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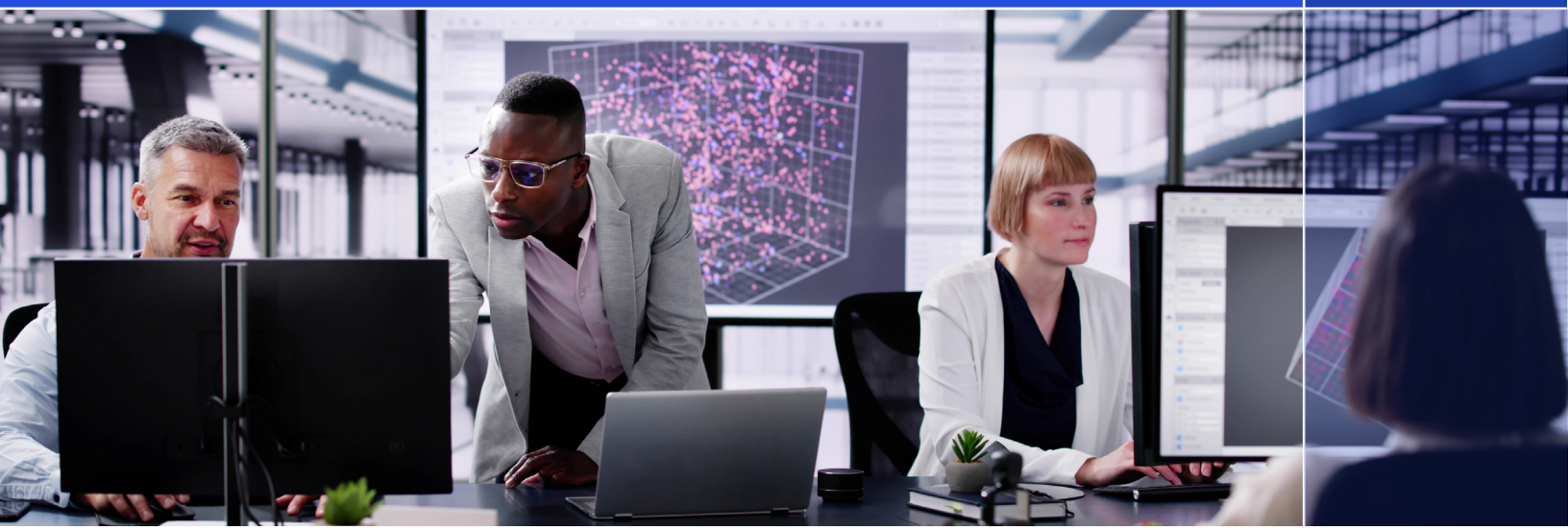
WHITEPAPER

# WAN Evolution for the Cloud and AI Era



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## Glossary of Terms

CXP Cloud Exchange Point: is a fully virtualized point of presence delivering an entire network stack with rich network services

Connector: is a termination point connecting on-prem and cloud networks

CSP Cloud Service Provider: provides a wide range of cloud computing services

MCN Multi-cloud Networking: utilizing multiple CSPs to build, deploy, and manage applications and workloads

## The critical role of the WAN

Wide area networks (WANs) are critical infrastructure for every enterprise. The WAN connects data centers, branches and users, providing the transport network for enterprise data, access to applications and links between businesses, suppliers, and customers.

Technology transitions and changing business needs are driving WAN evolution at an accel ted pace. As networks become more distributed, they are becoming more complex. Most organizations depend on networks to reach their customers, sell their products, process transactions, manage supply chains, gather business information, and distribute workloads. A well designed, well run network can deliver competitive advantage; a sub-optimal network will hold the enterprise back.

If the WAN is fundamental to the modern business, it is also increasingly challenging to deploy and manage. Post Covid, networks need to be able to cope with the work-from-anywhere needs of a remote workforce. They also need to contend with componentized and atomised applications, distributed data and, with IoT, a growing number of dispersed devices. In the cloud and AI era, networks also need to adapt to a new dimension of complexity. Building networks within and between clouds is technically challenging because all public clouds implement networking principles in different ways. Managing these networks is an ongoing challenge.

The WAN is critical infrastructure, but it has also been the area that has proved slowest to adapt, hardest to change, and most likely to be impeding the progress of the business.

