

**(CityJSON == CityGML)**

**&&**

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&&  
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Full disclosure:  
I started CityJSON and I'm still an editor

Geonovum sessie over 3D  
Amersfoort  
2023-10-03

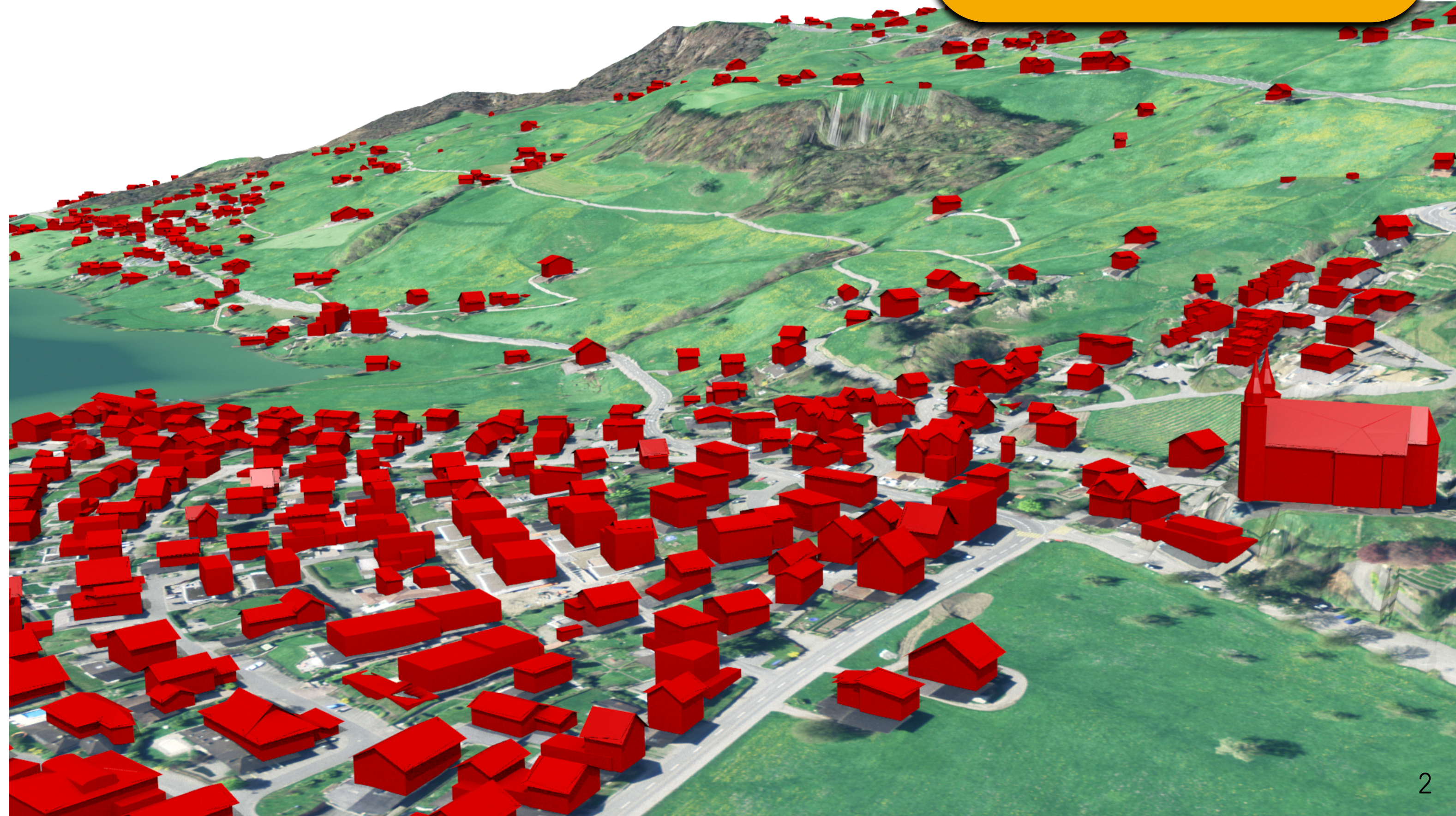
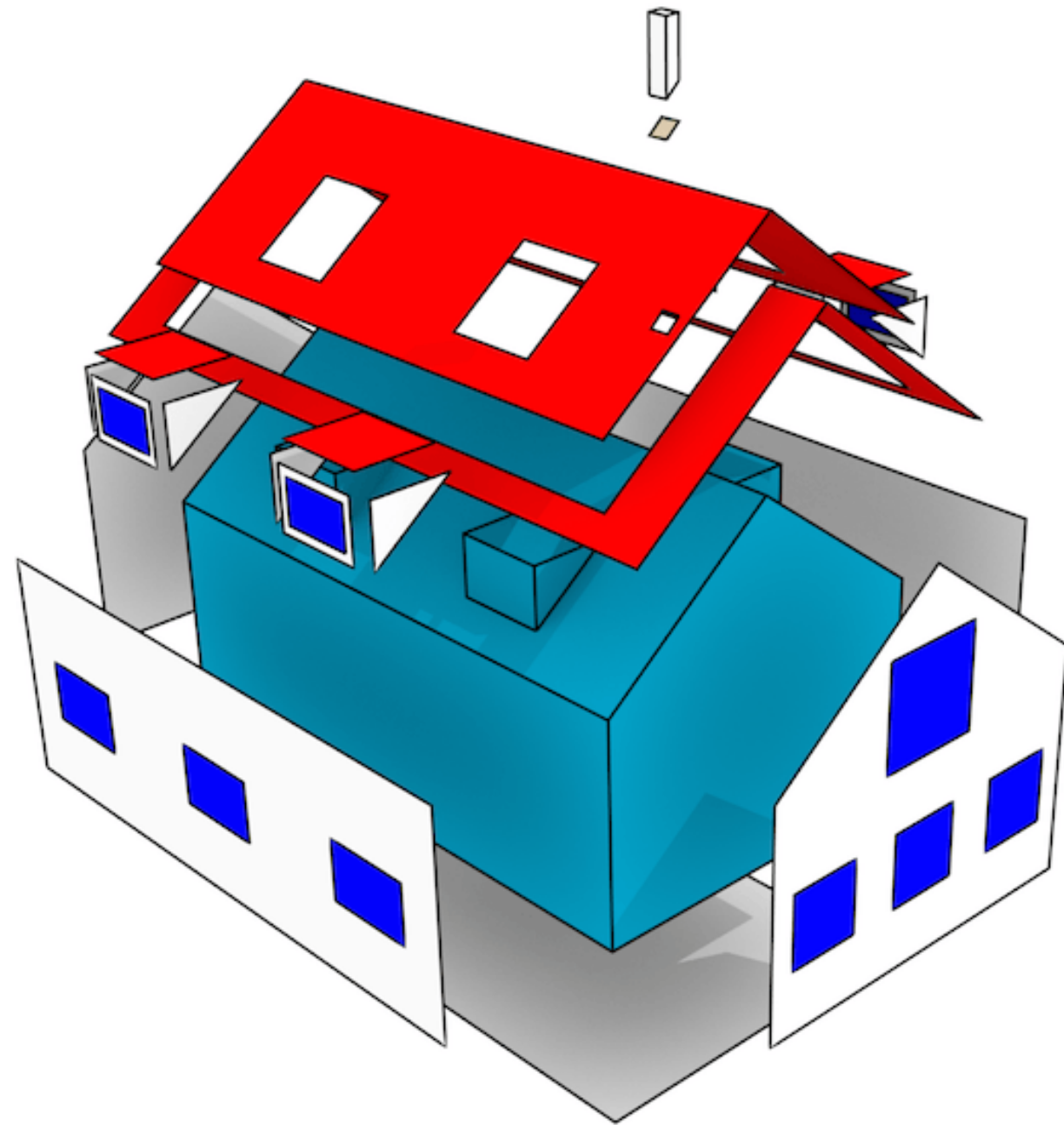




# CityGML

International standard (from OGC) for representing  
and storing semantic 3D city models

