National Aeronautics and Space Administration

JPL Project Information Management: A Continuum Back to the Future

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ARMA
GLA Meeting

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JPL Project Information Management: The End Game

Rover is driven over staggered ramps to test the suspension's range of motion. **NASA/JPL-Caltech**

Enables project teams to collaborate and efficiently share information that is needed to plan, design, build, test, launch and operate robotic spacecraft

'Von Braun' mound in Spirit's drive direction. Image from the 1,871st Martian day, or sol, of the rover's mission on Mars (April 8, 2009). **NASA/JPL-Caltech**

How did we get there?

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JPL Project Information Management: Organizational Foundation

Office of the Chief Information Officer

Integrated Flight Project Support Office (1721)

- **Define and implement flight project IT collaboration processes**
- **Coordinate IT application development & services between OCIO and flight projects**
- **Launch Site Support Planning & Implementation**

Hardware Configuration & Information Management (172E)

- ***Information Management***
  - **Information Management Engineer (IME) personnel**
  - **Access Control: US & Foreign (Export Control – ITAR)**
  - **Information system architecture & Project collaboration processes**
    - **Information capture, management, sharing, reuse, context**
  - **Project Tool Evaluation & Implementation**
- **Hardware Design Control**
  - **Manage Change Control & Waiver Processes**
  - **Implement & Manage PDMS**

Project IT & Management Tools Support (172D)

Collaborative cross-discipline teams that share ideas and problem solve

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Information Management Engineer (IME)

IME is responsible for:

- Identifying, collecting, cataloging, and archiving information throughout the Project's lifecycle.
- Implementing and managing appropriate level of access control to Project information
- Architecting the Project's collaborative information system environment and configuring IM tools
- Ensuring the Project complies with institutional and project-specific processes, policies, and requirements, including ISO, records retention, and ITAR
- Co-drafting Information and Configuration Management Plan (ICMP)
- Providing IM support as a project team member from formulation through end of mission

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Information Management: Standards

Project Requirements

- Collaborate and share information
- Manage large amounts of information
- Maintain access controls to protect JPL & partner information

Information/Configuration Management/IT

- Collect Project IM/CM/IT requirements
- Provide IM/CM & IT staff support
- Define & implement Project IM/CM processes & tools

Infrastructure Support

- Institutional policies & requirements
  - IT Security
  - Export Control
  - Project Information & Records Management
- Institutional tools & services
  - Networking, data storage, UMS, LDAP
  - Collaborative tools
  - Audio/Video/Data conferencing

Project Information System Architecture

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Information System Architecture

