

# The OWS-10 Testbed and the AIXM Validator Service

Markus Schneider, 2014/05/03

# Introducing m-click.aero



- Airtraffic management
- System-wide information management
- Standards-based aviation solutions (ISO / OGC)
- Efficient AIXM / FIXM Technology / Middleware



# Agenda



- The OWS-10 Testbed
- Transactional Web Feature Service 2.0 (WFS-T) for AIXM and FIXM GML
- The AIXM Validation Service

# The OWS-10 Testbed



- Collaboration in rapid prototyping between
  - Government
  - Private sector
  - University organizations
- Goals
  - Reduce technology risk
  - Reduce technology lifecycle costs
  - Mobilize new technologies
  - Expand markets and improve customer choice



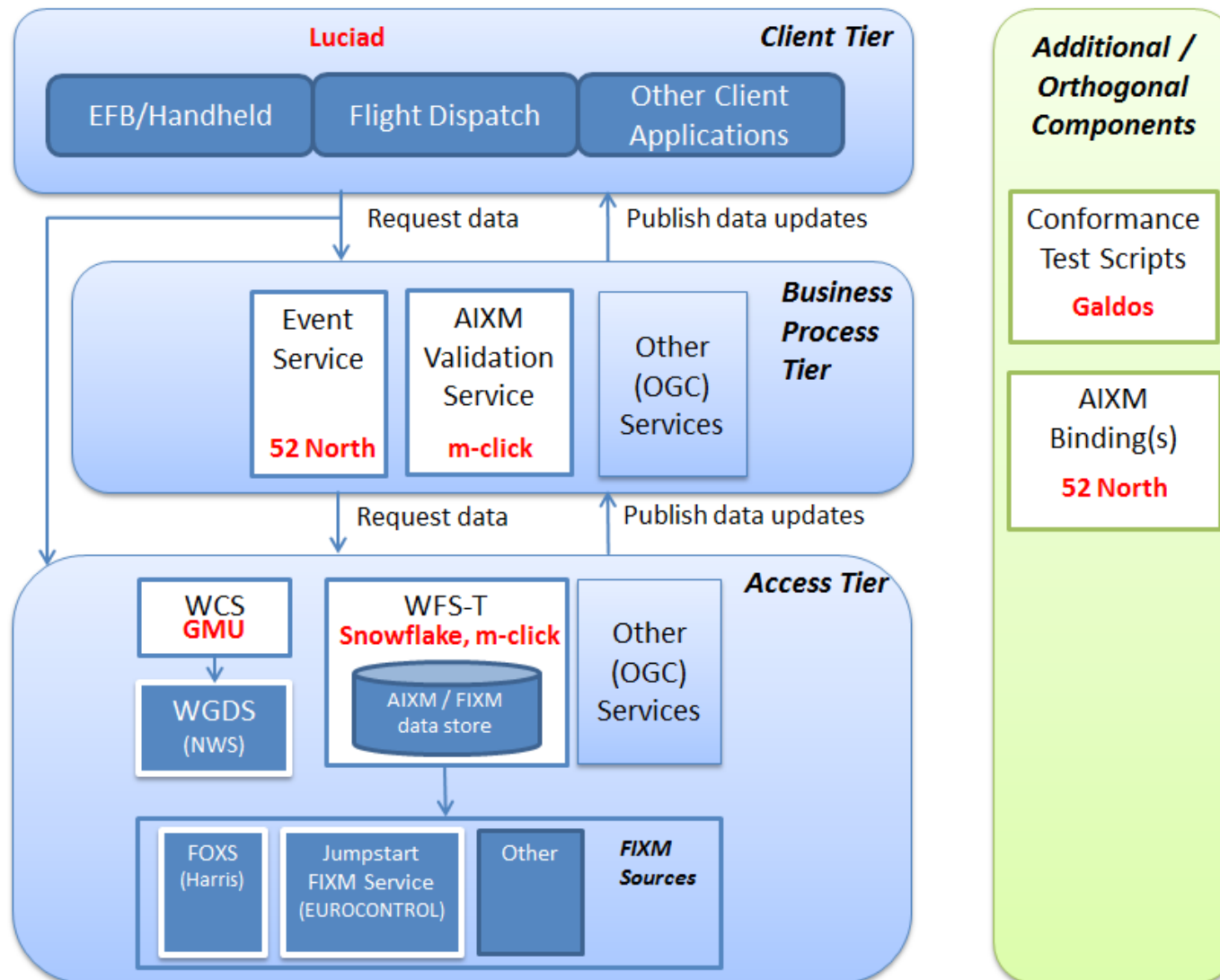
# The OWS-10 Testbed



- Working period: September 2013 – May 2014
- Three activity threads
  - **Aviation**
  - Cross-Community Interoperability
  - Open Mobility
- Aviation results will be presented in free webinar
  - 27 May 2014, from 1000 to 1130 EDT
  - <http://www.opengeospatial.org/projects/initiatives/ows-10>



# OWS-10 Aviation Components



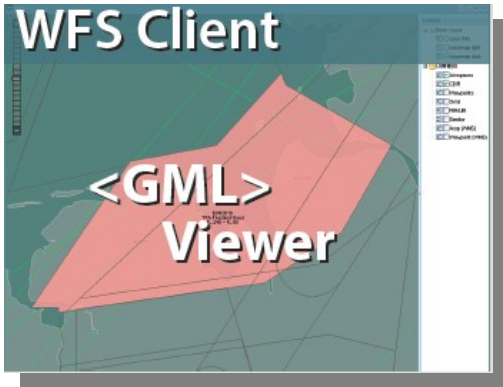
# WFS-T 2.0 for AIXM and FIXM GML



- WFS: Web Feature Service
- OGC standard for accessing Geoobjects over the Web
- Several implementations available from different companies
- Every WFS instance supports queries
