GPS-based Telemetry and Telematics Services in the Americas

November 2002

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The Growing Importance of Telemetry & Telematics Services in the Americas

High levels of business interest in a wide range of telemetry and telematic services, coupled with advances in wireless network technologies, have cultivated the development of a variety of GPS-based applications and created a multifaceted assortment of players, technology platforms and service concepts. The variety and breadth of available and potential GPS services is overwhelming, from Fleet Management and Asset Tracking to Security Systems Control and Lost Vehicle Location.

Constructed over a period of twenty years, at a cost of over $10 billion, the GPS satellite based navigation system is operated by the United States Department of Defense, with access provided free of charge for non-military uses. GPS permits land, sea, and airborne users to determine the location of assets in real-time, 24 hours a day, in all weather, anywhere in the world. The complete GPS system consists of 24 satellites and five ground stations. Although it was originally intended as a worldwide positioning and navigation service for U.S. Armed Forces and authorized users only, GPS now supports a broad range of consumer and commercial applications.

GPS products have already penetrated a variety of industries in the Americas and are expected to gain wider acceptance in previously untapped sectors. Corporations are quickly recognizing that sophisticated GPS management systems and enhanced coverage capabilities of wireless networks make centralized control over mobile assets feasible, enabling enterprises to efficiently and effectively monitor remote operations. Enterprises in the Americas have recognized the value proposition of GPS technology and many have already made the necessary investments to take advantage of its use. Furthermore, recent advancements in wireless network technologies have contributed to a surge in overall demand for GPS-based services. In fact, many companies already using GPS technology are rapidly upgrading their technology platforms to improve the value and reach of their systems.

As with any technology that finds widespread commercial adoption, the cost of GPS hardware continues to drop, while the performance and features steadily improve. To date, GPS has been most successful in supporting services such as remote asset monitoring, fleet tracking, security systems, lost vehicle location, Supervisory Control and Data Acquisition (SCADA), and a number of other positioning and navigation products. A range of enterprises in the utility, transportation, logistics, and security industries, as well as the public sector, have invested in machine-to-machine GPS technology platforms in an effort to maximize operational efficiency.

To rationalize their investments, companies choosing to adopt GPS telemetry and telematics services are increasingly demonstrating tangible return on investment (ROI), with improved productivity, reduced operational costs, and enhanced customer service. The marriage of GPS technology with wireless communication networks enables precise position location of valuable assets, yielding major benefits to enterprises, including:

- *Improved Asset Utilization*
  - In industries that cover a wide area, routing, coordination and timeliness are key in addressing time-to-market needs. In the trucking industry for instance, the dispatcher is alerted once a truck is diverted off its planned route. Prolonged idling in certain areas could also provide insights into the routing of trucks during certain hours of the day.
- *Reduced Cost Impact of Poor Asset Status Information*
  - In the refrigerated container (reefer) market, an open reefer or one wherein the temperature suddenly drops can lead to spoilage and loss. GPS provides precise coordinates while wireless technologies send alarm signals so the problem can be addressed.
- *Improved Operating Efficiency*
  - Real-time tracking benefits a wide range of industries. The public transportation system, for example, can benefit from GPS and wireless technologies, as buses can be tracked in order to determine whether more buses are needed during peak times or rush hours.
- *Reduced Theft Claims*
  - GPS enables real-time tracking of mobile assets such as containers that can be recovered immediately once theft is detected by sending alarms via wireless networks.
- *Enhanced Customer Service*
  - Traders, exporters and importers that need to know the status of their cargo can use GPS to tell clients precisely when delivery will be made.

The "Killer Applications" for GPS-based Services

Fleet Tracking & Fleet Management

With precision and accuracy far better than other radio navigation systems available today or in the foreseeable future, GPS is revolutionizing the transportation industry. Thanks to progress in wireless network coverage and the development of a variety of advanced GPS-based applications, vehicle operators, shippers and their customers can now monitor shipments from origination point to delivery.

