# WAN Virtualization

## Introduction

**What is it & how does it work?**

WAN Virtualization is an intelligent software layer that sits between the physical WAN resources of a business. Hardware is installed in each segment of the WAN so that the software can oversee all areas (Plant, 2014). It is intelligent because it monitors and measures all the links and paths available, and makes routing, re-routing, and load balancing decisions in real time based on the current state of the network (Polat, 2015). It also has the ability to offer Quality of Service (QoS), meaning it can segregate network traffic based on QoS policy (Polat, 2015). This can greatly improve the performance of video streaming, VOIP, and other high bandwidth services.

WAN Virtualization software can be monitored centrally so the network manager can be kept up to date in real time about the whole state of the network. If a link goes down, or there are significant quality distortions, the network can be rerouted almost instantaneously so that the end user does not notice the disruption of service. This includes issues related to network congestion (Polat, 2015). Network encryption can easily be implemented while running WAN Virtualization. The software can run the majority of common encryption functions (Polat, 2015).

A good WAN Virtualization implementation allows all available bandwidth to be used both when the network is quiet and congested. Application traffic can be moved from one connection to another in real time if the state of the network changes. This is important as it ensures maximum bandwidth utilization and predictable application performance. In a network that is not using WAN Virtualization, if a link fails then all traffic is directed over a secondary link. While this may stop internet access being lost, there will likely be a major disruption in important services, with priority packets fighting for bandwidth against less important packets (Addington, 2015). If WAN Virtualization was being used in this circumstance, packets would be prioritized to minimise disruption to important services (Addington, 2015).

Hardware is required to be installed and set up at every business location.

**Why it will suit our business**

Our company’s primary interconnectivity is via service provider connections (MPLS VPN). We also have a mix of local internet connections and dedicated back door links (e.g. dark fibre). Having multiple connections across multiple sites under our companies’ WAN makes it very difficult to monitor performance and quality of service. WAN virtualization performs “bandwidth aggregation”. This means that all links can be used almost all the time, and if a link fails another can take its place almost instantly (Parmenter, 2012). It also uses “loss-mitigation” which minimises the impact of packet loss, latency, and jitter (Parmenter, 2012). This suits our business because all of our current links can be aggregated together. This means that we do not have to change any existing contracts to our ISP’s. It also means that if we decided to add more connections with future expansion of our business, we can simply aggregate the new connections without changing the existing connections (Ecessa, 2014). WAN virtualization will figure out how to best distribute the network load with the new topology(Parmenter, 2012).

WAN Virtualization gives our business full control over how we want our network to run. We can see in real time the current network load, what routes are being used, and what segments of our network have the most traffic. We can apply policy to our routes so that certain packets have priority in the areas that need them. For example, we can give high priority to VOIP packets in our call center, but make those packets low priority for our servers network. In this way we can ensure that our network is running as optimally as possible (Layer 3 Technologies, 2014). We could also save money by choosing to use the network links from ISP’s that have cheaper bandwidth (Layer 3 Technologies, 2014).

Finally I would like to mention future requirements of our business. Our network may be currently meeting our needs, but as the trends show, demand for bandwidth will continue to grow. Communications becomes more media rich daily (Polat, 2015), and as we employ more staff network demands will continue to increase. By moving to a Virtualized network, all the common problems associated with network growth and expansion will be easy to monitor and manage. Future plans to become cloud based will also be much easier to implement using this system (Polat, 2015).

## MPLS vs WAN Virtualization

Multiprotocol Label Switching (MPLS) consists of multiple sites each with a Customer Edge (CE) device installed, that connects to a provider core network with a Provider Edge (PE) device installed. The provider must run a dedicated line to each of the sites, which can often take some time (depending on the provider). The provider must also configure EIGRP or BGP between the PE and multiple CE’s (Cisco, 2014). This takes some control from your network administrator. MPLS is an expensive option to implement, and the enterprise customer must also consider these potential problems (Cisco, 2014):

* Managed services are required, even if not needed.
* Control of traffic flow using multiple providers can be problematic.
* Changing providers requires coordination of switch over to prevent route loops.

WAN Virtualization can be viewed as a virtual extension of the network and transparently extend the infrastructure over a provider’s network. A few of the advantages this provides includes (Cisco, 2014):

* This can be implemented without provider input. I.e. The WAN is completely under your control.
* Supports both IPv4 and IPv6
* No limitations on number of routes exchanged between sites.
* Network convergence is not dependent on the service provider.
* Can be implement through both managed and non-managed internet connections.

As we have an existing MPLS connection, we do not have to get rid of this if we decided to implement WAN Virtualization. In fact it can be aggregated along with our other existing connections.

## Disadvantages

There is an initial setup cost associated with implementing WAN virtualization. This includes the cost to purchase the software and a cost to set up and install the hardware across all out our business sites. This initial cost can be expensive, however this cost can pay for itself in less than a year depending on network circumstances (Carmen, n.d.).

## Summary

WAN Virtualization has many benefits as described above. After thoroughly researching the technology I feel it would be of great benefit to our business if we decide to implement it. Our existing network WAN is difficult to manage stretched across multiple sites and multiple ISP providers. We are occasionally at the mercy of our ISP when we need to make changes to our MPLS setup. These changes can often take a long time to implement and require precise coordination between ISP and our network technicians, in order to avoid significant down time which affects our employees and customers. By moving to a Virtualize WAN, we have full control when we add new connections, and branches to our network.

The up-front cost of implementing this solution will pay for itself after a short amount of time, and then provide ongoing savings on our current infrastructure. We will have a more flexible and reliable network, with faster reaction times should a link fail.

Being able to centrally monitor our network, and provide QoS policy from a management node will reduce man hours needed when making changes to our network. It will reveal what areas of our network are under strain and allow us time to make changes before critical failure is reached.

Moving to WAN Virtualization technologies will future proof our business, and continue to keep us competitive in a time of continuing technological advancement.

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**Additional Readings**

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