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A Score and Cluster Head Based Algorithm for Finding MRC against Link Failures

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Abstract-An Internet plays very important role in day to day life; the slow convergence of routing protocols after a network failure becomes a big problem. Internet performing an essential function in the living activities such as online transaction, online marketing, online business and some other type of communications infrastructure; due to slow convergence of routing protocols after network failure becomes the massive problem for communication network. A recovery technique name Multiple Routing Configurations (MRC) is used to guarantee fast recovery from link and node failure in networks. In the communication network if the communication is done from the different nodes to transfer the data from source node to destination node, if the nodes who communicate with each other are broken or the communication link is failed due to some interference, then network stop and data may lost in this process. So recovery of the data from the network and keep the network functional even if the nodes in the network are failed is the most important for the communication network. In this paper we present SMRC and CHMRC and analyze its performance with respect to delay, energy consumption, jitter, PDR and throughput like parameters. This research also presents how the best nodes are found for load distribution after failure.

General Terms- **Network Recovery Scheme, Node or Link failures, Multiple Routing Configurations**

*Keywords-***Cluster head, Routing Instability, Proactive Mechanism, Failure Recovery and Multiple Routing Configurations.**

1. INTRODUCTION

In last decennary, availability and reliability of the internet have been increased very rapidly. The Internet has been transformed from a special purpose network to a ubiquitous platform for a wide range of applications used for communication. If the node or any links in the networks are failed, it will affect huge amount of TCP connections or phone conversations, in an opposing direction effect. The ability to recover from failures has always been a central design goal in the Internet.

IP networks are automatically robust, since IGP routing protocols like OSPF are designed to update the forwarding information based on the changed topology after a failure [1].This re-convergence assumes full distribution of the new link state to all routers in the network field. If the new state information distrusted over the network, every router on the network calculates new legal routing tables. To optimize the convergence of IP routing many different Efforts are developed, i.e., detection of nonfunctional nodes, dissemination of information and calculating the shortest path, since, time required for convergence is still more for applications with real time requirements. The problem is that since most common network failures very short, it occurs very fast and because of this re-convergence process can cause route flapping and increased network instability [1].Multiple Routing Configurations is a proactive and local protection mechanism that allows recovery in the range of in very short time [2]. In this the normal IP convergence process can be put on hold till system recover. Multiple Routing Configurations allows packet forwarding to continue over preconfigured alternative next-hops immediately by detecting failure in the system [3]. MCR used against network failures. Because no re-routing is performed, failure detection mechanisms or hardware alerts can be used to trigger MRC without compromising network stability [4]. Recovery from any single node or link failure is guaranteed by MRC, which constitutes a large majority of the failures experienced in a network.

Multiple Routing Configurations [MRC] that allows fast and good recovery from failure [5]. The shifting of recovered traffic to the alternative link may lead to congestion and packet loss in parts of the network. Ideally, a proactive recovery scheme should not only guarantee connectivity after a failure, but not cause an unacceptable load distribution. This task is learned as one of the principal challenges for pre-calculated IP recovery schemes [6]. MRC improves the fastness of the routing but it does not protect network from multiple failures. It can protect only from the single link/node failures.An alternate approach, which is to compute backup routes that allow the failure to be repaired locally by the router detecting the failure without the immediate need to inform other routers of the failure. This schema is called IP fast reroute MRC [7][8].

MRC as a proactive disaster recovery scheme that can be applied to datacenter disaster networks. The effect of the MRC recovery process on the post failure load distribution over network links and how this impact can be minimized by a manual technique to minimize the impact of MRC and compare it to an automatic technique called modified MRC.A new solution that implements unequal weight load balance inside OSPF and use it with MRC. This new method accomplish good load distribution for traffic across network [9].

This paper proposes the unequal weight balance in OSPF while using MRC as a fast IP reroute technique, which will enhance efficiency as compare to earlier fast IP reroute technique. Simultaneously, new technique proposed as a Score based unequal weight balance in OSPF while using MRC as a fast IP reroute technique is a new method which is based on distance and energy of respective node in the network, by which failure link is optimized with alternate path and data packets move easily from source to destination. Advanced to score method, a new technique is proposed called cluster head method which will enhance the lifetime of network and powerful network.

The rest of this paper is organized as follows: In Section II, concept of MRC is presented. In section III a score based multiple routing configuration technique is proposed used to achieve good load distribution of traffic across network links after failure while using MRC. In section IV, a new solution is proposed to overcome the disadvantages of the two previous methods. Section V presents experimental results or graphical analysis and finally Section VI and section VII gives the conclusion and future work respectively.

