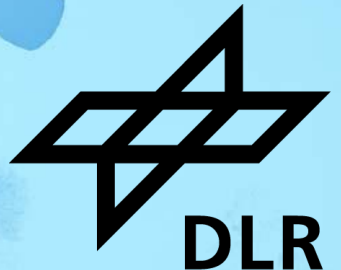


Discrete global grid systems for spatio-temporal aggregation and visualisation

FOSS4G Europe, 2026-06-30, Timișoara

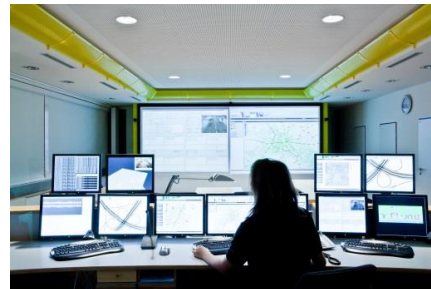
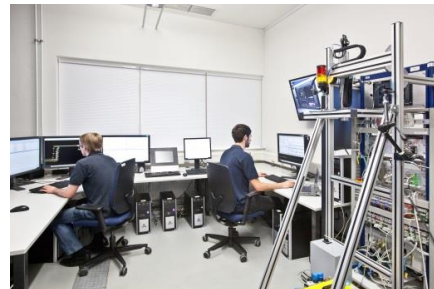
Michael Scholz



Institute of Transportation Systems



Research infrastructure



3

Record

Grid

Spatial

Text

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

AZ email

123

location

creation_time

AZ traffic_m

123 bearing

123 travel_quality_level

123 travel_active_goals_level

123 travel_compare_to_experience

erlebensatlas3f

376

POINT (10.64994

2025-09-15

public_transport

[NULL]

4

5

3

erlebensatlas3f

372

POINT (10.143891

2025-09-15

public_transport

281.4

4

5

4

erlebensatlas3f

376

POINT (10.65778

2025-09-15

public_transport

[NULL]

4

5

3

erlebensatlas3f

376

POINT (10.63058

2025-09-15

public_transport

287.7

[NULL]

[NULL]

[NULL]

erlebensatlas3f

372

POINT (10.127351

2025-09-15

public_transport

272.4

[NULL]

[NULL]

[NULL]

erlebensatlas3f

376

POINT (10.5087

5: 2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

372

POINT (10.114015

2025-09-15

public_transport

228.6

[NULL]

[NULL]

[NULL]

erlebensatlas3f

376

POINT (10.43342

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

372

POINT (10.104819

2025-09-15

public_transport

267.6

[NULL]

[NULL]

[NULL]

erlebensatlas3f

376

POINT (10.39928

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

376

POINT (10.26605

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

377

POINT (10.016893

2025-09-15

public_transport

193

[NULL]

[NULL]

[NULL]

erlebensatlas3f

376

POINT (10.2367

5: 2025-09-15

public_transport

287.7

[NULL]

[NULL]

[NULL]

erlebensatlas3f

377

POINT (10.018893

2025-09-15

public_transport

125.3

[NULL]

[NULL]

[NULL]

erlebensatlas3f

376

POINT (10.20296

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

377

POINT (10.029125

2025-09-15

public_transport

194

[NULL]

[NULL]

[NULL]

erlebensatlas3f

376

POINT (10.09616

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

377

POINT (9.9944908

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

376

POINT (10.017432

2025-09-15

public_transport

287.7

[NULL]

[NULL]

[NULL]

erlebensatlas3f

376

POINT (10.008611

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

361

POINT (10.056018

2025-09-15

public_transport

209.1

[NULL]

[NULL]

[NULL]

erlebensatlas3f

361

POINT (10.055965

2025-09-15

public_transport

266.7

[NULL]

[NULL]

[NULL]

erlebensatlas3f

376

POINT (10.009857

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

361

POINT (10.024485

2025-09-15

public_transport

209.5

[NULL]

[NULL]

[NULL]

erlebensatlas3f

347

POINT (10.067992

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

347

POINT (10.064815

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

347

POINT (10.069450

2025-09-15

public_transport

64.2

[NULL]

[NULL]

[NULL]

erlebensatlas3f

347

POINT (10.073675

2025-09-15

public_transport

258.5

[NULL]

[NULL]

[NULL]

erlebensatlas3f

347

POINT (10.100967

2025-09-15

public_transport

74

[NULL]

[NULL]

[NULL]

erlebensatlas3f

347

POINT (10.118848

2025-09-15

public_transport

30.9

[NULL]

[NULL]

[NULL]

erlebensatlas3f

347

POINT (10.128806

2025-09-15

public_transport

30.2

[NULL]

[NULL]

[NULL]

erlebensatlas3f

352

POINT (10.065443

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

352

POINT (10.035868

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

352

POINT (10.027373

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

352

POINT (9.9939667

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

352

POINT (9.9941626

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

352

POINT (10.006455

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

366

POINT (10.010639

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

366

POINT (10.009

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

366

POINT (9.983

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

366

POINT (9.990

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

340

POINT (10.065511

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

340

POINT (10.046890

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

366

POINT (9.9978153

2025-09-15

public_transport

59.1

[NULL]

[NULL]

[NULL]

erlebensatlas3f

340

POINT (10.027519

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

366

POINT (10.031158

2025-09-15

public_transport

19.1

[NULL]

[NULL]

[NULL]

erlebensatlas3f

340

POINT (10.027325

2025-09-15

public_transport

[NULL]

[NULL]

[NULL]

[NULL]

erlebensatlas3f

340

POINT (10.0265

2025-09-15

public_transport

101.1

[NULL]

[NULL]

[NULL]

Michael Scholz

2026-06-30

FOSS4G Europe

Timisoara

Value

225.0

25.4

20.37

000

DLR

Properties

Data

Diagram

Show SQL

Enter a SQL expression to filter results (use Ctrl+Space)

Grid

Spatial

Text

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137

138

139

140

123

geometry

AZ

123 depth

123 heading

123 height

AZ type

123 width

123 datasourcedesc

123 linearparent

227,571

POINT Z(10.48639830

[NULL]

0.07

[NULL]

0.5

reflector post

0.07

13

77

227,573

POINT Z(10.48669416

[NULL]

0.07

[NULL]

0.49

reflector post

0.07

136

77

227,575

POINT Z(10.48703795

[NULL]

0.07

[NULL]

0.48

reflector post

0.07

13

77

227,577

POINT Z(10.48745317

[NULL]

0.07

[NULL]

0.5

reflector post

0.07

136

77

227,579

POINT Z(10.48781178

[NULL]

0.07

[NULL]

0.47

reflector post

0.07

136

77

227,581

POINT Z(10.48790373

[NULL]

0.07

[NULL]

0.48

reflector post

0.07

136

77

227,583

POINT Z(10.48894486

[NULL]

0.07

[NULL]

0.5

reflector post

0.07

13

77

227,585

POINT Z(10.48938750

[NULL]

0.07

[NULL]

0.49

reflector post

0.07

13

77

227,587

POINT Z(10.48968622

[NULL]

0.07

[NULL]

0.5

reflector post

0.07

13

77

227,589

POINT Z(10.48974066

[NULL]

0.07

[NULL]

0.5

reflector post

0.07

136

77

227,591

POINT Z(10.49014877

[NULL]

0.07

[NULL]

0.49

reflector post

0.07

13

77

227,593

POINT Z(10.49058980

[NULL]

0.07

[NULL]

0.48

reflector post

0.07

13

77

227,595

POINT Z(10.49069314

[NULL]

0.07

[NULL]

0.48

reflector post

0.07

13

77

227,597

POINT Z(10.49093210

[NULL]

0.07

[NULL]

0.49

reflector post

0.07

13

77

227,599

POINT Z(10.49130146

[NULL]

0.07

[NULL]

0.49

reflector post

0.07

13

77

227,601

POINT Z(10.48830499

[NULL]

0.07

[NULL]

0.49

reflector post

0.07

136

77

227,603

POINT Z(10.48673894

[NULL]

0.07

[NULL]

0.48

reflector post

0.07

4

77

227,605

POINT Z(10.48580418

[NULL]

0.17

176

2

emergency phone

0.35

13

77

227,607

POINT Z(10.49107397

[NULL]

0.08

[NULL]

1.39

pole

0.08

13

77

227,609

POINT Z(10.49063205

[NULL]

0.08

[NULL]

2.97

pole

0.08

17

77

227,611

POINT Z(10.49031074

[NULL]

0.08

[NULL]

1.14

pole

0.08

4

77

227,613

POINT Z(10.48956389

[NULL]

0.08

[NULL]

1.24

pole

0.08

26

77

227,615

POINT Z(10.48877226

[NULL]

0.08

[NULL]

1.39

pole

0.08

13

77

227,617

POINT Z(10.48798973

[NULL]

0.08

[NULL]

1.79

pole

0.08

73

77

227,619

POINT Z(10.48748044

[NULL]

0.5

[NULL]

7.32

overhead gantry n

0.5

4

77

227,621

POINT Z(10.48726161

[NULL]

0.08

[NULL]

1.27

pole

0.08

4

77

227,623

POINT Z(10.48607386

[NULL]

0.08

[NULL]

1.49

pole

0.08

13

77

227,625

POINT Z(10.48580740

[NULL]

0.08

[NULL]

1.76

pole

0.08

13

77

227,627

POINT Z(10.48581627

[NULL]

0.08

[NULL]

1.31

pole

0.08

13

77

227,629

POINT Z(10.48590300

[NULL]

0.08

[NULL]

0.99

pole

0.08

17

77

227,631

POINT Z(10.48591868

[NULL]

0.08

[NULL]

1.23

pole

0.08

4

77

227,633

POINT Z(10.48592777

[NULL]

0.08

[NULL]

1.32

pole

0.08

4

77

227,635

POINT Z(10.48602584

[NULL]

0.08

[NULL]

1.56

pole

0.08

4

77

227,637

POINT Z(10.48603497

[NULL]

0.08

[NULL]

7.08

pole

0.08

13

77

227,639

POINT Z(10.48652262

[NULL]

0.08

[NULL]

1.25

pole

0.08

13

77

227,641

POINT Z(10.48729256

[NULL]

0.08

[NULL]

1.59

pole

0.08

73

77

227,643

POINT Z(10.48744712

[NULL]

0.08

[NULL]

2.46

pole

0.08

4

77

227,645

POINT Z(10.48777325

[NULL]

0.08

[NULL]

8.83

pole

0.08

4

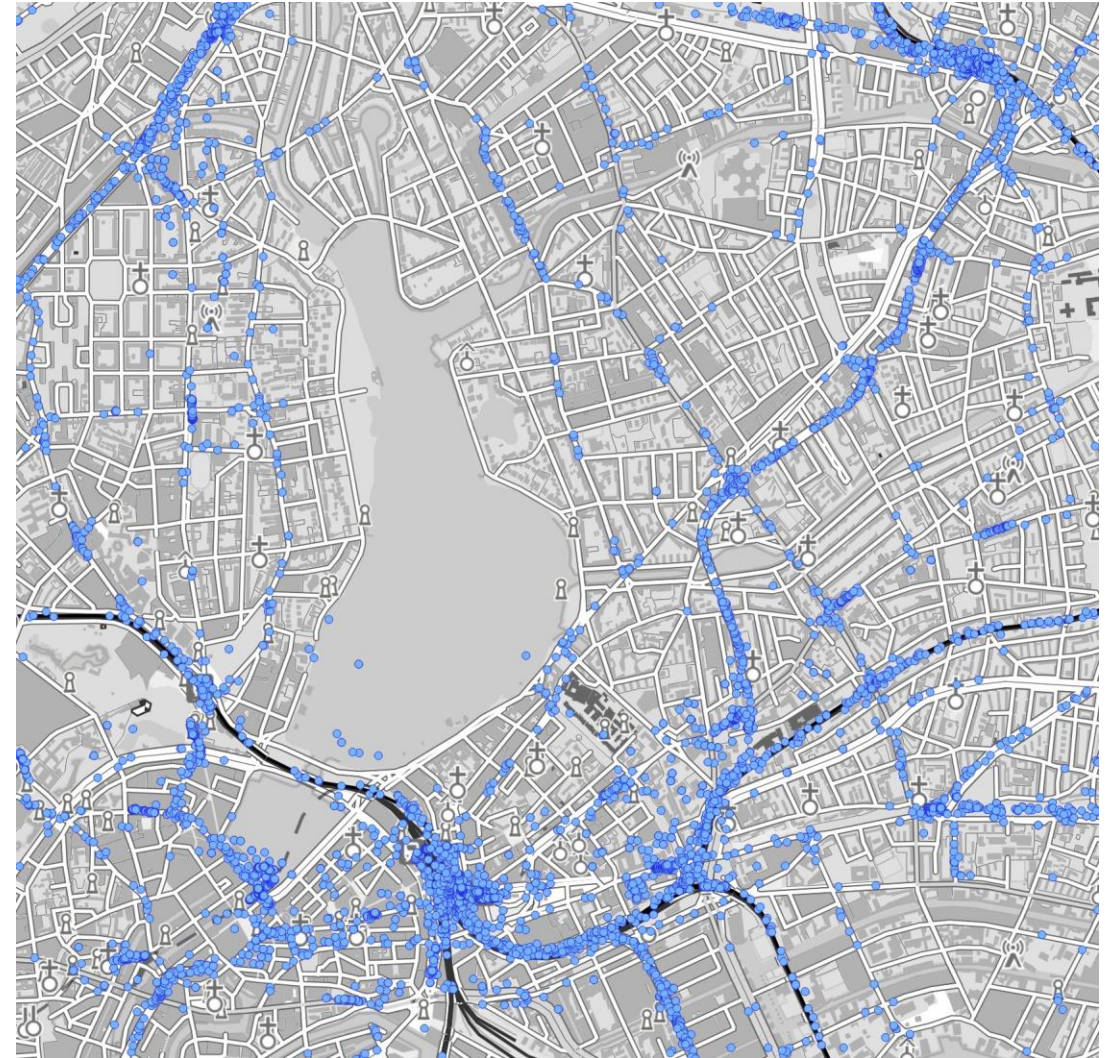
77

Processing of spatio-temporal event data

Big vector data



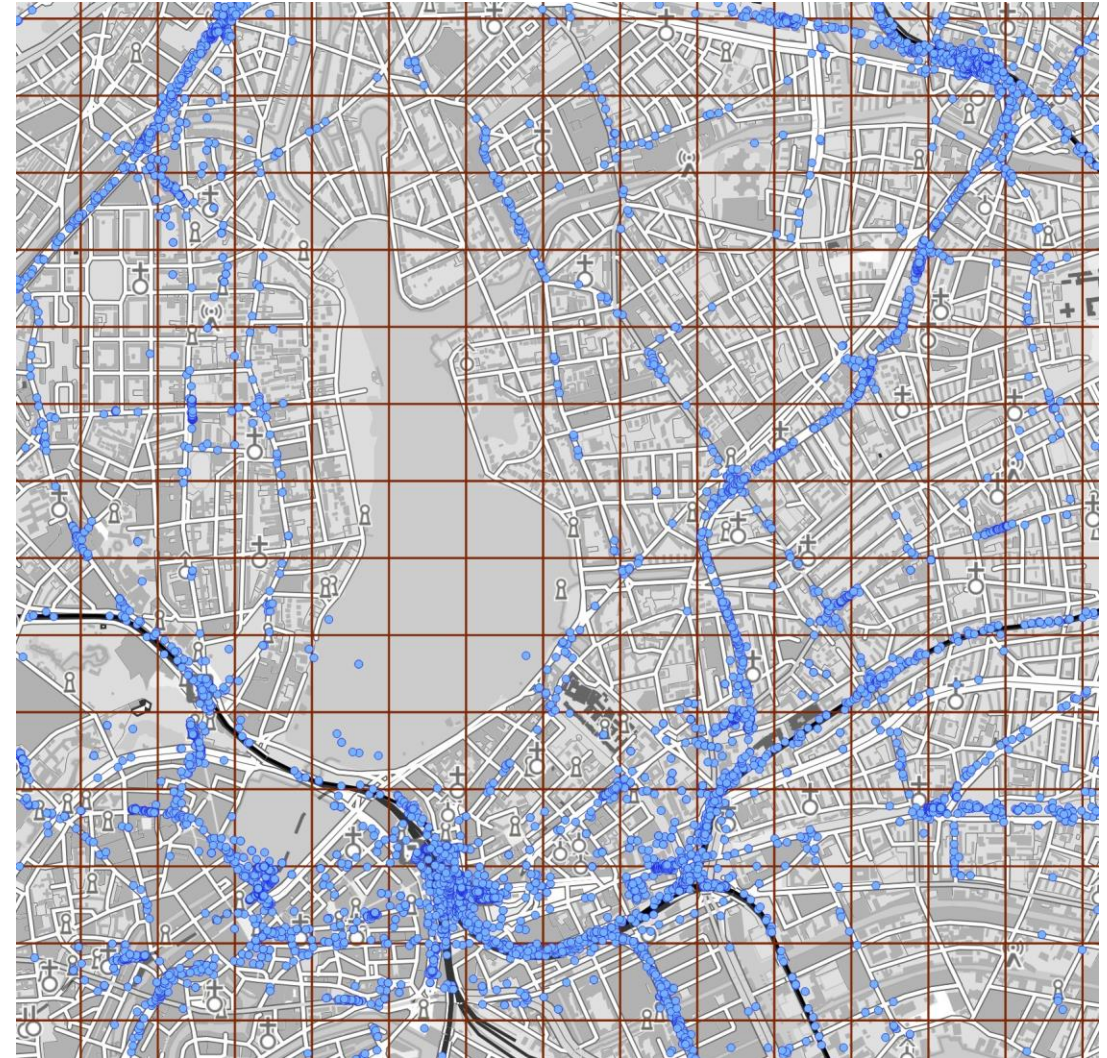
Processing of spatio-temporal event data