Fleet management involves tracking, monitoring, and management of the trucking, rail, shipping, and public transportation industries. Deregulation of the commercial transportation industry in North America has created a dynamic environment for commercial fleets, where intensifying pricing pressures threaten the financial survival of many independent carriers. In this climate, the ability of fleets to control costs and operate at peak efficiency has taken on renewed importance. The ability to track, locate, and manage assets can be critical to a company's overall performance and bottom line. By reducing costs through fewer lost assets, enhanced equipment utilization, reduced out-of-route miles, and "just-in-time" inventory availability, fleet tracking has transitioned from a premium service to a standard component of most fleet businesses. The business case for adopting asset tracking solutions is becoming significantly more compelling as capital and operational costs decline and performance improves with a range of GPS-based monitoring services.

Almost every new wireless location tool that has appeared in the marketplace over the last twenty years has been applied to fleet tracking systems in one way or another. Location tracking terminals were first installed in freight trucks in the early 1980s, permitting operators to maximize fleet capacity utilization, monitor performance, and diagnose mechanical problems remotely. At the time, Loran C was the navigation tool of choice for vehicle location. There was, however, always one fundamental element missing from the early solutions - ubiquitous coverage. Even today, truly ubiquitous coverage remains rare in the industry. Satellite communications, for instance, is a "line-of-sight" solution, so reliability is limited to 'outdoor' environments where there is a clear, unobstructed sky view. Similarly, terrestrial communications is line-of-sight from the tower and is limited in range by transmit power and the curvature of the earth.

GPS fleet tracking capability by itself can lead to reduced out-of-route miles, increased equipment utilization, and improved overall fleet productivity. With the right network solution, fleet operators are now able to seamlessly provide customers with real-time shipment

information in even the most remote locations, while offering added measures of safety and security to their assets and field personnel.

The overwhelming success of fleet management in the long-haul trucking industry is leading to adoption in short-haul services, such as trucks used by parcel/delivery services. In addition, other transportation businesses are beginning to demonstrate impressive adoption rates for GPS services, including:

- *Public Transportation (i.e. Vehicles/Buses)*
- *Refrigerated Containers (Reefer Tracking)*
- *Railcars*

The benefits of knowing the real-time location of mobile assets create a powerful argument towards the capital expenditure necessary to modernize a fleet with advanced GPS communication technology. To reduce costly inventories, consignees are increasingly pushing for just-in-time delivery, which requires more accurate and efficient methods of fleet management. Furthermore, GPS technologies permits fleet operators, in real-time, to monitor a driver's performance (i.e., too fast, too slow, too many stops, or doesn't stop enough). Fleet owners and operators can reward drivers for adhering to driver performance standards that promote safety, reduce insurance rates, and decrease vehicle and trailer maintenance.

Shipping Containers & Reefer Tracking

The transportation industry has more than 8.5 million standardized containers circulating worldwide. Containers allow for intermodal shipments of cargo, as standard units can be stacked on railcars, towed by trucks, or placed in ships' holds. The 1966 agreement on the standard shape and size of containers, brokered by the Geneva-based International Organization for Standardization (ISO), is only one of the many ISO-arranged international agreements that have led to more efficient freight transport. Growing at approximately 7 percent per year, the industry has sought to improve efficiencies through containerization, as well as through automated handling, location tracking, and other high-tech measures.

The increased adoption of just-in-time inventory management by manufacturers during the 1990s spurred the growth of scheduled freight contracts in the U.S. trucking industry and has expanded to the shipping industry. At the forefront of the transportation industry's growth is GPS-based technology that allows time-specific delivery and real-time tracking of cargo. The shipping container and refrigerated container industries (also known as “reefer tracking”)

commonly use GPS along with other wireless technologies to report on vital status information, such as a trailer's precise location; whether a trailer is connected or disconnected from a tractor; if a trailer is loaded or empty; if its doors are open or closed; as well as a variety of other security measures involving remote monitoring.

