

DRIVING EFFICIENCY AND
STUDENT SAFETY



TABLE OF CONTENTS

1. GPS Technology: A Critical Link For
K-12 Communication And Safety Page 02
2. ActSoft, Inc. Tracking Technology:
Monitoring Buses And Students Via GPS Page 06
White Paper
3. The Edulog GPS Difference: Scalable Options
For Maximizing Value While Reducing Costs Page 10
White Paper
4. Driving Efficiency And Student Safety:
Evaluating GPS Solutions For Your District Rear Pocket
Informational DVD
5. Sprint Family Locator
Locate Your Family With GPS Technology Rear Pocket
Brochure
6. Evanston/Skokie & Nextel Increase
Efficiency And Parents' Peace Of Mind Rear Pocket
Case Study
7. Prince George's District Tracks 1,300
School Buses With Mobile Phone Network Rear Pocket
Case Study

GPS Technology: A Critical Link For K-12 Communication And Safety

GPS Technology: A Critical Link For K-12 Communication And Safety

Nextel Goes To School

Whether it's for students and their teachers; principals and administrators; or your transportation, security, and maintenance crews—Nextel is there with affordable wireless solutions for communication whenever you need them. Nextel's wireless network, devices, and service increase connectivity and productivity to improve safety, transportation, and management capabilities for everyone at your school. No matter what your wireless communication needs are—Nextel will always be your K-12 connection.

GPS Technology Keeps Track Of Buses And Students

The idealistic image of students climbing aboard shiny yellow buses and trundling safely to and from school is a daily staple for countless families. But when something goes wrong, from a traffic jam to an incident as unsettling as an accident or—as happened in Oley, Pennsylvania, in 2002—a hijacking, school officials and parents need to know one thing: Where is the bus?

For many schools, Global Positioning System (GPS) technology, used in combination with wireless communication technology, is providing the answer to this question ... and much more.

GPS technology utilizes an array of 24 satellites in stationary orbit 11,000 miles in space to define precise locations on the surface of the Earth, based on standards of latitude and longitude. In addition to supplying geographic location, elevation, and time information, GPS provides tracking and navigation data that can be analyzed with Geographic Information Systems (GIS) software. Developed by the US Department of Defense to provide all-weather round-the-clock navigation capabilities for the military, GPS became commercially available in 1997 when President Bill Clinton's

administration decided to cease degrading the GPS signals it made available to the public. Once this decision was made, positional location accuracy increased to 15 meters from perhaps 100 meters, and now to perhaps a centimeter. This access to instantly updated digital mapping has many useful applications for school transportation concerns.

School transportation personnel can use the routing and scheduling capabilities of a GPS/GIS digital mapping system to analyze and plan a school's or district's optimal bus routes based on general mapping data such as demographics, business activity, housing patterns, highways, street intersections, railroad crossings, and rivers combined with specific transportation attributes such as school sites, bus maintenance facilities, street names and numbers, students' home addresses, one-way streets, average traffic and bus speeds, traffic restrictions, school accesses, etc. The technology's ability to provide instantly updated maps when new subdivisions are completed or hazardous road conditions occur allows for immediate updating of bus routes to compensate.

Aiding in the development of efficient and flexible bus routes is a valuable feature of a GPS system. Another very important advantage of GPS technology for school transportation is the ability to know where the buses are at all times.

The assumption is that the buses and bus drivers will run on-time and on-route from each student's home to school and back again each day. But the reality is that situations can arise to throw the best-laid plans off track. Students who are tardy to the bus stop, unexpected road hazards resulting in traffic slow-downs or detours, mechanical problems, bad weather, and countless other situations can cause a bus to vary from its schedule. If the bus is equipped with a wireless communication device and GPS software, a school official has the capability to log on to a website and

locate the bus instantly. Beyond this tracking capability, wireless phones allow the school immediate contact with the bus drivers and vice versa if a situation or concern arises, enhancing safety.

When the Evanston/Skokie School District 65 in Illinois was searching for a solution for monitoring their buses, they chose Nextel to provide fleet management and tracking services. The district can now track all of its school buses in real time with the added bonus of data that help them plan the best routes.