Processing of spatio-temporal event data

Aggregation

Grid cells

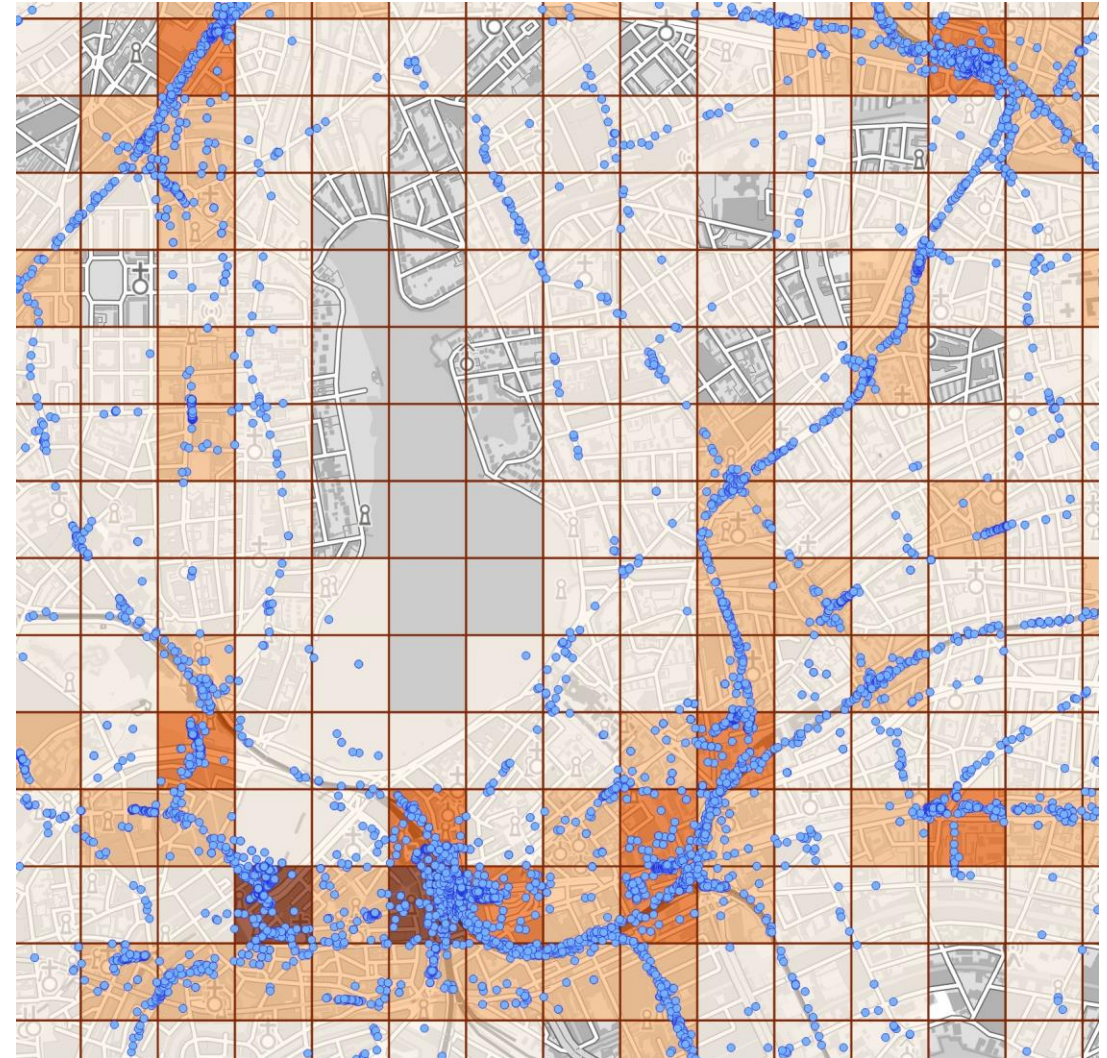


Processing of spatio-temporal event data

Aggregation

Grid cells

- Binning
 - Collecting all spatial features falling into one cell

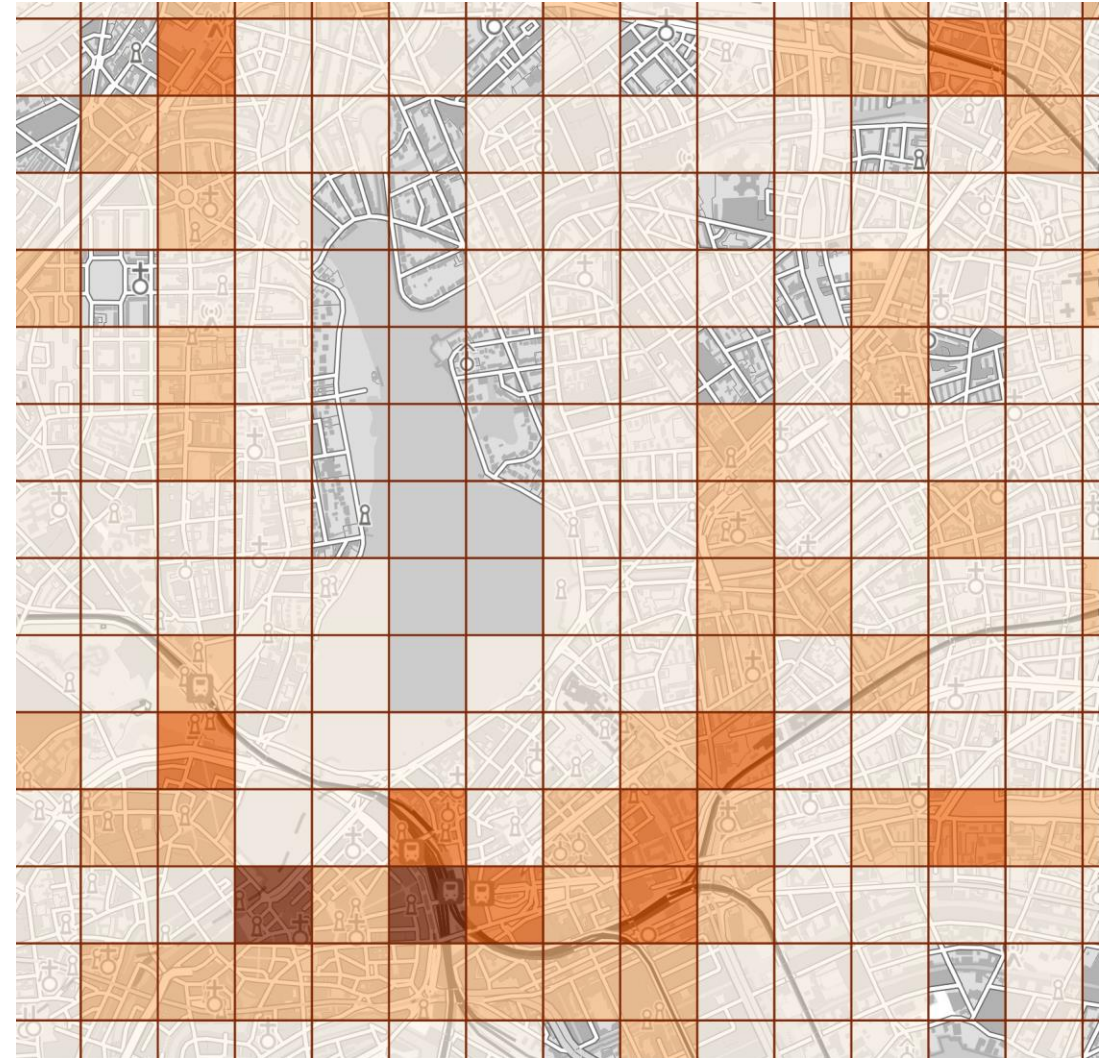


Processing of spatio-temporal event data

Aggregation

Grid cells

- Binning
 - Collecting all spatial features falling into one cell

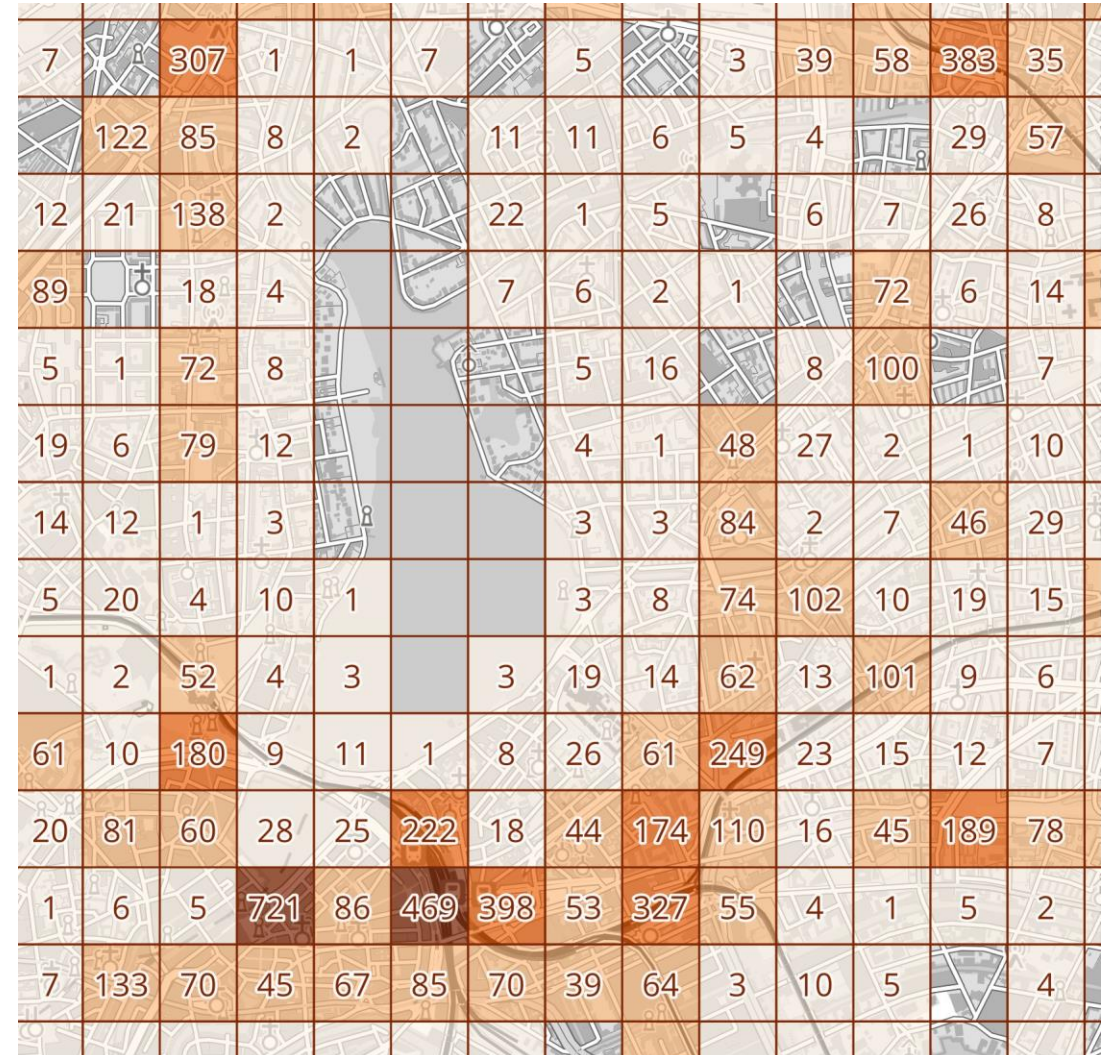


Processing of spatio-temporal event data

Aggregation

Grid cells

- Binning
 - Collecting all spatial features falling into one cell
- With statistical computation
 - `count(feature)`

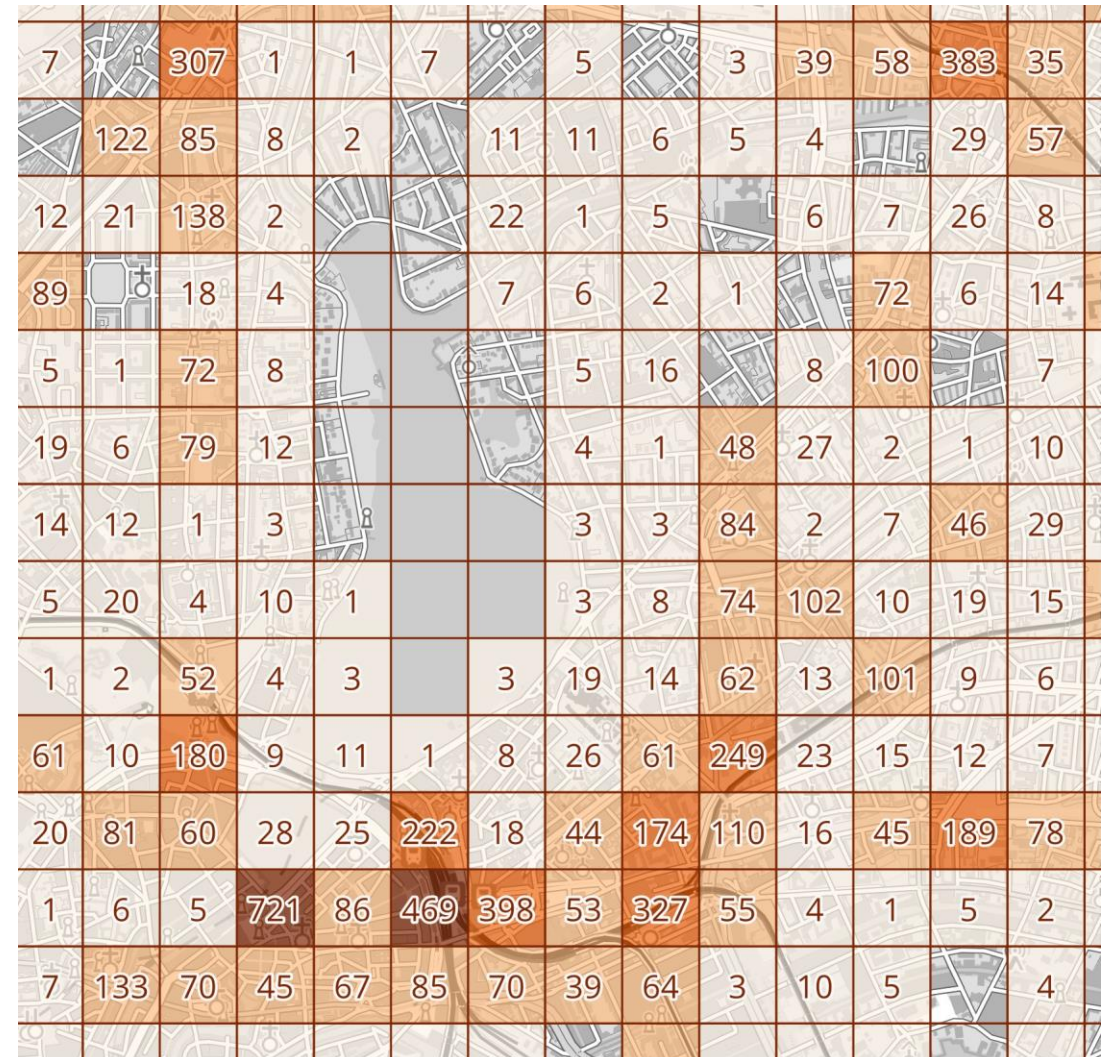


Processing of spatio-temporal event data

Aggregation

Grid cells

- Binning
 - Collecting all spatial features falling into one cell
- With statistical computation
 - `count(feature)`
 - `sum(feature.rainfall)`
 - `avg(feature.temperature)`
 - ...
 - `myComplexFunction(val1, val2)`

