

Aeronautical Information Services

Towards a Global Digital NOTAM Specification

Presented to: ATIEC 2016

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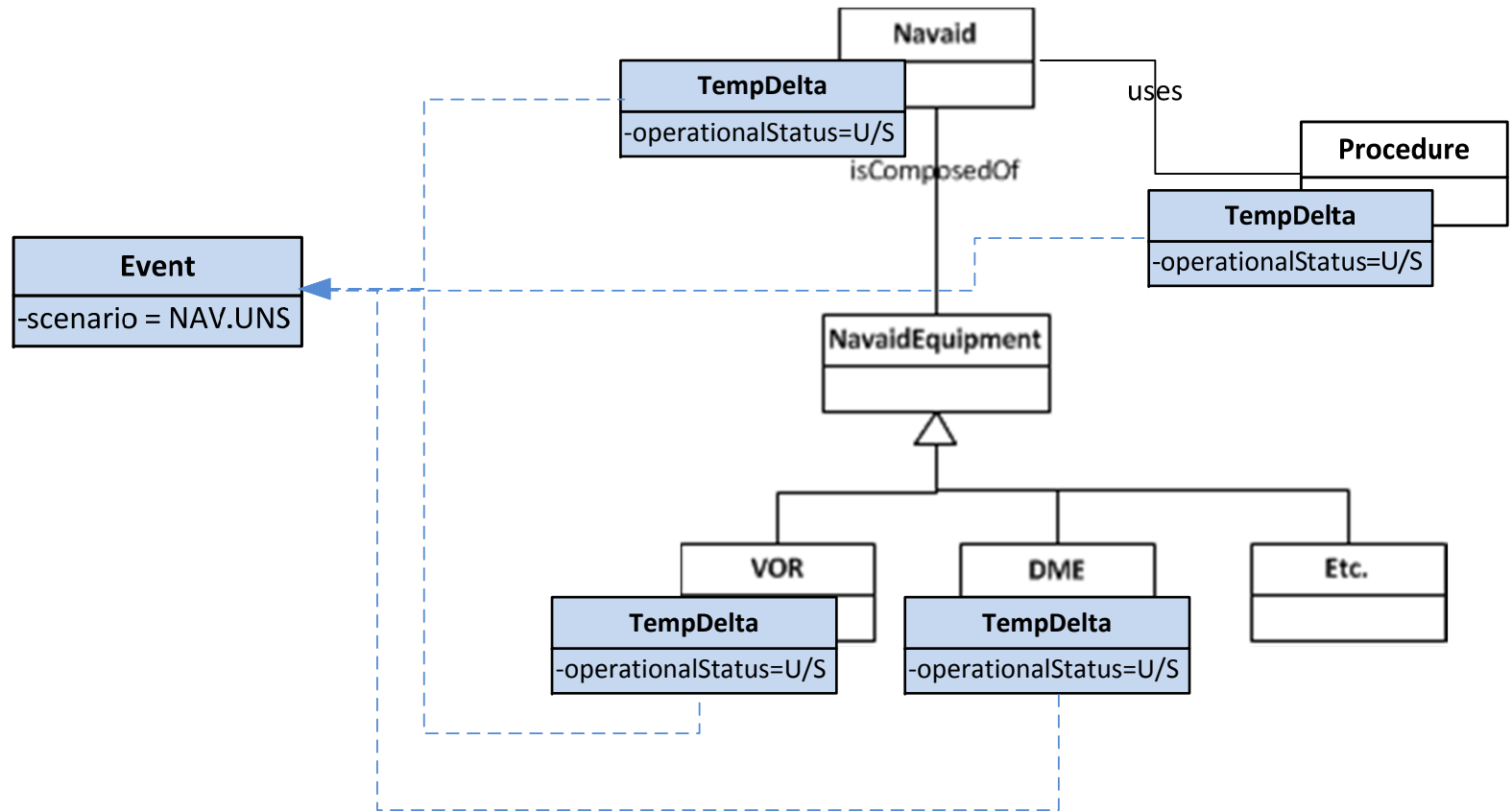
Date: 22 August 2016

Aviation Information World – Forecasting the Future



“Digital NOTAM” – AIXM coding

VOR/DME “DCA” Out of service...



