

Maine



Technology

A publication featuring the Information Services technology of Maine State Government

Maine Executive Leadership Forum

There are no boundaries to what we can accomplish with technology, when there are no barriers to block our access.

Flexibility with accountability, the right approach as we move forward.



The convergence of data, voice and video is inevitable!

Accessibility for all persons is a foundation issue.

CIO Dick Thompson's "Food for Thought" Regarding Technology in Government

Complimenting Governor Baldacci for "setting the stage for improving the business of government", CIO Dick Thompson showed the Maine Executive Leadership Forum conferees the above slide which encapsulates his perspective for deploying technology in government. See his web site <http://www.state.me.us/CIO/> for the entire presentation, which includes slides presented by Carrie Gott, General Manager of InforME and Ray Halperin, Information Technology Manager at the Maine Department of Transportation.

Following the presentation, there was a Q&A with the audience. Dick discussed his interest in improving protocols and tool sets (how they are developed, partners selected, life cycle and risks reduced), in order to deliver projects within original budgets, and actually deliver the anticipated services/functionality. He was also asked to take the lead in procuring credit card rates for on-line use throughout government, and pledged to follow up on this issue with the State Treasurer. Accessibility and security will remain key issues for the future.

Governor Baldacci Speaks to Maine Executive Leadership Forum



BY MARY N. CLOUTIER

After greeting participants at the August 14 Maine Executive Leadership Forum, Governor Baldacci called technology a "wonderful tool" to increase Maine citizens' participation in "figuring out" solutions to challenges. For example he noted the thousands of comments he received via the on-line Budget Balancing Tool¹, and how much he appreciated being able to read input from citizens, and interact with them.

Now that the budget issue has been addressed, the Governor observed we need to turn attention to doing a better job at explaining what State agencies do, and the services they provide, using technology. While many agencies have been migrating to Web services, he suggested others need to start deploying this method more actively. The Governor congratulated the Department of Inland Fisheries and Wildlife on their effective marketing of various licenses (fishing, Any Deer, Moose etc.) via the Web, and complimented the "adoption rates"² for several Secretary of State services.

Governor Baldacci also pointed out that technology will play a significant role in unifying the current Departments of Human Services, and Behavioral and Development Services; and

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Converting To Java-Based Technology

By PETER KONIECZKO

Maine Revenue Services (MRS) is shifting its emphasis away from mainframe COBOL towards enterprise server/Java solutions with two new projects. The first project is an in-house rewrite of the Internet Sales Tax application. The second project is the 1040 Internet filing application. The Internet Sales Tax application is being developed by an in-house team of programmers, and the 1040 Internet filing project is being developed by a vendor.

The switch to Java is a logical extension of MRS' data processing strategy to include a mix of new technology solutions that complement the bread-and-butter tax applications on the IBM mainframe. MRS has a document scanning application written primarily in C++ and Web-based systems running on the Windows IIS Web server. Group Manager Scott Armington sees Java as the long-range platform of choice, primarily because Java runs on many different platforms giving MRS more options in the development of new technologies. Each of the two projects is relatively small, making them ideal candidates for introducing Java-based technology to the MRS programming team.

MRS formed a project team of senior-level programmers that have experience in object-oriented development. The

Governor Baldacci Speaks, cont.

anticipates it will serve as the infrastructure for the development of new services following the merger. Noting that "people are busy", he said services must be accessible, flexible, mobile, and available at the workplace.

Horizontal integration – the blurring of the distinctions between state, county, and municipal services – will occur via technology. Technology also impacts individual's and the state's economic well being through the increasing use of distance learning education.

Governor Baldacci concluded by noting that, although Maine is a leader in utilizing technology, and has received a number of prestigious awards, much more needs to be done. He encouraged the conferees to discuss ways to improve high quality services to Maine citizens.

project team members offer a wide range of talents. Some members are good project stabilizers, while others provide good problem-solving abilities often needed when working with new technologies. Both skills are essential to a successful project.

