

Enterprise Information Architecture for Mission Development

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Problem Statement: JPL Today



Parts Catalogues
Item Data



Electronic Libraries
Documents



E-Mail Archives
Messages



*What did I call it?
Where did I put it?
How do I find it?*



Engineering Repositories
Drawings, Models



Problem Reporting
Data, Reports



Financial Data
Budget Reports

How Do I Look For Information?

Does Mars Polar Lander =
MPL 98? MPL? Mars PL?

- Terms are used inconsistently
- Terms vary from system to system
- Documents and associated Objects are often separated
 - Search is most often time consuming and unsuccessful
 - Design and engineering rationales frequently lost for mission teams of the future



The Solution: An Integrated Enterprise Information Architecture



A Unified View of our information space

- Integrated with business processes and best practices
- Based on institutional policies and common architecture
- Independent of any specific repository or technology
- Able to deal with harmonization of information according to a larger point of view
- Relevant and useful to our customers

*Expressed with shareable metadata
and its values (taxonomy)*



Information Building Blocks

An integrated information architecture is made up of several components:

- Common Metadata Specification
 - Core Metadata Specification for JPL Information Objects
- Common language (Controlled vocabularies)
 - By discipline, product, life cycle, process, etc.
 - NASA Taxonomy, JPL Taxonomy, Partner Taxonomies
- Business Rules for data reconciliation
 - You say "to-ma-to" and I say "to-mah-toh"

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The Various Uses of Metadata

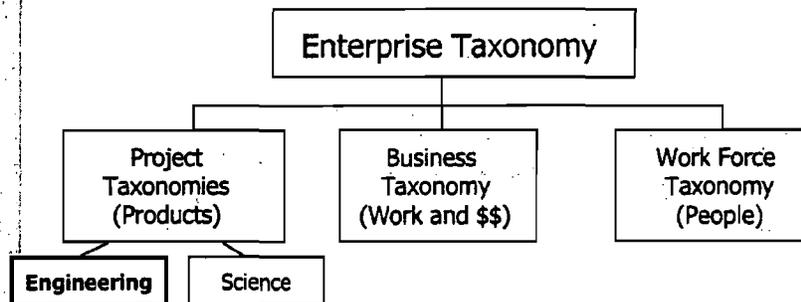
Metadata Classes

- Enables rules for rationalization and search across disparate repositories
 - Identify and distinguish
 - Who produced the content and who is the owner
 - Search and Browse
 - What is the content about
 - Enables information discovery
 - Use Management and Records Compliance
 - Publication venues and access rights
 - Retention and other compliance issues
- JPL Metadata Core Specification for Project Documentation

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Developing A Tiered Taxonomy

- Knowledge Domains require varying processes, work flows and vocabularies
- Enterprise Information Architecture is tiered, some tasks require more granularity in a vocabulary than others.
- There is overlap between Domains in the "white spaces of knowledge".



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JPL Enterprise Project Taxonomy Goals

- Tightly integrated with JPL Project Metadata Core Specification
 - Provides vocabulary values for the appropriate metadata fields
 - Designed to be relevant for a domain of users (communities of practice)
- Provides a classification scheme for identifying content
 - A means for tagging content so it can be used and reused in different contexts
- Derived from JPL standard gold sources
 - Vocabulary owners are Subject Matter Experts in their domains
 - Discoverable with Service Oriented Architectures or Semantic Web technologies

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JPL Enterprise Taxonomy - Built on a Solid Foundation: NASA Taxonomy

Facets	Strategic Value
Access Requirements	Sensitivity and access control
Audiences	Who the content is intended for
Business Purpose	Why the content was created
Competencies	Relevant field or discipline
Content Types	The genre of the content
Industries	External partners & businesses
Instruments	Flight payloads that yield science
Locations	Sites where work occurs – on and off Earth
Missions/Projects	NASA's lines of business
Organizations	NASA organizations
Subject Categories	The topic of the content

