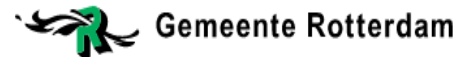


An integrative versioning workflow for 3D City Model maintenance

Konstantinos Mastorakis
Delft, November 2020



Supervisors:

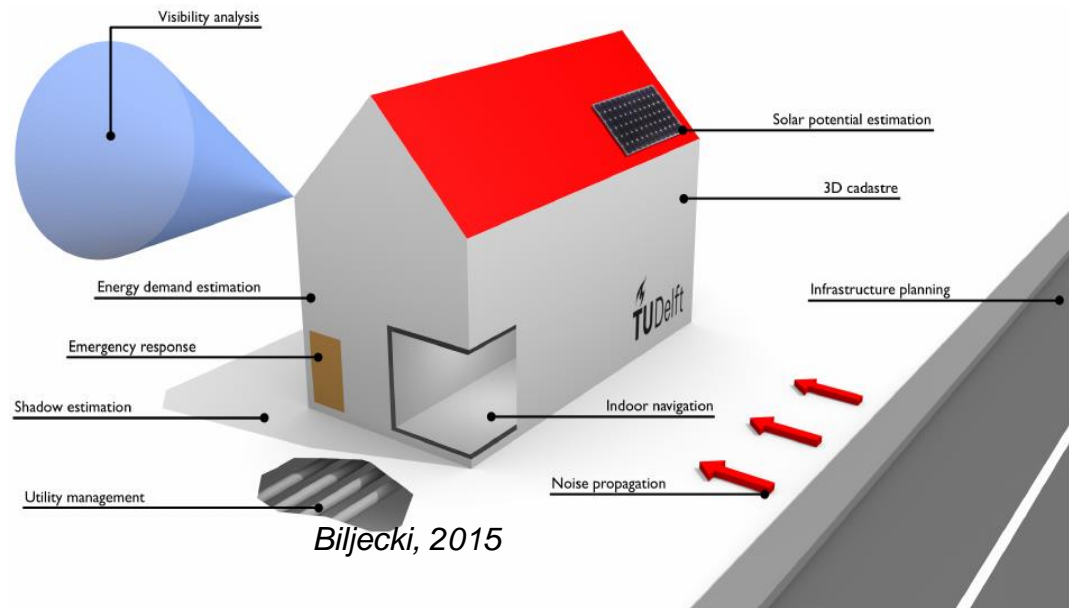
Hugo Ledoux, *TU Delft*

Stelios Vitalis, *TU Delft*

Maarten Vermeij, *Gemeente Rotterdam*

Introduction

- ***Why maintaining a 3D city model at first place?***
 - Improve the way they are currently “updated”
 - Keep up with reality / Urban fabric changing very fast
 - Maximize its value / Attract more users



Motivation

- ***Design a maintenance workflow for 3D City Models***
 - Two main components:
 - Visual editing platform (*Up3date*: a Blender add-on)
 - Perform all changes via a graphical environment
 - Versioning Control System (VCS) for 3D City Models (Git-based)
 - Keeping track of history
 - Concurrent Updating

Research Questions

- To what extent can a Git-based versioning approach be used for the maintenance of a 3D City Model of a typical municipality?
 - What would be a conceptual workflow that would make this approach practical and manageable?
 - How can the maintenance process be improved by combining the versioning workflow with 3D visual editing capabilities of the model?

Use case (1/2)

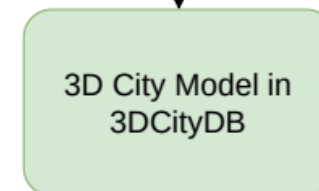
- ***3D City Model of the municipality of Rotterdam***
 - Initiated in 2011 as proof of concept
 - Remodeled from scratch in 2016
 - Contains *LoD* 0, 1, and 2 buildings, trees, infrastructure...
 - New iterations in a biennial life-cycle
 - Outsourced to third parties

Use case (2/2)

#	Key Point	Expected Effect
1	Maintaining model updated at regular intervals	Standardize the current maintaining procedures
2	Keeping track of maintenance history	Monitor the evolution of the urban fabric
3	Testing alternative scenarios for urban planning	Enhance the planning process while promoting concurrent collaboration
4	Motivate domain experts to use the model in custom applications	Raise the interest of third parties to experiment with the 3DCM
5	Incorporate the results of the external applications	Allow the work of third parties to enrich the 3DCM with more information

	2016-2018	2018-2020
<i>New</i>	3079	NA
<i>Mutated</i>	1228	NA
<i>Deleted</i>	1538	NA
<i>Total</i>	5845	10000 (approx.)

incorporation



Related work

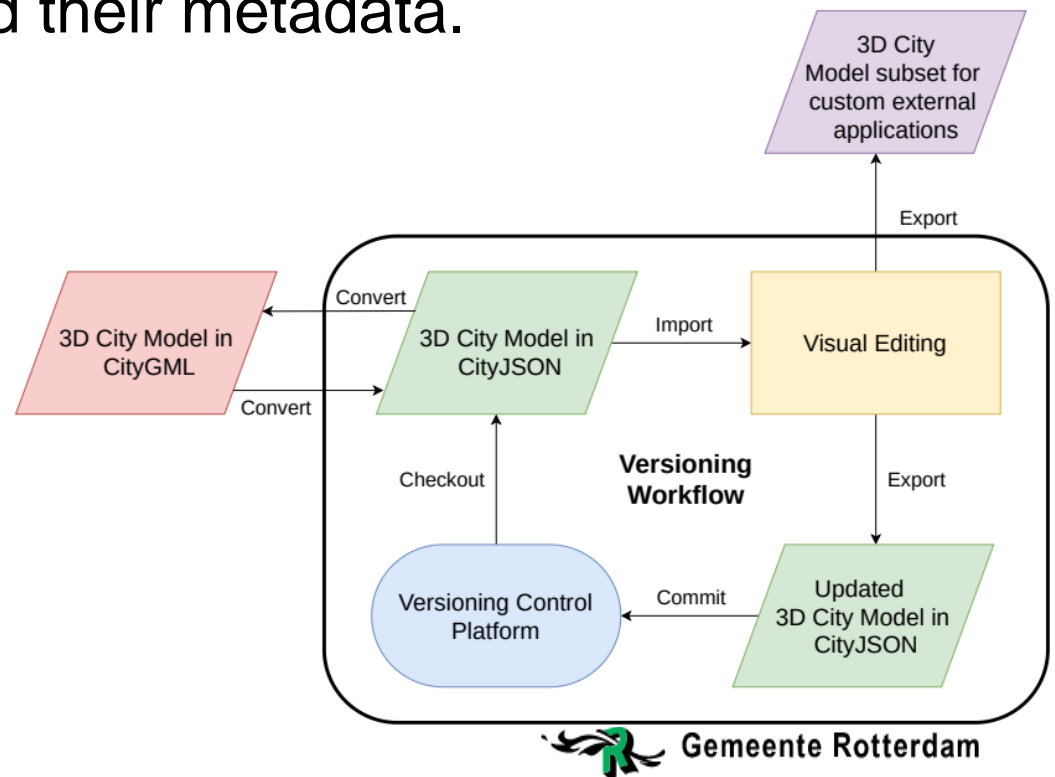
- **CityJSON:** A compact and easy-to-use encoding of the *CityGML* data model (*Ledoux et al, 2019*)
- **Git:** Distributed VCS for source code files
- A data structure to incorporate versioning in 3D city models (*Vitalis et al, 2019*)
- **CityGML v3.0. versioning module:** A data model that allows versioning in *CityGML* files
- **Scenario ADE:** An extension of the *CityGML v.2.0* data model for virtual scenario testing

Introducing the workflow

The core workflow

- **Instance:** A *3DCM* file representing the model at a given time point
- **Versioned file:** A file used as a repository that contains multiple instances and their metadata.

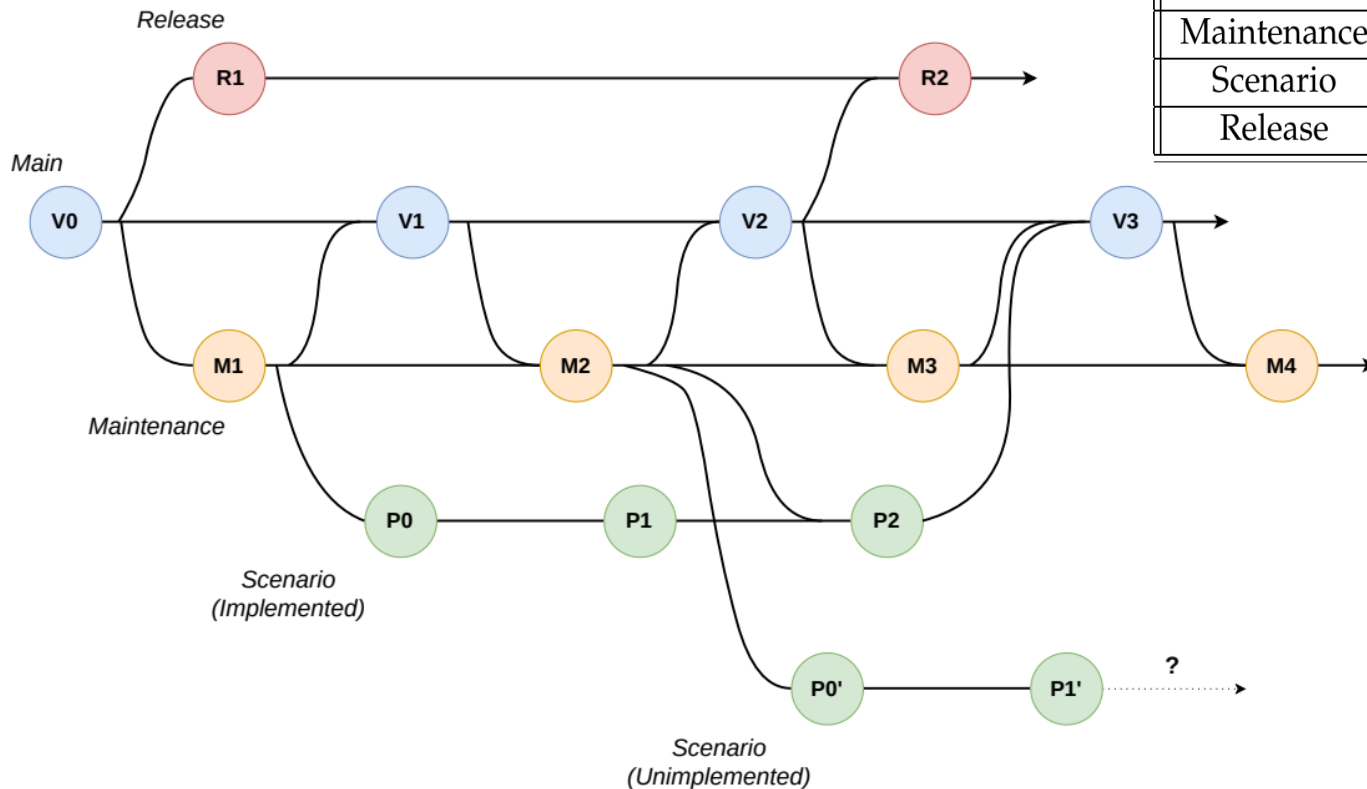
- The core workflow:



