

Dynamic Routing for The Various Topologies In A Vanet

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Abstract

In Vehicular Adhoc Network (Vanet) The Quality Of Service Is Based On Various Factors Like Throughput, Reliability, Mobility, Latency. It Is Very Difficult To Produce Very Good Vanet Network. The Key Part In Vanet Is Routing. In This Paper We Discussed About Various Routing Protocol And Different Routing Algorithm. This Work Helped Us To Find Various Rerouting Algorithm Working For Dynamically Changing Network With High Mobility. In Order To Improve The Performance We Selected Dynamic Routing Protocol For Our Implementation To The Dynamically Changing Network Topology. In This Paper We Discussed Various Routing Protocol Merits And Demerits. The Comparative Result For The Dynamic Routing Protocol Is Simulated. The Various Factors Needed For Assessment Are Distance, Speed, No Of Nodes, Communication Overhead, Relative Mobility, Simulation Parameters, Simulation Tool Used, Mobility Model, Performance Metrics The Comparative Result Will Be Shown.

Key Word: Vehicular Adhoc Network, Routing Protocol, Routing Algorithm, Dynamic Routing.

1. Introduction

The Vanet Is A One Type Of Adhoc Network It Helps To The Collection Of Vehicles That Maintains A Message Network Among Them Exclusive Of Using Any Centralized Stand Position Or Several Organizers. The Base Station Hear What We Using Is The Internet Connection. Wireless Adhoc Network (Wanet) Is The Root Of All The Ad Hoc Networks. Vanet Is A Network Derived From Manet Which Organizes Its Message Network Itself Without Any Dependence On Any Other Infrastructure. The Manet Is Widely Used In Military Because Of Its Straightforward And Indispensable Communication Technique Just Like A Data Distribution Between Various Computers. Vanet Is Similar To Manet Along With Some Alterations. Vanet Is Show In Figure 1. That Is Composed Of The Mobile Nodes (Mn), Road Side Units (Rsu), On Board Units (Obu) For The Signal Processing (Data Sharing) To And From Rsus. (Muhammed Et Al. 2018). Rsus Are Permanent Install Units That Are The Entryway For The Communication Between Mn And The Servers Or Internet. The Vanet Provides Various Types Of Services In Various Fields. The Message Transmission In Vanet Is Carried Out Between One Vehicle To Another Vehicle (V2v) And Vehicle To Infrastructure (V2i). A Key Design Area In Va Net Is To Order The Message Appropriately For A Communication Network Is Routing And To

Deliver The Packet In Effective Manner To The Destination Node. Various Route-Finding Algorithms For Vanet Are Discussed And Presented With Boundaries Of Those Algorithms.

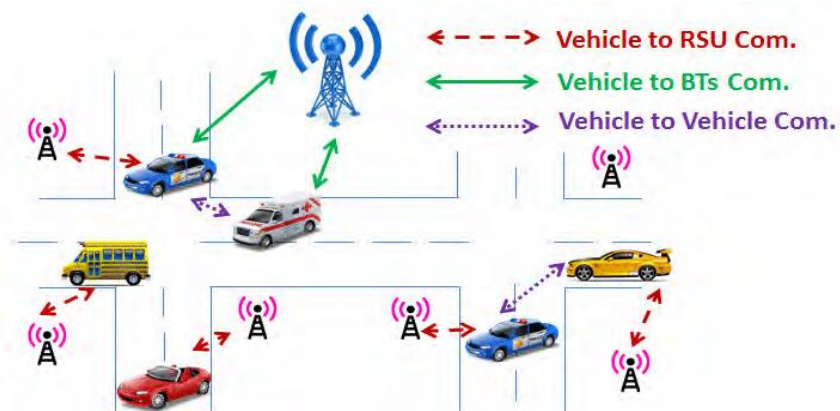


Figure 1. Vehicular Adhoc Network

2. Related Work

The Various Ways Of Message Attacks Like Black Hole, Grey Hole And Rushing Attacks Were Discussed. These Attacks Try To Stop Broadcast Message Between Vehicles And Roadside Units And Have A Direct Negative Impact On The Wide Getting Of This New Class Of Vehicles (Alheeti Et Al. 2015). The Vanet Is Using Dynamically Changing Topology. It's Very Hard To Predict The Performance Of The Network. The Various Routing Protocol And Its Attribute Measured Is Discussed (Arohi Gupta Et Al. 2016). Vanet Is Derived From The Mobile Adhoc Network(Manet).

