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TECHNICAL VALIDATION

VMware Cloud Foundation

Modernize Infrastructure and Provide a Cloud
Experience With Enterprise Security and Resilience

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Introduction

This report explores the use cases and business benefits of VMware Cloud Foundation's software-defined private cloud infrastructure and how it simplifies and automates operations while providing a highly resilient, secure, and extensible self-service environment.
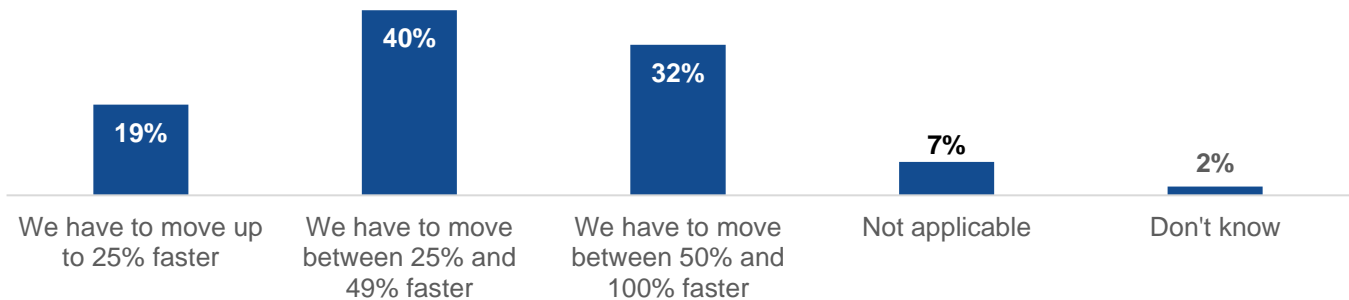
Background

The ability to rapidly satisfy customer requirements is critical when competitive alternatives are just a click away. As business and other organizational leaders look directly to IT to enable fast business decision-making, accelerating IT operations is an urgent priority. According to research from TechTarget's Enterprise Strategy Group, a significant majority (72%) of organizations reported that they must deploy applications and infrastructure at least 25% faster than three years ago, and nearly one-third (32%) indicated they must move at least twice as fast.[1]

Automation is a key to acceleration and, ultimately, success. This explains organizations' hope that infrastructure automation will significantly transform IT operations and pull on-premises infrastructure in line with efficiencies seen in public cloud services with the expectation of benefits such as reduced burden on IT operations (46%), improved security (45%), and reduced operating costs (42%).[2]

Figure 1. Deployment Speed Requirements Increasing Rapidly

Thinking of your organization's requirements today compared with three years ago, how much faster, if at all, does your team need to deploy applications and infrastructure? (Percent of respondents, N=377)

We have to move up to 25% faster	We have to move between 25% and 49% faster	We have to move between 50% and 100% faster	Not applicable	Don't know
19%	40%	32%	7%	2%

Source: Enterprise Strategy Group, a division of TechTarget, Inc.

While speed is of the essence, compliance, risk reduction, and recoverability are also top of mind. When it comes to planned investments, organizations are prioritizing data governance, risk, and compliance (41%) and disaster recovery (40%) among data protection technologies and services.[3] Ransomware is a significant threat that can potentially devastate organizations. While 89% of respondents ranked ransomware as one of the top five threats to the viability of their organization, nearly two-thirds (65%) placed it in the top three.[4] Backup and disaster recovery infrastructure is of critical importance: Without it in a fully functional state, no recovery even can be undertaken.

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[1] Source: Enterprise Strategy Group Research Report, *Distributed Cloud Series: The State of Infrastructure Modernization Across the Distributed Cloud*, November 2023.
[2] Ibid.
[3] Source: Enterprise Strategy Group Research Report, *2024 Technology Spending Intentions Survey*, February 2024.
[4] Source: Enterprise Strategy Group Research Report, *2023 Ransomware Preparedness: Lighting the Way to Readiness and Mitigation*, December 2023.

VMware Cloud Foundation

VMware by Broadcom designed VMware Cloud Foundation as a full-stack, private cloud solution to support digital transformation initiatives by integrating software-defined compute, storage, and networking with infrastructure automation, developer automation, operations, and orchestration. VMware Cloud foundation enables self-service infrastructure consumption behind an automation framework to accelerate developer productivity to deliver apps and services to market faster.

