SREE VIDYANIKETHAN
ENGINEERING COLLEGE

TRANSCOMM – *Transform the Community*

Application ID: 5HFR4Z

Region ID: 10

TRANSCOMM

Transform the Community

Team members **E. S. Mukesh Rao** *(raomukesh2000@yahoo.com)*
V. S. R. Prasad Chowdary *(Prasad2011in@Rediffmail.com)*
T. V. R. Aditya Kumar *(Adityaiiii@winning.com)*
B. Sai *(vsrpc@yahoo.com)*

Project Mentor **S. Madhusudan, M. Tech.**

Head of the Department **P. Nageswara Rao, M. Tech.**

1 ABSTRACT

Time is one of the precious things for humans. A lot of time is being wasted waiting for our turn before a traffic signal. Traffic volumes are increasing rapidly especially in urban areas leading to traffic congestion and blockages. Especially in sub-urban areas where the traffic volume is medium sized, time is wasted waiting for a signal while the road with green signal has no body to pass by. The efficiency of conventional Traffic management system is less in sub-urban areas as compared to their use in urban areas. Intelligent Transportation Systems (ITS) play an important role in efficiently managing traffic. However, the problems faced by every traffic management system are as follows:

-Accurate Traffic Volume Detection

-Advanced Safety Warning Systems

-Optimized Traffic Management

-Traveler Information Systems

-Traveler Guidance and Location Based Services

Several Intelligent Transportation subsystems have come into existence that provide solutions to one or few of the problems above said. The proposed system is intended to provide the optimal solutions for all the above said problems. We developed a Real-Time Traffic Management system that is based on wireless communications. With the help of this system, the towns and cities are no longer required to worry about traffic congestion. The drivers can select shortest possible and less traffic-congested path to his destination. In case of any theft of his vehicle, he can track his vehicle from his home. The pollution due to vehicular emission can be reduced. Safety and security of the travelers can be enhanced. Traffic culprits can be easily identified and punished. Location based services can also be provided at low costs. This system also helps in automation of the vehicles. Thus, we can transform the present community into a digital one. Hence, we name it as “TRANSCOMM”.

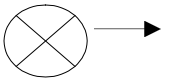
Our Traffic control and management system is similar to a wireless WAN. Every car has its own communication device named Personal Communication Device (PCD). It exchanges information with the stationary devices of our system using wireless technology. The stationary devices are scattered all over the city that provide traffic control and guidance services. In this report, we discuss Traffic management system in many points of view. The most important parts include Personal Communication Device (PCD) and its Hardware and Software configurations, Traffic Volume Detection Algorithms and Vehicle Positioning Algorithms. We discuss other parts about their functionality and how they cooperate with PCD. We also present how pollution control, automation of the vehicles, enhanced safety and security issues can be included into our project.

2 SYSTEM OVERVIEW

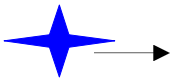
2.1 General Description

The TRANSCOMM system is designed to provide real-time traffic management and location based information services. The primary objective of this system is to enhance safety of travelers and existing traffic control systems capabilities and make location based services affordable and accessible to a common man. The TRANSCOMM consists of five sub-systems:

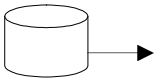
(a) Vehicle detection,
(b) Traffic management center,
(c) Intelligent control center,
(d) Communications and
(e) Information and guidance.



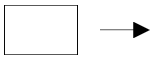
Intelligent Control Center (Junction).



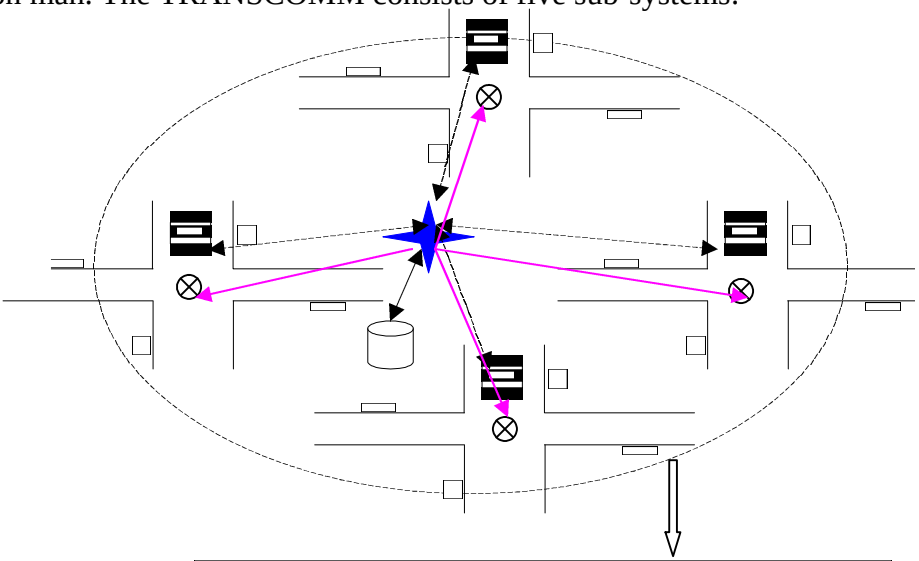
Vehicle Identifying Tower at Management center



Traffic Management Server



Road Identity Transmitter



The figure shows how vehicles with PCDs communicate with Traffic Management Server (TMS) and how TMS sends Traffic signals to ICC.

