White Paper

# Modernizing Federal IT Infrastructure: Beyond VMware and Legacy Platforms

RGS
Rancher Government Solutions

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# RGS HCI: Secure, Mission-Ready Hyperconverged Infrastructure powered by Harvester Government

RGS HCI with Harvester Government is Rancher Government Solutions' fully supported, government-hardened implementation of the open source Harvester project, delivered as part of an integrated bundle. Designed to meet strict federal security and compliance requirements from day one, RGS HCI includes Harvester Government, a FIPS-compliant, STIG-ready hyperconverged infrastructure (HCI) solution purpose-built for mission-critical workloads.

# Legacy Systems: Compounding Challenges for Government IT

Traditional infrastructure solutions have been the backbone of government IT operations for decades. However, they often come with heavy hardware dependencies and are not built to manage both containers and virtual machines efficiently. This limitation becomes apparent as government and military operations seek to modernize their IT environments to be more flexible, scalable and cost efficient.

Legacy IT infrastructures, like VMware's vSphere/VCF, are increasingly becoming bottlenecks for organizations trying to stay competitive and responsive. The recent acquisition of VMWare by Broadcom has only amplified these challenges and drawn attention to the inherent limitations of legacy systems. Plagued by high operational costs, inefficiencies, and rigid architectures, these systems compromise scalability and security by:

## Escalating Costs

Maintenance of outdated hardware and software requires significant resources. Organizations are often burdened with increasing licensing fees and maintenance costs as these systems age, which can strain budgets and drive funds away from innovation.

## Operational Inefficiencies

Legacy systems are proving too complex to update and maintain, usually requiring extensive manual processes that increase the likelihood of errors and downtime. This complexity can reduce operational efficiency and agility, making it even more challenging to adapt to new security requirements or tech innovation and advancements.

## Lack of Flexibility and Scalability

Legacy systems often operate in silos with limited compatibility with new technologies, making integration a significant challenge. The rigid nature of these legacy systems means government and military organizations can't scale operations as quickly and efficiently as needed. This becomes problematic as government and military operations

require integration with advanced analytics and real-time data processing technologies. Because traditional infrastructures can't quickly scale up or down, they struggle to meet the demands of critical missions without significant capital investment and operational disruptions.

### Security and Compliance Risks

Legacy systems can sometimes fall short of modern security compliance standards, exposing operations to increased cyber threats. As security standards become more stringent, older systems may not receive updates fast enough to address new vulnerabilities, putting critical mission data and operations at risk.

### Forced Obsolescence and Vendor Lock-In

Many legacy systems are built on proprietary technologies that lock organizations into specific vendors. This dependency results in a lack of control over infrastructure and can force agencies into costly and unnecessary upgrades.

Many government IT teams looking to avoid vendor lock-in are looking for flexible and efficient alternatives to traditional solutions like VMware's vSphere. As government and military operations' needs grow, so does the demand for systems that can seamlessly integrate containers and virtual machines (VMs) within a unified framework.

## RGS HCI with Harvester Government: A Legacy System Alternative

Rancher Government Solutions (RGS) offers a modern alternative to legacy hypervisor systems that are holding government and military operations back. In contrast to traditional platforms such as vSphere, Harvester Government is a modern hyper-converged infrastructure (HCI) solution that is purpose-built to run containers and virtual machines under a unified management framework by using Kubernetes as the orchestrator and lifecycle management platform.

It combines all infrastructure services including block storage, software-defined networking, load-balancing, and vGPU. It is an open source solution decoupled from hardware dependencies (outside of CPU architecture requirements) and can be installed easily using a simple menu-driven ISO install or PXE-booted automated install.

Being open source and open-standards-based means Harvester Government is highly flexible in working with other open source and open-standards applications and tools, especially those that target Kubernetes environments. The power of RGS HCI with Harvester Government comes from the extensibility of Kubernetes at its core that allows it to deliver fully declarative Infrastructure As Code for any workload in any environment.

## Rancher and Kubernetes Cloud: On-prem Edge

The entire RGS stack addresses the unique needs of US Government and Military operations but maintains an open source and open-standard policy, making it exceptionally flexible and adaptable with other software. Unlike all other Rancher products, Harvester Government sits at the infrastructure layer and is natively compatible with other Kubernetes applications and tools, many of which are in our certified integration application catalog. Unlike traditional infrastructure like VMware, many of the services available can run within Harvester Government's own Kubernetes-based cluster, which drives more flexibility and functionality than legacy systems.