Figure 2. VMware Cloud Foundation
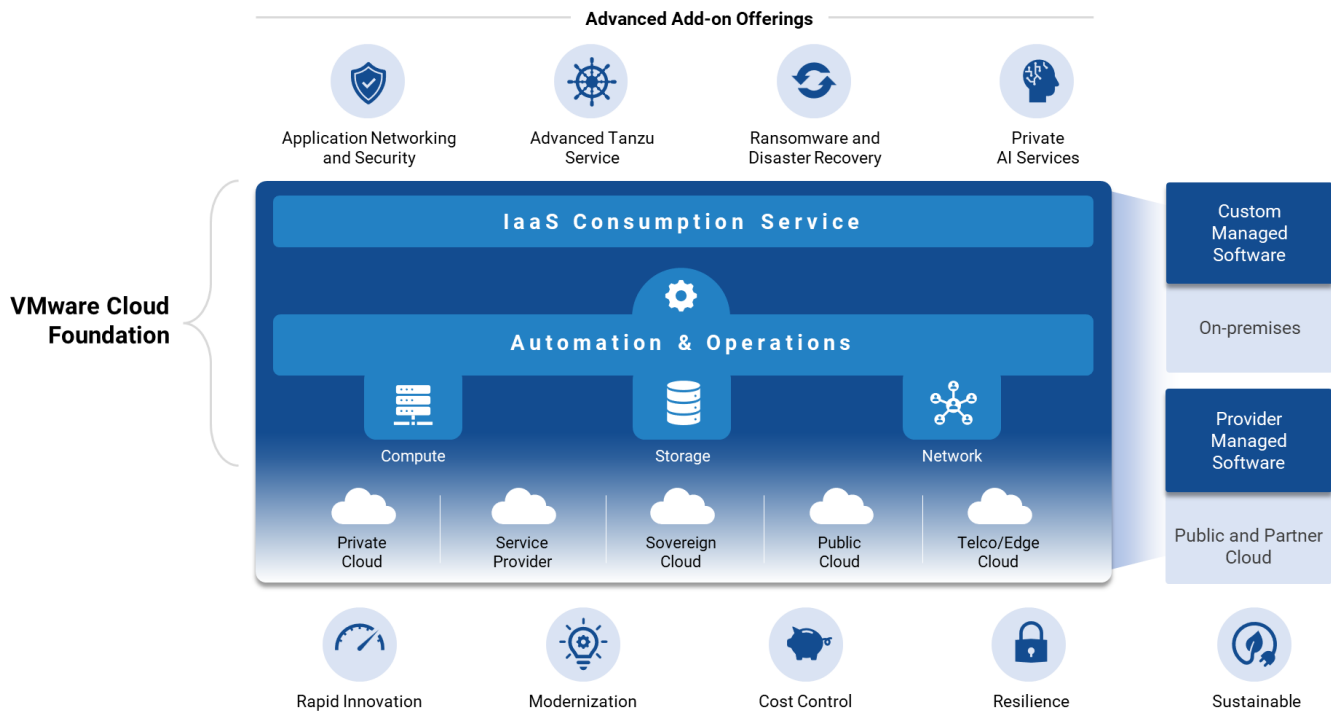
Source: VMware by Broadcom and Enterprise Strategy Group, a division of TechTarget, Inc.

Key use cases for VMware Cloud Foundation cover multiple business infrastructure initiatives, such as modernizing infrastructure, providing a cloud experience for developers, and enabling security and resilience.

Modernize Infrastructure

IT organizations need a cloud operating model that delivers developer-ready infrastructure services for all application types and enables them to modernize their applications. VMware Cloud Foundation is designed to help organizations build private cloud infrastructure that modernizes data center deployments with a cloud operating model for standardization, consistency, and scale.

Infrastructure automation for IT operations teams provides infrastructure as a service (IaaS) via a self-service catalog to empower teams to implement automation and orchestration across the infrastructure to not only streamline cloud operations, but also to enable application automation to provide a cloud experience for developers, DevOps, and line-of-business consumers with self-service and frictionless access to infrastructure services.

Organizations can further utilize the platform architecture and cloud operating model to extend private cloud infrastructures into supported public and partner cloud environments with workload mobility for efficiency and scale.

Cloud Experience for Developers

Developers need frictionless access to code, infrastructure services, runtime environments, system tools, libraries, and registries to keep continuous development pipelines flowing smoothly. VMware Cloud Foundation delivers infrastructure as code (IaC) capabilities, enabling developers to automate and manage infrastructure using code for more rapid and consistent deployments. In addition, generative AI (GenAI) is moving ever closer to the mainstream and has great potential to transform enterprises. VMware Private AI is an architectural approach for AI services designed to offer the differentiation of combining private data with open source and commercial AI solutions, all with a quick time to value and integrated security and management, while still assuring privacy and enabling control of corporate data.

Security and Resilience

Protecting business-critical applications and data from cyberattacks requires more than just protection and prevention. A comprehensive recovery solution is crucial. VMware Live Cyber Recovery is designed to enable creation and implementation of robust recovery strategies and cloud-based recovery solutions that meet business SLAs, accelerate time to protection, and simplify virtual machine (VM) recovery operations in response to modern cyberattacks. In addition, microsegmentation and distributed firewalls are available as an add-on option that complements VMware Cloud Foundation's built-in encryption of data at rest and data in motion.

VMware Live Site Recovery automation software provides policy-based protection and recovery. VMware Live Site Recovery integrates with replication technology and automates orchestration of recovery plans to minimize downtime in case of disasters and facilitate nondisruptive testing of recovery plans. Designed to manage both VMs and containers, VMware Cloud Foundation enables organizations to build, run, and manage a spectrum of applications and workloads within a unified private cloud environment. VMware Live Site Recovery integrates natively with VMware vSphere Replication and VMware vSphere Virtual Volumes integrated storage arrays. It supports array-based replication solutions from all major VMware storage partners.

