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 BOUNDMem: 1734.66 MB
RenderFenceTime: 52.567 ms
PhysicsFetchTime: 0.211 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 funcs 1337.8
time 0.000s internal timer 0.00s/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 %

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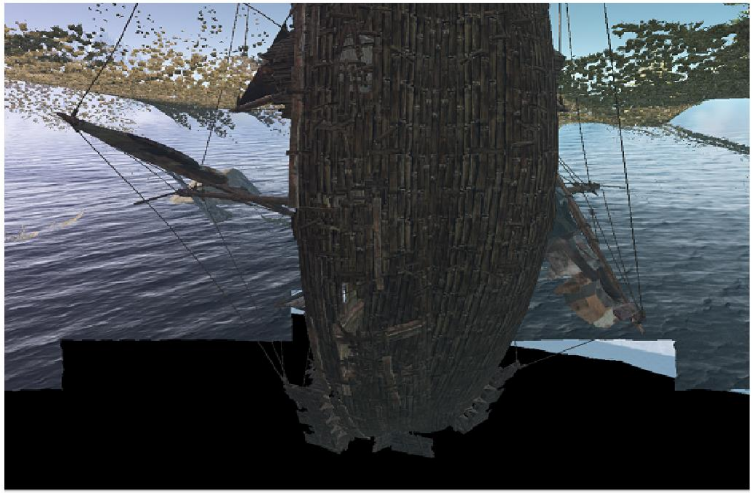

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THIS PRESENTATION

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

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01.

WHY?

A NEED

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

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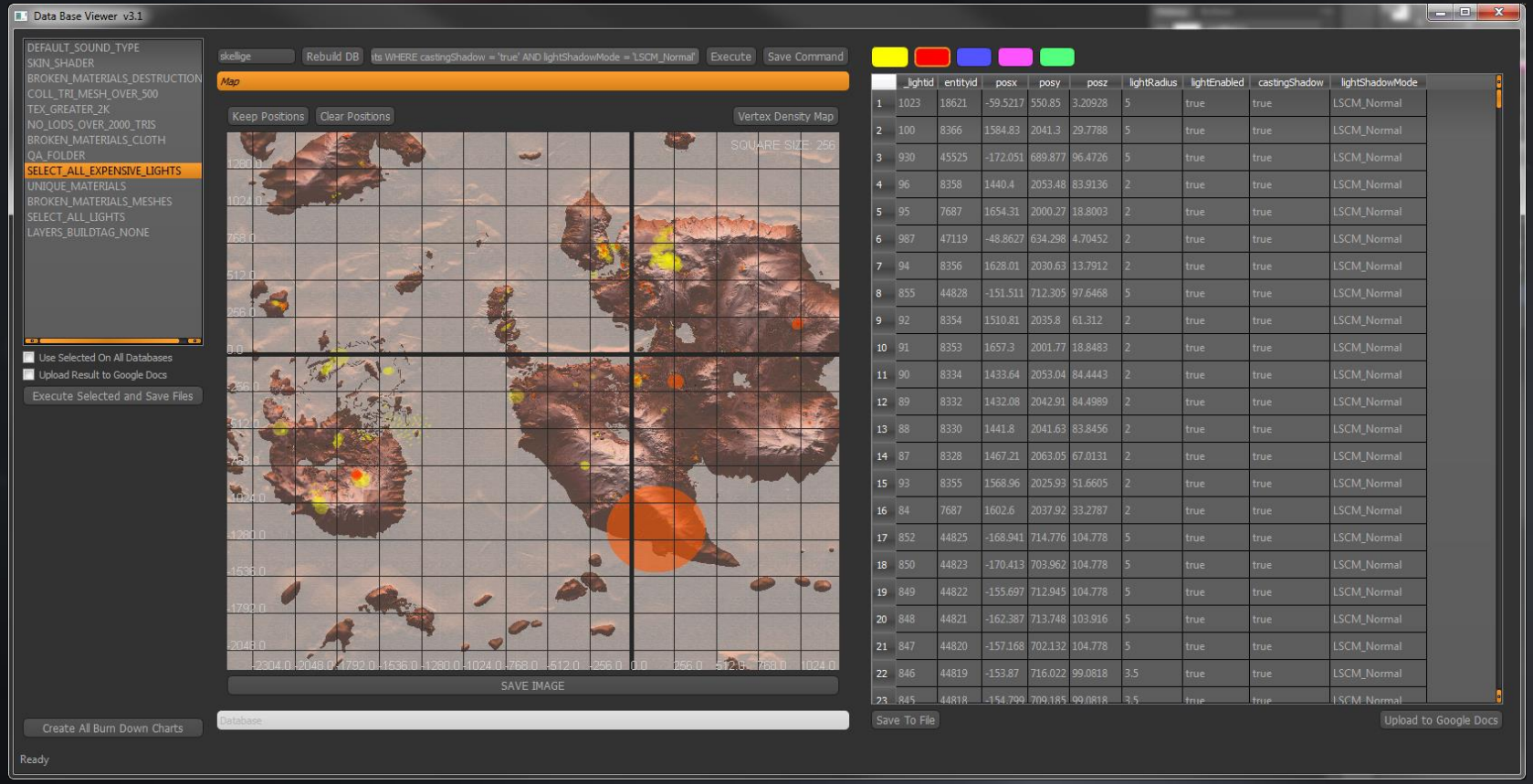
- Change asset inside our editor.
- Author asset inside our editor.
- Editor components.

