



# Sharing NASA's Knowledge With the World

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# Creating an Opportunity

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



- NASA's Knowledge Management goal
  - 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*

# Why is KM Critical to NASA?

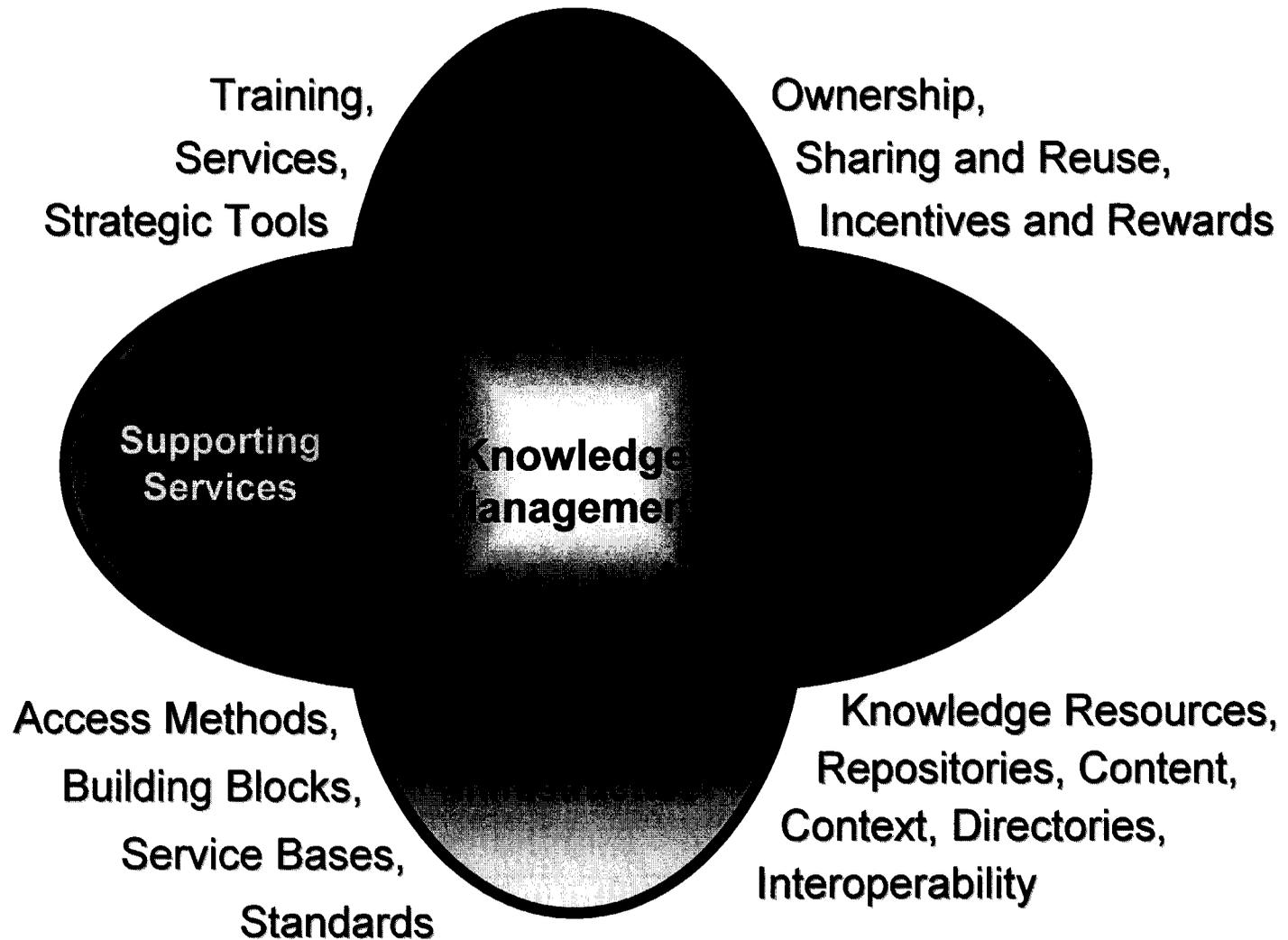
- We are constantly challenged to document and integrate our lessons learned to effectively manage the risk involved in space exploration and human space flight
- By its nature, NASA's employees have specialized knowledge
- The workforce in the Agency is aging
- Our goal is to share knowledge with each other and with the public



