



 **National Aeronautics and Space Administration**

+ Text Only Site
+ Non-Flash Version
+ en Español
+ Site Help & Preferences

FIND IT @ NASA :
+ Advanced Search

+ ABOUT NASA + LATEST NEWS + MULTIMEDIA + MISSIONS + MY NASA + WORK FOR NASA

+ For Kids
+ For Students
+ For Educators
+ For Media & Press
+ For Researchers
+ For Industry
+ For Employees

 THE VISION FOR SPACE EXPLORATION: OUR JOURNEY CONTINUES

+ LIFE ON EARTH + HUMANS IN SPACE + EXPLORING THE UNIVERSE

Making Sense of Rocket Science

Jeanne Holm
Douglas Hughes

Jet Propulsion Laboratory, California Institute of Technology

April 3, 2006



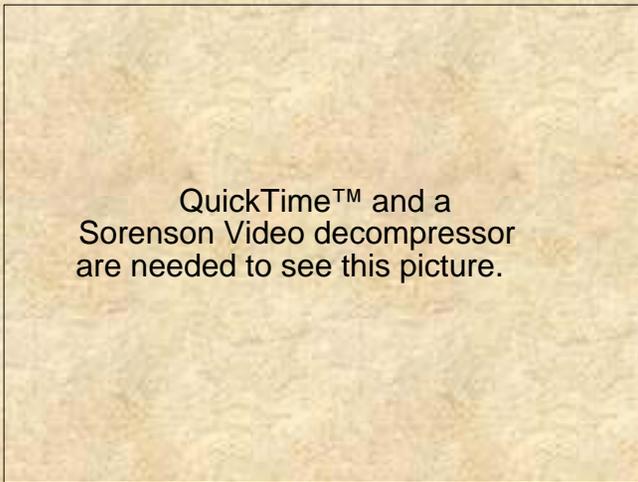
Creating an Opportunity

Collaborate



- ◆ *Knowledge management activities provide the chance to look across an organization, regardless of boundaries, and find opportunities to make a difference...*

Communicate



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NASA's Knowledge Management goal

Motivate



Knowledge management is getting the right information to the right people at the right time, and helping people create knowledge and share *and act upon information in ways that will measurably improve the performance of an organization and its partners*



A Tale of Three Portals

Collaborate



- ◆ NASA Public Portal

- <http://www.nasa.gov>

- ◆ InsideNASA - NASA Internal Portal

- <http://insidenasa.nasa.gov>

Communicate



- ◆ NASA Engineering Network

- <http://nen.nasa.gov>

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The NASA Public Portal

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- ◆ Was designed and intended to be a dramatic, interactive interface to NASA by the public, kids, media, educators, and students
 - Create “One NASA” on the web to enhance access
 - Exemplar of the *President’s Management Agenda*
 - Tie together NASA’s public-facing web resources
- ◆ Our known challenges included
 - An evolving architecture, with a 4-week deadline for deployment
 - Quick and easy navigation for our many audiences
 - Integrated search, content management, and portal
 - Industrial strength hosting solution: ~140,000 hits per day
- ◆ Our unknown challenge
 - On February 1, 2003 deployment, the Space Shuttle Columbia tragedy would occur



Business Issues and Project Context

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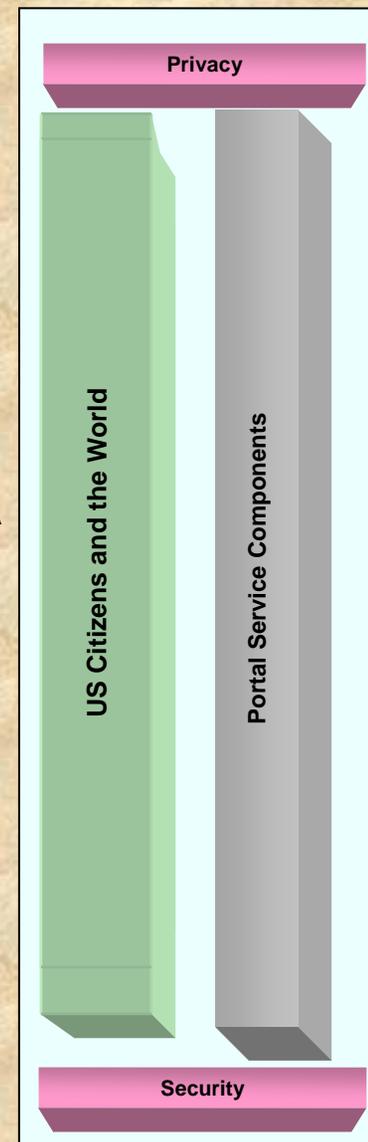
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Motivate



