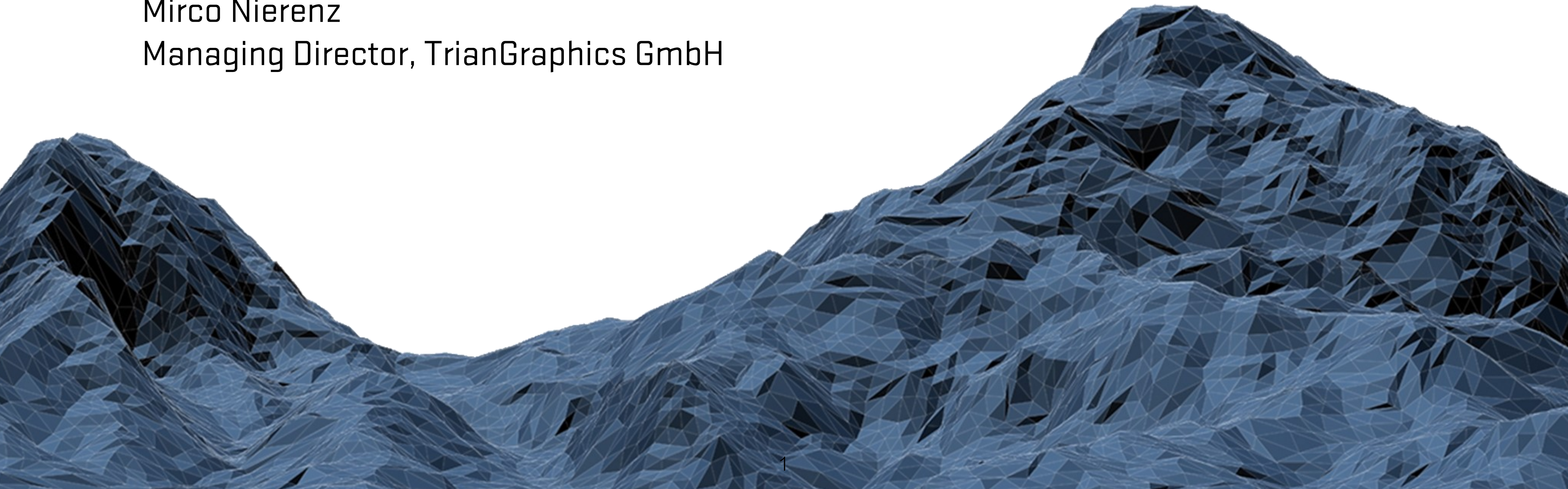


3D Scene Map Generation from Navigation Data

DSC 2022, Strasbourg

Mirco Nierenz

Managing Director, TrianGraphics GmbH





OVERVIEW

- Company / Products & Services
- 3D environment model - components and workflow
- Road Data: geodata and components, data types
- Import process: automation and editing
- Data problems in automated processes
- Generation features
- Exporting formats
- Metadata enrichment

