Traffic Light Detector Transport Application for Intelligent Transport System

Student: Fucheng Zheng - Bachelor of Engineering (Honours) in Electrical and Electronic Engineering
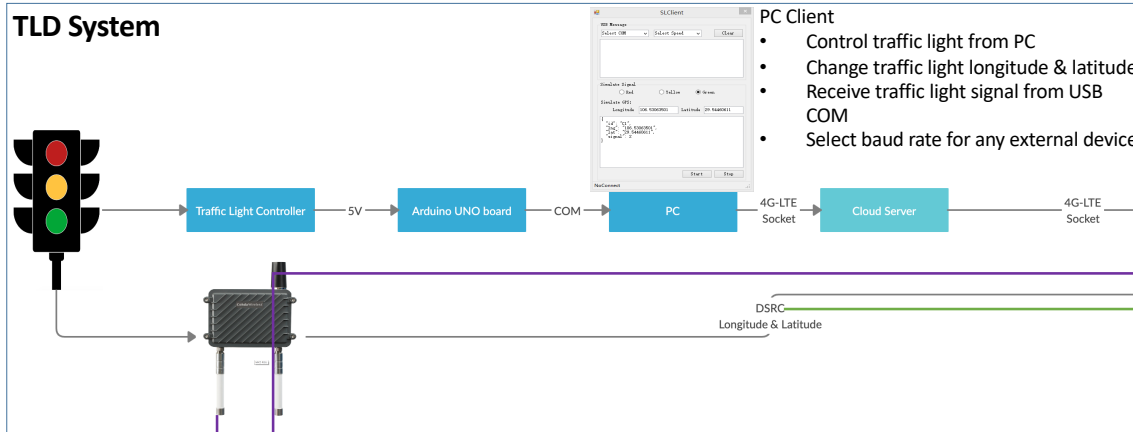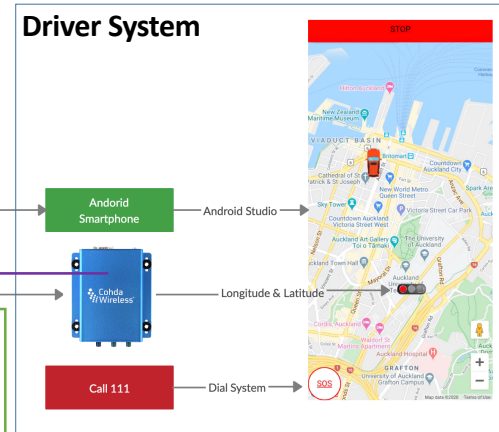Supervisor: Prof. Peter Chong

Objective: This project is to develop an application that can interact with the DSRC technology in ITS. All drivers within the DSRC broadcast range will be sent to the driver's phone application and display traffic lights to provide additional information (Red, yellow and green) and geographic location.

TLD System

PC Client
- Control traffic light from PC
- Change traffic light longitude & latitude
- Receive traffic light signal from USB COM
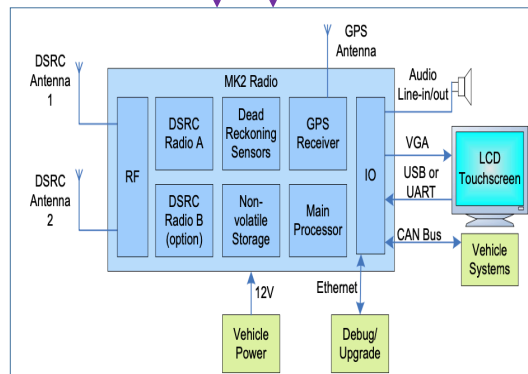- Select baud rate for any external device

Driver System

An android connected traffic light application, which bases on V2X communication. This application shows
- How far between the car and the traffic light.
- How many seconds are left in the green light.
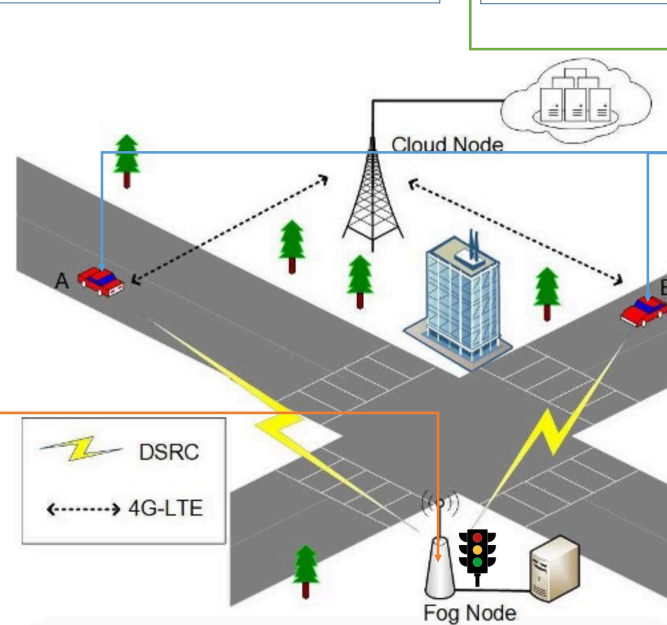- Do the driver have enough time to pass when he sees the yellow light.

BSM-Shell is an application shell that transmits and receives Basic Safety Messages and provides a shell for writing applications. It is an example application that demonstrates the MK5 OBU & RSU API usage for V2x applications:
- J2735 message encoding/decoding
- P1609.3 WME configuration
- P1609.3 WSMP packet transfer
- P1609.4 MLME configuration (ECDA queue parameters)
- GPS interfacing
- CAN interfacing
- VIC interfacing (12V inputs)
- UDP logging

Functionality
1. Sends a BSM every 50ms
2. Logs the sent BSM (XML) to a log file and/or UDP
3. J2735 decodes all received BSMs
4. Logs the decoded BSM (XML) to a log file and/or UDP

```
<BasicSafetyMessage>
  <msgID><basicSafetyMessage/></msgID>
  <blob1>
    74 2E 7C 0E 21 AB E0 F2 5E FC 6C E6 3C 8F 5C 00
    63 FF FF FF FF 2B D0 2D 7F 05 00 8C 00 1E 14 00
    AF 00 00 32 C1 A4
  </blob1>
  <safetyExt>
    <events>256</events>
  </safetyExt>
</BasicSafetyMessage>
```

BSM message sent over the control channel(DSRC). The mobile vehicle application receives and decodes the BSM and using the information of its embedded GPS calculates the safe brake distance, monitors position and vehicle speed.

The character string (blob1) contains, among other encoded information ：
1. The message identifier (0x74/116)
2. The time stamp (0xAB E0/4400 ms)
3. The car's latitude (0xF2 5E FC 6C/-22.8656020 degrees)
4. the car's longitude (0xE6 3C 8F 5C/-43.2238756 degrees)
5. The car's elevation (0x00 63/9.9 m)
6. The car's speed (0x2B D0/11.216 m/s),
7. The car's heading (0x2D 7F/145.8824 degrees),
8. The car's dimensions (width/length) (0x32 C1 A4/812 cm/420 cm)
These messages are sent over the DSRC Control Channel (178) every 50 ms to the vehicles inside of the radio range.