Global Information Management

EIM at the FAA: Translating Semantic Technologies into Direct User Benefit

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AIR TRANSPORTATION INFORMATION EXCHANGE CONFERENCE

Global Information Management

August 25-27, 2015
NOAA Auditorium and Science Center ● Silver Spring, MD

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Date: *August 27, 2015*

What is EIM?

- **Enterprise Information Management (EIM)** is a critical business initiative at the FAA, endorsed by executive leadership

- It is **a business discipline** that applies management best practices and governance techniques to effectively and efficiently deliver information as a service

- While EIM is **not a singular technology, system or an IT project**, by tapping into existing and new enterprise resources in the agency, it will make available needed enterprise data and information capabilities

TRANSFORMING THE FAA INTO AN INFORMATION-CENTRIC ENTERPRISE

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Information Centric

By Transforming FAA into an Information-Centric Enterprise we can:

- **Support and enhance LOB/SO capabilities** to manage and deliver data and information assets

- **Discover, access, and utilize** the potential of FAA data and information

- Create a partnership of **information and governance best practices**

- Discover and share **operational best practices** across the Agency

- Utilize **enterprise-wide shared enabling resources** (technology platforms & services)

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Semantic Components

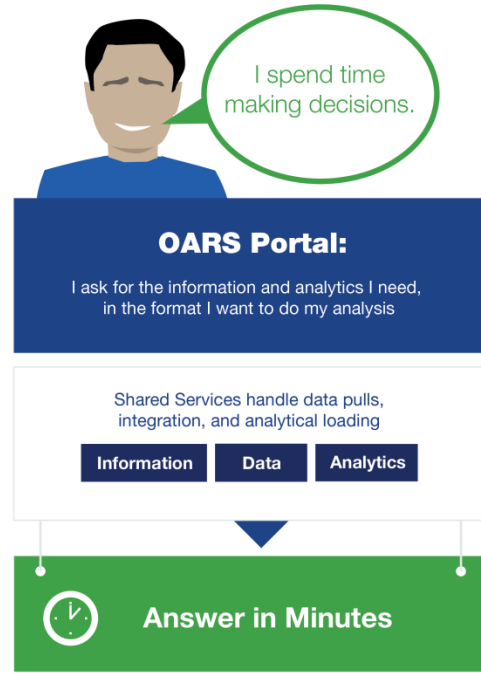To make FAA Information-Centric, we need central principles:

- Identifying **Cross-cutting information domains**

- Enabling **extensive tagging and metadata enrichment**

- Navigating across **concepts and information domains**

- ***Converging information around the user***

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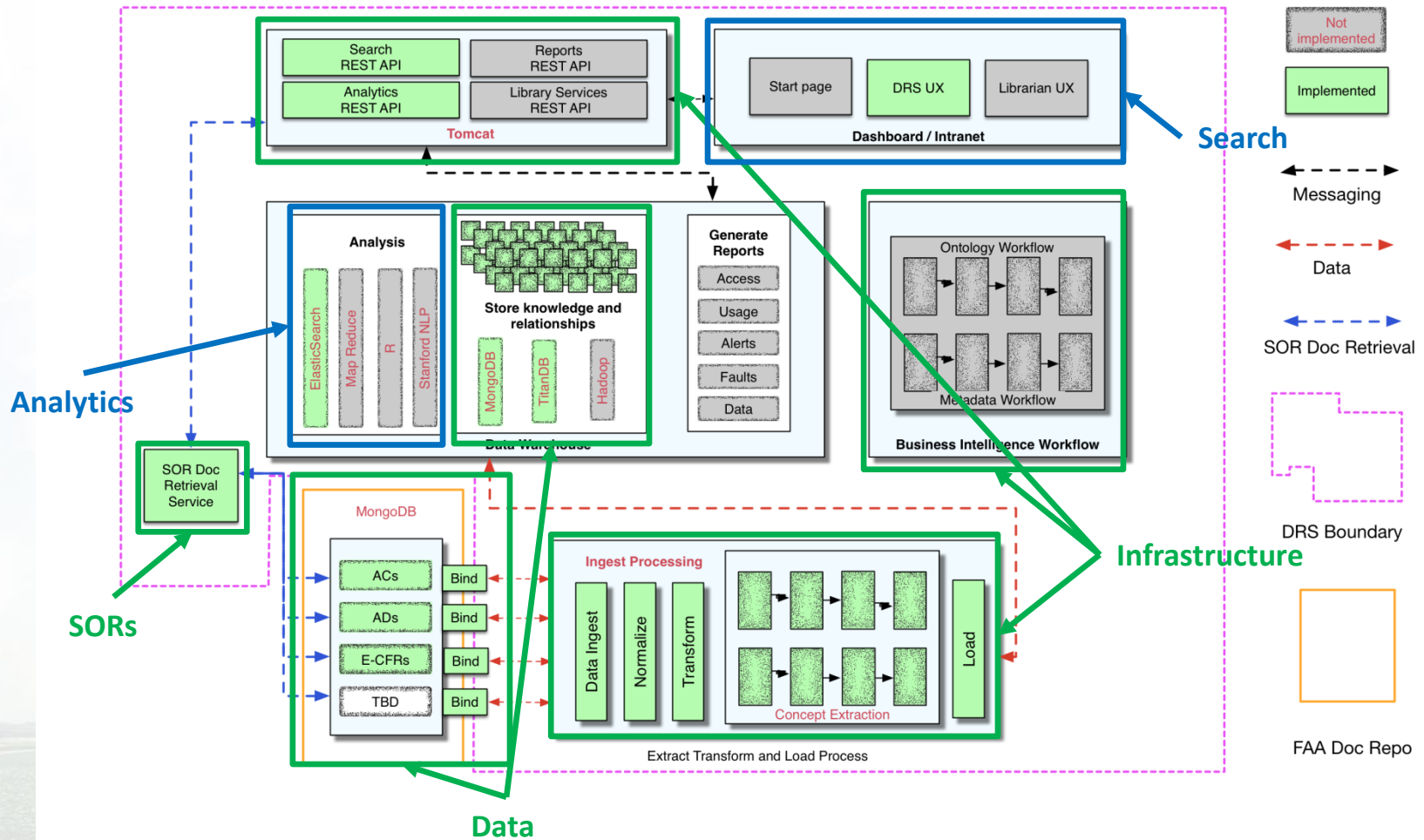# An Example
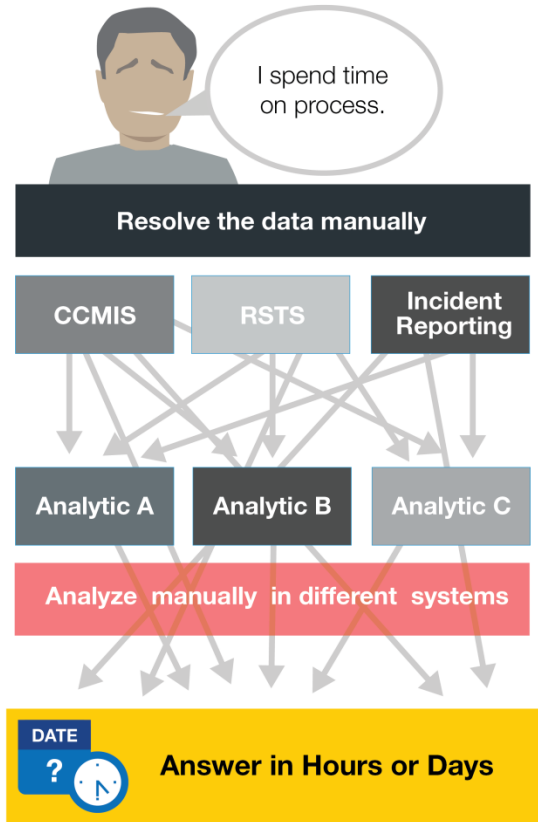
A Holistic Approach

- New initiatives involving process or technology are often "silos", very system-centric, and struggle as a result

- To be successful, this had to be an "integrated" effort, including:
  - Business Information Driven
  - Forward looking Governance
  - User Needs Discovery
  - Technology Demonstration