The Shipping Container Industry has demonstrated the following market trends/needs over the last two to three years:

- *Significant Growth of Intra-country Trade and International Trade*
- *A Rise in Demand for Theft Protection with the Increasing Number of High-Value Items*
- *Customer Demand for Precise Status Reports for their Cargo*

The North American Shipping Container Industry remains particularly ripe for increased activity with GPS-based applications. While Canada continues to be the largest trading partner with the United States, Mexico is the fastest growing export market among U.S. trading partners, and the trend is expected to continue over time. Mexico surpassed Japan as the United States' second-largest trading partner in September 1998, according to U.S. Department of Commerce trade statistics. Mexico has enjoyed an above average rate of growth in trade for a number of years, and its share of total trade in the region has risen considerably. Shipping containers and reefer tracking are expected to continue to play a vital role in trade activities between NAFTA partners.

The growing trade between the United States and Mexico is likely to lead to greater trade within the entire Latin American region. As a whole, the growth in the volume of merchandise imports continues to exceed that of merchandise exports by a large margin, and the region's trade expansion—both imports and exports—remains stronger than the global average. Furthermore, intra-regional trade has increased substantially with Brazil and Argentina, despite current economic challenges, providing the engines of growth for the export industries of other South American countries.

The geographical challenges associated with these trade relationships highlight the growing importance of ubiquitous coverage for GPS-based services. As wireless tracking services related to shipping containers in the Americas are set to experience significant growth in coming years, market participants are quickly recognizing that sophisticated GPS management systems and enhanced coverage capabilities of wireless networks make centralized control over mobile assets feasible, enabling very high accuracy for tracking valuable assets and cargo. GPS monitoring capabilities can, not only, increase the productivity and efficiency of remote operations, but also support additional security measures that can be critical for high-value

shipments. Progress in wireless network performance and coverage are now enabling companies to cost-effectively monitor assets in areas beyond the geographic and economic reach of traditional systems.

Security Systems and Lost Vehicle Location

Automatic Vehicle Location (AVL) was arguably the first "Killer App" for both wireless vehicle location and mobile data services. While AVL has been available as a high-priced service for the trucking industry during the past decade, plummeting prices for GPS chips, coupled with the emergence of certain cost-efficient wireless networks, have led to a number of affordable AVL product offerings for, not only, commercial fleets, but also consumers. Integrated solutions with automated vehicle and asset location information have become critical to enable better asset control, dispatch optimization and quick recovery in case of theft.

The current market for security services focuses on both commercial applications and the needs of the consumer. Since the early 1990s, automakers have tried to determine just what combination of communication and navigation products were appropriate as added features for new automobiles. The Japanese market was blossoming with vehicle navigation products, color displays with maps that included hotels, restaurants, and recreation areas. Try as they could, U.S. automakers could not justify adding $3,000 to the selling price of their high-end cars. Subsequent market surveys determined that 45 percent of the people purchasing a new cellular phone did so for the security aspects, 911, etc. As a result, Ford, GM, as well as a host of auto manufacturers introduced security products, which integrate GPS-based applications with security features. For example, a 24/7 service center charges a monthly service fee, typically $20 to $30, to provide directions, advice on hotels, gas stations, restaurants, essentially all of the services included on the CD ROM of a Vehicle Navigation System with one exception: the service center also has location-tracking capabilities that respond to emergency alerts and notify police, EMS, or a tow truck in case of a breakdown.

The success of location-based security features for both commercial fleets and consumer autos is closely tied to the wireless network supporting the application. Geographic coverage has evolved into a key market differentiator, as businesses and consumers in rural and remote regions begin to incorporate a mobile component to their day-to-day operations and activities.

In addition to personal security and convenience of services, most wireless products available for installation in vehicles have the ability to generate a silent alarm to a monitor center should the vehicle's alarm be violated. Nearly 2.5 million vehicles were reported stolen in the United States in 2001 - the equivalent of a theft every 19 seconds. In the same year, less than half of the vehicles stolen were recovered. Eighty percent of stolen vehicles are taken by professional

car thieves, who are not deterred by sophisticated alarm systems and/or locking devices. Vehicle theft is the most costly property crime in the United States, at an estimated $7.6 billion annually.