Adding JPL Specific Fields

JPL needs unique attribute sets that enable significant business processes

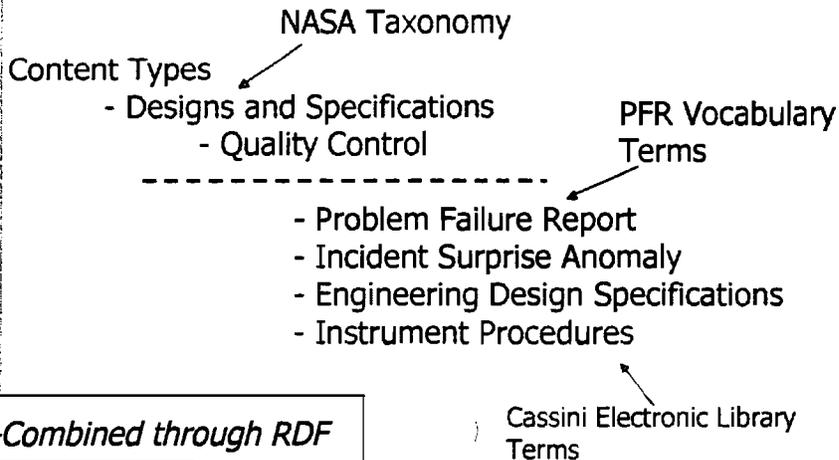
Definition	Value Sets
Mission Phase	Mission Life Cycle
WBS	Work Breakdown Structure
Document State	Content Versioning
System/Subsystem	Spacecraft structures
Repository	Where the object resides
Document Class	Is the object under CM?
Document Level	Project Hierarchy
Role	Who uses the Content

What is the Semantic Web and Why Is It Relevant?

- Today's Web is made for people to read and understand
- Tomorrow's Web will be made for computers to read and understand
 - Systems can perform transactions across applications without human help
 - Leverages the vast amount of data accessible on the Web for machine processing
 - Enables semantic unification of disparate data based on relationships and inferencing
 - Uses RDF for assertion statements and OWL for logic
 - Information can be advertised as a service available for query

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Using the NASA Taxonomy to Associate JPL Vocabulary Terms



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Validation: Faceted Navigation Prototype for Engineers

Semantic Search/faceted navigation for Flight Projects

- JPL Engineering Domain
- Pilot funded by JPL Chief Engineer
- For flight teams on Phoenix Mission
- Completed in 6 weeks
- Goal: Provide cross repository search from a single interface based on
 - Relationships of information objects
 - Life cycles – mission and content
 - Task analysis for specific roles
 - Engineering processes implemented with work flow

SEAMARK Search Entire Collection for

in Title

Find

Powered by: Vindex

14,981 Mars Heritage Documents

By Collection	By Mission/Project	By Organization	By Mission Phase
<ul style="list-style-type: none"> Documentation Heritage Collection 1433 ROMS/Chops 187 Problem Finding System 10659 Problem Reporting System 34 Team Center Comments 2499 	<ul style="list-style-type: none"> Aviation Technology 1498 Planetary Mission 19 Space Science 19 Unspecified 19 	<ul style="list-style-type: none"> 24 Business Operations 4 24 Engineering and Science 831 24 Solar System Exploration 88 24 Other - various interests 48 24 Mars Exploration 13947 24 Earth Based Technology 47 24 Interplanetary Network 10 	<ul style="list-style-type: none"> Phase A 3 Phase B 37 Phase C 71 Phase D 108 Phase E 7 Pre-Mars A 78 Unspecified 1445
By Content Type	By System/Subsystem	By Instrument	By Subject
<ul style="list-style-type: none"> Data 132 Design or Specification 90 Meeting File 1980 Plan 133 Procurement Record 544 Quality Control Record 10697 Report 311 Equipment 237 Power Package 229 Unspecified 198 	<ul style="list-style-type: none"> Flight System 799 Ground Data System 779 Ground Support Equipment 1892 Launch and Test Equipment 22 Landing System 32 Main Flight System 87 Payload 3483 Science Data System Equipment 7 Unspecified Subsystems 2877 Unspecified 781 	<ul style="list-style-type: none"> Accelerometers 118 Antennae 217 Cameras 738 Laser Altimeters 31 Microscopy Instruments 57 Radars 49 Robots 50 Seismometers 147 Telescopes 292 Unspecified 1770 	<ul style="list-style-type: none"> Astronomy 1116 Chemistry and Materials 12 Engineering 10097 General 49 Geology 8 Mathematics of Solar System 440 Physics 93 Social Sciences 204 Space Science 6 Unspecified 3899

