Citrix Virtual Apps and Desktops (CVAD)

Solution Architecture for VMware Cloud on AWS

DOCUMENT PURPOSE

This document provides a high-level Reference Architecture on Citrix Virtual Apps and Desktops service deployment in VMware Cloud on AWS environment.

AUDIENCE

This document is targeted at Citrix and VMware administrators, architects and consultants.

WE VALUE YOUR FEEDBACK

For comments on this document please send an email to: vmc-workloads@vmware.com

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Business Challenge

The need for greater agility and reduced management burden is driving workloads to the public cloud as a way to quickly respond to changing business needs and better utilize resources.

Migrating or extending a virtual desktop/application environment to the public cloud brings exceptional flexibility but requires a significant number of person hours, an assortment of tools and substantial risk. As companies make the move to public cloud, they also often discover that managing and maintaining cloud and hybrid environments further adds complexity and the need for retraining. If your organization is considering using the public cloud to deliver virtual desktops and applications, it's important to understand the challenges and to choose the right solution that minimizes your risks while enhancing both your external and internal customer experience.

Technology Solution

Citrix Virtual Apps and Desktops (CVAD) service provides virtualization solutions that give IT control of virtual machines, applications, and security while providing anywhere access for any device. Administrators can connect resources to the CVAD service through the Citrix Cloud Connector, which serves as a channel for communication between Citrix Cloud and your resource locations where server and desktop workloads reside. The Cloud Connector enables cloud management without requiring any complex networking or infrastructure configuration such as VPNs or IPSec tunnels. VMware Cloud™ customers will be able to connect multiple resource locations containing the machines and other resources that deliver applications and desktops to the end users.

Key Benefits

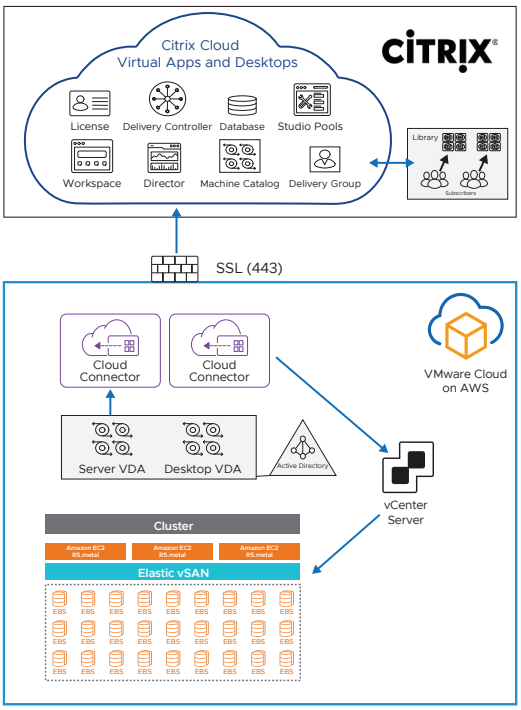
Citrix Virtual Apps and Desktops service will allow you to easily manage Citrix workloads to extend your virtual apps and desktops in vSphere as needed between either on-premises deployments or within VMware Cloud.

CITRIX VIRTUAL APPS AND DESKTOPS: KEY COMPONENTS

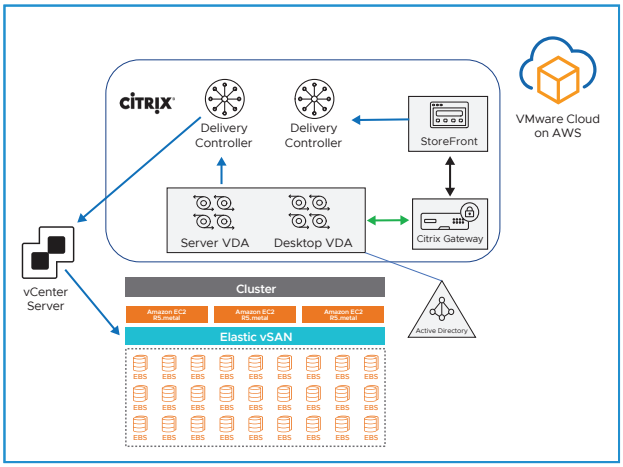
- Citrix Virtual Apps and Desktops service subscription
- Citrix Gateway service for Virtual Apps and Desktops or Citrix Gateway virtual appliance
- VMware Cloud subscription

Citrix Virtual Apps and Desktops service will allow either of the following deployment options:

1. **Simply leverage Citrix Virtual Apps and Desktops service capabilities** to easily manage and deliver workloads running within VMware Cloud on AWS.