It Is Defined As A Network That Has Many Free Or Autonomous Nodes Wirelessly Connected, It Is Collection Of Portable Devices Or Mobile Objects That Can Position Themselves In Various Ways And Operate As Infrastructure-Less Networks And Self-Configuring Networks. The Vanet Consist Of Highly Multifaceted Sceneries Such As Dynamic Topology, Self-Governing Topology, Recurrent Network Disconnections, Well-Organized And Quick Routing Of Packets And Many Of The Individuality That Make It Distinguish From Customary Networks(Jaap, Et Al 2005).

The Author Says About Statistical Framework Model To Address The Problem Of Optimizing Routing Configuration Parameters In Vanet (Al-Kharasani Et Al 2018). To Provide Efficient And Reliable Data Transmission Between Node-To-Node We Need Good Routing Algorithm. Direction-Finding In Vanets Is A Complex Task In Urban Surroundings. Overall Performance Assessment Of Two Accessible Direction-Finding Protocols Namely, Among Various Routing Protocol Importance Of Aodv And Dsr Algorithm For Vanets Is Discussed (Suman Malik Et Al.2019). Vanets Are Created By Intelligent Vehicles Prepared With On Board Units, Rsu And Wireless Communication Devices (Azees Et Al. 2016).

Based On The Vehicle Movement Speed, Fuzzy Logic Algorithm Is Working To Generate Steady Clusters By Taking Into Consideration Numerous Metrics Of Vehicle Velocity, Moving Pattern, And Signal Qualities Between Vehicles. Game Theory-Based Return Share Is Working To Guide Each Vehicle To Select The Route That Can Make The Most Of The Whole Network Performance (Celimuge Wu Et Al.2018). In This Paper They Introduced About Distributed Vanet Solution Named The Autonomous Vehicular Edge (Ave), Which Helps To Share Information Between V2i And V2v. They Further Discussed About The Hybrid Vehicular Edge Cloud (Hvc), Which Effectively Shared The Resource Like Rsu, Obu And The Cloud, By Using Multi Right Of Entry Networks (Jingyun Feng Et Al 2018).

The Trust Of Vanet Is Still An Challenging Issue In This Paper They Discussed About The Assess Approaches And Fixed Vanet In Particular Area Will Show Weak And Strong Spots. The Information Exchange Between The V2i And V2v Are Made Safe (Wex Et Al. 2008). The Best Path Selection For Data Transmission In Vanet Is Achieved With The Hybrid Direction-Finding Protocol Based On Both Geographical Information And Topological Data. The Performance Of The Network Is Measured By The Attributes Like Mobility Speed, Connection Time Span,Distance To The Destination Node And Total Mobile Node Present In The Neighborhood Of The Node. (Arianmehr Et Al 2019).

In This A New Routing Algorithm Swarm Optimization Is Introduced To Find The Optimal Route Between Three-Way And Intersections. The Packet Is Delivered More Accurately In Selected Routes. In This Each Packet Is Assigned With Some Number To Send The Packet From Source To Destination (Yarinezhad Et Al 2019). The Traffic Rerouting Is Very Important In Finding The Next Alternate Route For Reaching The Destination. , Using The Ant Colony Based Algorithm They Find A Route That Has Best Network Connectivity. The Current Network Connectivity Of The Particular Section Is Measured The Control Packets And Ants That Passed Through The Network Node. The Path Selection Time And Latency Associated With The Selection Are Reduced (Goudarzi Et Al 2019). The Tip Of Bionic View, They Construct The Spider Web Based On The Network Topology Initially It Will Select The Feasible Paths To The Target Using Artificial Spiders. The Connection-Quality Model And Transmission-Latency Model Are Created Choose The Best Route From All The Possible Paths. A Discriminating Forward Scheme Is Used To Forward The Packets In The Selected Route (Chen Et Al 2019).

