THE FUTURE OF CLOUD IS THE NETWORK

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Introduction and Overview

Why Cloud Networking?

To better understand the future of cloud, its crucial to assess the major legacy networking challenges that organizations face today. It is essential to expand the networking foundation to support modern applications, connect microservices and harness data for business services. To do so, or not do so, will determine success of an organization's cloud journey.

The pace of digital innovation is surging across the digital ecosystem in the post-pandemic era resulting in a sharp expansion of applications and cloud usage, warranting cloud networking's primacy. Experiences such as 8K ultra-high-definition video streaming, immersive VR and AR apps, gaming, self-driving vehicles, high frequency stock trading, automation driven by AI/ML systems, and IoT use cases with 5G networks are expected by enterprises. In response, organizations are adopting hybrid or multi-cloud frameworks to attain cloud networking benefits and deliver these experiences, meet key performance indicators (KPIs), and service level objectives (SLOs).

From our viewpoint, Cisco is exceptionally positioned to help customers connect their teams and technologies to build applications and services that deliver scalable, sustainable, differentiated business value. As we advocate in this paper, we see these customer benefits as encompassing automated secure connectivity, simplified operations & management, platform-based solutions, unified policy management, pervasive visibility & insights, and best-in-class high-performance infrastructure.

We see a tectonic shift to organization-wide adoption of hybrid or multi-cloud environments. From our view, these data points further validate our thesis:

> **By 2025, 50 percent of enterprises will adopt a centralized platform engineering and operations approach to facilitate DevOps self-service and scaling, which is substantial increase from less than 20% in 2020** *(according to Best Practices for Running Containers and Kubernetes in Production, Published 4 August 2020 - ID G00730344).*
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> **The global hybrid cloud market is expected to grow at a compound annual growth rate (CAGR) of 21% over the 2021-2026 period. The growth of cloud and industrialized services and the decline of traditional data center outsourcing indicate a shift toward hybrid infrastructure cloud services** *(according to Mordor Intelligence).*
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> **The global multi-cloud management market is estimated to reach USD 32.75 billion by 2028, registering a CAGR of 26.3% from 2021 to 2028** *(according to Grand View Research).* **This attests to organizations requiring a NetOps-driven cloud neutral strategy that can flexibly extend across multiple public clouds as well as private cloud infrastructure.**

In this paper, we examine the Cisco cloud networking portfolio and why we believe it is well-suited to enable the cloud neutral strategy key to maximizing value out of cloud both public and private. This includes delivering the hybrid or multi-cloud networking environments key to maximizing the cloud benefits of elasticity, speedier time to market, cost predictability, supporting performance-sensitive applications, and administering massive active data sets with ease.

Executive Summary

The Future is Now for Cloud Networking to Power Organization Cloud Journeys

- Top barriers to broader implementation of cloud capabilities include cultural resistance, the distribution of applications and storage, bridging NetOps/DevOps/SRE/SecOps gaps, cloud computing silos, and limited alignment of application and insights with analytics.

- To do cloud networking right, the top cloud networking objectives include the need to optimize -- distributed workloads; hybrid cloud environments; multi-cloud orchestration, and distributed cloud meshes.

- To meet the main challenges of cloud networking, organizations such as hyperscalers, telcos, and enterprises are demanding services that offer new levels of depth and breadth in global coverage, technology offerings, and vertical industry knowledge.

- The foundational pillars of cloud networking consist of automated secure connectivity, simplified operations, platform approach, unified management and policy, pervasive visibility and insights, best-in-class infrastructure, and simplified consumption models.

- The seven foundational pillars are key to addressing customer challenges and we believe Cisco's cloud networking platform aligns and are optimal at supporting each of the foundational pillars.

- We see Cisco as fulfilling the distinct task of the trusted advisor role in meeting organizational challenges in adopting cloud networking solutions.

- Additional Cisco advantages include breadth of experience in delivering complex solutions and deep support for emerging technologies.

- Decision makers across all organizations are selecting cloud networking solutions must take a comprehensive approach in understanding the strategic portfolio resources essential to successfully advancing their cloud journeys.

- We believe the Cisco Cloud Networking portfolio can deliver significant value across the entire cloud ecosystem. Cisco is unique in delivering a solution that advances innovation and powers digital transformation excellence through cloud neutrality and comprehensive observability.