“We implemented the system to better monitor the locations of our buses. Our parents don’t hesitate to call if the bus is a few minutes late and saying you don’t know is not a way to take care of families,” said Paul Brinson, Chief Information Officer for Evanston/ Skokie School District 65. “Not only is our service better, we can pull the tracking system data for documentation and use the information to verify we are being efficient.”

School board member Bob Eder agrees, “We have made great strides this year in developing a technology plan that integrates telecommunications into our operations; our Nextel phones are an important part of that plan. The Nextel phones give us a platform that allows us to achieve our communication goals and efficiently manage costs.”

Tracking information can also be made available to parents through a password-protected website. If parents are concerned about sending their child to the bus stop during inclement weather or when the radio is announcing traffic problems in the area, they can log on to a website and find out where the bus is and whether or not it is on schedule to pick up their child. And at the end of the school day, if the bus is late returning the child home, another quick check can save a concerned phone call to the school.

Beyond the tracking capability, Brinson appreciates the added depth of direct communication with the bus drivers. “We can instantly contact the bus drivers and leave our two-way radio as a back-up. Plus, if the driver has an emergency situation, he or she can call for help direct. These options in communication really enhance our safety.” GPS technology also allows for monitoring the speed the bus is traveling and adherence to railroad crossing procedures.

The mapping and tracking capabilities of GPS and wireless communication technology can strongly enhance school transportation efficiency and safety, but how can it help to track the students themselves?

Tracking Students For Added Safety

Kids will be kids. They might occasionally miss the bus in the morning, get off at the wrong school or bus stop, or forget to get off at their own stop, or get on the wrong bus to head home at the end of the school day. The risks and consequences of this sort of misstep are heightened for those buses transporting handicapped or other special education students. Wheelchair students might be left at bus stops. Others might be confined to the bus for times in excess of legal/medical limits.

One option available for student tracking with a GPS system is a swipe-card system. Students would swipe an ID card each time they entered or exited the bus. An existing database of students and bus routes would note any inconsistencies, such as students who missed the bus or got on or off at the wrong stops, and an alert could be sent either by email or phone to school personnel and/or parents about the irregularity.

How widespread is the use of GPS tracking technology for school transportation?

“I don’t think there are more than 200 districts seriously trying (the Global Positioning System) at this point,” said Steve Hirano, editor of *School Bus Fleet* magazine, a trade publication that covers the school transportation industry in North America. “Having said that, I think five years from now there are going to be hundreds of districts that have this and possibly thousands.”

The past decade has seen a sharp and rapid increase of the integration of wireless communication technology into daily life, lifting both communication and safety to much higher levels. Though it used to be such technologies were only available at great cost, they are now affordably available on wireless phones, making fleet management solutions more efficient, easier to deploy, and cost-effective.

Actsoft, Inc. Tracking Technology: Monitoring Buses And Students Via GPS

Actsoft, Inc. Tracking Technology: Monitoring Buses And Students Via GPS

Overview

Following September 11, 2001, tracking school buses and students has become a mainstream issue due to the rise of violence, school shootings, and terrorists' threats in the United States. In recent years, there has been a considerable increase in monitoring school buses and students to further enhance safety. It is imperative that the potential risks and vulnerabilities existing in our daily pupil transportation operations are understood and planned for accordingly.

In November 2006, Governor Bill Richardson of New Mexico lobbied for safer schools and school buses. Richardson stated, "Acts of violence are real threats to student safety that we must not ignore. While I want to be careful not to overreact to this violence, I also know that parents expect us to do everything possible to protect their kids while they are in our schools and on our school buses." Richardson is calling for a \$2.6 million investment to equip all 3,200 school buses in the state with GPS tracking capabilities. This example is just one of many concerning the government's efforts to help secure students' safety.

Currently, there are approximately 600,000 school buses traveling an estimated 4.3 billion miles to transport 24 million schoolchildren each school day. This massive undertaking is the equivalent of the entire populations of Florida, Massachusetts, and Oregon riding on a school bus twice daily.

- How do you find a vehicle if it strays from its route?
- Do all the students get on and off the bus safely?

