CROSS ORGANIZATION SEMANTIC SERVICE AND MORE …

Semantic Web for Air Transportation (SWAT) Interest Group

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Agenda

• Overview
• Cross-Organizational Semantic Services (CrOSS)
• Semantic Decision Support Tool (SDST)
• Summary
Overview

• Leverage Semantic Web Technologies
  • Provide actionable intelligence
  • Enable information discovery across organizational boundaries
  • Reuse existing data sources and services

• Address Operational Problems
  • Context-driven Decision Support for Pilot (Semantic Decision Support Tool)
  • Collaboration and Alignment of NextGen Activities (CrOSS)

Semantic Decision Support Tool

Information Filtering and Prioritization

Cross-Organizational Semantic Services

Data Federation and Correlation

Big Data Analytics

Semantic Web

Enterprise Knowledge

NOTAM, Weather, Charts, Airports, Flight Plans, ……

Requirements, CONOPS, Enterprise Architecture, ……

Requirements, CONOPS, Enterprise Architecture, ……
CrOSS: Informs Decision Making

Critical Information Requirement

Dataset Harvesting

Domain Modeling

Big Data Analytics

Organize -> Navigate -> Understand -> Decide

Better Decisions

Situational Awareness
Use Case: UAS Regulations

• Critical Information Requirement:
  • What guidance involving pilot actions in hazard conditions needs to be reviewed for integration of UAS into the NAS?

• Datasets:
  • Federal Aviation Regulations (FAR) ~16 MBs
  • 2013 Aeronautical Information Manual (AIM) ~ 8 MBs
  • FAA Advisory Circulars (AC) ~34 MBs

• Scale:
  • ~12,000 pages of regulatory guidance

• Domain Modeling
  • 3 Aviation Hazards: Icing, Lost Comms, Turbulence
  • 3 Pilot Functions: Avoid or Mitigate, Pilot Aviation, Pilot Communication
CrOSS Topic Authoring

Ontology Editor

Topic File

Topics defined in the ontology

Topic file generated from ontology
CrOSS Content Analysis Results

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Score Color Key
- High: 34%
- Medium: 44%
- Low: 22%
- None: 22%
CrOSS Today

• Content Analysis Workspace hosted on Defense Technical Information Center’s (DTIC) Production Environment

• MetaTagger Web Services
  - Real-time tagging of document submitted to MetaTagger
  - Automated indexing of DTIC collection data stored in Master Data Repository

• Knowledge Fusion Engine
  - DTIC Collections
  - Thesaurus
  - Metadata
  - Knowledge Graph (Linked Data)
Semantic Decision Support Tool (SDST)

- Sponsored by Air Force NOTAMS office and NextGen Joint Planning and Development Office (JPDO)
  - Currently Deployed in the NextGen Prototyping Network (NPN)

- Addressing Information Overload Challenges Pilots
  - Information to the right people at the right time
  - Improve safety and efficiency

- Context-based Information Prioritization and Decision Support
  - Federated semantic query across multiple data sources
  - Flexible business rules based on SPARQL
  - Context-based decision support
SDST Scenario

1. Pre-flight Planning
2. En Route Mechanical Failure
3. Arrival

**Trigger**

**Federated Semantic Query**

**Information Filtering and Prioritization**

**Recommended Action**

**Data Sources**
- NOTAMS
- Aerodrome
- Airfield Services
- Weather (Local, Regional)
- Aeronautical (DAFIF)
- Temporary Flight Restrictions (FAA)
- Special Use Airspace (DAFIF)

**Context Information**
- On-board Sensors
- Mission Information
- Flight Crew
- Aircraft Characteristics
SDST Next Steps

• Work Started on Context-based Aeronautical Information Delivery (CAID) Service for Air Traffic Control
  • Focusing on Air Traffic Control
  • Sponsored by FAA and Air Force
Summary

• Leverage Semantic Technologies to Capture Enterprise Knowledge
  • Ontology Development
  • Business Rules
• Establish Scalable Infrastructure for Knowledge Processing
  • Text Analytics
  • Big Data
• Develop Solutions to Address Operational Challenges
  • Mine information across document collections
  • Context-driven information delivery