The Top Challenges Impending Implementation of Broader Cloud Capabilities

To better understand the future of cloud, its crucial to assess the top legacy networking challenges that organizations face today. It is essential to expand the networking foundation to support modern applications, connect microservices and harness data for business services. To do so, or not do so, will determine success of an organization's cloud journey.

These challenges have the potential to form barriers that impede the ability of businesses to swiftly adapt to the pace of digital innovation and the resultant proliferation of applications by adopting and orchestrating hybrid or multi-cloud. We believe the top challenges include:

1. **Cultural Resistance Slows Lift and Shift and Re-factoring Goals.** For migration and containerization of applications to the cloud, we identify cultural resistance as a key challenge. Organizations must adapt their workforces to the cloud era by developing the skillsets and tools necessary for administering hybrid or multi-cloud environments. The acquisition of cloud skills, such as cloud-native application development capabilities, has the potential to disrupt ongoing operational diligence due to the increased burden of recruiting, developing, and reskilling the skilled team members needed. This especially includes the refactoring of applications across lift and shift implementations and managing the applications and workloads as well as cloud native applications throughout on-premises and public cloud environments with consistent policy control and enforcement.

2. **The Distributed Application Performance and Storage Challenge.** In the multi-cloud era, distributed applications and storage must span across the DC to the cloud to the edge, posing performance challenges. For instance, existing applications running in on-premises DCs are not developed to run on public cloud as well as edge computing infrastructure and as such require refactoring before distribution or migration. Mission-critical applications must fulfill the equivalent or better performance, security, and availability requirements regardless of workload distribution and location. In addition, storage must be distributed and aligned with capabilities available in public cloud, hybrid cloud, and edge settings.

3. **Bridging NetOps/DevOps/SRE/SecOps gaps.** The proliferation of DevOps, CI/CD, and software development techniques into operations is key to bridging NetOps/DevOps/SRE/SecOps gaps. As such, many applications must be rearchitected, and machine formats must be converted, requiring the convergence of applications and operational systems to assure application resiliency. Existing operations and business processes are at risk to disruption due to the application downtime needed during application modernization and assimilation across NetOps, DevOps, site reliability engineering (SRE), and SecOps domains.

4. **Acceleration of digital transformation initiatives.** Organizations are swiftly advancing their digital transformation journeys using cloud frameworks that lock-in cloud neutrality to assure cloud journey flexibility and improved bargaining leverage with cloud providers. The growing complexities of cloud and the edge adoption fueling digital transformation includes the proliferation of silos that house the distributed computing intelligence needed to scale and manage the latency, deterministic response intervals, scale, automation, orchestration, and storage throughout the hybrid or multi-cloud realms. As a result, the need for open-source standards that support cloud-neutrality becomes increasingly urgent.

5. **Aligning application and insights with analytics.** When it comes to application and performance insights in hybrid or multi-cloud environments, analytics plays an increasingly critical role. Organizations are demanding end-to-end visibility capabilities, including holistic telemetry, that provide a comprehensive yet simplified view of application and network performance across their hosting environments. Correlation based on historical context and being able to conduct impact analysis on dynamic baseline information is needed to glean predictive outcomes that is imperative for comprehensive network visibility. With disparate data lakes from telemetry across on-premises and cloud environments, the paramountcy of analytics-driven applications and performance monitoring is indisputable across intricate environments. This makes maximizing telemetry data across multiple data sets including application, infrastructure and network critical to providing a consistent visibility & insights platform.

Cloud Networking Done Right: Powering Optimized Outcomes Across Cloud Networking Objectives

From our perspective, through top priority cloud networking objectives, the essential value of cloud networking is crystallized. We identify these cloud networking objectives as including the need to optimize -- distributed workloads; hybrid cloud environments; multi-cloud orchestration, and distributed cloud meshes.

- **Cloud Networking Objective: Networking "to" the cloud.** For organizations who want to connect workloads from on-prem, branch, edge to any public clouds, they are using Cloud VPCs/Vnet to connect to external devices (i.e., branch routers, SD-WAN edge, colocation routers, or on-prem routers). Cloud-neutral solutions need to offer secure, scale out and fault tolerant connectivity solutions administered on-prem or in the cloud with pervasive visibility and analytics.

- **Cloud Networking Objective: Networking "within" the cloud.** For organizations that want to optimize single cloud, multi-cloud, or edge computing benefits surpassing public cloud capabilities in areas such as orchestrating and managing cloud native workload, cloud networking solutions need to offer cloud neutrality and cloud-aware secure cloud fabric that responds to the intent of workloads running on any environment.