The traffic data collection is done by the vehicle detection /surveillance subsystem. The Personal Communication Device (PCD) in every vehicle receives the identification of the in which it is from a Road Identity Transmitter (RIT) and it sends it to the Traffic Management center via a RF communication link. This is how traffic volume is detected. The basic equipment used at the traffic Management center to analyze traffic, is a computer. The data aggregated is analyzed, and decisions are made regarding the traffic control and the changes needed to improve traffic flow. The information regarding traffic control is sent to the appropriate intelligent control center at a particular junction, which will actually control the traffic using red and green lights associated with it. The communication subsystem relies on spread spectrum radio, cellular links, and ISDN. Each of these communication devices is used for specific links within the system. The information and guidance subsystem is used to provide location based information services, emergency services and other services that can improve the safety and enhance the traffic workflow.

2.2 Performance Requirements

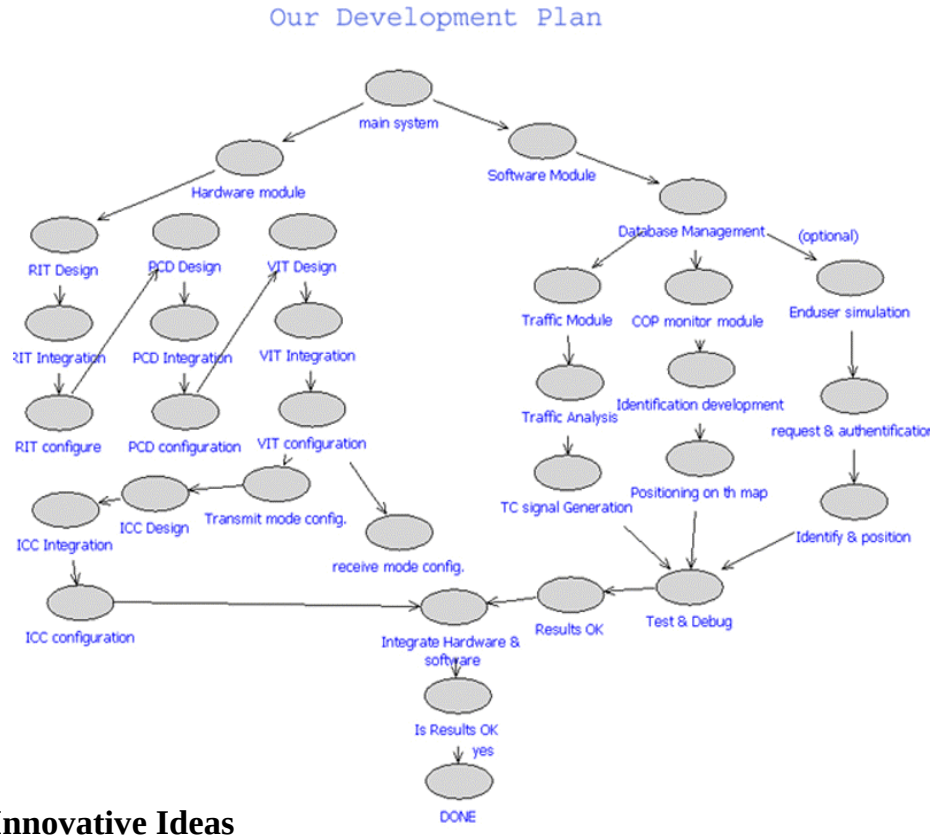
Our system is a complex and a real-time one. Hence, there include many constraints especially in hardware. However, the following are some of the important requirements regarding both hardware and software of our system:

- Real-Time Operation
- Portability
- Credibility
- Ease of Installation

- Adaptability
- Dissemination Tools
- Reliability
- Speed and Security in Communications.
- Open Architecture
- Cost Effectiveness
- All Weather Day/Night Operation

2.3 Design Methodology

We chose module based waterfall method as the design methodology because our system is indeed a very big real-time project. We used to maintain Design Books during the design and development of our project as a way of easy communication. We will have a Brainstorming session almost every day to discuss the problems that arise and solutions for them. We used state diagrams and UML (Rational Rose) flow diagrams that help even our Mentor to understand our design strategy easily. The figure below shows the UML flow diagram of our Development plan:



2.4 Innovative Ideas

There are mainly four innovative ideas involved in our system. They are as follows:

1. The first innovative aspect of our system lies in the fact that our system is capable of accurate traffic volume detection using wireless technology.

2. The second is the elimination of satellites necessity for city based positioning services.

3. Next, there is direct dissemination of information to the end user in our system in all types of environments.

4. The possible extensions of our system include automation of the vehicles and building eco-friendly vehicles, which enhances safety and security.

Above all, our system uses open architecture and flexible because it is compatible with the existing wireless communication system.

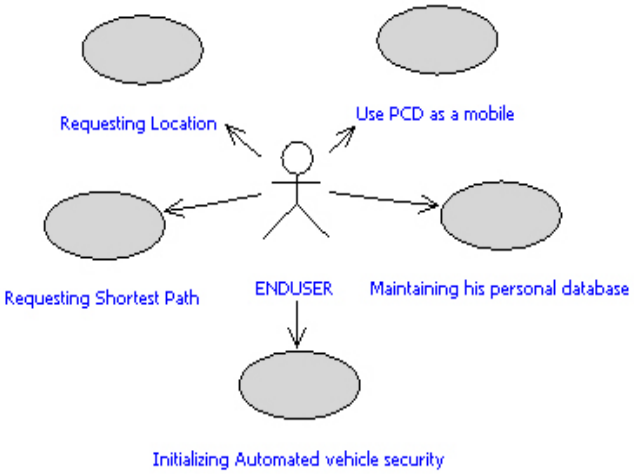
3 Implementation and Engineering Considerations

3.1 User Requirements

The main goal of our system is to provide traffic control using wireless technology. Apart form this; we can make many basic location services and automation of the vehicles affordable to the people. Thus, our system has three types of users. Firstly, Traffic controls Service Provider comprising of administrator, system operators and maintenance people. As the requirements of our system coincides with that of a Cell Phone service provider, interviews with them helped us a lot in recognizing their potential needs. Secondly, Every person with a vehicle is our target. Our system is aimed at providing affordable Location based services to him. The third type of users is an Information and Guidance Service provider. These people provide the location-based services using our system. Holding interviews with the concerned, every one's needs are collected.

