

Are Software Defined WANs Ready?

As software defined networking is helping to address challenges within the data center, how are companies responding to WAN challenges?

Executive Summary

For too long, enterprises have been locked in a world where the advanced Wide Area Network (WAN) functionality that was required to help expand their businesses and make them more agile has been unattainable due to cost or complexity (or both). As the global business environment continues to speed up, and companies need to be more agile to either gain a competitive edge or just keep up, the need for an automated WAN orchestration has gone from a dream to a necessity. With bandwidth being pushed to its limits, the high cost and relatively low bandwidth of Multiprotocol Label Switching (MPLS) lines are being challenged by broadband for businesses. But broadband does not offer the same features or dependability that enterprises have come to rely on with MPLS for their WAN services. Just as Software Defined Networks are bringing an opportunity to redefine the structure and economics of the data center, can Software Defined WANs do the same for the WAN space? Glue Networks is one vendor that is delivering a solution in this space that merits a close look if your enterprise is relying on Cisco routing today and you demand more flexibility or better performance from your WAN.

Are Today's WAN Solutions Flexible Enough?

Today's WANs have become quite complex. For years enterprise IT has struggled with an architecture that, while it delivered incredible capabilities for bringing together remote locations, remained inflexible, complex and loaded with manual processes. Configuring and maintaining an effective WAN structure was more of an art than a science, with few being able to truly leverage all of the capabilities that the hardware contained.

More recently, enterprise IT has had to deal with with the challenges of WANs that are not able to keep pace with the pressing needs of this rapidly changing business environment. Years of stability and gradual growth have been replaced by today's world that stresses agility as fluid environments are now demanding that businesses react quickly, predictively, just to keep up.

The IP networks that used to be focused on delivering data – mainly smaller files – are now struggling to not only route, but also prioritize the various new data types, including video, voice, rich media, streaming content and large files. With more services being streamed and more applications moving from local execution to cloud execution (like Microsoft Office 365), WAN bandwidth has been pushed to its limit. In straightforward terms, the need for more bandwidth can be solved simply by adding more lines. But T1 and E1 lines are prohibitively expensive, and relatively low in bandwidth compared to the exploding growth of bandwidth demands. The incremental benefit of adding more lines, relative to the cost, leaves most enterprises in a position where struggling within their current WAN footprint is the only rational business choice.

Within the network and outside of the network, the new mix of devices, data types and services is driving the need for a more flexible solution. The phrase “all business is global” is becoming more and more relevant as companies, even smaller enterprises, are finding that from their supply chain to their end customers, location is becoming less relevant. And in these circumstances, connectivity becomes more crucial to every transaction.

Trends within the data center, such as bring your own device, unified compute/storage networks, VoIP and mobility (from both a device and an employee standpoint) are pushing the limits of what can be done with traditional WANs.

But as enterprise IT needs to move faster to grasp opportunity in the changing business landscape, this static network environment is clearly out of sync with the needs of the business. When new opportunities present themselves, suppliers become competitors or acquisitions/mergers change the competitive landscape, a company needs to be able to take action. Dealing with competition today is challenging enough for companies, but if competitors are utilizing lower cost broadband solutions instead of MPLS and are able to successfully shield the broadband limitations from the end customer, those businesses running MPLS WANs are at a distinct disadvantage from both a cost perspective as well as a speed/agility perspective. Often the WAN limitations are holding enterprises back.

The Challenge with Today’s WANs

Today’s WANs are too inflexible and can’t keep pace with the changing needs of business. As enterprises are moving to more of a SaaS/cloud environment, the amount of traffic moving in and out of the enterprise is going up exponentially. The consumerization of IT – the expectation that new services should be available as easily as an app can be downloaded to a smartphone – is changing the perception of IT, from an organization that supports the business to an organization that is holding the business back. As CIOs work to partner more closely with the business units on aligning their goals, the limitations of a hard-wired, inflexible architecture are becoming more of an impediment to success. Automation and programmability are essential, not to meet a technology goal, but to meet a business goal.

