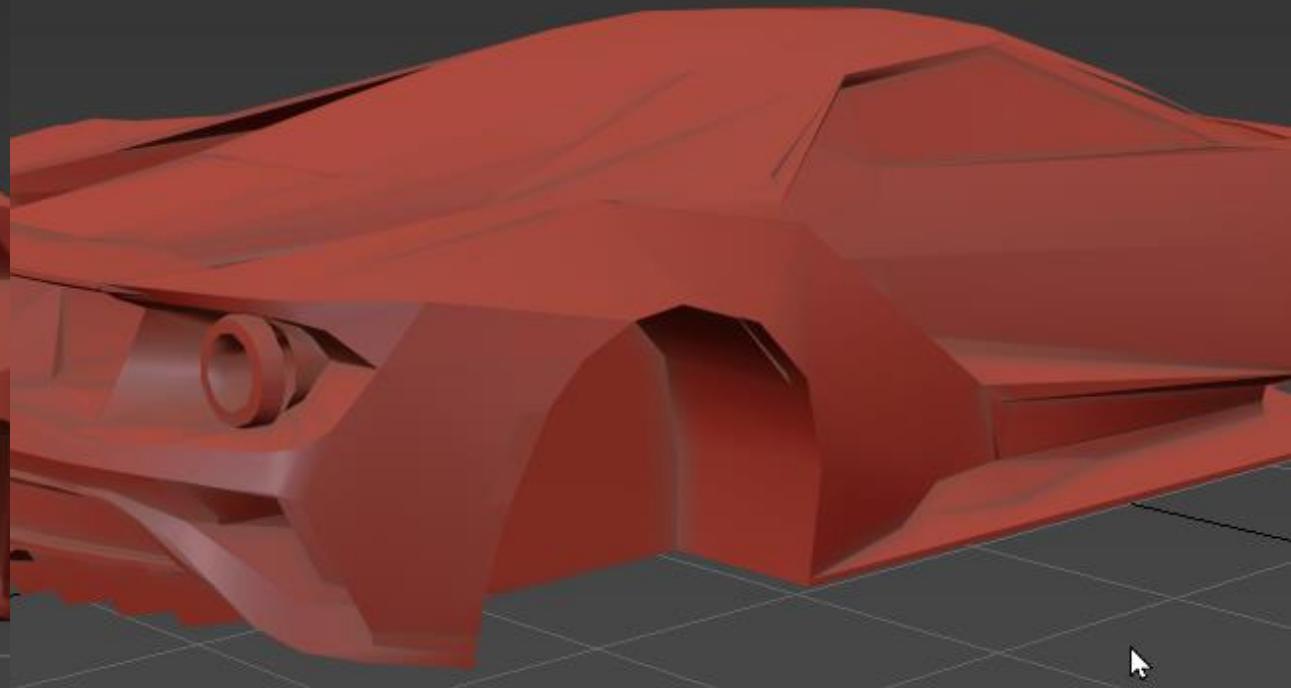
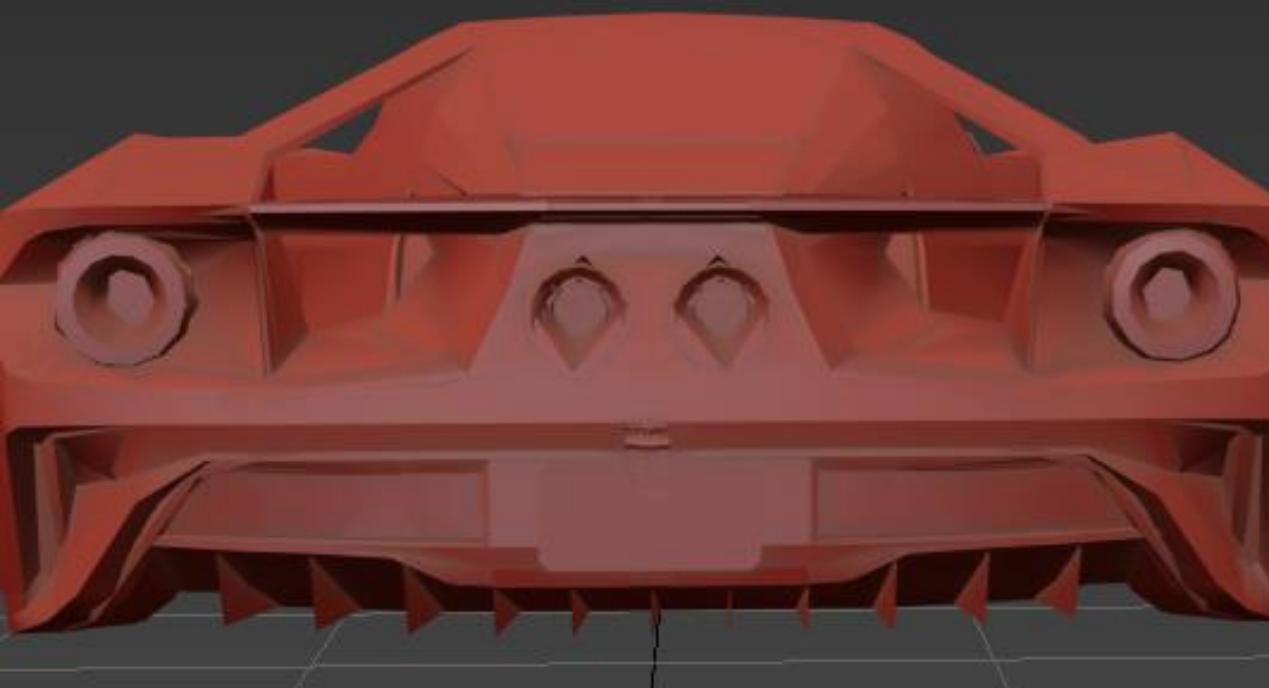


BEST REMESH LOD4



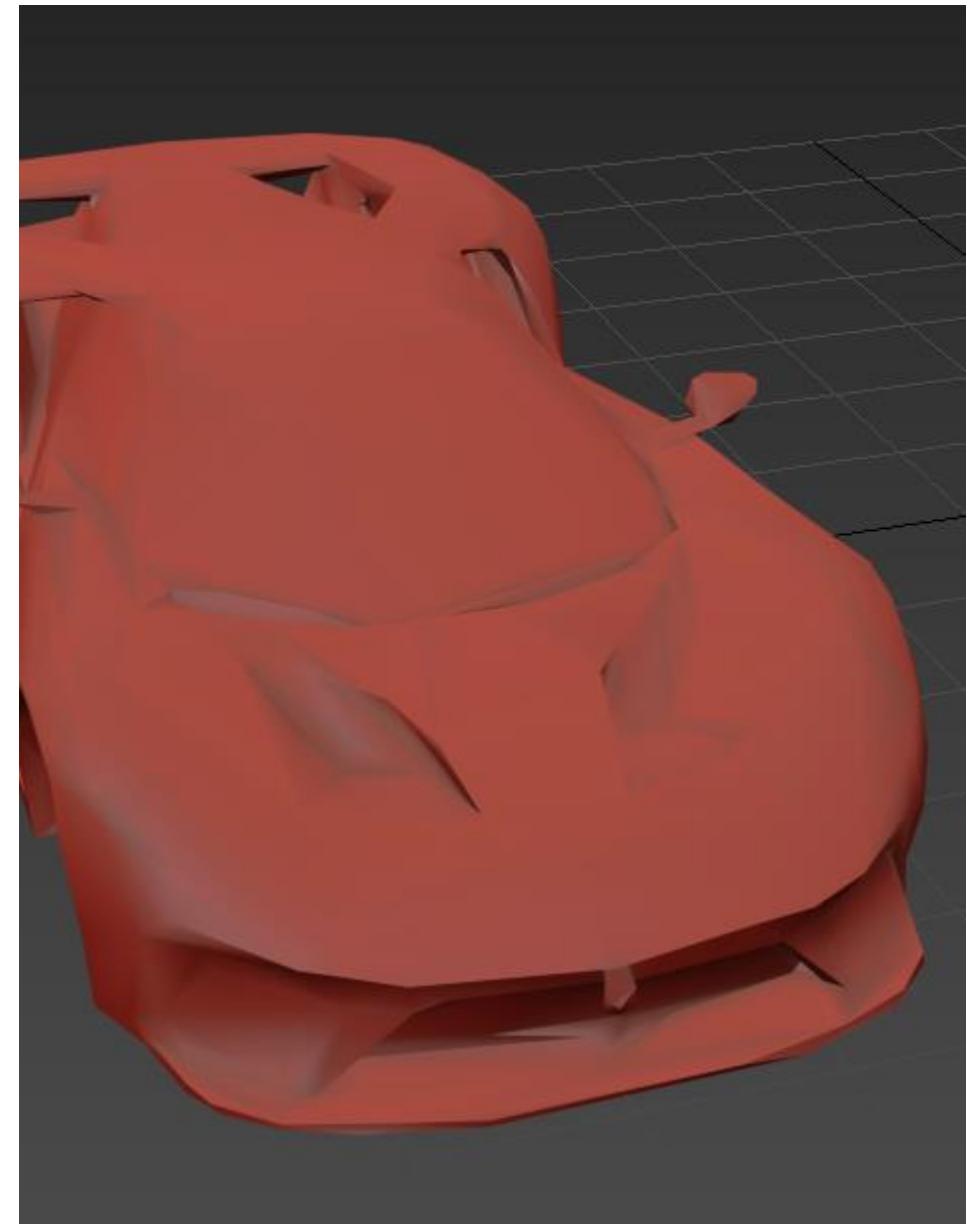
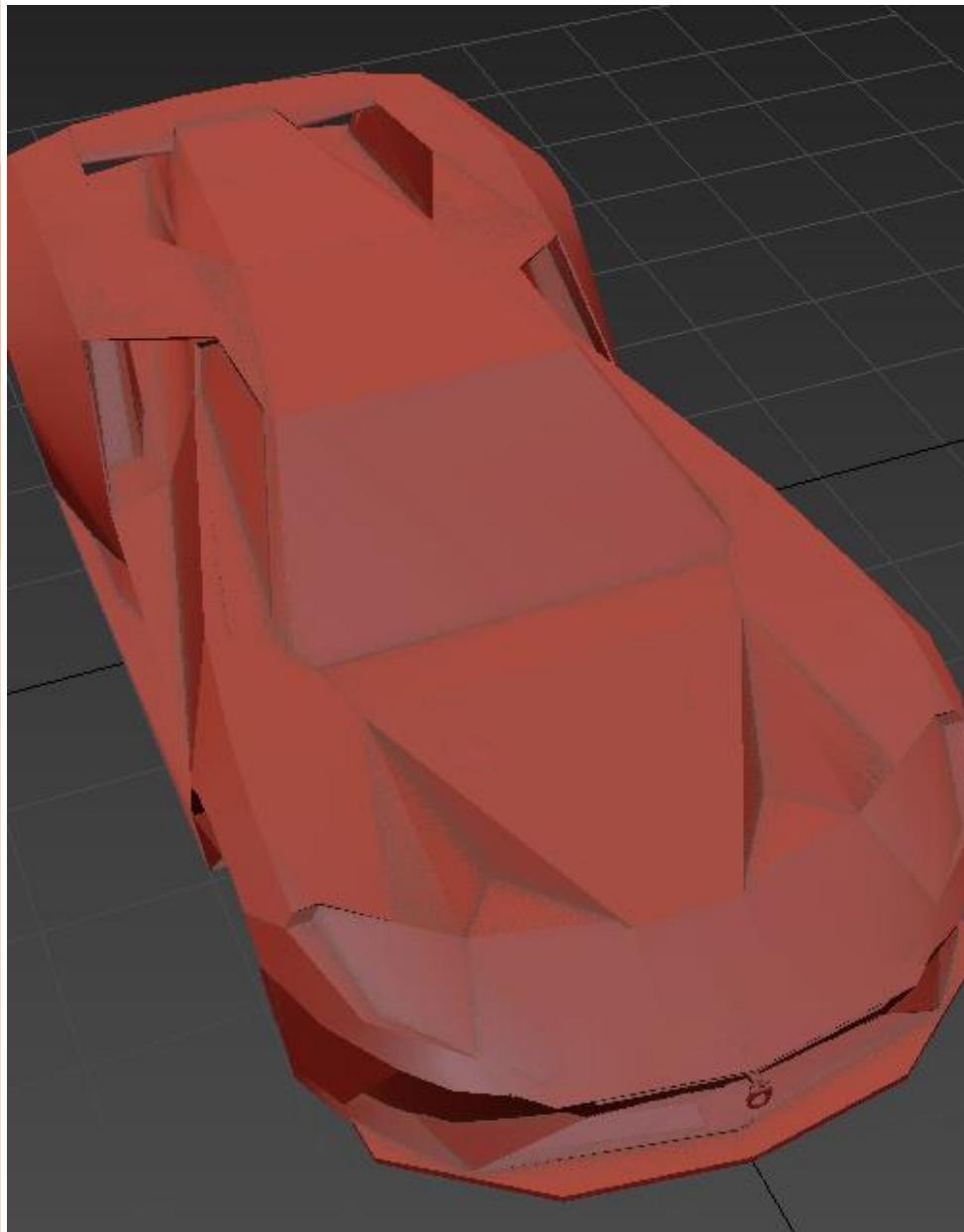


