FUTURIOM
FUTURE OF CLOUD TECH

Market Leadership Brief

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A New Approach for a High-Performance, Hybrid Cloud Network

1. Intro: Multicloud and Hybrid Networking Trends Take Shape

The new era of digital transformation has changed the way that organizations manage their infrastructure, requiring a new type of networking system that can support high-performance connectivity for apps wherever they reside – including inside traditional enterprise infrastructure, in the cloud, or at the edge.

Organizations large and small are in the process of transforming their infrastructure to unlock the potential of connecting critical data and new services. Depending on the size and needs of a specific organization, they might build their own cloud-like infrastructure (private cloud), a service that they could host and launch from the cloud ("webscale"), or use existing public clouds such as those from Amazon, Google, Microsoft, Oracle, and others.

Technology and business leaders have adopted cloud services because it gives them a higher-velocity path to launch new services and products using flexible technology platforms that can be consumed as a service. But in the rush to the cloud, other needs have been neglected. For example, what about connecting crucial apps and data that may still reside in enterprise datacenters, manufacturing environments, or compute environments at the edge? These varying domains require a new type of hybrid network connectivity -- an application-layer networking overlay that can connect apps and data wherever they exist, with high performance and security.

With new cloud services and capabilities ranging from development tools to cybersecurity and artificial intelligence/machine learning (AI/ML), organizations are looking at a variety of infrastructure approaches to using services from many different environments. When bringing both legacy and cloud-native applications and data into the mix, it is useful to provide connectivity among traditional infrastructure, webscale services, and public cloud. Others might want to combine the services and data capabilities of several clouds, in an approach known as hybrid cloud.

New Cloud Business Requirements

Technology investments are driven by business needs. The development and adoption of cloud services such as software-as-a-service (SaaS) is just one part of the equation. The end goal is to digitalize data and workflows to provide better visibility into business practices and speed up the delivery of new services.

The business response to the COVID-19 pandemic is a classic example, as retailers quickly scaled up digitization processes to enable real-time e-commerce and curbside delivery as demand quickly shifted to digital. The shift to digital has provided more tools for quickly responding to customer needs and providing better customer experience.

Another big driver is data mining to provide insights and analytics to business management for the delivery of better products and services. On the financial side, the conversion to consumption of services as SaaS or network-as-a-service (NaaS) has improved finances by shifting infrastructure from a capital expenditure to a monthly or annual expense.

According to a recent survey from Baker Mackenzie, the top areas of digital transformation investment include cloud computing (81%) and AI/ML (80%). Futuriom primary research shows there is indeed a groundswell of hybrid cloud initiatives developing in the real world. The table below shows some of the larger projects that Futuriom has identified in hybrid cloud automation.

Hybrid Cloud Initiative	Benefits and ROI	Source
Coca Cola European Partners (CCEP) partnered with IBM's Red Hat to build a single-dashboard management platform for hybrid and multicloud.	CCEP says that the move is designed to reduce operational expenses, increase resiliency, and leverage analytics and AI in daily operations, delivering business insights and better service.	https://manufacturingdigital.com/technology/coca-cola-and-ibm-red-hat-partner-digital-transformation
Target employed 4,000 engineers to collaborate on an "event-driven, microservices architecture" deployed across hybrid cloud, which includes a large private cloud infrastructure also connected to Google Cloud and Microsoft Azure.	The project enables management of complex workloads across multiple clouds and enables faster distribution and deployment of new applications and services. Target says this has increased site reliability and efficiency.	https://tech.target.com/blog/journey-to-a-hybrid-multi-cloud
Walmart has used cloud automation and DevOps across a hybrid cloud architecture.	Walmart claims flexibility to move workloads among clouds and to use flexible capacity for seasonal business changes.	https://www.ciodive.com/news/walmart-cloud-strategy-investors/573175/

This includes a "robust" private cloud.		
Using Kubernetes, Fidelity runs 3,000 Kubernetes services in its own hybrid cloud, which it calls the Fidelity Cloud Fabric.	Fidelity cites accelerated production deployments and development, including 20X more releases.	https://www.cncf.io/case-studies/fidelityinvestments/
BMW Group partnered with Hitachi Vantar's EverFlex to build hybrid cloud infrastructure.	BMW Group's hybrid cloud can flexibly adjust data management and digital infrastructure as needed to accelerate innovation and provide high-reliability production.	https://technologymagazine.com/cloud-and-cybersecurity/bmw-group-selects-hitachi-vantara-to-accelerate-hybrid-cloud

These large projects demonstrate a strong need to deploy hybrid infrastructure and connectivity. IT organizations would like to build applications that can connect and utilize a vast array of resources, whether those reside in public cloud, private cloud, or traditional IT environments. This will place new demands on networking technology.

2. Hybrid Cloud Challenge: What Does It Mean for Networking?

As hybrid and multicloud architectures loom on the horizon, one of the key needs is to securely connect, manage, and integrate networking among the various clouds. A new type of networking is needed to accommodate this, as traditional enterprise networks were not built for multicloud and hybrid cloud needs. Some folks call this multicloud networking (MCN) or hybrid networking.