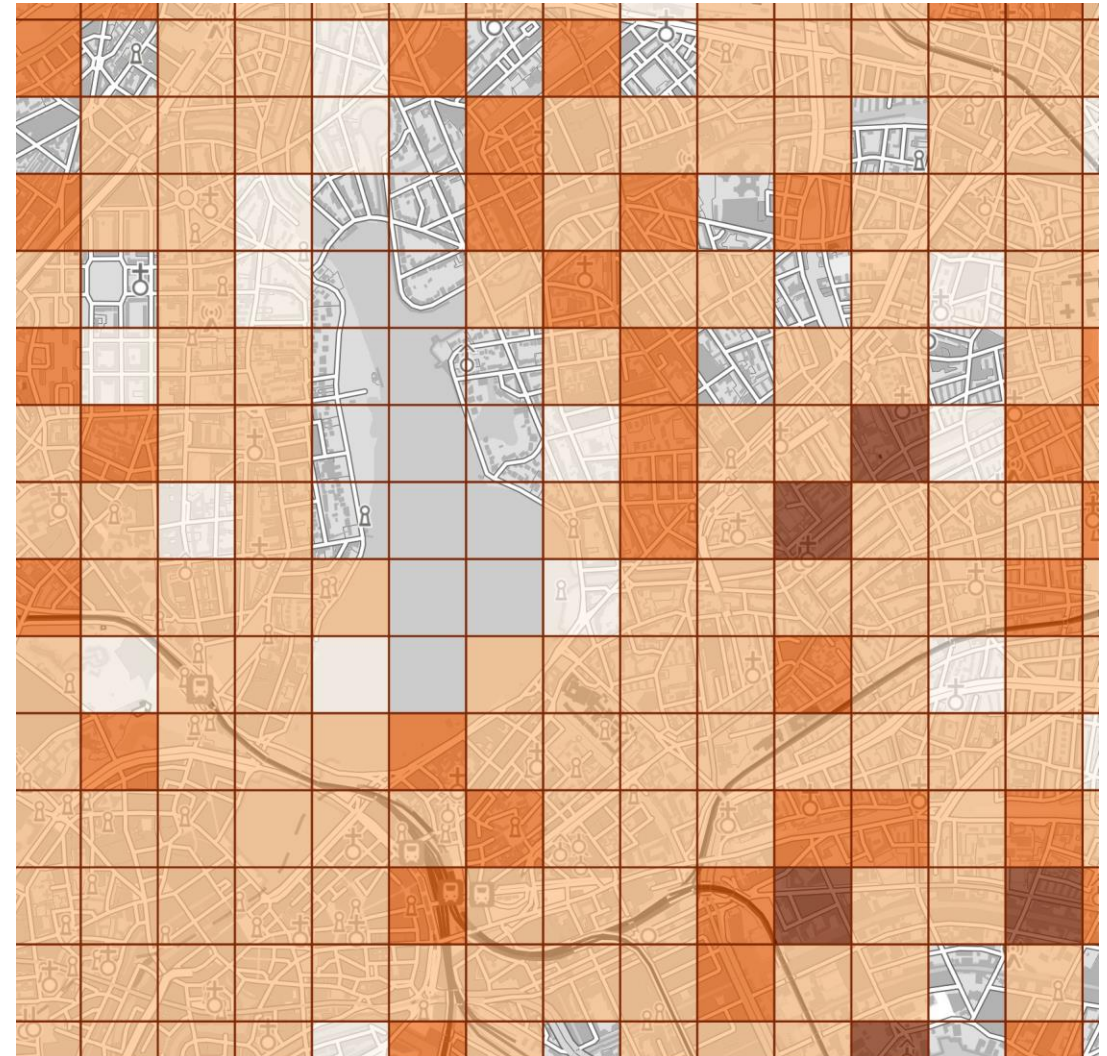


Processing of spatio-temporal event data

Aggregation

Grid cells

- Binning
 - Collecting all spatial features falling into one cell
- With statistical computation
 - `count(feature)`
 - `sum(feature.rainfall)`
 - `avg(feature.temperature)`
 - ...
 - `myComplexFunction(val1, val2)`



Processing of spatio-temporal event data

Aggregation

Data protection

- Does aggregation protect individual movement profiles?

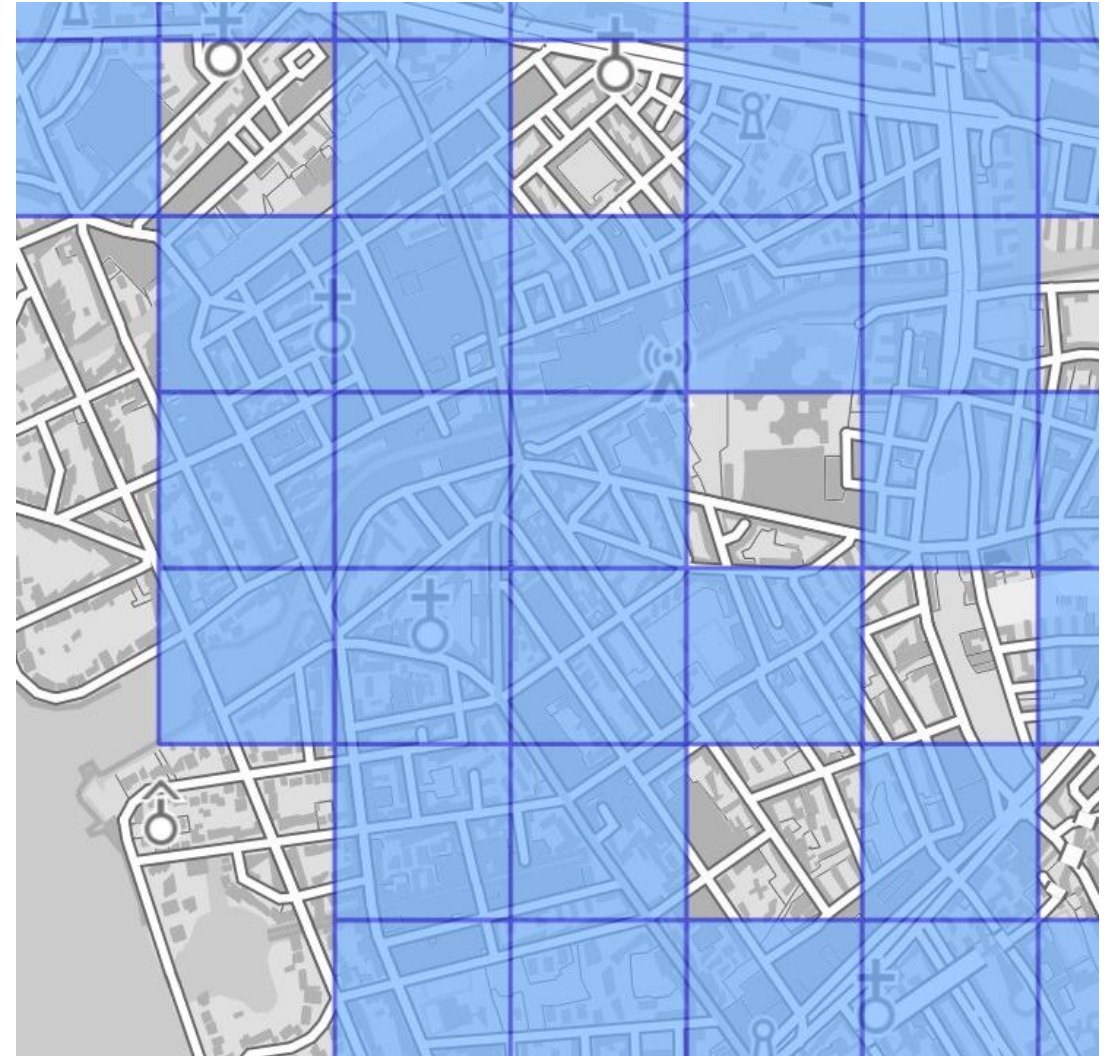


Processing of spatio-temporal event data

Aggregation

Data protection

- Does aggregation protect individual movement profiles?
- Well ...



Processing of spatio-temporal event data

Aggregation

Data protection

- Does aggregation protect individual movement profiles?
- Well ... maybe!
 - Choice of cell size and time window is crucial



Processing of spatio-temporal event data

Common problems

- OGC web services scale poorly with raw data volume
- Rendering performance drops as the volume of data increases
 - Data must first be sent to the client
- Therefore: aggregation in backend
 - But which grid should be used?



Grids and grid systems

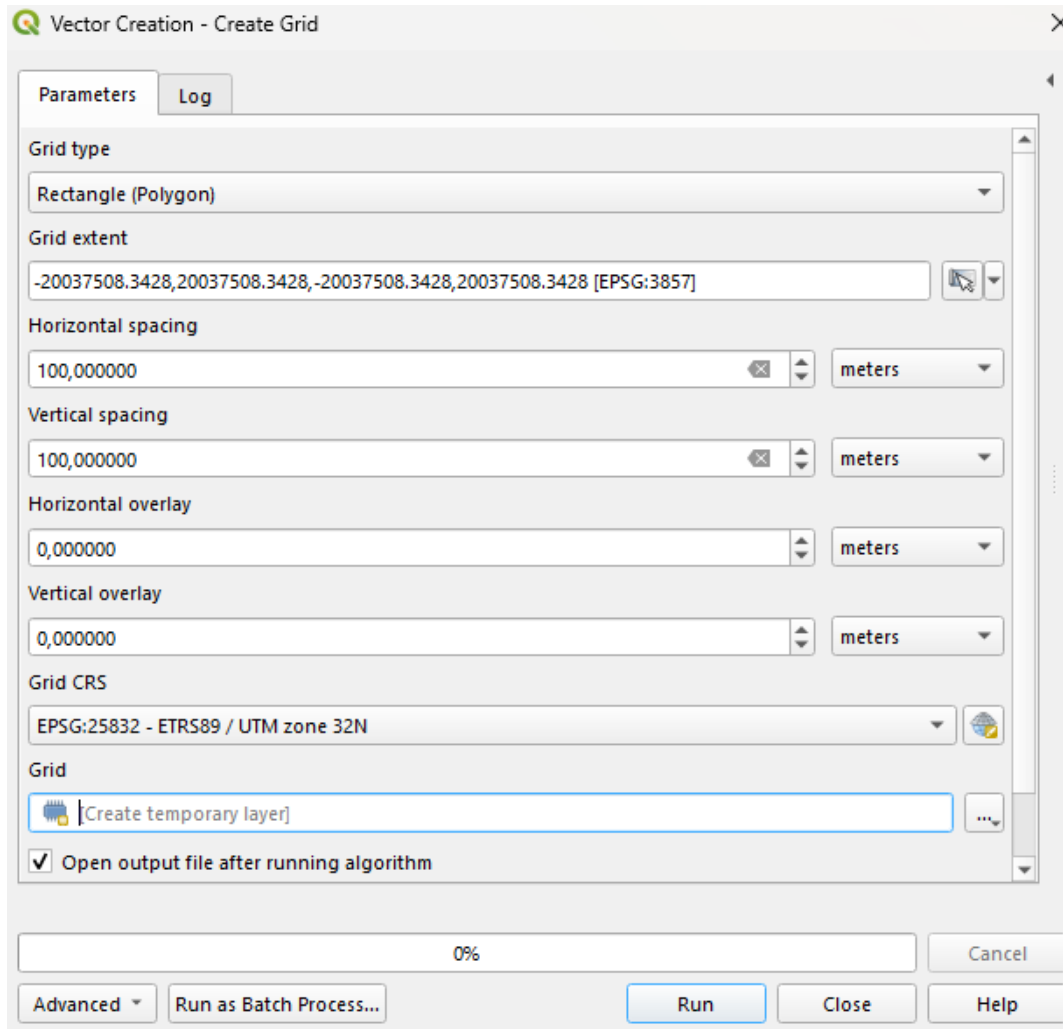
Grids and grid systems



- User-defined grids
- Official, national grids
- Discrete global grids

User-defined grids

Quickly clicked and generated



Vector Creation - Create Grid

Parameters Log

Grid type
Rectangle (Polygon)

Grid extent
-20037508.3428,20037508.3428,-20037508.3428,20037508.3428 [EPSG:3857]

Horizontal spacing
100,000000 meters

Vertical spacing
100,000000 meters

Horizontal overlay
0,000000 meters

Vertical overlay
0,000000 meters

Grid CRS
EPSG:25832 - ETRS89 / UTM zone 32N

Grid
[Create temporary layer]

☒ Open output file after running algorithm

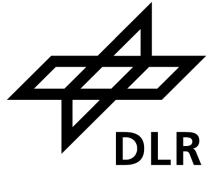
0%

Cancel

Advanced Run as Batch Process... Run Close Help

User-defined grids

Quickly clicked and generated



Vector Creation - Create Grid

Parameters Log

Grid type
Rectangle (Polygon)

Grid extent
-20037508.3428,20037508.3428,-20037508.3428,20037508.3428 [EPSG:3857]

Horizontal spacing
100,000000

Vertical spacing
100,000000

Horizontal overlay
0,000000

Vertical overlay
0,000000

Grid CRS
EPSG:25832 - ETRS89 / UTM zone 32N

Grid
 [Create temporary layer]

☒ Open output file after running algorithm

0%

Advanced Run as Batch Process... Run Close Help

7.3. Geometry Constructors

[ST_Collect](#) — Creates a GeometryCollection or Multi* geometry from a set of geometries.

[ST_LineFromMultiPoint](#) — Creates a LineString from a MultiPoint geometry.

[ST_MakeEnvelope](#) — Creates a rectangular Polygon from minimum and maximum coordinates.

[ST_MakeLine](#) — Creates a LineString from Point, MultiPoint, or LineString geometries.

[ST_MakePoint](#) — Creates a 2D, 3DZ or 4D Point.

[ST_MakePointM](#) — Creates a Point from X, Y and M values.

[ST_MakePolygon](#) — Creates a Polygon from a shell and optional list of holes.

[ST_Point](#) — Creates a Point with X, Y and SRID values.

[ST_PointZ](#) — Creates a Point with X, Y, Z and SRID values.

[ST_PointM](#) — Creates a Point with X, Y, M and SRID values.

[ST_PointZM](#) — Creates a Point with X, Y, Z, M and SRID values.

[ST_Polygon](#) — Creates a Polygon from a LineString with a specified SRID.

[ST_TileEnvelope](#) — Creates a rectangular Polygon in Web Mercator (SRID:3857) using the XYZ tile system.

[ST_HexagonGrid](#) — Returns a set of hexagons and cell indices that completely cover the bounds of the geometry argument.

[ST_Hexagon](#) — Returns a single hexagon, using the provided edge size and cell coordinate within the hexagon grid space.

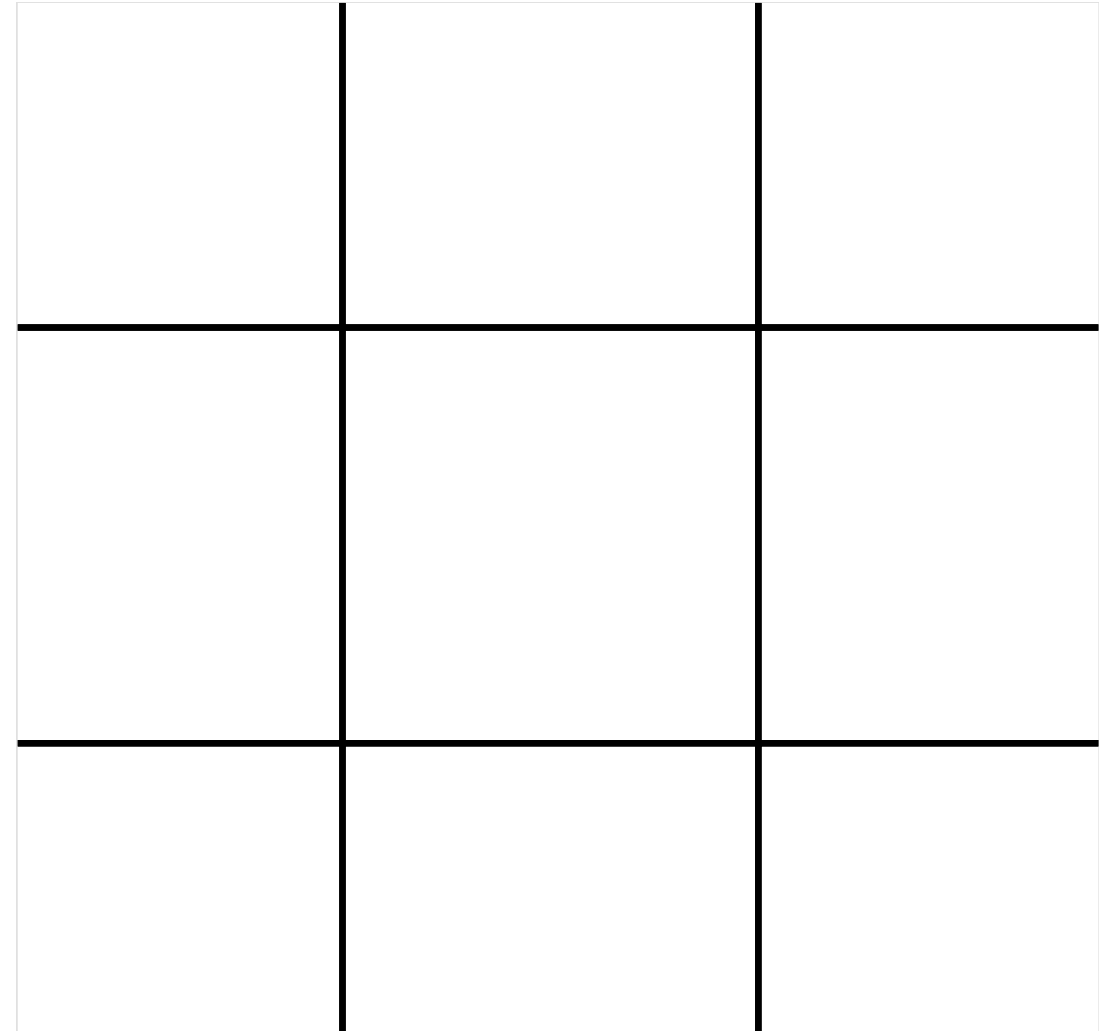
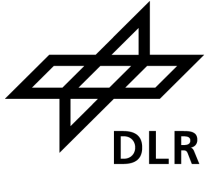
[ST_SquareGrid](#) — Returns a set of grid squares and cell indices that completely cover the bounds of the geometry argument.