In order to answer the call of protecting and monitoring our youth, multiple tracking and mobile management solutions are available to track school buses and students. This report provides information on the recent trends in tracking school buses, tracking students, and ActSoft, Inc.'s success in deploying tracking and mobile management solutions in the school bus vertical market.

Tracking School Buses

Any solution that tracks school buses provides tracking in a near real-time environment. The term "near real-time" is used because there are no solutions that do true "real-time" Global Positioning System (GPS) tracking. "Near" real-time means that the information that you get is slightly delayed from when it actually happened. This delay is typically measured in seconds, so the information is very fresh.

One trend in school bus tracking is to utilize a phone handset to provide tracking and communication. Phone handsets are inexpensive and most do an excellent job of tracking on a GPS system.

Some states and/or municipalities may have laws that prohibit cell phones in the school bus. In these instances, standard mobile phones are not allowed, but two-way voice systems such as Nextel Walkie-Talkie devices may still be. In the event that two-way radio communication is not allowed, the phones can be activated with just a data plan. Using a handset provides an additional level of safety and security. The ability to dial 911 is still available even if the voice plan is disabled. This is an important consideration when making a decision to implement a bus tracking application.

In a typical situation, phones are mounted on the dashboard in a black box and wired into the bus' electrical system, so that the phone's power supply cannot be interrupted either accidentally or intentionally.

In addition to using a handset device, hard-mounted units are available. Many educational governing bodies feel strongly that a durable hard-mounted unit must be placed in the bus for the system to work well.

Tracking Students

Two types of technology are frequently used by districts when implementing student tracking technology:

- Bar Code Reading
- RFID Card Reading

These technology solutions are found around us every day in the supermarket, building entrances, and even in many school buildings. Bar code reading and RFID have entered the mobile environment. Bar code readers are commonly used by FedEx, UPS delivery, and airlines.

Bar code reading has a lower initial implementation cost and has the ability to connect to Nextel Walkie-Talkie phones by serial cable or Bluetooth. This is a very cost-effective means for an implementation. Even if existing hardware has not been replaced, serial scanners will work with any Falcon-based phone so that future upgrades will only affect the phones.

RFID has recently entered the mobile environment and is being utilized primarily in student tracking. ActSoft is currently the only vendor within this market that can monitor the data through the handset by using “off the shelf” hardware that integrates to the school district’s existing access system.

Bar Code Reading

There are two ways in which this solution can be utilized.

1. An ID card with a printed bar code can be read as the student enters the bus. In this solution, a handheld reader scans each student’s card as they board the bus.
2. If the driver has a manifest with each student’s name and bar code, they can scan each student on the bus using the manifest as they board and leave the bus. This solution can be particularly useful on Special Needs buses that have an assistant. This usually provides the quickest Return on Investment (ROI) using Medicaid reimbursement.

RFID Cards Readers

There are many types of readers available on the market today. ActSoft, Inc. discovered and implemented a bar code

reader that not only could read bar codes but also has a 10-key pad included. This numeric pad can be used by the student to punch in their personal student ID number in the event they forget their RFID card.

RFID Cards

- There are many sizes and shapes of RFID cards on the market
- These cards not only vary in size and shape
- The price of cards is also a wide range

Biometrics (fingerprint readers) is another, more sophisticated way of tracking students. This is an efficient way of loading students quickly onto a bus. However, setting up a system that utilizes biometrics can be time-consuming, as every child’s finger has to be scanned and the fingerprint stored in a database.

Remote Engine Alerts And Idle Limiting

Recently, ActSoft, Inc. partnered with CV-MARC in order to provide an engine monitoring device targeting the commercial vehicle market. This device dramatically reduces engine failures, saves fuel costs by limiting idling, extends vehicle life, and saves jump starts by protecting the battery. It provides valuable management information on vehicles and driver performance through a secure, Internet-based and corporate reporting portal.

