AN OVERVIEW: MOBILITY BASED ANCHOR POINT NODE (APN) HYBRID NETWORK

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ABSTRACT

Mobile Ad-hoc Networks (MANET) are transient networks of mobile nodes, connected through wireless network different strategic methodologieshave been introduced to connect the entire world.To transfer the data or information from one network to another network within a less period time.The TCP network layer play a vital role in information-oriented. In rural territories there is fixed infrastructure of network connection. To provide communication between urban and rural environment we use APN. There are many TCP Variants which will provide a fast and rapid communication and transformation. We use DSR routing protocol for MANET infrastructure. This paper will mainly focus on mobility scenarios to evaluate the throughput, good put and end-to-end delay.

Key Words: MANET, APN, DSR, TCP Variants

I. INTRODUCTION

There has been marvelous growth in the Communication but failed to provide the optimistic solution for remote territories. Wireless networks have controlled this issue with some extend and are greatly deployed in homes; hotspots and offices with 54 Mbps channel capacity but still failed to produce promising result. Wireless LAN is mostly suited for urban territory but having no proper coverage within rural territory [1]. They propose APN hybrid network, which provide solution for disaster areas, Scattered Educational Institution, network of hospitals and Battle situation. APN scheme is smart choice for communication for those rural territories where is no existence of infrastructure based network to communicate within both territories [2]. An extensive investigational study of TCP variants over IP and Multi-protocol Label Switching (MPLS) networks by focusing Tahoe, Reno, New Reno, Sack and Vegas under Constant Bit Rate (CBR) traffic. For analytical results, TCP Reno, New Reno, Sack, Tahoe and Vegas were simulated on single, two, four and eight flows over a limited number of nodes. To analyze their performance based on throughput, average delay, packets sent, received, and lost for CBR traffic [3]. MANET's are formed using mobile node to communicate without any fixed infrastructure (i.e., wireless). These can also be used in the areas where the establishment of fixed infrastructure is very difficult. MANETs can also be used to deploy and coordinate the drones in the battlefield. MANET is having limited bandwidth, battery and computation power. MANET nodes will act as host as well as router because of lack of infrastructure. It is a self-developing and highly dynamic in some special cases like ad-hoc routing protocols [5]. In ad hoc routing protocols there should not be centralized authority. To avoid the wastage of bandwidth and battery power of the nodes the routing protocols should be route loop free. The routing protocols must reactive when they are in need, because to avoid unnecessary wastage of power and bandwidth.

Real time traffic flow of data packets form MANET–to-MANET or NETWORK-to-NETWORK must and should have low jitter. While sending the information the security is the main part where information should not be accessed by unauthenticated or intruder or attackers like Wormhole attack. There are some types of attacks like impersonation or Spoofing, Black-hole Attack, Sink-hole Attack, Sleep Deprivation, Rushing Attack, Location Disclosure, Denial Of Service (DoS) Attack and Flooding [4]. In TCP Variants there is a mobility hybrid network topology by combining the features of wired network with wireless and MANET in order to make reasonable communication even in remote areas. APN Hybrid network and find the strength of different flavors in APN Hybrid network. TCP is most elegant protocol in communicating world and designed for infrastructure network. TCP performs well in our APN Hybrid network.

II. RELATED WORK

Wafa Elmannai, et al. [6] Proposed simulation based study of TPC variants in Hybrid network, mobility is a major effect on TPC performance. MANET and all TCP Variants support Zone Routing Protocol (ZRP) with integration of random way point mobility model in MANET area. And Round Trip Time (RTT) to analyze the delivery ofpackets. TCP Vegas has better throughput and minimum end-to-end delay and better in order to delivery of data and improved RTT. In future work of TCP Variants TCP Vegas and westwood are combined that new variant cloud be better from mobility point of view in MANET and mixed environment.

