Prompt, Reliable Traffic Incident Communications

ntimc
National Traffic Incident Management Coalition

NATIONAL UNIFIED GOAL (NUG) FOR TRAFFIC INCIDENT MANAGEMENT

"Improved Incident Communications" is a "motherhood" issue—everyone agrees there is an urgent need to "improve incident communications." But, like "world peace," it's hard to know where to start, because "incident communications" is a broad topic, and so many aspects of traffic incident communications need improvement.

Improved and more coordinated multidisciplinary planning is needed to lay the foundation for improved incident communications. Coordinated response plans create mutual understanding of public safety and transportation responder roles, and mutual expectations about on-scene actions and interactions. When multidisciplinary groups plan together, train together, and exercise together, they develop the strong working relationships that under-gird effective communication.

Incident notification is a hot topic. The issue of who is notified of a traffic incident, and when they are notified, is of broad concern. Prompt dispatch of the appropriate type and level of emergency medical services (EMS) response is a life-or-death issue. "Secondary responders," such as transportation agencies and towers, may not be notified until after the first responders arrive on scene and determine that help is needed. This can have

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Utah Department of Public Safety Officer accessing the advanced traffic management system, which is integrated with law enforcement's CAD system.

Traffic Incident Response Planning

Public safety and transportation agency response to traffic incidents has been mediated more by intradisciplinary tradition and training, and by experience gleaned from multidisciplinary responses, than by organized, well-communicated preplanning. In the United States today, as law enforcement, fire, EMS and transportation responders arrive on an incident scene, regardless of order, they tend to focus single-mindedly on their roles, respectively:

- Traffic flow, crash investigation and scene clearance;
- Hazard suppression and patient extrication;
- Patient triage and care; and
- Roadway management, traffic flow, and scene clearance.

The evolution of the incident command system (ICS) and the National Incident Management System (NIMS) have improved coordinated response to large-scale events. However, response to more common events, such as car crashes involving few patients, rarely benefits from preplanning, or from proactive ad hoc interdisciplinary discussion and planning by commanders on the scene. There have been isolated efforts, such as training programs and standards for safety wear, to better prepare responders for safe operation at traffic incidents.

major ramifications on clearance time. The 9-1-1 system itself, taken for granted by most of the public (although many rural and remote areas of the nation still do not have basic 9-1-1 coverage), is facing unprecedented challenges in responding to calls originating from wireless and next-generation technologies such as voice-over-Internet Protocol (VoIP).

Public notification is an extremely important element of traffic incident management. Notifying motorists in time to divert them from the incident-caused traffic queue reduces incident-related travel delay and congestion, and decreases the likelihood of secondary crashes. While some progress has been made in recent years in real-time traveler information, nearly everyone agrees we have a long way to go.

Emergency routing is a major issue. Responders want and need real-time information advising the best route to and from incident scenes, and motorists need to know how to re-route. Future visions call for widespread use of mobile wireless technology linked to transportation management centers (TMCs). In the meantime, much could be gained by improving the voice communications links among TMCs, emergency response command centers, and the public news media, as well as more widespread use of existing "Smart Response" technologies.

Finally, there's the often-discussed interoperability issue, itself a term with many meanings. After September 11, the need for compatible, interoperable voice communication equipment to connect first responders at incident scenes received needed attention. To law enforcement, fire, and EMS, achieving "interoperability" through access to common radio channels has been a major goal, and some progress has been made with post-9/11 Homeland Security funding to improve public safety radio interoperability. Lack of adequate public safety radio spectrum has been a major issue for many years, and as a result recent FCC action has opened up new broadband spectrums for public safety use. This opens up the vision of a broader "interoperability" beyond voice communications, and beyond the first responders.

With broadband spectrum available for public safety use, it is technically feasible to design interoperable, mobile, wireless voice and data networks to connect all responders (law enforcement, fire, EMS, transportation, 9-1-1 centers, towing and recovery, and others) in real time. At the national level, advisory groups discuss the possibilities of a "network of networks" to connect all emergency responders through mobile wireless networks, but much work remains to create the will to develop such communications networks and to overcome the technical, institutional and funding barriers to greater information- and data-sharing. Strong partnerships among state and local traffic incident responders can foster the close working relationships necessary to development of cross-agency emergency information exchange networks.

