

Technical Review

Consistent and Efficient Hybrid Cloud Full-stack Lifecycle Management with VCF on VxRail

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Abstract

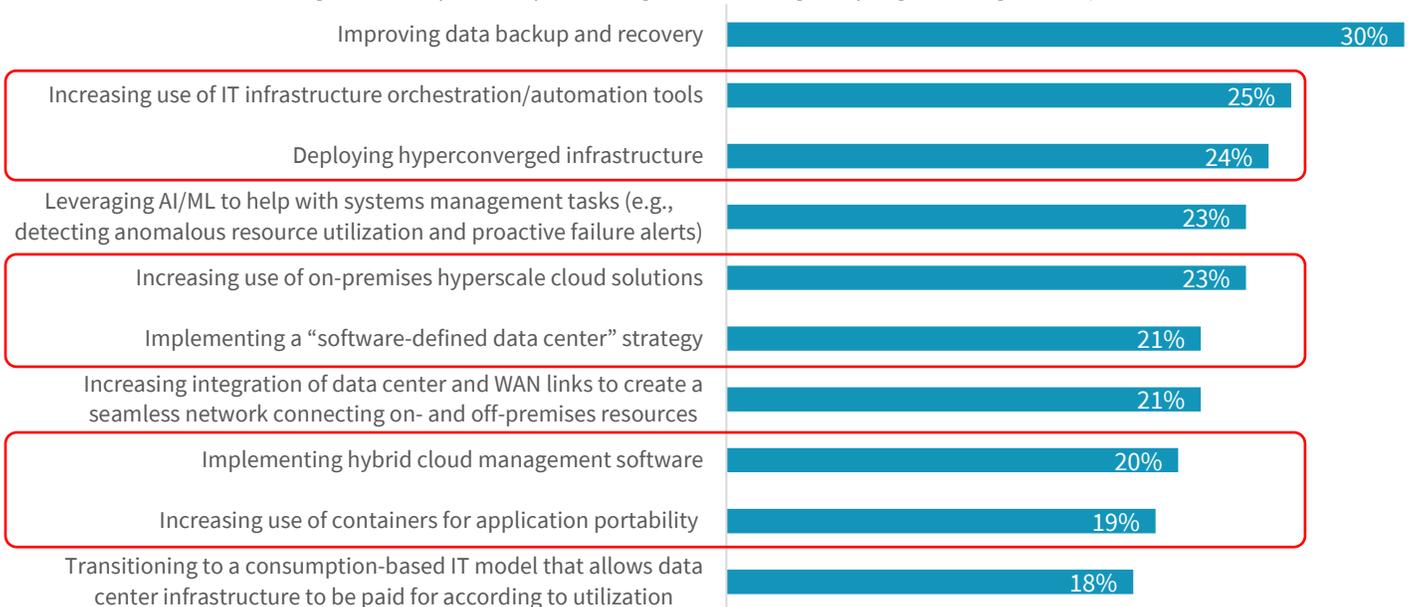
This ESG Technical Review documents ESG’s evaluation of how VMware and Dell Technologies’ co-engineering of VMware Cloud Foundation (VCF) and Dell EMC VxRail HCI enables organizations to extend their existing investments in infrastructure, people, and skills. We focus on the solution’s efficiency, consistency, and simplicity of lifecycle management for day 0 deployment, day 1 day-to-day operations, and day 2 maintenance, updates, and expansions across hybrid cloud infrastructure, operations, and services.

The Challenges

Organizations are modernizing their data centers to support current business initiatives including digital transformation, cloud architectures, and agile development, resulting in added complexity. Indeed, according to ESG research, nearly two-thirds (64%) of respondents said that their IT environment had become more complex in the last two years. In the same survey, IT leaders reported a problematic shortage of skills: 34% of organizations lack IT orchestration and automation skills, 33% suffer from a lack of cloud architecture/planning skills, and 32% have a deficiency of IT architecture/planning skills. Thus, when asked about their data modernization investment priorities, organizations indicated they would invest in improving efficiencies to meet the needs of the business.¹

Figure 1. Top Ten Data Center Modernization Investments

In which of the following areas of data center modernization will your organization make the most significant investments over the next 12-18 months? (Percent of respondents, N=658, five responses accepted, top 10 responses)



Source: Enterprise Strategy Group

¹ Source: ESG Master Survey Results, [2020 Technology Spending Intentions Survey](#), January 2020.