Enterprise Strategy Group Technical Validation

Enterprise Strategy Group completed a technical analysis of VMware Cloud Foundation with the goal of validating the business benefits organizations can expect across multiple business infrastructure initiatives and use cases.

Infrastructure and Application Modernization

The term "modernization" has many meanings to businesses and IT. At a basic level, it could refer to replacing or updating legacy systems and adopting new technology to optimize efficiency, scalability, and security. Further up the stack, it could refer to migration to the cloud, implementing containerization, or embracing DevOps practices to accelerate software development and delivery. To the business, modernization takes on a more strategic connotation. Leaders want to leverage technology to drive growth and innovation while gaining a competitive edge in increasingly digital and data-driven markets.
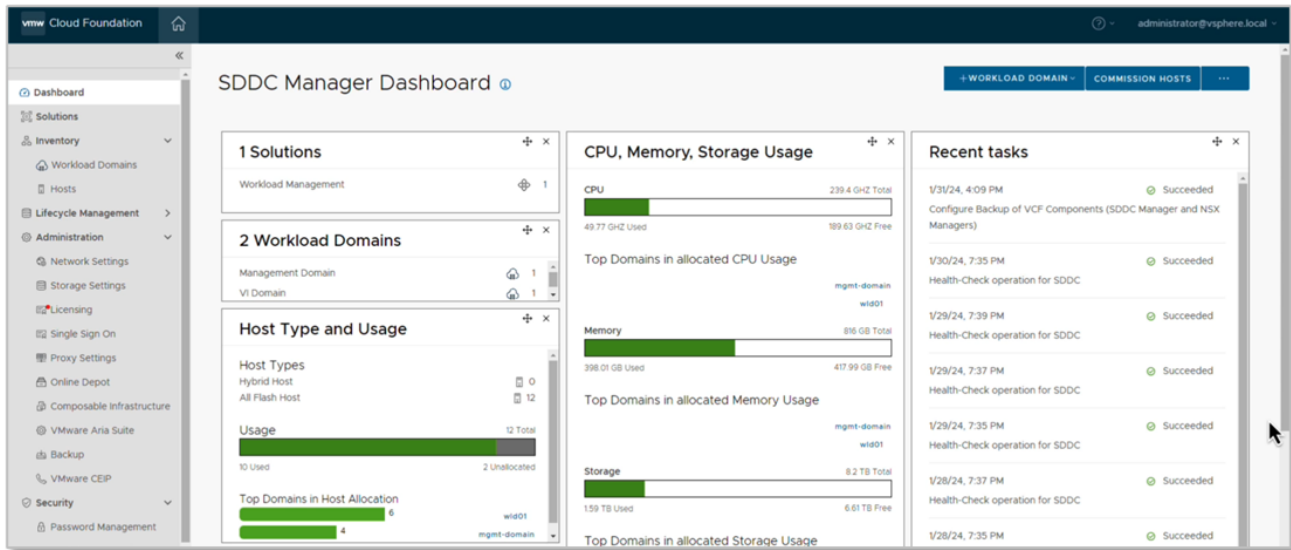
Enterprise Strategy Group examined how VMware Cloud Foundation can support an organization through all phases of its modernization journey—from designing and building the private cloud (Day 0), through allocation of resources (Day 1), and streamlining maintenance with automated lifecycle management (Day 2) capabilities.

Enterprise Strategy Group Analysis

VMware Cloud Foundation is deployed with full automation into greenfield environments using the VMware Cloud Builder OVA so organizations can quickly and easily deploy a software-defined data center (SDDC). VMware Cloud Builder contains all software needed to build, run, and maintain a private cloud environment, including the SDDC Manager appliance. Once VMware Cloud Foundation is deployed and SDDC Manager has been configured,

organizations can use SDDC Manager to perform administrative tasks on VMware Cloud Foundation. The SDDC Manager UI provides an integrated view of the physical and virtual infrastructure and centralized access to manage the physical and logical resources (Figure 3).
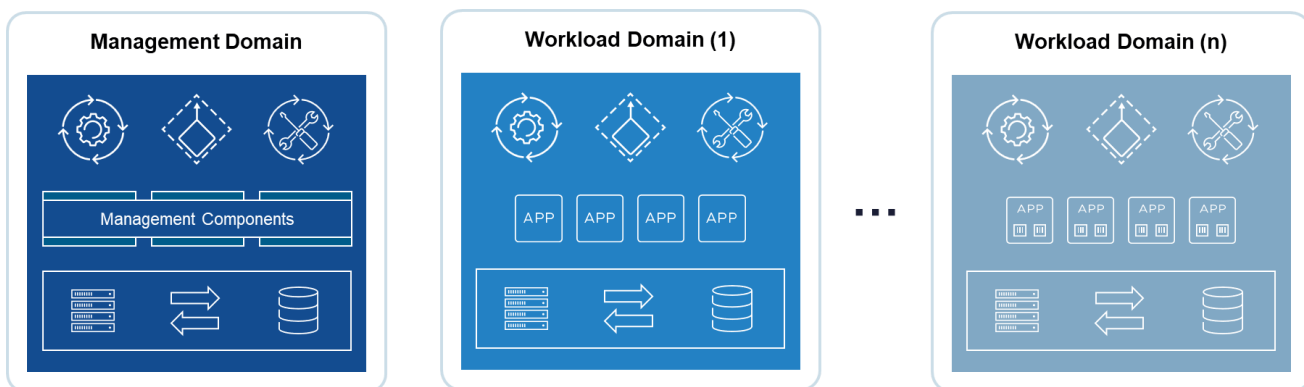
Figure 3. VMware Cloud Foundation SDDC Manager

