



# 3D Tiles Next

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**SOURCEPOLE**

Linux & Open Source Solutions



## 3D OGC Standards

- › CityGML (3.0, 2021) / CityJSON (1.0, 2021)
- › OGC common database CDB
- › 3D Portrayal Service (2017)
- › ***Community Standards:***
  - › Indexed 3D Scene (I3S), ESRI
  - › 3D Tiles, Cesium



## Indexed 3D Scene (I3S)

- › OGC I3S Community Standard Version 1.2, 16.12.2021
- › ArcGIS Pro, Enterprise, Online, Earth, City Engine
- › Closed-Source: Bentley ContextCapture u.a.
- › Open Source: loaders.gl → deck.gl
- › <https://www.ogc.org/standards/i3s>
- › <https://github.com/Esri/i3s-spec> (Version 1.7)



# 3D Tiles

- › OGC 3D Tiles Community Standard Version 1.0, 31.1.2019
- › CesiumJS (Apache Lizenz)
- › <https://www.ogc.org/standards/3DTiles>
- › <https://github.com/CesiumGS/3d-tiles/>
- › 3D Tiles Next Draft extension  
→ 3D Tiles 2.0





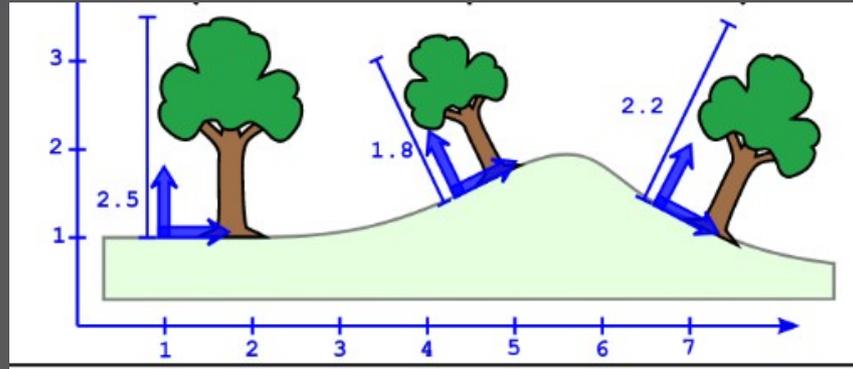
# 3D Tiles 1.0: Batched 3D Model



➤ **Tileset (JSON) → Model (b3dm) → glTF**



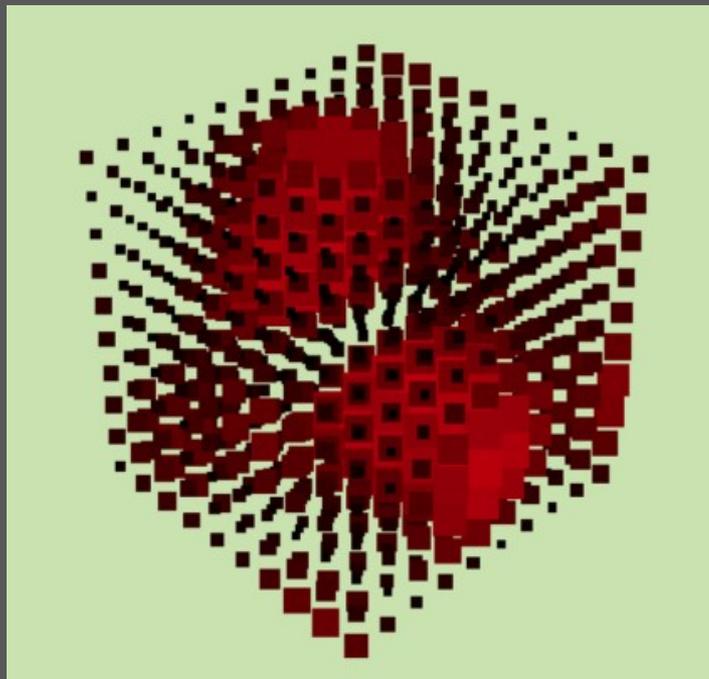
# 3D Tiles 1.0: Instanced 3D Model



➤ Tileset (JSON) → Model (i3dm) → glTF



# 3D Tiles 1.0: Point Cloud



› Tileset (JSON) → Data (points)