Using wireless modem hardware, the following data can now be captured automatically without any driver input:

- Vehicle ignition on/off
 - Engine idle time is calculated by checking that the engine has oil pressure as well checking GPS position of the vehicle
- Emergency door open/close
- Passenger door open/close (with a relay, can also detect when flashing lights are on along with the door open/close)

Summary

In light of recent events, technology is rapidly improving to meet the demands of protecting and monitoring our students and school buses. Wireless solutions effectively monitor school buses via GPS on the handset providing “near real-time” data for the schools and parents. In addition, solutions can track the vehicle’s route history,

locate vehicles, find closest drivers, and determine the time until the next routed stop. Students can be monitored by either bar code readers or RFID. These are common solutions which are highly efficient and cost-effective. As the demand becomes higher and governing bodies assert that tracking solutions be implemented into school buses, ActSoft, Inc. and Sprint Nextel will continue to research and create efficient, cost-effective solutions that meet the requirements of the school bus industry.

About Actsoft, Inc.

ActSoft, Inc. has been extremely successful within the school bus vertical market. ActSoft is an industry leader and currently provides solutions for over 60 school districts, tracking over 6,000 buses.

ActSoft provides the customer with multiple options depending on their tracking needs. ActSoft adopts a three-phased approach, which allows them to deliver a solution with low barriers to entry that can be easily implemented. As the client becomes comfortable with the technology and their particular requirements, they are able to grow with the system.

ActSoft's solution, Comet Tracker, enables administrators to see vehicle locations updated continually, find the closest drivers with the click of a button, review route history, define geographic boundaries, or assist in determining time until the next stop. By utilizing a reporting functionality such as the Stop and Activity reports, Comet Tracker can help increase driver responsiveness and responsibility.

ActSoft's success in the school bus industry has come with a great deal of time, effort, learning, and understanding of what potential customers want in a solution. They then match this with what is available in terms of affordable technology and meeting the market requirements.

About Sprint Nextel

Sprint Nextel partners with leading GPS and Location Based Service (LBS) application providers to offer K-12 school districts increased safety and security for their students, as well as enhanced operating efficiencies for their bus fleets. Sprint Nextel is widely recognized for developing, engineering, and deploying innovative technologies, including two robust wireless networks offering industry-

leading mobile data services; instant national and international walkie-talkie capabilities; and an award-winning and global Tier 1 Internet backbone. For more information, visit sprint.com/schoolbus2011.

“Comet Tracker gives us the ability to give parents and other members of the school family precise information about a specific bus location, historical traveled paths, and schedules, providing us the most positive addition to the school bus program during my 20+ year tenure.”

—Dr. Rick Grubb
Knox County Schools Transportation Supervisor,
School Zones and Attendance

The Edulog GPS Difference: Scalable Options For Maximizing Value While Reducing Costs

The Edulog GPS Difference: Scalable Options For Maximizing Value While Reducing Costs

Overview

GPS-based automatic vehicle location (AVL) technology is now commonly used in commercial logistics and public transit applications, but only recently has it been considered for student transportation by yellow bus fleets. Technological advances and increasing concerns about student safety and accountability have made GPS/AVL one of the hottest topics in student transportation management in the past 20 years. In addition to meeting safety concerns, there are number of tangible, financially feasible AVL benefits which can produce significant operational savings and support the decision to invest in AVL technology based solely on economic considerations—even without considering the immense value that arises from increased student safety.

“One Size Does Not Fit All ...”

Edulog recognizes that no single GPS solution will meet the needs of every school district: large districts, small districts, rural, urban, those with funds set aside for a GPS purchase, those on very tight budgets. In order to be a true GPS solutions provider, a company must offer viable options to all types of school districts. While other companies have developed a single, cookie-cutter solution, Edulog is the only one to offer an unparalleled range of GPS options.

Scalable Hardware Options

Edulog recognizes that a single type of GPS hardware will not work for all districts. In fact, a single type of hardware may not work for all of just one district’s GPS project. There are trade-offs to be considered when evaluating hardware options. Low-cost solutions are available to give school districts a way to get a GPS initiative started when budget constraints might otherwise make this impossible. However, the advantage of lower costs must be weighed against the limitations placed on the overall solution.

Even districts that have a set GPS budget set aside can benefit from multiple hardware options. For example, the hardware required for complete school bus tracking (including sensors for ignition on/off, door open/closed, flashing lights, stop arm, emergency event), is not necessary for tracking maintenance vehicles (white fleet). Thrifty clients can choose to mix and match hardware options for various vehicles in order to maximize value while reducing costs.