HAND LOD4

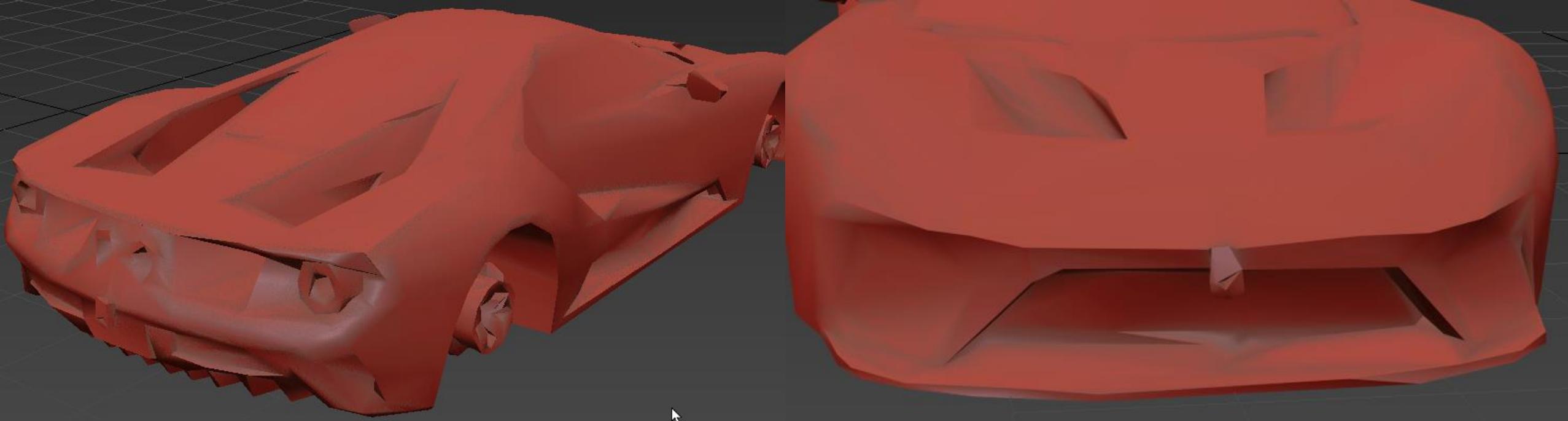


LOD 5

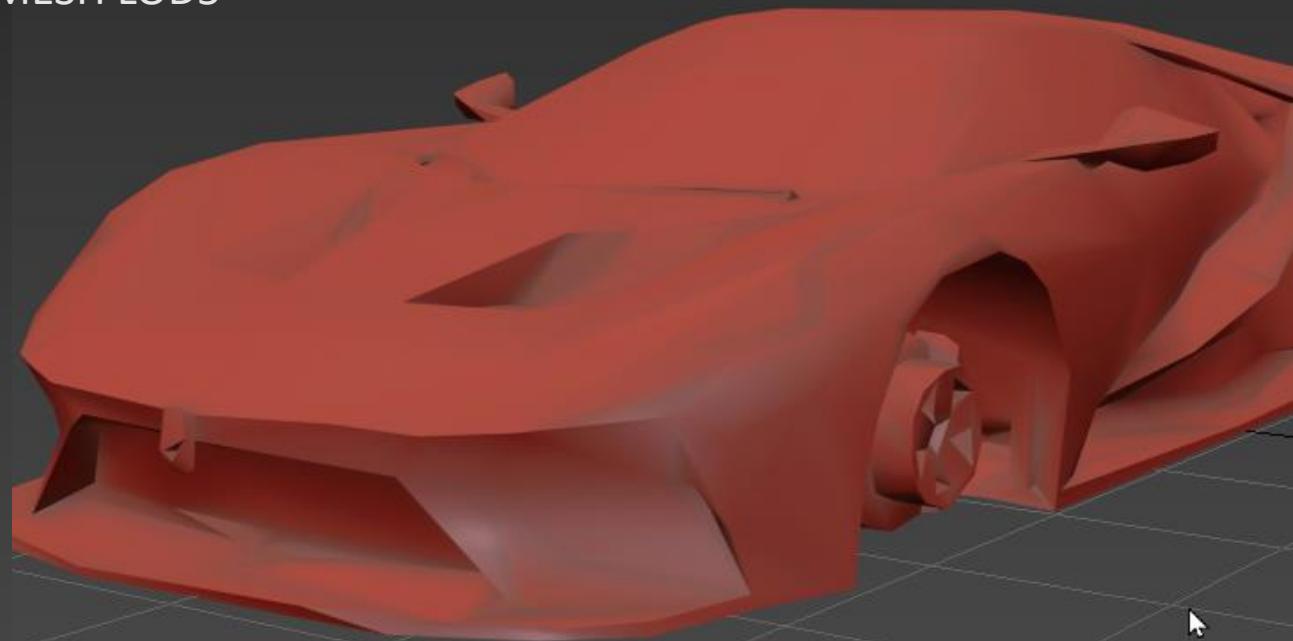
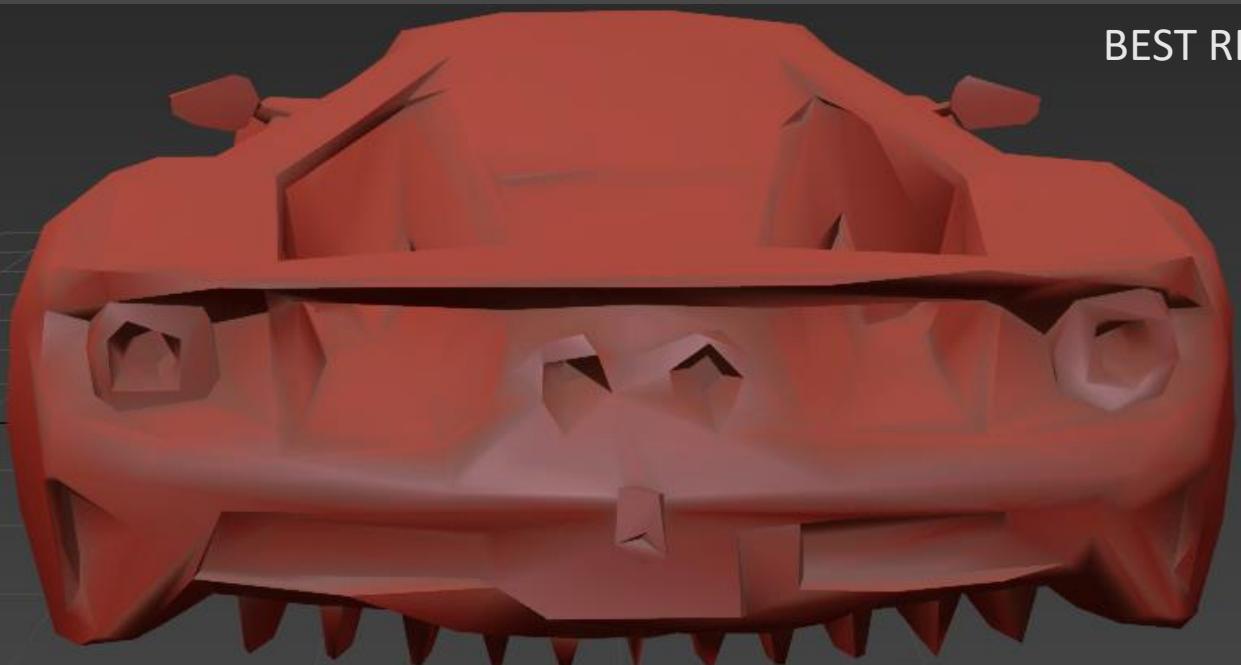
75 Objects Selected
Polys: 2,240
Tris: 3,796
Edges: 5,029
Verts: 2,945
FPS: 29.948

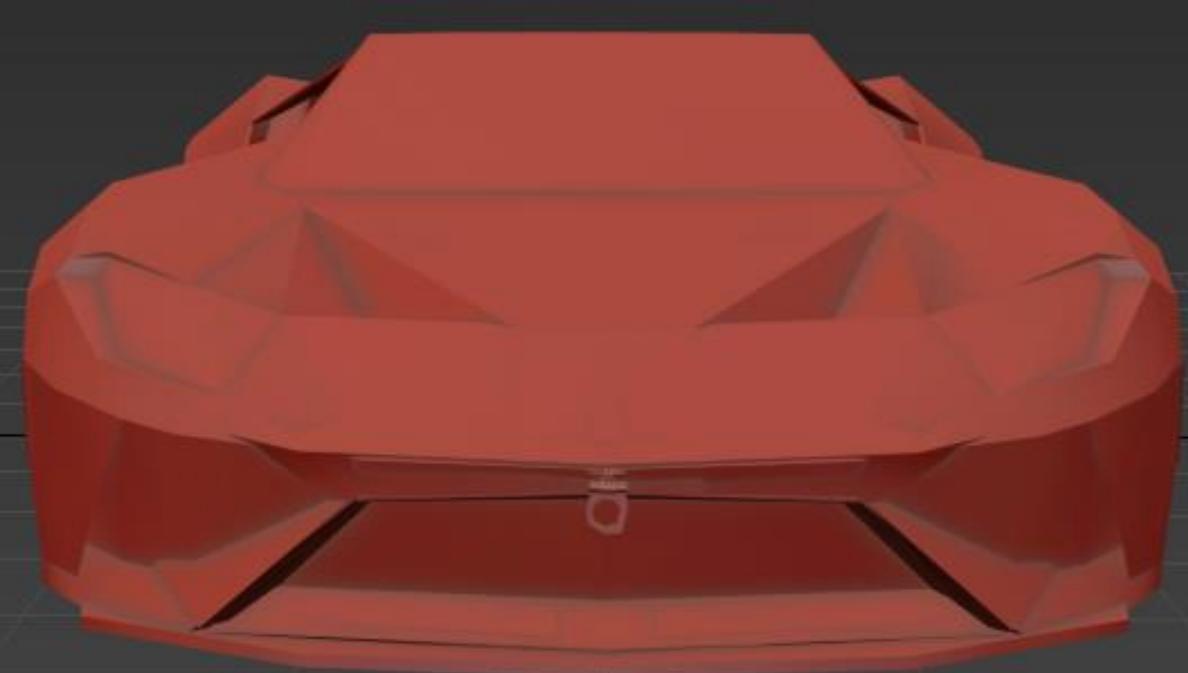
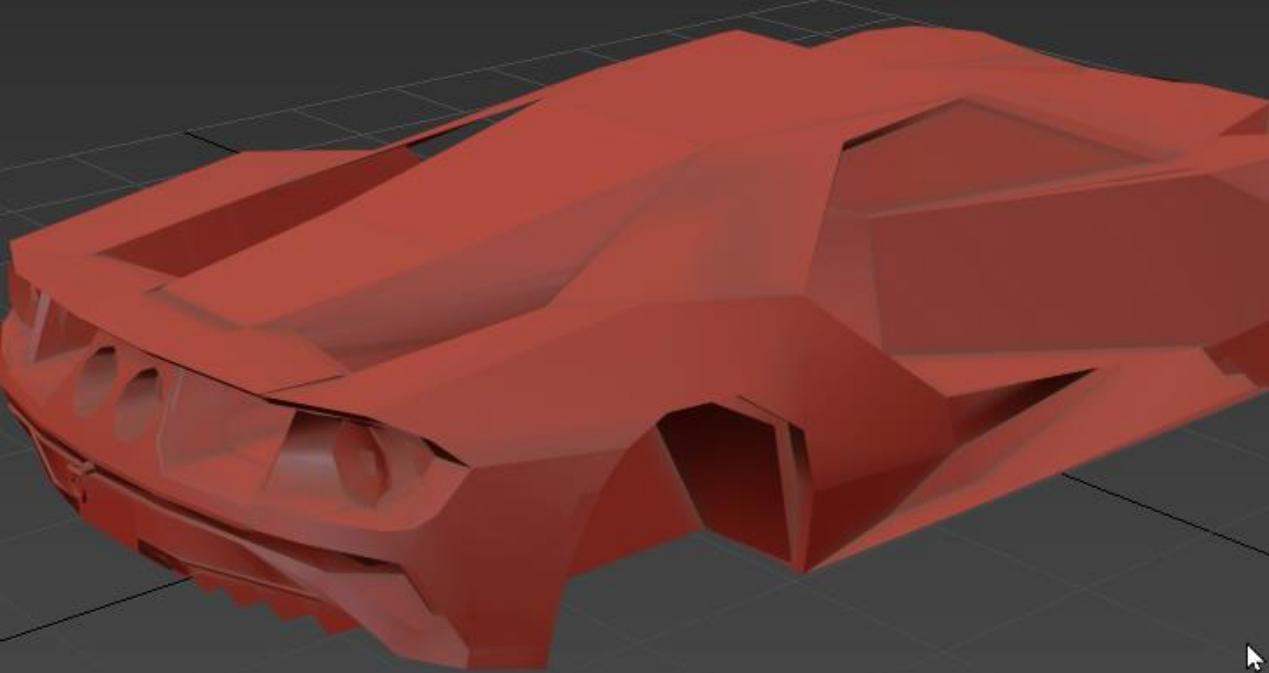


HAND RENDERED

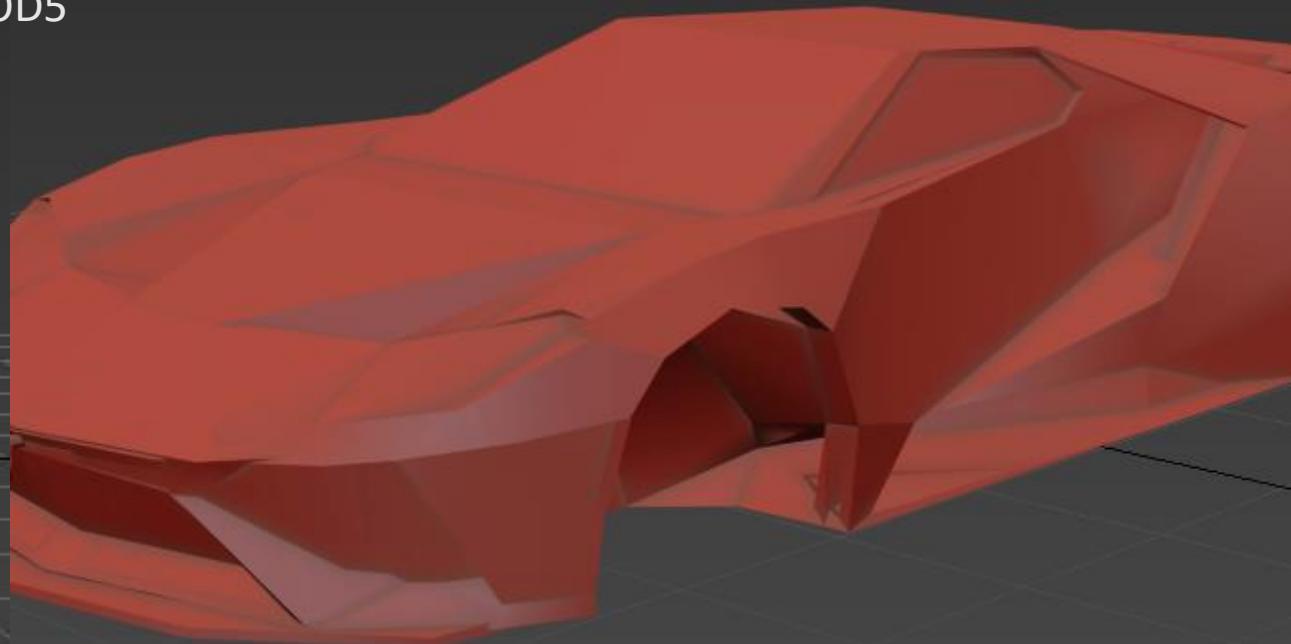
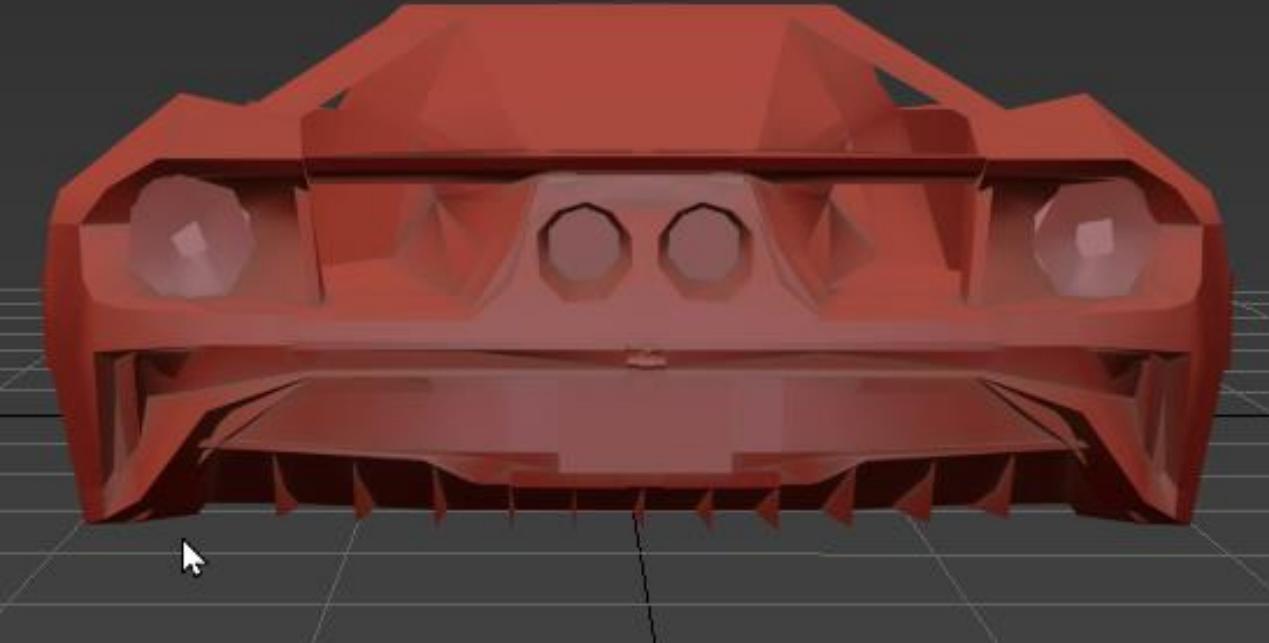


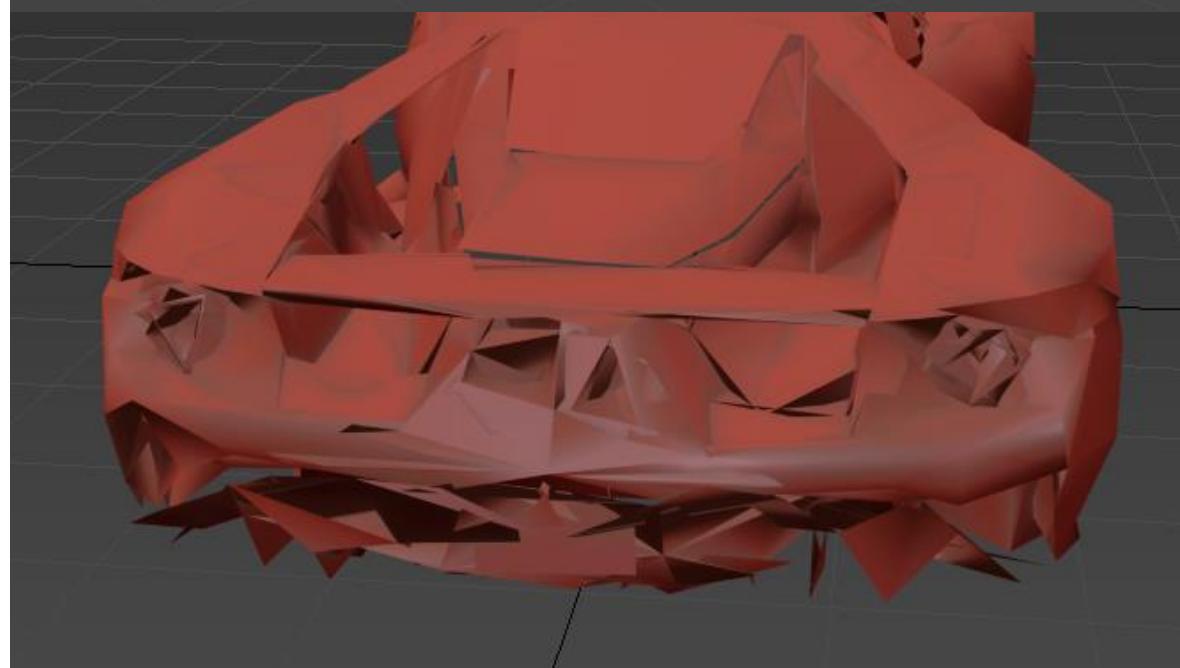
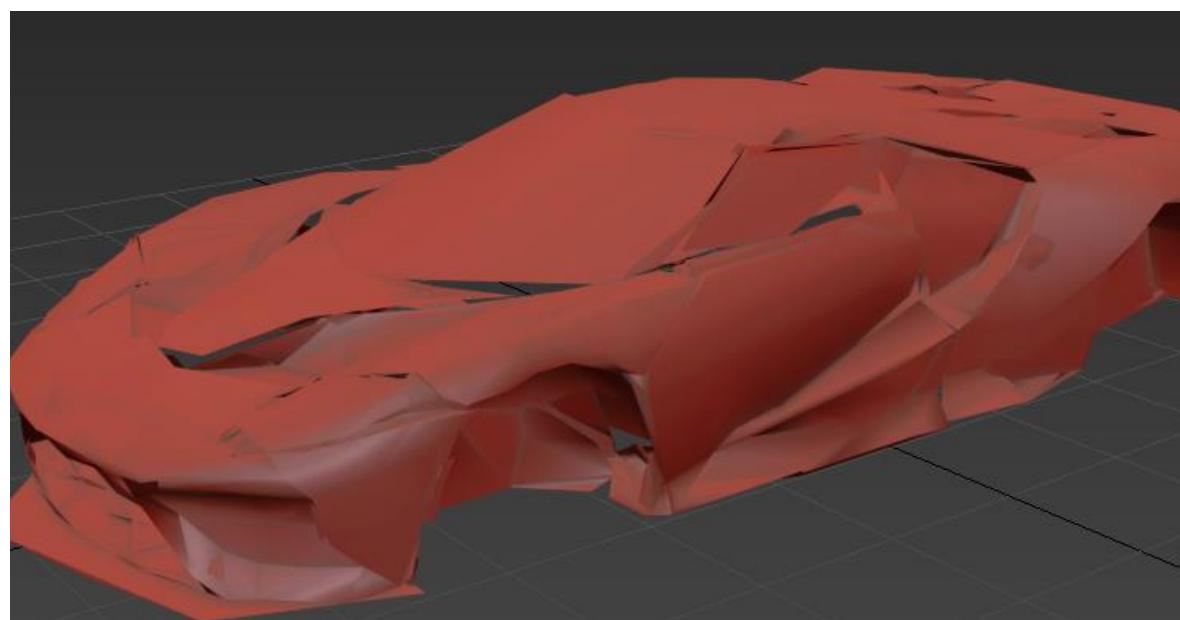
BEST REMESH LOD5



