



flexiWAN SD-WAN Open Source Overview

Pioneering The Second Wave of SD-WAN



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As Billions of things are being added to networks, computing expands to being everywhere, and real-time video communications is on the rise, Networking must evolve. Part of this evolution is moving network technologies to being software only and to leverage open source to enable the fundamental changes that we have seen with operating systems, browsers, and database software.

Software Defined Wide Area Networks (SD-WANs) is at the center of enterprises and service providers re-thinking how they will interconnect everything and ensure the end-to-end performance and security that the market is requiring. Some of the new WAN properties that the market is requiring include:

- Enterprise's migrating business critical applications to the cloud. This includes delay sensitive applications such as VoIP/Video real-time communications
- Agility in on-boarding new SaaS applications and opening new branch offices is required
- End to end encryption of data in motion
- Mitigation of increased security risks as the perimeter of the network becomes fuzzy for the digital enterprise
- Existence of new networking, security and analytics technology
- The Internet of Things (IoT) and connecting billions of devices

These usage model changes translate to the following requirements:

- 99.999% Reliability - Utilizing multiple connections with routing that is based on performance and cost
- Lower Costs - Utilizing best effort networks with shared access along with private networks with dedicated access
- Improving agility - automation and integration with Devop tools
- Offering Modularity - The ability to concatenate many network functions in order to provide the network services required
- Increased security - End-to-end security across many disparate networks
- Adaptability - An ecosystem that can quickly provide new features as the market evolves
- Application awareness - Taylor traffic processing for specific applications, organizations, and/or cloud services
- Flexibility and better control over the network by IT

SD-WAN: The Good and The Evil

The Good

Originally, SD-WAN stems from the high cost of traditional MPLS connections and the need for network agility. Over time, digital transformation has become the main driver for SD-WAN growth featuring 2 main advantages that make it a success: connectivity cost reduction and network agility with improved connectivity to cloud services.

Connectivity cost reduction & improved network reliability

SD-WAN allows for connectivity cost reduction due to:

- Transport Agnostic - The option to utilize lower cost connections such as broadband while maintaining network quality
- Wireless - Utilize alternative access such as 4/5G cellular
- Performance based routing - Dynamically selecting the best network path based on application requirements and link performance

