The Advisory Committee met in room E37-302, U.S. Department of Transportation, 1200 New Jersey Avenue, S.E., Washington, D.C., at 8:00 a.m., Robert Denaro, Chair, presiding.

COMMITTEE MEMBERS PRESENT
ROBERT DENARO, Vice President, Nokia, Chair
TERESA ADAMS, Ph.D., University of Wisconsin-Madison
STEPHEN ALBERT, Western Transportation Institute, Montana State University
SCOTT BELCHER, President and CEO, Intelligent Transportation Society of America
ROGER BERG, Vice President, Wireless Technologies, DENSO
JOSEPH CALABRESE, CEO, Greater Cleveland Regional Transit Authority
JOHN CAPP, Director of Global Active Safety Electronics, General Motors
PAULA HAMMOND, P.E., Secretary, State of Washington Department of Transportation
SONNY HOLTZMAN, ESQ., The Holtzman Group
STEVE KENNER, Global Director of Automotive Safety, Ford Motor Company
J. PETER KISSINGER, President and CEO, American Automotive Association Foundation for Traffic Safety
HANS KLEIN, Ph.D., Georgia Institute of Technology
SCOTT McCORMICK, President, Connected Vehicle Trade Association
RAJ RAJKUMAR, Ph.D., Carnegie Mellon University
BRYAN W. SCHROMSKY, Director, Federal Government and Public Safety, Verizon Wireless
TON STEENMAN, Vice President, Intelligent Systems Group, Intel Corporation
KIRK STEUDLE, P.E., Director, Michigan Department of Transportation
GEORGE WEBB, County Engineer, Palm Beach County, Florida

ALSO PRESENT
GREGORY WINFREE, Deputy Administrator, RITA
SHELLEY ROW, Director, ITS JPO
SHEILA ANDREWS, American Motorcyclists Association
ROBERT ARNOLD, FHWA
JOHN AUGUSTINE, Managing Director, ITS JPO
VALERIE BRIGGS, ITS JPO
BRIAN CRONIN, ITS JPO
SHANNON DULANEY, Honda
STEPHEN GLASSCOCK, ITS JPO
SAM LAMAGNA, Intel Corporation
ANDREW MEESE, Metropolitan Washington Council of Governments
DANA SADE, ESQ., NHTSA
MIKE SCHAGRIN, ITS JPO
MICHAEL TRENTACOSTE, FHWA
MARK VALCICH, Intel Corporation
CARLOS VELEZ, Citizant, Inc.
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Welcome and Opening Remarks

8:12 a.m.

CHAIR DENARO: Welcome, everyone. I hope you appreciate that we have a nice cozy room here.

MS. ROW: Our conference center is not particularly slick.

CHAIR DENARO: Right. This building has always been a challenge for us, but it is --

MS. ROW: It is what it is.

CHAIR DENARO: -- what it is. Yes, yes. So, Shelley, would you like to start out with any comments?

MS. ROW: Sure. Greg Winfree, who is the Deputy Administrator for the Research and Innovative Technology Administration for US DOT, will be here shortly to say a few words of welcome, as well. But I will just kick it off since Greg is running a few minutes late to say welcome. We are so pleased that you all have agreed to be part of the ITS Advisory Committee. We're not going to belabor you with a lot of the roles and responsibilities. We did some of that on the phone call. But we do just want to reiterate that this is your committee. We are here to help you help
us, so we take what you share with us and the thoughts and
the ideas that you have about the program, things that we
can do, things that we can change, we take that very
seriously, and we look forward to your comments.

There is, I think, a lot of the time at the end
of the agenda, we think it's a lot of time. We'll see.
There's never enough time. But there's time at the end of
the agenda for Bob to lead you all in a conversation about
how you all want to work, where you want to focus your time
because you have a lot of choices and it's your choice.

We have taken the liberty, however, to take today
and tee up some topics that we are particularly interested
in. You don't have to choose to focus your energies on
these. We're going to be talking about the connected
vehicle. That's probably no shock to anybody. That's
where, if we were completely selfish, we would love to have
your input. You get to choose, however. So if that's not
where you want to focus your time, you can choose
differently.

I'll say a few words about the rest of the
program later in the agenda, but, for now, just welcome and,
please, it's participatory. There will be some
presentations today. We don't know any other way to do this. The presentations are intended to be discussions, so the staff who will be leading that have been clearly indoctrinated to understand that this is a conversation. So please feel free to speak up, ask questions if it's not clear, provide comments during those, quote, presentations because we do want it to be a conversation with you today. That's it.

CHAIR DENARO: Thank you. Thanks, Shelley. Well, I'm Bob Denaro, and I will add my welcome also and also my thanks for your volunteering. All of you were selected because of your background and your experience, your expertise, and so forth. That probably means you're all very busy people, and we respect that. So we really respect the fact that you volunteered and you're willing to help. And the diversity and the breadth of experience that we have here is really one of our strengths.

I'm just going to go over a couple of thoughts I have. This is my third round on these committees, you know. I think, you know, after this stint for these two years, they need to take me in the alley and shoot me, you know. Is this being recorded? Yes, it is.
Anyway, it is an interesting process. I feel it's really, really important. I think, you know, given where all you are working, you know, in your jobs right now, I think you know how important this technology is to the future of ITS. And if we can be part of, you know, ensuring that this really does get deployed and really does save lives, I think we can all feel good about that.

Let me just go over a couple of thoughts for you because I know, I mean -- by the way, I think we have seven returning people. We tried to keep some amount of continuation on the committee so we have a little connection to where we've been. And then about two-thirds of the committee are new. So most of you are new people, let me just tell you, because I know when I first came to this, what do we do on this committee? You know, what are we trying to do, what's our purpose? So let me give you some thoughts, my thoughts anyway, on that. These are probably more just Bob Denaro thoughts.

First of all, if you look at these meetings, you know, if you think about a purpose of processing a product, the purpose, our charter, which you heard on the phone call, we'll talk more about that, but our process is really these
meetings, right? Let's be honest, okay? We're not all going to go back to our day jobs and spend hours and hours working on this, okay? So we really got to get done the essence of what we're going to do in these meetings and the deliberations and the discussions we have.

We will have extensive interaction with the JPO end, Shelley's staff as well. She's got a very talented team, in my opinion. And I hope all of you get to meet the key members there who are working on different aspects of this whole project.

There will be some interim work between this. I mean, we've got, at the very least, the RITA ads, I would hope. We'll talk a little bit more about some ideas I have for how we can keep the continuity because I know I struggle. I mean, if we're going to have two or three meetings a year, which is typically what we talk about, you know, we have this meeting, we get really engrossed in it and we're embedded and everything else, and then we go away for a while, and the next meeting comes up and you go what were we doing there, you know, what was that all about? So we've got to come up with a way to keep some consistency there and some involvement.
And then we really need to focus on a product. Our product is an advice memorandum to the Secretary, and I want to keep us focused on that. As we're going through all these discussions, we'll get off on tangents and different paths and so forth, but, at the end of the day or the end of our term, we're going to write a memo, and that's very important, giving advice saying, hey, here's things you're doing great, keep doing it, here's some things we think you need to change a little bit and here's maybe some things you didn't think about that, from our background, are really essential to this coming to fruition. So let's keep that memo in mind as we work through this and say how is this going to come together in advice eventually and what's important?

I'll say this. I'll just say this once in this meeting. It is an honor for each of us to be selected for this. But this is, in my opinion, not an honorary position. This is a working committee, okay? We need to do work. So I really implore you to please try to attend the meetings. No way is everyone going to be able to attend every meeting. I understand that. We understand that. But work your schedules as best as possible. We'll give as much advanced
notice as we can, and, you know, try to be here because, as I said, the work will get done here, not in between.

When we get to the memo writing stage, which is probably in the second year, more in there, there will be a little bit more outside work because, obviously, you're drafting things. I don't know about you, but trying to write something in a committee, like you're inside a committee room, is difficult. So we'll have assignments outside, so expect some outside work at that point.

And, again, our purpose is to review the program and advise the JPO. And one way I like to look at these kind of things is kind of a negative view, but it's to say if this were to fail, if this doesn't get deployed, and we don't have communicating cars or solutions of ITS that are saving money, what would have been the cause of that? What got in our way? And our job in this committee is to figure out that ahead of time. Let's figure out what those barriers might be, what those risks are, and then how, based on our collective experience, expertise, backgrounds, how can we advise the JPO to get past those hurdles? That's the way I look at it. So we're looking for the unknown right now of what could really cause us not to deploy.
A few guidelines in the meetings. My preference is that there be no spectators allowed. And I don't mean our visitors, I mean the people at this table. I want everybody to contribute. And, you know, I understand personalities. Although I'm sitting here speaking, I'm an introvert. No, no, no, I'm introverted, so I'll tend to be quiet. So I'll do my best, as your chair, to pull out comments from people. I often find at meetings like this it's the person sitting real quiet who has a zinger, you know, when they finally talk, yet, you know, maybe everyone is talking over them and so forth. So I do really ask you to speak up and let's hear from everybody because everyone has, based on your backgrounds, a tremendous amount to contribute to the discussion.

If you do miss a meeting, you have to miss a meeting, please try to catch up. You know, we have meeting minutes, we have the meeting materials and what we handed out, so please try to catch up on that so when you come to the next meeting we don't have to have the same meeting all over again.

So what's my role? Yes, I'm the chair, but this is a committee, okay? I don't dictate where we're going
here. My job is to figure out how we can come to a
consensus and pull that together.

I will say, and you'll get to know me, that I'm
not just a facilitator. I have opinions, and I have trouble
keeping quiet about that. So I will express my opinions,
but I'm expressing those as an equal member to all of you,
as well. And, you know, we'll have our debates and have our
discussions.

So, I mean, other than that, I mean, let's have
fun, okay? I think there's a lot of good that we can do
here. Let's get to know one another, and let's not get too
carried away with our importance, our individual importance.

But let's pull together and create a product. Like I said,
people were chosen for different fields they came from and
so forth, so really looking for your field of expertise,
where you might be coming at a different slant on what
you're seeing, and that's going to be the strength of what
we pull together.

So, again, thank you for being here and welcome.

So let's see. What do we got on the agenda here?

Are there any questions, by the way?

MR. MCCORMICK: I have a suggestion.
CHAIR DENARO: Yes, sure, Scott.

MR. MCCORMICK: Why don't we invite some of the people to the empty seats that are not filled?

CHAIR DENARO: Well, Greg is going to be here.

MR. MCCORMICK: Okay.

CHAIR DENARO: And Peter is going to be here.

MR. MCCORMICK: Okay.

**Introductions by Committee Members**

CHAIR DENARO: And we will do some introductions, and we actually allocated quite a bit of time for this first meeting because we want to try to get to know one another. And we'll also introduce because we do have some visitors and we'd like to get to know them also.

So Greg is going to join us, but maybe we can move into the introductions and then we'll just break when he gets here?

MS. ROW: I think that's a good idea.

CHAIR DENARO: Okay. All right. So we'll break when he gets here because we'd sure like to hear his comments. But what I want to do is spend some time going around and, you know, if you would, just give a little background, three or four minutes each. If you can talk
about three things maybe: what is your role in your organization and your involvement with ITS? So let's focus down. I'd like to understand, I think all of us would like to understand where are you coming from, so what is your direction in ITS? And then a second question would be, what are your expectations for work in the committee? What do you hope? You volunteered for this thing. You probably have some expectations, and I'd like to hear what those are. And, in general, what do you hope yourself to get out of this committee, your involvement?

So rather than jump to the first person who's now on the spot because they have to do that, I'll give my example first so all of you can think about answers. I've been involved with ITS for, like, 30 years. That's painful to say that, but I have. I started out in GPS and fleet management, then in telematics solutions. I was involved in the first OnStar program, that sort of thing, while I was at Motorola.

Most recently, I've been involved in digital mapping for about the last ten years and NAVTEQ and now part of Nokia. And that includes the emergence of the smartphone and things like that.
As far as my expectations, kind of what I said earlier, I hope we find a way to mine the expertise that we've got in this room and the diverse backgrounds, experience, and, frankly, the wisdom that you all bring to the table in this area and insight into the critical issues that we've got. And really, you know, I would like to see us make a measurable impact on the success of this program and helping the JPO move forward. They've got their problems. We're going to hear about that. We're going to look at that. We might think that there are a few problems that they don't know about yet, and, you know, we need to pull that together.

And, you know, what I want to get out personally, I look forward to, frankly, learning from all of you. I've found these meetings in the past two committees that I've been involved with very stimulating. I've learned a ton. It's kind of interesting when you get people with such diverse backgrounds. It forces you to kind of consider things you hadn't thought of. And so I hope that you'll expand my horizons and help me understand all this better.

So with that, Teresa, would you like to go next?

DR. ADAMS: I'll keep it short. All right. I'm
Teresa Adams. I'm at the University of Wisconsin-Madison. My background is in civil engineering. Currently, I direct our university transportation center. We're one of the ten Tier Ones in the country. We're the Center for Freight and Infrastructure Research and Education, so we're focused a lot on freight.

My own background related to ITS is I've done some work and followed, ever since the beginning of the first ITS architectures and stuff I can remember sort of doing class with helping students understand what some of that was all about. But then, you know, AVL and then a lot of GIS stuff, so that's kind of some of the different areas that go into this mix.

I don't have any ongoing projects right now, per se, in ITS. Our center looks at things that are related to freight and the connection with the economy, and so I can see lots of relationships there and the importance of ITS and helping the freight movement safely.

I guess my expectation here on this panel is I like to think about stuff. This is kind of fun for me to get in a group like this and to be able to participate in the discussion. And then for my own center, of course, I'm
watching for ideas and to be able to help direct, in my role, the research so that it's relevant.

CHAIR DENARO: Great. Thank you.

MR. BELCHER: I'm Scott Belcher. I'm the president of the Intelligent Transportation Society of America. We're the chief advocate for the use of technology to address transportation problems. I've got a couple of board members, and then actually most of you guys are all members of ITS America. We work very closely with the Joint Program Office and with each of you.

I've been on the committee for a couple of years now, and I think it's been good. I think last year we highlighted a couple of important issues that I think we need to continue, at least a couple of important issues that I'll continue to bring to the forefront, and part of that has to do with standards harmonization. It's a very important issue, especially as we become a more global industry. And we face some challenges abroad, as different regions of the country try to take primacy in this area. So that's an area I feel strongly about.

Another area which I'm sure will be part of the discussion because it is every year is that tension between
research and deployment. For those of you on the deployment side, you'll be very frustrated because RITA is a research organization; and for those of you on the research side, you'll be very frustrated with the folks who want to deploy, at least that's what we've been through every year on this committee and it's the right tension to have. It's the tension in any organization right now, quite frankly, that's in the ITS space. Whether you're in Intel or whether you're in Michigan DOT, that's the ongoing tension.

And so my warning and I think the good thing is I'm sure we'll grapple with that tension and I'm sure, at times, we'll all be frustrated. But that's okay.

And what I look to get out of this is really just to meet new organizations and new individuals who are thought leaders in the area so that we can try to bring them into the work of ITS America and try to think of other ways to help give them an opportunity to help shape and support the work that the ITS Joint Program Office is doing.

CHAIR DENARO: Thanks, Scott.

MR. CALABRESE: My name is Joe Calabrese. I'm on my second tour of duty. I run buses and trains in Northeast Ohio. I think I'm here to represent the public transit
industry. Public transit is doing well. Ridership is strong, very strong. The younger generation is really pro-public transit. We see that growth continue. They're very concerned about the environment and really concerned about and love that urban life. So I think my role here is to be sure public transit is not forgotten, which it quite often is.

In my life, my agency, because safety is number one for many of us around the table. We've invented some very low-tech anti-collision systems, primarily with people, buses with people, trains with workers on the wayside, and those systems have really been commercialized, so that's a good example of how those things can come to market.

Public transit has a number of issues, but I think it has a number of opportunities to include public transit in the mix here. Again, you'll hear me pretty active in saying that because we always get lost and fall off the end of the table at the end of the day. But I think any system that is designed to avoid collisions should include buses where you have 50 or 60 people that could be on that bus or trains where you could have several hundred or a thousand people on that train. Again, I think it's a
good test market for this product because it's controllable, it's finite. You have municipal agencies that are amenable to these things and interested in safety. And if there is an accident in public transit, which there is rarely, it is catastrophic. So I think that needs to be part of the mix. Thank you.

CHAIR DENARO: That's why we wouldn't let you go, Joe. You're the voice for transit.

MS. HAMMOND: Good morning. I'm Paula Hammond. I'm the Secretary of Washington State Department of Transportation, and we've been fortunate in our state to have so many technology companies that the innovation essence is all over our state.

Early on in our investments in ITS, we started with active or transportation management centers, meters, those kinds of things, so we've got a lot of involvement in this area for WSDOT. We have now morphed into having deployed active traffic management. We have HOT lanes now.

We have all electronic tolling on one of our corridors with variable pricing. So we're trying out different things and have seen a lot of success and public acceptance there.

We're also moving towards now, in a collaboration
with Oregon and Nevada, looking for the pricing transference to technology, now thinking about mileage-based user fees and starting to think about, if our nation can't do it as a whole, us West Coast states are willing to start, and we're working on some pilot projects. Oregon is ahead of us. Nevada has tried some things. But we've decided to form a collaborative where we can test and share amongst each other to try and advance the state of our collecting fees from users differently than just gas tax. So you'll see more of that from us, as well.

Personally, I'm here to learn, get to know people, and hopefully contribute to US DOT's decisions and policies as they start thinking about what will work best for our state's infrastructure and our country's infrastructure. Thank you.

MR. KENNER: All right. Good morning. I'm Steve Kenner. I work at Ford Motor Company. Some of you may have known Jim Vondale who was on this committee, and Jim is very happily retired. Some of you may not know that. So I replaced Jim starting last August. We had a nice transition, so it was really, you know, really helpful. One of the best transitions I've actually either not just
experienced but seen.

And so one of the things I wanted to mention about the role, even if you knew Jim, is I'm the global director for automotive safety at Ford. And with that is primarily three areas that I work on. One is, you know, we set the safety policy for the global Ford Motor Company, and then also we work on advanced regulations across the globe, as well. So we try and, again, bring data and information so that we can try and make a decision that's consistent with improving real world safety.

The second part of what we do is we work really closely with product development to make sure that the cars and trucks that we're designing and engineering, testing, and developing today are going to meet all the requirements and expectations and policies that we have, you know, four and five years from now, which, in some cases, is a little difficult because you need to sort of forecast where you think things are going. And as you know, that's not always so easy to do.

And then the third part of what I do is the investigation side of things globally. So whether it's a government investigation of an alleged safety defect or our
own internal investigation, you know, I'm responsible for
that, as well.

I'm a little different than Jim in terms of
background. You know, Jim was a lawyer, I think a lot of
you know. I'm an engineer. As a matter of fact, I've spent
my entire career in product development, so I've been
designing, developing, engineering, testing cars and trucks
for my whole life and it's really my first staff job. But
it's really been helpful because that interfacing
relationship with the product development team is really
important, and I know and understand the processes and have
great relationships with the leadership team in product
development. So it's turned out to be a very useful
background.

My last job, I should mention because sometimes
it's interesting because you'll hear me say things that
might seem a little odd, but I spent almost four years in
South America. I lived in Brazil, and I was in charge of
engineering for Ford South America. So we have a group down
there, GM and others. I had about 1200 or so engineers, so
it was a fairly, you know, big group and they had global
design leadership for B-cars that are not only for South
America but global. So it was a great experience for me.

In terms of ITS involvement, as Scott mentioned, I am now a new board member for ITS America. Ford's involvement in both the Crash Avoidance Metrics Partnership (CAMP) and the Vehicle Infrastructure Integration Consortium (VIIC), some of you know Mike Shulman from Ford on the research side and Mary Wroten who works in my organization who's the vice president of the VIIC. So we're very involved and committed because we really believe in the technology. And so we want to try and work through some of the issues that would be barriers to implementation.

So, certainly, that's my expectation is that we would address what we think are the biggest issues. I agree with Scott in terms of harmonization. You know, it's a huge issue if there's not harmonization. Certainly, everyone thinks of lack of harmonization between, for example, the United States, Canada, and Mexico, so you have seamless there.

But for automakers, it goes away beyond that because if we have a Ford Focus that we build in nine plants across the globe, we would like to be able to have a common set of hardware and software to a large extent as possible
to be able to prove out the system and then have it work, you know, throughout the globe. So it's really important to the automakers.

It's a huge burden if we have to do duplicate tests because the tests aren't the same, the standards aren't the same, and all that. We already put up with a certain amount of that in terms of, for example, historical crash test standards and so forth, you know, where we have to do different tests to meet different country requirements.

So the harmonization is something that I'm passionate about, and then the security issue which we're going to talk about some because I do believe that that's a huge obstacle right now. I believe we can overcome all these things, and we need to be part of that, but I think working on the hardest issues is really what we need to be doing.

In terms of what I get out of it, for me, learning a diversity of perspectives is great. Joe, you mentioned about public transit. I think if you heard Robert Brown and ITS America, and he had the Bill Ford just little video. Transportation is going to become more integrated.
People are not just going to think about driving to the West Coast, they're going to think about hopping on a plane for a little while, maybe driving for a little while, maybe taking rail. And so it's going to become just an interconnected network, and the automobile will be one piece of that but not it.

So I'm really interested in the other perspectives and that vision of how is transportation changing and what are the trends. I agree with what you said about the trends in terms of people under 25 that own automobiles is at a record low right now, so it is fascinating and we need to think beyond just GM or Ford in terms of vehicles talking to each other but then even the whole transportation network working together, as well.

MR. CALABRESE: My trip down yesterday was a car to the bus, to the train to the plane, to the bus to the train, to the bus.

MS. HAMMOND: And you walked.

DR. KLEIN: And did you have adequate information along the way to figure out the schedule?

MR. CALABRESE: Almost.

DR. KLEIN: My name is Hans Klein. I'm at the
Georgia Tech School of Public Policy. I'm here as an institutions and a networking or internet guy. I'm a social scientist. I have a PhD in political science. I do have my bachelor's degree in electrical engineering, computer science, so I do have an engineering background, as well.

I've been involved in ITS for 25 years now. I worked with Joe Sussman at MIT starting in late 80s with Lyle Saxton and others who started the IVH program, IVHS program at the time. And I worked with them. They were taking mostly an engineering perspective. I worked with Joe on policy issues and institutional issues. I looked at things like, frankly, early on in the program, the political process and the coalition building that built it the way that looking at technology development, in terms of the players, their roles and responsibilities, and even their interests as they came together to design an overall system.

I looked at challenges to implementation, the federal - state boundary and how that, in the American political system, creates difficulty sometimes to take a project at the federal level and carry it over to the users and the operators.

Since then, I actually, since the late 90s, I
switched and got involved in internet issues: internet
governance, the design of institutions for making rules and
regulations, for making standards on the internet, the
dynamics by which networks advance and diffuse. So it's
been really until about six months ago I wasn't involved in
ITS or I was involved very little.

I got called up to the Volpe Center about six
months ago. They were looking at internet governance for
models on what was going on in ITS and thinking about it in
those terms, so I had the opportunity to get back involved
then. Then at some point, I got somewhat of a surprise
invitation to serve on this committee. It was welcome.

And I see myself here again as bringing, A,
knowing at least the deep background on ITS and IVHS, not
always the latest things but I'm coming up to speed now, but
bringing some of that internet perspective to this kind of
federal development program. And it's quite interesting.
There are significant similarities, and there are
significant differences between the two. I think, in some
ways, the internet has evolved very rapidly and it offers
some lessons, its learning curve, some of the lessons
learned there can be brought over here in terms of
institutional design for implementation operation I think is a big one, in terms of the surprises that happen when you develop networks and they're open to lots of newcomers who want to use the networks and you thought they were going to do this and it turns out they start doing that and is it a good thing or a bad thing?

You know, the internet was designed, right from the get-go it was designed for different things than it was ever intended than actually turned out. Email was sort of a byproduct, and it turned out to completely dominate. The communication part turned out to completely dominate that network.

It evolved very rapidly. There was a strong user role in the diffusion and ongoing evolution of that network. I think the ITS program connecting with the user is a very important thing and thinking of strategies and institutions that bring users and developers as close together as possible. I do believe in market perspectives. I think it's terrific to get as many OEMs and networks and even small dot-coms involved as possible. I think they'll do a lot to make a system like this a success.

At a personal level and sort of an intellectual
level, I've been doing research on systems development for a
long time. And through participation here, I see two of my
research interests coming together. There really are sort
of two paradigms for how to develop a system. One is the
systems engineering process that we see quite strongly here
in the world of ITS. Federal systems, planning, long-range
perspective, working through the public system, and
integrating public/private partnerships is one perspective.
It's well-established. The US federal government has been
doing it very well. The Department of Transportation has
been doing it well for decades, mostly the post-war period.

The peer-to-peer, the other system development
paradigm is this peer-to-peer way of creating networks.
It's very different. It's not well understood. I like to
think that I understand it about as well as others, but I'm
not sure anyone really gets and fully understands the way
the internet has diffused laterally and brought enormous
social change and enormous benefit in being always connected
to the user, very little central control, very open to third
parties getting in and bringing ideas to the table, very low
barriers to thresholds for entrepreneurs and for new market
initiatives.
And I think those two paradigms are really coming together in this program. And as I was saying to Steve, I think they're kind of coming together in the dashboard of our car, and it's going to be really interesting to watch what happens in our vehicles when the world of internet and peer-to-peer networks comes together with the world of transportation and planning and industry players and the kind of work that this group has done. So I'll be thinking about that and writing about that as time goes on.

**Welcome by RITA Deputy Administrator, Greg Winfree**

CHAIR DENARO: Thanks, Hans. Before we go with Raj, remember that we stopped with you, but Greg is here with us right now, so thank you very much for coming. And we invite you to make new comments, if you'd like.

MR. WINFREE: Well, absolutely. And the first thing I'll say is I certainly could have used an intelligent vehicle this morning. I could have used that or the Google car or somebody needed to be driving that vehicle. But great to be here with you all. Again, to say, personally, I know we spoke over the phone, but thanks so much for the contribution of your time and service to this important endeavor. As many of you've heard me say over and over,
it's game-changing technology and it's one of the things that we at RITA really get excited about as we work with our partners at Highways and at NHTSA and FMCSA and across DOT. It's the kind of impactful move that will take the transportation system to the next generation and beyond, as we heard Deputy Secretary Porcari state yesterday.

So I don't want to take up anymore time since I'm a little tardy but just glad we're all here. Welcome to the RITA quarters here at DOT. Glad we could all fit. And I look forward to a productive session. Thank you.

CHAIR DENARO: Thanks, Greg.

MR. WINFREE: My pleasure.

CHAIR DENARO: Are you going to be able to spend a little time with us?

MR. WINFREE: I am.

CHAIR DENARO: Great. Good. Well, we're just going around and I asked everyone to tell us a little bit about how they come at ITS based on their day job and a little bit of their expectations for our committee and then personally what they hope to get out of this. So we're going to continue our round and get to know everyone. So, Raj, I think you're up.
DR. RAJKUMAR: Good morning. I'm Raj Rajkumar, a professor at Carnegie Mellon University. We do research that facilitates rubber meeting the sky, I guess in terms of rubber meeting the road. I play multiple roles at Carnegie Mellon. First of all, I co-direct a collaborative research lab that is sponsored by GM on vehicular information technology or technologies for inside the automobile since 2000. It's been substantial productive long-term relationship since then.

We focus on multiple things about intricate systems and software within the vehicle with the biggest area being vehicular networks, V2V and V2I. We look at all layers of the system, including the fiscal layer, protocols, large-scale assimilations, and emulations of deployments in big cities. So we have substantial presence there. It's a very well motivated, lots of interest from General Motors, and we have John from GM.

Then in 2007, our team from Carnegie Mellon won the 2007 DARPA open challenge for autonomous vehicles. We won the DARPA $2 million prize driving 60 miles in less than six hours autonomously, in open like traffic conditions, obeying traffic rules and such. Thanks to that success,
autonomous vehicles are no longer science fiction. And then I guess GM basically started a second collaborative research lab focusing on autonomous driving, per se. They're working at the next generation vehicle. We expect that we will see this vehicle later this year. The Google Car, for example, one of the key guys is one of our key guys on our team. So Google is borrowing our expertise, I think.

I think you will see what we can offer later this year. I can promise you it will be a really nice-looking car, much better than Google Car.

CHAIR DENARO: What's your point, Raj?

DR. RAJKUMAR: And in terms of corrective maintenance with autonomous driving, something like the autonomous driving is much, much easier and much faster. We hope to show that later on this year.

So the next role that I play is that I did a large project within the cyber-physical systems program in the National Science Foundation where we look at the basic components. The software that goes in the connected vehicles and into autonomous vehicles is very complex. You need to test a lot. You can test all you want, you can never be sure about the correctness of the software. So we
look at basically some basic challenges there. We have a person working on the team, as well, looking at the correctness of these systems, the correctness of the protocols and such. So that's a third role that I play.

A fourth role that I play is that I'm the director of a new industry transportation center at Carnegie Mellon which is joined with the University of Pennsylvania, about 16 faculty members across the two institutions, one on the western side of Pennsylvania and one on the eastern side. We believe we are two world class universities and looking at five different areas technologies within the vehicle, technologies in the infrastructure. We're looking at collecting data and doing large-scale mobility data. We're looking at the interface between the driver, the users, and the technology.

And the fifth area that brings those pieces together is the public policy component. So that started earlier this year. Just last week, we actually had a kick-off for UTC consortium. The UTC is called Technologies for Safe and Efficient Transportation. That's going to be T-SET. So this T-SET consortium comprises about 28 or so entities from the private sector, from the non-profit
sector, and from the governing sector of the local level, city level, and the federal level. We just had a really nice kick-off, lots and lots of interest. And we actually like to use the term we do R&D&D, where the last D is deployment. So we really actually want to basically take from the rubber that meets the sky all the way to rubber hitting the road and basically actually deploy in. So at Carnegie Mellon we take pride in basically coming up with great concepts with nice properties but then show that this is not just stuff that we can publish, we can actually take it public with the deployment, and we take a lot of pride in it.

With respect to my expectations, Bob, we actually have a strong passionate belief that ITS will actually play a major role in decreasing accidents, injuries, minimize traffic condition, and, therefore, improve the quality of life and society as a whole. And we would love to basically facilitate this actually happening sooner rather than later.

CHAIR DENARO: Thank you, Raj.

MR. STEENMAN: I am Ton Steenman, Intel Corporation. I've been with the company for about 30 years. I grew up in the Netherlands and spent some time in the
Netherlands first for Intel but then moved to Germany, moved to the U.S., spent about three years in Asia between Malaysia and Hong Kong, and I'm back in the U.S. now. For the company, I own all of our embedded businesses, so it goes everywhere from retail to communications infrastructure to healthcare, energy, and automotive, as well, are the markets that is under my remit, as well.

About five years ago, we got approached by the automotive industry and a couple of very large automotive OEMs, and they wanted our help and they were really struggling with the notion of how do I extend the digital lifestyle of consumers into the vehicle and how do I deal with the fact that consumer expectations are just evolving so rapidly because of consumer devices and how do I keep my vehicle competitive with that?

So about five or six years ago, we started to do a lot of research at BMW on that, and we've done some publications and some public announcements around the work we've done with BMW. And lately you've probably seen some of our announcements of the work that we've done with Nissan, with Toyota, with HKMC in Korea, and companies like that. So that's kind of a little bit of background.
We have a deep interest, we've kind of really built deep interest in automotive over the last five years. If you go back into corporate history, about 20 to about 10 years ago, we were deep in brake control systems and engine control systems. We left that about 10 years ago, but we re-entered the market about five years ago as we saw this intersection of consumer electronic devices, anything from PCs in the vehicle.

So from my perspective, what I'd like to get out of this committee personally, of course, interfacing and building relationships in the industry broadly I think is very important for Intel. Secondarily, Intel has a tremendous amount of resources. As a $60 billion company, we have like a large cadre of PhDs. Intel Labs is a part of the company that interfaces very significantly with academia but also does a lot of deep research. I don't think we are well connected into the automotive industry and the intelligent transportation industry enough yet, and I think we, as a company, have a lot to offer there probably, from the perspective of research and technologies.

From an ITS perspective, of course, as a company and me, personally, I'm extremely interested in improving
safety as that is good for everybody. I'm also equally interested in how can we use some of these technologies to really give people a better experience with transportation, how can we make the overall experience of particularly multimodal transportation a more interesting experience for consumers?

As a company and I think as an industry, there are a lot of things we can do. On the safety side particularly, of course, a tremendous amount of testing is necessary to succeed, but, if you think about it, on the other side of kind of the experience, efficiency, we can probably involve ecosystem. When I heard this week at the ITS conference that the government, which I really applaud, has made available so much data, like just to the public. I think if we form an ecosystem around that. We've been trying to do some of this with the announcement of our $100 million Connected Car Fund that we announced a few weeks ago as a company with the goal to really stimulate an innovative ecosystem of developers that can be brought to bear. And I think, as a company, we have a lot of experience in bringing open platforms to market that really stimulates a very open industry and a broad set of developers in an ecosystem that
can just be immensely innovative.

So, you know, these are kind of the different aspects that I will be interested in discussing here.

CHAIR DENARO: Thank you, Ton. George?

MR. WEBB: I'm George Webb. I'm county engineer for Palm Beach County. We're located down in Southeast Florida. Delray Beach, Boynton, Boca Raton are some of the names you might know and hopefully have visited down there, nothing to take away from Miami and Sunny, but we like our county and encourage you to come visit.

I've had the pleasure of being county engineer there for over 20 years. I've seen rapid growth in our county. We were absorbing about 25,000 people a year for about 15-plus years so a lot of growth and a lot of things has happened. We're very proud of what we've done on the transportation side of things because we've actually kept up. Our road network right now functions, probably about 95 percent of it, to our desired level of service or above. So with that kind of growth, it's been amazing to see happen.

We've had a lot of investment in transportation because of that. My county is also invested, we have about a thousand traffic signals under our control. We have a
traffic management center. We probably have somewhere in
the neighborhood of 400 to 500 miles of fiber optics in the
ground, which I think about regularly when I sit and talk
about ITS and how this thing is going to function and how
all this is going to work together and so forth.

My other role is that I have served on the
National Association of Counties Transportation Steering
Committee for probably 15-plus years, and I will tell you
that it's been an interesting experience to report as a
liaison about ITS back to that committee and to see a blank
stare from most of the people on the committee. Please
understand that most of the counties are rather small,
rather rural. And when you talk about the technology
involved here and what we can do, a lot of times it's like
I'm not interested, and we have a real issue regarding the
priorities in counties because right now, and I'm looking at
two state directors who can understand what I'm about to
say, you know, there's a real issue about our infrastructure
aging and the cost to potentially try and keep it up and/or
replace it. I have seven drawbridges in my county.
Replacing a drawbridge is a $40 million hit.

So it's a big, big issue about where to spend
what appears to be a very limited pool of transportation
dollars both at the federal level and the local level. So
we have that issue as far as trying to make that happen.

I've had the pleasure of being selected as the
National Association of Counties' representative to serve on
the VII working group, so I've had that as we've evolved
from that to IntelliDrive and to now connected vehicles.
I'm also, as part of the pooled fund study that AASHTO is
working from, as far as the local representative on that.

So my expectations on this is, with all this, I'm
an engineer, I'm dealing with ITS from an engineering
perspective, one of the frustrations that when we sit down
and talk it's always been, well, what's going on outside,
what are the car companies really doing, what are the
communication guys doing, and so forth, so I'm very
interested in understanding and listening and broadening my
perspective as far as understanding and opening up and
getting maybe a different, more cohesive vision of ITS,
particularly how it might be applied at the local level. So
I think I did my hope and expectations in the same one.

Thank you.

CHAIR DENARO: Thanks, George. Kirk?
MR. STEUDLE: I'm Kirk Steudle. I'm the director of the Michigan Department of Transportation, and I'm this year's AASHTO president, as well, so I get the great opportunity to represent Paula and our colleagues around the country.

Michigan has a long history in ITS. We put up one of the first what's called a SCANDI system, which was in the 1960s. It had ramp metering, it had monitors, had a whole bunch of stuff. I joined the agency in the mid 80s, and there was always a tour. You had to go work in the SCANDI system so that you knew what was going on.

After that little tour, I spent most of my time as a deployer. I was in road and bridge construction, so I was on the front end of building things.

I've been in the executive office for about ten years now as a chief deputy and then as director. I'm in my second administration, which is always interesting to transfer from one to another and see how things are set up, see what the priorities are. In the current administration, I have a current governor who used to be the chairman and CEO of Gateway Computers, so he's an IT guy. He understands it, although that's good and it's bad. He understands it
because when you tell him we're going to do this, then he'd say there's too many implementation problems, don't waste your time. Okay, then we won't.

I've been very involved in the last ten years with ITS. Michigan has a number of test beds, many funded through RITA, many funded with Michigan funds, as well, to just advance the whole program. There was a couple of test beds that we felt so strongly that we said this is where we need to go, put Michigan money in it to do it, and I think dragged a couple of other folks along the way. It's been tremendous.

