

ILLINOIS INSTITUTE  
OF TECHNOLOGY



**cta**

**IPRO 311**

**CTA Wireless Information Network**

**Instructor: Prof. Thomas Wong**


[www.iit.edu/~ipro-commnet](http://www.iit.edu/~ipro-commnet)

# Overview

- Description
- Goals
- Achievements
- Difficulties
- Conclusion



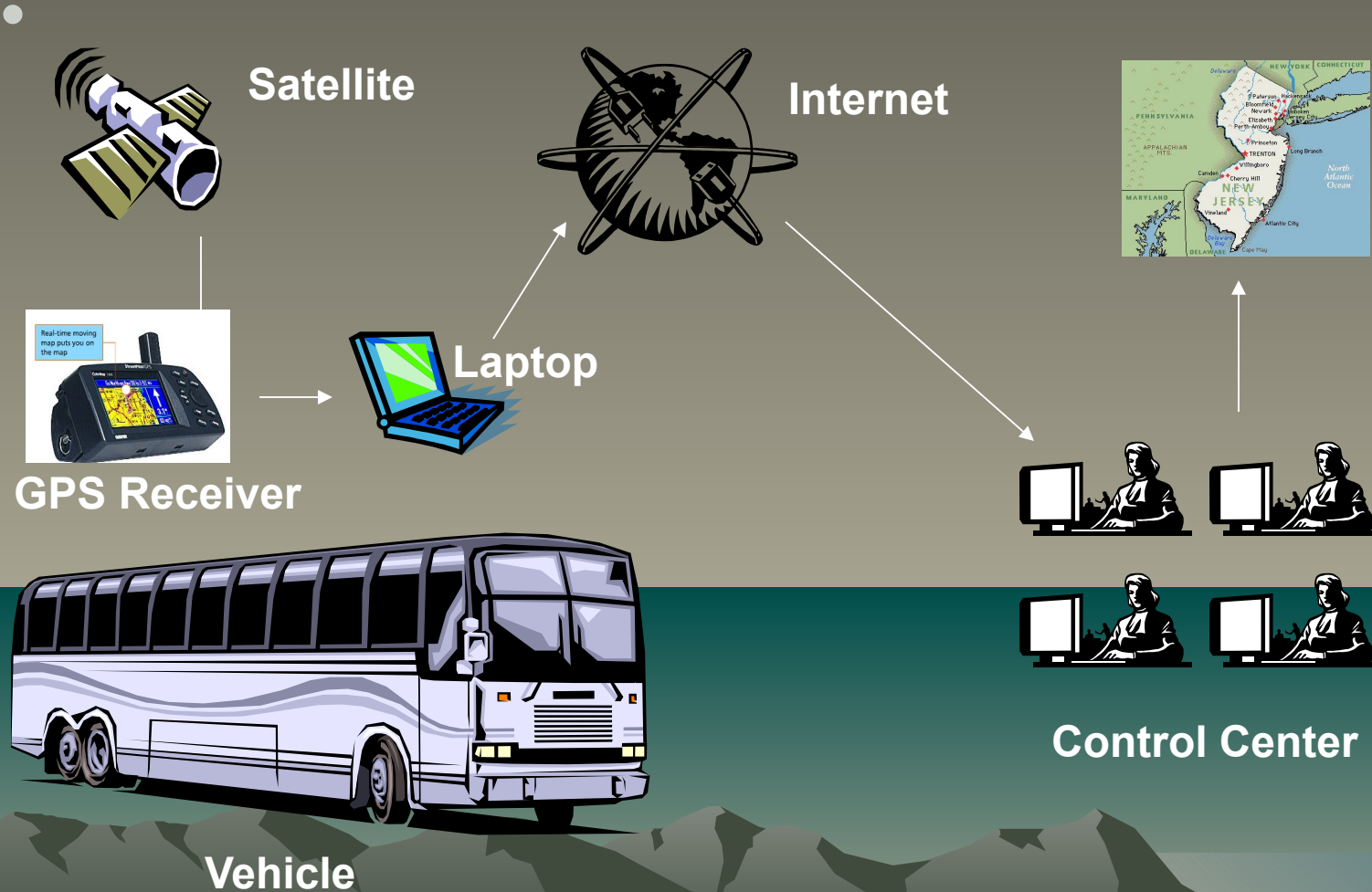
# Description

- Track vehicles real-time
  - Implemented using GPS technology
  - GPS data is transmitted using wireless technology to the internet
  - Data is picked up by client applications
  - Analyze data using Traffic Model
- 

