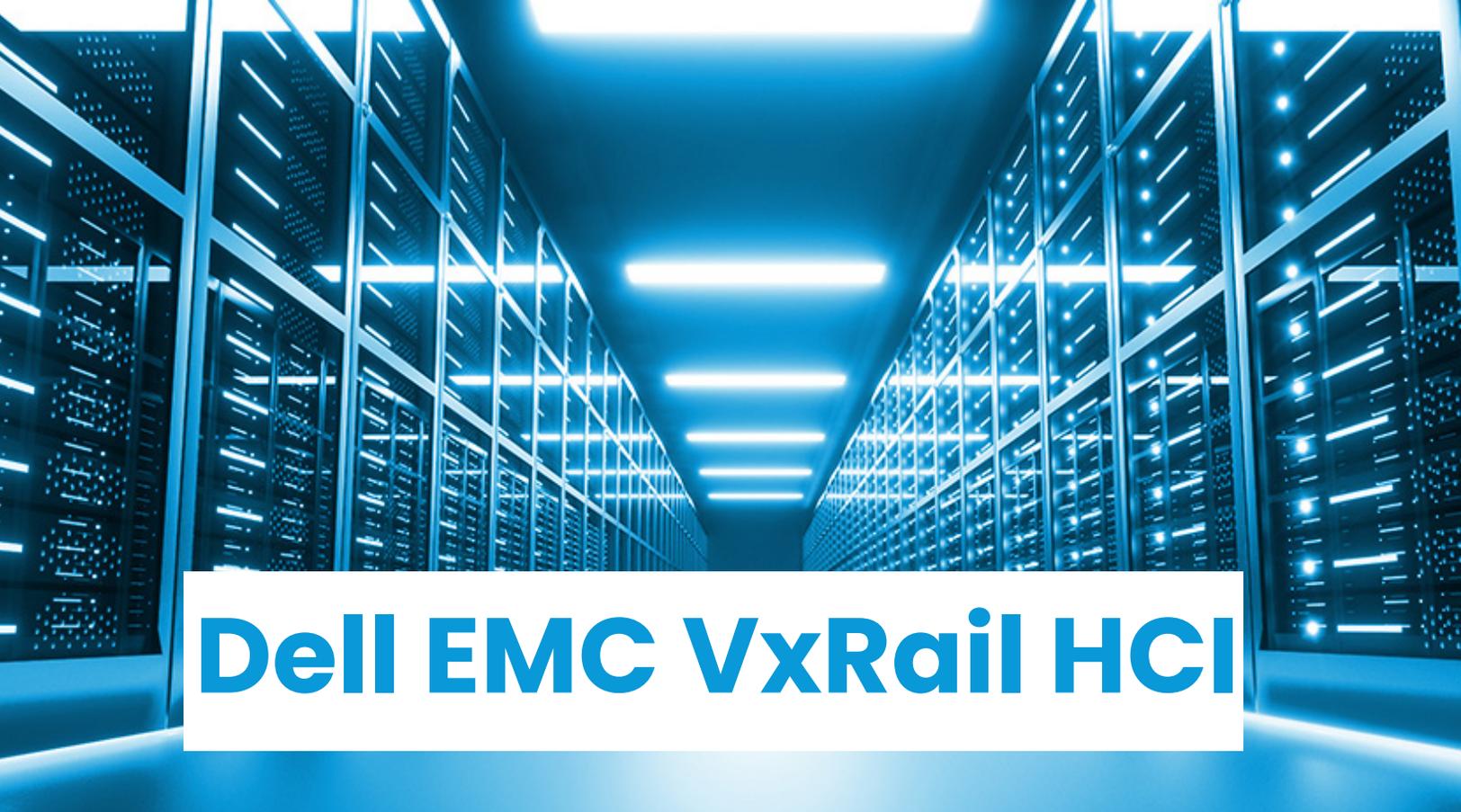


VXRAIL HCI SYSTEM SOFTWARE PROOF OF CONCEPT

Sponsored by Dell Technologies, VMware and Intel

Author Alastair Cooke, The CTO Advisor

www.thectoadvisor.com/delltech



Dell EMC VxRail HCI

INDEX

01. Executive Summary	3
02. Claims Tested	4
03. Hyperconverged Infrastructure Evolution	5
04. VxRail	6
05. Evaluation Process	8
4.1 VxRail Manager simplifies day two operations	8
4.2 VxRail delivers multi-cluster global management	9
4.3 VxRail RESTful APIs enable custom automation	10
4.4 Ecosystem connectors enable automation across the entire stack	11
4.5 Reduce risk with the Electronic Compatibility Matrix	11
4.6 VMware Cloud Foundation and VxRail Are Better Together	12
06. Alternative Dell Technologies Platforms	14
07. Conclusion	15

Executive Summary

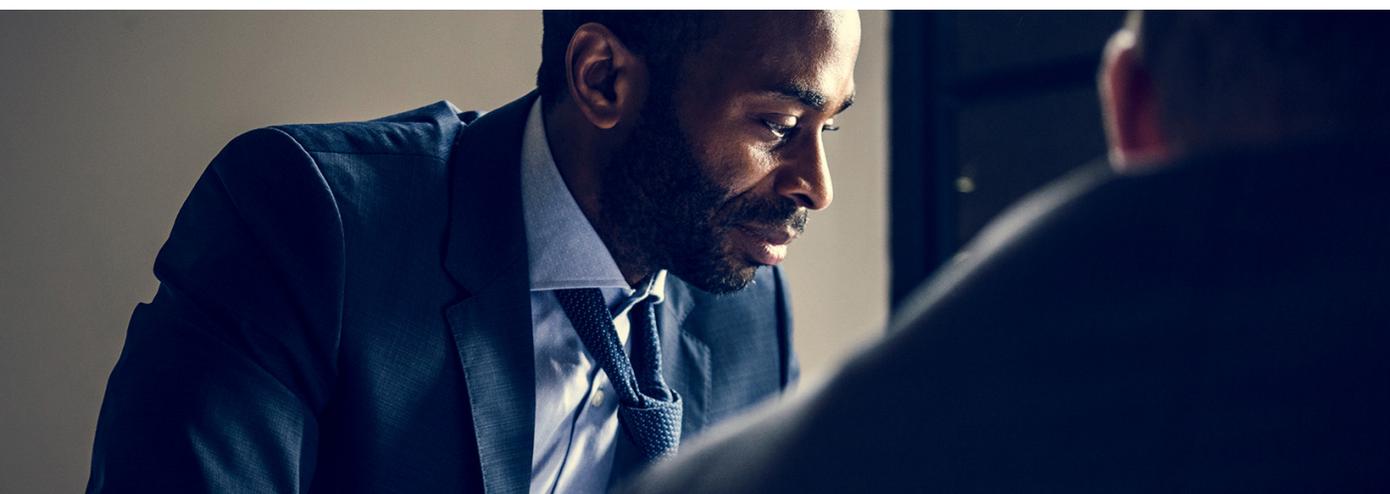
Building and selling differentiated products and services is your business goal; IT systems should support this goal.

Large teams of highly skilled technical staff managing the same virtualization platform as every other enterprise does not differentiate your business. The virtualization platform is central to on-premises IT and should be an enabler and force multiplier for your IT team. Choosing a highly automated platform will enable your staff to focus on what brings unique value to your business. **Dell EMC VxRail** simplifies and automates the deployment of vSphere, vSAN, and vCenter and the VxRail HCI System Software so that your teams can focus on the VMs and applications that bring business value.

VxRail delivers an engineered platform that enables VM-centric operations. It combines with other Dell EMC solutions to extend integrated operations to data protection and private cloud management.

VxRail provides an ideal platform for the deployment of these applications in containers and using Kubernetes through VMware Tanzu.

The range of VxRail system models includes options with Intel Xeon Scalable CPUs and support for SSD and Intel Optane storage and Persistent Memory (PMEM) for extreme performance. VMware Cloud Foundation (VCF) deploys VMware's value-add products on top of enterprise-scale deployment. VxRail is the only HCI platform directly integrated into VCF SDDC Manager, bringing simplicity to the deployment and management of the hardware and vSphere layers and the Software-Defined Data Centre (SDDC) to allow VM-centric operations at a large scale.



