Parallels Remote Application Server

Parallels® Remote Application Server on Nutanix Enterprise Cloud Platform Design Microsoft Server Hyper-V® 2012 R2

Parallels®

Contents

Executive Summary

Virtual Desktop Infrastructure (VDI) can help many large-scale business and organizations save money, simplify client image management, improve data security, and enable remote connectivity from any device. However, the initial up-front cost of implementing the hardware, such as servers, robust storage, and networking required to support hundreds if not thousands of concurrent users, can be substantial. Additionally, most traditional VDI and application publishing software solutions are very complex, requiring several weeks to implement and full-time system administrators to manage.

Considering the initial capital expense and overall complexity involved with implementing a traditional VDI solution, it's no wonder that many cost-conscious customers, particularly small and medium businesses, have failed to adopt this traditional approach. However, with the emergence of software-defined, hyper-converged platforms, such as the Nutanix platforms, and affordable comprehensive virtual desktop and application publishing solutions, such as Parallels Remote Application Server (RAS), the cost and complexity of VDI has been greatly reduced.

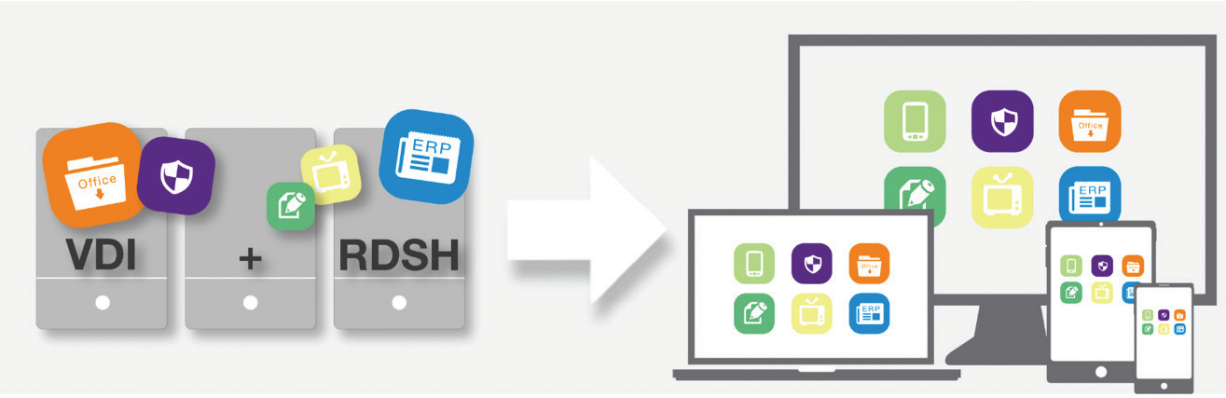


Figure 1 – Parallels Remote Application Server: How applications and VDI are delivered to end users

Project Overview

Reference Architecture

In order to facilitate rapid and successful deployment of the Parallels Remote Application Server FlexCast models, the Parallels team has built and tested a solution using the components described in this document.

Validation was performed by extensive testing using Login VSI to simulate real-world workloads and determine optimal configuration for the integration of components that make up the overall solution.

Audience

This reference architecture document is created as part of a Parallels Solution and is intended to describe the detailed architecture and configuration of the components contained within. Readers of this document should be familiar with Parallels Remote Application Server, its related technologies and the foundational components, Nutanix Enterprise Cloud Platform ('Nutanix'), Arista Networks ('Arista') hardware components, and Microsoft Windows Server® 2012 R2.

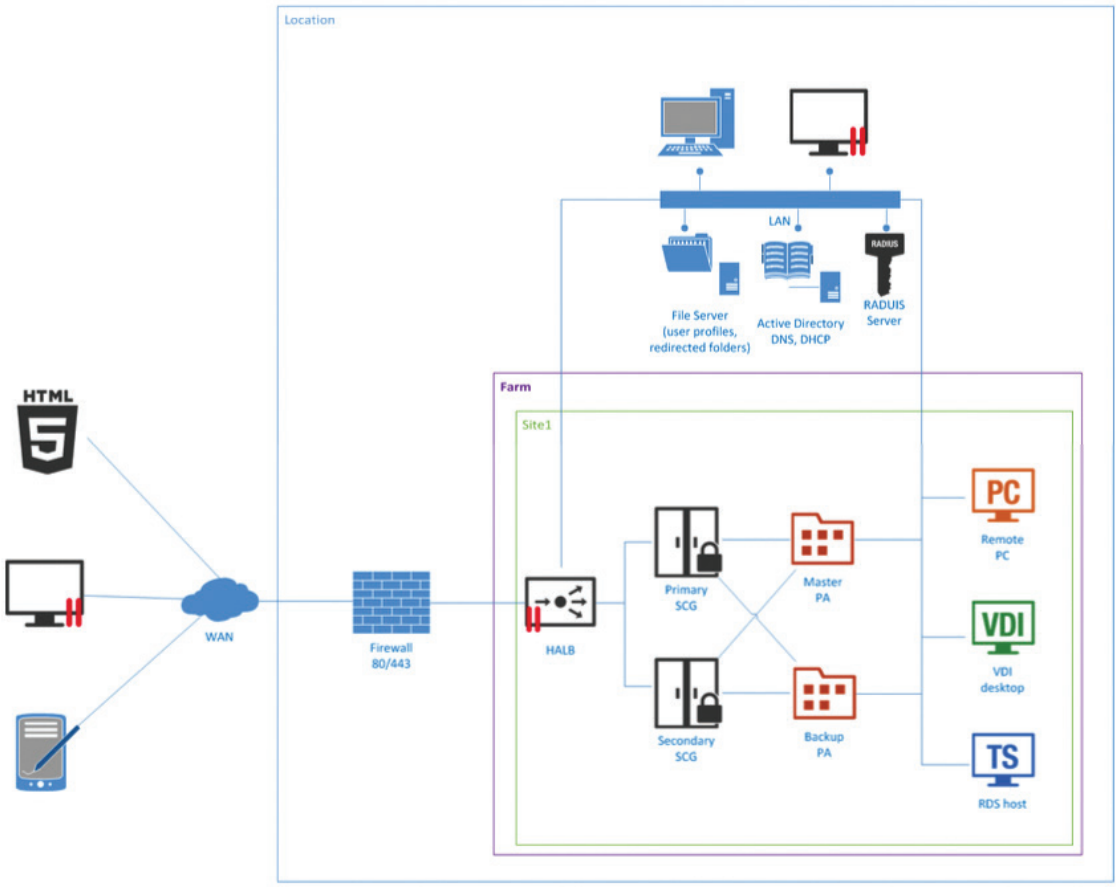
Purpose

The purpose of this document is to provide design information that describes the architecture for this Parallels Solution which is based on Parallels Remote Application Server Hosted Shared Applications (RDSH) and Parallels Hosted Virtual Desktop (HVD) FlexCast models. The solution is built on the Nutanix Enterprise Cloud Platform, NX-3060 nodes running Microsoft Hyper-V Server 2012 R2 to support the virtualized environment.

Architecture Overview

This solution is ideal for high availability environments with more than 300 concurrent users connected in SSL mode. Each client gateway should optimally handle 300 to 500 concurrent user connections* per gateway (see the note below). This can be scaled horizontally accordingly.

Both LAN and WAN users connect to the virtual address of a High Availability and Load Balancing virtual appliance in an internal network.



This Parallels solution was designed, built and validated to support two common Virtual Desktop types. The architecture for each desktop type is described to support up to 1,000 and beyond user desktop sessions:

- **Hosted Shared Applications (RDSH)**
- **Hosted Virtual Desktops.** Individual user sessions running on top of Microsoft Hyper-V.

Parallels Remote Application Server Virtual Desktop Types

This Parallels Solution document references Parallels Remote Application Server Hosted Applications and Hosted Virtual Desktops. Both types of virtual desktops are discussed below for reference..

- **Remote Desktop Session Host (RDSH).** A Windows® Remote Desktop Session Host (RDSH) using Parallels Remote Application Server to deliver Hosted Shared Hosts in a locked down, streamlined, and standardized manner with a core set of applications. Using a published desktop on the Remote Desktop Session Host, users are presented a desktop interface similar to a Windows 7 “look and feel.” Each user runs in a separate session on the RDS server.
- **Hosted Virtual Desktop (HVD) aka Hosted VDI.** A Windows 7, 8, and 10 desktop instance running as a virtual machine where a single user connects to the machine remotely. Consider this as a 1:1 relationship of one user to one desktop. There are differing types of the hosted virtual desktop model (existing, installed, pooled, dedicated, and streamed). This document exclusively refers to both Pooled and Persistent (Dedicated) HVDs.

The Pod Concept

The term “pod” is referenced throughout this solution design. In the context of this document, a pod is a known entity, an architecture that has been pre-tested and validated. A pod consists of the hardware and software components required to deliver 1,000 virtual desktops using either RDSH or HVD FlexCast models.

For clarity, this document does not attempt to describe combining both FlexCast models; it specifically discusses each type as s single entity of up to 1,000 desktops.

Parallels Remote Application Solution Overview

The Illustration below depicts the layers of the Parallels Remote Application Server Hosted Shared Desktop technology stack utilized in the solution.

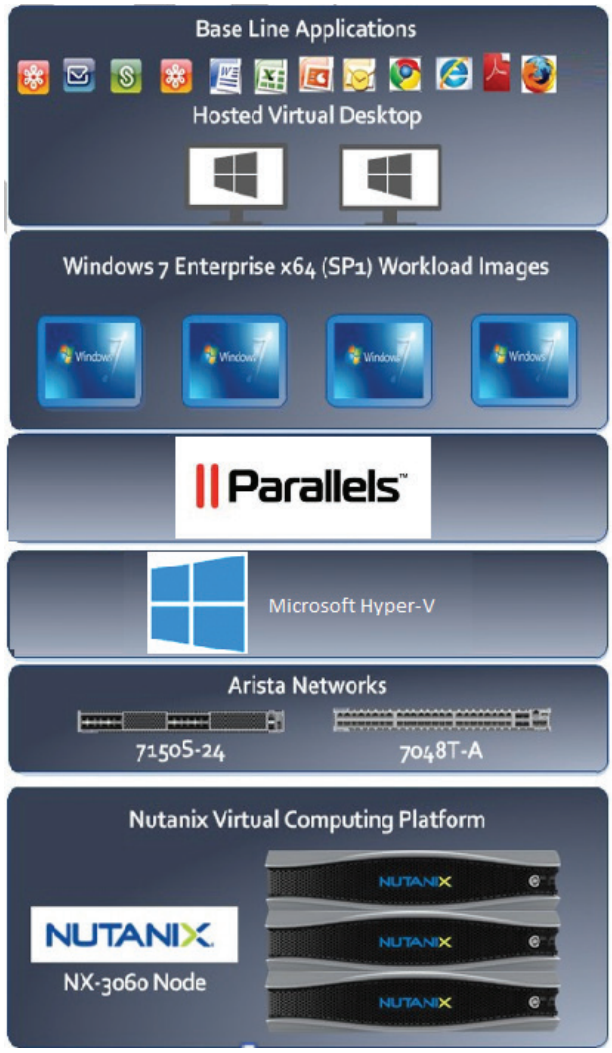


Figure 1. Remote Application Server stack depicting RDSH Workloads

The Illustration below depicts the layers of the Parallels Remote Application Server Hosted Virtual Desktop technology stack utilized in the solution.

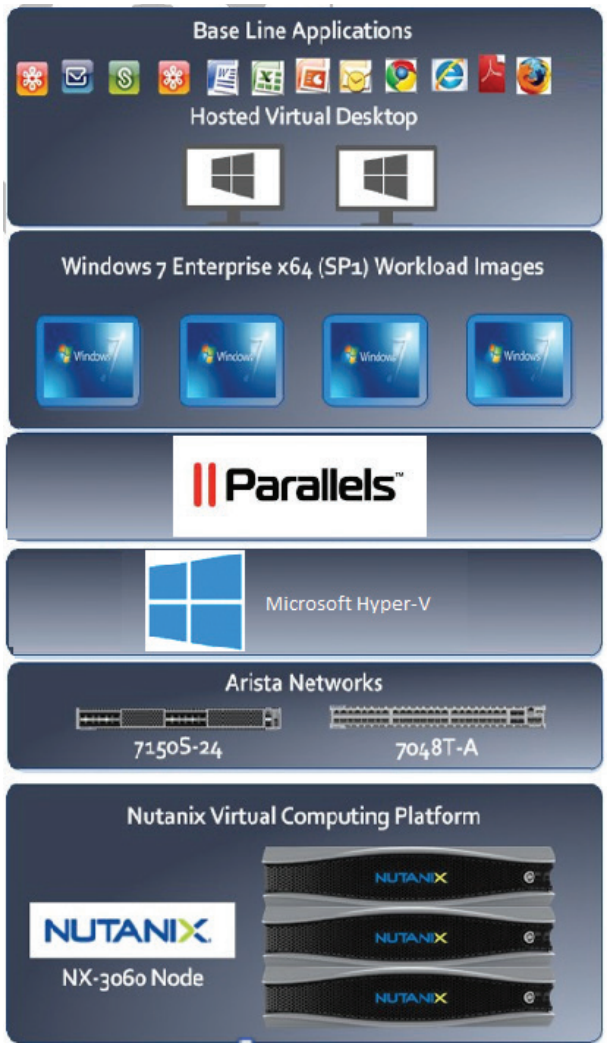


Figure 2. Remote Application Server stack depicting HVD Workloads

The Illustrations below depict the combined physical and logical view of the scale out architecture for both RDSH and HVD platforms using the Nutanix Enterprise Cloud Platform.

