StorMagic

Reference Architecture: Citrix Workspace appliance utilizing Cisco UCS-E160S M3 blades, Hyper-V and SvSAN 6.x

Contents

Executive summary

This white paper is intended for technical IT architects, system administrators and managers who are interested in server-based desktop virtualization and server-based computing (terminal services or application virtualization) that uses Citrix XenDesktop and XenApp. In this document, the term client virtualization is used to refer to all of these variations. Compare this term to server virtualization, which refers to the virtualization of server-based business logic and databases.

This document will detail a highly available, robust virtual desktop and virtual application solution, designed to make the deployment of virtual desktops easier being based on a proven, tested and certified reference architecture.

Introduction

Business Case

Today's IT staff are facing the ever-increasing complexity of maintaining remote user workstations, the growing need to avoid security exposures and the need for flexibility and global availability of compute resources, all with the expectation of achieving this with less cost.

The following solution document uses server-based desktop virtualization and server-based computing (client virtualization) to solve these business problems.

Client virtualization is an enterprise architecture that stores user data, user profiles, and application data files on centralized servers. This approach extends the robust server security, manageability and high availability down to user resource, simplifying and reducing cost by negating the need for full fat desktop clients on a hardware refresh cycle.

Client virtualization consists of server hosted virtual machines (VMs) running desktop operating systems in a datacenter model to enable security and high availability. This delivers a graphical representation (screen updates) to remotely connected users and allows local user input (keyboard/mouse/touch) to their virtual desktops or virtual applications. In a traditional desktop model, a user has the entire compute environment (OS, processing power, memory, and hard disk) placed in front of the user. In the case of client virtualization, a lightweight endpoint device is used with minimal need for processing power and little or no storage to access the user's desktop that is processed on more powerful server hardware.

A server-based approach to enterprise desktop management compared to traditional desktop environments includes the following advantages:

- Overall OPEX cost savings in desktop support, a centralized approach to client OS management, and reduced energy consumption
- Decrease connectivity costs by easily moving applications from the data center to the branch

- Ensure business continuity for critical applications; if the WAN ever goes down, you can still run the business
- Rapid and easy desktop deployment, including updates, patches, and security enhancements
- Easy accessibility through flexible endpoint devices such as notebooks, tablets, and thin clients
- A single pane of glass for management and reporting
- User and application virtualization that aggregates resources to load balance user workloads
- Enable easy and simple usage of centralized data center resources and processes for backup and recovery
- Improved security with data behind data center class firewalls, centralized IT administration and security protection
- Compliance with data protection, such as GDPR, HIPAA and Sarbanes-Oxley (SOX) security standards
- User data is never stored locally on the client device, minimizing the risk of data loss due to disk failure or theft.
- Broken clients can be quickly and easily replaced, minimizing loss of individual productivity.
- Users can be assigned more resources (CPU, memory, storage) quickly and easily, without the need to replace physical components in the client device.

Citrix Desktop Virtualization

Virtual desktop infrastructure (VDI) offers critical benefits to IT, including improved security and centralized desktop management, but the ability to securely access a remote Windows or Linux desktop isn't enough in today's organizations. The demands placed on IT require a more evolved approach. Organizations need to optimize user experiences to increase adoption, maximize capabilities by minimizing the number of consoles to manage, and ensure sensitive data stays safe — even in BYOD programs where employees access apps and data from personal devices.

- Customized VDI to satisfy any use case
- Secure remote PC access
- Run virtual desktops offline
- Single image management
- Simplified app management across VDI

XenDesktop

Citrix XenDesktop delivers Windows apps and desktops as secure mobile services. With XenDesktop, IT can mobilize the business, while reducing costs by centralizing control and security of intellectual property.

Utilizing XenDesktop enables delivery of full, dedicated, desktops built on a cloud enabled architecture that offers powerful management tools. This simplifies scalability, increases infrastructure flexibility, and can automate the delivery of apps and desktops. XenDesktop with HDX technologies enables the delivery of a native touch-enabled mobile experience that is optimized for the type of device, as well as the network.

XenApp

XenApp is an application virtualization solution that helps you optimize productivity with universal access to virtual apps, desktops, and data from any device. This session hosted model utilizes an instance on a shared OS/platform to ensure best use of available hardware resources, rather than launching a dedicated virtual desktop.

XenApp vs. XenDesktop—which one do I need?

	XenApp	XenDesktop
HDX technology for optimized user experience	✓	✓
Published Windows, Linux, web, and SaaS applications	✓	✓
Single Management console for apps and desktops	✓	✓
Centralized security in the datacenter	✓	✓
FIPS and Common Criteria certified	✓	✓
Single image provisioning technology	✓	✓
VDI desktops		✓
Remote PC access		✓
Offline client virtualization for disconnect user requirements		✓

StorMagic SvSAN – Software Defined Storage Solution

SvSAN is a software-defined storage solution designed to run on two or more servers. It is uniquely architected with the combination of a light footprint, availability out-of-the-box, uncompromising performance and centralized management deployment across a remote and branch office environment.

SvSAN eliminates the need for a physical SAN, which is costly, complex and presents a single point of failure. With high availability out-of-the-box, business critical applications and IT services suffer no downtime and the removal of a SAN along with the low cost of commodity servers and storage lowers IT acquisition and operating cost. Thousands of large organizations and SMEs across 72 countries have already chosen SvSAN to modernize their IT infrastructure.

SvSAN supports the industry leading hypervisors, VMware ESXi and Microsoft Hyper-V. It is installed as a virtual storage appliance (VSA) requiring minimal server resources to provide the

shared storage necessary to enable the advanced hypervisor features such as high availability/failover cluster, vMotion/live migration and VMware® Distributed Resource Scheduler (DRS)/dynamic optimization.

SvSAN can be deployed as a simple two-node cluster, with the flexibility to meet changing capacity and performance needs. This is achieved by adding additional capacity to existing servers or by growing the SvSAN cluster, without impacting service availability.

SvSAN includes advanced caching features such as memory read caching, data pinning and automated storage tiering, delivering unprecedented performance, efficiency and flexibility to modernize your IT.

Microsoft Hyper-V – Hypervisor

Microsoft introduced Hyper-V as a virtualization platform in 2008, and it continued to release new Hyper-V versions with new Windows server versions.

Since Hyper-V's debut, it has always been a Windows Server feature, which could be installed whenever a server administrator decided to do so. It's also available as a separate product called Microsoft Hyper-V Server. Basically, Microsoft Hyper-V Server is a standalone and shortened version of Windows Server where Microsoft cut out everything irrelevant to virtualization, services and Graphical User Interface (GUI) to make the server as small as possible. Plus, without the bells and whistles, the server requires less maintenance time and it is less vulnerable, because, for example, fewer components mean less patching.

Hyper-V is a hybrid hypervisor, which is installed from OS (via Windows wizard of adding roles). However, during installation it redesigns the OS architecture and becomes just like a next layer on the physical hardware

Cisco UCS-E160S M3 blade – Hardware platform

Cisco UCS® E-Series Servers bring data center-class blade servers to the branch office. These powerful, small-form-factor, x86 64-bit blade servers reside in Cisco® branch-office routers: the Cisco 4000 Series Integrated Services Routers (ISRs) networking platforms. The blades are virtualization-ready and host essential infrastructure services and mission-critical business applications, all while you maintain a lean branch-office environment.

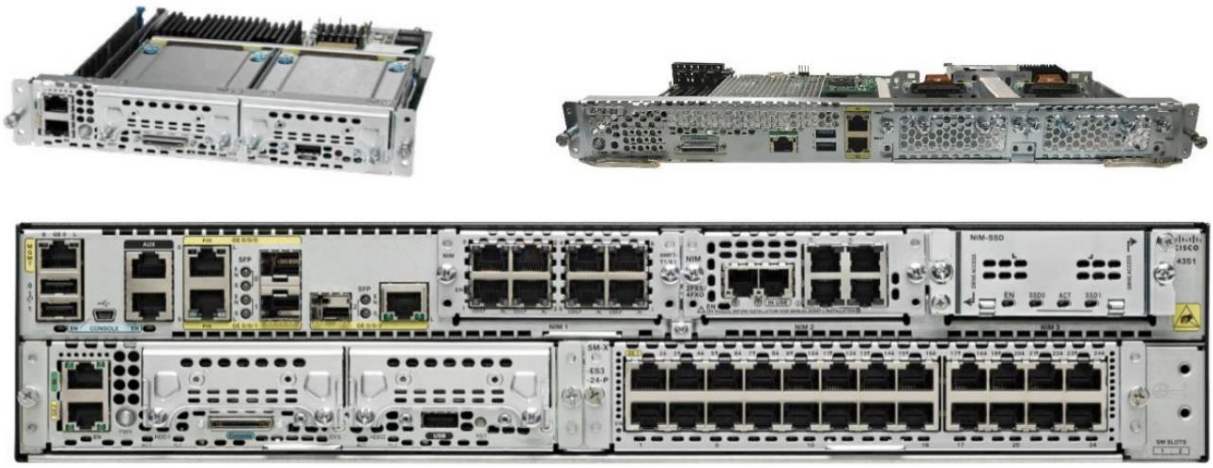

Figure 1. Cisco UCS E-Series blade server modules (top) and Cisco 4351 ISR (bottom)

The Cisco Unified Computing System™ (Cisco UCS) E-series M3 Server is available in three flavors: a singlewide module and two doublewide modules. This singlewide version occupies a single service-module slot in the Cisco 4000 Series ISR as shown above. The doublewide module occupies two service-module slots side-by-side. All Cisco UCS E-Series M3 Servers are high-density blade servers with single-socket Intel Xeon-D processors.

