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Optimization of Resources with Fine-Tuning of Transmission Parameters in VANETs

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ABSTRACT

VANETs (Vehicular Ad hoc Networks) are fast becoming a vital part of our life. Reliance on VANETs are growing day by day as wireless infrastructure is being used for varying resolutions such as safety/security, information/evidence, guidance/direction, etc. The amenity is rendered either by the network operator or formed with mutual co-operation amid moving vehicles at any specific immediate epoch. The ever increasing traffic of vehicles, possibly will lead to some real time disputes being encountered and it is essential to address such issues immediately on which we stumble upon, to provide virtuous services with little to no interruption. Efficiency of VANETs can be enhanced by carefully and continuously fine-tuning the transmission parameters which are instrumental in determining the handler’s experience for QoS (Quality of Service). In this paper, we have experimentally devised the values of different transmission parameters. Furthermore, default values for these transmission parameters may not deliver the best yield on an unceasing varying situation of the network. Thus, to acquire the optimum performance of VANETs in an overloaded environment, the transmission parameters are tuned further to convey better Quality of Service.

Keywords

VANETs, QoS, transmission parameters.

1. INTRODUCTION

Vehicular ad hoc network is at the moment a striking area of notice for the research civic. An upsurge in traffic issues with additional complexity in road layout infrastructures had really given a hard time to the researchers [1]. To deliver better quality of service, in various proceedings from safety applications to management issues tuning the parameters is quite essential [2]. Vehicular applications using VANET (Vehicle Ad-hoc Networks) communication can communicate among them by two means, (1) vehicles communicate with each other (i.e., V2V) and (2) vehicles can communicate with fixed network units positioned at the sideways of the road (RSUs – Road Side Units), using similar ad hoc wireless technology, IEEE 802.11p [3]. A sequence of demonstrative metaheuristic procedures such as mass optimization, differential progression, genetic-algorithm, and simulated-annealing were opted by many researchers to find a way to automatically optimize the resource utilization on diversified networks [4].

2. RELATED WORK

Quite a lot of algorithms, procedures and architecture results have been proposed by very many researchers, which can be used to support QoS in VANET communications. Transmission parameter tuning can yield significant gain in resource optimization and can enhance the overall performance of the networks. High level dynamism has provoked many issues such as jitters and link breaks between nodes. The use of meta-heuristic techniques [5] appear as well-suited way to address the issue on optimizing the resource utilization. Vanhatupa et al. [6] proposed a genetic algorithm for optimizing channels in a wireless-mesh network. Accordingly in MANETs, a distinct multiple objective targeting genetic algorithm was deployed to probe in further to acquire an optimal broadcasting approach [7]. The notion of Autonomous-Vehicular-Clouds (AVC) are suggested to adventure and explore the resource utilization in vehicular networks [8]. The Platform as a Service (PaaS) model is considered to provision cloud facilities for portable automobiles [9]. The exertion at [10] recommends designs of Vehicular Clouds (VC), Vehicles using Clouds (VuC) and Hybrid Clouds (HC). Foremost modules of applications likely in VANET are concerned with safety, aptness and viability.

Investigators have suggested procedures, where individually every vehicle estimates its specific broadcast control with dynamism built on the native density in order to alleviate the negative effects of elevated transmission power [11]. The rise in time interval of the transmission link in case of low traffic density for inter vehicular communication, is also monitored regularly by this projected procedure. The native density is calculated as explained by Balon [12]. Researchers also proposed to compute the communication range consequently with the estimated resident density of vehicles [13]. Owing to the sudden elevation of mobility in VANETs and swift variation of its topology, it has triggered a highlighting issue on balancing the network performance [14]. Researchers also have suggested that by fixing appropriate operative and Consistent Transmission Range [15], diverse message loading scenarios and their influences can be manipulated with ease. Vehicles classified based on the mean velocities are being used by research scholars to address the injustice that arise in V2I networks [16]. Investigations on fairness in V2I network are addressed in [17] and other V2V scenarios in [18]. Cooperative adaption schemes were proposed by few researchers to yield a better performance on VANETs [19], where the adaptation is done on the transmission power centered on the vehicle concentration.

3. PROPOSED WORK

The network design is endorsed to have a network size with a range of about 1500 x 1500 km with a Vehicle speed of 80 km/h with a simulation time 35 minutes has the following pondered transmission parameters optimized. The parameters tuned to optimize are Transmission power, Packet reception power threshold, RTS threshold, Fragmentation threshold, short retry limit, long retry limit. The performance is accordingly measured based on the criteria’s such as Data dropped (buffer overflow) in packets/seconds, Data traffic received in packets/seconds, Data traffic sent in packets/seconds, Delay in seconds.

