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Enhanced Optimal CDT with Appropriate Contention Count based on CNM in MANET

N. Sivapriya[1*], T.N. Ravi[2], R. Mohandas[3]

[1]Dep. of Computer Applications, Cauvery College for Women, Trichy, India
[2]Dep. of Computer Science, Periyar E.V.R. College(Autonomous), Trichy, India
[3]Dep. of ECE, Balaji Institute of Technology and Science, Narsampet, India

[*]Corresponding Author: nmsivapriya@gmail.com Tel.: +91 9489262172

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Abstract**—** Mobile Ad hoc Networks (MANETs) are a class of infrastructure less networks that are created through a number of autonomous wireless and mobile nodes. The inherent characteristics of such networks create the support of multimedia applications very challenging. In previous researches, the capacity and delay in MANETs was analyzed via considering the correlation of node mobility. Explored the characteristics of correlated mobility and figured out the essential relationships among the scheduling parameters and the network performance. However, the reliability and link stability for transmitting the packets is needed in MANET to achieve Quality of Service (QoS) support in terms of available bandwidth, high throughput and stable jitter. Hence, QoS aware metric for routing is incorporated with the Correlated Mobility (CM). In this method, Link Stability Factor(LSF) is estimated by considering received signal strength, the appropriate contention count and hop count. On the basis of the estimated LSF, stable link is determined. After that, the node with the highest LSF is elected as a reliable forwarding node. So, the proposed method improves QoS performance. The simulation results proved that our proposed methods are providing better results.

Keywords**—** QoS aware routing, Link Stability Factor, Contention Count, Signal Strength**,** Capacity-Delay Tradeoff

I. INTRODUCTION

MANET is a dynamic and wireless network that consists of mobile nodes. Such nodes communicate with one another directly or indirectly and each node performs as a host as well as a router because of the absence of centralized administrator within the network[1]. Also, the packet delivery is based on the chosen path quality was impacted by dynamic nodes and insufficient resources [2]. Mostly, the conventional routing approaches such as Ad-hoc Ondemand Distance Vector(AODV)[3] and Dynamic Source Routing(DSR)[4] have been focused on decreasing hop count on the chosen path. However, this condition is not effective for ensuring the QoS. The correlated mobility into the scaling analysis of wireless networks is discussed[5]. The higher capacity and its lower bound were achieved using packet delay in cluster sparse regime. The issues because of the performance of optimal capacity due to some delay constraints should to be solved, i.e., in various delay conditions, important insights are provided for the better wireless network operations. But, the upper bound capacity was not obtained upto a logarithmic factor since this approach does not consider a scheduling policy. Therefore,[6] introduced Optimal CDT(OCDT) by making use of the concept of Correlation of Node Mobility(OCDT-CNM). The basic relationships of the characteristics of CM were identified and also the network performance and scheduling parameters were shown. The upper bound of CDT in the entire sub-case of CM was established based on this technique. The attainable lower bound was obtained by finding the optimal scheduling parameters on specific constraints. However, the reliability and stability of link were required for further improvisation in QoS performance.

Hence in this work, QoS aware routing metric is identified and incorporated with the correlated mobility to improve the QoS performance. Initially, LSF is estimated with contention count, received signal strength and hop count. Contention count is described as the total number of nodes that are located inside the transmission range and assigned by transmitting the periodic packets to one hop neighbors. The sender determines the number of neighbors by the periodic packets received from all the neighbor nodes. Then, the received signal strength is estimated by cross-layer interaction technique. After the determination of LSF, then the node with the highest LSF is selected as the forwarding node. This improvement is called as optimal CDT with Reliable Forwarding based on CNM (OCDT-RF-CNM). And also, the QoS performance is enhanced based on selecting suitable contention count and optimal CDT. The proposed method is known as OCDT with Appropriate Contention Count based on CNM (OCDT-ACC-CNM). Section 2 explains about the QoS-aware routing and mobility constraint based approaches for MANETs. Section 3 explians about the proposed technique. Section 4 demonstrates the overall performance valuation of the proposed technique. Section 5 concludes the research work.

II. RELATED WORK

Optimal Capacity–Delay Tradeoff in MANETs With Correlation of Node Mobility [6] investigated the characteristics of correlated mobility and figured out the fundamental relationship between the capacity, delay and the associated system parameters, which afterwards provides great help to derive the capacity-delay tradeoff. This methodology reduce delays by sending redundant packets along multiple paths through flooding mechanism and also it cannot increase capacity but improves delay.