The multi-branch structure

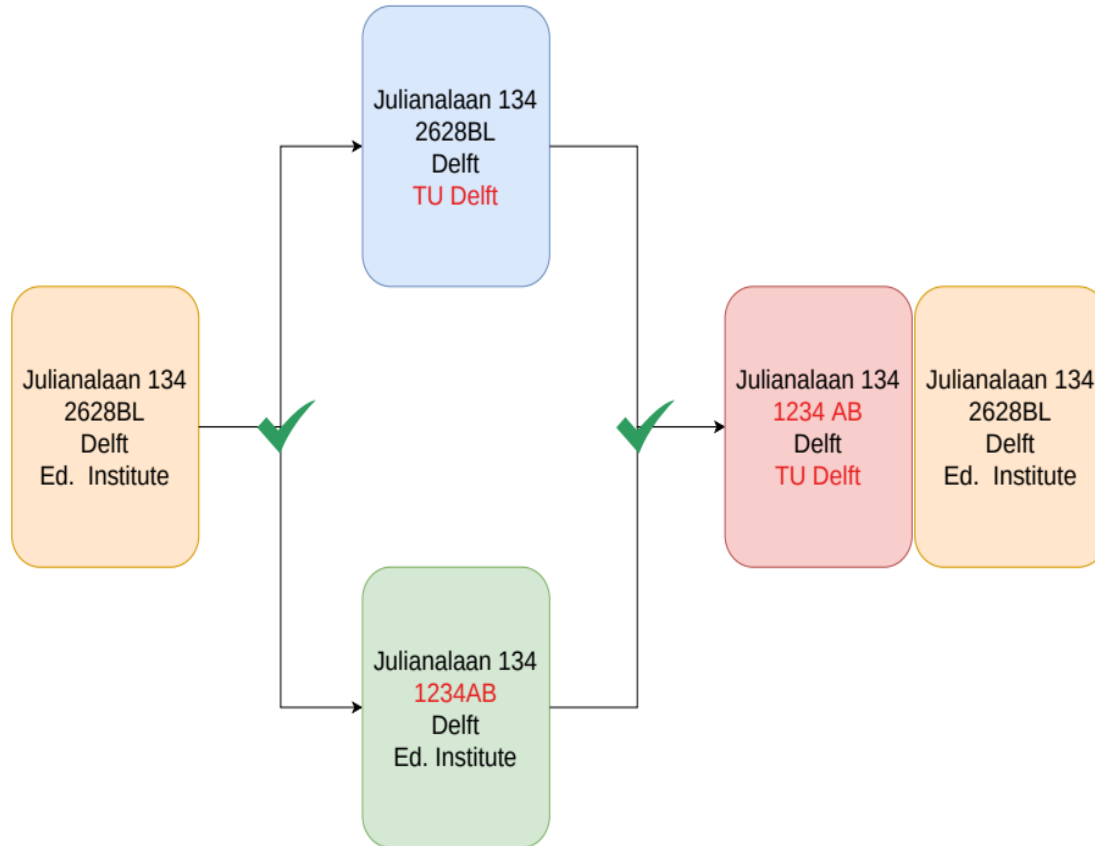
- 4 conceptual branches: **Main**, **Maintenance**, **Scenario**, **Release**

Branch	Number of practitioners
Main	0
Maintenance	1 or >1
Scenario	>1
Release	0

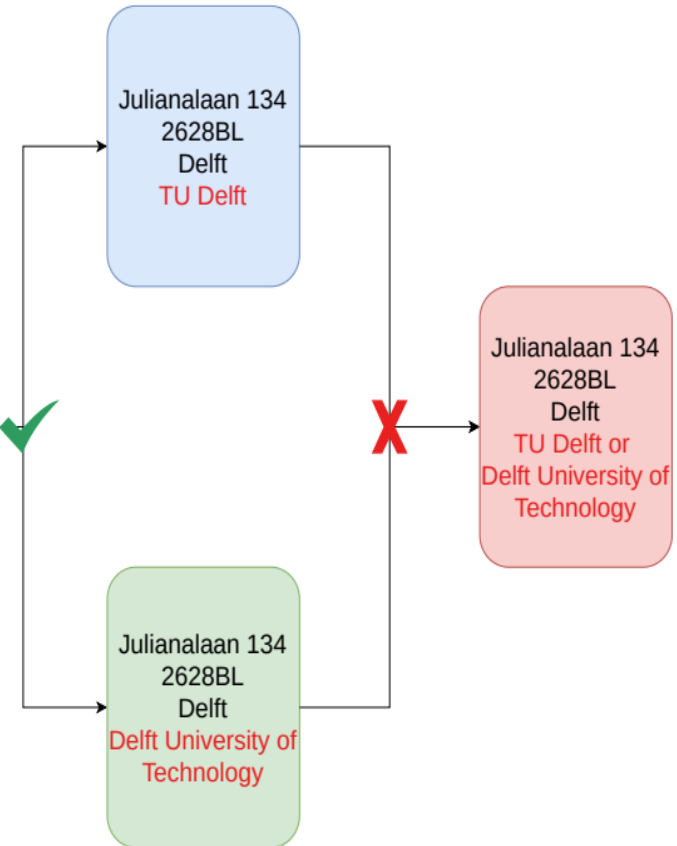


Merging conflicts

No conflict



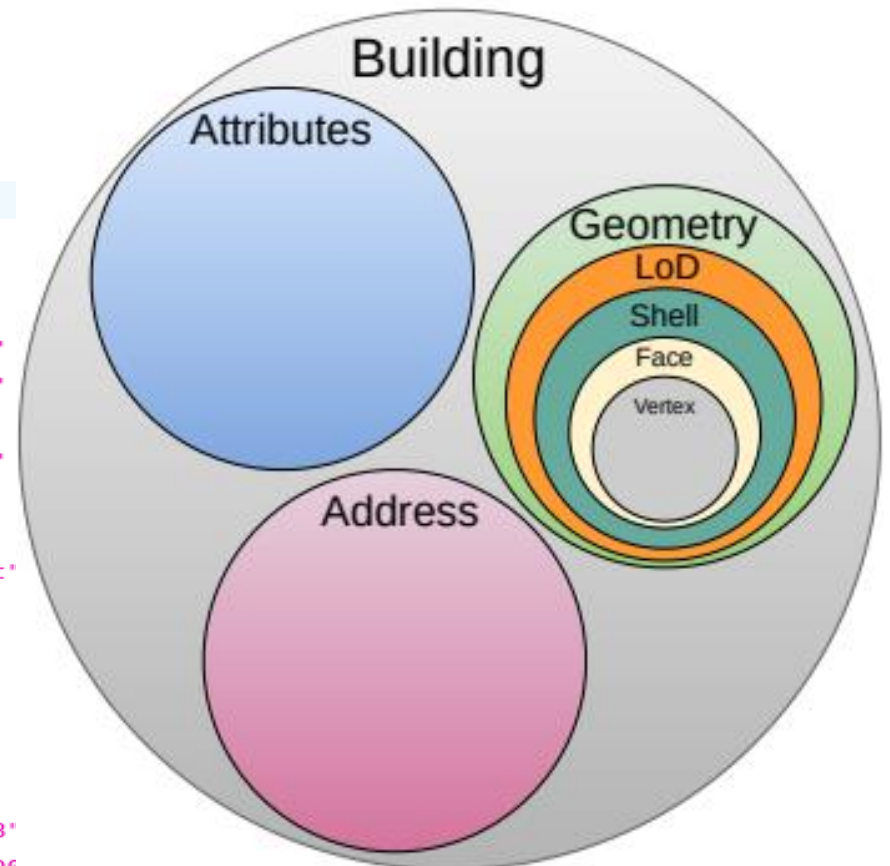
Conflict



The smallest entity

```

▼ ID_0599100000012859:
  ▼ geometry:
    ▶ 0: {}
    ▶ 1: {}
    ▼ 2:
      type: "Solid"
      ▼ boundaries:
        ▶ 0: {}
        ▶ semantics: {}
      texture: {}
      lod: 2
  ▼ address:
    CountryName: "Nederland"
    LocalityName: "Rotterdam"
    ThoroughfareNumber: "57"
    ThoroughfareName: "Voorhaven"
    PostalCode: "3025HD"
  ▼ location:
    type: "MultiPoint"
    ▼ boundaries:
      0: 81783
      lod: 0
    type: "Building"
  ▼ attributes:
    yearOfConstruction: 1916
    creationDate: "2016-04-18"
    gebouwnummer: "05991000000"
    hoogste_bouwlaag: 2
    statusOmschr: "Pand in gebruik"
    aantalBouwlagen: 3
    laagste_bouwlaag: 0
    typeOmschr: "tussenpand"
  
