Comparative Analysis of DSR with CA-AOMDV Routing Protocol in MANET

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Abstract: MANET consists of several wireless mobile nodes which dynamically exchange data among themselves without the reliance on a fixed base station or a wired backbone network. Multipath routing allows the establishment of multiple paths between a pair of source and destination node. It is typically proposed in order to increase the reliability of data transmission or to provide load balancing and has received more and more attentions. Multipath routing protocol based on DSR protocol, which incurs only 2n control packets for a route discovery and does not require new types of control messages over DSR. We propose a scheme to improve existing on-demand routing protocols by creating a mesh and providing multiple alternate routes. Their algorithm establishes the mesh and multipath without transmitting any extra control message. Specifically, the proposed DSR uses the channel average nonfading duration as a routing metric to select stable links for path discovery, and applies a preemptive handoff strategy to maintain reliable connections by exploiting channel state information. DSR utilize the multipath functionality at each hop.

Index Terms: *Manet, Handoff, Channel Aware Routing, ANFD and AFD*

1. INTRODUCTION

An ad hoc network is a mobile, multi-hop wireless network with no stationary infrastructure. The autonomous and self-configuring nature of ad hoc networks provide several advantages such as fast and easy deployment, little or no reliance on a pre-existing infrastructure and cost-effectiveness. Until recently, ad-hoc networks found application mainly in the military and emergency management [1][3][4][5]. A significant amount of current research has been directed to designing efficient dynamic routing protocols for ad hoc networks. The challenge here is to reduce routing overheads in spite of the changing topology. This is a critical issue as both link bandwidth and battery power are premium resources. Several new protocols focused on the issue of overhead reduction without compromising on application visible performance metrics [1][3].

1.1 Manet

The next generation of wireless communication systems, there will be a need for the rapid `deployment of independent mobile users. Significant examples include establishing survivable, efficient, dynamic communication for emergency/rescue operations, disaster relief efforts, and military networks. Such network scenarios cannot rely on centralized and organized connectivity, and can be conceived as applications of Mobile Ad Hoc Networks. A MANET is an autonomous collection of mobile users that communicate over relatively bandwidth constrained wireless links. Since the nodes are mobile, the network topology may change rapidly and unpredictably over time. The network is decentralized, where all network activity including discovering the topology and delivering messages must be executed by the nodes themselves, i.e., routing functionality will be incorporated into mobile nodes. The set of applications for MANETs is diverse, ranging from small, static networks that are constrained by power sources, to large-scale, mobile, highly dynamic networks. The design of network protocols for these networks is a complex issue. Regardless of the application, MANETs need efficient distributed algorithms to determine network organization, link scheduling, and routing. However, determining viable routing paths and delivering messages in a decentralized environment where network topology fluctuates is not a well-defined problem. While the shortest path from a source to a destination in a static network is usually the optimal route, this idea is not easily extended to MANETs. Factors such as variable wireless link quality, propagation path loss, fading, multiuser interference, power expended, and topological changes, become relevant issues. The network should be able to adaptively alter the routing paths to alleviate any of these effects. Moreover, in a military environment, preservation of security, latency, reliability, intentional jamming, and recovery from failure are significant concerns. Military networks are designed to maintain a low probability of intercept and/or a low probability of detection. Hence, nodes prefer to radiate as little power as necessary and transmit as infrequently as possible, thus decreasing the probability of detection or interception. A lapse in any of these requirements may degrade the performance and dependability of the network.

1.2 Hand off

In cellular telecommunications, the term **handover** or **handoff** refers to the process of transferring an ongoing call or data session from one channel connected to the core network to another. In satellite communications it is the process of transferring satellite control responsibility from one earth station to another without loss or interruption of service. In any mobile phone conversation your call is passed from one cell to another in order to keep the signal strong. This process of handing the call from one cell to another is called a handoff or handover in . It is how this transfer takes place that defines the difference between soft and hard. In all non-CDMA systems, including analog, IS-136, GSM, and iDEN, the handoff process is an all-or-nothing affair. At some point in time the switch instructs the phone to change from one cell to another. The phone does this by terminating its connection with the old cell and then establishing a connection with the new cell. The term "hard" comes from the sharp-edged nature of this process.