- WFS-T: Adds possibility to modify (Insert/Update/Replace/Delete) datasets
- m-click WFS-T instance based on WFS 2.0 reference implementation



# Querying data from an AIXM Web Feature Service



Request: GetFeature

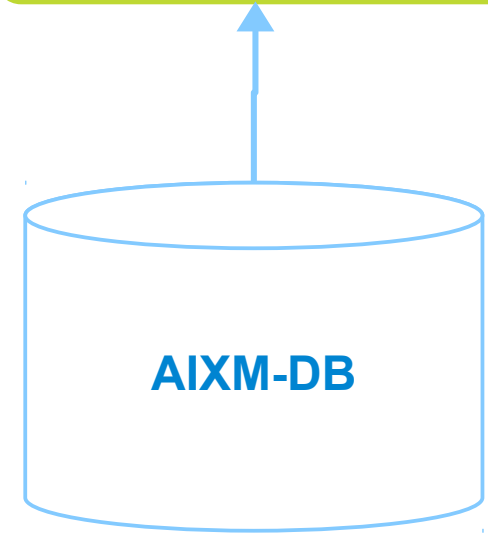


Web Feature Service



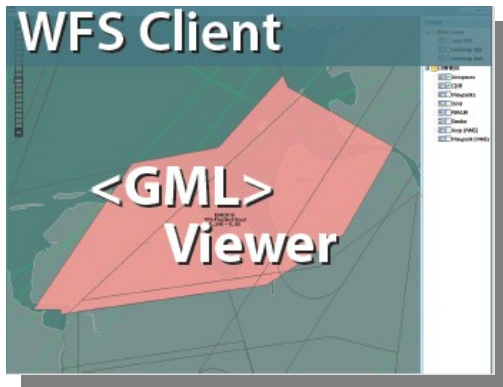
Response: AIXM 5.1

```
<aixm:Airspace
  gml:id="urn:uuid:4fd9f4be-8c65-43f6-b083-3ced9a4b2a7f">
  <gml:identifier codeSpace="urn:uuid:">4fd9f4be-8c65-43f6
  <aixm:featureMetadata>
  <gmd:MD_Metadata>
  <gmd:CharacterSet>
  <gmd:MD_CharacterSetCode
    codeList="http://www.aixm.aero/schema/5.1/ISO_19
    codeListValue="utf8">utf8</gmd:MD_CharacterSetCo
  </gmd:characterSet>
  <gmd:contact xlink:href="#MessageContact"/>
  <gmd:dateStamp>
  <gco:DateTime>2013-04-23T12:00:00Z</gco:DateTime>
  </gmd:dateStamp>
  <gmd:identificationInfo>
  <gmd:MD_DataIdentification>
  <gmd:Citation xlink:href="#MessageCitation"/>
  <gmd:abstract>
  <gco:CharacterString>
    Donlon sample data, including Digital NOTAM
    Luciad (www.luciad.be); currently maintained
  </gco:CharacterString>
  </gmd:abstract>
  <gmd:pointOfContact xlink:href="#MessagePOC"/>
  <gmd:resourceConstraints xlink:href="#MessageCon
  <gmd:language>
  <gco:CharacterString>eng</gco:CharacterString>
  </gmd:language>
  <gmd:topicCategory>
  <gmd:MD_TopicCategoryCode>transportation</gmd:
  </gmd:topicCategory>
```





