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# Optimizing Your Hybrid Cloud with VMware

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streamline operations

Overcome IT complexity  
and increase agility

Maximize hybrid cloud  
with VMware Tanzu<sup>®</sup>

**Hitachi Vantara**  
**Special Edition**

**Gary Breder**  
**Paul Morrissey**

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# Introduction

Cloud computing is a compelling way to deliver IT services — it's cost-efficient, agile, scalable, and flexible. But for a lot of organizations, picking absolutely everything up and heading to the cloud isn't feasible, or even desirable. Merging the best of cloud computing with traditional on-premises solutions — including those already doing their jobs well right now — makes a lot of sense in a complex and interdependent environment. This best-of-all-worlds approach is the hybrid cloud, which is growing by leaps and bounds.

Getting the most from hybrid cloud requires a careful look at infrastructure and services, along with some significant rethinking. The good news is that stepping into this diverse and sometimes complex world doesn't have to be difficult. In fact, it can be surprisingly simple and easy to achieve a robust and scalable hybrid cloud with solutions such as those provided through Hitachi Vantara and VMware.

Indeed, what's known as a converged and hyperconverged infrastructure puts a complete foundation in place to get started quickly and easily: a hardware-software platform complete with software automation in an appliance format. Computing, storage, networking, and the hypervisor are all there, ready to work right out of the box. And with the latest modern application capabilities integrated together, your developers can accelerate coding, testing, and deployment. The IT operations team can benefit from consistency, predictability, and efficiency. Digital transformation can happen much more rapidly, costs can be reduced, and the business can become all the more competitive.

## About the Book

*Optimizing Your Hybrid Cloud with VMware*, Hitachi Vantara Special Edition, is your guide to this transformation. You discover more about what the hybrid cloud is, why it benefits your enterprise, and what areas to consider as you embark on your hybrid cloud journey. You dive into the world of Kubernetes and containers and learn how VMware solutions can enable hybrid cloud success. You dig into the infrastructure and automation needs that must be considered and find out how Hitachi Vantara's groundbreaking solutions open the door to easier entry into the hybrid cloud.

# Foolish Assumptions

When we wrote this book, we made a few assumptions about you, the reader:

- » You're involved in IT as an architect, an admin, a chief technology officer (CTO), or maybe a DevOps leader.
- » You understand some of the benefits and challenges of the hybrid cloud.
- » You want more information about how VMware, Kubernetes, and Hitachi Vantara may answer your needs.

# Icons Used in This Book

In the margins of this book, you see visual guides to help you explore the content. Here's what those icons mean:



REMEMBER

In case you're reading quickly, please be sure to slow down and digest the paragraphs marked with the Remember icon.



TIP

The Tip icon points to ideas and actionable insights about moving your legacy IT to hybrid cloud.



WARNING

Life in IT is full of warnings, and in this case the icon lets you know of something that could go awry if you aren't careful.

# Beyond the Book

When you put this book down, you may be ready for more detail and depth. If so, check out these resources:

- » [www.hitachivantara.com](http://www.hitachivantara.com): Visit the Hitachi Vantara website for hybrid cloud solutions that work right out of the box.
- » [www.vmware.com](http://www.vmware.com): VMware provides a foundation for innovation in the multicloud world.

- » Exploring what hybrid cloud entails
- » Weighing advantages and challenges
- » Preparing to make the move

# Chapter 1

## Getting to Know Hybrid Cloud

It's obvious that digital technologies are changing the world. Data-driven business models stir up one industry after another, and digital revolutions create whole new ways of working. In this chapter, you explore how the concept known as *hybrid cloud* helps enable these revolutions. You get a general understanding of hybrid cloud, its advantages and challenges, and some initial thoughts on how to get the most from this approach for your organization.

### Defining Hybrid Cloud

Data-driven companies are creating all-new, flexible value chains. Customers, employees, and partners alike are relying on digital experiences no one could've imagined a decade ago — with the accelerated shift to remote work driven by a pandemic and the digitalization that optimizes today's business processes. Businesses that hope to thrive amid the change are modernizing their digital core and their data-driven strategies.





REMEMBER

As this digital revolution changes how businesses operate, the innovation for the infrastructure powering the new workloads and applications is often described by terms that end in the letters “aaS” — that is, *as a Service*. One capability after another has moved from some sort of traditional delivery to an as-a-Service model. The main types are Software as a Service (SaaS), which delivers the functionality of the software without the need to install and support it. You’ve got similar innovations involving the infrastructure (IaaS). These are pay-as-you-go compute, storage, and network resources for supporting your applications. And there are development platforms (PaaS) to create and run your own applications and workloads.

These days, you’ve got so many types of as-a-Service solutions that sometimes they compete for the same acronym — data management or desktop or delivery as a Service, and backup or banking as a Service, for example. It’s not surprising that people are now just simplifying the idea into *Anything as a Service* (although the acronym for that is generally seen as XaaS).



REMEMBER

At the heart of all this acronym-happy transformation is cloud. It’s a way of doing IT that can greatly accelerate new application and service delivery, make IT a whole lot more agile when it comes to meeting workload demands, and shift the financial model to one focused on consumption-based operating expenses.