[ST_Square](#) — Returns a single square, using the provided edge size and cell coordinate within the square grid space.

[ST_Letters](#) — Returns the input letters rendered as geometry with a default start position at the origin and default text height of 100.

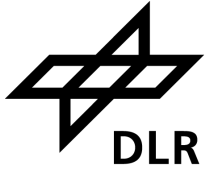
User-defined grids

Quickly clicked and generated

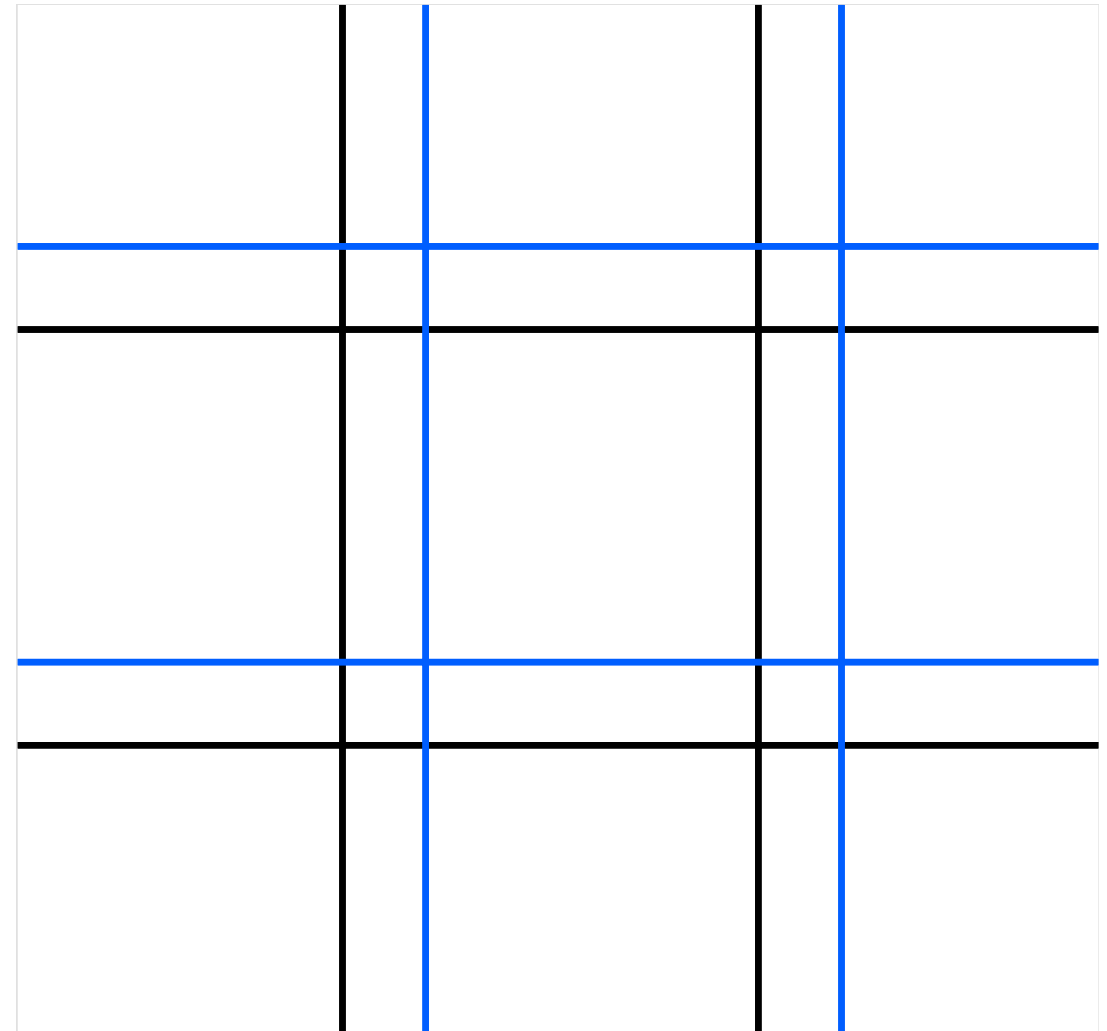


User-defined grids

Quickly clicked and generated

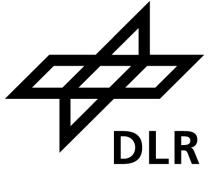


- Flexible geometry
 - Arbitrary coordinate origin
 - User-defined projection

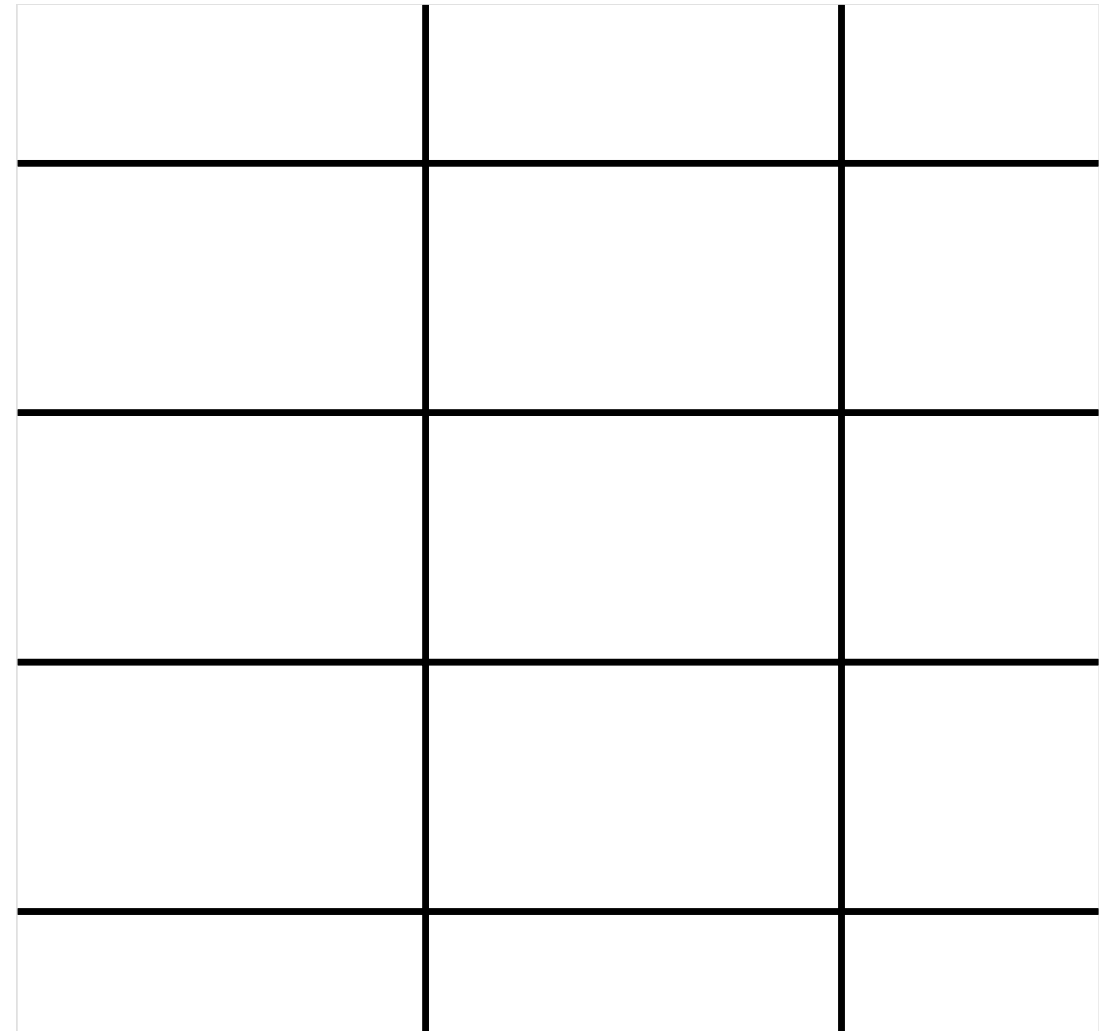


User-defined grids

Quickly clicked and generated



- Flexible geometry
 - Arbitrary coordinate origin
 - User-defined projection

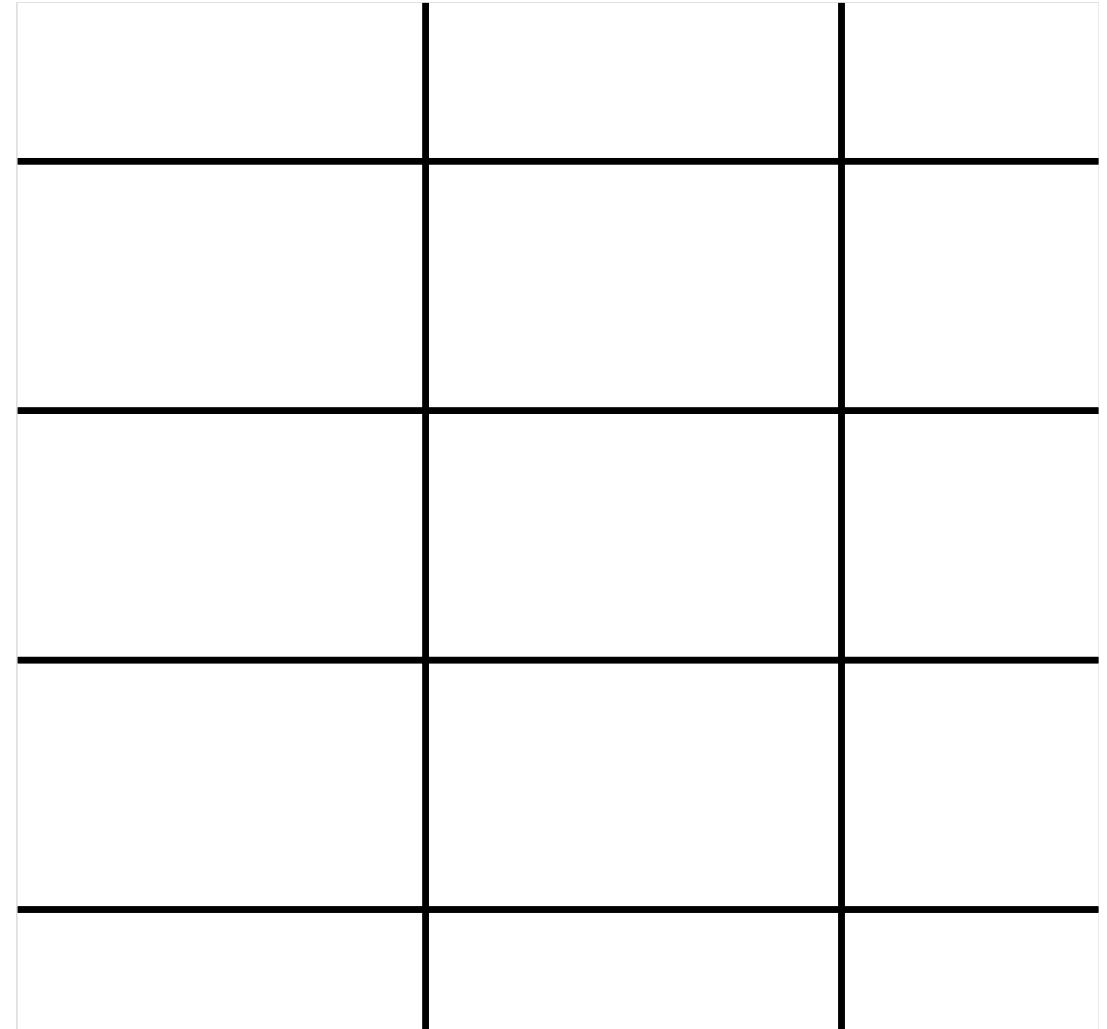


User-defined grids

Quickly clicked and generated

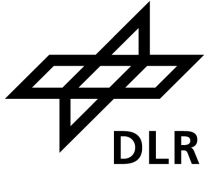


- Flexible geometry
 - Arbitrary coordinate origin
 - User-defined projection
- Not “sustainable”
 - Poor comparability of cell data in user-defined grids



Official, national grids

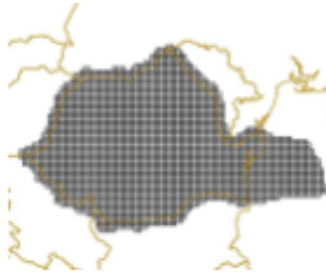
EEA reference grid for Romania



Official, national grids

EEA reference grid for Romania

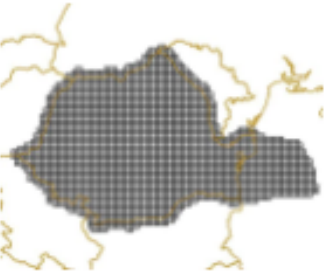
- Coordinate reference system
 - ETRS/LAEA, equal area
- Licence: CC BY 4.0

☐		EEA reference grid for Romania (100km), May 2013
		The grid is based on proposal at the 1st European Workshop on Reference Grids in 2003 and later INSPIRE ...
☐		EEA reference grid for Romania (10km), May 2013
		The grid is based on proposal at the 1st European Workshop on Reference Grids in 2003 and later INSPIRE ...
☐		EEA reference grid for Romania (1km), May 2013
		The grid is based on proposal at the 1st European Workshop on Reference Grids in 2003 and later INSPIRE ...

Official, national grids

EEA reference grid for Romania

- Coordinate reference system
 - ETRS/LAEA, equal area
- Licence: CC BY 4.0
- Resolutions: just 3

☐		EEA reference grid for Romania (100km), May 2013
		The grid is based on proposal at the 1st European Workshop on Reference Grids in 2003 and later INSPIRE ...
☐		EEA reference grid for Romania (10km), May 2013
		The grid is based on proposal at the 1st European Workshop on Reference Grids in 2003 and later INSPIRE ...
☐		EEA reference grid for Romania (1km), May 2013
		The grid is based on proposal at the 1st European Workshop on Reference Grids in 2003 and later INSPIRE ...

User-defined and official grids

Disadvantages of both approaches



- Poor comparability of cell data in a global context

User-defined and official grids

Disadvantages of both approaches



- Poor comparability of cell data in a global context

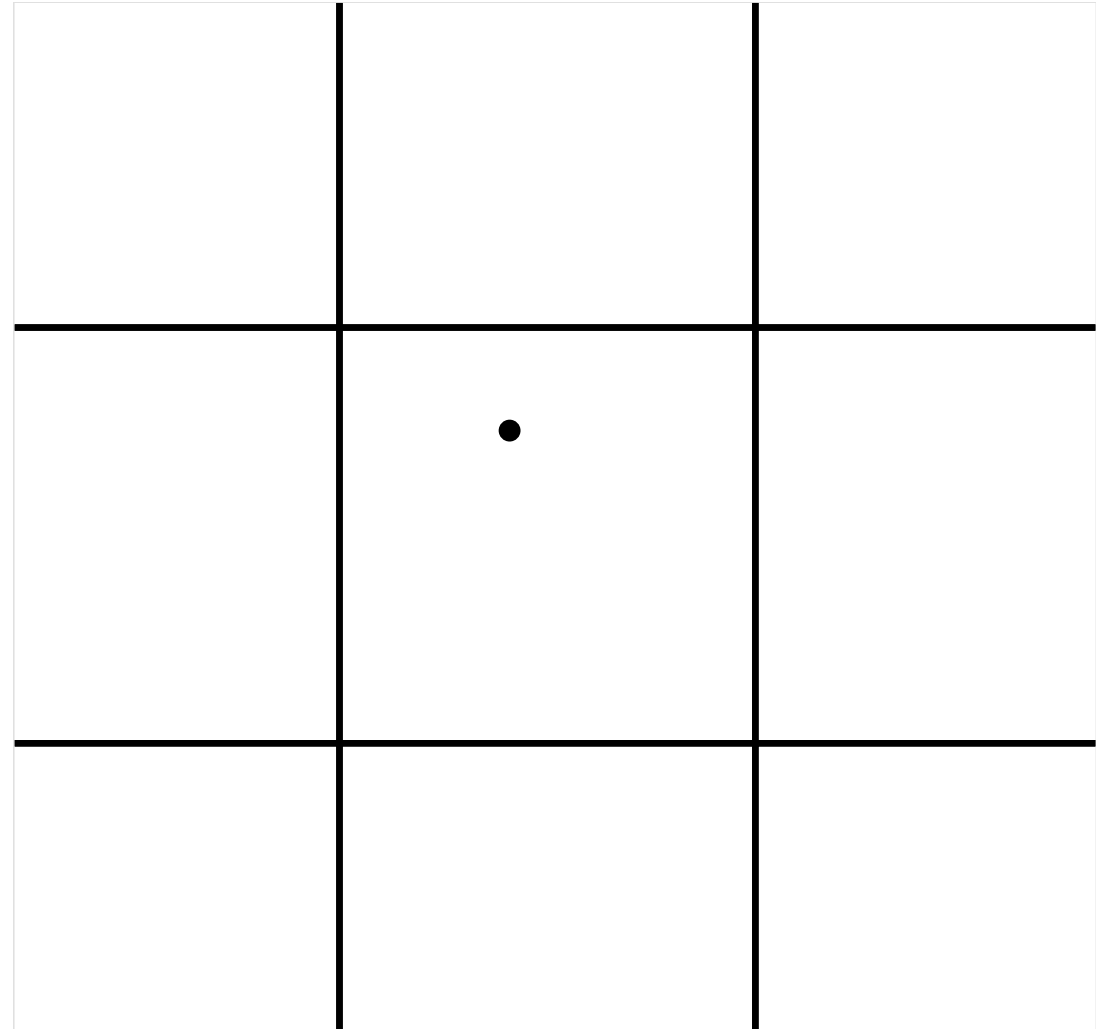
“[..] Other grids could be also used, however they need a lot of harmonisation work, as well as a number of conversion tools. [..]”

