Cloud optimized archive format for planet-scale vector tilesets

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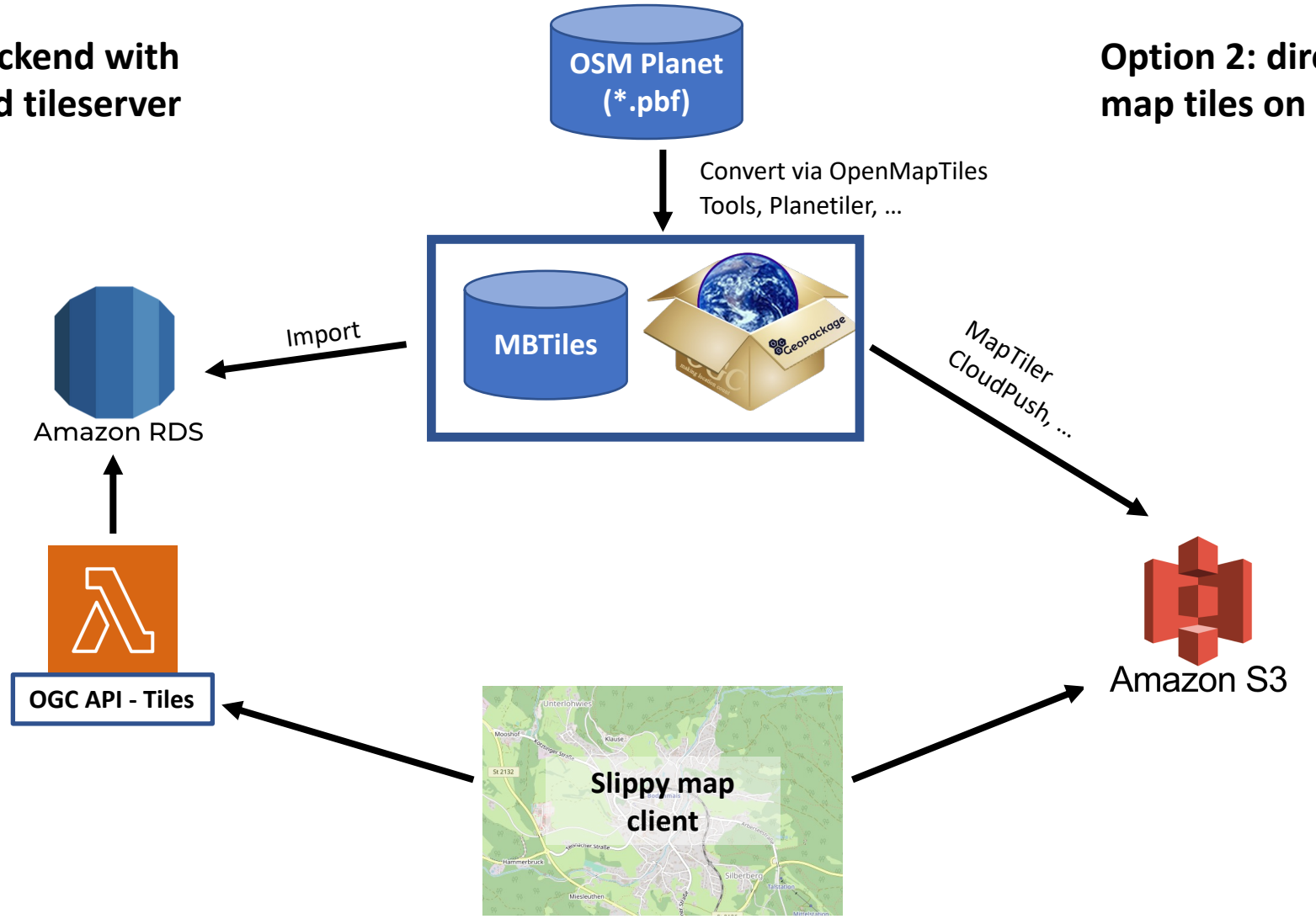
Providing planet-scale tilesets in the cloud

