NYSDOT's Winter Traveler Advisory – A high volume real-time ArcIMS site

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Abstract
The Winter Traveler Advisory is NYSDOT's first ArcIMS website intended for public use on the Internet. The website publishes real time winter road conditions collected by the snow plow drivers as they work. This presentation will cover the data collection interface, system architecture and database design as well as an interactive diagnostics tool which walks support staff through a wizard checking the status of system components to streamline troubleshooting and maintenance. Because of the high volume and availability requirements the system employs a redundant ArcIMS configuration as well as our first ArcSDE production instance. This presentation will include the challenges faced building a secure and stable system as well as the rewards reaped from the first hand experience.

Introduction
New York State DOT is undergoing a transformation. This transformation will redefine DOT's structure and modernize its mission. Originally DOT was organized to efficiently plan, design, and build, the state and interstate highway systems. Now that these highway systems are mostly complete, the DOT is shifting its focus to operating the infrastructure to optimize performance along five priority result areas. These areas are mobility/reliability, safety, economic sustainability, security, and the environment. It is clear that a cornerstone of this transformation is in information management. The Winter Traveler Advisory (WTA) fits well in this transformation as it allows DOT maintenance workers a new way to provide valuable information as they perform their regular work. The idea is very simple. Why not capture information about the current status of the road network directly from snow plow operators, and make it available to the public via an interactive web-base map? This article will describe the data input mechanisms, the output map functionality, technical support challenges, and public reaction to the WTA.

Input
The critical information link was already in place when we started the WTA. In most areas we already had snow plow drivers in radio contact with radio dispatchers located throughout the state. We reached out to the DOT maintenance forces to coordinate and pre-define the road segments that they would be responsible to report on. The reporting is to happen whenever snow and ice removal is in operation. As a plow operator drives onto one of these reporting sections they are to radio in and report the road status, and optionally include weather conditions and other pavement conditions observed. The plow driver uses the radio to communicate the report to a radio dispatcher. The radio dispatcher in the office clicks on an internal web form to enter the report. Fortunately, most of the offices that the dispatchers work from are on the DOT wide area network.

WTA Input Form

We developed a simple HTML form with radio buttons for the required status field and check boxes for the optional contributing pavement and weather conditions. The input forms are generated dynamically using J2EE and Oracle 9i Application Server. As edits are made to the reporting road segments, those changes are automatically reflected in the input form. For example, a change may be needed to the road segments to make more granular reporting possible. If the driver finds that conditions typically change in the same place along a segment, the driver may request that the segment be broken into two to allow independent reporting on the two segments.

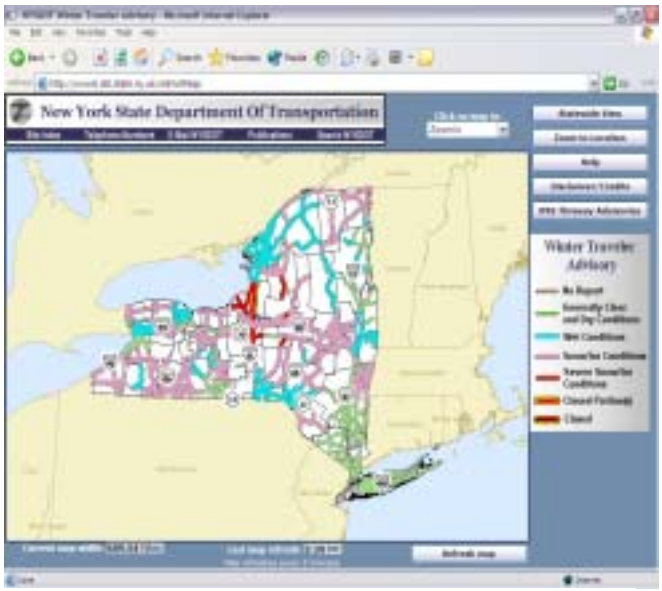
With data being input from more than sixty locations around the state both day and night, over seven hundred DOT employees have input accounts to the WTA. In some locations the job of radio dispatcher is rotated among the plow drivers. Six hundred and seventy road segments are currently being reported on.

The New York State Thruway Authority also built a Winter Traveler Advisory System. The Thruway system is also based on an Oracle database. DOT and the Thruway met to standardize both road segments and the wording of the status codes. We used the national standard Transportation Management Data Dictionary (TMDD) as a starting point to select appropriate code values. We established a database link to extract current road reports form the Thruway system and automatically populate the Thruway portion of the DOT system every ten minutes.