While MRS has used object-oriented tools, the primary focus is still COBOL, and an object-oriented mindset needed to be developed. The project team used three methods. First, read books. MRS purchased a number of books related to object-oriented design and Java frameworks. The books cover the methods and outputs of a good object-oriented design. Second, attend classes. Some of the team members attended a one-week class on object-oriented design. Many programmers took advantage of the curriculum at University of Maine Augusta. Each type of training has its advantages. The one-week immersion training is more focused, while the semester-long courses provide more time to absorb the material. Third, learn by doing. The project team used its accumulated knowledge to create use-cases of typical sales tax internet filing activities.

The project team struggled with the translation of the use-cases into a good object-oriented design, because the team did not have enough practical experience in either object-oriented design, or the subtleties of the new Java platform. The team got back on track when the team adopted a framework.

A framework, in object-oriented parlance, is a set of programs on which a team can build an application by writing business logic according to framework rules. In return, the framework provides functionality that supports the general requirements of the application. The concept of a framework is not new. MRS uses the COBOL-based Install/1 framework in its mainframe tax application. Unlike the Install/1 framework, the Java frameworks use pure object-oriented designs. One such Java-based

framework is Jakarta Struts. Jakarta Struts is a widely used, open-source product. The Struts framework provides a set of programs that perform the essential functions of a Web application. The Struts program design is based on the Model-View-Controller design pattern. The project team creates a Web application by writing Java Objects that display pages, edit data, and update databases. The Struts framework manages and coordinates the application pages so that they work together as a coherent Web application.

The project team developed Struts expertise from three basic sources. Technical literature was the first. There are many very good books available that provide working examples and explanations. The working examples are as valuable as the explanations. The second source is the Web. Everyone wants to be a programmer. The corollary is: everyone wants to be an author. The Web is a good resource for ideas and examples. Advice from experts is the third source. The MRS project team shares information with Java developers at the Bureau of Information Services. MRS also has a working relationship with the vendor that is developing the 1040 income tax Internet application. The sharing of ideas and experiences with other developers is a good way to leverage academic ideas into practical knowledge.

A new technology needs a new set of tools to make the technology new. Java is no different. The Java language and compiler is free and can be downloaded off the Internet, but using an integrated development environment (IDE) is a more effective way of developing applications with frameworks. Besides editing and compiling, an IDE provides graphical tools that help in organizing, testing, and deploying applications. IDE's also offer tools that are custom built to make framework development easier.

¹ See <http://www.state.me.us/newsletter/april2003/main.htm>

² the percent of total potential customers utilizing a service via the Web

Java-Based Technology, cont.

MRS reviewed three different IDE's. Key factors in the decision were: ability to deploy to the Oracle server, testing tools, interface to source control, and overall stability of the product. The programmers used each IDE for about a month. Some time was lost in switching development tools, but the feedback from using the development tools in a real-time project was invaluable.

Source configuration management (SCM) provides source level version control. SCM products generally work with different IDE's, but each IDE has a preferred source control tool. The preferred SCM generally offers better integration with the IDE than others. Our strategy is to pick an IDE and make sure we can use the product's favored SCM.

The conventional wisdom of data processing seems to go along with the axiom that you can't teach an old COBOL programmer new tricks. Some technology experts recommend outsourcing the development of new, object-oriented technology. MRS is proving that the combination of modern development tools and selective outsourcing makes a real impact on our transition to the new Java-based technology.

Questions? Contact the author by e-mailing peter.c.konieczko@maine.gov. See also Peter's autobiography (http://www.state.me.us/newsletter/nov99/peter_konieczko.htm), printed in the November 1999 issue of this publication.



Maine Department of Transportation (MDOT) Moving Back to its Renovated Headquarters in September

"A recent tour of the MDOT building revealed a colorful interior – sandy yellow walls, with brick-colored accent walls and elements of dusty blue and green – and entirely modern workspaces. Less obvious to the naked eye, but more important for the building's tenants, were mold filled walls that had been gutted and replaced, a wealth of new energy efficiency measures, from motion sensors on the lights to increased insulation in the exte-

rior walls, and the addition of a dehumidification cycle in the HVAC system to create drier conditions during summer months."

