Roadway Safety Data Program

OHIO LOCATION BASED RESPONSE SYSTEM

STATE AND LOCAL DATA INTEGRATION

CASE STUDY

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ACRONYMS

AADT	Annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
DOT	Department of Transportation
FDE	Fundamental Data Elements
FHWA	Federal Highway Administration
GIS	Geographic information system
GPS	Global positioning system
HPMS	Highway Performance Monitoring System
HSIP	Highway Safety Improvement Program
HSIS	Highway Safety Information System
HSM	Highway Safety Manual
LBRS	Location Based Response System
LIDAR	Light detection and ranging
MAP-21	Moving Ahead for Progress in the 21st Century
MIRE	Model Inventory of Roadway Elements
MIS	Management Information System
NCHRP	National Cooperative Highway Research Program
NHS	National Highway System
ODOT	Ohio Department of Transportation
OGRIP	Ohio Geographically Referenced Information Program
OIT	Office of Information Technology
RSDP	Roadway Safety Data Program
TMS	Traffic Monitoring System
XML	Extensible Markup Language

EXECUTIVE SUMMARY

Quality data are the foundation for making important decisions regarding the design, operation, and safety of roadways. While crash data have been a consistent element of highway safety analysis, in recent years there has been an increased focus on the combination of crash, roadway and traffic data to make more precise and prioritized safety decisions. The application of advanced highway safety analysis processes and tools requires a comprehensive inventory of roadway safety data combined with crash data to better identify and understand problems, prioritize locations for treatment, apply appropriate countermeasures, and evaluate the effectiveness of the those countermeasures. Comprehensive roadway safety data include information on roadway and roadside features, traffic operations, traffic volumes, and crashes.

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INTRODUCTION

This case study presents the Ohio Location Based Response System (LBRS) integrating State and local roadway data for analysis. LBRS is an initiative under the Ohio Geographically Referenced Information Program (OGRIP), a Governor-appointed GIS coordinating body for State and local government. The Ohio Department of Transportation (ODOT) provides support, technical guidance, and Quality Assurance/Quality Control (QA/QC) services for LBRS and is responsible for integrating the data into the State's LRS to create the official transportation base-map for Ohio. The program provides consistent location referencing for all public roadways. ODOT maintains the statewide roadway inventory database and integrates data owned and supplied by the local agencies.

BACKGROUND

The majority of the public road mileage in Ohio is owned by local agencies such as counties, cities, and villages. Each local agency maintains the mapping data for the local roads in their jurisdiction. Prior to LBRS, the local road maps lacked consistency in how they were created and stored. Location referencing for local roads held to no single standard. In particular, locating crashes on local roads used to be "hit or miss", with higher accuracy crash data provided on the major routes from the Ohio State Highway Patrol but inconsistent location information from local law enforcement agencies. A key problem was the fact that for the most part, local roads did not have a consistent linear referencing system of mileposts. Many local roadway crash reports referenced approximate street addresses, alias street names, or even intersections that no longer existed. Many of the features used to reference a crash location were not mile-posted. Using street addresses as a location reference was a problem because the State road database did not contain any addresses ranges, and the data on local names of the streets was often inaccurate. Given that roughly two-thirds of crashes in Ohio occurred on non-State roads, this was a significant problem for the State in accurately reporting the status of crashes on all public roads.

Additionally, county engineers, auditors, and city officials were spending money independently of each other to develop property and roadway maps of the same areas to their own specifications. The duplication of effort was extensive. The repercussions of having inaccurate and often conflicting map data of various qualities and ages were even worse. Counties developed and augmented their own electronic centerline files, but to various data standards. Staff members at the State and local level saw the clear benefit in working together to create a uniform standard for referencing all public roads.

In response to these issues, the State of Ohio developed a Location Based Response System (LBRS), which establishes partnerships between State and local government agencies for sharing

street centerline data with address ranges. The LBRS gathers accurate locational information on all roads and addresses in a county. The information helps to save lives and save taxpayer dollars by reducing redundant data collection activities. The information is web-based, and is therefore available for all stakeholders as agencies or local governments gather new information. The source data of the local routes is made immediately available for download from the web page, and user-friendly web maps are made available through the site typically within six months of data updates supplied by the local agencies.

The conceptual program development began in 2001. At that time, there were no Federal data requirements that needed to be met. Ohio developed the data specifications and standards for this program in 2004-2005 with a collaborative effort between State and local agencies. They were fortunate that the standards they developed met the eventual MAP-21 requirements for route addressing and road segment descriptions (e.g., division type, cardinality, etc.).

SYSTEM DESCRIPTION AND USE

The primary objective of the LBRS effort was to assign route numbers and address ranges to local roads and milepost the various features, such as intersections, along those roads. Each agency collected the data for their own roads. Although ODOT established the specifications and data standards, the local agencies were responsible for assigning route numbers to each local road and determining milepost ranges for each route. According to the process established by the State, the local agency could number the routes using any numbering scheme they chose, as long as it was organized and consistent. The local agency was also responsible for ensuring correct centerline data and street names. If a road crossed a jurisdiction boundary, it was given a different route number in the other jurisdiction.