ABOUT US

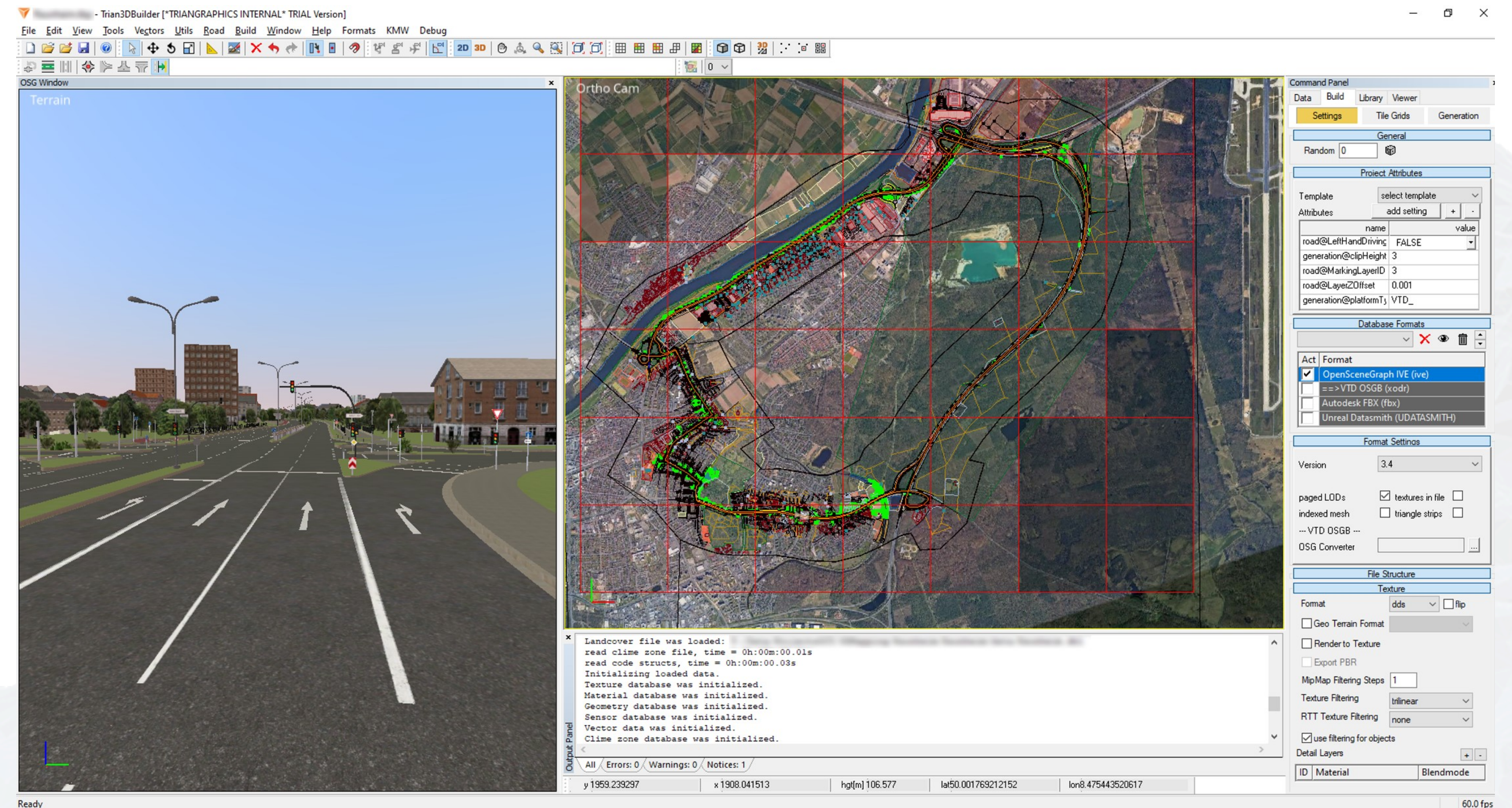
TrianGraphics GmbH

Founded 2004 in Berlin

Specialized in 3D content creation

- Database Creation services
- Software development

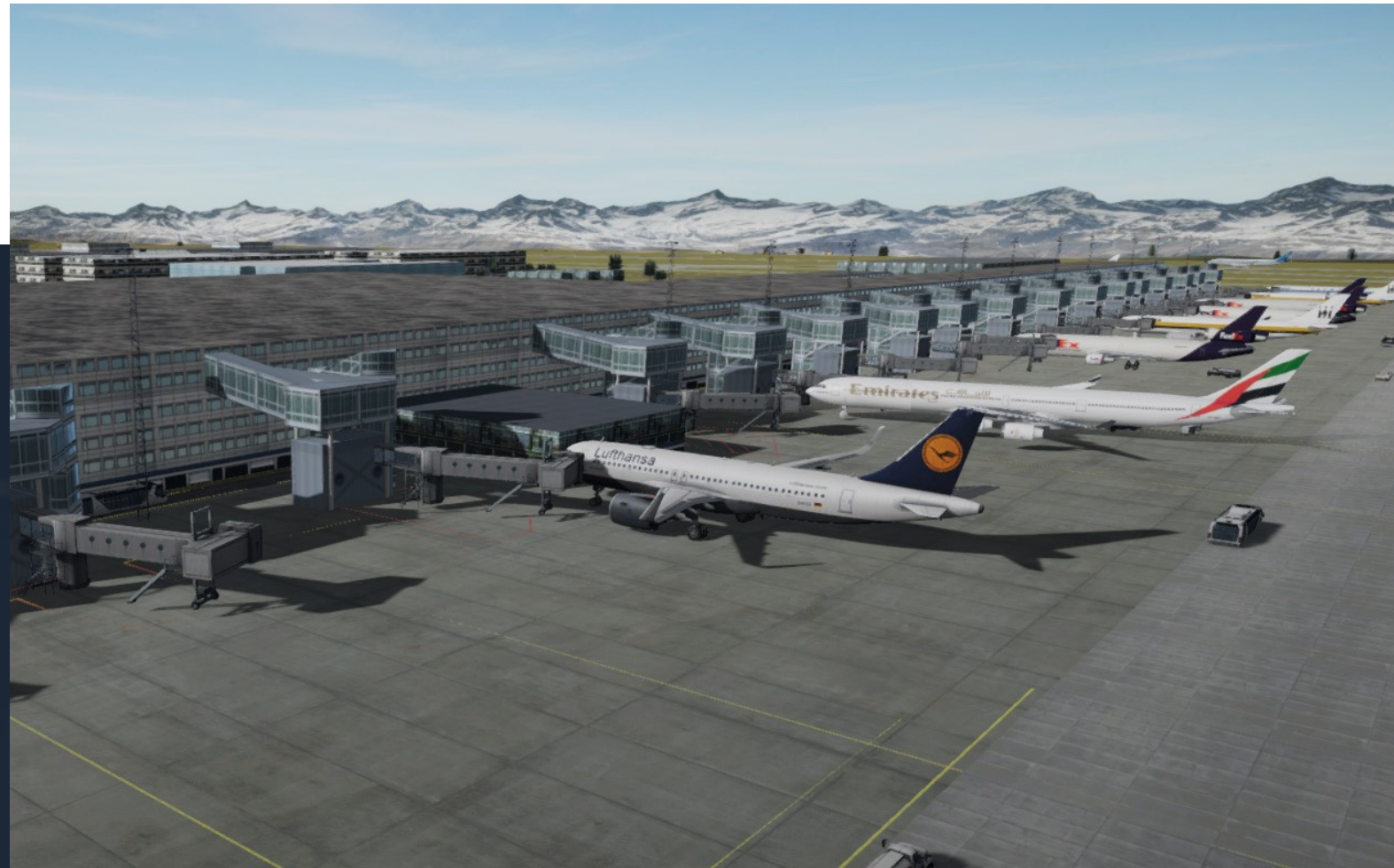
Database Generation System Trian3DBuilder



MARKETS



FLIGHT



Vast databases for flight simulations including fully-featured airports



MARITIME



Databases from nautical charts, can be combined with ground databases



GROUND



Highly-detailed open world environments optimized for real-time rendering



AUTOMOTIVE



Complex road networks for ADAS & AV testing. Highways and urban scenarios

3D ENVIRONMENT MODEL

- What:
static visual representation of all **road and environment** information in a **3D format**
- Why:
to be used as a component of **digital twins** to **test sensors** (RGB camera, LiDAR, radar)



3D ENVIRONMENT MODEL

Current Approaches

- Modeled manually
 High quality → expensive, changes difficult
 (requirements, updates, formats)
 Size limited
- Generically generated
 No real routes, generic look

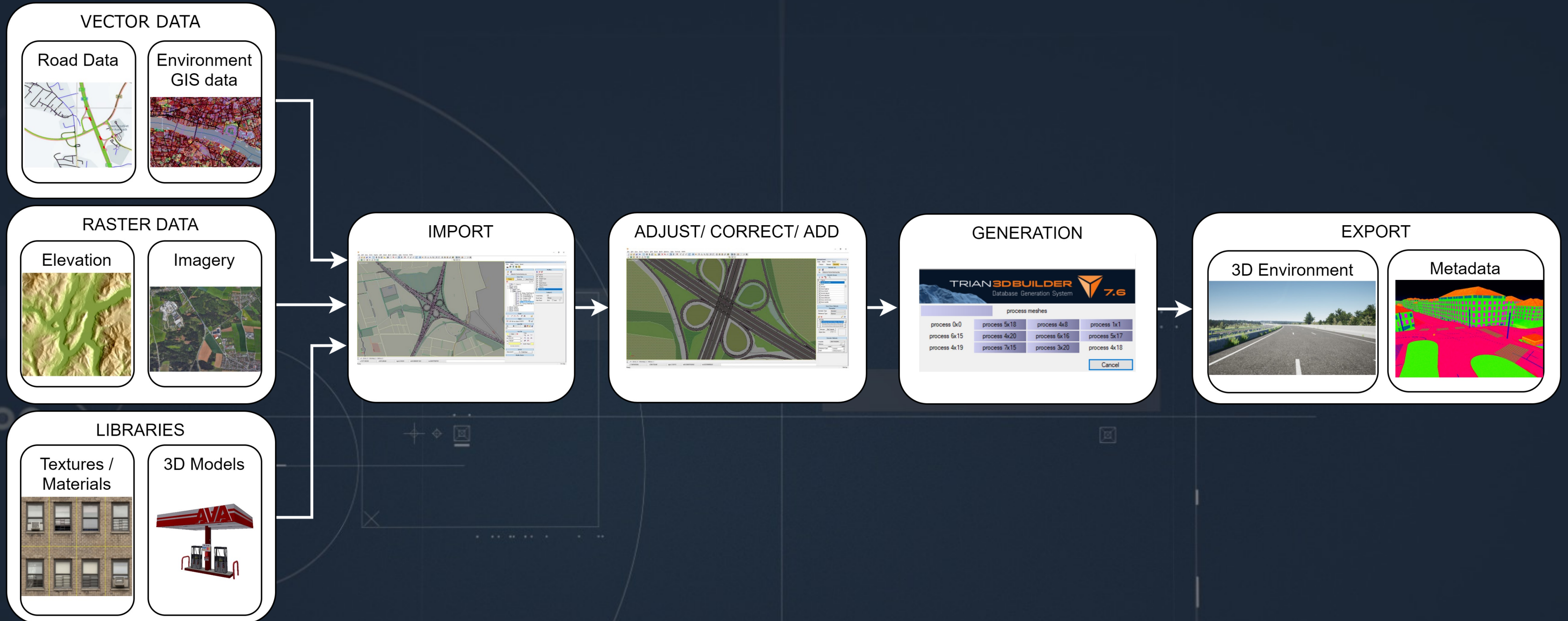
Our Approach

- Real geographic data
- Highly automated approaches
 → quickly convertible in unlimited size
- Generation rules to the source data
 → changes are easy to implement
- Fast conversion to other formats



COMPONENTS

Workflow and components of the 3D environment model



IMPORT

Road data types

- **Actual measurement data**
 Highest quality
 OpenDrive (ASAM), Road5 (IPG), RoadToSimulation (DLR), Shape per Lane (TrianGraphics)
- **Navigation data**
 Medium-high quality: HERE HD Live Map
 Medium quality: HERE RDF
- **GIS Data**
 Low quality: OpenStreetMap
- **Manually generated data**
- **Data can be merged from all sources**



IMPORT

Road data: Actual measured data



- **Content**

- Road networks

- Single road lanes with type, markings
 - Polynoms for height, side offset, reliefs
 - Complex intersections

