INTRODUCTION

- A **vehicle tracking system** combines the installation of an electronic device in a vehicle, to enable the owner or a third party to track the vehicle's location.

- Modern vehicle tracking systems commonly use GPS & GSM technology for locating the vehicle.

- Vehicle information can be viewed on electronic maps via the Internet or in mobile phone via SMS.
Why the firms need VTS

- Fuel and Power Saving
- Effective Fleet Control
- Instantaneous Fuel Level Monitoring
- Decreasing the Accident Risk
- Driver and Load Security
- Evaluation of Drivers Performance
- Monitoring the Delivery Time
- Safer Vehicle Renting
In which sectors is VTS used

- **School and Employment**
  VTS can alert when vehicle is approaching

- **Public Service**
  VTS avoids misusage

- **Railroads**
  VTS can monitor the wagons online

- **Private Yatches and Fishing Boats**
  VTS locates the vehicle in case of emergency

- **Logistics, Cargo, Distribution, Transportation**
  Fleet management

- **Police**
  Communication with other vehicles

- **Rent a Car Firms**

- **Working Vehicle**
  Monitoring vehicle which project they are working
Reasons of Using VTS for Logistic Companies

- Prevent smuggling
- Knowing the exact location of the cargo
- Storing data about routes of trucks
- Providing information to customer
Technologies Involved

• **GPS – Global Positioning System**
  Allow GPS receiver to determine its exact POSITION in longitude and latitude, velocity, direction etc.

• **GSM – Global System of Mobile**
  Allow this POSITION information to be sent to central control room as SMS or GSM data call

• **GPRS – General Packet Radio Service**
  Allow transfer of multimedia content like photograph to central control room or other mobile unit

• **GIS – Geographical Information system**
  City maps with technical information which allow converting the POSITION information into possible address, street or place.
What is GPS?

Developed by the U.S. Department of Defense for the military, the Global Positioning System (GPS) is a worldwide, satellite-based, radio navigation system that will give you the exact position of your vehicles, no matter where they are, what time it is, or what the weather is like. A total of 24 satellites orbit the Earth, monitored continuously by earth stations. The satellites transmit signals that can be detected by GPS receivers located in your vehicles and used to determine their location with great accuracy.
How does GPS work?

Each GPS satellite transmits radio signals that enable the GPS receivers to calculate where its (or your vehicles) location on the Earth and convert the calculations into geodetic latitude, longitude and velocity. A receiver needs signals from at least three GPS satellites to pinpoint your vehicle’s position.

GPS Receivers commonly used in most Vehicle tracking systems can only receive data from GPS Satellites. They cannot communicate back with GPS or any other satellite.

A system based on GPS can only calculate its location but cannot send it to central control room. In order to do this they normally use GSM-GPRS Cellular networks connectivity using additional GSM modem/module.
What is GSM?

GSM, Global system of Mobile, is a popular Mobile communication system provided by Cellular service providers or GSM Operators in most countries internationally.

It is used for in most mobile handsets used by us.

GSM Mobile communication system can be intelligently used by electronic devices which can collect some data and send it to the central place using SMS or GSM data call.

GSM is required in Vehicle tracking systems because GPS system can normally only receive location information from satellites but cannot communicate back with them. Hence we need some other communication system like GSM to send this location information to central control room.

Other technologies can also be used but they are more costly.
What is GPRS?

General Packet Radio Service, is new communication services introduced by GSM operators. These services are part of same GSM network. These services allow secure and confirmed transfer of content like digital photos or other data to other GPRS capable system.

Example of services based on GPRS is MMS (Multimedia Messaging Service).

GPRS is required in case we want to take snaps and transfer them to the central control room. They are not required for GPS tracking etc.

GPRS does not involve additional hardware but we need to use more advanced GSM modules which support GPRS.

GPRS services are not provided by all GSM operators.
What is GIS?

Geographical Information System, GIS is a software which consist of specially developed comprehensive and detailed maps of the city with longitude and latitude information of each place, street, junctions and address.

These maps are useful to locate the address of a vehicle fitted with GPS system.

GPS-GSM system only provide the longitude and latitude of the vehicle but GIS software if properly developed can provide details of exact or nearby address where the vehicle is.

In case one does not have detailed GIS maps of the city it would be very difficult to track and teach the vehicle in very short time.
Active versus passive tracking

- Passive devices store GPS location, speed, heading and sometimes a trigger event such as key on/off, door open/closed.

