Performance Analysis of Distributed Cache Invalidation Method in Mobile Ad hoc Networks using AODV and AOMDV Routing Protocols

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Abstract-- Mobile Ad hoc Networks (MANETs) is an active wireless network that can be formed without any existing permanent framework networks. Mobile Ad hoc Networks is an independent structure of mobile nodes communicated with wireless channels. Distributed cache invalidation method is performed among intermediate routing mobile nodes. In MANETs routing protocols are provided desirable route establishments of the mobile nodes. Ad hoc On-demand distance vector routing protocol (AODV) was well known single route protocol, Ad hoc On-demand Multipath Distance Vector routing protocol (AOMDV) is extends the AODV protocol with multipath. These results are carried out in network simulator version2 (NS2), the performance is analyzed and compared between AODV and AOMDV routing protocols.

KeyWords: *MANETs, AODV, AOMDV, NS2*

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1. INTRODUCTION

Mobile Ad hoc Networks is an arrangement of digital mobile nodes, the communication between mobile nodes was not included any permanent framework networks. Routing in mobile ad hoc networks is the process of choosing the topology for data transmission in the network.

Routing protocols distribution in Mobile Ad hoc Networks (MANETs) can be accomplished in numerous ways. These routing protocols can be divided into Proactive routing protocols, Reactive routing protocols and Hybrid routing protocols based over the network framework.

Proactive routing protocols are keeps the network topology information in the form of routing tables. The proactive routing protocols are managed shortest paths by using periodically updated way of the network topology. Examples of the Proactive routing Protocols are Destination Sequenced Distance Vector (DSDV) protocol and Fish-eye State Routing (FSR) protocol, etc.

Reactive routing protocols are not exchange the routing information regularly and the paths are maintains only if the network needs it. The reactive routing protocols are accomplished route discovery process between the source mobile node and the chosen destination mobile node. It is also known as On-demand routing protocols. Examples of the on-demand routing Protocols are Ad hoc On-demand Distance Vector Routing (AODV) protocol, Dynamic Source Routing (DSR) protocol and Ad hoc On-demand Multipath Distance Vector (AOMDV) protocol, etc.

The cache invalidation method is maintained continuation of information between the mobile nodes (client) and the server. Cache consistency algorithm is to follow the enhance probability distribution of information and Cached information is assigned time to live value.

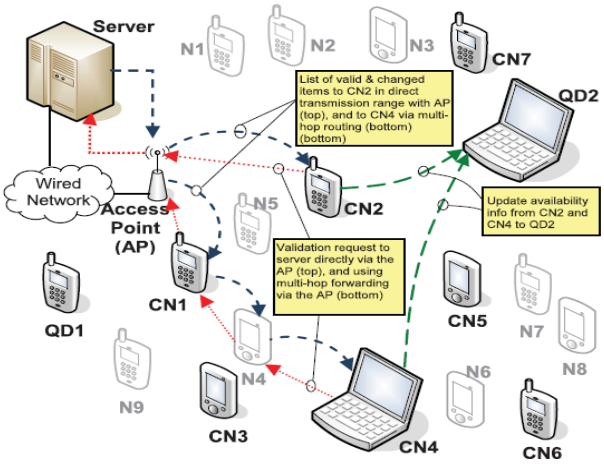

Figure1. Design Structure

2. RELATED WORK

In this section we present some of these existing works on cache invalidation mechanisms in MANETs.

[1] In Mershad.K and Artail.H proposed that the server update method of maintaining cache consistency is frequently used Invalidation reports. Therefore information regarded with the data transmission of the server and mobile nodes did not maintained.

[2] In Hassan Artail, Haidar Safa and Khaleel Mershad proposed that the cooperation based database caching system for Mobile Ad Hoc Networks, in the mobile nodes submitted queries to cache nodes. The queries are used as a

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directory to information cached in mobile nodes that previously requested them.

[3] In Liangzhong Yin and Guohong Cao proposed that the cooperative caching, which allows the sharing and coordination of cached data among multiple mobile nodes.

[4] In Guohong proposed that the cellular networks use update invalidation report method for dynamic motion of mobile nodes from one radio propagation area to another propagation area.

3. ROUTING PROTOCOLS

3.1. Ad hoc On-demand Distance Vector (AODV)

Ad hoc On-demand Distance Vector (AODV) routing protocol is a reactive protocol, every path is discovered only if it is required and is also maintained information provide that they are individual used. The path is discovered through the route discovery process, the network mobile nodes are queried on a path to reach the destination mobile node. Ad-hoc On-demand Distance Vector routing protocol that managed the loop free paths.

