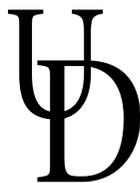


A DELAWARE POLICY FORUM

Intelligent Transportation Systems:

Future Directions for Delaware



Institute for Public Administration

College of Human Resources, Education and Public Policy

University of Delaware

February 1999

Foreword

**Dr. Jerome Lewis,
Institute for Public Administration**

As the director of the Institute for Public Administration at the University of Delaware, I am totally delighted to have all of you here to discuss how we are all going to be living and traveling in the not too distant future, if not the present. I believe we have brought together an excellent group of speakers for this Intelligent Transportation Systems forum. Thanks for working in preparing the forum should go to my colleague Robert Warren and Christian Schlosser, a graduate assistant in the Institute. I also want to thank Scott Sabol, from the Delaware Transportation Institute which is a joint project of the University of Delaware and Delaware Department of Transportation, Ralph Reeb, Gene Donaldson, Patricia Faust from DelDOT as well as a number of other people who helped us come up with the ideas and speakers for this forum. It probably will not cover every detail but I think that by the time the day is over, you will know a lot more about intelligent transportation. We want you to relax, listen, and feel free to ask questions and make comments as we go along. Thank you for being here with us.

Welcome Address

**Anne Canby,
State of Delaware, Secretary of Transportation**

Currently, there is a great opportunity for Delaware to develop an integrated Intelligent Transportation System (ITS). Integrated Traffic Management Systems (ITMS) represent a new approach for ITS. Over the past year, Delaware put together a strategy for ITMS deployment. State legislation provides the basis for a long time budget. The State's overall goal is to make the transportation system safer and more efficient. In some areas this is critical because there is no room for more roads. The existing infrastructure has to be managed effectively. This means that institutional changes and providing new skills are needed. For successful implementation of ITMS the idea of partnerships is very important. Not only the Delaware Transportation Institute (DTI), but also the University and the automobile industry are substantial partners. Additionally, not just State government, but also municipalities and counties have to be involved. Our customers are also key partners.

Recently, the State of Delaware took several concrete steps towards ITMS. At the initial stage of the program "champions" have to be identified that can become leaders around the State. Delaware is also a member in the I-95 Corridor Coalition. Furthermore, there are two test sites for commercial vehicle screening in Delaware. Delaware also is a member of a consortium of New Jersey toll road agencies to introduce electronic tolls and a single customer service center. Right now the consortium is engaged in obtaining a firm to implement the system this fall. A crucial element of Delaware's ITMS strategy is a close working relationship with U.S. DOT. The intention is to bring together the right plan, program, organization, and people.

Table of Contents

1.	Introduction: Fundamental Issues Relating to the Application of Intelligent Transportation Systems <i>Robert Warren, Ph.D.</i>	1
2.	ITS, The Technofix or New Service Concept <i>Stephen C. Lockwood</i>	3
3.	Private Sector Applications of ITS <i>Jonathan Slevin</i>	11
4.	The Montgomery County Experience <i>Bill Corder</i>	21
5.	Public Sector ITS Programs at the Local Level: ITS for Smaller Cities and Rural Areas <i>Ed Roberts</i>	26
6.	ITS and Federal Transportation Policy <i>David Gendell</i>	33
7.	Current DelDOT ITS Programs and Planning <i>Gene Donaldson</i>	38
8.	Panel: Public and Private ITS Applications in Delaware <i>Moderator: Scott A. Sabol</i> <i>Panelists: Gary Kirk</i> <i>Michael Eadicicco</i>	44
9.	Open Discussion: ITS Issues, Agenda, and Priorities for Delaware	51

1 Introduction: Fundamental Issues Relating to the Application of Intelligent Transportation Systems

*Robert Warren, Ph.D.
Institute for Public Administration,
College of Human Resources, Education and Public Policy,
University of Delaware*

Let me also welcome all of you here and say we are delighted to be able to bring together so many people to talk about a topic which is so much around us. As with almost everything else of our lives these days, transportation is becoming more and more entwined with telecommunications and information technology. For example, we have in various staged developments video monitors with electronic messages informing drivers to take alternative routes, collision avoidance radar systems, constant GPS tracking capacities for truck fleets and bus systems, automated highways that take over control of the movement of the vehicle, electronic toll payments, and demand responsive transit systems.

These technologies are evolving rapidly in a variety of directions. Which ones will be incorporated into transportation and when are critical questions. Some years ago when I was at the University of Washington in Seattle, the big breakthrough was the amphibious car. We saw advertisements of this vehicle, which would be pretty useful in the Puget Sound area, being able to drive down the highway and then just drop into the water, continue over Lake Washington or Puget Sounds, to the other side. That was the last we ever heard of it. Thus, anticipating how technology will be applied is always an interesting, chancy but hopefully and rewarding adventure.

At the start of this decade, the 1990s, only a handful of academics and scientists used the Internet. Now few aspects of life have not been affected by the Internet. If you were looking at the Wall Street Journal on Monday of this week, you might have seen an article on computer industry's race to capture the automobile. Among other things, it says Microsoft is getting into the car business. Not content with dominating the computer industry, firms like Microsoft, Intel, and IBM are attempting to capture the market of computer and electronics in your car. Clarion is expected to be the first to offer a personal computer for the car as a replacement

for factory installed radios. It will contain PC software, a modem to allow you to download and to receive information by simulated voice. You can talk on the phone without taking your hands off the steering wheel. But don't jump up to buy this yet. The initial unit is \$1500.00. Along with this burgeoning of technology there are also a vast array of decision points in its application. We have Metropolitan Transportation Planning Organizations, state DOTs, the U.S. DOT, private firms in transportation, and firms producing new technology that is being adopted. So, there are a number of challenges in how we move forward and utilize these opportunities. One is that the architecture of ITS be open and systems interoperable. Various technology applications must be compatible and coordinated programmatically and functionally. Policy makers have to be able to understand what is operational and available, what types of new technology and applications can be expected with some degree of certainty, and which innovations, although highly touted, are likely to be dead ends. Reality needs to be separated from hoopla in this enterprise. We are very lucky to be able to bring together a set of uniquely qualified people to help us identify issues and opportunities concerning how Delaware can best utilize ITS.

2 ITS, The Technofix or New Service Concept

*Stephen C. Lockwood
Vice President and Senior Advisor on ITS,
Parsons Brinkerhoff, Rockville, MD*

Today, you are going to hear a lot about ITS in Delaware. You will get a set of views from the federal, state, and local government as well as the private sector perspective. I am going to presume that most of you are familiar with Intelligent Transportation Systems in terms of basic concepts. I am also assuming that the relevance of ITS to Delaware is obvious—given the diverse mobility needs of this state for agriculture, industry, tourism, community, and urban transportation in limited space. Therefore, I am going to look over the horizon and the way in which fully realizing the potential may challenge some of the fundamentals in institutional structure in surface transportation.

Let me start by illustrating a story from my days in Texas. It appears that there was an elderly billionaire Texas oilman who, for his 100th birthday, decided to give himself a custom designed, fancy Italian sports car. On his birthday he decided to try it out on the interstate and took his son for the test spin. Once on the highway, he wound it up to about 130 mph. His son, looking increasingly nervous, said “Gee dad, don’t you think you ought to have your bifocals on, driving at this speed?” His father replied, “Hell son, I’ve had the windshield ground to my prescription.” Regrinding our windshield to a new kind of prescription is what ITS implies—a new way of looking at the relationships between transportation infrastructure services, the needs of travelers, and the institutional structure. Changes are needed in the roles and relationships between and among the public and private owners and operators of the infrastructure and the providers of service—both vertically and horizontally. ITS fosters a new concept of the transportation problem and potential solutions through its ability to focus on systems performance in customers’ terms, by tailoring solutions very specifically to varying demands, providing a new range of service options, and developing new relationships with users via information. This potential flows out of the fact that ITS reflects the convergence of information networking, analytical power, and increased span of control that makes it possible to more fully manage transportation systems in real time.

To illustrate, let me enumerate some of the features of ITS:

- ❖ Institutional priority placed on real time operations as the highest priority mission.
- ❖ Attention to the service needs and attributes as the customers see them, not necessarily as we engineers see them. Not just on travel time but also reliability and security. (Surveys indicate people place a much higher value on the reliability of service than on time savings suggesting an entirely different way of thinking about what we are doing as transportation providers.)
- ❖ Demand-responsive transportation services in highway and mass transit separately based on the ability to allocate total capacity on a real time basis in response to time of day, patterns, vehicle types, trip types, etc.
- ❖ A learning approach to managing interruptions of service or “incidents”-moving from the reactive style which characterizes most agencies today, to a more proactive style. (An obvious example is in road weather information. We can now predict through electronic sensing and information technology where there is going to be icing conditions and a loss of traction before they happen rather than waiting for snow to actually fall and for a car to skid off the road.)
- ❖ Provision of information for travelers that is very specifically itinerary driven, custom tailored to the user, multimodal and push oriented (automated provision over a variety of media of communications devices, the specific information needed to make a travel decision).
- ❖ The introduction of varying prices for peak and non-peak travel. Other industries provide premium services for a price. Why do we need to have a one size fits all policy? We have the technical capacity to create variable pricing.
- ❖ Closer relationships with other service providing institutions, such as police and emergency management.
- ❖ Integration of transportation services with the provision of business services, logistic services, and consumer information services which consumers are already heavily focused on in their application outside of transportation.

There are barriers to moving in these directions. The constraints, however, are not technology, but institutional: the traditional mix of public entities; the complex intergovernmental relationships that characterize the transportation sector; the very limited role that private entities play; the conventions of federal aid programs; and the limitations on funding. We are operating in an inherited institutional context with a set of roles and relationships that were originally designed to support a major national construction program in the 1960s context.

In fact, our institutional framework is still characterized by the features that were part of that setting. The transportation infrastructure is a government monopoly delivered through a fragmented set of public entities. It is still dominated by capital intensive solutions and principally oriented towards improving capacity as reflected in expenditures of resources. We pay about two cents a mile for transportation infrastructure—less than operating your car air conditioning in Delaware in the summer time on a per mile basis. It is funded as a capital program, not as a service. The facilities and services are provided by government entities maintaining a carefully established arm's length relationship with the private sector. That makes it difficult to capitalize on what the private sector has to offer in terms of expertise, technology, or capital. Finally, and very importantly, we have a very limited relationship with our customer users—in terms of feedback with respect to what they need and want and how they feel about the service that we are providing.

This is the institutional framework into which we are trying to “mainstream” ITS. It was designed for a very specific purpose and it worked very well for providing major interregional highway infrastructure. However, it may not be so well-suited for managing and operating that infrastructure and for a service provision-oriented mission.

It is interesting to note that characteristics of the surface transportation sector as we have inherited it are exceptions to current general trends in other kinds of infrastructures such as telecommunications, power, water, and waste. There is substantial and radical institutional change taking place in these other sectors. We all know what has happened with telecommunications, beginning with the break-up of AT&T to the current competition over local telecommunication services. There has been rapid innovation, new technology competition, and price discounts. I called up a long-distance service the other day and said, “I’m paying 15 cents a minute” and they said, “Would you like to pay 7?” Even in the power sector, with the breaking up of generation, transmission, and distribution, you can now buy Californian-produced power in New Jersey. The provision of waste processing is being outsourced to private entities because of high technology made it more efficient. In each of those sectors—in contrast to transportation—there are advancements in the quality and efficiency of the services which are associated with new institutional features that are quite different from their traditional arrangements.