The 2005 FHWA / AASHTO "scan" of traffic incident response practices in Europe revealed significantly different practices in some European countries. England, Germany, and The Netherlands have made a commitment to nationwide preplanning, and developed well-communicated standards for response. The Dutch have established a "national directive" for traffic incident management to foster a multidisciplinary responder culture that combines safety, effective scene management, and quick clearance.

The Dutch responders covered by the directive include EMS, law enforcement, fire, transportation, and towing and recovery. The directive establishes the following priorities for on-scene operations: (1) Responder (workers') safety; (2) traffic safety; (3) assistance to victims; (4) maintaining traffic flow; and (5) salvaging cargo and vehicles.

The Dutch directive defines initial safety measures to be followed by all traffic incident responders, regardless of the order of their arrival on scene. First priority is establishing a 100-meter buffer between the scene and on-coming traffic, with the responder's vehicle in a "fend-off" position, and traffic cones set in particular patterns. The directive continues with standards for safety wear, vehicle livery, patient care, and the like. It mandates a multidisciplinary command conference on scene, so that mutual expectations established by the preplanning are enhanced by communication of specifics relevant to the event at hand.

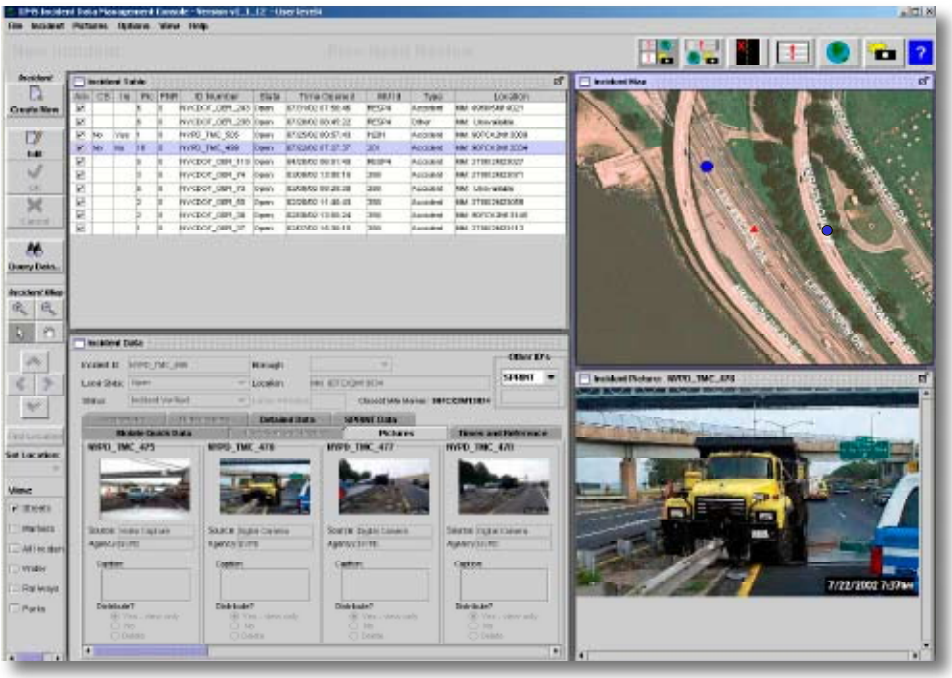
The National Cooperative Highway Research Program (NCHRP) has funded a study to analyze what the United States might learn from incident responder training programs both at home and abroad. While such detailed

standards may not be appropriate for the National Unified Goal (NUG) for traffic incident management, state and regional traffic incident management planners should be encouraged to detail their response plans. The more effective the pre-event communication of expectations, the less likely that radio and other communications will impede response operations. Since no two events will ever be exactly alike, a complete communications plan must be an effective mix of pre-planned communications and on-scene ad hoc communications.

