



THE
WITCHER®
WILD HUNT

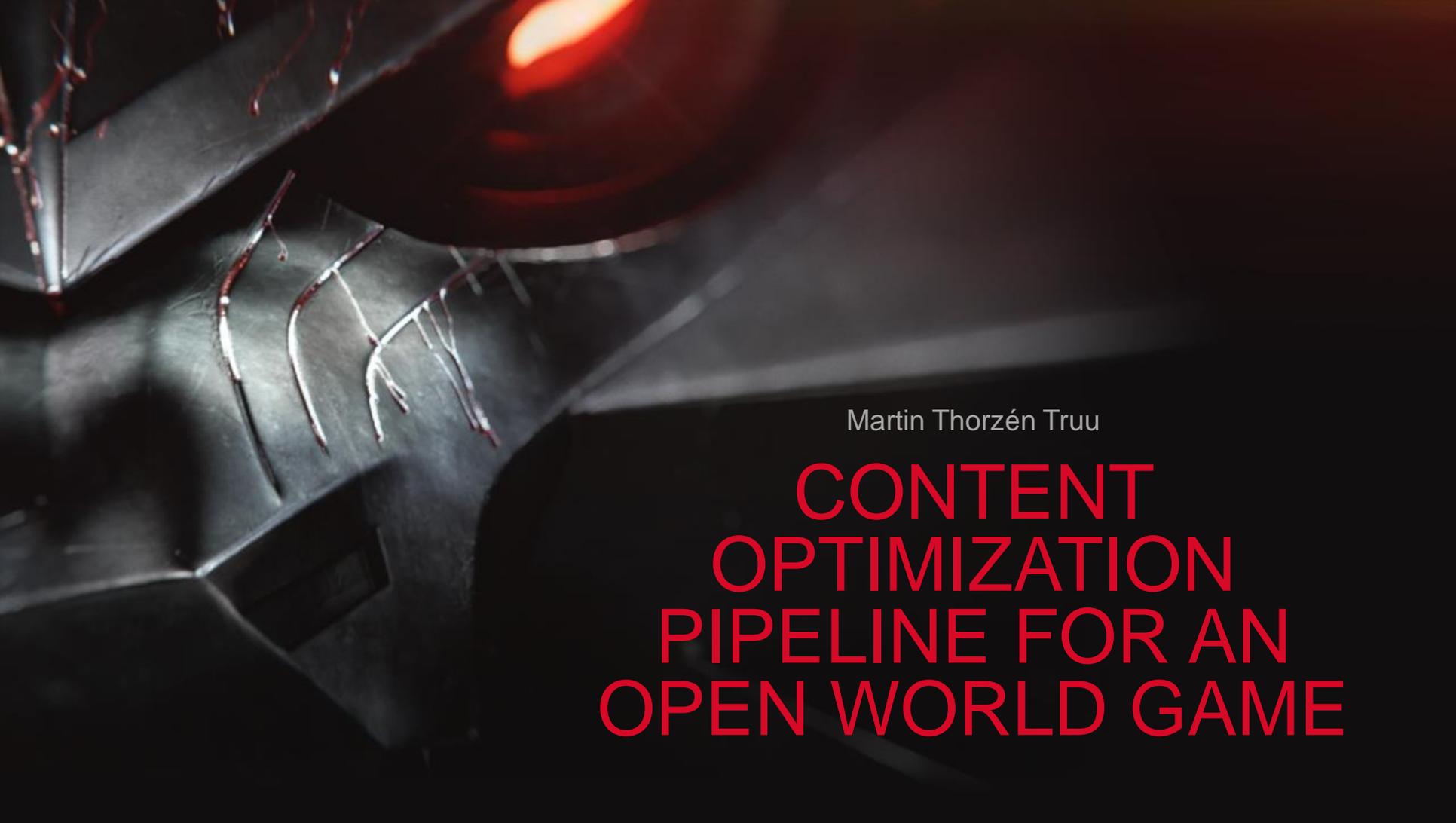


DID YOU KNOW...

CHUCK NORRIS DEVELOPS ONLY ON THE PS4.
NO OTHER CONSOLE DARES GO NEAR HIM.