3.3.1 Route Discovery

To set up route discovery process, the source mobile node is generates Route Request (RREQ) control packets. The control packet is to consist of IP address of location and destination mobile node ID. The source mobile node is to communicate the route request control packets of neighbor mobile nodes.

The destination mobile node generates Route Reply (RREP) control packets of the response from route request control packets. The packet consists of IP address of location and the sequence number. It is also to contain the source mobile node IP address with hop counts to reach the destination mobile node.

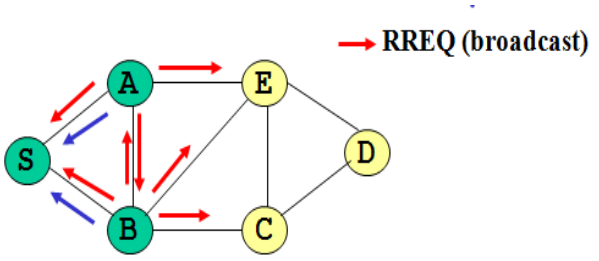

Figure2. Route Request control packet in AODV

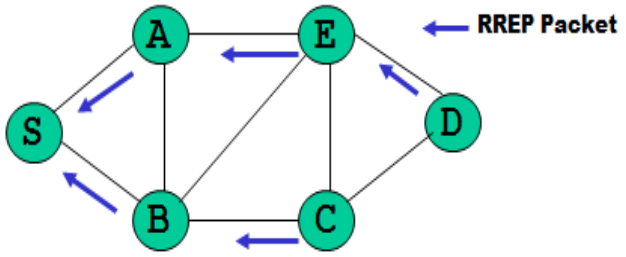

Figure3. Route Reply control packet in AODV

These mobile nodes are broadcast route request control packets to the destination mobile node and unicast route reply control packets to the source mobile node. These are arrangements to determine routes to the mobile nodes. This hop-by-hop sending route request control packets progress of the route reply packets to reach the source mobile node. The source mobile node is to accept route reply packets and initiate that route to data packets communication. Route discovery performs frequently to control overhead and delay metrics among mobile nodes in the mobile ad-hoc networks. It is complicated to calculate the time period of the process because that counts on the current state of blockages in the network also the range and present topology of the network.

3.3.2. Route maintenance

The source mobile node to reach the destination mobile node is connects with intermediate routing nodes. A specific connection break happen to the mobile nodes then upstream the link break is near the source mobile node that invalidates inside its routing table of the mobile nodes to reach the destination mobile node. The mobile node generates Route Error message (RERR) control packet that records each of these missed nodes to reach the destination mobile node. The mobile node invalidates its routing table and generates route reply control packet. The route reply control packets transmit to the source mobile node. The source mobile node accepts route reply control packets and then it can reinitiate communication between the mobile nodes.

3.2. Ad hoc On-demand Multipath Distance Vector routing protocol (AOMDV)

Ad hoc On-demand Multipath Distance Vector routing protocol (AOMDV) is an addition of multipath to Ad-hoc On-demand Distance Vector protocol. Multipath routing creates multiple paths to the source mobile node and the destination mobile node.

To setup route discovery process the source mobile node generates Route Request (RREQ) control packets and broadcast to reach the destination mobile node, it is the same way like AODV protocol. Each route request control packets pass to different neighbor nodes from the source mobile node determines a node disjoint path.

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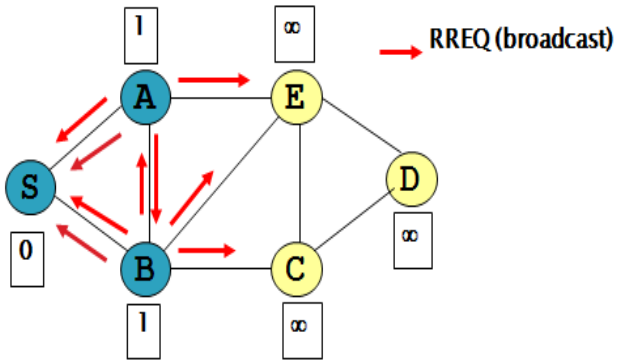