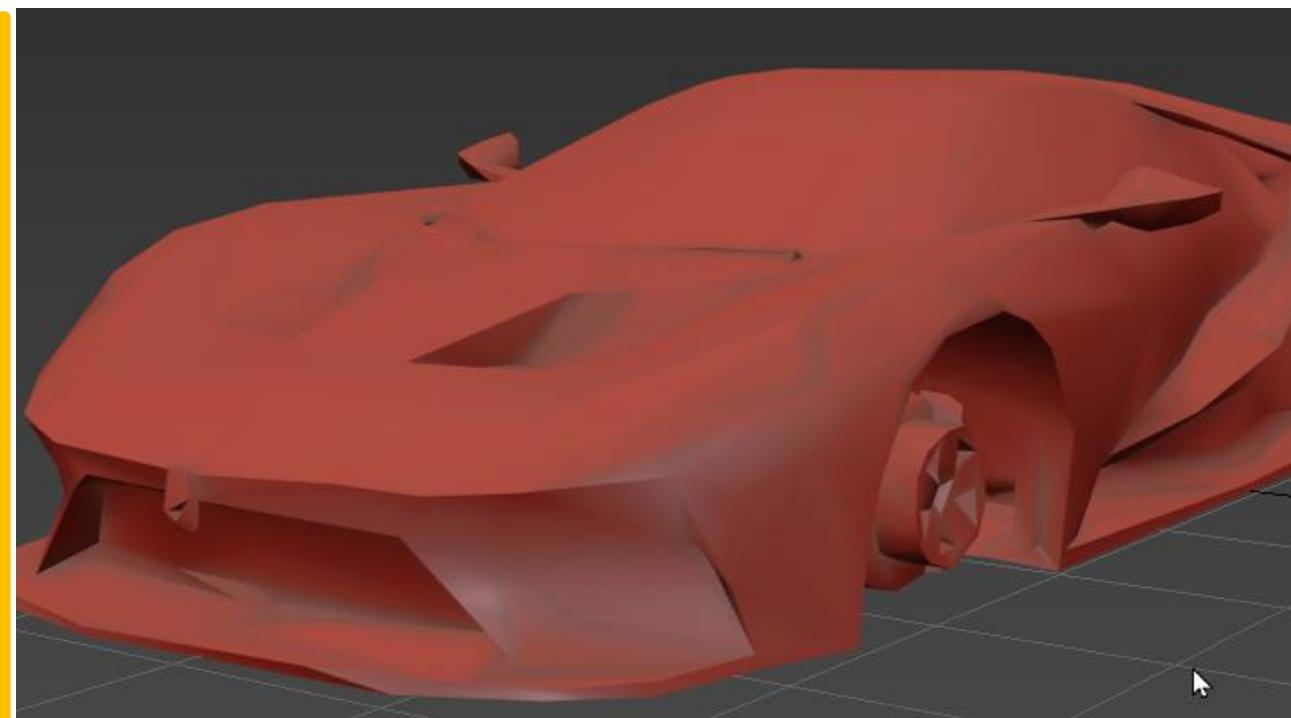


HAND LOD5





REDUCTION VERSION

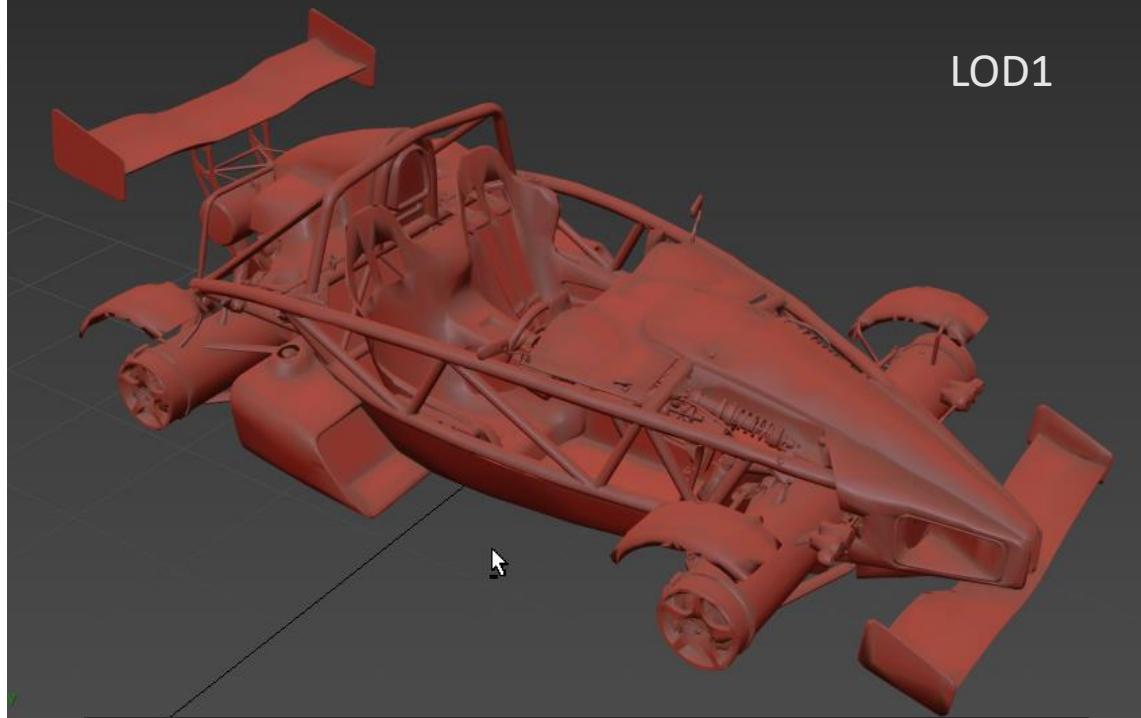


ARI_ATOM

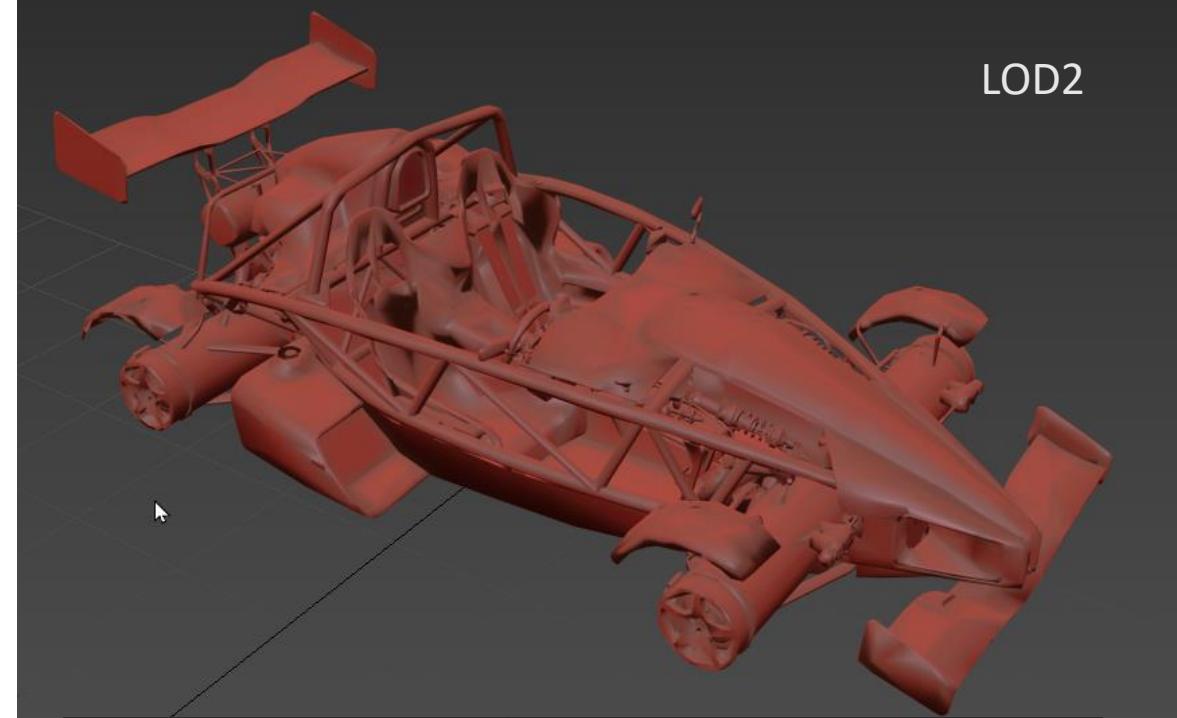
HYBRID Setting

same settings on a different car. This is explored to see if the settings can be transferred. From car to car.

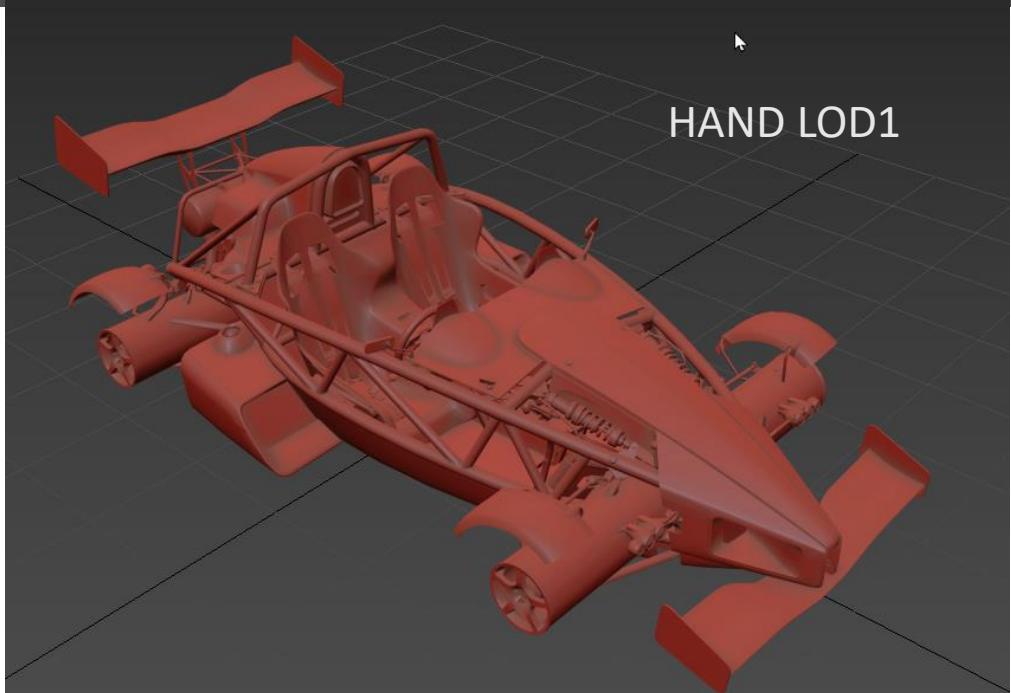
Conclusion: not always. To get ideal results settings need tweaking for each car as the process currently stands.