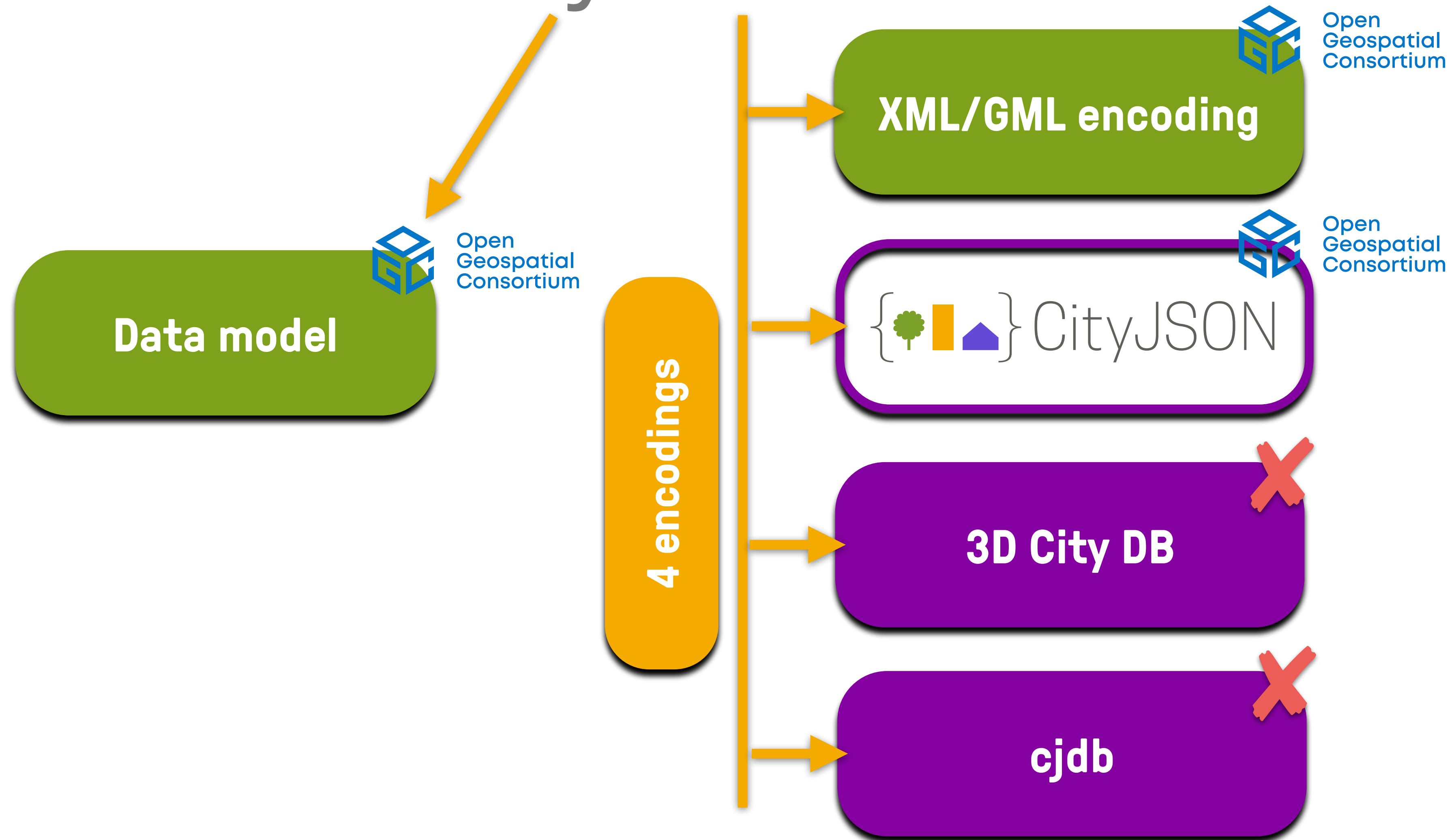
v1.0 in 2008  
v2.0 in 2012  
v3.0 in 2021 & 2023