These other sectors still have plenty of physical infrastructure and a lot of civil and electrical engineering. But the critical difference is the focus on service and performance in customers' terms and on providing user-responsive options and competition. The services are provided on a price basis with the users paying fees for the service. The facilities are typically investor-owned and financed with private capital. The services are delivered with very extensive reliance on private entities. These characteristics are at the opposite end of the institutional spectrum from transportation. Taken together, they suggest that reaching the full potential of ITS may require evolving towards some different set of financial and institutional arrangements in the transportation sector. From the experiences of other sectors, I believe you can identify some of the key changes the transportation institutional framework will have to adopt if it is going to be able to share some of the innovative, efficiency, and service-oriented characteristics they have achieved.

First, a customer service mission is important in these other sectors and increasingly central to their survival and their ability to generate resources and capital and invest in the new technology as competition is introduced. To capitalize on this potential, ITS must be part of an overall systems management and operations mission with a clear user service orientation.

Second, in surface transportation, this would suggest some kind of enterprise type management and organization, some new level of accountability to ensure the adequate performance of the services for which the transportation agencies are responsible. Institutionally, this means careful attention must be given to business planning, process re-engineering, performance reporting, customer surveys, and other typical business techniques for a service delivery enterprise. Some of these activities are beginning to penetrate surface transportation institutions (state DOTs).

Third, building the technical capacity to deal with technology and service innovations is an important dimension that other sectors illustrate. It indicates a need to develop the kind of core technical capacities that are required to deliver ITS. This may call for change in personnel regulations or new professional capacity building activities and, particularly, for the use of such steps to build capacity within the agency to capitalize on ITS.

Fourth, a more streamlined product delivery systems is needed, built around a completely different relationship with the private sector. This will probably require some changes in procurement law and in the removal of legal and administrative

barriers accessing the latest technology. Today, we have a very constrained relationship between huge industries that deliver the technology that we need in ITS and public agencies. In part, these constraints are intended to guard against waste, fraud, and abuse. However, they make it extremely difficult to develop the kind of partnerships and relationships where the private sector has a major stake in technology advancement rather than simply responding to specifications set out by the agency. If that takes some change in law, then so be it.

Fifth, commercialization of service is complicated. Our current funding focuses on physical infrastructure and its expansion and preservation. We lack a price-based relationship with our customers through which they can interact.

At the end of the list is the need to think about reallocating the responsibilities involved in ITS among existing institutions—realigning the sectoral roles both vertically and horizontally. We already have fragmentation among levels of government even in a small state like Delaware. Bigger jurisdictions are much more complicated. Coordination and cooperation have become so burdensome that it may require that we invent some new kinds of authorities, new kinds of institutions to resolve regional issues on a one-time basis rather than having to negotiate every single little move among dozens of local authorities.

These suggestions are my short agenda for big changes—if we are going to capitalize on the full promise of ITS. These changes challenge a lot of the current realities. They suggest the need for new kinds of relationships and, in many cases, will involve changes in regulation or even law. Such changes are very difficult and they are slow, in part because we do not have a very rich professional dialogue about institutional matters. Transportation professionals who come out of a civil engineering background and people coming out of public administration and law and management backgrounds do not talk together.

It also must be recognized that in order to bring the future forward faster, it is necessary to start by acknowledging the limitations of these existing institutions and, as a matter of policy, to work toward establishing a new and appropriate framework. That is a hard kind of admission to make but I think it is an important one. This is what reinventing is all about. It seems to me that we need some reinvention of transportation if we are going to fully realize the potential of ITS, not as simply a set of technologies, but as a new framework for the future of customer mobility services.

Stephen C. Lockwood
Selected Comments on Questions asked

There are a lot of interesting experiments going on around the country in institutional relationships. TRANSCOM in New York, as many of you know, represents a set of New York transportation entities who have placed in TRANSCOM the responsibility for information gathering and dissemination, particularly about incidents in New York. There are other innovative examples of institutions. There is the I-95 Corridor Coalition which includes Delaware and other surrounding states. In Houston, TranStar is based on a memorandum of agreement for metropolitan transportation operations in which the state DOT, the local transit authority, and local governments participate. There are other examples many of you can cite of institutional invention, the new institutional technology. They are not as well known as hardware to people like ourselves and they need to be better known and we are going to begin to match institutions to the technology.

Universities are playing a key role in the ITS world through the ITS Centers of Excellence around the country. But the triangular relationship between the infrastructure owner and operators industry and research institutions is not well developed. There is no business school for transportation administration personnel. You can go to business schools that hardly deal with the public sector at all. If they do, they normally do not deal with infrastructure. If they do, they do not know much about the implications of ITS. So, there is a very strong role for research institutions.

There are 13 states that have passed public-private partnership legislation to either enable or to clarify existing fuzzy state law or constitutional provisions or to introduce new ones. They are typically oriented around creating the conditions where the state can “partner” with a private entity by co-mingling public resources and private resources to deliver public services. Delaware has its own legislation. A public entity can receive revenues from fee-paying customers and keep them in the program. The state can provide certain kinds of risk mitigation to private entities to encourage them to invest in transportation, such as the use of an exclusive franchise. These types of policies clear a lot of the ground around issues that have traditionally been a barrier to public-private relations. The remaining barriers perhaps are more cultural than legal. It is a tradition in transportation infrastructure as a public activity.

Standards development is a well-developed process in this country as well as in all advanced countries. This allows investors to move ahead in providing products with assurance that they are going to be compatible and interoperable with other parts of the systems and services. The process moves at a relatively slow pace in the U.S. because it all works by consensus on a voluntary industry participation basis.

standards development activity is also international. Europe has its own set of standards. We have ours. There is a lot of regular contact because there is an interest that most of these interfaces have a common international standard. This is particularly true for things like in-vehicle communications products that you would like to develop so all would work in the United States, Germany, France, Canada, or Japan. Sometimes, if one country gets ahead, it can establish a de facto standard. Like so many other things in our society, we forget how much is done on a voluntary basis. It is not established by regulation or law, and that is the way we are doing it.

There has been a general thrust to try and mainstream ITS into the Federal Aid Transportation Program and eliminate specific programmatic earmarking. The federal intent is to get away from telling states that they have to spend money on this or that project and allowing them to look at the federal grants as a broad resource and apply them flexibly as meets their own conditions. As you all know we do have something called the U.S. Congress and individual congressmen have their own ideas about how money should be spent. There has been a lot of earmarking historically.

My sense is that a tension between transportation and land use planners is always going to naturally exist. It is important to establish better connection between transportation supply and demand. Then travelers can understand the conditions of travel that face them the moment they want to travel, and service providers can understand the nature of the demands at any given moment and can make whatever adjustments in available infrastructure to best accommodate them. One result will be a reduction of the pressure to add more infrastructure. I believe this will de-escalate some of the transportation versus land use tension. Imagine that, 10-15 years from now, automotive vehicle identification technology will allow us to record most of the daily auto travel throughout the day in terms of origin and destination. Having this data, we can predict for next Tuesday about 80% of what is going to happen between 6 and 10 a.m., based on historical records, and make

whatever adjustments are needed in supply by changing the directionality of lanes. Furthermore, suppose you could pre-register your trip the night before so the infrastructure supplier may get an idea of exactly what demands are going to be faced. That can sharpen the ability to provide service. Suppose the infrastructure operator said, "Look, if you travel between 7:15 and 7:30, I'll give you a discount. But if you insist upon going between 7 and 7:15, I am going to charge you a 20% premium." This would begin to shape the demand to meet the supply. This type of pricing is done in telecommunications all the time with premium and discount services. It is the convention of the free enterprise system to operate that way. That convention operates in most services-except in transportation. Can we approximate that convention by tighter communication feedback loops to providers and consumers with certain travel patterns to introduce a price structure as a normal feature? I think that is where the future lies.

The question has been asked, is it the impact of technology alone that forces institutional change or do forces external to the institutions deploying the technology have to be an important impetus in bringing about change? Certainly, there are things now possible because of ITS technology. But it is not specific little technology. It is the basic concept of what you can do in a systematic way on a regional scale that is very different. The fact is that you can now operate systems in real time, get feedback immediately, and communicate with customers while en route. As these and other new capabilities become more clearly understood, there will be people who want to take advantage of them as a matter of good policy or attractive business. Another set of forces will be people who run around and talk about ITS like me. Maybe I will stimulate somebody else to think up an approach they would not have otherwise thought of. There will be a day in which leaders of public administration and management look at transportation institutions and see what lessons they can apply from private sector into these institutions. There will be a day, when industry sees big bucks in some of these things and they will move into transportation sectors in a large way. It is only a matter of time before some multi-billion dollar information and communication players begin to act in this market. We can either help this happen quickly or we can probably create barriers to slow it down. When I look out on the transportation landscape, I am not sure where we are in terms of "bringing the future forward faster." What is missing is a vigorous dialogue among the service providers about the preconditions—the institutional and financial—to really make good on the promise of ITS. I guess that's the point I have been trying to make more than anything else.

3 Private Sector Applications of ITS

Jonathan Slevin
President, Mobility Ventures, Inc.
Fairfax, VA and Columnist for ITS-World

What I am going to be talking about is titled the “Private Sector Applications of ITS.” However, I am going to change the title a little bit in a moment. What I am going to do, and of course it reflects my background, is seek to keep what I am saying and the perspective that I’m giving grounded in the marketplace. Transportation and ITS within it do have market dynamics and are part of the broader economic marketplace within which we all live.

Let us try to keep in mind ITS in relationship to the marketplace. I am sure we all know the value of marketing—my profession. Intelligent transportation systems don’t stand a chance without it. Let me illustrate this with the following story:

When Parker Pen marketed a ball-point pen in Mexico, its ads were supposed to say, “It won’t leak in your pocket and embarrass you.” However the company mistakenly thought the Spanish word “embarazar” meant “embarrass.” So the ads actually said, “It won’t leak in your pocket and make you pregnant.” In Taiwan, the translation of the Pepsi slogan, “Come alive with the Pepsi Generation” came out as “Pepsi will bring your ancestors back from the dead.” I mention these examples so that you will give people such as myself the respect we deserve.

To speak about private sector applications of ITS, it will be helpful first to discuss, “What is ITS in relationship to the private sector?” Though people, including a number of those in this room, were doing “ITS” years before ITS existed, the origin of dedicated funding for a defined initiative to push technology onto a conservative transportation profession was in the 1991 ISTEA legislation. Over \$1 billion in federal funding for ITS since that time has been delivered to states and others under “research” and research-type categories.

This federal ITS initiative has from the beginning sought out and supported private sector participation in the advancement of intelligent transportation systems. The government funded the launching of the Intelligent Transportation Society of America, and continues to provide about \$3 million a year, in order to

have a forum where the public and private sectors can work together on ITS. It was therefore important that ITS America also be a member-based organization to attract the state and local public sector agencies and the private sector firms that need to be working together to apply ITS technologies to transportation. This has been successfully done. Discussions about what technologies constituted ITS have been an important part of the process. Where do you draw the line: Do you include ABS? Air bags? Why not intermittent windshield wipers? What kind of membership participation do you seek to attract?

Definitions of what constitutes ITS invariably include information technologies and electronics applied to the surface transportation infrastructure, or network. Although cars, buses, trucks and trains are part of this network, they are not necessarily part of ITS. Where there is not a predominant and ongoing public sector role—whether to fund, regulate, provide vision, inform, or educate—there will tend not to be ITS. The vehicle itself—except in areas of safety and traffic management affected by information technologies and electronics—is not part of ITS. Certain kinds of technologies applied to the transportation network such as ETC, emergency signal preemption, incident management, and automatic vehicle location and identification for public transit most surely are. Since the private sector is involved both in the ITS and the non-ITS part of the transportation network, I believe it is more useful to talk about “infrastructure or network” on the one hand and “consumer market” on the other, rather than “public-” and “private-sector ITS applications.” So I have just renamed my talk, “ITS and the Consumer Market Place.”

