Solution Brief

Large Enterprises, Service Providers, Government

Graphiant Network-as-a-Service Delivers Next-Gen WAN

Specifying Intel CPUs, the Graphiant NaaS WAN service replaces MPLS and SD-WAN by offering a new WAN that is scalable, flexible and easy to configure and deploy

Businesses want to connect their increasingly distributed workforce and give them secure WAN access to cloud services, data-intensive applications, partners and other resources and services.

Multi-protocol label switching (MPLS) was the pioneering technology for WANs with first networks deployed in 1999, and it still has a significant installed base today. But MPLS is a technology that depends on dedicated physical circuits between remote offices and HQ. MPLS offers limited network visibility and doesn't feature policy control compared to modern technologies. A lack of automation results in very long provisioning cycles for new or expanded services.

As broadband internet services grew more popular, branch offices and remote workers started using them for faster access to the cloud. This led to the creation of software-defined WAN (SD-WAN) which offered the ability to use a variety of WAN services (MPLS, 4G/5G, broadband internet, etc.) in a secure way with policy control and automation. SD-WAN enabled customers to prioritize critical business traffic and it worked with advanced security measures to keep data secure.

SD-WAN helped simplify the management of various WAN technologies and allowed enterprises to choose the WAN access service that was best and most cost-effective for their environment. But SD-WANs were also limited in scalability due to their mesh network architecture and were only a single tenant option requiring multiple individual controllers for locations with multiple tenants.

In the era of containers and virtual machines, network topologies became complex and dynamic with new applications and services being spun up on cloud servers outside of an enterprises control.

These shortcomings led Graphiant, an Intel® Industry Solutions Builders Partner, to build a stateless core network-as-a-service that combines the best features of SD-WAN and MPLS using modern networking technology.

How Graphiant NaaS Works

The Graphiant NaaS operates on a private network that ensures all enterprise applications are delivered from source to destination with guaranteed SLA. Graphiant devised its service to enable a network manager to have full control and policy management over the entire enterprise WAN.

Graphiant designed the service to keep routing and control in the cloud, while allowing customers to use policies to program the stateless core to route traffic with little overhead. This enables users to program and enforce network service levels across all the devices and endpoints in the network.