THE
WITCHER
WILD HUNT





Martin Thorzén Truu

CONTENT OPTIMIZATION PIPELINE FOR AN OPEN WORLD GAME





THE
WITCHER
WILD HUNT



GAMEPLAY_BOUND

Mem: 1734.66 MB
RenderFenceTime: 52.567 ms
PhysicsFetchTime: 10.211 ms
PhysicsClothFetchTime: 0.018 ms
SimulateAndDrawParticles: 0.000 ms 0 nb
FinalizeMovement: 0.001 ms
PhysXCharacterControllerMove: 0.000 ms 0 nb

blocks: 0 signals: 0 tuncs: 13378
time: 0.000s internal timer: 0.000s/0.00%

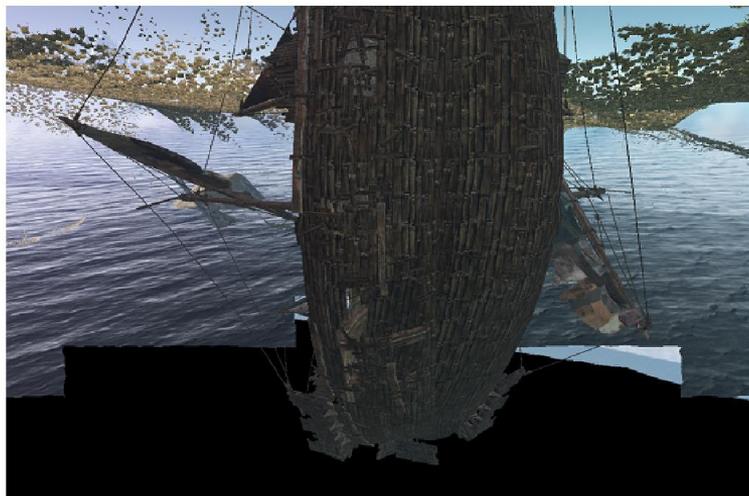
Scene Stats

Triangles:	52.5 M / 4.0 M = 1313 %
Chunks:	715.0 / 10.0 K = 8 %
Textures:	324.8 Mb / 500.0 Mb = 65 %





THE
WITCHER
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Scene triangles: 1507812

Scene chunks: 38

Scene vertices: 1001136

THIS PRESENTATION

- ◆ Why?
- ◆ How?
- ◆ Outcome
- ◆ What we learned

A close-up, low-angle shot of a dark, metallic, angular object, possibly a piece of machinery or a futuristic helmet. The object is illuminated from the top, creating strong highlights and deep shadows. A bright, glowing red light source is visible in the upper center, casting a warm, orange-red glow. Several thin, branching, metallic structures extend from the main body of the object, resembling a stylized tree or a complex circuit board. The overall atmosphere is mysterious and technological.

01.

WHY?

01. WHY?

A NEED

- ◆ Find problematic assets
- ◆ Not enough sanity checking
- ◆ A lot of entities (500 000)

01. WHY?

- ◆ Change asset inside our editor.
- ◆ Author asset inside our editor.
- ◆ Editor components.

A dark, industrial scene with a glowing red light source in the upper center. The scene is filled with metallic, angular structures and some thin, white, fibrous or wire-like elements. The lighting is dramatic, with strong highlights and deep shadows.

02.

HOW?

DATABASE VIEWER

Data Base Viewer v3.1

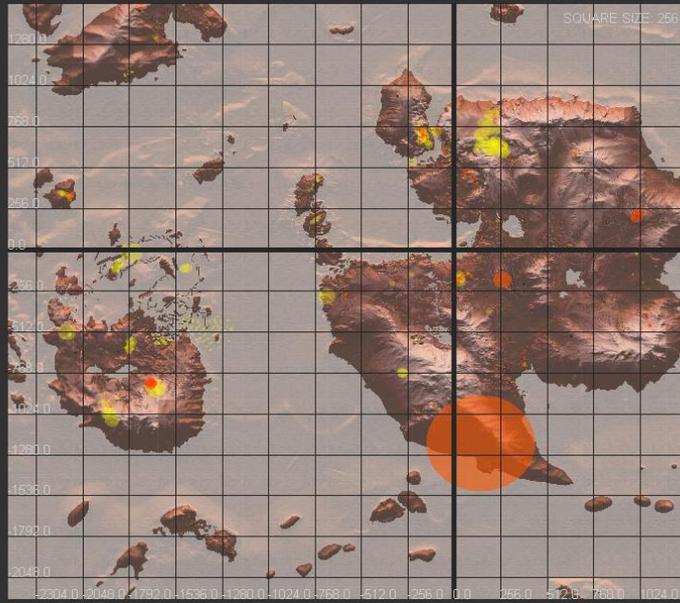
DEFAULT_SOUND_TYPE
SKIN_SHADER
BROKEN_MATERIALS_DESTRUCTION
COLL_TRI_MESH_OVER_500
TEX_GREATER_2K
NO_LODS_OVER_2000_TRIS
BROKEN_MATERIALS_CLOTH
QA_FOLDER
SELECT_ALL_EXPENSIVE_LIGHTS
UNIQUE_MATERIALS
BROKEN_MATERIALS_MESHES
SELECT_ALL_LIGHTS
LAYERS_BUILDTAG_NONE

skelge Rebuild DB its WHERE castingShadow = 'true' AND lightShadowMode = 'LSCM_Normal' Execute Save Command