Figure4. Route Request control packet in AOMDV

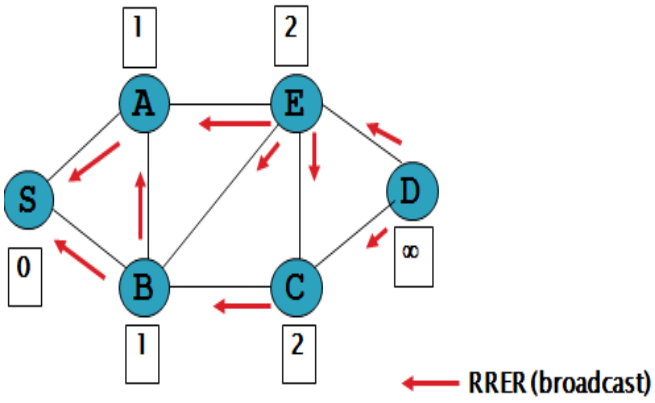

Figure5. Route Reply control packet in AOMDV

The destination mobile node accepts route request control packets and it is generates Route Reply (RREP) control packets then broadcast in multipath to reach source mobile node. Mobile node keeps the advertised hop counts that are determining the maximum number hop count for every route that is used for transmission packets. The duplicated path advertisements are accepted by the mobile nodes for determining paths to reach the destination mobile node. The Route request control packets reached same intermediate nodes from the source mobile node is not passed for transmission. Therefore, multipath routing can reduce data route failures and also decreases delay that is caused by route disconnection but increases overhead.

4. NETWORKSIMULATOR2

Network Simulator Version 2 (NS2) is an event driven simulation tool that has proved useful in studying the dynamic nature of communication networks. NS2 has two languages are Tool Command Language (TCL) and C++.

C++ is the programming language (backend language) for algorithm implementation and packet processing .TCL is the frontend language for varying parameters or configurations.

NS2 simulation outputs are shown in the animation form and text form. An animation form output is used the Network AniMator (NAM) tool and graphical type output is used the Xgraph tool.

parameters	values
simulator	NS2.34
simulation area	1600x1600
number of nodes	16
traffic type	CBR,UDP
routing protocols	AODV,AOMDV

Table1. Simulation Parameters

5. PERFORMANCE METRICS

This field analyzes performance of routing protocols with the cache invalidation technique in mobile ad-hoc networks. Some essential performance metrics can be calculated as

A. Throughput: Throughput is total data packets successfully delivered to the destination mobile node in a time period. The other two metrics are the most essential for best-effort traffic in communication network.

B. Delay: Data packets are travel from the source mobile node to reach the destination mobile node. It contains every possible delay effect of buffering as route discovery time, communication time at the MAC layer and transfer time. It is measured in millisecs.

C. Packet delivery fraction: The rate of packets delivered to the destination mobile node is created with the Constant Bit Rate (CBR) source. It determines the packet delivery ratio of the communication network.

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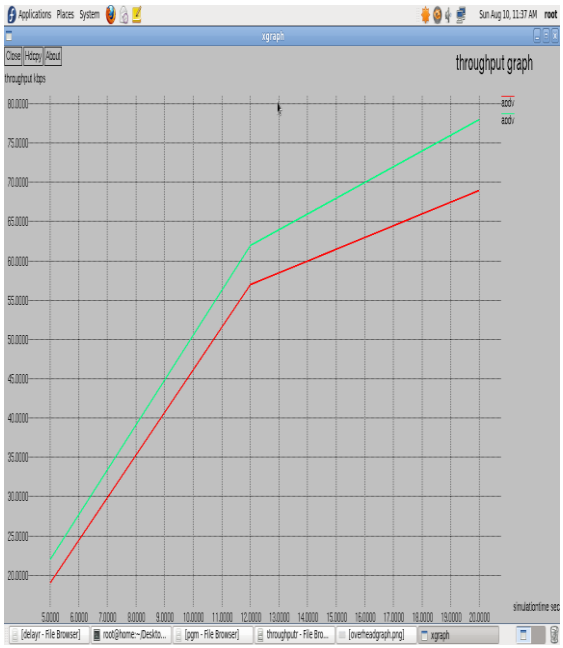
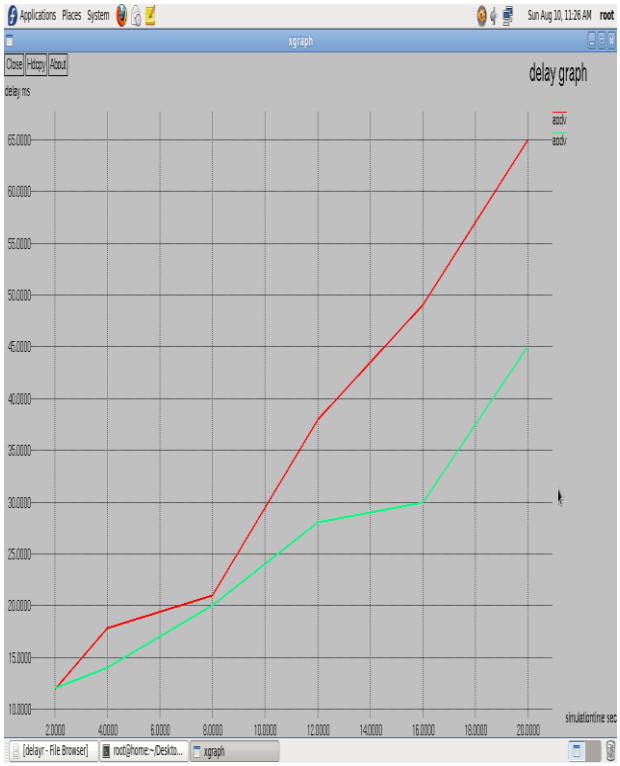
6. SIMULATION RESULTS