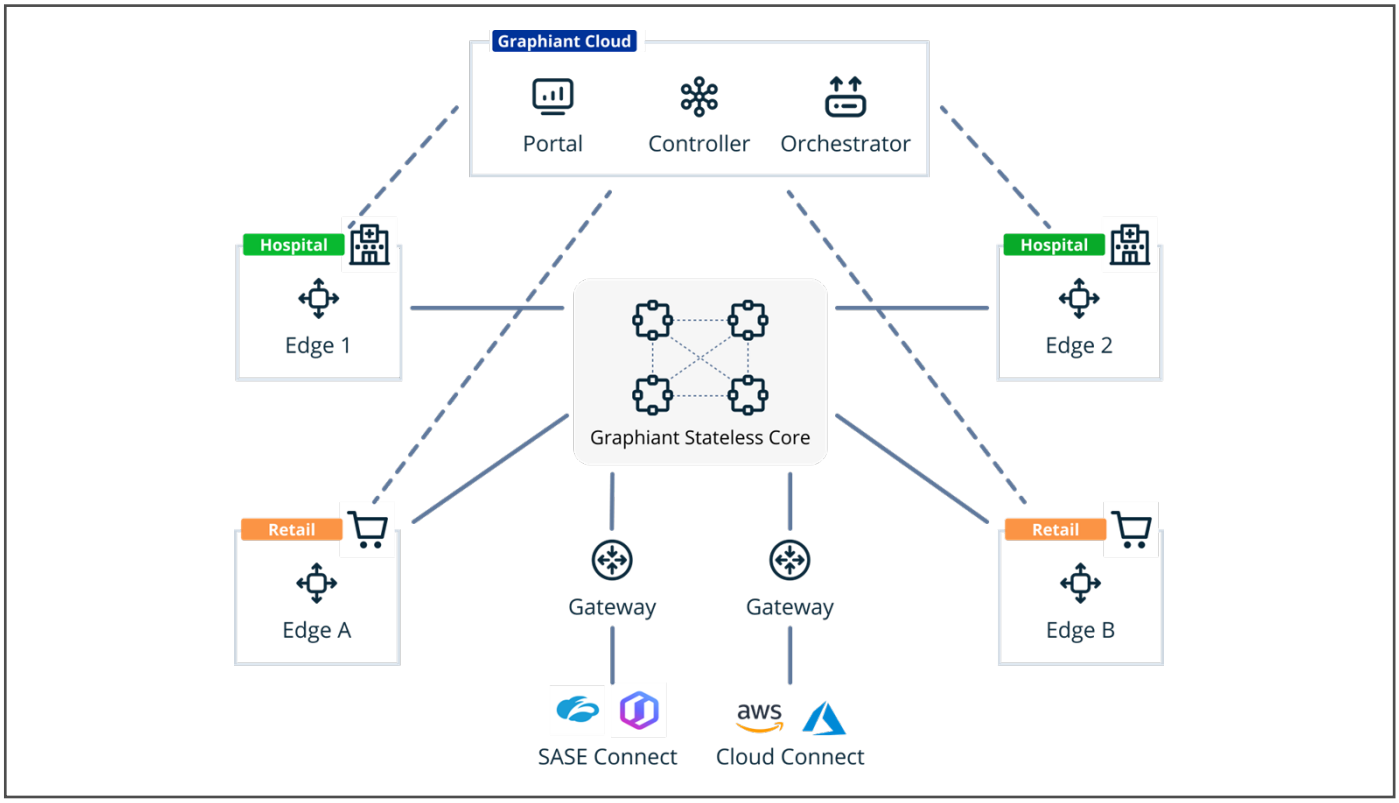

Figure 1. Here is the Graphiant NaaS network including the stateless core, edge and portal parts of the service.

Because Graphiant is an "Network-as-a-Service" offering it's easy to deploy, configure and manage with no capital investment and up to 70% less ongoing cost when compared to MPLS. The Graphiant solution is comprised of four components as seen in Figure 1.

Graphiant Edge: This software connects the enterprise network to the Graphiant NaaS. It's a virtualized function that provides routing, security and policy capabilities exchanged via Graphiant Portal - removing the need for the core to do that processing. Graphiant Edge runs on a range of Intel® CPUs depending on the network size. The Graphiant Edge is deployed either as a bare metal application or via a virtual machine and can be deployed either in an on-premises server or in the cloud.

Graphiant Stateless Core: The Graphiant Stateless Core is the MPLS edge-to-edge packet forwarding engine component of the Graphiant NaaS. It is a private network with PoPs across the world that provide network onramps and offramps. The Graphiant Stateless Core also features new protocols and label switching techniques that facilitate metadata label switching across the backbone network which facilitates policy enforcement and guaranteed SLAs.

Thanks to the intelligence built into the Graphiant Edge, routing instructions in the form of MPLS labels and Graphiant meta-data is programmed at the edge, allowing the stateless core to focus on simple label-switched packet forwarding. No customer routing/policy state is maintained in the Graphiant Stateless Core.

Graphiant Portal: This portal is a cloud-hosted configuration, monitoring, and reporting infrastructure dashboard that allows configuration of the network from edge-to-edge.

With the portal, users can configure, upgrade, monitor, and troubleshoot their network. This includes setting up the third-party services through the Graphiant Gateway. An API gateway is also available for the portal, allowing customers to interact with the service programmatically.

Using the portal, network managers can easily establish granular policy controls including QoS, defining segment membership, influencing path selection and mapping B2B traffic as needed.