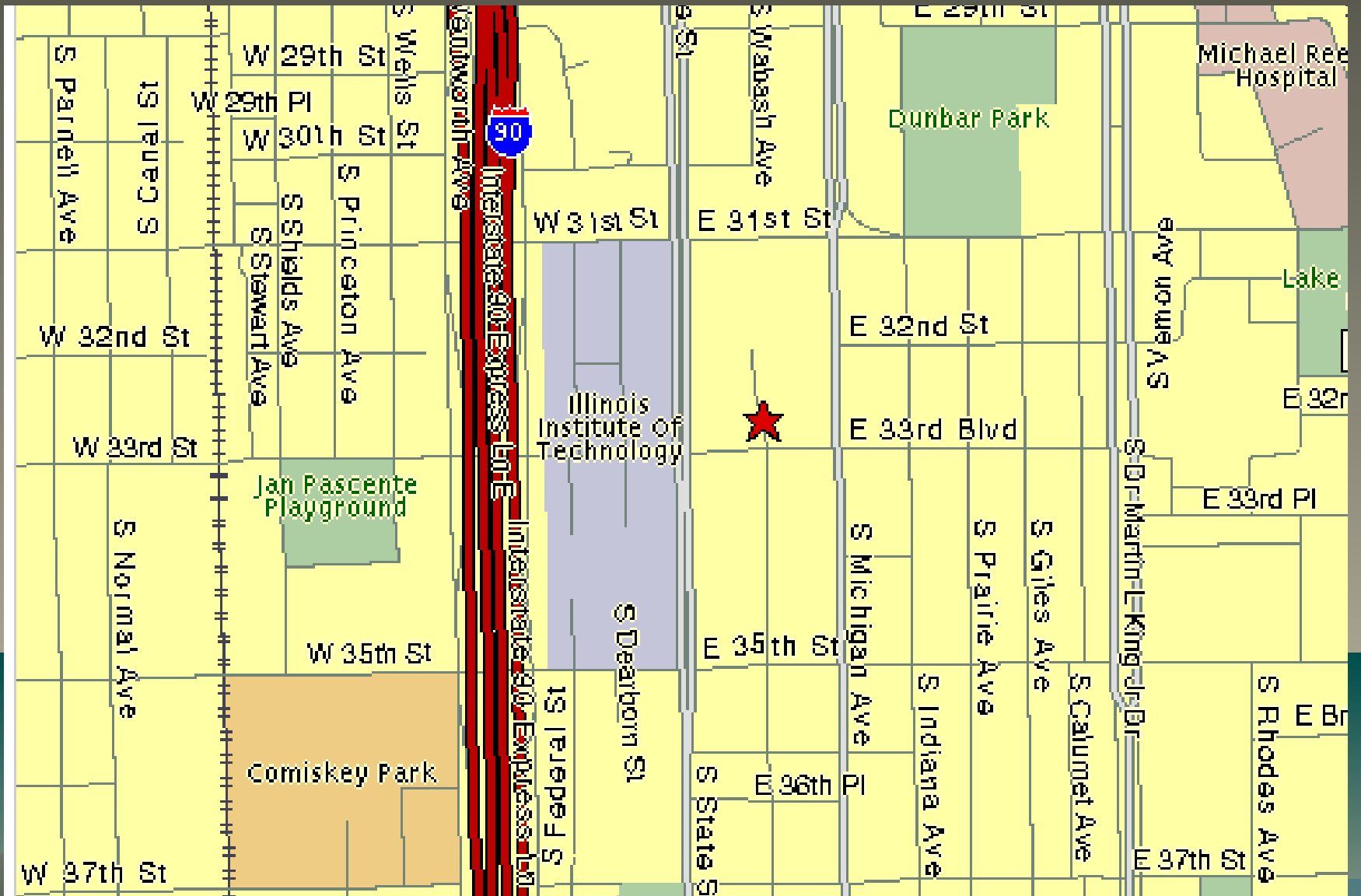
# Essential Components

- Hardware
- Garmin GPS Device
- Laptop Computer
- Wireless LAN Cards, HUB and Antenna
  
- Software
- GPS Reader Software
- GPS Thing – to map GPS information

# System Architecture



# Illustration



# Goals

- Upgrade GPS Software Interface
- Enable text messaging between vehicle and control center
- Troubleshoot Signal Shutdown Problem
- Rework output from traffic model



# GPS Reader software

- Reads information from GPS device
- Creates server to transmit GPS data on the internet
- Multithreaded C-Windows programming using TCP/IP protocol