- Objects

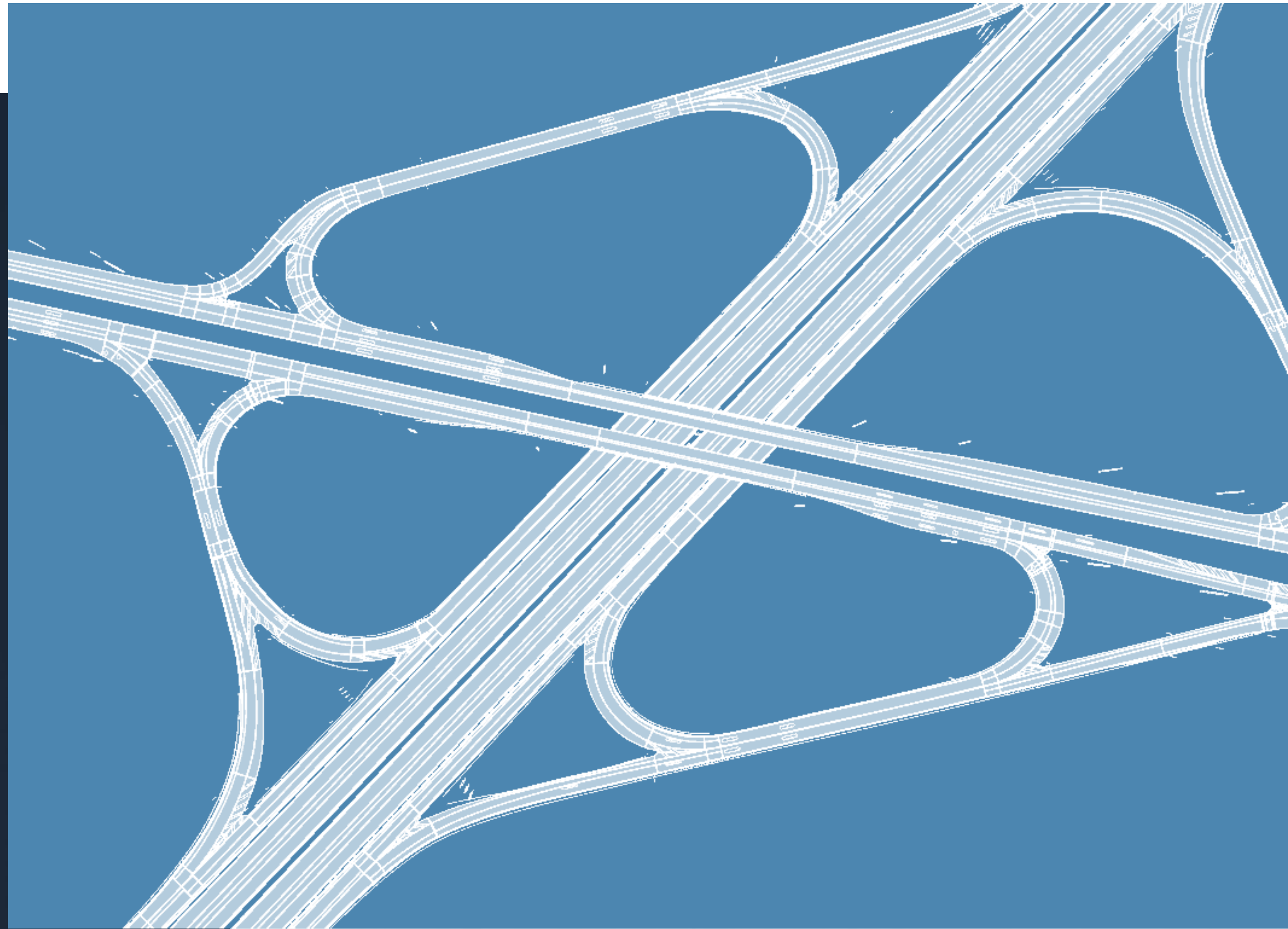
- Barriers and obstacles
 - Signals/signs with type/subtypes/values, orientation/size
 - Boundary objects, outlines

- **Availability**

- Databases provider service on request

- **Quality**

- Up to 1 cm resolution
 - Extensive object lists (depending on acquisition)



IMPORT

Road data: HERE HD Live Map

- **Format**
 - Online Access
- **Content**
 - Road network
 - Single road lanes with type, markings
 - Complex intersections
- **Objects**
 - Barriers and obstacles
 - Signals/signs with category/color, orientation/size
 - Boundary objects as points
- **Availability**
 - Western Europe, North America
- **Quality**
 - Highways with 1 m resolution
 - Secondary roads converted to RDF with partial errors, but high update rate
 - Specific objects for highways



IMPORT

Road data: HERE RDF



- **Format**

- SQL Database

- **Content**

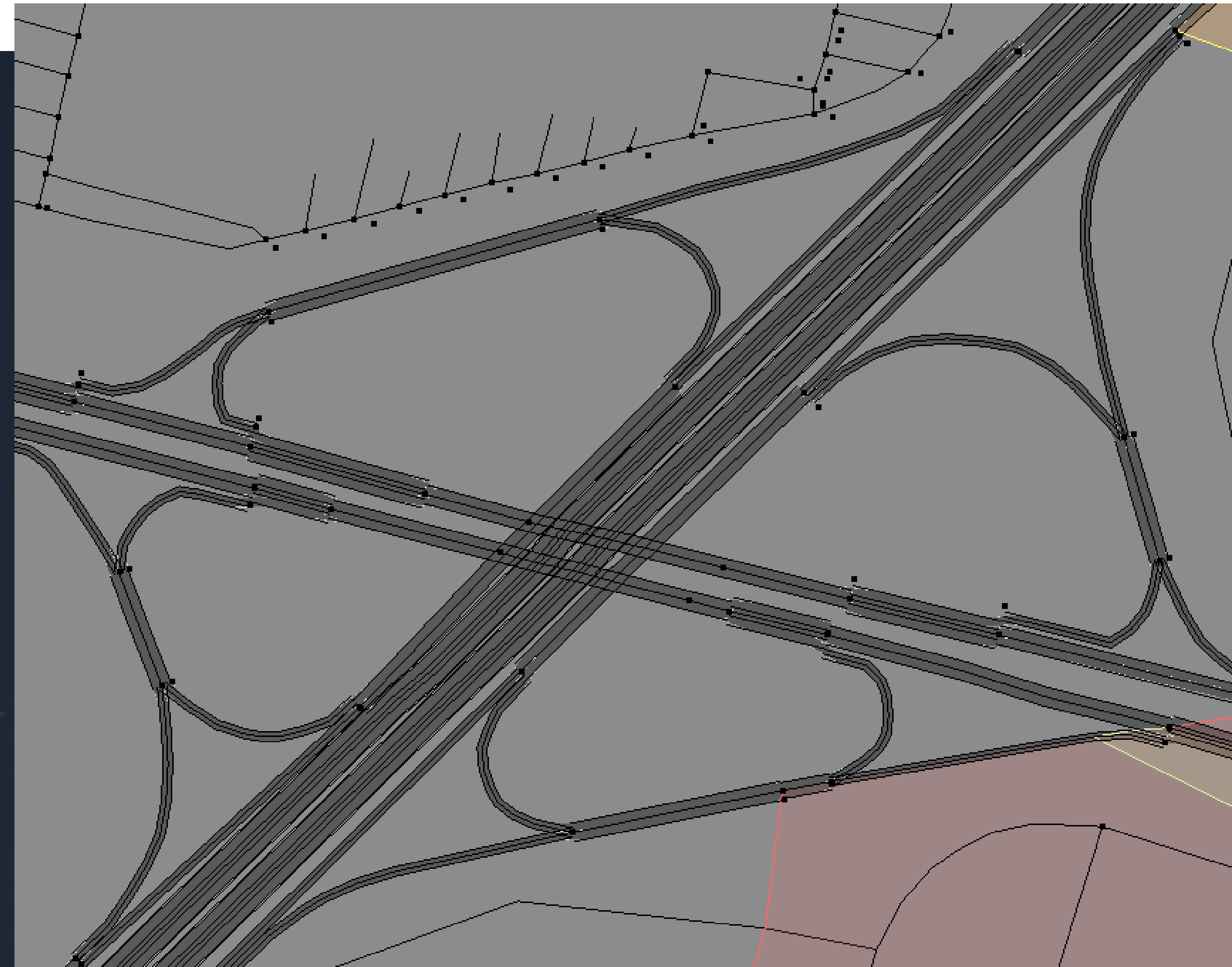
- Roads as center line with number of lanes, general width
- Crossing as point intersections
- Objects: Signals/signposts with category/values, orientation/size, position street center

- **Availability**

- Europe, America, Africa, Australia, Arabia, parts of Asia

- **Quality**

- Highways have better quality (ADAS) than secondary roads



IMPORT

Road data: OpenStreetMap (OSM)