The winners in this game will be those who make the right choices in terms of cloud adoption, cloud technologies, and cloud operating models that provide flexibility and enable them to continually optimize. Those who want to get ahead must ask their IT teams to shift their focus from managing infrastructure to adopting a cloud approach for delivering IT services to the organization they support.



TIP

A cloud-first approach — lifting and shifting all applications, data, and workloads to the cloud — may seem like the boldest way to venture across the changing landscape. The more forward-thinking approach, though, is to think of cloud as a *way* to do IT rather than a *place* to do IT. This leads to more strategic outcomes than blindly moving everything to public cloud. Placement in this approach is based on security needs, performance considerations, financial realities, and operational considerations.

The best approach is most often hybrid cloud, which provides common workload management and data services spread across core, cloud, and edge infrastructures. Here's a quick overview of the hybrid cloud concept:

- » Hybrid cloud is the coordinated use of data center and public cloud resources.
- » It embraces various types of apps and workloads, such as legacy apps, traditional apps that are virtualized or bare-metal, modern cloud-native apps, and legacy apps that have been refactored as cloud-native.
- » Hybrid cloud opens up different types and classes of resources that allow you to run any of the apps and workloads on-premises or off.
- » Your IT teams benefit from greater flexibility and agility.
- » Improve customer engagement, boost profitability, and build new competitive advantage for your company.

## Exploring the Ups and Downs of Hybrid Cloud

Like any big decision, the move to hybrid cloud has its pros and cons. The opportunities are tremendous and make it absolutely worth the effort, but the challenges shouldn't be underestimated.



REMEMBER

First, the upsides (and there are a lot of them):

- » **Increased flexibility:** You can use private cloud when it makes sense, on-premises resources when that may be more appropriate, and tap into the resources of the public cloud when necessary.
- » **Greater agility:** Hybrid cloud puts you in a better place for responding to changing business needs and priorities. It's easier to scale up when your demand is higher, and if your demand outgrows your on-premises capacity, you can gain even more scale by moving applications to the public cloud. Hybrid cloud is also allowing businesses to speed up time-to-market of new innovations.

- » **Lower costs:** One big plus of the cloud, of course, is the ability to buy only what you need to consume, and your appetite will vary. Hybrid cloud lets you pick where you're going to run workloads in order to find the most cost-efficient approach.
- » **Added values and insights:** A diversity of resource and application types helps you work smarter and improve the business' bottom line.
- » **Opportunities for compliance:** If you're in a highly regulated industry, there will likely be some workloads you can't move to the public cloud, or which have special security requirements. The flexibility of hybrid means you can treat sensitive data in whatever way you must to be compliant, while still leveraging the benefits of cloud.



WARNING

It's also worth preparing yourself for the challenges that may lie in the hybrid cloud path ahead:

- » **Risk of disruption:** Significant change, such as moving to a hybrid cloud approach, brings the risk of disruption. The payoff of this disruption can be fantastic, but it is, well, disruptive.
- » **Added complexities:** A move to a new hybrid environment could easily be more complex than what you were doing before, as you deal with new technologies, legacy equipment, cybersecurity concerns, and the increase in application and resource types that need to be managed. Increasing the management tools and application services could make it harder to optimize for cost targets and more difficult to reach performance and availability targets.
- » **The need for skills:** Sometimes, you don't know what you don't know, until one day it hits you. In the hybrid cloud approach, new operational models and new app services for cloud-native apps require new skills. That can create a skills gap because your organization hasn't yet gained a lot of experience with these elements.
- » **The accelerated pace of change:** The hybrid cloud approach provides a great deal more flexibility and agility. As a result, the business may ask you to put all that flexibility and agility to the test, which can expose weakness in your processes and operations that were designed for simpler times.

# Getting the Outcomes You Want

Simpler is better. That's age-old wisdom that rings true in many aspects of life. That doesn't mean it's the right mantra for every situation, though. Consider the world of IT. In the past, you could gain efficiency through standardization. You got ahead by standardizing tools, operating systems, vendors, and approaches. Totally sensible, and hybrid cloud would in some ways seem to stray from this simple wisdom.



REMEMBER

But that's really the point. With hybrid cloud, you're embracing a diversity of application types and many types of IT approaches, and a lot of different resource types. In the past, that would've been seen as a liability, but in this world, it's an opportunity.

Indeed, in the hybrid cloud world, efficiency doesn't come from simplicity — it comes from something else. We're talking about a high degree of functionality and capability that are integrated together. That allows generalists to operate the diverse environment, while automation reduces the burden on administrators.

Here's another bit of common wisdom — don't change just for the sake of change. There is a place for this wisdom in the hybrid world. You need to minimize changes that aren't necessary, and because hybrid pulls in a diversity of resources, this is entirely possible.



TIP

Indeed, you can win by changing what needs to be changed, leveraging what works now, and expanding platforms your team already knows well. Your hybrid environment can include tools and app services that your people are familiar with today.

Businesses that really succeed in hybrid cloud get there through a tailored and dynamic management plan. They're making the move with a keen eye on balancing time, risk, cost, and the value they hope to achieve. That requires systematically analyzing every application. Which ones should move to the cloud? Which need refactoring or rewriting? Which would be best to keep on-premises?