They balance simplicity, performance, and application density while operating in an energy-efficient environment providing better energy efficiency than preceding models. The servers also include integrated remote lights-out management.

They thus provide an excellent platform for introducing virtualization into the branch office and supporting mission-critical business applications. The innovative, zero-footprint form factor of the Cisco UCS E-Series Servers in conjunction with the lower total cost of ownership (TCO) of the Intel Xeon processor™ increases business agility and enhances reliability when compared to standalone rack-mount and tower servers.

Product Specifications for M3 E-Series

Feature	Cisco UCS E160S M3 (Singlewide)	Cisco UCS E180D M3 and E1120D M3 (Doublewide)
CPU	• Intel Xeon Broadwell DE processor D-1528 (9-MB cache, 1.90 GHz, and 6 cores)	• 180D: Intel Xeon Broadwell DE processor D-1548 (12-MB cache, 2.0 GHz, and 8 cores) • 1120D: Intel Xeon Broadwell DE processor D-1557 (18-MB cache, 1.50 GHz, and 12 cores)
DRAM	• 8 - 64 GB • 2 DIMM slots, each with 8 GB, 16 GB, 32 GB VLP DDR4 RAM	• 16 - 128 GB • 4 DIMM slots, each with 16 GB or 32 GB VLP DDR4 RAM
Hard-disk drive (HDD/SSD)	• 2 SFF slots; Up to 4 TB each (SSD) and 2TB each (HDD); Refer to the ordering and compatibility guide for more information	• 4 SFF slots; Up to 4 TB each (SSD) and 2TB each (HDD); Refer to the ordering and compatibility guide for more information
RAID options	• Hardware RAID 0 and 1 • LSI MegaRAID SAS 3108 controller • Queue depth: 928 • Stripe size: 64K • PCIe passthrough	• Hardware RAID 0, 1, 5, 10 • LSI MegaRAID SAS 3316 controller • Queue depth: 928 • Stripe size: 64K • PCIe passthrough
Power Loss Protection for Cache Back Up	• No	• 1 Super Capacitor (3-year life) for Power Loss Protection • Write-through/Write-back cache with power back up
Network interface cards (NICs)	• 2 internal Gigabit Ethernet ports (Broadcom 5719) • 2 external 10 Gigabit Ethernet ports (1000/10000) (Integrated within Intel Xeon-D CPU)	• 2 internal Gigabit Ethernet ports (Broadcom 5719) • 2 external 10 Gigabit Ethernet ports (1000/10000) (Integrated within Intel CPU) • 1 dedicated management Ethernet port (10/100/1000) for Cisco IMC
Cisco IMC	• Integrated Emulex Pilot-3 BMC • IPMI 2.0 compliant for management and control	• Integrated Emulex Pilot-3 BMC • IPMI 2.0 compliant for management and control

Feature	Cisco UCS E160S M3 (Singlewide)	Cisco UCS E180D M3 and E1120D M3 (Doublewide)
	• Command-line interface (CLI) and WebGUI management tool for automated, lights-out management • KVM	• Command-line interface (CLI) and WebGUI management tool for automated, lights-out management • KVM
Integrated eMMC storage	• 8-GB partition for Cisco IMC • 8-GB partition for Intel X86 host.	• 8-GB partition for Cisco IMC • 8-GB partition for Intel X86 host.
Front-panel connectors	• 1 KVM console connector (supplies 1 VGA, 1 serial, and 1 USB 2.0 connector) • 1 onboard USB 3.0 connector	• 1 KVM console connector (supplies 1 VGA, 1 serial, and 1 USB 2.0 connector) • 2 onboard USB3.0 connector
Physical dimensions (H x W x D)	• 1.58 x 7.44 x 7.5 in. (4 x 18.9 x 19.1 cm)	• 1.58 x 16.23 x 7.5 in. (4 x 41.2 x 19.1 cm)
Maximum weight	• 2.5 lb (1.1 kg)	• 7 lb (3.2 kg)
Temperature: Operating	• According to operating requirements of deployable platform: • 32 to 104°F (0 to 40°C) normal	• According to operating requirements of deployable platform: • 32 to 104°F (0 to 40°C) normal
Temperature: Non-operating	• –4 to 149°F (–20 to 65°C)	• –4 to 149°F (–20 to 65°C)
Humidity: Operating	• According to operating requirements of deployable platform: • 10 to 85% operating	• According to operating requirements of deployable platform: • 10 to 85% operating
Humidity: Non-operating	• 5 to 95%	• 5 to 95%

Feature	Cisco UCS E160S M3 (Singlewide)	Cisco UCS E180D M3 and E1120D M3 (Doublewide)
Altitude: Operating	• 104°F (40°C) at sea level to 10,000 ft (0 to 3,000m); maximum ambient temperature decreases by 1°C per 300m	• 104°F (40°C) at sea level to 10,000 ft (0 to 3,000m); maximum ambient temperature decreases by 1°C per 300m
Altitude: Non-operating	• 15,000 ft (4600m)	• 15,000 ft (4600m)

