Who Should Read This:

VMware vSphere architects and administrators who are considering extending their on-premises VMware infrastructure into the cloud, and who wish to understand how they can apply their vSphere knowledge and experience to vCloud Air infrastructure and operations.

Administrators and managers who are comparing alternative approaches to cloud infrastructure, and wish to get the most value from current staff investments, and minimize delay, disruption, and retraining costs during transition.
Introduction

VMware vCloud® Air™ is cloud Infrastructure-as-a-Service (IaaS) that helps customers extend and modernize their on-premises infrastructure using computing, networking, and storage resources they can manage with their tools and skill sets.

This chapter defines vCloud Air, describes the unique approach of VMware to and capabilities for cloud computing, explains major service offerings, and identifies drivers and differentiators for choosing VMware.

- Definition and differentiation
- Approach and capabilities
- Service offerings
- Why VMware vCloud Air?
Introducing vCloud Air

vCloud Air is an Infrastructure as a Service (IaaS) Cloud Owned and Operated by VMware, and Based on VMware Software

The Service Includes IaaS and Related Service Offerings

- Infrastructure as a Service is the core of vCloud Air: basic computing, networking, and storage building blocks
- Platform as a Service Application Services are middleware or database building blocks used primarily by developers
- Managed Services are complete applications or solutions offered by VMware and its partners primarily to admins and end users

The service is offered from a network of Tier 3+ data centers, each with redundant power feeds to all systems, N+1 UPS, backup generator with days of fuel on hand, and multiple contracts for emergency resupply.

The VMware Approach to IaaS

The service is designed and built to help customers extend and modernize current computing environments, and create new ones that:

- Build on their investments in applications, data, people, and processes
- Avoid “information islands” where incompatible protocols or complex migration processes isolate business information
- Deliver a “write once, deploy anywhere” development experience for maximum efficiency and a seamless computing environment

The VMware Hybridity Point of View

vCloud Air is a hybrid service. This means the cloud is part of your computing environment — not the other way around — so:

- Off-premises extension is seamless, giving you instant capacity, infinite scale, and significant savings in capital expenses
- Applications and data are completely mobile from your premises to vCloud Air, and back to your premises
- You stay in full control, using your current staff, processes, tools, and automation
vCloud Air Offerings

VMware vCloud Air Service Offerings Can Be Deployed Individually or in Combination, on Monthly, Annual, or Extended Lease Agreement Terms

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Steady-state, predictable performance, ideal for production, mission-critical, and security- or compliance-driven workloads

Flexible environment ideal for proof-of-concept or short-term projects that don’t require dedicated infrastructure

Cost-effective, feature-rich solution with Recovery Time and Recovery Point selections to deliver appropriate disaster recovery performance

Most resource levels are expandable or upgradeable. Please consult your VMware Sales representative for details, limits, and fees.

All vCloud Air offerings include at no charge: Firewalls, VPNs, Load Balancers, Disk I/O, Redundancy and High Availability, DHCP, and NAT.
Why VMware?

Customers Choose VMware for:

Market-Leading Reliability Features

vCloud Air
- Fully-redundant, reliable virtual machines
- Automatic availability monitoring and free, fast virtual machine restart
- Automatic performance optimization
- Zero-downtime maintenance

Other Clouds
- Buy twice as many machines and try to sync them
- Buy monitoring software and figure out how to use it
- Buy multiple virtual machines and kill off poor performers
- Guaranteed downtime

Application Flexibility

Consistency between on-premises and cloud environments, and easy migration in either direction deliver compelling value from initiatives like these:
- Development and testing — test anywhere, deploy anywhere
- Extend current applications — the only cloud that makes it easy
- Disaster recovery — consistency, simplicity, and price
- Modernize enterprise applications — reliable, controlled transition
- Next-generation applications — performance, reliability, flexibility

Summing Up
This chapter introduced vCloud Air, describing the VMware “Hybridity” approach and features that set vCloud Air apart from alternative cloud offerings.

References
These resources cover related topics and provide additional detail about vCloud Air use cases and migration:
1. VMware vCloud Air
   Central location for all the information you need to get started with vCloud Air.
2. VMware Hands-on Labs Online
   A free online portal with opportunities to try out vCloud Air in a tested and documented lab environment.
3. VMware vCloud Connector
   The primary location for you to read about and download VMware® vCloud Connector® for migrating workloads to the service.
Security and Compliance

Under the vCloud Air security model, VMware protects its cloud computing infrastructure, and helps users manage security in their cloud environments using the same tools and processes they use on premises.

