Global Information Management

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

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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

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)

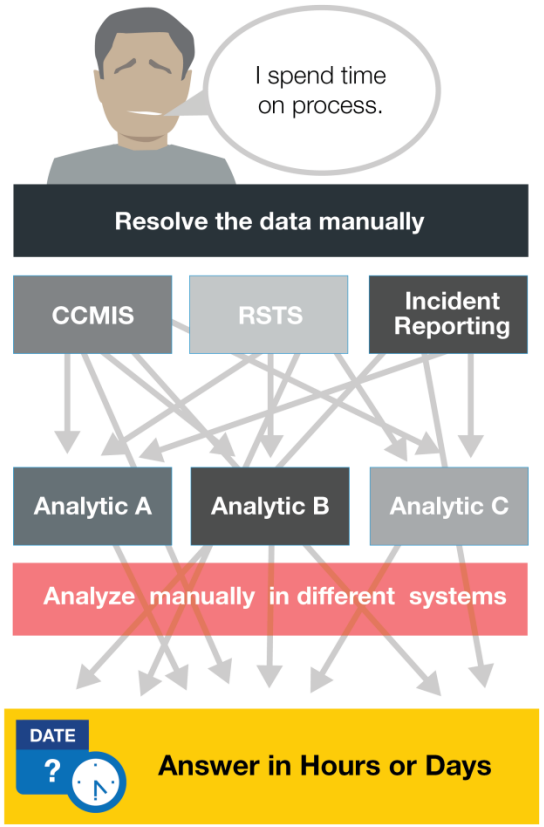
Semantic Components

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

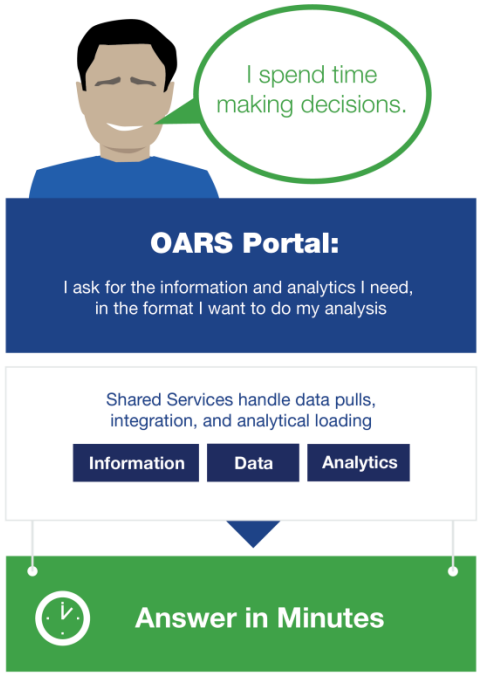
- Identifying **Cross-cutting information domains**
- Enabling **extensive tagging and metadata enrichment**
- Navigating across **concepts and information domains**
- ***Converging information around the user***