```



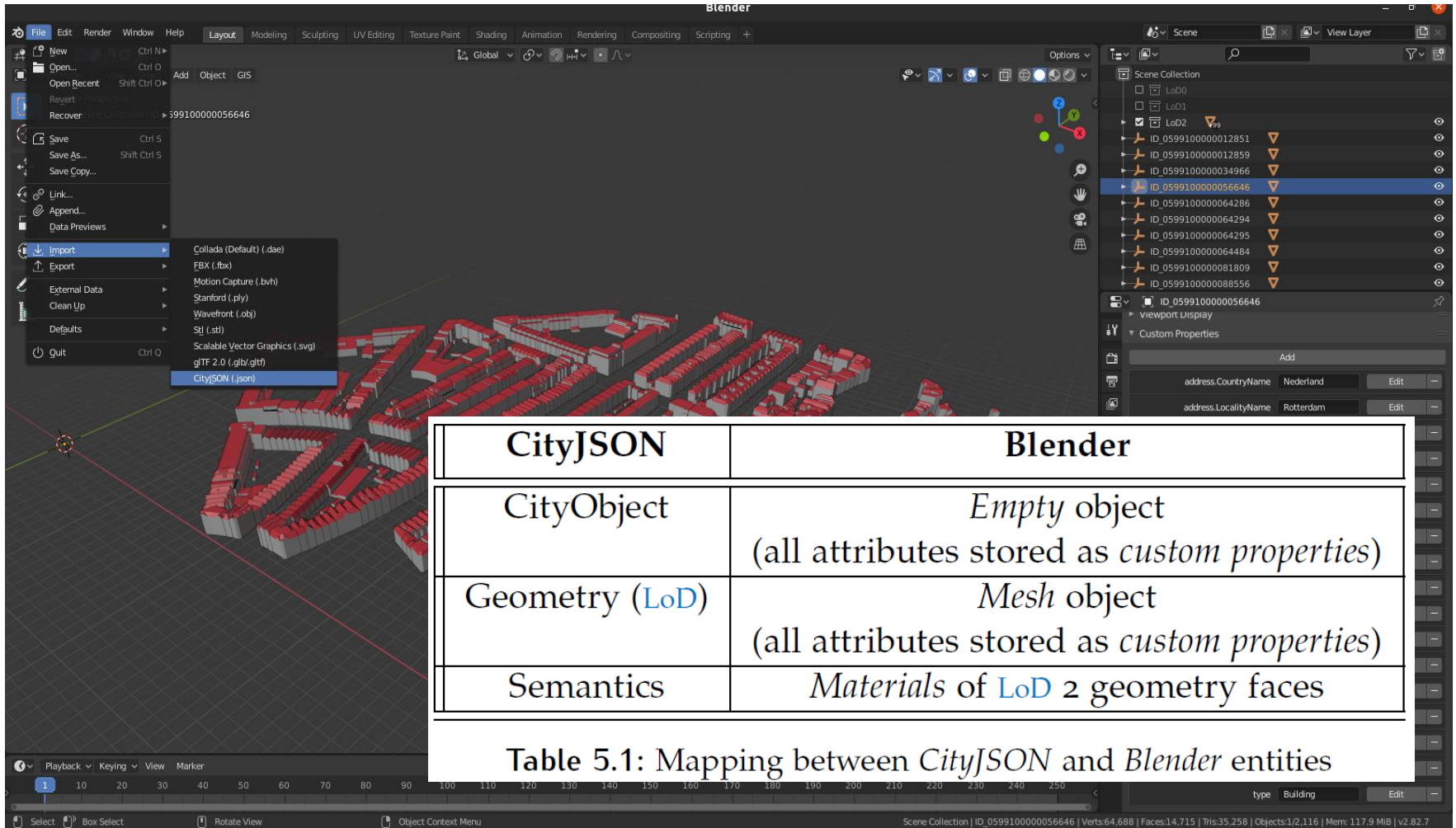
Information loss is limited to

Resolving conflicts

- Choosing which instance should be kept
 - Programming software to resolve them
 - Predefined ways of resolving a conflict from the VCS (not necessarily meaningful)
 - Requires VCS to have cognitive abilities (AI) which is not the case at the moment
 - Let the user decide how to resolve
 - Resolution is guaranteed to be meaningful
 - Maximizes human supervision
 - Can become time consuming
- In practice, manual resolution superior to “automatic”

Workflow Implementation

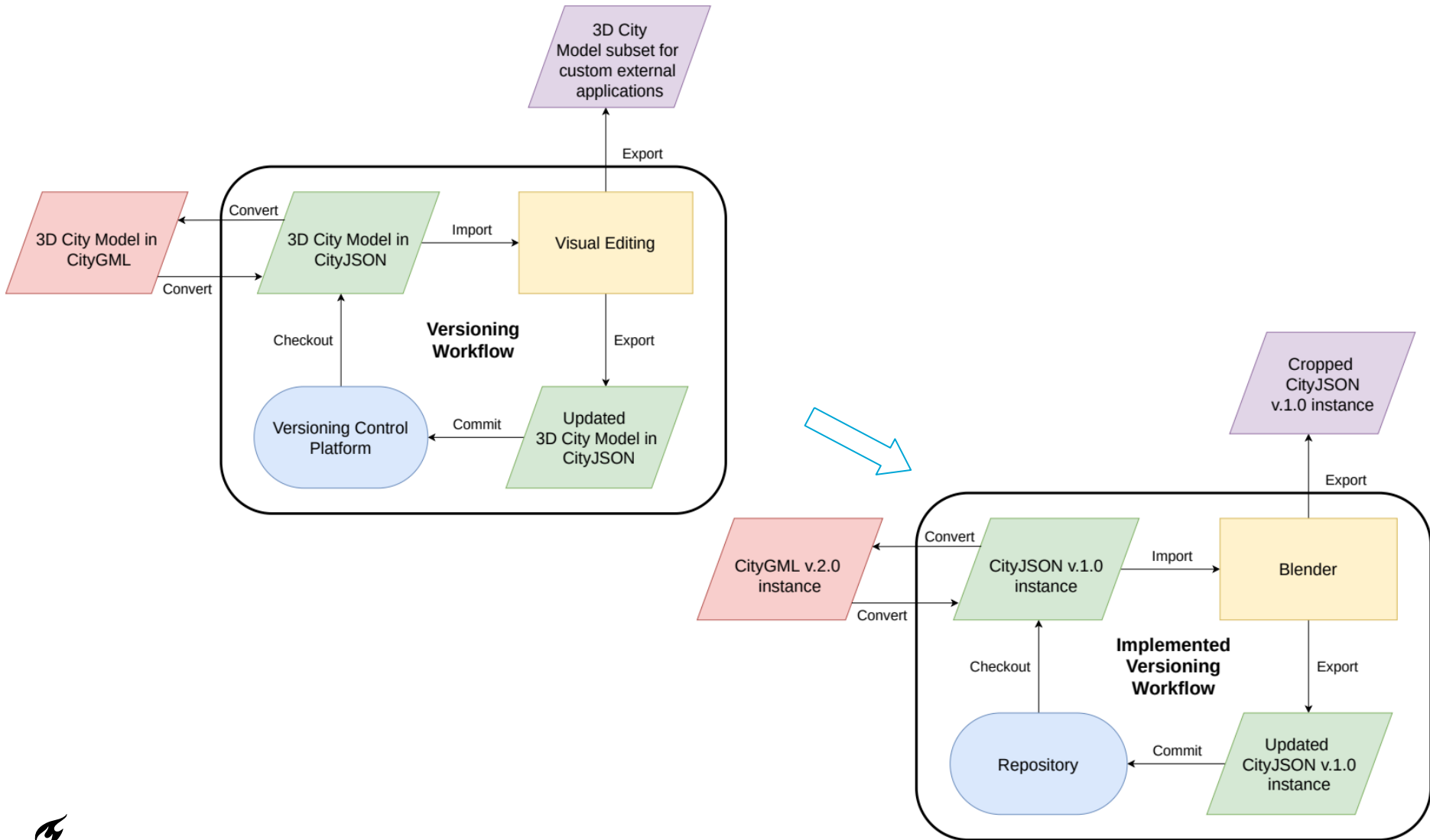
Implementation components



CityJSON	Blender
CityObject	<i>Empty</i> object (all attributes stored as <i>custom properties</i>)
Geometry (LoD)	<i>Mesh</i> object (all attributes stored as <i>custom properties</i>)
Semantics	<i>Materials</i> of LoD 2 geometry faces

Table 5.1: Mapping between *CityJSON* and *Blender* entities

From concept to implementation



Testing

type:	"CityJSON"
version:	"1.0"
extensions:	{}
metadata:	{}
▶ CityObjects:	{...}
▼ versioning:	
▼ versions:	
▼ b9ca079909bf4654ca67f08cab9e8cae4545a749:	
author:	"Konstantinos Mastorakis"
date:	"2020-08-19T19:52:43.562161Z"
message:	"Initial Commit"
parents:	[]
▶ objects:	[...]
tags:	{}
▼ branches:	
main:	"b9ca079909bf4654ca67f08cab9e8cae4545a749"
maintenance:	"b9ca079909bf4654ca67f08cab9e8cae4545a749"
scenario:	"b9ca079909bf4654ca67f08cab9e8cae4545a749"
release:	"b9ca079909bf4654ca67f08cab9e8cae4545a749"
▶ vertices:	[...]
appearance:	{}
geometry-templates:	{}

2.0

and

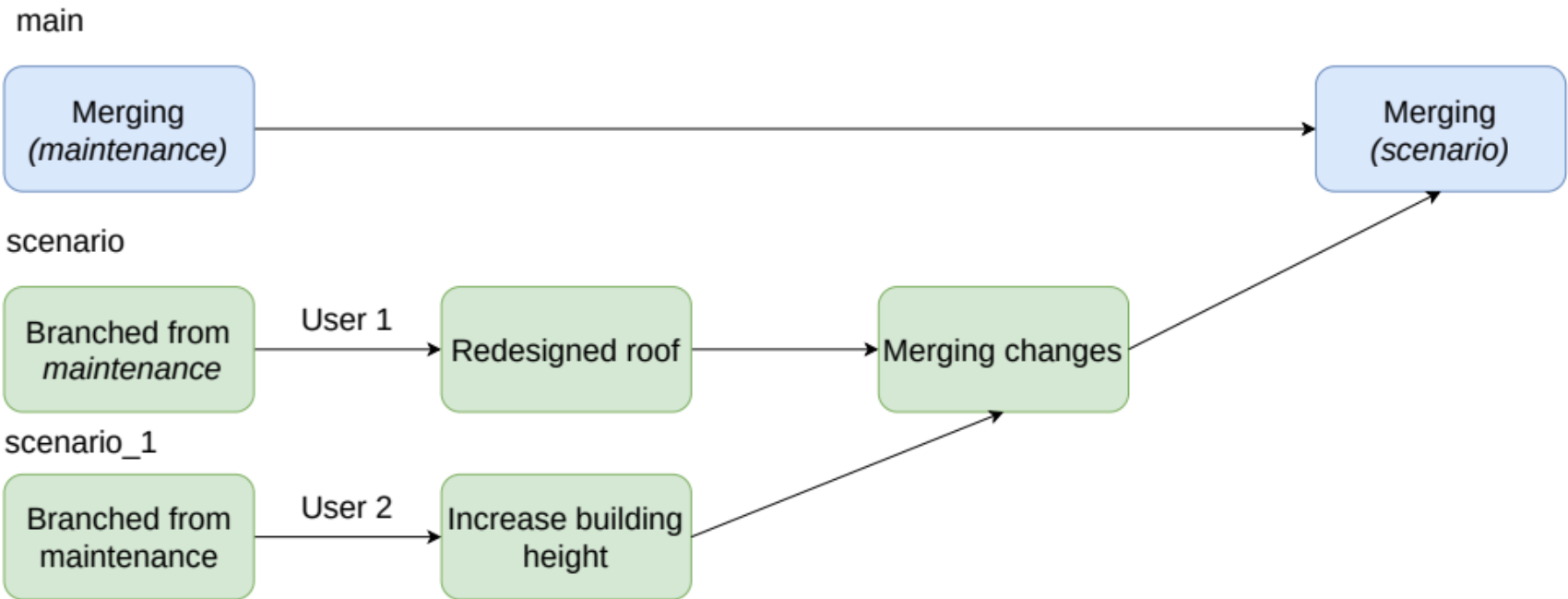
Fundamental operations

```
type: "CityJSON"
version: "1.0"
extensions: {}
metadata: {}
CityObjects: {...}
versioning:
  versions:
    b9ca079909bf4654ca67f08cab9e8cae4545a749: {...}
    a493d4a48ff40151bfd7a57b49bb28b99975402b:
      author: "Konstantinos Mastorakis"
      date: "2020-08-20T13:09:57.609656Z"
      message: "ID_0599100000669100_postal_code_changed"
      parents: [...]
      objects: [...]
      tags: {}
      branches:
        main: "b9ca079909bf4654ca67f08cab9e8cae4545a749"
        maintenance: "a493d4a48ff40151bfd7a57b49bb28b99975402b"
        scenario: "b9ca079909bf4654ca67f08cab9e8cae4545a749"
        release: "b9ca079909bf4654ca67f08cab9e8cae4545a749"
      vertices: [...]
      appearance: {}
      geometry-templates: {}
      attributes: {...}
```