This chapter gives a working knowledge of security in vCloud Air environments, including:

• Threats in cloud environments
• VMware security support
• VMware cloud security model
• Compliance
VMware Protects You Against Two Types of IaaS Vulnerabilities

1. **Threats to Hypervisor Trust**
   Corrupted virtual machines may allow illegitimate copies to access data from outside the environment. vCloud Air is built on the most trusted, battle-tested VMware® vSphere® hypervisor. VMware monitors all its environments for hypervisor vulnerabilities, and applies patches immediately upon discovery.

2. **Network Traffic Manipulation**
   Network traffic that can be intercepted or manipulated raises risks of man-in-the-middle attacks or data interception. VMware supports and recommends connecting your infrastructure to vCloud Air using IPsec VPN or Direct Connect.

VMware Supports “Bring Your Own Security” with:

**Seamless Networking**

- Properly configured VPN or Direct Connect provide:
  - The same flexibility you have on premises today
  - Better visibility into traffic across your hybrid network
  - Support for consistent policies across environments

**Additional Security Controls**

- Network-limited controls for IPv4 Layer-3 address spaces, critical for PCI workloads
- Highly-available Edge Gateways that stay under your control, with consistent firewall configurations

**Security Operations**

- VMware maintains:
  - An active intrusion detection system managed by our IT security staff to monitor our networks for incidents
  - An incident response system to address any such incidents by notifying customers and authorities so they can jointly manage any damage

---

**Cloud Threat Model and VMware Security Support**

VMware is committed to protecting its customers and ensuring the security of their environments. Here are some key points:

- **VMware Protects You Against Two Types of IaaS Vulnerabilities**
  - **Threats to Hypervisor Trust**: Corrupted virtual machines may allow illegitimate copies to access data from outside the environment. VMware monitors all its environments for hypervisor vulnerabilities and applies patches immediately.
  - **Network Traffic Manipulation**: Network traffic that can be intercepted or manipulated raises risks of man-in-the-middle attacks or data interception. VMware supports connecting to vCloud Air using IPsec VPN or Direct Connect.

- **VMware Supports “Bring Your Own Security” with:**
  - **Seamless Networking**: Properly configured VPN or Direct Connect provide:
    - The same flexibility you have on premises today
    - Better visibility into traffic across your hybrid network
    - Support for consistent policies across environments
  - **Additional Security Controls**:
    - Network-limited controls for IPv4 Layer-3 address spaces, critical for PCI workloads
    - Highly-available Edge Gateways that stay under your control, with consistent firewall configurations
  - **Security Operations**:
    - VMware maintains:
      - An active intrusion detection system managed by their IT security staff
      - An incident response system to address any discovered incidents

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**Introduction**

**Security and Compliance**

**Networking**

**Management**

**Availability**

**Getting Started**
Security Model and Compliance

Shared Security Responsibilities
VMware is responsible for:
- Platform protection to keep VMware vCloud Air host environments protected
- Proper hypervisor setup including monitoring for new threats and immediate patching when any are detected
- Workload management assistance to help users manage cloud environments using the same tools and processes as in their on-premises data centers
- Threat monitoring to detect and defend against attacks on vCloud Air host environments
- Support for security solution providers to ensure that their solutions work in vCloud Air environments

vCloud Air users are responsible for:
- Virtual machine setup, including OS resources under your control, middleware, runtime, data, and applications
- Proper firewall configuration at the Edge Gateway of virtual data centers in your cloud environment
- Firewall and application logging, and monitoring the logs for security events
- Data encryption — VMware supports, highly recommends, and will assist with in-guest encryption of sensitive data
- “Bring your own security”, extending effective security and control across on-premises and cloud environments

VMware tools and services help customers meet their security responsibilities

Summing Up
This chapter has outlined the threat model for Infrastructure-as-a-Service environments and explained how VMware meets its responsibilities under a shared security model.

It has also outlined user responsibilities under that model, and detailed the support VMware offers to help users meet them.