Find out more about our study at <https://thectoadvisor.com/delltech>

Claims Tested

The Dell Technologies team asked us to investigate six specific claims about the unique capabilities of the VxRail platform. These claims are aimed at post-deployment activities that operations and support teams carry out over the lifetime of a deployed platform.

These benefits are in addition to the simplified deployment and VM-centered management benefits of VxRail, which we did not specifically test. The core of these claims is that VxRail provides benefits around streamlined and unified management that extend beyond the single HCI cluster to an enterprise-wide “VM as a service” approach with rich lifecycle and hardware management. Further, VMware Cloud Foundation on VxRail provides even more value when it comes to delivering vSphere clusters as a service. The specific claims are:

CLAIMS

- 1 VxRail Manager simplifies day two operations
- 2 VxRail delivers multi-cluster global management
- 3 VxRail RESTful APIs enable custom automation
- 4 Ecosystem connectors enable automation across the entire stack
- 5 Reduce Risk with the Electronic Compatibility Matrix
- 6 VMware Cloud Foundation and VxRail integrate to deliver measurable benefits

Hyperconverged Infrastructure Evolution

Hyperconverged Infrastructure (HCI) products have been available for many years as a simplified way to deploy and operate a virtualization platform.

The initial value proposition was a very short time to value through automated deployment and simplified operations. The convergence was initially around compute capabilities with ethernet networks and storage. The storage network is converged with the management and VM connectivity network on 10Gb (or faster) Ethernet.

The persistent storage is directly attached inside the virtualization hosts, forming a scale-out storage cluster to provide high availability from this host-based storage. Over time, converged management became a core part of HCI. Drivers and firmware, storage, virtualization, data protection, network, and VM management are consolidated in a single appliance managed via a universal console.