Harvester Government extends beyond traditional virtualization by enabling organizations to deploy and manage essential infrastructure services declaratively, using Kubernetes-native workflows. This approach consolidates VM-based and container-based workloads into a unified, operationally efficient platform.

By leveraging the underlying Kubernetes control plane, Harvester Government allows you to run core infrastructure components—such as Git servers, OCI-compliant image registries, and secrets management services—directly as components of the platform. These services benefit from native scheduling, availability, and lifecycle management, enabling consistent, secure operation without the need for external automation tooling or dedicated virtual machines. With Kubernetes under the hood, Harvester Government inherits a unified language and API that can describe all workloads, processes, and resources running within an entire environment.

With Rancher as the management plane, you enable new capabilities with an intuitive UI and power-user interfaces via the Kubernetes API, including:

- Define and manage RKE2 clusters as Infrastructure As Code (IAAC)
- Robust RBAC backend supporting different authority providers
- Powerful GitOps CI/CD tool with Fleet

## Harvester Government Architecture

Harvester Government is architecturally composed of a collection of tightly integrated, Kubernetes-native components—each responsible for a core function of virtualization, storage, networking, or management. While these components operate as individual services within the cluster, their abstraction and orchestration through the Harvester Government control plane delivers a seamless hyperconverged infrastructure experience.

- **Kubernetes Orchestration with RKE2:** At its core, Harvester Government utilizes RKE2, a hardened Kubernetes distribution, to orchestrate and manage workloads. This provides a robust and secure foundation for running both VMs and containers.

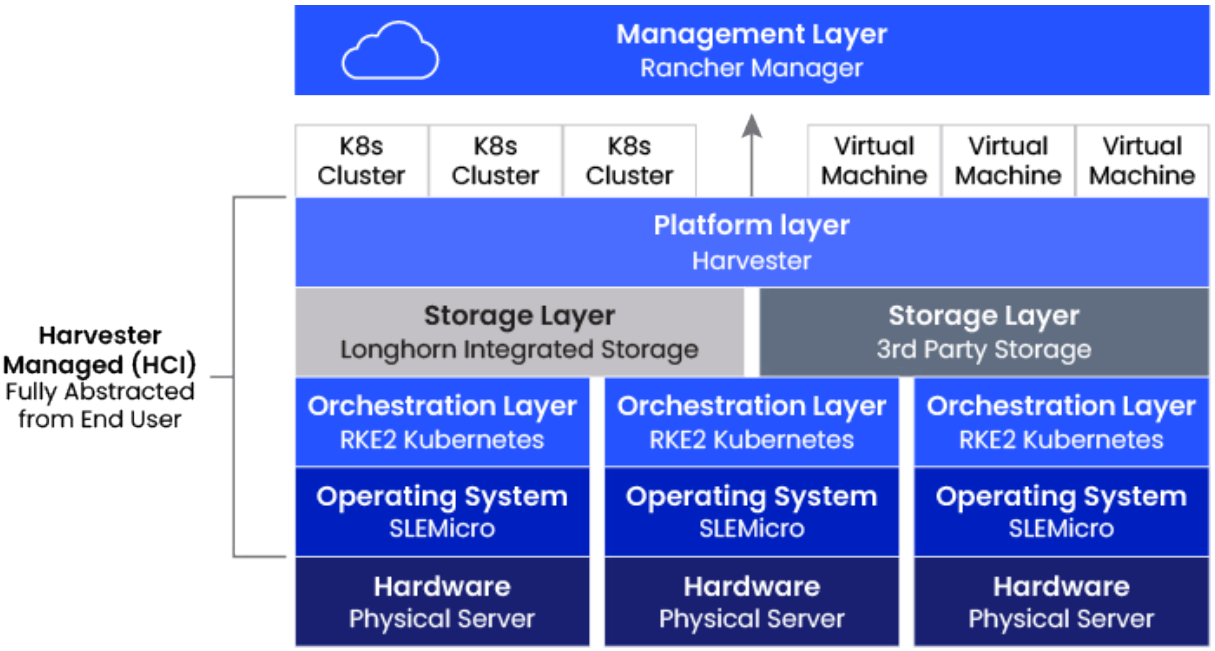
- **Virtualization with KubeVirt:** KubeVirt extends Kubernetes by adding virtualization capabilities, allowing users to run and manage VMs alongside container workloads within the same platform. This integration simplifies operations and unifies infrastructure management.
- **Storage with RGS Storage or Longhorn:** Harvester Government incorporates RGS Storage (Longhorn), a distributed block storage system, to provide scalable and reliable storage for VMs and containers. RGS Storage (Longhorn) offers features like snapshots, backups, and replication, ensuring data resilience and availability.