Source: VMware by Broadcom and Enterprise Strategy Group, a division of TechTarget, Inc.

VMware Cloud Foundation simplifies the deployment of applications and workloads using *Workload Domains*. A Workload Domain is a self-contained entity that contains dedicated resources for compute, storage, networking, and security that are automatically deployed and configured using VMware Cloud Foundation automation.

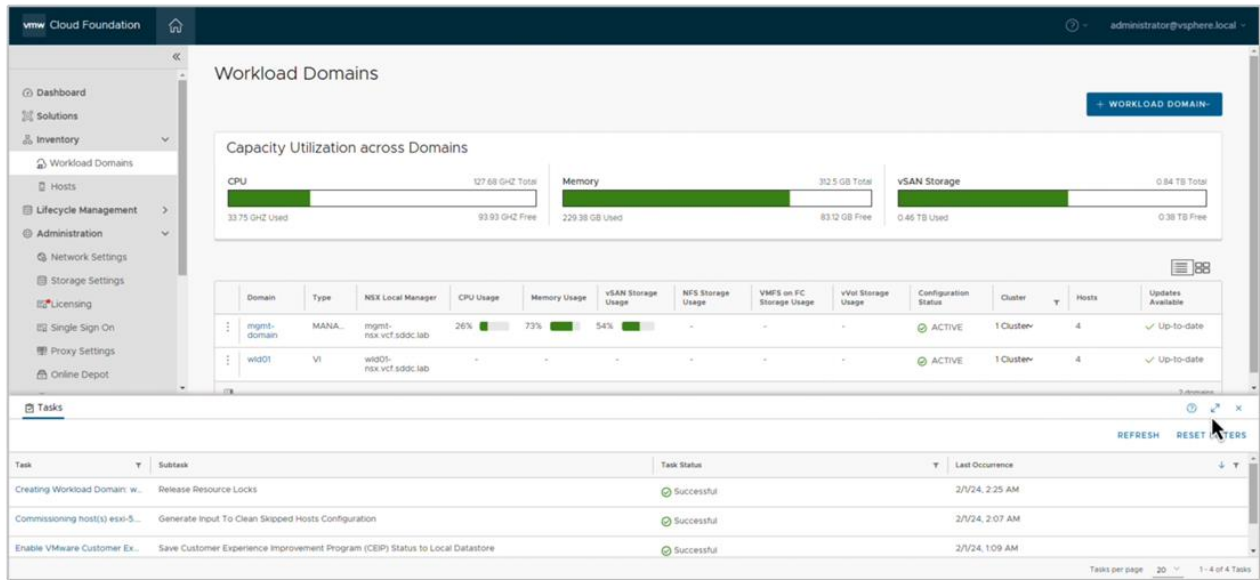**Figure 4.** VMware Cloud Foundation Workload Domains

Source: VMware by Broadcom and Enterprise Strategy Group, a division of TechTarget, Inc.

It's important to note that the management domain is created at VMware Cloud Foundation deployment and contains all of the management components of VMware Cloud Foundation. Workload Domains can be provisioned for numerous use cases, and each Workload Domain is comprised of one or more vSphere clusters. Workload Domains are scaled, and the software lifecycle is managed completely independently of other domains.

Enterprise Strategy Group walked through the process of creating a Workload Domain, which was simple and consisted of just a few clicks and answering a handful of configuration questions—selecting storage, which vCenter image to use, hostname, and password, for example. In less than four minutes, we had entered all the necessary information and clicked **Finish**. At this point, an automated workflow was initiated to create the new domain. The process, which includes all deployment and configuration tasks across the entire infrastructure stack, was completed with no additional effort or interaction required in about 90 minutes.

Figure 5. VMware Cloud Foundation—Workload Domain Deployed

Source: VMware by Broadcom and Enterprise Strategy Group, a division of TechTarget, Inc.

VMware Cloud Foundation automation also simplifies and accelerates lifecycle management using a fully validated bill of materials to reduce risk and simplify change management. With VMware Cloud Foundation, organizations can manage the standardized building blocks of a private cloud platform rather than multiple individual hardware and software components.