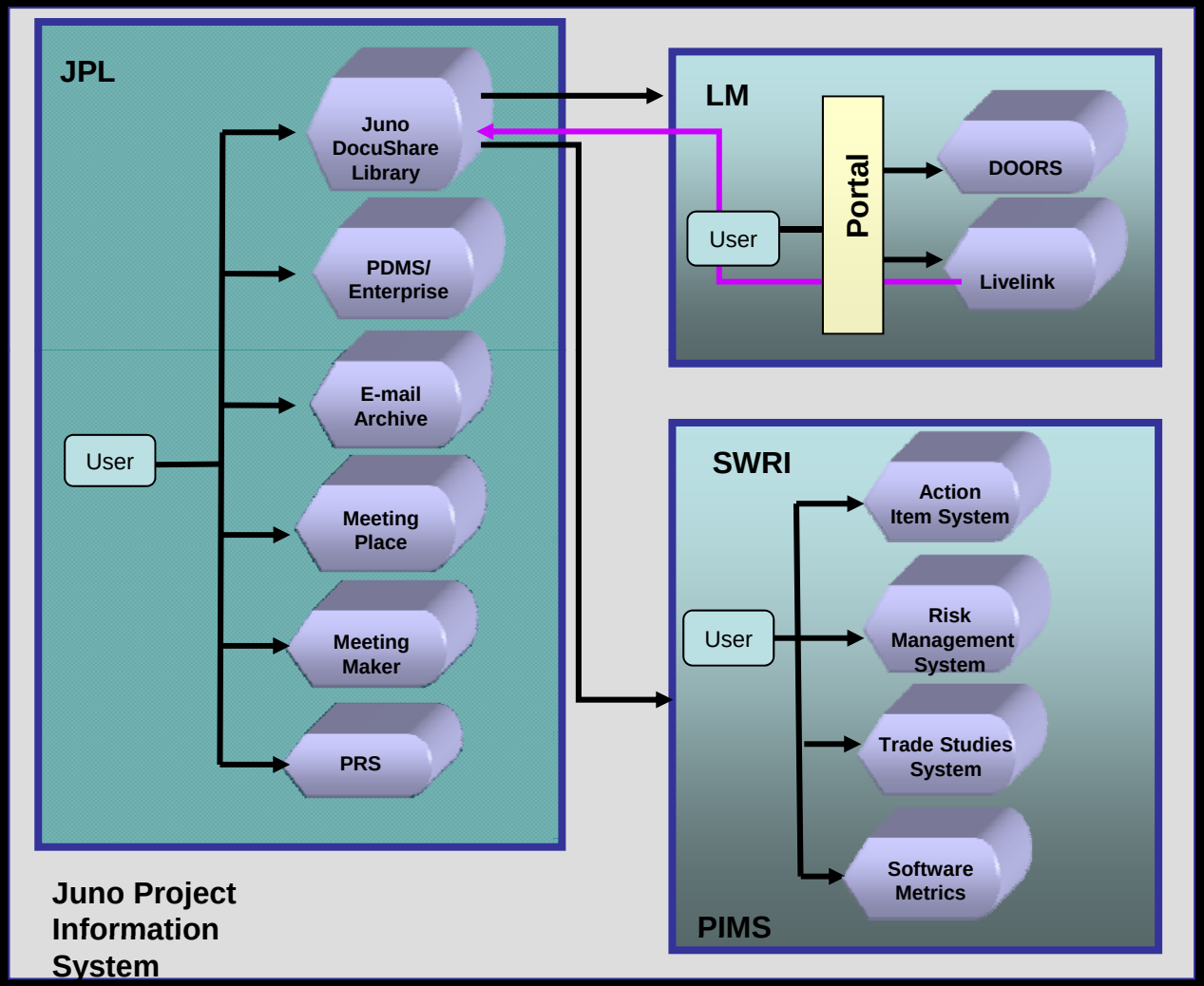
Information architecture =

structure +

information +

processes +

access controls



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Information System Architecture

Information Management

- Designed information workflow that leverages information capture and reuse
- Developed web-based system to manage information from project formulation through project completion