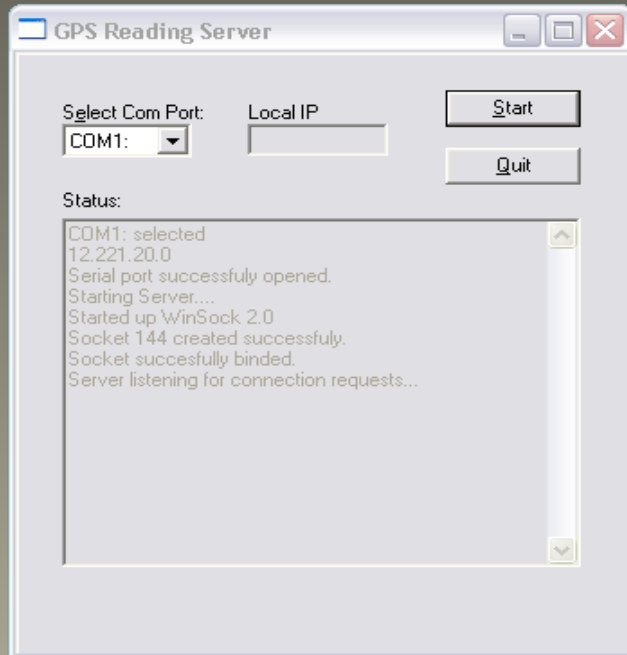




# GPS Reader

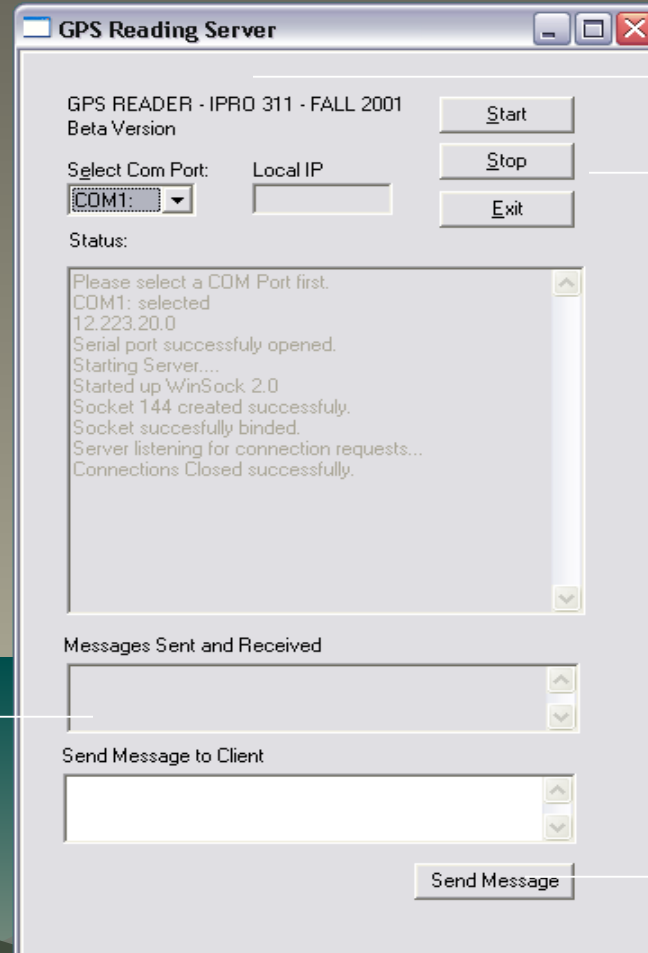
## REDESIGNED

### OLD APPLICATION



Send Message  
Box

### REDESIGNED



Added Text

To Stop GPS  
Connection

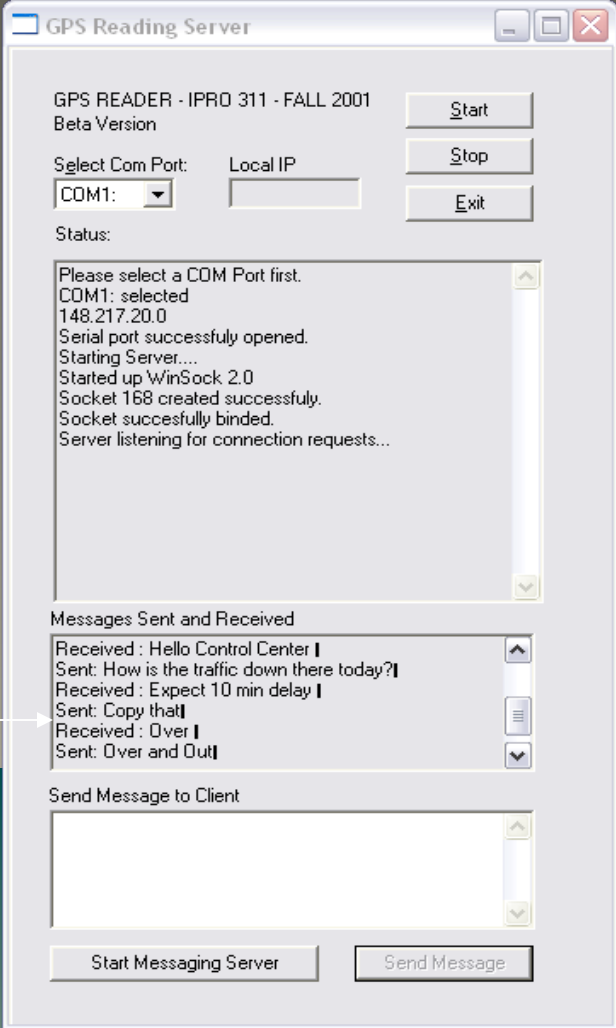
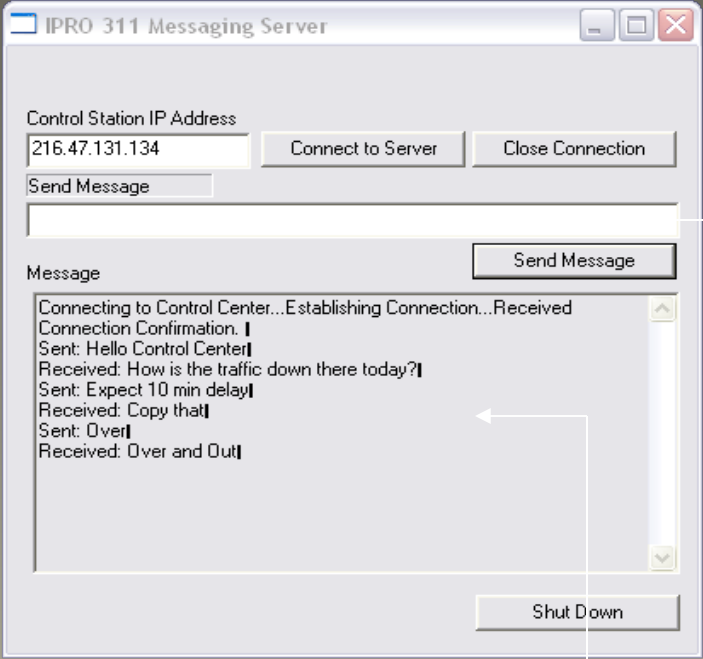
Messages  
Sent / Recv

# New Text Messaging Application

- Designed new messaging application using multi threaded C-Windows programming
- Synchronous Socket programming via TCP/IP protocol
- Text Communication between Control Center and Vehicle

# GPS Server - Vehicle

## Messaging Application



Vehicle IP Address

# What is a Traffic Model ?

- **INPUT**
  - NUMBER OF CARS
  - LENGTH OF ROUTE (METER'S)
  - TIME (SECONDS)
- **COMPUTES**
  - AVERAGE VELOCITY
  - TRAFFIC DENSITY
  - TRAFFIC FLOW
- **OUTPUT**
  - PRODUCES AN HTML FILE WITH RESULTS
  - OUTPUT TABLE FOR DESIRED STREET

# FORMULAS USED

- Average velocity is computed using Length of the route and Time using the formula