In a CDMA system, all cells and all callers operate on the same frequency. Each conversation is distinguished from the next by the encoding sequence used to modulate the bits onto the wide carrier. The receiver in each CDMA phone has the ability to demodulate multiple code sequences at the same time. These receiver elements are likened to the tines of a fork, and the unit is called a Rake Receiver.

The CDMA switch chooses multiple cells in your general vicinity and it broadcasts a copy of your conversation on each. Your phone assigns each of these cells to one of the tines in its Rake Receiver. The phone may now choose any of these tines, and it may also combine the output of two or more tines to smooth the transition from one cell to another. Because contact with a cell is never broken at any time during this process, the handoff is considered "Soft". CDMA supporters will tell you that this soft approach has three primary advantages over the hard approach. The first is a much lower incidence of dropped calls during the handoff process. However, considering the low number of dropped calls reported by GSM users, one has to question if this advantage truly exists in practice.

The second advantage is that soft handoffs do not have a detectable impact on the audio. When you use a phone near a cell boundary, handoffs can rapidly occur between one cell and the other. This phenomenon is known as "Thrashing". When trashing occurs on a hard handoff system, the call quality can be severely compromised. In practice, this does seem to work.

The third advantage is that soft handoffs allow a phone to combine the signals from two sites simultaneously. Under very weak signal conditions this can translate to more error-free data recovery than either of the two sites could yield on their own. It's hard to say if this actually works in practice or not. If it does, we would tend to think that the number of cases where it might be advantageous to you are very small.

1.3 Channel Aware Routing

Routing is a critical issue in mobile ad hoc networks because of their dynamic network topology i.e. mobile station interconnection is achieved via peer level multi hopping technique and scarcity in the network resources i.e. Bandwidth and battery life. Although routing design is greatly impacted by the fading mechanisms in the wireless channel, existing routing protocols for MANET consider typically only the path-loss effect as far as propagation impairment is concerned while ignoring the deleterious effects of channel fading and shadowing. Link breakages in wireless networks can severely deteriorate network throughput and routing performance.

Another significant impediment of existing routing protocols for wireless ad hoc networks is that the considerable differences in the communication channels between nodes due to the differences in propagation/interference characteristics and differing capabilities of the heterogeneous nodes themselves are rarely considered, which can directly impact the network lifetime. For example, some nodes in the network may be equipped with an antenna array while certain other nodes may impose a tight maximum transmit power constraint due to limited battery life.

Route outage probability metric, if used to select optimal route paths, is perhaps more appropriate for MANETs than the conventional minimum hop-count metric because it is much more desirable for a packet to reach its destination with a high success probability even if it involves a few additional hops than it be lost while traversing a route with fewer hop counts i.e., the cost of each hop is represented by link outage probability rather than just uniform integer value of "1" for each link used as in conventional routing protocols.

An interesting attribute of the "route outage probability" metric is that it allows the abstraction of the physical layer characteristics of the communication link for decisions at higher layers of the protocol stack. Thus one may incorporate the node capabilities e.g., number of array elements used for diversity combining, remaining battery life along with the knowledge of the propagation channel using this metric alone.

2. RELATED WORKS

2.1 Route Fragility:

A Novel Metric for Route Selection in Mobile Ad Hoc Networks

A key factor deciding the performance of a routing protocol in mobile ad hoc networks is the manner in which it adapts to route changes caused by mobility. Exploiting the intuition that a less dynamic route lasts longer, propose a new metric, the Route Fragility Coefficient (RFC), to compare routes. RFC estimates the rate at which a given route expands or contracts. Expansion refers to adjacent nodes moving apart, while contraction refers to their moving closer. RFC combines the individual link contraction or expansion behavior to present a unified picture of the route dynamics.