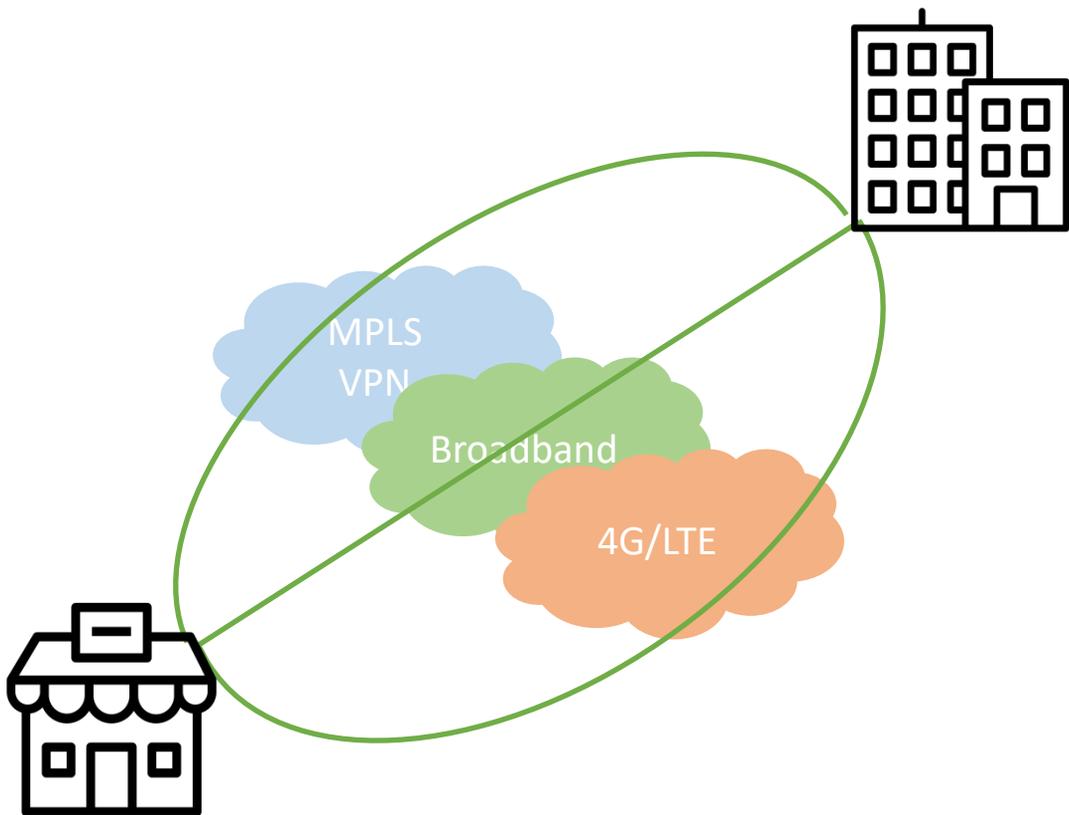


Figure 1: Utilization of multiple connections

Network agility and improved connectivity to cloud services

Most enterprises start off utilizing Internet connections to their SaaS provider. As SD-WAN solutions have matured, they are allowing enterprises to continue utilizing the Internet. Enterprises like the cost, performance, and security features that Internet based SD-WANs offer without having to pay the premium price for private networks utilizing technologies such as MPLS.

The Evil

The closed nature of current SD-WAN is a major concern for enterprises and service providers. Existing SD-WAN closed black box solutions limit the ability of IT managers to control their networks, select the elements and technologies that comprise the SD-WAN they deploy and limit the differentiation service providers can offer to their customers.

Networking, and specifically SD-WAN, require expertise in many domains. A single vendor can't be an expert in all fields SD-WAN touches. But most claim they are as an excuse for their closed systems that set you up for vendor lock. On the other hand, application vendors, service providers and enterprises have the capacity to best prioritize & optimize different parts of their specific proprietary traffic, even in the encrypted domain. Domain expert vendors in areas such as DPI, security, VoIP and encryption can offer superior components in their technology domain. Unfortunately, SD-WAN solutions are closed and don't allow for this.

As a result of this, service providers tend to adopt a multi-vendor approach and resell end-to-end black box, closed, vendor specific solutions that don't interconnect. They do so in the hope that what vendor A doesn't cover in their product is covered by vendor B and by that decide solution of which vendor to offer to a given enterprise customer. This is of course not a valid long term solution because the combination of enterprise requirements is unknown and technology evolves at a rapid pace.

In many cases, adding services such as security, advanced routing and analytics require an additional appliance which is not an affordable option in the case of small branches. An open architecture allows an organization to integrate these additional services in the same system.

An open architecture is required for future proof enterprise networks

As SD-WAN is experiencing rapid growth and deployment in a rate [exceeding \\$1B/year](#) at the end of 2018, service providers and enterprises are looking at the future requirements of SD-WAN and how key networking and enterprise IT requirements of the future will be supported by SD-WAN.

The “[IDC's Worldwide Enterprise Networking Predictions, 2019](#)” report predicts that Intelligent Networking will move from Intent-Based Networking to Increasingly Autonomous, Self-Driving Networks. The rapid and on-going changes require enterprise networks to be based on an open and flexible foundation, such that allows for the integration of new cutting edge technologies without being required for a forklift each time new technologies are introduced.

Decomposing SD-WAN to interchangeable integration elements allows for building the network for current needs while being ready for the requirements of the future.

The Second Wave of SD-WAN by flexiWAN

[flexiWAN](#) allows enterprises and service providers to adapt their SD-WAN solution without being limited by the cost, vendor lock and the specific routing capabilities offered by proprietary SD-WAN vendors. flexiWAN offers an open architecture open source SD-WAN infrastructure that includes the vRouter, management, orchestration and automation as well as core SD-WAN baseline functionality.

flexiWAN allows an agile network design required for modern networks and applications by offering native and optimized integration points for enterprise/service provider specific or 3rd party logic.

The flexiWAN optimized integration points allow for modification or replacement of core SD-WAN functionality as well as 3rd party logic. This allows service providers and enterprises to select or develop their best of breed elements of the SD-WAN technology. These include the basic elements of SD-WAN that manage and optimize the traffic as well as additional services such as security and application/traffic specific handling.

With this open architecture, service providers and enterprises can deploy a low cost, secured and high throughput SD-WAN solution without being tied to a black box solution while having full control over the system. Moreover, SaaS application providers and MSPs can add elements that differentiate their service from competition by having close control over the way their traffic is handled based on dynamic feedback received from their application.

Software architecture

The flexiWAN SD-WAN open source is architected as an open system that allows for 3rd party logic and value added services integration through performance optimized integration points (green circles) as depicted below.

