Comparative Study on Qos Metrics of Temporally Ordered Routing Algorithm for Mobile Adhoc Networks in the Context of Different Node Deployment Models

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Abstract- *A MANET is a collection of autonomous mobile devices. In MANETs, the nodes are mobile the network may change unpredictably over time. In this paper, we investigate the impact of three node deployment models, namely Grid, Random and Circular with different simulation time for TORA routing protocol of QoS metrics using the OPNET 14.5 simulator. Simulation results reveal that Random node deployment model outperforms circular and grid node deployment model.*

Keywords — *MANET, TORA, RANDOM, GRID, CIRCULAR.*

I. INTRODUCTION

Mobile ad hoc networks [1] consist of mobile devices that use wireless transmission for communication. can be set up anywhere and at any time because they do not need infrastructure or central administration. The overall routing protocol types responsible for transmitting packets between different mobile nodes in ad-hoc network falls into three broad categories. The routing protocols are proactive, reactive, and hybrid. One of the challenging issues in MANETs is routing. The paper is as follows: Reactive routing protocol "TORA" is summarized in section 2, Methodology is explained in section 3, Simulation Environment is explained in section 4, and results are presented in section 5 and final conclusion in section 6.

II. ROUTING IN MANET

A routing protocol [2][3][4][5][6] is needed whenever a packet needs to be transmitted to a destination via a number of nodes and many routing protocols have been proposed for ad hoc networks. These protocols find a route for packet delivery and deliver it to the correct destination. The study of various aspects of routing protocols has been an active area for many years for research. Many protocols have been suggested keeping applications and type of in view network. Basically, routing protocols can be broadly classified into two types as (a) Table Driven or Proactive Protocols, (b) On-Demand or Reactive Protocols.

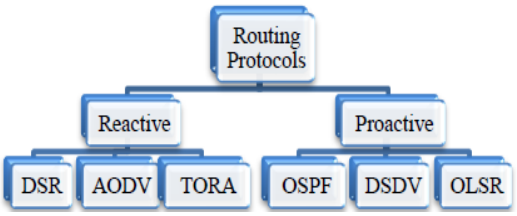

Figure 1: Routing protocols

We mainly concentrated on TORA Routing Protocol in this paper.

A. Table Driven or Proactive Protocols: In Table Driven routing protocols, every node maintain one or more tables containing routing information to each other node in the network. All nodes update periodically these tables to maintain the latest view of the network. Some of the table driven or proactive protocols are DSDV, GSR, WRP, and ZRP.

B. On Demand or Reactive Protocols: In these protocols [7][8], routes are created as and when required. When a transmission occurs from source to destination, then the route discovery procedure is invoked. The route remains valid till destination is achieved or until the route is no longer required. Some of the existing on-demand routing protocols are DSR, AODV, and TORA.

TORA (TEMPORALLY ORDERED ROUTING ROTOCOL)

TORA [9] [10] is a distributed, highly adaptive routing protocol designed to operate in a dynamic multi-hop network. TORA uses an arbitrary height parameter to decide the direction of a link between any two nodes for a given destination. Accordingly, multiple routes often exist for a given destination, but none of them are necessarily the shortest route. To initiate a route, a QUERY is broadcasted by the node to its neighbors. This QUERY is rebroadcasted throughout the network until it reaches the destination

or an intermediary node that has a route to the destination. The recipient of the QUERY packet then broadcasts the UPDATE packet, which states its height with respect to the destination. When this packet propagates in the network, each node that receives the UPDATE packet sets its height to a value greater than the height of the neighbor from which the UPDATE packet was received. This has the effect of creating a series of direct links from the original sender of the QUERY packet to the node that initially generated the UPDATE packet. When it was discovered by a node that the route to a destination is no longer valid, it will adjust its height so that it will be a local highest with respect to its neighbors and then transmits a UPDATE packet. If the node has no neighbors of limited height with respect to the destination, then the node will attempt to discover a new route as described above. When a node detects a network break, it will generate a CLEAR packet that results in a reset of routing over the ad hoc network.

TORA Protocol resumes that the link status sensing, neighbor discovery, in order packet delivery and address resolution are all available readily. The solution is to run the Internet MANET Encapsulation Protocol at the immediately below TORA. This will make the overhead of this protocol difficult to separate from that imposed by the lower layer.

III. METHODOLOGY

Simulation tool

OPNET provides a comprehensive environment for modeling and does the performance analysis of networks and distributed systems. The OPNET package contains numbers of tools. Those tools constitute of three categories corresponding to the three types of modeling and simulation projects: Specification, Simulation and Data Collection, and Analysis. These phases ought to essentially be in sequence and form a simulation cycle as in Figure 2.

