semNOTAM

Intelligent NOTAM Prioritization

dke Data & Knowledge Engineering

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Semantic DNOTAM

- Ontology-based representation & querying of DNOTAM
  - SWIM component which you can add to any application
  - Integrated Digital Briefing & In-Flight Briefing

- Started 2014, duration 3 years
- Joint Undertaking of FREQUENTIS & University of Linz
  - Industrial Research & Experimental Development project founded by the Austrian Research Promotion Agency (FFG)
  - Supported by AustroControl, Eurocontrol, FAA (FNS Distribution Service Demo) and various pilots

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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]

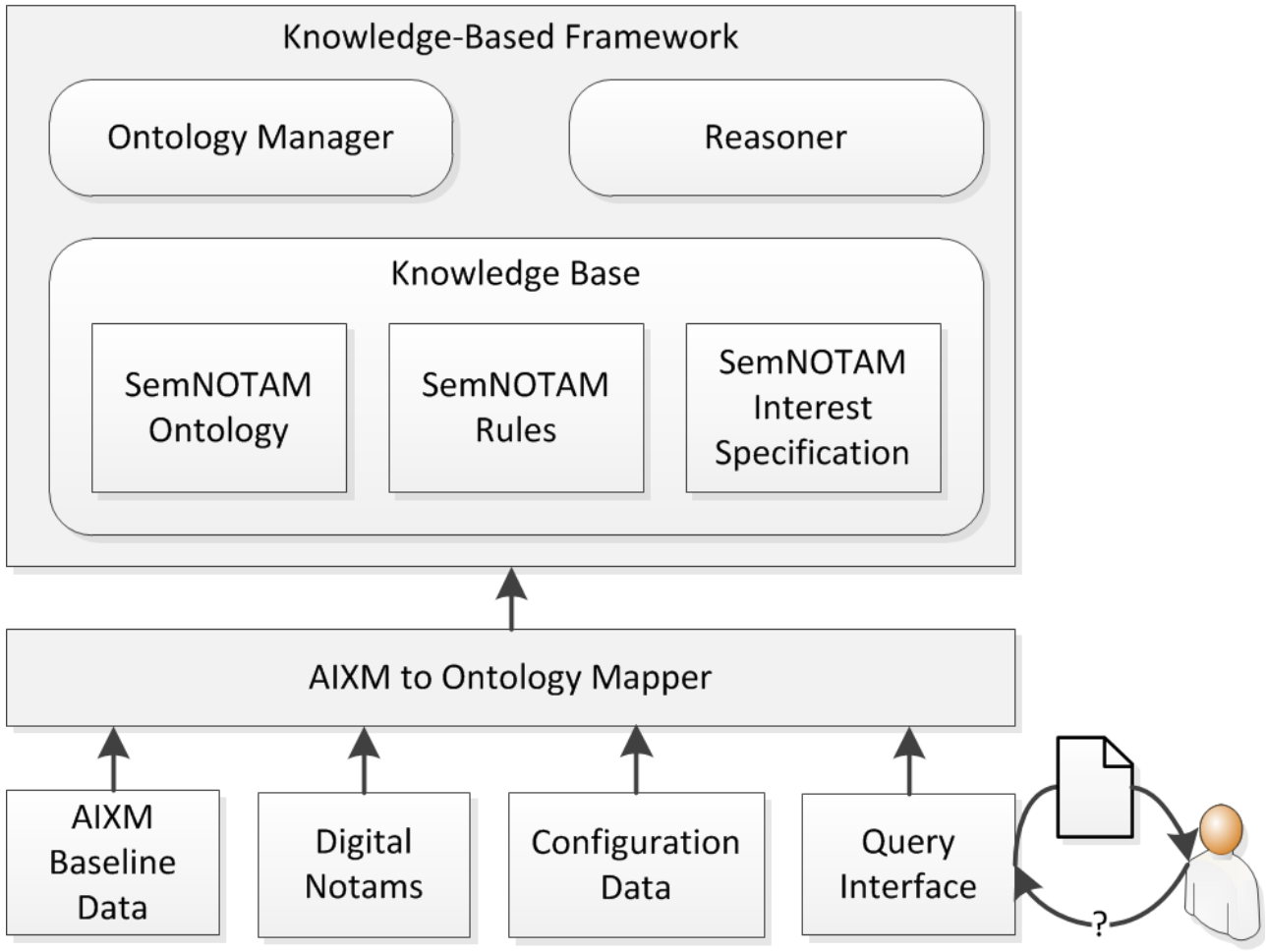
Requirements Analysis

- Scenarios to be supported:
  - Pilot Briefing (Flight Planning, Departure Briefing, and Debriefing)
  - Dispatcher Briefing (Flight Preparation, Flight Update, and Debriefing)
  - On-board Briefing (context of pilot briefing)
  - Controller Briefing

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

[5, 6]