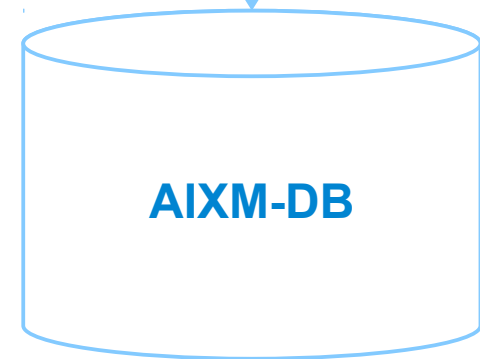
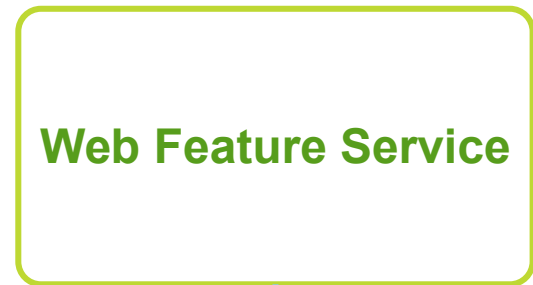
# WFS-T: Inverse dataflow: From client to WFS



Response: TransactionSummary



Request: Transaction



```
<aixm:Airspace
  gml:id="urn:uuid:4fd9f4be-8c65-43f6-b083-3ced9a4b2a7f">
  <gml:identifier codeSpace="urn:uuid:">4fd9f4be-8c65-43f6
  <aixm:featureMetadata>
  <gmd:MD_Metadata>
  <gmd:CharacterSet>
  <gmd:MD_CharacterSetCode
    codeList="http://www.aixm.aero/schema/5.1/ISO_19
    codeListValue="utf8">utf8</gmd:MD_CharacterSetCo
  </gmd:characterSet>
  <gmd:contact xlink:href="#MessageContact"/>
  <gmd:dateStamp>
  <gco:DateTime>2013-04-23T12:00:00Z</gco:DateTime>
  </gmd:dateStamp>
  <gmd:identificationInfo>
  <gmd:MD_DataIdentification>
  <gmd:Citation xlink:href="#MessageCitation"/>
  <gmd:abstract>
  <gco:CharacterString>
    Donlon sample data, including Digital NOTAM
    Luciad (www.luciad.be); currently maintained
  </gco:CharacterString>
  </gmd:abstract>
  <gmd:pointOfContact xlink:href="#MessagePOC"/>
  <gmd:resourceConstraints xlink:href="#MessageCon
  <gmd:language>
  <gco:CharacterString>eng</gco:CharacterString>
  </gmd:language>
  <gmd:topicCategory>
  <gmd:MD_TopicCategoryCode>transportation</gmd:
  </gmd:topicCategory>
```