A Cognitive Agent-based Resource Prediction considering Mobility [7] introduced for predicting the resources by using agents via the two resource prediction agencies. Agents were used to predict the energy, mobility, traffic, bandwidth and buffer space efficiently which is essential for resourceful support multimedia and real-time communications. However, the prediction approach was not used before transmission at network layer and MAC layer.

Multipath Battery and Mobility-Aware routing technique [8] was developed in MANET. A metric that handles both residual battery energy and nodal speed was used by this approach. The objective of this approach was ranking the link stability with the help of link assessment function and selecting the most capable and stable paths to the destination. In addition, an Energy and Mobility Aware scheme was proposed for setting the readiness of nodes. But, the contribution of this approach in large scale network was less.

A link-state QoS routing protocol based on link stability for Mobile Ad hoc Networks [9]was proposed for establishing the stable and sustainable paths in MANET. A link stability was utilized as the core path identification concept along with the degree of mobility calculation of a node next to its neighbor. This scheme was applied on the OLSR protocol for selecting the sustainable MPR topology and nodes. But, the link stability estimation was not the unique parameter for evaluating the durability and the availability of the link.

Multi constrained Quality of Service Routing using a Fuzzy-cost technique [10] was introduced for selecting an optimal path. All the resources that are available for any path is transformed into single metric fuzzy cost using this method. And also the prediction of node movement was obtained for determining the path lifetime. However, in this approach, other QoS parameters that consist of buffer length and power consumption were not focused.

III. METHODOLOGIES

A. *OCDT WITH RELIABLE FORWARDING BASED ON CNM (OCDT-RF-CNM)*

QoS aware routing metric is described which is incorporated with correlated mobility for determining the reliable forwarding node. In this method[11], the reliable forwarding node is identified based on the link stability.

1) SYSTEM MODEL

Assume n nodes moving over an extended square of area n. The entire nodes are separated into $m = \theta(n^v)$, $0 \le v \le 1$ groups where v is the speed of the node. Every group covers an area of radius $R = \theta(n^{\beta}), 0 \le \beta \le 1/2$ where β is the radius of transmission range. Each and every set consists of cluster. Every cluster on average have $q = n/m$ nodes, thus the outcome cannot alter even if the value of q differs in clusters. However, $\theta(n/m)$ remains unaltered.

a) Time Scale

Time is separated into slots of equivalent unit duration. Nodes move over slots following a correlated mobility fashion. It is not dynamic for every slot that it remains static. Mobility time scale is assumed to be slow, that is, the speed of packet transmission is faster than node movement.

b) Correlated Mobility

Assume x, y denotes a specific cluster center and one of its cluster members, respectively. The motion of cluster center and member is explained below with respect to CM.

- **The motion of cluster center:** The network scheduler determines the position of every x within the next slot, till the last part of every slot. x position is randomly selected within all network area, separately from other x in every slot. Once the decision is received, the entire x be in motion to the scheduled positions in the next slot.
- **The motion of cluster member:** After choosing the new position of cluster center x, the entire nodes within this cluster be in motion the new region close to x. After that, the position of y is uniformly selected in the new region independently from other nodes.

The examination is carried out based on the values of $\beta \, and \, v$ as follows, Cluster dense regime ($v + 2\beta > 1$), critical regime ($v + 2\beta = 1$) and sparse regime ($v + 2\beta < 1$) are the full area mR^2 which the entire clusters covers $\omega(n)$, $\theta(n), o(n)$ respectively. Then, weak CNM is represented in $\omega(n)$, medium CNM is represented in $\theta(n)$ and strong CNM is represented in $o(n)$.

c) Traffic Pattern

Each node is considered as a source node linked with one destination, ie., in the network, independently and randomly selected between every other nodes. Additionally, the destination is considered that is consistently selected between the whole clusters except the cluster of the source. The source nodes transmit packets to the respective destination using a common wireless channel.

