

Intelligent Transportation Systems: An Overview

Neil D. Schuster
President & CEO
Intelligent Transportation
Society of America



Thank you Ariën, good morning.

First, I would like to congratulate you on your 13th annual meeting. ITS America, the Intelligent Transportation Society of America had its 13th annual meeting earlier this year. So, we are of the same age. Margaret Mead, a very famous anthropologist, once said: "Never doubt that a small group of thoughtful committed citizens can change the world; indeed, it is the only thing that ever has." Now, the ITS community is a fairly small group. It is a small industry. Are we thoughtful committed citizens? We believe we are. We are about to change the transportation. We are using technology to transform transportation. The one thing in the two years I've been with ITS America, that really gets my attention, is how much passion there is in our industry, for what ITS can achieve. I saw that first hand a few months ago, looking at a precision docking system, which is the ability to drive a car or bus without a driver, braking, accelerating, turning, stopping. The founder showed it to us, how we could precision dock a bus against a platform with a few centimeters to spare. We watched this bus go in, he did a wonderful job. He and our group got out and he sent the bus around. While the bus came again to the station. He bent down and put his fingers over the edge of the platform. He did not even look at the bus, he looked at us. The bus came up and parked itself without a driver centimeters from his fingers. I said to him: "You have faith in your system", and he answered: "I wrote the algorithm." This is somebody, who has not only faith but passion for what he is doing. That passion is making technology the driver to change the transportation. We are going to transform the transportation experience completely in, how we provide transportation, how we manage it, how we pay for it, how we consume it. We tend not to think of something we can consume. But it is a commodity, whether we are sitting on an airplane or in a bus, we are using transportation capacity. In some indirect way we are paying for it. I used this analogy with someone recently, whom I was trying to explain how dynamic this change is going to be. I said: "When I grew up many years ago, if I wanted to write something to somebody, I took a piece of paper and put it in a typewriter. I turned the handle, the paper came up and I hit a key which physically moved and struck the paper. At the end of the line I reached up for a silver bar, the carriage return, and moved to the next line." This person said: "What is a carriage return?" You can see, how fundamentally different it is to communicate now, as it was 20 to 40 years ago. That is what is going to happen in transportation.

Why ITS?

- Why ITS – Meeting the \$300 Billion Challenge
 - The cost of road fatalities and injuries \$230 billion
 - The cost of congestion \$70 billion
- ITS can help move people and goods without fatality, injury or delay on efficient, integrated transportation systems

Why ITS? This is a very good question to ask. We are not developing technology just because it is fun - and it is - or just because it seems like the right thing to do. We are developing it to meet a challenge, a drain on our economy in the USA of \$300 billion a year. That is the estimate, what it costs us in terms of our traffic congestion and our fatalities and injuries in transportation. It's a staggering number and it effects us all each and everyday. Our fatality rate is not dropping, it actually rose a little bit last year. The institutes that measure the congestion say that the average American wastes, not travels, additional 51 hours (this is over a week) a year because of congestion. Dr. Runge, who heads the National Highway Traffic Safety Administration in our federal government, and he is an emergency room physician, calls it a health epidemic, and it is. We believe ITS is the answer to it. The Secretary of Transportation, Mr. Mineta, gave a speech recently and said: "We are at war on our safety problem. This is a call for action, this is battle stations for everybody." In Congress some folks, who are leading an effort to get more money for transportation, realize that what we need is a quantum leap in the federal funding, that will spur the private sector investment, that needs to get us where we are. Now our board met in August, with all of this going on, and adopted a new vision and mission for us, something we like to look at every few years. They said, our vision is a future where people and goods are moving without delay, injury or fatality on integrated systems that are built and operated to be safe, cost effective, efficient and secure. Zero fatality, zero injury, zero delay. We said delay rather than congestion, because we know our transportation systems will be congested. That is a function of demand, but we can take some of the unpredictability of travel out of the travel equation. If it takes us an extra 5 minutes to go somewhere because of congestion, and if we know about that and can predict it and can plan for it, we will not be late. That is a very advanced goal, zero fatality. Jim Rouse, the developer, who develop quite a few of the malls and urban renewals, said: "When I sail, I point towards the North Star. I don't expect to reach it, but it gives me something to aim for." So, we have something to aim for .