In Latin America, car theft is on the rise as well. In addition, vehicles stolen in North America often times end up in Latin America. As such, a United States initiative in cooperation with the National Insurance Crime Bureau, which represents the U.S. insurance industry, manages an initiative to recover U.S. stolen vehicles from Central America and the Caribbean. The U.S. State Department, spearheaded by the Office of International Criminal Justice (ICJ), has developed a treaty to identify, recover, and return stolen vehicles to the United States. This treaty is modeled after a similar agreement between the U.S. and Mexico, under which several thousand vehicles are recovered each year.

The Stolen Car Recovery Treaty has been discussed with government representatives from Panama, Costa Rica, El Salvador, Nicaragua, Guatemala, Honduras, Belize, and the Dominican Republic. Representatives of the FBI, U.S. Customs, and the National Crime Insurance Bureau have also provided FBI-developed stolen car training for local law enforcement officials in Panama, El Salvador, Honduras, and Venezuela. Plans are currently being formulated to expand this program into South America and other parts of the world where stolen U.S. vehicles are being marketed in large numbers.

End users and insurance companies have indicated a preference for wireless tracking devices as a way of deterring thieves and recovering stolen vehicles. However, the high cost associated with wireless systems for this purpose limits the market to luxury car owners who have the financial wherewithal to procure such devices. In the long run, terminal prices are expected to decrease, which should lead to widespread installation in many types of vehicles. This relatively niche market should thus begin to grow out of the luxury car market and into mass markets. By the middle of the decade, the service is expected to be widespread such that stolen vehicles can be tracked from a home station using a PC.

GPS technology has been used to track and recover stolen cars at an increasing rate. Once vehicle theft is detected, GPS signals, sent through wireless networks, can pinpoint the precise location of the vehicle in real-time, enabling the authorities to recover the vehicle. Adequate recovery and location of a stolen vehicle requires, on average, approximately ten signals being sent by the owner or enforcement agency. Signals will vary in size from simple vehicle tracking functions to more sophisticated functions. Apart from location tracking, revenues for the stolen car market could potentially come from remotely disabling the vehicle. A short messaging signal averaging 5 seconds per data transfer can be sent to the vehicle, which could disable the vehicle, honk its horn, turn on its lights, or lock its doors. Other signals of a longer

and larger data transfer can simulate the automobile running out of gas. Service costs vary considerably per technology.

The Consumer Electronics Manufacturers Association (CEMA) projects the growth of the market for consumer security units at about $800 million in 2002. Furthermore, by 2005 the FCC's E911 mandate will have made location tracking technology standard with voice communications networks. Although the development of wireless network location technology has been driven by the FCC's E911 ruling, it is not exclusive to voice networks and can be used to track receivers on any two way data network (paging, Cellemetry, Mobitex, ARDIS, CDPD, etc.) Once the hardware has been installed at the broadcast site, customers can take advantage of enhanced security offerings as well as commercial location-based services. And, in unique cases, such as the Numerex Cellemetry™ Data Service, the implementation does not require any infrastructure build out of the wireless towers.

Technical and Market Benchmarks

A Comparison of Network Technologies for the Americas

Technology	Provider(s)	Infrastructure Costs	Geographic Coverage	Transmission Reliability
Cellemetry				
Cellemetry™ (AMPS, D-AMPS)	Numerex	NIL	Extensive	High
Packet Networks				
CDPD	AT&T Wireless Verizon Wireless	Low to Medium	Low	Medium
Mobitex	Cingular	Medium	Low to Medium	Medium
Paging Networks				
ReFlex	Arch Wireless SkyTel PageNet Weblink Wireless	High	Low to Medium	High
Dual Voice/Data Networks				
Circuit-Switched Networks	Sprint PCS VoiceStream	Medium	Medium to High	Low to Medium
IDEN (Packet-Switched)	Nextel	Medium	Medium to High	Medium
High Speed Data Networks				
GPRS	AT&T Wireless Cingular VoiceStream	High	Limited (Select Markets Only)	High
1xRTT	Verizon Wireless Sprint PCS AT&T Wireless	High	Limited (Select Markets Only)	High
Satellite				
LEO Satellites	Orbcomm	High	Line of sight coverage*	Medium to High*

Source: Frost & Sullivan **Satellite signals tend to be blocked while indoors or under trees.*

A Comparative Analysis of Technology Platforms & Network Performance.