A MANET can be defined in double vector space model $(G(V,E), P_e, \theta(R))$ where

- The graph $G(V,E)$ denotes the network.
- $V\ and\ E$ are node sets and edge sets are available in the network
    - $\forall(e) \in E$, link (e) is active when any two nodes are in Communication Range (CR) of one another.
    - $S = \{S_1, S_2, S_3, \dots, S_d\}$ is source set and Destination set $D = \{D_1, D_2, D_3, \dots, D_d\}$ in the network.
    - $\varphi(e), \eta(v), \rho | v \in V, e \in E$ is signal strength of link, node's contention count and hop count.
- $\{P_e(l,i,j) | l,i,j \in V, P_e \leftarrow \{\varphi(e), \eta(v), \rho\}\}$ is the Probability of the link(P_e) at route R, from every source i to destination j which is dependent on signal strength, contention count and hop count.
- $\{\theta(R)(r,S,D_i) | r,S,D_i \in V\}$ is the cost factor for the particular route R, for several source nodes S to a specific destination D_i, in multicast routing protocol.
- A stable link has maximum link quality from a set of requested links to a specific node.

  $S_l = max_{i=1}^{r}(P_{e_i})$ (1)
- A reliable route is a set of stable links.

  $R = R \cup_{i=1}^{l} (S_i)$ (2)
- The probability of route failure is on the basis of the weakest that is, unstable link in the route.

  $P_{RF} = 1 - min_{i=1}^{l}(P_i)$ (3)

2) CLUSTER SPARSE REGIME (CSR)

a) Scheduling Policy

The source and its destination are denoted as $s\ and\ d$ respectively for a traffic stream $s \to d$. Additionally, C_s and C_d indicate two clusters that contain $s\ and\ d$ correspondingly, where $C_s \neq C_d$. Opportunistic broadcasting method is applied for totally employing the CNM.

Step 1 : Once s meets a cluster C_k $(k = 1, \dots\dots R_c^s)$, R_c^s is the number of clusters who have messages of s, a relay will be produced in C_k by using one-Hop Unicast(HU). This procedure is known as Inter-Cluster Duplication (ICD) and this procedure will not terminate until any one of the relays meets C_d.

Step 2 : Through one-HU, if one in every of the relays meets C_d, a novel relay will be produced in C_d. Else, perform above process.

Step 3 : By using broadcast, the recently created relay in C_d will generate relays in C_d (the total number of relays generated within C_d is represented as R_d^s).

Step 4 : If any one of relays in C_d is got by the destination within the range l^s, the message of s will be sent to the destination by h^s-hop unicast transmission. If not, perform step 3.

b) Upper Bound of Capacity-Delay Tradeoff

The upper bound of Capacity-Delay Tradeoff in Cluster Sparse Regime [11] is computed.

c) Achievable Lower Bound

An unit slot is split into three sub-slots. The sub-slot operation is explained as follows:

- Through one HUT, nodes create ICDs and C_d gets messages from one in every of the ICDs. The transmission range of r^s is used by every hop.
- By broadcasting in C_d, R_d^s ICDs are generated.
- By using h^s, if one of the intra-cluster duplications is taken using the destination in l^s, subsequently the message of s will be delivered to the destination. Every hop uses the transmission range of r^s.

3) CLUSTER DENSE REGIME (CDR)

In this regime $(v + 2\beta > 1)$ wherever the node mobility illustrate weak correlation, in cluster sparse regime, it is examined which area covers every cluster or the number of clusters becomes larger when compared with the situation. The scheduling policy is introduced in CDR.

Step 1: Nodes including a certain message create relays by kth broadcast using broadcast area A_d $(k = 1, \dots, \theta(u))$. The total number of ICDs is represented in R_c^d.

Step 2 : Through h_2^d -hop unicast transmission, if one of the relays is captured through a node in C_d in range l_2^d, the message will be transmitted to the node. If not, perform the above process.

Step 3: By broadcast, the taken relay within C_d make novel ICDs (the number of ICDs in C_d are represented in R_c^d).

Step 4: Using h_2^d, if one of the ICDs is taken based on its destination in l_2^d, the message will be sent to the destination. If not, perform above process.

4) CLUSTER CRITICAL REGIME (CCR)

This regime $(v + 2\beta = 1)$ is achieving the best performance of the optimal CDT. It is represented that the medium CNM is really benefitting the network performance. This regime is better than that in a dense regime because when the node mobility show weak correlation, the number of clusters is large and every cluster covers a large area of the network that outcomes in the severe competition of the limited radio resources and a longer delay in every cluster. The advantages of medium correlation of node mobility in the network performance are

- The connectivity is guaranteed.
- The clusters are not tightly overlapped that relieves the competition for radio resources between them compared with the case of dense regime.
- Every cluster covers a relatively small area that minimizes the transmission delay in the cluster.