<p>The National Aeronautics and Space Act</p>	<ul style="list-style-type: none"> Effectively communicate the relevance of NASA’s work in the everyday lives of the American public – from medical devices to better tires and stronger homeland security.
<p>E-Gov Act and President’s Management Agenda</p>	<ul style="list-style-type: none"> Adopt a citizen-centric model with a focus on what the public needs and how best to serve them for their needs. Achieve economies of scale internally through the migration of common infrastructures, tools, software and processes and information sharing.
<p>NASA Management Goals</p>	<ul style="list-style-type: none"> Use the web as a primary communication avenue of the values & mission driving NASA today Demonstrate NASA’s leadership in response to the e-Gov initiative Transform NASA.gov into a “lever of public influence” to re-ignite and reunite the American people’s passion for NASA. Coordinate web traffic on NASA’s operational computer network





Alternatives and Rationale

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Motivate



- ◆ RFP to Industry August 2002
- ◆ 27 Proposals received September 2002
 - 22 deemed non-compliant
- ◆ Downselect to four candidates October 2002
 - Artistic design
 - Technical design
 - Relevant experience
- ◆ Funded candidates through Preliminary Design Review
 - Fixed Price R & D contract
- ◆ Bake-off in November 2002
- ◆ Contract awarded in December 2002
- ◆ Portal on-line and operational January 31, 2003



Project Details and Solution Used

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Motivate



- ◆ Prime Contractor
 - eTouch Systems Corporation
- ◆ Hosting in 2 data centers
 - VeriCenter, Inc.
- ◆ Infrastructure
 - Servers - HP DL 380 G4
 - Operating System: Red Hat Linux ES 3.0, ES, 2.1 and 7.3
 - Web Server: Covalent Apache 2.0.43
 - Application Server: BEA WebLogic Server/Express 6/8,
 - Database: Oracle 9i
 - Search Software: Verity Enterprise K2 Server 4.5
 - Server Monitoring: Sysedge
 - Email & List Server: QMail & EZMLM
 - Portal: Vignette Application Portal 4.1
 - Content Management: eTouch CMS 1.3
 - Webmetrics: Urchin and FunnelWeb
 - Discussion Forums: JIVE Forums
 - Backup: Veritas Netbackup
- ◆ Caching and Streaming
 - Akamai Technologies, Inc.



Business Results

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Motivate



- ◆ Public is being well served
 - Traffic in first 5 days of the Portal equaled the traffic for the previous six months
 - Mars Rover interest in 10 days in 2004 exceeded entire previous year
 - Deep Impact broke previous records by a factor of 7
 - While “regular” NASA.gov visitors have grown an average of 15% per year, Peak visitors have grown 50 times over the past 3 years!
- ◆ NASA is benefiting from increased exposure
 - Customer satisfaction ratings remain high
 - 79.0 vs 73.5 Government Aggregate
- ◆ Per user cost declining
 - 35% drop from 2004 to 2005



Challenges and Lessons Learned

Collaborate



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Motivate



- ◆ Keep ahead of demand
 - Increasing use and number of computers on the Internet
 - Explosion of broadband
 - Rich media and streaming media
 - NASA TV
- ◆ Keep content fresh, meaningful and accessible
 - Distributed publishing via CMS
 - Review by neutral outsiders
 - U.S Rehabilitation Act Section 508 compliance
 - Intelligent search
 - Personalization - MyNASA
 - Enabled by Vignette, along with authentication



When Success is Out of This World!