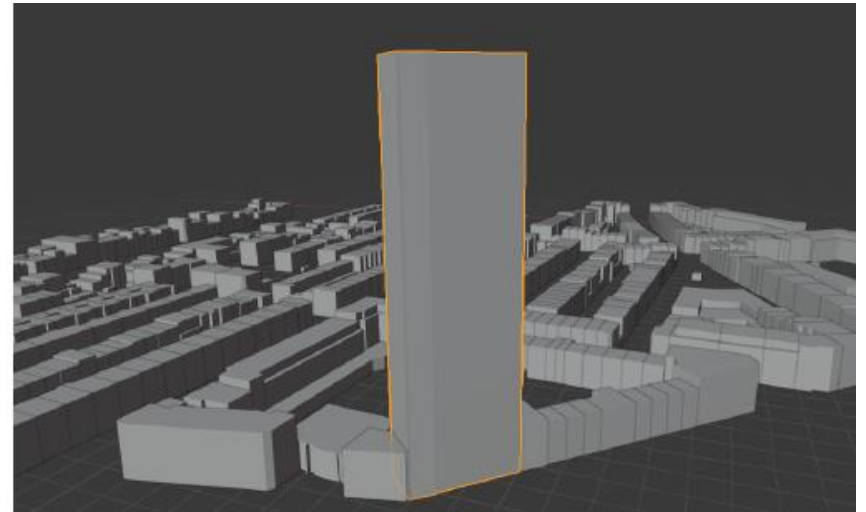
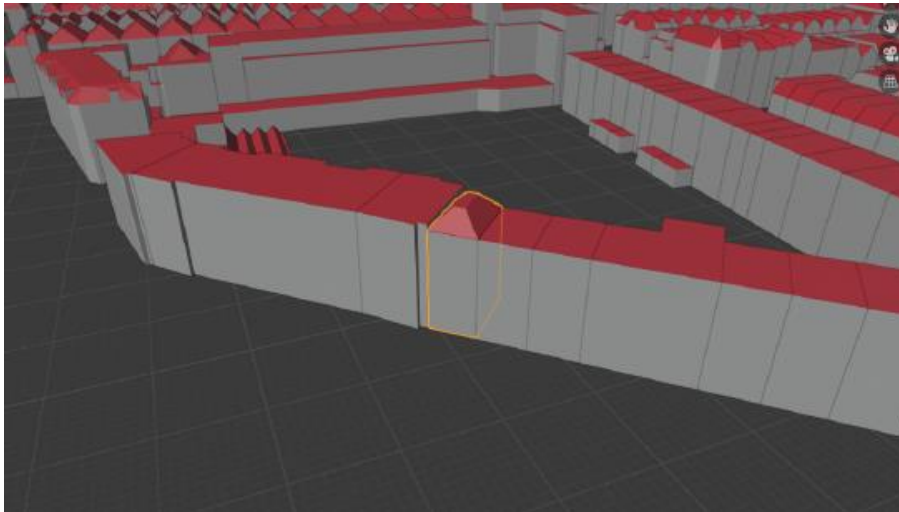
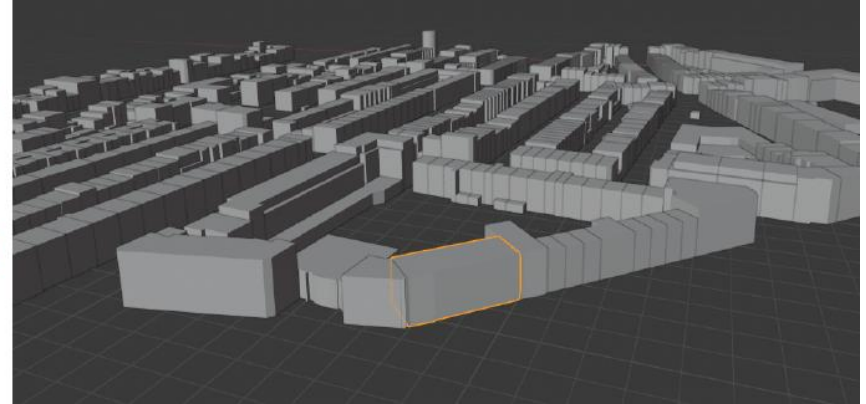
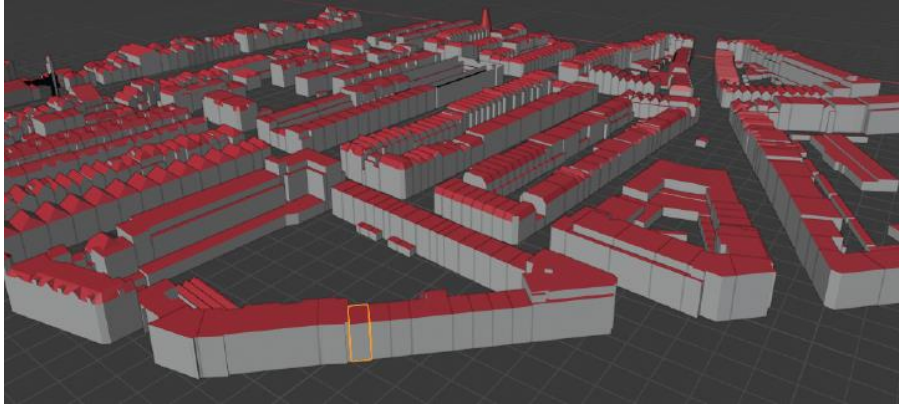
Simulating the testing and implementation of new scenarios

Scenario explanation (1/2)

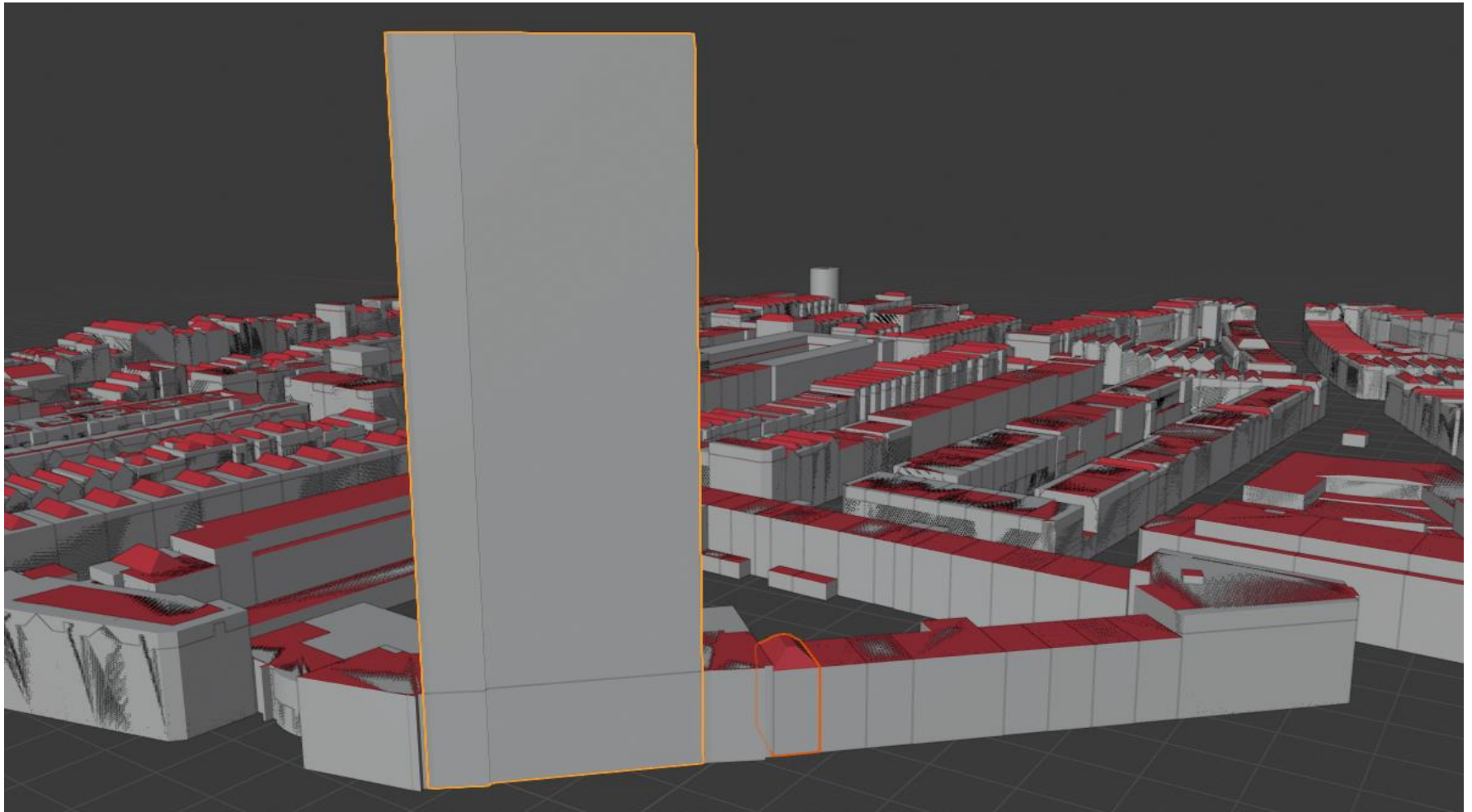
- The shape of a roof needs to be decided to maximize its solar capacity depending also on a nearby building which is going to be extended upwards



Scenario explanation (2/2)



Committing and merging scenario(s)



scenario_1.

C58148262529C01d552caacebbab5d4562661b7b

Simulating Conflict Scenarios

Conflict Scenarios

```
(venv) konstantinos@HP-ZBook-Studio-G5:~/Dropbox/Thesis/Versioning_Prototype/cityjs
on-versioning-prototype$ cjbv ../../test_datasets/testing_final/vcityjsons/versioned
_conflicts.json commit ../../test_datasets/testing_final/B3_18_normalized_reorder_a
ttribute.json -a "Konstantinos Mastorakis" -m "ID_0599100000012851_attributes_swapp
ed"
▼ Opening ../../test_datasets/testing_final/vcityjsons/versioned_conflicts.json...
Opening ../../test_datasets/testing_final/B3_18_normalized_reorder_attribute.json..
.
Appending vertices...
Removing duplicate vertices...

Changes:

    changed: ID_0599100000012851 (d6ade9370ad2e5c.. -> d200c4bb3f915ef..)

1144 objects not changed.

Updating master to 74e5d00d9e5c6dd654d786b2908ffd2294032f88
Saving to ../../test_datasets/testing_final/vcityjsons/versioned_conflicts.json...
```