Compute Power from Intel Technology

Graphiant NaaS runs on data center or cloud servers that use a wide variety of Intel CPUs. The Graphiant Edge, Graphiant Core, and Graphiant Gateway make use of Intel's Open Edge Platform. This Intel-developed, open source software provides microvisor tools, an edge manageability framework and edge AI libraries including GETi, Intel® SceneScape and OpenVINO. This software stack supports the operation of software like Graphiant Edge, Graphiant Core, and Graphiant Gateway.

One of the form factor innovations from Intel which Graphiant chose to test is Intel® NetSec Accelerator Reference Design. The reference design enables an autonomous server packaged in a PCIe add-in-card form factor, configured with an Intel® Ethernet Controller and an Intel® processor. The incremental compute resource supplied by the reference design allows Graphiant to reduce cost of operation while delivering modern WAN services.

Products based on the reference design can plug into any Intel-based server with PCIe slots and deliver the data plane and cryptography performance needed for Graphiant NaaS infrastructure, including advanced cryptography such as post-quantum cryptography (PQC) as well as network security workloads enabled with AI. Its unique form factor allows deployment of additional network security optimized computers in space- and power-constrained data centers and edge locations, at much lower cost. The small footprint of the server in add-in-card form factor also allows hardware disaggregation of network and network security functions, where the practice could be much more costly when done by installing full size servers into data center and edge locations. Graphiant seeks this agility and flexibility aspect of the design to scale its edge infrastructure capabilities and capacity.

CPU	Intel Xeon D-1747NTE Processor
Memory	Dual DDR4 Up to 32G
Storage	Up to 512 G eMMC
Ethernet	Intel® Ethernet E810 Network Adapter
External Ports	2x25GbE SFP28
Form Factor	FH - 3/4L - SW
Power	90W - 145W
Host Interface	X16 PCIe Gen4
Baseboard Mgmt. Controller	Aspeed AST2600
Throughput (Bi-directional Offload)	50 Gbps

Figure 2. The Senao SX904 is built on the Intel NetSec Reference Design. Included in the image are its specifications.

Quantum Safe Security

To prevent against cybersecurity challenges stemming from quantum computing, Graphiant is prototyping a post quantum cryptography (PQC) solution that uses Arqit software running on Intel NetSec Accelerator Reference Design network security accelerator cards.

Arqit's SKA-Platform facilitates IPSec tunnel endpoints that generate symmetric keys that protect the networks against attacks by hackers using today's computers or by emerging cryptographically relevant quantum computers (CRQC). The SKA-Platform can facilitate symmetric keys ratcheted on a frequent basis. This dramatically reduces the lifetime of the encryption key and mitigates the opportunity for a device to be "spoofed" or impersonated on the network. Most importantly, Arqit's symmetric key agreement (SKA) process replaces the need for manual key generation, couriering, loading, auditing, accounting, and other manpower-intensive and fundamentally unscalable key management operations.

Enterprise Use Cases

The Graphiant NaaS combines the guaranteed delivery and privacy of MPLS services with the access agility of broadband services to fit into four enterprise applications. These include:

- Public cloud access: Connect to multiple public cloud services with private connectivity.
- Enterprise backbone: Create a network that provides high-throughput services to connect buildings or campuses.
- WAN: A single network to link remote workers and branch offices across multiple geographic locations.
- B2B partner network: Build an extranet that allows fast and secure data sharing with partners or customers.

