Smart and Connected Passenger Vehicles

Pervasive Connectivity Will Fundamentally Change the Automotive Landscape

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Introduction

Personal mobility—how we travel—will look fundamentally different in the future. *Transportation will be connected:* passenger vehicles, buses, trains, traffic lights, and travelers will communicate with each other throughout the journey. This can create huge benefits:

- Less time stuck in traffic, and more productivity while traveling
- Less congestion and emissions, and more informed choices about how to travel
- Fewer traffic accidents and more peace of mind

Some, but not all, of these benefits come from connecting public transportation. Today, 85 percent of all global surface miles are driven by a total of 750 million passenger vehicles. By comparison, buses and trucks amount to 200 million vehicles, and railcars to 6 million. In 2030, the number of passenger vehicles will almost double to 1.4 billion, whereas the number of buses and trucks will grow by only 50 percent, to 300 million.[1] So, although public transportation is important, especially in urban agglomerations, the *Smart and Connected Passenger Vehicle will be the mainstay* of Connected Transportation.

The Cisco Internet Business Solutions Group (IBSG) has worked extensively with auto industry OEMs, and also with government agencies and industry associations, to put a "price tag" on benefits associated with the Smart and Connected Passenger Vehicle. Cisco IBSG believes these benefits exceed US$1,000 per vehicle annually—enough to finance the necessary roadside and service infrastructure. Most important, this revenue pool doesn't come mainly from "societal" and hard-to-monetize sources like CO_2 reductions, or from costs associated with accident reductions. Instead, 30 percent of this revenue potential is generated by vehicle users, and another 20 percent by auto OEMs.[2]

Four Trends Create a Disruption Point for the Auto Industry

If Smart and Connected Passenger Vehicles create such significant benefits, why are we not already experiencing larger adoption? In Cisco IBSG's opinion, four trends are now coming together to create the necessary disruption point for the auto industry:

1. **Increased displacement of internal combustion engines by plug-in hybrid and fully electric vehicles.** With few exceptions, electric vehicles entering the market today are "conventional" vehicles with the combustion engine replaced by a battery pack and an electric motor, but are not designed from the ground up as electric vehicles. The necessary new design paradigm for electric vehicles puts a much higher premium on weight savings, but also calls for much more integration of in-vehicle systems, which in turn requires rethinking the in-car electrical and electronic architecture.
2. **Improved software development in the auto industry.** Electronics today account for most of the innovation—and problems—in the auto industry. Electronics represent 25 percent (U.S.) to 35 percent (Europe) of a car's cost (with an upward trend), and more than 50 percent of warranty repair costs.[3] As opposed to almost everything else in a car, software development in the auto industry is still very much in a pre-*Kaizen* mode. Every supplier of a "box" understandably protects its intellectual property. The result is "siloed" systems and difficulties in maintaining integrity.
3. **Industrywide movement toward cross-industry platforms, standardization, and convergence of systems.** Engineering complexity and associated costs are growing due to increased customization options and models. Adding proprietary systems or layering features and functionalities on top will not resolve this problem. Already, initiatives like the AUTOSAR (AUTomotive Open System ARchitecture) consortium create a standardized middleware layer, which allows independent software and hardware, along with open-sourcing applications, to be used—a novelty for the industry.
4. **New policy and increased use of technology.** Because GDP and auto adoption correlate, globalization and growing wealth increase passenger miles and vehicle demand. At the same time, environmental, traffic-congestion, and safety concerns require smarter use of the road infrastructure, which can be resolved only by new policy and by using more technology.

In light of these developments, all major auto OEMs have announced that they will launch a Connected Passenger Vehicle within the next three years and build a growing ecosystem of services around it.

Take, for example, the next-generation *Sync/MyFord* offering from Ford and Microsoft. The "old" Sync has mainly been a media platform that could read out SMS messages and let you operate mobile phones and media players (connected via Bluetooth or USB) using voice input or car controls. The new Sync is an in-vehicle connectivity experience that provides navigation services and traffic alerts, calls 911 if your airbag deploys, and also replaces many traditional vehicle buttons, knobs, and gauges. Ford and Microsoft have teamed up with a third party—INRIX, the leading provider of real-time, historical, and predictive traffic information in the United States. This has now been extended by Microsoft's *hohm* platform for Ford's upcoming electric vehicles. *hohm* is a web-based service that helps customers determine when and how to most efficiently and affordably recharge electric vehicles and plug-in hybrid electric vehicles.

Cisco's Vision for Smart and Connected Passenger Vehicles

Cisco's vision for Smart and Connected Passenger Vehicles points in this direction, but goes beyond and predicts that pervasive connectivity will **fundamentally change the way cars are built, how they are used and serviced, and how they integrate with the environment.** Cisco IBSG envisions four key capabilities in the connected vehicle:

1. **Connect within the car.** Currently, a multitude of proprietary and largely independent networks create mounting complexity and challenges regarding reliability and integration. A converged, in-vehicle network would reduce the physical complexity by managing the network intelligently, while at the same time creating new sources of value. An intelligent gateway would be the centerpiece, running not only communication and security applications, but also vehicle-specific and third-party applications.
2. **Connect to personal devices,** including laptops, PDAs, iPads, media players, and other nomadic devices. Like cars, mobile devices have become an integral part of our lives, but they don't integrate well yet. Users want the applications on their personal devices—for example, Microsoft Outlook, social networking applications like Loopt, and collaboration software such as Cisco WebEx—to run in their cars, too.
3. **Connect "around" the car.** This includes interacting with the up-and-coming Intelligent Traffic Infrastructure and other cars to enable collision avoidance, or with the SmartGrid for automated and optimized charging of electric vehicles. This will require multiconnectivity (e.g., multiple cellular, Wi-Fi, 802.11p / DSRC) as well as advanced connectivity and mobility management to ensure uninterrupted sessions at high speed to meet latency requirements for critical applications, and to satisfy network and computing security imperatives.
4. **Connect to the cloud,** from which a host of new services will be provided. These will include touchless payment for parking or fuel, congestion-based road pricing, pay-as-you-drive schemes from insurers, geo-fencing to alert parents when their teenager is driving to places he or she should not go, and many more services that have yet to appear.

Instead of OEMs developing similar technologies individually, Cisco believes in a platform play enabling the four main capabilities described above. By going with an end-to-end network and data-center architecture, automakers can reach the market faster and invest their own resources in innovation, customer experience, and service differentiation. In addition, mobility service providers and regulators will have a robust and scalable foundation for their respective offers.

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Endnotes

1. Sources: IRF World Road Statistics, U.S. Energy Information Administration, ITF Trends in the Transport Sector.
2. Source: Cisco IBSG Automotive and Economics practices, 2010
3. Sources: Ward's Automotive; McKinsey / PTW HAWK Survey, 2003; Mercer Management Consulting; Bosch Electronics Handbook

More Information

Cisco Internet Business Solutions Group (IBSG), the company's global consultancy, helps CXOs from the world's largest public and private organizations solve critical business challenges. By connecting strategy, process, and technology, Cisco IBSG industry experts enable customers to turn visionary ideas into value.

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