Option 1: backend with database and tileserver

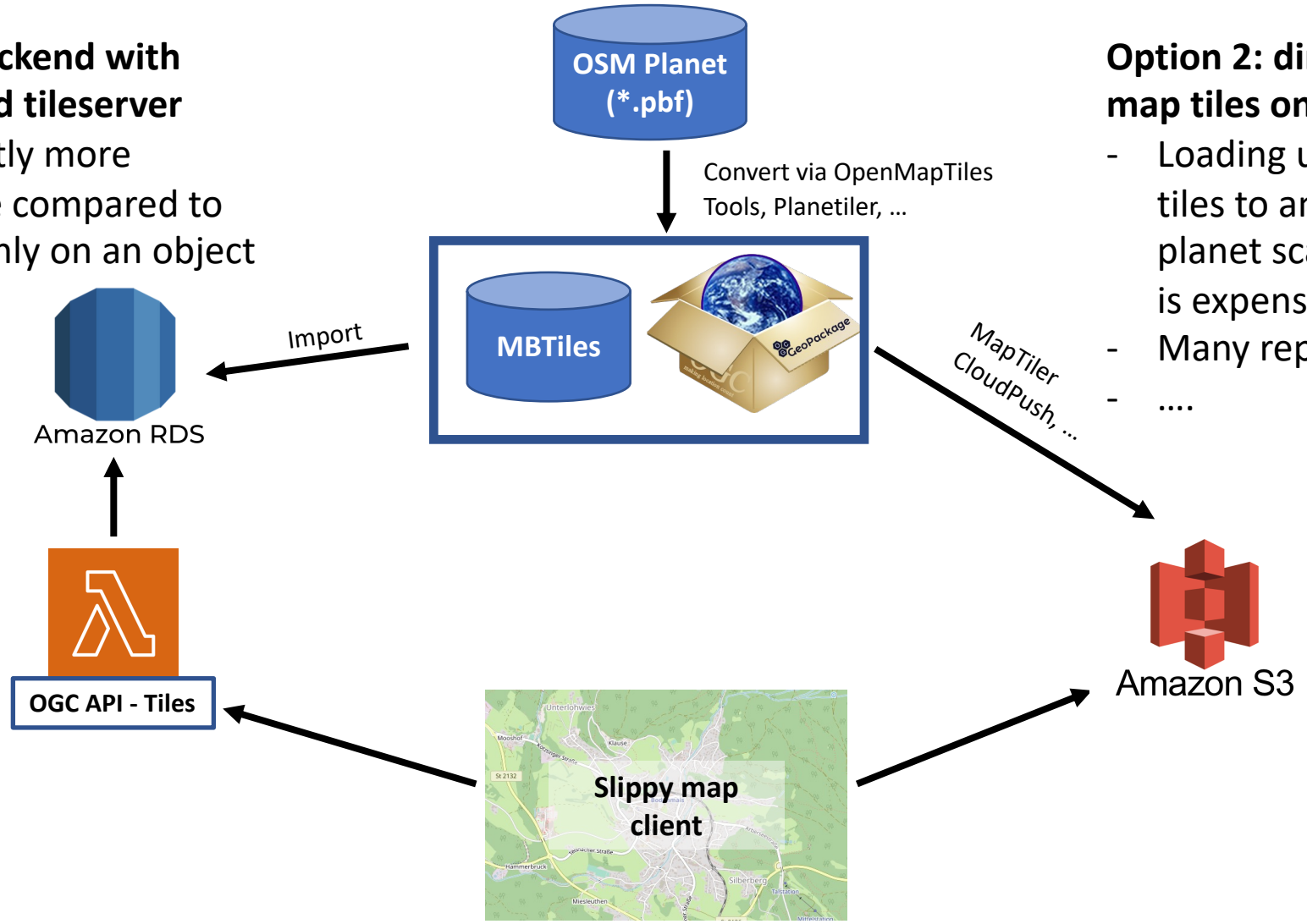


Option 2: directly hosting the map tiles on an object storage

Providing planet-scale tilesets in the cloud