Digital NOTAM Specification

- **Identify types of “events” for which the information is currently provided through NOTAM**
 - Example: runway closed, navaid u/s, new obstacle, etc.
- **Provide the AIXM 5.1 encoding rules for each type of event**
 - business rules!
- **... also, support the automatic generation of NOTAM messages (as long as necessary)**



Digital NOTAM Specification

<i>scenarios</i>	<i>scenarios</i>
•Published special activity area – activation	•Displaced threshold
•Published ATS airspace - activation or deactivation	•Declared distances changes
•Ad-hoc special activity area – creation	•Runway portion closure
•Ad-hoc ATS airspace – creation	•Airport Usage limitation
•Route portion closure	•Runway usage limitation
•Route portion opening	•Taxiway usage limitation
•Aerodrome closure	•Approach lights unserviceable
•Runway closure	•Approach lights downgraded
•Navaid unserviceable	•Runway lights unserviceable
•New obstacle	•Obstacle lights unserviceable
•Taxiway closure	•Visual Approach slope indicator unserviceable
•Surface contamination (SNOWTAM)	•Taxiway lights unserviceable
•Other Event (any other situation that does not have a dedicated scenario)	

Application: graphical briefing

Integrated Digital Briefing x Alex

10.16.86.200:8082/BriefingHMI/#/main

DuckDuckGo Chrome Extensions: ... Pyotr Ilyich Tchaikov... YouTube News SESAR WJ Fatca Relief Coming... TV Miscellaneous Wien-Donaustadt - ... METGIFS

FREQUENTIS Integrated Digital Briefing Welcome dbriefing [logout](#) [Generate ePIB Documents](#)

16-01-28 15:00 TEST01 KJFK - LOWW

- Overview
- + Aerodromes
- + En-Route
- Settings
- Flight Plans

Request Date:	Jan 29, 2016
Flight Number:	TEST01
Departure Aerodrome:	KJFK JOHN F KENNEDY INTL
Destination Aerodrome:	LOWW SCHWECHAT
Alternate Aerodromes:	LOWI LZIB
Emergency Aerodromes:	LOWG LOWL KBOB
FIR:	KZBW CZQM CZQX EGGX EGGT EBBU EDGG EDUU EDMM LKAA LOVV
Generic Route:	BETTE KANNI SUPRY LIMRI XETBO BANBA KONAN AMASI BOMBI OSBIT LULAR VENEN
Height Limits (lower/upper):	First: 0/300 Other: 0/300 Last: 0/300
Width of Route:	20 NM
Radius around aerodrome:	25 NM

Application: graphical briefing


Integrated Digital Briefing
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Generate ePIB Documents

FREQUENTIS Integrated Digital Briefing

16-01-28 15:00 TEST01 KJFK - LOWW

- Overview
- Aerodromes
 - DEP : KJFK
 - Airport**
 - TMA
 - MET
 - ARR : LOWW
 - Alternate
 - Emergency
 - En-Route
 - Settings
 - Flight Plans



Time filter: 16-01-28 14:00 to 16-01-28 16:00 [Edit](#)