Unlike other companies that offer only one or at most two options, Edulog has developed a complete portfolio of GPS hardware that provides a perfect fit for any district. Equally as important is the fact that each option is easily scaled up to the next—providing clients a no-risk upgrade path as their needs change. Plus, clients are not forced into making one fleet-wide purchasing decision after another. Instead, individual units can be upgraded in smaller batches while the overall system continues to function with a mixed combination of units.

Cell Phone Only

Simply installing a cell phone on a bus is enough to get started with GPS. But Edulog’s cell phone solution exceeds the capabilities of all stand-alone AVL solutions by integrating AVL software with planned routing data (see next page). Districts with existing cell phone-based GPS solutions can easily upgrade to Edulog’s integrated solution by keeping their existing equipment and simply updating the mobile application on the phone.

Cell Phone + TetheredLocator (TL)

The value of a cell phone-based GPS solution can be multiplied exponentially by adding the TL unit that can accept a full range of sensor inputs from the school bus. When combined with the TL mobile application (firmware), the full set of Edulog AVL software features become available, including integration between the GPS information and planned data.

Cell Phone + BlueLocator (BL)

Combining a Bluetooth-enabled cell phone with the BL unit offers the additional flexibility of being able to use the cell phone for voice communication, push-to-talk, and text messaging as a part of the overall GPS solution. This configuration is ideal for field trip buses that travel outside of local radio coverage and need voice communication in addition to GPS tracking. It is also an ideal solution for maintenance vehicles (white fleet), because the cell phone can also send work order information to/from employees in the field.

Location Messaging Unit (LMU)

The LMU and embedded Edulog firmware offer clients the most robust and complete range of integrated GPS/AVL features available today. In addition to the full range of sensor inputs, the LMU can be combined with a variety of student tracking options; integrated with the onboard bus computer for diagnostics; and connected to a mobile data terminal (MDT) for displaying student and transportation data, driver directions, maps of the planned bus route, and more.

FLEXIBLE COMMUNICATION OPTIONS

As with the choice of GPS hardware, there is often no single communication medium that will perfectly fit a school district's broad range of GPS needs. Edulog supports the full range of communication options including radio-based GPS systems, all of the major cellular networks, Wi-Fi, and beyond. Should a client desire to use a combination of communication options, Edulog can work to make it happen.

But beyond the choice of the network itself, Edulog offers powerful software tools that allow clients to maintain control over how much data is transmitted from the GPS unit and when—which greatly reduces customer concerns about cellular overage charges, and allows clients to configure the system to fit within a smaller data plan. This integrated software functionality is unique to Edulog.

“Real” Integration With Bus Routing Software

Many school districts have come to understand the importance and value of selecting a GPS solution that offers integration between the AVL software and planned bus

routing data. However, the term "integration" needs to be explained because there are critical differences between one "integrated" system and the next.

One-Way Integration With Planned Routing Data

By taking planned routing data and importing it into AVL software, clients can perform comparative analysis with the actual GPS data being collected. Clients can then see much more than just the location of buses—they can see which buses are running early or late and determine when a bus skips a stop or makes an unscheduled stop, etc. This type of one-way integration with planned data results in a much more valuable solution than what is provided by any type of stand-alone AVL system. It allows districts to manage by exception and focus attention only on those instances where something unplanned or unexpected is occurring.

Edulog's EduTracker AVL software offers the most advanced collection of these types of integrated features derived from comparing GPS data with planned routing data. The system effectively "talks" to the users, letting them know when something unplanned happens. It allows dispatchers to handle early/late buses with extremely accurate information rather than having to simply react as phone calls stream in from parents. And while implementation can be simplified when Edulog's routing software is the source of the planned data, it is not required. EduTracker can use planned routing data from whatever brand of bus routing software the district currently uses.

For districts not currently using any type of bus routing software, Edulog offers a function in EduTracker that does not require routing software to take advantage of these features. Instead, live GPS data can be collected from actual bus runs and then used to populate the planned database so comparative analysis and management by exception can still occur.