2. **Manually install the Citrix Virtual Apps and Desktop management components** and the app and desktop workloads within VMware Cloud on AWS as part of your hybrid-rights entitlement.



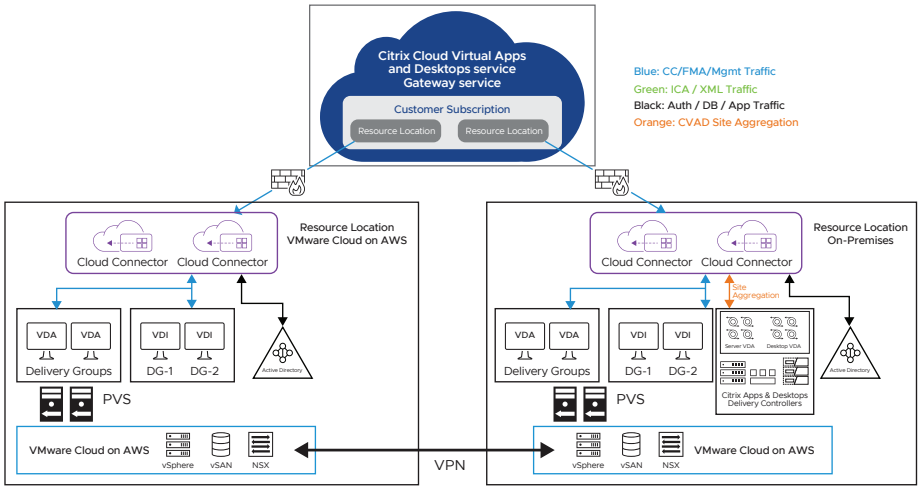
Either option provides a simplified management solution that takes advantage of cloud services at scale with simpler workload migration, while extending your data center to further support disaster recovery, colocation, rapid provisioning, enhanced security and compliance.

Solution Architecture

Migrating or extending a virtual apps and desktops environment to the cloud requires a flexible management platform. To simplify the deployment and management of this complex environment, the customer will deploy Cloud Connectors in each resource location to allow Citrix Cloud services to send management commands into each resource location. Citrix Cloud Connectors are managed and updated by the Citrix Cloud service. The customer will be able to enjoy the latest feature innovations released on Citrix Cloud without maintaining the Cloud Connector. Citrix Cloud will send hypervisor management commands through the Cloud Connectors to VMware vCenter® or VMware Cloud vCenter.

Architecture Overview

The Citrix Apps and Desktops service allows customers to aggregate existing on-premises Citrix Apps and Desktops installation while adding additional resource locations in VMware Cloud on AWS. This flexibility minimizes the impact of the migration to VMware Cloud and allows customers to seamlessly integrate a VMware Cloud environment to the existing deployment. Administrators will be able to leverage the single CVAD services console to manage all resource locations.