Integration of workflow and system design

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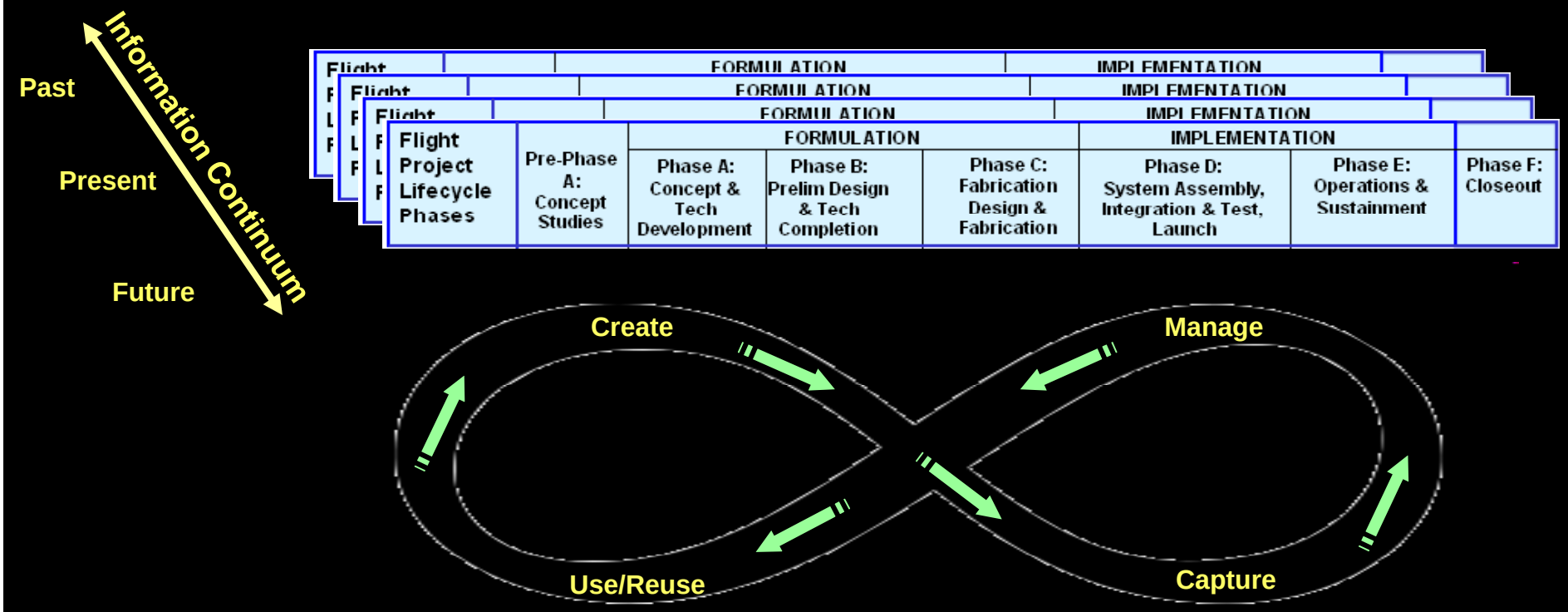
Information Continuum throughout the Project Life Cycle



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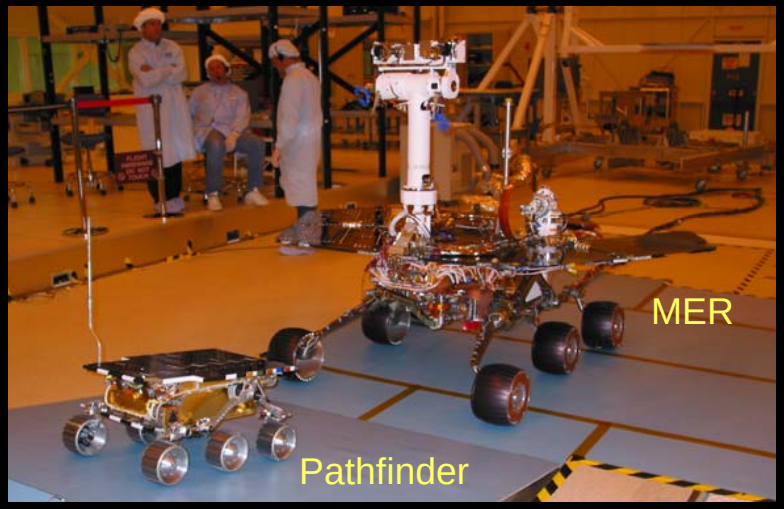
Application of Information Continuum

- Start with Mars Pathfinder design
- Add Athena Payload
- Make rover independent of lander (new design)
- Combine
- Repeat for second rover

NASA/JPL-Caltech



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Information Continuum:
Reuse – the Mars Exploration Rover (MER) Experience

Rover Project team needed to quickly access and reuse past project information

- Reviewed mars project archival collections in hard copy and digital formats and identified pertinent materials
- Captured digital information in on-line, web-accessible system
  - Collected native files whenever possible
- Created physical repository for hard copy and a/v materials

