VxBlock Central Workflow Automation: Enabling an Agile Infrastructure

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White Paper

Abstract

VxBlock Central Workflow Automation supports organizations that want to accelerate IT operations through infrastructure automation but are concerned about the challenges and maintenance overhead of internal automation approaches. This paper discusses the use cases and opportunities for automation within the data center and how VxBlock System automation can dramatically reduce data center management overhead.

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Executive summary

The rapidly evolving, modern business environment places a significant change-management burden on IT teams. These teams are tasked with delivering infrastructure and applications at a dramatically accelerated pace.

Virtualization and automation can be a fundamental response to these business challenges. However, building meaningful automation can be complex and time consuming. The initial development cost can be significant, and the cost of maintenance fueled by the challenge of responding to an evolving infrastructure landscape can quickly erode the initial value of internal automation programs.

Some of the maintenance challenge can be addressed through careful analysis to determine what tasks should be automated. Some tasks are insufficiently frequent or time consuming to warrant the development and maintenance effort.

However, after completing such analysis, IT organizations often conclude that while automation would be beneficial and potentially transformational, the ongoing sustaining effort is too significant to ignore. The final automation might be more complicated than the task that it was created to address.

The challenge, therefore, is to determine how to benefit from the power of automation while simultaneously addressing the maintenance issue.

Dell EMC VxBlock 1000 is a leader in converged infrastructure (CI), providing enterprises worldwide the simplicity of a turnkey engineered system experience that allows them to focus on innovating rather than spending time on maintenance.

For VxBlock System 1000 administrators, VxBlock Central has made the promise of automating and managing the infrastructure a reality. VxBlock Central provides a single unified interface and access point for CI operations. It dramatically simplifies daily administration by providing enhanced system-level awareness, automation, and analytics. VxBlock Central includes launch points to VMware vRealize Orchestrator with workflows for automating daily operational tasks and to vRealize Operations for deep VxBlock analytics and simplified capacity management. These advanced automation and management capabilities are available at no cost to current and future VxBlock customers.

This paper reviews the challenges and opportunities of automation and describes a set of automation tools and capabilities that allows IT administrators to accelerate IT infrastructure deployment and optimize system utilization.

Acknowledgments

Automation use case

Data centers today are complex entities with a wide range of technology products that require considerable effort to maintain and operate. According to studies by both IDC and Gartner, this complexity reaffirms the notion that the cost of infrastructure acquisition is only a small part of the total cost of operating and maintaining that asset through the years.[1] Indeed, operating expenses can be up to three times more than the cost of acquiring the infrastructure assets, as shown in the following figure:
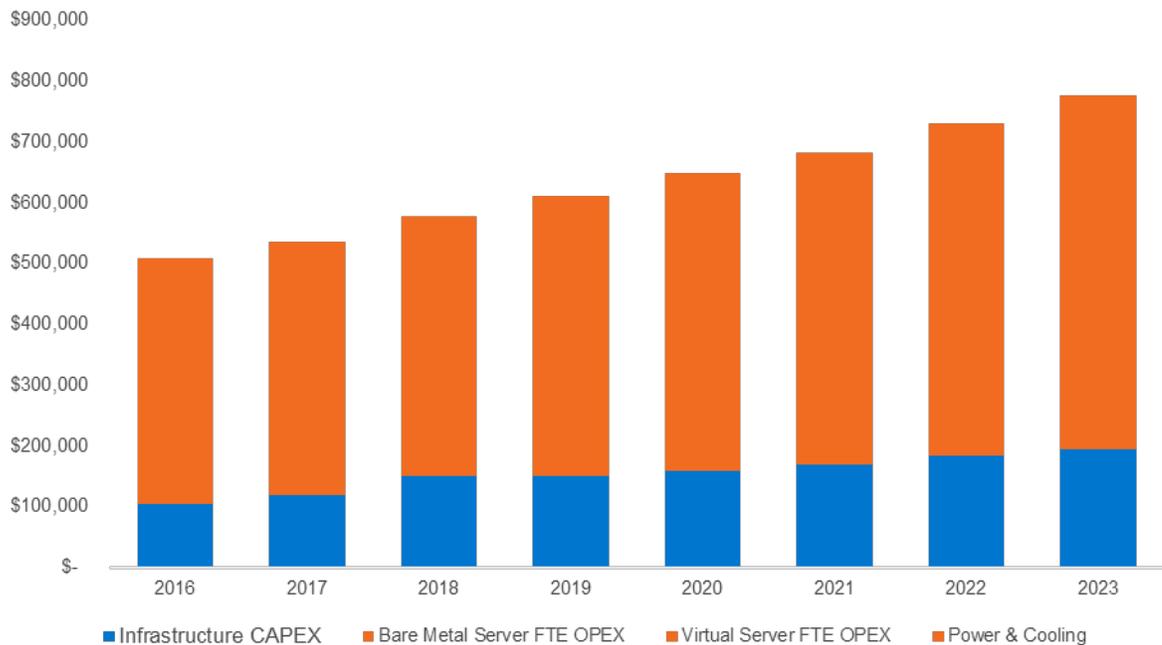
Figure 1.   Data Center infrastructure and power ratios and costs[2]

