

Before the  
U.S. Department of Transportation  
Cambridge, MA 02142

In the Matter of

Vehicle Infrastructure Integration Business Model

**COMMENTS OF CONNEXIS LLC**

Connexis LLC (hereinafter Connexis) hereby submits comments in response to the Request for Information (hereinafter RFI) which solicits information concerning potential business models for achieving the Vehicle Infrastructure Integration (VII) vision.

The U.S. Department of Transportation (U.S. DOT or Department) is requesting information concerning potential business models for achieving the VII vision. This vision is predicated on the existence of ubiquitous, vehicle-to-infrastructure and vehicle-to-vehicle data communications capabilities that will enable public and private user services to improve roadway safety and also enhance mobility, improve traffic operations, relieve congestion, and lessen the environmental impacts of transportation. It would also help promote energy conservation, enable electronic payment of transportation-related fares, tolls, and parking fees, as well as allow for user access to the Internet from motor vehicles.

**I. INTRODUCTION**

Over the past several years, the Department has been pursuing an ambitious program termed Vehicle Infrastructure Integration (VII), which would enable a broad range of safety, mobility, and commercial applications using vehicle-to-vehicle and vehicle-to-roadside communications. The roots of this program date back many years to the earliest days of intelligent transportation systems (ITS).

The potential value of cooperation between highways and vehicles was first noted as far back as the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which directed U.S. DOT to “develop an automated highway and vehicle prototype from which future fully automated intelligent vehicle-highway systems can be developed.”<sup>1</sup> The 1997 Automated Highway System demonstration, although regarded by some as a technological blind alley, helped to highlight both the promise and the difficulty of effective vehicle-highway cooperation.

In January 2002, the Intelligent Transportation Society of America (ITS America) produced the National ITS Program Plan: A Ten Year Vision, which included an Integrated Network of Transportation Information to facilitate interaction and cooperation among multiple aspects of the transportation system. That January was also the occasion, at the 2002 annual meeting of the Transportation Research Board, where U.S. DOT first proposed the concept of a Roadway INFOstructure that would capture information on the state of the roads and share it with both infrastructure managers and vehicles. In August 2002, at a TRB-sponsored workshop on the Roadway INFOstructure, a vision of cooperation between vehicles, drivers, and the infrastructure enabled by wireless communications was discussed. Six months later, in February 2003, this vision was encapsulated in the charter of ITS America's Automotive, Telecommunications, and Consumer Electronics Forum as:

Vehicles, drivers, and the roadway infrastructure functioning as a single, well-integrated system to save lives, reduce injuries, increase travelers' productivity and mobility, and enhance their quality of life.<sup>2</sup>

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<sup>1</sup> Section 6054(b), Title VI, Part B – Intelligent Vehicle-Highways System Act, Public Law 102-240 (1991).

<sup>2</sup> ITS America Automotive, Telecommunications, and Consumer Electronics Forum Charter, available at <http://www.itsa.org/itsa/files/pdf/ATCEForumCharter.pdf>.

February 2003 was also the occasion of ITS America's workshop to further consider and characterize the cooperation implied by the Integrated Network of Transportation Information. At the conclusion of this workshop, the concept of bringing the vehicle manufacturers to a common table with the U.S. DOT and American Association of State Highway and Transportation Officials (AASHTO) to promote vehicle-infrastructure cooperation was first articulated.

By the following January, at the 2004 annual meeting of the Transportation Research Board, the notion of a concerted effort to advance vehicle-infrastructure cooperation was announced by representatives of the automotive industry, U.S. DOT, and AASHTO. Since that time, these three major stakeholders have continued to work on their vision and definition of the project now known as VII.

Significant progress has been made towards this goal since the joint announcement. The FCC has allocated 75 megahertz (MHz) of spectrum at 5.9 gigahertz (GHz) for supporting Dedicated Short Range Communications (DSRC).<sup>3</sup> Standards and operating procedures for the use of this spectrum have been developed. The Department, in partnership with the automobile industry and state departments of transportation has embarked on a comprehensive program of research and development to develop and test a prototype architecture, as well as a broad number of safety and mobility applications. While a number of technical challenges remain, these are largely engineering problems that are not expected to seriously limit deployment of such systems.

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<sup>3</sup> *Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, OET Docket No. 98-95, Report and Order, 14 FCC Rcd 18221 (rel. Oct. 22, 1999).

The major challenge facing this program is finding a practical business model for deploying and operating such a system. To date, the Department has primarily focused on public sector models for a number of reasons. The Department is now acknowledging the limitations and challenges of a public sector business model and is seeking input on several issues related to alternate solutions.

