GEO BASED ROUTING FOR BORDER GATEWAY PROTOCOL IN ISP MULTI-HOMING ENVIRONMENT

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Declaration

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Abstract

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Key words: BGP, SDN, AS-PATH, optimum route selection, Internet Architecture, Internet routing, Latency

BGP is the one and only protocol used by ISPs to exchange routing information between Autonomous Systems. An Autonomous System is an IP network or group of IP networks under a common administration with common routing policies. Internet Service Providers (ISP) connects to each other to facilitate reachability among Autonomous Systems using BGP protocol.

Many ISPs setup multiple upstream connections to achieve global connectivity, redundancy, and a better quality of service. Multiple upstream connectivity results multiple paths to destinations. ISPs need to apply complex route policies to select the best outgoing interface to destination among multiple paths since BGP protocol does not consider link congestion, and distance to destination during the route selection process. Incorrect path selection leads to unnecessary traffic route between autonomous systems, high latency and low quality of service. Most prevailing issue for the South Asian internet users is that Internet content is not hosted within the region but in Singapore, Europe, and USA data centers. BGP protocol does not select shortest distance always when multiple upstream connections are available to ISP. This results in high latency to the end users.

We can simulate different ISP path delays by introducing delay element between end server and client terminal. This proposal provides experimental results on how end user experience varies when delay to end server varies. Delay is proportional to distance between user terminal and end server. Therefore, this proposal considers distance to end server when solution is proposed to optimize end user delay. Traditional BGP does not consider geographical distance to end server when selecting outgoing interface. BGP has thirteen criteria to select best outgoing interface but most dominant criteria is the AS-PATH length. This research focuses on equal AS path length occurrences of current full BGP routing table in multi-homing environment. Equal AS-PATH length results BGP protocol to select outgoing interface randomly based on lowest router ID or lowest interface ID. The proposal suggests using geo graphic distance to destination as tiebreak condition for equal AS-PATH. This enables BGP itself to calculate best path without using complex routing policies.

BGP is a heavily adopted protocol in the internet domain. It is hard to change such a stable implementation to achieve proposed geo based routing. SDN based implementation proposes in this proposal since SDN implementation is becoming popular in IP networking domain. New route selection criteria for BGP can easily implement using SDN controller. Simulation results reveal approximately 50 percent of the routing decisions are based on equal AS-PATH length if special routing policies are not applied. Further, simulation result justifies a relationship between latency and web page browsing user experience.

Dedication

This is dedicated to my loving Father and Mother.

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List of Abbreviations

Abbreviation	Description
AS	Autonomous System
BGP	Border Gateway Protocol
EBGP	Exterior Border Gateway Protocol
IBGP	Interior Border Gateway Protocol
ISP	Internet Service Provider
SDN	Software Define Networking

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