- *The Administration will adopt information technology systems to capture some of the knowledge and skills of retiring employees. Knowledge management systems are just one part of an effective strategy that will help generate, capture, and disseminate knowledge and information that is relevant to the organization's mission.*

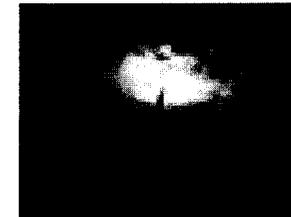
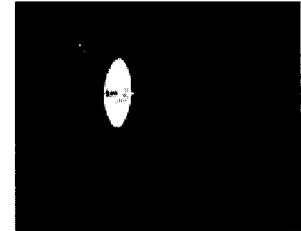
*President's Management Agenda*

# KM Critical Success Factors



# Key Areas for NASA's KM Strategy

- To sustain NASA's knowledge across missions and generations
  - KM will identify and capture the information that exists across the Agency
- To help people find, organize, and share the knowledge we already have
  - KM will efficiently manage NASA's knowledge resources
- To increase collaboration and to facilitate knowledge creation and sharing
  - KM will develop techniques and tools to enable teams and communities to collaborate across the barriers of time and space



# Framework for KM at NASA

## Sharing and Using Knowledge

- o Create a culture that encourages knowledge sharing
- o Reward and recognize knowledge sharing
- o Encourage knowledge sharing

