RESEARCH ARTICLE OPEN ACCESS

# Investigating the impact of the Hello Interval Time on the Performance of the OSPF in MANETs

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## ABSTRACT

In the modern communication, networks have different routing protocols with various architectures, adaptability, processing delays and convergence capabilities. For real time applications, Nodes are distributed randomly and Open shortest path first is considered as a pre-eminent routing protocol. OSPF is a dynamic routing protocol used in practical networks to spread network topology towards the adjacent routers. This selection depends on several parameters such as network convergence time, bandwidth and network scalability demands. OSPF Protocol parameter such as HelloInterval timer requires some modification for real time applications. In this paper, we investigate the impact of HelloInterval timer in OSPF by using OPNET Simulator 14.5.

***Keywords:-*** Open Shortest Path First (OSPF), HelloInterval, Nodes.

## I. INTRODUCTION

In Mobile ad-hoc networks (MANETs) [1] are self-configuring networks of nodes connected via wireless without any form of centralized controlling. In MANETs each node acts both as host and as router, it must be capable of forwarding packets to the other nodes, Topologies of these networks change frequently. MANETs are easily deployable, highly mobile networks and these properties are qualifying them as an attractive topic for the research community.

QOS and Routing are the two major issues in Mobile Adhoc Networks. In an Internetwork, Routing is the act of moving information from the source to the destination. Routing Protocols play crucial role in MANETs. Routing protocol for mobile ad-hoc network can be categorized into Reactive, Proactive and Hybrid routing protocols.

Performance evaluation is an important and essential element in a protocol development because the result can be used in many applications.

The rest of this paper is organized as follows. Section-II about Literature Review, Section-III deals with Routing Protocols of MANET, Section-IV describes OSPF Routing Protocol, Section-V about METHODOLOGY, Section-VI about OPNET modeler, Section VII deals with OPNET based practical OSPF, Section VIII deals with Simulation

## II. LITERATURE REVIEW

Few present in the literature are focus at optimizing OSPF operation for wireless networks. Wollman and Barsoum [4] advise adjustment of certain default timer values, and heavier reliance on route aggregation, to solve some Open Shortest Path First performance problems. Baker [5] has suggested OSPF modifications for MANET, in the context of OSPFv3 for IPv6 that allows for rove between areas, specifies a new mobile adhoc networks interface type, allows for more complicated link metrics, enhances scalability by limiting the number of neighbour relationships formed, and considers IPv4 and IPv6 integration issues. Bolt, Beranek, and Newman's(BBN) has developed a proprietary “Radio OSPF” that aims to leverage side information available at a wireless router to remove the sending of OSPF Hello neighbor discovery messages and modify designated router-related flooding [6].Thomas R.et.al describe how to adapt OSPF to adequately handle wireless networks in a scalable manner[7].

