

The Architecture of Project Observatory

by

Gary M. Cole
CEO, Marin Research, Inc.

The Architecture of Project Observatory

Copyright (c) 2000 by Marin Research, Inc.

Project Observatory™, Project Telemetry™, Project Gateway™, Project Directed Workflow™, ProjectGo!™, and the distinctive Gateway globe are trademarks of Marin Research, Inc. "Total Project Information. All the Time. Everywhere."™ and "Connecting Your Project Community"™ and "Bringing Projects into Focus"™ and "Observatory Pictures"™ are service marks of Marin Research, Inc. Lotus® and Lotus Notes® and Domino® are registered trademarks of Lotus Development Corporation. Windows® is a trademark, Internet Explorer® and Project® are registered trademarks of Microsoft. Netscape Navigator® is a trademark of Netscape Communications. PalmPilot® is a registered trademark of Palm Corporation. WorkPad® is a registered trademark of IBM Corporation.

Marin Research, Inc.
100 Larkspur Landing Circle, Suite 114
Larkspur, California 94939

info@marinres.com
<http://www.marinres.com>

Introduction

Project Observatory was created to address the need for a program & project office (PMO) information system that would be scaleable, relatively painless to deploy, and comprehensive.

The classic strategy for building an enterprise PMO facility has been to train the entire enterprise in critical path planning and standardize on a scheduling tool. In theory this allows all work to be planned as projects and to be consolidated into a management picture. In practice this takes a very long time and a very large amount of effort. As a result, few organizations have achieved the goal of creating a management information system that truly represents the enterprise.

The problem is that, to succeed with critical path planning, you need to be able to define all of the required tasks in each project and be able to estimate each individual resource assignment to a good level of precision. Then, you must capture actuals and update the plans periodically for the life of the project. In a few disciplines, such as construction, this is a natural and well-established process. For most corporate projects, however, there is simply too much uncertainty, and not enough time, to estimate, schedule, track and report at this level of detail. Since these projects are consuming the bulk of the organization's professional resources, they need to be at the core of a management picture.

With Project Observatory, we take a very different approach. We accept the reality that the majority of projects in contemporary organizations do not have task level, critical path schedules.

If you were to set up a paper PMO process, you would start by defining a "standard" project report. You would then require project leaders to submit reports on a scheduled basis. This is exactly the way Project Observatory works. Instead of a paper document, we use an XML format. Instead of a word processor, we use a "fill in the blanks" form based application (Reporter).

With this kind of reporting, the time required of project leaders is very small, perhaps no more than 10 minutes per week for typical projects.

For those projects that do maintain computerized schedules or are managed in Project Gateway Repositories, we can automatically extract the management level data from the scheduling tool or database so that the project leader does not need to file another report. As a result, the highest quality information is always provided to management.

The key insight here is that there is a difference in the level of detail that project scheduling systems require and that management requires. It is much better to have basic management information (milestones and resource requirements) for every project than to have detailed information for a few and no data at all for the rest. By formally defining this intermediate level, which we call a Project Abstract, we can combine detailed task level plans with projects that are defined at the "paper report" level. Since the data is all computer readable, we can manipulate it and combine it in ways you could not do with paper reports. This is particularly beneficial when compiling resource and skill requirements.