MOVING FROM SYSTEM-CENTRIC TO INFORMATION-CENTRIC

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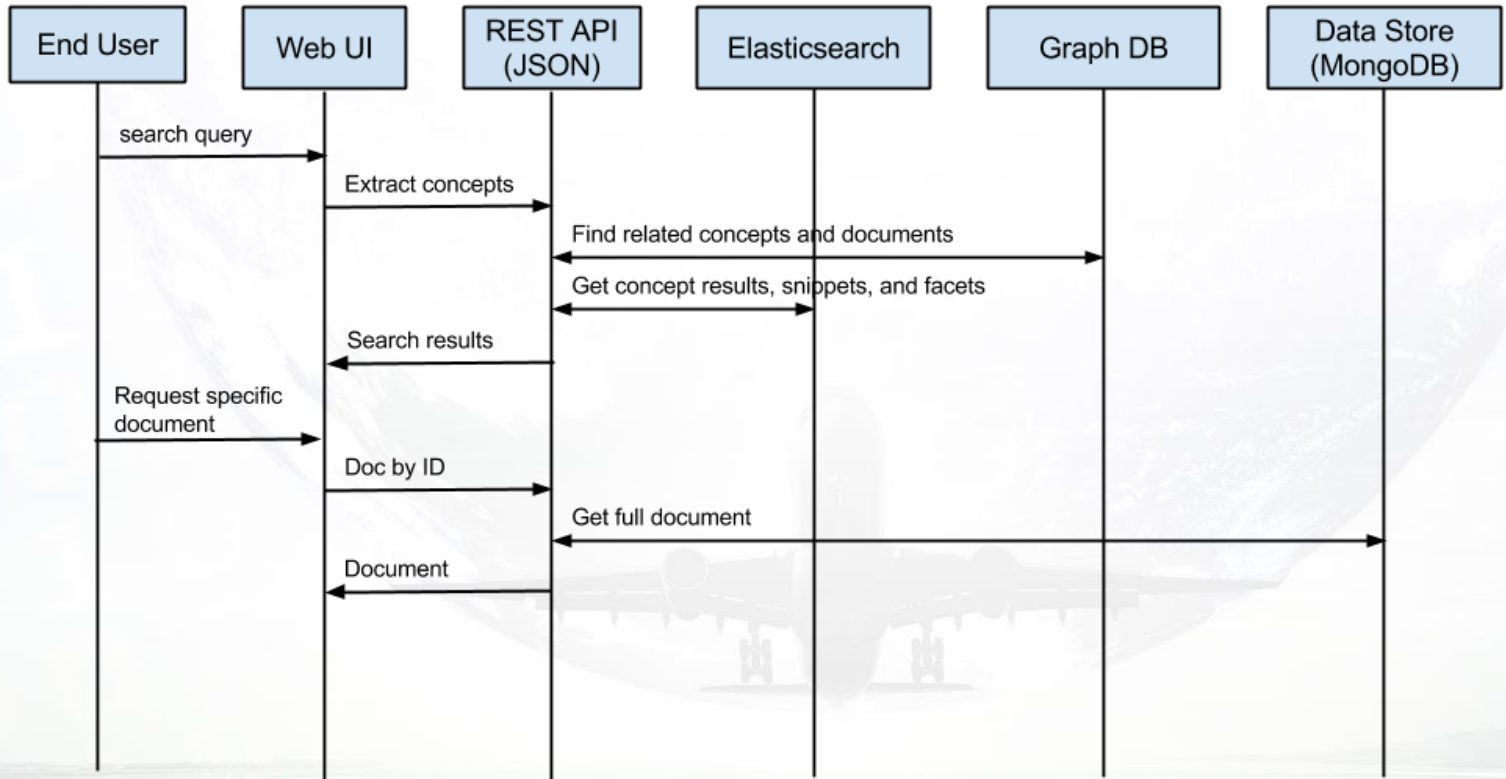EUROCONTROL

How To Implement

- Governance
  - FAA Steering Committee - prioritization
  - Information and Data Advisory Board – enterprise policy
  - COI's – information domain layer
  - COP's – data subject layer, data infrastructure
- Needs Discovery
  - Process for understand business need
- Technology Demonstration
  - Data Management
  - Advanced Analytics
  - **Semantic Enrichment and Search** (Specific Example: Dynamic Regulatory System (DRS))