The Solution: VMware Cloud Foundation on VxRail, the Dell Technologies Cloud Platform

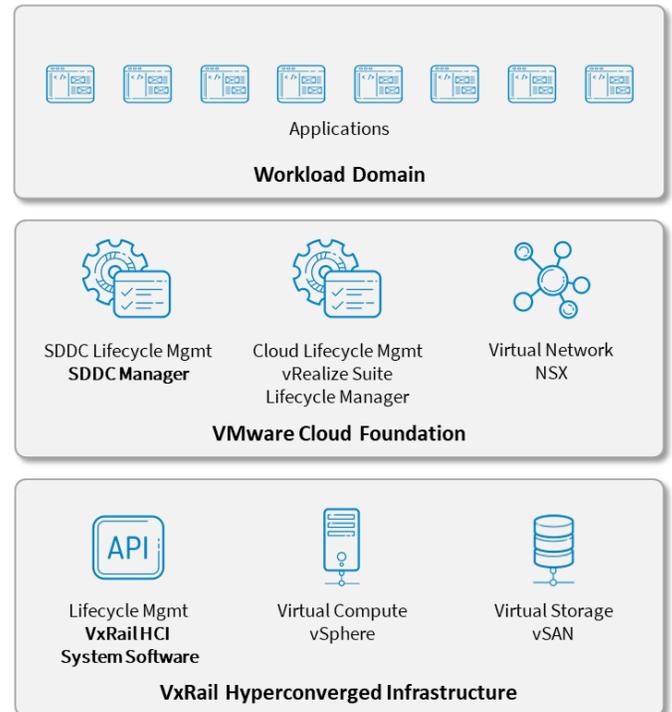
The suite of integrated infrastructure solutions from Dell Technologies and VMware has the goal of providing a single, unified, consistent model and operating structure for hybrid cloud infrastructures. Dell Technologies designed the solution based on three foundational architectural concepts: delivery of a turnkey solution, leveraging VxRail hyperconverged infrastructure (HCI); flexibility, with standardized designs incorporating VMware Cloud Foundation (VCF), which includes the SDDC components of vSphere, vSAN, and NSX along with vRealize Suite cloud management; and full management, incorporating automation and orchestration for simplification and consistency across day 0 deployment, day 1 day-to-day operations, and day 2 maintenance, updates, and expansions.

VMware provides a software-defined data center (SDDC) abstraction with a hybrid cloud environment and standardized infrastructure experience; a common set of data services for workloads; a common management model; and workloads abstracted and decoupled from the underlying hardware to enable workload mobility.

VCF separates workloads into workload domains such as a management domain, used to host the Cloud Foundation management systems; a virtual infrastructure domain for typical and custom organization workloads; horizon domains for Horizon virtual desktop workloads and management; and Tanzu Kubernetes Grid Integrated (TKGI) domains for container workloads and management. Organizations can move workloads between their own private cloud and public clouds supporting Cloud Foundation.

Dell Technologies and VMware co-engineered VCF on VxRail, the Dell Technologies Cloud Platform, leveraging the existing VxRail infrastructure management operating model and extending it into Cloud Foundation. The same VxRail automated cluster management capabilities are used to manage VxRails for standard cluster use cases and when using VxRail with VCF, maintaining a consistent VxRail infrastructure operating model experience for all use cases. Organizations deploying the solution benefit from:

- **Consistency**—Utilizing VCF on VxRail ensures consistent deployment, management, operations, and scaling across infrastructure, compute, storage, networking, and workloads, and ensures workload mobility between public and private clouds.
- **Operational simplicity**—VCF on VxRail delivers automated lifecycle management with full-stack integration providing control and visibility of software and hardware including the VMware cloud software stack and the entire hyperconverged infrastructure layer for a consistent, tightly integrated VMware environment.
- **Flexibility**—VxRail offers thousands of potential hardware configuration options, along with multiple consumption models, service models, and deployment models, providing flexibility and enabling organizations to right-size solutions to meet their performance, capacity, and budgetary requirements.
- **Scalability**—VxRail HCI is a clustered solution and can both scale up and scale out, enabling organizations to increase compute and storage capacity and performance by adding nodes. Lifecycle management enables customers to mix node configurations and generations in a single cluster, minimizing the need for technology migration. Tight



integration in the infrastructure management stack automates and orchestrates expansions, simplifying infrastructure management.

- **Cloud mobility**—VMware Cloud Foundation ensures organizations can migrate workloads between Dell Technologies Cloud Platform and public clouds including Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform, and more than 4,200 cloud partners.
- **Agility**—Using familiar VMware tools for provisioning, automation, orchestration, and governance accelerates deployment with a single operational hub for public, private, and edge clouds, and provides flexibility for workload placement. Integrated with SDDC Manager, VxRail Manager is used to deploy, configure, and lifecycle manage ESXi, vSAN, and HW firmware. The fully integrated and seamless SDDC Manager orchestrated process leverages VxRail Manager to execute upgrades and patches, while VxRail Manager continuously monitors health of hardware components and provides remote service support.
- **Unified architecture**—The SDDC separates workloads into workload domains and supports existing applications, modern container-based applications, and virtual desktop environments, eliminating the need for separate siloed environments for different workloads.
- **Single vendor experience**—Dell Technologies Cloud Platform architecture is based on standardized VMware Validated Designs. Dell Technologies' support organization tests all configurations, updates, and patches to ensure effectiveness and compatibility. Customers can work directly with Dell Technologies for purchasing, deployment, services, financing, and full-stack solution support.

ESG Tested

ESG explored VCF on VxRail typical day 0 deployment, day 1 operations and management, and day 2 updates and expansion scenarios. We focused on the simplicity and consistency of management and operations of the infrastructure, and how Dell Technologies and VMware co-engineering extended the existing VxRail infrastructure operating model into Cloud Foundation, resulting in an integrated solution that provides users with a consistent VxRail infrastructure operations experience for VxRail-based vSphere clusters or hybrid clouds using VCF on VxRail.