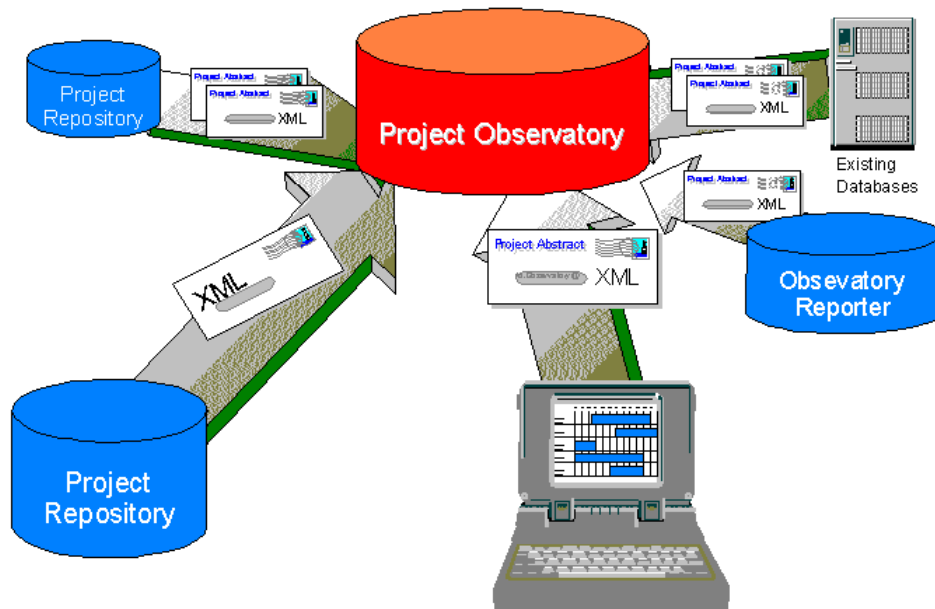
The Observatory Center application was designed to extract the maximum amount of management benefit from this data. Though a combination of consolidation, automation, interviews, and visualization, we create a living picture of project performance and organizational commitments that provides a sound basis for staffing decisions, project prioritization, and progress assessment. All of which helps the PMO fulfill its mission of creating a more predictable enterprise.

Design Concepts

This system was designed from the ground up to meet the needs of the contemporary project office to collect, correlate, and disseminate management information.

The following schematic illustrates how project information is collected from external sources and delivered to the observatory for processing and compilation. Information arrives in the form of XML compliant messages which contain management level project schedule and resource information. Note that Project Observatory can work directly with any number of Project Gateway Repository systems, but that you don't need to use those systems to get the full power of the Observatory.

Support for
Global Enterprises



Project Observatory combines project and resource information into a common customer defined framework that represents the owner's department, division, or enterprise. It also provides a comprehensive documentation library facility. This allows documents such as program charters and project meeting minutes to be linked with comprehensive schedule and resource reports.

Deployment without
disruption

Observatory collects management information about project goals and resource requirements. You do not need to build a body of expertise in project scheduling software or task level planning in your organization in order to use the system. Thus, it is well suited to research, marketing, and consulting organizations as well as the more classic users of project management techniques.

A key component of this is the Observatory Reporter. This web based tool allows non-planners to report their project performance and resource requirements using simple forms and templates.

One of the hardest problems in any large organization is to get everyone using a common nomenclature. To minimize the deployment effort, the naming conventions used in the observatory are independent of those used by the creators of the project information. This means that existing plans and databases do not have to be changed.

Staff planning
and deployment support

Project Observatory provides a centralized capability for tracking the skills and availability of your professional staff. Part of this is an integrated search and reservation system that finds candidates that best meet your needs using capacity, demand, skill, and location factors. Automated interview facilities collect and maintain skills usage and competencies data without requiring dedicated support staff.

History improves understanding

A program office needs to understand trends, and that means that it must look at more than just the latest status report. One of the key concepts in this system is that project and resource information is stored in a time structured data cube which can be easily visualized to examine trends. The system also provides automated archiving and metrics components to maximize the re-use of experience.

Dashboards and Briefings for Managers

Dashboards highlight the people and projects that really need attention. The briefing facility leads users step by step through relevant information about the projects, programs and organizations for which they have responsibility.

XML provides independence

Project Observatory defines extensible common public framework for accepting project information using XML. This allows any existing project planning tools, and future ones, to provide management information to the system via direct connection or email. It also means that information in legacy databases can be made available in the Observatory environment at little cost.