## III. ROUTING PROTOCOLS OF MANET

The routing protocols for MANETs can be classified as following way

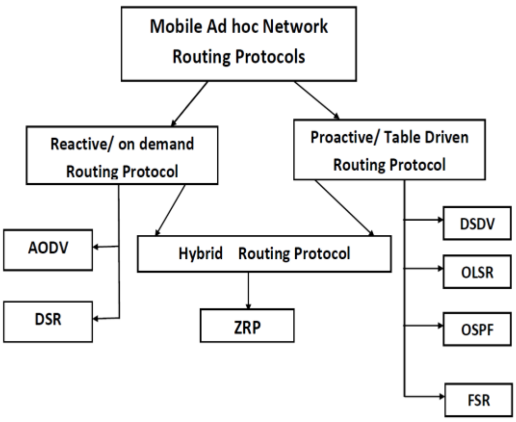



Fig 1: MANET routing protocols

1) ***Proactive Routing Protocol:*** Proactive routing protocols are derived from link state protocols; these are developed for wired and wireless networks. The main feature of proactive protocols is that each node maintains the route for the every other node. The route creation and maintenance is achieved with the help of periodic and event triggered routing updates. Periodic updates take place when time intervals are set between routing updates. Event triggered is an update when an event occurs. Proactive protocols can perform well in a network where significant number of data sessions is involved. It is not bandwidth efficient and not dependent on whether the route is needed or not. Control messages are periodically transmitted in proactive routing protocols. The main advantage of this protocol is that the nodes can easily get routing information to establish the session. The disadvantage of this protocol is that a lot of data is kept by the nodes to maintain the route. Proactive protocols show better performance over reactive and hybrid protocols in context of delay, where topology is changing dynamically. Examples of proactive routing protocols are OSPF, OLSR and DSDV.
2) ***Reactive Routing Protocol:*** On-demand or reactive protocols only create routes when the source node requests it. When a node requests a route towards another node, a route discovery process is initiated within the network. The route discovery will end once a route is found or once all possible routes are examined. The discovered route will then be maintained until it is no longer valid or not desired.
3) ***Hybrid Routing Protocol***: The hybrid routing protocols are a combination of both reactive and proactive routing protocols to improve them. The protocols typically use a proactive near to keep routes to neighborhood nodes. But for the nodes beyond the region area the protocol behaves like a reactive one. Some of the hybrid routing protocols include Zone Routing Protocol (ZRP), etc.

## IV. OSPF

The OSPF (Open Shortest Path First) protocol development started in 1987 by the IETF (Internet Engineering Task Force) as a replacement to the RIP protocol. During that period, the Internet was evolving and broadened, resulting in more and larger networks resulting in bigger routing tables. The RIP updates in the new network environment were also wasting a lot of bandwidth. The OSPF working group of IETF managed to create a new hierarchical, classless link-state protocol that achieved higher convergence to adapt to the network changes faster, used a more descriptive metric than hop-count, and supported security and Type of Service. The first version of OSPF, named OSPFv1 was published in 1989, in the Request for comment 1131. Problems regarding the deletion of information in the routing tables, the performance of the network being destroyed by endless routing update loops, and the motivation to enhance the protocol interval times and routing lookup process, lead to the publication of the OSPFv2 in 1991, in the RFC 1247, Further enhancements to Open shortest path first v2 in 1994 with RFC 1583 and RFC 2178 in 1997, Last revision was in 1998 with RFC 2328 [2] to fix minor problems authored by John Moy. Finally, OSPFv2 was modified to support the new IPv6. The new version named OSPFv3 was published in 2008, in RFC 5340 [3].In Routing table of an OSPF Network, the router maintains a synchronized routing table with its neighbors. In an OSPF network the hello protocol is used to discover neighbors, and maintain connectivity between neighbors.

We used OPNET simulator for OSPFv3 in wireless network Deployment method as shown in the following fig

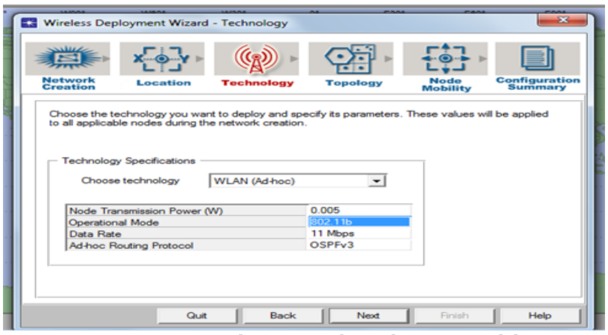



Fig 2 Wireless Network Deployment model

## V. METHODOLOGY

There are several ways in order to validate a new framework or protocol in a networked environment such as: mathematical modeling, simulation and test-bed emulation. Mathematical modeling is the fastest method, but when a complicated model with various factors is to be modeled, it is not accurate and it becomes inapplicable. In Simulation models, the interaction between modeling devices usually create a detailed packet-by-packet model for network activities. Test-bed emulation is implementing a new framework or protocol in small scale on real devices. This method is more expensive and almost always involves unexpected engineering problems. Simulation is chosen for experimental purpose because it is economic. The simulation is carried out by OPNET Modeler.