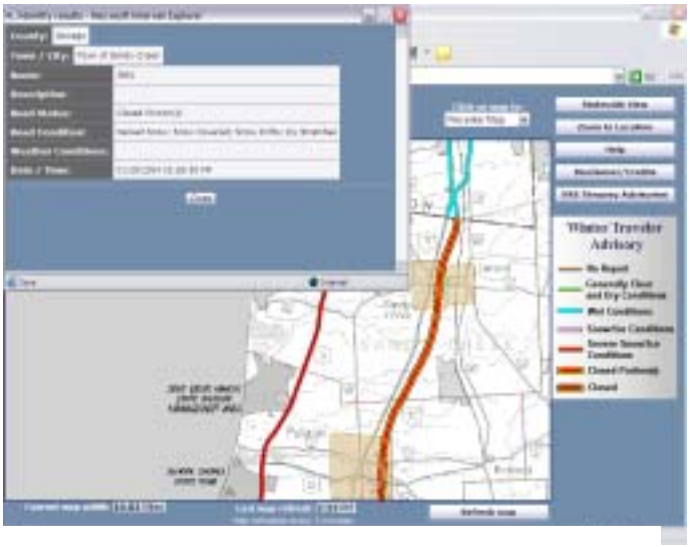
Since the State DOT does not maintain roads in New York City, we are partnering with New York City Department of Transportation, New York City Police Department and the New York City Joint Traffic Operations Center to enter reports on selected streets and highways within the city. The New York City Joint Traffic Operations Center is a node on the DOT wide area network, so reports can be entered from that center using the same forms that DOT's radio dispatchers use.

Output

Once a report is in the database the Internet Map Server (IMS) joins it to a spatial feature representing that road segment. The road segments and the supporting base map images are stored in Oracle using ESRI's Spatial Database Engine (ArcSDE). Reports over four hours old default to "no report".



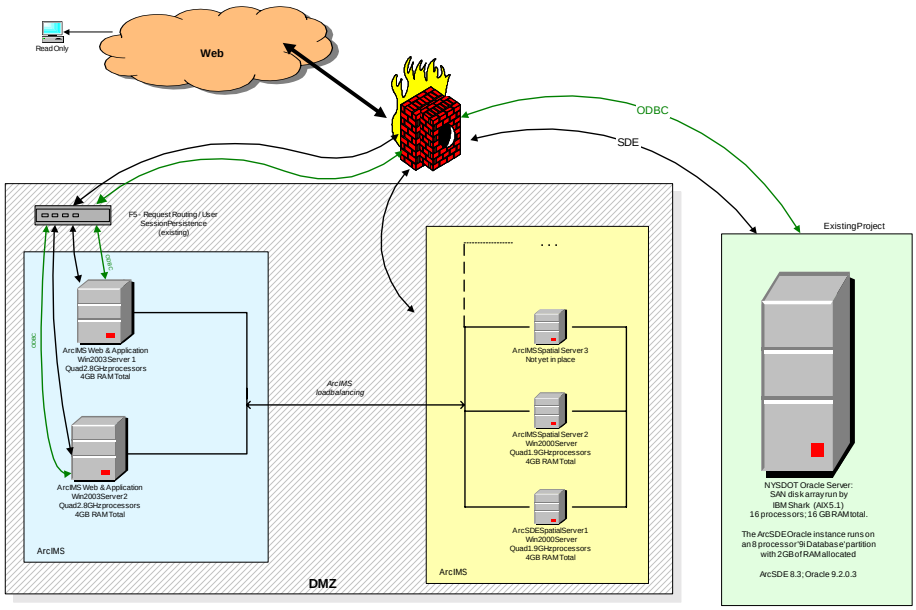
WTA State-Wide View



The Internet Map Server allows users to zoom in and out, re-center the map, zoom directly to a place of interest and click on a road segment to get a detailed report. Road segments are colored based on values in the status field, but other contributing weather and pavement conditions are available by clicking on the road. Using scale triggers, the Internet Map Server is configured to provide greater base map detail as the user zooms in to a larger scale.

WTA Zoomed in on Oswego County

Two web servers running the Internet Map Server and Active Server Page code sends requests to two spatial servers. The spatial servers create the map images by connecting to the database to join each road report to the shape of the road stored in ArcSDE. They then overlay the road data on the appropriate base mapping, and return a PNG image. The Internet Map Server is able to convert the screen position of the user's mouse clicks into real world coordinates to interact with ArcSDE. Multiple instances of the Internet Map Server spatial server component are running on each spatial server.



Support

The WTA is the first NYSDOT application requiring IT support around the clock. Although the DOT IT Group is not staffed on non-business hours, we put together a support plan with IT managers and technical experts answering off-hours support requests.

Since the server components are redundant and automatically load balanced, it is very hard to know which components are not functioning correctly when problems occur. Problems are hidden from the user by allowing the system to automatically shift requests to the components which are working properly. To monitor the site and troubleshoot problems, we developed a diagnostics tool. This tool acts as a wizard displaying results from various parts of the system, and asking the support staff a series of questions about how the results look. The diagnostics tool can then automatically send an email to all support staff and management including the results of the diagnostics and recommended corrective actions.

Fan Fair and Feedback

The Winter Traveler Advisory was announced to the public in a press release by Governor Pataki on January 27, 2004. View the press release at www.state.ny.us/governor/press/year04/jan27_1_04.htm. January 28 was a snowy day throughout New York. We received 255,000 hits in 5 hours on the 28th. The system continued to run although the performance was slow. The WTA announcement was written up in at least 16 news papers and appeared on many TV stations. We made a few adjustments to tune performance. Now under a normal load during a snow storm of 14,000 hits per hour, the performance is good. Feedback from the traveling public has been favorable. To get to the WTA go to the NYSDOT Web page (www.dot.state.ny.us) during the winter driving season and click on the *Winter Traveler Advisory* link. Then to view the map, click on the *Current Conditions* link.

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