IMPROVEMENT OF CONVERGENCE DELAY IN OSPF BY USING BACKUP PATH TECHNIQUE

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Abstract- A shortest-path algorithm finds a path containing the minimal cost between two vertices in a graph. In this research paper, our main concern is to create the backup path using shortest path algorithm. So that when any node fails, it quickly adapt another predefined path as stored in back up table.
As many real-world situations rely on shortest-path algorithm, this proposed solution can create a new milestone in respective fields. Further research can apply the proposed algorithm for better performance where shortest path algorithm needs to be implemented. There has been a surge of research in shortest-path algorithms due to the problem's numerous and diverse applications.

Keywords – OSPF, Convergence Delay, Dijkstra's Algorithm**.**

I. INTRODUCTION

1.1 Routing Protocol

A routing protocol [1] specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network. Routing algorithms determine the specific choice of route. Each router has a priori knowledge only of networks attached to it directly. A routing protocol shares this information first among immediate neighbors, and then throughout the network. There are three classes of Routing Protocols:

- Interior gateway routing by link state routing protocols
- Interior gateway routing by distance vector protocols
- Exterior gateway routing

1.2 Link State Routing Protocol

The basic concept [2] of link-state routing is that every node constructs a map of the connectivity to the network, in the form of a graph, showing which nodes are connected to which other nodes. Each node then independently calculates the next best logical path from it to every possible destination in the network. The collection of best paths will then form the node's routing table. Through link state routing protocol

- Routers [3] broadcast and receive link state packets to and from other routers via the network. Link state packets contain the status of a router's links or network interfaces.
- The router builds a topology database of the network.
- The router runs the Shortest Path First (SPF) algorithm against the database and generates a SPF tree of the network with itself as the root of the tree.
- The router populates it route table with optimal paths and ports to transmit data through to reach each network
- Examples of link state routing protocols are:
- Open Shortest Path First (OSPF) for IP
- The ISO's Intermediate System to Intermediate System (IS-IS) for CLNS and IP
- DEC's DNA Phase V

- Novell's NetWare Link Services Protocol (NLSP)

1.3 Open Shortest Path First (OSPF)

Open Shortest Path First (OSPF) [4] is a link state routing protocol (LSRP) that uses the Shortest Path First (SPF) network communication algorithm (Dijkstra's algorithm) to calculate the shortest connection path between known devices.

The OSPF routing policies to construct a route table are governed by link cost factors associated with each routing interface. Cost factors may be the distance of a router, network throughput of a link, or link availability and reliability, expressed as simple unit less numbers. This provides a dynamic process of traffic load balancing between routes of equal cost.

OSPF selects the best routes by finding the lowest cost paths to a destination. All router interfaces are given a cost. The cost of a route is equal to the sum of all the costs configured on all the outbound links between the router and the destination network, plus the cost configured on the interface that OSPF received the Link State Advertisement on.

1.4 Dijkstra's Algorithm

Dijkstra's algorithms[5] used for calculating the shortest path, which introduced by the famous Dutch computer scientist Edsger W. Dijkstra, was recognized as the best algorithm that can be applied to get the shortest path from a node to any other nodes. However, with the development of the computer, the scale of the problems is increasing continuously, and meanwhile the use of traditional Dijkstra has increased the space and time complexity.

Given a graph and a source vertex in graph, find shortest paths from source to all vertices in the given graph. We generate a SPT (shortest path tree) with given source as root. We maintain two sets, one set contains vertices included in shortest path tree, and other set includes vertices not yet included in shortest path tree. At every step of the algorithm, we find a vertex which is in the other set and has minimum distance from source.

II. LITERATURE REVIEW

Fahim Ahmed et al. [7] proposed an algorithm for graphs with real edge weights to solve single source shortest path problem with the feature of negative weight cycle detection in order to optimize time complexity in this paper. The time complexity analysis and proof of correctness confirmed that, for graph with identical configuration, the proposed algorithm provides faster and accurate solutions with quasilinear time complexity than the existing algorithm that comes out with the same solution with a polynomial time complexity.

Pritesh Kumar Jain et al. [8] covered the comparison of routing methodology based on logical addressing using subnetting, concept of Dynamic Host Configuration Protocol in this paper. Routing protocols are used to transmit packets across the Internet. Routing protocols specify how routers communicate with each other. The router has prior knowledge about the adjacent networks, which can assist in selecting the routes between two nodes. There are various types of routing protocols that are Inter domain and Intra domain, Routing Information protocol, open shortest path first and Enhanced Interior Gateway Routing Protocol have been considered as the pre-eminent routing protocols for real-time applications. Subnet allows administrators to divide their private network into virtually defined segments with many advantages of subnetting. Dynamic Host Control Protocol is a service that automatically assigns IP addresses to devices that connect to the network.