B. OCDT WITH APPROPRIATE CONTENTION COUNT BASED ON CNM (OCDT-ACC-CNM)

The sparse, dense and critical regimes select the relays, but stable relays are not achieved. So, the stable relays are selected by considering the received signal strength, appropriate contention count, hop count and multi-objective optimization using normalization.

- Link quality (l_q) is measured between X and Y (X<Y). Route cost factor, X and Y denote the minimum and maximum value respectively.
- In the range 0 and 1, Reliable link probability(P_{l_q}) is measured via normalized l_q. The path probability (R) is the summation of logarithmic probability of all active links and is given by

$$R = \sum_{j=1}^{l} -log\{P_j\} \quad (4)$$

- In above equation, the number of links is represented as l in between Sources and Destinations. Log of every link probability gives negative outcome and as a result the negation of this value will create it a positive value.
- Thus the probability of stable route S_R is the minimum of all presented paths.

$$S_R = min_{i=1}^{p} R_i \quad (5)$$

- In above equation, p denotes the total number of paths between Source and Destination.

1) Contention Count (CC) Estimation

Reliability is calculated with the knowledge of node that might possess awareness regarding its neighboring nodes in addition to received signal strength. The neighbor count may be determined with the help of periodic packets (PPKTs). PPKTs are simple packets that are used to test connectivity in the network and to gather information concerning neighbor nodes.

- $S = \{n_1, n_2, n_3 \dots, n_i\}$ is the contention set of node N, in the set, n denotes the neighboring node and i denotes an integer. After that contention count (ρ_N) of node N can be indicated as follows,

$$\rho_N = |S| \quad (6)$$

- In the above equation, $|S|$ denotes the cardinality of contention set S.
- Appropriate contention count value is based on received signal strength. A reliable path with stability is discovered using appropriate CC. Larger CC at a node increases competition for available resources and smaller CC is decreases the network connectivity. An appropriate CC is enabled for better network connectivity and network availability (like bandwidth).

2) Received Signal Strength(RSS) and Hop Count(HC) estimation

The link quality between any two adjoining nodes is represented in the signal strength. When power loss is minimum then it can be represented as maximum signal strength which exhibits the quality and the path transmission is found to be stable and strong. It is finished when RSS maximizes while some pair of neighboring nodes move towards every other and vice versa. Signal strength is calculated as follows,

$$RSS = \frac{received\_power_{packet}}{noise} \quad (7)$$

3) Multiobjective Optimization by Normalization

For a link to be stable, the RSS should be maximum, CC has to be a middle value and HC should be minimum. At this time, optimization is required when more than one objective is conflicting. Trade-off is required when these objectives cannot be fulfilled with the minimum or maximum value concurrently. These kinds of issues are usually called as multiobjective optimization issues. To avoid this issue, normalization technique has been utilized on the entire three objectives.

4) Lower Bound Normalization

This approach bounds the lower value to zero, and upper value is unbounded.

$$f_L = \frac{f_i(x) - f_{i_{min}}}{f_{i_{min}}} \quad (8)$$

5) Upper Bound Normalization

This approach bounds the upper value and lower value is unbounded.

$$\boldsymbol{f_U} = \frac{\boldsymbol{f_i(x)}}{f_{i_{min}}} \quad (9)$$

6) Upper-Lower Bound Normalization

It offers both lower bound and upper bound to the objectives. It can be found using,

$$f_{UL} = \frac{f_i(x) - f_{i_{min}}}{f_{i_{max}} - f_{i_{min}}} \quad (10)$$

7) Link Stability Factor(LSF)

In this approach, contention count and signal strength with upper-lower bound and an hop count with upper bound have been implied. The normalized values of contention count, received signal strength and hop count are used in finding LSF. Thus, the stability of an arriving link is calculated.

$$LSF_i = \frac{SS_{norm_i}}{HC_{norm_i}} - \left|CC_{norm_i} - CC_{med}\right| \quad (11)$$

In the above equation, SS_{norm_i} denotes the normalized received signal strength at a node. The normalized hop count at any node is given as HC_{norm_i}. CC_{norm_i} denotes the normalized contention count at any node and CC_{med} indicates median contention count. The signal strength, hop and contention count are used to find LSF. The neighboring node with high LSF is selected as forwarder node. In the network, an appropriate CC is allowed with availability of resources, like bandwidth and well connectivity. And also it is evaluated based on received signal strength; additionally, hop count is reduced and these three parameters are mapped into one factor called LSF.