<input checked="" type="checkbox"/>	1 TWY Closure	16Jan18 14:00 to 16Jan28 23:00	A0296/16
	TWY JB, JA, Y between RWY 13R/31L and TWY J closed		
<input checked="" type="checkbox"/>	2 TWY Closure	16Jan18 14:00 to 16Jan28 23:00	A0296/16
	TWY H between TWY Y and TWY Z closed		
<input checked="" type="checkbox"/>	3 TWY Closure	16Jan18 14:00 to 16Jan28 23:00	A0296/16
	TWY NB closed to Southbound turns to TWY A		
<input checked="" type="checkbox"/>	4 TWY Closure	16Jan18 14:00 to 16Jan28 23:00	A0294/16
	TWY Y between TWY J and TWY H closed		
<input checked="" type="checkbox"/>	5 OTHER	15Dec30 17:35 to 16Dec31 17:35	A9408/14
	RWY 22R PAPI beyond 8 deg right of rcl unusable		
<input checked="" type="checkbox"/>	6 OTHER	15May05 20:10 to 99Dec31 00:00	A4415/14
	RWY 22L engineered materials arresting system not STD		
<input checked="" type="checkbox"/>	7 OTHER	16Jan17 23:45 to 16Jan29 23:15	A0286/14
	RWY 13R/31R wet deiced liquid and deiced solid observed at 1601172149		
<input checked="" type="checkbox"/>	8 OTHER	15Nov05 05:25 to 16Jan29 22:00	A8166/14
	RWY 22R PAPI commissioned		
<input checked="" type="checkbox"/>	9 OTHER	15Dec02 17:00 to 16Apr01 17:00	A8773/14
	Runway status lights (rws) are in an operational test and must be complied with. Runway status lights are red in-pavement lights that serve as warning lights on runways and taxiways indicating that it is unsafe to enter, cross, or begin takeoff on a runway. Note: runway status lights indicate runway status only. They do not indicate clearance. Pilots and vehicle operators must still receive a clearance from air traffic control before proceeding. For additional information visit: http://www.Faa.Gov/air?Traffic/technology/rws		
<input checked="" type="checkbox"/>	10 OTHER	16Jan17 23:22 to 16Jan29 23:15	A0281/14
	RWY 13R/31L wet deiced liquid and deiced solid observed at 1601172122.		
<input checked="" type="checkbox"/>	11 OTHER	16Jan17 23:15 to 16Jan29 23:15	A0280/14
	RWY 04R/22L wet deiced liquid and deiced solid observed at 1601172115.		
<input checked="" type="checkbox"/>	12 OTHER	16Jan17 23:45 to 16Jan29 23:15	A0284/14
	RWY 04L/22R wet deiced liquid and deiced solid observed at 1601172145		
<input checked="" type="checkbox"/>	13 RWY Closure	16Jan22 05:10 to 16Feb13 14:00	A1388/16
	RWY 13L/31R closed		

Application: graphical briefing

Integrated Digital Briefing

10.16.86.200:8082/BriefingHMI/#/main

WELCOME dbriefing [logout](#)

Generate ePIB Documents

16-01-28 15:00 TEST01 KJFK - LOWW

- Overview
- Aerodromes
 - DEP : KJFK
 - ARR : LOWW
 - Alternate
 - LOWI
 - Airport
 - TMA
 - MET
 - LZIB
 - Emergency
 - En-Route
 - Settings
 - Flight Plans

Time filter: 16-01-28 21:11 to 16-01-28 23:11 Edit

<input checked="" type="checkbox"/>	149 OTHER	16Jan19 12:00 to 16Jan29 15:00	A0086/14
	Additional ascents of radiosonde out of LOWI. Ballon diameter 1,5M.		
<input checked="" type="checkbox"/>	150 New Obstacle	15Jan09 02:00 to 16Feb18 02:00	A2616/
	crane 2 coordinates: 471540N 0112201E elev.: 590M/1936FT AMSL max height above GND: 13M/43FT AGL obst marked		
<input checked="" type="checkbox"/>	151 New Obstacle	15Jan09 02:00 to 16Feb18 02:00	A2616/
	2 Cranes erected within area LOWI (ambergasse 1-3) crane 1 coordinates: 471541N 0112201E elev.: 591M/1939FT AMSL max height above GND: 14M/46FT AGL obst marked		
<input checked="" type="checkbox"/>	152 New Obstacle	15Dec28 02:00 to 16Mar25 02:00	A2647/
	Temporary crane 471548N 0112225E elevation 600M/1969FT AMSL (height 25M/82FT AGL) Lighted.		
<input checked="" type="checkbox"/>	153 New Obstacle	15Dec28 02:00 to 16Mar25 02:00	A2648/
	TEMP crane 471604N 0112223E ELEV 669M/2195FT AMSL (HEI 35M/115FT AGL) Lighted.		
<input checked="" type="checkbox"/>	154 New Obstacle	15Dec28 02:00 to 16Mar25 02:00	A2646/
	Temporary crane 471617N 0112251E elevation 672M/2205FT AMSL (height 27M/89FT AGL) Lighted.		
<input checked="" type="checkbox"/>	155 New Obstacle	16Jan26 23:00 to 16Feb02 02:00	A2599/
	Temporary crane at LOWI (within obstacle clearance area, aprx 1500M east of THR RWY 26) 471644N 0112341E elevation 662M/2172FT AMSL (height 36M/118FT AGL) day marking : yes night marking : yes		
<input checked="" type="checkbox"/>	156 New Obstacle	15Dec21 02:00 to 16Feb02 02:00	A2599/
	Temporary mobile crane at LOWI (apr 1500M east of THR RWY 26) 471644N 0112341E elevation 662M/2172FT AMSL (height 44M/144FT AGL) day marking : yes night marking : yes Used to erect another crane.		

