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Connecting Customer Locations Using Different Service Provider MPLS Networks

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Abstract: MPLS (Multi Protocol Label Switching) technology is de facto standard in service provider environments and most companies are connected over service provider MPLS infrastructure. Sometimes it happens that one company from a small country such as Croatia merge with another company in a small country like Slovenia. Both companies have their own network infrastructure that is connected through service providers in their respective country, but since the two companies are now one administrative domain their networks should reflect this and connect into one bigger network in order for this network to become more efficient and to better support business goals. There are simple and common solutions such as S2S VPN, but in this case it would not be long-term and optimal solution especially if there is traffic like multicast, VoIP or various datacenter traffic. The direction in which we should go is to connect the two companies into a single organization using one of the mechanisms for connecting service providers also known as carrier supporting carrier. In this paper we will describe advantages and disadvantages using carrier supporting carrier options A and B. Once two companies are connected in this manner, it is much easier to manage traffic and to implement QOS mechanisms.

Keywords: MPLS, carrier supporting carrier, interAS connection, back-to-back VRF exchange, eBGP VPNv4 exchange

INTRODUCTION

In cases where it is necessary to link the two companies that merged into one big company, and they are separated by large geographic distances the problem becomes the fact that both companies are using different service provider which is more complicated than if they were connected to the same provider where everything is under one administrative control. It is possible to temporarily use the common methods such as IPSec VPN tunneling over Internet, but it can be much more complex and has its limitations when it comes to different traffic types and general traffic management scenarios. The challenge, especially in countries where this merging of big companies is not a common situation, is negotiation with service providers on how to solve this connectivity issue given the specific requirements of the network environment of service providers. In a small country like Croatia this situation is a rare thing, but recently there were a number of large mergers of some of the largest companies and therefore it is necessary to be familiar with the solutions that will enable seamless connectivity through two national telecom networks. The two solutions that will described in this paper are often used in situations like this elsewhere in the world. One solution is Inter-AS Back-to-back VRF connection also known as Option A, another solution is MP-eBGP between autonomous system boundary routers (ASBRs) also known as Option B [1]. There are some other solutions that could be used in cases of large networks because of need for scalability and other benefits in relation to the two options mentioned above, but they are not described in this paper because they are not used in environments of small countries like Croatia.

A BRIEF INTRODUCTION TO HOW THE MPLS NETWORK WORKS

MPLS networks today are the basis for any ISP environment and because of its flexibility, scalability and the possibility of isolating users are widely used in telecom industry. MPLS technology generally uses MPLS labels to create VPN connections for the purpose of forwarding traffic through the network of service providers, and between user locations. These MPLS labels are generated by the router for each prefix and then they are sent to the neighbouring routers so they can know which label to use when forwarding traffic to the originating router. MPLS labels are associated with customer network addresses. Service provider network using MPLS labels creates one-way link state path (LSP) through which traffic is forwarded between PE routers (Provider Edge routers). At the PE routers that are connected with CE routers (Customer Edge routers) multiple instances of separate routing tables or VRFs (Virtual Routing and Forwarding) are created for every user that connects to the provider edge router. Because these routing tables are completely independent, user address space can overlap which is one of the most important features. What makes each prefix unique is 64-bit value called Route distinguisher, which is added to every 32-bit network prefix that PE router gets

form CE router in order to form a unique 96-bit value called VPN-IPv4 address which is then transported through MP-BGP (Multiprotocol Boarder Gateway Protocol) to other PE routers. This is similar to multitenancy except that the user cannot control the provider edge router, everything is controlled by the service provider. At the destination, PE router can use RD to distinguish routes of every customer and to install them in the right VRF. Exchange of routing information between customer and the service provider is done through one of the interior routing protocols or using static routes. The whole principle is shown in the figure 1.

