Beyond the Basics: Actionable Guidelines to Implement Private Cloud



Are you implementing a private cloud?

We're here to help! Jump to any area and use our checklists to get started and go beyond the basics:

- <u>Cloud operations value realization</u>
- <u>Architecture and design for successful transformation</u>
- Infrastructure to maximize automation and scalability
- <u>Self-service efficiencies and templates</u>
- Intelligent provisioning for configuration stability
- People change management



Table of Contents

Link to any section below.

Executive Summary

<u>Cloud Operating Model: Realize Value From Your Private Cloud</u> <u>Get Started Checklist: Create a Private Cloud Operating Model</u>

Architecture and Design: Build a Well-Architected Private Cloud Get Started Checklist: Create an Architecture that Supports Business Success

Infrastructure: Create a Strong Foundation Get Started Checklist: Create Domains for Efficient Workload Management

Self-Service Cloud: Develop Tools for Self-Service and Visibility Get Started Checklist: Create a Self-Service Environment

Intelligent Provisioning: Deliver Stable Environments at Scale Get Started Checklist: Create Intelligent Provisioning for Every Workload

People: Define Teams and Roles Get Started Checklist: Create a People Plan for Change

Infographic: Tips for Implementing Private Cloud

Learn More: Explore VMware by Broadcom Resources and Services

Executive Summary

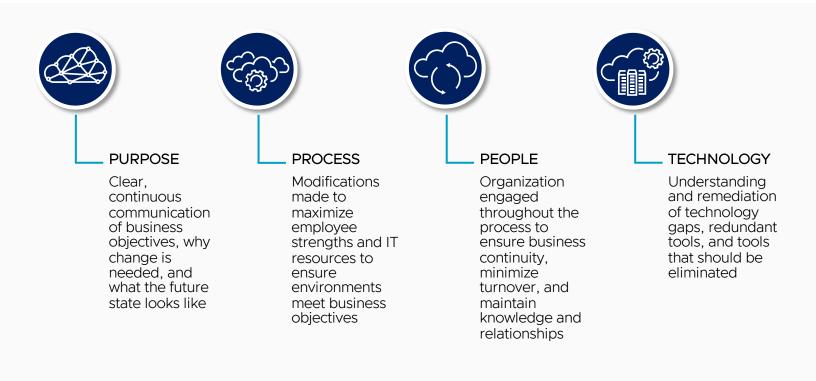
I'm not sure that our technology is aligned with or prioritizing overarching business goals. I'd like to see some ROI from our IT investments.

– Financial Services Executive

The Challenge: Technology deployments are not strategically aligned to business objectives

Aligning business objectives with your technology ecosystem is essential for sustainable growth and competitive advantage. When implementing a private cloud within your existing infrastructure to meet evolving business needs, a comprehensive approach can help avoid a cumbersome and possibly ineffective transformation. Diving in without a solid strategy and a clear roadmap can result in prolonged timelines, escalated costs, overburdened staff, and frustrated leadership.

With a well-structured plan and the right support, challenges can be mitigated and managed to drive transformation success and ensure that your private cloud is a strategic enhancement that aligns to business goals. A comprehensive methodology includes four key areas: purpose, process, people, and technology.



The Solution: A comprehensive private cloud powered by a full-stack approach

What is a private cloud? We define a private cloud as a computing environment dedicated to a single business, organization, or government agency. Unlike the shared resources of a public cloud, the computing resources in a private cloud such as servers, storage, and networking are provisioned solely for this environment's use.

Private clouds can be hosted on premises, within a data center, or by a third-party cloud service provider on dedicated infrastructure. This type of cloud environment offers:

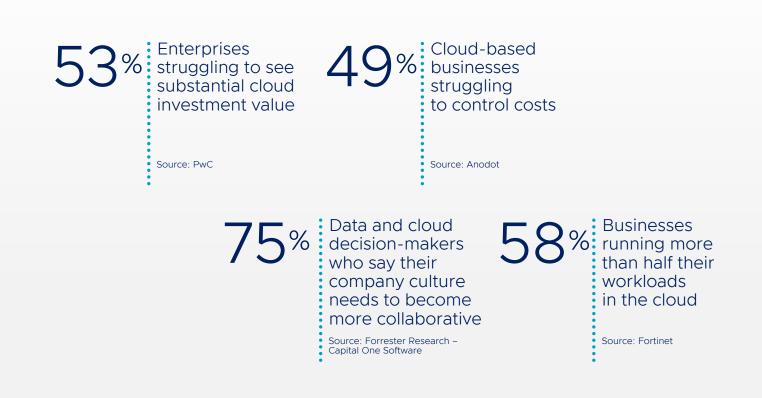
- Increased performance and reliability Predictable performance from dedicated resources, redundant systems, and failover mechanisms provide greater reliability and uptime and allow for optimized workload management.
- Flexibility and customization Tailored infrastructure to customize needs for specific workloads, integration with legacy systems, and implementation of specialized security measures as well as scalability and adaptability of solutions and resources.
- Enhanced security and control Data protection with a dedicated environment for greater control over access and security measures and segregation from public environments to reduce the risk of unauthorized access and breaches.

