XenDesktop® 7.5 on Amazon Web Services (AWS)

Design Guide

July 14, 2014

Revision History

Revision	Change Description	Updated By	Date
0.1	Document Created	Peter Bats	April 17, 2014
1.0	Final Draft	Peter Bats	May 19, 2014

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About This Design Guide

This Citrix Design Guide provides an overview of the XenDesktop® 7.5 on Amazon Web Services (AWS) solution architecture and implementation. This design has been created through architectural design best practices obtained from Citrix Consulting Services and thorough lab testing, and it is intended to provide guidance for solution evaluation and the introduction of proof of concepts.

The Design Guide incorporates generally available products into the design and employs repeatable processes for the deployment, operation, and management of components within the solution.

Overview

Citrix customers wanting to leverage public cloud Infrastructure as a Service (Iaas) in order to expand their on-premises datacenter capabilities, without investing in new capital resources, can now host and provision desktops and applications using XenDesktop 7.5 within AWS. This capability enables faster proof of concept and pilot builds for migration to XenDesktop 7 for existing XenDesktop implementations or as part of a new or hybrid XenDesktop implementation where the leverage of public cloud infrastructure is preferred.

This document provides high-level design guidance using a sample implementation of XenDesktop 7.5 Hosted Shared and Server Virtual Desktop Infrastructure (VDI) FlexCast® models within the AWS cloud.

- Hosted Shared Desktops are built upon Windows Server 2008 R2 and Windows Server 2012 RDS Session Host servers where multiple user sessions execute on a single shared server instance.
- Server VDI Desktops are built upon Windows Server 2008 R2 and Windows Server 2012 for use cases where a single user requires a VDI-based dedicated or pooled server instance, which provides an execution environment that is not shared.

Used in conjunction with the XenDesktop Modular Reference Architecture, this document provides basic best-practice guidance for companies looking to leverage Citrix and AWS cloud technologies to deliver a state-of-the-art solution for their users.

Use Case

Let us assume “Contoso Corp.” (Contoso) plans to leverage AWS and Citrix products to deliver a hosted desktop solution for their accounting department. The solution will provide value to the department by enabling access to hosted desktops and applications from any device. The value of this solution for Contoso is most evident in the ability to quickly bring new desktop services on line through a subscription to AWS infrastructure services rather than a protracted capital investment and datacenter build out project. Since the new desktops are an extension of the existing Contoso datacenter, the infrastructure already in place at Contoso will be connected to AWS through a NetScaler CloudBridge Connector. This connectivity enables the AWS-hosted XenDesktop infrastructure components to communicate with the Contoso corporate Active Directory and back-office services like Microsoft Exchange or Microsoft Lync, as well as the corporate Secure Remote Access services enabled through Citrix NetScaler Gateway™.

The objective of this guide is to outline Contoso’s business considerations and show how hosting their new XenDesktop 7.5 Windows Server-based FlexCast models in AWS could address them.

Business Objectives

- Provide secure access to desktops and applications for the accounting team
- Avoid the need to build new infrastructure within the Contoso datacenter
- Leverage as much existing corporate infrastructure as possible to align with current IT practices and policies and to keep new expenses as low as possible
- Use monthly programmatic funding instead of capital expenses for this project
- Manage the service within a public cloud environment in order to scale based on seasonal resource requirements
- Provide support for any device, enabling temporary contractors to "bring your own device" (BYOD)

Technical Objectives

- Quickly design and implement an environment to establish the value and metrics
- Ensure high availability of critical components to ensure business continuity
- Implement an "n+1" highly available solution to avoid any business interruption
- Support access from user-owned devices that vary in form factor and operating system

Citrix XenDesktop 7.5 on AWS

Contoso selected XenDesktop as their solution since it enables the best user experience across the public Internet from any device according to independent analysis and, after reviewing the Citrix XenDesktop Modular Reference Architecture and AWS IaaS capabilities, they believed they could build a solution without a large upfront capital investment.

The Citrix XenDesktop 7.5 solution (see Figure 1) hosted on AWS consisted of a small number of components:

- Citrix XenDesktop 7.5 Delivery controllers
- Hosted Shared workers (Windows Server RDS Session Host enabling session isolation)
- Server VDI Workers (Windows Server pooled or dedicated VDI-based instance isolation)
- An AWS local Active Directory Domain Controller (DC) that is a member of the Contoso corporate forest
- An AWS local SQL Server Instance
- An AWS local File Server for the storage of XenDesktop Roaming User Profiles

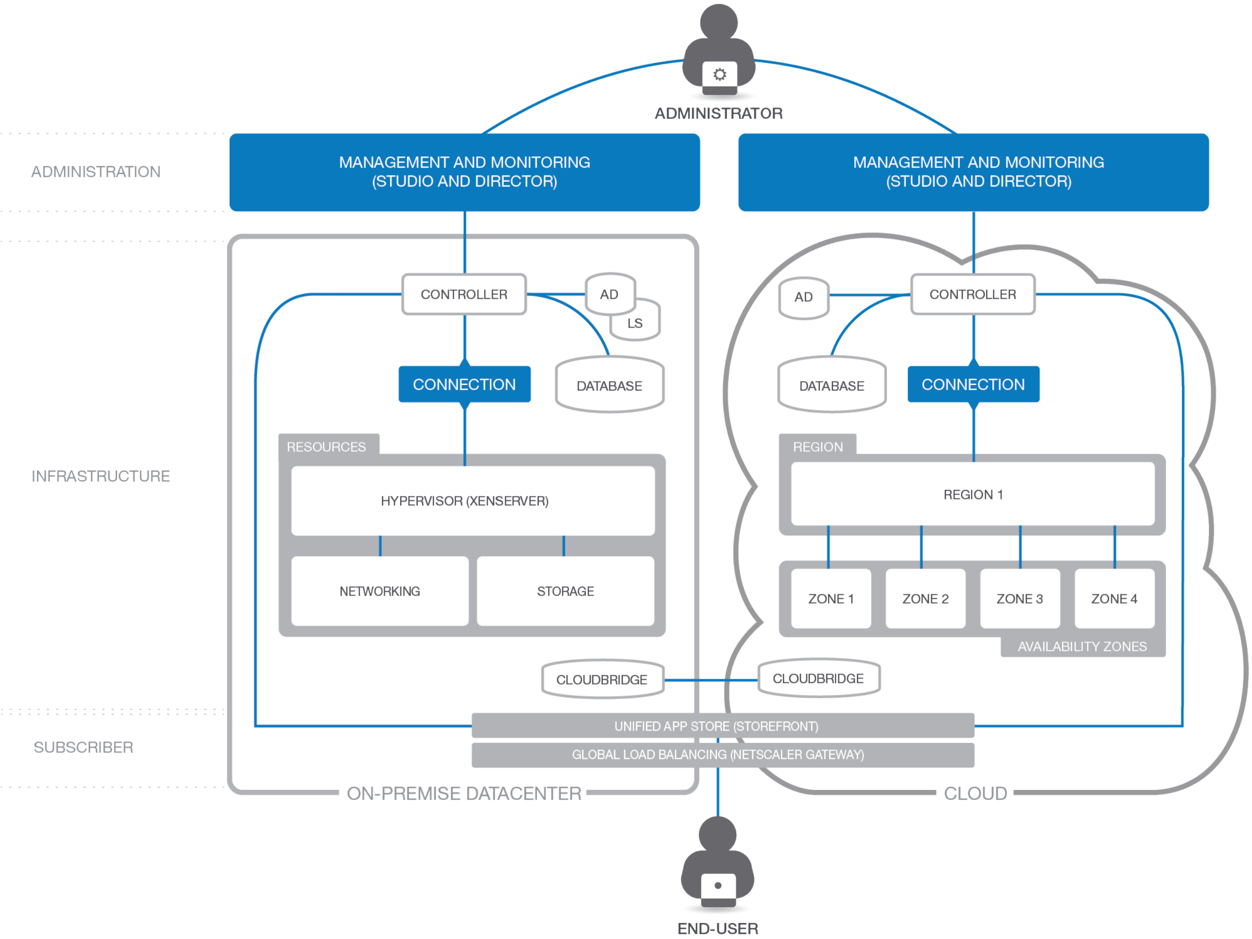


Figure 1. Architectural diagram of hybrid XenDesktop deployment.

The remaining components were already in place in the Contoso on-premises corporate datacenter.

A brief description of key Citrix components follows:

- **Citrix Receiver.** Citrix Receiver is an easy-to-install client software component that lets you access your documents, applications and desktops from any of your devices including smartphones, tablets and PCs.
- **Citrix XenDesktop Delivery Controllers.** These XenDesktop 7.5 Servers are used to manage and deliver the Windows applications and desktops.
- **Hosted Shared Workers.** These XenDesktop 7.5 workloads, leveraging Windows Server Remote Desktop Services Session Host as the foundation, are used to deliver shared hosted applications and desktops for most users.
- **Server VDI Workers.** These XenDesktop 7.5 workloads, using Windows Server without the Remote Desktop Services Session Host role, provide VDI-based instance- or server-level isolation of an individual server instance for those users that require more customization or administrative control of their virtual desktop.
- **Citrix License Server.** The Citrix License Server hosts all the licenses that enable Citrix products and features.

- **NetScaler Gateway.** NetScaler Gateway is a secure application and data access solution that provides administrators granular application- and data-level control while empowering users with remote access from anywhere.
- **StoreFront Services.** StoreFront Services provides authentication and resource delivery services for Citrix Receiver, enabling users to create centralized enterprise stores to deliver desktops, applications, and other resources to users on any device, anywhere.

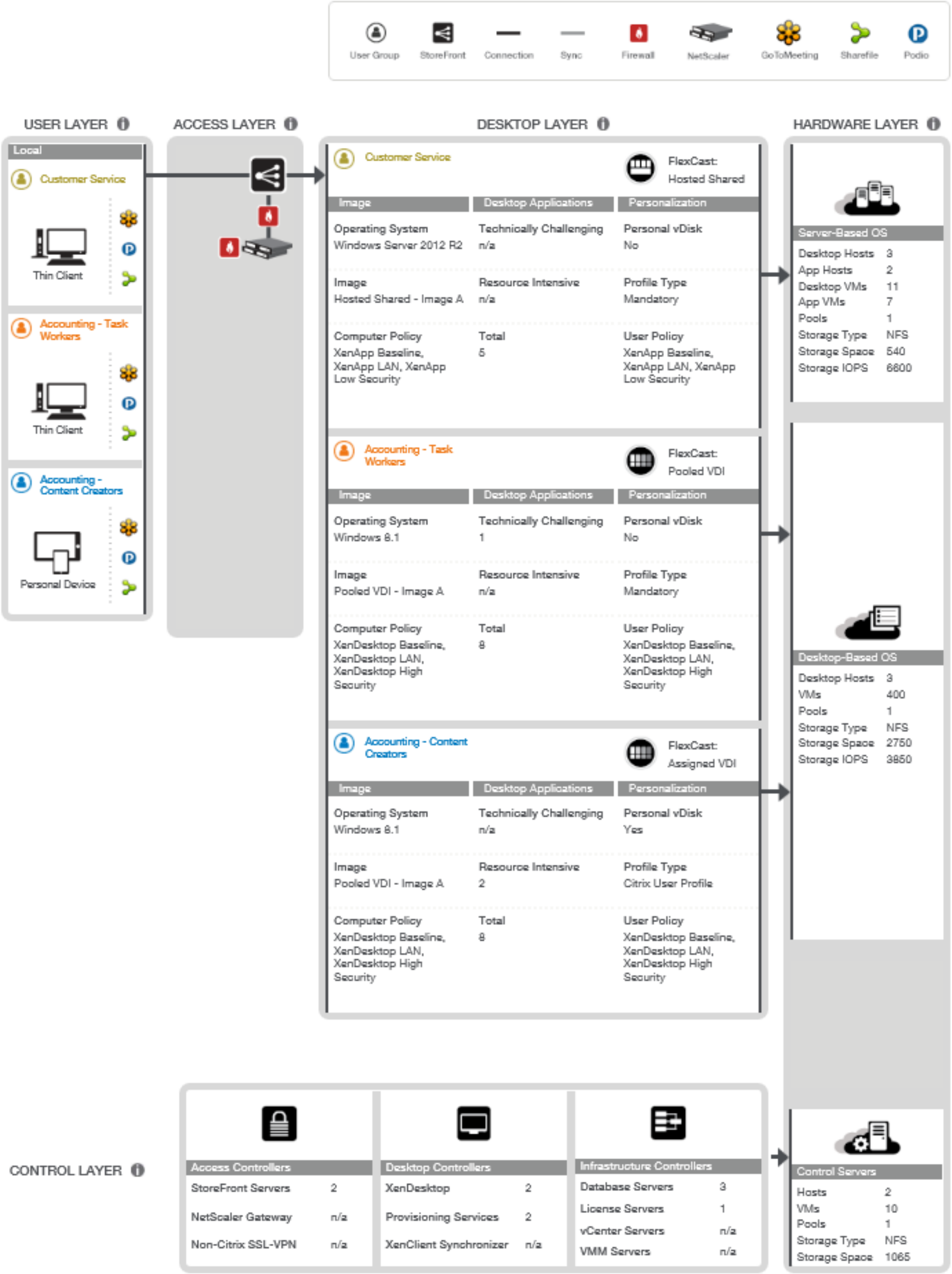
XenDesktop 7.5 on AWS Architecture

Once Contoso had completed their assessment and concluded that a Citrix XenDesktop 7.5 solution on AWS could meet their objectives, they quickly moved into the design phase. Contoso wanted a simple, easy process to determine the hardware and storage sizing to support their individual implementation based on the needs of their subscribers. Contoso used Citrix Project Accelerator—an open, web-based application where you can manage your move to virtualized desktops and applications based on best practices of Citrix's top consultants—to assist with the user assessment and environment design. In conjunction with project accelerator guidance, Contoso made the following design decisions:

- Although Project Accelerator is currently designed for the 5.6 and 7.1 versions of XenDesktop, Contoso decided that its output could be used as a foundational design to work from in conjunction with their own testing to determine the final requirements when they went to production. [Please note: Although in order to remain consistent with the true outputs of the Project Accelerator tool we have left the original graphic outputs of the Project Accelerator that show "Windows 7" or "Windows 8.1" as one of the desktop images to deploy, the actual implementation on AWS must use Windows Server 2008 R2 or Windows Server 2012 instances to enable "Server VDI" for these desktops. Windows Client operating systems are not supported for hosting on AWS at this time (http://aws.amazon.com/windows/).] The output of Project Accelerator is only part of the data used to design the complete solution, and some AWS-specific adjustments must be made in order to remain compliant with Microsoft licensing. More detail is available in the "Solution Capabilities and Constraints" section of this guide on page 22.
- High availability is important for a robust solution, so an "N+1" configuration was chosen to ensure that the solution sizing included a spare server to handle user capacity in the event of a failure.
- All users would need to connect to AWS over an encrypted connection through a CloudBridge Site-to-Site VPN between AWS and the Contoso corporate network. Secure remote access would be provided by the NetScaler Gateway within the corporate network.
- Active Directory, DNS/DHCP, and SQL Server would be provisioned in AWS to reduce login times for this solution.
- A variety of financial applications as well as MS Office would be made available as part of the standard desktop image for this group of users.

The following architecture (see Figure 2 and Figure 3) is a visual representation of the solution as recommended by Citrix Project Accelerator. Where Figure 2 shows the on-premises resources, Figure 3 shows the AWS-hosted resources. Additional considerations that leverage this output as the base are documented later in this guide. The following diagrams represents Contoso's projected hardware and infrastructure requirements based on a team of 2325 users, spread over multiple types of users: Customer Service reps, Sales – Mobile, Sales – Normal, Sales – Developers, Accounting – Task Workers and Accounting – Content Creators.

Each layer of the architecture diagrams is discussed in detail in the following sections.



Customer Service

FlexCast: Hosted Shared

Image	Desktop Applications	Personalization
Operating System Windows Server 2012 R2	Technically Challenging n/a	Personal vDisk No
Image Hosted Shared - Image A	Resource Intensive n/a	Profile Type Mandatory
Computer Policy XenApp Baseline, XenApp LAN, XenApp Low Security	Total 5	User Policy XenApp Baseline, XenApp LAN, XenApp Low Security

Accounting - Task Workers

FlexCast: Pooled VDI

Image	Desktop Applications	Personalization
Operating System Windows 8.1	Technically Challenging 1	Personal vDisk No
Image Pooled VDI - Image A	Resource Intensive n/a	Profile Type Mandatory
Computer Policy XenDesktop Baseline, XenDesktop LAN, XenDesktop High Security	Total 8	User Policy XenDesktop Baseline, XenDesktop LAN, XenDesktop High Security

Accounting - Content Creators

FlexCast: Assigned VDI

Image	Desktop Applications	Personalization
Operating System Windows 8.1	Technically Challenging n/a	Personal vDisk Yes
Image Pooled VDI - Image A	Resource Intensive 2	Profile Type Citrix User Profile
Computer Policy XenDesktop Baseline, XenDesktop LAN, XenDesktop High Security	Total 8	User Policy XenDesktop Baseline, XenDesktop LAN, XenDesktop High Security

Server-Based OS	
Desktop Hosts	3
App Hosts	2
Desktop VMs	11
App VMs	7
Pools	1
Storage Type	NFS
Storage Space	540
Storage IOPS	6600

Desktop-Based OS	
Desktop Hosts	3
VMs	400
Pools	1
Storage Type	NFS
Storage Space	2750
Storage IOPS	3850

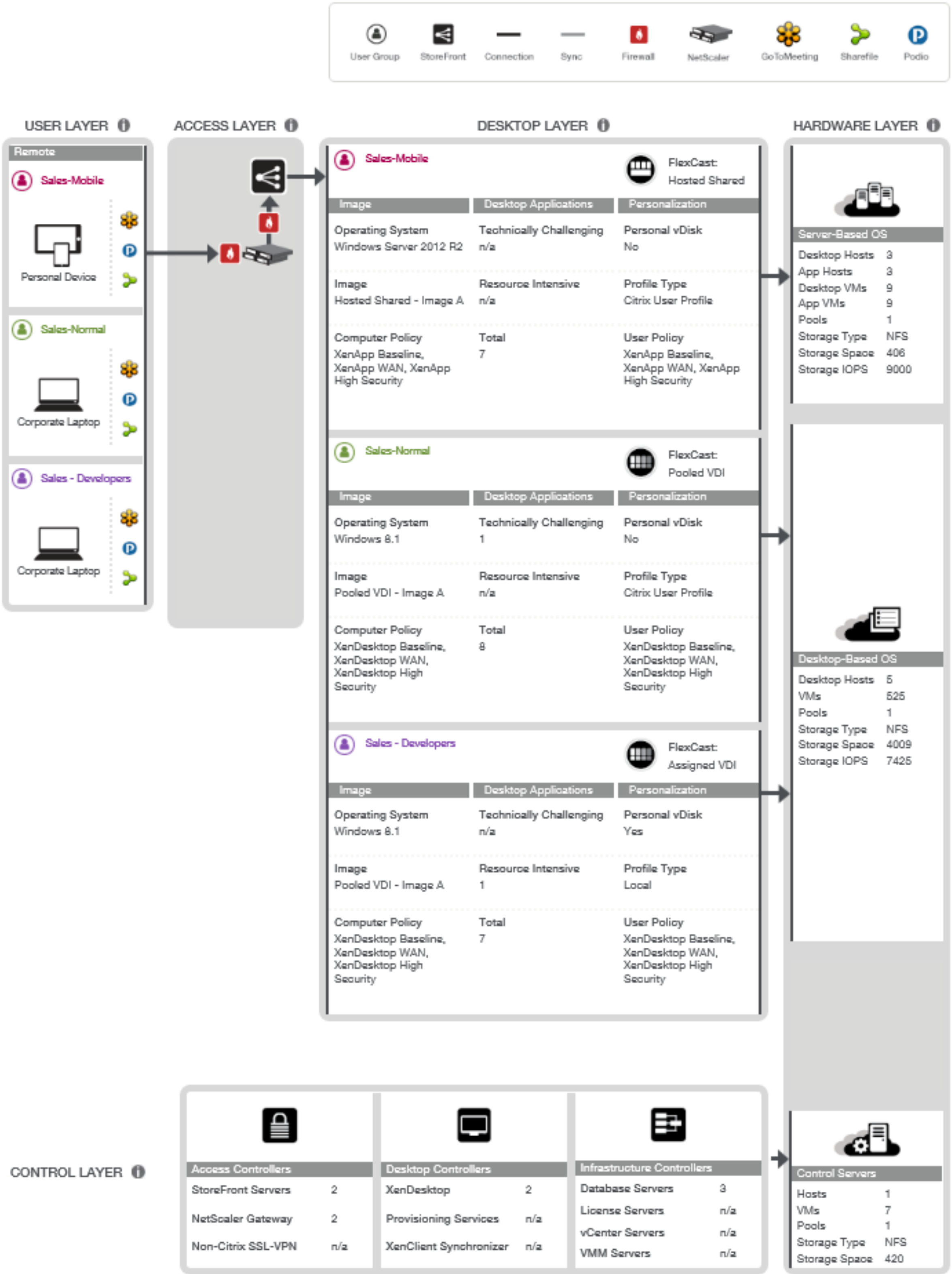
Access Controllers	
StoreFront Servers	2
NetScaler Gateway	n/a
Non-Citrix SSL-VPN	n/a

Desktop Controllers	
XenDesktop	2
Provisioning Services	2
XenClient Synchronizer	n/a

Infrastructure Controllers	
Database Servers	3
License Servers	1
vCenter Servers	n/a
VMM Servers	n/a

Control Servers	
Hosts	2
VMs	10
Pools	1
Storage Type	NFS
Storage Space	1065

Figure 2. Project Accelerator output for Contoso on-premises resources for hybrid Desktop as a Service (DaaS) project.