A. Transmission Power

The simulated results are shown accordingly in Figure 1 represented as node 01 graph with a transmission power of 0.001, Figure 2 represented as node 02 graph with a transmission power of 0.005, Figure 3 represented as node 03 graph with a transmission power of 0.020, Figure 4 represented as node 04 graph with a transmission power of 0.050.The transmission power should be tuned in such a way to address issues that may arise due to high penetration ratio or vehicle density in VANETs. The transmission power should be reduced as the automobile density or penetration percentage is elevated and should be increased as the scenario changes vice versa.

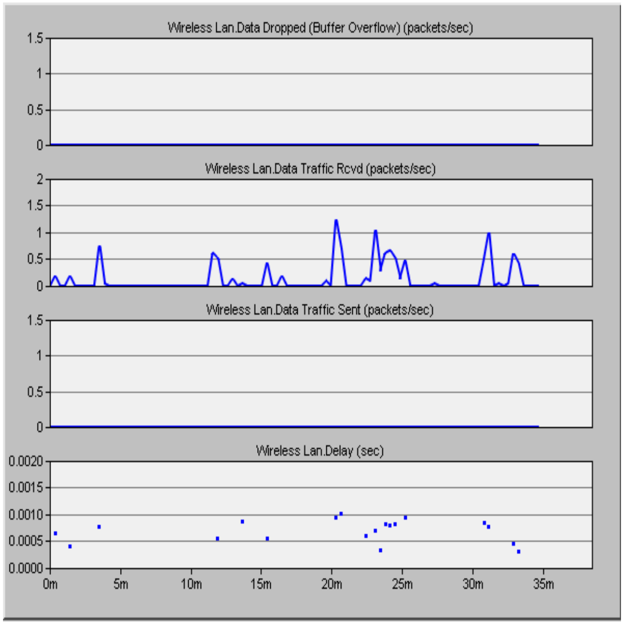

Figure 1. Node 01 graph with transmission power of 0.001

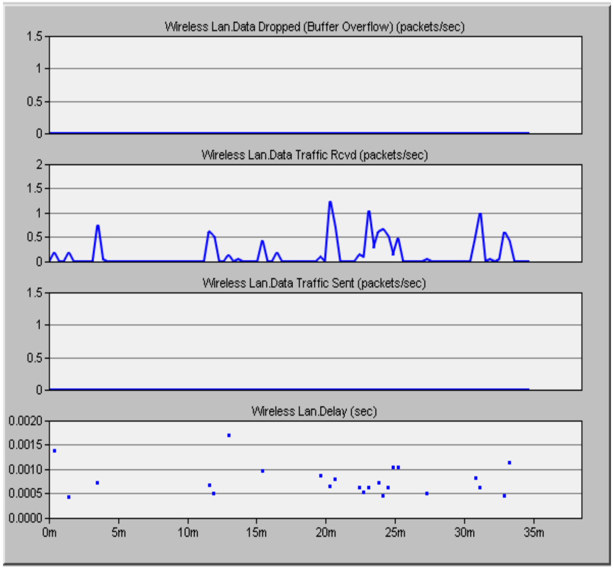

Figure 2. Node 02 graph with transmission power of 0.005