Implementing a private cloud is a strategic decision with multiple benefits. A full-stack approach to private cloud transformation is designed to address diverse needs and drive significant advantages.

- Cost management and enhanced ROI: This approach helps in effectively managing costs and achieving greater returns on technology investments, ensuring that every dollar spent contributes to business growth.
- Accelerating application modernization: A full-stack approach facilitates the modernization of applications, fostering greater innovation and supporting a faster time to value. This acceleration is key to staying competitive in today's rapidly evolving digital landscape.
- Leveraging advanced analytics and AI: By integrating advanced analytics and AI, workload performance and capabilities are enhanced, providing businesses with the insights and automation needed for smarter decisionmaking.
- Ensuring uptime and resilience: A focus on managing risk and strengthening cybersecurity is crucial for minimizing downtime and building a resilient IT infrastructure.
- **Promoting sustainable IT operations**: This approach can contribute to reducing carbon dioxide emissions, aligning with the growing need for sustainable IT practices.

For more support and to accelerate your path to reaching business objectives and value from your technology investments, use this document to learn more about the VMware by Broadcom Professional Services framework for a full-stack, phased approach for private clouds:

- Cloud Operating Model Create seamless operations within your IT environment
- Architecture and Design Address your unique initiatives and use cases
- Infrastructure Ensure scalability and flexibility of your resources
- Self-Service Cloud Enable a shift to strategic, high-value activities
- Intelligent Provisioning Create efficient and reliable configurations
- People Develop strong, skilled, and collaborative teams







Cloud Operating Model: Realize Value Faster From Your Private Cloud

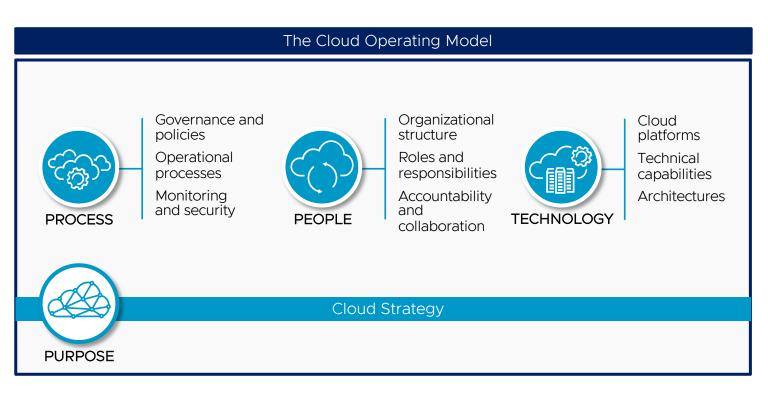
We need to be able to do more than use the basics of our technology tools. Gaining value from our investments and using what we have to our advantage is a big business priority.

- Chief Executive Officer

The Challenge: Using every tool to your advantage

To gain optimal value from your technology investments, it's crucial to ensure that each component of your ecosystem is operating efficiently and contributing towards business priorities and goals. Effects of using technology without enabling valuable capabilities include missed opportunities for innovation, underutilized resources, increased operations costs, and a loss of competitive advantage.

When implementing a private cloud into your existing environment, including a private cloud operating model with existing systems and processes is essential to achieve optimal value of your technology investments. A private cloud operating model helps define your needs broadly within the realm of purpose, process, people, and technology and plan the activities needed to reach desired outcomes.



Successful integration includes assessing compatibility, planning migrations, and implementing strategies to seamlessly merge the new operating model with existing operations.



The Solution: Smart integration of private cloud

A thoughtful private cloud operating model is an effective way to ensure seamless operations within your IT environment. The steps below include cloud operating model components that will create a more efficient, scalable, and cohesive integration of your private cloud.

Creating seamless integrations with existing infrastructure, applications, and workflows and ensuring compatibility for all hardware, software, and networking components helps create an optimal private cloud.

- Compatibility assessment Conduct a thorough assessment of existing systems, applications, and processes and evaluate hardware, software, network configurations, and dependencies
- Migration planning Develop a detailed plan outlining the steps, processes, and timelines for transitioning the current environment to a private cloud and consider factors such as data migration, application reconfiguration, and penitential downtime for migration
- Data and application mapping Map the data and applications targeted for migration and understand the dependencies and relationships between components
- Harmonization strategies Adopt standardized practices to ensure consistent configurations and aligned security policies to maintain a wellcoordinated environment
- Interoperability planning Ensure that communication protocols, APIs, and data formats are compatible to facilitate seamless interaction and data exchange between different components
- User training and communication Provide training sessions to familiarize both end users and IT teams with the new private cloud operating model to ensure a smooth transition for all stakeholders

- Testing and validation Conduct rigorous testing of the integrated environment before full deployment for performance, security, and validation of critical workflows
- Incremental deployment Consider a phased rollout to a private cloud to reduce risk, identify issues, and adjust implementation based on user feedback and lessons learned
- Change management Establish clear and consistent communication regarding the benefits of a private cloud to reduce resistance and challenges arising from the integration
- Monitoring and optimization Deploy monitoring tools and processes to track environment performance and continuously optimize configurations, resource allocations, and workflows based on data and feedback
- Documentation and knowledge transfer Facilitate knowledge transfer by maintaining detailed documentation of the integrated private cloud environment, including configurations, processes, and best practices