Let me briefly compare the enormous differences in culture between infrastructure-oriented and consumer product firms. For example, government contractors selling ITS products scour the Commerce Business Daily for procurement opportunities. But consumer product developers and marketers keep focused by reading Gorman’s New Product News, which estimates that of the 13,244 new products introduced in the United States in 1990, 70 to 80 percent will fail. These folks stay in business by constantly seeking answers to three basic questions: Who is the consumer? What do they want? What will they pay? Companies that sell technologies to the public sector do not need to use consumer research to learn what their customers will buy or to test different products in geographical areas using test/control cell design. They do not gauge consumer acceptance by using a limited scale, controlled test release of the product to learn if it attracts the expected level of consumer use and if not, why not. They do not develop models that break

consumer behavior into hierarchical states (awareness, intent, search, trial, repeat) and measure the strength and interaction of marketing mix elements. Market forces, sometimes benefiting from government R&D and technology transfer activities, have advanced technologies, such as computing power, that are needed to realize the vision of a mobile, safer, interconnected world. The world—and current culture—of ITS ends where consumer products begin.

The remainder of what I am going to say is about that is not really ITS. Let's take a look at how the intersection of five industries—communications, consumer electronics, automobile manufacturing, financial services, and semi-conductor and computer software—during the next decade will transform the automobile and the driving experience and perhaps help the movement of automotive companies toward becoming more like mobility companies in the more distant future.

Specifically, I will talk about the courtship going on in the motor city between auto and electronics firms. The race for affordable ways to more fully engage more of our senses while driving or riding in a car has commenced. By 2010, if not before, an integrated, mobile multi-media system operated by powerful micro-processors that integrates functions providing security, safety, entertainment, communications, and information will be standard equipment in the vehicle. Pioneering efforts to bring the electronic environment of the home and office to the vehicle are being advanced by different consortia each led by one of the Big Three—Microsoft, IBM, and Intel.

"We're incredibly busy around here," says Barbara Churchill at IBM, project manager for the Network Vehicle. "This is a worldwide effort," explains Mike Iannitti, market development engineer at Intel for the Connected Car PC. Kate Monberg, engineer at Visteon Electronic Systems declares, "It is absolutely crazy here." Visteon Electronics Systems was the auto component unit of Ford. It is still part of Ford but it has been transformed into a separate subsidy of 78,000 employees called Visteon. And Perry Lee, product manager at Microsoft for the AutoPC, says, "People are excited. The buzz is growing louder." Last fall and this winter, products and concepts using Windows CE Version 2.0, MMX Pentium chips, Java applications, speech recognition software, and better, faster, and cheaper laptop technology were not only exhibited at the Consumer Electronics Show and Comdex where you'd expect them but they were also introduced at the Tokyo, Detroit, Frankfurt and New York auto shows, and at the Society of Automotive Engineers International Congress and Exposition. What a long

journey, since the early 1960s, when federally funded research into what became ITS in the 1990s was halted because an influential member of the U.S. Congress viewed the possibility of a computer function within the automobile as fanciful and dangerous.

A limited, though still exciting, "AutoPC" after-market product based on Microsoft's Windows CE Version 2.0 platform will be introduced by Clarion Corporation of America in June 1998, as a plug-in replacement for the car radio. Editors at Computer Life magazine believe the upcoming Auto PC line of products in the dash will trigger a major shift in how we think about cars. Auto PC will supply or support applications such as a tuner, CD player, navigation, address book, wireless communications and GPS location systems, engine diagnostics, controls for home security, and speech-recognition and speech-generation technologies. Production vehicle products in the 1999 model year such as Visteon's Voice Activation System and a full-featured Intel after-market product, along with advancements from Microsoft, will continue to change our understanding of an automobile from a mechanical to an electronic device and information system on wheels.

Monday's Wall Street Journal wrote that engineers around Detroit are circulating computer jokes, such as, "If Microsoft built cars, occasionally your car would die on the freeway for no reason, and you would just accept this, restart and drive on." At the Society of Automotive Engineers trade show this week I heard other jokes, such as: Bill Gates decided to measure Microsoft accomplishments against General Motors, as follows: If automotive technology had kept pace with computer technology over the past few decades, you would now be driving a V-32 instead of a V8, and it would have a top speed of 10,000 miles/hr. Or you could have an economy car that weighs 30 pounds, gets a thousand miles to the gallon of gas, and costs less than \$50. GM said in response, "Yes, but would you really want to drive a car that crashes 4 times a day?"

"Connected Car PC Technology" is the name for what's happening at Intel. The manufacturer of semiconductor chips is working with companies such as Ford, Citroen, Volkswagen, Visteon, Trimble, and Qualcomm to develop products for in-vehicle computing. Intel has the advantage that it sold chips to Detroit for 10 years or so. Of course, the semiconductor industry is already well established in vehicles. Today's Chrysler minivan has more computing power than did the 1969 Apollo mission to the moon. Ron Smith, vice president of Intel's Semiconductor

Products Group, says the automobile is the next logical venue for PC technology. The market research firm Dataquest, based in San Jose, sees an increase in worldwide sales of semiconductors just for navigation systems from \$246 million in 1996 to \$1.7 billion in 2001. Today's powerful, complementary visions emerging from computer and consumer electronics firms are giving birth to a steady stream of automotive products. Speech-recognition and speech-generation technologies coming to market this year allow drivers to control with simple voice commands those vehicle functions such as climate control and audio which until now have been done manually. Happy will be the driver who no longer has to fumble with a cell phone and avoid driving into a tree but instead can verbally request, or answer an incoming call, hands free.

Mobile workers can connect to the office system for voice mail and e-mail through voice commands, access their "Information Manager" on the drive home, or search with the "Headlines" command and hear the day's news delivered in a natural speaking voice. It can be the same with "Read Stocks" or verbally accessing information from a database by asking, "Restaurant," "Mexican," "Moderate Priced," "Casual." In three years, if not two, commuters will be able to get audio books on demand. Drivers can send engine diagnostic information wirelessly to a service station they trust and learn what is needed without having to come in and get hooked up to equipment in the work bay. Drivers can also call home, activate home control functions that adjust air conditioning, turn on the lights, and unlock the door, without taking their hands off the steering wheel.

Right now, you may be aware that GM Onstar Program and Ford Rescue have programs with cellular phone connectiveness to a call center. They have the ability to receive engine diagnostic information that comes a terminal screen at a call center and categorizes any engine problem in three different areas of severity. This non-technical person you just called on your cell phone can see where you are spatially because of your GPS system and can say, based on the computer-generated diagnosis: "Well you better pull right on over and stop right now and I'll send you a tow truck, I'm calling them right now." Alternatively, "You've got a little problem, you can go another couple hundred miles or so but you really better get it taken care of in a day or two." Or "Yes, there is a little problem there but it looks like you are okay, in a couple of weeks or so, you better come by and have it checked out." That is being done now where the information is being pulled out of the engine and being sent and read at a distant call center either in Irving, Texas, if it is a Protection One Westar system for Ford RESCU, or outside

of Detroit, Michigan if it is the EDS system for the General Motors OnStar Program. Drivers can also call home of course, activate home control functions that adjust the air conditioning, turn on the lights, and unlock the door, without taking their hands off the steering wheel. One company in particular I have mentioned, Protection One Westar, already has 1.1 million subscribers to its home office security system. They are the folks who have been working with Ford since 1995 and run the Ford RESCU Program. Now they will operate Infiniti Communications Center for that automobile company and are very focused on putting in a lot of resources into mobile security connecting home, office, and car security functions. Ford's research tells them it is something people will pay for.

The integration of existing technologies provides the foundational performance and price value of mobile multi-media systems. Other engineering and breakthrough technologies will provide the appeal of all this stuff to lower the cost to drivers and passengers. Delphi Delco Electronics Systems has for nearly a decade offered a commercial head up display product. But use has been limited by a lack of information available for display, and also by their fixed segment vacuum florescent display technology. Reconfigurable head up display technology can alert drivers to incoming calls or e-mail messages by projecting icons that appear at eye level in the driver's forward view—where the driver's eyes would be any way. They can also flash an icon warning a driver who is following a car too closely. According to Robert Schumacher, Director of Advanced Engineering, through a technological breakthrough, Delphi Delco is now building experimental models of bright, large, full color reconfigurable images that are visible to the driver in bright daylight. I just saw it demonstrated.

After decades of research, powerful speech-recognition technology is just now, in the words of Business Week magazine, "bursting into the marketplace." This high priority area of IBM currently employs 200 speech engineers, including David Nahamu who says, "Without question 1998 will be the year of natural language products." This means that sentences, as people actually speak them, will be recognized and taken in text and functions will be performed off of that. Visteon, already mentioned, has been working on voice technology in an auto environment for many years and has a system scheduled for a production vehicle in model year 1999. "Voice control and text to voice capabilities are key technologies in future telematic products and information services," says Bob DeNaro, director of Motorola's Telematics Information Systems Business. So, expect all three of the consortia and others to unveil voice-activated mobile

systems that allow drivers to place calls or retrieve voice mail messages without taking their hands off the wheel, verbally access faxes and e-mail with text to speech technology, and eventually plumb the depths of your NavTech or Etak databases through voice commands.

Talking with the folks involved in these projects is kind of fun. They are excited. There is a sense they are contributing to something grand and historic. I believe history will likely record this time period from 1998 to 2003 or so as a time where the consumer will witness a radical change in the course of personal transportation due to new, low power microprocessors, designed for specialized devices; advances in speech recognition technology; ubiquitous, affordable, digital and satellite based wireless technology; mechanical functions in the automobile being taken over by electronics; and the consumer electronics industry along with Microsoft, Intel and IBM bringing the experience of an open architecture and established standards to the automotive industry.

GM's OnStar system currently has 16,000 subscribers. The thing is much too expensive; they know that. The hardware is \$895.00 and then it's \$22.50 a month to subscribe, not counting your cellular phone charges. Also, the single microphone for voice input doesn't cut it. Those 16,000 subscribers are based on its availability in Cadillac models last year. Ford, on the other hand, has 7,000 Lincolns that have the Ford RESCU system built in. They pay a bit more for the system but do not have a monthly fee. So, those 7,000 people are able to access the call response center that is based in Irving, Texas. The day I called I thought I heard the rustling of a map. But they actually pick up the navigation maps and things based on GPS. They know where you are and they can give you turn by turn instructions on how to get somewhere. It is available now. This year, General Motors has expanded the availability of GM OnStar into 40% of its North American cars. In 1999 it will be available in 100% of the cars. They can readily do this now with 16-20,000 subscribers. In the auto industry, this is nothing. If they had 16 million subscribers, they could not handle that, it is too expensive. Some of their partners have explained to me that they do not see the call center as a permanent model. They have to work things out to get consumers aware of the kind of information that is available so they will continue to be able to grow and develop more products. They are looking forward to eventually being able to provide real time traffic information to people. This will be an important factor in consumers deciding to buy and use the technology. They also say that traffic information itself would not be enough of an attraction to create a mass market.

Although as IBM's Churchill puts it, "We are developing a technology that consumers do not yet know they want," extensive market research by many companies collectively shows that people want the time in their vehicles to be safe, productive, and entertaining. They won't pay a lot for the extra value, but they are willing to pay something, and significantly more for an integrated bundle of options. The potential market, of course, is huge.