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DRS Architecture

7

DRS Use Design

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DRS Ontologies

- Ontologies Integrated
    - **Aircraft-List.rdf**
    - **CFR_91.rdf**
    - **CFR_129.rdf**
    - **DRS-Aircraft.rdf**
    - **DRS-AirOperator.rdf**
    - **DRS-Atmosphere-Airspace.rdf**
    - **DRS-Document.rdf**
    - **DRS-GeneralFlightRules.rdf**
    - **DRS-MaintenanceRepair.rdf**
    - **DRS-OperationsForeignCarrier.rdf**
    - **DRS-PilotCertificate.rdf**
    - **Manufacturer-List.rdf**

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DRS Technologies

- Technologies Used:
  - **mongDB**
  - **Titan**
  - **REST APIs**
  - **TTL/SKOS Ontologies**
  - **TopBraid, Protégé**
  - **Elasticsearch**
  - **Regular Expression**
  - **Stanford NLP**
  - **Elasticsearch**
  - **Cytoscape**
  - **JAX**
  - **Gremlin**

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Search Principles

- Three Methods for Driving Relevance, Recall, and Precision
    - Semantic Traverse (Gremlin/Titan)
    - Keyword tuning (use of sets in Elasticsearch)
    - Scoring (use of basic relevance scoring functions in Elastic Search)
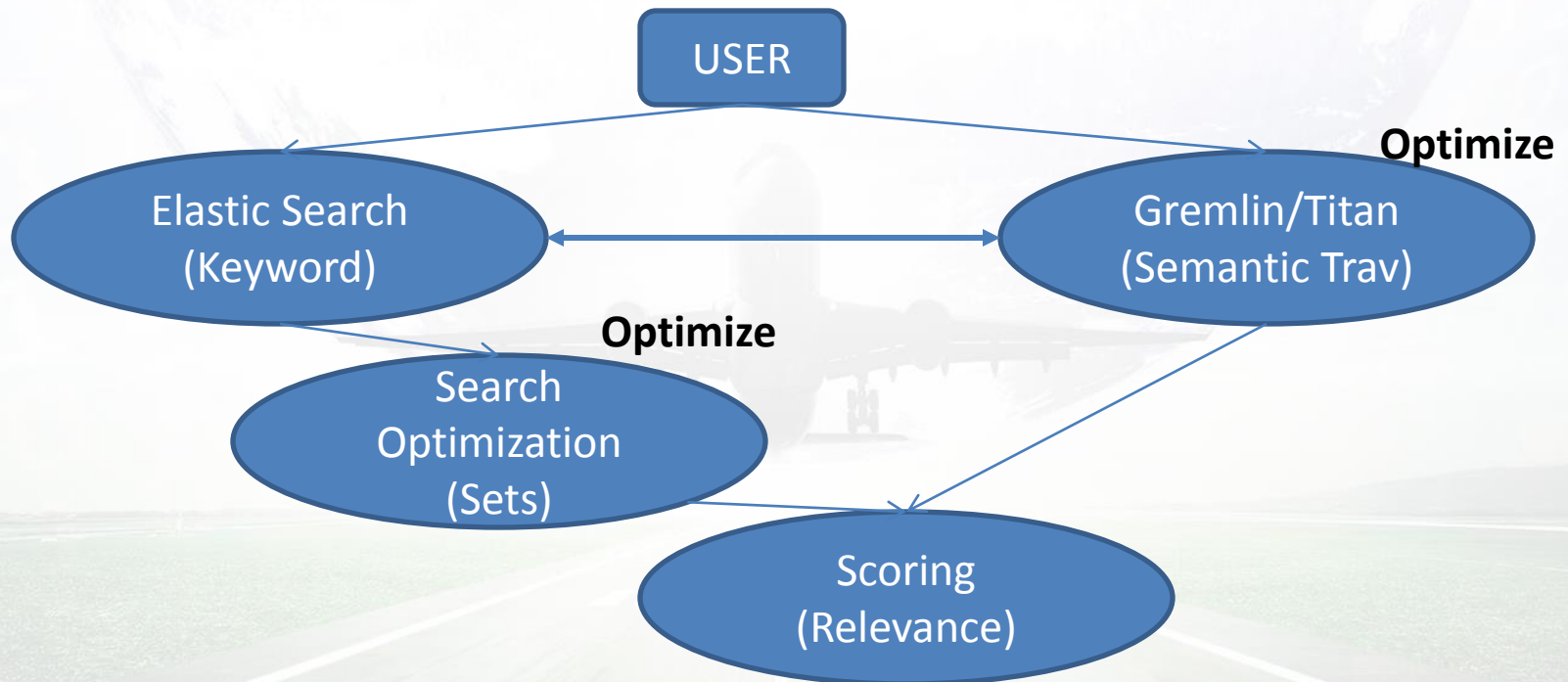
Semantic Traverses