Graphical NOTAM symbols

- **No ICAO standard**
- **SAE International**
 - “*Human Factors Minimum Requirements and Recommendations for the Flight Deck Display of Data Linked Notices to Airmen (NOTAMs)*” (Document ARP6467).
 - Does not provide authoritative graphical symbols, just examples!
- **OGC® Testbed 10**
 - “Aviation Human Factor Based Portrayal of Digital NOTAMs” ER
- **EUROCAE**
 - Technical Work Programme 2016
 - develop a “*standard for representation of digital NOTAM in PIB*” (and other ground applications...)



Application: graphical briefing

Integrated Digital Briefing x

10.16.86.200:8082/BriefingHMI/#/main

FREQUENTIS Integrated Digital Briefing

Welcome dbriefing [logout](#)

[Generate ePIB](#)

UAL 234 KJFK - ESSA 15-07-29 12:06

- Overview
- Aerodromes
 - DEP : KJFK
 - Airport
 - TMA
 - MET
 - ARR : ESSA
 - ALT : ESSB
 - Emergency
- En-Route
 - FIR: KZBW
 - Config
 - MET
 - FIR: CZQM
 - FIR: CZUL
 - FIR: CZQX
 - Config
 - MET
 - FIR: EGGX
 - FIR: BIRD
 - FIR: ENOR
 - Config
 - MET
 - FIR: ESAA
 - Config
 - MET
- Settings
- Flight Plans

Disable FIR

110W PIE-120SSE ILM WST ISSUANCES POSS. REFER TO MOST RECENT ACUS01 KWNS FROM STORM PREDICTION CENTER FOR SYNOPSIS AND METEOROLOGICAL DETAILS. AREA 2...FROM EKN-40SW CSN-50SW CRG-80SW CTY-CEW-50NNE MSL-VXV-EKN WST ISSUANCES POSS. REFER TO MOST RECENT ACUS01 KWNS FROM STORM PREDICTION CENTER FOR SYNOPSIS AND METEOROLOGICAL DETAILS.

SIGMET: WAUS42 KKCI 290245 MIAT WA 290245 AIRMET TANGO FOR TURB VALID UNTIL 290900 AIRMET TURB...NC ME NH VT MA RI CT NY LO NJ PA WV MD DC DE VA AND CSTL WTRS FROM YSC TO BGR TO 110SE BGR TO 200SE ACK TO 160SE SIE TO 190ESE ECG TO 20NE ILM TO 20S JST TO 70NE YYZ TO YOW TO YSC MOD TURB BTN FL270 AND FL400. CONDS CONTG BYD 09Z ENDG 09-12Z. [IWX00M SIGMET](#)

SIGMET: WAUS41 KKCI 290245 BOST WA 290245 AIRMET TANGO FOR TURB VALID UNTIL 290900 AIRMET TURB...ME NH VT MA RI CT NY LO NJ PA WV MD DC DE VA NC AND CSTL WTRS FROM YSC TO BGR TO 110SE BGR TO 200SE ACK TO 160SE SIE TO 190ESE ECG TO 20NE ILM TO 20S JST TO 70NE YYZ TO YOW TO YSC MOD TURB BTN FL270 AND FL400. CONDS CONTG BYD 09Z ENDG 09-12Z. [IWX00M SIGMET](#)