Conflict Scenarios

```
(venv) konstantinos@HP-ZBook-Studio-G5:~/Dropbox/Thesis/Versioning_Prototype/cityjson-versioning-prototype$ cjb ../../test_datasets/testing_final/vcityjsons/versioned_conflicts.json commit ../../test_datasets/testing_final/B3_18_normalized_reorder_attribute.json -a "Konstantinos Mastorakis" -m "ID_0599100000012859_lod_2_faces_swapped"
Opening ../../test_datasets/testing_final/vcityjsons/versioned_conflicts.json...
Opening ../../test_datasets/testing_final/B3_18_normalized_reorder_attribute.json...
Appending vertices...
Removing duplicate vertices...

Changes:

    changed: ID_0599100000012859 (d278de805af79dd.. -> c33e4caba5ad000..)

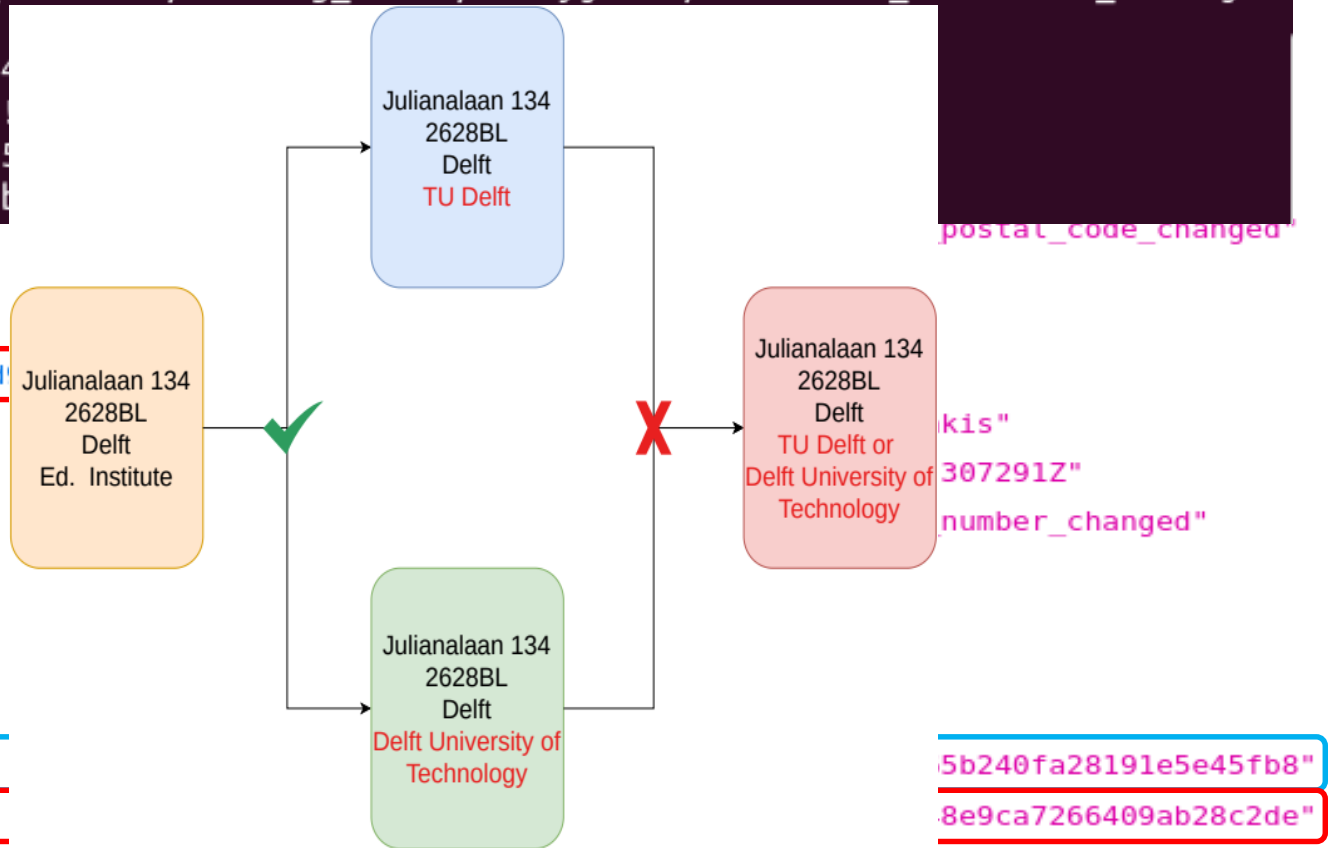
1144 objects not changed.

Updating master to 824798c78cbe2a4ad3ed912d19f1a0211b42e885
Saving to ../../test_datasets/testing_final/vcityjsons/versioned_conflicts.json.
```

Conflict Scenarios

```
(venv) konstantinos@HP-ZBook-Studio-G5:~/Dropbox/Thesis/Versioning_Prototype/city
json-versioning-prototype$ cjb ../../test_datasets/testing_final/vcityjsons/versi
oned_conflicts_test.json merge testing master -a "Konstantinos Mastorakis"
Opening ../../test_datasets/testing_final/vcityjsons/versioned_conflicts_test.js
n...
Common ancestor: 824
There are conflicts:
- ID_059910000001285
Forgive me for not b
```

```
message:
  ▶ parents:
  ▶ objects:
  ▼ 68258e642350d
  author:
  date:
  message:
  ▶ parents:
  ▶ objects:
tags:
  ▼ branches:
  master:
  testing:
```



Conclusions

Conclusions

- Defining the “smallest entity” wisely is crucial!
- Answering the research questions:
 - *Git*-based VCS is a very promising solution for 3DCM versioning
 - Increases the 3DCM data value with regular updates
 - Tracks history automatically
 - Branching is simple / Allows concurrent maintaining
 - *Git*'s built-in operations match Rotterdam's key points
 - Distributed architecture optimal for 3DCM versioning
 - Visual editing capabilities are more important than expected
 - Simplifies the creation of the next instance of the 3DCM
 - Maintainers don't have to be experts with 3DCM data models
 - Complex geometric editing (reshaping a roof) is next to impossible without a GUI

(A bit more philosophical) conclusions

- When mingling its order of attributes and/or faces...
 - Can an object be considered the same?
 - Open for discussion... but:
 - From a developing point of view the answer should be positive
 - For a robust system the answer should be negative but smart mechanisms should be developed (normalization / alphabetical / lexicographical ordering might prove useful)

Practical comparison with other potential solutions

- *CityGML v.3.0* versioning module
 - It introduces information redundancy within the data model which is not optimal for versioning
 - Both versions and transactions between versions have to be stored alongside and be “synced”
 - Creates many potential break points
- Transaction types are also predefined by the data model which is limiting the versioning robustness without any significant practical benefit
- Software implementations for *gml*-based formats are not straightforward

How can Rotterdam benefit from the workflow (by investing resources)

- Pilot testing the workflow for gathering real feedback and moving the workflow from prototype to more operational
 - Defining the optimal “smallest entity” with real world feedback
 - Invest into training practitioners to familiarize with the technical aspects of the workflow
 - Investigate into maintaining the model either in tiles or as a whole

How can Rotterdam benefit from the workflow (without investing resources)