The Future WAN

Alkira believes that the future WAN will have the following characteristics:

- Entirely virtualized
- Built in the cloud
- Globally available
- Elastically scalable
- Consumed as a service
- Heterogenous (on-premises, cloud, multi-cloud, edge)
- Rapidly provisioned with intent-based design canvas
- Fully integrated with higher level network services, e.g. firewalls
- Complete visibility, manageability, and control
- Simplified operation
- Programmable with APIs and SDKs


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**The goal of the enterprise WAN is to provide a homogenous network that encompasses heterogeneous environments including on-premises sites, colocation facilities, Internet and SaaS applications, cloud, multi-cloud, and edge computing.**

Virtualization is a well-established trend. Just as enterprises increasingly rely on outsourced compute and storage in the cloud and colocation facilities, they no longer need to be concerned with buying and managing hardware.

Routing is here to stay, but routers as we know them are on a path to extinction. Over time the CPE that connects branches, users and devices to networks will be greatly simplified or taken out of the equation altogether. In fact, the advent of 5G and beyond will provide networking at speeds equivalent to today's fiber optic infrastructure, connecting everything to intelligence residing at the cloud edge.

The trend that was marked by the appearance of the software-defined WAN (SD-WAN) will result in completely virtualized networks with more programmable control in the hands of the enterprise but with complexity hidden or abstracted. This will enable network teams to provision new capacity, change network configuration, and add groups of remote users without having to wait for a service provider.

WANs will be consumed entirely as a service, eliminating capex and enabling enterprises to pay only for the capacity that they use. Lower total cost of ownership will go hand in hand with greater flexibility. Where today's capacity must be planned and purchased in advance, tomorrow's will be available on demand, elastically scalable according to the needs of the organization, enabling enterprises such as retailers to respond to seasonal variations in demand and allowing all enterprises to flex capacity according to changing business needs or to respond to unforeseen events.

Six WAN challenges for the CIO

- How to aggregate of power of multiple clouds to build the network
- How to connect the WAN not just to but through the cloud for end-to-end visibility and control
- How to leverage the distinctive (cloud-native) capabilities of different clouds without multiplying complexity
- How to integrate the different environments, including data centers, existing network fabrics and one or more clouds in a single cohesive network
- How to maintain the end-to-end network visibility, advanced controls, and strong governance
- How to transform WAN from enterprise laggard to enabler or organizational agility


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The future WAN will be built in the cloud. The huge investment by the hyperscalers in global network infrastructure provides a near-infinite source of raw power that can be harnessed by the enterprise. However, the cloud also introduces new dimensions of complexity. All clouds are different and building networks that cross multiple cloud regions and exploit the capabilities of individual cloud providers is fraught with problems.

Most current WAN solutions cost too much (e.g., MPLS), deliver too little in terms of guaranteed service (Internet) or leave enterprises with integration work to do once they reach the cloud (SD-WAN).

Factors influencing WAN evolution

- Cost
- Time to service
- Expansion of remote working
- Edge, IoT
- Cloud and multi-cloud
- Operational complexity
- Investment protection
- Governance
- Organizational agility

Time to provision new network services or to build SD-WAN cloud on-ramps using DIY approaches can cause costly delays to the introduction of new services that deliver business value.

The expansion of remote working creates new headaches for IT, including the time taken to connect globally distributed users, implementation of robust security, network troubleshooting and recovery. Similarly, the trends to edge computing and IoT mean the network will play a greater role in managing widely dispersed resources.

Cloud environments pose particular challenges. Existing WAN solutions all support some level of connectivity to public clouds, e.g., AWS, Azure and GCP, but provide weak integration, and little visibility and control of resources within the cloud. Because each cloud environment handles the same networking concepts in a different way, this becomes a multidimensional problem for enterprises whose networks involve two or more clouds.

For example, applying an enterprise-wide security policy using stateful firewalls across different environments, or deploying a network directory, require additional integration effort – the manual stitching together of resources – which increases time and cost.

**As complexity increases, so do the risks of delay, increased cost and failure.**

Network teams require detailed knowledge and expertise of each cloud environment, which forces enterprises to hire highly skilled personnel. Specialization also means the enterprise is reliant on a small number of individuals who understand how the network works.


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CIOs considering how to use the WAN as a lever of digital transformation have three major considerations:

- **Investment protection** – How do I protect existing investments in IT infrastructure (e.g., data center, SD-WAN) while putting the organization on an evolutionary path to the cloud?
- **Governance** – How do I ensure that the WAN enables me to apply all the policies that keep the organization safe and accountable, from information security to the network segmentation and advanced routing that underpin data protection and privacy? How do I make that easy to do when my network crosses multiple regulatory jurisdictions?
- **Agility** – How do I ensure that the network can move at the speed of the business and not the other way around?