General Approach



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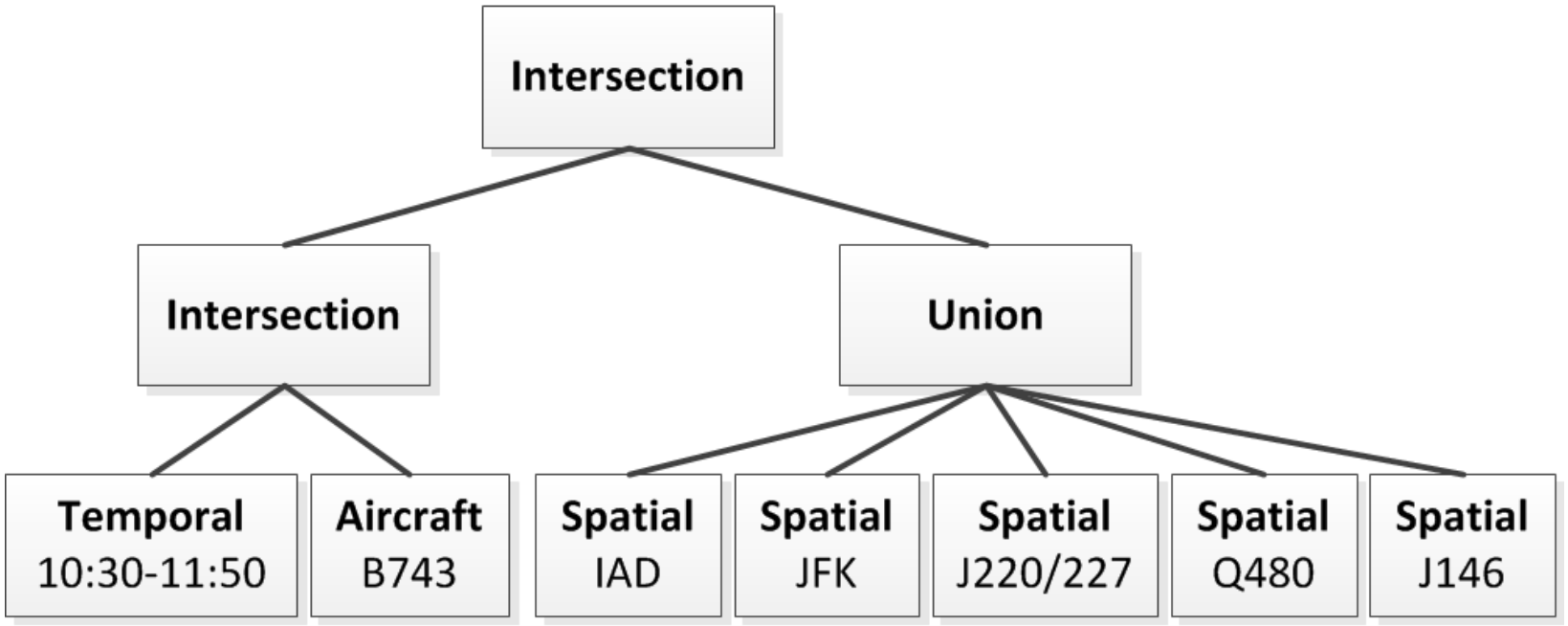
Query Interface

