Scalable IPv6 Multi-Homing Scheme Based on End-to-End Argument

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***Abstract*—The motivation of the multi-homing is to improve reliability and load sharing. However, the existing multi-homing schemes for IPv6 seem to simply focus on preserving connectivity via other links when one of the links fails. In this letter, we present a multi-homing scheme in IPv6 considering the load sharing and delay latency, and reliability. The simulation results show the distinct performance of our approach.**

***Index Terms*—Connectivity, load sharing, multi-homing.**

I. Introduction

MULTI-HOMING refers to a single network having more than one connection. Being multi-homed is intrinsically complicated. It is not well handled by Border Gateway Protocol (BGP), and it interacts in complex ways with aggregation and address allocation policies. In particular, the fundamental concept of IPv6 is based on firm route aggregation, by which Top Level Aggregator (TLA) needs to announce the aggregate of their address space only to other TLA peers. Due to the above reason, the way to support the multi-homing in IPv4 that announces the IP address space that you obtained from one of the providers to both of your upstream providers violates fundamental principle regarding aggregation. So, it requires a fair amount of thoughts and careful configuration to deploy multi-homing on IPv6.

There are several researches [1], [4]–[6] to naturally support multi-homing on IPv6. The outstanding research [1] among them provides the reliability by advertising reachability via direct EBGP and nondirect EBGP, as shown in Fig. 1. In this scheme, the packets destined to Host B's PreA:site:hostid address are routed through ISP A in normal cases. However, once failure happens on the primary link, the packet cannot be delivered on the primary link. Instead, ISP-BR(Border Router)-A tunnels the packet toward E-BR-B(Exit Border Router). This solution works very well in that it does not affect the scalability of the routing system in default-free zone or core network. However, as shown in Fig. 1, it may cause centralized tunneling overhead on ISP-BR-A and long packet delay. Long packet delay comes from the fact a tunneling may be established across several domains under hierarchical architecture on IPv6, even though logical path of tunneling looks so short, as you can see in Fig. 1.

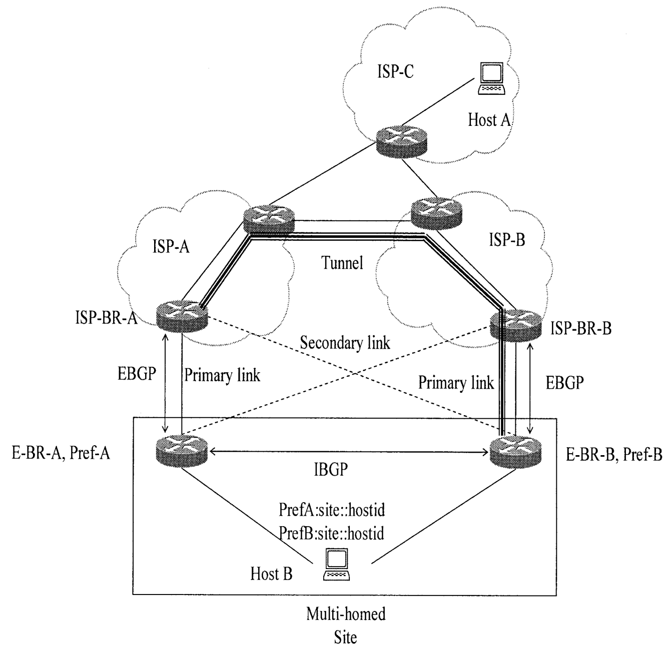

Fig. 1. Multi-homing support at site exit router.

In practice, this model does not a flexible architecture. To solve the above problem, we introduce one of the important Internet philosophies, "end-to-end argument," for IPv6 multi-homing. It establishes the direct tunneling between sender's site exit router and receiver's site exit router. Doing so, it can preserve the on-going connectivity with minimized delay.

In the light of load sharing, the ISP border router connected to multi-homed site can make decisions for detouring some packets to other links. Once ISP border router perceives more excessive link utilization than pre-determined threshold on link, ISP border router requests the sender's site exit router to make use of alternative links for transmitting the packets.

II. Proposed Scheme

The main design goals of the proposed scheme are to share congested load over one link with other un-congested links and minimize the packet delay until broken link is restored.

The flow sequence and network architecture of proposed scheme are depicted in Fig. 2. The proposed scheme introduces a new database, which consists of AS (Autonomous System) number and a list of site exit routers' addresses within an AS. This site exit routers' address are used to establish a new

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