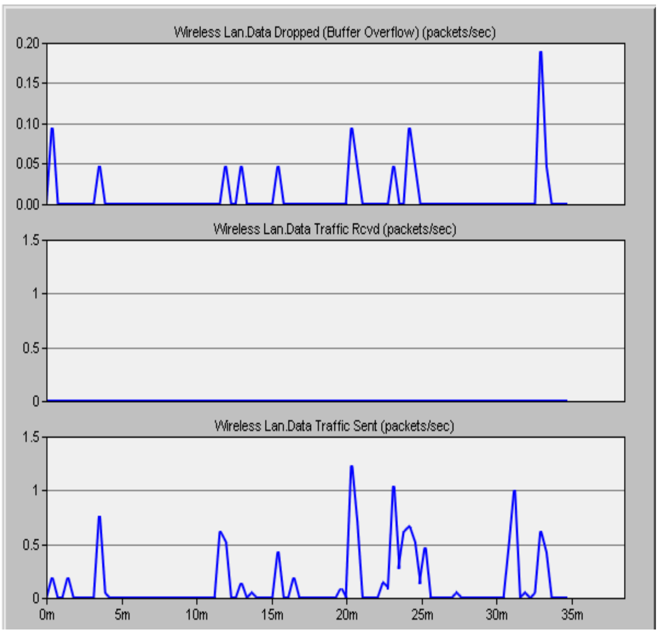

Figure 3. Node 02 graph with transmission power of 0.020

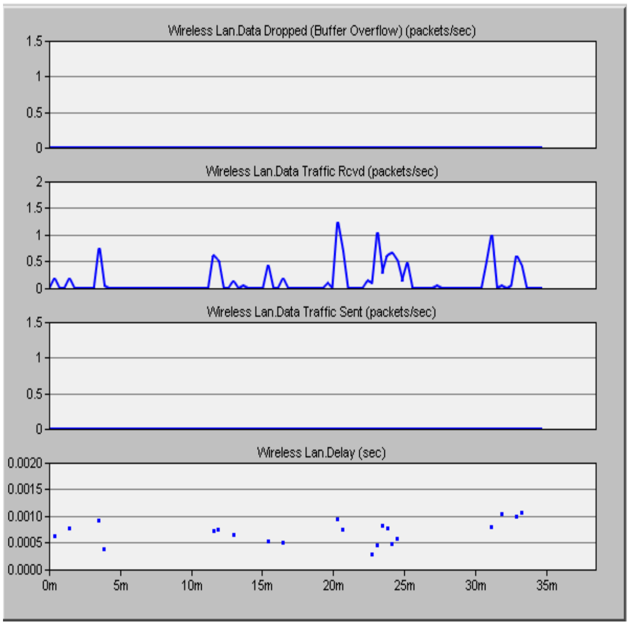

Figure 4. Node 04 graph with transmission power of 0.050

B. Packet reception power threshold

The simulated results are shown accordingly in Figure 5 represented as node 01 graph with a packet reception power threshold of -95, Figure 6 represented as node 02 graph with a packet reception power threshold of -90, Figure 7 represented as node 03 graph with a packet reception power threshold of -85, Figure 8 represented as node 04 graph with a packet reception power threshold of 0.050.

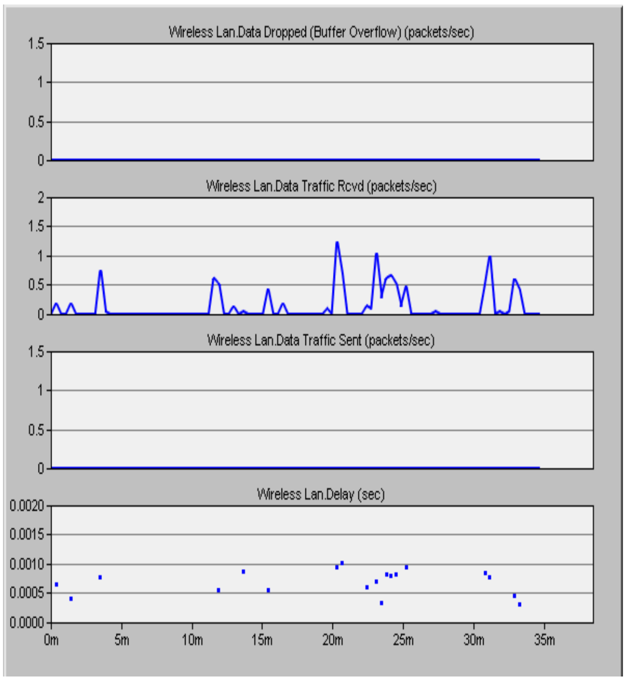

Figure 5. Node 01 graph with a packet reception power threshold of -95

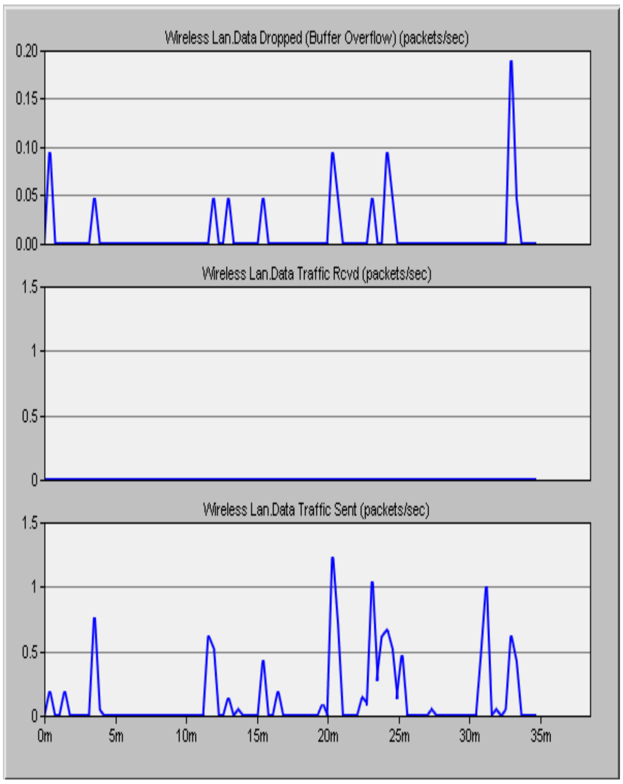

Figure 6. Node 02 graph with a packet reception power threshold of -90.

