Chapter 2

Background Study

2.1 Literature Review

Brief overview of some existing congestion control schemes have been described in this section:

Van Jacobson [28] suggested new algorithms for the management of congestion which include the time estimation, back-off retransmission, slow system, better identification strategy, and changing window measurement. Authors proposed that the movement on the TCP would follow packet conservation rule. They proposed that once every old packet is processed, no new packets must be permitted to reach the network. Congestion can be avoided to a great degree by these processes. Royer and Toh [53] describe the new routing schemes used by MANETs. They are defined as table-driven and demand-type according to routing strategy. Mauve et. al [37] suggested a multi-cast routing protocol for MANETs. A community membership scheme was supported by the specified Scalable Position Based Multicast (SPBM) using GPS. The data transported in this way are not vulnerable to alterations in the configuration of the network. This determination on forwarding depends on the members of the party situated in the direction. They also noted that the party membership overhead trusts on nodes, but is irrespective of the multi-cast transmitters for a particular class. Through the use of simulation and by statistical analysis, they proved their opinion. Shakkottai et al. [57] noted that it is difficult to simulate congestion control algorithms, especially the definition of the congestion window. To calculate the delay, several differential equations were written. The author overlooked the network's complexity to make it easier. They explained the probability of using this deterministic model for congestion-free networks.

In future, MANET systems are supposed to be based on an all-IP design and able to hold interactive provisions,like recording of voice,video and data-handling in real-time. For the transmission of real-time audio and video packets, multimedia applications impose strict specifications on networks. These current specifications typically involve a fast packet delivery capacity, a low latency and a slight jitter, relative to the specifications of conventional data-only applications. The delay difference between successive packets is often called jitter. For real-time flows, it is a major evaluation metric. A smaller jitter suggests a larger flow of content. In MANET, existing routing protocol, find suitable transmitting paths from the origin of stream to the desired location not taking into the consideration of existing multimedia device network activity and QoS specifications. The key reasons for packet failure, longer latency and routing overhead for streaming multimedia in MANETs are more agility, interference, and channel error. Such functionality can be accomplished by the planned QoS-Aware Congestion Adaptive Routing (QACAR) by choosing a path that can fulfil application requirements or by offering sufficient network input if application requirements can not be met. In order to gain QoS help, the protocol should divide system collection into various earliness states and implement priority scheduling and queuing supervising techniques. In order to serve QoS in ad hoc system, many very critical things, such as the routing scheme, operation model, entry management, resource agreement, data flow planning, signalling strategies and MAC rules, need to be considered. Tran and Raghavendra [60] proposed that the routing protocols should not only be aware of congestion for large-scale communication of traffic jams such as multimedia content, but it should also respond to network congestion. To satisfy the above criteria, a congestion and adaptive routing protocol has been proposed to avoid less packet loss, then compared to other routing protocols, which are non adaptive to congestion and seek to prevent other than reactively cope with congestion from happening in first place. If any node faces congestion on the primary path, the node can choose a bypass path. Selected bypass path properties may or may not be the same as the main route. In CRP, this criterion was not regarded. So the stated application condition will not be fulfilled. Chen and Heinzelman [5] work on bandwidth estimation for MANET and it is QOS-Aware Routing Protocol. The main function of existing QSR routing protocol is to integrate the operation mechanism and its feedback control system. In order to respond to network traffic, this protocol is used to estimate bandwidth and fits well with stable network topology.

A new algorithm, RED (Random Early Detection), has been introduced by Floyd and Jacobson [16]. The basic framework of this strategy is that by calculating the relative queue length, the router can feel the congestion. The router alerts the sender node until the network overload has happened. To encourage the source to change the packet transmission rate to prevent queue overload and network congestion. There are two stages of RED algorithm.In first stage, total queue length is calculated and in second stage, decrease likelihood is calculated. It is used to determine whether or not packets are lost, and is the signal of network congestion if packet drop occurs. Since the RED algorithm depends on queue lengths, evaluating the magnitude of network congestion is an intrinsic challenge. SRED [21] thus needs a broad variety of parameters to function effectively under various forms of congestion situations. Flow Random Early Drop (FRED) [18] is a added form of RED that employs multiple falling decisions per individual flow system for connexions of different bandwidth uses. FRED also keeps a record of flows within the buffer that have packets, so the FRED throughput is equal to the size of the buffer. The advantages of per flow queuing and round robin scheduling can be accomplished by FRED with considerably less complexity. Many of the queue control systems developed which are RED-oriented [25], [61], [32].