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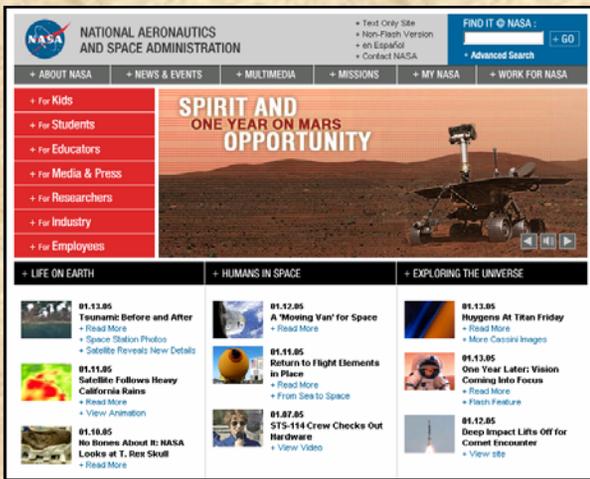
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Motivate



- ◆ Landings of the Mars Exploration Rovers on the Red Planet and the dramatic Deep Impact mission became the largest online events to date
- ◆ Streaming live coverage, dynamic and distributed publishing, and automatic image upload brought fresh images within minutes of the spacecraft sending them to Earth
- ◆ Expanded content brings information to NASA's six key audiences
- ◆ Rich, interactive media at the home page helps people see NASA's message and understand our discoveries





A Snapshot of Portal Traffic

◆ Deep Impact and Return To Flight Combined

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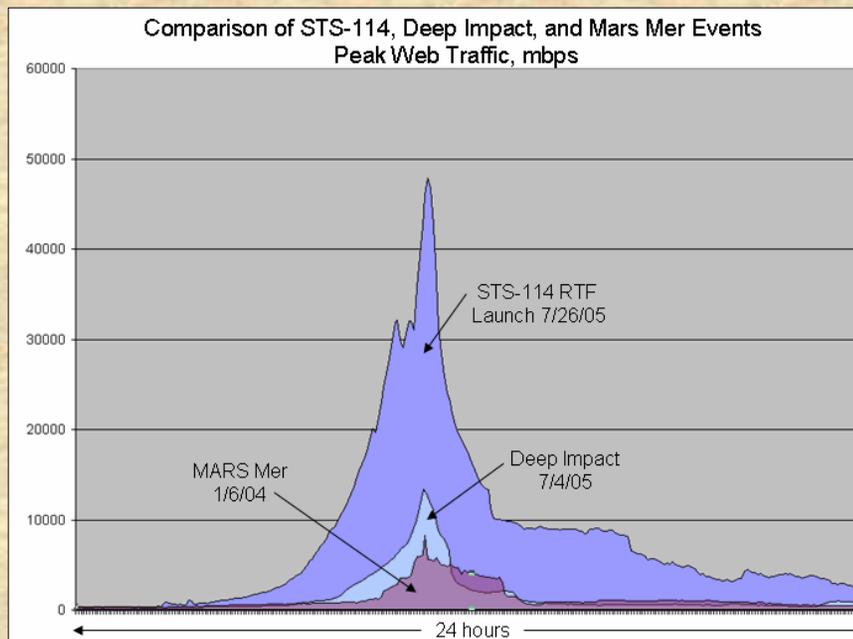
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Motivate



	Visitor Sessions	Pages Viewed	Hits (number of items requested)	Amount of Information Sent to Public (megabytes)
NASA Portal	25,249,589	235,326,840	5,890,490,696	138,176,407
NASA Web TV	476,152	N/A	4,581,538	77,698,916
Yahoo NTV	2,174,411	N/A	6,909,343	98,754,685





Inside NASA

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Motivate



- ◆ Intended for employees and partners
- ◆ Customizable
- ◆ Access to e-mail
- ◆ Instant messaging
- ◆ Collaborative tools
- ◆ Application integration
- ◆ Built on Vignette
- ◆ Re-use of NASA Portal infrastructure

The screenshot shows the 'Inside NASA' web portal. At the top, there's a header with the NASA logo and 'Inside NASA' branding. Below the header, there are several main content areas:

- Michael Griffin:** A section featuring a photo of Michael Griffin and a quote: "I look forward to working together to advance a bold exploration program. I share with you a great sense of privilege that we have been given the wonderful opportunity to extend humanity's reach throughout the solar system."
- NASA-Wide Announcements:** A list of recent announcements, including "A Message From Administrator Michael Griffin" and "NASA Administrator Michael Griffin to Address Agency".
- NASA Transformation:** A section titled "Welcome to the NASA Transformation Dialogue portal" with a sub-header "Learning Transformation Dialogue, March to June 2005".
- NASA TV:** A section for watching NASA TV Online, including links for "Watch NASA TV Online", "Live Now", "Archive Site", "Link Events to Schedule", and "Daily Programming Schedule".
- Quick Links:** A list of links for "Employee Exams", "Vacation and Leave", "Integrated Financial Mgmt. (IFM)", "Life Events", "NASA Forms", "NASA Jobs", "NASA", "NASA Institute", "Received Commitment to Excellence", "Return to Flight", "Science & Technical Information (STI)", "Travel Manager", "Vision for Space Exploration", and "Web/FAQ, Time & Attendance Systems".
- Emergency Operations:** A prominent section titled "KSC Emergency Operations" with a sub-header "KSC is at 'Weather Clear' Status". It includes a timestamp "Last Updated: 25-Oct-05 11:00 AM EDT" and text stating: "At 3:30 PM, October 24, KSC went to *Weather Clear*. Assessment Teams have been deployed to take stock of storm damage. By 12:00 PM EDT today, October 25, we hope to announce an 'All Clear.' For now the Center remains closed except to the Damage Assessment and Recovery Teams and those required to report to duty by their supervisor. The Center will return to full work on Wednesday, October 26." It also includes a "NOTICE" about the Max Brewer Bridge and contact information for reporting duty status.
- Homeland Security Alert:** A section titled "THREAT ADVISORY" with a sub-header "ELEVATED" and a message: "Significant Risk of Terrorist Attacks. Dept. of Homeland Security".
- NASA-Wide Announcements (Bottom):** A list of announcements including "Porter Named NASA's Associate Administrator for Aeronautics" and "Message from the Administrator: Presidential Directive on Energy Conservation".



Inside NASA Facts

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Motivate



- ◆ The primary internal portal for the U.S. space agency
- ◆ Visitors (monthly):
 - 800,000 hits comprising 28,000 sessions
 - 10 minutes per session
 - Growth pattern: 43% increase monthly in unique visitors
- ◆ Content: 90+ portlets
- ◆ Links: ~1700
- ◆ Reliability: 99.995% uptime
- ◆ End-to-end support: 1.0 FTE (full time equivalent)



Business Issues and Project Context

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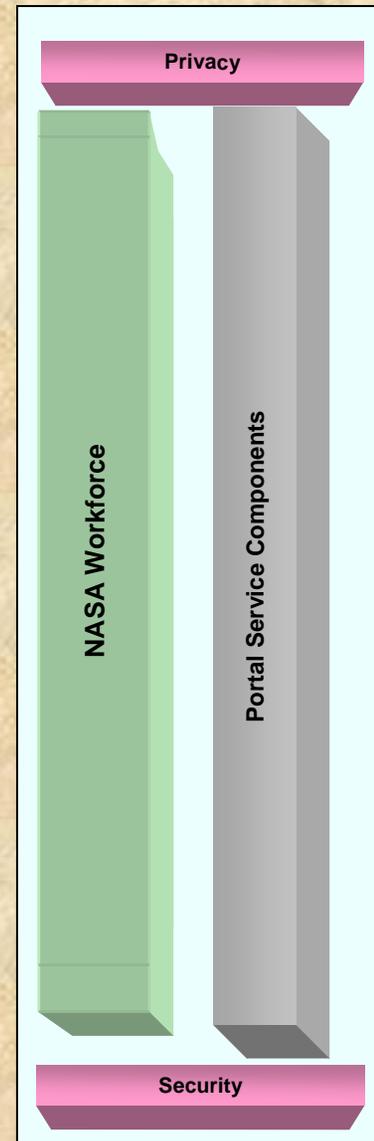
Motivate