02.

HOW?

DATABASE VIEWER



	_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	8353	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	-155.697	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

HOW WE APPROACHED IT

World

↓

Layers

↓

Entities

↓

Components

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

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
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, vertC
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, importI
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,
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, mat
CREATE TABLE IF NOT EXISTS CollisionShapes (id INTEGER PRIMARY KEY, meshcomponentid INTEGER, collisionShape, vertCount INTEGER, triangleCount INTEGER, material, UNIQUE(meshcomponentid, collisionShape, material), FOREIGN K
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','LB
insert or ignore into entities (name, layerid, componentsCount, posx, posy, posz, bbminx, bbminy, bbminz, bbmaxx, bbmaxy, bbmaxz, drawableComp) values ('env_inn_test',(select id from layers where path='Z:\r4data\levels\is
insert or ignore into entities (name, layerid, componentsCount, posx, posy, posz, bbminx, bbminy, bbminz, bbmaxx, bbmaxy, bbmaxz, drawableComp) values ('env_inn_test4',(select id from layers where path='Z:\r4data\levels\i
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_Envi
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','LB
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\
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','e
insert or ignore into layers (path, worldid, static, buildTag, layerName) values ('Z:\r4data\levels\island_of_mist\gameplay\interrior_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!

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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"

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SQL MAGIC

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

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

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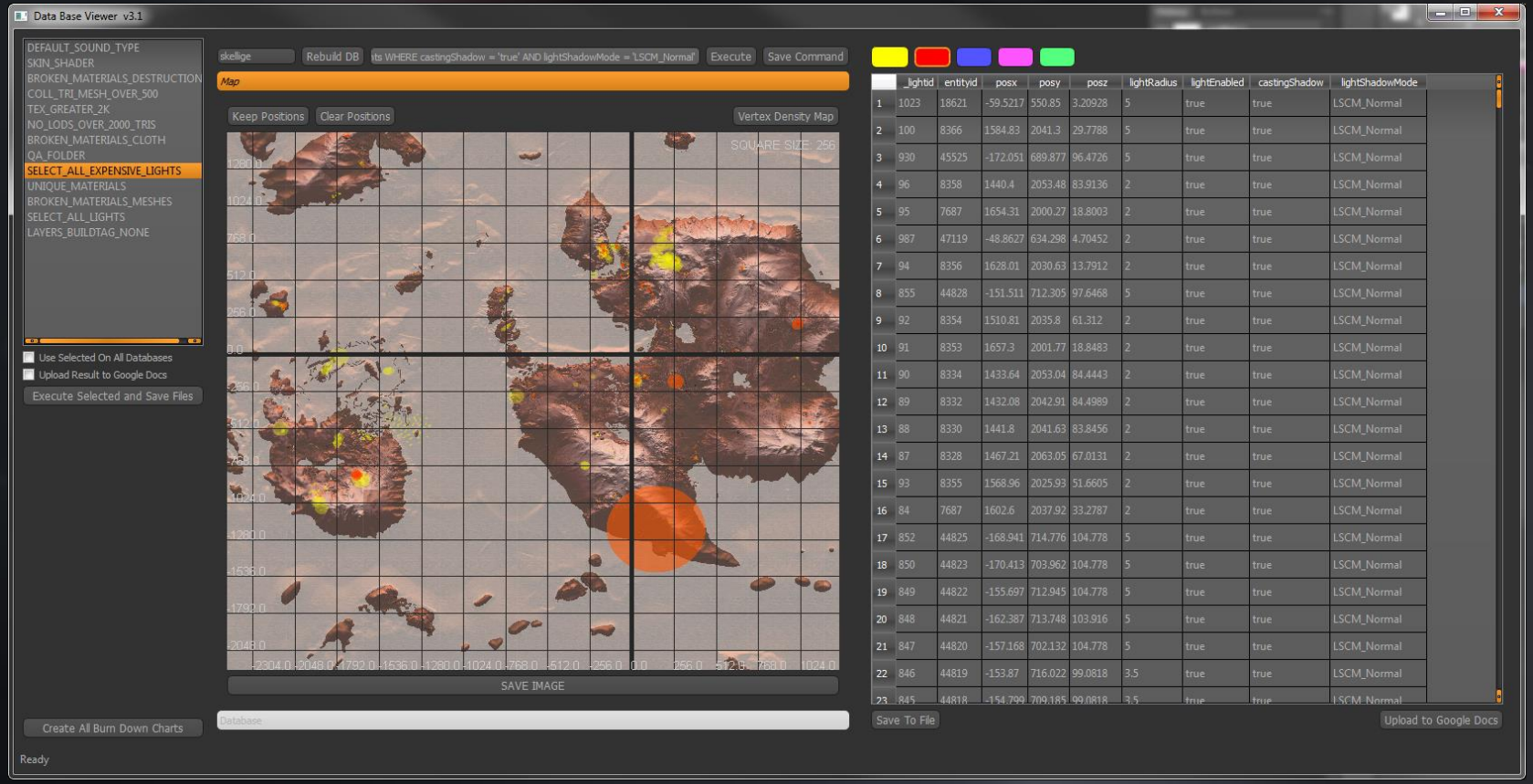
SQL MAGIC