Table 1. Cisco UCS E-Series

Architecture overview

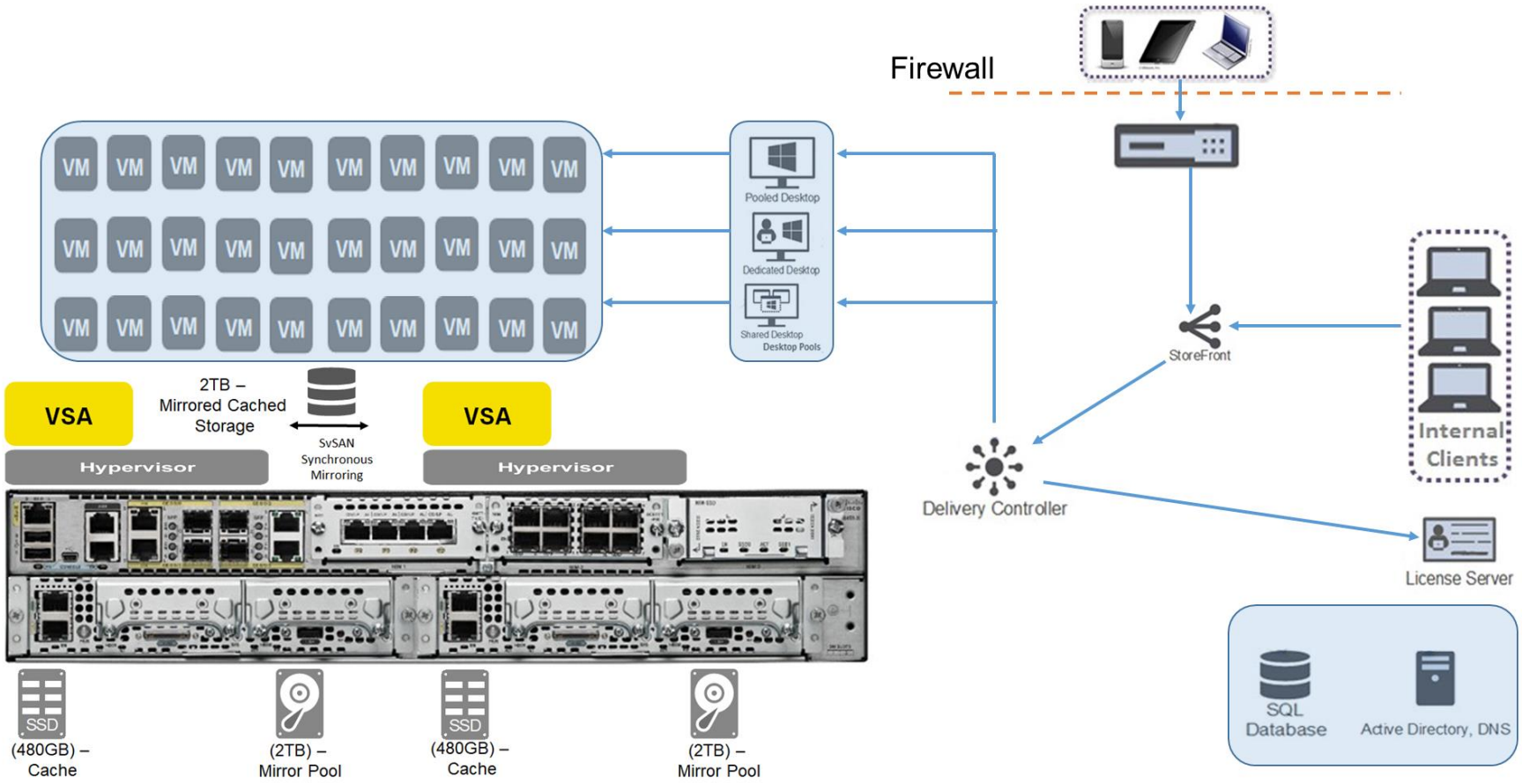

Figure 2. Cisco UCS E-Series with Cisco 4351 ISR & Citrix Cloud

Network Overview

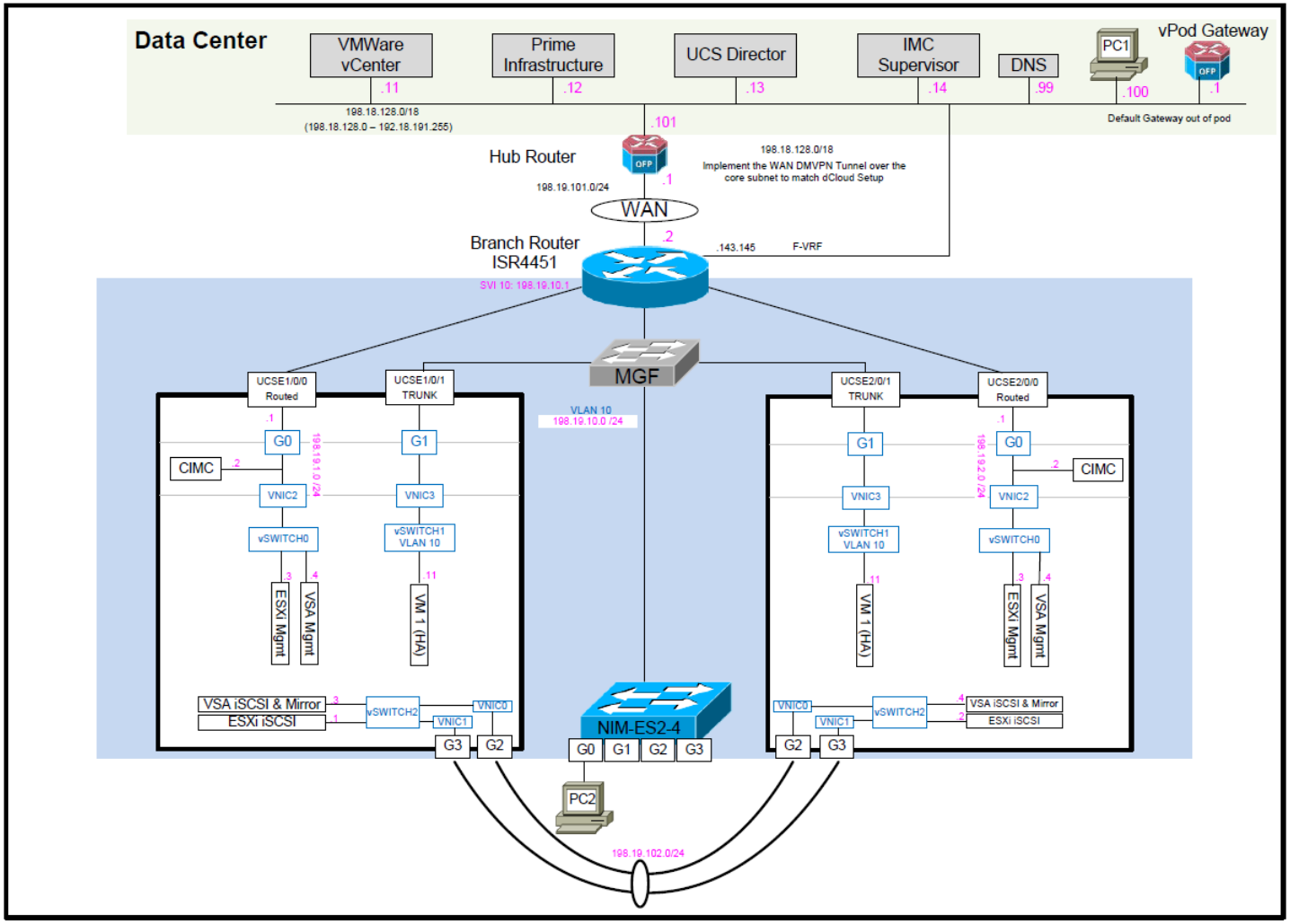

Figure 3. Cisco UCS E-Series with Cisco 4351 ISR – Example network architecture

Component model

Citrix XenDesktop features the following main components:

Desktop Studio – (Citrix Cloud)

Desktop Studio is the main administrator GUI for Citrix XenDesktop. It is used to configure and manage all of the main entities, including servers, desktop pools and provisioning, policy, and licensing.

Storefront – (Citrix Cloud)

Storefront provides the user interface to the XenDesktop environment. The Web Interface brokers user authentication, enumerates the available desktops and, upon start, delivers a .ica file to the Citrix Receiver on the user‘s local device to start a connection. The Independent Computing Architecture (ICA) file contains configuration information for the Citrix receiver to communicate with the virtual desktop. Because the Web Interface is a critical component, redundant servers must be available to provide fault tolerance.

Delivery controller – (Citrix Cloud)

The Delivery controller is responsible for maintaining the proper level of idle desktops to allow for instantaneous connections, monitoring the state of online and connected desktops, and shutting down desktops as needed. This workload could sit in a centralized datacenter or local to the site/users to remove reliance on the WAN.

A XenDesktop farm is a larger grouping of virtual machine servers. Each delivery controller in the XenDesktop acts as an XML server that is responsible for brokering user authentication, resource enumeration, and desktop starting. Because a failure in the XML service results in users being unable to start their desktops, it is recommended that you configure multiple controllers per farm.

PVS and MCS – (MCS used in this reference architecture)

Provisioning Services (PVS) is used to provision stateless desktops at a large scale. Machine Creation Services (MCS) is used to provision dedicated or stateless desktops in a quick and integrated manner.

License Server– (Citrix Cloud)

The Citrix License Server is responsible for managing the licenses for all XenDesktop components. XenDesktop has a 30-day grace period that allows the system to function normally for 30 days if the license server becomes unavailable. This grace period offsets the complexity of otherwise building redundancy into the license server.

XenDesktop SQL Server – (Citrix Cloud)

Each Citrix XenDesktop site requires an SQL Server database that is called the data store. This is used to centralize farm configuration information and transaction logs. The data store maintains all static and dynamic information about the XenDesktop environment. Because the XenDeskop SQL server is a critical component, redundant servers must be available to provide fault tolerance.

Citrix Cloud Connector

Citrix Cloud is a platform that hosts and administers Citrix services. It connects to your resources through the Citrix Cloud Connector on any cloud or infrastructure you choose (on-premises, public cloud, private cloud, or hybrid cloud). It allows you to create, manage, and deploy workspaces with apps and data to your end-users from a single console.

These devices are configured with a StorMagic utility:

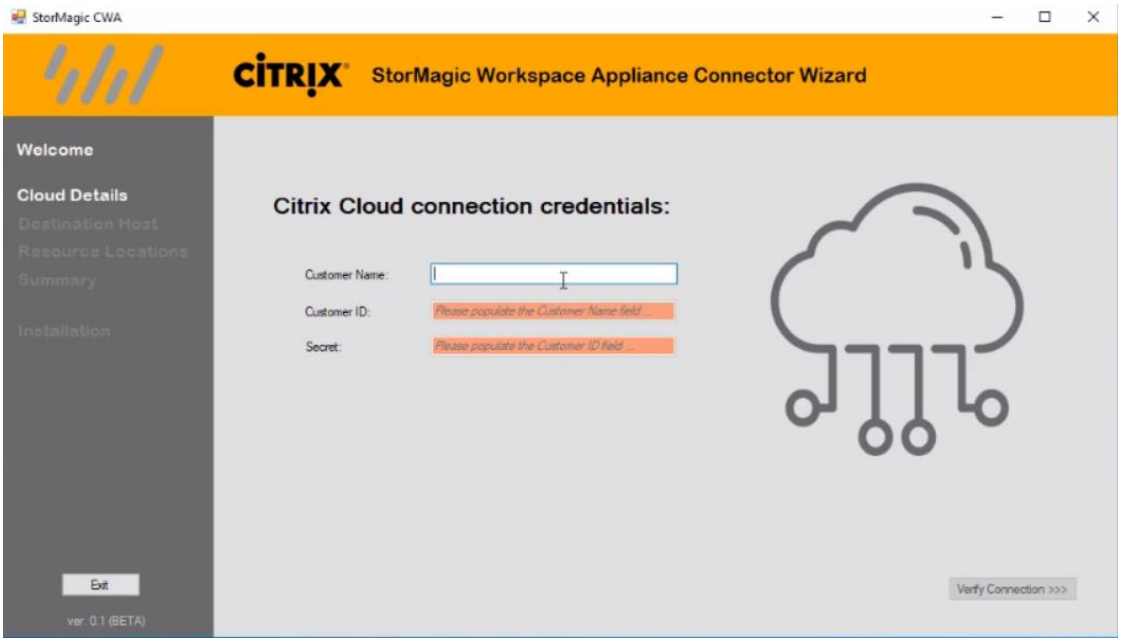

Figure 4. StorMagic Cloud Connector wizard

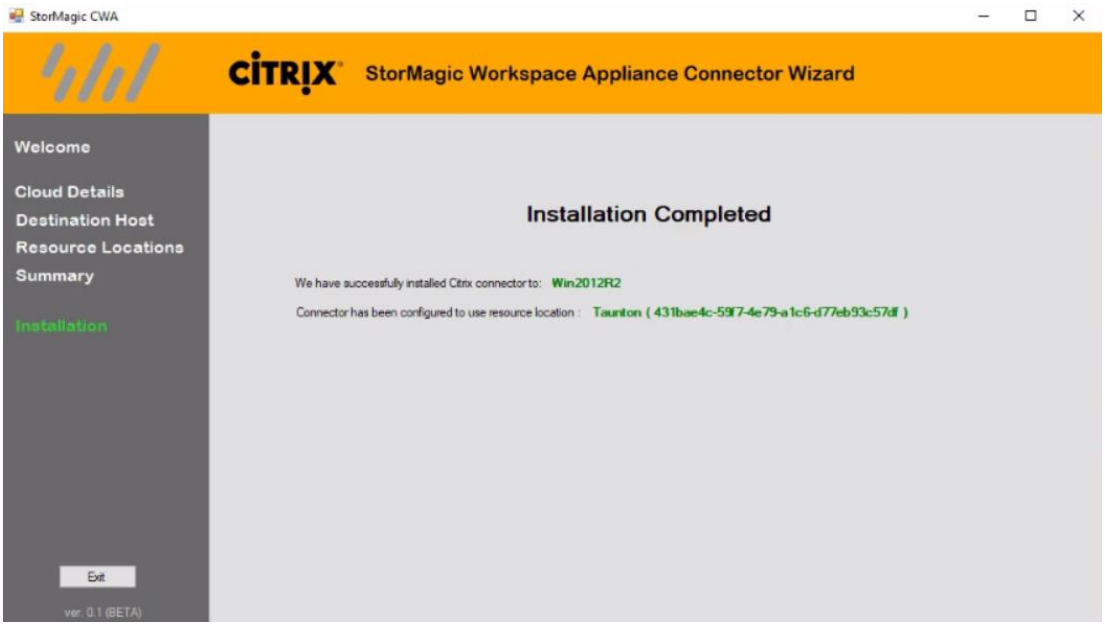

Figure 5. StorMagic Cloud Connector wizard

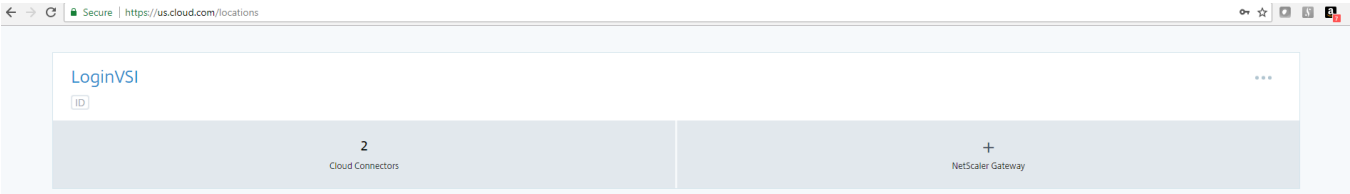

Figure 6. Citrix Cloud – Cloud Connector management

Client devices

Citrix XenDesktop supports a broad set of devices and all major device operating platforms, including Apple iOS, Google Android, and Google ChromeOS. XenDesktop enables a rich, native experience on each device, including support for gestures and multi-touch features, which customizes the experience based on the type of device. Each client device has a Citrix Receiver, which acts as the agent to communicate with the virtual desktop by using the ICA/HDX protocol.

VDA

Each VM needs a Citrix Virtual Desktop Agent (VDA) to capture desktop data and send it to the Citrix Receiver in the client device. The VDA also emulates keyboard and gestures sent from the receiver. ICA is the Citrix remote display protocol for VDI.

Hypervisor (Hyper-V Core 2016 used in this reference architecture)

XenDesktop has an open architecture that supports the use of several different hypervisors, such as VMware ESXi (vSphere), Citrix XenServer, and Microsoft Hyper-V.

AD/DNS/System Center Virtual Machine Manager & SQL

Microsoft Infrastructure that can be hosted locally or in a main datacenter

Citrix Cloud and the Cloud Connector instances authenticate to and control the Hyper-V Citrix VMs via SCVMM.

Shared storage

Shared storage is used to store user profiles and user data files. Depending on the provisioning model that is used, different data is stored for VM images. In this architecture StorMagic SvSAN is being utilized to enable a highly available software defined storage platform.

LoginVSI

A ‘good or better than’ user experience is a critical success factor for all VDI and DaaS deployments. Based on our industry standard virtual user technology, Login VSI offers enterprises and vendors a complete software solution to build and safeguard the optimal performance, scalability and availability of virtual desktop environments.

Login VSI works with VMware Horizon, Citrix XenDesktop, Citrix XenApp and Microsoft Remote Desktop Services (RDS).

The technology utilizes pre-set workloads:

Task Worker	Microsoft Word, Microsoft Outlook, Internet Explorer, Adobe Reader, Microsoft Excel
Office Worker	Microsoft Word, Microsoft Outlook, Internet Explorer, Adobe Reader, Microsoft PowerPoint, Microsoft Excel, Photo Viewer
Knowledge Worker	Microsoft Word, Microsoft Outlook, Internet Explorer, Adobe Reader, Microsoft PowerPoint, Microsoft Excel, Freemind / Java, Photo Viewer
Power Worker	Microsoft Word, Microsoft Outlook, Internet Explorer, Adobe Reader, Microsoft PowerPoint, Microsoft Excel, Freemind / Java, Photo Viewer, Simulated application install.

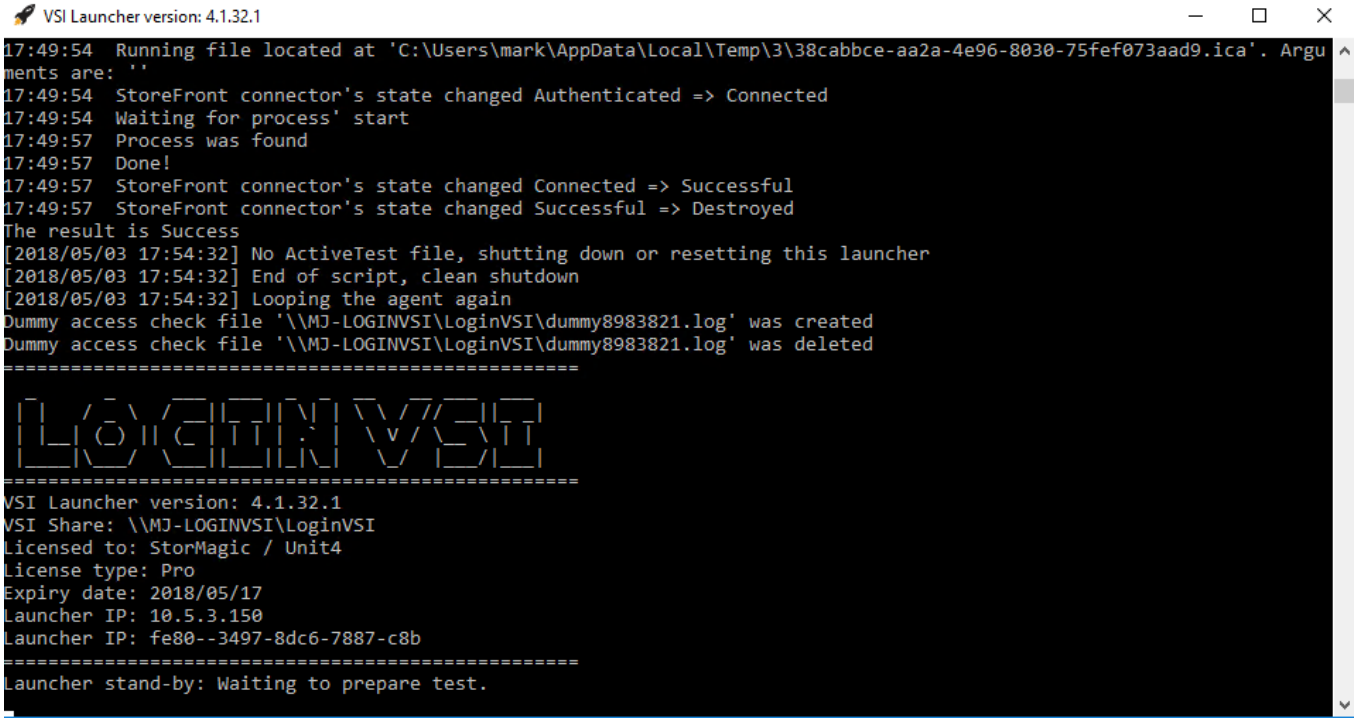

Figure 6. LoginVSI Launcher

Citrix XenDesktop provisioning

Citrix XenDesktop features the following primary provisioning models:

- Provisioning Services (PVS)
- Machine Creation Services (MCS)

Provisioning services – (Not used in this reference architecture)
Hosted VDI desktops can be deployed with or without Citrix PVS. The advantage of the use of PVS is that you can stream a single desktop image to create multiple virtual desktops on one or more servers in a data center. Figure 3 shows the sequence of operations that are run by XenDesktop to deliver a hosted VDI virtual desktop.