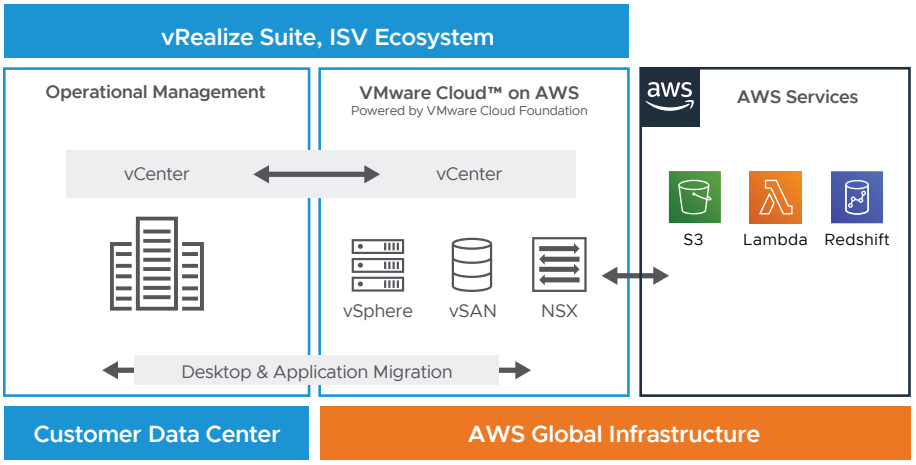
Citrix Virtual Apps and Desktops service customers can move the existing Virtual Apps and Desktops images from the on-premises environment to the VMware Cloud on AWS environment with minimal changes, including Citrix Provisioning Services (PVS).

VMware Cloud on AWS

VMware Cloud on AWS brings VMware's enterprise-class software-defined data center software to the AWS Cloud, and enables customers to run production virtual desktops and applications across VMware vSphere-based private, public and hybrid cloud environments, with optimized access to AWS services. VMware Cloud on AWS integrates VMware's flagship compute, storage and network virtualization products (VMware vSphere®, VMware vSAN™, and VMware NSX®) along with VMware vCenter, and optimizes it to run on dedicated, elastic Amazon EC2 bare-metal infrastructure that is fully integrated as part of the AWS Cloud.

VMWARE CLOUD ON AWS:
KEY COMPONENTS

- Cloud SDDC
- VMware Cloud on AWS Compute
- VMWare Cloud on AWS Cluster Configuration
- VMware Cloud on AWS Storage: vSAN
- VMware Cloud on AWS Networking: NSX



VMware Cloud on AWS Key Components

This section describes the key components of the solution.

Cloud SDDC

The VMware Cloud SDDC contains clusters of compute instances that are imaged with the latest builds of the VMware ESXi hypervisor. The build versions are newer and differ from that of generally available on-premises versions. The SDDC includes a set of management appliances that include vCenter, NSX, and any additional add-ons that might be deployed such as VMware HCX or VMware Site Recovery Manager™. These appliances manage all clusters within the SDDC. Deploying a second SDDC will produce a second management stack to manage the clusters within the new SDDC. A maximum of two SDDCs can be deployed, however this is a soft limit and can be increased by contacting VMware Support or your account team.

VMware Cloud on AWS Compute

VMware Cloud on AWS is built on the AWS Elastic Compute (EC2)' metal instances. At the time of this writing, there are two different instance types available to choose from when building the SDDC Cluster. Through various automation mechanisms, VMware ESXi is installed and configured directly onto the EC2 hardware.

The i3.metal instance, specifically i3.16XL, is comprised of dual socket Intel Broadwell CPUs with 18 cores per socket, 512 GiB of RAM, eight 1.74TB NVMe SSDs, and an EBS boot volume.

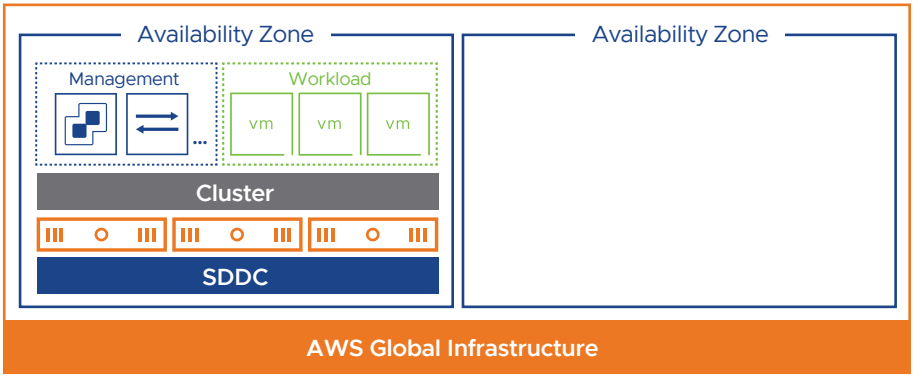
The r5.metal instance is comprised of dual socket Intel Skylake CPUs with 24 cores per socket and 768 GiB of RAM, but unlike the i3.metal instance, this server is diskless. All storage is derived from Amazon Elastic Block Storage (EBS).