A comparison of the technical strengths and weaknesses applied to strategic marketing and operational requirements should provide an answer to the question: *What applications are best addressed by which technologies?*

The success of GPS-based Telemetry and Telematics services will rely heavily on the ability to efficiently and seamlessly integrate wireless network technologies with GPS-based applications into a readily usable and affordable package, customized to industry needs and functions. Flexible application platforms, ubiquitous coverage, and superior reliability are anticipated to emerge as the true differentiators for service providers as functionality becomes commoditized.

The overall improved performance, coverage and compatibility of underlying wireless networks is likely to continue to contribute to significant market growth in GPS-based services. To date, there are in excess of 200 terrestrial wireless service providers competing to supply communications services to businesses and consumers in the United States alone. Of the top 200 service providers, approximately 62 are cellular, 136 are PCS, and 2 are ESMR. Analog cellular remains the "king of coverage" in the Americas and is frequently recognized for superior geographical coverage, and consequently broader service availability, than competing wireless networks.

Paging Networks

With the addition of the auctioned narrowband PCS licenses, there are now over 100 regional and nationwide paging carriers in the U.S. offering one way and two way paging services. Paging has evolved from its one-way voice services in the 1960s, to numeric paging which optimized bandwidth usage, to alphanumeric, and now two-way paging that gives a confirmed receipt of message. Paging has a well-established customer base and is the lowest cost form of data messaging. However, paging runs into a number of challenges when it comes to GPS-based Telemetry and Telematics services.

Although paging networks function efficiently in many urban areas, network incompatibilities force customers to pay careful attention to what coverage is offered in rural areas. In fact, coverage is often sporadic outside major metropolitan areas. This greatly diminishes the ability to consistently support services involving asset tracking, lost vehicle location, and other remote monitoring services. A significant network footprint is the cornerstone for most of these GPS-based applications. Shortcomings related to coverage have forced many paging operators to

focus their marketing efforts on services directed toward the needs of urban populations (i.e., person-to-person data transfer) as opposed to GPS-based Telemetry and Telematics services.

Packet Networks

Packet systems break down messages into packets, which are sent over a wireless network and reassembled in the proper order at the receiving site, reconstructing the original message. Packet-switched networks that carry data in bursts through multiple channels often have lower costs than circuit-switched networks that carry data through a dedicated channel and require a constant connection. Additionally, packet-switching allows "always on" capability that requires no dial-up, so users are normally charged based on the byte size of the data transmitted or accessed, as opposed to time. Similar to paging networks, packet networks are hampered by dispersed coverage and network incompatibilities, forcing customers to pay careful attention to what coverage is offered in specific areas.

Cellular Digital Packet Data (CDPD), a data network operated by AT&T Wireless and Verizon Wireless, actually rides on top of the original U.S. analog infrastructure, known as AMPS. CDPD enables TCP/IP data transmission over analog cellular systems and takes advantage of unused cellular spectrum. Although CDPD utilizes a portion of the cellular radio spectrum for conveying packet messages, the service requires additional equipment installation at each and every cellular base station. Since networks such as CDPD require hardware upgrades, there is no guarantee of coverage in all analog service areas. Thus, CDPD has relatively poor geographic coverage and is not optimal for GPS-based monitoring/tracking applications, which often demand ubiquitous coverage. Although there are multiple suppliers of CDPD, development has slowed in the face of D-AMPS (D-AMPS is the conversion of analog cellular to digital). Moreover, equipment, particularly modems, is still relatively expensive.

Similar to CDPD, Cingular's Mobitex (formerly BellSouth Wireless Data) network has relatively good nationwide urban coverage, including impressive indoor coverage, but lacks the broad geographical footprint to reach remote regions necessary for the vast majority of GPS-based applications. Since dedicated packet networks, such as Mobitex, must bear the entire cost of network infrastructure, packet coverage is often limited to metropolitan areas (as customers must be concentrated to justify infrastructure costs). Thus, dedicated packet networks, such as CDPD, Mobitex, and others, are often best suited for business oriented person-to-person data transfer, in high population areas, rather than GPS-based Telemetry and Telematics services.