## Limitations

MPLS is a more than 20-year-old technology that is built on ATM and frame relay WAN architectures.MPLS remains a big market, estimated at more than $40bn globally and the technology is still widely used. MPLS connections are private and come with service level guarantees; however, they are also relatively expensive, typically of moderate to low bandwidth and slow to provision, leading many organizations to consider public Internet connections or SD-WAN as alternatives.

MPLS was designed for a relatively static IT world of on-premises site-to-site connectivity and data center applications. It is ill-suited to the anywhere-to-everywhere connectivity demands of the cloud and AI era.

While MPLS connections were often the default choice for applications with low-latency requirements, such as voice and video, technology advances and cost considerations have largely eroded this advantage.

**MPLS limitations**

- Inflexible
- Poor cloud integration
- Slow to provision
- Expensive


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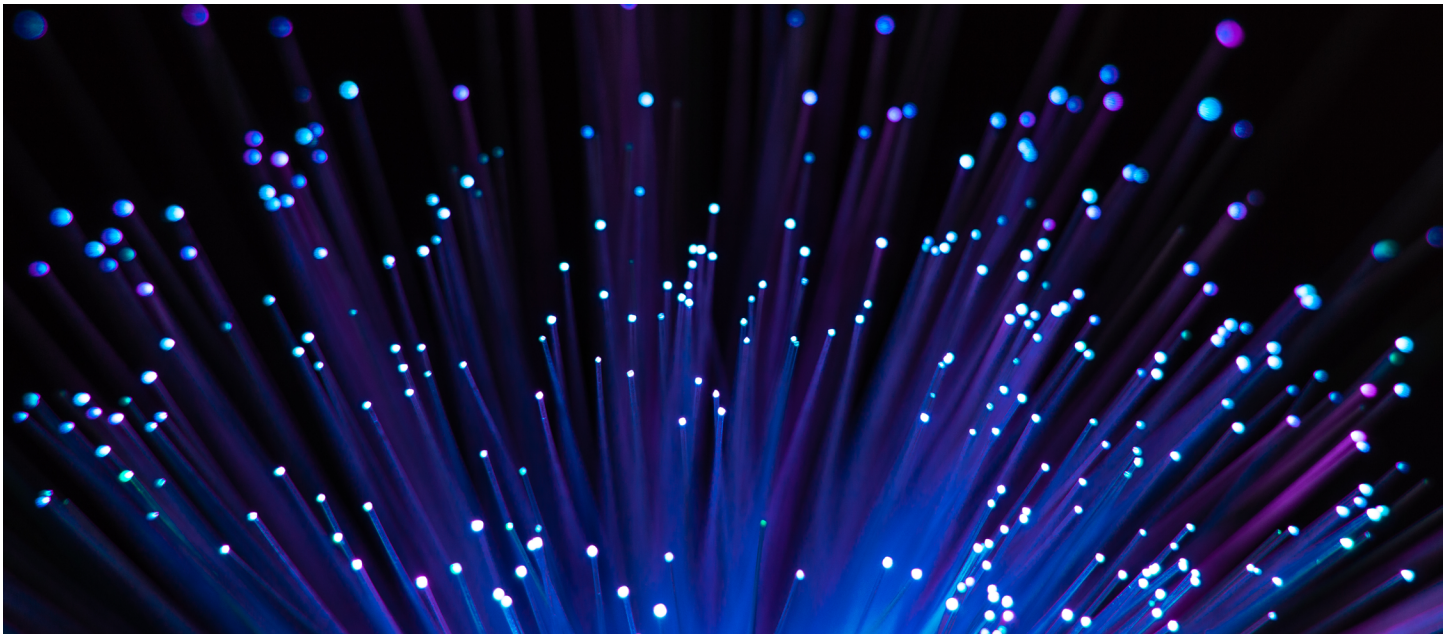

SD-WAN, which first appeared in the early 2010s, overcomes many of the limitations of MPLS. One of its major advantages is transport independence, which allows organizations to mix MPLS and Internet circuits or possibly replace MPLS circuits all together to achieve significant cost savings.