SIGMET: WAUS41 KKCI 290245 BOSS WA 290245 AIRMET SIERRA FOR IFR AND MTN OBSCN VALID UNTIL 290900 AIRMET IFR...NH VT MA NY FROM 30SE YSC TO 30W BOS TO 40WSW ALB TO 30E MSS TO 30SE YSC CIG BLW 010/VIS BLW 3SM BR/FG. CONDS DVLPG 06-09Z. CONDS CONTG BYD 09Z ENDG 12-15Z. [IWX00M SIGMET](#)

SIGMET: WAUS41 KKCI 290245 BOSS WA 290245 AIRMET SIERRA FOR IFR AND MTN OBSCN VALID UNTIL 290900 AIRMET IFR...ME NH MA RI AND CSTL WTRS FROM 30ESE HUL TO 140E ACK TO 60ESE ACK TO 50SSE PVD TO 20WSW BGR TO 30ESE HUL CIG BLW 010/VIS BLW 3SM BR/FG. CONDS CONTG BYD 09Z THRU 15Z. [IWX00M SIGMET](#)

SIGMET: WAUS41 KKCI 290845 BOSS WA 290845 AIRMET SIERRA UPDT 1 FOR IFR AND MTN OBSCN VALID UNTIL 291500 AIRMET IFR...ME NH VT MA RI CT NY AND CSTL WTRS FROM 50SE HUL TO 160ESE ACK TO 70S ACK TO 30W BDL TO 50S PLB TO YSC TO 20W BGR TO 50SE HUL CIG BLW 010/VIS BLW 3SM BR/FG. CONDS CONTG BYD 15Z THRU 21Z. [IWX00M SIGMET](#)

SIGMET: WAUS41 KKCI 290845 BOST WA 290845 AIRMET TANGO UPDT 1 FOR TURB VALID UNTIL 291500 AIRMET TURB...ME NH MA RI CT NY NJ MD DE VA AND CSTL WTRS FROM 70NW PQI TO 60NE PQI TO 200SE ACK TO 160SE SIE TO 70E ORF TO 30SW PVD TO 40SE YQB TO 70NW PQI MOD TURB BTN FL280 AND FL420. CONDS CONTG BYD 15Z ENDG 15-18Z. OTLK VALID 1500-2100Z...TURB OH LE BOUNDED BY 20WNNW YYZ-40WNNW AIR-CVG-FWA-30SE ECK-20WNNW YYZ MOD TURB BTN FL340 AND FL400. CONDS ENDG 18-21Z. [IWX00M SIGMET](#)

SIGMET: WAUS41 KKCI 290845 BOSS WA 290845 AIRMET SIERRA UPDT 1 FOR IFR AND MTN OBSCN VALID UNTIL 291500 AIRMET MTN OBSCN...ME NH VT NY FROM 50E YQB TO 20WNNW BGR TO 20S MPV TO 30ENE MSS TO YSC TO 50E YQB MTNS OBSC BY CLDS/BR. CONDS ENDG 12-15Z. [IWX00M SIGMET](#)