User-defined and official grids

Disadvantages of both approaches



- Poor comparability of cell data in a global context
- Tooling: none
- Cumbersome aggregation (binning)
 - `GROUP BY`
`ST_Intersects(point, cell)`

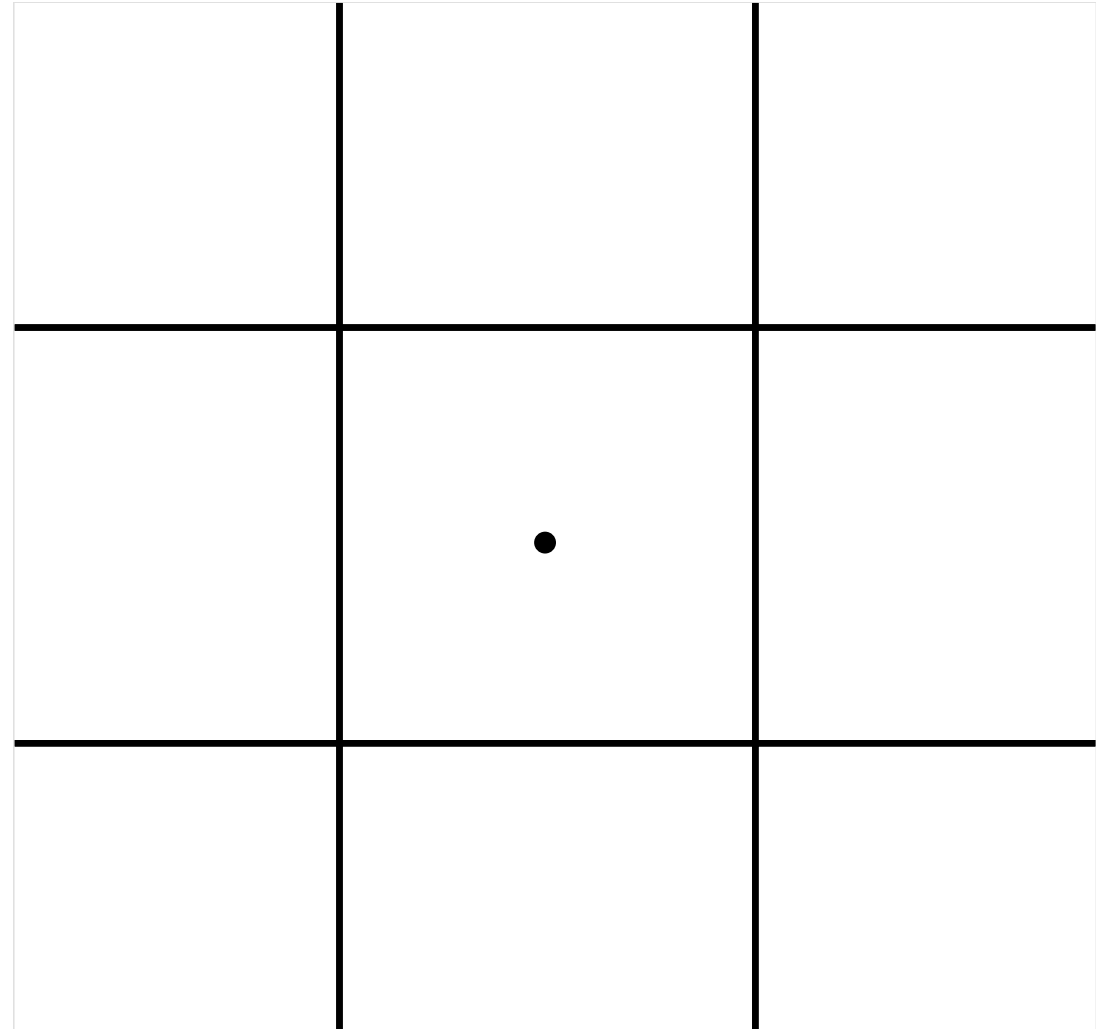


User-defined and official grids

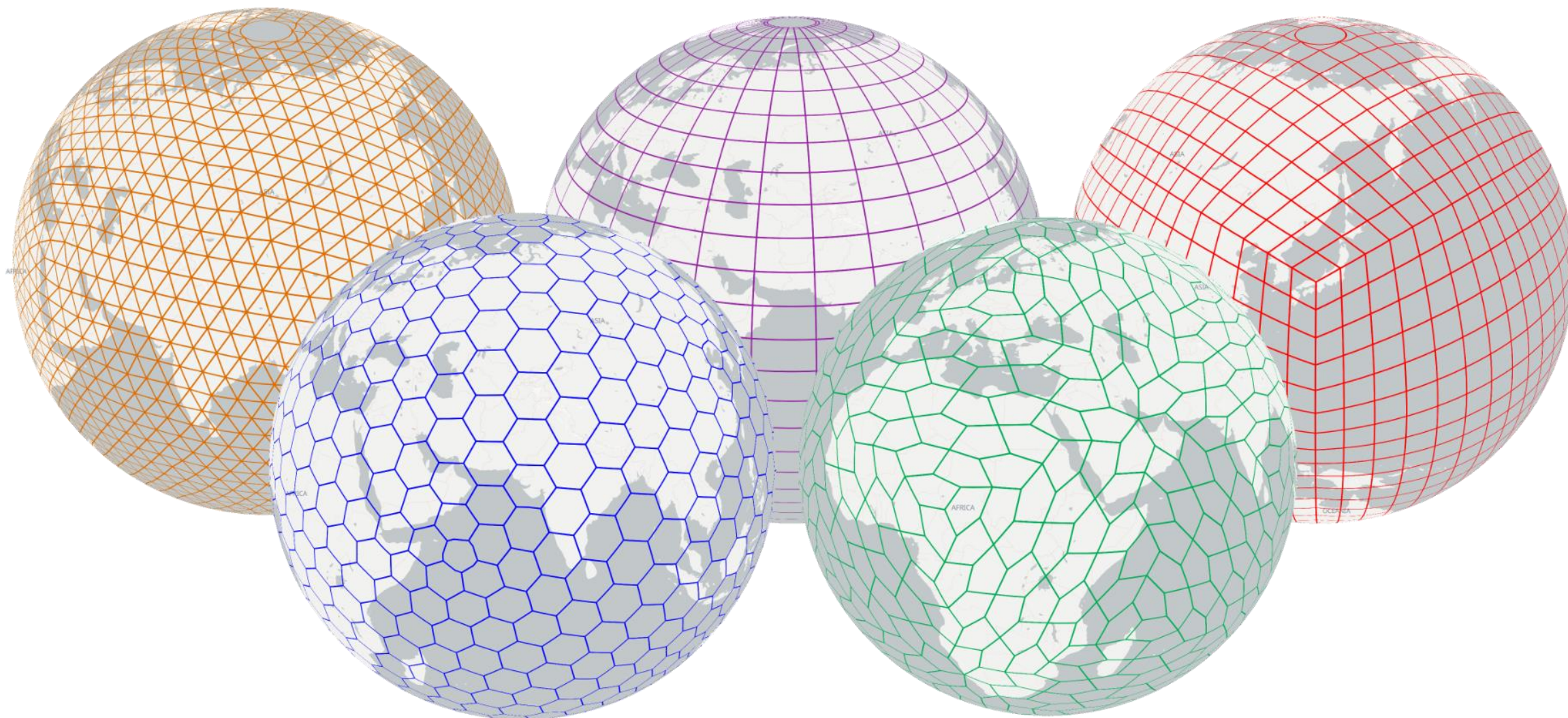
Disadvantages of both approaches



- Poor comparability of cell data in a global context
- Tooling: none
- Cumbersome aggregation (binning)
 - `GROUP BY`
`ST_Intersects(point, cell)`
 - `GROUP BY`
`ST_SnapToGrid(point, 500.0)`



Discrete global grid systems DGGS



Discrete global grid systems



Many different

- Google S2
- Uber H3
- A5
- IGEO7
- HEALPix
- IVEA7H
- Geohash
- ...

Discrete global grid systems

Many different

- Google S2
- Uber H3
- A5
- IGEO7
- HEALPix
- IVEA7H
- Geohash
- ...



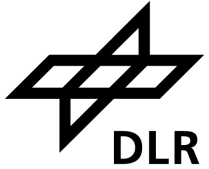
Discrete global grid systems

Key arguments

- Enables global analyses
 - Independent of local projections
 - Wide range of resolution levels

H3

Res	Average edge length (Km)
0	1281.256011
1	483.0568391
2	182.5129565
3	68.97922179
4	26.07175968
5	9.854090990
6	3.724532667
7	1.406475763
8	0.531414010
9	0.200786148
10	0.075863783
11	0.028663897
12	0.010830188
13	0.004092010
14	0.001546100
15	0.000584169



Discrete global grid systems

Key arguments

- Enables global analyses
 - Independent of local projections
 - Wide range of resolution levels
- Hierarchical
 - Defined parent-child relationships
 - Defined conversion between resolution levels

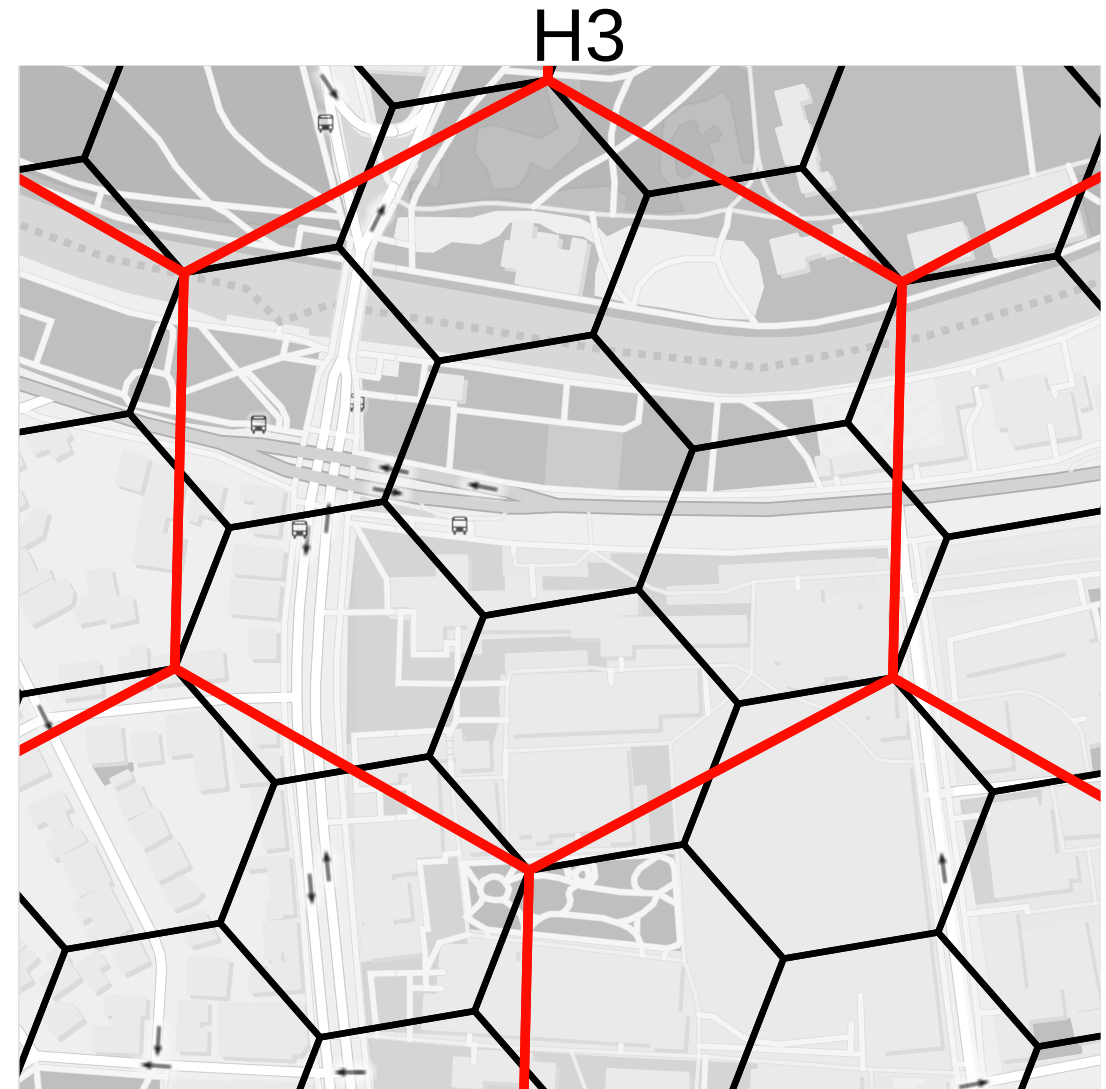


Base map: VersaTiles Graybeard, map data © OpenStreetMap contributors, [ODbL](#)

Discrete global grid systems

Key arguments

- Enables global analyses
 - Independent of local projections
 - Wide range of resolution levels
- Hierarchical
 - Defined parent-child relationships
 - Defined conversion between resolution levels

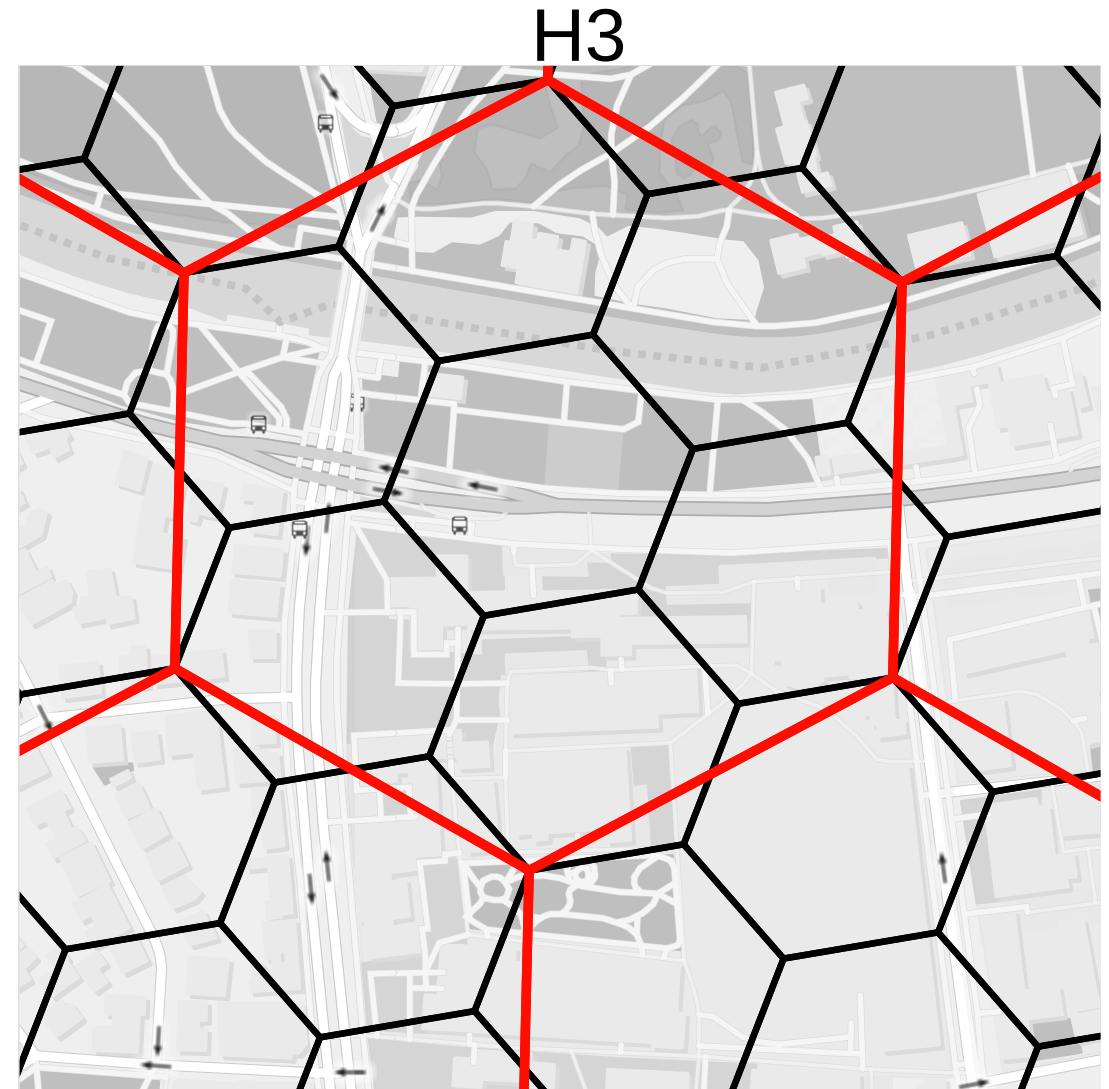


Base map: VersaTiles Graybeard, map data © OpenStreetMap contributors, [ODbL](#)

