

VMware Telco Cloud Platform Public Cloud

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Abstract

Telecommunications service providers (SPs) are poised to profit from new revenue opportunities from 5G and related services. However, SPs' existing vertically scalable, on-premises infrastructure creates barriers to realizing the upside of 5G. Partnerships with public cloud hyperscalers like Amazon Web Services (AWS) are promising but come with a variety of constraints that may limit strategic flexibility. VMware® Telco Cloud Platform™—Public Cloud offers a solution. It enables SPs to take advantage of the best attributes of on-premises telco cloud and public cloud infrastructure as a service (IaaS) while preserving the ability to migrate functions wherever the SP wants them to go.

Introduction

Telecommunications SPs are at a unique strategic juncture in today's marketplace. Opportunities abound, with 5G and related services offering revenue growth as other categories decline. However, existing methods of building and expanding on-premises/own infrastructure cannot keep up with the explosion of services and capture potential opportunities created by 5G. As a result, SPs are exploring partnerships with hyperscalers to accelerate their business expansion. SPs are also looking into utilizing the same hyperscalers to deliver and run modernized applications alongside network functions in order to streamline their business operations and increase efficiency.

The option of migrating workloads to the public cloud does come with a number of potential difficulties, however. As scalable and flexible as public clouds may be, using them without clear objectives and strategies could lead to a lock-in situation with limited ability to migrate to other clouds or back to on-premises telco clouds. Interoperability with other clouds is similarly narrow in scope. Variations in machine formats create a costly process of refactoring or re-architecting applications after migration.

VMware Telco Cloud Platform—Public Cloud offers a solution. Based on an integration with VMware Cloud on AWS, a jointly engineered modern hybrid cloud serviced developed by VMware and AWS, it enables SPs to take advantage of the best attributes of both on-premises telco cloud and public cloud IaaS offered by AWS. At the same time, it preserves the ability to migrate functions wherever the SP wants them to go.



Market Overview and Drivers of Current SP Strategy

Average revenue per user (ARPU) is trending down as SPs roll out 5G networks and compete more intensely with one another. The pressure is on to stand out. The 5G shift also creates enticing new business opportunities. These include support for services like enhanced mobile broadband (eMBB), ultra-reliable and low latency communication (URLLC), and massive machine-type communications (mMTC). Each of these can lead to sticky revenue sources from smart cities, telemedicine, Industry 4.0 and so forth.

The 5G shift creates enticing new business opportunities.

Operational Constraints Blocking the Realization of New Strategies

The revenue opportunities are there, but they're difficult to operationalize. Here's the problem: SPs have traditionally invested in monolithic, vertically integrated cloud stacks that they run on their own premises. These are generally designed to run vendor-specific virtualized and containerized network functions. To be effective in business terms, though, SPs' cloud stacks must now be horizontal in nature. They have to support any network function from any vendor. This is not easy on a vertically integrated cloud stack.

Additionally, the vertically integrated cloud stacks are more expensive to operate. They tend to lack consistency and lag in automation across network functions. This further complicates service deployment and adds to cost. The application of networking and security policies must be uniform and consistent regardless of network functions and their respective deployment locations. An automated multi-cloud architecture with global deployment is clearly preferable but economically unrealistic for even the biggest SPs.

Inability to adapt and quickly seize business

An SP's existing infrastructure is almost always an obstacle to adapting to new customer requirements and moving quickly enough to seize business opportunities. The time and financial commitment required to build horizontal cloud architectures can be prohibitive. When additional factors, like location and anticipated scaling up, are added into the planning process, the difficulty becomes even more considerable. As a result, SPs' 5G services rollouts can slow down. They are missing opportunities to enter new markets and respond to higher demands, unless they want to make enormous upfront investments.



Limits on data center construction

Even if an SP has the intent to build a data center, barriers remain in the way. One issue is cost. Industry consensus is that data center construction costs are *trending upward*, to around *\$10 million per megawatt* or \$200 million for a 20-megawatt data center. That's a lot of capital expense (CapEx). It then takes time to build, so SPs may miss early adopters and "first-mover advantage" scenarios that can be so beneficial to establishing new markets.