An Example

SAFETY ANALYSIS TODAY



OARS EIM TOMORROW



A Holistic Approach

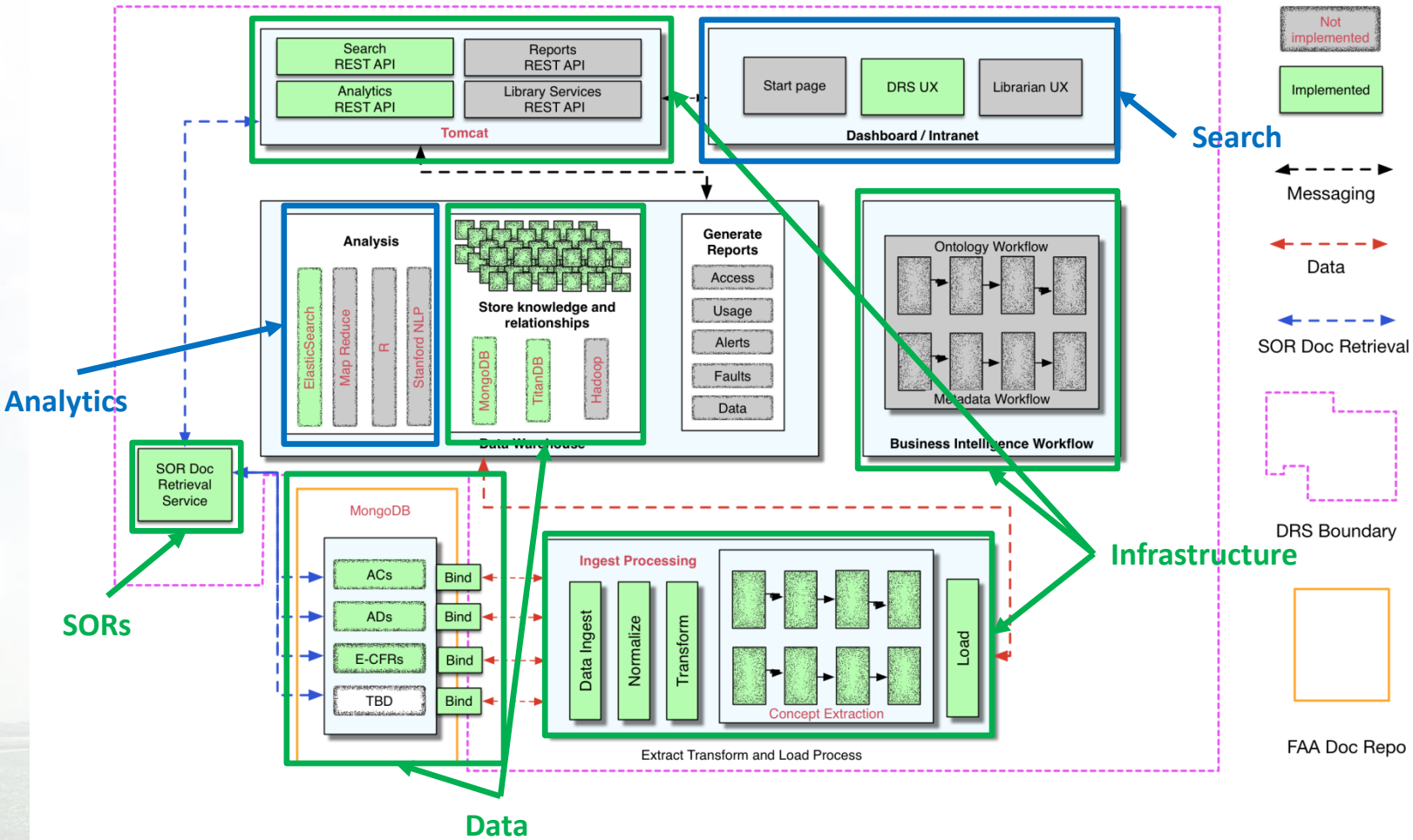
- New initiatives involving process or technology are often “silos”, very system-centric, and struggle as a result
- To be successful, this had to be an “integrated” effort, including:
  - Business Information Driven
  - Forward looking Governance
  - User Needs Discovery
  - Technology Demonstration

MOVING FROM SYSTEM-CENTRIC TO INFORMATION-CENTRIC

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))