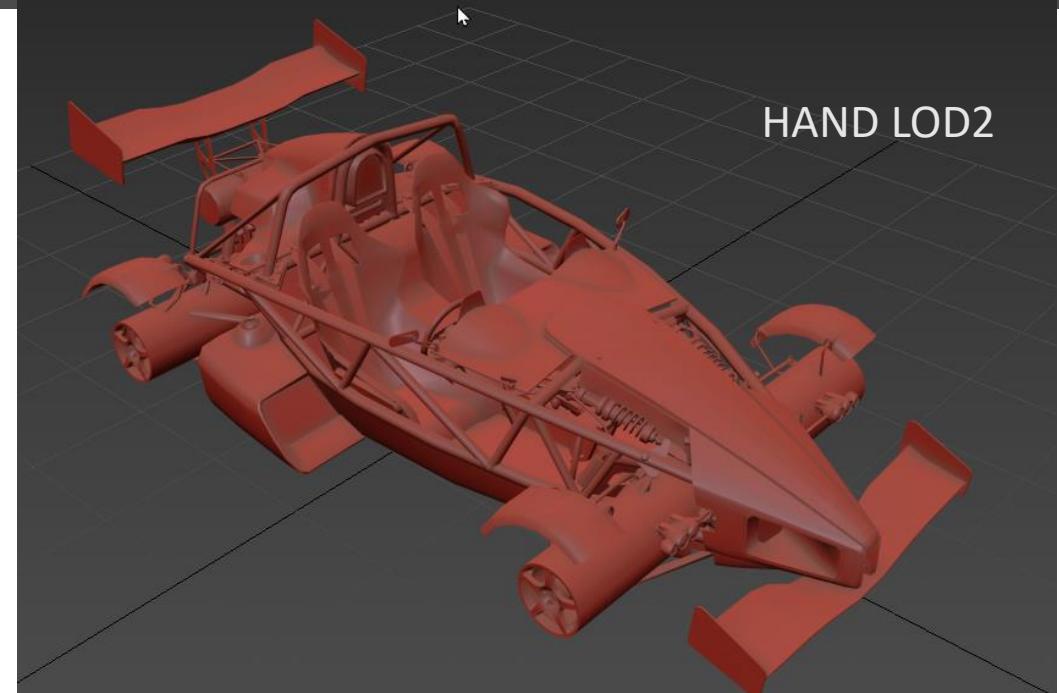
LOD1



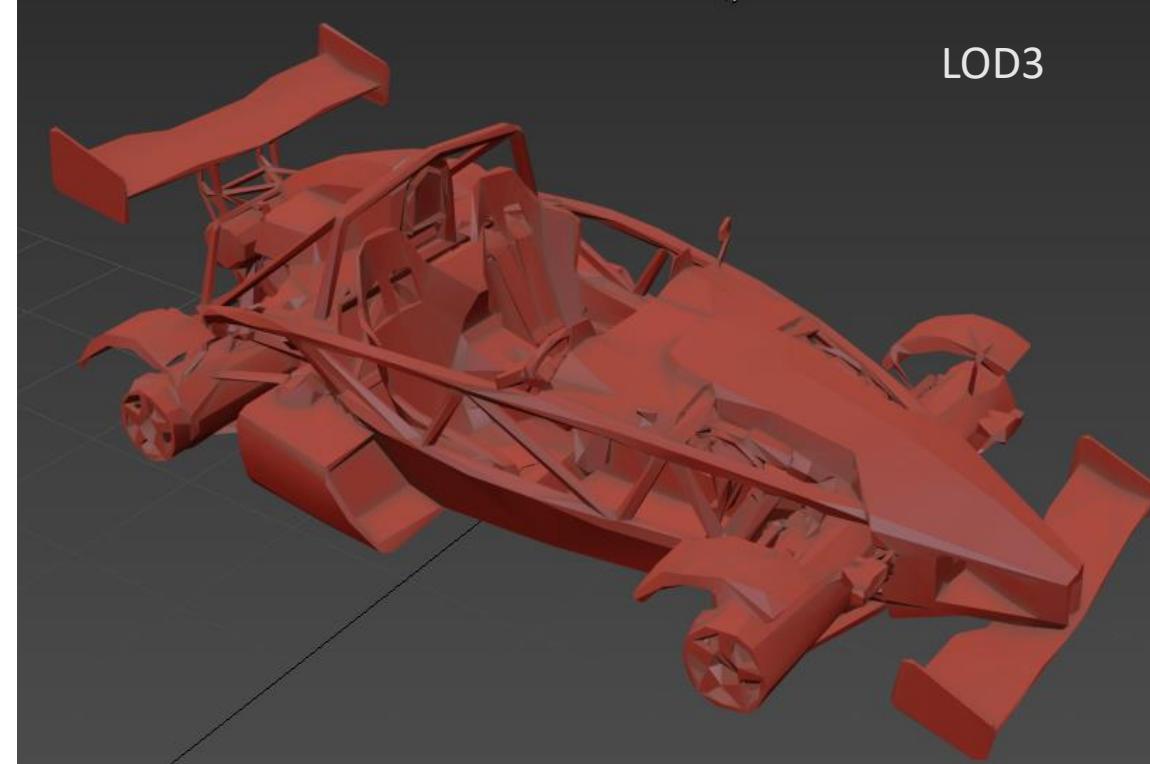
LOD2



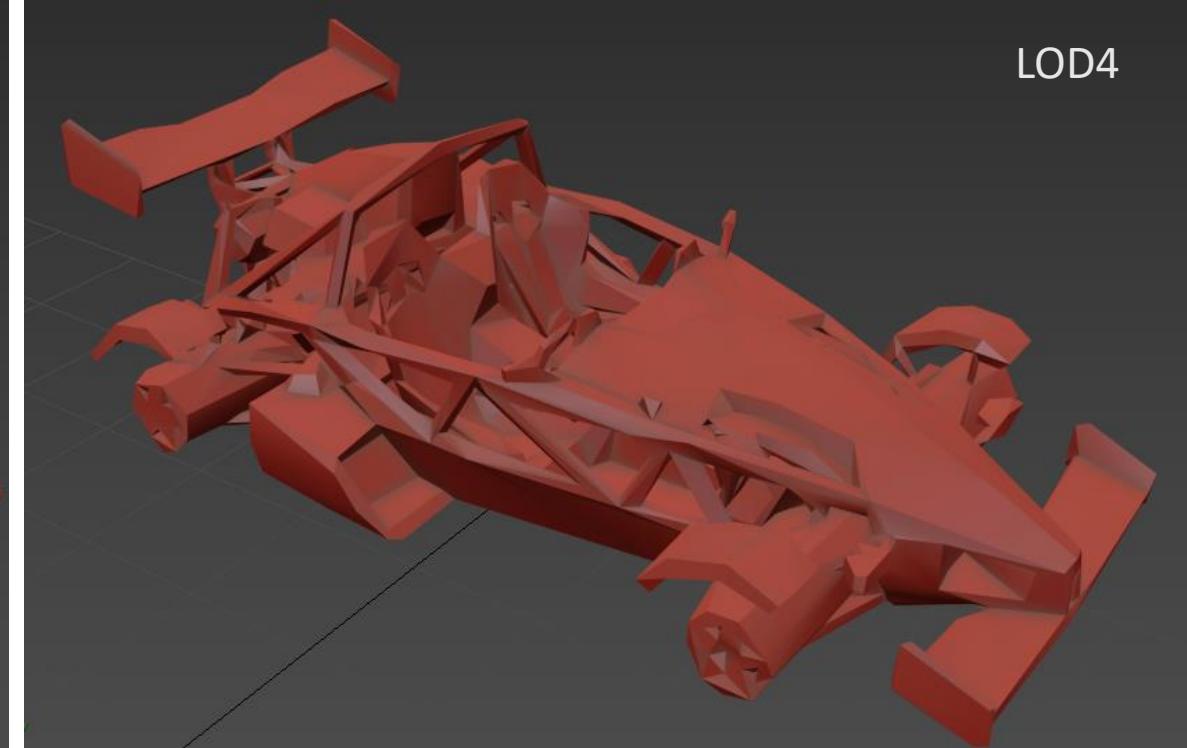
HAND LOD1



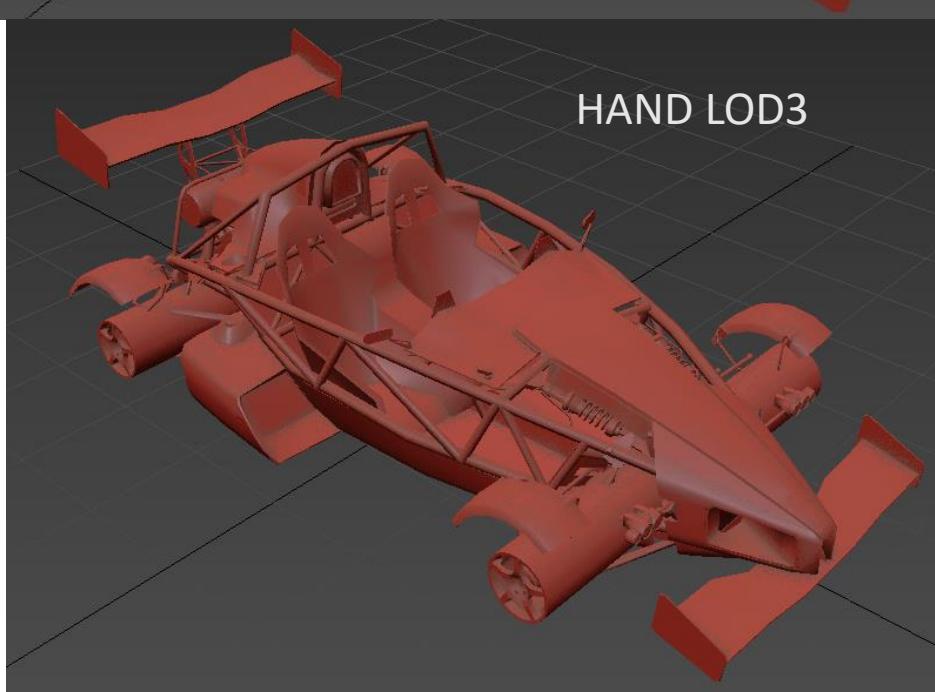
HAND LOD2



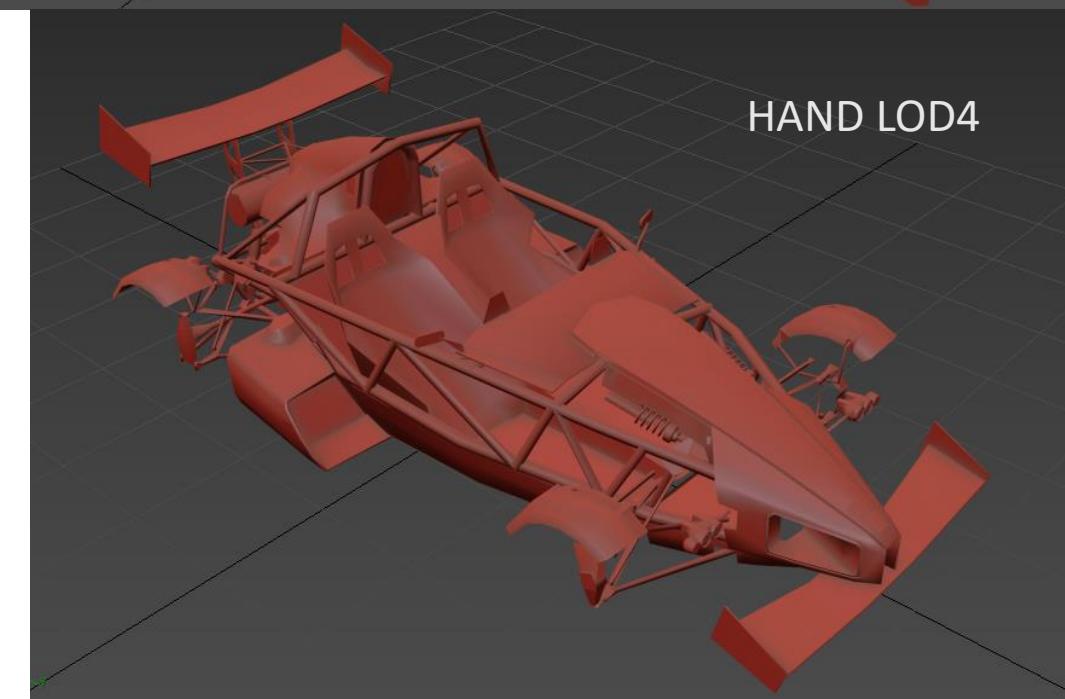
LOD3



LOD4

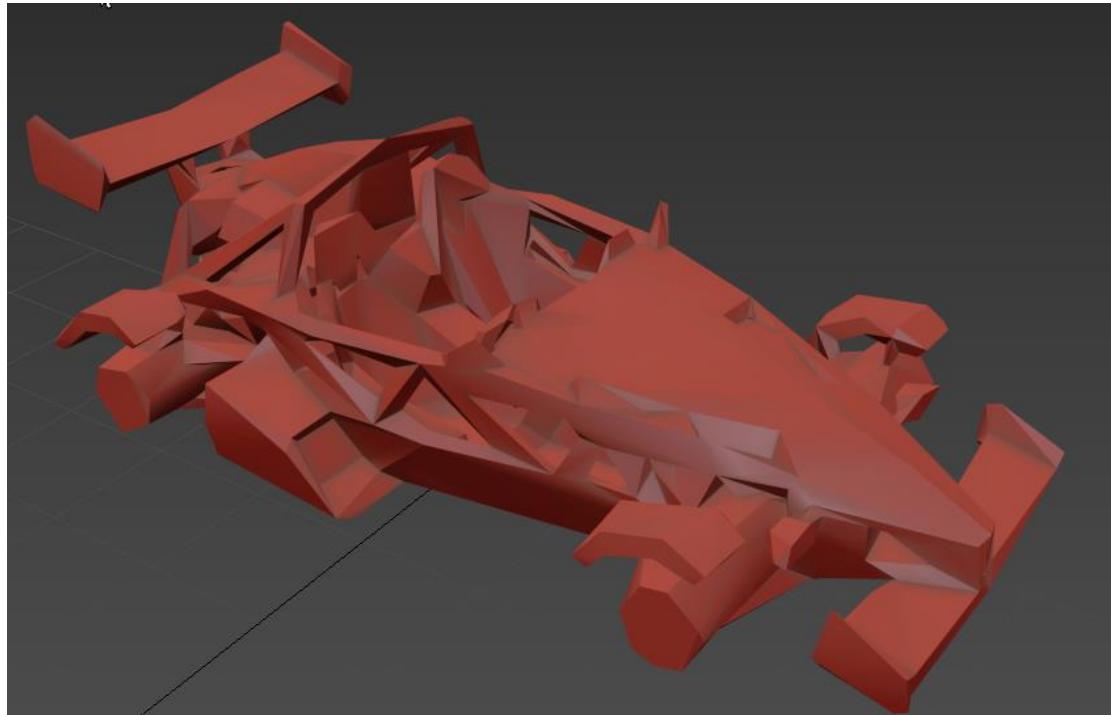


HAND LOD3

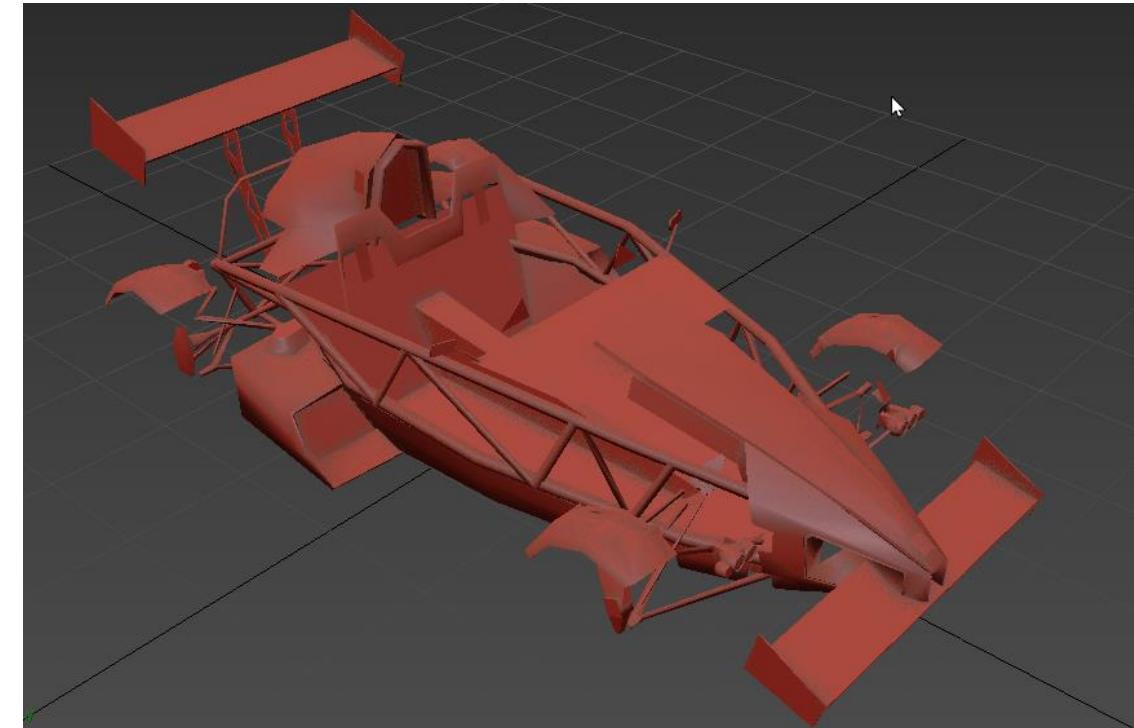


HAND LOD4

LOD5



HAND – LOD5



Possible next steps – HYBRID version

- ✓ Looks better
- ✓ Triangle counts are within range
- ✓ The car doesn't fall apart

Cons:

- shading the whole car – material pipeline needs to change (how much?)
- Can only be done at build time
- Can't be integrated immediately

ARI_Atom
same REDUCTION SETTINGS as **FOR_Pheonix**

111 Objects Selected
Polys: 50,576
Tris: 61,093
Edges: 85,321
Verts: 35,937
FPS: 39.827

109 Objects Selected
Polys: 23,782
Tris: 27,723
Edges: 39,883
Verts: 16,883
FPS: 39.827

108 Objects Selected
Polys: 11,513
Tris: 13,329
Edges: 19,845
Verts: 8,942
FPS: 39.827

99 Objects Selected
Polys: 4,691
Tris: 4,854
Edges: 7,985
Verts: 3,720
FPS: 39.827

98 Objects Selected
Polys: 2,358
Tris: 2,420
Edges: 4,359
Verts: 2,567
FPS: 64.868

Reduction

LOD1

HAND

Reduction

LOD2

HAND

Reduction

LOD3

HAND

Reduction

LOD4

HAND

Reduction

LOD5

HAND

107 Objects Selected
Polys: 31,819
Tris: 59,291
Edges: 67,043
Verts: 36,234

106 Objects Selected
Polys: 16,357
Tris: 30,384
Edges: 34,662
Verts: 18,966

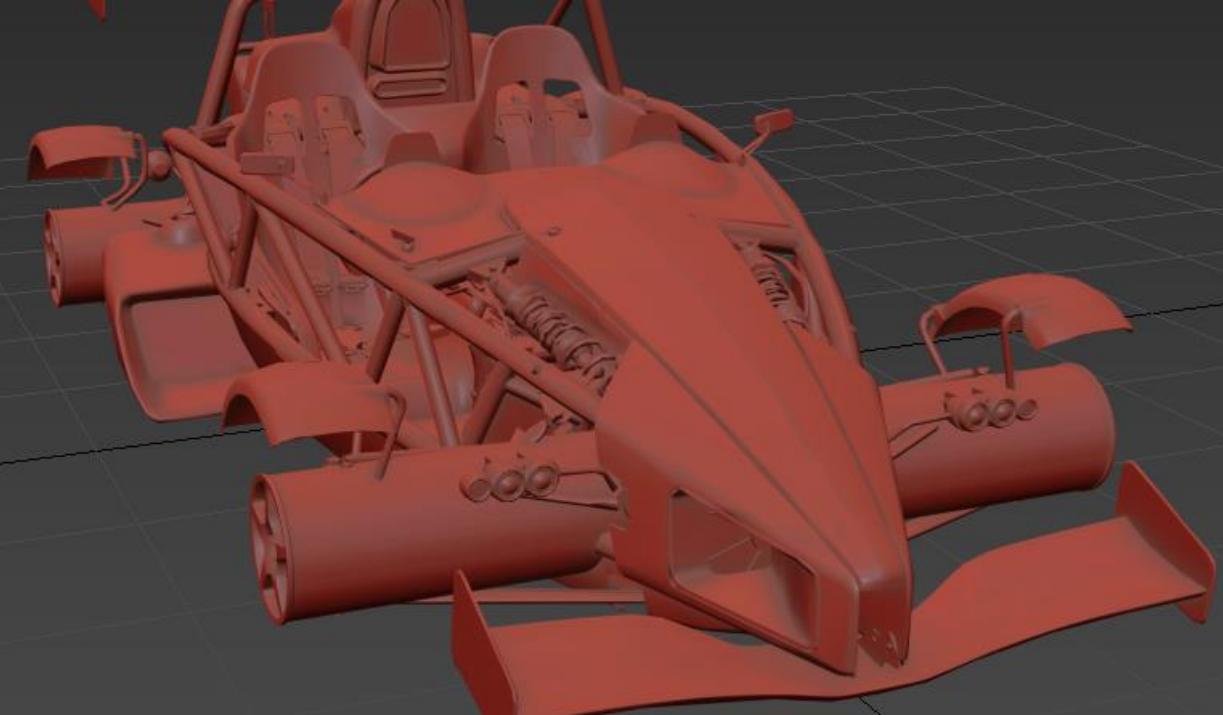
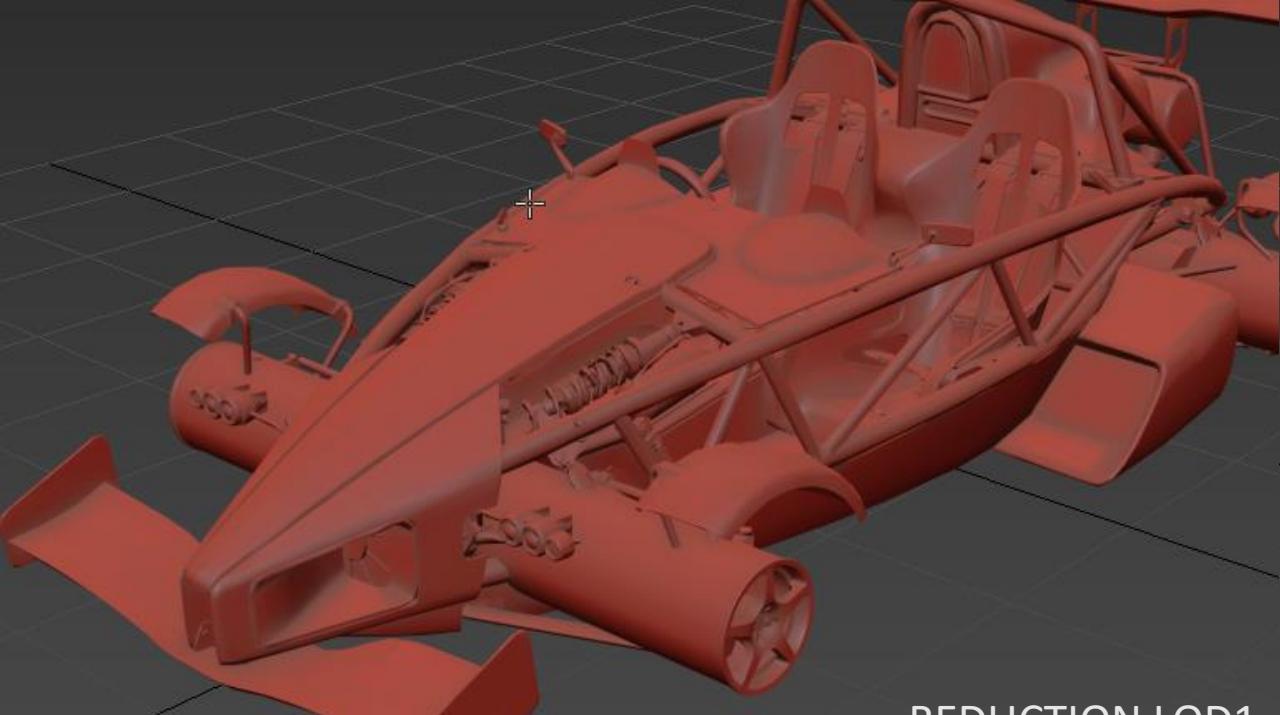
102 Objects Selected
Polys: 8,416
Tris: 15,734
Edges: 18,385
Verts: 10,345