Norrozila Sulaiman et al. [7] Proposed DSR Routing Protocol which is dependent on the cache memory for every node to store the routing path from source to destination. The New Route of cache structure –the cache of DSR protocol will be divided for two sub-caches: first part called (MASTER ROUTE cache) which saves information about the source node the numbers of hops the status of the route and destination node. The proposed algorithm provides minimum delay and minimum time route discovery for both the master and the index route cache.

Abadul Samad Isma'il et al. [8] Proposed collaborative virtual environment and congest control algorithm. Study the performance of TCP Vegas versus different TCP variants in homogeneous and heterogeneous wired networks are performed via simulation experiment using network simulator 2 (ns-2). The performance of TCP Vegas outperforms other TCP variants in the homogeneous wired network. However, it achieves unfair throughput in heterogeneous wired network.

Ramarathinam al. [9] Proposed evaluated the performance of TCP Reno, New Reno, SACK and Tahoe with respect to good put under three routing protocols over static multi-hop network and assumed Reno is to be better but conditions are not clearly mentioned in which, TCP Reno is better. We introduce only single DSR routing protocol with APN hybrid network with inclusion of TCP Vegas and West Wood. Our work covers both urban and rural environments and suited for realistic scenarios and simulated with NS2. In our work, Vegas is good and Tahoe is worse performer.

Stylianos et al. [10] Proposed examined the qualities of TCP Vegas and TCP New Reno with respect to TCP Reno over AODV routing protocol by using different topologies over square and strip simulation areas. Their work indicates that TCP Vegas is better than other variants and they also assume with their results that TCP Reno is worse in all the conditions.

Milan Todorovic et al. [11] Proposed presented test bed simulation and compared the newly proposed protocols, including TCP Probing, TCP Westwood/Westwood+, TCP Freeze, TCP Jersey, TCP Reno and JTCP

with already existed protocols namely, TCP Vegas, TCP SACK and TCP New Reno on the bases of three benchmark metrics, which are average congestion window, throughput and completed time.

A.O. Oluwatope et al. [12] Proposed there are many application which are related to internetwork to browse like "WWW-World Wide Web", "FTP-File Transfer Protocol" and email to deliver the data or information over the network. TCP is a connection oriented network and it is reliable to service level application layer. The Quality-of-Service in the wired network is less than one percent of packet loss due to error in connections of links. Thus increase in wireless network communication day by day there is an extension of service level futures are getting updated in TCP layer for the efficient usage of wireless infrastructure.

Michelle Berger Servio Lima Alexandros Manoussakis et al. [13] Proposed Collaborative Virtual Environment (CVE) combining the two or more networks to work together with the distributed users. The comparison is made between different TCP Variants to known the throughput n escape time between the data packets sent from one network to other when there is an increase in the number of users and congestion control can be done through the TCP layer.

Abdulsalam Ya'u Gital et al. [16] Proposed One of the strengths of TCP is its high responsiveness toward network congestion. TCP is also a defensive protocol as it detects incident congestion as its result to try and lessen the impacts of the congestion. Thereby prevent collapse of communication. The TCP focuses on reliability, stability, and correctness of data transfer which fits well with requirements of loss sensitive applications such as web browsing and file transfer.

2.1 Routing Protocol

DSR is simple and efficient on-demand routing protocol designed for multiple wireless-ad-hoc networks based on source routing. Our main objective goals are to analyze the TCP Variants in hybrid network by increasing the ratio of mobility in Manet environment. Dynamic Source Routing Protocol (DSR) supports the Manet (Rural environment) to find out the route to destination when a node initiates a packet. Various on demand routing protocols (reactive) are introduced such as AODV, DSR, LAR, ZRP, TORA, PAR, ABR, SSR and FORP [17, 20].

Optimizing Routing Technique based on fuzzy logic concepts. The paths generated by conventional dynamical source routing protocol deviate far from the optimal paths because of the lack of knowledge about the global topology and the mobility of nodes. Routing optimality affects the network performance, especially when the load is high. Longer route consumes more bandwidth, power and is more prone to disconnections. We use TCP Variants with DSR routing protocol in APN hybrid network to analyze the qualitative and quantitative performance in the form of throughput, packet delivery ratio and end-to-end delay for each TCP variants.