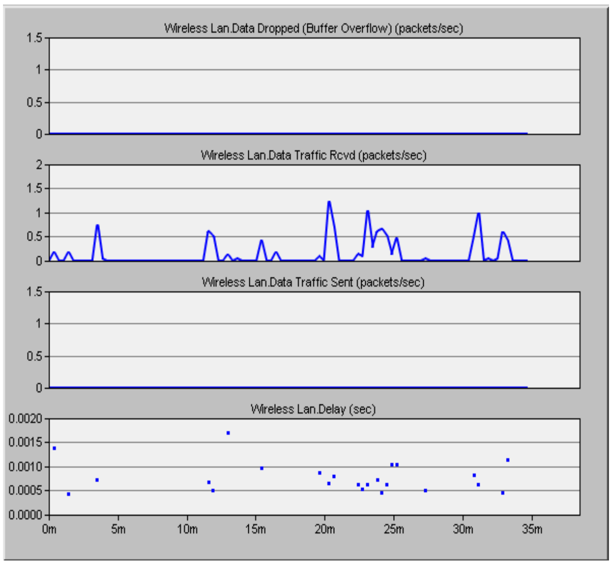

Figure 7. Node 03 graph with a packet reception power threshold of -85.

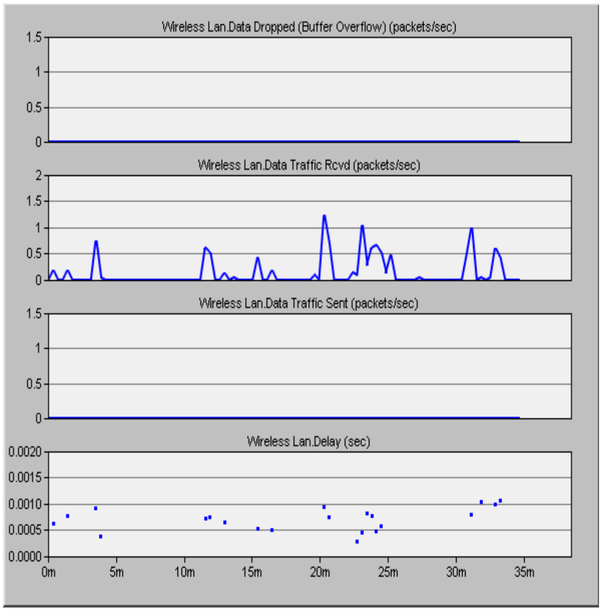

Figure 8. Node 04 graph with a packet reception power threshold of -80.

C. Rts threshold

The simulated results are shown accordingly in Figure 9 represented as node 01 graph with Rts threshold of 256, Figure 10 represented as node 02 graph with a Rts threshold of 512, Figure 11 represented as node 03 graph with a Rts threshold of 1024, Figure 12 represented as node 04 graph with a Rts threshold of 2048.

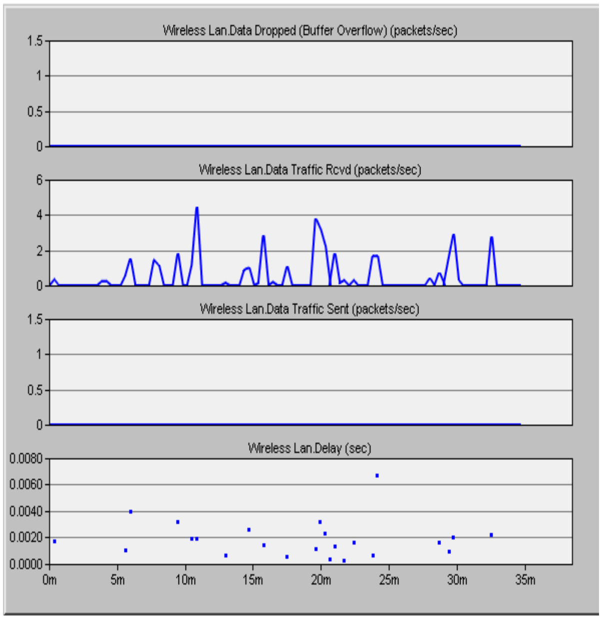

Figure 9. Node 01 graph with Rts threshold of 256

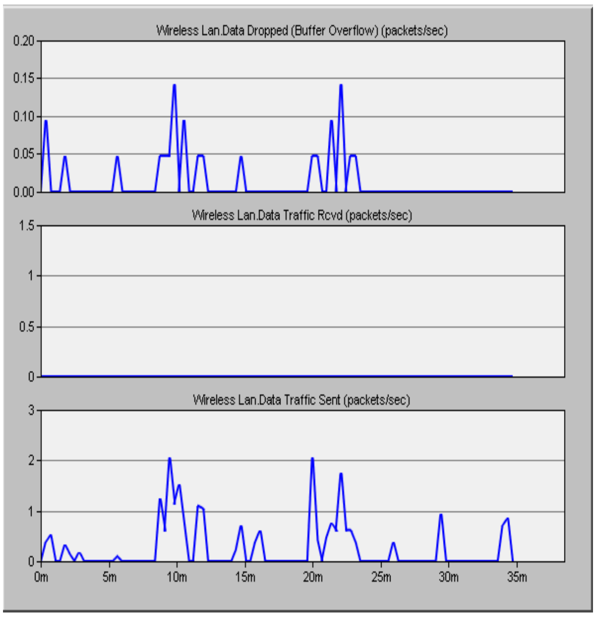

Figure 10. Node 02 graph with Rts threshold of 256.