When the virtual disk (vDisk) master image is available from the network, the VM on a target device no longer needs its local hard disk drive (HDD) to operate; it boots directly from the network and behaves as if it were running from a local drive on the target device, which is why PVS is recommended for stateless virtual desktops. PVS often is not used for dedicated virtual desktops because the write cache is not stored on shared storage.

PVS is also used with Microsoft Roaming Profiles (MSRPs) so that the user's profile information can be separated out and reused. Profile data is available from shared storage.

It is a best practice to use snapshots for changes to the master VM images and also keep copies as a backup.

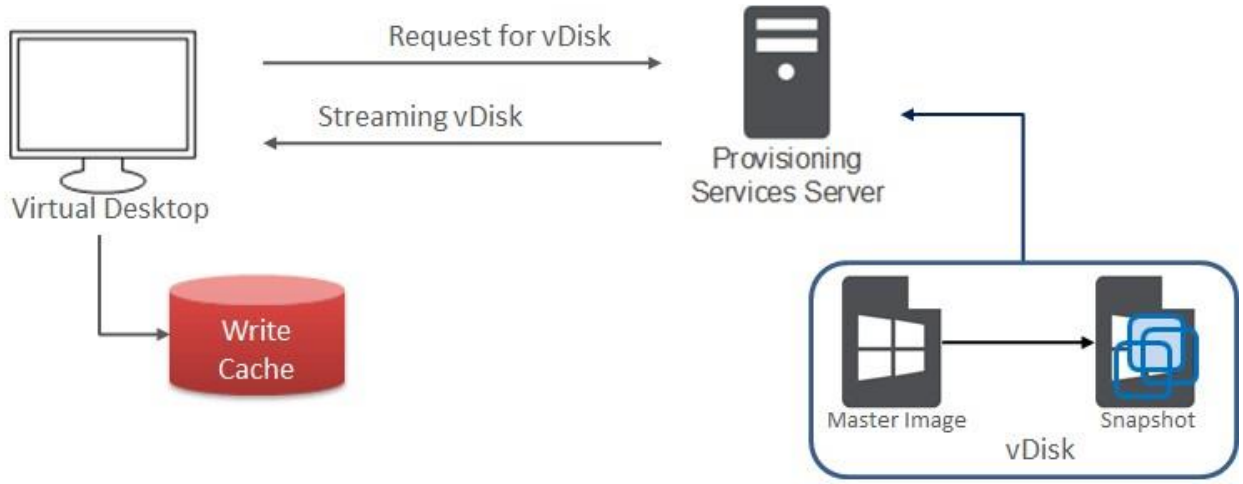

Figure 7: Using PVS for a stateless model

Machine creation services – (MCS used in this reference architecture)

Unlike PVS, MCS does not require more servers. Instead, it uses integrated functionality that is built into the hypervisor (VMware ESXi, Citrix XenServer, or Microsoft Hyper-V) and communicates through the respective APIs. Each desktop has one difference disk and one identity disk (as shown in Figure 4). The difference disk is used to capture any changes that are made to the master image. The identity disk is used to store information, such as device name and password.

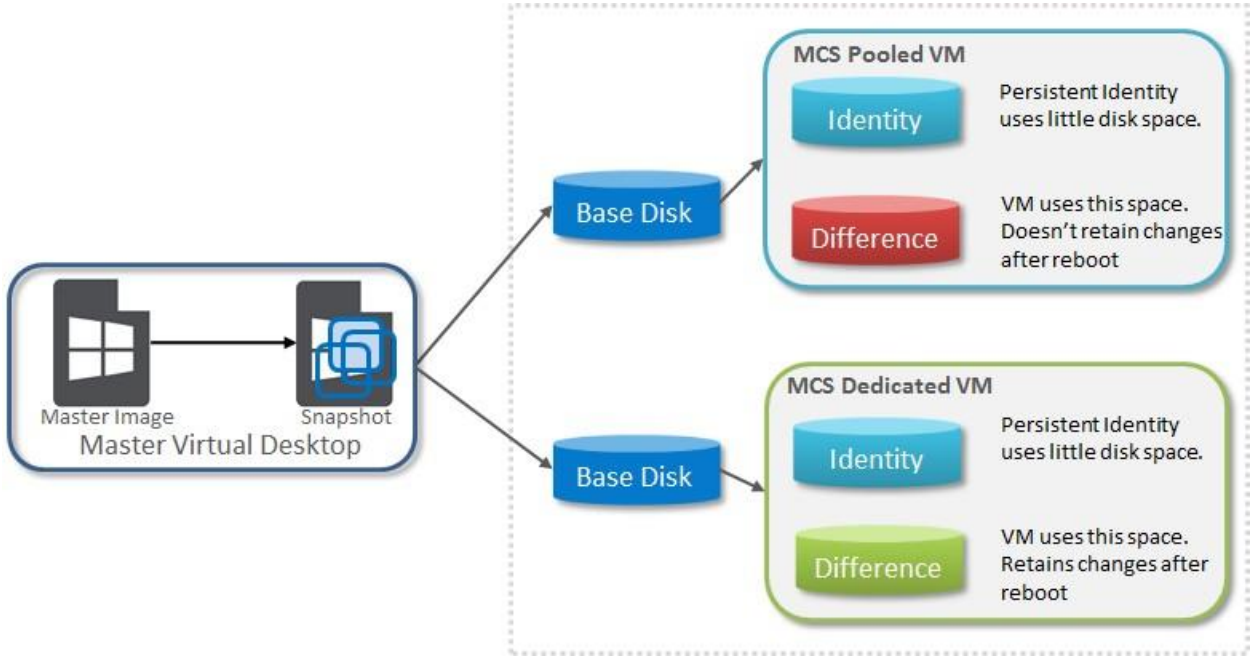

Figure 8: MCS image and difference/identity disk storage model

The following types of Image Assignment Models for MCS are available:

- Pooled-random: Desktops are assigned randomly. When they log off, the desktop is free for another user. When rebooted, any changes that were made are destroyed.
- Pooled-static: Desktops are permanently assigned to a single user. When a user logs off, only that user can use the desktop, regardless if the desktop is rebooted. During reboots, any changes that are made are destroyed.
- Dedicated: Desktops are permanently assigned to a single user. When a user logs off, only that user can use the desktop, regardless if the desktop is rebooted. During reboots, any changes that are made persist across subsequent restarts.

MCS thin provisions each desktop from a master image by using built-in technology to provide each desktop with a unique identity. Only changes that are made to the desktop use more disk space. For this reason, MCS dedicated desktops are used for dedicated desktops.

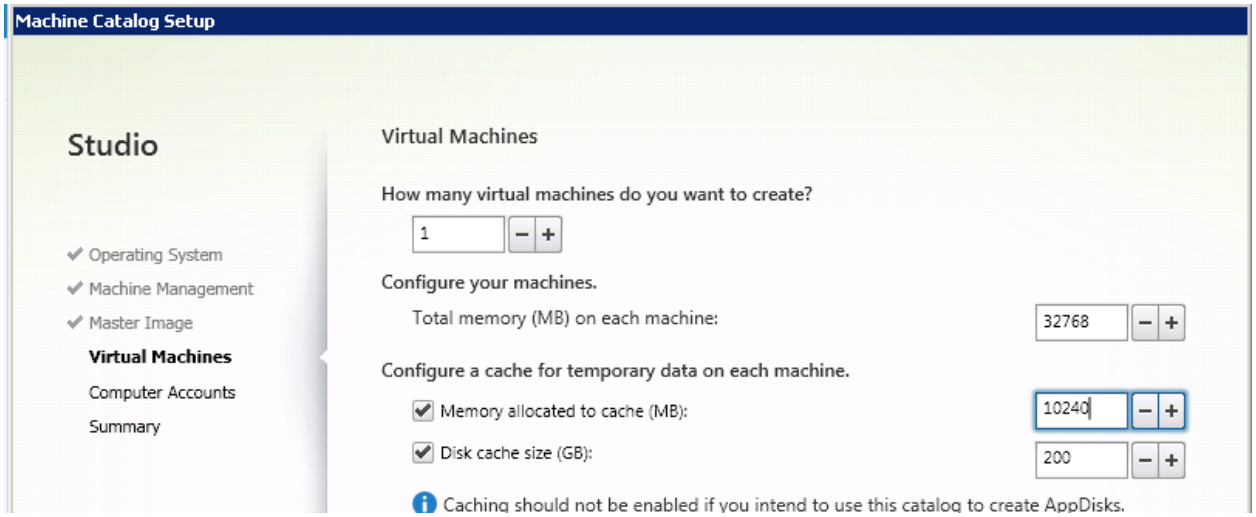

Figure 9: Caching option for Pooled and Hosted Shared desktops

Storage Model

This section describes the different types of shared or distributed data stored for stateless and dedicated desktops. Stateless and dedicated virtual desktops should have the following common shared storage items:

- The master VM image and snapshots are stored by using Network File System (NFS) or block I/O shared storage.
- The paging file (or vSwap) is transient data that can be redirected to NFS storage. In general, it is recommended to disable swapping, which reduces storage use (shared or local). The desktop memory size should be chosen to match the user workload rather than depending on a smaller image and swapping, which reduces overall desktop performance.
- User profiles (from MSRP) are stored by using Common Internet File System (CIFS).
- User data files are stored by using CIFS.

