ISSN 2348-1196 (print)
International Journal of Computer Science and Information Technology Research ISSN 2348-120X (online)
Vol. 2, Issue 3, pp: (110-115), Month: July - September 2014, Available at: www.researchpublish.com

Real Time Tracking In Wireless Network Using Gps/Avl

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Abstract: **The Paper entitled as "Real Time Tracking in Wireless Network Using GPS/AVL". The main Objective of this Paper is to tracking the vehicle using Wireless Network. Tracking a positioning system helps the server to locate the position by sending an SMS to the receiver which in turn sends back a SMS informing its current Global Position.**

As companies wanting to tracking their vehicles/employees begin their search for information about GPS tracking devices, many come upon what appears to be an easy, affordable solution. To the buyer who in not familiar with how GPS systems work, GPS enabled phones appear to offer the cheapest way to start tracking your employees and your fleet. To the buyer who is uneducated with GPS equipment, GPS phones seem to be an easy way to begin reaping the benefits of GPS tracking.

Vehicle tracking is a way of monitoring the location, movements, status and behavior of a vehicle or fleet of vehicles. This is achieved through a combination of an electronic vehicle location unit (VLU) fitted in the vehicle,

A method of returning the data to the user and PC or web based software. The data is turned into information by management reporting tools in conjunction with a visual display on computerized mapping software.

This paper is deals with two parts of wireless Technologies. First we are going to discuss about the Global Positioning System, which deals with the appropriate segments. Second we are going to look at Automatic Vehicle Locator concept and Process implemented in the real time.

Keywords: **Vehicle location unit (VLU), GPS tracking, Computerized Mapping.**

1. INTRODUCTION

GPS-The Global Positioning System (GPS) is a group of 27 Earth-orbiting satellites (24 in operation and three extras in case one fails). When people talk about a "GPS," they usually mean a GPS receiver. The U.S. military developed and implemented this satellite network as a military navigation system, but now lets everyone use the signal Position using the signals from four or more GPS satellites. Four Satellites are needed since the process needs a very accurate local time, more accurate than any normal clock can provide, so the receiver internally solves for time as well as position. In other words, the receiver uses four measurements to solve for 4 variables –x, y, These values are then turned into more user friendly forms, such as latitude/ longitude or location on a map, and then displayed to the user. Each GPS satellite has an atomic clock, and continually transmits messages containing the current time at the start of the message, parameters to calculate the location of the Satellite and the general system health. The signals travel at a known speed - the speed of light through outer space, and slightly slower through the atmosphere. The receiver uses the arrival time to compute the distance to each satellite, from which it determines the position of the receiver using geometry and trigonometry.

2. SYSTEM SEGMENTATION OF GPS

The Current GPS consists of three major segments. These are the space segment SS , a control segment CS ,and a user segment US.

2. A Space Segment

Orbiting at an altitude of approximately 20,200 kilometers (12,600 miles or 10,900 nautical miles; orbital radius of 26,600 km (16,500 or 14, 00NM)), each SV makes two complete orbits each sidereal day. The ground track or each satellite therefore repeats each sidereal day. This was very helpful during development, since even with just 4 satellites, correct alignment means all 4 are visible from one spot for a few hours each day. For military operations, the ground track repeat

can be used to ensure good coverage in combat zones. The additional satellites improve the precision of GPS receiver calculations by providing redundant measurements. With the increased number of satellites, the constellation was changed to a no uniform arrangement. Such an arrangement was shown to improve reliability and availability of the system, relative to a uniform system, when multiple satellites fail.

2. B Control Segment

GPS standards, so to change the orbit of a satellite, the satellite must be marked 'Unhealthy', so receivers will not use it in their calculations. Then the maneuver can be carried out and the resulting orbit tracked from the ground. Then the new ephemeris is uploaded and the satellite marked healthy again. Even if just one satellite is maneuvered at a time, this implies at least five satellites must be visible to be sure of getting data from four.

