www.ijecs.in
International Journal Of Engineering And Computer Science ISSN:2319-7242
Volume 4 Issue 3 March 2015, Page No. 10599-10602

A Literature Review of Reliable Multipath Routing Techniques

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Abstract **- Nowadays the demand of network is increasing rapidly. The ever increasing usage of such network requirements additionally demands fast recovery from network failures. Multipath routing is one in all the most promising routing schemes to accommodate the various needs of the network. It has basic features like load balancing and improved bandwidth. Author Cho et al. introduced a reliable multipath routing scheme known as directed acyclic graphs. The property of directed acyclic graph is that they allow multipath routing with all possible edges whereas ensuring secured recovery from single point of failures. We have used the concept of DAG in our proposed method.**

Keywords – Multipath routing, directed acyclic graphs, fast recovery

I. INTRODUCTION

Multipath routing is a technique that exploits the underlying physical network resources by utilizing multiple source-destination paths. Traffic engineering has been used to imply a range of objectives, including load- balancing, constraint based routing, multi-path routing, fast re-routing, protection switching etc.

The use of multipath routing is to minimize the overall delay in the network. The web nowadays provides only a single path between any pair of hosts that basically limits the throughput possible between them. Multipath routing are often effectively used for maximum utilization of network resources. It provides the node a selection of next hops for the similar destination.

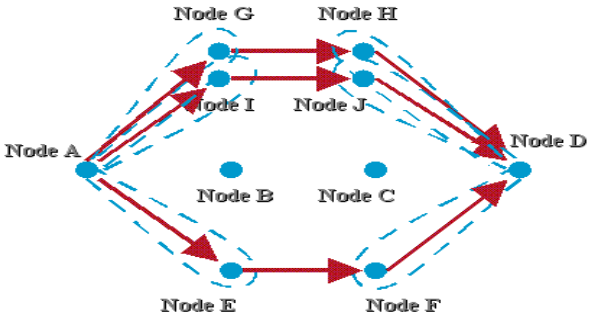

Fig.1. Multipath Routing

The increasing use of streaming multimedia and voice-over-IP, precipitated by decreasing value of hand-held transmission devices and internet books, necessitates enhanced bandwidth provisioning and fast recovery from network failures. Thus, current IP networks use many different ways for improved end-to-end bandwidth and load balancing (using multipath routing) and fast recovery from link and node failures (using fast rerouting strategies). Multipath routing is a promising routing scheme to accommodate these needs by using multiple pairs of routes between a source and a destination.

II. LITERATURE SURVEY

A. Resilient multipath routing with independent directed acyclic graphs

AUTHORS**:** S. Cho, T. Elhourani, and S.Ramasubramanian

In order to achieve resilient multipath routing, introduces the idea of independent directed acyclic graphs (IDAGs) during this paper. Link-independent (node-independent) DAGs satisfy the property that any path from a source to the root on one DAG is link-disjoint (node-disjoint) with any path from the source to the root on the other DAG. Given a network, author used polynomial-time algorithms to compute link-independent and node-independent DAGs. The algorithmic program developed during this paper: 1) provides multipath routing; 2) utilizes all

B. A framework for reliable routing in mobile ad hoc networks

AUTHORS*:* Z. Ye, S. V. Krishnamurthy, and S.K. Tripathi

Mobile ad hoc networks include nodes that are usually at risk of failure. As such, it is necessary to produce redundancy in terms of providing multiple node-disjoint paths from a source to a destination. Authors initial propose a modified version of the popular AODV protocol that permits us to find multiple node-disjoint paths from a source to a destination.

C. Performance analysis of reactive shortest path and multi-path routing mechanism with load balance

AUTHORS: P. P. Pham and S. Perreau

Research on multipath routing protocols to produce improved throughput and route resilience as compared with single-path routing has been explored in details within the context of wired networks. However, multipath routing mechanism has

not been explored completely within the domain of ad hoc networks.

D. A review of multipath routing protocols: From wireless ad hoc to mesh networks

AUTHORS**:** J. Tsai and T. Moors

Multipath routing permits building and use of multiple paths for routing between a source-destination pair. It exploits the resource redundancy and diversity in the underlying network to produce advantages like fault tolerance, load balancing, bandwidth aggregation, and improvement in QoS metrics such as delay. There are three elements to a multipath routing, namely, path discovery, traffic distribution, and path maintenance. Path discovery involves finding accessible paths using pre-defined criteria.