<p>E-Gov Act and NIST Guidelines</p>	<ul style="list-style-type: none"> ◆ Achieve economies of scale internally through the migration of common infrastructures, tools, software and processes and information sharing. ◆ Secure information based on classification and share appropriately within the Agency
<p>NASA Management Goals</p>	<ul style="list-style-type: none"> ◆ Use the web as a primary communication avenue of the values & mission driving NASA to the NASA workforce ◆ Provide Access to the tools needed by the Workforce in an easy manner



Inside NASA Portal





Alternatives and Rationale

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Communicate



Innovate



Motivate



- ◆ When the decision was made to move the pilot operational, six alternatives were analyzed for
 - ✗ Stabilize on pre-existing SunOne 3.0 (long-term viability and usability of SunOne inadequate)
 - ✗ Develop in-house portal software (cost-effective COTS solutions were available)
 - ✗ Competitive RFP for full market saturation (existing options were available within NASA)
 - ✗ Develop on open source portal options, like Jet Speed (technology was immature)
 - ✗ Upgrade to SunOne 6.1 (InsideJPL made this transition, which was very costly in time and money)
 - ✗ Separate, independent analysis by HR and OCIO of Plumtree (usability concerns and costs)
 - ✓ Move to Vignette and shared infrastructure with NASA Portal (My NASA)
 - Evaluated Vignette independently and with eTouch to determine match to requirements
 - Functionality met requirements and provided good future capability deployment
 - Operational costs and complexity to OCIO would be minimized with shared infrastructure



Project Details and Solution Used

Collaborate



Communicate



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Motivate



- ◆ Prime Contractor
 - eTouch Systems Corporation
- ◆ Project Management, Content Lead, Application Integration
 - NASA JPL
- ◆ This initiative was part of a NASA Knowledge Management task (JPL Task Order 10260) sponsored by the NASA CIO and given to JPL for implementation in 1999.
- ◆ Migrated from the JPL infrastructure to the NASA Portal Infrastructure in April 2005



Business Results

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Motivate



- ◆ Agency-wide communications
 - Managers and teams use Inside NASA for routine and critical communications
 - Highly distributed model allows prompt updates and information
- ◆ Emergency operations
 - Provides real-time information for employees during emergencies (such as recent hurricanes)
 - Integrated information source
 - Available on remote devices (via VPN or token from cyber-cafes, Blackberry, and PDA)
 - Help desk support for for everything from return to work status to local supplies and evacuation routes
- ◆ Communities of practice
 - Allows broad-based, open collaboration across NASA and its partners
 - Spurs innovation and creative solutions
 - Elicits tacit knowledge from our experts
 - Captures and manages key knowledge for the Agency
- ◆ Application integration
 - Serves as the fulcrum for single sign on (still to come) and application integration (underway)
 - Absolute simplicity of portal application allows for levels of integration (from web connectors through full re-hosting)
 - Allows NASA to utilize investments in existing technologies and harness the power of Vignette for customization, distributed publishing, and easy integration
- ◆ Per user cost declining
 - In FY '07 projected to drop ~80 over FY '06



Challenges and Lessons Learned

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Motivate



- ◆ Sunset existing services once integrated into InsideNASA to achieve full cost savings
- ◆ Funding reduction has implications
 - Limitation on the number of personnel
 - The amount of content housed
 - Response time to users
 - Reduction in reliability
- ◆ Management strategy for consolidation across NASA
- ◆ Additional navigation needed as portal grows
- ◆ Critical Agency content owners/publishers offer RSS and XML feeds
- ◆ More external content sources are automatically exploited in portlets
- ◆ Implement Agency-wide strategy for search.
- ◆ Full integration with NISE (when delivered)
 - E-Authentication
 - Directory



NASA Engineering Network (NEN)

