# GENERAL MOTORS ONSTAR

Introduction

OnStar is a subscription-based dashboard communication service created by General Motors (GM). The service provided numerous safety and convenience features, from emergency assistance to remote door unlocking to hotel reservations. GM announced in the spring of 2000 that voice-activated Internet access and cellular telephone services would be available through OnStar beginning in the fall.

OnStar is a telematics device. A telematics system combines vehicle control and monitoring systems with location tracking and wireless telecommunications. A study of the telematics market by The Strategis Group in 1999 projected an increase in revenues for automobile telematics services from less than $40 million in 1999 to $1.7 billion in 2004. The number of subscribers to telematics services was expected to climb from under 200,000 at year-end 1999, to more than 11 million by 2004 (see **Figure 1**).[1]

Figure 1: Projected growth in subscribers to telematics services
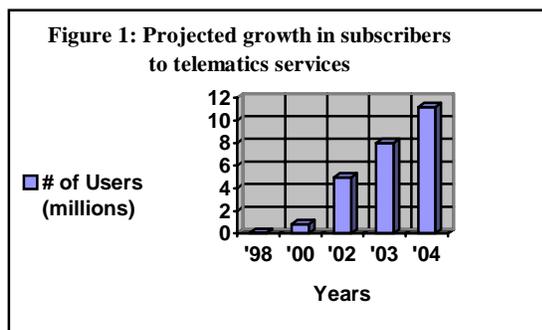
GM's OnStar System

For the model year 2000, the OnStar system cost consumers around $600 for installation. GM offered two different subscription packages. The basic service plan cost $199 per year, and provided customers with roadside assistance and emergency help. The premium service plan cost $399 per year and, in addition to OnStar's basic offerings, provided various concierge and convenience services, as well as routing assistance. See **Exhibit 1** for a full comparison of the features of the basic and premium service plans.

OnStar was designed and developed by General Motors North America Operations, Delco Electronics, Hughes Electronics Corporation, and Electronic Data Systems. GM launched OnStar in Cadillac models in 1996. Initial customer reaction to OnStar was positive, and by 1998 OnStar had 22,000 subscribers. GM, seeking to leverage its first-mover advantage in the automotive telematics arena, increased the types of vehicles equipped with OnStar to include top line models from Oldsmobile, GMC, Chevrolet and Pontiac. By the end of 1999, OnStar had nearly 150,000 subscribers and revenues of $43 million. In 2000, General Motors expanded the number of OnStar-ready vehicles to 31 models. The company was adding 5000 new OnStar subscribers per month in the spring of 2000, and expected to roll-out over 1 million OnStar-equipped vehicles by the year's end.[2,3] General Motors predicted that OnStar

[1] "Automotive Telematics 'Hotter than a Jalapeno in a Heat Wave," *Dow Jones Interactive PR Newswire*, November 11, 1999.
[2] Lee Copeland, "GM Lures Consumers with OnStar Service," *Computerworld*, April 17, 2000, p. 20.

would be ordered on half of the 2.8 million cars in which the option would be available in 2001, which would account for 29 percent of the company's entire vehicle production.[4]   Auto analyst John A. Casesa forecasted revenues of $900 million for OnStar by 2002, with average revenue growth of 33% a year through 2010.[5]   Indeed, OnStar was viewed as a potent source of future income for GM.

A New Strategy for General Motors

Under the leadership of CEO Richard Wagoner, General Motors began a transformation it hoped would recast the world's biggest firm in terms of sales as a New Economy giant. As Wagoner explained, "The Internet is offering all sorts of capabilities to do things faster . . . We need to lead in that whole e-business area."[6] In order to accomplish its e-business goals, General Motors developed a three-pronged strategy that focused on: (1) business-to-consumer (B2C) e-commerce, (2) business-to-business (B2B) e-commerce, and (3) rolling communications devices.

The first part of General Motors' new strategy, B2C e-commerce, was related to its online shopping service, called BuyPower. In 2000, the BuyPower site contained information on every GM model, and was the only site to also provide information on dealer inventories.[7] General Motors' used BuyPower as a tool to cross-sell goods and services like GM Mortgages, GMAC Insurance and advertising. In the three months following the April 2000 site-redesign, visits to the GM BuyPower Web site increased by 130%, and sales leads for dealers rose by 90%.[8]

The second part of GM's strategic change, B2B e-commerce, was the company's attempt, in conjunction with Ford and DaimlerChrysler, to create

an online parts-buying and communications enterprise. General Motors predicted that the parts market, called Covisint, would save the company $1 billion per year from improvements in cost efficiencies and through the streamlining of its supply chain. By combining the first and second parts, General Motors believed it would have the ability to create a Web-based service whereby customers could purchase cars online, have them built to order, and delivered within days.

