

# DFS Datasets State of Play

ICAO EUR/MID DDS Workshop

3.4 Germany Experience



**DFS** Deutsche Flugsicherung

# Presentation outline

Access DFS's datasets at [aip.dfs.de/datasets](http://aip.dfs.de/datasets)

## 1) Current datasets and developments

Which datasets does DFS currently offer?

## 2) Issues with current datasets

What are DFS's real-world experiences with the current datasets?

## 3) Potential solutions and outlook

Some solutions for the problems identified in this presentation

# Current datasets

- Obstacles Area 1
- Navaids
- DesignatedPoints and Angle-, DistanceIndication
- ATS-Route
- AirportHeliport
- AirportGroundService
- Service
- Runway
- TOLF (Touchdown and Liftoff area for helicopters)
- Aerodrome-Mapping-Dataset
- Airspace
- GroundLightSystem
- Apron and Taxiway



*Aerodrome-Mapping-Dataset visualization via WMS*

## Why are some datasets available earlier than others?

Dataset	Reason for early release	Reason for later release
eTOD Obstacles Area 1	Data already available, relatively flat structure, easy to migrate from 4.5	None
eTOD Obstacles Area 2	None	Complex set of rules that define the areas. Hard to validate. Large areas of ground must be covered, for which no prior obstacle assessment took place → no data available. Data that is available does not fulfill applicable data quality requirements.
eTOD Obstacles Area 3	None	Few airports can provide the required data (and quality). It is hard to validate.
eTOD Obstacles Area 4	None	Few airports can provide the required data (and quality).
DesignatedPoint	Flat structure, easy to migrate from AIXM 4.5, small features	None

## Why are some datasets available earlier than others?

Dataset	Reason for early release	Reason for later release
AirportHeliport	Feature itself is relatively flat	Incompatibility between different databases (and their UUIDs). Contains lots of timesheets and contact information.
Service	None	Incompatible with AIXM 4.5. Cross-border relation impossible to model without ambiguity (more later). RoutePortion completely incompatible to AIXM 4.5 → Lots of manual adaptation is required.
GroundService	Completing service dataset with airport services	Few AIXM 5.1 attributes can be directly mapped. Therefore, many annotations are needed.
TLOF	Small dataset, flat structure	None
Aerodrome Mapping Dataset	Many features are relatively flat	Huge datasets. Lots of relationships. Hard to validate due to complex relationships and lots of complex spatial data. Many geometry-types and extractions.

## Why are some datasets available earlier than others?

Dataset	Reason for early release	Reason for later release
Airspace	None	Complex structures. Incompatible with AIXM 4.5. Issues with GML-Arcs / Circles / GeoBorders (more later).
Runway	Features are relatively small, good AIXM 5.1 mapping	Features also released in aerodrome mapping datasets. Incompatibility between different databases
Apron & Taxiway	Features are relatively small/flat	Features also released in aerodrome mapping datasets. Incompatibility between different databases
GroundLightSystem	Features are relatively small/flat	Features also released in aerodrome mapping datasets. Incompatibility between different databases
Procedures	None	Complex structure. Lots of attributes / relationships. Incompatible with AIXM 4.5 / existing databases and systems. Complex curve geometry

# Why are some datasets available earlier than others?

<b>Dataset</b>	<b>Reason for early release</b>	<b>Reason for later release</b>
Navaid	Data already available, small dataset	Structure more complex and incompatible to AIXM 4.5 databases.
ATS-Route	Route- / RouteSegment-Feature itself is easy to migrate from AIXM 4.5	Large dataset and massive amount of references → harder to validate. Lots of timesheets