Discrete global grid systems

Key arguments

- Unique cell IDs as indices
 - Comparability and “portability”
 - Stability of algorithms

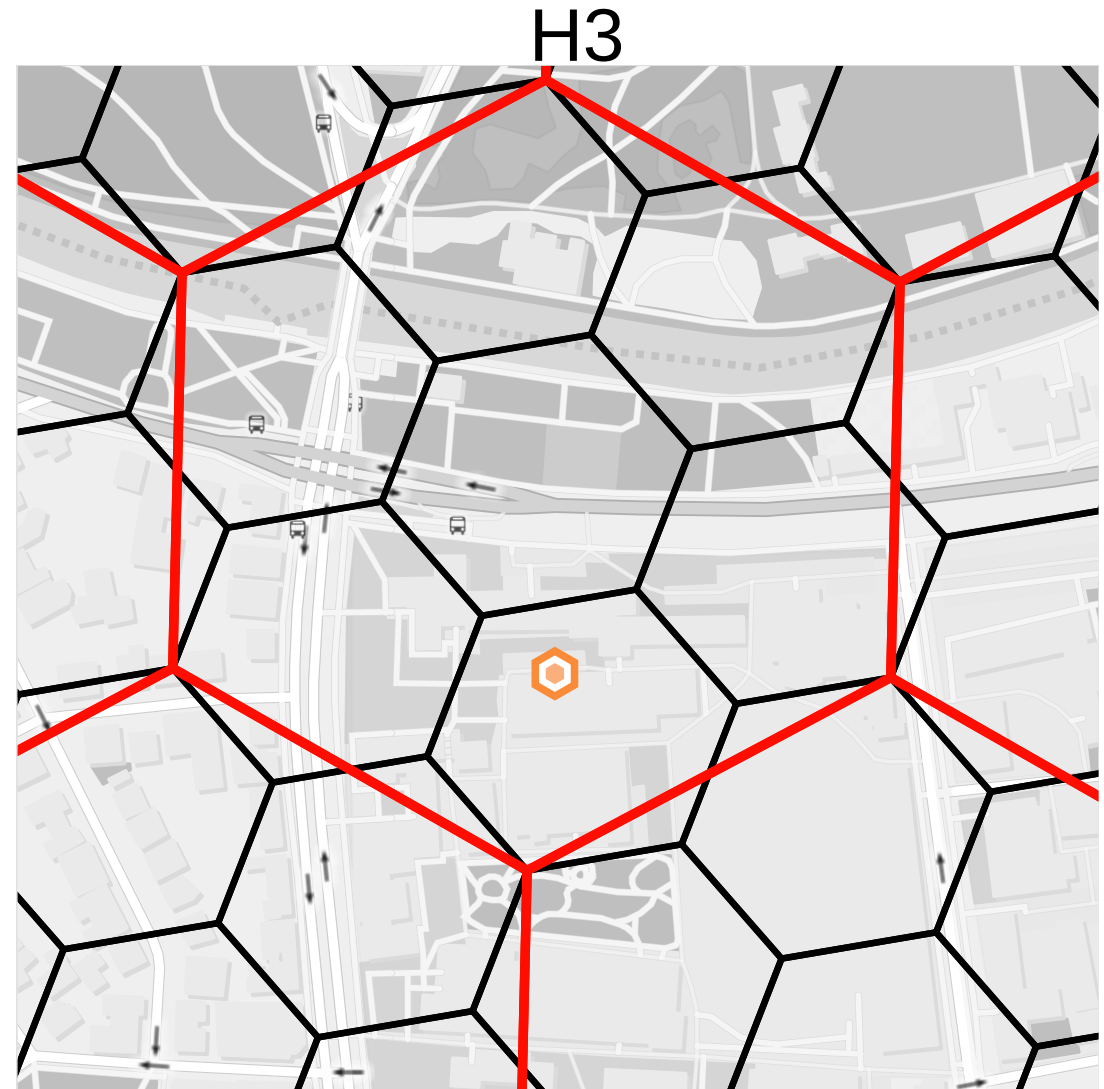


Discrete global grid systems

Key arguments



- Unique cell IDs as indices
 - Comparability and “portability”
 - Stability of algorithms
- Tooling for diverse software stacks
- `latLngToCell(lat, lng, res)`
 - `latLngToCell(45.747, 21.227, 10)`



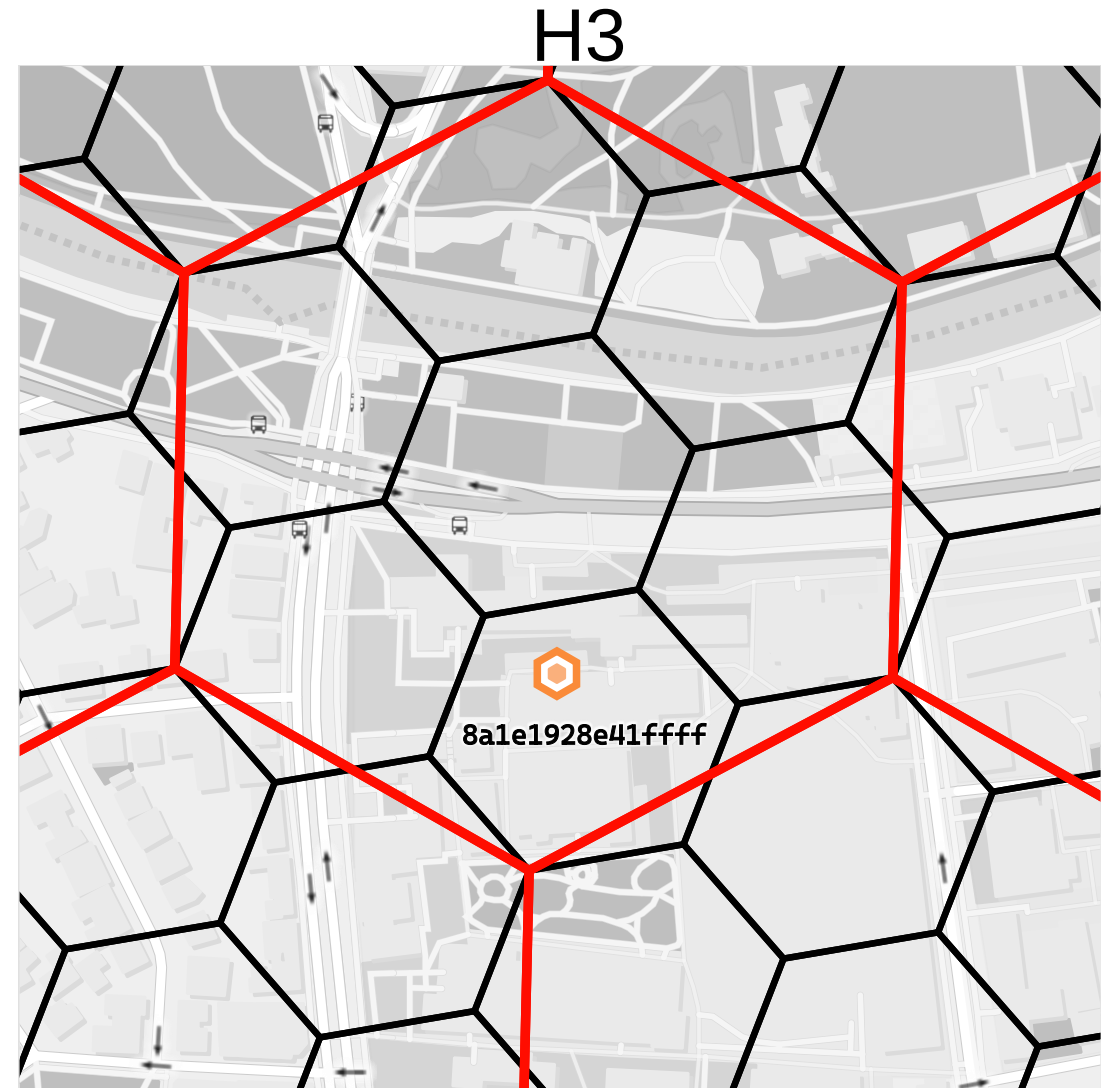
Base map: VersaTiles Graybeard, map data © OpenStreetMap contributors, [ODbL](#)

Discrete global grid systems

Key arguments



- Unique cell IDs as indices
 - Comparability and “portability”
 - Stability of algorithms
- Tooling for diverse software stacks
- `latLngToCell(lat, lng, res)`
 - `latLngToCell(45.747, 21.227, 10)`
→ cellID **8a1e1928e41ffff**



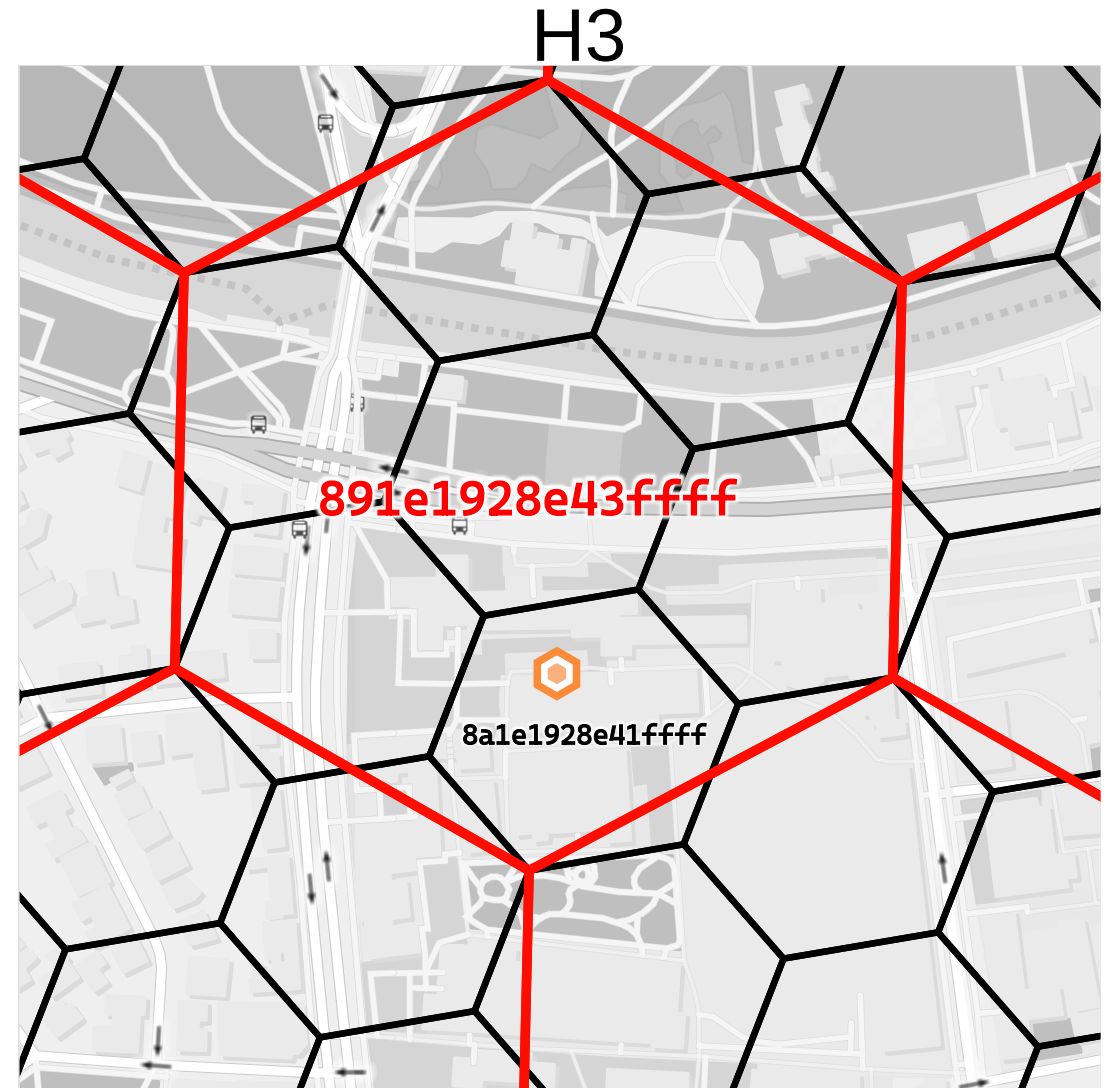
Base map: VersaTiles Graybeard, map data © OpenStreetMap contributors, [ODbL](#)

Discrete global grid systems

Key arguments



- Unique cell IDs as indices
 - Comparability and “portability”
 - Stability of algorithms
- Tooling for diverse software stacks
- `latLngToCell(lat, lng, res)`
 - `latLngToCell(45.747, 21.227, 10)`
→ cellID `8a1e1928e41ffff`
 - `latLngToCell(45.747, 21.227, 9)`
→ cellID `891e1928e43ffff`

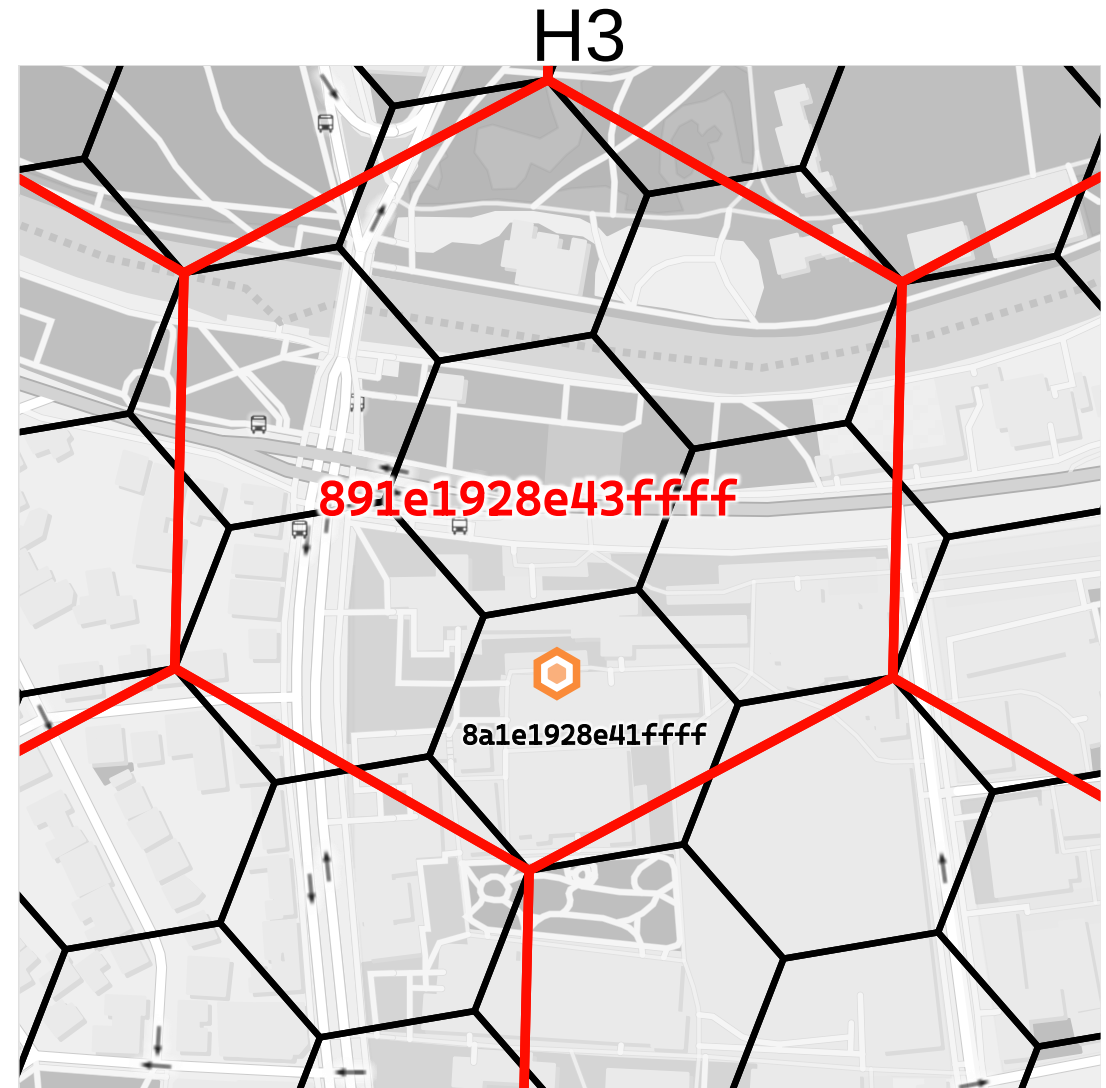


Base map: VersaTiles Graybeard, map data © OpenStreetMap contributors, [ODbL](#)

Discrete global grid systems

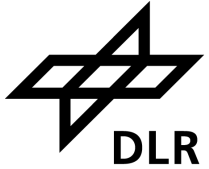
Key arguments

- Unique cell IDs as indices
 - Comparability and “portability”
 - Stability of algorithms
- Tooling for diverse software stacks
- `latLngToCell(lat, lng, res)`
 - `latLngToCell(45.747, 21.227, 10)`
→ cellID `8a1e1928e41ffff`
 - `latLngToCell(45.747, 21.227, 9)`
→ cellID `891e1928e43ffff`
- GROUP BY cellID



Discrete global grid systems

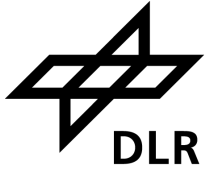
Brief comparison



Property	INSPIRE grid	S2	H3
Region of application	RO, EU	Global	Global
Working coordinate reference system	Projected 2D, LAEA	WGS84 (internally, cube faces projected on sphere)	WGS84 (internally, icosahedron faces projected on sphere)
Geometry	Square	“Square“, quadtree-like	Hexagon
Resolution levels	3	31	16
Finest resolution	100 m	~ 1 cm	~ 58 cm
Stability of hierarchy	Good	Good (×4)	Average (~×7)
ID codes the hierarchy	Implicit	Yes	Yes
Open-source ecosystem	Small	Medium	Large
Licence	CC BY 4.0	Apache 2.0	Apache 2.0

Discrete global grid systems

Glorifying H3?