REMEMBER

A one-size-fits-all approach doesn't really exist, but depending on your business needs, you may choose a few proven fast-track paths to success:

- » **Hybrid-cloud-in-a-box simplicity:** The use of converged and hyperconverged infrastructure is the key foundation.

With the proper infrastructure and advanced automation for operational efficiency, you can simplify the compute, network, and storage infrastructure — but you need to choose your infrastructure carefully. Make the best decision, and you can seamlessly integrate with modern container and virtual machine (VM) management systems, such as VMware Tanzu and Red Hat OpenShift. And it gets your DevSecOps teams on the same page.

- » **Storage unification:** Software-defined storage architectures for block, file, and object storage allow for storage portfolios that integrate into the major hybrid cloud stacks. It's orchestrated centrally with Artificial Intelligence for IT Operations (AIOps) and modern software-defined data services that let you scale to meet workloads and extend the data plane for cloud-native apps.
- » **Near-cloud placement of critical data infrastructure:** Near cloud, with colocation providers, offers an alternative to an on-premises data center and public clouds. You can maintain complete control over mission-critical data while gaining cloud-like management and high-speed connectivity to public cloud computing.
- » **Hybrid cloud data protection:** The hybrid cloud's most deployed paths include data backup, archive, and disaster recovery. Protection and recovery are flexible, and you can set up "dual use" methods such as using cloud archives for compliance reporting.
- » **AI data and workload management:** Unlike traditional file-based apps, AI data workloads need massive bandwidth for training, mixed read/write handling for data pipelines, and ultra-low latency for inference at the edge. Distributed file management and edge-cloud data pipelines are among the answers.



REMEMBER

Whichever path you choose, travel it with a strong partner. Your partner should allow you to focus on an integrated approach, providing more advanced capabilities for hybrid cloud (without increasing complexity) and XaaS delivery models to make your entire environment more cloud-like.

- » Understanding cloud-native applications
- » Deploying with containers and Kubernetes
- » Getting to know VMware Tanzu

# Chapter 2

## Exploring VMs and Containers

It's a race to maintain existing applications while developing new ones. All of them must be managed so they continue to deliver business services, run reliably and securely, are kept up-to-date, and run at the peak of efficiency. Containers have proven to be a vital tool in achieving these goals, especially for the new cloud-native applications and workloads.

This chapter explores the most effective approaches for managing these new cloud workloads and data and explains the role of microservices for this new style of applications. We outline how containers are used to deploy code, how Kubernetes orchestrates the magic, and how VMware Tanzu brings it all together for forward-thinking enterprises.

## Managing Cloud Workloads and Data

What makes a cloud-native app different from other kinds of apps? This sounds like a trick question, and the most obvious answer is that it runs in the cloud, but the trick is that's not the most important point. What makes it different isn't *where* it runs but *how* its assembled and managed.

For sure, a cloud-native app is designed specifically for the architecture found in the cloud. A microservices architecture is a set of functional application building blocks that are used to assemble a complete application that an organization needs to support a particular business function. These building blocks are independent and have their own data store and application logic. Microservices are used and reused in different combinations to create various applications. You can think of applications as no longer being written, but instead they're assembled from these microservices. Simply put, the concept of microservices splits up the work of an application into independent modules or services. Each has its own goal and taps into its own data.

Also key to running and managing cloud-native applications is the concept of containers. This type of software is aptly named because it isolates an application from physical resources and lets it run the way it's supposed to. If a microservice is running in a container, it won't run into interference from other microservices. You can even have multiple instances of the same service.

Application program interfaces (APIs) allow these separate microservices modules and containers to communicate with one another. They hold it all together and make maintenance and security more manageable.

Think of it as kind of like having a full orchestra of modules that are working together to perform the symphony of the application. Whether you're talking Beethoven or Shostakovich, a symphony is complicated, requiring careful orchestration — it's not coincidental that your cloud-native app relies on *orchestration tools* to manage container life cycles.

The cloud-native symphony needs these tools to handle such things as resource management and load balancing. The tools provision and deploy containers across server cluster nodes, and handle restarts in case of failure.

This is the key to why applications running in cloud can be more efficient and quite powerful. Cloud-native apps are designed and assembled specifically to take advantage of the dynamic microservices-enabled environment in the cloud or in your data center. They're fully optimized and up to the task in a number of key ways:

- »» Microservices are independent of one another, which is great because it's not uncommon for some of an app's components to require updating faster than others.
- »» Automation makes it easier to manage and update cloud-native apps, and your developers can work on one microservice without worrying about how it's going to affect another. Even if they're just looking, your engineers will appreciate visibility into specific services.
- »» Failure in one microservice doesn't impact another, thanks to the use of containers.
- »» Cloud-native apps are more cost-effective because of their efficient use of resources. Microservices only use their storage and computing resources as needed and return these resources back to a common pool when idle. This also makes scaling up or down much easier.
- »» They're portable, which means containers can port microservices from one vendor's infrastructure to another's, or from one cloud to another — including your own data center.