The third part of General Motors' e-business strategy dealt with OnStar.

How OnStar Works

Figure 2: The OnStar System
Source: www.onstar.com

From the car, OnStar customers connected to an OnStar Advisor through OnStar's three-button system (see **Figure 2**). After pressing the OnStar button or the OnStar emergency button, the rest of their interaction was hands-free. A small microphone located in the dashboard picked-up the user's voice.

OnStar is a universal communications device that bridges satellite and cellular technology. The primary OnStar communications system relied on the Global Positioning System (GPS) network. The secondary communications system functioned through a nation-wide cellular network. Both systems worked together to provide OnStar users with a coast-to-coast, 24-hour communications service.

All OnStar-equipped vehicles used GPS via a radio transmitter. The radio transmitter sent signals from the vehicle to a GPS satellite orbiting the Earth. The GPS satellite and the GPS receiver in the vehicle both generated the same signal, called a pseudo-random code. The OnStar system measured the time it took for the radio signal to travel between the satellite and the vehicle, and then used this time period to calculate the distance between the two objects.   OnStar used measurements from four satellites to pinpoint a vehicle's location, with an accuracy of within 30 feet. (See **Exhibit 2**)

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[3] Staff, "Merrill analyst sees 33% annual revenue growth for GM's OnStar unit," *Dow Jones Business News*, (14 February 2000).

[4] OnStar Making Big Connections, *The London Free Press*, June 30, 2000, p. E2.

[5] "Merrill analyst…"

[6] Robyn Meredith, "Digital Drive," *Forbes*, (29 May 2000): 128.

[7] Meredith.

[8] Jim Mateja, "Chicago Tribune Transportation Notes Column," *Chicago Tribune*, Aug 13, 2000.
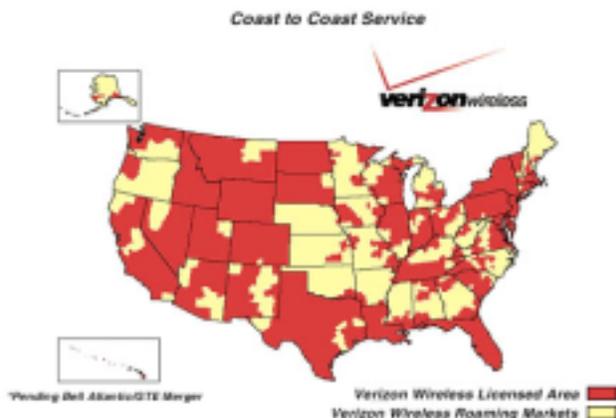
Figure 3: OnStar's telematics network

Source: www.verizon.com/prodserv/maps/wrless_map.html

The secondary communications system that OnStar employed was a nationwide cellular telephony network. Telephony refers to communication made through a telephone network comprised of both cable and wireless services. To provide its planned voice-activated cellular telephone service (named OnStar Personal Calling), General Motors partnered with Verizon, a company created by the partnership between Bell Atlantic and VodafoneAirtouch, to give OnStar customers access to Verizon's telephony network. As of 2000, Verizon companies were the largest providers of wireline and wireless communications in the United States, serving the equivalent of nearly 95 million access lines and 25 million wireless customers. Verizon was also the world's largest provider of print and on-line directory information. Through the OnStar-Verizon network, OnStar customers will be able to make personal phone calls from any location in the United States to practically any place in the world. OnStar's GPS and telephony networks combined will produce one of the largest telematics networks in the country (see **Figure 3**).

OnStar's Evolution

OnStar began as a closed, internal system linking OnStar customers with OnStar advisors only. OnStar customers did not use the system to contact anyone outside of the OnStar advisor network. However, as executives within General Motors recognized the financial potential of the telematics industry, they saw OnStar as a universal communications device. In order to attain this goal,

the OnStar design team had to make several major technological changes to the OnStar system in order to create a network that could allow outside communications. The primary changes included cellular telephony, Internet access, and the creation of an Extensible Markup Language (XML) database. General Motors partnered with Motorola and Saturn Electronics and Engineering to redesign OnStar's dashboard system to accommodate these changes.