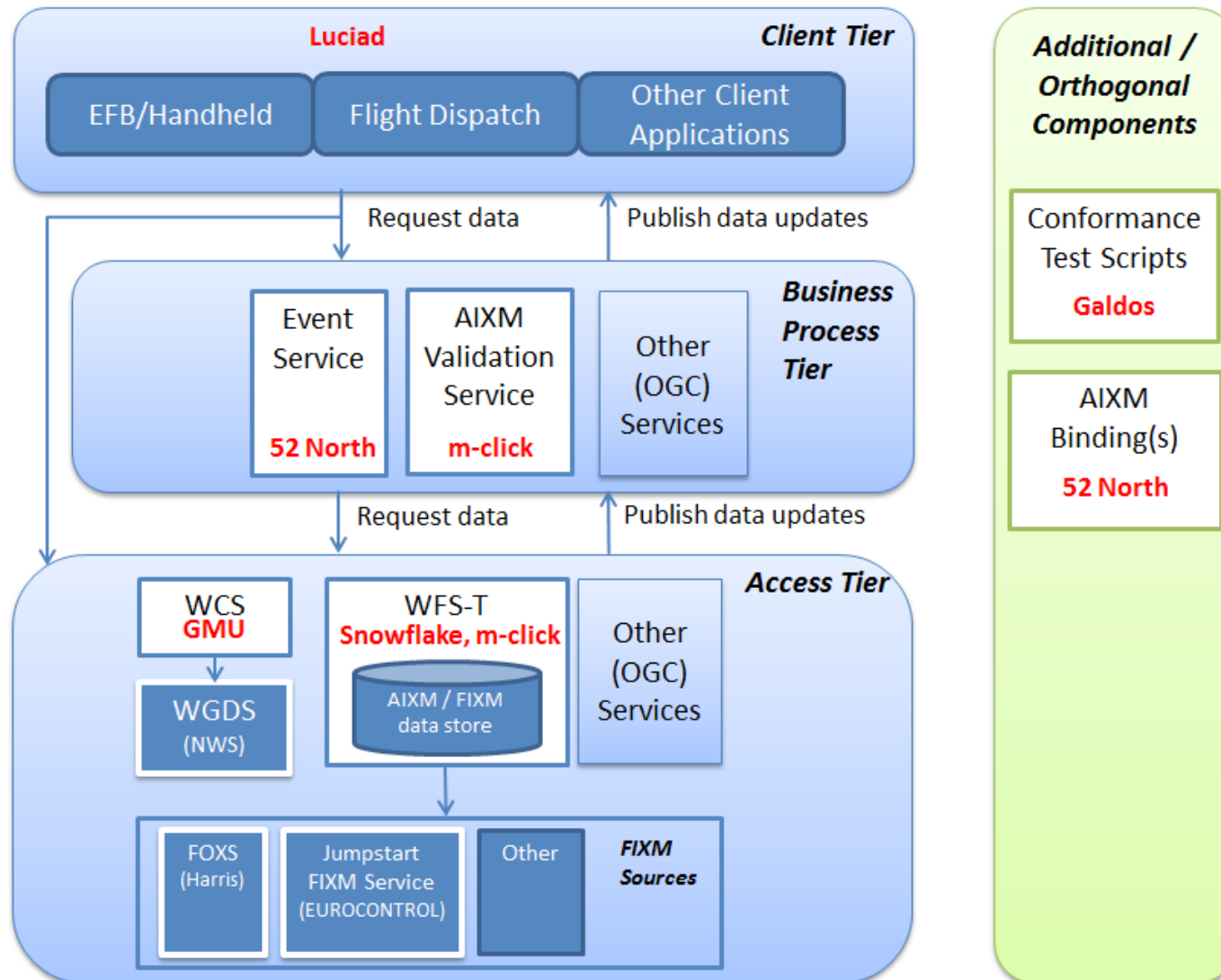
# WFS-T 2.0: Achievements / lessons learned



- Verified WFS-T profile for use with AIXM 5.1 and FIXM GML
- Verified interoperability between WFS vendors
- Mirrored AIXM datasets from OWS-9 WFS
- Integrated WFS-T into OWS-10 example scenario: Live FIXM update



# OWS-10 Aviation Components





# E. Porosnicu: „Business Rules and Digital NOTAM validation“

## Conclusion



- Data verification is a critical aspect for the safe deployment of Digital NOTAM applications
- Using the general AIXM 5.1 Business Rules concept
  - SBVR -> rule definition
  - Schematron -> as coding example
- Event Specification appendix
  - Identify all rules that are relevant for Digital NOTAM verification