2.2 A Mobility Tracking Model for Wireless Ad Hoc Networks

In an ad hoc wireless network, connectivity is determined by the physical locations and transmission ranges of the mobile units. In effect, user mobility causes the topology of an ad hoc network to change dynamically over time, which complicates the important tasks of routing and flow control. Propose a novel scheme for tracking the mobility of users in a wireless ad hoc network. Mobile nodes track their positions using pilot signal strength measurements from neighboring nodes.

2.3 Exploiting Path Diversity in the Link Layer in Wireless Ad Hoc Network

The goal is to exploit path diversity in the link layer by choosing the best next hop to forward packets when multiple next hop choices are available. Such choices can come from a multipath routing protocol, for example. This technique can reduce transmission retries and packet drop probabilities in the face of channel fading. The mechanism at the link layer that forwards packets to the best suitable next hop link to enable efficient packet forwarding on a multi-hop route. This mechanism is dependent on the availability of multiple next hops, which could be computed by a multipath routing protocol.

2.4 Locating in distributed ad-hoc wireless sensor networks

Wireless sensing nodes rely heavily on the ability to establish position information. The algorithms presented herein rely on range measurements between pairs of nodes and the a priori coordinates of sparsely located anchor nodes. Clusters of nodes surrounding anchor nodes cooperatively establish confident position estimates through assumptions, checks, and iterative refinements.

2.5 On-Demand Multipath Routing for Mobile Ad Hoc Networks

Design of efficient routing protocols in such networks is a challenging issue. A class of routing protocols called on-demand protocols has recently found attention because of their low routing overhead. The on-demand protocols depend on query floods to discover routes whenever a new route is needed. Such floods take up a substantial portion of network bandwidth. An analytic modeling framework to determine the relative frequency of query floods for various techniques. Results show that while multipath routing is significantly better than single path routing, the performance advantage is small beyond a few paths and for long path lengths.

2.6 Efficient Simulation of Ricean Fading within a Packet Simulator

Packet level network protocol simulators use simple channel models for computational efficiency. A typical method for doing this is to compute a packet error probability assuming a certain fading distribution without taking into account time-correlation. The fading models have the appropriate statistics and also time co-relational properties obtained from the Doppler spectrum. An efficient implementation based on a simple table lookup is described.

3. PROPOSED SYSTEM

We introduce an enhanced, channel-aware version of the CAAOMDV routing protocol. The key aspect of this enhancement, which is not addressed in other work, is that we use specific, timely, channel quality information allowing us to work with the ebb-and-flow of path availability. This approach allows reuse of paths which become unavailable for a time, rather than simply regarding them as useless, upon failure, and discarding them. We have utilized the channel ANFD as a measure of link stability, combined with the traditional hop-count measure for path selection. The protocol then uses the same information to predict signal fading and incorporates path handover to avoid unnecessary overhead from a new path discovery process. The AFD is utilized to determine when to bring a path back into play, allowing for the varying nature of path usability instead of discarding at initial failure. This protocol provides a dual attack for avoiding unnecessary route discoveries, predicting path failure leading to handoff and then bringing paths back into play when they are again available, rather than simply discarding them at the first sign of a fade. Further, the same information is required to determine ANFD, AFD and predict path failure, enhancing efficiency.

The overall effect is a protocol with improved routing decisions leading to a more robust network. Improvements in performance over CAAOMDV are around 25 percent for standard network performance measures. We call this protocol Channel-Aware CAAOMDV. Note that this protocol is intended to improve on CAAOMDV in conditions where the channel can be reasonably allowed for. In conditions of high channel variability, there is little sense in even attempting channel prediction and other performance improvement methodologies will need to be utilized.

3.1 ANFD and AFD

The mobile Rayleigh or Rician radio channel is characterized by rapidly changing channel characteristics. As the amplitude of a signal received over such a channel also fluctuates, the receiver will experience periods during which the signal cannot be recovered reliably. If a certain minimum threshold signal level is needed for acceptable communication performance, the received signal will experience periods of

- sufficient signal strength or "non-fade intervals", during which the receiver can work reliably and at low bit error rate
- Insufficient signal strength or "fades", during which the bit error rate inevitably is close to one half (randomly guessing ones and zeros) and the receiver may even fall out of lock.