Queue management systems typically have three queue management components: (1) the measure of congestion, (2) congestion control function and (3) the process of feedback [8], [31], [56] and [54]. The indicator for congestion is used to assess whether there is congestion. The queue management for the role of congestion control dictates what should be done when it senses congestion. The process for input the congestion signal is to warn the origin to adjust its measures of transmission. The role of congestion control is to drop all receiving packets when the queue becomes full, with a probability of one (1), and packets are dropped by the congestion signal.

The goal of the rate-based AQM is to maintain the rate of message achievement at the queue, that is some proportion of the capability of the link. It regulates queue length circuitously [6]. Moreover, a queue-based AQM, adjusts the size of the queue [29] to assure the aim of the routing [55], [23], [34].

To support the control of network output by TCP, the active queue management mechanism has been implemented to allow the implicated router. As an efficient technique to manage congestion, AQM has been an enticing focus of research [42]. In fact, the router-implemented AQM function has significant. For example, the creation of performance for the network can not be improving the usage of the network, minimising packet drops, and maintaining low-delay, best-effort service [48]. Some control theory based scheme has been developed such as, PI [63], robust control [9], prescribed performance control [64], and state-feedback congestion mechanism [66]. In practise, it is well-known about time varying characteristics of internet parameter,examples are - load factors, round trip time and connection power. However, the conventional operate parameters found in unique network assumptions which can not be modified, resulting in network output sensitivity in various scenarios. In this context, few researchers developed adaptive routing [65], those are good for uncertain environment, such as [51], [52], [62] to name a few.

The distinction between these systems lies primarily in the process of parameter-adjustment. Their pathways for dropping-probability adaptation in response to network conditions are distinct. In Droptail, arrival packets are lowered while there is a queue overflow. At congested connexions, Droptail has a wide queue length and a high packet loss rate. In fact, Droptail leads to a process called global synchronisation. As global synchronisation happens, the overall throughput of TCP flows reduces. Unless the queue is full [67], the droptail queue is unable to signal congestion by falling packets. It is simply a clear control of the queue and does little to stop congestion. However, owing to its simplicity, Droptail is the most common queue management scheme [30]. The RED algorithm estimates a time-averaged queue size. There are Two thresholds which are used to compare to the average queue size.These are minimum and maximum threshold.There is no packet dropped. If the average queue size is less than the median,any arriving packet is dropped if the average queue size approaches the limit. When the time-average queue size approaches a minimum with a probability p that increases linearly until it reaches the highest packet falling probability $(maxp)$ at the maximum average queue size, packets are dropped probabilistically. Instead of dropping them, RED [19] also has an option to mark packets. BLUE [14] uses buffer overload and link-idle incidents to tackle congestion instead of estimating the average queue capacity. If, over a certain amount of time, the queue size tends to reach a certain value, called freeze time, and the likelihood of a decrease will be increased by a constant value of $d1$. In the other hand, if the connexion stays idle during the freeze time, the likelihood of a decrease will be diminished by a constant value of $d2$. When handling the queue size, the SRED [38] algorithm has its own characteristics. First, in order to change the drop chance, SRED [38] will figure out the number of active connexions (or flows). Traffic load is determined by initialising the hit parameter equal to 0 first and generating an empty zombie list. Its source and destination addresses are placed in the list for each packet delivery. Once the list is complete, with each subsequent packet delivery, a random zombie is picked up from the list and its content is correlated with the source and destination of the current packet. If a match occurs, hit is set to one. Otherwise, hit is set to 0, and the content of this zombie may be replaced with the source and destination of this new packet with a certain probability of p. REM [54] aims to maintain high utilisation, low losses and a low latency in queuing. If a match occurs, the hit is set to one, otherwise, hit is set to 0 and the content of this zombie can be replaced with the source and destination of this new packet with a certain probability of p. REM [54] aims to achieve high utilisation, low loss and low latency in queuing. In overload situations, the packet arrival rate exceeds the link capacity and there is an increase in router queue. As a result the congestion in a network shoot up and causes more packet loss or labels the signal so that TCP senders decrease the rate of transmission.

The main aim of the proposed research work is to change and update the current RED algorithm in order to improve the performance of the new models developed for MANNET. A difficult problem is the design of suitable and reliable routing protocols in a network like this. In specific, on-demand routing protocols are commonly researched since they use fewer bandwidth than proactive protocols.

