Project Summary

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science

Inventory and Monitoring Division

Integrated Resource Management Applications (IRMA)

irma.nps.gov

Updated September 15, 2011

1. PROJECT OVERVIEW

Data and information about National Park Service (NPS) resources are an invaluable asset, as evidenced by the many management and planning decisions, information products, and services that result from their use, analysis and synthesis. Managers, planners, interpreters, scientists, and other staff need to be able to efficiently search for, retrieve, share, and disseminate data and information in order to effectively manage public lands. The data and information obtained through studies and management actions also need to be shared with the general public and various constituencies, as it is the broader public that ultimately decides the fate of NPS resources.

The Natural Resource Stewardship and Science (NRSS) Directorate is transforming the way it manages and delivers resource information to parks, partners, and the public. IRMA, Integrated Resource Management Applications, is the name given to both the project that is guiding this transformation, and the web portal that is the end result. Modern information technologies, and in particular, service-oriented architecture (SOA), upon which IRMA is based, are providing tools, procedures, and protocols that allow multiple data systems, within and among various programs and agencies, to share data and information.

The IRMA system is the initial step towards a data and information “one-stop” that has been requested by national park managers, planners, and staff. The design and functionality of the IRMA Portal is based on interviews and surveys with hundreds of users from multiple stakeholder groups (see below) who were asked “what does the data system need to do in order to help you do your work”?

The initial work on developing an integrated data system was led by the NPS Inventory and Monitoring (I&M) Division (http://science.nature.nps.gov/im/).. A primary role of I&M is to collect, organize, and make available natural resource data, and to contribute to NPS's institutional knowledge by transforming data into information through analysis, synthesis, and modeling. Two of the goals of the I&M Program, namely, “integrate natural resource inventory and monitoring information into National Park Service planning, management, and decision making,” and “share National Park Service accomplishments and information with other natural resource organizations and form partnerships for attaining common goals and objectives,” can only be achieved through the development of a modern information management infrastructure (e.g., staffing, hardware, software) and procedures that ensure that relevant natural resource data collected by NPS staff, cooperators, researchers and others are entered, quality-checked, analyzed, reported, and archived.

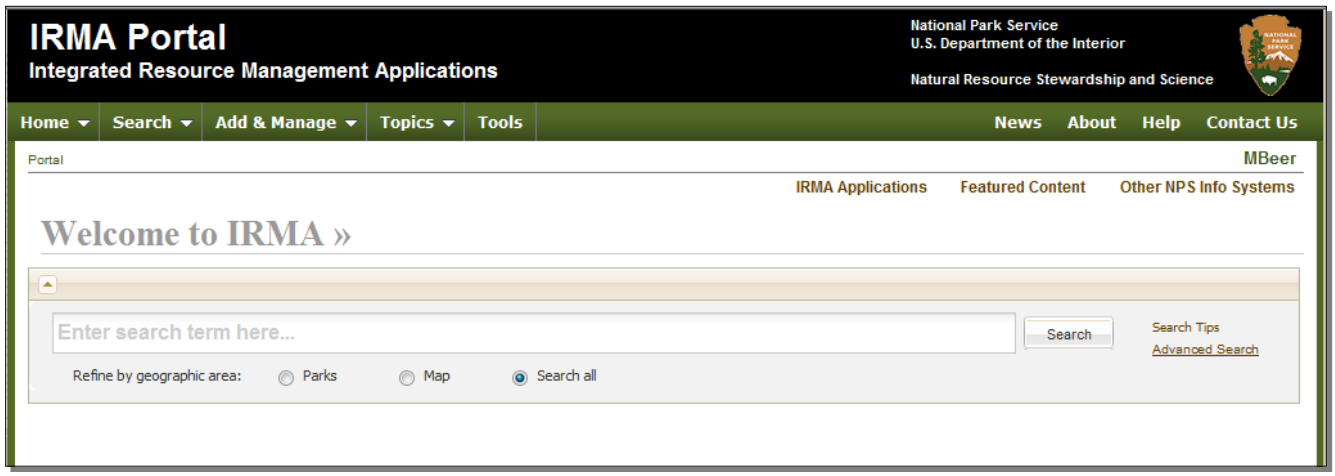

Figure 1. Home page of the IRMA Portal (http://irma.nps.gov) as of September, 2011. Implicit in the portal is automated authentication (i.e., no login or password requirements) and common navigation patterns regardless of the data being accessed.

The Natural Resource Stewardship and Science Directorate (NRSS) adopted the SOA technology for two primary reasons: (1) to better serve users; and (2) to improve management of its current and future IT investments. Service-oriented architecture holds the promise of better cost sharing, rapid adaptability to changing mission needs, and improved interoperability with other data systems. With ever-increasing amounts of data and continually-changing user and technical requirements, developing an information management framework with maximum flexibility makes sense. SOA is the tool of choice to meet users' needs over the long term, and to allow sharing information sharing both internally and externally.

Between 2004 and 2006, NPS funded studies, convened workgroups, and conducted hundreds of interviews with NPS staff and collaborators to determine user needs and core requirements for natural resource data systems so that the NPS could more effectively meet its mission. In October, 2006, the director of the NPS Natural Resource Program Center (NRPC)[1], issued a policy directive to create an integrated data system with a central web portal, single sign-on system, and common user interface for all natural resource applications. The I&M Program then took the lead to develop IRMA, which has now integrated multiple natural resource applications and streamlined the process of entering, storing, and disseminating information.

In 2011, IRMA broadened its scope to include all types of resource data, including cultural resources. IRMA is now leading the way to a truly integrated, service-wide information system.