Cellular Telephony

The planned OnStar cellular telephony service was called OnStar Personal Calling. The service will be voice-activated. Users will push an OnStar button on the dashboard, say "dial," and then speak the number. The service will handle incoming calls through a number assigned to each vehicle by GM. General Motors contracted with Verizon to provide the cellular network. The OnStar coast-to-coast cellular network will position General Motors as the largest reseller of cellular services.

Internet Access

General Motors announced that it would add Internet access through a voice-activated portal called OnStar Virtual Advisor beginning in the fall of 2000. GM worked with IBM, Microsoft, GeneralMagic, and ObjectSpace to perfect the in-vehicle platform and the back office software that General Motors would use to manage the service (i.e. the "thin-client model"). There were three essential factors that General Motors had to address when developing the OnStar Virtual Advisor.

The first factor was the creation of a back office software package that could handle the web traffic. Both Microsoft and IBM played integral roles in the development of this software. The architecture gave General Motors the capability of connecting wirelessly to a server and to applications anywhere in the world. Applications running on the network and accessed via a small, embedded chip built into the car gave users access to real-time information.

The second factor General Motors addressed was the creation of a cross-functional, on-board system manager that could tie together all of OnStar's various technologies.[9] Given OnStar's

[9] Staff, "OnStar selects ObjectSpace to provide infrastructure for in-car communications system," *PR Newswire*, (27 March 2000).

existing communications features, General Motors wanted to develop a platform that could handle OnStar's traditional services, while incorporating new features in a seamless manner. In order to be effective, the new system manager had to be a multilingual integration tool capable of linking together the diverse interfaces already supporting the on-board system. In addition, OnStar engineers wanted the new platform to be Internet accessible so that engineers, technicians and users could access it in any number of ways, from in-car systems to hand-held devices. OnStar partnered with ObjectSpace, a leading provider of integrated Internet infrastructure and business-to-internet-business (B2Bi) solutions, to create the desired platform. ObjectSpace's application, called OpenBusiness, provided an Internet-centric platform that was easily scalable and adaptable, and based on open standards. In addition, the OpenBusiness service architecture offered General Motors the ability to add any number of heterogeneous services while maintaining the same scalability. The dynamic nature of the OpenBusiness platform allowed it to drive OnStar's Vehicle Communication subsystem (VEHCOMM), which tied together twelve major systems into one interface.

The third, and perhaps most important, factor was the creation of a voice-activated user interface.[10] All Internet access in the OnStar system was provided through the OnStar Virtual Advisor. General Motors chose to use magicTalk, a voice-activated interface created by General Magic, as the underlying application for the portal. In order to ensure that magicTalk would be available over the next several years, General Motors took an equity stake of approximately $15 million in General Magic.

Extensible Markup Language

Despite advances in cellular and Internet technology, General Motors realized that it needed to address issues with its proprietary OnStar database.[11] The initial OnStar model relied on human advisors to provide OnStar customers with the information customers sought. While this scenario worked when a customer needed help filing a police report or reporting a medical emergency, OnStar's

incorporation of Internet features created the need for a more technologically advanced model. OnStar contracted with numerous companies to provide information for the OnStar network. The difficulty was creating a fast and efficient way for the information to be accessed by customers without the need for human intervention. The answer was XML.

Extensible Markup Language (XML) is a low-level computer syntax for representing structured data. As the foundation language upon which most other markup languages are based, XML enables computers to understand programming codes across different languages and applications (see **Exhibit 3**). Therefore, a database written in XML can be manipulated for use in any number of applications.

GM planned to offer voice-activated sports scores, weather forecasts, news, and stock quotes through OnStar's XML-based voice files in the fall of 2000. An OnStar subscriber would, for example, request a sports score, which is translated by voice-recognition software into an XML-tagged data request. The requested data will be retrieved from an outside Web site of an OnStar partner as XML-tagged data, and then translated into voice-XML and played over the vehicle's stereo speakers.[12] (See **Exhibit 4** for a diagram of how OnStar's technology interacts.)