## **II. CONNEXIS HAS A LONG STANDING INTEREST IN THE VII PROGRAM**

Connexis LLC is an operating company of Ygomi LLC. Ygomi LLC builds and operates companies that deliver innovative software and services for essential business needs. Ygomi currently operates five information and communications technology companies which develop and commercialize leading-edge solutions in areas including technical support for multi-location enterprises, vehicle telematics, consumer applications using distributed call centers, wireless digital signal processing software, and retail point-of-sale software. Headquartered in Oak Brook, Illinois, Ygomi and its companies serve leading corporations around the world, with more than 1,600 employees across Europe, Asia and the U.S.

Connexis is a next generation telematics service provider led by a team that has decades of experience in the automotive, telematics, call center, and telecommunications industries. The company works with vehicle manufacturers worldwide to deliver superior, cost-effective telematics services through long-term partnerships. Its end-to-end capabilities include protocol conversion and data routing, call centers, and connections to content providers. Drawing on the capabilities of its sister companies, Connexis offers vehicle manufacturers the functions needed for a complete and flexible telematics solution. In addition, we drive innovation through leadership roles in major industry organizations, partnering with other influential members of the ITS community from around the world.

### **III. CONNEXIS'S OVERALL CONCEPT OF VII**

We strongly support the concept of VII. It is only a matter of time before vehicles become networked to each other and the rest of the world. The applications currently being developed and tested likely represent only a small portion of the potential of VII. Certainly and most importantly, VII will offer the potential to significantly reduce crashes and improve mobility. One only has to look at the dramatic way the Internet has changed our lives to see the potential for VII to fundamentally change the way we travel.

We believe, however, that the process of “connecting” vehicles has already begun as we see more advanced telematics services being offered. It is our position that this is a positive outcome that will lead to the more sophisticated vision of VII by creating demand for such services, developing the necessary institutional structures, and advancing the development of technologies and applications. Such developments should be encouraged and a more evolutionary migration plan that engages the private sector in deployment should be pursued.

### **IV. SPECIFIC RESPONSES TO U.S. DOT QUESTIONS**

The RFI provided a long list of “questions” related to VII and DSRC. We have summarized these questions into six topic areas and have provided our thoughts on each of these areas.

#### **A. What incentives or opportunities can be provided to stimulate private sector investment in VII?**

In Connexis's view, the deployment and operation of such a system would best be accomplished through the private sector, which has the resources, experience, and ability to do so in a timely way. The challenge is creating an environment that engages the private sector. To date, the private sector has been unable to identify any clearly profitable applications that would warrant building out such a system using private funds. In order to stimulate private investment

in a DSRC network, some incentives are required. Federal funding would be an obvious incentive. However, we do not believe this is necessary; nor is it the best choice. We believe that the 75 MHz of spectrum that was allocated for this purpose has significant commercial value for a number of non-transportation related applications. We also believe this 75 MHz of spectrum is more than enough for any reasonable set of VII applications. For these reasons, it should be possible to stimulate interest in building out and operating this network by providing some portion of this spectrum for other commercial uses to the group that agrees to take on this task.

In order to pursue this concept, U.S. DOT would have to engage the Federal Communications Commission (FCC) since the spectrum was not allocated to DOT and the Department has no control over its use. We respectfully suggest that DOT work with the FCC to issue a formal joint Notice of Inquiry. The Notice could seek input on this concept and, based on that feedback, a Notice of Proposed Rulemaking could be issued seeking to amend existing rules to foster development of the spectrum for ITS applications.

**B. What is the evolution path to VII and how will the deployment of VII-like services using alternate communication protocols impact VII deployment?**

The original notion of the simultaneous deployment of a nationwide network of DSRC roadside units and in-vehicle units to support the full range of identified “VII applications” was not based on technical requirements. It was always recognized that DSRC was not required for many “VII applications.” Many, if not most, applications could be met using other communications technologies, including available commercial services such as cellular, Wi-Fi, and WiMAX. It was assumed, however, that some form of secure, low latency communications protocol was necessary for most safety applications. Dedicated spectrum is critical for these safety applications and DSRC was designed to meet the requirements of these applications.

While the U.S. DOT and its VII partners have been debating and analyzing various business models for achieving this vision of a simultaneous DSRC network deployment, the notion of a nationwide deployment of DSRC was in fact an assumed business model. An alternate model is a market-based model that results in a number of services being offered piecemeal using various communications technologies with DSRC being deployed over time.