USER LAYER

Remote

Sales-Mobile

Personal Device

Sales-Normal

Corporate Laptop

Sales - Developers

Corporate Laptop

ACCESS LAYER

DESKTOP LAYER

Sales-Mobile

FlexCast: Hosted Shared

Image	Desktop Applications	Personalization
Operating System Windows Server 2012 R2	Technically Challenging n/a	Personal vDisk No
Image Hosted Shared - Image A	Resource Intensive n/a	Profile Type Citrix User Profile
Computer Policy XenApp Baseline, XenApp WAN, XenApp High Security	Total 7	User Policy XenApp Baseline, XenApp WAN, XenApp High Security

Sales-Normal

FlexCast: Pooled VDI

Image	Desktop Applications	Personalization
Operating System Windows 8.1	Technically Challenging 1	Personal vDisk No
Image Pooled VDI - Image A	Resource Intensive n/a	Profile Type Citrix User Profile
Computer Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security	Total 8	User Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security

Sales - Developers

FlexCast: Assigned VDI

Image	Desktop Applications	Personalization
Operating System Windows 8.1	Technically Challenging n/a	Personal vDisk Yes
Image Pooled VDI - Image A	Resource Intensive 1	Profile Type Local
Computer Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security	Total 7	User Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security

HARDWARE LAYER

Server-Based OS	
Desktop Hosts	3
App Hosts	3
Desktop VMs	9
App VMs	9
Pools	1
Storage Type	NFS
Storage Space	406
Storage IOPS	9000

Desktop-Based OS	
Desktop Hosts	5
VMs	525
Pools	1
Storage Type	NFS
Storage Space	4009
Storage IOPS	7425

CONTROL LAYER

Access Controllers	
StoreFront Servers	2
NetScaler Gateway	2
Non-Citrix SSL-VPN	n/a

Desktop Controllers	
XenDesktop	2
Provisioning Services	n/a
XenClient Synchronizer	n/a

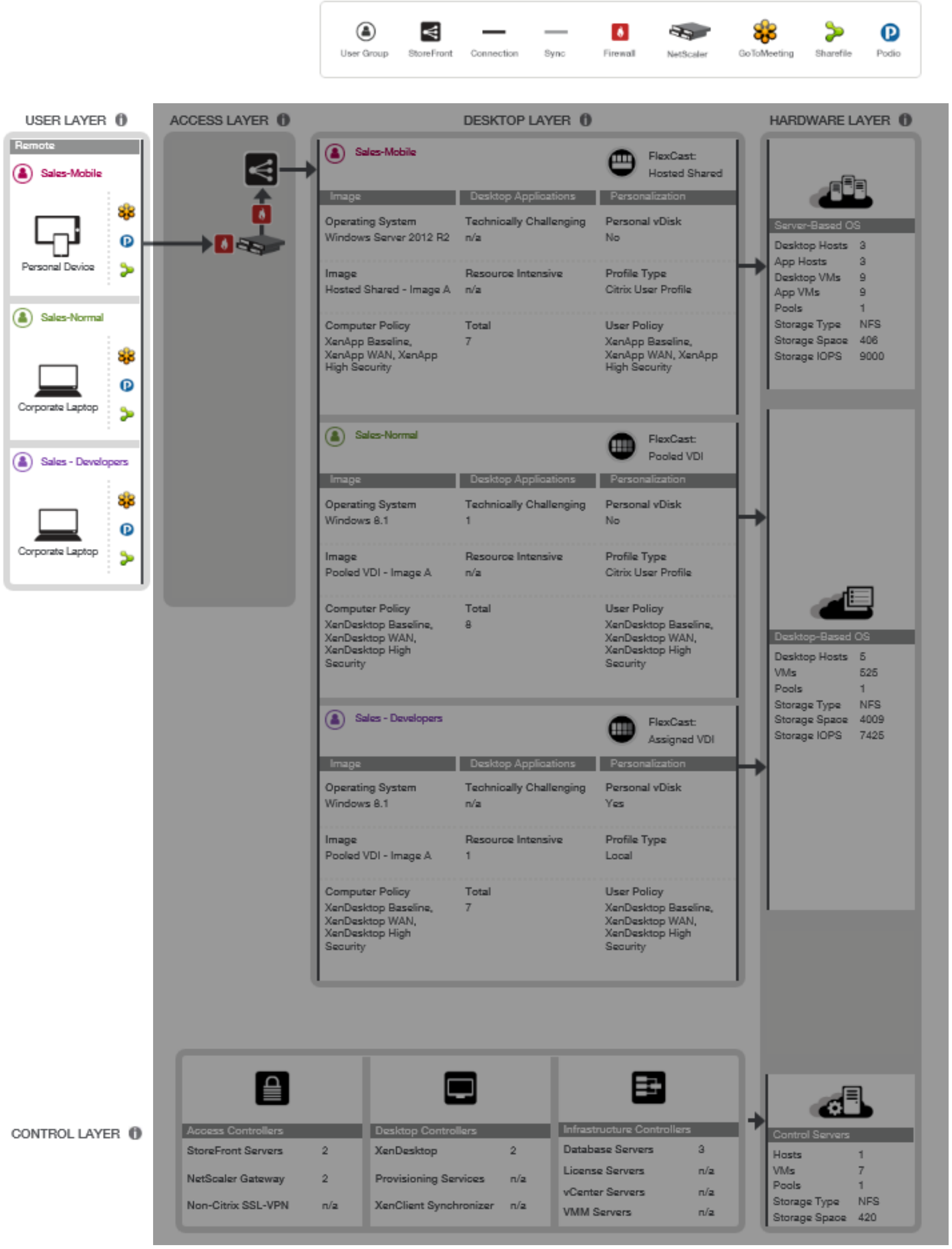
Infrastructure Controllers	
Database Servers	3
License Servers	n/a
vCenter Servers	n/a
VMM Servers	n/a

Control Servers	
Hosts	1
VMs	7
Pools	1
Storage Type	NFS
Storage Space	420

Figure 3. Project Accelerator output for Contoso AWS resources for DaaS project.

User Group

The user group layer (see Figure 4) represents the subscriber types that will access the AWS or on-premises hosted desktops or applications from their own end-point devices. Although the graphic represents these devices as “Corporate Laptops” and “Personal Devices,” these devices can be anything from a smartphone or tablet to a PC, Mac, or Linux desktop or laptop. These user groups represent the use cases of “Task Worker” or “Content Creator.” The details of what is delivered to these different user groups are enabled within the desktop layer, behind the access layer section.



Sales-Mobile — FlexCast: Hosted Shared

Image		Desktop Applications		Personalization	
Operating System	Windows Server 2012 R2	Technically Challenging	n/a	Personal vDisk	No
Image	Hosted Shared - Image A	Resource Intensive	n/a	Profile Type	Citrix User Profile
Computer Policy	XenApp Baseline, XenApp WAN, XenApp High Security	Total	7	User Policy	XenApp Baseline, XenApp WAN, XenApp High Security

Sales-Normal — FlexCast: Pooled VDI

Image		Desktop Applications		Personalization	
Operating System	Windows 8.1	Technically Challenging	1	Personal vDisk	No
Image	Pooled VDI - Image A	Resource Intensive	n/a	Profile Type	Citrix User Profile
Computer Policy	XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security	Total	8	User Policy	XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security

Sales - Developers — FlexCast: Assigned VDI

Image		Desktop Applications		Personalization	
Operating System	Windows 8.1	Technically Challenging	n/a	Personal vDisk	Yes
Image	Pooled VDI - Image A	Resource Intensive	1	Profile Type	Local
Computer Policy	XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security	Total	7	User Policy	XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security

Server-Based OS	
Desktop Hosts	3
App Hosts	3
Desktop VMs	9
App VMs	9
Pools	1
Storage Type	NFS
Storage Space	406
Storage IOPS	9000

Desktop-Based OS	
Desktop Hosts	5
VMs	525
Pools	1
Storage Type	NFS
Storage Space	4009
Storage IOPS	7425

Access Controllers		Desktop Controllers		Infrastructure Controllers	
StoreFront Servers	2	XenDesktop	2	Database Servers	3
NetScaler Gateway	2	Provisioning Services	n/a	License Servers	n/a
Non-Citrix SSL-VPN	n/a	XenClient Synchronizer	n/a	vCenter Servers	n/a
				VMM Servers	n/a

Control Servers	
Hosts	1
VMs	7
Pools	1
Storage Type	NFS
Storage Space	420

Figure 4. The user group layer includes subscribers that access the AWS or on-premises hosted desktops or application from their own devices.

Contoso requires the following Citrix component on each end-point device:

- **Citrix Receiver.** Citrix Receiver is a universal thin client that runs on virtually any device operating platform, including Windows, Mac, Linux, iOS and Android. This is the one client users need to access business-critical apps and data from today’s latest tablet and smartphone devices and improve their mobility. Citrix Receiver can be downloaded and installed by employees on their personal devices.

Access Layer

The access layer (see Figure 5) consists of the servers responsible for providing connectivity to the entire XenDesktop 7.5 environment on AWS.

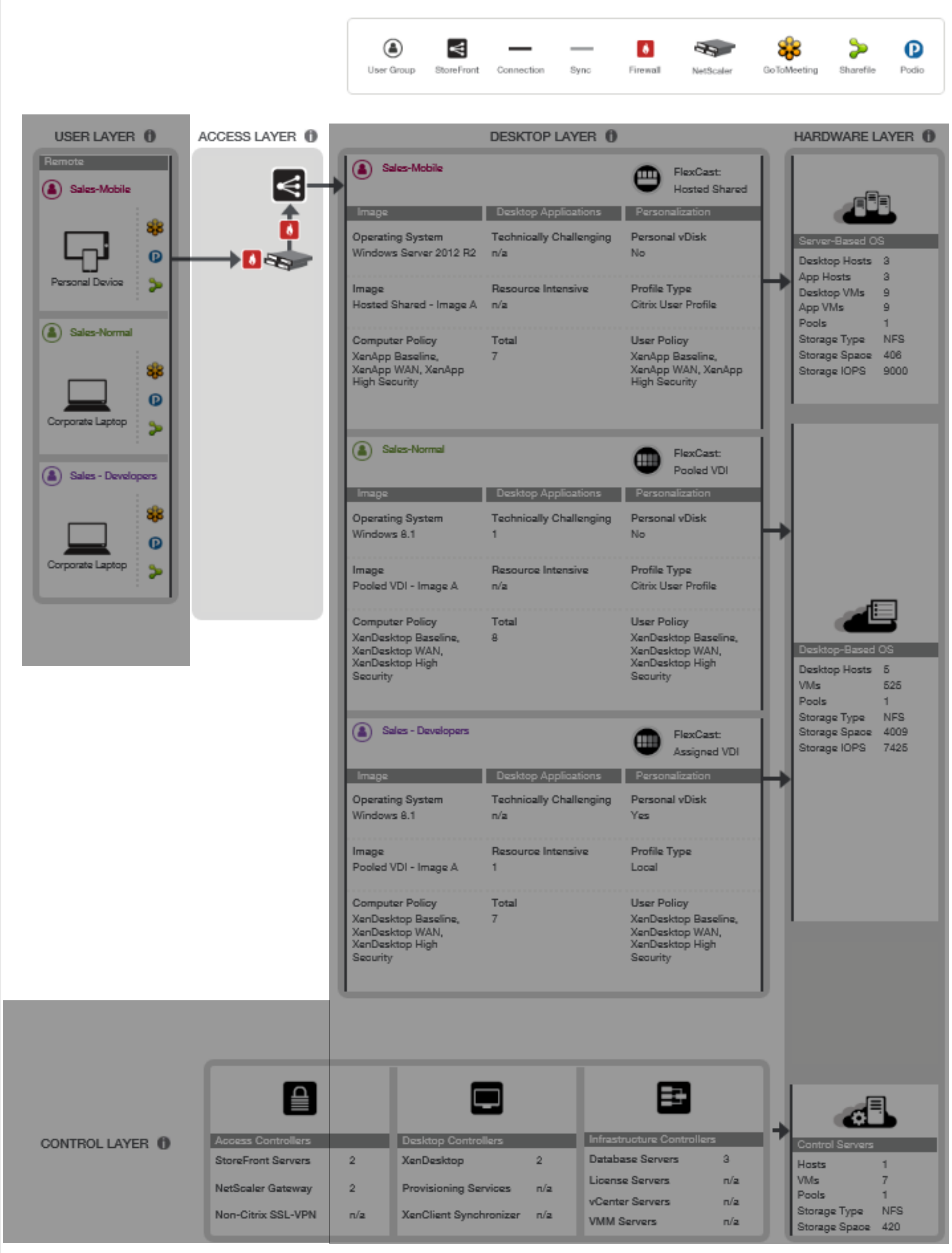


Figure 5: The access layer provides connectivity to the hybrid XenDesktop 7.5 environment.

Contoso's solution required the following Citrix components to provide secure remote access:

- **StoreFront Services.** StoreFront Services provides a self-service subscription service to desktops and applications via an enterprise app store, giving users convenient access to all the resources they need. Contoso created a centralized enterprise app store with StoreFront Services within their on-premises datacenter to enumerate and aggregate the resources available for each user. Contoso deployed a pair of StoreFront servers to ensure high availability.

Table 1. StoreFront Service Configuration.

StoreFront Services Servers	
Instances	2 StoreFront Server VMs
Virtual Machine Configurations	
Memory	4 GB RAM
Processor	2 vCPUs
Hard Drive	60 GB
Installed Software	
Web Interface	StoreFront 2.5
Windows Server	Windows Server 2012
IIS	7.5 or greater
Microsoft .NET Framework	4.0
Ports Utilized	
StoreFront	80, 443

- **NetScaler Gateway**. NetScaler Gateway is a secure application and data access solution that gives administrators granular application and data-level control while empowering users with remote access from anywhere. IT administrators gain a single point of management for controlling access and limiting actions within sessions based on user identity and the endpoint device. The results are better application security, data protection and compliance management.

  NetScaler Gateway works in conjunction with StoreFront Services to authenticate the user and create an SSL tunnel between the end user and NetScaler Gateway to ensure secure remote access from any device. NetScaler Gateway requires either a physical or a virtual NetScaler appliance. Contoso selected two physical NetScaler MPX appliances to host NetScaler Gateway in an active/active mode to ensure secure access is highly available and maximum capacity.

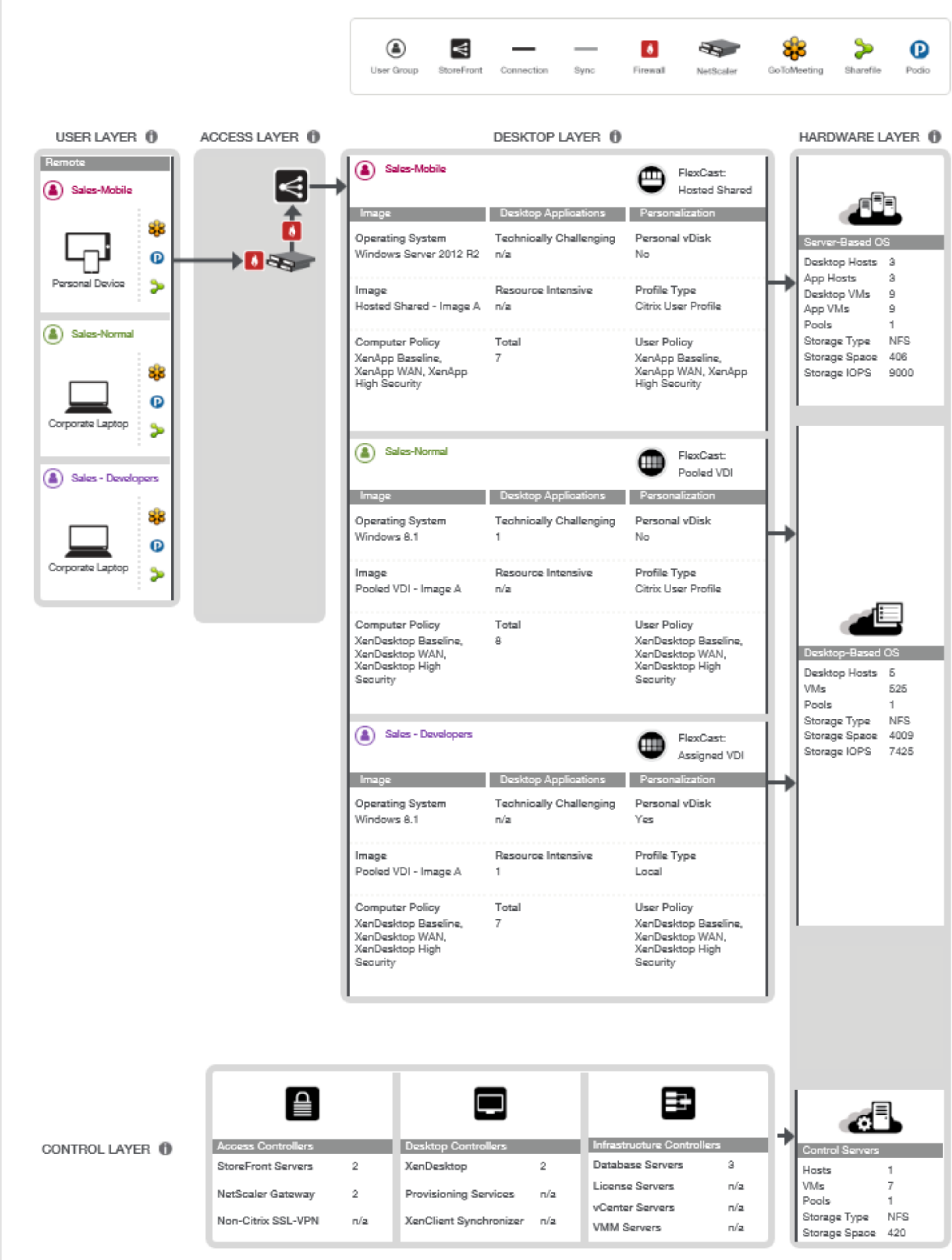
Table 2. NetScaler Gateway Configuration.

NetScaler Gateway	
Instances	
NetScaler MPX	2 physical NetScaler MPX-5500
Build	10.1
Throughput	500 Mbps
Ports Utilized	
DMZ	80, 443
Internal	80, 443, 1494, and 2598

Citrix recommends installing NetScaler Gateway in the network DMZ. When installed in the DMZ, NetScaler Gateway participates on two networks: a private network and the Internet with a publicly routable IP address. NetScaler Gateway can be used to partition local area networks internally in the organization for access control and security by creating partitions between wired or wireless networks and between data and voice networks.

Desktop Layer

The desktop layer (see Figure 6) represents the separate use cases that Contoso will service: plans for 500 users to access Sales – Mobile resources, 500 users to access Sales – Normal resources, and 25 users to access Sales – Developers resources.