- o Monitor information
- o Encourage knowledge sharing

- o Utilize intelligent agents
- o Encourage knowledge sharing

Education and

IT

Human

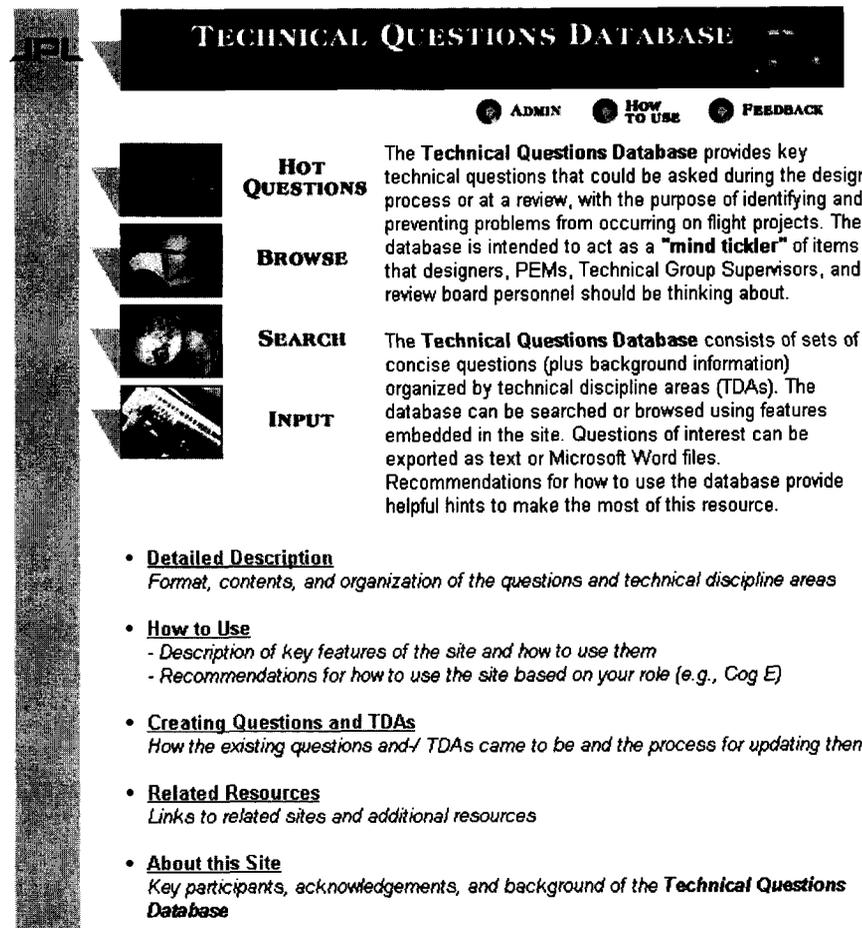
Security

# Making Progress on Knowledge Sharing

- Providing training and mentoring
  - Academy of Program and Project Leadership hosts team-targeted training, just-in-time online learning, and a community for managers
    - <http://appl.nasa.gov>
- Encouraging storytelling
  - Knowledge Sharing Initiative (storytelling) provides forums for people to share stories and publishes the best of those
    - [http://appl.nasa.gov/knowledge/knowledge\\_home.htm](http://appl.nasa.gov/knowledge/knowledge_home.htm)
- Recognizing people for sharing knowledge
  - An Human Resource Recognition Management Study is looking at changing our incentives to encourage knowledge sharing
- Enhancing our ability to capture knowledge and expertise
  - Mission assurance collects best practices for managing our risk
    - <http://pbma.hq.nasa.gov/pbmamaster.html>
  - Our Lessons Learned Information System encourages sharing of successes and failures
    - <http://llis.nasa.gov>

# Technical Questions Database

- Best questions asked at technical reviews
- Helps to create a virtual presence when key people cannot be there
- Over 700 questions
- 42 subject areas



**TECHNICAL QUESTIONS DATABASE**

[ADMIN](#) [HOW TO USE](#) [FEEDBACK](#)

**HOT QUESTIONS** The **Technical Questions Database** provides key technical questions that could be asked during the design process or at a review, with the purpose of identifying and preventing problems from occurring on flight projects. The database is intended to act as a "mind tickler" of items that designers, PEMs, Technical Group Supervisors, and review board personnel should be thinking about.

**BROWSE**

**SEARCH** The **Technical Questions Database** consists of sets of concise questions (plus background information) organized by technical discipline areas (TDAs). The database can be searched or browsed using features embedded in the site. Questions of interest can be exported as text or Microsoft Word files.

**INPUT** Recommendations for how to use the database provide helpful hints to make the most of this resource.

- **Detailed Description**  
*Format, contents, and organization of the questions and technical discipline areas*
- **How to Use**  
*- Description of key features of the site and how to use them*  
*- Recommendations for how to use the site based on your role (e.g., Cog E)*
- **Creating Questions and TDAs**  
*How the existing questions and/ TDAs came to be and the process for updating them*
- **Related Resources**  
*Links to related sites and additional resources*
- **About this Site**  
*Key participants, acknowledgements, and background of the **Technical Questions Database***

# Deploying New Systems and Services

- Capture design knowledge
  - Creating a service and tools to capture in-process design decisions for use on current and future missions
- Collaborative environments for missions
  - Creating access to tools and training for virtual teams
  - Quick start team environment

**NASA CIO Board** [edit](#)

Project status  The project is running smoothly [?](#)

**Welcome to the NASA CIO Board eRoom..**

**NASA CIO Board eRoom News**  
 - Current IMPORTANT news/event items will go here...  
 - Click here to view an online eRoom Tour and eRoom Documentation> [Support](#)

**Purpose**  
 This eRoom contains the following folders, one for each of these Projects listed below - you can access these folders from the item area (below) or from the map (to the left):  
 A. IT Policy - Holcomb; B. IT Governance - Strassmann; C. IFMP Guidance - Ciganer; D. IT & IFMP Costs - Peters; E. eRoom - Pillay; F. NISSU - Helmick; G. Architecture - Pettus

Name	Modified	Owner
Read This First	7 Jun 02 10:42am	David Wenner
*Play Area	31 May 02 4:00pm	Everyone
_Calendar and Milestones	10 Jun 02 11:23am	CIOPart
_Contacts	13 Jun 02 1:58pm	David Wenner
_General Discussion	30 May 02 4:46pm	CIOPart
_Support	31 May 02 4:00pm	David Wenner
_Task List	30 May 02 4:51pm	CIOPart
A. IT Policy - Holcomb	31 May 02 3:08pm	Lee B. Holcomb
B. IT Governance - Strassmann	30 May 02 5:30pm	Paul A Strassmann
C. IFMP Guidance - Ciganer	30 May 02 5:30pm	David Ciganer