3. Routing Protocol

It Is A Protocol That Enables The Exchange Of Routing Tables Between Routers In An Internetwork. Routing Protocols Are The Software Implementation Of Specific Routing Algorithms, Which Are Mathematical Procedures For Determining The Cost Of Various Paths Or Routes Through An Internetwork So That Traffic Can Be Routed Most Efficiently (R. Brendha Et Al 2017).

The Routing Protocol Is Made Up Of These Components.

1. Data Structures – This Is Information About Remote Networks. It Is Usually Stored In The Ram And May Be Comprised Of Tables Such As Neighbor Tables And Topology Tables.
2. Algorithm – This Is The Sequential List Of Steps That The Routing Takes When Determining The Best Path To A Particular Network.
3. Routing Protocol Messages – These Are Messages That Are Used To Maintain Updated Routing Information. Examples Include; Hello Messages, Update Messages Among Others.

3.1. Characteristics

- Exchange Of Information On Interfaces To Discover Neighboring Routers
- Exchange Of Routes That Have Been Advertised
- Running Of The Algorithm So As To Determine The Best Path
- Adding Of Best Paths To The Routing Table
- Detection Of Topology Changes And Making The Necessary Changes

4. Routing Algorithm

It Is An Arithmetical Process That A Active Router Uses To Calculate Entry For Its Routing Table. Routing Algorithms Are Implemented As Software Running Within The Internal Cpu Of A Router. They Are Implemented As A Routing Protocol Because They Involve Procedures And Protocols That Allow Routers To Exchange Information With One Another In Order To <http://annalsofrscb.ro>

Calculate The Metrics Of Various Paths Or Routes Through An Internetwork. Routing Algorithms Base Their Work Off The Values Contained In A Combination Of Variables. These Values Can Be Determined Dynamically By Inspecting Header Information In Packets Directed Toward The Router, Or They Can Be Manually Specified By Network Administrators. The Routing Algorithm Then Processes The Values Of These Variables To Generate The Internal Routing Table For The Router. Figure .2 Show The Various Routing Protocol And Routing Algorithm. The Table.1 Explains The Working, Advantage And Disadvantage Of Routing Protocols. The Variables Are Generally Known As Routing Metrics And Can Include The Following:

- **Hops:** The Number Of Intermediate Routers Between A Given Network And The Local Router
- **Latency:** The Time Delay In Processing A Packet Through The Router Or Over A Given Route
- **Congestion:** The Length Of The Packet Queue At The Incoming Port Of The Router
- **Load:** The Processor Use At The Router Or The Number Of Packets Per Second That It Is Currently Processing
- **Bandwidth:** The Available Capacity Of A Route To Support Network Traffic; Decreases As Network Traffic Increases
- **Reliability:** The Relative Amount Of Downtime That A Particular Router Might Experience Because Of Malfunctions
- **Maximum Transmission Unit (Mtu):** The Largest Packet Size That The Router Can Forward Without Needing To Fragment The Packet.

4.1. Dynamic Routing Protocol

Dynamic Routing Is A Networking Technique That Provides Best Data Routing. When There Is A Change In Routing Table According To The Change In Topology. In Rapidly Changing Vanet Environment The Routes Are Changing Dynamically. In Order To Find The Optimal Path Dynamic Routing Uses Multifaceted Algorithms. The Figure.3 Shows The Various Types Of Dynamic Routing Protocol.