3.1.1 End User Requirements

End user is the person who uses Personal Communication Device (designed by us) in his vehicle. End user enjoys many facilities of our system. End user can request his location in the city. End user can also request the shortest and optimized path of travel when he inputs source and destination End user can maintain his personal database and can also use the PCD as a scheduler and also as a mobile phone.

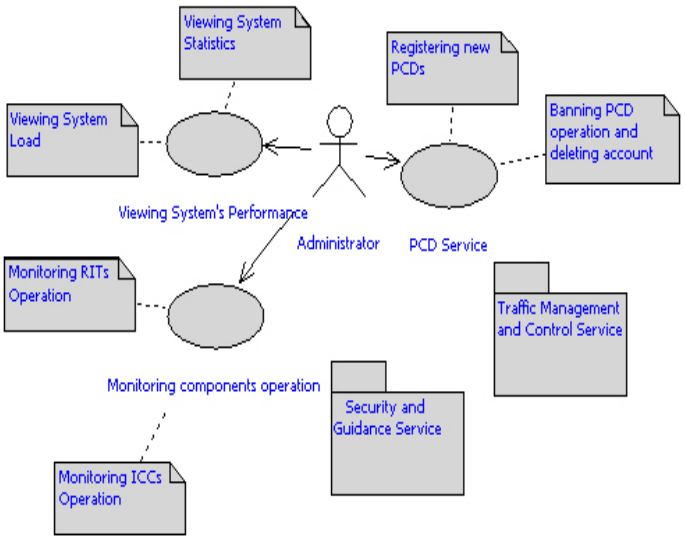


END USER USE CASE DIAGRAM

End user is the one initiate the PCD into SECURE MODE, which guards the vehicle from any type theft.

3.1.2 Administrator Requirements

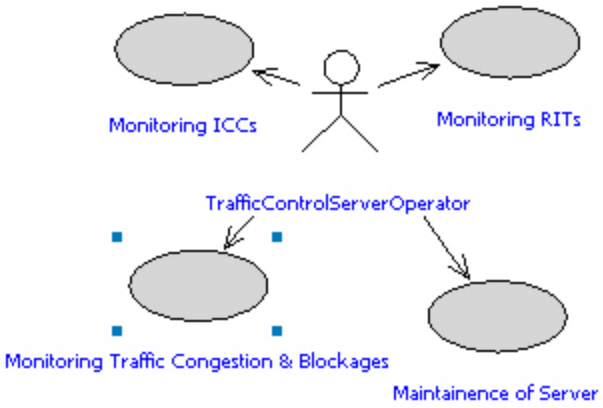
Administrator plays a vital role in installation and maintenance of our system. Administrator is entitled to monitor the overall system performance. Administrator registers new PCD into the network's database. Administrator has the right to abandon or delete the PCD account from the database. Administrator monitors the operation of all the devices (RIT and ICC) working in the network. Administrator supervises operators in traffic management, security and guidance service.



ADMINISTRATOR'S USSE CASE DIAGRAM

3.1.3 Traffic Control Server Operator Requirements

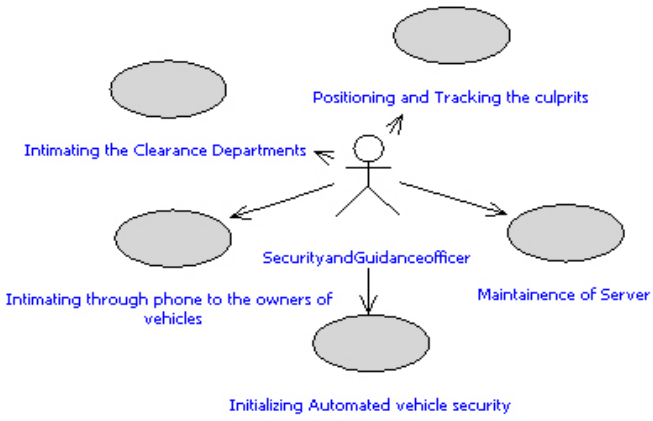
Traffic control server is the important part of our system, which collects and analyzes the data received by the administration center from the PCD. It manipulates the data and produces appropriate traffic ad advisory signals to the ICCs. The operator monitors the RIT and ICC functioning and takes necessary steps to maintain them in working condition. He also monitors any traffic blockages and congestions, which are actually impossible through our system.



TRAFFIC CONTROL SERVER OPERATOR'S USE CASE DIAGRAM

3.1.4 Guidance and Security Officer Requirements

There are security and guidance officers in information, guidance and security service center. He clarifies authorization in case of any malpractice, confirms the theft and intimates to vehicle owners. He also intimates to the vehicle owners at times of emergency and hazardous situations. He maintains the information and guidance server, which is used to service location based requests.