Day 0 Deployment

ESG started the evaluation by exploring typical day 0 deployment activities in an enterprise environment. We started with a freshly powered-on VxRail cluster, and, because VxRail comes pre-installed with all necessary software, we were able to bypass the manual process of installing and configuring vSphere and vSAN. Instead, we used the native VxRail Manager wizard process to automate the installation and configuration process. We then deployed VCF on VxRail and created a VxRail-backed virtual infrastructure workload domain to host application workloads.

The two-step process of deploying VCF on VxRail started with deploying the VMware Cloud Builder OVF, and then using Cloud Builder to deploy VCF.

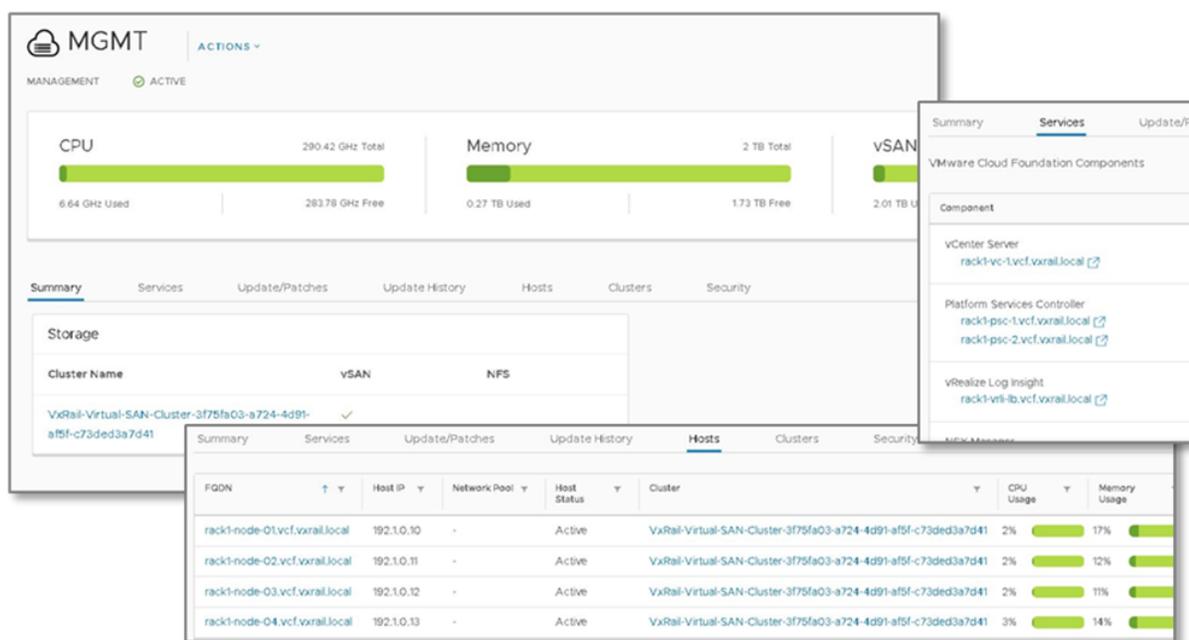
Dell Technologies and VMware jointly engineered VMware Cloud Builder with VxRail integration, and the deployment wizard uses built-in knowledge of VxRail and APIs and services running on the VxRail Manager node to automate and orchestrate the deployment of VCF onto the VxRail cluster, simplifying the installation and configuration process and building upon the cluster configuration that VxRail had already automated as part of native VxRail cluster build operations.

At the end of the Cloud Builder OVF deployment process, we logged in to the Cloud Builder web portal to deploy VMware Cloud Foundation and build the base SDDC infrastructure. Dell Technologies and VMware provided a configuration file enabling us to pre-specify the configuration parameters.

The unattended bring-up process completed after a few hours and automated numerous steps, including configuring ESXi, creating and configuring redundant platform services controllers (PSCs), and installing and configuring NSX and SDDC Manager. This kind of automation eliminates the time and effort of manually installing, configuring, and verifying each component.

Cloud Builder created a VCF management domain that is used by administrators to manage the entire cloud infrastructure. (A domain is a policy-based resource container with specific availability and performance attributes that combine vSphere, vSAN storage, and NSX networking into a unified consumable entity.) As shown in Figure 2, the VCF domain dashboard displays the overall status and configuration of the domain, and provides tabs enabling administrators to review and modify domain configuration. We observed that VCF domains simplify the complex environment and enable administrators to manage the infrastructure using a higher level of abstraction, simplifying administrator workloads.

Figure 2. The Preconfigured Virtual Infrastructure Management Domain



Source: Enterprise Strategy Group

Next, leveraging the integrated VxRail and VCF lifecycle management, ESG deployed a VxRail-backed virtual infrastructure (VI) workload domain for running applications. This was a three-step process where we created a new VI workload domain instance in VCF, provisioned a new VxRail cluster, and added the VxRail cluster to the VI workload domain.