Digital NOTAM in Europe

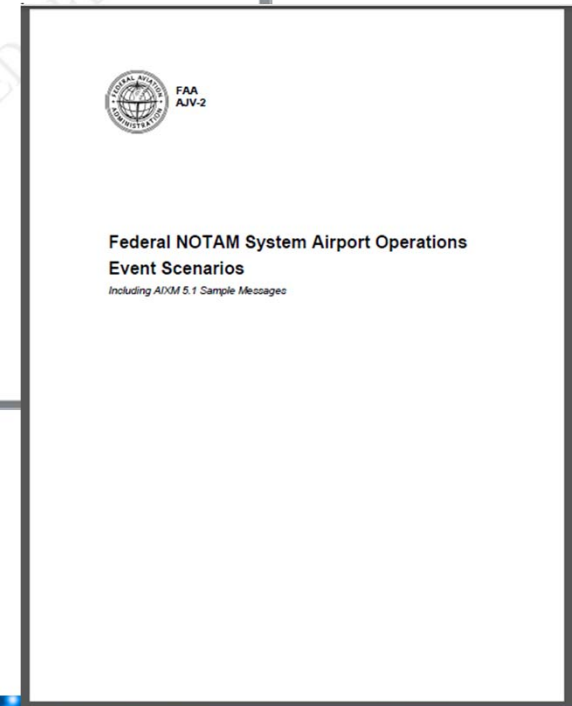
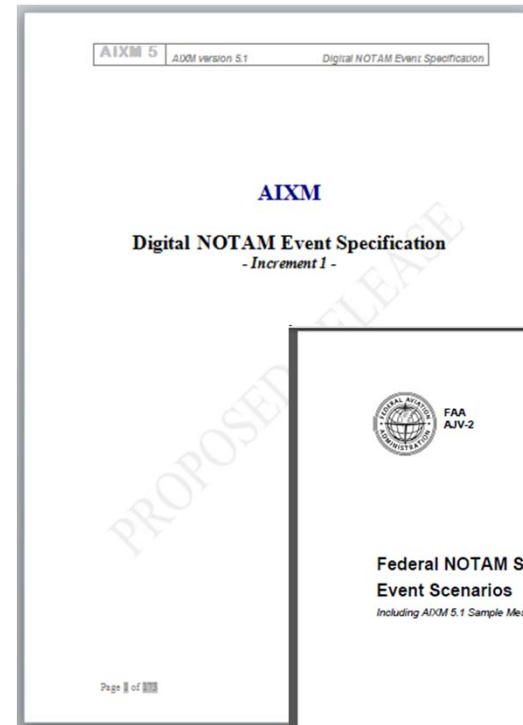
- **EUROCONTROL Centralised Service CS#5 (EAIMS)**
 - Digital NOTAM coding capability
 - Graphical briefing capability
 - Some NOTAM will have to be post-digitised by the service provider, at least in the initial phase
 - Operational around 2020
 - Will replace the current EAD system
- **European ANSP with a local system**
 - Digital NOTAM plans/trials

Expecting to receive Digital NOTAM from world-wide!



Scenarios

- **DNOTAM Focus Group**
 - Participants: Eurocontrol, FAA, NavCanada, industry
 - model the most common events, both airport and airspace (SAA.NEW, RWY.CLS, SAA.ACT, etc.)
- **FAA**
 - additional/alternative scenarios
 - initial focus on all airport events
 - fast deployment (FNS-NDS)



Scenarios

Digital NOTAM Specification

```
<event:Event gml:id="uuid.f50faa4a-3037-45ea-a69d-5e982d74991a">
  <gml:identifier codeSpace="urn:uuid:">f50faa4a-3037-45ea-a69d-5e982d74991c</gml:identifier>
  <event:timeSlice>
    <event:EventTimeSlice gml:id="evttsl-0046">
      <gml:validTime>
        <gml:TimePeriod gml:id="evtntp-814199">
          <gml:beginPosition>2016-01-14T06:23:00Z</gml:beginPosition>
          <gml:endPosition>2016-01-25T06:22:59Z</gml:endPosition>
        </gml:TimePeriod>
      </gml:validTime>
      <aixm:interpretation>BASELINE</aixm:interpretation>
      <aixm:sequenceNumber>1</aixm:sequenceNumber>
      <aixm:featureLifetime>
        <gml:TimePeriod gml:id="evtntp-814199">
          <gml:beginPosition>2016-01-28T12:33:00Z</gml:beginPosition>
          <gml:endPosition>2016-01-29T12:33:00Z</gml:endPosition>
        </gml:TimePeriod>
      </aixm:featureLifetime>
      <event:name>LZIB 0046</event:name>
      <event:encoding>DIGITAL</event:encoding>
      <event:scenario>SFC.CON</event:scenario>
```

What does this scenario mean?

Is it correctly encoded?

Is it complete?

How can I verify it ?