Cavallaro, Michaela (2003, July 21). Fixing a broken building. MaineBiz, P. 30. www.mainebiz.biz

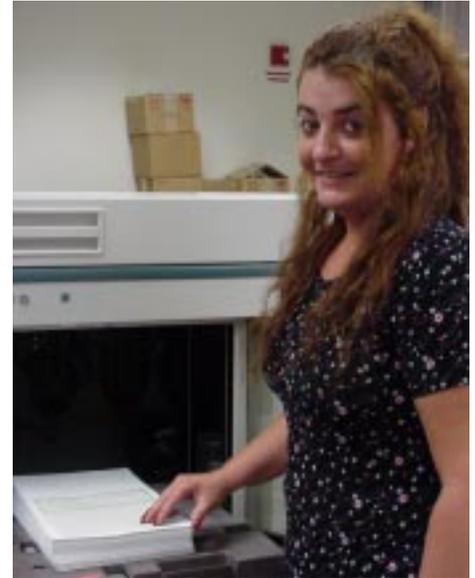
Interested in seeing photos of the building's renovation? They can be viewed and downloaded at the following url: <ftp://ftp.state.me.us/outgoing/july2003a/>.

At Your Service For Large Mailings

By PAULETTE MCKEE

Need to send thousands of individualized letters or forms to constituents? The Bureau of Information Services (BIS) can help. By using Elixir Forms/Letter design we can print, address and create "self mailers" (like State paychecks), and even deliver them to the post office for you!

Does your agency still print addresses on labels? If so, there are more cost effective and efficient options at your disposal. Self mailers, V fold forms (your 1099 was a V fold), and "post PIN number cards", used by MRS to conduct electronic filing are three examples currently used by state agencies. Self mailers offer a number of significant benefits over conventionally produced mail (labels on envelopes). For example self mailers, with internal, individually addressed computer printed forms or letters include a standard envelope, so additional envelopes are no longer needed, and nobody has to spend time folding, inserting, and sealing ;-)



Paulette removes paychecks from the DP 180 printer.



For example, the Bureau is planning to use this technology to print your 2003 W2 forms on BIS' very fast Xerox DP180 printer¹. In the photo on the left, Senior Operator **Karen Withee** is holding an early prototype of the design of this "form". Production Services will work with customers and vendors to customize forms to their individual needs.

For more information contact Paulette McKee (via e-mail Paulette.Mckee@maine.gov). She will design forms and work with you to explore the options you could use to more efficiently communicate with your constituents.

¹ See http://www.state.me.us/newsletter/mar2003/xerox_dp180_print_system.htm.

Orienteering Mapping in Maine

By MICHAEL HENDRICKS

Orienteering Maine (OME) is a club designed to promote and organize orienteering events. Orienteering is a sport where participants navigate with map and compass along a predefined course and try to return to the finish in the shortest amount of time. Detailed large-scale maps are critical, and OME is in the process of creating maps at various locations throughout the state to support orienteering. The use of Information Technology, such as Geographic Information Systems (GIS) and Global Positioning Systems (GPS), is an integral component of this process. This article describes the process employed during the OME Mapping Project over the last two years.

Orienteering is a sport of navigation with map and compass, where the object is to run, walk, ski, or mountain bike to a series of points shown on the map, choosing routes—both on and off paths. Over the last year, orienteering meets have been held at the University of Maine in Orono, Castine, Sedgwick, the Bangor City Forest, and at the Craig Brook National Fish Hatchery. In addition, Pineland Farms in New Gloucester hosted orienteering for the inaugural 2003 Maine Games.

Accurate large-scale topographic maps—typically at a scale of 1:15,000 or 1:10,000—are essential for enjoyable orienteering. Orienteering maps have a specific look and feel defined by an international specification. These maps describe the features that are obvious on the ground, such as boulders, slope information, and thick brush, which allows a competitor to make effective route decisions.

The resulting detailed topographic map allows Maine's orienteering club, Orienteering Maine (OME), to host a meet at that location. In addition, the map is then available for others in the community while hiking, biking, or skiing in the area.