Dynamic Routing Is A Networking Technique That Provides Optimal Data Routing. Unlike Static Routing, Dynamic Routing Enables Routers To Select Paths According To Real-Time Logical Network Layout Changes.

Merits:

- Allows The Exchange Of Routing Information Whenever The Network Experiences A Change In Topology.
- Since The Routes Do Not Have To Be Configured Manually, There Is Less Administrative Overhead.
- Less Error-Prone Than Static Routing.
- Allows Scalability Since There Is Less Administrative Overhead Involved.

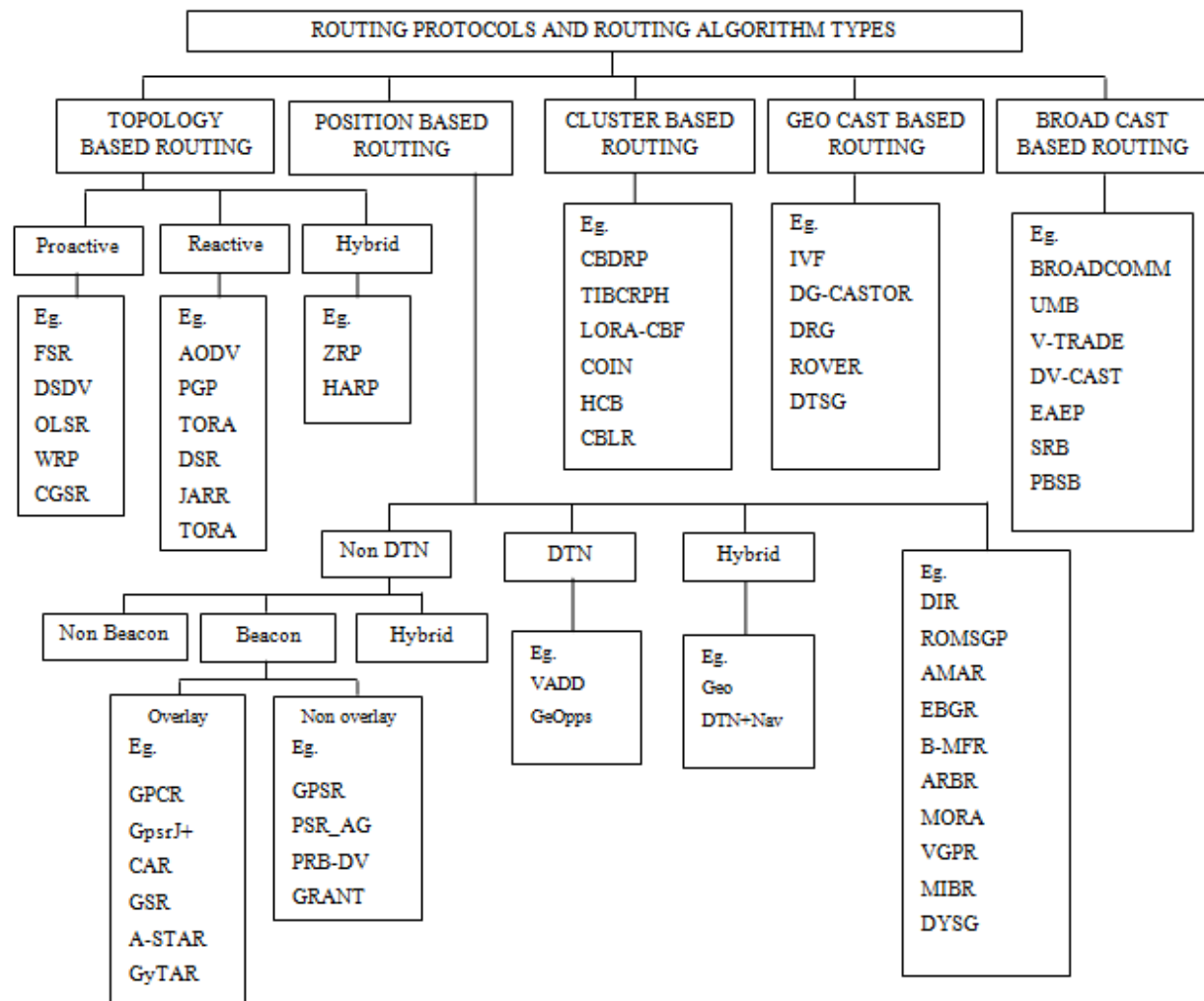


Figure 2. Routing Protocols And Routing Algorithm Types

Table 1. Classification Of Routing Protocol

Classification Of Routing Protocol			
Protocol	Working	Advantages	Disadvantages
Topology Based Routing Protocol Proactive	Used To Store All The Network Nodes Routing Information In The Routing Table. Each Contains Next Hop Information. Maintains Existing Node Information	Routes Are Predefined. Route Is Fixed. Reduces The Latency.	Frequent Update Of Routing Table. High Network Load. Bandwidth Utilization Is High. Network Performance Is Low.
Topology Based Routing Protocol	On Demand Routing Protocol. It Uses Unicast Communication	Network Traffic Is Less. Consumes Low Bandwidth.	Searching Delay Is High For Route. If Communication Exceeds,

Proactive		Backup Is Maintained For Both Sender And Receiver	Flooding Of The Network Causes Suspension Of Nodes.
