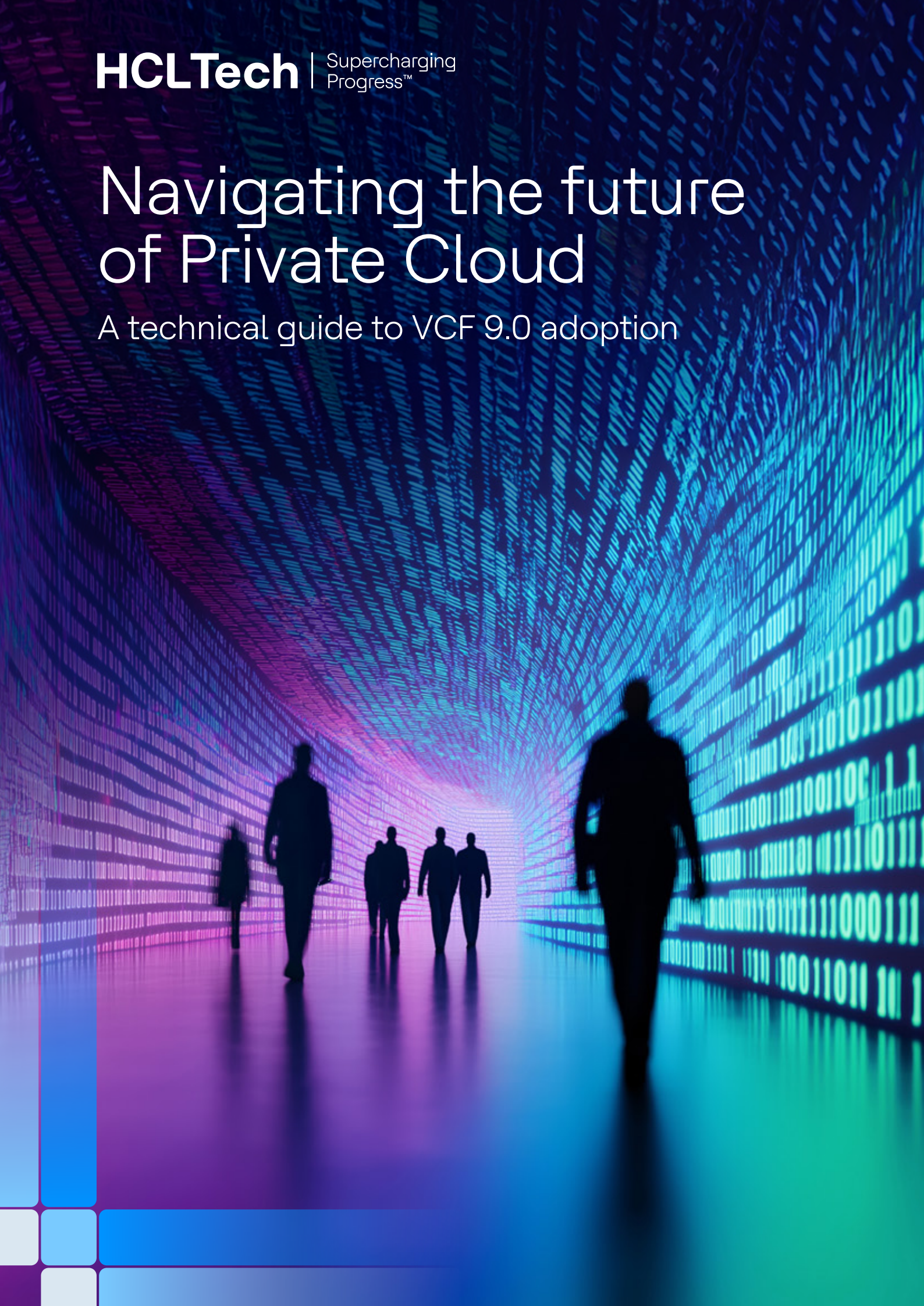


Navigating the future of Private Cloud

A technical guide to VCF 9.0 adoption



1. Challenges with Private Cloud adoption

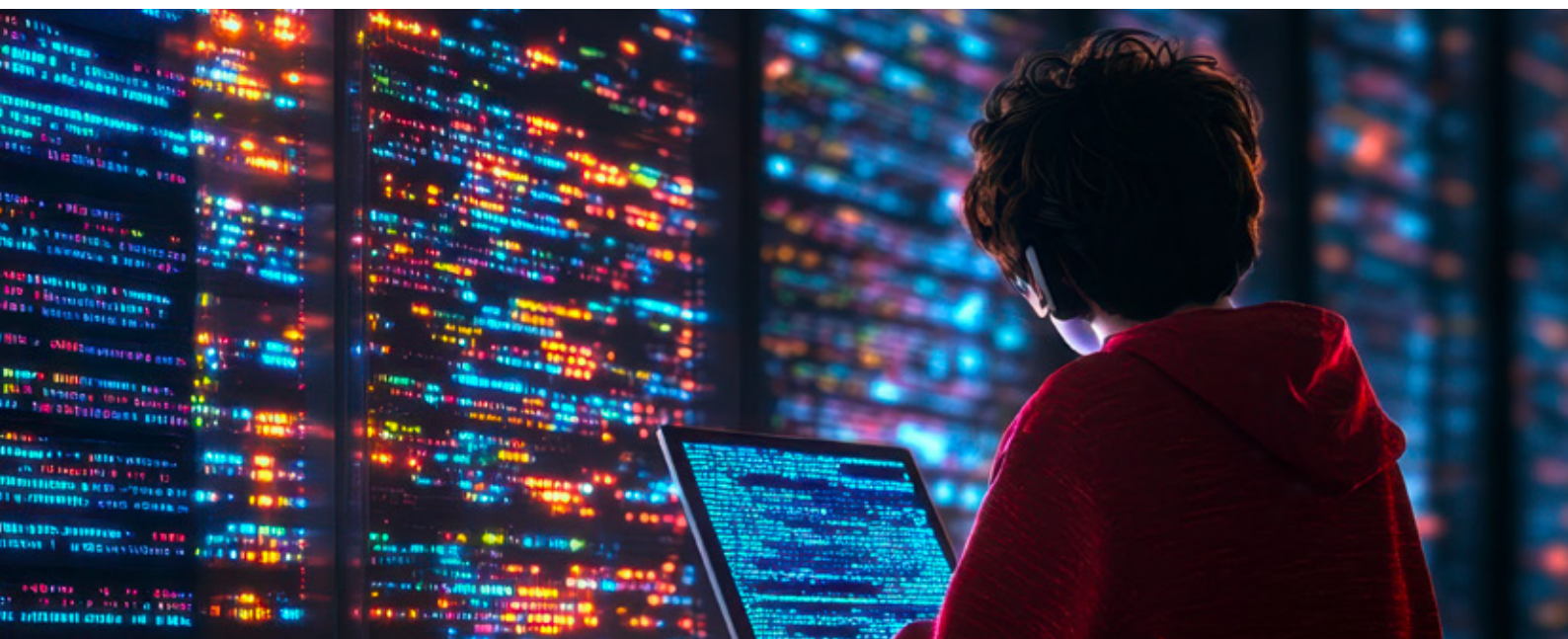
In today's modern world of rapidly changing markets and rapid development, it is necessary to implement a data center that allows customers to focus on running their businesses and provides resources on demand in a flexible consumption model, meeting the ever-evolving needs of businesses.

Customers are facing high upfront and ongoing costs, limited scalability compared to public clouds, a lack of inhouse expertise and the need for specialized staff, integration of complexities with existing systems and challenges in maintaining optimal security and compliance.

Key challenges in Private Cloud adoption



- Lack of cost-effective and efficient solutions for Private AI
- Rising TCO in Public Cloud driving repatriation
- Security and compliance inconsistency
- Resource constraints limit modern workload performance
- Complex, fragmented infrastructure and operations.
- Lack of unified developer experience in hybrid environments



2. Introduction and overview of VMware Cloud Foundation (VCF)

VMware Cloud Foundation is a unified private-cloud platform that combines the scale and agility of public cloud with security and performance of private cloud, delivering increased productivity and lower Total Cost of Ownership (TCO). Modernize infrastructure with integrated, enterprise-class compute, networking, storage, management and security across all endpoints. With automated infrastructure and intelligent operations, organizations can optimize performance, lower costs and reduce operational overhead.

3. VCF 9 architecture

The infrastructure core offers advanced computing, multiple storage interfaces and enhanced networking. Layered over the core is VCF Operations and Automation, providing oversight, lifecycle management and configuration management for infrastructure and applications.



VCF primary solution components

- VCF fleet:** The overarching framework that encompasses one or more VCF instances, providing a unified management layer for a collection of SDDCs.