# Customer preferences?

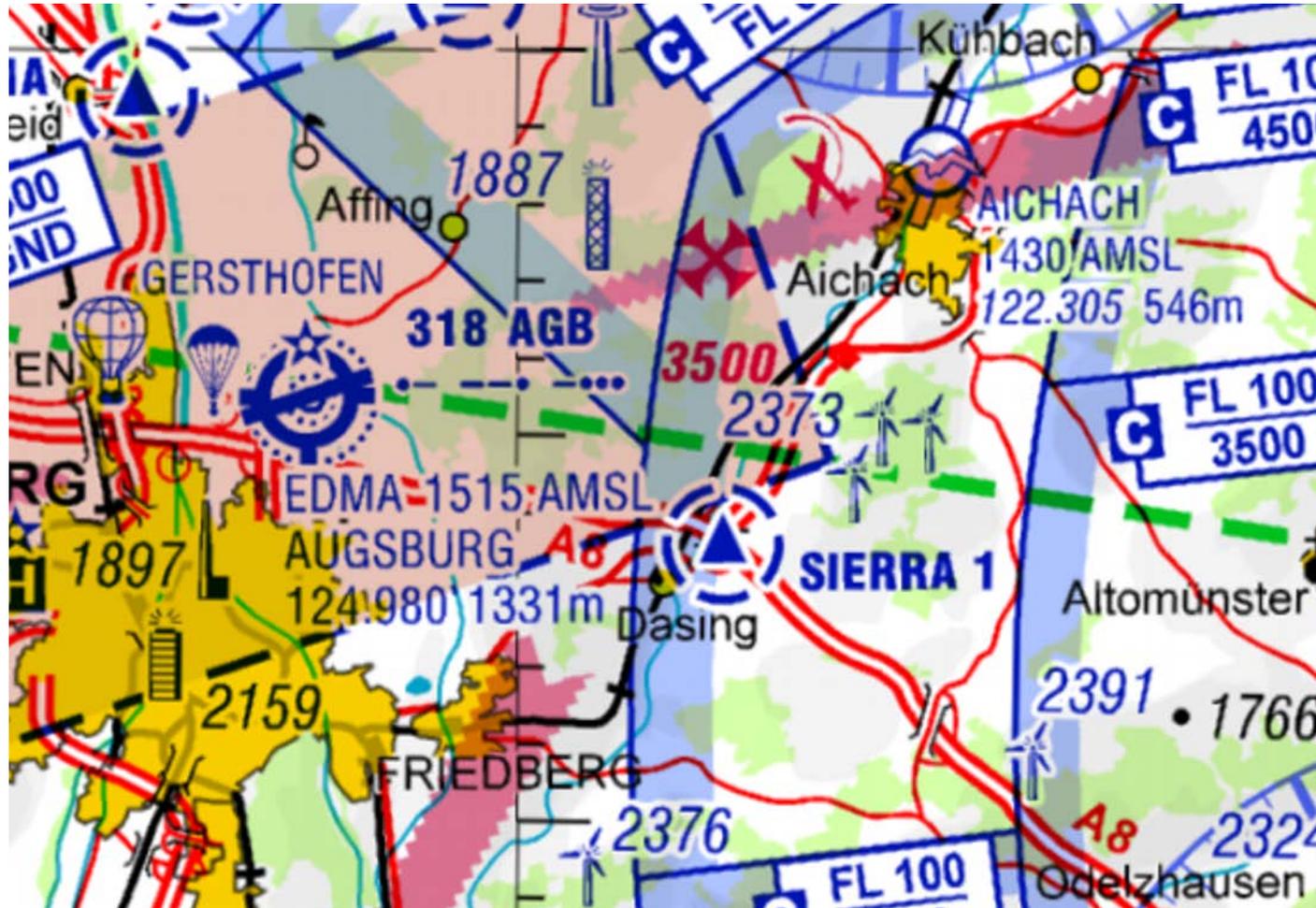
Observations from over a year of AIXM 5.1.1 publication

- AIXM vs. GeoJSON vs. Excel
- Partial dataset processing
- Customers prefer GeoJSON due to flatter structures and better compatibility with third-party GIS. Due to the absence of GML-geometry there are fewer or even no ambiguities.
- Excel is still a widespread tool for data-processing and due to its “omnipresence” it is often preferred over AIXM / GeoJSON in general.
- If at all, AIXM 5.1 is only sporadically used to extract specialized datums not present in any other dataset. Improvised parsers\* are often used to perform this task.

\* Such parsers are only designed to process a feature or a specific value in a specific „dialect“ of AIXM. These parsers are unable to process all features of AIXM or even a whole dataset.