For traditional WAN management, administrators relied on more manual processes that were pseudo-automated. Scripts were written with wildcards that are then merged with flat files containing specific information for a particular device. This is then uploaded to the device, restarted, and then – if all of the stars align – the router is ready to run. This process put more reliance on human interaction and was always loaded with potential for costly mistakes. The few automation tools available presented just as much complexity, leaving the manual process as the desired path for most enterprises.

Many cities have added more intelligent routing to their vehicle traffic to make the most of limited bandwidth (roads and lanes.) For years, highways were over-provisioned, with far more lanes than needed during most times of the day, in order to handle capacity at peak. But highways like the Kennedy Expressway in Chicago have transformed from expressways to slowly moving parking lots during much of the day because of the cumulative effect of years of traffic growth. “Programmability”

allows Chicago to somewhat ease congestion with reversible lanes that can add extra capacity in one direction based on inflows and outflows into the city. But with the typical MPLS circuit, the extra bandwidth needed to handle peak traffic, or the new patterns that are emerging, remains too expensive and does not provide enough bandwidth to truly change the equation for businesses. Broadband options are available, but while there is dramatically more bandwidth, the QoS for these connections will not reach the level of MPLS, leaving enterprise IT in a conundrum – do you route all of your traffic over the more expensive MPLS, incurring a stiff penalty to your budget (if you can afford it at all) or do you risk some quality/features in moving to a broadband solution? Hybrid solutions, that employ both, have been too difficult to manage because of the changing traffic patterns, application needs and the shifting device and endpoint strategies.

Further complicating this challenge is the emergence of the “[internet of things](#),” a device and sensor-rich strategy that businesses are beginning to employ in order to capture more data about their businesses. If you can imagine the complexity of WAN traffic today, just imagine the geometric explosion of data and traffic as devices around the world all start “calling home” or tens of thousands of products in multiple warehouses around the world can all communicate, be tracked and be correlated in big data systems. Suddenly the explosion of endpoints and trackable components will drive even more unique traffic and access challenges for companies around the world. All of this traffic is driving even greater need for security and privacy as this data is directly tied to the health and condition of a company, bringing a real-time pulse that could have huge implications if WAN configuration errors led to a breach of this data. The need to lock down and secure data as it moves over the WAN is putting additional pressure on IOT deployments. Recent high profile security breaches at retailers [Target Stores](#) and [Neiman-Marcus](#) clearly illustrate the real business costs of keeping data secure.

Change management for today’s WANs is a critical process for IT and as complexity of the network and endpoints increase, the complexity of the change management goes up exponentially. Today’s manual change management processes can’t keep pace with the changing needs of the business, nor the velocity with which business is moving and evolving. With today’s offices becoming less of a physical environment and more of a virtual environment, companies are looking to mobility and telecommuting to drive down the physical costs of facilities as well as put their employees closer to the action. This drive to mobility is causing an impact on the WAN as companies need to provision for new mobile users and provide for services like [Microsoft Lync](#) that unify their phones, chat and teleconference presence on a single device over a WAN connection. The conversations that used to happen over the conference room table are now happening over the WAN, with application sharing, rich data and video all being the norm rather than the exception. Users expect these tools to work outside the office just as they work from within the firewall – with the same bandwidth and quality. Companies can save millions on PBX capabilities through these new collaboration tools, but the stress on the IP network and maintaining call level quality increases cost on the other end – there is no free lunch.

Maximizing the Investment

Today's businesses already have an investment in WAN equipment, and some of the solutions targeted at solving these WAN challenges have a compelling value proposition up until encountering the line item that replaces existing equipment (that may not be fully amortized yet) with new platforms. Often these platforms are from smaller networking startups that, while they have an innovative technology, remain untested, both as a technology and a business.

IT is nothing if not sensible about risk; sometimes to their detriment. But their job is to protect the most valuable asset of the company – its data. With an investment in expensive equipment and a proven platform that is working today, making the change to new technology often difficult. While today's WAN might not be meeting all of the needs for bandwidth, if it is working, IT is hesitant to tip the apple cart and jump to a new strategy, especially when they can prove that today's strategy is meeting *most* of the company's needs.