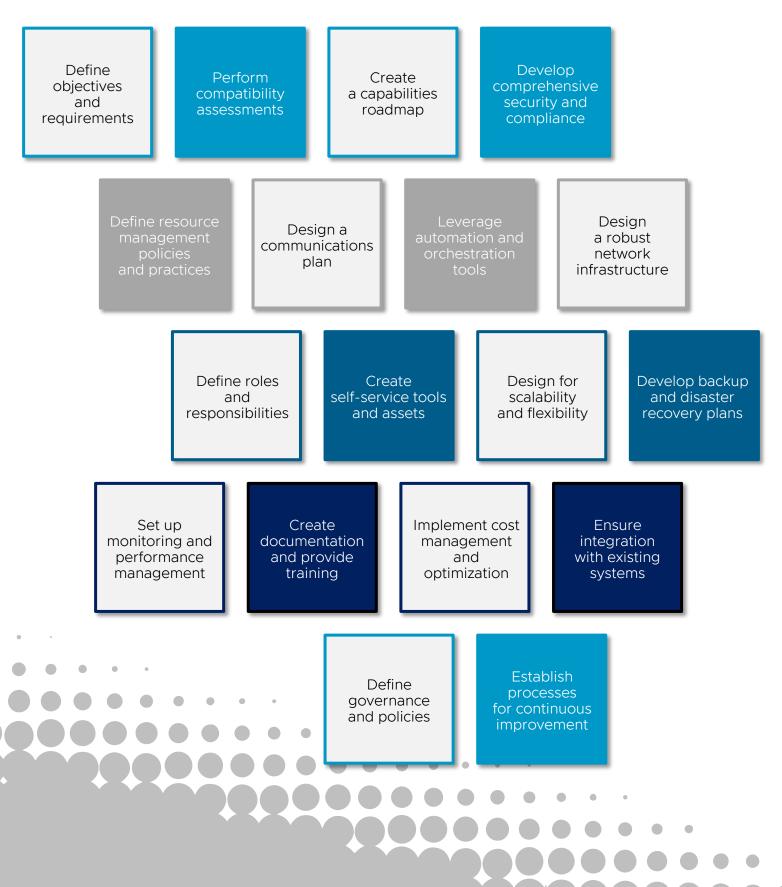




Get Started Checklist: Create a Private Cloud Operating Model



Start building the steps for your process, people, and technology with these tips.



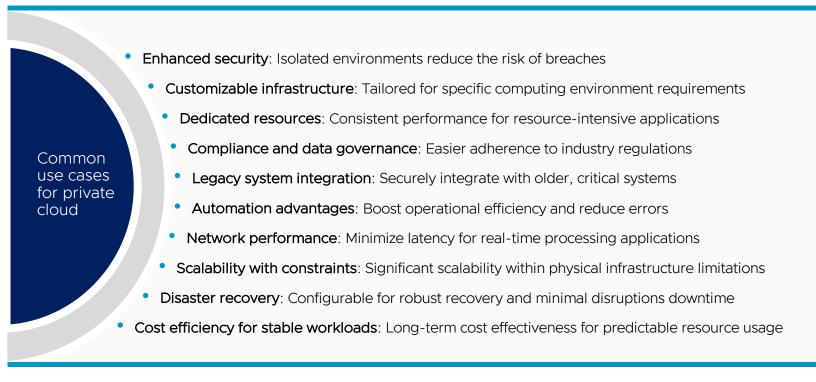
Architecture and Design: Build a Well-Architected Private Cloud

I've learned to work around redundancies and legacy systems and do the best with what we have, but we could be so much more efficient. I'd like to be able to improve the way we do things.

– Solution Architect

The Challenge: Unique business case requirements and use cases

Within every organization, different lines of business present unique requirements and use cases. Some lines of business may require more control, security, and dedicated resources than public clouds can provide. Others need resolution for technical drivers such as compliance, integration of legacy systems that are often incompatible with public clouds, and latency. The following are examples of common use cases for private cloud.





The Solution: Identify strategic initiatives and map use cases

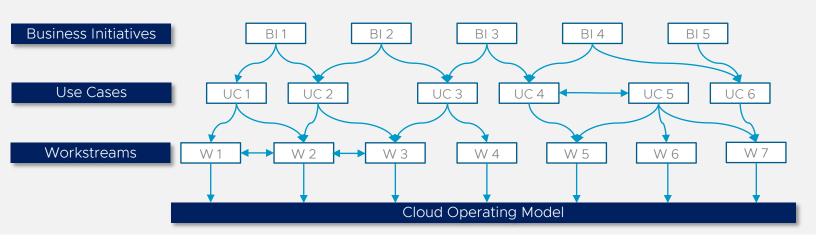
Improve the performance and cost of a well-architected private cloud by identifying strategic initiatives and aligning the architecture to business unit requirements and use cases.