III.METHDOLOGY ARCHITECTURE FOR HYBRID NETWORK

We propose hybrid network by combining the fixed network with Wireless and MANET in order to make possible communication even in remote rural territories. The architecture of hybrid network is based on Anchor point nodes (APN). The nodes, which are not within the range of wired areas, can communicate with wired nodes through APN. APNs can play a role as coordinator node in hybrid network. Each node in MANET that is nearest to wired network but cannot get signal from Foreign Agents/Home Agents would be APN. The APN of

MANET has information about the nodes, which are within MANET network. Similarly, the node that is located at the end of each wired network is APN. Both APNs would play a role as coordinators and make possible communication for rest of nodes in fixed and MANET network. The APN of MANET has information about the nodes, which are within MANET network. Similarly, the node that is located at the end of each wired network is APN. Both APNs would play a role as coordinators and make possible communication for rest of nodes in fixed and MANET network [15].

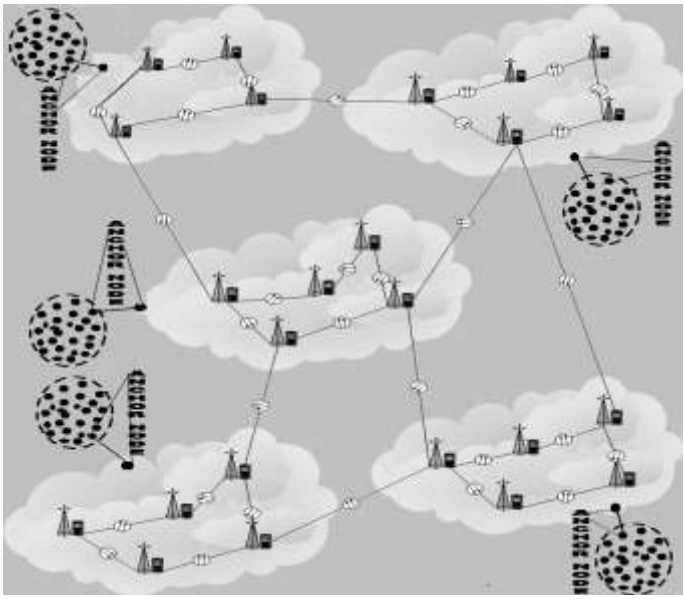

Figure 1: Proposed Architecture of Hybrid Network.

In Figure 1, five networks are jointly connected and each of networks with network cloud represents urban territory. Rest of area, which is out of network clouds, represents the rural tertiary. The nodes, which are in circle, make the MANET network. Each node in circle plays a role as APN and coordinating with node that is at end of cloud from every edge of the network. The node that coordinates with MANET-APN; said to be Infrastructure bases Anchor point node (IBAPN). APN hybrid network is simulated with NS–2 by changing number of mobile nodes and using different mobility Scenarios. The proposed architecture is well suited for urban and rural territories and producing encouraging performance.

3.1 Initial Connection Setup and Handoff Process

This section gives overview of initial connection setup and handoff process for MANET Mobile Node (MMN). Figure 2 shows a timing diagram of the signaling involved in initial connection setup and hand off event. An initial connection setup and MMN hand off process can be defined in the following steps.

Step1: Nodes, which are available in MANET, intend to communicate with corresponding node (CN) but they do not have initial connection setup. Therefore, MMN sends message to Current MANET Anchor Point Node (CMAPN) as message “Request for connection setup with CN”.

Step2: When CMAPN receives the Request for connection setup from MMN, it coordinates with Infrastructure Based Anchor Point Node (IBAPN) and forwards the message “coordination request for connection setup”.

Then in response CMAPN sends message back "Reply for connection setup with CN" to (MMN). When MMN gets the message from CMAPN then it will keep on waiting till initial connection is setup.