In the U.S. alone, drivers spend 500 million hours a year in cars, which is, on average, 12 percent of each driver's day. There are 200 million cars, 15 million new cars each year. Worldwide there are 600 million vehicles in service. Approximately 30 million U.S. households are paying for Internet access. Intel is serving a 70 million unit market. Pentium performance is well established, the MMX chip supports speech recognition technology. There were 20.4 million Windows workstation software licenses in use in the U.S. and Canada at the end of 1996, according to International Data Corporation. *Penital Computing Magazine* reports there are 40 million mobile professionals in this country, people who do their job on the move—delivery, sales, real estate, utility workers and all sorts of things. Of these, 60% are using a PC in the office or home and Windows is the operating system. So that's how many people who have mobile jobs and are familiar with the PC. Seventeen percent of the population in the U.S. uses wireless communications today. In Japan it's 30% and growing.

Put it all together and what you get, says Charles Szuluk, President of Visteon, is that "Drive time will never be down time again." It is their promise, like it or not. There are still things to be worked out, however. What, for example, is going to happen if you do not want to use your navigation system and you have someone in the car? While talking to them, you say you wonder how to "navigate" this thing next week and the next thing you know your voice-activated system comes on, although you did not mean for it to. There are a couple of ways of dealing with this. One is you can press a button to deactivate the voice recognition system. Another is that action commands in the software can be programmed to recognize a pause before or after them. So, if you say "navigate", your system will come on. But if you say "navigation system tomorrow", it won't activate it, it won't come on.

To start to wrap up, the automotive electronics market is clearly part of what's driving this. Strategy Analytics UK forecasts that the world market in automotive electronics will grow from \$16 billion in 1997 to \$26 billion by the year 2004. The

proportion of electronics in automobiles taking over previously mechanical functions and introducing new functions is estimated to steadily increase from today's approximate 15% of a car's value at an annual rate of 8% growth a year.

So, how is all of this coming together? I asked Perry Lee of Microsoft, "What happened when you guys from Microsoft went knocking on the door of General Motors?" Clearly they opened the door, but what kind of reception did you get? He said the auto industry was already shifting mechanical functions to electronic control, a way of shortening the production cycle and kind of rethinking what a car is but "we met a little resistance." There were comments about how the industries were incompatible. There were comments about 48 months squeezed into maybe 30-month design production cycle for a car versus the two month life span of a computer, things of that sort. He said that they also found auto manufacturers who had the same kind of vision as Microsoft.

Agreements were soon reached, and the computer companies, auto manufacturers, and consumer electronics firms began working together to write code and define user interfaces and interaction. "AutoPC has been a collective effort," says Lee. "OEMs who adopt the open platform of PCs will achieve quicker time to market, lower costs, and provide more choices due to easy integration with other products." OEMs and end-users want current PC and electronics technology in today's vehicle, explains Jim Mazurek, manager of multimedia systems for Visteon, and open systems is how they will get it. He expects the auto industry will accept the standards coming over from the computer industry. "We anticipate a price curve that starts to emulate the PC industry and a platform that is more flexible than what today's auto OEMs provide."

How are auto manufacturers, traditionally very proprietary, going to meet the challenges of open platform and flexibility? How will they get the necessary standards in the car so we do not end up with the Beta and VHS and so forth and so on? Well, it has to be open systems and it's going to be Microsoft. Nobody says that but we can because it's obvious. What people do say is that it's too soon to say that the auto industry has accepted Windows CE or other standards. The industry will be helped tremendously, says Robert Schumacher of Delphi-Delco, if everybody in the auto industry will settle on a single set of standards for how multi-media operates. When I say, "It is going to be Windows," he says, "Could be. People say that." The auto industry lacks the constraints under which state,

federal, and local regional departments of transportation government entities operate. However, it has its own constraints that are based upon proprietary business plans, projections, and presence in the marketplace. This movement of information systems, computer information, into the car is going to happen very, very rapidly. A person with Delphi who has been involved with the auto industry in Detroit for 20 years said two days ago, "I have never, ever seen anything move as rapidly as this in the auto industry" and he is talking about the last three months. Obviously there has been a lot of research going on and people have been working on things in the consumer electronics firms and the computer firms for the last several years. There is no contract with any OEM who says that yes, we are going to use Windows CE. These are all going to be available as after-market products with increasing functionality. Starting this June and continuing on, they will be available as a dealer option and factory installed. It is all going to cost, as a package, under \$1,000. That is everybody's price. People are not going to pay more than that. Some functionality they will all want is going to end up costing as little as \$200.00. The services that have been provided up to this June, such as navigation services, are too expensive. I am not going to pay \$22.50 a month for a navigation service. That and a whole bundle of services will end up in an affordable \$5-\$10 a month range. The roller coaster ride to market has begun.

Cars will become more attractive places to spend time. I am influenced a bit by a study I read of the development of mobility centers in Europe, rental car places where you cars are shared and where not just traffic information but also mobility information is available. This makes options or multimodal ways of traveling easier and more practical due to information technologies. These things provide incentives for auto manufacturers and the whole industry to expand its breadth to include other modes and to be supportive of other modes of travel. That is my visionary hope for 20-30 years down the road in the states. So I suggest, in conclusion, that we begin to prepare to be mobile in a brave new world.

4 The Montgomery County Experience

*Bill Corder
Senior Engineer Technician,
Transportation Management Center, Montgomery County,
County Department of Public Works and Transportation, Rockville, MD*

Montgomery County is a community of 850,000 people outside of Washington, D.C. There are 3,500 miles of roadway in the county. About 1,000 miles of it are major arterial roadways, very heavily congested in rush hours. We are an urban area. Silver Springs and Bethesda are in the lower part of the county, next to D.C. Thirty years ago this area was a suburban community, then it all changed. The two busiest pieces of interstate highway in Maryland run through Montgomery County. Traffic in the Washington metropolitan area is going to more than double in the next 15-20 years but there will not be much of an increase in road capacity. So, we have to respond without building more roads and introduce ITS technologies to better manage the existing roadways in the county. Moreover, 60% of your delays on roadways are nonrecurring congestion, such as incidents and accidents. The Montgomery County Advanced Transportation Management System (ATMS) consists of control, monitoring, and information. We have integrated our transit system in the county.

A computerized traffic signal system that we started in 1980 is a key element. Eagle Signals is our prime contractor. It is an old computerized signal system. We know that in the near future we will have to start implementing some changes on it. It allows us to do real time traffic signal operations and traffic response. It gives the ability to control all 750 traffic signals in our county, including state roads, and to respond to incidents and accidents. The easy part is the managing the everyday traffic, because you know what it is going to be. What we have found, in dealing with other centers across the country, is that few make signal timing changes when there is an accident blocking two or three lanes. We make such changes on the average of 25 to 30 times a day due to incidents, accidents, and construction.

Orbital Sciences is used as a subcontractor in doing multi-map. It is an older real time GIS system but is effectively used. It maps our traffic signals and transit buses. We have 250 transit buses in Montgomery County and we are putting GPS on the buses and creating an automated vehicle location system. This includes scheduled adherence. The GIS system provides different layers of vector maps

and we also have built in the digital orthos. All of this operates in our communications center where our technicians and our people make use of the systems. Traffic signals can be controlled from there. So, if we wanted to we could respond to an accident by changing the signal times in the affected area. This monitoring capacity allows us to see any events in the center and to react to them, so a signal can be put on flash or a bus off route.

There are two major lane control systems in the county. We run electronic signs. We are implementing a message type signing system but it is probably going to be another year or so to put it in place. The system is also capable of 3,000 sampling detectors. Most of our detection system is still the old loop in the pavement type. We do have auto scope and we have several new companies that are bringing in vision based technology for feature detection. We are also experimenting with some microwave and sonar detectors, but still our major detection is the old loop in the pavement.

The county is also developing video surveillance capacity. There are now almost 50 camera on traffic surveillance. The full motion cameras' images are brought back to our center full motion on a fiber optic system. There is about 200 miles of our fiber optic backbone built now. In order to build this system in the county, we had to do a salesman job to create a capital improvement project called Fibernet. Not only does Fibernet do transportation work but it is also dropped into every school, firehouse, and library so the whole community will benefit from our fiber cable project.

Our traffic surveillance cameras do multiple jobs. They are used to put traffic information on cable television. Our county government has a channel on the subscriber cable system like most local governments. We take that channel over in the morning and evening rush hours for providing traffic flow data. There are 200,000 cable subscribers in the county. In addition, part of our camera pictures text is going on our traveler's advisory radio. We run two frequencies on low wattage transmitters. We tried to establish a more powerful radio station that would have cost only half a million dollars but there was political opposition because this was perceived as going into competition with private sector radio. Consequently, we lost the chance to have potentially been in every automobile in rush hour giving them traffic information. Now, all broadcast stations out of D.C. use information we produce. They can turn on and get direct inputs from cameras in our video surveillance system. They use them for their traffic reporting. A lot

of people have asked why we are not selling this video. If we would have gotten into selling it, the lawyers would have had to sit down and agree and we still would not be getting any information out. We have done it on a handshake. Some day we may lose out to the handshake and have to step back. Our station is a state of the arts broadcast station. It runs on an all computerized basis.

We have also been putting out information on our own web site for almost two years ago. Our agency runs the web site for the whole Department of Transportation and gets information from each division. The web site puts out real time information to report where incidences and construction and other things are affecting the motorists. All of our transit routes are covered. You can pull them up by geographic areas. When first started, the web site jumped up to 10,000 hits real quick and now we are averaging 20,000 hits a day. On bad weather days, it jumps up to 30 and 40,000 hits a day. In our area, a lot of people are crossing from Virginia or Washington into Montgomery County. Everybody has a computer, so people are making use of our system by taking a look at the web site. You can bring up our camera images which show a new picture every 4-5 minutes and that accounts for about half the hits. So, people are getting a feel for the road before they head out. The use of streaming video is coming around now to being applied in some state governments, such as Arizona and our own in Maryland.

In terms of other information outlets, we are working with kiosks using our Internet web page. The first one is going to go into a major county mall this spring. We have been working on that for a couple of years and it required getting lawyers involved to deal with liability and all of that at the mall. We are also part of the I-95 Corridor Coalition. We have an intelligent network station in our center that is part of 50 home stations on the I-95 sharing information. The federal government supported this technology starting 5-6 years ago. It is a wide area network. The group is now starting to see the future and thinking about getting on the Internet and sharing that information with the whole world instead of the 50 centers.

Perhaps more familiar, we fly an airplane every morning and evening rush hour, about 1,000 hours a year. One of our technicians in the airplane is an observer. We go up in the rush hours, for any emergency, and for special events throughout the year. The plane has a radio to communicate with state and county police, the state DOT, and our county DOT and fire department. We can talk to the officer on the street. It becomes a real platform for communications to handle incidents and

major accidents. We fly at about 1,500 feet around the county and coordinate along with our transit integration. You could not afford enough personnel on the ground to see as much as an airplane can every rush hour, handle the routine every day complaints on signals, and calling in the location of disabled vehicles. It is a real plus for our operations. Our police and fire services both are marking more use of it now. The plane uses a Westcam gyrostabilized ball that holds a camera and uses a microwave link back to the center and to portable receivers. Because the camera is infrared, we can see at night real well. The police have made use of it doing surveys of different police actions and things like that. Environmental protection folks go out and take pictures of illegal dumping and now they are using the infrared for some stream monitoring. So, it has been a sell to the county from our viewpoint as a shared resource, but it is run by the DOT and the county. We lease the airplane and we have a contract for pilot services.

