2007 NASCIO Award Submission
Category: Information Communications Technology Innovations

Project:

Integrating Geospatial Imaging and Business Process for Mobile Field Use:

Virginia Department of Forestry Integrated Forest Information Resource System (IFRIS)

Executive Summary

In the past, when forestry rangers, management and loggers were in the field, they relied on maps and property pin markers to determine location and used paper-based maps and input for their business processes. Through two major and sequential IT initiatives, the Virginia Department of Forestry (VDOF) has facilitated a paradigm shift in the way their field personnel work.

The integration of geospatial mapping, GPS-enabled pocket PC devices and forestry business applications have dramatically changed the way the VDOF does business. The change enables superior management of the state's more than 15 million acres of forest land, maximizes financial and human resources and significantly improves service delivery to citizens and businesses.

The Integrated Forest Information Resource System (IFRIS) is a centralized, Web-based enterprise system that sews geospatial mapping into routine employee accomplishment recording. With IFRIS in operational use since April 2006, VDOF now has launched the next phase, the Forest Protection and Mobile Computing (FPMC) project. FPMC expands on the geospatial toolset by integrating use of GPS-enabled Pocket PC devices for efficient, timely, and geospatially accurate field data collection. Secure data transfer and synchronization is created for activities such as wildfire incidents and mitigation, water quality law enforcement, and forest health observations.

VDOF leverages the Virginia Geographic Information Network (VGIN) by integrating digital aerial photos and topographic maps from VGIN's Geospatial Enterprise Platform (GEP). IFRIS and GEP are hosted by the Virginia Information Technologies Agency (VITA) to minimize redundant efforts. IFRIS leverages Web services and Service Oriented Architecture constructs to unify all spatial and nonspatial operations. It leads the way for enterprise mobile computing in the Commonwealth.

Unprecedented benefit will derive from enterprise use of GPS-enabled mobile devices for field data collection. IFRIS minimizes redundant data entry and errors, increases workforce productivity and supports a mobile workforce through technology. It streamlines and integrates administrative functions with business applications, supports multiple program areas, enables location-based tracking of activities, feeds employee and agency reporting and vastly improves customer service. This application is the first of its kind in the nation and is a prototype for other states.

The Commonwealth's investment in IFRIS provides a strong return on investment. In less than one year, five paper forms have been eliminated and one full time payroll position has been transferred to customer service. Virginia's Cost Benefit Analysis Tool projects measurable financial benefit. Cost avoidance is expected to be $293,000, cost savings $558,600 and the ROI is expected to be 55% with a payback period of 2.6 years.

IFRIS is creating a significant positive business impact as it transforms the way the organization does business. It supports nearly all agency performance metrics in VDOF's Strategic Plan and the Commonwealth's Strategic Plan for IT. IFRIS and the FPMC project have over 25 performance metrics for success as identified in its Project Performance Management Plan.

Description of the problem and solution

There are more than 15 million acres of forest land in Virginia that require sound management if long-term protection and sustainability of this resource is to be ensured. To this end, the Virginia Department of Forestry (VDOF) regularly provides private landowners with professional forest management assistance with practices such as aerial spraying assistance, prescribed burning, and tree planting. Last year alone, VDOF assisted landowners by developing management plans that covered more than 147,000 forested acres, and helped renew over 80,000 acres through tree planting.

Historically, however, the agency's mechanism for tracking information about these types of activities has been to record very simple data (e.g.: planting–pine–50 acres) into a tabular database. Sometimes a paper map was drawn and stored at the county office in a filing cabinet as an accompaniment to the activity, but these maps were not readily available to anyone outside that office. This method has limited efficiency and usefulness in terms of preserving the rich geospatial history of forest management in Virginia.

Recognizing this deficiency, VDOF developed a centralized, Web-based enterprise information system to manage employee timesheets, leave reporting, and, using seamless integration of GIS functionality, track accomplishments by mapping the time-series of forest management activity. The Integrated Forest Information Resource System (IFRIS) is a centralized, Web-based enterprise system that sews geospatial mapping into routine employee accomplishment recording.

Seamless GIS functionality tracks accomplishments by mapping the time-series of forest management activity. IFRIS allows staff, many without GIS experience, to easily perform Web-based editing of geodatabases that store geometry of forest management activity with data describing existing forest stand type/condition. Users navigate to the property of focus and, using aerial photography as a guide, map the forest management work that is being, or will be, performed.

