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Multi-hop overlay Transport for High Throughput transfers in the Internet

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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. so, deploying overlay routing needs the placement and maintenance of overlay infrastructure, which gives the following optimization problem: Find a minimal set of overlay nodes such that the required routing properties are satisfied. Here, we rigorously study this optimization problem and it is NP-hard and derive a nontrivial approximation algorithm for which the approximation ratio depends on specific properties of the problem. 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, using up-to-date data reflecting the current BGP routing policy in the Internet, a relative small number of less than 110 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 50%. 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.

KEYWORDS: Overlay network, Resource allocation, Voice-over-IP (VoIP).

I. INTRODUCTION

OVERLAY routing has been proposed in recent years as an effective way to achieve certain routing properties, without going inside the long and tedious process of standardization and global deployment of a new routing protocol. For example, overlay routing are used to improve TCP performance over the Internet, where the main idea involves of breaking the end-to-end feedback loop into smaller loops which requires the nodes capable of performing TCP Piping would be present along the route at relatively smallest distances and some of the examples for the use of overlay routing are papers like RON and Detour, at where overlay routing is used to improve reliability [1]. Yet another example is the concept of the "Global-ISP" paradigm , by which an overlay node is used to decrease the latency in BGP routing. In order to deliver the overlay routing across over the actual physical infrastructure, someone needs to deliver and manage overlay nodes that will have the new extra functionality and 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. 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 [3]. In the shortest-path routing across over the Internet BGP-based routing example, this question is mapped with 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 within them, In TCP performance , this may finds the minimal number of relay nodes needed in order to make sure that for each TCP connection, there is a path within the connection endpoints for which every predefined round-trip time [5].

(RTT), there is an overlay node capable of TCP Piping. Regardless of the specific conclusion in mind, we define a general optimization problem called the Overlay Routing Resource Allocation (ORRA) problem and study its complexity which turns out that the problem is NP-hard, and we present a non trivial approximation algorithm for it [4]. Note that if we are only interested in improving routing properties between a single source node and a single destination, then the problem becomes easy, and determining the optimal number of nodes becomes trivial since the

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potential candidate for overlay placement is less, and assignment would be good. But, when we consider one-to-many or many-to-many scenarios, then the single overlay node may affect the path property of many paths, and that leads to the deciding of best locations becomes much less trivial [10].

We test our general algorithm in three specific such cases, where we have a large set of source–destination pairs, and the goal involves of finding the 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 [9]. The first scenario we consider is AS-level BGP routing, at where the goal is to find the minimal number of relay node locations that can allow shortest-path routing between the source–destination pairs. Recall the routing in BGP, which is policy-based and depends on the business relationship between the peering ASs, and as a result, a considerable fraction of the paths in the Internet do not go along a shortest path (see [5]) The phenomenon is called as path inflation, which is the motivation for the scenarios. We consider the one-to-many setting where we want to improve routing between a single source and many destinations. This case at where the algorithm power is most significant. since, in many-to-many setting, there is very little amount of overlap between the shortest paths, and thus will not improve completely over the basic greedy approach.1 We demonstrate, using real up-to-date Internet data, that algorithm could suggest the relatively small set of relay nodes which can significantly reduce latency in current BGP routing. The second scenario we consider is the TPC improvement example discussed above. In this, we test the algorithm on a synthetic random graph, and we showed the general framework could be applied also to this case, results in very close-to-optimal results [8].

II. RELATED WORK

Using overlay routing to improve network performance is motivated by many works that studied the inefficiency of vari- 1This phenomenon is due to the fact that we want shortest paths. When we consider different metrics, for example bounded delay and affects smaller, and the gain in the many-to-many case is also significant of networking architectures and applications [13]. Analyzing a large set of data, Savage et al rises the question of how “good” is Internet routing from a user’s perspective considering round-trip time, packet loss rate, and bandwidth. They showed that in 30%–80% of the cases, there also an alternate routing path with better quality compared to the default routing path. In [7] and later in [1], the authors show that TCP performance is strictly affected by the RTT. so, breaking the TCP connection into low-latency sub connections improves the overall connection performance [17].