Position Based Routing Protocol	Position Based Routing Protocol Is Protocol Based On The Geographic Location Information Of Nodes In The Routing Process.	No Route Table Are Maintained Latency Is Reduced	Gps Needed. In Tunnel Signal Problems Will Arise. Failure And Deadlock Are Possible.
Cluster Based Routing Protocol	Base On The Geographical Location It Grouped.	Highly Scalable Suitable For Huge Network.	Latency Is High.
Broadcast Based Routing Protocol	In Broadcast Routing The Messages Are Broadcast Among Vehicles And Between V2i/I2v.	Implementation Is Easy. Good For Small Network.	Network Size Increase Bandwidth Will Increase. Collision And Blocking Occur.
Geocast Based Routing Protocol	In The Geographic Region Based Routing Geocast Routing Protocol Is The Best One. It Is A Multicast Routing Protocol.	In This Routing Collision Is Reduced.	There Is A Need For The Gps, Position And Location Finding Services. Satellite Signal Does Not Reach In The Tunnel.

4.1.1. Routing Information Protocol (Rip)

Rip Is A One Type Of Distance Vector Routing Protocol (Dvsrp). It Is A Intradomain Routing Protocol That Can Function Only Within A Given Routing Domain. Eg. Microsoft Windows Nt Server And Microsoft Windows 2000 Server Support Rip.

4.1.2. Interior Gateway Routing Protocol (Igrp)

Igrp Is A One Type Of Distance Vector Routing Protocol (Dvsrp). It Is Steady Routing Even In Very Large Or Complex Networks.

4.1.2.1. Characteristics Of Igrp

- In Transient Node Routing Loops Not Allowed.
- Latency Is Less In A Changing Network Topology.
- Overhead Is Less
- Igrp Must Work In A Given Bandwidth