We now have 75 buses linked to our system. This just happened in the last few weeks, but it has been about a three-year project. The tracking of the buses is not the problem. It was integrating the computer-aided dispatch. The central transmission for our bus operations dispatch is in our center along with our traffic, so if all the technology clicks on tracking buses, there are at least 250 radios and buses feeding in information about what is going on in the highway and vice versa. This allows monitoring of schedule adherence for the transit system, both the bus itself and our central and we will know when we are running even 10 minutes late. Merging this with other inputs we will be trying out bus priority by creating the zones on a call if it is running late and our signal system will respond.

The Automatic Vehicle Location (AVL) system will allow us to put out for the transit system better information with our communications. We built both copper and fiber cable lines throughout the county. This spring we will be putting out our first message sign giving status of the routes at bus stops and at our metro site where we have many bus routes running through. It may be like the systems at the airport showing flight status. As far as I am concerned, I do not ride the bus, because I never know where it is. But I think if we start telling people where the bus is and that it is really coming, we can get more people riding the bus. In Montgomery County the transit system has done nothing but grow since it started 25 years ago. It is a 250-bus system. We are currently testing, as noted, bus priority with 75 vehicles and we will go ahead and complete the rest of the system over the next year or two.

Parking management is an area still needing emphasis. We are trying to work with the Federal Highway Administration on some funds to implement a parking management program in the Bethesda and Silver Springs areas of the county.

An important part of our program is an incident management team. We communicate with our emergency response vehicles every day, all day long. We are sharing information with them and vice versa from their center next to the Baltimore Washington International airport. The incident management team in the county is made up of fire, police, DOT, and environmental protection people. There is also an incident management team made up for the state and the metropolitan area with Northern Virginia, D.C., Montgomery County, and PG County. “The old guys” get together once in a while and talk so that when you have the big incident at 3 a.m. or rush hour we all know each other and their resources. The incident management is nothing more than everybody getting together to get the job done and dropping the institutional barriers of a police department, fire department, and the state DOT. We have been working at it for 15-20 years and we have a pretty good thing going in Montgomery County. It is still hard to work with the old volunteer firemen though. All that we are doing in Montgomery County gives us the benefits of reducing congestion, improving the system capacity, providing for a safe roadway network, and improved air quality. That is about it for Montgomery County as far as what we are doing as a local government.

Montgomery County Advanced Transportation Management System (ATMS)—
Overview (from <http://www.dpwt.com>)

5 Public Sector ITS Programs at the Local Level: ITS for Smaller Cities and Rural Areas

Ed Roberts

*Manager ITS Group, Transportation Planning,
Highway Safety and Traffic Engineer, Department of Transportation,
Albany, New York*

I want to start off by giving you a sentence or two characterizing exactly where we are in New York State in terms of addressing small urban and rural ITS. I would like to characterize that as being on the verge of taking and creating a program to address that, versus being in a position to talk about all we have accomplished with a long-standing program. My speech today is more focused on telling you how we intend to go about building ITS capacity outside metropolitan areas.

First, there is a need to give you a rough idea of what the heck is rural about New York anyway. When people think about New York, they think about New York City. We have a number of large metropolitan areas in the state. We have five of the 75 major metropolitan areas in the nation including New York City, Albany, Syracuse, Rochester, and Buffalo. Our initial state ITS program focused on these areas because the need is there. The congestion-oriented problems are so overwhelming that we really had to deal with them in large urban centers and get of our legs under us before we moved on. We have been doing ITS strategic plans in these areas. All are either under way or completed at this point with the exception of Syracuse, which should start up this year.

Now we are moving on to look at ITS for the small urban and rural areas because, in all honesty, the people in those areas are coming to us and saying they think there are some needs there that can be addressed by ITS. New York State is divided into 11 regional offices and generally each regional office has a major city associated with it. Of these, attention is needed for the four regions that include the cities of Watertown, Utica, Binghamton, and Hornell respectively. Hornell is about 10,000, Utica 60,000, Watertown 29,000, and Binghamton is 48,000. They are definitely small-sized cities, but tremendous rural areas surround each. The Adirondak Mountains are in the area around Watertown, the Finger Lakes are in the Hornell area, and Binghamton has the Catskills. I think you can see there is a

lot of tourist attraction areas involved and I think that is one of the big things about small urban and rural ITS. If you want to take ITS to these areas you really need to know what the major issues are. In New York State's DOT we tend to be overfocused on the metropolitan areas and we really need to turn our heads around and deal with what rural areas actually need rather than what we think they require. In metropolitan areas, transportation issues are related to things like congestion, travel time, and travel time reliability. In small urban and rural areas, the critical issues deal with safety, security, and quality of life.

The U.S. DOT has identified several critical program areas in applying ITS to small towns and rural portions of the country. I would like to go over them. First, ITS can be used to foster traveler's safety and security. When people in rural areas or small towns need emergency services, we want to find ways to help get them faster and delivered to exactly where they are needed. Tourism and travel information services are a big focus of rural and small urban ITS. For example, when tourists are traveling in an area they are unfamiliar with they can miss turns or pass an exit. They do not know how to get from one place to another and there are obvious ways ITS can help. Some people in rural areas do not have good access to automobiles. They need public transit and paratransit services. These are services ITS can help make more accessible.

The need to take care of the traffic signals and make them operate efficiently, clear the snow and ice, and maintain the pavement exists in rural as well as metropolitan areas. There are many ways ITS can contribute to those agencies providing those services more efficiently. Public fleet operations and maintenance also must be dealt with. In rural areas there is a lot of mileage involved in providing basic public services. ITS can help these agencies deal with scheduling and monitoring their vehicles to take advantage of the most efficient routes and maintaining their fleets in general. Finally, U.S. DOT also points out that commercial vehicles operate in small urban and rural areas. Attention must be given to how ITS solutions can be of help to commercial vehicle operations.

The U.S. DOT identified these small town and rural area needs with input from various government agencies and the private sector as well. It also commissioned a study which included interviews and focus groups of citizens. I would like to talk about some of the findings. In focus groups, people were asked what they see as key advance travel information system needs that relate to small rural and urban areas. Some of the answers may be surprising in terms what people see as

their highest priorities. They put a priority on things like the ability to call for help in emergencies, warning of approaching hazards ahead, in-vehicle falling asleep alert, information on road closures and congestion ahead, advisories on safe speeds for the prevailing conditions, and directions in routing to their destinations. When you ask people what do they think they need, their responses line up pretty well with those critical program areas U.S. DOT had identified. The challenge is how can ITS be used to respond to these needs and concerns?

We have had a lot of experience now in dealing with ITS in the metropolitan areas across the state and we know what their unique challenges are, but non-metropolitan places require different and creative approaches. First and foremost, the problem is to overcome the lack of awareness. There was a general lack of awareness at every level when we initiated an extensive ITS program several years ago. But I can say right now that at the local level, in small urban and rural areas, there is almost a complete lack of awareness of what ITS is and what it can do. Where there is some awareness it is probably a misconception that ITS involves only expensive high tech solutions. We really first have to deal with increasing the awareness in the small urban and rural areas. There just won't be any way to develop a program without it. Most of other issues we have identified are pretty obvious.

There are fewer dollars and other resources available. In the rural areas, the small number of transportation personnel tends to have a number of hats. You do not have an ITS expert in a rural area or a small urban area. The problems in these areas are real but they are often viewed as less urgent. I do not mean to put the problems down, but congestion problems in the New York City area get a lot of attention and that is difficult to match for the problems in smaller areas. There is a requirement in some of these critical program areas for people who are untraditional partners to work together. These include emergency service people, tourism boards, offices of tourism, commercial vehicle operations, and private sector firms.

A more difficult mix of tools must be put into motion to address these types of issues. So, you really have to work hard at getting the right people at the table and the right partners to work together. This is complicated at times by the question of who really has the leadership. In rural areas, when you start talking about emergency services and specialized things, you are likely to be in an area in which your agency may not be in control of the service area or have expertise in it. You

really have to be aware that you need to identify who the proper people are and who can come forward as the champions for the program and work with those people. Finally, constituencies in these areas often lack what I call a critical mass. You have somebody over here with an idea to address a problem and somebody over there and they are hundreds of miles apart. It is hard to bring things together to the point where people can recognize that there is a critical need. Somehow, you have to work past those difficulties and form the necessary partnerships.

Given this context, the way we are approaching it in the New York State DOT is through a pooled consultant study that will help these regions address their rural ITS needs. The reason we did a pooled study is because none of these areas, we talked about a lack of resources a second ago, had enough money to hire their own consultant to do an adequate study. They just could not afford it. They had too many other needs. They came up with \$400,000 among them. One of the regions put in \$200,000 and the other three put in about \$70,000 each. This created the critical mass necessary to go forward and start a study that can help all four of them. One of the things they identified right away was that there are common solutions to problems in all four of these areas. So, one of the biggest tasks in this project is to develop a toolbox of solutions that can be used in all the different regions. That way they get the benefit of money spent no matter which region it is.

Another thing they are going to do relates to the awareness issue. The consultant will help each of the regional offices to form and involve stakeholder committees. So we will bring the proper stakeholders to the table and involve them in identifying needs and the solutions. I think this will go a long way to increase awareness.

This study will also develop either a strategic plan or strategic direction for the regions. The reason for the distinction is the region that put in \$200,000 has enough money to get a pretty well fleshed-out strategic plan. It will identify needs, look at the tools required, come up with goals, objectives, and solutions, and lay out a program. That is what we are calling a strategic plan. The other regions do not have enough money to do that so they are going to get what we call a strategic direction. I would characterize this as sort of an executive summary of a strategic plan. It will talk about the needs and the possible solutions but it certainly won't be as detailed. Even so, we have asked the consultant to identify for these regions, the three top opportunities for deploying ITS within their region in a way that would be in sufficient detail that, if the region chose, it

could prepare an initial project proposal for it, which is the way we start a project. We have also put in a small amount of money, because some of the regions felt that they might have a solution that was identified in their study that they would want to progress using in-house personnel. In this case, the money could be used for a bit of technical assistance from a consultant. There is also an option that allows this undertaking to be supplemented in any one of these regions if another project comes along that can provide monies that can enhance the strategic plan or direction project.

There are other things that are happening as well. Something we are encouraging in the New York State DOT is that when we do a plan we do not stop and wait for the plan to be done. There are certain obvious needs for which you do not have to wait. I want to give you a few examples of things that I think are pretty neat that are happening, are really cost effective, and characterize well the solutions for these smaller areas. One is a system that was put in place in the Buffalo area. Buffalo is not a small urban area but this can be deployed in a small urban area. It's a congestion ahead system. There is a toll bridge up the interstate that backs up at certain times of the day. When it backs up, there are some people who do not have to go on the toll bridge to get where they are going. So, we can let them know ahead that traffic is backed up and what alternate route is available to divert them off the bridge. It is a very simple system. The region used a traffic signal controller to monitor detectors on the interstate to sense when the traffic is backed up. In this case a radio, very inexpensive equipment, sends a signal to the sign and it starts flashing beacons that indicate a backup ahead, a simple solution to a relatively complex problem.