As shown in Figure 3, the VI workload creation process uses a configuration wizard in SDDC Manager, and we entered the configuration information. The automated process, which included validating the configuration, creating the domain configuration and credentials, deploying a vCenter Server appliance, authorizing SDDC Admins group, moving Domain VMs to the management resource pool, and updating the inventory, completed in about ten minutes.

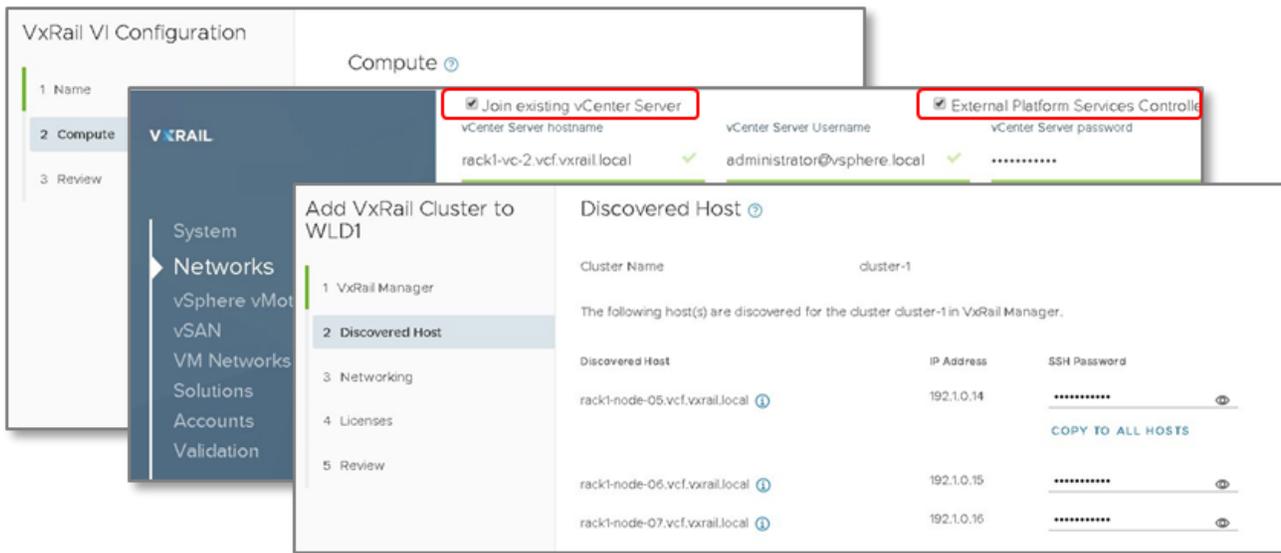
The next step was to deploy a separate VxRail cluster to provide the compute, storage, and memory resources for the virtual infrastructure workloads. Because VxRail nodes come pre-installed with all necessary software to create a vSphere cluster, we were able to bypass the manual process of installing and configuring ESXi and vSAN. Instead, we used the native VxRail first run wizard process to automate the installation and cluster configuration process.

The deployment wizard automatically detected and identified the nodes in the cluster, and we used a prebuilt JSON file to specify the configuration. The Dell Technologies and VMware co-engineered automation enabled us to automatically join the VxRail cluster to the vCenter Server and Platform Services Controller we had just created for the VI workload domain

using SDDC Manager. The unattended deployment process completed a workflow of more than 75 individual steps, which saved time and effort, and helped to reduce the opportunity for human errors.

Next, we added the VxRail cluster to the VI workload domain using SDDC Manager. As a result of the joint-development efforts, VCF used the native VxRail Manager to discover cluster configuration information and perform the necessary cluster operations. The VCF deployment wizard prepopulated configuration information for us to confirm, and then automatically added the VxRail cluster to the VI workload domain, deployed and configured an NSX instance for the VI workload domain onto the management domain, installed and configured the NSX vSphere Installation Bundles (VIBs) on all VxRail cluster hosts, and made the domain ready to host application workloads.