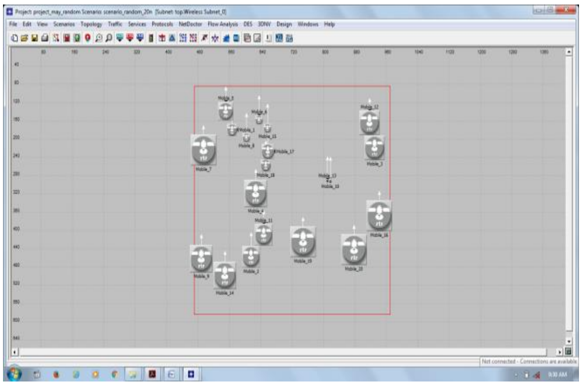
## VI. OPNET Modeler

OPNET (Optimized Network Engineering Tools) is the leading commercial discrete event simulator [8], which is highly used in industry and academia. OPNET follows object-oriented principles. A hierarchy of models are used in a network model in order to simulate network behavior. In OPNET, network model contains node models, and a node model consists of processes, transmitters and receivers. A process model simulates behaviors of a node using a state transition diagram, in which transitions are conditions/events that occur in a network's life span. The OPNET library contains many predefined network devices and protocols such as: routers, switches, fixed and mobile wireless workstations, etc. OPNET combines C language with state transition diagram, and offers a new language called Proto-C which is being used for designing and implementing process models. Also, C++ can be used to extend OPNET pre-existing models also OPNET offers debugging facilities through OPNET debugger (ODB), in which you can follow packets flow and movements of a mobile node in a simulated environment.

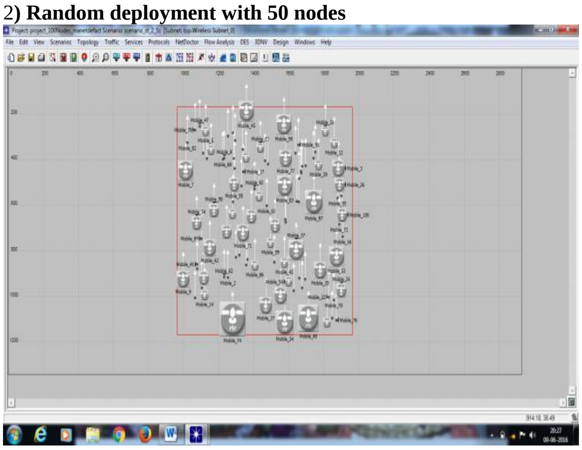
## VII. OPNET BASED PRACTICAL OSPF

These simulations have been performed using Opnet v14.5 to investigate the impact of HelloInterval Time in OSPF.
The performance metrics are delay and throughput.
**Delay:** Represents the end to end delay of all the packets received by the wireless LAN MACs of all WLAN nodes in the network and forwarded to the higher layer. This delay includes medium access delay at the source MAC, reception of all the fragments individually and transfers of the frames via AP, if access point functionality is enabled.
**Throughput:** Represents the total number of bits (in bits/sec) forwarded from wireless LAN layers to higher layers in all WLAN nodes of the network.
For this, the simulation is carried out within a 500m X 500m area by varying the number of nodes. In small and medium networks the Nodes placement is in two models. In small network it is for 20 nodes, In medium network is for 50 nodes. This is shown in the following fig

**1) Random deployment with 20 nodes**



2) **Random deployment with 50 nodes**



## VIII. SIMULATION ENVIRONMENT

TABLE I
SIMULATION ENVIRONMENT

| | |
|---|---|
| Area | 1000m x 1000m |
| Nodes | 20, 50 |
| Node Placement Model | Random |
| Mobility Model | Random Way Point |
| Node Transmission Power | 0.005 |
| Operational mode | 802.11b |
| Data rate | 11Mbps |
| Simulation time | 1000 sec |
| Hello interval | 1,1.05,1.10,1.25,1.5,1,75,2.0 sec |

## IX. RESULTS AND ANALYSIS

To evaluate the performance of routing protocols, the following metrics are considered.
The variation of Delay with varying HelloInterval time of 20 mobile nodes is shown in the Figure a. It describes that delay

is less when HelloInterval time is minimum and comparatively high when HelloInterval time is high.

