The Security of The Goods Through the Global Positioning System (GPS): Description and Application

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Abstract. Today, security is a very important issue for the global economy, especially in freight transport companies, due to the impact that crime has had lately, and that has led to initiatives to increase security in the chain of supply, especially during the physical movement of the merchandise, taking measures and control actions to increase the effectiveness and effectiveness of the security guidelines, measures that allow them to provide a safe and competitive service. That is why the present research work has the purpose of designing a location and tracking system for transport units for security through GPRS / GSM technologies, the information analyzed to determine the types of goods, the characteristics of the system, was through a field of investigation within the company ZEEK, a branch located in the Municipality of Santa Ana Chiautempan, Tlaxcala, Mexico. In order to determine the type of companies that prefer technologies and invest in equipment, this is done through a Pareto analysis. The feasibility of applying a location and security system has several functions, for example, it helps us in the event of an unwanted event such as door opening, shock or the variation of the load temperature, it increasingly becomes a You need to know the exact location, either for security in case of theft or for control and monitoring, giving it an added value with the implementation of a mobile application that shows the exact location in real time. It was also possible to obtain results through the customers´ information who have the GPS system. During the analysis of the investigation I concluded that it is feasible and necessary to implement a security system based on the need for the care of the goods and thus also safeguard the integrity of the users.

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1. Introduction:

When Designing and proposing a location and monitoring system for the security of goods, applying the Global Positioning System (GPS) technology that allows the traceability of moving vehicles. The rise in crime incidence has impacted on the constant increase in insurance policies, which have even increased their cost above 100%, said Enrique González (2016). Due to the statistics of robberies presented in various studies, they are now carried out with more violence and there is no strategy that allows for the prevention of such crimes, which also generates a history for measures to be applied. security after such an event.

The problem that occurs in companies is the inability to prevent the theft of their inventory during their transfer. One of the main points is that most of them have losses, when there is theft of goods that companies have for a commercial purpose or asset investment. Undoubtedly, insecurity and especially violence generate high costs for businesses, as well as heavy burdens for affected individuals and their families.

That is why it is important that this is a point to consider in order to resort to current and evolutionary technology, which allows us to establish better safety standards in vehicles at the time of transfer, always having the location in real time and accurate with a range of minimum error, and with a wide range of devices with different characteristics according to the primary needs of a common customer or company.

2. Classification of Goods:

The goods are classified depending on the type of study or situation, it should be clarified that for this investigation the goods of a company such as assets, merchandise, inventory, raw material, everything that the company can transport for its monitoring and in turn for delivery to another company of some product or merchandise.

THE GOODS: Set of properties or wealth that belong to a person or company, refers to those physical elements that, in some way, meet human needs and can be marketed.

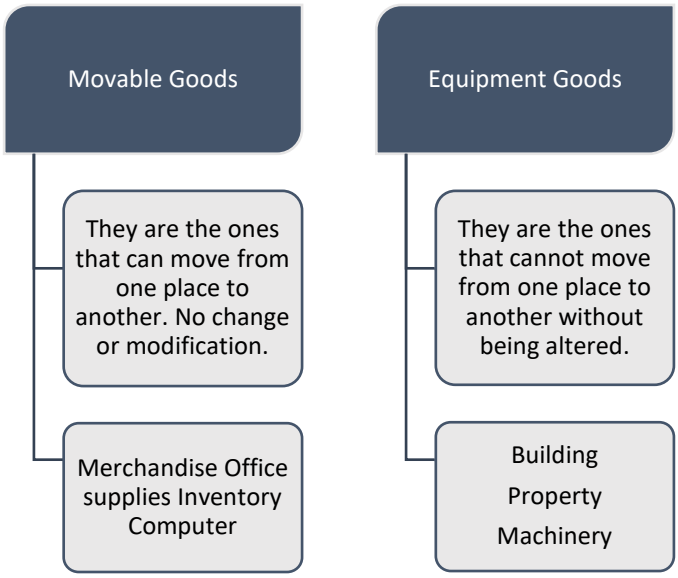

Figure 1. Classification of goods according to their mobility. Source. Own elaboration taking the information from Morales, 1999, Page 3

For this work, movable property is considered with the objective of applying the technologies and with this, keeping a better control during the shipment and reception in the supply chain.

