CHAPTER 10

CONCLUSION AND FUTURE WORK

10.1 CONCLUSION

MANETs are a newer archetype of wireless communication for highly movable users. These are composite, distributed, momentary, possibly multi-hop, wire-less, infrastructure-less networks made up of a collection of dynamically self-organizing, self-creating, self-configuring, self-adaptive, self-administering, indiscriminately as well as arbitrarily located wireless transmitting and relaying nodes, which can possibly be bandwidth-constraint as well as resource (battery power)-constrained. They construct a transitory, co-operative network amongst themselves without using any such available pre-existing infrastructure of communication which can be formed and de-formed wherever and any-moment “on the fly” in absence of any central system administration. In circumstances, where mobile telephony is either impossible or difficult to initiate, perhaps MANETs can be of great help. Dependency on a costly infrastructure can be heavily reduced using MANETs as equated to current situation in telecommunication wired as well as wireless networks. So, they can be described as an assemblage of mobile nodes, having no pre-existing, pre-determined association, which communicates through each other via wireless links, thereby forming a dynamic graph. However, MANETs suffers from limitations in comparison to wireline networks such as time-varying and asymmetric broadcast features, lesser reliability, hidden terminal and exposed terminal problems, limited bandwidth, lower energy efficiency, fading-noise-interference conditions, multiple access, narrow wireless broadcast ranges, constrained battery power operation, limited resources at disposal, channel is unprotected from outside signals, absence of everlasting link, Routing, Multicasting, Moderated TCP performance, Security and Privacy etc.

Wireless networks is a “sea” of channels, with the objective to deliver required performance in the most proficient manner, it becomes imperative for the ‘Traffic Managers’ to re-assign unused bandwidth to subscribers in addition to administer Quality of Service (QoS) route by regulating congestion via installing efficient routing mechanisms as well as congestion control mechanisms. Routing is process of finding feasible, shortest (i.e. minimum hop length) route to be followed by data packets from an origin node towards target node utilizing most resourceful route. Productivity of route can be gauged by evaluating a number of performance parameters such as count of hops, Mobility, etc. Congestion control scheme
aims at saving network from congestion collapse. It ensures that users increase their traffic load as long as there is no congestion in network and decrease their traffic load after encountering congestions. As a result, network load oscillates around an operation state where high network utilization is achieved and delay is moderate. Congestion control is a dynamic resource management problem that can be formulated as a control system. QoS is an assurance by network to fulfill pre-determined / promised service performance parameters / controls for user like end-to-end delay, available bandwidth, probability of packet loss, total network throughput etc. Apparently, to honor this assurance, sufficient network resources must be made available when a service is invoked. The very first indispensable job is to discover a right route amid origin till the target(s) node(s) through network, or route it through a network having required resources available for meeting QoS control statistics for the desired service. Another indispensable job of QoS is the task of resource request, identification, and reservation.

Here, varied Routing Protocol of MANETs have been extensively studied along with their responsibilities, major challenges faced by them, main requirements, their varied Taxonomies. Also, Comparative Analysis is done along with Evaluation of Various Existing Routing Protocols for two parameters namely Count of Nodes (Number of Nodes) as well as of Mobility of Nodes on four Simulation Metrics namely End-to-End Delay (seconds), Throughput (Kb/second), Packet Dropped (Number), and PDR (%) using Qualnet as Simulator is carried out. However, it is also established from simulation results of varied routing protocols that all of them exhibit different results under uniform MANET’s traffic environment, scenario and application environment. In MANETs, traffic management is one of the vital issues which are affected by routing to a great extent. Varied protocols performance is found thereby a conclusion is reached that any of these protocols cannot be nominated as best protocol as performance of one is better on one parameter; another performs better on second parameter. Therefore, there is a necessity and possibility of scheming effectual Routing Protocols for MANET’s by transforming existing ones or developing newer ones according to necessities.