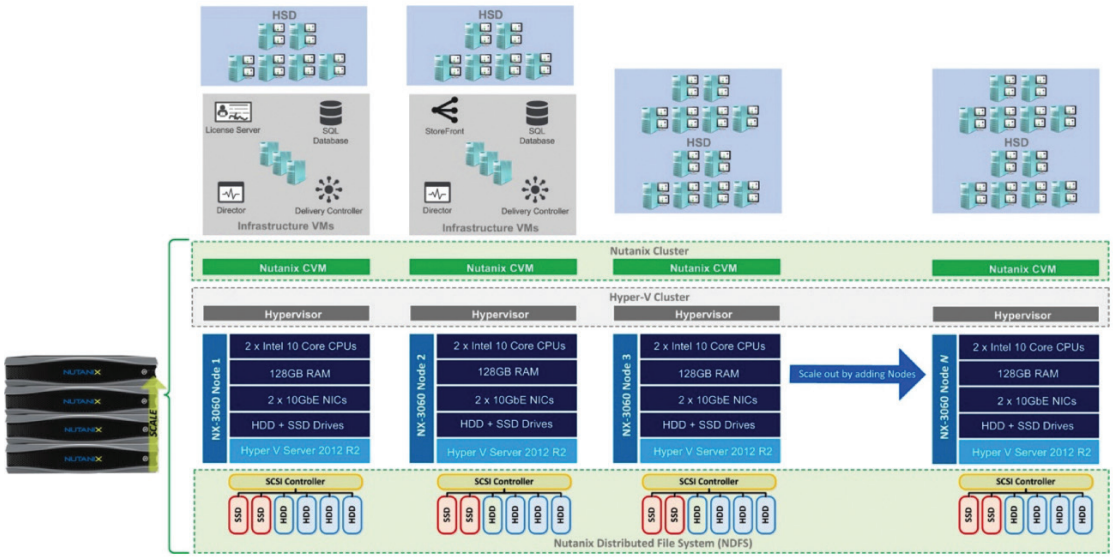


Figure 3. Logical View of the RDSH Solution

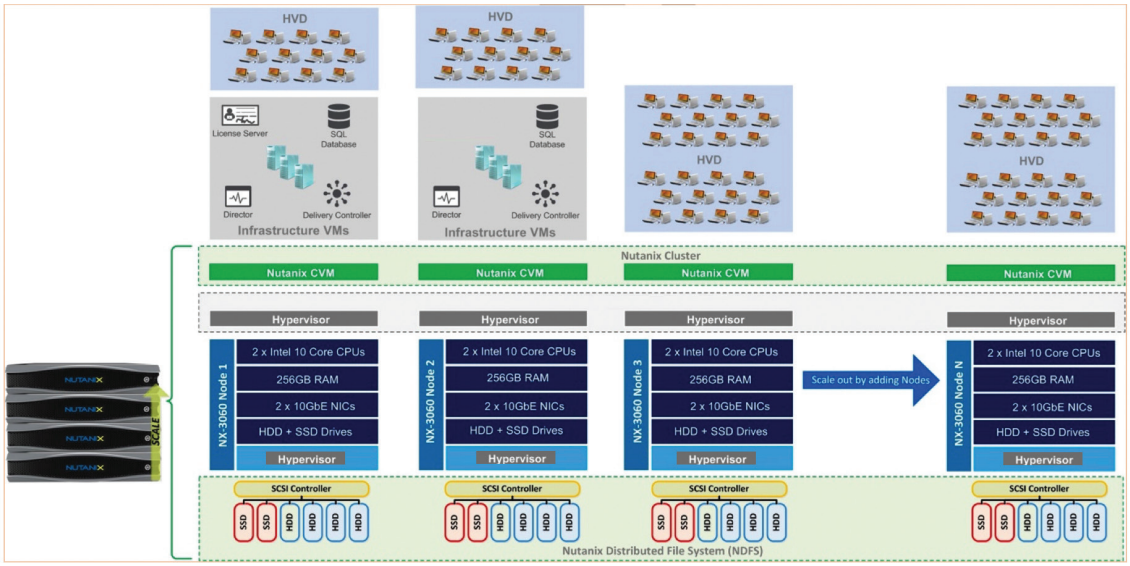


Figure 4. Logical View of the HVD Solution

- **Hosted Virtual Desktops** (HVD). Describing the delivery of 1,000 Pooled desktops or Persistent (Dedicated) Windows 7, 8, and 10 virtual desktops powered by Parallels Remote Application Server (RAS).
- **Hosted Shared Hosts** (RDSH). Describing the delivery of 1,000 Shared virtual desktops based on Microsoft Windows Server 2008 R2 or Windows Server 2012 R2 Remote Desktop Session host workloads powered by Parallels Remote Application Server (RAS).
- **Microsoft Hyper-V Server 2012 R2 (Hyper-V).** The virtualized desktop and server instances are hosted on Microsoft Hyper-V Server 2012 R2 Server Core. Hyper-V was deployed onto the Nutanix nodes through the Nutanix Foundation Deployment Tool and configured into a Fail-Over cluster to support Live Migration, HA, and other cluster functions.
- **Nutanix Enterprise Cloud Platform.** The web-scale Nutanix solution is a converged storage and compute solution, which leverages local hardware components and creates a distributed platform for virtualization. The modular building-block design allows customers to start with small deployments and scale out incrementally into large cluster installations.

  *The Nutanix Enterprise Cloud Platform integrates multiple high-performance computing resources with enterprise-class SSD and HDD storage controlled by the Nutanix Controller VM (CVM) in a cost-effective 2U appliance, removing the need for network-based storage architecture, such as a storage area network (SAN) or network-attached storage (NAS). Nutanix clusters can be scaled without downtime by simply adding additional Nutanix nodes. The additional compute and storage are automatically added to the virtualization and storage pools; no additional configuration or tuning is needed.
- **Nutanix NX-3060 Node.** The underlying compute, network, and storage hardware is based on the Nutanix NX-3060 node. Each node is equipped with dual socket 10-core Intel® Xeon Ivy Bridge CPU processors, between 128-256 GB RAM, a pair of 10GbE network adapters, and local storage consisting of SSD and HDD drives. The NX-3000 series solution is a bundled hardware and software appliance which houses virtual computing nodes in a 2U rack unit footprint. Each node runs Microsoft Windows Server 2012 R2 (Server Core and Data Center are supported) with Hyper-V Server 2012 R2 role enabled and the Nutanix Controller VM (CVM).
- **Nutanix Controller Virtual Machine** ('CVM'). The Nutanix CVM is what runs on the hypervisor, consolidating and controlling storage across the entire Nutanix cluster. It serves all of the storage I/O operations for the Hyper-V 2012 R2 hypervisor and all VMs running on that host over SMB3.
- **Arista Networks Ethernet Switching.** Arista Networks provides the Ethernet switching capability within this platform. The entire Arista portfolio features data center switches that are inherently suitable to the types of

workloads expected by Parallels Remote Application Server. In this solution, the Arista 7150S-24 switch has been chosen to provide top-of-rack connectivity with 24 ports of 10GbE. The out-of-band connectivity required for Nutanix node management (IPMI) is provided by an Arista 7048T-A switch with 48 ports of 100/1000Mbps Ethernet.

- **Applications.** Tier-2 applications which may include line of business or customer-specific applications that are not embedded as part of the master disk image may be delivered using Parallels Remote Application Server distributing either RDS workloads or Microsoft® App-V.
- **Supporting Infrastructure.** The following components are assumed to exist within the customer environment and are required infrastructure components:
    - Microsoft Active Directory® Domain Services.
    - Licensing servers to provide Microsoft® licenses are assumed to exist.
    - Public Key Infrastructure (PKI) certification services are assumed to exist.
    - DHCP Services with sufficient IP addresses to support the proposed virtual desktop workloads. This can be provisioned as part of the solution using the Windows Server 2012 R2 DHCP Role.

This design document will focus on the desktop virtualization components which include the desktop workload, desktop delivery mechanism, hypervisor, hardware, network, and storage platforms

Parallels Remote Application Server Solution architecture breaks the design into a number of distinct layers, discussed below:

- User Layer. This layer details the user segments defined during the project's "assess phase." Users are grouped based on their network connectivity to the data center, recommended end point devices, security requirements, data storage needs, and virtual workforce needs.
- Access Layer. This layer describes how the user layer will connect to their desktop, which is hosted in the desktop layer of the architecture. Local and remote users will connect directly to the Parallels High Availability Load Balancer and Web Portal, while remote users connect via encrypted socket layer (SSL) connection.
- Publishing Agent. This layer is responsible for managing and maintaining all other layers. It provides details on the controller requirements to support the entire solution. The Publishing Agent is broken down into the following subsections:
    - Infrastructure. The Infrastructure section is responsible for providing the underlying resources to support each component. These resources include Active Directory, database requirements, and license servers.
    - Publishing Agents in VDI. The Publishing Agent section provides details on the components required to support the desktop layer, which depends on the Parallels VDI agent deployed in Hyper-V.
    - Access Controllers. The Access Controllers section focuses on the required versions and virtualization resources.
    - Hypervisor Layer. This section describes the configuration for Microsoft Hyper-V Server 2012 R2. Hyper-V is a "Type 1" hypervisor that runs directly on the hardware resources described in the Hardware Layer.
    - Network. This section defines the physical network switching and logical connectivity requirements to support the solution.
    - Hardware Layer. This layer is responsible for the physical devices required to support the entire solution. It includes servers, processors, memory, and storage devices. This layer is broken down into the physical and logical components and provides the Bill of Materials (BoM) to deploy the entire solution.

The illustration below describes the distinct layers of the architecture:

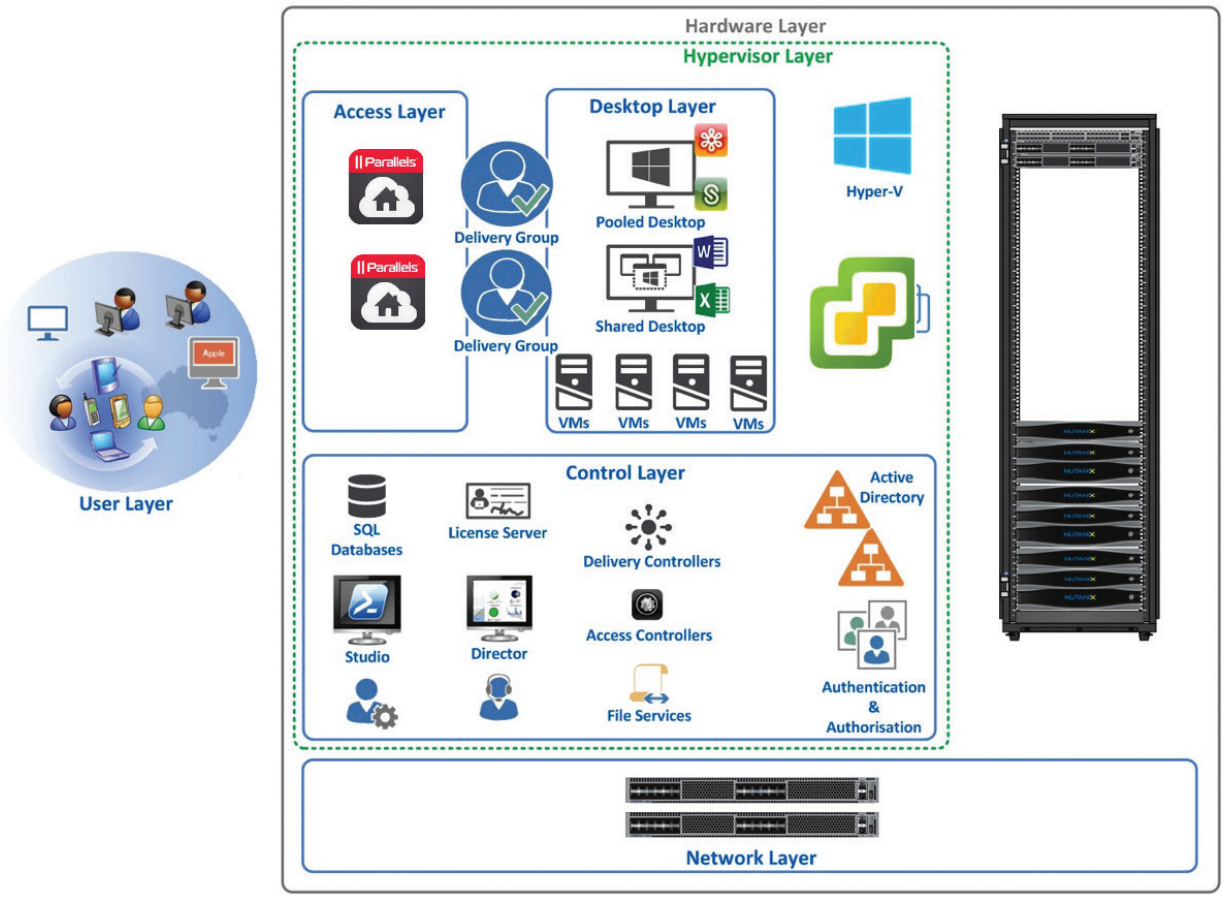


Figure 5. Architecture Layered View

Design Recommendations

Assumptions

The following assumptions have been made:

- Required Parallels and Microsoft licenses and agreements are available.
- Required power, cooling, rack, and data center space is available.
- There are no network constraints that would prevent the successful deployment of this design.
- Microsoft Windows Active Directory Domain services are available.
- Microsoft SQL Database platform is available.

