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| Sponsor | Nominations must be submitted by an AASHTO member DOT willing to help promote the technology | 1. Sponsoring DOT (State): **Idaho Transportation Department (ITD)**
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| 1. Name and Title: **Steve Spoor, Program Manager**
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| Organization: **Idaho Transportation Department, Highways Division, Mobility Services Group** |
| Street Address: **3311 W State Street** |
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| 3. Is the sponsoring State DOT willing to promote this technology to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative? Yes or No: **Yes** |
| **Technology Description (10 points)** | The term “technology” may include processes, products, techniques, procedures, and practices. | 4. Name of Technology:**Winter Automated Reporting System (WARS)** |
| 1. Please describe the technology.

**WARS is a maintenance support system that combines snowplow spreader data, plow position and AVL data into meaningful information that is utilized to improve the quality of winter operational reporting, reduce operator data input time, and improve ITD’s winter operations. The snowplow truck spreader, plow position and AVL data is generated by Certified Cirus Controls (Cirus) SpreadsmartRX spreader controllers which includes an on-board data recorder that is connected to ITD’s network via WiFi communication protocols. The information is then stored on ITD servers using Cirus software. The WARS system imports and converts the data into a meaningful report format that is then used by operators, road foreman, and management personnel for improving winter operational efforts. The WARS system was developed by ITD using contract programmers. ITD defined winter operational activities based on a combination of various truck sensors. Data collected from the snowplow truck on-board data recorder is converted to these operational activities while GPS data is processed to display route/milepost ranges within ITD’s highway network. The WARS system creates activity/route records that include the operator, labor hours, truck number and miles/hours, material types, total quantity of material used, and completed work units. Upon operator validation, the data is interfaced directly to ITD’s Agile Assets - Maintenance Management System (MMS). During the interface, work orders, day cards for labor, equipment, materials, location, and accomplishments are automatically created eliminating the need for operator input of this information into the MMS.** **During the operator validation step, the WARS system displays an Operator Daily Summary screen summarizing all data derived along with a map showing the routes and truck data for specific points on the routes.** |
| 6. 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 list your attachments here.**a. Daily Summary Report and Truck Activity Maps****b. Data Flow Diagram****c. Photos** |
| **State of Development** **(30 points)** | Technologies must be successfully deployed in at least one State DOT. The AII selection process will favor technologies that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use. | 1. Briefly describe the history of its development.

**In 2012 ITD initiated a project to utilize snowplow and AVL data to improve winter operations and streamline the reporting of winter maintenance activities. ITD tried various spreader controller and data recording partners before finalizing our WARS partnership with Certified Cirus Controls, Agile Assets, and contract programmers from Experis. Software development was managed by ITD’s Enterprise Technology Systems Group. The project was ranked second amongst all IT projects developed in 2015 as providing the best return on investment. ITD’s existing infrastructure included WiFi communication capability at all Maintenance Stations around the state. Due to Idaho’s topography and rural setting, it was determined that cellular communication would not be a statewide solution for communicating data. Cirus was chosen due to the fact their product included all necessary hardware integrated within a single hardware device and WiFi communication was the standard protocol of the hardware. The team worked with Cirus on enhancements to their standard software to meet communication and database configuration goals and objectives. Once these software products were activated and controllers were installed in snowplow trucks, ITD began collecting and reporting data for validation by management for process improvement, utilizing Cirus’ standard reporting software. Very early in the deployment and use of the software, the team recognized the need for enhanced reporting capability, and the benefits to be received from interfacing the data collected by the trucks directly to our Agile Assets Maintenance Management System. The team defined the requirements for the enhanced capability and contracted with Experis to develop the WARS software that offered enhanced reporting and the ability to import the truck data directly into the MMS. This development effort began in the fall of 2014 and was deployed the fall of 2015. The team established the data interfaces and the database configuration, along with the query and report formats. Enhancements were identified through use of the software and completed throughout the 2015/2016 winter season.**  |
| 1. For how long and in approximately how many applications has your State DOT used this technology?

**The system was deployed statewide in Idaho for the 2015/2016 winter season in five (5) of the six (6) Districts on approximately 250 trucks. For the upcoming season, the system is fully developed and will be utilized by all six (6) Districts on ITD’s entire fleet of 409 trucks statewide. All snowplow operators will be required to use the system this winter season insuring data consistency and accuracy statewide.** |
| 1. What additional development is necessary to enable routine deployment of the technology?

