

Meeting the Challenge of Electronic Communication”

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The Jet Propulsion Laboratory (JPL), California Institute of Technology, is challenged with not only providing an environment where engineers and scientists can exchange information quickly and accurately, but also providing the public with the fruits of its exploration in away that is both interesting and understandable to all age groups and professional arenas. Web technology has given us the means to meet this challenge. A myriad of tools and technologies are used daily to solve communication problems from simple memo distribution to highly complex Web sites instantly delivering custom data around the world.

A Jo/f of Reality

The strategic planning architectural coding, and tools used for building JPL’s Web sites are best illustrated by case studies. These examples include the JPL Technical Report Server; the Advanced Spacecraft Development Program Information Exchange (PIE); and the DMIE Information System.

The Paperless Project Arrives

The Advanced Spacecraft Development Program Information Exchange (PIE) system, illustrates a project based entirely on electronic information databases (a “paperless” project). Implementation of the paperless project concept employs a modular approach, where features can be easily added and integrated. The project Web site consists of a number of features, including posting and review areas, group calendars, search capability for text and graphics, online forms for metadata submission, auto-upload of user files, and hypes-links to other online tools (such as a receivable/deliverable system). The architecture and scalability of the application offers the ability to include archival and retrieval of e-mail messages, auto-posting and auto-converting to PDF of user files, and a working interface to the JPL Product Data Management System for control of project configuration items. With this approach, each new project team wishing to use the system can choose which features best fit its requirements.

The PIE system began as a concept to electronically store “information” as opposed to “documents.” Individual textual descriptions, tables, schedules, and graphical information not only would be searched and sorted, but also cut, pasted, and edited to build a new document or presentation. Files needed to be accessed by all program members, including off-site contractors, principal investigators, and science teams at U.S. institutions and universities, NASA and other government agencies, and collaborating Russian scientists.

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The Web was the practical choice for a system that met the program's requirements. Using WAIS as the search engine, Perl scripts serve as glueware to provide metadata and search term input, sorting capability, and search result display by creating HTML pages in real-time fashion. The cost of this glueware was leveraged off a JPL task for the Defense Nuclear Agency to develop the Data Archival and Retrieval Environment (DARE) software, as well as the institutionally supported Andrew File Server (AFS) for shared disk space.

As in most online systems, architecture design and software development can actually be the easy part. Data capture faces cultural and financial roadblocks. It is difficult to convince program members to use online capabilities for entering their own metadata and uploading files. For the PIE system, a half-time librarian/computer operator was employed to enter and quality check the metadata, convert native formats to PDF or HTML, upload browse and native formats, maintain access lists, and perform general Web site operations functions.

Two years after conception, the PIE system is growing at a fast pace. It now contains roughly 2,000 files, has about 1,000 hits per week, and provides access to hundreds of JPL users in addition to 35 off-site users. It also serves as a model for other programs and projects wanting to go "paperless."

Low-Cost, Easy-Access Answers

The JPL Technical Report Server (JPLTRS) (<http://techreports.jpl.nasa.gov>), which illustrates a straightforward concept in bringing traditional documentation to an online and searchable system, is one of 11 distributed databases that create the NASA Technical Report Server. This distributed database of information (with over two million records), searchable by both metadata and full text, allows users anywhere in the world to quickly find information they need and to print out copies at their desk or download files for their own use.

Using commercially available, and generally free, software to architect and access the site keeps production and maintenance costs low. The primary tools of the TRS system are: the Wide Area Information Server (WAIS) (both the free and commercial versions are used), HTML, Adobe Acrobat, and Netscape Navigator. By building a robust system from the start, maintenance costs have remained very low for both system administration, as well as for overall management. The focus of the maintenance is now in adding information and continuing to populate the TRS sites.

Creating Electronic Institutional Records

The Define and Maintain the Institutional Environment (DMIE) process is the process that defines, generates, maintains, and continuously improves the structures and operations of the Laboratory. This includes the Laboratory's policies and procedures, as well as organization charts, charters, roles, and process definitions and maps. The documents are created by people throughout the Laboratory.

The DMIE Information System (DIS) is the document management and information system that supports the DMIE process. It is made up of a gateway (the IE Navigator), an Oracle database, and a set of workflow tools.