# Differences in GML interpretation and display in different applications

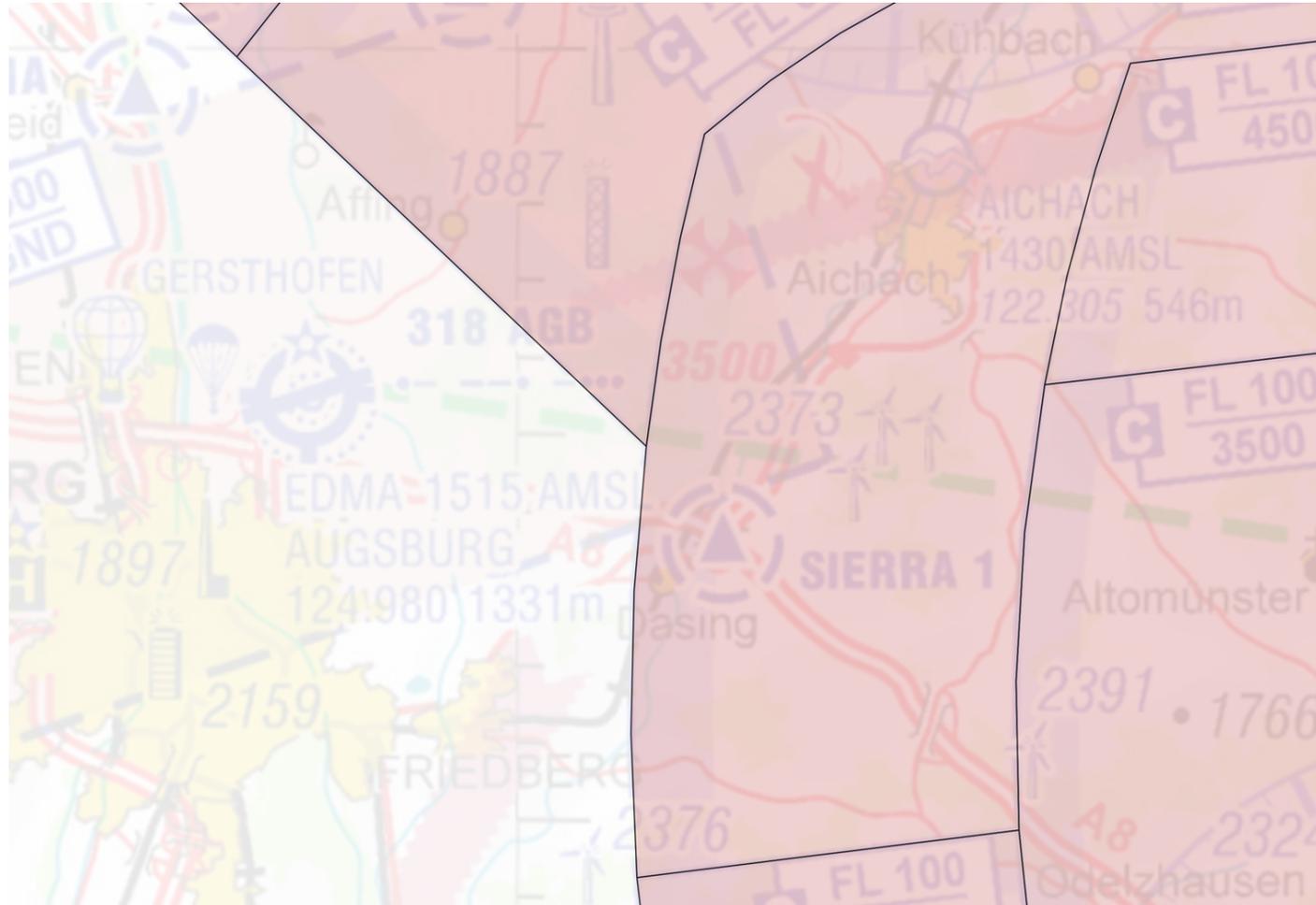
## Circular Arcs



*In the ICAO 1:500.000 chart*

# Differences in GML interpretation and display in different applications

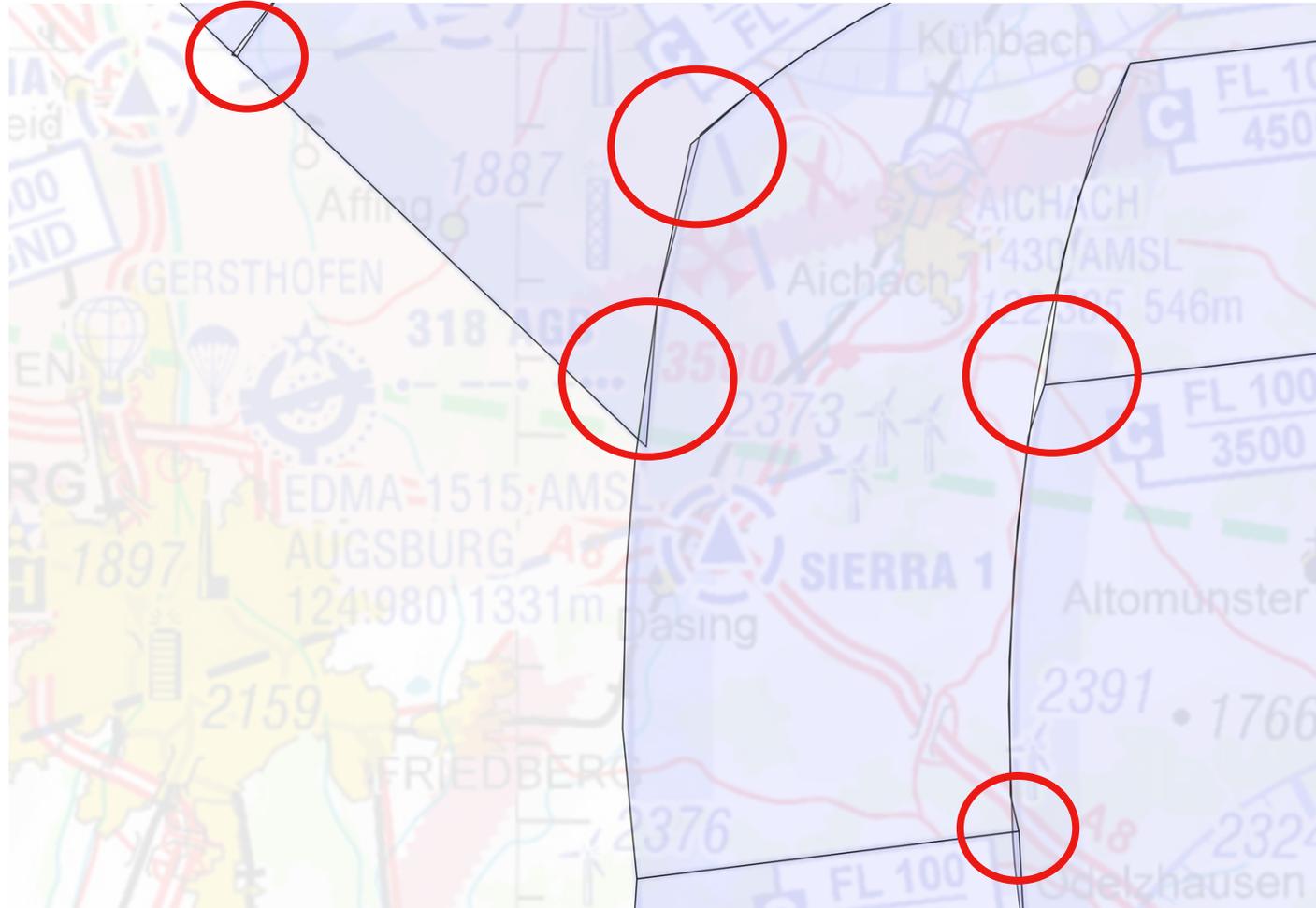
## Circular Arcs



*Airspace dataset viewed in the software it was designed with*

# Differences in GML interpretation and display in different applications

## Circular Arcs

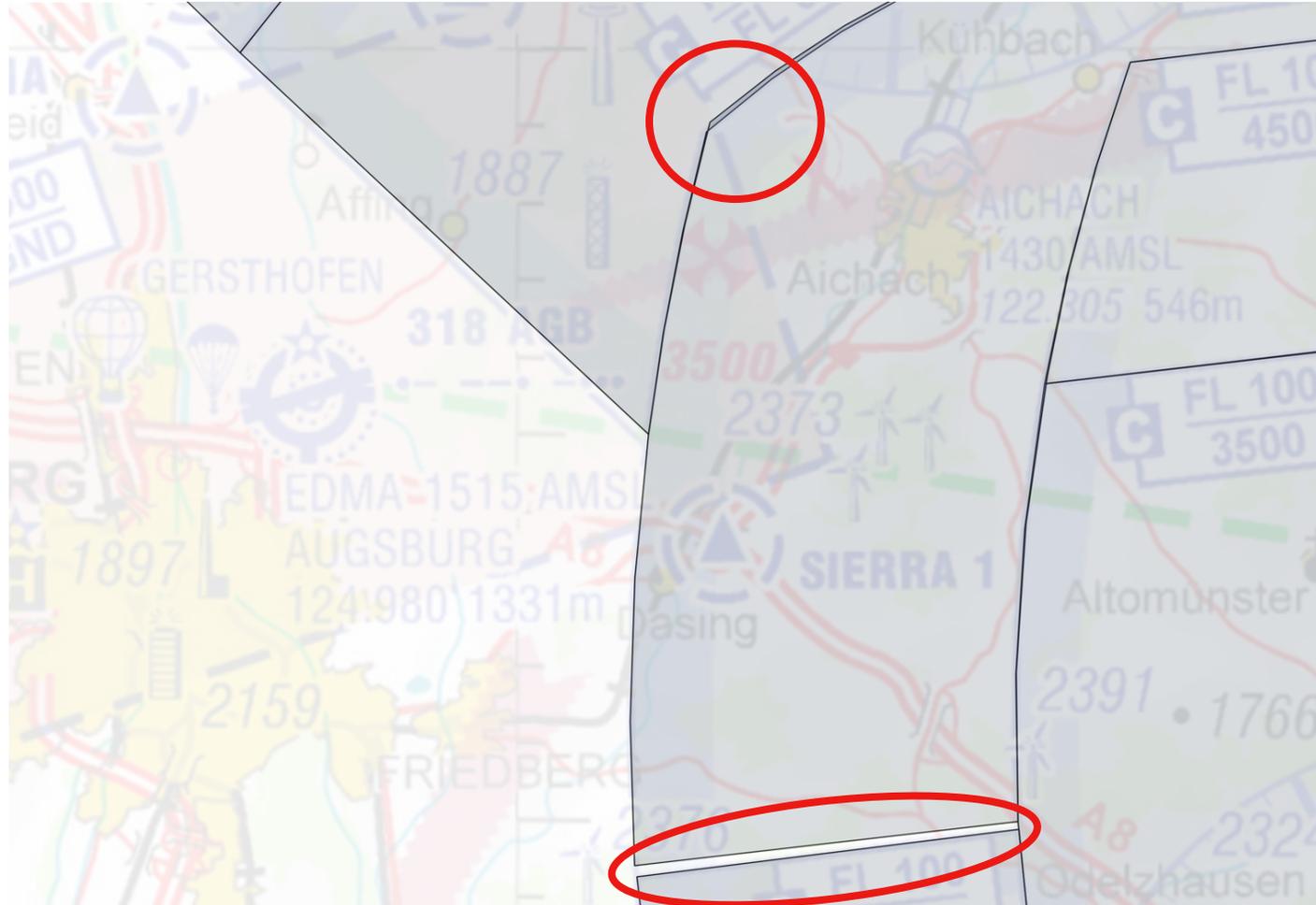


*Same dataset viewed with QGIS*



# Differences in GML interpretation and display in different applications

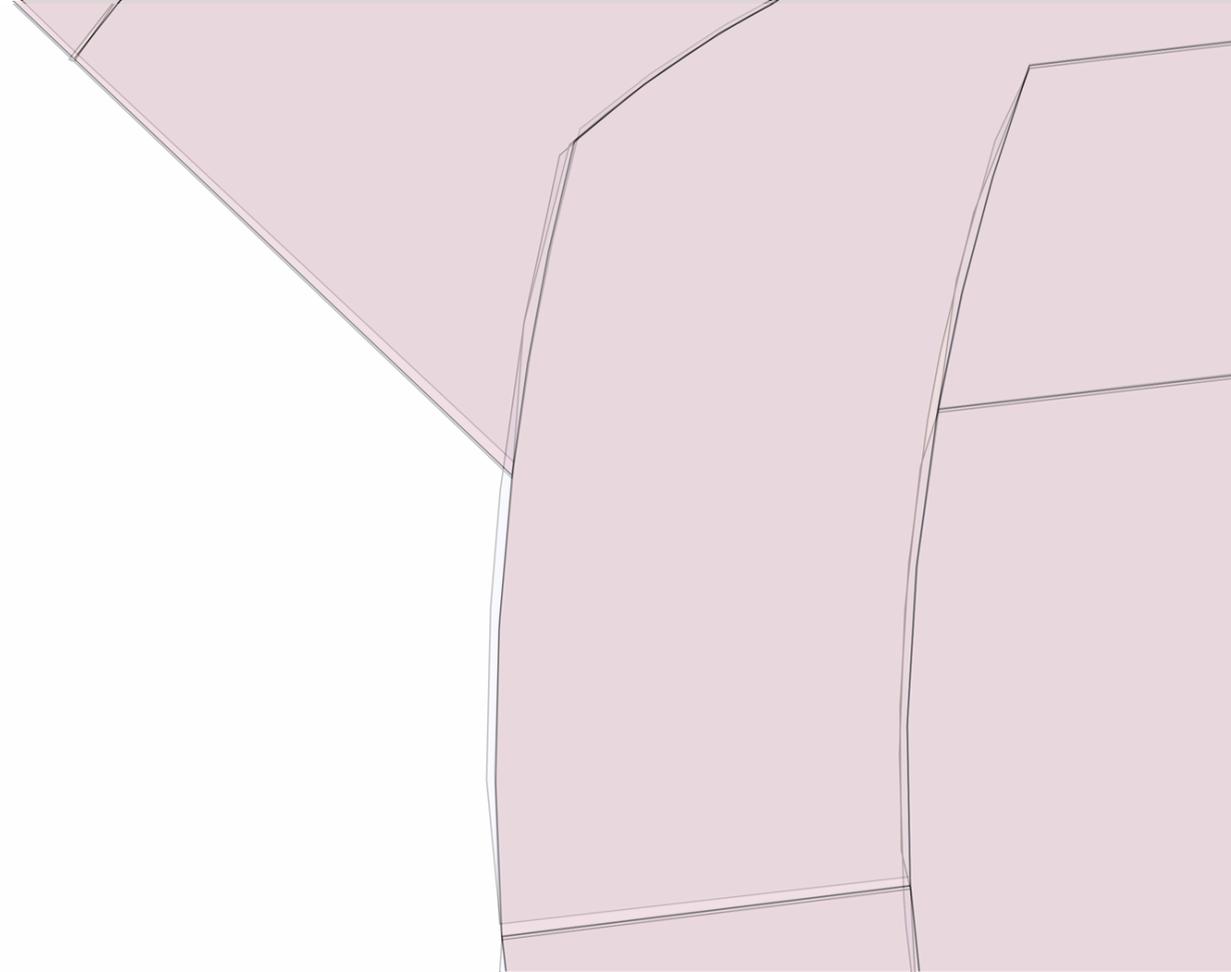