Incident Notification

All traffic incident responders need prompt incident notification with timely and accurate incident information. While incident notification procedures vary from jurisdiction to jurisdiction, in major metropolitan 9-1-1 facilities, notification of traffic incidents occurs through a call to a 9-1-1 center, which then notifies emergency first response agencies—generally defined as law enforcement, fire and rescue, and emergency medical services (EMS). In many rural areas, often the call-taking and dispatch functions are combined.

Transportation agencies and private sector responders, including towing and recovery companies and traffic control companies, generally are not recognized as emergency responders. Consequently, incident notification may not occur at the dispatch center, and may be delayed and haphazard, which slows response times. Towers, for example, complain that there are no standard procedures for notifying towers of an incident to which they are expected to respond. "Last called and first blamed" is a frequent refrain in the towing industry. In cases where transportation officials must be on-scene to



Screenshot from New York City's Integrated Incident Management System (IIMS), which enables NYPD officers to transmit incident scene photos to NYCDOT's Traffic Management Center, speeding prompt dispatch of appropriate responder resources.

manage decisions regarding road or lane closures or openings, or call-outs of towers, notification delays lead to clearance delays. Delay in notification of transportation agencies also causes delays in application of traffic management tools, such as changeable message signs (CMS), traffic signal timing, and traffic surveillance technology.

Co-location of Transportation Management Centers (TMCs) with public safety call-taking and dispatch has solved the notification issue for transportation agencies in some areas, but at a national level this remains a significant issue.

Some states have recognized transportation as emergency responders, with beneficial results. In Oregon, for example, ODOT maintenance personnel are frequently the first responders on the scene at rural incidents, where the public safety agencies have difficulty in providing adequate and speedy coverage. In urban areas, ODOT incident response teams are assigned to specific corridors, with a goal of arriving on scene as soon as possible to negotiate roadway issues with other responders. Statewide, twenty percent of the time, the transportation responders arrive first. ODOT is notified of incidents using the same CAD system that the state patrol uses. Two of three ODOT TMCs, including the statewide traffic management operations center in Portland, are co-located with Oregon State Patrol dispatch. Use of Unified Command principles ensures that roles are understood by all involved.

Still more incident notification policy issues swirl around Automated Crash Notification (ACN) systems (which open a voice link to call centers when a vehicle crashes or when occupants press a call button), and the emerging Advanced Automated Crash Notification (AACN) technologies (which also transmit crash data). At issue is

whether the calls and/or data should go directly to 9-1-1 centers (as the 9-1-1 community advocates), or be routed through private sector call centers where the operators are not trained in 9-1-1 call-taking. Additional legal and privacy concerns surround the routing of crash data, which has the potential to speed the dispatch of appropriate emergency medical resources to the crash scene, and to help hospitals and trauma centers prepare for the arrival of crash victims.

Public Notification

The National Traffic Incident Management Coalition (NTIMC) held "listening sessions" with member organizations in 2006 to learn about stakeholder priorities for improvement of traffic incident management. The issue of public notification of traffic incidents emerged as a major concern. Here are some typical comments:

- "Faster, more reliable incident notification and public information is a major priority for the trucking industry. We need to get incident information to the truck driver at a point where there's still another option—that is, alternative routing to avoid incident-related traffic backup." (American Trucking Associations)
- "NUG themes should include public notification. Communications with the general media should be considered...." (I-95 Corridor Coalition Southern HOGS)
- "The NUG should promote partnering with the news media as a best practice. For example, the United Kingdom has a national media person who broadcasts incident information." (American Trucking Associations)
- "Why can't we have more timely information out to drivers to tell them not only what has happened, but what we want them to do? For example, 'Accident ahead. Move Left and Slow Down.' (Cumberland Valley Volunteer Fire Association/Emergency Responder Safety Institute)

Several stakeholders expressed concern about the delivery of traveler information to drivers via cell phone as a dangerous driver distraction. For this reason, stakeholders voiced reservations about the 511 Traveler Information system, through which many state DOTs provide real-time traffic and road condition information from TMCs to the public. The 511 Deployment Coalition, which coordinates deployment of 511 by state DOTs, is aware of the safety concerns and encourages public information messages to ask drivers not to use cell phones when they are driving; rather to call 511 before they leave home, or to pull over to the side of the road. Many states' 511 deployments also deliver real-time information on the web, and future plans in many states call for delivery by many other mechanisms.