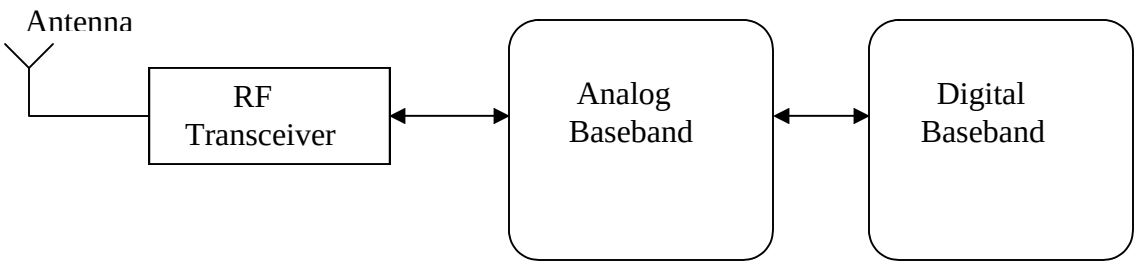


SECURITY and GUIDANCE OFFICER USE CASE DIAGRAM

3.2 Personal Communication Device (PCD)

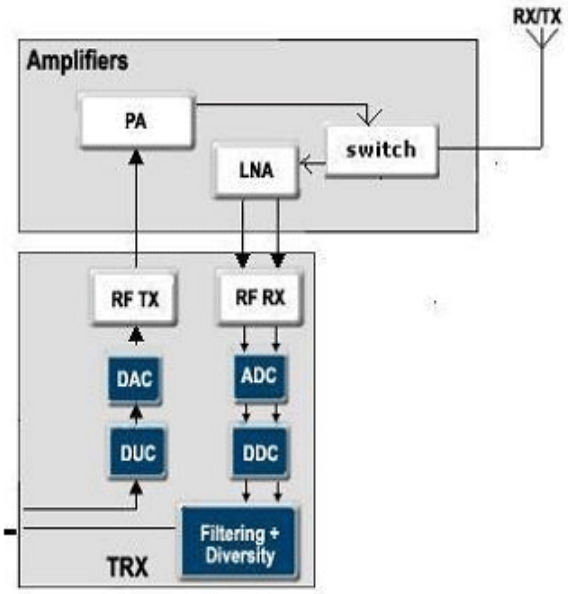
3.2.1 Functional Description

3.2.1.1 Functional Block Diagram



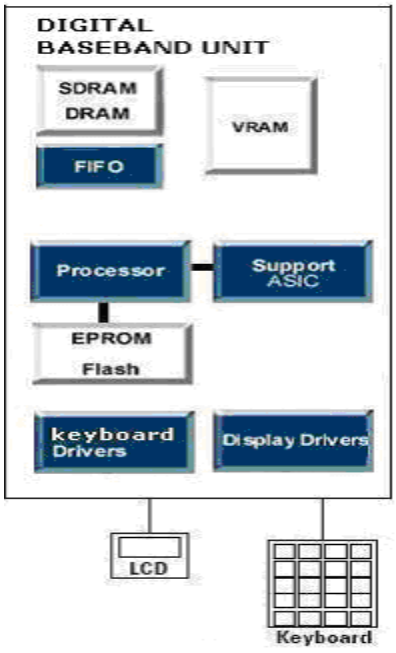
3.2.1.1 RF Transceiver:

The RX/TX antenna receives and transmits the data. The electronic switch is a Switchplexer. The switchplexer selects transmitter section for certain period of time and receiver section for certain period of time. Amplifiers are used to increase power of the signal while transmitting and decrease the noise level while receiving the signal.



Power amplifier (PA) is used to increase the power of the transmitting signal and Low noise amplifier (LNA) is used to decrease the noise in the received signal and then amplify the signal for further processing. Digital to analog converter (DAC) is used to convert the digital transmission signal into analog transmission signal. Digital up converter (DUC) is used to shift the frequency of the transmitting signal suppose if the signal frequency is 'f' Hz to a new frequency 'f + fo' Hz. Here the operating frequencies are in the order of MHz.

Digital down converter (DDC) is used to shift the frequency of the transmitting signal suppose if the signal frequency is 'f' Hz to a new frequency 'f-fo' Hz. Here the operating frequencies are in the order of Mega Hz. Analog to digital converter (ADC) is used to convert the received analog signal into digital signal. Filtering of the received signal is done and we use automatic frequency control and automatic gain control to maintain constant amplitude level. In our system, the receiver will be receiving road ID (RID) + time + Latitude + Longitude while receiving from Road Identity Tower (RIT) and position in the map while receiving from Vehicle Identity Tower (VIT). In our system, the transmitter will be transmitting Road ID (RID) + time + Latitude + Longitude + Vehicle ID (VID).



3.2.1.2 Digital Baseband:

The main function of the digital baseband unit is to provide device drivers for other devices such as LCD and Keyboard. The digital baseband unit consists of all the processors and memory, both RAM and ROM. The one actually manipulates the digital data fed into the device.

In our system, our main aim is to concatenate received data and Vehicle ID (VID). This can be achieved by writing a string concatenation program in the EPROM and when ever we receive the desired bit format we can run this program on the processor, concatenate with the predefined Vehicle ID (VID),

and then send this to the analog baseband unit for further processing. We also have display and keyboard drivers for displaying and keyboard input. It is also used to process the End User position request and maintain his database.