The goal of the AQM based routing protocol is to maintain the rate of packet reaching at the waiting line, that is some proportion of the capability of the link. It regulates queue length circuitously [6]. A queue-based AQM adjusts on the (fast or average) dimension of the waiting line [29] and its activity is to maintain the size of the queue at a level of objective measure [55], [23], [34].

In this research work, we explore and solve the problem for AQM based ad hoc mobile networks protocol to provide quality of service. The current work focuses on providing approaches through non-immediate layer connections, which contributes to decreased connection failures and increased packet delivery. In addition, it attempts to use routing protocol link prediction to prevent network layer link breaks and to use regulated power to relay control and data packets to increase its value on the MAC layer.

2.2 Problem Domain

The main aim of the proposed research work is to change and update the current RED algorithm in order to improve the performance of the new models developed for MANET. A difficult problem is the design of suitable and reliable routing protocols in a network like this. In specific, on-demand routing protocols are commonly researched since they use fewer bandwidth than proactive protocols. For example, work done by Perkins et. al. [46] is based mainly on this type of protocol (AODV). Ad-Hoc on demand distance vector(AODV) and Dynamic resource routing are two important on demand Ad-Hoc routing protocols on which most commonly research workers have been done. The drawback of these two protocols have been seen on the watch of Perkins et al. [47], Broch et al. [2], and Das et al. [11]. The key explanation is that with each data session, all create and depend on a single path. Whenever the active route has a connexion split, each of the two routing protocols would trigger a mechanism for route exploration.

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It has been discovered that not many authors thoroughly define the AQM algorithm which they are proposing. There is a need to encourage AQM to adopt an agreed format for researchers to outline their work in a standard algorithmic format with performance results.

In AQM based research, different authors use different performances parameters to prove the efficacy of their proposed AQM schemes. These include fairness, jitter delay, packet loss, throughput and goodput of the application of links use, queue stability, responsiveness, sophistication and robustness. It could be useful for AQM studies to define standardised definitions in conjunction with uniform implementation, for all these metrics based thresholds where applicable. A prevalent calculation and set of statistics may also be able to applicable. It could be helpful to have a common, online and open AQM performance repository of results for the researchers to upload those results with their algorithm. This makes an ongoing comparison possible. Often, this will have more definite way of judging success in terms of progression of the performance of the whole research arena of AQM. However there are some findings on the AQM schemes based on the performance metric, the evolutionary procedure of AQM is a problem because the web environment is more complicated.

RED's benefits are recognised by few researchers over drop tail routers. But there are some issues that decrease its efficiency. We propose to make some adjustments to the classic RED design unlike current RED improvement strategies. The majority of the original RED remains constant. The limitations of RED algorithm are as follows:

(i) If congestion is too high, it is impossible for the gateway to controlling the average queue size by numbering a fraction at most packet max_p so the average size of the queue will surpass. The max_{th} and the gateway mark of each packet before each packet is picked.

(ii) The coming data packet is discarded with Pa probability even when the current queue size is empty. This is happened when the average queue size belongs between the minimum and maximum value.

(iii) As communications minimize their sending percentage, then window instantly decreases but the average queue size would decline slowly. If the average queue length is higher, then entering data will be fall with greater probability in no congestion condition.

(iv) If congestion becomes instantly high, then that instant queue size will be increased and the limits of queue will be raised and exceeded but no packets will be randomly dropped because the average size of the queue is less than $min_t h$.

(v) RED efficiency is dependent on the number of competitors participating in flows / sources. When the load is high, the RED output is degraded.

(vi) Wild queue fluctuation is detected with RED when the traffic load is change.

(vii) RED achievement is conscious to the size of the packet.

(viii) RED output is incredibly susceptible to the configurations of its variables.

In this research work, we explore and solve the problem for AQM based ad hoc mobile networks protocol to provide quality of service. The current work focuses on providing approaches through non-immediate layer connections, which contributes to decreased connection failures and increased packet delivery. In addition, it attempts to use routing protocol link prediction to prevent network layer link from break and to use regulated power to relay control and data packets to increase its value on the MAC layer.

2.3 Motivation

The main motive of the proposed research work is to modify and upgrade the existing RED algorithm to improve the performance of the new models, developed for streaming multimedia through MANET. The implementation of appropriate and efficient routing protocols in a network like this is a difficult problem.

After surveying briefly the following aims of this research has been listed below:

- To explore the congestion window, models of mobility and the RED mechanism principle.
- To describe the variables that are liable for congestion in RED.
- To evaluate the performance of proposed innovative RED based algorithms.
- To develop RED based model for Congestion Control in Mobile Ad hoc Networks using AQM.
- Achieve higher performance (throughput and goodput) than RED based algorithms using AQM.

