

VISUAL EFFECT

Although there are many off-the-shelf solutions to increase operational efficiency in the TMC control room, **Ernest L. Mills** discovers that smart people using smart ideas in a smart way can achieve so much more

Illustration courtesy of Innovant/Photos courtesy of HNTB ©Warren Westura





Imagine it's rush-hour and you're driving up a highway ramp in New Jersey when your tire blows, forcing your vehicle into a guardrail. As other road users whizz past your disabled vehicle, you ponder your limited options. Yet, within moments, a police cruiser pulls up, then a tow truck. Before you've fully grasped the situation, you and your car have been delivered from danger.

Such a scenario of response may be idealized, but it represents a daily situation in New Jersey, which in recent years has invested in the technology, facilities and operational culture to revolutionize the efficiency and safety of the state's roadways. The most visible sign of this investment is the state's US\$29 million 28,000ft² New Jersey Traffic Management Center (TMC), located in the town of Woodbridge. Opened in 2008, the Center brought together for the first time professionals from the New Jersey Turnpike Authority, Department of Transportation and State Police. Then it armed them with some of the most advanced traffic management technology available. The results have been transformational. "We've significantly reduced the mean time for removing incidents from the road," enthuses Brian Gorman, director of IT and administration for the Center. "The obvious impact is that the sooner you respond to incidents, the lower the chance for secondary incidents.

"But a major, less easily discerned benefit is in the preemption or reduction of traffic build-up," he continues. The standard metric for peak traffic in the region is that for every minute it takes to clear a traffic-stopping event, the build-up of idling vehicles will stretch one mile. Furthermore, it takes as long as 15 minutes for that single mile of back-up to clear. So, seconds really matter and tight coordination among units – police, fire, towing, maintenance – is critical.

POWER OF PROXIMITY

According to Gorman, the impetus for the creation of a unified TMC came from the merger of the state's Turnpike and Garden State Parkway authorities in 2003. As opportunities for consolidating operations of these two groups were investigated, it became clear that there was an opportunity to do more than save money.

For decades the Turnpike, Parkway and DOT – which covers all other state roads – operated as insulated, vertical operations. They communicated but not in ways realized in a unified environment. They shared information via phone, email or even fax, and at times notices would be issued only after the heart of a crisis had already passed. If a motorist caught in a major back-up was to call one of the authorities to complain, the response may have been 'Sorry, that isn't my road'. People



← If a state is to improve congestion, highways must be operated more efficiently – which starts off in the control room

↓ The new Woodbridge TMC brings separate agencies together for the good of the community



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don't want to hear that – they demand the accountability and coordination afforded by a fusion center approach.

Woodbridge resolves this issue by putting key traffic management professionals, as well as state police dispatchers, in one facility – and in one cavernous room. To create the TMC, New Jersey worked with general architecture and engineering firm, Kansas City-based HNTB. According to HNTB's Anthony Bartello, who led the firm's involvement, the aim from the start was to create a facility that would transform the way traffic was managed in the state. "Working with Brian Gorman and his team, we designed this facility from the user outward," Bartello details. "The entire focus was to create a working environment that would bring about better communication and better decisions." For example, the team's best-practices research uncovered the fact that NASA-style floor layouts in control rooms (i.e. series of long rows all facing forward) can actually create artificial

boundaries between groups – people from the front row never actually interact with the people in the third row. "To create greater synergy among our teams, we organized workstations into pods, and arrayed them around a slightly elevated staging so supervisors are within earshot of all the groups. The turnpike and DOT traffic supervisors are literally shoulder-to-shoulder in this design," Bartello says.

Due to the workplace design, there is a continuous flow of critical information as people take a few steps to confer with other teams, or in an emergency call out to alert a team to a problem. Each of the 42 workstations has a computer, four flat-screen monitors and access to an array of traffic-related data and visual information. Supplementing these are phone and radio communications, which connect staff to one another and to a range of emergency resources, police and maintenance crews – even motorists, who will call to report accidents or inquire about back-ups.

According to Bartello, the Center in Woodbridge has an additional hidden benefit – it is extraordinarily 'green', constructed with 25% recycled metal panels and with a control system that intelligently manages lighting, heating and air-conditioning, and even window blinds to minimize energy use while maximizing the comfort of the traffic teams.

THE WALL

As with many control centers, the most instantly impressive element in the New Jersey Center is the operations room with its massive array of video screens. The state's videowall is 18ft tall by 55ft wide, comprised of 48 integrated DLP video screens. These act as one large computer screen with images extending across individual screen boundaries. The turnpike and DOT have more than 450 traffic video cameras across the state, connected by 440 miles of fiber-optic cable that form a massive figure of eight across New Jersey. Supervisors who control the wall can display video from any of these cameras, as well as being able to control the camera movements. They can bring up a map of the state as a whole, featuring color-coded alerts, or introduce such information as television newscasts of breaking news or weather reports.