Dedicated virtual desktops or stateless virtual desktops that need mobility require the following items to be on NFS or block I/O shared storage, provided by SvSAN in this architecture:

- Difference disks are used to store user's changes to the base VM image. The difference disks are per user and can become quite large for dedicated desktops.
- Identity disks are used to store the computer name and password and are small.
- Stateless desktops can use local solid-state drive (SSD) storage for the PVS write cache, which is used to store all image writes on local SSD storage. These image writes are discarded when the VM is shut down.

Operational model

Hypervisor support

This reference architecture was tested with Microsoft Hyper-V 2016 Core hypervisor.

Compute servers for virtual desktops

Benchmarking was carried out with LoginVSI using:

1. XenDesktop (Windows 8.1) dedicated virtual desktop models

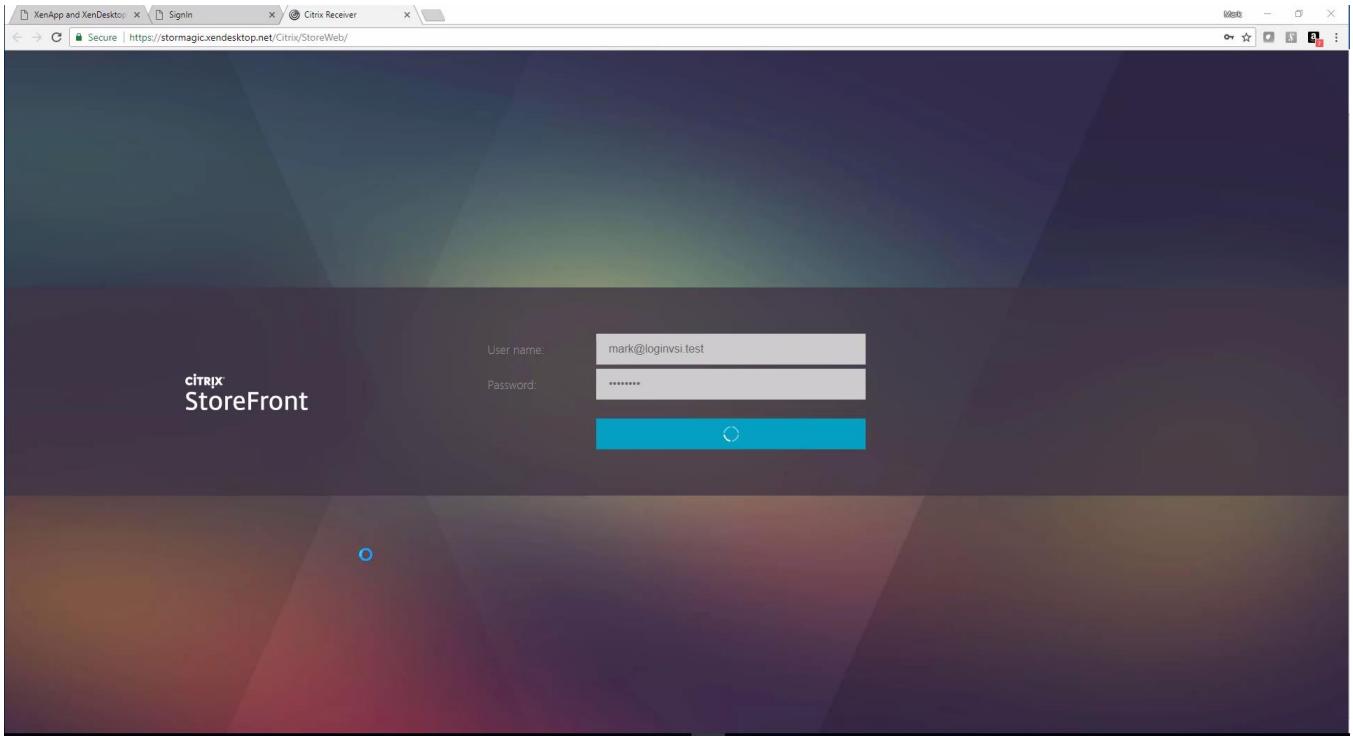

Figure 10: Citrix StoreFront Login

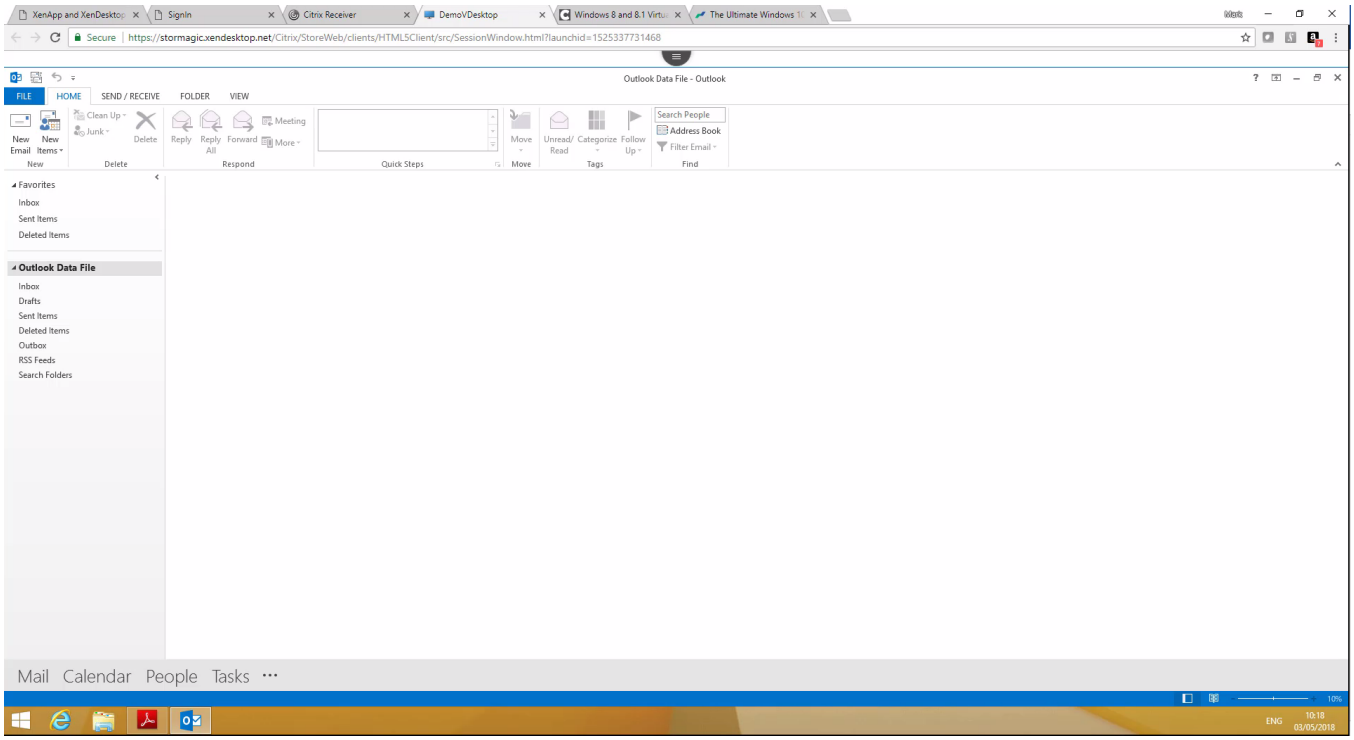

Figure 11: Knowledge worker session

UCS-E160S M3 dedicated desktop performance results

Table 2 lists the VSI max performance results for different Login VSI 4.1 workloads with Hyper-V 2016 and Windows 10.

Table 2: Login VSI Performance on Hyper-V 2016 Core

Processor	Workload	Dedicated
D-1528 (9-MB cache, 1.90 GHz, and 6 cores)	Task worker	20 users/desktops
D-1528 (9-MB cache, 1.90 GHz, and 6 cores)	Office worker	20 users/desktops