There are few unknowns in the world of WAN equipment with most of the market share firmly in the hands of networking giant [Cisco](#) and enterprises trust Cisco to deliver the quality, capability and bulletproof security to help them run their IT environments. The investments in Cisco equipment far exceed all other vendors combined, so any solution that wants to challenge how WANs are being deployed needs to take on Cisco equipment, both from an unamortized perspective as well as a comfort level around security and stability. As a "known entity" Cisco is the safe choice and the leader that challengers need to overcome.

Any WAN challengers need to convince enterprises to leave the warm security blanket of their Cisco environment to move to a different product. But who has the comfort in making that change? This is why many of the networking startups in the SDN world are facing a tough road; while they have interesting technology and opportunity, unseating the leader is difficult in a risk-averse world. As we have [pointed out in our other research](#), the software defined approach has promise, but few IT organizations are actually taking that first step yet; especially when it comes to a hardware-based solution.

The Software Defined WAN

In order to create the flexible environment for WAN communications, what enterprises need is a Software Defined WAN, but that technology just hasn't been addressed by the market to date. Much of the focus on software defined elements first took hold lower down the stack, at the data center/network level, where the scope was smaller and the complexity was lower than what was being seen at the WAN level. With cabling and provisioning being a daily issue for network support staffs, there was a pressing need at the data center level that SDN was able to address immediately.

A Software Defined WAN is dealing with a more complex environment, but once the technology is implemented, the solution can deliver results for companies by bringing the increased functionality that enterprise IT demands and reducing the risk by relying on software as opposed to hardware platforms (that require a capital investment and a multi-year amortization.) Dynamic WAN optimization has been

a dream for most IT teams simply because the tools were not readily available in the past and those that did try to automate ran the risk of an increased number of errors as reconfiguration process was always an opportunity to introduce unwanted or incorrect elements into the process.

The software-based WAN orchestration of WAN optimization makes far more sense as it allows enterprise IT to leverage the investment that they have in existing hardware, provides more flexibility, removes the variability of the hardware from the discussion and helps scale faster than people and processes are able to scale.

Emerging full stack providers utilizing Software Defined WAN technology along with customized hardware platforms focus on integration of their software with their physical platform, leaving solutions limited from a feature perspective or isolated from the rest of their network. These solutions end up with a “rip and replace” methodology that makes enterprise IT uneasy as they have to make decisions up front with an impact that may last far beyond the current lifespan of the companies offering the platforms. One company offering a pure software-based solution is a company called Glue Networks.

Glue Networks

[Glue Networks](#) claims to deliver the capabilities required for an agile company looking to automate their WAN infrastructure. Glue was recently recognized by Gartner as a “[2013 Cool Vendor](#)” and their Branch Wide Area Software-Defined Network solution was identified as a [2013 Top 3 Use Case](#) choice for the Open Networking User Group. While Glue is a newcomer on the scene, they are positioning the company with two benefits that they claim will put them at the front of the pack:

Software-only solution: For enterprise IT this greatly reduces the risk as there is no hardware to change in your data center. There is little chance of ending up supporting orphaned platforms or having to replace unamortized hardware because the vendor has either vanished or been swallowed up by a larger entity that is not aligned with your IT plans and directions.

Focused on Cisco: Glue Networks’ products are Cisco certified, on the Cisco price list and sold by Cisco partners & resellers. This alignment removes much of the risk for the decision, and allows enterprise IT to leverage their existing Cisco investments. More importantly, it can work with Cisco routers (for support levels, [click here](#).)

