



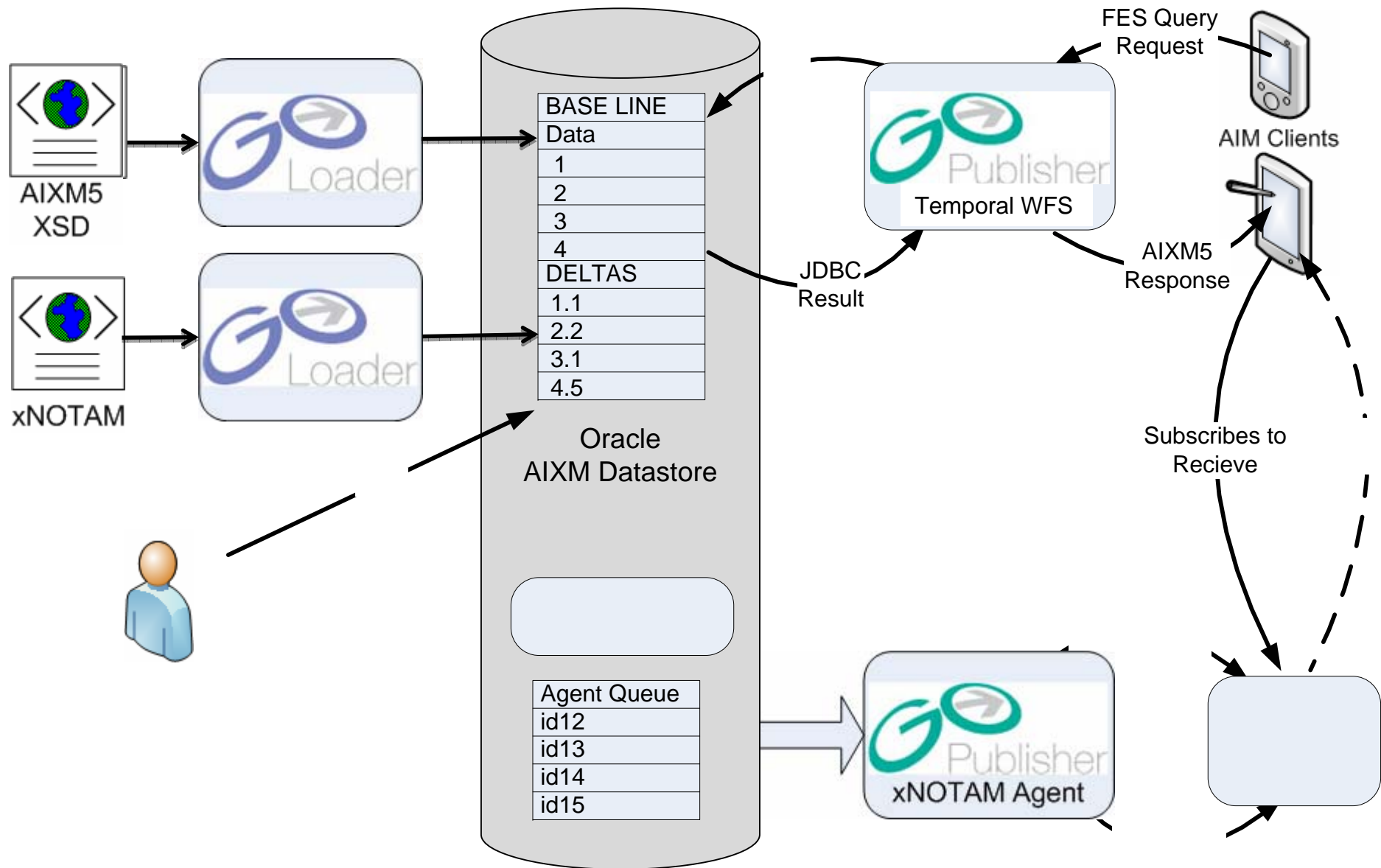
# OWS6-AIM Server Side Architecture

Ian Painter - Snowflake Software



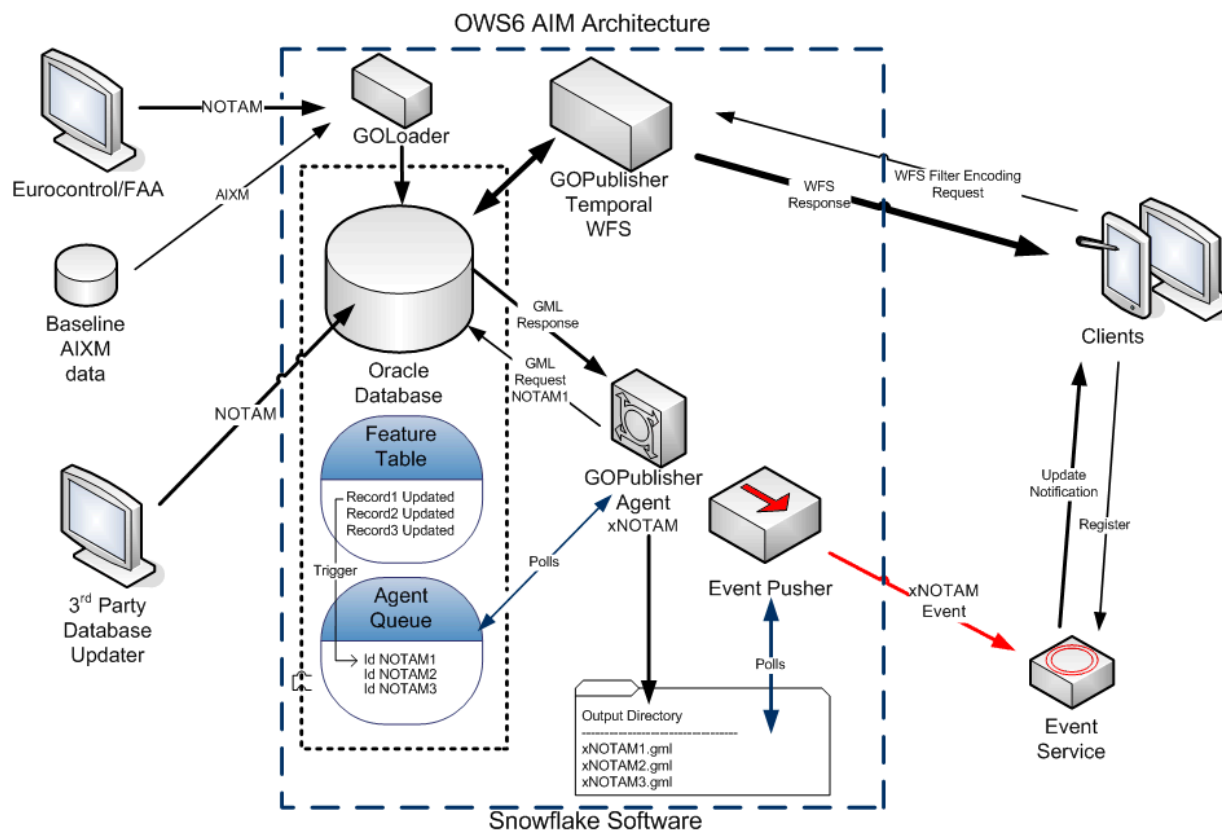
## Server Side Scenarios

1. Flight is ready – Load baseline data
  - Query on timeframe of flight and within 100 nautical miles of flight path
2. Flight is delayed for 3 hour - Query for any changes
  - Query aixm:TimeSlice since baseline data was last obtained
3. An xNOTAM is received that ILN runways are closed
  - Change uploaded and xNOTAM forwarded to clients