Sales-Mobile — FlexCast: Hosted Shared

Image	Desktop Applications	Personalization
Operating System Windows Server 2012 R2	Technically Challenging n/a	Personal vDisk No
Image Hosted Shared - Image A	Resource Intensive n/a	Profile Type Citrix User Profile
Computer Policy XenApp Baseline, XenApp WAN, XenApp High Security	Total 7	User Policy XenApp Baseline, XenApp WAN, XenApp High Security

Sales-Normal — FlexCast: Pooled VDI

Image	Desktop Applications	Personalization
Operating System Windows 8.1	Technically Challenging 1	Personal vDisk No
Image Pooled VDI - Image A	Resource Intensive n/a	Profile Type Citrix User Profile
Computer Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security	Total 8	User Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security

Sales - Developers — FlexCast: Assigned VDI

Image	Desktop Applications	Personalization
Operating System Windows 8.1	Technically Challenging n/a	Personal vDisk Yes
Image Pooled VDI - Image A	Resource Intensive 1	Profile Type Local
Computer Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security	Total 7	User Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security

Server-Based OS	
Desktop Hosts	3
App Hosts	3
Desktop VMs	9
App VMs	9
Pools	1
Storage Type	NFS
Storage Space	406
Storage IOPS	9000

Desktop-Based OS	
Desktop Hosts	5
VMs	525
Pools	1
Storage Type	NFS
Storage Space	4009
Storage IOPS	7425

Access Controllers	
StoreFront Servers	2
NetScaler Gateway	2
Non-Citrix SSL-VPN	n/a

Desktop Controllers	
XenDesktop	2
Provisioning Services	n/a
XenClient Synchronizer	n/a

Infrastructure Controllers	
Database Servers	3
License Servers	n/a
vCenter Servers	n/a
VMM Servers	n/a

Control Servers	
Hosts	1
VMs	7
Pools	1
Storage Type	NFS
Storage Space	420

Figure 6: The desktop layer includes the various use cases that are planned for this solution.

The Contoso solution required the following Citrix components to provide the desktop layer:

- **Citrix XenDesktop Delivery controllers.** These XenDesktop 7.5 Infrastructure Servers are used to manage and deliver the Windows applications and desktops.

XenDesktop Controller Servers	
Instances	2 XenDesktop Controllers
Virtual Machine Configurations	
Instance Type	M3.large
Memory	7.5 GB RAM
Processor	2 vCPUs
Disk	60 GB HD
Installed Software	
XenDesktop Version	7.5
Winders Server	Windows Server 2012

- **Hosted Shared Workers.** These XenDesktop 7.5 workloads, leveraging Windows Server Remote Desktop Services Session Host as the foundation, are used to deliver shared hosted applications and desktops for most users.

Hosted Shared Desktop Workers	
Instances	9 XenApp Desktop Workers
Virtual Machine Configurations	
Instance Type	M3.2xlarge
Memory	30 GB RAM
Processor	8 vCPUs
Disk	160 GB HD
Installed Software	
XenDesktop VDA Version	7.5
Winders Server	Windows Server 2012 – Hosted Shared
Hosted Shared App Workers	
Instances	9 XenApp Application Workers
Virtual Machine Configurations	
Instance Type	M3.2xlarge
Memory	30 GB RAM
Processor	8 vCPUs
Disk	160 GB HD
Installed Software	
XenDesktop VDA Version	7.5
Winders Server	Windows Server 2012 – Hosted Shared

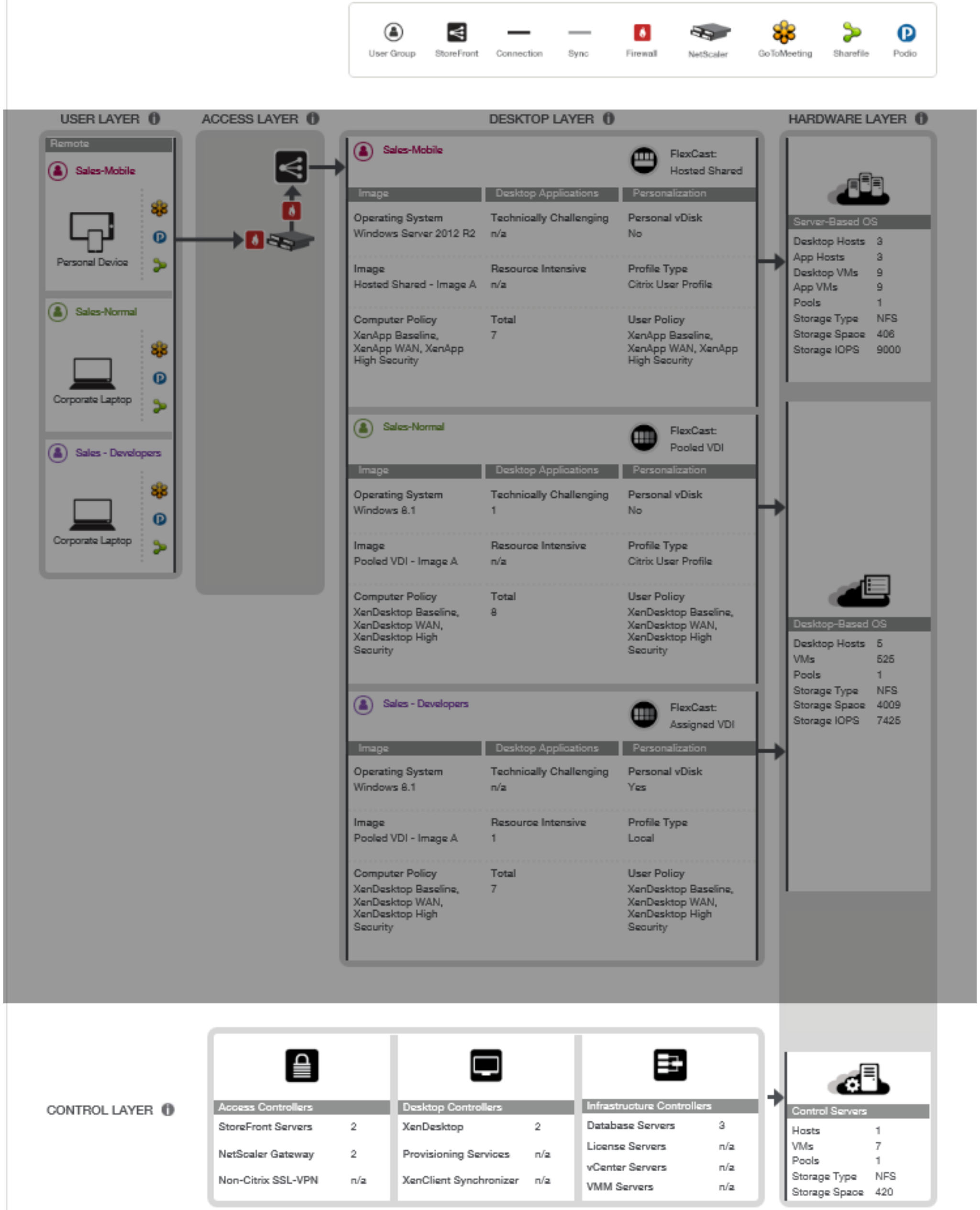
Pooled VDI Desktop Workers	
Instances	500 Pooled VDI Desktop Workers
Virtual Machine Configurations	
Instance Type	c3.large
Memory	3.75 GB RAM
Processor	2 vCPUs
Disk	50 GB HD
Installed Software	
XenDesktop VDA Version	7.5
Winders Server	Windows Server 2012 – Server VDI

- **Server VDI Workers.** These XenDesktop 7.5 workloads, using Windows Server without the Remote Desktop Services Session Host role, provide VDI-based VM or server-level isolation of an individual server instance for those users that require more customization or administrative control of their virtual desktop.

Pooled VDI Desktop Workers	
Instances	500 Pooled VDI Desktop Workers
Virtual Machine Configurations	
Instance Type	c3.large
Memory	3.75 GB RAM
Processor	2 vCPUs
Disk	50 GB HD
Installed Software	
XenDesktop VDA Version	7.5
Winders Server	Windows Server 2012 – Server VDI
Assigned VDI Desktop Workers	
Instances	25 Pooled VDI Desktop Workers
Virtual Machine Configurations	
Instance Type	g2.2xlarge
Memory	15 GB RAM
Processor	8 vCPUs
Disk	60 GB HD (SSD)
Installed Software	
XenDesktop VDA Version	7.5
Winders Server	Windows Server 2012 – Server VDI

Control Layer

The control layer (see Figure 7) contains all the infrastructure components required to support the access and desktop layers. The Access Controllers and Desktop Controllers were previously discussed in their respective sections. This section outlines Contoso's implementation of the Infrastructure Controllers and Control Hosts placed in AWS to decrease WAN traffic for logon and the potential increased logon times that can result.



Sales-Mobile — FlexCast: Hosted Shared

Image	Desktop Applications	Personalization
Operating System Windows Server 2012 R2	Technically Challenging n/a	Personal vDisk No
Image Hosted Shared - Image A	Resource Intensive n/a	Profile Type Citrix User Profile
Computer Policy XenApp Baseline, XenApp WAN, XenApp High Security	Total 7	User Policy XenApp Baseline, XenApp WAN, XenApp High Security

Sales-Normal — FlexCast: Pooled VDI

Image	Desktop Applications	Personalization
Operating System Windows 8.1	Technically Challenging 1	Personal vDisk No
Image Pooled VDI - Image A	Resource Intensive n/a	Profile Type Citrix User Profile
Computer Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security	Total 8	User Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security

Sales - Developers — FlexCast: Assigned VDI

Image	Desktop Applications	Personalization
Operating System Windows 8.1	Technically Challenging n/a	Personal vDisk Yes
Image Pooled VDI - Image A	Resource Intensive 1	Profile Type Local
Computer Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security	Total 7	User Policy XenDesktop Baseline, XenDesktop WAN, XenDesktop High Security

Server-Based OS	
Desktop Hosts	3
App Hosts	3
Desktop VMs	9
App VMs	9
Pools	1
Storage Type	NFS
Storage Space	406
Storage IOPS	9000

Desktop-Based OS	
Desktop Hosts	5
VMs	525
Pools	1
Storage Type	NFS
Storage Space	4009
Storage IOPS	7425

Access Controllers	
StoreFront Servers	2
NetScaler Gateway	2
Non-Citrix SSL-VPN	n/a

Desktop Controllers	
XenDesktop	2
Provisioning Services	n/a
XenClient Synchronizer	n/a

Infrastructure Controllers	
Database Servers	3
License Servers	n/a
vCenter Servers	n/a
VMM Servers	n/a

Control Servers	
Hosts	1
VMs	7
Pools	1
Storage Type	NFS
Storage Space	420

Figure 7. The control layer includes the components required to support the access and desktop layers.

According to the Project Accelerator, Contoso's solution required the following Citrix and Microsoft infrastructure components within the control layer:

- **Active Directory.** Citrix XenDesktop and XenApp leverage Active Directory for authentication and policy setting enforcement on both users and computers.

Active Directory Controller Requirements	
Instances	2 Active Directory Controllers
Virtual Machine Configurations	
Instance Type	m3.medium
Memory	3.75 GB RAM
Processor	1 vCPUs
Disk	60 GB HD
Installed Software	
Winders Server	Windows Server 2012

- **SQL Server Database (SQL Mirroring)**. The SQL Server Database provides high availability with automatic failover Database Services used by XenDesktop 7.5.

SQL Server Requirements	
Instances	3 SQL Server database servers
Virtual Machine Configurations	
Instance Type	c3.xlarge
Memory	7.5 GB RAM
Processor	4 vCPUs
Disk	60 GB
Installed Software	
SQL Server version	SQL 2012
Authentication	Mixed
TCP/IP	Enabled
Named Pipes	Enabled
IP Address	10.16.3.50
Port	1436
Disk space data files	60Gb
Disk space log files	20Gb
Winders Server	Windows Server 2012

Management and Operations

For day-to-day administration, Desktop Director was leveraged to manage and support the environment. Support staff and administrators were granted access to the console.

Administrators manage the site using Citrix Studio. This console handles all site-level responsibilities including policies, device and user allocations. Only senior administrators are granted access to the Citrix Studio. The console was installed on each XenDesktop controller for high availability.

Solution Capabilities and Constraints

The Project Accelerator outputs provide the base sizing and architecture. The following sections provide additional considerations, tools and optimizations specific to Amazon Elastic Compute Cloud (Amazon EC2) platform itself. By taking these additional factors into consideration, along with the base sizing and architecture, a complete hybrid solution in the Contoso datacenter and Amazon EC2 could be implemented.

The following sections outline some of the considerations within AWS that have influenced this design beyond the recommendations from the Project Accelerator.

AWS as an IaaS Platform

The AWS platform has evolved to include several technologies that enable Infrastructure as a Service (IaaS). This section provides a brief overview of those technologies that are leveraged as a part of the Citrix XenDesktop solution on AWS.

More information about Amazon EC2 and Windows VM Instance capabilities and Citrix CloudBridge can be found at:

- http://aws.amazon.com/ec2/instance-types/
- https://www.citrix.it/products/cloudbridge
  - Installing CloudBridge VPX on AWS
  - CloudBridge Technical Overview

Networking

Amazon Virtual Private Cloud (Amazon VPC) enables a logically isolated section of the Amazon Web Services (AWS) Cloud where you can launch AWS resources in a virtual network that you define. Administrators have complete control over the virtual networking environment, including multiple layers of security, to control access to the Amazon EC2 instances in this VPC.

The example in this guide uses a single VPC for all AWS-hosted XenDesktop 7.5 workloads. A Citrix CloudBridge Site-to-Site VPN connection was used between Contoso's on-premises corporate datacenter and the AWS-hosted virtual network (VPC).

More information regarding AWS Networking can be found at http://aws.amazon.com/vpc/

Storage

The scenario in this document leverages Amazon Elastic Block Store (Amazon EBS) shared storage as provided to the VM instances provisioned within AWS. In addition, a Windows Server 2012 File Server has been configured within AWS as a shared file service for the storage of user profiles and data. Additional storage can be allocated within the environment as required for other workloads not documented in this guide.

More information about AWS storage can be found at http://aws.amazon.com/ebs

Important! Because Citrix Provisioning Service is not supported with AWS at this time, the storage calculations from the Project Accelerator can differ significantly from the storage actually used. Please select Machine Creation Services (MCS) as the storage technology to "provide" your storage requirements as part of your cost models.

Provisioning

The provisioning of VM Instances within AWS is accomplished entirely from the Citrix Studio console. Larger scale environments can be provisioned using Citrix XenDesktop SDK combined with AWS CloudFormation templates. The console UI examples in this guide are used for the sake of clarity, while it is generally recommended that a Citrix Service Provider (CSP) or enterprise deployments leverage the XenDesktop SDK and AWS CloudFormation templates to ensure continuity when provisioning instances over time or at larger scale.

More information about AWS CloudFormation and samples can be found at http://aws.amazon.com/cloudformation/aws-cloudformation-templates

Secure Access

For the scenario in this guide, secure access to desktops and applications within AWS is provided through the Contoso on-premises NetScaler Gateway when connecting to AWS-hosted workloads. The connections made through the NetScaler Gateway are then passed through the CloudBridge Site-to-Site VPN to the AWS-hosted desktops and applications (see Figure 8).

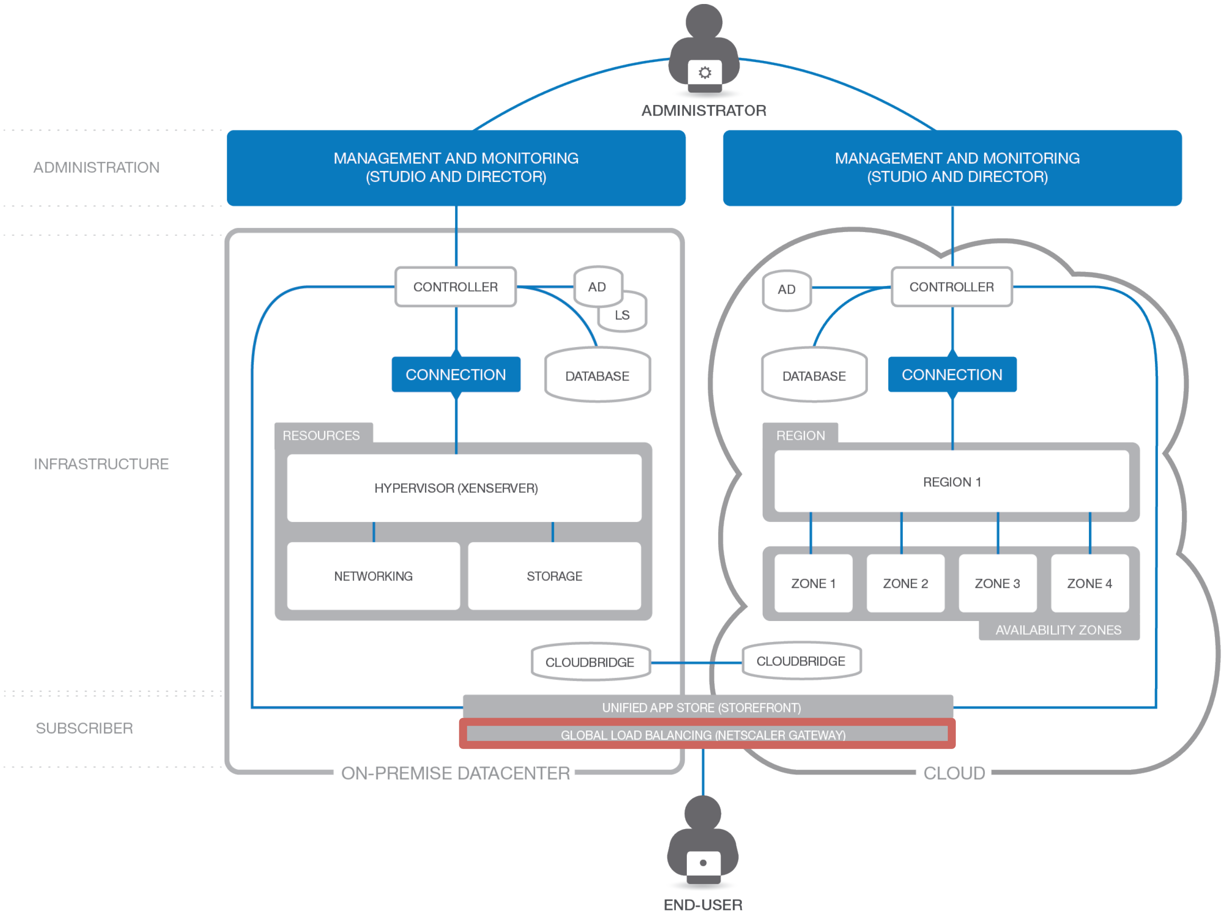


Figure 8. Citrix NetScaler Gateway provides unified and secure access to on-premises and AWS-hosted desktops and applications.

More information about Citrix NetScaler Gateway can be found at http://www.citrix.com/edocs.

Microsoft Instances and Services Used for this Guide

Microsoft Windows Server 2012 Datacenter Instances were used for all Windows Servers in this guide. Some of the roles and services enabled on various servers include:

- Active Directory Services
- File Services
- Internet Information Services
- Microsoft SQL Server 2012 Service Pack 1
- .NET 3.5
- .NET 4.0
- Remote Desktop Services
- Remote Desktop Service License Server

Citrix Components Supported in AWS for this Solution

The following Citrix components for this solution are currently supported within AWS:

- Citrix XenDesktop 7.5 Delivery controllers, Hosted Shared Workers and Server VDI Workers
- NetScaler Application Delivery Controllers, CloudBridges and NetScaler Gateways

Scenario: Augmenting On-Premises Services with XenDesktop 7.5 Controllers and Workers Hosted in AWS

The following sections walk through creation of an AWS virtual private cloud (VPC) to be used for XenDesktop. This scenario augments on-premises services with XenDesktop 7.5 controllers and workers hosted in AWS. The key steps include:

- Creating the AWS virtual private cloud (VPC) network. This includes creating the VPC network infrastructure, adding security groups, and configuring DHCP options.
- Configuring and launching the XenApp and XenDesktop infrastructure instances.

Figure 9 shows the sample architecture used for this scenario.