86 Objects Selected
Polys: 3,555
Tris: 6,566
Edges: 7,925
Verts: 4,573

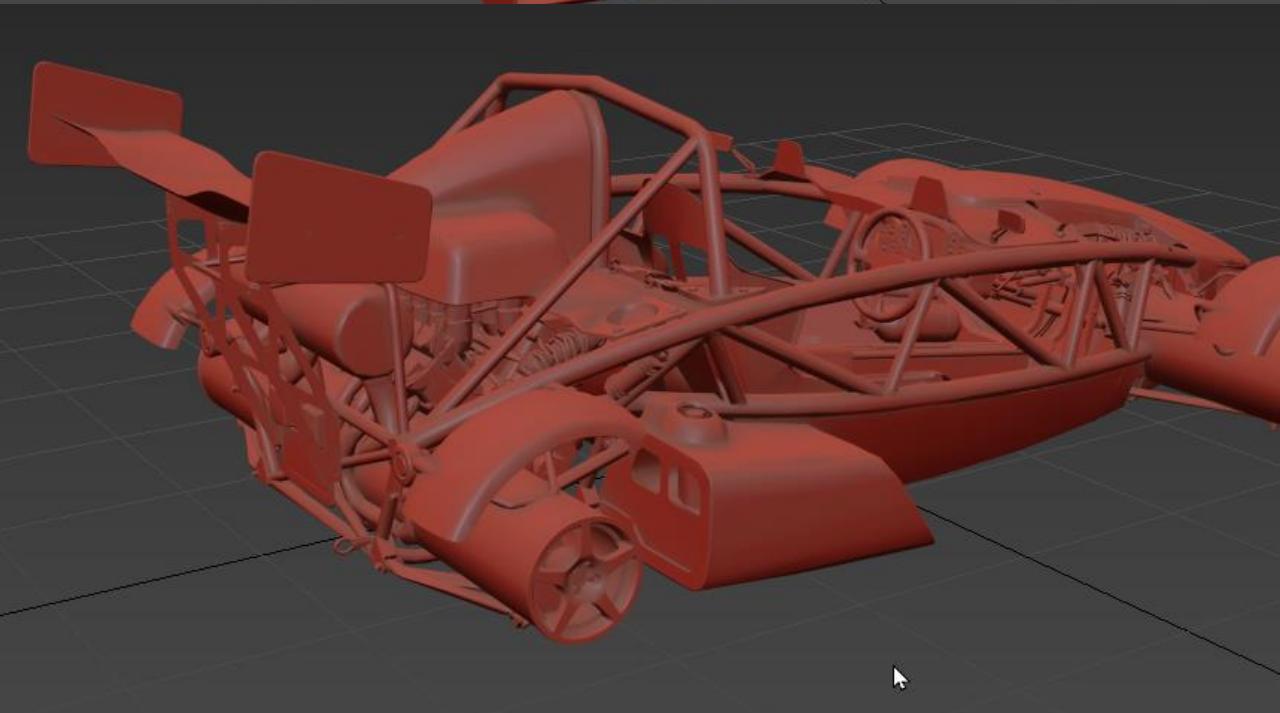
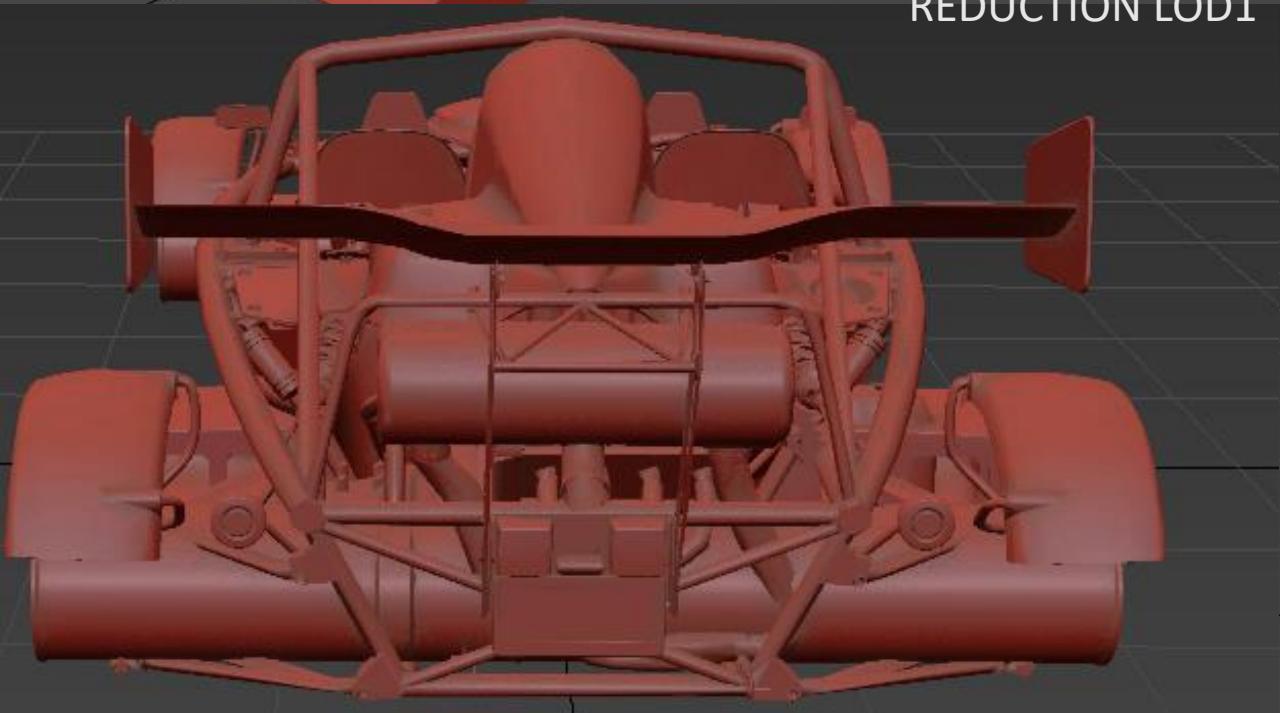
68 Objects Selected
Polys: 1,880
Tris: 3,401
Edges: 4,321
Verts: 2,601

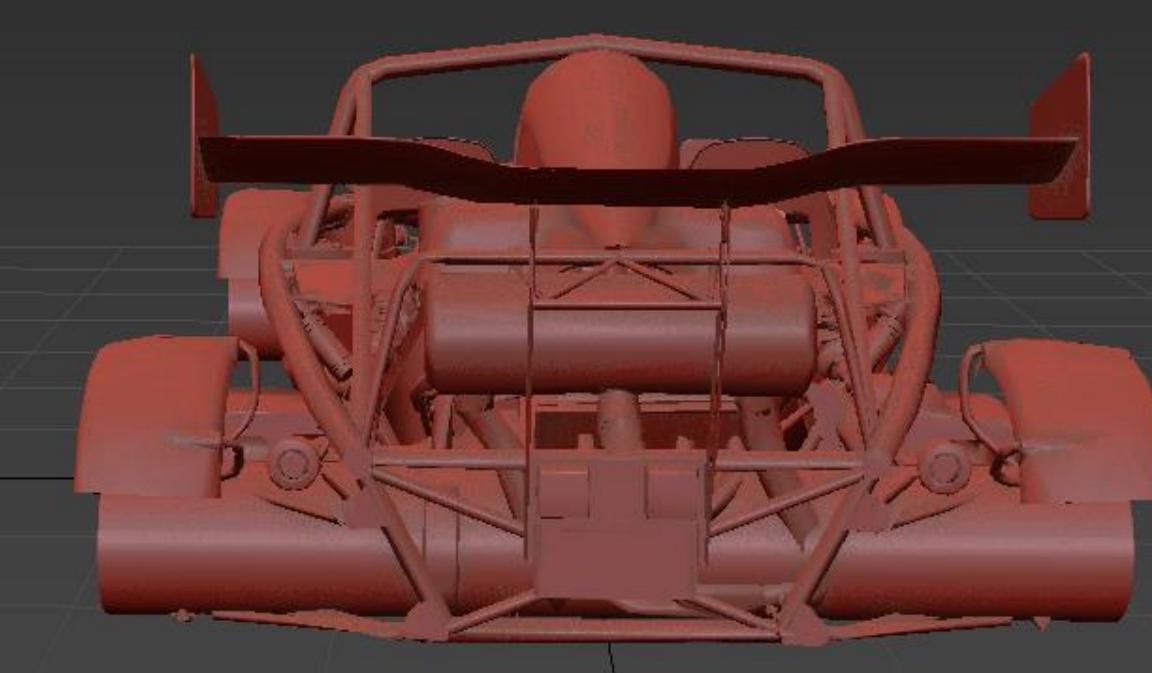
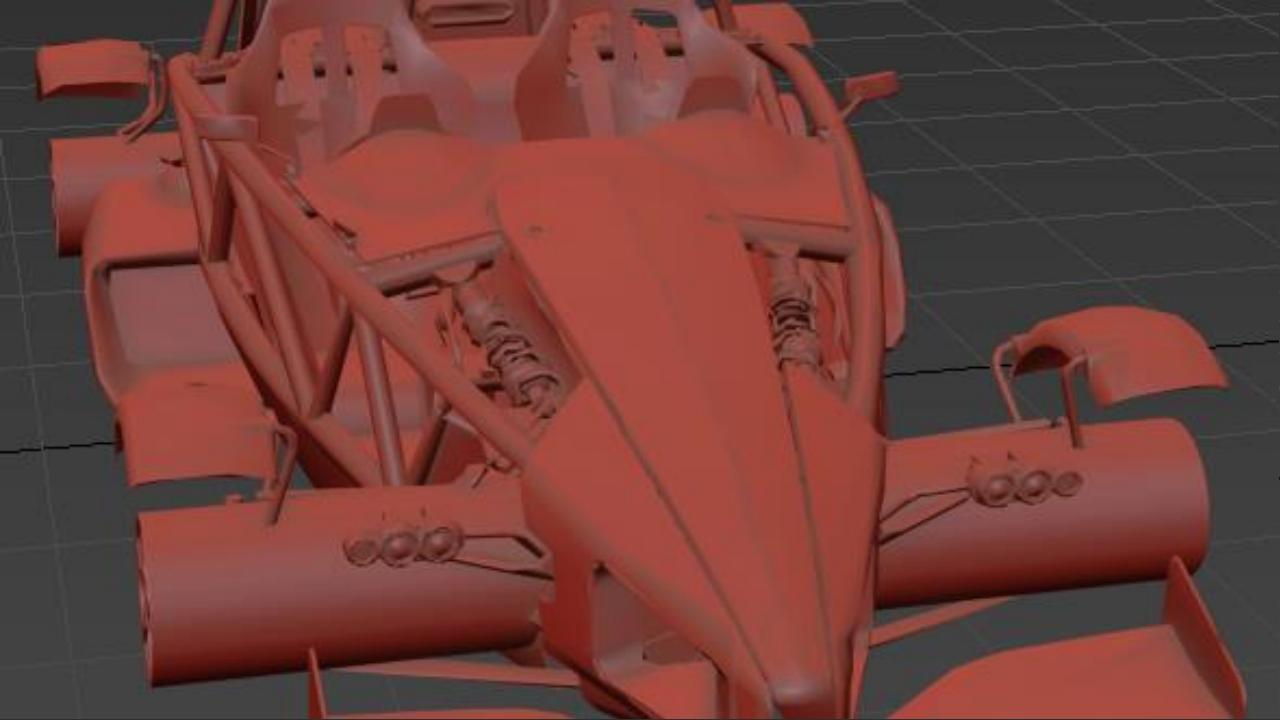
ARI_ATOM -REDUCTION

Special settings – has more TRI count so ratio was increased all other settings were the same as Pheonix.

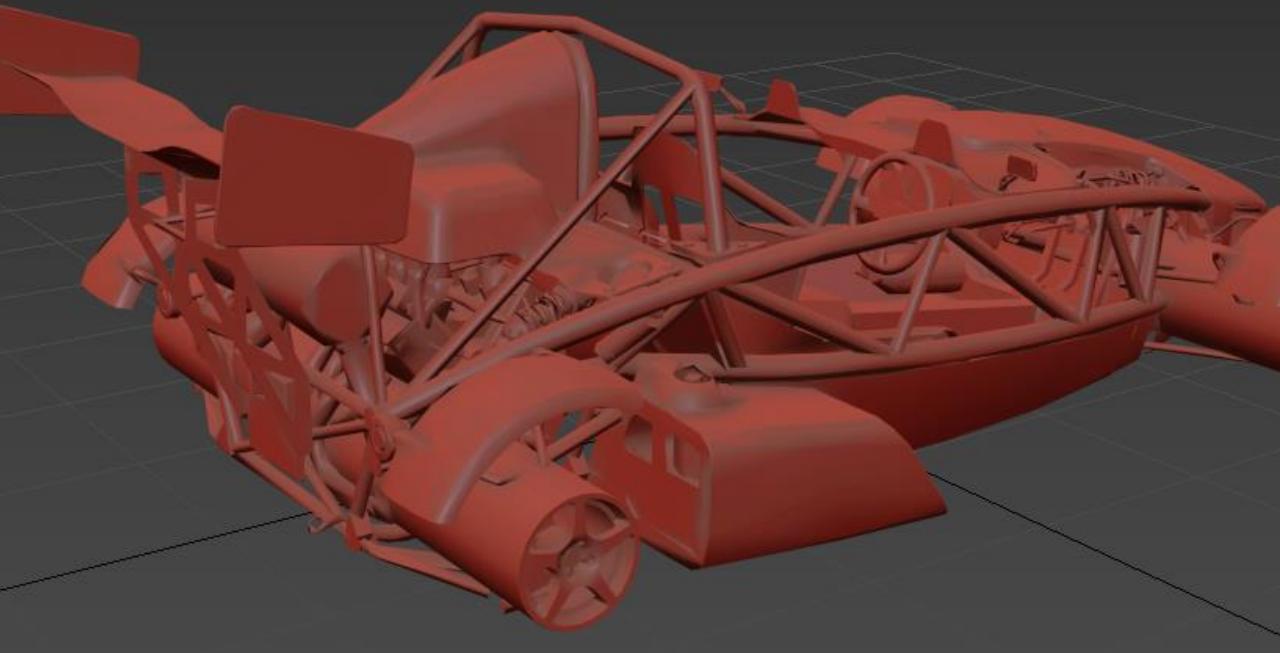
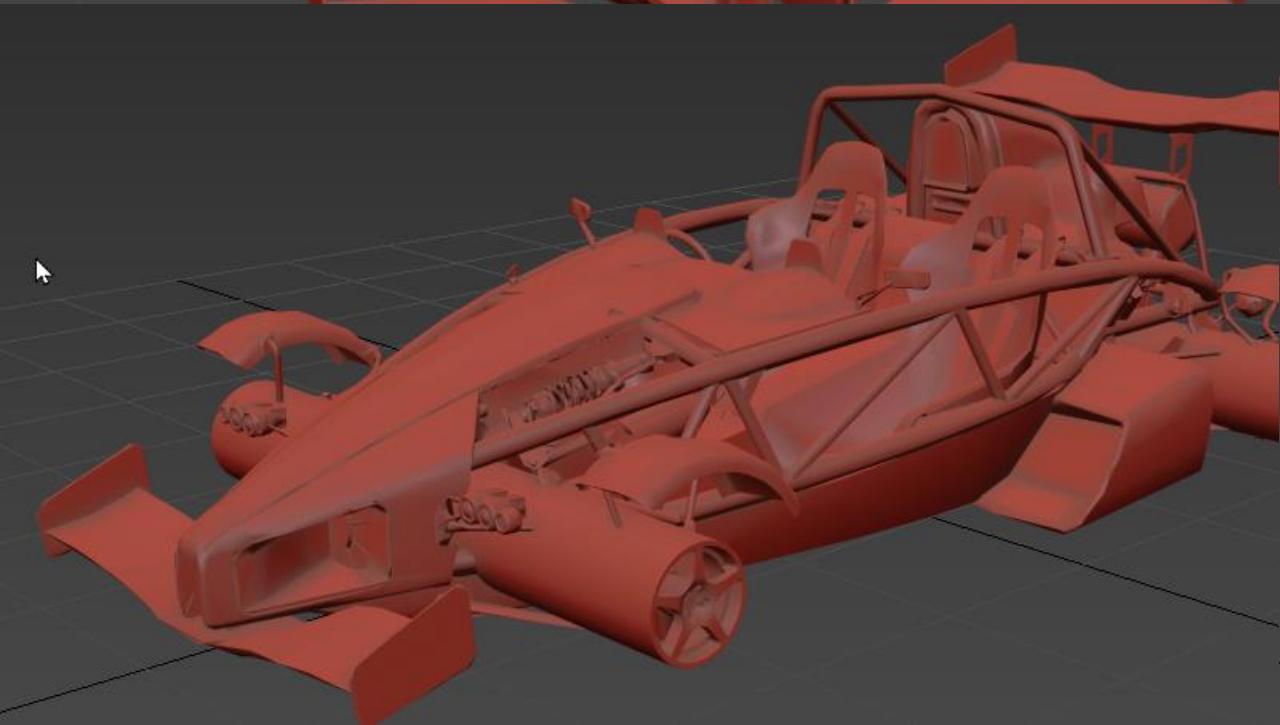


