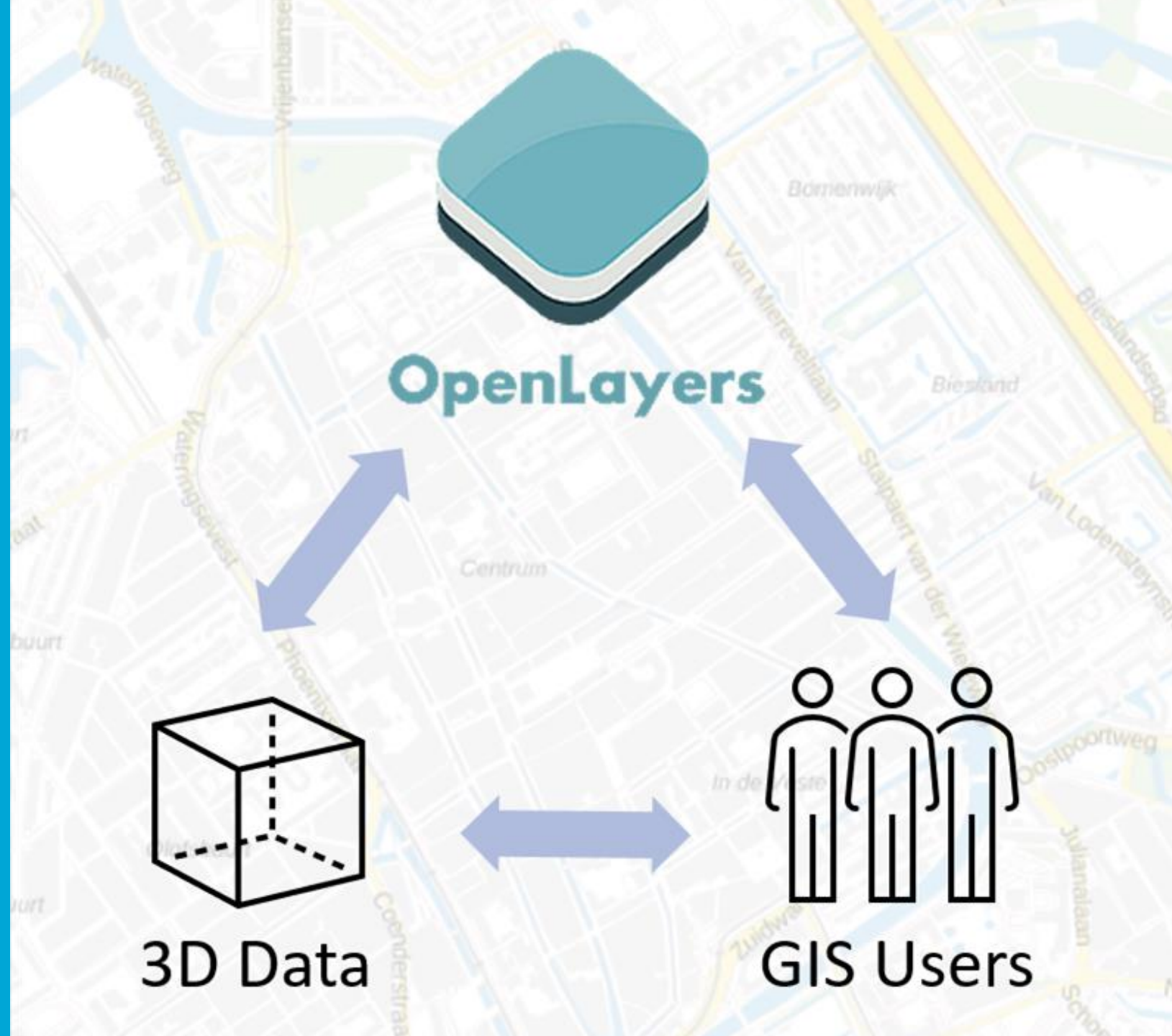


Integrating 3D Functionality into a Web Application for Sharing Geo-information

Stein Köbben

 TU Delft



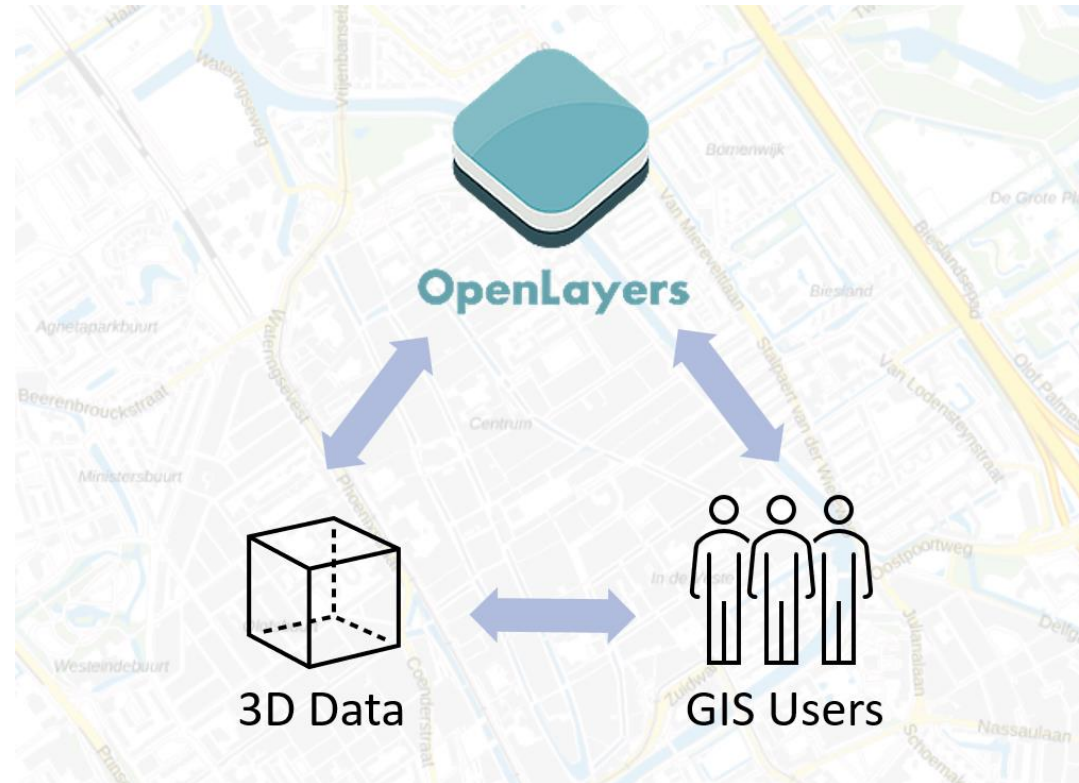
Content

- Introduction
- Demo
- Related Work
- Methodology
- Proof of Concept
- Results
- Conclusions

Introduction
Demo
Related Work
Methodology
Proof of Concept
Results
Conclusions

Introduction

- 2D geo-information
- Web viewers
- 3D geo-information
- Tool to publish 3D geo-information on the web
- Tailormap
- OpenLayers



Introduction
Demo
Related Work
Methodology
Proof of Concept
Results
Conclusions

Research question

How can 3D functionality be integrated into an existing OpenLayers based GIS web application to ensure that publishing is both useful and user-friendly?

1. What types of 3D datasets are available and which are the most relevant use cases for 3D web GIS?
2. How can you make it useful to publish 3D datasets without the need of coding?
 - a. What features and options do users need to make publishing 3D data useful?
 - b. What are the necessary manual steps users must undertake in the publishing process?
3. How can the code for 3D functionality be effectively integrated into an existing OpenLayers application?
4. What should an effective data flow for 3D datasets in a web GIS environment look like?
 - a. How should 3D data be stored?
 - b. What processes should be handled server-side and client-side in the management of 3D data?

Introduction
Demo
Related Work
Methodology
Proof of Concept
Results
Conclusions

Demo



Introduction
Demo
Related Work
Methodology
Proof of Concept
Results
Conclusions

Related Work

- Previous research
 - Technical needs for web viewers
 - Research for specific use cases
- State of art
 - MapStore
 - Cesium Stories
 - ArcGIS Online
- Use cases

Introduction
Demo
Related Work
Methodology
Proof of Concept
Results
Conclusions

Related Work - Use Cases

- Urban planning
- Asset management
- Management of pipes and cables
- Flood management

Introduction

Demo

Related Work

Methodology

Proof of Concept

Results

Conclusions

Methodology

- User and application research

To answer:

1. What kind of 3D datasets are available and what are the useful use cases of 3D online GIS?
2. How can you make it easy to publish 3D datasets without too much expert knowledge?