## Networking with Multus and Kube-VIP

- **Multus:** Enables the attachment of multiple network interfaces to pods, facilitating advanced networking scenarios and integrations with existing network infrastructures.
- **Kube-VIP:** Provides virtual IP address management and load balancing capabilities, ensuring high availability and seamless traffic distribution across services.

## Operating System with SLE Micro and Elemental

- **SLE Micro:** A lightweight, immutable operating system optimized for containerized workloads, offering enhanced security and minimal maintenance.
- **Elemental:** Facilitates the deployment and management of SLE Micro, streamlining OS provisioning and updates across the infrastructure.
- **Management with RGS Manager or Rancher Manager:** Harvester Government integrates with RGS Manager (Rancher Manager), providing a centralized management interface for Kubernetes clusters. This integration simplifies cluster provisioning, monitoring, and maintenance tasks.



# Capability Matrix

The matrix below highlights how Harvester Government delivers feature parity—and in many areas, enhanced capability—compared to VMware's VCF stack. Built on open, Kubernetes-native components, Harvester Government supports both VM and container workloads with integrated management, automation, and observability, offering a modern, mission-ready alternative to proprietary infrastructure.

| Capability | Harvester Government | vSphere |
|---|---|---|
| **Virtualization** | Kubevirt | ESXi |
| **Native Containers** | RKE2 | **Not supported** |
| **Storage** | RGS Storage (Longhorn) | vSAN |
| **Management** | RGS Manager (Rancher) | vCenter |
| **Cluster Management** | RGS Manager (Rancher) | Tanzu Mission Control |
| **RBAC** | RGS Manager (Rancher) | **Not supported** |
| **Networking** | Multus + Canal | vCenter + NSX-T |
| **Load Balancing** | Kube-VIP (L2 & BGP) | NSX-ALB (Avi) |
| **Guest Container Orchestration** | Any Kubernetes | TKGs / Workload Mgmt |
| **OS Layer** | SLE Micro + Elemental | Photon |
| **Ops Management** | RGS Manager + Fleet + Monitoring | Aria |
| **GitOps Automation** | Fleet/Flux/Argo/Tekton | Tanzu Automation |
| **Native Automation** | Fleet | **Not supported** |
| **Service Mesh** | Istio, Consul, etc. | Tanzu Service Mesh* |
| **Observability** | RGS Observability | Tanzu Observability |
| **Native APIs** | Unified and Open | Fragmented and Closed |

* *Only available within AWS multi-cloud footprint*

## The Rancher Government Solutions' Difference with RGS HCI

The U.S. Government demands infrastructure solutions that meet the highest standards for security, compliance, and air-gapped operations. Harvester Government, RGS's differentiated build of the open source Harvester project, is purpose-built to address these needs. Delivered through the RGS HCI entitlement, it combines upstream innovation with RGS's hardened software supply chain—Carbide—to provide built-in enhanced security, STIG alignment, and mission-ready reliability for high-compliance and tactical environments.