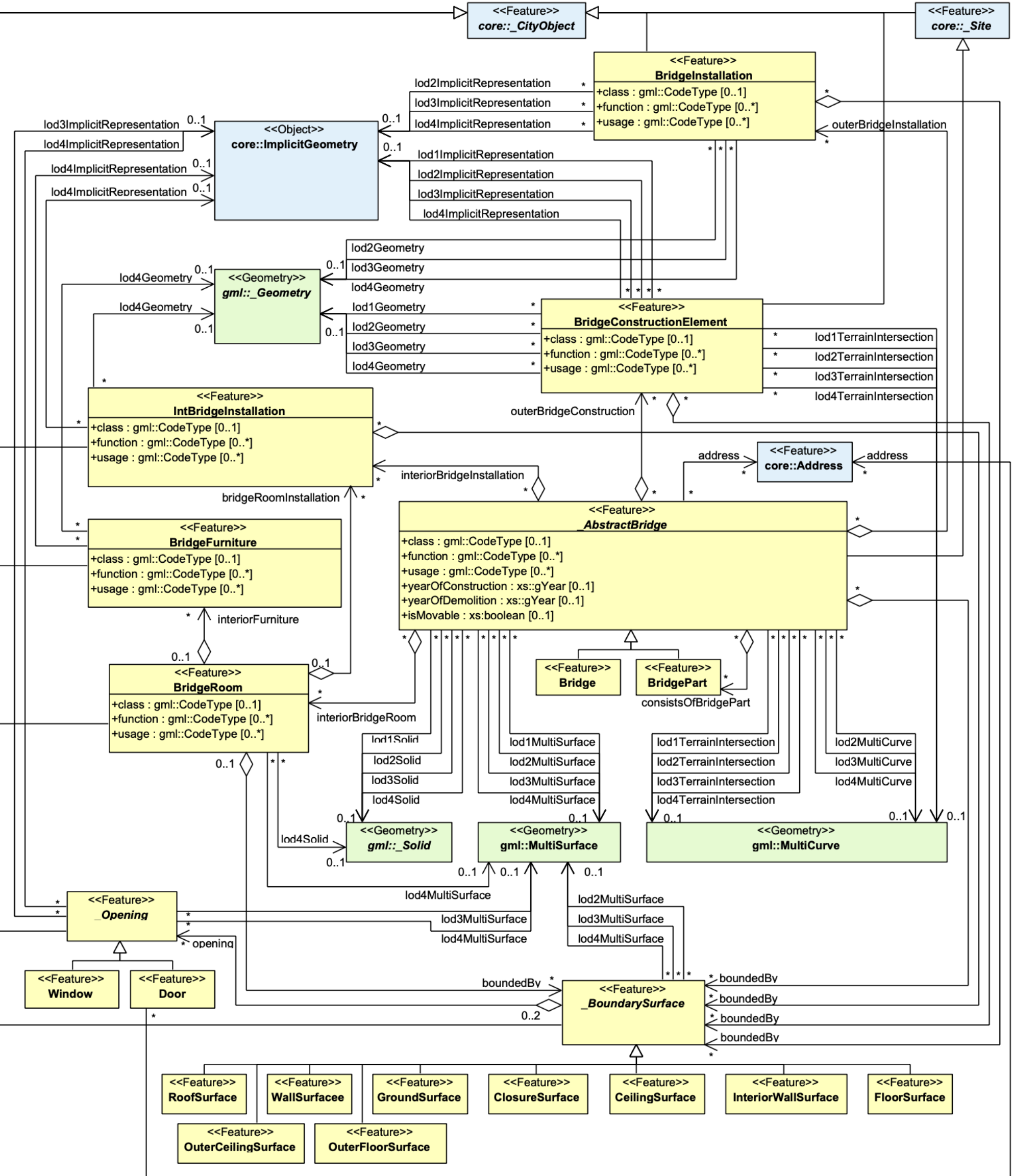


# CityGML



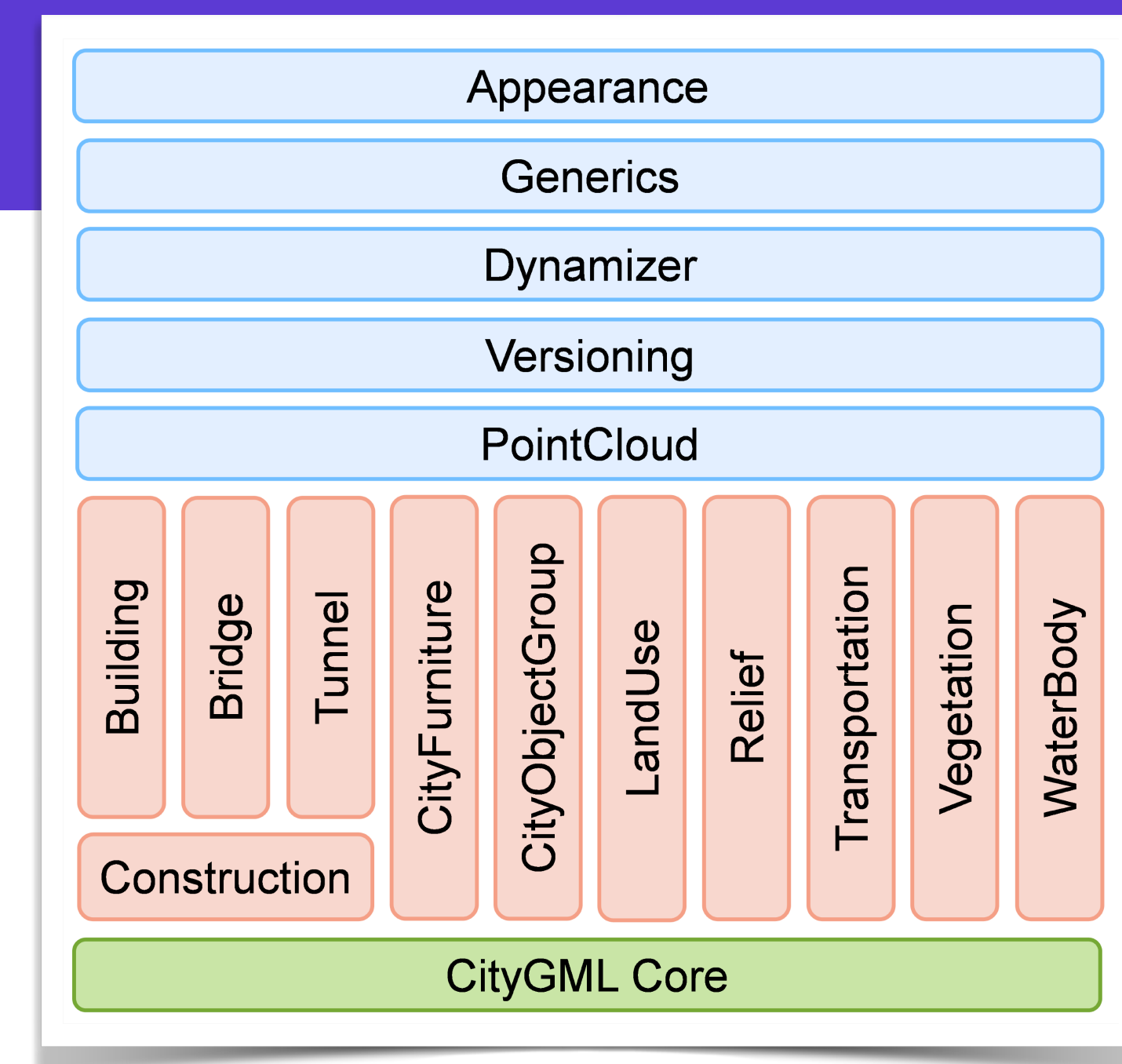
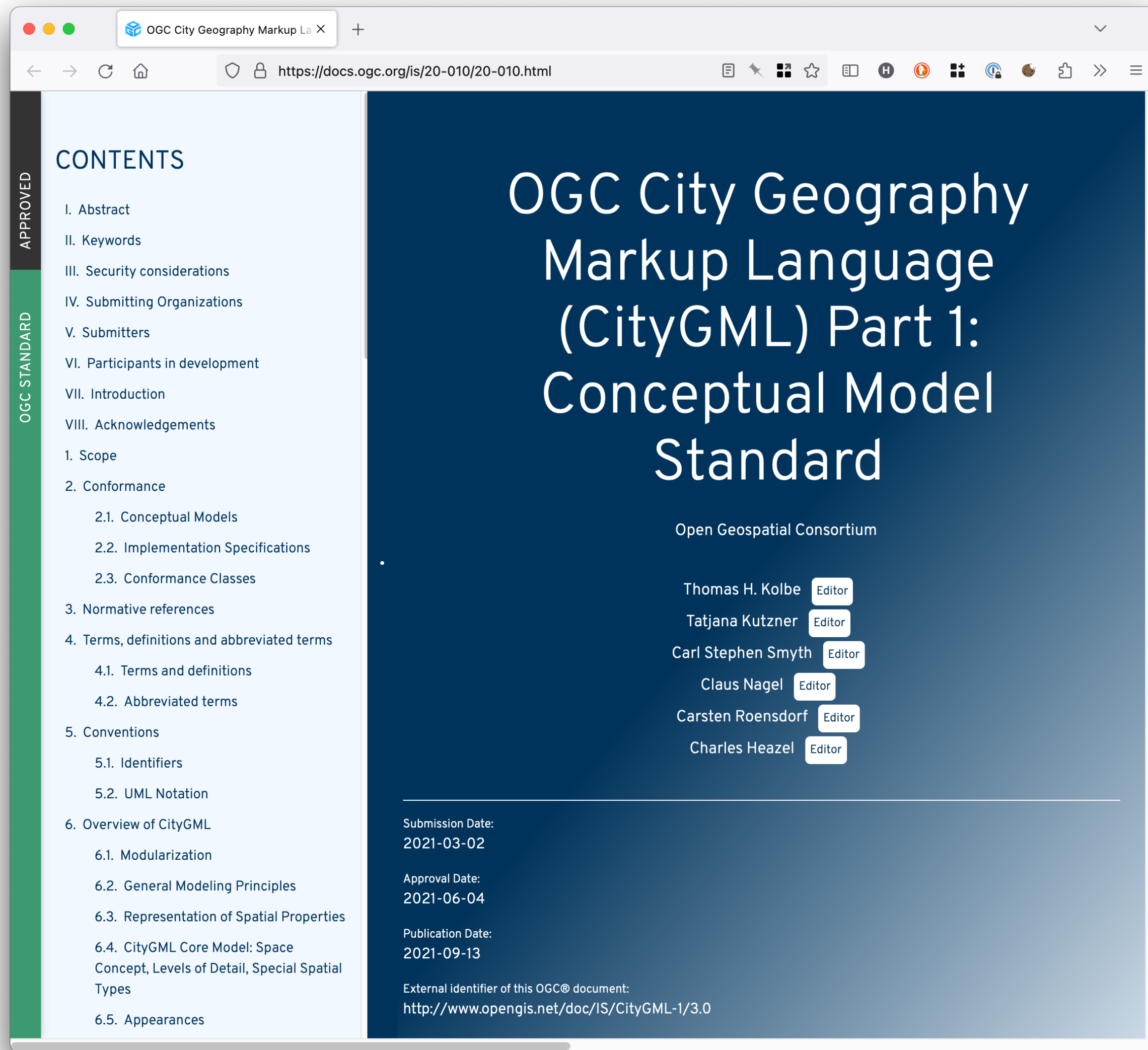


# Data model == UML



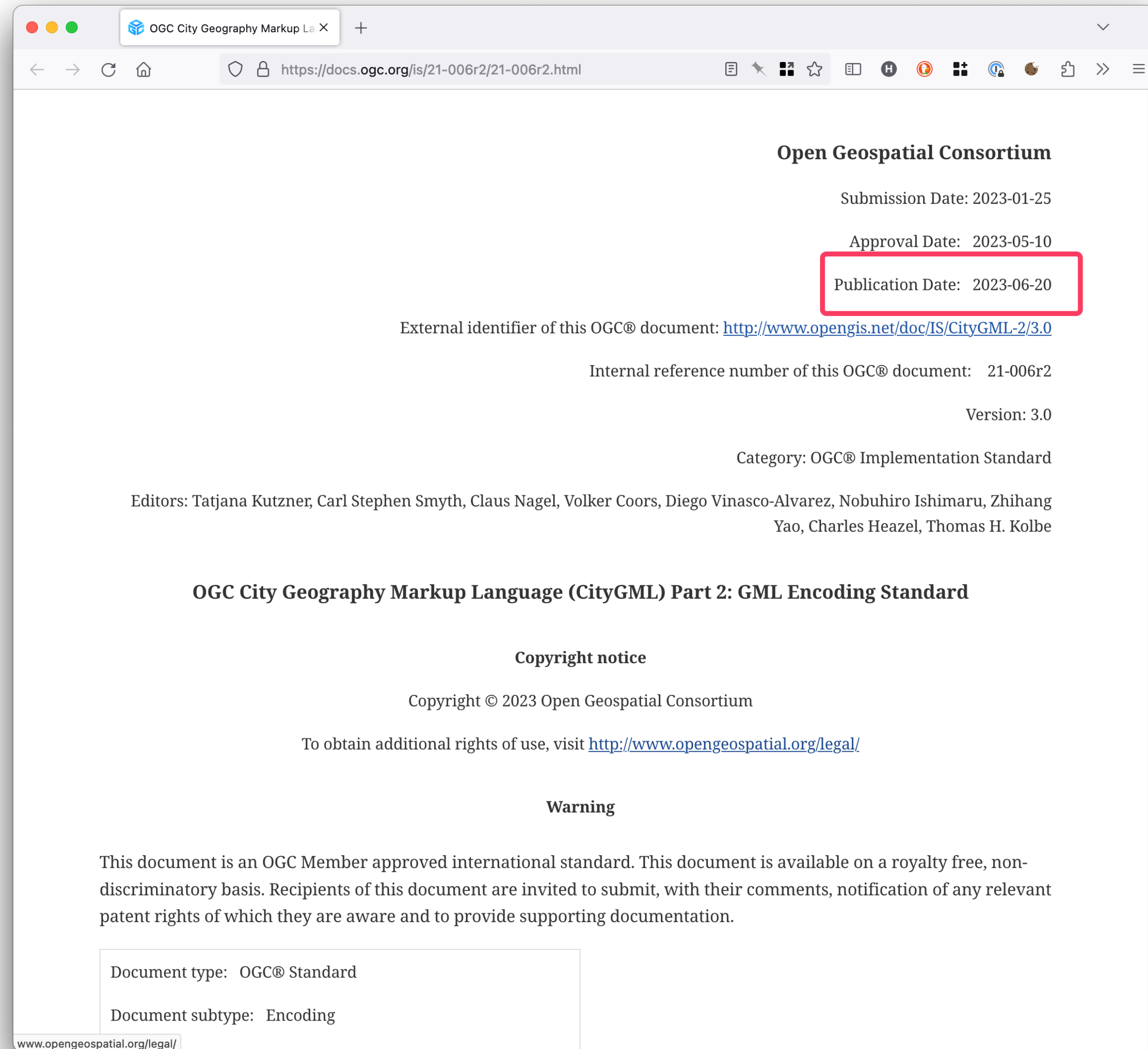
# Encoding == XML or JSON or ...

```
{
  "type": "CityJSON",
  "version": "2.0",
  "transform": {
    "scale": [1.0, 1.0, 1.0],
    "translate": [0.0, 0.0, 0.0]
  },
  "metadata": {
    "referenceSystem": "https://www.opengis.net/def/crs/EPSG/0/7415"
  },
  "CityObjects": {
    "id-1": {
      "type": "Building",
      "attributes": {
        "measuredHeight": 22.3,
        "owner": "Elvis Presley"
      },
      "geometry": [
        {
          "type": "MultiSurface",
          "lod": "2.1",
          "boundaries": [ [[0, 3, 2, 1]], [[4, 5, 6, 7]], [[0, 1, 5, 4]] ]
        }
      ]
    }
  },
  "vertices": [
    [231, 2321, 11],
    [1111, 321, 12],
    ...
  ],
  "appearance": {
    "materials": [],
    "textures": []
  }
}
```



- Adds interior of buildings (rooms, storeys, etc)
- no more LoD4
- Adds point clouds, versioning, etc.
- Revamp of the ADE mechanism





- No software support at the moment: FME will **\*\*not\*\*** work
- Except citygml4j (from the main CityGML developer)