Map

Keep Positions Clear Positions Vertex Density Map

SQUARE SIZE: 256



2304.0 2048.0 1792.0 1536.0 1280.0 1024.0 768.0 512.0 256.0 0.0 256.0 512.0 768.0 1024.0

SAVE IMAGE

Create All Burn Down Charts Database

Ready

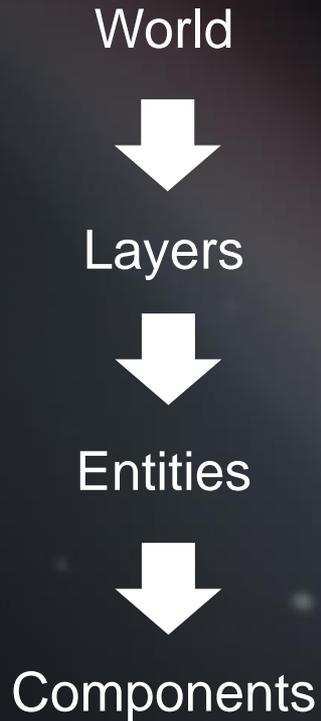
Light selection: Yellow, Red, Blue, Purple, Green

	lightid	entityid	posx	posy	posz	lightRadius	lightEnabled	castingShadow	lightShadowMode
1	1023	18621	-59.5217	550.85	3.20928	5	true	true	LSCM_Normal
2	100	8366	1584.83	2041.3	29.7788	5	true	true	LSCM_Normal
3	930	45525	-172.051	689.877	96.4726	5	true	true	LSCM_Normal
4	96	8358	1440.4	2053.48	83.9136	2	true	true	LSCM_Normal
5	95	7687	1654.31	2000.27	18.8003	2	true	true	LSCM_Normal
6	987	47119	-48.8627	634.298	4.70452	2	true	true	LSCM_Normal
7	94	8356	1628.01	2030.63	13.7912	2	true	true	LSCM_Normal
8	855	44828	-151.511	712.305	97.6468	5	true	true	LSCM_Normal
9	92	8354	1510.81	2035.8	61.312	2	true	true	LSCM_Normal
10	91	8359	1657.3	2001.77	18.8483	2	true	true	LSCM_Normal
11	90	8334	1433.64	2053.04	84.4443	2	true	true	LSCM_Normal
12	89	8332	1432.08	2042.91	84.4989	2	true	true	LSCM_Normal
13	88	8330	1441.8	2041.63	83.8456	2	true	true	LSCM_Normal
14	87	8328	1467.21	2063.05	67.0131	2	true	true	LSCM_Normal
15	93	8355	1568.96	2025.93	51.6605	2	true	true	LSCM_Normal
16	84	7687	1602.6	2037.92	33.2787	2	true	true	LSCM_Normal
17	852	44825	-168.941	714.776	104.778	5	true	true	LSCM_Normal
18	850	44823	-170.413	703.962	104.778	5	true	true	LSCM_Normal
19	849	44822	-155.687	712.945	104.778	5	true	true	LSCM_Normal
20	848	44821	-162.387	713.748	103.916	5	true	true	LSCM_Normal
21	847	44820	-157.168	702.132	104.778	5	true	true	LSCM_Normal
22	846	44819	-153.87	716.022	99.0818	3.5	true	true	LSCM_Normal
23	845	44818	-154.799	709.185	99.0818	3.5	true	true	LSCM_Normal

Save To File Upload to Google Docs

02. HOW?

HOW WE APPROACHED IT



02. HOW?

- ◆ Simple solution, fast too implement
- ◆ Iterating through all the Worlds/Layers/Entities/Components
- ◆ Querying properties
- ◆ Stored as SQL Statements