Space and power are arguably more serious obstacles. In many cities, especially the major urban areas where SPs can launch the most lucrative 5G services, there simply isn't the space or electric available. Or, if the space is free, it will not be easy to provision 20 megawatts of power. Permitting and the like can also cause delays and headaches.

Other considerations include operating expenses (OpEx) and capacity. Data centers are not cheap to operate, especially when capacity is taken into account. The nature of data center construction is such that an SP would be well-advised to over-build so as to have the ability to scale up service capacity without having to start a new construction project. This makes sense, but the overprovisioning inherent in the practice leaves the SP with the requirement to carry the cost of running an underutilized data center for the first several years of its operation.

Data center construction costs are trending upward, to **around \$10 million per megawatt.**

Limits on talent/slow hiring cycles

Then, there's the matter of people. The United States, for example, is in the midst of a labor shortage that is hitting the tech sector with particular force. Qualified professionals are getting hard to find. And, SPs are running into gaps in employee skill sets as they take on new technologies like containers, edge computing and radio access network (RAN). An SP that wants to build a data center to support new 5G services may struggle to staff it.



The Potential—and Potential Difficulties—of Public Cloud Option

Facing these constraints, a natural strategic reaction is to embrace cloud hyperscalers like AWS, despite lingering concerns about competition for telco business from these companies. Instead, both telcos and hyperscalers are coming together in a mode of “coopetition.” It’s impossible to know how these relationships will evolve over time, but for now it makes a great deal of sense for AWS, Microsoft Azure and Google Cloud Platform (GCP) to work with SPs on 5G

services. There’s a natural synergy. The hyperscalers have the capacity ready to go. The SPs have the brand name and expertise in working with telco customers, which the hyperscalers lack.

How an SP can work with a hyperscaler

Hyperscalers like AWS offer SPs IaaS. The SP can configure the infrastructure however it wants to support its IT and telco workloads. As shown in the reference architecture in Figure 1, the SP can build its infrastructure on IaaS, layer by layer.

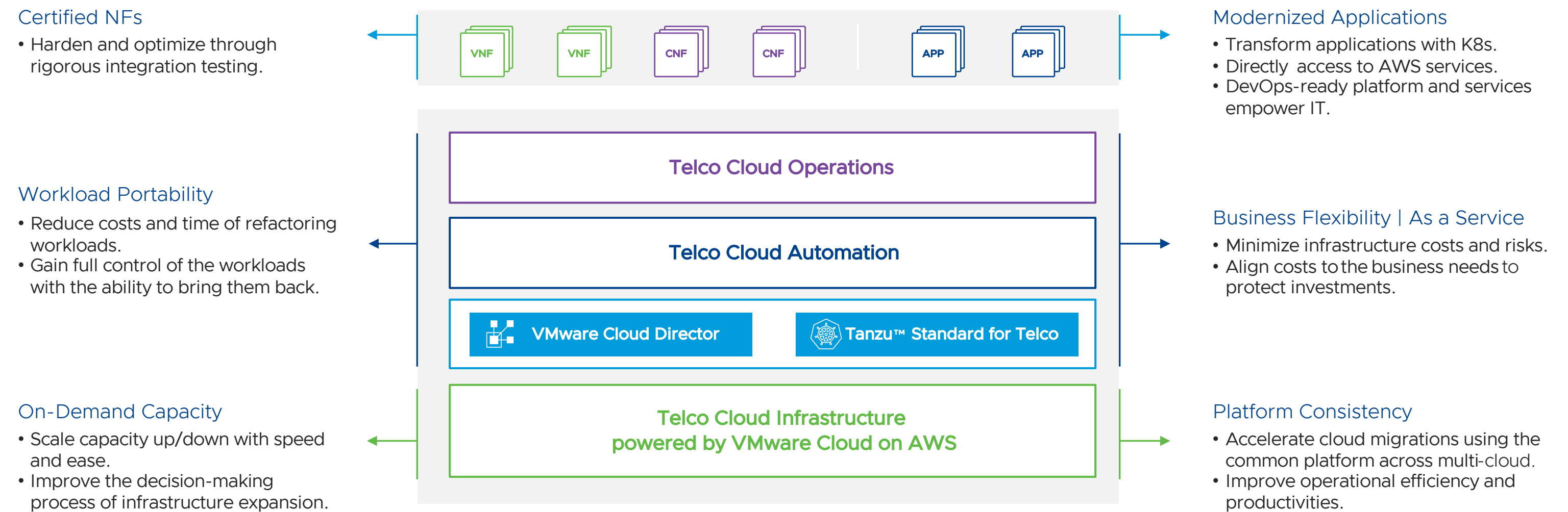
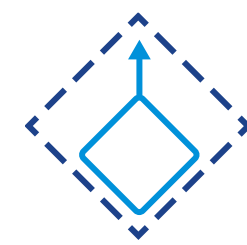