$$\text{Average velocity} = \text{Length} / \text{Time}$$

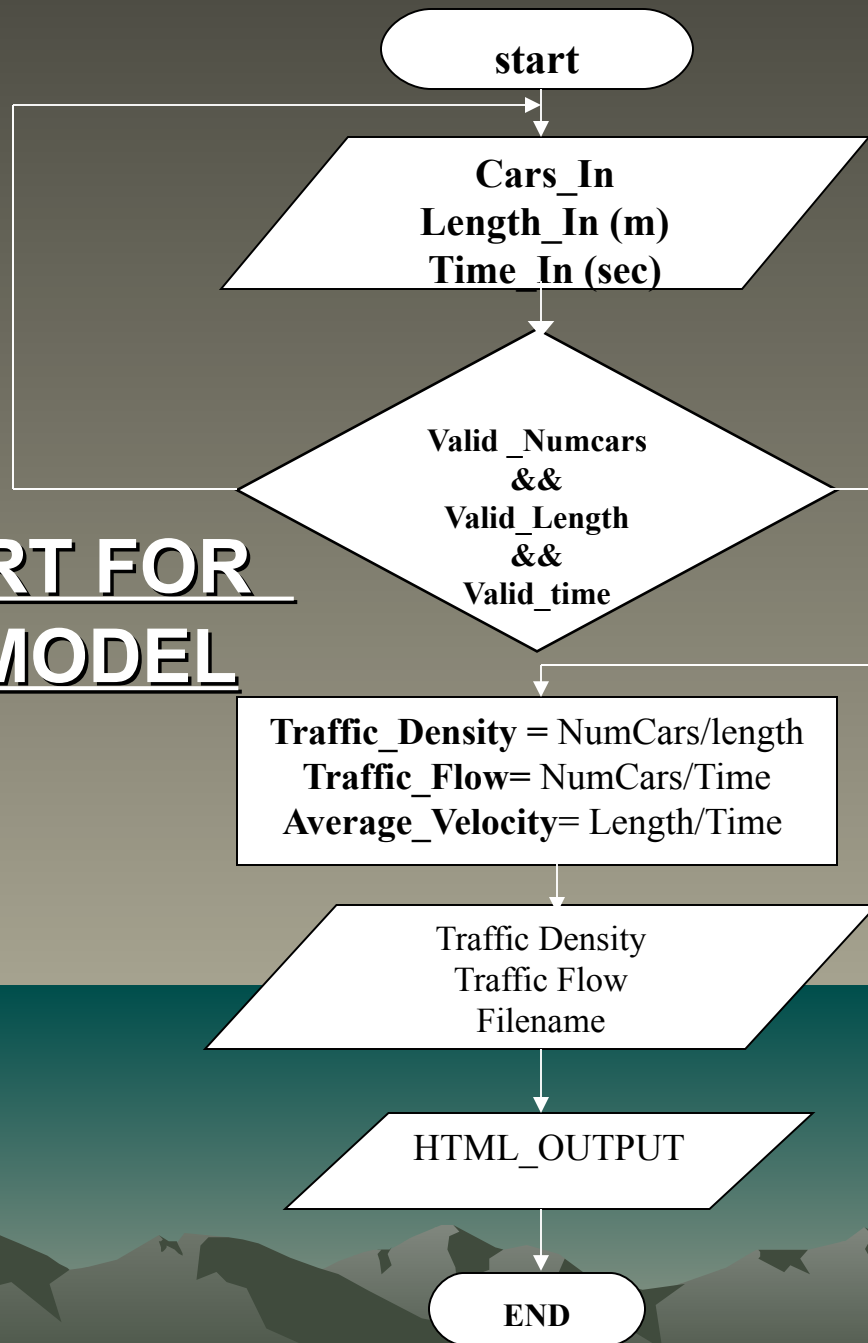
- Traffic density is computed using Number of cars and Length of the route using the formula

$$\text{Traffic Density} = \text{Number of cars} / \text{Length}$$

- Traffic Flow is computed using Number of cars and Time using the formula

$$\text{Traffic Flow} = \text{Number of cars} / \text{Time}$$

# FLOWCHART FOR TRAFFIC MODEL



# OUTPUT TABLE

T(sec)	N(cars)	L(m)	V(m/sec)	TF(cars/sec)	TD(cars/m)
100	10	1	10	0.1	0.01
T(sec)	N(cars)	L(Km)	V(Km/h)	TF(cars/sec)	TD(cars/Km)
100	10	0.625	36	0.1	10
T(sec)	N(cars)	L(Miles)	V(Miles/h)	TF(cars/sec)	TD(cars/Miles)
100	10	1000	57.6	0.1	16

# Poster

- Gathering Data
- Select Materials
- Outline / Layout
- Deadline







# Ingredients for Success

- Team Contribution
- Time Management/Organization
- Weekly Team/Group meetings
- Commitment
- Hard Work
- Enthusiasm

# IPRO Experience

- Develop Organization and Responsibility
- Define Goals
- Team Environment
- Leadership
- Out of class experience



# Accomplishments

- GPS Reader redesigned
- New Text Messaging Application developed
- More precise inputs to Traffic Model
- Enhanced Output



# Challenges

- Co-ordinate group meetings
- Evenly distribute work load
- Meeting Deadlines
- Signal loss - GPS device
- Real time input – Traffic Model



# Recommendations

- Implement Asynchronous messaging
- Troubleshoot Signal loss problem
- Track more than one vehicle
- Implement traffic model to analyze real time data
- Three junior/senior level CS/CIS/CPE programmers

# IPRO 311 Team