Figure 3. Deploying a VxRail-backed Virtual Infrastructure Workload Domain



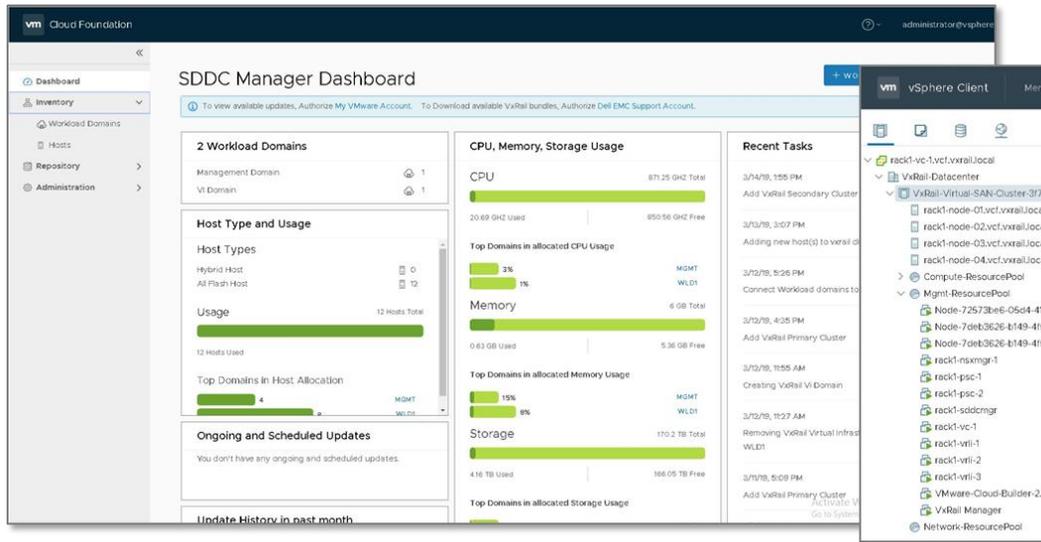
Source: Enterprise Strategy Group

Day 1 Operation

ESG explored how the SDDC Manager would be used for typical hybrid cloud infrastructure day 1 operations activities. As shown in Figure 4, vSphere presented a VM-centric view of the infrastructure. VCF presented a cloud domain view of the infrastructure. This higher level of abstraction removes many of the complexities of the infrastructure, enabling us to manage logical groupings of resources. Details of resources were available with a mouse click when we needed to explore further.

Each VCF workload domain incorporates an NSX Manager and a vCenter Server and deploys in Enhanced Linked mode. Thus, a VCF administrator has global visibility into all workload domain infrastructure and has the flexibility to establish different domain security and configuration policies based on business or workload needs.

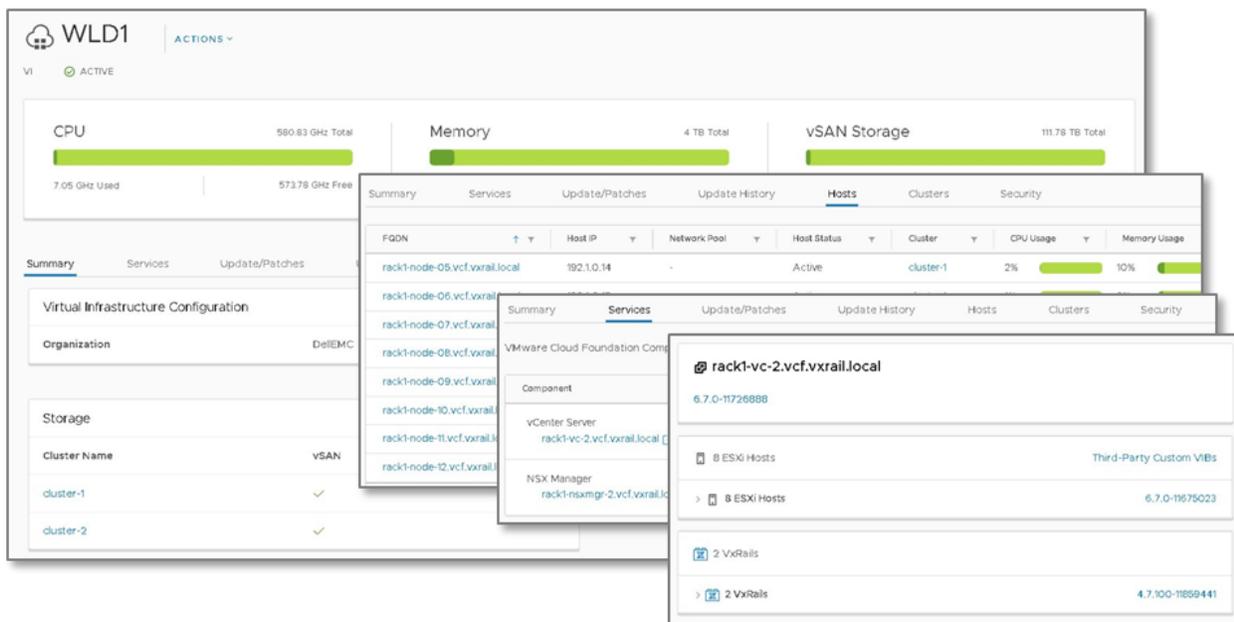
Figure 4. SDDC Manager Dashboard



Source: Enterprise Strategy Group

The VCF workload domain dashboard provided status and resource information for both the VCF management domain and the VI workload domains. As shown in Figure 5, drilling down for more information on the workload domain, we observed the real-time compute, memory, and storage resource utilization. Using VCF allows users to access host, cluster, services, update/patch, and other relevant information necessary for the day-to-day operations and maintenance of the hybrid cloud infrastructure.