Why This Matters

IT teams are feeling the pressure to deliver business velocity—the ability to rapidly satisfy customer requirements. Automation is a key tool to accelerate operations. It's no surprise that nearly half of organizations we surveyed (45%) identified automation or AIOps as the top method they are using to move faster.[5] This explains organizations' hope that infrastructure automation will significantly transform IT operations and ultimately provide on-premises infrastructure with efficiencies seen in public cloud services with expected benefits such as reduced burden on IT operations (46%), improved security (45%), and reduced operating costs (42%).[6]

Enterprise Strategy Group validated that VMware Cloud Foundation automation helps organizations accelerate all phases of modernization: from building private cloud and allocating resources to streamlining maintenance and automating lifecycle management.

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[5] Source: Enterprise Strategy Group Research Report, *Distributed Cloud Series: The State of Infrastructure Modernization Across the Distributed Cloud*, November 2023.
[6] Ibid.

Providing a Cloud Experience for Developers

One of the acknowledged strengths of cloud infrastructure is its dynamic and agile nature. Ensuring that configuration changes are consistently applied across all systems is critical to avoid deployment issues from keeping environments consistent, reliable, and robust. Enterprise Strategy Group looked at how VMware Cloud Foundation delivers self-service access to code, infrastructure services, runtime environments, and all the tools, libraries, and registries developers need, transparently.

Enterprise Strategy Group Analysis

Infrastructure-as-code capabilities are intended to enable developers to automate and manage infrastructure using code. The primary objective of IaC is to automate the provisioning and maintenance of infrastructure. With IaC, the intent of the provider is coded through policies and variables, while the needs of consumers are expressed through inputs and tags. VMware Cloud Foundation automation gives users a robust set of tools to confidently create and manage code for infrastructure provisioning.
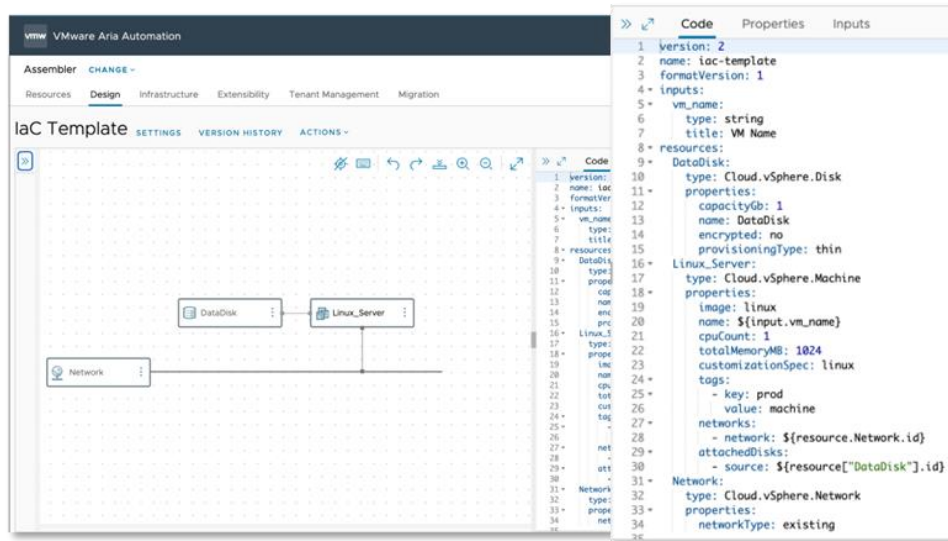
Figure 6. Infrastructure as Code
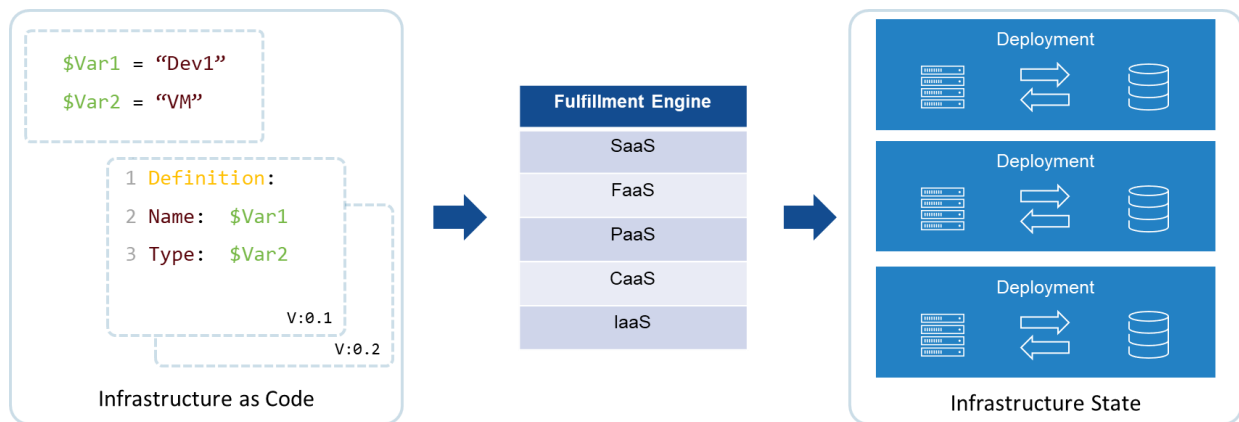
Source: VMware by Broadcom and Enterprise Strategy Group, a division of TechTarget, Inc.