# Short AIXM business rules recap

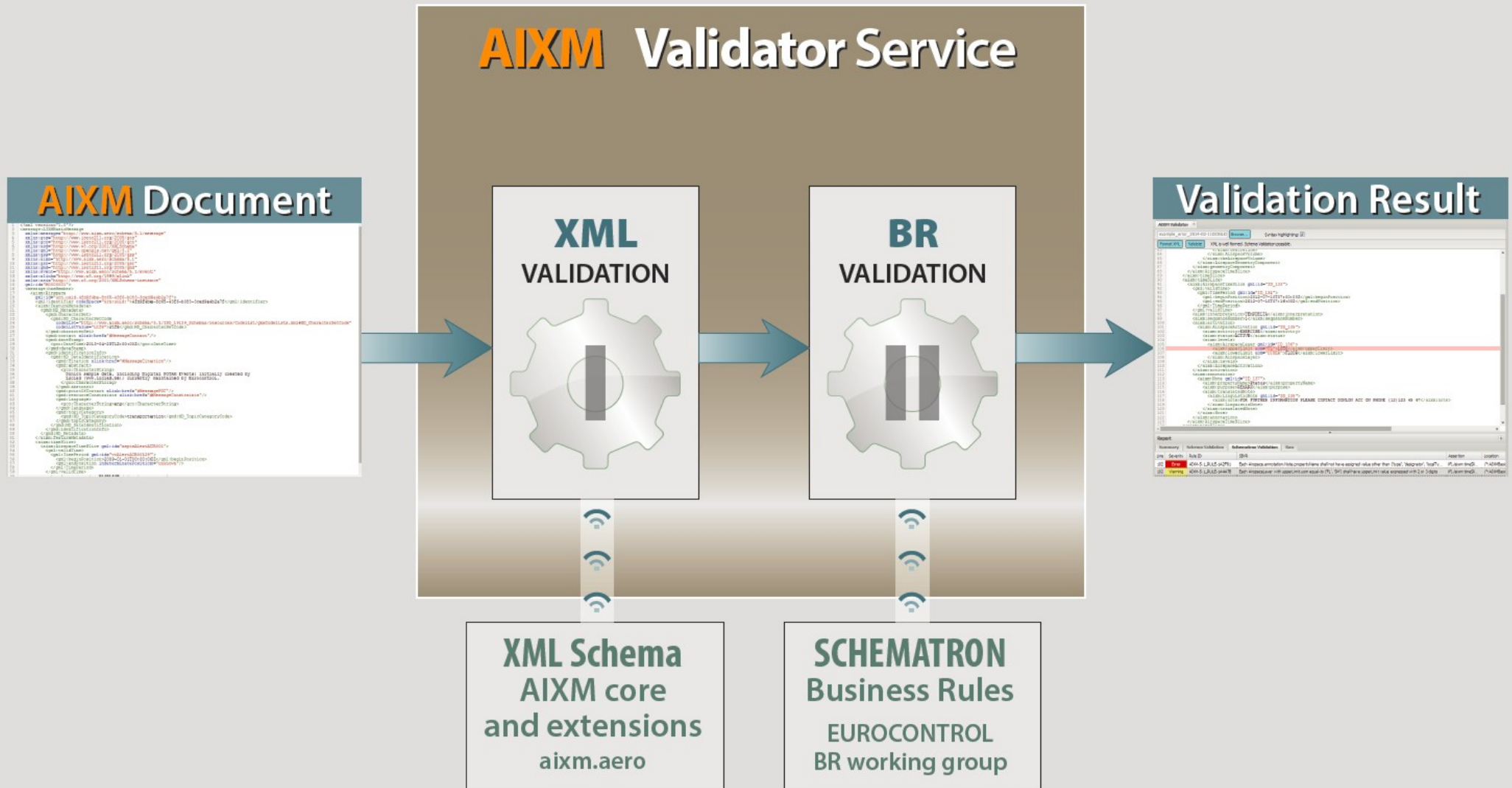


- What are business rules again?
  - Domain-specific requirements
  - Semantic checks
  - Dependencies between values
- Encoded using Schematron (80/20)
  - An ongoing effort
  - Rules defined by AIXM-BR community project
- AIXM Validation Service implements latest rule set