# 3D Tiles 1.0: Composite Tiles

Composite Tile:



- **Tileset (JSON) → Models (b3dm, i3dm, points)**



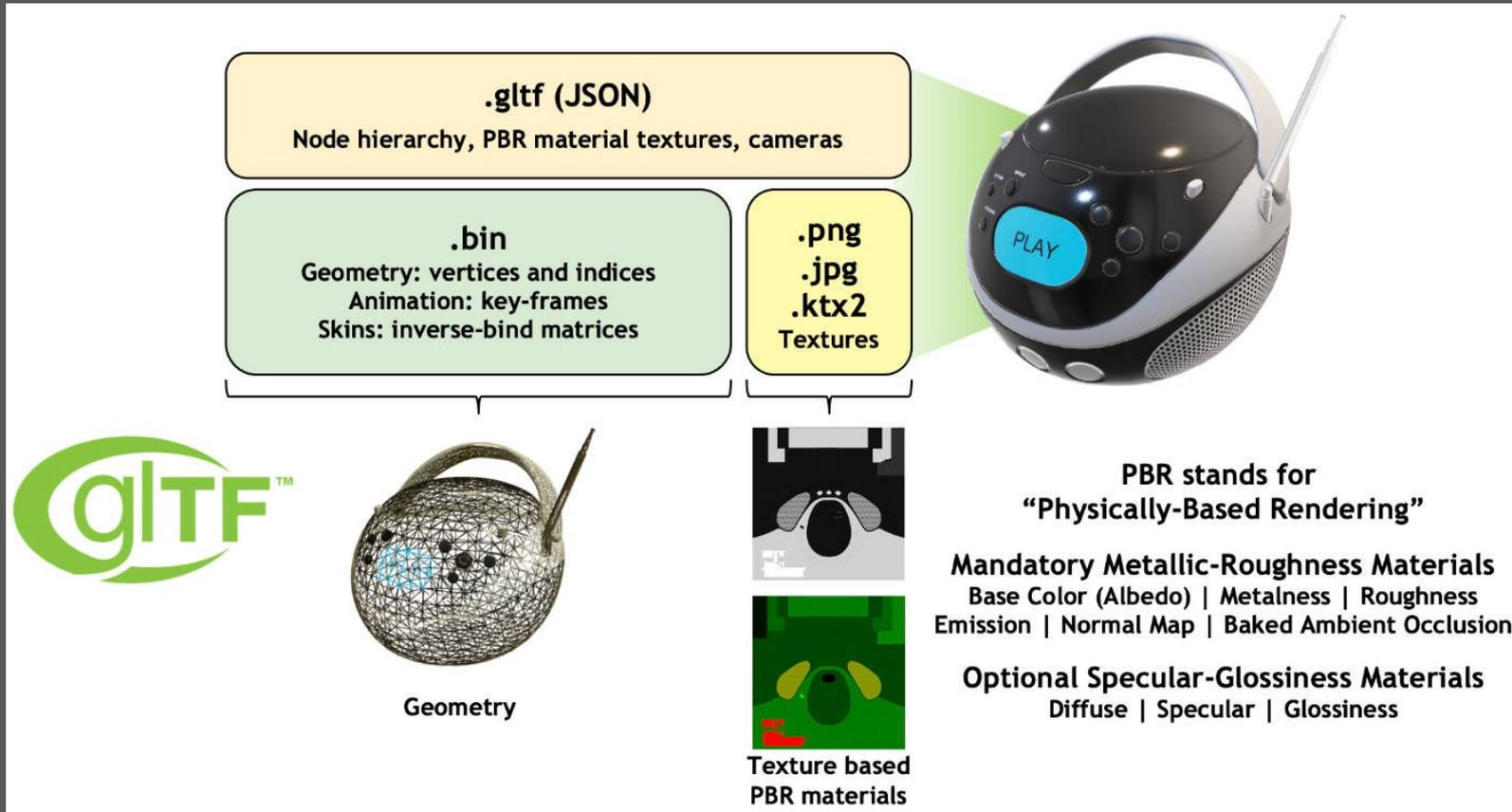
# 3D Tiles 1.0: Declarative Styling

```
{  
  "color": {  
    "conditions": [  
      ["${height} >= 300", "rgba(45, 0, 75, 0.5)"],  
      ["${height} >= 200", "rgb(102, 71, 151)"],  
      ["${height} >= 100", "rgb(170, 162, 204)"],  
      ["${height} >= 50", "rgb(224, 226, 238)"],  
      ["${height} >= 25", "rgb(252, 230, 200)"],  
      ["${height} >= 10", "rgb(248, 176, 87)"],  
      ["${height} >= 5", "rgb(198, 106, 11)"],  
      ["true", "rgb(127, 59, 8)"]  
    ]  
  }  
}
```





