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# Bandwidth Secure VPN Using PRA with QOS

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***Abstract:*** A Virtual Private Network (VPN) provides end users with a way to privately access information on their network over a public network infrastructure such as internet. the data packets are transmitted across a public routed network, such as internet that simulates a point-to-point connection. The basic structure of the virtual circuit is to create a logical path from the source port to the destination port. We proposed a new algorithm "Provisioned Restorable algorithm" (PRA) to achieve better quality of service by combining the provision and restoration algorithms. Our algorithm used to meet the bandwidth requirements specified by customers in virtual private networks

***Keywords:*** VPN, Hose model, Bandwidth, K shortest path, restoration, provisioning and optimization.

## I. INTRODUCTION

A virtual private network (VPN) is a network that uses primarily public telecommunication infrastructure, such as the Internet, to provide remote offices or traveling users an access to a central organizational network. VPNs typically require remote users of the network to be authenticated, and often secure data with encryption technologies to prevent disclosure of private information to unauthorized parties.VPNs may serve any network functionality that is found on any network, such as sharing of data and access to network resources, printers, databases, websites, etc. A VPN user typically experiences the central network in a manner that is identical to being connected directly to the central network. VPN technology via the public Internet has replaced the need to requisition and maintain expensive dedicated leased-line telecommunication circuits once typical in wide-area network installations. Virtual private network technology reduces costs because it does not need physical leased lines to connect remote users to an Intranet. Existing studies on quality of service deals with bandwidth in hose model. In this paper an Enhanced Hose model is used to specify the bandwidth and link utilization between the end points.

## II. EXISTING SYSTEM

Ravi et al. proposed an algorithm enhanced cost optimized VPN provisioning algorithm to optimize the total bandwidth reserved on edges of the VPN [1]. Ravi et al. proposed a provisioning algorithm for VPN in enhanced hose model with QoS support to construct the cost optimized delay satisfied VPN tree. Active routers in VPN offers better performance in terms of end to end cost using scheduling [3]. Ravi et al. proposed enhanced restoration algorithm in VPN with quality of service support identifies the restoration path whose cost is smaller than those provided by disjoint path [4]. Ravi et al. proposed approximation algorithm that computes a primary quality of service path and a restoration topology, which comprising of a set of bridges, each of which protects a different part of the primary quality of service path [5].

A virtual private network (VPN) is a confidential data network that makes use of the public Internet [6] to maintain privacy through the use of IP tunneling technology and network security protocols. VPNs can be regarded as a replacement of the expensive private leased lines. The main purpose of a VPN is to provide a company secure communication among multiple sites through the shared Internet. More detailed descriptions of VPNs can be found in [7] and [8].

The hose model was proposed by Duffield et al. to solve the problems of the pipe model [9]. The provisioned restorable algorithm (PR) shows better performance than the disjoint path and approximation algorithms by optimizing the total bandwidth reserved on edges of the restorable VPN tree. The possible extensions of the present work including the use of additional models of network and achieving additional quality of service parameters were discussed

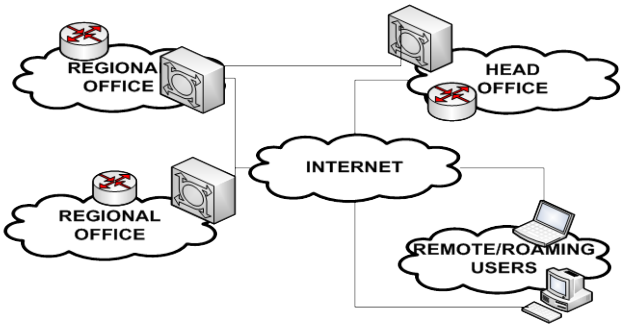


Figure 1 : VPN Connectivity overview

## III. PROPOSED PR ALGORITHM

Input: Network as graph
Output: The cost of the primary QoS path and restoration paths of the given network
Topology.

a. For each pair of vertices find the k-Shortest delay path if available. Totally v-1 set of shortest path available i.e.) {k1} {k2} …{kv-1} set of shortest path and each set having k-paths.
b. Generate a new tree by taking union of paths taking one from each set of shortest paths. It produces k1 x K2 x… kv-1 number of induced trees. It may contain cycle.
c. For each tree perform the cycle detection algorithm to detect the cycle. If cycle is found delete the tree from the list.
d. Compute the cost required for each tree.
e. The tree with the low cost is selected as the Least-delay Least-cost optimized VPN tree.
f. Now apply the approximation restoration algorithm on the least-delay least-cost optimized VPN tree.