One way to reduce these operational costs is through infrastructure automation. Regardless of the industry vertical, company size, or geography, investments in automation are occurring today, and Dell expects that those investments will double in the next 2 to 3 years.

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[1] Infrastructure & Power - IDC, Admin ratios and costs – Gartner, Analysis and Interpolation: ISG S&P

[2] Data Center Automation Trends, an internal Dell Technologies sponsored survey of more than 200 customers worldwide
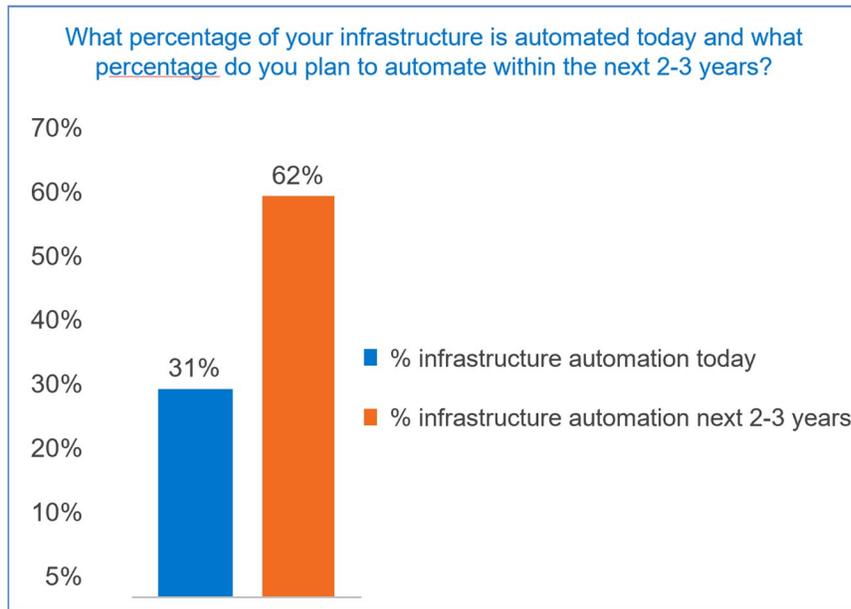
Figure 2.   Percentage of IT infrastructure automation—current and near future, per survey of more than 200 Dell Technologies customers

The reduction of repetitive tasks through automation is becoming an essential priority. IT budgets dedicated to automation are increasing year by year, growing to almost a third of the global IT budget for many companies worldwide over the next few years.[3]
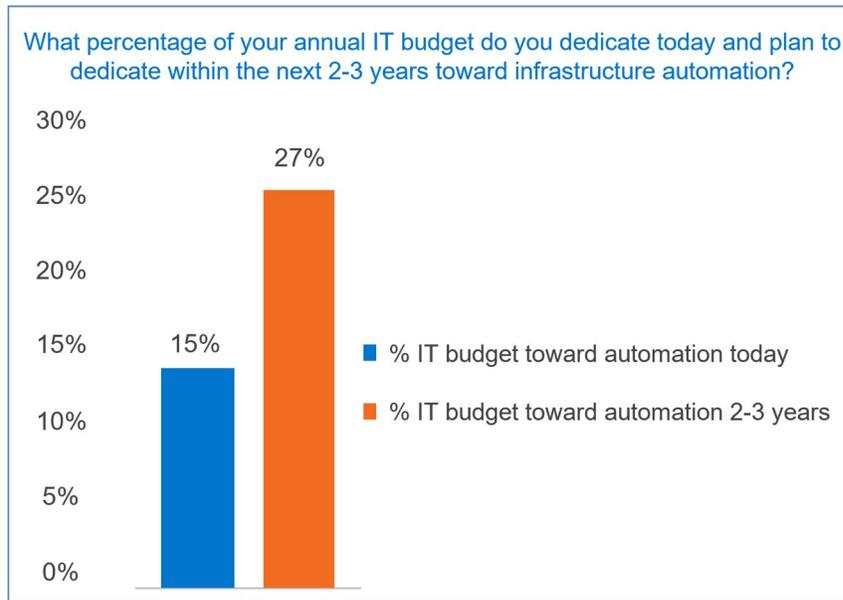
Figure 3.   Percentage of annual IT budgets for automation—current and near future, per survey of more than 200 Dell Technologies customers