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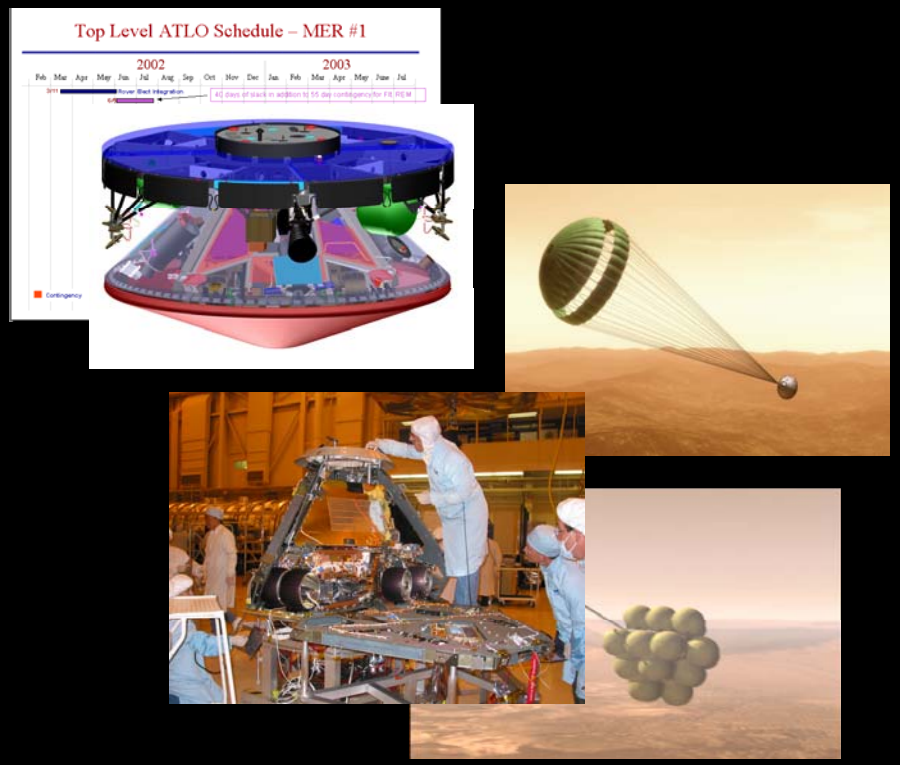
Information Continuum: Create – New MER Objects

- Digital files are in institutionally supported, standard native and web-viewable formats
  - MS Office files, PDF, CAD files, JPEG, GIF, TIFF, MPG, AVI, Quicktime, etc.