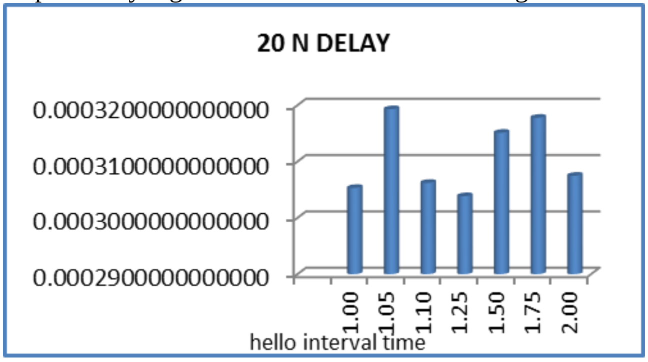



Fig a) Variation of delay with hello interval for 20 nodes

The variation of Delay with HelloInterval time of 50 mobile nodes is shown in the Figure b. It describes that the delay is less at less HelloInterval time and maximum at maximum HelloInterval time.

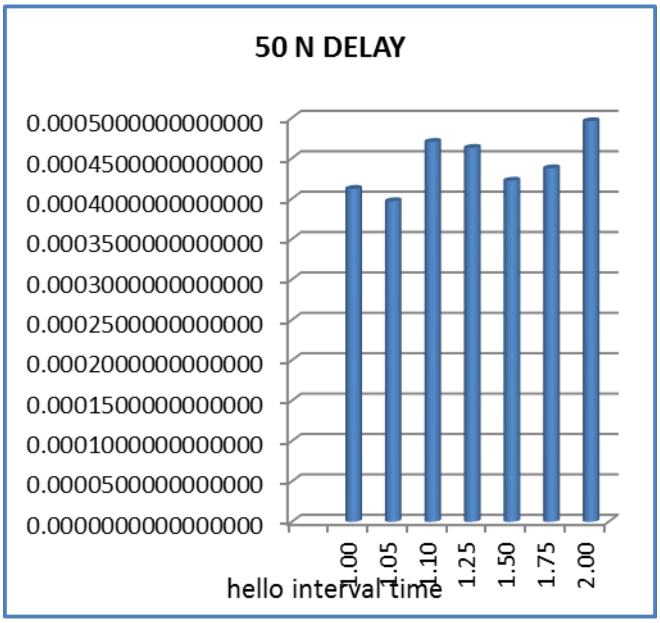



Fig b) Variation of delay with hello interval for 50 nodes

2) Throughput: Represents the total number of bits (in bits/sec) forwarded from wireless LAN layers to higher layers in all WLAN nodes of the network.

The variation of Throughput with varying the number of HelloInterval time is shown in the Figure a) 20 nodes, b) 50 nodes