A current and supported version of Parallels Remote Application Server must be deployed to ensure all features and components of the solution are at a supported level; refer to the following link for the latest **Parallels Remote Application Server** client download. Alternatively, Parallels offer HTML5 access without local software installed.

- The User layer in the context of this document is for reference only. User analysis, definition, and segmentation for the use of VDI desktop types is out of scope for this document.

Logical Architecture Overview

This section discusses the logical architecture and concepts for the remainder of this document. From an architectural perspective, Hyper-V will be deployed onto the aforementioned hardware (Hardware Layer) with the infrastructure servers (Publishing Agent) and virtual desktops (Desktop Layer) deployed as Hyper-V VM instances.

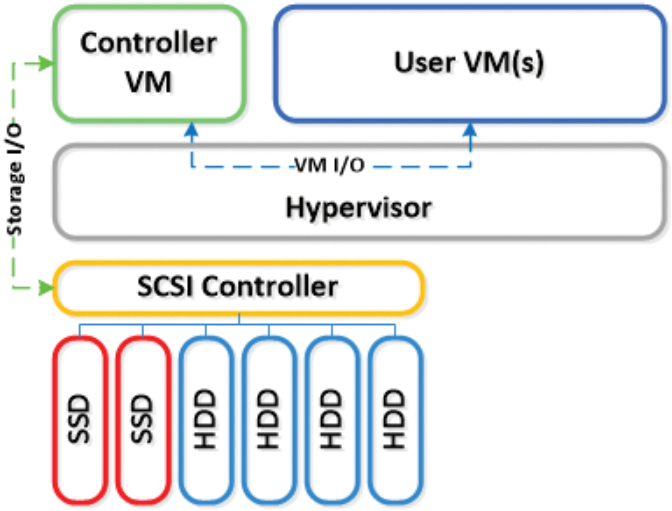
From a physical hardware perspective, each server node will be configured identically as per the recommended Nutanix

NX-3060 Bill of Materials. From a logical perspective, the hosts for each desktop can be defined as follows.

- A minimum of three server nodes is required to establish a Nutanix Cluster. The three nodes running Hyper-V are utilized for hosting both use cases for RDSH and HVD desktop workloads.
- The platform can be scaled out to support additional desktop and user capacity by simply adding Nutanix nodes to the existing Hyper-V and Nutanix cluster. Scaling out the solution can be achieved by incremental modular scale out by adding a node or by 1,000 user pods, which both allow for granular scale out to precisely meet the capacity demands.

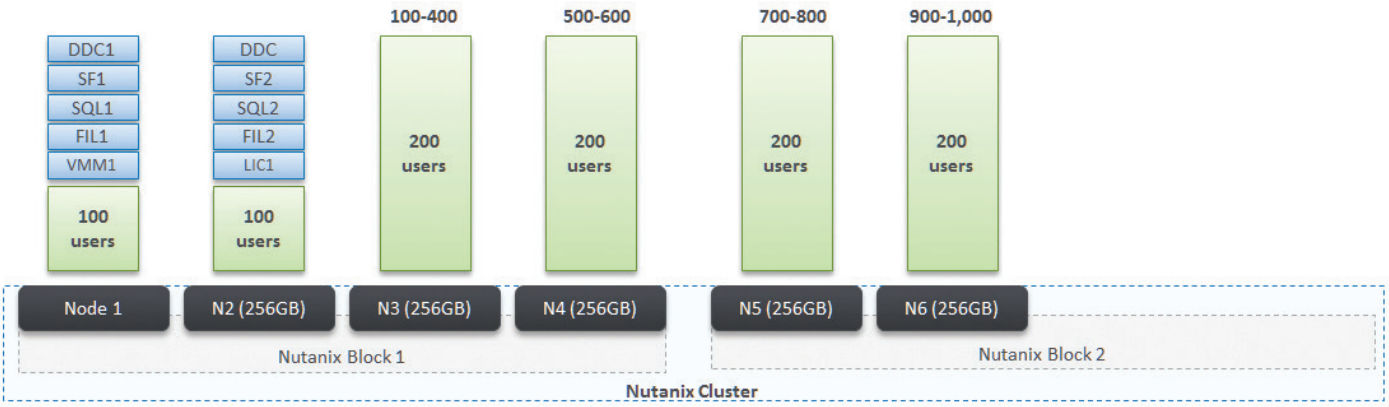
Nutanix Node

The Illustration below depicts the logical architecture of a node from the Nutanix Enterprise Cloud Platform, which consists of the Nutanix CVM virtual appliance running on Hyper-V 2012 R2, which in turn leverages high density compute, memory, 10GbE network interface adapters, and local solid state drive and hard disk drives.



Pod of 1,000 RDSH Users

The logical and physical components that make up the platform to deliver a 1,000-user Hosted Shared Desktop solution are described below:



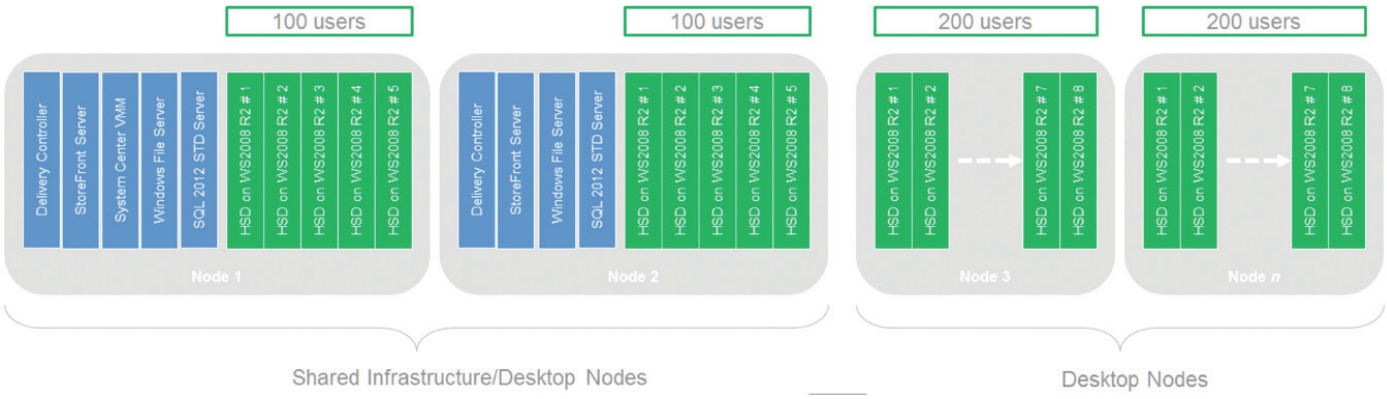


Figure 8. RDSH – VM allocation and scale out

Component	Quantity
# of Parallels Remote Application Users	Up to 1,000
# of Parallels Remote Application Sites	1
# of Parallels Publishing Agents	2
# of Parallels Gateway Servers	2
# of Parallels/Microsoft License Servers	1
# of Nutanix Clusters	1
# of vCenter Servers	1
# of Windows File Servers (DFS-R/N in Active/Passive setup)	2
# of Arista 7150S-24 10GbE ToR Switch	2
# of NX-3060 Nodes running MS Hyper-V 2012 R2	6
# of Remote Desktop (Terminal Server) RDS (HSD) Windows Server 2008/2012 R2 Server VMs	40
# of Arista 7048T-A 100/1000 Mbps Switches	1

Table 1. 1,000-User RDSH Pod Detail

Pod of 1,000 HVD Users

The logical and physical components that make up the platform to deliver a 1,000-user Hosted Virtual Desktop solution are described below:

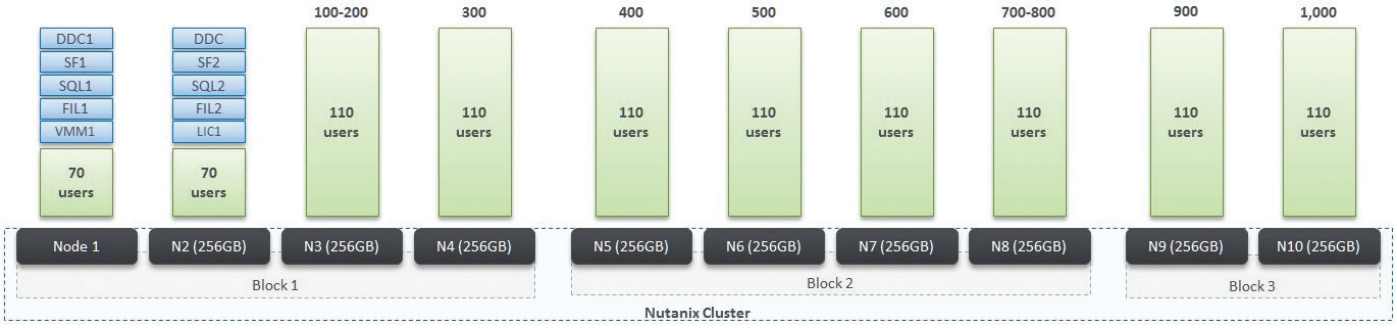


Figure 9. 1,000 HVD users - Virtual machine allocation in relation to Nutanix nodes

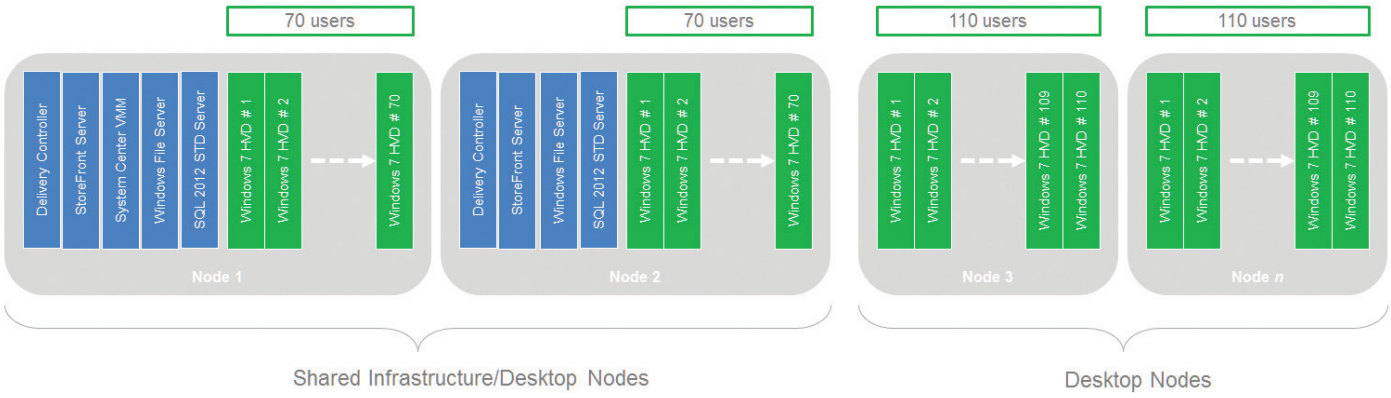


Figure 10. HVD – VM allocation and scale out

Component	Quantity
# of Parallels Remote Application Server Users	Up to 1,020
# of Parallels Remote Application Server Sites	1
# of Parallels Remote Application Server Publishing Agents	2
# of Parallels HALB Servers	2
# of Parallels/Microsoft License Servers	1
# of Nutanix Clusters	1
# of vCenter Servers	1
# of Windows File Servers (DFS-R/N in Active/Passive setup)	2
# of SQL 2012 Standard Servers (DB Mirror in Active/Passive)	2
# of NX-3060 Nodes running MS Hyper-V 2012 R2	10
# of Windows 7 Enterprise HVD (virtual desktops)	1,020
# of Arista 7150S-24 10GbE ToR Switches	2
# of Arista 7048T-A 100/1000 Mbps Switches	1

Table 2. 1,000-User HVD

Scale Out Guidance for RDSH

This section outlines the sizing metrics applicable to the Nutanix NX-3060 nodes, network switch ports, Hyper-V hosts, Infrastructure server VMs, and the required Citrix and Microsoft licenses to set up the RDSH solution based on the suggested scale-out increment.