REMEMBER

Just to be clear, beyond cloud-native apps, you also may run cloud-based or SaaS-based apps, and although that sounds similar, it's not the same thing. SaaS-based apps run in the cloud — think of customer relationship management (CRM) with [salesforce.com](https://www.salesforce.com) as an example. There will be some applications that run more efficiently or effectively in a public cloud compared to your data center. But there will always be traditional bare-metal and virtualized apps that will never be converted, refactored, or rewritten into cloud-native apps and containers. In the hybrid cloud world, not everything is moving to a cloud workload and container.

Yeah, it might be easier to manage this diverse set of application types and workloads if absolutely everything was going to move to cloud workloads and containers. But this kind of standardization usually doesn't serve the needs of the business as well as using the best approach for each application, workload, and data type. This is why it's vitally important to be able to manage all this diversity in a cohesive fashion.



# Using Containers in Code Deployment

No one needs to tell you of the dizzying pace at which business and technology operate these days. People have for years been saying that change is a given and that the winners are those who fully embrace the power of change. But change seems to be happening faster than ever, including in the world of cloud computing.

Indeed, whole business models rely on disruptive computing concepts — and their ability to rapidly change to meet the circumstances of the day. Take delivery as one example. When the COVID-19 pandemic hit, there was a sudden explosion in the demand to have stuff delivered to your door, from restaurant meals to groceries to virtually anything and everything that could be put in a box and shipped. Companies that were able to quickly enhance and scale up their shopping and delivery apps were quick winners.

And think about the speed at which that change happened. The world pretty much shut down in a matter of days back in early 2020. Who had time for a software delivery cycle requiring weeks and weeks for new ideas and upgrades to move into production?



REMEMBER

For those entrepreneurs who were thinking on their feet, containers helped put their quick ideas into motion. Containers, and the way they fit into cloud-native architectures, made it possible to quickly package an app and all of its various dependencies into an image, and then get that deployed into production.

Containers are a big part of the answer to a problem that has long faced developers. How do they develop their applications and consistently port them to production? Various roadblocks make that tricky — for example, a developer's computer environment is often different from the environment on the production server.

By providing a virtual environment in which an app can run, that problem is mitigated. It doesn't matter what the underlying platform is, what kind of computer, or what kind of OS, because the app is in a self-contained environment.



REMEMBER

Here's another issue. To help an application scale effectively, your developers will spread the workload across multiple containers. You need a control plane to manage that issue, and there's also a need for containers and the modules they support to pass configuration data back and forth.

That's where the orchestration tools mentioned in the last section come into play — and *Kubernetes* is a prime example. It's an open-source platform offering a simple API for defining container infrastructure. Kubernetes orchestrates your containerized applications.

Kubernetes, which some folks like to abbreviate as K8s, automates and manages such things as resource utilization, configuration, availability, scalability, failure handling, and desired state. It lets you take full advantage of the power of microservices and containerization and brings applications into production at the speed you need — even the speed required by a pandemic.



REMEMBER

Kubernetes orchestration turns the innovation potential of containers into reality. Cloud-native applications can be published quickly, then continuously maintained and updated. Automation and orchestration of application infrastructure is simplified into self-service.

In the world of Kubernetes, a *control plane node* acts as the brain of the whole distributed system. Within it is an API server and scheduling capabilities. The workloads are run in *worker nodes* called *Pods*, which include one or more container instances. A node is able to run multiple pods, and the Kubernetes cluster pools resources from the nodes that are within it.

Kubernetes keeps a close eye on the containers in each pod and takes action if something goes awry. If a pod has trouble, Kubernetes will try to redeploy it. If an underlying node in the Kubernetes cluster has issues, it will redeploy pods to another node.

By using standard plugins and interfaces, Kubernetes is compatible with all kinds of different infrastructure providers. A container storage interface (CSI) allows interaction with storage, and a container network interface (CNI) provisions networks. A standard API is used to define the desired state of an application.

Many good reasons exist for moving toward a cloud-native architecture. Of course, few enterprises are starting out from scratch, and most have critical apps that aren't cloud native or containerized. Even as they make moves toward cloud-native architectures, the reality is that they've got a mix of workload types and need a common infrastructure and tool set that work with both legacy and modern architectures.



VMware's software-defined data center is one such engine that can live in both worlds and run apps side-by-side, whether they're legacy or modern. For organizations using the VMware vSphere cloud computing virtualization platform, Kubernetes clusters can be deployed on top of vSphere.

A Kubernetes cluster uses a vSphere cluster or a resource pool to provision nodes as virtual machines (VMs). The Kubernetes cluster scales up or down through the addition or deletion of VMs for Kubernetes worker nodes. If a node fails, Kubernetes can restart pods on the next worker node VM.

After they've deployed a Kubernetes cluster on vSphere, your developers can access the familiar Kubernetes API that's part of the control plane VM. Then, they can use that API to deploy containerized application services as pods within the cluster.

You can deploy both stateful and stateless applications on Kubernetes. For stateful apps, those that need to persist data, Kubernetes depends on infrastructure to provision storage for those persistent volumes. The CSI interacts with the infrastructure to handle the creation, attachment, and deletion of those volumes.

VMware has a vSphere cloud provider and native CSI volume plugin. vSphere provides volume disks that Kubernetes makes available to pods that request them. Those who've been operating in this environment will recognize there are significant similarities between Kubernetes and vSphere, especially in terms of how they manage infrastructure resources. Kubernetes manages container-based workloads, and vSphere manages VM-based workloads.