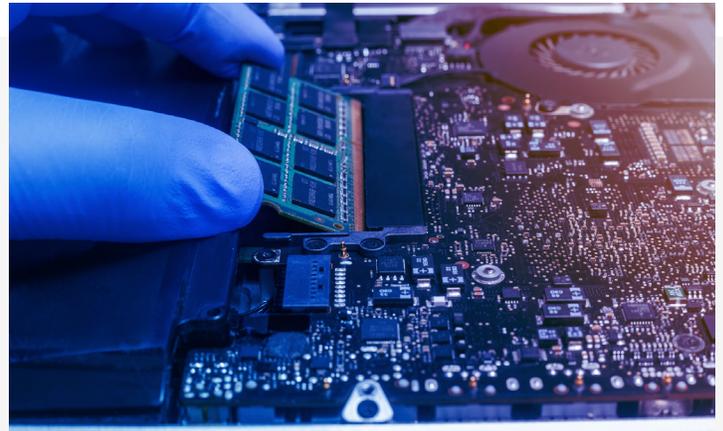


THE OBJECTIVE

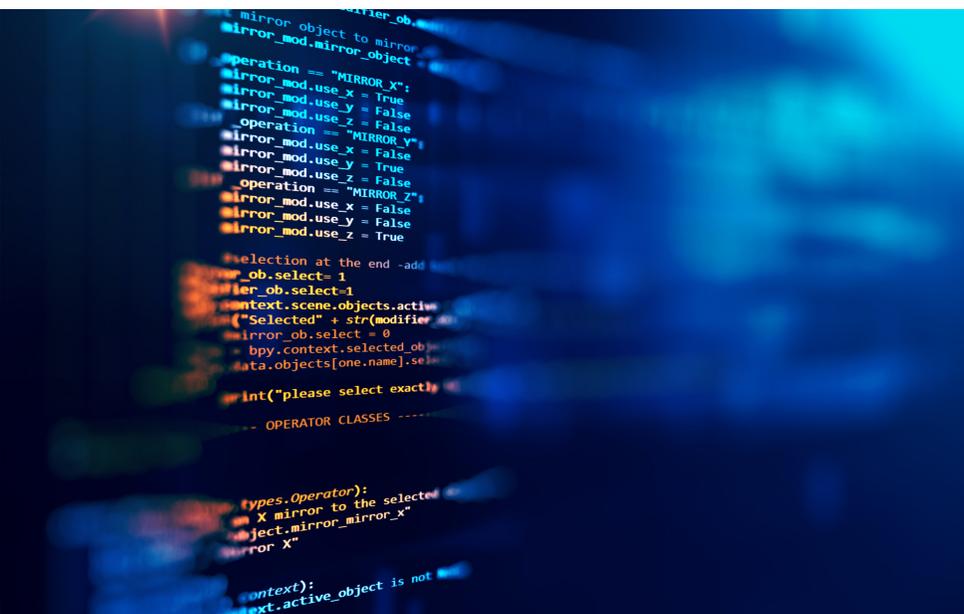
Hyperconverged Infrastructure enables all aspects of a VM's life be managed through a single console without requiring detailed management of the underlying virtualization and physical resources. This study looks at some specific claims that Dell Technologies makes about the unique value of VxRail and its integrated view of your vSphere environment. We put those claims to the test and look at how they result in better IT operations in the real world.

VxRail

Dell EMC VxRail hyperconverged infrastructure delivers VMware vSphere and vSAN using rack-mount servers. Dell Technologies or partner engineers complete the initial deployment, then ongoing operation by the customer is tightly integrated with the vSphere platform. The white glove initial deployment frees customers from learning another deployment process.



The SaaS-based multi-cluster manager shows that this platform is aimed at Hybrid-IT customers who require the certainty of partnering with a large vendor for enterprise-wide deployment. The VxRail Manager integrates with the vSphere Client, enabling the customer's vSphere team to use a familiar tool for hardware platform management. Integration carries beyond simple status display; updates, performance, and system health are managed through the VxRail manager for the vSphere platform and all supporting components to ensure a consistent and reliable platform over years of operation. VxRail is also tightly integrated with VMware Cloud Foundation (VCF). The VCF SDDC Manager requests bundle creation and update orchestration from the VxRail Manager, and the VxRail SaaS console is aware of VCF connected clusters. Dell Technologies has a portfolio of other vSphere and VM-focused software products; many of these integrate into VxRail and enable unified management through the vSphere client.

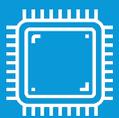


The primary selling point of HCI, in general, is around the value of the software.

However, all software must run on hardware, and VxRail offers various hardware configurations that allow clusters to match cost and performance balances for a variety of workloads. The broad range of Intel's portfolio enables customization of performance to meet differing use cases and requirements.



VxRail Hardware Configurations:



**4 - 112 CPU
Cores**

The range of physical servers primarily contains Intel Xeon Scalable processors with between four and 112 CPU cores per server.



64GB - 6TB

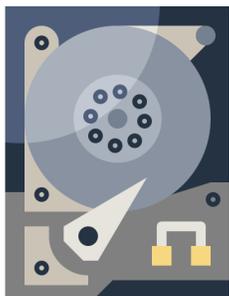
The RAM options range from 64GB to 6TB, with some models supporting up to 12TB of Intel Optane Persistent Memory DIMMs.



**1GBE -
100GBE**

Network connectivity options include multiple ports and speeds up to 100Gbps using Intel 800 series NICs on board or in expansion slots, with support for high-speed RoCE v2.

There is also a range of storage options from capacity-oriented SAS hard drives, through SSDs, all the way to NVMe, and Optane storage. There are VxRail options designed for general-purpose compute workloads, VDI, GPU-intensive workloads, and high-performance databases and mission-critical applications.



SAS HDD



SSD



NVMe

Evaluation Process

The CTO Advisor team had remote access to VxRail clusters in a Dell Technologies Customer Solutions Center, allowing our technical specialist hands-on testing.

Our specialist replicated a customer's behavior, attempting to run all the tests without assistance but calling on a Dell Technologies engineer when required.