GM custom-built its XML database to respond to voice commands. Programmers at OnStar not only re-formatted the entire OnStar database into XML, they also ensured that all content was coded with XML tags that associate voice requests with information. The decision to use an XML database to support Virtual Advisor and Personal Calling gave GM the option to make its OnStar database available through its company Web site, or through a host of other outlets. A bonus for OnStar was that by creating pure XML content on the back-end, the data could be relatively easily delivered to a variety of devices, such as cell phones and hand-helds.[13]

OnStar: Strategy Issues

General Motors was the world's largest firm in sales. However, it had a reputation as a lumbering behemoth, "the quintessential stuck-in-the-mud

[10] Staff, "OnStar invests in GeneralMagic," *Advanced Materials and Composite News* 6, (19 December 1999).

[11] Carol Sliwa, "OnStar takes voice XML for drive," *Computerworld* 34, (22 May 2000): 21.

[12] Sliwa.

[13] Sliwa.

company." GM's net profit margin was well below that of their competitors. As one analyst noted, if one were to subtract General Motor's stake in Hughes Electronics, GM's 1999 Wall Street valuation was only $33.5 billion, or one-fifth of annual income.[14] OnStar's Managing Director, Chet Huber, forecast OnStar's revenues to surge from $61 million in 2000 to $2.3 billion in 2005. GM posted $6 billion in income on revenues of $177 billion in 1999, with nearly a quarter of the profits coming from its financial services branch.[15] OnStar project spokesman Todd Carstensen noted, "Traditionally in the auto business, the profit margin is in the single digits. In telecommunications, it's in the double digits. If we can move to a subscriber relationship, there's the potential for huge revenue."[16]

OnStar was an essential element in General Motor's efforts to reposition itself as a New Economy enterprise. As Mark Hogan, head of e-GM, explained, "It's a matter of morphing our company to embrace customers in a whole different way."[17] The OnStar strategy had four primary elements: (1) development and expansion of OnStar's telematics capabilities, (2) syndication and entry into the telematics retail arena, (3) the acquisition of new partners and subsidiaries, and (4) a movement to increase OnStar's independence from General Motors.

Expansion

OnStar began as an in-house communications system. OnStar's central priority was roadside assistance and emergency services. By expanding OnStar's services to include personal telephony and Internet access, General Motors created a voice activated, universal communications network. Americans spent roughly 500 million hours each week commuting in their cars.[18] General

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[14] Meredith.

[15] Lee Copeland, "GM now sells Web technology, not just cars," *Computerworld*, June 5, 2000.

[16] Mark Ribbing, "GM, Bell Atlantic join in wireless revolution," *The Baltimore Sun*, March 12, 2000, p. 1D.

[17] Jon Pepper, "GM is on threshold of reinventing transaction," *The Detroit News*, (26 March 2000).

[18] Cate Corcoran, "Are Smart Cars a Dumb Idea?" *The San Jose Mercury News*, Sept. 25, 1999, http://www.mercurycenter.com/svtech/news/indepth/docs/car092699.htm accessed Sept. 7, 2000.

Motors hoped that with OnStar, they company could capitalize on the increased time commuters were spending in their vehicles.

Syndication

OnStar began as a proprietary service, available only in General Motors vehicles. Initial customer reaction to OnStar was positive, and GM experienced increased vehicle sales and OnStar subscriptions in the time period after the product's release. Seeking to capitalize on the growing demand for telematics services in vehicles, GM decided to offer OnStar to some of its competitors.

General Motors agreed to its first OnStar syndication when it signed a deal with Honda in early 2000. GM agreed to supply the OnStar service to Honda for use in Honda's Acura RL sedan model. GM licensed the OnStar service to Honda, and will supply the device schematics and telematics backbone, while Honda will handle all installation procedures and pay OnStar subscription fees for access to the OnStar network. General Motors announced an agreement in September of 2000 to license OnStar to Toyota for use in the Lexus LS 430 sedan starting in October. Branded as "Lexus Link," the option will provide some features not available to GM's OnStar customers, such as notification of a sudden loss in the vehicle's battery power, memo-recording capability, and a system back-up battery.

Acquisitions

Critics contended that General Motors' plan to use OnStar as a key part in the effort to reshape the company was risky. To create OnStar, General Motors had to establish a network of key partnerships with several companies across a number of industries. See **Exhibit 5** for a diagram of the OnStar Organizational Flowchart.