02. HOW?

SQL STATEMENTS, YAY!

```
CREATE TABLE IF NOT EXISTS Worlds (id INTEGER PRIMARY KEY, name, size);
CREATE TABLE IF NOT EXISTS Layers (id INTEGER PRIMARY KEY, path, worldid INTEGER, static, buildTag, layerName, FOREIGN KEY(worldid) REFERENCES Worlds(id));
CREATE TABLE IF NOT EXISTS FoliageTiles (id INTEGER PRIMARY KEY, worldName, treeCounter INTEGER, grassCounter INTEGER, pos);
CREATE TABLE IF NOT EXISTS Entities (id INTEGER PRIMARY KEY, name, layerid INTEGER, componentsCount INTEGER, posx, posy, posz, bbminx, bbminy, bbminz, bbmaxx, bbmaxy, bbmaxz, drawableComp, FOREIGN KEY(layerid) REFERENCES Layers(id));
CREATE TABLE IF NOT EXISTS MeshComponents (_id INTEGER PRIMARY KEY, entityid INTEGER, posx, posy, posz, bbminx, bbminy, bbminz, bbmaxx, bbmaxy, bbmaxz, lodCount INTEGER, materialCount INTEGER, triangleCount INTEGER, vertCount INTEGER);
CREATE TABLE IF NOT EXISTS DestructionComponents (_id INTEGER PRIMARY KEY, entityid INTEGER, posx, posy, posz, bbminx, bbminy, bbminz, bbmaxx, bbmaxy, bbmaxz, materialCount INTEGER, streamingLod INTEGER, depotPath, importFile);
CREATE TABLE IF NOT EXISTS ClothComponents (_id INTEGER PRIMARY KEY, entityid INTEGER, posx, posy, posz, bbminx, bbminy, bbminz, bbmaxx, bbmaxy, bbmaxz, materialCount INTEGER, streamingLod INTEGER, depotPath, importFile, importFile2);
CREATE TABLE IF NOT EXISTS Lods (id INTEGER PRIMARY KEY, meshcomponentid INTEGER, lodNr INTEGER, memorySizeCPU INTEGER, memorySizeGPU INTEGER, lodDistance, triangleCount INTEGER, vertCount INTEGER, chunkCount INTEGER, materialCount INTEGER);
CREATE TABLE IF NOT EXISTS Coords (id INTEGER PRIMARY KEY, meshcomponentid INTEGER, col, row, size, static, posx, posy, posz, triangleCount INTEGER, materialCount INTEGER, uniqueMeshComponentId, collisionShapeName); FOREIGN KEY(meshcomponentid) REFERENCES MeshComponents(_id); FOREIGN KEY(materialCount) REFERENCES Lods(id); FOREIGN KEY(triangleCount) REFERENCES MeshComponents(triangleCount); FOREIGN KEY(vertCount) REFERENCES MeshComponents(vertCount); FOREIGN KEY(chunkCount) REFERENCES MeshComponents(chunkCount); FOREIGN KEY(materialCount) REFERENCES Lods(materialCount); FOREIGN KEY(collisionShapeName) REFERENCES CollisionShapes(name);

INSERT OR IGNORE INTO layers (path, worldid, static, buildTag, layerName) VALUES ('Z:\r4data\levels\island_of_mist\environment\env_global_skellige.w2l', (select id from worlds where name='island_of_mist' LIMIT 1), 'true', 'E');
INSERT OR IGNORE INTO entities (name, layerid, componentsCount, posx, posy, posz, bbminx, bbminy, bbminz, bbmaxx, bbmaxy, bbmaxz, drawableComp) VALUES ('env_inn_pest', (select id from layers where path='Z:\r4data\levels\island_of_mist\environment\env_global_skellige.w2l' LIMIT 1), 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0);
INSERT OR IGNORE INTO layers (path, worldid, static, buildTag, layerName) VALUES ('Z:\r4data\levels\island_of_mist\environment\env_storm_01.w2l', (select id from worlds where name='island_of_mist' LIMIT 1), 'false', 'LBT_Env');
INSERT OR IGNORE INTO layers (path, worldid, static, buildTag, layerName) VALUES ('Z:\r4data\levels\island_of_mist\gameplay\block_functionalities.w2l', (select id from worlds where name='island_of_mist' LIMIT 1), 'false', 'E');
INSERT OR IGNORE INTO entities (name, layerid, componentsCount, posx, posy, posz, bbminx, bbminy, bbminz, bbmaxx, bbmaxy, bbmaxz, drawableComp) VALUES ('blockgameplaytrigger0', (select id from layers where path='Z:\r4data\levels\island_of_mist\gameplay\block_functionalities.w2l' LIMIT 1), 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0);
INSERT OR IGNORE INTO layers (path, worldid, static, buildTag, layerName) VALUES ('Z:\r4data\levels\island_of_mist\gameplay\encounters.w2l', (select id from worlds where name='island_of_mist' LIMIT 1), 'true', 'LBT_Quest');
INSERT OR IGNORE INTO layers (path, worldid, static, buildTag, layerName) VALUES ('Z:\r4data\levels\island_of_mist\gameplay\interior_triggers.w2l', (select id from worlds where name='island_of_mist' LIMIT 1), 'false', 'LBT_
```

02. HOW?

- ◆ Several files
- ◆ 2Gb text-file
- ◆ Now we had databases for all levels.
- ◆ Now the fun begins!