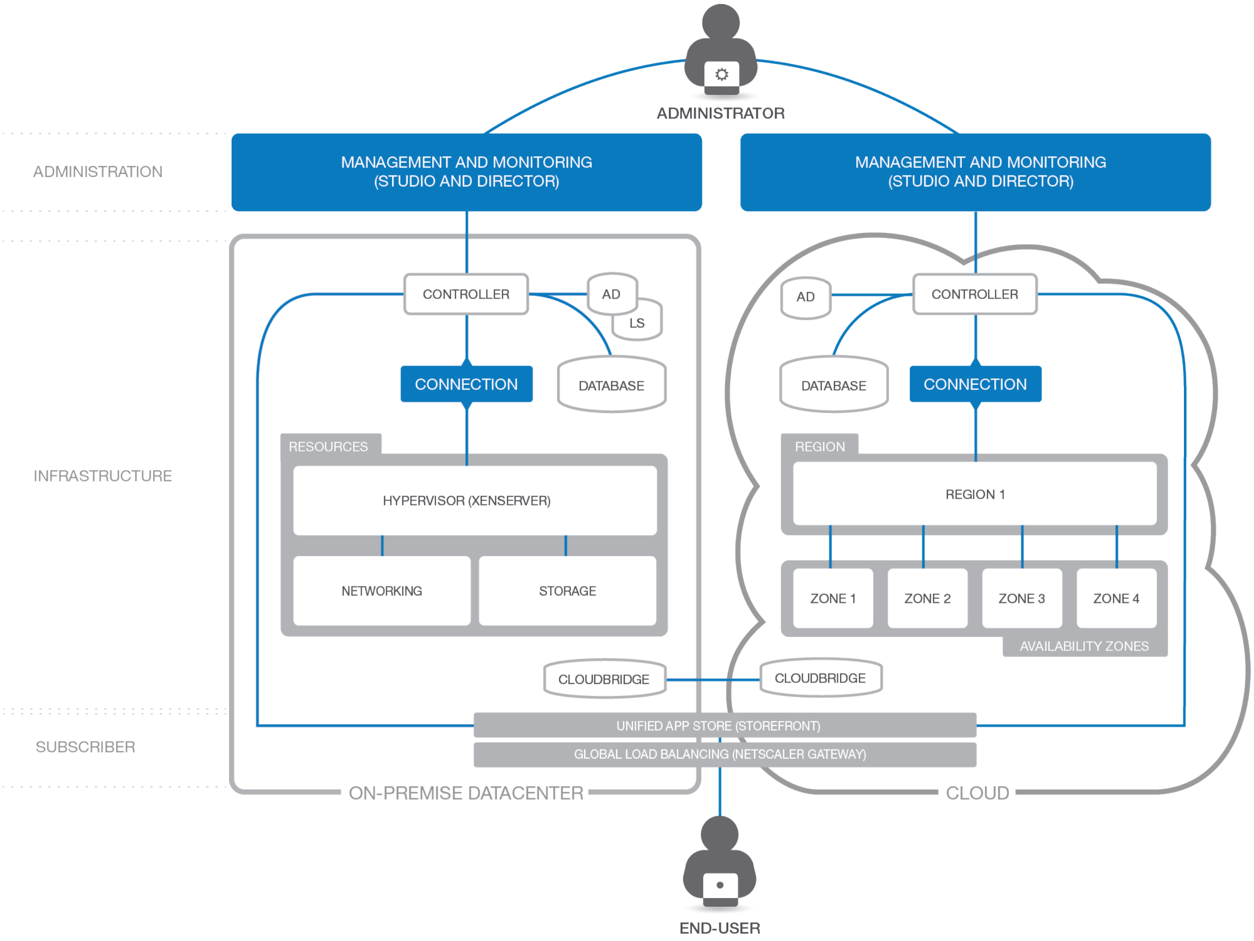


Figure 9. Sample architecture used by the scenario to augment on-premises services with XenDesktop 7.5 controllers and workers hosted in AWS.

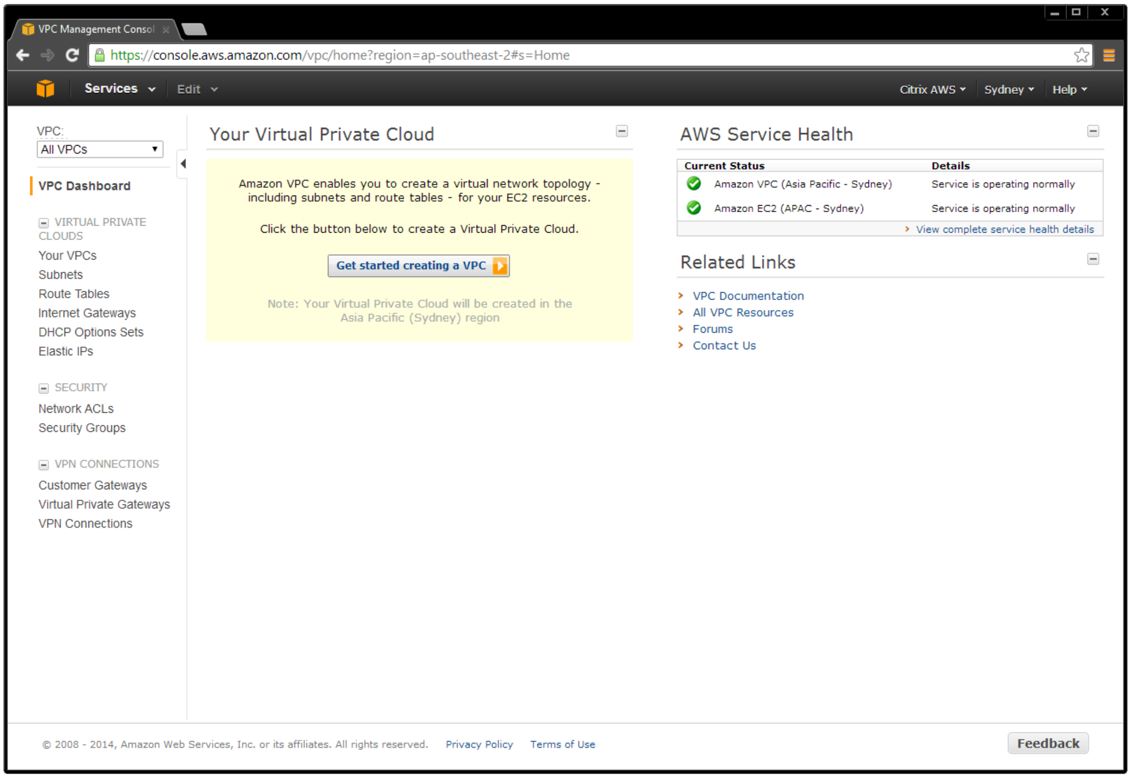
Set Up the VPC Network

The following sections cover the key steps in setting up the VPC network: creating the VPC network infrastructure, adding security groups, and configuring DHCP options.

Create the VPC Network Infrastructure

Creating a site involves creating the Virtual Private Cloud (VPC) network infrastructure in your Amazon Web Services account.

1. Log in to your AWS account, and navigate to the VPC tab. Click **Get started creating a VPC**.



Your Virtual Private Cloud

Amazon VPC enables you to create a virtual network topology - including subnets and route tables - for your EC2 resources.

Click the button below to create a Virtual Private Cloud.

Note: Your Virtual Private Cloud will be created in the Asia Pacific (Sydney) region

AWS Service Health

Current Status	Details
✓ Amazon VPC (Asia Pacific - Sydney)	Service is operating normally
✓ Amazon EC2 (APAC - Sydney)	Service is operating normally

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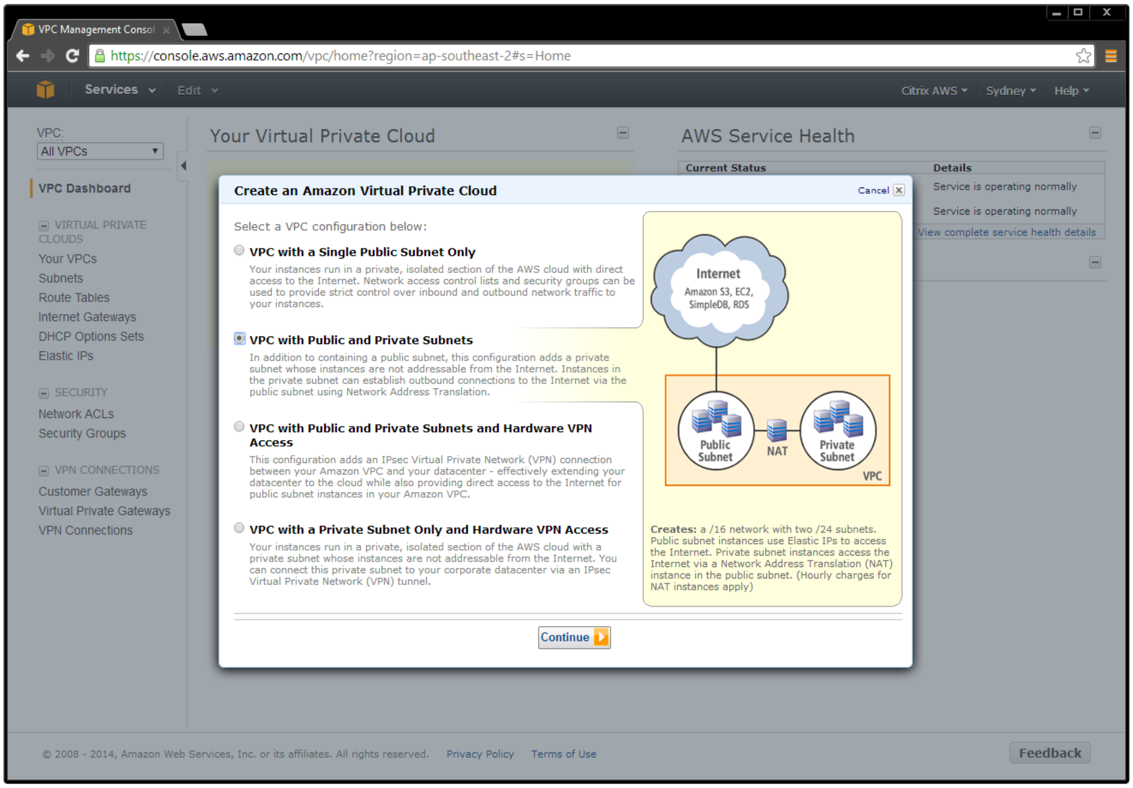
2. Select VPC with Public and Private Subnets.



Create an Amazon Virtual Private Cloud

Select a VPC configuration below:

○ **VPC with a Single Public Subnet Only**
Your instances run in a private, isolated section of the AWS cloud with direct access to the Internet. Network access control lists and security groups can be used to provide strict control over inbound and outbound network traffic to your instances.

● **VPC with Public and Private Subnets**
In addition to containing a public subnet, this configuration adds a private subnet whose instances are not addressable from the Internet. Instances in the private subnet can establish outbound connections to the Internet via the public subnet using Network Address Translation.

○ **VPC with Public and Private Subnets and Hardware VPN Access**
This configuration adds an IPsec Virtual Private Network (VPN) connection between your Amazon VPC and your datacenter - effectively extending your datacenter to the cloud while also providing direct access to the Internet for public subnet instances in your Amazon VPC.

○ **VPC with a Private Subnet Only and Hardware VPN Access**
Your instances run in a private, isolated section of the AWS cloud with a private subnet whose instances are not addressable from the Internet. You can connect this private subnet to your corporate datacenter via an IPsec Virtual Private Network (VPN) tunnel.

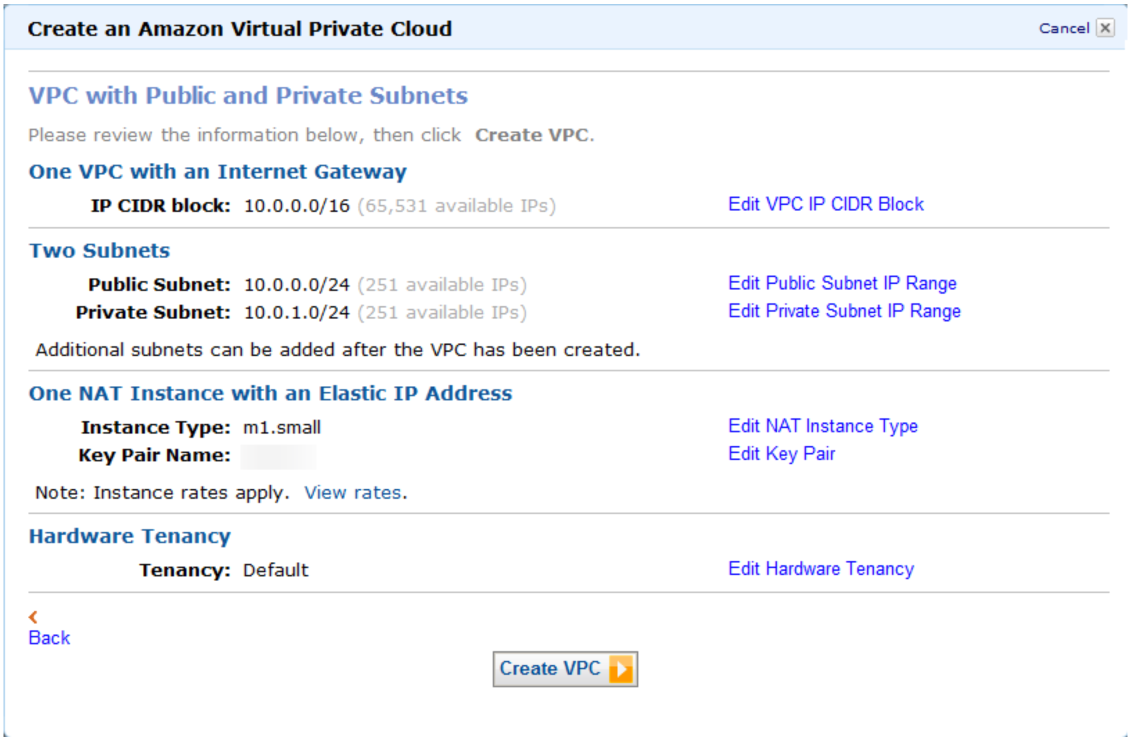
Creates: a /16 network with two /24 subnets. Public subnet instances use Elastic IPs to access the Internet. Private subnet instances access the Internet via a Network Address Translation (NAT) instance in the public subnet. (Hourly charges for NAT instances apply)

Note: To create a hybrid setup between your on-premises environment and AWS:

a. Select **VPC with Public and Private Subnets and Hardware VPN**.

b. Alternatively, use a NetScaler VPX Platinum Edition enabling NetScaler Gateway as well as CloudBridge Connector. The CloudBridge Connector enables a WAN-optimized VPN function between your on-premises environment and your Amazon VPC.

3. Next, the wizard displays the default settings for the VPC and provides an opportunity to make adjustments. This sample deployment uses the default network settings. Adjust these settings accordingly, and then click **Create VPC**.



Create an Amazon Virtual Private Cloud

VPC with Public and Private Subnets

Please review the information below, then click **Create VPC**.

One VPC with an Internet Gateway

IP CIDR block: 10.0.0.0/16 (65,531 available IPs) — Edit VPC IP CIDR Block

Two Subnets

Public Subnet: 10.0.0.0/24 (251 available IPs) — Edit Public Subnet IP Range

Private Subnet: 10.0.1.0/24 (251 available IPs) — Edit Private Subnet IP Range

Additional subnets can be added after the VPC has been created.

One NAT Instance with an Elastic IP Address

Instance Type: m1.small — Edit NAT Instance Type

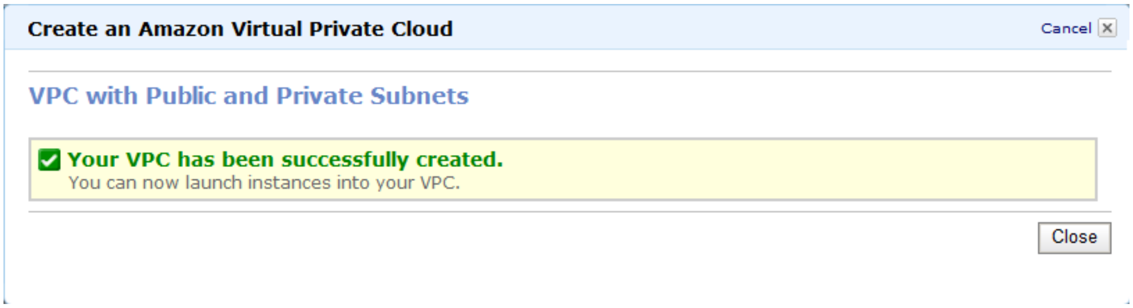
Key Pair Name: — Edit Key Pair

Note: Instance rates apply. View rates.

Hardware Tenancy

Tenancy: Default — Edit Hardware Tenancy

4. A confirmation message is displayed, indicating the VPC has been successfully created.



Create an Amazon Virtual Private Cloud

VPC with Public and Private Subnets

☑ **Your VPC has been successfully created.**
You can now launch instances into your VPC.

Note: When the VPC is automatically created, it includes the public and private subnets, the router, NAT gateway, and the Internet gateway.

Add Security Groups

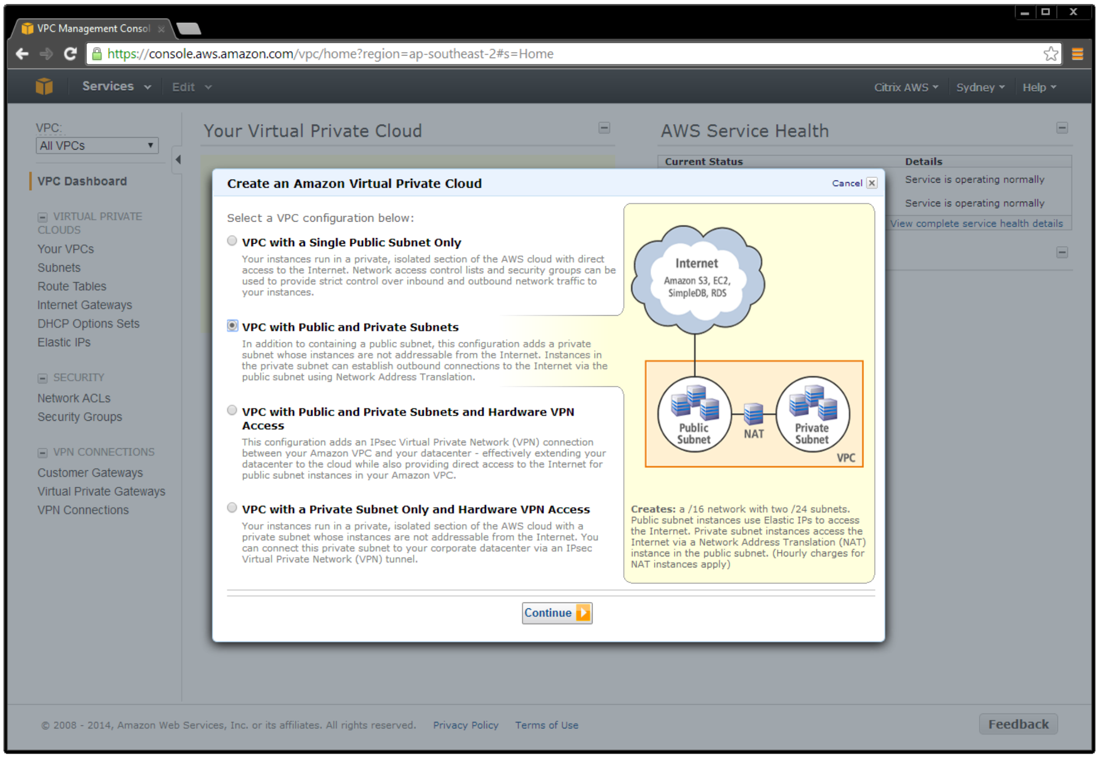
The security groups in Amazon VPC provide communication between the Internet and public network, and the public and private network. The security groups contain ACLs and are the basis of the firewalls for the subnets and instances used in this deployment.

You must create the following security groups:

- NAT security group
- Public security group
- Private security group

Add NAT Security Group

1. On the VPC tab, select **Security Groups > Create Security Group**.



Create an Amazon Virtual Private Cloud

Select a VPC configuration below:

○ **VPC with a Single Public Subnet Only**
Your instances run in a private, isolated section of the AWS cloud with direct access to the Internet. Network access control lists and security groups can be used to provide strict control over inbound and outbound network traffic to your instances.

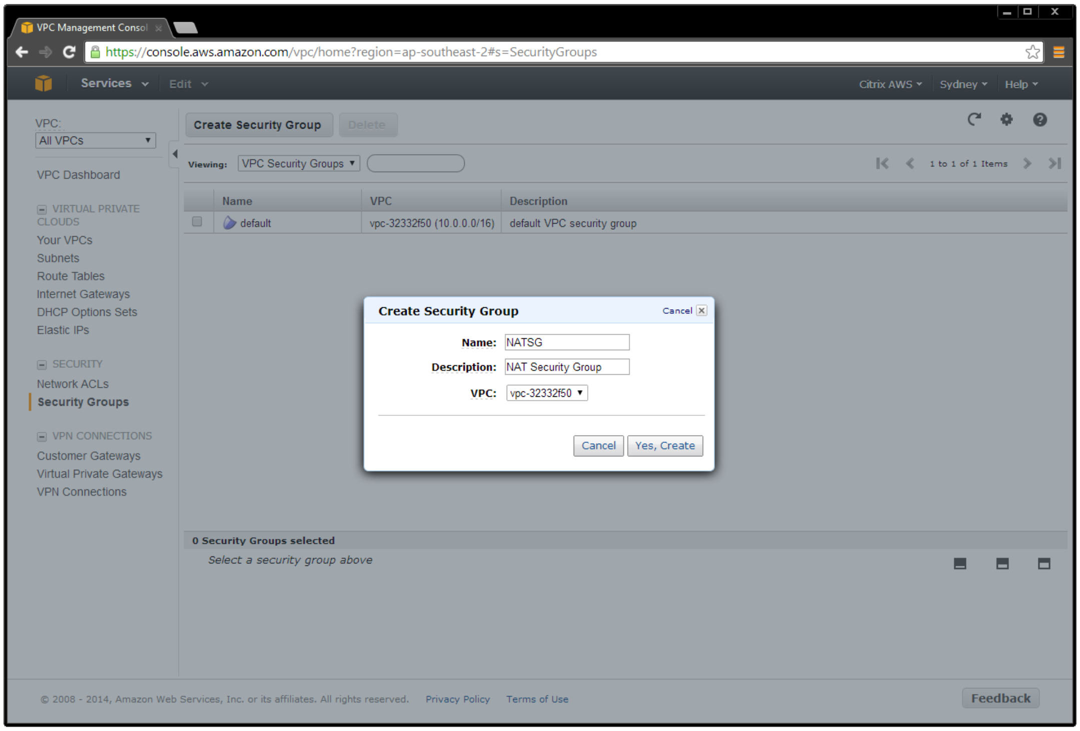
● **VPC with Public and Private Subnets**
In addition to containing a public subnet, this configuration adds a private subnet whose instances are not addressable from the Internet. Instances in the private subnet can establish outbound connections to the Internet via the public subnet using Network Address Translation.