# InsideNASA

- Intended for employees and partners
- Customizable
- Access to e-mail
- Instant messaging
- Collaborative tools

See more information at  
<http://insidenasa.nasa.gov>

National Aeronautics and Space Administration

## Inside NASA

your portal to the NASA internet

Friday, November 15, 2002 Log Out

My Front Page

**User Information**

**Welcome to InsideNASA**  
 Jeanne Holm  
 Last Update:  
 November 15, 2002 11:14:31 AM PST  
 306 minutes left  
 180 minutes max life time

**Bookmarks**

Enter URL Below:  
  
[NASA Knowledge Management Team](#)  
[JPL KM Library](#)  
[OneNASA Portal](#)

**Google Search**

Google™  
  
 Search the Web  
 Search NASA

**SpaceLink Search**

Quickly jump to some of Spacelink's popular areas...  
  
  
 ...OR search all of NASA by entering keywords or a phrase below:

**Today@NASA**

**Today@NASA**  
 FY 2003 Budget Amendments for NASA  
 November 15th, 2002  
[Astronaut Photo Album](#)  
 November 14th, 2002  
[Popular Science Magazine Awards NASA](#)  
 November 13rd, 2002  
[2003 Budget Changes](#)  
 November 12nd, 2002  
[STS-113 Launch Rescheduled](#)  
 November 11th, 2002

**Employee Locator**

Enter a name or e-mail address:  
 Search for:   
 Search by:  Full Name  
 Match by:  Substring

**E-Mail**

[NetMail](#)

**My Tools**

- [Employee Express](#)
- [FirstGov.gov](#)
- [Benefits Estimator](#)

**My Pay & Benefits**

- [Pay](#)
- [Leave and Earnings Statement](#)
- [Benefits](#)
- [Benefits Statement/IRBES](#)

**My Solar**

**Welcome to SOLAR**  
 We have refreshed the SOLAR look. You have no doubt noticed by now that many of the SOLAR pages have a new appearance. We are not complete with all pages so stay tuned as we continue to increase the user friendliness and visual appeal of SOLAR.

**Featured Training:**  
 Take the 2002 mandatory IT Security Training  
 • [Employees: Basic IT Security for 2002](#)  
 • [Managers: ITS for Managers 2002](#)

**Available Resources:**  
 Please take a moment to read the first issue of the [NASA SOLAR e-Learning Newsletter](#). This bi-monthly publication is designed to keep you informed about SOLAR and e-learning activities throughout NASA.  
[Gov Online Learning Center](#) is a Government-wide resource that supports development of the Federal workforce through simplified and one-stop access to high quality e-Training products and services.  
 SOLAR is pleased to offer online access to a rolling 12 month [SOLAR Calendar](#).

**Notes**

Nov 15, 2002 10:27:08 AM [jdyson](#) Si vis pacem, para bellum.  
 Nov 15, 2002 [irvann](#) InsideNASA will have its own announcement

**Today@JPL**

**Today@JPL**  
 NASA Prepares for 'Last Chance' Meteor Shower  
 November 14th, 2002  
[How to Sort Science Fact from Science Fiction](#)  
 November 13th, 2002  
[JPL Missions Chosen for Popular Science Magazine Award](#)  
 November 8th, 2002  
[Galileo Millennium Mission Status](#)  
 November 6th, 2002  
[NASA's Stardust Comet-Chaser Passes Asteroid Test](#)  
 November 4th, 2002

**Today @ LaRC**

**Langlev Research Center**

# Looking Ahead

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- Knowledge architecture
  - Structured approach to integrating NASA's distributed content systems
  - Managing Knowledge for Space Projects
    - International Astronautics and Aeronautics (IAA) Working Group on KM for Aerospace
      - Looking at key issues facing project and program managers for knowledge capture, sharing, and retrieval
- Expertise locator
  - Organized around sharing knowledge person-to-person over virtual social networks
  - Captures and stores conversations