References
These resources cover related topics and provide additional detail about vCloud Air security and compliance:
1. **VMware Compliance and Certifications**
   - Up-to-date information on compliance, with links to relevant certificates and documents.
2. **vCloud Air Networking Guide**
   - Detailed descriptions of network security setup using firewalls and IPsec VPN. Also see the step-by-step [Firewall Tutorial](#).
3. **vCloud Air Marketplace**
   - Third-party security solutions for vCloud Air, including intrusion detection systems (IDS), encryption, and load balancing.
Networking

vCloud Air includes several different networking components, and offers several different options for bringing virtual machines or applications from your on-premises environment or vSphere instance into the service.

This chapter provides an operational understanding of vCloud Air networking, including:

- Features and top-level services
- Basic and advanced networking configurations
- Connecting the service and your data center
- Security: rights and roles
Networking: Concepts and Options

Cloud Options

VMware vCloud Air Virtual Private Cloud
(1 virtual data center)
VMware vCloud® Air™ Virtual Private Cloud offers this multi-tenant service limited to one virtual data center, with one Edge Gateway for all networking configuration within the instance.

VMware vCloud Air Virtual Private Cloud
(≥1 virtual data center)
VMware vCloud Air Virtual Private Cloud also offers this single-tenant service that may be carved into multiple virtual data centers, each with its own Edge Gateway, networking profiles, and configurations.

Virtual private and dedicated clouds differ in other ways, but the number of virtual data centers and Edge Gateways is most relevant for networking.

Edge Gateways and Default Networks

Edge Gateway

The primary building blocks of vCloud Air networks, Edge Gateways are virtual appliances where you can configure networking services such as network address translation (NAT), firewall, load balancing, IPsec VPN, and DHCP for virtual data centers in your cloud instance.

Isolated Network

Your virtual data center includes a single isolated network not connected to the Edge Gateway; it is used for private internal access. Isolated networks are ideal for deploying protected virtual machines that are not directly connected to the Internet.

Routed (Gateway) Network

Your virtual data center is provided with a routed network, also called a gateway network because it connects to the Edge Gateway. Routed networks are where you deploy virtual machines and networking appliances that need to connect to the Internet.

External Network

Your cloud instance comes with an external network with a public IP address that connects vCloud Air to the public Internet.

Note: Virtual data centers come with an Edge Gateway and these three default networks whenever there is at least one available public IP address.

Note: Edge Gateways may create up to 10 different network spaces. One is unmodifiable and reserved for the external network. The others may be modified, and you can create up to nine routed or isolated address spaces.
Network Configuration

Two Methods for Configuring Your Networks

1. Basic Networking Configurations

Basic configurations like network address translation (NAT) and firewall rules can be completed through the vCloud Air Management Web Portal. Configurations for each virtual data center in your cloud instance may be accessed and modified using the gateways tab of your vCloud Air Dashboard.

**IP address assignment**
Each default routed, or gateway, network includes a pool of IP addresses covering a preset range. The network can assign these addresses to virtual machines attached to it in three ways:

1. Automatic
3. DHCP

**Firewall rules**
On the firewall tab, enter details such as source and destination IP addresses, source and destination ports, and your choice of filtering protocol.

Firewall rules can regulate traffic:

- “North-south” — entering or leaving the cloud instance
- “East-west” — from one network within your cloud instance to another

For example, the web front end of a three-tier application might sit on one network, the application tier on a second, and a database on a third. Edge Gateway firewall rules can regulate traffic crossing from networks to any other, as well in from or out to the Internet.

**NAT rules**
NAT rules convert public IP addresses to internal, private IP spaces, defining private IP spaces within the service. Define the spaces, front-end them with public IP addresses, and NAT will translate the public addresses into your private space.

2. Advanced Network Configurations

More advanced networking configurations like load balancing are accessed and modified from the VMware vCloud Director Management Portal, accessible from a link on the gateways panel of the vCloud Air Management Web Portal.

**Load Balancing**
Load balancing is accomplished by creating virtual servers and establishing server pools. vCloud Air supports multiple pools and multiple virtual servers.