2. Concept Of MRC

Multiple Routing Configurations (MRC) is a proactive and local protection mechanism [1]. MRC is based on generating back up configurations. Back up configurations are generated in such a way that for all links and nodes in the network, there is a configuration where that link or node is not used to forward traffic. Thus, for any single link or node failure, there will exist a configuration that will route the traffic to its destination on a path that avoids the failed element. Also, the backup configurations [10] constructed so that all nodes are reachable in all configurations, i.e., there is a valid path with a finite cost between each node pair.

MRC allows packet forwarding to continue over preconfigured alternative next-hops immediately after the detection of the failure. Thus when a router detects that a neighbor can no longer be reached through one of its interfaces, it does not immediately inform the rest of the network about the connectivity failure. Instead, packets that would normally be forwarded over the failed interface are forwarded on an alternative interface towards its destination. MRC does not affect the failure free original routing, i.e., when there is no failure, all packets are forwarded according to the original configuration, upon detection of a failure, only traffic reaching the failure will switch configuration. All other traffic is forwarded according to the original configuration as normal [11].

MRC approach is threefold. First, create a set of backup configurations, so that every network component is isolated in one configuration. Second, for each configuration, a standard routing algorithm like OSPF is used to calculate configuration specific shortest path trees and create forwarding tables in each router, based on the configurations. The use of a standard routing algorithm guarantees loop free forwarding within one configuration. Finally, design a forwarding process that takes advantage of the backup configurations to provide fast recovery from a component failure.

To send the packets from source node to destination node, first it checks the neighbor nodes of source node. The source node requests the destination node to generate the available paths. If don‘t select the destination node it asks to give destination node. To select the particular shortest path, and send the packets to the particular destination node. The failures are fairly common in the everyday operation of a network due to various causes such as maintenance, fault interfaces, and accidental fiber cuts.

MRC is based on constructing a small set of back-up routing configurations that are used to route recovered traffic on alternate paths after a failure. The backup routing configurations differs from the normal routing configuration in which link weights are set so as to avoid routing traffic in certain parts of the network. We examine that if all links attached to a node are given sufficiently high link weights, traffic will never be routed through the particular node. The failure of that node will affect traffic that is sourced at or destined for the node itself. Similarly, to eliminate a link (or a group of links) from taking part in the routing, we assign it infinite weight. The link can then fail out without any consequences for the traffic. Our approach (MRC) is Threefold. First we create a set of backup configurations, so that every network component is isolated in one configuration. Second, for each configuration, a standard routing algorithm like OSPF is used to calculate configuration specific shortest path trees and create forwarding tables in each router, based on the configurations. The use of a standard routing algorithm guarantees loop free forwarding within one configuration. Finally, we design a forwarding process that takes advantage of the backup configurations to provide fast recovery from a component failure [12] [13].

In basic system the backup configurations such that for all links and nodes in the network, there is a configuration where that link or node is not used to forward traffic. Thus, for any single node or link failure, there will exist a configuration that will route the traffic to its destination on a route that avoids the failed element. Also, the backup configurations must be created so that all nodes are accessible in all configurations, i.e., there is a valid path with a finite cost between each node pair. Using a specific shortest path calculation, each router generates a set of configuration-specific forwarding tables. For the ease of, so that a packet is forwarded according to a routing configuration, meaning that it is forwarded using the forwarding table calculated based on that configuration.

In this paper we have a separate forwarding table for each configuration, but more proficient solutions can be found in a practical implementation. It is important to note that MRC does not affect the failure-free original routing, i.e., when there is no failure, all packets are forwarded according to the original configuration, where all link weights are normal. On the detection of a failure, only traffic reaching the failure will change configuration. All other traffic is forwarded according to the original configuration as usual.

Figure 1 shows the simple route selection schema used for the different conditions. Figure 1 (a) shows the selection of routes at the time of failure occurrence in MRC and figure 1 (b) shows the selection of routes at the time.

