SDWAN – Its Impact and The Need of Time

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Abstract: This paper tries to provide a justification for the need of time in "Software Defined Wide Area Networks" (SDWAN) market, for its prolonged survival. The "Software Defined Network" (SDN) concept mainly asserts to decouple data plane and control plane of a network switch. The traditional network switches were having both control plane and data plane operations performed in the same box. The SDN concept gives new paradigm for computer networks, which basically explains how data plane operation can be offloaded from switch and how it can be centralized. The SDWAN is very much similar in concept with SDN. The difference lies in how the solutions are being offered by the market. With SDWAN the critical applications' traffic can be given fixed priority in terms of packet-loss, delay, jitter in the network with pre-defined "Service Level Agreement" (SLA). This form of "Application based routing" (AAR) is the unique strength of SDWAN. This paper also brings various points from existing SDWAN solutions available in market which significantly raise concern of vendor-specific solution rather than original intention of SDWAN making vendor-free approach.

Keywords: SDN (Software Defined Network), SDWAN (Software defined Wide Area Network), SLA (Service Level Agreement), ISP (Internet Service Provider), AAR (Application Aware Routing), SaaS (Software as a Service).

1. INTRODUCTION

This paper assumes that the reader is familiar with SDWAN concept and its relevant terminologies. But still it gives basic architecture of SDWAN taking various solutions available in the market, into
consideration. It then brings some significant points on current solutions which help customers in selecting right SDWAN solution from the vendor. Some of the important acronyms have been expanded to convey the appropriate meaning and context in subsequent sections. Then the need of time with respect to SDWAN solutions in the market, has been discussed referring to various kinds of solutions offered by companies. There has been a descent attempt to bring the lacking strategies into notice both for SDWAN customers and providers.

SDWAN concept is successfully turned into reality by various companies [1], [4], [17] and these companies are working very hard to automate most of the manual driven decisions by exploring various add-on solutions with SDWAN. SDWAN is helping to upgrade customer edge equipment at remote sites, integrating services which aid in load-share over multiple uplinks of any type. It also provides simplified interface for policy management for real-time application performance [3]. After referring to significant SDWAN solutions by leading providers, the generic architecture for SDWAN involving mandatory components has been devised, which is depicted by Fig.1 [7], [8], [11]-[15]. Branch-office-traffic, if destined to SaaS (Software As A Service), is not backhauled to MPLS lines, instead it will be sent on public cloud. This typically happens only if there is relevant policy pushed from SDWAN controller to SDWAN edge.
It is to be noted that, on edge, the branch-office-traffic, more specific to an application, will be scrutinized for packet loss, jitter, latency and bandwidth utilization.
This information will be used to apply the policy if configured and take necessary traffic steering step either over MPLS lines or public cloud. The steering logic is the core of all SDWAN providers. Most of the companies have patented approach and rest of them have leveraged existing networking protocol(s) [7]. There has been an enormous amount of efforts put by number of SDWAN providers, for making seamless user experience by providing extremely user-friendly
management interface. SDWAN edge and SDWAN controller always talk over secured tunnel [18]. Controller is responsible for pushing and popping the policies to and from its
terminated edge respectively. Controller can have more than one edges terminated based on number of branch-offices which can be geographically separated.
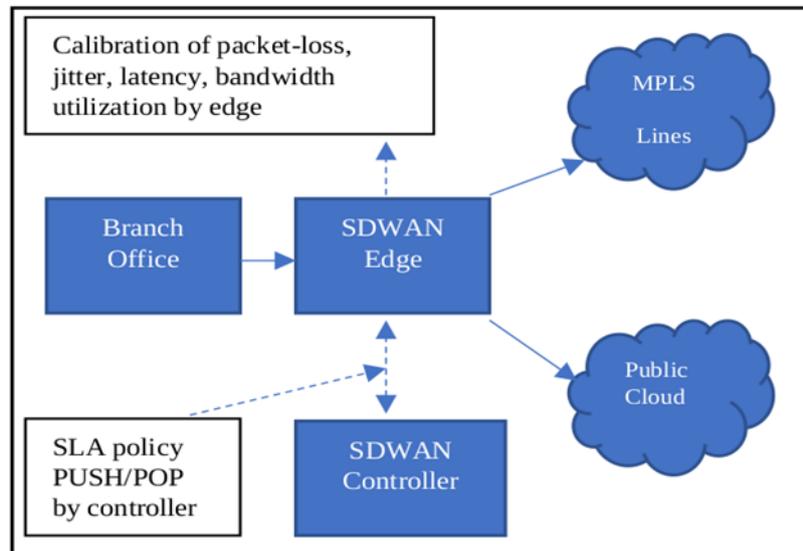
Figure1. Typical SDWAN Architecture

Various companies offer various flavors of SDWAN solutions. Among them, the two major categories are as below [7], [8], [11]-[15].