This two-state simplification of the wireless channel behavior is called a Gilbert-Elliot model.

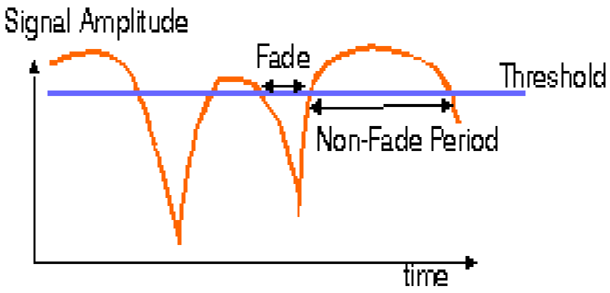

Fig -1: Fade and non-fade periods for a sample of a fading signal

It is of critical importance to the performance of digital mobile networks that the block length or packet duration is chosen taking into account the expected duration of fades and non-fade intervals.

One of two approaches can take:

1) Make the block length at least an order of magnitude longer than the average fade / non-fade period, and rely on error correction to cope with burst errors. This approach can be used for mobile reception of digital broadcast signals (e.g. DAB), particularly if the effect of fading is mitigated through using a wide transmission bandwidth and appropriate signal processing. This approach would be impractical in indoor office communication wireless LANs with high bit rates and extremely small Doppler spreads, i.e., with very long fade / non-fade periods.
2) Make the block length shorter than the average fade / non-fade period and retransmit lost data. This approach works best in full duplex mobile data systems and random access data systems. The effective throughput depends on two aspects:

1) The probability that a block runs into a fade and

2) The overhead bits required in block headers.

If the data block length is larger than the average non-fade period, almost all blocks will experience a signal fade and a corresponding burst of bit errors. This may result in an excessive packet dropping rate, unless powerful error correction codes are used. If the system supports a feedback signal with acknowledgments of received blocks, it is mostly advantageous to use only limited error correction coding, but to rely on retransmission of lost blocks. To minimize the number of retransmissions, one should choose the block length shorter than the average fade and non-fade period.

Average Fade Duration:

Outage Probability = Average number of fades per second * Average fade duration where the average number of fades per second is called the threshold crossing rate.

Average Non Fade Duration:

The average nonfading duration is affected by both the physical propagation environment e.g., obstacles such as trees and buildings and the node velocities. The ANFD, is the average length of time that the signal envelope spends above a network-specific threshold, Rth, Þ is the ratio between the transmission threshold and the root-mean-square power of the received signal, fT ¼ f0vT =c is the maximum Doppler shift of the transmitter, f0 is the transmitter signal carrier frequency, c _ 3 _ 108 ms_1 is the speed of electromagnetic radiation (signal speed), and _ ¼ vR=vT is the ratio of the receiver velocity to that of the transmitter where vR and vT are the receiver and transmitter node velocities, respectively.

3.2 Block Diagram

The Overall diagram is shown in Fig.2 clearly explains how the control is shifted from one module to the other. How the fading is controlled through the Handoff controller and how quick the decision is taken by the system in order to send and receive the data. It clearly indicates how the signal is transferred from the base station to the mobile host.

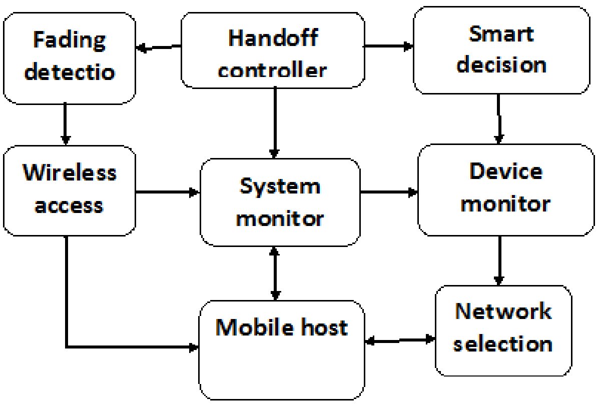

Fig -2: Overall block diagram

3.2.1 Network Selection

Cellular systems, which are based on a star-topology, if the base stations are also considered to be mobile nodes the result becomes a 'network of mobile nodes' in which a base station acts as a gateway providing a bridge between two remote ad hoc networks or as a gateway to the fixed network.

