INTRODUCTION

All transportation agencies face increasing challenges and difficulties with its current transportation system. Population growth, rising costs, increasing traffic congestion, and increasingly scarce resources all support the need for transportation alternatives other than infrastructure improvements. The Wisconsin Department of Transportation (WisDOT) seeks to provide effective, coordinated, and efficient operations to maximize traffic flow, reduce delays, and improve safety, emphasizing the application of Intelligent Transportation Systems (ITS).

THE INTEGRATED PROCESS

Since 2008, WisDOT has aggressively been establishing a streamlined and integrated ITS business process. This process incorporates two key new developments along with traditional ITS tools like architecture, and binds them into an integrated and dynamic process with spatial information systems and web-based tools.

The Traffic Operations Infrastructure Plan

The first of the two key new developments is the Wisconsin Traffic Operations Infrastructure Plan (TOIP) and associated components. As part of the Wisconsin statewide long-range transportation plan, Connections 2030, WisDOT identifies 37 statewide system-level priority corridors. These corridors serve critical sectors of the state’s economy and connect to other states, and include both interstate and parallel arterial routes. As part of a comprehensive approach to transportation, Connections 2030 also recognizes the need for ITS deployment throughout the state. Building on the corridors framework, WisDOT developed the TOIP with the goals to evaluate ITS projects in the same manner as traditional infrastructure projects and integrate ITS into the planning process. A major objective of the TOIP is to apply quantitative and economic assessment toward recommending ITS deployments statewide in such a way that they may be deployed in concert with other construction activity.
The TOIP methodology gives a Deployment Density Class recommendation for every segment of roadway, reached through an analysis of 10 critical inputs, encompassing mobility, safety, environmental factors, and special events. These criteria were developed with key characteristics in mind, such as: consistency with the criteria used in WisDOT planning efforts; the ability to realistically measure the effectiveness of alternatives; ensure operational alternatives are compared with each other and with other types of improvements; rely on data that are readily available, quality controlled and regularly updated; and generate results that can be easily summarized for presentation to decision-makers and the public.

WisDOT has subsequently developed the TOIP Communications Systems Layer (CSL) to address communications needs for TOIP planned deployments. The CSL considered connections to TOIP deployments, partner agencies and WisDOT offices to provide an overall, statewide plan detailing technical fiber network recommendations and cost estimates for the more than 1,400 individual points representing data users, such as WisDOT offices, state agencies, campuses, and ITS devices. All of the TOIP and TOIP CSL data, information, and mapping are regularly updated and made available to stakeholders online and via and interactive map powered by ArcGIS Server.

**Dynamic Spatial Inventory**

The second of the two key new developments mentioned above is a full-featured ITS and communications spatial inventory system. How all of this ties together is illustrated in the ITS business process in Figure 1.

![ITS Process Diagram](image)

*Figure 1. Wisconsin ITS Business Process*

WisDOT is currently deploying the SpatialInfo suite of products for spatial inventory and asset management. This fills the last critical gap in the cycle by injecting a versatile and dynamic inventory system that continually takes in as-built information, fuels the information necessary
for maintenance activity, and can then in turn be used for further deployment planning. Recommendations from the TOIP portion of the process flow through the Wisconsin statewide architecture, which was overhauled in 2011 and is now regularly updated and made available online to all stakeholders. As resources allow, deployments follow the systems engineering process, are constructed or implemented, and the as-built information comes back around to the new inventory system.

SpatialInfo is built on an Oracle Spatial database and is robust enough to be relied upon by major telecom and internet providers. WisDOT is the first transportation agency to adopt SpatialInfo, and the deployment is integrated directly through the WisTransPortal, Wisconsin’s transportation data hub, comprising several real-time and archived data applications. The diagram in Figure 2 provides an overview of the new system. As illustrated, there are multiple ways to interact with the inventory, whether you are a technician updating the data via the AutoCAD front end interface, an emergency maintenance crew needing to locate a fiber path via any web browser, or a field technician outside documenting a new installation offline.

![Figure 2. ITS Inventory Overview](image)

Training in early 2012 was provided to WisDOT personnel and contractors on the software, content administration, fiber, splices, facilities, huts, and point inventory (e.g. dynamic message signs). The final product of this project is up to date ITS and communications inventory and as-built information, including coordinate locations, design detail, device and equipment detail, as-built documents, and GIS metadata.

**CONCLUDING REMARKS AND FUTURE WORK**

The recent concerted efforts toward an integrated and dynamic ITS business process is just now coming to full fruition as the final key components are falling into place. WisDOT has already begun the process of establishing its ITS inventory data and as-built plans in SpatialInfo. Through 2012 as deployment, training, and content updates are completed, the business cycle shown in Figure 1 will fully become an integral, accurate, and efficient underpinning of WisDOT’s ITS program.