In its newest form, networking will be a powerful enabling tool for cloud applications. It will be used to integrate existing technology infrastructure. This might include linking traditional and legacy assets such as datacenters to the cloud, as well as building new applications that can tap into all this infrastructure – whether it's cloud-based or based on traditional technology. Enterprises may also need to connect to partner networks or contractors, including remote workers.

Networking technology is perceived to have adopted more slowly to the cloud than other pieces of technology infrastructure such as storage and compute. Networking is harder to change. Storage and compute are discrete functions that can be adopted and scaled in contained environments. Networking touches more elements – not only storage and compute, but also datacenters, public wireless and wireline communications services, and enterprise applications.

Hybrid Networking Challenges

Feedback from the marketplace indicates that most end users likely won't use traditional networking tools to connect to multiple or hybrid clouds. Why is that? Quite simply, traditional networking gear, such as routers and switches, was built for single datacenter or private enterprise environments. The multicloud or hybrid network must adapt to the ephemeral nature of the workforce and applications. It can't be tied to specific boxes, networks, or even IP addresses – and it must be quickly programmable. It must also provide built-in, zero-trust security.

Let's look at several of the key limitations of traditional networking gear for hybrid cloud or public

cloud applications.

- **IP Transit limitations.** Organizations increasingly rely on IP Transit and the Internet to create overlay tunnels that bridge the gaps between cloud services, but there is no common or quick way to define and implement service levels or policy across multiple clouds and IP Transit networks.

- **MPLS is past its time**. Network innovations such as MPLS were effective for connecting private datacenters, but they were built for a different architecture based on branch offices, headquarters, and datacenters – not the ephemeral hybrid workforce, which might be roaming across different locations and consuming apps from all corners of the world. MPLS services are also very expensive, and IP transit is becoming an increasingly affordable alternative, if implemented correctly.

- **Adoption of infrastructure as code and APIs.** Network managers want to move toward "infrastructure as code," which enables them to build networking policy directly into applications. This requires tools that can talk to public cloud networking constructs and be programmed via application programming interfaces (APIs) at the application layer.

- **Scripting has limitations.** Past enterprise datacenter implementations are often scaled and managed with scripting tools, such as Ansible or Terraform. However, these scripting tools are largely operated by humans in response to scaling demand. The answer is to build an automated network that can respond in real time to demand for high-performance IP Transit.

- **IPsec can only do so much.** The generic IPsec tunnel overlay has become the standard for connecting across cloud networks. However, each of these tunnels must be provisioned individually. "Tunnel scaling" can become a problem in many cloud-scale networks. In addition, IPsec tunnels may consume excess resources by requiring a lot of encryption and decryption.

- **Networking impact on cloud costs.** Cloud egress data costs present another challenge to building networks using cloud resources.

The bulk of end users surveyed by Futuriom indicate they envision using a hybrid network that can connect multiple environments or hybrid clouds. In many cases, networking for hybrid and multicloud arrangements will prove to be a major challenge. Connecting different computing domains or platforms requires a flexible networking infrastructure that can also be managed and monitored to ensure security and compliance.

The next step for the cloud migration will be to build a flexible networking infrastructure that can bridge enterprise, private datacenter, and public cloud. This software-driven multicloud networking approach will be used to dynamically provision, manage, and integrate management of the networks that can link traditional enterprise networks, private datacenters, and public cloud platforms and services.

3. Building Cloud Networking that Responds to Business Needs

If the network needs to adapt to hybrid environments, what does it look like? The hybrid-ready network needs many characteristics that differ drastically from traditional networking technology. Primarily, it must be able to respond to the business needs we outlined above.

Hybrid networking needs to be flexible enough to connect to many different types of networks and devices, and it needs to be programmable. But there are many other needs. If one were to sum up a key characteristic of what organizations need from networking, it's the same thing they got when they moved to the cloud: a more responsive infrastructure that could respond on demand to business needs and new service models.

These new business service models require new cloud networks to execute on the following:

- **Connection of any network or device:** This means the capability to connect to any network, any application, or any device, including edge compute, Internet of Things (IoT), cloud, and enterprise networks.
- **Full application-level programmability:** The capability to program and configure using automation driven by data models and APIs in order to respond in real time to business needs and applications across a multicloud or hybrid cloud network.
- **Unified networking visibility:** The capability to provide a simplified management experience and single networking fabric for connecting to any network topology or domain, ranging from enterprise to hybrid and multicloud.
- **Cost-effective hybrid cloud networking:** Providing a cost-effective solution for transporting data among clouds, including consideration of the economics of costs such as cloud egress charges.
- **Full policy and security control:** Centralized network security and policy control to provide quality of service (QoS), secure end-to-end encryption, and threat mitigation.

Core Networking Control Is Key

As we look at these new cloud networking business requirements, it is clear that organizations need more control in connecting across core networks, whether that's by using public cloud networks, IP Transit, private enterprise networks, or private communications services. When building hybrid networking overlays, it's important to control and manage the networks as one logical entity.

Existing overlays using IP Transit and public cloud networks do not give organizations full control over the performance and security of the network. With traditional networking elements, there is no way to deliver a consistent network experience and control. Current approaches to cloud networking – IPsec tunnel propagation and use of IP Transit – have limitations. These limitations include scale, visibility, and cost control.

