Cost-Effective Resource Allocation of Overlay Routing Relay Nodes

Abstract

Overlay routing is a very attractive scheme that allows improving certain properties of the routing (such as delay or TCP throughput) without the need to change the standards of the current underlying routing. However, deploying overlay routing requires the placement and maintenance of overlay infrastructure. This gives rise to the following optimization problem: Find a minimal set of overlay nodes such that the required routing properties are satisfied. In this paper, we rigorously study this optimization problem. We show that it is NP-hard and derive a nontrivial approximation algorithm for it, where the approximation ratio depends on specific properties of the problem at hand. We examine the practical aspects of the scheme by evaluating the gain one can get over several real scenarios. The first one is BGP routing, and we show, using up-to-date data reflecting the current BGP routing policy in the Internet, that a relative small number of less than 100 relay servers is sufficient to enable routing over shortest paths from a single source to all autonomous systems (ASs), reducing the average path length of inflated paths by 40%. We also demonstrate that the scheme is very useful for TCP performance improvement (results in an almost optimal placement of overlay nodes) and for Voice-over-IP (VoIP) applications where a small number of overlay nodes can significantly reduce the maximal peer-to-peer delay.

Existing System

OVERLAY routing has been proposed in recent years as an effective way to achieve certain routing properties, without going into the long and tedious process of standardization and global deployment of a new routing protocol. For example, overlay routing was used to improve TCP performance over the Internet, where the main idea is to break the end-to-end feedback loop into smaller loops. This requires that nodes capable of performing TCP Piping would be present along the route at relatively small distances. Other examples for the use of overlay routing are projects like RON and Detour, where overlay routing is used to improve reliability. Yet another example is the concept of the “Global-ISP” paradigm introduced in, where an overlay node is used to reduce latency in BGP routing.

In order to deploy overlay routing over the actual physical infrastructure, one needs to deploy and manage overlay nodes that will have the new extra functionality. This comes with a non negligible cost both in terms of capital and operating costs. Thus, it is important to study the benefit one gets from improving the routing metric against this cost.

Disadvantages of Existing System

1. Non negligible cost both in terms of capital and operating costs.

Proposed System

In this paper, we concentrate on this point and study the minimum number of infrastructure nodes that need to be added in order to maintain a specific property in the overlay routing. In
the shortest-path routing over the Internet BGP-based routing example, this question is mapped to: What is the minimum number of relay nodes that are needed in order to make the routing between a group of autonomous systems (ASs) use the underlying shortest path between them? In the TCP performance example, this may translate to: What is the minimal number of relay nodes needed in order to make sure that for each TCP connection, there is a path between the connection endpoints for which every predefined round-trip time (RTT), there is an overlay node capable of TCP Piping? Regardless of the specific implication in mind, we define a general optimization problem called the Overlay Routing Resource Allocation (ORRA) problem and study its complexity. It turns out that the problem is NP-hard, and we present a nontrivial approximation algorithm for it. Note that if we are only interested in improving routing properties between a single source node and a single destination, then the problem is not complicated, and finding the optimal number of nodes becomes trivial since the potential candidate for overlay placement is small, and in general any assignment would be good. However, when we consider one-to-many or many-to-many scenarios, then a single overlay node may affect the path property of many paths, and thus choosing the best locations becomes much less trivial.

Advantages of Proposed System

We test our general algorithm in three specific such cases, where we have a large set of source–destination pairs, and the goal is to find a minimal set of locations, such that using overlay nodes in these locations allows to create routes (routes are either underlay routes or routes that use these new relay nodes) such that a certain routing property is satisfied.

SYSTEM REQUIREMENTS:

HARDWARE REQUIREMENTS:

- System : Pentium IV 2.4 GHz.
- Hard Disk : 40 GB.
- Floppy Drive : 1.44 Mb.
- Monitor : 15 VGA Colour.
- Mouse : Logitech.
- Ram : 512 Mb.

SOFTWARE REQUIREMENTS:

- Operating system : - Windows XP.
- Coding Language : Java.
- Data Base : MY SQL