# AIXM5

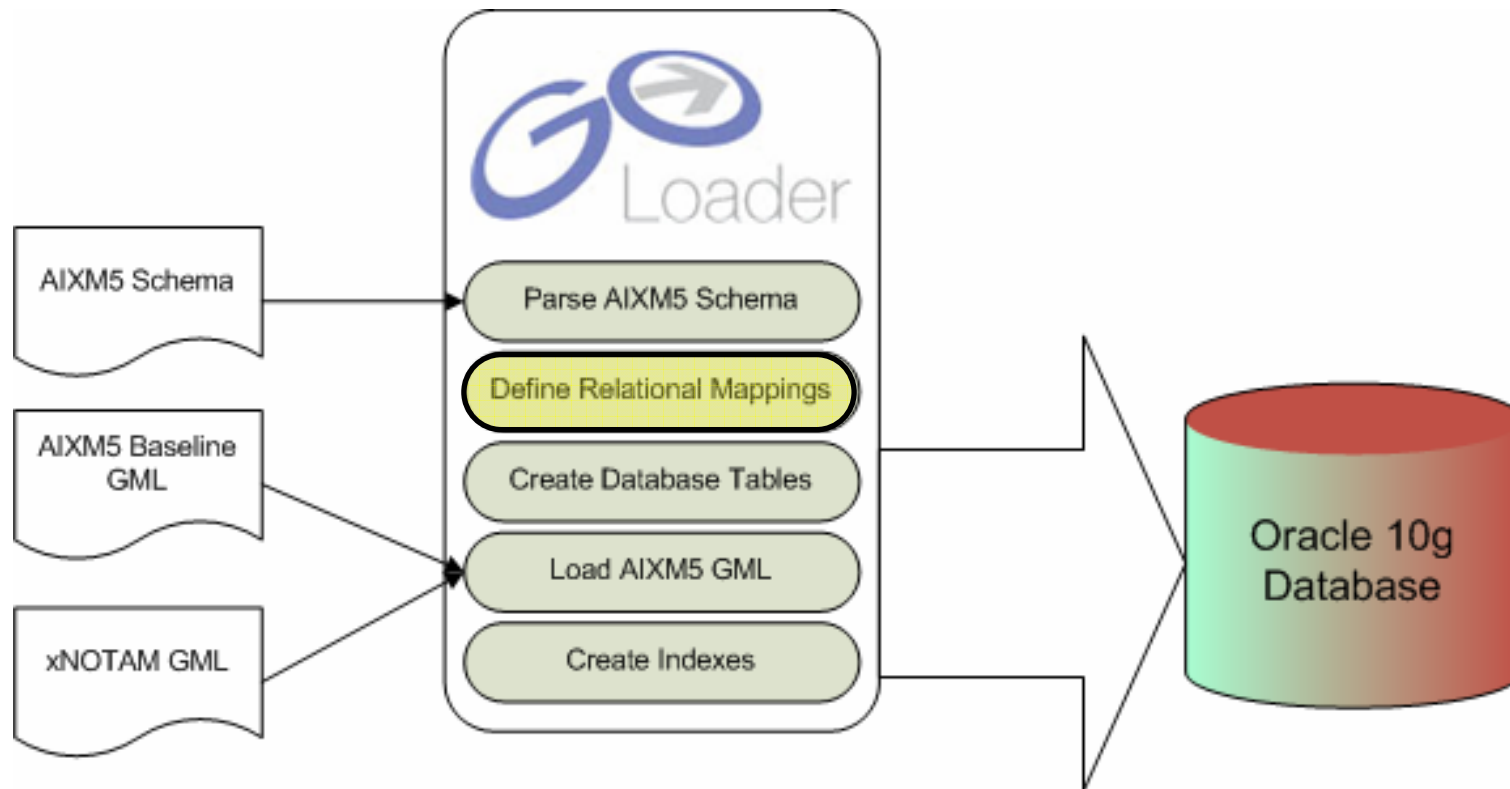
# OWS6-AIM Server Side Architecture



1. GO Loader: Loading xNOTAM & AIXM5 baseline data
2. GO Publisher WFS: publishing AIXM5 over WFS
3. GO Publisher WFS: Temporal queries over FES2.0
4. GO Publisher Agent: Bulk Publishing xNOTAM to the Event Service

# AIXM5 Data Load & Management

# Creating and Loading the AIXM5 Datastore



# Define Relational Mappings

GO Loader 1.6-beta-3-SNAPSHOT

File Tools Help

6. Tables | 7. Loader Configuration | 8. Spatial Reference | 9. Tablespace & Partition | 10. Checkpoint | 11. Create Tables | 12. Load Files | 13. Create Indices