I really look towards the future, and I really see connected vehicles as the way that we get cars to not crash. That's my ultimate vision is zero fatalities from cars that don't crash. I think there are just so many opportunities that come from that. And whether it's autonomous or vehicles that are just smart, there's a lot of other real smart people who figure out how to do that, but I really think that that is where the future is going to be.

I am on Scott's ITS America Board of Directors. I think I just started my second term there. That's been very interesting for me, as will this committee, to
understand different people's perspectives. Just the
introductions of all of your backgrounds, and I know a
couple coming up here, I think is tremendous. And the
ability to look at all those diverse ideas I think will help
tremendously.

Having been on this committee once before, I saw
the diverse opinions come out. Interesting discussion at
times. And I think we ended up with some good advice for
Shelley and the team here. So I'm looking forward to a
great interaction with all of you and getting to know some
other folks with some different backgrounds.

CHAIR DENARO: Thanks, Kirk. Bryan?

MR. SCHROMSKY: Hello. My name is Bryan
Schromsky. I'm with Verizon Wireless. I've been with the
company for 12 years now. My background has been with
public safety, public utilities, telematics. I mentioned
before, AVL fleet management, that was my expertise. I
mean, we originally connected the first vehicle for usually
law enforcement, public safety, public utilities, you know,
retrofitting the vehicles.

Our big growth obviously is meant to be for under
25s. I'm the last year of Gen X, so I am old. Mobility,
everything is about mobility. And one of the things that's nice when I look through the pack here and my goals in this committee is a lot of things that Verizon does is try to enable not only from the vehicle but to infrastructure, to logistics, and, you know, really is enabling the platforms so all of those different components can take advantage of it, right? So that's one of my -- and my personal goal, and thank you again for the honor to serve on this committee, is to understand the problems not only technology speaking but also with the real problems from state/local interacting with the fed. We see that, obviously. And also the connection not only in taking the vehicle itself but, you know, if you didn't have navigation in your vehicle, could you use your smartphone, and how does that talk, and the vehicle pulls up and obviously, a lot of work that we do with OnStar, you know, does the vehicle then talk to the infrastructure or, if it doesn't have connectivity, does it talk to the home when it gets home and data dumps, and how that all ties back in and security.

Now, selfishly, coming from a law enforcement family, obviously vehicles and losing a family member in the line of duty from another vehicle strike, my uncle in the
line of duty, for a routine traffic stop, what can I use that technology to improve public safety not only from vehicle crashes but high-speed chases? Can I shut the vehicle down remotely to deter that, or can I manipulate the infrastructure to allow public safety in real time to do what they need to do? So that's one of the areas in particular that I'm really interested in. So thank you.

MR. MCCORMICK: My name is Scott McCormick. I believe I know most of you here. I have sort of a long sordid history in this environment. Back about 12 or 13 years ago, all 12 automakers got together and formed a consortia to develop all of the specifications for how devices can communicate inside the vehicle, for antitrust reasons they can't be in charge of themselves so I was the executive director of that organization. And we developed about 3500 pages of standards that, because I'm a member of the technical advisory committee, moved that to all the world standards organizations. Most of those products you use now in the vehicle environment. The common message set, for example, was developed by that organization.

At the end of developing that term, Scott Andrews and I, another individual in this space, proposed to the
automakers the idea of communicating outside the vehicle. He and I wrote a cooperative agreement for them with the United States government. And I incorporated a new entity called the VII Consortium, for which I was the first president of, and then after about nine months the automakers realized that, although they historically don't like to have their suppliers organized, there was a lot of industries that needed to be involved and an entire ecosystem in order to bring to fruition all of these plans and architectures.

So I incorporated a new entity called the Connected Vehicle Trade Association, which was started with 12 founding directors, of which Intel's Director of Strategy was one of those founding directors. And we've been in place now for over seven years and have involved ourselves in a number of activities, everything from the Connected Vehicle Proving Center to the Mackinac Bridge Project to a lot of international activities.

I also have a second role as chair of the Global Telematics Forum, which is the heads of the trade associations from North America, the trade associations in this space from North America, Australia, China, Europe,
Japan, Korea, and Taiwan. And so I have a lot of activities with those other world organizations to help harmonize and move these environments forward.

Because we have 17 different industry sectors and representative trade associations, we were hoping to bring to the table some things that we feel are of importance and to take back to them those areas that they're less developed on that they need in order to help this environment. We're about enabling growth in this environment, and safety is our prerogative, as well.

CHAIR DENARO: Thanks, Scott. Well, Peter is not here yet, so let me tell you about my friend Peter. Just kidding. We'll let him introduce himself when he's here. Sonny?

MR. HOLTZMAN: I'm Sonny Holtzman. I'm an attorney. I've been practicing for about over 50 years. I'm from Coral Gables, a beautiful place. If you don't care, stop in Palm Beach County.

Most of you are engineers and scientists, and you are known to be creating the pie and attorneys are generally known as taking a slice of the pie here. I think we have a better role than that, and I think it might be that we bring
to the table maybe our financial, our professional, and our political experience to help navigate everything through the process. That's what I've been doing kind of in the toll industry.

ITS is interesting. I heard Greg speak the other day. It's a learning curve for me. I always think that the toll industry is on a parallel track to ITS. They don't seem to come together, and I think there's a lot of integration. I don't know whether it's fault or whether we just haven't done it yet, and maybe it's there and I don't know it, but that's something I'm looking forward to.

So my expectations are perhaps we can look at that and see what comes of it as we go forward. I'm anxious to give to the committee whatever I can in that regard.

CHAIR DENARO: Thanks, Sonny. John?

MR. CAPP: Good morning. My name is John Capp. I'm with General Motors, and I'm in Detroit. I've been with GM for 27 or 8 years. Went to General Motors Institute up in Flint. It's part of who I am.

Mostly, it's safety. I've worked in the regulatory part of safety back when we started the first side impact regulations with some of the people here at
NHTSA and some of that. Then I've been in product
development most of my career. I worked on airbags and
restraints and body structure crash stuff. I spent a couple
of years in Opel in Germany where we were trying to get
comment on some of our safety approaches on vehicles.

Then about five years ago, I was asked to
transition more to the electronics side of safety, advanced
safety, and then wearing two hats since then. One is to
plan our advanced technology work in the area of safety.
Most of it's electronics, including technologies like this,
but also active safety, driver-assisted systems. And the
other hat that I wear is actually more mainstream, an
engineering hat of executing this stuff, so I have to live
with some of the problems that I create.

And I've got folks that are working on some of
the systems that are being deployed on GM cars today with
collision-imminent braking systems and camera radar systems
and things like that. The software team, too, is a part of
my team.

So what's nice about that is I've got the chance
to kind of do some of the planning for technology for the
company when it comes to these technologies but then also
the practical side of implementing them. And that was done on purpose so that we can connect the advanced to the reality and the practical side. And at our company at least, the idea of throwing stuff over the wall from the research side to the product side, that wall is getting a lot shorter. And jobs like the one that I have are intended to kind of make that wall go away, so we're working on advanced stuff that we're serious about doing.

So that kind of gets to my expectations of being, you know, part of this. I mean, this is a technology that we believe in. It's going to happen someday. Safety is a huge reason for it to happen, but there's also going to be other conveniences. I don't think anybody is in dispute that it will happen, certainly not in my company, although it's taking a long time.

So my own expectation and interest is I really see a lot of these stars beginning to align. I see real momentum, and I think over the last couple of years the JPO projects, the time lines that exist, the NHTSA date for 2013, all of these things have had a profound effect, I think, just over the last couple of years on focusing people's efforts. And as such, I mean, the challenges are
still there, but we know what those are now. And Steve mentioned earlier the security. That's probably one of the biggest remaining ones that we see as an impediment from a technical standpoint.

But then the challenge of getting technology on vehicles gets beyond the technical impediments. There's really a few ways that we end up putting technology on vehicles or features in general. And sometimes it's just somebody in the company is just passionate about and is a champion of it and they've got to have it. You don't see as much of that these days because our business is so practical and competitive, but, occasionally, you see a car that's wildly styled or something, and it's just got personal passion, somebody who went to the mat and was able to make that happen.

But most things happen more from a practical standpoint, that there's a need. Now, we know there's a safety need, but there's also got to be a customer need because it's competing with other stuff. I mentioned some of the other technologies that I'm involved with. I can put technologies today on vehicles that have one cost point that people can afford to pay for it and it gives them value
today.

We know this technology is going to add value, too, but it's in this chicken and the egg state of how do we show ourselves that it's got this value? How do you show customers? Somewhere there's got to be money moving around, right? That's how everything happens, in this country at least.

But the other way sometimes things happen on vehicles is through regulation. This one has a potential to eventually go down that path, too. You can make part of it fairly easy. I tend to think it will probably be a combination of those in the interim period or else it will take a long time again. So I'm hoping we get to the point where we see, we get these technical impediments behind us, like security, things like that, and we can start to see enough of the other players. We talked yesterday with some of the state folks also seeing the reality, agreeing on which technology it's going to be, how it's going to do, so that this recipe will live for a while because people who buy cars don't want to find out two years later that it doesn't work and we were just kidding and there's a new technology.
So the more we start to all see the same basic recipe that's got some future in it, the more likelihood that people are going to invest, states, our companies, everybody else, on behalf of our customers. So I'm encouraged that I think there's progress being made there, and I'm glad to be a part of this to maybe help get us a little bit closer to that.

CHAIR DENARO: Thanks, John. Roger?

MR. BERG: Good morning. My name is Roger Berg. I'm with DENSO Corporation. We're an international world leader and Tier One automotive supplier to -- everyone thinks of the Detroit 3, but there's actually 20 or 30 different car companies that we supply parts to.

When Bob was talking about his introductory remarks, he was saying, yes, we'll leave this meeting and go to our main jobs, and I thought to myself, well, my job is much like kind of a vision of this committee. The names and the faces are different, but the people that I go and talk to are very passionate about this, connected vehicles and the impact it can make on not just our business but on society. And I think that the three ways I look at that are, you know, learn from some of the past mistakes we've
made, execute, you know, today's programs to kind of move
this thing forward. And, third, I think about what kind of
future society we will have when intelligent transportation
systems become such a great part of our lives.

So DENSO is not one of the, you know, jump on the
bandwagon kind of ITS companies. We -- I wouldn't say
invented, but we built an electronic power train car in the
1950s. We were one of the companies that had the first
deployment of commercial connected vehicles on the Mayday
system in Japan. And so that's to say we have a long
history in ITS, but it doesn't mean we know everything. In
fact, as of today, we know basically nothing.

So the second kind of pillar to that is, you
know, executing today's programs. So DENSO has a huge
investment in the connected vehicle program. We've been
developing early feasibility studies of how wireless
technologies can work for intelligent vehicles to, you know,
developing product and implementing it, putting it into
field trials, and learning all those lessons about what
works and what doesn't. And that has kind of given us
lessons for how we might be able to formulate the future of
what a connected vehicle society looks like and how it can
be impacted by the work that everyone in this room does.

So in terms of my expectation for participating in this industry and a committee like this is I have this vision that in my lifetime I'd like to see at least one day where nobody dies in the transportation system in the United States. And that's kind of like a first, you know, threshold. And once that occurs, everyone will be happy, of course, but that just kind of sets the next goal. So let's make two days in a row where nobody dies, and then after it's two days in a row it's a week, and then after it's a week it's a month. And soon this lofty goal of zero crashes, zero fatalities starts becoming a reality by taking it step-by-step. So, hopefully, the work that we're doing in this committee and in this industry will get us to that kind of a vision where traffic crashes or transportation system crashes and people actually losing their lives is something that was in the past and not in the future.

CHAIR DENARO: Thanks, Roger. Steve?

DR. ALBERT: That's hard to follow. My name is -

CHAIR DENARO: Not for you.

DR. ALBERT: My name is Steve Albert. I'm the director at the Western Transportation Institute in Montana
State University. This is my third term on this committee.

I generally kind of be the rural guy, but my background really kind of stems from the early 1980s and starting the ITS program in Houston, Texas, coming to Washington, D.C. as a consultant and starting a lot of the ITS programs across the country, and then realizing Montana is not a bad place to go and I don't have to lock my doors, and started a small transportation research center there that now we're doing work in almost every state and about 16 countries, some of that relating to ITS but many in other areas.

I have held a variety of leadership positions through ITS America either being on the board or head of the state chapters. I'm the past president, and you've heard a number of professors talk about the University Transportation Centers Program, I'm the past president of that organization. And I think, you know, in Bob's charge, what do you want to see out of this committee, I've provided, I don't know, three or four congressional testimonies, and, when I think about what happens at these meetings, one of the things I'd like to remind you of is if you think of the United States as a big piece of Swiss cheese -- there's an image, huh? And the holes in the Swiss
cheese are predominantly urban areas. If we're going to achieve a national system, we're going to have to think about the areas outside of those holes, which are predominantly rural. And when you find that 60 percent of the fatalities are in rural areas and 70 percent of the road miles are in rural areas, if all this does is help you get around the beltway in your urban area, we're missing the bigger opportunity. And a bigger opportunity to save lives, quite frankly, is in a rural area. So we're discussing the issues of roll out and deployment. Don't just think about the holes in the Swiss cheese, think about the whole Swiss cheese.

CHAIR DENARO: Thanks, Steve. And I suspect that's not the last time we'll hear you talk about the rural --

DR. ALBERT: I will try not to be, oh, there's that rural guy.

CHAIR DENARO: Well, thank you all for those introductions. I think you can see now why I was excited about this team. We've got -- two things that struck me by what all of you said. A, we've certainly got the diversity I talked about. But, secondly, look at the passion for ITS
in this room. So I think we've got the right team, so
that's pretty exciting.

What I'd like to do, I'll go over the agenda in a
minute, but let's just do a quick introduction of the other
guests we have in the room and staff members and so forth.
If you would just give your name and what part of the
organization you're involved with, or, if you're not within
the staff here, what your involvement is. I don't think we
have the time to go through all your background and
everything, but if you give a quick introduction I would
appreciate that.

So would you like to start?

MS. DULANEY: Sure. Hi, I'm Shannon Dulaney.
I'm a federal affairs analyst for Honda in our government
relations office here in D.C.

CHAIR DENARO: Great, thank you.

MS. BRIGGS: I'm Valerie Briggs with the ITS
Joint Program office, and I lead the policy research team.

MR. MEESE: I'm Andrew Meese from the
Metropolitan Washington Council of Governments. We're the
regional planning organization for Washington, D.C. and
vicinity. I'm sitting in as an observer for Ronald Kirby,
who is joining the committee and regrets that he had out-of-town commitments and could not be here. I know that he would bring a lot of perspectives to this committee. You know, we're very interested in urban congestion issues that we have to deal with.

One of the things that I think he might bring to the discussion, he's very interested in demand management, in addition to supply management. And we are very involved with that in our region.

Does everybody know what this is, this key fob? This is a Capital Bikeshare key fob, and in two years we've gone from zero bike-sharing to hundreds of trips a day in this region of people who are creating this new transit mode of bike-sharing. So it's an exciting place to be here. We've got a lot of interesting things going on.

I personally do have over 15 years of work in ITS, you know, in our perspective, and hopefully Ron will be able to join the future meetings and bring his perspective.

Thank you.

CHAIR DENARO: Thanks for representing Ron.

Appreciate that.

MR. TRENTACOSTE: Good morning. I'm Michael
Trentacoste with the Federal Highway Administration. I'm the Associate Administrator for Research Development Technology and also get to be the director of the Turner-Fairbank Highway Research Center. So Jeff Lindley, who's the Associate Administrator of Operations, and myself are really the co-leads in FHWA for the ITS program. You all know Joe Peters and Monique Evans and Carl Anderson. They report to me.

MR. ARNOLD: I'm Bob Arnold, Federal Highway, Office of Operations. I'm the director of Transportation Management, which has a lot of the strategies that deploy and need ITS.

MR. LAMAGNA: I'm Sam Lamagna from Intel Corporation. I'm chief of staff with Intelligent Systems Group, all those things that are embedded in communications like Ton Steenman spoke of earlier.

MR. SCHAGRIN: Hi. I'm Mike Schagrin with the ITS Joint Program Office, and I'm the program manager for connected vehicle safety.

MR. VALCICH: Hi. Mark Valcich with Intel Corporation. I manage Intel's relationship with Department of Transportation and focus on federal enterprise solutions.
MR. CRONIN: Good morning. I'm Brian Cronin with the ITS Joint Program Office. I'm our team leader for research.

MR. GLASSCOCK: Stephen Glasscock, your liaison for administrative logistics, and I will take responsibility for the cramped quarters. I promise next time it will be a lot more comfortable and better.

MS. ROW: You guys should know Stephen will make your life much easier.

MR. VELEZ: I'm Charlie Velez. I'm with Citizant Incorporated, a JPO support contractor.

MS. ANDREWS: Hi. My name is Sheila Andrews, and I'm probably the fly in the ointment here. I'm actually with the American Motorcyclist Association, so we actually, just for context, represent individual riders, so we are the end users, the individuals that are impacted by the research and deployment of ITS technologies. We know that, you know, motorcyclists tend to be a little slow to develop things like ITS because of our wonderful nostalgic love of our old, you know, clank-around motorcycles, but we want to make sure that our voice is, if not at the table, at least in the room.
CHAIR DENARO: Thank you. Greg, do you want to make some comments?

MR. WINFREE: Actually, a very good segue. I'm a passionate motorcyclist and AMA member, so motorcycle interests are at the table. So that's certainly one of the interests that I have, as the team has heard on several occasions. And like Steve being the rural guy, I tend to be the motorcycle guy, so we'll tag team you that way.

MS. ANDREWS: Well, I won't have to show up then.

MR. WINFREE: You're always invited. You're always invited. But just real quick, importantly, the main reason we're here is the number 32,788, right? And we see that as a static number, and those are individuals who, unfortunately, have perished on our roadways. But one of the things we don't really talk about, and I think I mentioned it in the ITS America video opportunity, is really that's 32,788 families that lost a breadwinner, that lost a mother, have lost a father, have lost a sister, a brother, a twin who perhaps had that bond severed. So these are impacts that will last for months, will last for years, will last for the rest of a lifetime of these families. And these are folks, you know, if you only come at this from an
economic perspective, who are not as productive, but more from a safety perspective, which is what we're passionate about.

You know, like Brian, I also have, and who in here hasn't had someone in the family taken from them in a needless vehicular accident? So that's the main reason why we're here, to get that number down. Thirty-two thousand seven hundred eighty-eight is unacceptable for a country as sophisticated as the United States. We can do better, we must do better, and we look forward to working with you on helping drive those numbers down. As we said, the quest for zero, towards zero. That's where we need to be looking at.

I really appreciate Roger when he said, you know, one day without fatalities, two days, and let's start to piece together that story because that is achievable. So thank you.

CHAIR DENARO: Thanks, Greg, for nailing that down for us. I agree. All right. I just want to talk about the agenda for just a second, so if you have that or you don't necessarily need to look at it. But what we're going to be doing, we just went through the introductions and so forth. Shelley is going to talk to us and just give
us a quick overview. We had an overview in our phone
meeting, but we'll get a quick overview from her here also.

We'll take a break. I think we'll go ahead and let Shelley
do that. It's only 15 minutes, and we'll delay our break by
another 15 minutes.

And then we're going to get some more briefings
from Shelley and the team in terms of the program, some of
the key issues that they're working on, what's current, and,
frankly, it's going to bring me up to date, as well. We'll
break for lunch. And then after lunch, a continuation,
actually, of the presentation by the JPO and getting to some
of the implementation issues.

And then as Shelley said earlier, we'll close out
in the afternoon with a couple of hours of discussion. I
want to start this discussion with how we're going to focus.

I mean, I'm sure seeing what your jobs are, that every one
of you struggles with focus in your job. We're going to
struggle with that here, too, and we're not going to succeed
unless we find that focus. Focus means two things: we've
got to find a manageable set of things to work on and,
secondly, hopefully the most important things that we're
going to focus on.
So I don't know if we'll reach conclusions yet because I'm not sure we'll have enough information, but, as far as we can get, that will be good. And then that will be it. And we will talk a little bit about the time line of the other meetings. We'll get your input on when might be the right timing, how many meetings do we want to have, how we see that going, and so forth. All right? Are there any questions at this point of where we are? All right.

MR. MCCORMICK: Did everyone show up that's on the committee? Was everyone able to make it? Are we missing anyone that's --

CHAIR DENARO: Peter and Ron, I believe.

MS. ROW: That's very good.

CHAIR DENARO: Which is superb.

MS. ROW: That's very good.

CHAIR DENARO: Keep it up. Shelley?

**ITS JPO Overview**

MS. ROW: All right. Okay. So I am genetically unable to be in a room with an empty flowchart. I'm going to help Mark out and get him out from behind the flowchart.

CHAIR DENARO: By the way, Shelley, there was some mysterious document that did appear in front of us on
the table, too.

     MS. ROW: Yes.

     CHAIR DENARO: This guy right here, which got interesting.

     MS. ROW: Yes. And so I'll just mention that.

We can bury you in paper, so this is our brand new strategic planning document. It is available or going to be available electronically if it isn't already posted.

     CHAIR DENARO: Two days ago.

     MS. ROW: Is it posted?

     CHAIR DENARO: Yes.

     MS. ROW: Excellent. Thank you, Valerie.

     CHAIR DENARO: I found it.

     MS. ROW: Yes. So this is a summary of the entirety of the program. We started doing this I guess in 2010. It's a four-year horizon, so we're up toward the end of it. It lays out the vision that we saw in 2010 and then gives you a snapshot of where we are on that research today.

But it covers the entirety of the program which you will not hear about today. So this is available to you. If you don't want to take the big document, that's fine. We understand that. It is available online.
So I'm just going to take a few minutes and just try to give you an overview because, as Scott said, there are a number of things that have come up every time. So we want to just position you to understand that, and maybe it will make it a little easier for you to decide how you want to use your time.

So the thing that I wanted to share with you is this little diagram. It's not perfect, but it's okay. It's the best we've got. So this is the way the -- ITS in the department works, and I think many of you in technology organizations, you understand it. You go from research here to implementation, right? And so that's what Scott rightly pointed out has always been a discussion point here.

So what I wanted you to understand about the ITS program, which is what you're here to advise us on, the ITS program is in this part. So this is the ITS Joint Program Office role, and it spans across this area, what you'll hear us refer to as technology transfer.

When you get over into implementation, you begin to get our modal partners, like FHWA who's here with us, FTA, Federal Motor Carrier Safety Administration, clearly NHTSA, so a lot of the organizations that we work with. And
so they have a much bigger role than we have when you get to
the implementation side. So we share a lot of work here in
this technology transfer piece. You'll hear us talking
about our professional capacity building program. Each one
of our research programs has a technology transfer
component, and we try to focus the research with
implementation in mind, begin with the end in mind.

So we wanted you to understand that it is going
to be a push/pull in your conversations because, clearly, we
all want to be here [implementation]. It's just that our
role has been here [research], and we just need to position
it to get to implementation.

The other thing that I would say, if you heard
any of our presentations over the last weeks, Scott has kept
us very busy, the connected vehicle part of our work is
moving from research into implementation. And so now a lot
of those things that we're working on, several of you talked
about the security system, some of those things, they're,
yes, kind of researchy, but they're in this research to
implementation. It's literally is it going to work, can you
build it, is it automotive grade, is it going to literally
work in a deployed environment? So that's where the program
is, and that's where we would like to have your assistance in some of those particularly tricky items that are going to get this into the deployment side.

The other thing that we wanted you to just be aware of is in the research arena for US DOT we get $110 million a year, and that supports this work that we do here. The modes, like FHWA, NHTSA, they have some other money. It's actually not as big as this for ITS because it's spread across, like, in highways. They do research on pavement and bridges and roadway design and safety systems and all kinds of things. So they have a little bit of ITS money that's in this area, but not as much as what we manage out of the ITS Joint Program Office.

When you get all the way over to implementation, though, that's where you see a lot of our partners here in the room. We have two leading state DOTs. We have several local government agencies, transit properties. We included in your package a recent report that we did that looked at deployment, and this is typically the traditional ITS deployment: cameras, signs, message signs, fiber, transit, AVL, electronic toll collection. That research shows us that there's about an average of $1 billion a year being
spent by state and local agencies on the deployment of ITS. It's been growing, and so that's about the average over the last I think ten years or so that we've been measuring it.

So the deployment is really happening by those of you here in the room, and this doesn't even come to close to capturing what those of you who are companies are doing. We don't have an eye on that, except for the work that ITS America did two years ago, three years ago.

MR. BELCHER: About a year and a half ago, about $48 billion a year in the private sector.

MS. ROW: Okay. Forty-eight billion in the private sector. So that's where all of this is happening, so we try to just see that. What else did I want to share with you? So in our $110 million, we do, the vast majority of this is in research. And in this particular case, it's in connected vehicle research.

So just to clue you in on the code, in the connected vehicle program you'll hear V2V, vehicle to vehicle; vehicle to infrastructure, V2I; V2P, vehicle to pedestrian. And, in general, we'll talk about V2X, so V to anything else like motorcycles, for example. We don't forget motorcycles.
The other things that I just want you to be aware of because you get to choose where you want to focus your energies, right? These things, this kind of V to everything, it's all about safety in this particular context. We also have a mobility program. We call it DMA, dynamic mobility applications, mobility being the operative word. So there's a lot of work on how you use connected vehicle information for mobility applications.

The safety work is centered around DSRC, dedicated short range communications, because it's the only thing that will work for the imminent safety crashes. DMA, we want to look at can we use an evolutionary path from the safety applications that would enable mobility applications through DSRC, but also we recognize that that, too, could be done through cellular, it can be done through other ways, as well. And we don't want to not consider that because we think there's a lot of potential there.

The other thing you'll hear us talking about is AERIS. That's our cleverly named -- it's Latin for what, Brian? Air something? I don't know. I didn't take Latin ever. This is our environmental work. Cloud? Is it cloud?

Okay, thank you. So this is our environmental work. Same
idea. How do you use connected vehicle systems to enable environmental kinds of applications? This work is the farthest out in time of anything that we're doing. We're looking at applications that we don't even know if it's possible to see if it's something that's there. That's part of the work that we do.

And then we have a data part of the program.

DCM, right? Thank you. I can't remember our own acronyms.

So the DCM program, and Ton mentioned interest in the data, we, too, believe that data is a huge enabler. It can be huge. This work is where we're doing a research portal for research purposes where we're going to be collecting and have collected data from freeways, arterials, transit. We are going to get data from the connected vehicles when we have that data, and we're going to make that available on this research portal in order to try to, many of you are in the academic community, to enable that kind of research and what could you do if you had this kind of robust multi-modal data. I don't know yet how that's going to evolve over time. We're pretty clear that we in DOT don't want to always run a data portal, so we're going to do this for our research situation and then kind of see how that moves and
does it work as an enabler.

The other thing that I would just briefly mention that began to cross over into this area, architecture. We do maintain the national architecture. We just completed a core systems architecture that looks specifically on how the connected vehicle fits into the overall architecture. One of the main things about that is it helps identify the interfaces because the other big part of that are standards. That's a huge thing, so we've spent a lot of time and a lot of money on the standards program, developing a standards that support all aspects of the connected vehicle work. And, increasingly, we're working in the international community. Because of some of the things that Steve said, we do recognize and we hear from our automotive partners how important that is for them, for their manufacturing. The reason we care about that at the federal level because if it enables them, DENSO, enables you all to be efficient in your manufacturing and keeps the cost down, that's important to the U.S. consumer. So that's why we care about it. We've had really some remarkable success particularly working with the Europeans. The Japanese were at the table with us, as well. We're working on a memorandum of agreement with the
Koreans, as well.

This is an area several people have pointed out.

The previous committee did a lot of work here. And one of the things I wanted to share with you, the previous committee split up into subcommittees. And you all talk about this later whether you choose to do that or not. They chose to split up into subcommittees. There was one committee that worked specifically on standards because it was such an important thing for them.

We were able to have US DOT staff as not members but participating with those subcommittees. We got benefit from this before we ever got the memo from you all. So I want you to know that, even as you do your work, before you put pen to paper and before you give us a final memo, if we are able to work alongside you and hear your discussions, we will get benefit from it even while you're still working. And we actually made changes in the program and moved some things forward as a result of some of the things that were discussed in this committee, particularly on standards. So it was very helpful, very helpful.

The last thing I would mention is our professional capacity building program. That is clearly in
this technology transfer area. We work very closely with
the Federal Highway Administration, Federal Transit
Administration, to take what we learn here, marry it with
what we see the interest being in the deployer community,
and provide training and educational experiences there. So
we're conscious of that and trying to help make this flow
smoothly. It's hard. It's hard to break down that wall and
get from research into a deployable implementable system
that meets everyone's needs.

So I wanted you to have that overview. You get
to decide where you want to focus your energy. I said to a
couple of you this morning or yesterday we've stacked the
deck today. Because this is your first meeting, we chose
for you today because if we had our choice, and it is not
our choice, we would have you focus your talents on some of
these difficult issues that we're facing now to get the
connected vehicle work into implementation, research to
implementation. So you're going to hear discussions today
and participate in discussions today that are going to seek
to take you from understanding at a high level to
understanding it at a more detailed level because we believe
that's where your talent can help us. So hang on. It's
going to be a lot of information, but that's where we feel like we could use the talent in this room.

Again, you don't have to choose that, but we're going to talk about the vehicle-to-vehicle program. Mike Schagrin is going to lead that conversation. We're going to talk about vehicle-to-infrastructure for safety. Brian is going to talk also a little bit about the mobility side of that. And we're specifically going to talk about the security system because that's where we've got a particularly difficult problem. Again, it's a discussion. Feel free to participate in the discussion as we go through.

The last thing I'll say, you're going to see some of the JPO staff in these conversations. I believe we have some other people coming in to join us. We inherently work multimodally. We are a very small office in the ITS Joint Program Office. We sit in RITA, which is inherently designed in DOT to work across modes. We do that. We really try to walk that talk. Our modal partners are here, and you can ask them when we're not here.

But, consequently, we do have a very talented staff in the Joint Program Office. I am so proud of them. They're awesome. We also have a very talented staff in the
Federal Highway Administration, in NHTSA, in Federal Transit, Motor Carriers, in those other modes, and so you'll get to meet some of them. Our job is to bring to you the people, the resources, the documents that you need to deliberate, discuss, and then feed us back what your best advice is to us.

So any questions for me about kind of where we sit, what we do?

CHAIR DENARO: Just to underscore that, Shelley, how small are you?

MS. ROW: We are 18 people, and that includes our support staff, by the way. So it's even smaller than that—

CHAIR DENARO: Just looking at your RITA heads and this document in front of us and everything else, these are 18 very busy people.

MS. ROW: We are busy. Our modal partners are also very busy. So one thing I didn't mention, too, that running across this, we have a program management office, so we have a series of contractors and a series of electronic systems that help us keep track. This $110 million, 80 or 90 percent of that goes out in contracts, so there's a tremendous contract management thing that goes on in our
office because many of you are the recipients of contracts that we issue in this office. So we have a lot of staff just to make sure that, support staff to make sure that we can keep track of all the contracts and how that's going.

And we have a website. Valerie's team manages the website and trying to make sure that we have good communication with all of our stakeholders.

Any other questions, comments, thoughts?

DR. KLEIN: Do you have any scenario in which implementation would be an order of magnitude bigger than anything you have put here in which it's driven by adoption, by consumer demand in which this system just takes off and gets hot, it's all the rage, it just explodes? And is there anything, is that a scenario that you've thought about at all to try to, what would make that happen? So not how can we get over the finish line, but how do we just make it explode?

MS. ROW: That's a good point. We think that there's a lot of potential in the mobility side and eventually in the environmental side, and a lot of that might be driven by apps. You know, if you can do some of that data and provide some robust data, then there's a lot
of you in the room that could take that and be very creative
and innovative. We talked to Ton the other day about the
number of creative developers that are out there. So we
think there's some potential there.

The role that we see for the federal government
is how do you bring together enough data to make it worth
their while? And then the other role that we have is, while
we believe that there's a lot that you're already seeing in
terms of consumer apps there, one of the things that we
serve are our stakeholders in the public sector. It isn't
completely clear to us that that market is big enough to get
applications developed that will serve their unique needs.
Maybe it is; we don't know. But that's another area that we
pay attention to make sure that what they need is different
from what a consumer needs, and we want to make sure that
that market gets served, as well.

The only other thing I would say is on this
safety piece, because we're working across the automotive
platforms and with a lot of Tier One suppliers and others,
what they've told us is that the federal government serves a
unique role there because we can help them work together,
and that's very awkward, difficult, sometimes illegal for
them to do if it's not in a pre-competitive environment. So we are very clearly focused there, and they tell us when we've gotten outside of that circle and now it's gone into a competitive environment, and that's where our role ends there and they have to go and do their thing.

MR. BELCHER: Shelley, just one thing. For those of you who don't know, the U.S. Department of Transportation has partnered with the White House on a new website called safety.data.gov, which they placed over 700 safety data sets going up to 1,000 by the end of the month, as well as a number of tools and apps, with the idea of trying to seed the market in the safety sense so that app developers and companies start to match up the different data sets and provide new products and services.

And they're driving towards a major meeting in, I guess it was 100 days last week when the White House announced it, so 96 days, where they'll be bringing a whole lot of folks. They brought together a bunch of app developers, hackers, and others to look at these data sets, and they're going to then do what they call a datapalooza in 100 days or 96 days or something. And that will be a really unique opportunity to just see the kind of thing that
Shelley is talking about, stuff that we can do in this space but that's being done in the safety and transportation space. So that is kind of a fascinating exercise.

MR. VALCICH: If I may, I think one of the things a couple of years ago when we were creating the strategic plan and laying out our program, you talked about sort of what's the point when there's that explosion, and I would say that we determined that the V2V research and sort of getting that requirement of equipment in vehicle that's going to enable safety is that jumping off point. And so sort of all of our eggs are really, maybe not all but 90 percent of them are in that basket of trying to get to that NHTSA 2013 decision. And when that happens, we think that is an explosion point.

CHAIR DENARO: Why don't we take a break? We'll come back and continue the discussion. The Department of Transportation has generously provided a mountain of chocolate and sugar over here. But I understand that in the southeast sector of Washington the calories don't count, so enjoy.

(Whereupon, the foregoing matter went off the record at 9:54)
ITS JPO Briefing and Group Discussion

CHAIR DENARO: All right. We're going to get started with some presentations from now by the JPO. Mike is going to kick off, I believe. We've got a little bit of a logistics issue. Paula and -- what I'm saying is I think Mike is going to stand over here, so if it's more convenient for you to slide your chairs around or whatever, feel free to do whatever you need there. Visibility-wise I think we're okay. All right. I think we're on.

MR. SCHAGRIN: Good morning, everybody. Once again, my name is Mike Schagrin with the ITS Joint Program Office, and I'm the program manager for the safety program for connected vehicles. And so under my portfolio, I handle vehicle-to-vehicle communications for safety, vehicle-to-infrastructure communications for safety, safety pilot, driver workload, and also some work on the international harmonization activities.

The beginning of the talk is simply about vehicle-to-vehicle and safety pilot programs, and Brian is going to talk to you about the vehicle-to-infrastructure
program. And as part of this discussion, I want to kind of frame where we are with everything with the research. You'll hear this recurring theme, if you haven't picked up on it already, research towards implementation. That is a major thrust of where we are. After several years of doing research work, we are actually at a point I think, as Shelley pointed out, little pieces of the triangles where we are making the transition now into early adoption and completion.

So let me talk about the vehicle-to-vehicle program, the whole idea to create connectivity. Now, as you heard earlier, the safety for crash imminent situations, the technology that we're talking about is dedicated short range communication. And I'll get in to some more of that detail about how that works a little bit later on.

Dedicated short range communication is based on wi-fi technology. It has to be able to work at a very low latency, ten times per second, very secure environment, and is the only technology that we have today to address the safety crash imminent situation that we're talking about.

So it's about connectivity. It's about all modes, so we are looking at cars and trucks and buses
initially. To those in the room that care about motorcycles and bikes and rail, it can all be extended, but the initial thrust is on cars, buses, and trucks. We're also looking at things like after-market devices and connectivity to infrastructure. One point to make, though, is that on a previous slide was it's all about creating a greater situation of awareness with safety, mobility, on environmental issues, and having greater situational awareness of the environment to help address those issues.

So the opportunity for safer driving, the idea with this technology is to create a 360-degree situational awareness to be able to allow your vehicle to see things that you can't see, whether it's a blind spot issue or something else that you're not paying attention to. And the idea is to issue advisories or warnings or, at some point, even have control elements in the vehicle. We are doing research in all of those areas, but our initial thrust for a decision next year will be on primarily the awareness element, but we are looking at factoring the control element, as well, in terms of what kind of benefits can we achieve.

There's this 80-percent number that we've been
talking about, how connected vehicles have the potential to
address 80 percent of vehicle crash scenarios for unimpaired
drivers. That doesn't mean that it's going to be 80 percent
effective. What it means is, out of all the crash scenarios
that are available to us, this technology can address 80
percent of those. Now, we still have to look at how
widespread deployment is and how effective this technology
is in the operations, and so we're trying to get that data
that will feed into our decision point next year.