When comparing instances, note that the i3.metal host is general purpose, whereas the r5.metal host is storage centric and offers greater storage configuration flexibility. This will be outlined further in the vSAN section.

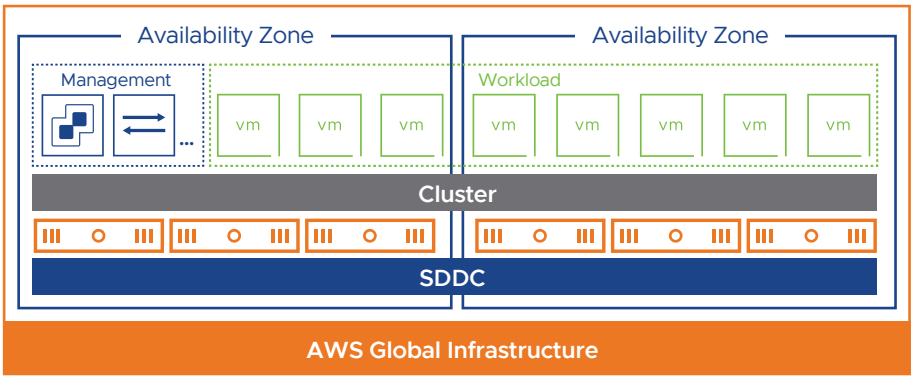
	I3.METAL	R5.METAL
Compute		
CPU Type	Intel Xeon E5-2686	Intel Xeon Platinum 8000
CPU Cores	36 cores @ 2.3 GHz	48 cores @ 2.5 GHz
RAM		
	512 GiB	768 GiB
Storage		
Type	Local NVMe Flash	Elastic Block Storage (EBS)
Capacity Tier	~10,600 GiB	15,000 GiB – 35,000 GiB
Network		
	25 Gbps	25 Gbps

VMWare Cloud on AWS Cluster Configuration

Default (single-AZ) clusters can contain a minimum of three nodes and a maximum of 16 nodes, with up to 20 clusters per SDDC. To maintain performance, VMware Cloud does not allow consumers to mix node types within a single cluster. However, mixing node types within a SDDC is allowed. For example, having two clusters—one cluster with i3 nodes, and one cluster with r5 nodes—is acceptable, but having a single cluster with a mix of i3 and r5 nodes is not possible. All clusters within the SDDC are managed by a single management stack. This stack is only hosted, and consuming resources, in the first cluster. All resources from any additional clusters created are available for workload consumption.



Stretched (multi-AZ) clusters can contain a minimum of six nodes and a maximum of 16 nodes. Stretched clusters can only be deployed in regions with at least three availability zones. An even number of nodes is split and deployed across two different availability zones within the region and a witness node is deployed into a third availability zone. In this architecture, vSAN's synchronous write operations are used across AZs, resulting in a recovery point objective (RPO) of zero and a recovery time objective (RTO) of the vSphere HA restart time.