The technology behind this swift synthesis of visual information was developed by Activu Corporation, a New Jersey-based software and services firm that focuses on enhanced visualization, information sharing and collaboration for control room environments. Activu is an open, scalable network-based solution that runs on commercial, off-the-shelf hardware. This makes it well suited for the complex systems challenges faced by New Jersey traffic operations, which has accumulated a broad range of highly specialized programs over the decades. Each of these valuable programs does a specific task well. For instance, a program might translate and



← An agency employee works on programming the communications system in the state-of-the-art Data Center below the operations floor of the facility



send data from a traffic volume sensor or a certain type of video camera. The problem is that, until recently, it had been nearly impossible to harness all of these diverse data streams into one, meaningful whole. "Right from the start, Brian [Gorman] made it clear that he wanted to evolve our software in certain ways to meet their needs," explains Paul Noble, Activu's CEO. "We were very open to that idea because, as a company, we believe that technology should be client-driven, not feature-driven. We knew they would take our technology and run with it in a new direction."

INTEGRATION

In essence, Activu acts as a unifying software layer that gets the best from the myriad of other programs used by New Jersey traffic units without requiring that they be upgraded or modified. As a result, Activu allows users to access data without regard to its source – the hardware and software simply put the information in front of you without the need to intellectualize it. In this kind of technology ecosystem, all systems continue to contribute value, whether they are rusty old analog cameras, new IP cameras, news TV, or any variety of sensors or other data sources.

Beyond delivering this functionality, Activu integrated its solution with Verint IP cameras already deployed across New Jersey, which allowed users to pan, tilt or zoom key cameras to get better views of highways – all without leaving the Activu environment. Another client-driven innovation involved the creation of a 'preview' mode, in which users can view their content on local displays without affecting the larger videowall. Activu also customized the solution to allow for 'touring' – a process by which users can view all of their cameras in regular rotation.

VIRTUALIZATION

Perhaps the most unusual aspect of the New Jersey Center is that – although it is a remarkable facility – it also is smart enough to make itself non-essential in an emergency. This 'virtualization' capability, also driven by Activu's software, begins with a fully redundant system on a second set of servers, so that in the event of a disaster, the traffic

When minutes are miles...

Triage is the word Brian Gorman uses to describe what traffic supervisors do in the moments following a roadway accident or other incident. Gorman, the director of IT and administration for the New Jersey Traffic Management Center in Woodbridge, says that supervisors must process information, direct others to act, listen to feedback, respond to change – and communicate with other parties to ensure they can react appropriately. The time it took to perform these tasks – and the implications of a timely response – changed dramatically after the Center brought Turnpike, Parkway and DOT staff together with state-of-the-art technology tools.

Imagine that an incident occurs during peak travel times. If it takes a minute to begin to mitigate the incident, about a mile of back-up will occur. That mile of back-up can take 15 minutes to clear.

Extrapolate that to four minutes and motorists are facing an hour of delay. If more minutes pass, a back-up involving hundreds of cars now perhaps involves thousands, with idling cars generating many tons of CO₂ emissions – and fuming motorists as well.

In the traffic management arena, minutes really are miles...



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control team can switch seamlessly to the back-up system. In addition, punctuating the 440 miles of fiber-optic cable that loops through the state are 120 points of connection, ranging from service plazas to EZ-Pass computer nodes. At any of these locations, a team can set up an emergency control room using laptops. What's more, as the system stores user preferences, when this team connects they will instantly see their information in their preferred views. They

can manipulate the cameras, crop and send screens to colleagues – much as if they were back at their workstations in Woodbridge. According to Gorman, this gives the traffic team the ability to respond to extraordinary events, regardless of the time of day, or even where the skilled staff members happen to be in the state.

LOOKING AHEAD

Gorman reveals that the Center is now investigating two new technologies that may further compress response time and improve public safety. The first is the use of automated response mechanisms that offer staff a set of likely 'actions' based on a traffic scenario. For example, if a truck were to overturn, the computer might suggest that fire, police and cleanup crews be dispatched and that certain key roadway signs above and below the accident point be illuminated to detour motorists. Such automation could help get the message out faster.

Beyond such enhancements, Gorman envisions ultimately moving to predictive traffic tools. By running traffic data through sophisticated algorithms, these tools would tell traffic managers in advance where back-ups are likely to occur, allowing for proactive efforts to mitigate the problems with using the usual array of tools.

Gorman also envisions a future when there is seamless, regional coordination of traffic flow. In essence, by sharing tools and data, traffic managers will be able to help drivers traverse long corridors with minimal disruption. In the northeast, conversations about such regional cooperation are just beginning to overcome many decades of institutional animosities. But Gorman is hopeful, concluding "Good ideas survive." ■

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← **The Activu solution has removed many of the obstacles that previously hindered efficient real-time response**