SQL MAGIC

- ◆ *“Give me all meshes that has no lods and the triangle count is larger than 2000 and autohide distance is greater than 50 meters”*

"SELECT DISTINCT depotPath, triangleCount, author, autoHideDistance FROM MeshComponents WHERE lodCount < '1' AND triangleCount >=2000 AND autoHideDistance >= 50"

02. HOW?

SQL MAGIC

- ◆ *“Give me the position and radius of all the lights that casts shadows”*

*SELECT posx, posy, radius FROM Lights WHERE
shadowCasting = false*

02. HOW?

SQL MAGIC

- ◆ *“Give me vertex count and boundingbox area of mesh components”*

```
SELECT bbminx, bbminy, bbminz, bbmaxx, bbmaxy, bbmaxz,  
vertCount FROM meshcomponents
```

A DATABASE VIEWER

Data Base Viewer v3.1

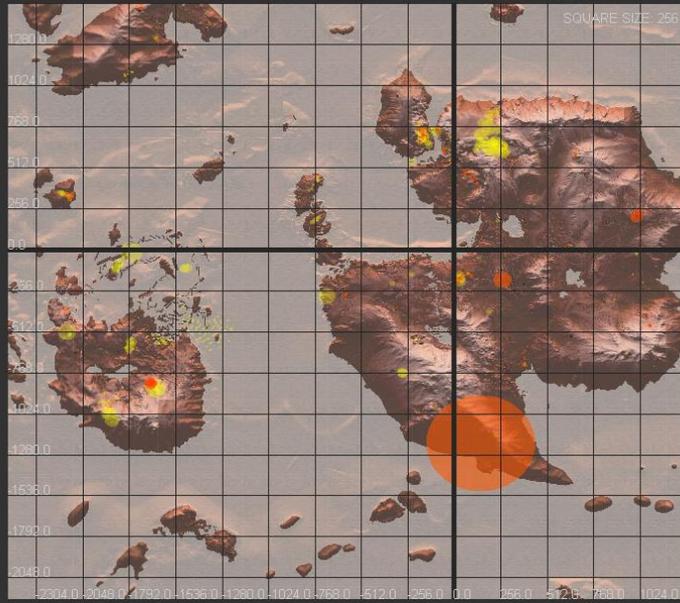
DEFAULT_SOUND_TYPE
SKIN_SHADER
BROKEN_MATERIALS_DESTRUCTION
COLL_TRI_MESH_OVER_500
TEX_GREATER_2K
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SELECT_ALL_LIGHTS
LAYERS_BUILDTAG_NONE

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Map

Keep Positions Clear Positions Vertex Density Map

SQUARE SIZE: 256



2304.0 2048.0 1792.0 1536.0 1280.0 1024.0 768.0 512.0 256.0 0.0 256.0 512.0 768.0 1024.0

SAVE IMAGE

Create All Burn Down Charts Database

Ready

Light color palette: Yellow, Red, Blue, Purple, Green

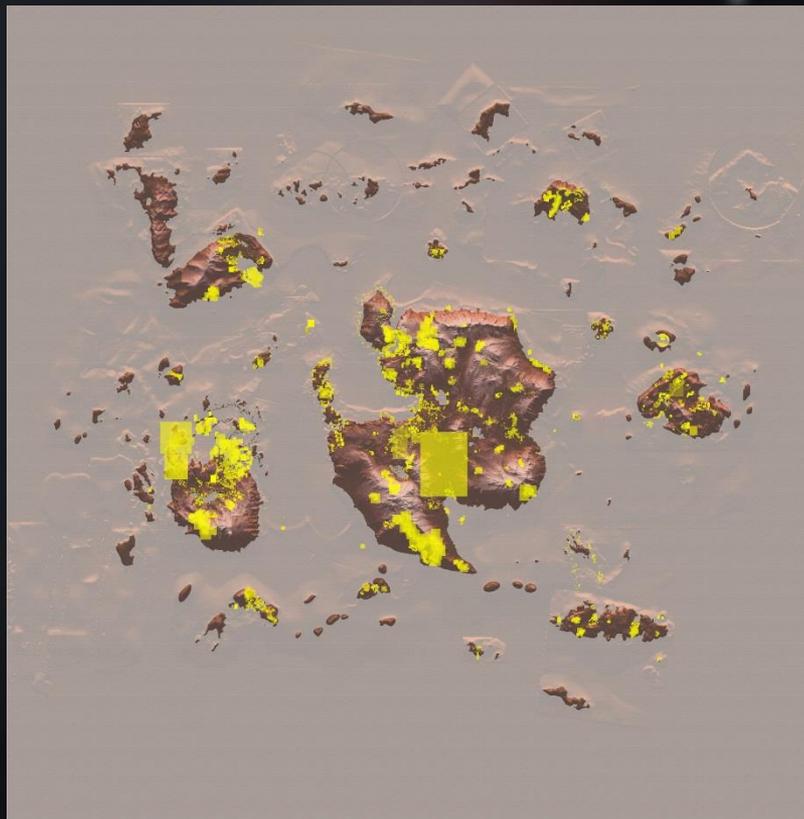
	_lightid	entityid	posx	posy	posz	lightRadius	lightEnabled	castingShadow	lightShadowMode
1	1023	18621	-59.5217	550.85	3.20928	5	true	true	LSCM_Normal
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3	930	45525	-172.051	689.877	96.4726	5	true	true	LSCM_Normal
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5	95	7687	1654.31	2000.27	18.8003	2	true	true	LSCM_Normal
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14	87	8328	1467.21	2063.05	67.0131	2	true	true	LSCM_Normal
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16	84	7687	1602.6	2037.92	33.2787	2	true	true	LSCM_Normal
17	852	44825	-168.941	714.776	104.778	5	true	true	LSCM_Normal
18	850	44823	-170.413	703.962	104.778	5	true	true	LSCM_Normal
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23	845	44818	-154.799	709.185	99.0818	3.5	true	true	LSCM_Normal