Here, Multicast Routing protocols have been extensively studied along with their types, intentions, Research Methodology, Taxonomy of various Multicast Routing Protocols. Also, Simulation Environment of Qualnet along with its Protocol Stack, results and corresponding discussion on Application Layer performance metrics namely Multicast Received Average End-to-End Delay, Throughput (bits/second), Average Jitter, Average Total Message Transmitted, Average Total Message Received, Multicast Packet Transmitted as Data Source,
and Average Total Message Received is carried out for four protocols namely ODMRP, MOSPF, DVMRP and PIM-DM is completed. It can be concluded from the simulation results that the reliability of ODMRP and DVMRP protocols is better as compared to two other protocols. So, there are various shortcomings in different routing protocols and it is difficult to choose routing protocol for different situations as there is trade-off between various protocols. Consequently, there is an inevitability and need of wily efficacious Multicast Routing Protocols for MANET’s by makeover of prevailing ones or evolving fresher ones according to requirements.

Here, numerous Routing Optimization Techniques have been extensively studied such as ACO, PSO, ABC, CSO, AIS, GSO, BFOA, SI, basic algorithm of original BFOA and new Algorithm is proposed along with its flowchart, its simulation environment in MATLAB thereby realizing results and their analysis with varied count of nodes (ranging from 10 to 30) by comparing parameters with BFOA as well as without BFOA for three performance metrics namely Total Packet Transmitted, Total Delay, Total PDR as well as their Average result and finally conclusion is reached. After scrutiny of results, we reached the conclusion that Total Packet in our network (with BFOA) gets reduced because there is no congestion in our network, so packet gets delivered, at first attempt. Total Delay is reduced in our network because it specifies the delay from origin till target. Also packets get transmitted from new path every time, so there is no chance for congestion to occur and packets are delivered in the first attempt thereby the Total Delay is reduced. PDR is also increased in our network because packets get deliver to target node at first attempt and every time a new path is used so more number of packets can be transmitted in our network. So, we can say that our Proposed Algorithm supported network is more efficient than preceding work.

Here, Congestion Control, causes for Congestion collapse in wireless multi-hop network, Existing Techniques like C3TCP, TCP-AP, TCP/RCWE, Edge-based approach as well as Ad-hoc TCP (ADTCP) have been extensively studied. Here, ADTCP is selected here for comparison with Proposed Technique named as Modified Adaptive Dynamic Congestion Control Technique (MADC-AODV) on simulation environment in Network Simulator (ns-2) thereby realizing results and their analysis for eight performance metrics namely Worst Case End to End Delay, Average End to End Delay, Packet Delivery Ratio (PDR), Normalized routing overhead ratio (NROH), Energy consumed (mu joules), Average Number of Hopes Traversed (intermediate node traversed count), Count (Number) of Packets Dropped, and Throughput for four protocols namely DSR, AODV, AD-TCP and our proposed Modified Adaptive Dynamic Congestion Control Technique (MADC-AODV). Henceforth, a
conclusion is reached that our proposed method performs better than others on most of the performance metrics.

Here, TCP Performance in MANETs has been extensively studied along with impact of several factors on it such as High BER, Route Failures, Path Asymmetry, Network Partitioning, Power Scarcity, Multipath Routing, Interaction amongst MAC Protocol and TCP, Hidden and Exposed Node Impact, Congestion Control in MANETs along with its phases, Problem Identification in Variants of TCP like TCP Tahoe, TCP Reno, TCP New Reno, TCP Vegas, TCP-SACK, TCP-FACK, and Proposed Modified TCP Vegas using Network Simulator (ns-2.35 version). Henceforth, realized results and their analysis on the basis of mobility of nodes as well as Count (number) of nodes in the network for four performance metrics namely Packet Dropped, End-to-End Delay, Throughput, and PDR helped in reaching a final conclusion. The simulations presented here show the effectiveness of throughput, End-To-End Delay and congestion window (cwnd) in the network. After analyzing performance from simulated data and graphs, we found that Proposed Modified TCP Vegas is better than any other TCP variants for sending data and information due to its better Congestion Window (cwnd) and Avg. end- to- end delay. It also showed a consistent performance as an average, whereas the others had varied response. This is due to fine tuning of congestion window size by taking into consideration the RTT of a packet, whereas other protocols like TCP New Reno, SACK, and Reno continue to increase their window size until packet loss is detected. We hope these results will be of some use in future study in this area helping the growing interest and resulting in the required protocol for today’s high demanding world.