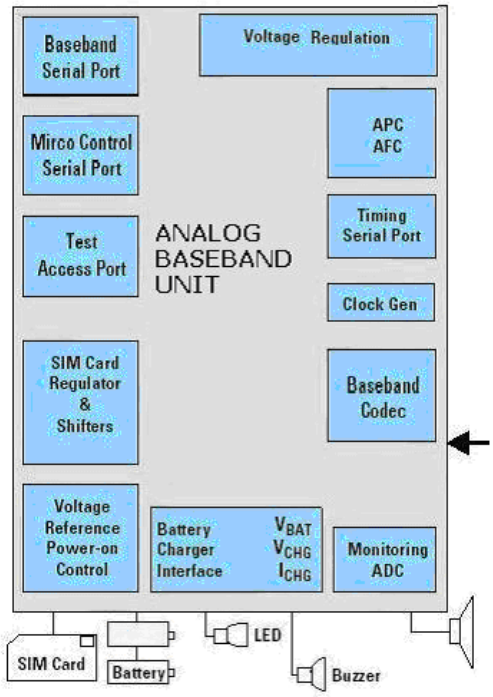
3.2.1.3 Analog Baseband:

The main purpose of this analog baseband unit is to interface with power control, SIM card, and encode and decode the transmitting and receiving signals form the GSM transceiver section.

In our system, the received signal will be decoded into its original bit format. Prior to decoding, data correction will be done. While we are transmitting the data will be encoded into a desired format. In our system, we utilized NRZ coding technique.

In our system, the purpose of SIM card is to retain a MAP of a city. Even we can download the map into the PCD instead of SIM module at every instant.

We will have a speaker to communicate from the administration center.



3.2.2 Software Simulation of PCD

As it is clear from the above functional description, the development of PCD is complex and time consuming. The PCD is currently being developed. However, we have used Emulators of already existing devices with all the above features to show how our PCD will work in its post development stage. We used Ericsson's R380s Emulator kit available in the website of Ericsson for simulation of different modes of operation of PCD.

PCD operates in two modes for traffic control. Firstly, in RECEIVE mode, PCD receives information from RIT that includes road identification, its position coordinates and time of transmission.

Simulated PCD in Receive Mode

In TRANSMIT mode, the PCD couples the vehicle identification with information received from RIT and transmits the same to Administration center by establishing an RF communication between them.

Simulated PCD in Transmit Mode

Communication protocols are being developed using xml in HTTP environment. Below is an example of data format transmitted by RIT:

```
POST /newRequest HTTP/1.0
Content-Type: text/xml
Content-Length: 145
<?xml version='1.0'?>
<!DOCTYPE DFMT SYSTEM "file://RIT2PCD.dtd">
<DFMT_RIT>
  <LOCATIONINFORMATION>
        <ROADID>rid</ROADID>
        <TIMEOFTRANSMISSION>time</ TIMEOFTRANSMISSION>
  </LOCATIONINFORMATION>
</DFMT_RIT>
```

The code given below is the data format sent by the PCD to Traffic Control Server:

```
POST /newRequest HTTP/1.0
Content-Type: text/xml
Content-Length: 175
<?xml version='1.0'?>
<!DOCTYPE DFMT SYSTEM "file://PCD2TCS.dtd">
<DFMT_PCD>
  <VEHICLE INFORMATION>
        <VEHICLEID>vid</VEHICLEID>
  </ VEHICLE INFORMATION>
  <LOCATION INFORMATION>
        <ROADID>rid</ROADID>
        <TIMEOFTRANSMISSION>time</ TIMEOFTRANSMISSION>
  </LOCATIONINFORMATION>
</DFMT_PCD>
```

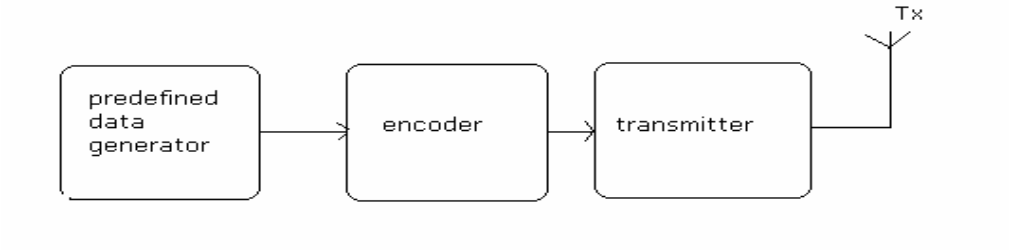
3.2.3 Theft Detection and Intimation Algorithm

When the user wants to park the vehicle in his shack and likes to go to bed at night, he would like to ensure the safety of his vehicle. The PCD can enhance the security of his vehicle when it is placed in SECURE mode. In secure mode, the PCD keep monitoring the receiving RIT information. If there is a change in it, it is clear that the vehicle has been on the move. If any one tries to move the vehicle without resetting PCD to NORMAL mode, PCD sends vehicle theft intimation to Traffic Security officer and who intimates the message and the vehicle location to the concerned owner by other means. The PCD owner only can make the PCD to enter into SECURE mode and reset back to NORMAL mode. This is accomplished by a password protection system. This system also informs the owner of its location when it is subjected to theft. The theft detection and intimation algorithm is as follows:

1. Select “Enter SECURE MODE” from the menu list.
2. Enter Authorization Password.
3. Now the vehicle has entered ‘SECURE’ mode.
4. If there is change in information received from RIT or if the PCD is dismantled from the vehicle, intimate the ‘vehicle theft message’ to Traffic Security officer.
5. Raise the vehicle theft Alarm.
6. Meanwhile security officer would clarify the authorization of the person handling the vehicle and sends the PCD if required to stop the Alarm.
7. If the person handling the vehicle is found to be unauthorized, security officer conveys the theft message to Cops and the authorized persons of the vehicle about the present location of the vehicle.