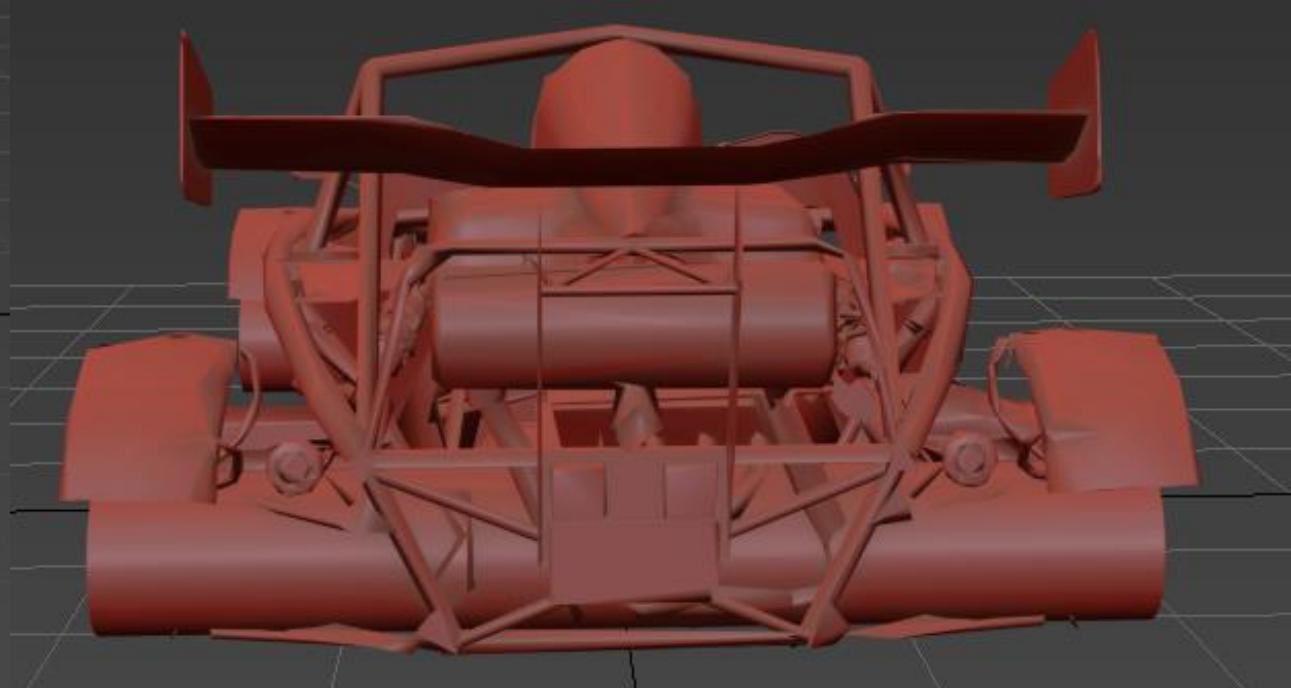
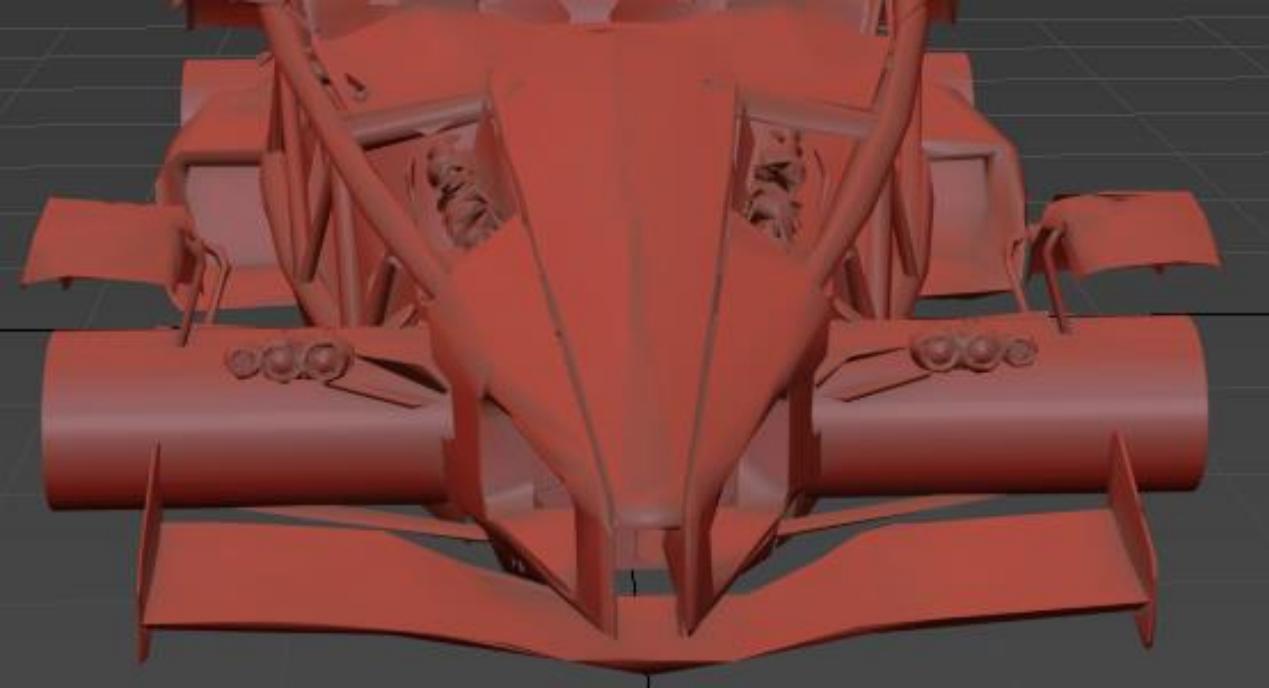
REDUCTION LOD1



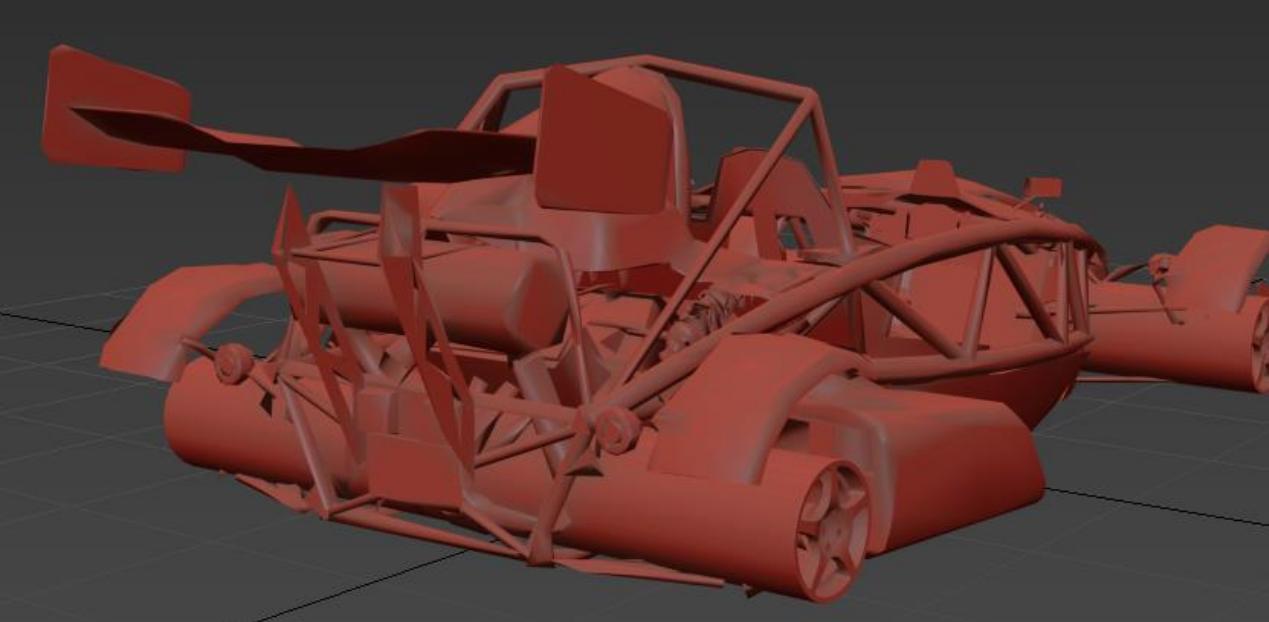


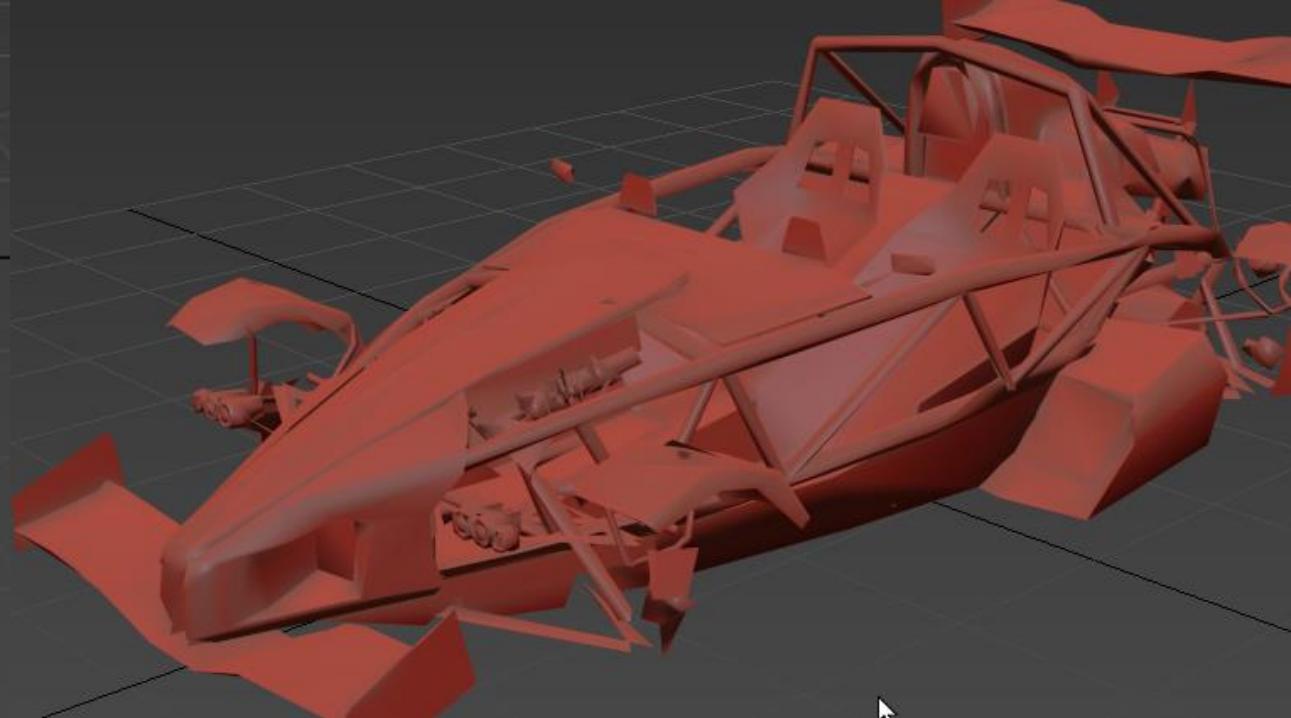
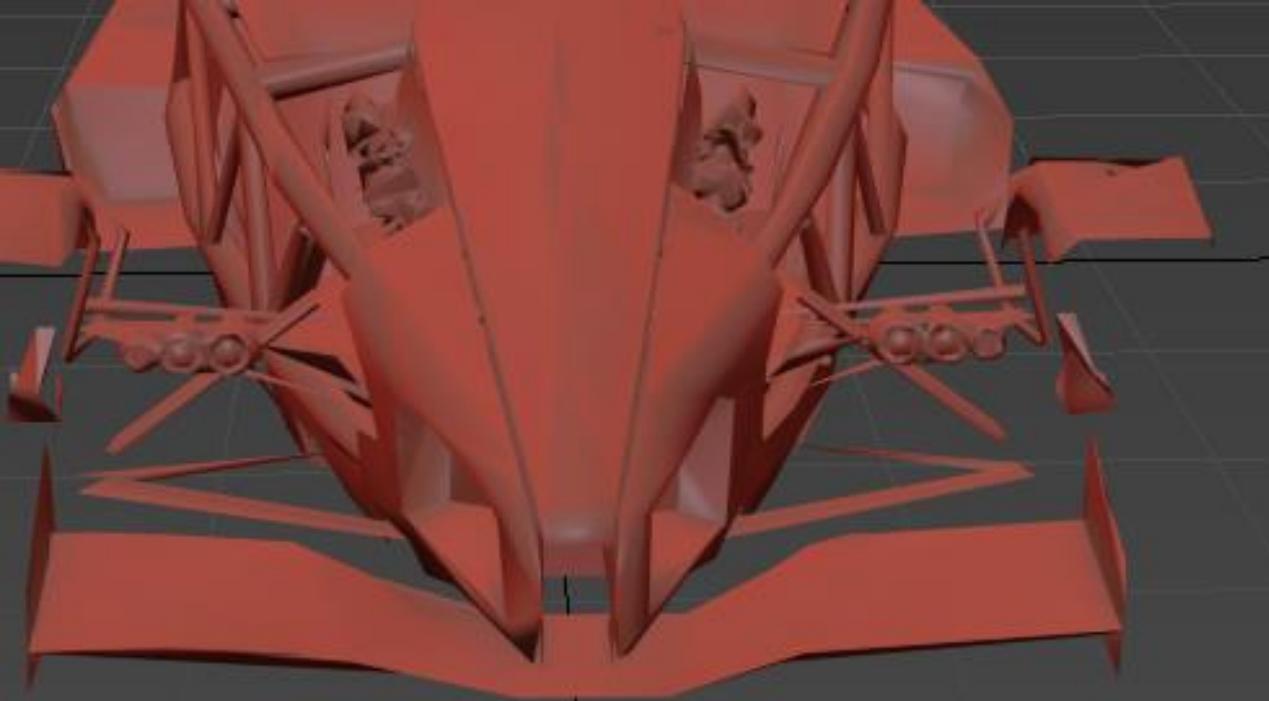
REDUCTION LOD2



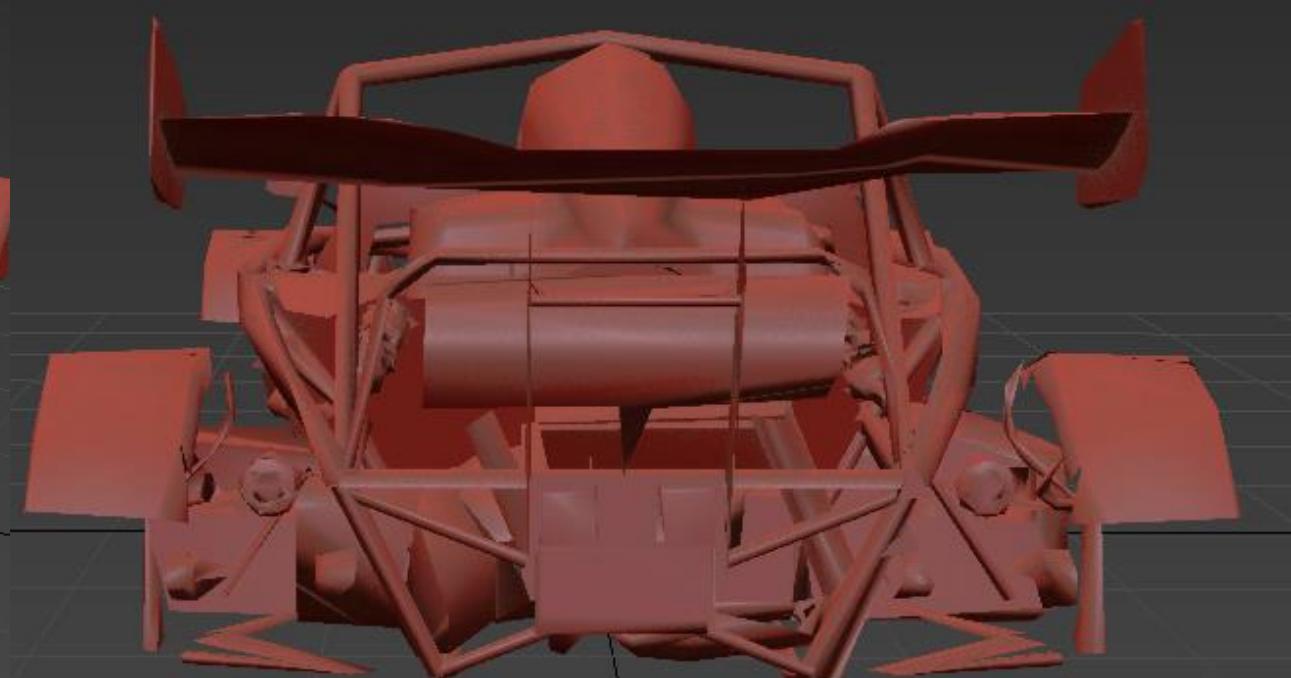
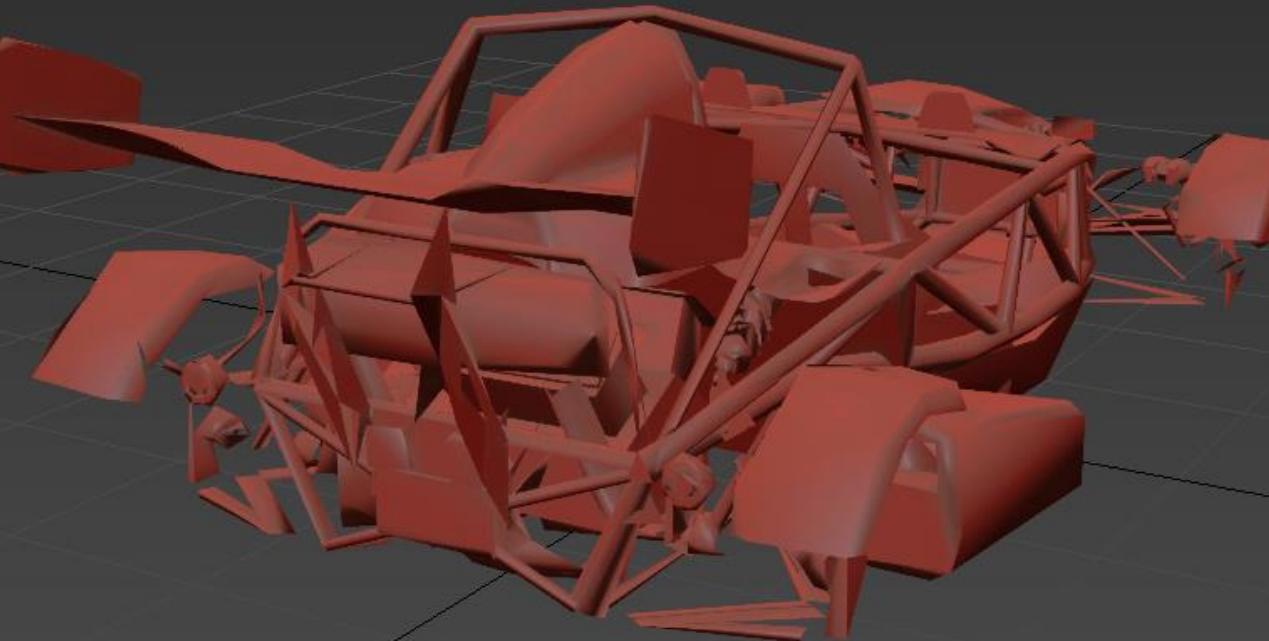