Step3: IBAPN forwards the message "forwarding coordination request for connection setup" to its HA/FA within wired area. When message is delivered at HA/FA then IBAPN sends back message with "Accept coordination request" to CMAPN.

Step4: HA/FA forwards message with "forwarding initial connection setup" to (CN) for initial connection setup. When message is forwarded to CN then HA/FA sends response back to IBAPN "Accept forwarding coordination request". CN establishes connection "accept initial connection setup" with (MMN).

Step5: Whenever MMN changes its location and moves to another MANET then it sends the request for handoff to new MANET Anchor point node (NMAPN) with message "request for joining".

Step6: NMAPN sends the message "location change forwarding message" (LCFM) to IBAPN forintimating the handoff process and same message is forwarded from IBAPN to HA/FA and finally message is reached to CN for location update.

Step7: When LCFM is forwarded by NMAPN then it sends the message "update" to CMAPN. In response, CMAPN sends acknowledgement (ACK) to NMAPN for location update.

Step8: When CN gets the message LCFM then it establishes the connection again with MMN and message is forwarded with "new connection setup in change of location".

Step9: With the establishment of new connection setup between CN and MMN then data exchange process is started.

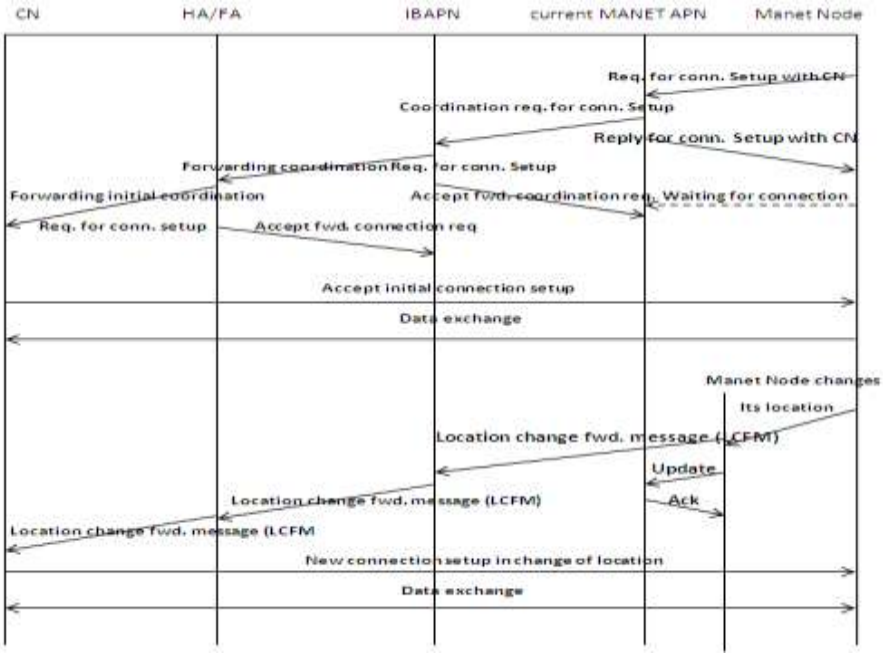

Figure 2: Initial connection setup and handoff process.

3.2 Manet-To-Manet Search For Manet Mobile Node (Mmn)

This scheme is introduced to search MMN. Whenever any corresponding node (CN) searches the MANET Mobile Node (MNN), it may require the following steps to find the required MMN in any MANET as described in the flow chart in Figure 3. Firstly CN contacts with (HA). Whenever request from CN is received to HA consequently HA coordinates with (IBAPN). The node (IBAPN) has capability of coordinating with (CMAPN). IBAPN is regarded as static node, which is fixed on that region where HA signaling powers becomes weak. IBAPN coordinates with CMAPN in order to search the required MMN in MANET [18]. CMAPN is the node, which has the functionality of broadcasting the message within same MANET and coordinating with other (NMAPN). CMAPN broadcasts the message (msg) to its MANET and taking decision whether MMN is available or not in its MANET.