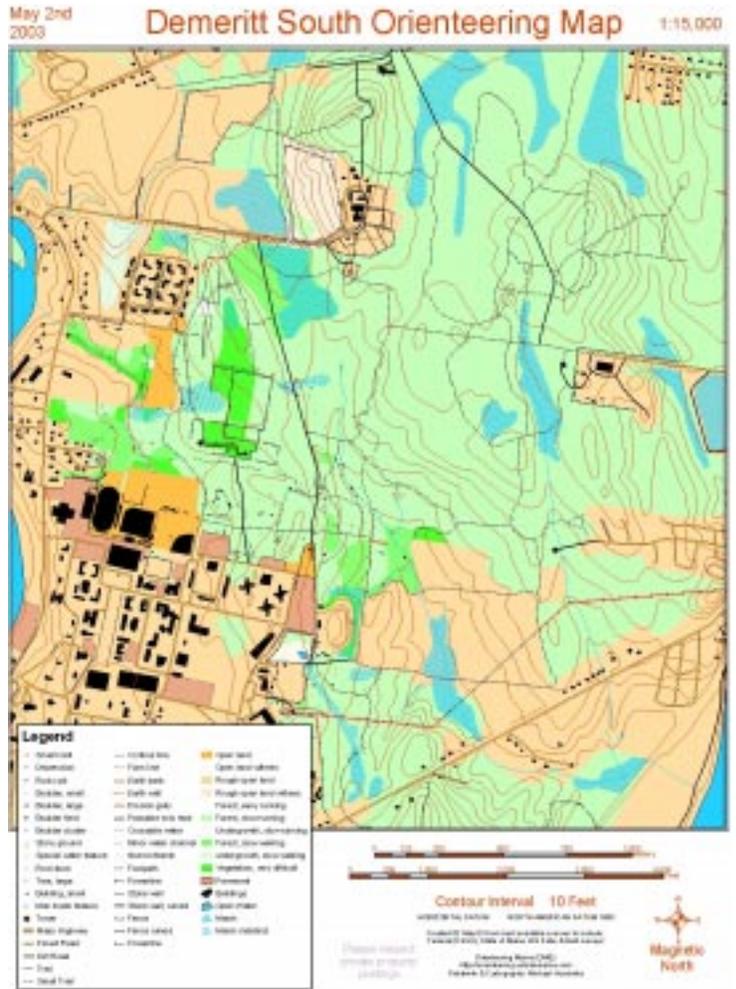
Over the last two years, OME has worked hard to create maps at various locations throughout the state to support orienteering. The creation of a detailed topographic map requires the integration of various information services to include GIS, GPS, mobile computing, and the extensive use of geographic data from the Maine Office of GIS's (MeGIS) Web site.

ArcGIS from ESRI, the leader in commercial GIS software, is used as the primary tool to create the orienteering maps. For field data collection, a Compaq 3800 Pocket PC running ArcPad software from ESRI is used along with a Pathfinder Pocket GPS made by Trimble.

The process begins by gathering all available geographic data and creating a base map. Though too general for the final product, the USGS 1:24,000 digital map data available on MeGIS' Web site provides much of the data at this stage. This is an excellent example of the benefit of having geographic data available to the community via the Web. With the completion of a rough base map, field data collection can begin.

To increase efficiency while gathering geographic data in the field, the mobile GIS software, ArcPad, was customized specifically for orienteering map creation with ESRI's Application Builder software. Point, line, and polygon input files are associated with standard orienteering mapping codes and symbols. This allows the field worker to efficiently map features.

We did not employ differential correction of the GPS data. This was decided for a number of reasons, one of which was to test the ability to create a map at this level of detail, with uncor-



The OME mapping project produced the following quality large-scale topographic maps:

- Demeritt South, Orono, UMaine
- Demeritt Ski Map, Orono, UMaine
- Marsh Island Special, Orono, UMaine
- Bangor City Forest
- City of Castine
- Essex Park, Bangor

rected data. This was only feasible because of the diminished importance of absolute positional accuracy of orienteering maps. The primary difficulties with this approach were the expected trouble in aligning certain base map features and the misalignment of GPS data gathered on separate dates. Most of these errors are within the bounds of normal cartographic generalizations at the scale required, and are worked out in the office.

After gathering the required data in the field with ArcPad, we transfer the geographic data to the desktop GIS and produce the final map.

Orienteering Mapping, cont.

A customized style sheet was created that symbolizes the data according to the international specification of orienteering maps (ISOM2000).

Overall, this project has been a success. The techniques and procedures developed while creating these maps were presented at this year's ESRI International Users Conference in San Diego, and at this summer's Maine GIS Users Group meeting.

If you would you like to participate in an orienteering event this upcoming year Orienteering Maine's current schedule is shown below.