# The NASA Public Portal

- Was designed and intended to be a dramatic, interactive interface to NASA by the public, kids, media, educators, and students
  - To create “One NASA” on the web so the public can find what they want faster and easier
  - As a pre-eminent example of the *President’s Management Agenda’s* e-Gov initiative
  - To replace the NASA home page and tie together NASA’s public-facing web resources
- We selected the following partners to help us create the NASA portal
  - **eTouch Systems Corporation** as the prime technologists for content management and implementation
  - **Critical Mass** as the design firm focused on interactivity and usability
  - **Sprint** (previously AT&T) for the hosting and caching environment
- A dramatically different site that will engage and inspire the American public
  - Content management solution, search, information architecture, and design
    - <http://km.nasa.gov/portal-white-paper.html>

# Challenges

- Our known challenges included
  - A highly competitive, two-step procurement process
    - Broad participation from industry, ranging from art firms to industrial-strength vendors
    - Madison Avenue style with industrial strength service
    - Detailed information can be found at <http://acquisition.jpl.nasa.gov/rfp/webportal/>
  - An evolving architecture, with a 4-week deadline for deployment
  - Deploying a portal that provided
    - Quick and easy navigation for our many audiences
    - A simple-to-use, highly capable content management solution
    - Interactive design and flash modules
    - Content migration from top 2600 sites on NASA's web by September 28 (encompasses ~3.5M web pages)
    - Industrial strength hosting solution to handle ~142,000 hits per day
- Our unknown challenge
  - Hours after deployment, the Columbia tragedy would occur

# Schedule

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- *Previously—Contractors selected and concept developed*
- January 2—Accelerated schedule from NASA Administrator
- January 6—Designed interim portal
- January 17—AT&T contract awarded
- January 21—Educator Astronaut site live
- January 31, 11:45 p.m — Deployment
- February 1—75 million hits
- February 1 and on
  - Ongoing content development and integration
  - Refining publishing workflows
  - Enhancing portal design and functionality

# Evolving Architecture

- February 1 functionality provided basic architecture and capabilities
  - Robust hosting solution at AT&T
  - Supported Educator Astronaut site
  - Provided front-line access for Columbia information
    - Updated design within hours of deployment
    - Added information architecture components
    - Continuing to publish significant content
- June 12 will provide full functionality for
  - Interactivity and enhanced design
  - Personalization via “My NASA”
  - Content management solution for anytime, anywhere publishing for NASA personnel
  - Content migration/integration from top 300 web sites
    - 2600 sites by September 28 (encompasses ~3.5M web pages)
  - Complex information architecture tied to advanced search and underlying taxonomy
  - Integrated workflow from creating content to personalized views

# NASA Portal User Interface

**NASA NATIONAL AERONAUTICS AND SPACE ADMINISTRATION** Top Story or Interactive Feature [+ en Español](#)

[ABOUT NASA](#) | [NEWS & FEATURES](#) | [EVENTS](#) | [MULTIMEDIA](#) | [MISSIONS](#)

[For Kids](#) ↗  
[For Students](#) ↗  
[For Educators](#) ↗  
[For Media & Press](#) ↗

