

A COMPARATIVE STUDY OF MOBILE AND VEHICULAR ADHOC NETWORKS

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Abstract—*Mobile Ad Hoc Network and Vehicular Ad-Hoc Networks are emerging area for research and development. VANETs are subclass of MANETs. But unlike MANETs it does not have battery constraints and have high mobility. Unicast and Multicast protocols in MANETs and VANETs use broadcasting to provide important control and route establishment. Possible applications of VANETs relying on broadcast for sharing safety, weather, and road information among vehicles. This paper presents a comparative study of Mobile and Vehicular adhoc network*

Index Terms— *Mobile Ad hoc NETWORKs, Inter-Vehicle Communication, Vehicular Ad hoc NETWORKs, Broadcast, Urban MultiHop Broadcast, Multi-Hop Vehicular Broadcast*

INTRODUCTION:

Mobile nodes temporary form a network for information sharing and require no need of routers and base stations is called Mobile Ad Hoc Network (MANET). They communicate with each other over multihop wireless links. [1]. RFC 2501 [2] shows that MANETs have different features like dynamic topologies, limited security, bandwidth and energy constrains.

Vehicular Ad-Hoc Networks (VANETs) are special case of MANETs [3]. Self Organized and distributed network, where fast moving vehicles have fixed movement along some path. [4]

VANETs have salient features (high speed, no battery constraints, limited movement, reliability and security problems) that discriminate it from other adhoc network. [5]. In wireless network, broadcasting is frequently used operation as compared to wired network. They are a lot issues and problems in wireless adhoc network because of node mobility and scattered resources. [6] VANETs are promising network for intelligent systems having short communication range between the vehicles [7].

Mostly in Vehicular adhoc network (VANETs), vehicles are interested in the same kind of information for example information about any

accident, road block, parking, and fuel station or weather situation of particular route. So the broadcast is frequently used in vehicular adhoc network for information sharing. In this paper: section 2 and 3, characteristics and uses of MANETs are discussed. In section 4 and 5 broadcast approaches and security issues of MANETs are given. In section 6 and 7, characteristics and uses of VANETs are described. In section 8 and 9 broadcast approaches and security issues of VANETs are given. Lastly in section 10 conclusions is given.

CHARACTERISTICS OF MOBILE ADHOC NETWORKS

RFC 2501[2] shows that MANETs have several salient characteristics:

Dynamic topologies: Nodes communicate with each other directly and also with intermediate nodes. As the network is dynamic, the nodes enter and leaving frequently.

Bandwidth constrains; wireless links have variable and lower capacity than wired links. Fading, noise, and interference conditions effect the throughput of wireless communication.

Energy constrains: Majority of nodes in MANETs dependent on batteries for their energy. So the most important parameter for optimization is energy conservation.

Limited physical security: Security is more complicated and difficult to achieve in Mobile wireless networks as compare to wired network. Different attacks like denial of service attack, man in the middle attack eavesdropping and spoofing should be considered. As they is no central server and base station so failure of single point can't produce more harm as compare to wired network.

USES OF MANETS:

They are different uses of mobile adhoc networks. Some of them are listed below [8]

- For military and rescue use.
- Information distribution (meetings, seminars etc.)
- Internet / intranet hot spots (public transportation)
- Localized advertising and shopping
- New mobile devices are invented constantly and used various ways.

BROADCAST APPROACHES IN MANETS

Different unicast and multicast protocols like Dynamic Source Routing [9], Zone Routing Protocol [11], Ad Hoc On Demand Distance Vector [10], and Location Aided Routing [12] use broadcasting to establish and maintain the route in MANETS.

Brad Williams in [13] presents the comparative study of broadcast approaches in MANETS using NS2 simulator. Impact of simple flooding, probability method, Area method and Neighbor knowledge method are analyzed with different network parameter like increasing network load, node mobility and traffic rate.

SECURITY IN MANETS

Security in MANETS is challenging task and difficult to achieve as there is no central server and base station. Wireless network is more vulnerable to security attack as comparable to wired network. Security attacks like eavesdropping and spoofing, denial of service attack etc can be possible on MANETS. Security mechanisms mainly dependent upon cryptography to ensure the security. [14]

CHARACTERISTICS OF VEHICULAR ADHOC NETWORKS

Vehicular Ad-Hoc Networks (VANETs) are special case of MANETS in which fast moving vehicles form a temporary network. VANETSs do not need any infrastructure. Vehicle to vehicle communication in VANETS allow to share information without any infrastructure as in Intelligent Transportation Systems[3]. Self Organized and distributed network, where fast moving vehicles have fixed movement along some traffic path. [4]

USES OF VANETS:

The purpose of VANET is to provide comfort and safety for passengers.

Comfort Applications: It improves the traffic efficiency and passenger comfort. Traffic information system, gas station and weather information are example of comfort application. [15]

Safety Applications: Sharing emergency and safety data among vehicles improves the safety of passengers. Safety application are Emergency warning system, road condition and traffic sign violation warning. [15]

BROADCAST APPROACHES IN VANETS

In VANETS, broadcast is a most commonly used technique. Sharing safety, weather, and road information among vehicles depends on broadcast. Broadcast plays important role in VANETS, as it is used to establish and maintain the route for unicast and multicast protocols. Different broadcast schemes are designed for VANETS scenarios.