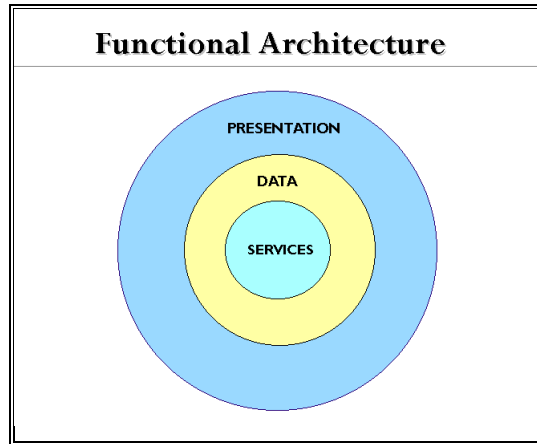
Extensible

The architecture of the Project Observatory system and the use of XML and Java allows future implementations on other platforms. The layered services architecture allows an unlimited number of future extensions both in data handling and presentation. The object store makes it possible to maintain unique data for individual projects or managers without impacting other entities.

The Observatory Center Application

Observatory Center
System Services
Data Storage
Presentation Services

The application is implemented on the Lotus Domino server platform that provides access by both Notes and Web Clients, document level security, user authentication and access control, replication, agent execution support, and the Notes object store data facility.



The software itself can be understood as a three tier structure: System Services, Data Storage, and Presentation Services.

The **System Services** layer is controlled by the administrator defined policy setting and user set preferences. These services process incoming project information and interact with certain users via questionnaires and notifications.

The **Data Storage** layer records current and historical project and resource information and provides a library for user documentation.

The **Presentation Services** layer formats, tabulates, visualizes, queries, and sequences

the information to provide answers to users. This is where the Report, Dashboard, Visualization, and Briefing facilities reside.

System Services

Services are controlled by policy settings made by the administrator.

Services

Message Processing
Consolidation
Data Maintenance
Notification

The services tier has four major functions:

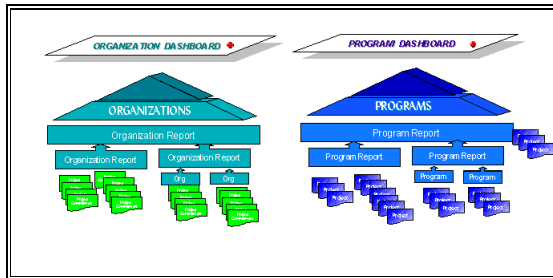
- To process project information provided in XML format and maintain project and commitment documents.
- To aggregate project and user information into an administrator-defined hierarchy of programs and organizational units.
- To maintain and augment this data for the life of the entities and ultimately archive it.
- To evaluate performance and notify managers when action is needed.

Message Processing Services

At the base of the system is a message processing core that accepts posted or emailed content in pre-defined XML formats. These messages are used to construct and maintain "standing reports" about projects and resource commitments. The message processing service does currency translation and merges new data with the historical records. It also identifies new items that need attention and notifies the administrator.

One of the features of this service allows it to relay project reports to other Project Observatory databases so that independent systems can work at the regional and enterprise levels and share common project reports.

Consolidation Services



These services rollup data from individual project, commitment, and reservation records into hierarchical entities representing programs, individuals and organizational units.

A set of worksheets allows the administrator to adjust the data structure to support an evolving enterprise with minimal effort.

Data Maintenance Services

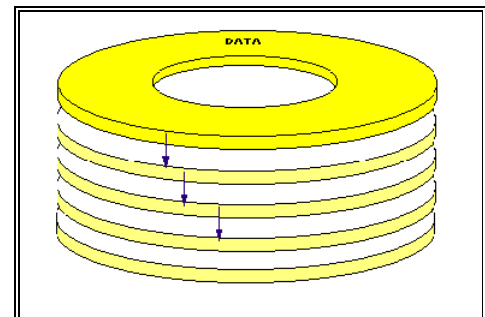
Services

Data Maintenance

Historian
History Maintenance
Project Interview
Member Interview
Metrics Interview
Remove and Archive
Processed Reports

Historian. The historian service builds a history stack for each report by periodically making a copy of the current data according to system policy settings. This creates the time cube that makes possible much of the trend analysis and forecasting.