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[3] Data Center Automation Trends, an internal Dell Technologies sponsored survey of more than 200 customers worldwide

Infrastructure automation does not only save time, but it creates higher-quality outcomes, with fewer errors and more secure operations. As with any other core data center projects, automation efforts must be planned, built, tested, and maintained over time. These efforts require a well-designed strategy along with a wide range of skills, tools, and technologies.
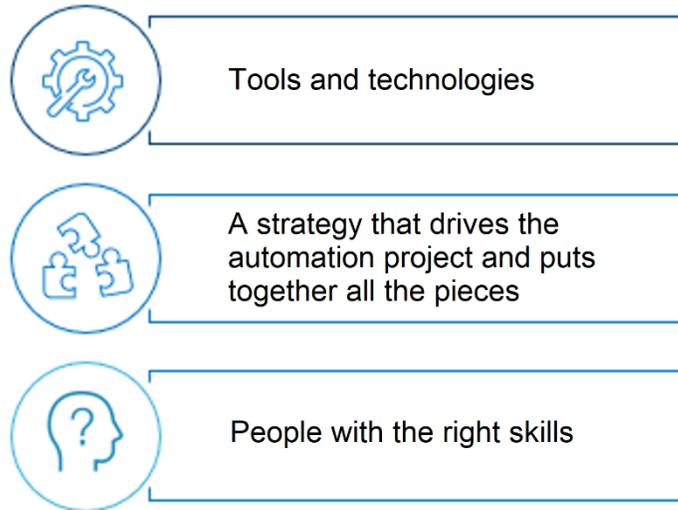
Figure 4.   Automation requirements

VxBlock Central Workflow Automation provides the framework that IT departments need to develop and implement their automation strategy.

Automation decision point

Not all tasks should be automated. If a task is completed infrequently or requires minimal effort, it is unlikely that automation will add significant value.

How long can you work on making a routine task more efficient before you are spending more time than you can save?

The following matrix outlines how much time is consumed when tasks are completed multiple times over a period of five years. A task that takes a day to complete can seem significant. However, if it is completed once a year, it might not be a candidate for automation. A task that is completed five times a day and takes 1 hour to complete consumes 10 months of effort over 5 years. Such a task is an obvious candidate for automation.

How often you do the task (across 5 years)

	50 / Day	5 / Day	Daily	Weekly	Monthly	Yearly
1 Second	1 Day	2 Hours	30 Minutes	4 Minutes	1 Minute	5 Seconds
5 Seconds	5 Days	12 Hours	2 Hours	21 Minutes	5 Minutes	25 Seconds
30 Seconds	4 Weeks	3 Days	12 Hours	2 Hours	30 Minutes	2 Minutes
1 Minute	8 Weeks	6 Days	1 Day	4 Hours	1 Hour	5 Minutes
5 Minutes	9 Months	4 Weeks	6 Days	21 Hours	5 Hours	25 Minutes
30 Minutes		6 Months	5 Weeks	5 Days	1 Day	2 Hours
1 Hour		10 Months	2 Months	10 Days	2 Days	5 Hours
6 Hours				2 Months	2 Weeks	1 Day
1 Day	Time saved due to automation over **5 years**				8 Weeks	5 Days

Time spent on the task (vertical axis label)

Figure 5.   Time spent to complete tasks and time saved through automation

This evaluation of tasks is fundamental to any determination about automation. It should be the starting point to any conversation about automation and should be completed before any evaluation of the automation options. Completing this analysis allows the organization to fully determine the scope of internal development efforts. It also allows an organization to determine whether vendor-provided software solutions such as VxBlock Central Workflow Automation will provide sufficient value to justify an investment in those solutions.