○ **VPC with Public and Private Subnets and Hardware VPN Access**
This configuration adds an IPsec Virtual Private Network (VPN) connection between your Amazon VPC and your datacenter - effectively extending your datacenter to the cloud while also providing direct access to the Internet for public subnet instances in your Amazon VPC.

○ **VPC with a Private Subnet Only and Hardware VPN Access**
Your instances run in a private, isolated section of the AWS cloud with a private subnet whose instances are not addressable from the Internet. You can connect this private subnet to your corporate datacenter via an IPsec Virtual Private Network (VPN) tunnel.

Creates: a /16 network with two /24 subnets. Public subnet instances use Elastic IPs to access the Internet. Private subnet instances access the Internet via a Network Address Translation (NAT) instance in the public subnet. (Hourly charges for NAT instances apply)

2. Add ACL rules for inbound and outbound traffic. Select:
    a. Create a new rule
    b. Port number
    c. Source IP address



https://console.aws.amazon.com/vpc/home?region=ap-southeast-2#s=SecurityGroups

Name	VPC	Description
default	vpc-32332f50 (10.0.0.0/16)	default VPC security group

Create Security Group

Name: NATSG

Description: NAT Security Group

VPC: vpc-32332f50

0 Security Groups selected

Select a security group above

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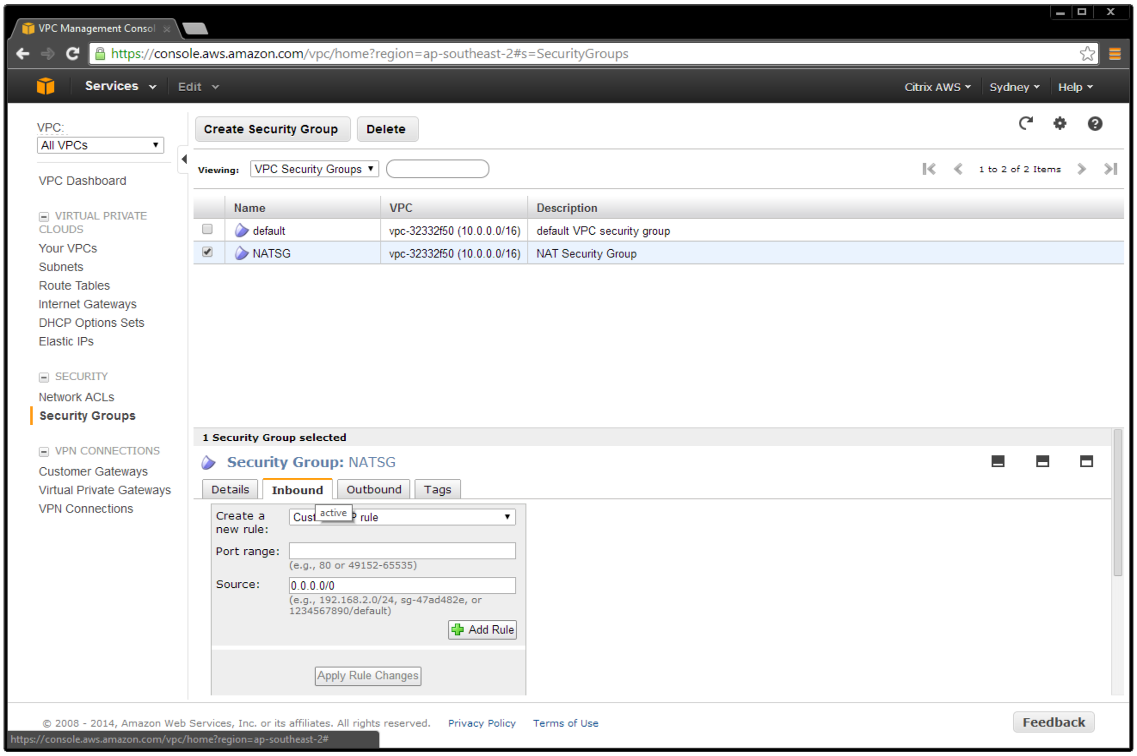
Note: A source IP address of `0.0.0.0/0` indicates that you want to allow all inbound or outbound traffic.

Create ACL rules to match the inbound and outbound traffic table (see Table 3).



	Name	VPC	Description
☐	default	vpc-32332f50 (10.0.0.0/16)	default VPC security group
☑	NATSG	vpc-32332f50 (10.0.0.0/16)	NAT Security Group

1 Security Group selected

Security Group: NATSG

Create a new rule: Cust active rule

Port range:
(e.g., 80 or 49152-65535)

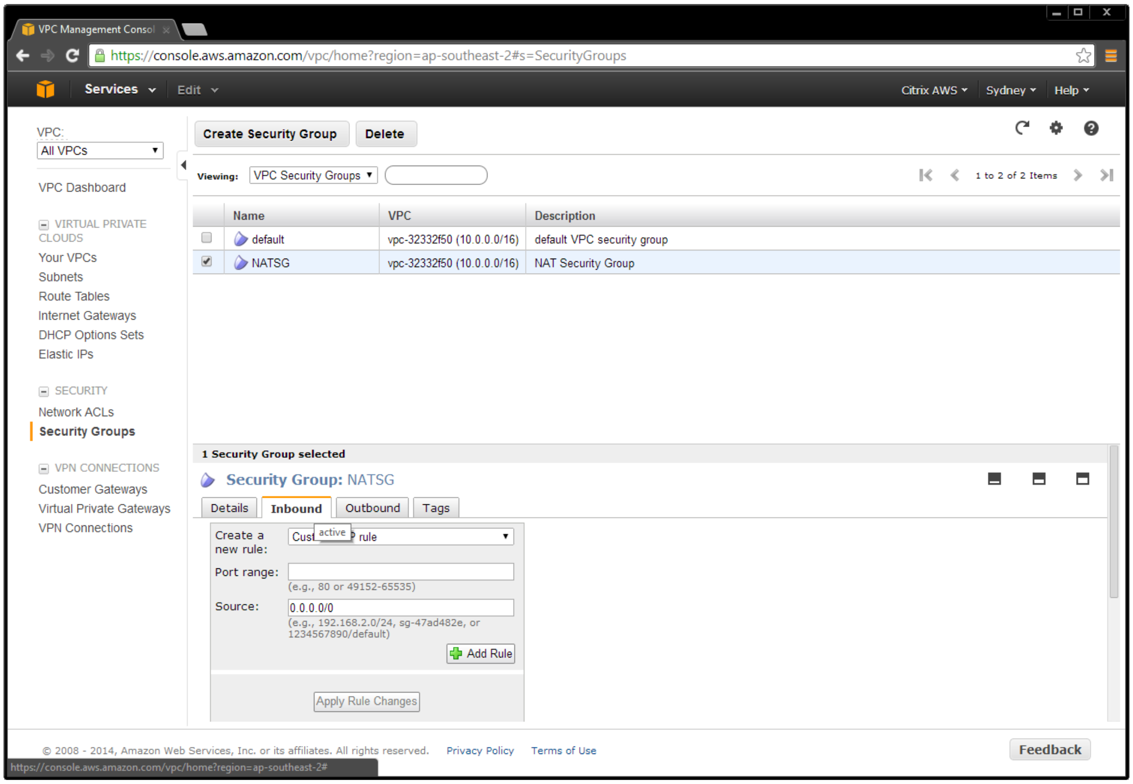
Source: 0.0.0.0/0
(e.g., 192.168.2.0/24, sg-47ad482e, or 1234567890/default)

Table 3. NAT security group rules.

Inbound			Outbound		
Type	**Traffic**	**Source**	**Type**	**Traffic**	**Source**
All	All	privateSG	All	All	0.0.0.0/0
TCP	22 (SSH)	0.0.0.0/0			

The VPC wizard automatically creates the NAT instance.

3. Go to the EC2/Instances page, and locate the instance. Right-click the instance, and change the security group to **NATSG**.



	Name	VPC	Description
□	default	vpc-32332f50 (10.0.0.0/16)	default VPC security group
☑	NATSG	vpc-32332f50 (10.0.0.0/16)	NAT Security Group

1 Security Group selected

Security Group: NATSG

Create a new rule: Cust active P rule

Port range:

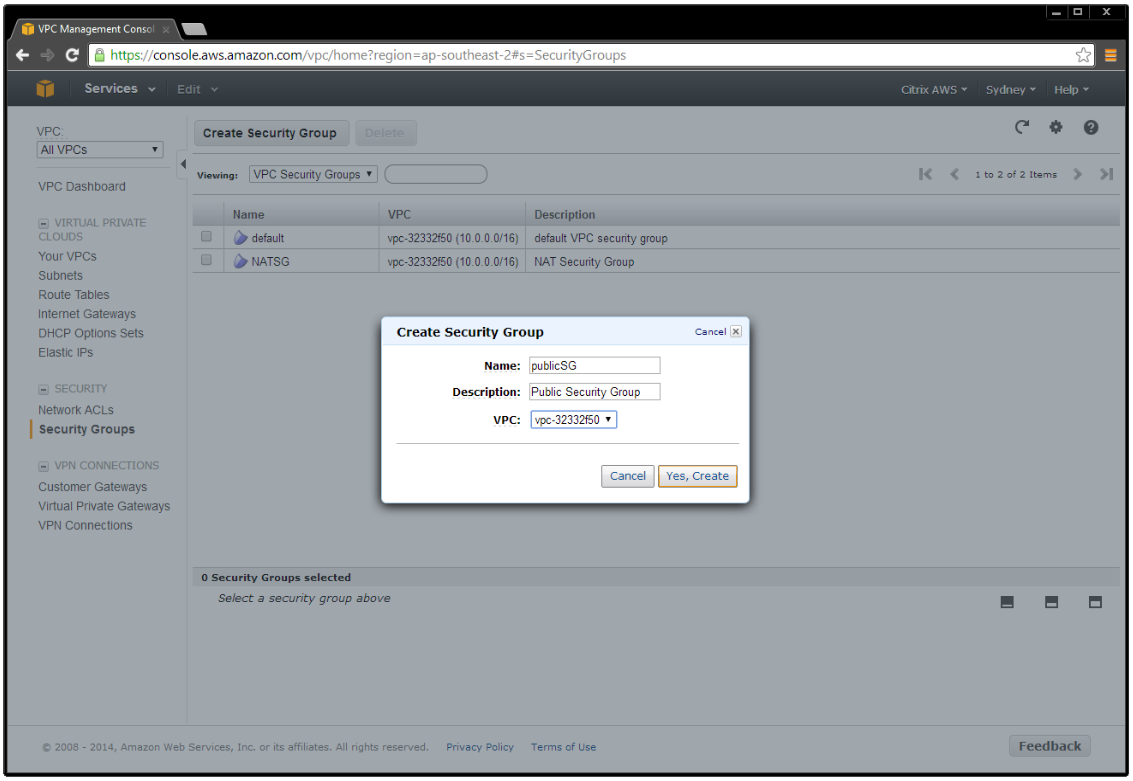
(e.g., 80 or 49152-65535)

Source: 0.0.0.0/0

(e.g., 192.168.2.0/24, sg-47ad482e, or 1234567890/default)

Add Public Security Group

1. On the VPC tab, select **Security Groups > Create Security Group**.



Name	VPC	Description
default	vpc-32332f50 (10.0.0.0/16)	default VPC security group
NATSG	vpc-32332f50 (10.0.0.0/16)	NAT Security Group

Create Security Group

Name: publicSG

Description: Public Security Group

VPC: vpc-32332f50

0 Security Groups selected

Select a security group above

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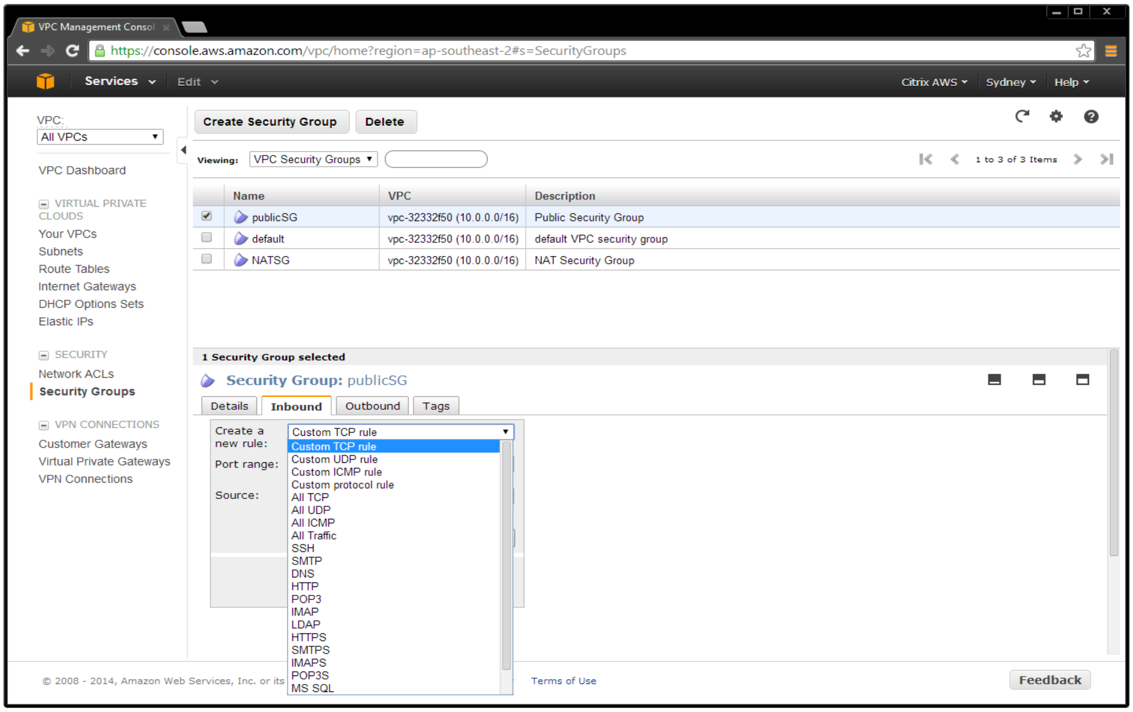
2. Add ACL rules for inbound and outbound traffic. Select:
   a. Create a new rule
   b. Port number
   c. Source IP address

Note: Entering a Source IP address of `0.0.0.0/0` allows all inbound or outbound traffic.

Create ACL rules to match the public network security group (publicSG) rules table (see Table 4).



https://console.aws.amazon.com/vpc/home?region=ap-southeast-2#s=SecurityGroups

VPC: All VPCs

Viewing: VPC Security Groups — 1 to 3 of 3 Items

	Name	VPC	Description
☑	publicSG	vpc-32332f50 (10.0.0.0/16)	Public Security Group
□	default	vpc-32332f50 (10.0.0.0/16)	default VPC security group
□	NATSG	vpc-32332f50 (10.0.0.0/16)	NAT Security Group

1 Security Group selected

Security Group: publicSG

Create a new rule: Custom TCP rule

Port range:

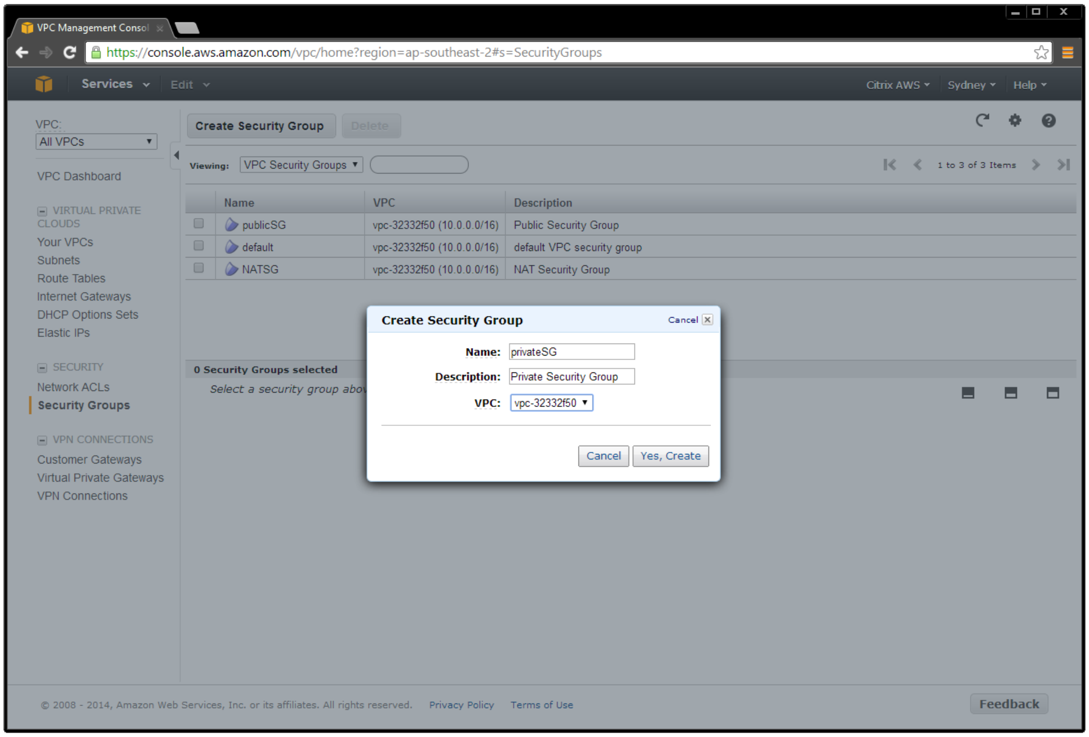
Source:

Table 4. Public network security group (publicSG) rules.

Inbound			Outbound		
Type	**Traffic**	**Source**	**Type**	**Traffic**	**Source**
All	All	publicSG	All	All	0.0.0.0/0
	All	publicSG		All	privateSG
ICMP	All	0.0.0.0/0	ICMP	All	0.0.0.0/0
TCP	22 (SSH)	0.0.0.0/0			
	80 (HTTP)	0.0.0.0/0			
	443 (HTTPS)	0.0.0.0/0			
	1494 (CA)	0.0.0.0/0			
	2598 (Sess)	0.0.0.0/0			
	3389 (RDP)	0.0.0.0/0			

Add Private Security Group

1. On the VPC tab, select **Security Groups > Create Security Group**.



Name	VPC	Description
publicSG	vpc-32332f50 (10.0.0.0/16)	Public Security Group
default	vpc-32332f50 (10.0.0.0/16)	default VPC security group
NATSG	vpc-32332f50 (10.0.0.0/16)	NAT Security Group

Create Security Group

Name: privateSG

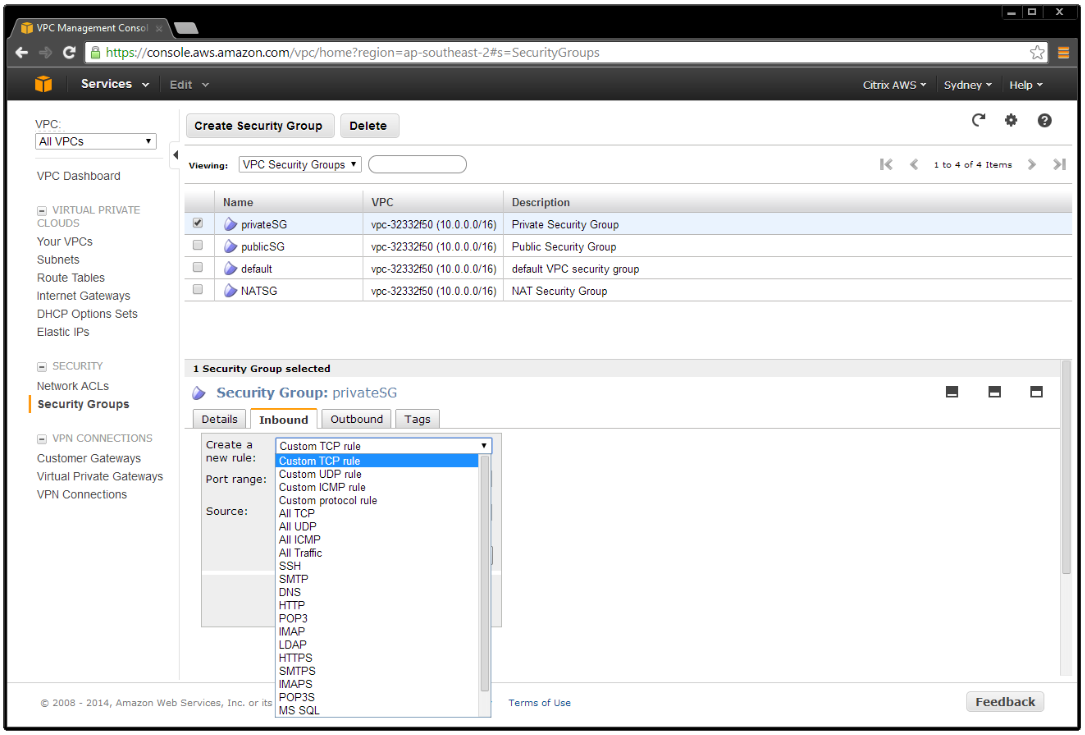
Description: Private Security Group

VPC: vpc-32332f50

2. Add ACL rules for inbound and outbound traffic. Select:
   a. Create a new rule
   b. Port number
   c. Source IP address

   Note: Entering a Source IP address of `0.0.0.0/0` allows all inbound or outbound traffic.