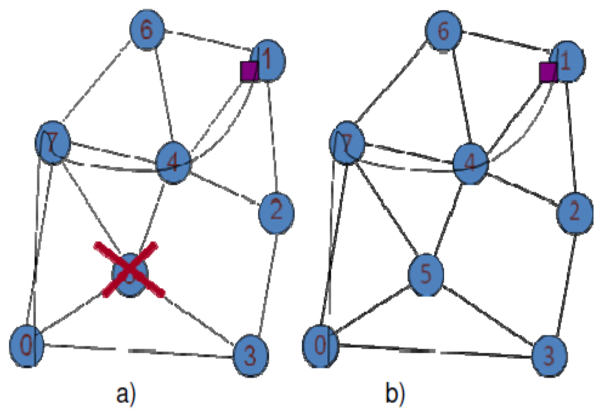


Figure 1 Selection of routes in MRC a) At the time of failure occurrence in MRC b) After the failure recovery in MRC.

With MRC, the link weights are set individually in each backup configuration. It provides more flexibility with to recovered traffic from the route and how it mange. The backup configuration used after a failure is selected based on the failure instance, and thus can choose link weights in the backup configurations that are well suited for only a subset of failure instances. MRC is based on providing the routers with additional routing configurations, allowing them to forward packets along routes that avoid a failed component. MRC guarantees recovery from any single node or link failure in an arbitrary bi-connected network.

3. A SCORE BASED MRC FOR FINDING NODE AND LINK FAILURES

This paper proposed a new technique called a Score based unequal weight balance in OSPF while using MRC as a fast IP reroute technique is a new method which is based on distance and energy of respective node in the network, by which failure link is optimized with alternate path and data packets move easily from source to destination.

The aim of proposed score based system is to find multiple routing configuration against node or link failure in the network. Objective of proposed research is to design and implementation of Score based algorithm uses with MRC for finding failures from the network, which will work for achieving good load distribution across network links and increases the lifetime of network.

This is research is best to send data packets from sender to receiver without losing data by alternate path using MRC when any node or link is failed. The proposed technique overcome the limitations of Earlier research methodology to The shifting of traffic to alternate links after a failure can lead to congestion and packet loss in parts of the network. The technique use to minimize the impact of the MRC recovery process on the post failure load distribution over network links. Two techniques used to achieve a good load distribution across links after failure are compared in earlier paper are given .The first technique which utilizes manual link weight manipulation with MRC. The second technique is the modified MRC [9].

3.1 Architecture of SMRC

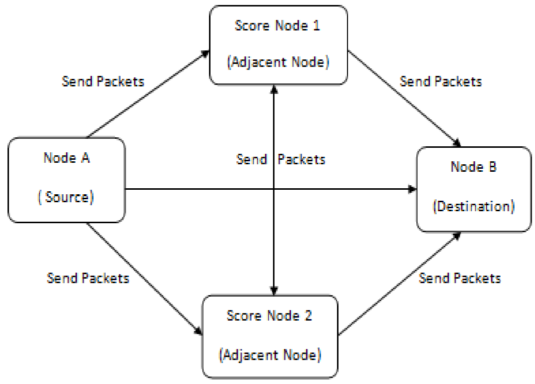


Figure 2.An Architecture of score based MRC.

Figure 2 shows the simple route selection schema used for transfer data packets from source to destination by using score based algorithm. In the above figure, S1 and S2 are the minimum score value node which are selected as a best node for transmission and for load balancing in multiple routing configurations.

3.2 Algorithm of SMRC

The steps of a score based algorithm for finding link or the node failure using MRC are given below. Which shows the flow of data packets from source to destination.

1. Initialize N[node],d ,e;
2. Set S [source]; D [Destination];
3. If d> 0 and d< N and Ne > Nsrc_e
4. Set sc[score]= f(d,e)
5. Set sc1 and sc2
6. Repeat to step 3
7. Stop.

4. A SCORE AND CLUSTER OF CLUSTER HEADBASED MRC FOR FINDING FAILURES

Cluster architecture is a scalable and efficient solution to the abovementioned problems by providing a hierarchical routing among mobile nodes [14]. To minimize the energy consumption is by using appropriate clustering algorithm, because clustering algorithms are more energy efficient than direct routing algorithm. In this, sensor nodes are grouped together to form small clusters and a cluster head (CH) for each cluster is elected [15]. In this architecture, sensor node transmits data to their respective CH and CH aggregates data and forward them to a base station. Sensor nodes in clusters transmit messages over a short distance within their respective clusters therefore minimum amount of energy exhausted from sensor nodes in clusters but in case of CH more energy is drained due to message transmission over long distance i.e. CH to the base Station [16].