# Scenenformat glTF 2.0



› Khronos group (OpenGL, etc.)



# Viewer

- › CesiumJS
- › loaders.gl → deck.gl
- › iTowns ([github](#))
  - › Three.js basiertes JS/WebGL Framework
- › mapbox-3dtiles ([github](#))
  - › Mapbox GL JS custom layer für 3D Tiles
- › 3DCityDB-Web-Map-Client ([github](#))
  - › Cesium-basierter Viewer für CityGML und 3D Tiles
- › 3d-tiles-renderer ([github](#))
  - › Three.js basierter Renderer für 3D Tiles



# Game Engines

- O3DE (OSS, Amazon)
- Unreal





# Datengenerierung (Cesium GS, Inc.)

- › Cesium Ion (proprietär)
- › CDB to 3D Tiles ([Github](#))
  - › OGC CDB → 3D Tiles
- › Cesium Native ([Github](#))
  - › C++ Bibliotheken für 3D Tiles Streaming, glTF Verarbeitung
- › glTF Pipeline ([Github](#))
  - › Javascript Tools für glTF / GLB Konvertierung und Optimierung



## Datengenerierung (3rd Party)

- › **py3dtiles (GitLab)**
  - › LAS / XYZ → 3D Point Cloud Tiles, b3dm API
- › **pg2b3dm (Github)**
  - › Konvertierung von PostGIS 3D Geometrien in b3dm Tiles
- › **Cesium Point Cloud Generator (Github)**
  - › XYZ → 3D Point Cloud Tiles
- › **Cesium Terrain Builder (Github)**
  - › DEM → Cesium Terrain Tiles (altes Format)



## 3D Tiles Next

- › Direkte Referenzierung von glTF Modellen in 3D Tiles
- › Implizites Tiling
- › Metadaten: Einbettung Metadaten wie Property Types (z.B. “Fenster”)



# 3D Tiles Next Migration 1/3

- › Batched 3D Model → glTF mit EXT\_mesh\_features

## 3D Tiles 1.0

*.b3dm file*

b3dm Header

Batch Table

glTF

## 3D Tiles Next

*.glb file + extension*

glTF

EXT\_mesh\_features



# 3D Tiles Next Migration 2/3

- › Instanced 3D Model → glTF mit EXT\_mesh\_gpu\_instancing, EXT\_mesh\_features