## IV. SECURITY MECHANISMS

Secure VPNs use cryptographic tunneling protocols to provide confidentiality by blocking intercepts and packet sniffing, allowing sender authentication to block identity spoofing, message integrity by preventing message alteration, Secure VPN protocols are such as IPSec(Internet Protocol Security), Transport Layer Sceurity,Secure Shell (SSH) , Authentication, Routing Virtual Router Trusted Delivery networks, Tunneling Protocol

## V. ANALYSIS OF DATA

We model the network as a graph G = (V, E) where V is the set of nodes and E is the set of bidirectional links connecting the nodes. Each link (i, j) is associated with two QoS metrics – the bandwidth capacity Lij and the delay Dij. The delay value of a path is defined as the sum of the delay values of all links along the path. The VPN specification in the hose model includes [7]: (1) A subset of the nodes $P \subseteq V$ corresponding to the VPN endpoints, and (2) for each node i ε P, the associated ingress and egress bandwidths $Bi^{in}$ and $Bi^{out}$ respectively. Note that the terms "ingress" and "egress" are taken with respect to the VPN endpoints. This model can be enhanced to include a delay requirement in two ways: (1) Associate a delay requirement Di with each node i, which specifies the maximum delay from this node to every other node in the VPN, or (2) Group applications that use the VPN into different delay classes characterized by their end-to-end delay requirements that must hold between every pair of end points. We adopt the latter approach in this paper. We use |P| source-based trees to realize the hoses, one tree per hose. For a given source based tree T rooted at the VPN endpoint i, we denote by Tv the connected component of T containing node v when link (u, v) is deleted from the tree. In this case, the traffic passing through link (u, v) can only originate from i to the other endpoints in Tv. The traffic that i can send is bounded by $Bi^{out}$, and the traffic that Tv can receive cannot exceed $\sum B j^{in}$, j ε p∩ TV. Thus the bandwidth reserved for link (u, v) of T is given by CT (u, v) = min ($Bi^{out}$, $B\sum B j^{in}$, j ε p∩ TV }. Since we are interested in minimizing the total bandwidth reserved for tree T, the problem of computing the optimal source-based tree for endpoint i can be expressed as follows: Optimal Delay-Constrained Source-Based Tree Problem: Given a set of VPN endpoints P with their associated ingress and egress bandwidths and the delay requirement D, compute a source-based tree T rooted at endpoint i whose leaves are the other VPN endpoints. The objective is to minimize CT while satisfying the delay requirement, delay (i, j) $\leq$ D.

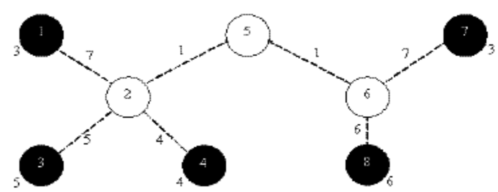

Figure 2: Example network

## VI. PERFORMANCE EVALUATION

The proposed is the combination of provisioning and restoration algorithm, named as provisioned restorable VPN algorithm which is the main criteria for reducing the total cost. The number of node chosen for analysis is 500. Also, we have compared our provisioned restorable VPN algorithm with disjoint path and Approximation restoration algorithm on the basis of the following parameters: cost, number of nodes and delay constraints.

Figure 3: VPN Cost

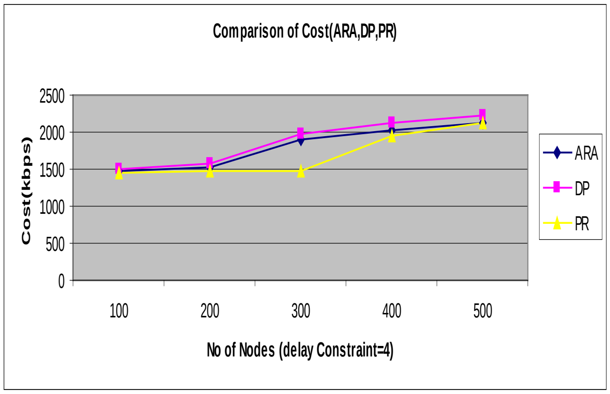


Figure 4. Comparison of Cost of ARA, DP and PR where delay constraint is set to 4 mse