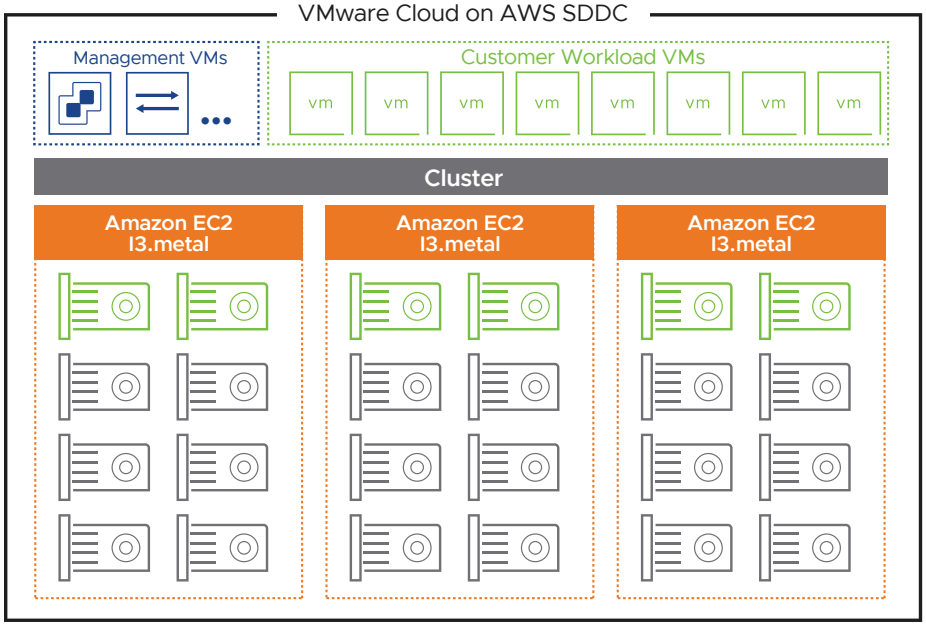
VMware Cloud on AWS Storage: vSAN

Storage is provided via VMware vSAN for all instance types.

As noted previously, i3.metal instances utilize eight internal NVMe SSDs. Each host is configured with two disk groups using the standard vSAN configuration—a single device for the cache tier and three devices for the capacity tier in each disk group. This architecture limits the impact of the loss of a cache device as well as providing increased write performance. Allowing each i3 instance to boot from an EBS volume allows vSAN to consume all of the NVMe devices for workload performance and capacity. The NVMe devices are self-encrypting, and vSAN encryption is enabled by default.

Available storage capacity for workloads depends on a number of design factors including:

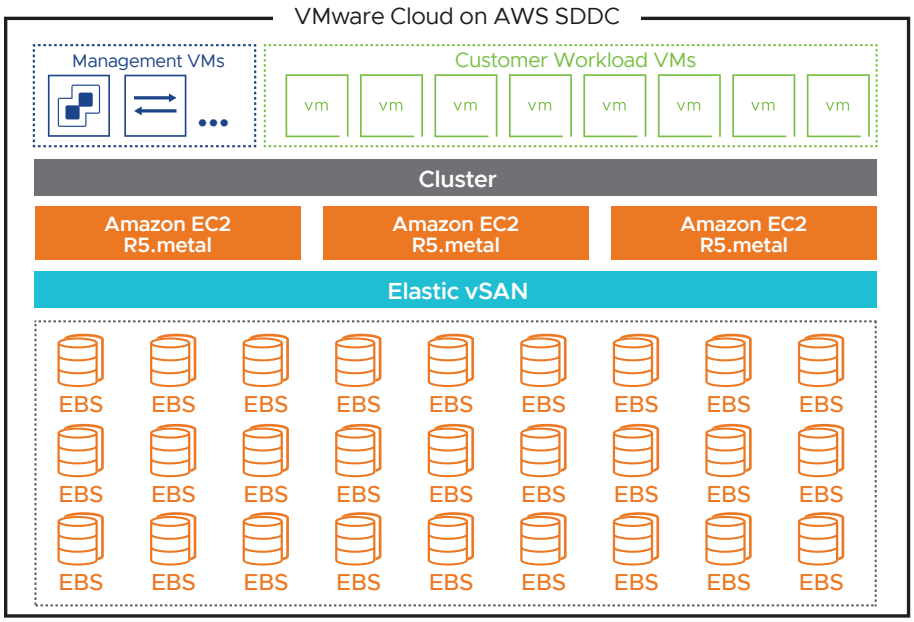
- Total Number of Hosts
- vSAN Deduplication and Compression
- Fault Tolerance Method (FTM) – RAID 1, RAID 5, RAID 6
- Failures to Tolerate (FTT) 0, 1, 2, 3



The r5.metal instances were introduced with Elastic vSAN. They are diskless hosts backed by AWS Elastic Block Storage (EBS) General Purpose SSD (gp2) volumes. These instances are best used for clusters that may be storage bound based on the workloads they're hosting. This instance type is able to provide flexible and scalable storage with the ability to add capacity on-demand while still maintaining operational consistency.

