

## A Look Ahead at Telematics In the Year 2013

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*What will the automotive telematics market look like and what role will telematics services play in the automobile and intelligent transportation systems (ITS) in the year 2013 – 10 years from today? This white paper provides a road map for getting from where the market is today to where we believe the market will be in 2013.*

Predicting the future of any technology or market has never been more difficult or riskier than it is today, following three years of turmoil, disappointment, and stagnant growth in virtually all major areas of technology. Few emerging niches of the technology landscape are in as much disarray as telematics. But all is not lost. There is a future vision for the telematics business in which the automotive and wireless industries, along with the consumer, all recognize significant value from the provision of telematics services.

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### Telematics Defined

There is disagreement regarding almost all aspects of telematics, beginning with its definition. Given that an estimated 50 to 70 percent of cell phone minutes are used in vehicles, defining exactly what is and what isn't telematics makes a big difference in market estimation and forecasting.

We define telematics as vehicle-dependent information, products, and services. By “vehicle-dependent” we mean products, services, and information that are *physically dependent* on the vehicle's architecture or location. So while remote

diagnostics, automatic collision notification (ACN), and stolen vehicle tracking fit within this definition, wireless cell phone usage and speech-to-text e-mail do not. Regardless, to enable telematics services, an in-vehicle wireless communications connection to an outside network is necessary.

### Where Are We Today In Automotive Telematics?

In general, automakers and their suppliers believe that because they manufacture and sell the vehicle, they are best positioned to determine the nature of the wireless connection inside the vehicle and to provide the associated services, or at least generate some revenue from enabling these services. The issue of how best to structure the telematics business model has been the crux of the conflict between telematics technology providers and the auto industry. The failure of the market to deliver compelling, cost-effective automotive telematics solutions to consumers stems from this conflict.

The U.S. automotive original equipment (OE) telematics market today consists of a growing number of hardware solutions, with service provisioned largely through two primary telematics service providers (TSPs), General Motor's OnStar and ATX Technologies.

OnStar has approximately 80 percent of the market share and provides service to an estimated 2.5 million vehicle owners, the majority of whom drive GM vehicles. OnStar also provides branded and

private label service on individual models of non-GM original equipment manufacturers (OEMs), including Lexus, Acura, Audi, Subaru, and Isuzu. In all, OnStar will be offered on 60 individual models by year-end 2003 in the U.S. ATX Technologies provides private-labeled telematics services as an outsourced TSP, predominantly to Mercedes and BMW, with a total of approximately 400,000 subscribers.

The overwhelming majority of the OEMs that offer telematics services install hardware solutions that consist of an embedded analog cellular transceiver, a GPS system, an embedded telematics control unit (TCU), and a user interface that generally consists of three buttons and a microphone (audio input/output).

The cost of the OnStar hardware system is approximately \$350 per vehicle. Consumers can choose from three service plans ranging from \$199 to \$799 per year. These annual fees exclude personal wireless calling, which requires a separate contract for prepaid wireless minutes.

GM offers one year of OnStar free with the purchase of an OnStar-equipped GM vehicle. Mercedes and BMW have longer service contracts with costs included in the vehicles' manufacturer's suggested retail price or option packages.

#### **The Embedded Hardware Business Model Currently Reigns**

There has been much debate over the embedded TCU business model. This high-cost, high-risk approach has resulted in churn rates (i.e., for any given period of time, the number of participants who discontinue their use of a service divided by the average number of total participants) of approximately 80 percent. The majority of OnStar's subscribers are new vehicle owners enjoying their first free year of service.

OnStar-equipped vehicles currently in "circulation" number more than 6 million. Service is provisioned through Verizon's nationwide analog network.

In 2002, the Federal Communications Commission bowed to pressure from wireless carriers and lifted a 20-year mandate on carriers that their networks be compatible with analog standards. This ruling established a five-year sunset period, during which wireless carriers will almost certainly phase out their analog networks in favor of faster, more efficient digital networks. When this process is complete in 2008, the 8 to 10 million vehicles that will have already been sold with embedded analog transceivers (regardless of automaker or TSP) will not be able to communicate with digital wireless networks.

