Level 3: Automating Quality Control
AGENDA

1. Why do we validate data?
2. Indoor Mapping standards compliance
3. Validating CAD data
4. Validating topology
5. Automating validation workflows
Data validation means checking ...

- Single objects (geometry and attributes)
- Relationships between objects
- Completeness
- Correctness
- Standards compliance
Data validation means checking ...

- Schema or data model
- Attribute values and domains
- Geometry
- Topology and spatial relationships
- Networks
- And more
Venues worldwide are generating indoor maps of their spaces for:

- Space management / planning
- Geolocating assets
- Helping patrons navigate
Indoor Mapping Challenges

- Must **integrate** multiple sources to produce an indoor map.
  - GeoJSON, Revit, IFC, CAD (Autodesk, Bentley), Civil 3D, Esri Geodatabase, databases, CityGML …
- Must **transform** inconsistent data.
- Must **comply** with specifications of the indoor format, e.g. IMDF, HERE, ArcGIS Indoors, IndoorGML.
  - Strict data models and explicit spatial relationships.
- Venues constantly change, so maps need to be updated **automatically**.
Tips for Validating Attributes

- Phone Numbers / UUID / Business Names:
  - AttributeValidator and regular expressions
    - `(^\+[0-9-]{10,15}$|^$)`

- Hours of Opening – OSM Standard:
  - “24/7”, “Mo-Fr 08:30-20:00”

- Websites:
  - Regular expressions
  - HTTPCaller & HTTP Status Code
Useful Transformers for Validating Geometries

- **GeometryValidator** – pass only valid geometries.
- **GeometryFilter** – filter by geometry type and pass only valid ones.
- **SpatialFilter** or **SpatialRelator** – ensure valid spatial relationships.
  - Choosing the right spatial join transformer: see the article [fme.ly/byu](http://fme.ly/byu)
Automated IMDF Validation

A. **Upload** your IMDF data and get your validation report.  [safe.com/imdf](safe.com/imdf)

or

A. Add an **IMDFValidator** transformer to your workspace - available from FME Hub - [hub.safe.com](hub.safe.com)
CAD Standards Compliance
CAD Data

Key source of data updates for many GIS departments.

- Very loose schemas or data models.
- Hard to impose a drawing standard on contractors.
- Often more detail than is needed in GIS.
City of Kitchener

- Digital Submission Compliance
- Contractor CAD data added to GIS
- CAD standard
  - Standards Checker
  - Attribute Checker
  - Topology Checker
Validating Topology

Hydrographic Networks, Electric, Water, Gas Networks
Tips for Validating Topology

● Relationships include:
  ○ Connectivity
  ○ Adjacency
  ○ Enclosure

● Rules:
  ○ ISO 19110 Feature Catalog
  ○ Database connectivity rules
Natural Resources Canada

*Maintaining the feature catalog for Canada’s national map*

Spatial Relationships

![Spatial Relationships Table]

Attribute Values

![Attribute Values Table]
FME Workspace for NRCan’s Catalog Validation

One custom transformer per validation concept!
Utility Network Topology: Connectivity
Utility Network Migration Workspaces

- Schema mapping
- Topology
  - Geometric Network (lines & junctions)
  - Explicit network (associations between junctions & devices)
- Creating Assemblies

![ArcGIS Device](image1.png)  ![UN Assembly](image2.png)
Transformers for Validating Connectivity

- **NetworkTopologyCalculator** for building geometric networks (lines & junctions).
- **SpatialFilter** for identifying objects that are supposed to connect, e.g. devices on lines.
- **TopologyBuilder** and **PointOnLineOverlayer** for building connected features and identifying missing junctions/devices.
Tip: set up your data validation workflows to run automatically.

- On a **schedule**, e.g. daily quality control.
- In response to an **event**.
  - “Watch” a directory, FTP, Amazon S3 bucket ...
  - Email.
  - Database triggers.
- As a **web service**.
- Self-serve **drag-and-drop** webpage (or mobile app) that anyone on the team can use.
Real-time Display  Upload CAD data and watch it appear in real-time

Step 1
Download example data

- distribution_N25_good.dwg
- distribution_N25_bad.dwg

Next step
To ensure *complete*, *correct*, and *compliant* data, we must check:

- Attributes
- Geometries
- Topology
FME Transformer Gallery

Manipulate your data exactly as needed by using any combination of FME’s 497 transformers.

- **GeometryValidator** - Detects selected issues in input features, and optionally repairs detected issues. Each input feature is processed individually.
- **AttributeValidator** - Validates any number of attributes against user-defined test conditions, routing the feature according to the outcome of the test(s) and identifying any tests it has failed.
- **JSONValidator** - Validates the syntax of JSON (JavaScript Object Notation) text.
- **XMLValidator** - Validates the syntax or schema of an XML file or text. There are different ways to specify the XML source to be validated.
Data Validation Resources

- Improving Data Compliancy Using FME
  - City of Kitchener
- CAD Data Validation using FME
  - Colonial Pipeline
- Data Validation Victories: Tips for Better Data Quality
  - Safe Webinar
- FME Extensive Usage Inside the Mapping Production System
  - Natural Resources Canada
- Creating & Validating IMDF
  - Knowledge Center
- Ultimate Geospatial Data Validation Checklist
  - Safe Blog
- IMDF Validator
Questions?