A participant from the trucking industry articulated a strong vision for the traveler information system of the future. While he described a system tailored for truckers' needs, the basic vision would serve all motorists well:

"We need an incident information system that will deliver real-time information without distracting truck drivers. We need timely and critical information to be pushed out to drivers. An ideal system would be where the driver could plug their route in electronically, and get notification when something happens along the route. Notification could go to the dispatcher, or directly to the trucker. It would be easy to obtain information

regarding how to re-route according to weight, route, etc. This would require national coordination so the driver can avoid diverting into yet another incident in the region."

Emergency Routing Information, Coordination, and Communication

Embedded in the traveler information vision for the future quoted above are three resource-intensive capabilities that currently are generally lacking in most jurisdictions: rerouting information, rerouting coordination, and rerouting communications.

Rerouting Information: Pre-planning emergency detour routes, including commercial vehicle routes, is an important element of preparedness for major traffic incidents. The trucking industry would like to see states work together more closely to coordinate alternative routing, and to provide information about restrictions on alternative routes (e.g. tunnels, hazmat, or weight restrictions). Experience gained from previous emergencies or special events can be used to plan the most effective diversion strategies.

Rerouting Coordination: What if there's another major incident on the pre-planned diversion route? Adjusting detour routes to accommodate real-time traffic and road conditions will require integration and fusion of real-time traffic information regionally, interstate, and nationally. While it will take many years to fully fuse and integrate the nation's traffic information system, regional fusion already has taken place in many areas of the country. For example, the I-95 Corridor Coalition was able to effectively coordinate traffic management throughout the corridor from the I-95 Interim Operations (Traffic Management) Center at TRANSCOM (in New Jersey) during the events of September 11. While coordination at that time depended on phone, fax and e-mail, the future promises more automated capabilities.

A glimpse of that future may be seen in the Washington, DC metropolitan region, where a Regional Integrated Transportation Information System (RITIS) is being planned that will compile real-time transportation data from each of the region's transportation agencies. RITIS will feed this information to a soon-to-be developed region-wide entity responsible for improving interagency coordination of incident management among the three state DOT agency partners—Maryland, Virginia, and the District of Columbia. The National Capital Region's Regional Transportation Coordination Program (RTCP) is under development, with initial funding of $1.6 million under the 2005 SAFETEA-LU federal transportation reauthorization legislation. The RTCP program will have three major focus areas: improved technology systems for data sharing; multi-agency coordination of standard operating procedures and notification practices; and improving the quality and timeliness of information provided to the news media.

Rerouting Communications: A final element in the realization of the "traveler information vision of the future" would be a "surface traffic control" communications system, analogous to the aviation industry's air traffic control system, to push critical information out to drivers when they need it.

Media Relations: While it will be many years before "surface traffic control" is fully evolved, much more could be accomplished using existing technology. Strong partnerships with the news media can go a long way toward improving the dissemination of the information that transportation officials already have. For major incidents, it makes sense to designate a spokesperson with responsibility for providing the news media with timely and accurate information. Media relations has been a somewhat overlooked area in the emerging discipline of traffic incident management. Workshops, policy papers, and recommended practices for public communications about traffic incidents should be considered.

CAD-ITS Integration

While DOT TMCs sometimes share information with state highway patrol dispatch centers, it is relatively rare for communications and data to be shared in real time among responders (transportation, law enforcement, fire, EMS, 9-1-1, towers). Yet the technical feasibility of real-time information sharing networks has been demonstrated, and in a few areas of the country, such systems already have been built. With the current emphasis and interest in "interoperability," the public safety interoperability vision needs to be expanded to include integration of Intelligent Transportation Systems (ITS) with public safety computer-aided dispatch (CAD).