1.1 Service-oriented Architecture: The DOI and Industry Standard

The Department of Interior has identified service-oriented architecture as a standard and "best practice" that will allow data exchange and integration among different data systems within and external to DOI agencies (see Figures 2-4 below). Service-oriented architecture is widely used in

[1] The Natural Resource Program Center (NRPC) was integrated into the Natural Resource Stewardship and Science Directorate in 2011. Events and decisions occurring before this integration will still refer to NRPC.

the online banking, travel, and shopping industries, and SOA is integral to the DOI's enterprise architecture principles (see http://www.doi.gov/ocio/architecture/). A basic premise of SOA is that data are structured into concise, reusable, and sharable "services." These services then become flexible data building blocks that, using standardized tools, can be assembled or shared in a variety of ways depending on the information need. Advantages of this modern architecture as determined by DOI include the following:

- SOA maximizes information system investments via flexible, reusable services
- SOA increases the sharing of systems and information across agencies and organizations
- SOA reduces system risk due to reusable and shared services that have been designed for interoperability

An illustration of SOA-type information-sharing capabilities is the development of third-party travel websites such as Orbitz or Travelocity. When booking an airline flight, hotel, and rental car from one of these websites, data are being exchanged among systems developed by different companies. An airline, hotel, or car rental company is able to expose portions of its data to external users (such as Travelocity) for the purpose of data assembling and sharing. A single, centralized, data system is not necessary; rather, a common set of tools, standards, and governance procedures (inherent in SOA) makes it possible to share data among multiple, disparate systems. Figure 2 provides a simplified illustration of this concept.

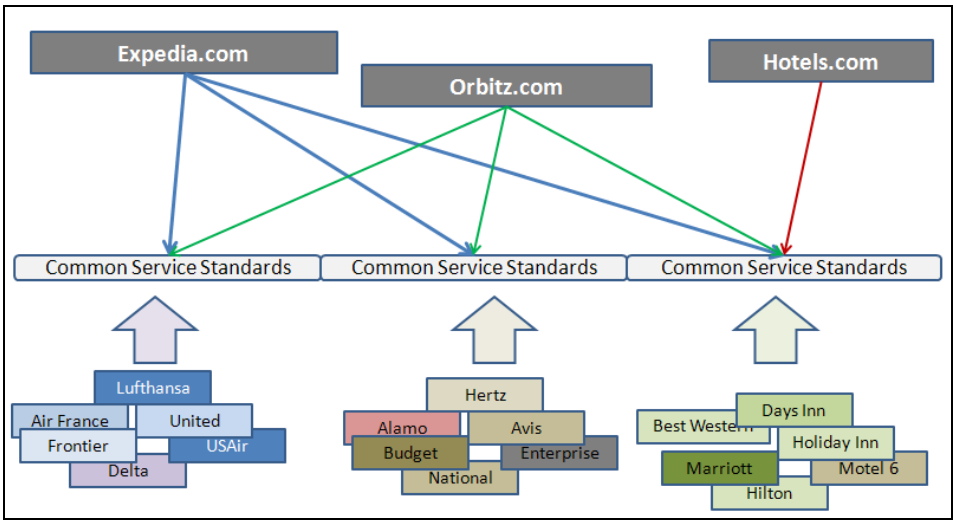

Figure 2. Use of a common set of tools, standards, and governance procedures (inherent in SOA) makes it possible for private companies or state and federal agencies to share data among multiple, disparate systems. It is not necessary to have a single, centralized system, nor is it necessary for everyone to get together in advance and agree on common data structures or to design or develop the various components of the system all at once.

The public sector can put similar concepts to work (see Figure 3). Exposing portions of data systems or information sources as services and establishing common messaging specifications among them can result in sharing information across agencies or bureaus. Access to shared information could be through agency-specific or topic-specific interfaces (e.g., NPS IRMA Portal, a portal focused specifically on climate change, or existing portals such as Data.gov).

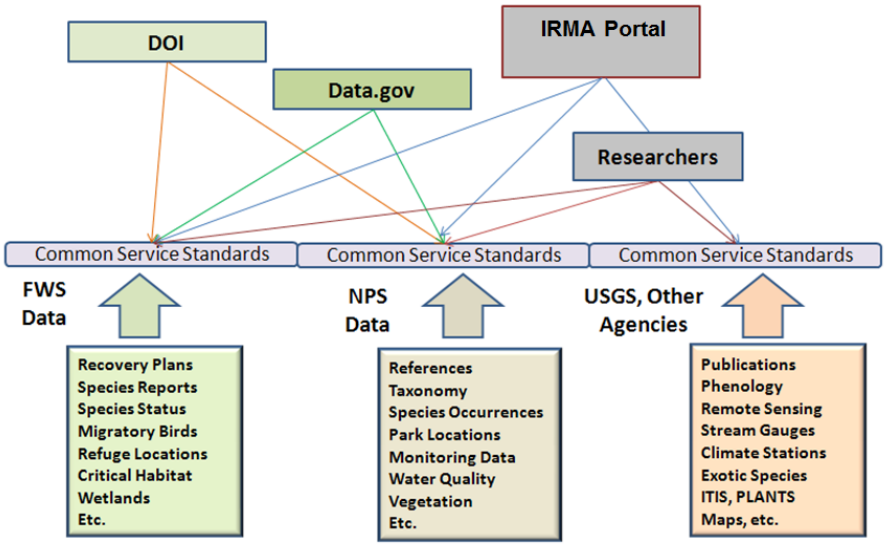

Figure 3. SOA provides the framework for sharing information among different government agencies and bureaus by using a common data service exchange standards.