The Institutional Environment (IE) Navigator is a Web-based interface that employs:

- . Search engines, which allow the user to search throughout the repository (simple search) or in user-defined parts of documents (power search)
- Indices, which allow users to list sets of documents by different document types
- . Perl scripts which take the results of a user's search or index choice and produce (on-the-fly) HTML pages from the SGML in the repository
- . E-mail capability to provide feedback to process owners, including requests, clarifications, and waivers
- . An Oracle database that contains the document repository (including official, draft, and archival documents) and a registry of owners and processes
- . The tools that allow process owners and others to write, revise, review, and publish institutional documents, including a workflow engine (Life* FLOW), authoring tools (Guided Editor, based on Adept Editor), and the Compound Document Manager

Altogether, the DMIE Information System enables process owners to easily create, edit, and revise documents; allows online review of draft documents; allows users to find and read official, draft, and archive documents; allows reconstruction of the full set of documents as of any given date; allows users to send waiver requests, improvement suggestions, and clarification requests directly to the responsible process owners; and tracks feedback and uses it to trigger process owner review of the documents.

Switched On for Success

One of JPL's tasks is providing information products and services for internal and external distribution, with projects that vary in scope from simple, single page Web sites to complex interactive information delivery systems. Internally, JPL reaches more than 19,000 workstations in a multi-platform environment over a high-speed Ethernet Web-based network. Externally, JPL potentially reaches millions of computers on the World Wide Web over a variety of network service and modem connections.

The challenge of producing documents and information sites for delivery to this myriad of operating systems, hardware configurations, and network capabilities requires not a single solution, but a strategy of scaleable solutions based on customer requirements and end-user environments. Chief among the goals of electronic publishing at JPL is to deliver quality content to a defined audience. While this is a relatively simple statement, past history shows that the rush to populate the Internet has led to less than desirable (sometimes unusable) information sites. Working closely with customers, content is carefully evaluated and audiences clearly defined to determine the best method of conversion, production, and distribution of the material.

Converting native text and graphics files to composed HTML documents with a cohesive Web structure is a significant challenge. The demand for implementation of uniform HTML standards, a desirable trait for both intranets and the WWW, seems to be countered by productivity tools laced with proprietary code and non-standard implementation of HTML. At JPL, processes and tool sets are continually evaluated in an effort to keep pace with the continued growth of electronic publishing. As part of a scaleable strategy, implementation of new processes and tools is adjusted to

meet job requirements and provide the best balance of productivity, quality, and standards conformity.

Summary

The task of producing and maintaining quality information sites and structures is further complicated by the advent of automated Web site production tools aimed at nontechnical users. An open workplace environment with employees empowered to create their own Web presence could spell disaster for corporate or institutional intranets. Documentation and electronic publishing support groups providing education and support services that can be the best defense against a well-intended but poorly designed or executed site.

Biographical Sketches

Jeanne Helm oversees many technical communication and electronic publishing projects for NASA's Jet Propulsion Laboratory, California Institute of Technology. As Process Owner for Information Dissemination and Electronic Communications, Jeanne helps engineers and scientists present their information across the Internet without violating the institutional and Federal regulations governing release of technical data. Jeanne also manages the JPL Technical Reports Server, which is part of a NASA-wide distributed, fully searchable archive of all NASA technical publications. She also provides consulting to Disney Worldwide Services in the fields of technical communication, training, and electronic publishing.

Peggy Panda has participated in many activities relating to Web-based Internet and intranet information systems at the Jet Propulsion Laboratory (JPL). She serves on the design team for JPL's first electronic labwide information access system and is the task lead for implementing the concept of a "paperless project" for an international team of engineers and scientists. In an effort to promote the use of standards in electronic publishing, Peggy organized and currently chairs the JPL SGML Implementation Subcommittee and also is helping to standardize the content, production process, and change control process for project documentation deliverables by designing a Web-based authoring tool that uses SGML as the archival format.

Christopher Hawley currently leads the Electronic Publishing Services (EPS) team of the Jet Propulsion Laboratory Technical Documentation Section. EPS creates "from-the-ground-up" solutions for a variety of electronic publishing challenges from presentations and newsletters to Web site development and online information retrieval systems. Chris' background in digital publishing includes creation of books, periodicals, corporate legacy documents and promotional collateral, advertising and electronic publishing on the Internet. A ten-year veteran of digital publishing and the DTP revolution, Chris has evolved along emerging technologies, seamlessly making the philosophical and practical transition from print media to the electronic publishing environment. He maintains an integrated knowledge of design and production software, pre-press and printing operations, and a variety of electronic information delivery systems.