Circuit-Switched Networks

A number of North American carriers continue to use costly and inefficient circuit-switched voice networks to carry data. The market is dominated by three access techniques: CDMA, TDMA, and GSM. These digital technologies support voice, SMS, and digital paging, as well as a host of other data services. Circuit-switched cellular fully utilizes the current cellular infrastructure. Thus, coverage matches the nationwide footprint of the cellular voice market. AMPS remains the only truly ubiquitous network with respect to coverage.

Since circuit-switched networks carry data through a dedicated channel, they have significantly higher costs than packet-switched networks, which remove most of the overhead involved in setting up, managing, and removing dedicated connections. With circuit-switched networks, GPS-based applications such as remote monitoring, asset tracking, and lost vehicle locations can be extremely costly since the applications can consume dedicated network resources for irregular data traffic. Thus, circuit-switched networks are terribly inefficient for most GPS-based applications that require high interval data transfer.

High-Speed Networks

The American 2.5G systems are following an evolution similar to the European system. However, the rollout and implementation of these enhanced networks (i.e., GSM/GPRS and CDMA1x) trail their European counterparts by anywhere from 18 to 24 months. Broadband wireless technologies in the U.S., such as GPRS and 1xRTT, have yet to be deployed nationwide and are therefore extremely limited in coverage. In Latin America, these technologies are even further away from broad commercial deployment. Moreover, true "Third Generation" (3G) networks, such as WCDMA and CDMA2000 (1xEVDV), are not expected to be available to North American markets until late 2004 to 2005 at best. In the meantime, the high costs associated in deploying these next-generation networks indicates that service roll-out, particularly in rural and remote areas, will be limited.

Next-generation wireless data services are expected to remain extremely costly over the next five years, as carriers struggle to establish to economies of scale and recoup enormous infrastructure investments. The substantial equipment, infrastructure, and service costs associated with next generation network technologies are expected to greatly hamper adoption of services. The cost of hardware systems alone will need to drop dramatically for remote asset management applications to be deployed en mass and for commercial security and telematic devices to be practical. GPRS and CDMA1x do not currently appear to be adequate solutions for the vast majority of GPS-based Telemetry and Telematics services, as customers demand economical solutions as well as ubiquitous network coverage.

Satellites

The main advantage of the use of satellites with GPS-based Telemetry and Telematics services is the extensive coverage in remote and rural settings. The technology is ideal for long-haul applications as well for services that require international and inter-continental coverage. Satellite terminals are, however, relatively expensive compared to other transceivers, as economies of scale have not yet been achieved.

Little LEO satellites are in near real-time mode, where latency is from milliseconds to a few seconds. Most applications can be tapped by Little LEOs, excluding certain applications that require real-time mode. If a pipeline is leaking, for instance, instant information is needed so that immediate action such as closing a valve can be initiated immediately.

With satellites, the possibility of a blocked signal creates concerns for a variety of security applications. A stolen car stored in an indoor location, for example, cannot be tracked using satellite technology. In addition, satellite signal transmission can encounter blockage in urban canyon environments. As a result, satellites are often most valuable as a complementary platform in a hybrid offering.

Cellemetry

The Numerex Cellemetry Data Service is a breakthrough technology that transmits short messages via the control channels of the cellular network. Cellemetry uses the overhead control channels of the AMPS cellular system to transport telemetry messages. The message handling capacity of these control channels is significantly greater than is required by the cellular system, even during peak hours. Empirical tests in AMPS cellular markets have demonstrated sufficient operational capacity for both the cellular operation and Cellemetry Data Service. In fact, measurements have indicated that the capacity of the control channels far exceeds the need of the cellular system.

The analog cellular network (AMPS) is divided into 790 voice channels and 42 control channels. The control channels are more robust than the voice channels for several reasons. First, the control channels are digital, unlike the voice channels which are analog. Second, the control channels operate at higher transmission power than the voice channels, giving enhanced coverage. Finally, the cost of using the control channels is far less than the regular voice channels.