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

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

A DATABASE VIEWER



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

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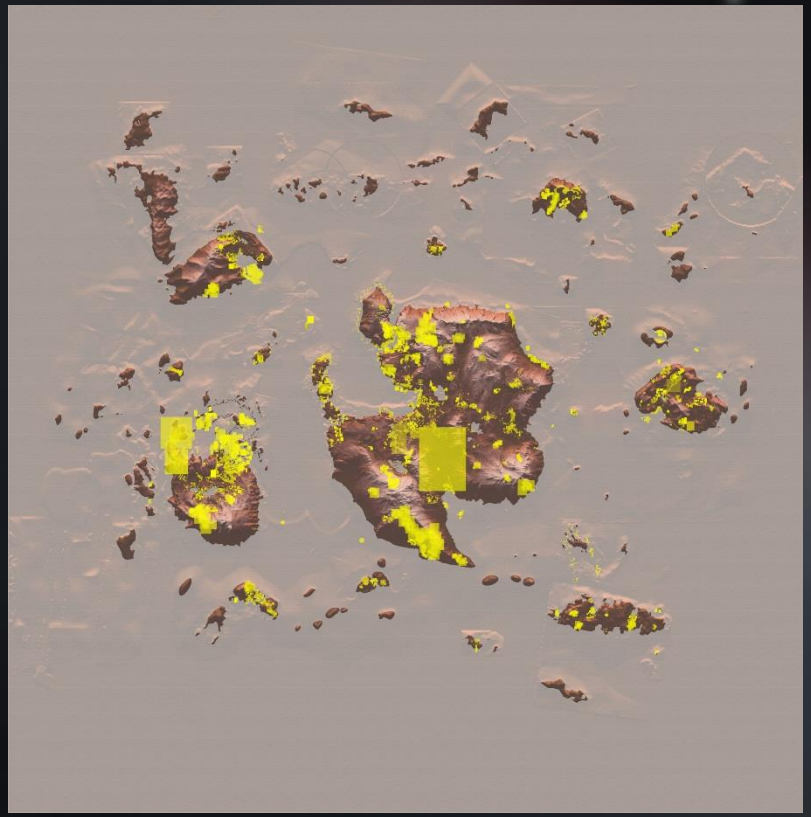
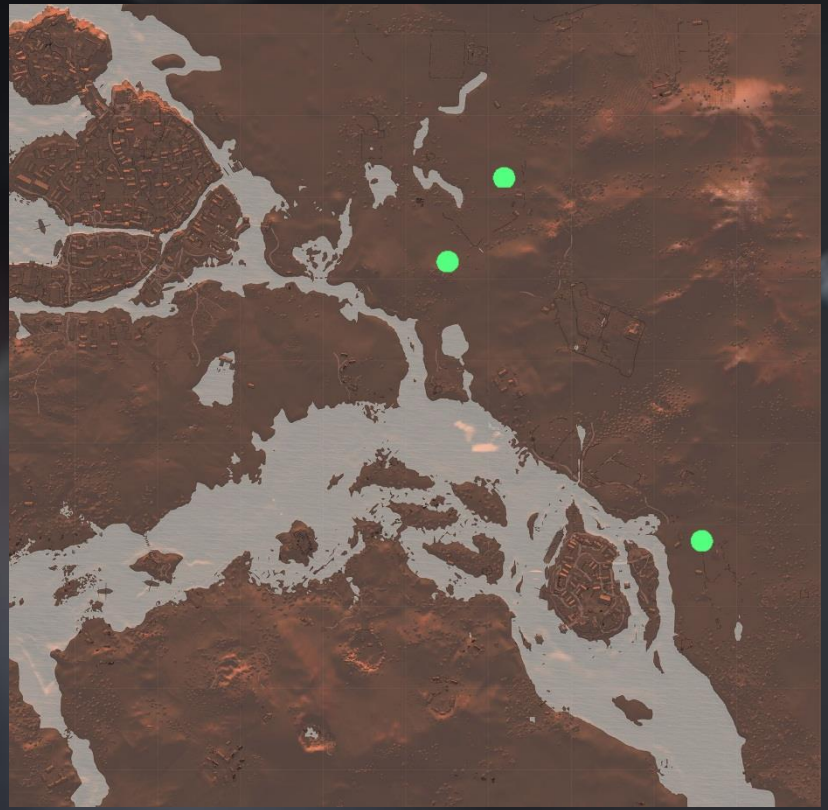
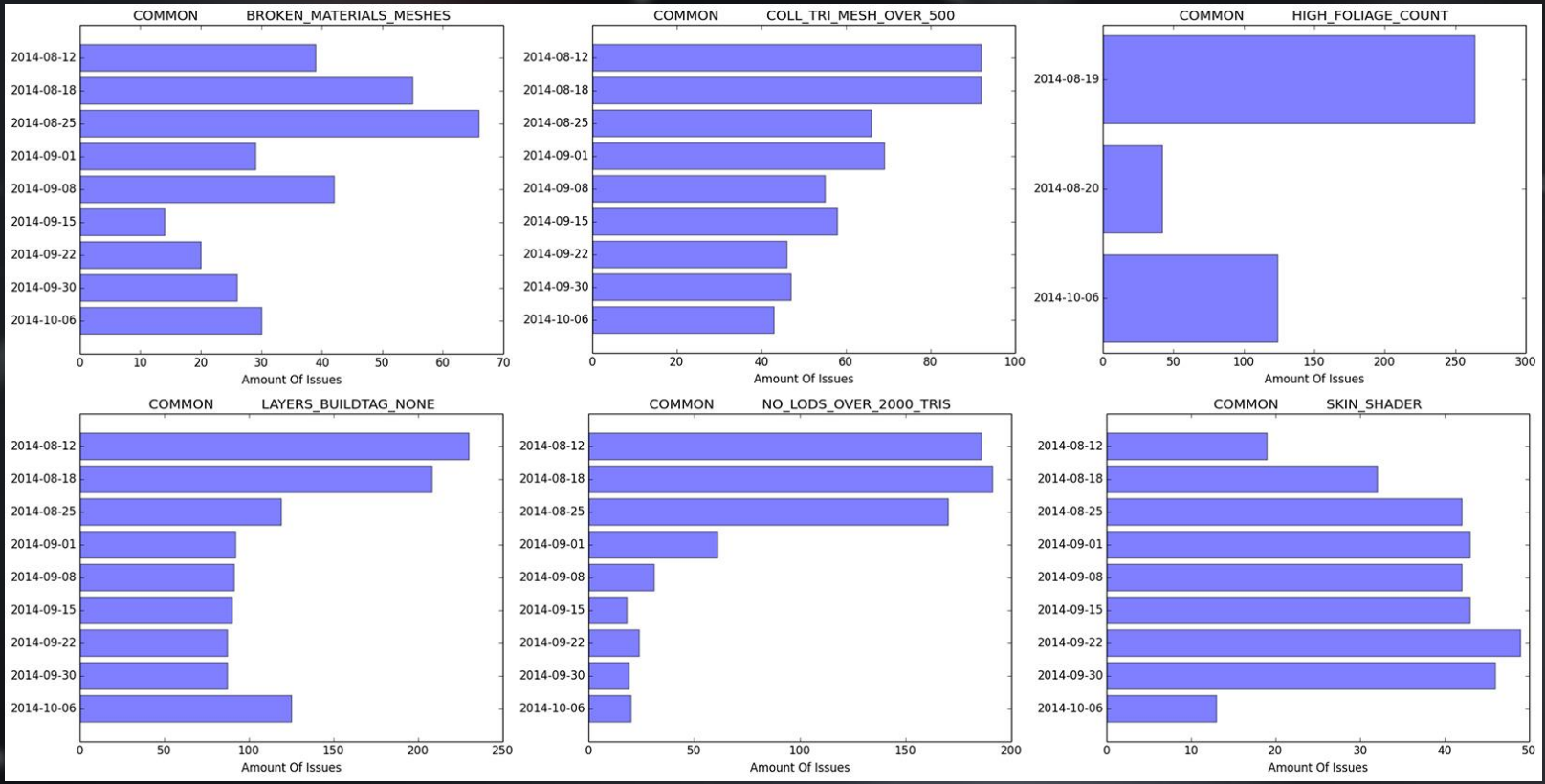
Vertex Density Map