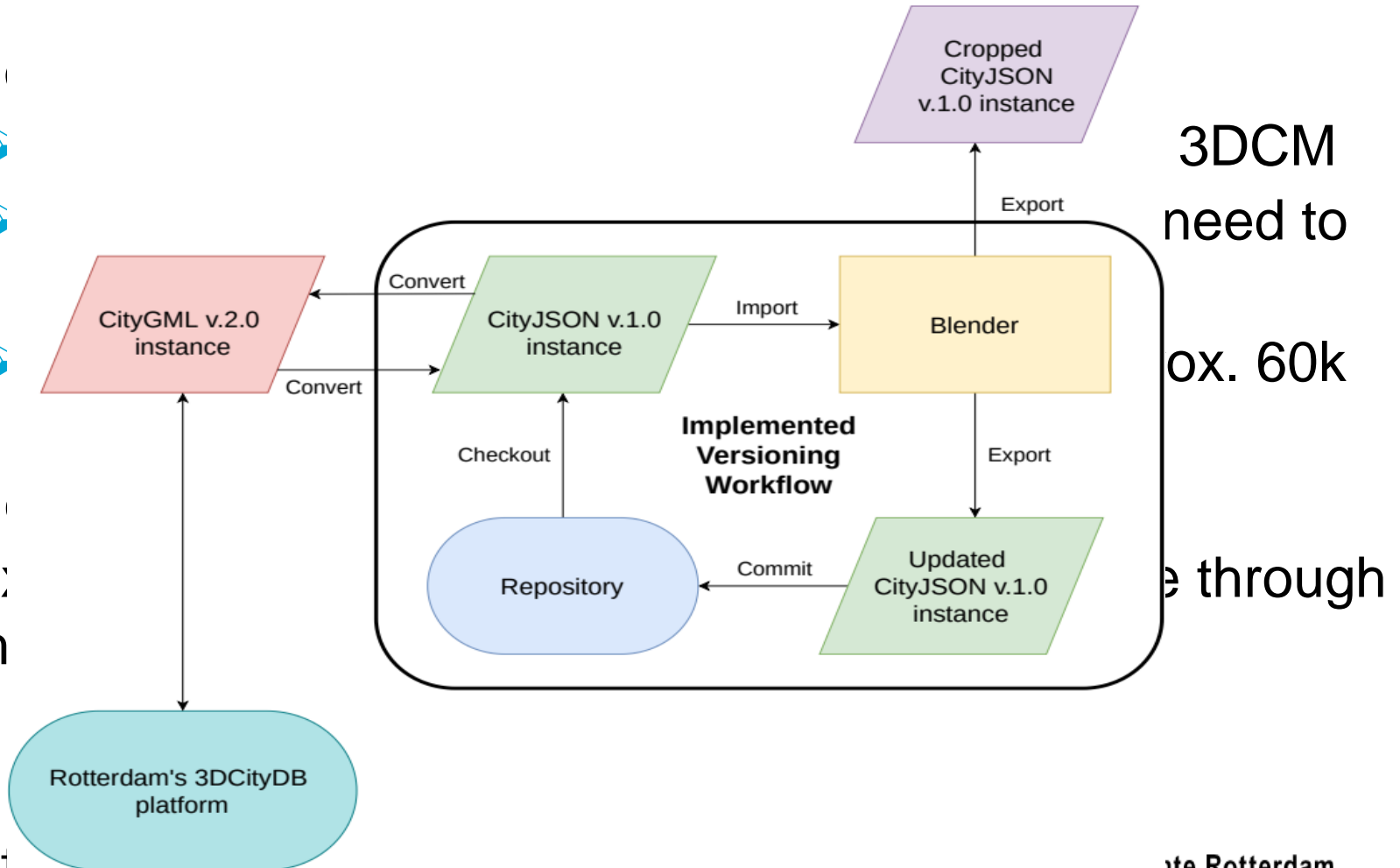
- N



- N

- E

th

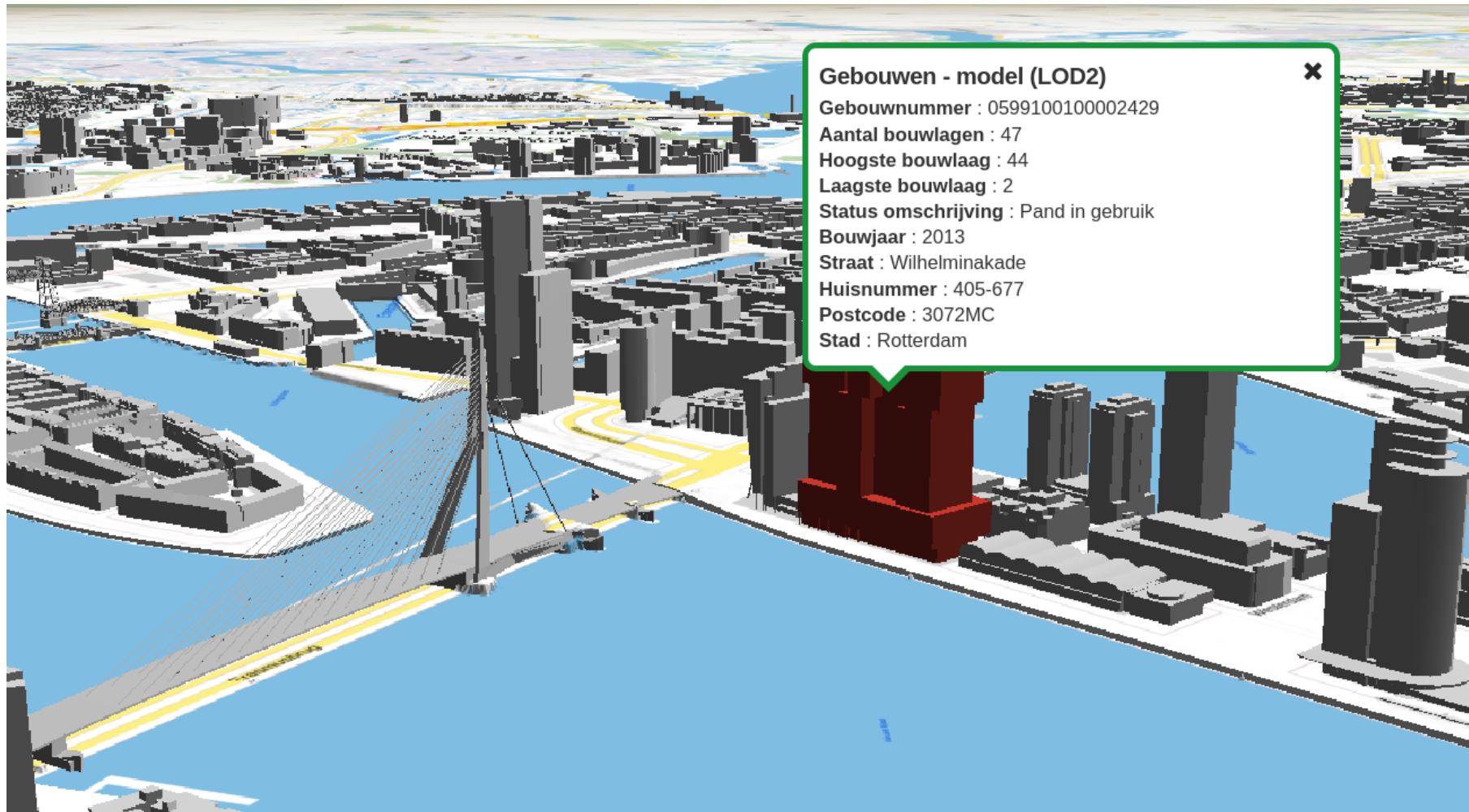


What is likely to be improved anyway

- *3DCityDB* (currently the platform for storing the *3DCM*) might support *CityJSON* since the former uses *citygml4j* which already supports the *CityJSON* format.
 - Integration of the workflow with the currently existing platform will be significantly simplified
 - Ideally the suggested workflow could be further developed to work directly on the *3DCityDB* platform if *CityJSON* gets supported

Future work for enhancing the workflow

- Integrate validity check within the workflow
 - val3dity
- Merging subsets back to the repository
 - Requires merging 3D geometries
- Combine the add-on with GIS capabilities
 - Blender-GIS
- Investigate into updating *BAG* from the 3DCM maintenance
- Create an automatic generator of “striped” instances for the *release* branch
- Incorporate and handling of building textures



Gebouwen - model (LOD2)

Gebouwnummer : 0599100100002429
Aantal bouwlagen : 47
Hoogste bouwlaag : 44
Laagste bouwlaag : 2
Status omschrijving : Pand in gebruik
Bouwjaar : 2013
Straat : Wilhelminakade
Huisnummer : 405-677
Postcode : 3072MC
Stad : Rotterdam

Thank you!

The CityGML v.3.0 versioning module

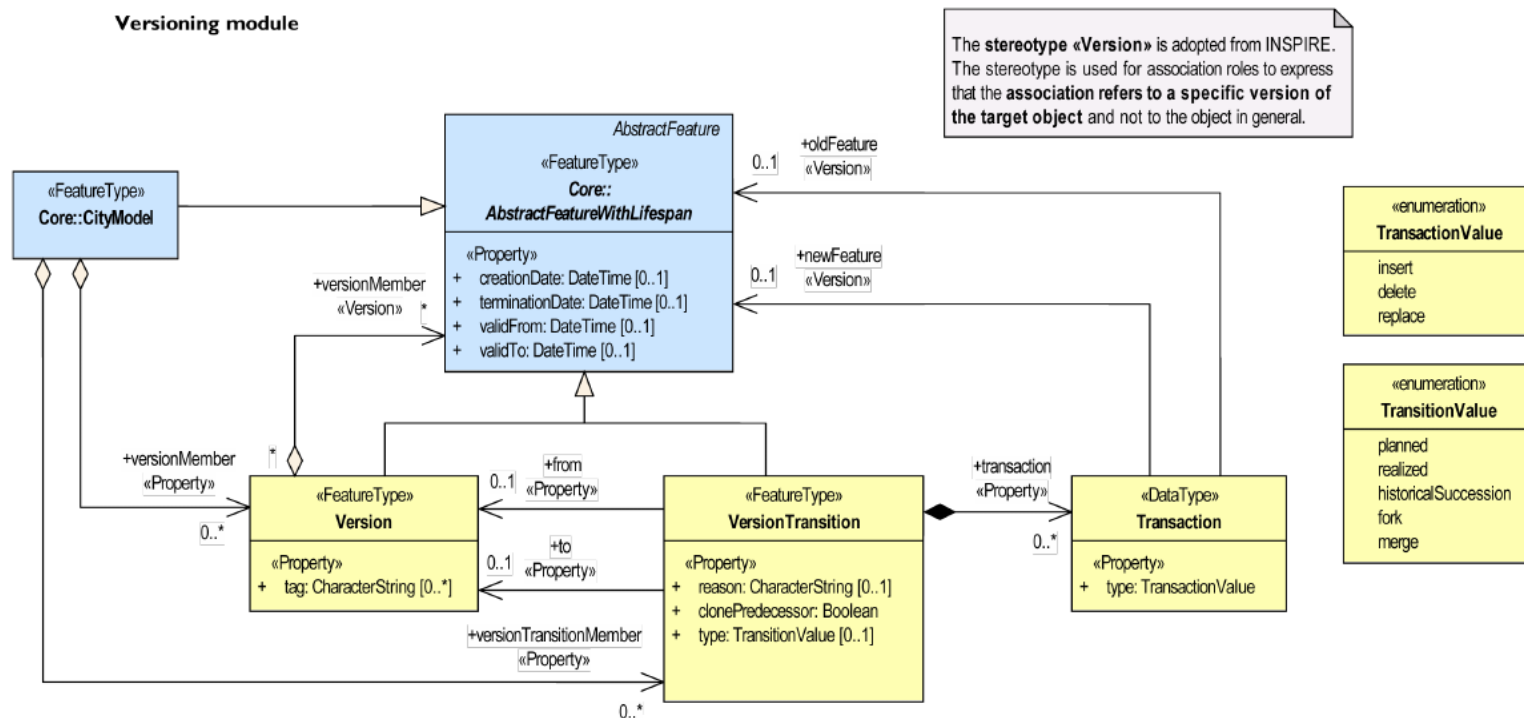


Figure 2. Proposed versioning for CityGML version 3, from OGC (2019).

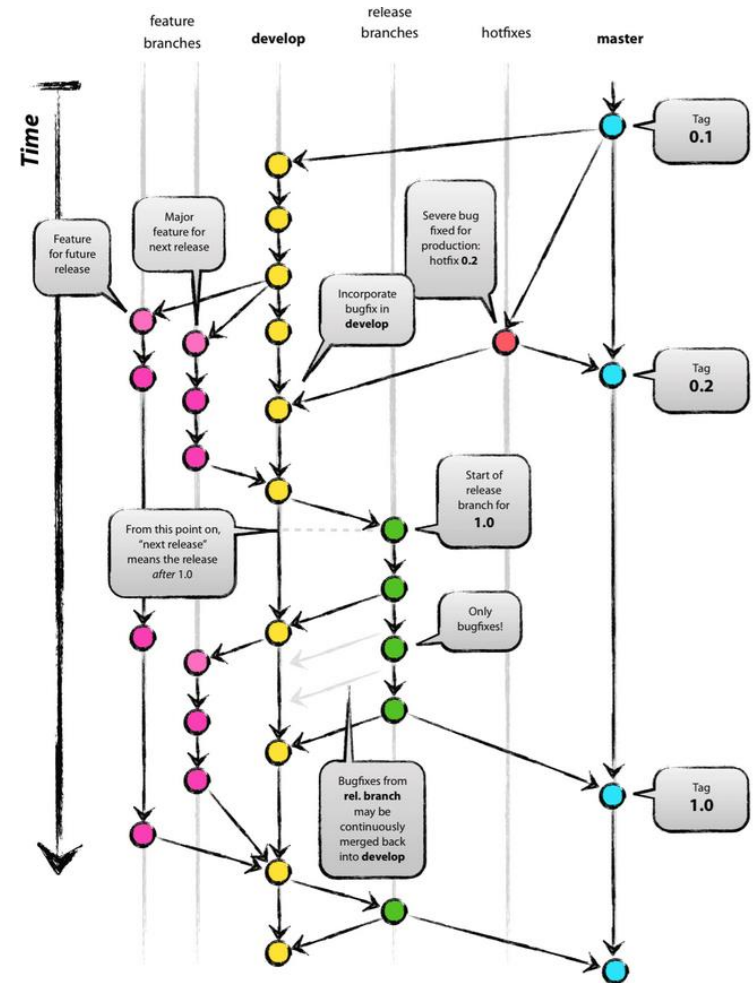
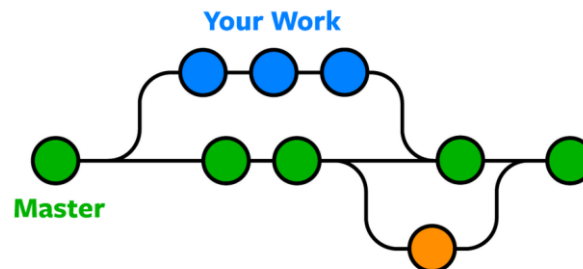
CityJSON

- An alternative encoding to the *CityGML* data model
- Designed with software developers in mind
- Based on the *JSON* notation, compact and flat
- Supported by all modern programming languages

```
"CityObjects": {
  "ID_0599100000601416": {
    "address": {
      "CountryName": "Nederland",
      "LocalityName": "Rotterdam",
      "ThoroughfareNumber": "81",
      "ThoroughfareName": "2e Schansstraat",
      "PostalCode": "3025XM",
      "location": {
        "type": "MultiPoint",
        "boundaries": [
          65580
        ],
        "lod": 0
      }
    },
    "type": "Building",
    "attributes": {
      "yearOfConstruction": 1912,
      "creationDate": "2010-03-08",
      "gebouwnummer": "0599100000601416",
      "hoogste_bouwlaag": 3,
      "statusOmschr": "Pand in gebruik",
      "aantalBouwlagen": 4,
      "laagste_bouwlaag": 0,
      "typeOmschr": "tussenpand"
    }
  }
}
```