1. Project Management | 2. GML Schema | 3. GML Filter | 4. Translation Policy | 5. Translations

**AIXM5 Schema** | **AIXM5 Schema Types** | **Relational Mapping**

GML Elements	Type	Operation	Table	Column	Relational Columns	Relational DataTypes
gml:identifier	gml:CodeWithAuthorityType	Insert	AIRPORTHELIPO...			VARCHAR 250
aixm:featureMetadata	aixm:FeatureMetadataPropert...	Discard				
aixm:timeSlice	aixm:AirportHeliportTimeSliceP...	Join	AIRPORTHELIPO...			
owns	xs:boolean	Discard				
aixm:AirportHeliportTimeSlice	aixm:AirportHeliportTimeSliceT...	Insert	AIRPORTHELIPO...			
gml:id	xs:ID	Insert	AIRPORTHELIPO...			
gml:validTime	gml:TimePrimitivePropertyType	Insert	AIRPORTHELIPO...			
xlink:href	xs:anyURI	Discard				
nilReason	gml:nilReasonType	Discard				
owns	xs:boolean	Discard				
<b>gml:AbstractTimePrimiti</b>						
gml:AbstractTimePrimiti	gml:AbstractTimePrimitiveType	Discard				
<b>gml:AbstractTime Ge</b>						
gml:AbstractTimeGe	gml:AbstractTimeGeometricPri...	As Base				
gml:TimePeriod	gml:TimePeriodType	Insert	AIRPORTHELIPO...			
frame	xs:anyURI	Discard				
gml:id	xs:ID	Insert	AIRPORTHELIPO...			
gml:metaDataPr	gml:MetaDataPropertyType	Discard				
gml:description	gml:StringOrRefType	Discard				
gml:description	gml:ReferenceType	Discard				
gml:identifier	gml:CodeWithAuthorityType	Discard				
gml:name	gml:CodeType	Discard				
gml:relatedTime	gml:RelatedTimeType	Discard				
gml:beginPositic	gml:TimePositionType	Insert	AIRPORTHELIPO...	BEGINPOSITION		DATE_TIME
calendarEx	xs:string	Discard				

**Relational Tables**

**Relational Columns**

**Relational DataTypes**

Project: AIXM Demo2

## Data Load Issues (Shapefiles)

- Shapefiles were missing data (aixm:identifiers)
- Mixed projection systems and projections not identified in source data
- Geometries in the shapefiles were not always valid, containing self intersections, duplicate vertices and other geometry errors – these were fixed using the Oracle geometry tools.
- Sections of Runway where runways crossed each other were often held in separate shapefiles from other runway sections..
- Lengths and widths of the Runway features were not included



## Data Load Issues (AIXM5)

- Generally more complete and accurate
- Gml:id unique within a file but not within database
- Ids in xlink not within the same file
- AIXM5 overlapping shapefiles
- Indeterminate dates invalid for queries

# Publishing AIXM5 & xNOTAM

## Publishing AIXM5 and xNOTAM

- Baseline & Delta data delivered using:
  - GO Publisher WFS - OGC Web Feature Service (WFS 1.1 compliant)
- Data queries using:
  - Filter Encoding Specification (FES 1.1)
- Temporal queries using
  - Temporal Operators from (FES 2.0 draft)
- xNOTAM delivered using:
  - GO Publisher Agent – Batch GML publication engine
- Data delivered:
  - AIXM5.0 (inc xNOTAM) – GML 3.2.1

# Features Published

GO Publisher Desktop

File Edit Tools Help

Project Settings SQL filters Desktop settings WFS settings Agent settings

Project name: OWS6\_temporal C:\\_WXXM\_AIXM\_conference\AIXM\GOPublisher\_Project\ows6\_test103\_Temporal\_test.gpp Format: GML 3.2

Target namespace: Prefix:

Database to XML mapping

Name	Enabled	DB type or const value	XML path	Type in XML	Required
Database	<input checked="" type="checkbox"/>		message:AIXMBasicMessage	message:AIXMBasicMessageType	
gmlid_fc	<input checked="" type="checkbox"/>	gml_fc_1	@gml:id	xs:ID	Yes
AIRPORTHELIPORT	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:AirportHeliport	aixm:AirportHeliportType	No
AIRPORTHELIPORTUSAGE	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:AirportHeliportUsage	aixm:AirportHeliportUsageType	No
AIRSPACE	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:Airspace	aixm:AirspaceType	No
AIRSPACEUSAGE	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:AirspaceUsage	aixm:AirspaceUsageType	No
DESIGNATEDPOINT	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:DesignatedPoint	aixm:DesignatedPointType	No
NAVAID	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:Navaid	aixm:NavaidType	No
ROUTE	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:Route	aixm:RouteType	No
ROUTESEGMENT	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:RouteSegment	aixm:RouteSegmentType	No
RUNWAY	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:Runway	aixm:RunwayType	No
RUNWAYCENTRELINEPOINT	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:RunwayCentrelinePoint	aixm:RunwayCentrelinePointType	No
RUNWAYDIRECTION	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:RunwayDirection	aixm:RunwayDirectionType	No
RUNWAYELEMENT	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:RunwayElement	aixm:RunwayElementType	No
TAXIWAY	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:Taxiway	aixm:TaxiwayType	No
TAXIWAYELEMENT	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:TaxiwayElement	aixm:TaxiwayElementType	No
VERTICALSTRUCTURE	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:VerticalStructure	aixm:VerticalStructureType	No
INSTRUMENTAPPROACHPROCEDURE	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:InstrumentApproachProcedure	aixm:InstrumentApproachProcedureType	No
STANDARDINSTRUMENTDEPARTURE	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:StandardInstrumentDeparture	aixm:StandardInstrumentDepartureType	No

Preview XML Preview Schema Execution View

```

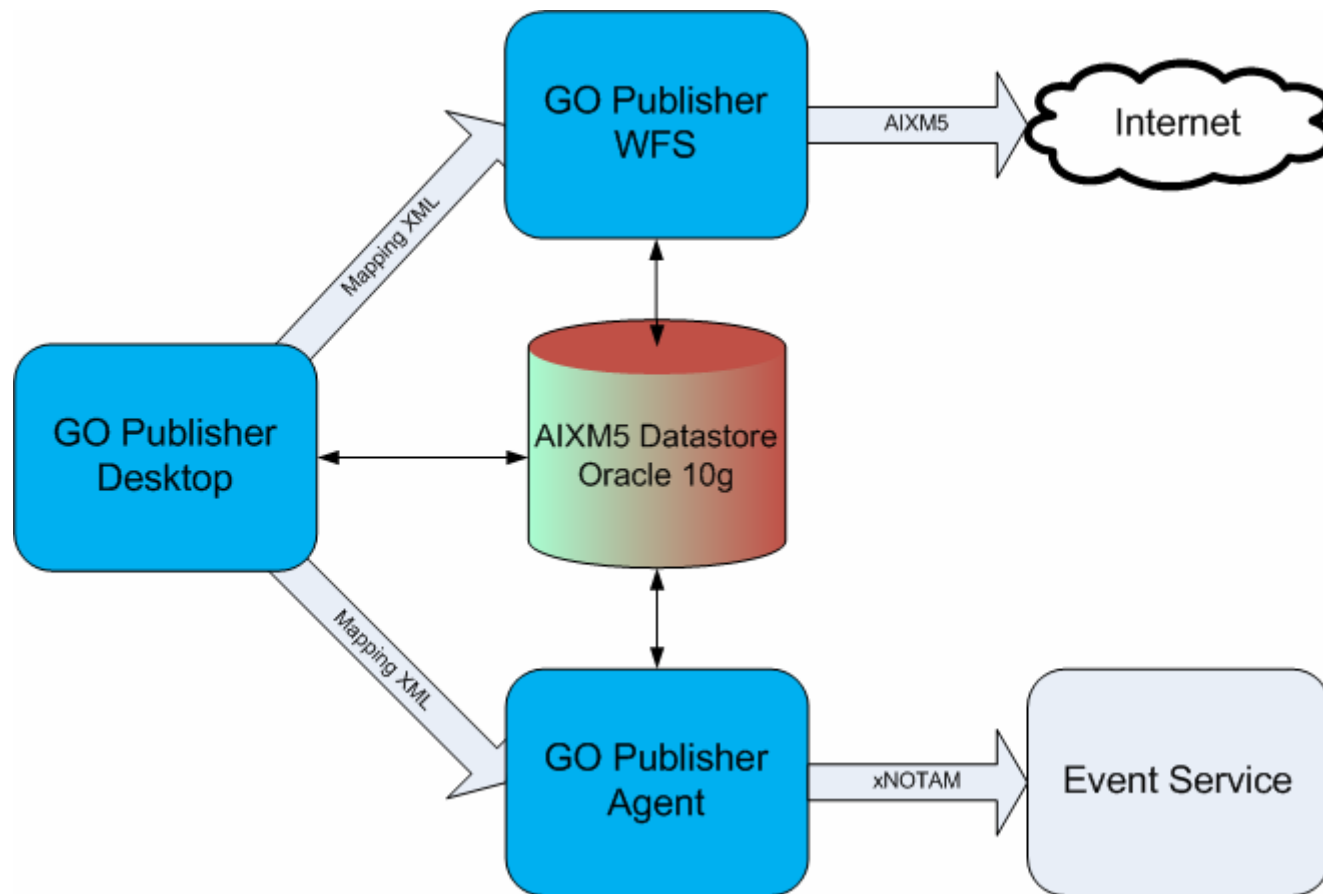
</gml:LineStringSegment>
  </gml:segments>
</aixm:Curve>
</aixm:trajectory>
</aixm:ProcedureTransition>