The amount of storage capacity is defined during cluster creation; from 15–35 TB per host. All hosts must have the same storage capacity. When the need to scale arises, there are two options—If additional storage as well as compute resources are required, hosts can be added to scale both resources. If storage is the only resource needed, the hosts can be auto-scaled in 5 TB increments up to 35 TB total per host.

Each r5.metal instance is configured with three disk groups containing 3-7 capacity disks per group. The volumes are encrypted with vSAN compression enabled, but vSAN deduplication is disabled for performance purposes. The ability to have increased and scalable capacity comes with a performance trade-off. AWS sets an IOPS limit to 16,000 per volume, regardless of size, and throughput is limited to 250 MiB/s. This may be sustainable for a variety of workloads but will certainly play into the design decision.



Stretched clusters are available for both i3.metal and r5.metal instance types, however it should be noted that designing for capacity and performance should be carefully considered. The non-preferred AZ will contain a mirror copy of the data in the preferred AZ, and because we are performing synchronous writes between AZs, there is additional overhead in the write transactions.

DESKTOP & SIZING GUIDELINES

This section provides recommendations and guidelines for designing your VDI environment.

VMC Sizer

VMware's VMware Cloud on AWS Sizer allows you to understand the total cost of ownership (TCO) for your SDDC by providing size and cost estimates based upon workload specifics. Simply choose the workload type (VDI) and specify the size(s) of the VMs, including CPU, RAM, Storage Size, IOPs, IO Profile, etc.

This will produce a sizing recommendation that includes instance type, number of clusters, cluster sizes, total cores, total RAM and storage usage breakdown.

https://vmc.vmware.com/sizer/

Citrix Sizer

Citrix Design methodology

Citrix VDI Handbook and Best Practices
A comprehensive guide to desktop virtualization with XenDesktop 7.x. The handbook covers the Citrix Consulting Methodology, provides experiences from the field, and recommended best practices.

VMware Cloud on AWS Networking: NSX

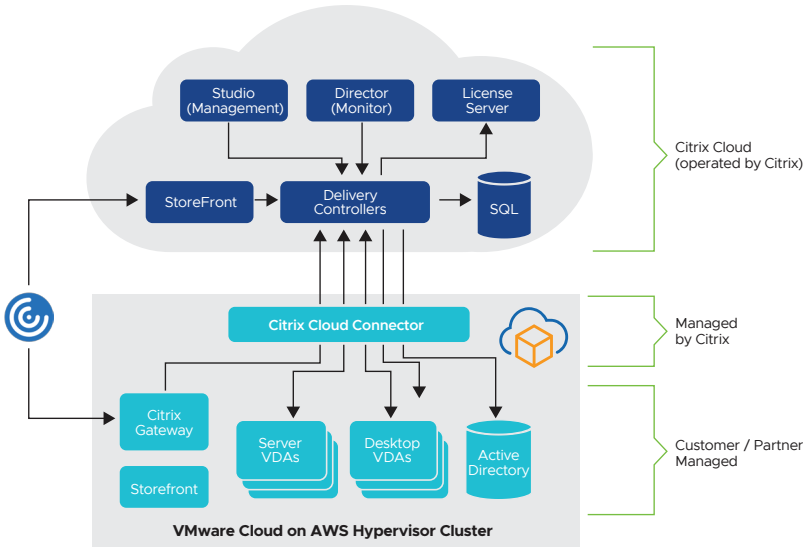
VMware Cloud on AWS leverages NSX-T for all network communication services within the SDDC, including routing, security, firewalling, ingress/egress traffic distribution and virtual switching. The purpose of this section isn't to dive into NSX-T, the NSX-T architecture for VMware Cloud on AWS, or AWS VPC/Networking concepts, but rather to provide host connectivity details.