SD-WAN allowed organizations to implement direct Internet access (DIA) at branches, which improved performance for SaaS applications by eliminating the data center traffic backhaul. The resulting lower traffic on the WAN circuits provided more bandwidth capacity at the data center headends and a subsequent better user experience for data center applications.

SD-WAN enabled better traffic management and incorporated application-aware intelligence to enable the network to differentiate high and low-priority applications, and route those based on the underlying circuit performance.

Claims by SD-WAN vendors to solve problems of cloud connectivity have sometimes been exaggerated. SD-WAN has certainly improved access to cloud services for branch networks as compared to MPLS, but its support for cloud-native constructs has remained fairly rudimentary.

SD-WAN typically takes the network to the edge of the cloud, leaving enterprises with additional integration work, such as cloud-native routing, transit connectivity and deployment of stateful security services (e.g., next generation firewalls).

A further drawback of SD-WAN is that while it separates the logical network from the underlay, many SD-WAN products are tied to proprietary hardware. Software changes may involve hardware upgrades or replacement.

SDWAN limitations

- Basic cloud connectivity
- Weak or incomplete cloud-native integration
- Hardware dependencies, e.g., router upgrades, replacements
- Steep learning curve for DIY implementation


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## Benefits of a Cloud Backbone

There are two questions CIOs should be asking about WANs in the cloud and AI era, depending on whether they are primarily focused on WAN replacement or better cloud connectivity:

- What opportunities does the cloud provide for building a better WAN?
- What is the best WAN solution for connecting to, through and across different clouds?

Cloud backbone is delivered and operated through the Alkira Portal with a simple web graphical user interface and a single click provisioning within a matter of minutes. The network subsumes the cloud-native capabilities of the public clouds but abstracts the underlying complexities. The Alkira Portal design canvas hides the intricacies of each different environment and views the entire global cloud fabric as a single, unified entity.

Cloud backbone delivers the following services:

- Elastic, on-demand, SLA backed wide area network (WAN) with any-to-any connectivity between enterprise remote sites, campuses, co-location facilities and data centers
- Natively cloud and multi-cloud by incorporating cloud workloads connectivity without the use of cloud onramps or cloud gateways
- Intelligently inserted auto-scaling network services, such as the next generation firewalls
- Full operational visibility, monitoring, troubleshooting, and governance
- Advanced routing controls for brownfield interoperability during transition from legacy WAN to the Alkira Cloud BackboneSteep learning curve for DIY implementation


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Enterprises can migrate away from the MPLS service into the cloud backbone for their wide area networking needs across the on-premises and cloud environments.

**Alkira is also leveraging its profound knowledge of SD-WAN to ensure that existing network fabrics fully integrate with the cloud backbone.**

Benefits of this approach are:

- Investment protection and an evolutionary path toward the cloud edge for network connectivity and network services delivery (versus traditional on-premises edge at the branch or data center)
- Instantly enhance SD-WAN capabilities by incorporating new features not available in a given SD-WAN solution, e.g., zero trust network access for remote user connectivity
- Advanced cloud networking with integrated next-generation firewall security
- End-to-end segmentation between users/sites and cloud workloads for resource separation and reduced attack surface
- Improved application experience leveraging high speed, low latency Alkira cloud backbone for interconnecting regionalized SD-WAN fabrics
- Multi-vendor SD-WAN interoperability (M&A) leveraging Alkira cloud backbone