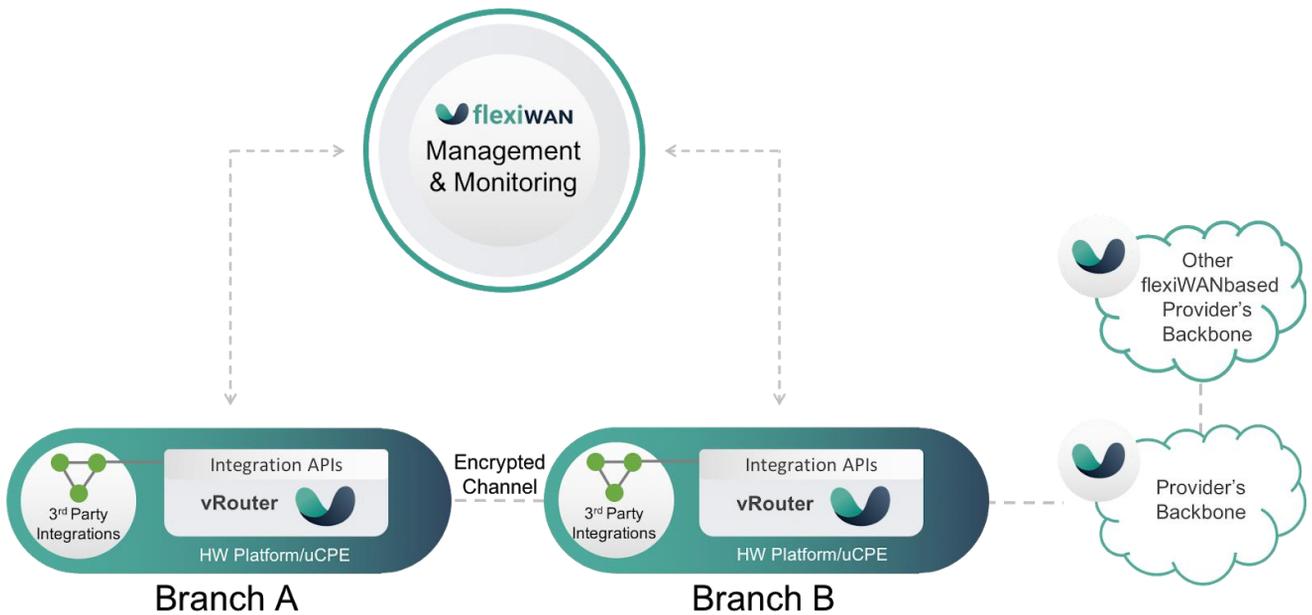


Figure 2: flexiWAN Architecture

The architecture above shows virtual routers located at two branch offices. The routers are connected and centrally managed by the flexiWAN Management & Monitoring system. Traffic is tunneled between the vRouters or sent over the best route to the cloud.

3rd party integrations

Through native and optimized integration points, flexiWAN allows for 3 types of integrations into the core of the system:

Domain experts – these are integrations provided by technology expert companies that enhance the functionality of flexiWAN, examples can be application identification, security and VoIP optimization

Application/service providers – companies offering SaaS applications, MSPs, service providers and IaaS providers can offer integrations for proprietary management of their services thus, add their differentiation to SD-WAN

Enterprises/users – for specific management of enterprise traffic, enterprises can add their logic for how the traffic they generate is being handled

Why SD-WAN open source?

The shift from proprietary hardware to general purpose hardware has allowed enterprises and service providers to control and limit vendor lock as well as significantly reduce cost. Today we are witnessing a strong trend of open source in the networking space, tier 1 and smaller service providers as well as large and small enterprises place open source as first priority when they come to select their networking solutions.

Open source is an accelerator of innovation, it reduced barriers to entry, allows companies to release new innovative products and services in a short time and at lower development cost which results in a lower total cost of ownership.

Quoting from Mike Volpi's article on TechCrunch titled [How Open-Source Software Took Over The World](#), "When top companies around the world are polled, few of them intend to have their core software systems be anything *but* open source. And if the Fortune 5000 migrate their spend on closed source software to open source, we will see the emergence of a whole new landscape of software companies, with the leaders of this new cohort valued in the tens of billions of dollars."

This brings us to the natural shift from proprietary SD-WAN to SD-WAN open source. While SD-WAN products use open source in their core, the products themselves are offered in the old fashion way of closed monolithic software. Moreover, the architecture of these products is closed, making them a black-box overlay solutions. Offering SD-WAN open source is only one element in a broader strategy of flexiWAN for democratizing the SD-WAN market, dramatically lowering barriers to entry for companies to adopt it or offer services that are based on the flexiWAN SD-WAN Open Source. Above all, the flexiWAN SD-WAN Open Source makes enterprise networking vendor lock an episode of the past.

