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16. Abstract

For more than 30 years, traffic engineers have attempted to provide information to travelers about traffic conditions and other occurrences on the roadway network that could affect their journey. The traffic data collected by agencies and its dissemination was, and still is, a necessary tool to help those agencies manage the transportation system to provide the public better service. Recent improvements in traffic sensor and data acquisition methods now allow public agencies to expand the capabilities of their transportation management systems by providing a better representation of the network. By having the ability to acquire better traffic data, each agency has information that is more valuable to itself, to the public, and potentially to provide enterprise than similar information of just a few years ago. However, several procedural and institutional questions arise when an agency contemplates undertaking the acquisition and dissemination of traffic information. To determine how other agencies have answered these questions and to provide a reference to assist in developing policy and procedures, this research project synthesized the state-of-the-practice of traffic information dissemination within the United States by conducting a survey of some of the agencies that are operating traffic management centers and disseminating traffic information. This project also synthesizes the findings.

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OVERVIEW OF THE STATE-OF-THE-PRACTICE IN DISSEMINATING TRAFFIC INFORMATION BY ADVANCED TRAFFIC MANAGEMENT SYSTEMS

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The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Texas Department of Transportation (TxDOT), or the Federal Highway Administration (FHWA). This report does not constitute a standard, specification, or regulation.

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The authors wish to thank the numerous traffic management centers (TMC) professional contacted throughout this study. Any incorrect information given regarding their systems or experience with sharing traffic data is solely the responsibility of the authors.

This research is being performed in cooperation with the TransLink™ Research Center. The TransLink™ Partnership includes the Texas Department of Transportation (TxDOT), Metropolitan Transit Authority of Harris County (METRO), Rockwell International, Southwest Bell-Technology Resources, and the Texas Transportation Institute (TTI).

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INTRODUCTION

For more than 30 years, traffic engineers have attempted to provide information to travelers about traffic conditions and other occurrences on the roadway network that could affect their journey. The traffic information was usually site specific and was generally collected and disseminated by traffic management systems designed for freeway surveillance and control. The traffic information was provided to the motorist via changeable message signs located strategically on the roadway network, by commercial radio station spot announcements, through newspaper bulletins to advise of roadway construction or road closures, and by news-hour TV traffic reports in some of the larger metropolitan areas. The information content provided was designed by the engineers to encourage motorists to alter their trip (e.g., different routing, different time, etc.) in accordance with a traffic management plan to make more efficient use of the road network, and/or to inform the motorist of unusual conditions to reduce their frustration.

The traffic data collected by agencies and its dissemination was, and still is, a necessary tool to help officials manage their transportation system to provide the public better service. In the past, few questions arose concerning whom or how the information should be disseminated since the information available to public agencies concerning traffic conditions was very limited. However, that has changed.

Recent improvements in traffic sensor and data acquisition methods now allow public agencies to expand the capabilities of their transportation management systems by providing a better representation of what is occurring on the roadway network. A traffic management center (TMC) can collect detailed information about traffic conditions and other factors that affect the traveler. Today, this capability is considered an integral part of the government provided metropolitan

infrastructure. The information it provides is a critical element of the scheme to improve transportation through the use of technology, the fundamental concept of the Intelligent Transportation Systems (ITS) initiatives.

By having the ability to acquire better traffic data, the agency has information that is more valuable than similar information of just a few years ago to itself, to the public, and potentially to private enterprise. The improved information is more valuable to the agency because it helps the agency provide better services more efficiently. More complete information has value to the public because it helps them make better decisions about their travel choices before they start their trip, and while en route. Improved traffic information also has the potential of adding value to private sector products when it is combined with other services and/or information.

However, several procedural and institutional questions arise when an agency contemplates expanding its traffic management system technology and undertaking the acquisition and dissemination of improved traffic information. Such questions include: What is the area of coverage? What type of data should be acquired? Should all data that is collected be available for distribution? Whom should the data be made available to? How should it be delivered? Should the data be made available at no cost, or should it be sold? If it is sold, what is the pricing model and what ownership rights transfer to the buyer (and transfer from the seller)? Is this additional data required to do the work the agency is chartered to do, or is the agency expanding their charter? And, a host of other similar questions.

To determine how other agencies in the U.S. are responding to these questions, and to provide a reference to assist in developing traffic information dissemination policies and procedures, TxDOT has undertaken the research presented in this document. The research objective is to develop an overview of the state-of-the-practice for disseminating traffic information by advanced traffic management systems (ATMS) in the United States. This includes systems used for freeway traffic management and systems used for traffic signal system control.

CONDUCT OF THE STUDY

The researchers' principal source of data for this study were interviews of officials with agencies that provide information to motorists as a routine service of their ATMS. The study also included reviewing the world wide web (WWW) pages of agencies that are disseminating traffic information via the Internet. Since the research emphasis was on understanding the information dissemination activities that are occurring relative to expectations unique to the United States, interviews were not conducted with foreign agencies.

The interview surveys were conducted to determine what information was provided by ATMS, the means used to disseminate the information, whether agreements existed concerning use of the information by other parties for value added purposes, and to inquire whether the agency had encountered any sensitive issues with the collection or dissemination of information by their ATMS. No attempt was made to inquire about, or to evaluate, either the effectiveness of the information disseminated or the techniques and technologies used for its distribution. A questionnaire was developed to help guide the interviews and is presented in the appendix.

Although there are TMCs within almost all of the urban areas of the U.S., and in some areas there are mulitple centers operated by different agencies, time and budget constraints required that the survey be limited to a representative sample. The following process was used to select the survey sites.

A precursory review of the attributes of TMCs in the 75 major urban areas was made to provide a basis for selecting the sites to be surveyed. This review was made based on available data which was not verified by the agency and, therefore, the summary statistics may be outdated. However, the information provided is more than adequate for the purposes of providing comparative data for survey site selection purposes. A summary of the traffic information dissemination components for the centers in the major urban areas was developed and is shown in table1.

Table 1. Summary of Metropoitan Area Traffic Management Centers and Their ATIS Components

						Information Distribution Method														
Location		Agency	Type	Mile/ Signal	Year	VMS	Lane Sign	HAR	Radio	Kiosk	TV	Cable TV	Call in	Dial in	Cell Tel	Pager	FAX to Media	Inter-nal Tel	WWW	Other
Phoenix TOC	AZ	ADOT	FMC	42	1995	29			Yes										Yes	
Phoenix TMC	AZ	City	TSS	480	1975															
Mesa TMC	AZ	City	TSS	255	1988															
Fresno TMC	CA	Caltrans	FMC	347		20		10												
Los Angeles TMC	CA	Caltrans	FMC	750	1970	67		10				1	1						Yes	Traffic Vision (21)
Orange County TMC	CA	Caltrans	FMC	258	1995	33		2	5	2		1								Calif. Info. Network
Anaheim TMC	CA	City	TSS	212	1988	Yes		Yes				Yes		Yes					Yes	
Los Angeles ATSAC	CA	City	TSS	1855	1984	7														
Pasadena TMC	CA	City	TSS	280	1992	9		1												
Long Beach TMC	CA	City	TSS	281	1985															
Smart Corridor	CA																			
Sacramento CHP/TMC	CA	Caltrans/	FMC	41													Yes			
Sacramento TOC	CA	City	TSS	250	1996															
San Jose TOC	CA	City	TSS	540	1994	9		2												
San Francisco/Vallejo TOC	CA	Caltrans	FMC	118	1997	30		2					2							TRAVINFO
***TRAVINFO	CA	Caltrans-Pvt.-see above																		
San Diego TOC	CA	Caltrans	FMC																Yes	
San Diego TMC	CA	City	TSS																	
Colorado TOC	CO	CDOT	FMS	7	1996	16		8	12		1	Yes	2				1			
Denver TOC	CO	CDOT	FMS		1982															
Newington Ops.Ctr	CT	Conn DO	FMC	18/300	1996	27		2	Yes									Yes		
Bridgeport Ops. Center	CT	Conn DO	FMC	56		44			Yes									Yes		
Hartford TMC	CT	City	TSS	200	1988															
Jacksonville TCC	FL	FDOT	FMC	113	In design															
Golden Glades (FI) Interchange	FL	FDOT	FMC	32	1996				4											
I-595 (FI) CMS System	FL	FDOT	FMC	20	In de															
Pompano TOC (Ft. Lauderdale)	FL	FDOT	FMC																	
Orlando I-4 SMIS	FL	FDOT	FMC	39	1994	22			Yes											
Orlando TMC	FL																			
Seminole County TMC (Orlando)	FL		TSS	89																
Tampa Sunshine Skyway Bridge	FL	FDOT	FMC	9	1990	6			Yes											Remote Stop Sigs. (2)
Atlanta TMC	GA	GADOT	FMC	50	1996	41		12		140		Fut.	1	2				1	Yes	
Honolulu TMC	HI	City	TSS	300								Yes								
Honolulu TMS	HI	HDOT	FMC	44	In design															
Chicago TMC	IL	IDOT	FMC	136	1970	20		11	Yes			Yes	Yes	Yes	Yes	Yes			Yes	
Borman Expwy. TMC	IN	INDOT	FMC	3	1996	12		4												
New Orleans TMC	LA	City	TSS	38	1996															
Boston Regional TOC	MA	MA DOT	FMC	8	1996	Yes			Yes						Yes				Yes	SmarTraveler
****SmarTraveler	MA	Pvt.-see above							Yes		Yes	Yes	Yes		Yes	Yes			Yes	America Online
MD CHART SOC/TOCs	MD	MD SHA	FMC	500	1995	60		44	20				yes							
Montgomery County ATM	MD	County	TSS	650	1994	Yes		2				Yes							Yes	
I-95 Coaliation	ME-VA		ATIS																	