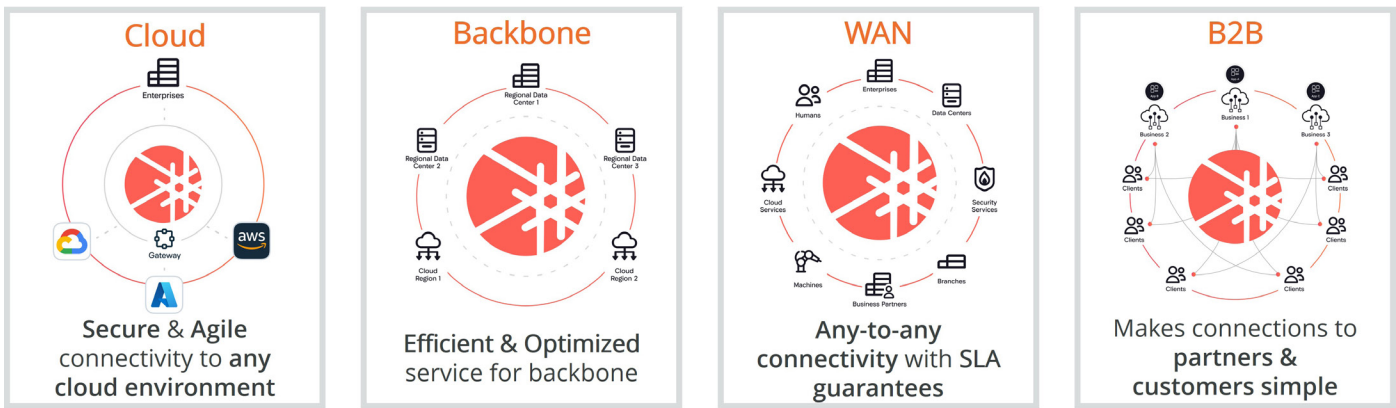

Figure 3. Four use cases for the Graphiant NaaS.