Each EC2 instance maintains redundant connectivity to the AWS network backbone, however this only appears as a single physical 25 Gbps Elastic Network Adapter (ENA) within vCenter. The ENA carries all traffic to and from the host via the NSX Virtual Distributed Switch. A series of VMKernel interfaces make up both the management and compute logical networks:

- vmk0: Host Management
- vmk1: vSAN
- vmk2: vMotion
- vmk3: NSX Tunnel End Point (VTEP)
- vmk4: AWS API

Citrix Virtual Apps and Desktops service

Citrix manages the core components in Citrix Cloud. Citrix also takes care of installing and upgrading the following components: Delivery Controller, Citrix Studio, Citrix Director, Workspace configuration, Citrix StoreFront and Citrix Gateway services.



In a Citrix Virtual Apps and Desktops service deployment, a resource location contains items from the access layer and resource layer:

- Cloud Connectors
- Active Directory domain controller
- Virtual Delivery Agents (VDAs)
- Hypervisors that provision VDAs and store their data
- Citrix Provisioning Service (optional)
- Citrix Gateway (optional)
- StoreFront servers (optional)

REFERENCES

VMware Cloud on AWS Documentation

To learn more about VMware Cloud on AWS please visit the following resources:

VMware Cloud on AWS Overview

VMware Cloud on AWS Documentation

VMware Cloud on AWS Sizer

VMware Cloud on AWS Configuration Maximums

Citrix Documentation

To learn more about Citrix Cloud services please visit the following resources:

Citrix Cloud Services

Citrix Virtual Apps and Desktops service reference architecture

Citrix VDI Handbook and Best Practices

Citrix Cloud Virtual Apps and Desktops Service Reference Architecture and Deployment Methods

Choosing the Provisioning Model for Image Management

Citrix Virtual Apps and Desktops Single-Server Scalability

Summary

This solution architecture guide has described the integration of Citrix Virtual Apps and Desktops with VMware Cloud on AWS to create virtual desktop and application environments in a hybrid cloud environment. This architecture provides exceptional scalability and an excellent user experience, while allowing IT organizations to be a strategic player in their organization. VMware's comprehensive customer-managed VDI solutions are easy to plan, deploy and operate, and optimized for your organization's specific needs.

Citrix Solutions on VMware Cloud on AWS: VDI Benefits

Citrix offers a unified evergreen management platform with the Citrix Virtual Apps and Desktops service. This service dramatically simplifies the hybrid and multi-cloud deployment challenges for customers who want to extend the virtual apps and desktops delivery solution from on-premises datacenter to multi-cloud infrastructure.

Next Steps

VMware Cloud on AWS is the only hybrid cloud solution that allows you to modernize, protect and scale vSphere-based applications, leveraging the public cloud while delivering:

- **Enterprise grade Capabilities** that allow organizations to leverage predictable, high-performance compute, storage and networking delivered by VMware vSphere, NSX and vSAN running on modern Nitro system-based Amazon EC2 elastic, bare metal infrastructure.
- **Simple and consistent operations** that reduce operational overhead and achieve your cloud strategy faster—whether it is migration, extension, or protection—by leveraging existing skills, tools, processes and familiar VMware technologies.
- **Pay-As-You-Go consumption** with the flexibility to consume on-demand hourly or take advantage of one-year and three-year reserved models for deeper discounts while aligning costs to business need with variable consumption options and investment protection.

Citrix Virtual Apps and Desktops service product delivers value in three key areas:

- **Management:** Gives IT the ability to simplify the management of applications and desktops with the tools and features needed in one console to manage Windows apps and desktops. This flexibility enables IT to easily leverage workloads on any hypervisor, in any cloud or both (hybrid cloud). Enables current customers to move to the cloud seamlessly at their pace.
- **Experience:** Citrix Virtual Apps and Desktops provides a high definition user experience regardless of the device your workers are using or their location.
- **Security:** With app virtualization and VDI, corporate apps, desktops and data remain protected in the datacenter—not users' endpoint devices—enabling security and compliance while providing remote access from anywhere. IT gains full visibility and control over centrally managed apps and desktops, defining and enforcing policies that determine which resources specific users, or groups, can access.