The stack architecture can get a bit complicated, though, as those two separate entities go about dealing with similar tasks. That's why VMware brought it all together by embedding Kubernetes constructs within vSphere. It's known as vSphere with Tanzu, and it creates the architecture needed to run Kubernetes and vSphere together.

## Exploring Tanzu Kubernetes Grid

What's the Holy Grail of digital transformation? There are plenty of potential answers, but one that's hard to beat is that it's the ability to modernize your operations, gain the immense new

capabilities of cloud-native apps and microservices, and do it faster and more cost-efficiently. At the same time, to be that Holy Grail it should avoid adding the complexity of unfamiliar data and application services that are separate from what your applications are using today.



REMEMBER

Too much to ask? Not necessarily. VMware Tanzu Kubernetes Grid is an open-source-aligned Kubernetes distribution that allows consistent operations and management of Kubernetes infrastructure across multiple clouds. VMware Tanzu is all about using microservices, containers, and Kubernetes to liberate apps from their infrastructure so they can run anywhere and work independently. It's about helping users run, operate, and manage multiple Kubernetes clusters, across multiple clouds, but all the while staying connected to the VMware virtualization portfolio.

Add in the ability to proactively manage apps that are in production and to easily automate security and the delivery of containerized workloads. And it enables an infrastructure with consistent Kubernetes everywhere. Developers end up with more time to actually develop, their plates cleared of many of the tasks that could otherwise distract from their creativity.



REMEMBER

Multiple products together make up the Tanzu suite. Here's a rundown of the ones you need to know:

- » **VMware Tanzu Mission Control:** This centralized hub is for simplified, multi-cloud, multi-cluster Kubernetes management.
- » **VMware Tanzu for Kubernetes Operations:** This provides a simplified, consistent approach to container deployment, scaling, and management with tools, automation, and data-driven insights.
- » **VMware Application Catalog:** This is a curated image catalog with prepackaged application components and an extensive Bitnami library of open-source software. It's all tested for use in production environments and constantly maintained.
- » **VMware Tanzu Observability:** This offers enterprise observability for monitoring and operating multi-cloud environments. There's full-stack visibility of nodes, pods, and containers.



TIP

Moving into a more powerful future can be a pretty daunting endeavor, but it doesn't have to be an all-at-once venture into a brave new world. Moving your legacy IT to the hybrid cloud, with the help of such advances as containerized workloads and tools from VMware, offers the ability to expand and improve upon what you already have and know.

That makes a whole lot more sense than adding a bunch of new things wholesale that aren't integrated into your present reality.

## IN THIS CHAPTER

- » Pondering the hybrid cloud big picture
- » Planning for the infrastructure
- » Keeping it all under control
- » Getting the services you need

# Chapter 3

# Maximizing the Application Infrastructure

Your overall hybrid cloud solution requires a lot of thought about infrastructure. It must be flexible enough to meet the needs of a diverse set of applications and workloads as well as your various stakeholders that are in different places in their modernization journey. This chapter explores considerations required for your hybrid solution and takes a look at the physical infrastructure you need. It extols the virtues of a single control pane to manage the whole environment and discusses how your infrastructure must adapt to a wide range of business use cases.

## Considering the Overall Hybrid Solution

One of the many beautiful things about a hybrid solution is the very fact that it's a hybrid. It's not just one thing; it's the best parts of multiple things. That fits nicely with the fact that most organizations are diverse, with needs that are not only unique compared to other organizations but also unique from one part of the enterprise to another.

The idea of hybrid IT isn't a journey to the finish line so you can move on to some other IT project. Each organization and business process you support will change over time. Hybrid cloud gives you more choices and options to continually optimize your applications, workloads, and data.



REMEMBER

One answer is automation. It's a ticket to doing more with less and doing more without always having to be an ultra-specialist. Another answer is a unified environment when it comes to management. Yes, the IT resources are hybrid, but your admins won't be well-served by using separate tools and app services while they optimize the coordinated use of public and private resources.

This section gives you key considerations as you ponder the overall hybrid cloud solution.

## Stability and consistency

You need infrastructure that can manage all the different application and data types effectively in the hybrid cloud. Are you running customer-facing apps that need to leverage real-time data, such as location, weather, or search results, from the internet? Enterprise apps that must meet stringent compliance requirements? Industrial apps that integrate IoT devices and sensors? Are you running analytics workloads, artificial intelligence (AI) and machine learning (ML) workloads that require vast historical data from multiple sources? Shared databases? Virtual desktops? You must plan for infrastructure that can handle any area where you answered "yes."

With new products always coming down the pike, you need to be able to deploy new code reliably and affordably. A unified computing landscape is the only surefire way to speed application and product development. Pre-validated turnkey solutions are a plus for streamlining time to production.

## Modern automation

Your IT team will greatly appreciate the ability to cross manual tasks off the list. Anything that reduces the number of service tickets is certainly welcome.



REMEMBER

Automation is a must. Your hybrid cloud infrastructure needs to be all about self-service and automation. That means full-stack automated life cycle management to ensure that the compute functions are always in top shape.