Option 1: backend with database and tileserver

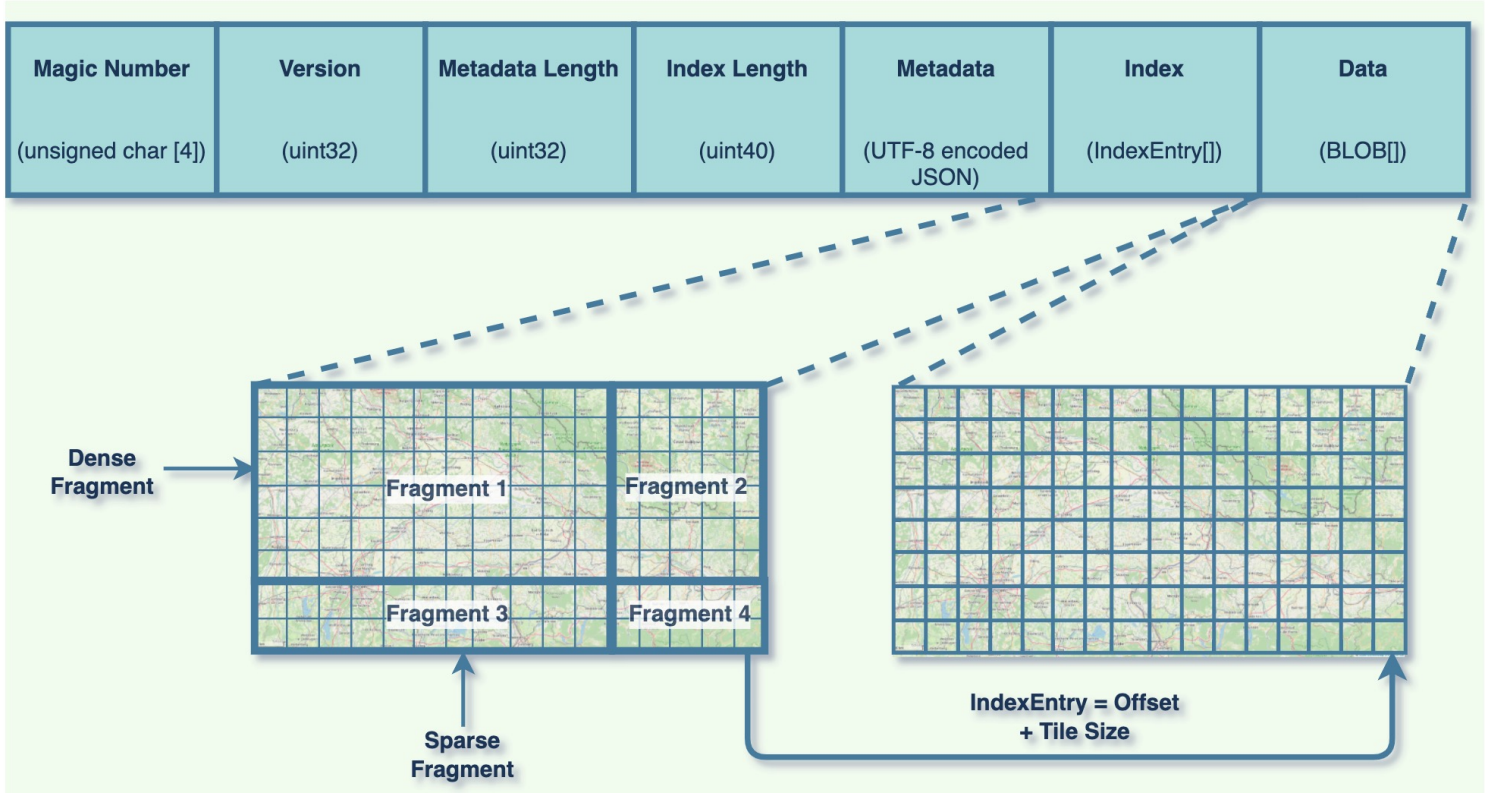
- significantly more expensive compared to hosting only on an object storage
- …