- VCF operations:** A centralized console for fleet-wide operations, including fleet lifecycle management, certificate management and monitoring across different VCF instances.
- VCF automation:** A self-service portal for consuming the VCF infrastructure, enabling users to provision VMs, containers and other resources with ease.
- vSphere foundation:** The underlying virtualization platform, including ESXi for hypervisor functionality and vCenter Server for managing the virtual environment.
- vSAN:** The software-defined storage component that provides a unified storage solution for the VCF stack.
- NSX:** Software-defined networking for network virtualization and management.
- SDDC manager:** A component within each VCF instance responsible for managing the SDDC stack, including provisioning, configuration and upgrades.
- Cloud installer:** Facilitates the initial deployment and configuration of the VCF infrastructure.

In addition to the core Modern Private Cloud services, several advanced services complement and enhance the value of the solution. Key elements are mentioned below:



4. Key features and benefits of VCF 9

Private cloud strategic business initiatives focus on modernizing infrastructure, cloud experience and security and compliance. The three key pillars of successful private cloud deployment are:



Modern infrastructure

Organizations need to build an advanced, flexible and scalable infrastructure to adapt to changing business needs and deliver modern applications.



Unified cloud experience

Organizations must deliver a platform that provides self-service access to infrastructure resources for running modern workloads.



Secure and resilient platform

As cyber threats and compliance demands grow, organizations must ensure that the infrastructure safeguards data against potential threats, maintains business continuity and compliance and supports rapid recovery from disruptions.

5. Transition to VCF 9

There are several transition paths to VMware Cloud Foundation 9.

- Deploy a greenfield VCF 9.x environment and migrate the existing workload
- Converge an existing non-VCF vSphere environment to VMware Cloud Foundation 9
- Upgrade an existing VMware Cloud Foundation environment through a multi-step process.



