

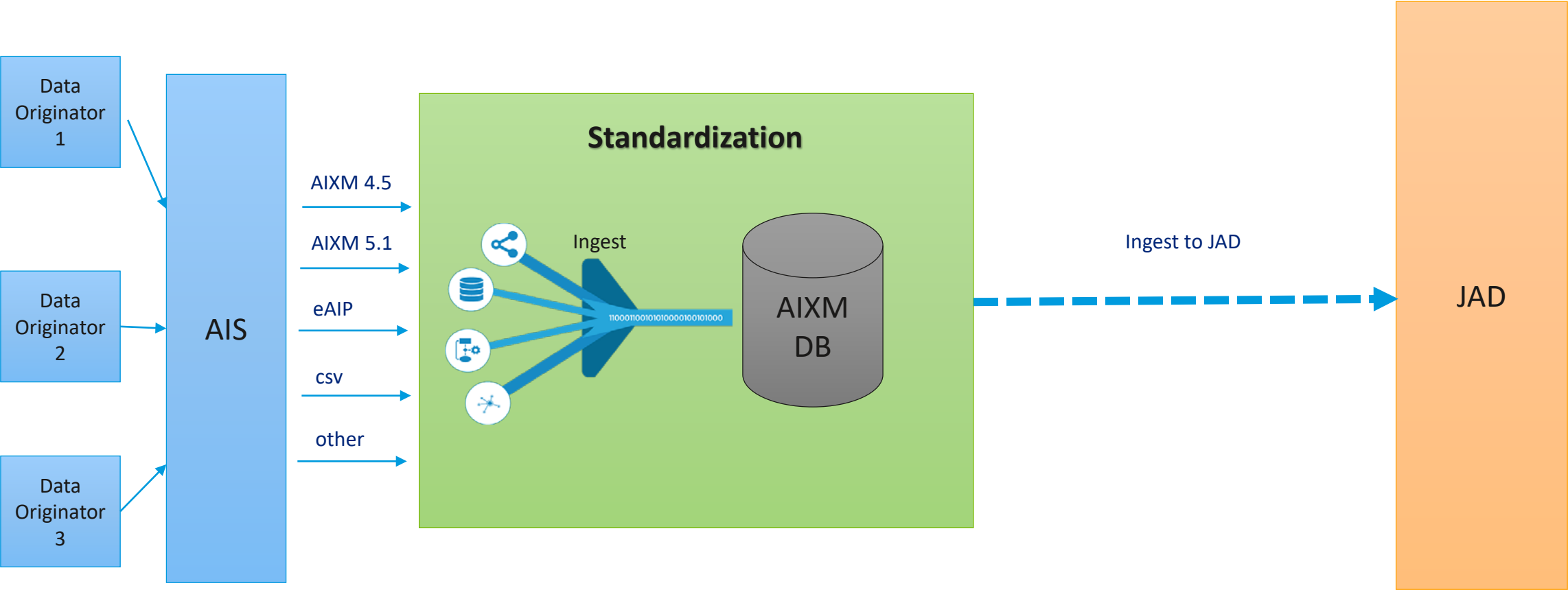


User Perspective on Digital Aviation Data

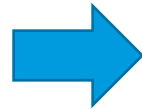
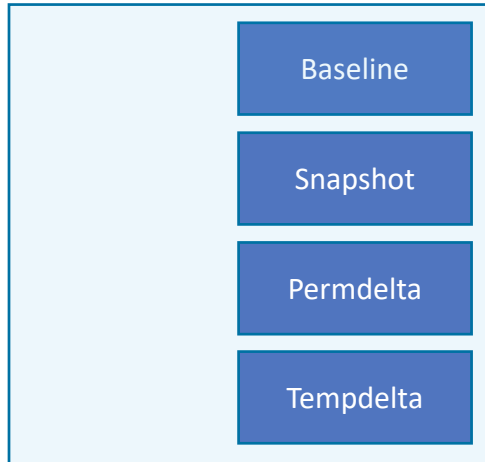
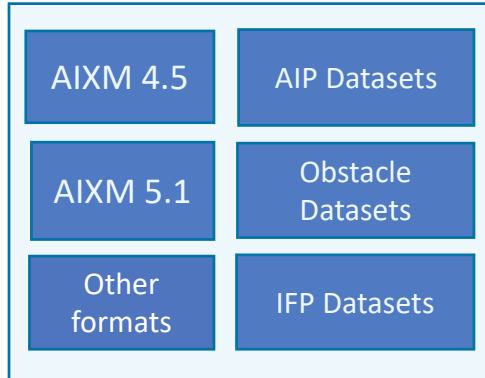
Boeing Research Project

Christine Groos
22 May, 2023

High Level Data Supply Chain



AIXM Data Validation – What We Check

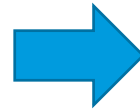
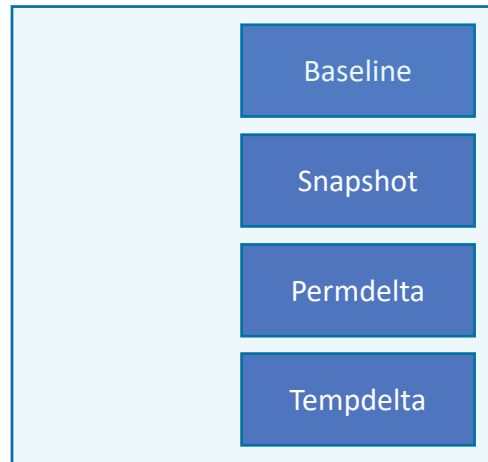
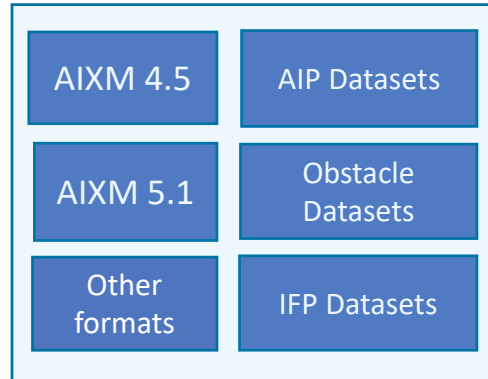