Major metropolitan areas in the United States have advanced traffic management systems (ATMS) at the core of their ITS deployments. But ATMS systems generally are not integrated with public safety CAD systems. Most existing CAD systems are proprietary and are not designed to exchange information with CAD systems offered by other vendors, let alone with ATMS. CAD vendors have been generally hesitant to design their systems for easier interoperability. Additional challenges are posed by variations in formats and protocols for data and for messaging, and different system standards in the transportation and public safety communities.

Funding of system integration is of course another major challenge. In 2003, the FHWA sponsored field operational tests of integrated CAD-ITS systems in Salt Lake City and Washington State. A more viable long-term funding model may be to use of a combination of transportation and homeland security funding. Recently, the Oregon Department of Transportation (ODOT) used a $400,000 homeland security grant and a $700,000 Urban Area Security Initiative (UASI) grant to integrate ODOT, the Oregon State Patrol (OSP), the City of Portland's 9-1-1 system, and public safety communications in surrounding counties.

The Cincinnati region also is a leader in the coordinated use of homeland security and justice funding for integrated public safety communications, going beyond voice integration to regional voice and data integration. In 2003, Hamilton County, Ohio implemented a new 800 MHz digital trunk radio system, providing a voice link among emergency medical technicians, firefighters, and law enforcement officers. They then built a mobile data computer network, which includes the County Coroners' Office, the Public Health Commissioners' Office, 44 fire and rescue departments, 44 Hamilton County law enforcement agencies, and tri-state area hospital emergency rooms, and the Emergency Management Operations Center. Thanks to strong regional coordination, all of the agencies agreed to spend about $2.7 million of the region's UASI funds to purchase mobile data computers. At the same time, Hamilton County was implementing a new CAD system, and wanted to integrate it with the region's Advanced Regional Traffic Interactive Management & Information System (ARTIMIS) to exchange real-time traffic data and to obtain video feeds from ARTIMIS' cameras. Again thanks to strong regional coordination, the county was able to secure a Congressional earmark of $700,000 from the Department of Justice's COPS-MORE program to support integration of the new CAD system with ARTIMIS.

On the east coast, the I-95 Corridor Coalition will soon have in place the first link of what could become a fully integrated corridor-wide network. The Hudson Valley Transportation Management Center (HVTMC) is building a comprehensive solution for CAD to CAD, ATMS to ATMS, and CAD to ATMS in the Hudson Valley, NY. The system effectively creates a "center to center" communication backbone, separating CAD and ATMS data and linking them to state and multi-state systems. The system will be located at the HVTMC facility in Hawthorne, NY. The HVTMC has already successfully completed a CAD-ATMS interface using the same principles as a proof of concept. This new project will create a model for the rest of the state, and the I-95 Corridor Coalition, to use in their interface projects.

CAD-ITS integration would not only provide for more coordinated and accurate traffic incident communications at control centers and on-scene; it would greatly facilitate data-gathering related to incident operations, which is in demand as the basis for more performance-based traffic incident management. Data on incident durations, locations, and types would be available in a single consolidated, transportation / public safety database.

Wireless remote laptop

Regional Wireless Interagency Emergency Information Exchange Networks

Voice communications (radio, telephone) are the backbone of the local first responder emergency communications system in this country. But wireless networked technologies are revolutionizing the way Americans communicate in both their personal and business lives. Wireless transmission of text, data, images and video is already commonplace.

As noted in the introduction to this paper, now that broadband spectrum is increasingly available for public safety use, it is technically feasible to build interoperable, mobile, wireless voice and data networks to connect all responders (law enforcement, fire, EMS, transportation, 9-1-1 centers, towing and recovery, and others) in real time.

Sharing information through regional emergency communications networks increases situational awareness and event and resource control. Both at the control center and on-scene, better information makes it easier to monitor the event and manage resources appropriately. Unified Command also is much easier when emergency responders integrate their information and communications systems so that all the responders share up-to-the-minute incident information.