3.2.2 Wireless access

The type of network and the software platforms needed to reconfigure, adapt, manage and control a diversity of multimedia, multi-rate services and network connections. We have seen that there will be a range of radio access air interfaces optimized to the environments and the service sets that they support.

The re-configurability and the middleware flow through to the wireless access network. The radio part of the 4G system will be driven by the different radio environments, the spectrum constraints and the requirement to operate at varying and much higher bit rates and in a packet mode.

3.2.3 Fading Detection

The average fade duration quantifies how long the signal spends below the threshold. The measured data will help the practicing engineers in studying the wireless channel fading. Applying the suggested AFD calculation schemes to the measured data conclude that system channel fading follows distribution within a range of 2.5km from the base station. The probability of a signal outage should be equal to the threshold crossing rate multiplied by the average duration of a fade. The ANFD is inversely proportional to the speed of the mobile user. Channel fading occurs mainly because the user moves.

If the user is stationary almost no time variations of the channel occur (except if reflecting elements in the environment move) The ANFD increases proportional with the square root of the fade margin. The non-fade duration is not so sensitive to whether the signal experiences fades below a constant noise-floor or a fading interfering signal.

There are four modules we are use in this project

- Route recovery
- Failure detection
- Network selection
- Route maintenance

Route Recovery

Route recovery scheme in ad hoc networks to reduce the time delay and control overhead in the route recovery process. Maintaining connectivity with the sink node is a crucial issue to collect data from sensors without any interruption. While sensors are typically deployed in abundance to tolerate possible node failures, a large number of such failures within the same region simultaneously may result in losing the connectivity with the sink node which eventually reduces the quality and efficiency of the network operation.

The idea of this distributed heuristic is based on maintaining the route information at each node to the sink and then utilizing such information for the relocation of the sensors. Route recovery scheme to solve the link failure problem caused by node movement, packet collision or bad channel condition. Since it considers a backup node mobility and conduct route recovery implicitly, it can support fast route recovery and then provide reliable and stable route for routing protocol.

Routes need not be included in packet headers Nodes maintain routing tables containing entries only for routes that are in active use At most one next-hop per destination maintained at each node DSR may maintain several routes for a single destination Sequence numbers are used to avoid old/broken routes Sequence numbers prevent formation of routing loops.

- Dynamically maintain the knowledge of necessary neighbourhood information
  - ➢ Information from link layer
  - ➢ Hello messages
  - ➢ Information from information dissemination in support of routing
  - ➢ Information from data transmission
- Might include information beyond the 1-hop neighbours for some protocols
  - ➢ For example, multi-points relays for OLSR

Dynamic maintenance of neighbourhood information such as location, direction, ID, resources etc.

Fig -3 : Route Recovery

Failure detection

A node along the path fails, causing other nodes to fail or there are collisions along the path. The whole network appears to be failing when it is the sink that has failed. Failure at the sink may be due to bad sink placement, changes in the environment after deployment, and connectivity issues. Find link state of the neighbor node to communicate with the base station.

A challenge in detecting link failures in wireless mobile networking environment is for both ends of failed link to detect and react to the failure independently almost at the same time to avoid service disruption. Our link periodic exchange of failure detection mechanism makes use of small-sized messages between neighboring nodes. A node can infer it receive link quality based on the messages sent by its neighbors. Each message sent by the node to a neighboring node also serves as an acknowledgment to the messages sent by the neighbor. By indicating to its sent but failed to neighbors of the hello messages they have shown up, its neighbors can assess their transmit link quality. With both inferred receive and transmit link quality available at both ends of a link, the two ends can independently detect link failures almost at the same time.