- **Saturday September 13th 2003** - University of Maine. First event of the new school year.
- **Sunday, September 21st 2003** - OME will celebrate National Orienteering Day with a local meet at Pineland Farms in New Gloucester.
- **Saturday, October 25th 2003** - It's the traditional OME Halloween-O event, once again this year at Byard's Point, in Sedgwick
- **Saturday February 7th 2004** - Strap on your skis, and explore the lesser known trails of the University of Maine extensive ski trail system.
- **Saturday April 24th 2004** - University of Maine. Celebrate spring

To see examples of all the maps and get additional information you can visit this Web site at http://www.spatial.maine.edu/~hendrick/Orienteering/O_info.htm.

Lieutenant Colonel Mike Hendricks is a PhD candidate in the Spatial Information Science and Engineering Department at the University of Maine. As an Officer in the U.S. Army, he has worked in the Geospatial Information Technology field for the past ten years. Upon completion of his degree in 2004, he will return to the U.S. Military Academy as an Academy Professor of Geospatial Information Science. He can be reached at phone: 207-947-0853, e-mail: hendrick@spatial.maine.edu, or the Web at: www.spatial.maine.edu/~hendrick.

Partnerships to Protect Lives and Property Incident Management System Being Developed

By Bob White

Investments in the Bureau of Information Services' (BIS) Oracle and Geographic Information System (GIS) infrastructure enable the State to partner with OnStar and others¹ to instantaneously notify first responders of vehicle accidents, while simultaneously posting crash data to the State's secure web site and providing a map of the incident location to direct rescuers to the site. Crash data (called "telematics") could also be instantaneously available to hospital trauma centers!

In the U.S. approximately 42,000 people die annually, (20,000 die before they receive appropriate medical attention) from injuries sustained in motor vehicle crashes. An additional 250,000 people sustain serious injuries, and research has demonstrated that trauma victims have a "golden hour" of opportunity in which if medical treatment is received, the chances of surviving or fully recovering, is greatly increased².

How can we respond more quickly? Instead of creating a vast new system, the Maine Office of Geographic Information Systems' (MeGIS) proposed an Incident Management system be built upon several existing platforms. These include the State's enterprise GIS and Oracle databases, Maine Department of Transportation's (MDOT) CARS³ network, US Geological Survey (USGS) river monitors⁴, National Weather Service automated weather stations⁵, and the Gulf of Maine's GOMOOS⁶ buoy network. In addition to these, MeGIS has also been conversing with OnStar and ATX Technologies in order to rapidly and reliably deliver accident data to E9-1-1 centers.

MeGIS is using grant funds provided by the Institute for the Application of Geospatial Technology at Cayuga Community College, Inc. This grant initially focused upon using remotely sensed data in GIS. The proposal began by integrating the river flow monitor network, and sought to graphically display river heights and flow on an ArcIMS mapping site. Subsequently we learned automated weather station, GOMOOS buoy systems, and MDOT's CARS/511 system's remotely sensed data also can be mapped by GIS. Not surprisingly, the Maine Emergency Management Agency, emergency first responders, and others want to access data from all of these sources in one convenient, easy to use application.

Indeed, directly transmitting Automated Crash Data directly from automo-

biles to Public Safety Answering Points (PSAP) would have a huge impact on safety. For example, using this integrated information, PSAP dispatchers eventually will be able to distinguish minor fender benders from severe crashes and react accordingly. This data could also be transmitted to interstate electronic message boards to advise travelers of accidents ahead.

The system also has implications for Homeland Security. For example, commercial containers of hazardous materials can be retrofitted with the devices and tracked in real-time. Should the transport stray off course, or if it is hijacked, stolen, or involved in an accident, emergency officials can track its location.

MeGIS is working with public and private sector colleagues, to publish a standard method for data content providers to make their remotely sensed data available. Once this method is finalized, MeGIS will test this system by its servers receiving XML soap messages, processing data packets, and routing them to the PSAP closest to the accident.

Bob White (bob.white@maine.gov) is a Senior Programmer Analyst for MeGIS where he is responsible for management of public safety/emergency management projects, project reviews and quality assurance. Bob is a certified Emergency Number Professional (ENP), and co-chair of the NENA Data Committee's GIS Study Group <http://www.nena.org>.