VCF Automation provides a visual approach to getting started with IaC. The cloud template designer within the platform provides a palette of components that a developer can drag onto a canvas design. The visual representation of the topology shown is rendered in YAML in the code pane on the right (Figure 7).

**Figure 7.** VMware Aria Automation—Cloud Template Designer

Source: VMware by Broadcom and Enterprise Strategy Group, a division of TechTarget, Inc.

VMware Aria Automation provides capabilities to deploy and manage Kubernetes clusters to provide a developer platform. Using YAML templates, the infrastructure and Kubernetes manifest code can be piped into the deployment. Also, VMware Aria Automation provides Kubernetes management of vSphere supervisor services out of the box, which can help platform teams provide necessary services for developers to consume infrastructure.

VMware Private AI is an architectural approach for AI services designed to assure privacy and enable control of corporate data, choosing from open source and commercial AI solutions, all with a quick time to value and integrated security and management.

Figure 8. VMware Private AI Foundation with NVIDIA
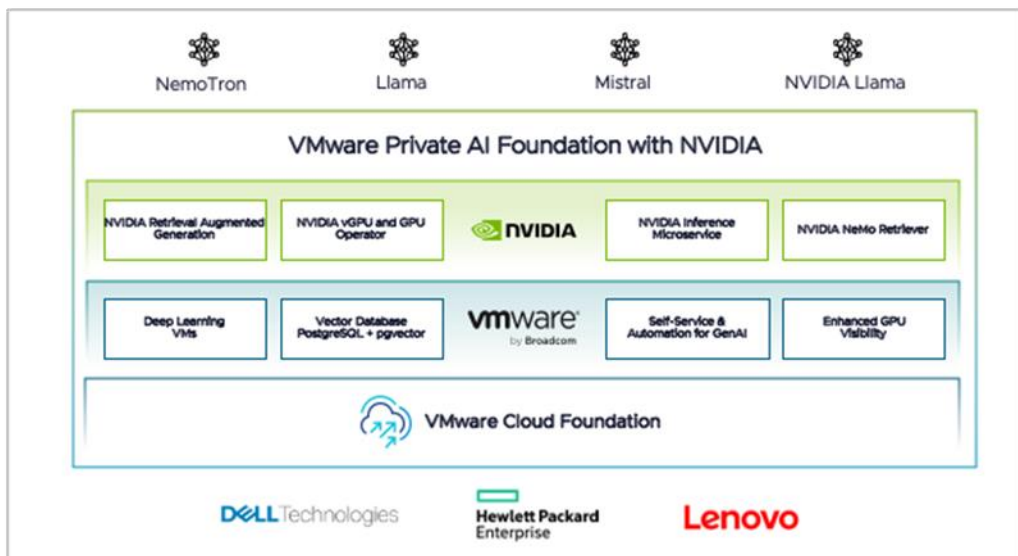
Source: VMware by Broadcom and Enterprise Strategy Group, a division of TechTarget, Inc.

The VMWare Private AI Foundation with NVIDIA is comprised of a set of integrated VMware and NVIDIA platforms for GenAI. It includes platforms for automating the environment of the data scientist seeking rapid provisioning and reproduction of their development tooling.

This joint GenAI platform enables enterprises to run retrieval-augmented generation (RAG) workflows, fine-tune and customize large language models (LLMs), and run inference workloads in their data centers, while addressing privacy, choice, cost, performance, and compliance concerns. It simplifies GenAI deployments for enterprises by offering an intuitive automation tool, deep learning VM images, vector databases, and GPU monitoring capabilities. This platform is an add-on to VMware Cloud Foundation, and NVIDIA AI Enterprise licenses will need to be purchased separately from NVIDIA.

Why This Matters

Enterprise Strategy Group research revealed that testing and quality assurance (33%), integration (32%), security (32%), and coding and development (31%) are the top time-consuming processes in application development.[7] Clearly, organizations need a solution that can automate and accelerate the development process while assuring consistency, reliability, and a robust development environment.

Enterprise Strategy Group validated that VMware Cloud Foundation and VMware Private AI give developers agility and a dynamic cloud experience while transparently ensuring data privacy and sovereignty, especially for AI model training and inferencing.


Security and Resilience

Ransomware and other cyberattacks damage organizations in many ways, with data exposure, data loss, and operational disruption all contributing to the financial, compliance, and reputational exposure and damage. VMware Cloud Foundation enables a cyber-resilient private cloud, with out-of-the-box infrastructure hardening, comprehensive east-west security and confident cyber-recovery.

Enterprise Strategy Group Analysis

First, we looked at ransomware recovery, focusing on how VMware Cloud Foundation enables organizations to implement security measures to safeguard against ransomware attacks, minimizing vulnerabilities and providing rapid recovery capabilities to enable businesses to quickly restore operations and data integrity in the event of a ransomware incident. VMware provides guided ransomware recovery plans that step a user through ransomware recovery tasks. From validating and selecting backup recovery points (see Figure 9), through security analysis and validation, to staging and recovery into an on-demand isolated recovery environment (IRE).