- **Format**

- Online Access or .OSM file

- **Content**

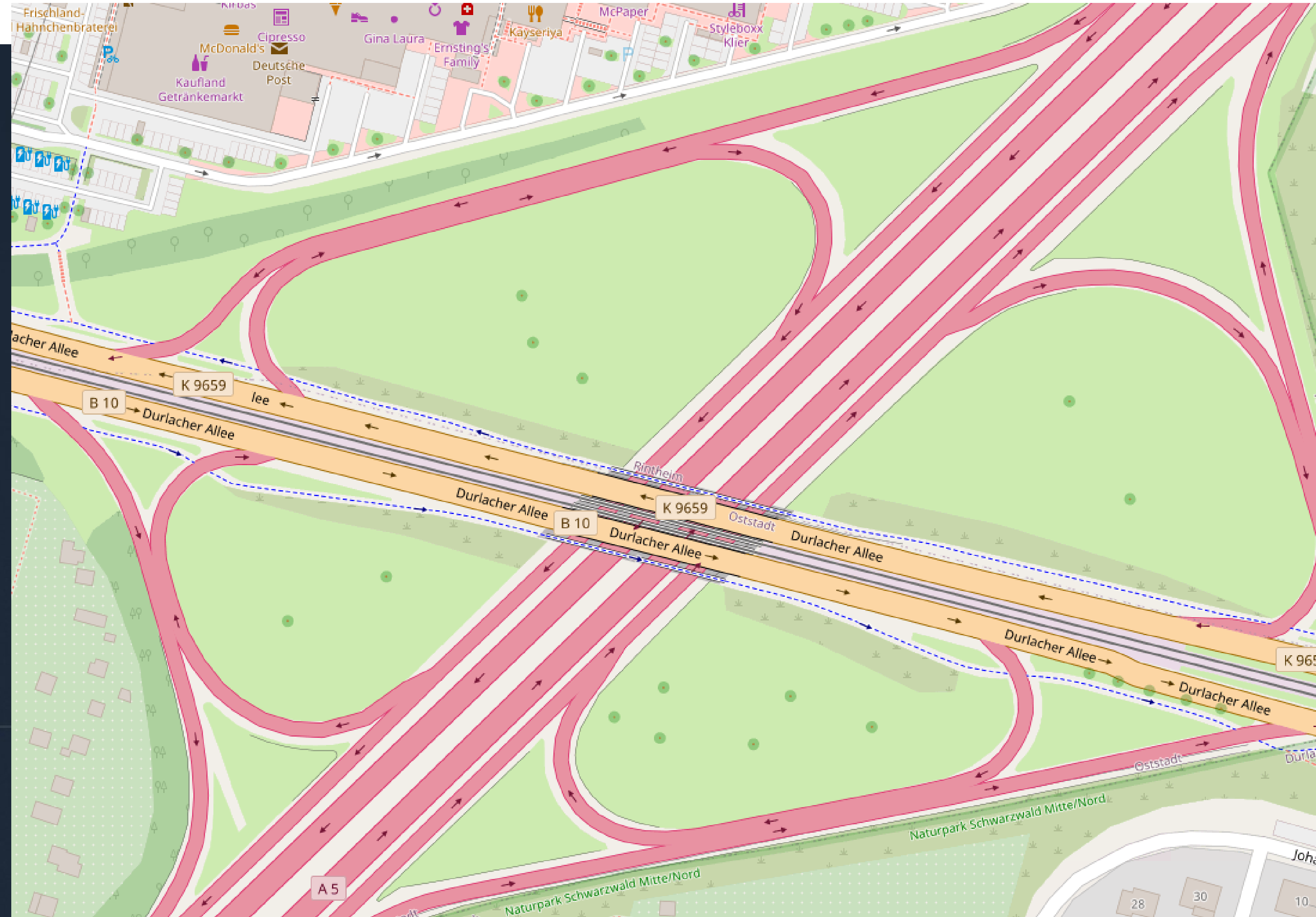
- Roads as center lanes
 - with number of lanes, general width and direction type
- Objects
 - Rarely signals/signs with type
 - Boundary objects rare