CHAIR DENARO: Mike, could you flesh out a little
bit for us what you mean by awareness and the difference
between, say, advisories and warnings?

MR. SCHAGRIN: Sure, yes. And by the way, everybody, this is meant to be interactive, so, like Bob
just did, feel free to jump in.

CHAIR DENARO: I'm just trying to set an example,
Mike.

MR. SCHAGRIN: So an advisory might be more of
kind of a heads up. Maybe there's an icy road ahead, and so
maybe there's a vehicle whose traction control kicked in,
you know, because of an icy spot or something that's going
on that's down the road a ways. That can be communicated
back to vehicles where it's not a crash imminent thing.
It's not going to happen the next second if you don't take
action, but it kind of gives you that advisory, that heads
up.

A warning would be more like if somebody slams on
their brakes in front of you and you have a half a second to
react or you hit something, that would be more of a warning.

You have to react immediately in order to avert something.
And then, of course, a control is let's say you still don't
do it. The vehicle could possibly take over and help you to
mitigate that crash situation.

MR. STEENMAN: Mike, what's the range? How far
back or forward does it transmit?

MR. SCHAGRIN: So the technology that we're
talking about operationally works at 300 meters line of
sight.

MR. STEENMAN: So anything beyond that, we will
have to look for a different method, like through the
infrastructure or something like that?

MR. SCHAGRIN: Right. That's a really good
point.

MR. SCHROMSKY: So by passing it back --
MR. STEENMAN:  Hopping.

MR. SCHAGRIN:  So we're not doing hopping right now. That is a concept that is being explored here and in Europe, but we're not doing the multi-hopping yet.

MR. STEENMAN:  That's not part of the initial specification -

MR. SCHAGRIN:  Right. It's one vehicle to another vehicle, not past the block. However, Scott is right, future concepts would have that, as well. And as far as other technologies go, yes, if you're thinking beyond the 300-meter range, remember we're doing kind of the crash scenarios, you might look to an LTE type of situation where --

MR. STEENMAN:  Yes, because you have plenty of time.

MR. SCHAGRIN:  Because you have more time. You know, stopped a queue of cars that are further down --

MR. STEENMAN:  That's a mile down the road.

MR. SCHAGRIN:  Right. You could get them warned the other ways --

MR. SCHROMSKY:  I equate it to installing wi-fi in your house and deciding to go outside. So it's short
range, and it has wi-fi and it can't hop between the two -

CHAIR DENARO: So hopping is not part of the design right now, but there is a possibility of a cellular link also being part of awareness?

MR. SCHAGRIN: Oh, absolutely. Absolutely.

MR. STEENMAN: And then the data would be exposed in the vehicle, and this is part of the standard that it could just end up in a different environment than just --

MR. SCHAGRIN: That's right. And I think you'll probably hear me and Brian talk about this some more in terms of how we could offer vehicle data, to somebody or about environment, you'd have to transport it back down to other vehicles or ranges around. But what I'm talking about right now is that's here, point to point, that vehicle-to-vehicle communications right now.

MR. KENNER: So it's my understanding that there's a lot of applications, even the security ones, if you talk about downloading security certificates and so forth, that you would be able to go vehicle to cloud back to vehicle no problem. It's really the imminent crash situations where, at least today, with what we know today, the vehicle to cloud to vehicle just isn't fast enough to be
able to work.

MR. STEENMAN: But not deterministic enough.

MR. KENNER: Right, right, right. And then the second part is, if you saw some of the pre-reading where we talked about the basic safety message, too, there are other elements as well that don't have to be on the DSRC either. So I think the short answer to the question is, absolutely, the cellular communication or to the cloud will be a huge part of this. It's really the crash imminent part that, at least at this point, we need to have the vehicle-to-vehicle DSRC in order to be able to accomplish I think.

MR. SCHROMSKY: It would be faster. It would probably be like putting, register your car and then transmitting it in milliseconds. I mean, they could do it on the back haul, but they get the information back and forth. It just wouldn't be feasible.

MR. STEENMAN: Is DSRC pretty much, is it already, did you find out that that's the only technology that we have to zero in on?

MR. SCHAGRIN: Yes. We've been looking at it for several years and considered all of the options, including the 4G, and clearly, for the crash imminent situations, LT
is fast, 4G is fast, IG will be even faster. We're still not quite there yet, and DSRC really is the only technology that supports our requirements.

MR. STEENMAN: And it works.

MR. SCHAGRIN: And it works very well.

MS. ROW: Yes, I just wanted to make sure that you all understood and make sure that this is an accurate statement that the research that we're focused on is on the DSRC safety applications, and so you're talking about, you know, the handoff with cellular and the potential for cellular. We completely agree with that. Our research right now is focused on the safety applications, and that might be an area for further discussion.

MR. MCCORMICK: Do you have my cube drawing?

MR. SCHAGRIN: Yes, we do. Yes, we do.

MR. MCCORMICK: I think that will kind of bound everything.

CHAIR DENARO: So the safety pilot does not have any cellular applications in it right now?

MS. ROW: Not cellular apps. Some of the security we're looking at.

MR. SCHAGRIN: We're looking at a security
standpoint looking at cellular --

CHAIR DENARO: Yes, yes, yes, yes.

MR. SCHAGRIN: -- that's not a millisecond realtime, you know. But for V2V, vehicle-to-vehicle, very clearly there's a box around DSRC. Absolutely. And I also want to pick up on this performance issue and talk about LTE and what it can do and stuff like that. For DSRC, not only is there a 300-meter line of sight range, the value in this, because they'll be built like autonomous systems like radars and camera systems, which I'm sure it eventually would, the DSRC can actually outperform radar and camera system for the scenarios we're talking about. It can see around cars, around trucks. It can see around blind corners. We saw this in the demo where you had a blind intersection where there was a truck that was impeding your vision. Instead of going through the intersection, you stop for the cross-traffic and he t-boned you, right? And you saw that in the electronic emergency brake light application where a lead car may be braking with another car in between, and you're the last car, you could have warning before that middle car brakes.

So it has this performance capability but well
beyond what radars and camera systems can do. It doesn't mean they won't be complementary to each other, but it can outperform some of this other technology.

MR. KENNER: The other quick comment I wanted to make, and it doesn't necessarily need to be addressed by this team, but I wanted to at least make sure that I've at least made the comment. For the 80-percent number, I think it's really important between now and the end of next year that we have, you know, data experts on crash data to go through each one of the scenarios that are inside of that 80 percent and, first of all, make sure there's alignment on, yes, this is definitely something that would benefit from it, so that when we speak we speak with one consistent voice and maybe have a refined version of that.

The second reason I want to do that is because I want to make sure that in the applications that we're doing, even in CAMP, that we're actually addressing all of those scenarios. We do the demo with, you know, four or five of the scenarios. But I'm not sure until we go through that process that we're actually developing the algorithms for every one of those scenarios. I'm not sure.

So going through that I just think would, ah,
help us speak with one voice within a common, let's say
refined data; but then, B, make sure that we're working on
all those scenarios in the software so that we're actually
capturing every one of those to maximize the benefit we get, as well.

MR. SCHAGRIN: I think we're actually doing that as part of the analysis as part of the decision that comes out. We attempted exactly that so.

CHAIR DENARO: Okay. Mike, we're going to get you off chart two.

MR. LAMAGNA: Well, I just had a question about the DSRC. Is it being utilized in any of the industry as they start thinking about security, deterministic behavior, privacy aspects of it? Any place else, machine-to-machine, is DSRC being utilized?

MR. SCHAGRIN: Well, Scott said yes, but, I mean --

MR. MCCORMICK: The Air Force.

MR. SCHAGRIN: Can you expand on that a little bit?

MS. ROW: And also toll tags.

MR. MCCORMICK: And the Air Force. The Air Force
has been using it for quite a long period of time. They
turned into utilizing it this way for programming the secure
version of wi-fi, if you will, so they're not building using
the DSMC standard, but they have a lot of interest in this
spectrum. They would like to see anything not used turned
over to them, so I think it's critical, you know, we show
the viability of it to protect that spectrum.

MR. SCHAGRIN: And the electronic tolling for
years has used an earlier version at 915 megahertz. In some
cases, it's 2.4 gigahertz. But 5.9 is the next evolution of
that. And Europe, Europe using 5.8 for tolling and 5.9 for
other applications, so it's actually worldwide where we're
looking at this technology.

MR. BELCHER: If I could, Mike and Bob, this is
probably for the later discussion, but I think we need to
make a marker here. There is a very, to your point, there's
an important study that's going on by NTIA about whether the
5.9 gigahertz spectrum that we've had set aside for this
program can allow unlicensed uses because there is a desire
out there to use this spectrum for other purposes. It's a
big pipe, can send a lot of data short distances, so it's a
really interesting application.
And so over the next 18 months, kind of consistent with the time frame in which US DOT is going to make a decision about a regulatory stance on connected vehicles, NTIA is going to come out with or the FCC is going to come out with a decision about whether this spectrum should be allowed to be shared. Really critical to the future of this program, and so this is something, Bob, I'd like to make sure we put on the table for later discussion because it may be something that this program advisory committee can, in its memo to Congress, advise about the importance of this and the importance of not putting the spectrum at risk. I'm not saying it can't be shared. I don't know. I don't know. But it is a very important issue and not one we should lose sight of.

CHAIR DENARO: Please bring that up again when we talk about a focus --

MR. BELCHER: I will.

MR. STEENMAN: You're mainly probably concerned about interference?

MR. BELCHER: Yes, yes. And interference one time is enough to make the difference.

MR. STEENMAN: Right.
DR. KLEIN: The connected vehicle has been described to me as wi-fi on the car or for the car. It can be a planned with a safety orientation. Will there be other applications allowed to run over this? And also do you anticipate there will be a parallel network reaching the car, possibly LTE based, mobile phones, reaching the car, so within the car, there might be two networks going on?

MR. SCHAGRIN: We have car company reps here, and I don't want to speak for them, but I'd suspect there would be a suite of different communication technologies.

DR. KLEIN: Because if there's a consumer driver for network adaptation, I'm wondering if maybe some of that positive energy lands over on the LTE network and then DSRC and connected vehicle might not benefit from that motor drive of consumer investment.

MR. MCCORMICK: Well, I can kind of just interject something. There's been literally tens of millions of dollars in research on determining which communication protocol and which spectrum. It's which need, based on the latency, based on the desire of use, of how they're going to use it and the type of functionality occurs. And I'm not sure that that's where you want to go with your
presentation. I think that's an important topic that we should break out for this afternoon on when we have a discussion, but I think we're covering ground that they've spent years already covering, if I can just, we can go to it later.

MS. ROW: I did want to just make a point. Hans, you asked about having other applications run alongside the safety applications. Valerie is going to talk later about some of our US DOT principles. We are trying to look at this as a way to be an enabler for private industry, so we felt like it was important for US DOT to understand what we care about. One of the principles that she will share with you is that we have said that we are okay with other applications running alongside the safety applications as long as the safety applications take a priority and nothing else interferes with the safety applications.

So in our thinking, we've allowed for that to be because we think it could be a big enabler. But we've got to protect the safety applications.

MR. SCHROMSKY: So when Progressive puts in a sensor up on an open two port and there's safety in certain diagnostics of the car, there's a commercial application
that they'll give you a cheaper insurance --

MR. STEENMAN: Actually, that's not safety.

MR. SCHROMSKY: Okay. But a similar concept.

Certain standards are put in a car that you can take it for --

MR. MCCORMICK: Right. It's actually a requirement about how the bandwidth was allocated by the FTC that said you really can't do anything on it for which there's a commercial implementation on another system either. So you can't run email, for example.

MR. SCHAGRIN: In case anybody doesn't know this yet, research towards implementation. Now, what's important about this site, I'm actually going to dwell on this for a second because it drives home some points, we are on the tipping point, if you will, the tipping point of going from that research to implementation. We don't want to kid ourselves and go in with something that isn't fully fleshed out. And so I think the value of this committee is to really point out the real world issues that perhaps we haven't thought about yet.

Now, we are going to be doing some real world testing coming up, and that will help flesh out some
additional things that we need to take care of. But, you
know, the idea is to really move this into the real world,
into implementation, make it a deployment across the nation.
And so if there are pitfalls, kind of land mines along the
way that you can think of, that would be very helpful in
terms of finding those out.

Okay. So this is about all vehicles, all road
users talking to one another. So it could eventually
include pedestrians, as well, in terms of maybe when this
wi-fi technology that's been adapted for this automobile
environment is cheap. It's wi-fi chips, and they're very
cheap. So at some point when things come down small enough,
they could actually be applied to bicyclists and pedestrians
and anybody who is on the road in terms of being a potential
safety issue.

Okay. So to help us focus, here are some key
program objectives in the area of safety. There's this 2013
decision we've been talking about that NHTSA has teed up
next year. And what they are going to do is make a decision
on this technology, and it could be anything from we need
more research to let's regulate, or it could be anything in
between. So all options are on the table, as they say.
But, ideally, what we're looking for and why we're doing all this and why we're investing so heavily on all this stuff is to try and get towards a regulation so that all this technology is going to be in each and every vehicle in the future. That's where we'd like to get to.

We have a similar milestone in 2014 for heavy vehicles, class 8 trucks. And then in 2015, we're looking at infrastructure implementation guidance. Not only is this about vehicle-to-vehicle communication, but it's also about vehicle-to-infrastructure communications. So we want to be able to enable information from the infrastructure and back to the infrastructure in terms of things like signal phase and timing information that could help with safety and the ability.

And so, Brian, like for safety, it may not be the crash imminent millisecond scenario, but it could be broadcasting this information by way of LTE, for example. You could help with tuning out the flow, the green wave issue which helps mobility, it helps environmental issues. So there's a lot of opportunities here.

MR. WEBB: Mike, just a question. When you use the term just technology, we are talking about DSRC?
MR. SCHAGRIN: Well, for the vehicles, for safety, crash imminent safety, we're talking about DSRC. For the NHTSA decision, it's DSRC. For that last item I was talking about --

MR. WEBB: Right, understand.

MS. ROW: Just to clarify that, Mike, to make sure this is correct, if NHTSA were to choose to pursue a regulatory path, they would be looking at specifying the standards and the performance requirements, right? Around some of the apps?

MR. SCHAGRIN: Absolutely.

MS. ROW: So it's, yes, DSRC, but it's actually broader than that. It's what that regulatory environment might look like. Is that fair?

MR. SCHAGRIN: Yes. And I don't know if they actually call it DSRC by name. It would be performance requirements. But if something else came along that met those performance requirements, NHTSA does performance-based regulation, and so they would have in there performance requirements for the technology and for some of the applications.

MR. LAMAGNA: Do you believe that to be the goal,
the 2013 goal for new vehicle deployments or also retrofitting cars, as well?

MR. SCHAGRIN: Okay. So let's talk about this for a second. Yes, it's about new cars, and NHTSA has said they also have the authority over, you say retrofit, I'll say aftermarket, things that are brought into the vehicle that have a safety functionality. So we are looking at aftermarket systems, pneumatic devices being brought into the vehicle that can, without being integrated into the vehicle. Okay. So without being hooked into the OBD port or anything else, it's like analysis is brought in on your dashboard, so you don't have vehicle sensor data but you have GPS and the DSRC communications. And with that, you can enable certain safety applications, so we're looking at that, as well, but NHTSA says they have the authority to oversee and regulate that area, as well.

MR. MCCORMICK: And just so there's some clarity, 2013 is when NHTSA makes a decision if they're going to begin a rulemaking process, which could last a couple of years. Given that that puts until 2015, and Peter Pell is no longer in place but if we ask him do you think they'd make a decision in advance of the 2016 election and he said
probably that's unlikely that they would make the decision mid 2016 and give the implementation period of about two years.

MR. SCHAGRIN: Can you save that, because I have a slide? Okay. So in terms of the remaining research in support of this 2013 decision, you know, we're looking at interoperability standards that include data, that's an SAE standard, communications, and security. Those are all part of the standards the interface document or specification that's going to be part of whatever regulation or decision takes place.

We have done driver clinics, and I'll actually talk more about that. We've done driver clinics designed to get user acceptance data for these safety warning systems, which has been very positive.

We have a deployment, which I also talked about. But the idea there is to get effectiveness data that can demonstrate real world capability to show that here's what we're talking about, here's how it works with real drivers in the real environment. And you really need that to say, hey, yes, it does work. That's real proof that it is successful in terms of being operational.
We're also looking at device certification. We don't want devices coming in that haven't been fully certified and conform to operational specifications or requirements that are to ensure safety. We don't want, you know, our big thing is, you know, driver distraction. You don't want to have devices that are brought in that distract drivers in a negative way. The distraction has to be positive. In other words, bringing your eyes back to the road. So there are certification requirements that need to be established, so we're going through that, as well. And then there's policy implementation issues, and Valerie will be talking about some of those later on.

CHAIR DENARO: Mike, on a model deployment, and I guess talking to Shelley's overlapping triangles there, clearly testing is hugely important to this. Does that -- is somebody going to talk more about that, both the pilot and maybe other tests that are going to be done?

MR. SCHAGRIN: Yes.

CHAIR DENARO: Okay.

MR. SCHAGRIN: Yes. This is an advisory.

CHAIR DENARO: No, no, I'm saying, I mean today. Are we going to hear more in-depth about -- okay, great.
Thank you.

MR. SCHAGRIN: Okay. Let's go to the next slide, please. Okay. In terms of outstanding technical issues, security, which you'll hear about both from a technical policy perspective, as we mentioned earlier, is one of the big nuts we have to crack and we're putting an awful lot of resources into trying to figure out how to solve that issue. And congestion mitigation, when you have several hundred vehicles in the operating environment and there's a chance for interference and collision of the communication messages, we just have to make sure that we have that strategy in place that allows for safety communication of the communication messages so that congestion does not become a problem. So we're working on that, as well. The other part are the two big technical issues that are still being worked that are very solvable.

MS. ROW: He says with great confidence.

MR. SCHAGRIN: Okay. Let me talk about the associated technology from an operations standpoint. Okay. So what is it? It's a wi-fi product. It's called 802.11p, for those that are technical and know what that means. It's a wi-fi standard that's been adapted for a highly-mobile
environment, and it's very cheap to produce in quantity. So unlike radars and camera systems which are more expensive, this is a technology that can be put on each and every vehicle of all classes, in all of the vehicles, not just the high-end vehicles.

How the technology works. It generates messages at ten times per second. Just imagine how fast that is. It's what we need for this crash imminent situation. There's a basic safety message, which is an SAE standard. It has to deal with the vehicle size, the position, the speed, and so on, so it gives basic information about a vehicle, if that information is available, to transmit to other vehicles. So there's a basic part one element, which is transmitted ten times per second.

There's also something that's called part two, which is an event-driven sort of message, so that if you're traction control comes on, it's not going to generate it ten times per second, but if an event happens it would send that flag out to the other vehicles. As I said, the operating range is 300 meters line of sight. It's necessary for crash imminent situations, and the benefit of the technology is the cheaper price, the higher performance capability, you
get less false alarms because of how it operates, and its accuracy and robustness. It can outperform some other technologies that are currently on the market.

The drawback of the technology is that both vehicles need to be equipped. So in order to have communications, both vehicles have to have the technology on them. That doesn't mean that we have to have 100 percent deployment with vehicles in order for us to get benefits. If we were to equip ten percent of the fleet, you could always start getting benefits, early benefits. Now, you equip more and more of the fleet and the benefits increase. So it's not an all-or-nothing. It's a gradual progression of benefits as more and more market penetration exists.

Yes?

DR. ADAMS: Can you clarify for me what that means, line of sight versus, then you say it can communicate around vehicles and blind intersections? What does that mean?

MR. SCHAGRIN: Yes. So let's say we're on a straightaway. Picture -- where's the rural person? Steve. So if you're on a rural road and this truck in front of you is kind of slow, and you're getting impatient and you want
to pass them, right? So you start your maneuver to head out into the lane, and another car is coming at you 300 meters away line of sight. It will operate in that kind of range. So a straightaway line of sight, you can see each other, and it will be operating at 300 meters. It actually operates further than that, but from our standards, our performance requirements, that's all you need is 300 meters as a max.

Now, if you're at an intersection let's say, and you're stopped. And I assume you did not hear the V2V demonstration. If you're at an intersection and you're stopped, and you make your legal stop, and then you want to start proceeding. But with cross traffic, somebody decides just to blow through. It happens, it happens all the time. Let's say you can't see it because of an obstruction or something, it will warn you about this other vehicle before you can see it and before there's a line of sight capability. Anybody can go around corners because we can actually see around corners.

DR. ADAMS: The intersection of the line of sight.

MR. SCHAGRIN: Yes.
DR. ADAMS: Okay.

DR. RAJKUMAR: If there's a barrier between the sender and the receiver, the signal does not travel as far.

DR. ADAMS: Right.

DR. RAJKUMAR: Because you should be able to see across intersection but not as long as 300 meters. So the distance is shorter if there are barriers or pollution in between.

DR. ADAMS: Right, okay. But is it just the signal has to intersect somehow? Is that --

MR. SCHAGRIN: I'm sorry. What was it?

DR. ADAMS: I'm still kind of trying to picture the ways in how it would sort of, and what this means, like, around the corner. Anyway, I don't want to --

CHAIR DENARO: Basically, every car that's putting out a message and all other cars are receiving it, and any car that's receiving it just needs to figure out whether they care or not about what they're hearing. And if it happens to be a crossing vehicle, oh, I care about that.

DR. ADAMS: Oh, that's what we mean about -- okay.

MR. MCCORMICK: It's spherical.
DR. ADAMS: Right. And so you just need to intersect those spheres. Yes, okay, all right. That makes sense. Okay.

DR. KLEIN: And don't confuse the line of sight meaning that --

DR. ADAMS: Yes, I keep thinking it's --

DR. KLEIN: -- only if you see the other car does this work. That is not --

DR. ADAMS: That's what's confusing me. Okay, all right.

MR. LAMAGNA: Mike, has there been any studies on the effects of weather on the quality of service?

MR. SCHAGRIN: It has no effect on the quality of service.

MR. LAMAGNA: So rain, it doesn't affect it at all. Excellent.

CHAIR DENARO: Somebody said at the conference, and it's anecdotal, but somebody said that there was a terrible rainstorm, I think it was in Florida or something, and they said they were having problems with DSRC. I assume that you guys or your contractors have done a lot of testing on that and that's not --
MR. SCHAGRIN: Yes, we probably had a problem with intense -- seeing the people -

CHAIR DENARO: Yes, right.

MR. SCHAGRIN: -- but it does have no effect on the technology at all. And I'll tell you an area where we actually had a little hiccup regarding the technology: solar flares. Solar flares actually disrupt GPS, and that's where we get into a bit of a problem. It doesn't affect DSRC communications, but it affects GPS, and the two fundamental technologies that support our safety scenarios is GPS and DSRC.

DR. RAJKUMAR: Mike, can you talk about the accuracy of GPS that would be mandated?

MR. SCHAGRIN: I won't talk about specific mandates. I can talk about GPS, the accuracy that we're talking about in these crash scenarios. There's only two types of accuracy in this discussion. For vehicle-to-vehicle, we're talking about relative position. You don't care exactly where you are in the road, you care where you are with respect to the other vehicle. And the technology is very accurate to lane level. What I mean by that is if you are traveling in the same lane as somebody, you will get
a warning if it's necessary. Let's say the car stops, brakes suddenly. Let's say a car is in the adjacent lane and it brakes suddenly. You will not get a warning because it is outside of that area of concern, so it is that accurate to a one level accuracy for the vehicle-to-vehicle and relative to --

DR. RAJKUMAR: Sub-meter or plus/minus two meters?

MR. SCHAGRIN: No, it's not sub-meter.

DR. RAJKUMAR: It is plus/minus two meters?

Okay.

MR. SCHAGRIN: For a vehicle-to-infrastructure, like at intersections, you care where you are on the road with respect to that intersection, so that is considered absolute accuracy.

CHAIR DENARO: Mike, what studies have you done, contractor, however you've done it, to verify that accuracy, relative accuracy you're talking about? I mean, have you done research in that area?

MR. SCHAGRIN: Oh, yes, absolutely.

MS. ROW: I know we've done some with the Turner-Fairbanks to check on the accuracy and measure it actually
at ground truth. But the other thing that I was going to offer to the discussion, Raj, and I think I'm not completely sure where we are in the testing on this, you know, we did a proof-of-concept test that pre-dates what we're doing in Ann Arbor. That I was told used the highest grade GPS receivers possibly known to man, and that was great. What we're doing now is using automotive grade GPS receivers, which is not the highest thing known to man, but it's automotive grade. And they're testing that, and they're also testing with different manufacturers because there's an issue with the correction -- you're going to know way more about this than I'm going to know -- the difference with how they handle the corrections, and that's what's being tested right now to understand if we can get the relative positioning that Mike is talking about to do the crash imminent situations.

CHAIR DENARO: So you're saying that is part of the safety pilot is actually evaluating the GPS accuracy?

MR. SCHAGRIN: Yes.

MS. ROW: Yes. Actually, I think it's some of the pre-testing that's being done before we ever go out there.

MR. SCHAGRIN: We're doing that right now.
DR. RAJKUMAR: So while at FHWA, I was basically doing this study because they're supposed to give certified devices to the Ann Arbor contractors.

MS. ROW: That's right.

DR. RAJKUMAR: So it pre-dates the safety pilot.

MR. SCHROMSKY: Just autonomous GPS, no AFLT or A-GPS integration used, as well, or no?

MR. SCHAGRIN: Those are acronyms I don't know.

MS. ROW: I don't know that one.

MR. SCHROMSKY: So each carrier, similar to E911 services when you dial 911 from a cellular device, I have to try and locate you from the cell site to tell where you are, so we're getting a big push from GPS companies, as well as app developers, to get access to the cellular infrastructure, not just us, all the other carriers, so your time to first fix is greatly reduced and also the accuracy of those particular elevations, as well. So you use a combination of not just using the autonomous GPS looking at 24 birds in the sky, you're also using the cellular infrastructure and you're using both. So you see, actually, Google does a lot of this.

MR. SCHAGRIN: Okay. So we are not going to be
dependent on a cellular connection. Those guys are actually ranging off the cellular towers and things like that and to fill in those spaces, but it's not going to give you this kind of accuracy that --

MR. MCCORMICK: Well, actually, they all do. I mean, for a number of years, for CAMP I hosted a differential correction server because, once you get the GPS signals down, then you have to correct it for the local magnetic variation before you push it out to the Nokia network. There's an algorithm that adjusts for that in every major metropolitan area basically on the planet.

MR. SCHAGRIN: But let me just say if there's a high technical discussion, maybe we should take -- if there's more experts in here, I'd be happy to do that but --

MR. MCCORMICK: I'm just curious. I mean, I'm --

MR. SCHAGRIN: Yes, but we've done a lot of work in this area to make sure we have the performance requirements that are acceptable for this imminent crash situation.

CHAIR DENARO: This is an area of concern for me because there are some conditions under which GPS, the two receivers tracking different satellites, and your assumption
about relative performance breaks down. And so I'm just trying to understand the research you've done there and, if not enough, you know, whether that's going to be done going forward because that's a serious vulnerability in my opinion. You know, I did the drive, and I've done it before, and there's nothing like going on that drive. It really cements how important lane-level accuracy is. If you don't have lane-level accuracy, you've got missed alarms, you've got false alarms, you've got a nightmare. That's really got to be nailed down.

MR. KENNER: I'll just try and say it real brief, but, originally, when we had the vehicles and the demos, even the ones that were done at the world congress, you know, had the more precise GPS. The ones that we drove now do not. They are automotive grade, so when I talked to the research team they said they've already completed the research that gives them the confidence to do the model deployment in Ann Arbor, and then they're really just doing sort of the validation in Ann Arbor of the research they feel is already done and is right. So they're confident, and that's why people are working on the automotive-grade devices, you know, for the model deployment in Ann Arbor.
CHAIR DENARO: My other point is getting good satellites out there on the plateau, you know, and at the show here where I've got about a two-degree mask to the horizon versus doing it where I live in downtown Chicago. That's going to be a whole other field with GPS and expecting it to work.

MS. ROW: One point before you leave this slide, Mike, that I wanted the group to be aware of. On the drawback to the technology that both vehicles need to be equipped, two points there. They both need to be equipped, but they don't have to be identically equipped. So for example, with this safety panel that Mike is going to talk about, we will have the fully integrated vehicles that, those of you who rode in them, that's what you saw. We will also have some aftermarket safety devices that will have lesser capability, and then there's also several thousand of the vehicle awareness devices that are simply basic devices that are just sending out a more limited basic safety -- is it even the full basic safety message? It is. So it's integrated into the vehicle then to do that.

MR. SCHAGRIN: No, not the second part, just the first part.
MS. ROW: Okay. And I do understand, though --
this is what happens when they let me out of the building.
I get to talk to the engineers. It's really exciting. And
so they told me on the drive over here they got to test some
of the positioning and the antenna placement on the vehicle
awareness devices, you know, because they're going to be
retrofitting those in regular people's cars. And so they
learned a lot from what was going to work, what wasn't going
to work. It didn't work as well as they had hoped, and so
now they're going back and examining some of that. So those
are other different kinds of positioning issues that they're
grappling with.

MR. SCHAGRIN: When we went and did these driver
clinics that I'll talk about, we did them around the
country, six different locations around the country:
Virginia, Texas, California, Florida. We weren't doing the
clinics with the actual real drivers. At night, the
vehicles would be out doing performance testing, and the
idea was to get a better understanding of how the vehicle
would perform in different geographical environments: urban
canyon, rural road, and so on. So we actually had gotten
thousands of miles of data associated with performance
testing of the technology just recently.

Okay. Safety pilot. Safety pilot is a program that's really meant to give us that real-world appreciation of how this technology works. There's really two major elements. One are the driver clinics, as I said, around the country, over 100 drivers in each location who got to experience the crash scenarios in a very controlled environment, a raceway, parking lot, where they weren't in danger. We had them drive and experience how these safety warnings work, how the technology works, and then you got the feedback on that.

The second part is the model deployment that's going to take place in Ann Arbor, Michigan with, roughly, 3,000 vehicles: cars, trucks, buses. And that is currently going through that pre-model deployment stage. We're ramping up and getting ready. But on August 21st, we actually started that launch. We started collecting data, and that data will be collected for a year, and that data will be used to help assess the effectiveness of the system to the real-world operating environment, and that will feed into that NHTSA decision.

The driver clinics, what we get from that is the
user acceptance data: how well the systems work, would they buy it, how would you change things? And the driver clinics came back with a very, very positive response.

So with safety pilot, it is about safety. It is about V2V and V2I. It is about aftermarket devices, as well as integrated, embedded systems. Cars, trucks, and buses. We're actually exercising the security solutions to make sure that everything has integrity. A vehicle that's operating in a bad way, a sensor goes out or something, how do you pull that vehicle off the grid in terms of the data that it's communicating? So we're exploring all that as part of our model deployment.

CHAIR DENARO: Mike, maybe you're going to get to this, but let me just ask it. I'm not clear exactly on what's being measured in the model deployment. We don't need to go over all that detail right now, but one question I had is, will it look at unintended consequences. George, maybe the story you told me last night at dinner about the lady who rented a car and had a Mercedes run into the car. Would you tell that story?

MR. WEBB: Sure. I mean, it's somewhat anecdotal, but it was the lady supposedly had a Mercedes, a
regular driver. She went somewhere and she rented a car, driving along the freeway, and changes lanes and almost has an accident because she was used to the systems in her car notifying her on lane change execution, and that's what she had gotten used to. It only took the one experience to wake her up that she can't do that in the rental car, but, again, it's the system expectation of the drivers and how they respond or not, which I think is where Bob was going.

CHAIR DENARO: So my question is will the safety pilot even get at things like that?

MR. SCHAGRIN: We'll document, we're going to have a lot of research, a lot of data that's going to be captured. We have these data collection systems that collect not only the communications data but, for the integrated vehicles, we have video collection, as well, so I've seen what's going on with the drivers when things are starting to happen.

MS. ROW: I don't know they're specifically designed to capture that. In fact, that came up to one of the Senate staffers that rode in the cars. That was the question that he had, as well. So, yes, I mean, yes, it's a good question.
CHAIR DENARO: And there are even, if you will, nefarious consequences. I mean, I heard when radar-based braking systems came out for adaptive cruise control where it would actually slow you down that there were kids who thought it was great sport to go out there and try to set the system off. So they would race into the back of the car and say, oh, cool, look, and set it off. So do you end up causing more accidents because stupid kids, in this case, are doing things like that? I mean, at the end of the day, this is one of the things that wakes me up because are there things we don't know about that could create a public impression of this that's bad?

MR. BELCHER: So the connected vehicle program is going to be able to deal with stupid kids?

(Laughter.)

MR. BERG: I want to say something else. There's also the other side of it. So I took a ride in this Google vehicle, right? And I asked the guys who have been riding 100,000 miles in these cars demonstrating it to everyone, I said, well, what did you think what's different now after the 100,000 miles than the first day you were in this car. And they said, well, I've really become aware of how stupid
people act on the road, because that they would never have
thought about driving a regular car. But now they're in
this car and looking at the surroundings, and they're much
more observant and much more aware of what's going on around
them.

So I think, you know, you can almost look at it
the opposite way, as well. So there may be some unintended
consequences that are not so good, but there may also be
more awareness when people have these things.  

MR. LAMAGNA: Another aspect there is Tom and I observed when we
were on these test rides is, there will be some of those who
will want to have some freedoms over the adjustment of
sensitivity of these systems and how much sensitivity are
you going to give the operator versus how much will be fixed
from the factory?

MR. SCHAGRIN: It will probably be up to the
OEMs.

MR. SCHROMSKY: Question. More of a policy side,
though. I mean, is there a CALEA aspect to this at all from
a law enforcement --

MS. ROW: No, no.

MR. SCHAGRIN: We're not doing enforcement.
MS. ROW: Yes, we've not designed the system to be an enforcement tool.

MS. BRIGGS: But that's not what you're asking.

MS. ROW: Oh, is that not what you're asking?

MS. BRIGGS: You're asking about telecom law.

MR. SCHROMSKY: Exactly.

MS. ROW: Oh, oh, I'm sorry.

MS. BRIGGS: So we'll talk about that later.

MR. SCHROMSKY: Okay.

MR. SCHRAGRIN: Good answer.

MS. ROW: Good, good.

MR. SCHRAGRIN: So with the safety pilot, what we tried to do is get out of the user acceptance data, so both the clinics and the actual mod deployment would give us user acceptance data. The safety system effectiveness values will feed into the ultimate benefits assessment that will support the 2013 decision, how a system operates in a real world both for the applications and security solution, and the role aftermarkets can play in accelerating benefits.

And so at this point, I actually have a couple of questions for these people who haven't been talking very much. So the questions I have teed up for this group that I
would like to get feedback on is do aftermarket devices have the potential to accelerate benefits for safety?

Now, what we know is that safety doesn't sell as much as other things do. People will pay for parking information, weather information, traffic information before they'll probably pay for safety. And so while this is about safety, you know, and we're looking at aftermarket devices as part of safety pilot, do aftermarkets really have a potential for accelerating benefits for safety? That's one question.

And then if DSRC is mandated for safety, what is the growth potential for that enabling technology, or is this anticipated to be a niche market for safety only? So there's no DSRC out there now, but will DSRC be this enabling capability that goes beyond just safety? We need it for safety and, once it's in place in the vehicles, it can be leveraged for other purposes. So these are two questions that I would actually like to get feedback on.

DR. KLEIN: Well, do you guys have a strategy such that, the strategy such that aftermarket devices will accelerate benefits for safety?

MR. SCHAGRIN: Well, our strategy is to look at
it as part of the safety pilot model deployment. We have
gone out and had some development contract issue, and our
plan is to have multiple vendors with their products mixed
into the safety pilot along with those embedded systems, and
so we look at how they operate in that environment. See,
the problem, the issue is that with the turnover of new
cars, which I think is now up to, is it 14 percent?

MR. MCCORMICK: It will be 14.4 million this
year.

MR. SCHAGRIN: But it came up, I think it's
increasing now, and you guys are having the best year in a
few. I think it's like 14 percent or something. But even
with that, you only turn over so many vehicles each year.
We've got 250 million-plus vehicles on the roads today.

MR. KENNER: The average age right now is right
about 11 years, I think.

CHAIR DENARO: Really?

MR. KENNER: Yes, 11 years. It's the oldest I
think maybe ever.

CHAIR DENARO: Wow.

MR. SCHAGRIN: Yes. So how do you, you know, we
don't want to just wait for new car turnover. We want to
get the existing fleet equipped somehow, even if it's just that device like a toll tag that generates this basic safety message that lets other people, other vehicles with the more equipped systems pick them up, you know. So that is a part of our, what we're looking at in terms of strategy.

CHAIR DENARO: Hans, what did you mean by your question of strategy? What do you mean by strategy?

DR. KLEIN: Well, people are going to buy aftermarket devices. If I was told that, by regulation, I had to spend $200 on a safety device, I'd be pissed off. But I've somebody in my backseat who demands Netflix, and I'm going to spend $200 no matter what. There I have no choice. So if I have to invest $200 in the backseat anyways, maybe that could satisfy all these tech specs for the safety devices, and I don't even know I'm paying for safety. You tell me we're giving you safety for free, and I'm like, wow. Thank you, DOT. This is incredible.