IV. SIMULATION RESULTS

The simulation is carried by using Network Simulator (NS-2) to evaluate the performance of the proposed approaches OCDT-RF-CNM and OCDT-ACC-CNM with existing CDT, CDT-CNM and OCDT-CNM. In Table 1, the simulation parameters for generating MANET are listed below.

Table 1. Parameters for Simulation

Parameters	Value
Number of nodes	40
Node's speed	0.01m/s
Network simulation area	1500 X 1500 sqm
Frequency	2.4GHz
Radio range	250 m
MAC Protocol	802.11s
Packet size	512 bytes
Packet type	RTP/UDP
Transmission Power	15dB/m
Number of channels	2
Channel capacity	2 Mbps
Transmission rate	4 Mbps
Packet interval	2ms
Traffic Source	CBR
Node mobility	0 to 20mts.sec
Traffic rate	4 packets/sec

The created MANET with AODV routing protocol is enhanced with CDT, CDT-CNM, OCDT-CNM, OCDT-RF-CNM and OCDT-ACC-CNM. The following performance metrics are calculated. The performance is evaluated under simulated environment with existing methodologies. The results obtained and proved that proposed methods performs better than existing protocols.

A. Throughput

The total number of bits received at the server within exact time duration is called throughput.

$$Throughput = \frac{Total\ Bytes\ Received \times 8}{(t - t_f)} \quad (12)$$

In the above equation, the time of packet received is represented in t_f and t is represented either the time of final packet received or if the session is complete.

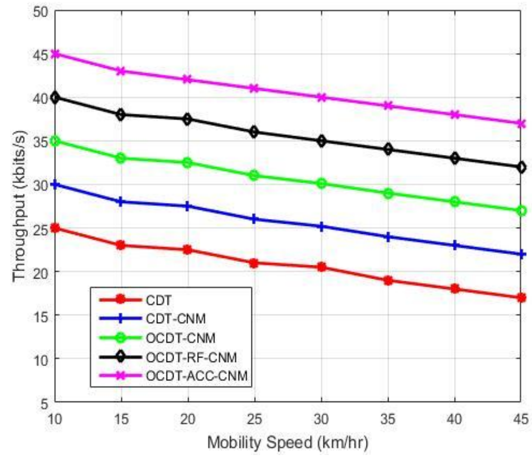

Figure 1. Throughput

It is shown by Figure 1, comparison results of the proposed OCDT-RF-CNM and OCDT-ACC-CNM approaches with existing CDT, CDT-CNM and OCDT-CNM approaches in terms of throughput. Mobility speed (km/hr) is denoted in X-axis and throughput values (kbits/s) in Y-axis. From the line chart, it can be concluded that the proposed approaches provide high throughput.

B. Routing Overhead (RO)

Routing Overhead is calculated as the ratio between number of packets used for finding route from source to destination and the number of packets sent from source to destination during data transmission. During packet transmission the routing information is exchanged among nodes for which some bandwidth is utilized that reduce the data packets transmission. Routing overhead is changed periodically based on link quality and contention count.

$$Routing\ overhead = \frac{Sum\ of\ routing\ packets}{sum\ of\ data\ packets} \quad (13)$$

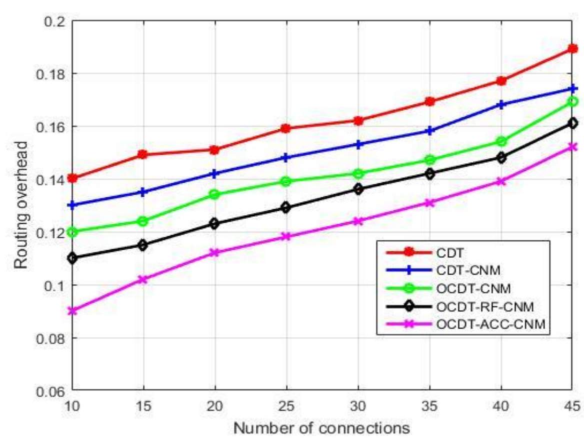

Figure 2. Routing overhead

Figure 2 shows that the comparison of CDT, CDT-CNM, OCDT-CNM, OCDT-RF-CNM and OCDT-ACC-CNM methods in terms of Routing Overhead. From the resultant graph, it is evident that the proposed methods excel the existing methods.