   Create ACL rules to match the private network security group (privates) rules table (see Table 5).



	Name	VPC	Description
☑	privateSG	vpc-32332f50 (10.0.0.0/16)	Private Security Group
□	publicSG	vpc-32332f50 (10.0.0.0/16)	Public Security Group
□	default	vpc-32332f50 (10.0.0.0/16)	default VPC security group
□	NATSG	vpc-32332f50 (10.0.0.0/16)	NAT Security Group

1 Security Group selected

Security Group: privateSG

Create a new rule: Custom TCP rule

Port range:

Source:

Table 5. Private network security group (privateSG) rules.

Inbound			Outbound		
Type	**Traffic**	**Source**	**Type**	**Traffic**	**Source**
All	All	NATSG	All	All	0.0.0.0/0
	All	privateSG		All	privates
ICMP	All	publicSG	ICMP	All	0.0.0.0/0
TCP	54 (DNS)	publicSG	UDP	52 (DNS)	0.0.0.0/0
	80 (HTTP)	publicSG			
	135	publicSG			
	389	publicSG			
	443 (HTTPS)	publicSG			
	1494 (CA)	publicSG			
	2598 (Sess)	publicSG			
	3389 (RDP)	publicSG			
	49152 - 65535	publicSG			
UDP	53 (DNS)	publicSG			
	389 (LDAP)	publicSG			

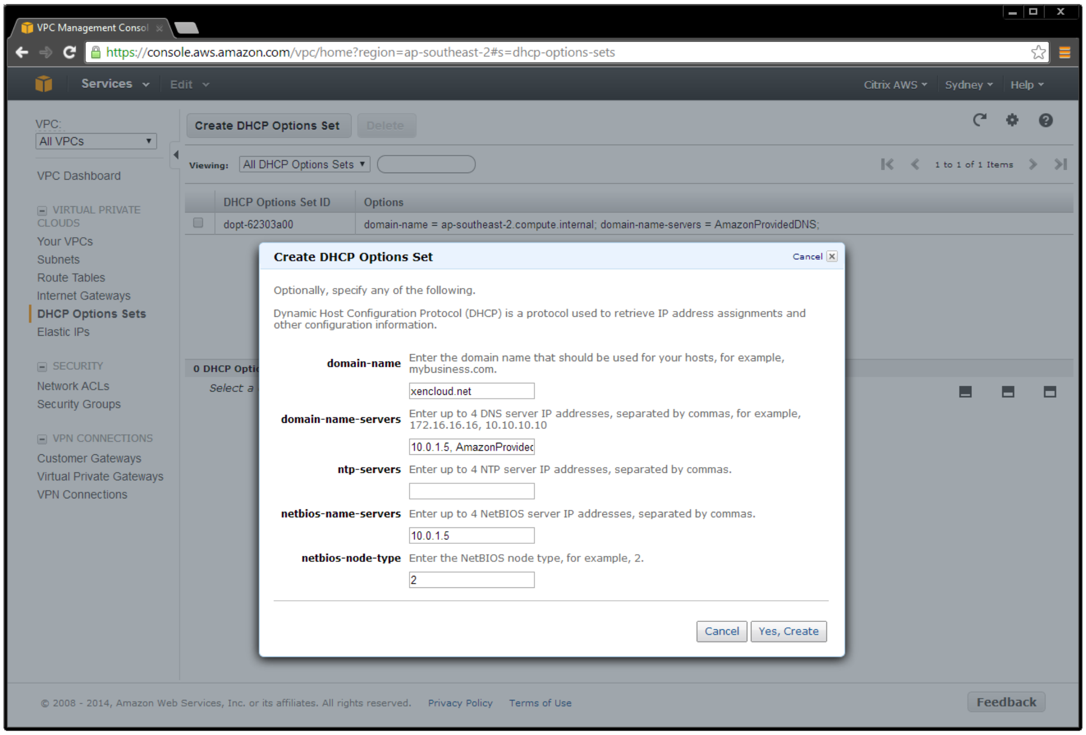
Configure DHCP Options

There is a domain controller running DNS in the private network. The controller enables Citrix servers to authenticate and communicate with each other. To implement this communication:

- Create a new DHCP options set that contains your DNS server IP address.
- Add an open-source DNS server on the Internet in case a server needs to access the Internet.

Create a DHCP Options Set

1. Navigate to the VPC tab, and select **DHCP Options Set > Create DHCP Options Set**.



DHCP Options Set ID	Options
dopt-62303a00	domain-name = ap-southeast-2.compute.internal; domain-name-servers = AmazonProvidedDNS;

Create DHCP Options Set

Optionally, specify any of the following.

Dynamic Host Configuration Protocol (DHCP) is a protocol used to retrieve IP address assignments and other configuration information.

domain-name Enter the domain name that should be used for your hosts, for example, mybusiness.com.
xencloud.net

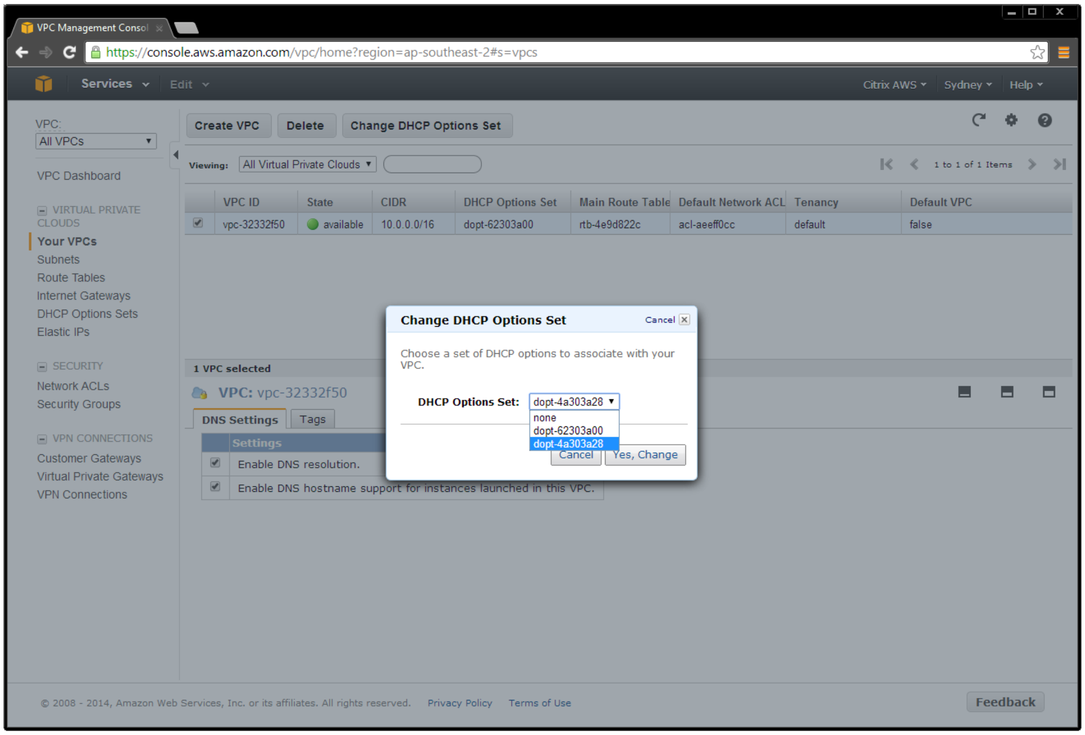
domain-name-servers Enter up to 4 DNS server IP addresses, separated by commas, for example, 172.16.16.16, 10.10.10.10
10.0.1.5, AmazonProvidec

ntp-servers Enter up to 4 NTP server IP addresses, separated by commas.

netbios-name-servers Enter up to 4 NetBIOS server IP addresses, separated by commas.
10.0.1.5

netbios-node-type Enter the NetBIOS node type, for example, 2.
2

2. Select the VPC, right-click on your selection, and choose **Change DHCP Options Set to the new set**.



	VPC ID	State	CIDR	DHCP Options Set	Main Route Table	Default Network ACL	Tenancy	Default VPC
☑	vpc-32332f50	● available	10.0.0.0/16	dopt-62303a00	rtb-4e9d822c	acl-aeeff0cc	default	false

1 VPC selected

VPC: vpc-32332f50

	Settings
☑	Enable DNS resolution.
☑	Enable DNS hostname support for instances launched in this VPC.

Change DHCP Options Set

Choose a set of DHCP options to associate with your VPC.

DHCP Options Set: dopt-4a303a28

Set up the XenApp or XenDesktop Infrastructure Instances

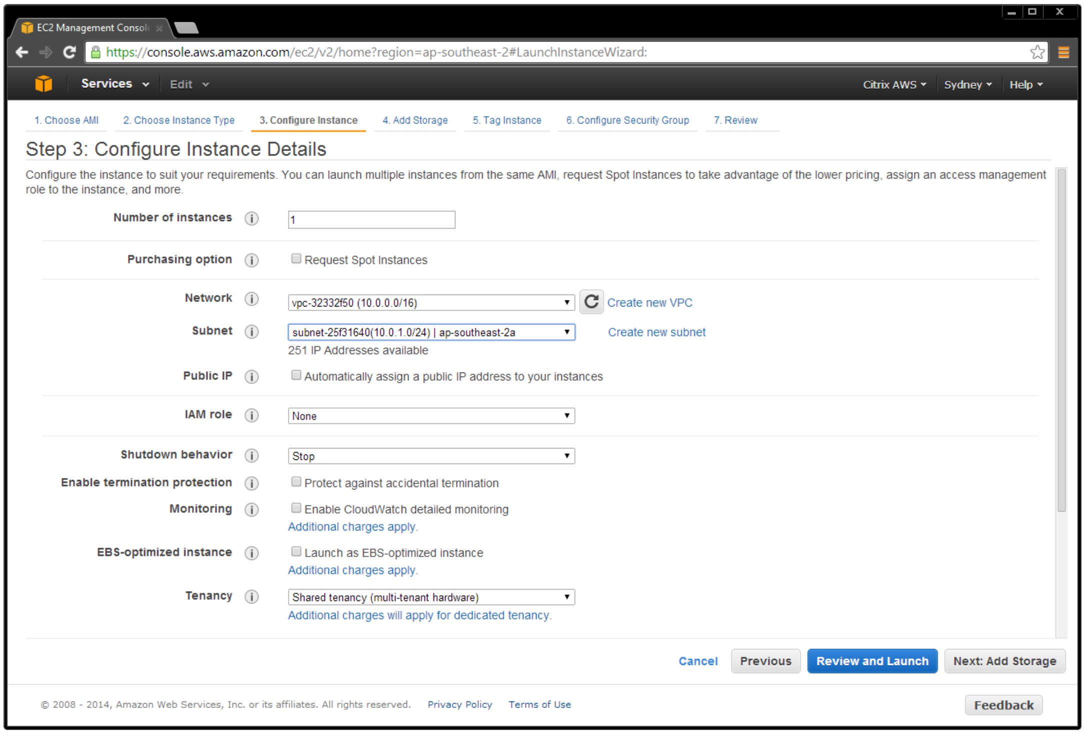
The following sections walk through setting up the following Amazon machine images (AMIs):

- Domain Controller AMI
- Remaining XenApp or XenDesktop AMIs
- NetScaler AMI

Launch and Configure a Domain Controller Amazon Machine Image (AMI)

Create a domain controller for the site as follows:

1. Select **AMIs** in the EC2 tab**.**
2. Depending on operating system you use, perform a search in the Amazon AMIs for **Windows Server 2012 Base** or **Windows Server 2008 R Base**. Ensure that the machine is deployed to your subnet, and make sure it is in the private subnet `10.0.1.0/24`.

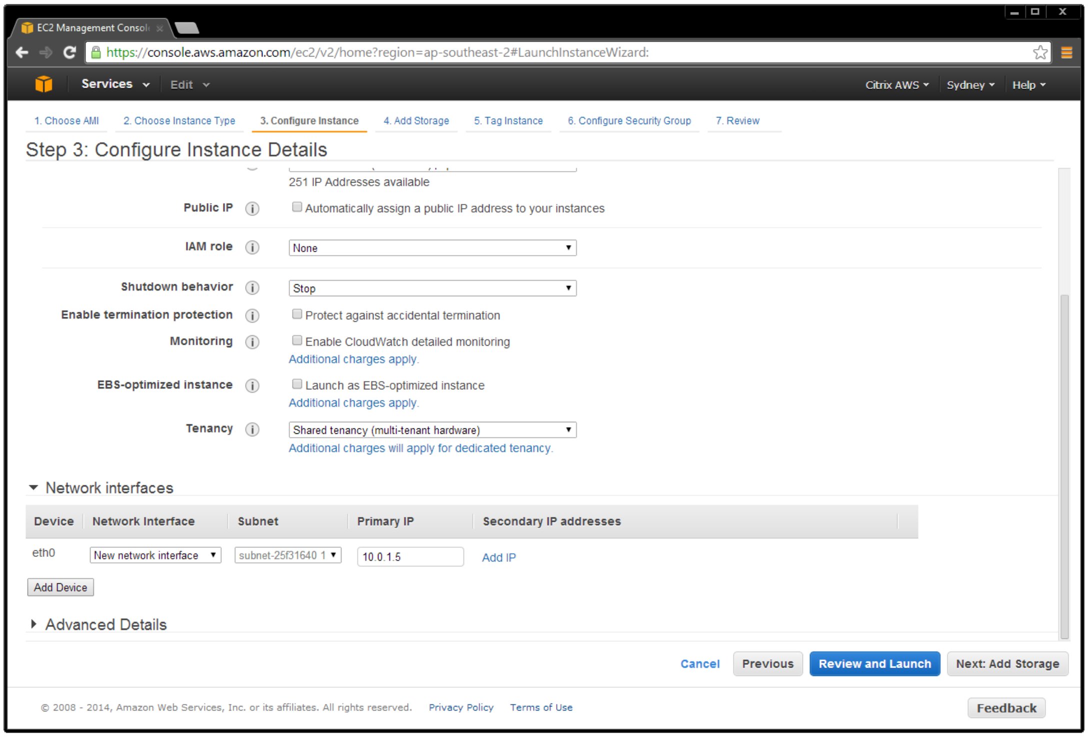


Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot Instances to take advantage of the lower pricing, assign an access management role to the instance, and more.

Number of instances	1
Purchasing option	□ Request Spot Instances
Network	vpc-32332f50 (10.0.0.0/16) ▾ Create new VPC
Subnet	subnet-25f31640(10.0.1.0/24) | ap-southeast-2a ▾ Create new subnet 251 IP Addresses available
Public IP	□ Automatically assign a public IP address to your instances
IAM role	None ▾
Shutdown behavior	Stop ▾
Enable termination protection	□ Protect against accidental termination
Monitoring	□ Enable CloudWatch detailed monitoring Additional charges apply.
EBS-optimized instance	□ Launch as EBS-optimized instance Additional charges apply.
Tenancy	Shared tenancy (multi-tenant hardware) ▾ Additional charges will apply for dedicated tenancy.

3. Assign the IP address for this server.



Step 3: Configure Instance Details

251 IP Addresses available

Public IP: □ Automatically assign a public IP address to your instances

IAM role: None

Shutdown behavior: Stop

Enable termination protection: □ Protect against accidental termination

Monitoring: □ Enable CloudWatch detailed monitoring
Additional charges apply.

EBS-optimized instance: □ Launch as EBS-optimized instance
Additional charges apply.

Tenancy: Shared tenancy (multi-tenant hardware)
Additional charges will apply for dedicated tenancy.

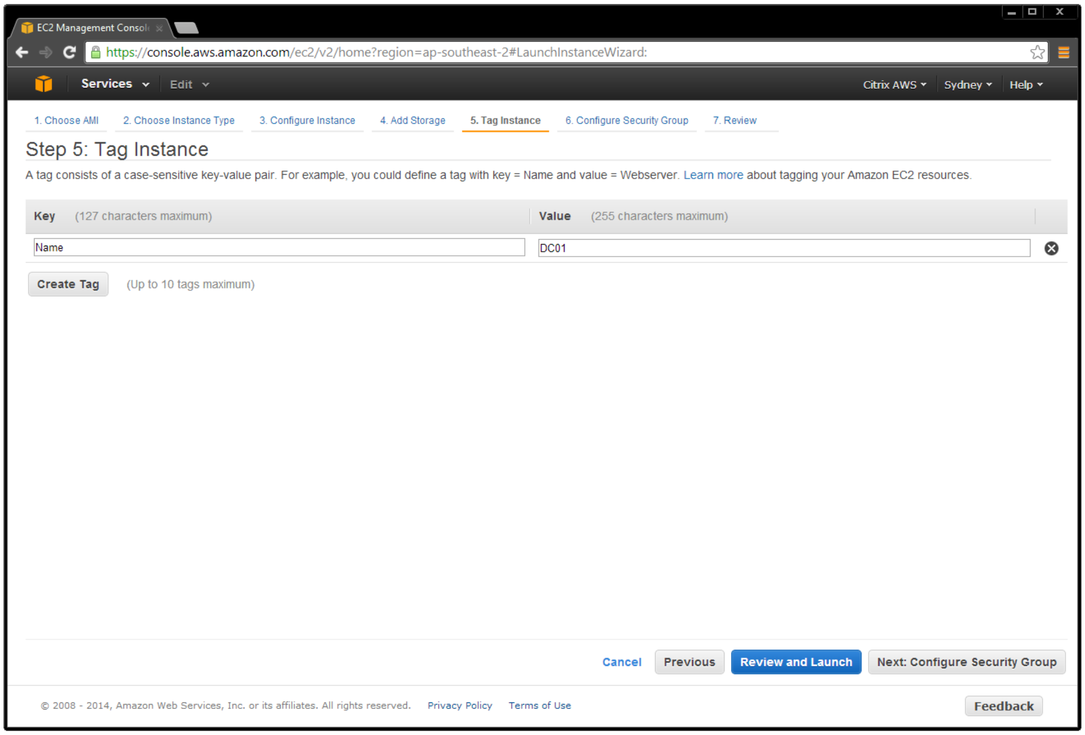
Network interfaces

Device	Network Interface	Subnet	Primary IP	Secondary IP addresses
eth0	New network interface	subnet-25f31640 1	10.0.1.5	Add IP

Add Device

Advanced Details

4. Assign a friendly name to the AMI to make it easily identifiable in the Amazon console.



EC2 Management Consol
https://console.aws.amazon.com/ec2/v2/home?region=ap-southeast-2#LaunchInstanceWizard:
Services
Edit
Citrix AWS
Sydney
Help
1. Choose AMI
2. Choose Instance Type
3. Configure Instance
4. Add Storage
5. Tag Instance
6. Configure Security Group
7. Review
Cancel
Previous
Review and Launch
Next: Configure Security Group
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Feedback

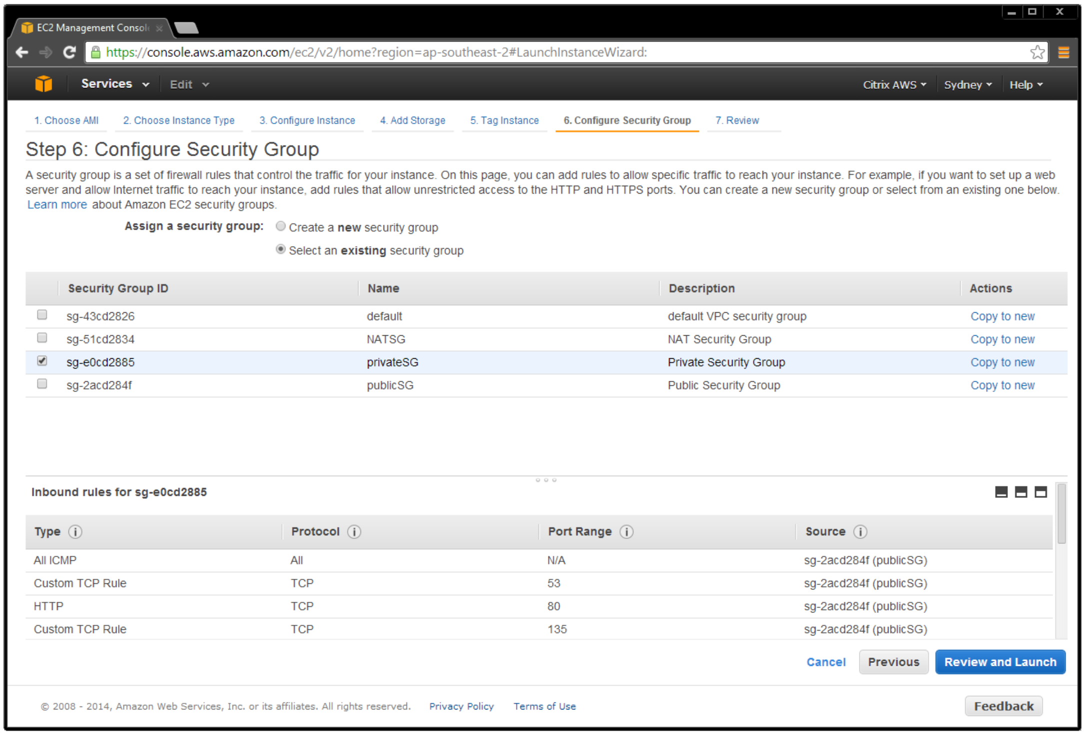
Step 5: Tag Instance

A tag consists of a case-sensitive key-value pair. For example, you could define a tag with key = Name and value = Webserver. Learn more about tagging your Amazon EC2 resources.