**Server pools**
Server pools distribute incoming requests across multiple servers according to a load-balancing algorithm selected from these options:

- IP_HASH
- ROUND_ROBIN
- URI
- LEAST_CONN

**Virtual server**
The virtual server located at the entry point of the network serves as the front end to these pools.

**Configuration**
To configure load balancing in the vCloud Director portal:

1. Select Load Balancer from the gateway properties.
2. Set up the server pool:
   - Configure the load balancing algorithm and health check information.
   - Add the virtual machines you choose to be members of the server pool.
3. Configure the virtual server by specifying the public IP address and cookie or session ID persistence.
4. For more information about the Load Balancer in the Edge Gateway, consult the vCloud Air Networking Guide.
Connecting vCloud Air and Your Data Center

Three Ways to Connect Your On-Premises and vCloud Air Virtual Data Centers

1. Public Internet
   - You may connect to the service over the public Internet using the Edge Gateway external (public) IP address. However, this is not very secure, and raises capacity and latency issues.

2. IPsec VPN
   - You may create secure channels between on-premises VPN devices and the service using one or more IPsec VPNs. IPsec VPN tunnels terminate at the Edge Gateway of your cloud instances.
   - Configure the VPN in vCloud Air by specifying:
     • Service-side information available at the Edge Gateway.
     • Customer-side information as if you were configuring a front-end customer edge router.

3. Direct Connect (Continued)
   - **Direct connect options**
     - **Private line**
       - Direct Connect over Telco infrastructure is called Private Line; it:
         • Starts from your on-premises external router
         • Passes through a direct-connect Telco partner device
         • Terminates at the Edge Gateway of your Cloud instance
       - Your dedicated line will terminate right at the Edge Gateway, so you can extend VLANs or create IPsec tunnels over your new dedicated line.

   - **Cross Connect**
     - If your data center is co-located with vCloud Air you may cross-connect them, for example to use the Cloud for front-end computing but maintain your own storage.
     - In this case:
       • Storage would reside in your customer-side CoLo cage
       • The dedicated Direct Connect line would extend to the Cloud
       • The front-end computer would be hosted on the VMware side

Final Points on Connectivity

- Virtual machines are disconnected from the Internet by default, with NAT disabled and firewalls set to deny all traffic. You must create firewall and NAT rules to allow traffic between virtual machines, and between the Internet and virtual machines.
- A single virtual data center may have multiple types of connection — in fact, a single Edge Gateway may be used for Public Internet, IPsec VPN, and Direct Connect connectivity.
Security Rights and Roles

Security Rights and Roles
Role-based access control allows you to assign appropriate privileges to different users for segregation of roles and security. Relevant rights and roles include:

- Account administrators, who may add users and edit their rights but not manage virtual data-center resources or networking
- Virtual infrastructure administrators, who may create virtual data centers and modify resource allocations, but not create users or manage networking
- Network administrators, who may configure network resources but not manage users or non-network resources
- Read-only administrators, supervisors who may check but not change just about anything
- Subscription administrators, who may purchase resources and support but not manage vCloud Air
- End users, who may create and manage virtual machines only based on available templates and networks, but cannot create templates or networks

Network administrators may configure firewall and NAT rules, create networks and IP address pools, and meet other network responsibilities. End users can only connect their virtual machines to a pre-established network. This approach gives substantial access and control to network administrators to ensure that resources and virtual machines deployed into the service are in compliance with enterprise requirements.

Summing Up
This chapter has described vCloud Air networking services, connectivity options, and configuration rules. It demonstrates that vCloud Air networking is a flexible, customizable solution that takes advantage of advanced network virtualization to give you the ability to recreate and support traditional network architectures. vCloud Air networking is based on the same networking stack as VMware® vCloud Suite®, uses the same VXLAN configurations and the same VMware vCloud® Networking and Security™ (vCNS) configurations.

In short, if you are a qualified VMware network administrator, you already have the skills and experience to use vCloud Suite, vSphere, and vCNS products, applying the same network policies you use today in your on-premises environment.

References
These resources cover topics related to and provide additional detail about the material covered in this chapter:

1. vCloud Air Networking Guide
   Information on configuring VMware vCloud Air networking and gateways, adding networks to gateways, and setting up security.

2. Tutorials
   Tutorials and videos demonstrating the steps to configure basic networking services.

3. VMware Education Services
   Additional training videos with detailed information on navigating the networking features of the vCloud Air Management Portal.