This matches the expected VxRail customer, a vSphere team focused on VM operations and responsible for the environment, and a support contract with Dell Technologies for escalations. A Dell Technologies engineer was immediately available to allow the testing to proceed rapidly, and all tests were completed over two weeks. Most of the 43 test items were conducted by the CTO Advisor technical specialist. However, some were undertaken by Dell Technologies engineers under our specialist's direction. Using the Dell Technologies Customer Solutions Center allowed rapid and free access to a physical VxRail system.

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The Dell Technologies Customer Solution Center was simple to use and powerful for allowing the CTO Advisor team to access real hardware. All we had to do was to describe the tests we wanted to perform, and we had remote access within 15 minutes. It was an easy interaction that allowed us to run a full array of tests with no issues..

*- Thom Greene,
Technical Consultant*

CLAIM

01

VxRail Manager simplifies day two operations

Day-to-day operational tasks are easily accomplished through the VMware vSphere client, where the VxRail Manager plugin provides context menus alongside the native VMware menu items.

These menus go beyond simply providing detailed hardware firmware, driver versions, and health, providing guidance such as optimal vSAN disk layout based on the installed hardware in the cluster. This centralized control plane also provides a marketplace of Dell EMC solutions that integrate with VxRail Manager and complete management within the vSphere client. For example, RecoverPoint integrates with VxRail Manager and vSphere to

provide VM data-protection management from within the vSphere client. VM's backups can be scheduled and monitored by IT staff using the same tool that they use to manage and monitor VM configuration and performance. Fewer tools mean less context switching, more productivity and more consistency.

Everyday support tasks are accomplished through the single console, including logging support tickets when issues arise. From the same vSphere client and VxRail plugin, an engineer can log the ticket and gather the VxRail support bundle, plus all hardware configuration and driver versions to enable rapid root cause identification and remediation. Less engineer time spent marshalling this data together translates into a shorter time to resolution and less system impairment or downtime.

CLAIM

02

VxRail delivers multi-cluster global management

VxRail exclusively includes SaaS multi-cluster management providing unique features that are not available on vSAN Ready Nodes or traditional 3-tier virtualization architecture.

MyVxRail is the web console that customers use for multi-cluster global management. The MyVxRail portal allows customers to consolidate their VxRail clusters into a single management view with a global map of all deployed clusters. The web console includes health management which shows aggregate health across clusters and drills down data into specific physical nodes and VMs. The console provides performance anomaly detection and event reporting across clusters in addition to health.



The Global View

The global view is beneficial for planning cluster consumption and capacity and selecting the right location to deploy new workloads.



The Unified View

This unified view is great for troubleshooting performance issues within a cluster or across multiple global VxRail clusters.

The resource usage of individual VMs is visible, and VMs that are consuming a lot of resources are immediately visible. Upgrades are a fact of life for operations teams, and SaaS multi-cluster management provides a unified view across clusters and allows upgrades to be initiated for clusters.

Upgrades apply in a single action and include vSphere, vSAN, vCenter software, drivers, firmware, and microcode on all the adapters in the servers. Reliable and straightforward upgrade processes benefit IT operations teams with less research and upgrade orchestration planning to do and business application owners as the updates do not cause application outages. This upgrade management feature might be sufficient reason to pay the extra license to use SaaS multi-cluster management even for environments with only a single VxRail cluster. And multi-cluster active management allows you to actively manage and execute updates for multiple VxRail clusters from a central location for a more efficient upgrade process.

“

VxRail SaaS multi-cluster management enables a single-pane-of-glass view of the entire infrastructure. Our current workflow requires checking our VMware monitoring tool, the hardware management system, and some custom scripting to pull deeper detail about the problematic virtual machines and hosts. Using the SaaS Management tools, we can see all the detail we need, and it would help resolve issues more effectively.

- Thom Greene,
The CTO Advisor, Technical Consultant

CLAIM | **03** VxRail RESTful API enable custom automation

The RESTful APIs on a VxRail system allow access to detailed node health and cluster state information and version information for firmware, driver, and code.