C. Packet Delivery Ratio (PDR)

PDR refers the fraction among total number of data packets received and total number of data packets transmitted over the communication medium. It is calculated as follows,

$$PDR = \frac{Number\ of\ data\ packets\ received}{Number\ of\ data\ packets\ transmitted} \quad (14)$$

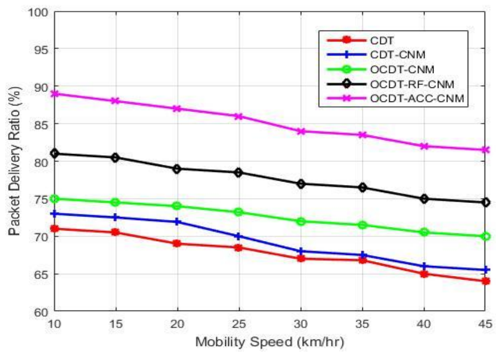

Figure 3. Packet Delivery Ratio

Figure 3 shows that the comparison of CDT, CDT-CNM, OCDT-CNM, OCDT-RF-CNM and OCDT-ACC-CNM techniques in terms of PDR. In this graph, mobility speed (km/hr) is denoted in X-axis and the PDR value (%) is represented in Y-axis. The PDR value has been achieved higher in proposed methods when compared to existing methods.

D. End-to-End Delay

End-to-End Delay is computed as the proportion of total delay for packets received by the destination to the total number of packets received by the destination.

$$Delay = \frac{Total\ delay\ for\ packets\ received\ by\ the\ destination}{Total\ number\ of\ packets\ received\ by\ the\ destination} \quad (15)$$

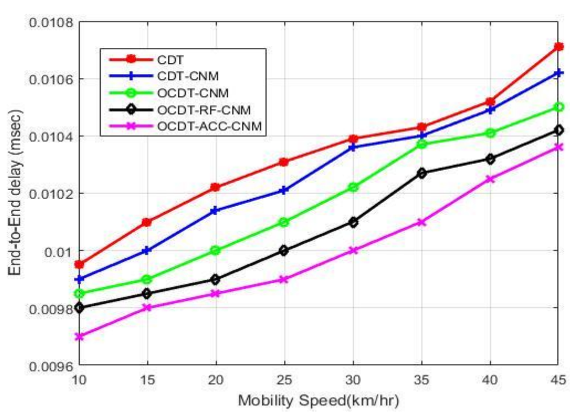

Figure 4. End-to-End Delay

Figure 4 shows that the comparison of CDT, CDT-CNM, OCDT-CNM, OCDT-RF-CNM and OCDT-ACC-CNM techniques in terms of delay. Mobility speed (km/hr) is represented in X-axis and the End-to-End delay value (msec) is represented in Y-axis. The End-to-End delay value found to be promising in the case of proposed methods than existing methods.

E. Average Route Lifetime (ARL)

ARL is described by average route lifetime spend from route establishment (RE) to route failures (RF).

$$ARL = T_{RF} - T_{RE} \quad (16)$$

In the above equation, T_{RE} represents the time when the route got established for transmitting data packets and T_{RF} denotes the time when a link or route got broken.

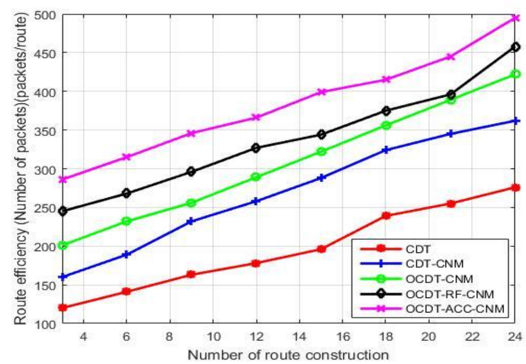

Figure 5. Average Route Lifetime

From Figure 5, it is revealed that the proposed OCDT-RF-CNM and OCDT-ACC-CNM approaches achieve high average route lifetime compared to the other existing CDT, CDT-CNM and OCDT-CNM approaches. In this graph, number of route construction and route efficiency are represented in X-axis and Y-axis respectively. Average Route Lifetime is relatively high due to proposed methods than the other existing methodologies.