Table 1. Summary of Metropoitan Area Traffic Management Centers and Their ATIS Components (Continued)

						Information Distribution Method														
Location		Agency	Type	Mile/ Signal	Year	VMS	Lane Sign	HAR	Radio	Kiosk	TV	Cable TV	Call in	Dial in	Cell Tel	Pager	FAX to Media	Inter-nal Tel	WWW	Other
Detroit MITSC	MI	MDOT	FMS	33	1980															
Oakland County TOC	MI	County	TSS	506	1996							Yes								FAST-TRAC
Minneapolis TMC	MN	MnDOT	FMC	160	1970	50		Yes	Yes			Yes	Yes							
St.Paul TMC	MN	City	TSS	340	1992															
Minneapolis TCC	MN	City	TSS																	
Kansas City	MO																			
St. Louis TMC	MO	MHTD	FMC	134	In de			4												
CARAT	NC	NC DOT	FMC	15	u/c	15		4												
Charlotte TCC	NC	City	TSS	410	1985	1	Yes													
Greensboro TMC	NC	City	TSS	300	1994	Yes		Yes												
Greensboro FMC	NC	NC DOT	FMC	27		16		1					1							
Winston-Salem TCC	NC	City	TSS	300	1995															
Winston-Salem FMC	NC	NC DOT	FMC	41		14		2	Yes								Yes			
Raleigh TMC	NC	City	TSS	400	1996															
New Jersey Turnpike	NJ	NJTA	FMC	44	1970	Yes		Yes	Yes				Yes							
NJ MAGIC	NJ		FMC	92		Yes		Yes												TRANSCOM
North NJ TOC	NJ	NJ DOT	TSS		In design/const.															
Las Vegas Traffic System	NV	City	TSS	472	1984															
McCarran Fwy.MgMt.(Las Vegas)	NV		FMC	5		20	42	Yes					Yes							
TRANSCOM	NY		ATIS																	
White Plains TCC	NY	City	TSS	96	1994															
NY City TOC	NY	City	TSS	6000	1970															
INFORM - Long Island	NY	NYSDOT	FMC	34	1985	100			Yes	Yes	Yes	Yes		Yes			Yes			
Cincinnati ARTMIS	OH	OH/KY D	FMS	88	u/c				10 rpts/day				2							
Columbus TMC	OH		FMS	115	u/c				Yes											
Kettering TMC	OH	City	TSS	72	1994															
Portland TMC	OR	OR DOT	FMC	103		4			3				3							
Philadelphia TIMS	PA	PA DOT	FMC	12	Unde	4														
Providence TOC	RI	RI DOT	FMC			Yes							Yes							
Charleston	SC	SC DOT	FMC	7		6														
Charleston	SC	City	TSS	180	1990															
Ft.Worth TMC	TX	City	TSS	240	1987															
Ft. Worth TxDOT SOC	TX	TxDOT	FMC	13		21			2				1							
Dallas SOC	TX	TxDOT	FMC		u/c	13							1							
El Paso FMC	TX	TxDOT	FMC	65		13														
Houston TranStar	TX	TxDOT	FMC		1996	Yes			Yes	Yes				Yes					Yes	Display at Activity Ctrs.
San Antonio TransGuide	TX	TxDOT	FMC	57	1995	48													1	Low Power TV
Salt Lake City TOC	UT	CITY	TSS	220	1983															
Va. Beach/Hampton Rds. TMC	VA	VDOT	FMC	19	1996	Yes			Yes				Yes	Yes						
Va. I-64 Tunnel/bridges-3 Systems	VA	VDOT	FMC	17		142		6					Yes							
Norfolk TMC	VA	City	TSS	100	1989															
Va. I-66/395 TOC	VA	VDOT	FMC	22		100		Yes				Yes								

Table 1. Summary of Metropolitan Area Traffic Management Centers and Their ATIS Components (Continued)

						Information Distribution Method														
Location		Agency	Type	Mile/ Signal	Year	VMS	Lane Sign	HAR	Radio	Kiosk	TV	Cable TV	Call in	Dial in	Cell Tel	Pager	FAX to Media	Inter-nal Tel	WWW	Other
No. Virginia	VA	VDOT	FMC	155	1994			5	Yes			Yes	Yes							
Seattle, TSMC	WA	WA DOT	FMC	91		43		7	Yes	2		Yes	4						Yes	
Bellevue TOC	WA	City	TSS	137	1987															
Seattle TMC	WA	City	TSS	875		3														
Milwaukee MONITOR	WI	WI DOT	FMC	33	1995	14			Yes				Yes	Yes			Yes			
Legend																				
ARTMIS	Advanced Regional Transportation Management and Information System																			
ATIS	Advanced Transportation Information System																			
ATM	Advanced Traffic Management																			
ATSAC	Automatic Traffic Surveillance and Control																			
CARAT	Congestion Avoidance and Reduction for Autos and Trucks																			
CHP	California Highway Patrol																			
FMC	Freeway Management Center																			
HAR	Highway Advisory Radio																			
INFORM	Information for Motorists																			
Mile/Signal	Number of freeway miles or number of traffic signals																			
MITSC	Michigan Intelligent Transportation System Center																			
Ops. Ctr.	Operations Center																			
SMIS	Surveillance and Motorist Information System																			
SOC	Satellite Operations Center																			
TCC	Traffic Control Center																			
TCMC	Traffic Control Management Center																			
TIMS	Traffic and Incident Management System																			
TMC	Traffic Management Center																			
TOC	Traffic Operations Center																			
TSMC	Traffic System Management Center																			
TSS	Traffic Signal System																			
VMS	Variable Message Signs																			
WWW	World Wide Web																			

The list of 89 centers in 75 urban areas shown in table 1 was narrowed to a short list of centers that appeared to be the most heavily involved in information dissemination. Sites were assigned to the short list based on a number of subjective factors which included how long the center had been providing information, the diversity of devices used to disseminate information, personal knowledge of the researchers about the activities the sites were involved in, and other factors. The selection from the short list to the final list of sites to be interviewed was biased toward freeway and traffic signal ATMSs that were recognized by sources within the transportation field (e.g., FHWA's regional reports to TRBs Freeway Operations Committee, etc.) as having an aggressive information dissemination program. As the interviews progressed, the list of sites to be surveyed was revised to include centers whose information dissemination was more diverse and reflected a broader regional perspective than that of the traditionally defined freeway and signal system ATMSs. The sites interviewed are shown in table 2.