- **Cloud Networking Objective: Networking the private cloud.** For organizations that prioritize bringing the cloud to the on-prem software-defined data centers and run their mission-critical broadly verticalized workloads in their own private clouds, cloud networking solutions need to offer agile, highly available, and scale-out secure multi-site data center connectivity that is consumed based on self-service, on-demand, and pay-as-you go models.
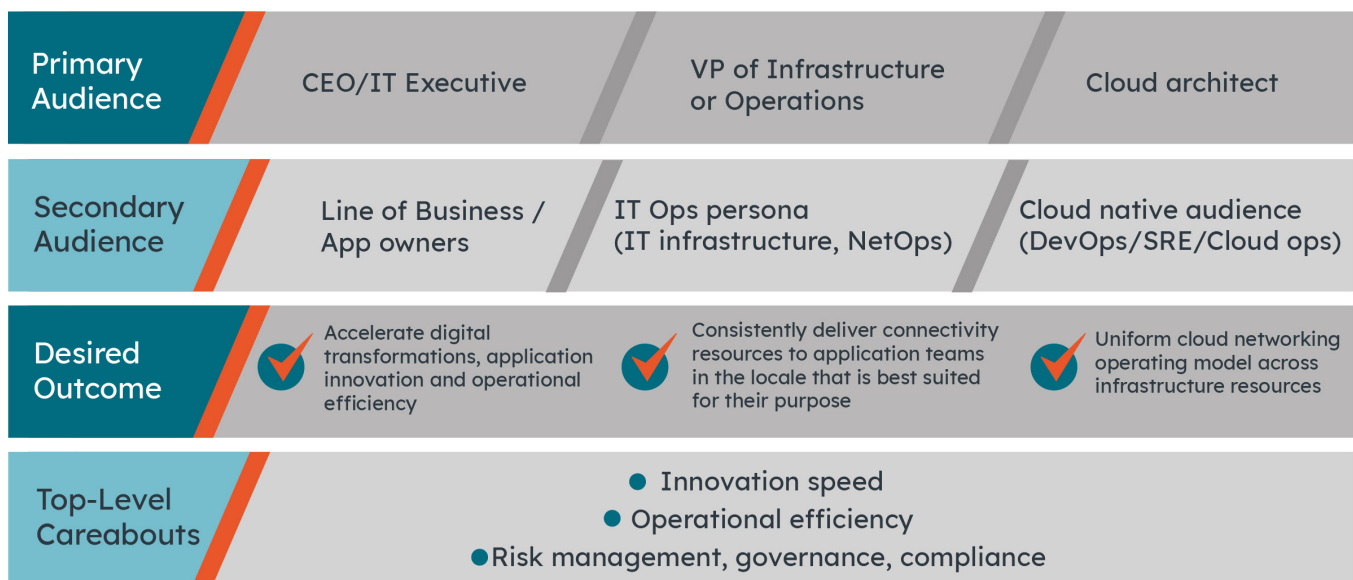
- **Cloud Networking Objective: Networking "between" clouds.** For organizations that require networking between clouds to secure the deployment of distributed applications across clouds and edge sites, cloud networking solutions need to support distributed cloud mesh capabilities that can relieve NetOps and DevOps teams from the uncertainties of managing multiple services between clouds.

What is the Market Looking for?

To meet the main challenges of cloud networking, organizations such as hyperscalers, telcos, and enterprises are demanding services that offer new levels of depth and breadth in global coverage, technology offerings, and vertical industry knowledge. This includes data center, cloud and edge capabilities that deliver support for any technology and serves any vertical.

As a result, we ascertain that organizations are prioritizing collaboration with trusted partners that deliver consistency across public and private cloud environments which enable business units, including engineering, marketing, and IT, to focus on developing their core business deliverables and services whilst minimize silos. Through an intent-based platform and infrastructure as code, organizations gain the intent-aware fabric needed to fulfill the demands of the application in the cloud native realm and across any networking fabric, while also meeting the specific priorities of decision-making personas.

The cloud networking portfolio needs to primarily address the priorities of these key personas:

Primary Audience	CEO/IT Executive	VP of Infrastructure or Operations	Cloud architect
Secondary Audience	Line of Business / App owners	IT Ops persona (IT infrastructure, NetOps)	Cloud native audience (DevOps/SRE/Cloud ops)
Desired Outcome	✔ Accelerate digital transformations, application innovation and operational efficiency	✔ Consistently deliver connectivity resources to application teams in the locale that is best suited for their purpose	✔ Uniform cloud networking operating model across infrastructure resources
Top-Level Careabouts	● Innovation speed ● Operational efficiency ● Risk management, governance, compliance		

Organizations are seeking platform-based SaaS solutions that provide the design, deployment, and operation of a network across and within hybrid or multi-cloud environments at scale for any workload. With such solutions, organizations can deploy cloud networks in single or multiple cloud environments, including public and private clouds, and edge locations.