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Motivate



- ◆ Our newest system and is still emerging
- ◆ Sponsored by the NASA Office of the Chief Engineer
- ◆ NEN is a robust, flexible knowledge management system that
 - Provides a multi-purpose community management tool, task management tool, and lessons learning tool
 - Allows for managing and sharing of discipline standards, requirements and processes with a minimum of labor
 - Includes ITAR/EAR-compliant space for restricted content
- ◆ NEN integrates a content management system, portal, search engine, and engineering community management system in support of engineering discipline communities and NASA lessons learned
- ◆ NEN is built on the NASA Portal and InsideNASA, to reach across organizations and ensure that information is made available across NASA secured networks with 99.95% availability
 - NEN uses the Vignette portal software
- ◆ NEN also reaches to the Ames' NX (NASA Xerox DocuShare) system
- ◆ NEN complies with all Agency IT standards, including Section 508 conformance



Communities for Collaboration

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Standards

Integration to document management

InsideNASA
your portal to the NASA intranet

Welcome to Inside NASA

HOME BUSINESS CENTERS EDUCATION EMPLOYEES **ENGINEERS** MANAGERS NEWS & LIBRARY HELP/FEEDBACK

SYSTEMS ENGINEERING

Welcome (SE)

Welcome to the Engineers' Portal. As NASA's Chief Engineer, I welcome your comments, suggestions, and questions.

— Christopher Scolese
+ Read Biography

Contact:
christopher.scolese@nasa.gov

Community Administrators:
Keri.Murphy@jpl.nasa.gov
Greg.Williams@jpl.nasa.gov

Announcements (SE)

Check here frequently for information about changes to this Community Portal and discipline-related announcements.

New Portlets: Key Documents & Calendar (Systems Engineering)

Conferences & Workshops — Register Now!

- [2006 INCOSE Systems Engineering and Architecting Doctoral Student Network \(SEANET\)](#)
- [2006 Conference on Systems Engineering Research](#)
April 07 - 08, 2006
- [PMI Project Risk Symposium 2006](#)

April 06, 2006

Discussion Boards (SE)

Forum (1-6 of 6)	Msgs	Last Post
Thermal Engineering	5	2/14/2006 1:39 PM
Requirements and Requirements Analysis	1	10/13/2005 12:48 PM
Career Development	1	10/12/2005 7:01 PM
NPRs, Specs and Standards	4	10/12/2005 3:36 PM
Project SE Lessons Learned, Cases Studies	3	10/12/2005 3:24 PM
Scope of Work Development	2	10/12/2005 3:23 PM

All Forums

Engineering Standards

- NASA Technical Standards Program
- Tech. Standards Committees & Working Groups
- Materials & Processes Technical Info. System-II (MAPTIS)
- Reliability Maturity Model@ Integration (CMMI)
- NASA Spaceflight Hardware Workmanship Standards
- GSFC Standards Coordination
- Space Shuttle Process Control Standards
- NASA Science Office of Standards & Technology
- FGDC Geospatial Data Standards
- Standards Developing Organizations
- Industry & Gov't. Standards Developers & Providers
- Systems Engineering Revitalization

Key Documents (SE)

Actions on Selected... Go Add... Go View... 1 - 13 of 13

Type	Title	Owner	Edited	Size
<input type="checkbox"/>	GSFC - Testing WIRE_#4472E8.pdf	emeans	02/01/06	5 MB
<input type="checkbox"/>	GSFC Thermal Balance #4472E9.jpg	emeans	02/01/06	96 KB
<input type="checkbox"/>	ISMIS Technical Conference 2003	nen-admin	10/04/05	344 KB
<input type="checkbox"/>	JPL_System_Thermal_T#4472EC.pdf	emeans	02/01/06	132 KB
<input type="checkbox"/>	JPL governing test d#4472EA.jpg	emeans	02/01/06	137 KB
<input type="checkbox"/>	JPL Thermal Balance #4472EB.jpg	emeans	02/01/06	138 KB
<input type="checkbox"/>	MIL-HDBK-340A1.pdf	emeans	02/01/06	402 KB
<input type="checkbox"/>	MIL-STD-1540E1.pdf	emeans	02/01/06	3 MB

POC's for SE

SE Community POC's

- Steve Kapurch — PEO Systems Engineering, OCE, NASA HQ + Read Biography
- Daniel Schumacher — OCE, NEN Manager + Read Biography

Community Administrators:
Keri.Murphy@jpl.nasa.gov
Greg.Williams@jpl.nasa.gov

Find it @ NEN

To search the entire NEN repository, enter a search term in the text box below and click GO. Click on the advanced search button to refine your search.