Build versus buy

Many organizations have invested in in-house automation. This investment has allowed them to see task-level time savings, optimized workflows, and streamlined resource allocation. However, automation that is developed in-house comes with an embedded cost that can erode the initial savings. The cost of managing and updating automated workflows to allow for new firmware and software can be substantial and is not always considered in an initial cost estimate for automation.

The decision to develop internal workflows is a valid one. It allows the organization to maintain control and use internal knowledge to develop customized workflows that are optimally aligned to the organization's specific use cases.

However, that internal approach also comes with limitations. Flexibility is assured, but at a substantial maintenance cost and with additional hidden costs that might not always seem

obvious. Engineering teams such as the one that develops VxBlock Central Workflow Automation have the support of an extensive, multifunctional organization to ensure that all aspects of the software are fully considered. Scalability, governance, and security risk assessments are part of the overhead of workflow development. These assessments add substantial cost to the development life cycle and can be challenging to manage within the context of customized automation projects. Thousands of engineering hours are spent developing and refining best practices and procedures for the VxBlock Central Automation, ensuring predictable and supported outcomes.

The following figure compares VxBlock Central Workflow Automation with in-house automation based on Dell EMC VxBlock 1000 customer feedback. The figure shows key areas in which VxBlock Central Workflow automation can provide improved outcomes.

	VxBlock Central Workflow Automation	In-house automation
Ability to scale	🟢	🟡
Service assurance	🟢	🟢
Time savings	🟢	🟢
Managed sustaining costs	🟢	🟡
Governance	🟢	🟡
Deterministic outcomes		🟢
Security risk management	🟢	🟡

Figure 6.   Comparative analysis of VxBlock Central Workflow Automation and In-house software automation

VxBlock Central Management and Operations software

One of the challenges of delivering a repeatable automation experience is aligning to a software stack that is familiar and compatible with the existing software landscape. VxBlock System 1000 is supported by software that aligns with leading virtualization, management, orchestration, and life cycle management products.

VxBlock Central Management and Operations software is licensed in a modular way, as shown in the following figure. The modules are available at no cost to current and future VxBlock customers.
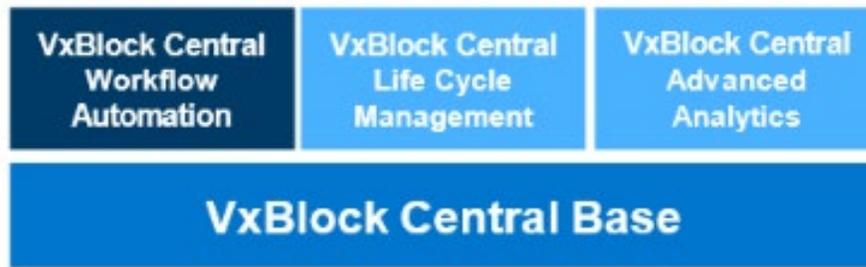
Figure 7.   VxBlock Central Management and Operations software modules

- The **Base** module allows for VxBlock systems management with inventory reporting and alerting, integrated with Dell EMC CloudIQ software.

- **Workflow Automation** provides on-demand infrastructure provisioning using engineered workflows through vRealize Orchestrator.

- **Life Cycle Management** enables applying modular/component-level upgrades through guided-path workflows to optimize system performance.

- **Advanced Analytics** allows you to view capacity and KPIs to discover deeper actionable insights in vRealize Operations.

VxBlock Central Workflow Automation architecture

VxBlock Central Workflow Automation architecture encompasses three tightly coupled building blocks—VxBlock Central, VxBlock Central Orchestration Services, and VMware vRealize Orchestrator—that provide end-to-end automation assurance. The combination of these components allows for the delivery of not just individual workflows, but a holistic experience that is consistent, repeatable, and robust.