We view a portfolio development approach that focuses on using a single network automation and operations platform strategy which enables consistent networking policy, security, governance, and visibility across hybrid or multiple cloud environments as comprehensively meeting what the market wants foremost. This includes supplying a single point of management, with usage-based or emerging on-demand networking and operational services.

Cisco Cloud Networking Definition

Cisco's Cloud Networking prioritizes enabling consistent secure connectivity and operations across public and private cloud environments that can enable engineers to deliver services on top. Delivered through Cisco's intent-based platform and infrastructure as code, an intent-aware fabric is enabled that can meet the specific demands of the application.

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Cisco Cloud Networking addresses the design, deployment, and operation of a network across and within multiple cloud environments at scale for any application. As such, Cisco customers can deploy cloud networks in a single, or multiple, cloud environments, including public clouds, on-prem "private clouds", and distributed edge locations. Cisco's "unified cloud networking and operations platform strategy" is designed to enable consistent networking policy, network security, governance, and network visibility across multiple cloud environments through a single point of management, with usage-based or on-demand networking and operational services.
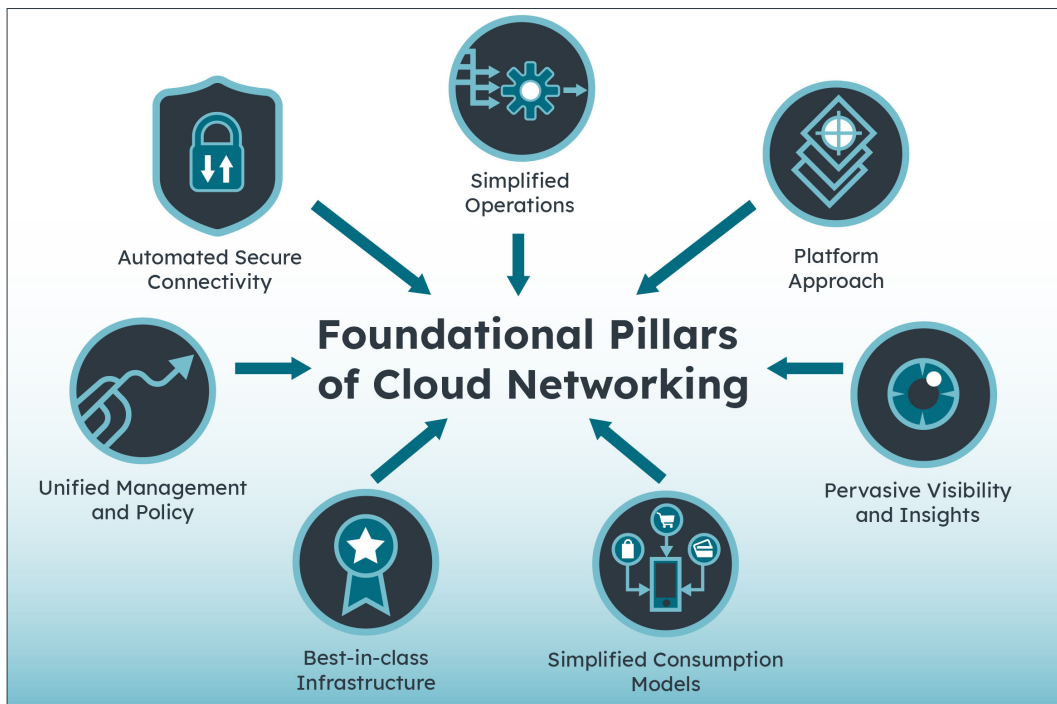
The value proposition of the Cisco Cloud Networking platform is clear. We see Cisco as fulfilling the distinct task of the trusted advisor role in meeting organizational challenges in adopting cloud networking solutions. To better understand our viewpoint and the overall Cisco value proposition, an overview of the Cisco Cloud Networking portfolio assets provides reference and insight. We identify Cisco Nexus Dashboard as underpinning the Cisco Cloud Networking solution and unique ability to fulfill the complete cloud networking requirements of organizations:

Cisco Nexus Dashboard

- Cisco Nexus Dashboard
  - » Orchestration
  - » Insights
  - » Data Broker
  - » Controllers
  - » Connectors
- Cisco ACI — APIC, Cloud APIC, Container Network Interface (CNI)
- Cisco Nexus Switches

For organizations to fully benefit from the foundational pillars of cloud networking, we believe that they must prioritize the value proposition that fulfills and augments all seven of the pillars. Fundamentally, organizations must be able to design, deploy, and operate their cloud networks efficiently and securely. We anticipate organizations that successfully operationalize their cloud networks can attain a competitive edge over their rivals. From our perspective, Cisco Cloud Networking precisely delivers such capabilities across all the pillars.

Foundational Pillars of Cloud Networking and How Cisco Cloud Networking Delivers the Superlative Solutions for the Cloud Networking Era

Automated Secure Connectivity

Simplified Operations

Platform Approach

Unified Management and Policy

Foundational Pillars of Cloud Networking

Pervasive Visibility and Insights

Best-in-class Infrastructure

Simplified Consumption Models

The Cloud Networking framework provides seven foundational principles that we believe are essential to fulfilling the topmost cloud networking requirements of organizations across the global digital ecosystem. We see the seven foundational pillars as key to addressing customer challenges to validate our perspective. For each pillar we directly connect how we see Cisco's cloud networking portfolio aligns and is optimal at supporting each of the foundational pillars:

1. **Automated Secure Connectivity (Pillar 1).** Connect any workload from any location through automation with deep visibility and insights into the network application. We anticipate that automation and insights will be vital to assuring secure connectivity throughout any cloud networking environment, especially network applications which are distributed throughout cloud frameworks. We see automated secure connectivity as vital to ensuring organization can address and successfully administer the distributed applications and storage challenge.

   Cisco Solution: Automated Secure Connectivity. Cisco Nexus Dashboard supplies the Orchestrator service key to delivering hybrid cloud connectivity at scale and uses the embedded Insights services to assuring intent with automation. In addition, Dashboard supports the powerful analytics engine and assurance required to continuously validate and verify the operational states of the network while proactively detecting any different types of anomalies throughout the network, root cause of the anomalies, and identify remediation methods. These capabilities include the assurance of automated and secure connectivity. We see it as a tool to modernize the operation of networks, streamline network team troubleshooting, increase operational efficiency, and proactively prevent network outages.

2. **Simplified Operations (Pillar 2).** Automate entire cloud ecosystem at scale with correlated visibility and insights available from a single user interface (UI) across all clouds eliminating operational concerns. This capability will be critical for organizations to maintain a single source of truth for ensuring the comprehensive visibility key to adapting their operations to cloud requirements. Through simplified operations, we anticipate that organizations can link existing gaps among their NetOps, DevOps, SRE, and SecOps teams according to their cloud networking requirements.

   Cisco Solution: Simplified Operations. Whether organizations are managing hybrid cloud or multi-cloud implementations, they may not be realizing the simplified operations needed to produce the better performance and greater cost reductions as expected. We believe Cisco Nexus Dashboard can simplify and automate cloud operation tasks. It will help IT simplify transition to hybrid applications using a single agile platform. Besides bridging the gap in tooling, one of the major capabilities of the Nexus Dashboard is enabling a flexible operational model for different personas—NetOps, DevOps and SecOps —across a plethora of use cases.

3. **Platform Approach (Pillar 3).** One platform that revolves around the operator with integrated full-lifecycle workflows across all clouds beyond advanced network management and extending into Cloud Native with consistent APIs and Infrastructure as Code (IaC) automation.

   Cisco Solution: Platform Approach. To help deliver high performance networks that adapt to a world where applications and infrastructure are hyper-distributed across a diverse technology landscape, Cisco Nexus Dashboard is the platform that IT Ops teams have been looking for to operate hybrid network clouds. With a unified view of network infrastructure and operations, distributed teams can manage on-premises, virtual edge, and cloud sites. Cisco Nexus Dashboard consolidates multiple operational view for various user personas and provides real-time insights and automation services to operate intricate hybrid cloud network environments.

4. **Unified Management and Policy (Pillar 4).** A single intent aware fabric defined in policy, managed from a single location that responds to the demands of applications. A policy that can define connectivity, L4-7 services, end-to-end segmentation, container communications which can be integrated into IaC process to bridge NetOps and DevOps. We see the adoption of unified management and policy as integral to advancing the pressing need to upskill organizational workforces as well as swiftly onboard cloud-smart personnel to securely administer cloud frameworks.