In many if not most cases it is not practical to gain commitment from multiple agencies or jurisdictions to build a new, consolidated, shared in-

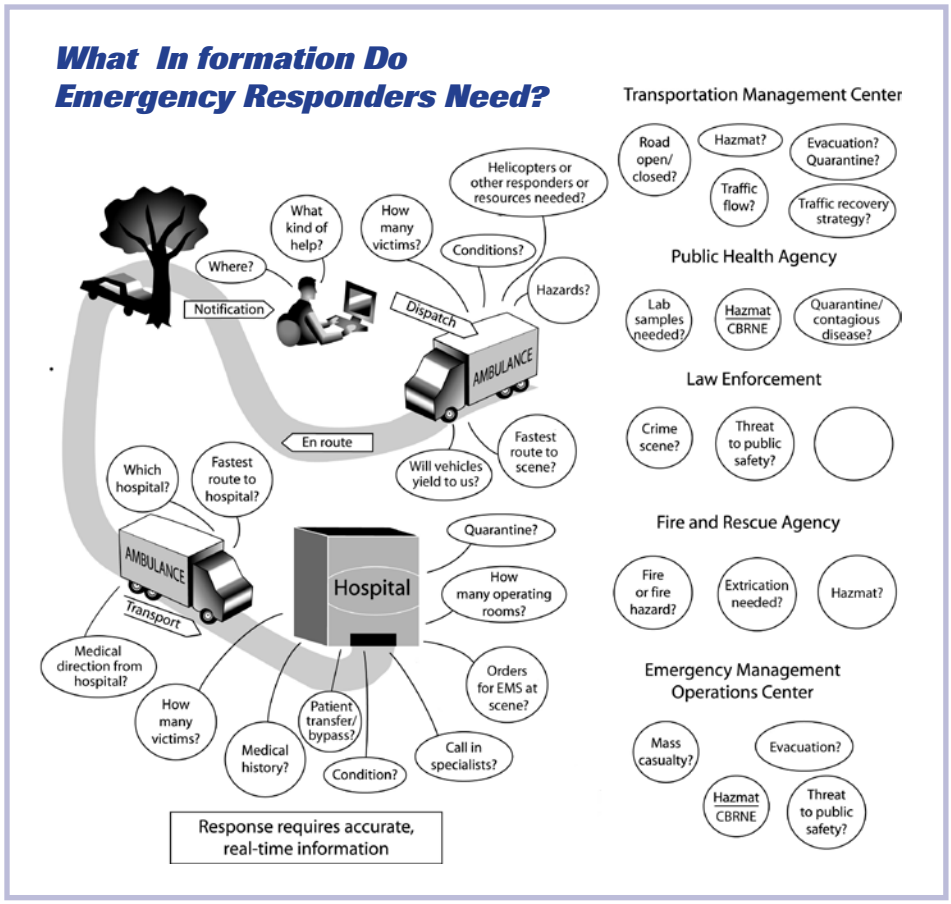


Figure 1: ITS America's Public Safety Advisory Group (PSAG) produced this drawing in 2004 depicting the information needs of various incident responders, and how they might be linked in a real-time wireless cross-agency emergency information exchange network. Such networks would enable a broad range of public safety, transportation, public health, and emergency management agencies to share voice, video, graphic and text data in real time.

formation or communications system or network (although that is exactly what has occurred in New Orleans, post-Katrina). But the idea of a common system architecture and compatible equipment that will permit users to more easily share information or communications capability, as needed, is broadly attractive. In a "network of networks," individual partners maintain their own information and communications networks, but can easily link them to others at the local, state, or national level. The ITS America Public Safety Advisory Group (PSAG), which includes representatives of leading transportation and public safety national associations, has discussed the desirability of a "network of networks" to connect all emergency responders in real time through mobile wireless networks. Many institutional barriers must be overcome to deploy broad-based networks. Leadership is needed to develop models for financing, technology development, data-sharing and privacy protocols.

Figure 1 depicts the user information that each emergency responder might need, which could be provided thorough such a shared "network of networks."