*“The inability to predict or adapt to future changes in technology makes embedding wireless communications technology in vehicles illogical.”*

Thus, the current U.S. telematics subscriber base of more than 3 million, and the roughly 8 million vehicles now on the road with analog TCUs, in all likelihood have a useful lifespan of no more than five years. For their model year 2004 vehicles, GM and other OEMs will begin transitioning to digital transceivers to avoid the obsolescence that their existing pool of telematics-equipped vehicles now face.

However, the migration to digital transceivers does not address the fundamental problem with this business model: embedding wireless technology in automobiles. Technology changes rapidly, while automobiles stay on the road for 15 to 20 years. They can only be retrofitted at significant cost.

The inability to predict or adapt to future changes in technology makes embedding wireless communications technology in vehicles illogical. Furthermore, almost all drivers have personal cell phones that provide access to some of the same services and benefits they can get with embedded systems.

### Telematics Services: Trying to Find Value

Automakers and the wireless industry have conducted numerous studies to determine whether and how much consumers would be willing to pay for various services, including ACN, access to news reports, stock quotes, and real-time traffic reports, to name a few. In some studies, consumers were asked to rate the importance of more than a dozen service offerings and how much they would be willing to pay for each.

Of course, various services are of different value to different people. However, *services cannot be purchased individually*, and the failure to recognize the implications of this on consumers led to a myriad of market forecasting errors.

*“When it comes to vehicle safety features (airbags, for example), consumers have been conditioned to receive products and services for free.”*

TSPs bundle services together into packages. Consumers are smart enough not to pay twice for the same services. When confronted with the option of purchasing a bundle of services, some of which they already have, don't want, or don't need, they have opted not to purchase at all. Unfortunately, automakers sell vehicles mostly from inventory through dealer networks. So they install all of the hardware necessary to enable all services, before knowing whether the eventual buyer will ultimately pay for any.

While consumers seem most interested in safety and security services (e.g., ACN, remote diagnostics, etc.), they don't value them highly enough to justify the costs associated with installing them as *standard* equipment in vehicles. Low retention rates have proven this to be true.

Perhaps it is the passive nature of these services that make them less appealing than predicted.

When it comes to vehicle safety features (airbags, for example), consumers have been conditioned to receive products and services for free. We believe that is likely to happen with telematics, beginning with luxury vehicles as manufacturers attempt to utilize telematics as a product differentiator in a brutally competitive selling environment. ITS will also eventually offer many of the same safety and security benefits to drivers that telematics systems currently offer.

### Strong Demand For Real-time Traffic and Navigation

As we move up the value chain of telematics services, we come to real-time traffic and navigation systems. These systems, some available with on-board computer displays in higher-end vehicles, allow drivers to see and plan multiple routes to their destination. Some believe these systems can be a panacea for sitting in traffic jams when combined with real-time traffic reports.

Real-time traffic data routinely tops the charts of the most desired wireless location services in consumer surveys, but this data is not yet widely or consistently collected throughout the U.S. There has been a good deal of activity in both the public and private sectors to rectify the lack of reliable, real-time traffic data. However, up to this point, it is the public sector that is leading the way on real-time traffic data collection, providing most of the raw information to private sector companies.

At present, the navigation software element of these systems (e.g., digital maps) is more advanced than the real-time traffic information systems that exist. However, for a robust, dynamic routing service to be truly valuable to the consumer, the real-time traffic information has to be accurate, timely, and easily accessible.

The public sector, through the implementation of phone-based 511 services, is accelerating its efforts to make real-time traffic information available to consumers so they can avoid congested areas, construction, and inclement weather. However, 511 services are in their infancy in the U.S., having only been rolled out to about 14 percent of the nation's

population between June 2001 and February 2003. The ultimate relevance of 511 for everyday travel – and its resulting impact in improving real-time data collection – is unclear.