¹ ATX technologies are used by Ford, On-Star is used by General Motors, and Triple A is investing in developing an "after market" system for older vehicles.

² See http://www.state.me.us/newsletter/july2000/enhancing_the_chain_of_survival.htm

³ See <http://www.state.me.us/newsletter/may2002/multi.htm>

⁴ See http://www.state.me.us/newsletter/april01/river_watch_2001.htm

⁵ See http://www.state.me.us/newsletter/august2002/national_weather_radio_transmitt.htm

⁶ See http://www.state.me.us/newsletter/june2002/what_is_a_gomoos.htm

State GIS CD Products Serve Towns Officials and Teachers

BY DAN WALTERS

Last fall the Maine Office of GIS (MeGIS) completed the initial large-scale issue of a CD product containing town and state-wide Geographic Information Services (GIS) data for municipal planning. Thirty-two towns received the CD product as the result of a collaborative effort between MeGIS, the Maine State Planning Office, and the councils of government. All existing state GIS data for the town, plus adjacent towns, full metadata, and a shareware GIS software package were included on the CDs. This product has been made possible by the collaborative efforts of many State agencies and is a compilation of the GIS layers that have been produced over the years for the state's GIS.

Two additional distributions have been made since last fall. Twenty-five CD sets were requested by the State Planning Office, councils of government, and municipalities over the course of the winter, and a second large-scale distribution for 49 towns was delivered to the State Planning Office in July, 2003. Additional data layers have been contributed by State agencies since the initial product release¹ and each set now includes three CDs. The shareware GIS package has also been updated and the new version is included. The data CD products have proved to be quite popular and MeGIS now produces standard Municipal Data CD sets in quantity for councils of government and municipalities.

The product has also been popular with teachers. On July 31st and August 1st, 2003, MeGIS hosted a grade 6-12 Educational Leadership in GIS workshop in Augusta. This was the second MeGIS sponsored workshop in using GIS on iBooks, and it was attended this year by 20 teachers and informal science educators from around the state. ESRI (Environmental Systems Research Institute <http://www.esri.com/>) provided each educator, free of charge, a 1-year ArcView license and copies of the 530-page manual Mapping Our World: GIS Lessons For Educators, containing seven modules, or lesson plans, for demonstrating GIS in the classroom.

ESRI also provided a professional trainer who presented an introduction to GIS, ArcView basics, and an introduction to Mapping Our World. MeGIS provided CDs of digital data and images of the local townships for each teacher's school and conducted preliminary exercises in using local data with ArcView. To date, 47 CD packages have been produced for educators.

To acquire these Municipal Data CD sets, contact Larry Harwood by e-mailing larry.harwood@maine.gov, or calling 207-624-8879 for assistance.

Dan Walters, the Administrator of MeGIS, may be contacted with questions and comments via e-mail dan.walters@maine.gov.

¹ See http://www.state.me.us/newsletter/august2002/gis_data_for_municipal_planning.htm



BY LESTER DICKEY

Challenge

In the reports of last month's electrical blackout in New York and areas to the North and West, newspaper reports said that the blackout affected 50 million people over an area of 9,300 square miles. One or the other of these numbers must be grossly wrong. Which one and why? This is not a trick question. Explain your answer. For a little more difficult challenge, but no pizza, what is a more realistic estimate for the number that is grossly wrong in the question above?

Please e-mail **Lester Dickey** with your answer and your name, phone number, and the organization for which you work. Or call **Barbara Buck** at **624-9501**. The winner will be drawn from all the correct entries and will receive a **FREE** donated pizza, either from **CJ's Pizza** or from the **EDOC Cafeteria**. All answers must be in no later than the **14th** of the month.

Last month's challenge brought 70 submissions, with 52 being correct. The winner, chosen by random drawing, is **Donald Miville of WCB in Lewiston**. The answers to last month's Challenge: The brick weighs 3 pounds (48 ounces). The second question had an answer of 70.

Upgrading Momentum

BY JOHN C. TYLER

Many Bureau of Information Services customers use Momentum to move/exchange files (e.g. on-line tax returns), and several convenient new features will soon be available.

Recently redesigned dial-up services now allow multiple files to be submitted during one phone call. Momentum responds with a yes/no question, asking if there are any more files to transfer, telling mailbox users how many files there are in the mailbox, and sharing the transfer status of each file.