Much work remains to be accomplished if this vision for the future of emergency communications is to be realized. Development of a real-time wireless incident communications network requires the many stakeholders to work together to provide a coordinated suite of standards and open system architectures, in a reasonable time frame. New public policies are required to provide incentives (positive and negative) for standards compliance. Technology users need to be educated about the benefits of broad-scale voice and data interoperability, and encouraged to demand and specify interoperable standards and open architectures. Funding programs ideally would encourage the sharing of networks to save money. At the same time, information-sharing policies need to be developed to address privacy concerns related to sharing of medical and judicial information. Work on common data dictionaries must be coordinated and accelerated, and agreements on common emergency communications terms must be developed.

Next Generation 9-1-1 and the "Network of Networks"

Nationwide, emergency response agencies lack the basic transmission infrastructure to support an emergency communications "network of networks." The National Highway Transportation Safety Administration's (NHTSA)'s Next Generation 9-1-1 Initiative is currently developing a national framework and deployment plan for the Next Generation 9-1-1 System. Part of this effort should be to consider how to upgrade infrastructure to support the entire emergency communications "network of networks." The transmission of text, data, images and video into 9-1-1 centers, and linking 9-1-1

call centers to other emergency responders through regional emergency communications networks, will require a major upgrade of transmission infrastructure. 9-1-1 centers are already struggling to handle calls from wireless phones, because many call centers still do not have the technology necessary to locate wireless callers (this capability is called wireless E9-1-1). In August 2003, 75 percent of Americans lived in areas without full wireless E9-1-1 call location capability. But before the wireless location challenge has been met, another, even more difficult challenge is facing 9-1-1: What happens when a citizen tries to send a text message to a 9-1-1 center? Or tries to call 9-1-1 using a computer (voice-over IP?), or a picture of an incident scene from a cell phone? Most 9-1-1 call centers cannot accept those types of calls. The current 9-1-1 system is based on telephone technology.

Funding for "Smart Response" Technologies

While it may be many years before the vision of cross-agency emergency information exchange networks can be attained, in the meantime much can be gained through additional funding for purchase of state-of-the art information and communications tools for first responders. According to the ITS America' PSAG, here's how incident responders can benefit from ITS technologies:

Monitor the scene remotely: Closed circuit video cameras placed along roadways observe real-time traffic and can assist law enforcement agencies in monitoring red-light runners, aggressive drivers, and criminal activity. When mounted on airplanes or helicopters, cameras can provide live transmission using downlinks to traffic management and public safety operations centers.

Verify the Incident: Closed-circuit video cameras assist in incident verification, which speeds response and assures appropriate asset deployment.

Dispatch the closest unit: Automatic Vehicle Location (AVL) systems track the location of law enforcement, fire, EMS, towing, and freeway service patrol vehicles, so dispatchers can determine which available units are closest to the scene.

Access real-time traffic and travel information: ITS systems use traffic surveillance cameras and traffic and weather sensors to provide real-time traffic and travel condition information. Public safety agencies can "pull" this information into their information and communications systems, so both command center and field units have route guidance based on real-time traffic and travel condition information.

Stop wasting time at red lights: Traffic Signal Priority or Preemption Systems give green-light priority to emergency vehicles passing through intersections.

Signal other vehicles to clear the way: Emergency signaling technologies enable emergency vehicles to transmit a warning to devices in vehicles in their forward path.

Prevent crashes and increase crash survivability: New in-vehicle safety technologies such as seat-belt alarms, driver condition alarms, and crash-worthy construction reduce the changes that responders will be injured or killed on the highway.

Control scene access: Smart Passes assist in controlling access to secure areas and in identifying responders.

Manage incident-related traffic: The TMC can assist responders by adjusting traffic signal controls and changeable message signs to assist in scene access and control, or to manage evacuation and exclusion zone operations.

Access real-time incident information, maps, and databases: Computer terminals in emergency vehicles, or handheld wireless devices provide on-scene responders with access to incident information, route guidance, maps and databases.

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