This research proposes unequal weight balance in OSPF while using MRC as a fast IP reroute technique, which will enhance efficiency as compare to earlier fast IP reroute technique. Advanced to score method, a new technique is proposed called cluster head method which will enhance the lifetime of network and powerful network.

A Cluster head algorithm used the score based inside unequal weight balance in OSPF while using MRC as a fast IP reroute technique, which is based on distance and energy of respective node in the network, by which failure link is optimized with alternate path and data packets move easily from source to destination. This proposed method is enhanced the network lifetime and overcome the all demerits of previous methods and algorithm. This method is better to find the alternate and the shortest path after node or link failures from the huge network. As the cluster head algorithm used the score method which will gives the two best node to every cluster head in each cluster network. This techniques used to achieve a good load distribution across links after failure and used to achieve strong and the powerful network.

4.1 Architecture of CH-MRC

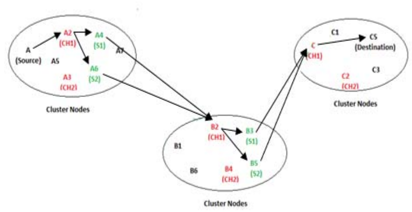


Figure 3.An Architecture of score with Cluster and cluster head based MRC.

Figure 3 shows the cluster and cluster head system merge with score algorithm which enhances the lifetime and durability of the network. The Goal of implementing this system is reduced delay; consume less energy, increased throughput .This paper compare five parameters with existing system through graphs.

4.2 Algorithm of CH-MRC

The steps of cluster of cluster head based algorithm for finding link or the node failure using MRC are given below. Which shows the flow of data packets from source to destination.

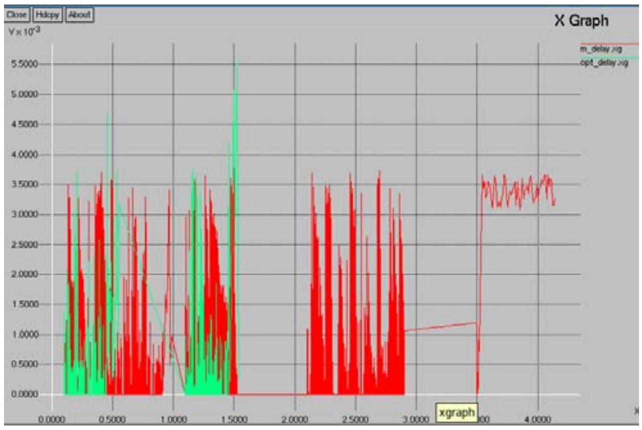
1. Initialize N, d, e // no. Of nodes, Distance and energy
2. Set S [source]; D [Destination]
3. If { $src_clust_energy1 > $src_clust_energy2 }
4. Set clust1 $CH1 // ($src_clust)
5. Else set clust1 $CH2 // ($src_clust)
6. Apply sc[score]= f(d,e)
7. Set sc1 and sc 2
8. If { dest_clust_energy1 > $dest_clust_energy2 }
9. Set clust2 $CH1 // ($dest_clust)
10. Else set clust2 CH2 // ($dest_clust)
11. Repeat to step 3
12. Stop.

Above steps shows the how data is transferred from source to destination by using the two techniques for achieving the good load balancing.

5. EXPERIMENTAL RESULTS

This research compared the five parameters with the existing MRC system and achieves the better performance while implementing it Aim of this research is to reduce the delay

Where, Delay = {Receiving time – Transition time}



Here, red color indicates the delay values for MRC and green color shows the value for CHMRC, where delay of CHMRC is less than the MRC Delay of CHMRC is 0.4 ms and delay of MRC is 0.8 ms and delay of without MRC is 2.3 ms.

Second parameter is energy, CHMRC consumes the less energy where, energy= {Transition energy – Receiving energy}

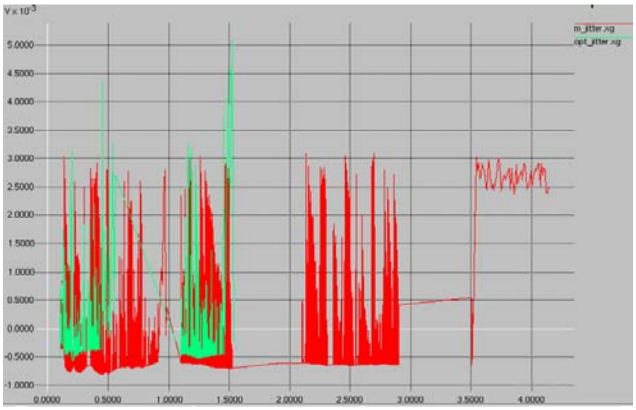
Green color is the energy consumption for CHMRC.