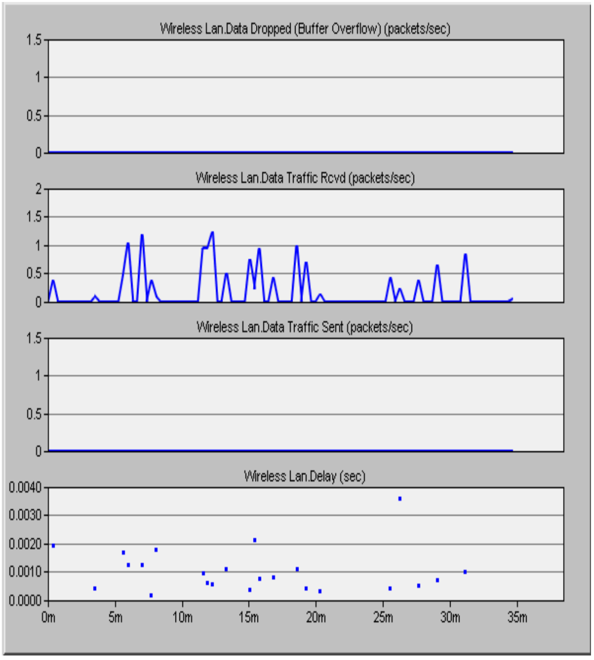

Figure 11. Node 03 graph with Rts threshold of 1024.

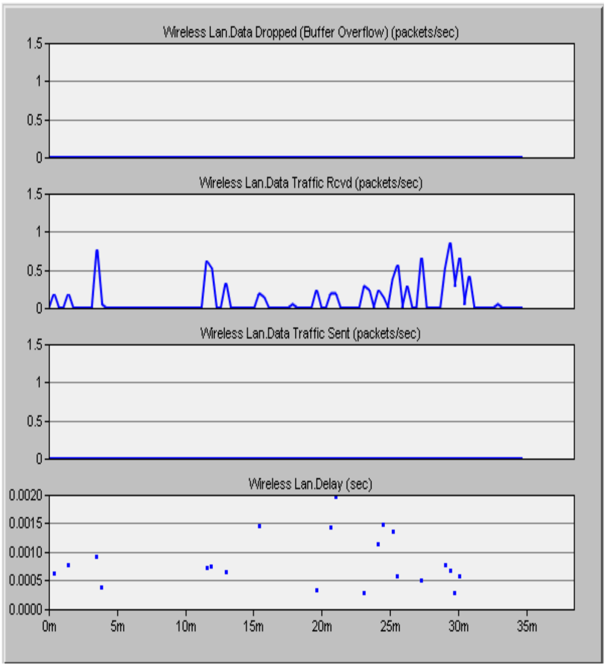

Figure 12. Node 04 graph with Rts threshold of 2048

D. Short retry limit

The simulated results are shown accordingly in Figure 13 represented as node 01 graph with short retry limit of 9, Figure 14 represented as node 02 graph with a short retry limit of 11, Figure 15 represented as node 03 graph with a short retry limit of 13, Figure 16 represented as node 04 graph with a short retry limit of 15.