   Cisco Solution: Unified Policy Management. The Cisco Nexus Dashboard orchestration capabilities deliver the consistent and unified policy required to enable agile IP mobility and disaster recovery as well as policy-driven automation for inter-site network interconnects. Intelligent consumption is a hybrid approach that requires virtualization, optimization, and orchestration of both applications and infrastructure across public cloud and on-

prem. We see the solution as providing partners the ability to offer services to fully manage customer workloads in real-time based on the customer's business and technical requirements, and the specific interdependencies of their individual workloads.

5. **Pervasive Visibility and Insights (Pillar 5).** Across all performance, operations, and governance dimensions, pervasive visibility from infrastructure to workloads for making operational decisions. Through end-to-end visibility, organizations can enforce governance, manage risk, and regulatory compliance across heterogenous environments. Moreover, they can use analytics engines to optimize telemetry across various data sets including application, infrastructure, and network sources to ensure consistent visibility and insights.

    Cisco Solution: Pervasive Visibility and Insights. For operators to manage, maintain and troubleshoot their networks effectively, it is important to have a deep understanding of a network's constituents and their properties, what the network is doing, how it is being used, how it is responding to the demands on it, and, most importantly, how it will respond to new loads arising due to new business processes. When changes occur in the control plane, data plane, and forwarding plane of a network, it is important to detect, locate, and root cause anomalies as close to real time as possible.

    Cisco Nexus Dashboard with its insights capability automates troubleshooting and helps rapid root-causing and early remediation. Unified network repository and compliance rules keep the network state aligned with operator intent. It simplifies audits and ensures compliance while also helping infrastructure owners comply with SLA requirements for their users.

    Visibility into application traffic through Cisco Nexus Dashboard is additionally possible with its packet brokering function, a key capability to staying on top of increasing complexity. Using the data broker controller software and Cisco Nexus switches, operators can aggregate and forward traffic to analytics tools for monitoring both out-of-band and inline network traffic.

    In addition, Cisco Nexus Dashboard's orchestration capabilities enable multisite networking orchestration and policy management, disaster recovery and high availability, as well as provisioning and health oversight key to assuring observability and comprehensive cloud visibility. This includes multi-cloud orchestration that supports AWS and Microsoft Azure as well as the single pane of glass perspective key to the administration and orchestration of multiple networking fabrics.

6. **Best-in-class Infrastructure (Pillar 6).** Essential aspects of cloud networking are defined within software overlay, it is also necessary to consider the underlay, including the capabilities of the infrastructure. Critical elements such as the hardware scale can help the customer achieve consistent architecture building blocks with compatible features, code, and day two operations.

    Cisco Solution: Best-in-Class High Performance Infrastructure. Using Cisco Cloud Scale ASIC technology, the Cisco Nexus data center switches are built for organizations with the most demanding environments. Immediate benefits of the Cisco Nexus series include scale and investment protection with 1/10/25/50/100/400G, and 800G ready multispeed ports as well as security and visibility with streaming telemetry, advance analytics, and line-rate encryption (MACsec). Moreover, the series delivers unified ports supporting GbE and fiber channel, RDMA over converged Ethernet (RoCE), and IP storage and delivers application performance with up to 50% faster completion time with intelligent buffers and zero packet drop.

    Cisco ASIC innovation, especially Silicon One, is designed to enable feature parity across its cloud infrastructure portfolio which enables customers to have consistent hardware building blocks for predictable and consistent high performance. We see Cisco Silicon One providing the singular architecture required to provide the highest-tier bandwidth routing and web scale switching silicon essential to enabling unalloyed convergence throughout cloud networking environments.

7. **Simplified Consumption Models (Pillar 7).** Providing the simplicity and flexibility of self-service, on-demand, pay-as-you-go consumption model with real-time capacity management and full-time cycle experience platform. We see this model as enabling utility consumption for underpinning elastic operations and economics.

Cisco Solution: Simplified Consumption Models. Cisco Nexus Dashboard provides the unified operations across all the customer's sites and services and can scale out based on the size, number of sites, and the operational services used to manage them and as a result is well-suited for delivery as an "as-a-Service" offering. This includes enabling operations teams a consistent way for service access control and lifecycle management of the unified operations' services and infrastructure.