Two-Way Integration: True GPS-Based Routing

Those few companies that claim to offer "integrated GPS" are in fact only able to provide one-way integration with planned data. But Edulog's GPS solutions go far beyond this initial milestone. When used in conjunction with Edulog's routing software, EduTracker can take live GPS data and push it into the planned routing database. For the first time in industry history, rather than having to rely on a "best

guess" model of what's occurring on the road, clients can update routing information based on data collected in the real world in real time.

As real-world GPS data is moved into the district's routing system, it greatly improves the accuracy of such things as exact stop locations and times, street segment speeds, etc. More exact data provided by the GPS system can lead to increased efficiencies and extremely meaningful run and route optimization. This unique GPS solution with two-way integration to routing software will not only actually improve the district's transportation data, but will even serve to auto-calibrate the district's GIS map as it is used over time. Two-way integration of AVL and routing software is another industry milestone, and unique to Edulog.

Smart Student Tracking

No topic related to school bus GPS/AVL has received more attention in recent years than student tracking. The motivations for automatic student tracking range from increasing student safety and security; improving the efficiency of special needs routing; meeting state/provincial reporting requirements; and securing Medicaid reimbursement.

The options for student tracking technology are as diverse as the motivations to implement them. Hardware products include RFID, swipe cards, bar coding, mobile data terminals (MDT), biometrics, and more. The only clear conclusion is that there is no perfect answer to student tracking. Every option has advantages and disadvantages that clients must consider to make an informed decision.

In keeping with the "one size does not fit all" philosophy, Edulog's approach to student tracking has been to design its GPS solutions to offer clients the ability to select from the complete range of student tracking options. For many clients, a combination of student tracking technologies will provide the best fit.

But being a true solution provider means going far beyond simply selling a variety of hardware options. There needs to be accountability and responsibility for the operational success of the overall system—which is directly affected by the selected technology. Therefore, Edulog works with each individual client to understand and define the unique requirements and expectations for the student

tracking system. Only then can meaningful, objective recommendations be made, and subsequent operational experiences be evaluated with the district.

Student Tracking Hardware

While a variety of student tracking options are available, many clients have selected the following technologies.

Radio Frequency Identification (RFID)

Widely used in other industries, RFID technology offers clients an effective way to accurately identify students as they board and exit the bus. The type, size, and costs vary based on the range or proximity required by the client for both the RFID reader and the student credential being scanned. The smaller the range, the less passive the system is—thus requiring physical participation from each student to ensure a successful scan. Edulog works with clients to adapt the installation of this equipment to fit with the models of school buses in a client's fleet.

Mobile Data Terminals (MDT)

Through the integration of the student tracking system with planned routing data, student information can be sent out to each bus and displayed on an MDT for the driver to interact with. This can be especially effective for special needs student tracking: the driver can simply push a button to indicate whether or not a child was picked up—and if not, select from a list of reasons why. Beyond student tracking, the MDT offers the additional features of being able to provide run directions, color moving maps, and more to the driver—all especially helpful for frequently changing bus runs and/or substitute drivers.

Student Tracking Software

As with GPS/AVL, the value of a student tracking system can be exponentially increased when it is integrated with planned routing data. Rather than simply tracking which students board and exit the bus, clients can compare this information a list of students assigned to a given bus stop. Not only can dispatch know when a child has exited at an unassigned stop, the driver will know when someone boards the bus who isn't supposed to.

A true dispatch tool, EduTracker allows operators to better manage phone calls from parents and determine with detailed accuracy where their child is located, if/when

they were picked up or dropped off, and exactly what time this occurred. Beyond daily operations, further routing efficiencies can occur because the system gives you a better understanding of exactly how many students are actually riding the bus compared to the total number eligible for transportation.

School District System Management

In order for student tracking to work, clients need much more than student tracking hardware and software—they need a cohesive management system. Many districts underestimate the resources needed to successfully maintain and operate a student tracking system—especially when individual credentials are assigned to students. Questions need to be answered, like: Who will assign cards to students? Where will this occur? What happens when a card is lost? How will all of this integrate with the existing student database?

Fortunately, Edulog has developed software tools within EduTracker to help clients manage these challenges. Card assignments are as simple as scanning an ID and then the system instantly connects this card number to both the transportation assignment for that student and the student record within the district's student information system.

Sprint  **POWER UP**SM
Together with NEXTEL