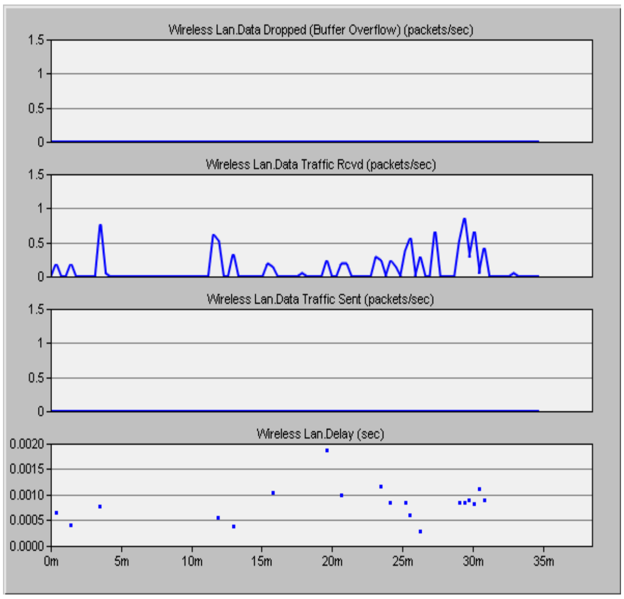

Figure 13. Node 01 graph with short retry limit of 9

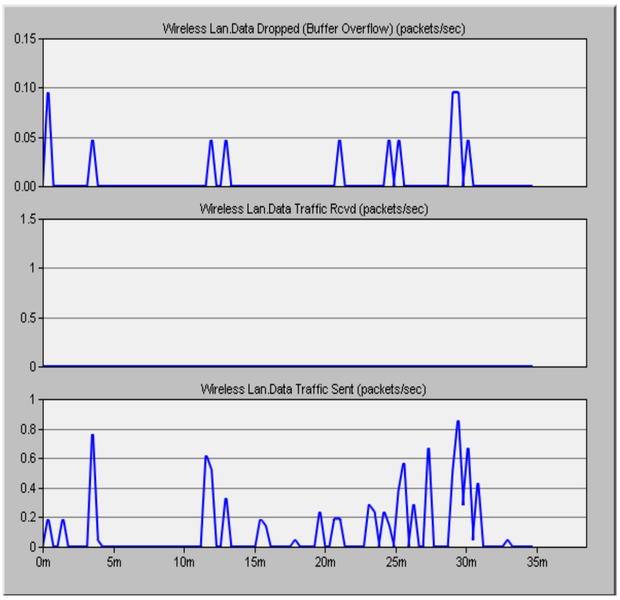

Figure 14. Node 02 graph with short retry limit of 11

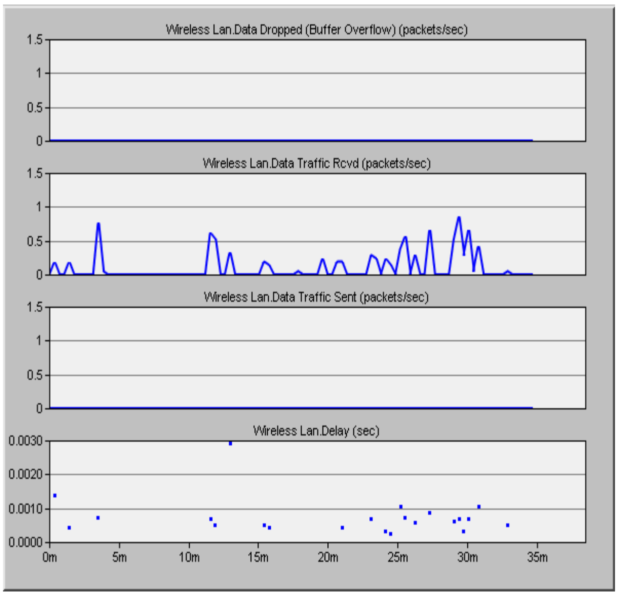

Figure 15. Node 03 graph with short retry limit of 13

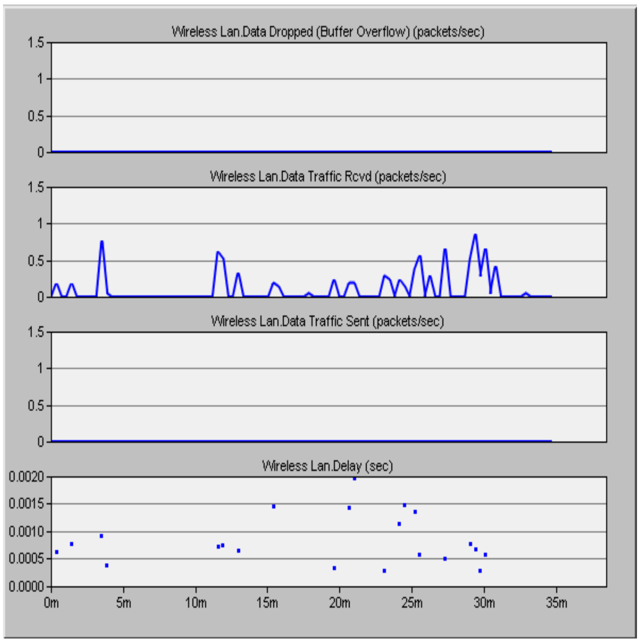

Figure 16. Node 04 graph with short retry limit of 15

E. Long retry limit

The simulated results are shown accordingly in Figure 17 represented as node 01 graph with long retry limit of 7, Figure 18 represented as node 02 graph with a long retry limit of 9, Figure 19 represented as node 03 graph with a long retry limit of 11, Figure 20 represented as node 04 graph with a long retry limit of 13.