History Maintenance. This service purges the history stacks to gradually reduce the number of snapshots of older material. This allows high temporal resolution of near term history of events to be maintained with a lower resolution of older history to save space.

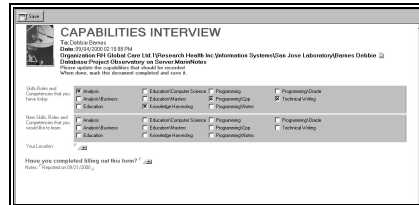


Skills and Capabilities Maintenance Services

This set of services creates, sends, and processes questionnaires about skills and capabilities in the enterprise. The system provides a standard, centrally maintained list for these attributes.

Project Leader Interview. Project Leaders will be interviewed to determine what skills are used on their projects. This interview process is run by the database to tag each resource commitment with the best skill code.

Capabilities Interview. Members will be interviewed to determine what their current capabilities are and what other areas of work are of interest. This builds a constellation of skills, roles, competencies and interests for each individual. These interviews will be repeated periodically according to policy settings.



Remove and Archive. This service will archive completed and canceled projects (and others marked by the administrator) along with the documentation of those projects.

Metrics Process. This service creates, sends, and processes questionnaires about the specific results produced by completed projects. This information is packaged into the Metrics Center database for future queries.

Processed Reports Service. This service removes the project reports that have been processed and provides for a soft delete capability for user created documents.

Notification Services

- Notification
- Target Notification
- Trend Forecasting
- Report Notification
- Escalation
- Library Notifications

Dashboard Target Notification. This service sends notices to managers whenever schedule, budget, or short term dashboard capacity targets are exceeded due to changes in reported information.



Trend Forecasting. This service actively monitors trends in schedule, budget and capacity and notifies managers about problems that will likely occur in the near future.

Forecast documents are created when problems appear and managers are notified.

Missing Report Notification. This service sends notices to project managers when expected updates are not received or when the project appears to require rescheduling. It can also be configured to remind all project managers on a weekly basis to update their status.

Escalation Reports. This service sends detailed reports to program managers about projects that require attention. These notices report missing reports, overdue issue resolution, and other possible project disorders. Additional escalation is provided to alert the administrator to possible data flow problems with connected repositories and report applications.

Library Notifications. Library documents may define due dates that trigger automatic notifications.

Data Storage

Observatory data is stored in the Notes object store as a set of very rich consolidated entities that represent Projects, Project Resource Commitments, Reservations, Programs, Individuals, and Organizational units.

Each of these entities contains hundreds of field of text, scalar and vector information and hyperlinks to other entities. In addition to this rich tapestry of contemporary information, historical versions of each entity form a deep ensemble of time phased evolutionary information. Much of the sophistication of the presentation layers was developed to mine these data cubes.

Entity Documents

Project and Project Commitment documents are created automatically when messages are received. A Project document typically contains the following information elements

Identification, Ownership, Sponsorship
Description
Links to commitment reports, program reports, library documents, external documents.
Status summary description
Target settings
Open Issues
Milestone titles, status and dates
Standard Project Management statistics (cost, effort, time)
Historical trend lines for all statistical parameters
Time phased data for planned, proposed, actual work, budgeted capacity, task starts and finishes.

Program and Organization documents are created by the administrator, but, once created, are updated automatically by the core level functions to contain consolidated information from a collection of project or project commitments.

Resource Reservations are created by users and approved by managers. They are interpreted as additional commitments for a specified Organization. Although manually created, approved reservations are updated weekly by the core agents and will be automatically removed when time period for which they have been defined has ended.

Library Documents

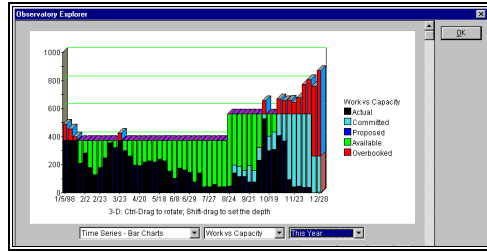
The library layer contains user created documents in a variety of pre-defined formats. Any document can be associated with any project, program, organization, or commitment. The list of associated documents is displayed as part of the report (as well as in the library views).