- **VxBlock Central** provides a single unified interface and access point for CI operations. It provides the foundation for our VxBlock Central Orchestration and Automation operations by collecting all the required data from each individual VxBlock System component and passing it along for consumption by VxBlock Central Orchestration Services.

- **VxBlock Central Orchestration Services** works as a centralized authentication and database server by integrating with VMware vRO and VxBlock Central server. It hosts the micro services which are responsible for communicating with the end devices and provides the relevant data VMware vRO required to build the orchestration layer.

- **VMware vRealize Orchestrator** is a process and development automation platform that enables users to create and run automated, configurable processes to manage both VMware and third-party technologies. vRealize Orchestrator is also packaged and licensed with VMware vCenter Server and requires no additional cost to customers. VxBlock Central Workflow Automation uses vRealize Orchestrator and its workflow engine to intelligently configure, automate, and orchestrate the delivery of storage, network, and compute at the virtual infrastructure layer and the physical layer based on customer requirements. Integration of VxBlock Central Workflow

Automation with vRealize Orchestrator keeps the operating environment simple, extensible, and consistent.

The following figure illustrates how the components of VxBlock Central Workflow Automation integrate and align with the overall VxBlock Central software landscape:
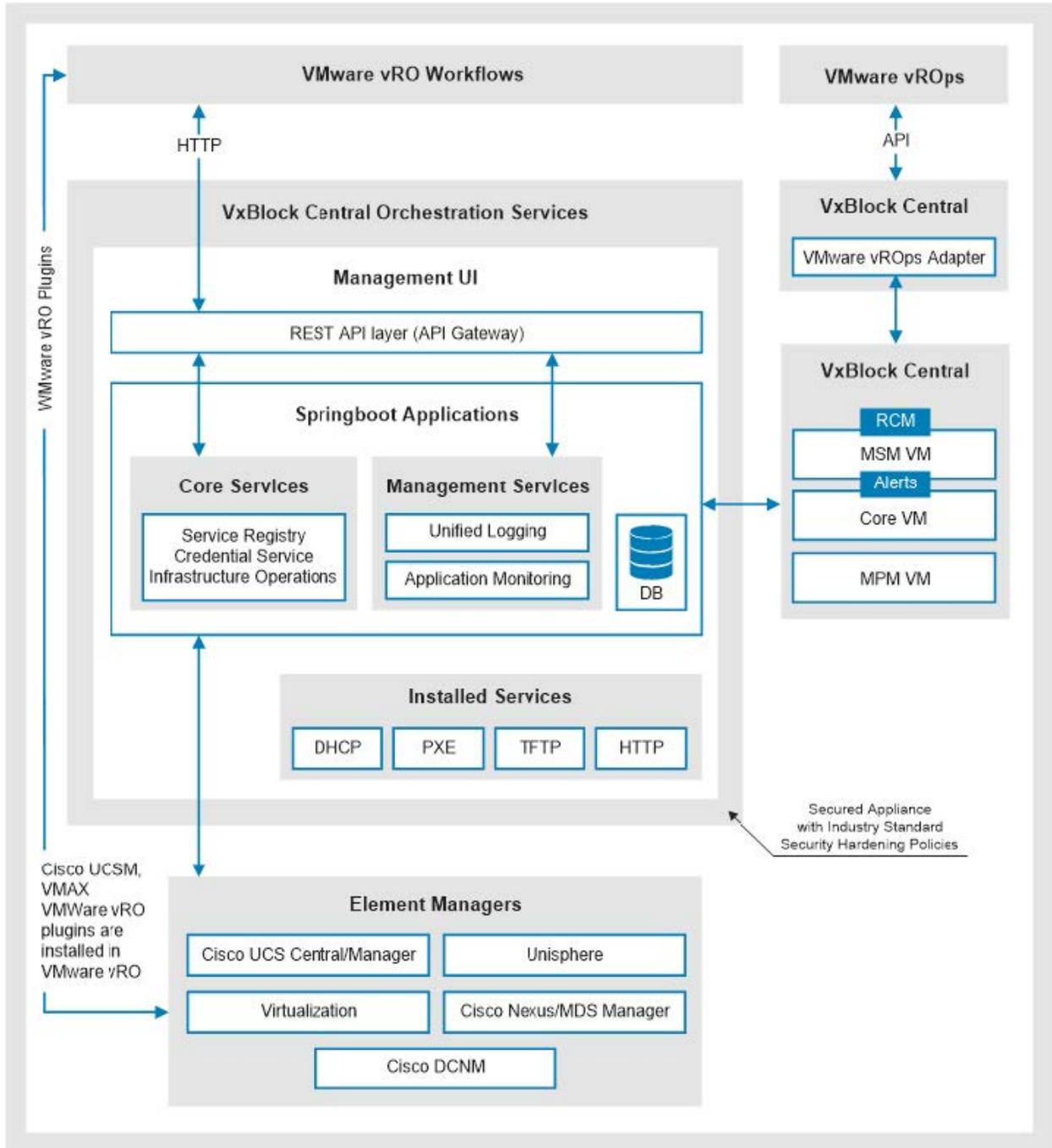