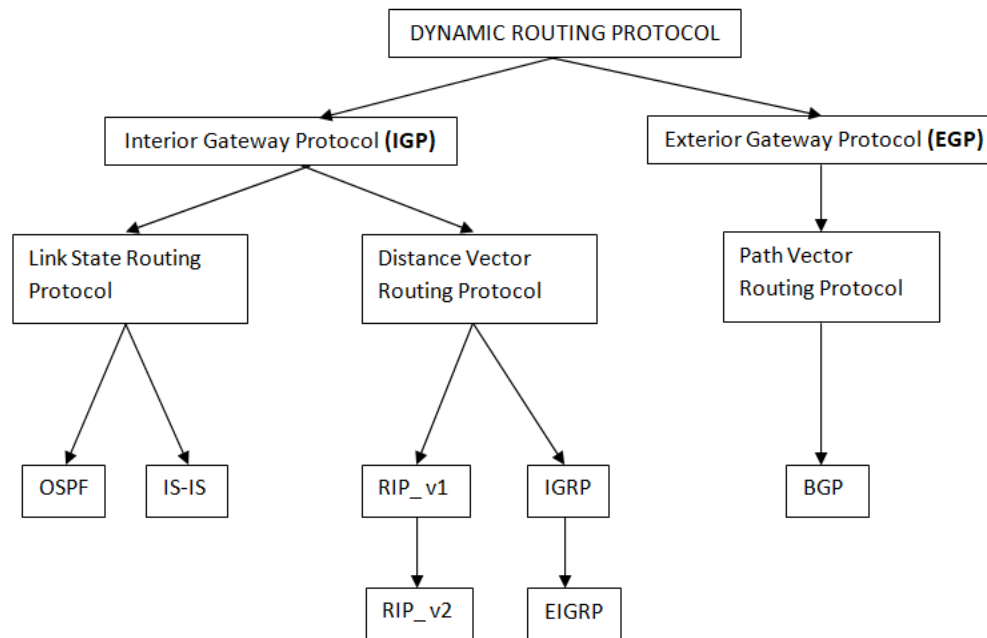


Figure 3. Dynamic Routing Protocol

4.1.3. Open Shortest Path First (Ospf) Protocol

It Is One Type Of Link State Routing Protocol (Lsrp). It Works On Large Domain. Ospf Is An Intradomain Routing Protocol That Can Function Only Within A Given Routing Domain.

4.1.3.1. Characteristics Of Igrp

Ospf Is Also A Hierarchical Routing Protocol That Can Be Used Within A Single Autonomous System. Ospf Evolved From The Earlier Open Systems Interconnection (Osi) Reference Model Routing Protocol Called Intermediate-System-To-Intermediate-System (Is-Is). Ospf Supports Multipath Routing And Uses One Or More Routing Metrics, Including Bandwidth, Reliability, Load, Latency, And Mtu. If Ospf Uses More Than One Metric, It Also Supports Type-Of-Service (Tos) Requests For Differentiating Traffic.

4.1.4. Border Gateway Protocol (Bgp)

Bgp Is Derived From Path Vector Routing Protocol (Pvrp). Bgp Is A Inter Domain Routing Protocol Created Specifically To Enable The Core Or Backbone Routers Of The Internet To Communicate With Each Other. Bgp Provides Scalability, Flexibility, And Network Stability.

5. Creating Vanet Using Dynamic Routing

On Studying Various Routing Algorithm We Decided To Use Bgp Routing For Creating The Vanet. Border Gateway Protocol Version 4 (Bgp4) Is The Egp Used To Exchange Routes Between Autonomous Systems In The Internet.

Advantages Of Using Bgp

It Uses A Autonomous System

1. It Is Used In Large Scale
2. It Improves The Scalability Of The Network
3. It Improves The Flexibility Of The Network
4. It Improves The Network Stability Of The Network
5. It Improves The Complexity Of The Network In Order Improve The Security

Working Of Bgp

If We Are Submitting A Message Across The Internet, Bgp Is Responsible For Searching At All Of The Available Paths That Message Could Travel And Select The Best Route, Which Usually Means Hopping Between Autonomous Systems.

Autonomous System (As)

Any Small Network That Present In The Vast Internet Is Known As Autonomous System (As).

Every Network Is Fundamentally A Huge Collection Of Routers Run By A Single Organization. Each

Autonomous Systems Are Active Member Of Internet Service Provider (Isp) Or Companies, Universities, Government Agencies, And Scientific Institutions.