F. Packets dropped

Packets dropped is a most significant QoS metric that illustrates the collision of the stability on the total number of lost packets in the network.

$$Packets\ dropped\ = \frac{Total\ No.of\ lost\ packets}{Total\ number\ of\ packets\ transmitted} \quad (17)$$

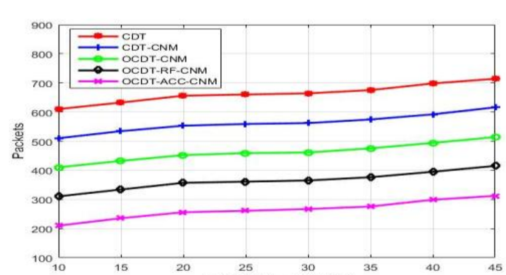

Figure 6. Packets dropped

In Figure 6, it is illustrated that the proposed OCDT-RF-CNM and OCDT-ACC-CNM approaches achieve less packet dropped compared to the other existing approaches. In this graph, mobility speed (km/hr) is denoted in X-axis and packets is indicated in Y-axis.

G. Packet Delivery Delay (PDD)

Packet Delivery Delay is computed as follows,

$$PDD = \frac{\sum(sent\ time - arrival\ time)}{\sum Number\ of\ connections} \quad (18)$$

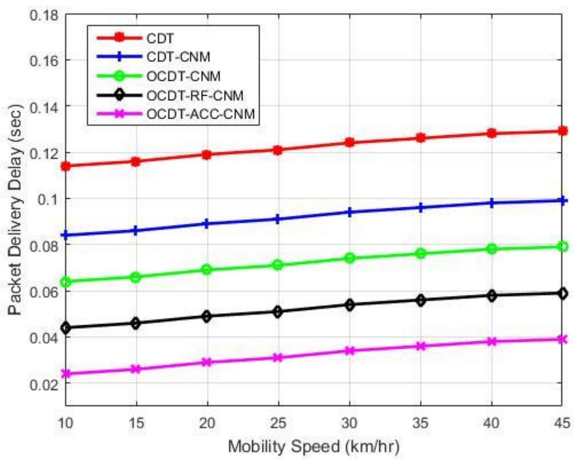

Figure 7. Packet Delivery Delay

It is shown by Figure 7, comparison results of the proposed OCDT-RF-CNM and OCDT-ACC-CNM approaches with existing CDT, CDT-CNM and OCDT-CNM approaches in terms of PDD. Mobility speed (km/hr) is indicated in X-axis and the PDD values is symbolized in Y-axis. From the line chart, it is concluded that the proposed approaches provide less Packet Delivery Delay in an appreciable manner.

H. Network Lifetime

The lifetime of the network is defined as the operational time of the network, in addition, time taken to execute the dedicated task.

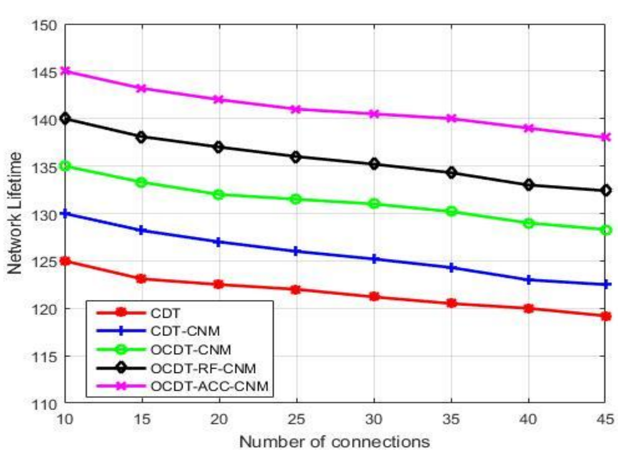

Figure 8. Network Lifetime

The comparison of proposed and existing approaches for metric network lifetime is illustrated in Figure 8. From the analysis, it is demonstrated that the proposed approaches achieved very high results than the other existing approaches.

V. CONCLUSION

In this paper, a QoS aware routing metric with correlated mobility is introduced for determining the reliable forwarding node. In this technique the reliable forwarding node is identified by using the link stability. The link stability is determined by considering the appropriate contention count. Finally, the simulation is analyzed for the proposed approaches in terms of throughput, routing overhead, packet delivery ratio, end-to-end delay, average route lifetime, packets dropped, packet delivery delay and network lifetime. The simulation results proved that our proposed methods are providing better results.

REFERENCES

[1] M.Anandhi, Dr.T.N.Ravi, "A reactive protocol for data communication in MANET", 51st Annual convention of the Computer Society of India, CSI 2016, Digital Connectivity – social impact, Springer, pp. 208-222, 2016.