The Grand Vision

- 21st century technology for 21st century operations
- Performance-based transportation management
- Integrating vehicles and infrastructure
 - gather data
 - share it
 - interpret data
 - use it
- Towards zero deaths, predictable travel time

We want to face 21st century with 21st century technology for 21st century operations. We need to perform when we manage our system. We have to base our system on performance measures. Very few, almost no, cities, states or localities measure their congestion and announce, what they are measuring, because they know they have trouble solving it. So why set themselves up for a situation they can't resolve. We believe technology will help them solve that. How will we do it? By integrating all the technologies, that exist and will exist, in roadways and in vehicles, and there are a number of those things, then merge those technologies, have them work together. This is not easy. The carmakers and state governments are to get together and try to talk to each other. It's interesting to watch. The car industry wants to meet their profit goals and the government is worried about the next election. They have trouble talking to each other, but they must. Because if they can work together, they will give us transportation technology. They will give us a generation of people, who are always connected. They expect to be always informed and they are empowered. So we will take all of these technology systems, integrate them so that we share, gather, interpret and then use data, that is robust and makes us better at what we do.

Now, the telecommunication's challenge to achieve all of this is staggering. I remember my first online experience. It was a service called Prodigy. I was connected at 2400 bits per second, eventually it became 9600. I thought that was fast. Today that is impossibly slow. Why is that? Because the amount of data, that Prodigy was giving me, was minimal. It was enough for what I needed to do. But our needs grow. I am sure there are many innovators, who looked at the technology and said, I can do better than this. To do that, I need better content, higher bandwidth and more telecommunications capacity. Because I need to grow overtime and thoughtful committed citizens in the internet arena are always looking for the ways to make things better.

What is ITS?

- **Safe vehicles: car, truck, bus and train**
- **Assisting the driver**
 - automatic crash notification
 - crash avoidance – intelligent vehicles
 - lane departure warning
 - smart cruise control
 - precision docking

Let me tell you briefly, what ITS is. It is safe vehicles. It is all the technologies in cars, buses and trucks that will assist the driver. I would like to be a good citizen. So I wear my seat belt, every time I am in a car. I do not drink, when I am going to drive. But good citizens can be distracted, they can have accidents, can be fatigued. We are only as good a driver as we are. All of the enforcement and education government can do, can only make me a better driver up to a certain level. I have to recognize, I have limitations. What will make me a better driver then? I have given up to be a good golfer. I have personal limitations. What is making me a better driver then? The next frontier is technology, because technology can assist me and make me a driver beyond my ability. How can it do it? If I have a crash and run off the road in a rural area, where there are not 50 other cars with cell phones to report the accident, my health or even life may be in danger, because nobody can immediately be called to assist me. There are a wide variety of automatic crash notification systems, that can help do that. But we need to go beyond that. We need to avoid a crash in the first place and we can. If you talk to carmakers, they will tell you, they can built a car that does not crash. We have built airplanes that generally do not crash. Why have we done that? We've decided its global policy that all airplanes have a transponder in their track by radar. We can do that in vehicles, very expensive, of course, lots of political issues. But we have technologies to make cars more difficult to crash into each other. Intelligent vehicles are doing some incredible things to prevent me from departing my lane, when I am absent minded, to prevent me from running into the car in front of me with adapted cruise control and to use precision docking systems to make it easier for me to park. I believe Toyota announced they are going to sell a car that can park itself. So, we have all of these things in the vehicle and the horizons are limitless and incredible. Vehicles that will tell me when I am drowsy by measuring my reaction.

What Else is ITS?

