Semantic DNOTAM

- Ontology-based prioritization & querying of DNOTAM
  - SWIM component which you can add to any application
  - Industrial Research & Experimental Development project founded by the Austrian Research Promotion Agency (FFG)

- Joint Undertaking of FREQUENTIS & University of Linz
  - Supported by AustroControl, Eurocontrol, various pilots & FAA FNS Distribution Service

- Ends December 2016
Motivation

- “The current pre-flight information bulletins contain on average 50% NOTAM messages that are irrelevant because it is not possible filter out, for example, information that does not concern that type of aircraft or that flight.” [1, p. 10]

- Intelligent querying and filtering of Digital NOTAMs has been identified as important [1]

- “[...] the current NOTAMs system is clumsy to use and that it is easy to make mistakes using it.” [2, p. 2]
After closer evaluation of 389 NOTAMs, only 68 were applicable.

After fine-grade filtering only 32 NOTAMs affect the route of flight.

*presented by Ernie Bilotto during the NOTAM industry day 2014*
More specific and relevant to route of flight

Filtered so pilots can prioritize

Pilot’s Bill of Rights Act of 2012

Authorized NOTAM Improvement Program:
- Pertinent and timely
- Archived in a public, centralized location
- Filtered so pilots can prioritize
- More specific and relevant to route of flight

NOTAM Industry Day 2014

Air Transportation Information Exchange Conference - Global Information Management
ATM Information Reference Model

Harmonized, common, digital reference for operational language which requires semantic interoperability:

- **Information Model**
  - Captures operational languages and dialects
  - Provides a reference containing agreed and harmonized definitions and their interrelations

- **Logical Data Model**
  - Refines the Information Model to support system and service development
ATM Information Reference Model

- WXXM
  - Meteorological Information
- FIXM
  - Flight Information
- AIXM, AMXM
  - Aeronautical Information
- Airport Information
- AIDX
  - Environment
  - Capacity Demand
  - Flow Management
  - Surveillance Information
Best Paper Award
@ICNS 2015
Requirements Analysis

- **Identified scenarios:**
  - Pilot Briefing (Flight Planning, Departure Briefing, and Debriefing)
  - Dispatcher Briefing (Flight Preparation, Flight Update, and Debriefing)
  - In-Flight Application (context of pilot briefing)
  - Controller Briefing

- **Other requirements:**
  - 100 % recall
  - Prioritization/Grouping
  - Customizing/Personalization
  - Delta queries

[5, 6]
Requirements Analysis

- **DNOTAMS**
  - Meaning in time and space
  - Event Scenarios (EuroControl/FAA)

- **Business terms (AIRM, event scenarios, user-defined, etc.)**

- **Business rules**
  - Use of business terms
  - Relevance rules
  - Annotation rules (e.g. importance)
Query Interface

Interest Specification

for flight from Washington (IAD) to New York (JFK)
Business Terms

- Business terms in SemNOTAM are defined in an intuitively understandable, precise, and machine-readable form called concept.
  - Concept contains all elements compliant
  - Part of the SemNOTAM Ontology

- Types of business terms:
  - NOTAM business terms (special type event scenarios)
  - Auxiliary business terms

- Relations between business terms
Business Relevance Rules

Business relevance rules are specified in an intuitively understandable, precise, and machine-readable form called SemNOTAM Rule.

Example NOTAMs:

- N1: Runway Closure for wingspan greater than 150ft
- N2: Airport closed for helicopters

Rules:

- An runway closure restricted to greater than x is irrelevant if the aircraft’s wingspan is smaller than x ± buffer.
- An airport closure is irrelevant if the aircraft restriction does not meet the aircraft type.
Semantic Annotation

- Used for prioritization and grouping
- Topic groups and groupings
- Annotation rules
  - can use business terms
  - assign topic groups to NOTAMs
- Large number of rules can be split into sets
- Graphical arrangement specification
Groupings, Topics

- **Grouping**: used for linking
  - Either ordered
  - Must be complete

- **Topic**: name of a group of topic groups

- **Topic group**: semantically close NOTAMs
Ordered Viewing - Grouping Arrangement

- Two possibilities for ordered viewing
  - View single ordered grouping
  - Use grouping arrangements

- Grouping arrangement
  - Allows ordering of results regarding several groupings
  - Specified as a list of topics
semNOTAM Scenarios

- Integrated Digital Briefing
- In-Flight Prototype

- DNOTAM events, MET (METAR, TAF, SIGMET)
- Division into phases of flight
- Representation as charts / text / timeline
- Semantic filtering and prioritization
semNOTAM Scenarios
In-Flight Prototype

Aircraft Avionics (On-Board System)

Electronic Flight Bag

EFB Manager

DNOTAMs Flight Plan Parameters

Filter System

Ground System

Dispatcher

Active Flights Data

DNOTAM Publisher

Filter System

DNOTAMs Flight Plan Parameters
Summary

- Introduced SemNOTAM enabling fine-grained semantic filtering and prioritization of NOTAMs
- Flexible and adaptable architecture
- Integrated DBriefing & In-Flight scenario

Get the right information at the right time to reduce costs!
Outlook

- Flight relevant Information on an Electronic Flight Bag
- Weather Information prioritized according to the situation awareness and needs of the pilot

- SemNOTAM methods can used with other XMs/AIRM:
  - Weather Information Exchange Model
  - Aviation Information Data Exchange
  - Flight Information Exchange Model
Contact Information

eduard.gringinger@frequentis.com

semNOTAM.frequentis.com
References