You're looking for automated firmware to drive upgrades. That should include full-stack upgrades, switches and all, to ease the workload of your IT teams.

## Consistent operations



REMEMBER

Your infrastructure should aim toward autonomous ML operations and self-governing performance, health, and capacity management. Automation is the key for keeping the infrastructure up and running. That includes automation on day-zero provisioning and configuration, giving you faster provisioning of clusters, speedier deployment, and more rapid return on investment. But it also includes predictive analytics that give you greater insight into what's about to happen next.

Your hybrid cloud must be able to provide the best service-level agreement performance for all workloads. Infrastructure must support applications anywhere, easily scaling as data requirements grow. In short, a unified hybrid cloud should be able to run apps consistently, anywhere, with fail-safe performance.

## More considerations

Self-service access to infrastructure and cloud-native application services are essential for developers and apps alike. Meanwhile, your IT administrators and operators require a robust platform, along with platform management services that let the apps team run services that power the business.

Security is a key point to factor in, as well. Granular data protection is a must, and micro-segmentation can help ensure business continuity.

# Optimizing the Physical Infrastructure

Your new infrastructure must be able to handle all the requirements of new cloud-native apps, while at the same time be great at handling existing applications because you aren't fully reinventing all your wheels at the same time.





REMEMBER

To put it another way, your environment will include both new and existing elements. But it would be ridiculously inefficient to have duplicate infrastructures that can't be a shared resource for all types of work. It's worth thinking a bit about converged, hyperconverged, and non-converged architectures, and how they fit into your IT environment.

First, *non-converged architecture* taps into your physical servers to operate a virtualization hypervisor, which is responsible for managing virtual machines (VMs) on that server. In the non-converged world, storage is attached to the physical server. It could be a storage area network, direct-attached storage, or network-attached storage. But the key difference is that these individual components generally lack the management and analytics tools that help you optimize how the resources are used together.

Optimized use of the resources is what sets apart converged and hyperconverged infrastructures. A *converged architecture* setup is hardware-based. It converges storage and processes, combining workloads, mitigating compatibility issues, and in general, reducing costs. *Hyperconverged architecture* is a software-based way to go about converging storage and processes. Check out Chapter 4 for details on the benefits of hyperconverged infrastructure.



TIP

As you move forward, you may need additional options for VMs and containers alike. You need to consider persistent storage requirements in container environments. The best approach is a hyperconverged infrastructure that's powered by VMware Cloud Foundation and employs Tanzu Kubernetes.

## Loving the Single Control Pane

The benefits you gain by moving to a hybrid cloud environment are compelling, for sure. VMs, containers, Tanzu Kubernetes — all are keys to building, running, and managing modern apps on any cloud, increasing your IT velocity, and simplifying multi-cloud operations.

But as long as we're talking about simplifying, it's worth imagining what would *not* be simple: having to keep an eye on multiple dashboards and control panes to manage the diverse resources

in your hybrid cloud environment. You might as well try to steer your car, fly a plane, and operate your lawn tractor all at once.

To coordinate and optimize the use of multiple resources in multiple clouds, it helps to see everything and control everything in one place. Otherwise, it wouldn't be a "hybrid cloud," it would just be a long list of separate and disparate compute resources that can't be used together.



REMEMBER

A single control pane, on the other hand, offers unified management of converged infrastructure, hyperconverged infrastructure, and cloud foundation solutions. It's one management plane for deploying, administering, and operating workloads in any environment.

In terms of your Kubernetes deployment, it's a unified dashboard providing efficient management and governance of multiple on-premises or cloud-based Kubernetes clusters, along with all resources across them. In short, it's keeping your eye on the ball. One ball. Not needing to juggle many balls in the air at the same time. What's not to love about that?

## Putting the Right Services in Place

Your hybrid cloud requires infrastructure that lets you process vital data and gather insights from that data. It recognizes that different apps require different services and because of that your hybrid cloud infrastructure works to ensure a robust breadth of modern application services.

You can deploy your workloads wherever they fit best, whether on the edge, in data centers, in private or public clouds. You can also move those workloads from one computing environment to another as the need arises. Beyond supporting applications anywhere, your hybrid cloud infrastructure allows for easy scaling to meet growing data requirements and optimize performance for individual workloads. And, it relies on automation to accelerate business outcomes. This is infrastructure immune to traffic jams, thanks to policy-based provisioning, automated firmware and driver upgrades, and expansion of storage as needed.



REMEMBER

With the help of hybrid cloud infrastructure and tools such as VMware Tanzu, consider the various use cases that indicate how you can modernize your applications and infrastructure:

- » **Accelerating DevSecOps:** Your DevSecOps teams are most impactful when they're focused on their apps, not fretting over infrastructure or packaging. Tanzu can simplify building and deploying applications on Kubernetes in a number of ways and includes a self-service catalog of building blocks, databases, runtimes, and the like. Better visibility, meanwhile, helps with troubleshooting and continual improvements.
- » **Pushing ahead with Kubernetes:** It's great for container delivery, but Kubernetes can be complicated to deploy and operate. The right tools can simplify the Day 1 and Day 2 operations and allow you to run the same Kubernetes in the data center as well as on the public cloud and the edge.
- » **Changing your existing business-critical apps:** If your current apps are hard to update and scale, they can stall your response to customer needs while also opening potential security issues. You can respond in a number of ways, including containerizing existing workloads to run in the cloud, or you can rearchitect and rewrite your existing software. Either way, you need to also modernize your infrastructure to better operate clouds and apps.
- » **Getting to the cloud:** Moving workloads to the public cloud can upgrade operations and cut costs, but getting there is more than just an infrastructure question. Your apps need to run there, and it takes more than just a lift-and-shift. Tanzu tools can help rationalize and modernize an existing portfolio and build cloud-native apps.
- » **Centralizing management of clouds, clusters, and apps:** Through Tanzu, you can implement centralized lifecycle and policy management for all clusters run by multiple teams and deployed in multiple clouds. And an observability platform gives visibility into how apps are operating and what issues need to be fixed.

- » Striving for flexibility
- » Tapping into unified cloud benefits
- » Appreciating workload mobility

# Chapter **4**

## Modernizing with VMware and Hitachi Vantara

**H**ybrid cloud mixes the best of public cloud with your on-premises infrastructure, to optimize efficiency and agility, and let your organization deliver services in the best way possible. The question is, what's the ideal infrastructure platform for your hybrid cloud?

This chapter explores one approach to modernization powered by VMware Cloud Foundation, benefiting from VMware Tanzu for Kubernetes, and employing the expertise of Hitachi Vantara. It discusses infrastructure options, outlines the benefits of a unified cloud platform, and offers thoughts on workload mobility.

### Appreciating Flexibility in Infrastructure

Hybrid cloud adoption is skyrocketing and taking over the IT service delivery model. It's an appealing upgrade in agility, scalability, cost efficiency, security, and many other areas. But it's really

only possible when you can step back, rethink, and rearchitect the underlying IT infrastructure that you'll be using to build and manage your workloads in the hybrid cloud.



REMEMBER

The platform of choice is *hyperconverged infrastructure* (HCI). It's the answer to the potentially increased complexity that comes from hybrid cloud. After all, you want a better option, but wouldn't you also like to reduce complexity?

HCI combines pre-integrated and pretested compute, storage, networking, and hypervisor functions into an appliance format. It's all right there in a box. That makes it a whole lot easier to deploy and makes scaling much smoother and more seamless.



TIP

An even better option is disaggregated HCI and VMware Cloud Foundation. Disaggregated means there is seamless interoperability involving an integrated HCI appliance along with external storage area network (SAN) storage. Scaling and resource utilization are more flexible, compared with older HCI designs that had fixed-node configurations. In other words, it's ready to roll with the emerging trend of software-defined everything.

Are you hoping to extend the benefits of an earlier HCI implementation so you can take advantage of hybrid cloud? This has big advantages, allowing you to meet the service-level agreements for your applications while gaining the flexibility of scaling compute and storage independently.

## Benefiting from the Unified Cloud Platform

Your aim is faster delivery of IT services and applications, whether in the cloud, on-premises, or both. And you want to ensure a stable production platform, a more flexible operating environment, and a nondisruptive way to maintain existing systems.



TIP

Goals like that mean a massive rip-and-replace project isn't a good plan. Too costly, too complicated, too risky, too time-consuming. A unified cloud platform is the way to go, with HCI protecting existing investments in SAN storage, and avoiding the creation of new silos.

Think of hybrid cloud as a moving target. Although you want to hang onto what's working, you also want to move workloads to the cloud when you can benefit from increased flexibility and agility. That means strategic use cases such as business continuity, online transaction processing, compliance, and data protection have an attractive home in the cloud. But some of your legacy data may continue to live at home on your on-premises systems.

Disaggregation lets your IT teams figure out what the right configurations will be for various workloads. And it means you can move at your own pace, simplifying deployment, scale-up and -out, management, and data migration.



REMEMBER

Picking the right partner in this transformation is vital. Better yet, picking a partner that has, itself, picked the right partners may be the ideal. An example of that situation is Hitachi Unified Compute Platform (UCP) RS. It's a solution that's tightly integrated at the hardware, software, and tools levels.

The UCP RS platform combines Hitachi's HCI appliance with Intel's Optane persistent memory and SSD technology, along with VMware Cloud Foundation. The result is a software-defined solution optimized for hybrid cloud environments.

The system was designed from the ground up with the goal of simple, fast deployment — whether as a greenfield implementation or as a scale-out of an existing platform. Putting it all together before putting it into the box cuts down on what otherwise would be time-consuming, complicated on-floor integration tasks.

As a unified system, it delivers IT services in both on-premises and cloud environments. Its stable production platform has built-in resilience, along with full visibility into hardware performance and behavior. It's a flexible operating environment, eliminating infrastructure component silos for compute, storage, and networking. That means you're not locked into vendors the way you otherwise might be.

Plus, having a tightly integrated solution means maintenance of existing systems is nondisruptive. Expect rolling, automated upgrades, plus high-visibility monitoring and management of data centers.

# Gaining Mobility

*Software-defined data centers* are increasingly popular, and that's another reason behind the growing adoption of HCI for hybrid cloud. A key attraction is the ability to tap into powerful, multi-featured tools such as VMware Cloud Foundation and VMware's great virtualization tools: vSphere (for compute), vSAN (for storage), and NSX (for networking and security).