Energy consume by CHMRC is 1.5 mj where energy consume by MRC is 3.9 mj and energy consume by without MRC is 5.5 mj.

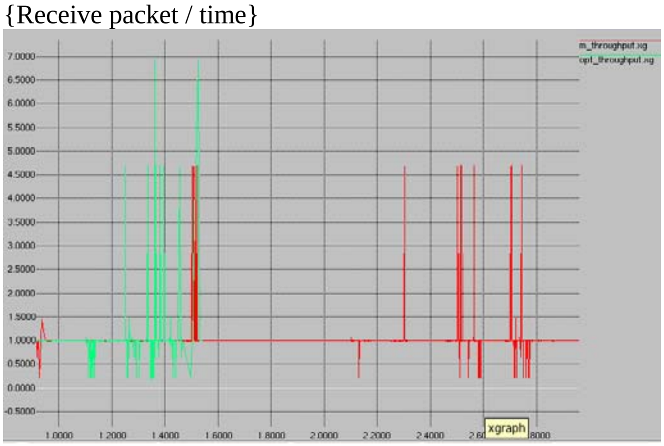
Jitter is another parameter to compare which should be near to zero or zero value. The formula for jitter is-

Jitter ={Delay – Mean Delay}

The value for CHMRC is exact zero where value for MRC is -0.500 and without MRC is -1.0 . This paper achieves the better result for jitter which enhances the lifetime of network and overcome the disadvantages of existing system as compared with the jitter parameter with the others.

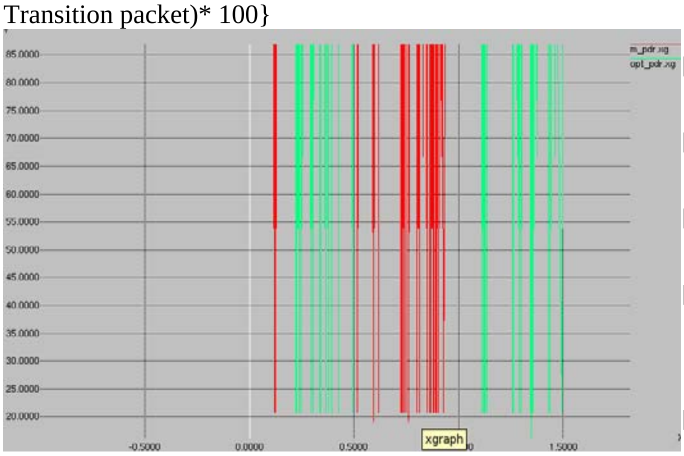


For better performance throughput must be high and this research gives the high throughput where, throughput = {Receive packet / time}



Red color shows the throughput value for MRC and green color shows the throughput value for CHMRC, where throughput of CHMRC is more than the MRC. Throughput of CHMRC is 7.00 and throughput of MRC is 4.5 and throughput of without MRC is 3.5

Packet delivery ratio is should be more than the other methods .The formula is - PDR = {(Receiving packet / Transition packet)* 100}



Green color shows the value for CHMRC 85 packets where value for MRC is 84.9 packets and without MRC is 84.5 packets.

6. Conclusion

This paper proposes, the unequal weight balance in OSPF while using MRC as a fast IP reroute technique, which will enhance efficiency as compare to earlier fast IP reroute technique.. Also, the impact to the MRC recovery process on the post failure load distribution over network links and how this impact can be minimized. Simultaneously, new technique proposed as a Score based unequal weight balance in OSPF while using MRC as a fast IP reroute technique is a new method which is based on distance and energy of respective node in the network, by which failure link is optimized with alternate path and data packets move easily from source to destination. Advanced to score method, a new technique is proposed called cluster head method which will enhance the lifetime of network and powerful network. This paper conclude that a newer technique is needed that overcome the above mentioned disadvantages. This new technique overcomes all previously mentioned disadvantages while achieving good load distribution across network links.

7. Future Work

The analytic review on the different Multiple Routing Configuration technique used to recover the failure in the communication network is proposed. In future, Multiple Routing Protocol can be implement l to recover the route of the communication in case of failure in the network. Also, security and compression protocols can be implementing in future for better performance PDR is also optimize in future.

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