Here, Quality of Service (QoS) Routing Protocols for MANETs have been extensively studied such as Existing QOS Algorithm (CLAODV) as well as our Proposed QOS Routing Protocol-Adaptive Hybrid QoS Routing Protocol (AH-AODV) for Estimation as well as steps for selection of QoS Route contingent on Bandwidth, Admission Control, Delay, Jitter and Packet Loss along with Route Metric, Route Selection, Route weights, Weighting Method using Network Simulator (ns-2.29 version) thereby realizing results and their analysis on the basis of Count (number) of nodes in the network (ranging from 20 to 100), Rate of Packets (Count/second) (varied from 1 to 16) as well as Pause Time (second) (varied from 10 to 240) for three performance metrics namely End-to-End Delay, Control Overheads and PDR thereby finally conclusion is reached. So, focus is on QoS and related issues in the routing protocols in MANETs. Our proposed protocol (AH- AODV) improves the performance of
the network, but it is not a perfect solution to guarantee an optimum value of all performance parameters. We have not considered complexity of our proposed protocol.

Finally, Traffic Management has been exclusively focused along with existing and proposed one, Taxonomy of Traffic based upon Payload and Statistical analysis like PBNS, PBFS, and MBFS, Deep Packet Inspection, Taxonomy methods, benefits of Traffic Taxonomy, Statistical Bunching, Traffic Clustering means like ‘K-Means’, Hierarchical Clustering using MATLAB as Simulator thereby realizing results and their analysis on the basis of Count (number) of nodes in the network (ranging from 10 to 100) for three performance metrics namely End-to-End Delay, Normalized Routing Overhead and Total Throughput thereby finally conclusion is reached. So, Traffic classification system is a major technique for community as well as method protection within elaborate surroundings akin to cloud computing headquartered atmosphere. To gain robust network traffic classification, a newer scheme is endorsed here to sort out main issues of unidentified purposes within the decisive effort of a minor ‘supervised training set’. This proposed approach owns some of the best potential of sensing unidentified flows produced through unidentified functions thereby using the relationship expertise amongst real-life community site visitors for lifting the classification performance. Reducing quantity of packets in drift samples may just cut back the computing overhead in collecting the elements, moreover, lowering the quantity of features amassed may even decrease the computing and memory overhead each in amassing elements and in classification. However, on the contrary ideally more know-how (more packets and more elements) on a go with the flow can be required as a way to furnish higher precision. The procedure is capable to categorize the packet into given three courses namely touchy, Malicious, and nice Effort; the outcome exhibit that the process is capable of producing greater than 80% of accurate results.

10.2 Future Scope

Our review suggests that in forthcoming efforts, analysis of various routing algorithm, Congestion control mechanisms, QoS supported mechanisms which in totality can significantly improve Traffic Management of MANETs. In future, exploration can be done on the effectiveness of these Traffic Management techniques in a particular situation where a particular protocol will perform better and making its usage in a particular scenario.

1. Proposed Techniques can be extended to real life situations.
2. The work could be tested on different set of protocols and different topologies.
3. Security can also be provided on these networks in future.
4. We have used MATLAB, ns-2, Qual Net for simulations of different sections of our study. Comparisons of set of protocols used in our research can be done on other network simulators like OPNET in future.

5. We have used AODV as Base protocol. Comparisons of set of protocols used in our research can be done on other Base protocol like DSR, ZRP etc. in future.

6. We have used Random Way Point as our Simulation Mobility Model in our research. Other Simulation Mobility Model like Random Walk Through or Manhattan can also be used in future.

7. We have used CBR as Traffic type in our research. Other Traffic type like FTP or VBR etc. can also be used in future.

8. We have studied mobility as well as scalability here in our research on X-axis which can be altered in future researches to find out their effects on varied performance matrices.

9. We have performed here analysis of TCP algorithms as well as comparison of them. In future, exploration of effects of congestion avoidance algorithm on all TCP variants and MANETs routing protocol can be carried out. In order to accurately simulate realistic congested network environment, there is a need to experiment with more multiple TCP flows. So, we propose to develop new algorithm for congestion avoidance in congested network to improve TCP environment.

10. Here, LDA process has been proposed for site visitor's classification, which is able to toughen classification performance with no trouble by incorporating correlated expertise into the classification approach. In future work, analysis of more classification process as well as augmenting its performance both theoretically as well as experiential views can be carried out. A gigantic count of experiments shall be approved for two actual-world site visitor’s data units to authenticate this proposed method. The traffic classification performance will probably be extended further for resolving severe complex situation of only a fewer count of coaching samples.