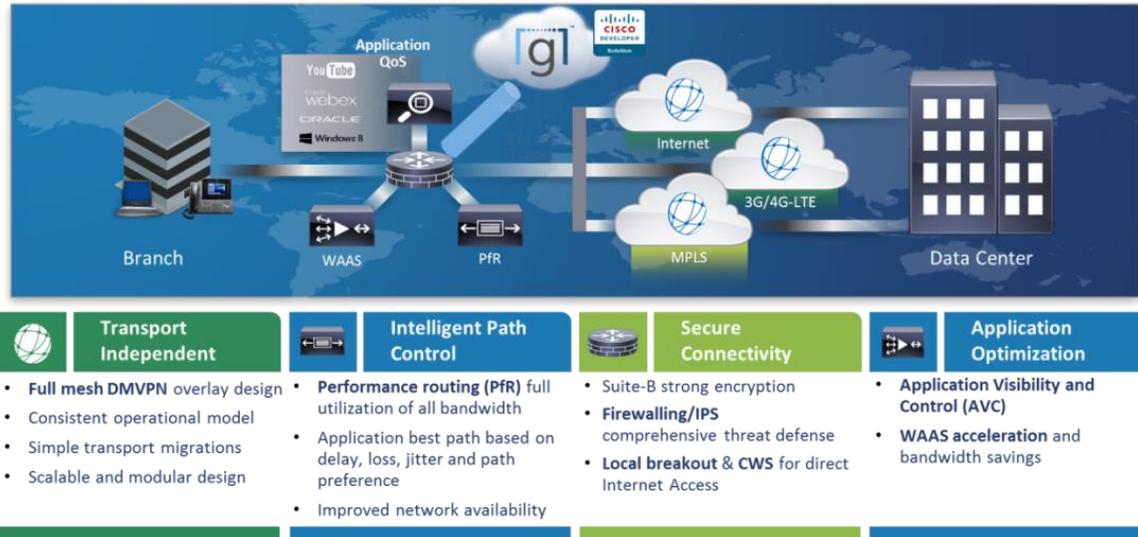


Figure 1: Source Glue Networks



Figure 2: Source Glue Networks

The Gluware orchestration engine is an expert system that is designed to allow an enterprise to create WAN policies (pre-vision), intelligently provision them (pro-vision), and dynamically life cycle manage (post-vision) them while tuning the WAN. Instead of a load and pray approach of filling in wild cards and sending a configuration to the router, Glue helps build and maintain the WAN with error checking and self-healing in an intelligent and real-time manner.

The Glue Networks solution is designed to work in concert with existing Cisco equipment by pulling in the configurations and routing data, analyzing the data and then building the appropriate configurations that can then be pushed back down to the platforms. Unlike SDN controllers that take an active role in the routing of data and the traffic management, Glue Networks is primarily allowing the Cisco products to do what they were meant to do, unlocking the potential of

these products that had previously been far too complex for enterprises to take advantage of in the past. By utilizing existing equipment, Glue Networks can potentially lower the risk at time of deployment because an enterprise's existing equipment can all stay in place and there are no changes to cabling that

need to be comprehended in the process, giving enterprises more flexibility in the deployment. The investment that companies have made in Cisco training and certification is not lost as that investment can continue to be leveraged because the physical hardware layer is still intact.

Through Glue Networks' intelligent WAN optimization, a central policy-based orchestration engine handles the main tasks of managing the policies and configurations to the Cisco routers. Through this centralized resource, traffic patterns and usage can be coordinated across a number of devices. The orchestration engine handles all of the automation and also performs all of the error checking tasks to ensure that there are no issues with the configurations.

Gluware applications "plug in" to the solution; initially a SOHO automation and Next Generation WAN application were available, and in January 2014 Glue Networks launched a new IWAN application.

Zero touch provisioning allows the Central Policy Orchestration engine to provision the Cisco routers on the network without user intervention.

The App Aware Dynamic WAN is a fluid environment that can react to the demands of the business, changing the routing parameters to support the business at an application, traffic and quality of service level. For instance, setting a QoS level for a communications application at a certain level may require reducing the available bandwidth for certain lower priority applications to ensure that level of service over the WAN to remote locations. Because there are agents talking directly to the Gluware engine, Gluware can help manage this, changing router configurations on the fly to adapt and enforce this policy.

What enterprise IT should see from this solution is a tunable WAN fabric that can monitor and manage performance levels as well as automate the data handling based on network conditions or events. This expert system sits on top of the lower level architecture and enables a hybrid WAN environment which allows enterprise IT to utilize both MPLS and broadband connections. This strategy aligns application needs to bandwidth, latency and quality parameters of each connection. Remote routers can "call home" to the Glue cloud for provisioning, so companies can not only optimize those routers in their data center, but also those that are located in the remote branch offices. This helps ensure that both sides of the WAN are provisioned and optimized for optimal traffic handling. Along with the unified monitoring and lifecycle management, Glue can give enterprise IT a holistic view into their WAN from an application level.