REMEMBER

With these tools, you're able to disaggregate infrastructure and benefit from easier management, faster deployment, and much greater flexibility. VMware Cloud Foundation packs comprehensive infrastructure services into a software-defined platform that also integrates cloud management and improves security. And it can do so on-premises as well as via a cloud service, which is the very definition of a hybrid cloud environment.

- » Automating your operations
- » Pooling multiple resources
- » Controlling from one place
- » Tapping into trusted expert help

# Chapter 5

## Ten Key Takeaways for Your Hybrid Cloud Journey

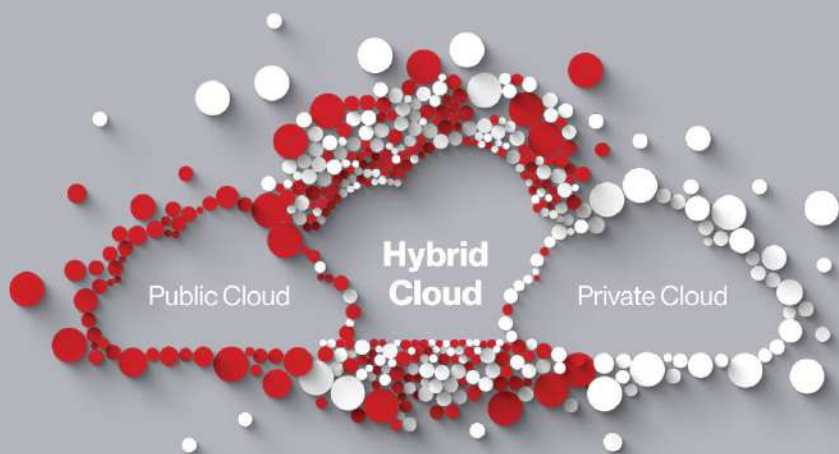
**R**eady to rock in the digital transformation revolution? Hybrid cloud can ease you from today to tomorrow, enabling success and disruptive growth with a minimum of complexity and the most cost-efficient approaches. Here are some key thoughts:

- » **Tapping into the cloud:** One of the most prevalent trends is to use multiple clouds, including on-premises clouds, to deliver IT services. That gives IT more flexibility to use different clouds, each of which excels at providing unique services and cost points.
- » **Easing in with a hybrid approach:** Your hybrid cloud should provide common application development, workload management experience, and data services across core, cloud, and edge infrastructures. The result is increased flexibility, greater agility, and lower costs.
- » **Employing microservices and containers:** Microservices allow development teams to assemble and reuse common code. Containers and Kubernetes clusters make that process more efficient by enabling application deployment life cycle and management to operate across multiple clouds.



- » **Using automation to get ahead:** Ensure scaling and velocity to deliver IT services by providing self-service access to developers and automating infrastructure operations. Examples include predictive analytics for performance, health, and capacity management.
- » **Reducing costs:** Rapidly changing business environments can quickly obsolete IT investments. The flexibility of hybrid cloud enables IT to cost-effectively redeploy resources, change the location of those resources, and modify applications and data services.
- » **Pulling your resources together:** VMware Tanzu brings together microservices, containers, and Kubernetes to free apps from their infrastructure and let them run anywhere and independently. Users can run, operate, and manage multiple Kubernetes clusters, across multiple clouds, while staying connected to the VMware virtualization portfolio. They can proactively manage apps in production and easily automate security and the delivery of containerized workloads.
- » **Benefiting from flexible data services:** Applications and workloads requiring different storage types and service level objectives can be easily accessed using policy-based selection. Scalable, software-defined storage technologies and data services are integrated with VMware technologies to simplify management.
- » **Reducing complexity:** A single control pane offers unified management of converged, hyperconverged, and application infrastructures. With multiple resources in multiple clouds, a single management plane is helpful for deploying, administering, and operating workloads.
- » **Getting trusted partner help:** Choose a strong partner and technology portfolio that allows more advanced capabilities for hybrid cloud without added complexities. For example, Hitachi Unified Compute Platform (UCP) RS combines Hitachi's hyperconverged appliance complete with modern processors and the latest NVMe technology so you can take advantage of enterprise storage, all integrated with VMware Cloud Foundation.
- » **Protecting your business:** A reliable platform ensures that you get uninterrupted operation of the enterprise hybrid cloud that runs your business and that your data is protected. This reduces risk and increases security in a world of increased cyberthreats.

# Hybrid Cloud Infrastructure for the Data-Driven



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# Optimize your hybrid cloud with VMware

This book contains everything you need to optimize your VMware hybrid cloud. Maximize gains in flexibility, agility, and cost savings without getting bogged down by increased complexity. Harness a diversity of multicloud resources to power your business, while ensuring that management and operations are streamlined and efficient. See how hybrid cloud can be more powerful and cost effective than you ever thought possible.

## Inside...

- What's new with hybrid cloud today
- Practical steps to reduce costs
- Simplify management of multicloud resources
- Optimize application and workload placement
- Prepare for uncertainty and risk
- Avoid common pitfalls of hybrid cloud
- Actions you can take right now

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