For OnStar to work, all of the pieces had to fit seamlessly and function at a high level of proficiency. Despite minor attempts to gain equity positions in a few of its smaller OnStar related partners, GM had very little control over the direction and well-being of the majority of OnStar network participants. Critics worried that it was possible that changes within several of the key industries, like cellular telephony, Web design, and telematics itself, could have a major impact on the functionality of OnStar's critical partnerships. Critics argued that this lack of vertical integration could have serious implications. In addition, many critics were puzzled

why General Motors did not utilize more in-house help from subsidiaries like Hughes Electronics to update the OnStar system.[19]

Independence from GM

OnStar was a wholly-owned subsidiary of GM, situated within e-GM, the company's headquarters for all consumer-oriented electronic business initiatives. However, rather than craft an image in which OnStar was but one segment within General Motors, OnStar underwent a process through which it hoped to become independent.

In 1998, OnStar replaced the advertising company initially responsible for branding OnStar, New York based Ammirati Puris Lintas (APL), with Detroit based Campbell-Ewald Advertising (CEA). APL's branding campaign presented OnStar as a feature available in General Motors vehicles. Despite success in increasing OnStar's customer's base and revenues, OnStar's executive managers were unhappy because they felt OnStar was being linked too closely with GM. The overriding sentiment within the OnStar division was that OnStar was a dynamic product in and of itself – it had generated product-specific revenues and had developed a loyal following of users.

With the blessing of General Motors corporate, OnStar replaced APL with CEA and undertook the development of a new OnStar image. Launched in the spring of 2000, OnStar's new advertising campaign used Batman as the product spokesman. CEA and OnStar deemed that pairing Batman and OnStar was a good fit because Batman achieved much of his power through the innovative use of advanced technology. In addition, Batman tested higher in recognition, credibility and likeability than other characters such as Indiana Jones and the Terminator. The Batman character was seen in several OnStar commercials and in an online contest called the Batman Challenge.

The primary goal of the OnStar branding campaign was to create a GM-free image. According to OnStar executives, consumers typically thought that General Motors' products were stodgy, unreliable and old-fashioned. They wanted

consumers to consider OnStar a sleek, high-tech communications service. The idea was to create an image similar to the one cultivated by microchip manufacturer Intel and its "Intel inside" campaign. Survey data indicated that OnStar had 60% brand awareness, with only 5% of respondents associating OnStar with General Motors.[20]

To further support the OnStar brand name and perception of independence, a directive required GM divisions that used OnStar to use a conjunction when discussing the service in marketing efforts, such as "Cadillac and OnStar" or "Oldsmobile with OnStar."

While the long-term success of OnStar as a company within the General Motors umbrella was the driving issue behind OnStar's actions, many OnStar and General Motors' executives thought that OnStar could be spun-off in an initial public offering. An IPO had the potential to raise billions of dollars for General Motors and OnStar. Critics argued that OnStar's push for independence was a misstep for General Motors.[21] General Motors wanted to recast its image from an Old Economy Goliath to a New Economy enterprise. General Motors was counting on OnStar to help with the transition. An independent OnStar, critics felt, would diminish General Motors' high-tech appeal.

The Competition

General Motors and OnStar were the leaders in the telematics industry in 2000. The response by other car companies was mixed. Honda licensed OnStar from General Motors to add as an option for its Acura line. Toyota was involved in discussions with GM to license OnStar. However, other companies chose to develop their own telematics systems. In 2000, GM's two greatest rivals in telematics were Ford and the American Automotive Association (AAA). Mercedes Benz's system, while not as developed as Ford's or AAA's, was also an important competitor. **Exhibit 6** provides an overview of the competing telematics systems.

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[19] Julia King and Lee Copeland, "GM retools for e-commerce that goes well beyond cars," *Computerworld* 34, (17 April 2000): 18.

[20] Jeff Green, "Forward Motion: OnStar exits GM's garage en route to independence," *Brandweek* 41, (10 April 2000): 18.
[21] Copeland, April 17, 2000.

Ford already had an established, but limited, roadside assistance network by 2000. Called RESCU (Remote Emergency Satellite Cellular Unit), it was available as an expensive option on high-end Lincoln models. However, Ford announced a partnership with Qualcomm in July 2000 to develop a full-fledged, OnStar-like telematics system called Wingcast. The goal of Wingcast, according to Ford CEO Jacques Nasser, was to make all Ford vehicles "personalized portals for [Ford's] global consumers."[22] Ford expected to install Wingcast in one million cars by 2002, three million cars by 2003, and all of its new cars and trucks by 2004. Nissan Motor Company planned to integrate Wingcast into its Nissan and Infiniti brands.