1.1 Self-Managed SDWAN

In this kind of solution, the customer-company will buy hardware and software required for making their organization SDWAN aware and starts deploying the solution using its own internal IT team. The customer-company is sole responsible for performance of SDWAN deployment. Again, there are multiple variations under self-managed SDWAN model based on deployment management. The most widely used solution is of third-party managed type.

1.2 Third-party managed SDWAN

Here the customer-company will outsource the deployment and management of SDWAN solution to third-party either not disturbing the underlay architecture or completely migrating to new topology. Typically, this type of outsourcing involves heavy cost to company as all branch offices connecting to their respective headquarter will be migrated to new solution.

2. Application Aware Routing (AAR)

The typical ISP (Internet Service Provider) SLA (Service level Agreement) is an agreement between customer and provider on parameters like uptime, down time, latency of traffic, VPN service, failing which, the ISP will face commercial loss. With advent of SDWAN, there are bunch of additional parameters which will be with existing ISP SLA. These new parameters are more granular with respect to application-traffic. The internal SLAs are more challenging to configure as it involves real-world ping and traceroute tests, whose figures will be exposed by providers on request. [2]

To find optimistic thresholds as part of SDWAN-SLA, it is a must task to monitor user experience by understanding characteristics of applications and their protocols' sensitivity [3]. SDWAN providers assure that they will help crafting internal SLAs based on factors like mission-critical traffic or applications [5].

The key point in any SDWAN solution is the AAR (Application Aware Routing). It is a provision for a user to define allowed packet loss, jitter, latency and bandwidth utilization for an application. It is to be noted that, this

AAR will be predefined in some SDWAN solutions and it will be dynamically updated based on calibration of the above-mentioned parameters.
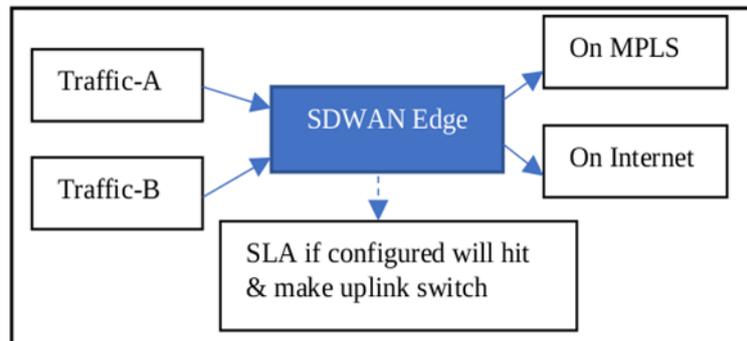

Figure2. SDWAN SLA classification

The Fig.2 depicts how a traffic will be analyzed for configured SLA parameters and sent either over MPLS or Internet cloud after qualifying the SLA, if any [10]. So, the SLA parameters will be monitored continuously to keep optimal uplink switch for desired traffic. These parameters are basically the threshold values of latency, jitter and loss. Various methodologies are available for measuring these parameters.

Some companies disclose the technology or the approach used to monitor the parameters for framing SLAs [4]. But majority of the companies don't disclose.

3. SDWAN & Managed Service Provider (MSP)

MSPs invest significant time and money to ensure that the hosted applications on data centers are always up and running. Because the degraded or failed circuits will end up in customer support and retention issues which incur loss.

MSPs if partnered with Carriers or Communications Services Providers, then they are enabling competitor. Also, the carrier network connectivity cost is not effective and feasible, as single carrier cannot reach all their sites.

MSPs if partnered with a Managed SD-WAN provider providing data centers and core networking as well as the service and support for that environment, then there comes the challenge. Traffic going into the Managed SD-WAN environment goes into a black box, because of which MSPs can't see into that environment, nor can they manage it, control it or determine service intervals to support customer service. Hence Managed SD-WAN providers are "Just Another Carrier" for MSPs [5]. Also, some horde of providers is coming up as an alliance of service and technology providers from across the globe to provide SD-WAN-as-a-Service to enterprise customers [6].

4. CONCERN ON ABSENCE OF RFC

The SDWAN took birth from SDN concept. SDN will continue to exist as it has strong stance of RFC [8]. And of course, SDN-realization is outstanding at data centers as of today both in ease and efficiency [2]. But for SDWAN, as of now, there is no standard RFC(s) which provide(s) information on mandatory components and features present in any SDWAN solution. Because of which vendors are using their own proprietary approach in the solution.

This kind of end-end proprietary approach slowly leads to bigger problems like, to list few:

- Monopoly in Market.
- Challenging black-box testing.