- 1. Develop a strategic vision: Ensure that all key stakeholders and anyone affected by upcoming changes are involved throughout the transformation and have a shared vision of a future state
- 2. Define controls and guiding principles: Decide how decisions will be made as new circumstances arise
- 3. Define the future state: Visualize and understand the desired outcomes for reference architectures, process models, service definitions, and use cases
- 4. Define the current state: Validate and document current architecture and models and use artifacts to create the future state
- 5. Develop critical path items: Identify the people, process, and technology dependencies that will impact digital transformation
- 6. Create a financial model: Define a model that results in the desired return on investment
- 7. Create a high-level roadmap: Document the steps required to evolve from current state to future state using the data gathered in previous steps

Once the business and strategic initiatives have been defined and captured in a roadmap, the use cases should be integrated into the overarching cloud strategy.

IT value is recognized and better understood once the IT workstreams and use cases are effectively mapped to the business initiatives.

Example of Use Case and Workstream Mapping

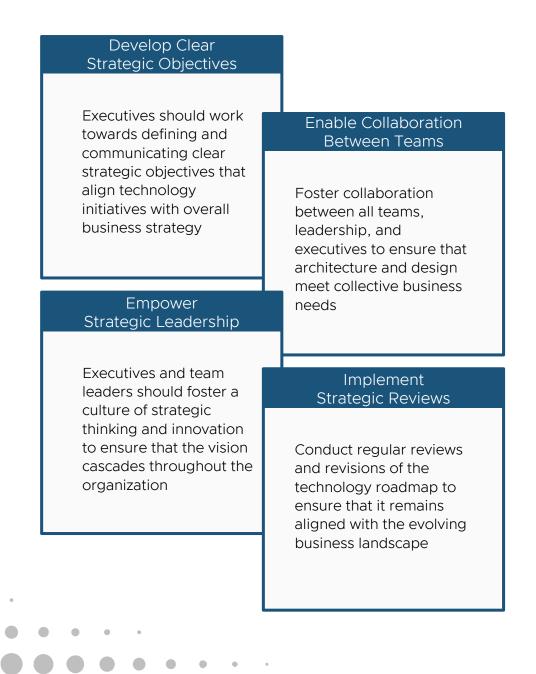






Get Started Checklist: Create an Architecture that Supports Business Success

The process of mapping use cases includes performing a comprehensive analysis of the applications, workloads, and data sets within the private cloud environment. The checklist below is useful to stay on track and ensure all stakeholders are included in the process to create a well-architected private cloud.



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Infrastructure: Create a Strong Foundation

There's a lot of piecemeal and manual work we do. If we could look at our systems as a whole and address changes through a full-stack approach, we could spend more time on high-value activities.

- Retail IT Cloud Engineer

The Challenge: Manual work and wasted resources

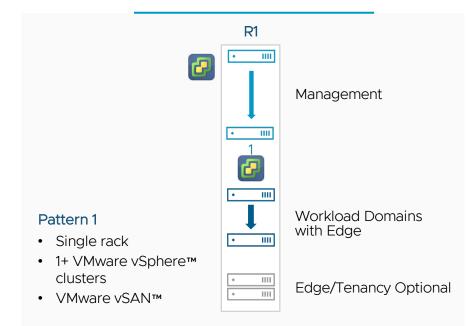
Manual labor and inefficient resource allocation significantly strain and undermine the overall infrastructure of IT ecosystems, limiting scalability and impeding peak performance. The infrastructure is the cornerstone of your private cloud, and constructing a robust one that adapts to your organization's evolving needs is crucial for ensuring efficiency and minimizing resources waste.

Each of these steps plays a vital role in constructing a resilient, scalable, and efficient infrastructure for your private cloud. Emphasizing strategic development and continuous improvement, this approach ensures your IT ecosystem is not just operational, but also primed for future growth and innovation.

Depending on organizational use cases, the layers and components for private cloud should be implemented at appropriate levels for desired outcomes and target states.

- 1. Assess cloud readiness: Evaluate your current IT environment to determine how ready it is for transitioning to a private cloud.
- 2. Design and deploy virtual resources: Utilize a reference architecture to design and deploy virtual compute, network, and storage solutions.
- 3. Integrate and configure a cloud operations platform: Seamlessly integrate and fine-tune a cloud operations platform for optimal performance and management.
- 4. Network segmentation and security: Implement network segmentation using distributed firewalls to enhance security.
- 5. Implement security standards: Adopt and enforce robust security protocols to safeguard your infrastructure.
- 6. Define data center services and team roles: Outline the roles and required skills of your team in relation to data center services (see 'People' section).
- 7. Automate operational processes: Streamline and automate key operational processes for efficiency (see 'Cloud Operating Model' section).
- 8. Develop platform lifecycle management capabilities: Foster capabilities to manage the platform's lifecycle effectively.
- 9. Establish KPIs and metrics: Define key performance indicators and metrics to measure success and guide continuous improvement.