The APIs focus on day-2 operations, although it also supports initial deployment tasks such as cluster creation. The APIs can report various health, version, and update status information for the servers and virtual appliances that make up the VxRail platform. You can use the APIs to generate a support bundle for the entire cluster or retrieving Knowledge base articles. There are a set of capabilities to update whole clusters and monitor the update status, which simplifies upgrading from one VxRail platform build to the next even across multiple clusters. An API for operational tasks will appeal to automation-focused vSphere teams, particularly in a DevOps-focused organization. In these organizations, manual change is frowned upon, and version-controlled scripts or declarative configuration tools are preferred.

While an API is an excellent start to automation, language-specific Software Development Kits (SDK) enable far more efficient use of the API. VxRail has a PowerShell module (an SDK) that provides rapid access to cluster information and operations. PowerShell is one of the most common systems operations automation languages for vSphere due in part to the VMware PowerCLI SDK for PowerShell. With these two SDKs, reporting scripts that query vSphere can also query VxRail and combine data from both into a single report. Equally, PowerShell scripts that are run in response to faults could gather support bundles from both vSphere and VxRail to submit with a support call.

```

curl_easy_setopt(curl, CURLOPT_FOLLOWLOCATION, 1L);
if (code != CURLE_OK) {
    fprintf(stderr, "Failed to set redirect option [%s]\n",
            curl_easy_strerror(code));
    return false;
}
code = curl_easy_setopt(curl, CURLOPT_WRITEFUNCTION,
                        curl_write);
if (code != CURLE_OK) {
    fprintf(stderr, "Failed to set writer [%s]\n",
            curl_easy_strerror(code));
    return false;
}
code = curl_easy_setopt(curl, CURLOPT_WRITEDATA,
                        (void *)writeBuffer);
if (code != CURLE_OK) {
    fprintf(stderr, "Failed to set write data [%s]\n",
            curl_easy_strerror(code));
    return false;
}
code = curl_easy_perform(curl);
if (code != CURLE_OK) {
    fprintf(stderr, "Failed to create CURL connection [%s]\n",
            curl_easy_strerror(code));
    return false;
}
code = curl_easy_getinfo(curl, CURLINFO_RESPONSE_CODE, &statusCode);
if (code != CURLE_OK) {
    fprintf(stderr, "Failed to get response code [%s]\n",
            curl_easy_strerror(code));
    return false;
}
if (statusCode == 200) {
    fprintf(stderr, "Success: %s\n", writeBuffer);
} else {
    fprintf(stderr, "Error: %s\n", writeBuffer);
}
return true;
}

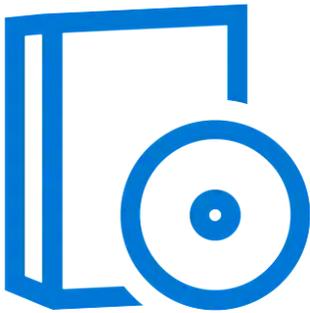
Context *context = (Context *)voidContext;
if (COMPARE(char *name, "TITLE")) {
    context->title = name;
    context->addTitle = true;
}
(void) attributes;
// libxml and element callback function
static void EndElement(void *voidContext,
                       const xmlChar *name) {
    Context *context = (Context *)voidContext;
    if (COMPARE(char *name, "TITLE")) {
        context->addTitle = false;
    }
}
// Text handling helper function
static void handleCharacters(Context *context,
                             const xmlChar *chars,
                             int length) {
    if (context->addTitle) {
        context->title.append((char *)chars, length);
    }
}
// libxml PCDATA callback function
static void Characters(void *voidContext,
                      const xmlChar *chars,
                      int length) {
    Context *context = (Context *)voidContext;
    handleCharacters(context, chars, length);
}
static void onData(void *voidContext,
                   const xmlChar *data,
                   int length) {
    Context *context = (Context *)voidContext;
    handleCharacters(context, data, length);
}

```

CLAIM | 04 *Ecosystem connectors enable automation across the entire stack*

The VxRail ecosystem connectors allow further management to be integrated into VxRail Manager, extending the reach of the integration with the VMware vSphere client.