3.3 Road Identity Transmitter (RIT)

The main purpose of this RIT is that it will be transmitting continuously a unique predefined Road Identification (RID) and time of transmission. In our system, we generate the Road Identification by using data generator or an EPROM. In the encoder section, we modulate the signal by using QPSK digital Carrier modulation. In the transmitter section, we have a Power amplifier to increase the strength of the signal. To transmit both time of transmission and Position data along with RID, we can use a simple micro –controller system with a memory.



Basic Architecture of Road Identity Transmitter

There are devices in the market that serves our function. For example, when we want to send only Rid, we can use Texas Instruments Keyring Tag RI-TRP-WFOB-01 that can be the most economical one for simple traffic control.

3.4 Intelligent Control Center (ICC)

3.4.1 Traffic Signal Receiver

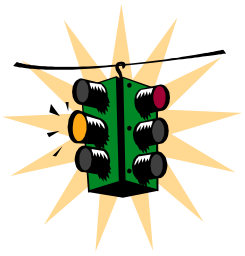
The receiver part of the Intelligent Control Center (ICC) located at the junction actually functions both as receiver and as transmitter. However, for most of the time, ICC antenna acts as the receiver. The information regarding traffic control transmitted from Administration center is received and is stored in the memory.

3.4.2 Intelligent Processing Unit

The information received from Administration center is relayed to the concerned by the processor through properly wired communication channels. The processor is called Intelligent because in case it does not receive information or there is a considerable delay in receiving information then it would take the decisions of its own especially follows the same previous order.

3.4.3 Signal Dissemination device

The signal dissemination devices are those that convey the message to the users in readable and understandable form. The basic dissemination device used for showing the traffic signals around a junction is traffic lights. Various other devices are used based upon its location and environment there. For example, near speed breakers, work zones and alternate path intimation, we use Visual Message Sign Boards as shown in figures



3.5 Administration Center

3.5.1 Functional Requirements

3.5.1.1 Traffic Control Center

The Traffic control center, if included as part of the loop, will house a computer and several viewing monitors. The information relayed by the personal communication device (PCD) will be evaluated and analyzed by Traffic control server. The final decision on the status of traffic and the nature of the information to be disseminated thus made by a machine rather than automatically by a human. The computer may be either WINDOWS, DOS, or UNIX-based, and should be connected to the data collection devices, Intelligent control center, and information dissemination devices via suitable communication links. Finally, the Traffic control computer may be automatic or can be monitored by trained traffic personnel. The data is received from PCD via a tower called Vehicle Identifying Tower (VIT).

3.5.1.2 Information, Guidance and Security Center

The Information, Guidance and Security center provides the services to the End Users, Government Traffic Management, Surveillance and Security departments. The services provided by this center fall within three categories:

- ***Surveillance***

  Surveillance can be defined as monitoring the area under consideration to obtain the status of traffic and detecting any abnormal traffic flow conditions. The system should be capable of performing traffic surveillance and obtaining updates on the status of traffic within and around the area. This important function helps in maintenance of traffic flow. In the event of an incident/accident or congestion, quick detection via surveillance can help prevent the build-up of long queues and dissipate traffic congestion quickly. The various functions included are Incident Detection, Queue Detection and Congestion Monitoring. Location Based information and guidance services also come under this category.

- ***Advisory***

  Advisory functions are functions that provide advisory information regarding traffic conditions and means of reducing congestion, delays and accidents. There is a very fine line distinguishing advisory functions from advanced warning functions. Advisory functions primarily provide the motorist with traffic information to prevent the occurrence of a hazardous situation, whereas advanced warning functions provide motorists with warning messages regarding prevalent hazardous situations. The Various functions included are Delay Advisory, Speed Advisory and Alternate Route Advisory.

- ***Control***

  Control functions impose restrictions on motorists in terms of speed and movement. Most departments of transportation are wary of using control signs because they involve several liability issues. Nevertheless, if necessary or in the event of a lane closure or incident within the work zone, the system should be capable of providing some control functions to manage the traffic. These include Change lanes and Speed limit functions. In the event of a lane closure and change in roadway geometrics within a work zone, requiring motorists to change lanes, the system should be able to provide control signs, which tell the motorists that they must change lanes.

3.5.2 Traffic Analysis Algorithm

The system to be developed is to provide real time traffic control that provides intelligent traffic control based on the ‘ *density of traffic on each road*.’ The system gives importance to the most congested road. To avoid the possibility of giving the opportunity to only one side every time and thus blocking the all other sides, we had selected the other parameter ‘ *Time of a particular side being without signal* ’. After thoroughly analyzing the merits and demerits of all the existing sensors like IR sensors, Video Cameras, Pressure based Sensors etc to know the density of traffic on each road, we conclude that even the natural climatic changes have a great effect on their performance. Therefore, we introduced a new sensor that is based on wireless technology and has the ability to give accurate measurement of traffic density on a road.

The traffic Analysis Algorithm is as follows:

1. Start NEW cycle
2. Consider the lanes related to a particular ICC junction and retrieve traffic volume data from the database.
3. Analyze their traffic based on traffic density and time of waiting.
4. Generate and transmit the appropriate traffic control and advisory signals to the concerned ICC.
5. Are there any ICC junctions waiting to be served for this particular cycle. If yes, go to STEP 2.
6. If NO, go to STEP 1.