In [15], [18], and [19], the authors show that in many cases, routing paths in the Internet was inflated, and the actual length (in hops) of routing paths between clients is longer than the minimum hop distance between them. Using overlay routing to improve routing and network performance has been studied before in several works. In [31], the authors studied the routing inefficiency in the Internet and used an overlay routing in order to evaluate and study experimental techniques improving the network over the real environment. The concept of using overlay routing to improve routing scheme was presented in this work, it does not deals with the deployment aspects and the optimization aspect of such infrastructure. A resilient overlay network (RON), which is an architecture for application-layer overlay routing to be used on top of the existing Internet routing infrastructure, has been presented in [22]. Similar to our work, and the main goal of the architecture is to replace the existing routing scheme, if necessary, use the overlay infrastructure.

III. EXISTING SYSTEM

Using overlay routing to improve routing and network performance has been known before in several works. The authors know the routing inefficiency in the Internet and used an overlay routing in order to evaluate and study experimental techniques improving the network over the real environment [20]. While the concept of the use overlay routing to improve routing scheme was presented in this work, it does not deals with the deliver aspects and the optimization aspect of such infrastructure. A resilient overlay network (RON), which is the architecture for application-layer overlay routing to be used on top of the existing Internet routing infrastructure, has been presented and the main goal of this architecture is to replace the existing routing scheme. if needs, use the overlay infrastructure that mainly focuses on the overlay infrastructure and it does not consider the cost associated with the deployment of such system [29].

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IV. PROPOSED SYSTEM

In this paper, we concentrate on this point and study the minimum number of infrastructure nodes tha need to be added in order to maintain a specific property in the overlay routing. In the shortest-path routing cross over the Internet BGP-based routing example, the question of What is the minimum number of relay nodes that are needed in order to make the routing between a groups of autonomous systems (ASs) use the underlying shortest path between them. In the TCP performance [35] , this may translate to the minimal number of relay nodes needed in order to make sure that for each TCP connection, there is the path between the connection endpoints for which every predefined round-trip time(RTT),and there is the overlay node capable of TCP Piping .Regardless of the specific conclusion in mind, we define the general optimization problem called as Overlay Routing Resource Allocation (ORRA) problem and It turns out the NP-hard, also we present a nontrivial approximation algorithm for it [37].

V. SCREEN SHOTS

A. Server module:

Fig 1 : Cost-Effective resource allocation of overlay routing relay nodes.