Git

- Solution developed to maintain source code files for software developers
 - Distributed architecture
 - Most popular VCS
 - Stores snapshot of every version instead of differences (deltas) between two consecutive ones
 - Branching made simple



Driessen, 2010

A data structure for incorporating versioning in 3DCM (Vitalis et al, 2019)

- Wrap and encode
- All versions
- Each version

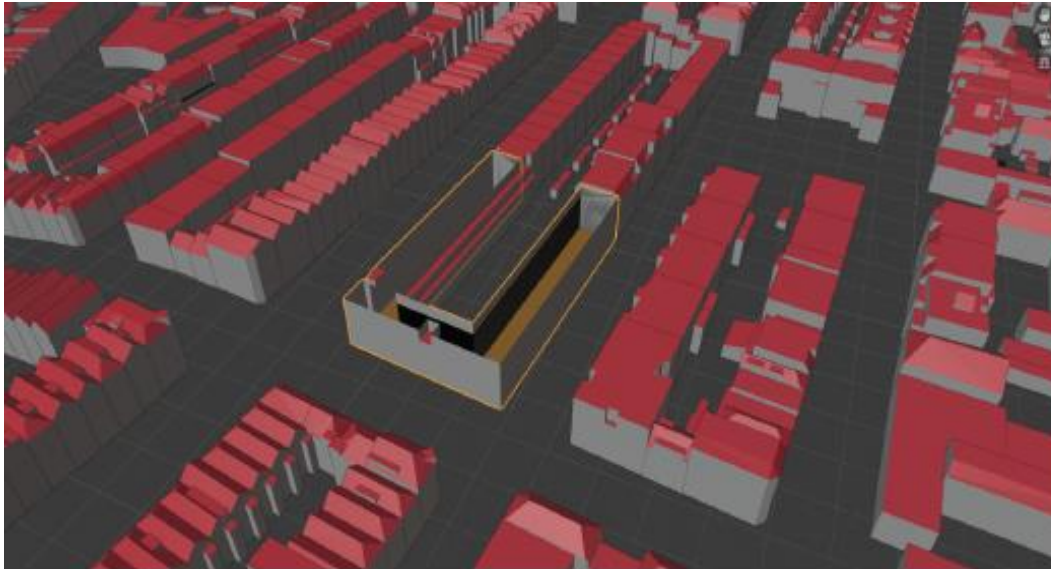
```
{
  ...
  "CityObjects": {
    ... // Here we define "building1" and
    "building1-renovated"
  }
  "versioning": {
    "versions": {
      "version01": {
        "author": "John Doe",
        "date": "2019-03-04T18:34:12.24Z",
        "message": "First version of the city
model with the building",
        "objects": [
          "building1"
        ]
      },
      "version02": {
        "author": "John Doe",
        "date": "2019-03-05T18:34:12.24Z",
        "message": "Building1 was renovated",
        "parents": [ "version01" ],
        "objects": [
          "building1-renovated"
        ]
      }
    }
  }
  ...
}
```

data model and
the file (repository)
date, message

Maintenance iterations frequency

- Fixed number of buildings
 - New iteration when a predefined building count (X) is met
 - $X = \text{Total buildings that need maintenance per year} / \text{Working days of the year}$
 - Favors consistency with respect to workload
- Fixed time interval
 - New iteration after a predefined period of time
 - Favors consistency with respect to time

Visually edit an *object's* geometry (1/2)

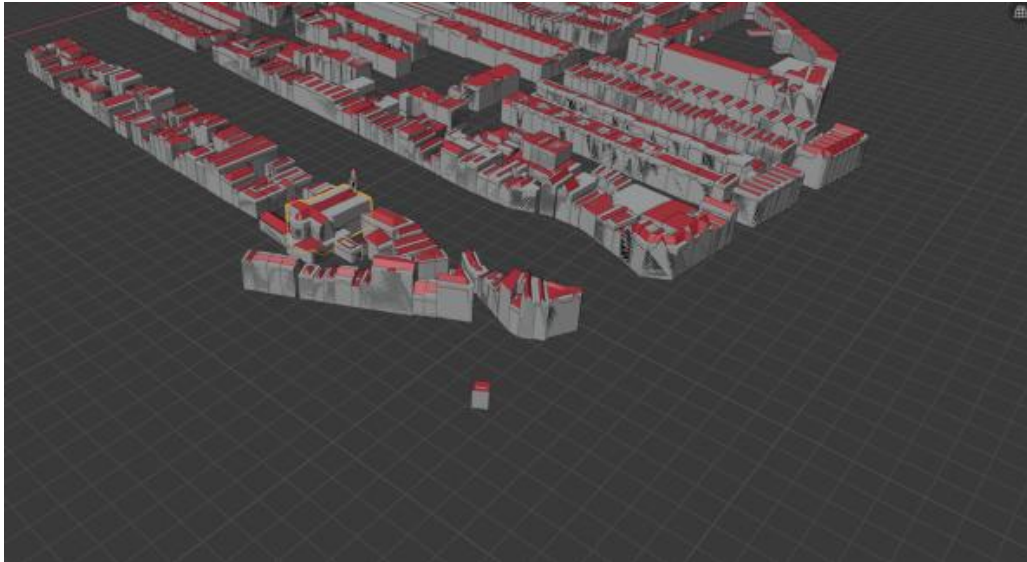


```
▶ 34: [-]
▶ 35: [-]
▶ 36: [-]
▶ 37: [-]
▶ 38: [-]
▶ 39: [-]
▶ 40: [-]
▶ 41: [-]
▶ 42: [-]
▶ 43: [-]
▶ semantics: {}
  texture: {}
  lod: 2
type: "BuildingPart"
▼ parents:
  @: "ID_0599180008688769"
```

Visually edit an *object's* geometry (2/2)

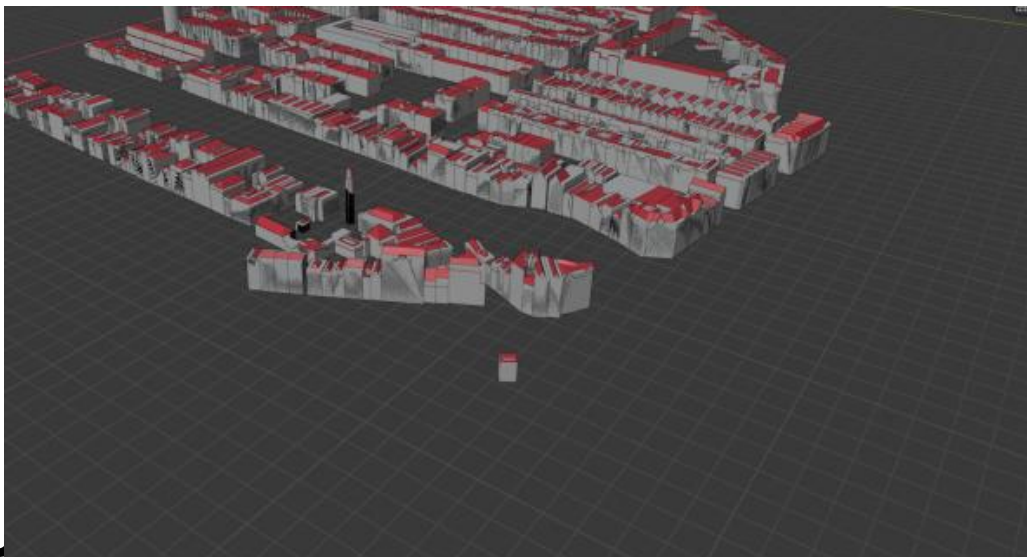
▼ versioning:	
▼ versions:	
▶ b9ca079909bf4654ca67f08cab9e8cae4545a749:	{...}
▶ a493d4a48ff40151bfd7a57b49bb28b99975402b:	{...}
▼ 5c0a626ea58438ac24af8d3059ff9487f1d7d42d:	
author:	"Konstantinos Mastorakis"
date:	"2020-08-20T14:08:16.169781Z"
▶ message:	"ID_d86alc93-08c6-4fc2-90...f64afa008 edit geometry"
▶ parents:	[...]
▶ objects:	[...]
tags:	{}
▼ branches:	
main:	"b9ca079909bf4654ca67f08cab9e8cae4545a749"
maintenance:	"5c0a626ea58438ac24af8d3059ff9487f1d7d42d"
scenario:	"b9ca079909bf4654ca67f08cab9e8cae4545a749"
release:	"b9ca079909bf4654ca67f08cab9e8cae4545a749"
▶ vertices:	[...]
appearance:	{}
geometry-templates:	{}

Delete whole object (1/2)



- ID_848b57d6-528f-4c1d-ab65-27cbb29633d: [-]
- ID_855d2dc8-fc25-4a95-ac57-ad7af7aa0a5d: [-]
- ID_870f7d50-a0ea-4d0f-a070-d5d804536ed9: [-]
- ID_878ff256-afb7-44af-a863-e8ec6a0bf5bd: [-]
- ID_892dacc2-4138-4de3-b36a-ad029ff2d79f: [-]
- ID_8974a5bc-00a7-462c-8f77-41f3470cb4dc: [-]
- ID_8ae195a2-55ac-4566-937a-184d8a28294d: [-]
- ID_8b8150af-189b-4b6a-ab5c-8f46cc79266c: [-]
- ID_8ba3e1d2-820d-41d4-97b5-805556699a95: [-]
- ID_8e2e4513-b726-4b2d-bf52-bd48a484c777: [-]
- ID_8e5517ea-f145-4648-864d-a20f75514968: [-]
- ID_8f69f6c7-f4ff-4c28-9f1c-b497c656f0ed: [-]
- ID_8fcad19c-6a93-4016-b7c2-43990ca23f1f: [-]
- ID_901289ec-bbcb-4fe1-8627-bac581432c44: [-]
- ID_9260aab2-145d-499b-8c11-dbc1719bcb59: [-]
- ID_92b22bb3-c9d2-4686-aded-e329df0d13d3: [-]
- ID_9378a738-4a19-46ec-9393-84489ff0eac91: [-]
- ID_93b8aaa2-47c7-4187-a76e-94cf2cccd2ac: [-]