Table 2. Bgp Works On Two Important Attributes They Are Weight And Preference

S.No	Weight	Local Preference
1	If One Path Has A Better Weight Then We Select This Path As The Best Path	If One Path Has A Better Local Preference Then We Select This Path As The Best Path.
2	If The Weight Is Equal, We Move Down To The Next Attribute.	If The Local Preference Is Equal, We Move Down To The Next Attribute.

Table 3. Bgp – Routing Algorithm

S.No	Bgp – Routing Algorithm	
1	Select The Next Hop Loop (I=0 To N In M) If (Bp==1) Print A Else Path Not Exist	Install Routing Table (Irt→M) Select Best Path (Sbt→ Bp) Select Path (Sp→A)
2	Choose The Rout With Highest Preference Select Path If(Path With In As) Loop (I=0 To N In M) If (Bp==1)	Autonomous System →As

	Print A Else Path Not Exist Select Path If (Path Not In As) Select External-Router-Id =Med If (Med&&As&&Path==Active) Establish Connection Broad Cast Message If (Primary_Route==0) Establish Connection Broad Cast Message Else (Secondary Route) Establish Connection Broad Cast Message	
3	Shortest Path	
4	Select Lowest Origin Attribute	
5	Select Lowest Med Value	
6	Select The Routes Received From Ebgp Over Ibgp	External Bgp= Ebgp Internal Bgp= Ibgp
7	Select The Nearest Exit From Your Network	
8	Implementation Stable Route	
9	Select Routes Learned From The Router With Lower Router Id	
10	Select Routes Learned From The Router With Lower Ip Address	

6. Vanet Location

The Figure.4 Is The Place Where Our Vanet Location Is Actually Created. The Traffic Level In That Particular Location Varies Based On The Timing. From The Morning 8.Am To 10.Am And Evening 3.Pm To 8.Pm The Traffic Level Is High. The Vehicle Mobility Is Slow Due To High Traffic. It Is Calculated Approximately 300 To 500 Vehicle Are Crossing The Signal Per Minute. During Normal Hours It's Calculated That 100 To 200 Vehicle Per Minute. Due To The Large Number Of Vehicle Crossing The Particular Signal At Same Time The Latency Of The Network Will Be High. In Order To Reduce The Latency Associate With Each V2i And V2v Communication We Implemented The Dynamic Routing Algorithm Bgp. Comparative Study Effectiveness Of Implementation Of Bgi In Our Network Was Studied And Shown In Both High And Low Traffic Situation.