- Information that empowers:
 - Relevant, timely, accurate information to allow rational choice
 - for system operators
 - for transportation consumers
- Transportation management centers
- 511 across the U.S.
- In-vehicle information
- Global positioning
- Fleet management
- Cargo tracking

ITS is a whole range of technologies, that provide information. Sensors, cameras, all kinds of things in the roadway that are gathering information about the road network and providing that information back to some operation center, that can analyze and make relevant timely decisions based on good data. For the operator of the system, if I have good information, I can manage my streets and as a consumer, if I have good information, I can make a rational choice. We see transportation management centers come up in every area of the country, certainly in every metropolitan area. We don't walk out of the house without our cell phone. The city doesn't operate without a transportation management center. We get information from a variety of sources. We get it, before we travel, we get it on the website, we may listen to the radio, we call 511 which is the national number we are developing in the US, so no matter what city you are in, you dial 511 and you get traffic and weather information. We get it on our cell phones, we get it in the vehicles, we have navigation systems and the next generation of those systems will not only tell me, how to get from point A to B, but tell me how to get there based on the congestion and conditions right at this time. So we have all these technologies, we have global positioning satellites. We can use these technologies individually. Of course, companies use them to manage their fleet, manage their cargo and bring a level of security into the system. But all of these technologies will converge. We've seen this already. There is vehicle technology in the vehicle and there is roadway technology in the roadway. Then we have technology in our pocket. We have our cell phone, our pager and our PDA, we carry those things with us. There is no reason why those three major systems can't converge to make more powerful data and better systems. We've seen much of that in transportation. We've seen a change in our thinking.

The Challenges

- Adequate federal funding
- A healthy private sector
- Consumer awareness and market demand
- Privacy concerns
- Liability issues
- Data ownership

What are the challenges? It is not easy. I like to keep it fairly simple. I look at our vision and mission and I ask, how can we achieve that? For me it's really three things. We need adequate funding at the federal and state level. We need innovation in the industry. We need more people who are willing to develop a system and put their fingers over the edge of the platform. And we need awareness. Those are the challenges we face.

It is interesting, that we tend to think in transportation, that we in the ITS arena, that are worried about operations and system performance, compete with those who spend and invest money to build roads. We'd like to think that this is where our competition is. But I heard the administrator of our Federal Transit Program, Jennifer Doran, speak at a conference recently. She said: "That's not a real challenge. If we constantly think of, our competition is between modes, our investment dollar can go to railroad, highway, to train or bus. That's not good. What we really need to think of is our competition for non-transportation government dollars. For a city or state or a governor to have to decide, do I spend money on transportation, on education, on health insurance, on law enforcement? That's where the competition is." What we need to do in transportation is to reach out to these folks and explain to them that we have some good partnerships going.

It is interesting, when regions first started to put transportation operation centers in place, in some cases they decided to locate the state police in that facility, because they use our highway systems and they have to know what is happening on the roadways. This leads to a dialogue, which is a wonderful thing about technology. It allows these dialogues to take place and makes them a requirement. If we have the ability to do new things with new partners and new agencies, we have to reach out and talk to these folks.

In this case, it is a natural partnership with the state police that has been formed or is forming. We are working very closely with law enforcement to make sure, that they understand our needs, we understand their needs and we give them the technology, that can make their job better and easier. Ultimately, technology for its own sake is nice, but there is no market for something that doesn't help people resolve problems, entertain us. Transportation technology can enable better transportation and that's where we want to head.

We need a healthy private sector. No doubt about it. Most of the innovation comes from the private sector. We need consumer awareness and that is an issue of market demand. Because if there is a market for ITS, it is probably one of the principle key elements of a healthy environment and of a greater adoption of technology in the future.

We've got some interesting legal issues, privacy concerns. People who worry about government's use of GPS. Now government knows where I am going. First of all, government does not care, where you are going. Second of all, we have privacy protections in place, just like we do for all government uses of information. The government, the city which manages the transportation system does not care, that I am driving on that Interstate. They care that there is a car on that Interstate. If privacy is a concern, we have to address.