Network Selection

In the current cellular systems, which are based on a star-topology, if the base stations are also considered to be mobile nodes the result becomes a ‘network of mobile nodes’ in which a base station acts as a gateway providing a bridge between two remote ad hoc networks or as a gateway to the fixed network. This architecture of hybrid star and ad hoc networks has many benefits; for example it allows self-reconfiguration and adaptability to highly variable mobile characteristics e.g. channel conditions, traffic distribution variations, load-balancing and it helps to minimize inaccuracies in estimating the location of mobiles.

Together with the benefits there are also some new challenges, which mainly reside in the unpredictability of the network topology due to mobility of the nodes; this unpredictability, coupled with the local-broadcast capability, provides new challenges in designing a communication system on top of an ad hoc wireless network. The following will be required:

- Distributed MAC and dynamic routing support
- Wireless service location protocols
- Wireless dynamic host configuration protocols
- Distributed LAC and QoS-based routing schemes.

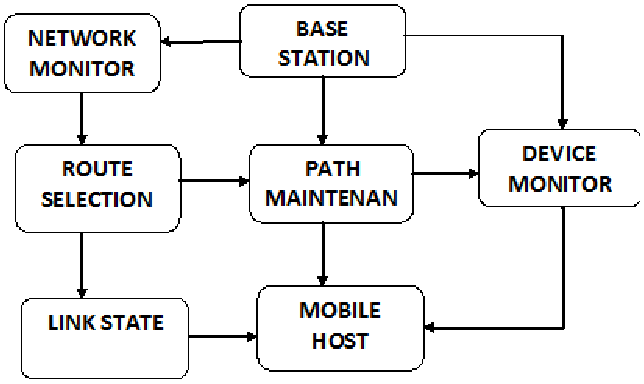

Fig -4: Network Selection

In mobile IP networks we cannot provide absolute quality-of-service guarantees, but various levels of quality can be 'guaranteed' at a cost to other resources. As the complexity of the networks and the range of the services increase there is a trade-off between resource management costs and quality of service that needs to be optimized. The whole issue of resource management in a mobile IP network is a complex trade-off of signaling, scalability, delay and offered QoS.

As already mentioned, in 4G we will encounter a whole range of new multirate services, whose traffic models in isolation and in mixed mode need to be further examined. It is likely that aggregate models will not be sufficient for the design and dynamic control of such networks. The effects of traffic scheduling, MAC and CAC and mobility will be required to devise the dimensioning tools needed to design 4G networks.

Route maintenance

Route maintenance in CA-AOMDV is a simple extension to AODV route maintenance. Like AODV, CA-AOMDV also uses RERR packets. A node generates or forwards a RERR for a destination when the last path to the destination breaks. CA-AOMDV also includes an optimization to salvage packets forwarded over failed links by re-forwarding them over alternate paths. This is similar to the packet salvaging mechanism in DSR. The timeout mechanism similarly extends from a single path to multiple paths although the problem of setting proper timeout values is more difficult for CA-AOMDV compared to AODV. With multiple paths, the possibility of paths becoming stale is more likely.

But using very small timeout values to avoid stale paths can limit the benefit of using multiple paths. In my experiments, we use a moderate setting of timeout values and additionally use HELLO messages to proactively remove stale routes. Thus, the timeouts in the current version of CA-AOMDV primarily serve as a soft-state mechanism to deal with unforeseen events such as routing table corruption and to a lesser extent for promptly purging stale routes. In another work, I have devised an adaptive timeout selection mechanism for purging stale cached routes in DSR, which can be applied to CA-CAAOMDV with appropriate modifications. As an alternative, timeout selection can be based on analytical characterization.

The modification of the project is we are using DSR Algorithm which avoids the connectivity problem in Handoff.

4. EXPERIMENTAL RESULTS

This is a stage in the project where the theoretical designs turned into working system. The most crucial stage the user confidence that the new system will work effectively and efficiently.