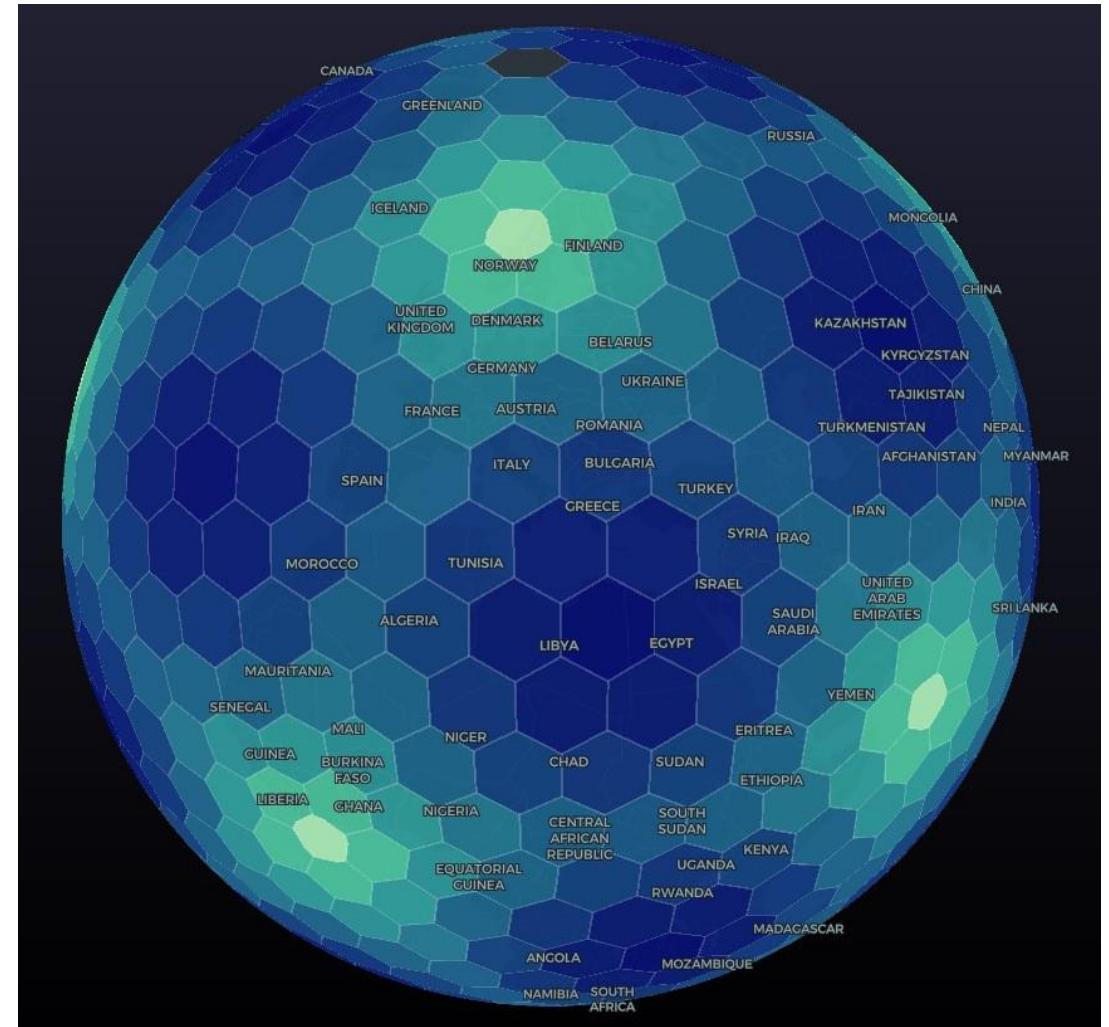


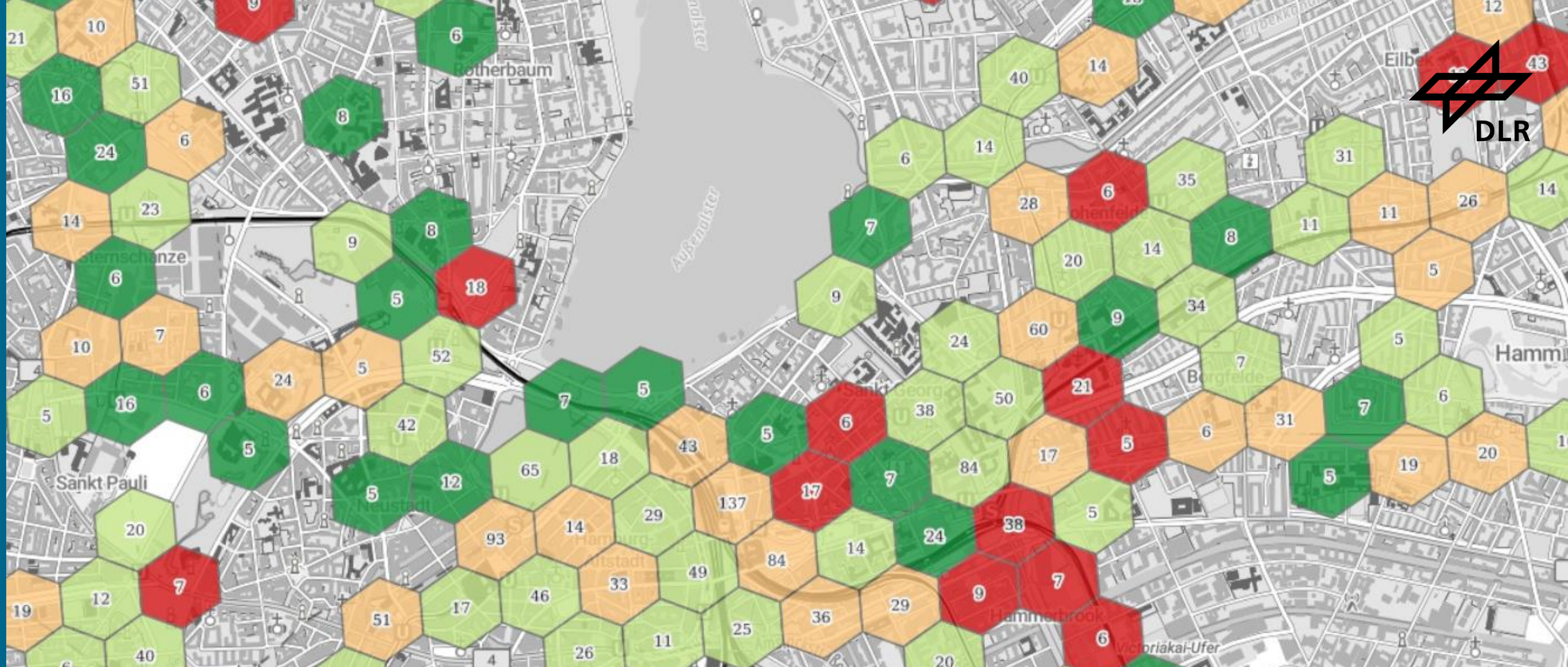
- [illegible]

Discrete global grid systems

Glorifying H3?

- Area variance as (huge) drawback
 - *“H3 cells vary in size across the globe, with the ratio between the largest and smallest cell areas being roughly 2”*
- For hexagonal area equality
→ IGEO7

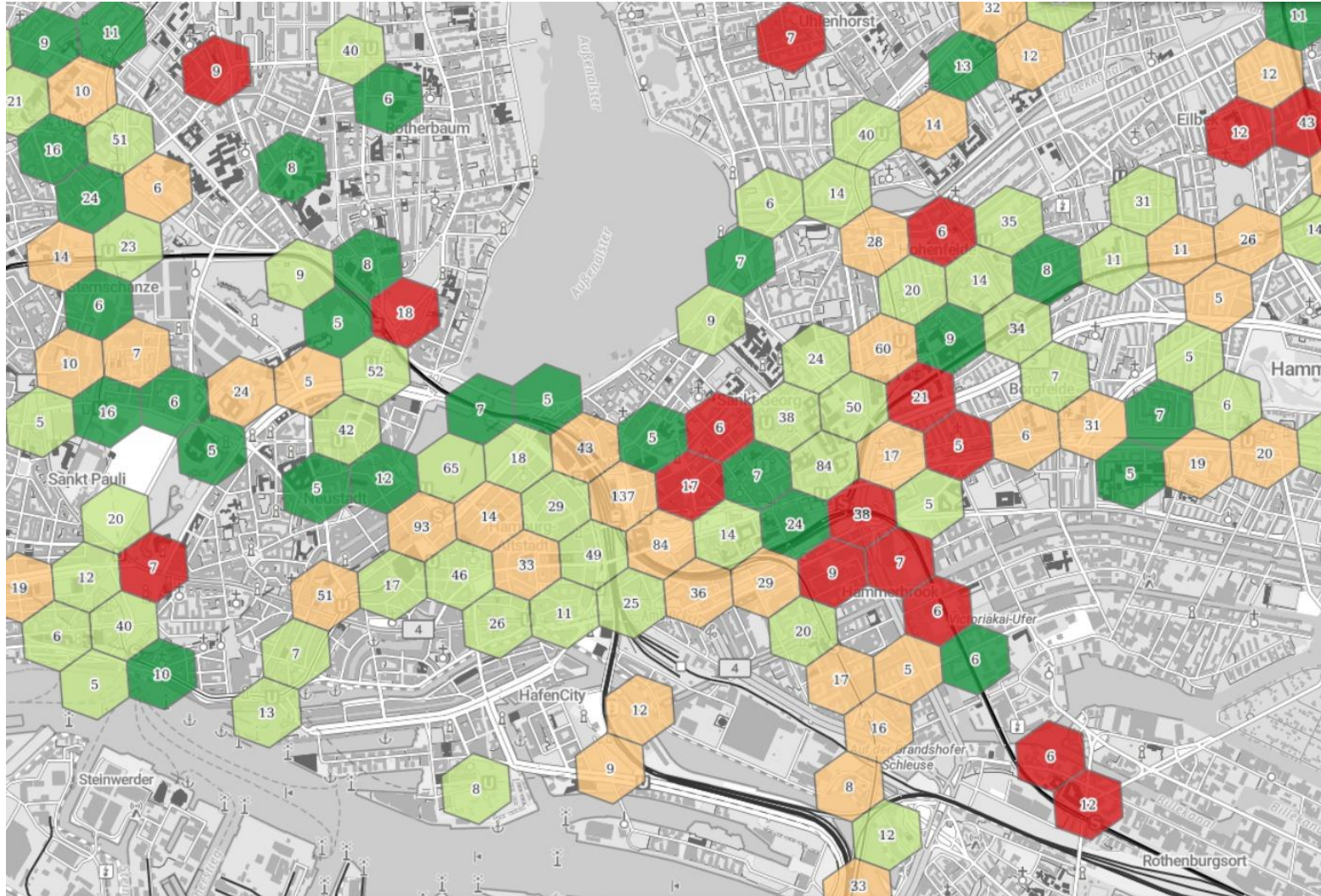
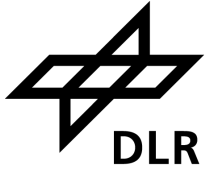