2.4 Objectives and Scope

The preliminary expected target of the suggested research work is related to the improvement of the performance of existing algorithms for streaming data over ad hoc networks. The specific purposes of the research work carried out are listed below.

- To study and compare the simulation performance of various RED based ad hoc routing protocols.

- To design a congestion control routing protocol with AQM for improving the packet delivery performance of ad hoc Network.
- To design a congestion control Ad-Hoc network having an efficient routing algorithm,that can work at various network situations.
- To evaluate the performance of these algorithms with respect to packet delivery ratio, control overhead and delay for the existing routing protocols.

To achieve this objective, the following methods have been proposed.

(i) **Application of Dynamic Weight with Distance to Improve the Performance of RED (ADWD-RED-IP)**. Here, the dynamic weight parameter Dq is presented with a probability of Pq to increase the RED efficiency.

(ii) **Active Queue Management in RED to Reduce Packet Loss (AQM-RED-RPL)**. Here, we accomplish less packet drop by making many refinements and monitoring both the average queue size and the immediate queue size of the packet dropping function.

(iii) **A Predictable Active Queue Management to Reduce Sensitivity of RED Parameter (PAQM-RS-RED)**, which can also be incorporated as a clear demonstration in under RED routers, eliminates the sensitivity to variables that influence the functioning of RED and in a broad range of traffic situations can reach a clearly defined target average queue length reliable.

(iv) **An Innovative Active Queue Management Model Through Threshold Adjustment Using Queue Size (IAQM-TA-QZ)** provides an algorithm that adapts the threshold parameters and probability of packet drop as per the load condition of traffic.

(v) **A Nobel Congestion Control Algorithm Using Buffer Occupancy RED (CCA-BO-RED)** which measure the rate of occupancy of the queue and treat it as a congestion parameter that will be predicted when the queue is crowded. This method is used to modify RED variables dynamic.

(vi) Finally, we have proposed a new approach (**Active Queue Management in RED considering Critical Point on Target Queue: AQM-RED-CPTQ**). In order to provide greater congestion management over the network while also preserving the value of RED, it works to enhance these criteria. This model will introduce Critical Point on Target Queue and some traits of RED and its variations.

These algorithms support QoS and adapt to network congestion. The validity of these algorithms has been tested on various network scenarios. The fast and effective convergence of the results of our proposed algorithms show that they are efficient algorithms for streaming data in mobile ad hoc networks. The details of the proposed works are discussed in the relevant chapters.

2.5 Contributions

In this investigation, we have proposed six models to improve the performance in AQM:

In the first model, we have proposed an **Application of Dynamic Weight with Distance to Improve the Performance of RED (ADWD-RED-IP)**. The dynamic weight parameter D_q is presented with a probability of P_q to increase the RED efficiency. We add a new range variable here and enhance the priority queue with the existing RED algorithm to boost network performance. Once the typical queue length with probability P_b is close to the minimum threshold value, enhance RED (**ADWD-RED-IP**) automatically sets queue parameters based on queue conditions and handles queuing delay and enhances throughput.

In the second model, a new active queue management framework has been defined that aims at reducing the rate of packet loss in an easy and scalable way. We have made a few improvements to the existing RED scheme's packet drop feature. The majority of the initial RED is now unchanged. We have accomplished this by making many refinements and monitoring both the average queue size and the immediate queue size of the packet dropping function. Simulations demonstrate that our approach **Active Queue Management in RED to Reduce Packet Loss (AQM-RED-RPL)** provides the higher throughput and lower packet drops compared with RED , BLUE, REM, FRED, LDC and SRED. Since, this is familiar with RED which indicates that the proposed solution can be easily upgraded / replaced by existing RED implementations.

In the third model, **A Predictable Active Queue Management to Reduce Sensitivity of**

RED Parameter (PAQM-RS-RED), which can also be incorporated as a clear demonstration in under RED routers, eliminates the sensitivity to variables that influence the functioning of RED and in a broad range of traffic situations can reach a clearly defined target average queue length reliable. Based on a comprehensive experiment, we think that, this is robust enough for router implementation.