# CityGML files are very complex

- files are deeply nested, and large
- many “points of entry”
- many diff ways to do one thing

it makes the life of  
developers very  
unpleasant



- ➔ few software packages *correctly* read/write CityGML-XML
- ➔ no parsers in JavaScript
- ➔ I personally get 😞 each time I get a new file



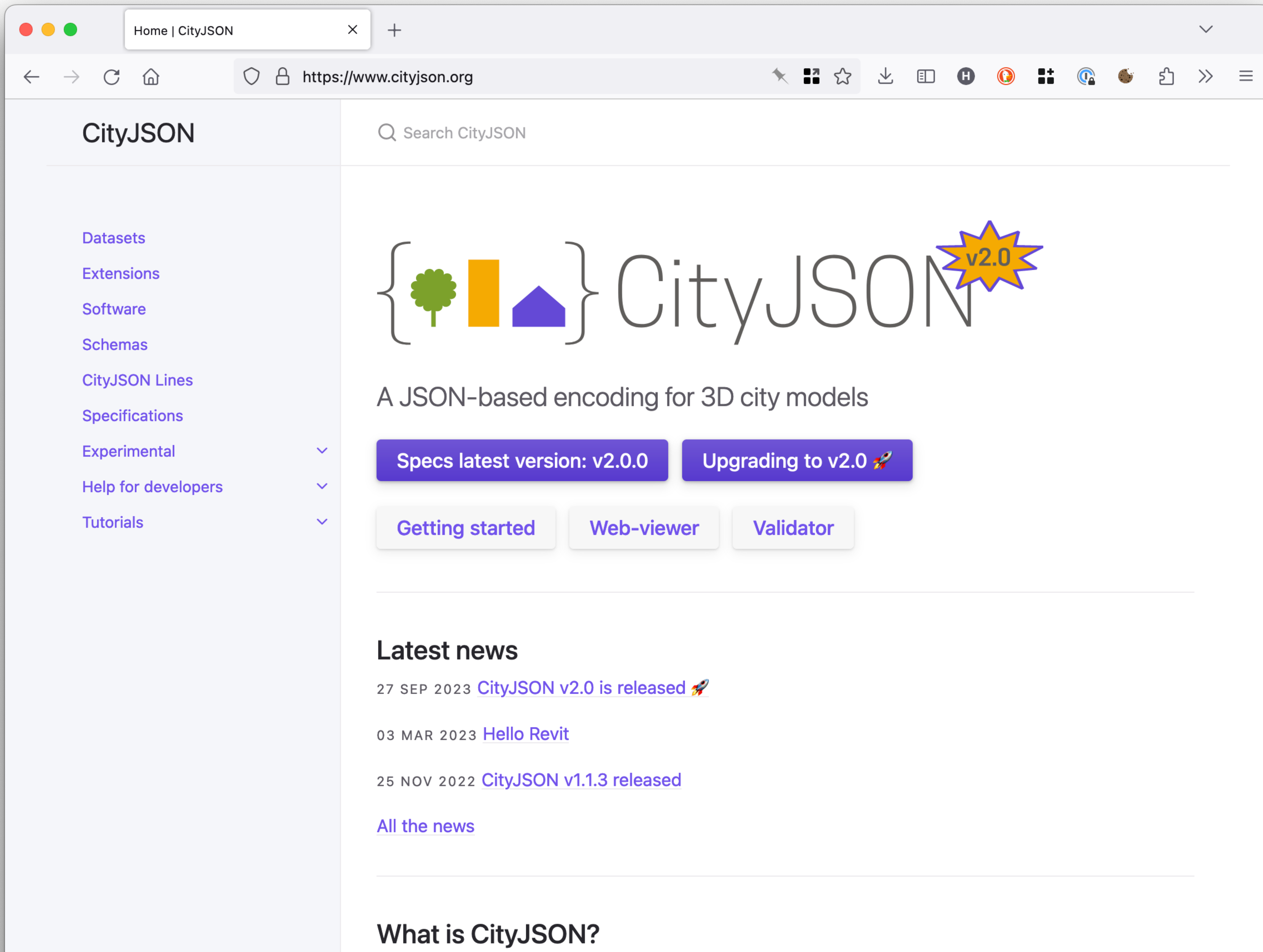
# CityGML files are very complex

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v2.0  
just released!

CityGML v3.0  
conformant

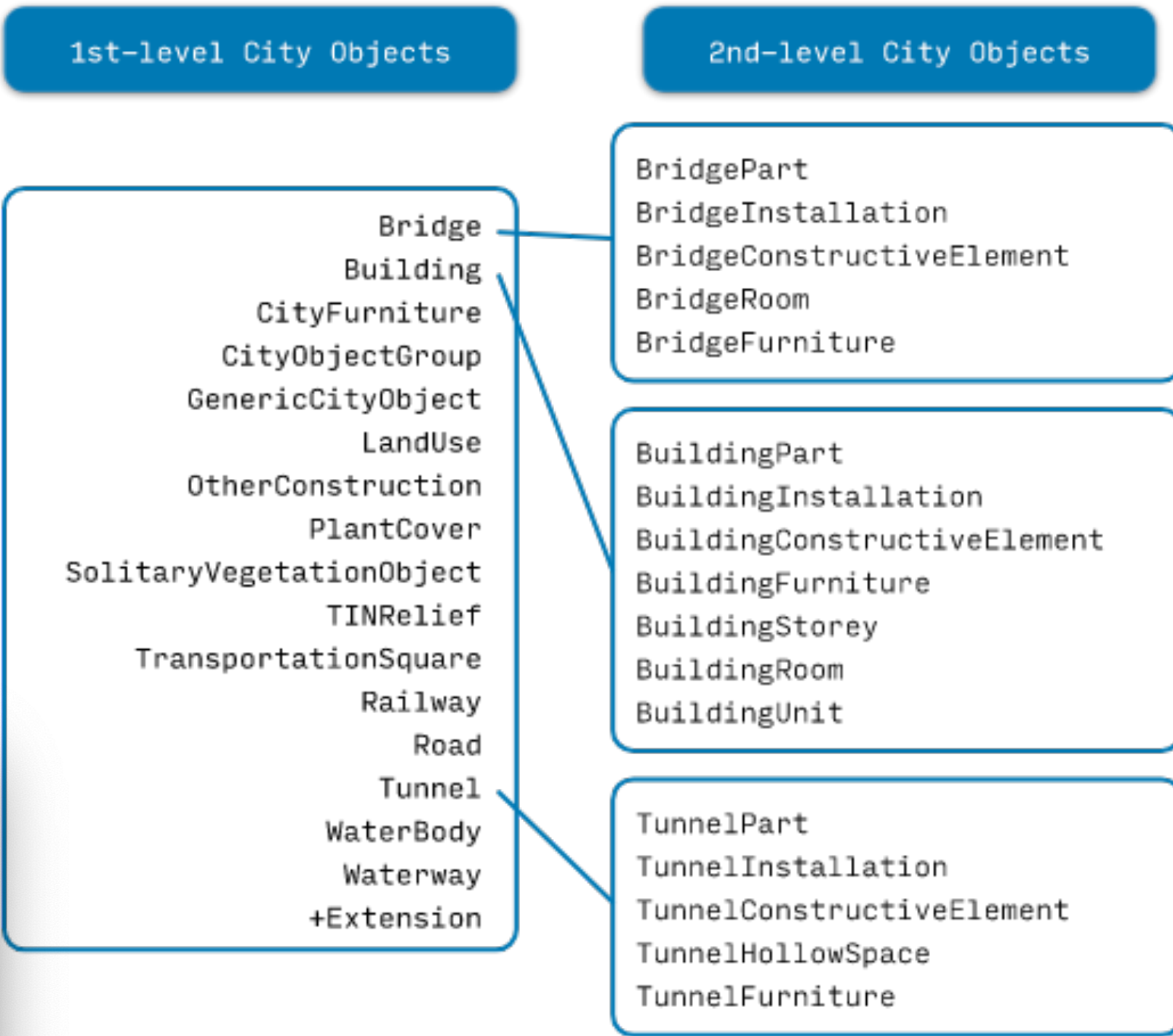
Approved by





# CityJSON v2.0 implements most of CityGML data model

- all core modules of CityGML data model v3.0 are mapped 💪
- Subset of CityGML core (~97% of features)
- Modules not supported is on purpose (to keep it simple)



CityJSON v3.0 implementation detail: X

https://www.cityjson.org/citygml/v30/

### CityJSON

- Datasets
- Extensions
- Software
- Schemas
- CityJSON Lines
- Specifications
- Experimental
- Help for developers
- Tutorials

### Overview CityGML modules

✓	100% supported
⚠	partially supported (often missing features are for the sake of an efficient implementation)
✗	module not supported at all

CityGML module	compliant?	extra info
Core	⚠	all geometries can be represented, Implicit Geometries are supported (called <a href="#">Geometry Templates</a> ). Only the <code>ExternalReferences</code> are not supported.
Appearance	⚠	the CityGML class <code>TexCoordGen</code> is not supported, ie one must specify the UV coordinates in the texture files.
Bridge	✓	
Building	✓	