Save To File Upload to Google Docs

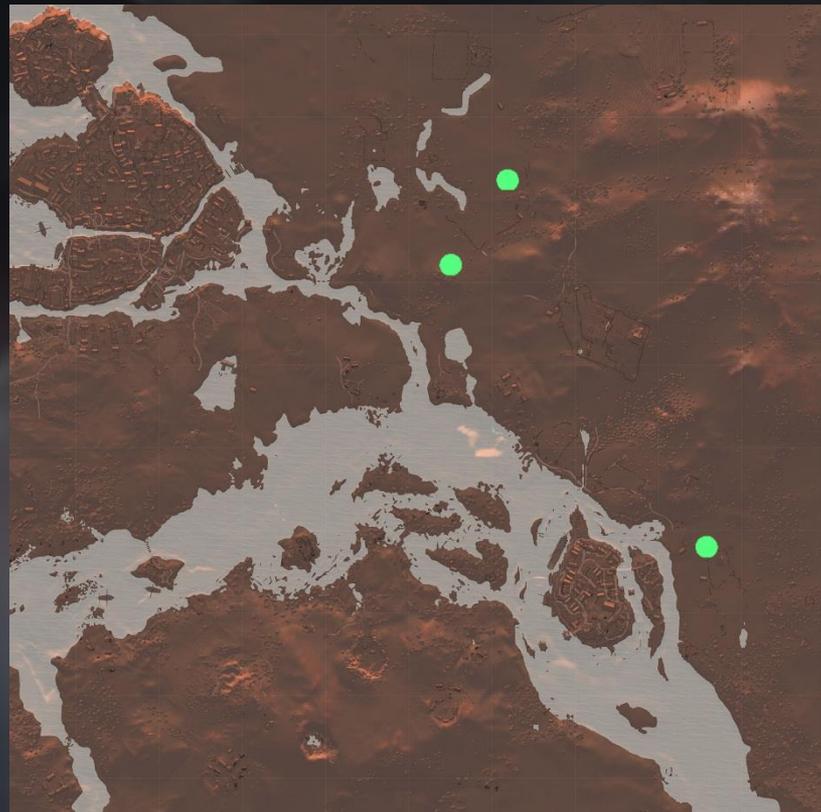
02. HOW?