MR. SCHAGRIN: Wait, wait, wait, wait, DOT is not providing these devices.

DR. KLEIN: Okay. Well, I'll thank the regulator. Thank you, regulators who made this happen. I don't know how it happened, but I just got safety for free.
DR. ADAMS: So as I understand it, though, we're trying to keep that dedicated, the DSRC, dedicated for the safety. So within that, the aftermarket I can think of right away, you know, as a parent of teenagers or something like that, that extra layer, would that be considered safety? You know, like the graduated licensing and all kinds of things? I'd want to know where my kids are. I'd want to know -- so there's some security issues, a little more control over passengers or, you know, younger people or fleets. So are those considered safety? I'm sure you guys have thought about this.

MR. SCHAGRIN: I mean, we've talked about --

DR. ADAMS: I'm sure you guys have thought about this, yes.

MR. SCHAGRIN: The thing with the DSRC and this technology, it's wi-fi technology. It's shorter range than cellular, and so to communicate with the vehicle you have to be within range of -- well, for V2V, you're within range --

DR. ADAMS: Oh, yes, so that would be --

MR. SCHAGRIN: -- vehicles. If you're talking about getting off the vehicles and into some kind of cloud
environment --

DR. ADAMS: You have to pass that -- yes, okay.

MR. SCHAGRIN: -- you have to pass that through either an infrastructure unit or you switch over to a cellular type of capability. So I think what you're talking about, more of a kind of general safety for your kids, is a little bit different than we're talking about for safety for crashes.

DR. ADAMS: Yes.

MR. SCHAGRIN: But this technology could be leveraged for those purposes, though, but you have to have the connection.

DR. ADAMS: Oh, you'd have to have that customization kind of thing where, you know, as a younger driver with the buffer zone.

MR. SCHAGRIN: Well, that gets back into the other comment about sensitivity.

DR. ADAMS: Yes, yes.

MR. SCHAGRIN: The car companies may or may not want to talk about that. You know, like with some of the adaptive cruise control, you can program that to be one-car length, two-car lengths, and maybe a second, a second and a
half, or two seconds distance between you and the other vehicle. I assume you can do something like that, leveraging --

DR. ADAMS: Yes, yes.

MR. SCHAGRIN: -- this technology, as well.

MS. HAMMOND: So if everybody on the highway, if there's one person who doesn't have this whatever, the warning device, it doesn't work? I mean, is that --

MR. SCHAGRIN: No, you may have missed that conversation. If a vehicle does not have the technology, they will be not part of the capability. It doesn't mean the system breaks down.

DR. ADAMS: So you can still sense them, they just can't sense you.

MS. ROW: No. If they're in your blind spot, you won't know it because you're --

DR. ADAMS: Okay.

MS. ROW: -- communicating.

MR. MCCORMICK: When you look at adoption curves, I mean it wasn't until 2002 that OnStar actually had two OnStar-equipped vehicles have a head-on collision. They actually thought there was a problem, a glitch in their
system when it occurred because the likelihood that you were just going to pass another car with OnStar, let alone have a head-on collision, it would show the same accident, the same air bag deploys.

So the issue is really when we look at the adoption curve of how many do you have to have population-wise before you get real benefit? In your rural areas, you'll probably never pass anybody until you get 90-percent adoption. In Chicago, in Detroit, in D.C., depending on the level of adoption in that area, you may be as low as 40 percent. It may be as low as four years, and that's probably the good thing about people keeping their cars longer because a decade ago when we looked at this everybody was keeping their car for five years. It was like who wants to buy the first fax, right? Now it's like, well, people are having this car longer, they're having mature technologies, they're figuring out ways to pair it with other capabilities so you're not having to update your in-vehicle electronics.

In general, five years after everyone starts putting it in, there will be definite realizable benefits. Will there be some in the first year? Yes. It will be rare
and anecdotal. Will it be --

MS. HAMMOND: But won't the driver become complacent thinking he's going to get his warnings around him and --

MR. SCHAGRIN: I like to think of it like a horn. You don't wait for somebody to honk their horn to make you a safer driver. This system does not come on unless it's absolutely needed. It's a safety net of sorts. So think of it like a car beeping a horn at you because you're distracted or something. This comes into play -- one of the things they're very sensitive about and we have to make sure are minimized are what's called nuisance alarms. You don't want to be warning people before they need to be warned. And so the timing issue, we've done a lot of research in that area to make sure that we're not waiting too long but we're not warning too early either.

CHAIR DENARO: Well, related to that, though, there's also the missed, I mean the false alarm where you're alarming somebody and there wasn't a problem. And people are going to get really upset. They're going to take their car back, I'm going to take my Ford back and say fix my car, it doesn't work, and you're not going to be happy about
MR. MCCORMICK: The human factors people have, is that they know that 20 percent of the drivers do nothing when they're given an alarm, an alert that says your oil is hot. Twenty percent of the people just ignore it, and that's not just in the U.S., that's worldwide. They just ignore it. And if it ever comes on, they're kind of like, well, I'm going to drive 20 miles and then maybe I'll call and figure out what it is or pull over and look at my manual. So those 20 percent of the people are going to end up being the ones that are the most critical, and that's why you have to get to a more times driving scenario where the car will brake for you or keep you in your lane.

MS. ROW: If I could just go back for just a moment to the aftermarket discussion because some of the things that you guys just pointed out is the reason that we're so interested in understanding if that has some potential because it gives us benefits quicker and, you know, it just helps. But if you start thinking about that, you don't have to think very long before you begin to run into some dilemmas. So first of all, why would, after somebody who's making something that you can carry in a
vehicle, why would they spend the extra money to make theirs capable of communicating? Why would someone buy it for extra money? You know, how do they see the value proposition? But at the same time, you also have to have a relationship with the automotive industry because it only works if you're going to be able to give out some amount of information coming from the vehicle, or you only have access to a part of the basic safety message that you can get from an autonomous piece of equipment, like this is riding in a car. So then what kind of applications can you get out of that? Does it make a difference?

MR. SCHROMSKY: I mean, my own personal use is I look at it like a navigation system. My vehicle at the time didn't have a navigation system, so I bought a Garmin or TomTom. You know, I didn't want my wife to get lost and, my perceived safety, this is what I want to do. I like your point is it's a little bit more that I have to talk to the vehicle, not just the eyes in the sky, so I do think there's a large aftermarket for that if there is a perceived need, value slash safety. So I think it's -- or if I just bought something and then GM or Ford comes out with something great next year and I bought my car last year, I might want to
have an aftermarket that they want to offer that I can take advantage of and buy it and hook it into it, right?

MR. STEENMAN: People probably pay for efficiency and obtaining experiences. I think the key here is that if we can make the data that comes out of it anonymous and, as a result of it, you have an opt-in and say if you buy this and you opt into these things and you get it for free, but you get all these other great benefits back, like, you know, you get like real real-time data updates on traffic because now we know throughput and to get you from A to B, we know how to accurately reroute you. There's probably a whole bunch of other things you can do if you can make the data anonymously available outside of the vehicle.

MR. MCCORMICK: That is kind of the fundamental problem when you deal with aftermarket is that no one does a very good job of articulating the value proposition. Until they do, safety is not going to drive the application.

MS. ROW: Right. It's packaging it with something else.

MR. MCCORMICK: Personal experience or personal benefit does.

MR. STEENMAN: They're the people who are willing
to pay for it.

MR. LAMAGNA: What are the ancillary benefits of putting this in your car? I think there's a certain percentage of the population that will expend the money for safety's sake. I don't think that's the overwhelming majority of the population, but if you can find other, what Hans was saying, what else do I get, you know. Perhaps it's a break on insurance premiums, perhaps it's a break on registration for the cost of the vehicles. What are those secondary benefits that I would get for deploying this in an aftermarket? That's where I think you start to get people to cross the chasm of does this become mainstream or not.

MR. MCCORMICK: But you're absolutely right. I mean, there are applications you can put on your phone that, you know, you pay for it and it detects if you're going more than five miles an hour, it disables texting. I talked to the guys that run those companies. A hundred percent of their clients are parents putting it on their kid's phone, not their phones.

CHAIR DENARO: Will this aftermarket device have GPS in it, or is it expecting to get that from the vehicle?
MR. MCCORMICK: This could be the aftermarket.

CHAIR DENARO: I understand. But your concept here, are you talking about a device that actually would have, it would be the GPS --

MR. MCCORMICK: Yes. Unless your car already has it. If your car has it and you're connecting through the OBD, too, you could use its --

CHAIR DENARO: Assuming a device is designed that way. That's why I'm asking.

MR. MCCORMICK: But that may be a choice that the automakers choose to say I'm going to make this port available or not.

CHAIR DENARO: Well, but, see, now I have a problem. If I have an aftermarket device that's kind of free-floating its own GPS, then maybe the operational, the specs break down of how this thing is supposed to work.

MR. STEENMAN: Well, you can guarantee it. It would almost have to have GPS in it to guarantee the capability because, if you have to borrow the GPS from something else, you don't know what you're borrowing.

CHAIR DENARO: True. But, back to Shelley's point, now that it's aftermarket and I stick that in my
dashboard or where I choose to pick it, its performance might be severely degraded and it doesn't meet the spec here of how it needs to work. So I don't know.

MR. CALABRESE: I just want to ask if you've done any market research. I mean, I may be the odd one in the room, but I think people would pay for it if the price is reasonable. Have you done any market research to see what is the price point? I mean, market this to mothers with young kids and of teenagers and everyone is going to say I'll take it if the price is reasonable.

MR. SCHAGRIN: The short answer is no. The long answer is we're focused on enabling the safety capability, but then we also have to think about this aftermarket strategy to some extent. We're not into the marketing. That's industry. But I think the answer to the question is if you aftermarket this you've got to determine what the demand is going to be.

MR. CALABRESE: It's a no-brainer that it should be an aftermarket product. If the price is reasonable, I think it will sell. But I think market research strategies would help you get --

MR. STEENMAN: There's probably analogies, right?
I don't know if airbags were ever an option that you could actually mark off on your buying criteria for a car and how many people actually bought it, where if it was only the adoption might have been, like, you got installed.

MR. BERG: Put them in another package. To be honest, the value might come from another feature in that package.

MR. CAPP: It's hard to believe optional airbags never sold very well.

MR. STEENMAN: Right, okay. So I think that's a really good adoption indicator for this safety technology. People would not pay for it.

DR. ALBERT: Just a reflective comment for a moment. You know, the only thing that's really been deployed nationally, I would guess, in ITS has been 511 and are ubiquitous across the United States when you pick up your phone and you dial 511 to get information. And the assumption in deploying 511 was, oh, everyone is going to want it to know about congestion and improve mobility. What we generally found was that 511 was predominantly used when there were weather events, when weather was the problem. We all went into the 511 thinking, oh, yes, people are going to
want this. So I guess my point that I'm making is let's make sure we understand what people are going to use things for before we go out and try to deploy them.

MR. SCHAGRIN: Just to get back to your marketing question, we did sort of the embedded systems, as part of our driver clinics, ask questions about price points. We do have some data, but it's not for aftermarket, it's for those embedded systems that was part of the class. And we actually have that data. It's all being distilled. There was a presentation this week that talked about some of that data. If you want it --

MR. CALABRESE: How well did the OnStar aftermarket thing work if there was ever a price point issue --

MR. CAPP: I'm not certain how well it's doing. It's a new product. I actually don't know how well it's doing. But we honestly believe that there's interest, right? We believe that there's interest because it's a lot of work to, the commitment it takes to integrate these new technologies into a vehicle. It also takes a lot of investment to create something that's an aftermarket quality and whether it's an OEM aftermarket or whether somebody else
decides they're going to sell them, you know. But to Mike's question, do aftermarket devices have the potential to accelerate benefits for safety, we're going to prove that, but I think all of us think, yes, they do have potential. We have to think of different ways of how do you make people want that aftermarket device because its benefit will be limited. It may be reduced from the integrated system, and it will be not much at the beginning of the cycle. Somebody is going to have to invest something to make people want those devices.

CHAIR DENARO: It's like buying the first fax machine. Who are you going to fax to?

MR. CAPP: Sure.

DR. KLEIN: Some aftermarket devices, maybe many of them, will only be truly useful if they can be integrated with the onboard network and get some vehicle data, as well. And there's, I'm sure, technical questions there of compatibility. There's market questions: are the two parties, do they have incentives and a business plan to get them to link together? In the world of telecommunications and telephony, they found sometimes that the different networks did not have incentives to interconnect. In fact,
the FCC, at some point, stepped in and said there's mandatory interconnection in order to get full functionality. Has that scenario ever been considered of incentives for interconnection, standards for interconnection? Would we have an FCC-type scenario where, in order to get the public benefits, you'd almost give everybody a little push to interconnect?

MS. ROW: I don't think we're quite there yet, Hans. Those are good thoughts. I just don't think we're quite there yet to understand what that might look like and what's needed.

MR. MCCORMICK: Yes. There's so many different ways to achieve the functionality that you're talking about, whether it's combining -- some automakers, a number of automakers are looking at trying to figure out if they can contact them here and there so it does that. Others are looking at Nokia's -- what do they call it? The connection between -- yes, terminal modem. It's now called --

CHAIR DENARO: MiraLink.

MR. MCCORMICK: MiraLink, yes. They're looking at MiraLink which is a mechanism where you put a device, embed a device in the car, and then the phone has the
ability to act as a passive transceiver; therefore, eliminating your need to have two cell chips and everything else. So there's a whole number of different ways to implement. The question is what is it that you want them to be able to accomplish by the spec, rather than define a technology requirement which could be obsolete in a matter of months. So I think the way they're going is actually the safer route than to worry about, you know, certified by performance, not by physicality.

MS. ROW: And one just quick thing to put on the table just because you're advising the federal government, we are looking at the federal role in that. So we don't ever expect to be manufacturing anything, of course. Wouldn't that be a scary thought? You know, so there's a limit to what market research we would do, but we are trying to be a catalyst to help all those creative, inventive people who are making consumer devices, who are thinking about where's the value, how do you bundle it, to be able to, what do we need to do to help that along, like your example with the FCC. And so that's one of the things, as you guys are pondering this and thinking about it, that's the frame that we're coming at this is how can we be an
enabler to that industry.

MR. SCHROMSKY: One thing, going back on the chip and that technology, one of the things that we face as we go into machine-to-machine and all the carriers in telecom is that chip is going to cost. So standardizing on a technology slash chip would greatly benefit both the OEM side and also aftermarket because that's one of the things about LTE, it's not us, it's an IEEE, 3GPP standard. It's going to what GM and Ford is going to put in their vehicles. That's also what LMR is going to use for the public safety radio network. That's also going to be used for, you know, if LG wants to make a refrigerator. All those chips that cost will be greatly reduced, no different than what Intel did with wi-fi and everything else, that I like the idea of picking that standard technology for your field because I think that will prove both the OEM adoption, as well as aftermarket, if there's one standard to build off of because that would greatly increase the adoption because I can tell you chips that cost, that is one of the biggest hurdles.

MR. BERG: Over a billion wi-fi chips were sold last year, and in 2015 I think it's up to five billion or something. So it's even more prolific than the cellular
CHAIR DENARO: These discussions are great, by the way. And you're right, Shelley. We did not have to worry about that. Let me suggest, we're going to have our focused discussion in the afternoon. Let's bring these points up, but let's not get too deep into the discussion. We can defer that to later. However, I would like anyone who brings up something to capture that because these are potential focus items for us to think about. So I'll use Hans as an example: this whole idea about maybe we need to extend this concept of what the aftermarket thing is and maybe it will enable it to do other things, as well, as part of the strategy for an aftermarket device. You know, let's capture that and let's let you be the proponent for that. This afternoon, let's bring that back up and have a little more discussion. But I'd like to get through and make sure we get all the information from the JPO folks so we can get through that, okay? So please do capture your thoughts like that and bring them back up later, and I'm trying to do the same.

MR. SCHAGRIN: All right. So, quickly, these are the applications that we've been looking at in the driver
clinics. Forward collision warning: a car on a highway has slowed down suddenly or stopped, and you don't want to rear-end it. Things like emergency electronic brake light when somebody does slam on their brakes, and maybe it's the car in front of you or several cars in front of you, you get this communications data that they slammed on their brakes and it warns you. And there's other applications of that that we talked about, as well. So this is vehicle-to-vehicle, and it's also a vehicle-to-infrastructure type of application. We have curve speed warning or possible red light violation warning.

Okay. So this is an example of some of the DVIs, or driver vehicle interfaces, that we --

    MS. ROW: You can make the sound, Mike.

    MR. SCHAGRIN: Beep, beep, beep, beep, beep. Actually, I was thinking about showing how they differ in some cases. They warn the driver with either audible -- they all have audible. They all have audible. They may even all have visual, and the visual could be something that's embedded in the dashboard or it could be like up here where you have like this heads-up display that you've seen on production in some of the Volvo type stuff.
And there's also the vibrating seat. It's actually directional, so if a car at an intersection is coming from the left-hand side, it will vibrate on the left-hand side. If it's coming on the right-hand side, it will vibrate on the right-hand side. So there's audible, visual, and haptic warnings, and sometimes a combination of those, that help to warn the driver.

Okay. These are locations of the driver clinics I have mentioned a number of times. We did them in different parts of the country to gauge different driver preferences and get feedback from these different types of populations. And like I said, we also did performance testing of technology when we weren't actually having the clinics taking place.

Okay. The model deployment sites, the 3,000 vehicles. Ann Arbor, Michigan, we're doing ramp-up right now. We'll be kicking it off on August 21st and collecting a year's worth of data. We got roadways instrumented with infrastructure. We've got, roughly, 3,000 vehicles, including cars, trucks, buses, integrated vehicles. We actually are working with eight of the car manufacturers as part of a consortium of CAMP VSC3. I don't know if you
people know what that is or not, but it's a car consortium, eight manufacturers. We'll be supplying 64 vehicles with integrated systems as part of this. We'll have 300 vehicles with aftermarket safety devices, and the remaining will have these like toll tag type of devices. They simply generate an auto message. They don't receive anything, and they don't interact with the driver at all. And the idea is to create a highly concentrated environment, so we do have the vehicles that are equipped with technology crossing or coming into contact with one another during this one-year period. And many of those vehicles will have very extensive data collection systems that we talked about earlier for collecting data that will be analyzed in terms of helping to assess the effectiveness of the systems.

All right. Let's go to the next slide.

MS. ROW: I'm sorry. Would you also just briefly mention, as I segue to the next one, the exercising of the security options as a part of safety pilot?

MR. SCHAGRIN: We will talk about security more later, but what we're looking at is how do you enable the security capability, that is, each of these devices need to have a certificate so that it becomes a trusted source, so
that when you're getting information from one vehicle to the
other that you can actually trust that it is a legitimate
message. So what we're looking at are the options for
security that include -- there's a couple of different
options we're looking at. There's a vehicle-to-
infrastructure DSRC link. That doesn't have to be realtime.
That's just a way of getting information from a
credentialing back-end office to a vehicle, and what it can
do is going to revoke the certificates, too, and take them
off the grid, basically. It's not disabling the vehicle,
it's disabling the vehicle to be able to generate bad
information, okay?

So we're looking at DSRC link from vehicle-to-
infrastructure. We're looking at cellular, and we're
looking at possibly another option, as well, in terms of
certificate and credential management. I think, Val, you're
going to talk about that more this afternoon, right?

MS. ROW: My point here is that in the safety
pilot we're going to be doing a DSRC example, and then
you're also going to be testing the cell example. Yes. So
that's also part of what we're doing in safety pilot, and
that's a big thing.
MR. BERG: Mike, have you modeled the mean of number of interactions you expect in this environment?

MR. SCHAGRIN: Yes. Okay. That's a really good question because it's good background. So before we actually went and started, the very first thing we did when thinking about the safety pilot model deployment was, well, how big does it need to be? What do we need for interactions? And so we actually did a very rigorous analysis up front to determine how many vehicles we needed to have, what kind of interaction rate we needed to have. And so the safety pilot model deployment was spec'd out based on that analysis by Volpe in connection with this.

MR. BERG: So do you know how many interactions are expected?

MR. SCHAGRIN: Yes, we have projections on, we actually have that data in terms of our projections on what we expect to get with this size of a vehicle fleet.

MR. WEBB: Mike, I kind of want to pick up on that because I'm sitting here trying to think of either the accidents or the number of adrenaline-rush situations that I could recall or my family has been involved in in their driving over the course of the last year. So I think that's
sort of where we're, I was trying to get ahead because I'm trying to understand what the driver expectation is on these systems, you know. Seat vibrating or voice talking or whatever, if it pops up once every 18 months, you know, the driver is, well, I bought my car, I don't know necessarily because I'm not going to experience it. It's different than having the GPS in your car or whatever that you're interacting with at all times.

So I guess that's what I was interested, too, is for how, for a regular driver in the course of a 12 or 15,000 miles a year, would they get into some of the safety situations that these devices are intended to --

MR. SCHAGRIN: So one thing is we don't expect there to be a crash during this time period. You know, we really don't because of the short period of time, one year. Three thousand vehicles were selected if a crash actually occurred. But the analysis was done with things like near-misses and other scenarios where you can get data without actually having a crash occur. And so like I said, Volpe did that analysis, and so it's that data we'll use to help check.

We also have data based on other trials that
we've done. There's actually modeling simulation that will be taking place, as well, based on other field trials and other data. So it will all feed into our projections in terms of all this.

MR. WEBB: But I guess my basic question is what kind of numbers do you, the studies have indicated that the average driver, if there is such a thing, could expect? That's what I'm saying.

MR. SCHAGRIN: If you want that data, I'd be happy to provide it. I don't have the numbers off the top of my head, but we do have numbers and what our projections are, given this kind of an environment, what we can foresee in terms of things like near-miss situations and where the alerts would actually go off.

MR. CAPP: There's knowledge, too, I mean, even though this whole pilot that Mike is talking about is talking about using DSRC and a little bit of cellular as the sensor for doing these features. In the field, we have some experience already with people that have features that do some of the same thing, these different sensors. And so we have knowledge on how people respond to some of these, and some of that knowledge has been collected the same ways,
through field studies where you collect their responses with other cameras and data in the vehicle and understand the customer only sees this, or driver, once every couple of years, are they going to know what to do?

So some of the benefit, Mike showed some of the driver interfaces there, it's already benefitted from some of that work that's been done. We've found in industry some effective ways to help alert people without bothering them.

We're trying to find that balance, and so this is building on that with this new sensor.

MS. ANDREWS: I may be a step down the line, but will there be data collection as far as interactions with types of vehicles? So I encountered a motorcycle and this is what the system gave back to me, or I encountered, you know, a Class 8 heavy-duty vehicle and this is what the system gave back to me.

MR. SCHAGRIN: Right. So the only data that will be collected, it kind of goes back to that other question, is both vehicles have to be equipped, so there's no motorcycles as part of this model deployment, so it won't be interacting with motorcycles. But if a car and a light vehicle, a car and a truck talk to each other, we'll have
that data. So we'll know whether it was the car or the truck or the bus. But for those that are not part of the actual system, they won't be part of that data collection.

MR. STEUDLE: Hey, Mike, if I could add, to increase the potential frequency of interactions for this pilot study, U of M has selected kind of the northeast corner of that area where people are going to be going into the same spot. So they're not taking a broad, you know, everybody lives around an area of a 20-mile radius. They're pinpointing people that live in this spot that commute on a daily basis to increase the interactions that could occur.

MR. SCHAGRIN: Let me build off of that. So the area we're talking about, you know, this is downtown Ann Arbor and this is the area that we have as our area of concentration that we're trying to create. And so what we're doing right now is trying to solicit drivers, and what we don't want are the drivers that just go into work at 8:00 in the morning and then the car sits all day and then they go at 5:00 back home. We're looking for flow, continuous flow. So we're trying to find drivers that are coming in and out of that area and going through the area throughout the day. So we're trying to get as much continuous flow as
possible.

MR. STEUDLE: They said the way you did it, there's a hospital right in the middle which has 24/7 operations, which was part of that. And then they targeted the school, there's a big high school right there, to get that interaction, as well. And actually the uptake of people volunteering has been pretty significant.

MR. SCHAGRIN: It's been phenomenal, actually.

MR. STEUDLE: They came up with a creative way of saying we will donate some money to the school's athletic fund or something if you sign up in your name. So the principal thought this was a great thing, and he got all kinds of parents to sign up.

MR. SCHAGRIN: We had, roughly, 1,000 people sign up in the first couple of days. So we actually started two weeks ago or a week ago, and within like 48 hours we had 1,000 people signed up. The incentive was we would give $100 to the parent, but if you'd like to donate that to your school, you know, $100 doesn't mean much to an individual, but when it's the parents of a kid, that means you get $30,000 or $40,000. That's why there's so much incentive by the principal.
All right. Next slide, please. Okay. So this is about the agency decision. Right now, in that left-hand box, the pre-model deployment is ramping up. August 21st is our start date, and we'll have a year of model deployment testing. And we'll do evaluation in parallel and have that data pulled together to support that 2013 decision. As I said earlier, all options are on the table in terms of what's being considered, but the decision will be based on the data that we get both from the safety pilot, from the driver clinics, and from other previous field trials that have been done that are helping with modeling simulation.

MR. BELCHER: Mike, for those of us who aren't as familiar, can you talk about what the range of options are? Because there are other options besides just a rulemaking. You can't? Okay.

MR. SCHAGRIN: I've been counseled by NHTSA. It's the standard language now that all options are on the table.

MR. BELCHER: All right. I apologize.

MR. SCHAGRIN: Can we see what is in the section, which is --

MR. BELCHER: It said the same thing in the
section.

MR. SCHAGRIN: All options are on the table. Now, what I can say, because it was said before, is that we are -- and I was corrected for it, so it my opportunity to get back here. Is that it is about, the safety pilot is about warning the driver. There is no control element in here. There's no automatic braking, there's no automatic steering. However, we are doing research in the control area beyond safety pilot. The consideration for the decision point will take everything that was on the table, including warning and control in terms of contributing to the benefits that support a decision. So that's what was talked about.

So it's the full range of more research to regulation. The vast majority is about warning, but there's data on control elements, as well, that will feed into that decision, consideration. I hope that helps, Scott. I'm sorry to be vague.

MR. BELCHER: I apologize for the question.

(Laughter.)

MR. SCHAGRIN: Okay. So --

DR. RAJKUMAR: Mike, when do the CAMP vehicles
get delivered?

MR. SCHAGRIN: When do the CAMP vehicles get delivered? They're already going through the pre-deployment. I mean, CAMP is in Michigan. Ann Arbor, Michigan is the deployment site. They're there within close proximity to each other. They're doing pre-mod interoperability testing now. They will be delivered physically onsite before the start date of August 21st.

DR. RAJKUMAR: Excellent, excellent.

MR. SCHAGRIN: Okay. That's it. Any other last questions or -

MS. ROW: Oh, could you very quickly talk about scalability?

MR. SCHAGRIN: All right.

MS. ROW: See, you put them in front of me. You should have known better.

MR. SCHAGRIN: All right.

MS. ROW: You can skip the other ones, but if you could just mention this one, just mention this one.

MR. SCHAGRIN: That one?

MS. ROW: Yes, just that one.

MR. SCHAGRIN: Okay. So scalability testing.
What we're doing right now is it has to do with the congestion issue. What happens if you have a whole bunch of vehicles communicating at ten times per second? Huge. So if we have our vehicles, you know, the red dots are the stationary objects that are generating ten times per second. And then we have vehicles, which are the green dots, running around the track trying to clog up the system, basically.

And then we ramp up some more, and we've got more dots, moving and stationary. And we've got, what do we do? 50, 200, in preparation for the model deployment of 3,000, although in the model deployment not all 3,000 will be in the same communication area. And so we just keep ramping up with more and more.

DR. RAJKUMAR: What is the distance from left to right?

MR. SCHAGRIN: Is this, actually --

MR. BERG: The ones on the right can't hear the ones on the left.

MR. SCHAGRIN: Do you know how far they can hear, how far the range is to this site? Do you know --

MR. BERG: It's about 500 meters, I think.

MR. SCHAGRIN: So it's a little bit outside of
the range.

So that's what where we're going for the congestion testing to make sure that we have no problems. We actually go to the field trial. This is really, this is really stressing out the system a bit.

MS. ROW: Because it's actually, I think the point is it's probably less about Ann Arbor and it's more about if you were on a congested freeway segment and you got all these vehicles in one spot all communicating ten times a second.

MS. HAMMOND: But I don't see any vehicles merging in with the other flow traffic. They all look independently operating.

MS. ROW: They are.

DR. RAJKUMAR: Detecting the left and the right.

MS. ROW: Paula, this is message congestion.

MS. HAMMOND: Oh, I see.

MR. SCHAGRIN: It's not about the actual vehicles merging.

MS. HAMMOND: So it is not warning them of a merge --

MR. SCHAGRIN: What we're trying to do is break
down the system of having too much communication taking place, and we actually got very good results on that.

DR. RAJKUMAR: So you don't see any problems, Mike?

MR. SCHAGRIN: No. I mean, they're tweaking it, but they know how to operate it very well.

MR. STEENMAN: Do you know when it that breaks? Does it break at 5,000 vehicles, at 10,000 vehicles?

MR. SCHAGRIN: We don't know yet. We haven't really --

(Simultaneous speaking.)

MR. SCHAGRIN: Okay. Let me tell you about congestion strategy real quickly. We're working with the Europeans on this. I mean, we're actually doing a lot of work between U.S. and Europe on this harmonization of things like security, congestion, data sets.

On the congestion, our approach has been to look at ten times per second and then maybe draw it back if we need to on the number of messages. The Europeans start at two times per second and throttle up as they need to, okay? So there's some of that going on.

The other thing is if it's so congested that
nobody is moving, it doesn't matter, right? When you have a parking lot on the freeway and all these vehicles are there, it doesn't matter really if they're communicating or not, from a safety perspective. They don't need it. There's a point where you hit the threshold where you still need it, there's so much traffic, you're slowing down, and you don't really need it anymore. So we haven't really broken the system yet in terms of the volume.

DR. RAJKUMAR: So I believe, if you take the total bandwidth of DSRC, look at I guess the size of each piece and the basic safety message, the size of this message, I think the raw number of vehicles can be -- the range is 250 vehicles at the max. But there will be a bunch of optional stuff on top of that and, basically, I guess that's only the useful data and the header information and so on. Practically speaking, we are probable at about 100 vehicles or less in a range of, at these --

MR. SCHAGRIN: I don't know that the numbers are substantiated. When you talk about the 100 vehicles or 250 vehicles, I don't think that, you know, we've actually exercised it and have been very successful at the roll out with those kinds of numbers.
MR. MCCORMICK: You've got to understand. You're not parked. It's not like having 100 vehicles in a 300-meter diameter. They're moving, and the theoretical number that they came up with a number of years ago, this was back when AT&T was getting into WiMAX, Everybody went, wait a minute. That's divisible bandwidth.

When we looked at it, the number is somewhere close to 20,000 vehicles. That's presuming they're moving and presuming they're only sharing the information that's relevant. And at the time, it wasn't all ten data pieces. They were assuming you were using, you know, two channels to do a handshake and do a validation. So it's yet to be seen, but that's the importance of this test is to find out exactly what is the load.

DR. RAJKUMAR: Is it 11 megabits per second?

MR. BERG: I think so. Or six.

DR. RAJKUMAR: Six? I see.

MR. STEENMAN: If you're in LA and you have, like, two intersecting 12-lane highways that are going at 30 miles an hour, a pool of traffic, that's a lot of cars --

MS. ROW: That's a lot of cars.

MR. STEENMAN: -- in a small area.
SCHAGRIN: Yes. No, you have to deal with the elevation thing, too, because, you know, if you're on a bridge or overpass and somebody is coming, you don't want to send out a warning when you don't need it, so that's all part of this.

DR. ADAMS: So when you did this, you actually had cars equipped and ran around --

MR. SCHAGRIN: Yes. We had two --

DR. ADAMS: -- and drivers and rental cars and --

MR. SCHAGRIN: Yes. How much rental cars we had to do to -- we put stuff on the vehicle, and those vehicles are all going.

MS. ROW: Yes, but the red dots are stationary.

DR. ADAMS: Right, right, right. But they were --

MS. ROW: They were transmitting.

DR. ADAMS: Wow.

DR. RAJKUMAR: So, Mike, how many vehicles are there?

MR. SCHAGRIN: That number says 200 vehicles, stationary and moving. Yes, we scale it up from 50 to 100 to 200. And then the last slide, the last back-up slide is just to represent that performance testing that we did as
part of the clinics. And even before the clinics, there
were -- you know, because recognizing that Chicago has a
different environment than Nevada.

CHAIR DENARO: This is the performance of what?

MR. SCHAGRIN: Of the communication, how well it
communicates between vehicles. GPS is part of that. Yes.
with all the multipath and everything, yes, to be sure it
operates everywhere, that it can operate on plateaus.

MR. BERG: And they even used it for GPS devices
in each car.

MR. SCHAGRIN: Oh, yes, that's another thing.
That's a good point, Roger, is that, as part of the safety
pilot, we put it in their deployment to have multiple
vendors. So it's not a single vendor talking to itself.
You know how that goes. You have to make sure that
interoperability is key, and we found out a lot of
information based on the fact that we had multiple vendors
operating with one another. So that's a huge hurdle, and
we've actually been able to specifically navigate through
that for the infrastructure and for the aftermarket devices.
And then, of course, with the CAMP vehicles, there's nine
different models, eight car manufacturers.
(Simultaneous speaking.)

CHAIR DENARO: So time check. So that was only V2V?

MS. ROW: That's right.

CHAIR DENARO: Who's going to talk about network security? You are? Lunch is outside. One suggestion is a working lunch. Is anyone opposed? You guys mind singing for your lunch? Valerie? Do you mind talking through lunch?

MS. BRIGGS: Oh, I can talk through lunch. I don't get lunch anyways.

MS. ROW: We don't let her eat lunch.

CHAIR DENARO: We're learning a lot. Okay. Why don't we take, you know, 15 minutes to get lunch, get back in here. We probably need to clear some of our stuff off here, and we'll go ahead and work through lunch.

(Whereupon, the foregoing matter went off the record at 11:49 a.m. and went back on the record at 12:13 p.m.)

CHAIR DENARO: All right. Some of you have finished lunch already, but for the rest of us we'll have a
working lunch. And Valerie is going to present for us.
Good discussion, by the way, prior to lunch. Let's keep
that up. That's great. Scott had a great suggestion.
Let's let it flow, and I agree.

MS. BRIGGS: So as I mentioned earlier, I'm the
policy person here in the JPO doing the policy research. So
yesterday I found myself at the ITS America annual meeting
doing a very similar presentation on the cyber security
experts from the auto industry, both GM and Ford. You know,
they were talking about all of these concepts, and I thought
how on earth did I get here? I never thought I'd be giving
presentations on cyber security, but it is actually, at
present, our biggest challenge in public policy, and you'll
see why as we go through this. And we really need some good
solutions in this area.

So the challenge in this arena, traditionally
when we think of security, at least I think of someone not
being able to attack my system. But in this case, security
is not just defense against attacks, but we also have to
recognize that we have a bunch of competitors, I mean
vehicle manufacturers who are competitors, as well as just a
lot of different players who need to communicate with one
another. And not only do they need to communicate, but they need to be able to send messages that are going to be the basis for vehicle safety applications that could save someone's life.

So these vehicles need to make sure that those messages are legitimate, that they're real, and that they can trust them before they take an action based on the messages. And so the real challenge in terms of security here is that trust and enabling a trust network.

Layer on to that the fact that you have vehicles in an environment and people don't want their vehicle to be able to be tracked. People want to have relative privacy as they move through the system. And so there are not a lot of systems out there that we're aware of where you're going to create an anonymous, private, secure system. And if we put those together, it really makes for a complex environment because some of those goals are generally conflicting. They also work together, to some degree.

And, of course, you can design any system, but then is it really implementable? And that's kind of our challenge is how do we make something that can be implemented, as well as just thought about on paper?
And so if you want to jump in, George, you can jump in.

MR. WEBB: Just very quickly that, I mean, invariably, every time I get in front of the county commissioners sitting in the transportation committee, privacy is the number one issue as far as this future system. They've got the concept, vehicles talking to each other, whatever, but privacy comes up in their minds as the number one issue as far as the concern. So I just want to relay that to the group.

MS. BRIGGS: Right, right. And so this is the challenge here. We had a number of -- well, okay, next slide. We've been working with the auto companies and a number of security experts on looking at this problem because you really kind of have to understand the vehicle environment as well as understand the security environment to address it. And so this group of security experts and automakers have really looked at all different ways of doing security, and they decided that the best way to do security is through a PKI system because it's the most secure way to do it. And this basically involves a secret code that is generated somewhere, and then there are certificates that
are generated based on some aspect of that code and sent out to all of these vehicles. Vehicles have these certificates, and then they basically sign them and they send them to other vehicles. And then since the other vehicles know that basic element of the root code, then they're able to know which vehicles are trusted. That's probably about as much as you need to know. That's about as much as I know.