- **Availability**

- Worldwide, density/scope dependent on location

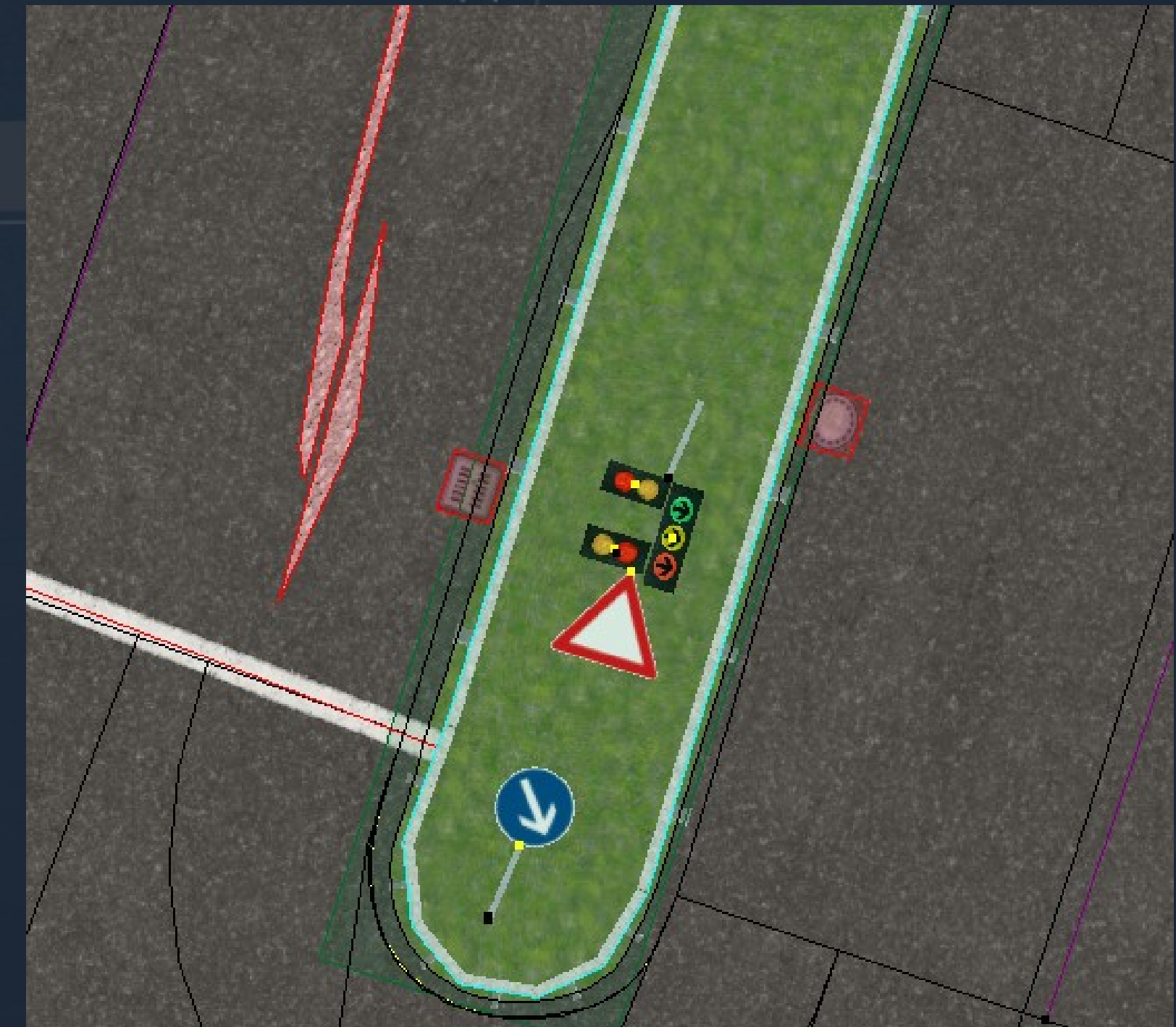
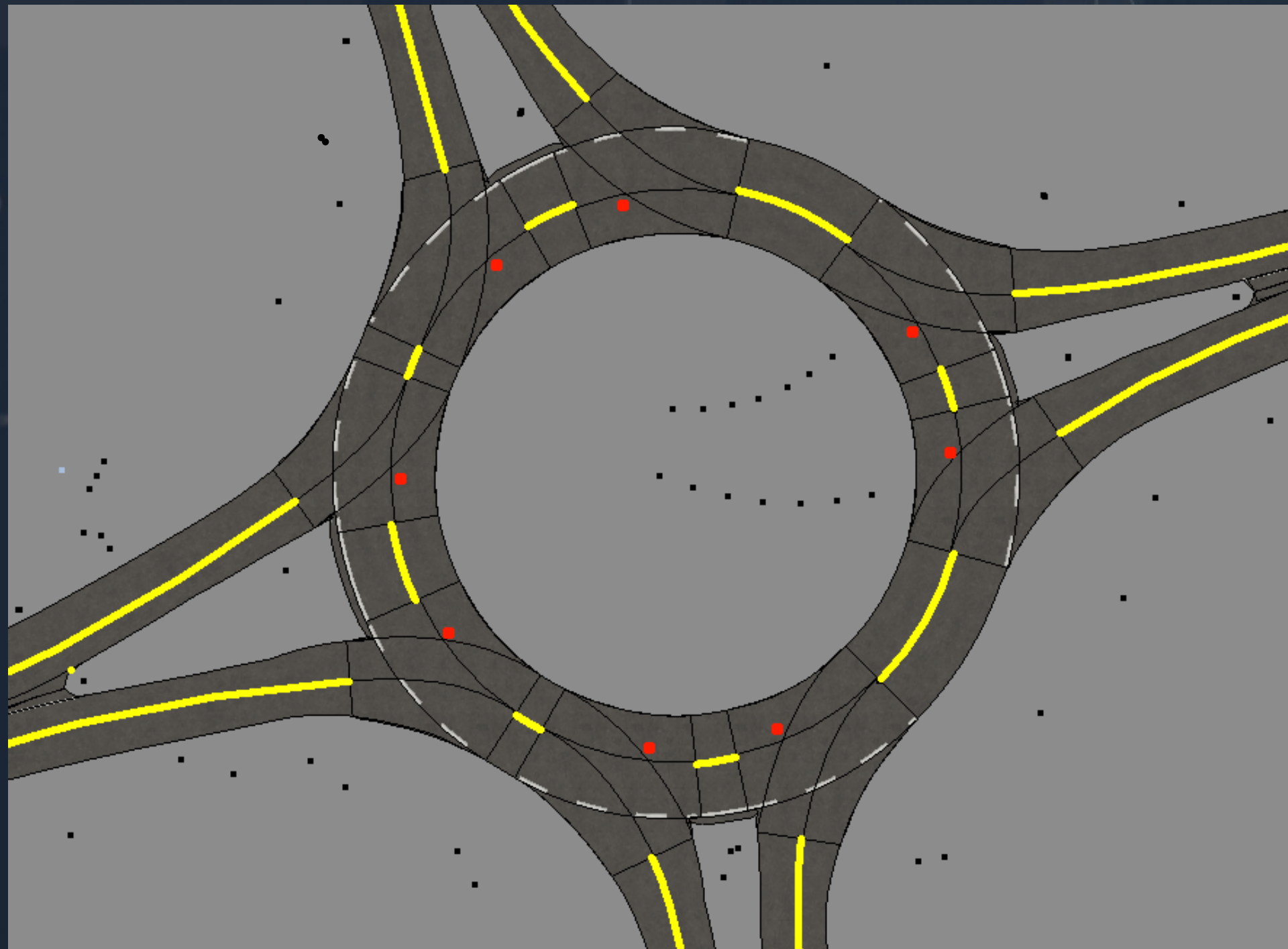
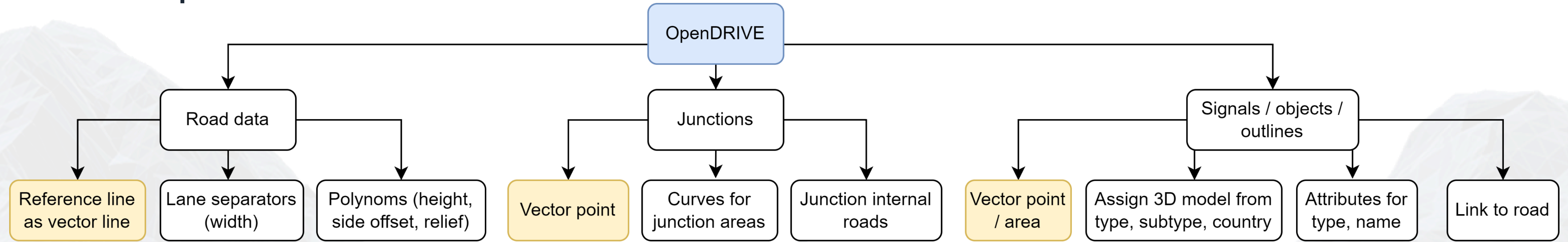
- **Quality**

- Low accuracy
- Variable quality of attribution



IMPORT

Road data: OpenDRIVE



EDITING

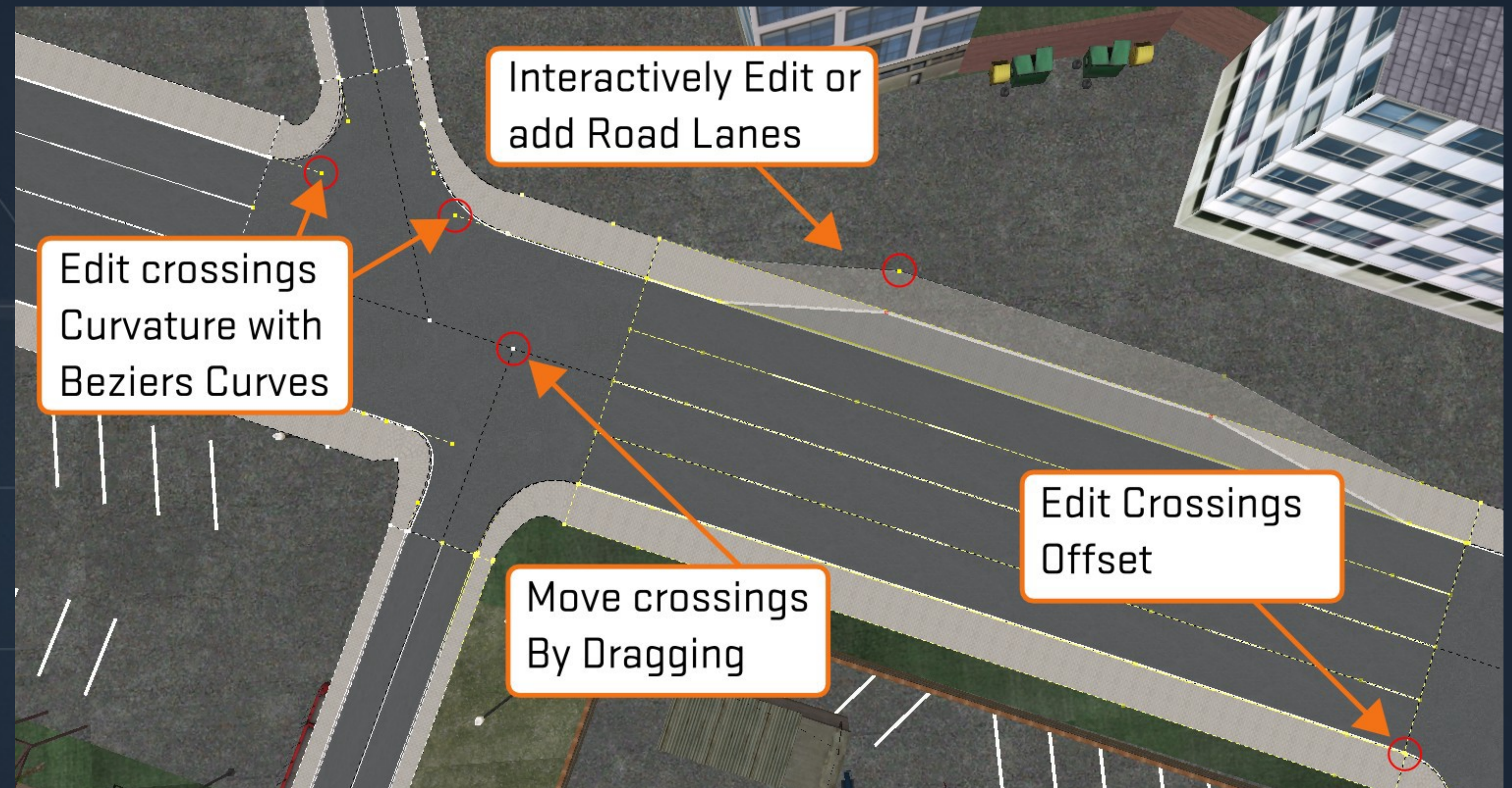
Automation

Import

- Wizard for project generation
 - Using Bounding or GPS- Track
- Use of templates (Assignment of generation rules based on attributes)