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[7] Source: Enterprise Strategy Group Complete Survey Results, *Code Transformed: Tracking the Impact of Generative AI on Application Development*, April 2024.
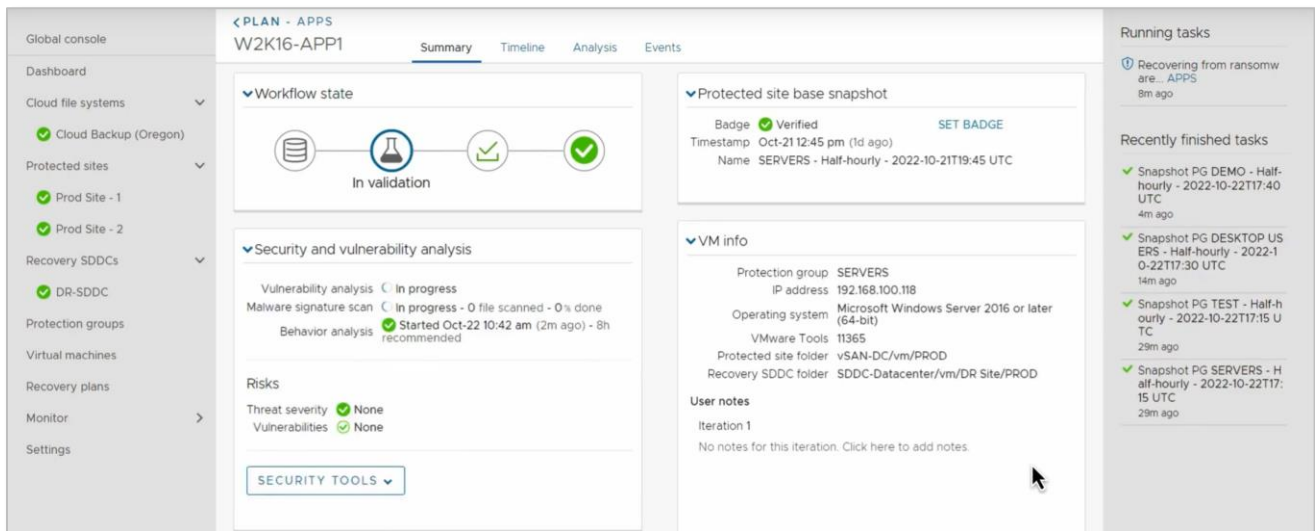
Figure 9. VMware Ransomware Recovery Plan—Guided Restore Point Selection
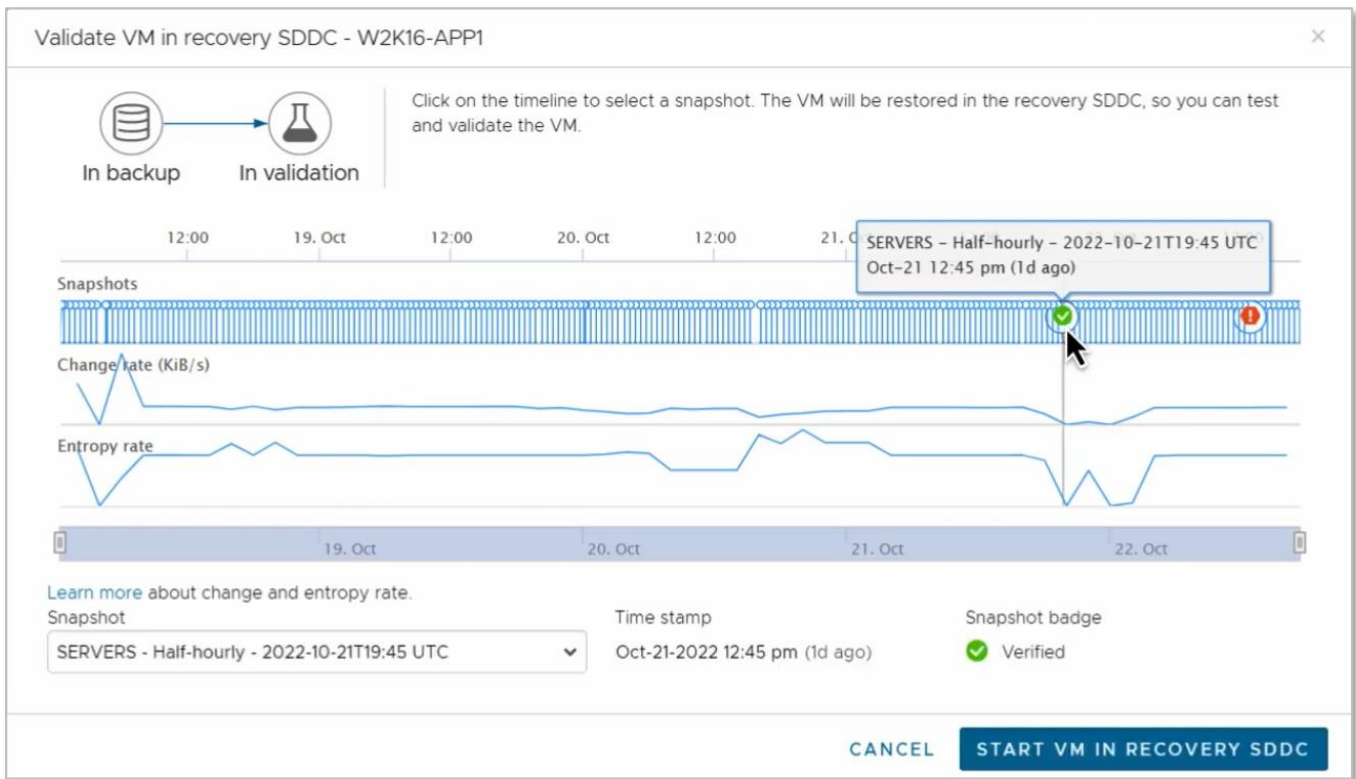
Source: VMware by Broadcom and Enterprise Strategy Group, a division of TechTarget, Inc.