Organizations would like a simple way to build one network that maintains full security and performance, regardless of which cloud network is being used. To deliver this type of centralized

management and control of an application flow to multiple clouds, hybrid networks and MCNs will need to deliver network abstraction and programmability across any domain -- such as public cloud, IP Transit, or private communications network – and they must be able to do this using a consistent, programmable experience.

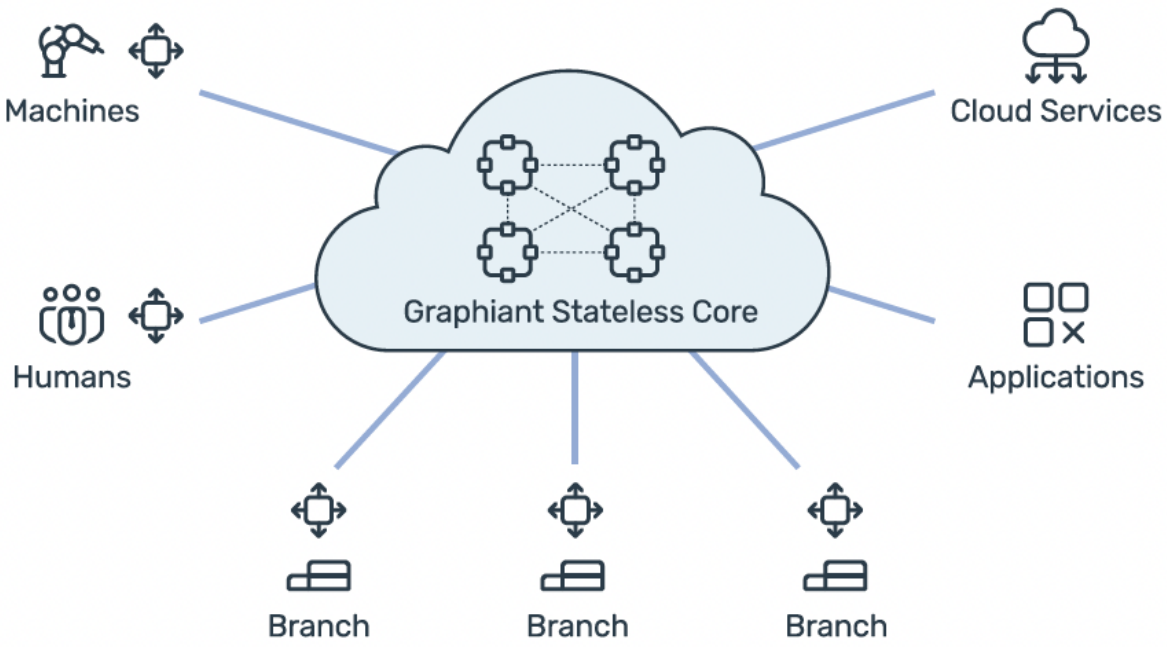
Another challenge in building hybrid networking and MCN is management of costs and control of the network. For example, depending on how MCNs are built using third-party points of presence (PoPs), they can incur excess transit or data egress fees, depending on how data is used in public cloud services.

4. Graphiant's Solution: A Stateless Core Cloud NaaS

With the complex requirements we have outlined for the future of MCN and hybrid networks, it's clear that the next hybrid network will need significant innovation at the application layer of the network, so that applications can be developed with native network functionality.

Graphiant has developed an elegant solution that addresses the key needs of these next-generation hybrid networks -- network programmability, visibility, cost control, and management of policy/security – across any network, in any environment.

Graphiant has developed a cloud-based network-as-a-service (NaaS) that delivers full control and policy management over any IP or cloud network, giving the user the power to control the network. It does this using a unique architecture that keeps cloud-based routing and control in the cloud, while assigning network policy tags that can be used by applications or networking devices at the edge. This enables users to enforce specific networking service levels to be programmed across all the devices and endpoints in the network.


Machines
Cloud Services
Graphiant Stateless Core
Humans
Applications
Branch
Branch
Branch

This approach has many advantages:

- **Instant NaaS connectivity:** Customers or partners can instantly connect to a cloud-based network providing security and QoS, consuming the network as a service.
- **Policy and SLAs:** Unlike plain-vanilla IP Transit, the Graphiant stateless core can enforce specific QoS and security policies across the entire hybrid network or MCN, from endpoint to destination.
- **Full security compliance and control:** The Graphiant NaaS provides full encryption and zero-trust security elements, without requiring firewall configuration or resource-consuming encryption/decryption processes to enforce policy.
- **Cost control:** The Graphiant solution maximizes cost savings across MCNs by minimizing networking data transfers and cloud egress costs, while maintaining a business-quality network that can use the most economical networking services.

As networking demands rise with the proliferation of applications and resources, it's time for solutions that can bridge the gaps between traditional enterprise networks, private datacenters, and cloud services. Graphiant has come up with an innovative solution that can solve these challenges while putting policy, control, and QoS fully into the hands of any organizations looking to operate an MCN.