There are liability issues. If I buy a car and it is supposed to prevent me from departing from my lane. I depart from my lane, that is probably something, where the average consumer will then immediately go to court and try to make somebody responsible for that, even though that person was not using the system the way it was intended. So there are many liability issues we have to deal with. Technology is making us more aware of those issues.

There are some data ownership issues. All the information, we collect on what is happening in the roadways and transit system vehicles, that is extremely valuable information. Who owns it? When a state collects information from sensors in the roadway, is it theirs? Yes. Is it available for use by others? Possibly. Should those others pay for it? Maybe. If a private company comes in and says: I want your data, because I want to do great things with it for you and for your system. Should the government be able to ask for some money for that? There are some interesting data ownership issues.

ITS America is active in all those areas. We are actively encouraging, advocating that government invest more in transportation and in technology. Our government made it very tough for itself. We usually make transportation laws on a 6 year cycle by creating a situation, that when the current law expires all federal dollars for transportation expire. That happened on Sept. 30th this year. There is no new law in place. Congress could not come to terms with, what they want for the next 6 years. They had to pass another interim law to allow funding to continue over the next few months until Feb. 29th. But we all know, even then there will be no new 6 year law, because the issues and divisiveness over how to solve the transportation problems remains very big. We want to do some wonderful things with awareness to get beyond our industry, to get to the media and even to consumers. We will sponsor a pavilion at the next Consumer Electronic Show in January of next year.

The Opportunities

- **An unprecedented amount of information (high data content)**

- the Interstate of Information

- **A break-through level of communication**

- Fiber and wireless

- Satellite

- Global Positioning System (GPS)

- Dedicated Short Range Communication (DSRC)

The opportunities, I think, are endless. We are talking about an amount of information, we cannot even put our arms around and define it. The data content and the telecommunication's challenge is incredible. We tend to talk about integrated networks, but really it is the Interstate of Information. Back in the 1940's and 1950's some very forward thinking thoughtful committed citizens in the US said, wouldn't it be great and necessary for us to be able to drive from New York to California and not stop at a stoplight and always be on a paved road for high speed with limited access and controlled environment. A lot of folks said, that this is not possible, not necessary and how can we pay for? Some visionaries said, we need it. They created a program, standards and a new way of financing. They built these roads, about 70 000 km of Interstate Highways.

What we are talking about is an Interstate of Information. It is a project as far reaching as our Interstate system and a major investment. All the data and communication we need is a major undertaking. I heard some people in our industry estimate, creating this Interstate of Information, is probably a 15 year project and maybe even longer, at a cost of probably \$50 billion.

How are we going to do this? Certainly fiber, fiber optics cabling and of course wireless are the answers. We have some other technologies on the horizon, that may come. We will use satellites to a greater degree, we will use GPS and DSRC. But our data content needs are first and foremost going to be provided by fiber. Those needs will always be growing. If it is a \$50 billion project now in our minds, ten years from now it is another \$50 billion. We did not stop the internet 5 years ago, because it is done. Growth will always exist. There will be other thoughtful committed citizens, who will look at this technology and the communications and the data content, they will say: We should be able to do even more.

Federal Support

- **\$110 million per year in research**
- **\$125 million in deployment**
- **Federal investments to grow significantly in next 6 years**

The type of federal support, we have enjoyed over the course of the last 6 to 12 years, is in the United States about a \$110 million per year in research and \$125 million in deployment. That needs to grow significantly. If we are going to face this \$300 billion challenge each year in our economy and if we want to build a \$50 billion or more information network, we need more than \$250 million a year for technology.

There are some folks in Congress, there is a caucus in the House of Representatives and there is a private public sector advisory group to this caucus, which mostly consists of ITS America members. They get together and map out the necessary funding. For the \$250 million roughly we are getting now, we continue to fall short. Instead we need at least \$1 billion or \$2 billion a year from the federal government. That is just basically to keep pace with our needs. If we really want to improve transportation, we need in the neighborhood of \$5 billion, or even more if we want to get some breakthroughs in transportation.