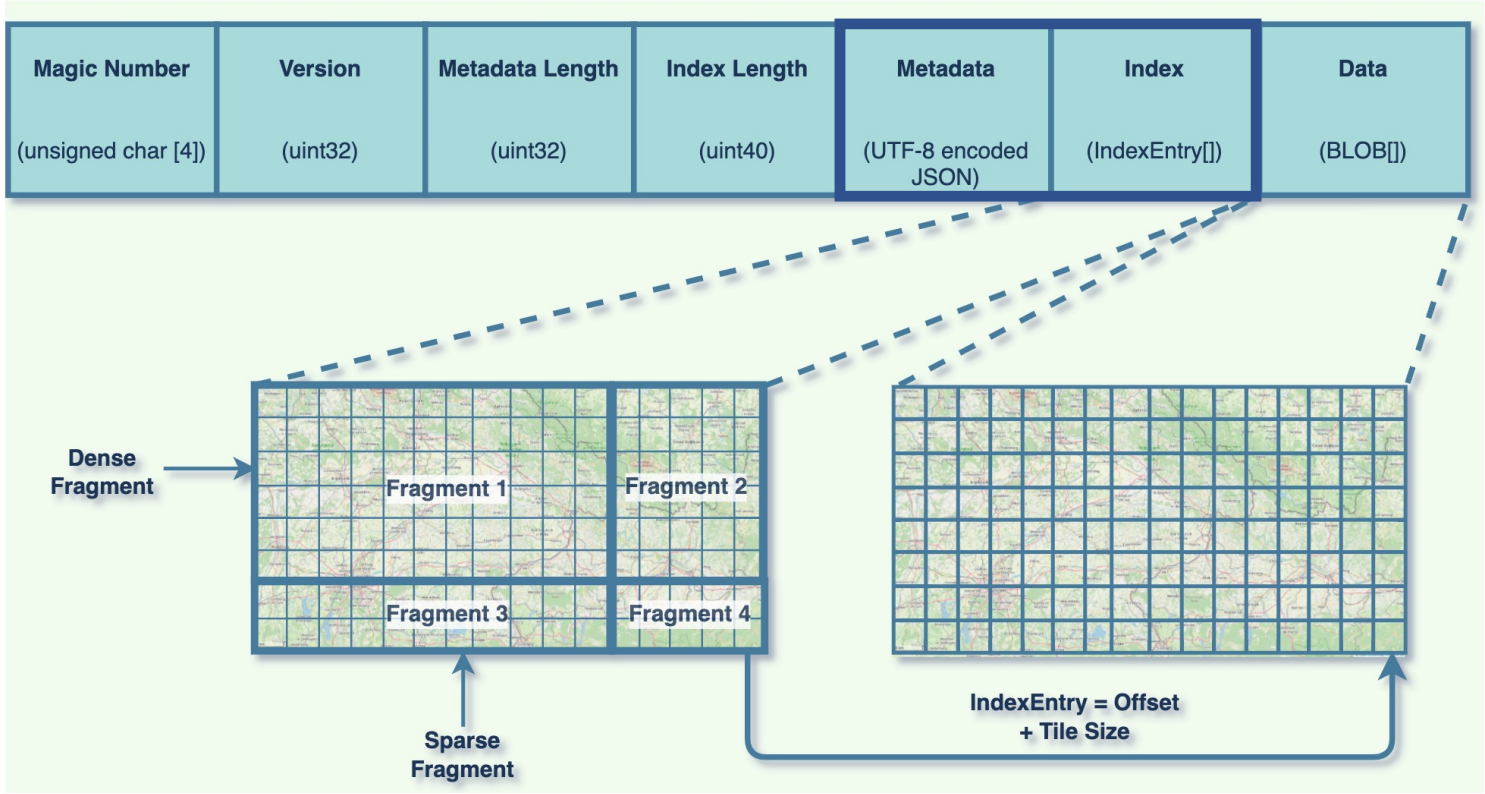
Option 2: directly hosting the map tiles on an object storage

- Loading up over 350 million tiles to an cloud storage for a planet scale vector tiles dataset is expensive
- Many repeated (raster) tiles
- ….