4. Introduction to Gateway Services DHCP
   A step-by-step tutorial illustrating DHCP configuration inside vCloud Air.
Management

VMware overcomes the challenge and complexity of managing hybrid infrastructure by providing a single set of tools and processes that work seamlessly across your on-premises VMware vSphere data centers and vCloud Air.

This chapter reviews the capabilities of VMware management tools in vCloud Air environments to:

• Administer vCloud Air resources
• Migrate workloads between environments
• Give users cross-environment self-service catalogs
• Use consistent application deployment blueprints
• Automate configuration and compliance management
• Monitor on-premises and cloud environments
Getting Started with Hybrid Infrastructure Management

Management Challenges

Good business reasons to move to the cloud
Agility and cost are the top two reasons businesses adopt private and cloud infrastructure.

But management challenges stand in the way
• Different tools needed to manage on-site and public cloud workloads
• Difficult migration processes to move workloads to the cloud, and especially to move them back on premises
• Inconsistent tools for managing workloads in incompatible environments
• Misaligned policies and standards due to conceptual, technical, and operational differences on premises vs. cloud
• Multiple teams needed to manage across environments, adding cost, delay, and risk

VMware Overcomes Management Challenges with:

• One set of tools and processes to manage workloads in on-site and vCloud Air environments
• Seamless migration to vCloud Air, or back to your on-premises data center
• One set of tools — not “compatible tools”, the same tools — to extend your vSphere environment into the cloud
• Consistent policies and standards that minimize your compliance effort, legal exposure, and regulatory risk
• One team, backed by a single, responsive VMware support organization
• One environment, improving your span of control, your team’s productivity, and your company’s return on IT investments

Download and Install the vCloud Air vSphere Client Plug-in

• It’s free, at my.vmware.com
• Use it to manage:
  − vCloud Air resources
  − Virtual data centers
  − Virtual machines: vCPU, vRAM, storage, and more
• Use the same tool to manage on-premises and cloud environments

If you’re a VMware Infrastructure management administrator familiar with vSphere Web Client, you already know how to use it.
**VMware Management Tools: vCloud Connector, vCenter Configuration Manager**

**vCloud Connector Links Your Data Centers and the Cloud for:**

**Migration**

Use vCloud Connector to migrate virtual machines between data center and the service:
- At no charge for migrations in either direction
- Without “lift and shift”, containers, or other tricks
- Consistently across vSphere, vCloud Air, and any other public cloud based on vSphere

**Content Synchronization**

Synchronize your catalog across environments, to:
- Maintain a synchronized master library of templates
- Subscribe to master library content
- See changes automatically reflected in local libraries

**Data-Center Extension**

Securely link your on-premises and cloud data centers:
- Extend Layer 2 over a secure SSL VPN tunnel
- Move virtual machines from on-premises vSphere to cloud environments
- Maintain original IP and MAC addresses

**VMware vCenter Configuration Manager Centralizes Control and Compliance for:**

**Patch Management**

VMware vCenter Configuration Manager™ lets you deploy security patches consistently using a single tool:
- Select a cloud environment as just another endpoint
- Use the tool exactly as you do today
- Gain the same level of control as in your current vSphere environment

**Security Compliance**

Audit and report compliance using your current reports:
- For PCI, HIPAA, and other regulatory frameworks
- Add your cloud environment as a target endpoint
- Send your security teams the same reports they’re used to receiving
VMware Management Tools: vCenter Hyperic, vCenter Operations, vCloud Automation Center

### VMware vCenter Hyperic and vCenter Operations

**Monitor Performance within the Service for:**

**OS, Application and Middleware Monitoring**

- Use VMware vCenter™ Hyperic to collect comprehensive performance data, with:
  - 50,000 metrics across 75 application technologies
  - Plug-ins for Java, IIS, SQL Server, and many more
  - Extensible with custom plugins that use Java and XML APIs

**Advanced Infrastructure Analytics**

- Gain insight and visibility across your entire hybrid cloud:
  - Integrate with vCenter Operations Manager for unified management
  - Correlate performance metrics with configuration changes for fast root-cause diagnosis
  - Centrally execute control operations across your entire hybrid cloud infrastructure

### VMware vCloud Automation Center for Server

**Automates Catalogs and Approvals for:**

**Policy-based Governance**

- Use VMware vCloud® Automation Center™ for Server to deliver one self-service catalog in cloud and on premises:
  - Control application and cloud access user by user
  - Build in workflows to manage multi-level approvals
  - Accelerate IT service delivery by making applications available across both environments