This white paper covers the scenarios below:

Converge an existing non-VCF vSphere environment to VMware Cloud Foundation 9.x

- Converging a vCenter Instance and ESX Hosts to VCF 9.x
- Converging vSphere plus Aria Operations and Aria Operations for Logs to VCF 9
- Converging vSphere plus Aria Operations, Logs and Automation to VCF 9 (using Aria LCM)

Upgrade an existing VMware Cloud Foundation environment through a multi-step process

- Transition VCF 5.2 without Aria Suite to VCF 9.x
- Transition VCF 5.2 with Aria Suite (Aria LCM+Ops+Automation+Logs) to VCF 9.x

The table below lists all VCF components, you must upgrade the management plans first, followed by core SDDC components in a distinct upgrade order.

S. No.	VCF component	Minimum version required to upgrade in VCF 9	Converging existing standalone components to VCF 9.0
1	Aria Suite Lifecycle	8.18 P2	Yes ¹
2	Aria Operations / VCF Operations	8.18 P2	Yes, automated or manual
3	Aria Automation / VCF Automation	8.18 P2	Yes
4	Aria Automation Orchestrator / VCF Operations orchestrator	8.18 P2	Yes
5	Aria Operations for Networks / VCF Operations for networks	8.18 P2	Yes
6	Aria Operations for Logs / VCF Operations for logs	8.18 P2	No ²
7	Workspace one Access	8.18 P2	No ³
8	VCF/SDDC Manager	5.2	N/A
9	NSX	4.2.1	No ⁴
10	vCenter	8.0 U1+	Yes
11	ESX	8.0 U1+	Yes
12	vSAN	8.0 U1+	Yes

¹ VMware Aria Lifecycle will no upgrade to version 9.0. After the VCF Operations fleet management appliance is deployed, the existing connection with VMware Aria Operations is imported to the new appliance.

² No upgrade path for VMware Aria Operations for Logs. Redeploy of VCF Operations for logs 9.0 is required

³ No upgrade path for VMware Workspace one access (WOA), Redeploy of VCF Identity Broker – VIDB 9.0 is required

⁴ NSX 4.x deployments that are not part of VCF instances can be upgraded to version 9.0 only after they are first imported to existing VCF instances as workload domains. Starting with VCF 9.0, NSX is available exclusively as part of the VCF stack. Standalone deployment or upgrade of NSX is not allowed.

Key considerations applicable to all upgrade scenarios:

Readiness checklist:

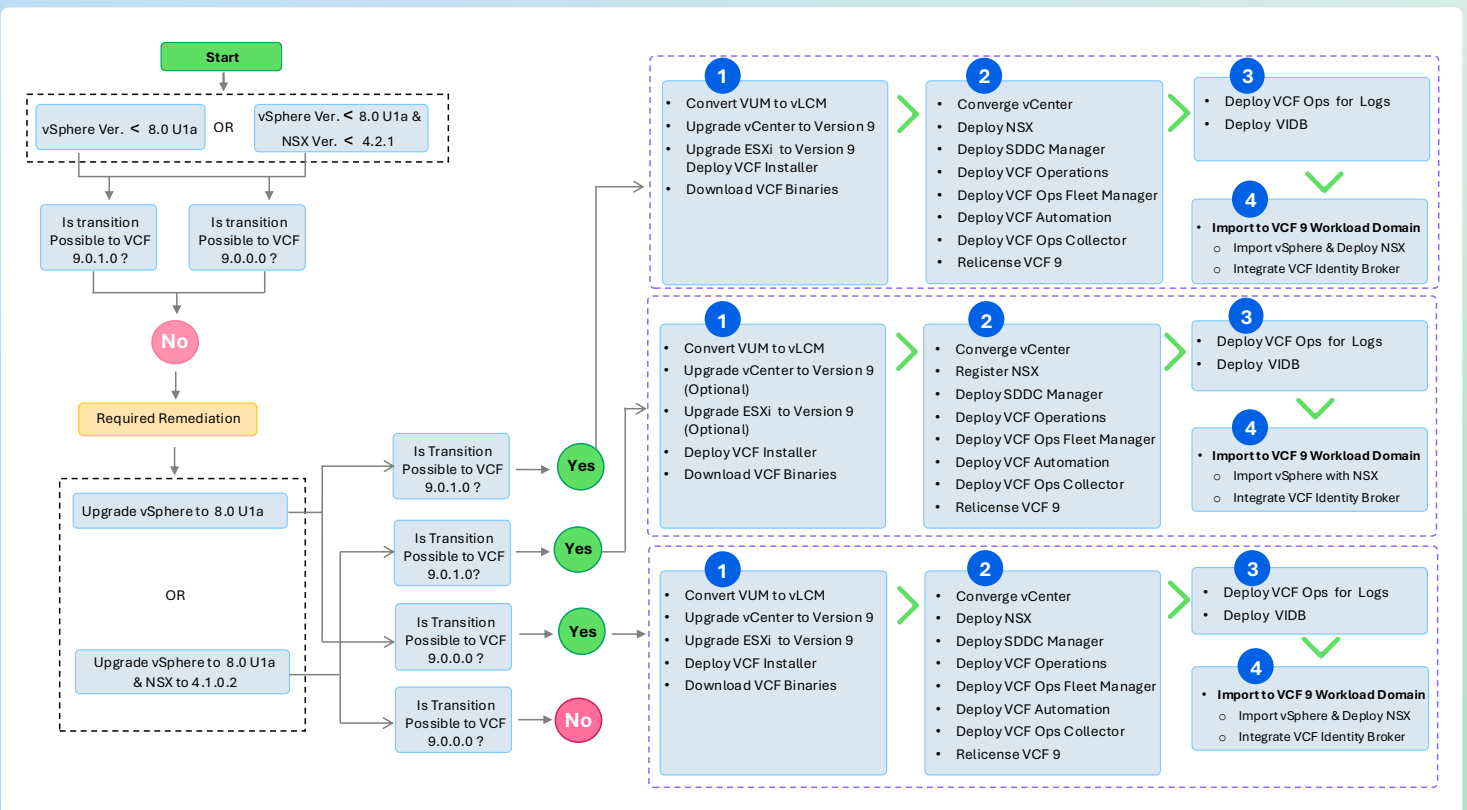
- Keyless licensing activation (90 days)
- Compliant hardware to support VCF 9
- Sufficient CPU, memory, IPs and storage available for VCF scale and resource requirements for new appliances
- Choose between Simple or HA appliance model
- Choose VCF fleet deployment design
- Check VCF 9 Hardware and Software Compliance
- Plan New Network Configuration: IP, DNS, FW rules for new appliances and for upgrades – SDDC Manager, NSX, VCF Operations, VCF Automation, VCF Identity Broker, VCF Operations for log
- vCenter enhanced linked mode must be removed.
- Any vSphere lifecycle manager baseline clusters must be converted to use vSphere lifecycle management images
- Ensure 3rd party integration support from vendors (not Broadcom)