B. Client module:

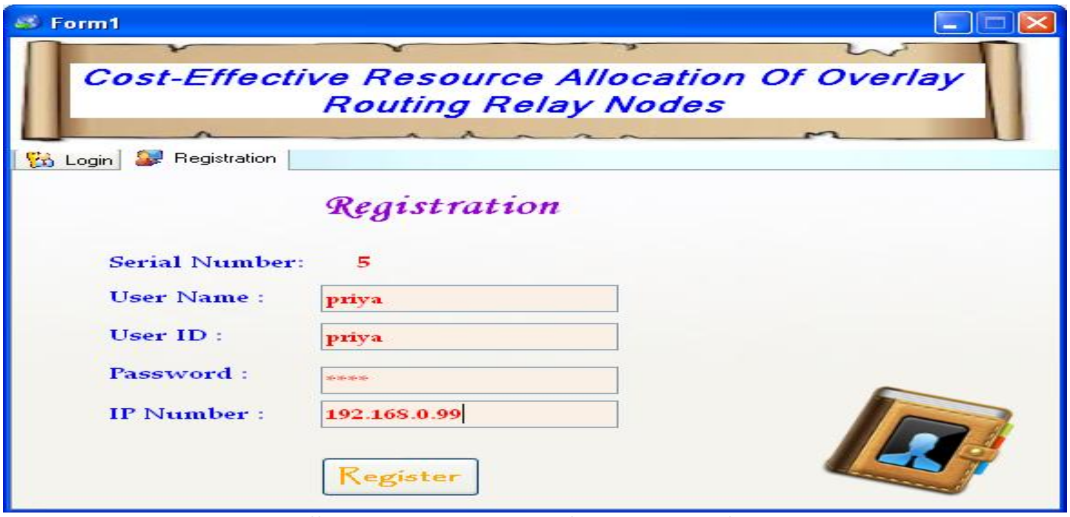

Fig 2 : Cost effective resource allocation of overlay routing for Registration.

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C. Router :

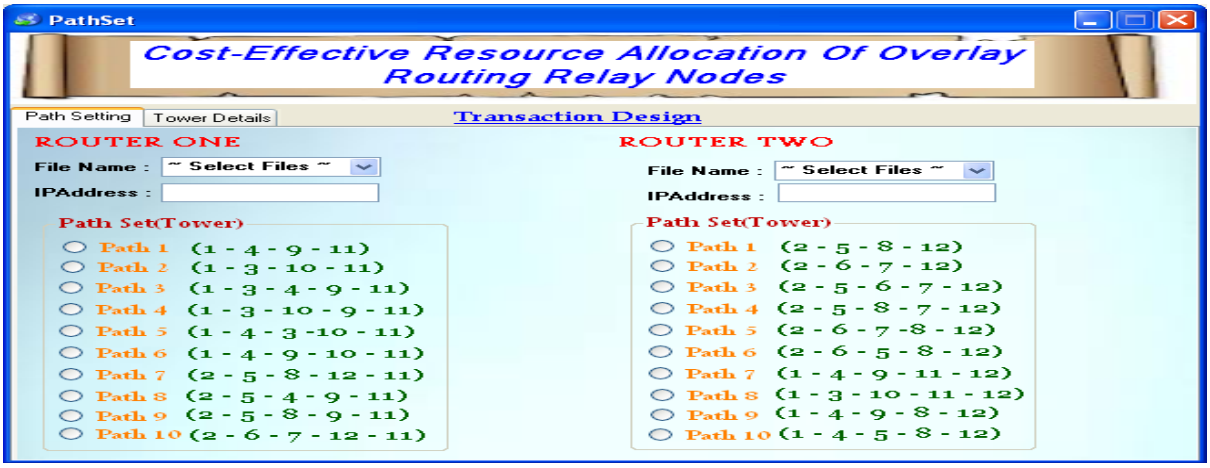

Fig 3 : Cost effective resource allocation of overlay routing for router one & router 2 path set.

VI. CONCLUSION

While utilizing overlay steering to enhance system Performance was contemplated in the past by numerous works both functional and hypothetical, not very many of the consider the expense connected with the organization of overlay infrastructure. Numerous issues are left for further research. One intriguing course is an expository investigation of the vertex cut utilized as a part of the algorithm. It would be fascinating to discover properties of the underlay and overlay steering that guarantee a bound on the measure of the cut. It would be likewise intriguing to study the execution of our system for other steering situations and to study issues identified with genuine usage of the plan. Specifically, the association between the expense regarding securing overlay hubs and the profit as far as execution increase attained to because of the enhanced directing is not paltry, and it is fascinating to explore it. The business relationship between the distinctive players in the different utilization cases is complex and, thus it is vital to study the practical parts of the plan. For eg, the one-to-numerous (BGP) steering plan can be utilized by a vast substance supplier with a specific end goal to enhance the client experience of its clients. The VoIP plan can be utilized by VoIP administrations, (for example, Skype) to enhance call nature of their clients. In both these cases, the definite interpretation of the administration execution pick up into real income is not clear and can advantage from further research.

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