**Fast Forward to 2013: Mass Gridlock In the Making?**

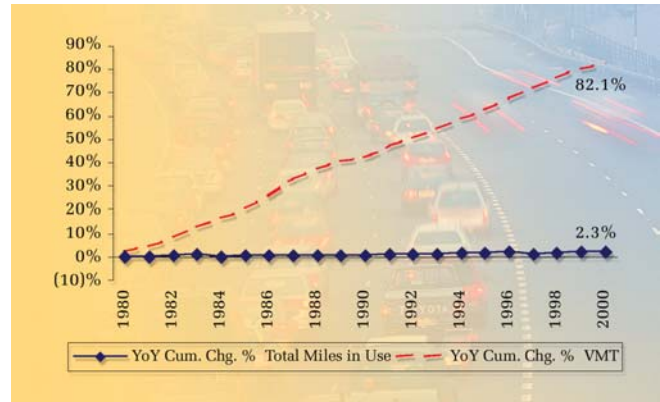
What would happen if real-time traffic and navigation information became highly accurate and widely disseminated? The idea of low-cost or even free real-time traffic information combined with robust dynamic routing solutions sounds like an extremely attractive application. Ideally, drivers would be alerted to traffic jams or construction areas on primary roads before reaching them, given an estimate of the expected delay, and offered an alternative route.

Because 511 systems are free to the user and most drivers are familiar with alternative routes in their home neighborhoods and commute areas, most would likely choose alternative secondary routes to avoid delays. So in addition to the regular traffic on these secondary roads, there would be a mass influx of vehicles re-routed from primary roads. As the volume of re-routed vehicles spiked, secondary road traffic volume would approach, and ultimately hit, capacity. This could eventually create mass gridlock in urban areas.

In the near term, however, there is “excess capacity” on secondary roads that could be utilized during periods of congestion on primary roads. While filling this excess capacity represents a one-time benefit, it is a benefit nonetheless.

The problem of traffic jams and congestion on America’s roadways cannot be solved solely through the dissemination of real-time traffic information to drivers. Since 1980, the total number of new miles of road in use in the U.S. has grown just 2.3 percent, while vehicle miles traveled (VMT) have grown by 82.1 percent – or more than 1.25 trillion miles (Exhibit 1). During the same period, the U.S. vehicle base has grown from 136 million vehicles to more than 210 million, an increase of more than 50 percent.

**Exhibit 1. New Road Construction Vs. Vehicle Miles Traveled**



Source: U.S. Dept. of Transportation

Given the statistics above, it is easy to understand why congestion and the associated economic costs of congestion have grown so consistently and substantially. It’s estimated that congestion results in approximately 6 billion person hours of delay per year and more than \$80 billion in lost wages and wasted fuel, or roughly \$1,000 per driver. Advanced traffic management, high-occupancy vehicle lanes, ITS, and the proliferation of electronic tolling have all had positive impacts on traffic flow in major metropolitan areas, but there is no question that the battle is being lost. Growth in the vehicle base and VMT continues to increase at historical rates, while growth of lane-miles in use remains nearly stagnant.

In the near term, real-time traffic information may have value to the few that have best-in-class navigation systems. However once existing roadway capacity utilization is optimized, real-time traffic information is likely to lose its value.

**Telematics and ITS - The Future**

**Relationship Between You, Your Car, and the Road**

The growth of ITS throughout the country and the explosion of electronic toll collection (ETC) are having a profound impact on drivers. For example, conventional toll lanes can process roughly 400 vehicles an hour, while ETC lanes can process

1,200 an hour, improving traffic flow and alleviating congestion. The overwhelming majority of toll collection agencies in the United States use ETC to some extent. Millions of customers throughout the country now have ETC transponders in their vehicles that communicate via unlicensed spectrum with toll facilities.

ETC is one of the most advanced niches of the emerging wireless electronic payment systems (EPS) market, and many toll agencies are now looking at innovative ways to expand the applications for their transponders, including moving into mobile commerce. Presently, most toll agencies give transponders away to drivers for free at a cost of roughly \$25 apiece, ETC transponders could be an inexpensive way to bring some basic telematics services to drivers.

*“The number of ETC customers already dwarfs the number of telematics subscribers in the U.S., and the ETC market is growing at a faster clip than the telematics subscriber base.”*

For example, dedicated ETC lanes have video cameras that capture license plate images as they pass through the toll plaza for violation enforcement. Those cameras could also be used for telematics applications, such as stolen vehicle tracking, for vehicles that don't have a telematics system but do have an ETC transponder.