So it's based on this exchange of certificates. Well, the other challenge that we have is with that privacy through the system. We've been looking at how long can a certificate be because you don't want someone to be able to kind of identify, you know, be able to track certificates. And so people have, these security experts just came up with, well, maybe certificates should only be five minutes long. And so a vehicle should have many, many, many, many certificates because each certificate only lasts five minutes. Well, you also have to then look at how you manage that many certificates.

Today, the biggest certificate management system out there, we're told by our consultants, is the DoD federal bridge system, and it has generated about 103 million certificates in its lifetime. We're talking about 250
million vehicles times five-minute certificates here, right?

So it's just an uncomparable scale to anything else that's out there if we look at that kind of scenario. So while that might make sense, we also have to think about whether that's really implementable.

And so the security experts are continuing to look at this issue. And there are a number of papers out there, for those of you who are techies because we got quite a few of you here on the committee. I'd be happy to point you to those papers that tell more about this. But I think that's about as far as we need to go today.

So next slide. So, basically, you need three parts.

MR. STEENMAN: Is the JPO doing a lot of research in this area?

MS. BRIGGS: Yes, it's a big area, and we're still doing a lot of research.

MR. STEENMAN: And they have a lot of security experts that are part of that?

MS. BRIGGS: Yes. In fact, I think they've, it's the auto companies who are leading it, and they've worked with I think eight different security experts. So they
didn't want to just go to one, one firm and say solve our problem. And so they've been working with a range of different security experts and also talking to the Europeans and how they're doing it.

MR. STEENMAN: I assume that DoD must have a lot of expertise in that area.

MS. BRIGGS: The DoD does. And, of course, you know, the contractor community that does DoD work also does other federal work. And so, yes, there is a lot of expertise out there, but this is a hard challenge, you know. So -- yes?

MR. MCCORMICK: If I could add something to Ton, Kevin Rushton, he's no longer with Intel but he was with the architecture group. He was part of the contract that worked for Intel on the VII architecture that addressed some of this security, so at Intel we did not have -- from the very beginning.

MR. STEENMAN: Okay. Post the McAfee acquisition we did a year ago --

MR. MCCORMICK: No, they're not. And that's something --

MR. STEENMAN: -- get involved --
MR. MCCORMICK: Yes, you really should.

MR. LAMAGNA: I'm sorry. What was that name again?

MR. MCCORMICK: Kevin Rushton.

MR. LAMAGNA: Okay.

MR. CALABRESE: What's the main privacy issue?

MS. BRIGGS: Well, you don't want someone to be able to trace a vehicle through the system. And if someone can figure out the certificate code for one vehicle, you know, if they could read that, then you don't want them --

MR. CALABRESE: I thought, I thought my vehicle was communicating with your vehicle.

MS. BRIGGS: Right.

MR. CALABRESE: Where is it going beyond -- if it's no further than 300 feet --

MS. BRIGGS: Right. These are open standards and, basically, part of a basic safety message. So it's your vehicle sending off a message ten times per second.

MR. WEBB: But I can put a device on the side of the road and pick up a signature from your vehicle, and I can put another device a mile away, and if I read that same signature, I know that you have traveled that mile. So it's
being able to track that by not necessarily vehicle-to-
vehicle but vehicle-to-infrastructure discussion.

MR. MCCORMICK: That's one of the personal
privacy issue. The security issue actually has four legs to
this. One, you don't want bad actors. You don't want bad
programming in the system to deploy an airbag when he needs
to turn on the radio. You don't want that. You don't want
anything malicious. It could be a 14-year-old, it could be
al-Qaeda. We don't want anything malicious occurring on the
system that has a pervasive effect on the system.

And because you have to have trust in the system,
if you can determine that an invalid signal is coming for
whatever reason, you have to have a means of getting rid of
that certificate or getting rid of that vehicle from
communicating in the system. In other words, neutralize it,
neuter it so that it doesn't do any of those things.

And then, lastly, you have the personal privacy
of which they address in this system, but you really have to
have a data and privacy policy first before you figure out
how you're going to implement it. And that's what Valerie
is chartered with is the whole policy. MR. CALABRESE:

So it's beyond Scott and my vehicles communicating to each
other. And Scott doesn't know who I am, and he goes there's
a vehicle 200 meters away. The concern is beyond that.

   MS. BRIGGS: Yes. The basic safety message that
Mike talked about earlier is totally anonymous. But if
you're going to link it to security certificates, then you
have something that is linked to the vehicle. So that's the
whole challenge of this.

   MR. STEENMAN: And then we connect the data to
the infrastructure or to the cloud, and it gets all exposed,
right?

   MS. BRIGGS: Right.

   MR. STEENMAN: Anybody could use it anyway,
certificate management --

   MS. BRIGGS: So they're kind of mutually opposing
goals. So --

   MR. WEBB: Valerie, I'm sorry. These are all
going to be delivered to my vehicle's DSRC?

   MS. BRIGGS: Well, that's a good question.
George. We're going there. They don't have to be. So you
basically need three elements of that security system, with
a PKI system. You need a network for communicating those
certificates to the vehicle, and you can't, you probably
can't load them all on the vehicle in a batch. And you have
to do things like be able to have revocation of non-
functioning equipment, as Scott mentioned. And then you
have to be able to tell the other vehicles which vehicles
are malfunctioning.

So there's some back and forth that's needed,
whether that's on a daily basis or a monthly basis or an
annual basis. We're looking at all of that. But you do
need some communication with the vehicles on a regular
basis, and you don't want that to have to be pulled, you
want that to be a communication push, not a communication
pull, because there may be a handful of us who would do it,
update our security credentials, but I would bet a lot of us
would forget.

And so the other thing that you need is, of
course, a back office function to manage all of this, and
that does need to be a centralized function. And so, you
know, how is that done? Who owns/operates it? Who does it?
Where does the money come from? That's where the big
policy questions start to come in because there's no easy
answer to that.

And then the final question is, we talked about
the fact that there's infrastructure desire for many of the
applications. Well, how does the infrastructure for the
applications fit in with the infrastructure for security?
Next slide.

And that's a big question and one we're looking
at, whether they're and how they're related, if they are
related. So just to put this in perspective, you have the
communication network among the vehicles. You have
communication back to a central authority for certificate
management processes. And that communication is needed for,
basically, the certificate processes, revocation lists, and
other management functions. We're currently looking at
various ways to do that, but cellular and DSRC seem the most
promising.

If you go on to the next slide, the question
becomes then how does infrastructure fit in this and what
does that mean for infrastructure? This, of course, is very
important to our folks in the room. Is infrastructure part
of the means of delivering the communications needed for
security, or is infrastructure simply one of the elements on
the system, just like a vehicle, that needs certificates in
order to communicate but isn't key to delivering the
certificates back to the vehicles. And that's an outstanding question.

Regardless, we think that we need to figure out what that means for the infrastructure, for the traffic signals and for the public sector, and so that's something that we're looking into too, what it means.

Okay. So next slide. We've broken down the communications needs into communications needed for the vehicle-to-vehicle safety applications, so the applications that Mike talked about this morning; those needed for vehicle-to-infrastructure applications. There are vehicle-to-infrastructure safety applications that have similar needs to the V2V safety applications. You need the low latency if you're doing crash avoidance applications.

There's a whole host of vehicle-to-infrastructure applications that are mobility based that don't require that low latency communications, many of which are starting to be delivered in various ways today. And then there's the certificate management functions on top of that. And so they're each distinct and have distinct communications needs, so we're looking at, you know, what those are and whether it makes sense for them to be combined or separate.
CHAIR DENARO: When you say one size fits all, you mean one network or one --

MS. BRIGGS: Well, because they have different needs.

CHAIR DENARO: Yes, no, no, is that what size --

MS. BRIGGS: Yes.

CHAIR DENARO: Different networks potentially?

MS. BRIGGS: Yes.

MR. MCCORMICK: Different protocols.

MS. BRIGGS: Different protocols, different media.

MR. WEBB: Valerie, just to go back again, you said one certificate is only good for five minutes. So potentially it's not --

MS. BRIGGS: Well, that's still on the table.

MR. WEBB: Fair enough. But whatever that is, that's not a communication every five minutes because I also heard the idea of potentially downloading a group of certificates at a time so that I'm going through --

MS. BRIGGS: Exactly.

MR. WEBB: -- certificates, depending on how long I drive my car or whatever. So it's not --
MS. BRIGGS: And it's like a monthly batch of certificates, something like that. You download a whole batch.

DR. ADAMS: You get them validated, and then whenever you get a message from that certificate, you're good with it. You don’t have to --

MS. BRIGGS: Right.

DR. RAJKUMAR: This comes to about 10,000 certificates per year, so they're downloading I guess 1,000 certificates per month. And then you basically pick up one from your 1,000, use it for five minutes, throw it away, pick up the next certificate and use it for five minutes.

MS. BRIGGS: And the other thing you have to know is, your vehicle has to know is which of the other vehicles it should listen to. So you have to have a process to tell your vehicle which certificates are no longer valid, so that's the other thing that has to be communicated.

MS. ROW: So this is hugely important, so I just want to make sure everybody is following on this. So you have to have, however often we download the certificates, and there's some wireless connection from wherever you get the certificates to the vehicle. Then there's some kind of
periodic wireless connection to revoke a certificate, should it be necessary. So first you've got to detect the misbehavior, then you have to communicate with the vehicle to revoke it. So there's clearly a wireless system that has to come into being that's managed by someone. And as Valerie said, they all need money.

MR. MCCORMICK: That's the issue.

MS. ROW: And so there is the -- what is the wireless media that's going to manage that? Who is going to manage that? And where is the revenue source that's sustainable that would manage all of that type of communication?

So the balance that's Valerie is talking about between privacy and security is that the more private you make it the more frequent the security certificates are updated, right? But the more communication you potentially have to have, so the cost goes up then. So where is that balance point between whatever the communication media is, the appropriate level of privacy that we can protect, and something that is affordable from some kind of financial model from somebody somewhere. So if you guys just fix that for us --
MR. MCCORMICK: I think this is a very appropriate topic for a subgroup because seven years ago for Bill Jones I held the first security workshop with William White and all of the automakers and everything else. And, unfortunately, it's gotten to a point where everyone talks about the certificate authority. Well, that's a concept that was brought into play by a number of beltway companies, all of whom revealed to me that they thought they could be this certificate, and I'm not sure that there's not a more appropriate way to do this that doesn't require a centralized authority that could be done more autonomously for that.

And I don't want to get into it here, but I think also, between what you said and what your comment was about being able to have the latent information, that one of the things this subgroup might want to look at is getting a little more intelligence into the infrastructure side of it that would allow it to do those things. And I think, since you brought it up, I'm going to say I don't necessarily think we ought to kind of fix the scenario or refine it. I think we ought to look at the whole model and question
everything.

MS. HAMMOND: I have a question. What are the variables that cause the need for the re-certification over some span of time?

MS. BRIGGS: Because you don't want someone to, you don't want someone to be able to identify your vehicle associated with that certificate. And so the certificate basically has the same, is the same message, and it's sent out ten times per second. So if someone puts a reader over here and another reader a block down the street and can tell where you're traveling, if they were to --

MS. HAMMOND: And that's the issue is someone might learn where you're driving?

MS. BRIGGS: Now, whether that someone knows that that's you, I mean there are a lot of issues here.

MS. HAMMOND: I'm putting it on my Facebook all the time.

MS. BRIGGS: Well, that's true, too. This really comes into play if it's not an opt-in system.

MR. STEENMAN: Because there's a lot of corporate secrecy issues, right? I don't want to know that I am flying to whatever and go meet the GM, right? I don't want
my competitors to know that. So there's, you know, outside
doing personal privacy, there's a lot of corporate privacy
issues.

MR. CALABRESE: Can there be an on/off switch?
CHAIR DENARO: It gets very complicated on the
privacy because we've seen this in navigation, you can infer
a lot of stuff. You know, it's really scary when you get in
and analyze. If you see somebody at the same spot on the
road everyday, you know, you can infer that they're always
going to be away from their house at that time. If you look
at just a short path or whatever, it's easy to eventually
infer where they came from, so where their home is.

There's just a whole lot of scary scenarios like
that that people have looked into and discovered, so it
really is an issue, an important issue.

DR. ADAMS: But aren't the certificates
themselves coded? Aren't they encrypted, the
identification?

MR. MCCORMICK: No.

MS. BRIGGS: It's a public certificate.

DR. RAJKUMAR: You just need to compare it to
certificates including for messages that are identical they
get from the same source.

DR. ADAMS: But my question is, how does somebody know the source?

MS. BRIGGS: They wouldn't necessarily know that it's you. They would just be able to know that someone traveled that route.

(Simultaneous speaking.)

MS. BRIGGS: And they still have to figure out who the certificate belongs to.

MR. MCCORMICK: This a very interesting conversation because we do have an awful lot of privacy if we use this, and the fundamental question that nobody is asking is how much more we're giving up by putting something in the car.

MS. BRIGGS: And what's acceptable, what's acceptable.

MR. MCCORMICK: So it's one of those things that says, well, if you're in the car, you have it. Well, if you have this, I mean I personally don't care if people follow where I go, but apparently, people do.

MS. ROW: While we all recognize that that's true, we all carry cell phones, if you look at what's going on in
the VMT discussion, the miles-based user fee discussion, there is amazing amounts of concern about trackability.

MS. HAMMOND: Well, even with our tolling transponders.

MS. ROW: That's another one.

MS. HAMMOND: But it's, you know, the more the public has been exposed to this and the more they know about what their cell phones give away, I think, I almost think it's a generational thing.

DR. KLEIN: It's clearly a generational thing.

CHAIR DENARO: There's a wall you climb over that's tough. If I buy a phone and I opt in to all kinds of stuff, that's one thing. If the government makes me put something in my car and it has even the slightest chance of, you know, invading my privacy, then that's not so good.

MR. SCHROMSKY: I mean, every time you download something on your phone, which people forget to realize, there's called what's an end user license agreement. And the number one thing that you'll notice that pops up is location information is the number one thing you consent to.

So you're consenting to whoever developed that application, and you might not care.
But where you bring in the government piece and where law enforcement, where I would be nervous is, you start putting passive infrastructure for speed. I've got 100 officers from my department, I can't patrol the streets, so I'm going to put remote speed cameras that are passive, a lot cheaper than putting a Jeep with cameras and a person in there. I can put a lot more, in the great state of Washington, a lot more places --

MS. BRIGGS: That's been a long fight in the ITS industry. And from the beginning, we've put firewalls in ITS and said ITS cannot be used for speed enforcement because of that reason, because people would not use ITS. And so while we can say we don't think it's a good idea, I mean, ultimately, what's done and how it's done is up to the system operator. Andy?

MR. MEESE: At the opposite end, when you want the system to know that this is a police car or a transit bus, I mean, what's the consideration there when you don't want them --

MS. BRIGGS: Yes. We actually have, and Brian might talk about, Dynamic Mobility Applications is doing research on applications for public safety, specifically
those sorts of things, applications to tell people when they should move over because an emergency vehicle is coming, things like that.

MS. ROW: But, Valerie, I think, too, what Andy is getting at is if you are a fleet owner, and some of you have fleets, then you could choose to make that non-anonymous. I mean, you could certainly choose it.

MR. MEESE: I mean, emergency vehicle, a preemption of traffic signals, you know, a transit bus, you know, things like that where you want to know.

MS. BRIGGS: Yes. And, actually, Maricopa County, Arizona has been testing a lot of those on its own. There is testing in that area.

MR. WEBB: Valerie, before you get back to that, I just want to understand, Raj was throwing some numbers out, and I got my thousand numbers coming to me. But is also I'm getting 500 million certificates that other people are good? So how am I checking what I'm getting from somebody else, whether that's coming from a certificate?

DR. RAJKUMAR: The major question, Valerie, I think, is how big is a certificate and how big is the encrypted message now?
MS. BRIGGS: So all of that is in that paper that's in there. There's two papers in there that have a lot of that, and we're about to get another more detailed one out.

DR. RAJKUMAR: Okay, thanks. I think we could reduce the number of vehicles that can be -

(Simultaneous speaking.)

MR. WEBB: I was just trying to understand just how the system worked because I thought I understood it's one thing for me to get mine, and then I'm broadcasting, but am I checking --

MS. BRIGGS: You are checking. You actually are.

MR. WEBB: -- everybody else's --

MS. BRIGGS: I think you are.

MR. WEBB: -- so I've got to have the databases of what good that everybody else has been delivered?

DR. RAJKUMAR: Imagine that you're talking to all the people in the room. Each one is sending you ten messages. You've got to basically decrypt each of those messages.

MR. MCCORMICK: It's one of those, I validated that you're a real car and you sent me real information.
There's no hard drive on the car that's storing this information.

DR. ADAMS: Oh, so you validate it on the time --

MR. MCCORMICK: Yes.

DR. ADAMS: Okay, all right.

MR. MCCORMICK: Because, you know, it asks you, I don't care about you anymore. If you're ahead of me, I don't care about you anymore. So it's a very informal construct that we're looking at.

MR. SCHROMSKY: Who monitors? For instance, would the states be mandated to actually monitor to keep this or --

(Laughter.)

(Simultaneous speaking.)

MS. BRIGGS: That's a good question. That is a good question.

DR. ADAMS: How do they validate it?

MS. BRIGGS: What? The certificate?

MR. MCCORMICK: Think of it as sending your remote control signal and the TV validates that you want to go to this channel. It doesn't store that information.

DR. RAJKUMAR: Your browser, for example, has
built in identity information from VeriSign, for example. So this device, DSRC, would have the identity of the certification manager, CME.

DR. ADAMS: Okay. So that's the interoperability again.

DR. RAJKUMAR: Yes, yes. What John was saying earlier that there is going to be a private entity managing this, there is going to be a public entity, or a combination. That's the question that the DOT faces.

DR. ADAMS: Or the vendors.

MR. MCCORMICK: Or neither.

DR. ADAMS: Or neither.

MR. MCCORMICK: Or something else. Certificate management entities are the huge problem. That's where the huge cost comes in, and I think that's the thing that we need to revisit and provide some different thinking around.

DR. ADAMS: Well, we would need this certificate management even if we weren't so concerned about all this privacy.

MR. MCCORMICK: It doesn't require building in people --

DR. ADAMS: That's right.
(Simultaneous speaking.)

MS. ROW: It's a trust issue, you know. Steve had to leave, but Steve is going to be communicating with John's vehicles, and there are different makes and models of vehicles communicating with Roger's equipment as a Tier One supplier, and they've got to be able to trust that each other have a valid message and that they can continue to read each other's ten-times-a-second messages.

DR. ADAMS: Right. But you want to keep al-Qaeda and the 14-year-olds out.

MS. BRIGGS: And that's the other part of it.

(Simultaneous speaking.)

MS. BRIGGS: So it's our goal to be advancing the bar in transportation safety and security. It's not our goal to be advancing the bar in cyber security. All right. That's a good point.

(Simultaneous speaking.)

MS. BRIGGS: So let's go to the next slide.

So this is one that you all probably know a lot about. We have looked at all sorts of different communications capabilities, WiMAX, satellite radio, all sorts of different communications capabilities, but continue
to come back to these three, cellular, wi-fi, and DSRC, being the most plausible and really cellular and DSRC being the most plausible. But we're not throwing out wi-fi, and I'll tell you why in just a minute.

For the security communications, cellular, the problem with cellular -- the good thing about cellular, it's out there, really out there. And the problem with cellular is it's made for point-to-point communications, as opposed to broadcast communications. And my understanding is that that makes it much more inefficient to do some of the communications needs that we have, also requires IP addressing. So, again, that goes back to you have a way to identify that device on the vehicle again, and we're trying to avoid that. And so there are those two problems with cellular. The auto companies and their security experts are looking at whether those are things that can be addressed.

The wi-fi. It is a potential because many people park in garages that might have wi-fi, and you may be able to download certificates from that. But, again, that would be a pull mechanism, rather than a push. Wi-fi is not ubiquitous across the transportation system. It couldn't be used alone for security.
DSRC, of course, is the other thing we're looking at. Because we need DSRC for many of the other applications, it doesn't make sense to piggyback the security communications on a DSRC base. And, of course, the problem with DSRC is that it's not out there. And so we'd have to have a DSRC network in place to use it. Yes?

DR. KLEIN: I was talking to a bunch of cell phone people at ITS America on the exhibit floor, and they were telling me all the ways they could trace me based on my cell phone. I was actually unaware that my Bluetooth feature gives off a little MAC address wherever I go. Maybe you didn't know either. So if I say I've got a certain level of privacy when I'm driving in my car right now, and it might be much lower than I know, but that's the baseline. If we didn't implement security on DSRC, I would, in fact, drop below that very low baseline, or would I just match that baseline? Because I already don't have privacy.

So if you give me super privacy, my phone will still --

MS. BRIGGS: You don't have privacy because you choose to carry a cell phone and you have signed an agreement and checked the box that says it's okay for my cell phone company to track me. And so you basically opted
to give away your privacy, whereas the problem here is if it's something that's mandated on every vehicle then it becomes a whole different issue than something that you basically opted to allow people to track --

DR. KLEIN: Okay. So the government mandate is a big issue. But let's say, I mean, hypothetically, this system would work with 60-percent penetration and 60 percent of the driving population would give away their privacy because they know they already did it over there, and we could avoid this complex certificate issues, would that --

MR. BELCHER: No, because there's two issues. There's the privacy and there's security.

DR. KLEIN: So security comes in.

MS. BRIGGS: Security does come in.

DR. KLEIN: Security comes in. Especially if we get into automated vehicles, we're all terrified of security. Initial DSRC does not have an automation that's information --

MS. BRIGGS: Well, that's not our focus right now.

DR. KLEIN: But we have a pathway for automation.
MS. ROW: But I think there's another piece of this, and I'm not sure that we've completely communicated. So let's say there's three parts to this security conversation. There's a privacy component, there's a hacking/cyber security component, there's a trusted network component, and that's the one that I don't think we're getting a complete picture on here. That is, actually, the one that we are -- Privacy is probably going to be a cost/benefit, what's an acceptable kind of a tradeoff? But the trusted network for the automotive industry to function within and a traffic signal, by the way, to function within has to be established. And that doesn't have anything to do with privacy. If we had no privacy issue at all, we still have to have a trusted security network for all of these people to work and play in. So that's the piece that, you know, you have to understand that part, too.

MR. SCHROMSKY: It's almost like a credit card network. You're creating, trust between merchants and suppliers and --

MR. MCCORMICK: Except your there's a number changes.

MR. SCHROMSKY: But, I mean, the same concept.
MS. BRIGGS: So I wanted to acknowledge our team here. We really are multimodal, and, actually, Bob Arnold is leading this part of the project. Do you want to say anything, Bob? He didn't know what he was getting into.

Okay. Next slide. So we're having our contractors look at various scenarios of how you can combine communications capability to suit various needs. And they're looking at the technical aspect: what would it take to build out a network using these capabilities or to leverage existing networks, what would be the costs?

And they're also looking at potential business models. Now we are going to -- this is -- I have got my contractors looking at potential business models. We've got to start somewhere. And so we're looking at potential business models of what are ways to do this, and this is just one scenario we're having them look at. We've already said the DSRC is necessary for the active safety application, so all of them use DSRC for the V2V and V2I communications. We're having them look at a scenario that uses cellular for the others, assuming there's no DSRC used for certificate management or for the mobility needs for the system: what does that look like? And so that's one
Another scenario is you take advantage of whatever is out there scenario. So this is, again, using DSRC for the safety apps but using cellular or DSRC for the mobility apps, meaning you can take advantage of either. And then using whatever is available for the certificate management, and this is where Wi-Fi might come in. You know, you could use your garage or you could have various others used for the certificate management functions. Next slide

MR. STEENMAN: Whatever is their refresh rate really determines all of this, right? Because if the refresh rate is only once a day then it's easier to solve than when it's like every half hour.

MS. BRIGGS: And that is how it all becomes so iterative. I mean, because you can make various assumptions and you can do analysis and modeling around those.

MR. STEENMAN: You get a bit of the cost because the more certificates you need to store the more storage you need to have in the car, which makes the system more expensive.

MS. BRIGGS: Yes. So we are making some
assumptions and doing some cost analysis.

MR. STEENMAN: I mean, I like the idea of certificates like stored on servers. I think it would be great.

MS. BRIGGS: So then the third scenario is an all-DSRC scenario. What would that look like? And so that's what we're looking at, this analysis, and we're looking at the technical aspects, cost modeling, and what might be potential business models.

So this slide just tells, you know, kind of what we're doing. We're exploring private and hybrid models, primarily. I don't think I put in here the slide that says -- oh, that's in the next presentation. We are focusing on private and hybrid models because I think all of you who are in state and local government realize, you know, the situation that the government is in and the likelihood of the government running something like this. And so we're focusing our research efforts on, you know, what are some of the private sector or public/private models. We're evaluating the technical aspects, as well as the costs, of these models.

CHAIR DENARO: And when you say you're
evaluating, what you mean is you've got contractors working on doing a study?

MS. BRIGGS: Yes, yes, we have contractors working on a study.

CHAIR DENARO: When will this kind of information be available? What's the rough schedule?

MS. BRIGGS: Good question. This fall. The results are all due in the September time frame. We're planning a late September public workshop, so we should be able to announce the results --

MR. MCCORMICK: Is that going to be made available to the --

MS. BRIGGS: Oh, yes, absolutely.

MR. STEENMAN: I want to go back to that one question I asked earlier about without was involved. I just want to make sure that you have the best and the brightest in the industry involved. Like, incidentally, I was at Stanford University two weeks ago, and I was talking to the security expert, and he brought this subject up. And he said, "I have all kinds of creative ideas." He's their, like, encryption security guy. And so I was just, like, do we have like academia, like the best and the brightest
involved maybe, to your point, to solve the problem differently, instead of using something that we just --

MS. BRIGGS: Well, you know, I would like to say I hope so. I certainly hope we have some of the best and brightest involved. We are government and government contracting themes and requirements, so, you know, we have access to who we have access to, to some degree. But we, you know, that is a challenge, but we do have a number of experts involved in this, many of them working through the auto companies on looking at this issue.

MR. SCHAGRIN: We always could use more eyes on the problem, and so one of the things we do want to do is have what I call independent or peer review of what we're trying to do. So if, for example, you have experts in this field that you think would be able to contribute to making it a more practical and, you know, employable solution that meets the requirements, that would be helpful, very helpful.

MR. STEENMAN: That's definitely something --

CHAIR DENARO: Well, let me just say a process item that one of the methods we can use as a committee is we can form into subcommittees and look at these things and so forth. We can call in experts ourselves and have them talk
to us or together with JPO or whatever, but if we can look
at the list that they've got and say, well, between us,
we've got some other ideas. If we want to call an expert,
have a review, have a briefing and a review and so forth, we
can do that.

MS. ROW: One thing that, and this is one of the
reasons that we wanted to tee this subject up for all of you
is because we struggle with how to even tackle this because
we are the government. We do have certain contracting
requirements that we have to go through to hire people to
support us in these areas. It doesn't always lend itself to
going exactly who we'd love to have because also, if we go
do what we call a full and open competition, it takes six
months or something to get a contract out the door. So it
then pushes us into some of the contractual ranges that we
already have in place, so we may or may not be able to get
exactly what we want.

The other thing is that inherently in this work,
as Valerie was saying, you know, there are so many options,
permutations, and combinations of how it might balance in
terms of how much communication is there, how frequently are
things updated. And there's so many different options,
we're not sure that we are going to ultimately be the ones to solve it. It's more likely to be whomever it is that might, in fact, will not operate it, that they are probably going to be in a much better place to understand how to make those tradeoffs from a business perspective.

MR. STEENMAN: Yes, and that's a whole different issue from the technology again, right?

MS. ROW: Yes.

MR. ARNOLD: There may be technology out there that is on the horizon we just don't know about. I think that part of this exercise is to find a path that works. It might not ultimately be the path used, but we know there's at least one way to do it.

MS. ROW: And so, consequently, because we're the government, we're not well suited to, you know, even sort some of this stuff out. So this is another area that you all can think about if it's --

MR. STEENMAN: As I asked, I think, earlier, is the DoD and the NSA involved? I mean, they have like some of the best security experts in the world.

MR. MCCORMICK: Some of the contractors, like William White, has a crypto analysis. They do a lot of that
work for the DoD.

MR. SCHROMSKY: Solving security I think is the encryption. The operation is really where the day-to-day. I mean, I've got visions of the D block all over again because, seriously, that was one of the big challenges, right? Who was going to maintain this and build this network, and nobody bid on the spectrum because they didn't want regulation. There was no guaranteed customer base. There was no funding. There was only a million -- but there's got to be this private/public partnership. That's the only way it's going to work. I mean, I also think that if you did come up with security, you solve that problem of who's doing the accreditation that validates, whether maintaining that is being -- you know, I envision almost like an NCIC and CJIS kind of aspect, if you're familiar with the Criminal Justice Information System and background checks and everything else. They do an accreditation to all the states to make sure they're compliant, but that's a government-run facility. That's not doing the day-to-day stuff, but it's doing accreditation.

MS. BRIGGS: You should read our paper. We have a lot of that in there.
MR. MCCORMICK: And there's questions that have come up just as recently as a couple of weeks ago. It took Germany several years to get Google to show them what they actually harvested when they drive through. They're not just taking pictures of the property. They're harvesting emails and text messages and passwords and credit card information. So there's always an issue that when you put in a system a management agency and an ability to harvest that information, there's always the question of whether or not that could be abused, not whether or not that's the intent.

MS. BRIGGS: And that's something I didn't go into. The other project that we're doing right now is really looking at the structure of that certificate management entity and how you divide out all those functions so that you can't combine the information, and that's the other aspect that turns out to be somewhat complicated and different than the systems out there today.

MS. ROW: And that paper is in there, too.

MS. BRIGGS: It is. They're both in there. So I wanted to introduce Dana. Dana is from NHTSA, and Dana is a legal counsel from NHTSA, and she's been leading our legal
team that's looking at all of these issues from a legal standpoint, and it's a team of lawyers across the department.

    MS. SADE: Lawyers and policy experts.
    MS. BRIGGS: That's true.
    MS. SADE: It's legal policy, so we've got terrific lawyers and also seasoned policy experts from all the modes and from OSD.
    MS. BRIGGS: So we're glad she could make it. Feel free to ask her questions, too.
    MS. ROW: And so one final thing before we move on from this, just so, again, so you all are aware, in order for NHTSA to make an agency decision in 2013, this has to be doable, this security system. So to Bob's point, we have to know that there is some way to do this in the same time line that we're doing all the technical work with the vehicles. So, you know, we've got to be able to see a way forward and actually, in fact, NHTSA needs to be able to reasonably quantify the cost of it because that will go into their cost-benefit analysis that they have to do for the vehicle side, and that factors into their decision making. So that's why this has become the big focal point for so much
of our activity, someone called it the mountain that we're
trying to climb, because it's on the same time line as all
the other work.

MS. BRIGGS: And it started a lot later.

MS. ROW: And it started later.

MR. KISSINGER: Can you just expand on the last
bullet a little bit? I mean, a little bit --

MS. BRIGGS: Yes.

MR. KISSINGER: -- how much --

MS. BRIGGS: Sure.

MR. KISSINGER: -- is in all these uncertainties?

How much can you test in the field?

MS. BRIGGS: They are testing the system, a
prototype system, that's based on a PKI system. It is, I
think they're testing both DSRC and cellular for
communications, and they're looking at what protocol, what
processes, how many servers, what do you need to do it, and
what lessons learned can you get from standing up a certain
security entity for the model deployment.

MR. MCCORMICK: You have a listener up there on
the program, don't you? You have a listener on the roadway
to see what they can harvest?
DR. RAJKUMAR: Valerie, a quick question. I understand the message signing process for the certificate. Can you say how the revocation process is expected to work?

MS. BRIGGS: That's a very good question, and I think that's one of the most unclear parts of it. And, you know, frankly, I don't know that I can say a lot more about it. We know that we think it's necessary because, you know, you'd need to be able to get bad actors off the system. But how it works, you know, we're not sure yet.

DR. RAJKUMAR: I see.

MS. ROW: And that's an area, too, all of this, we can bring in other people. If this becomes an area of interest for the committee, then we can bring in other people who've done the actual technical analysis, who've looked at it at several more layers down. Happy to do that.

MR. MCCORMICK: It's an embedded three-character field that, if a broadcast goes out to say, you know, destroy any sequence carrying these codes in this field, then it just wipes them out.

DR. RAJKUMAR: I understand the end result. I want to know how one gets to that step.

MR. MCCORMICK: It's broadcast, and that's part
of the reason when they get into talking about infrastructure why you, at some point, have to have infrastructure because somebody may not, somebody doing something to violate the system, intentional or unintentional, is doing it while they're traveling. They're not sitting in their garage doing it. So part of the question is I have to have some mechanism either in my codes to recognize it as an invalid code or pass an infrastructure to do it. Either way works.

DR. RAJKUMAR: Yes. I believe we need to have a subcommittee to look at the details.

MR. WEBB: But as part of this system, and I think heard, Shelley, you say it, if we find a track that can show that it would work, but I think I've heard the car companies talk and say this thing needs to be in place at the same time we're rolling out.

MS. ROW: It does or a migratable system.

MS. BRIGGS: That is something that we'll talk a little bit more about.

MR. WEBB: I understand. I just want to put on the table simply because that track, though, then has to be somebody's determination cost affordable. You can develop a
track and say, yes, we can do this for $10 billion and run it for a billion dollars a year; it's doable. But the idea is then is it feasible is another question.

MS. ROW: Right. And I think I probably overstated because I don't want to step on what NHTSA is going to be doing, but, yes, we do need to know that there's a way forward, but I think we need to -- what's that? Yes.

MS. BRIGGS: Okay. That's it for this.

CHAIR DENARO: Thanks, Valerie.

MR. STEUDLE: I have a general comment about this whole piece, and it kind of gets to your open discussion at the end, and I'll keep it on my notes. But there was a statement earlier that Shelley made that said, you know, they were learning as the last committee was even writing. And it appears to me that this issue is so urgent it can't wait until we write a report two years from now, that it does need this subcommittee to bring in those additional experts that you all know who they are. I would suggest that that's probably an early action item and bring them in soon because 2013 is getting here, and you need to make a decision.

MR. MCCORMICK: Why? Do we need to wait until
the end of the two years? We can give these periodic
recommendations --

CHAIR DENARO: Yes, yes. I mean, we're engaging
with the JPO. They can farm, if you will, you know, mine
what we're saying along the way, earlier than we publish a
formal memo at the end. We may end up saying in our final
memo that we're gratified that a lot of these things are
already underway based on our deliberations that are going
on, and that's fine.

But, no, you make a good point. I don't think
it's only the security issue, given the decision in 2013,
which is kind of before the end of our -- I think there's a
lot you can and should do prior to that point to help that.

MR. STEUDLE: Yes. In this last discussion,
somebody said about additional experts looking at it. It
would seem like a small group --

CHAIR DENARO: Yes, yes, yes.

MR. STEUDLE: -- here's our broader vision.

CHAIR DENARO: So one thing we want to discuss at
the end is, as we said, how we're going to organize in a
timeline. I'm kind of a fan of saying, okay, if we want to
think about six meetings or whatever, what do we think we're
getting done at each one? What's our milestone schedule, if you will? And if we've got a couple of, you know, hard points, like a 2013 decision, we may want to put that in place as a milestone and back up from there saying what does that imply about our meetings leading up to that?

Brian, you up?

MR. CRONIN: This is the rest of the program in some short amount of time. I don't know, let's say five minutes or less. So --

CHAIR DENARO: That's about four seconds a slide.

MR. CRONIN: Next slide. We're going to talk to V2I, and we have both safety elements and mobility and weather and environment sort of all dealing with this V2I world. And so on the right side --

CHAIR DENARO: Let me just interrupt. Can you put it into perspective for us? Because you've got some priorities and sequencing of your program, V2V and V2I, can you give us that topdown just so that we understand where this will fall and how and when?

MR. CRONIN: So we're working on it now in this same time. I actually have a slide on that at the end of this. But V2V, first, and we made some funding decisions,
like pushing the safety pilot, and kind of altered some of
this. But, actually, that's a very big question of we
probably can't slow too much, and so that's one of the
things we'll talk about. But running in parallel there's
various resources.

So on the right side, we've been talking this
morning and the first half of the afternoon about V2V, about
data flowing to DSRC. And there's the basic safety message,
but SAE has also created this J 2735 message that has a
whole bunch of other data that's presumably available on
vehicles, and I say presumably available because how we
define available I think is important.

So that data could be there. It's not there in
all vehicles yet, but there's data that would be core to
enabling the safety applications. There's some part two
data that might come when triggered, there's some additional
data. But there's all kinds of other data on vehicles that
might be available. And so the program has been operating
in this environment about, if we can get access to that
data, we might be able to manage the transportation system
more effectively from an operator perspective, or the
cell.
way from the private sector. So we had data from vehicles, and then there's, wait, we have communications to travelers all the time so we can start sending them messages like you've got parking spaces available; or, hey, you drive 35 instead of 55, it actually will get more capacity out of this system; or there's fog ahead; or your train is coming in five minutes; or all these safety applications. So we're fundamentally balancing infrastructure messages and data messages and how do we use this, how do we pay for it, what do we need?

