

**AASHTO Technology Implementation Group  
 Nomination of Technology Ready for Implementation  
 2013 NOMINATIONS DUE BY FRIDAY, SEPTEMBER 14, 2013**

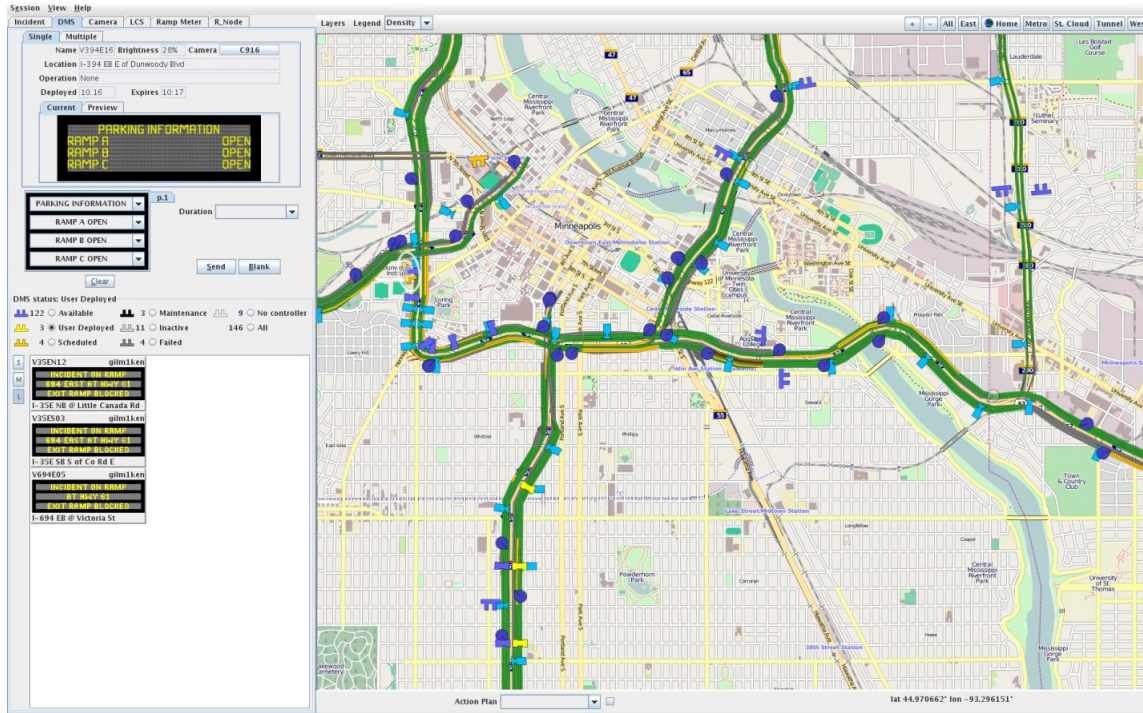
<b>Sponsor</b>	<i>Nominations must be submitted by an AASHTO member DOT willing to help promote the technology.</i>	1. Sponsoring State DOT: Minnesota
		2. Name: James M. Kranig Title: MnDOT Metro Regional Transportation Management Center Engineer Mailing Address: 1500 West County Road B2
		City: Roseville                      State: MN                      Zip Code: 55113
		E-mail: jim.kranig@state.mn.us      Phone: 651.234.7020      Fax: 651.234.7006
		3. Date Submitted: 09/13/2012
		4. Is the Sponsoring State DOT willing to promote this technology to other states by participating on a Lead States Team supported by the AASHTO Technology Implementation Group? Please check one: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<b>Technology Description (10 points)</b>	<i>The term "technology" may include processes, products, techniques, procedures, and practices.</i>	5. Name the technology: Intelligent Roadway Information System, Advanced Traffic Management System Open Source - General Public License Software
		6. Please describe the technology: The Intelligent Roadway Information System (IRIS) is an extensive Advanced Traffic Management System (ATMS) software originally developed by MnDOT to control the Freeway Management System for its Regional Transportation Management Center for the Minneapolis-Saint Paul Metro Area.  IRIS capabilities include: -Collection of data from 5500 traffic detectors -Automatic operation of 430 ramp meters and posting of variable speed limits based on traffic conditions -Control of 340 Intelligent Lane Control Signs and 140 Dynamic Message Signs -Incident posting from XML feed from State Patrol CAD -Speed and density web map data population -Output of an XML file read by web maps [MnDOT and other web developers] to post speed -Flow or density graphically -Configuration of DMS parameters -Display and pan-tilt-zoom control of 550 video cameras -Field device error identification -Communication error identification -Dial-up connection to field devices not on fiber -Graphical feature to easily build and modify roadway geometry within the IRIS client.  Subsequent additions by Caltrans include connection to Road Weather Information System (RWIS), Highway Advisory Radio and remote device dial-up.  MnDOT has decided to make IRIS available as an open source software through a General Public License (GPL). Through a GPL, any other entity can use the software and modify the software for their purposes without paying a license fee. However, the GPL does prohibit reselling the software as is or after it has been modified. Any additional functions and enhancements to IRIS must be made available to all others on the same basis. As a result, a private entity could charge an agency for the development of a new function but that software is then part of the IRIS Open Source GPL software. The code for this new function cannot be sold to others.  The benefit of an IRIS open source GPL software is the low cost to implement compared to paying for licenses for similar non-open source GPL ATM software. There are no ongoing license fees for related support software as these are also open source GPL.  The University of California - Davis Campus AHCMT assessed the use of IRIS by Caltrans and concluded that in comparison to proprietary ATMS software, the acquisition cost is approximately 98 percent lower, annual maintenance cost was about 68 to 86 percent lower, and a five year total cost was estimated to be 72 percent lower.
		7. If appropriate, please attach photographs, diagrams, or other images illustrating the appearance or functionality of the technology. (If electronic, please provide a separate file.) Please check one: <input checked="" type="checkbox"/> Yes, images are attached. <input type="checkbox"/> No images are attached.