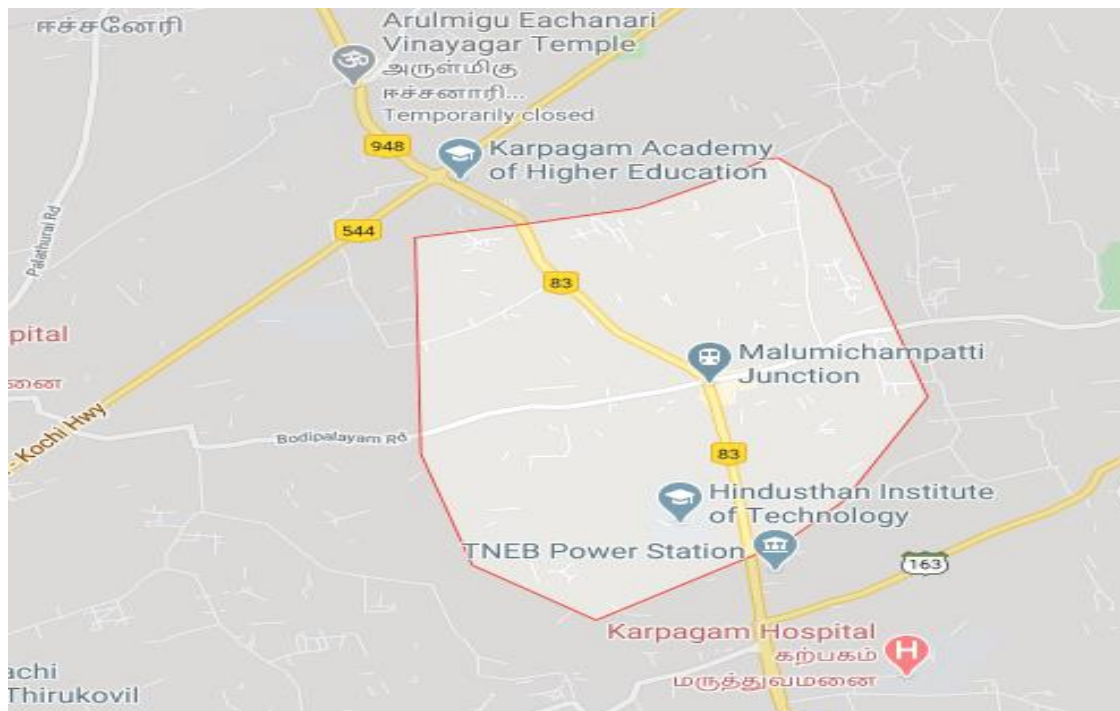


Figure 4. Vanet Location

6.1. Working Of Bgp Used Vanet And Its Result

Its Identifies That Various Routing Path Is Avail In Our Network. The Best Optimal Path Is Selected Between The Source And Destination Path. The Comparison Of Bgp Is Done At To Different Times. 1. Below Normal, 2. Normal Traffic 3. At Peak Hour

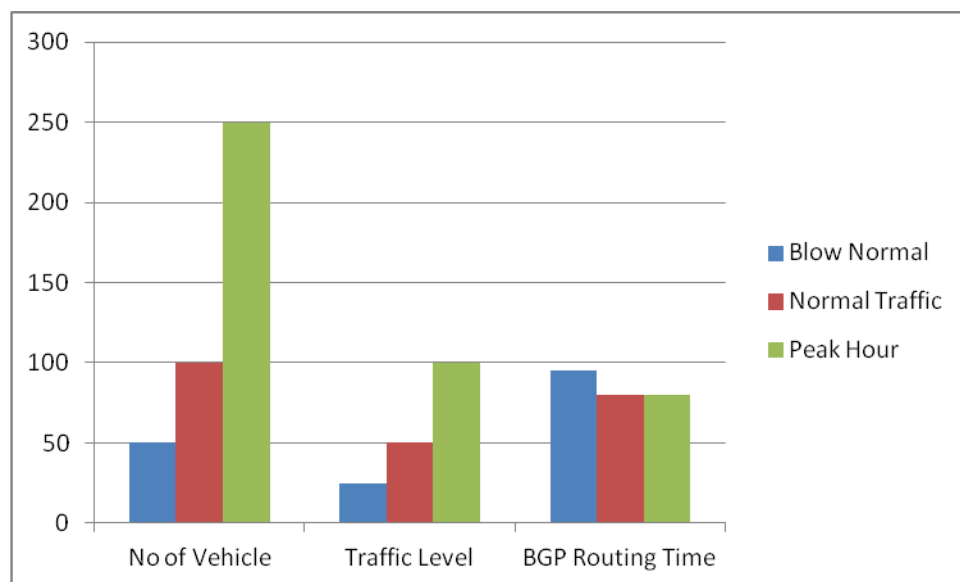


Figure 5. Bgp Performance With Different Traffic Level

7. Conclusion And Future Work

In This Paper We Survey About Various Routing Protocol And Algorithm Used In Vanet. The Dynamic Routing Protocols Are Studied For Routing Purpose. In Dynamic Routing Bgp Is Used For That Creating Path In Vanet. The Performance Of Vanet By Using Bgp Is Analyzed At A Particular Location. In Future The Dynamic Routing Can Be Extended To Unexpected Traffic Detection And Alternate Path Finding In That Route.

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