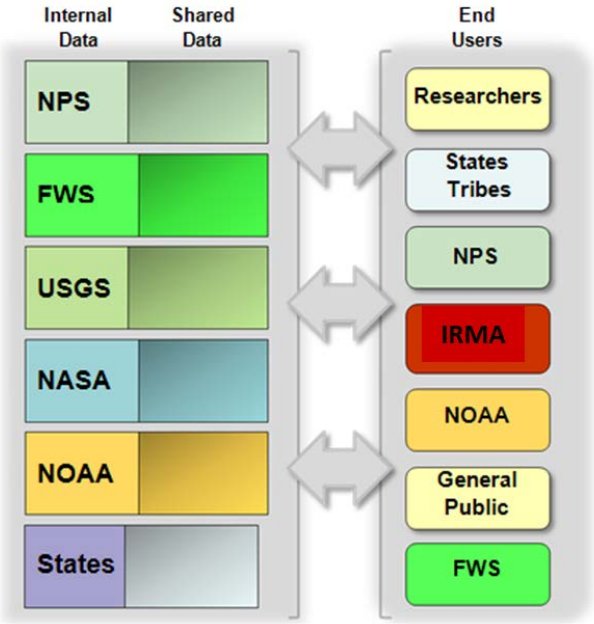

Figure 4. Conceptual diagram illustrating how service-oriented architecture, using industry and DOI standards, allows agencies to maintain and protect their internal data sets, yet make portions of their data available for sharing within and external to the DOI. A few examples of agencies within and external to the DOI are shown.

2. PROJECT HISTORY

The National Park Service, like many federal agencies, faces multiple challenges related to data collection, storage, dissemination, synthesis, and use for scientific and management purposes and by oversight entities. The information on park natural and cultural resources that is collected and managed by parks is voluminous, distributed, and complex.

In the 1990s, many of these challenges were addressed by developing separate computer applications and data structures to house different types of data and information. Three NPS web-based systems developed by the I&M Program serve as good examples:

- NatureBib was created to store bibliographic information such as research publications, technical reports, and a variety of memos and other documents.
- NPSpecies was created to manage information on the occurrence and status of plant and animal species in each park, along with associated attributes and evidence records.
- The NPS Data Store was developed to store primarily geospatial data sets and their associated metadata.

These systems, built with the best technology at the time, captured hundreds of thousands of records and provided tools for searching for and storing information. They were, however, "stovepipes": each had its own login, navigation, and search logic; systems did not interact well; users had to enter data in multiple locations and search different systems to answer common questions. The information, when isolated and placed in separate systems, lost value because the relationships among the data became weaker or disappeared altogether.

After a thorough evaluation of the issues (see below), NRPC determined that a new information management system was indeed needed and it would have several basic requirements: a single sign-on to eliminate the numerous and changing passwords; a central web-based portal where users could access multiple applications; and streamlined workflow for entering, editing, searching, sharing, and retrieving data. A service-oriented architecture (SOA) framework was selected as having the potential to solve the most difficult problems that had been identified.

2.1 Recommendations from the PRIDE Project and Systems Board

In 2004, the I&M Program funded a user needs analysis to evaluate data and information needs by parks and other levels of the NPS organization, and to determine whether the I&M goal of integrating natural resource data and information into park planning and decision-making was being met. This analysis project was known as PRIDE (Protecting Resources through Informed Decision-Making and Education). PRIDE incorporated the concepts of enterprise architecture and used the DOI Enterprise Architecture "Methodology for Business Transformation" model to ensure that business functions would, indeed, drive information system development. PRIDE was supported by staff within Chief Information Officer's office of both the NPS and the DOI.

As part of the PRIDE project, more than 60 interviews were conducted that encompassed NPS managers, planners, and other staff at the park, region, and national levels; representatives from I&M networks; research scientists; and staff from other federal and state agencies and partner organizations. The findings from these interviews were recorded and documented, and were used as the basis of a full SWOT (strength, weaknesses, opportunities, threats) analysis.

The PRIDE team determined that improvements were needed to make natural resource data and information more accessible, to increase their availability for analysis and synthesis, and to make data and information more relevant and usable for a wide variety of stakeholders. Natural resource data and information were not being successfully integrated into park and Service-wide planning, management, and decision-making.

An additional outcome of PRIDE was the clarification of three enabling goals of NPS natural resource programs:

- Understand the state of parks' natural resources in order to make better decisions
- Expand informed and supportive constituencies for natural resource programs
- Create a more adaptive, flexible, and responsive natural resource directorate that can understand and respond to drivers of changes (e.g., climate, disturbance, demographics, technology)

Complementary to PRIDE, in 2005 the NPS Inventory & Monitoring Advisory Council (IMAC) recommended that the I&M Program evaluate the NatureBib, NPSpecies and NPS Data Store applications from a user's perspective and determine what changes should be made to eliminate redundancies and to develop a streamlined process for users. A four-member "Systems Board" was formed to carry out the evaluation. In early 2006, the board contracted part of the evaluation to a specialist who conducted 90 interviews with system users over the course of five months.

The PRIDE project and the Systems Board both confirmed that systems were not meeting user needs, and recommended rigorous streamlining of systems to produce an optimal workflow for users. Specific recommendations included eliminating the stovepipe application model; a transition to SOA; and the hiring of a project architect/manager to lead the transition. To implement the recommendations made by the PRIDE project and the Systems Board, and to improve the accessibility, use, and transfer of natural resource information within NPS, NRPC Center Director George Dickison issued a policy on NRPC Natural Resource information technology (IT) systems in October 2006. The policy directed NRPC to begin the transition to a more efficient and integrated approach to natural resource information management, beginning with NatureBib, NPSpecies, and the NPS Data Store, and to transition to an SOA framework. IRMA was officially started.

3. PROJECT IMPLEMENTATION

The IRMA project scope statement was developed from key points in the new NRPC policy; in particular:

- NRPC systems will transition to Service-oriented architecture (SOA). This transition will strategically position NRPC to better deal with future changes in technology. NatureBib, NPSpecies, and NPS Data Store applications will begin planning for this transition immediately. All other NRPC applications will initiate planning for their transition.
- NRPC will create a central web portal, a single sign-on system, and develop a common user interface for all natural resource applications.
- NRPC will integrate all applications (starting with NatureBib, NPSpecies, and the NPS Data Store), eliminate redundant data storage, and streamline standard functions across

applications (e.g., data entry, editing, searching and data retrieval) while maintaining the separate missions of each application.