## 3D Tiles 1.0

*.i3dm file*

i3dm Header

Per-instance  
Transformations

Batch Table

glTF

## 3D Tiles Next

*.glb file + extension*

glTF

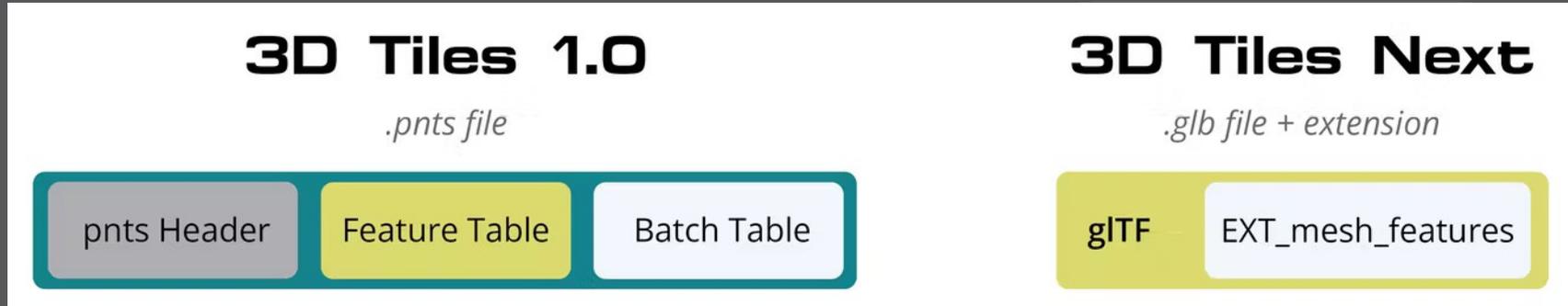
EXT\_mesh\_gpu\_instancing

EXT\_mesh\_features



# 3D Tiles Next Migration 3/3

- › Point Cloud → glTF POINTS mode mit EXT\_meshopt\_compression, KHR\_mesh\_quantization, EXT\_mesh\_features

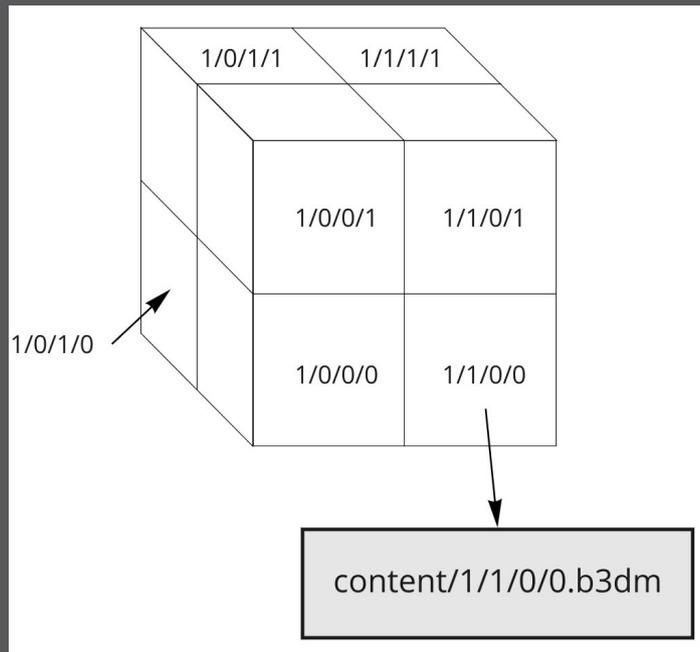


- › Composite → glTF mit Extensions



# Implizites Tiling

## > Quadtree + Octree



## > Subtrees: tile + content + child subtree availability



# 3D Tiles Next Extensions

- › **GLTF 2.0 Erweiterungen:**
  - › **EXT\_mesh\_features**
- › **3D Tiles 1.0 Erweiterungen:**
  - › **3DTILES\_content\_gltf, 3DTILES\_multiple\_contents**
  - › **3DTILES\_metadata**
  - › **3DTILES\_implicit\_tiling, 3DTILES\_bounding\_volume\_S2**



# Ausblick

- › 3D Tiles Next → OGC 3D Tiles 2.0
- › OGIS 3D
- › Support für weitere OSS Game Engines (z.B. Godot)?
- › OSS-Workflow Datenaufbereitung
  - › Blender glTF 2.0 Exporter (**Extensions**)
- › Willkommen im “Metaverse”!
  
- › **Diskussion:**
  - › Netzwerkwelt Forum Bühne 1



# Danke!



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