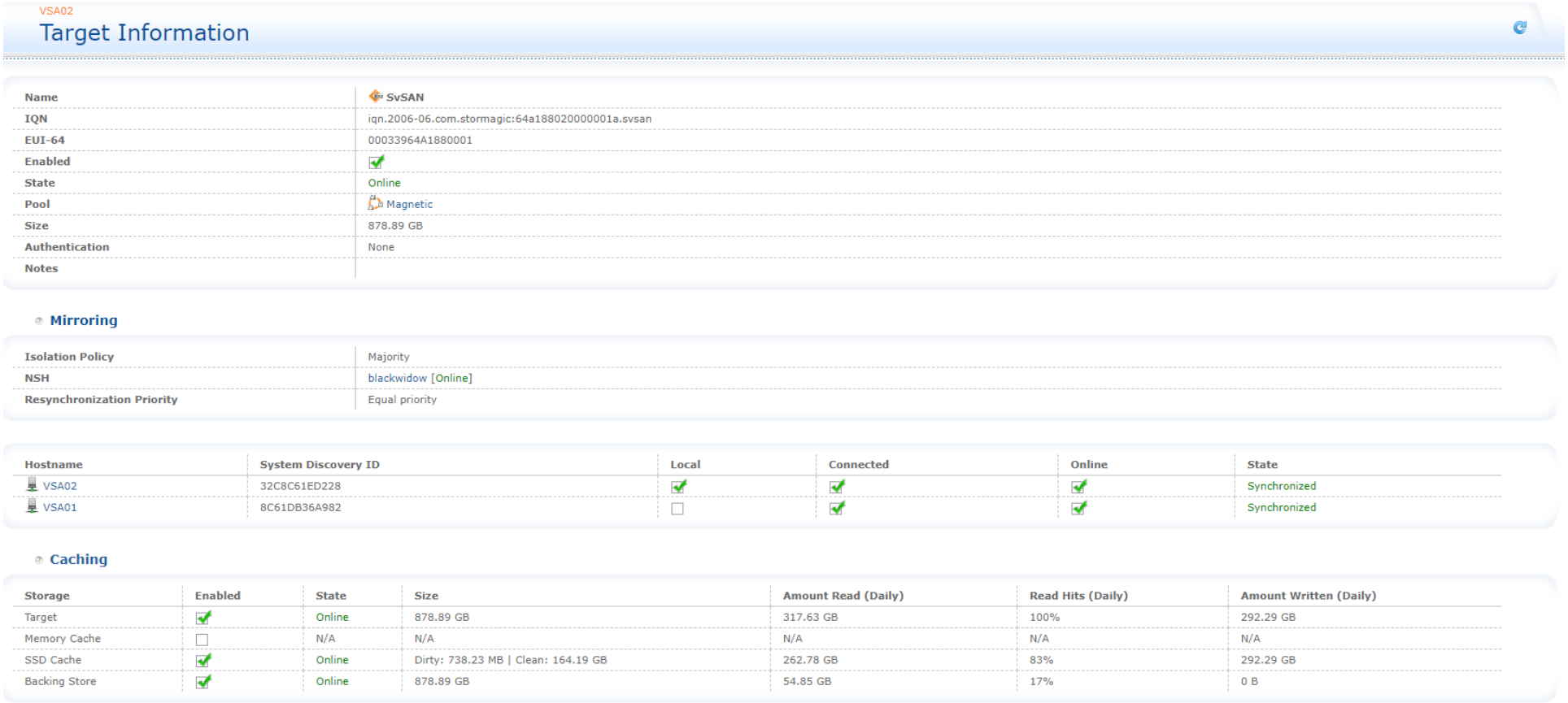

Figure 12: SvSAN storage information (Task Worker)

The above web interface displays the highly available storage volume presented to the E160s by SvSAN. Here we see that 100% of the VDI write I/O is being services by the SSD, 165GB thus far, with 83% of the total reads also service direct out of the cache tier.

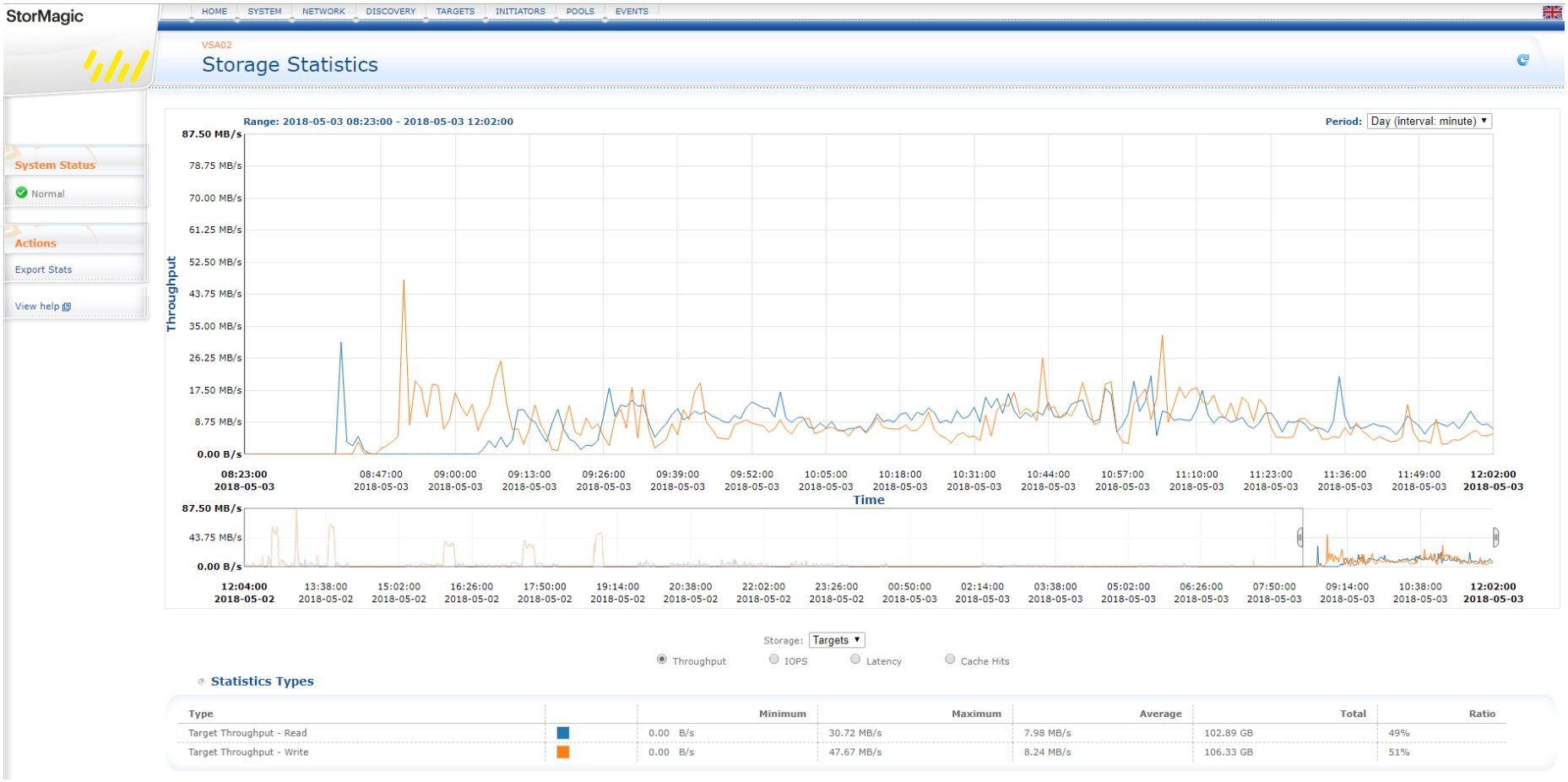

Figure 13: SvSAN storage statistics (Task Worker)

The statistics presented by SvSAN show that as all the throughput is low there are significant IOPs down to the underlying storage.

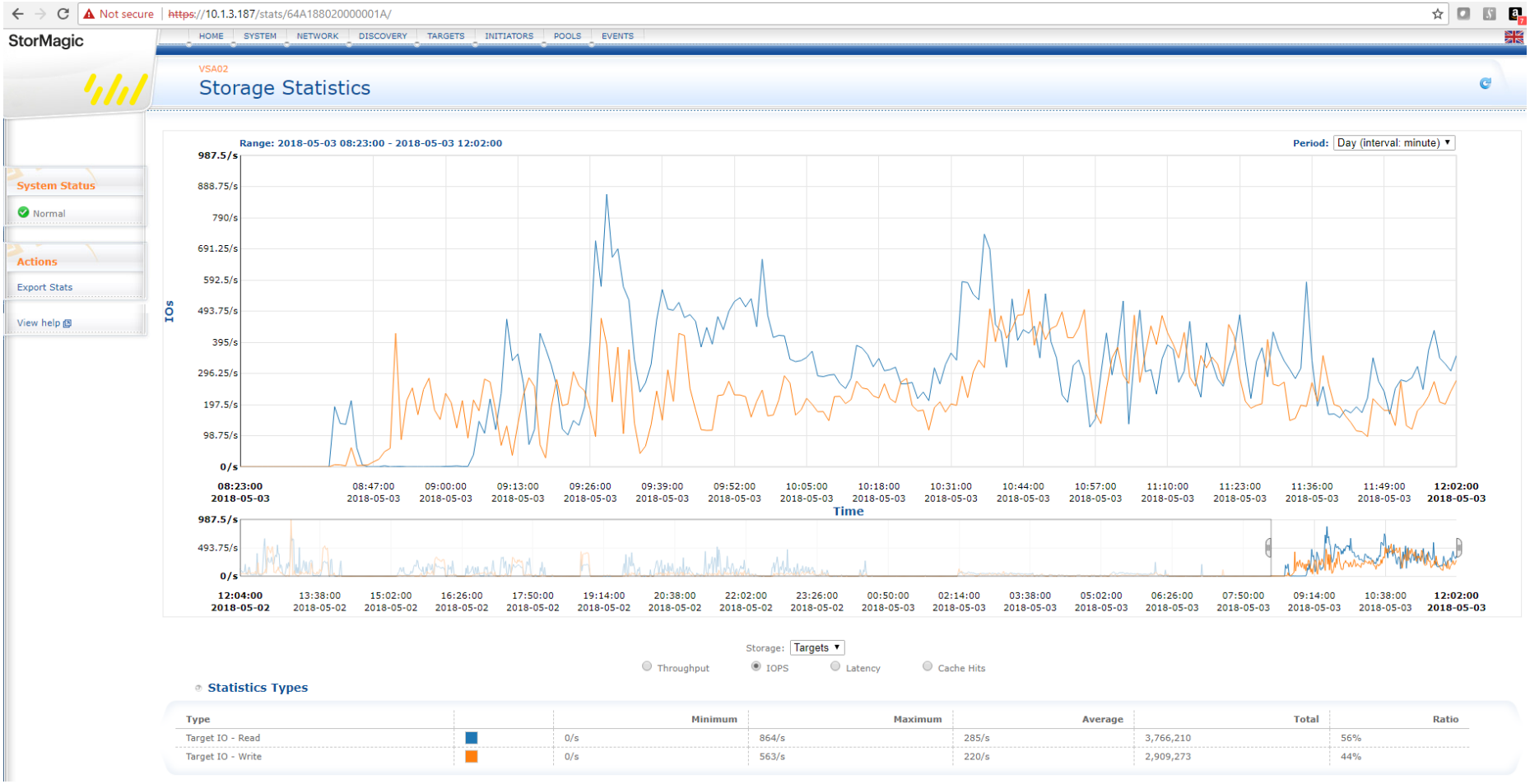

Figure 14: SvSAN storage statistics (Task Worker)

The statistics presented by SvSAN show that the workload is typically spikey and slightly heavier on reads than writes sitting steady just under 1k IOPs.