The same regional office has implemented another type of system. It is a bridge closing system and also addresses a "seat of the pants" need. There is a bridge in the Buffalo area that has to be closed eight to ten times a year because of snow and ice. It used to be the police would go out and put their cars in front of the bridge and divert traffic. Now, they have developed a system similar to this with flashing beacons. When the police want to close the bridge they just call on the telephone, enter a code, and the system automatically flashes lights on signs in major approach areas telling people that the bridge was closed and diverting them. Faxes are also sent to all the appropriate enforcement agencies, transportation operation agencies, and radio and TV stations. When the police want to re-open the bridge, they call again, enter a code, and the whole thing is reversed. The signs are turned off and notice goes out that the bridge is open

again. The police still go out when the bridge needs to be closed but they do not have to send as many people. Also, they do not have to deal with as much of a traffic jam because some drivers are diverted due to the signal providing advance notice. This is a good seat of the pants ITS solution to a common problem.

Another area where I see a lot of activity in small urban and rural areas is the use of portable variable message signs and highway advisory radios. In New York State DOT, our regions have a ton of these things. One region can have around 50 of these signs that are used for construction sites or maintenance activities, and the management of a problem area. The public has complimented very much on our use of these signs. For some reason, even when you put a static type of a message up, and we try not to do that, it grabs a lot more attention than a standard sign.

The variable message sign use is not limited to the major urban areas but can be used all over a region for special events, construction, and spot safety problems. We had a truck rollover problem in a section of a highway and were not sure what was causing it. While we were studying what the problem was, the region brought out a couple of portable variable message signs and put one up on the approach to this curve. They told the trucks to reduce the speed and then there was another one further on down the line that flashed the message "30 mph." This allowed us to reduce rollovers while we did a study of what was causing the problem. Eventually permanent signs were put in but this is an example of how these portable signs can be effective for interim solutions.

I just want to mention a couple of things briefly. Several of our regions are implementing what I call cost effective solutions. If you utilize ITS, it almost always carries with it an operational element and in most cases non-metropolitan regions cannot afford to pay for full blown operations. In one creative response, a region is hiring recently retired department employees on a part-time basis to come into the office and run a mini traffic management system. In another area, we work with the State Police to deploy warning signs. Most of the regional DOT offices do not have 24-hour operations, so we worked with the police who do have 24-hour a day people. We put the computers that control the signs in one of the State Police substations and developed some operating procedures with them where they can run the signs. As a result, we do not have to go out and hire more people. It is an effective way to partner and deal with reducing operating costs.

The last thing I want to mention is that ITS is going to happen to us whether we want it to or not. Many ITS solutions will be driven by the car manufacturers and the people who are willing to buy the devices and put them in their car such as in-vehicle emergency location and communication systems. It does not have anything to do with whether the particular state DOT wants it to happen or not. But we see it happening and we become partners. We have to come to the table and we are going to be a part of the process. It is cost effective, because we do not really pay any money at all when that type of thing happens. So my point is if you are going to look at ITS for small urban and rural areas, you have to realize it is not something that you can just decide that you do not want to deal with it. One day there will be cars with these devices coming down your street, whether it is a city street or rural road. The OnStar Center is going to call up your public safety agency saying there is an accident in such and such a road and we need to have somebody go out there. You should be aware this is the future and you will need to be able to respond effectively. In closing, let me emphasize, if you are going to take on small urban and rural ITS, be sure you know the issues and be sure you know the challenges. If you can, try to pool resources because no one in these areas has enough money. Finally, do not sit on the sidelines, get involved whether you like it or not.

6 ITS and Federal Transportation Policy

David Gendell
Regional Federal Highways Administrator

I am especially interested in the intermodal nature of the program in Delaware. The U.S. Department of Transportation has an ITS Joint Program Office, which is headed by Christine Johnson. The program started as a reaction to the existence of advanced technology in Europe and Japan. In the late 1980s and early 1990s, the U.S. felt that they should look at it. The program was originally called AVHS (Automated Vehicle Highway Systems) and then renamed ITS. There are “two pillars” on which the highway mobility is based upon. The first aspect is renewal of the transportation infrastructure through using the latest in materials technology. The second pillar emphasizes the ITS program by applying enhanced technology to improve safety, reliability, and efficiency of transportation operations.

The ITS program, enacted by the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, is a joint effort of industry with government. We can think of ITS as a demonstration of the latest wave of technology which is part of everybody’s life. The involvement of the membership of transportation associations is crucial in this process. Although some say they are not involved in ITS, they actually are. Everybody plays a critical role in this business. ISTEA 1991 provided one billion dollars for ITS, half from funds provided to the states and half from an administrative program. Two hundred million dollars were designated for research. Deployment and mainstreaming the idea of ITS received \$150 million. Five percent of the money went to commercial vehicle operations (CVO), and 4 percent for developing an ITS system architecture. The AHS (Automated Highway System) demonstration in November 1997 in San Diego provided visions for future directions of the program. Substantial funds have been invested in operational tests and demonstration projects. For these projects, Congress has earmarked certain amounts of money. The overall intention is to make certain we get the maximum benefit out of earmarked funds.

One example for ITS application is “Partners in Motion” in the D.C. metropolitan area. All players provide information to a private firm that is putting the information out to the public. One obstacle in this process is the different

communications standards being used for TV traffic surveillance. More compatibility is necessary. The Washington Metro transit system is planning for systems of electronic fare collection and electronic traveler information systems. An important aspect of these efforts is that these systems be developed recognizing the needs of all potential users of the information. Moreover, the Federal Transit Administration recognizes the importance of a common set of standards and is cooperating in the national effort to develop ITS standards.

Operational tests on ITS were already being conducted during the 1980s. But the early efforts sometimes did not involve stakeholders. Therefore, the plans were not that useful. As a result, one requirement in draft bills for reauthorization in Congress is a system architecture for each area. But this is no easy thing to implement. There is an outreach effort in the development of 100 standards that include representatives of the industry that produces the equipment. Currently there are 10 standards in place, 20 are planned for next year and 30 for the following year. Development of these standards is in everybody's interest. The first standards relate to communication systems for ITS: The task is to design interoperability among systems which should interact. Also, common architecture for ITS is very important. Currently a system architecture course, directed towards local and state governments, is being developed.

Various ITS systems are already deployed by several jurisdictions. The I-95 Corridor Coalition has done great things and Delaware has served as a prime administrative host for these efforts. The I-95 Coalition consists of 42 agencies, such as toll authorities, local authorities, and states. Its focus is on communication and information, but it is also getting increasingly involved in goods movement and commercial vehicle operations (CVO). Maryland is first in applying a statewide approach to ITS. The most important areas include bringing information to users and the detection of and response to incidents. Within Maryland, Montgomery County is the leader of local governments in terms of integrating surveillance for transit at the local level. Currently, most signal control systems are static. In contrast, the next generation, as already applied in Arlington, Virginia, is adapting to traffic demands which allows switching between 10 different signal timing programs. Furthermore, electronic toll collection is already common in the New York City metropolitan area.

Above all, the question of benefits from ITS is crucial: "What do we get for the money?" The benefit-cost ratio of ITS is 8 to 1. In addition, ITS is 35 percent less

expensive than construction in providing additional capacity. Between four and seven billion dollars of ITS investment are going to transit over the next 10 years. The current process of ISTEA reauthorization has immediate consequences for ITS. The Administration's proposal seeks total funding of \$175 billion over 6 years. It would provide \$1.3 billion for ITS and \$100 million for the implementation of ITS technologies.

Present national initiatives aim at making freeway and local management systems interoperable. In addition, the vision is to develop prototype systems. Another area is training and local guidance relating to standards. Generally, this task is not so complicated, because the industry wants standards. However, the difficulty lies in the fact that standards are still being developed as they are tested. Therefore, they have to be modified if necessary. The general focus of U.S. DOT is to look at several market segments: First, there is the intelligent vehicle initiative. U.S. DOT wants to help make sure that market-driven technology provides things that provide user safety, mobility, and information. Another emphasis of the Administration is on safety issues. Furthermore, the deployment initiative is targeting operating systems that are easy to implement. Generally, these systems need to evolve over time.

Federal ITS Program—Summary

- ❖ Formal Federal ITS Program established in 1991
- ❖ Focused on research and technology transfer activities
- ❖ Focus is gradually changing to include more emphasis on deployment activities

What has been funded?

Fiscal Year 1991-1996—Total ITS Funding—\$991.1 million

- ❖ AHS—49.8 million (5%)
- ❖ System Architecture—37.2 million (3.8%)
- ❖ CVO—38.6 million (3.9%)
- ❖ R&D—176 million (18%)
- ❖ Deployment Planning, T2, Program Support and Mainstreaming—124.7 million (12.8%)
- ❖ Operation Tests/Corridors—582 million (56.7%)

Program Accomplishments since 1991

- ❖ National Program Plan
- ❖ Aggressive R&D program
- ❖ Over 80 operational tests

- ❖ Over 80 local deployment plans
- ❖ Four Priority Corridors
- ❖ Identification of “core” intelligent transportation infrastructure
- ❖ National Architecture developed
- ❖ Standard program initiated

I-95 Priority Corridor

- ❖ Coalition of 12 states and D.C.
- ❖ Administrators from 42 agencies serve on Executive Board
- ❖ Focus on:
 - Communications and coordination
 - Inter-regional travel and incident management
 - Multimodal traveler information
 - Commercial vehicle operations

Region 3 Activities

- ❖ Statewide incident management: Maryland/Virginia
- ❖ Integrated traffic/transit management: Montgomery County, MD
- ❖ Advance traveler information: Washington, D.C. Region—Partners-in-Motion
- ❖ Real-time traffic adaptive control signals: Arlington, Virginia

Sample ITS Benefits

- ❖ 8:1 Benefit/Cost Ratio in Metropolitan Areas
- ❖ 35% less expensive than capacity project
- ❖ 10-year period—Transit saves \$4-7 billion
- ❖ 20:1 Benefit/Cost Ratio for Commercial Carriers

Current National Initiatives

- ❖ Model deployment initiatives
- ❖ Metropolitan: Seattle, Phoenix, San Antonio, New York City Tri-state region
- ❖ CVISN: Maryland and Virginia serving as prototypes
 - California, Colorado, Connecticut, Kentucky, Michigan, Minnesota, Washington/Oregon

Where are we going?

- ❖ Model Deployments
- ❖ Technical Guidance, Training, Standards
- ❖ Integrate Program and Project Development

NEXTEA (proposed)

- ❖ \$175 billion over 6 years (FY98-2003)
- ❖ \$1.3 billion for ITS
- ❖ Research and Technology Transfer
 - \$96 million annually for FY98-2000
 - \$130 million annually for 2001-2003
- ❖ Deployment Incentive
 - \$100 million annually

Research and Technology Transfer

- ❖ Intelligent Vehicle Initiative: Continuation of AHS program with emphasis on human factors and in-vehicle systems
- ❖ Training
- ❖ Standards development

Deployment Incentives and Provisions

- ❖ Encourage integrated deployment, innovative financing and public/private partnerships
- ❖ Emphasize operations and maintenance
- ❖ Contains limitations and priorities to ensure commercial vehicle and rural applications

Conclusion

“This telephone has too many shortcomings to be seriously considered as a means of communications. The device is inherently of no value to us.”

Western Union internal memo, 1876

7 Current DelDOT ITS Programs and Planning

Gene Donaldson

ITS Administrator, Delaware Department of Transportation

Earlier you heard about Montgomery County. That was my baby, I was working with it from its beginning. It is now 20 years old. We were doing ITS before ITS was a name. We had to because Montgomery County had such a growth problem we had to use technology to improve how we managed the system. I learned a lot over those 20 years. One important lesson I learned from that experience is you cannot work in a vacuum. Since I have been in Delaware, we have been trying to do things in parallel where we are involving academia and focus groups. We are actually going outside of DelDOT now and working with cities, local jurisdictions, and so forth.