The solution can be scaled out incrementally by adding additional server nodes. Notes on Microsoft licensing used as per the below samples:

- **# of MS Core Infrastructure Suite (CIS) Standard.** MS CIS includes System Cente 2012 R2 Standard and licenses for 2 x Windows Server 2012 Standard VMs o**r** Operating System Environment). Refer to http://www.microsoft.com/licensing/about- licensing/SystemCenter2012-R2.aspx.
- **# of MS SQL Server 2012 Standard Server.** Assumes SQL Server is licensed as a 2 VCPU (v-cores) VM with MS Software Assurance. SQL Server license requires a minimum of four core licenses. Active-Passive SQL Server deployment means no additional licenses are required for a secondary passive SQL Server. Refer to http://www.microsoft.com/licensing/about-licensing/sql2014.aspx.

Scenario: 3 x Nodes (Minimum Requirement)

Hardware Compnents	Quantity	Infrastructure Components	Quantity
# of NX-3060 nodes (128 GB)	3	# of SCVMM servers	1
# of RU (Nutanix nodes)	2	# of Hyper-V hosts	3
# of 10GbE Ports	6	# of Hyper-V Clusters	1
# of 1GbE Ports (IPMI)	3	# of Nutanix Clusters	1
Total # of 10GbE Ports	6	# of Parallels Remote Application Servers	1
Total # of 1GbE Ports	3	# of RDSH users	400
# of Arista 7150S-24 10GbE Switches	2	# of RDSH Windows Server VMs	16
# of Arista 7048T-A Switches	1		

Table 3. Hardware Component Breakdown - 3 x Nodes

Parallels/Microsoft License Components	Quantity
# of Parallels Remote Application Server Users/Device	400
# of MS Remote Desktop Services CALs	400
# of MS Core Infrastructure Suite (CIS) Standard	13
# of MS SQL Server 2012 Standard Servers	1

Table 4. Component Breakdown - 3 x Nodes

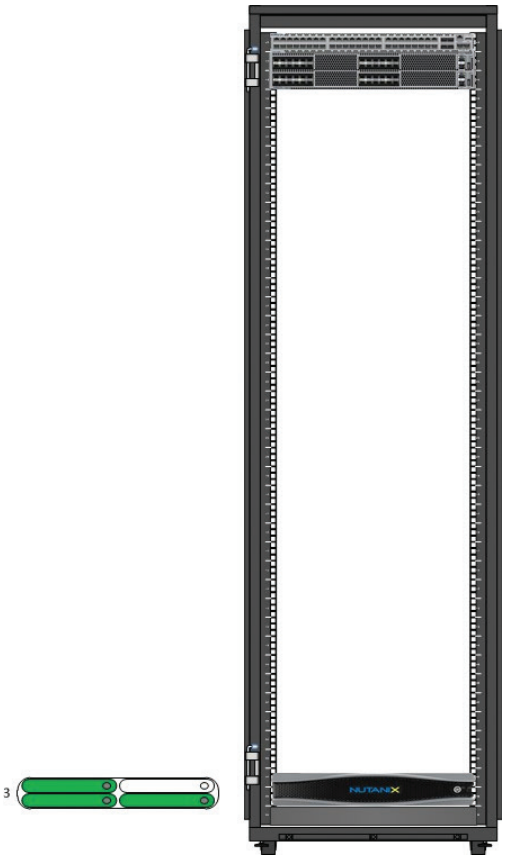


Figure 11. Rack Layout – 3 x Nodes

Scenario: 4 x Nodes (Single Block)

Hardware Components	Quantity	Infrastructure Components	Quantity
# of NX-3060 nodes (128 GB)	4	# of SCVMM servers (if using Hyper-V)	1
# of RU (Nutanix nodes)	2	# of Hyper-V hosts	4
# of 10GbE Ports	8	# of Hyper-V Clusters	1
# of 1GbE Ports (IPMI)	4	# of Nutanix Clusters	1
Total # of 10GbE Ports	8	# of Parallels Remote Application Server Sites	1
Total # of 1GbE Ports	4	# of RDSH users	600
# of Arista 7150S-24 10GbE Switches	2	# of RDSH Windows Server VMs	24
# of Arista 7048T-A Switches	1		

Table 5. Hardware Component Breakdown - 4 x Nodes

Parallels / Microsoft License Components	Quantity
# Parallels Remote Application Server Users/Device	600
# of MS Remote Desktop Services CALs	600
# of MS Core Infrastructure Suite (CIS) Standard	17
# of MS SQL Server 2012 Standard Servers	1

Table 6. Component Breakdown - 4 x Nodes

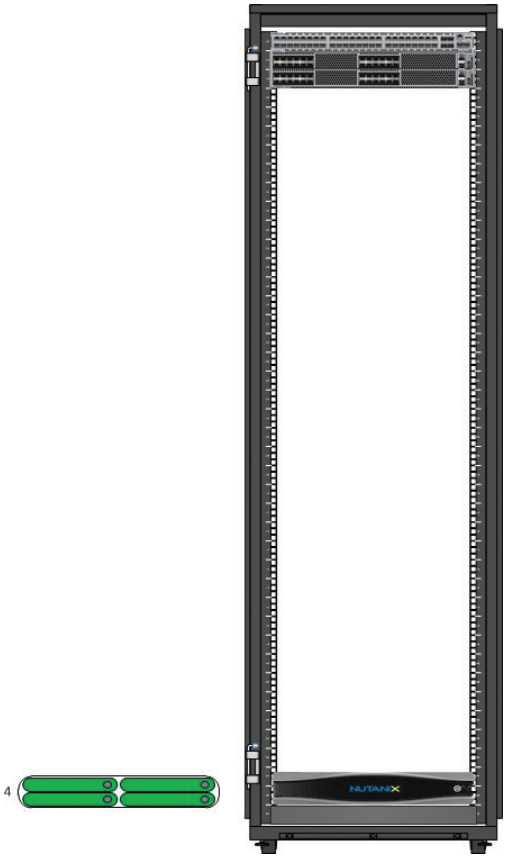


Figure 12. Rack Layout – 4 x Nodes

Scenario: 6 x Nodes (1½ Block)

Hardware Components	Quantity	Infrastructure Components	Quantity
# of NX-3060 nodes (128 GB)	6	# of SCVMM servers	1
# of RU (Nutanix nodes)	4	# of Hyper-V hosts	6
# of 10GbE Ports	12	# of Hyper-V Clusters	1
# of 1GbE Ports (IPMI)	6	# of Nutanix Clusters	1
Total # of 10GbE Ports	12	# of Parallels Remote Application Server Sites	1
Total # of 1GbE Ports	6	# of RDSH users	1,000
# of Arista 7150S-24 10GbE Switches	2	# of RDSH Windows Server VMs	40
# of Arista 7048T-A Switches	1		

Table 7. Hardware Component Breakdown - 6 x Nodes

Parallels / Microsoft License Components	Quantity
# Parallels Remote Application Server Users/Device	1,000
# of MS Remote Desktop Services CALs	1,000
# of MS Core Infrastructure Suite (CIS) Standard	25
# of MS SQL Server 2012 Standard Servers	1

Table 8. Component Breakdown - 6 x Nodes

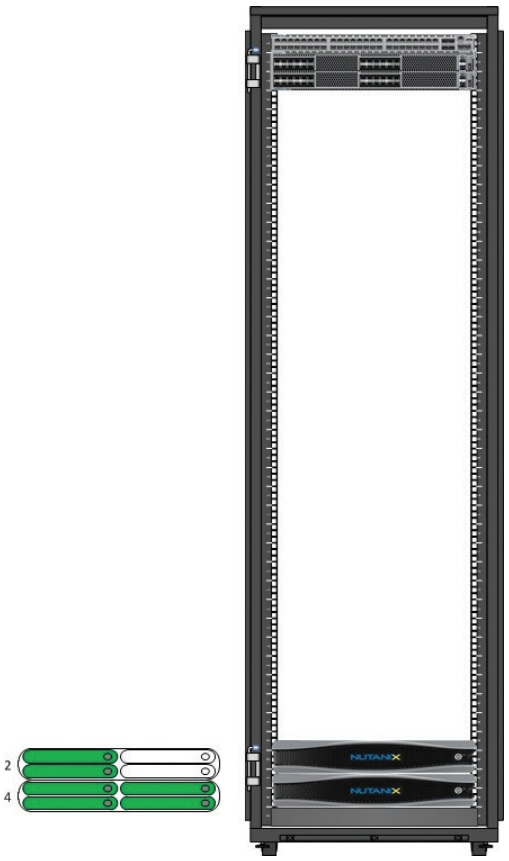


Figure 13. Rack Layout – 6 x Nodes

Scenario: 8 x Nodes (Two Full Blocks)

Hardware Components	Quantity	Infrastructure Components	Quantity
# of NX-3060 nodes (128 GB)	8	# of SCVMM servers	1
# of RU (Nutanix nodes)	4	# of Hyper-V hosts	8
# of 10GbE Ports	16	# of Hyper-V Clusters	1
# of 1GbE Ports (IPMI)	8	# of Nutanix Clusters	1
Total # of 10GbE Ports	16	# of Parallels Remote Application Server Sites	1
Total # of 1GbE Ports	8	# of RDSH users	1,400
# of Arista 7150S-24 10GbE Switches	2	# of RDSH Windows Server VMs	56
# of Arista 7048T-A Switches	1	# of Arista 7048T-A Switches	1

Table 9. Hardware Component Breakdown - 8 x Nodes

Parallels / Microsoft License Components	Quantity
# Parallels Remote Application Server Users/Device	1,400
# of MS Remote Desktop Services CALs	1,400
# of MS Core Infrastructure Suite (CIS) Standard	33
# of MS SQL Server 2012 Standard Servers	1

Table 10. Component Breakdown - 8 x Nodes

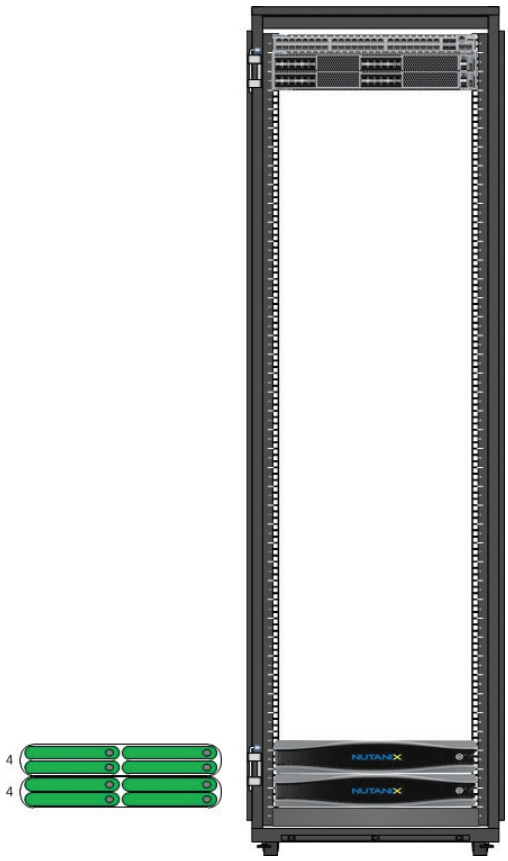


Figure 14. Rack Layout – 8 x Nodes

Scale Out Guidance for HVD

This section outlines the sizing metrics applicable to the Nutanix NX-3060 nodes, network switch ports, Hyper-V hosts, Infrastructure server VMs, and the required Citrix® and Microsoft licenses10 to set up the HVD solution based on the suggested scale-out increment.

The solution can be scaled out incrementally by adding additional server nodes. Notes on Microsoft licensing used as per the below samples[11].

- **# of MS Core Infrastructure Suite (CIS) Standard.** MS CIS includes System Center 2012 R2 Standard and licenses for 2 x Windows Server 2012 Standard VMs or Operating System Environment. Refer to http://www.microsoft.com/licensing/about- licensing/SystemCenter2012-R2.aspx.
- **# of MS SQL Server 2012 Standard Server.** Assumes SQL Server is licensed as a 2 VCPU (v-cores) VM with MS Software Assurance. SQL Server license requires minimum of four core licenses. Active-Passive SQL Server deployment means no additional licenses are required for secondary passive SQL Server. Refer to http://www.microsoft.com/licensing/about-licensing/sql2014.aspx.