Table 2. Agencies Interviewed

Location/System	System Description
Boston Massachusetts DOT Integrated Project Control System/Boston SmarTraveler	ATMS for freeway surveillance and control for Central Arterial/Tunnel and related freeways.
Capital Region (Washington, D.C. Area) Capital Region Traveler Information System	Regional transportation information system.
Chicago Illinois DOT Traffic Systems Center	ATMS providing freeway surveillance and control for the Chicago metropolitan area.
Cincinnati Advanced Regional Transportation Management and Information System (ARTMIS)	ATMS providing freeway surveillance and control for the Cincinnati/Northern Kentucky metropolitan area.
I-95 Coalition Information Exchange Network (IEN)	Transportation information exchange and coordination among 12 northeastern states.
Long Island, NY Information for Motorists (INFORM) System	ATMS for northern Long Island providing freeway surveillance and control, and arterial street traffic signal system control.

Table 2. Agencies Interviewed (Continued)

Los Angeles City of Los Angeles Automated Traffic Surveillance and Control System (ATSAC)	ATMS for surveillance and control of traffic signals in Los Angeles.
Montgomery County, Md Advanced Traffic Management Center (ATMC)	ATMS for surveillance and control of traffic signals in Montgomery County.
New York City Tri-state Region TRANSCOM	Roadway construction and traffic information coordination agency.
Seattle Washington DOT Traffic Systems Management Center (TSMC)	ATMS for freeway surveillance and control in the Seattle metropolitan region.
Northern Virginia Northern Virginia Transportation Operations Center	ATMS for freeway surveillance and control in the northern Virginia/Washington, D.C. metropolitan region.
SmartRoutes Systems	Private sector information service provider (ISP).

SURVEY OF ADVANCED TRAFFIC MANAGEMENT SYSTEMS

The following is a summary of the agency interviews performed by TTI. The description includes a summary of the information and how it is disseminated, a description of information the TMC may regularly receive from other agencies and how it is used, the TMCs data archiving policies, any privacy issues or considerations that have arisen, and a discussion of policy related matters. Most of the interviews were performed in March 1997.

Boston - Massachusetts DOT Integrated Project Control System/ Boston SmarTraveler

The Integrated Project Control System (IPCS) that is being constructed as part of the Central Artery/Tunnel Project is the principal ATMS in Boston and will not be fully operational for some time. The ATMS related traffic information dissemination in the area is performed in conjunction with the Massachusetts Highway Department by SmarTraveler, an ATIS developed and operated by

the firm SmartRoute Systems. The service covers approximately 700 miles of roadway in the greater Boston area.

Summary of Information Disseminated

SmarTraveler became operational in 1993. The service provides location specific traffic and transit data to the public via telephone. Traffic information includes a description of traffic conditions, incidents, road conditions, estimated travel times, and construction. Current condition descriptions are given for commuter rail, subway, bus, Logan airport, etc. and transit schedule and fare information is available.

SmarTraveler also disseminates Central Artery/Tunnel construction information and construction traffic conditions via telephone. This traffic information is generated manually.

Information similar to that described above is also disseminated via the WWW. Refer to the Internet section of this report for a description of the web site.

Direct communications links with commercial television and radio stations and with WWW on-line services (America On-line) are used to provide traveler information. Other entities SmartRoute, the firm operating the system, provides information to are considered proprietary.

Non Control Center Generated Data

Boston SmarTraveler maintains telephone contact with enforcement agencies and fire departments in the region. Information is also obtained via telephone from other sources. All verified traffic related data obtained from these sources is disseminated.

Data Archiving

Data is not archived.

Privacy Considerations

No privacy issues have been raised. CCTV is not currently available for dissemination.

Policy

Current activities and payment are specified by a detailed contract between Massachusetts DOT and SmartRoute. Upon completion of the Central Artery/Tunnel Project, it is anticipated that a new contractual arrangement will be developed.

Capital Region Traveler Information System (CRTIS)

The Capital Region Traveler Information System (CRTIS) for the Washington, D.C. metropolitan area is neither an ATMS nor is it operational. However, it is of interest to this review as it is one of several advanced transportation information system (ATIS) models that exist or are being formulated. The CRTIS is one of the two components of the Capital Beltway ITS Showcase Project. The second Showcase component is a regional transportation management system. Twenty-eight public and private organizations are participating in the Showcase Project. Battelle is the overall systems manager. TRW is the principal system designer/developer and operations of the CRTIS will be performed under subcontract to TRW by SmartRoute.

Discussion of Information Acquisition and Disseminated by the Transportation Information Center (TIC)

Battelle has assumed principal responsibility for the data fusion and dissemination. Currently they are working out the agreements with private parties to define the information to be provided by the Transportation Information Center (TIC) and the costs which will be incurred. Battelle's project focus is on the business side and the delivery systems needs.

TRW, one of the team participants, more concerned with the technical side. TRW is defining the data formats and protocols for data to be supplied from traffic control systems. They are approaching this task assuming that traffic control systems in the past were not designed to provide either all of the data needed or data in the proper format. It is also assumed that most of the data needed does not come from a traffic detector.

Virginia Department of Transportation (VADOT) is in the process of upgrading the Northern Virginia Transportation Operations System and will attempt to accommodate TRWs needs. However, for other traffic management systems in the Washington metropolitan area it may not be possible for the agency to provide the data in the form desired. The Showcase Program does not provide funds to upgrade these systems. On the other hand, there is no requirement that the agency do so to continue as a participant in the project.

TIC does not depend on agencies providing data on an exclusive basis. There are no restrictions on the agencies use of their data. No payment will be made for public agency data. The public agencies, however, may end up as a customer of the TIC. TIC information may be made available to the agency at no cost for the agency's internal use, but the agency cannot use the information for release to the public.

Public funding to the TIC and the Showcase Project will end in three years. After that it must become self-supporting.

Chicago - Illinois DOT Traffic Systems Center

The Illinois Department of Transportation (IDOT) is a pioneer in the use of technology for traffic management. IDOT has operated a freeway surveillance and management system in the Chicago metropolitan area for more than 35 years. The instrumented system currently encompasses 136 centerline miles of freeway and is being expanded to bring the total to more than 150 centerline miles.

Summary of Information Disseminated

IDOT initially distributed traffic information from the traffic systems center (TSC) to the public via commercial radio stations. IDOT accomplished this by providing verbal information to radio station personnel that called into the center.

In 1974 the TSC service was expanded to provide printed reports that showed the congested freeway links. This report was generated by the surveillance computer logging the location of roadway traffic sensors whose volume and speed relationship data met or exceeded the congestion criteria. The report was automatically updated every five minutes. In essence, the report was a printed version of the freeway links that would be displayed in red on the TSCs display map. The report was available to the public either via a dial-in computer connection or through a dedicated telephone line, with the latter being the more common access method used by radio and television stations.

Today, commercial radio and television stations continue to receive traffic data from the TSC as described above. The information reported that is generated from the traffic sensors by the surveillance computer has been expanded to include the limits of congestion on the freeway and the estimated travel time for trips between various prominent locations 10 to 20 miles apart.

IDOT also disseminates this information to the public using highway advisory radio (HAR). The information derived from the traffic sensors is automatically digitized and broadcast by 11 transmitters strategically located in the area. Two frequencies are used. Frequency 1610 provides the congestion limits and 530 gives the estimated travel time. Although the information is regionwide, flashing beacons located near the transmitters are illuminated if some of the broadcast information concerns traffic condition in the vicinity.

IDOT also disseminates a color graphics display of the sensor data described above to all via the WWW. Refer to the Internet section of this report for a description of the web site.

Twenty variable message signs are used to provide information of localized interest to motorists. The signs are used to provide information on incidents of all types, traffic congestion, lane closures, etc.

IDOT uses CCTV only to verify clearance of a reversible roadway section. The video is not shared with others. IDOT does not anticipate undertaking a program to add CCTV surveillance as they believe much of the function served by CCTV is provided through their motorist assistance program and the cellular *999 telephone service.

Non-TSC Generated Data

Besides the data acquired directly by the TSC, they have access to information from the *999 cellular telephone call-in service currently operated by the Illinois State Tollway. Most of the data provided by the service pertains to incident management and is not directly disseminated.

IDOT will have access to the traveler and video information that will be available from the information sharing component of the Gary-Chicago-Milwaukee Priority Corridor. A design study is underway to develop a three state Corridor Transportation Information Center (C-TIC) and to define policies for information sharing among agencies and the public including information service providers (ISP).