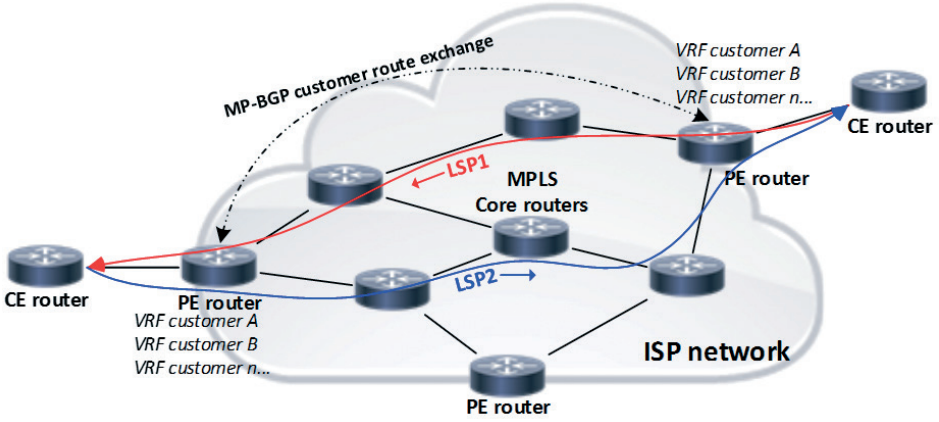

Figure 1: Principle of MPLS VPN network

BACK-TO-BACK VRF (OPTION A)

If one now wants to exchange routes between two merged companies that are using different service providers one should connectivity between two providers using one of the mechanisms mentioned before. The simplest way is to use Option A which is the easiest to implement and it has very little impact on the existing networks, since the configuration of ASBR router does not differ from other PE routers. Each service provider treats the other service provider as a customer and use one of the interior routing protocols or static routes to exchange routing information. Besides using RIP, OSPF, EIGRP routing can be achieved using static routes or external BGP. Traffic forwarding is done over standard IP protocol without need for exchanging any of the MPLS labels or VPN-IPV4 addresses. Service provider networks are independent from each other, and the only thing necessary is that every service provider configures its PE router as if connecting another customer location and then connect two ASBR routers. Problem may be scalability when connecting a large number of users, which is particularly evident when using eBGP for the connection between the two service provider. Although this option is not very scalable it is safe to say that for all practical purposes it scalable enough. The principle is shown in Figure 2.