A. Throughput graph



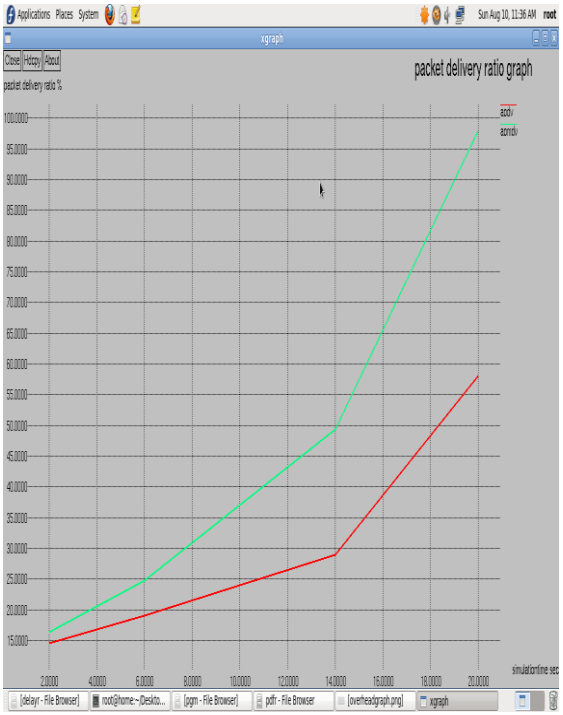
Throughput varying with simulation time

B. Delay graph



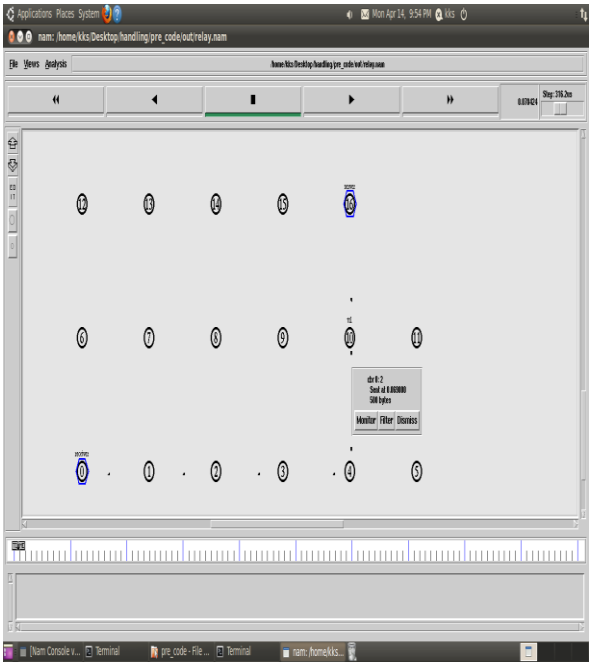
Delay varying with simulation time

C. Packet delivery ratio



Packet delivery ratio varying with simulation time

D. NAM output of packets transmission scenario



7. CONCLUSION

This paper calculated the performance of distributed cache invalidation method in mobile ad-hoc network using routing protocols. Comparison was based on the packet delivery fraction, throughput and delay. We concluded that AODV gives better performance as compared to AOMDV in terms of overhead, but AOMDV gives better performance in

packet delivery fraction, throughput and delay compared to AODV.

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