**Top Story:** [NASA Investigation](#) ↗

**Search:** FIND IT @ NASA:  [START SEARCH](#) ↗

**IMPROVE LIFE HERE** | **EXTEND LIFE TO THERE** | **FIND LIFE BEYOND**

Audiences

NASA Vision

- 

02.10.03  
Cold Winter? El Niño?  
Perhaps Not  
[+ View feature](#)
- 

02.01.03  
Earth Imitates Art  
[+ View feature](#)
- 

02.01.03  
Helping Houston Study Air  
Pollution  
[+ View feature](#)

- 

02.24.04  
Highway to Honor Columbia  
Astronaut  
[+ View feature](#)

- 

02.18.03  
Astronauts Observe Blue  
Clouds in Space  
[+ View feature](#)

- 

02.14.03  
Interactive Columbia Tribute  
[+ View feature](#)

- 

02.20.03  
Lunar Mystery Solved  
[+ View feature](#)

- 

02.19.03  
Snow Gullies on Mars  
[+ View Feature](#)

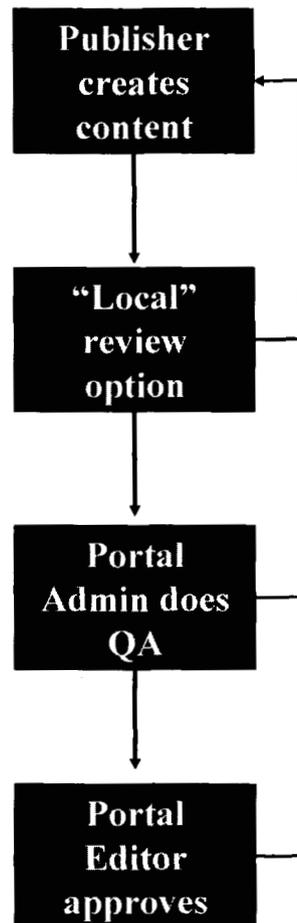
- 

02.11.03  
Baby Pictures of the  
Universe  
[+ View feature](#)

# Ongoing Publishing

- Three roles will be involved in publishing
  - **Publisher** for content creation
    - Anyone at NASA can submit an item for publication (either existing web information or a new piece of information)
  - **Portal Administrator** for quality assurance
    - Is the metadata correct?
    - Is it properly placed in the information architecture?
    - Is it cleared for release (export, 508, etc.)?
  - **Editor** approves content and context
    - Does it send the right message?
    - Is it prioritized correctly?
    - Should it be placed in multiple views?
  - Editorial Board members come from Center Public Affairs offices and Enterprise leadership
- System manages and archives information while in process and throughout lifecycle through archive

# Publishing Workflow



- Template enforces information architecture and content structure
- Web-based interface for anyone at NASA to publish and share knowledge

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- “Local” reviews are dependent upon information architecture (IA) and publisher. May include export control, management, launch approval, or legal. Can be specific to a location or topic.

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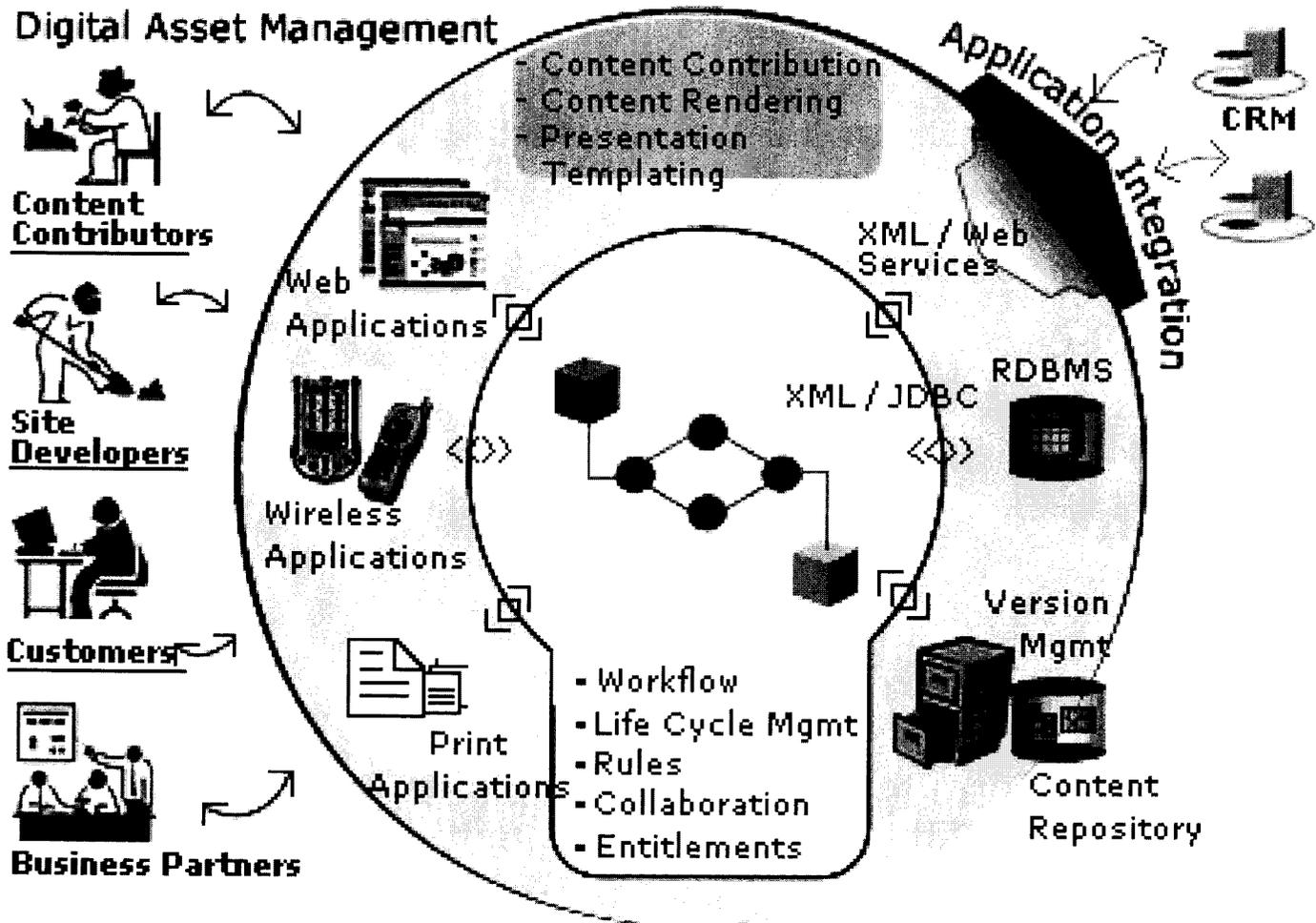
- Portal Administrator reviews metadata, IA, attachments, format, and audience level for completeness and accuracy