The most important changes are in the types of Internet access allowed. For some time customers have requested migration from dial-up to the Internet. To accomplish this, we are changing Momentum's FTP host service. The new Internet service accepts 128 bit Secure Socket Layer (SSL) encryption. Customers will be allowed to log on to this service and send files over a secure FTP link. The host product is WS-FTP Pro written by Ipswitch Inc. This is the host version of the WS-FTP/LE client that most use to send and receive files. In order to use the SSL service, you need a SSL capable client, and BIS supports the WS-FTP Pro client. It is not expensive – approximately \$40.

We are also releasing Momentum's Secure Web Mailbox add-on. This is the secure Web-based package that provides 128 bit SSL secure file transfer over the Internet.

Questions? Visit Momentum's site <http://www.momsys.com/> or e-mail john.c.tyler@maine.gov.

The New World of Pavement Management – Efficient and Effective

BY ROBERT WATSON

Maine's Department of Transportation collects pavement condition information on approximately 9,000 miles of roads every two years. The data collection is done using an ARAN (Automatic Road Analyzer) van. The first ARAN vehicle was purchased in 1988. It was replaced with the current ARAN in 1998, and has been upgraded since to contain the latest available data collection technology.



Today's ARAN is equipped with five cameras (three digital and two analog), a very accurate Distance Measuring Instrument (DMI), a rut bar to measure rut depths, and lasers to measure the smoothness of the road. Data is collected on removable hard drives that hold up to 100 gigabytes. At the end of a week's data collection, these hard drives can be removed from the van's computers, brought into the office, and inserted into office computers for data processing. This is in contrast to our first van, which collected data on 5 1/4" floppy discs. The expanded ability to store data has allowed us to combine some of our collection routes in the field, and to make our data collection more efficient. As you can imagine, we were only able to collect short sections at a time when the data was stored on floppy discs.

Images collected from the right of way camera (mounted in an enclosure on the roof of the van looking straight ahead) are used to support the Department's TIDE-Imager application. This program is distributed through the Department's Intranet and can be used to view the images collected by the van from any PC. Thus, Division personnel can "ride" a section of road from the office if a complaint is received and respond immediately to that complaint.

In addition, Project Development personnel are using the application during the design process, often saving a trip into the field to look at a particular feature of an existing roadway during the design process. Others using this application include the Inventory Section, Legal Services, and Safety Management. This has proven to be a very popular application. We are also exploring the development of a "portable" version of this application to be used in a public hearing, or similar setting, where a connection to the Department's Intranet is not available.

Another major improvement occurred in 2001 when we purchased an "off the shelf" crack analysis program, aptly called WiseCrax. This program is fed digital images from the pavement cameras mounted on the van. It then measures and rates the distresses on the roadway. The software is "intelligent"

enough to distinguish between longitudinal, transverse, and alligator cracking.

Before this software was implemented, the roadway distress analysis was still largely a manual process. A technician watched the videotapes of the road collected by the van, and manually rated one hundred feet every half mile. This gave us a network sample rate of about 4% (in other words, only 4% of the highway network was being rated, and that number was applied to the whole system). With the new system, we acquire a network sample rate of 100% for every road we collect.

This has a huge effect on the accuracy of the analysis we do in pavement management. The crack analysis data is combined with rut depth and International Roughness Index (IRI) to determine the Pavement Condition Rating (PCR). As the pavement management data collection and processes become more efficient and more accurate, we can better recommend how to allocate our pavement preservation dollars.

Questions? Comments? Contact the author, Robert Watson, P.E., who is a Pavement Management Engineer, in the Systems Management Division of the Department's Bureau of Planning. He may be reached by calling (207) 624-3535 or e-mailing robert.watson@maine.gov.

Geodetic Surveying, cont. from page 8

have changed over the years. Aerial Surveys suffice in some areas, and help reduce the size of route surveys in others.

Data from MDOT's statewide permanent geodetic control stations (first established in 1966) will soon be available via the Internet. These stations, which appear in various adjustments throughout the past 37 years, form the basis of all GIS mapping field work for use by state, federal, and municipal governments, as well as being used for precise control surveys by MDOT and private land surveyors.

