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AVL Tracking Technologies Primer

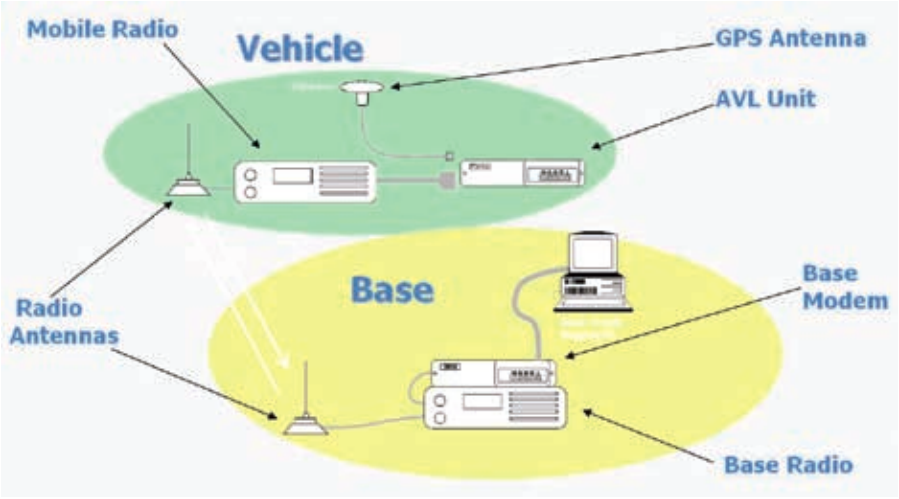
Paul A. Wardner | Special to School Transportation News

Whether designed for small or large school bus fleets GPS tracking technologies and implementations are growing faster than ever. Today Global Positioning System (GPS) and Automatic Vehicle Location (AVL) technologies allow for a variety of options, such as the ability to constantly track your fleet or have a "black-box" recording solution.

But what are the differences in AVL systems and how can they benefit you? First let's take a look at the broad scope of the AVL market.

At the heart of most AVL systems lies a GPS receiver. The receiver listens to several dedicated satellites provided and supported by the federal government. This constellation of 24 GPS satellites constantly orbits the Earth. Several are "in view" or available at any given moment to deliver data transmissions to or from a ground station or receiver. The receiver simply picks up the signals from at least four satellites and calculates its location by the information given.

Most consumer GPS receivers incorporate built-in LCD displays for showing the map location. This is quite handy if you are navigating unfamiliar territory. Unfortunately, using this technology for third-party monitoring requires sharing of information. To offer GPS technology to a dispatch-oriented environment the data (location, heading and speed) needs to be sent to the base or dispatching center where a digital mapping program displays the unit on screen. There are several means of transmitting the data.



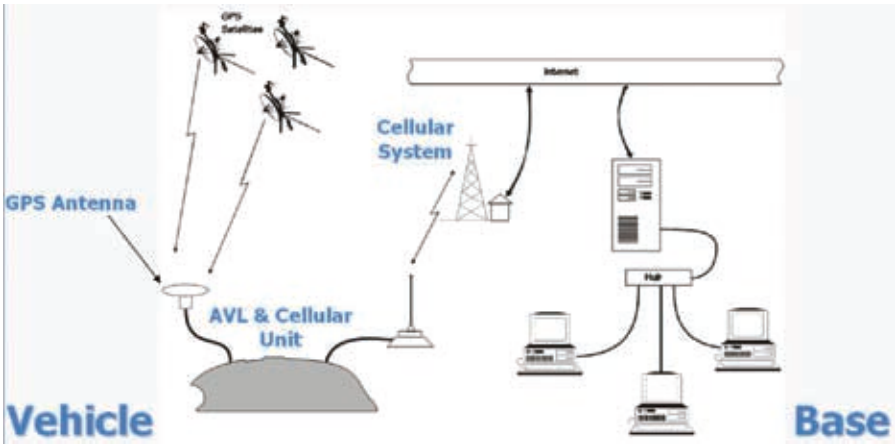
Radio Dispatch

Two-way radios used for voice communications in buses can be connected to the GPS receiver via modem. The data from the GPS receiver is converted into audible tones transmitted through the mobile radio back to the base station, where another modem is used to convert the audio tones into data routed to the dispatching computer. If the modem simply transmits the data over the voice channel all other bus drivers can hear the short data burst each time any GPS update is sent.

To solve this problem many modems have the ability to mute the receiver audio so the data burst is softened or eliminated entirely. Many school districts are heading toward dedicated radio channels that send data on a different channel than used for voice traffic. The modem in this case changes the mobile radio channel for the data burst and then returns to the previous channel to receive voice calls.

Smaller school districts that cannot afford the additional radio channel can take advantage of a product known as expanded memory. This product allows the GPS update information to be stored in a memory device for later download or retrieval (passive/black box).

With this style of recording all GPS updates and events can be archived for months or years. The module can be removed to allow downloading to the base or dispatch computer for reports such as driver performance, incident or accident review or route optimization. The expanded memory device is also used in conjunction with the modem radio interface to allow the dispatcher to "poll" the unit to get the current location in real time. The advantage of using an existing radio system is the infrastructure is already in place and the AVL simply "piggy-backs" onto the system for increased utilization. The draw back is that the operation is limited to the radio coverage of the system.



Cellular Network

By coupling the GPS receiver with a cellular system and passing the data on directly, the system coverage becomes nationwide.

Activity buses can be best served with this technology. The AVL unit contains a GPS receiver along with a cellular phone module which allows the data to be sent to the cellular network.

The network then routes the data to an Internet Protocol (IP) address to be picked up by the mapping software.

Service plans are typically set up for roaming access with cost set for data use rather than "air-time-minutes." Such plans offer specific data usage that fits the operation of the

AVL system. For example, a plan that provides 1 MB of data transfer, the bus can send GPS updates every 2 minutes.

The obvious advantage to cellular is the bus can be nearly anywhere in the U.S. and have coverage. A built-in cellular transceiver makes the AVL unit "stand-alone" requiring only power, GPS and cellular antenna connections. The downside is the monthly cost associated with the service.

The best of both worlds is an AVL system that can support both technologies where the regular route buses use the existing radio system and the activity buses are outfitted with cellular-based AVL for traveling.

Satellite System

Traditionally the cost structure of using satellite communication is applicable to large fleets. School bus operators that dispatch thousands of buses traveling over wide areas benefit from nationwide coverage or bulk rate plans. The AVL unit in this case uses the GPS receiver as before and includes a satellite transceiver to send the data through a different set of communication satellites back to a network operations center. The student transportation market may not be ready to embrace this technology as the equipment and data plan pricing is still significantly more than the radio- or cellular-based solutions.

Clearly, there are several platforms that address basically the same thing … tracking your school bus fleet. The way in which data is sent and the advantages and compromises of each should be weighed for each application. School districts should compare the initial hardware costs against the ongoing system access or monthly billing costs to determine which is best for their budget. STN

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