[2] Gangwar, S., Pal, S., & Kumar, K., "Mobile ad hoc networks: a comparative study of QoS routing protocols", arXiv preprint arXiv:1201.5688, 2012

[3] CPerkins, "Adhoc On-Demand Distance Vector(AODV) Routing", RFC3561[S], 2003

[4] Johnson, D., Hu, Y. C., & Maltz.D, "The dynamic source routing protocol (DSR) for mobile ad hoc networks for IPv4", No. RFC 4728, 2007

[5] Yoon, J., Noble, B. D., Liu, M., & Kim, M., "Building realistic mobility models from coarse-grained traces", Proceedings of the 4th international conference on Mobile systems, applications and services, ACM, pp. 177-190, 2006.

[6] Jia, R., Yang, F., Yao, S., Tian, X., Wang, X., Zhang, W., & Xu, J., "Optimal Capacity–Delay Tradeoff in MANETs With Correlation of Node Mobility", IEEE Transactions on Vehicular Technology, Vol. 66, no. 2, pp. 1772-1785, 2017.

[7] Chaudhari, S. S., & Biradar, R. C., "Traffic and mobility aware resource prediction using cognitive agent in mobile ad hoc networks", Journal of Network and Computer Applications, Vol. 72, pp. 87-103, 2016.

[8] Jabbar, W. A., Ismail, M., & Nordin, R., "Energy and mobility conscious multipath routing scheme for route stability and load balancing in MANETs", Simulation Modelling Practice and Theory, Vol. 77, pp. 245-271, 2017.

[9] Moussaoui, A., Semchedine, F., & Boukerram, A., "A link-state QoS routing protocol based on link stability for Mobile Ad hoc Networks", Journal of Network and Computer Applications, Vol. 39, pp. 117-125, 2014.

10] Santhi, G., & Nachiappan, A., "Fuzzy-cost based multiconstrained QoS routing with mobility prediction in MANETs", .Egyptian informatics journal, Vol. 13, no. 1, pp. 19-25, 2012.

11] Yao, S., Wang, X., Tian, X., & Zhang, Q., "Delay-throughput tradeoff with correlated mobility of ad-hoc networks", INFOCOM, 2014 Proceedings IEEE, pp. 2589-2597, 2014.

[12] P.Rajeswari, Dr.T.N.Ravi, "QoS-DHT Based Fault Tolerant Routing Mechanism for Improving Link Stability in MANET", International Journal of Computer Technology and Applications, ISSN: 2229 6093, Vol. 6, no. 6, pp. 1021-1029, 2015.

Authors Profile

Mrs. N.Sivapriya pursed Bachelor of Science, Master of Science in Information Technology and Master of Philosophy from University of Bharathidasan, Trichy in 2004. She is currently pursuing Ph.D. and currently working as Assistant Professor in Department of Computer Applications, Cauvery college for women, Trichy. She has published many research papers in reputed international journals. She has 11 years of teaching experience and 5 years of Research Experience. Her area of research interest is computer networks especially mobile adhoc networks.

Dr. T.N. Ravi, born on 01.06.1964, has started his teaching career in the year 1985. Currently, he is working as Assistant Professor of Computer Science, Periyar E.V.R. College (Autonomous), an institution run by the Director of Collegiate Education, Government of Tamil Nadu, India. He is basically a Mathematics Graduate, completed both Under Graduation and Post Graduation. He had completed B.Ed., in Mathematics, P.G.D.C.A., and then completed M.Sc. & M.Phil. in Computer Science. He has successfully completed his Ph.D. in Computer Science in the year 2010. He pursued his research in the area of Parallel Computing and also did real time testing at National Aerospace Laboratories, Bangalore, India. His area of research interests are Parallel Processing, Network Computing, Genetic Algorithms, Artificial Intelligence and Data Mining. He has guided about 40 M.Phil Scholars and currently guiding 8 Ph.D.Scholars.
He has published 39 research articles in International / National Journals. He has delivered about 30 invited talks at State Level and National Level Conferences. He acted as Chair for several Conferences at State and National Level. He has rendered his academic services to various Universities,Institutions within and outside Tamil Nadu, Tamil Nadu Public Service Commission Board Examinations etc.,

Dr. R.Mohandas pursed his Bachelor of Engineering, Master of Engineering and Research in Anna University. He is currently working as Associate Professor in the Department of ECE, Balaji Institute of Technology and Science, Narasampet, Warangal. He has 9 years of experience in Teaching. He has published many papers in reputed international journals. His area of interest is Communication Networks, Digital Electronics and Software Engineering.