Is open source secured?

A typical claim vendors use in their attempt to keep users away from open source is security. There is nothing like fear to keep people away from taking an action for change.

Let's analyze this carefully and try to put some clarity into this claim. Before getting into detailed reasons to counter this claim, let's look at some well-known examples and think, is Windows more secure than Linux? I'll leave it to you to answer.

As a starting point we should assume that any software, closed proprietary and open source will have security vulnerabilities. Question is, how are these vulnerabilities handled.

A few reasons why open source is typically more secure than closed commercial software.

Hackers can see the code and find vulnerabilities

This is a common myth that has a flip side. Yes, everyone can see the code and find security holes. While hackers (the “bad guys”) typically explore for vulnerabilities in commercial products as well as open source, the “good guys” and the community as a whole find issues in the open source, fix them or report them. This creates a rapid and efficient cycle of discovery of issues and fixes which leads us to the next analogous point. On the other hand, in the case of closed products, you are left with the “bad guys” who look for vulnerabilities and use them for hacking the product posing security risks on the enterprises using them.

More eyes, more people to fix issues

Code is open, developers of the open source can't keep problems to themselves and report them to the users only once solved. A quick action is required. They must report and fix right away. The community typically helps in this process.

Having more eyeballs on the open source product and the code itself results in a faster cycle of finding security vulnerabilities and fixing them, there are good chances that the issues will be discovered by the “good guys” rather than by the “bad guys” /hackers. This is different from the typical case of closed products where in many cases hackers find a security vulnerability and utilize it. At some point, the vendor discovers this vulnerability but it takes time until there is a release that fixes it, during this time the users are not aware of this issue. This is why we normally see announcements by vendors that talk about a patch release that fixes security issues but we don't see an earlier announcement about the issues themselves before they are fixed. This of course is unless the issue was discovered by an external party and the vendor was forced to release his comment on the matter which is typically - “we are working on fixing the issue”.

Open source is used in all types of products but can you control it?

Commercial closed products also use open source, in most cases, they need to report which are used due to open source license requirements.

Let's imagine a case in which vulnerability was found in an open source embedded in a closed commercial product and a fix of the open source was released. How much time will it take the vendor of the closed product to release a new version that includes the fix for the open source vulnerability?

Typically more time than it would take the competing open source product to do so. Moreover, in case of an open source that uses other open source products in which a vulnerability was found, users in the community can upgrade the version of that sub open source component and close the security hole. Users of the closed commercial product don't have this privilege, they can only hope their vendor will be quick in providing the patch version.

Hardware based vs. Software based networking systems

Recent years have shown tremendous improvement in hardware acceleration technologies such as DPDK, IOMMU, TSO/LRO, etc. That allows software based platforms to perform as fast and sometimes even faster than specific hardware technologies. On the other hand software based systems have more flexibility and easier to be replaced or upgraded.

Making Routing Virtually Free

For too long, enterprises and services providers have built their networks with the philosophy of “switch where you can, route where you must”. This philosophy is based on the high cost of routing due to one vendor having a monopoly on the market and the performance of proprietary hardware that could only scale vertically.

flexiWAN’s SD-WAN Open Source will enable enterprises and service providers to push routing out to the virtual edge of networks, enabling better end-to-end network performance and security. The all software approach will enable horizontal scaling. As users are primarily mobile and applications are in the cloud, the user experience of an application is dependent on the performance across multiple disparate networks. Thus the end-to-end performance and security controls are imperative for next generation SD-WANs.

Conclusion

Over the past 20 years, every area of IT has had radical changes in the technology and cost models, except for network routing which has not changed much since the mid-90’s. The time is now for networking to join the software revolution including the move to an open architecture and open source solution. Flexiwan’s goals are to make SD-WANs faster, better, cheaper, and more secure and empowering the industry and network developers to foster an open ecosystem.

Note: Future flexiWAN whitepapers will go into more details including how flexiWAN will compliment existing open source network initiatives and where targeted development and focus will reside.

About flexiWAN

flexiWAN is pioneering the Second Wave of SD-WAN through an Open Architecture SD-WAN Open Source that allow for 3rd party logic to be integrated into the core of the system. To learn more, visit flexiWAN.com and follow us on Twitter [@flexiWAN](https://twitter.com/flexiWAN) and [Linkedin](https://www.linkedin.com/company/flexiwan).