```

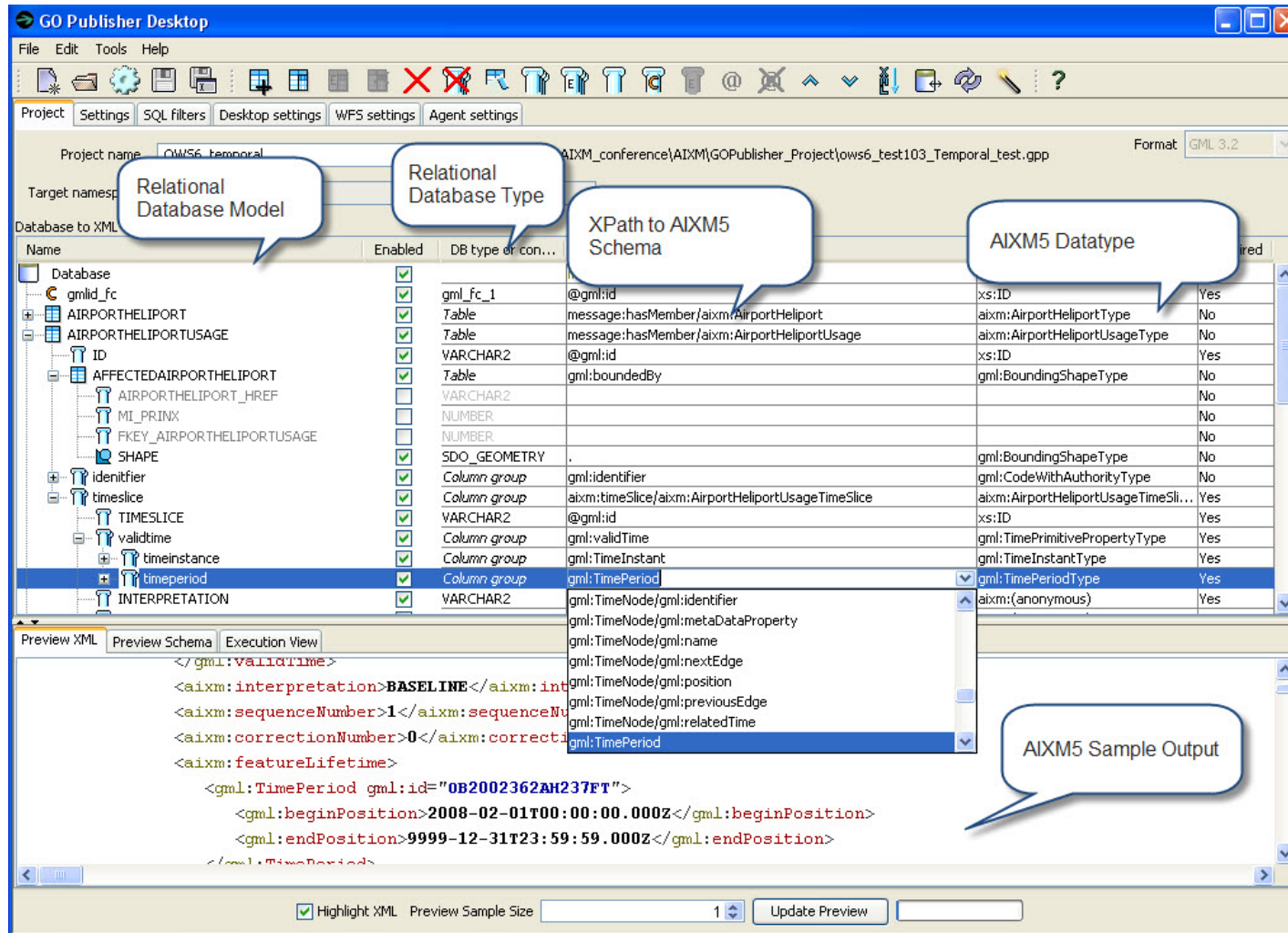
Highlight XML Preview Sample Size: 1 Update Preview