Figure 8.   VxBlock Central Workflow Automation architecture

Delivering results—operational expense reductions

Long-touted automation benefits such as simplicity, speed, agility, and consistency might seem remote and unrealistic. However, at Dell Technologies, we have translated our decades of experience in building converged systems for customers into a software architecture that delivers on the promises of automating and orchestrating converged operations. We have validated and tested VxBlock Central Workflow Automation—both within development environments and in customer deployments—and gathered data on operational processes that were automated.

To determine the impact of automation in specific delivery scenarios, we completed several comparison tests. The following table indicates the impact of automation for several critical administration tasks:

Table 1.   Automation impact on key administration tasks

Workflow	Description	Operational improvement
Provision host (ESXi) SAN boot (PowerMax)	Using an automated workflow for compute capacity expansion, IT administrators can complete a 5-blade expansion in an estimated 45 minutes. Completed manually, this process can take one day to complete.	• Before automation: 11 steps, 5 tools • After automation: 1 step, 1 tool
Create a storage volume and datastore for ESXi host/cluster (PowerMax)	Using an automated workflow to add storage resources, IT administrators can provision 30 storage volumes to an existing vSphere ESXi cluster in approximately 6 minutes. Without automation, this process can take up to 80 minutes.	• Before automation: 6 steps, 3 tools • After automation: 1 step, 1 tool
Create a LUN and datastore; move VMs to new datastore (PowerMax)	Using an automated workflow to create a storage LUN and datastore, and move VMs, IT administrators can migrate 50 virtual machines to the newly provisioned storage in approximately 6 minutes. Without automation, this process can take up to 2 hours to complete.	• Before automation: 10 steps, 3 tools • After automation: 1 step, 1 tool

These benchmarks illustrate how VxBlock Central Workflow Automation can dramatically reduce the time that is spent on completing compute capacity expansions on converged systems by eliminating the manual steps and reducing the number of tools required.

One of the most common requirements of IT is to expand on infrastructure assets, whether to support new applications, improve the performance of existing applications, or increase the number of users or application instances. In a VMware virtualized environment, this business need directly translates to provisioning ESXi hosts and storage volumes.

Usually, various stakeholders must address this business need. VMware administrators require spare physical resources to provision the new hosts. Those administrators probably have to ask the storage administrators to create space for new volumes, and network administrators have to manage the new entities. Automating these tasks, which would reduce the number of steps and IT staff involved to complete the operation, would significantly reduce complexity.