Features of RGS HCI with Harvester Government:

- FIPS 140-2/140-3 support at both Operating System & Kubernetes layer
- US-Soil built Harvester software assets and digitally signed container images with SLSA-3 Secure Supply Chain Compliance via Carbide Secured Registry
- Encryption-at-rest for Harvester VM Volumes & CSI Persistent Disks (Experimental)
- UI Improvements & Carbide Branding
- Embedded Docs for disconnected knowledge management
- Hardening and Harvester DISA STIG (In Process) compliance out of the box

*Note: The features described above are exclusive to customers of Rancher Government Solutions and are not included in the upstream Harvester releases.*

## Advantages of RGS HCI with Harvester Government for Federal Operations

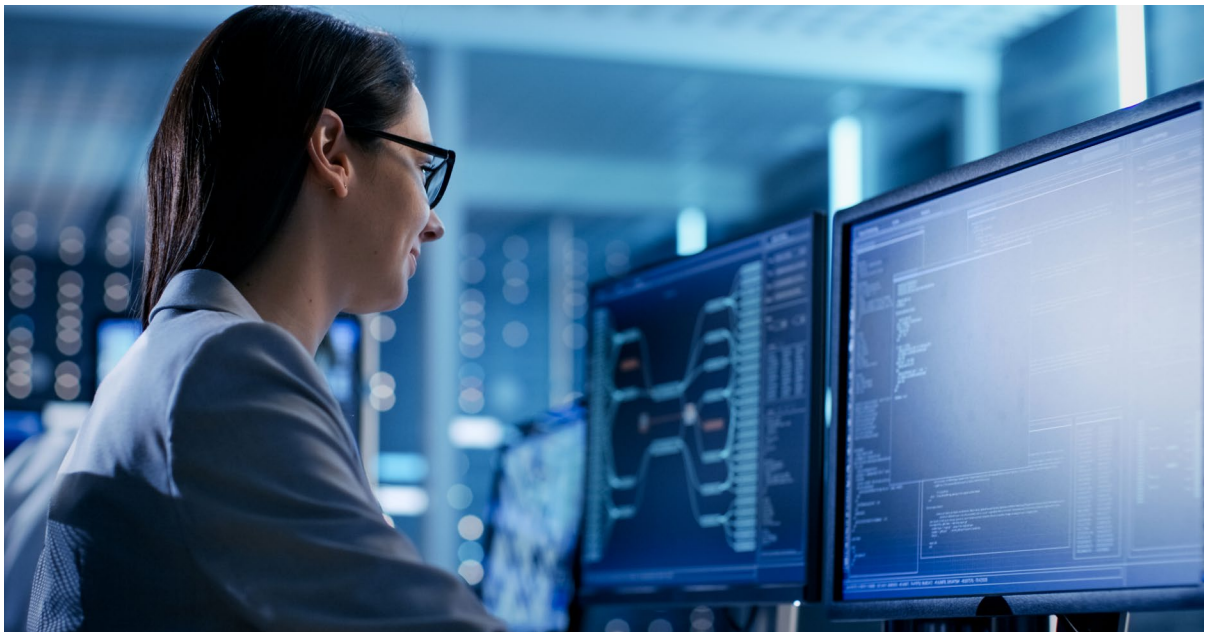
Advancements in cloud-native technologies and automation have outpaced the capabilities of many legacy systems, meaning there isn't always a direct comparison between old and new solutions. In some cases, RGS HCI with Harvester Government may lack the specific features found in traditional solutions like VMware. However, this reflects that the industry has moved toward more innovative solutions that traditional models just can't provide.

RGS HCI with Harvester Government introduces a new approach by integrating deeply with Kubernetes and offering a robust platform that excels when traditional infrastructures falter. Being open-source and adhering to open standards, RGS HCI is more adaptable in working with third-party solutions within the Kubernetes and Cloud Native Computing Foundation (CNCF) space—an area where VMware falls short.

This flexibility also extends to hardware compatibility, with RGS HCI capable of operating on a diverse range of equipment, like VxRail servers and older hardware like VxRail servers

and other, older hardware that can be repurposed instead of collecting dust in a closet. Decoupling hyperconverged infrastructure from hardware dependencies can open up the reuse of existing hardware patterns and help reduce or remove blockers from hardware procurement lead times.

Finally, standardizing infrastructure management by using Kubernetes as a universal language across all elements, whether containers or virtual machines, allows for greatly reduced infrastructure code. Reduced complexity means easier maintenance, faster upgrades, more enhancements, and faster onboarding. Transitioning to a real, modern on-prem infrastructure opens up many usage and consumption patterns for engineering and operations teams.