Editing

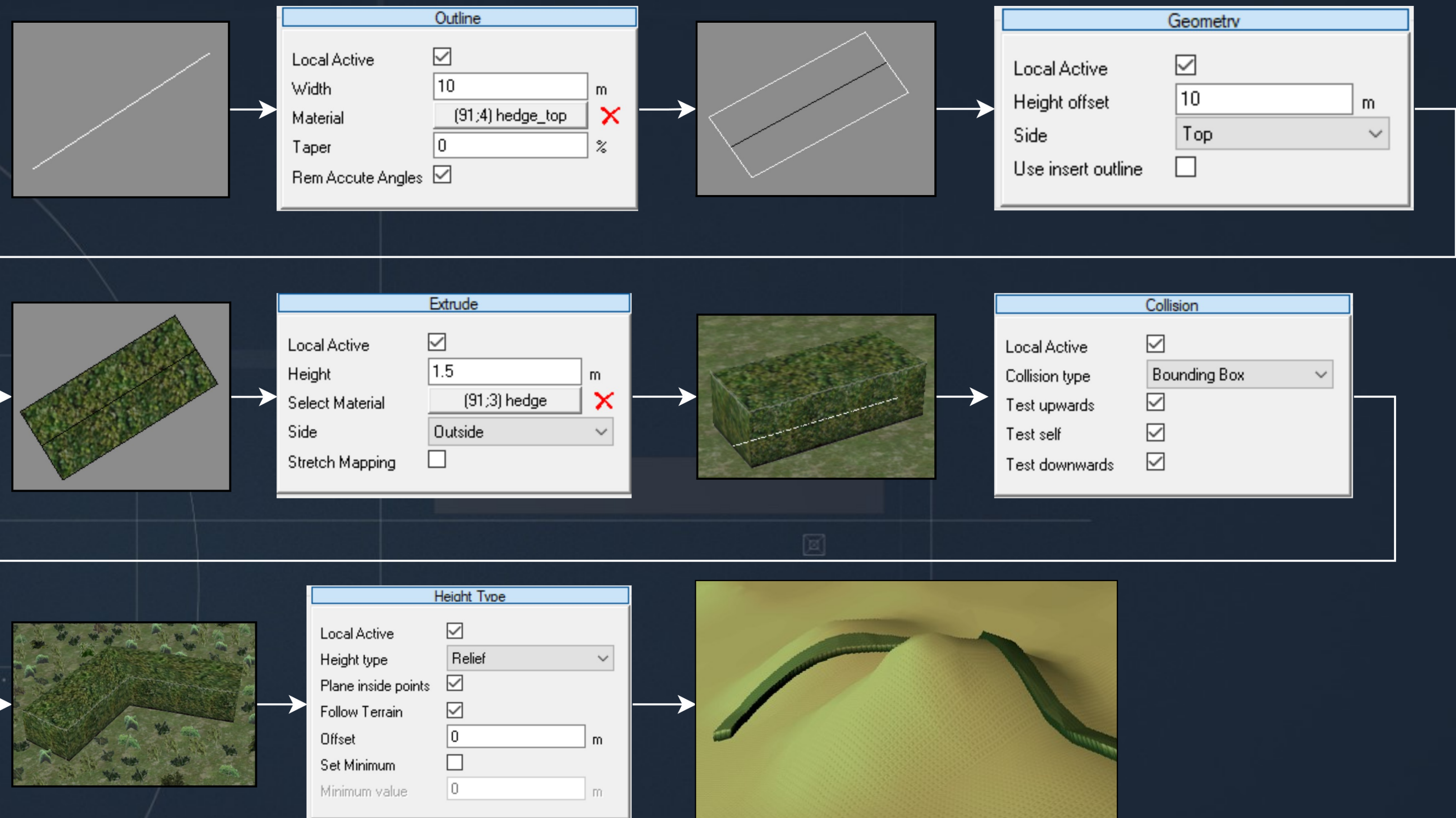
- Generation rules allow general and individual editing
- WYSIWYG Mode
- Use of templates for common settings
- Many auxiliar functions to generate, convert and verify
- Access to libraries of templates, models, materials and textures



GENERATION

Generation features

- Basic functionalities
- Combined with flexible rules
- Use of attributes to assign templates



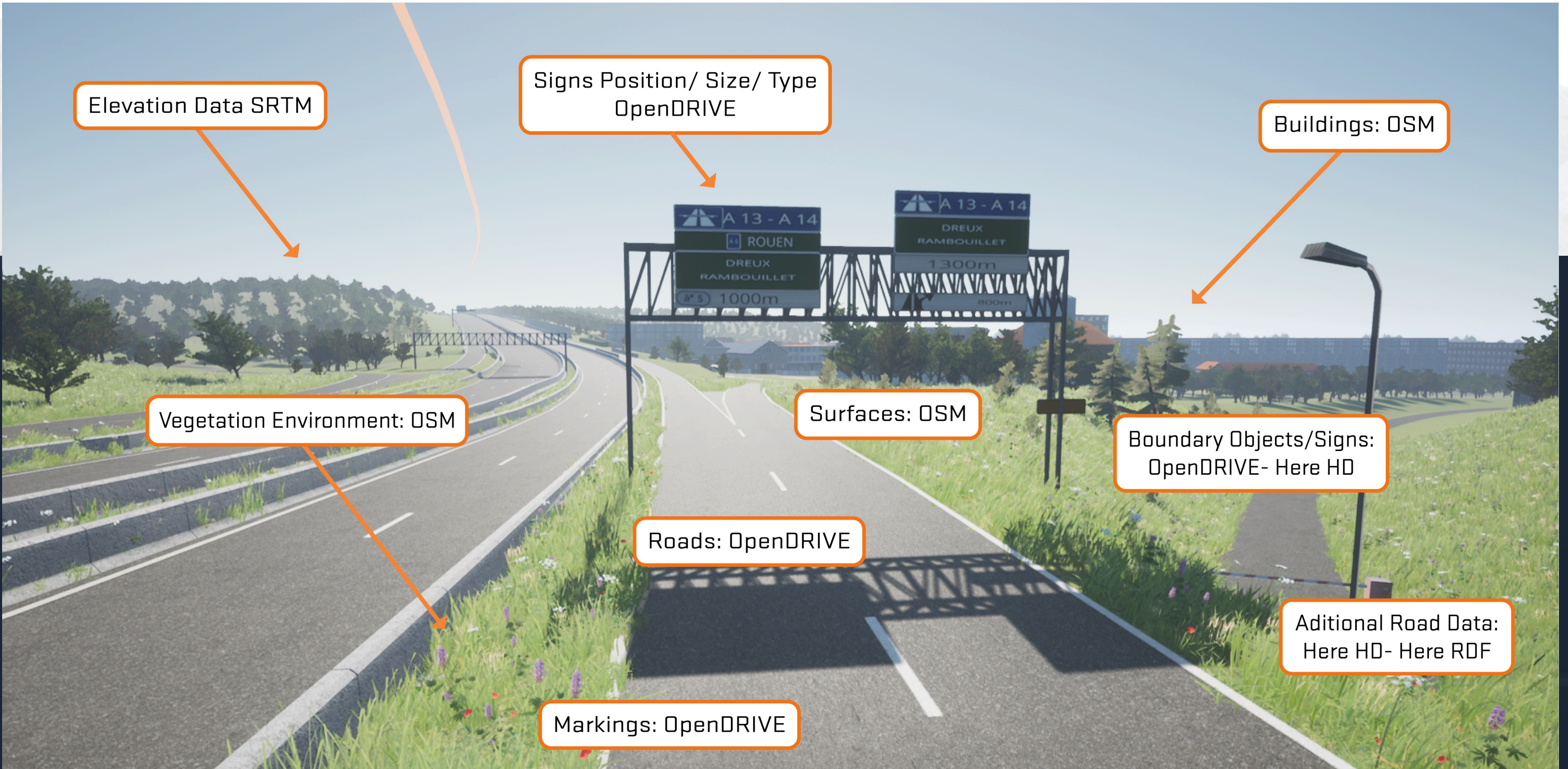
GENERATION

Generation features

- Buildings
- Inserts, Smoothing
- Render In Texture
- Light points
- Generic Texturing
- Level Of Detail
- Paging
- Multi-texturing, Overlays
- Multi-core CPU