So just think about that as we go. So Mike had the number about 80 percent for safety and the types of accidents we can do, and we're working hard to try to figure out. And Greg was asked by the press this week what is that number around mobility and V2I safety, and the problem is there's a lot of numbers, and so we really can't put it into one.

So the safety line is the number of accidents and crashes. That's fact. That's based on the data we collect and so forth. And so the second slide, the bullets in the back, are we've looked at intersection crashes, we've looked at runoff road crashes, we've looked at different things
like that. And that is our sort of sum of the information we have there.

On the mobility part, so from the TTI study, that's the information we get on the way and congestion. The other bullets under that are simulation analysis we're starting to get at, starting to look at the opportunity. So the first one is cooperative adaptive cruise control. We talked earlier, I think this group over here during lunch was saying, you know, if we had automated vehicles running on freeway lanes, that's facing like this. All of a sudden, the capacity of the freeway has expanded tremendously. Well, cooperative adaptive cruise control looks at using connected vehicle technology and your cruise control to do that. And so we could do that, and so we're looking at that application.

We're looking at things like signal system improvements both from transit authority, emergency vehicles, and just better signal control and see how we can reduce the delay at intersections. Things like transit connection, if we have better enhanced communication. Transit already communicates with their vehicles. They already have that, but they have bandwidth constraints, they
have issues, they can't always communicate with their travelers. How do we connect that further?

Incident response, freight delivery. How do we reduce deadhead truck delivery? How do we improve information to freight operators so they have shorter trips, less time? Weather: how do we have to put less salt on the roads? Global warming may solve that, but what can we do? Steve, how do we get better information in the rural areas?

And then environment. So there are a lot of things we can do on reducing fuel use. Ecodriving. How do you get reduced idling at intersections if you had better information on you're going to be sitting there for two minutes, which, hopefully, you won't be doing. But that's kind of the things we're working on, trying to put that into a succinct message that we can deliver that talks about why we need infrastructure and what type.

MR. LAMAGNA: Do you have a goal where we can eke out X percentage of efficiencies to be adequate for all this?

MR. CRONIN: So that's one of the things we're looking at. We don't have the same kind of data that we have in sort of the safety data sets. Just to fundamentally
say that, nationwide. So as we talk about V2I, I wanted to put up sort of some of the assumptions we've been looking at in the program and some of the questions. We can talk about this for two hours if you want, but I think some of these things will be some of the things we talk about or you guys choose to talk about in the afternoon.

We've been assuming that vehicles have DSRC at some point in life and that penetration rates would climb and vary over a 20-year time to refresh the vehicle fleet. However, there are cell phone-based applications out there now that are improving the travel experience. Now, whether those cell phone-based applications are helping the State of Michigan operate their transportation network or Joe operate his transit fleet more effectively, a little bit but maybe not as much as we think we could do if you have a connected vehicle environment. But they're coming in. They're increasing. There's a lot more going on there, and we definitely can leverage that.

We have a connected vehicle core system architecture, which I don't want to do a whole course about that. But that is guiding a lot of our connected vehicle work and how we think this rolls out.
So some of the questions is where do we need DSRC? Where do we need the technical capability of that versus let's just use cellular or another infrastructure. How would the benefits equation change as penetration rates of infrastructure or vehicles with different kinds of communications capabilities change and evolve? How would a cellular-based solution actually improve to a public sector agency if the cellular solution is really a customer that's in my cell phone provider?

We haven't done a lot of work. There was a comment earlier about networks, and so there is a DSRC-based network and then there's this cellular network. Where and how do they merge, and what does that change in terms of the business relationship? So there are issues there. Yes?

DR. KLEIN: This is kind of on a previous slide, but the vehicle data, this is an absolutely strict legal question: who owns that data according to a court of law?

MS. SADE: The answer is that we don't have an answer right now. The best example I can give you is NHTSA's EDR rulemaking, our black box rulemaking. We did not make a determination from a legal perspective in that rulemaking about who owns the data on the box. Various
states have regulated in that area that it's the individual
who owns the car at the time an accident occurs.

But, you know, it's funny, we were just meeting
with the auto companies this morning and talking about, this
is one of the issues that kind of was on the table. And I
think it's going to depend on a lot of different factors.
It's something that we might weigh in on, we, NHTSA, if we
decide to a rulemaking. It will be dependent on state law.

It's also something that the federal government, you know,
Congress has been very interested in lately, privacy, you
know, who owns data. And I think really, a lot of it is
going to depend on, you know, A, whether the Hill legislates
in this area; B, who ends up owning the system, you know;
and just kind of how the whole system evolves.

So the short answer is there's not an answer, and
that's one of the policy areas that we're going to be and
have actually started already really going into. It's a
little bit further down the road than what we're working
right now. But it's really complicated.

MR. MCCORMICK: I mean, there's more than one
piece of legislation on the Hill right now about privacy,
and they're written by legislators, litigators, and the
consumer privacy advocates. And my analogy is that if I buy a TV that comes with a remote and I change my channels and I don't want the guy I bought the TV from or my wife or the government to know what channels I'm watching, that doesn't necessarily give me the rights to that piece of information that's being beamed out of there because a lot of that is IP and the company. There are over 42 networks in the average car, over 200 sensors. Much of the data, and if you took a typical vehicle running for a year, it generates an X amount of data. The X amount of data that has almost none of it is personally attributable or, rightly, the ownership of the individual because that's IP that the Tier Ones and the automakers have in order to drive your control and the operating systems.

So the first question that has to be asked that I have yet to see asked yet is which pieces of data are we talking about? The little bit of answer that I get out of anybody studying the question is that it comes back to me as, well, you're not talking about data then, you're talking about metadata. I'm talking about --

MS. SADE: When we're talking about the data, when you're talking about what the suppliers and the auto
companies own, they own the IP and the software. They don't necessarily own, you know, own the data that's being collected. I mean, the auto companies have taken the position, many of the auto companies have taken the position that it is their data that's generated, but I think that that's, you know, that's really not legally viable.

MR. MCCORMICK: Providing there's any of the other answers that haven't been focused.

MR. BELCHER: Well, let's ask it maybe a little bit more simply, and maybe, John or Roger, you guys can help. The basic data that comes off of the OBD port when you take your car to a service station, who owns that data from your perspective?

MR. CAPP: I don't think that we know.

MR. BELCHER: You don't know?

MR. CAPP: No.

MS. SADE: And it may be that the, consumer that's, you know, purchasing the vehicle has entered into a contract to give up rights to the data. For example, OnStar data, you know, there was that whole issue. That's because the contract in accepting the service agreement, the consumer was giving up rights to the data. I think that a
lot of these issues, in the context of services and apps, you know, you give rights away to the developer. I think in the context of this system, it really hasn't fleshed out.

MR. BELCHER: And what about as, I mean, there are an increasing number of apps that have been developed to pull data off of the vehicle. And this is being done in a vacuum? I mean, there aren’t fights going on between the OEMs or the Tier One providers and the app developers and the consumers that are using this data or pulling it off of the vehicles?

MR. MCCORMICK: Depending on how you get it off may invalidate your warranty.

MR. CAPP: Well, it's still happening, though. I mean, we're not necessarily providing open access to the vehicle systems, you know, keys to how the software and things work, to anybody else to write apps. Because of these issues and others, all kinds of things can go wrong.

MS. ROW: So one thing that you guys, as Brian proceeds through his discussion here about mobility and other applications and now that Dana is here, too, keep in mind that if we look at the V2V applications, there's a certain set of data that is needed to do those safety
applications. If NHTSA were to choose to pursue a regulatory path, they would be looking at some amount of data that's necessary for that. But there's a whole lot of other data that is not part of what NHTSA would be doing because they only have the authority to look at safety situations, right? But so while Brian is going to be talking about all this other data and all these other applications, it's not necessarily that we, the government, are going to be enabling all of that stuff to just magically appear.

MS. SADE: I think it's important just to point out that NHTSA's authority is based on certain statutory language that has to do with regulation of motor vehicle equipment. And, you know, the language, as it applies to a lot of these kind of developing technologies, ends up with some fairly interesting results such that, you know, for example, you were talking about apps that pull data off the car. There are also apps that send information and communicate with the car that interact with the systems, like turn on your car remotely or unlock it.

Our position is that we have the authority to regulate those apps because they're there, and that's not to
say we'll necessarily do that but it's within the four corners of what we're allowed to regulate. And I think, Shelley, when we talked about the message with the regulatory authorities -- I'm not one, by the way. I'm a general person. You know, they did take the position that, pretty broadly, what is communicating into the vehicle and the onboard equipment and out, a lot of that would be covered. So I think that --

MR. STEENMAN: Would it stand up in court if we'd be challenged?

MS. SADE: I think that we don't move forward unless everyone, you know, Justice and OSD is happy with it. I think it probably would. You know, it all has to do with a very narrow definition or, you know, a very specific definition of what motor vehicle equipment is.

MR. STEENMAN: It's going to be an interesting field, and it will probably move around a lot over the next several decades --

MS. SADE: Yes, you know, and --

MR. STEENMAN: -- as devices get brought in and the cars get integrated, they have apps, they collect data, collect data from the car, what's regulated and what's not,
and what's the ownership of the owner of the car and the
citizen and what's not.

MS. SADE: Interesting. Interesting way to
characterize it and, you know, challenging qualities from a
regulatory standpoint.

DR. KLEIN: Right. But to get some systems to
fully realize their benefits, including their public
benefits, you want the network to be interconnected so data
exchange can take place, and you want the crucial data
that's being, wherever it is on the system, to be freely
shared and then, boom, you've got a functioning system. But
different entities own or control or regulate different
aspects of the system, and they might feel that it's not at
all in their interest to interconnect or not in their
interest to share the data, even though it might be in the
public interest to do so.

MR. HOLTZMAN: It seems to me that you have a
vacuum here where you need a lot of, there are a lot of
unanswered questions on these legal issues. And someone has
got to do that and really bring something to our table, as
counsel for DOT or somebody, because we're going to be
sitting behind the time line if we don't have something in
advance. You've got to take your what-ifs, what if, what if, what if, and provide some answers. There's no answer as close as you can to what might be a cogent legal thing.

MR. MCCORMICK: Well, part of the problem is it's exacerbated by the fact that the automakers are polarized in terms of what they believe and their native policy versus another company.

MR. HOLTZMAN: That's another issue to take up.

MR. MCCORMICK: So you don't get consensus out of that critical industry, so, I mean, that's difficult.

MR. HOLTZMAN: Good point.

MR. CRONIN: Let's go to the next slide. This is illustrative, and so it's not based on any facts at the moment, but it's not so far off.

You have a graph showing the bottom line is a potential V2V curve. 2018, NHTSA has done something, and all of a sudden there's vehicles doing safety with DSRC. And it starts with the new car fleet and maybe it bumps up as aftermarket kicks in. So it's trying to show sort of how you accumulate benefits from a safety perspective.

Now, let's say we're talking about V2I here. So if there's vehicles floating around and they're not
interacting with other vehicles but they drive past an intersection every day, there's some benefit both from a safety or a mobility perspective that we can start to accrue. So how do we handle that infrastructure line, and what do we need? And so some of the things are do we need DSRC, do we need cellular?

So let me paint a picture. Joe and 20 of his other transit properties across the country say I want to put in new VRT lines and I'm going to include transit signal priority, connection protection to do bus transit light rail connections. I'm going to use, in that case, Smart Starts program, and now maybe I forget how big it is, but 25 million or so a property, maybe ten a year can actually get access to that. And so that's going to paint a picture of how you get some infrastructure in place for transit.

Paula is successful with Oregon and Nevada and is doing a mileage-based user fee and decides she wants DSRC points across those states to get that information flow, to get that data about how many miles. You have some infrastructure. George says I've going to upgrade my traffic signal control system now because I want to keep up 90 percent of your effectiveness, and so you've upgraded
your signal system. And Kirk says, well, you know, the
trucks, I've got to do my inspections, so I'm going to
enhance my Smart Roadside, I'm going to look at my border
crossing with Canada and do some stuff at the bridges there.
And so that's going to be one infrastructure build-up
model, and that's using existing resources maybe.

Ton says, you know, if I've got this DSRC data,
you know, I might make a business out of this, and I'm just
going to stick DSRC units all over the country. I don't
know how much that costs, but you're a large company and
maybe you'll find a need. But you say I'm going to do DSRC,
so I'm going to stick that all out there and maybe that
happens overnight and maybe five years. Or Brian says, you
know, you don't actually need DSRC for all those
applications, and Verizon can do this today. That's the
conundrum we're in, and we're trying to figure out where do
we need DSRC, how do we get it out there, what are some of
the market forces? So that's what I'm trying to show there.

MR. CALABRESE: Even for vehicles, the cars have
to be receivers.

MR. CRONIN: So you need cars, and that needs to
come up, but you need infrastructure, too.
MR. CALABRESE: Yes. The infrastructure could be the quicker point, but if it's not in the cars to transmit that you still have no system.

MR. CRONIN: Right. And so you've maybe put it in because you're going to communicate with buses. So there's some issues there of timing and how do we improve benefits and how do we make all this happen.

So this is the core system architecture, the V2V world. It goes with this piece and coming in to here for security. And the whole rest of the picture starts to deal with everything else, and that's it for the core system architecture. But I wanted to throw it out there because it's a big piece of work that we've been doing.

So we have a V2I safety program. There's a big track on enabling technology and communication systems, communications positioning. The major thing we've been working with is signal phase and timing. This is connecting in with your traffic signal and putting out what is the signal: green, yellow, red, how much time before it changes.

That will enable safety applications, mobility applications, environmental applications. That's why we went to the high priority message for us. And then
developing sort of the prototype roadside equipment that would enable this sort of work, and it's in the safety program but it's crosscutting.

Then we're looking at different applications, so we've been working with AASHTO, we've been working with the transit industry, with the trucking industry, and created a variety of applications that are of high interest and potentially high value on that work. And so we're working on developing those different applications with the concepts of operations. Then we look into prototype testing and development and then creating the implementation guidance, the standards, the functional specifications, this sort of thing to actually implement and do.

MS. HAMMOND: Well, I was just going to comment that with the big issue for state and local agencies is that, as Congress is on its what? Ninth or tenth extension of re-authorization, no hope for future additional funding, how we take care of the assets we have and then think to the future about our ability to put these kinds of things on the infrastructure is really going to be a big challenge and a tradeoff. So the more we keep the money issue and the investment issue for infrastructure in our minds I think the
better.

MR. CRONIN: That's one of the reasons why we're trying to figure out where do we need DSRC versus we could just use cellular or something like that. But I also think it's easy to say just use cellular. It's not clear to me that it's as simple as my phone. There's a lot more going on there.

MS. ROW: One of the things that would be particularly helpful for us to help you is to understand the kinds of things that you'll need to know to take into account so that you can make investment decisions. So we do the best we can to get the information that we think a public agency would need. So if you can help us understand how you made that investment decision, then we'll work it from that side.

MR. CRONIN: So at the end of this summer, we should have concepts of operations and some requirements that will help us understand how these different kind of applications are going to work, what data they actually need, and sort of how they need to be, how the communication needs to work.

DR. ALBERT: Question, Brian? I'm surprised that
road departure or lane departure isn't one of the big areas.

MR. CRONIN: And that's the curve speed warning but --

MS. ROW: But that's a good point, though. To make that work, you'd have to put in infrastructure. So where would you choose to do that? How would you make that decision? Traffic signals are the easier one to conceptualize, but where would you choose to, in the middle of a rural area, put in a --

DR. ALBERT: Hot spots.

MS. ROW: Yes.

MR. STEUDLE: That's been the conversation on the infrastructure side is hot spots where there's known --

MS. ROW: Known problems.

MR. STEUDLE: -- known problems, you know, just a spot out in the middle of rural wherever.

MS. ROW: Yes, an electronic rumble strip.

MR. STEUDLE: We're working on wireless.

MR. CRONIN: So these are just pictures of some of the applications. I think I'll just go through this quick, and we'll look at it later. But there's roadside
infrastructure, and it has to communicate. So this is the big message in the infrastructure because you need additional hardware out there, and so how do we do that? This is a stop sign. That’s another one.

So to kind of wrap up this V2I safety, a couple of the big things, what specific DSRC-based applications do we need in order to benefit and when and how does that accrue, given we’re not going to go out and, overnight, have every intersection equipped with DSRC. So what are the hot spots? What are the ones that are needed?

We have good information that we can work with the states and others, so I’m trying to pull that together. So we’re working on that.

We talked a little bit about this morning: How do we cost effectively get absolute positioning for intersections? We’ve mentioned for V2V you need relative. So far the discussion for V2I-based intersection that you need absolute positioning, and so that’s more stringent. That’s potentially more costly, so how do we do that? Maybe we do leverage the cell tower network. And so we actually have some positioning work that we’re doing out of Turner-Fairbanks, and there will be more to come in trying to
figure out what do we need to do there.

We started talking about how equipment
installation would actually occur and where we really need
that. And so the question Shelley just asked is, you know,
what information do we need to help you decide to invest in
a DSRC infrastructure?

So on the mobility, it's a very similar
structured program as V2I safety in terms of what
applications do we need that are going to have value and
then prototyping them and deploying testing. The big part
up-front is we have a whole data program, and so this is
taking into account that there are existing sources of data
out there that sensors, radar, cameras, your cell phone that
are being used in various different ways and help with some
aspects of traffic management and transportation management.

We can't do everything, so how do we layer in connected
vehicle data to enhance that? So there's going to be a
whole huge thing about managing, storing, and using, and
just maintaining these large data sets and what do we need
to do. And so then we have a whole track then on the
applications that would use both the data and the
communications and what's the benefit from there and then
implementation guidance.

So we have specific resources towards weather-based applications and solutions and environment and just because of time I'm just not going to talk about all of that. But it's very similar.

So this is just some pictures that don't really show the applications but just to highlight we are working on freight-related applications. We're working on speed harmonization and cooperative cruise control kind of things, intersection applications, transit applications, incident management of safety-related. And then on the bottom left is enabling traveler information, so there's a lot of private sector travel information, companies and providers out there, we're not trying to step in and take over their business. We want to enable that, and so we're looking at what else do we need to do to help enable those kind of activities.

So I wanted to take a few minutes to talk about data and how critical it is and some of the key issues. And so this isn't the, I'm not a graphic artist, so the next few slides aren't the best showcase of graphics. And so there's one of the note slides of Mike's, the last slide of Mike's
presentation that we never really got to was a little bit more about the basic safety message and the safety message in general. There's part one, which Mike did: speed, heading, position. There are seven or eight different data elements that come through ten times a second. And then part two is if an event happens and you hit your anti-lock brake, that's going to generate some additional data. And so different applications might use that and it might trigger some other data every now and then into some of these messages.

And so the question is, from a mobility or V2I safety or AERIS, what data do we really need? And the reality is also we don't need it ten times a second, and if we collected it ten times a second I don't know that we have the data storage for that. But it's coming, I guess.

So let's talk a little bit about this. Let's take sort of the baseline and some I added to your slides. So today we have existing probes, existing data sources from GPS readers. You read the congestion report that just came out that supposedly we all have less congestion. I guess that's because less people are working is what they say, but supposedly I'm wasting less time in traffic.
some data from our sensors and systems that we have now.

Now, if we had the basic safety message and only communicating via DSRC, we can do some applications. Some of the mobility applications are actually V2V, this cruise control. We could identify the hot spots and do queue warning and do some other applications that would do stuff. Next slide.

Now, if we had the data in the basic safety message part two so that part two is only sent when something happens, so if nothing ever happens that data is not available. Let's say I wanted to know that my windshield wiper was on. I don't need to know that ten times a second, but I sure would like to know it's raining out all of a sudden or it's icy or various different things like that. And so there are various other applications that we can enable with this additional type of data. And if it's at DSRC and at a regular interval, maybe not ten times a second but once a minute or something like that, we could do that. And then, finally, if we had this data but all of a sudden now we're linked in and we can find a cellular solution to get that data off our vehicles, we think we can enable a variety of more applications.
So we need to look at sort of how we bring all that together, how we make that environment. So right now I can bring my cell phone into my 1998 car and I don't get much of anything because it doesn't connect and so forth. But in my 2012 car and I have Bluetooth that I can do this and I can get other data and information, maybe there's things I can do. But it's a little unclear. We were in a conversation yesterday, and I'm pretty certain the car companies said that the DSRC communications connection to that data is not the, well, I'm just going to say OnStar, but the cellular that a lot of cars are starting to have cellular built in, that's not necessarily connected to the same data network that we're connected to. And so it's not as simple as it's connected. They've got to do work, so there has to be a value to add that connection in. So we need to paint that picture and explain that value. Next slide.

So kind of summing it up is what specific data do we actually need? It's great that there's this laundry list of data elements that people said, wow, that would be great, but do we really need it and how do we justify the auto industry making it available and the public sector using it?
How often do we need it? What are going to be the benefits? How do we get it? Right now, one of the things, the basic safety message, there's no storage. It's just broadcast. It's not being stored on the vehicle. It's not really even being, you know, there's no storage in the vehicle, and we had to put infrastructure out there, and it could go to that and then someone could connect there and go to the cloud or go somewhere. But right now there is no storage of the basic safety message. So that would need to happen on vehicles if we wanted to send it out, you know, in a variety of ways. And so think of the cellular, too.

I put an infrastructure hot spot. I'm only getting the data in that 300-meter range. And so everything you did between the last time you passed and that time, I have no idea. And so were you stopped for 30 minutes on the freeway in that time? I don't really know. So there are some issues there. I think they meant how do we leverage in the fact that there is cellular out there, people are using it, people are sharing data. And so how do we leverage that?

MR. STEENMAN: But the key here is, it might be we
need to create a platform that you can innovate. I mean, when Apple came out with the iPhone, they had no idea what kind of applications people were going to come up with. They just created the platform and they created an ecosystem around it to go innovate on, and they just made stuff available. You don't have to sort all that out.

CHAIR DENARO: So what you want to do is, first of all, create the platform for access. Secondly, make the data available. And then maybe do some EPIs in there potentially, but, beyond that, let them figure out what they can do with it. Look at all the things that are being done with accelerometers on phones now that, you know --

MR. STEENMAN: The most creative stuff.

CHAIR DENARO: -- probably Apple never thought of that.

DR. KLEIN: You're totally cool with that? Let chaos reign on the vehicle.

MR. CAPP: Because I'm also cool with it when it's --

MR. SCHROMSKY: When OnStar pays a wholesale rate for connectivity, the business model has changed to a more usage model, at least for the costs. That's really what's
going to happen, so who's going to pay for all that data usage out there so you're actually starting to see the business model change again where app developers will start paying for the usage that you buy the app and that also includes the data. So the cellular networks can actually aggregate the data that's not being used with this app, if that makes sense. You can actually separate the two, but that's a big issue because, to your point before, every manufacturer in the world that I know of is putting some kind of cellular connectivity into a vehicle, whether it's automotive, truck, and all the carriers competing to put their technology in there now. The good thing is with LTE it will be a software-based radio to make it a little bit easier. But right now the build -- he's paying for it so where he makes money, concierge services and everything else, is the value add for them offering those services that give the diagnostic.

MR. CAPP: And so maybe Verizon is going to offer the free --

MR. SCHROMSKY: There you go.

MR. CRONIN: That helps the traveler. And then I think the question on top of that is then how does impact
for our public sector agencies who manage and operate the system?

MR. STEENMAN: I wasn't meaning that we create an open safety platform that would innovate on. If you expose the data somewhere in the car or in the infrastructure, and you can do it in the car today. There's a lot of innovation going on on secure partitions for kind of this type of innovation for consumers and vehicles that could not mess with your vehicle at all, or you could innovate in the infrastructure and then provide mobility applications.

MR. SCHROMSKY: On a positive note, there is precedence, for instance, recently with the CMAS commercial message alert system where all carriers opt in, that going back to your 511 earlier, Steve, is if there's a weather condition there's a way to broadcast from the cell sites to anybody in the general area that there's a tornado, a hurricane, whatever it may be. So there are mechanisms to actually do a broadcast. It has not, so you're not the pioneer when it comes to this. And that's really the FCC coming in almost like the Emergency Broadcasting System. So there are avenues. It just hasn't been updated because now there's so much more that you want to do, right? So when I
hear weather, I'm like you can do that today, right? So there's --

MS. ROW: You say so we can do that today, but the weather we're talking about is with the data coming from the vehicle.

MR. SCHROMSKY: Correct. But there's a way to broadcast, but there's a precedence there that's really doing it one way. It wouldn't take much to do it the other way. There's probably some privacy and some other issues, but, you know, there are mechanisms there.

MS. ROW: Particularly for the public sector folks, and I think anyone in the public sector who's here today probably understands this, but if we've got these messages for safety that are flying between the vehicles, as Brian said, they're not stored, they're just flying between the vehicles. So if Kirk wants to be able to use any of that data for mobility solutions, he's got to put something somewhere out here to suck the data up and then be able to figure out how to process it and all of that. So --

MR. STEUDLE: But it would seem to me that the value for us is those safety messages are going between cars. That's where it's got to be. We're going to see the
result then of, you know, them colliding or not colliding
with the backup that we're going to get from the rest of
them that are going to fill into the system. I don't know
that we would ever be in the middle of, okay, there's two
cars about ready to crash because that would make so many
roadside --

MR. MCCORMICK: And it really takes until you get
hopping so that when an incident occurs and it hops to
wherever that post is, every ten miles apart or something,
you know.

MR. WEBB: The basic safety message, there's two
parts, one and two, right?

MS. ROW: Right.

MR. WEBB: And so one is the core, you know, and
is that the part of discussion when NHTSA is going to look
at stuff and two becomes starting to be real optional, and
there won't be a regulatory potential decision regarding the
number two information? And then if you can even answer
this, are there anymore costs to separate one versus two or
combine that data coming out? So whether you send five
pieces of information or 25 pieces of information that
you're already collecting in the car anyway, it's no real
additional expense to the car companies --

MR. CAPP: -- message sets.

MR. WEBB: Yes, absolutely. Absolutely. As I just said, one, a message set, two or whatever. But I have the understanding that --

MR. CRONIN: Dana and Mike might answer better, but some of the safety applications use the part two data, yes.

MR. WEBB: Oh, they do? Okay.

MR. CRONIN: It's part of the process. But sort of from a mobility perspective, if you were going to say I've identified five pieces of that part two data that I'd like to have and none of the current triggers happen to get that data, then they're not flowing. But that data is still there and available. The question is what does available mean?

MS. SADE: And I also just want to point out that NHTSA's authority isn't necessarily limited to part one either. You know, it has to do with two things. One is it safety related, which clearly would be the highest. The other information is weather, etcetera. And, two, you know, the extent to which it's being sent out or received in the
car may also be a basis for encompassing that into the regulation.

MS. ROW: So one of the things, just to build on what Dana said, is one of the things that we're seeking to understand when Brian says what data do you need, and the "you" in that case particularly in our mind are public agencies. What data do you need to operate and manage your systems better, and is it already included in the basic safety message part one or part two or not? Because if we can't make a safety-related argument with NHTSA, that's where their authority lies, and so we would like to be able to know what it is that you think are going to be, quote, killer apps and what data elements that they would require, and are we going to have those data elements that you could even get access to somehow?

CHAIR DENARO: Right.

MR. CRONIN: So, Bob, this is more or less my last, I mean there's some other slides. Now, this is just another caveat here. I thought there might be a timing question issue, and it just so happens the VIIC put some slides together for a presentation they gave us yesterday, and so this was their slide. And so this is not NHTSA's
slide, this is not a definitive thing, but it does paint a picture, which is if NHTSA makes a decision in 2013 it's going to take some time, there's going to be some sort of processes. And if it's a positive direction of what the program is hoping for, then, at some point out there in '18, '19, '17, '20, somewhere around there, there's going to be vehicles with this equipment.

And so the question is in our V2I research, if we follow the path we're in right now, we're going to be prototyping and developing these V2I safety and mobility applications and weather applications, and we might have some prototypes, which you've done some testing on, done in the 2014 time frame. Now, these won't be prototypes that have been operationally tested. So a transit signal authority application, you could test that. You need one bus and one intersection. A freeway-based application that's relying on 40-percent penetration, you could test the communication works and some things, but you're never going to operationally test that in the very near term.

And so we're kind of dealing with that and what do we do. So we can do some prototype development and some application work, and so we're targeted on that, and we're
around the 2014 time frame. And then we have a decision: do we need to do pilot two, which is all the safety and mobility and kind of things and applications and so forth or not? And then even sort of before that is if we decide to go this sort of cellular solution, do we need to be building and prototyping all these DSRC-based applications?

And so that's sort of where we are right now. We're moving down the path. The mobility work is not predicated on DSRC, so we are looking at a variety of things and we're trying to figure out from all of our applications that we would build and test are ones that are in the public sector, so we're not doing all the private sector kinds of applications and so forth. But that's where we are.

MS. ROW: The other timing thing I would just point out on this slide, too, is if you're looking at, particularly in terms of the public sector folks, if you have any kind of infrastructure footprint at all, then for V2I safety application, like curve speed warning or a traffic signal application, those could be spot safety improvements that work from day one. So it works really nicely for John's cars that are coming out, and those are really nice things to have on day one, particularly at an
intersection because those crashes seem to be very severe.

So if you're looking at a time line of where, and, again, this is the VIIC's picture, if they postulated cars coming off the assembly line in like 2019 or something like that, that means, from a public sector point of view, we would need to be working with you guys to start getting stuff out in the field in advance of that or in that time frame. And, of course, the state and local governments have a planning cycle, as well, just like everybody else, and so that needs to be backed up a little bit, as well. And so then we need to understand what it is that you need to understand in order to put it into your plans.

So it looks like it's a lot of years in there, but when you back all of those numbers up, it's not a lot of years. And just so you know, in government time, 2013 is tomorrow. I know that's not it in technology time, but in government time that's tomorrow.

CHAIR DENARO: Or never.

MS. ROW: It's still tomorrow.

DR. KLEIN: If, in some ways, there's two parallel trajectories going on, the public sector development project and a private sector, currently probably
OEM-led, automaker-led project going on, do you feel confident that you know what's happening in the private sector and what kind of networks the automakers will be putting in their cars so when it comes time on your schedule to put your stuff in, will the automakers have leapfrogged others and maybe some of the hardware you were planning on putting in is already in the car and stuff like that? Because that's pretty competitive information. I assume it's absolutely, there's trade secrets, there's competitive advantage, there's all kinds of stuff going on here, and it's very difficult for you to be able to plan when the infrastructure is being done in parallel and possibly with very little publicity until it's ready.

MR. CRONIN: Yes. So we, our partnerships with this group called the VIIC and campus and a pre-competitive nature, so we can't really talk to them about cellular and some of the solutions there. And so one-on-one conversations, we know some. But, no, I would say I don't.

MS. ROW: But the other part, and Hans, please, you guys, jump in, what we look at is how to enable a capability for an application for safety. How the automotive manufacturer chooses to implement that in their
vehicle systems, that's their call. So they're figuring out the engineering. They know however their systems are evolving their suppliers, so they're the ones who I think are thinking about those issues that you were just articulating. We don't have to do a lot of that. As long as we're working hand-in-hand, they know kind of what we're thinking and we know what their capabilities are, and they're figuring out the engineering that proprietary to them. Is that true?

MR. CAPP: The protocol, these message sets, security. As long as that's kind of known as something that will work, then, yes, then we can go and design special boxes with suppliers and talk to other systems we have in the car.

CHAIR DENARO: Complicating this also is, besides just the OEMs, you've got considerations like IBM doing a smart city solution or whatever, you know, and Nokia doing an industry-wide solution, and so forth. So does it evolve first within the auto companies? Is there some other entity that does it like that? And then you've got other applications like we talked about vehicle miles traveled and tolling, but then there's also this whole insurance, which
has tremendous incentives for doing that. And maybe that evolves, which gets GPS and data into vehicles and out of vehicles and so forth. So there's a lot of moving parts here in terms of how this might evolve.

DR. KLEIN: I mean, it would be wonderful to do all these standards and then open the newspaper one morning and discover the General Motors car is offering everything on the car. At least our standards work paid off.

MR. CRONIN: There's some test beds out there. There have been states, locals working on the technology. We're working with them. Interoperability is a key. Trying to get them to use the same equipment and have interoperability will be something we're working through. This is just Mike's slide from earlier, as I said. It's about connecting both vehicles and the infrastructure. So that's it.

CHAIR DENARO: All right. How is everyone doing? Just a check on the agenda, we've got principles and concepts. I think you said those are pretty brief discussions; is that right?

MS. ROW: What I would suggest is I don't know that we need to go through the US DOT principles. I think
we can explain to you what it is, and you can read those.

It's a really short document, and you can get it like right away. So my suggestion would be that we do just a little bit on the concepts document that Valerie did because it's going to piggyback on exactly what we just talked about.

Now, you can decide if you want to do that before or after the break, but I think that's a pretty short, we've talked a lot about it, but just to kind of bring it home, I think.

**CHAIR DENARO:** So I want to keep the energy level going. We only have two hours to go here, gang. So let's keep engaged here. Do we need a little coffee break right now maybe to -- okay. Let's take our ten minutes.

(Whereupon, the above-entitled matter went off the record at 1:56 p.m., and resumed at 2:14 p.m.)

**Implementation Approach Discussion**

**CHAIR DENARO:** All right. So what we decided before the break is we're going to skip the principles. It is in your read-ahead, if you had a chance to look at that. We're going to talk about these implementation scenarios briefly, and then we'll get into our focus discussion and
finish up by four.

Valerie, are you going to lead us through this?

MS. BRIGGS: I am.

CHAIR DENARO: Okay, great.

MS. BRIGGS: Okay, next slide. So we basically just wanted to get you guys talking because we were afraid you wouldn't be talking very much. And so we wanted to talk about some things related to the implementation model: how do we do this, how do you enable security, how do you enable this environment to get started?

So, A, how do you get started? And when you start, is it the same, you start the same way that you end. Are they one in the same, or do you start somewhere and migrate somewhere else? So from where we start, are there transitions that have to take place? To some degree, you know, what is the private sector's role? So those are all questions on the table and ones that we'd be interested in hearing your thoughts on.

MR. MCCORMICK: Just a question on that last one. What do you mean by partnership? I mean, largely, historically, there aren't really many public/private partnerships. There are a lot of contractor/contractee
relationships that are friendly.

MS. BRIGGS: We're not talking about contractor/contractee relationships.

MR. MCCORMICK: I know. So what do you mean by partnership? How do you envision that happening?

MS. BRIGGS: Well, how has something like this been done before? I mean, I think this is a new realm, a new era, and we've got to think about how it could be done. That's the question on the table.

MS. ROW: We don't know is the answer. We don't know.

MR. MCCORMICK: And it's a difficult question because, you know, people claim that someone has been, you know, is the favorite son if they get chosen to be part of that partnership.

MS. ROW: Yes, it's tricky. And Valerie, too, mentioned that third one on here of where's the value, and that's one of the things we're interested in.

MR. STEENMAN: Interesting idea, you know. Largely, what you need to be able to do to start with is all passive, right? So you can draw an analogy with PNDs, you know, personal navigation devices, and you could arguably
say they may drive safer because you didn't need to have a
map on your steering wheel and all this other good stuff.
The adoption of PNDs was actually pretty good in the
marketplace as a consumer device, and there was some real
inherent value.

So why couldn't we treat this or look at this the
same way? You make it an aftermarket consumer device that
has some value beyond warnings that would pop up about
crash impact and things like that, and you try to drive the
adoption by the consumer device. And if you look at the
automotive market today, and you can probably comment on it,
as well, John, is because of PNDs I think the car OEMs are
actually selling more integrated navigation devices because
people start to recognize the value of, you know, having it
in my car is actually a lot better.

MS. BRIGGS: Does anyone want to comment on that
idea on the table?

MR. MCCORMICK: Well, the problem is that all the
PND companies are collapsing because you can do it on your
phone. But the point he's making is valid. If you had a
device, in terms of phone or PND or whatever, that would
incorporate that technology, and that was really what they
were looking to try to do with the mobile link, that gives you that early adoption without being, gee, I got to go and have somebody install this box in my trunk kind of thing. So I think that's going got be the difficulty with adoption. If you want consumers to adopt it, it's got to be consumer grade. I'll put it that way. It's got to be something that has perceived value. I mean, and think about that.

MR. STEENMAN: And it needs to, but, hopefully, and this is probably an industry discussion, can it do a little bit more than just the safety features? Because we had the discussion earlier about people don't want to pay for just safety, and then you have to go give them away, and that doesn't work either.

CHAIR DENARO: What I struggle with is, you know, on one hand, for this safety requirement, we've got this requirement for low-latency communications, so it's got to be DSRC. And safety has all kinds of things that have to come with it, like all the certificate and security and trusted and all that kind of stuff. On the other hand, you've got some consumer things that could be cool if you just had access to the data, and that would be good. I can envision those things being completely separate, no
connection whatsoever, or potentially there could be some
crossover, in which case your model starts to work in that
we get adoption because of some other features and we drag
safety along with it. I'm struggling with where that
connection is really. Where is it needed? We could
probably envision, oh, you could do this, but, you know,
where is it really compelling that you need to do it? And I
don't know that answer myself yet, and that's maybe
something we need to explore because I love your model. If
we could find a way that adoption would be viral and pull
this in place, you know, we're done. I mean, that could
happen. But I just struggle with a lot of that.