# GIS specialists do not all use/have FME: Python parsing is very easy

CityJSON makes developers happy (and thus productive)

```
import json

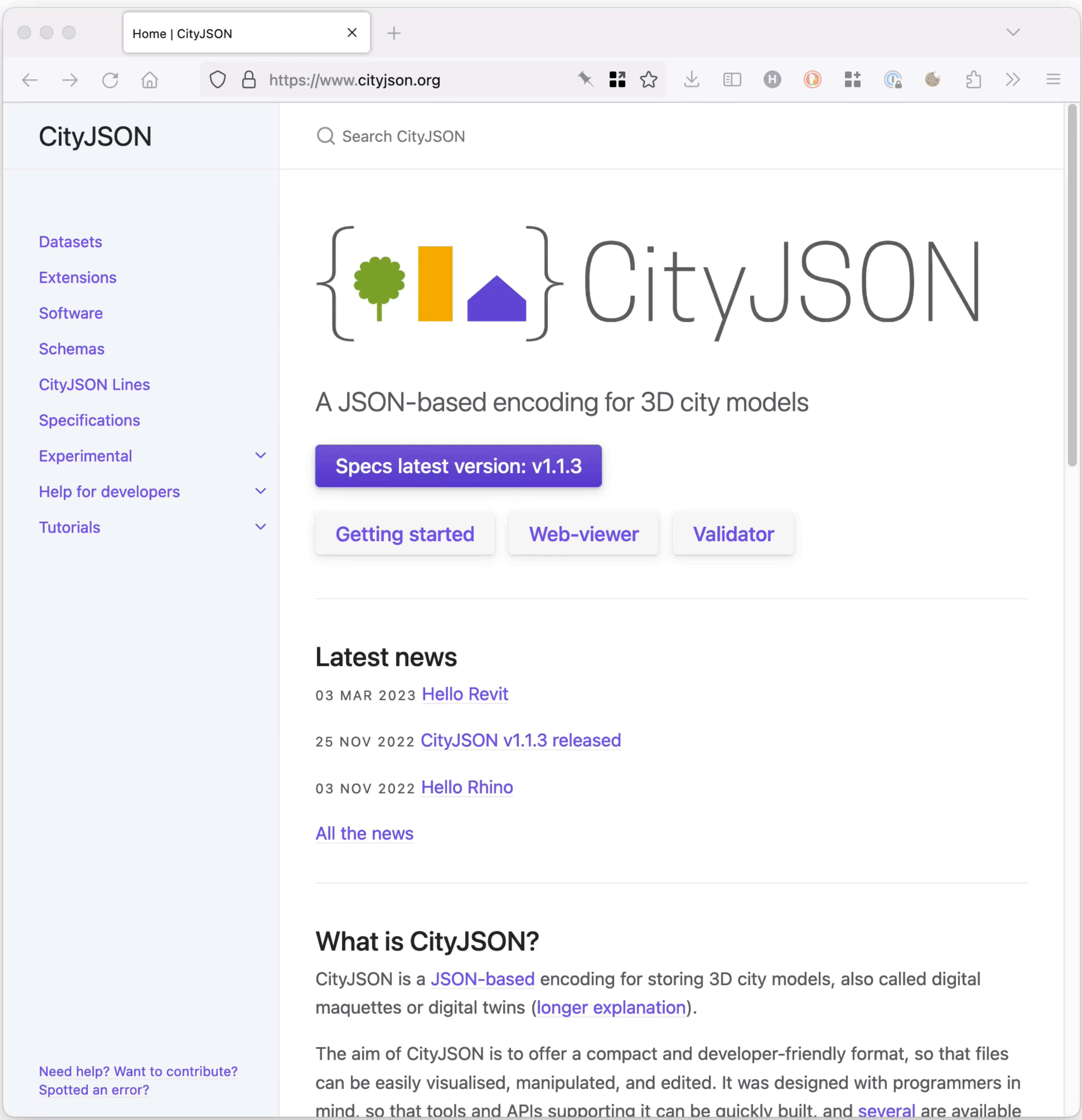
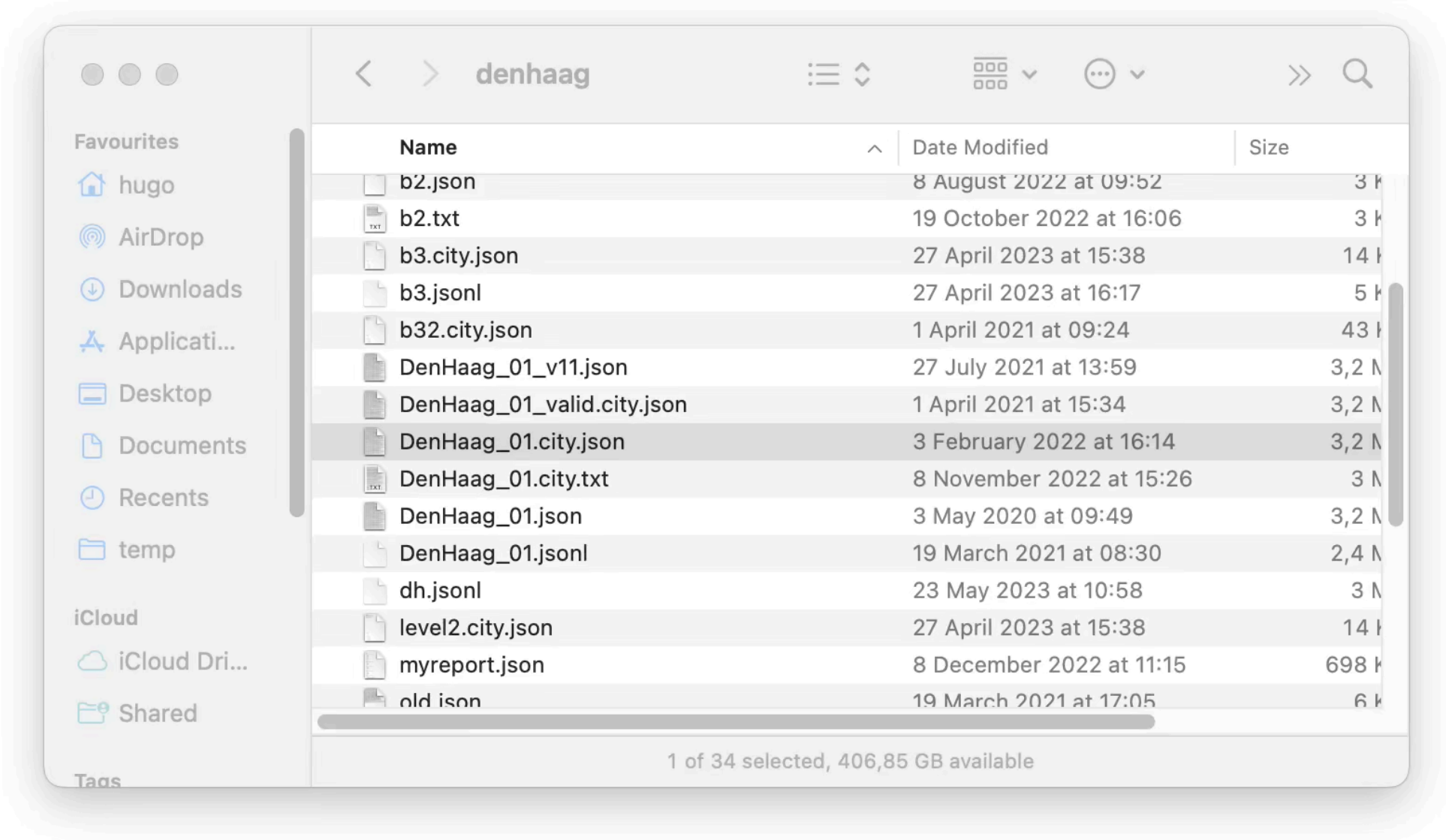
fin = open('mycity.json')
cm = json.loads(fin.read())

print "There are", len(cm['CityObjects']), "CityObjects"

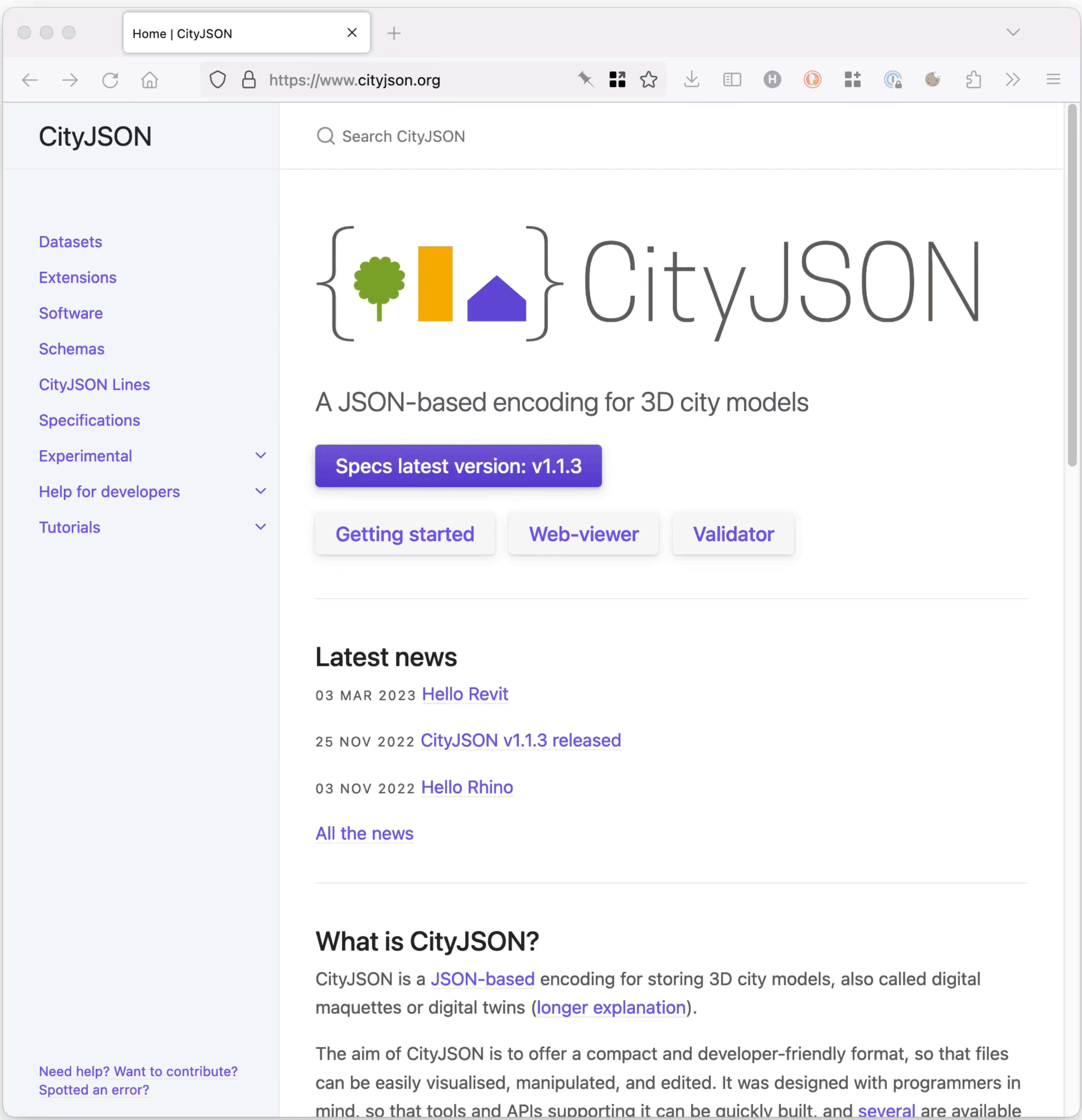
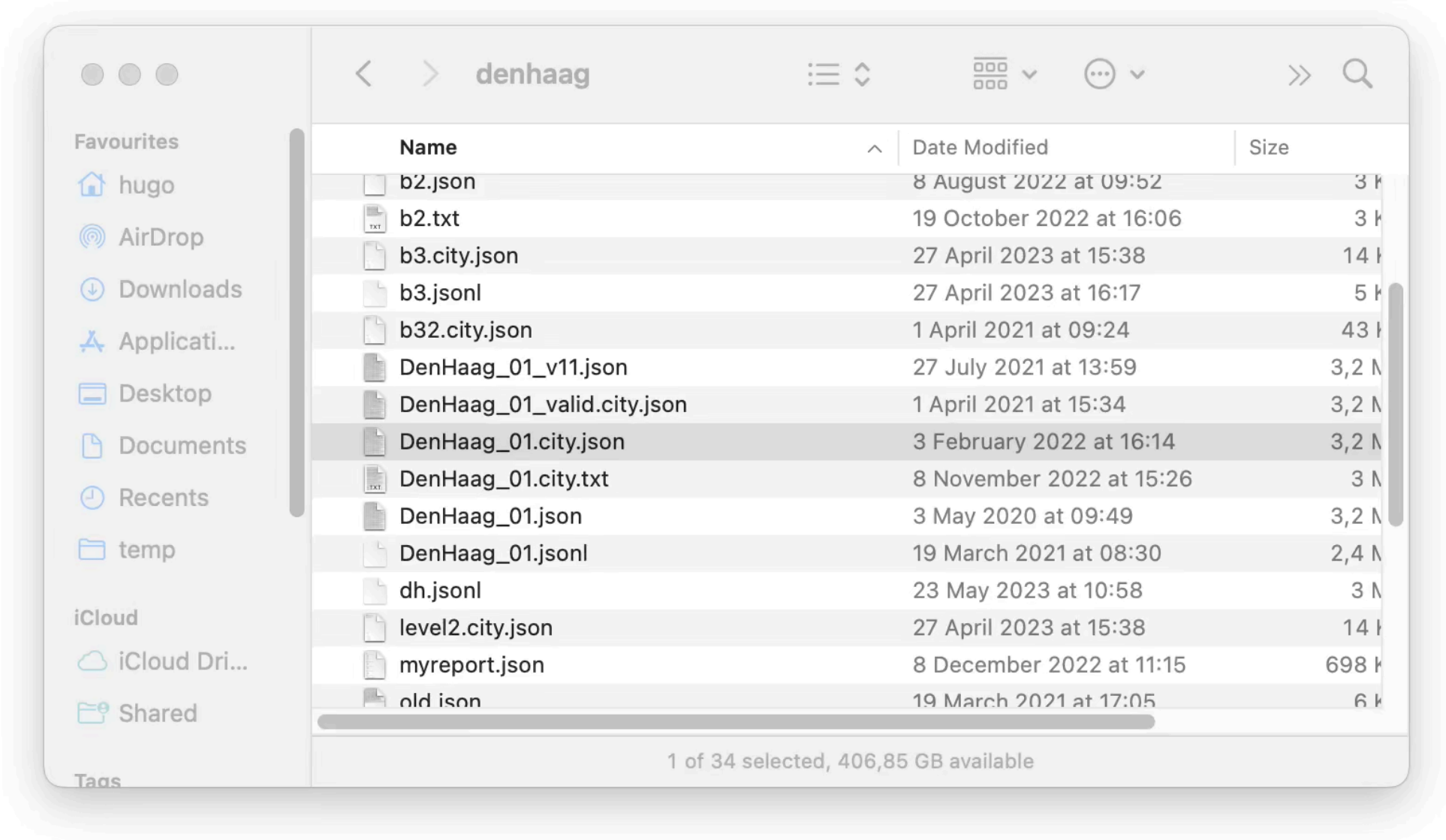
# list all ids
for id in cm['CityObjects']:
    print "\t", id
```