- NRPC will hire a SOA Project Manager to help transition to SOA. Initially this will be a contracted position that will report to the NRPC Center Director.

3.1 IRMA Demonstration Project

IRMA project staff determined that an initial "data portal" demonstration project would answer fundamental questions that needed to be asked before embarking on this large-scale project; in particular: could our data, currently in independent systems, be effectively merged into a single user interface? When users had a chance to try this prototype, was it something they found useful? And, could IRMA staff successfully make the significant internal cultural change that now emphasized collaboration as opposed to stovepipe-based independence?

The IRMA demonstration project (IRMA Demo) focused on the three priority NRPC systems, NatureBib, NPSpecies, and the NPS Data Store, single sign-on, and an integrated user interface.

Basic functional requirements were informally gathered relating to:

- How users would access a data portal
- How users enter search terms
- How search terms are applied to the source databases
- How the results were presented
- How the results were downloaded

After four months of successful staff collaboration, the IRMA Demo was presented at the annual Inventory and Monitoring Program data management conference in February 2007. Several comprehensive feedback sessions accompanied the demo. The review gave users the opportunity to comment on the preliminary model, suggest changes or improvements, and confirmed to IRMA project staff that the demo was headed in the right direction to meeting user needs.

3.2 SOA Architect/Project Manager

In April 2007, NRPC contracted with Phase One Consulting to assist with the IRMA effort. Phase One hired a project architect/project manager who had extensive private-sector experience building software development organizations and large-scale service-oriented architectures. This person also had strong project management abilities, technical and programming skills, and demonstrated past success developing and leading large and complex teams.

3.3 Staff Reorganization

The first steps towards a transition to service-oriented architecture required fundamental changes to the organizational structure, hardware, software, and overall software development practices. In the pre-IRMA environment, each information system had its own system manager and software developer. Developers were not shared across projects and were responsible for database design, business logic, user interface, testing, and overall system administration. The

reliance on one person presented system risk in the event of staff turnover, and did not allow in-depth knowledge in any particular area of application development.

In 2007 the software development group was reorganized into three primary groups: functional analysts, developers, and quality-assurance testers.

- Functional analysts were responsible for identifying application stakeholders, interviewing users, documenting user needs, and translating these needs into the specific functional requirements a system needed to meet.
- Developers focused on building the software applications and graphical user interfaces (GUIs) as determined by the functional analysts.
- Testers developed specific test cases and independently and objectively tested software iterations, reporting bugs or other problems needing correction.

User requirements were now the driver of the development process. Team members had responsibilities in their areas of concentration and worked across all applications instead of just one. Staff were able to broaden their skills within their areas of expertise. Collaboration and teamwork were essential and becoming the norm.

3.4 User-driven development

Before initiation of the IRMA Project, software development was typically overseen and directed by one or more resource specialists who determined overall system functionality. The approach was, “if we build it, they will use it.” Systems did not take into account user needs and, as a result, resulted in user dissatisfaction.

To ensure that redesigned systems delivered a useful end-product, user requirements needed to be solicited, understood, and integrated at every stage of development. The first step of user-driven development was to identify key stakeholders, which would include end users and any others who would be affected by or had influence on the development of the information system. Input from stakeholders in each of the following groups was obtained through conference calls and interviews:

- Park natural resource specialists
- Park planners
- Park superintendents
- Park interpreters and public information officers
- Researchers and academicians
- Inventory and Monitoring Network staff
- Regional and WASO natural resource staff
- Fire Management staff
- Research Learning Centers
- Other federal agencies
- Partner organizations
- State natural resource agencies

3.5 Technical Standardization

In the pre-IRMA environment, information systems were based on a variety of software languages and tools. Technical skill sets ranged from MS Access, VB scripting, and Cold Fusion, to J2EE or .NET platforms, with both Oracle and SQL Server licenses being required. No consistent, standardized programming language or practices were in place.

An analysis was conducted evaluating major platforms and programming languages and the decision was made to standardize on the .NET development environment, primarily due to a clear cost advantage and the federal commitment to Microsoft products. Developers were then trained in using the new software tools and environment. Hardware resources were also evaluated regarding speed and security. The decision was made to move to a blade server configuration, with distinct environments established for development, QA, pre-production, integration, and production.

Essential team collaboration tools were also acquired and integrated into work processes. Microsoft SharePoint was established as the primary repository and work site for all IRMA-related project products, including documents, schedules, project plans, and announcements. Other collaboration tools such as Project Server, Project Web Access, Team Foundation Server, and HP Quality Center were evaluated and acquired.

Each distinct group within the IRMA team works with specific software tools. Functional analysts use Visio and Balsamiq for documenting workflows, database table structures, and user interfaces. Developers work in the .NET Visual Studio environment using C# as the programming language. QA testers use HP/Mercury Service Test as their key testing tool, and HP/Mercury Quality Center with Test Management as their communications tool. SQL Server 2005 or 2008 is used for the development and production databases.

As IRMA has progressed, a series of extensions and plug-ins have been added to enhance either development or presentation, including Ajax.net, ExtJS (a javascript library) and XML Spy. The GUI developers create the user interface using Visual Studio, ASP.Net pages, and Javascript.

Geospatial functions use SQL Server 2008 spatial data types and web mapping services for data storage and GeoJSON and OGC standard well-known text (WKT) for data interchange. GUI clients are based on OpenLayers and ExtJS extensions. These GUI components are integrated into the overall MVC architecture of IRMA.