**Minor bug fixes have been made but otherwise the system is performing as planned. Additional reporting capability has been identified and is being considered for development. Otherwise, the system as currently developed will be utilized and could be deployed in other DOT’s.** |
| 1. Have other organizations used this technology? Yes or No: **No** If so, please list organization names and contacts.
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| Organization | Name | Phone | E-mail |
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| **Potential Payoff****(30 points)** | Payoff is defined as the combination of broad applicability and significant benefit or advantage over other currently available technologies. | 1. How does the technology meet customer or stakeholder needs in your State DOT or other organizations that have used it?

**The WARS system met the goals of improving data quality, reducing operator input needs, improving winter maintenance management tools, and reducing winter maintenance costs. The system provides operators with a user friendly interface to review their daily work efforts and submit the information electronically to the MMS which creates their payroll and updates material stockpile quantities. This has reduced operator data input from 30 to 60 minutes daily to approximately 5 minutes for review and validation only. ITD now has granular data to review current state operations and costs versus results in an effort to evaluate and investigate potential increases to winter operation efficiencies. District management is able to accurately understand current winter operations and make necessary changes to achieve overall performance improvements and cost reductions. It is anticipated the system including software development and the deployment of all related spreader controller hardware will have a payoff of approximately 2 to 3 years. This payoff is primarily attributed to material savings, but labor and equipment cost savings will also be realized.** |
| 12. 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 system has only been deployed for a single winter season, so the total cost savings and benefits are yet to be fully determined. Pilot studies conducted by ITD demonstrated that through data analysis accompanied by process improvement resulted in a minimum 10% savings of winter operations chemical materials. For ITD, we anticipate materials savings of approximately $1M/year upon the full deployment of the system in 2016/2017. Other direct cost savings include a reduction of operator input time equating to approximately 7,500 labor hours/year and reduction of equipment costs through improved efficiencies. The cost savings associated with equipment has yet to be analyzed. Four (4) years prior, ITD implemented Winter Performance Measures that has resulted in improved winter operations performance, enhancing safety, mobility, and reducing severe winter weather crash events. By deploying the WARS system, ITD now has the ability to validate consistent performance from operators across all sections of highway. We anticipate further improvements in safety and mobility. Lastly, we have begun the process of integrating WARS data with other management systems in an effort to improve our overall efficiency and expect further cost reductions above the values stated above.** |
| 1. 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?

**The opportunity for replicating the WARS model elsewhere could include state DOTs, local government entities responsible for winter maintenance, and foreign countries. The primary ingredients needed are the snowplow controller, ability to capture and record the applicable truck data, an AVL system, and an asset management system in which to import operational data.** |
| **Market Readiness (30 points)** | The AII selection process will favor technologies that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential. | 1. What actions would another organization need to take to adopt this technology?

**Another organization would need to assess their data sources for fusion potential and determine the feasibility and cost for performing this project. The technology as deployed is an enterprise solution requiring consistency across the entity. This requires the entity to determine a hardware, communication protocol (WiFi or cellular), network capability for communication, and the ability to automate data transfer between various systems.** |
| 1. What is the estimated cost, effort, and length of time required to deploy the technology in another organization?

**The WARS system was developed to be compatible with current hardware choices within ITD. The hardware choice which then dictates the data format will be a key element is estimating the cost of deployment into another agency. Other potential costs include updating spreader controllers, establishing communications, and the potential deployment of a MMS. However, these costs are not directly related to using the system as designed. Costs specific to the software system itself would be those to update the code for the specific hardware decisions and existing software systems of the entity. This effort will vary depending on the entity and their current state of practice. For reference, the ITD WARS project development budget was $1.2 Million, excluding the truck hardware upgrades, and required 18 months to launch.** |
| 1. What resources—such as technical specifications, training materials, and user guides—are already available to assist deployment?

**ITD developed the following training materials:****WARS Training Guide** **Multiple WARS Overview Training Videos****WARS Introduction video for new employees** **Cirus Log Definitions Document****UTC Time Conversion for Cirus Logs vs WARS Data Document****Cirus/WARS support and contact information document** |
| 1. What organizations currently supply and provide technical support for the technology?

**ITD, Certified Cirus Controls, Agile Assets and Experis are all able to provide guidance to any interested agency.** |
| 1. Please describe any legal, environmental, social, intellectual property, or other barriers that might affect ease of implementation.

**The intellectual property of the WARS system is owned by ITD and was developed by ITD utilizing contract programmers from Experis and Resource Data Inc. The system utilizes software licenses from Certified Cirus Controls, and ESRI. Entities deploying the system would be responsible for establishing their own software licenses for the use of these companies’ products.**  |
| ***Submit Completed form to*** | [***http://web.transportation.org/tig\_solicitation/Submit.aspx***](http://transportation1.org/tig_solicitation/Submit.aspx) |