<b>State of Development (30 points)</b>	<i>Technologies must be successfully deployed in at least one State DOT. The TIG selection process will favor technologies that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.</i>	<p>8. Please describe the history of the technology's development.</p> <p>In the late 1990s IRIS was developed to replace the outdated ATMS software based on the unsupported OS2 operating system. The new system was created to accommodate the National Transportation Communications for ITS Protocol (NTCIP) standard, ITS field equipment and support the significantly expanded Twin Cities Freeway Management System. The new Regional Traffic Management Center combining MnDOT traffic and incident management functions with the State Patrol 911 call and dispatch functions also benefited from the new software.</p> <p>The first step developing the IRIS was creating the map-based interface and control of NTCIP Dynamic Message Signs. Next was the collection of traffic data from the freeway traffic detectors used by IRIS to operate the ramp metering system. Final steps included:</p> <ul style="list-style-type: none"> <li>-Posting of incident data</li> <li>-Simplified roadway system coding for the map interface</li> <li>-Control of field device parameters</li> <li>-Reading traffic incident information directly from the 511 system</li> <li>-The ability to view and control video within IRIS</li> <li>-Control of managed lanes Intelligent Lane Control Signs (ILCS) to automatically post variable speed limits and to automatically suggest sign deployment based on incident information.</li> </ul> <p>After MnDOT offered IRIS as open source software through the GPL, Caltrans investigated its potential use for their Traffic Management Centers in California. Caltrans contracted with University of California-Davis AHCMT to improve the portability of IRIS for other agencies. Caltrans added connection to its Roadway Weather Information System, control of Highway Advisory Radio, operation of California Automated Warning System and device dial-up communications.</p>																				
		<p>9. For how long and in approximately how many applications has your State DOT used this technology?</p> <p>IRIS has been used in the Twin Cities since 2002. IRIS was expanded to Saint Cloud, MN to make it a remote client. IRIS was later installed in Rochester, MN in 2007 and in Duluth, MN in 2010.</p> <p>Caltrans researchers used the Stockton, CA, District to assess the feasibility of IRIS for Caltrans starting in 2009. Since then, Caltrans has added three more traffic management centers in 2011 and 2012. Other state agencies are assessing IRIS as well as agencies in several foreign countries.</p>																				
		<p>10. What additional development is necessary to enable routine deployment of the technology?</p> <p>No additional development for IRIS is needed. However, to deploy IRIS to control ATMS in a specific location, the basic mapping must be incorporated, the roadway system must be coded, and the field devices (those not the same as field devices already integrated by other IRIS users) must be integrated into IRIS.</p>																				
		<p>11. Have other organizations used this technology? Please check one: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If so, please list organizations and contacts.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Organization</th> <th style="text-align: center;">Name</th> <th style="text-align: center;">Phone</th> <th style="text-align: center;">E-mail</th> </tr> </thead> <tbody> <tr> <td>Caltrans</td> <td>Stan Slavin</td> <td>916.653.3068</td> <td>stan_slavin@dot.ca.gov</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Organization	Name	Phone	E-mail	Caltrans	Stan Slavin	916.653.3068	stan_slavin@dot.ca.gov												
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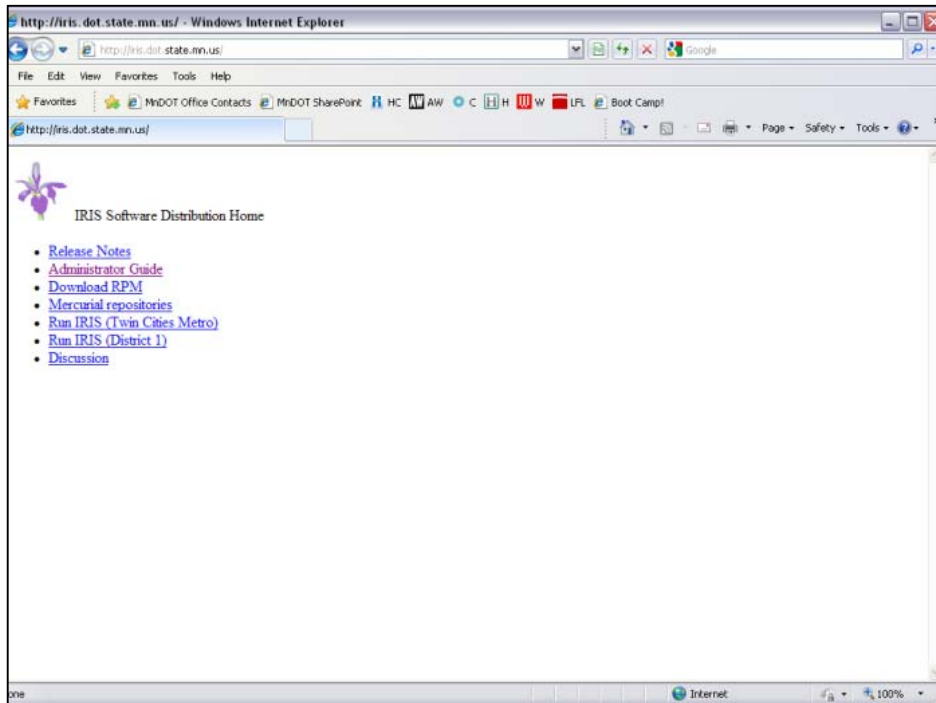