All development is now done in a 3-tiered environment:

- The presentation layer is the user interface: it provides the information display for the user. There is no logic or functionality embedded within a display page; it is simply for viewing the information presented by the business logic layer.
- The business logic layer contains the rules and calculations of a service and controls its functionality, separate from both its presentation and from access to the database.

- The database layer consists of the servers and databases where information is stored and retrieved. Data are independent from application and business logic layers, which improves security and performance.

3.6 Deconstruction

The IRMA team initially thought that a transition to SOA could be accomplished by building web services on top of existing databases, and modifying applications but maintaining the existing data structures. As work progressed it became evident that the existing structures were unwieldy and inefficient. Full redesign, while time-consuming and more difficult, would result in a data structure that was far more modular, efficient (faster response times), and able to serve us well into the future.

Each of the three primary systems (NatureBib, NPSpecies, and the NPS Data Store) was deconstructed, with both distinct and shared functions identified. Shared functions were those used by multiple applications; for example, establishing user identity, or selecting a park unit. Distinct functions were specific to one application only (Figure 5).

NatureBib	
Units	User Identity
Attach files	Taxonomy
Metadata	Audit
Project	Notification

NPSpecies	
Units	User Identity
Attach files	Match lists
Metadata	Observations
Taxonomy	Vouchers
Status	Notification

NPS Data Store	
Units	User Identity
Attach files	Taxonomy
Metadata	Audit
Project	Notification

Figure 5. Examples of shared functions (shaded cells) and distinct functions (white cells) within three applications.

Once these core functions were identified, basic or “primitive” services could be built to deliver them. Primitive services provide a very focused function, but can be combined in a number of ways as “composed” services to either reconstruct legacy applications or to rapidly build new applications. For example, the Unit Service, which contains information on designated NPS geographic and administrative units (e.g., parks, monuments, I&M networks, regional offices) is a primitive service that has been built once but that can be used many times by various applications that need it. The primitive services can also be handed over to others in DOI or elsewhere, to directly communicate with services hosted in the NRPC environment or to be installed locally for other uses.

A brief summary of the initial primitive services that have been identified as part of the IRMA project are as follows:

- Metadata: Information about documents, data sets, articles, images; links to full-text documents and files; will allow searching all content, including PDFs. This is the primary service that is called when a user makes a request to “search for data or documents.”
- Identity Management: Eliminates user logins and passwords. System determines who you are and your specific roles and permissions for data sets and subsets (e.g., who is allowed to edit or delete certain records, upload data, or view sensitive data for a park or group of parks).

- Units: Information on designated NPS geographic or administrative areas such as parks, offices, networks, or regions. Includes ability to link and cross-link units (e.g., one unit may comprise many units).
- Species Park species lists and associated data on the occurrence and status of species in each park.
- Taxonomy: Provides crosswalks for scientific names and common names among multiple taxonomic systems, such as the Integrated Taxonomic Information System, USDA Plants data system, and various State taxonomic classification systems.
- Notification: Allows users to request and receive customized notifications (via email or other means) when specific events occur in an information system (e.g., "send me an email if a new species or report is added for my park").
- Feedback: Provides a mechanism for users to submit bugs or suggestions directly to information system managers; resolution of progress is visible. Engages users directly in improving information system and helps ensure system functionality meets their needs.

Data within these services that are appropriate for sharing can also be exposed to external consumers, who can then integrate the information into their own systems or services. In this way, SOA provides the key to data integration and coordination among DOI bureaus, other agencies, and external partners. Information provided as a service can be shared and integrated by multiple end users, even if their respective systems are substantially different. Fundamental to this ability is XML (Extensible Markup Language), SOAP (Simple Object Access Protocol) messaging and REST (Representational State Transfer), all of which are web standards in widespread use.

3.7 Reconstruction: Composed Services

Once information has been deconstructed into focused, primitive services, it can be reassembled in a variety of ways to meet multiple purposes. Composed services replace the deconstructed silo applications, relying on the primitive services as components (Figure 6).

Services can be composed in multiple ways for both internal use and external data sharing. For example, an information system for managing information on species observations could use many of the primitive services illustrated in Figure 6. Any primitive services developed specifically for observations may prove useful for other applications in the future.

In a similar way, external users, via SOAP or REST protocols (both internal and external to NPS) can make calls to IRMA's primitive or already-composed services, or assemble their own combination of services to meet their needs.

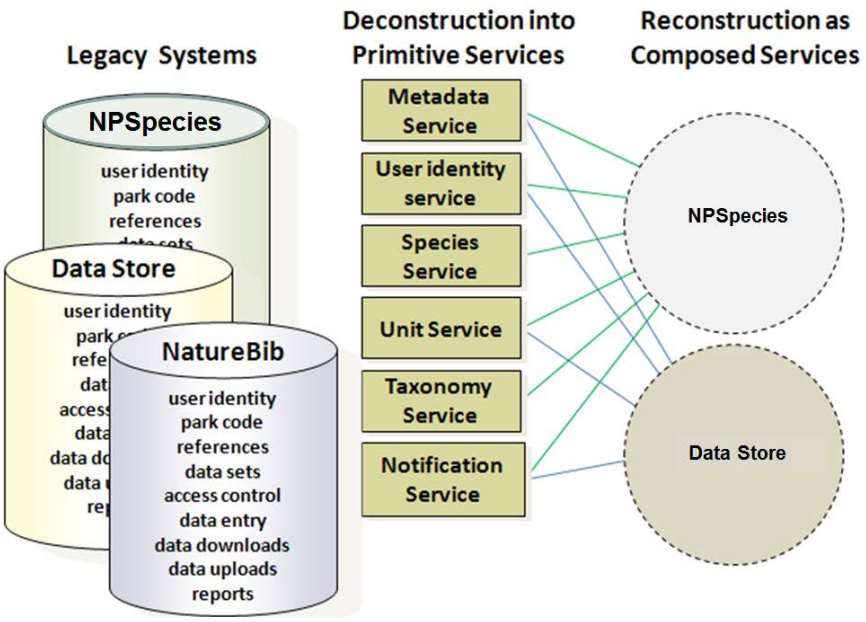

Figure 6. Illustration of the deconstruction of legacy system information into primitive services, which are then shared and recomposed to form new information systems.

