International Journal of Application or Innovation in Engineering & Management (IJAIEM)
Web Site: www.ijaiem.org Email: editor@ijaiem.org
Volume 3, Issue 10, October 2014 **ISSN 2319 - 4847**

Global Clock Synchronization Method based on Highest Clock Divergence in MANET

Md. Naim Ansari#, Hemant Kumar Soni*

#Department of Electronics & Communication, PCST
RGPV University, INDIA

*Assistant Professor, Department of Electronics & Communication, PCST
RGPV University, INDIA

ABSTRACT

MANETS attracted lots of attention towards it. It is basically mobile ad hoc network which is a collection of wireless nodes that can dynamically be set up anywhere and anytime without using any pre-existing network infrastructure. This paper concentrates on the clock synchronization and routing overhead protocol for MANET. It is very much clear that any network which does not have any clock synchronization, would get crash and is of no issue. So for the intend of power saving, low routing overhead and better synchronization, researchers work on synchronization of clock. This synchronization give better performance of any network, specially wireless network .

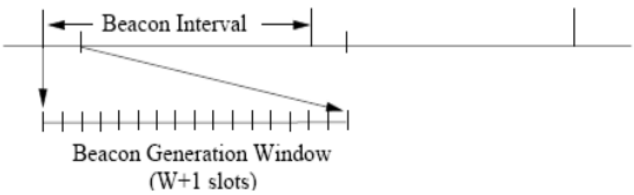
Keywords:- Clock Synchronization, Wireless Network, Routing Overhead, Network Simulator (NS-2.31)**.**

1.INTRODUCTION

In Challenged networks such as sparsely populated mobile ad hoc networks (MANETs) and mobile wireless sensor networks (WSNs), mobile nodes are chronically isolated each other and they meet very occasionally. Such a kind of networks typically arise in deep-space exploration, wildlife tracking, underwater networking, and emergency networking in disaster areas [1]. To realize effective networking in those situations, global clock synchronization is one of key issues. Due to the limitations in the energy, the computation and computation capacity of the mobile nodes are highly constrained. There are different types of nodes in the network, some are overburdened with traffic while some have unused energy. The distribution of workload is be evenly done so that the nodes with unused energy can also share the workload. For the global clock synchronization, each node has to adjust its clock time to the reference time by compensating its clock skew and/or clock offset properly, where the reference time would be real time, the clock time of a reference node, and the average clock time among nodes. The primitive procedure for this compensation between two nodes is to exchange packets that include their clock information bilaterally with one another. They also have to estimate the delay in the direct packet delivery to other node, i.e., link delay, which consists of transmission delay at the sender, propagation delay between the sender and the receiver, and receiving delay at the receiver. If there exist more than two nodes in the system, additional mechanisms will be required for the global clock synchronization. In recent years, averaging-based algorithms for fully distributed global clock synchronization have been studied [2]–[8]. Those averaging-based algorithms estimate the averages of clock rates and/or offsets, and they can essentially be connected to the discrete-time agreement/linear-consensus algorithms [9], [10] that enable a large number of distributed nodes to reach agreement on a common value, e.g., the global average among their local values, in an iterative and fully distributed manner. The rest of the paper is organized as follows. Section II gives a background and literature review on the work related to this research work. Section III describes about the proposed work. Section IV describes the simulation and testbed environment used to obtain the results in this paper. Finally, paper concludes in Section V along with the dimension of future work.

2.LITERATURE REVIEW

This section goes though various clock synchronization methods in brief. these are as follows:
In 802.11 TSF, clock synchronization is achieved by periodical timing information exchange through



beacon frames, which contain timestamps. In the IEEE 802.11 standards [11], an ad-hoc network is called an Independent Basic Service Set (IBSS), in which all of the stations are within each other's transmission range. According to the IEEE 802.11 specifications [11], each station maintains a TSF timer (clock) of the order of microseconds. Clock or timing synchronization is achieved by nodes periodically exchanging timing information through beacon frames. Each node in an IBSS shall adopt the timing received from any beacon that has a TSF time value (the timestamp) later than its own TSF timer. All nodes in the IBSS adopt a common value, a Beacon Period, which defines the length of beacon intervals or periods. This value, established by the node that initiates the IBSS, defines a series of Target Beacon Transmission Times (TBTTs) exactly a Beacon Period time units apart. Time zero is defined to be a TBTT. Beacon generation in an IBSS is distributed; all nodes in the IBSS participate in the process.There are extensive studies on global clock synchronization in multi-hop wireless networks and the surveys are given in [13], [14]. If the network is composed of static nodes and/or low-mobility nodes, the simplest way is toform a hierarchical topology rooted by a special node, i.e., root node, and to broadcast the clock time of the root node to all other nodes along with the topology. This category of global time synchronization schemes includes Network Time Protocol (NTP) [15] and its extension [16], tree-based approach [17], [18], and cluster-based approach [19]. These approaches, however, will not work well in challenged networks due to the following reasons: i) Making and maintaining the hierarchical topology are difficult due to sparse node density, node mobility, and node failures, and ii) estimation errors increase with the number of hops from the root node.