Scenario: 3 x Nodes (Minimum Requirement)

Hardware Components	Quantity	Infrastructure Components	Quantity
# of NX-3060 nodes (256 GB)	3	# of SCVMM servers	1
# of RU (Nutanix nodes)	2	# of Hyper-V hosts	3
# of 10GbE Ports	6	# of Hyper-V Clusters	1
# of 1GbE Ports (IPMI)	3	# of Nutanix Clusters	1
Total # of 10GbE Ports	6	# of Parallels Remote Application Server Sites	1
Total # of 1GbE Ports	3	# of HVD users	250
# of Arista 7150S-24 10GbE Switches	2	# of VDIs	250
# of Arista 7048T-A Switches	1		

Table 11. Hardware Component Breakdown - 3 x Nodes

Parallels / Microsoft License Components	Quantity
# Parallels Remote Application Server Users/Device	250
# of MS Virtual Desktop Access	250
# of MS System Center 2012 R2 CMS Client ML	250
# of MS Core Infrastructure Suite (CIS) Standard	5
# of MS SQL Server 2012 Standard Servers	1

Table 12. Component Breakdown - 3 x Nodes

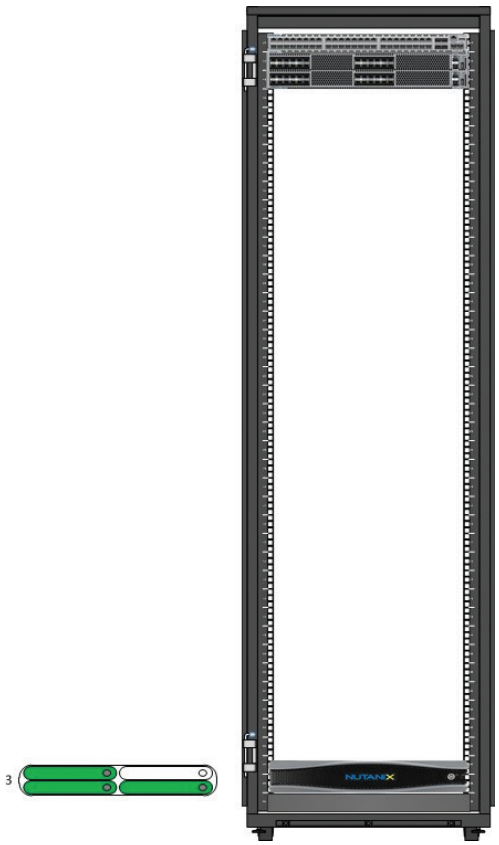


Figure 15. Rack Layout – 3 x Nodes

Scenario: 4 x Nodes (Full Block)

Hardware Components	Quantity	Infrastructure Components	Quantity
# of NX-3060 nodes (256 GB)	4	# of SCVMM servers	1
# of RU (Nutanix nodes)	2	# of Hyper-V hosts	4
# of 10GbE Ports	8	# of Hyper-V Clusters	1
# of 1GbE Ports (IPMI)	4	# of Nutanix Clusters	1
Total # of 10GbE Ports	8	# of Parallels Remote Application Server Sites	1
Total # of 1GbE Ports	4	# of HVD users	360
# of Arista 7150S-24 10GbE Switches	2	# of VDIs	360
# of Arista 7048T-A Switches	1		

Table 13. Hardware Component Breakdown - 4 x Nodes

Parallels / Microsoft License Components	Quantity
# Parallels Remote Application Server Users/Device	360
# of MS Virtual Desktop Access	360
# of MS System Center 2012 R2 CMS Client ML	360
# of MS Core Infrastructure Suite (CIS) Standard	5
# of MS SQL Server 2012 Standard Servers	1

Table 14. Component Breakdown - 4 x Nodes

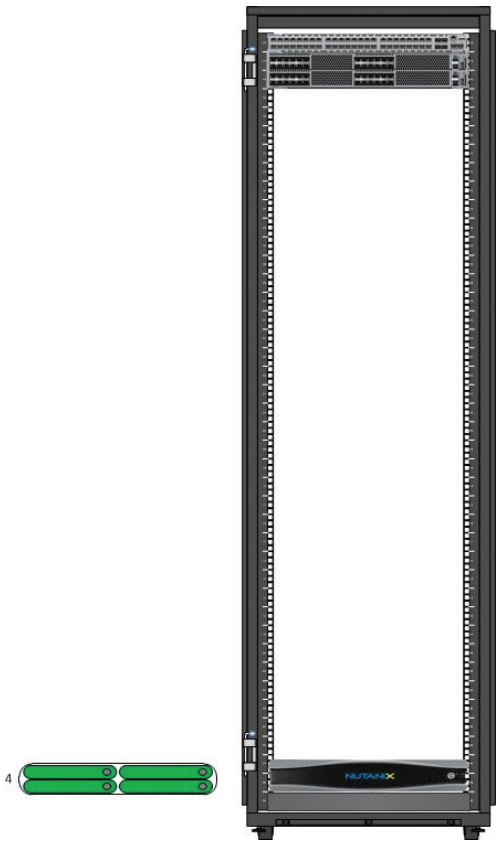


Figure 16. Rack Layout – 4 x Nodes

Scenario: 6 x Nodes (1½ Block)

Hardware Components	Quantity	Infrastructure Components	Quantity
# of NX-3060 nodes (256 GB)	4	# of SCVMM servers	1
# of RU (Nutanix nodes)	2	# of Hyper-V hosts	6
# of 10GbE Ports	8	# of Hyper-V Clusters	1
# of 1GbE Ports (IPMI)	4	# of Nutanix Clusters	1
Total # of 10GbE Ports	8	# of Parallels Remote Application Server Sites	1
Total # of 1GbE Ports	4	# of HVD users	580
# of Arista 7150S-24 10GbE Switches	2	# of VDIs	580
# of Arista 7048T-A Switches	1		

Table 15. Hardware Component Breakdown - 6 x Nodes

Parallels / Microsoft License Components	Quantity
# Parallels Remote Application Server Users/Device	580
# of MS Virtual Desktop Access	580
# of MS System Center 2012 R2 CMS Client ML	580
# of MS Core Infrastructure Suite (CIS) Standard	5
# of MS SQL Server 2012 Standard Servers	1

Table 16. Component Breakdown - 6 x Nodes

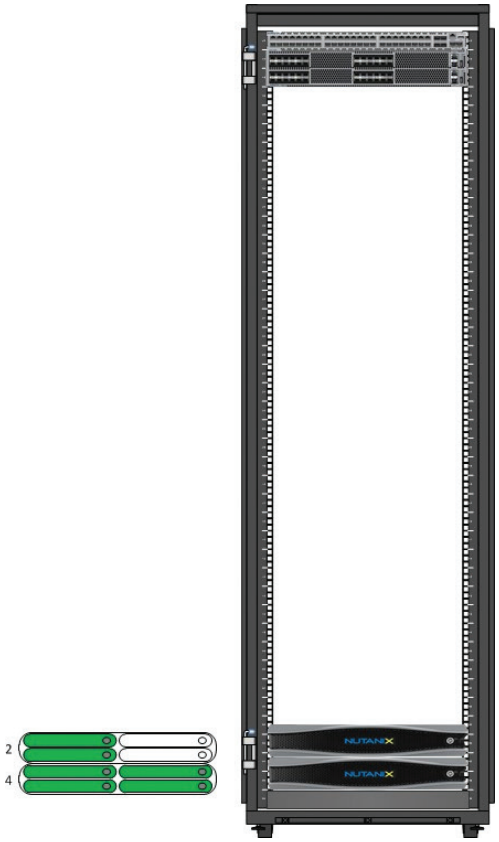


Figure 16. Rack Layout – 10 x Nodes

Solution at a Glance

This section defines the key decisions points and options offered by Parallels and Nutanix. The subsequent sections within this document provide the detailed configuration of each element.

Category	Design Decisions
Scalability	• The Nutanix Enterprise Cloud Platform can start with configurations for 100 users or so and scale to 10,000s of users with its Distributed File System underlying the converged compute and storage architecture. • Minimum number of nodes – three (3) Nutanix NX-3060 nodes (also referred to as NX-3360 with the second digit referring to the number of nodes within the 2RU chassis). Three nodes can support: 400 RDSHs and the supporting Parallels Remote Application Server components or • 250 HVDs and the supporting Hyper-V persistent Desktops.
Parallels Solution	• Parallels Remote Application Server v15 • Machine Creation Services workload delivery • Highly scalable and redundant Publishing Agent servers • Vertical scalability by increasing CPU/RAM resources or Horizontal scalability by adding Publishing Agent • VMs can be failed-over or live migrated within the Hyper-V hosts

Desktop Types	Persistent (or Dedicated) desktops • Hosted Shared Hosts(HSD) on Windows Server 2008/2012 R2 Standard • 8 vCPUs, 16 GB RAM, 100 GB disk, 1 vNIC • Horizontal scalability by deploying more VMs onto available hosts • Redundancy by overprovisioning desktop capacity • VMs can be failed-over or live migrated within the Hyper-V cluster(s) Hosted Virtual Desktops on Windows 7/8 &10 Enterprise SP1 x64 • 2 vCPUs, 2.0 GB RAM, 100 GB disk, 1 vNIC • Horizontal scalability by deploying more VMs onto available hosts • Redundancy by overprovisioning desktop capacity • VMs can be failed-over or live migrated within the Hyper-V cluster(s).
Hypervisors	Microsoft Server 2012 R2 (Windows Server 2012 R2 Datacenter with Server Core) • Clustered Hyper-V deployment managed via System Center Virtual • Machine Manager (VCENTER) • Hyper-V Failover Cluster allowing for Live Migration, HA, and other functions • Horizontal scalability by deploying additional individual server nodes • Recommendation: up to 24 Hyper-V nodes per cluster
Compute and Storage Hardware	• Nutanix NX-3060 node • Acropolis (NOS) Version 4.x or later • Dual-socket Intel 10-core Xeon E5-2680v2 processors @ 2.8Ghz • RAM nodes for RDSH workloads • 256 GB RAM nodes for HVD workloads • Nutanix CVM with its Distributed File System presenting SMB3 volume to the Hyper-V nodes within the cluster • Disk storage and storage controller (CVM) redundancy • Storage tiering and deduplication provided by Nutanix CVM • Storage is presented as a local share by the Nutanix CVM – no external SAN or NAS is utilized • Multiple NX-3060 nodes within a Nutanix cluster with all nodes accessing a single Storage Pool. Storage performance is scaled out as more Nutanix nodes are added.
Networking and Related Hardware	• DNS round robin will be utilized to load balance the Parallels High Availability Load Balancer servers • Pair of Arista 7150S-24 10GbE 24-port ToR switches is required to interconnect the nodes; alternatively, customer can leverage existing • 10GbE switching fabric. Refer to Appendix for Network Requirements. • Customer can leverage existing 1GbE network switches to integrate the IPMI node management NICs into their environment. Alternatively, an Arista 7048T-A 100/1000 Mbps switch can be procured. Refer to Appendix for Network Requirements.
File Storage	Windows File Server VM with DFS solution • File Server to support user profile data only up to 1 GB per user for maximum of 1,000 users. Capability to support more users, however File Server virtual disks capacity would need to be adjusted. • Additional storage requirements will require scale-out of the Windows file server solution or scale-up by provisioning the Windows file servers with larger capacity virtual hard drives

Applications	• Baseline applications installed as per the SOE (Tier-1) • Integration and deployment of Line of Business (LoB) or customer-specific applications (Tier-2) would need to be catered for. Additional services and infrastructure may be required.
Access	• Redundant Parallels HALB servers with DNS round robin for simplicity and low cost. Recommendation to leverage Citrix NetScaler® HA appliances as the environment is scaled-out. • Additional load balancing capability can be used via Citrix NetScaler appliances • Vertical scalability to High Availability Load Balancer (HALB)/Firewall servers by increasing CPU/RAM resources Remote Application solution, i.e., in the form of Availability Load Balancer (HALB)/Firewall servers or other, is out of scope and would need to be factored in, if required.
Availability/Redundancy	• Assumes single datacenter (physical location) only • Publishing Agent – redundant servers (N+1 VMs placed on different hosts) • Hyper-V hosts – fail-over cluster with up to 24 hosts per cluster, with capability for VM Live Migration and HA; overprovision capacity by having N+1 servers • Hyper-V NICs – active/active NIC teaming • SQL 2012 DB Servers – redundant servers (N+1 VMs placed on different hosts) • If vCenter server is unavailable, power functions of the VMs are not affected. • All VMs that are running will continue to run, any connected user will notice no service disruption. • Any user who tries to connect to a session will succeed. • Power functions can still be managed manually from the local console if needed. • Windows Filer Services – redundant servers (N+1 VMs placed on different hosts). DFS-N in active/passive setup for user profile data • Windows DHCP Services – redundant servers (N+1 VMs placed on different hosts) • Storage – Data redundancy, performance, data protection and storage tiering capabilities managed by the Nutanix CVM. • Arista Network Switches – redundant configuration, N+1 setup

SECTION 2 - SOLUTION

User Layer Design

User Topology

This design is focused on the delivery of Publishing Agent Persistent Virtual Desktops using Parallels Remote Application Server as discussed in the section.