FAA additional scenarios

```
<ns12:Event ns5:id="Event_1_11627044">
  <ns5:boundedBy xsi:nil="true"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"/>
  <ns12:timeSlice>
    <ns12:EventTimeSlice
    ns5:id="Event_TS_1_11627044">
      <ns5:validTime>
        <ns5:TimePeriod
        ns5:id="Event_TS_TP_1_11627044">
          <ns5:beginPosition>2015-04-17T21:25:00.000Z</ns5:beginPosition>
          <ns5:endPosition>2015-04-19T21:00:00.000Z</ns5:endPosition>
        </ns5:TimePeriod>
      </ns5:validTime>
      <ns9:interpretation>BASELINE</ns9:interpretation>
      <ns12:scenario>82</ns12:scenario>
      <ns12:extension>
        <ns6:EventExtension
        t_01_11627044">
          <ns6:classification>DOM</ns6:classification>
          <ns6:accountId>SFO</ns6:accountId>
          <ns6:airportName>SAN FRANCISCO
          INTL</ns6:airportName>
          <ns6:lastUpdated>2015-04-17T21:25:00.000Z</ns6:lastUpdated>
          <ns6:icaoLocation>KSFO</ns6:icaoLocation>
```



Scenarios – verification rules

- Example

Coding specification rule

- “[RWY.CLS] Event must have CLOSED operationalStatus”

It is prohibited that a RunwayDirectionTimeSlice with availability.ManoeuvringAreaAvailability.operationalStatus not equal-to 'CLOSED' belongsTo Event with scenario equal-to 'RWY.CLS' and with version equal-to '2.0'

AIXM - SBVR rule

```
(: for each runway direction :)
for $runwayDirection in . return
(
  if
  (
    (: if its operationalStatus is not 'CLOSED' :)
    not($runwayDirection/aixm:availability/aixm:ManoeuvringAreaAvailability/aixm:operationalStatus='CLOSED')
    and
    (: and we find one (or more) event that... :)
    count
    (
      for $event in //event:Event
```

Executable computer code

.....

Even more – data quality checks!

The screenshot displays the FREQUENTIS Integrated Digital Briefing interface. The main header shows the flight details: 16-01-28 15:00 TEST01 KJFK - LOWW. The left sidebar contains navigation options: Overview, Aerodromes (DEP: KJFK, Airport, TMA, MET), ARR: LOWW (Airport, TMA, MET), Alternate, Emergency, En-Route, Settings, and Flight Plans. The central map shows a 3D view of the airport with a red arrow pointing to a specific location labeled '132'. The right sidebar contains a list of NOTAMS, with a red circle highlighting entry 132. The NOTAM list includes a time filter and several entries with detailed descriptions and warnings.

Time filter: 16-01-28 21:11 to 16-01-28 23:11 Edit

NOTAM ID	Category	Effective Period	Priority
132	Displaced Threshold	15Dec10 00:00 to 16Apr10 01:00	A1546/15
133	OTHER	15Oct14 13:24 to 99Dec31 00:00	A2125/14
134	OTHER	15Sep09 14:56 to 99Dec31 00:00	A1882/14
135	OTHER	15Nov17 17:04 to 16Feb12 16:00	A2381/14
136	OTHER	16Jan11 08:22 to 16Apr01 16:00	A0045/14

132 Displaced Threshold 15Dec10 00:00 to 16Apr10 01:00 A1546/15
RWY 16 THR displaced 300 M. New THR location 480705N 0163446E.
WARNING: THR coordinates do not have the required resolution (1/100 seconds of arc)
WARNING: Displaced THR coordinates are not co-linear with Runway centreline

133 OTHER 15Oct14 13:24 to 99Dec31 00:00 A2125/14
Boeing 747-8 ops LOWW due to finalized compatibility project AIC A 5/09 not valid for B748. All published approach and departure procedures calculated for category DL. For PAPI, MEHT and glide slope check AIP LOWW ad 2.14 B748 may use all RWYs, TWYs and aircraft stand taxilanes which are useable unrestricted by ICAO code E aircraft. Pilots shall exercise caution when taxiing through TWYs A11, A12 and exit1 as main gear to pavement edge clearance may be limited. Oversteering technique is required. TWY lima between exit 6 and exit 13 is an aircraft stand taxilane for B748. Rescue and FIRE fighting CAT 9 available - CAT 10 on request via ATC 15 minutes in advance. Taxiing on TWYs and aircraft stand taxilanes during night and low visibility only permitted if center line lights are visible. Otherwise marshaller assistance mandatory. Ref AIP austria LOWW ad 2.24-1-2: Max wingspans on parking stands not valid for B748 - MNM clearance to objects 7.5M