ID_848b57d6-528f-4c1d-ab6! ^ v Highlight All Match Case



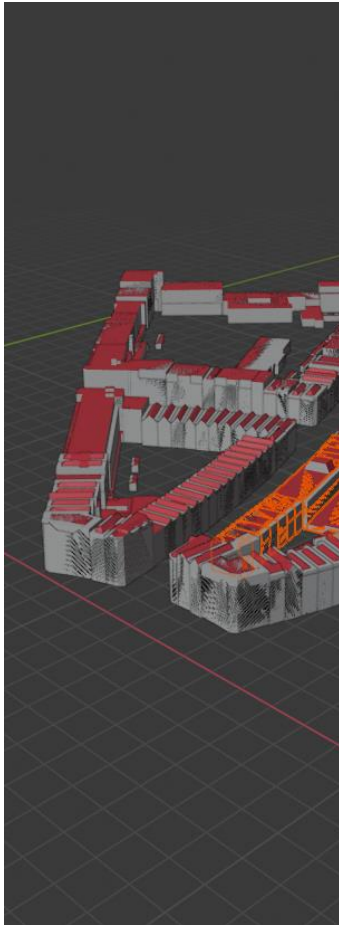
- ID_855d2dc8-fc25-4a95-ac57-ad7af7aa0a5d: [-]
- ID_870f7d50-a0ea-4d0f-a070-d5d804536ed9: [-]
- ID_878ff256-afb7-44af-a863-e8ec6a0bf5bd: [-]
- ID_892dacc2-4138-4de3-b36a-ad029ff2d79f: [-]
- ID_8974a5bc-00a7-462c-8f77-41f3470cb4dc: [-]
- ID_8ae195a2-55ac-4566-937a-184d8a28294d: [-]
- ID_8b8150af-189b-4b6a-ab5c-8f46cc79266c: [-]
- ID_8ba3e1d2-820d-41d4-97b5-805556699a95: [-]
- ID_8e2e4513-b726-4b2d-bf52-bd48a484c777: [-]
- ID_8e5517ea-f145-4648-864d-a20f75514968: [-]
- ID_8f69f6c7-f4ff-4c28-9f1c-b497c656f0ed: [-]
- ID_8fcad19c-6a93-4016-b7c2-43990ca23f1f: [-]
- ID_901289ec-bbcb-4fe1-8627-bac581432c44: [-]
- ID_9260aab2-145d-499b-8c11-dbc1719bcb59: [-]
- ID_92b22bb3-c9d2-4686-aded-e329df0d13d3: [-]
- ID_9378a738-4a19-46ec-9393-84489ff0eac91: [-]
- ID_93b8aaa2-47c7-4187-a76e-94cf2cccd2ac: [-]
- ID_93cca9ee-9f48-4f48-873c-d28326ad1990: [-]

ID_848b57d6-528f-4c1d-ab6! ^ v Highlight All Match Case

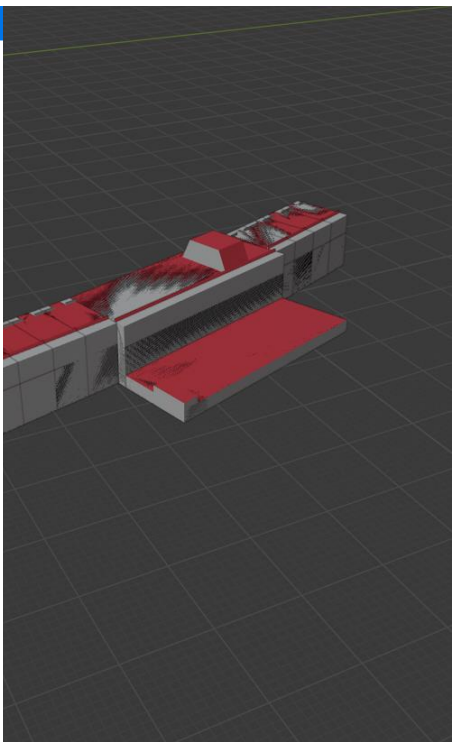
Delete whole object (2/2)

```
▼ versioning:
  ▼ versions:
    ▶ b9ca079909bf4654ca67f08cab9e8cae4545a749: {...}
    ▶ a493d4a48ff40151bfd7a57b49bb28b99975402b: {...}
    ▶ 5c0a626ea58438ac24af8d3059ff9487f1d7d42d: {...}
    ▼ b927d455c7971f3cbba5f83988658646177eaa52:
      author: "Konstantinos Mastorakis"
      date: "2020-08-20T14:47:02.495869Z"
      message: "ID_848b57d6-528f-4c1d-ab65-27cbb29633d1 deleted"
      ▶ parents: [...]
      ▶ objects: [...]
      tags: {}
    ▼ branches:
      main: "b9ca079909bf4654ca67f08cab9e8cae4545a749"
      maintenance: "b927d455c7971f3cbba5f83988658646177eaa52"
      scenario: "b9ca079909bf4654ca67f08cab9e8cae4545a749"
      release: "b9ca079909bf4654ca67f08cab9e8cae4545a749"
```

Exporting a subset (outside of VCS)



```
type: "CityJSON"
version: "1.0"
▶ metadata: {}
▼ CityObjects:
  ▶ ID_0599100000415249: {}
  ▶ ID_0599100000415250: {}
  ▶ ID_0599100000415251: {}
  ▶ ID_0599100000415252: {}
  ▶ ID_0599100000415260: {}
  ▶ ID_0599100000415261: {}
  ▶ ID_0599100000415262: {}
  ▶ ID_0599100000415263: {}
  ▶ ID_0599100000415264: {}
  ▶ ID_0599100000415265: {}
  ▶ ID_0599100000415266: {}
  ▼ ID_61c18aaa-1d05-4a6e-9cd4-3adb20b44e04:
    ▶ geometry: {}
    type: "BuildingPart"
    ▼ parents:
      0: "ID_0599100000415253"
  ▼ ID_774bdcc9-2ece-4289-8bd7-912af31f481a:
    ▶ geometry: {}
    type: "BuildingPart"
    ▼ parents:
      0: "ID_0599100000415253"
  ▶ ID_0599100000415253: {}
▶ vertices: {}
```

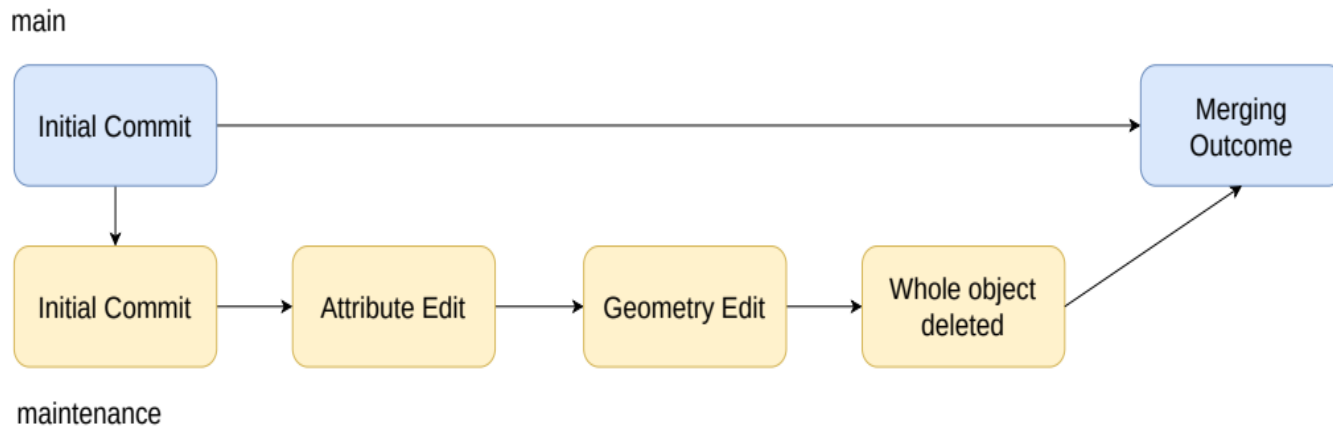


A simple maintenance case

- Edit an attribute of an object
 - Edit the geometry of an object
 - Delete a whole object
- ⇒ Each edit is independently committed to *maintenance*



Maintenance is (fast-forward) merged into *main*



Merging *maintenance* into *main*

```
Found 4 versions.

* version b927d455c7971f3cbba5f83988658646177eaa52 (maintenance, main)
  Author: Konstantinos Mastorakis
  Date: 2020-08-20T14:47:02.495869Z
  Message:

      ID_848b57d6-528f-4c1d-ab65-27cbb29633d1 deleted

* version 5c0a626ea58438ac24af8d3059ff9487f1d7d42d
  Author: Konstantinos Mastorakis
  Date: 2020-08-20T14:08:16.169781Z
  Message:

      ID_d86a1c93-08c6-4fc2-90c6-0c1f64afa008 edit geometry

* version a493d4a48ff40151bfd7a57b49bb28b99975402b
  Author: Konstantinos Mastorakis
  Date: 2020-08-20T13:09:57.609656Z
  Message:

      ID_0599100000669100_postal_code_changed

* version b9ca079909bf4654ca67f08cab9e8cae4545a749 (scenario, release)
  Author: Konstantinos Mastorakis
  Date: 2020-08-19T19:52:43.562161Z
  Message:

      Initial Commit
```



```

* version a675e34ac692c0418a82420bb706987e5df3ec47 (scenario)
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-26T16:59:23.047245Z
    Message:

    Merge scenario_1 to scenario

* version c5814a2b2529c01d592eaacedbab3d436286fb7b (scenario_1)
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-26T16:21:06.232885Z
    Message:

    ID_0599100000760584_lod_1_geometry_extruded

* version e52c328ce44fc3e0a39cd9af7245cbb6d0476609
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-26T16:56:46.839261Z
    Message:

    ID_0599100000760585_lod_2_roof_redesigned

* version b927d455c7971f3cbb5f83988658646177eaa52 (maintenance, main)
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-20T14:47:02.495869Z
    Message:

    ID_848b57d6-528f-4c1d-ab65-27cbb29633d1 deleted

* version 5c0a626ea58438ac24af8d3059ff9487f1d7d42d
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-20T14:08:16.169781Z
    Message:

    ID_d86a1c93-08c6-4fc2-90c6-0c1f64afa008 edit geometry

* version a493d4a48ff40151bfd7a57b49bb28b99975402b
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-20T13:09:57.609656Z
    Message:

    ID_0599100000669100_postal_code_changed

* version b9ca079909bf4654ca67f08cab9e8cae4545a749 (release)
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-19T19:52:43.562161Z
    Message:

    Initial Commit

```

Log after merging *scenario_1* into for *scenario*

```

* version a675e34ac692c0418a82420bb706987e5df3ec47 (scenario, main)
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-26T16:59:23.047245Z
    Message:

    Merge scenario_1 to scenario

* version c5814a2b2529c01d592eaacedbab3d436286fb7b (scenario_1)
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-26T16:21:06.232885Z
    Message:

    ID_0599100000760584_lod_1_geometry_extruded

* version e52c328ce44fc3e0a39cd9af7245cbb6d0476609
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-26T16:56:46.839261Z
    Message:

    ID_0599100000760585_lod_2_roof_redesigned

* version b927d455c7971f3cbb5f83988658646177eaa52 (maintenance)
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-20T14:47:02.495869Z
    Message:

    ID_848b57d6-528f-4c1d-ab65-27cbb29633d1 deleted

* version 5c0a626ea58438ac24af8d3059ff9487f1d7d42d
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-20T14:08:16.169781Z
    Message:

    ID_d86a1c93-08c6-4fc2-90c6-0c1f64afa008 edit geometry

* version a493d4a48ff40151bfd7a57b49bb28b99975402b
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-20T13:09:57.609656Z
    Message:

    ID_0599100000669100_postal_code_changed

* version b9ca079909bf4654ca67f08cab9e8cae4545a749 (release)
  \ Author: Konstantinos Mastorakis
    Date: 2020-08-19T19:52:43.562161Z
    Message:

    Initial Commit

```

Log after merging *scenario* into main