Urban MultiHop Broadcast [16] is based upon IEEE 802.11 protocol. It solves the Broadcast storm, Hidden node problem without sharing information among the neighbor nodes. Mobility Centric Data Dissemination Algorithm for Vehicular Networks [17] is a mobility centric scheme that merge three techniques, Geographical, Opportunistic and Trajectory based forwarding. Multi-Hop Vehicular Broadcast [18] disseminates the information to other vehicles & store it in the local database for safety use. It has two main features. i.e Congestion Detection and Backfire algorithm.

Different techniques are proposed for broadcast but they can't consider the importance of message except relevance based approach. Relevance based approach [19] is the only scheme that forward relevant message for sharing and discard the surplus messages.

SECURITY IN VANETS

Different attacks that are possible on VANETS (Bogus information, Denial of service, Masquerade ID disclosure and wrong position information) and there counter measure are mention in [20].

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REFERENCES

- [1] Sunsook Jung, Nisar Hundewale, Alex Zelikovsky, "Energy Efficiency of Load Balancing in MANET Routing Protocols", IEEE, 2005.
- [2] Corson, Macker, "Informational RFC 2501 MANET Performance Issues", January 1999.
- [3] Saleh Yousefi, Saeed Bastani, Mahmood Fathy, "On the Performance of Safety Message Dissemination in Vehicular Ad Hoc Networks", IEEE Fourth European Conference on Universal Multiservice Networks, European, 2007.
- [4] J. Harri, F. Filali, C. Bonnet, Marco Fiore, "VanetMobiSim: Generating Realistic Mobility Patterns for VANETs", ACM VANET'06, September 29, 2006, Los Angeles, California, USA.
- [5] Hao Wu , Richard Fujimoto, Randall Guensler and Michael Hunter," MDDV: A Mobility-Centric Data Dissemination Algorithm for Vehicular Networks", ACM VANET'04, October 1, 2004, Philadelphia, Pennsylvania, USA
- [6]Jie Wu, Fei Dai,"Broadcasting in Ad Hoc Networks Based on Self-Pruning", Twenty-Second Annual Joint Conference of IEEE Computer and Communications Societies, IEEE INFOCOM 2003
- [7]Tamer Nadeem, Pravin Shankar, Liviu Iftode "A Comparative Study of Data Dissemination Models for VANETs", IEEE,2006
- [8] Andre Schumacher, Sauli Painilainen, Torsten Luh, "Research Study of MANET Routing Protocols", 2004.
- [9] D. Johnson, D. Maltz, and Y. Hu, "The dynamic source routing protocol for mobile ad hoc networks," April 2003, internet Draft: draft-ietf-manetsdr-09.txt.
- [10] C. Perkins, E. Belding-Royer, and S. Das, "Ad hoc on demand distance vector (AODV) routing," July 2003, request for Comments 3561.
- [11] Z. Haas, "A new routing protocol for reconfigurable wireless networks," in Proceedings of the IEEE International Conference on Universal Personal Communications (ICUPC 1997), Oct. 1997.
- [12] Y. Ko and N. Vaidya, "Location-aided routing (LAR) in mobile ad hoc networks," in Proceedings of the ACM/IEEE International Conference on Mobile Computing and Networking (MOBICOM'98), 1998.
- [13] B. Williams and T. Camp,"Comparison of Broadcasting Techniques for Mobile Ad Hoc Networks", ACM MOBIHOC, 2002.
- [14] J. Martin Leo Manickam, R. Bhuvanewari, M.A. Bhagyaveni and S.Shanmugavel
- Secure Routing Protocol for Mobile Ad-Hoc Networks,SCSC 2007.
- [15] Saleh Yousefi, Mahmoud Siadat Mousavi, Mahmood Fathy," Vehicular Ad Hoc Networks (VANETs): challenges and perspectives" 6th International Conference on ITS Telecommunications Proceedings,2007.
- [16] Gokhan Korkmaz, Eylem Ekici, "Urban MultiHop Broadcast Protocol for InterVehicle Communication Systems", ACM VANET'04, October 1, 2004, Philadelphia, Pennsylvania, USA.
- [17] Hao Wu , Richard Fujimoto, Randall Guensler and Michael Hunter," MDDV: A Mobility-Centric Data Dissemination Algorithm for Vehicular Networks", ACM VANET'04, October 1, 2004, Philadelphia, Pennsylvania, USA
- [18] Tatsuaki Osafune, Lan Lin, Massimiliano Lenardi," Multi-Hop Vehicular Broadcast (MHVB)", 6th International Conference on ITS Telecommunications,2006
- [19] Timo Kosch, Christian J. Adler, Stephan Eichler, Christoph Schroth, and Markus Strassberger ," The scalability problem of vehicular ad hoc networks and how to solve it", IEEE Wireless Communications , October 2006
- [20] Maxim Raya and JeanPierre Hubaux," The Security of Vehicular Ad Hoc Networks", SASN'05, ACM November 7, 2005,