- Active devices collect the information but usually transmit the data in real-time via cellular or satellite networks to a computer or data center for evaluation.
Simple GPS-GSM Vehicle Tracking Unit

Optional Inputs/Outputs like Emergency button, Alarm signal etc.

Main Vehicle Tracking unit consist of **Vehicle Controller, GPS Receiver, GSM Modem**

GSM Antenna

System work on 12VDC or 24VDC from Car power supply

GPS Antenna
GPRS based GPS-GSM Vehicle Tracking

1. GPS Receiver: Calculate its position.
2. GPS Receiver: Receive signals from 3-4 satellites.
3. Vehicle Controller: Communicate its position to GSM Modem via vehicle controller.
4. GSM Modem: Communicate GPRS connection to internet through nearest GSM Tower. GSM Modem can be always connected to the internet.
5. GSM Tower: Connects GSM Modem to Internet.
7. Server: Display location on the computer with maps.
SIMCOM SIM548

◆ The GSM/GPRS+GPS Module for Satellite Navigation

◆ Connects to the specific application and the air interface.

◆ Allows goods, vehicles and people to be tracked at any location and anytime with signal coverage.
SIMC0M SIM548

Features

◆ Tri or quad-band GSM/GPRS+GPS
◆ 80PIN CONNECTOR
◆ GSM part based on SIM300C
◆ Accuracy Position 10m
◆ Embedded SIM card holder
◆ Processor type ARM7/TDMI
◆ Two serial GPS interfaces
◆ Size: 55±0.15 x 34±0.15 x 2.9±0.3 mm
◆ AT commands via GSM/GPRS serial interface
Theory of operation (GPS PART)
Description

• In the RF section the GPS signal detected by the antenna is amplified, filtered and converted to an intermediate frequency (IF).
• The function of the correlators is to acquire and track the satellite signals.
• Gps core calculates the position, velocity and time.
• The data of the navigation solution are available at the serial RS-232 interface.
circuit diagram showing the connection between the microcontroller and LCD & microcontroller and max232
GSM-GPS Antenna Connector
Interface of Serial port

[Diagram showing the interface of serial port between MODULE (DCE) and CUSTOMER (DTE).]

- Serial port connections:
  - TXD, RXD, RTS, CTS, DTR, DCD, RI

- Debug port connections:
  - DBG_TXD, DBG_RXD

- Serial port connections for CUSTOMER (DTE):
  - TXD, RXD, RTS, CTS, DTR, DCD, RI

- Serial port connections for Debug port:
  - TXD, RXD

Interface of serial port
GPS Part Serial port features of SIM548

- Seven lines on Serial Port Interface
- Contains Data lines TXD and RXD, State lines RTS and CTS, Control lines DTR, DCD and RI;
- Serial Port can be used for CSD FAX, GPRS service and send AT command of controlling module. Serial Port can use multiplexing function;
- Serial Port supports the communication rate as following: 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Default as 115200bps.
SOME APPLICATION AREAS

- Online Fleet Management
- Fuel and Heat Level Monitoring
- Order and Cargo Tracking
- Fleet Performance Analysis
- Security, Road Assistance
- Emergency Help
Reasons of Using GPS Tracking Systems for Insurance Companies

- **Security for theft**

  With variations of vehicle tracking system insurance companies can locate the stolen vehicle and stop its engine. To make this system common Insurance companies offer discount for the insurance of cars. Ex: Genel Sigorta provides 15% discount for the customers who are agree to apply UND vehicle tracking system (UND is a product of UND Teknolojileri, which has a agreement with Genel Sigorta.)
Reasons of Using GPS Tracking Systems for Automotive Producers

- To provide emergency service to customers
  Ex: Porsche offers a GPS tracking system for its customers. With pushing on a single button called S.O.S on the middle console Porsche customer can get road service. (Only in Europe)
- To keep track of the products against auto theft
Some Features of VTS

OPTIONAL FEATURES

What is the temperature of Vehicle
Which driver is driving the vehicle - “RFID based”
What is the fuel level
Which goods are loaded - “Barcode reader”
Locking the Doors
Stop the Engine
In Cabin Camera
In Cabin Microphone Connection
POTENTIAL PROBLEMS OF VTS

- Some Vehicle Firms void warranty when VTS loaded
  - Mercedes and Renault is accepted the warranty after VTS loaded for Reysaş Company

- Interrupting Privacy – Legal Punishment
  - Tracking
  - Listening and Video Recording
THANK YOU