- Technical methodology

3. How can the code for 3D functionality be integrated into an Openlayers application?
4. What should the data flow look like?

Introduction
Demo
Related Work
Methodology
Proof of Concept
Results
Conclusions

Methodology – User and application research

1. Literature study
2. Interviews
3. Testing Sessions



Municipality



Kadaster



Private companies



Safety regions



Introduction

Demo

Related Work

Methodology

Proof of Concept

Results

Conclusions

Methodology – Technical methodology

- Cesium
- Type of data: 3D vector data, 3D Tiles
- Data flow
 - External server
 - 3D Tiles



Introduction

Demo

Related Work

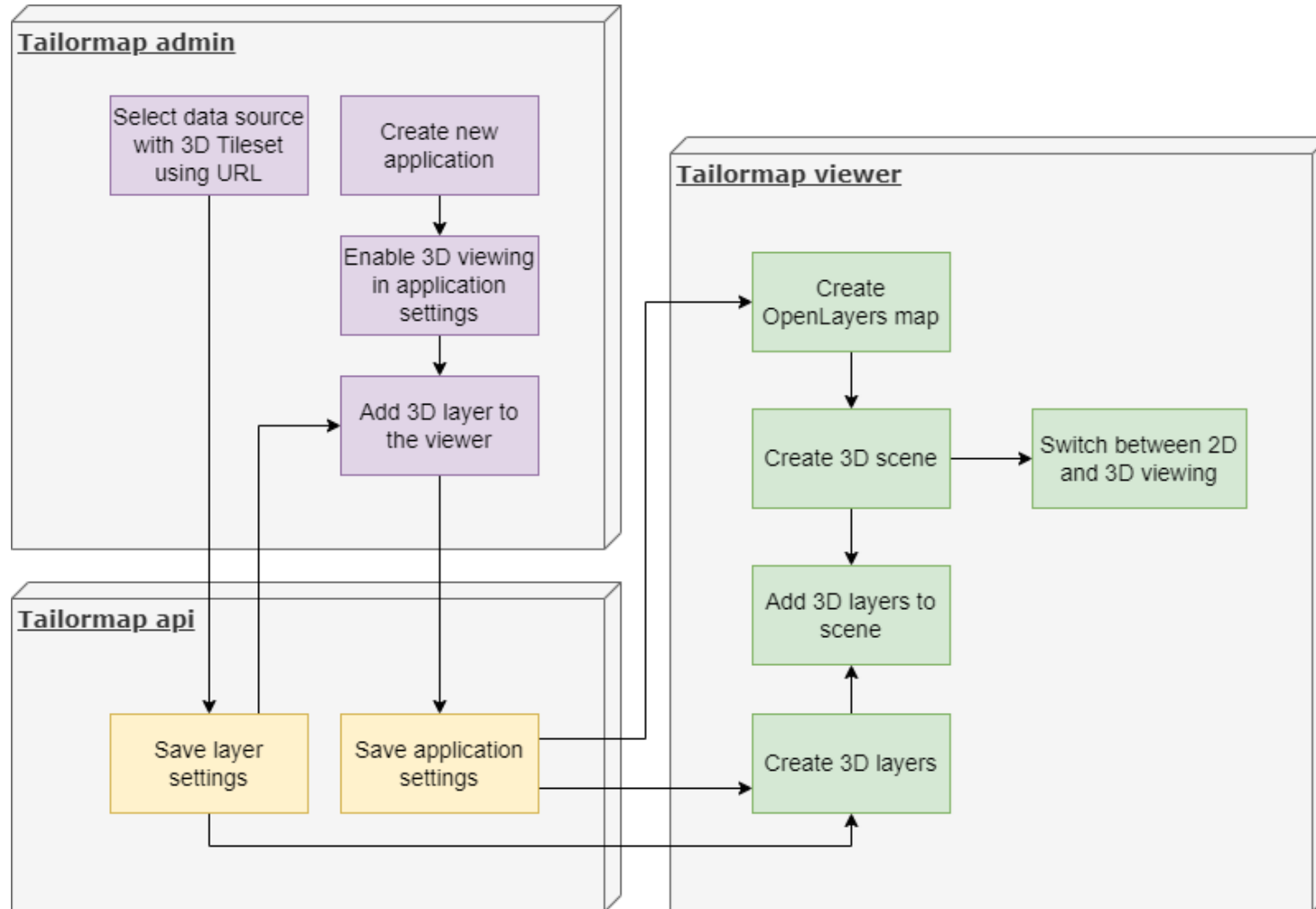
Methodology

Proof of Concept

Results

Conclusions

Proof of Concept



Introduction
Demo
Related Work
Methodology
Proof of Concept
Results
Conclusions

Results

- Use cases
- Datasets
- Technical guidelines
- Functions

Introduction
Demo
Related Work
Methodology
Proof of Concept
Results
Conclusions

Results - Use cases and datasets

Use case	named by parties	Needed datasets
Visualise building project / city development project	3	Vector data (buildings)
Management pipes and cables	2	Vector data
Asset Management	2	Vector data (buildings)
Object information first responders	1	Vector data (buildings)
Disaster management	1	Vector data (buildings), Terrain Model
Show vulnerable buildings	1	Vector data (buildings)
Show possibilities 3D data	1	Vector data (buildings), Terrain Model
Get feedback Citizens	1	Vector data (buildings)

Introduction
Demo
Related Work
Methodology
Proof of Concept
Results
Conclusions

Results - Technical guidelines

- New protocol for saving connection parameters for 3D services
- Only load 3D scene and layers if needed
- Keep existing functionality for 2D
- Create new layer type for 3D layers
- Create separate layer manager for 3D layers

Introduction

Demo

Related Work

Methodology

Proof of Concept

Results

Conclusions

Results - Functions

Essential:

- Allow switching between 2D and 3D viewing in viewers
- Click on objects to see its attributes in the viewer.
- Set up colours based on attributes in admin.