Figure 1: Reference architecture for how a telco can deploy on public cloud IaaS.

VMware Cloud on AWS serves as the consistent telco cloud infrastructure. A virtualized infrastructure manager (VIM) lets the SP control and manage the horizontal consistent infrastructure to deploy virtualized network functions (VNFs) while container as a service (CaaS) enables the SP to run cloud-native network functions (CNFs) and modernized applications. The SP can host what amounts to a limitless set of workloads on this stack. Automation facilitates economical management, while analytics allows for assurance in telco cloud operations.

Benefits of this approach include:



Extreme scale and geographic reach
AWS and the other major public cloud providers have immense scale and reach. They offer on-demand capacity. Their sites span the globe with effectively unlimited capacity. By partnering with VMware and AWS, an SP can instantiate a wide array of 5G and related telco services in almost any region of the world at any required scale and scope.



Flexibility
The ability to make quick changes in configuration or software is the essence of public cloud IaaS. By deploying their network functions and modernized applications on VMware Telco Cloud Platform—Public Cloud, SPs gain a great deal of flexibility—along with the potential to align costs with business needs. The SP can scale IaaS resources up and down as needed, such as with a seasonal or episodic spikes (e.g., a major sporting event that requires a lot of connectivity for one day), but then nothing the next day.



Low/no CapEx
VMware Cloud™ on AWS is based on an OpEx model. The SP pays for the resources it uses and nothing else. There is not CapEx for infrastructure. The only CapEx would be for software licenses.



Fewer personnel issues
VMware employees manage the infrastructure, so the SP does not have to recruit and retain as many specialized people. The SP can focus on the business growth by just operating the telco cloud itself.

Potential problems with public clouds for SPs

The advantages of migrating telco workloads to the public cloud notwithstanding, a number of potential problems still loom for SPs that want to use public cloud IaaS offerings from hyperscalers. One issue is provider lock-in. Once deployed on a public cloud, it may be challenging to move the telco workloads to another public cloud IaaS. It won't be impossible, but barriers to migration can be significant. The SP risks getting stuck. The lock-in scenario does not bode well for bringing network functions back to SP-owned on-premises infrastructure, either.

Migrating network functions to public cloud IaaS may also result in the creation of cloud silos. Without the right tooling, each public cloud IaaS will require separate operations. Network and security policies may differ from cloud to cloud. Furthermore, the SP will almost certainly lack automation capabilities that span multiple public clouds. As this unfolds, the SP might have pockets of network functions running inefficiently, each vulnerable to different threats.

Operability between public cloud IaaS is typically limited as well. And, while it is always possible to establish integrations between telco stacks on different IaaS platforms, that is not always an optimal approach. The integration becomes another bit of technical debt to deal with, something to manage and update over time.

A further issue arises from differences in machine formats from on-premises telco cloud to public cloud or from one public cloud to another. If customers want to migrate network functions and modernized applications between platforms, they will invariably need to refactor or re-architect them. Different tools and skill sets prevail across hybrid cloud/multi-cloud environments, along with disparate management tools and security and governance policies. Coping with these differences leads to increases in time, costs and risks in migration projects.



Making Public Cloud IaaS Work for SPs: VMware Telco Cloud Platform—Public Cloud

VMware has endeavored to solve these problems and make public cloud IaaS a viable option for SPs. The VMware Telco Cloud Platform—Public Cloud enables SPs to modernize their networks by seamlessly incorporating public cloud IaaS as an

integral part of their 5G architecture. The solution is one element of VMware's broader cloud-smart approach, which is all about giving organizations the freedom to choose the right cloud based on their strategic business goals. It's a cloud-agnostic approach that transcends the more abstract concepts of cloud-first or multi-cloud. Cloud-smart helps VMware customers establish cloud strategies that are uniquely suited to their business needs.