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VDOF will also use geospatial web services to improve customer service. DOF is mandated to impose punitive action against harvest operators (loggers) who do not comply with Virginia's Water Quality Law. However, through the FPMC initiative, DOF strives to provide loggers with unprecedented customer support in the form of automatically-generated harvest planning information packages. When loggers notify DOF of the location and size of upcoming harvest activity (as required by law), the Web-based notification portal will process their input through geospatial web services (GIS) and deliver back to the customer a series of maps and other information. The maps will show aerial photography, topography, water features of concern, BMP placement recommendations, as well as information about sensitive resources that have been detected in the vicinity. This "carrot" is meant to support loggers in protecting Virginia's waterways, hopefully preventing the need for the law enforcement action "stick".

Synchronization of enterprise database and geospatial data from handheld devices is brokered by Web services. VDOF leverages investments made by the Virginia Geographic Information Network (VGIN) by integrating digital aerial photos and topographic maps from VGIN's Geospatial Enterprise Platform (GEP). Both IFRIS and GEP are hosted by the Virginia Information Technologies Agency (VITA) to minimize redundant efforts. IFRIS leverages Web services and Service Oriented Architecture constructs to unify all spatial and nonspatial operations. It leads the way for enterprise mobile computing in the Commonwealth.

The IFRIS project is also designed to allow further growth; currently, the following additions are in the requirements/design phase:

- Wildfire Incident Mapping (coupled with Firefighter labor tracking for timesheets)
- Woodland Homes Community mapping/ hazard assessment
- Other feature Mapping for posting to IFRIS Web business data

Significance of the project to the improvement of the operation of government

IFRIS is creating a significant positive business impact as it transforms the way the organization does business. It supports nearly all agency performance metrics in VDOF's Strategic Plan and the Commonwealth's Strategic Plan for IT. IFRIS and the FPMC project have over 25 performance metrics for success as identified in its Project Performance Management Plan, including:

- Elimination of redundant data entry labor and postal costs
- Elimination of support of antiquated legacy systems
- Improved data formats, accessibility and use via GIS functionality
- Unique service delivery to harvest operators (loggers) through on-demand delivery of harvest planning maps and guidance documents
- Improved customer service across all agency activities
- Successful implementation of project management best practices
- Increase in workforce productivity
- Development of a mobile workforce through technology
- Employee and agency accomplishments mapped to individual, strategic, and grants-matching goals.

By integrating business functions, VDOF has is moving away from paper-forms-based information flow, thus improving data accuracy and timeliness. By geospatially enabling all of its core business data, VDOF supports increased information availability and usability.

IFRIS allows easy data share across boundaries of government because it has been built to leverage GEP data layers from in the form of aerial photos and topographic map layers. The FPMC project solves the issue of how to transfer data safely and securely from mobile device to secure server enterprise application, thus supporting the protection of assets, credentials and privacy of systems and their users.

VDOF's work relies on the ability to view and use maps and mapped data in the field. Incorporation of GPS-enabled handheld devices allows staff to capture data describing the nature and location of wildfire incidents, forest observation and other critical data. Collecting and visualizing geospatial data in the field improves the quality of information, and therefore service quality.

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Public value of the project

The Commonwealth's investment in IFRIS provides a strong return on investment. In less than one year, five paper forms have been eliminated and one full time payroll position has been transferred to customer service. Virginia's Cost Benefit Analysis Tool projects measurable financial benefit. Cost avoidance is expected to be $293,000, cost savings $558,600 and the ROI is expected to be 55% with a payback period of 2.6 years.

Unprecedented benefit will derive from enterprise use of GPS-enabled mobile devices for field data collection. The IFRIS Mobile pilot phase was completed in January 2007, is now being implemented and will be completely deployed system wide by March 2008. This groundbreaking second phase of the project successfully:

- Allows users to collect a GPS point for a "forest health observation" and enter associated attribute data (and labor hours spent making the observation);
- Performs on-the-fly conversion of GPS point (or rather averages from multiple position collections) into a point feature in a mobile geodatabase;
- Allows users to make additional time sheet entries in the field;
- Allows users, when getting GPS signal, to view their position relative to a basemap (basemap has not been developed to satisfaction as map cache issue is still outstanding);
- Allows users to zoom in, out, pan, measure lines, areas, and go back to "current" position;
- Via Web services, allows user to synchronize with IFRIS Web (push and pull data).

IFRIS is also a model for agencies planning to sew GIS functionality into enterprise systems. The Virginia Departments of Conservation and Recreation and Game and Inland Fisheries are currently partnering with VDOF to develop uses. IFRIS serves as a model nationally for all state forestry organizations who must adopt geospatial accomplishment reporting to the U.S. Forest Service by October 2007; several other states are currently consulting VDOF. Future applications will include creation of portals with public access to IFRIS's rich datasets.