The Solution: Right-sized and flexible infrastructure



A strong infrastructure foundation can adapt to changing demands and can scale efficiently. This is not easy to do and requires employing dynamic scalability mechanisms, optimizing resource allocation, and implementing elastic solutions that can expand or contract in response to workload fluctuations, ensuring optimal performance and costeffectiveness. The example here depicts a rack configuration that can address scalability needs.

Building and maintaining a private cloud from scratch using traditional technology can result in heavy capital costs and deployments that take months. This can require ongoing investment for maintaining and updating disparate systems and result in increased operational expenses.

One way to ease the challenges of infrastructure transformation to a flexible private cloud is to implement a third-party solution like VMware Cloud Foundation[™]. Within VMware Cloud Foundation, two types of domains are recommended to minimize downtime and efficiently manage workloads: the Management Workload Domain and the Virtual Infrastructure Workload Domain.

The Management Workload Domain hosts all management of virtual machines (VMs) including:

- VMware vCenter® server nodes
- VMware NSX® Manager™
- VMware Cloud Foundation™ SDDC Manager™
- VMware Aria™ servers (e.g. VMware Aria Automation™, VMware Aria Operations™)
- Additional core infrastructure services such as Domain System Name (DNS), Active Directory (AD), or Dynamic Host Configuration Protocol (DHCP)

This domain facilitates efficient management, authentication, and accessibility of network resources.

Virtual Infrastructure Workload Domains host all other workloads within the environment, including workloads provisioned by workflow automation tools or those that are manually provisioned.



Click here for Table of Contents

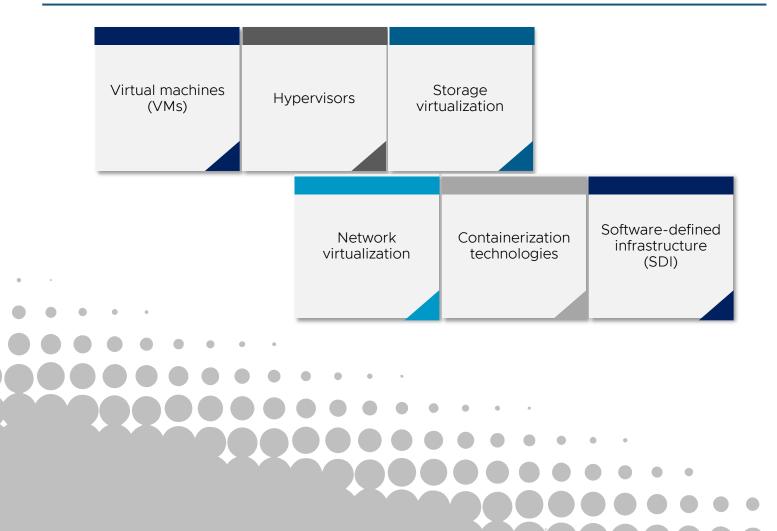
Get Started Checklist: Create Domains for Efficient Workload Management

Incorporating domains cohesively and effectively into the infrastructure architecture involves combining networking, storage, security, and other relevant domains to create a unified infrastructure framework that operates seamlessly and supports the diverse needs of the organization.

Management Workload Domain



Virtual Infrastructure Domains



Self-Service Cloud: Develop Tools for Self-Service and Visibility

Sometimes I feel like I'm reinventing the wheel to get things done. I wish we had reliable self-service tools and assets that work end-to-end in our systems.

- DevOps Engineer

The Challenge: Lack of automated tools and processes

An absence of self-service tools crates increased workloads, elevated dependency on support requests, and reduced agility to address user needs promptly. Developing automated and self-service tools and processes within a private cloud environment empowers IT groups by reducing their workload, enhancing efficiency, and enabling users to independently address their needs and spend more time on strategic, high-value activities.

The Solution: Automated efficiencies and self-service templates

Incorporating automation successfully requires integration into relevant systems and monitoring tools to ensure end-to-end reliability and create a seamless user experience. The following steps are recommended:

- 1. Assess and plan: Identify repetitive tasks, evaluate automation potential, and design the steps to achieve automation
- 2. Standardize: Establish organization-wide procedures and configurations for automation across all environments with the IT ecosystem
- 3. Test and validate: Test automation scripts, cloud templates, and workflows thoroughly to ensure accuracy and reliability
- 4. Document: Document automated workflows and processes for easy reference and future improvements
- 5. Improve and adapt: Continuously review and improve automated processes to adapt to evolving technologies and requirements

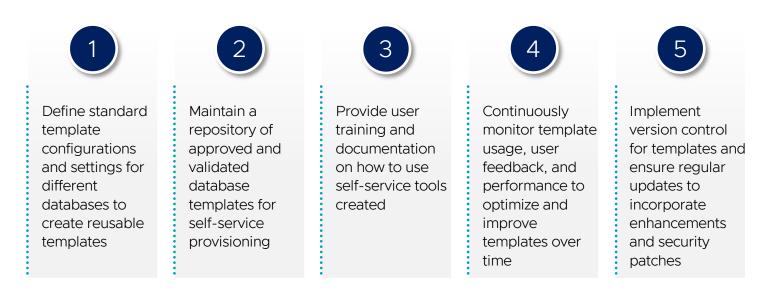
When leveraging automation, routine tasks, provisioning, and management workflows can be streamlined. The efficiencies gained help to reduce manual efforts and accelerate service delivery and provisioning while maintaining accuracy and consistency.