In forth model, **An Innovative Active Queue Management Model Through Threshold Adjustment Using Queue Size (IAQM-TA-QZ)** provides an algorithm that adapts the threshold parameters and probability of packet drop as per the load condition of traffic. The suggested solution would adopt an improved method to change the parameters of the RED queue thresholds to handle the maximum queue length effectively. The key point would be that this algorithm will definitely increase the efficiency of the model over the standard RED approach when traffic load varies and the queue length will be adjusted accordingly. In this model, an attempt has been made to make some changes in design and special implications of enhanced successful queue control to tackle time delay schemes by adopting threshold adjustment that can help to maintain proper queue size.

In the fifth model, we're proposing a new model **A Nobel Congestion Control Algorithm Using Buffer Occupancy RED (CCA-BO-RED)** with dynamic tuning of RED parameters. We measure the rate of occupancy of the queue for this reason and treat it as a congestion parameter that will be predicted when the queue is crowded. This method is used to modify RED variables dynamic. The simulator findings indicate the feasibility of the approach suggested.

Finally, we have proposed a new approach (**Active Queue Management in RED considering Critical Point on Target Queue: AQM-RED-CPTQ**). In order to provide greater congestion management over the network while preserving the value of RED, it works to enhance these criteria. This model will introduce Critical Point on Target Queue and some traits of RED and its variations. We simulate the algorithm that use the well-known network simulator NS-2, by compared it to the initial RED. Simulation results demonstrate that better queue size than RED is obtained by the proposed algorithm and the wait and losses are reduced.

Finally, we have compare these proposed models and find that our approach performs better than other existing models in terms of throughput, packet loss and goodput.

2.6 Thesis Outline

The thesis is organised, as follows:

Chapter 1: Introduction, MANET, routing in MANET, cross layer design, congestion in MANET, challenge for congestion control are described here.
Chapter 2: The review of the literature, problem domain, contribution has been described here. We too have provided the inspiration for the problems in this area and based on that the different objectives of the mobile Ad-Hoc network have been drawn. We have also explained various comparison metrics which are used to examine our proposed schemes.

In this thesis, six different approaches of congestion control algorithm have been developed namely the RED based. To improve the performance and accuracy different techniques are adopted to route the packet through MANET. The whole work of the thesis is subdivided into ten chapters.

Chapter 1

(Introduction)

This chapter offers a short description of the MANET routing protocol. Again RED based congestion control protocol, research objectives, a summary of contributions, organization of the thesis are included in this chapter.

Chapter 2

(Backgroung Study)

In this chapter, we have explored some background literature to construct the problem domain by which we can motivate ourself to finding the objectives of the thesis. Then some contributions are pointed out and finally thesis outlines are made.

Chapter 3

(Research Methodology)

In this chapter, different methodologies have been described. Limitations of existing routing algorithms, factors of congestion with their impacts are presented in this chapter.

Chapter 4
Model-1: ADWD-RED-IP
(Application of Dynamic Weight with Distance to Improve the Performance RED: ADWD-RED-IP)

In the conventional congestion management mechanism of Mobile Adhoc networks (MANET), RED faces new problems such as high packet drop ratio, efficiency loss and regular connection failures. Network congestion arises because the demand for network capacity is larger than the usable resources and when the connexion rates induced by the intermixing of heterogeneous network architectures are gradually mismatched. AQM offers a framework for safeguarding congestion from flows of individuals. RED is one of the strategies that utilises the successful queue management process. The basic principle behind the management of the RED queue is intended to spot ongoing congestion soon and pass congestion alert to a end nodes. Preventing congestion is the fundamental concept behind RED. This model (**Model-1: ADWD-RED-IP**) implements the dynamic weight parameter D_q with a probability P_q likelihood to maximise RED output, introduces a new variable in range and improves the priority queue with the current RED network performance enhancement algorithm. Improve RED automatically sets queue parameters according to queue conditions when the common queue duration is similar to the minimum threshold value with likelihood P_b, and manages queuing delays and increases throughput.

Chapter 5
Model-2: AQM-RED-RPL
(Active Queue Management in RED to reduce packet loss: AQM-RED-RPL)

An powerful congestion management mechanism operating on the intermediate gateways is RED. We have defined a modern active queue management framework aimed at growing the rate of packet loss in an easy and scalable way. We also have made a few improvements to the existing RED scheme's packet drop feature. The majority of the initial RED is now intact. We have accomplished this by making many refinements and monitoring both the average queue size and the instant queue size of the packet dropping feature. Simulations reveal that the maximum throughput and lowest packet drops are achieved by **Model-2: AQM-RED-RPL** than by RED , BLUE, REM, FRED, LDC and SRED. As this is completely compliant with RED, hence this solution can be quickly upgraded / replaced by current RED implementations.