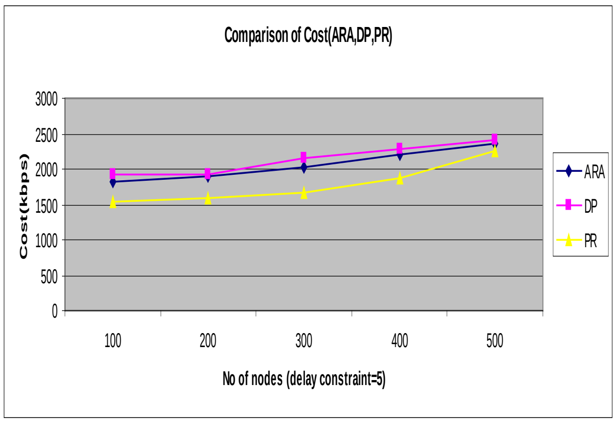


Figure 5. Comparison of Cost of ARA, DP and PR where delay constraint is set to 5 msec

The results show that the cost of the provisioned restorable VPN algorithm is less than Disjoint path and Approximation algorithm. The cost is increasing in proportion with the number of nodes.

## VII. CONCLUSION

The provisioned restorable algorithm shows better performance than the disjoint path and approximation algorithms by optimizing the total bandwidth reserved on edges of the restorable VPN tree. The provisioned restorable algorithm reserves less bandwidth when compared to the disjoint path and approximation algorithm. Also the performance of restorable provisioned algorithm with the independent provisioning and restoration algorithms were presented. The cost and delay constraint was compared over different number of VPN nodes. The results show that by combining restoration and provisioning algorithms, we are able to achieve better quality of service guarantees.

The possible extensions of the present work including the use of additional models of network and achieving additional quality of service parameters were discussed. In this paper an Enhanced Hose model is used to specify the bandwidth and link utilization between the end points.

## VIII. ACKNOWLEDGMENTS

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## IX. REFERENCES

[1]. R.Ravi and S.Radhakrishnan, “Enhanced Cost Optimized VPN Provisioning Algorithm”, in International Journal of Computer Science & Network Security, Vol. 8, No. 2, pp. 116-121, 2008.

[2]. R.Ravi and S.Radhakrishnan, “Provisioning Algorithm for VPN in Enhanced hose model with QoS Support“in the IETECH Journal of Information Systems, Vol 1, No.1, pp. 031 – 035, 2007.

[3]. R.Ravi and S.Radhakrishnan, “Provisioning QoS in Virtual Private Network using Dynamic Scheduling”, in Journal of Computer Science, Vol. 4(1), pp. 1-5, 2008.

[4]. R.Ravi and S.Radhakrishnan, “Enhanced Restoration Algorithm in Virtual Private Network with QoS Support” in Asian Journal of Information Technology, Vol 6(10), pp.1035-1040, 2007.

[5]. R.Ravi and S.Radhakrishnan, “Mathematical Approach for Restoration Algorithm in Virtual Private Network with QoS Paths” in Journal of Statistics and Applications, Vol 3, No.1-2, pp. 155-169, 2008.

[6]. H. Liang, O. Kabranov, D. Makrakis, and L. Orozco-Barb’s, Minimal Cost Design of Virtual Private Networks, in IEEE Proceedings of the CCECE ’02, Vol.3, pp. 1610 – 1615, 2002.

[7]. T. Erlebach, M. Ruegg, Optimal Bandwidth Reservation in Hose-Model VPNs with Multi-Path Routing, INFOCOM, Vol.4, pp.2275-2282, 2004.

[8]. Li-Der Chout Mao Yuan Hong, Design & Implementation of Two Level VPN Service Provisioning Systems over MPLS Networks, IEEE International Symposium on Computer Networks, pp 42-48, 2006

[9]. S.M.KrishnaGanesh, T.AshokKumar, Optimized Approach for Provisioning VPN in the Hose Model with QoS, Journal of Global research in Computer Science, Vol.3, No.2, Feb 2012,pp.1-4.