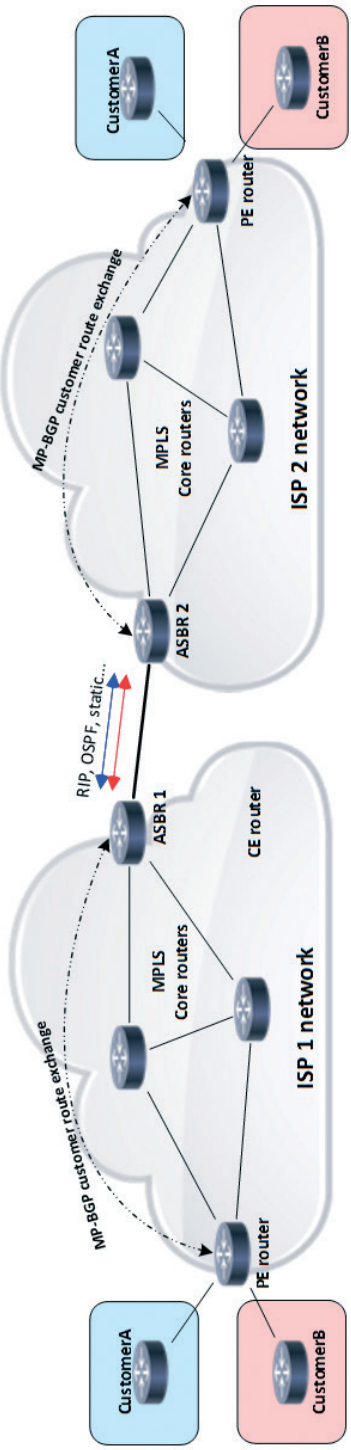

Figure 2: Inter-AS option A

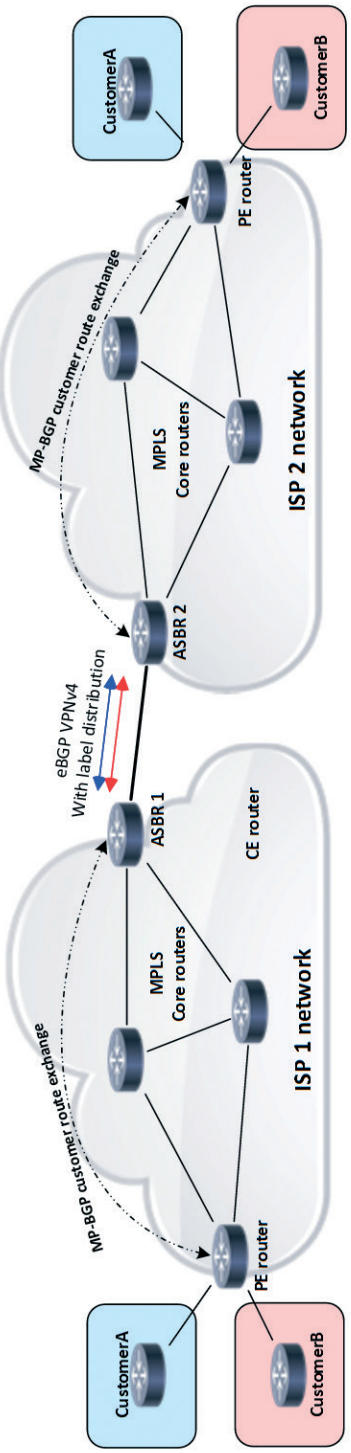

Figure 3: Inter-AS option B

MP-EBGP BETWEEN ASBRS (OPTION B)

In the case of option B providers are not using interior gateway protocols or static routes, but all of the routes are exchanged through VPNv4 eBGP connection that is configured between ASBR routers. This is the same VPNv4 connection that is used between PE routers inside service provider's networks. In this case, it appears like the connection between two end points is achieved through a service provider network without interruption of MPLS domain. The advantage of this option is that it is not necessary to use separate VRF instances for every user, because customer routes are exchanged using MPBGP. This solution is more scalable than option A because it does not depend on the number of sub-interfaces and variety of routing protocols that needs to be configured between ASBR routers, which is evident in the case of large number of users who have a large amount routes. The principle is shown in Figure below.

PROPOSED SOLUTION

Recently Croatian biggest supermarket chain with over 700 stores merged with one of Slovenian biggest supermarket chains which as consequence caused their two networks to be connected. Because these two partners are in different countries in order to connect their network infrastructure they can use either some form of tunneling over the Internet like IPSec VPN or they can use MPLS VPN over one of service providers in their own country. Because of the large amount of various traffic that needs to be transferred better solution would be to use MPLS VPN connection, especially because this type of companies are already using MPLS network for communication within their own countries. Because there are not many cases of this type of partnerships in these two countries, service providers does not need to use more scalable and complex option B, but more simple option A which is completely adequate in this situation. It does not matter what routing protocol will two service provider use for route exchange between their ASBR routers because they will use MPBGP in their own networks for route redistribution between different customer locations. As long as the method is the same on both sides everything will work just fine and the two merging companies will be able to merge their network infrastructure.

CONCLUSION

In situations like this where we have merging of two big companies in two different countries or even in the same country just using different service provider it is necessary to connect their two networks for the benefit of the business. One very efficient way is to use service provider MPLS backbone that is already there and it is built for this purpose. Also connecting networks over MPLS backbone enables other benefits such as making SLA agreements. Connecting the two service providers is a matter of nego-

tiating between customer and service providers and the way in which the two service providers will connect could be, as it is proposed, Option A, which is simple and scalable for this purpose.

REFERENCES

[1] Pepelnjak, I., Guichard, J. and Apcar, J. (2003). *MPLS and VPN Architectures.*