Possible Data Validation Checks

- **AIXM Schema Validation**
 - XSD Validation (wrong XML structure)
 - Usage of non-standard symbols (AIXM specific pattern requirement)
 - Number of symbols of a string value
 - UOM availability
- **Missing Links Validation** (check for references to non-existing features)
- **Geometry Completeness Validation** (check for features with missing geo properties)
- **AIXM Business Rules Validation**
 - AIXM Model Business Rules
 - EAD Business Rules
 - AIXM 4.5 Business Rules
 - AIXM GML Profile Business Rules
 - ICAO Annex 10, 11, 14, 15 Business Rules
 - FAA
 - Customized
- **AIXM Visualization for Geometry Correctness**

Datasets from ANSPs

AIXM Data Validation – What We Find



Datasets from ANSPs

Examples of Findings

- **AIXM Schema Validation**
 - Usage of language specific symbols: [ÁÃËÕçâé](#)
 - Value should contain no more than specific number of symbols (depending on value): 10, 16, 60 or other
 - Empty designators of some features: --
 - Missing Frequency (value should not be less than 1): [0 MHZ](#)
 - Space characters in phone numbers: [\(0\) 4 77 60 49 87](#)
- **Missing Links Validation**
 - Non-standard references, without using UUIDs
 - References to features of bordering countries
 - Features coded with reference to DesignatedPoints using Navaid's UUIDs
- **Geometry Completeness Validation**
 - Incomplete geometry for some features: [AircraftStands](#)
 - No geometry at all for some critical features: [Airspaces](#)
 - Geometry with country extensions
- **AIXM Business Rules Validation**
 - Elevation is in [FT](#) and vertical accuracy is in [M](#)
 - RouteSegment [WidthLeft](#) and [WidthRight](#) have different UOMs
 - No [lowerlimit](#) reference coded for Airspace
 - No [designator](#) coded for AirportsHeliports
 - Missing accuracy of some values: [field elevation](#)

Check of UAE AIP Dataset

- **AIXM Schema Validation**
 - ✓ *No AIXM schema violation identified*
- **Missing Links Validation**
 - ✓ *No missing links identified*
- **Geometry Completeness Validation**
 - *16 features without geometry
(mostly related to features within aerodromes)*
- **AIXM Business Rules Validation**
 - *Business Rules are available, but UAE has not activated them for now*



Check of Several AIP Datasets – Example: Business Rules Validation

- Unit of measurement must be the same

```
<aixm:elevation uom="FT">6.0</aixm:elevation>  
<aixm:geoidUndulation uom="M">8.681</aixm:geoidUndulation>  
<aixm:verticalDatum>EGM_96</aixm:verticalDatum>  
<aixm:verticalAccuracy uom="M">1.0</aixm:verticalAccuracy>
```

```
<aixm:widthLeft uom="NM">5.0</aixm:widthLeft>  
<aixm:widthRight uom="FT">5.0</aixm:widthRight>  
<aixm:navigationType>RNAV</aixm:navigationType>
```



- No assigned Airspace lowerLimitReference value

```
<aixm:upperLimit uom="FT">2300.0</aixm:upperLimit>  
<aixm:upperLimitReference>MSL</aixm:upperLimitReference>  
<aixm:lowerLimit uom="FT">0.0</aixm:lowerLimit>  
</aixm:AirspaceVolume>
```

Check of Several AIP Datasets – Example: Business Rules Validation

- **RouteSegment Upper Limit should be greater than 0**

```
<aixm:upperLimit uom="FT">0.0</aixm:upperLimit>  
<aixm:upperLimitReference>MSL</aixm:upperLimitReference>  
<aixm:lowerLimit uom="FT">0.0</aixm:lowerLimit>  
<aixm:lowerLimitReference>MSL</aixm:lowerLimitReference>
```

- **UOM not defined**

Runway:

```
<aixm:nominalLength uom="M">20.0</aixm:nominalLength>  
<aixm:nominalWidth>20.0</aixm:nominalWidth>
```

VerticalStructure:

```
<aixm:verticalExtent>590.0</aixm:verticalExtent>
```

RunwayProtectedArea:

```
<aixm:length>90.0</aixm:length>  
<aixm:type>STOPWAY</aixm:type>
```

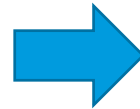


AIXM Data Validation – What We Need



AIXM 4.5	AIP Datasets
AIXM 5.1	Obstacle Datasets
Other formats	IFP Datasets

	Baseline
	Snapshot
	Permdelta
	Tempdelta



User Requirements and Recommendations

- **Close Collaboration with Data Providers**
 - Early announcement of plans to transition to AIXM data format
 - Feedback on data testing and discussion about findings
 - Data issue clarifications
 - Communication in general
- **Additional Requirements in the Future**
 - Certified data
 - Transparent data ownership
 - Timelines



Datasets from ANSPs