Building a user-friendly self-service cloud allows stakeholders to access resources and services independently and involves developing intuitive interfaces, cataloging services, and providing transparent visibility into available resources. This empowers users to select and deploy services seamlessly and is done most effectively through the development and integration of templates.



At this phase of the private cloud journey, it's critical to engage with business groups that will be consuming the platform to understand the types of templates required. Different groups will have specific template needs for the types of databases required, lifecycle management, governance, security, and operating systems.

Leveraging a process for incorporating templates within a private cloud environment accelerates deployment and ensures that best practices are used across your organization's infrastructure. Key steps to include in the process are:



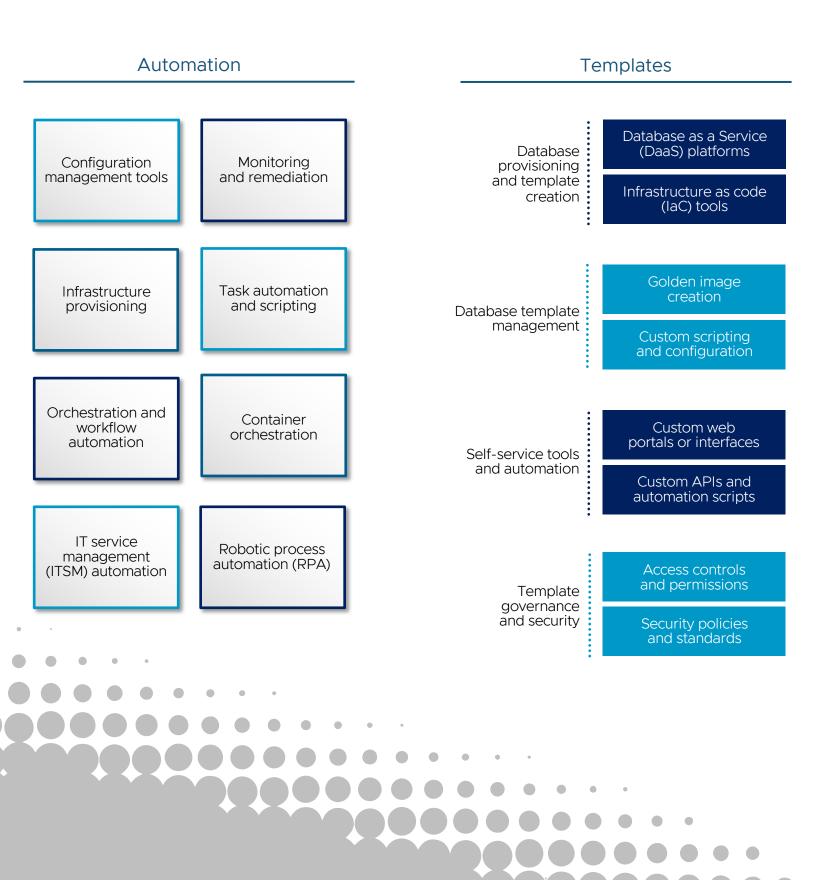
Creating self-service templates will help maximize user value by decreasing the time spent on lowvalue tasks and allow for more skilled consumption of the platform.





Get Started Checklist: Create a Self-Service Environment

Use these categories to begin creating self-service tools and assets.



Intelligent Provisioning: Deliver Stable Environments at Scale

It's difficult to ensure smooth execution of all tasks when we keep bumping into issues because of lack of testing and teams reusing old APIs.

– Project Manager

) The Challenge: Inefficient configuration and instability

Delivering stable environments at scale can be challenging due to many factors such as:

- **Complexity**: As systems grow in size and scope, it's harder to manage configurations and dependencies across components
- Manual processes: Heavy reliance on manual configuration and maintenance increases the likelihood of errors and inconsistencies, causing system instability
- **Rapid changes**: Continuous updates, patches, and technology changes amplify complexity and can introduce unforeseen compatibility issues or errors
- Lack of standardization: Inconsistent configurations across multiple environments or components result in difficulties maintaining stability
- **Resource constraints**: Limited resources or infrastructure constraints strain the capacity to manage and monitor large-scale systems effectively
- Dependency chains: Interconnected infrastructure dependencies can create vulnerabilities and trigger a chain reaction of system-wide issues if one component fails

Implementing a holistic approach and system-wide configuration management addresses the challenges above and helps minimize downtime.

The Solution: Configuration management with a holistic approach

Efficient configuration management ensures consistency and stability across the private cloud environment. This includes establishing standards, tracking configurations, and implementing change management processes to maintain a reliable and secure infrastructure.

Positioning workloads on the most appropriate infrastructure resources based on predefined criteria such as specific requirements, location, cost, or compliance ensures optimal performance, cost efficiency, and adherence to compliance and policy requirements.