The VxBlock Central Workflow Automation library provides the means for automating the tasks. The following figure illustrates the steps that are automated by the **Provision host (ESXi) and add host to cluster - SAN boot** workflow:
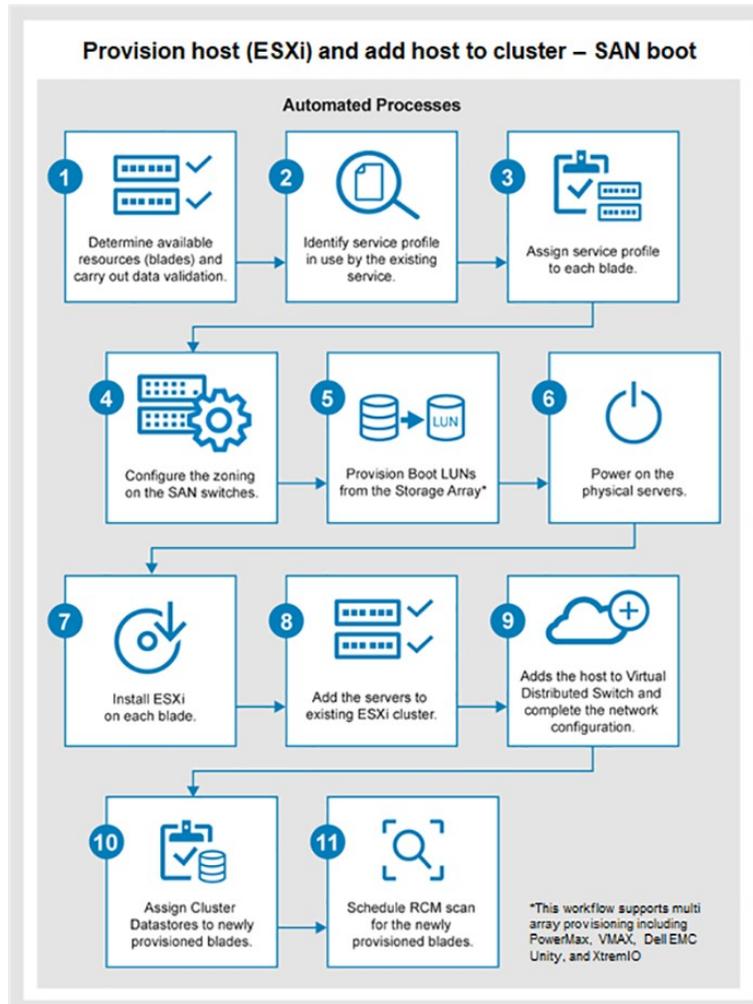
Figure 9.   Automating provisioning a host and adding it to a cluster

VxBlock Central Workflow Automation library

CI architects and engineers develop and maintain the VxBlock Central Workflow Automation library based on CI best practices. New workflows are added regularly to this living library. Drop-down menus make complex orchestration simple, repeatable, and fast.

The library is built based on customer needs regarding time-consuming daily tasks. When we identify new use cases that represent a universal need for all customers, we can quickly add new workflows to the library. This innovation journey will continue to deliver operational innovation that delivers orchestration, automation, and life cycle management for all VxBlock customers.

As shown in Figure 9, the VxBlock Central Workflow Automation library includes workflows in the following categories:

- Compute/Host Management

- Storage Management

- Snapshot Management

Compute/Host Management

VxBlock System 740/1000 (PowerMax/VMAX)
- Provision ESXi cluster
- Provision ESXi hosts – PowerMax/VMAX boot
- Provision bare metal server – Cisco UCS
- Add host to vSphere cluster
VxBlock System 350/1000 (Unity)
- Provision ESXi hosts – Unity boot
VxBlock System 540/1000 (XtremIO X2)
- Provision ESXi hosts – XtremIO boot
- Provision ESXi cluster

VxBlock System 350/540/740/1000
- Provision ESXi hosts – SD Boot
- Move ESXi host from cluster to cluster
- Provision bare metal server – SAN boot
- Remove host from production cluster
- Create new service profile template
- Create datastore cluster with configuration
- Remove VMFS datastores from datastore cluster
- Add VMFS datastores to datastore cluster
- Create VDS and default port groups

Snapshot Management

VxBlock System 740/1000 (PowerMax/VMAX)
- Create snapshot of storage group
- Rename snapshot of storage group
- Delete snapshot of storage group
VxBlock System 350/1000 (Unity)
- Create snapshot of block LUN
- Export Snapshot of block LUN to a host
- Delete snapshot of block LUN

Storage Management

VxBlock System 740/1000 (PowerMax/VMAX)
- Create storage volume and VMFS datastore for ESXi cluster/host
- Expand storage volume and increase VMFS capacity of existing datastore
- Remove VMFS datastore and associated storage volume
- Delete VMFS datastore and associated storage volume
- Add datastore to existing ESXi cluster
- Expand block volume
- Delete block volume
- Create a new LUN and datastore; move VMs to new datastore
- Create new LUN and attach RDM to VM

VxBlock System 350/1000 (Unity/Unity XT)
- Create storage LUN and VMFS datastore for ESXi cluster/host
- Expand storage LUN and increase VMFS capacity of existing datastore
- Remove VMFS datastore and associated storage LUN
- Delete VMFS datastore and associated storage LUN
- Add datastore to existing ESXi cluster
- Create a new LUN and datastore; move VMs to new datastore
- Create new LUN and attach RDM to VM