If required MMN is available in its MANET then search process is finished. In response CMAPN sends availability of node with message "Found MANET Mobile Node Search" (FMMNS) to IBAPN. Furthermore IBAPN informs the HA regarding the availability of MMN with message (FMMNS). By this process, the connection is established between CN & MMN and communication is started through same process. In case of MMN is not available in same MANET [16].

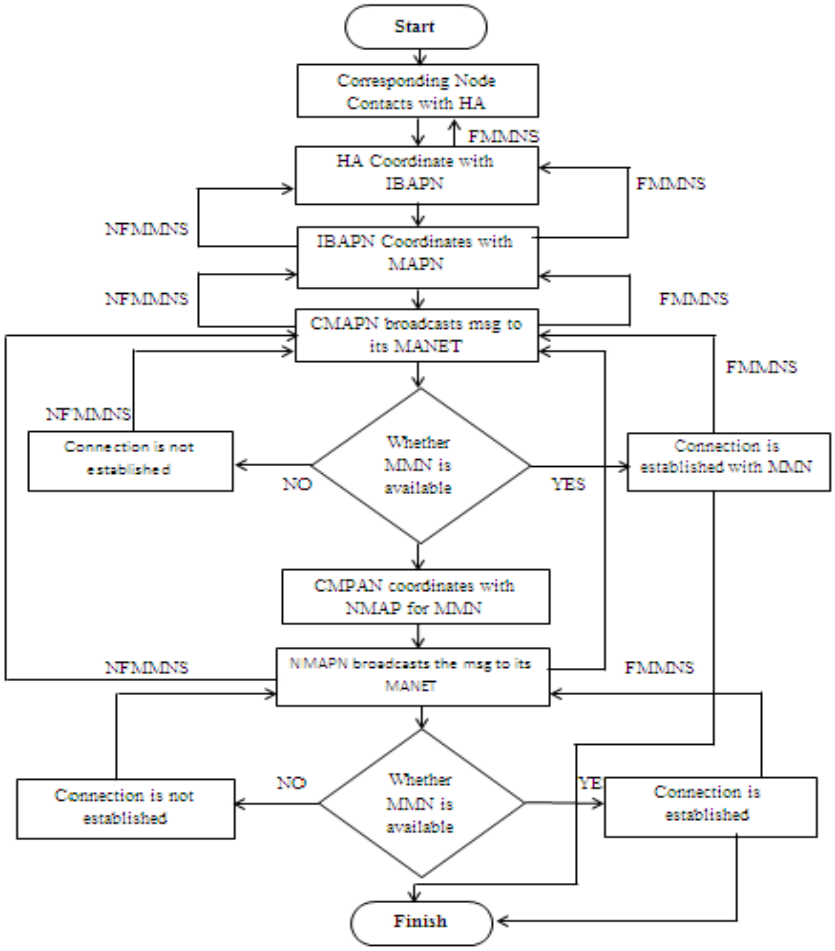

Figure 3: MANET-to-MANET search Architecture

CMAPN sends back the message "Not Found MANET Mobile Node Search" (NFMMNS) to IBPAN; as same message is forwarded to HA through IBAPAN and intimated the CN regarding the non-availability of MMN. If

MMN is not found in the same MANET then CMAPN coordinates with New Manet Anchor Point Node (NMAPN) for the search of MMN. NMAPN is the Anchor Point Node of other MANET. NMAPN broadcasts the message to its MANET. If MMN is available to its MANET then NMAPN informs the availability of MMN to CMAPN with message "FMMNS". After receiving the message of availability of MMN in Manet, CMAPN forwards the same message FMMNS to IBAPN. IBAPN forwards the availability message "FMMNS" to HA consequently connection is established between CN and MMN.