The performance of reliability of the system was tested and it gained acceptance. The system was implemented successfully. Implementation is a process that means converting a new system into operation. Proper implementation is essential to provide a reliable system to meet organization requirements. During the implementation stage a live demon was undertaken and made in front of end-users.

Implementation is a stage of project when the system design is turned into a working system. The stage consists of the following steps.

- Testing the developed program with sample data.
- Detection and correction of internal error.
- Testing the system to meet the user requirement.
- Feeding the real time data and retesting.
- Making necessary change as described by the user.

4.1 Comparative analysis of DSR with CA AOMDV

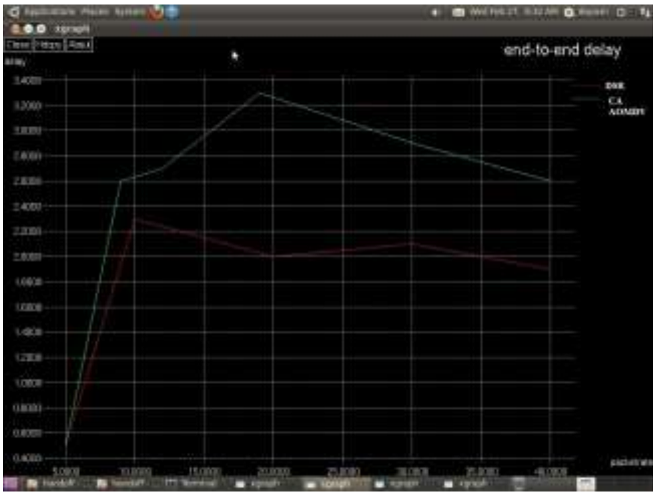

Fig -5: End-to-End delay

Fig -8: Routing Overhead

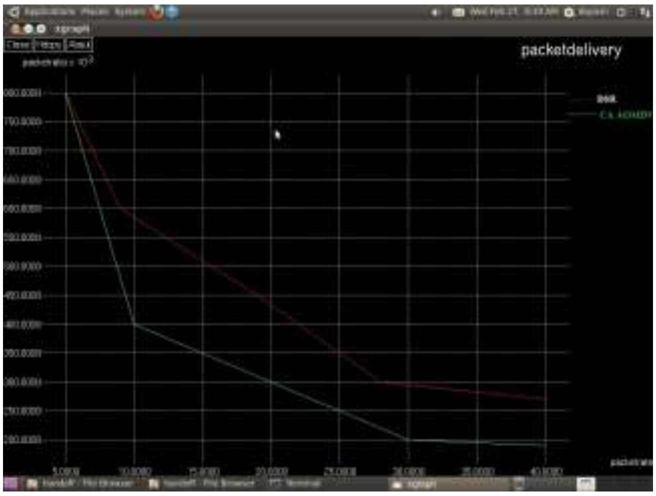

Fig -6: Packet Delivery

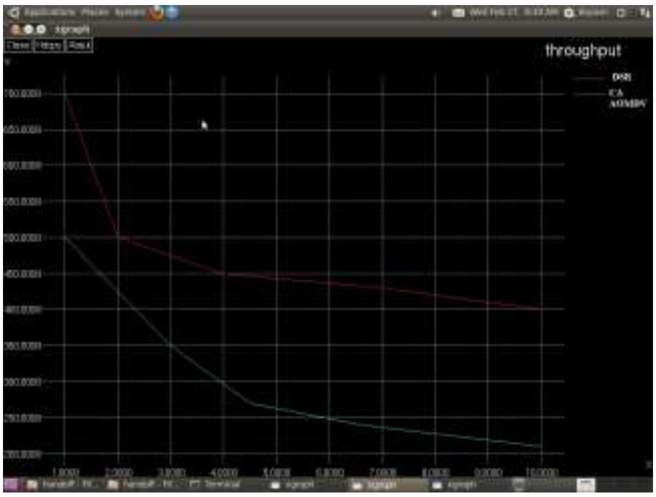

Fig -7: Throughput

CONCLUSIONS

We have proposed an on-demand multipath distance vector protocol CAAOMDV that extends the single path AODV protocol with DSR to compute multiple paths. There are two main contributions of this work. We show how route discovery mechanisms in the AODV protocol can be modified to obtain link disjoint multiple paths from source and intermediate nodes to the destination. We use the notion of an advertised hop count to maintain multiple loop free paths in the distance vector framework. We have studied the performance of CAAOMDV with DSR relative to AODV under a wide range of mobility and traffic scenarios.