Library documents support versioning from Notes and Web clients.

Library documents fall into two classes, documents that require future action, and those which do not. Action class documents are supported by the Library reminder service that will notify one or more people when a document requires attention.

A Notify on Response method is provided so that authors can be immediately informed when responses are posted to their documents.

Additional formats can be created by the customer and, once installed, will appear as native formats.



The Observatory Explorer

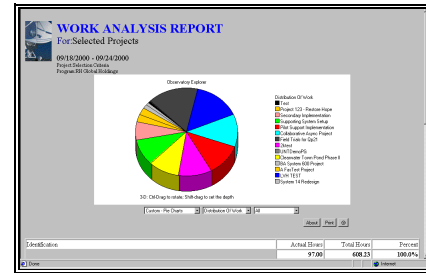
Every entity document has a series of pre-generated graphic data sets. The Explorer will display as many as 200 different charts in Bar, Stacked Bar, Line, Trend, and Pie formats that cover such subjects as workload, skill distribution, trends of actual cost, etc.

Work Analysis

The work analyzer allows the totals shown in entity reports to be deconstructed into their components and regrouped for analysis. The result is a table of work components and a variety of supporting charts.

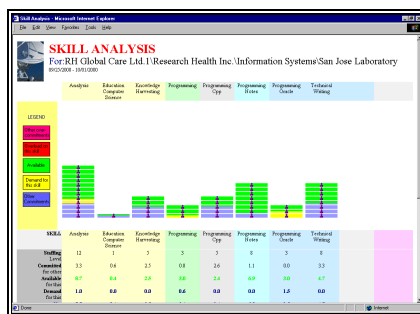
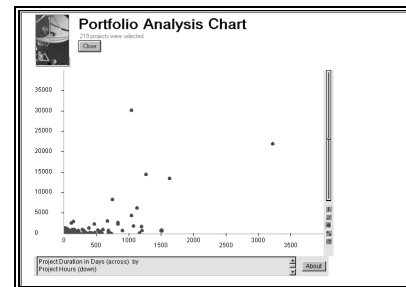
Portfolio Work Analysis

This provides work analysis for an arbitrary set of projects selected by search criteria.



Project Portfolio Analysis

This bubble style interactive chart plots project work, cost, counts and other values against user specified attributes. The projects are selected using a set of search criteria including program association, manager name, location, and scenario. The plot axes of the display are selected from extensive lists that include all of the user defined classification criteria as well as common project parameters.

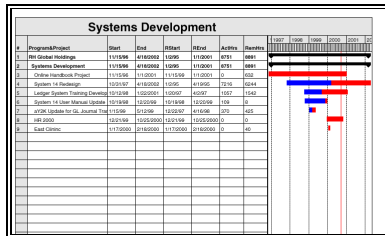
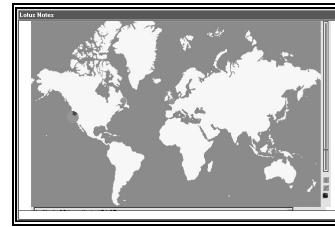


Skills Analysis

The skills analysis produces a very specialized bar chart and supporting tables which depict the demand and supply for skills within an organizational unit. Because each person typically has several capabilities, the focus this chart is to show where resources are being used as well as where they are needed. A supporting table, called a tradeoff matrix, helps managers find alternatives.

Geographic Analysis

Observatory codes individuals, groups, and projects with location keywords that have associated coordinates. This information can then be depicted on a map using the Observatory Cartographer. The display overlays stacked bar and pie chart data onto an interactive world map. This is particularly useful in conjunction with resource searching

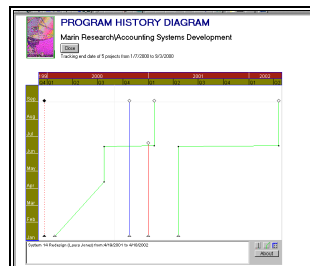
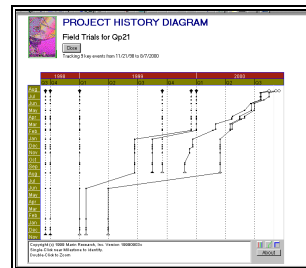


Gantt Charting

The Gantt facility creates and maintains Gantt charts for selected Programs and Organizational units using current project and resource schedule information. These documents are prepared in Adobe Acrobat format so they are readily downloaded, viewed and printed.

