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Efficient And Robust Resource Allocation In Resilient Overlay Routing Relay Node Networks

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Abstract — Overlay routing is an efficient way to certain routing properties without long and tedious process of standardization and global deployment of a new routing protocol. Deploying overlay routing requires the placement and maintenance of overlay infrastructure rise to the optimization problem. An algorithmic framework can be efficient resource allocation in overlay routing. The actual benefit can gain from schemes namely BGP Routing, TCP Improvement and VOIP Applications. A BGP Routing is up-to-date data reflecting the current BGP routing policy in internet, a 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%. TCP Performance improvement is an optimal placement of overlay nodes and Voice-over-IP (VOIP) applications is a small number of overly nodes can reduce the maximal peer-to-peer delay.

Keywords—TCP Improvement, BGP Routing, VOIP Applications, Resilient Overlay Network(RON), Autonomous systems(Ass), Round – trip time(RTT) and Overlay Routing Resource Allocation(ORRA) and Hybrid Location- Based Adhoc Routing(HLAR).

I. INTRODUCTION

Overlay routing is an effective way to achieve routing properties to break the end-to-end feedback loops into smaller loops. A Node capable of performing TCP Piping along route at smaller distances. The use of Overlay routing is (I) to improve reliability (ii) to reduce latency in BGP routing. The benefit improving the routing metric against cost. A general optimization problem called the Overlay Routing Resource Allocation (ORRA) and studies its complexity. The goal is to find minimal number of relay node location can allow a shortest-path routing between the source-destination pairs. A Routing in BGP is policy – based and depend on business relationship between Ass and a fraction of the paths along a shortest paths is called Path Inflation.

II. PROBLEM DEFINITION

To deploy Overlay Routing over the actual physical infrastructure, one needs to deploy and manage overlay nodes functionality. A non negligible cost both in terms of capital and operating costs. An algorithmic framework can be used in efficient Resource allocation in overlay routing. The set of routing path is derived from the underlying scheme and the set of routing paths from the overlying routing schemes.

Algorithm *ORRA* $(G = (V, E), W, P_u, P_o, U)$

1. $\forall v \in V \setminus U$, if $w(v) = 0$ then $U \leftarrow \{v\}$
2. If U is a feasible solution returns U
3. Find a pair $(s, t) \in Q$ not covered by U
4. Find a (minimal) *Overlay Vertex Cut* V' $(V' \cap U = \phi)$ with respect to (s, t)
5. Set $\epsilon = \min_{v \in V'} w(v)$
6. Set $w_1(v) = \begin{cases} \epsilon, & v \in V' \\ 0, & \text{otherwise} \end{cases}$
7. $\forall v$ set $w_2(v) = w(v) - w_1(v)$
8. $ORRA(G, W_2, P_u, P_o, U)$
9. $\forall v \in U$ if $U \setminus \{v\}$ is a feasible solution then set $U = U \setminus \{v\}$
10. Returns U

The ORRA Problem is a nonnegative weight function over the vertices to find a set as 1) feasible and 2) cost of minimal among the feasible sets. The underlying routing scheme is minimum hop count and overlay routing is shortest path with edge length. Every link is an underlying path, the link cannot be used both in underlying and overlay network and it can be removed from graph. Deploying relay nodes that packet can be routed through concatenation of the underlay paths and packets can be routed. A feasible solution to the ORRA Problem. All nodes have an equal weight may as optimal solution.

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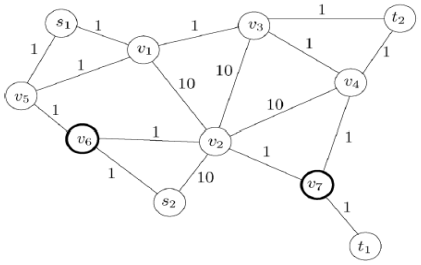

Fig1: Overlay routing example: Deploying relay server on v6 and v7 enables overlay routing.

An approximation preserving reduction from the set covers (SC) Problem. An algorithm is the number of vertices required to each pair with the set of overlay paths. The algorithm can apply for an arbitrary weight function, capturing the cost of deploying a relay node may be different from one node to another.

The algorithm picks vertices that weight is equal to zero until a feasible set. Each iteration at least one vertex gets a weight is equal to zero then worst case the algorithm stops after iteration and returns a feasible set. The actual performance of the algorithm, an approximation analysis may be emitted in implementation.

III. SYSTEM ANALYSIS

a. Existing System:

Overlay Routing is to improve routing and network performance an order to evaluate and improving the network. A resilient overlay network (RON), is an application – layer overlay routing to be used on top of the existing routing infrastructure. The architecture is to replace the existing routing scheme. The work mainly focuses on the overlay infrastructure (monitoring and detecting routing problems and maintaining the overlay systems and the cost associated with the deployment of system.

b. Proposed System:

The minimum number of infrastructure nodes can be added to maintain a overlay routing .The shortest path routing over the Internet, BGP- based routing: to make the routing between a group of autonomous systems (ASs) use the underlying shortest path between them. The TCP performance under each TCP connection, there is a path between the connection end points for every predefined round trio time (RTT), there is an overlay node capable of TCP Piping. General optimization problem called the Overlay Routing Resource Allocation ORRA) problem and study its complexity. It turns out the problem is a nontrivial approximation algorithm.

Advantages:

(i) Improving routing properties between a single source node and a single destination node. Finding the optimal number of nodes become trivial since overlay placement is small and assignment would be good.

(ii) A single overlay node may affect the path property of many paths and choosing a best location becomes much less trivial.