The Next Generation Intelligent WAN

As a transport-independent product, an intelligent WAN can deliver intelligent path control, allowing applications to utilize multiple physical paths between WAN locations, helping ensure connectivity for applications, and allowing for better optimization.

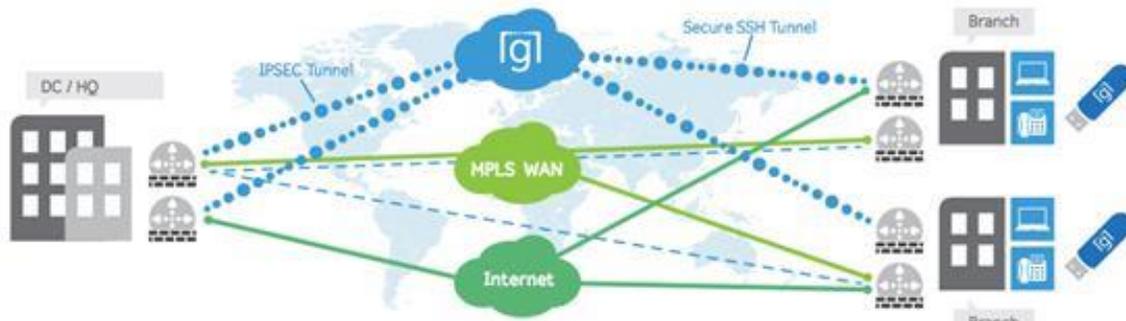


Figure 3: Source Glue Networks

The Glue technology is designed to integrate with a data center SDN controller via the RESTful API. This helps ensure that WAN health is taken care of while Gluware enables a dynamic and programmable network connected with the data center. While one may think that data center SDN tools may also be extended out to the router, network environments are very different from WAN environments. It makes no sense to use data center SDN tools as they are designed for dealing with a different type of environment that has different characteristics. WANs are typically bandwidth-starved, so effectively managing the bandwidth is a key requirement where data center services typically have more available bandwidth, resulting in tools that are less likely to be “optimized for optimization.”

Gluware is designed to directly orchestrate, utilizing current WAN routers or leverage new SDN WAN controller architectures. In the SDN WAN controlled model, Gluware is an expert system app that is able to sit on top of the Cisco Application Policy Infrastructure Controller (APIC) Enterprise Module and leverage this new controller as an alternative way to orchestrate the WAN devices. Gluware is able to offer enterprises a migration strategy from a controller-less architecture to a controlled architecture without needing to build their own orchestration in-house and validate advanced WAN architectures. Gluware is promoting the fact that enterprises can have a faster time to market, minimize risk, and build a future proofed architecture that works with current routers as well as SDN controller architectures.

One advanced feature of Cisco routers is Performance Routing (PfR), a capability that is a part of most modern models, but something rarely utilized by enterprise IT to its fullest extent because of the complexity in configuration and monitoring. Why try to take advantage of a feature that allows for optimizing the performance if you do not have the resources on your staff to actively manage the feature? Glue Networks has designed their products to allow enterprise IT to take advantage of PfR, utilizing a feature that they have been paying for all along in the hardware. With Gluware, enterprise IT can set watermarks and the Gluware Central Policy Based Orchestration Engine is designed to work with the Cisco APIC Enterprise Module or directly with WAN routers to monitor/manage to keep quality of service within those metrics.

Glue Networks Savings

Glue Networks is highlighting the savings through a case study of a deployment with a large pharmaceutical company that was spending \$74M per year on WAN services, including their MPLS contracts. As costs were increasing budgets were decreasing, putting the company in a difficult position and forcing them to reevaluate their service providers.

The company opted for a new WAN solution built on Glue Networks that included a hybrid model with roughly 20% of their traffic remaining on MPLS and about 80% moving to broadband which is currently being deployed using Gluware. The Glue Networks' case study shows costs are projected to fall from \$74M USD per year to roughly \$15M USD per year, a savings of \$59M USD that also delivers significant process and business improvements as well.

According to Glue Networks the company was able to segment locations based on the application needs and break the locations out to primary, secondary and tertiary locations. Primary locations retained MPLS but were supplemented by broadband for their less critical apps, giving a performance boost for the most important locations. The secondary locations utilized a redundant dual broadband configuration and the tertiary locations, which were the least critical, had a single broadband connection. Gluware was the tool linking the routing across these different transports and ensuring the consistency for communications through the active orchestration.