ENVIRONMENT



DATA ISSUES

Quality

- Matching positions (e.g., signs and posts)
- Junction shape, height → ASAM
- Match between the different data sources
- Accuracy (Intersections, CCW order, duplicates)
- Inadequate attributes

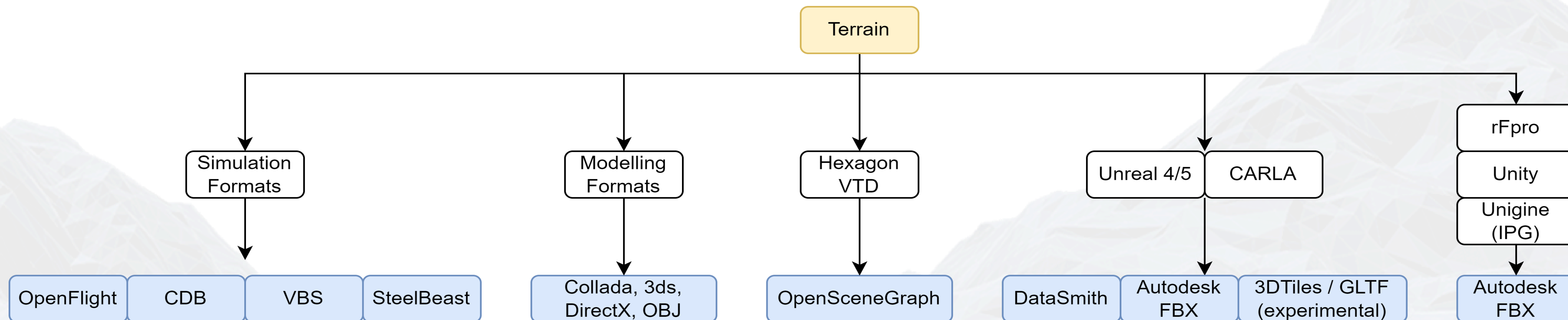
Content

- Data source for roadside objects
- Heterogeneous data density (OSM)
- Data source for sign texts → ASAM