Project History Diagramming

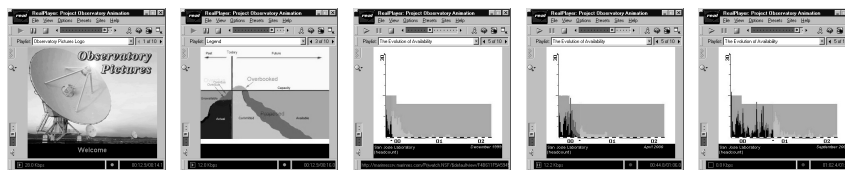
This tool takes the historical cube of milestones of a project and creates a Scheduled Time vs. Historical Time interactive diagram. Each milestone is shown as a lifeline connecting the dates at which it was forecasted. Schedule adjustments show as lateral shifts in the lifelines. This is a powerful diagnostic tool that helps program managers understand projects that have had a history of problems.



Program History Diagramming

This tool creates an interactive diagram in the Schedule Time vs. Historical Time format which traces the lifelines of the endpoints of all projects within a selected program. Well-forecasted projects display vertical lines, projects that have had unstable histories show lateral adjustments. This helps identify projects or managers that may need attention.

Workload Animator



Every project, program and organization records planned work, actual work and capacity as a function of time. This can be seen as a histogram representing the work plan as it exists at a single point in time. The animation system extracts an ensemble of these histograms from the historical entity data. It combines them into a time lapse visual animation. Animations show the evolution of work and availability in a revealing way. Animations are displayed using a freely-available Real@Player. Each animation contains explanatory titles and an animated legend. The system updates all movies periodically to incorporate recent data.

Briefings

Presentation
Briefings
Standard
Exec Summary
Personal
Custom Scripts

A briefing is a walk-through style of information delivery that is particularly well suited to a management audience. Briefings are graphic slide show presentations that are generated on request. The user of the briefing simply presses a "Next" button to step through the presentation in the prepared sequence, or can select pages in any order.

Briefings are inherently more digestible than long reports because they lead the viewer through a logical sequence of information and highlight problems. The briefing generation process pre-analyzes the data to determine what information would be of interest. (E.g., if there is overdue work, then show one or more pages about it, but if there is not any, skip these pages.)

Each page of the presentation is a live report that is generated on demand. This means that the briefing pages are themselves interactive documents rather than static text displays. The more advanced user can use this feature to learn more; other users will simply read the pages. Most pages present information in a graphical format such as progress meters, pie charts, and trend diagrams.

Obviously, the sequence and content of a presentation must be appropriate to the interests of the audience. To achieve this, the briefing system is implemented as an engine controlled by a user selected script. To further increase flexibility, the briefing can automatically incorporate library pages that have been pre-created by the manager of the entity being reviewed.

Virtually every Query, Visualization, and Report output is accessible in the context of a briefing, but the particular set provided is determined by the script used and the state of entity on which the briefing is based.

A key element of the briefing facility is its extensive use of historical information. Status reports, for example, provide links to all prior status reports. Work and Cost are presented as trend lines. Project History diagrams are included where appropriate.

Briefing Scripts

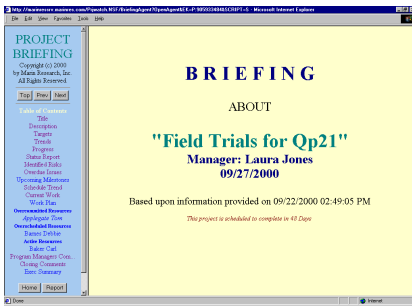
The system contains two standard scripts, one for producing a one page executive summary and the other for generating a full, general purpose briefing. The scripts are assembled as a list of pre-defined functions with very minimal parameters. Approximately 60 pre-defined functions and a collection of 50 pre-defined forms make up the briefing components. These functions are themselves analysis tools that only generate briefing content if there is relevant information to display for the entity.