I am going to talk to you about the integrated transportation management strategic plan in Delaware, our program to implement it, and the benefits it will provide for the state. First, the system: we have our urban network, interstate network, and an arterial network. One of my former employees reprimanded me and said, "Gene, what about the rural network in Delaware?" Yes, we are going to address that also. But, it is a system and the reason I came to Delaware was Anne Canby, the Secretary at the Department of Transportation, looks at it as a system and that is what we need to implement. Through transit, rail, the ports, bicycles, airports, and earlier there was a mention of pedestrians, yes, they are part of the transportation system. We must accommodate them.

Now, I will discuss the problems. In Delaware, there are over 660,000 registered motor vehicles, almost a vehicle per person. We have over 20,000 reported accidents annually and there are far more unreported. Between 1980 and 1994, the annual vehicle miles traveled increased 66 percent. In that same time period, roadway capacity increased 7 percent. Although transit is really being used in Delaware, especially in certain areas such as around Wilmington, we have to do better to deal with congestion. There are two types of congestion. One is recurring where you just do not have enough capacity, not enough lanes, and too many vehicles. The only way to fix that is to add more lanes or reduce the amount of demand or vehicles. Then, there is nonrecurring congestion. That is your disabled vehicles, accidents, construction, weather, and special events. Over 60 percent of

your delay on urban roadways is caused by nonrecurring events. For every one minute of roadways blocked, there are five minutes of delay. If we develop systems, policies, and programs to attack that nonrecurring congestion, we will improve that 60 percent delay factor. Also, congestion is costly to business. National statistics say over \$1,000 loss a year per employee is related to congestion. We cannot build our way out of congestion in Delaware because of the high cost to build, \$10-15 million dollars a mile, environmental impacts, and limited land availability.

In Delaware, we have a statewide, long-range transportation plan. From that plan, we have just completed our integrated transportation management strategic plan. This plan was developed with wide participation. We went out and talked to commuters. We met with the freight movement providers, the tourism industry, other agencies throughout the state, the MPO and others were involved in the process, DelDOT staff, and so on. There was a vision that came out of the strategic plan to develop a balanced integrated transportation management system. Using monitoring, control, and information, we would improve the system. There are four major strategies that came out of the plan and those strategies will save Delaware and its citizens' time, lives, and money. The major strategies that will create the necessary infrastructure include the signal control system, commercial vehicle operation (CVO), information systems, and communications systems. We need to disseminate accurate real time information. That is critical. What is exciting me is that Bill Gates may be our partner to the extent Microsoft gets involved in ITS by putting advanced communication and information electronics in autos. We need to provide real time information and people will have access to it through radio, the Internet, in-vehicle electronics as well as such things as our dynamic message signs. To do this we need to develop the partnerships with local agencies, the University, and private sector groups.

For example, the University of Delaware is doing an ITS course and they are getting a good response. So, we are happy to see these kinds of things because we cannot hire all the people ideally needed to support ITS. We are going to do an integrated transit traffic management system alluded to by Secretary of Transportation Anne Canby. Transit and our highway operations will be handled from one center on a 24-hour, seven days a week basis. We are going to use multiple systems with open architecture. Proprietary systems will be avoided. By having an open system, we will be able to be interoperable and make adaptations as technology changes. The critical thing is we are going to coordinate DelDOT

activities with police, fire, and other emergency services. Where we have traffic adaptive systems in Delaware, we are going to bring them together into one system that is managed from the center. We are going to look at using electronic signing and reversible lanes. In my vision, the pipe (road capacity) is actually bigger out here than you think if you just better manage it.

A critical feature is using automatic vehicle locating, global positioning systems (GPS). We are going to equip all of the DART paratransit and fixed route vehicles with this equipment to improve our scheduling. We are also talking about broadening on-demand scheduling beyond paratransit vehicles where we can move through neighborhoods and pick up people as they call in. GPS will allow us to track the vehicles and be able to re-route as necessary. The other thing it gives you is the real time information, what Bill Corder was talking about earlier, that will make public transit attractive to more people. They will use it because they know a bus is actually coming and that is what we want. We intent to build into our system priority treatment of transit vehicles. As they go through the network and are late, this information will automatically be communicated to the center. The system will make decisions on how it will adjust traffic signals to move them faster through the system.

Electronic toll collecting is also a component of our Integrated Transportation Management System (ITMS) program. We will look at ramp metering and things like commercial vehicle operations. We need to monitor the network and use detection systems that are well developed in the state. There are thousands of detectors in the roads out there now. We are going to link these back into our previously mentioned unified operations center. We are going to use newer technology and some of it is being tested in Delaware now.

Information will come from a variety of sources. We are working on parking management with the Wilmington Parking Authority to see if we can know what parking garages are full and put that information out to the user. We are going to look into aerial monitoring and we have our motorist assist patrol. Video cameras are being installed on I-95. They will provide critical information for traffic control and event response. We are going to enhance our traveler's advisor radio and work on utilizing cable TV systems for advisory reports. For example, I have talked with Suburban Cable, which covers most of New Castle County with connections to 140,000 homes and businesses. They are interested in what we are doing and are coming back with a proposal for us. That is a way for us to get our

information almost immediately to the user. Variable message signs are coming. The Internet is also something we are working on and we will have a real time web site with a substantial amount of information which will be expanded over time. You will see our camera images on the Internet. You will get information on transit. It will be an integrated web site. To support all of this, we have to fully develop a communication system. We are surveying now what we have in Delaware and how to enhance this system. We are going to create a transportation management team to work together on a daily basis—not just because there is a major incident.

The technology we are talking about is very sophisticated and fast changing. We need to train our staff in how to operate and maintain it, as well as make it accessible to aware citizens and customers.

We need to work closely with our partners. I used to be in county government and I used to cuss the state. But we learned to work together and so I bring to the state a perspective from below. I know I have to work with the local jurisdictions in the counties and can make this happen.

Now to create these systems, you cannot just build things and then go add it on. So, as part of DelDOT's program, as part of the planning process, we know we are going to add the systems and so that is part of the planning and design.

Now, I will discuss our program. Given limited resources, we had to look at Delaware and determine where we could get the most bang for the buck. We used several criteria for determining where the greatest needs were for applying ITS. These included congestion, traffic volumes, the presence of transit routes, the extent of goods movement activity, the seasonal and recreational travel demands, and the part of our state with concentrated tourism. There are a variety of needs. For example, I live off of Route 54 and that bypass route is frequently under water. I could not get any information about whether it was closed, open, or whatever. So, we need to improve information about such conditions.

In the first cut of our priority assessment, approximately 700 of the state's 4,000 miles met criteria for action. But this was still too big an undertaking for us to do in a six-year capital program. We weighted some criteria and ended up with 250 of the most critical miles identified. In the northern part of the state and in this area, the railroad lines are a part of the 250-mile network. As we move south

through the state, Boyd's Corner, the Middletown area, Smyrna, Dover, and Milford there are sites that we need to monitor, even in our more rural areas, the Route 13 and 113. Then in the southern part of the state, the resort areas and Bridgeville, Georgetown, and Millsboro are part of the 250 critical miles. We have put together a program we call ITMS 2000. By January 1, 2000, we will have implemented major components of the ITMS system that includes segments along the I-95 corridor which will include the roads that serve it; the cities of Wilmington, Newark, Dover; the resorts; and twenty-four hour observation in the transportation management center.

Some of the DelDOT staff members are shaking their heads saying that guy is crazy, but we are going to do it. These are the kinds of things we are going to achieve by January 2000. An important part of what we have done is administrative restructuring. We knew we had to support what is coming and we sat down and restructured the Bureau of Traffic so that they could do this job. It is now called the Traffic Engineering and Management. It was an interesting experience and I think successful. Traffic adaptive signal systems will be a priority with detection systems and video monitoring. We are going to build a demonstration project, implement the transportation management team, enhance our traveler's advisory radio system, get the real time web site going, and have dynamic message signs.

These kinds of systems actually bring organizations together. They are bridges, conduits. Everybody has a win out of it. No matter what you do, you need information about transportation. You need to monitor what is happening. This is what happened in the Washington, D.C. area. There were seventy agencies in the region that came together for the first time to deal with ITS issues. I was still with Montgomery County and chaired the meeting and worked on cooperating between these different players. ITMS advanced systems bring agencies together.

Looking at the big picture, the benefits of ITS include increased safety, reduced delays and congestion, reduced fuel consumption, increased work productivity, improved freight movement, and improved transit operation information. It eliminates or delays new road construction. Further, there is improved incident and special event management and, as you heard earlier, there is an 8:1 benefit to cost ratio. It facilitates our customers who can make educated route travel time and mode choices. That is critical for managing the system. I am ready to work

with any of you and tell you any time about the system and hope that you will be part of where we are heading.

In closing, I would like to emphasize what we call Integrated Transportation Management Systems (ITMS). This is transportation management in a broader sense. It is programs and policy and it is all the things we have talked about. ITS is a tool to help us do that. I do not want people to think that we put in these gizmos and the world gets better. It is a whole series of things that have to work together and that is what I call transportation management.



Panel: Public and Private ITS Applications in Delaware

Moderator: Scott A. Sabol

Panelists: Gary Kirk

Michael Eadicicco

Gary Kirk

President, Delaware Motor Transport Association Inc., Camden, DE

For the last year, I have been working on the I-95 Corridor Coalition and the state's own projects—talking with our members and trying to understand what the industry has in mind for ITS. It was interesting the first time Gene Donaldson called us all into an advisory meeting. I was thinking, what is ITS? What is it all about? Many of us really were not sure what ITS was about over the last year. Our biggest message to DelDOT was, keep us informed and let us have input.

ITS could be a cost benefit system that uses available technology to increase productivity and aid in the movement of goods. It must assist carriers to satisfy their varied customers and result in a beneficial increase in profits. In addition, it must increase safety for both the carrier and public, reduce congestion, conserve fuel, and result in reduced regulatory and compliance costs. I know you have heard that from a lot of the people and hopefully, I can help put the broad picture together by summarizing the perspective of the motor transport industry. Several major areas I think should be kept in mind.

1. The cost versus benefit. First and foremost, ITS must be affordable to both the motor carrier and the State. The cost must be justifiable and there must be a tangible benefit to everyone. If it does not save us money and the benefit does not outweigh the cost, then it is not a beneficial thing. However, our regional U.S. DOT administrator pointed out it should do that, so we will be supporting it.

2. Share the vision in the future, work together. All stakeholders, both public and private, must have a common vision of what they want to accomplish and how they want to get there. This must come about through close cooperation and continuing communication from all involved. This point was highlighted several times today.

3. Interoperability standards. Until national standards are developed for ITS, confusion and duplicate efforts will be the norm. While individual states and regions have their own plans and requirements, we must push for a national standard and cooperative effort across the country. Years ago, you used to see trucks with multiple license plates across the front. You do not see that any more. Two years ago, you saw many fuel stickers on the sides of trucks. They are slowly disappearing and now there is only one on each side of the truck. National efforts were put into place to work together to do one plan. There are two programs, IRP and IFTA which eliminated all those license plates and stickers. We now pay our taxes and registration to the State and it gets split up amongst all the states in which we travel by the amount of miles. As long as issues and initiatives are continually done like that, kept open-ended and in electronic mode, it saves money for the State. These are examples of why we need national standards and systems. In the future, we do not want to return to the old habits and use multiple transponders or other communication devices. The industry wants a seamless open-ended system that will allow a truck with one transponder to travel throughout the country, passing through toll barriers, and clearing weigh stations and roadside inspections.