Data Archiving

IDOT archives summarized sensor data. The data is used for planning and trend analysis.

Privacy Considerations

IDOT has not experienced any privacy related issues due to information dissemination. This is principally due to the fact that they do not share video images with others.

Policy

In the past, consideration was given to selling the data disseminated from the TSC. IDOT concluded that the information that could be provided from the TSC must be available at no cost to anyone that wants the data. The subscriber is required to pay any costs that are required to bring the communications line into the TSC, the cost of any equipment or software needed (there are ample ports available on the surveillance computer) on both ends, and the monthly communications cost. IDOT requires that a value added subscriber, such as an ISP, acknowledge that the IDOT traffic data is free and that what the customer is paying for is the repackaging of the data.

The financial aspect of public agency information dissemination may be raised again within the context of the Priority Corridor C-TIC. However, the TSCs current policy concerning this matter is not expected to be affected.

Cincinnati - Advanced Regional Transportation Management and Information System

The Kentucky and Ohio Departments of Transportation have formed an association to construct and operate a regional transportation management and information system in the Cincinnati metropolitan region. The system, which is just coming on-line, encompasses almost 50 centerline miles of freeway.

Summary of Information Disseminated by the TMC

Dissemination of traffic information from the TMC began summer 1997. The operation of the TMC and the dissemination of traffic information is performed by SmartRoute under a subcontract with TRW. Traffic data collected at the TMC is used by SmartRoute to develop traffic information and SmartRoute acts as an information service provider (ISP) and provides the information to others for a fee. Information is provided to commercial radio and television stations.

The information consists of incident related data, congestion locations and limits, and live video feeds from traffic surveillance television cameras. SmartRoute has entered into a contract with one television station and discussions are underway with two other stations. Traffic information is provided from the TMC via a traffic advisory telephone service operated by SmartRoute. Traffic information will also being provided via variable message signs; 30 in Ohio and 10 in Kentucky.

Non-TMC Generated Data

SmartRoute is anticipated to use traffic information sources other than those located in the TMC. However, details of these sources are not available at this time.

Data Archiving

Archiving of traffic and video data has not been addressed.

Privacy Considerations

There are no known concerns about privacy issues.

Policy

Ohio and Kentucky have adopted an information policy statement regarding acquisition and dissemination of ARTIMIS information. The policy states that travel data and information provided by the system directly to the traveler (e.g., CMS, HAR, traffic advisory telephone) is free of charge. The policy provides for access to all information gathered by publicly funded equipment is available to information service providers at the same cost (30 percent of gross revenues) as it is made available to the system operators (TRW and SmartRoute) under a change order to the systems integrator contract. A copy of this policy is included in the appendix.

I-95 Coalition - Information Exchange Network

The I-95 Coalition is an association of government agencies from Maine to Virginia along the I-95 corridor. It was formed in 1992, and is comprised of 26 principal members (12 state departments of transportation, 12 toll authorities, New York City, the District of Columbia, and the U.S. Department of Transportation) and numerous participating political subdivisions and private organizations. The goal of the Coalition is to "...serve as a unifying force coordinating a seamless, state-of-the-art, multimodal transportation system serving...the corridor." The I-95 Coalition's Information Exchange Network (IEN) facilitates this goal by providing for the exchange of information among agencies, but it does not perform a direct traffic management action.

Summary of Information Disseminated by the IEN

The IEN acquires, aggregates, and disseminates information between government agencies. The principal thrust is having and disseminating information necessary for effective incident management in the corridor. Besides the information normally associated with an incident, IEN provides the appropriate contact list, management skills available, resource descriptions and locations, emergency services descriptions, and other management information.

Currently, all information is available to all users. A filtering technique is being developed to allow an agency to access only information of interest. The network is structured to provide information on: 1) the facility, 2) local jurisdiction, 3) the region, and 4) the corridor. Each agency is responsible for creating and maintaining their information at the facility level. Integration of other systems that the Coalition members may operate into the IEN is the agencies' responsibility, not that of the IENs.

Non-IEN Generated Data

The IEN receives all information from members.

Data Archiving

Dynamic data (incident, etc.) is not archived. Static data (name lists, telephone lists, etc.) is backed up in accordance with standardized backup procedures established by the IEN that specify the frequency and type of backup to be performed so that the system can be restored in the event of a crash.

Privacy Considerations

No privacy issues have been raised.

Policy

An agreement exists between the I-95 Coalition members and associates.

Long Island, New York - Information for Motorists (INFORM)

The INFORM system performs traffic surveillance and management on a 35 mile corridor extending from New York City along northern Long Island. The system provides freeway traffic management for the Long Island Expressway (I-495) and the Northern State Parkway, and performs monitoring and control of traffic signals on Jericho Turnpike. One of INFORMs initial objectives was to balance traffic flow on the three parallel facilities.

Summary of Information Disseminated by INFORM

INFORMs primary method of disseminating traffic information to the public is through 104 variable message signs located on the freeway and approaching arterial streets. The signs provide information on traffic conditions, incident conditions, and roadway conditions in the vicinity of the sign. Information includes lanes closed, limits of congestion, and a qualitative delay indication (e.g., long, very long, etc.).

Incident information, congestion limits, road conditions, and information on other events are distributed to about 20 radio stations, businesses, and traffic services (Metro and Shadow Traffic) via facsimile. The transmissions are tailored to each recipients needs (e.g., provide only during the rush hour, provide on a 24-hour basis, etc.).

A computer graphic display map of the INFORM roadway network, referred to as VTIP, is used by about 40 subscribers. The mapping software is provided by NYSDOT for the subscriber's PC. The subscriber accesses INFORMs real time traffic sensor average speed data via dial-in and dedicated telephone. This data causes the subscriber's PC display map of Long Island to show the average link speed on the roadway by the use of different colors. A second display page provides the subscriber information about incidents or other traffic related information. VTIP functions either as a one time snapshot if a dial-in connection is used, or as a display that is updated once per minute if a dedicated phone line is used.

A live video feed of INFORMs traffic surveillance cameras is provided to television cable channel 12. This service is available to other channels, but has not been requested.

A 1-800-ROADWORK call-in telephone line is provided to advise the public of construction in the corridor. The ROADWORK service is updated twice a day by INFORM operators. It includes a program that searches for conflicting construction activities that would adversely affect traffic. When conflicts are identified, the field construction engineers are advised of the conflict by INFORM operators so that mitigating measures can be developed.

Traffic data is also provided by INFORM to the I-95 Coalitions IEN, and to TRANSCOM.

Non-TMC Generated Data

INFORM does not have direct access to other data sources. They have a good working relationship with regional enforcement agencies which will telephone or radio INFORM about traffic incidents or bad road conditions. INFORM uses the enforcement agency data to assist in developing

information to be disseminated to the public. INFORM also receives information from various agencies via telephone and facsimile. This information may or may not be disseminated to the public.

Data Archiving

Fifteen minute summaries of traffic sensor volume, speed, and occupancy data is archived for three to four years. Video data is not archived.

Privacy Considerations

Issues of privacy invasion have not been raised. However, stops were installed on the pan and tilt mechanisms of television cameras at locations believed to be sensitive to ensure that the cameras view only the roadway.

Policy

The VTIP and dial-in services are provided to anyone that wants to be a subscriber. The subscriber is provided with software and data at an annual fee of $200. The subscriber must also pay for the installation of the telephone line, communication equipment, and monthly communications cost. The department chose to charge a modest annual fee to limit the service to users with more than a casual interest.

As mentioned, a live video link will be made to any television provider that requests it. A fee will be charged for the connection. The agreement with channel 12 (which has expired) specified that NYSDOT would be provided some number of 10 to 30 second slots of air time. This was determined to have a value of about $60,000 per year if fully used by the department.

The department has investigated the feasibility of providing data on an exclusive basis to a private sector information service provider and charging for the data. To do so would require that the NYSDOT broadly solicit requests for proposals from the public, evaluate and select the best

proposal, and enter into a contract. The department's current position is that the information is available on a non-exclusive basis.

The department has a policy that sign messages are to be reviewed periodically for content and usage by the INFORM Sign Committee.