And, you know, for example, I was talking
earlier, you mentioned the aftermarket device. I just
struggle with the robustness of that device in terms of its
positioning and things you need for this application. So
that is possibly an area for discussion for us.

MR. STEENMAN: Yes. Scott and I were talking
about, like, if you look at the time lines, we are going to
sit here in 2019, and we maybe got some things in the car.
That's the end of the century. I'm not going to be around.

I'm not going to be sitting on the committee. I'm going to
be in Hawaii.

MS. BRIGGS: So as we're thinking about this, there are some real challenges, as you all have already figured out in thinking through this. Our first priority at DOT is to enable crash-avoidance safety applications, so, certainly there's a lot of cool stuff that could be done. Ultimately, we're interested in getting to those safety applications.

You would not have an opt-in scenario, no user choice or ability to disable. This was something that was part of the principles, and I hope you will read the principles. Let me step back and tell you what the principles are. The principles that you have in your packet were put together by RITA, our office, NHTSA, and the Federal Highway Administration. And they're meant to kind of put out there on paper what we see as our bottom line in system implementation. So that factors that we are basing our research decisions on right now in terms of getting to research implementation.

But we thought it was important to actually write those down because we need to be able to go back to them and point to them. And they've been helpful already in --
MR. STEENMAN: And I'm still struggling a bit with, you know, be careful what you say here because, like, saying safety is not important is like saying beat your child. But it seems to be, like, this one-sided drive versus the most important, as well, is to make society more productive and efficient. You know, the other numbers that we talked about in the infrastructure piece, and we always go back to safety is the only thing we're really interested in.

MS. ROW: That's a valid point. And it's not the only thing we're interested in. It has been, clearly, the focus, and it's been easy. And part of it it's been easy to make a compelling case for it.

MR. STEENMAN: Well, probably for the DOT.

MS. ROW: For the DOT.

MR. STEENMAN: Not so much for private industry.

MS. ROW: That's true. But there's nothing that says, and that's why you guys are here, there's nothing that says that maybe there's some bundling thing that doesn't want to happen here. And so the other thing I was going to say about the principles along that line is one of the reasons we felt it was important for DOT to write down these
principles is because, as we look toward the future and what's implementable, we think it's highly likely it will go a very private sector-driven route. And so if that happens, we don't want to lose the part that's valuable to us, right? So that's why we wanted to do the exercise of writing down the things that we care about in a box, and that's what's in those principles. So we are anticipating that, as more of you all get engaged and you see some value there, that as you begin to go down that track, we're able to say, great, go, as long as we get these things.

MR. STEENMAN: Maybe a clarifying question, as just a charter and an area of interest, is the DOT interested in eliminating gridlock on the highways and in cities?

MS. HAMMOND: And we aren't under a gag order, so we can say --

DR. ADAMS: So would something like this possibly be accompanied with some incentives for early adopters? I mean, like what happened with the hybrid car vehicles, you got a tax credit, you were able to use HOV lanes, I mean all that kind of stuff. Has that been discussed?

CHAIR DENARO: Good question.
MS. BRIGGS: I mean, there are a lot of things on the table for discussion. And we, again, are a research organization, so, you know, our authority is to do research. But we are doing research into possible paths.

MS. ROW: I would hold that thought.

CHAIR DENARO: Well, let me append Valerie's statement, too, and this is where maybe we go beyond answering Shelley and Valerie's questions. They've got some naughty issues they're dealing with as a research organization. We're a separate committee. If we want to say some things that we think, forget about JPO right now, DOT, we're talking with you guys, you need to have some incentives in place. It's not their authority to do that, but we want to go beyond these guys and say that, we can say that. So those kind of thoughts -- and, again, I will suggest we keep it within the domain of we want to do things, we want to recommend things that are going to maximize the probability of deployment of this kind of system. But to do that, we may come up with some things that are beyond the scope of responsibility for the JPO. And as far as I'm concerned, that's fair game.

DR. KLEIN: What if we recommended an industry
consortia and forget the public sector?

    MS. ROW:  Recommend away.

    MR. BELCHER:  A procedural question.  So we write a report at the end of the term of this advisory committee, and the report goes to DOT, but it also goes to the Hill. If we were to write an interim report or interim reports, do those also go to the Hill or do they just stay at DOT?

    MR. GLASSCOCK:  I don't believe --

    MR. BELCHER:  So just one?

    DR. RAJKUMAR:  So Valerie discussed the no option and substantive fees, so does that mean that the CME has to be supported through fees on non-core safety features? I think that's what I mean.

    MS. BRIGGS:  Well, that is one way to interpret it. If this is mandated, you don't want people to have to pay a monthly fee for their, you know, safety features. And so that's what that gets down to. Certainly, there are other ways to structure. Nothing is free. I mean, no one is pretending that something happens for free.

    MR. STEENMAN:  You can make consumers pay for their license plates. I pay a lot of money for my license plate.
MS. BRIGGS: This says no optional subscription fees, right? You don't have an option, or, you know, most safety features today are built in with the price of the vehicle. You pay for them; you just don't realize you're paying for them.

MS. ROW: I mean, 911 service, there's a fee on your phone bill. So there's a lot of different ways to do it. It's just that this is the one that, from US DOT, we can't do this one.

MR. STEENMAN: You mean you cannot enforce it as the DOT?

MS. ROW: No, this is the one that is unacceptable to us. It's in our principles that we understand there's nothing free, it has to be paid for somehow, and so the only fee option that is unacceptable to DOT is an opt-in subscription fee.

MR. STEENMAN: Completely separate, you get a bill at home just for this.

MS. ROW: Just for safety.

MR. STEENMAN: Okay, okay.

MS. BRIGGS: Okay. So adequate protections need to be in place for privacy. Controlled environment is
necessary for systems that interface with vehicle
electronics, so that means, you know, of course we don't
want someone to be able to get in and tell your steering
wheel which way to go or brake your car.

MR. BELCHER: Are you also considering an opt-in
scenario, a non-mandated --

MS. BRIGGS: Are we considering a non-mandated
scenario?

MR. BELCHER: Yes.

MS. BRIGGS: Dana, do you want to take that one?

MS. SADE: NHTSA has not made a decision with
respect to what direction we're going to be going. There
are a number of options on the table. One would be more
research. Another would be going into, you know, a
rulemaking. So --

MR. BELCHER: Okay. So it could be a non-
mandated where you opt-in and --

MS. SADE: This is research so --

MR. BELCHER: Okay, thank you.

MS. SADE: -- it will tell us what our options
are.

MR. BELCHER: Okay. Thank you. That's helpful.
MS. ROW: Let's go to the next slide.

MS. BRIGGS: Dana, this is yours. Do you want to comment on this one?

MS. SADE: Sure. Well, we did a pretty thorough analysis of the department's authority with respect to the system currently. Each of the different modes analyzed their own authority. NHTSA did a thorough analysis of our authority. OSD did a thorough analysis of JPO's authority, and what we basically determined was that we do have sufficient current legal authority to regulate or otherwise support many critical aspects of this environment, including equipment in new vehicles, the aftermarket devices, and also the security system. And I think, to be clear, parts of the security system would be subject to regulation as motor vehicle equipment and other parts might just be something that we can support through non-regulatory means, as we are a government authority, you know, a government agency with inherent authority to do certain things.

One of the other things that seems to be really important in terms of implementation options is that, you know, we have also determined that we do not have legal
authority to require states or other entities to install the roadside infrastructure, and that was actually something that we were surprised to hear and the auto industry really didn't have a good sense of until we did this analysis. And it certainly, you know, it certainly kind of interplays with a lot of the different implementation options.

DR. KLEIN: And that's all conditional on safety, or are there other core regulatory functions? Probably safety is the big one, is it?

MS. SADE: Are you talking about the --

DR. KLEIN: The legal authority derives from a safety mandate.

MS. SADE: The legal authority actually derived from the Motor Vehicle Safety Act and it derives from the definition of motor vehicle equipment. There's different authority in different modes. The two that are primarily regulatory are FMCSA and, you know, with respect to FTA and some of the other modes, they have programs that will support states' implementation, but they don't have direct authority that's regulatory. And then the last bullet really relates the most to Highway's legal authority or lack of legal authority to require states to implement certain
roadside, you know, roadside units or DSRC.

MR. HOLTZMAN: It's made to appear that if you did have state authority, it would be full speed ahead, but that's not entirely accurate, is it?

MS. SADE: No. I mean, absolutely not. Frankly, the last legal bullet is almost, I mean it's, you know, we still need the money to fund it, and so --

MR. MCCORMICK: What do you mean by support implementation? I'm not clear on the meaning of that phrase. You say regulate or support implementation. Does that mean you can require the implementation?

MS. SADE: Well, the reason I worded it this way is because of the distinction in the security system area between what we would regulate and what we might be able to support or facilitate through like a no-cost contract or public/private partnerships. The definition of motor vehicle equipment is broad enough so that I think it clearly covers equipment in new motor vehicles and lots of aftermarket devices that are relevant to, that are part of this system. The security system parts of it, you know, parts of it that adjust, you know, all the security systems within the vehicles, obviously.
MR. MCCORMICK: I guess what I'm saying is I'm not reading that you can require implementation.

MS. SADE: That's the last bullet?

MR. MCCORMICK: No.

MR. WEBB: No, second to last.

MS. SADE: We can't require implementation. What we tried to identify or figure out was what authority do we have that would support implementation? We obviously have a lot more authority with respect to the OEMs, and that's a huge part of this to be able to actually have the equipment in the vehicles and the aftermarket devices working together and working in a way that will, you know, that will create this connected vehicle environment. But that doesn't work without a security system, so the security system is, you know, the support of implementation is meant to operate the fact that it's not necessarily subject to regulation but it's something we can support through our regulator or --

MR. WEBB: Just real quick on the second bullet, I see this slide being used in the future. Is maintenance also something that you cannot regulate? So I want to say for the slide to install or maintain --

MS. BRIGGS: No. I mean, I think I wish I had a
Highways lawyer here. No, what I'm going to say is we don't require them to put it in, but, to the extent that it's already there, I think it would be subject to the normal rules that apply to --

MR. WEBB: Careful with this question. Another entity installs the stuff. Can US DOT then tell the maintaining agencies that they have to maintain it?

MS. BRIGGS: If another entity installs it?

MR. WEBB: As in a private entity or whomever to install the equipment?

MS. BRIGGS: No. I mean, that's, you know, I think, you know, like you have clear --

MS. ROW: Clear up on the slide is what you're saying.

MR. WEBB: Yes.

MS. ROW: Got it.

MS. BRIGGS: -- I mean, you have certain standards that, you know, are kind of a common level of care in terms of how safe, but it's their own --

MR. WEBB: So let me address where I'm headed in this. I understand in a lot of the discussion on the re-authorization public/private partnerships, okay. So if, in
fact, a public/private partnership was and Verizon says, you know, I'm going to fund putting out all this infrastructure out there, but I don't want to maintain it, you know, I'm going to leave it up to the feds to figure out how it's going to get maintained. So that was where the gist of the question is coming from.

MS. BRIGGS: Yes. I mean, this comes down to, I think those of you in state agencies who are used to dealing with this world know, basically, where the authorities are. But people outside that don't necessarily, so this was to communicate to others that we can't just say make it happen and you guys --

MR. STEUDLE: I think that the biggest misconception is the interstate highway system is owned by US DOT. It's not. It's owned by 50 states, and we have coordinated the standards so that it all looks and feels the same, but it is owned by 50 different agencies. And US DOT can't say you will do this, and they can't say you will install this and, once it's there, you have to maintain it forever because, at some point, it will become too costly and some will say, "Forget it, I don't have enough money. Federal government, you're not giving me enough money to
take care of this. Private partner, you've walked away.
We're turning it off." So that's what that slide is really
to say is that there is a point of how far US DOT can go.
That's really what you were trying to get at.

CHAIR DENARO: Right. But on that highway, they
can say, but if you put up a sign it needs to look like
this.

DR. ADAMS: There could be standards for this
infrastructure.

MS. SADE: That's correct.

DR. ADAMS: But only if you guys help pay for it
or --

MS. SADE: The standards are part of the MUTCD,
to the extent that it's fizzling, and that's a really
interesting debate --

MS. ROW: Communication standards are not part of
the MUTCD.

MS. SADE: What?

MS. ROW: Communication standards are not part of
the MUTCD.

MS. SADE: No, the communication standards
wouldn't be, but it could be viewed as creating, you know, a
DR. ADAMS: I guess it's just kind of missing off the chart.

MR. STEENMAN: Is there any research available that shows the differential between the adoption of regulated technology versus open market unregulated technology?

MS. BRIGGS: Oh, that is such a good question. Shelley probably has one somewhere, but we didn't put it on these charts.

MR. STEENMAN: It really might be interesting to see.

MS. BRIGGS: We do have adoption curves for ITS, and, of course, there are a million adoption curves for various technologies. I mean, we do have a tortoise and a hare slide that has, you know, public sector adoption, private sector, and you can probably guess which is which.

MS. ROW: Did you hear the question?

MR. MCCORMICK: No, but I gathered about the adoption curve.

MS. ROW: No, no, is there a different adoption curve for regulated equipment versus --
MR. MCCORMICK: Yes.

MS. ROW: Yes, is it different for regulated versus --

MR. MCCORMICK: And your best example is really commercial vehicles, because interstate commercial vehicles, the federal government has the authority to solve. They turned on texting ban in vehicles. The adoption curve for commercial vehicles, for transit vehicles, or trains, all those things, is much, much more rapid because it's a smaller body of vehicles for one thing, and it's not governed by the number of changes that occur by platform year over year that allows the automakers and the motorcycle people.

Their problem changes, their improvements, their technology, etcetera, etcetera. So the adoption curve is much, much slower, but the thing is is that there are disruptive changes that occur. CTS was a perfect example. When it came out and when it comes out in 2013 with Q and the haptic seats, we'll probably hit another adoption curve phenomenon that will also drive the competitors.

MR. STEENMAN: It might just be something to look into longer term for, particularly, the memo that needs to
be written because it could influence the position we should take or the perspective of should you regulate this or not.

DR. ALBERT: Also, the organizational or business model you want to enter into. So it would be nice to know that up-front I think.

MR. STEENMAN: Well, yes.

MS. BRIGGS: Great. Let's move on. So we already covered this public/private. Fully public I think is pretty unlikely. So getting started, this is just a slide, I'm not going to go through the details, but we are working on how you simplify the security structure to look at what can be done quickly versus, you know, and so the OEMs and the security experts are working with us on that, and I only get a few details on that.

Next slide. So then the question becomes, you know, you start out with the thing is it the same solution from the beginning and the end, or is there some transition? What does the end state look like? You know, is there a role for public infrastructure or not?

MS. ROW: And one of the things that I do want to mention about here, we talked about the security system, if it used DSRC for the security certificates, if it used
cellular. We didn't talk about a model that the OEMs are
studying right now, which is an early adoption model.

MS. BRIGGS: That's what that last slide was.

MS. ROW: This one is?

MS. BRIGGS: The previous one.

MS. ROW: Oh, the previous one. Well, I think
it's just a short, I think now it's short, but they're
studying an option that would require either no
infrastructure or very little infrastructure because you
would just pre-load a lot of the certificates on the
vehicles. They think it would work while there was low
penetration but probably would not work for a sustained
environment. So that gets to one of these transition
things. Would it make sense if you could start that way
just to get rolling and then have something that you could
evolve into that's a more sustainable model over time? And
we don't know.

DR. ALBERT: Question. Is the roll out for this
anticipated to be kind of a national roll out all at once,
or is --

MS. BRIGGS: That's in the principles, yes.

DR. ALBERT: That's in the principles.
MS. BRIGGS: Ultimately, you want a system that's interoperable nationally and that extends nationwide and even across North America. But none of us are under the illusion that it's going to happen overnight across the nation.

MR. STEENMAN: But you'll probably get most of the immediate benefit locally because how many people --

MR. MCCORMICK: Yes.

MR. STEENMAN: -- are driving long distance, right? There's few.

MR. MCCORMICK: Yes. I mean, the average person only spends 350 hours a year in their car, and 95 percent of that is local.

MR. STEENMAN: Yes.

MS. BRIGGS: What's local to one of us is not the same as what's local to another one of us.

MR. STEENMAN: But you could roll it out by metropolitan area.

MR. WEBB: You'd have to talk to the car companies about that. But, again, you know, they're selling nationwide --

MS. ROW: Right. So it's the same system. It's
the same system nationwide, but you could start it in
metropolitan areas, for example.

MR. CAPP: So the discussions earlier on having
some infrastructure show up to give these people the ping
for this new technology in the cars for benefit, that could
be very localized.

MR. WEBB: Right, right.

MR. CAPP: And easily aftermarket.

MR. STEENMAN: I was thinking like, initially,
when the penetration is really low, you would think that the
few people that have it would benefit greatly from having
some infrastructure there, like traffic lights having it,
because then they get the benefit of that. So that's where
the sequencing of doing V2V first and then doing V2I later
doesn't make immediate sense to me.

MR. MCCORMICK: That's actually the history of
5.8 in Germany because Mercedes came up with the entire plan
to use that, a much smaller spectrum, about one-fourth what
we have, and they said, basically, we're going to do this
until we get all the cars. And when they asked them, well,
who gets this, they said, well, it would only be in Mercedes
because that's all the bandwidth there is. At that point,
the government started working on --

MR. STEENMAN: That works in Munich, but nowhere else.

MR. SCHAGRIN: In your comment, you said the V2V versus V2I, that this is where it breaks down and it doesn't make sense to you. Is that what I think you said?

MR. STEENMAN: Yes. You wouldn't think the V2I would be so much after V2V.

MR. SCHAGRIN: Right. So by having this V2V decision point next year, that breaks the cycle. And once we have that indication of where we're going then the other can come into place, too. Before we had that decision point, we were going back and forth. I mean, we started off with original vehicle-to-infrastructure model, right? And we were just kind of like just going back and forth. That causes all sorts of things to happen.

MR. STEENMAN: But really good enforcement function in place.

MS. ROW: But what we think is possible is that, again, we'll go into pretend land, so let's pretend that in 2013 NHTSA makes a decision to start pursuing regulation, right? So then that triggers a multi-year cycle. They have
to go do their notice of proposed rulemaking, they have to have a phase-in period. So you've got, I don't know, some number of years before it actually has to start coming off an assembly line. But the minute that NHTSA made a decision like that, then people like Roger, the equipment starts stabilizing --

MR. CAPP: Nobody is saying there has to be a regulation to do this. The process of starting your regulation starts to show everybody the seriousness of the rules, the stability of it, so that you're willing to start investing. And a whole bunch of people need to see enough of it to start investing --

MS. ROW: And so if they start manufacturing it and it's stable, and the standard is stable, then we're able to turn around to Kirk and George and Paula and say, okay, here's literally what it means to you for your traffic signal system, right? Now, they've now got a five-year window in there to say where are my hot spots, where do we need to do this? And right now we're working with the controller manufacturers so that the future controllers that they're going to purchase anyway are easily adaptable to the technology. So we think that while they're lagging, that,
if NHTSA makes that decision that we'll be able to bring these guys into the mix in time that it kind of comes together about the time the --

MR. MCCORMICK: There's at least two auto companies that are planning on putting it into their vehicle several years in advance so that they can turn it on once the regulation comes out.

MS. ROW: And, see, that would be even better.

MR. MCCORMICK: It's better for them because it helps them sell more cars, depending on if they have the ability to market the viability of it.

MR. STEENMAN: But if NHTSA makes a decision in '13, could there be an aftermarket in 2014?

MS. ROW: There could. Again, it gets back to the stable technology, stable standards, stable technology, and we think that if NHTSA made that decision then, you know, GM and Ford are not the only ones who are going to be energized.

MR. CAPP: It's going to start a chain reaction of other people willing to make another bet, right? Everyone thinks NHTSA is going to get the momentum going.

MR. STEUDLE: And then on the infrastructure
side, that same thing will happen because there will be a whole bunch of private companies that will say I can help you, I can help you make this, I can come in with a private venture, you know, and a concession deal for ten years, and I can advance all these things for two. There's a whole bunch of stuff that will pop when we know that's gone.

MS. ROW: And it's stable.

MR. STEUDLE: And it's stable, right. And, you know, all the radio guys, they've built two radios, right? A radio and a receiver, so they've got to sell one on the other side.

CHAIR DENARO: I think we're struggling here with, you know, safety, which is necessary, but who wants it, I mean who wants to buy it; and the other sexier applications, which consumers may want to purchase. But I think something that probably there's--also a political reality, okay? If we stay focused or they stay focused on safety, then there's a lot more success of surviving multiple years through appropriations and everything else.

I don't know if anybody else was involved in the earlier days of GPS, but the only reason we have GPS here today, and this is absolutely true, is because it was a
system designed to guide ICBMs in a test program. That's the only way it survived multiple congressional hits. It was for Navy Trident missile systems, and it was actually a number one priority and couldn't be canceled. And it survived through, otherwise, what cuts were there. Of course, that was never the real reason.

So this is a win if this thing starts out with V2V safety, but it's much bigger because of all these other ancillary applications that happen. That's a win. That wasn't a bad decision. It was a good thing. MS. ROW: And so that brings us full circle back to we've got to solve the security system problem.

MR. WEBB: I was going to say that parallels --

MS. ROW: Yes. And so part of that conversation that was in this implementation scenarios piece is that, again, we're kind of beginning to think it's not going to be a DOT-operated system, right? We're not going to operate it. There was a vision long ago that the states were going to somehow magically operate it. We don't think that's going to happen. So that leads us to a public/private option or to a fully private option.

So Valerie's been trying to tee up some research
from the government. You'll love this. The government is
going to research where the private sector might find
value. You like that?

MS. BRIGGS: Aren't you going to tell us a better
way to do it?

MS. ROW: Yes. Tell us the answer. So that's,
you know, that's another part of the puzzle.

CHAIR DENARO: Mark Zuckerberg thought he was
building a college yearbook online, so the consumers told
him it was something else and, boy, were they right.

MR. SCHROMSKY: I think the safety aspect is, I
mean, but if you're looking from private company, you
mentioned one thing, those sexy apps, right? So, A, where
am I going to park today? I've got a parking meter. You
know, do I got a spot at BWI? There's going to be a
company, companies already out there, that are going to go
into different data sources and say, "You know what? Give
me your Michigan information from your MDOT cameras. You
know what? I'll pay you a fee. Give me your screens that
you have out there," and you probably would say, "Okay. You
know what? I'm going to go to AccuWeather and I'm going to
get your data streams there, and I'm going to host all this
stuff. And I'm either going to develop an app that you're all going to pay for, or I'm going to sell that information and be the front man to other app developers and say, okay, what do you want because I've got every hooks into manufacturers and everything else out there. Oh, by the way, if you want the safety, I've got that."

It's already being done today, and I can do so much on the phone, right? So industry will figure out a way to monetize it and figure that out there or some of the automotive -- you know, GM could do the same thing and offer that as a service --

MR. CAPP: The app stuff, yes. The security piece is the question. The business model for who wants to run this bank. Who wants to run this security bank and handle all these certificates? And Valerie talked about it, go around and pick up all the pieces of paper from the old ones when they're used, who wants to do that? What's the business model for that? That's the bottom line she's asking for ideas on. Because the way you said it, I think it's clear there's money to be made when you're handing out services, but this --

MR. SCHROMSKY: But, I mean, I'm transferring
those services, I'm getting it today already, right? I mean, you're transmitting --

MS. ROW: So will any of those services subsidize that security thing?

MR. SCHRÖMSKY: Yes.

MS. ROW: And is that a model somewhere in there that wants to happen?

CHAIR DENARO: And the only way I'll get the data is if I take on the banking job.

MR. MCCORMICK: You have to understand, too, is we tend to look at very linearly at this situation. Back in 1976, I was doing graduate work, and I utilized the internetworking protocol to transfer information over 110 mod line to another university as part of ARPANET allowing us to use the beginning of the internet. And no one could foresee what it evolved to over the next 37 years now, and there were points of explosion that occurred when Berners-Lee developed the HTML code, when they were able to incorporate images, when they did chat.

We're going to see this is going to be a very similar implementation. What we create here probably won't exist in five years, you know. We'll have evolved past
that. And when you look at that implementation time line and you look back at what the ramp is of technology, there are processor improvements, there are technology improvements, there are communication improvements that are going to occur over time.

What I think part of what we have to do is make sure that we've created a path that says before the JPO, if you're going into this for federal highway, if you're going to do a research program, here's what you have to keep in mind from the viewpoint of industry and from the public entities in terms of here's what changes and how and how you can manage your program going forward without us, you know, without anybody else.

MR. STEENMAN: That's a very interesting point because now we might be fretting over storing, like, 500 million certificates in a car, but in five years from now that might not be a problem at all. It might be like no issue because the technology just evolves so quickly.

DR. ALBERT: Sounds like we need a subcommittee -

Committee Focus Discussion

CHAIR DENARO: Okay. Let me just do a time check here. We can chat, but there's two things I'd like to
accomplish before we leave in 66 minutes, and that is, the first one is I'd like to make some progress in terms of the focus issues. I took some notes, and I've got some suggestions, but I want to see if we can make some progress on narrowing this down to some focus issues that we think we want to deal with. Secondly, I want to make sure before we leave that we have a discussion of how we want to structure the rest of our meetings: how many meetings do we want, roughly when, and how are we going to do that? And that latter discussion, be mindful of some milestones that we have, like a 2013 decision and so forth, and how do we align with those milestones. So is that good for everyone that we get to that?

DR. RAJKUMAR: So you're speaking October 2013, right? That's the --

CHAIR DENARO: Yes, I think so.

MR. SCHAGRIN: Just late in 2013. In order for input from here to be useful to them, you need it sooner than October. October 30th isn't useful to them. And input to the process, you know, in getting our safety pilot data, the safety pilot model deployment includes August of next year. But we're also incrementally getting data out, so
we'll be doing our analysis throughout the process to the very end.

DR. RAJKUMAR: I thought that data goes to Volpe. Will it be available to this committee, for example?

MR. SCHAGRIN: You want to do analysis of the data?

DR. RAJKUMAR: If the data set goes to Volpe I thought or --

MR. SCHAGRIN: No, we're not going to make this data available to the committee. There's no reason for that.

DR. RAJKUMAR: Oh, I see, I see.

MR. MCCORMICK: I don't think that's what our function should be.

MR. SCHAGRIN: No, no, there's no reason for that.

MR. MCCORMICK: There are people that, a lot of really smart people dealing with that.

MR. SCHAGRIN: Your previous question, though, on when should you tee up some kind of input, to be able to affect the process and the decision, I would think by the summertime of next year.
MR. MCCORMICK: I would like to offer another idea. I think there's two people in here, I'll call them the technology/industry people, that can provide some input on some of the burning issues they've got with regard to looking at the security framework, with looking at the items we talked about with how different could we evolve the infrastructure side of the architecture to obtain more benefit, that literally, I think, within a few months we could either -- and it may not be that we're providing a recommendation to JPO. We may just be connecting them with the right people. I would like to see that subcommittee formed, and I think the players of that will be obvious. I think it needs to be bounded by the automakers, and it needs to have tier. I'd like to see Ton on it.

CHAIR DENARO: Okay. Well, what I'm proposing doesn't conflict with that. So, I mean, I want to decide on focus issues, and one of them is probably already sitting on the table. So that's fine. And the organizational question is how do we want to organize to attack this. It sounds like I'm hearing subcommittees. If that's the way we go, then we can name that person and get launched.

MR. MCCORMICK: I'd also like to suggest that the
technologists don't necessarily need to physically meet in
order to accomplish what they need to accomplish. We can
Skype or WebEx or email a lot of that background contact as
a matter of efficiency for all --

CHAIR DENARO: That also was a part of the
discussion when I said lining up our meetings and so forth.
I didn't necessarily mean physical meetings. However, as
Stephen will remind me, we have to be very mindful of our
FACA status. And there's starting to be a lot more
scrutiny. I mean, this is a public meeting right now. It
had to be announced in the Federal Register and all that
kind of stuff. People are invited. Our subcommittee
meetings largely will be of that nature, too, potentially.

MR. MCCORMICK: But you can hold a WebEx that you
can have participants --

CHAIR DENARO: I agree, I agree. I'm just
saying that 30 days ahead you have to have a Federal
Register announcement and that sort of thing. There might
be some level of meeting that doesn't require that if it's
not truly a meeting because you could be doing some research
work, but, anyway, I just want to point that out.

MR. MCCORMICK: But as a subcommittee doing a
working session, is that something that needs to be publicized?

[Simultaneous speaking.]

MR. GLASSCOCK: It comes down to doing committee business, and that's a very fine line and there's no wider issue. If you're doing research, you're talking amongst yourselves, you're passing ideas, that's okay. It's where someone would look at your work and say, if you're doing something you're going to vote on or something major like that, but you can do research and contribute to the main committee. I guess the main objective would be, you know, the main committee has to agree, concur with whatever recommendations that you're bringing to the committee, right?

MR. MCCORMICK: Understood.

MR. GLASSCOCK: So research, communication with each other, talking offline, that's okay. But --

MR. MCCORMICK: But if you form let's say a subcommittee, at the end of this discussion there's subcommittee one, and it's you, you, and you, subcommittee two, you, you, you. And subcommittee two says, okay, we're going to do a teleconference call and chart out what are the
focus areas, that would be a meeting. But if you said I'm going to pick up the phone and call individually some members on the subcommittee and say, "Here's what I'm thinking. Do you share that idea? Great. I'm going to call Paula and see if she agrees. Yes, she does, too," that's informal. But if the committee, the subcommittee says let's meet to decide and make a decision, I think that's where Stephen's guidance kicks in. You have to publicize that.

CHAIR DENARO: But I think I heard a distinction, Stephen, correct me if I'm wrong, that if we do not authorize any subcommittee to make any decisions, the only thing they're authorized to do is bring recommendations to the committee, at which point we make that decision, does that relegate their meeting to not be a meeting?

MR. AUGUSTINE: I would agree with you.

MR. GLASSCOCK: Yes, it does. It does. I just would caution that the subcommittee issue has become elevated, so, you know, we need to be cognizant of that and remember that.

MR. MCCORMICK: But let's say -- I just want clarity on this because I think it's important. If we have,
let's say, six people on a subcommittee, and I throw up a
document repository where we can share information, ideas,
whatever, and we have an email group that we communicate
with each other.

    MR. GLASSCOCK: That's perfectly fine.

    MR. MCCORMICK: Thank you.

    CHAIR DENARO: And the role that I just stated
where I don't think any of us want to delegate a decision to
a subcommittee. We want them to do work and bring
recommendations. But then we will jointly make that
decision here, which is a public meeting. So by definition,
they're doing research. So we'll just be clear about the
marching orders we give to subcommittees. Hopefully, that
will help us with your guidance. Okay. All right. That
was easy.

    So what I want to do now is, I'll be a scribe
here, is I want to collect suggestions for some focus areas,
and I'm going to cut off the discussion in 30 minutes. So
if we want to continue that discussion in our next meeting
or afterwards and so forth, that's fine, to come up with
other focus areas. But, frankly, in terms of workload, you
know, if we're going to break up into subcommittees and deal
with focus areas, those committees are going to be two
people each, we're not going to have anymore than three to
five, at most. So let's see if we can reach some kind of
consensus on what the major issues might be.

MR. MCCORMICK: I think the CME entity issue,
security issue is an important one.

CHAIR DENARO: Give me how --

MR. MCCORMICK: I would say, CME, the certificate
management entities.

MR. STEENMAN: And the whole security framework.

CHAIR DENARO: Security framework?

MR. MCCORMICK: Yes.

MR. BERG: And what's the objective?

DR. ADAMS: Review the technologies that are out
there, the options.

MR. MCCORMICK: Understand the ways of looking at
how that could be managed.

CHAIR DENARO: By the way, let me say something,
too, about what our mission is. Our mission is not to solve
problems, solve the problems for them that they've been
struggling with for three years, and we're going to show up
and, you know, with our tremendous wisdom, we're going to
solve it for them. It's a continuum. It can be as simple
as we're just teeing up, hey, here's an area where you guys
need more research, and here's some places where you might
go because we know some people in the industry and so forth.
Beyond that, and, by the way, here's where we think it
might lead and so forth.

So anywhere along there we could operate, okay?
But it's not likely that we're going to solve problems, and
I don't think we should expect to solve problems as a group.
So really our recommendations are to direct work in certain
areas and hopefully bring some suggestions on how to get
that done.

DR. RAJKUMAR: Bob, I'm feeling like we should
have a high-level macroscopic framework of what the
different areas would be.

CHAIR DENARO: Exactly.

DR. RAJKUMAR: Examples would be, for example,
technology. This will go under technology. There are
clearly policy issues, and maybe a third could be business
issues.

CHAIR DENARO: I agree with that, and I want to
do that, but I think what I would like to do is do it maybe
bottom-up because we've had some good discussions here.

Let's jump on a couple of things that we want to focus on, and then we can step back and see if there's a framework above that.

DR. RAJKUMAR: Okay, fair enough.

DR. KLEIN: I would suggest something along the lines of market-based deployment on a networks model. That's not a very eloquent way of putting it, perhaps. But conceptualizing this as information networks coming inside the car and consumer market-drivenness, how will that whole model affect DSRC --

CHAIR DENARO: You used the word before, too, strategy. And I hear the word model, so help me write that down because I like that, but how would you describe that?

DR. KLEIN: Maybe strategy to facilitate, ways to facilitate market-driven, consumer-driven network services.

DR. ADAMS: Is it adoption or marketing? And is it just --

MR. MCCORMICK: Well, the adoption is a result of good marketing. I mean, there might be issues of who owns the data, for instance. A market model might need to know what the property rights are in the system and what other
systems connect and whether you need to put policy in place
to encourage network interconnection to promote deals among
private actors who will build the system.

CHAIR DENARO: Okay. We'll come back and assign
subcommittees to these. We'll let them flesh this out to
make sure we're, quote, on the same page.

MR. MCCORMICK: Would this include incentive
strategies, as well?

CHAIR DENARO: Yes. I like that one. Any
others?

MR. MCCORMICK: Communication. I have
historically read about how they really need to develop a
better communication strategy. To understand--

CHAIR DENARO: You mean publicity or --

MR. MCCORMICK: Well, I don't know if I -- well,
yes, you could characterize it as publicity, but, I mean,
there's a lot of work that's gone into this program, there's
a lot of new companies coming into this environment that
know nothing about it, and there's a lot of things to get
your head around here. And I think that kind of would help
feed the bullet you just wrote, but I think there needs to
be a communication strategy better than I posted 8,000 pages
on the website for you to download. We need to --

CHAIR DENARO: You're talking about new groups --

MR. MCCORMICK: Yes. Shelley has got her Twitter, and you could have your blog, but it really needs to be, there needs to be a strategy put together that says we're going to move forward with this, we've got several years in front of us to figure out how do we get to the point where we can implement that marketing strategy.

CHAIR DENARO: Yes.

DR. ADAMS: So communicating to -- okay. It's outreach, not, not --

MR. MCCORMICK: Well, outreach is what you do in a communication strategy once you've developed it.

CHAIR DENARO: Not to be confused with communication technology.

DR. ADAMS: Correct. Okay.

CHAIR DENARO: Scott?

MR. BELCHER: I've got two things just to add here for discussion. One is continuing the advice of the committee on standards and global harmonization, and then the second would be -- and I don't know if this is the right committee, this is the right place to do it, but it would
certainly help the cause, and that's to consider whether
this committee has the capability to have an opinion or
provide input to the FCC on unlicensed uses of the 5.9
gigahertz band.

CHAIR DENARO: Is that related to this point?

MR. BELCHER: No, no, it's completely separate.
It's a different issue, but I'm not sure, I don't know if we
can do it, but if we could it would be very helpful.

MR. MCCORMICK: Maybe what we can do is develop a
framework for how they can engage the right stakeholders to
get input to it, which many of us are.

MR. BELCHER: This is unlicensed uses of the 5.9
gigahertz spectrum, which there's 75 megahertz --

DR. KLEIN: That's the spectrum for DSRC that has
restrictions proposed on it by the FCC.

MR. BELCHER: But right now it's set aside for
connected vehicles. The NTIA and the FCC are doing a study
to determine whether that spectrum could be shared and
unlicensed uses could be used, and there are concerns by the
OEMs. We don't know at this point whether that could
happen, but if it did happen and it started to be shared and
then we deployed this program and it threatened the safety
of the users, that could be a real issue. But it's been
underutilized for the last eight or nine years, so that's
the challenge we face.

MR. MCCORMICK: I think there's an important
public entity topic, if I can. We instituted a smart
intersection and bridge, and when you look at it you had to
deal with the local entity, the county entity, the state
entity. You had to deal with how you would put that
physically into the existing hardware that was on the
roadway, where that implement should go to. I think there's
a real need for a framework to help all of the public
entities, you know, understand what the scope of
implementing infrastructure would be.

DR. ADAMS: Yes, I think that's a good one, too.