**Application Blueprints**

- Simplify application release automation:
  - Provision consistent development, test and production environments quickly across cloud and on premises
  - Promote or roll back changes for consistency across environments; for sandboxing, test, or break-fix
  - Build from standardized, approved components and templates
Summing Up, References

Consistency Across On-Premises vSphere and Cloud Environments Unlocks Your Productivity with:

- One experience
- One set of tools and workflows
- One source of support

Summing Up
This chapter outlined the challenges of managing hybrid physical and cloud environments, and demonstrated the VMware approach of managing both with a common set of tools and processes.

References
These resources cover related topics and provide additional detail about vCloud Air management:

1. Watch these videos for demonstrations of how these products interact with vCloud Air:
   - vSphere Web Client plug-in
   - vCloud Connector
   - vCloud Automation Center

2. Access detailed product information, links to additional resources, and purchasing details for these solutions on the VMware website:
   - vCloud Connector
   - vCenter Configuration Manager
   - vCenter Hyperic
   - vCenter Operations Manager
   - vCloud Automation Center
vCloud Air offers its users a broad range of data protection and disaster recovery solutions to help them maintain availability of applications and data in the cloud, and manage the processes by which they do so.

This chapter discusses data protection and disaster recovery options in cloud environments, including management of Active Directory, DNS, and automation of disaster recovery.

- Data protection: managing backups and restores
- Disaster recovery: configuration and testing
- Advanced disaster recovery topics: Active Directory, DNS, and automation
Data Protection – Setting Policies

Setting Data Protection Virtual Data Center-Wide

Enabling and Configuring Virtual Data Center-Wide

Data Protection

On the virtual data center user interface, click “Actions” and “Enable Data Protection” to enable data protection with a fully automated policy throughout a virtual data center, confirm that the virtual data center has been updated, set its retention period, and schedule backup windows.

Changing Default Policies

Enabling data protection for a virtual data center automatically protects all virtual machines in it. Any changes to the data protection policy affect every virtual machine and vApp in the virtual data center.

Setting Data Protection for a Single Virtual Machine

Self-service Options: Setting Data Protection by
Virtual Machine or vApp

Switching a virtual data center to self-service allows enabling and configuring data protection for any of its individual virtual machines, or for all virtual machines associated with any vApp.
Data Protection – Recovery and Management

Recovering from Backup

**Restore Options**

Each vApp restore point offers users options to:
- Restore the vApp as a new instance
- Restore it in place, overwriting the current instance
- Delete it, or delete all backups

Disabling Data Protection; Deleting Virtual Machines and vApps

**Disabling Data Protection**

Disabling data protection does not delete any of the restore points available for a virtual machine or vApp. Deleting restore points requires opening the restore points and deleting them individually.

**Backups of Deleted Virtual Machines and vApps**

Deleting virtual machines and vApps does not delete their backups:
- Backups continue to consume storage
- Storage consumed is not attributed to any virtual data center or vApp
- Backups show the original virtual data center of its virtual machine or vApp

Backup Storage Use and Trend

**Monitoring from the Administrator Dashboard**

Display shows storage use by data protection only:
- Data includes storage available and storage consumed
- Graph indicates 30-day trend and the last few day's data
- Data protection restore point policies affect consumption significantly
VMware vCloud Air – Disaster Recovery

Basic Configuration, Testing, and Failover

VMware vCloud Air™ Disaster Recovery is a storage-agnostic, encryption-enabled solution for protecting business-critical workloads in the cloud.