Figure 2: Elements of VMware Telco Cloud Platform—Public Cloud.

VMware Telco Cloud Platform—Public Cloud is powered by VMware Cloud on AWS, a field-proven solution, delivered, operated and supported by VMware. VMware Cloud on AWS functions as the consistent telco cloud infrastructure with VMware vSphere for compute virtualization, VMware NSX for networking and security, VMware vSAN for storage and VMware HCX for application migration. Figure 3 shows the architecture of VMware Cloud on AWS, which allows SPs to directly access AWS native applications. This enables SPs to improve the services and customer experiences they offer. On this foundation, VMware Telco Cloud Platform—Public Cloud offers telco-centric functionalities that support both VNFs and CNFs, along with cloud-smart automation. The result is to simplify telco multi-cloud operations, analytics and intelligence to maintain telco-grade service quality and availability.



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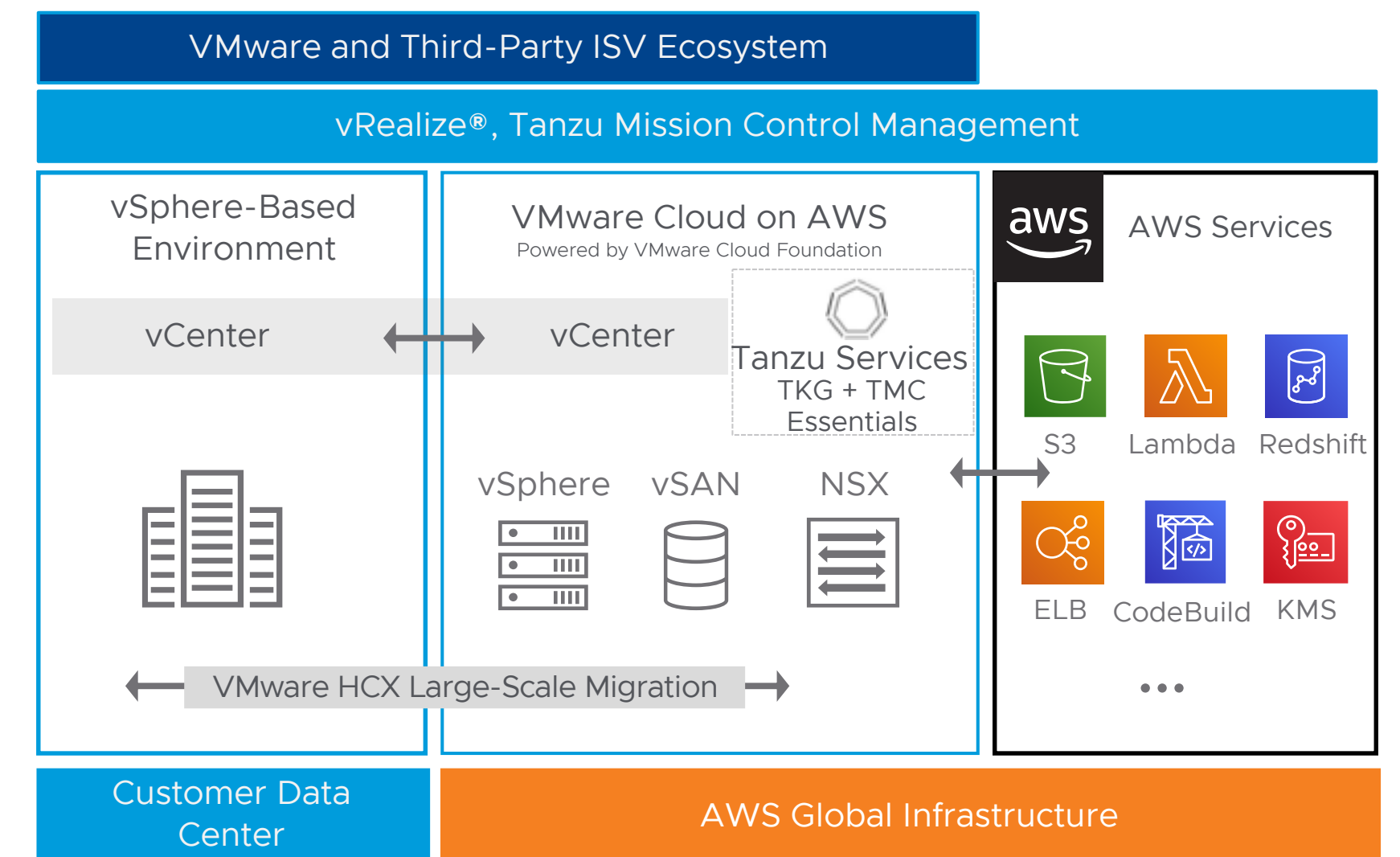


