PERFORMANCE ANALYSIS OF BORDER GATEWAY PROTOCOL FOR MANETS IN THE CONTEXT OF BEST EFFORT AND QoS MODELS

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Abstract *– In this paper the performance of the Border gateway protocol is analysed with respect to Queuing delay, Throughput and Utilization in the context of IPv4 and IPv6 models using OPNET Modeler. Performance of BGP is analysed and results have been taken using four scenarios: 10,15,20,25 users with varying Simulation times of 300, 600, 900, 1200, 1500 and Simulation areas of 500 x 500, 1000 x 1000 and 1500 x 1500. By analysing the graphs in OPNET, it is concluded that throughput and utilization increases with increase in number of users but at the same time throughput and utilization decreases with increase in simulation time at constant number of users. And also observed that that there is a better improvement in Throughput and Utilization when moving from IPv4 to IPv6 in any scenario.*

Keywords: *Mobile Ad-hoc Networks, OPNET modeller, Queuing Delay, Throughput, utilization.*

I. INTRODUCTION

The usage of wireless technologies are increasing and it influences in the development of new theories and structures for the communications. One of these new technologies is the mobile ad-hoc networks. A mobile ad-hoc network (MANET) is a self-configuring infrastructure-less network. Taking advantage of spontaneous and infrastructure-less behaviour, MANETS can be integrated with satellite network to provide world-wide communication for emergency and disaster relieve services and can also be integrated with cellular network for mobile data offloading. To achieve different results, different architectures of integrated system, protocols and mechanisms are designed. Literature survey explained that BGP is implemented only in OPNET software till date.

In this paper, the performance of Border gateway protocol has been analysed using different scenarios with respect to Throughput, Queuing delay and Utilization.

II. SIMULATION FRAMEWORK

Computer simulation has become one of the primary tools for evaluating the performance of Mobile ad-hoc networks in terms of Queuing delay, Throughput and Utilization. In this paper, the results for Mobile ad-hoc networks are validated using OPNET modeler 14.5.

Throughput for each active connection in the network is computed as follows: For each connection, the ratio of the sum of arrival rates of each path used in that connection to the input rate given at each path used in the given connection is computed.

Bandwidth is the maximum rate of data transfer across a given path, Bandwidth may be characterised as network bandwidth, data bandwidth, or digital bandwidth.

Queuing delay is the time a job waits in a queue until it can be executed.

Using OPNET, a general framework has been developed to test BGP performance for different simulation users and simulation times.

III. INTRODUCTION TO OPNET MODULAR 14.5:

Opnet Modeler, 14.5 is a high level event based network level simulation tool. OPNET modeler is the industry's leading network development software first introduced in 1986 by MIT graduate. OPNET allows you to design and study communication networks, devices, protocols and applications. Modeler is used by the world's most prestigious technology organizations to accelerate the R&D process. Some of the customers include pentagon, MIT, UIC and many more. OPNET's object-oriented modelling approach and graphical user interface (GUI) enable relatively easy means of redeveloping models from the actual world network, hardware devices, and protocols. OPNET supports all major network types and technologies, allowing you to design and test various scenarios with reasonable certainty of the output results.

The application areas include:

- Network planning (Both LAN and/or WAN) and analysis of performance and problems prior to actual implementation.
- Wireless and satellite communication schemes and protocols.
- Microwave and fiberoptic based network management.
- Protocol development and management.
- Routing algorithm evaluation for routers, switches, and other connecting devices.

IV. MOBILITY MODEL:

Random way point mobility model is most popular mobility model for the movement of mobile users, and how their location velocity and acceleration change over time.

The government of nodes is governed in the following manner: each node begins by pausing for a fixed number of seconds. The node then selects a Radom destination in the simulation area and a random speed between 0 (excluded) and some maximum speed. The node moves to this destination and again pauses for a fixed period before another random location and speed. This behaviour is repeated for the length of simulation to evaluate mobile ad-hoc network (MANET) routing protocols, because of its simplicity and wide availability.

DEFINITION OF GENERALISED RWP MOVEMENT PARAMETERS:

The following parameters describe a simulation set up with generalised RWP mobility in a complete manner.

- Size and shape of simulation region
- Initial space node distribution
- Static parameter
- Probability density function of the pause time
- Minimum speed and maximum speed

V. PERFORMANCE EVALUATION AND ANALYSIS:

The performance of Border Gateway Protocol is analysed with respect to metrics Queuing Delay, Throughput and Utilization in the context of Best effort and QoS models. It is observed that there is a significant improvement in Throughput and Utilization and reduced Queuing delay when moving from IPv4 and IPv6 models in any scenario. However future work may be extended to ensure the effectiveness of IPv6 in terms of network metrics. Analysis of this work of one scenario shown in the fig 1, fig 2, fig3 and fig 4 in simulation area of 500 x 500 meters:

a. *Simulation for 10 users : It is observed that when number of users increases, throughput and utilization values are better improved when moving from IPv4 to IPv6 technology at varying values of queuing delay at constant dimensions of terrain region.*

b. *Simulation for 15 users : It is observed that when number of users increases, throughput and utilization values are better improved when moving from IPv4 to IPv6 technology at varying values of queuing delay at constant dimensions of terrain region.*

c. *Simulation for 20 users : It is observed that when number of users increases, throughput and utilization values are better improved when moving from IPv4 to IPv6 technology at varying values of queuing delay at constant dimensions of terrain region.*

d. *Simulation for 25 users : It is observed that when number of users increases, throughput and utilization values are better improved when moving from IPv4 to IPv6 technology at varying values of queuing delay at constant dimensions of terrain region.*

VI.RESULT AND COCLUSIONS:

By analysing the graphs, it is observed that throughput and utilization of BGP increased when the number of users is increased. The MANET's thought put and utilization begins with the small value, after that it keeps on

increasing and decreasing within some specific range at the same. After some time it decreases sharply, and again increases sharply within some specific range. The reason for this increasing and decreasing is propagation delay and overhead collisions affecting at that time. During large traffic, the rate of collision count increases which further affects the throughput of the system.