3.5.3 Vehicle Positioning Algorithm

This system exploits the efficiency of the GSM technology. By using this system, we can eliminate the need for satellites for positioning. This system mainly utilizes the predefined RID along with Latitude and Longitude of that area. We are increasing the accuracy of the system by using Latitude and Longitude and making mapping easier. The other advantage is that PCD itself can identify where it is instead of requesting administration center for its position. However, in our system we used administration center for identifying the vehicle.
The vehicle-positioning algorithm as follows:

1. Start
2. Check for authentication
3. If TRUE goes to step 3 otherwise go to step 9.
4. Retrieve from the database RID, VID, Latitude, and Longitude.
5. Load the city map.
6. Map the retrieved data form the database on to the map.
7. Map RID on to the map.
8. Map the Latitude and Longitude.
9. Locate the vehicle on the city map.
10. Repeat step 2.
11. End.

Suppose the vehicle is requested for tracking for any security concerns, the vehicle tracking is done as follows:

1. Start
2. Enter the vehicle number to be tracked.
3. From now onwards while the traffic control server is updating, we keep a record of the previously traversed Road Identifications.
4. Search the tracking file database for the vehicle number
5. If mapping is found, display the traversed path.
6. End.

3.6 Communication Protocols:

3.6.1 Between RIT and PCD:

The PCD is to receive the Road ID from RIT. The PCD and RIT communication is just like that a cell-phone receiving signal from tower. We should take care that signals from other RITs should not interfere when it is in a particular road. It is taken care while placing RITs in the Roads. Here the RIT has only Transmitting section. The DTD file shown first in page 9 gives a clear idea about the format of data transfer between RIT and PCD.

3.6.2 Between PCD and VIT:

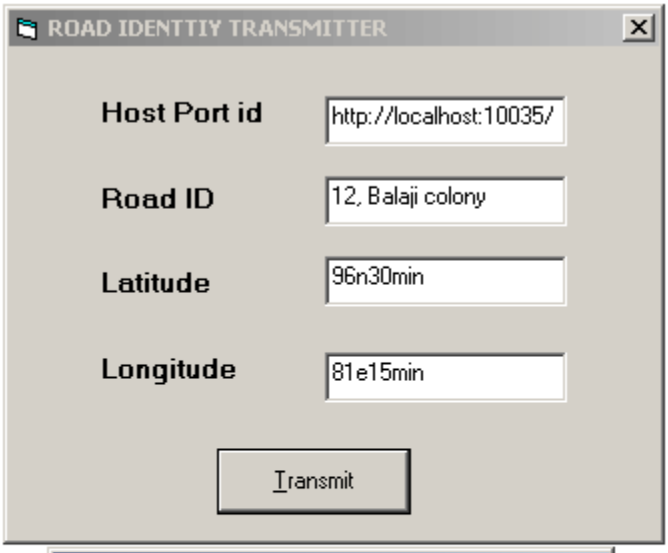
Even this communication link is same as the above but the PCD and VIT has both the transmitting and receiving section. This PCD operation is like a cell-phone sending voice message and receiving voice message signal from the other. The VIT is to provide the received signal (RID + VID) to the servers and to transmit the TC signals to ICC. The DTD file shown second in page 9 gives a clear idea about the data transfer format between PCD and VIT.

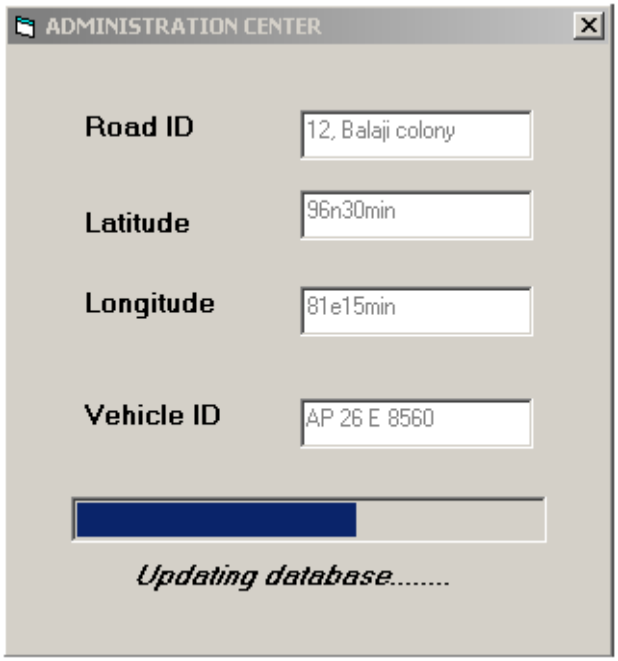
3.7 Communication Links:

Arguably, the most important feature of the system is the communication links between the various components. The communication links make it possible to integrate several technologies and systems together to form the real-time traffic control and vehicle locating system. There are several communication links that may be adopted for the real-time traffic systems, including radio communication links (Ultra High Frequency, Spread Spectrum, microwave, etc.), cellular links, ISDN links, wireless links, and several others. Appropriate communication links may be chosen for the system depending on the constraints and suitability for each type of link. The key factor to be considered when choosing the communication link is that the chosen link should work reliably at all times. Cost considerations may also affect the decision for a particular communication link.

3.8 Tools Developed

During the process of design and development of our system, we have developed tools for the administration center. We have implemented traffic volume detection using XML and HTTP (Hyper Text Transfer Protocol). We maintain the database of the received data by using R-DBMS oracle 8i running in the backend and Visual Basic 6.0 in the front end. Visual Basic 6.0 is used to provide GUI for the administrator and visualize the collected data to the administrator.





The Data (Road Identification (RID) + Location Information [LATITUDE & LONGITUDE]) transmitted by RIT is received by the PCD in one frequency range. The PCD couples the same with the Vehicle Identification (VID). As we already said, except PCD all other devices are simulated using computers. We show you in the figures the interfaces used to simulate Road Identity Transmitters and Traffic Database collection Server at Administration center. The communication between Administration center and Intelligent Control Center is simulated in the same way, utilizing HTTP wired network. We are currently in the stage of simulating the vehicle tracking.