Without DSRC deployment or government intervention, many of the VII applications will be developed and provided by the private sector using alternative technologies. There is already evidence of such deployment in the U.S. and elsewhere. This includes real time traffic information being provided by satellite radio; vehicle diagnostics service being provided through a cellular telephone link; and icy road conditions being provided from one vehicle to other vehicles upstream using the drivers' personal mobile telephones. What is unclear is whether the envisioned public sector applications, such as probe data, and safety related applications will be realized under a private sector based deployment scenario.

Independent of the communications technology, there is the issue of whether the private sector will see any value in providing the public sector applications or how the public sector could influence the provision of such services.

While DSRC is not required for many VII applications, it will support most currently identified applications. The limitation or challenge of DSRC is that it is, by definition, short range. This limits its ability to support important services that require more ubiquitous coverage such as Automatic Collision Notification (ACN). Also, its short-range beacon-based architecture is infrastructure intensive, which significantly limits its ability to cost-effectively support rural areas and highways. For these reasons, DSRC will not meet all the communications requirements of VII. A more ubiquitous (but limited) long range communication capability will be needed to support rural areas and applications requiring continuous coverage such as ACN.

We have previously commented to the FCC suggesting that they consider the use of the planned public safety broadband in 700 MHz band.<sup>4</sup>

**C. How will public sector services be provided?**

It is critical in a private sector deployment scenario to ensure that public sector applications are supported. Left to chance (and the marketplace), these critical mobility and safety applications would likely be slow to be offered, if they were offered at all. Any agreement to enable the private sector deployment of DSRC should include requirements for supporting these applications. In our view, it is critical that safety services be provided at no charge to the consumer. Other public services such as probe data collection should be provided at a price agreed to between the public sector and the private sector network operator.

**D. What are the challenges to VII deployment and how can they be addressed?**

There are no real technical challenges. There will certainly be business risks, but those can be balanced by the potential for spectrum use. As noted above, it is important to ensure any DSRC deployment scenario supports key public sector services. Developing an “agreement” that provides enough incentive for the private sector, while ensuring the needs of the public sector are met will be a significant challenge. Other issues such as liability and privacy, while significant, are not particularly unique and the private sector is well versed in addressing these issues.

**E. What are the near term applications and benefits of VII?**

Some private sector telematics applications will be available early on because they are not dependent on market penetration of equipped vehicles (i.e., the first On-Star equipped vehicle provided On-Star services). Probe data based services will become available relatively early on as market penetration becomes sufficient to provide adequate data (approximately five

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<sup>4</sup> *In the Matter of Implementing a Nationwide, Broadband Interoperable Public Safety Network in the 700 MHz Band*. PS Docket No. 06-229, *Ninth Notice of Proposed Rule Making*, FCC 06-181 (rel. Dec. 20, 2006).

percent of the traffic stream). Some of the more important safety applications will be the last services to become available because they depend on large numbers of equipped vehicles (Vehicle to Vehicle) or special hardware installations (Cooperative Intersection Collision Avoidance Systems).

**F. Is DSRC required for VII and what are the alternates?**

DSRC is not required for VII. There are and will be a number of communications alternatives that will exist simultaneously both in the marketplace and in vehicles, some of which will be more attractive in particular applications and circumstances. A sensible architecture should recognize this, make good use of it (e.g., allowing a vehicle to choose the technology that makes sense at the moment), and not be locked into a particular technology for the life of the vehicle, regardless of its attractiveness at this particular instant in time.

Many applications can be supported by other available communications means. Even for applications requiring some of the design features of DSRC, such as low latency and security, these requirements could be met using alternative designs. Dedicated spectrum would be required and the system would have to be designed to meet these specific requirements. If the private sector were to build such a system, there is a reasonable probability that such a system would be based on more modern technologies that met the same requirements.

**V. CONCLUSION**

Connexis believes that some form of DSRC using the allocated spectrum should be deployed nationwide to provide, at a minimum, the VII related applications that have the potential for dramatically improving mobility and reducing our highway fatality rate. We believe only the private sector has the expertise and ability to deploy and operate such systems as is evidenced by the cellular and Internet industries. This can only occur, however, if the private sector is encouraged, with the appropriate incentives, to deploy and operate such a system. The

most promising incentive to attract private sector investment is to allow the use of some portion of this valuable spectrum for commercial purposes.

Under such a private sector model, the government should ensure that the critical safety applications are supported and that these services be provided without charge to the public. Other public sector applications such as probe data applications could also be supported, but some sort of cost recovery system would have to be established (i.e., the public sector would pay for use of this data).

Respectfully submitted,

/s/

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