Chapter 4

Restoration Technique to Optimize Recovery Time for Efficient OSPF Network

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ABSTRACT

Some high speed IP networks, which involve interior gateway protocols, such as OSPF, are not capable of finding the new routes to bypass the effect like failure in time. At the point when the failure occurs the network must converge it before the traffic has the capacity to go to and from the network segment that caused a connection disconnect. The duration of the convergence period of these protocols vary from hundred of milliseconds to 10 seconds, which creates unsteadiness and results high packet loss rate. This issue may be determined by proposing an algorithm that can rapidly react to the topology change and reduce the convergence time by providing back up path which is already stored in routing table before the failover occurs.

INTRODUCTION

1. Routing Protocol

A routing protocol 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 (Introduction IP Routing). A routing protocol shares this information first among immediate neighbors, and then throughout the network. This way, routers gain knowledge of the topology of the network. The term Routing Protocol refers specifically to one of the operating layers of the OSI model, which similarly disseminates topology information between routers. The specific characteristics (Wu,
n.d.) of routing protocols include: Routing path, Hop count, Convergence time, Scale up factor. There are three classes of Routing Protocols: Exterior gateway routing, Interior gateway routing by distance vector protocols, Interior gateway routing by link state routing protocols.

A. Exterior gateway routing: Border gateway protocol (BGP) is the routing protocol used on internet for exchange traffic between autonomous systems.

B. Interior gateway routing via distance vector routing protocols: It uses simple algorithm that calculates a cumulative distance value between routers based on hop count (Grang & Gupta, 2013).

C. Interior Gateway Routing via link state routing protocols: The basic concept 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 (Introduction IP Routing):

i. Routers broadcast and receive link state packets to and from other routers via the network.

ii. Link state packets contain the status of a router’s links or network interfaces.

iii. The router builds a topology database of the network.

iv. 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.

v. 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:

1. Open Shortest Path First (OSPF) for IP
2. The ISO’s Intermediate System to Intermediate System (IS-IS) for CLNS and IP
3. DEC’s DNA Phase V
4. Novell’s NetWare Link Services Protocol (NLSP)

2. Open Shortest Path First (OSPF)

OSPF protocol was developed due to a need in the internet community to introduce a high functionality non-proprietary Internal Gateway Protocol (IGP) for the TCP/IP protocol family. OSPF (Moy, 1998; Coltun, Ferguson, Moy & Lindem, 2008) is a popular interior gateway routing protocol. Such protocols provide routing functionality within a domain, which is generally, although not necessarily, contained within an autonomous system (AS) (Hawkinson & Bates, 1996). OSPF belongs to the category of link state routing protocols that generally require each router in the network to know about the complete network topology. In 1989, the first version of OSPF was defined as OSPFv1, which was published in RFC 1131. The second version of OSPFv2 was introduced in 1998, which was defined in RFC 2328. In 1999, the third version of OSPFv3 for IPv6 was released in RFC 2740 (Islam & Ashique, 2010). OSPF has introduced new concepts such as authentication of routing updates, Variable Length Subnet Masks (VLSM), route summarization, and so forth.