## Circular Arcs



*Exported to another third-party software, viewed with DFS design software*

# Differences in GML interpretation and display in different applications

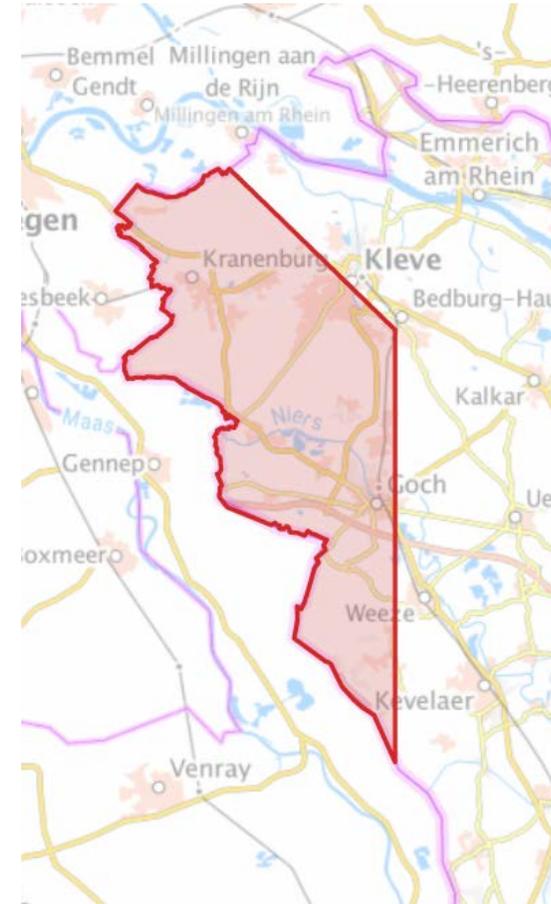
## Circular Arcs



*All three views combined*

# Geoborder issue

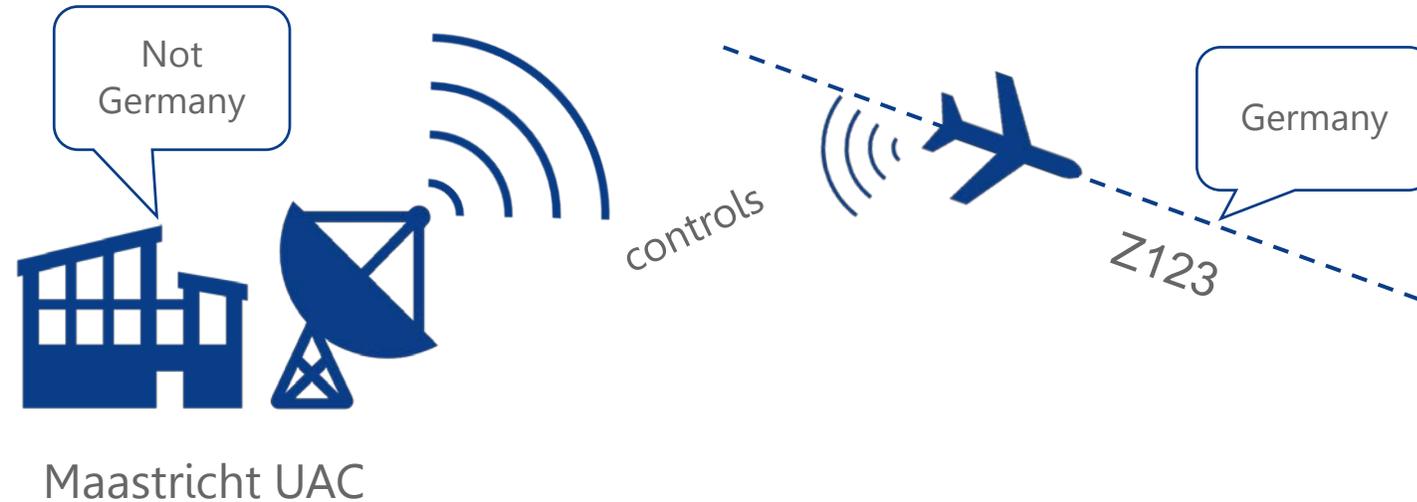
- Multiple ways of embedding a geoborder in an airspace geometry exist
- It appears that the most common embedding method (UUID of complete geoborder in airspace geometry) is incompatible with most third-party GIS
  - This is detrimental to the acceptance of AIXM 5.1
- Even if the receiving system “understands” this encoding method, the geoborder and the algorithm for “trimming” the geoborder are not standardized, which leads to different geometries in different systems.
- If the design system uses a different algorithm than the receiving system, the data exchange is prone to produce invalid geometries.
  - This renders all available validation methods useless.



*Restricted Airspace from the German dataset, that runs along the border to the Netherlands*

Today's processes are incompatible with providing features in only one dataset

## Example!



**Example Situation:** Bilateral agreements state that Germany publishes all routes with more than 50% of their length over German territory and all services provided on them.

- No problem in AIXM 4.5 by using the "Rsg"-element (Route Segment) in combination with the "SER"-element (Service)
- No chance in AIXM 5.1 without publishing redundant, probably outdated "Service"-features

# Interoperability

- AIXM 5.x allows freedoms that are good for dataset creators but lead to compatibility issues for data users
  - Parsers must be adapted for each new data source
  - Coordination between data providers and data users is required in the event of changes in information encoding
  - Bespoke modifications between individual partner systems are required
  - Large amount of work for all involved, high risk of faulty interpretations
- Efforts for harmonizing data are high, uniform basis would reduce costs for all parties
  - Misinterpretations are reduced

# Potential solutions and outlook

- Standardized, open source, well specified implementation, that shows how elements of AIXM 5.1 geometry are interpreted
- Redesign (slicing into smaller features) of features, that are subject to cross-border-coordination
  - Services
  - RoutePortion etc. as independent features
  - etc.
- FAIVA (**F**ABEC **A**eronautical **I**nformation **V**alidator) to ensure harmonized AIXM implementations (more at IFAIMA Global AIM Cairo 2023 | Session 6)

# Thank you for your attention.

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