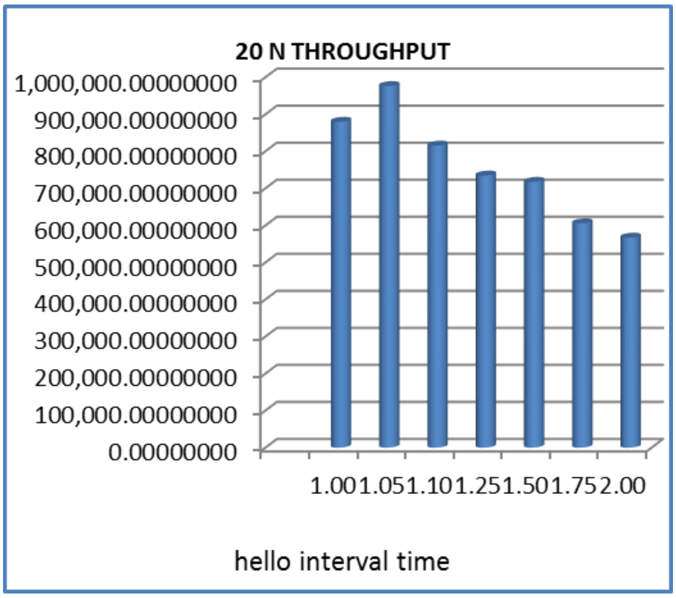



Fig a) Variation of Throughput with hello interval for 20 nodes

The variation of Throughput of 20 nodes with HelloInterval time of 20 mobile nodes is shown in the Figure a. It describes that throughput is maximum when HelloInterval time is minimum and comparatively minimum at maximum HelloInterval time.

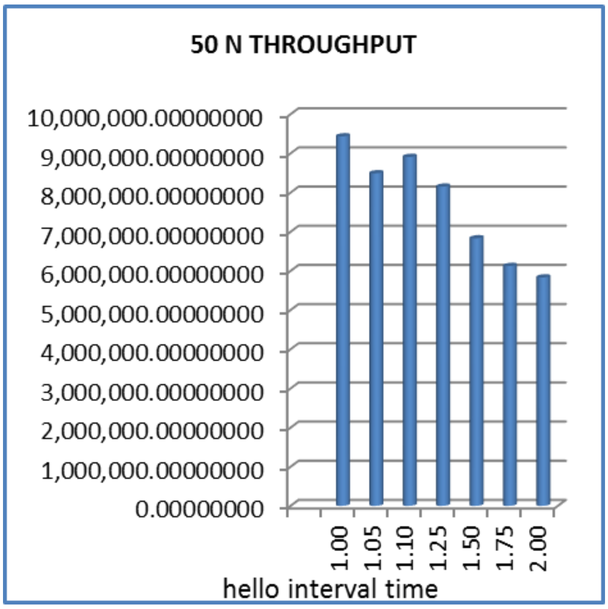



Fig b) Variation of Throughput with hello interval for 50 nodes

The variation of Throughput of 50 nodes with varying the HelloInterval time of 50 mobile nodes is shown in the Figure a. It describes that throughput is minimum when HelloInterval time is less and comparatively maximum at maximum simulation time.

## X. CONCLUSION & FUTURE SCOPE

We observed that different HelloInterval time exhibit different performances according to the network size and speed. In future, there is a necessity to adjust the HelloInterval Time interval according to the situation. Soft Computing Techniques may be applied for HelloInterval time to get the better performance.

## REFERENCES

[1] S. Corson and J. Macker, "Mobile Ad hoc Networking (MANET): Routing Protocol Performance Issues and Evaluation Considerations," RFC 2501 (Informational), Jan. 1999. [Online]. Available: http://www.ietf org/rfc/rfc2501.txt

[2] J. Moy, "OSPF version 2," Internet Engineering Task Force, Request For Comments (Standards Track) RFC 2328, April 1998.

[3] R. Coltun, D. Ferguson, J. Moy, and A. Lindem, "OSPF for IPv6," Internet Engineering Task Force, Request for Comments (Standards Track) RFC 5340, July 2008.

[4] Wollmn. W. and Y. Barsourn 'Overview of Open Shortest Path First Version 2 (OSPF "2)

[5] Baker, F., *"An* outsider's view of MANET'' *Internet l-Draft: draft-baker-manet-review-0l.ur (expired),* Mach 2012.

[6] Zavgen, J, Presentation at Panel Session on Adhoc Networks, IEEE Milcom Conference, October 1997

[7] Thomas R.et .al "A WIRELESS INTERFACE TYPE FOR OSPF", **0-7803-814&8103617.W** ***(C) 2003*** IEEE

[8] http://www.opnet.com/