CHARTING SUCCESS ON THE ROAD

by Jenny Mangelsdorf

Whether you are the frightened parents of an abducted child or someone simply trying to make it through a winter storm to get to work on time, the ability to quickly post Amber[1] Alerts or determine Maryland's fastest, safest roadway is priceless. For more than a decade, CSC has helped develop and upgrade the intelligent transportation system (ITS) Maryland uses for real-time operation of its highway system.

Managed by the Coordinated Highways Action Response Team (CHART)[2], the program's launch marked Maryland's early entry into the ITS arena in the mid-1980s. The program has since evolved into a statewide advanced traffic management system covering more than 500 miles of roadway. The system improves highway safety and operating efficiency and enhances existing system operations, the movement of goods, and emergency weather operations and environmental quality.

CSC has worked with CHART since 1997 when it provided a comprehensive telecommunications analysis of the initially deployed CHART system. Since then, we've supported the system's development, enhancement, and implementation. CSC was the lead developer of the system's operational software, as well as provided systems engineering as CHART overhauled the traffic management system's communications network. We continue to provide CHART with software and business area architecture development, requirements analysis, and validation. We also provide systems analysis and administration, systems engineering, and integration activities for the traffic management system, which was one of the first statewide ITS deployments in the U.S.

CLIENT: State of Maryland's Coordinated Highways Action Response Team

CHALLENGE: Improve real-time operations of Maryland's highway system.

SOLUTION: Develop, enhance, and support one of the first statewide intelligent transportation systems in the U.S.

RESULTS: A statewide, advanced traffic management system that improves highway safety, operating efficiency, the movement of goods, existing system operations, emergency weather operations, and environmental quality.

Intelligent transportation systems

When CSC first helped deploy the redesigned CHART system, we established our reputation for innovation in intelligent transportation systems. CSC used asynchronous transfer mode technology to transfer data in packets over the network and provide multicasting video delivery to State Highway Administration locations. This lets operators view and operate CHART's closed-circuit television (CCTV) traffic surveillance cameras and destination monitors from multiple traffic operation centers throughout the state.

"At the time, CHART was one of the first ITS systems in America to use video multicast capabilities, which let people in different cities view video from cameras located throughout the state," says Darrell Shahin, CSC's CHART principal engineer.

Ten years later, CSC redesigned the video delivery system to use Internet Protocol multicasting over the Maryland Department of Transportation's statewide Gigabit Ethernet enterprise network, which CSC also designed and deployed. CHART now manages more than 200 controllable CCTV cameras, 80 stationary cameras, 90 speed detectors, 150 dynamic message signs, more than 40 highway advisory radios, and two local media video exchange interfaces. It also imports weather and road surface condition data from the state's weather/pavement sensor station system. Additionally CHART distributes video to 300 video monitors/feeds at more than 80 statewide operations centers, which belong to more than 35 operating agencies.

By distributing digital CCTV video, messaging, system alerts, and data to Maryland's Statewide Operations Center, which runs 24x7, and satellite centers, operators can evaluate and post road and weather conditions, provide emergency response, manage traffic flow, and provide travelers with real-time information. CCTV video is also streamed to the CHART Web site, www.traffic.md.gov.

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Integration with existing systems key

"A key hallmark of CHART's network architecture and software was our integration of the client's existing systems," says Shahin. This lets CHART add new technologies to the system and network, while maintaining compatibility with existing infrastructure. This also fosters interagency cooperation by giving the system the flexibility to integrate with systems deployed by other state and county agencies.

To further broaden CHART's data sharing capabilities, the system captures expanded travel time and neighboring-state data via third-party public-private-partnership systems and data.

"Maryland's CHART system is a national leader in regional highway traffic data sharing," says Shahin. "Most intelligent transportation systems were initially deployed on a regional basis, and tended to be isolated from each other. Today there's a growing awareness that we need to share data and coordinate operations between systems, both at the inter- and intrastate level."

In Maryland, the I-95 highway runs through Maryland, Virginia, and Delaware. A bad traffic accident in northern Virginia can impact traffic flows in Maryland and vice versa. A future key improvement, called the data exporter, will enhance the system's ability to make data even more accessible to other organizations using standard Web-based XML data transmission protocols.

"From day one, our goal was to ensure both highway data and video were available to other agencies and the public," says Richard Dye, CHART Systems Administrator. "Today, in fact, we probably share more video with other governmental and private sector first responders than any other traffic system."

From the beginning, CHART also planned on sharing lessons learned from the system's development and all of its design documents — from high-level to detailed design, to the actual source code itself.

"It's available to anyone who requests it," says Dye. "In fact several states have already used our code, including one that has modified part of it, which we then have taken back and used ourselves, saving us development time and money."

Decreasing congestion, increasing revenue

In an effort to decrease traffic congestion and capture revenue, state transportation agencies are looking to high-occupancy and express toll lanes. In Maryland, administrators plan to use CHART's ability to interface with the state's electronic toll collection system to obtain toll rates and display them on dynamic message signs. This will also let operators vary toll rates depending on the amount of congestion in these lanes. (Read the white paper "CHART Systems Engineering Approach" at www.csc.com/CHART.)

Operators already use CHART to automatically post travel times on dynamic message signs, helping motorists make informed, alternate-route decisions and decrease road congestion. Previously, all messages required direct operator intervention.

Making tasks easier for operators, who could be under extreme stress, is an additional feature of CHART that CSC developed.

By building a universal interface for all of CHART's systems, operators only have to access one main menu as opposed to other systems that use a dashboard approach that then directs operators to manufacturer-unique utilities, each with their own brand of controls.

"When we hired CSC, we were contracting a process as much as contracting a company," says Dye. "We wanted to ensure that the company that won the contract would do more than simply look at our requirements, but also tell us if we could build our system better.

"We've been more than satisfied with the quality of CSC's software development," Dye adds. "Just as importantly, we have a partner who has totally embraced the process, to the point that they have taken on CHART's responsibility as if they were state employees. We really appreciate that." ■

[1] AMBER (America's Missing: Broadcast Emergency Response) Alerts are emergency messages broadcast when a law enforcement agency determines that a child has been abducted and is in imminent danger.

[2] The Coordinated Highways Action Response Team (CHART) is a joint effort of the Maryland Department of Transportation, Maryland State Highway Administration, Maryland Transportation Authority, and the Maryland State Police in cooperation with other federal, state, and local agencies.