Wingcast will differ from OnStar in several ways. First, Wingcast will function as an independent company, with plans to eventually go public. Second, rather than depend on a physical device that may require updates (at the consumer's expense) as with OnStar, Wingcast will consist of digital hardware, with upgrades in the form of downloads. Third, the Wingcast system, based on a portable phone, will work outside the vehicle, whereas the OnStar system is hard-wired into the car.

The AAA used its reputation and experience as the premiere roadside and emergency assistance service as a springboard into the telematics arena.[23] AAA's Response Services Center LLC was tested in six markets in 2000. It offered subscribers many of the same features available through OnStar, including an instant link to an operator who could provide route guidance, dispatch a tow truck, track a stolen vehicle, or alert emergency services after a crash. AAA planned to package other services, such as Internet connectivity and remote vehicle diagnostics, in the near future. AAA hoped to expand the service through its existing membership base of 43 million people and its association of 86 affiliated clubs. While AAA's telematics service was still in its nascent stages in 2000, the company had an excellent reputation and loyal customer base upon which it could rely.

The Mercedes Benz roadside assistance system, called TELEAID, was primarily an accident reporting mechanism. Comprised of three main elements – an on-board device, a mobile phone network, and a call center – TELEAID worked by automatically notifying TELEAID operators when an accident occurred. If a TELEAID equipped car was in an accident, the system generated a distress signal that was sent to the call center over existing mobile phone networks. Operators tracked the vehicle's location using GPS and notified the nearest emergency personnel. Unlike OnStar, TELEAID was not a universal communications device. However, TELEAID designers were working closely with other Mercedes Benz engineers to integrate the TELEAID system with Mercedes Benz's existing hands-free cellular phone device and prototype mobile Internet portal.

Conclusion

The OnStar system left GM executives full of questions. Should the company continue to syndicate OnStar, or is it of more value to GM as an exclusive feature? Should OnStar be spun-off? Will telematics devices become standard for all vehicles, and if so how would this affect decision-making regarding OnStar? How should GM respond to Wingcast? Has General Motors placed too much emphasis on a nebulous market or has it not been aggressive enough establishing OnStar as the industry standard?

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[22] Ronna Abhramson, "Don't Like my Driving? Call Ford, Qualcomm," *The Standard*, (31 July 2000).

[23] Aaron Robinson, "Who you gonna call?; AAA will launch challenge to GM's OnStar," *Automotive News* 74, (10 April 2000): 8.
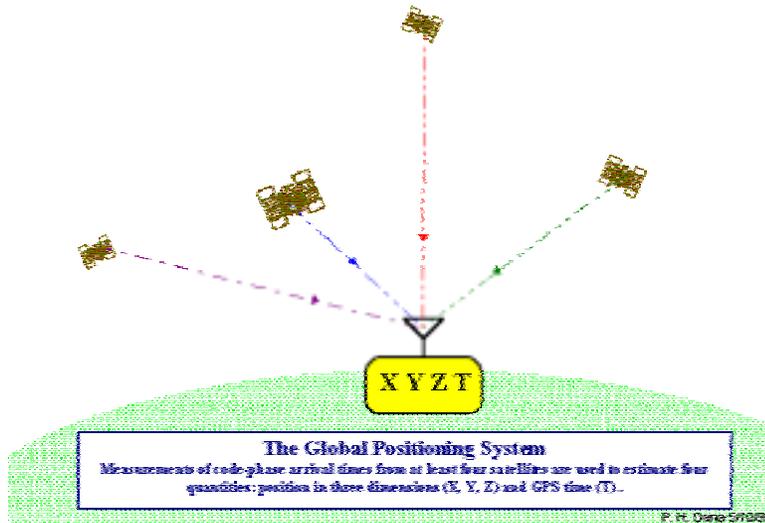
Exhibit 1: OnStar Service Plans