- Set up connections to services providing 3D datasets.

Important:

- Colour objects based on attributes in the viewer.
- Filter objects based on attributes in the viewer.
- Allow viewing underground.
- Have the option to turn 3D capabilities on and off.
- Set which attributes of 3D objects can be seen in an application.
- Set aliases of attributes of 3D objects for an application.

Introduction

Demo

Related Work

Methodology

Proof of Concept

Results

Conclusions

Conclusions

How can 3D functionality be integrated into an existing OpenLayers based GIS web application to ensure that publishing is both useful and user-friendly?

- Follow technical guidelines
- Keep publishing process similar to process for 2D
- Implement essential functions

Introduction

Demo

Related Work

Methodology

Proof of Concept

Results

Conclusions

Conclusions - Discussion

- Research question was answered
- Limitations
 - Amount of Users Interviewed
 - Interviewed Parties
 - Implementation in One Application
 - Data Types
- Contributions
 - Usable implementation
 - Knowledge about user needs
 - Knowledge about technical needs
- Future work
 - User Research
 - Extend Implementation
 - Additional Implementations

Introduction

Demo

Related Work

Methodology

Proof of Concept

Results

Conclusions

Conclusions - Discussion

- Research question was answered
- Limitations
 - Amount of Users Interviewed
 - Interviewed Parties
 - Implementation in One Application
 - Data Types
- Contributions
 - Usable implementation
 - Knowledge about user needs
 - Knowledge about technical needs
- Future work
 - User Research
 - Extend Implementation
 - Additional Implementations

Introduction

Demo

Related Work

Methodology

Proof of Concept

Results

Conclusions

Conclusions - Discussion

- Research question was answered
- Limitations
 - Amount of Users Interviewed
 - Interviewed Parties
 - Implementation in One Application
 - Data Types
- Contributions
 - Usable implementation
 - Knowledge about user needs
 - Knowledge about technical needs
- Future work
 - User Research
 - Extend Implementation
 - Additional Implementations