There are a number of classifications that can be used to define a user's role within an organization and determine the most appropriate virtual desktop type that is best suited for a customer's environment and circumstances.

Access Layer Design

The Access Layer explains how a user group will connect to their assigned virtual desktop. User location, connectivity, and security requirements play a critical role in defining how users authenticate Citrix®. Parallels HALB provides a unified

application and desktop aggregation point. Users can access their desktop through a standard web browser using the Parallels Remote Application Server Web Portal and client access.

The key design decisions for the Access Layer are as follows:

Decision Point	Description/Decision
Version/Edition	Web Portal and Client access version v15
Authentication Point	Active Directory
Security	A server certificate will be installed to secure authentication traffic: • HTTPS will be required for all web sites, ensuring that users' credentials are encrypted as they traverse the network.

Table 17: Web Portal and Client Configuration.

Web Portal & Gateway Configuration. A master Publishing Agent will be created to provide the required access and enumeration of the RDSH or HVD desktops. The Web Portal and Gateway servers will be added into a single server group, providing additional capacity and increasing availability. A server Group provides a unified configuration and synchronization of user settings.

Desktop Layer Design

The desktop layer focuses on the design considerations for the user's desktop, which must provide them with the right set of applications, capabilities, and resources based on their needs.

Each of the virtual desktops within the Parallels Remote Application Server Solution represents a true-to-production configuration consisting of a core set of applications that are pre-installed as part of the virtual desktop "master image."

Each of the virtual desktops, Windows 7/8 or 10 or Windows Server 2008/2012 R2 RDS (Remote Desktop Services), requires Persistent Desktops created in Hyper-V level and access will be coordinated by Parallels.

Applications

Parallels Remote Application Server Solution was tested:

- Microsoft Office Suite
- Calculator
- WordPad
- File Explorer
- Printing

Virtual Machine Specifications	Descriptions/Decision
Storage	100 GB
Page File	Fixed 16 GB
Network Interface	Single virtual card
Memory	16 GB Memory allocated
vCPU	8 (VM)
Operating System	Windows Server 2008 R2 or Windows Server 2012 R2

Table 18. Remote Desktop/Terminal Server VMs Configuration

Publishing Agent Design

The Publishing Agent provides the design decisions for the underlying infrastructure supporting the virtual desktop layer.

The Publishing Agent design is unique per data center and subdivided into the following components:

- Infrastructure
- Desktop Publishing Agent Microsoft Hyper-V
- Access Controllers (Web Portals)
- Gateways
- High Availability Load Balancer

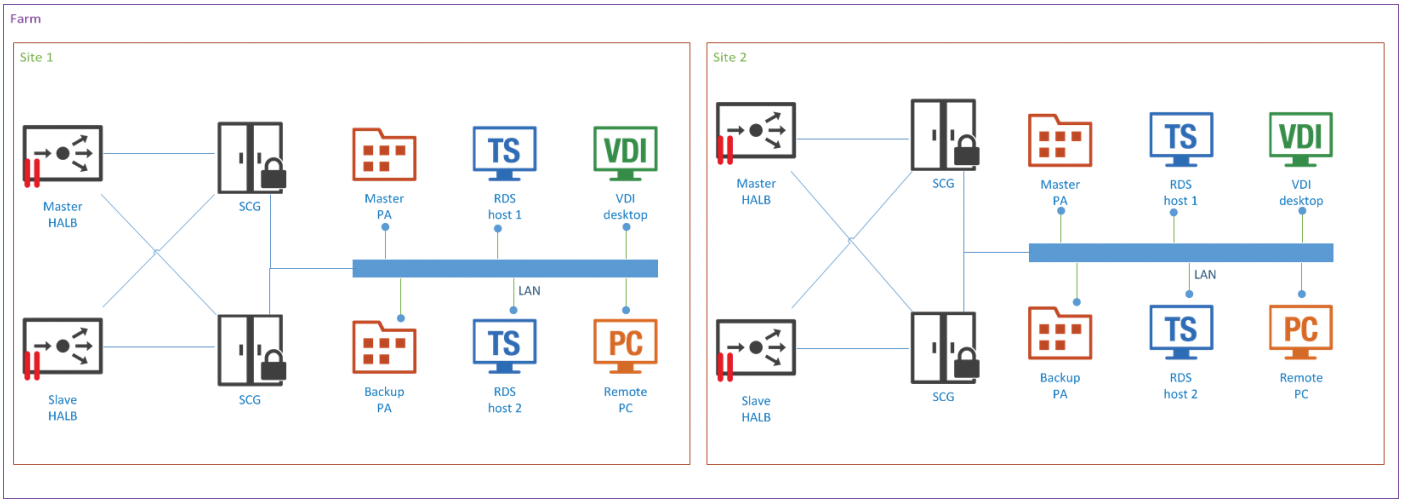


Figure 18. Publishing Agent Logical View

Infrastructure

The SQL Server database used in Parallels Remote Application Server today is an optional component for reporting and statistics. The database should be installed and configured in a different server.

D:\ 100 (Databases) (Example)
Category
SQL Version Microsoft SQL Server 2012 Standard Edition SP1 (used at the time of testing)
Number of Servers 1
Server O/S Microsoft Windows Server 2012 R2 Standard Edition
CPU Allocation 2 vCPU (Example)
RAM Allocation 8 GB (Example)
Storage Allocation C:\ 100
D:\ 100 (Databases) (Example)

Table 19: Database Summary

Active Directory

This Parallels Solution has a requirement to use Microsoft Active Directory Domain Services, and as such, it is an assumption that such an environment already exists within the customer's environment. The decisions discussed below describe requirements from the existing Active Directory in the form of Organizational Units and Group Policy Objects.

Supplementary requirements must also be met to ensure sufficient capacity from authenticating Domain Controllers can service any additional requirements or load placed on the system by adding further Users, Groups, machine Objects and policy processing load. DECISION POINT

Category	Decision/Description
Group Policy Application	Each infrastructure server role will have a minimum security baseline applied (MSB) via GPO
	All RDS workloads will have a minimum security baseline applied (MSB) via GPO
	Windows 7/8 &10 workloads will have a minimum security baseline applied (MSB) via GPO
	RDS workloads will have a Machine GPO applied specific to their application delivery requirements. This GPO may have Loopback mode enabled to apply user based settings at the RDS workload OU level
	Windows 7/8 &10 workloads will have a Machine GPO applied specific to their application delivery requirements. This GPO may have Loopback mode enabled to apply user based settings at the machine workload OU level
	User based policies may be applied at the user or machine level using the loopback mode
	Infrastructure servers such as Hyper-V hosts will be deployed in relevant OUs and MSBs applied appropriate to their role.

Table 20: Active Directory Requirements

Access Controllers (Web Portals)

Parallels Remote Application Server Web Portal is an easy and secure way to publish hosted applications, desktops, and services to remote users using a web-based portal. You can organize information and customize the portal to provide the required applications. The interface is intuitive and highly customizable.

Companies can apply their branding to each screen of the web portal; administrators can customize by changing company name, placing their logo or a banner, and defining a color theme. It is also possible to customize the welcome message and the URL that users follow to access the customized portal.

Category	Design Decisions
Server O/S	Windows Server 2012 R2 Standard Edition
Servers per site	2
CPU Allocation	2 vCPUs
RAM Allocation	4 GB
Storage	C:\100 GB
Access Method	Internal
Load Balancing	DNS Round Robin

Table 21: Web Portal Summary

Access Controllers (Gateway)

The Parallels Remote Application Server Secure Gateway tunnels all the Parallels Remote Application Server data on a single port. It also provides secure connections and is the user connection point to Parallels Remote Application Server.

By default, the Remote Application Server Secure Gateway is installed on the same server where Parallels Remote Application Server is installed. You can add additional Secure Client Gateways in a site to support more users, load balance connections, and provide redundancy.

Category	Design Decisions
Server O/S	Windows Server 2012 R2 Standard Edition
Servers per site	2
CPU Allocation	2 vCPUs
RAM Allocation	4 GB
Storage	C:\100 GB
Access Method	Internal
Load Balancing	DNS Round Robin

Table 22. Parallels Remote Application Server Gateway VM configuration

Access Controllers (High Availability Load Balancer)

HALB is a software solution that sits between the user and the Remote Application Server gateways. Many HALB services can run simultaneously, one acting as the master and the others as slaves. The higher the number of HALB services available, the lower the probability that users will experience downtime. The master and slave appliances share a common or virtual IP, also known as VIP. Should the master HALB service fail, a slave is promoted to master and takes its place seamlessly.

Category	Design Decisions
Server O/S	Windows Server 2012 R2 Standard Edition
Servers per site	2
CPU Allocation	2 vCPUs
RAM Allocation	4 GB
Storage	C:\100 GB
Access Method	External

Table 23. Parallels Remote Application Server Gateway VM configuration

Hypervisor Layer

Microsoft Hyper-V Server 2012 R2 Edition will be deployed to each Nutanix NX-3060 node. Hyper-V will provide the hypervisor hosting platform to the virtualized desktop and infrastructure server instances.

For Hyper-V deployments, Microsoft System Center Virtual Machine Manager (VMM) will be leveraged to provide the VM operations and management interface to Hyper-V. VMM will also provide the integration interface between Parallels components.

The figure below depicts the relationship between the Nutanix Enterprise Cloud Platform and the Hypervisor.

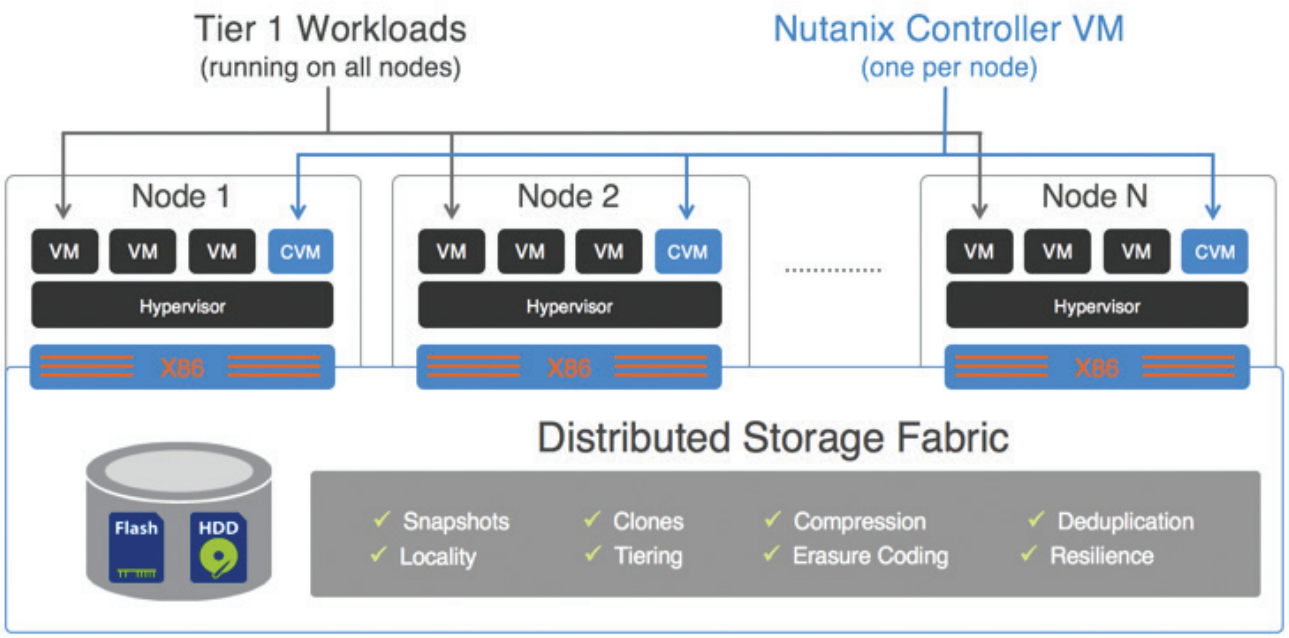


Figure 19. Hyper-V Host Deployment

Microsoft Server 2012 R2 Overview

The Illustration below depicts the physical components logically connected between a single Nutanix NX-3060 node, the Microsoft Hyper-V 2012 R2 hypervisor, local storage and associated switching infrastructure:

- Network. 2 x 10 GB On-board Ethernet Adapter for the hypervisor
- Management. 1 x 100/1000Mbps On-board Ethernet Adapter for IPMI Management
- Network Teaming. 1 x Network Team created consisting of 2 x Physical Network adapters (pNIC).
- Team A. All traffic types including Host Management, Infrastructure VMs, and Workload VMs (pNIC 1 + pNIC2)

