Border Gateway Routing Protocol Convergence Time Analysis with Minimum Route Advertisement Information

Manoj V.N. Vadakkepalisseri[1] and K. Chandrashekaran[2]

[1] Department of Computer Science and Engineering,
Mekelle Institute of Technology,
Mekelle, Ethiopia, East Africa
manojvnv@gmail.com
[2] Department of Computer Engineering,
National Institute of Technology, Surathkal, India
kchnitk@gmail.com

Abstract. The Border Gateway Protocol (BGP) is the default routing protocol for the routing between autonomous systems in the Internet. BGP's convergence time is mainly dependent on the Minimum Route Advertisement Interval (MRAI) value, But the influence of this MRAI value on the router's resources is not yet understood well enough to improve the existing protocol implementation in terms of the specific aspects like CPU utilization, Memory requirement, Bandwidth utilization and convergence time. Therefore it has been analyzed to understand the relationship between the setting of Minimum route advertisement (MRAI) value and the resource requirement of BGP. This paper analyse the convergence times and number of exchanged updates to the different MRAI settings of BGP. In particular, the influence of the MRAI timer in the router CPU utilization, Bandwidth and Memory requirement, number of updates and convergence time is investigated. Designed an algorithm to enhance the convergence time of BGP by considering the minimum route advertisement interval time and reduce routing update overhead. And it shows enhancement of 17% of CPU utilization, 10% of Bandwidth, 10% of memory requirement and 14% of convergence time when compared with the existing system.

1 Introduction

Routing in the Internet is performed on two levels (intra-domain and inter-domain) implemented by two sets of protocols [13]. Interior gateway protocols (IGPs), such as Routing Information Protocol (RIP) etc., Exterior Gateway Protocols (EGPs), such as EGP and Border Gateway Protocol (BGP), route packets between Autonomous Systems (inter-domain). This paper focus on BGP, it performs interdomain routing in Transmission-Control Protocol/Internet Protocol (TCP/IP) networks. BGP is an Exterior Gateway Protocol (EGP), which performs routing between multiple autonomous systems or domains and exchanges routing and reachability information with other BGP systems. The primary function of a BGP system is to exchange network-reachability information, including information about the list of autonomous system

V.V Das et al. (Eds.): BAIP 2010, CCIS 70, pp. 310–319, 2010.

paths, with other BGP systems. BGP uses a single routing metric to determine the best path to a given network. This metric consists of an arbitrary unit number that specifies the degree of preference of a particular link. The BGP metric typically is assigned to each link by the network administrator. The value assigned to a link can be based on any number of criteria, including the number of autonomous systems through which the path passes stability, speed, delay, or cost.

The BGP routers have to gain knowledge about possible destinations. As long as the involved routers negotiate the new routes but try to route data on invalid or contradictory paths, data may never reach its destination. The time of unsettled path selection after a topology change is also called convergence time. Its duration is dependent on the Minimum Route Advertisement Interval Timer (MRAI) [13]. Its value has critical interest to the stability of the Internet. As the global Internet encompasses a huge number of computers, routing update is also big overhead. MRAI and Routing update values are the two main concern of this work.

When a BGP router first comes up on the Internet, either for the first time or after being turned off, it establishes connections with the other BGP routers with which it directly communicates. BGP neighbours exchange full routing information when the TCP connection between neighbours is first established. When changes to the routing table are detected, the BGP routers send to their neighbours only those routes that have changed. BGP routers do not send periodic routing updates, and BGP routing updates advertise only the optimal path to a destination network. BGP routers send and receive update messages to indicate a change in the preferred path to reach a computer with a given IP address. If the router decides to update its own routing tables because this new path is better, then it will subsequently propagate this information to all of the other neighbouring BGP routers to which it is connected, and they will in turn decide whether to update their own tables and propagate the information further. Routers that use BGP are called BGP speakers [7].

2 Exchange of Route Information and Route Processing in BGP

BGP speakers perform two tasks. The first task is forwarding of packets between end systems on the Internet [13]. For a router the destination of a packet is a network, rather than a single end system. Routers in their routing tables store only network addresses, called destination. One destination in a BGP routing table is represented by a pair consisting of an IP address prefix and the length of the prefix [13].

The second task of BGP speakers is maintaining information regarding routes (paths) from a particular speaker toward destinations in the Internet. The path contains a list of AS numbers, which describes all ASs which a packet has to traverse along the route to the destination. A BGP speaker may store multiple paths to each destination. Those paths are stored in a BGP routing table or RIB (Routing Information Base). The list of AS numbers in a path conveys more information than the distance use in traditional distance-vector protocols. It is used to prevent creation of routing information loops. That is also the reason why BGP is often called path-vector protocol, to distinguish it from distance-vector routing protocols. BGP uses the length of a path (the number of ASs in the path), as a distance metric.