We observe that DSR offers a significant reduction in delay, often more than a factor of two. It also provides reduction in the routing load and the frequency of route discoveries. In general, DSR always offers a superior overall routing performance than AODV in a variety of mobility and traffic conditions.

Future work is to allocate frequency range for the mobile users in order to increase the Quality of Service.

REFERENCES

[1]. “Associativity-Based Routing for Ad-Hoc Mobile Networks”, C.Toh, Wireless Personal Comm., vol. 4, pp. 103-139, Nov. 1997.

[2]. “Principles of Mobile Communication”, G.L.Stuber, second ed. Kluwer Academic, 2001.

[3]. “Mobility Prediction Model Based Link Stability Metric for Wireless Ad Hoc Networks”, H.Zhang and Y.N.Dong,

Proc. Int'l Conf. Wireless Comm., Networking and Mobile Computing (WiCOM), pp. 1-4, Sept. 2006.

[4]. "Wireless Channel-Aware Ad Hoc Cross-Layer Protocol with Multiroute Path Selection Diversity", M.Park, J.Andrews, and S.Nettles, Proc. IEEE Vehicular Technology Conf. (VTC)-Fall, vol. 4, pp. 2197-2201, Oct. 2003.

[5]. "Route Fragility: A Novel Metric for Route Selection in Mobile Ad Hoc Networks" O. Tickoo, S. Raghunath, and S. Kalyanaraman, Proc. IEEE Int'l Conf. Networks (ICON), pp. 537-542, Sept. 2003.

[6]. "New Cross-Layer Design Approach to Ad Hoc Networks under Rayleigh Fading", P.Pham, S.Perreau, and A.Jayasuriya, IEEE J. Selected Areas in Comm., vol. 23, no. 1, pp. 28-39, Jan. 2005.

[7]. "Signal Stability- Based Adaptive Routing (SSA) for Ad Hoc Networks", R.Dube, C.Rais, K.Y.Wang, and S.K. Tripathi, IEEE Personal Comm., vol. 4, no. 1, pp. 36-45, Feb. 1997.

[8]. "ExOR: Opportunistic Multi-Hop Routing for Wireless Networks", S.Biswas and R.Morris, ACM SIGCOMM Computer Comm. Rev., vol. 35, no. 4, pp. 133-144, Aug. 2005.

[9]. "Exploiting Path Diversity in the Link Layer in Wireless Ad Hoc Networks", S.Jain and S.R.Das, Proc. Sixth IEEE Int'l Symp. World of Wireless Mobile and Multimedia Networks (WoWMoM), pp. 22-30, June 2005.

[10]. "Microwave Mobile Communications", W.C.Jakes, second ed. Wiley Interscience, 2001.

[11]. "Efw: a cross layer metric for reliable routing in wireless mesh networks with selfish participants," S.Paris, C.Nita-Rotaru, F.Martignon, and A.Capone, in Proc.2011 IEEE INFOCOM, pp. 576–580.

[12]. "MSAWAN: a survivable architecture for wireless LANs," Virendra, S.Upadhyaya, V.Kumar, and V.Anand, "in Proc. 2005 IEEE IWIA, pp. 71–82.

[13]. "Path set selection in mobile ad hoc networks," P. Papadimitratos, Z.J.Haas, and E.G.Sirer, in Proc. 2002 ACM MobiHoc, pp. 1–11.

[14]. "Trust management in mobile ad hoc networks using a scalable maturity-based model," P.Velloso, R.Laufer, D. de O Cunha, O.Duarte, and G.Pujolle, IEEE Trans. Network and Service Management, vol. 7, no. 3,pp. 172–185, 2010.

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