Phoenix Search Pilot – Intuitive Browse by Category

15,000 Items ~ 5 Repositories ~ Sponsored by the JPL Chief Engineer

Further Use Cases: Faceted Navigation Using Relationships

- Project Manager:
 - "I'd like to check all documents needed to complete my Certification for Launch to see what state they're in, no matter where they are."
- Cognizant Engineer:
 - "I'd like to see all problem failure reports on a sub-system I designed and flew 5 years ago so I can incorporate the lessons learned into my current mission."
- Project Information Management Engineer:
 - "I'd like to see the status of all Phase B documents that I need to prep for an upcoming gate review so I know we're ready."
- Fabrication Shop Manager:
 - "I'd like to see all drawings in the approval release cycle so I can plan to staff my shop appropriately to get all the work done on schedule."

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The Business Value of Common Data Models

- Data models identified in each domain allow us to work across repositories in a unified manner increasing:
 - Data integrity, business intelligence, nimbleness of the enterprise
- Decreasing IT developer time on:
 - Data validation, individual development of common data values, maintenance of common data values, presenting information graphically through dashboards or other collaborative tools
- Decreasing Flight Teams' time on:
 - Retrieving information, synthesizing information, managing documentation for reviews, managing budget information

This method improves JPL's business efficiency greatly!

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On the Horizon

- Collaborative spaces for virtual spaces based on
 - Mission Life cycle
 - Content types
 - Systems and subsystems under development
 - Engineering processes
- New capability
 - Visualization – dashboards, charts, graphs
 - Saved searches, subscribed searches, personal searches, team searches
 - Faceted navigation by relevant attributes
 - Workflow enabled by
 - Metadata about people, places and things giving a 360 dg view of the knowledge space

The screenshot displays a web application interface with a top navigation bar containing links for Home, Documents, and My Searches. The main content area is divided into several sections:

- Documents:** A section for document management with a 'FILTER' dropdown and a 'RELEASE TIME PERIOD' bar chart showing activity from March 26 to April 03.
- KEYWORDS:** A section for keyword-based searches.
- RESULTS:** A list of search results, including:
 - Southern Midge, Lark**
 - Author: [colt@jpl.nasa.gov](#)
 - Drawing Number: 12114-1-2
 - Revision Date: 2007-03-01
 - Revision: 1
 - Release: Release for Prod
 - Motor Assembly, Flex Spring**
 - Author: [hughes@jpl.nasa.gov](#)
 - Drawing Number: 12114-1-2
 - Revision Date: 2007-03-01
 - Revision: 1
 - Release: Release for Prod
 - Flex Spring Plug**
 - Author: [hughes@jpl.nasa.gov](#)
 - Drawing Number: 12114-1-2
 - Revision Date: 2007-03-01
 - Revision: 1
 - Release: Release for Prod
- MY SEARCHES:** A list of saved searches with counts, such as 'My Collocation' (3/2) and 'To Review' (25/20).
- SHARED SEARCHES:** A section for shared search capabilities.
- CHECKLISTS & STANDARDS:** A section for compliance and standards.

A text box in the bottom right corner of the screenshot reads: "Seamark Upgrade: Semantic Web Technology applied To Collaboration Platforms".