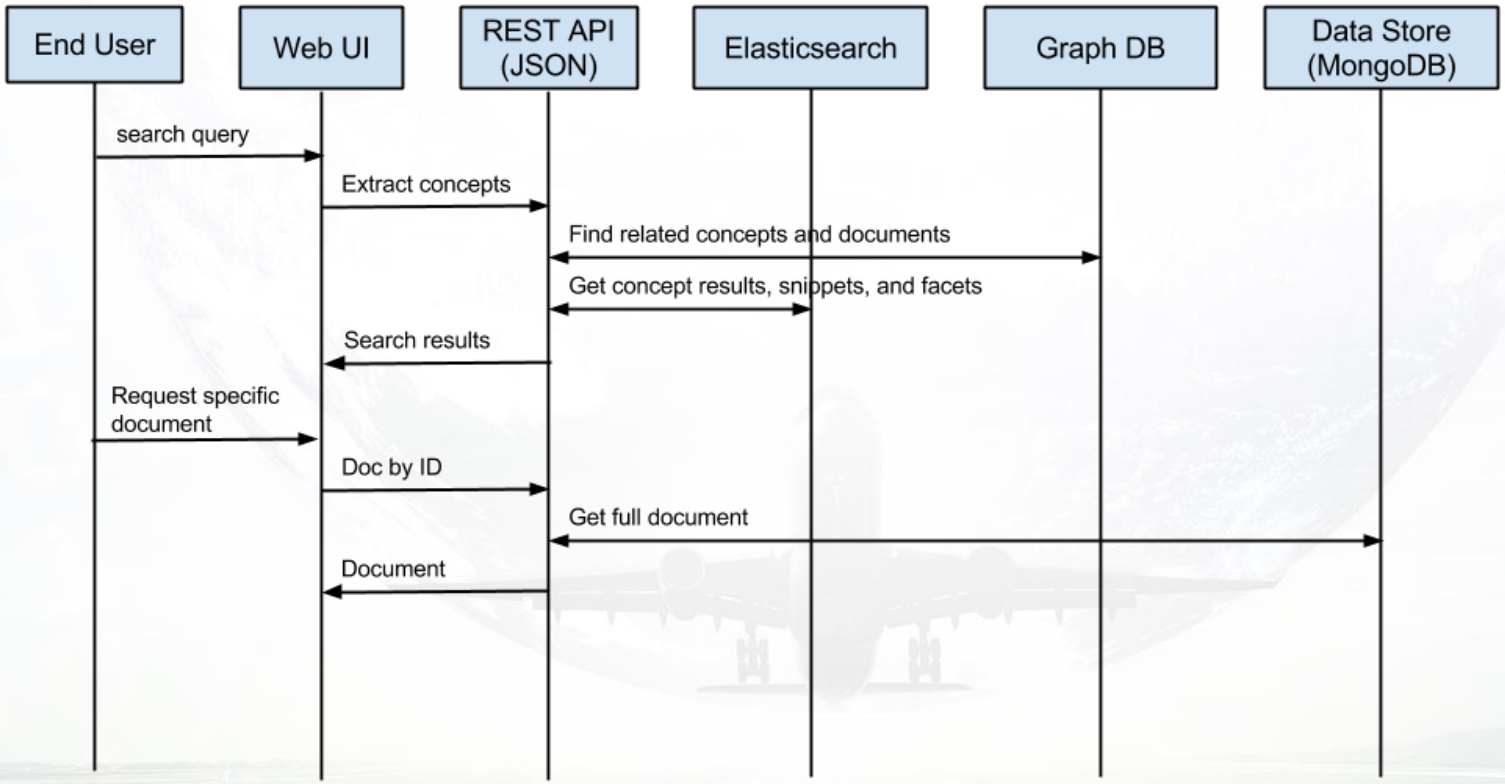
DRS Architecture



Federal Aviation Administration

EUROCONTROL

DRS Use Design



DRS Ontologies

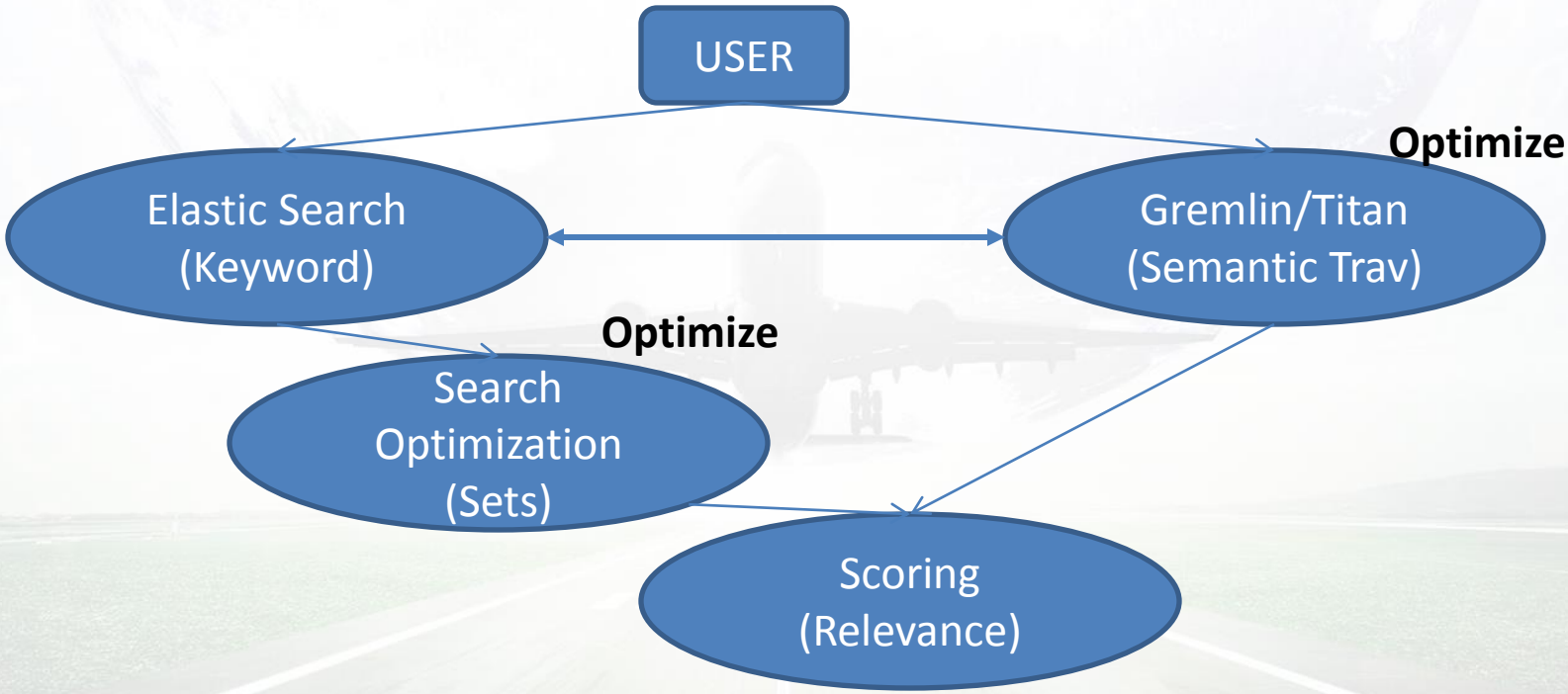
- Ontologies Integrated
  - Aircraft-List.rdf
  - CFR_91.rdf
  - CFR_129.rdf
  - DRS-Aircraft.rdf
  - DRS-AirOperator.rdf
  - DRS-Atmosphere-Airspace.rdf
  - DRS-Document.rdf
  - DRS-GeneralFlightRules.rdf
  - DRS-MaintenanceRepair.rdf
  - DRS-OperationsForeignCarrier.rdf
  - DRS-PilotCertificate.rdf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