And also observed that that there is a better improvement in throughput and utilization when moving from IPv4 to IPv6 in any scenario.

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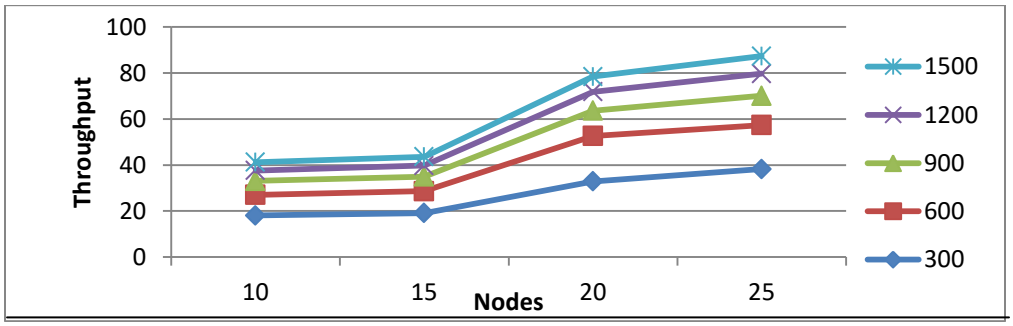

Fig 1. Throughput in IPv4

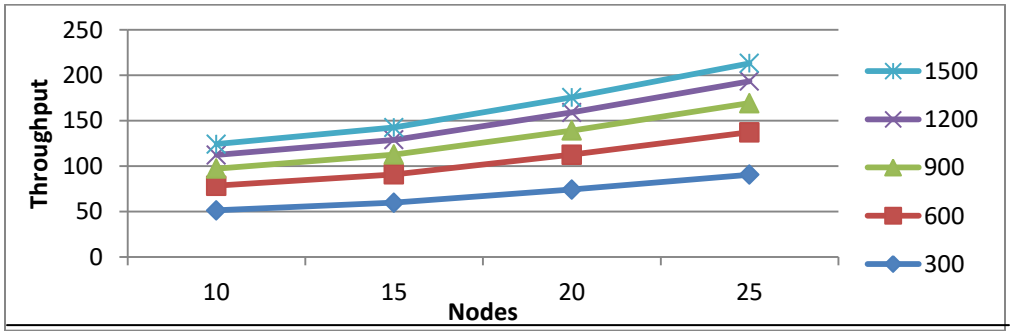

Fig 2. Throughput in IPv6

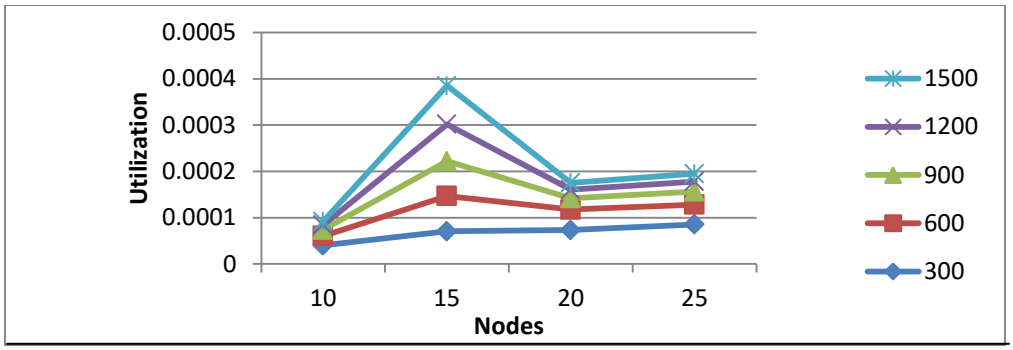

Fig 3. Utilization in IPv4

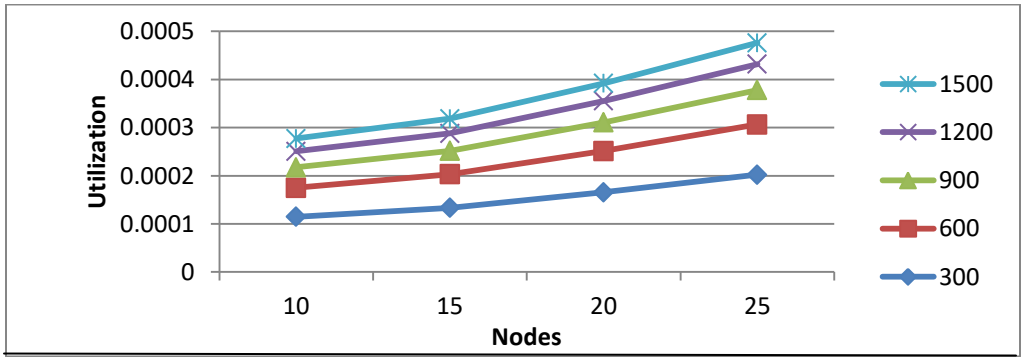

Fig 4. Utilization in IPv6