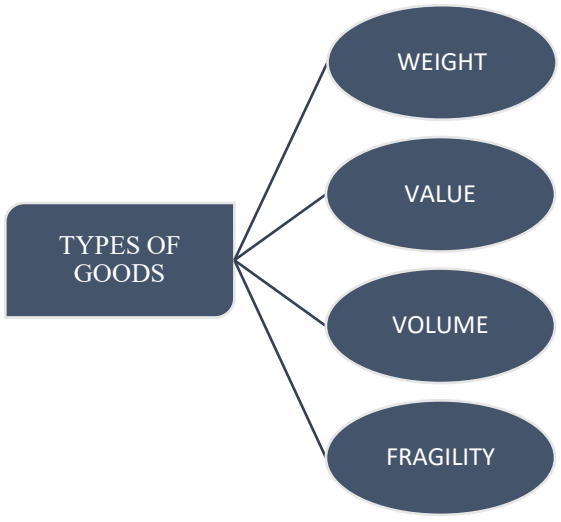

Figure 2. Types of goods according to their characteristics. Source. Own elaboration

3. System Description:

It is a system focused on implementing technologies compatible with the needs of each client or company, for the protection or transfer they require, always considering that the cost of security will have a future impact-benefit, because it will be reflected to some degree in trust. of positioning and at the same time the prevention of theft or loss, always considering that when implementing the technologies, it is of a great boom at international level.

The Global Positioning System or GPS: It is a global satellite navigation system that allows you to determine the position of an object, a person, a vehicle. Accuracy up to centimeters can be achieved.

The invention of this system is attributed to the governments of France and Belgium, although it was developed and installed by the United States Department of Defense, which is currently in charge.

The GPS operates through a network of 27 satellites (24 operational and 3 backup) in orbit at 20,200 km above the globe, with synchronized paths to cover the entire surface of the Earth. When it is desired to determine a position, the receiver that is used for it automatically locates at least three satellites of the network, from which it receives signals indicating the position and the clock of each one of them. Based on these signals, the device synchronizes the Positioning System clock and calculates the distance to the satellite. By "triangulation" the three satellites calculate the position in which the GPS is. The triangulation in the case of the Global Positioning System is based on determining the distance of each satellite from the measurement point. Knowing also the coordinates or position of each of them by the signal they emit, the absolute position or actual coordinates of the measurement point is obtained.

4. Technologies Involved in the System:

In order the equipment to function, the interaction of some technologies is necessary, which help to obtain the information needed to determine the exact location:

- Global GPS Positioning System: Determines the coordinates (longitude, latitude) of the equipment on the globe.
- GSM / GPRS cellular system: Communicate our mobile equipment with the web server through the Internet cloud.
- AVL Equipment (Automatic Vehicle Location). It has integrated a GPS and a microcontroller that commands the equipment.

Product characteristics

Product name: AVL Standard, Supported browsers: Google Chrome

Platform: Zeek GPS which is the case study for this investigation.

Figure 3. System Diagram.
Source: Vehicle tracking and monitoring and control system, Leon 2012, p. 21

5. Description of Operation

The GPS location system allows us to have activity records of a vehicle (in real time or historical consultation), for this a GPS / GPRS electronic device is used, which once installed, reports activity data allowing to have a geographical reference of the location of the unit, as well as the events that occur in the unit.

This product aims to offer control over vehicles and thus increase the safety of transported goods, improve driving times and thus reduce not only fuel costs but also maintenance costs and increase transportation efficiency. It can be installed in any type of vehicle, from a private vehicle to a tractor unit as long as it has the following requirements: Feeding energy source of 12 to 24 Volts.

1. Engine Ignition Signal.
2. Dashboard for GPS device location.
3. The unit has no electrical problems.
4. Mobile data plan.