City of Los Angeles - Automated Traffic Surveillance and Control System

Los Angeles installed their Automated Traffic Surveillance and Control System (ATSAC) for traffic signal control in 1984 and the system now orchestrates the operation of almost 3000 traffic signals. The system includes an extensive implementation of vehicle detectors which is used in conjunction with computer generated color graphics displays to depict traffic conditions on the arterial street network. This information is used extensively by city engineering personnel and is shared with Caltrans District 7 personnel as part of the Smart Corridor Demonstration Project. However, the city does not disseminate traffic information to the public on a routine basis.

Montgomery County, Maryland - Advanced Transportation Management Center (ATMC)

Montgomery County, Maryland operates an Eagle MONARCH computerized signal system that provides centralized control of about 650 traffic signals. Although signal systems do not normally acquire traffic data suitable to derive traffic information of interest to the public, Montgomery County supplemented the signal system's surveillance capabilities and has developed an advanced transportation management center (ATMC) that disseminates traffic and other information.

Summary of Information Disseminated

The ATMC is involved in directly providing transportation related information to government agencies, to the media, and to the public. The ATMCs role as an information provider was formalized about six years ago by providing traffic information to commercial radio stations via

telephone dial-in. This service was expanded to report information via text messages on cable 55, the county's public access channel. The information includes traffic incident information, road conditions, weather, roadway construction, and special events.

From the ATMC, the county prepares the information described above as well as other traffic related public interest information in a text format. The text information is then automatically digitized and provided on the secondary audio capabilities of cable TV channel 55. The audio reports are also transmitted to the public via HAR. To "fill in the gap" between information provided to the public at home or their place of business, the county is pursuing the purchase of an existing 1000 watt radio station that will serve the 650 square mile region.

In addition to the reports described above, the county currently provides live video feeds from its traffic surveillance cameras (stationary and aircraft) to all radio and TV broadcast stations. This information, expanded to include transit information, is also available via the WWW. Refer to section 3 for a description of their web page. A pilot project is underway to evaluate the effectiveness of providing similar information via kiosks located in business and commercial areas.

The county is also a participant in the I-95 Coalition Information Exchange Network. Information concerning incidents, construction, weather, and other events affecting traffic in the county is shared with other I-95 Coalition members. In a similar manner, the county will participate in the National Capital Region Traveler Showcase that is under development.

It is the county's opinion that adequate technology and information service providers exist to disseminate the traveler information. The key to a successful ATIS is acquiring useful information. "There just is not enough good traffic information."

Non-ATMC Generated Data

The ATMC does not have direct access to enforcement dispatching or other information sources. It coordinates and shares information with other agencies via telephone, facsimile, radio, etc. There are no enforcement CCTV facilities in the county.

Data Archiving

Neither traffic data nor video is archived.

Privacy Considerations

The county was sensitive to the potential of privacy issues arising from the use of television cameras for traffic surveillance, so precautions were taken early during and after its procurement. These precautions are credited for invations of privacy concerns not being raised as an issue. Operators are trained to use the cameras to obtain an overview of what is occurring on the roadway, but the camera's zoom lens capability is not used to provide a close up that allows details to be discerned. Operators are trained that the cameras are not to be used for surveillance purposes other than for traffic. Also, the signal output from cameras to the media or the web page can be selectively blocked by the operators.

Policy

Agreements exist between the county, the I-95 Coalition, and the National Capital Region Showcase concerning the dissemination of traffic between agencies. The county retains all rights to data they furnish to the Showcase and the county receives Showcase information without cost. However, the County cannot furnish Showcase provided information to the public or to other agencies.

The county has an 'understanding with the media and other information service providers. The ATMC will provide its traffic data to all interested parties at no cost. The receiving party is required to pay any equipment and communications costs associated with receiving the information. The county will not sign an exclusive agreement or establish a propriety arrangement with an ISP.

In the future, the ATMC may share control of the TV cameras with the Maryland State Highway Department. Details of this arrangement have not been finalized.

New York City Tri-state Region - TRANSCOM

TRANSCOM is an association of 14 member agencies in the three state area surrounding New York City. TRANSCOM membership also includes a large number of participating agencies (i.e., fire and enforcement) from various political subdivisions, toll authorities, etc. Like the I-95 Coalition IEN, TRANSCOMs operation center serves to coordinate and disseminate transportation information among agencies, but it does not function as a traffic management center.

Summary of Information Disseminated

TRANSCOMs focus is on incident and construction related transportation data. TRANSCOM serves as an information clearing house to promote interagency cooperation by keeping the member agencies advised of major occurrences. TRANSCOM is not involved in information concerning routine traffic volume or traffic congestion conditions on the highways.

TRANSCOM does not provide information directly to the public. TRANSCOM is linked to the participating agencies and to the traffic services (Shadow Traffic and Metro Traffic) via 80 character, alpha-numeric pagers for dissemination of incident or other time critical information. Other information is provided via facsimile, telephone, etc. TRANSCOM relies on the technologies of their participating agencies (VMS, HAR, etc.) and the traffic services to disseminate information to the public.

TRANSCOM is a principal participant in the ITS Model Deployment Initiative (MDI). The MDI is an aggressive program to provide regional trip planning that involves multiple agencies and transportation modes. It is anticipated that TRANSCOMs role will change, but it is not clear what that role will be at this time.

Non-Operations Center Generated Data

All information is supplied to TRANSCOMs operations center where it is aggregated and redistributed to the TRANSCOM members.

Data Archiving

All incident data is logged and permanently archived. TRANSCOM currently does not have access to video.

Privacy Considerations

There have been issues of privacy intrusion. TRANSCOM does not give out any information that could be considered as human interest or reporter style news (i.e., no guts and gore reporting).

Policy

TRANSCOMs policy is to provide information to the member agencies and the two traffic services at no cost. Although, since TRANSCOM is funded by the member agencies, they are indirectly paying for it. TRANSCOMs functional policy is that a member need only make one call to TRANSCOM and TRANSCOM to ensure all appropriate parties are notified.

Seattle - Washington DOT Traffic System Management Center

The Washington Department of Transportation (WSDOT) is another pioneer in the use of technology for traffic management. The traffic system management center (TSMC) collects traffic information on almost 100 miles of freeway in the Seattle region

Summary of Information Disseminated by the TSMC

WSDOT considers the information the TSMC provides via the WWW to be their biggest disseminator of traveler information and representative of the information provided to the public. Traffic information includes levels of congestion on freeway links, incident information, roadway construction details, snapshot video from TV cameras, and emergency road closures. Refer to the Internet section of this report for a more complete description of their web page.

A direct, live action video feed is provided to four commercial TV stations. They can select any camera for viewing, but they do not have camera control capabilities. Similar information and video feeds are provided to the University of Washington for its use in the Traffic Reporter program, and in their efforts directed to becoming a traffic channel. Microsoft is also a recipient of the information and video services.

A secondary information source is available from the VAX computers that serves as a traffic bulletin board for businesses, ISPs, etc. This service is provided to all that request it on their computer by software provided by the TSMC.

TollFree Cellular is a service provided to the public by one of the cellular telephone providers. The cellular provider has a direct connection to the TSMC traffic data. Cellular subscribers have a toll free number to obtain current traffic information, which is also accompanied by advertising.

A 24-hour traffic telephone service is provided by the TSMC to furnish traffic information to the public. The service provides a prerecorded message that is updated while the TSMC is staffed (6:00 A.M. to 7:00 P.M.). Traffic information is also provided to the public via 50 to 60 changeable message signs and eight HAR transmitters.

The information available to the TSMC for dissemination will be expanded to include information on the arterial (e.g., nonfreeway) streets upon completion of the North Seattle ATMS Project. It is anticipated that this information will be speed based rather than the congestion based information now available.

Non-TSMC Generated Data

A direct feed from the Washington State Patrol Dispatch is provided to the TSMC, and the TSMC extracts relevant traffic information from it. The Washington State Patrol feed is used primarily to develop information concerning incidents. The State Patrol has access to the TSMC traffic data.

Data Archiving

Data from the two tunnel systems is archived for two weeks. No other data or video is archived.

Privacy Considerations

Invasion of privacy issues has not occurred. WSDOTs procedures are very similar to those used by Montgomery County. Also, there are internal agreements between the TSMC and the State Patrol--don't zoom in with the camera.