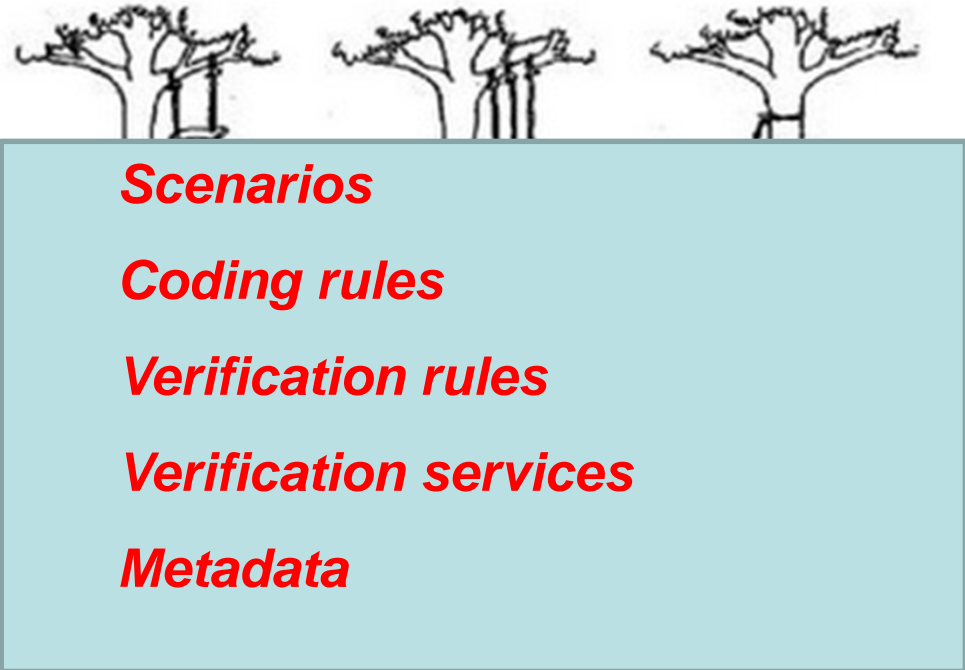
134 OTHER 15Sep09 14:56 to 99Dec31 00:00 A1882/14
Intermediate holding position lima 3 established on TWY lima between exit 6 and exit 7.

135 OTHER 15Nov17 17:04 to 16Feb12 16:00 A2381/14
Ref AIP austria, LOWW ad 2.22, Item 2.2.3. Current rush hour periods in UTC are: 0600-0800, 0930-1030, 1330-1430, 1600-1745 and 1830-2030.)

136 OTHER 16Jan11 08:22 to 16Apr01 16:00 A0045/14
Deicing procedure for act on main-apron and gac-apron: p r o c e d u r e: 1. Report the necessity for deicing asap either to your ramp-agent or contact directly your contracted deicing agent. ACFT without contracted deicing agent MAY contact Vienna Ice on 131,625 MHZ or telephone +431700722050. 2. Report necessity for deicing to ATC when ACFT is completely ready (doors closed, ready for start-up/push-back). 3. Areas: de-icing standby area: prkg psns e48 to e99. De-icing south: prkg psns f43, f47, f51, f53, f55, f57, f59, (f45, f55 for code f ACFT). De-icing north: prkg psns f42, f44, f46, f48, f50, (f46 for code f ACFT). 4. ACFT cleared to the deicing standby area approach prkg psns e48 to

We need a globally applicable Digital NOTAM Specification

- a unique opportunity to do it right!
- a joint responsibility for the Digital NOTAM designers and the end users!



As produced
by the
engineers.

As installed at
the user's
site.

What the
customer
really wanted.