The number of ETC customers (more than 10 million) already dwarfs the number of telematics subscribers in the U.S., and the ETC market is growing at a faster clip than the telematics subscriber base. In many major U.S. cities, such as New York and Orlando, ETC transponder penetration rates are already above 50 percent.

Automakers are also introducing ITS-type features, such as adaptive cruise control, in high-end

vehicles. While this may not seem like an ITS feature (and hasn't been called a telematics feature), the ability of the car to monitor and respond to changes in its surrounding environment has long-term ITS implications.

The convergence of telematics, ITS, the automobile, and the driver is in its early stages today, but we expect this trend to accelerate and provide quantifiable benefits by 2013 through applications we can't even imagine today.

#### **What Will Automotive Telematics Hardware Look Like in 2013?**

The predominant embedded-systems-based telematics business model of today has not gained much traction with consumers. Drivers continue to use their cell phones to access value-added information and a simple hands-free car kit when convenience and/or safety is either desired or mandated by law. While we see a number of new cell-phone-based telematics hardware solutions entering the marketplace, these solutions still fail to address technology obsolescence issues.

By 2013 we expect telematics hardware solutions to be technology agnostic, providing the kind of “plug-and-play” functionality and scalability that power outlets or in-vehicle cigarette lighters provide. In this type of model, we see a system capable of easily and cost-effectively switching out various technologies based on the user's cell phone, which we expect will still be the primary communications link for consumers.

Basically, we see two trends in telematics hardware. First, as discussed previously, we expect a move from analog to digital transceivers in embedded systems. The second trend is a gradual shift in mentality from offering an embedded-only solution to a hybrid or cell-phone-centric solution. Beginning this year, many automakers and suppliers, like DaimlerChrysler and BMW, plan to install Bluetooth chips in vehicles. These chips can interface with any Bluetooth phone.

The bet on Bluetooth is a big one. There are only a few Bluetooth-enabled handsets on the market

today, and the technology has not been widely tested. Where it has been tested, universal interoperability between devices has been a challenge. This has led to delays in rollout at some automakers.

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As a long-term solution, Bluetooth does not address the fundamental issue of technology obsolescence because a chipset must still be embedded in the vehicle. Eventually, whether it's five, 10, or 15 years down the road, there will almost certainly be a superior wireless technology available that the wireless industry migrates to. This is inevitable. One thing is certain: the wireless industry will not ask the auto industry for permission to migrate to new technologies.

#### **What Will Automotive Telematics Services Look Like in 2013?**

Some automakers, such as DaimlerChrysler's Chrysler North America operations, don't believe that even basic automotive telematics services like ACN, remote diagnostics, and theft detection can be cost-effectively delivered to the masses in today's environment. They may well be right.

To date, of the traditional “Big Three” automakers, only Chrysler has avoided the huge investment losses in telematics that GM and Ford have experienced. And there has been little evidence that a significant percentage of nonluxury vehicle buyers are willing to pay for the services currently being offered. Nevertheless, the availability of OnStar service continues to expand both within GM and across non-GM OEMs.

We expect higher-end telematics services, such as screen-based navigation, to remain (for the most

part) in luxury vehicles costing \$30,000 or more. Navigation and routing will always be a useful service for drivers who are lost, and many will be willing to pay for it.

We believe safety and security services are more likely than not to be included as standard on luxury vehicles by 2013 in an effort by OEMs to differentiate their products. These services will include ACN, remote diagnostics, and theft detection and recovery, among others. If automakers recognize the implications of, and tremendous value inherent in, remote diagnostics, we could see more widespread penetration of telematics.

Regarding real-time traffic information, although the reality of growing congestion, stagnant new road construction, and limited capacity of alternative routes may limit a driver's options, the value of the information seems to be in informing drivers of what is happening and even reassuring them that there is no better alternative available.

#### **Implications for Automakers, Vehicle Owners, and Dealers**

In our 2013 vision, we see a business model in which automakers cede the revenue opportunities associated with telematics services to wireless carriers. Their objectives: to increase subscriber penetration, reduce churn and to differentiate their products, and focus on the long-term cost reduction opportunities that stand to be realized.