VxBlock System 540/1000 (XtremIO X2))
- Create storage LUN and VMFS datastore for ESXi cluster/host
- Expand storage volume and increase VMFS capacity of existing datastore
- Remove VMFS datastore and associated storage LUN
- Delete VMFS datastore and associated storage LUN
- Add datastore to existing ESXi cluster
- Create a new LUN and datastore; move VMs to new datastore
- Create new LUN and attach RDM to VM

Figure 10.   VxBlock Central Workflow Automation library

Compute/Host Management workflows—Allow rapid, on-demand provisioning of compute resources to quickly respond to business needs. This folder contains workflows that automate the provisioning of a new ESXi host cluster and the provisioning of multiple ESXi hosts to an existing cluster for multi-arrays across VxBlock Systems. The folder also includes workflows for provisioning bare-metal servers. Other capabilities include automation to move compute capacity between clusters.

Storage Management workflows—Eliminate manual and repetitive storage management and administration tasks to help the operations teams rapidly provision storage resources. This folder contains workflows that allow administrators to easily scale up and down their existing storage infrastructure to meet growing needs of the business.

Snapshot Management workflows—Help automate manual and repetitive administrative tasks such as creating and deleting snapshots of existing storage groups and LUNs.

All automation workflows are downloadable to licensed users from a digitally accessible library.

Next steps in your infrastructure automation strategy

Further advancement of an automation strategy has implications for the teams that are involved, the skills and the technologies at hand, and for the organization's culture and processes.

For team members, automation represents a great opportunity to shift from a niche administration role (server, storage, network) to a more holistic data center administrator role, made possible by the introduction of virtualization and automation. This change does not have to be immediate. It can start with a small core team that gradually spreads the new technologies and operating methods to the wider team at the right pace for each company and group of individuals.

New technologies are another key component in an automation implementation strategy. The adoption of a proper automation framework, including a flexible and versatile orchestration engine, enables the operational savings and efficiency that result in rapid service delivery and increased business agility.

Culture and processes must evolve to comply with the IT transformation needs. Having a well-trained IT team with the right skills and technologies serves little purpose if paperwork and authorizations defeat the benefits that automation brings. We can provision a new cluster to host the latest business application in less than an hour. However, if the process of authorizing the creation of new hosts, new storage volumes, and new IP addresses or edited network rules takes a few days to complete, all the investment in new skills and technologies is pointless. As technology evolves to facilitate and automate operations, so must the accompanying processes.

Conclusion

Automation and orchestration of VxBlock System resources helps to address the business challenges involved in driving IT transformation by delivering services more quickly, at a reduced cost, while improving operational efficiency. It reduces the IT bottlenecks faced by all lines of business because less time and fewer resources are spent in managing the scaling up and down of the infrastructure.

Automation can be achieved through in-house development efforts. However, this approach is not without risks and cost.

Developed to integrate with vRealize Orchestrator, VxBlock Central Workflow Automation reduces administration overhead by providing a library of engineered workflows. CI architects and engineers develop and maintain the VxBlock Central Workflow Automation library based on CI best practices.

Integrating VxBlock Central Workflow Automation delivers:

- **Higher efficiencies**—Streamline operations by automating daily tasks.
- **Lower total cost of ownership (TCO)**—Eliminate manual operational processes and spend less time on infrastructure administration throughout the VxBlock life span.

- **Added flexibility**—Expand compute, storage, and other resources as needed with highly automated provisioning and orchestration workflows.

- **Reduced operational costs**—Avoid the significant overhead that can come with integrating automation into life cycle management processes. Dell Technologies maintains the workflows, ensuring that the latest software and firmware versions are continuously updated across the infrastructure.

- **Minimized sustaining investments**—Rely on Dell's centralized service to maintain workflows and stay current with new software versions and patches, avoiding the maintenance challenge and associated overhead.

- **Accelerated delivery**—Provide new services and applications more quickly, and reduce risk to existing services and applications when making infrastructure changes.

Related resources

Gartner's IT Automation Predictions for 2020

6 Ways the Workplace Will Change in the Next 10 Years