3.8 PROJECT STATUS as of September, 2011

NRSS has completed building the essential infrastructure its information management system (Figure 7 illustrates some of the components of this infrastructure), and information is being reliably entered in the system and delivered to NPS and the public through the IRMA Portal. Three legacy applications, the NPS Data Store, NPSpecies, and NatureBib, have been retired.

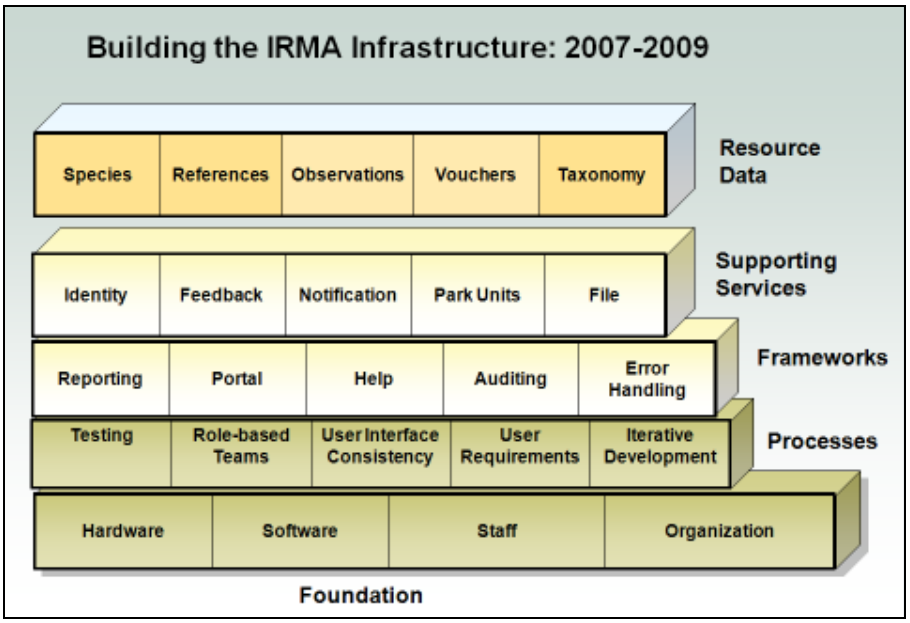

Figure 7. The initial stages of the IRMA project involved building a strong foundation and developing standard processes and frameworks that are used by all components of the integrated data system. Not all services and processes are shown.

4. Integration with Other Programs and Agencies to Address High-Priority Issues

Rapid climate change is potentially the most far-reaching and consequential challenge to meeting the mission of the DOI and its bureaus. The potential loss of species and impacts to communities and ecosystems is without precedent.

To meet the significant challenges posed by rapid climate change, the Department of Interior is promoting significant interagency collaboration including the establishment of Regional Climate Change Response Centers and a series of interagency Landscape Conservation Cooperatives to provide scientific data and technical support to inform land management and planning. As part of the DOI Climate Change Task Force, an interagency workgroup addressing "Climate Change Impacts Data Collection, Integration, and Management" recently made the following recommendation to DOI leadership:

> To meet the significant challenges posed by rapid climate change, we need a significant DOI response to develop effective and efficient means of finding, retrieving, using, and sharing the best available data and information. This will require both a top-down and bottom-up approach to addressing Department-wide data management issues. Much of the data and information needed to address climate change challenges already exists from more than 1000 sources, most of it from outside of DOI. Modern information technologies, and in particular, Service-Oriented Architecture (SOA), are providing tools, procedures, and protocols that allow multiple data systems hosting differing data structures to share information. Therefore, it is not necessary (nor practical) for data to be collected and stored in a consistent data structure or format for it to be used in data analysis, synthesis, and modeling to address management issues. **The key to data sharing and integration is the development of data systems that use DOI and industry standards to allow data exchange across multiple data systems.**

The IRMA team is collaborating with other programs and agencies to develop web-based data sharing among multiple systems, which demonstrate how web services can be used to seamlessly share and integrate data across agency data systems. The overall architecture of this web-based data sharing is illustrated in Figure 8.

Projects that are currently underway include the following:

- The U.S. Fish and Wildlife Service's newly-established Inventory and Monitoring Program is building a data discovery and retrieval system for the National Wildlife Refuge system that is based on IRMA, and the two systems will be linked and mutually searchable. This sets the stage for unprecedented technology and data sharing between two DOI bureaus.
- The U.S. Geological Survey and IRMA staff have successfully demonstrated integrating data from the USGS Publications Warehouse into the IRMA environment. This integration allows users to search two distinct websites from using a single user interface.
- Preliminary data exchanges are taking place with the Integrated Taxonomic Information System (a multi-agency partnership) as a means of populating the taxonomy service that supports NPS species applications.