Intel PROSet/Wireless  
Connected to: tmobile  
Speed: 54.0 Mbps  
Signal Quality: Very Good

## Deploying the mapping to Publisher AIXM5



# Mapping AIXM5 using GO Publisher



**GO Publisher Desktop**

Project name: QWS6\_temporal | Target namespace: AIXM\_conference\AIXM\GOPublisher\_Project\ows6\_test103\_Temporal\_test.gpp | Format: GML 3.2

Name	Enabled	DB type or con...	XPath to AIXM5 Schema	AIXM5 Datatype	Required
Database	<input checked="" type="checkbox"/>				
gmlid_fc	<input checked="" type="checkbox"/>	gml_fc_1	@gml:id	xs:ID	Yes
AIRPORTHELIPORT	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:AirportHeliport	aixm:AirportHeliportType	No
AIRPORTHELIPORTUSAGE	<input checked="" type="checkbox"/>	Table	message:hasMember/aixm:AirportHeliportUsage	aixm:AirportHeliportUsageType	No
ID	<input checked="" type="checkbox"/>	VARCHAR2	@gml:id	xs:ID	Yes
AFFECTEDAIRPORTHELIPORT	<input checked="" type="checkbox"/>	Table	gml:boundedBy	gml:BoundingShapeType	No
AIRPORTHELIPORT_HREF	<input type="checkbox"/>	VARCHAR2			No
MI_PRINX	<input type="checkbox"/>	NUMBER			No
FKEY_AIRPORTHELIPORTUSAGE	<input type="checkbox"/>	NUMBER			No
SHAPE	<input checked="" type="checkbox"/>	SDO_GEOMETRY		gml:BoundingShapeType	No
identifier	<input checked="" type="checkbox"/>	Column group	gml:identifier	gml:CodeWithAuthorityType	No
timeslice	<input checked="" type="checkbox"/>	Column group	aixm:timeSlice/aixm:AirportHeliportUsageTimeSlice	aixm:AirportHeliportUsageTimeSli...	Yes
TIMESLICE	<input checked="" type="checkbox"/>	VARCHAR2	@gml:id	xs:ID	Yes
validtime	<input checked="" type="checkbox"/>	Column group	gml:validTime	gml:TimePrimitivePropertyType	Yes
timeinstance	<input checked="" type="checkbox"/>	Column group	gml:TimeInstant	gml:TimeInstantType	Yes
timeperiod	<input checked="" type="checkbox"/>	Column group	gml:TimePeriod	gml:TimePeriodType	Yes
INTERPRETATION	<input checked="" type="checkbox"/>	VARCHAR2	gml:TimeNode/gml:identifier	aixm:(anonymous)	Yes

**Preview XML**

```

</gml:validTime>
<aixm:interpretation>BASELINE</aixm:int
<aixm:sequenceNumber>1</aixm:sequenceNu
<aixm:correctionNumber>0</aixm:correct
<aixm:featureLifetime>
  <gml:TimePeriod gml:id="OB2002362AH237FT">
    <gml:beginPosition>2008-02-01T00:00:00.000Z</gml:beginPosition>
    <gml:endPosition>9999-12-31T23:59:59.000Z</gml:endPosition>
  </gml:TimePeriod>