Considerations for proper and reliable configuration include the following:

Version control

- Organize files into logical structures within version control systems
- Define branching strategies for development, testing, and production environments, enabling proper code isolation and controlled promotion of changes

Immutable infrastructure

- Recreate resources with updated configurations
 rather than create in-place modifications
- Emphasize replacement over modification to ensure consistency and predictability

Idempotency and consistency

- Ensure script operations are idempotent, allowing repeated execution without changing the system's state after initial setup
- Use the same codebase or templates for different environments to maintain consistency and reduce divergence

Automated testing

- Implement automated unit tests to validate scripts and ensure correctness of configurations and deployments
- Test integration components to validate their behavior and functionality in a simulated environment

Parameterization and variables

- Utilize variables and parameterization making scripts dynamic, allowing customization of different environments or configurations
- Avoid hard-coding sensitive data in files and instead use secure methods like environment variables or secrets management

Change management and documentation

- Implement change management processes to track modifications to code and ensure proper review and approval before deployment
- Maintain detailed documentation describing infrastructure components, configurations, and deployment procedures ot facilitate understanding and troubleshooting

Continuous integration / continuous deployment (CI/CD)

- Implement CI/CD pipelines to automate building, testing, and deploying infrastructure changes, ensuring rapid and reliable deployments
- Define workflows including testing, approval gates, and automated deployment stages for code changes

Monitoring and observability

- Implement monitoring to track impact of infrastructure changes, enabling quick detection and response to issues
- Integrate logging and metrics to gain visibility into the performance and behavior of deployed resources

Collaboration and governance

- Implement role-based access control (RBAC) to control access to code and deployment processes
- Define and enforce governance policies to ensure compliance, security, and adherence to standards across deployments

Adopting a holistic approach involves integrating intelligent provisioning mechanisms accounting for factors such as workload characteristics, resource utilization patterns, and performance metrics. This ensures stable environments even during scale-ups or fluctuations in demand.

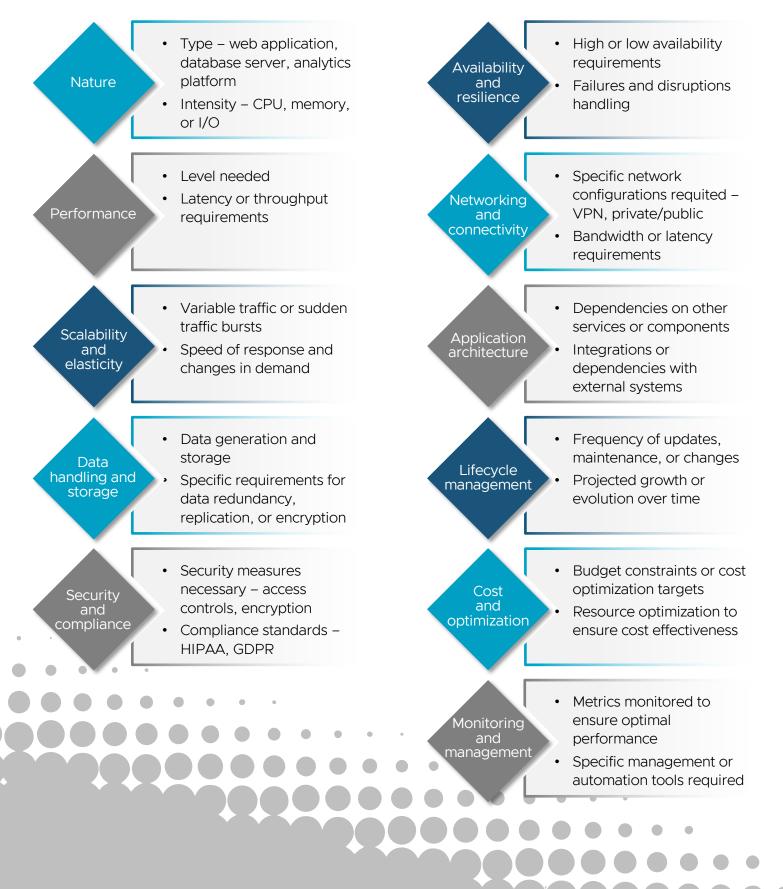




Get Started Checklist: Create Intelligent Provisioning for Every Workload



Analyze each workload for the following characteristics to create intelligent provisioning within your private cloud.



People: Define Teams and Roles

I hate to lose good people and watch years of knowledge about our systems walk out the door. It's tough to maintain a staff with the broad knowledge base and internal relationships necessary to optimize our cloud operations.

- Chief Technology Officer

The Challenge: Silos, lack of collaboration, competing priorities, and skills gaps

Extensive organizational and technology changes can cause turnover, knowledge loss, and lack of collaboration. Poor communication, disjointed leadership, and the absence of a shared vision can result in a siloed culture.

Transparency and continuous communication can help maximize existing talent and set a foundation for growth throughout a digital transformation.

The Solution: Develop cross-functional teams

Assembling cross-functional teams equipped with the expertise needed to manage, operate, and innovate within the private cloud environment empowers staff to do what's best for the business. Cultivating strategic teams involves identifying skills, fostering collaboration, and promoting continuous learning to adapt to evolving technologies.