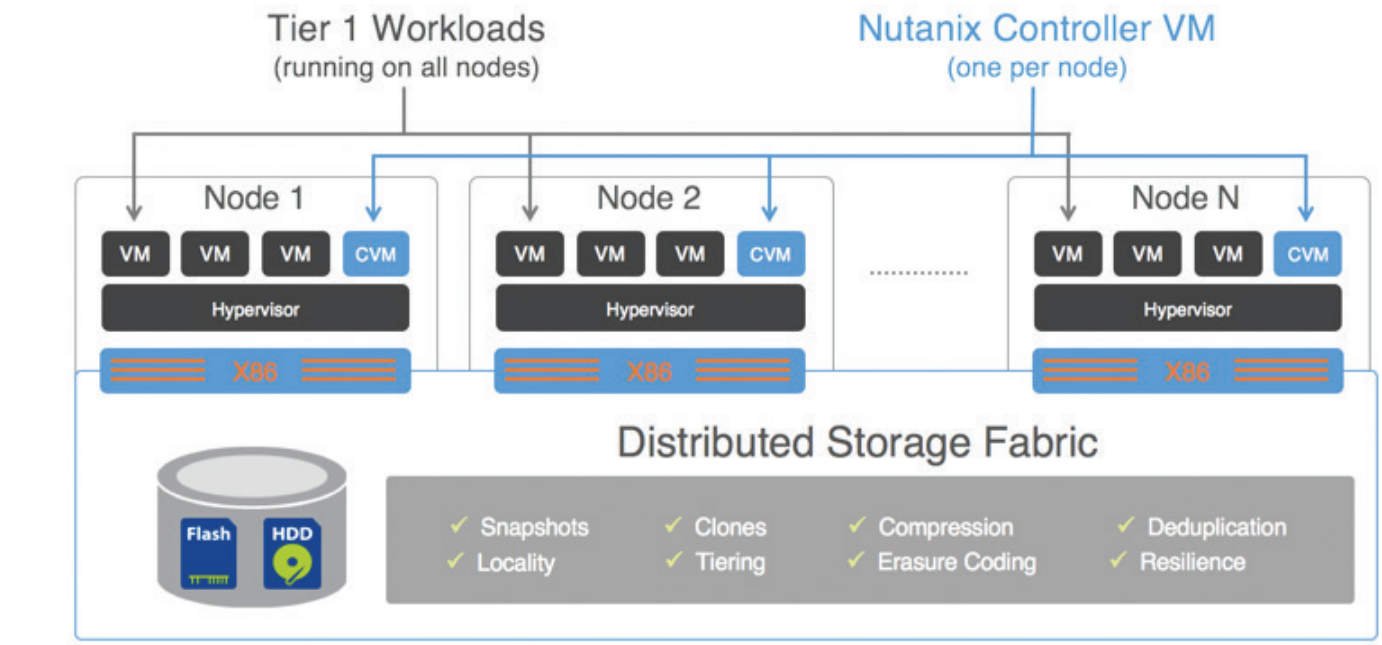


Figure 20. RDSH Hyper-V Host

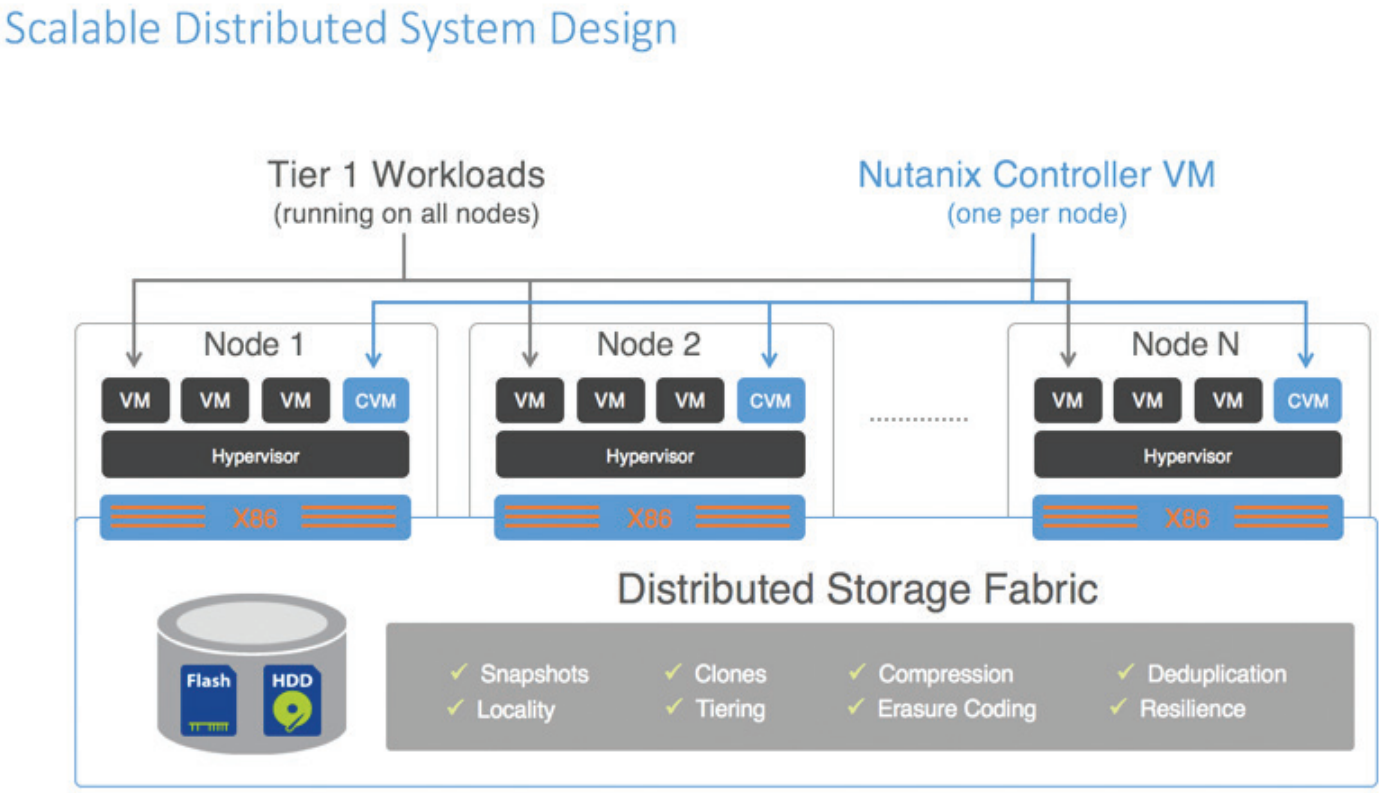


Figure 21. HVD Hyper-V Host

Network Layer

Overview

Arista Networks' switches and network operating system are designed from the ground up for reliable, economic data center operations. Providing the industry's leading port density, lowest latency, and first extensible operating system, Arista switches scale seamlessly to meet application and storage demands. Standards-based layer 2 and layer 3 multi-pathing technologies provide an increase in scalable bandwidth and HA that is transparent to both users and applications.

Combining Arista Networks switches with Nutanix Enterprise Cloud Platform provides the perfect platform for Parallels Remote Application Server workloads. The dynamic buffer allocation of the Arista 7150S-24 provides packet memory to congested interfaces on demand as load dictates and helps to avoid packet loss. The Arista 7150S-24 additionally provides low latency and a suite of advanced traffic control and monitoring features to improve the agility of modern high performance environments. With enhanced microburst and latency analysis, visibility at even the slightest transient congestion at microsecond granularity is possible.

Scalable Network Design

Arista Networks' Software Driven Cloud Network designs provide unprecedented scalability, performance, and density without proprietary protocols, lock-ins, or forklift upgrades. The network design for Parallels Remote Application Server on Nutanix is very simple, yet may scale out to support thousands, or tens of thousands, of Hosted Virtual or Shared Desktop deployments.

A single tier, "Spline" network design is utilized for this deployment. This single tier scale is determined by the number of interfaces available in the top of rack switch selected. This design includes a 24-port 10GbE switch. A Spline design, with the various Arista switch models available, could potentially scale up to provide 10GbE connectivity for up to 2,000 Nutanix nodes within a single tier of two Arista switches. A Spline design is inherently non-oversubscribed with a 1:1 contention ratio between compute and storage nodes.

Starting with a 24-port 10GbE switch and scaling out in the future is also possible. By converting the Spline design to a 2-tier, Spine/Leaf design, the network design can scale out while maintaining minimal to zero oversubscription to support tens of thousands of Hosted Virtual and Shared Hosts on Nutanix Virtual Platform nodes.

The Arista cloud network designs are illustrated below:

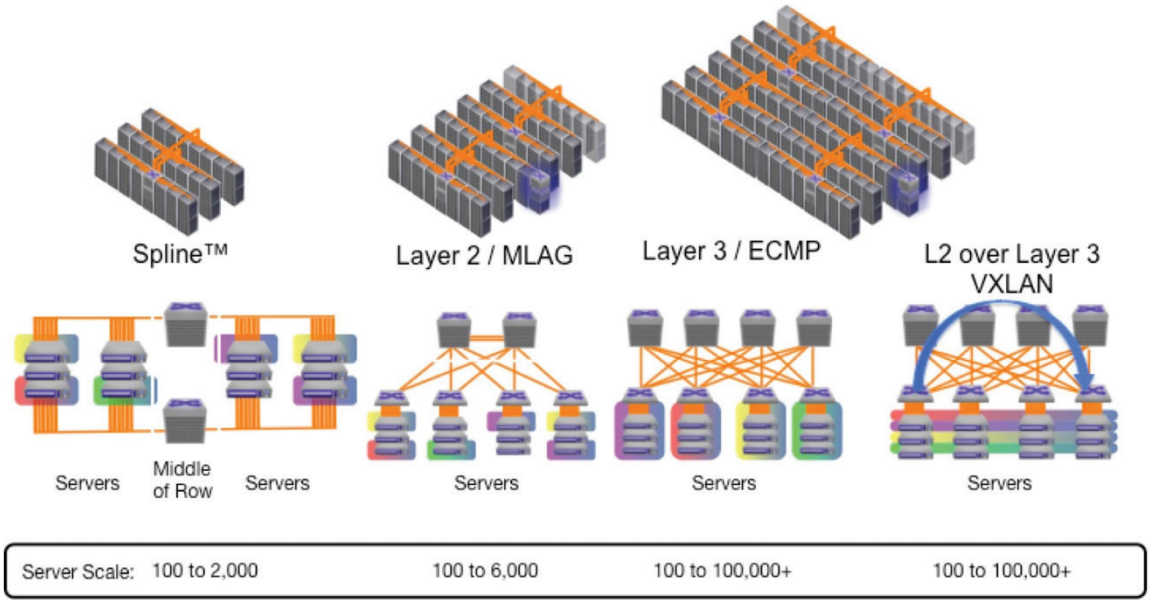


Figure 22. Arista Networks Design

Multi Chassis Link Aggregation

Modern infrastructure should be able to run active/active. Multi Chassis Link Aggregation (MLAG) at layer 2 and Equal Cost Multi-Pathing (ECMP) at layer 3 enables infrastructure to be built as active/active with no ports blocked so that networks can use all the links available between any two devices. In this design, MLAG is utilized to provide a redundant connection to the IPMI switch and may also be utilized to provide upstream network connectivity to core or edge network services.