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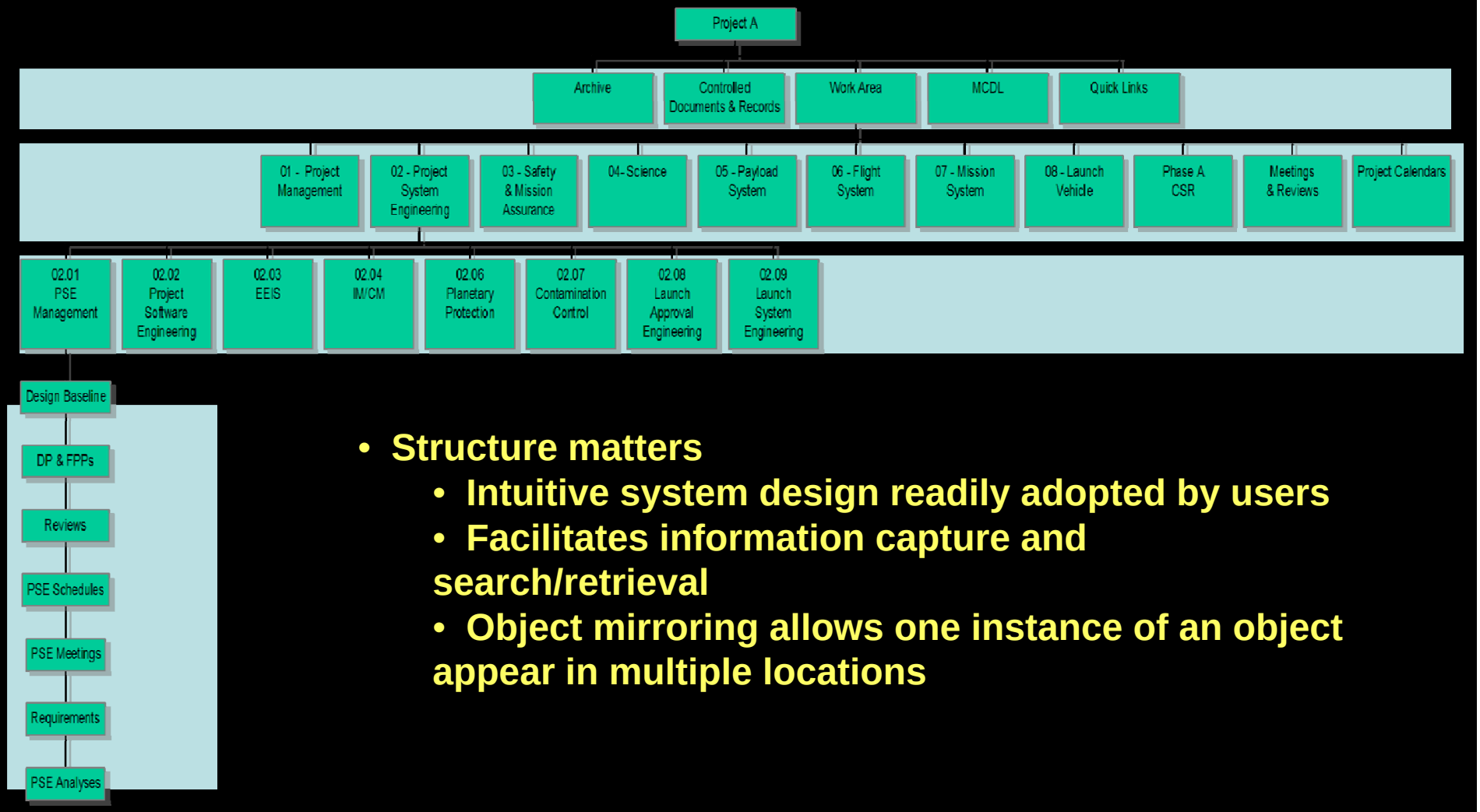
Information Continuum:
Capture – Standard Electronic Library Architecture



- **Structure matters**
  - **Intuitive system design readily adopted by users**
  - **Facilitates information capture and search/retrieval**
  - **Object mirroring allows one instance of an object appear in multiple locations**