Example: ExperienceAtlas

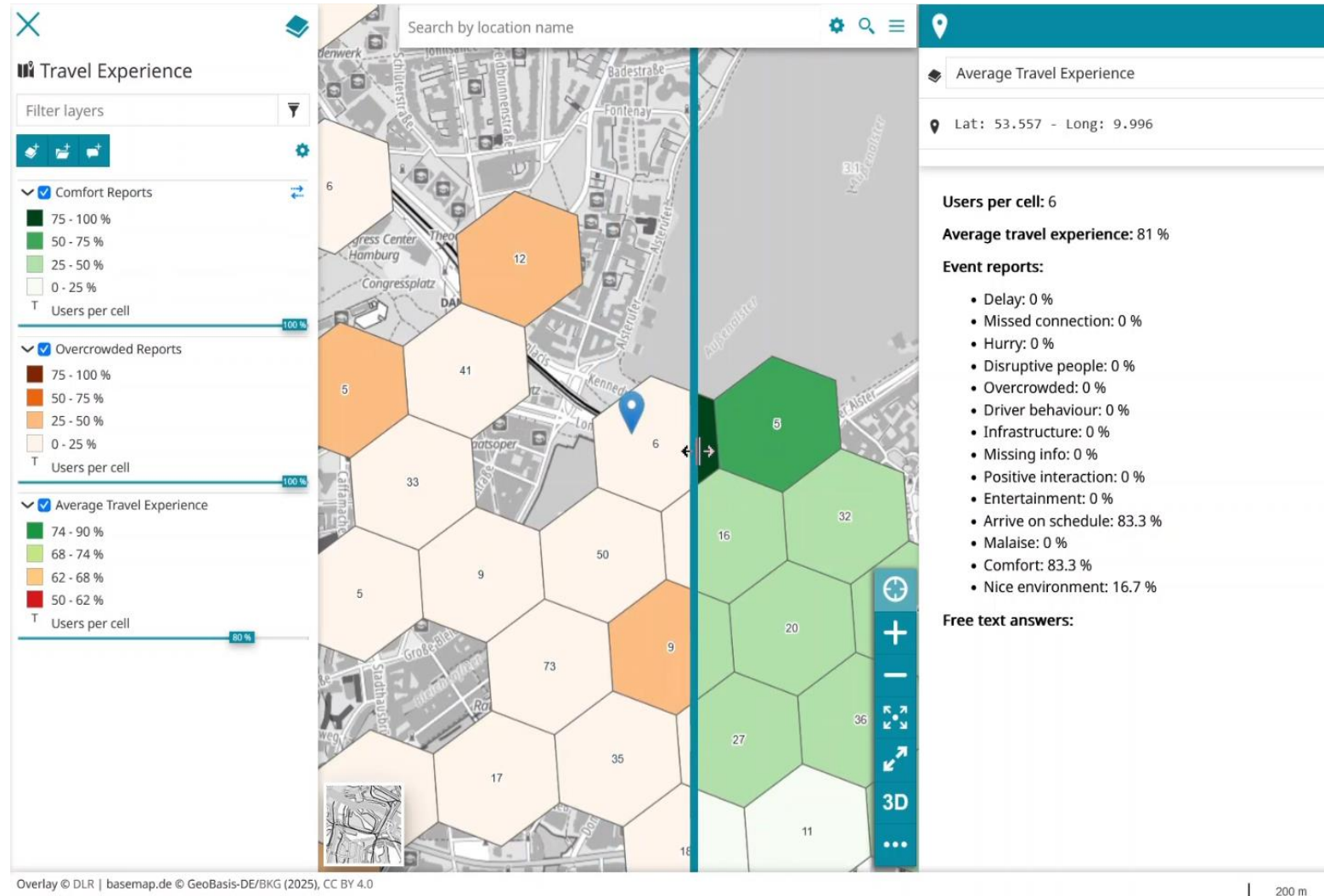
Project ExperienceAtlas

Demo as web map and video

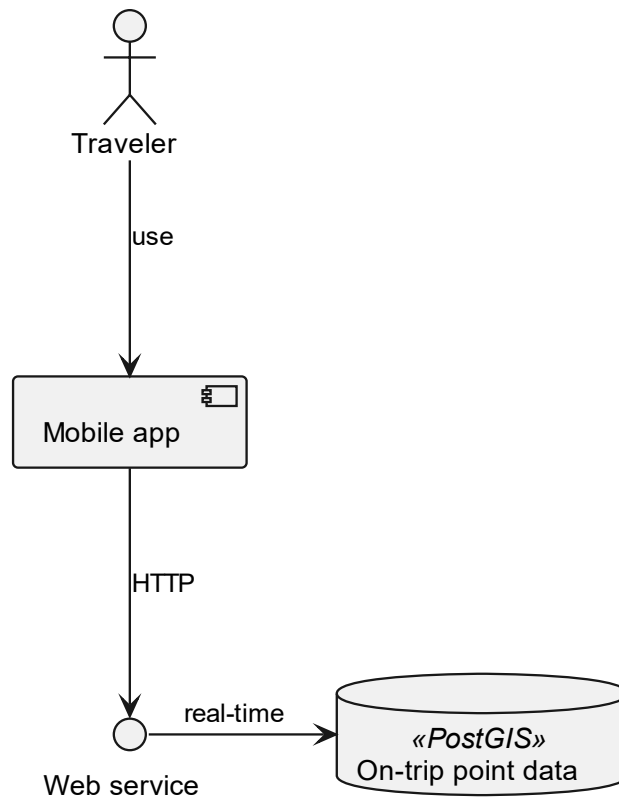


Project ExperienceAtlas

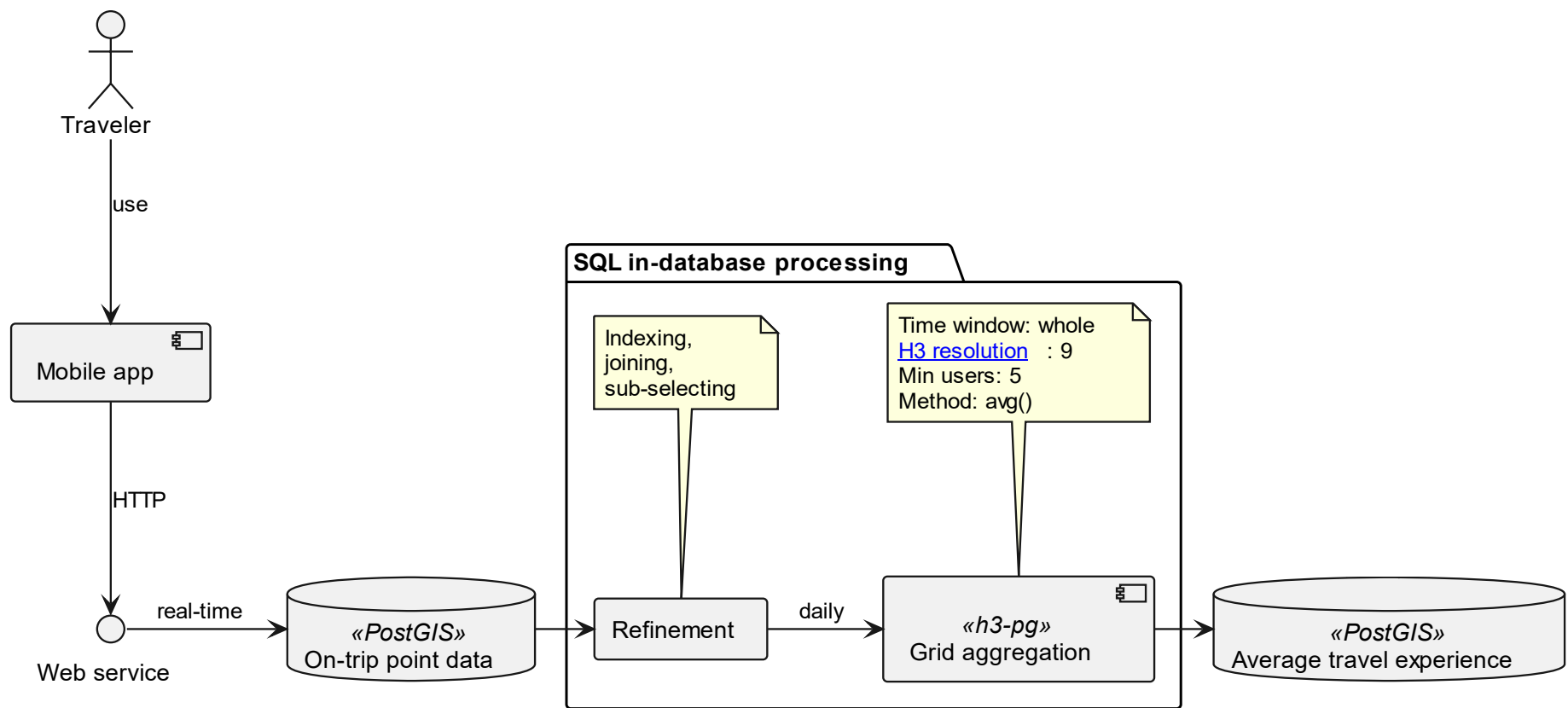
Demo as web map and video



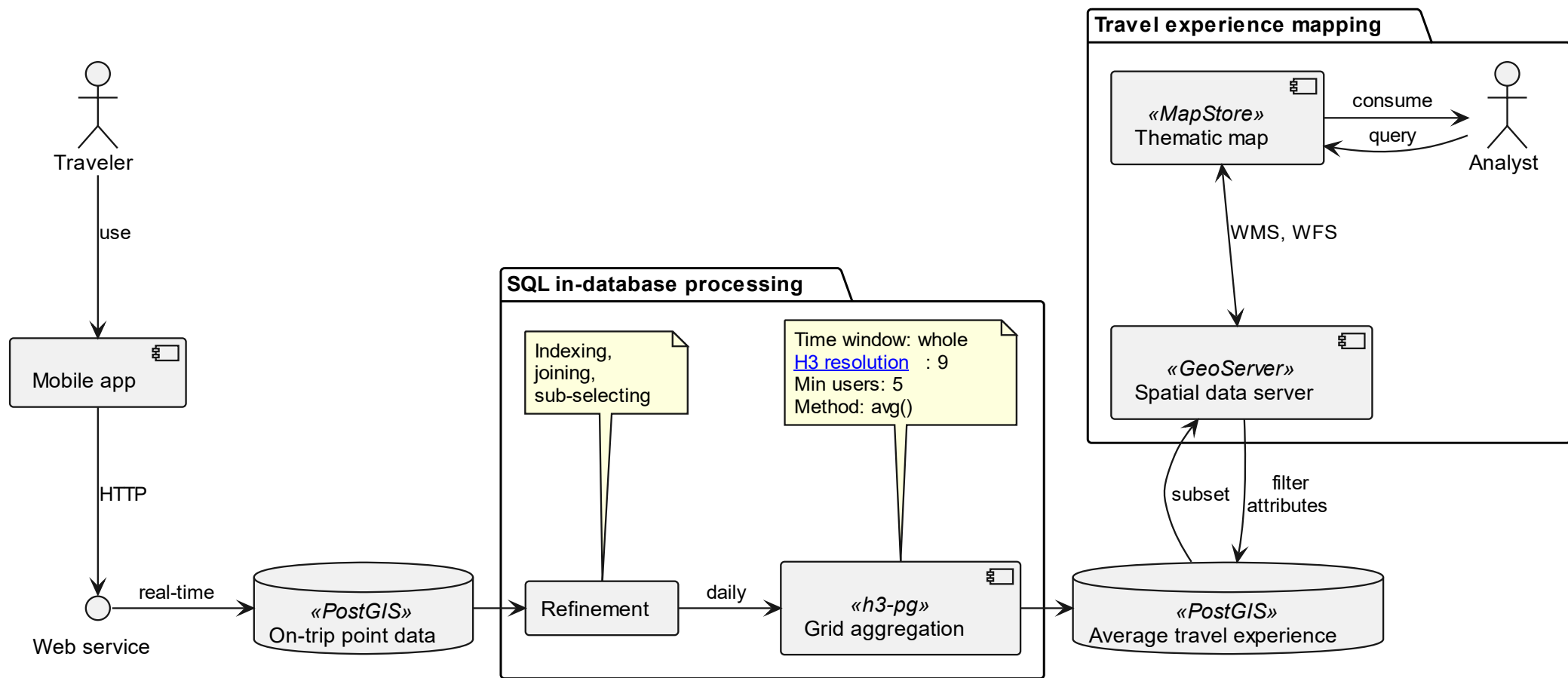
System architecture



System architecture



System architecture

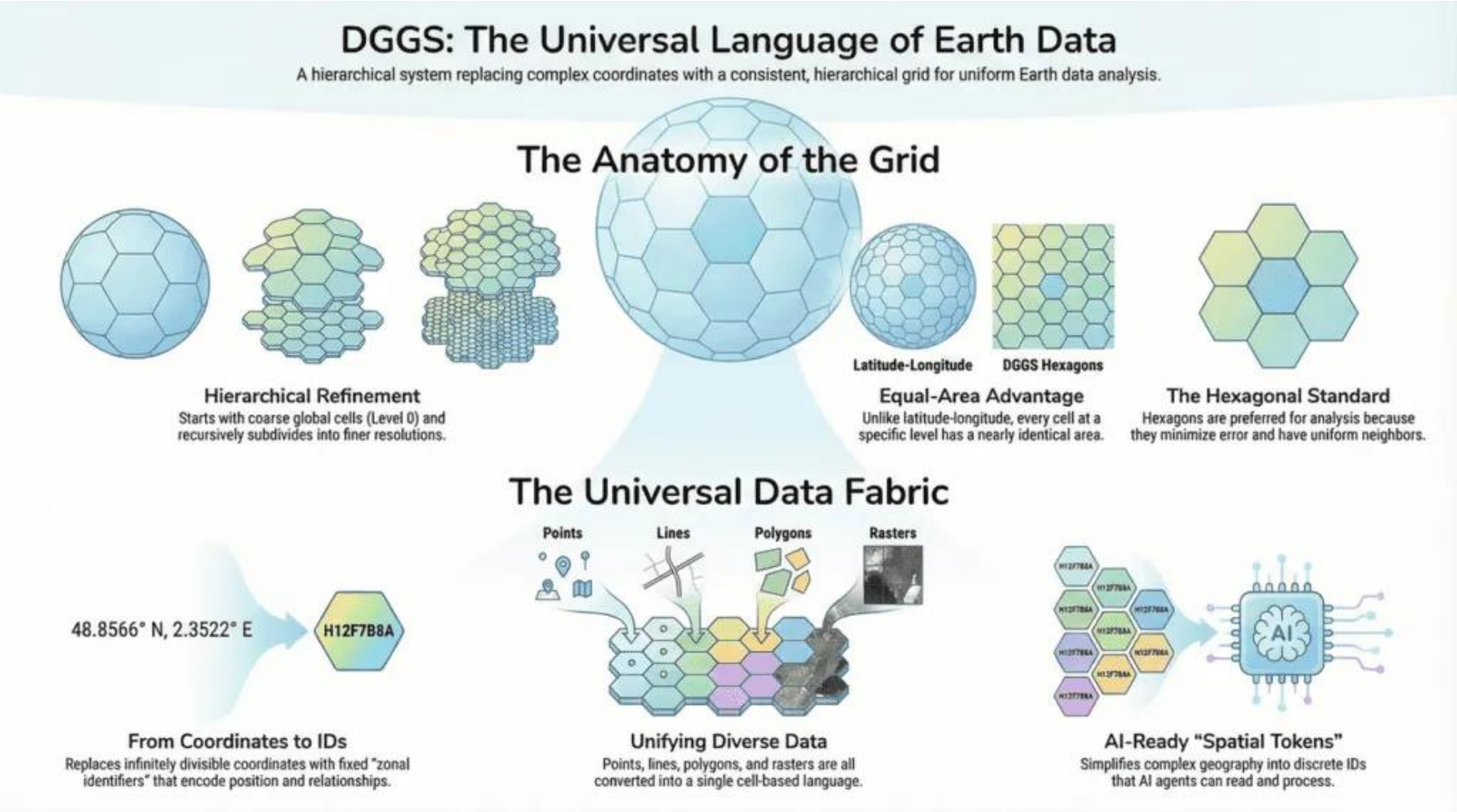




Outlook and OGC activities

OGC AI-DGGS Pilot

“Spatial tokens” as common spatial language



*“DGGS cells are to geospatial AI
what tokens are to language models”*

Sources and resources:

- [From chat to map: How DGGS + Agentic AI turn geodata into verifiable decision-making bases](#)
- [AI-DGGS Pilot for Disaster Management](#)
- [Video recording](#) of OGC's AI-DGGS workshops

- DGGAL, the Discrete Global Grid Abstraction Library
 - Implements OGC API – DGGS standard
 - Provides uniform functions on different DGGS

- Vgrid as Python library and as Vgrid plugin for QGIS
 - Creation of different grid geometry layers
 - Binning functions

- GeoPlegma

Additional resources



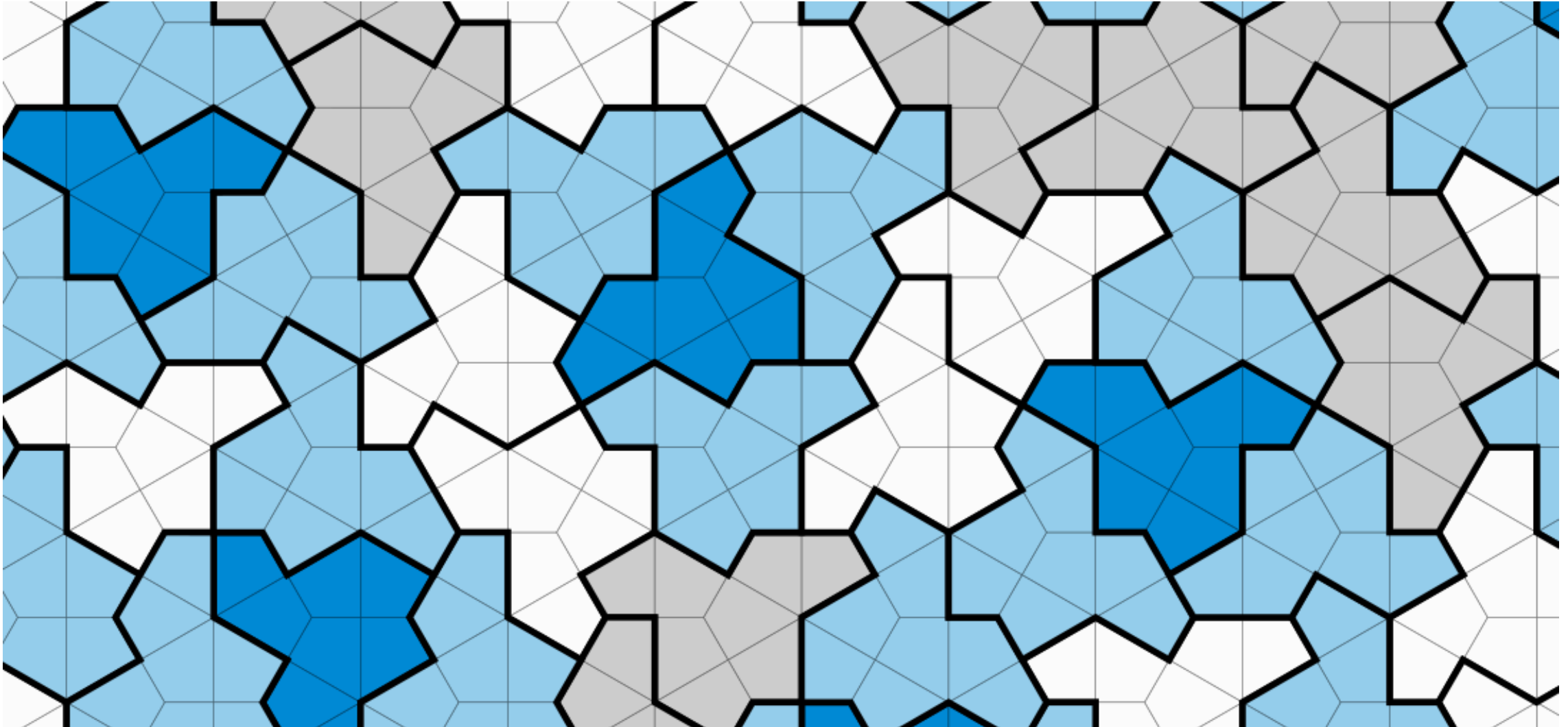
- The Shape That Actually Wins at Everything 🐝
- Hexbin vs. H3
- IGEO7 vs. H3
- IGEO7 vs. S2
- A5 vs. H3: Visualises area variance of H3
- Alexander Knoch et al.: *Area and shape distortions in open-source discrete global grid systems*, <https://doi.org/10.1080/20964471.2022.2094926>

Other DGGS-related talks on this conference



- Efficient Neighbourhood Computation and Cloud-Native Storage for the IGEO7 DGGS Using the Z7 GBT Indexing
- Tiling the Earth: Interactive HEALPix in the Browser
- Asking a Province a Question: LLMs, H3, and Open Dutch Geodata
- Storing your Satellite in a DGGS
- Indexing with Hexagons: GBT Explained

*If the structure stays the same,
your algorithms stay the same 🤗*



Topic: **Discrete global grid systems for spatio-temporal aggregation and visualisation**

FOSS4G Europe, Timișoara

Date: 2026-06-30

Author: Michael Scholz

Institute: Transportation Systems

Licence: All content and media „© CC BY-NC-ND 3.0“,
unless otherwise stated