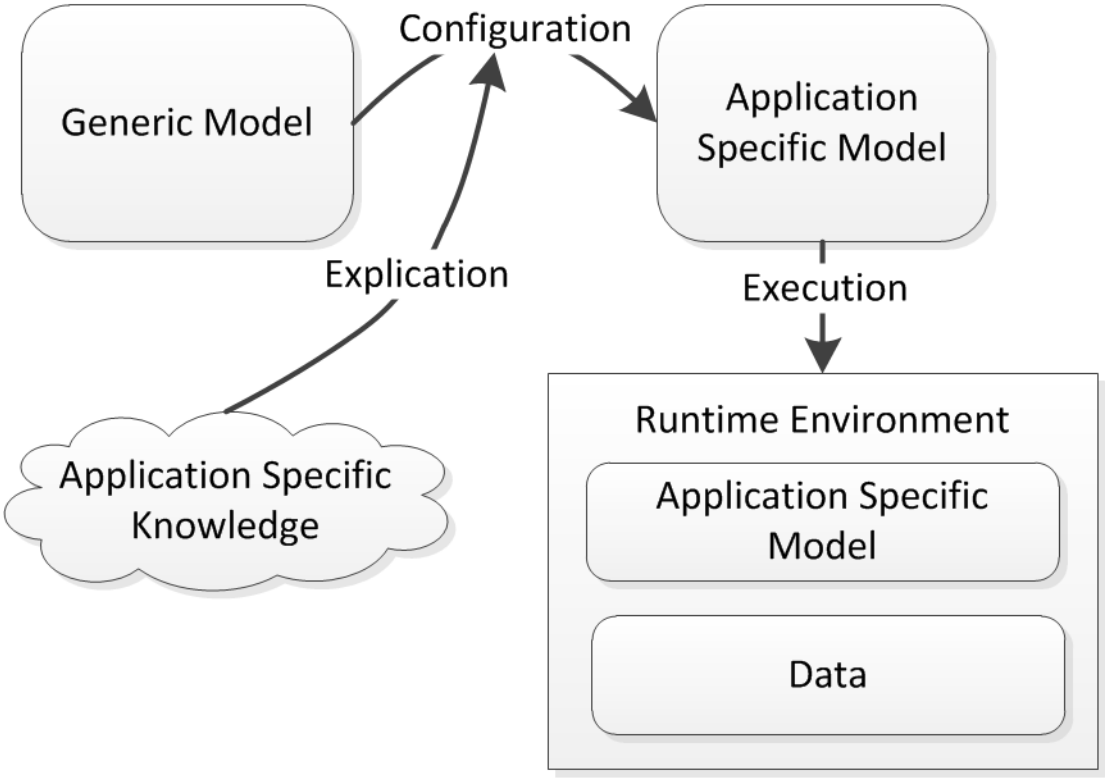
Interest Specification

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



Architecture

Two-model architecture implementing the general approach



Semantic Filtering based on Event Scenarios

- Business relevance rules
  - Spatial rules
  - Temporal rules
  - User defined rules
- Relevance rules can use business terms
- Large number of rules
  - => split them into sets
  - regarding their event scenario

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:

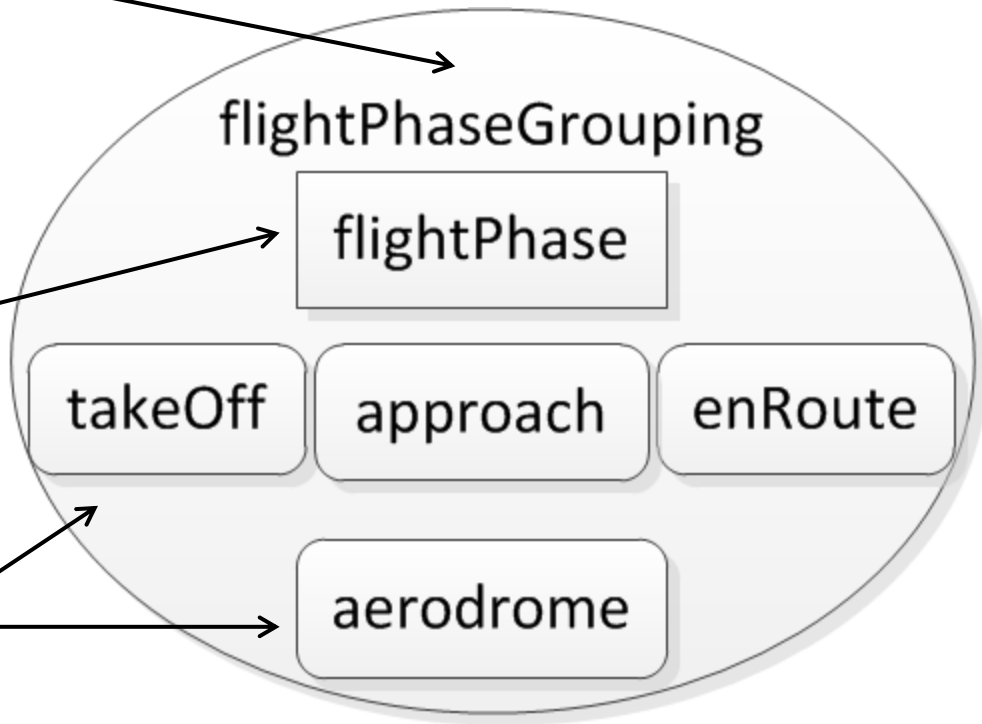
- An runway closure restricted to greater than x is irrelevant if the aircraft's wingspan is smaller than x ± buffer.
- An airport closure is irrelevant if the aircraft restriction does not meet the aircraft type.

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 in Relation to AIRM

- SemNOTAM prototype is specific to AIXM 5.1
- SemNOTAM methods can used with other domain models
  - Weather Information Exchange Model
  - Aviation Information Data Exchange
  - Flight Information Exchange Model

- Future Possibilities:
  - Flight relevant Information display in the Electronic Flight Bag
  - Weather Information prioritized according to the situation awareness and needs of the pilot

Conclusion and Outlook

- Introduced SemNOTAM enabling fine-grained semantic filtering and prioritization of NOTAMs
  - Semantic annotation
- Flexible and adaptable architecture
- Can be used in the scenarios described

- Future work: personalization/customization
- Acquire more input from operational people

Questions

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[4] Gringinger, Eduard, Wilson, Scott, Van der Stricht, 2015, AIRM-based, Fine-grained Semantic Filtering Of Notices To AirMen, ICNS 2015.

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