Figure 5. Workload Domain Dashboard



Source: Enterprise Strategy Group

Day 2 Update and Expansion

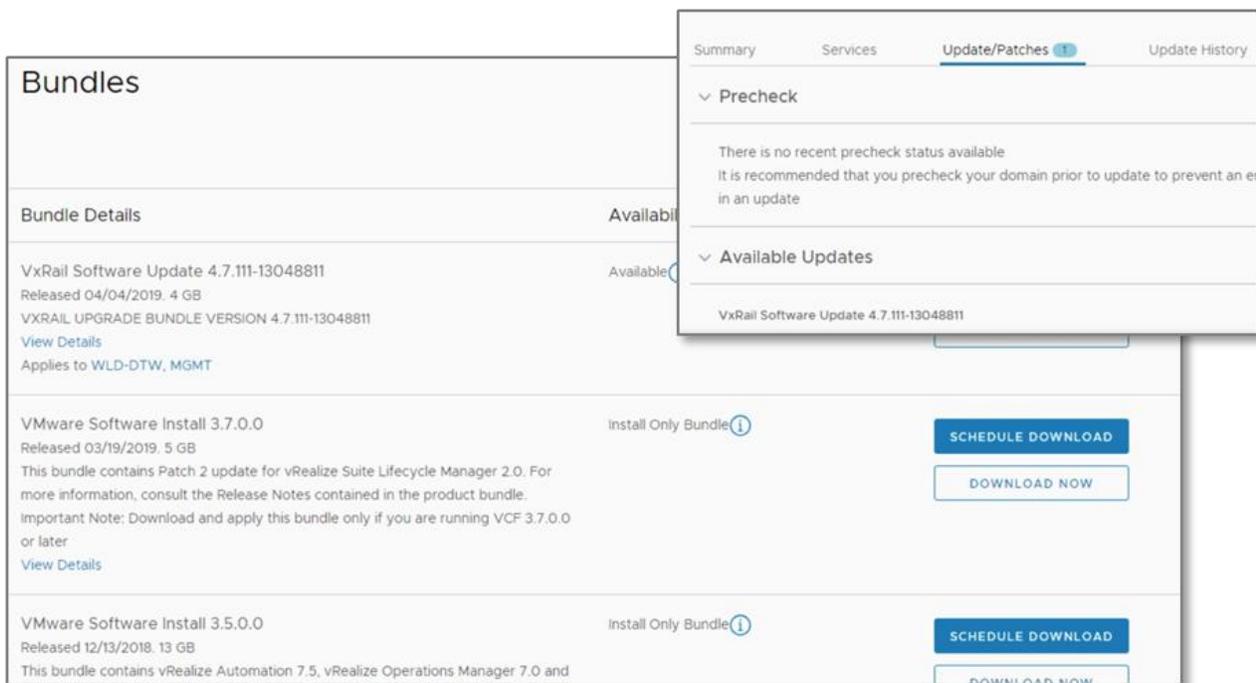
ESG explored typical day 2 update and expansion activities in an enterprise environment. We started by updating the environment, and then expanded the environment in two steps: we added a host to scale a VxRail cluster and then added a cluster to scale a workload domain.

As a result of the co-engineering between Dell Technologies and VMware, VMware Cloud Foundation has been designed to detect and manage native VxRail update bundles along with the Cloud Foundation software update bundles. Dell EMC pre-validates and pre-tests every VCF on VxRail upgrade bundle and patch for the administrator, ensuring compatibility with one another and with the running version of VCF on VxRail. VCF enforces validation and compatibility checks, ensuring that administrators can perform updates without having to manually validate version compliance and compatibility. This saves time and minimizes the risk of a misconfiguration resulting in unplanned downtime when performing lifecycle operations.

The Update/Patches tab of VCF’s workload domain dashboard displayed two available update bundles, one for VxRail software, and one for VMware software, as shown in Figure 6. We used the automated precheck feature that ensures that the environment is in a healthy state and there are no issues that would cause the update to fail. If there were errors, VCF would display any outstanding issues along with guidance on how to remediate the problems. We used VCF’s automation and orchestration to update VxRail and VMware software.

The integration of VxRail updates into the native SDDC Manager automated workflows eliminates the need to use multiple tools and processes to perform full-stack lifecycle management of hardware and software components for the SDDC infrastructure. It also reduces the amount of time to perform these updates as well as reduces the risk of unplanned downtime due to the accidental mishandling of update execution by an administrator.