High foliage count map



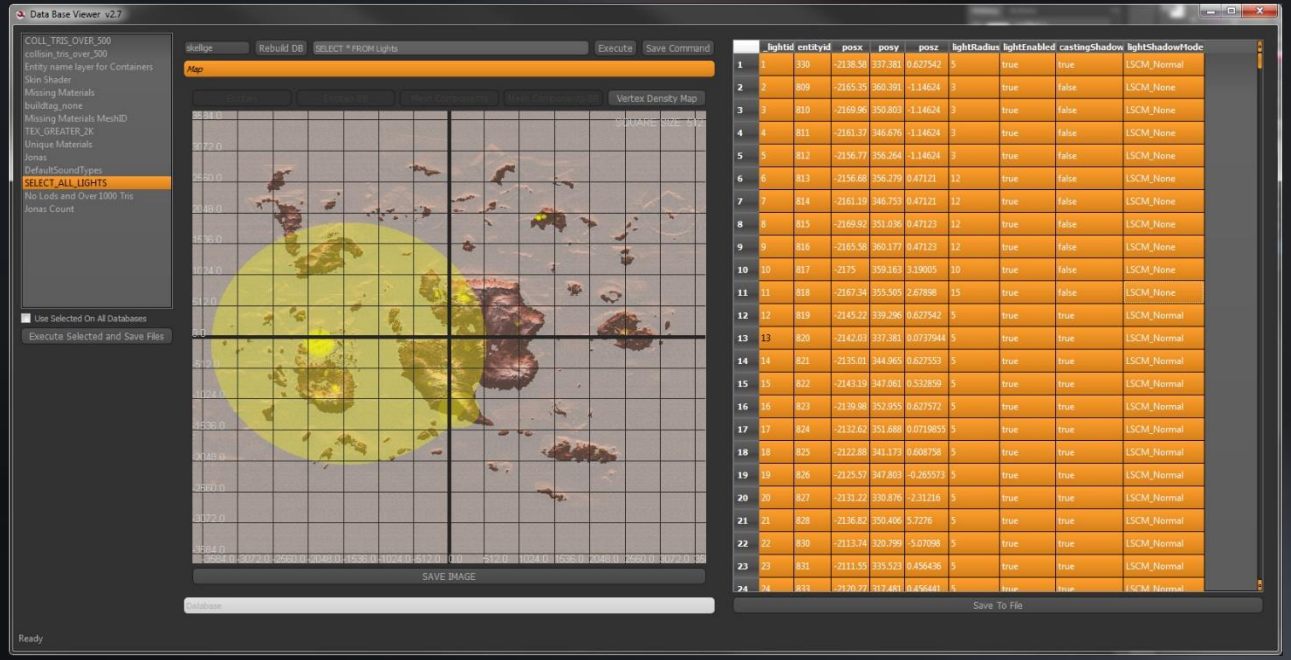

COMMON BROKEN_MATERIALS_MESHES
2014-08-12
2014-08-18
2014-08-25
2014-09-01
2014-09-08
2014-09-15
2014-09-22
2014-09-30
2014-10-06
0 10 20 30 40 50 60 70
Amount Of Issues
COMMON COLL_TRI_MESH_OVER_500
2014-08-12
2014-08-18
2014-08-25
2014-09-01
2014-09-08
2014-09-15
2014-09-22
2014-09-30
2014-10-06
0 20 40 60 80 100
Amount Of Issues
COMMON HIGH_FOLIAGE_COUNT
2014-08-19
2014-08-20
2014-10-06
0 50 100 150 200 250 300
Amount Of Issues
COMMON LAYERS_BUILDTAG_NONE
2014-08-12
2014-08-18
2014-08-25
2014-09-01
2014-09-08
2014-09-15
2014-09-22
2014-09-30
2014-10-06
0 50 100 150 200 250
Amount Of Issues
COMMON NO_LODS_OVER_2000_TRIS
2014-08-12
2014-08-18
2014-08-25
2014-09-01
2014-09-08
2014-09-15
2014-09-22
2014-09-30
2014-10-06
0 50 100 150 200
Amount Of Issues
COMMON SKIN_SHADER