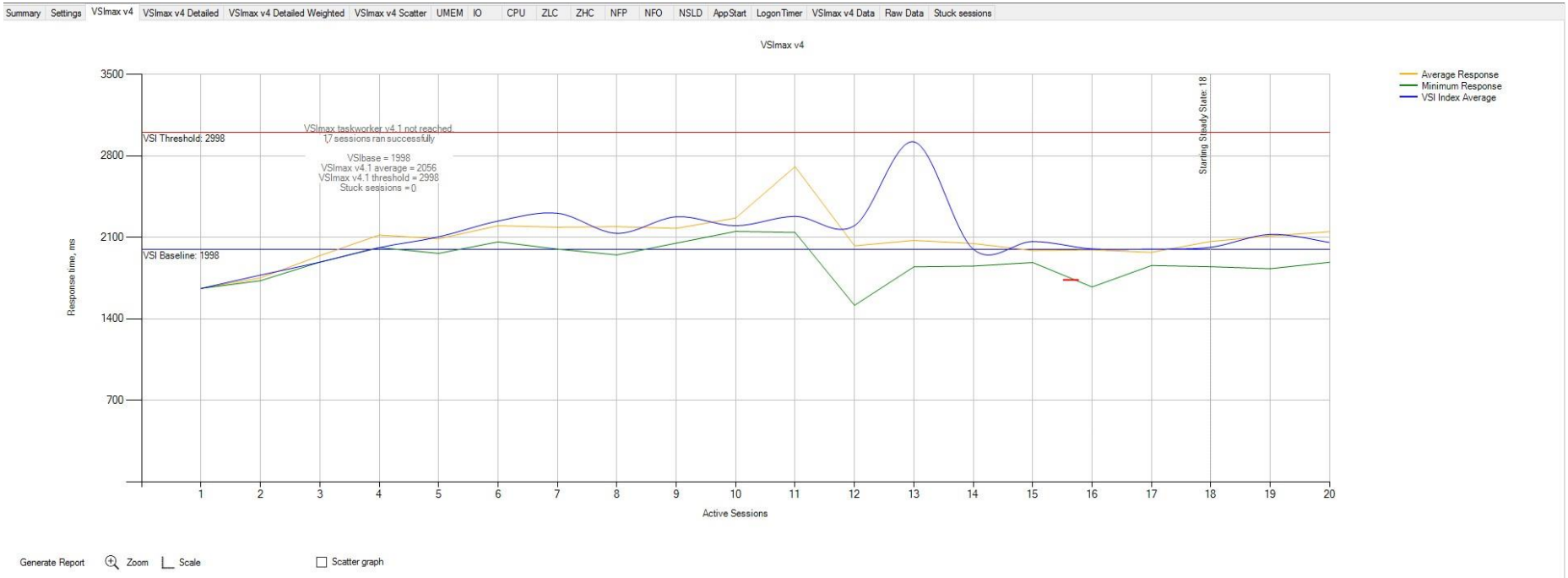

Figure 15: LoginVSImax v4 – Task Worker

The above loginVSI graph details 20 dedicated desktop VMs sitting comfortably at the VSI baseline running the Task Worker workload.

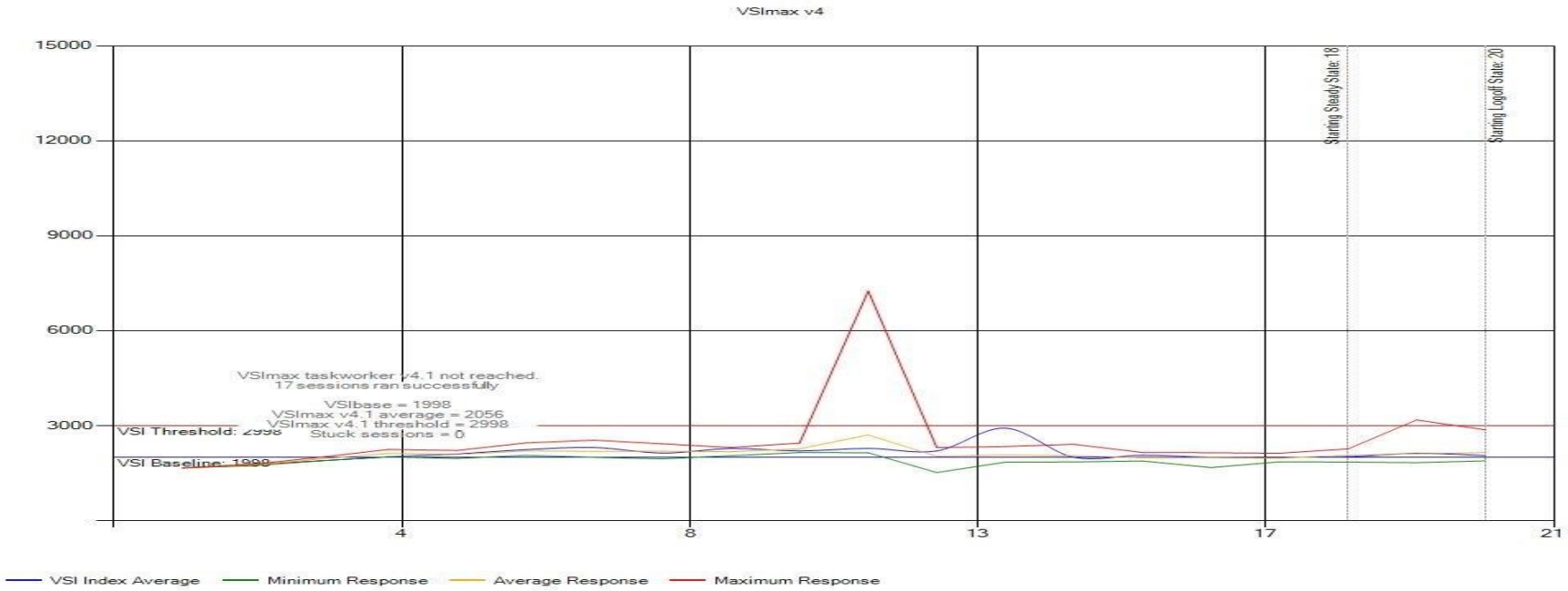

Figure 16: LoginVSImax v4 – Office Worker

The above loginVSI graph details 20 dedicated desktop VMs between the baseline and the threshold running the Office Worker workload.

BOM

Part Number	Description	Qty
ISR4451-X/K9	Cisco ISR 4451 (4GE,3NIM,2SM,8G FLASH,4G DRAM)	1
CON-SSSNT-ISR45XK9	SOLN SUPP 8X5XNBD Cisco ISR 4451 (4GE3NIM2SM8G FLASH4G D	1
UCS-E160S-M3/K9=	UCS-E, SingleWide, 6 Core CPU, 8 GB Flash, 1-2 HDD	2
CON-ECMU-UCSE16M3	SWSS UPGRADES UCS-E, SingleWide, 6 Core CPU, 8 GB Flas	2
EM3-MEM-32G	32 GB 1200MHz VLP RDIMM/PC4-2400 2R for UCS-E M3	4
SW-DISK-COVER	E-Series 140S Hard Disk Drive Blank Face Plate Cover	2
EM3-HY-480G-2T	480GB SSD + 2TB SATA Combo	2
UCS-STORM-2TA-1S=	StorMagic SvSAN Adv SW License - 2TB, 1 Node; 1Yr SnS Reqd	2

Resources

Citrix: https://www.citrix.com/

Cisco UCS E-Series: https://www.cisco.com/c/en/us/products/servers-unified-computing/ucs-e-series-servers/index.html

LoginVSI: https://www.loginvsi.com/blog-alias/login-vsi/665-simulating-vdi-users-introduction-to-login-vsi-workloads?highlight=WyJ0YXNrIiwid29ya2VyIiwidGFzayB3b3JrZXIiXQ==

StorMagic SvSAN: https://stormagic.com

https://citrixready.citrix.com/stormagic/svsan-workspace-appliance-cloud-connector.html