ADVANCED SEARCH GO

You may also search on the following categories.

- NASA Centers
- Mission Directorates
- Topics
- By Year

Discussions and Q&A

Find information

• Plus action item tracking, saved searches and subscriptions and more.



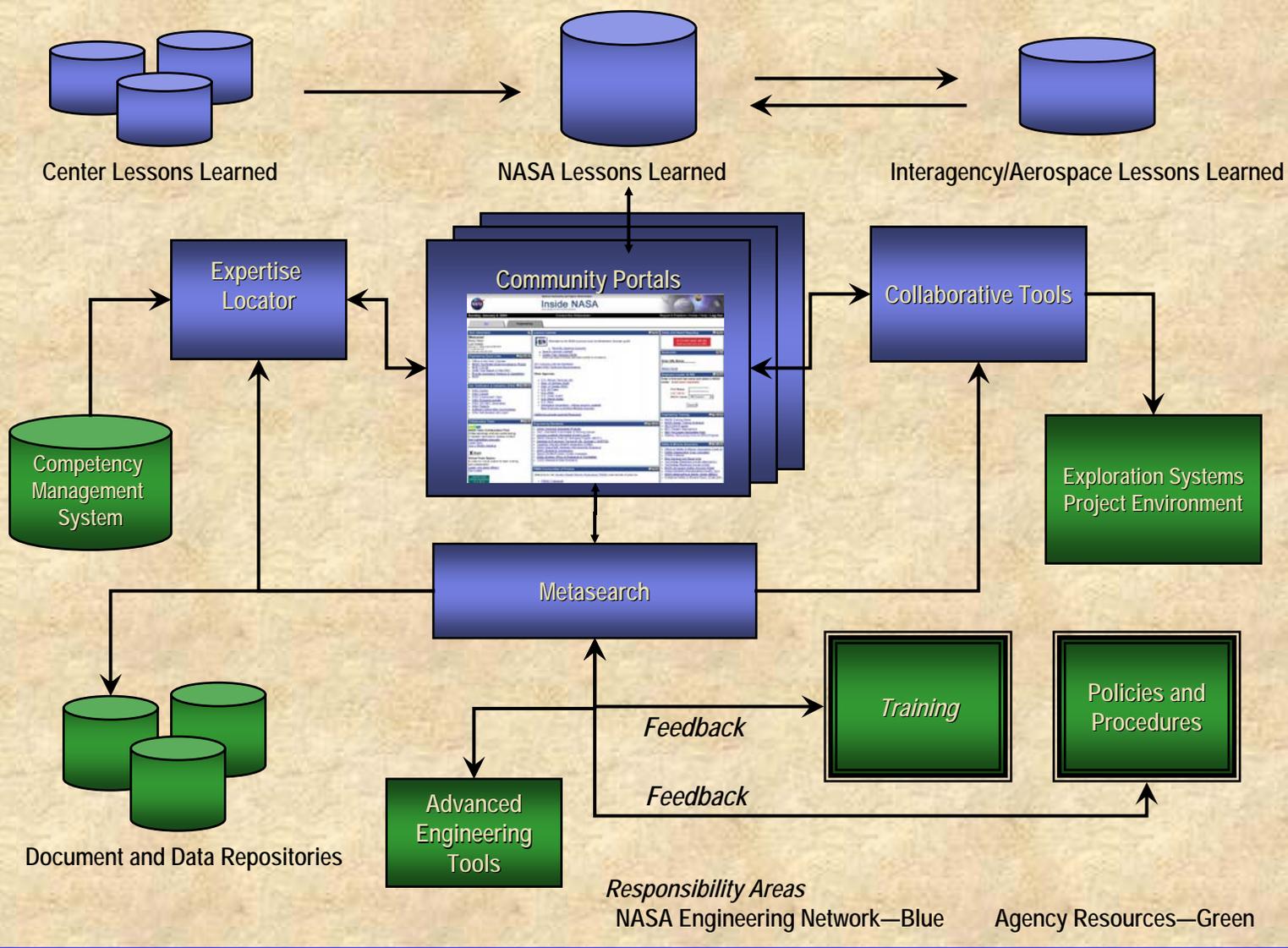
Learning Process Occurs Behind All Components: Embed learnings into tools and communities