VMware by Broadcom recommends a services approach in which teams are accountable for their services from definition through end of life. Two common team structures include a Cloud Infrastructure Services Team and a Cloud Services Team.

Cloud Infrastructure Services Team This team is responsible for implementing and administering the architecture and infrastructure components to deliver services spanning cloud environments, including VMware Cloud Foundationbased private and hybrid clouds. They are responsible for proactively monitoring the cloud infrastructure and collaborating with other team members to address events before they impact any cloud services.

Cloud Services Team This team is responsible for all on-demand computing services to help businesses be more agile, efficient, and cost effective. This team promotes innovation and develops new products and services. Based on organizational maturity, the team may be divided into multiple deployment teams including IaaS, PaaS, CaaS, and DaaS.



An additional element of team development involves outlining roles and responsibilities within teams to promote effective management. This includes specifying tasks, establishing accountability, and fostering a collaborative culture to ensure that each team member contributes effectively to the overall objectives.

Following this structure allows teams to own all elements of their services, increase domain expertise, and maximize visibility for the lifecycle of their services.

When implementing a private cloud, certain roles and responsibilities may require adjustment. Effectively implementing changes in roles and responsibilities includes:

- Identifying skills gaps
- Defining role profiles
- Determining role responsibilities
- Establishing collaboration and communication
- Documenting role responsibilities, expectations, and boundaries
- Providing training and development opportunities
- Encouraging continuous learning and skill enhancement and improvement
- Establishing feedback loops
- Adjusting and refining role allocations and responsibilities based on feedback

Following the recommendations above promotes a well-coordinated and efficient cloud environment that encourages collaboration and minimizes silos.

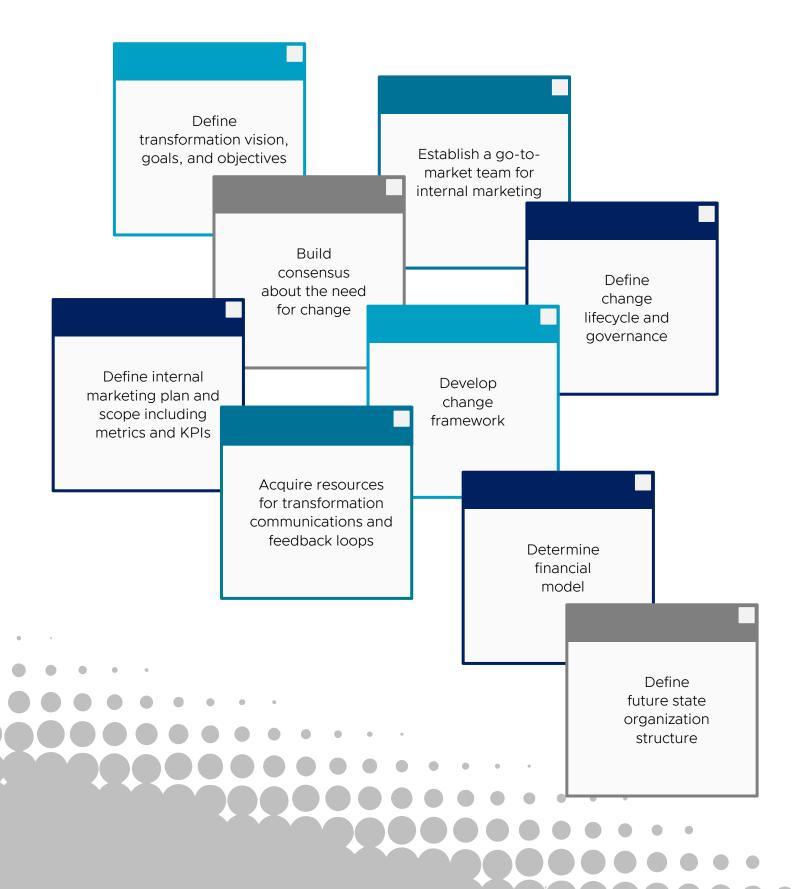




Get Started Checklist: Create a People Plan for Change

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Use the steps below to create a plan for ongoing transparency and continuous updates during change cycles.



Infographic: Tips for Implementing Private Cloud

Get started with private cloud

Implementing a private cloud is a strategic decision with multiple benefits. A full-stack approach to private cloud transformation is designed to address diverse needs and drive significant advantages.

Create seamless operations

2

Creating seamless integrations with existing infrastructure, applications, and workflows and ensuring compatibility for all hardware, software, and networking components helps create an optimal private cloud.

Map changes to the business



IT value is recognized and better understood once the IT workstreams and use cases are effectively mapped to the business initiatives.

Develop at the right levels

Depending on organizational use cases, the layers and components for private cloud should be implemented at appropriate levels for desired outcomes and target states.

Maximize self-service



Creating self-service templates will help maximize user value by decreasing the time spent on lowvalue tasks and allow for more skilled consumption of the platform.

Optimize every workload



Positioning workloads on the most appropriate infrastructure resources ensures optimal performance, cost efficiency, and adherence to compliance and policy requirements.

Encourage collaboration



Following a team structure allows teams to own all elements of their services, increase domain expertise, and maximize visibility for the lifecycle of their services.



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