OPNET uses the idea of modeling domains to symbolize its modeling environments, and graphical editors for editing the Network, Node, and Process models.

Specifically, there are many editors in OPNET: project editor, node editor, link model, process editor, external system editor, editor, Interface Control Information editor, packet format editor, and probability density function editor etc.

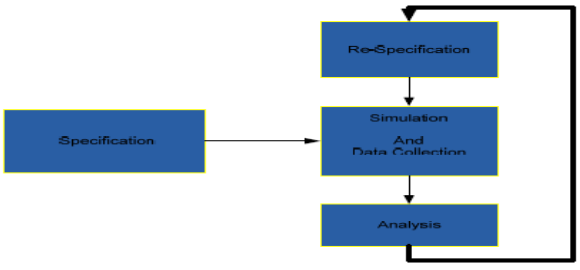

Figure 2: Simulation Cycle in OPNET

A network Domain is used to define the network topology of a communication network. The communicating entities are called nodes. A network domain is created by using the Project editor tool of the OPNET modeler. Node Domain describes nodes' internal design in terms of functional elements in the node and data flow between them. The process defines the behavior of processes, including algorithms, protocols, and application, specified using infinite state machines and an extended high-level language. External System specifies the interfaces to the models provided by other simulators running at the same time as with an OPNET simulation (a co-simulation).

This is to evaluate the performance of existing wireless routing protocol TORA in various node placement models like Grid, Random and Circular i.e. the nodes are placed in various arrangements and moves randomly. The simulations have been performed using OPNET version 14.5 a software that provides scalable simulations of Wireless Networks. OPNET provides a complete environment to model and does a performance evaluation of networks and distributed systems. For this, the simulation is carried out within a 500m X 500m area by varying the simulation time.

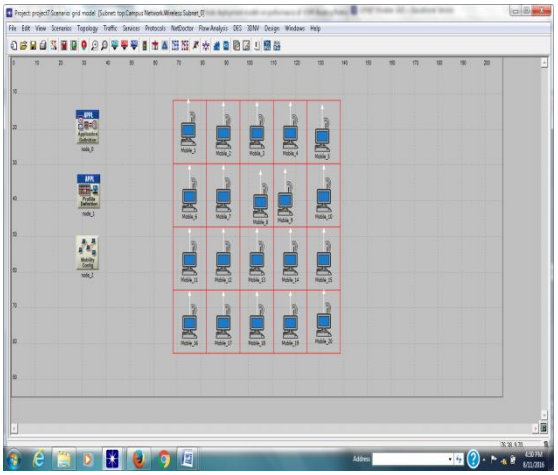

Figure.3: Grid Node Deployment Model

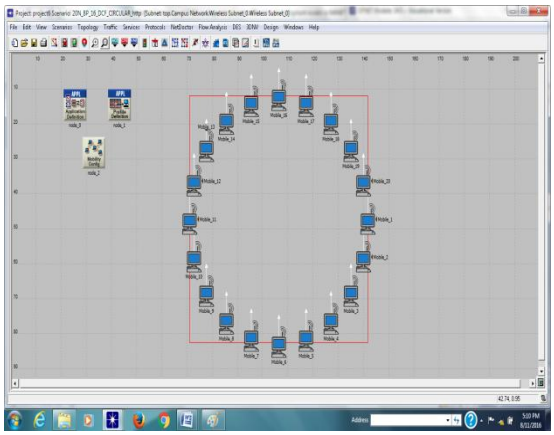

Figure 4: Circular Node Deployment Model.

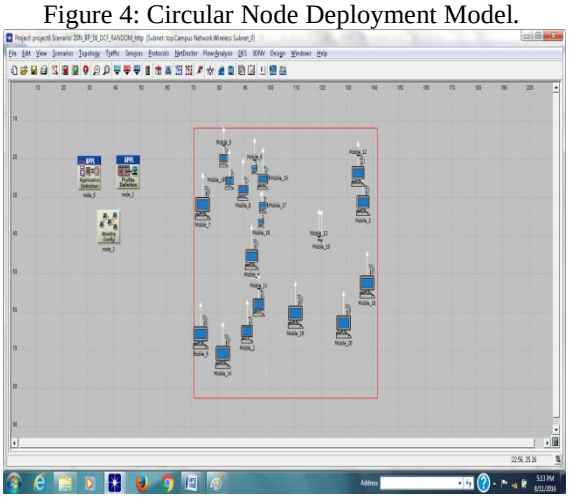

Figure 5: Random Node Deployment Model.