It is a set of ecosystem connectors that enable the SaaS multi-cluster management console to retrieve VM resource and performance data for the holistic performance map. Other Dell Technologies products, such as Dell EMC RecoverPoint, use ecosystem connectors to integrate more aspects of VM or infrastructure management into VxRail manager and the vSphere client. The vSphere console is the main point of control; however, the connectors allow bidirectional connectivity, so the native tools in solutions such as RecoverPoint can still be used.



An example of the ecosystem connectors is the Dell EMC SmartFabric connector which integrates physical switch management into VxRail Manager and vSphere. Matching the physical switch configuration to the vSphere virtual switch configuration is an essential part of reliable VM networking, so allowing the vSphere switch configuration to drive physical switch configuration will reduce network issues. Managing the physical switches from inside vSphere brings software-defined network benefits to VxRail deployments that do not include VMware's NSX SDN. The SmartFabric

connector does require compatible switches and only manages the switches directly connected to the VxRail hosts. The SmartFabric was previously only aware of the physical servers connected to each port, and now it has visibility into the vSphere Distributed vSwitch. Once enabled, new or replacement physical switches are automatically configured, and new portgroups on the vSphere distributed switch are automatically created and trunked on the physical switches. The integration of SmartFabric enables more autonomy for the vSphere team, less time spent troubleshooting network issues or waiting for networks to be provisioned by the network team. The network team continues to be responsible for connectivity beyond the vSphere servers to other data center resources,

CLAIM | 05 *Reduce Risk with the Electronic Compatibility Matrix*

One significant part of the value of VxRail is certainty and simplicity around infrastructure updates and upgrades.

The electronic compatibility matrix provides confidence around the compatibility of physical hardware, firmware, and drivers before upgrades are deployed to clusters. The integration of the compatibility matrix into the upgrade process removes the possibility of human error leading to an unexpected incompatibility. The result is that VxRail Infrastructure maintains a continuously validated state, ensuring reduced risk as updates and upgrades are deployed and less platform downtime. In discussion with Dell EMC, Dell EMC claims the electronic compatibility matrix is unique to VxRail because of what the Dell EMC

has validated for VxRail. The outstanding value is in the automation of the validation of every iteration of upgrade paths so you can choose the desired state for your compliance purposes. This eliminates the need to manually look up each component, which could consume a senior engineer for hours for each server configuration or possibly months for a large vSphere deployment. With many similarly named items, it is very easy to miss a note on a single component where compatibility changes between vSphere versions and end up with problems during the upgrade. The electronic compatibility matrix system uses the VxRail inventory to identify and validate all components before upgrades begin.



CLAIM

06

VMware Cloud Foundation and VxRail Are Better Together

There is a natural synergy between VxRail and VMware Cloud Foundation (VCF); each simplifies the management of a separate layer of IT infrastructure.

Dell Technologies and VMware joint engineering provides deep integration between VCF and VxRail for deployment and operational tasks. At the start of VCF deployment, the Cloud Builder VM offers the options of a standard VCF deployment or a VCF deployment on VxRail. If the VxRail option is taken, the VMware SDDC manager integrates with the VxRail manager to share information and responsibilities. For example, when the SDDC Manager deploys updates to VxRail ESXi hosts, it delegates to the VxRail manager to orchestrate the Dell EMC managed components. SDDC manager ensures that updates are deployed in the correct order with the ESXi upgrade from the SDDC manager.

Similarly, when a customer deploys a new VxRail cluster, the VxRail Manager makes the hosts available directly in SDDC manager to be added to a workload domain. There are no other hardware platforms with this level of embedded support in VCF. With other plat-

forms, the deployment of ESXi hosts is entirely separate from the addition to VCF. Driver and firmware updates are also managed separately from the vSphere updates in the SDDC manager. The combination of VxRail and VMware Cloud Foundation provides a unified platform for vSphere cluster deployment and operation.



“

The idea of deploying the full VMware SDDC experience in our datacenter is appealing but the amount of expertise required to get it up and running makes us wonder if it's worth it. VCF and VxRail's integration means that someone else has done the heavy lifting of automating NSX-T, vSAN and vSphere deployment. Knowing that someone is testing the vSphere updates against the VxRail hardware gives us the peace-of-mind to run updates without spending weeks or months researching each individual component.