6. Parameters of: Geo-reference, date, speed, distance traveled using the GPS odometer, direction and idle times.

The coverage of the location service depends on the network and infrastructure of the cell phone service provider, it is important to know that there are parts of the national territory in which there is no cellular service such as road sections between cities and / or states, in these cases, the teams store the events that occur at that time and then send them when there is GPRS coverage. There is a remote possibility that within a city with cellular coverage teams of different brands do not have data sessions or service, these periods of non-coverage are small and varied from 30 seconds to 3 minutes, so at that time the unit does not You can transmit your location in real time, but it still stores the locations, events and will be reported when the GPRS connection resumes. It is important to know that the position or geo-reference that a vehicle tracking equipment gives us will not always be accurate, since it is the result of an approximate calculation of the information of different GPS satellites.

The accuracy of the location is closely related to the installation and location of the equipment, such as external obstacles, which can be metal or concrete objects (to name a few) that prevent or obstruct the signals sent by GPS satellites, increasing the error of the GPS module calculation resulting in the unit being in an incorrect location or very distant from the actual location of the unit. The travel tolerance that is handled is 50 meters in motion and +/- 10 meters with the unit stopped.

Table 1. *Actions and main characteristics of the platform*.

1. Automatic reports: a) Movement or engine status on 1 minute. b) No movement or engine status off: 10 minutes.	8. Dead time consultation.
2. Events of: a) Engine on and off. b) Panic button. c) Connection and disconnection of equipment. d) Drag. e) Start and end of Idle.	9. Ponts of interest.
3.Interface control: a) Engine shutdown. b) Electric sheet action.	10. Geo-routes.
4. Creation of geo-fences.	11. Address search.
5. Reports and notifications via email.	12. Map coordinate query.
6. History inquiries of up to 3 months. a) Written activity reports. b) Graph reports.	13. Last position.
7. Continuous tracking.	14. Search for nearest unit.

Source: Zeek GPS Fleet Manual Page 2.

7. Analysis of customer information with the GPS System: ZEEK GPS Case Study.

Table 2. *Sample of 163 customers classified by the line of business*.

Turns	Companies	Frequency	Percentage
Foods	2	0.012	1%
Commercial	8	0.049	5%
Federal	51	0.313	31%
Local	48	0.294	29%
Others	8	0.049	5%
Particular	10	0.061	6%
Private	5	0.031	3%
Public	31	0.190	19%
	163		100%

Customer Relationship with GPS. Source: Own elaboration

With this information, a Pareto diagram is drawn up to identify the companies that use the systems most frequently and the most common reasons for using the positioning system and its benefits could also be found.

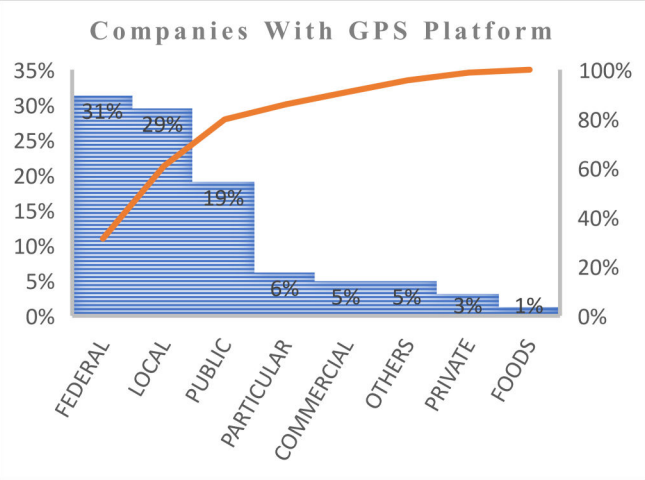

Figure 4. Companies that already have the global positioning system installed. Source. Own elaboration.

8. Conclusions

Logistics is not for everyone, but logistics is general in the requirement of security of goods. The results of the analysis of these customers that were taken in order to determine the type of commercial line of cargo transport, with this we can see that the scope of federal transport is more frequent the use of the system, due to the type of merchandise that is transported, considering the monetary value that this implies, with this we can conclude that the greater the investment, the greater the security there is during the transfer of the goods.

The GPS product is recommended that it is an original model and that it has an official tracking platform, it has not yet been violated by the attackers; That is why it is highly reliable. (Testimony of experts and clients interviewed)

We can obtain the service with a specialized and certified company. Location system, alert with panic button in case of theft or crash, remote engine shutdown. 24/7 surveillance, 365 a year, etc.

The system offers multiple products depends on the needs of the customer for control and security of the goods, can be obtained through accessories.

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