Policy

WSDOTs position is that the information acquired by the TSMC is necessary for the traffic management functions they have been charged with. The data is to be made available to the public and business organizations at no cost other than the cost of connecting to WSDOTs port and communicating the data/video. If the business organization can add value to it and benefit from acquiring the information, than that is a secondary benefit to the public. WSDOT will not enter into an exclusive or propriety arrangement with others.

Northern Virginia Transportation Operations Center (TOC)

Virginia Department of Transportation has operated a freeway management system in the northern Virginia area surrounding the District of Columbia since the mid 1980s. The system performs traffic surveillance on approximately 32 centerline miles of Intestates 66, 395, and 95, and construction is underway to expand the system an additional 40 miles.

Summary of Information Disseminated by the Traffic Operations Center

The principal method used by the TOC to disseminate information to the public is via changeable message signs strategically located on the roadway network. In the event of an incident,

the traffic radio services (Shadow and Metro Traffic) are contacted by the TOC via telephone. The radio services then disseminate the information via commercial radio.

The traffic radio services and the local television stations are provided with a live action video link to the traffic surveillance television cameras. The camera feeds are also provided to Erol's Internet Services for dissemination via the WWW.

Non-TOC Generated Data

The TOC does not have direct access to traffic information from others.

Data Archiving

Traffic volume and speed data are archived for one year. Video is not archived except for video that is used for operator training.

Privacy Considerations

There were concerns about potential privacy intrusions when the system was being constructed. However, they did not occur. The TOC has the capability of inhibiting outside access to any television camera.

Policy

A short agreement exists between VADOT and the recipients of the live action camera feeds. It states that VADOT is not liable for their use of the feed, that VADOT can terminate the agreement within 30 days notice, and that the recipients cannot impose requirements on the cameras usage by VADOT. All data and video is provided at no cost. However, the cost of bringing communications services into the center, the cost of communications hardware, and the monthly communications cost must be paid by the user. It is anticipated that this policy will apply to data provided the Traffic

Information Center (TIC) that is being developed for the Capital Region Traveler Information System.

SmartRoute Systems

SmartRoute Systems is a private firm in the advanced transportation information system (ATIS) business with two areas of focus. The first is collecting traffic and traveler data within a metropolitan area, processing the data, repackaging it, and creating a propriety traveler information database. The enriched traveler information is then delivered by various technologies to the public and private clients. The second, complementary focus is operating traffic management and information systems for public agencies. SmartRoute is included in this review as they are representative of emerging information service providers that have a business interest beyond that of the more familiar commercial traffic radio services.

SmartRoute's ATIS entry was the 1993 development of the SmarTraveler service for Boston. This was accomplished as an adjunct to Massachusetts Highway Department's selection of the firm to operate the interim control center for the construction of the Central Artery/Tunnel. The firm has recently been selected to provide similar traffic reporting services in the metropolitan areas of Cincinnati, Philadelphia, Washington, D.C., New York City, and Minneapolis.

SmartRoute seeks to form a relationship with the government agencies responsible for traffic management and maintenance. The type of the relationship varies by agency. However, the prevailing concept presented is 1) that all parties make some investment of money, 2) agency data is provided at no cost, 3) restrictions will apply to any data an agency receives from SmartRoute, and 4) SmartRoute is the owner of all traveler information they generate.

SmartRoute provides certain data to the public at no cost. Other data (perhaps the same as furnished to the public) is provided to client companies for a fee. Whether an agency shares in the revenues or profits SmartRoute may generate, or the rights the agency retains to data they have provided to SmartRoute, appears to be negotiated on a case-by-case basis.

ATIS ON THE INTERNET

Traveler information is increasingly disseminated on the Internet. TTI has reviewed the prominent sites on the Internet and assessed what information is commonly available through this medium. The features of these traffic information Internet sites are summarized in table 3. Several trends were identified in reviewing these sites:

- Real-time speed conditions are represented in two primary formats: as colored dots or as colored links on freeway segments.

- Other types of real-time information in the form of images from CCTV cameras, detector data, accidents information, road closure and construction information, and variable message sign (VMS) messages are displayed on many of the area maps.
- Few sites give information or maps with detailed representation of roadways other than freeways. Houston and Phoenix show surface streets on their maps.

- Many sites use icons to represent points of interest in the metropolitan area.

- A few sites provided multimodal information to travelers for bus, ferry, and rail information as well as interstate travel data such as information on airports and Amtrak stations.

- Many sites have clickable maps where users can pull down information concerning specific freeway links, points of interest, etc.

- A couple of sites (Atlanta, Houston) are developing route planning functions allowing users to select an origin and destination and the system determines the best route, either by car or transit.

Table 3. Summary of Traveler Information on the Internet

Feature	Atlanta, GA	Boston, MA	San Antonio, TX	Long Island, NY	Seattle, WA	Houston, TX (6)	Phoenix, AZ	Chicago, IL	L.A./Orange Co., CA	San Diego, CA	Detroit, MI	Montgomery Co., MD	Twin Cities, MN (7)
Area Map (1)	F	F	F	F	F	F-S	F-S	F	F	F	F-S	A	F
Speed Data	M-RT		M-RT	M-RT	M-RT	M-RT	M-RT	M-RT	M-RT	M-RT	M-RT		M-RT
Clickable Map	A	A			A	A		A	A	A	A	A	
Transit Fares	A	A			A	A			A	A		A	
Transit Schedules	A	A			A	A			A	A		A	
Transit Route Maps	A	A			A	A			A	A		A	
Construction Info.	M	T		M	M						M	T	
Accidents	M	T							M	T	M	T	
Road Closure Info.					M		T		M	T	M		
Points of Interest	A	A			A	A							
Highway Travel Time		T		M-RT		T-RT		M-RT					
Airport Information	A	A			A	A							
CCTV Images (2)					M		M					M	
Carpooling Function (3)					A		A		A				
Routing Function (4)	A					A							
VMS Status (5)											A		

F = freeway; S = surface street; M = presented on a map; RT = real-time information; A = available through the web site

Notes:

1. Graphical depiction of the metropolitan area which could include freeways, surface streets, geographical features, and/or points of interest.
2.. Closed circuit teliveision (CCTV) images of roadway segments for the purpose of visually assessing traffic conditions.
3. Allows user interface with ridesharing database for carpools and vanpools and can include ride matching capablilities.
4. Allows the user to specify routes for desired origins and destinations.
5. Variable Message Signs (VMS) status posted on the web site displaying the current messages on VMS in the area.
6. A private and public site are available for this city. Both are included in this summary.
7. Some interesting improvements are slated for this web site in the near future (see text).
8. T = text

The following presents an overview of each of the Internet sites. In an effort to coordinate these Internet applications, TTI has created links to each of the sites highlighted below from TransLink's™ web page (http://translink.tamu.edu).

Atlanta (http://www.georgia-traveler.com/traffic/rtmap.htm)

Atlanta has one of the more robust web sites. All modes of transportation, except bicycle or pedestrian facilities, are represented in a variety of ways. Highway information is communicated using a map interface that visually informs motorists of trouble spots on the freeway network using icons and color coded dots. The colors represent various ranges in speed, and the icons represent accidents and road work. More information concerning a desired freeway section can be obtained by clicking the corresponding link on the map. Detailed accident and construction information is also available in text format by clicking on its icon.

A route planning function is available that allows the user to indicate the trip origin and destination in the form of an address or point of interest. A text description of the route determined by the system is furnished which provides detailed information including all turn movements and the name of all roadways used.

Other motorized modes that are represented on the Atlanta ATIS web site are bus, rail, and long distance modes such as Amtrak, Greyhound, and airlines at Hartsfield Airport. Maps are provided to help locate local train and bus stations and the Hartsfield International Airport. Maps and tables can be selected to describe MARTAs, the regional transit authority, bus/rail fares, routes and schedules. Parking information at each of the MARTA rail terminals is also given. Information available for other transportation modes includes taxi, limousine, and auto rental services.

Boston (http://www.smartraveler.com/bos-com/)

As indicated earlier, Boston's ATIS service is provided by SmarTraveler. The web site contains qualitative descriptions of current conditions for highways, commuter rail, subway, bus, commuter boats, and major features such as Logan airport. These elements are described using

clickable route maps where operating conditions, fares, schedules, and other items of information are contained. This same information is also offered through clicking on a series of links.