## Migrating to RGS HCI with Harvester Government

Unlike traditional vendors' typical rip-and-replace migration methods, migrating from VMware to RGS HCI with Harvester Government involves shifting an entire environment to run on top of a different infrastructure. While this can be a disruptive process and vary widely from customer to customer, the inherent multi-cloud capabilities of Rancher Government's suite of products, cloud-native tools, and VM migration add-ons means this process is broken down into a phased approach. Additionally, RGS HCI can coexist with vSphere environments seamlessly, making hybrid applications a feasible solution.

At a high level, we find two primary migration patterns with customers: VM migration and container migration. Knowing the functionality of the workloads is essential in cutting through the confusion.

As with all things Rancher Government, Kubernetes is under the hood, making the level of automation achievable without the UI involved in the process very high. Automated migration of similar workloads can also be an easy process when using automation tools and scripts that leverage Rancher and Kubernetes APIs.

## VM Migration

Migrating VMs from vSphere to RGS HCI with Harvester Government is straightforward, with a specific add-on tool crafted and curated for this exact use case—the VM Import Controller. When installed, this add-on tool can peer into your vSphere environment to fully migrate your VM and attached volumes into RGS HCI.

As part of this migration, you can define the mapping of vSphere-based networks to RGS HCI networks. Once the VM has been migrated to RGS HCI, you can export and save it to a base image that can be replicated or tied into infrastructure tooling like Terraform/Ansible.

## Container Migration

There are a few ways to manage containers:

1. For customers opting to keep their vSphere containers as simple Docker containers running on a VM host, those containers would be automatically captured in the VM Migration approach.
2. Customers using RKE2 or K3S clusters within vSphere can leave them be, import them to RGS Manager (Rancher Manager), or continue backing them up and restoring the clusters onto RGS HCI using Kubernetes backup solutions within our certified integration matrix, such as Kasten or Velero. RGS Manager can also be migrated from vSphere to RGS HCI using the Rancher Backup Operator.
3. Customers using other Kubernetes distributions, such as TKGs or Workload Management, can import those clusters into RGS Manager and manage them directly. Migrating these clusters may require extra steps as TKG uses a non-industry standard for managing packages and applications. Migrations here must be based on specific migration needs per application or copying the persistent volumes and deploying the same applications onto a new RKE2 cluster with the exact specifications. Migrating applications from these clusters may be an easier route.

All of these working patterns can be employed when migrating your infrastructure. With adequate planning, any downtime or disruption to operations can be minimized or eliminated. We suggest working with a Rancher Government Solutions Architect to plan this process, as every environment is unique.

# RGS HCI with Parity Opportunities

While VMware offers proprietary extensions beyond core virtualization, many of these features are tightly coupled to its ecosystem and add complexity without broad applicability. RGS HCI with Harvester Government takes an open, modular approach—leveraging Kubernetes-native alternatives and widely adopted standards to deliver similar functionality without vendor lock-in. Some of these features include:

- **NSX-T:** A true Layer-7 SDN that ties into the vSphere ecosystem to provide tenanted, virtual private clouds with granular control. Issues with this feature include:
  - Difficulty in installing and requires significant hardware resources to run.
  - Many customers leveraging this capability do not need the scale of SDNs it provides.
  - Large organizations may use this to run their own on-prem clouds for numerous teams and applications with varying levels of self-service enabled.

  **Solution:** Upcoming Open vSwitch integration with RGS HCI will allow for full Layer 3 networking infrastructure to be described and managed within the cluster as Kubernetes objects. Not only will this consume far less resources than NSX-T, it will be more full-featured with cloud-native architectures making it far more flexible and easy to manage.

- **Backups:** Much of the government IT industry uses Veeam as its backup and recovery solution. However, this solution does not need to run solely on legacy infrastructure.

  **Solution:** Veeam's Kubernetes-focused backup solution, Kasten, works natively with RGS HCI's RKE2 baseline, allowing for an easier transition to a more modern infrastructure with reliable backup and recovery capability.

- **VM Migration:** In some infrastructures, customers have amassed a set of virtual machine template images. Issues with this include:
  - Templates are often used in a golden image pattern where they are approved and STIG'd; however, migration of these VM templates would need to occur as a running machine and, as a result, become stateful.