I particularly enjoy the challenge of manipulating software and numerical values, and working collaboratively to provide cost efficient and accurate surveys used by MDOT's Highway, Bridge and Multimodal Design Teams, the motoring public, and others. I am sure additional challenges will arise as the Control Station's database appears on the Web.

Over the years, I have been trained and mentored by many. I especially want to recognize: Marshall Strout, Robert Ronco, Lloyd Ireland, Rick Lane, Phil Parent, Brian Casey, Don Laflin, Tim LeSieg and Bill French.

Questions? Contact Harry Nelson by e-mailing harold.nelson@maine.gov.

¹ Website where datasheet descriptions of NGS stations and benchmarks can be found: <http://www.ngs.noaa.gov/>.

² see: http://www.state.me.us/newsletter/dec99/ground_truth_about_airborne_glob.htm

25 Years of Geodetic Route Surveying

BY HAROLD E. NELSON

Over my 25 year career with Maine Department of Transportation's (MDOT) survey activities I have seen many changes. Starting in 1977 as part of a Route Survey Crew, I used engineers' transits and 100 foot long steel drag chains (metal tape) to collect topographical data for strip maps which later became "cut sheets" of highway plans. We also used evolving hand held calculators which had recently replaced "hand crank" mechanical calculators. The Survey Office used a Coordinate Geometry (COGO) program on the State's mainframe system.

In 1978, I began working on Control Surveys with Blair J. Riopell and later Richard S. Lane. These crews used more precise equipment, such as optical theodolites (referred to as a transit with a college education), and Electronic Distance Meters, which used light waves to measure slope distances. Field data was recorded by hand and computed by calculator, although in the late 1980's PCs appeared in the office. These crews created control survey stations with State Plane Coordinates for use in developing new highway alignments, Right of Way definitions, and Photogrammetric Mapping.

The 1990's witnessed laptop computers, electronic data collectors, and Total Station instruments that enabled a route survey crew to survey in the morning and view a map on their laptop in the truck during lunchtime! Between field and office editing, the need for hand plotting the survey was eliminated. The engineer's transit and steel tapes fell by the wayside.

Global Positioning System (GPS) surveys, which used the U.S. military's NAVSTAR satellite constellations, also appeared in the 1990's. Using GPS, a control survey along State Route 9, ("the Airline" between Bangor and Calais) was completed in a matter of days, instead of weeks; and it had a much higher accuracy than surveys created via classical geodetic methods. This was my last official field work for 10 years, having been promoted to Project Coordinator for the Survey Section.

Collecting GPS data in the field is exacting and unexciting work. However, MDOT crews also monitor for quality assurance and checking (QA QC) via satellite epoch tallies. If one station has problems (e.g. trees or trucks blocking a signal), a cell phone call to others allows for changes in the default scheduling.

The intricate work is survey planning and execution, and the critical post processing and applications of coordinates from the Federal and Cooperative Base Network stations. National Geodetic Survey (NGS), private land surveyors, and MDOT's Photogrammetry and Control Unit, supervised by Timothy E. LeSiege, PE, cooperatively set up and observed a Base Net of GPS stations in 2000. (I was a field observer.) Tim's and Keith C. Reynolds' (GPS Party Chief) efforts resulted in the creation of approximately 80 GPS order control stations which bolster the geodetic infrastructure and the NGS Database¹.

Following the 2000 GPS Campaign, I assumed responsibility for GPS computations, and for the contents of the Control Station database. I also mentored Route Survey Crews

regarding how, and which GPS control stations to use, and answered their questions with regards to applications of control data.

MDOT's Photogrammetry and Control Unit also offers Airborne GPS surveys² which can be merged with MX CADD data from the Route Survey Crews. Project lengths and scope

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Geodimeter photo: 1960's distance measuring technology using laser.



Harold E. Nelson and Mount Harris: The author holds a Trimble 4000SX GPS receiver while standing next to the GPS antenna set over NGS benchmark M 130, during the NGS 2000 Height Modernization Campaign. NGS set the benchmark in 1966 and made it into a Cooperative Base Network GPS station in 2000. Behind the author is Mount Harris in Dixmont, site of a First Order Coast Survey station set in the 1850's, juxtapositioning two different eras in geodesy.

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