Introduction

Demo

Related Work

Methodology

Proof of Concept

Results

Conclusions

Conclusions - Discussion

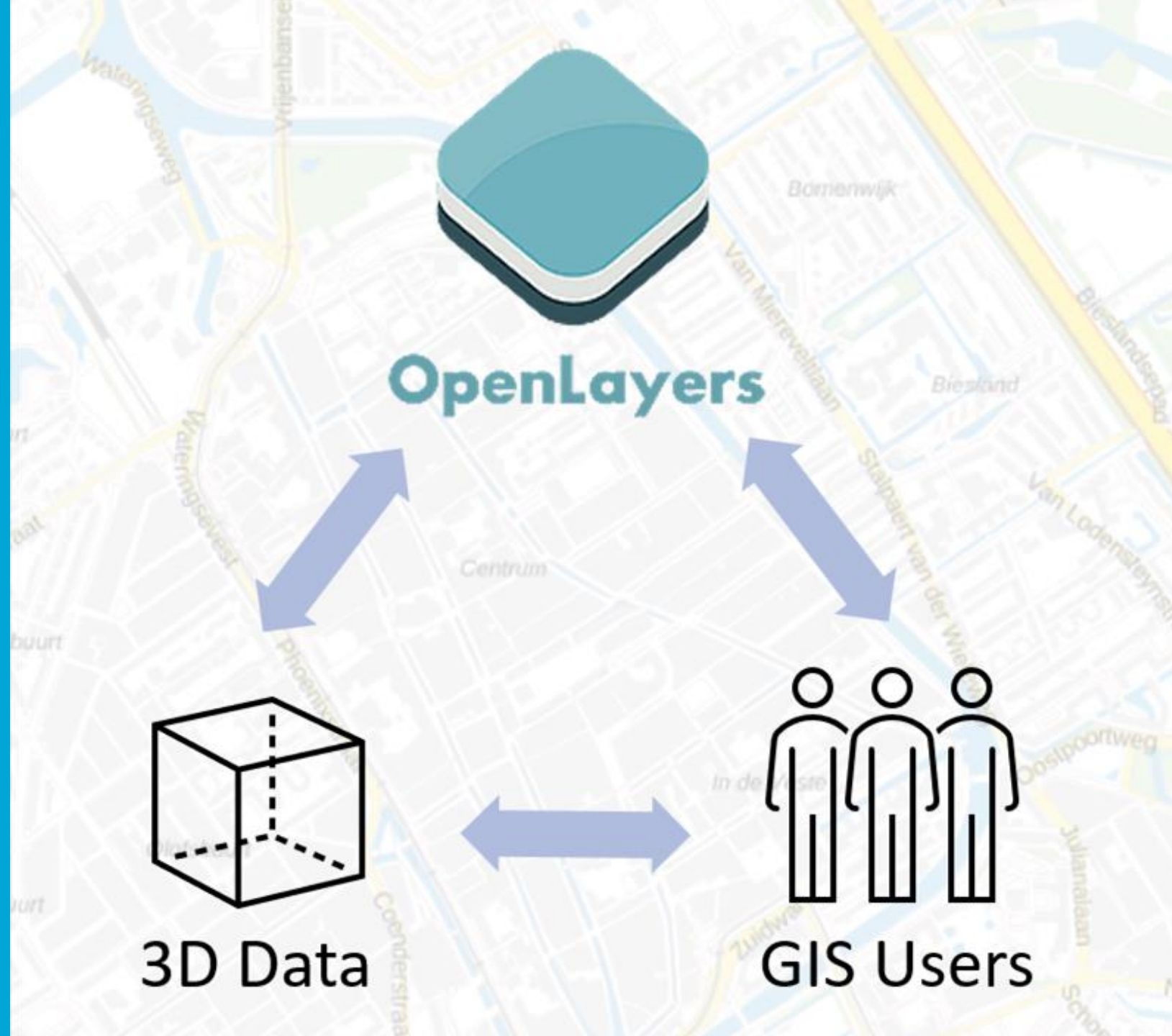
- Research question was answered
- Limitations
 - Amount of Users Interviewed
 - Interviewed Parties
 - Implementation in One Application
 - Data Types
- Contributions
 - Usable implementation
 - Knowledge about user needs
 - Knowledge about technical needs
- Future work
 - User Research
 - Extend Implementation
 - Additional Implementations

Introduction
Demo
Related Work
Methodology
Proof of Concept
Results
Conclusions

Integrating 3D Functionality into a Web Application for Sharing Geo-information

Stein Köbben

 TU Delft



Back-up - Map projection

- Cesium accepts:
 - EPSG: 3857 (web-mercator)
 - EPSG: 4326
- Possible solutions for other projections
 - Service provides data in 2 projections
 - OpenLayers raster reprojection

Back-up - 3D Tiles

- 3D Tiles 1.0
 - Batched 3D Model
 - Instanced 3D Model
 - Point Cloud
 - Composite
- 3D Tiles 1.1
 - Backwards compatible
 - Implicit tiling
 - glTF tile format