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- Content-specific Editor approves publication, prioritizes, and places in content area

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# Digital Asset Management System



# Current Status

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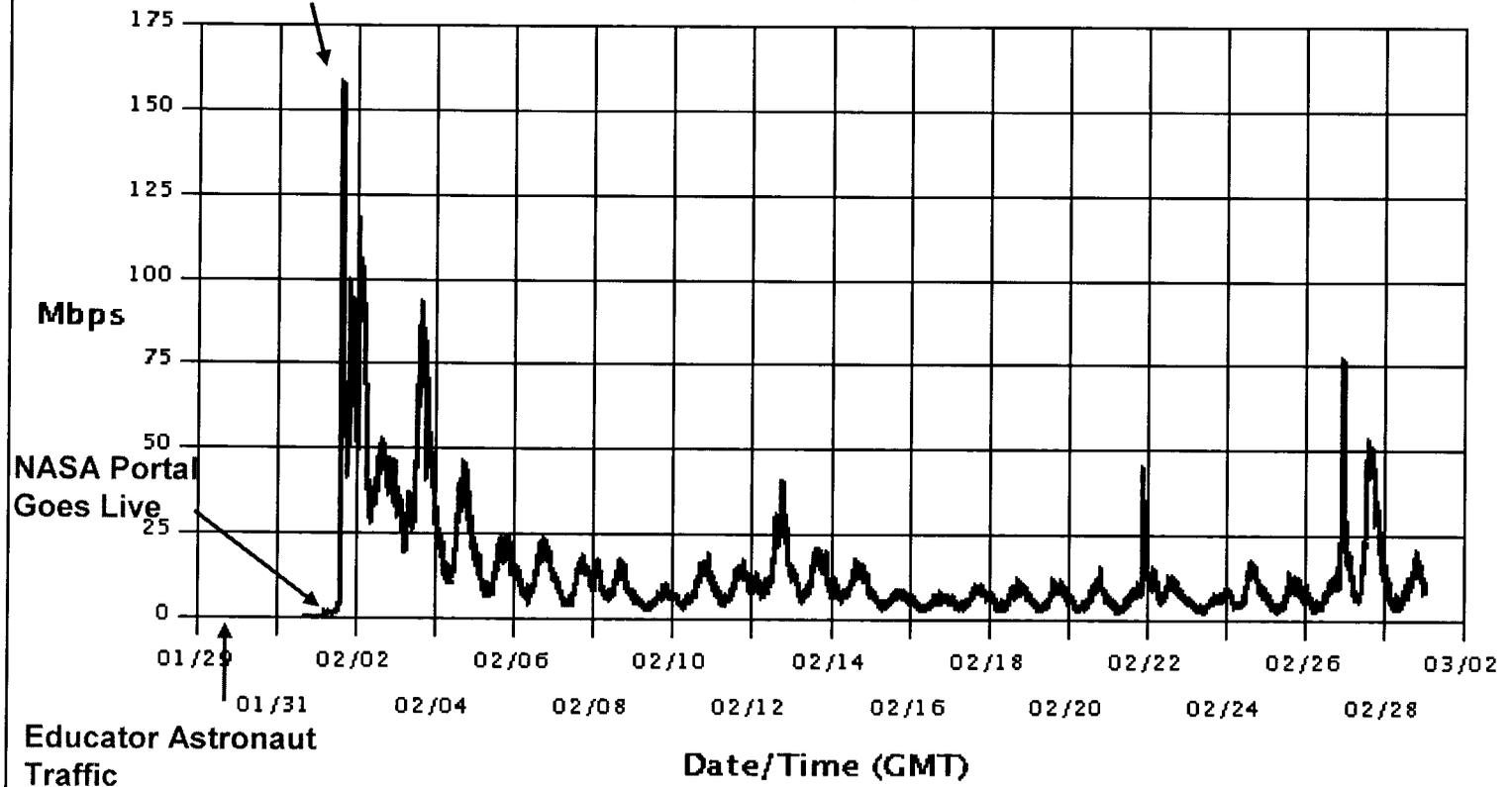
- Portal continues to be stable and serving content
- Total hits to date: 748,410,614
  - Unique visitors: 6,751,523 (accumulated weekly)
  - Actual traffic: 3,119,821 hits per hour at peak
    - Expected traffic: 6,000 hits per hour
  - Traffic in first 5 days was the expected traffic for the six months
    - For example, we expected 20,000 queries/day on our search engines, designed for 20,000 queries/hour
      - Received ~1.5M search queries on February 1
- Total information transferred
  - 6.82 terabytes