Please Note: There is currently no upgrade path from vSphere with NSX to VCF 9 management domain. Whereas we can direct import vSphere+NSX to VCF 9.0.1.0 version if pre-requisites version matched.

5.1 Converging the existing vSphere or vSphere+NSX to VCF 9.x

Key steps:

1. Upgrade vSphere 8.x to vSphere 9.0.
2. For the converging scenarios from vSphere+NSX to VCF 9.0.1.0 management domain, vSphere upgrade to version 9 is optional.
3. Deploy the VCF installer in the same cluster where the vCenter instance is running. This will become the 'default' cluster for the VCF management domain.
4. Configure a depot in the VCF installer and download the VMware Cloud Foundation 9 binaries.
5. After the binaries have been downloaded, deploy a new VCF Fleet using the newly upgraded vCenter instance as the VCF management domain. The VCF Installer will convert the vCenter instance into a VCF 9.0 management domain and proceed to deploy the remaining VMware Cloud Foundation components, which include NSX, SDDC Manager, VCF operations, a VCF operations collector, VCF operations fleet management and VCF automation.
6. After VMware Cloud Foundation is deployed, register for VCF Operations with the Business Services Console and download the license file. Assign the license file to the vCenter instance, which will, in turn, license the VCF components.
7. Deploy VCF operation for Logs & VCF Identity Broker.
8. Import vSphere environment in workload domain
9. If you have an existing vCenter instance, with or without NSX Manager, you can use VCF Operations to import it to a VCF instance as a workload domain. If NSX Manager is not present, you deploy a new instance during the import procedure.