Other Differentiators: Why They Matter

Understanding the key cloud networking pillars, use cases, and Cisco's Hybrid Cloud portfolio differentiators are all critical in developing a thorough cloud journey strategy. We advocate other benefits must be factored into the cloud networking selection process. These additional advantages include breadth of experience in delivering complex solutions and deep support for emerging technologies.

Cisco CX Services for Cloud is a multi-offer portfolio that provides expertise and guidance throughout the lifecycle to meet customers' needs at every step of the cloud journey, from strategy and design to implementation, testing, optimization, and more. The portfolio includes embedded services in **Cisco Hybrid Cloud** as well as expertise that can be provided through Advisory Services, Support Services, and Success Track engagements. In addition, Cisco CX teams collaborate to help ensure organizations develop a cloud networking platform that is future prepared by assisting with design and deployment, providing end-to-end security and monitoring expertise, as well as assisting them to speed the transition to multi-cloud and hybrid cloud operating model.

Advisory Services include **Business Critical Services for Cloud** and **Advanced Services**. Business Critical Services for Cloud delivers continuous cloud expertise and optimization across the transformation lifecycle, powered by analytics, insights, and automation. For project-based needs, Advanced Services provide guidance that reduces complexity and speeds results. Support Services are packaged to deliver the right support for complex cloud environments to reduce service disruptions and swiftly resolve issues. In addition, Success Tracks is a packaged solution that offers advisory expertise and support plus insights and learning to accelerate business outcomes with a simplified, use case-guided lifecycle journey.

Moreover, we see Cisco leveraging its SD-WAN solutions, consisting of **Cisco SD-WAN Cloud OnRamp for MultiCloud, Cisco SD-WAN Cloud Interconnect**, and **Cisco SD-WAN Cloud Hub**, and market influence to ease multi-cloud networking implementation and administration. From our perspective, Cisco OnRamp automates and seamlessly connects enterprises to the leading public clouds (e.g., AWS, Azure, Google Cloud) with site-to-cloud connectivity, allowing SD-WAN policy to be extended into the cloud infrastructure.

Cisco SD-WAN Cloud Interconnect automates on-demand connectivity between multiple sites and to the world's leading cloud provider networks directly from your SD-WAN controller. We view Cloud Hub with **Google Cloud** as an industry breakthrough solution that leverages SD-WAN and Google's new Network Connectivity Center to interconnect branch sites, on-prem data centers, and Google Cloud using Google's high performance, global cloud network.

Cisco AppDynamics provides visibility across an organization's application topology through a single pane of glass. This includes application performance management that observes and manages end-to-end performance of intricate distributed applications and end user monitoring that improves user experience with mobile and browser real-time visibility as well as infrastructure visibility that we see as key to unlocking deeper insights by correlating server and database performance with application performance.

Cisco ThousandEyes immediately identifies what is impacting user experiences across any domain including those that the user does not own or control. Through a combination of active and passive monitoring techniques plus real-time Internet outage detection, users can gain deep insights into user experience across the services and applications delivered and consumed. This helps ensure visibility from switch to SaaS and everything in between that are integral to delivering invaluable digital experiences.

We see Cisco Nexus Dashboard capabilities fulfilling a broader range of cloud networking demands through integration and partnership with third party solution providers. Major third-party Cisco Nexus Dashboard integrations includes collaborating with HashiCorp **Terraform** and Red Hat **Ansible** to improve customer DevOps tools using IaC technology. Specifically, Terraform is an open-source IaC platform and Ansible is an open-source configuration management tool dedicated to the configuration of the infrastructure. In concert with Cisco Nexus Dashboard, we see Terraform well suited to supporting and augmenting Cisco orchestration capabilities with Ansible fulfilling intricate configuration management demands.

Cisco partners with **ServiceNow** to meet customer IT service management (ITSM) needs. From our perspective, the ServiceNow partnership enables Cisco Nexus Dashboard to use built-in best practices that can swiftly consolidate disparate tools to a single system of engagement across cloud environments. This includes harnessing shared data and analytics with IT service workflows that can improve IT productivity throughout cloud networking implementations.