# It's ready for the web

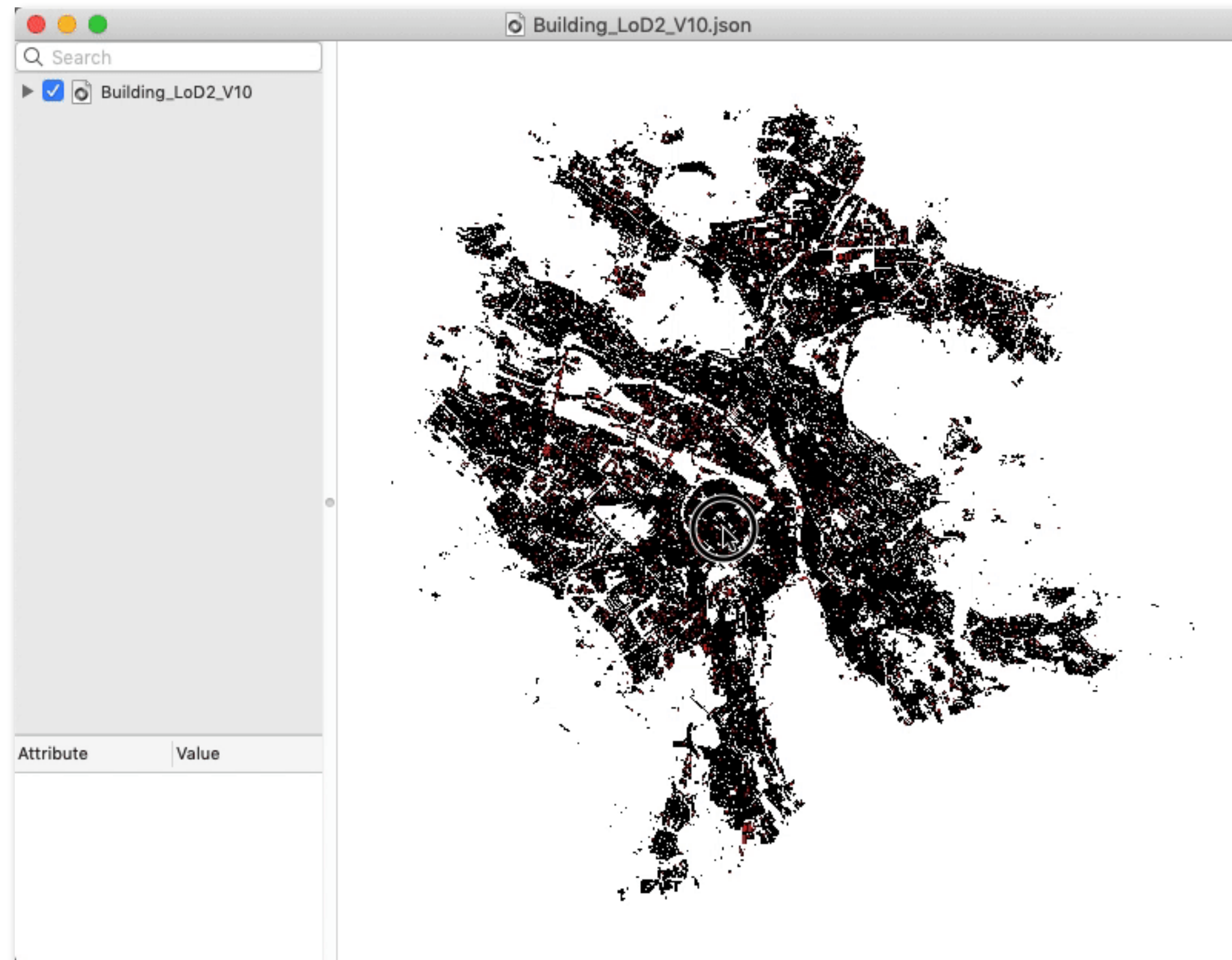


# It's ready for the web





# Compression of files: Zürich LoD2 buildings



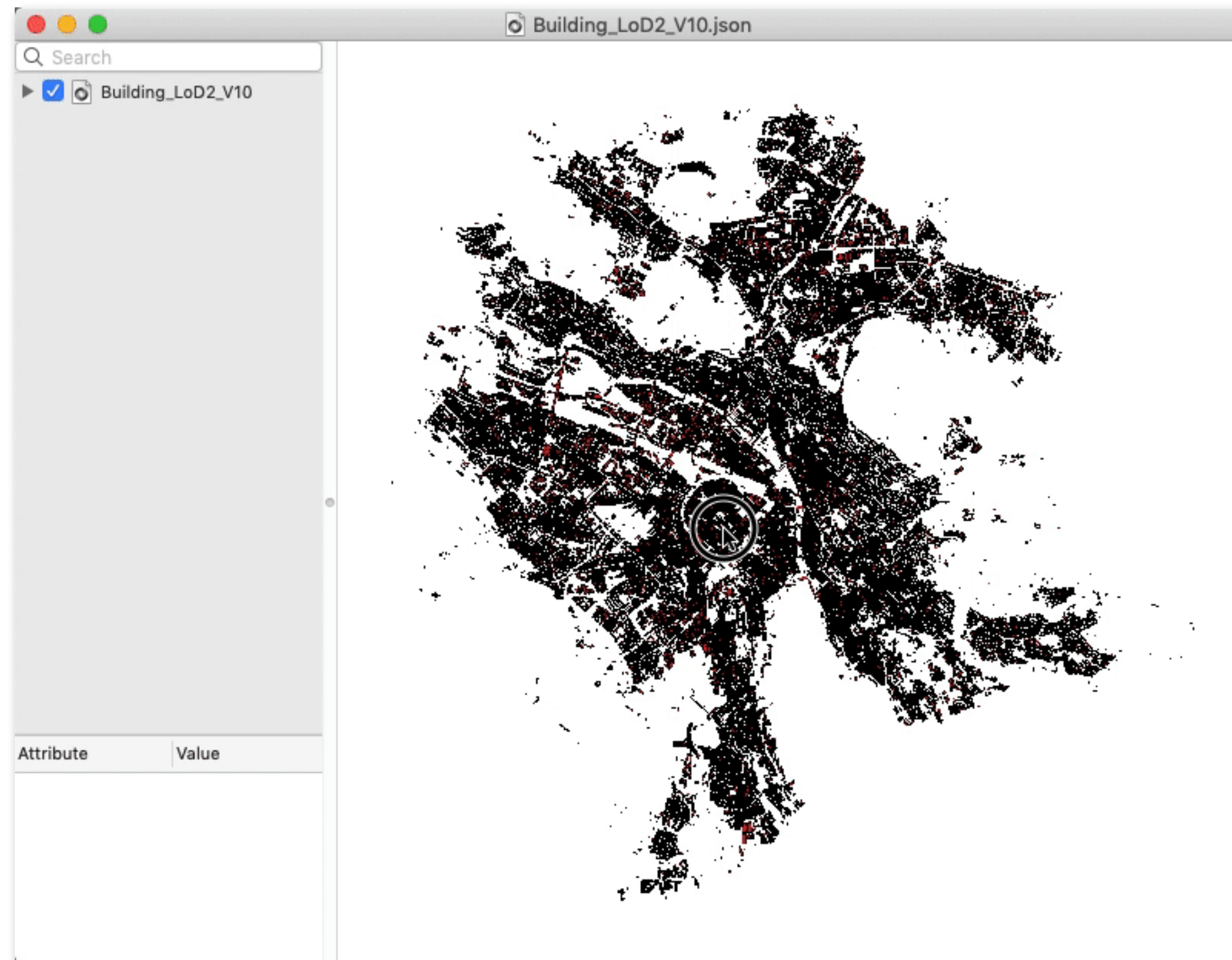
**CityGML-XML v2.0 = 3.0GB**

(but 1GB of spaces/CRs/tabs!)

**CityJSON v2.0 = 292MB**

Compression == 7.1X

# Compression of files: Zürich LoD2 buildings



**CityGML-XML v2.0 = 3.0GB**

(but 1GB of spaces/CRs/tabs!)

**CityJSON v2.0 = 292MB**

Compression == 7.1X



# CityJSON support in software

Good list of software

Most are open-source

Many written by students at TUDelft

Software | CityJSON

https://www.cityjson.org/software/

CityJSON

Datasets

Extensions

Software

Schemas

CityJSON Lines

Specifications

Experimental

Help for developers

Tutorials

Summary table

Software			View	Generate	Edit	Convert	Parse/API	Validate
<a href="#">3D City DB</a>	🖱	💻						
<a href="#">3dfier</a>	>_	</>		⚙				
<a href="#">Autoconverter</a>	🖱	💻	⚙			⚙		
<a href="#">azul</a>	🖱	💻	⚙					
<a href="#">C# library</a>	>_	</>					⚙	
<a href="#">citygml-tools</a>	>_	📁				⚙		
<a href="#">citygml4j</a>	>_	</>					⚙	
<a href="#">cityjson2jsonfg</a>	>_	💻				⚙		
<a href="#">cjio</a>	>_	📁				⚙	⚙	⚙
<a href="#">cjval</a>	📺	📁						⚙
<a href="#">FME</a>	🖱	💻	⚙	⚙		⚙		
<a href="#">IFCCityJSON</a>	>_	💻				⚙		
<a href="#">Measur3D</a>	🖱	💻	⚙					
<a href="#">ninja</a>	🖱	💻	⚙		⚙			
<a href="#">ParaView reader</a>	🖱	💻	⚙					
<a href="#">QGIS plugin</a>	🖱	💻	⚙					
<a href="#">RevitCityJSONImporter</a>	🖱	💻			⚙	⚙		
<a href="#">RhinoCity</a>	🖱	💻		⚙	⚙	⚙		
<a href="#">RhinoCityJSONReader</a>	🖱	💻			⚙	⚙		
<a href="#">Schema Store</a>	>_	</>					⚙	
<a href="#">tyler</a>	>	💻	⚙			⚙		

Need help? Want to contribute?  
Spotted an error?

**(CityJSON == CityGML)**

**&&**

**(CityGML == CityJSON)**



# citygml4j + citygml-tools

citygml4j / citygml-tools

Type to search

Code Issues 3 Pull requests Discussions Actions Projects Security Insights

citygml-tools Public

Unwatch 7 Fork 16 Star 101 Code

clausnagel updated dependencies ✓ d376940 · 2 months ago 402 Commits

master Go to file

.github/workflows	run build action on multiple platforms	last year
gradle/wrapper	updated Gradle to 7.5.1	last year
resources		
src/main		
.gitattributes		
.gitignore		
CHANGELOG.md	updated changelog	2 months ago
Dockerfile	use Apline image for Docker	last year
LICENSE	Initial commit	5 years ago
README.md	updated changelog and readme	5 months ago
build.gradle	updated dependencies	2 months ago
gradlew	updated Gradle to 7.5.1	last year
gradlew.bat	updated Gradle to 7.5.1	last year
settings.gradle	initialized Gradle	last year