IV. SIMULATION ENVIRONMENT

PARAMETERS	VALUES
Area	500m x 500m
Nodes	20
Nodes Placement	Random, Grid, Circular
Mobility Model	Random Way Point
Node Transmission Power	0.005
Operational mode	802.11b
Data rate	11Mbps
Simulation time	300,600,900,1200,1500 sec
Defacto values set	MANET
Routing protocol	*TORA*

Table 1: Simulation Parameters

V. RESULT AND DISCUSSION

To evaluate the performance of routing protocols, the following metrics are considered:

Throughput (bits/sec): Represents the total number of bits (in bits/sec) forwarded from wireless LAN layers to higher layers in all WLAN nodes of the network. Comparing the three node deployment models throughput for random node deployment model gradually comes to steady state at 1500 seconds of simulation time.

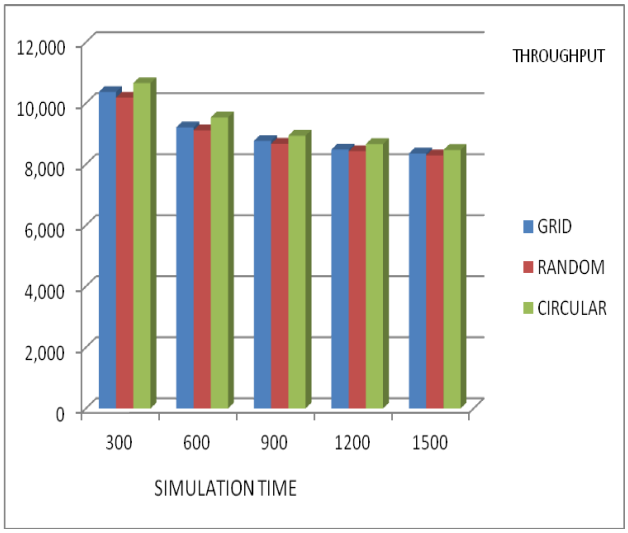

Figure 6: Variation in throughput with simulation time.

Delay (sec): 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. Comparing the three node deployment models delay for random node deployment model gradually comes to steady state at 1500 seconds of simulation time.

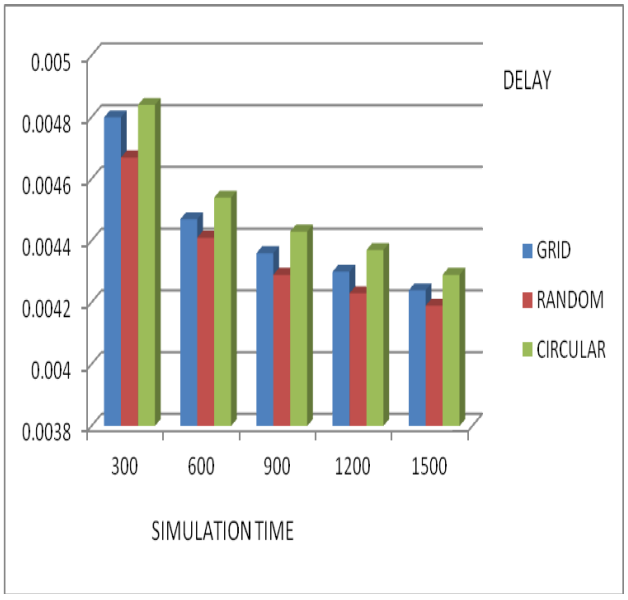

Figure 7: Variation in delay with simulation time

Load (bits/sec): Represents the total load (in bits/sec) submitted to wireless LAN layers by all higher layers in all WLAN nodes of the network. Comparing the three node deployment models load for random node deployment model gradually comes to steady state at 1500 seconds of simulation time.

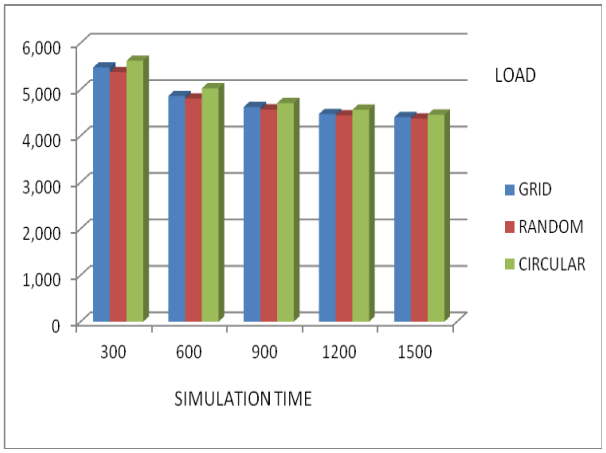

Figure 8: Variation in load with simulation time

VI. RESULTS AND DISCUSSION

In this paper, we have analyzed performance evaluation of QoS metrics of TORA routing protocol under different node deployment models with different simulation time. From the analysis, we conclude that random node deployment performs better than the circular and grid node deployment models.

VII. REFERNCES

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