Alternative Dell Technologies Platforms

While the VxRail platform and its integration with VCF are compelling, they may not fit every requirement. There are a variety of ways that Dell Technologies can deliver vSphere and vSAN or VMware Cloud Foundation, depending upon how much integration engineering you want to provide and how much is provided by Dell Technologies.

Least integrated, but most flexible are a whole portfolio of best-of-breed Dell Technologies components; storage, Intel Xeon Scalable CPU-based servers, adapter cards, and switches. Customers can engineer these best-of-breed components into their

DELL Technologies

own specialized vSphere platform, with or without vSAN and VCF, to fit their specific needs. For a business that wishes to deploy a hardware combination that Dell Technologies certifies, there are vSAN Ready nodes, validated bundles of their best-of-breed servers and components. Dell Technologies developed vSAN Ready nodes guarantee component compatibility and support and provide a rapid path to deploy a vSphere cluster with vSAN for customers who want to deploy their own clusters. VxRail is the next step of engineering, a hardware and software package for simple deployment and ongoing operations with vSphere and vSAN. Adding VCF to VxRail brings an engineered software-defined data center solution on top of VxRail's engineered vSphere. It is excellent for customers that want to focus on their VMs on a large scale rather than spending a lot of time on the underlying layers. For customers who do not want to manage the underlying layers at all, there is the VMware Cloud on Dell EMC, a fully managed vSphere platform as a service in your datacenter.



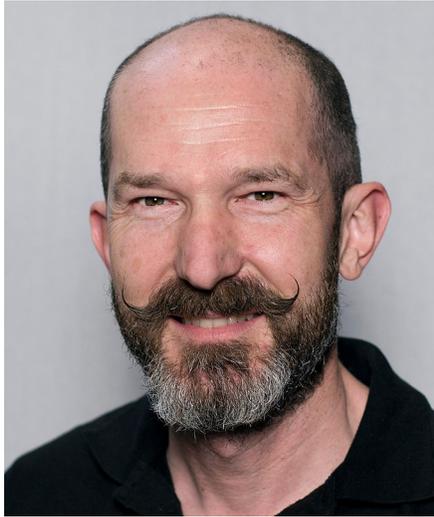
Conclusion

Our hands-on time with the VxRail Manager and the surrounding VxRail HCI System Software features definitely confirmed tight integration and a focus on simplifying day-to-day operations.

The integration enables project, operations, and performance management teams to be more productive. The extensive coverage allows simpler issue handoff between different teams as system identities and tools are the same for the teams. For an operations team, the highlight is the ability to far extend the functionality of the vSphere console with VM-centric management. The project implementation team will benefit from rapid, highly automated vSphere cluster deployment through VxRail integration with VCF. It allows focusing on the unique part of any deployment rather than repetitive and generic deployment tasks. SaaS multi-cluster management provides broad-reaching insight for system reliability engineers and performance management and capacity planning at scale.

Hyperconvergence started with simple deployment, allowing a focus on the VMs that deliver applications. The integration between VxRail and datacenter technologies from both Dell Technologies, VMware and Intel extends this simplification to enterprise scale. Many of the routine tasks and research that every customer must perform in the same way have been automated to it required minimum effort. Instead, the action is focused on the elements unique to each customer, delivering more business differentiating value for each customer.





Alastair Cooke

CTO Advisor Analyst

Alastair Cooke is an independent industry analyst who has been writing about the challenges and changes in the IT industry for over ten years. IT infrastructure, Virtualization, end-user compute, and Public Cloud technologies are all focus areas. Alastair started his thirty-year career as a hands-on technical consultant including for global companies such as Glaxo Wellcome and VMware, as well as smaller New Zealand based companies. The second half of his career has been as a technical trainer and content creator, making video and writing about enterprise IT topics. As a Trainer, Alastair has taught courses for VMware, HPE, Nutanix, and AWS. Alastair is a host of Build Day Live, hands-on video education with enterprise IT vendors such as HPE, Dell Technologies, Pure Storage, Oracle, Supermicro, Cohesity, and NetApp.