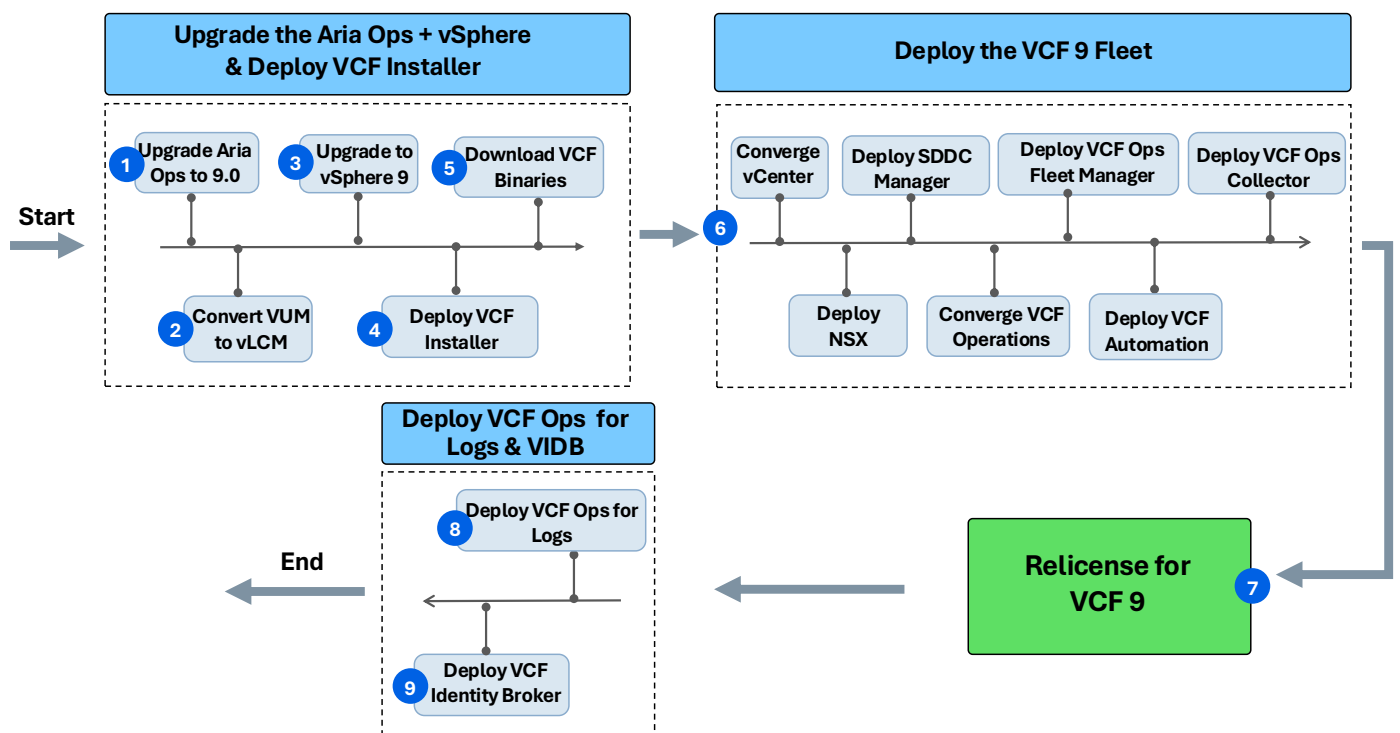


Workflow Diagram 1

5.2 Converging vSphere plus Aria operations and Aria operations for logs to VCF 9.x (Without Aria LCM)

Key steps:

1. Begin by first upgrading Aria Operations to VCF operations 9.0
2. If you are using vLCM Baselines (aka VUM) you will need to switch to vLCM images prior to the upgrade as VMware Cloud Foundation 9.0 only supports vLCM Images.
3. Next, upgrade vSphere 8.x to vSphere 9.0.
4. For the converging scenarios from vSphere+NSX to VCF 9.0.1.0 management domain, vSphere upgrade to version 9 is optional.
5. Deploy the VCF Installer in the same cluster where the vCenter instance is running. This will become the 'default' cluster for the "management domain"
6. After the binaries have been downloaded, deploy a new VCF Fleet using the newly upgraded vCenter instance as the "management domain". The VCF Installer will convert the vCenter
7. Instance into a VMware Cloud Foundation 9.0 management domain and proceed to deploy the remaining VCF components which include NSX, SDDC manager, VCF operations, a VCF operations collector, VCF operations fleet management and VCF automation.
8. After VCF is deployed, register VCF operations with the Business Services Console and download the license file. Assign the license file to the vCenter instance, which will in-turn license the VCF components.
9. Deploy VCF Operation for Logs & VCF Identity Broker.
10. Import vSphere environment in workload domain
11. If you have an existing vCenter instance, with or without NSX Manager, you can use VCF Operations to import it to a VCF instance as a workload domain. If NSX Manager is not present, you deploy a new instance during the import procedure.