The highway information is comprised of estimated travel times, road surface conditions and delays due to construction, accidents and/or bottlenecks. Information for other modes of transportation contains similar information without the travel time estimates. Although the information at this site is updated periodically it is not automated and should not be considered real-time information.

Chicago (http://www.ai.eecs.uic.edu/GCM/GCM.html)

This site contains traffic speed and travel time information for the Gary-Chicago-Milwaukee corridor. The medium used to display this information is a map with colored freeway links whose conditions are updated every minute. The colors represent degrees of congestion that are directly related to speeds in those sections. Travel times shown on the map refer to freeway travel to and from the downtown loop.

Detroit (http://compus.merit.net/mdot/)

Detroit's site pinpoints the location of accidents (red 'X'), road work (yellow link), and closures (white link) and is updated every 90 seconds. Additionally, the Detroit map allows you to zoom into the large interchanges to investigate speed conditions on ramps and read the current messages displayed on changeable message signs in the vicinity.

Houston (http://traffic.tamu.edu/traffic.html)

The web site for the Houston transportation system includes both highway and transit information. The highway information is displayed using a map with color coded links representing different ranges of speeds on local freeways. The data on the map is updated every minute and can be used in a route builder function to help users build travel routes on local freeways.

The transit information is accessed via a link to the Houston Metropolitan Transit Authority of Harris County (METRO) home page and is comprised of route maps and tables containing bus fares and schedules. This information is also available from a private sector web site provided by AccuTraffic which contains a clickable map with much better detail of the surface street transportation network as well as points of interest, although the color coding of highway conditions is less refined because of the aggregation of speed data into larger speed ranges. The AccuTraffic site also provides icons on the map with text information on accidents and construction.

Long Island, New York (http://metrocommute.com/LI/#heading)

The Long Island area freeway map is updated every minute with speed, travel time, and construction data. Complimenting this information are textual descriptions of weather, delays, and construction. The freeway map is clickable bringing up text descriptions of the various exit and entrance ramps accessing adjacent areas and roadways.

Minneapolis/St. Paul, Minnesota (http://www.traffic.connects.com/)

The information on the Minneapolis/St. Paul Twin Cities web site is limited to highway information only using a map to display freeway speeds using colored freeway links to represent ranges of speeds. However, some interesting improvements are being developed for this site that will provide more detailed incident information. These improvements will allow incident information comprised of incident nature, location, length of traffic back-up, and estimated duration to be communicated via the existing map. The improvements were slated for the fall of 1996, however they have not yet been put into place. No transit information is provided or is accessible from this site.

Montgomery County (http://webserv.dot.co.montgomery.md.us/atmspage/atmspage.html)

Information on this web site is comprised of highway and transit information. The highway portion contains incident, parking, road work, special events, and weather information. Real-time camera images supplement the textual information with visual assessments of highway conditions.

The cameras are accessed by clicking on a map region then clicking the icon of the desired camera in that region. The transit portion contains bus schedules, fares, and route maps.

Phoenix (http://www.azfms.com/)

The Phoenix Trailmaster web site offers motorists on-line access to highway and transit operating conditions. The highway information is shown in various link colors on a map, each color representing a range of speed. Access to still frame images of traffic conditions augments the speed data allowing the user to make visual assessments. The CCTV cameras are accessed via a clickable map, as well as a list of links. Road closures and weather conditions are conveyed in text format through clicking a series of links. Bus schedules and fares constitute the transit information. On-line access is also provided for rideshare and vanpool programs in the Phoenix area.

San Antonio (http://transguidewwwserver.datasys.swri.edu/current_traffic.html)

This site contains traffic speed information only. The medium used is a map with colored freeway links whose conditions are updated every minute. The colors represent degrees of congestion that are directly related to speeds in those sections.

Seattle (http://wsdot.wa.gov/regions/northwest/nwflow/)

The Seattle area web site probably contains the most traveler oriented information of all reviewed web sites. The information is comprised of an area map with colored freeway links indicating various degrees of congestion. The area map also has clickable icons for information on points of interest in the area, including Sea-Tac airport which also provides access to airline information. A CCTV map augments this data with camera images that are updated every 90 seconds. Incident logs are easily accessed by clicking the appropriate button above the map, but are available only in text. Construction information can be accessed from a separate map of local freeways. Emergency road closure information is supplied in a text format. Ferry and bus fares, schedules, and route maps are also available at this site. Amtrak also has a link establishing their

presence as an element of the transportation system. For those who are interested in ridesharing, this site provides access to an HOV lane map and a ride matching function.

Southern California (http://www.scubed.com/caltrans/transnet.html)

The Los Angeles/Orange County traveler information web site provides links to bicycle, transit, and highway information. The highway information for the local freeways is updated every minute. Information includes accidents, prevailing speeds, and road closures. This information can be viewed on an area map or in a list that indicated conditions by freeway segment. Transit fares, estimated travel times, schedules, and route maps are provided for transit operations. This site also provides access to a ride sharing program for individuals interested in carpooling from Ventura.

The San Diego web site is closely linked to the L.A./Orange County site. This web site provides detailed traffic information as well as the common transit information. The traffic information is displayed on a map and in lists, and communicates the average speeds and flow rates at a desired location. The range of speeds on the freeway network can be ascertained from the various colored dots shown on the map; however, more detailed information is accessed by clicking on a specific roadway link, or dot, on the map. Highway conditions are described further by bulletin boards which give road closure and incident information. The transit information is comprised of commuter rail and trolley schedules, fares, and route maps. Amtrak information is also furnished.

SURVEY OBSERVATIONS

When this study was initiated, the objective was to investigate what practitioners operating traffic management systems were doing to provide traffic information to the public. In this context, the traffic management system is characterized by the energies of the system and the operating personnel being focused on maximizing the utilization of the agency's specific assets. These assets are typically a freeway network or the agency's traffic signal systems. Examples of systems within this classification include the city of Los Angeles, northern Virginia, and to a lesser extent, NYDOTs INFORM system. However, a growing number of traffic management systems have 'pushed the envelope' and distribute information about events not directly associated with the agency's assets,

but which may be of interest to some of the travelers within the region. Montgomery County and the Capitol Region Traveler Information System are examples of this latter category. The coupling of advanced traveler information systems with advanced traffic management systems is logical; however, it makes it more difficult to determine where resources should be expended and where the division of activities between the public and private sector should be.

Given this, centers surveyed include those that are either responsible for operations (e.g., northern Virginia) or information service centers (e.g., TRANSCOM), or they combine both functions (e.g. Montgomery County). The following is a synopsis of observations made during the conduct of this survey about the state-of-the-practice of traveler information.

- The most common information disseminated from traffic management centers concerns incidents. Information is also disseminated concerning traffic flow conditions, speed, and travel time between significant locations.

- Almost all of the centers provided information to traffic service reporters (Metro Traffic, etc.).

- Those centers responsible for operations all used variable message signs to disseminate information. Many provided video feeds to commercial television stations. Many provide dial-in traffic services.

- Few of the centers have access to traffic related information contained in other systems, (e.g., enforcement computer aided dispatch) but most expressed interest in having access in the future. None had access to video from other agencies, but several had plans to obtain access.

- None of the centers indicated that they had traffic related information that they would not disseminate.

- Invasion of privacy was not identified as an issue. However, all centers interviewed that had television cameras were sensitive to the potential of this becoming an issue and had taken

precautions. The most frequent precaution taken was to instruct operators of improper camera usage (e.g., do not zoom in to reveal detail, don't point the camera at buildings, etc.). However, most did not have written policies concerning camera usage.

- Most agencies have a policy regarding information dissemination, butit is not a written policy.

- None of the agencies currently charge for the information they disseminate now, nor do they have plans to do so. However, several agencies have, or will have, an agreement with an information service provider (ISP) in which the agency will receive a portion of the ISPs profits from repackaging the agency's information and selling it. This approach is more prevalent among new systems or information centers than with established systems.

- None of the agencies indicated that they would (or could) enter into an exclusive agreement or a proprietary arrangement to provide traffic information or data to a single ISP.

- All agencies that provide information feeds to the media require the media to pay any costs necessary to make the connection and any monthly communications cost. All parties interested in this service are treated equally.