full conversion CityGML <-> CityJSON

About

Collection of tools for processing CityGML files

processing tool citygml cityjson citygml-tools

Readme

16 forks

Report repository

Releases 15

v2.1.0 Latest on Apr 4

+ 14 releases

Packages

No packages published

Contributors 2

- Supports CityGML-XML v3.0
- Bidirectional conversion
- Open-source

```
hugo@hl-mpb16: ~/software/citygml-tools-2.1.0
Last login: Tue Sep 26 10:17:47 on ttys005
~ ➤ cd ~/software/citygml-tools-2.1.0
~/software/citygml-tools-2.1.0 ➤ ./citygml-tools
Missing required subcommand.
Usage: citygml-tools [-hV] [--extensions=<folder>] [-L=<level>]
                  [--log-file=<file>] [--pid-file=<file>] [@<filename>...]
                  [COMMAND]
Collection of tools for processing CityGML files.
  [@<filename>...]  One or more argument files containing options.
-L, --log-level=<level>  Log level: error, warn, info, debug (default: info).
--log-file=<file>       Write log messages to this file.
--pid-file=<file>       Create a file containing the process ID.
--extensions=<folder>  Load extensions from this folder.
-h, --help             Show this help message and exit.
-V, --version          Print version information and exit.

Commands:
help      Display help information about the specified command.
stats     Generates statistics about the content of CityGML files.
validate  Validates CityGML files against the CityGML XML schemas.
apply-xslt Transforms city objects based on XSLT stylesheets.
change-height Changes the height values of city objects by a given offset.
remove-apps Removes appearances from city objects.
to-local-apps Converts global appearances into local ones.
clip-textures Clips texture images to the extent of the target surface.
subset    Creates a subset of city objects based on filter criteria.
filter-lods Filters LoD representations of city objects.
reproject Reprojects city objects to a new coordinate reference system.
from-cityjson Converts CityJSON files into CityGML.
to-cityjson Converts CityGML files into CityJSON.
upgrade   Upgrades CityGML files to version 3.0.
~/software/citygml-tools-2.1.0 ➤
```



```
hugo@hl-mpb16: ~/software/citygml-tools-2.1.0

~/software/citygml-tools-2.1.0 ➔ ./citygml-tools to-cityjson ~/temp/DenHaag_01.xml
[08:32:04 INFO] Starting citygml-tools.
[08:32:04 INFO] Executing 'to-cityjson' command.
[08:32:04 INFO] Found 1 file(s) at /Users/hugo/temp/DenHaag_01.xml.
[08:32:04 INFO] [1|1] Processing file /Users/hugo/temp/DenHaag_01.xml.
[08:32:05 INFO] Writing output to file /Users/hugo/temp/DenHaag_01.json.
[08:32:07 INFO] Total execution time: 02 s.
[08:32:07 INFO] citygml-tools successfully completed.

~/software/citygml-tools-2.1.0 ➔

Last login: ...
~ ➔ cd ~/
~/software/ ➔
Missing re
Usage: cit

Collection
[@<f
-L, --lo
--lo
--pi
--ex
-h, --he
-V, --ve

Commands:
help
stats
validate
apply-xs
change-h
remove-apps
to-local-apps
clip-textures
subset
filter-lods
reproject
from-cityjson
to-cityjson
upgrade

Removes appearances from city objects.
Converts global appearances into local ones.
Clips texture images to the extent of the target surface.
Creates a subset of city objects based on filter criteria.
Filters LoD representations of city objects.
Reprojects city objects to a new coordinate reference system.
Converts CityJSON files into CityGML.
Converts CityGML files into CityJSON.
Upgrades CityGML files to version 3.0.

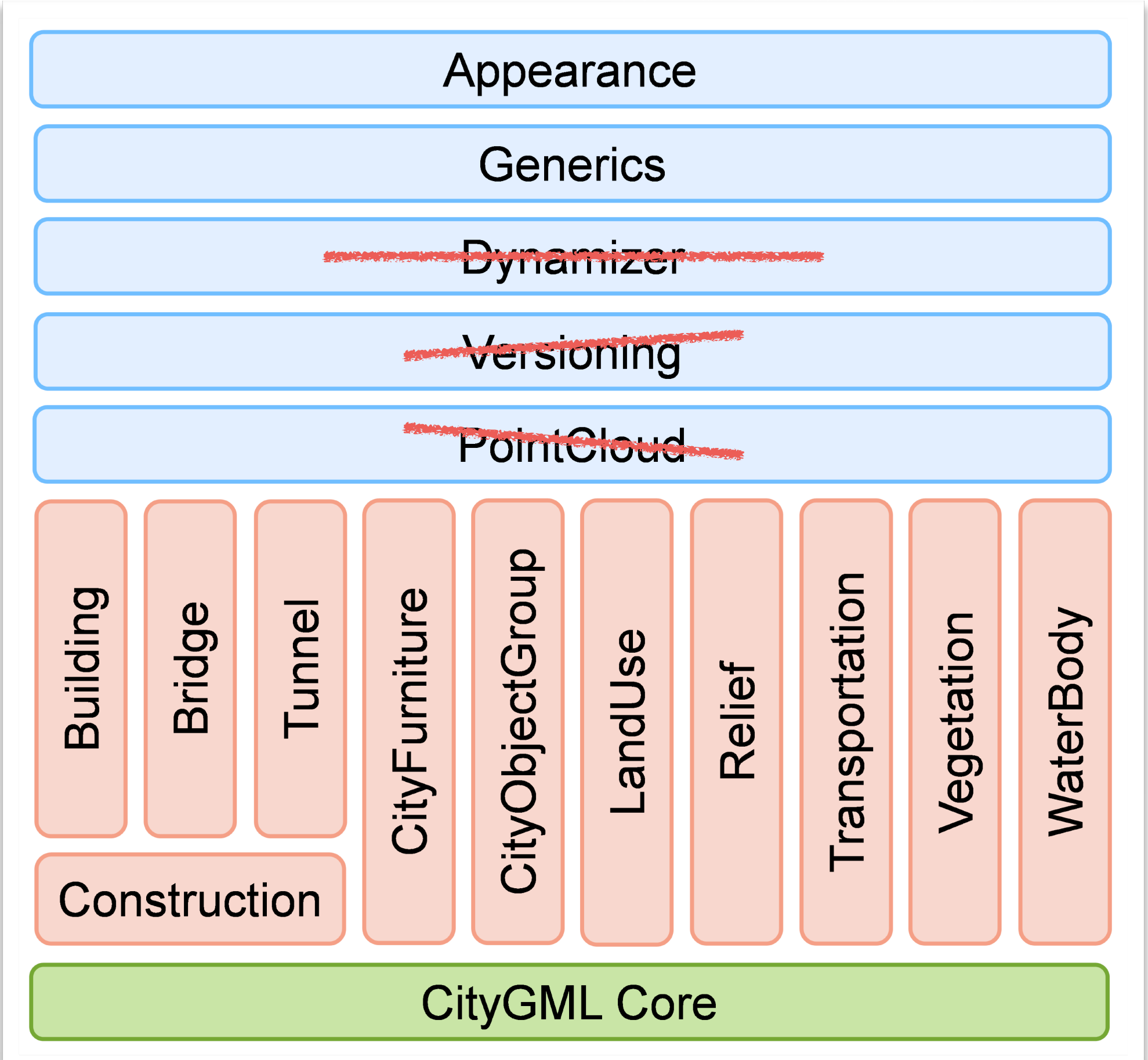
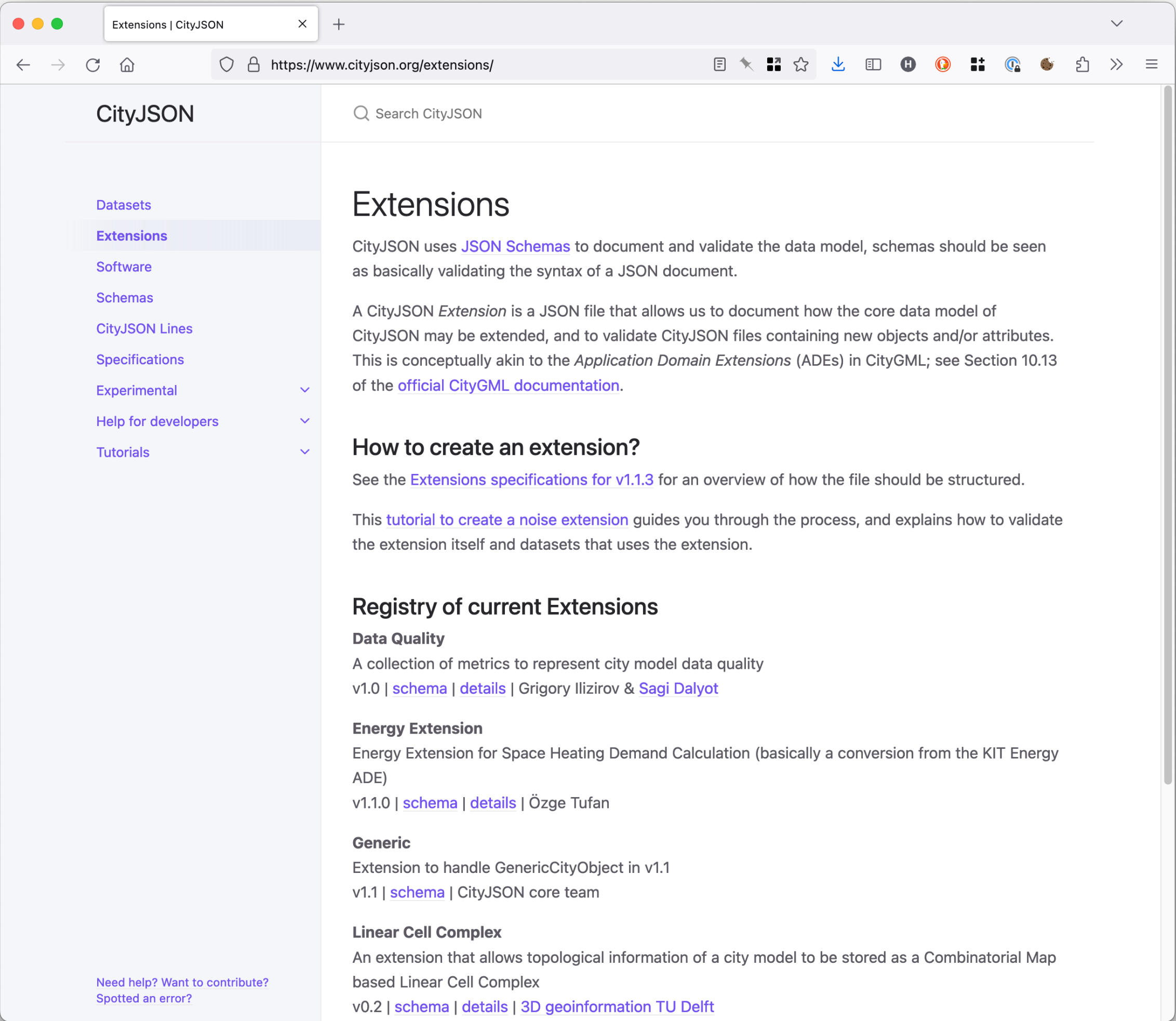
~/software/citygml-tools-2.1.0 ➔
```



# Certainly it can't be that simple? Indeed, there are 2 caveats

#1. ADEs != Extensions

#2. CityGML modules not supported in CityJSON





# thank you.

Hugo Ledoux

`h.ledoux@tudelft.nl`  
`3d.bk.tudelft.nl/hledoux`

`https://cityjson.org`  
`https://citygml.org`



3DBAG has all 10M buildings  
in NL in CityJSON