4. Institutional barriers are one of the greatest obstacles that we must overcome for a successful implementation of a national ITS program. Especially inter-governmental barriers, with which the motor carrier industry has extensive experience, have to be broken down across the board. A carrier who operates in all the 48 contiguous states is currently required to deal with over 150 different agencies to get their authority and take care of everything else. These include revenue departments, DOTs, and public utility commissions. If the carrier transports hazardous material or oversize or overweight loads, then dozens or more agencies enter the picture. Within this state, luckily, Delaware has tried to make it work. But some states do not have the "one stop shopping" a lot of states have. Even the intra-state carrier has to deal with a lot of people. So hopefully we can consolidate into one area with one stop shopping and the use of the transponder to communicate some of that information to make it so much easier for goods to get moved across our roads.

5. Privacy of the data becomes an important issue when you are dealing with computers and if you are providing a lot of information that state and federal governments want. Many carriers are concerned over who will have access to the data and what the data will be used for. Carriers collect a lot of data for their own vehicles, which they use to run their own businesses. The majority of this information has little to do with government requirements. There are concerns that confidential information may be accessed by competitors. In addition, with so much information available there is a possibility of “data overload” and governments may be requiring or asking for more information than they really need for safety and other regulatory requirements.

6. Another issue is funding. Who is going to be the funding source? Is it going to be the federal government, the states, or the users? That has yet to be determined. Also, DelDOT asked what the industry is willing to do. If the benefits outweigh the costs, the money will come.

7. Regulatory compliance burden. The ITS program must realize cost effective procedures for safety compliance and payment of taxes and fees. The current requirements are labor and cost intensive, plus they are often confusing and difficult to comply with. When ITS is completed, it must create a simplified regulatory system. Ideally, carriers should be able to collect data once, organize it into one format, and then report it to one agency. From there, other agencies would then be able to have access to go in and retrieve the information they require.

*Michael Eadicicco
Operations Coordinator for I-95 Corridor Coalition, TRANSCOM,
Jersey City, NJ*

The I-95 Corridor Coalition is a partnership of the major public and private transportation agencies serving the northeast corridor of the United States from Maine to Virginia. Built on the foundation of cooperation and coordination, the Coalition serves as a unifying force for the members in our common mission to use technology to provide seamless transportation services in our corridor. Members include state and local departments of transportation, transportation authorities, transit and rail agencies, motor vehicle agencies, state police and law enforcement, the U.S. Department of Transportation, and transportation industry associations. The I-95 corridor contains more than 50 million residents approximately 25 percent of the U.S. population, 6.2 percent of the landmass, 13 major airports, more than two dozen rail stations, 11 major seaports, and 30,000 miles of Interstate and primary highways. This array of people, facilities, and goods makes the region one of the most congested in the United States. Agencies in the twelve member states manage 250 billion vehicle miles each year. Further details about the Coalition can be found on the Internet (<http://www.i95coalition.org>).

Briefly, let me just tell you a bit more about what our organization looks like. We are starting with activities on a regional scale and will work down to lower levels. We are doing that through the efforts of our regional undertakings such as addressing incident management efforts. Right now this reflects an accurate sense of our membership. I will give you a brief overview.

The Coalition is an extensive network up and down the northeast and we face all of the tasks and the challenges of trying to make things improve in this large and important region of the nation. We are a virtual organization and basically exist on the funds that are provided to use by the federal government and more importantly on the volunteerism of the member agencies themselves. They provide staff and the participants involved in our projects. That is what really makes us successful. In the past, for operational purposes, we have used technical review working groups and task forces. That structure is in the middle of a change and is moving to a more programmatic approach that we call program

tracts. The key ones are incident management, commercial vehicle operations (CVO) initiatives and travel information systems, Electronic Toll and Traffic Management (ETTM), and Advanced Traveler Information Systems (ATIS).

Overall, our goals include developing a consensus in our program, educating the agencies regarding each other's resources, developing a region wide real time information exchange, and promoting compatible operational techniques. Some of our key projects relevant to ITS deal with coordinated incidents reporting and management. They are the foundation for many activities. Incident management for the corridor was the first thing that we focused on. The fact of the matter is, you cannot do anything if you do not have relationships in place, if you do not have people who are active and believe in what you want to do. Everything else builds on that. We refer to our incident management group currently as HOG, or Highway Operations Group. It involves over 120 people from the various members including the 12 state police agencies. The information exchange network stations, which is a real times communications system between the various entities, has currently 51 organizations plugged in. The 52nd will be Amtrak, which will be in place shortly. Another project, Highway Advisory Radio, is an operational test to be expanded. The intent is to place Highway Advisory Radio (HAR) installations at critical junctures, which did not exist before. We also have CVO ITS programs, an advanced travel information test in the New England area. An Advanced Transportation Management System (ATMS) is envisioned for the corridor and its members.

On the incident management side, just to give you a sense of our approach, we view ourselves as a corridor organization but the fact remains that we have broken it down into regions because, functionally, that is what works. You go back 10 years and you know that no matter how good any organization was, we were all very territorial. "This is my responsibility, my turf, don't bother me." That doesn't exist any more. We recognize that, although there are common interests, regions have their own issues. They also recognize their borders overlap for functional purposes. Accepting this perspective has allowed incident management to move forward and become successful. With organizations like the Coalition, a cooperative environment will continue to develop. The methodology used places the good of the many above the needs of a few. I think that is a call from a Star Trek movie that I always loved, but it makes the point. It is adaptable to a changing environment and results in timely and efficient incident mitigation between borders.

Let me give you a brief look at the Information Exchange Network (IEN). It is a PC-based real time information exchange network. It is point and click, very simple technology. These are the various things it provides. Within a few moments in time, any organization can advise its neighbors of an accident either on a regional basis, a local basis, or a corridor-wide basis. There are good examples of where this has been helpful. In March 1996, when there was a fire on I-95 in the Philadelphia that destroyed a portion of the freeway, we only had 10 installations in place. But those 10 parties knew about it within 5 minutes time. Recently, over the summer in New York State, we had a similar situation with 40 installations in place. Again, everyone up and down the corridor knew very quickly that we had an incident that could impact people who were either close to the situation or long distance travelers.

One drawback of the system is it is in a dial-up environment that is not efficient. It was deliberately established that way because we wanted to lower the cost. We did not want to frighten members away from participating because it may cost them several thousand dollars a month to have a dedicated communications link. We have upgraded our incident management screen so it is a little more sophisticated. You can plot in any of the pertinent data—the nature of the incident, location, effects, time, direction, and whether it is regional or corridor-wide. We are actively involved in educating the members and investigating getting into a more dedicated environment. We are looking into using web technology and bringing down the cost.

We hope to move, when the data interface is in place, from existing traffic management systems to the IEN in the future. The Coalition has supported some regional data interfaces with our funds. One in Connecticut and one in the Virginia area. There may more funds in the future for us to provide but it is uncertain now because of the federal funding situation.

In terms of Highway Advisory Radio (HAR) operational tests, we have provided 14 standard and five digital installations at geographical points where a few years back, they just did not exist. Is HAR perfect technology? No it is not. It has more than its share of problems. We have learned a great deal from this test. The biggest problem is procuring hardware in an environment with changing technology. DelDOT, up until this point in time, has been our procuring agency. Without this support we would not have made as much progress we have. One thing we have done is produce a white paper on the procurement problems. It is readily

available from the Coalition for anyone who wants it. A lot can be learned from that. The key thing is to test the difference between analog and digital technology. Digital technology is far from perfected but there is a difference between the two.

We also have TRANSCOM in the New York metropolitan area. They are at the heart of the New York Metropolitan Model Deployment Initiative (MDI). We have hired them as our interim communications center. They have been very, very effective also in reaching out in our behalf, enhancing the information that comes over the IEN, and keeping the people abreast of what is going on. The Coalition also has a CVO program that is currently under way. It is a large working group that currently involves over 120 people. They are working on electronic registration, safety issues, roadside safety, electronic safety and screening, safety management, and an Advanced Travel Information Project that we call Fleet Forward. In the latter case, working with the ITS Foundation and The National Private Truck Council, we have picked out several firms who are going to participate in developing an advanced real time travel information that is vital. It provides a wide range of information beyond the fact that a road is not available.

We have an operational test going on in the New England area. We see this as a basis for other tests that can take place in the future outside of what the individual agencies may be doing on their own. It involves mass highway and mass turnpike as well as the transit and aviation entities there. It provides a public-private partnership which, as you may know, is at times hard to come by. The first phase will concentrate on providing traveler information about what is going on in the road systems within the Boston area between the transit entity and the ferry services. It uses, in part, the IEN as a backbone. The Massachusetts Bay Transit Authority is one of the 52 sites, as well as Mass Pike and the Mass Turnpike. We will build the second phase in the New York area working with the New York MDI. The Coalition has given it \$250,000 so that when they developed their architecture, they can provide IEN workstations to other transit entities that are not directly part of our membership.

In our ETTM vision for the corridor, we support one tag per vehicle, one account per customer, one set of credentials per commercial vehicle, and expanded use of the technology in general. This is something that the Steering Committee and the Executive Board strongly support and the steps being taken in Delaware are a reflection of that. In closing, what we have learned is if you work together, support a cooperative environment, build relationships, and use the proper ITS

technology successful cooperation and innovation will be possible. We have stumbled a little bit, we have tripped, and have even fallen on occasions but we are moving ahead. We are proud of what we have done and we want to continue a relationship with you and the other members of your organizations.

9 Open Discussion: ITS Issues, Agenda, and Priorities for Delaware

Several important comments on ITS issues, agenda, and priorities for Delaware were raised during the final open discussion.

- ❖ The risk of society getting more and more dependent on complex computer systems such as ITS. The underlying issue is a higher sensitivity and vulnerability as a result of terrorism, faults in the electrical system, or weather conditions.
- ❖ The issue of providing additional functional capacity to the transportation system by ITS and the various positive and negative impacts.
- ❖ New ITS technologies and institutions, such as transportation management centers, should be dedicated to managing existing resources more effectively instead of focusing on new construction as was done in the past.
- ❖ Road infrastructure has capacity limits, even with the application of ITS technologies. What policies are appropriate if the system runs out completely of capacity despite ITS? Building more roads or efforts to reduce the number or the length of the trips?
- ❖ Transportation, land use, and ITS are situated within a much broader array of technological changes that are affecting where people are, what they will be doing, and when they will be doing it. Therefore, ITS has to be put in context of general changes that are occurring in society.
- ❖ For future forums on ITS, increased attention should be given to technologies for transit oriented information.
- ❖ There is a tendency for planners and engineers to work more on hardware issues than on institutional issues, because this is the way they are trained. However, organization is an important issue and more thoughts should be given on issues relating to information and human resources.
- ❖ In terms of looking at ITS, more emphasis is needed on marketing and information systems and on interdisciplinary research involving business schools and other non-technical institutions.

Finally, respondents made the following topic proposals to be covered in future forums on ITS:

- ❖ ITS and pedestrians as an essential element of overall transportation management
- ❖ Existing ITS deployments, efforts of different agencies to improve transportation
- ❖ Progress report on implementation
- ❖ Data security, legal aspects, and institutional and technological barriers to ITS
- ❖ New technologies, including technical details
- ❖ Vendor information/demos
- ❖ ITS incorporating transit, integrating transit and highways
- ❖ Intermodal coordination (rail, bus) and its practical aspects in Delaware
- ❖ Need to give higher emphasis on public policy issues than purely on technology
- ❖ The entire spectrum of issues and players in transportation management
- ❖ Focus on the roles of state agencies, municipalities, and the private sector
- ❖ More information on financing initiatives
- ❖ Research addressing the information needs of customers and the way it is delivered