- The WWW has become an attractive method of disseminating traffic and related transportation data and increased usage of this medium will continue.

- No significant issues concerning the public and private sharing of data were identified.

- Traffic data is archived only as required for the agency's planning purposes. Video is not archived.

For the traffic management systems that are currently providing traveler information directly to the public, the information supplied and its method of delivery reflect the capabilities inherent in an earlier prevailing philosophy. That is, the system's function is to collect data and the primary focus is to provide input for the agency's management of the roadway facility (incident detection and

management, etc.). The use of the data by the agency to provide information direct to the motorist is of secondary importance and the agency's dissemination of information is generally limited to the roadway network managed. Given the expanded scope resulting from the ITS initiative, the role and function of these systems are being reexamined and a consensus does not yet exist on the services they will be expected to provide in the future. It is likely that the concept of an information center will emerge that works in conjunction with the traffic centers as we know them now. The information center will receive data from the traffic systems, from other transportation systems, and other sources of traffic data. The traffic centers will continue to perform their current functions, and more. The opinion as to what the public agency's role in the information center should be was mixed.

APPENDIX A

QUESTIONNAIRE

This questionnaire is to be used to guide the interview of officials from transportation departments in the U.S. that are operating traffic management centers (TMC) to determine what they are doing to distribute traffic information to the public, to other government units (including enforcement), and to information service providers. Questions to be investigated include:

- Currently, what information is regularly provided by the TMC to 1) the public and 2) to other agencies?

- How is it being provided? Describe the technology.

- Does the TMC receive information from others (e.g. enforcement TV, enforcement CAD, etc.) on a regular basis that it then disseminates 1) to the public and 2) to other agencies?

- What information does, or will, the TMC have access to that it will not disseminate 1)to the public and 2) to other agencies?

- Are there any camera location or content restrictions on sharing video displays available at the TMC with 1) the public, 2) inter-agency departments, 3) other government agencies, or 4) enforcement?

- Have issues of privacy been raised? Have they been resolved?

- Does the agency have formalized policies regarding information dissemination?

- Does the agency charge for information now, or plan to charge for it in the future, if the information is provided to an information systems provider (ISP) that will add value to the information and sell it at a profit?

- What formal agreements with the public or private sector to share information exist or are anticipated?

- What arrangements exist to provide information to the media (radio, TV, etc.) and to private interest parties? Do any of the arrangements favor certain media or interested parties (e.g., does the arrangement with one TV station preclude providing the information to others at a later date)?

- What issues have been encountered, or are expected, in the private and public sharing of data?

- What information (e.g., video tapes) is archived? Is this a policy or legal requirement? For how long? Is information provided for off-site use (e.g., enforcement, court, etc.)?

APPENDIX B

CONTACTS

The following agency contacts were made during the interviews performed during this study.

Location/System	Contact
Boston Massachusetts DOT Integrated Project Control System/Boston SmarTraveler	Beth Bowers SmartRoute Systems (617) 494-8100
Capital Region (Washington, D.C. Area) Capital Region Traveler Information System	Jim Robinson Virginia DOT (804) 786-6677
Chicago Illinois DOT Traffic Systems Center	Joe McDermott Illinois DOT (847) 705-4141
Cincinnati Advanced Regional Transportation Management and Information System	Leon Waldon Kentucky Transportation Cabinet (502) 564-7433
I-95 Coalition Information Exchange Network	Raman Patel I-95 Coalition (212) 465-5502
Long Island, NY Information for Motorists System	Joe Contegni New York DOT (516) 952-6781
Los Angeles City of Los Angeles Automated Traffic Surveillance and Control System	Anson Nordby Los Angeles DOT (213) 580-1196
Montgomery County, Md Advanced Traffic Management Center	Gene Donaldson Montgomery County DOT (301) 217-2190
New York City Tri-state Region TRANSCOM	Matt Edelman TRANSCOM (201) 963-4033
Seattle Washington DOT Traffic Systems Management Center	Dave Berg Washington DOT (206) 440-4485
Northern Virginia Northern Virginia Transportation Operations Center	Jimmy Chu Virginia DOT (703) 383-2600
SmartRoutes Systems	Beth Bowers SmartRoute Systems (617) 494-8100

APPENDIX C

ARTIMIS INFORMATION POLICY
Ohio Department of Transportation (ODOT)
Kentucky Transportation Cabinet (KYTC)
ARTIMIS Policy Committee

The following Program Objective and Information Policy Statements, unless amended by the signatory parties, shall be in effect until September 30, 1998. After that date, this approach to Program Management will be extended or a different approach put into place.

The signatory parties have spent many hours deliberating relevant issues in developing these Statements. In addition, five well-known experts from other State Departments of Transportation were consulted for advice and input.

ARTIMIS PROGRAM OBJECTIVE

The objective of the ARTIMIS Program is to more effectively detect and manage congestion in the Cincinnati-Northern Kentucky Urbanized Area, whether due to capacity or incidents. ARTIMIS activities will concentrate on the freeway and expressway systems. The primary function of the equipment, the Control Center, and other services included in the Program is to expedite clearance of incidents on those covered roadways. As part of these efforts, information will be provided to the traveling public to assist in making informed decisions about their travel, thereby reducing frustration and delay, improving motorist safety, and reducing emissions of pollutants.

All travel data and information provided by ARTIMIS directly to the traveler (i.e., via Changeable Message Signs, Highway Advisory Radio, and the Traffic Advisory Telephone System) is to be free of charge. This basic principle, however, does not preclude any private sector entity from obtaining data acquired from publicly funded equipment and activities, adding value to the information, and using the information for commercial purposes. Further, any private sector information provider may, with its own resources, obtain travel data, convert it to information, convey it to the traveler, and charge a fee or obtain remuneration as it sees fit.

The ARTIMIS Policy Committee, ODOT and KYTC recognize that the initial operations of ARTIMIS are critical to meeting the stated Program Objectives. In addition, it is the desire of these organizations to maximize the public investment that has been made in ARTIMIS. Therefore, after consideration of the many factors which may affect the achievement of these objectives, and after consultation with other DOTs around the nation, the following ARTIMIS Information Policy is hereby approved.

ARTIMIS INFORMATION POLICY

The Kentucky Transportation Cabinet is to maintain the Competitively-awarded Contract and Subcontract currently in effect with TRW and SmartRoute Systems, with a clarification in the revenue-sharing clause of Change Order Number 2 that 50% of net revenue is equal to 30% of gross revenue. Further, in accord with the ARTIMIS Program Objective, TRW and SmartRoute will, at all times, give first priority to Control Center Operations.

The ARTIMIS Policy/Technical Committees are to develop a strict protocol on all media/information provider personnel operating in the Control Center. Specifically, no interference with traffic management activities will be tolerated.

Media/information providers which are willing to abide by the same revenue sharing formula set forth in Change Order Number 2 will be eligible to access all information gathered by publicly funded equipment subject to the provisions set forth below. At the sole discretion of the Kentucky Transportation Cabinet, barter arrangements may be considered, although cash payments may be necessary.

Each prospective provider must submit a proposal for the method by which the data and information are to be transmitted to their facilities. Each proposal will be analyzed on a first come, first served basis by the ARTIMIS Technical and Policy Committees, and a response provided by the Kentucky Transportation Cabinet within thirty working days.

Each approved provider will be required to provide all equipment, telephone lines, etc. needed to transmit the data to their facilities.

Each media/information provider must furnish a copy of each revenue contract to the KYTC and ODOT. The copy must be furnished within three working days of execution. Failure to furnish any such contract will result in forfeiture of all access to the ARTIMIS Control Center and data.

All records of generated revenue and payments to ODOT and KYTC will be subject to audit by KYTC.

Consistent with the ARTIMIS Program Objectives, ARTIMIS Control Center staff will make every reasonable effort to provide information regarding the occurrence and clearance of major incidents to all media/information providers at no cost.

The ARTIMIS Technical and Policy Committees will continue to monitor activities nationwide concerning Traveler Information Systems. Then, in combination with lessons learned during the initial two years of operation, these Committees will develop a new policy which will be put into effect on October 1, 1998, consistent with any contractual arrangements established to continue ARTIMIS operation.