<b>Payoff Potential (30 points)</b>	<i>Payoff is defined as the combination of broad applicability and significant benefit or advantage over other currently available technologies.</i>	<p>12. How does the technology meet customer or stakeholder needs in your State DOT or other organizations that have used it?  IRIS has been developed to operate all of the field devices used in the operation of the freeway management system. It has been developed with substantial and direct input from the operators that use the software on a daily basis. This has resulted in a software that meets all of the current functional needs to enable the operators to efficiently and effectively manage the system. Based on the experience of Caltrans, IRIS can be deployed at a variety of centers very cost effectively and provides all of the priority features needed. Also, additional features can be relatively easily cost effectively developed.</p> <p>Having IRIS and using this system will benefit customers and stakeholders by having a transportation system that operates in more efficiently for Minnesotans. The system's ability to post necessary speed limits and incident information will assist the driving public so they can make safe and informed driving decisions. The system's active traffic management and lane control system will help reduce road congestion for customersa during rush hour and heavily travelled cooridors.</p> <p>13. What type and scale of benefits has your DOT realized from using this technology? Include cost savings, safety improvements, transportation efficiency or effectiveness, environmental benefits, or any other advantages over other existing technologies.  The total cost of developing IRIS since the late 1990s has been much less than the cost to purchase the equivalent software. The annual cost is solely the cost of two software developers who maintain and enhance the software. No licensing fees exist for IRIS or any of the supporting software. The cost to new adopters of IRIS is dramatically lower in comparison to proprietary commercial software. (Described by the Caltrans and UC Davis AHCMT report discussed in Section 6)</p> <p>14. Please describe the potential extent of implementation in terms of geography, organization type (including other branches of government and private industry) and size, or other relevant factors. How broadly might the technology be deployed?  There are no limitations in terms of geography and size when implementing IRIS. The decision to have individual IRIS servers at various centers would be based on the center jurisdictions and communications availability. Based on the needs of the agency, IRIS can deploy some or all of its features and functions. IRIS can be used by any public or private entity as long as the provisions of the GPL are followed.</p> <p>An example of deploying IRIS would be a private consultant assisting a public traffic agency in the initial deployment, device integration and on-going maintenance and enhancements. The low cost to deploy and maintain could enable much smaller traffic centers to incorporate a full featured ATMS software package that integrates all of their field devices similar to larger centers rather than having multiple separate field device software packages that are not integrated.</p>
<b>Market Readiness (30 points)</b>	<i>The TIG selection process will favor technologies that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.</i>	<p>15. What actions would another organization need to take to adopt this technology?  Organizations can use IRIS in a number of models. They can do all of the initial deployment and ongoing maintenance and development with in-house staff or they can contract with consultants or University resources to provide services.</p> <p>16. What is the estimated cost, effort, and length of time required to deploy the technology in another organization?  This will vary according to the size of the system being deployed, the number of field devices not previously integrated by others, the staff or consultant resources available and the extent of the features that are to be deployed. However, the study funded by Caltrans showed substantially lower costs as discussed in Section 6 above. Essentially, the time and effort would be comparable to deploying similar proprietary software.</p>