The alliance with **Splunk** gives Cisco Nexus Dashboard the ability to leverage Splunk's extensible data platform to deliver unified security, full-stack observability, and custom applications throughout cloud networking environments. This includes leveraging cloud-powered analytical insights for petabyte-scale data analytics across hybrid cloud and multi-cloud frameworks. In the post-pandemic era, enterprises are accelerating adoption of both hybrid cloud and multi-cloud. We believe this prevailing trend plays to Cisco's portfolio and channel strengths in the enterprise realm, further enhancing its cloud networking prospects. Cisco is continuing strong with innovative portfolio in this regard since Cisco Service Mesh Manager will serve to boost its cloud-native and Kubernetes credentials in supporting enterprise cloud journeys. Additionally, we see the Cisco Intersight platform as furnishing the cloud operations platform enterprises need to unify oversight across the entirety of their on-prem, public cloud, and cloud-based workloads/applications.

Conclusion and Recommendations

Decision makers across all organizations in selecting cloud networking solutions must take a comprehensive approach in understanding the strategic portfolio resources essential to successfully advancing their cloud journeys. Overall, due primarily to its deep heritage and company-wide DNA in building the Internet, our research indicates that Cisco's Cloud Networking portfolio has the cloud native constructs and networking in the cloud in its core that naturally expands from there onwards to securely connect on-demand and as-a-service across any multi-cloud scenario.

This includes aligning all hosting environments that fulfill the dynamically changing business needs of customers. As a result, we see Cisco as uniquely situated to ensure that organizations can merge their cloud networking operations with cloud-native architectures that spurs innovation and enhance the application experience.

As noted, applications are evolving into distributed, containerized components that need to communicate with each other. Since the network is the foundation for modern application innovation, we maintain that Cisco is uniquely positioned to deliver the reliability, security, and agile development to support and scale the emerging application architecture vital to multi-cloud flexibility.

Since operations and app architectures continue to modernize, their paths are converging rapidly to a singular interwoven point. Specifically, we see operations evolving from data centers to cloud/DevOps and ultimately AI-powered operations. Cisco's vision to merge cloud networking operations and cloud-native architectures is precisely what organizations require to accelerate app velocity and augment app experience.

From our assessment, we believe the Cisco Cloud Networking portfolio can deliver significant value across the entire cloud ecosystem. The products offer the perfect balance of capacity, performance, and features throughout 400G data center networking environments. In contrast to rivals, we believe Cisco is unique in delivering a solution that advances innovation and powers digital transformation excellence through cloud neutrality and comprehensive observability.

Cloud Networking Approach is Essential to Optimizing Journey. Organizations would do well to explore the Cisco Cloud Networking proposition, which addresses the design, deployment, and operation of a network across and within multiple cloud environments at scale for any application. As a result, Cisco customers can deploy cloud networks in a single, or multiple, cloud environments, including public clouds, on-prem private clouds, and distributed edge locations.

Cisco's unified cloud networking and operations platform strategy is designed to enable consistent networking policy, network security, governance, and network visibility across multiple cloud environments through a single point of management, with usage-based or on-demand networking and operational services.

Assign Priority to Cloud Networking Principles. By understanding the pivotal role Cisco's plays in addressing the seven cloud networking principles can play in making the cloud journey successful (e.g., automated secure connectivity, simplified operations, platform approach, unified management and policy, full stack observability, best-in-class infrastructure, and simplified consumption models), organizations can select a trusted and proven partner that can assure the cloud-agnostic strategic approach key to avoiding lock-in with third party cloud providers and combining the best of private and public cloud capabilities across hybrid and multi-cloud environments.

Prioritize Network as Key to Improved User Experience. Organizations should consider Cisco's prime commitment to the network as fundamental to delivering a best-in-class user experience. This includes understanding that Cisco cloud networking is application aware, cultivating API capabilities that can optimize IaC, visibility, and analytics to lessen mean time to repair and fortify security with segmentation and whitelisting features.

Customers who are looking to invest in Cloud Networking solutions should think about the answers to these questions before selecting a solution:

1. How is the VXLAN deployed across multiple data centers? Ideally to reduce complexity the VXLAN implementation should be automated and hidden from the engineer.

2. Can you view networking policy, including segmentation policy from a single dashboard across not only private cloud but also public?

3. From the same dashboard can the engineer see events which are correlated to help find root cause?

4. How do you move workloads from private cloud to public cloud? Is the native integration into a cloud workload optimizer tool?

5. When you look at private cloud is there common features across the portfolio, allowing the customer to have consistent building blocks within their architecture without lots of models being deployed?

6. Does the dashboard provide visibility into to what is being connected to the cloud networking fabric? How do I know where my Kubernetes Cluster are connected, and/or Prod App running on Bare Metal and Virtual Machines? Do you get more than a topology view? Are you able to capture visibility into the compute node, OS, OS Version, hostname, etc.?

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