SAFETY AND SECURITY PLAN (Basic Plan)	**COST: $199.00 PER YEAR**
AIRBAG DEPLOYMENT NOTIFICATION: The in-vehicle OnStar system immediately notifies an OnStar advisor when a vehicle's airbag is deployed.	
EMERGENCY SERVICES: By pressing the Emergency button, a driver's distress call is directed to an OnStar advisor who plots the vehicle's location and notifies the nearest emergency service personnel.	
REMOTE DOOR LOCK/UNLOCK: Armed with a unique customer PIN, OnStar users can instruct an OnStar advisor to remotely unlock or lock their vehicle's doors.	
ROADSIDE ASSISTANCE: When a driver has roadside problems, they can contact an OnStar advisor to help them diagnose the problem and to contact the appropriate assistance.	
THEFT DETECTION: If a user's vehicle is stolen, OnStar can contact the police, and track and locate the vehicle.	
Scheduled Fall 2000: PERSONAL CALLING: OnStar customers can use their in-vehicle cellular telephone to make hands-free calls from anywhere in the United States	

| **PREMIUM PLAN**	**COST: STARTING AT $399.00 PER YEAR**
CONVENIENCE SERVICES: OnStar advisors assist drivers with help from finding the nearest ATM to making hotel reservations.	
CONCIERGE SERVICES: OnStar advisors can help customers buy theatre tickets, gifts and many other items while users are on the road or at home.	
ROUTE SUPPORT: OnStar customers can contact an advisor for help plotting directions to their destination.	
MED-NET: an OnStar feature that stores a user's health information so that it can be provided to medical personnel in case of an emergency.	
ACCIDENT ASSIST: links users to advisors who can help with insurance issues and police reports.	
RIDE ASSIST: In case a user's vehicle is inoperable or a user is unable to drive, an OnStar advisor can contact a taxi or a driver's relative or friend to take the driver to their destination.	
Also includes AIRBAG DEPLOYMENT NOTIFICATION, EMERGENCY SERVICES, REMOTE DOOR LOCK/UNLOCK, ROADSIDE ASSISTANCE and THEFT DETECTION	

Scheduled Fall 2000: MYONSTAR VIRTUAL ADVISOR: OnStar customers can log into the Internet to access a wide array of information using OnStar's voice activated web portal

Exhibit 2: GPS Satellite Diagram

The Global Positioning System
Measurements of code-phase arrival times from at least four satellites are used to estimate four quantities: position in three dimensions (X, Y, Z) and GPS time (T).

Source: < http://www.colorado.edu/geography/gcraft/notes/gps/gps_f.html>

Exhibit 3: Extensible Markup Language (XML) Diagram
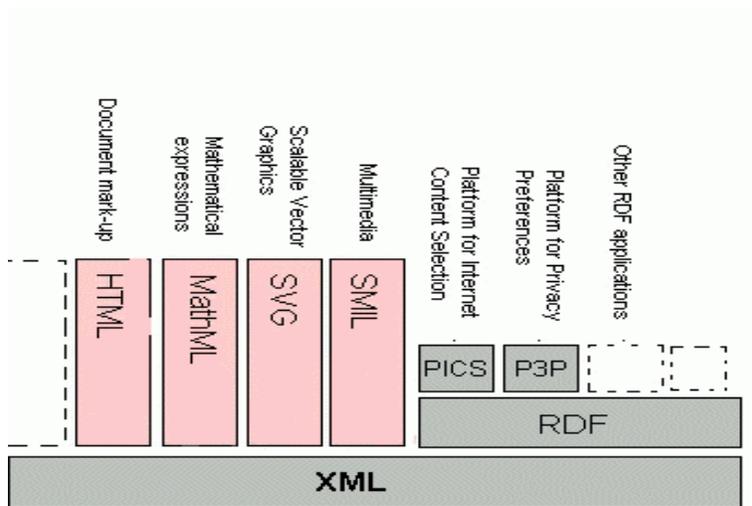
The World Wide Web Consortium (W3C), a World Wide Web regulating body located at the Massachusetts Institute of Technology, helped develop XML. The W3C recognizes the universal applicability of XML, as shown in this diagram, and has recommended that all future Web applications be based on XML.