Figure 6. Updating VCF on VxRail



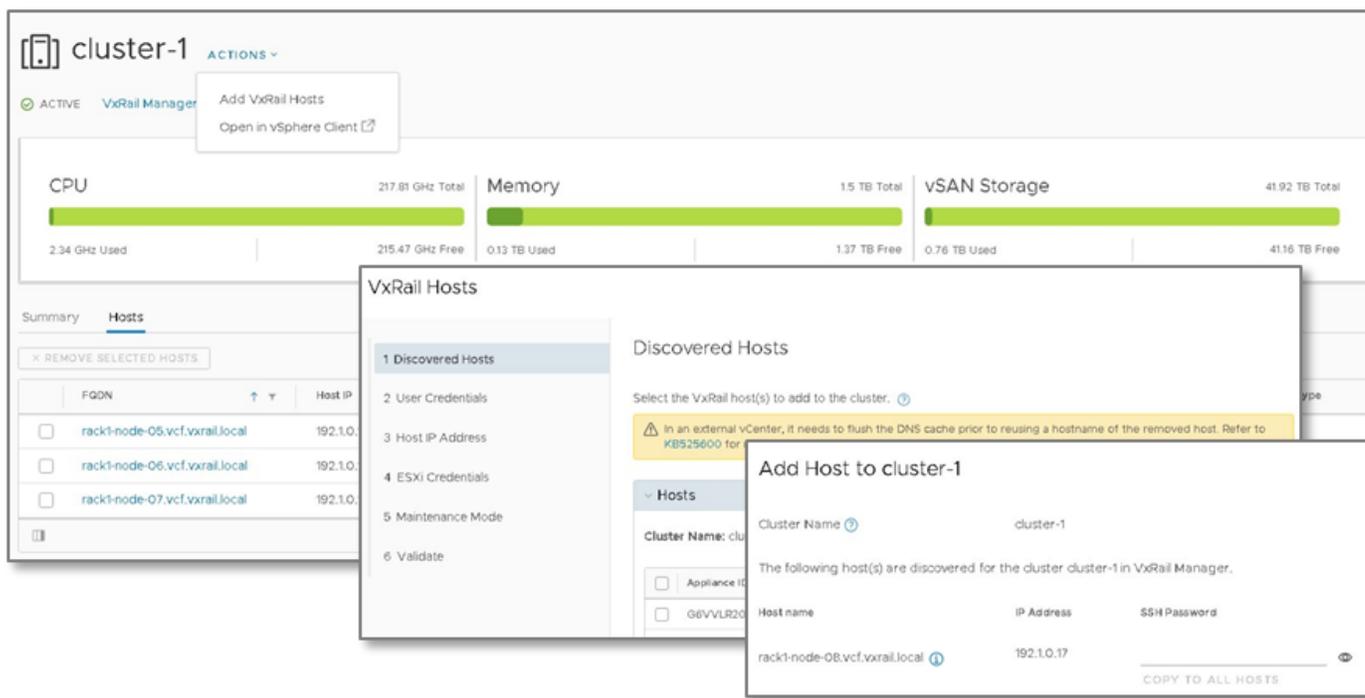
Source: Enterprise Strategy Group

Next, we scaled the VxRail cluster by adding a host. The scaling process is designed to leverage the native VxRail operating model by integrating the native VxRail operation process into the VCF lifecycle management process. Scaling by adding a host entails two steps: 1) using native VxRail Manager automation processes to add a new node to the cluster at the physical cluster level and making the node visible to the vCenter managing the cluster; and 2) adding that node into the VCF

workload domain inventory so SDDC Manager has visibility that a new physical node has been added to the workload domain cluster.

The VCF *add VxRail host* wizard automatically detected the new host and, after our confirmation, configured all software, added the host to the VxRail cluster, and added the host as an additional resource to the virtual infrastructure workload domain.