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Looking Ahead

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- ◆ We are working on a variety of new initiatives that are still being formulated, including
 - Agency-wide knowledge architecture
 - Update structured approach to integrating distributed content systems
 - Accelerating learning
 - Integrated approach to e-learning and support to the project managers
 - NASA Engineering Network
 - Portals to organize community and individual access to information
 - Collaborative tools expanded for secure access with our partners
 - Expertise and expert directories organized around sharing knowledge person-to-person over virtual social networks
 - Metasearch across distributed repositories
 - Semantic web technologies for enhanced search and expertise location
 - Managing knowledge for aerospace and government
 - International Astronautics and Aeronautics (IAA) Working Group on KM for Aerospace
 - Federal KM Working Group--Knowledge and Human Capital Retention

Knowledge Management Roadmap



Sharing Knowledge

- Adaptive knowledge infrastructure is in place
- Knowledge resources identified and shared appropriately
- Timely knowledge gets to the right person to make decisions
- Intelligent tools for authoring through archiving
- Cohesive knowledge development between NASA, its partners, and customers

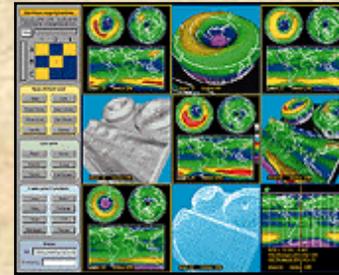


Integrating Distributed Knowledge

- Instrument design is semi-automatic based on knowledge repositories
- Mission software auto-instantiates based on unique mission parameters
- KM principals are part of NASA culture and supported by layered COTS products
- Remote data management allows spacecraft to self-command

Enables seamless integration of systems throughout the world and with robotic spacecraft

- Europa Lander/Submersible
- Titan Organics: Lander/Aerobot
- Neptune Orbiter/Triton Observer

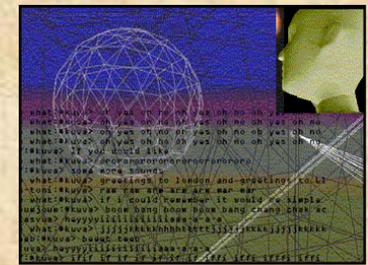


Capturing Knowledge

- Knowledge gathered anyplace from hand-held devices using standard formats on interplanetary Internet
- Expert systems on spacecraft analyze and upload data
- Autonomous agents operate across existing sensor and telemetry products
- Industry and academia supply spacecraft parts based on collaborative designs derived from NASA's knowledge system

Enables capture of knowledge at the point of origin, human or robotic, without invasive technology

- Mars robotic outposts
- Comet Nucleus Sample Return
- Saturn Ring Observer
- Terrestrial Planet Finder



Modeling Expert Knowledge

- Systems model experts' patterns and behaviors to gather knowledge implicitly
- Seamless knowledge exchange with robotic explorers
- Planetary explorers contribute to their successor's design from experience and synthesis
- Knowledge systems collaborate with experts for new research

Enables real-time capture of tacit knowledge from experts on Earth and in permanent outposts

- Interstellar missions
- Permanent lunar and Martian colonies

Enables sharing of essential knowledge to complete Agency tasks

- MarsNet
- Mars Exploration Rovers
- Space Interferometry Mission

2003

2007

2010

2025



Thanks!

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- ◆ Many thanks to the NASA Portal team, Inside NASA team and eTouch Systems who contributed to these ideas and to the excellent work they are doing in implementing solutions at NASA
- ◆ If you have any additional questions, please contact
Jeanne Holm, NASA/JPL
4800 Oak Grove Drive, Mail Stop 202-204, Pasadena, CA 91109
Jeanne.Holm@jpl.nasa.gov (818) 354-8282
- ◆ More information can be found about
 - NASA's KM program: <http://km.nasa.gov>
 - NASA's portal: <http://www.nasa.gov>