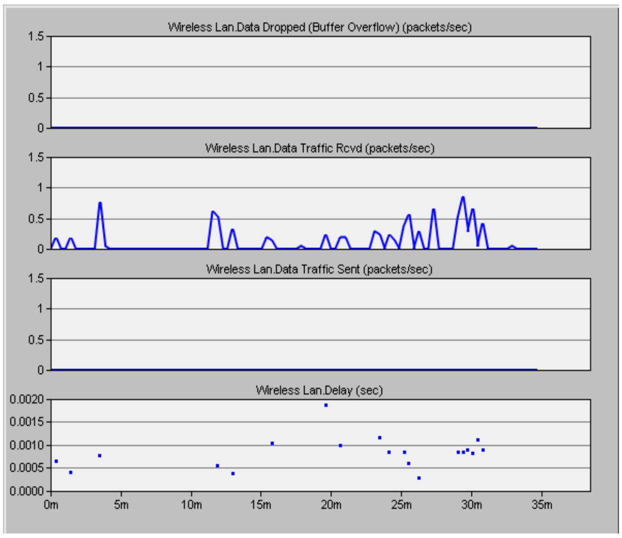

Figure 17. Node 01 graph with long retry limit of 7

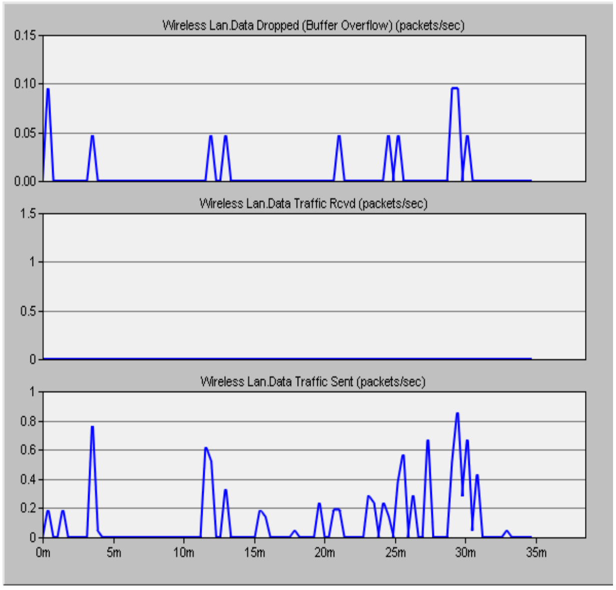

Figure 18. Node 02 graph with long retry limit of 9

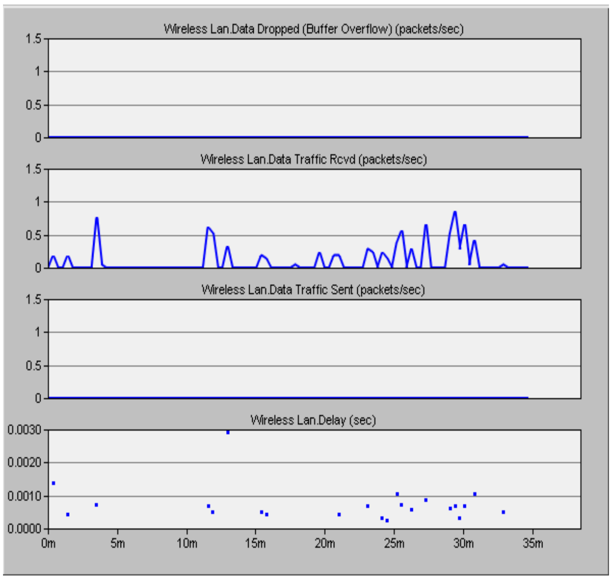

Figure 19. Node 03 graph with long retry limit of 11

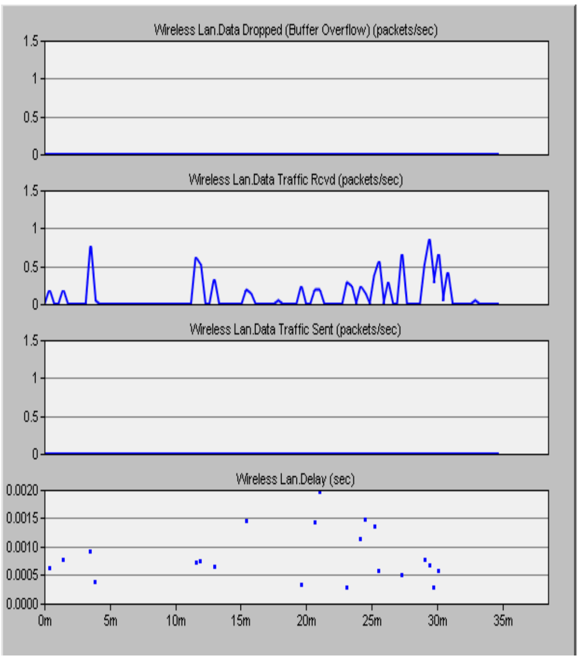

Figure 20. Node 04 graph with long retry limit of 13

4. EXPERIMENTAL RESULTS

The experimental results applied on a network size with a range of about 1500 x 1500 km with a Vehicle speed of 80 km/h with a simulation time 35 minutes has the following pondered transmission parameters optimized. The graphical representations of the tuned parameters have been showcased in detail. The fine-tuning of these transmission parameters. All the simulations were deployed using the simulator OPNET MODELER 14.5.

5. CONCLUSION

As it is clear from the experiments that we come across different results when transmission parameters values are changed. Henceforth, this study proposes optimum values of parameters in varied circumstances where resources are limited and user satisfaction is required.