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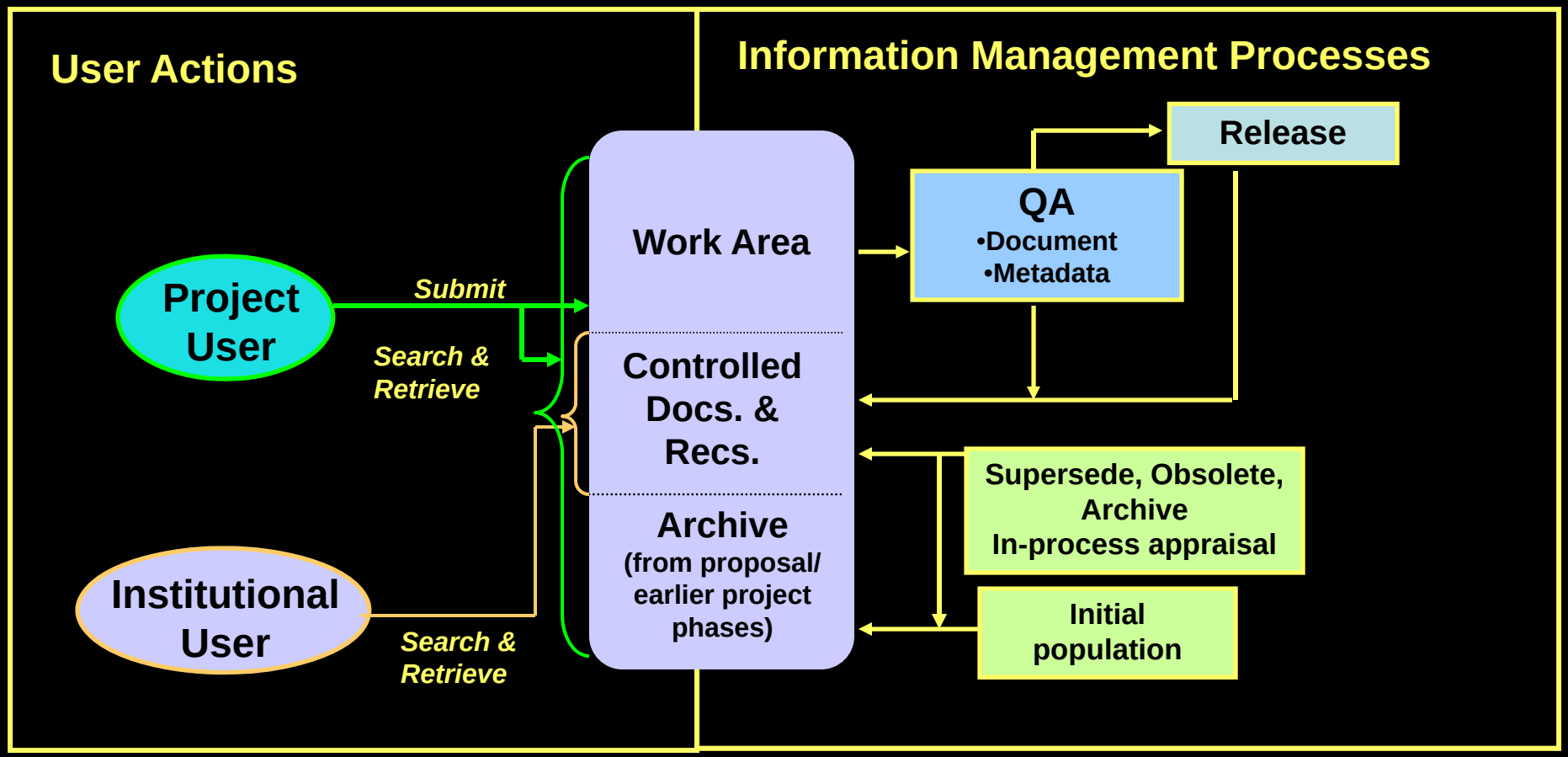
Information Continuum: Create/Capture/Use/Reuse



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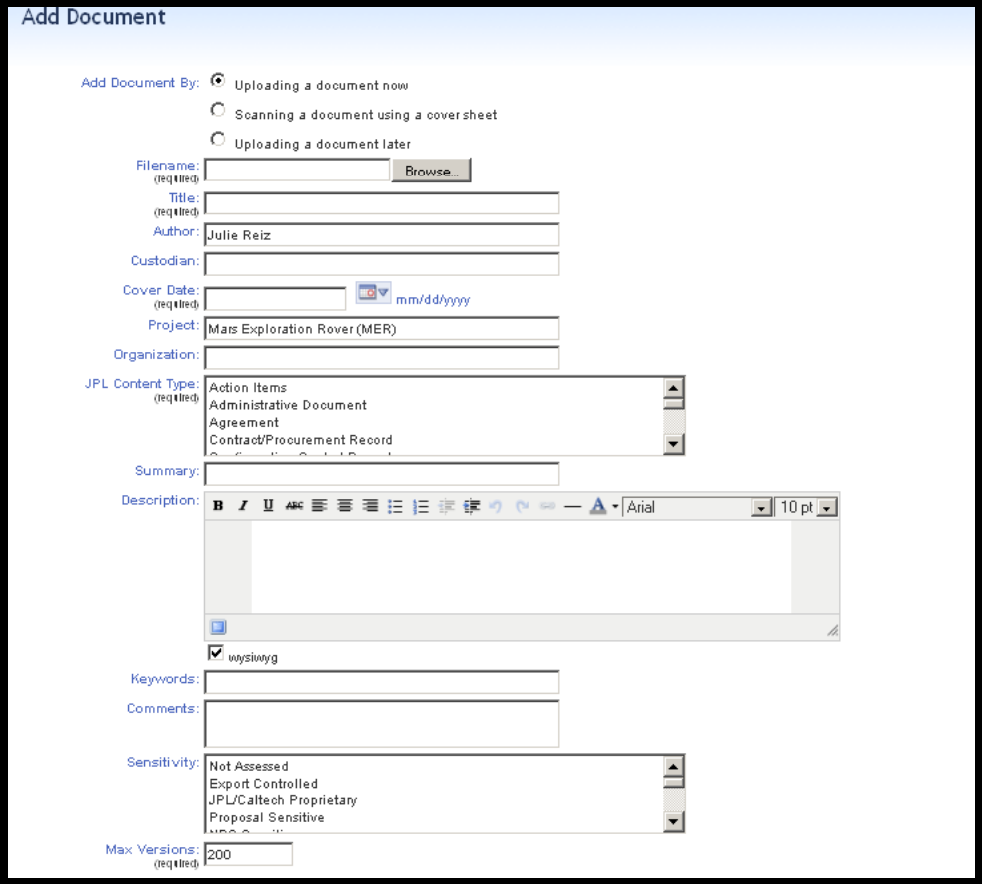
Information Continuum: Capture & Reuse: Metadata