Automakers set aside approximately \$800 to \$1,000 per vehicle (or 3 to 5 percent of the vehicle's invoice price) at the time of production for the following:

- Warranty accrual reserves (\$500-\$600)
- Recall costs (\$175-\$225)
- Service adjustment costs, like those associated with things not covered under warranty, but which the automaker pays for out of “goodwill” (\$50-\$100)
- Product liability costs (~\$100)
- The intangible, but real cost of brand equity.

By monitoring diagnostics, automakers would be able to more quickly identify recurring problems on vehicles, especially new product introductions, and initiate recalls faster. In turn, they could limit the number of vehicles that need to be recalled. After a few years, OEMs would have a good sense of the new benchmark for warranty realization and could thereafter reduce per vehicle accrual reserves, increasing their profits.

The vehicle's internal network can and already does centralize much of these data in response to the Environmental Protection Agency's on-board diagnostics II (OBD-II) legislation, which went into effect in 1996 for all new vehicles. While OBD-II guidelines were directed specifically at centralizing vehicle emissions data, OEMs have used the legislation to their and their dealers' advantage by connecting more and more sensors and systems to the network.

This allows dealers to use one piece of diagnostics equipment with one connection to get access to scores of systems and sensors within the vehicle. Customer's visits are streamlined and customer satisfaction enhanced. A simple wireless interface to a consumer's cell phone may be all that is needed to enable remote diagnostics services, either to a dealer or data monitoring center.

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**Who Will Be the Key Players  
In Automotive Telematics in 2013?**

The auto and wireless industries will continue to be the main players in telematics over the coming

decade, although we see their respective roles being refined. We also believe that many segments of the ITS industry (such as 511 system implementers) will become significant players in telematics as the convergence, integration, and interaction between the automobile, the driver, and the road increases.

The public sector will also play an increasing role in a myriad of ways in the coming years, from legislation on in-vehicle use of handheld cell phones, to the expansion of 511 systems nationwide, to dealing with the serious economic and environmental consequences of ever-worsening congestion on America's roadways.

**The Road to the Future**

The path to 2013 will not be an easy one. The telematics market today is disorganized and struggling to stay afloat as a viable market opportunity for the auto and wireless industries to pursue. The relationships between the auto industry, the wireless industry, and the public sector are all strained. Capitalizing on the growth of the telematics market opportunity does not depend on technology; it depends on the development of these relationships and implementation of common sense business models.

In addition, both the auto and wireless industries are dominated by stubborn 800-pound gorillas. Changes in the auto industry happen very slowly, as two-year new product development cycles force automakers to commit to technologies, features, and designs well before the product rolls out. Once the product is rolled out, redesign/replacement cycles average four to five years. So we don't expect the industry to be able to react quickly to consumer feedback or market developments.

And there are other factors to consider. Continuing profit erosion in a brutally competitive U.S. auto sales market and significant excess capacity/supply are forcing automakers to cut costs anywhere and everywhere possible. Automakers are targeting noncore product offerings like telematics systems for elimination or significant cost reductions in order to maintain profitability.

It is our view, however, that the wireless and automotive industries will ultimately work out their respective differences in order to unlock the value that telematics represents for each and that inevitable changes will put the telematics market on a long-term path for growth and success.

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Our end-state vision for telematics is one in which:

- The auto industry is focused on cost-saving opportunities.
- The wireless industry is focused on maximizing location-based service (LBS) revenue.
- The ITS industry is able to optimize transportation system performance based on probe vehicle data and seamless interaction with vehicles.
- The consumer is able to realize value at a reasonable cost from the services that both the public and private sector are delivering.

In 2013 we believe that the telematics business will be closer to this end-state vision, although legacy business models will continue to plague the pace of progress. We expect the auto industry to have learned the painful lessons of their early forays into telematics by 2013 and to have prepared for and perhaps launched business models that satisfy the structural problems that exist today.

We also expect that the telematics market will look much more like the niche area of the wireless LBS market that it really is and that it will be much more integrated with ITS. OEMs will cede control of the revenue opportunities in order to subsidize hardware costs and drive up subscriber use so as to derive the cost-savings benefits and CRM opportunities.

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