Home Documents and Lists Create Site Settings Logout Help

MSL Collaboration Website
Home

Documents

MSL Document Tree
Navigate by Image
See related
Parts, Test Results,
Liens, Waivers,
Requirements and more

Site Map

NAVIGATE BY

RELEASE PHASE
A: 50
B: 70
C: 20
D: 0
E: 0

POSITION
DocuShare
Teamcenter Engineering (121)
Teamcenter Enterprise (122)
SAP
PES

FILTER

CONTENT TYPE
Drawing Plans Payloads

RELEASE TIME PERIOD

March 03 Today

KEYWORDS

6 7 8 9 10 Next

1 File Molecule MSL Document
Drawing Number: 1011645
Author: Garyland
Published: 2002-03-24

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Home Documents and Lists Create Site Settings Logout Help

MSL Collaboration Website
Home

Documents

Look At Multiple Objects in Context
Includes data on people, projects
as well as engineering products

Site Map

NAVIGATE BY

RELEASE PHASE
A: 50
B: 70
C: 20
D: 0
E: 0

POSITION
DocuShare
Teamcenter Engineering (121)
Teamcenter Enterprise (122)
SAP
PES

FILTER

CONTENT TYPE
Drawing Plans Payloads

RESULTS

Person: William C. Allen

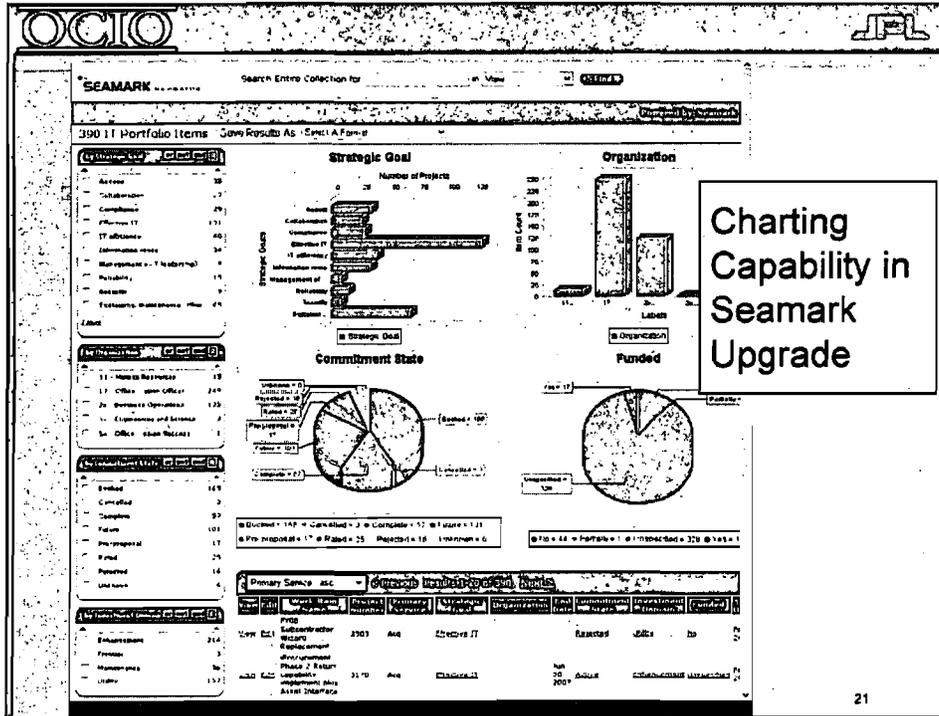
1 Link: Molecule MSL Document
Drawing Number: 1011645
Author: Garyland
Published: 2002-03-24

BY SEARCHES

SHARED SEARCHES

QUESTIONS & STANDARDS

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The slide contains the following text:

Thank you!

Jayne.E.Dutra@jpl.nasa.gov

The slide also features the OCIO logo on the top left and the JPL logo on the top right.

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