Cellemetry operates in the same manner in which roaming telephones operate in the cellular system. When a cellular telephone is turned on outside of its home system it sends its Mobile

Identification Number (MIN) and its Electronic Serial Number (ESN) to the cellular system via one of the control channels. Based on the cellular phone number, the local cellular switch is able to communicate with the "Home System" of the roaming telephone. It uses the SS7 network which interconnects all cellular switches in North America to confirm the user is allowed to use the system and the phone calling features that are available to that customer. Cellemetry radio, like a roaming cellular telephone, sends an ESN and MIN number over the SS7 network, but the MINs are specifically assigned, so the MIN and ESN are routed to a Cellemetry Service Gateway that is also connected to the SS7 cellular network. The MIN serves to identify the Cellemetry radio and the ESN is the data field that contains a tracking-based solution with alarm inputs.

Every 15 minutes a signal is triggered at the monitored site, a signal is sent via to the cellular network and then, via the North American intra-cellular network, to the "Cellemetry Gateway". The clearinghouse then forwards the alarm to the appropriate central station for dispatch. Once the signal has been successfully received at the central station, a confirmation is sent to the tracking unit via the cellular network. Tracking-based solutions with alarm inputs can generate multiple transmissions over the cellular network.

The wide deployment of AMPS and D-AMPS in the United States, Canada, and Latin America translates to ubiquitous coverage for Cellemetry Data Services without the need for additional equipment or modifications by the cellular carrier. Indeed, the coverage for the Americas could be considered nearly 100 percent, apart from the most remote regions of these continents. The vast majority of the “Killer Applications” for GPS-Telemetry and Telematics services normally reside within the AMPS and D-AMPS coverage areas. However, where the footprint falls short, a hybrid offering using LEO satellites can be bundled into the Cellemetry package

The Cellemetry patented technology has been licensed to strategic partners and application developers, providing a broad range of solutions available across North America, the Caribbean and Puerto Rico, with ongoing expansion into South America.

System cost is always a concern in wireless markets. As hardware costs come down, the business case for adopting GPS-based solutions is becoming significantly more compelling. Cellemetry provides an economical platform for deployment, as there is no need for additional equipment or modifications by the carriers.

Furthermore, Cellemetry uses low cost modems and provides customers with seamless coverage without the concerns and hassles of "roaming charges" from 3rd party cellular providers (in fact, customers can even roam across international borders). For example, long-haul as well as short-haul applications can be integrated in a service package for a client in the trucking/container industry, where a customized package can be negotiated to incorporate

diverse needs. In the end, the client sees one bill since the traffic can be carried on one network.

In terms of the "Killer Applications" mentioned above, fleet management, container/reefer tracking, and Lost Vehicle Location are believed to be the highest in overall potential for the Americas. Cellemetry is well suited to tap these applications, due to high network coverage and performance that can seamlessly penetrate local, regional and international markets at reasonable costs to customers.

Conclusion

Technical challenges and cost barriers have, historically, inhibited the widespread adoption of GPS-Telemetry and Telematics services. The cost of service was uneconomical and often unreliable. In addition, hardware systems were simply too expensive. Fortunately, the cellular industry has come a long way in supporting GPS-based applications with one-stop sources for reliable, ubiquitous, and economical solutions using existing cellular infrastructure.

By using the cellular network, Cellemetry takes advantage of a proven technology used by millions of cellular customers and available virtually everywhere. By far, the analog cellular network is the largest radio network in the world, with approximately 250 million packets of data transmitted over the control channels every day in North America. This represents an average of only 10 percent of the maximum control channel capacity. In fact, the capacity of the control channels for Cellemetry Data Services far exceeds the need of the cellular system.

Cellemetry offers the most comprehensive, robust network solution for customers interested in pursuing GPS-based Telemetry and Telematics services. The Cellemetry network has proven to efficiently and economically support seamless integration of GPS technology into readily usable and reliable offerings, customized to industry needs and functions. Cellemetry has emerged as a clear market leader by continuing to address the evolving demands of Telemetry and Telematics markets by offering not only economical network solutions, but also flexible application platforms, ubiquitous coverage, and superior reliability.