A secondary objective, accomplished in some locations, was the collection of basic road inventory data, such as speed limits, school crossings, stop signs, signals, and railroad crossings. This inventory collection was not a required deliverable as part of the LBRS effort, but one particular vendor collected these data for 60 of the 88 counties. These inventory variables are available in the source format, but have not yet been fully integrated into the statewide road characteristics inventory. Additionally, there is not a widespread initiative to maintain and update these local road characteristics annually.

At the State level, the primary use of the improved road centerline and mileposting data is crash reporting and safety analysis. Local road crashes are now placed much more accurately, allowing for better analysis of road safety issues in the counties. These data are also used to certify the official public road mileage. In the past, this certification process was conducted with paper maps. The LBRS allows the process to be digitized. This means that the process no longer requires visiting each county in person to discuss paper maps, but it can be done

through phone calls and emails. This represents significant time savings and has freed up a dozen ODOT maintenance personnel for other tasks.

The consistent mapping and referencing provided by the LBRS is also a benefit to many other State agencies, such as Emergency Management, Department of Natural Resources, Department of Revenue, and Department of Commerce. The advantage is having an enterprise geocoding service which provides all State agencies with a common map and linear referencing system. All data are consistent, field-verified, and maintained by the local agencies. For instance, the Department of Revenue is able to use these data for more accurate distribution of tax revenues.

At the local level, one of the most significant uses of the LBRS data is for better routing for 911 services. In particular, the field-verified nature of the LBRS address ranges provides better accuracy for 911 calls. It also supports next generation 911—an effort by the USDOT Research and Innovative Technology Administration, which requires intelligent street centerlines.

DATA INTEGRATION

The data is first verified at the local level for completeness, consistency, and accessibility. The local agencies make the data available on their server, and the State downloads the data. Most counties provide the data in shapefile (geospatial) format while a few counties use file geodatabases (another spatial format). The State runs its own data checks (e.g., checking for small gaps or overlaps in mileposts between consecutive segments, intersection nodes erroneously indicated at interchange locations, etc.), flags any changes, and discusses them with the local staff. Once the data has been finalized, the State incorporates it into the statewide dataset that is accessible to multiple State and local agencies.

DATA MANAGEMENT PRACTICES

The Transportation Research Board's NCHRP Report 666: Target-Setting Methods and Data Management to Support Performance-Based Resource Allocation by Transportation Agencies defined the concepts of data management, data governance and data stewardship. Briefly, Data Management is the set of practices related to collecting, storing, and preparing data for use (e.g., in safety decision making). Data Governance is the set of standards and practices applied to any data resource to control the quality of the data. Data Stewardship refers to ownership responsibility and control over data including authority for its collection, storage, integration, and use. Regarding data management, the data stewards at the local level are typically staff members in the GIS office or the county auditor or appraiser. Each local agency in Ohio is the owner of its own roadway data. The responsibility of developing and maintaining the route data belongs to the local agency. ODOT maintains the statewide road inventory database and

integrates the data supplied by the local agencies. The State also has the responsibility for checking the data for consistency and accuracy once it is submitted by the local agency.

RESOURCES

The initial LBRS funding plan was for the State and county to share the cost equally. The State identified capital funds to use and gained support for the idea of building capability at the local level with systems to support it. This funding arrangement worked well in counties that were already planning to do a centerline program and for those that recognized the value of having accurate centerlines and addresses. As ODOT began to realize the true value of the system, they started identifying safety project funds to help support the development and increased the State's share of the cost burden, particularly for counties who could not share as much of the cost. In 2008, the program received federal attention and was approved to use Section 408 (NHTSA-administered traffic records improvement grant) funds for the development effort. Additionally, the county engineers association decided to provide funds for local government share. In the end, the development of the LBRS was funded through multiple sources. The estimate of the total spent for the development and initial data collection is around $22 million (total combined from State, local, and 408 funds).

KEY OUTCOMES AND LESSONS LEARNED

LBRS delivered the following key outcomes and products for local agencies, ODOT, and OGRIP:

- Improved location references for crashes on local roads.
- Consistent mapping and data standards for all counties.
- Easy integration into the State roadway database.
- More efficient process for conducting safety analyses.
- Routine updates of State road mile posting and addressing.
- Improved data access for the State and counties alike.

The lessons learned from developing and implementing LBRS are that there can be successful integration of the local road addressing and mile posting into the State system. This integration proved beneficial for a number of State agencies, as well as the local agencies themselves. The process must be based on good communication and interaction between the State personnel who manage the statewide transportation data and the local agencies who collect and maintain the data from their local routes.

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