6. FUTURE ENHANCEMENTS

In this paper, we have concentrated on the experimental part of the exertion. For forthcoming enhancements some algorithms can be conceived, which will cater the users resource requirements automatically by changing the transmission parameter values accordingly. The proposed algorithm that updates the parameter values dynamically would also facilitate the management of resources and network conditions at diverse states. Some distributed scheme may be used for better management of those algorithms, as VANETs are mostly distributed networks.

7. REFERENCES

[1] Jothi, K. R., and A. Ebenezer Jeyakumar. "Optimization and Quality-of-Service Protocols in VANETs: A Review." *Artificial Intelligence and Evolutionary Algorithms in Engineering Systems*. Springer India, 275-284, 2015.

[2] Hornman, P. W. H. M. "QoS support for traffic safety applications in VANET communication infrastructures." *University of Twente, Enschede, The Netherlands* (2010).

[3] IEEE P802.11p/D3.0, "Draft Amendment to Standard for Information Technology-Telecommunications and Information Exchange Between Systems-Local and Metropolitan Area Networks- Specific requirements - Part

11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications- Amendment 7: Wireless Access in Vehicular Environment", 2007.

[4] Toutouh, J., García-Nieto, J., & Alba, E. (2012). Intelligent OLSR routing protocol optimization for VANETs. *Vehicular Technology, IEEE Transactions on*, **61**(4), 1884-1894.

[5] Chauhan, R. K., and Arzoo Dahiya. "AODV extension using ant colony optimization for scalable routing in VANETs." *Journal of Emerging Trends in Computing and Information Sciences* 3.2 (2012): 241-244.

[6] Vanhatupa, Timo, Marko Hännikäinen, and Timo D. Hämäläinen. "Genetic algorithm to optimize node placement and configuration for WLAN planning."*Wireless Communication Systems, 2007. ISWCS 2007. 4th International Symposium on*. IEEE, 2007.

[7] Sattari, Mohammad Reza Jabbarpour. "Ant-Based Vehicle Congestion Avoidance Framework Using Vehicular Networks". Diss. *University of Malaya Kuala Lumpur*, 2015.

[8] S. Olariu, M. Eltoweissy and M. Younis, "Towards Autonomous Vehicular Clouds," *ICST Transactions on Mobile Communications and Applications*, vol. **11**, no. 7-9, pp. 1-11, 2011.

[9] D. Bernstein, N. Vidovic and S. Modi, "A Cloud PAAS for High Scale, Function, and Velocity Mobile Applications - With Reference Application as the Fully Connected Car, in *Proc. Fifth International Conference on Systems and Networks Communications* (ICSNC), pp. 117-123, 2010.

[10] R. Hussain, J. Son, H. Eun, S. Kim and H. Oh, "Rethinking Vehicular Communications: Merging VANET with cloud computing", in *Proc. IEEE 4th International Conference on Cloud Computing Technology and Science*, pp. 606-609, 2012.

[11] Rawat, Danda B., et al. "Dynamic adaptation of joint transmission power and contention window in VANET." *Vehicular Technology Conference Fall (VTC 2009-Fall), 2009 IEEE 70th*. IEEE, 2009.

[12] Balon, Nathan, and Jinhua Guo. "Increasing broadcast reliability in vehicular ad hoc networks." *Proceedings of the 3rd international workshop on Vehicular ad hoc networks*. ACM, 2006.

[13] M. M. Artimy, W. Robertson, and W. J. Phillips, "Assignment of dynamic transmission range based on estimation of vehicle density," *VANET'05, Cologne, Germany*, 40 - 48, September 2005.

[14] Verma, Karan, Halabi Hasbullah, and Ajit Kumar. "An efficient defense method against UDP spoofed flooding traffic of denial of service (DoS) attacks in VANET." *Advance Computing Conference (IACC), 2013 IEEE 3rd International*. IEEE, 2013.

[15] Schmidt, Robert Karl, et al. "Degradation of Transmission Range in VANETS caused by Interference." *PIK-Praxis der Informationsverarbeitung und Kommunikation* 32.4 (2009): 224-234.

[16] Harigovindan, Vettath Pathayapurayil, Anchare V. Babu, and Lillykutty Jacob. "Ensuring fair access in IEEE 802.11 p-based vehicle-to-infrastructure networks." *EURASIP Journal on Wireless Communications and Networking*, 2012(1), 1-17 (2012).

[17] E Karamad, F Ashtiani, A modified 802.11-based MAC scheme to assure Fair Access for vehicle-to-roadside communications. *Comput Commun*. **31**(12), 2898–2906 (2008).

[18] W Alasmary, W Zhuang, Mobility impact in IEEE 802.11p infrastructure less vehicular networks. *Ad Hoc Networks*. **10**(2), 222–230 (2010).

[19] Rawat, Danda B., et al. "Enhancing VANET performance by joint adaptation of transmission power and contention window size." *Parallel and Distributed Systems, IEEE Transactions on* **22**(9), 1528-1535 (2011).