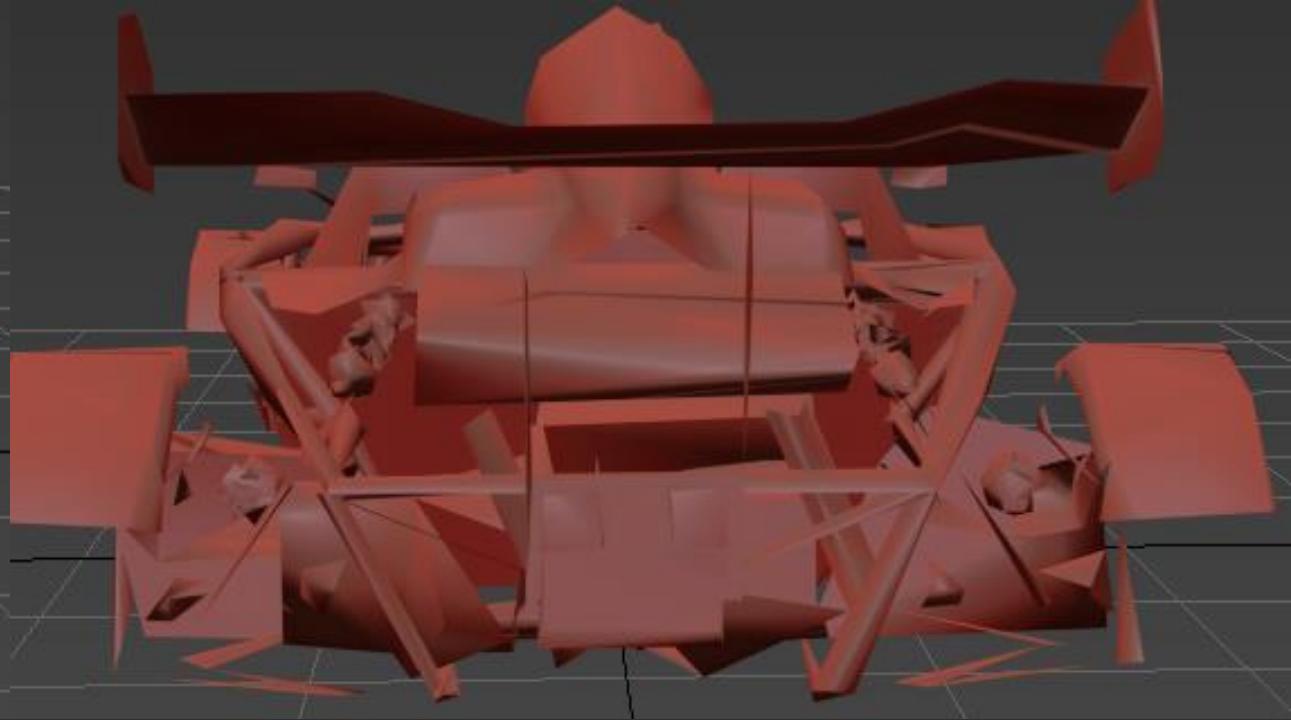
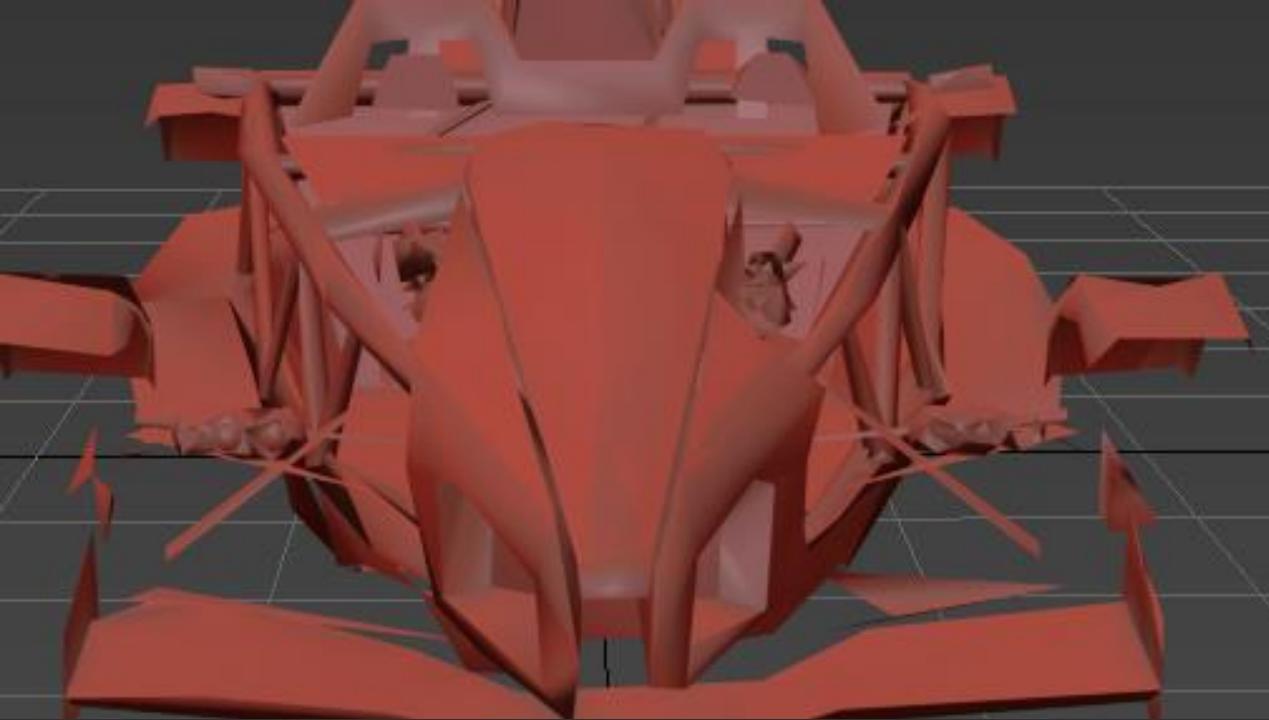
REDUCTION LOD3



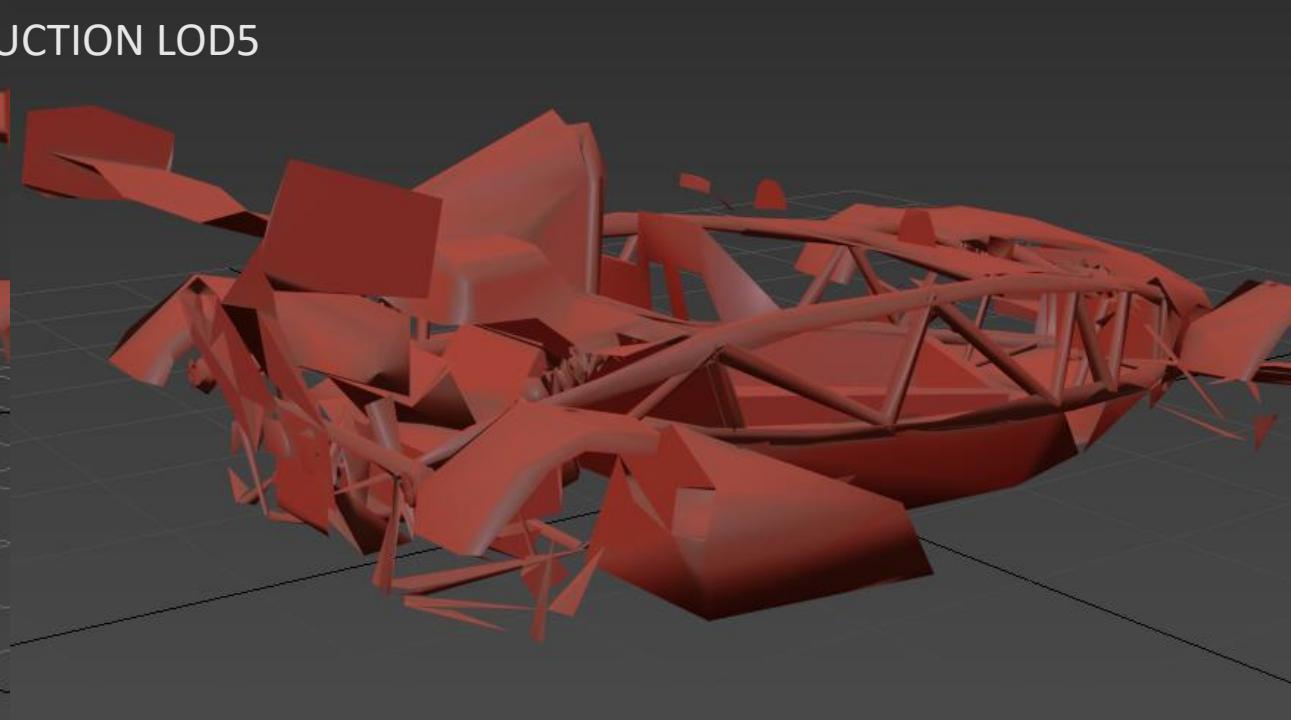
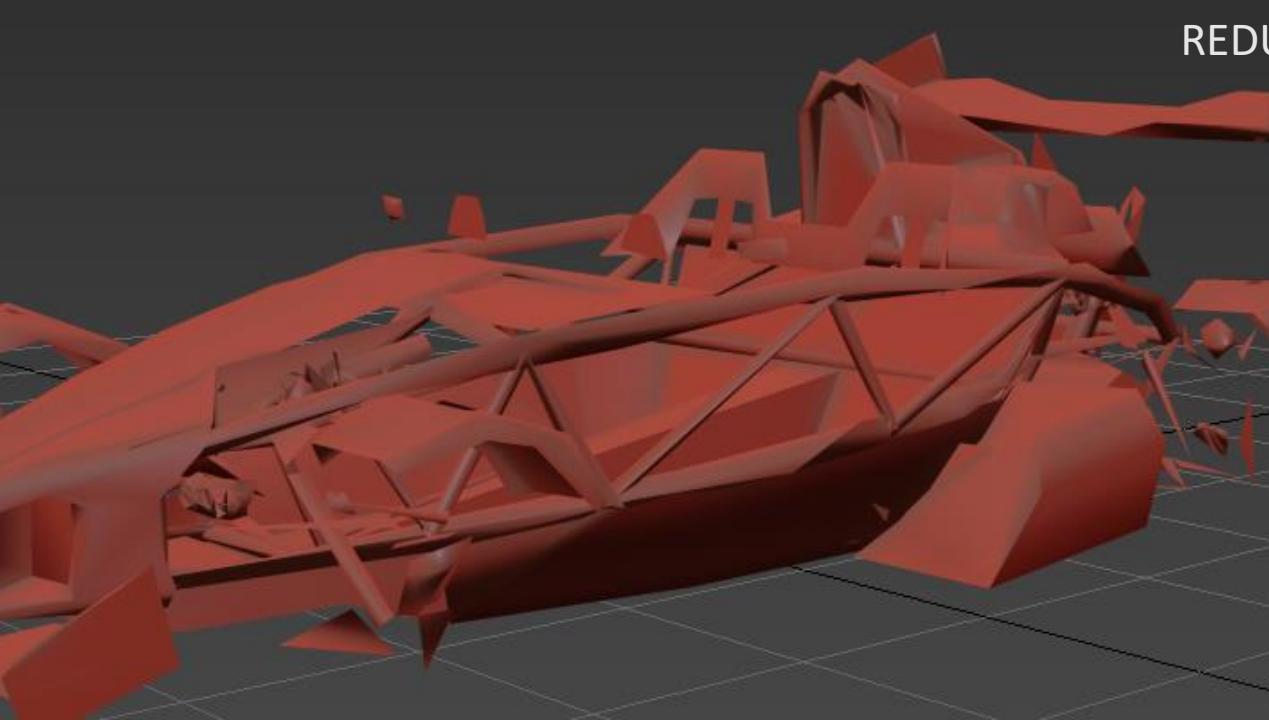


REDUCTION LOD4





REDUCTION LOD5



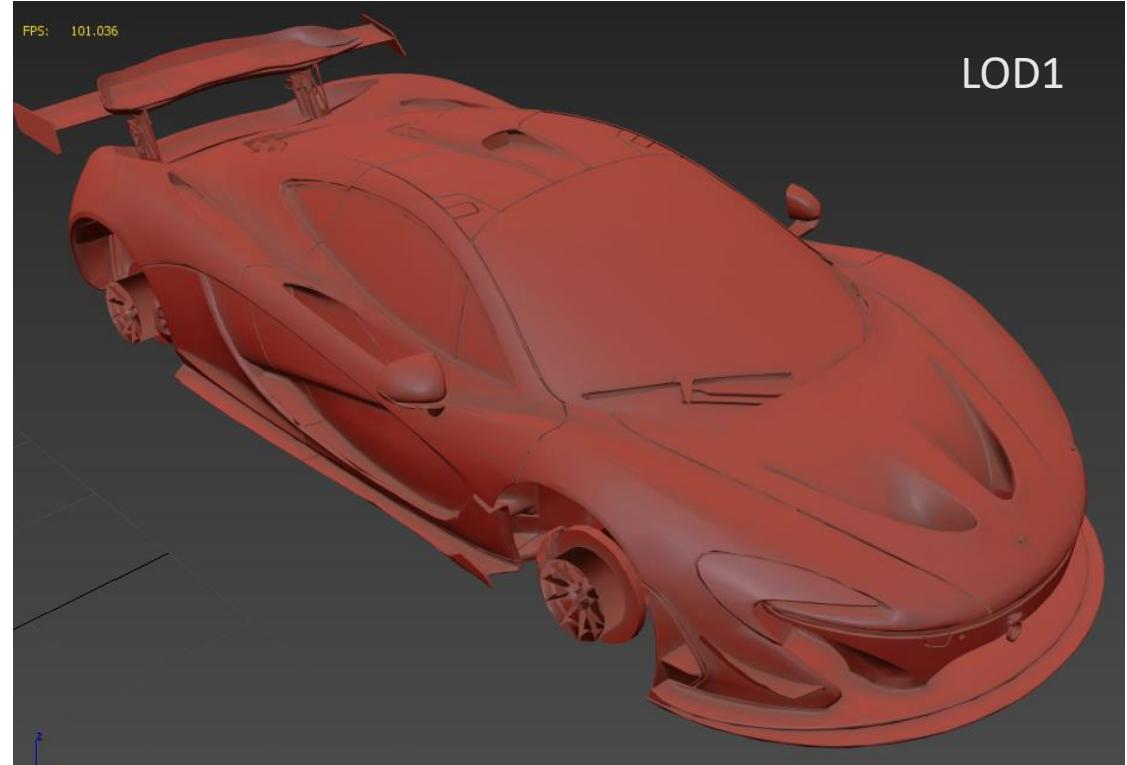
MCL_P1_13

same REDUCTION SETTINGS as FOR_Pheonix

	125 Objects Selected	125 Objects Selected	125 Objects Selected	125 Objects Selected
Reduction	Reduction	Reduction	Reduction	Reduction
LOD1	LOD2	LOD3	LOD4	LOD5
HAND	HAND	HAND	HAND	HAND