In addition to the significant budget savings, the company claims operational savings, allowing them to deploy in 20% of the time, reducing NRE by 88% and reducing overall operating expenses by 45%. Glue Networks stated that the company was able to move the company from a legacy environment while simultaneously reducing the company's risk level. Best of all, the company now has more bandwidth and a more flexible business.

Target Environments

Software Defined WANs and WAN orchestration can clearly benefit business, but, just as in SDN, the devil is always in the details as to whether a deployment is going to meet your business needs. A key discussion to have with any vendor is not only around their product, but also the associated services that are required to successfully deploy the solution.

For optimization of software-based WAN solutions, multi-site businesses and those with heavy WAN traffic are the types of organizations most likely to see benefit from these products. Here are the use cases that we find most interesting for these types of solutions:

Enterprises with a large number of remote branch offices

Branch office automation and remote users are the primary use case for Software Defined WANs. As numbers of sites or users increase, so does the complexity of communications, driving up the need for a more flexible solution. Glue Networks claims that the best ROI for their solution starts at around 50 locations, with the sweet spot being around 100 or more locations. In addition to the number of sites the makeup of the IT staff itself matters; those with lean IT

staffs and more generalists or those with larger staffs that have too many projects are prime examples of the environments where this technology makes sense.

Enterprises looking to reduce the cost of their MPLS service

Those enterprises that are keen to reduce their transport costs by replacing some (or all) of their transport capability can utilize a hybrid WAN to bring lower cost bandwidth options. Glue Networks claims the transport savings can be up to 60-80% and OPEX savings can be 40-70% versus a manual build.

Enterprises expanding into richer network configurations (voice, video, etc.)

For companies looking at expanding their networks with richer content or more bandwidth-consuming traffic like voice and video over the WAN, looking at Software Defined WANs can leverage lower cost, higher bandwidth hybrid transport options.

Enterprises in highly volatile markets where change is a necessity

Businesses that need to react quickly to changing environments or deal with spikes in traffic at either a seasonal or event-driven cadence can utilize Software Defined WANs to better manage their expansion while keeping pricing in check.

Service Providers looking for a competitive advantage

Today's Service Providers are always seeking unique solutions that can help build a differentiated offering for their end customers. In the competitive market where these providers operate, there is a driving need for more creative solutions that help their customers maximize their WAN communications and stay ahead of the curve.

Because of the complexity of most WAN environments, the best way to determine an actual ROI is to do an in-depth analysis of spending today relative to the proposed solution. A detailed ROI proposal is a must have in these situations because companies should focus more on the actual hard cost savings (fewer MPLS services, IPsec savings, etc.) and less on the soft cost savings (like time and productivity) that are harder to quantify and are often open to interpretation.

Moor Insights & Strategy's Recommendation

With the current focus on "software defined everything" the idea of software defined WANs is a concept whose time has come. In looking at the automation of networks through SDN, extending this discussion out to the WAN is a logical extension of that work.

While we believe that most enterprise IT are in the very early phases of SDN investigation and are waiting to see how the industry shakes out, investigating software defined WANs is an exercise that can run in tandem to network investigations.

We continue to stress that the "software defined everything" market is continuing to expand and there are a large number of solutions on the market today with more coming on a very regular basis. It is often

hard to choose the winners and losers, which is why most enterprises are still on the fence with their plans – nobody wants to deploy this generation’s 8-track tape.

Glue Networks is delivering a solution today that is worth customers investigating if they are running on a Cisco platform and needing additional bandwidth or increased flexibility. Customers should look into Glue and take the time to do an ROI assessment (including the services aspect) to see whether a Glue solution is right for them.

A key decision point in any architecture decision, beyond the standard ROI metrics, is the impact that it will have on your existing infrastructure. With an investment in both hardware and software today, most of which is probably not fully amortized, it truly makes sense to understand how any investment fits in *with* your current environment. Solutions that *replace* your current environment should be viewed with extreme caution as the track record for these products generally is far from being proven.

Important Information About This Paper

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