Configuring a site
• Select “Configure Replication” on the virtual machine
• Specify vCloud Air as your replication target, for example Disaster Recovery to Cloud service
• Initial full synchronization starts immediately, as shown on progress bar
• Confirm progress on the replication and virtual machine panels of your target virtual data center

Test failover
• Log in to vCloud Air with your username and password
• Initiate “Run Test Recovery” operation
• Specify “Synchronize recent changes” to synchronize with the source virtual machine, or “Use latest available data” to skip synchronization
• Select “View and Edit Details” on the dashboard to check network connection, operation, and arrival of virtual machine
• Power on virtual machine to confirm proper operation
• Run “Test Clean Up” in the vCenter client to remove test data from vCloud Air

Special considerations for permanent failover
• This permanently moves your virtual machine to the vCloud Air, so network settings attach to the recovery, not the test, network
• Your virtual machine will be ready and available to use within the service until on-premises site comes back online
• Select “Stop Replication” to perform full fallback to the on-premises environment

Advanced Topics: Active Directory and DNS

Disaster Recovery runs failed-over, not real-time, virtual machines. Here are two ways to set up Active Directory (AD) and DNS to ensure full recovery of workloads:

Option 1 – Cross Connect
• Using Direct Connect, set up Cross Connect from disaster recovery to your customer cage
• Set up AD and DNS infrastructure in your cage, and have the disaster recovery workloads point to this in the event of a failover

Option 2 – vCloud Air instance
• Run AD and DNS in a subscription cloud instance
• Interconnect the disaster recovery instance and subscription instance using VPN between the Edge Gateways
• Resembles Cross Connect option, but does not require a customer cage

In both cases, failed-over machines maintain domain membership, and attach to domain controllers in the cloud.

Advanced Topics: Automating Failover Steps

Many steps for executing a disaster recovery failover can be automated. Automation options include:
• Basic automation is available through standard vCloud API
  – There are vCloud Air extensions to these APIs
  – There are also vCloud Air-Disaster Recovery extensions
• These APIs can be used with compatible tools including:
  – vCloud Automation Center
  – vCenter Orchestrator
• Failback is currently a manual process with vCloud Connector
Summing Up

This chapter has outlined several ways to arrange for data protection and disaster recovery in VMware vCloud Air environments, including backup, restore, and both basic and advanced options for using Disaster Recovery.

References

These resources cover related topics and provide additional detail about Data Protection and Disaster Recovery to Cloud:

1. Data Protection Data Sheet
   Key Data Protection concepts, and an overview of its operation in vCloud Air environments.

2. Disaster recovery Data Sheet and FAQ
   An overview of how Disaster Recovery works, and answers to frequent questions.

3. Disaster Recovery User Guide
   Detailed documentation on configuring and managing Disaster Recovery.

4. vCloud Air Tutorials
   Links to videos demonstrating Data Protection and Disaster Recovery in action.
Getting Started

The first step on the journey to the cloud is usually a small one — a discrete, well-defined project with a strong business case, but outside the mainstream of business production. A clear set of objectives and careful preparation clear the way.

This chapter outlines five starting points for evaluating the capabilities of vCloud Air, and ways to prepare workloads for migration.

- Hybrid cloud starting points:
  - Development and Testing
  - Extend Current Applications
  - Disaster Recovery
  - Modernize Enterprise Applications
  - Build Next-Generation Applications
- Preparing workloads for migration to vCloud Air
“Starting Point” Use Cases

Extend VMware vSphere Environments without Adding Infrastructure or Complicating Migration, Configuration, or Management

Why Not Build On Premises?
You could launch any of these initiatives on premises. But the benefits of moving them to the cloud are especially compelling, due to:

- Open-ended capacity — data-center capacity is practically unlimited, and expansion requires no major capital investment
- Cost efficiency — you can balance and adjust your variable capacity to optimize cost/performance
- Coverage — vCloud Air increases geographic diversity, reduces local and regional disaster risks, and improves service to distributed businesses

1. Development and Testing
Many virtualization initiatives started with Development and Testing; they are also common starting points for the cloud. vCloud Air is an ideal destination to:

- Test new applications with no infrastructure constraints to demonstrate business value, and then deploy them on compatible vSphere infrastructure back on premises
- Test upgrades of current applications in an isolated, fully compatible environment, but with no risk to production apps and infrastructure
- Develop new in-house applications in a constraint-free cloud sandbox, with no incompatible “mystery” technology stacks to complicate the environment and add deployment risk
- “Cloudify” software development lifecycles using a hybrid DevOps experience for development and IT. Move applications to production with no code changes, and with full automation and governance

2. Extend Existing Applications
Give your existing applications flexible capacity, and start an incremental move to the cloud to help your users acclimate to the new environment:

- “Build and destroy” short-term training environments and other projects with no worries about capital expense, or waits for procurement and provisioning
- Consolidate your data centers and rationalize applications easily, on a fully compatible platform with no resource constraints or barriers to expansion
- Create hosted versions of popular applications and make them available through an end-user “Software-as-a-Service” catalog for efficiency and convenience
- Move applications one by one to your cloud environment to give end users a smooth path to their future computing environment
3. Disaster Recovery

vCloud Air offers the ability to stand up a remote data center for disaster recovery without the capital expenses of building one yourself. You can build a home-grown solution, or use VMware vCloud® Air™ Disaster Recovery. This service provides a packaged, ready-to-go, asynchronous replication and failover solution for vSphere customers, with:

- Always-on “warm standby” capacity on vCloud Air
- Recovery point objectives from 15 minutes to 24 hours with available bandwidth
- Self-service protection, failover, and failback workflows provided on a per virtual machine basis
- Accelerated initial data seeding available by shipping a disk
- Service includes two disaster recovery tests annually, and 30 days of recovered virtual machine run time in case of disaster

vCloud Air Disaster Recovery delivers world-class off-site resources with full local control using vCenter-compatible tools and interfaces.

5. Build Next-Generation Applications

New DevOps methodologies accelerate application provisioning by eliminating manual steps and streamlining the entire process:

- Cloud-based self-service application provisioning portals like Pivotal CF offer end-to-end deployment of self-healing, scalable, highly available applications — operations-ready, with application performance management, reporting, and auditing
- There are even complete hosted DevOps solutions that can be provisioned to either on-premises data centers or the service

These new solutions demonstrate how the hybrid cloud can not only extend your data center, but let you experiment with entirely new workflows in a flexible, low-risk, scalable environment that remains fully compatible with your on-premises environment.

Start Slow — But Start Now

Most companies don’t rush to the cloud — they move carefully, starting with low-risk initiatives that offer clear business value and give them a way to test the new environment before making a full commitment.

vCloud Air is exactly the right environment for that kind of experimentation — compatible with your current vSphere environment, scalable up and down, and equipped with a full suite of management tools you already know how to use.
Preparing Your Workloads

These are the Three Most Popular Approaches to Preparing Workloads and Migrating Them from vSphere or vCloud Environments to the Service.

1. **Import Open Virtualization Format (OVF) Files**
   - Create Open Virtualization Format (OVF) files from virtual machines, vApps, or templates. Import them one at a time to vCloud Air across the internet or through Direct Connect, using the built-in Java applet or a custom solution. Direct Connect can deliver up to 10 Gbps bandwidth. Importing OVF files works well for one-off migrations of smaller workloads.

2. **Offline Data Transfer**
   - Migrate very large workloads many at a time using Offline Data Transfer — vCloud Air will ship you an external storage device to fill with encrypted data and ship back to the service.

3. **vCloud Connector (VCC)**
   - By far the most popular migration method, vCloud Connector is a free tool that connects private and public clouds to allow them to be managed as a unit. Its latest features include:
     - Path-optimized copy with retry, for transfer continuity even if the network fails
     - Guest customization, for example to preserve Guest OS settings throughout the migration
     - Pre-copy checks for common errors
   - The Advanced version of VCC can extend or “stretch deploy” a private data center when it is moved to the cloud. To enable Data-center Extension:
     - Verify that the private data-center network can be extended
     - Create a new routed vApp network in vCloud Air
     - Create NAT and firewall rules as needed in both private and public networks
     - Create an SSL VPN tunnel from the edge of the private network to the Edge Gateway in your vCloud Air instance
     - Copy and deploy the virtual machine or vApp into the new routed vApp in vCloud Air
   - Data-center extension also requires vCloud Networking and Security, and the vSphere Enterprise Plus Distributed Switch feature.

**Summing Up**

This chapter described five “starting point” use cases with clear value propositions, low risks, and minimal impact. It also outlined three alternative techniques to get workloads of any size to vCloud Air.

**References**

These resources cover related topics and provide additional detail about vCloud Air use cases and migration:

1. **VMware vCloud Air**
   - Central location for all the information you need to get started with vCloud Air.

2. **VMware Hands-on Labs Online**
   - A free online portal with opportunities to try out vCloud Air in a tested and documented lab environment.

3. **vCloud Connector**
   - Central location for you to read about and download vCloud Connector for migrating workloads to vCloud Air.