IV. FEASIBILTY STUDY

The Performance of the ORRA algorithm in three practical scenarios:

1. BGP Routing Scheme
2. TCP Throughput
3. Bounded delay in Peer-to-Peer Overlay Networks

BGP Routing Scheme

BGP is a policy – based inter domain routing protocol is used to determine the routing paths between autonomous systems. Each AS is an independent business entity and the BGP routing Policy reflects the commercial relationship between connected ASs. A customer-provider relationship between ASs means that one AS pays another AS connectivity, a peer-peer relationship between ASs means have mutual agreement to serve their customers, a sibling-sibling relationship means have mutual-transit agreement. The BGP may require routing data using the shortest physical paths, relay nodes should be deployed on server location contain Ass.

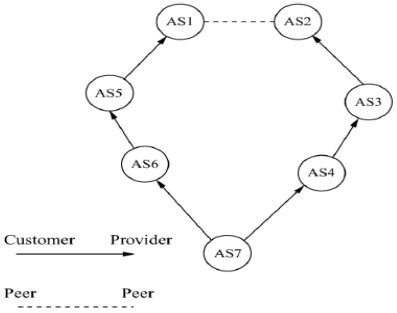

Fig2.: BGP Path Inflation

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TCP Throughput

Overlay routing is to improve TCP Performance. TCP Protocol is sensitive to delay and strict correlation between TCP Throughput and RTT. To break high-latency TCP connections into a few concatenated low-latency sub-connections.

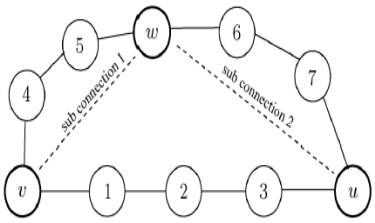

Fig3: Breaking a TCP Connection into two sub-connections reducing the maximum RTT.

A set of relay nodes is used as sub-connection endpoints and bound the RTT of each one of the sub-connections.

Bounded delay in peer- to- peer overlay networks:

It may not optimize the routing delay between network clients. The service of delay sensitive applications may be harmed. The quality of VOIP calls is sensitive to network delay and amount of effort is to reduce the delay between clients to achieve better quality. The length of each edge is equal to one (underlying routing scheme is a minimum hop count) and delay of each edge is proportional to distance between the random locations of the two points. The performance of the algorithm for different values of threshold.

V. MODULE DESCRIPTION

The implementation consists of the following modules such as:

- ✓ Node creation
- ✓ Implementation of communication and routing
- ✓ Performance analysis
- ✓ Implementation of hybrid location – based routing protocol
- ✓ Performance analysis and result comparison.

a. Node Creation

A Node is created. All the nodes are randomly deployed in the network area. Our network is a wireless network, nodes are assigned with mobility.

b. Implementation of communication and Routing:

A communication between nodes is provided. Sender and Receiver nodes are randomly selected. Communication traffic is enabled between nodes. A sample routing is performed with anyone of the familiar routing protocol.

c. Performance Analysis

The performance of the routing protocol is analyzed. Based on the analyzed results X-graphs are plotted. Throughput, delay, energy consumption are the basic parameters considered here and X-graphs are plotted for these parameters.

d. Implementation of hybrid location-based routing protocol:

A hybrid location-based routing protocol is implemented. Instead of using normal routing, location based routing is used to communicate with the nodes. The proposed protocol uses RREQ and RREP control packets along with location information.

e. Performance analysis and result comparison:

The performance of the proposed protocol is analyzed. Based on the analyzed results X-graphs are plotted. Throughput, delay, energy consumption are the basic parameters considered here and X-graphs are plotted for these parameters.

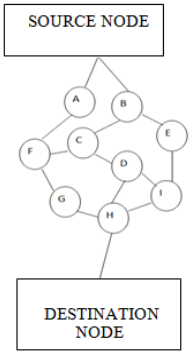

Fig4: System Diagram

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Finally, the results obtained from this module is compared with third module results and comparison X-graphs are plotted. Form the comparison result, final RESULT is concluded.

VI. CONCLUSION

In this paper, the fundamental problem developing an approximation algorithm to the problem. A customized algorithm for specific application framework that fits a large set of overlay applications. Three different scenarios, evaluated the performance of the algorithm, showing the algorithm provides close-to-optimal results. An Analytical study of the vertex cut used in the algorithm. To find Properties of the underlay and overlay routing bound on the size of the cut. The connection between the cost in terms of establishing overlay nodes and performance gain achieved due to the improved routing is not trivial and to investigate it. A BGP Routing can be used by a large content provider in order to improve the user experience of its customers. The VOIP Scheme can be used by VOIP services to improve call quality of their customers. The exact translation of the service performance gain into actual revenue is not clear.

VII. FUTURE ENHANCEMENT

Hybrid Location-based protocol (HLAR) combines a modified AODV protocol with a greedy-forwarding geographic routing protocol. The expected transmission count (ETX) metric to find the best quality route. The modified form of AODV as AODV –ETX, intermediate nodes report the broken routes to their source node. To allow nodes to calculate the quality (ETX) of shared links, nodes to locally beacon packets periodically. The periodic beacon packets include the node's ID and the current location coordinates.

HLAR initiates the route discovery in on-demand fashion. The RREQ packets include a time-to-live (TTL) will be the source node according to the hop count between the source node and destination node. The TTL field is decremented each time a current node cannot use location information and RREQ Packet will be dropped once its TTL field become zero. It allows the protocol to avoid unnecessary flooding of the whole network.

A destination node replies to receives RREQ Packets with a route reply (RREP) packets in three cases:

1. If RREQ packet is first receives from source node
2. If RREQ packet contains a higher source sequence number than RREQ packets responded to the Destination Node.
3. If RREQ Packet contains same source sequence number as RREQ Packets respond by the destination node, but the new packet indicates a better quality route is available.

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