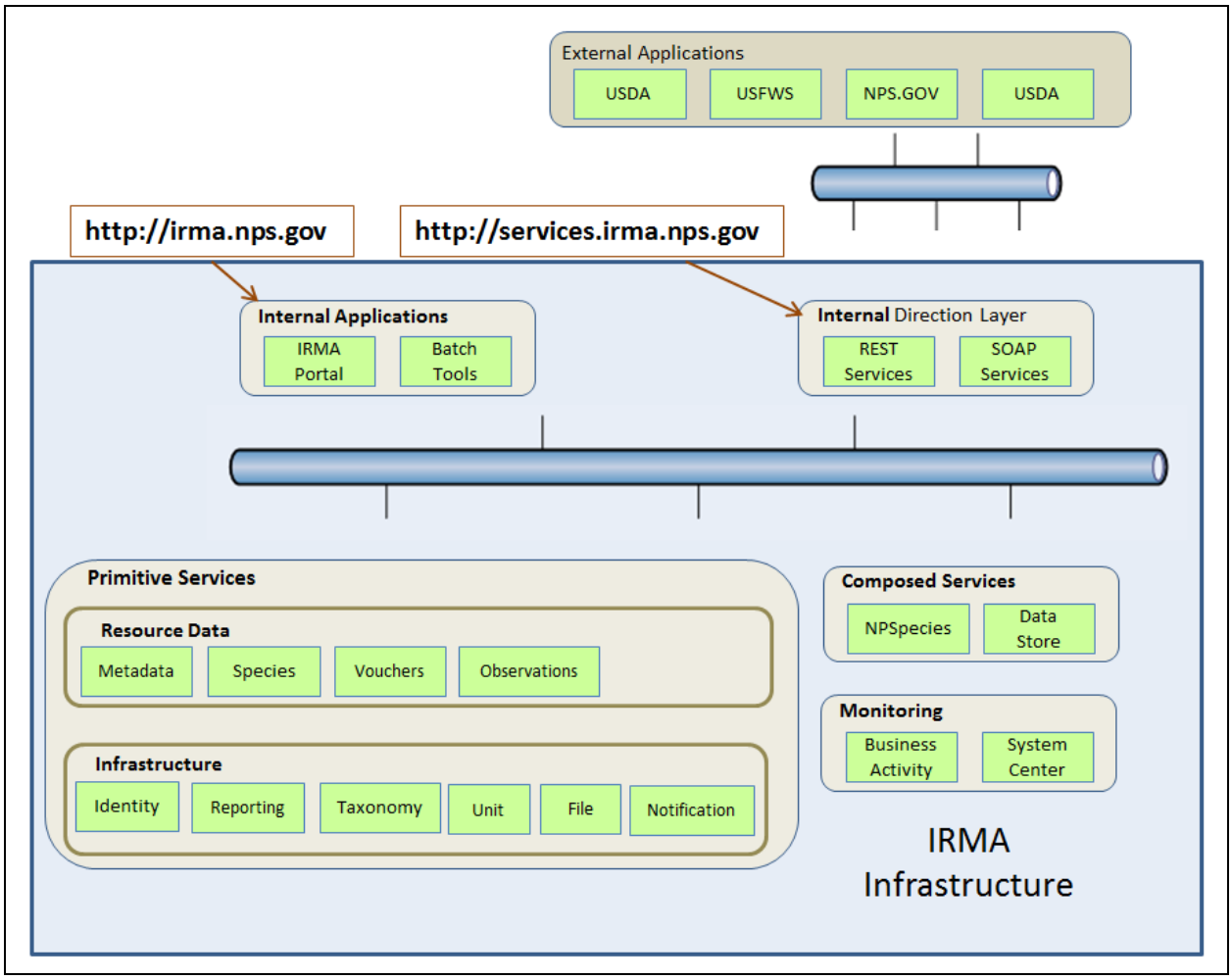

Figure 8. Overall architecture/topology of the integrated data system being developed through the IRMA project. NPS users can access data, information, and tools either through the IRMA portal (http://irma.nps.gov) or by calling web services available at http://services.irma.nps.gov.

- NPS network and program websites have begun incorporating REST calls into their websites, so that content is pulled directly from IRMA services.
- A workgroup has been established to ensure ongoing compatibility and data sharing among several other NPS systems, including the Technical Information Center, NPS Focus, NPSearch, the Open Parks Grid, and NPS Voyager.

REST- (Representational State Transfer) style web services allow users to fetch resources directly by using a URL composed with specific patterns, with the results returned as XML, CSV, or Microsoft Excel files. For example, the following URL fetches, from IRMA,a certified species list for Yellowstone National Park plants, including park status, formatted in default XMLExcel: http://irmaservices.nps.gov/npspecies/species/list/certified/YELL/vascular%20plant/ParkStat

Figure 9 illustrates an example of how this service might be used on a park website: embedding a REST-style link to IRMA data would eliminate the need to manually code and maintain a species list. Similar capabilities exist for fetching publication lists or bibliographies.