(Source: < http://www.w3.org/XML/Activity>)
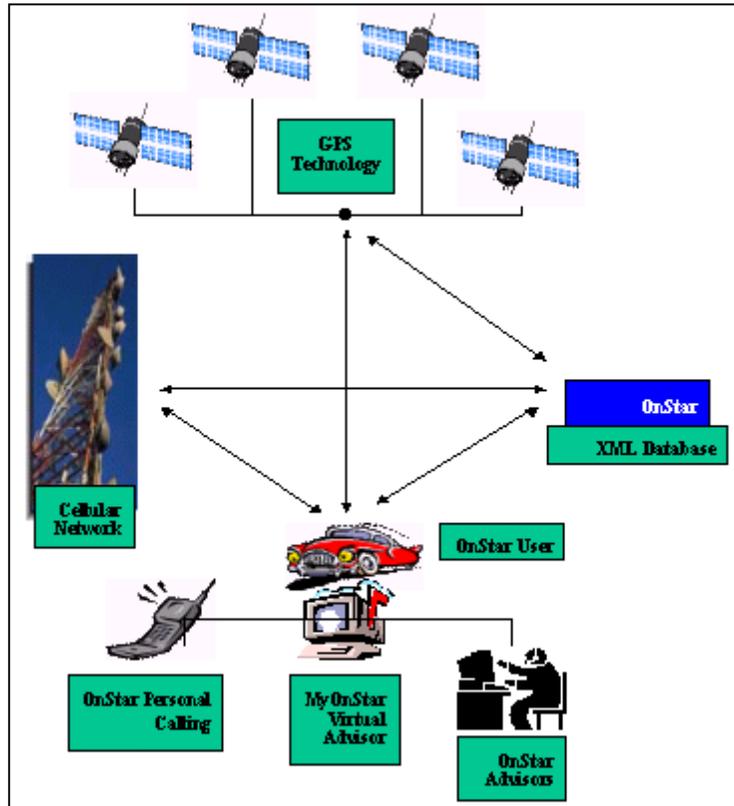
Exhibit 4: OnStar Technology Map

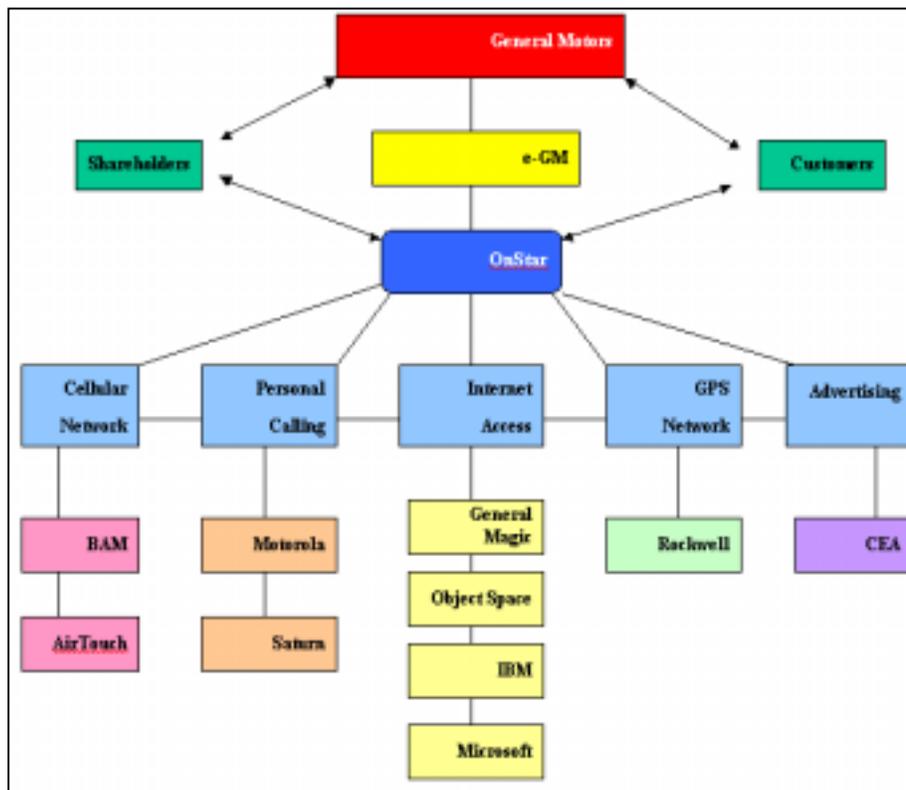**Exhibit 5: The OnStar Organizational Flow Chart**

Exhibit 6: Overview of Different Telematics Systems

	GM/OnStar	Ford/RESCU	Mercedes Benz/TELEAID	AAA
GPS Technology	Yes	Yes	Yes	Yes
Cellular Telephony	Optional, in Fall 2000	*	*	*
Internet Access	Optional, in Fall 2000	*	*	*
Roadside Assistance	Yes	Yes	Yes	Yes
Emergency Services	Yes	Yes	Yes	Yes
Convenience Services	Optional	*	No	No
Concierge Services	Optional	*	No	No

* Indicates that the company is developing this feature and plans to add it to their system in the near future.