3.GLOBAL CLOCK SYNCHRONIZATION METHOD BASED ON HIGHEST CLOCK DIVERGENCE IN MANET (GCSMBHCD)

The present section handle the working procedure of the GCSMBHCD method. the main concept of the GCSMBHCD method is it's concept of global clock synchronization. in this proposed work all the nodes of the adhoc network gets synchronized based on the global highest divergence value of clock of all clocks available in the all nodes of network. Here the proposed work of "GCSMBHCD" is segmented into various steps:

Step 1: Initialization
This is the phase where each nodes sends 'HELLO' message to other node of the network starts with local or nearby nodes.
Step 2: After Receiving 'HELLO' message
a. After receiving 'HELLO' message from other nodes of the network, each node finds the highest divergence of the clock.
b. Calculate the difference of it's own clock with the highest divergence clock of the network.
Step 3: Pre-final step
Each node gets ready with the difference clock value needs to update in their respective clock.
Step 4: Final Step
With the sending of the next 'HELLO' packet this calculated 'Clock difference' with next start BEACON time is updated to all nodes of the network.

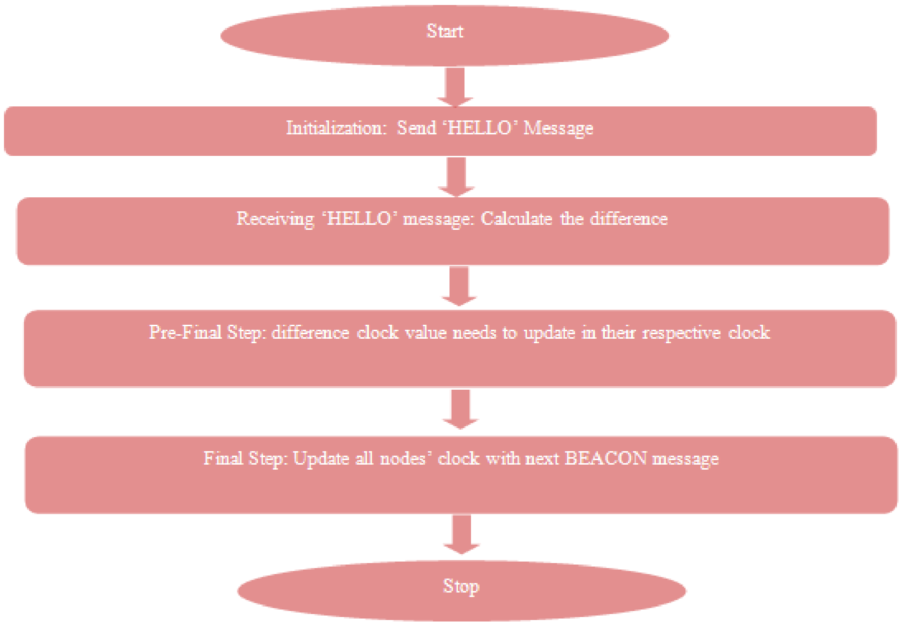


Fig 2 shows the comparison between clock drift of both methods.

4.SIMULATION AND RESULTS

There are various tools available for simulation of the adhoc network. Researchers have implemented and tested the adhoc environment clock synchronization in ns-2.31. Different ns-2.31 initial parameters are as follows, which were taken in consideration by researchers while performing the experiments:

Table 1: Various Simulation Parameters

Property	Values
set val(chan)	Channel/WirelessChannel
set val(prop)	Propagation/TwoRayGround
set val(netif)	Phy/WirelessPhy
set val(mac)	Mac/802_11
set val(ifq)	Queue/DropTail/PriQueue
set val(ll)	LL
set val(ant)	Antenna/OmniAntenna
set val(ifqlen)	100
set val(nn)	20
set val(rp)	AODV
set val(x)	1000
set val(y)	800
set val(stop)	90