2. C User Segment

The user's GPS receiver is the user segment (US) of the GPS system. In general, GPS receivers are composed of an antenna, tuned to the frequencies transmitted by the satellites, receiver-processors, and a highly-stable clock (often a crystal oscillator). They may also include a display for providing location and speed information to the user. A receiver is often described by its number of channels: this signifies how many satellites it can monitor simultaneously. Originally limited to four or five, this has progressively increased over the years so that, receivers typically have between twelve and twenty channels

3. HOW DOES GPS WORK?

Calculating a Position

A GPS receiver calculates its position by a technique called satellite ranging, which involves measuring the distance between the GPS receiver and the GPS satellites it is tracking. The range (the range a receiver calculates is actually a pseudo-range, or an estimate of range rather than a true range) or distance, is measured as elapsed transit time. The position of each satellite is known, and the satellites transmit their positions as part of the "messages" they send via radio waves. The GPS receiver on the ground is the unknown point, and must compute its position based on the information it receives from the satellites

4. MEASURING DISTANCE TO SATELLITES

The first step in measuring the distance between the GPS receiver and a satellite requires measuring the time it takes for the signal to travel from the satellite to the receiver. Once the receiver knows how much time has elapsed, it multiplies the travel time of the signal times the speed of light (because the satellite signals travel at the speed of light, approximately 186,000 miles per second) to compute the distance. Distance measurements to four satellites are required to compute a 3-dimensional (latitude, longitude and altitude) position.

In order to measure the travel time of the satellite signal, the receiver has to know when the signal left the satellite and when the signal reached the receiver. Knowing when the signal reaches the receiver is easy, the GPS receiver just "checks" its internal clock when the signal arrives to see what time it is. But how does it "know" when the signal left the satellite? All GPS receivers are synchronized with the satellites so they generate the same digital code at the same time. When the GPS receiver receives a code from a satellite, it can look back in its memory bank and "remember" when it emitted the same code. This little "trick" allows the GPS receiver to determine when the signal left the satellite.

5. HOW ACCURATE IS GPS

The accuracy that can be achieved using GPS depends on the type of equipment used, the time of observation, and the positions of the satellites being used to compute positions. In general, recreational and mapping grade receivers using C/A code without differential correction are accurate to between 5 and 15 meters. Many people using recreational grade receivers don't realize they cannot get highly accurate readings using them autonomously (without differential correction). Most mapping and recreational grade receivers with differential correction can provide from about 1 to 5 meter accuracy.

Some receivers use what is called "carrier-smoothed code" to increase the accuracy of the C/A code. This involves measuring the distance from the receiver to the satellites by counting the number of waves that carry the C/A code signal. These receivers can achieve 10 cm to 1 meter accuracy with differential correction. Dual frequency survey grade receivers using more advanced network survey techniques can achieve centimeter to millimeter accuracy.Some people wonder why GPS is better than Loran or other systems that use ground-based transmitters. The accuracy of ground-based location systems such as Loran, which uses low frequency radio signals, is affected by signal distortion, varied terrain, local atmospheric disturbances and limited coverage. Since GPS signals come from satellites, the problems common to ground-based systems can be avoided.

6. AUTOMATIC VEHICLE LOCATOR

An automatic vehicle locator (AVL) is a device that makes use of the Global Positioning System (GPS) to enable a business or agency to remotely track the location of its vehicle fleet by using the Internet. These devices combine GPS technology, cellular communications, street-level mapping, and an intuitive user interface, with the ostensible goal of improving fleet management and customer service. For example, a company using an AVL system is able to pinpoint the longitude, latitude, ground speed, and course direction of a given vehicle. The vehicle's location can be quickly found and it could be rerouted to provide timely delivery to a nearby customer. AVL systems also enable companies to structure delivery routes more efficiently by compiling a database of vehicle information, including location of customers in relation to established delivery routes. AVL systems generally include a network of vehicles that are equipped with a mobile radio receiver, a GPS receiver, a GPS modem, and a GPS antenna. This network connects with a base radio consisting of a PC computer station as well as a GPS receiver and interface. GPS uses interactive maps rather than static map images on the Web. This means users can perform conventional GPS functions such as zoom, pan, identify and queries.

AVL systems can be used to increase the accountability of field personnel and boost the efficiency of a company's dispatching procedure. Dispatchers can get a real-time snapshot of driver adherence to a route, provide customers with an estimated time of arrival, and communicate directly with drivers. Public safety agencies, such as police department or fire departments, can use AVL technology to improve response times by being able to dispatch the closest vehicles for emergencies.

Most AVL suppliers have created products that don't require dedicated servers and require minimal training of dispatchers. AVL systems use mouse clicks instead of keystrokes to page a single vehicle, a designated group of vehicles or an entire fleet. The Aertrax system, for example, operates without expensive receivers or other equipment. It can be operated with a PC or desktop that connects to the Internet. Aertrax includes a completely self-contained unit that uses a minimal amount of power from the vehicle in which it is installed. This unit transmits GPS location data, either on a regularly timed basis or in response to a command.

This data is then converted into mapping that is instantly available via the Internet.