3.9 Trade-offs

In our system, we target every one with a motor vehicle in a city/ town to use our Personal Communication Device (PCD). Hence, the number of potential users to be served and the amount of database to be maintained is obviously as large as that of a cellular service provider and in many cases it is even more. However, the requirements of super computer can be avoided by localizing the maintaining the database management. This is similar to setting up

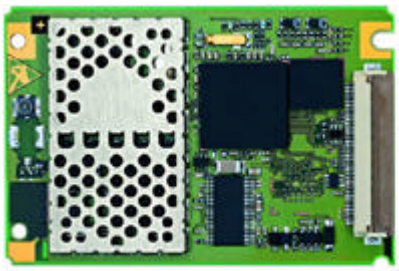
telephone exchanges in each city rather than one for all cities. The installation and maintenance charges of our system are large. However, the existing infrastructure of cellular service providers can be reconfigured to support our technology. In the past, even the cellular technology is criticized as impossible to implement. Now a day it is the driving technology for the entire world. We expect one day when our technology become assimilated like that of cellular technology.

3.10 Testing Summary

Testing of our devices was pretty easier because we used standard hardware circuits. We used black-box technique to test the functionality of our system. Developed parts were tested in different conditions subjecting to all types of environments. The use of integrated circuits reduced the risk of testing the compatibility with other system modules. Testing the algorithms were pretty easy because we have got standard inputs and we also tested the algorithms by imaging the worst situations and we were successful in getting through that test as well.

Due to lack of financial and technical resources, our development was hindered at some stages but we kept our maximum effort to complete the project with in stipulated time.

3.11 Marketing Outline



The marketability of our system is high because there is not much new infrastructure required. This system can be implemented easily in real time because it utilizes wireless technology, which is widespread all around the world. Our system starts first by reconfiguring the mobile stations and integrating them into one. Now we install RITs all over the city. It makes our system consummate.

Name of the component	Cost in U.S. DOLLARS
1. PCD	
1.1 GSM module	**$50**
1.2 LCD	**$10.79**
1.3 Keyboard	**$2.5**
1.4 Dipole Antenna	**$2**
2. RIT	
2.1 Data generator	**$2**
2.2 Encoder	**$10**
2.3 Dipole Antenna	**$5**
3. Administration center	
3.1 Single - point access	**$160**

TOTAL	**$ 242.29**

4 SUMMARY

Our system is intended to provide real time traffic control that provides intelligent traffic control based on the '*density of traffic on each road*.' The system gives importance to the most congested road. To avoid the possibility of giving the opportunity to only one side every time and thus blocking the all other sides, we had selected the other parameter '*Time of a particular side being without signal '*. There are many proposals around the world to use GPS for the purpose of traffic control and location based services. However, wireless technology is simple and robust in installation and maintenance than satellite technology. Hence, we opted for wireless technology. For this purpose, we have developed PCD, RIT and administration center. We have exploited the existing wireless networks, which can assimilate this system with little infrastructure in addition. Our system utilizes open wireless communication architecture, which is widely accepted throughout the world due to its flexibility and interoperability.

The basic question that arises for every end user and the provider of this technology is "*just for the sake of traffic control purpose, is it necessary to deploy such a huge amount of hardware and computers?***"** Then we started working on other possible applications of this technology. As far as our study is concerned, it has wide range of applications. The major application is provision of ***Geo-location Services*** that are often anticipated services by end users especially by people owning four wheelers. The major advantage of this facility is that we can eliminate the necessity of the satellite for positioning service. So this is purely based on landline wireless technology, many countries that have no expertise in space communications can assimilate this technology.

The other major extensions include:

- Improving the safety & security
  Safety & security can be improved by installing alert systems at speed breakers and through PCD-PCD communications.
- Automation of the vehicles
  Since PCD is nothing but a small computer with wireless technology enabled in the vehicle, we can use its computing power in the automation of vehicle.

Thus, this project aims at wireless digitization of the entire world, transforms the present community and brings more uses of computer to the society. This system necessitates the use of computers in every city and "*Adds Value to the Computer*". Our project turns a computer into a real-time traffic control system and location-based services provider with the use of simpler and affordable wireless technology justifying this year's theme of the competition "***ADDED-VALUE: TURNING COMPUTER INTO A SYSTEM***".

5 REFERENCES

5.1 Literature References

- Blonk, J.C., and Giezen, J. (1994), "Development of a General European Road Data Information Exchange Network: An Architectural Development Approach," Proceedings of the First World Congress on Applications of Transport Telematics and Intelligent Vehicle Highway Systems, Volume 1, Paris, France.
- "*Distributed Systems*" - George Coulouris, Jean Dollimore, Tim Kindberg.
- "*An introduction to database systems*" – C. J. Date
- "*Computer Networks, 3rd edition*" - Andrew S. Tanenbaum.
- "*Distributed Systems: Principles and Paradigms*" – Maarten Van Steen, Andrew S.Tanenbaum.
- "*Principles of computer hardware, second edition*", - Alan Clements.
- "*Communication systems* ", -Simon haykein

5.2 Internet References

- **www.ericsson.co.in\mobilityworld\mppSDK5.0**
- **www.ti.com**
- **www.msdn.microsoft.com**
- **www.ieee.org**
- **www.3g.com**

5.3 Search sites

- **www.google.com**
- **www.ieee.org**
- **www.excite.com**