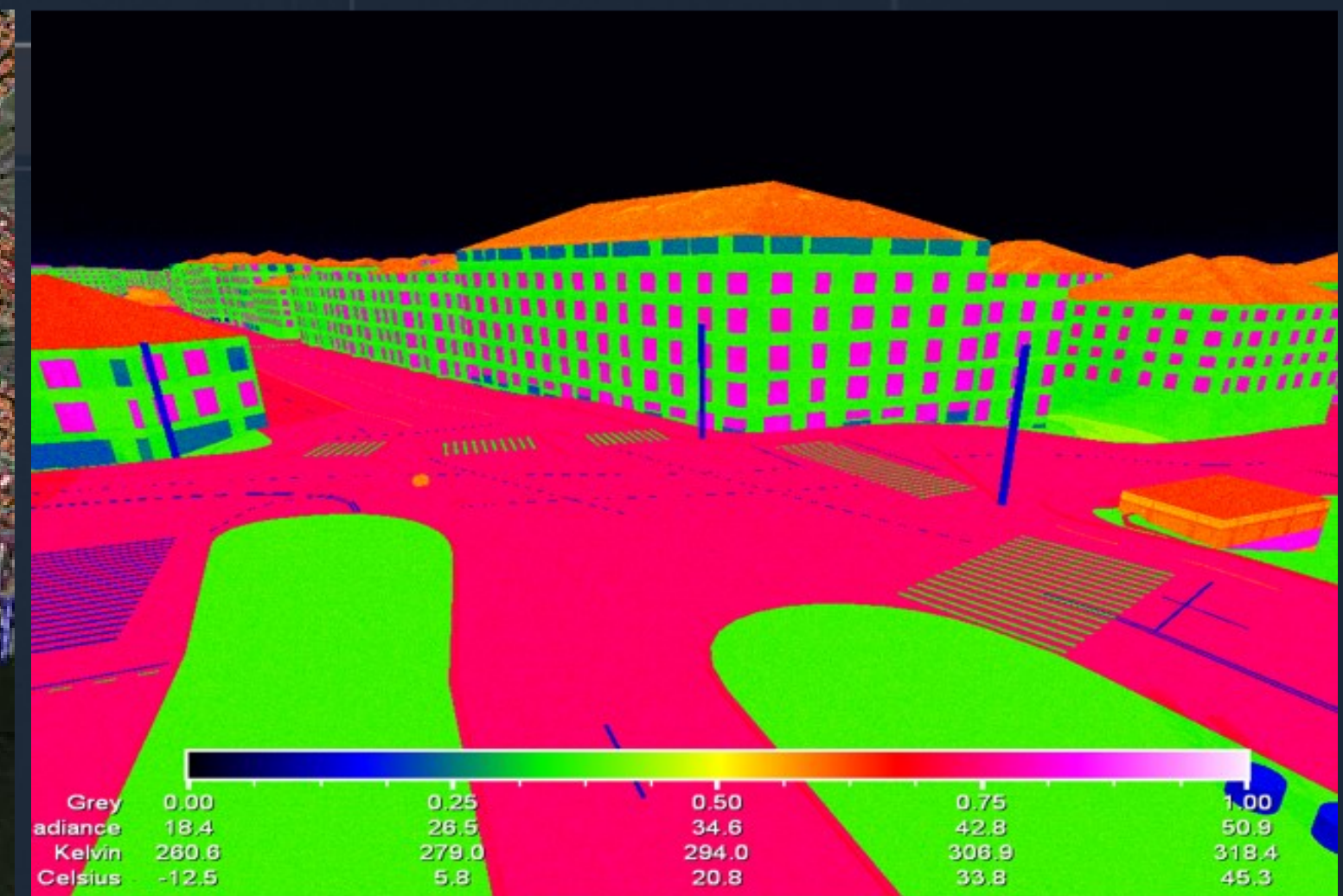
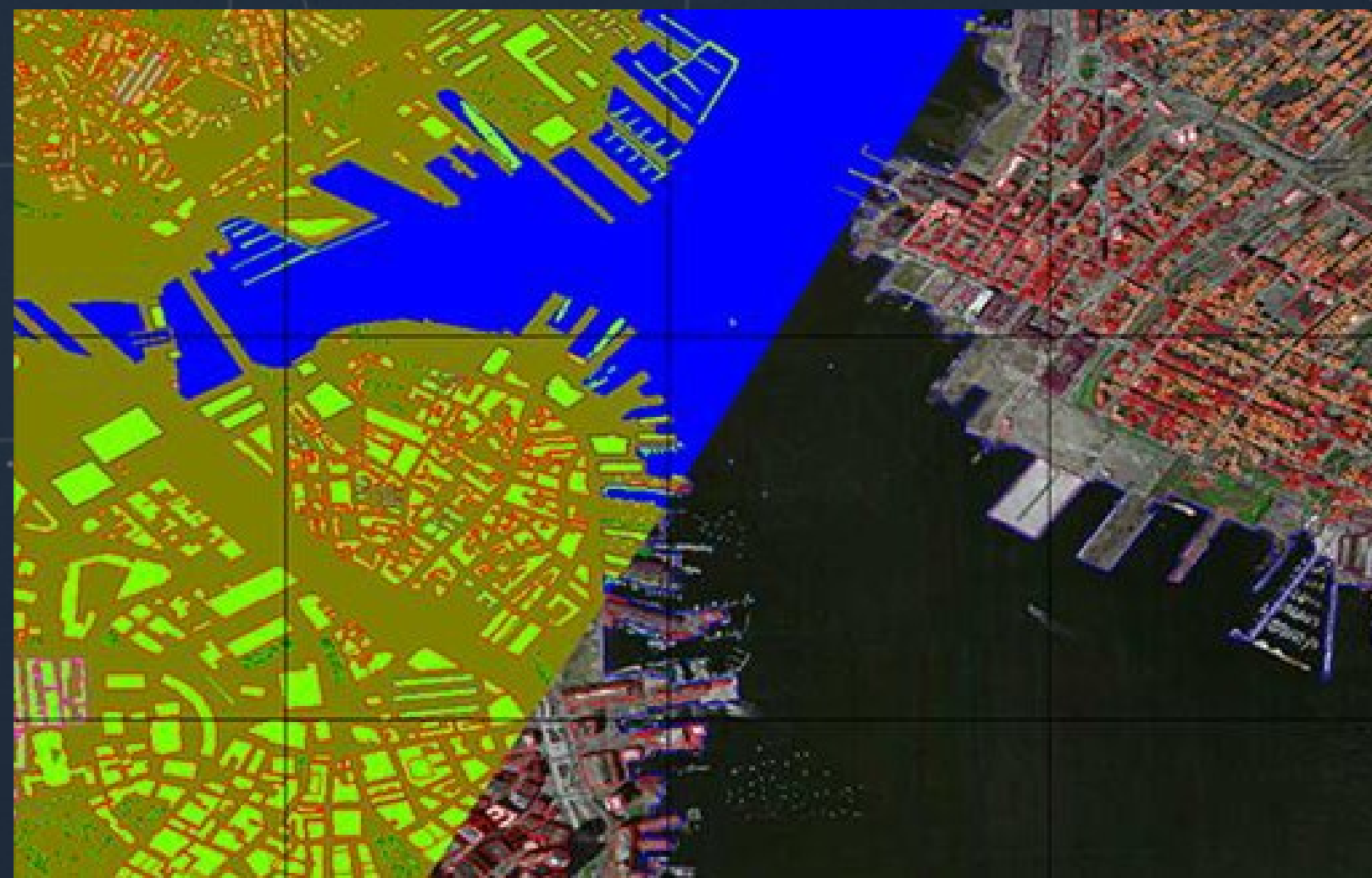
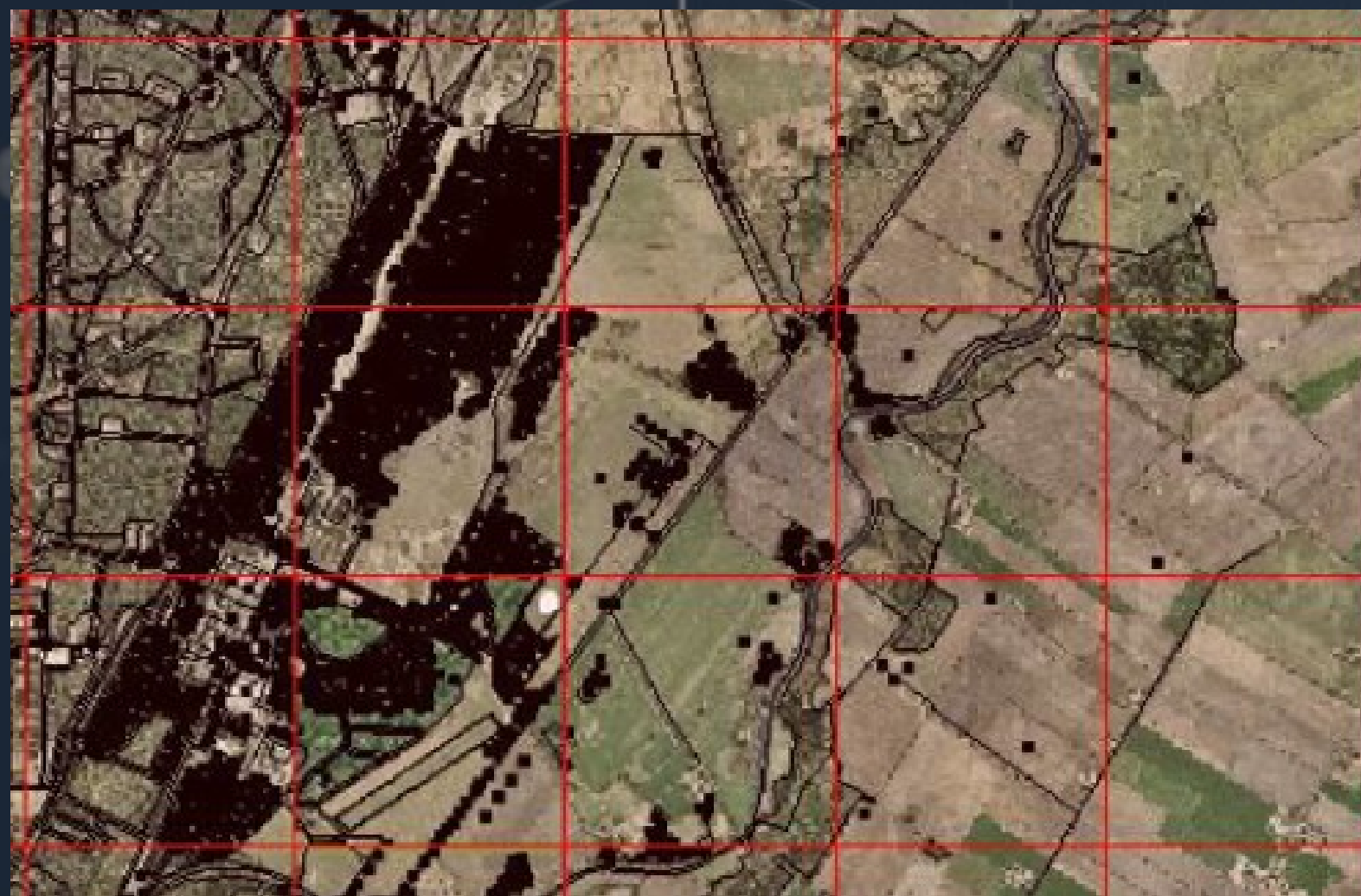
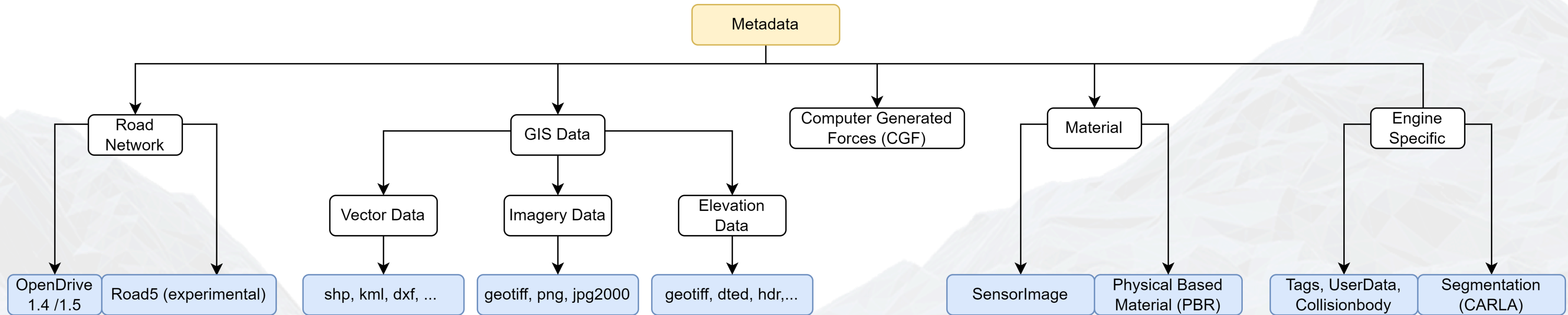
EXPORT

Terrain



EXPORT

Metadata





THANK YOU
FOR YOUR INTEREST

MEET US AT BOOTH 20!