- Tough-interoperability with other vendors.
- Large spread vulnerabilities.
- Less choices for small-customers' deployments.

5. SELECTING RIGHT SDWAN SOLUTION

Following are the descent salient points that help customer to choose the appropriate SDWAN solution for his/her organization.

5.1 Knowing the Extent of Closed Source Approach

Though SD-WAN products might use open source in their core but they are offered in the old fashion of closed monolithic software. So, a customer should ensure the due-diligence in understanding the architecture of these products to the extent which help the organization for long term relationship with the vendor, by conveying the requirements as and when required.

5.2 Think Through Multi-Vendor Deployments

With current SDWAN solutions, it might not be an easy process to have multi-vendor-deployments for a customer, because of vendor's end-end proprietary approach. So, it is always recommended to think through the inter-operability with multi-vendor boxes at customer-premises for long term economical deal.

5.3 Know Your Applications for Better AAR

Irrespective of type of underlying technology used for application-based-routing (AAR), the main intention of AAR is to route the traffic as desired at WAN egress. The predefined SLA that comes with SDWAN solution might be safe combination of loss, latency and jitter numbers. But they will not be the right optimal numbers.

Hence its very imperative for a customer to get strong hold on how the AAR is getting done [16] for a chosen SDWAN solution. For achieving this, customer must know all kinds of applications which are getting routed outside the LAN. This helps customer in devising the right SLA numbers required for the organization's critical applications.

5.4 Tick the Features Your Organization Needs

As of now, the SDWAN has a very sensitive and rapid-moving market. Every company is working in agile mode to implement every single thought that might give a new add-on to their marketing strategy. So, in short span, a barrage of SDWAN features will be in place. The customers will eventually have tough time to understand as to which use-case of SDWAN their organization qualifies. Hence it is the onus of the customer to make must-have-features list that are needed for the organization, before venturing into any SDWAN solution.

6. NEED OF TIME IN SDWAN MARKET

Below enlisted points are the gist of need-of-time for prolonged survival of SDWAN concept in the market.

6.1 An Open-Source approach

Tightly coupled vendor specific deployments should not be entertained to avoid monopoly. All vendors should follow a standard which helps in creating a strong forum of SD-WAN deployments. This helps tackling security issues effectively. There is a strong need of open-source SD-WAN solution, which allows companies to provide innovative solutions as fast as possible. This in turn reduces deployment costs.

The best possible example is LINUX forum, which has strong proven record. If global SDWAN leaders come forward to have a single strong forum, there will be no room for hackers and other security issues.

6.2 Global Single SDWAN community

The new and single open-source SD-WAN community needs to take birth to tackle lot of monopoly issues, which can be imagined due to tightly coupled vendor specific solutions that are prevailing today. The application based smart routing is the key point of SD-WAN architecture. This point must be constructively utilized but not for making closed source approach that is prone to vulnerabilities.

Hence with this single SDWAN community the vulnerabilities associated with any feature, if any, will be addressed faster and on time. This apparently leads to a unified way of management of any upcoming feature under SDWAN. Hence, the stronger the support-forum, the better is the room for SDWAN evolution in precise path.

6.3 SLA Automation

With advent of SDWAN, along with usual ISP SLA, there has been an incredible marketing strategy especially with respect to AAR. There is a strong need of tool that defines SLA for the user so that user can rely on it statistically and not by mere assigning some safe numbers as he is forced to do now.

At present, different companies have different way of setting the SLAs. There is huge competition among these companies for simplifying the configuration of SLA. This process should take one more step towards automating the SLAs based on type of application. Some of the companies are already exploring trending artificial intelligence and machine learning approaches for achieving this goal.

CONCLUSION

The SDWAN is new paradigm which is evolving rapidly day by day, with respect to type of customers' need and ask. So, it's very challenging to arrive on one goal standard. But as a technology SDWAN should come up with must-have features which every company should abide and provide solutions only with different efficiency (Example: The way we have routing protocols today with well-defined RFCs).

Already humongous research work is in place by lot of SDWAN providers. So, its high time to a have strong RFC with which the evolution can be seamless, constructive and well-defined for its prolonged survival in the market. The best examples for long-lived technologies are TCP/IP, MPLS and many more protocols which continue to live with great importance as they have strong RFCs and forum in place.

The SDWAN vendors should join hands and come forward to start making memorandums that describe methods, behaviors, innovational research applicable to the SDWAN solution based on use-cases. This in turn slowly helps IETF (Internet Engineering Task Force) to adopt an SDWAN RFC as Internet Standard.

The goal of this paper is not limited to appreciate the various SDWAN solutions available in the market, but also to bring out some useful information with which the customers can select right solution for their organization.

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