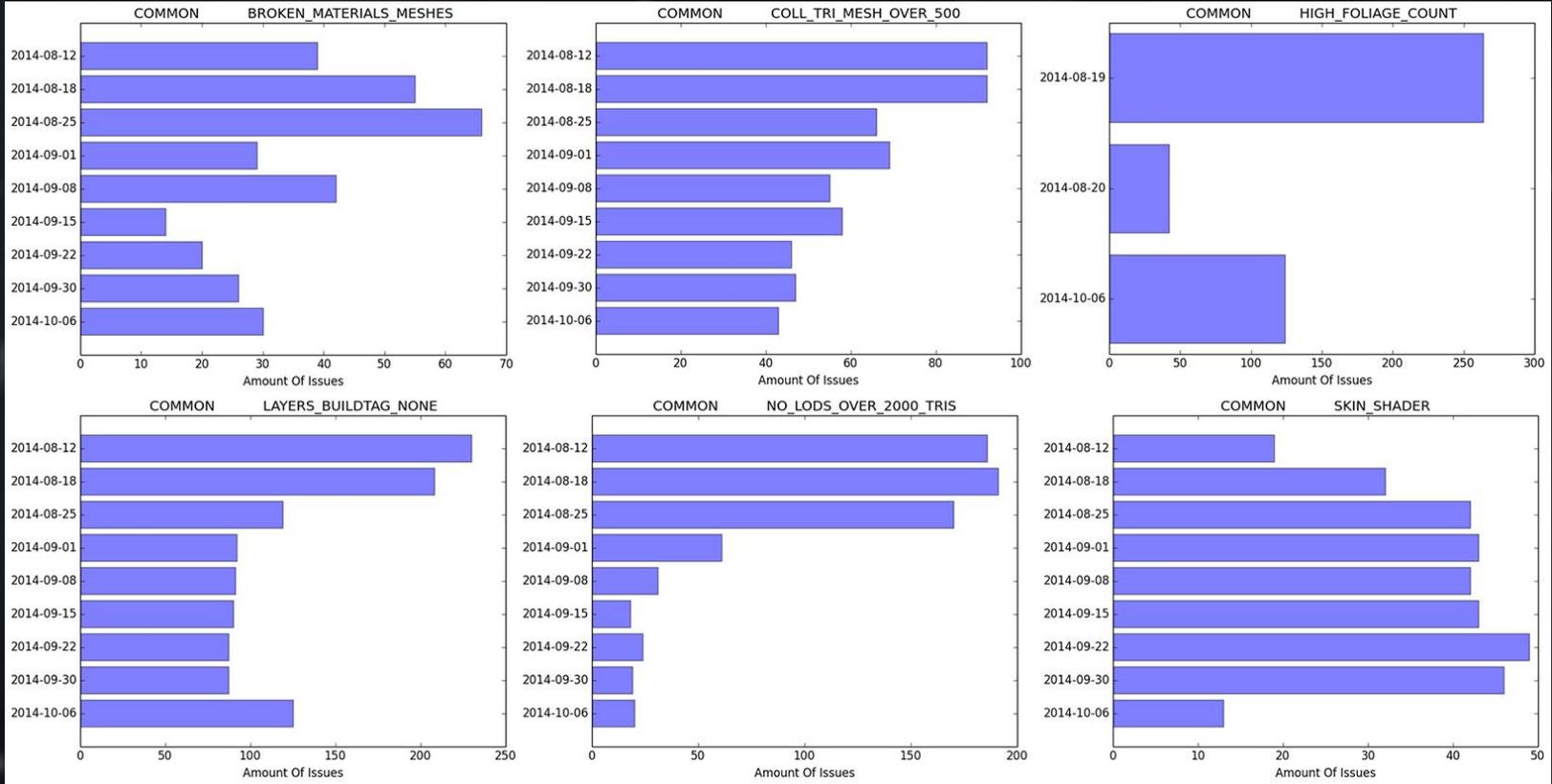
- ◆ Show properties and locations
- ◆ Vertex density maps
- ◆ High foliage count maps
- ◆ Save images
- ◆ Connected with our editor
- ◆ Gdata (Google API) for Google Docs

Vertex Density Map



High foliage count map





A close-up, low-angle shot of a dark, metallic, futuristic helmet. The helmet features a glowing red visor at the top. Several thin, white wires are visible, extending from the side of the helmet. The lighting is dramatic, with strong highlights and deep shadows, creating a sense of mystery and intensity.

03.

OUTCOME!

AMAZING FINDINGS

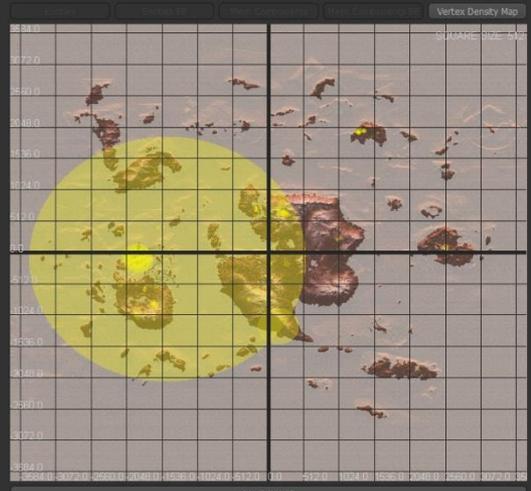
- ◆ A shadow-casting light that was 4000 meter in diameter.

Data Base Viewer v2.7

COLL_TRIS_OVER_500
collisn_tris_over_500
Entry name layer for Containers
Skin Shader
Missing Materials
Building none
Missing Materials MeshHD
TEX_GREATER_2K
Unique Materials
Jones
DefaultSoundTypes
SELECT_ALL_LIGHTS
No Lods and Over 1000 Tris
Jones Count