  **Solution:** RGS HCI with Harvester Government includes the guestfs tools with libvirt for importing running VMs from a vSphere or OpenStack environment, which makes the process simple and beneficial. For scaling needs of this process or when configuration-as-code is needed for migration, using HashiCorp's Packer tool within RGS HCI can be an alternative as Harvester's VMs are run within secure Pods that have native QEMU support, eliminating the need for additional tools to construct a VM programmatically.

| Feature/Capability | Upstream Harvester | RGS HCI (Harvester Government) |
|---|---|---|
| Security Compliance | No FIPS validation; no built-in STIG alignment | FIPS-compliant and STIG-ready out of the box |
| Lifecycle Support | Only latest release supported; no backporting | Long-term support with patching for older versions |
| Patching & Updates | Community-managed updates; user-maintained\| | Regular, managed updates and security fixes throughout lifecycle |
| Government Hardening | Baseline community version with no government-specific hardening | Hardened through Rancher Government Carbide™ |
| Integrated Bundle | Standalone hypervisor only | Part of RGS Virtualization with RGS Manager and RGS Storage |
| Support | Community support only (forums, GitHub) | 24/7/365 U.S.-based support by security-cleared engineers |
| Control & Auditing | Basic admin tools; no centralized policy control | Integrated policy management, RBAC, and audit logging |
| Procurement & Licensing | Free but unsupported; hidden costs in maintenance and risk | Socket-based pricing, no bloated license tiers |

# Licensing and Subscription Considerations

## Flexible, Transparent Licensing with Compute-Based Subscriptions

Rancher Government Solutions (RGS) uses a compute capacity-based licensing model designed for simplicity, scalability, and mission alignment. This approach ensures a clear and predictable pricing structure that scales directly with the hardware footprint, whether deployed in centralized data centers, distributed edge sites, or fully disconnected environments.

This model offers operational clarity. Customers can easily calculate their licensing requirements without needing to inventory VM configurations or track fluctuating resource utilization. It also aligns with how agencies procure and plan infrastructure—based on real, measurable compute resources, not opaque usage tiers. Crucially, no licensing server, telemetry, or callback mechanism is required—making it fully air-gap capable and ideal for classified, tactical, or sovereign deployments.

### Integrated Platform Bundles Featuring RGS HCI with Harvester Government

RGS platform subscriptions that include RGS HCI with Harvester Government are purpose-built to deliver modern virtualization alongside Kubernetes-native capabilities:

- RGS Virtualization is a cloud-native hyperconverged infrastructure solution that combines RGS HCI (Harvester Government), RGS Storage (Longhorn), and RGS Manager (Rancher Manager) for centralized virtual machine lifecycle management. It is designed to support legacy VM workloads alongside emerging cloud-native applications—offering a path forward from traditional hypervisors without sacrificing performance, security, or manageability.
- RGS Suite extends this foundation by adding observability, full-stack security, OS lifecycle automation, and compliance enforcement capabilities. It is ideal for organizations standardizing on a unified platform to support both virtual and container workloads at scale.

These bundles reflect the modular nature of the RGS architecture: customers adopt only the components they need while maintaining the flexibility to evolve their environments over time. Both bundles are licensed through the same core-based model, offering a consistent and scalable experience.

### Subscription Value Beyond the Software

Every RGS subscription includes more than just software access. Agencies benefit from 24x7 CONUS-based support staffed exclusively by U.S. citizens, ensuring timely and secure assistance in accordance with federal operational mandates. Subscriptions also include lifecycle management and patching for Common Vulnerabilities and Exposures (CVEs), even across older supported versions—helping customers maintain compliance and security without forced upgrades.

Whether operating in air-gapped installations, transitioning off legacy hypervisors, or deploying to mission edge environments, RGS subscriptions deliver the full value of secure, supported, and scalable infrastructure—purpose-built for the U.S. Federal Government.

## About Rancher Government Solutions

Rancher Government is designed specifically to address the unique security and operational needs of the U.S. Government and military as it relates to application modernization, containers, and Kubernetes.

Rancher is a complete open source software stack for teams adopting containers. It addresses the operational and security challenges of managing multiple Kubernetes clusters at scale while providing DevOps teams with integrated tools for running containerized workloads.

Rancher Government supports all Rancher products with U.S.-based American citizens currently supporting programs across the Department of Defense, the Intelligence Community, and civilian agencies.

To learn more about Rancher Government's products and solutions visit www.ranchergovernment.com

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