Vishal Nigam et al. [9] focused on the different dynamic routing protocols used in computer network in this paper. Dynamic routing is when protocols are used to find networks and update the routing tables on router. Routing Protocols are key elements to modern communication networks. With the expansion of the existing networks and the emergence of new applications that require a real time communication,

routing protocols become one of the most important decisions in the design of these networks. A routing protocol is used by routers to dynamically find all the networks in the internetwork and to ensure that all routers have the same routing table. Basically, a routing protocol determines the path of a packet through an internetwork.

Syed Yasir Jalali et al. [10] discussed that in a network topology various protocols are used for forwarding the packets. A routing table is maintained by routers for successful delivery of the packets from the source node to the correct destined node. The extent of information stored by a router about the network depends on the algorithm it follows. In this paper they evaluated the performance of RIP, OSPF, IGRP and EIGRP for the parameters: convergence, throughput, queuing delay, end to end delay, utilization through simulation which has been attempted using OPNET as simulating tool. They tried to find out which protocol suits the best for the network and through a thorough analysis they had tried to find the pros and cons of each protocol.

V.Vetriselvan et al. [11] discussed that in this modern internet era, routing protocols plays a vital role. Determines how the communication is done in router to forward the packets from source to destination. In this paper, they surveyed performance evaluation of various routing protocols. With certain criteria's like Jitter, Convergence Time, end to end delay, etc.

P. Priyadhivya et al. [12] discussed that routing is the significant characteristics of the internet since it enables messages to pass from one computer to another and eventually reach the destination. Each computer in the network performs routing by passing the message to the next computer. The commonly used routing protocols are RIP, OSPF and EIGRP. These are the interior gateway protocols that have been developed for IP networks and it is used to exchange routing information within an administrative network. This paper explains briefly about Interior gateway routing protocols.

Prachi Thakur et al. [6] discussed that in this internet era, routing protocols play an important role in path determination to send traffic fast. There are different types of routing protocols available such as static and dynamic routing protocols. Accordingly, this paper gives depth study of various dynamic routing protocols such as RIP, EIGRP and OSPF.

Vincenzo Eramo, et al. [13] analyzes intra-domain routing protocols improvements to support new features required by real time services. They propose a new multi-path dynamic algorithm which uses multipath data to make a fast determination about the new shortest paths when a link failure happens, reducing this way the network re-convergence time.

Xuezhi Jiang, et al. [14] presented the paper on Improving IGP Convergence through Distributed OSPF in Scalable Router; they propose a distributed OSPF (DOSPF) scheme to schedule routing computation through self-adaptively adjusting SPT waiting time.

Jaewon Kang, et al. [15] proposes an Adaptive Link Buildment (ALE) scheme that creates a link based on its stability in terms of connectivity and channel condition. The key characteristic of the ALE scheme is that it dynamically controls the latency of a new link creation by either accepting or dropping incoming Hello messages without generating additional control packets on the wireless channel. In addition, the ALE scheme is fully compatible with the legacy OSPF routing protocol.

III PROBLEM STATEMENT

Fast convergence time is required to meet network based application demands and quality of service requirements of modern dynamic large-scale routing domains, such as data centre's. Although OSPF sends triggered updates when a network changes or failure occurs but OSPF have lack of facility to obtain a new route to bypass failure in time, a lot of packet loss during convergence delay, Lack of backup routes for destination so that it can quickly adapt to alternate routes. The convergence delay, in case of failure, makes this technology a non-preferred choice for use in today's network design. Real

time application likes voice and video received qualities have been affected due to packet loss in convergence. Communication reliability is a desired property in computer networks. One key technology, to increase the reliability of a communication path, is to provision a disjoint backup path. OSPF has lack of backup path in case of failure.

IV RESULTS

For our proposed methodology, we used the Microsoft Visual Studio 2010 and Microsoft SQL server 2008. We developed the application in C# language with .Net Framework. We used the Dijkstra's algorithm. Dijkstra's algorithm is an algorithm for finding the shortest paths between nodes in a graph. Data is entered in the research through a dynamic graph whose nodes may be failure at run time.
The various steps utilized for the proposed work are given below:

a. Entered the no. of nodes by the user for the network.
b. Enter the weight of each edge by the user as the graph is directed weighted graph.
c. Enter the source and destination by the user.
d. Algorithm calculate the shortest path as well as the shortest alternate path with assumption of failure nodes.
e. Display the results.

V.CONCLUSION

Analysis of our proposed method is done on shortest path. We implemented an algorithm that find the shortest path with back up routing facility by the assumption of node failure. We measured the result by taking the weighted graph of nodes and through this research we decreased the convergence delay and improved the packet loss problem. Real time application like voice and video received qualities has been effected due to packet loss in convergence.

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