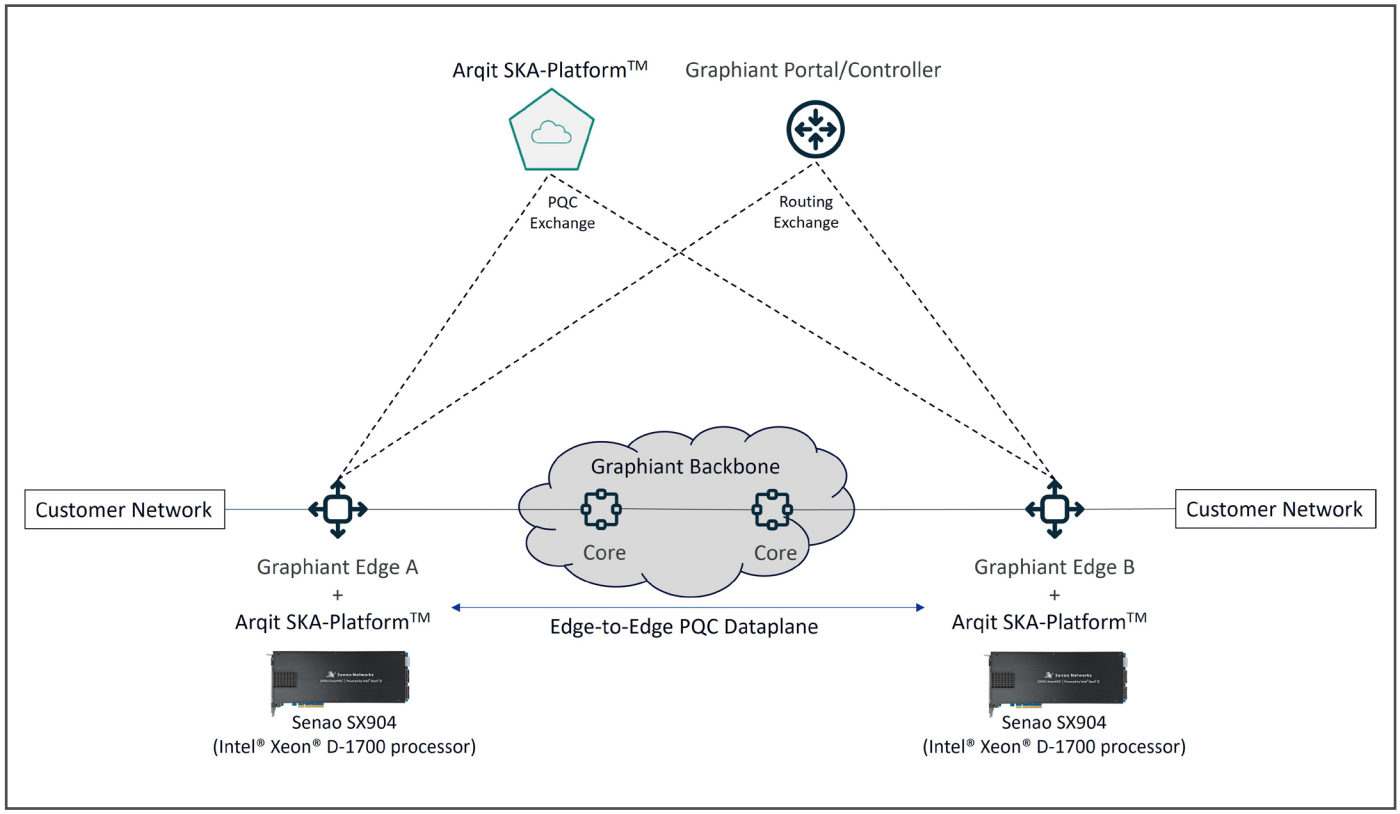

Figure 4. Arqit prototype lab topology.

Prototype Integration Lab Topology Setup

A prototype integration test environment was established in the lab to validate the interoperability between the Graphiant Edge platform and the Arqit SKA system.

The Senao SX904, equipped with an Intel® Xeon® D-1700 processor, was utilized to host the Graphiant Edge devices. For efficiency, the SX904 was deployed on an existing lab server rather than on a dedicated standalone host.

Integration with Arqit SKA-Platform: The Arqit NetworkSecure™ Adapter was integrated with the Graphiant Edge software, enabling secure connectivity to the Arqit SKA-Platform in the cloud. Through this prototype integration, the Edge devices successfully obtained shared symmetric keys facilitated by the SKA-Platform.

Controller Connectivity and Routing: Each Graphiant Edge device maintained secure connectivity with the Graphiant Controller, allowing the exchange of customer routing information between Edge devices. This setup ensured seamless and secure interconnection of customer networks across locations.

End-to-End Data Protection: All customer data transmitted between Edge devices was encrypted using the shared symmetric keys. Data remained encrypted while traversing the Graphiant backbone, ensuring end-to-end confidentiality. At no point was customer data decrypted during transit, maintaining the highest level of security throughout the communication path.

Conclusion

As the demand for WAN services grows to support increasingly distributed workforces, traditional WAN technologies are struggling to keep pace. The rigid, hardware-dependent structure of MPLS and the limited scalability of SD-WAN solutions reveal a gap in addressing today's dynamic networking requirements. This evolution creates the need for a new WAN architecture—one designed specifically for the cloud era.

Graphiant addresses this challenge by combining the best capabilities of both MPLS and SD-WAN into a next-generation Network-as-a-Service (NaaS) platform. The Graphiant NaaS is easy to configure and deploy, highly scalable, and provides centralized control with granular policy management. Built on Intel architecture–based servers, it delivers high throughput and low-latency performance, supporting a broad range of enterprise and service provider use cases.

The Graphiant data plane components—Edge, Gateway, and Core—can be deployed on the Senao SX904 SmartNIC, powered by the Intel Xeon D-1700 processor. This flexible design enables deployment without the need for dedicated or standalone hardware, optimizing cost and simplifying integration for both enterprise and service provider environments.

In a recent prototype, Graphiant successfully integrated with the Arqit NetworkSecure Adapter to establish quantum-resistant symmetric keys for end-to-end encryption, leveraging the cloud-based Arqit SKA-Platform. This collaboration underscores Graphiant's and Arqit's commitment to advancing secure, scalable, and future-proof networking solutions.

Learn More

Graphiant Home Page

Graphiant Technical White Paper

Arqit Quantum

Arqit SKA-Platform™ White Paper

Intel® NetSec Accelerator Reference Design

Intel® Xeon® Processors

Open Edge by Intel

Intel® Industry Solution Builders

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