Key (127 characters maximum)	Value (255 characters maximum)
Name	DC01

Create Tag (Up to 10 tags maximum)

5. Place the domain controller in the network by launching the AMI into the appropriate network and security group. This example places the domain controller in the private network.



Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. Learn more about Amazon EC2 security groups.

Assign a security group: ○ Create a **new** security group

● Select an **existing** security group

	Security Group ID	Name	Description	Actions
□	sg-43cd2826	default	default VPC security group	Copy to new
□	sg-51cd2834	NATSG	NAT Security Group	Copy to new
☑	sg-e0cd2885	privateSG	Private Security Group	Copy to new
□	sg-2acd284f	publicSG	Public Security Group	Copy to new

Inbound rules for sg-e0cd2885

Type	Protocol	Port Range	Source
All ICMP	All	N/A	sg-2acd284f (publicSG)
Custom TCP Rule	TCP	53	sg-2acd284f (publicSG)
HTTP	TCP	80	sg-2acd284f (publicSG)
Custom TCP Rule	TCP	135	sg-2acd284f (publicSG)

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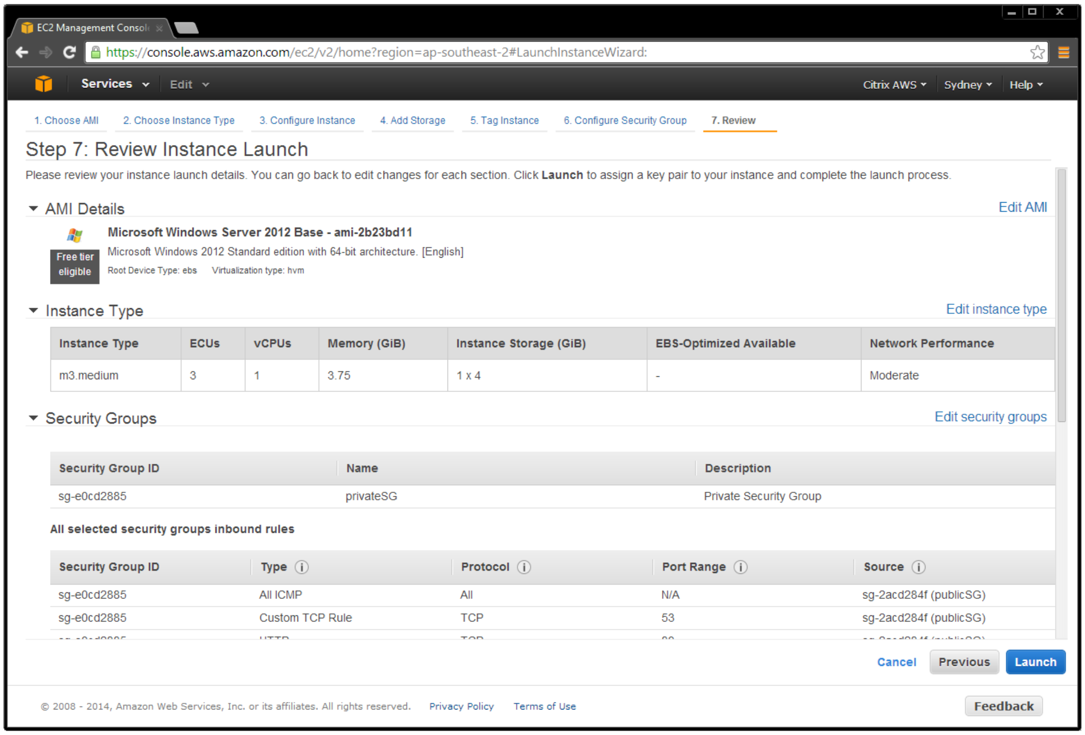
6. Review the settings, and then select **Launch**.



Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

AMI Details — Edit AMI

Microsoft Windows Server 2012 Base - ami-2b23bd11
Free tier eligible
Microsoft Windows 2012 Standard edition with 64-bit architecture. [English]
Root Device Type: ebs Virtualization type: hvm

Instance Type — Edit instance type

Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GiB)	EBS-Optimized Available	Network Performance
m3.medium	3	1	3.75	1 x 4	-	Moderate

Security Groups — Edit security groups

Security Group ID	Name	Description
sg-e0cd2885	privateSG	Private Security Group

All selected security groups inbound rules

Security Group ID	Type	Protocol	Port Range	Source
sg-e0cd2885	All ICMP	All	N/A	sg-2acd284f (publicSG)
sg-e0cd2885	Custom TCP Rule	TCP	53	sg-2acd284f (publicSG)

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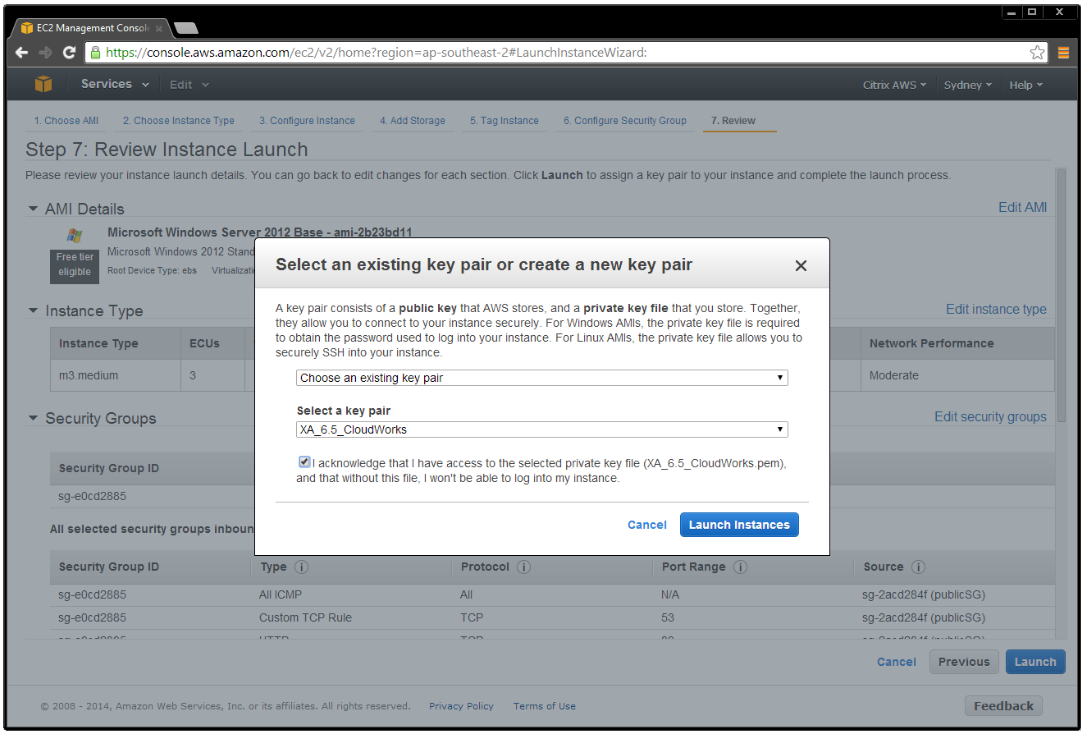
7. Choose an existing AWS key pair, or create a new one.



Select an existing key pair or create a new key pair

A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Choose an existing key pair

Select a key pair

XA_6.5_CloudWorks

☑ I acknowledge that I have access to the selected private key file (XA_6.5_CloudWorks.pem), and that without this file, I won't be able to log into my instance.

Launch Remaining XenApp or XenDesktop AMIs

Launch the remaining XenApp or XenDesktop AMIs using the parameters in Table 6. (Note that AMI IDs will change per region and after release of updates by AWS.) Ensure that you launch them into the correct network (private or public as applicable) and assign an IP address and the elastic IP addresses.

Note: The Amazon VPC wizard automatically creates the NAT server, so you should not need this AMI.

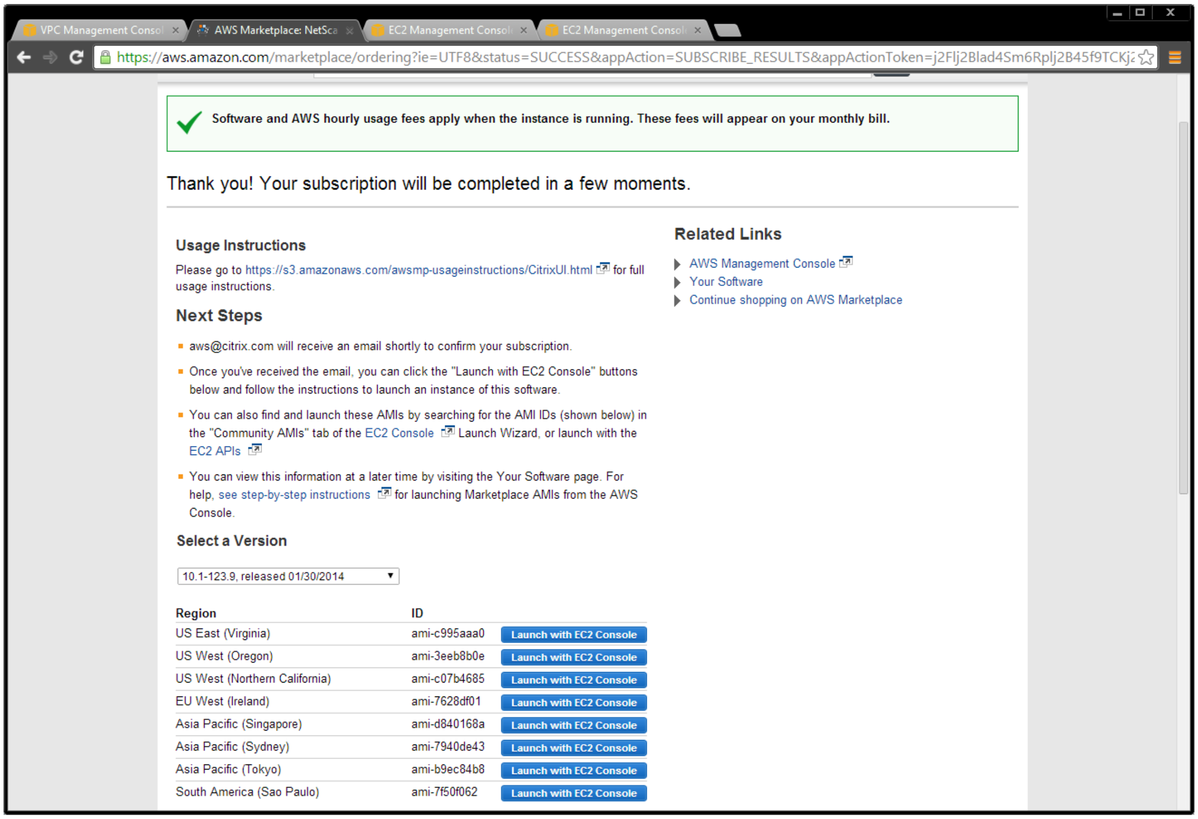
Table 6. XenApp / XenDesktop AMI parameters per function for AWS region US-East-1.

Function	AMI Name	AMI ID	Network	IP Address
Domain Controller	Microsoft Windows Server 2012 Base	ami-aede32c6	private	10.0.1.5
	Microsoft Windows Server 2012 R2 Base	ami-088c6460	private	10.0.1.5
	Microsoft Windows Server 2012 R2 Base	ami-9ed834f6	private	10.0.1.5
Delivery Controller	Microsoft Windows Server 2012 with SQL Standard	ami-eed83486	private	DHCP
	Microsoft Windows Server 2012 R2 with SQL Standard	ami-048c646c	private	DHCP
	Microsoft Windows Server 2008 R2 with SQL	ami-acd539c4	private	DHCP
VDA Master	Microsoft Windows Server 2012 Base	ami-aede32c6	private	DHCP
	Microsoft Windows Server 2012 R2 Base	ami-088c6460	private	DHCP
	Microsoft Windows Server 2008 R2 Base	ami-9ed834f6	private	DHCP
Bastion	Microsoft Windows Server 2012 Base	ami-aede32c6	public	DHCP
	Microsoft Windows Server 2012 R2 Base	ami-088c6460	public	DHCP
	Microsoft Windows Server 2008 R2 Base	ami-9ed834f6	public	DHCP
NetScaler VPX	NetScaler VPX Platinum Edition - 10 Mbps	ami-a55c44cc	public/private	10.0.1.100

Launch the NetScaler AMI

1. Ensure that you subscribe to NetScaler VPX in the AWS Marketplace.
2. In **Community AMIs** of the EC2 Console launch wizard, launch the AMI searching for the **AMI IDs**.

For detailed instructions, see https://s3.amazonaws.com/awsmp-usageinstructions/CitrixUI.html.



https://aws.amazon.com/marketplace/ordering?ie=UTF8&status=SUCCESS&appAction=SUBSCRIBE_RESULTS&appActionToken=j2Flj2Blad4Sm6Rplj2B45f9TCKjz

✓ **Software and AWS hourly usage fees apply when the instance is running. These fees will appear on your monthly bill.**

Thank you! Your subscription will be completed in a few moments.

Usage Instructions

Please go to https://s3.amazonaws.com/awsmp-usageinstructions/CitrixUI.html for full usage instructions.

Next Steps

- aws@citrix.com will receive an email shortly to confirm your subscription.
- Once you've received the email, you can click the "Launch with EC2 Console" buttons below and follow the instructions to launch an instance of this software.
- You can also find and launch these AMIs by searching for the AMI IDs (shown below) in the "Community AMIs" tab of the EC2 Console Launch Wizard, or launch with the EC2 APIs
- You can view this information at a later time by visiting the Your Software page. For help, see step-by-step instructions for launching Marketplace AMIs from the AWS Console.

Select a Version

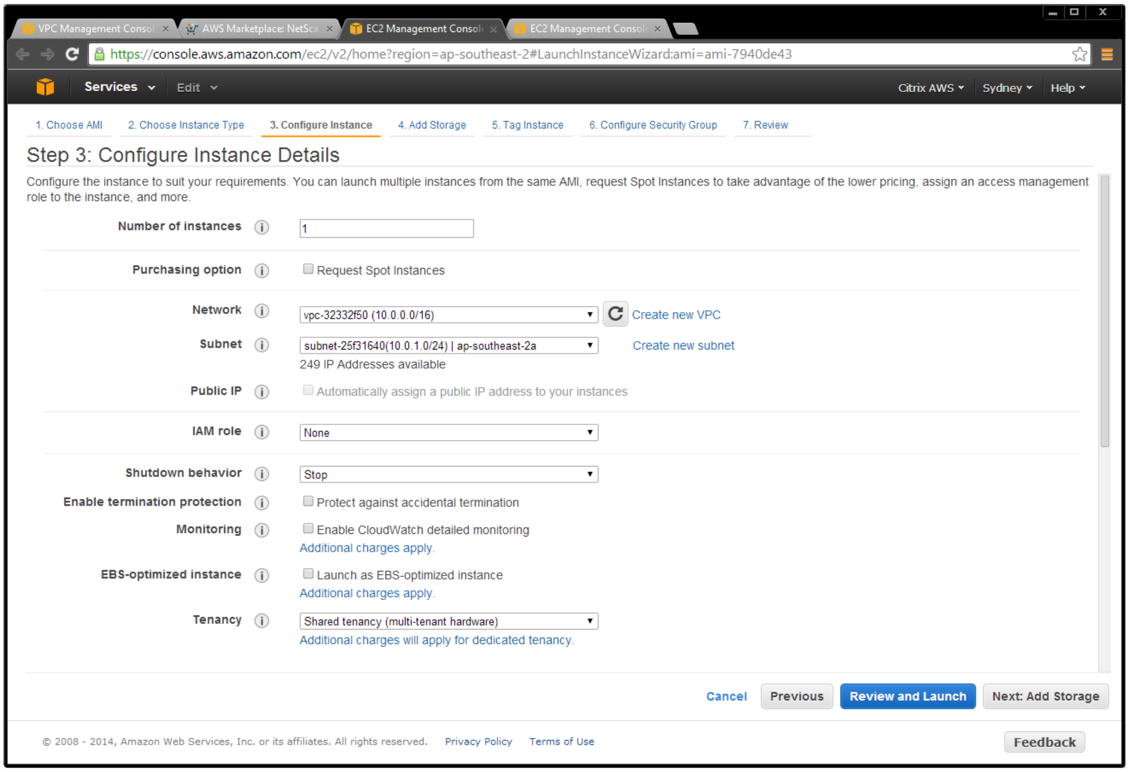
10.1-123.9, released 01/30/2014 ▾

Region	ID	
US East (Virginia)	ami-c995aaa0	Launch with EC2 Console
US West (Oregon)	ami-3eeb8b0e	Launch with EC2 Console
US West (Northern California)	ami-c07b4685	Launch with EC2 Console
EU West (Ireland)	ami-7628df01	Launch with EC2 Console
Asia Pacific (Singapore)	ami-d840168a	Launch with EC2 Console
Asia Pacific (Sydney)	ami-7940de43	Launch with EC2 Console
Asia Pacific (Tokyo)	ami-b9ec84b8	Launch with EC2 Console
South America (Sao Paulo)	ami-7f50f062	Launch with EC2 Console

Related Links

- AWS Management Console
- Your Software
- Continue shopping on AWS Marketplace

3. Deploy the instance into the private subnet.



Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot Instances to take advantage of the lower pricing, assign an access management role to the instance, and more.

Number of instances	1
Purchasing option	□ Request Spot Instances
Network	vpc-32332f50 (10.0.0.0/16) ▾ Create new VPC
Subnet	subnet-25f31640(10.0.1.0/24) | ap-southeast-2a ▾ Create new subnet 249 IP Addresses available
Public IP	□ Automatically assign a public IP address to your instances
IAM role	None ▾
Shutdown behavior	Stop ▾
Enable termination protection	□ Protect against accidental termination
Monitoring	□ Enable CloudWatch detailed monitoring Additional charges apply.
EBS-optimized instance	□ Launch as EBS-optimized instance Additional charges apply.
Tenancy	Shared tenancy (multi-tenant hardware) ▾ Additional charges will apply for dedicated tenancy.