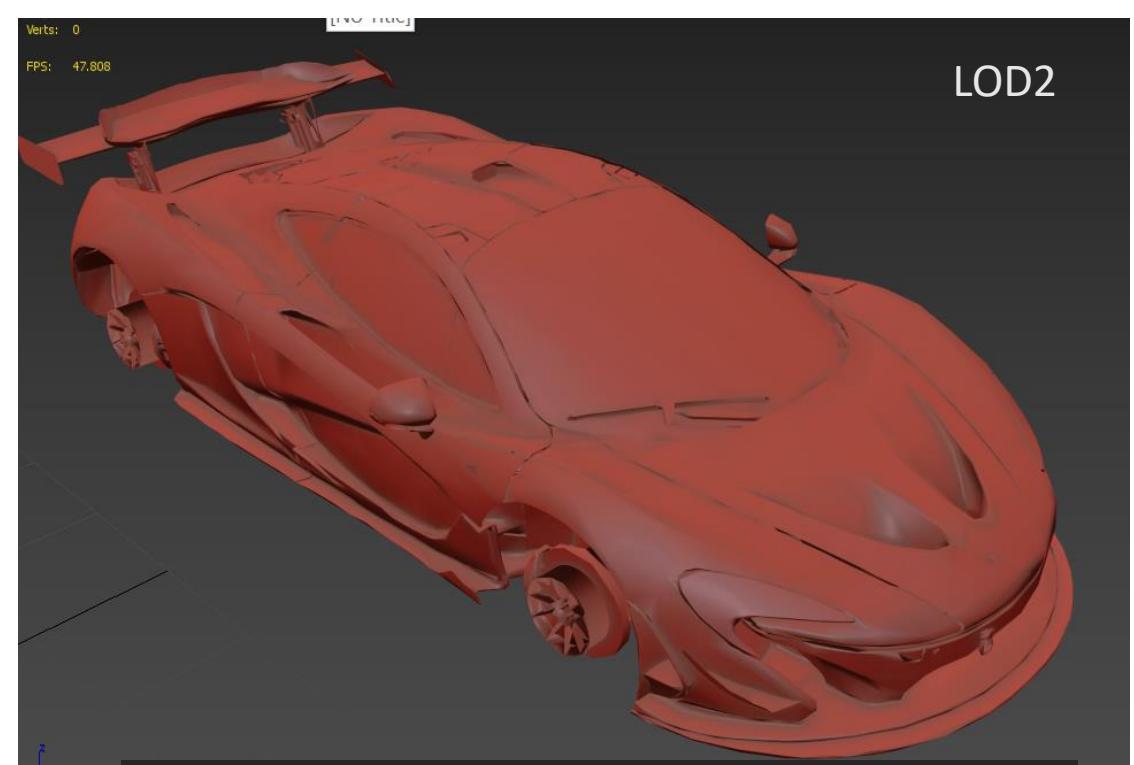
	58 Objects Selected	57 Objects Selected	57 Objects Selected	51 Objects Selected	36 Objects Selected
Reduction	Reduction	Reduction	Reduction	Reduction	Reduction
LOD1	LOD2	LOD3	LOD4	LOD5	LOD5
HAND	HAND	HAND	HAND	HAND	HAND

FPS: 101.036



LOD1

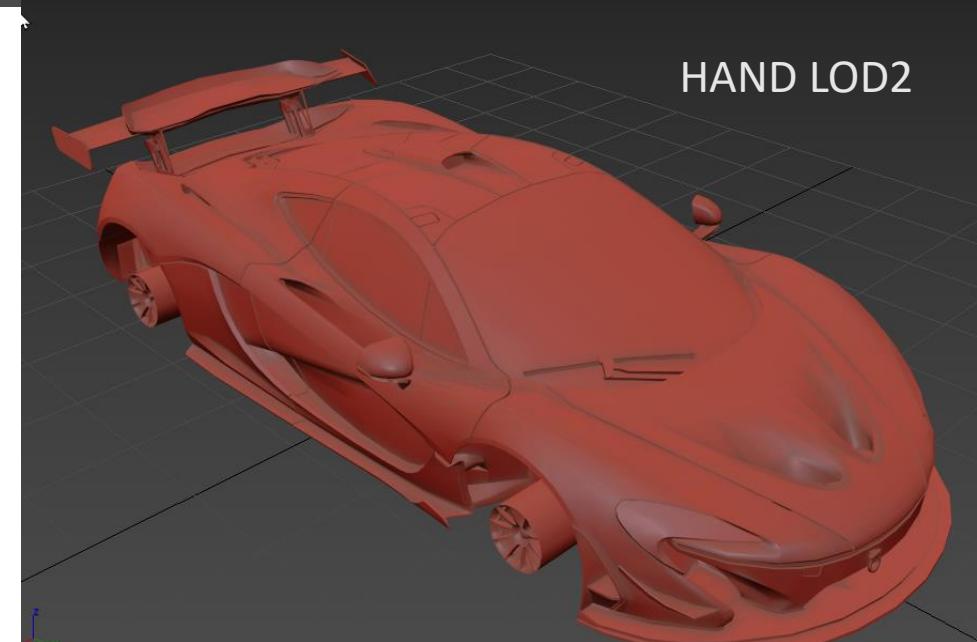
Verts: 0
FPS: 47.808



LOD2



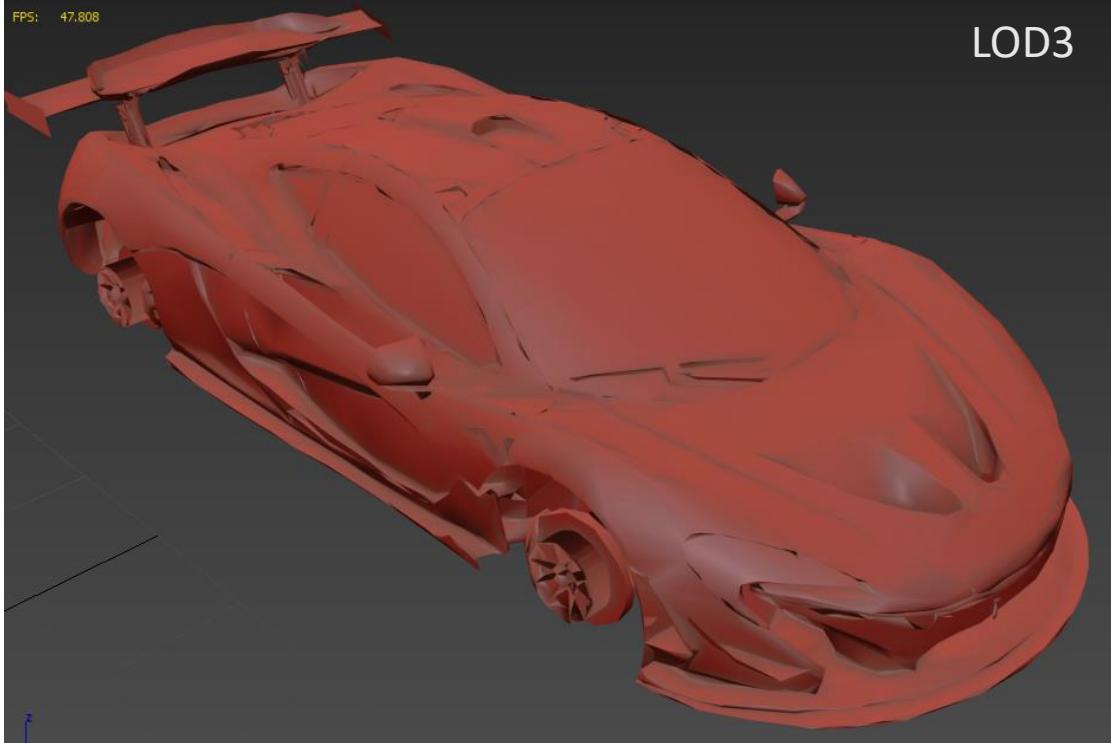
HAND LOD1



HAND LOD2

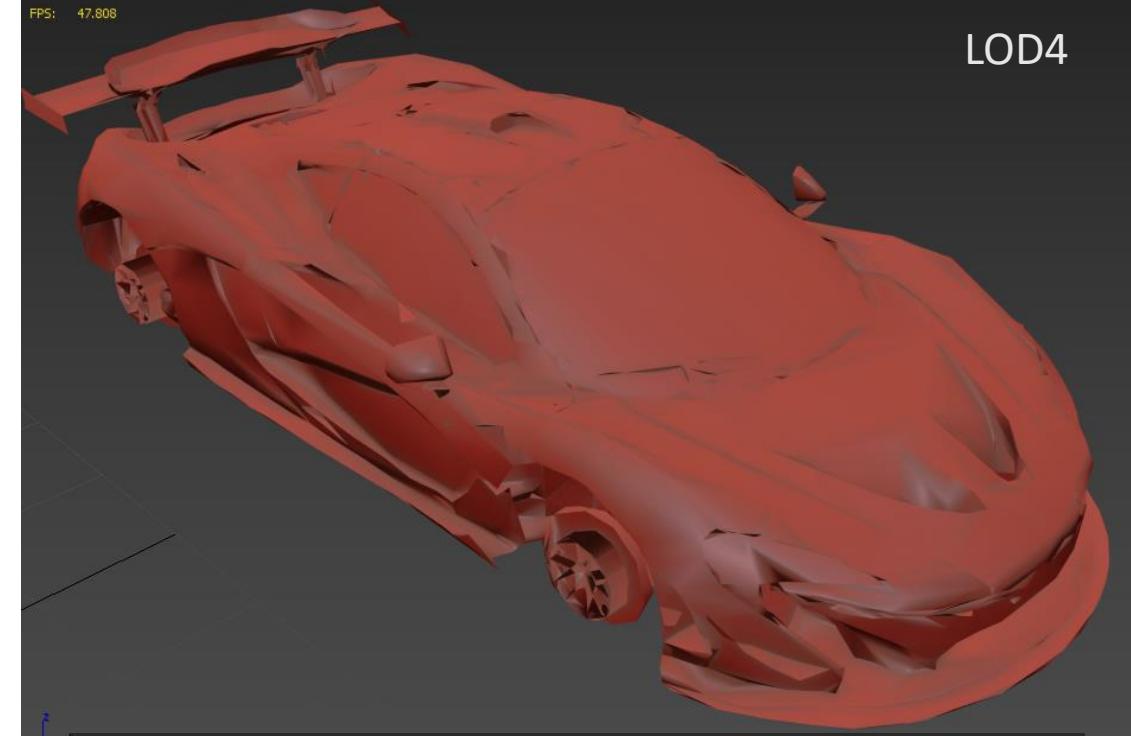
verts: 0
FPS: 47.808

LOD3

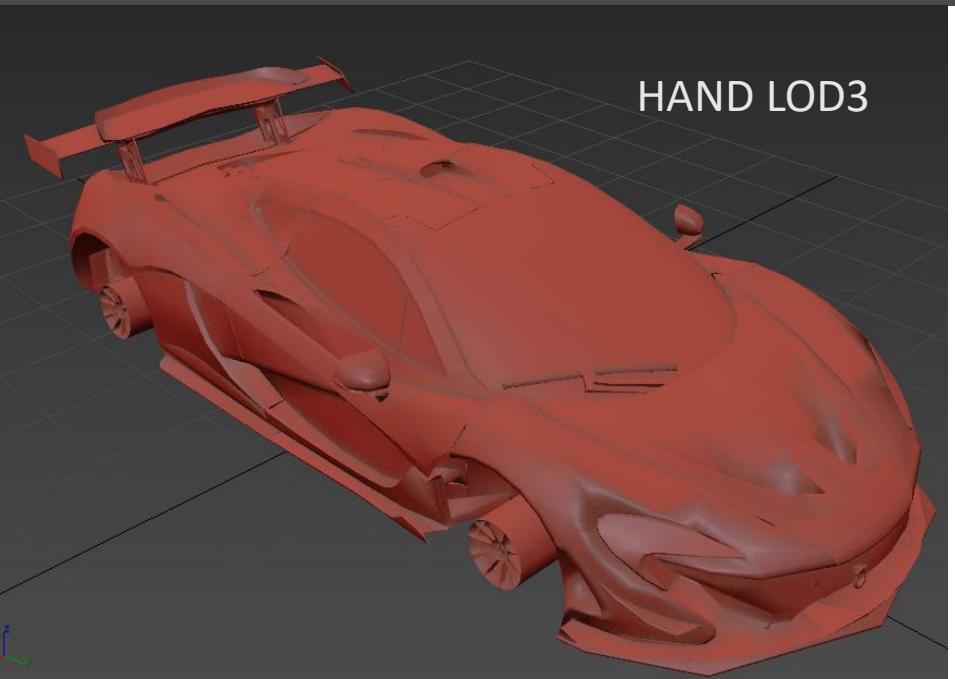


FPS: 47.808

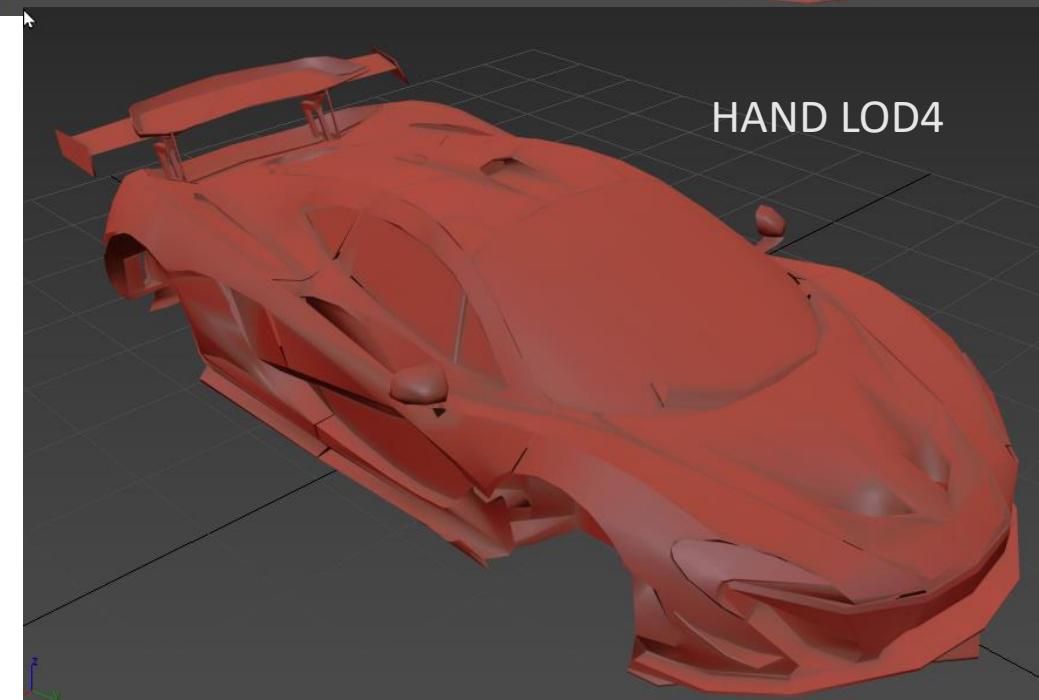
LOD4



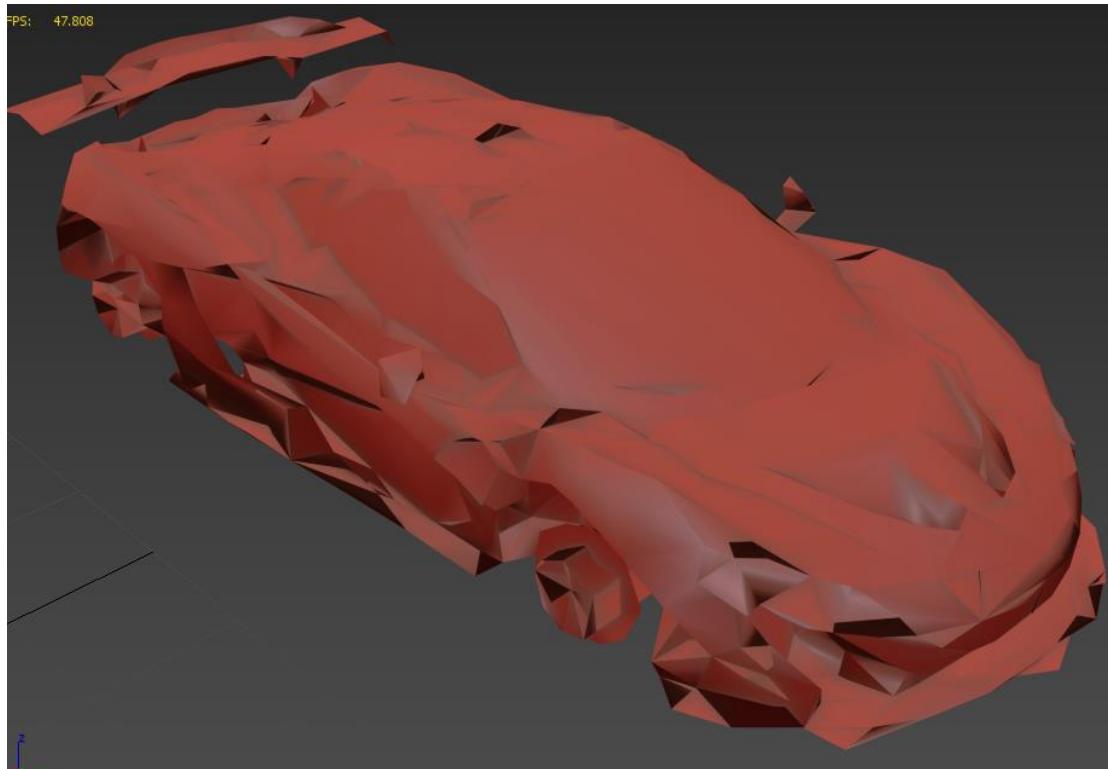
HAND LOD3



HAND LOD4



LOD5



HAND – LOD5