```

**AIXM5 Sample Output**

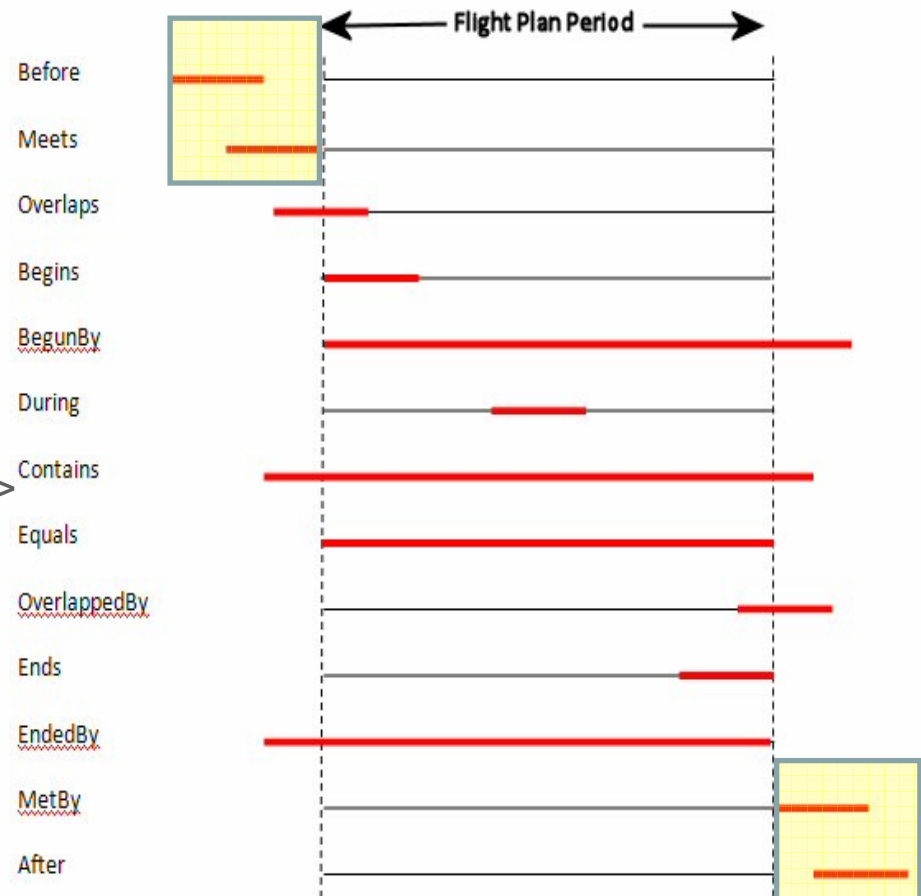
# Temporal Queries

Query on timeframe of flight and within 100 nautical miles of flight path

```

<fes:TemporalOperators>
<fes:TemporalOperator name="After"/>
<fes:TemporalOperator name="Before"/>
<fes:TemporalOperator name="Begins"/>
<fes:TemporalOperator name="BegunBy"/>
  <fes:TemporalOperator name="TContains"/>
<fes:TemporalOperator name="During"/>
<fes:TemporalOperator name="TEquals"/>
  <fes:TemporalOperator name="TOverlaps"/>
<fes:TemporalOperator name="Meets"/>
<fes:TemporalOperator name="OverlappedBy"/>
<fes:TemporalOperator name="MetBy"/>
<fes:TemporalOperator name="Ends"/>
<fes:TemporalOperator name="EndedBy"/>
</fes:TemporalOperators>
  
```

ISO 19108 Temporal Operators



## Server Side Results

- Proved that AIXM5 (and xNOTAM) can be loaded, managed and published
- The underlying OGC and ISO standards (GML, WFS, FE) fully supported the Aviation requirements
- Proved interoperability through multiple client integration
- Successfully implemented spatio-temporal queries
- Only minor issues along the way – no show stoppers

All Delivered using COTS





Any Questions?

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