# A Snapshot of the Portal Traffic

Average Five Minute Bandwidth

## NASA Portal

Columbia 01/29/2003 00:00 - 03/01/2003 00:59 GMT



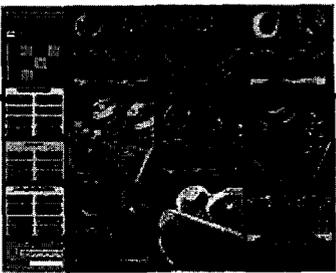
Report Run Date: Tue Mar 11, 2003 05:18 GMT

# Knowledge Management Roadmap



## 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



## 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 JPL'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



## 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 Lab 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



## 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 JPL, its partners, and customers

Enables sharing of essential knowledge to complete Agency tasks

- MarsNet
- Europa Orbiter
- Space Interferometry Mission

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

- Interstellar missions
- Permanent colonies

# Key Implementation Successes

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- Enlist, encourage, empower (baptize the evangelists)
- Get executive and/or broad sponsorship to achieve...
  - Cultural change
  - Deployment of systems and solutions
  - Infusion into the day-to-day processes
- Listen to your customers, and then listen some more
  - Make your first success the most important thing to your customers
- Keep focused on your long-term objectives, while working on day-to-day implementation
  - Think globally, act locally
- Become completely integrated to your core business
  - Avoid focusing solely on creating efficiencies
- Don't try to solve the whole problem—just start somewhere and solve part of the problem

# Thanks!

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- Many thanks to my colleagues and our partners who contributed to these ideas and to the excellent work they are doing in implementing knowledge management solutions at NASA
- Portal Team
  - Brian Dunbar, Douglas Hughes, Jay Dyson, Nitin Naik, Ellie Trevarthen, and Greg Williams
- More information can be found about
  - NASA's KM program: <http://km.nasa.gov>
  - NASA's portal: <http://www.nasa.gov>

# Contact

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–If you have any additional questions, please contact me

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•Jeanne Holm leads NASA's Knowledge Management Team and manages the NASA public and internal portals, content management, and search solutions. From her activities ranging from co-leading an international team searching for the best solutions in KM to advance aerospace to working on the US Government Federal KM Group, Ms. Holm strives to integrate distributed experts and underlying information systems to enable knowledge to flow across organizational boundaries. Her degrees in the Management of Information Systems, Executive Management, and Technical Communication help her in her work and as an instructor at UCLA.



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