Figure1. Vehicle Tracking System

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7. PROCESS OF VEHICLES TRACKING USING GPS/AVL

GPS technology enables the receiver to determine location within 100 meters. Differential GPS (DGPS) can pinpoint locations within a meter in moving applications. DGPS may allow a dispatch center to pinpoint a specific address on a street, or a department of transportation to predict the arrival of public transit systems or a utility to coordinate maintenance teams on power lines.

A basic GPS/AVL system comprises three main components: the GPS receiver/processor, the RF communications link, and the central processing display system. The GPS receiver may operate on one to 12 channels. The satellite antenna used with the GPS receiver must be located on the vehicle so that it provides unobstructed aerial visibility and minimizes the length of the cable run to the receiver. The antenna receives signals from the GPS satellites, and a communications link transmits the location data from each vehicle to a central processing location. The communications link can be radio, cellular or satellite.

Figure2. Space Segment and Control Segment

The Central processing location or display station receives digitized information from the vehicles in the fleet via a radio unit. The radio is interfaced to a modem and communications controller. The controller will produce a data output, such as RS-232, which can be used to drive a fleet management processor. This processor complies location data to create a real time database of all vehicle positions. A dispatcher can then monitor the activity of the fleet by viewing equipment, symbols moving across a digital map on a computer screen.

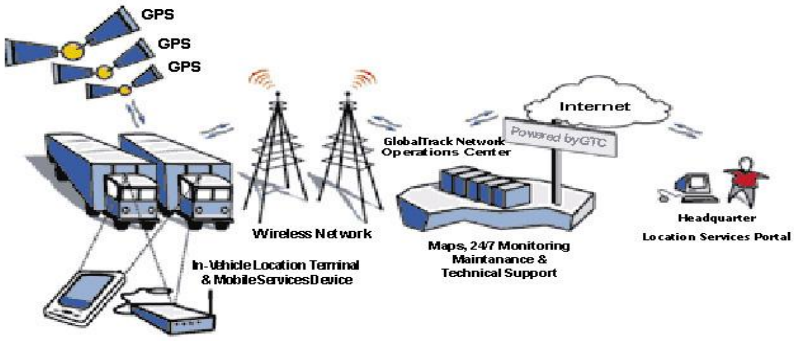

Figure3. Process of Vehicle Tracking System

The unit had wireless modem inside of is that is the same as what is inside of cell phone. This is how the system communicates the GPS data out of the vehicle in real time(See Wireless Networks below). Additionally, a GPS antenna is tethered to the unit with a lead wire(Typically 10'-15') The GPS antenna collects the GPS data and feeds it to the chip set in the unit, the data is fed through the wireless network (via modem) and the data is sent out to be displayed to the end user via the web.

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8. HOW IMPORTANT IS THE WIRELESS NETWORK USED FOR REAL-TIME TRACKING

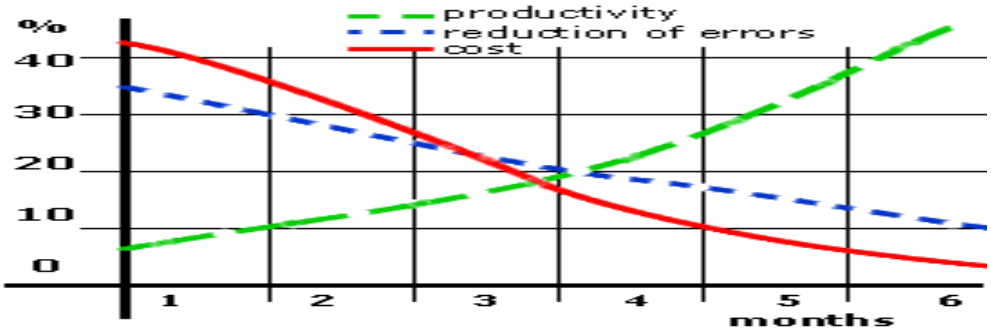
If you are looking to purchase a 1st tier GPS Tracking system, then you should be looking for a system that operates on a 1st tier digital Wireless network. The entire 1st tier digital wireless network. All of the 1st tier wireless networks. There are two types of digital wireless protocols that the major communication companies have utilized for the build out of their wireless networks.GSM/GPRS. There is an on going debate as to which of these protocols is superior for passing data over wireless, but for live data feeds for devices used for GPS tracking, mobile email, and wireless forms, the "always on "technology of GPRS is clearly superior.

9. WHAT ARE THE PRINCIPLE BENEFITS OF VEHICLE TRACKING

There are many opportunities to increase the efficiency, productivity and accountability of your organization through the simple, cost-effective implementation and use of a vehicle tracking solution.