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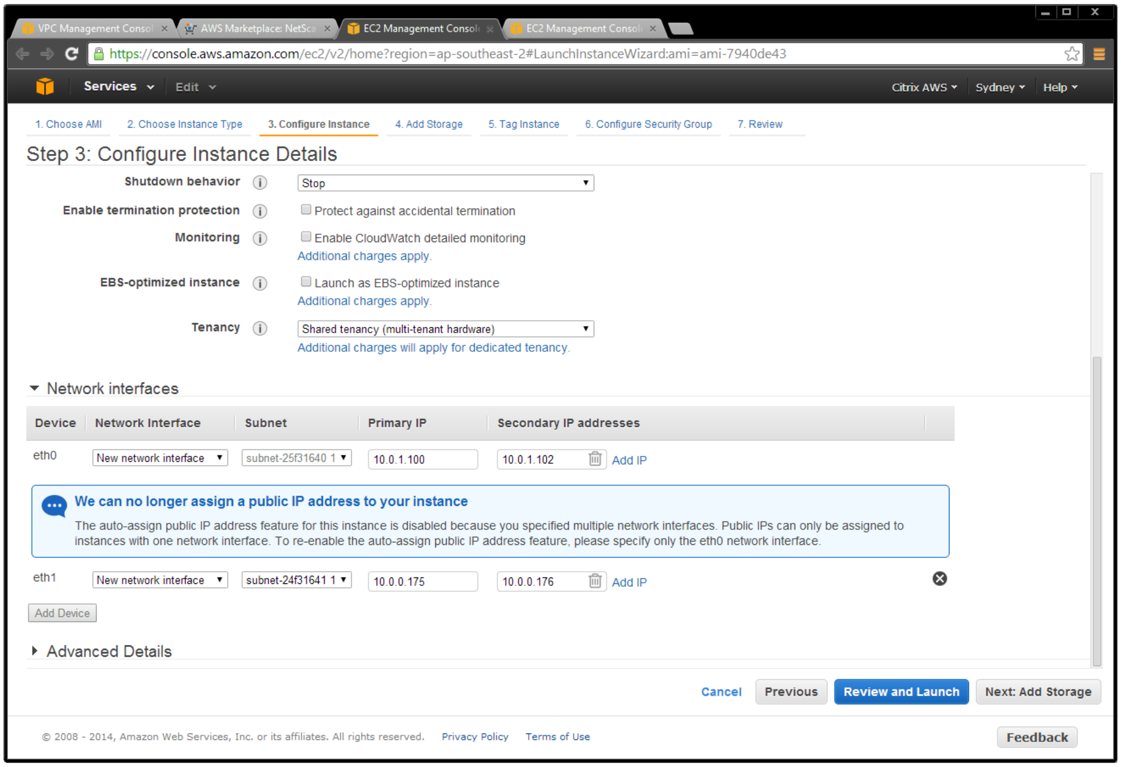
4. Ensure that this instance has two interfaces:
   - Public subnet
   - Private subnet:
     - `eth0` is connected to the private subnet
     - Primary IP address (NSIP) is `10.0.1.100`
     - Secondary IP address (SNIP) is `10.0.1.102`



Step 3: Configure Instance Details

Shutdown behavior: Stop

Enable termination protection: □ Protect against accidental termination

Monitoring: □ Enable CloudWatch detailed monitoring
Additional charges apply.

EBS-optimized instance: □ Launch as EBS-optimized instance
Additional charges apply.

Tenancy: Shared tenancy (multi-tenant hardware)
Additional charges will apply for dedicated tenancy.

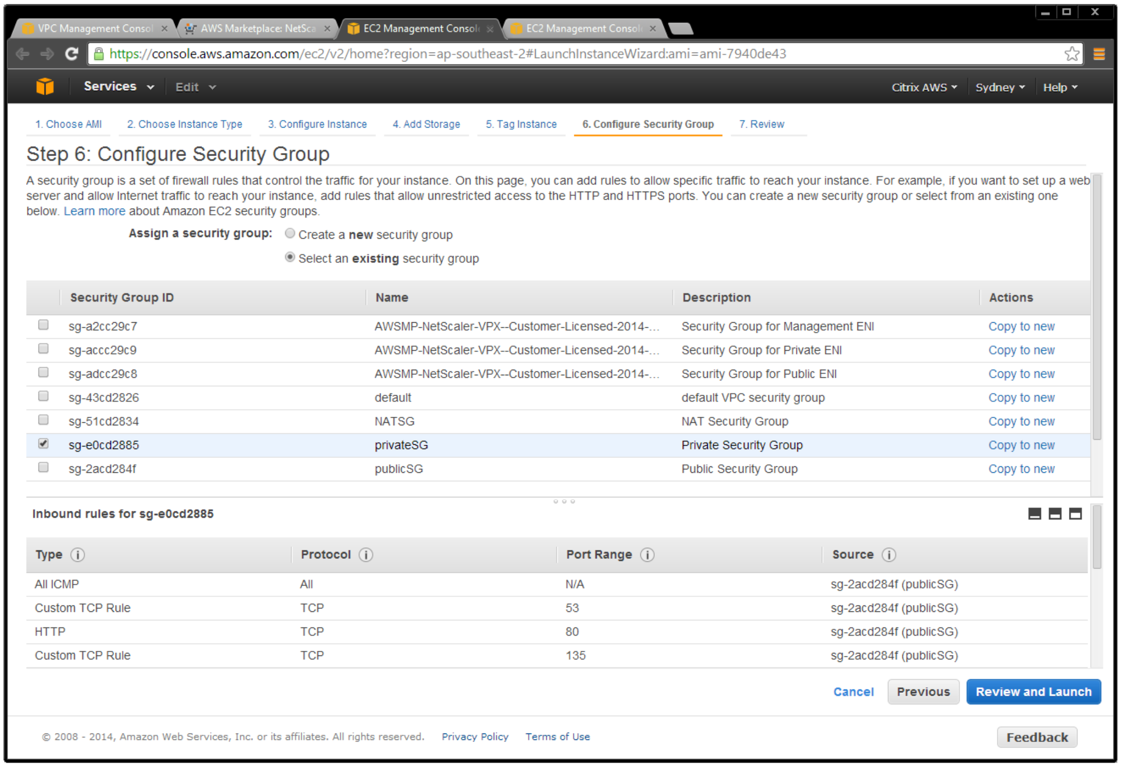
Network interfaces

Device	Network Interface	Subnet	Primary IP	Secondary IP addresses
eth0	New network interface	subnet-25f31640 1	10.0.1.100	10.0.1.102 Add IP
eth1	New network interface	subnet-24f31641 1	10.0.0.175	10.0.0.176 Add IP

We can no longer assign a public IP address to your instance

The auto-assign public IP address feature for this instance is disabled because you specified multiple network interfaces. Public IPs can only be assigned to instances with one network interface. To re-enable the auto-assign public IP address feature, please specify only the eth0 network interface.

5. Deploy the instance into the private security group.



Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. Learn more about Amazon EC2 security groups.

Assign a security group: ○ Create a **new** security group
● Select an **existing** security group

	Security Group ID	Name	Description	Actions
□	sg-a2cc29c7	AWSMP-NetScaler-VPX--Customer-Licensed-2014-…	Security Group for Management ENI	Copy to new
□	sg-accc29c9	AWSMP-NetScaler-VPX--Customer-Licensed-2014-…	Security Group for Private ENI	Copy to new
□	sg-adcc29c8	AWSMP-NetScaler-VPX--Customer-Licensed-2014-…	Security Group for Public ENI	Copy to new
□	sg-43cd2826	default	default VPC security group	Copy to new
□	sg-51cd2834	NATSG	NAT Security Group	Copy to new
☑	sg-e0cd2885	privateSG	Private Security Group	Copy to new
□	sg-2acd284f	publicSG	Public Security Group	Copy to new

Inbound rules for sg-e0cd2885

Type	Protocol	Port Range	Source
All ICMP	All	N/A	sg-2acd284f (publicSG)
Custom TCP Rule	TCP	53	sg-2acd284f (publicSG)
HTTP	TCP	80	sg-2acd284f (publicSG)
Custom TCP Rule	TCP	135	sg-2acd284f (publicSG)

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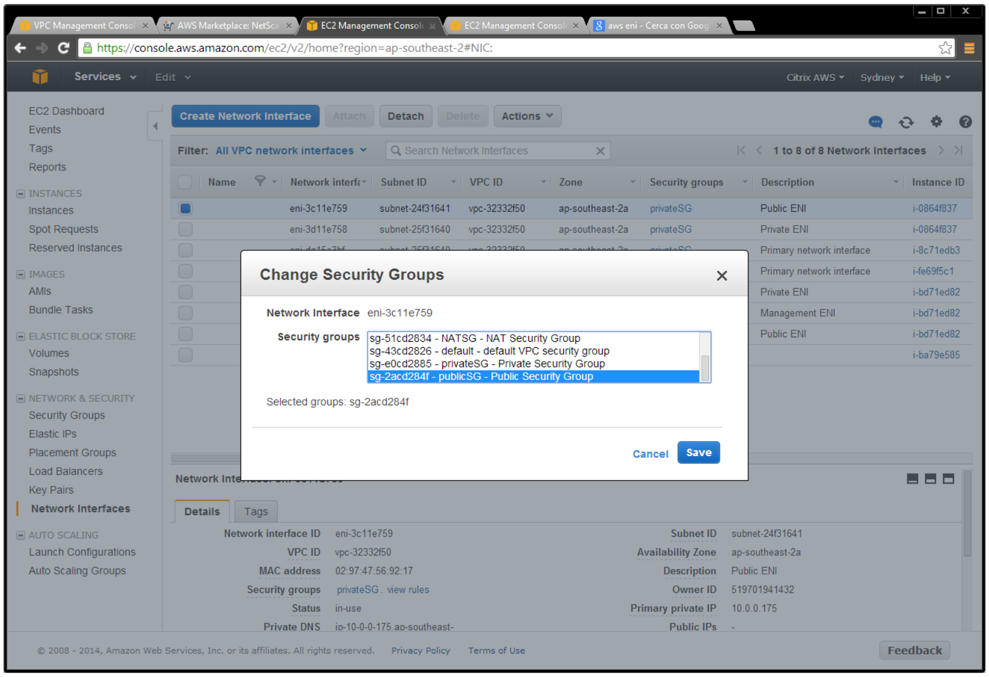
6. Configure the NetScaler AWS elastic network interfaces (ENIs) to be part of their respective security groups.

   - Public-subnet-facing ENI needs to be part of the public security group.
   - Private-subnet-facing ENI needs to be part of the private security group.

   a. Public ENI – Public Security Group:



Filter: All VPC network interfaces | Search Network Interfaces | 1 to 8 of 8 Network Interfaces

Name	Network interfa	Subnet ID	VPC ID	Zone	Security groups	Description	Instance ID
	eni-3c11e759	subnet-24f31641	vpc-32332f50	ap-southeast-2a	privateSG	Public ENI	i-0864f837
	eni-3d11e758	subnet-25f31640	vpc-32332f50	ap-southeast-2a	privateSG	Private ENI	i-0864f837
						Primary network interface	i-8c71edb3
						Primary network interface	i-fe69f5c1
						Private ENI	i-bd71ed82
						Management ENI	i-bd71ed82
						Public ENI	i-bd71ed82
							i-ba79e585

Change Security Groups

Network Interface eni-3c11e759

Security groups
sg-51cd2834 - NATSG - NAT Security Group
sg-43cd2826 - default - default VPC security group
sg-e0cd2885 - privateSG - Private Security Group
sg-2acd284f - publicSG - Public Security Group

Selected groups: sg-2acd284f

Cancel Save

Network Inte

Network interface ID	eni-3c11e759	Subnet ID	subnet-24f31641
VPC ID	vpc-32332f50	Availability Zone	ap-southeast-2a
MAC address	02:97:47:56:92:17	Description	Public ENI
Security groups	privateSG . view rules	Owner ID	519701941432
Status	in-use	Primary private IP	10.0.0.175
Private DNS	ip-10-0-0-175.ap-southeast-	Public IPs	-

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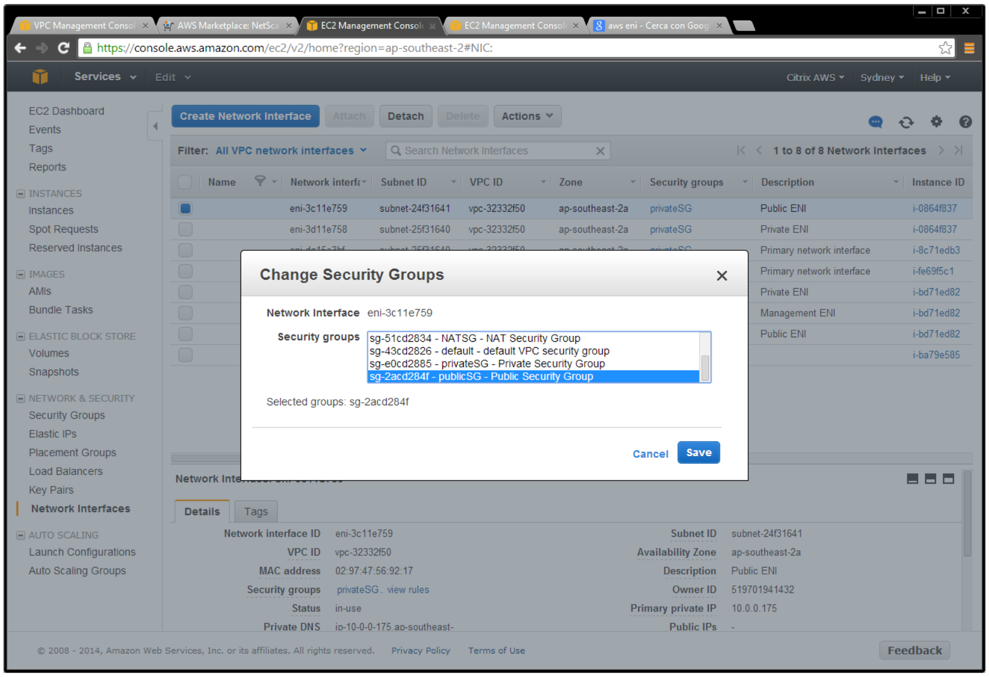
   b. Private ENI – Private Security Group:



Filter: All VPC network interfaces | Search Network Interfaces | 1 to 8 of 8 Network Interfaces

Name	Network interfa	Subnet ID	VPC ID	Zone	Security groups	Description	Instance ID
	eni-3c11e759	subnet-24f31641	vpc-32332f50	ap-southeast-2a	privateSG	Public ENI	i-0864f837
	eni-3d11e758	subnet-25f31640	vpc-32332f50	ap-southeast-2a	privateSG	Private ENI	i-0864f837
						Primary network interface	i-8c71edb3
						Primary network interface	i-fe69f5c1
						Private ENI	i-bd71ed82
						Management ENI	i-bd71ed82
						Public ENI	i-bd71ed82
							i-ba79e585

Change Security Groups

Network Interface eni-3c11e759

Security groups
sg-51cd2834 - NATSG - NAT Security Group
sg-43cd2826 - default - default VPC security group
sg-e0cd2885 - privateSG - Private Security Group
sg-2acd284f - publicSG - Public Security Group

Selected groups: sg-2acd284f

Cancel Save

Network Inte

Network interface ID	eni-3c11e759	Subnet ID	subnet-24f31641
VPC ID	vpc-32332f50	Availability Zone	ap-southeast-2a
MAC address	02:97:47:56:92:17	Description	Public ENI
Security groups	privateSG . view rules	Owner ID	519701941432
Status	in-use	Primary private IP	10.0.0.175
Private DNS	ip-10-0-0-175.ap-southeast-	Public IPs	-

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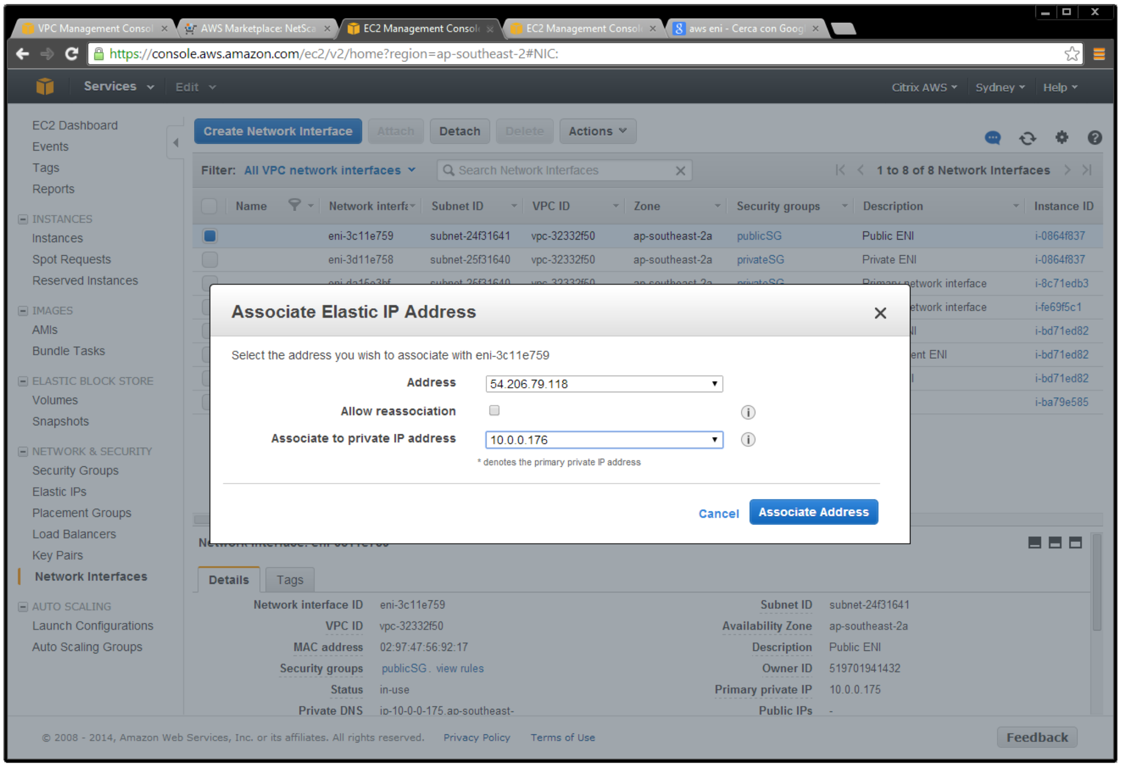
7. Assign an elastic IP address to the NetScaler public ENI – associated to the VIP (`10.0.0.176`).



	Name	Network interfa	Subnet ID	VPC ID	Zone	Security groups	Description	Instance ID
☑		eni-3c11e759	subnet-24f31641	vpc-32332f50	ap-southeast-2a	publicSG	Public ENI	i-0864f837
□		eni-3d11e758	subnet-25f31640	vpc-32332f50	ap-southeast-2a	privateSG	Private ENI	i-0864f837
□		eni-da15e3bf	subnet-25f31640	vpc-32332f50	ap-southeast-2a	privateSG	Primary network interface	i-8c71edb3
							etwork interface	i-fe69f5c1
							I	i-bd71ed82
							ent ENI	i-bd71ed82
							I	i-bd71ed82
								i-ba79e585

Associate Elastic IP Address

Select the address you wish to associate with eni-3c11e759

Address: 54.206.79.118

Allow reassociation: □

Associate to private IP address: 10.0.0.176

* denotes the primary private IP address

Cancel | Associate Address

Network interface ID	eni-3c11e759	Subnet ID	subnet-24f31641
VPC ID	vpc-32332f50	Availability Zone	ap-southeast-2a
MAC address	02:97:47:56:92:17	Description	Public ENI
Security groups	publicSG . view rules	Owner ID	519701941432
Status	in-use	Primary private IP	10.0.0.175
Private DNS	ip-10-0-0-175.ap-southeast-	Public IPs	-

Once the networking and compute instances are in place, the standard XenDesktop installation procedures as outlined in the product documentation can be followed. There are no special considerations when implementing XenDesktop delivery controllers or worker servers within AWS as proposed in this sample design.

Conclusion

By cross-referencing the Citrix Project Accelerator and XenDesktop Modular Reference Architecture, Contoso was able to implement a hybrid XenDesktop solution spanning the Contoso on-premises enterprise datacenter and AWS's EC2 environment. Leveraging public cloud infrastructure such as AWS virtually eliminated any need for a new Contoso capital investment, allowing them to bring their new service online quickly in a globally available, state-of-the-art cloud-hosted infrastructure.

By leveraging Citrix XenDesktop 7.5, Contoso was capable of providing an industry-leading desktop virtualization solution, ensuring the best user experience across any device, as enabled by Citrix technologies such as HDX™.

Additional Resources

Citrix XenDesktop Product Web Site

Citrix XenDesktop Modular Reference Architecture [PDF]

How to Deploy Xenapp and Xendesktop with Amazon Web Services

Flexing to the Cloud with Citrix XenDesktop and Amazon Web Services

NetScaler On AWS Overview

Citrix Project Accelerator

Amazon Web Services Web Site

Citrix HDX technologies

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