Vanet and its Architecture

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What is Vanet?

-VANET stands for vehicular AD HOC Network

-This is us transforming vehicles into “Networks on wheels” or “Computers on wheels”

-Enabling vehicles with networking technologies to make life better

Functions of VANET

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1 - Enable each vehicle with a Wifi/Wimax service and treat them as nodes

2 - Assign each vehicle a unique IP address.

3 - Any legitimate vehicle can access the public networks at any time

What are the advantages?

-Has a wide range of applications like:

- -Information sharing
- -Cooperative driving
- -Navigation
- -Internet etc.

AD HOC

-The network is AD Hoc - hence we need very minimal topological planning.

Requirements for such networks??
-Need to be **fast** and **dynamic** - adapt to any varying topologies

So how do they communicate?

Components in communication:

WAVE - Wireless Access in Vehicular Environment (IEEE 1609.2 standard)

OBU - On Board Unit : The device responsible to collect data from the various sensors and relay this information to other vehicles and infrastructure.

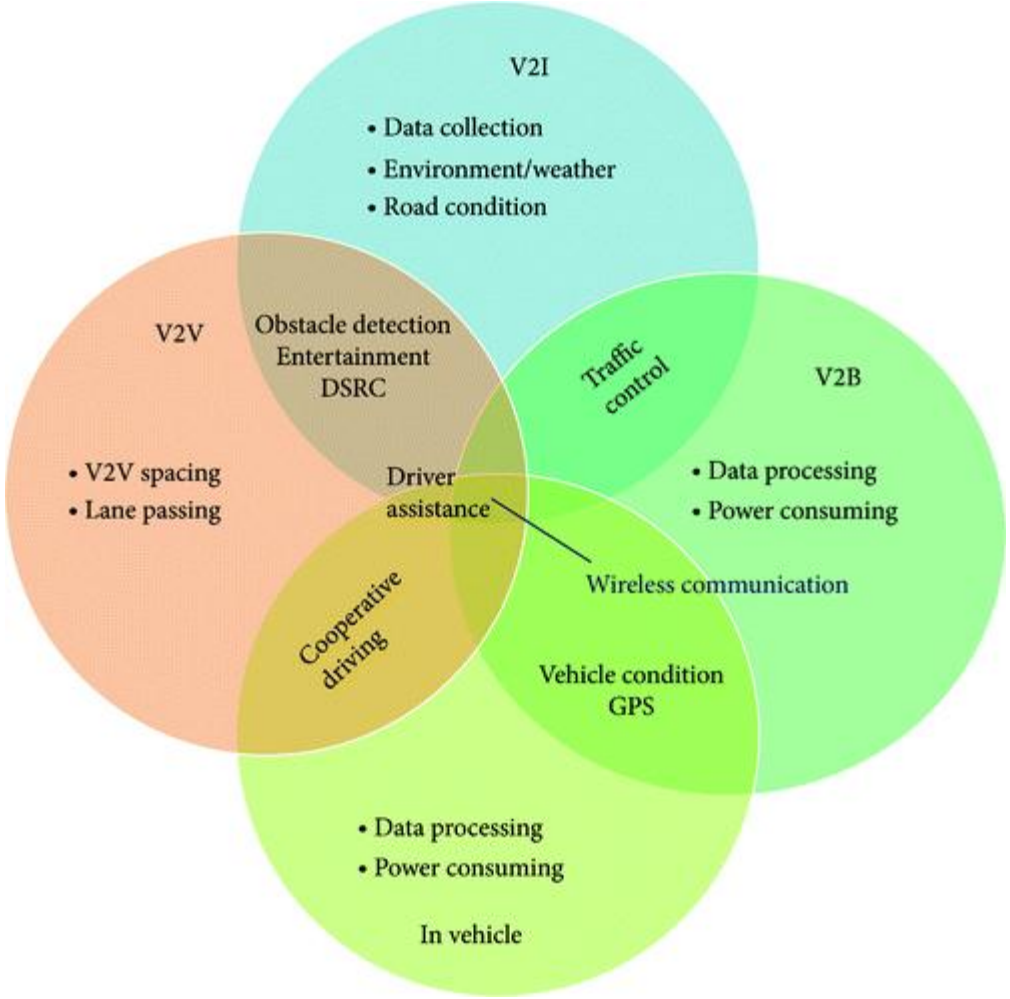
RSU - Roadside Unit - Devices on the roads to enable communication

So how do they communicate?

-We have 3 communication modes

1) V2V - Vehicle to vehicle communication.
2) V2I - Vehicle to infrastructure.
3) V2B - Vehicle to broadband - i.e. 3G/4G

VANET will be the worlds largest AD HOC network.


V2I
• Data collection
• Environment/weather
• Road condition
V2V
Obstacle detection
Entertainment
DSRC
Traffic control
V2B
• V2V spacing
• Lane passing
Driver assistance
• Data processing
• Power consuming
Wireless communication
Cooperative driving
Vehicle condition
GPS
• Data processing
• Power consuming
In vehicle

So how do they communicate?

Protocols -

They use Geographical routing protocol
It assumes

- All vehicles can determine their own positions
- All nodes know the positions of their direct neighbours
- The source node knows the position of the destination node

Why GRP and not TRP?

Topology Based Routing Protocols	Position Based Routing Protocols
Need of route maintenance for all routes.	No need of route maintenance.
Require large bandwidth if network topology changes.	Does not require large bandwidth.
Forwarding decision is based on the source node.	Forwarding decision is based on the position of destination and the next hop neighbor.
Based on route discovery scheme.	Based on location service scheme.
DSDV, OLSR, AODV, DSR, TORA, ZRP, etc.	GPSR, A-STAR, AMAR, GyTAR, EBGR, MFR, B-MFR, etc.

Routing

Each vehicle is considered a node.

1 - Proactive routing - Continuously maintains contact and updates position

2 - Reactive routing - Initiates route discovery only on demand

3 - Position based routing - Initiates route discovery based on location

VANET Challenges

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1 - Security - Since its an open network there can be a possibly many threats like data theft or malicious data.

Use of digital signatures is one possible solution

VANET Challenges

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2 - It requires lightweight components - both hardware and software.

They must be lightweight yet robust

VANET Challenges

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3 - Quality of service

Since it is a high speed and dynamic network packet losses and connection losses keep happening.

This has to be reduced and Packet delivery ratio must be increased

Thank you!