E. Congestion-oriented shortest multipath routing

AUTHORS**:** S. Murthy and J. Garcia-Luna-Aceves

Author presents a framework for the modeling of multipath routing in connectionless networks that dynamically adapt to network congestion. The fundamental routing protocol use shot-term metric supported hop-by-hop credits to reduce congestion over a given link, and a long-term metric supported end-to-end path delay to reduce delays from a source to a given destination.

F. A simulation study of security performance using multipath routing in ad hoc networks

AUTHORS: W. Lou, W. Liu, and Y. Fang

In this paper, author investigates the protection performance of the SPREAD scheme, that author proposed as a complementary mechanism to enhance data confidentiality in a mobile ad hoc network (MANET). SPREAD is based on two principles, secret sharing and multipath routing.

With the scheme, we are able to achieve robustness, load balancing, bandwidth aggregation, congestion reduction, and security compared to the single shortest-path routing that is sometime utilized in most networks. Multipath routing in today's IP networks is merely restricted to equal-cost multipath.

G. A survey of multipath routing for traffic engineering

AUTHORS: G. Lee and J. Choi

Techniques developed for multipath routing are usually supported using multiple spanning trees or directed acyclic graphs (DAGs). Once multiple routing tables are used, a packet needs to carry in its header the routing table to be used for forwarding. Once the corresponding forwarding edge is not available, the packet has to be dropped. This dropping is forced because to the potential looping of packets once transferred from one routing table to a different. Within the case of DAGs, computed by adding edges to the shortest-path tree, one cannot guarantee that a single-link failure will not disconnect one or more nodes from the destination. Techniques developed for fast recovery from single-link failures give more than one forwarding edge to route a packet to a destination. The techniques is also classified depending on the nature within which the backup edges are used.

H. IP fast rerouting for single-link/node failure recovery

AUTHORS: K. Xi and J. Chao

The authors develop a technique to enhance any given tree rooted at a destination with "backup forwarding ports." Whenever the default forwarding edge fails or a packet is received from the node connected to the default forwarding edge for the destination, the packets are rerouted on the backup ports.

I. IP fast reroute framework

AUTHORS: M. Shand and S. Bryant

Authors present a framework for IP fast reroute description three candidate solutions for IP fast reroute that have all gained significant attention. These are multiple routing configurations (MRCs), failure insensitive routing (FIR) and tunneling using Not-via addresses (Not-via). The common feature of all these approaches is that they use multiple routing tables. However, they differ within the mechanisms used to identify that routing table to use for an incoming packet.

J. Fast recovery from dual-link failures in IP networks

AUTHORS**:** S. Kini, S. Ramasubramanian, A. Kvalbein, and A. Hansen

The readers are observed for a detailed description of the higher then techniques. It is actually possible to use fast recovery techniques (irrespective of whether they guarantee recovery from single link failure or not) for multipath routing. However, all the above techniques need a significantly large number of routing tables, therefore a large range of extra bits within the packet header.

K. Independent trees in graphs

AUTHORS: A. Huck

Two trees are created per destination node specified the paths from any node to the root on the two trees are disjoint. The trees are also created to obtain link-disjoint or node-disjoint paths if the network is two-edge or two-vertex connected, severally. This approach is similar to those using multiple routing tables, except that only two tables are needed. Each packet could carry an additional bit in its header to indicate the tree to be used for routing. This overhead bit is also avoided by using a routing based on the destination address and also the incoming edge over that the packet was received, as every incoming edge are present on exactly one of the trees. The colored tree approach permits each node to separate its traffic between the two trees, therefore providing disjoint multipath routing. Additionally, once a forwarding link on a tree fails, the packet is also switched to the other tree. A packet is also transferred from one tree to different at most once because the colored tree approach is certain to recover from only a single-link failure.

III. CONCLUSION

As the value of hardware devices reduced and there is steady increase in resource availability voice over IP and other multimedia data streaming is enhanced. In such applications high bandwidth is expected besides faster recovery from single point of failures. So as to achieve this contemporary networks are using various methods like load balancing, recovery from node failures, and end-to-end bandwidth. Towards a good solution multipath routing may be used. This scheme together with techniques is able to do security, congestion reduction, aggregation of bandwidth, load balancing and robustness.

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