MR. MCCORMICK: Because, I mean, we went on this
nine-month voyage and discovery with frustration everyday
because we didn't know something because now you're dealing
with companies that, there are different kind of companies
that are working with the infrastructures, even if they were
partnered with the civil engineering firms that work for the
state. There was a merging there that I think there's a lot
of things that you guys all know how this has to happen, and
the technologists really don't.

MR. STEUDLE: So that could be, that's another form of communications. What I'm hearing is it's a communications geared towards governmental agencies and technologists to implement this.

MR. MCCORMICK: For infrastructure build out is what I call it.

DR. ADAMS: Yes, it could be part of that.

MR. MCCORMICK: I just know that that's something that doesn't exist and it would be real useful to have.

DR. ADAMS: Are we done with that one? I think we just put that as a dimension of the outreach; is that all right?

MR. MCCORMICK: Okay.

DR. ADAMS: Okay. So one that I would throw out, it's been in some of the side conversations I've had with folks, but that's sort of the transferability to some of the other modes. We talked a little bit about how does this interface with even some of our rail or the waterways, whether it's on the rivers or --

DR. RAJKUMAR: Multimodal transportation.

DR. ADAMS: Yes. Sorry?
DR. RAJKUMAR: Multimodal transportation.

DR. ADAMS: Yes. Well, because it's mostly very, very highway-centered, but I think some of the technologies and the communication platforms and things, they might have a role in some of our other transportation modes, as well.

CHAIR DENARO: Okay.

DR. ADAMS: That's good, yes.

DR. RAJKUMAR: Well, more of a question than a suggestion here, I understand that NHTSA is the one making the decision in 2013. I'm not sure that anybody in the room actually is from NHTSA. I would love to hear from NHTSA the questions that they would like to see answered, the risk areas that they think ought to be addressed.

DR. ADAMS: Turn around. The woman behind you is from NHTSA.

MS. SADE: But I'm actually not, I'm not the risk-benefit person, so that would certainly be someone we could hook you up with.

CHAIR DENARO: Okay. I'll just capture that as something -- I was going to say that, too, that some of these we might relegate to needing more information.

[Simultaneous speaking.]
MR. KISSINGER: What I'm suggesting is that a
subcommittee that would really pay close attention to the
field test and, as interim analysis or whatever, could
assist in independent review of that, as well as independent
recommendations about how it's feeding or could feed
eventually to that 2013 decision.

DR. RAJKUMAR: What does BFG stand for? BFG?

CHAIR DENARO: Briefing.

MR. MCCORMICK: The peanut gallery was getting a
little loose on this one. They're coming up with all kinds
of things of what BFG was.

CHAIR DENARO: Okay. I have one that I was
congrued about. And this might be resolved by just a
deeper dive, but I had some concern about the driver
research and maybe what's already being done on safety pilot
or what's been done up to now. The discussion we had about
potential unintended consequences, the driver complacency
occurring, and so forth, my concern is: are we doing enough
there to not end up with a problem on our hands at some
point in the future? So I'm just going to write that down
and talk about whether that's -- and this might be a deeper
dive. You did some clinics and everything else. Maybe we
just need a deeper dive of what came out of the clinics.

MS. BRIGGS: Do you want help with scribing and

CHAIR DENARO: Are you saying that my writing
looks like I do need help? Because you're probably right.
Thank you, thank you. Okay. Have we forgotten anything?
All right. I mean, we're not done. We've got more
meetings. We can come back to issues and so forth. I guess
my question now would be we've got a list of five here and
maybe three over there, eight. I don't see us having eight
subcommittees necessarily. How do we want to pare this
down? Or maybe a better way to do it, and, by the way, I'm
open to suggestions on processing, but maybe a better way to
start is I think there's a lot of agreement on this first
one.

MR. MCCORMICK: Well, the reason I think we ought
to have a technology industry subcommittee is that there's
probably a number of questions that come out of a variety of
these that could be pushed to that committee to clarify it.

CHAIR DENARO: Actually, that's where I was going
with this one, actually, because I've got some other areas
that I'm concerned about here, too. If you would just write
technology above that, Valerie. It includes the driver research piece.

DR. RAJKUMAR: The last three seem to be just briefings that we get from others, right?

CHAIR DENARO: Maybe. I don't know. They might be issues. I mean, briefings might not resolve it. George, did you --

MR. WEBB: Yes. From the standpoint of just trying to get my hands still continue to be around this thing, the ongoing how this thing is going to function and who's going to pay, and I'm speaking from the maintaining agency. I certainly don't have an idea of how to address it at this point because you almost need -- chicken and egg again, as we've heard. What is this thing going to be? I mean, if it's all private, hey, locals do this. But from the standpoint that you heard, a lot of this stuff we see, particularly if there's going to be infrastructure out there, it's going to be traffic-signal based, and between us and the states, you know, that's what we do. So I'm not sure where and how we deal with the money issue.

MR. MCCORMICK: We don't let anybody in traffic signal cabinets, right? Nobody.
CHAIR DENARO: We might be able to broaden this one in terms of --

MR. WEBB: That's what I was --

CHAIR DENARO: -- model it --

MR. WEBB: Yes, I saw that and I said, well, that's just --

MR. MCCORMICK: Yes, I think we need to put in a business model.

CHAIR DENARO: Yes.

MR. BERG: To me, that's a bigger question than the security thing. Security can be solved. Who's going to pay for it and how is it going to be sustained?

CHAIR DENARO: The biggest problem with security might be the model.

MR. MCCORMICK: I think the security framework issue is something we think we can probably provide some guidance for relatively quickly compared to the larger issues of the overall committee.

CHAIR DENARO: Right, right.

DR. ALBERT: Why can't security be put in the technology group?

CHAIR DENARO: If we had more of a model --
MR. SCHAGRIN: Well, then the whole technology --

CHAIR DENARO: Yes. Well, there is two pieces of it. Exactly.

MR. STEENMAN: Depending about security model, what architecture you pick, then that will really limit what kind of business model you can put around it. So you have to kind of tackle that together.

CHAIR DENARO: Yes, yes, okay.

MR. CAPP: Since you created the list, you kind of covered all of the aspects of this whole space, so it's a good lesson in that regard. But I guess the question that I'm going to ask now is do we need the help on everything, or are there specific areas that Shelley's team highlighted where they could use some advice or help or another set of eyes. It seems to me that's where we might want to prioritize because, you know, like the safety pilot stuff, there are a lot of people working on that. I don't know that they need any more sets of eyes, maybe just pare down the list a little bit. The security business model we just keep coming back to. Everybody is throwing their arms up on that. We ought to help on that, if we can.

CHAIR DENARO: Right. And I agree with you.
Going back to what we said in the beginning, you know, what I'd like to see us focus on is where do we see the vulnerabilities? Where do we see the potential barriers? And can we add some value in those areas that are the tough, the risk areas, what are the big risk areas?

**Committee Organization**

So can we talk about, I think we said the security framework is both technical and business model. Can we look at volunteers here on the -- and, by the way, are we all kind of in agreement that's maybe the way to go, as opposed to doing everything here together?

MR. MCCORMICK: Yes, I would like to have that at least be the first task of the technology subcommittee.

MR. SCHAGRIN: What is that actually trying to -- I heard a couple of things. Is that trying to draft a solution, or is it about, as Ton said, bringing some other eyes onto it, just kind of independent view or assessment?

MR. MCCORMICK: Two-thirds of the problem has been solved. The certificate management entity is not necessarily a robust solution, and I think that, in the seven years you guys have been doing it, that's the one piece that hasn't evolved. And I think there's some
alternate thinking that still meets the requirements that we can bring to that.

CHAIR DENARO: So can we write some names down there?

MR. STEENMAN: Put my name there.

DR. KLEIN: Well, how many committees do you anticipate having, based on past --

CHAIR DENARO: No more than 20. How many would you suggest?

DR. KLEIN: Four?

CHAIR DENARO: I would say three, maybe five max.

DR. KLEIN: Have people served on multiple committees or --

CHAIR DENARO: I don't recall but that's not, I have no problem with that. I think there's a model, this is another model discussion. It's kind of the overview model. Okay. So are we done here with people participating? There's more opportunity, so don't jump on the first one.

All right. Market-driven adoption strategy, and I think, Ton, this was your concept or suggestion of how many consumer adoption -- okay. Yes. So, Hans, I assume you'd like to be --
DR. KLEIN: Yes, I would like to.

CHAIR DENARO: Okay. Put Hans down. Who else?

DR. ALBERT: I'll join. I'll join Hans.

CHAIR DENARO: Great. Steve. Anybody else?

Going once, going twice.

MR. SCHAGRIN: Is this because folks don't want
to talk about potential business strategies or is there's
like an apprehension to?

MS. ROW: Or is it pacing because you're waiting
to see what other committees are coming?

MS. BRIGGS: Oh, that's a good point.

CHAIR DENARO: At this point, because these two
seem to have a lot of support, I'm going to now say what do
you think about these other areas? Which do you really want
as a focus item?

MR. MCCORMICK: Let me ask a question. On the
people that were on the last committee, was anyone here, was
Scott, on the standards and harmonization committee? I
think that would be useful to have. I would be useful to
see if he would want at least to be on that one since he
knows what went on and knows what was accomplished.

CHAIR DENARO: And Steve, his predecessor, Jim
Vondale, was very active in that one. So Steve would probably want to be part of that.

MS. ROW: I'm sorry. I missed that part of the conversation. Was there a sense that there was more work needed in that area?

CHAIR DENARO: Yes, that was --

MR. CAPP: I don't think they've done the gap analysis yet, have they?

MS. ROW: They're working on it right now.

MR. CAPP: Are they?

MS. ROW: I think so.

MR. MCCORMICK: And he made the comment when he was here that he says he thinks there's work to continue with that. And given the other things that we're talking about, those all kind of feed into that as we go through it.

MR. BERG: I think he's afraid it will just start to fall off if somebody says, oh, everything has been done already.

MR. MCCORMICK: Right.

MR. BERG: I'll show these people I went over to Germany and now everything is good.

MS. ROW: I can assure you we're not going to
Germany any time soon.

CHAIR DENARO: All right. We've got our candidates here. Let's pick the next most important one, you know, rather than assume we're going to do them all.

We've got outreach and communication promotion plan, standards harmonization we just talked about, spectrum uses.

We have whether or not we do some kind of involvement with safety pilot, a technology subcommittee which I would say is part, this was my concern, and those are together.

MR. MCCORMICK: I think the technology subcommittee is basically those people you're seeing in the security framework task.

CHAIR DENARO: I'm sorry?

MR. MCCORMICK: People that are listed on the security framework task are basically that subcommittee.

CHAIR DENARO: Ask them what?

MR. MCCORMICK: No, that those people working that task are probably the technology committee, subcommittee.

MS. BRIGGS: Those are technical people.

MR. MCCORMICK: Except your name is not up there yet.
CHAIR DENARO: What's that?

MR. MCCORMICK: I said your name is not up there. Be careful with the guy with the pen. He never writes his own name.

MR. STEUDLE: I think, from a DOT perspective, the communications promotion plan outreach stuff I think is good. I had lots of conversations with Shelley about how do we talk about this to certain audiences, but I think, you know, there's additional questions --

CHAIR DENARO: So you think they need work.

MR. STEUDLE: Yes. And I would be a volunteer for that.

CHAIR DENARO: Okay. Put Kirk's name. Anybody else want to be a part of that?

DR. ADAMS: I'll go.

CHAIR DENARO: Great. Teresa.

MR. HOLTZMAN: I'll serve on that. CHAIR DENARO: Okay.

MR. STEUDLE: How do we talk to the technology folks? How do we talk to government, levels of government? How do we talk to the people? What is that plan?

MS. ROW: If I might offer a thought, I know you
got the, I think that's supposed to be FCC down there on the last one. I know Scott Belcher mentioned it just briefly, but I'm not sure that we were very clear about that. So you are clear that DSRC was a spectrum that was allocated for this purpose, and that spectrum is under attack by a lot of other users who want into that spectrum. There is currently a study underway with NTIA that was mandated by Congress. The study was mandated by Congress, NTIA is conducting it, to see if we can share that spectrum with other users. It has a very specific time frame. John, what's --

MR. AUGUSTINE: Eighteen months, but I think they're going to try and get the bulk of the input by over the next eight months. Yes, October, so -

MR. BERG: There was a lower band that was the eight month thing, and then the DSRC band was 18 months.

MS. ROW: So just to be clear from a US DOT perspective, and this is just our perspective, we are very concerned about this and watching that study and participating to the extent that we can in that study because, while we want to look at if there's an option to share the spectrum with other users, we are very cautious that it's very early yet. I mean, we're researching six
applications, so we want to understand if there's any interference possibility with those six applications, but what are the other applications? This is an enabling technology, and what are the other applications? And so we don't want to be too accommodating too soon, even though we don't really have the choice. It's going to be NTIA who is going to have the say. But the rest of the industry will have an opportunity to weigh in with the FCC actually easier than DOT can. So if there is an interest in that, that is an area that, again, it's sooner rather than later, but it might be an area of very high leverage because if we don't have that we can all go home.

DR. ADAMS: So what would the group do then? Just try to provide information to make the argument --

MS. ROW: Well, you know what? I don't know, I think, John, you were gone when we did the introductions. This is John Augustine. John's the deputy director. He does everything in the office, but he's also a key on our spectrum stuff.

MR. AUGUSTINE: Yes. We don't know yet from NTIA the process, so they're going to define the process on how they're going to collect the data, what kind of modeling
simulation, what kind of technical parameters are going to be used to issue the study. At some point, they're going to have findings and be able to reach out to industry experts to get their views. So if this committee would want to be contacted by them or would have input to the NTIA, I'm sure we could provide your name or they would contact you or you could contact them.

The point is, the subcommittee, they want to look at what they're studying and come up with some findings, recommendations to NTIA to take into account when they write their report. If they write the report without any input, it could come out harmful to the DSRC band, and that would be detrimental to the program.

MR. MCCORMICK: And CVTA submitted a letter basically saying it needs to be maintained for this use and why and signed by the entire board. So I think it would be very useful if this committee becomes aware and understands what the issue is and then can reach consensus on the language that they would like to submit. I don't know that it's a big study. I think it's more of we understand what the issue is, we know what the risk is if we lose it, and then we just draft the language either individually as
entities, which actually might have more impact, as well as the committee.

MS. ROW: Well, that's an option. I just want you to understand the issue more fully.

CHAIR DENARO: Okay. So I think that has some potential high payoff, so I agree with you. Any volunteers to work on that one?

MR. MCCORMICK: Scott Belcher.

DR. RAJKUMAR: That could be a plenary docket for the whole committee, given its importance.

MR. MCCORMICK: Yes. I think really that may just be having John provide us a briefing on what the situation is, what the risks are, and then at the next meeting or whenever it's appropriate have a discussion. I think that's just homework we've got to do.

CHAIR DENARO: So one way to put it is we don't know what to do until we get -- okay, okay. So we'll put that one on the shelf.

MR. MCCORMICK: Who brought up the other modes? I thought that was really valuable.

DR. ADAMS: I did.

CHAIR DENARO: Yes, that was Teresa.
MR. MCCORMICK: I'm not volunteering.

MS. BRIGGS: Do you want to combine that one?

DR. ADAMS: It was more just looking at how this technology might transfer and do a little outreach on that. It is a bit of an outreach, but there's other modes rather than --

MS. BRIGGS: Do you all want a briefing on what we do --

DR. ADAMS: That would be good. That would be nice.

MR. MCCORMICK: Yes. We don't have to decide today -

MS. BRIGGS: Yes, start with a briefing. That's better, yes. Perfect, thank you.

CHAIR DENARO: How about this general technology area? I think we need some more in-depth briefing, but is that an area that you want to have a committee on?

MR. KISSINGER: I'm not sure I know what you mean by that.

CHAIR DENARO: Well, again, we do have what the program is and two examples that I wrote down in the notes. One was the driver research. Are we adequately testing for
and understanding unintended consequences and things like that? Second one was this whole question about positioning and whether there's been enough testing there. Now, again, a detailed briefing, they might say, yes, it looks like there's nothing more that needs to be done there, but it was a question in my mind.

MR. MCCORMICK: From some of the comments and questions, I think what would be useful is for the entire committee to be level set on what the history was; how we got to where we are; what has been studied, analyzed, investigated, and by whom; and then why you're on the path that you're on. Everyone is level set, and then the committee can sit there and go, well, we think you missed something because your perspective or Ton's perspective or somebody -- I think that is one of those, and we actually have a presentation on the history of this space somewhere, but that, I think, would be very useful because then people aren't familiar with what happened on DSRC or what happened with the automakers or why they're looking at boxes or whatever.

CHAIR DENARO: So make that briefing --

DR. ALBERT: Scott, could you repeat those three
subheadings?

MR. MCCORMICK: Well, the history of where it came from, you know, why they're --

DR. ALBERT: I'm saying so Valerie could write it down.

MR. MCCORMICK: You've got the history, the what was studied, what was done and why we're on the programs that we have now. I think that will level set everyone to say, okay, now I understand, you know, why you're doing what you're doing.

CHAIR DENARO: I'm comfortable at this point that we've got three areas we're focusing on for now, and there are some other areas where we need a little bit more information. And then when we get that, we might say, oh, we really want to dive in here, or we might say it sounds like you guys, you know, there's not much we can add. I'm comfortable with us being at that point for our first meeting, okay? So if we want to stop there, we can flesh this out between now and the next meeting.

One thing I want to come back to is I would like to, as Peter suggested, say who's going to take the lead here in helping us organize this? So the security framework
and business model, do we have a volunteer?

MR. MCCORMICK: I'll be the convener.

CHAIR DENARO: I'm sorry?

MR. MCCORMICK: I'll be the convener of that group.

CHAIR DENARO: Okay. So Scott. How about on market-driven and strategy, Hans, do you want to --

DR. KLEIN: I'm happy to do that.

CHAIR DENARO: Great. And Kirk or Teresa on this outreach --

DR. ADAMS: A group of two?

DR. RAJKUMAR: Three, three.

DR. ADAMS: Three. Okay. Who else do we have?

CHAIR DENARO: Sonny.

DR. ADAMS: Oh, good, okay. I can be the -- oh, on that one? Do you want to be the convener, George?

MS. ROW: So let me help with some of this. So if you get the people identified for these groups and we have one point of contact we can just kind of have a conversation with, we're going to do the legwork to send out emails to your groups, to set up a conference call number. I mean, we can help with all of that, so the logistics, even
if you raise your hand to be the convener, it's really just us having a point of contact. But we will do the logistics for you and, you know, help facilitate that.

CHAIR DENARO: Thanks for pointing that out.

MS. ROW: Yes.

MR. STEUDLE: Well, that was going to be my comment when it was over, say, okay, Shelley, you setting this up?

MS. ROW: Yes, yes.

CHAIR DENARO: And I personally agree with Scott when he asked about standards and harmonization, but I think we need to let him talk more about that.

MS. ROW: I'll go wrest him away.

CHAIR DENARO: Is that good enough for now for where we are to get started?

DR. ADAMS: Is everybody on something?

CHAIR DENARO: Here's what I suggest, Teresa, is we'll summarize this, send it back out to where we are, and we'll ask that others, you know, then sign up, as well. So we'll get this summarized out and fleshed out a little bit more.

DR. ADAMS: All right. Paula is on ours. All
right. So is there anybody else?

MR. MCCORMICK: We made you vice chairman, Scott.

CHAIR DENARO: Scott, what we said was that we're getting started with a couple of subcommittees and focus areas. There are areas where we're not sure we want to focus on that or not, so we'll get additional deeper dive maybe in the next meeting, and we can always define another subcommittee at that point. But one of them that we held off on because you were the champion was the continuation of the standards and harmonization effort. If you want to volunteer to lead that one and get some other volunteers --

MR. BELCHER: I'll volunteer it with Steve. I know Steve is very interested in that, yes.

CHAIR DENARO: Okay.

MS. HAMMOND: What do you mean by harmonization?

MR. BELCHER: So there's a whole effort underway in terms of creating standards for all the stuff we're talking about, and what's really important to the automobile manufacturers and to the U.S. government is that those standards be harmonized with other parts of the world so that we're not creating different --

MR. BERG: Harmonization doesn't mean necessarily
they're exactly the same, but they can coexist in a --

MS. HAMMOND: Interoperable?

MR. BERG: Yes. Well, in a non-conflicting -

MR. MCCORMICK: I guess what would be useful to

know maybe at the next meeting is to get an update of where

you think there's areas left to complete on that because I

know that they're concentrated on the automotive side of it,

but this environment also involves communication and

computation standards and nobody is conversant on all three,

you know. And we have representatives of those industries

that can probably find the right people to weigh in on where

you're at and where you're going.

MR. BELCHER: But I think I would go back to

Bob's caution to us all. I mean, I think, when I think

about this, this is a tough and challenging area, and the

reason I kind of keep it on, I suggested it is I think this

committee, by paying attention to it, can support the JPO.

I mean, one of the big risks, one of the things we see is we
don't put as much resources behind this as the other parts

of the world do. And so this committee can inform, the DOT

can inform the White House, can inform Congress that this is

a very important issue for our ability to be competitive.
And I'm not a technologist, Scott, so I want to try to help on the policy side where we can be supportive of DOT and kind of keep pushing in the right direction. But Shelley has got a staff person who can come and update us on kind of where things stand.

MS. ROW: Be careful what you ask for.

MR. BELCHER: Okay. Maybe you can bring in somebody else.

MS. ROW: No, no, it's not about that. It's the subject matter.

MR. BELCHER: Yes, it's the subject matter.

MR. BERG: Before we leave this, I have maybe one question. We've been talking about connected vehicle, but, Shelley or Greg or somebody, have you thought about what's after connected vehicle or what happens to the ITS community if connected vehicle deploys?

MS. ROW: Yes, that's a really good point. And I guess two things that we've just put this much thought into, I think what we see, what we think we see is that if you look at the automotive industry now you've got radars and sensors and those sorts of things. We think that will migrate to some combination with the connected vehicle that
will eventually migrate to something with automated vehicles. So we started to look at a little bit with NHTSA. NHTSA has got a lot of interest in the automated vehicle realm. So we think that that's part of the future, so there's that piece.

Separate from that, though, and we have done even less thinking about this, other than we've contacted some of the UTCs to say would you guys be interested in thinking about it, it's what does transportation management begin to look like in a completely connected world? So if everybody does have a thing and if everybody has opted in to stuff and there are ecosystems out there that are consolidating data from a lot of places and selling apps to consumers and operating agencies, what does that mean? So if everybody's app tells us that the freeway is closing, to reroute on a local street all at the same time, what is that like for you? So that's an area that we have about done about that much thinking in. But we feel like it's ripe.

And the other part of it, too, that I think is exciting and no one really gets excited, my other one is that, those of us in the transportation industry, we have all kinds of models, right? We've got planning models,
we've got capacity models, we've got all these models about how to optimize the system. They're based on an assumption of sensor data, loop data. So they were designed originally for the kind of data that we could get with that kind of technology. Well, now the technology is fundamentally different, so what does that mean to that whole community? What does it mean to that whole environment? You know, trip generation models, you know. Well, who's going to need that anymore or how does that change? And I don't think we've looked at that at all to see what might be possible.

MR. MCCORMICK: So what you might be needing in the future, is that really --

MS. ROW: Yes, what's the whole world going to look like?

MS. HAMMOND: We're seeing that now in a world where the INRIXes of the world are capturing flow data but not capturing capacity. So we're getting different kind of data than what our loop detectors collect, and we're trying to figure out how to integrate that for more knowledge and then what do we do with that information?

MS. ROW: Right, right.

MR. BERG: Do you need any advice from this
committee on that type of thing, or is that farther out than
you're asking us to address?

MS. ROW: No, you're welcome to look at that. I
mean, we think it's kind of blue sky creative thinking, and,
quite frankly, we just don't have time right now.

MR. MCCORMICK: What's a really interesting idea
is that rather than have a, you know, death-by-PowerPoint
all day long is that we could have a breakout session for an
hour that just is an idea-generation topic around one thing
and get a tremendous amount of different viewpoints and
expertise in the room, you know, if you have a topic like
that. And it's also more energizing for a meeting if we're
not just sitting here the whole time. We can say, okay, at
10:30 we're going to go into this working, talking, you
know, everybody gets to throw out ideas and do a plussing
session, etcetera, etcetera. And just knowing that it's on
the agenda, you know, tell me what you think the future of
our computational assessments needs to be, you know, we can
survey a lot of people to think about that.

CHAIR DENARO: And that is the model, Scott.
We're paying some dues in this meeting because we wanted to
get everybody up to a consistent level, so we had the JPO
walk through this stuff before. Now, it's kind of on
demand. The command performance is, okay, we're going to
request where we want some depth. We may have outsiders
come in, as I said, okay? We're going to have
subcommittees. We're going to want to hear what they've
come up with and what they've done and so forth. So the
format of the meetings will be, I hope, quite a bit
different.

DR. ADAMS: So on that particular idea, I think I
read in some of the pre-reading that there was a sample data
set that you guys are going to put out.

MS. ROW: That's the research portal.

DR. ADAMS: Which would then sort of be some sort
of a platform or at least, you know, the sample data set
then would be made available and then researchers could try
to do some of the things that you're talking about, right?

MS. ROW: Well, that's the, well, there's two
things. There's two.

MR. CRONIN: There's data.gov, which an element
of that is safety.data.gov. And so that's a lot of,
generally speaking, static data that we're trying to make
available to the public to use in a variety of different
ways, and so the latest being the safety.

    We're looking at it from the connected vehicle world of we need to better understand what this data is going to look like and how do we use it, and so we started a path of looking at connected vehicle data. So we started with, well, what is the existing data that's out there? And so we got some data sets. Some of it does have some more advanced GPS and Bluetooth data sets and other things, but it also is fully integrated with existing data.

    So we have that. We're trying to establish, and we had established for a while and we took it down, a realtime data feed on connected vehicle data to merge in to sort of overlap that. And so we're doing that for this research phase. Some of it might migrate over to data.gov.

    Right now, data.gov can't handle realtime data, but we don't have realtime data right now either, so we're still looking at that. So there is a, in the next few years, sort of, actually, it went up this week. So we have this research data exchange.

    DR. KLEIN: Where is it?

    MR. CRONIN: Where is it? I'll have to get back to you on it. I don't remember where it was. The data is
in the cloud, but, yes, I don't remember what we called it. So there's some issues there. So we have version one, and we're going to be adding different things. As we get the safety pilot data, we're going to put it in there. But we have a big question about timing, you know, so we're not going to put the data in before NHTSA makes a decision, but maybe there's some if it we can. So we're working through that.

**Future Meeting Discussion**

CHAIR DENARO: Okay. We have about 15 minutes left, so I'd just like to ask a little bit about our process going forward and talk about our meetings, and I'd like to get everyone on their way by 4:00 as we promised, myself included.

So, first of all, let me just say with respect to the subcommittees we'll send out an email that summarizes what we're asking. But just as a header, what I'd like to see from subcommittees is re-state the title, you know, modify it as necessary, develop a charge for the subcommittee that you're going to be working on, maybe some discussion of what the process will be, whether there's going to be outside help or what you plan to do that, and
that sort of thing. So we'll get that in place. And like I said, that will be in this email that follows up here. And we can coordinate a lot of other things through the emails also. We don't have to do everything here.

What I did want to talk about, though, is just understand what everyone's leaning is toward meetings. We talked about the fact that we've got some rather short-term milestones coming up. That would be great if we could get some kind of deliberations before those hit. We can't do a formal memo to the JPO and to the Secretary at this point, but we can certainly make inputs to the JPO prior to that.

So given that, my suggestion would be that, you know, we could go as few as two meetings, but I would prefer we go about three meetings. Yes?

MS. ROW: May I just interject something?

CHAIR DENARO: Sure.

MS. ROW: So, yes, at the end of your term, you will do a big report. But every year you will do a report, so you can do something small of things that are in process or whatever you want, or if you've got something that's in the interim you can do that. We have to report annually on the activities of the committee.
CHAIR DENARO: Okay. And we discussed that before --

MR. GLASSCOCK: And last year, the last meeting you did that. You provided the progress you were making, what you were working on --

CHAIR DENARO: Yes, yes, yes --

MR. GLASSCOCK: -- and then we just relayed that information.

CHAIR DENARO: Okay, great. That's good.

MR. BELCHER: Does it make sense to do something with the safety pilot after it's launched?

CHAIR DENARO: I'm not sure what you're saying.

MS. ROW: At the meeting?

MR. BELCHER: Well, have the meeting, Kirk could host the meeting, expose the committee to something more, like, real, what's going on there, and then go from there.

MR. STEUDLE: I think it solves one of the, you know, a little bit of a preview, a review just to get the committee, here's what it is. I would suggest it not be on the launch date. A little after. Let them get the bugs.

MR. BERG: What bugs?

MR. STEUDLE: You can have it at 1:05 because
everything will be done and launched by 1.

MR. SCHAGRIN: I would suggest September or October. That way, we'll have a good operational environment that folks can really kind of immerse themselves in and see what the real operational value of this will be.

MS. BRIGGS: Before it starts snowing.

MS. ROW: And, Valerie, what's the timing of some of the deliverables?

MS. BRIGGS: September.

MR. STEUDLE: And I'm sure he has a nice facility that we've met in last that is at least twice as big as this.

CHAIR DENARO: That's not saying much. I don't see us having a meeting prior to September. It's already June, for all intents and purposes. And summer is a tough time to get everybody together, so do we all agree on September? We can send a doodle out and look for times that work. September-ish for our next meeting?

DR. KLEIN: When is that security framework report due? That's a pretty interesting document that's being prepared on that.

MS. BRIGGS: So there's actually two studies, and
those are the ones that are due September-ish. So I guess we're happy with them, we can start talking about them and stuff. But if we need to review them and send them back, it may be more like October before we have a, you know, good ability to talk about them here. So we also are planning a public meeting, September 25th through 27th. So given that there are only 17 of us, we may want to think about what that means for us, too.

MR. MCCORMICK: That would be here?

MS. BRIGGS: No, it's in Chicago.

MR. MCCORMICK: Oh, Chicago.

MS. BRIGGS: So I guess maybe early October might be better for us.

MR. STEUDLE: Before the 15th.

CHAIR DENARO: Well, I like the idea of being in Ann Arbor, too.

MR. MCCORMICK: Yes, I do, too, because I can drive there in 15 minutes.

CHAIR DENARO: All right. We'll sort that in emails. But sometime, at least we've decided on the time frame. We'll think about the location. And then we can
work on meetings after that. We've already said we want to launch the subcommittees and get some work going there. In emails, we get some more information out so we can start working on things.

Possibility, we could also have a phone meeting prior to a face meeting, so that's something to consider. I'll basically query you for that in emails after we sort together our notes and so forth and see if we want to do that. That's usually a lot easier for everyone.

MS. ROW: Bob, the other thing that we can do with the subcommittees is, if it's on the topic, then we can have a phone briefing --

CHAIR DENARO: Yes.

MS. ROW: -- and get more background materials. The only thing I do need to flag to everyone's attention is that, because you are a federal advisory committee and, of course, you're being recorded, that we can have subcommittees. So, Stephen, how does this go?

MR. MCCORMICK: The one thing that I was going to say is I think what would be useful, particularly on the security one, is I'm going to get back in touch with you and we'll decide on what material and reading it and give to
them, so that, when we do have a telecon or whatever, everyone is level set.

MR. SCHAGRIN: Just one more point on the security, on the technical side, actually the deployment side, CAMP and VIIC have a deliverable to us in August. So if we have a maturing of the thinking in the next phase, it would be there in August, some more information.

CHAIR DENARO: Good.

MR. MCCORMICK: Well, I'll have John call them up and talk to them because --

MR. BELCHER: Bob?

CHAIR DENARO: Yes.

MR. BELCHER: Can I make one -- part of the value of the program advisory committee is the diversity of it and having people from different areas of interest. And I was listening to Scott talk about wanting to get all the technologists together. I would recommend balancing the technologists with people who think differently --

CHAIR DENARO: Good point.

MR. BELCHER: -- so people from the business side of something else, because, you know, all the technologists, we all have a tendency to talk to people like us. And so
having people not like us in the subcommittees is really important.

CHAIR DENARO: Good suggestion. All right. Any other comments, suggestions? George?

MR. WEBB: Yes, I've got one that I think is really near term. The Secretary wrote a letter regarding re-authorization and in that letter laid out an issue that's on the table where the Senate put a recommendation on that's being looked at that the 110 that we saw at the very beginning, that pie gets significantly cut by half to take that money and put it into deployment. So I'm not sure that we can act as a committee. I'm not sure that we should act as a committee. But I think it's an issue that, either individually or taking it back to our roots or whatever, I think that's a real bad mistake to do that. But, I mean, the re-authorization guys are sitting at the table talking to each other. So that's why I'm saying, from a time critical standpoint, you know, I think it's really important to make our positions known to the people sitting at that table, and I'm not sure how best to do that, but I wanted to put it out there because it is very time sensitive.

CHAIR DENARO: Yes. You know, commenting on budget is
something that we've typically steered away from mostly.

MS. ROW: You're coming on legislation.

MR. WEBB: I understand.

CHAIR DENARO: Right, yes.

MR. WEBB: And I'm raising that by having everybody look at their own organization and see if, in fact, you know, I'm going to take this back to National Association of Counties and see if we want to offer a position on that. Like I said, I just wanted to put it out there and find out if there was a feeling that, potentially, the other parties represented at this table might want to do the same thing.

I know it's very sensitive. That's why I said it may not be a committee issue, per se. But it's certainly of interest to those of us sitting here as far as the future activities that the committee may be looking at.

CHAIR DENARO: I completely agree with the importance and everything else. My personal preference is to not, as a committee, weigh in on that.

MR. WEBB: I understand.

CHAIR DENARO: But I appreciate you bringing it up and suggesting that any organization do that.
MR. BELCHER: George, if NACO or any other organization wants to coordinate with the other associations --

MR. WEBB: Got it.

MR. BELCHER: -- and we can put together a uniform strategy.

CHAIR DENARO: All right. Yes, go ahead.

DR. KLEIN: The final coalescing of various committees is going to kind of happen online?

CHAIR DENARO: Absolutely.

DR. KLEIN: You're going to put out a call and --

CHAIR DENARO: Absolutely, yes, yes. This is preliminary here. We're tired at the end of the day. I'm tired, you know, so right, right, right. And I want to leave some time for Greg and Shelley to say something also, but thanks a lot for your work today. I think we had a great discussion. I'm very pleased with the progress we made. I don't know how all you feel, you know, and what your expectations might have been. But I think we came together real well and had some very important discussions. So that was good.

You know, Kirk, you said something earlier when
we started about the mission of cars that don't crash, and
I've said something like that earlier. I went a little
further than that, and I said cars that can't crash. But,
you know, there couldn't be a nobler goal than that, and, to
me, I'm very motivated and very excited to be working on
that.

You know, if we think about what if, based on
this technology getting deployed and based on this committee
had some impact on this, what if in, pick a number, 2017 or
whatever, after some of these systems are on the road,
aftermarket and everything else, what if fatalities were
like half of where they are today? I mean --

MR. STEUDLE: What if in 2025 we get to Roger's
goal of --

CHAIR DENARO: Yes.

MR. STEUDLE: -- a day, a day of no fatalities.

CHAIR DENARO: Yes, what if Roger's dream, vision
is true, as well. I agree. And so I think it's really
important what we're working on. And the other thing I want
to say, too, and I'll say this for Shelley, I mean, and I'll
give you a little perspective from previous committees and
where we were. We've reviewed the JPO programs, and they've
had their concerns about this and that, and DSRC, but there's other technologies and everything.

One thing I'm hearing now, which is very interesting, and I think your principles helped a lot, is I'm hearing conviction on the part of the JPO that, hey, folks, it's safety, you know, if you're not on with that, leave the room. And it's DSRC because we've studied this and we know what we're doing and we're moving on. I am really pleased to hear that amount of conviction. And from that, I think that's contagious throughout the community and the industry, as well.

I'm sensing the beginning of a tipping point here where it sounds like this is going to happen. Two years ago, I wasn't so sure, you know. But I'm sensing that happening now, and I got that sense through the ITS America meeting. So it's an exciting time.

And as we're seeing, you know, struggling with the schedule here, we're struggling with the fact that we're going to be here two years. Within two years, there's a lot of decisions already made. You know, we've got to be faster on some of these things.

So we're in a rapid evolutionary period for this
program, and that's the importance of what we're doing. So Greg, Shelley?

MR. WINFRE: Well, I guess I would just say, and to pick up on the point that Scott was making about getting into the blue sky aspects. Shelley certainly hit on all of the important points, but we should probably factor in what our plenary session talked about yesterday from the Department of Energy perspective as we looked at electrification of the grid, alternative fuels. I mean, you need to wrap all of thinking that in and maybe even broader than our transportation focus. So please make it be as outside the box, when you have those discussions, as possible because that will help us all on the federal side as we move these issues forward.

But just to echo what Bob said and what Shelley said, thank you for your time, attention, and your service. It really is an exciting point with where we are headed with the transportation system. And I'll just keep it simple. It's game-changing, and this is really exciting to be involved with this at this level. So thanks so much.

Adjourn

CHAIR DENARO: All right. Thank you. We're
adjourned.

(Whereupon, the foregoing matter was concluded at 4:01 p.m.)