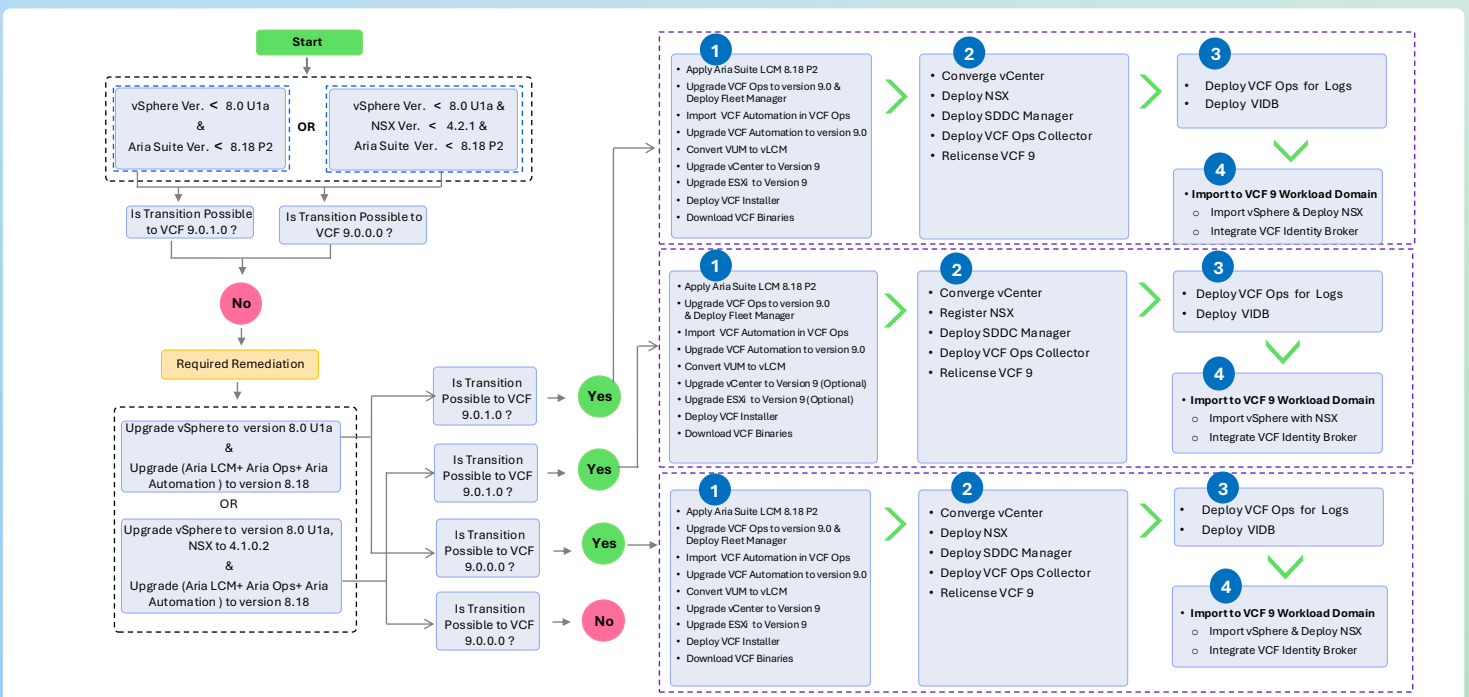


Workflow Diagram 2

5.3 Converging vSphere or vSphere+NSX plus Aria operations, logs and automation to VCF 9 (using Aria LCM)

Key steps:

1. Start with the 8.18 patch 2 to the Aria LCM.
2. After applying the patch, use Aria LCM to upgrade Ops from 8.18 to version 9.0. As part of the upgrade, a new instance of the VCF Operations fleet management appliance will be deployed.
3. Following the deployment of the new VCF operations fleet management appliance and subsequent upgrade to VCF Operations 9.0.
4. Import the existing instances of Aria automation in VCF operations
5. Upgrade Aria automation to version 9.0.
6. If you are using vSphere vLCM Baselines (VUM) , that need to switch to vLCM images prior to the upgrade as VCF 9 only supports vLCM Images.
7. Upgrade vCenter and ESXi to version 9.0.
8. For the converging scenarios from vSphere+NSX to VCF 9.0.1.0 management domain, vSphere upgrade to version 9 is optional .
9. Deploy the VCF Installer in the same cluster where the vCenter instance is running. This will become the 'default' cluster for the "management domain".
10. Configure a depot in the VCF Installer and download the VMware Cloud Foundation 9 binaries. After the binaries have been downloaded, deploy a new VCF Fleet using the newly upgraded vCenter instance as the VCF management domain.
11. The VCF installer will converge the existing VCF operations and vCenter instances into a VCF 9.0 management domain and proceed to deploy the remaining VCF components to include NSX, SDDC-M, Fleet manager, VCF operations and VCF operations collector and VCF automation.
12. After VCF is deployed, register VCF operations with the business services console and download the license file. Assign the license file to the vCenter Server, which will, in turn, license the VCF components.
13. Deploy VCF operation for logs and VCF identity broker.
14. Import vSphere environment in workload domain
15. If you have an existing vCenter instance, with or without NSX Manager, you can use VCF Operations to import it to a VCF instance as a workload domain. If NSX Manager is not present, you deploy a new instance during the import procedure.