Government and Industry Invest

- **Telematics providers**
- **Wireless providers**
- **Automakers**
- **Information service providers**
 - NextBus
 - TrafficGauge
 - MobilityTechnologies
- **State and local governments**

So federal government is investing, we know that, and state and local governments will invest more. Our industry is investing. They are doing the innovation that needs to be done to come to the market with new products, new services and, of course, for them with new revenue streams. So we have telematics suppliers, companies that provide the linkage between the vehicle and some operations center, or to take that vehicle and communicate with the local hospital, if that vehicle is in an accident. We have wireless providers, certainly, those cell phone companies, who want to look at ITS as a business model for them. They may want to provide their own network of information and to charge their customers for some information they get. We have the automakers, who are committed to safety. They want to bring these technology systems to a wider range of the population. We have information service providers, mostly small companies, you probably have never heard of like NextBus, TrafficGauge, MobilityTechnologies. Even buy a little pager, not very expensive, you can plug in your bus route, and on that pager you will know when the next bus is coming. That is what NextBus does. They take good information from states and local governments, translate that into useful data and sell to us. These are some innovative folks. All of these companies are looking at a price point which is very similar. They realize if I can get the price of the device to \$300 or less and I get the monthly subscription to \$5 or less, I have a business model I can sell to many consumers. They will do this with innovative technology, with cheaper and better ways of collecting, analyzing and distributing information.

The Future of Cable

- **Transportation will be transformed**

- Safety
- Connectivity
- Information and choice

- **Cable will be the mainstay**

- Fiber optic backbone
- Wireless may serve as the “last mile”

- **Competition to cable will exist**

- Telematics
- Global Positioning System (GPS)
- Satellite

I don't know when it will happen, but transportation will be transformed. Some day many of us will talk to younger folks and explain how we drove in the year 2003. We got into the car and drove and got to the place that we wanted to get, there was traffic, we were late. Those folks will say: “How did you survive? You mean, you were not connected in your car?” “Around 2000 we started to all carry a cell phone and maybe around 2005 we have a navigation system. But up until then no.” They will look at their safety, connectivity and information requirements. They want and will demand this and they will get it.

How do we deliver this? What is the future for the cable making industry? Cable will be the mainstay of that system. Fiber optic cables will be the backbone. We probably will use more and more wireless systems in the last mile or in an international arena, I should say, the last kilometer. I am changing my slides with a device that provides the last meter of connectivity. But cable is our future in terms of our communication.

There are some things on the horizon that will compete with cables. Telematics companies, maybe some satellite technologies, GPS, but I truly see cables as the main way that we will get to where we want to go.

Conclusion

- **ITS is the only solution**
 - Road building is inadequate
 - Telecommuting is a marginal solution
- **Cable is the likely conduit**
- **The telematics challenge is on the horizon**

We know that ITS is the only solution. We know from experience that state and local governments and the federal government cannot build roads fast enough to meet our demand. There is not enough money, not enough land area and there is not enough political will to build those new roads. Telecommuting is a solution, but it is at the margins. Unless we are all willing to stay home and live exactly where we work and not go out at night to have fun, then maybe telecommuting is the option. But we need to be mobile. Without a doubt we need to be safer when we drive, we need to be better informed. We have to be mobile. That is how our whole economy and lifestyle is structured. I found out last night, that even the Queen of England surfs the net. Why shouldn't all of us be able to stay connected? If we cannot do it with road building, we have to do it with operating our systems better. We take the telematics and the roadway systems and merge them. That challenge to continue to be mobile leads to some incredible partnership opportunities. It may be that the cable industry is looking at satellite and GPS and finds some partnership opportunities.

We have to take that engineer's passion and harness it. We have to have more individuals within our industry and even beyond who say: "ITS future is where I can put my fingers over the edge of that platform and guarantee that my bus will dock where it needs to without hitting me." Your industry will find the ITS arena as a place to do a lot of good business in the years ahead and help us reach that vision where there are no fatalities, injuries or delays.

Thank you! It has been a pleasure to join you.