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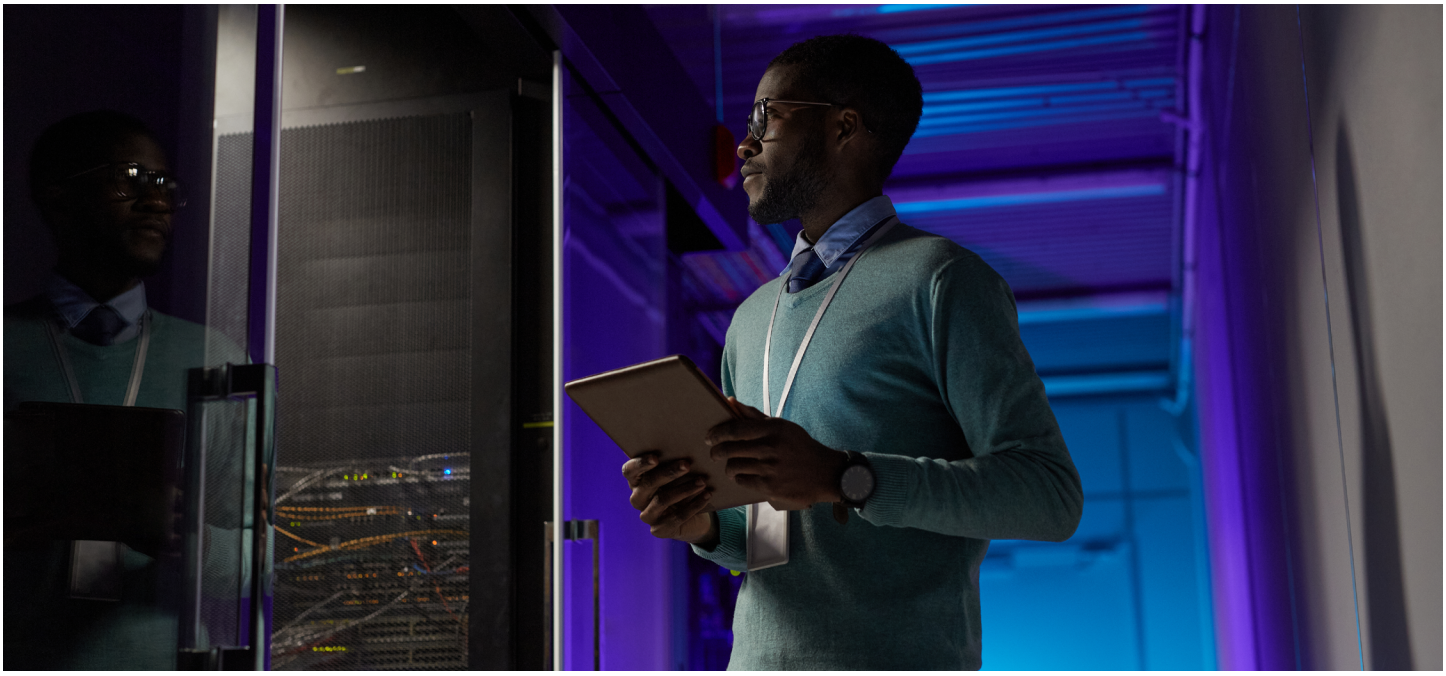
Other benefits of the Alkira cloud backbone are:

- Near infinite scalability and elasticity – because it is built on the global cloud infrastructure, capacity is unconstrained. Network bandwidth autoscales as demand for capacity increases and decreases. Enterprises pay only for what they use rather than provisioning for peak loads all year round.

- Visibility and governance via a 'single pane of glass' – Alkira's solution gives customers deep application, network and network services insights. NetOps and SecOps teams identify problems before they occur across the entire multi-cloud network. The full API support offers customers a programmatic approach to their entire multi-cloud network and simplifies integration with third-party tools.

- Integrated security and network services – Alkira's solution intelligently inserts network services of choice, e.g., firewalls, into the customer multi-cloud network. Leveraging Alkira intent-based policies, desired network traffic flowing through the cloud backbone between remote locations, public clouds and SaaS applications can be intelligently steered toward the globally deployed network services. Alkira's solution maintains complete traffic symmetry required for proper stateful network services operation for single cloud or multi-cloud use cases. In case of firewalls, organizations can effectively extend their security posture to the cloud workloads. Alkira's network service insertion and symmetric traffic steering capabilities are independent of individual public cloud capabilities and are not restricted by them.

- End-to-end segmentation – capabilities offered by the Alkira solution allow customers to segment the cloud backbone. Remote locations, data centers, colocation facilities, cloud workloads, SaaS/Internet exit points and network services can all be placed in their respective network segments, effectively isolating them from each other.

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## Summary - meeting the cloud challenge

Enterprises need WAN solutions that allow them to minimize complexity and leverage the potential of the cloud to enable digital transformation.

They need the assurance of a clear evolutionary path that protects existing investments, integrates with multi-cloud and legacy environments, and allows for the graceful retirement of end-of-life technologies.

Enterprises need to know that their network is fully aligned with corporate governance requirements and puts them in total operational control of strategic resources.

Above all, enterprises demand business agility, the ability to respond immediately to opportunities to deliver new services to customers, streamline processes and expand into new territories without having to wait for the network to catch up.

Businesses do not need to build and run their own network infrastructure any more than they need to generate their own electricity. Alkira's cloud backbone as a service marks a turning point for the industry in delivering a global, scalable, and secure foundation for wide area networks in the cloud.


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