DRS Technologies

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

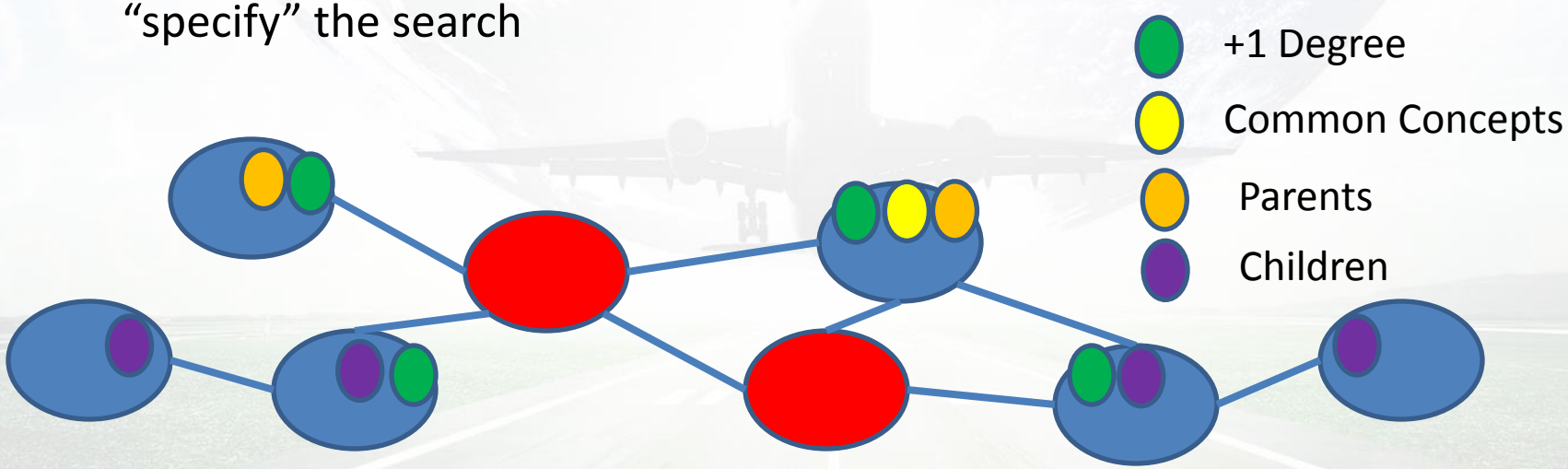
Search Principles

- 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



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**