The often quoted principle benefits of vehicle tracking include

- Increased productivity
- Reduced operational costs
- Improved customer service
- Enhanced security for both driver and vehicle



The list below provides some examples where the use of a vehicle tracking solution can have an effect in an organisation. There is a caveat; and that is, for these benefits to become a reality your organisation really has to be able to make full use of the information the tracking product delivers. A lot of thought should go into what can really be achieved by the implementation of a system. The stated aims need to be realistic and the chosen product needs to contain all the features required to assist you in meeting your desired objectives.

10. REASONS TO INSTALL (AND USE) A VEHICLE TRACKING SOLUTION

1. Introduce an AVL tracking system to your employees as part of a bonus and cost savings program. Employees and staff need to quickly accept the idea of using vehicle tracking technology to keep up with the times and increase the financial position of the company; rather than "big brother watching over them". Employees value their jobs in a tighter economy, more than they do the idea of being supervised. At the end of the day, vehicle tracking technology is essentially just another management tool to help you better run your business.
2. An AVL vehicle tracking system can be actively used to resolve customer disputes related to arrival time, service duration and service location. Employees will appreciate this level of detailed support.
3. By knowing the exact location of a vehicle, pinpointed on a map, remote staff that are lost can be better helped. This helps the employee stay on schedule and not have to speed or work over time to recover lost time.
4. Reducing the average speed of your vehicles. As an example, if you get your vehicles to slow down and stay within the speed limits, this relates directly into fuel consumption, maintenance and accidents that could save up to 20% on your monthly fuel bill. The additional benefit of reducing speed is that your drivers may well keep their licenses for a while longer! and you can reduce your insurance liability. You may find that servicing and maintenance costs will

reduce, however this will only be evident over time. It might take a year for you to really see the difference on your bottom-line, but it has to come if you are driving fewer miles and at the legal speed limits.

5. Verification of the accuracy of time sheets can be a key area for improvement. The introduction of an AVL system gives you the facility to compare a typical start-stop report to the time sheets. Determine what the average margin of error is and then compare that to the time sheets before you installed the vehicle tracking system. The benefit can equate to savings of thousands of pounds, per employee, per year.
6. Verify existing and promote new sales calls from your sales team. If each sales person can generate one additional sales call in every three days that mean an extra 84 sales calls, per employee, per year. How much in extra sales, new business and profits will this mean to your business every year? Add to this the savings from not paying for mileage or fuel for unproductive or personal driving on company times and your business is even further ahead.

11. FEATURES OF GPS BASED AVL SYSTEM

- **View your vehicles,** locations on a GIS map nationwide.
- **Recording and storing of up to 2000 positioning locations,** Route traveled, speed & other parameters. No data is lost due to poor or no GSM coverage.
- **Fuel Sensor,** To check fuel theft, contamination and usage.
- **Thermal Sensor,** To provide instant alerts for high and low tempratures in thermal sensetive cargo.
- **Accident Detector**, Detects Vehicle in case of an impact when an accident happens.
- **Set a series of speed limit rules**, This will allow reporting on the number of times a driver has exceeded a certain speed, and / instant alerts when a certain speed limit is breached.
- **Establish routes and rules to alerts**, and / or report on route deviation.
- **Track mileage**, Track actual mileage through GPS **@ +- 3%**
- **Measure distance from key on to key off**, and report generation by driver and / or vehicle.
- **Instant Alerts when a certain compartment (or series of compartments) is opened**. vital for critical high value transportation
- **View the vehicles from any Internet connected device** (PC, PDA etc) via a password protected web site.
- **Vehicle operating status,** provided at each transmission, including Ignition on / off, current speed, accurate odometer reading etc.

12. CONCLUSION

GPS/AVL allows fleet managers to improve their businesses with returns on investment with the efficiency gained from the technology. Quicker dispatch times for public safety agencies can save lives. Drivers and passengers are safer, and customer service is improved. In this paper, we had proposed a GPS based AVL system to identify the location of the vehicle. The monitoring of events at a central control center can allow the user to dynamically monitor the state of the vehicle.

REFERENCES

[1] J. Pabmanabhan," GPS Based Vehicle Tracking System",The Asian GPS Conference ,2001

[2] Srinivasa Manda "Vehicle Tracking System: Technologies and Benefits",GIS Development Procedding,2003

[3] Global Positioning System Standard Positioning Services Specification ,2nd Edition june2,1995.

[4] Wells David Ed 1989,Guide GPS positioning Fredericton ,NB,Canada: Canadian GPS