COMTiles Layout

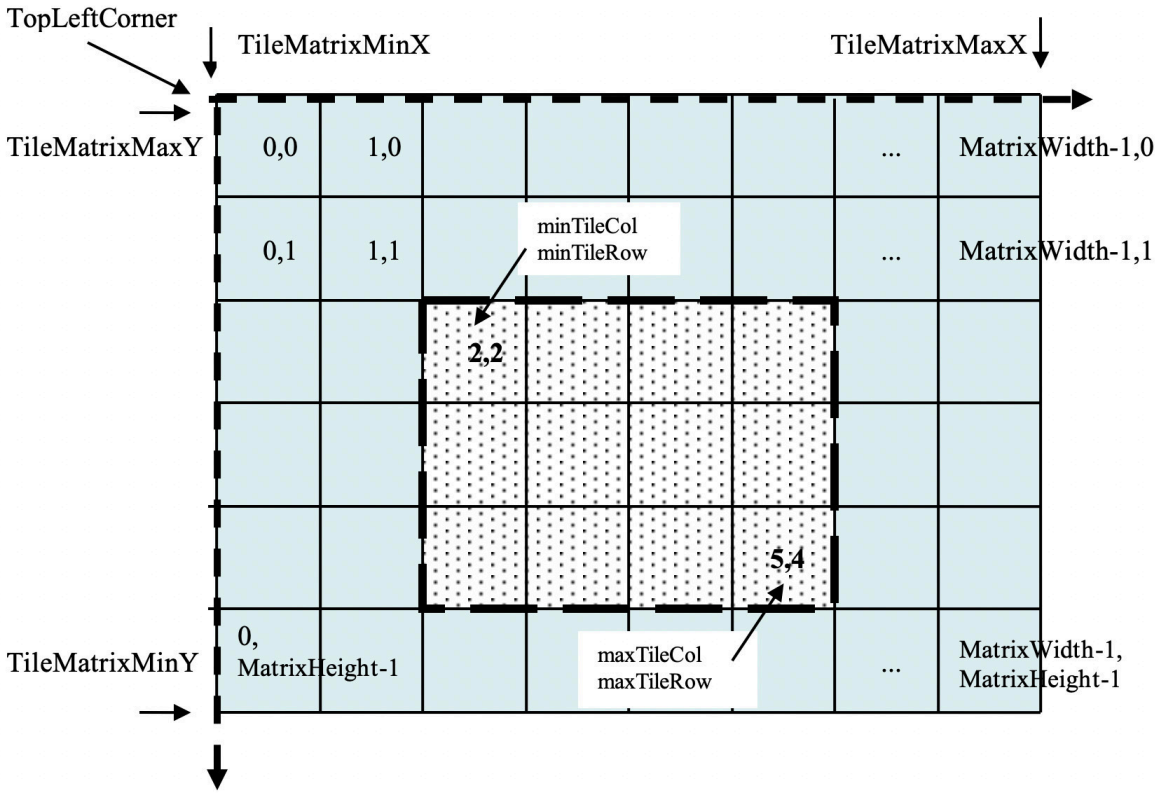


COMTiles Layout



Tileset Metadata

- In version 2 of the COMTiles spec the metadata will be based on the **“Two Dimensional Tile Matrix Set and Tile Set Metadata“** specification (currently draft) and extended with additional properties about the index layout
- Concepts
  - **TileSet metadata** -> attribution, crs, layers, dataType, …
  - **TileMatrixSet** -> Common TileMatrixSetDefinitions like WebMercatorQuad
  - **TileMatrixSetLimits** -> minTileRow, maxTileRow, minTileCol, maxTileCol, …