A user may create a new briefing script from a blank sheet or by loading the script for the standard briefing and modifying it to add or remove functions. Once saved, the new script will be available whenever a briefing is initiated.

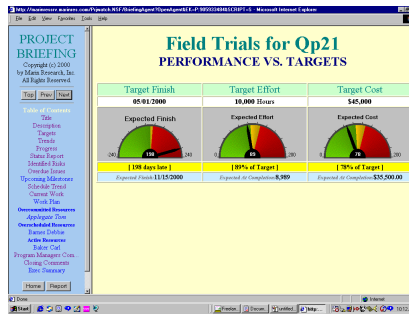
Personal Briefings

Personal briefings identify all of the projects, programs, and organizations owned by the user. They create a briefing whose pages are each executive summaries of the individual items. Each of these summaries, in turn, has an active link to create a full briefing if the user desires it.

Sample Briefing Sequence



Control panel and titles



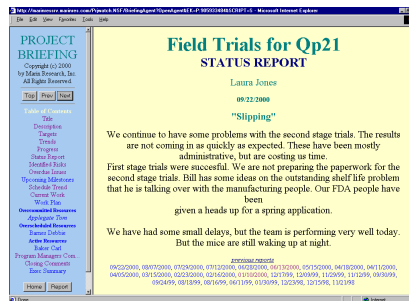
Performance Gauges compare project with management goals



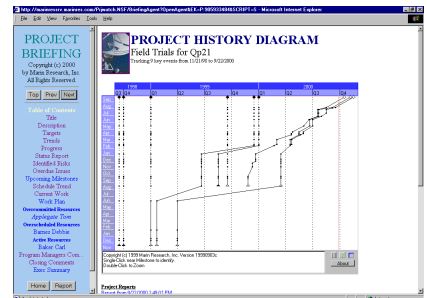
Historical Trends for Effort, Cost, Schedule



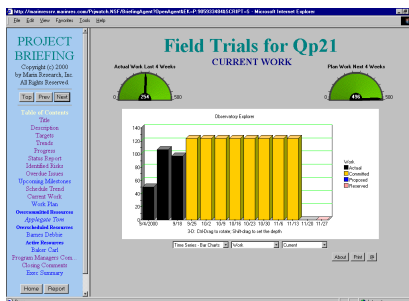
Percent Progress Gauges



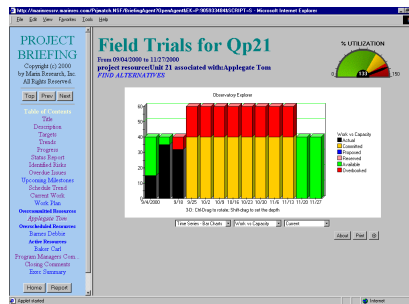
Status, with links to prior reports



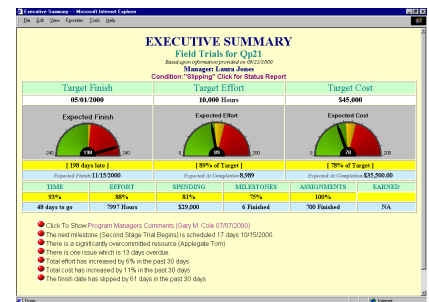
Time history of Project Milestones shows history of slippage



Actual and upcoming work for this project



Overcommitments for one resource with links to find alternatives



One page executive summary highlights key problems

S U M M A R Y

Project Observatory directly addresses the needs of PMO's for a comprehensive management information system.

It supports rapid deployment and enterprise scalability while minimizing the impact on the front line project leaders.

It provides managers with the information they need to choose, prioritize, and control the project process and create a more predictable and profitable enterprise.

<http://www.marinres.com>