Chapter 6
Model-3: PAQM-RS-RED
(A Predictable Active Queue Management to Reduce Sensitivity of RED Parameter: PAQM-RS-RED)

The RED active queue control scheme helps various operators on network to reach effective throughput and low latency simultaneously. But the average queue length varies with the congestion level and the RED parameter settings, so they are not predictable in advance. With minimal adjustments to the overall RED algorithm, our target in **Model-3: PAQM-RS-RED** is to resolve this problem. To do so, we are revising the 1997 Adaptive RED idea by Feng et al. [15] Although keeping the core concept unchanged, we make some algorithmic improvements to this plan, and then test its output using simulation. We notice that this model (**Model-3: PAQM-RS-RED**), which can be applied inside RED routers as a simple extension, eliminates vulnerability to parameters that influence the output of RED and, in a broad range of traffic scenarios, can consistently achieve a defined target average queue duration. We assume that, based on detailed simulations, **Model-3: PAQM-RS-RED** is fairly stable for router deployment.

Chapter 7
Model-4: IAQM-TA-QZ
(An Innovative Active Queue Management Model Through Threshold Adjustment Using Queue Size: IAQM-TA-QZ)

Without fixed topology / infrastructure, the mobile ad hoc network (MANET) comprises of different communicating nodes and networking equipment. Such elements of MANET traditionally interact with each other via wireless means of communication. The bottleneck existed at every intermediate node in this arrangement, that is in MANET, culminating in lengthy delays and packet failure, thereby degrading the overall efficiency of the entire network. Effective AQM, such as Random Early Detection [RED], is one way to control this bottleneck. Using of RED implies a great deal of ambiguity since it relies heavily on values of defined parameters that extract the average queue length. It is incredibly necessary to change these parameters according to the existing traffic load. As the queue length of its nodes is changed with respect to the adjustments in the current traffic load, a network will operate at its optimum. This **Model-4: IAQM-TA-QZ** includes an algorithm that varies the parameters of its threshold and the likelihood of the packet decrease according to the current traffic load. The suggested solution would be followed by an adaptive mechanism to change the criteria for the RED queue thresholds to do better control of the average queue duration. The key point is that this approach would definitely increase the efficiency of the network over the standard RED system when traffic load varies and the queue length will be adjusted accordingly.

Chapter 8
Model-5: CCA-BO-RED
(A Nobel Congestion Control Algorithm using Buffer Occupancy RED: CCA-BO-RED)

One of the most widely employment of Active Queue Management (AQM) algorithm is that IETF which suggests for implementation in the network is Random Early Detection (RED). Although RED promises low average queuing delay and high throughput at the same time, RED performance is highly responsive to the setting of RED parameters. Since network requirements differ significantly, so it is not an optimal approach to set RED parameters with defined values. For dynamically tuning RED parameters, we suggest a new **Model-5: CCA-BO-RED** file. We measure the rate at which the queue is filled for this reason and treat it as a congestion parameter that will be expected when the queue is overloaded. This parameter is used to customise RED parameters dynamically. The simulation findings indicate the feasibility of the approach we suggested, according to the observations, in complex network environments, we obtain considerably greater utilisation and less packet loss relative to the initial RED algorithm.

Chapter 9
Model-6: AQM-RED-CPTQ
(Active Queue Management in RED considering Critical Point on Target Queue: AQM-RED-CPTQ)

Since, several devices, such as multimedia with restricted bandwidth, are anticipated to better support the internet, new methods are required to control network congestion. To ensure the reliability of the Internet, Successful Queue Management (AQM) algorithms play an important role. Random Early Detection (RED) is the first successful queue management algorithms which is suggested in deployment on the networks, like-TCP/IP. RED has several tuning criteria that need to be carefully handled in order to have decent results under various network scenarios. In **Model-6:AQM-RED-CPTQ**, we suggest a new algorithm called Critical Point on Goal Queue. To boost these parameters, **Model-6:AQM-RED-CPTQ** works to provide improved congestion management across the network while retaining the RED value. Critical Point on Goal Queue and certain RED elements and their versions will be added in this model. In Model-6, we simulate the proposed algorithm by contrasting it to the original RED, utilising the well-known network simulator NS-2. Simulation findings indicate that better queue size than RED is obtained by the suggested algorithm and the wait and losses are minimised.

Chapter 10

(Conclusion and Future Research Work)

Summary of the experimental results and goals achieved are given in detail. Scope for further improvement has been described. Limitations are also highlighted. In the end, a list of references and publications is given.