During the establishment of connection, the involvement of CMAPN for communication follows two conditions. If NMAPN is within the range of IBAPN then connection is directly established through NMAPN, otherwise connection is established through CMAPN to NMAPN. In case of nonavailability of MMN in Manet, NMAPN forwards the message to CMAPN. The same message "NFMMNS" of non-availability of MMN is forwarded to IBAPN through CMAPN. Once again IBAPN gets HA informed with message "NFMMNS". When NFMMNS message is delivered to HA then other search approach is used for MMN and this search is said to be network-to-network search (NNS).

IV. PERFORMANCE COMPARISON OF TCP VARIANTS

For each TCP Variants the throughput performance Vegas produces encouraging throughput with different mobility patterns. The TCP Variants except TCP Vegas up to 40 percent but increase in mobility more than 40 percent, the performance of TCP SACK becomes little bit less than TCP New Reno. TCP New Reno is considered reliable protocol in increase of mobility ratios. TCP SACK is also good variant, but increase in the mobility ratio. An average elapsed time for delivery of individual data packets average End-to-End delays each TCP Variants on specific interval under different mobility. Vegas deliver data packets efficiently and produce uniform performance with minimal congestion and Tahoe is worse Performer [17].

4.1 The Performance-Affecting Factors For TCP

TCP suffers due to timeouts and duplicate acknowledgments. TCP does not differentiate losses due to congestion or a link error, and in resulting the performance of TCP is affected.

4.1.1 Round Trip Time (RTT)

RTT is set against congestion window to compute the Retransmission timeout (RTO) for each packet. The Variation of RTT reduces the performance of TCP. The RTT has much greater inconsistency in wireless networks than the wired networks.

4.1.2 Packet Error Rate

The packet losses indicate the congestion. The ratio of packet error rates in wireless links is greater than wired links. In Hybrid network, occurrence of Packet reordering is related with handoff (mobility).

4.1.3 Bandwidth Utilization

TCP tries to find out existing bandwidth in the slow start phase by doubling its congestion window against each RTT. TCP uses existing bandwidth by increasing it by 1MSS against each RTT. TCP identifies how much highest amount of data should be sent against each RTT [21]. There is different signal to Noise Ratio (SNR) available on wireless links, which reduces the bandwidth of channel. TCP does not also sense the fluctuation of SNR, and continuously sends the pace of the packet at the current rate, which causes the losses of packets. If

ratio of SNR also falls in Hybrid network due to mobility, the performance of TCP suffers a lot that causes for degrading the performance.

V. CONCLUSION AND FUTURE WORK

We have introduced Anchor point node approach in hybrid network. We simulate TCP Variants on our proposed scheme with different mobility scenarios. We mostly focus on Manet portion of network to analyze the condition of network with different mobility patterns. Wired-cum wireless mobile nodes are stationary in simulation and neither sends nor receives data. After completion of simulation time, we prove which Variant is best performer with our integrated scheme in hybrid network by using DSR routing protocol in Manet environment. TCP Vegas proves its strength with all of separate traffic flows [20]. Vegas provides constant end-to-end delay mobility with minimum packet loss in hybrid network, which makes Vegas smart choice for normal and large-scale real time traffic. Vegas produces encouraging throughput and good put as compare to other TCP variants.Our main scheme was to develop the connection between to territories which has not infrastructure. In future we would analyze and evaluate TCP Variants with our integrated proposed scheme in hybrid network with respect to different parameters by sending file of any specified size within fixed time for wireless environment and Manet environment with random mobility patterns.

REFERENCES

[1]. Sumathi Gopal and Dipankar Raychaudhuri, "Experimental Evaluation of the TCP Simultaneous- Send Problem in 802.11 Wireless Local Area Networks" ACM, August 22–26, 2005, Philadelphia, PA, USA.

[2]. Abdul Razaque Rind, Khurram Shahzad and M.Abdul Qadir, "Evaluation and comparison of TCP and UDP overwired-cum wireless LAN", IEEE INMIC-2006.

[3]. Madiha Kazmi, Azra Shamim and et all. "Comparison of TCP Tahoe, Reno, New Reno, Sack and Vegas in IP and MPLS Networks under Constant Bit Rate Traffic" Aug. 14-15, 2014 Pattaya (Thailand).