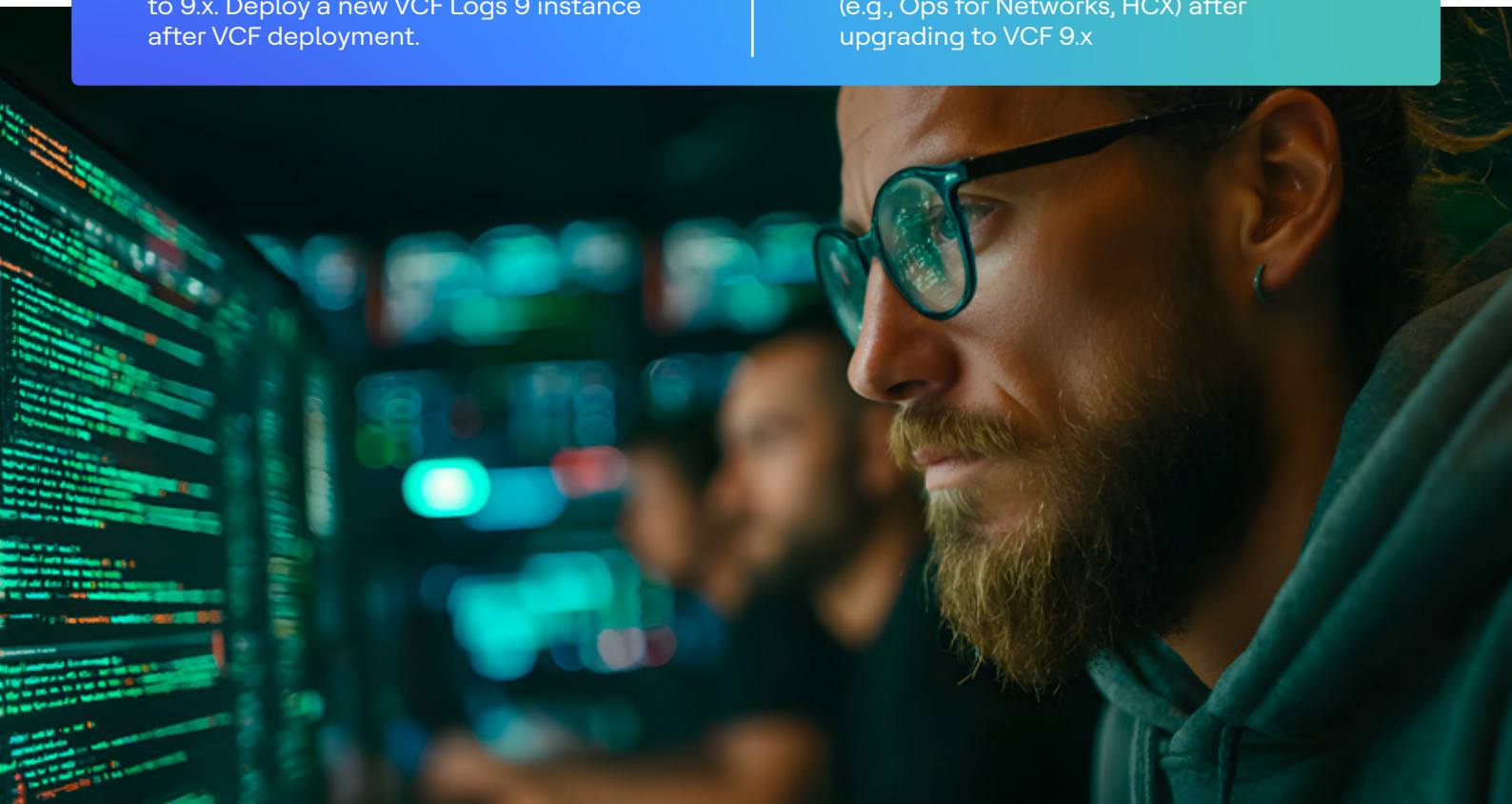
Workflow Diagram 3

6. Upgrade VCF 5.2 to VCF 9.x

6.1 Upgrade VCF 5.2 without Aria suite to VCF 9

Prerequisites and considerations

1. There is no upgrade path from VCF Logs 8.x to 9.x. Deploy a new VCF Logs 9 instance after VCF deployment.
2. Import/upgrade other components (e.g., Ops for Networks, HCX) after upgrading to VCF 9.x



Key steps:

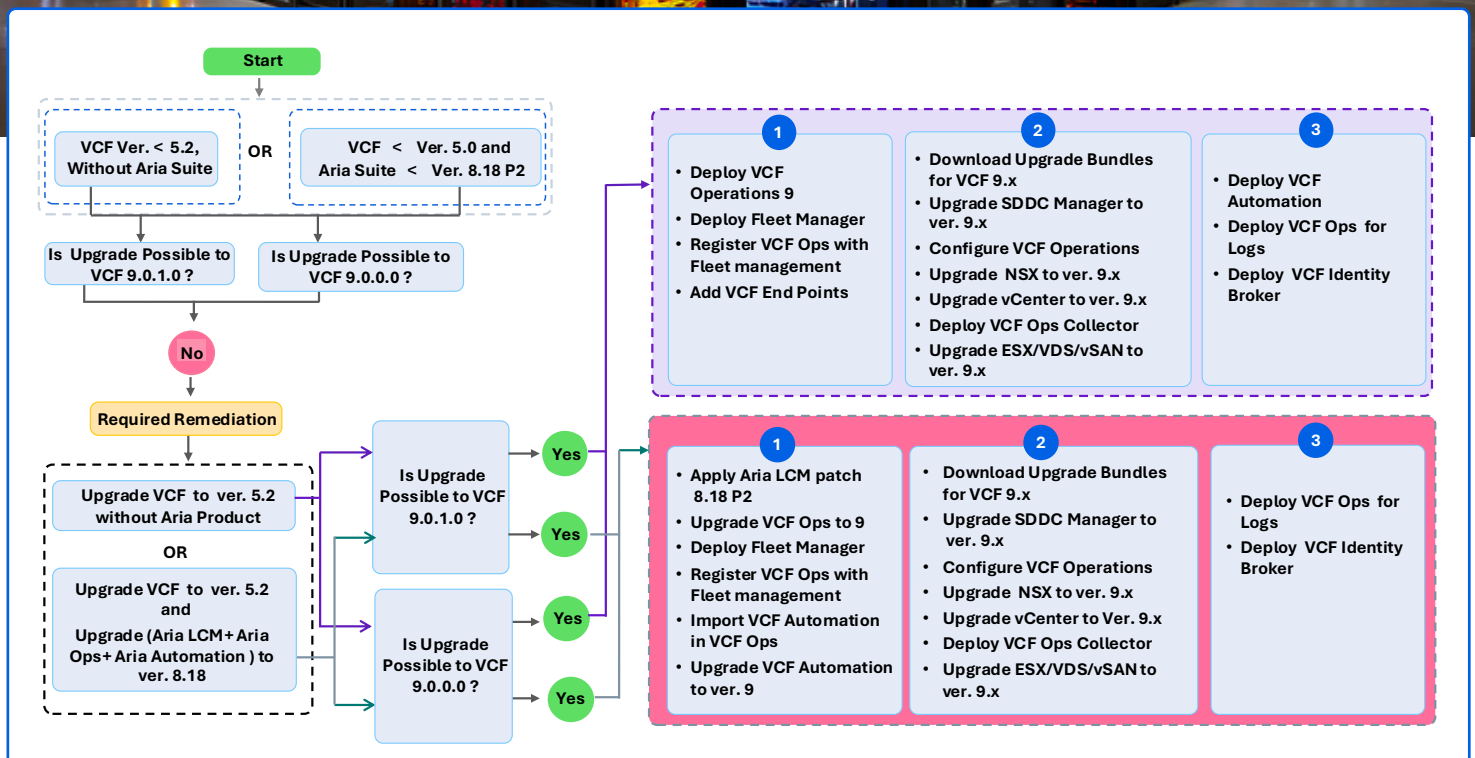
The upgrade path from VCF 5.x to VCF 9.x varies depending on if you have the Aria suite deployed in your environment. Here we assume that is not the case.