Use Selected on All Databases
Execute Selected and Save Files

Map



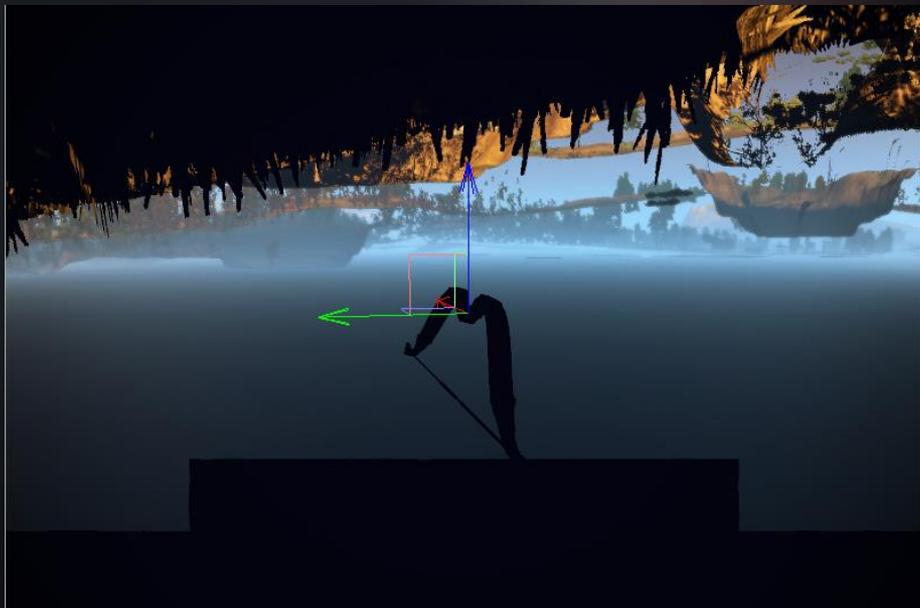
	lightid	entityid	posx	posy	posz	lightRadius	lightEnabled	castingShadow	lightShadowMode
1	1	350	-2138.58	337.381	0.627542	5	true	true	LSCM_Normal
2	2	809	-2165.25	360.101	-1.14624	3	true	false	LSCM_None
3	3	810	-2169.96	350.803	-1.14624	3	true	false	LSCM_None
4	4	811	-2163.37	346.676	-1.14624	3	true	false	LSCM_None
5	5	812	-2156.77	356.294	-1.14624	3	true	false	LSCM_None
6	6	813	-2156.68	356.279	0.47121	12	true	false	LSCM_None
7	7	814	-2161.19	346.793	0.47121	12	true	false	LSCM_None
8	8	815	-2169.92	351.036	0.47123	12	true	false	LSCM_None
9	9	816	-2165.58	360.177	0.47123	12	true	false	LSCM_None
10	10	817	-2175	359.163	3.19005	10	true	false	LSCM_None
11	11	818	-2167.34	355.505	2.67898	15	true	false	LSCM_None
12	12	819	-2145.22	339.296	0.627542	5	true	true	LSCM_Normal
13	13	820	-2142.03	337.381	0.773944	5	true	true	LSCM_Normal
14	14	821	-2135.01	344.965	0.627553	5	true	true	LSCM_Normal
15	15	822	-2143.19	347.061	0.532859	5	true	true	LSCM_Normal
16	16	823	-2139.88	352.955	0.627572	5	true	true	LSCM_Normal
17	17	824	-2132.62	351.688	0.0719855	5	true	true	LSCM_Normal
18	18	825	-2122.88	341.173	0.608758	5	true	true	LSCM_Normal
19	19	826	-2125.57	347.803	-0.285579	5	true	true	LSCM_Normal
20	20	827	-2131.22	330.876	-2.31218	5	true	true	LSCM_Normal
21	21	828	-2136.82	350.496	5.7276	5	true	true	LSCM_Normal
22	22	830	-2113.74	326.799	-5.07098	5	true	true	LSCM_Normal
23	23	831	-2111.55	335.523	0.456436	5	true	true	LSCM_Normal
24	24	833	-2136.97	373.403	0.456441	5	true	true	LSCM_Normal

Save To File

Ready

03. OUTCOME

- ◆ Animated bows under ground auto-hide distance over 900m.



03. OUTCOME

- ◆ Test assets still placed in the level (couple of weeks before final).



03. OUTCOME

- ◆ Ship that was 250 000 vertices.
- ◆ Over 200 meshes of 2000 triangles and no lods.
- ◆ 105 000 grass entities in an area of 32 sqm.

03. OUTCOME

RESULT

- ◆ Focus our attention
- ◆ Strike teams
- ◆ Accuracy

A close-up, low-angle shot of a dark, metallic, angular object, possibly a piece of machinery or a component of a vehicle. The object is illuminated from the top, creating strong highlights and deep shadows. A bright, glowing red light source is visible in the upper left corner, casting a warm, reddish glow over the scene. Several thin, metallic wires or cables are visible, extending from the top left towards the center of the frame. The overall atmosphere is dark and industrial.

04.

LESSONS LEARNED!

WHAT WENT WRONG

- ◆ Huge text file
- ◆ Trying to add everything to the database
- ◆ No real time update to the database
- ◆ Not enough functionality exposed Google Data API

WHAT WENT RIGHT

- ◆ Useful for different departments
- ◆ Found things we didn't know existed
- ◆ Fast and accurate data
- ◆ Visualizing data on a map

THANKS TO

- ◆ Krzysztof Krzyscin
- ◆ Patryk Brzozowski
- ◆ Emil Dziewanowski
- ◆ Lukasz Horzelski
- ◆ Jose Teixeira
- ◆ Kostas Michalopoulos
- ◆ CD Projekt RED



mthorzen@gmail.com

THANK YOU