		<p>17. What resources—such as technical specifications, training materials, and user guides—are already available to assist deployment?  The software and installation software are available on an FTP site. Programmer and user materials developed by MnDOT and Caltrans are available to assist the software and installation. In addition, the UC-Davis AHCMT report provides information about the process Caltrans used to test and deploy their IRIS. Most, if not all, the suggested improvements in the report have been accomplished by Caltrans. Finally, a development logging tool has been in place to track and control the improvements to IRIS.</p> <p>18. What organizations currently supply and provide technical support for the technology?  MnDOT self supports IRIS and coordinates with others using IRIS. UC-Davis provides technical support to Caltrans. A programmer, formerly working at UC Davis, was hired by Berkeley Transportation Systems that was subsequently acquired by Iteris. Multiple agencies and private compaies have or are considering employing IRIS and would be additional options for support.</p> <p>19. Please describe any legal, environmental, social, intellectual property, or other barriers that might affect ease of implementation.  The only conditions in using the IRIS are described in the General Public License. As described in Section 6, open source software via GPL states that any other entity can use the software and modify the software for their purposes without paying a license fee. However, the GPL does prohibit reselling the software as is or modifying the software and reselling it. Any additional functions and enhancements to IRIS must be made available to all others on the same basis. As a result, a private entity could charge an agency for the development of a new function, but that software is then part of the IRIS Open Source GPL software. The code for this new function cannot be sold to others</p>
	<p><b>Submit Completed form to</b></p>	<p><a href="http://transportation1.org/tiq_solicitation/Submit.aspx">http://transportation1.org/tiq_solicitation/Submit.aspx</a></p>

## MnDOT Intelligent Roadway Information System Example



## Intelligent Roadway System Webpage



- The Release Notes gives a basic overview of the major activities in enhancing and fixing IRIS. Note that the first entry on the reverse chronological list was made last week on April 26<sup>th</sup>.

-The Installation Instructions is intended to assist software staff in the installation process. This was made simpler as we worked with Caltrans and UC Davis AHMCT.

- Mercurial repositories is the method that the software people use to track and report activities to changes in the various modules.

- Run IRIS is initiating running IRIS after it has been installed.