Figure 3: VMware Cloud on AWS, the core of VMware Telco Cloud Platform—Public Cloud.

Getting the benefits of AWS for SPs, without the difficulties

SPs gain several advantages from this architecture. For one thing, it offers them virtually limitless scale on-demand. Then, with VMware Telco Cloud Platform—Public Cloud, the SP can make public cloud IaaS a natural extension of their existing on-premises infrastructure if it's running the VMware Telco Cloud Platform. SPs get full operational consistency with an on-premises telco cloud, but one that takes advantage of AWS's global footprint and reach.

The SP can easily migrate telco and IT workloads to public cloud IaaS—and migrate them back whenever they want. They can go in both directions relatively quickly, easily and cost-effectively by having the consistent infrastructure in both clouds. Applications do not have to be refactored in order to migrate from one cloud to another due to this consistency. Furthermore, the SPs can use the same tools, skill sets and governance and security policies as they switch from on-premises telco cloud to public cloud IaaS. The ability to achieve a multi-cloud capability, with migration between AWS and other public cloud IaaS, is in development.

The flexible capacity made possible by the on-premises/public cloud IaaS combination lets SPs rapidly adjust cloud capacity. The SP can respond to peaks and valleys in demand and resulting changes in traffic patterns, adapting easily to changing business needs and customer demands.

The SP can leverage full visibility of platform status to programmatically adjust platform resources based on workload location. Use cases include cloud bursting/scaling, disaster recovery and high availability, all done without overprovisioning on-premises telco cloud. The same workload performance can be maintained between on-premises telco cloud and public cloud IaaS.

VMware Telco Cloud Platform—Public Cloud addresses the problem of operational inconsistencies, too. There is just one management tool set and one group of security controls that apply to on-premises telco cloud and public cloud IaaS. Multilayer automation allows the SP to manage its telco cloud infrastructure to be efficient in managing elements of its telco cloud across all instances. And, the consistent tool set means almost no retraining of staff as workloads move back and forth from the public cloud.

A further benefit arises from the ability to run CNFs alongside modern applications on VMware Tanzu, allowing the SPs to modernize their 5G networks. On top of this, the SP is able to enrich customer experience by directly accessing more than 200+ native AWS services.



Conclusion

The telecom industry finds itself at a crossroads. A host of major revenue opportunities are at hand, which is good because traditional lines of businesses are flattening or shrinking. Getting to success with 5G and related technologies will mean deploying telco clouds with new, horizontal architectures on a vast scale—a mandate that is at once costly and slow to realize.

One solution, which SPs are increasingly considering despite competitive concerns, is to partner with public cloud hyperscalers. These companies have the capacity and geographic reach. They make CapEx unnecessary. However, they also present a number of challenges, such as the potential for lock-in and inefficient, inconsistent operation.

VMware Telco Cloud Platform—Public Cloud makes public cloud IaaS into a viable option for SPs. The platform lets SPs migrate telco and IT workloads to public cloud providers like AWS and also migrate them back to on-premises telco clouds when necessary. The management is seamless and contiguous across owned and public cloud instances. As a result of these capabilities, SPs gain the ability to deliver rapid time to value and accelerate time to market for new 5G services—entering new markets without having to incur upfront infrastructure costs and risks.

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accelerate time to market for new 5G services.





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