# The AIXM Validator Service



# AIXM validator service: How to use it



- Web interface: Ad hoc use for AIXM developers

Report			
Summary			
Schema Validation			
Schematron Validation			
Raw			
Line	Column	Severity	Message
24	76	Error	cvc-enumeration-valid: Value 'UNKNOWN-INTERPRETATION' is not facet-valid with respect to enumeration '[BASELINE, SNAPSHOT, TEMPDELTA, PERMDDELTA]'. It must be a value from the enume...
24	76	Error	cvc-type.3.1.3: The value 'UNKNOWN-INTERPRETATION' of element 'aixm:interpretation' is not valid.
42	58	Error	cvc-id.2: There are multiple occurrences of ID value 'A-c6211807'.
42	58	Error	cvc-attribute.3: The value 'A-c6211807' of attribute 'gml:id' on element 'aixm:AirspaceVolume' is not valid with respect to its type, 'ID'.
43	73	Error	cvc-pattern-valid: Value 'TEST-LIMIT' is not facet-valid with respect to pattern '((\+ \-){0,1}[0-9]{1,8}(\.[0-9]{1,4}){0,1}) UNL GND FLOOR CEILING' for type 'ValDistanceVerticalBaseType'.
43	73	Error	cvc-complex-type.2.2: Element 'aixm:upperLimit' must have no element [children], and the value must be valid.

- OGC Processing Service (WPS): Integrate with ease
  - Standards-based and interoperable
  - Invoke via WPS protocol
  - Designed for easy integration





# AIXM Validator Service: Web interface



**AIXM Validator** [x]

Airspace baseline - prepared.xml  Syntax highlighting:

XML is well formed. Schema Validation possible.

```
27 <ctrlType>MIL</aixm:ctrlType>
28 <metryComponent>
29 <AirspaceGeometryComponent gml:id="A-c6211807">
30 <theAirspaceVolume>
31 <AirspaceVolume gml:id="A-cd610fd4">
32 <upperLimit uom="FL">CEILING</upperLimit>
33 <upperLimitReference>STD</upperLimitReference>
34 <lowerLimit uom="FL">95</lowerLimit>
35 <lowerLimitReference>STD</lowerLimitReference>
36 <horizontalProjection>
37 <Surface gml:id="VID000004" srsName="urn:ogc:def:crs:O
38 <gml:PolygonPatches>
39 <gml:PolygonPatch>
40 <gml:exterior>
41 <gml:LinearRing>
42 <gml:pos>4.12861111 50.55611111</gml:po
43 <gml:pos>4.59166667 50.64</gml:pos>
44 <gml:pos>4.84305556 50.58916667</gml:po
45 <gml:pos>5.71 50.02222222</gml:pos>
46
47
```

**Validator Details**

Line: 31

Severity: Warning

Rule ID: AIXM-5.1\_RULE-1A4A7C

SBVR: Each AirspaceVolume with upperLimit.uom equal-to ('FL', 'SM') shall have upperLimit value expressed with 2 or 3 digits

Assertion: if(/.aixm:timeSlice) then ( every \$timeslice in /.aixm:timeSlice satisfies ( ((\$timeslice)/aixm:AirspaceVolumeTimeSlice/( not(/.aixm:interpretation=('BASELINE', 'SNAPSHOT')) or ( not(/.aixm:upperLimit) or (/aixm:upperLimit[@xsi:nil='true']) or not(/aixm:upperLimit[@uom = ('FL', 'SM')]) or (/aixm:upperLimit/text()/string-length() >= 2

**Report**

Line	Severity	Rule ID	SBVR	Assertion	Location
7	Warning	AIXM-5.1_RULE-CA648	Each Airspace with type equal-to ('FIR', 'UIR') shall have designatorICAO equal-to 'YES'	not(/.aixm:type...	/*:AIXMBasicMe
31	Warning	AIXM-5.1_RULE-1A4A7C	Each AirspaceVolume with upperLimit.uom equal-to ('FL', 'SM') shall have upperLimit value expressed with 2 or 3 digits	if(/.aixm:timeSli...	/*:AIXMBasicMe
37	Warning	AIXM-5.1_RULE-3E8	Each srsName with assigned value shall be equal-to 'urn:ogc:def:crs:EPSG::4326'	.[@srsName='u...	/*:AIXMBasicMe

<https://swim.m-click.aero/validator/>

# The OWS-10 Testbed and the AIXM Validator Service

Markus Schneider, 2014/05/19