Introduction:
Vehicular Ad Hoc Network refers to an Ad Hoc network that applies to traffic. As autonomous vehicles are becoming a trend among developed countries, people sense the need to develop an autopilot system that is capable of communicating with other vehicles on the street. While Ad Hoc network seems fancy enough at current stages, it is still not ready to be implemented for autopilot system. A network, effectively finding the shortest path to neighbors and maintaining high speed connections, is essential for autopilot system. However, Ad Hoc network is not able to precisely determine the shortest path because traffic is moving every second. Therefore, our project will focus on applying GPS signals to Ad Hoc network so that clients within the network can transmit packets through the location of the client by the shortest path.

Objectives:
- Build a routing table using GPS information
- Create a VANET test bed on Linux

Algorithm:
The consideration of next hop receiver is determined by the shortest path between all the 1-hop neighbors and the destination, that is 7.2.0.0 as shown in the figure below.

Methodology:
The system consists of 2 parts, front-end and back-end

Back-end:
GOLSR is written based on OLSR by adding geographic location to construct a GPS-based routing table. GPS location is provided by an external GPS device. Timestamp, latitude, and longitude are collected for calculating distance between two hops. By modifying the hello message, GPS is broadcasted among the ad hoc network. All nodes in the network then process and construct a routing table using the algorithm mentioned.

Front-end:
The front-end is an application about sending and receiving files using the information provided in the previous part. The application can be divided into 3 parts, sending, receiving, and forwarding as shown in the figure above.
- The sender first target the next hop destination according to its routing table, even if the next hop is an intermediate.
- The next hop neighbor receives and process the incoming packets. If the receiver matches the packet’s destination, the packet is stored to the device.
- The receiver, on the other hand, acts as an intermediate station, re-processing the packets and forwarding them to the next hop neighbor repeatedly.

Results:
- The application shows the sender’s IP and geographic location information
- The application displays the neighbor’s IP, geographical information and its distance to the sender
- The application allows users to share files with neighbors
- The application provides Logbook, showing events recorded by the program

Conclusions:
We have successfully constructed a VANET out of a few mobile Wi-Fi devices. Our product can adapt to a fast changing and fast moving network since it enables quick communications to newly discovered neighbors. Also, it can react quickly to any offline nodes. We have, moreover successfully built a VANET test bed. The final product of our project has a combination of front end and back end process displayed by a user interface. We look forward to applying our project in real-life scenario (autonomous vehicles) and further modifications to improve our system.