Figure 7. Adding a Host to Scale a VxRail Cluster

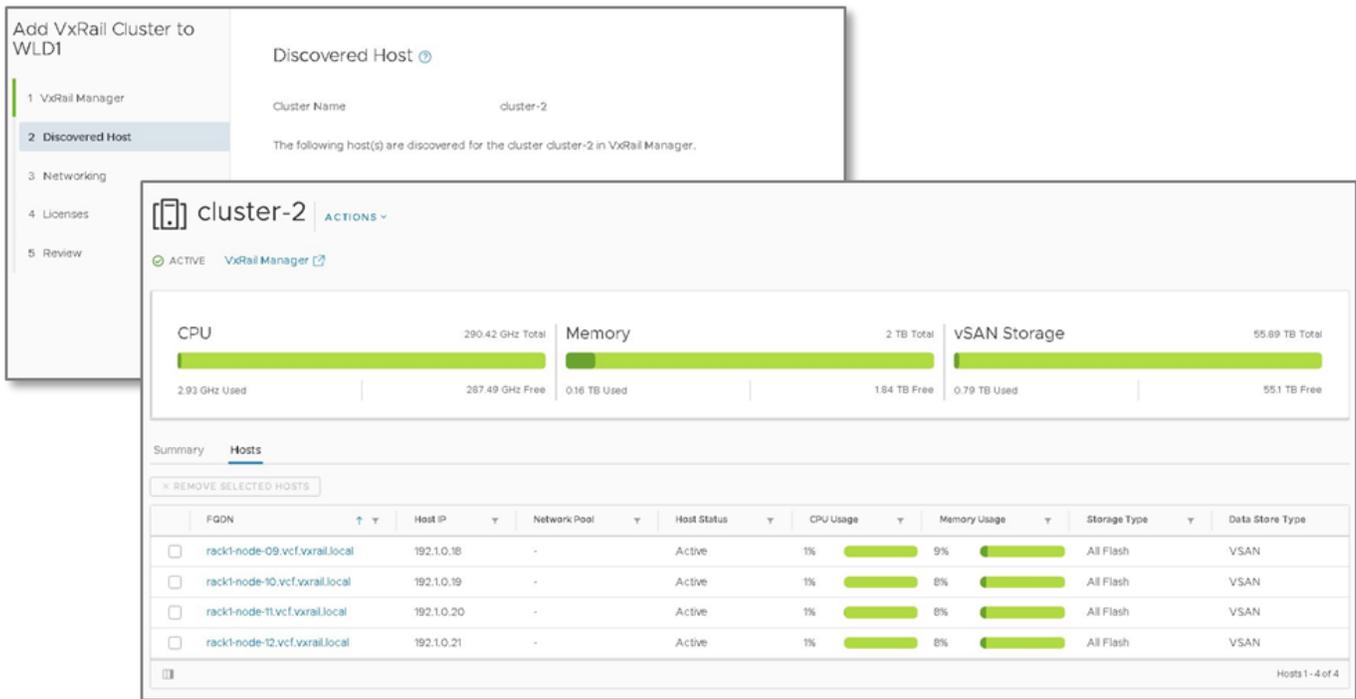


Source: Enterprise Strategy Group

The last step of exploring typical day 2 update and expansion activities was to add a VxRail cluster to scale the workload domain. First, we deployed a new VxRail, and, because VxRail comes pre-installed with all necessary software, we were able to bypass the manual process of installing and configuring vSphere and vSAN. Instead, we used the native VxRail wizard process to automate the installation and cluster configuration process. We uploaded a JSON file containing configuration information and the VxRail deployment wizard automatically configured the cluster, including vSphere and vSAN.

Next, as shown in Figure 8, we used VCF's *add VxRail Cluster* option to add the VxRail cluster to the workload domain. Just as with adding a VxRail host, the process to add a VxRail cluster was co-engineered and designed to leverage the native VxRail cluster build operations procedures and architecture. The *add VxRail Cluster* wizard automatically discovered the new cluster and its associated hosts. After providing credentials and IP addresses, VCF added the cluster to the workload domain along with adding the new hosts to the VCF and NSX Manager inventory of managed objects. The unattended, automated process also included configuring the necessary hosts and services to provide additional resources to the workload domain such as installing and configuring NSX VIBs on all the new VxRail cluster hosts.

Figure 8. Adding a VxRail Cluster to Scale a Workload Domain



Source: Enterprise Strategy Group

i Why This Matters

IT organizations quickly discover that delivering the simplicity, speed, accessibility, scalability, flexibility, self-service, and other benefits of hybrid clouds can be a complex and painful exercise, requiring the coordination and integration of many components.

ESG validated that VCF on VxRail simplifies and accelerates day 0 deployment, day 1 operations, and day 2 updates and expansions of hybrid cloud infrastructures. We used VxRail Manager to perform unattended deployment of VxRail HCI, and VCF to perform unattended deployment of a cloud infrastructure running on VxRail. Using VCF, we created a VxRail-backed virtual infrastructure domain, and explored how we could use VCF in the day-to-day operations of the environment. We also used VCF to perform unattended updates of VxRail and VMware software, to scale the VxRail cluster by adding a host, and to scale the workload domain by adding a second VxRail cluster. Dell Technologies and VMware co-engineering resulted in an integrated full-stack lifecycle management solution, automating and orchestrating the lifecycle management process, reducing administrative workload, and freeing resources for other critical IT tasks.

The Bigger Truth

As organizations turn to hybrid cloud infrastructures to meet the needs of the business, architecting, deploying, and configuring the necessary resources continues to present challenges. IT consumes valuable time cobbling together DIY cloud environments, relying on manual processes and the specialized knowledge of highly skilled staff. A critical lack of IT skills impacts the capabilities of internally developed solutions, which are often suboptimal and may struggle to support virtual and containerized workloads.

ESG validated that Dell Technologies Cloud Platform automates, simplifies, and accelerates day 0, day 1, and day 2 lifecycle management, reducing IT architect and administrator workloads. ESG's evaluation revealed:

- VCF on VxRail provides automated and orchestrated buildout of private cloud infrastructures, leveraging Dell Technologies and VMware best practices that are designed to obtain the best performance and security.
- The automated, orchestrated, and unattended deployment capabilities of the solution reduced dependencies on virtualization, storage, and networking expertise, and eliminated manual installation and configuration of multiple disparate components, enabling us to build and maintain complex hybrid cloud infrastructures quickly and easily.
- The platform leverages Dell Technologies and VMware co-engineering that incorporates knowledge of VxRail and inherits and extends native VxRail services and capabilities into VMware Cloud Foundation full-stack lifecycle management, enabling an unattended buildout and lifecycle management of a hybrid cloud infrastructure running on VxRail HCI.
- Full-stack integration simplified and automated day-to-day lifecycle management and enabled us to deploy a cloud infrastructure ready for application workloads without having to be cloud, virtualization, storage, or networking experts.
- Pre-validation of all VMware Cloud Foundation and VxRail support bundles by Dell Technologies ensures compatibility with one another and with the running version of VCF on VxRail. The platform's built-in precheck validates that the environment is in a healthy state and there are no issues that may cause an update to fail.

ESG evaluated VCF on VxRail in a controlled environment. Due to the many variables in each production data center, it is important to perform planning and testing in your own environment to validate the viability, efficiency, and efficacy of any solution.

VCF on VxRail is an integrated hybrid cloud infrastructure solution designed to help organizations build and operate cloud infrastructures. Dell and VMware co-engineered the solution, resulting in tight integration, simplification, automation, and orchestration of lifecycle management. If your organization is looking to increase business agility and operational efficiency by streamlining IT infrastructure and optimizing lifecycle management, then ESG believes that you should consider the consistency, simplification, and acceleration of building and operating your hybrid cloud architecture with VCF on VxRail.

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