Guided Restore Point Selection in VMware Live Recovery enables IT teams to select recovery point candidates, leveraging insights such as VMDK rate of change and file entropy, which help identify anomalies across snapshots to predict malicious activity within replicated workloads.

After recovery point candidates are selected, workloads are powered on in an IRE that can be provisioned directly from the VMware Live Recovery cloud console. Within the bounds of this secure, quarantined environment, workloads undergo a vulnerability scan, a signature-based scan with next-generation antivirus, and most importantly, a comprehensive behavioral analysis (Figure 10). Behavioral analysis is essential for modern cyber-recovery scenarios, as it is the only way to confidently detect and contain fileless attacks, which represent one of the most common techniques used by cybercriminals today.

Figure 10. VMware Live Recovery Workflow—Recovery Point Validation

Source: VMware by Broadcom and Enterprise Strategy Group, a division of TechTarget, Inc.

A built-in guest file and folder restore capability enables clean data from more recent restore points to be incorporated into the working version to minimize data loss. Push-button isolation levels, available through NSX-T integration, enable users to prevent lateral movement of ransomware within the IRE and therefore prevent reinfection of the production environment. When recovery point candidates have been validated, they can be staged for recovery, automatically including all changes, patches, other data sets, and remediations applied during validation. At this point, workloads are brought back to the production site with just a couple of clicks. It's important to note that all these steps can be performed at scale to reduce time to recovery.

In addition, VMware Live Recovery enables disaster recovery with active-active topology configurations. Production workloads are replicated to a secondary on-premises site to meet recovery point objective requirements as low as one minute with enhanced vSphere replication.

Why This Matters

Given the unabated increase in security threats, it's no surprise that cybersecurity is the clear leader among broad technology initiatives that have become significantly more important to the future of organizations over the past two years, cited by 57% of survey respondents.[8] When it comes to planned investments, organizations are prioritizing data governance, risk, and compliance (41%), and disaster recovery (40%) among data protection technologies and services.[9]

Enterprise Strategy Group validated that VMware Cloud Foundation automates and simplifies cybersecurity and disaster recovery, providing a resilient ecosystem where VMware Live Recovery delivers both disaster and cyber-recovery capabilities that enable organizations to confidently protect their data with a single product.

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[8] Source: Enterprise Strategy Group Research Report, *2024 Technology Spending Intentions Survey*, February 2024.
[9] Ibid.

Conclusion

Considering the business need to compete in an increasingly digital world, accelerating operations is an urgent priority, and business leaders are looking directly to IT teams to enable fast business decision-making. Organizations are working hard to implement infrastructure automation in the hope that it can transform IT operations and ultimately reduce the time and effort required for IT operations, enabling IT teams to focus on strategic initiatives rather than routine maintenance tasks.

VMware Cloud Foundation is a full-stack, private cloud solution to support digital transformation initiatives by integrating software-defined compute, storage, and networking with automation-streamlined operations and orchestration to enable organizations to accelerate developer productivity to deliver apps and services to market faster.

Enterprise Strategy Group validated that VMware Cloud Foundation automation helps organizations accelerate all phases of modernization. VMware Cloud Foundation's ability to accelerate the deployment of infrastructure resources enables faster provisioning of environments for development, testing, and production workloads, leading to quicker time to market for applications and services.

With VMware Private AI Foundation, organizations can increase productivity across every business unit and department while maintaining privacy, sovereignty, and control of corporate data and intellectual property.

The VMware Cloud Foundation platform enables a cyber-resilient private cloud deployment with out-of-the box infrastructure hardening, advanced threat protection with VMware vDefense, and confident cyber and disaster recovery with VMware Live Recovery.

If your organization is looking to accelerate its digital transformation and implement a cloud operating model for on-premises data centers, Enterprise Strategy Group recommends you take a close look at VMware Cloud Foundation.