2014-08-12
2014-08-18
2014-08-25
2014-09-01
2014-09-08
2014-09-15
2014-09-22
2014-09-30
2014-10-06
0 10 20 30 40 50
Amount Of Issues

03.

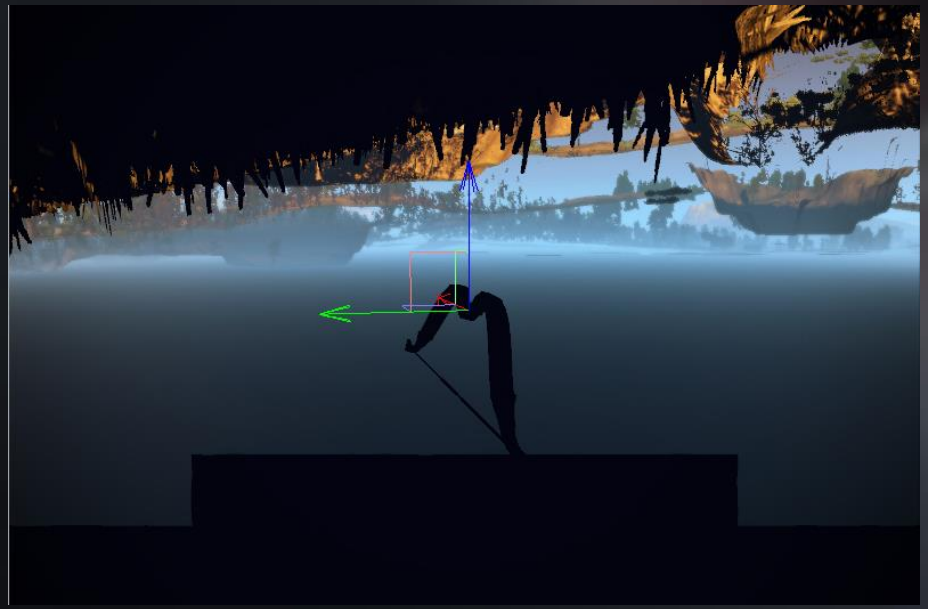
OUTCOME!

AMAZING FINDINGS

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



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



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

- 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.

RESULT

- Focus our attention
- Strike teams
- Accuracy

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

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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

- Krzystof Krzyscin
- Patryk Brzozowski
- Emil Dziewanowski
- Lukasz Horzelski
- Jose Teixera
- Kostas Michalopoulos
- CD Projekt RED

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THANK YOU