[4]. Harshavardhan Kayarkar "Security Issues in Ad Hoc Routing Protocols" M.G.M's College of Engineering and Technology,Navi Mumbai, India.

[5]. C. Venkatesh, N. Yadaiah and A. M. Natarajan, "Dynamic Source Routing Protocol Using Fuzzy Logic Concepts for Ad Hoc Networks", 2005.

[6]. Wafa Elmannai, Abdul Razaque and Khaled Elleithy "Simulation based Study of TCP Variants in Hybrid Network".

[7]. Ayoob A. Ayoob, Norrozila Sulaiman, Muamer N. Mohammed, and Ghaidaa M. Abdulsahib. "Reduction the Effect of Mobility in Link Transmitting Using Efficient DSR Route Cache for MANETs". Journal of Advances in Computer Networks, Vol. 2, No. 4, December 2014.

[8]. Abdulsalam Ya'u Gital, Abdul Samad Isma'il, Abdulkadir H. Alkali, Adamu I. Abubakar, Haruna Chiroma. "Throughput Analysis of TCP Congestion Control Algorithms in a Cloud Based Collaborative Virtual Environment", 2014.

[9]. V. Ramarathinam and M. A. Labrador, "Performance Analysis of TCP over Static Ad Hoc Wireless Networks". In Proceedings of the 12th International Conference on Parallel and Distributed Computing Systems, pages 410– 415. ACTA Press, 2000.

[10]. Stylianos Papanastasiou, Mohamed Ould-Khaoua, Lewis M. Mackenzie, "On the evaluation of TCP in MANETs",2004.

[11]. Milan Todorovic Noe Lopez-Benitez, "Efficiency Study of TCP Protocols in Infrastructure Wireless Networks", IEEE 2006.

[12]. A.O. Oluwatope, A. B. Obabire, and G. A. Aderounm, "End-to-End Performance Evaluation of Selected TCP Variants across a Hybrid Wireless Network", Issues in Informing Science and Information Technology Volume3, 2006.

[13]. Michelle Berger Servio Lima Alexandros Manoussakis, "A Performance Comparison of TCP Protocols over Mobile Ad Hoc Wireless Networks" Proceedings of the Electronics, Robotics and Automotive Mechanics Conference(CERMA'06), IEEE 2006.

[14]. M.Sayeed Akbar, Syed Zubair Ahmad and M.Abdul Qadir, "Quantitative analysis and Performance of TCP variants in IP and MPLS", In Proceedings of the 10th International Conference IEEE INMIC-2006.

[15]. David B. Johnson David A. Maltz and Josh Broch, "DSR: The Dynamic Source Routing Protocol for Multi-Hop Wireless Ad Hoc Networks", IEEE, MFOCOM 2001.

[16]. Abdulsalam Ya'u Gital "Throughput Analysis of TCP Congestion Control Algorithms in a Cloud Based Collaborative Virtual Environment" 2014.

[17]. D. Johnson, D. Maltz, Y.-C. Hu, and J. Jetcheva. "The Dynamic Source Routing for mobile ad hoc networks, IETF Internet Draft". http://www.ietf.org/internetdrafts/draft-ietf-manetdsr-07. Text, February 2002.

[18]. Fernando Tapia, "TCP over mobile ad hoc networks"thesis-2004.

[19]. Z. Haas, M. Pearlman, and P. Samar. "The Zone Routing Protocol (ZRP) for ad hoc networks, IETF Internet Draft" http://www.ietf.org/internetdrafts/ draft-ietfmanet- zone-zrp-04.txt, July 2002.

[20]. Mohamed Yahia, Jozsef Biro, "Behavior of TCP algorithms on ad-hoc networks based on Different Routing Protocols (MANETs) and propagation models", IEEE 2006.

[21]. Xin Yu and Zvi M. Kedem, "A Distributed Adaptive Cache Update Algorithm for the Dynamic Source Routing Protocol", December 20, 2004.