- Metadata supports:
  - authentication
  - discovery
  - access control
  - context
  - retention/disposition



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Information Continuum: In-Process Appraisal

- Why wait? In-process appraisal involves:
  - Reviewing Project information stored in the Project's information systems to determine what should be preserved. Appraisal process occurs throughout the Project's life cycle, especially at phase transitions
    - formulation → design → build → test → launch → operate
  - Filling-in gaps where information is missing
  - Tagging archival information

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Information Continuum: In-Process Appraisal Value

Programmatic purpose:

- Support efficient project operations
- Provide lessons learned for future projects
- Information needed to construct a project history
- Documentation that captures decision rationale, trade studies, risk assessment, descoping, replanning, and significant events, including
  - Action items
  - E-mail
  - Monthly/quarterly management reports and reviews
  - Design reviews
  - Policies and plans
  - Outreach materials

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Information Continuum: In-Process Appraisal Value (cont'd)

- Engineering purpose:
  - Manage the design baseline; analyze in-flight anomalies; reuse by proposals and projects:
  - Examples
    - Requirements
    - Problem/Failure reports
    - Reliability analyses
    - Hardware drawings and specifications
    - As-built lists
    - Engineering change requests
    - Design description documents
    - Test and integration data, notes, scripts
    - Design data packages

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Information Continuum: Preserve

- Projects are responsible for identifying and managing controlled documents and records and other information for preservation
  - IME function
- Custody of files are transferred to institution for long-term storage and access at end of project
  - Will be mapped to NASA file categories to determine disposition

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JPL's Information Continuum in Practice

- Integration of information management, records management and archiving processes
- Collaboration between cross-discipline teams: information, configuration, records management; IT infrastructure; tool developers
- Standard, repeatable information system architecture and common tools
- Capture and preserve information through structure and metadata for reuse in multiple contexts
- Information has concurrent values at time of creation: current, reuse, historical without finite phases – no discernable beginning/middle/end

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Conclusion

- JPL's information management practices and architecture support an information continuum
  - Concurrent use/reuse by primary and secondary users
- The information continuum value is illustrated in the evolution of the Mars rovers:
  - Mars Pathfinder → Mars Exploration Rover → Mars Science Laboratory
- Recognizing the importance of information management requirements early in the project life cycle resulted in:
  - Design of an information system that included extensible metadata
  - Reduced the risk of information loss through the use of in-process appraisal
    - identify gaps → revise capture strategy
  - Shaping project's appreciation for capturing and managing information for re-use by future projects – it is a natural outgrowth of their processes
  - Connecting geographically distributed partners into "One Team" through information sharing, common tools and collaboration

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The rewards…

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