There are two parameters on which researchers have proven their work. Those parameters are as follows:

1. Clock Drift
2. Routing Overhead.

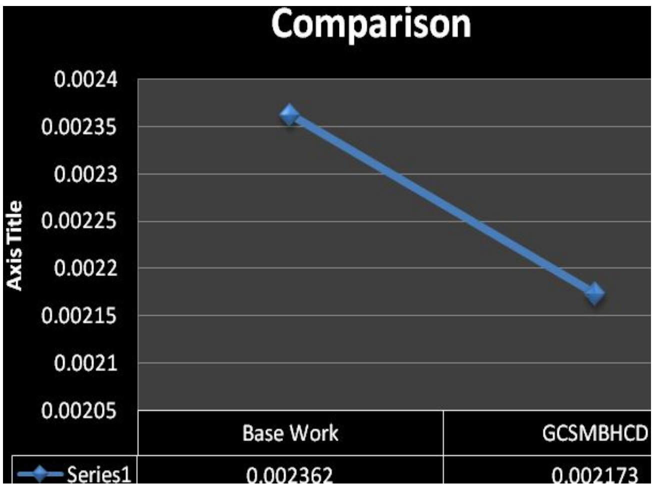


Figure 3: Comparison between GCSMBHCD with Base Work

Fig 4. Show the comparison among the Routing overhead among the base paper [20], GCSMBHCD and asynchronised method

5.CONCLUSION AND FUTURE WORK

Researchers have shown through their experiment that the performance of the GCSMBHCD in respect to both of the parameters,

1. Clock drift and

2. Routing Overhead,

is better than the performance of the base paper.

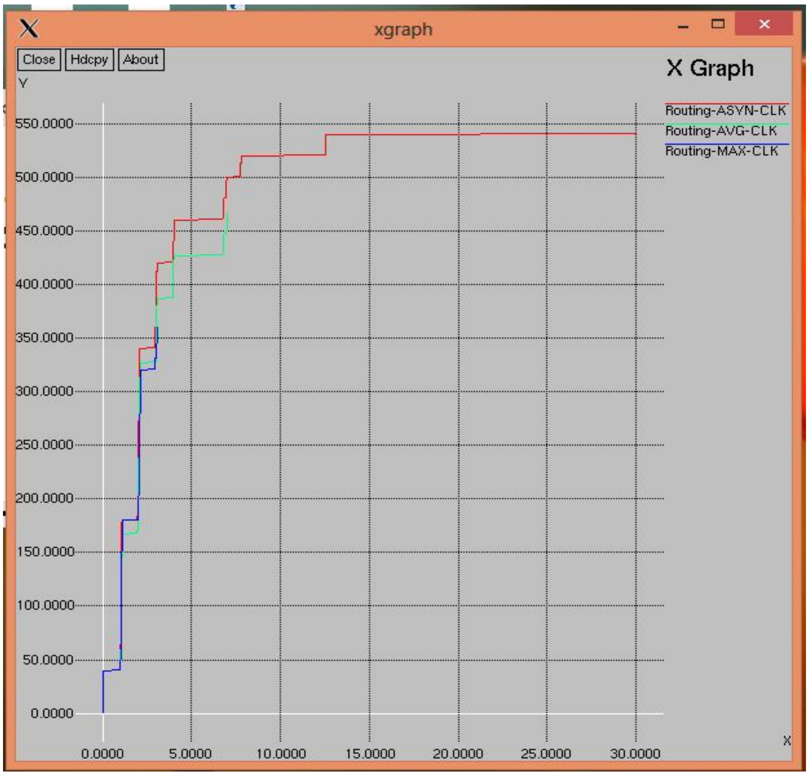


Fig 4: Comparison of Routing overheads

This work motivates researchers to work in the improvement of the Packed Delivery Ratio, End-to-End delay etc. These parameters would be taken in consideration by the researchers for the future work.

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AUTHOR

MdNaimAnsari Pursing M-Tech from P. C. S. T Bhopal in Digital communication Branch .And work as a Lecturer P. C. S. T Bhopal And doing Research work under the guidance of Mr. Hemantkumarsoni.

HemantkumarsoniM-Tech in Micro Electronics & VLSI Design from T I T Bhopal,Assistant Professor P. C. S. T Bhopal and Head of Department in Electronics & communication P. C. S. T Bhopal M.P