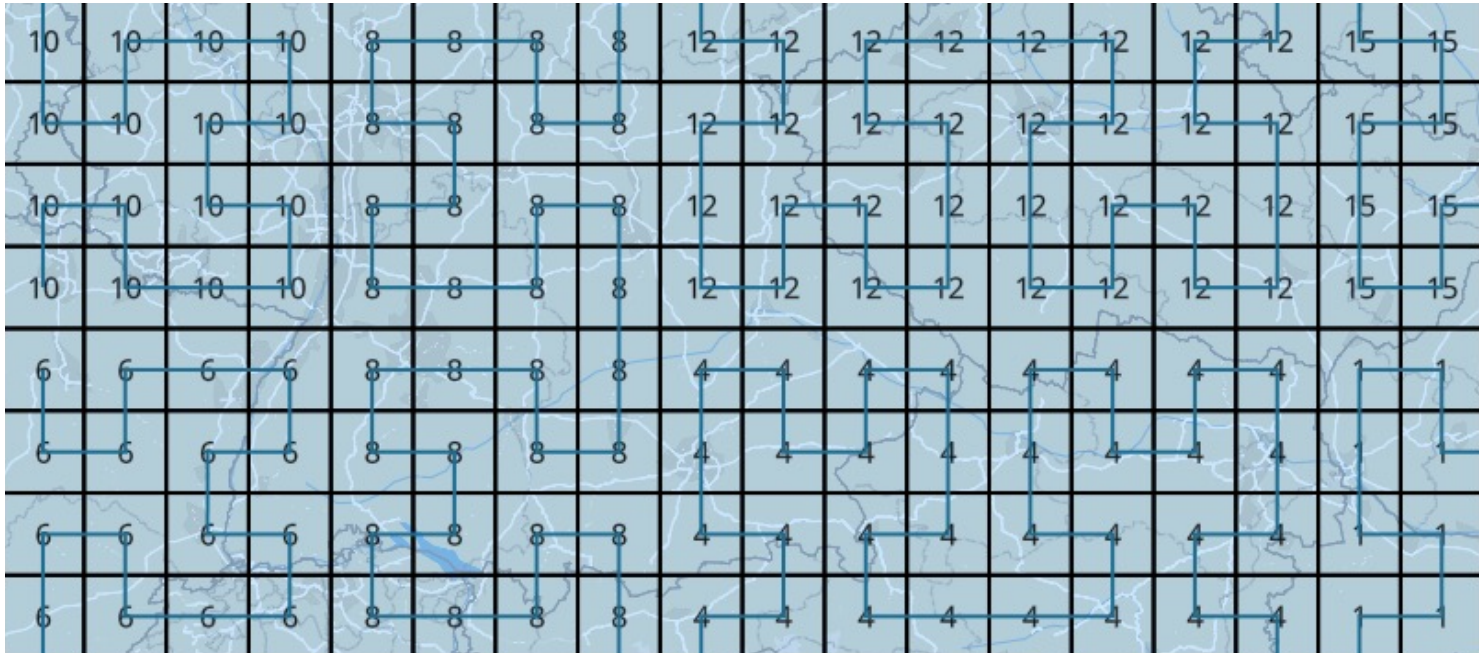


Index Design

- The size of the Index is to large to be fully downloaded at once for planet-scale tileset -> Index has to be streamable
- ComTiles use a **compressed tile pyramid** in the inititial fetch along with the header e.g. zoom 0-7 for planet-scale tileset (approx. 50 kb in v2)
- For higher zoom levels portions of the index are lazy loaded via **index fragments** (approx. 17 kb in v2) with a default of 4096 index records
- The index fragments are ordered on a **space-filling curve** (Hilbert or Z-Order)
- Most of the time only one additional pre-fetch per zoom level is needed before accessing the actual map tiles for the current viewport of the map -> **this is bearly or not at all noticeable for the user regarding the user experience**

Batching tile requests

- The individual tile requests can be batched to improve performance (for HTTP/1.1 requests) and in particular to reduce the storage costs
- This can reduce the number of tile requests by up to 90%.



Final thoughts

MBTiles

WMTS <-> GeoPackage

PMTiles, COMTiles, …

OGC Tiles - API <-> ?