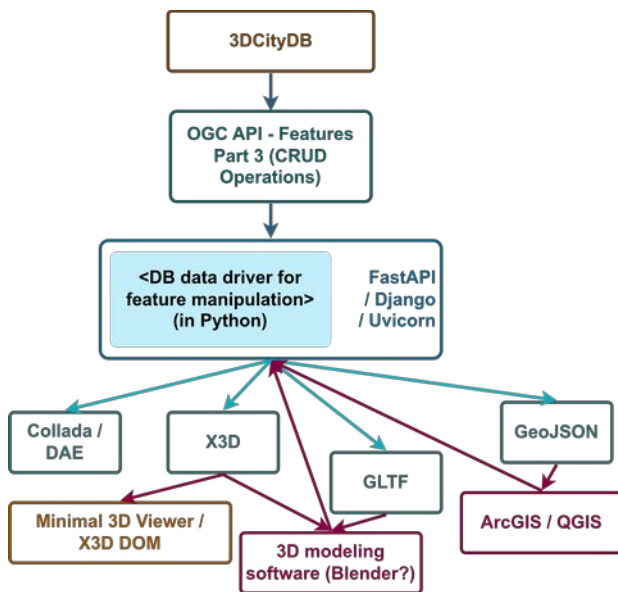**TUM**

Master's Thesis Proposal

The Potential of CRUD operations in "OGC API - Features" standard as a 3D Editing Interface

Possible Workflow's Diagram

CRUD (Create, Read, Update, Delete) refers to the basic operations of an API that can have the full functionality of property manipulation. There are many applications or interfaces that support CRUD operations through well-known HTTP request methods such as GET, POST, PUT, PATCH, and DELETE. These operations are already supported and standardized by different geographic web service standards, but they are called "Transaction" or specified in the documentation by adding a "T" extension to the standard name (e.g., WFS-T). On the other hand, CRUD operations are still being implemented in relatively new OGC (Open Geospatial Consortium) standards such as "OGC API – Features" [1].

"OGC API - Features" is a multi-part standard dedicated to providing spatial features with their geometry and attributes as a REST API. Part 1 and Part 2 (Core and CRS specification) were published in 2022. Parts 3 and 4 (Filtering and CRUD operations) are available as draft documents[2]. This standardization has been used by many applications to date, but current applications usually cover 2D geometries and are mostly in GeoJSON format. Given this situation, it can be said that there is still a missing link between 3D feature geometries and 3D modeling software packages.

CityGML 3.0 seems to be the strongest candidate for maintaining 3D feature datasets, covering all the basic needs of this type of application. However, a new tool called CityDB (successor of 3DCityDB v4) can bring all the advantages of PostgreSQL/PostGIS/SFCGAL capabilities to handle 3D features even for large urban digital twins.

In this master thesis proposal, it is proposed to develop a new OGC API implementation for 3D feature geometries that can be of Polygon, MultiPolygon, or PolyhedralSurface data types according to the Simple Feature Specifications. These geometries should be delivered in WKT or WKB formats (Well-Known Text or Well-Known Binary), and the CRUD operations (or transactions) should be recorded as SQL queries in the database.

By following this workflow, it might be possible to provide a common method for 3D modelers to retrieve and update 3D geometries using various software with a Python scripting interface, such as Blender. Another possibility to retrieve and manipulate geometries could be to use ArcGIS or QGIS with GeoJSON format.

Students who can contribute to this project should have a basic knowledge of Python. OGC API, WFS, and any other skills related to 3D modeling can be an advantage to the project.

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[1] - https://docs.ogc.org/DRAFTS/20-002.html
[2] - https://ogcapi.ogc.org/features/