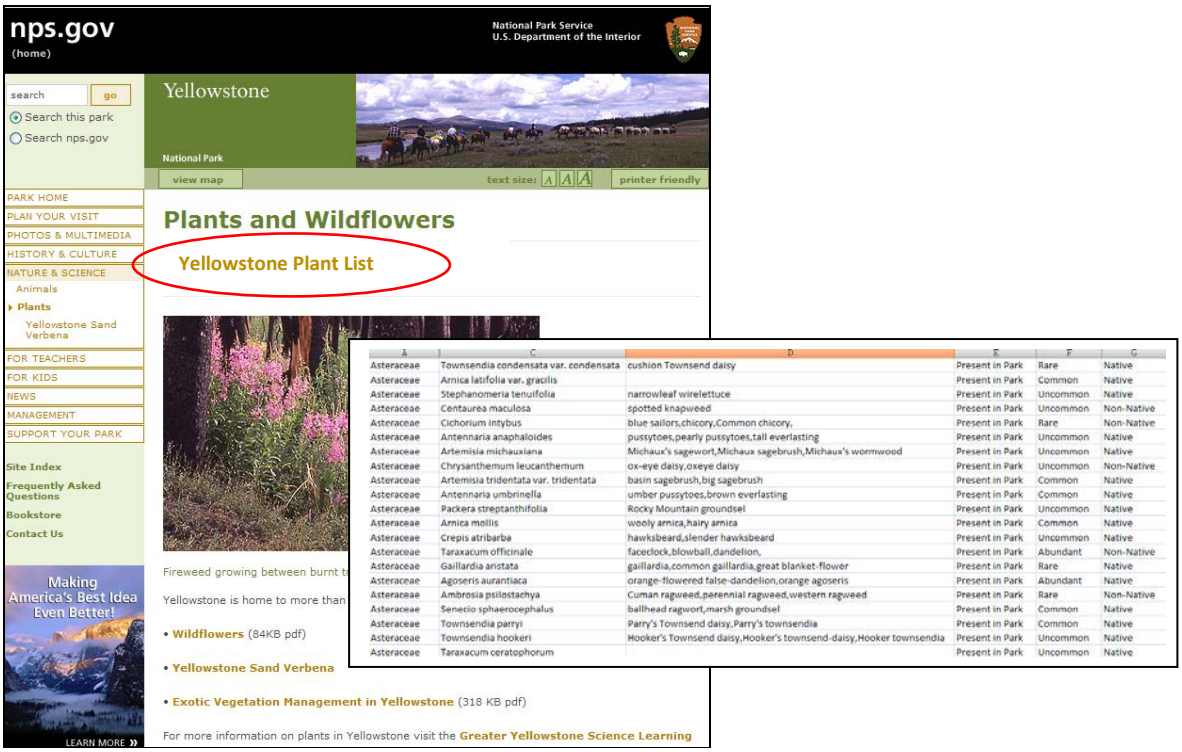

Figure 9. Data in IRMA can be accessed in multiple ways. For example, a REST-style command could be embedded in a website link (circled in red), resulting in data retrieved in real time from IRMA databases (inset). (Illustration purposes only; function not currently active on Yellowstone website)

5. IRMA ROADMAP – 2011 AND BEYOND

High-priority services and tasks for calendar year 2012 and beyond are:

<u>Retirement of additional legacy systems</u>

Other information systems within NRSS are slated for migration to IRMA. Primary candidates are systems handling data for research permits, pesticide use permitting and approval, service-wide technical assistance requests, park visitor use statistics, and threatened and endangered species tracking and reporting. Business analysts are in the process of compiling user requirements for these systems.

Research is also underway on leveraging Microsoft SharePoint capabilities with IRMA, which would allow us to blend SharePoint's sophisticated workflow engine in conjunction with IRMA applications.

<u>Cooperator and contractor access to the Portal</u>

Identity Management currently determines permissions and roles based on a user's identity within the Department of Interior's Active Directory. Users without an Active Directory account are accorded limited abilities ("guest" users). NPS cooperators and contractors, however, often need access to NPS-specific records and also the ability to create and edit records. Development of this type of authentication has been identified as a high priority by IRMA users.

Cultural resource data
In the summer of 2011, the NPS Cultural Resources Directorate began encouraging users to upload NPS cultural resource data and information to IRMA. IRMA staff will be working with cultural resources staff and data sets to assist with entry and batch upload of cultural resource data into IRMA.

Full-text searching: Many records in the IRMA Data Store have associated documents or data sets. A comprehensive search service will provide indexing of all content (including documents, PDFs, zip files, data sets) across the portal for fast searching and retrieval. Also implicit in a search service is the development of relevance tools, so that those resources most closely matching search criteria are presented first in search results.

Spatial visualization tools: Spatial searching is incorporated in the September, 2011 release of IRMA, and capabilities will be expanded and refined in each portal release. Visualization tools are currently available for landscape-level data sets as well as several natural resource inventory data sets. These capabilities will continue to expand as both IRMA and spatial visualization tools improve.

Extension of the IRMA Portal framework: Further development of the portal framework will allow users to customize their portal pages, set preferences, save queries, and receive automated updates. This development will take place in future iterations of the portal, and will be driven by feedback and priorities established by the user community.

6. KEY ELEMENTS FOR SUCCESS

The IRMA project is a sophisticated undertaking that has created, within NPS, a professional software development organization, solid business processes, and services to support these processes. The initial investment is expected to provide a solid return in terms of continually improving staff efficiencies, ensuring the longevity and accessibility of vital data, and supporting better-informed and substantiated park management decisions.

Several elements have been essential to the IRMA project's forward progress:

- Strong support from management, including the OCIO, NRSS directorate, NRPC Center Director, and I&M Division Chief. Undertakings such as IRMA are not without risk. Steadfast support and recognition of the project as a priority was maintained through project difficulties as well as successes.
- The commitment from management was backed up by adequate project funding.
- The project benefited from unequivocal user consensus that change was needed, and a clear direction on what users required and wanted. The IRMA Demo prototype further reinforced this consensus and gave team members focus and confidence.
- Developing a team structure in which all members have a chance to improve their skills, be in the forefront of new technology, and have a stake in project success had the effect of

revitalizing staff members. Cultural change, which can often be a challenge in turnaround projects, was less of an obstacle than initially envisioned.

- Outside expertise was obtained to launch and lead the project. Bringing in a project architect/manager from the private sector provided a fresh perspective, cutting-edge skills, and an aggressive, results-oriented focus, all of which were essential to the project's success.

7. INFORMATION RESOURCES

7.1 Publicly-accessible links

- IRMA Portal
  http://irma.nps.gov

- IRMA website
  http://science.nature.nps.gov/im/datamgmt/IRMA.cfm

- IRMA fact sheet
  http://science.nature.nps.gov/im/IRMA/IRMA_Brief_current.pdf

7.2 NPS internal links

- IRMA Intranet Site: includes links to 2006 NRPC policy on SOA, additional links and resources
  http://www1.nrintra.nps.gov/nrpc_soa/index.cfm

- IRMA SharePoint Site: general project information, including presentations, executive summaries, etc.
  http://nrpcsharepoint/irma/default.aspx