1. Begin the upgrade by first deploying VCF Operations 9.0.
2. As part of the VCF Operations deployment, a new instance of the VCF fleet manager appliance will be deployed.
3. Log into the VCF fleet management,
4. Register the VCF Ops 9.0 instance and add the existing VCF 5.x environment as an endpoint.
5. Downloading the upgrade bundles to the SDDC Manager, NSX and vSphere
6. Upgrade SDDC manager to version 9.0.
7. Complete the VCF 9.0 configuration in VCF operations.
8. Then proceed to upgrade NSX, vCenter and ESX
9. Upgrade the VDS versions and vSAN disk group versions.
10. Register VCF Operations with the business services console and download the license file. Assign the license file to the vCenter Server, which will, in turn, license the VCF components.
11. Deploy the remaining VCF components – VCF automation, VCF operations for logs and the VCF VIDB
12. Upgrade the remaining workload domains.

6.2 Upgrade VCF 5.2 with Aria suite (Aria LCM+Ops+Automation+Logs) to VCF 9.x

Key steps:

1. Begin the upgrade by upgrading Aria lifecycle manager to v8.18 p2
2. Upgrade Aria operations to VCF operations 9.0. As part of the VCF operations upgrade, a new instance of the VCF fleet manager appliance will be deployed.
3. Log into the VCF fleet management, Register the VCF operations v9.0 instance and add the existing VCF 5.x environment as an endpoint.
4. Next, import Aria automation into the VMware Cloud Foundation 9 platform.
5. Upgrade Aria automation to VCF automation v9.0
6. Downloading the upgrade bundles to the SDDC Manager, NSX and vSphere
7. Upgrade SDDC manager to version 9.0.
8. Complete the VCF 9.0 configuration in VCF operations.
9. Then proceed to upgrade NSX, vCenter and ESX
10. Upgrade the VDS versions and vSAN disk group versions.
11. After VCF is upgraded, register VCF operations with the business services console and download the license file. Assign the license file to the vCenter Server, which will, in turn, license the VCF components.
12. Next, deploy the remaining VCF components – VCF operations for logs and the VCF VIDB
13. Upgrade the remaining workload domains.



Workflow Diagram 4

7. Potential upgrade complexities and mitigation

S. No.	Complexity description	Mitigation
1	Hardware availability / compatibility	Hardware must meet VCF 9.0 requirement as per vSphere compatibility matrix.- https://compatibilityguide.broadcom.com/search?program=server&persona=live
2	vSphere multiple clusters associated in vCenter will be part of one VCF management domain after converging process	Hardware must meet VCF 9.0 requirement as per vSphere compatibility matrix.- https://compatibilityguide.broadcom.com/search?program=server&persona=live
3	vSphere multiple clusters associated in vCenter will be part of one VCF workload domain after import process	During the import process to the VCF 9 domain, all the vSphere Clusters will be part of a workload domain. If you want to import the source vCenter vSphere cluster in different workload domains than you need to associate the vSphere clusters in different vCenter before starting the import process.
4	Multiple VCF operations Instances converge not supported	VCF 9 has a single VCF operations instance per fleet and thus if existing environments have multiple instances these will need to be consolidated or left as standalone instances.
5	All Customer custom workflows may not be supported in the VCF 9.0	Customers need to adapt tools, workflows, automation and security practices for new VCF 9 architectures
6	VCF Automation API calls	If a customer's current environment relies on SDDC Manager APIs or scripts (e.g., deployment of VCF or WL domains), these need to be reevaluated or re-engineered for VCF Operations APIs.
7	VxRail not supported in VCF 9.0	Upgrade solution is WIP and subject to Dell providing guidance for deployment and upgrade scenarios.
8	Customer does not have sufficient Hardware for VCF 9.x repurpose	Create a greenfield VCF 9.x management domain with Aria Operations and import Aria Automation, if exists.

8. Conclusion

The deployment strategy for VCF 9.0 depends on the current state of your environment—whether you choose to deploy, converge, or upgrade, the guidance primarily focuses on the management domain, which forms the foundational logical block of a VCF instance. Following management domain transition of the existing workload clusters in workload domain.

Aria operations for network can be upgraded by leveraging the VCF operations portal.

Tanzu Kubernetes Grid (TKG) can be upgraded independently following the VCF 9.x upgrade. These upgrade paths empower organizations to tailor their cloud transformation journey while leveraging the full potential of VCF 9.x to drive innovation, efficiency and cyber resilience.



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About the Author

Kuldeep is Solution Architect and Migration SME with over 18 years of experience in IT infrastructure projects, specializing in data center transformation and service transition. Expert in migrating on-premises environments to public clouds (AWS, Microsoft Azure, VMC on AWS) and across multiple hypervisors (VMware, Microsoft Hyper-V).

He is proficient in designing Software-Defined Data Center (SDDC) solutions, including VMware Cloud Foundation (VCF) for on-premises, AWS, and Azure VMware Solution (AVS), as well as implementing NSX-V/NSX-T Software-Defined Networking (SDN) solutions.

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