- Specific to Titan, use the ontology to retrieve and / or prioritize relevant semantic concepts

  – Focus on traversing the ontology

    - Add vertices that are 1 degree from search concepts to broaden recall
    - Identification of common concepts and using this to specify an intersection narrows precision
    - Traverse up or down the ontology branch to broaden or narrow the search

- Use the concepts to provide an intelligent interactive user interface to "specify" the search

+1 Degree

Common Concepts

Parents

Children

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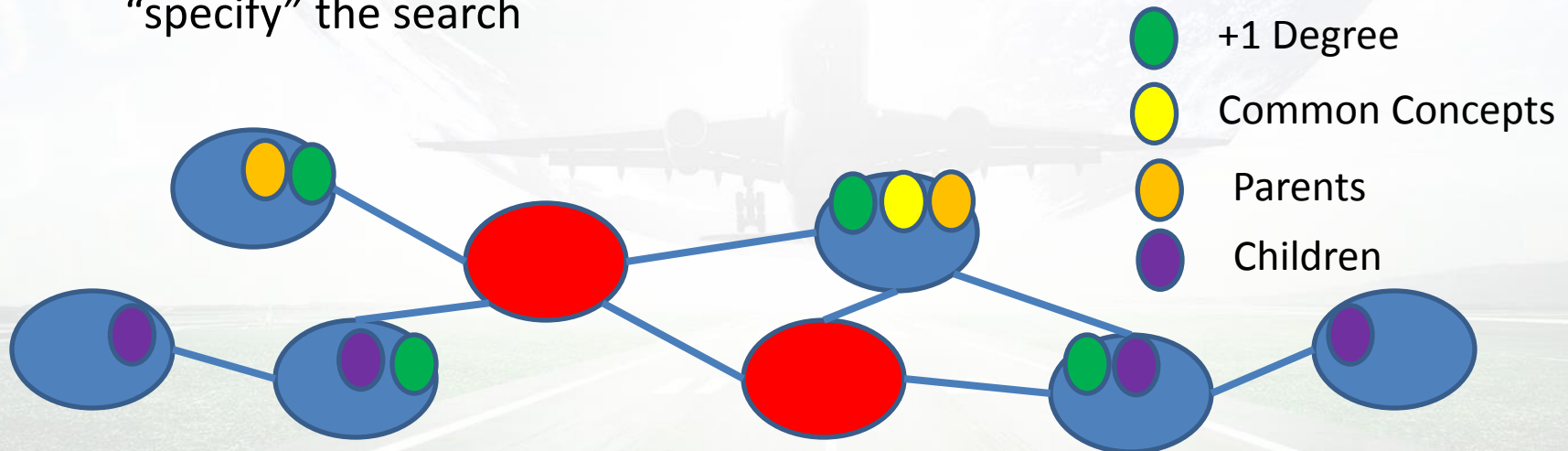
Direct User Benefit

- **Provide Relevant, Trusted Information in an Actionable Format to Enable Agile Decision-Making**
  - Semantic Search means more **relevant, information-driven results**
    - **See across repositories**
    - **See documents you weren't seeing before**
    - **Improve relevancy**
  - Graph interface means better understanding which leads to rule rationalization (IG report) and **better decisions**
    - **Document and rule cross-linking to allow users "complete" view of domain**

- **Guide Organizational Culture to Embrace an Information-Centric Enterprise**
  - **Improves effectiveness** of personnel in day-to-day work
  - Moving from **document to knowledge discovery**

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