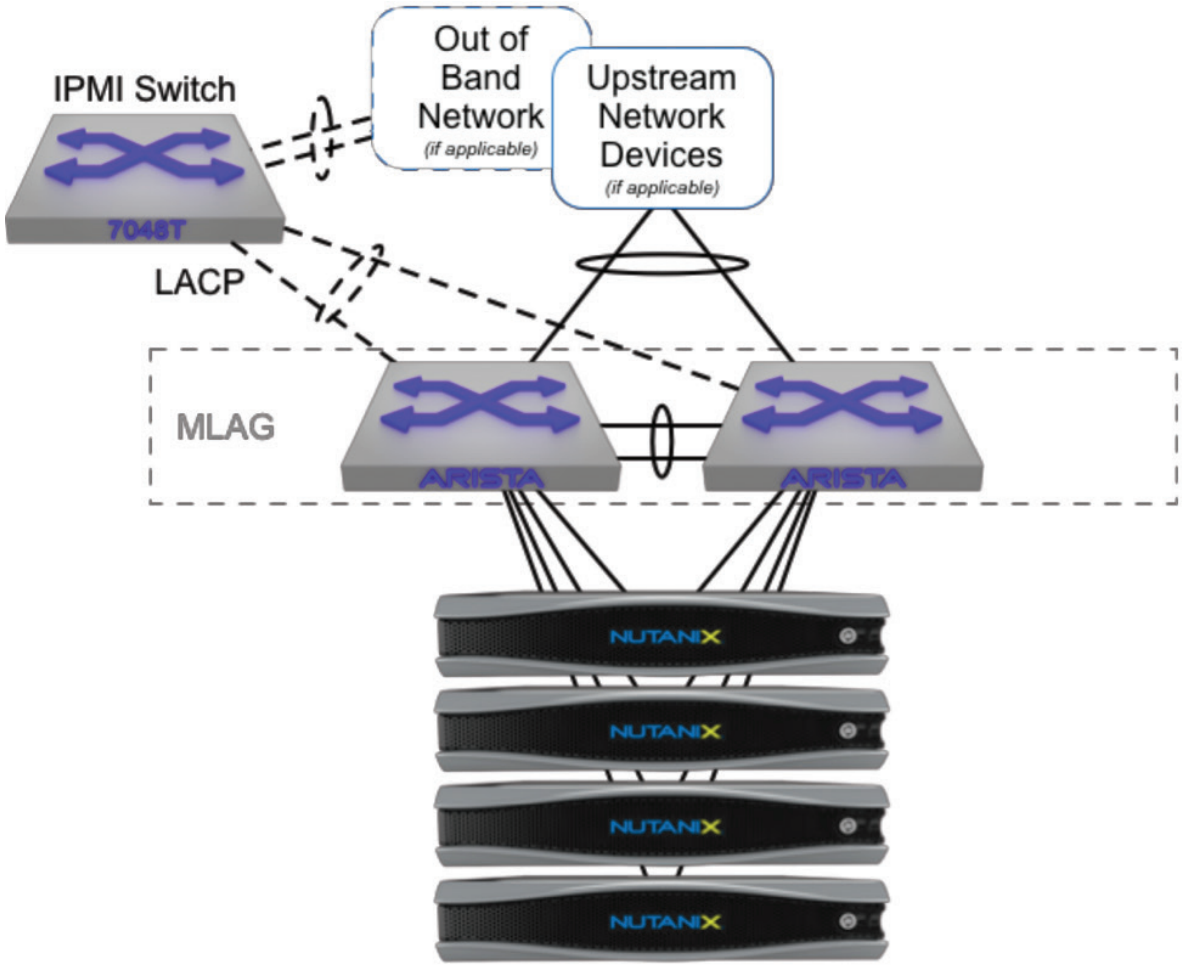


Figure 23. Sample Arista Networks MLAG Topology

Connectivity Design

Microsoft Hyper-V NIC teaming is available in two modes: switch independent and switch dependent.

- With a simple port-channel configuration between the Arista top of rack switches, Hyper-V may operate in switch independent NIC teaming mode..
- In switch independent mode, Hyper-V controls the switching intelligence to provide network redundancy and forwarding on all upstream links to the Arista switches.
- Should LACP be required from Hyper-V, MLAG configuration is available on the Arista switch platform as described above.

The Arista 7048T-A switch provides console management connectivity from the Nutanix nodes. The Nutanix Intelligent Platform Management Interface (IPMI) allows administrators out of band access to the Nutanix nodes. Through this interface, administrators have power control, console access, and the ability to attach and remove devices to each node within the Nutanix block.

DHCP

Category	Description
Version/Edition	Windows Server 2012 R2 DHCP Role enabled
Servers	If the customer does not have a suitable redundant DHCP service available, the two File servers described in this design may have the DHCP Role enabled.
(IPv4 & IPV6 Options) Failover	Failover Enabled

Windows File Services

This Parallels Solution has a dependency for Windows SMB file shares to host User Profile data for each of the pooled or shared virtual desktop types discussed in this document.

Resiliency within this architecture is provided by Hyper-V failover clustering and utilization of redundant components. E.g., if a single component fails there will be sufficient capability within the environment to allow end users to continue normal operations with minimal or no interruption to the business or their daily routine.

This section discusses design considerations to deploy two Microsoft Server 2012 R2 file servers. These file servers are intended to provide a redundant active/passive platform to host the file shares required to support the User Profile data of a single pod.

The illustration below describes the conceptual architecture:

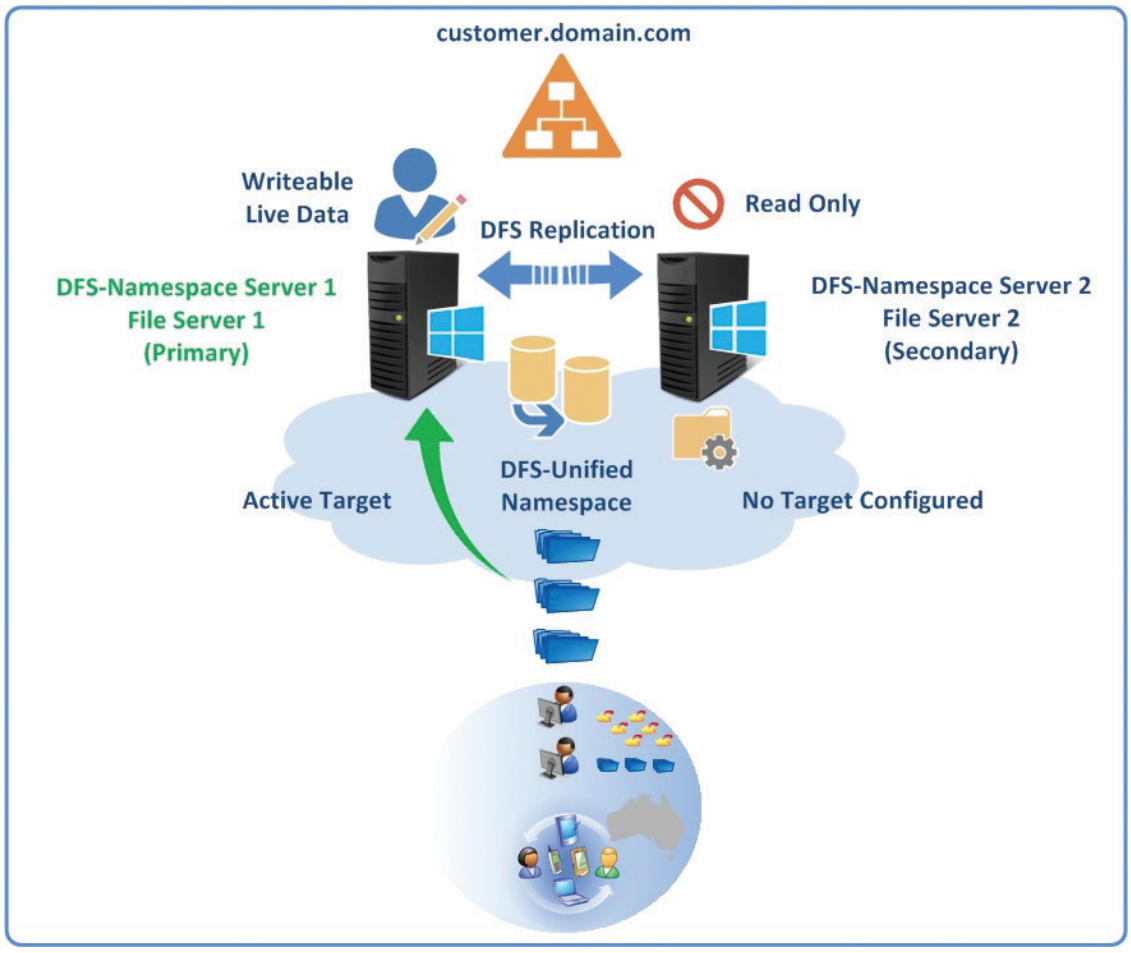


Figure 23. Sample Arista Networks MLAG Topology

The architecture is based on two file servers using DFS (Distributed File System) Namespaces to provide a unified share name, utilizing DFS Replication to replicate data from the primary file server to the secondary (read only) file server.

Manual intervention will be required to activate the secondary read only file server; however, testing has shown that downtime is minimal based on the applications tested.

This supported configuration is documented in the following Microsoft articles and should be used as a reference point:

- http://support.microsoft.com/kb/2533009
- http://blogs.technet.com/b/askds/archive/2010/09/01/microsoft-s-support-statement-around-replicated-user-profile-data.aspx

Note: At no point will the active primary file server be configured with secondary DFS targets. In the event of a failure or maintenance, manual steps are required to add the secondary file server targets; this is documented in the above articles.

Both file servers will be configured identically; if the primary server is failed over to the secondary server for maintenance, then the secondary server becomes the primary server from that point onward.

In the event of system maintenance, system failure, or any other event that requires downtime of the primary file server, the existing target links are removed and replaced with targets that point to the secondary file server; DFS Replication keeps both targets synchronized at all times. The secondary server is always configured as a read only copy to avoid unwanted writes to the data.

The illustration below described this configuration after a failover event occurs:

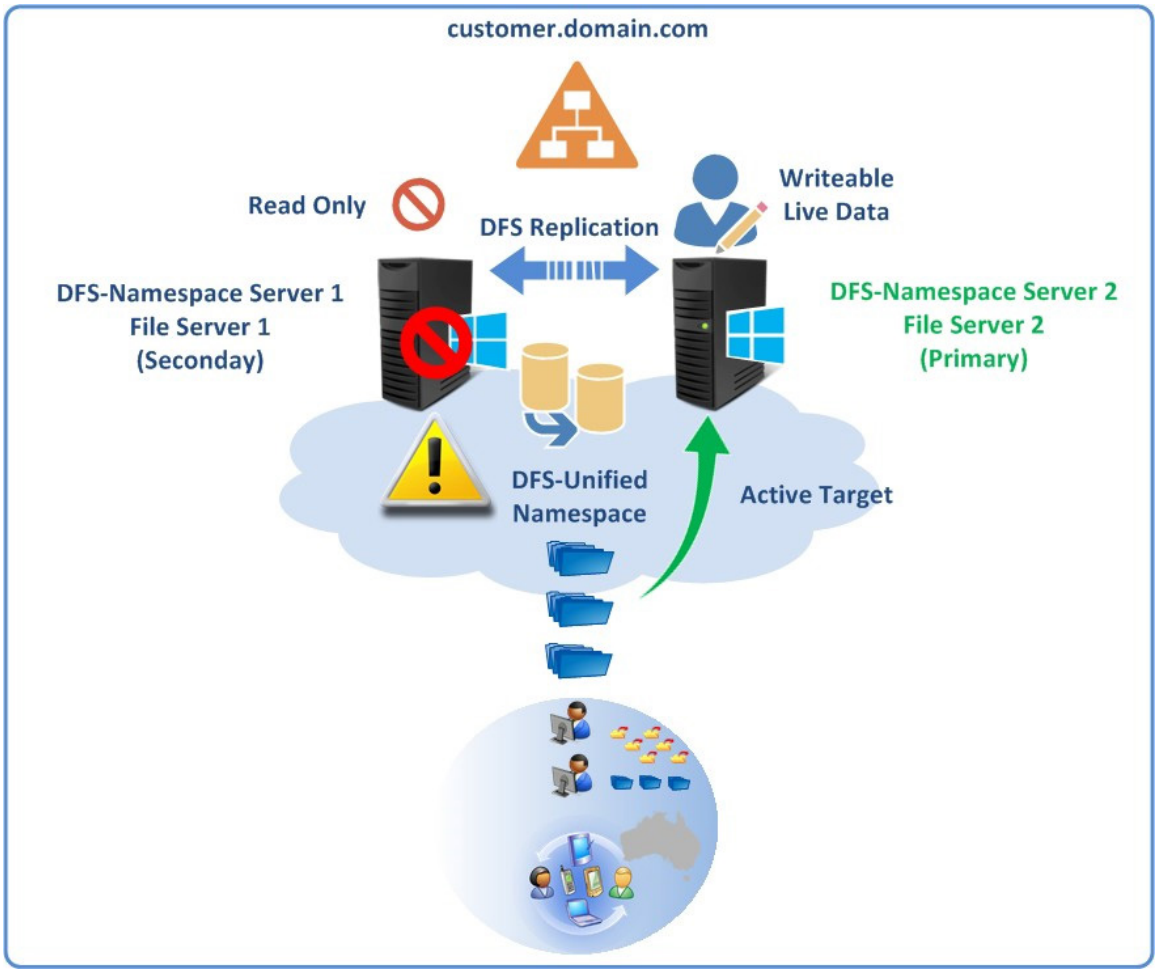


Figure 24. File Services – DFS Failover Configuration

File Servers

Category	Description
File Servers	File Server 1 File Server 2
Servers OS	Microsoft Windows Server 2012 R2 Standard Edition
CPU Allocation	2 vCPU
RAM	8 GB
Storage allocation per user	OS: 60 GB Users: 1 TB (for all users combined)

Table 24: File Server Configuration

DFS-Namespace

Category	• Description
File Server Redundancy	• Active/Passive deployment of File Services to support User • Profile data
DFS Namespace Servers	• File Server 1 • File Server 2 Domain Based: • Windows Server 2008 mode • Name: customer.domain.com\ProfileData (Example) • Path: \\File-Server1\ProfileData • Path: \\File-Server2\ProfileData • Referral Status: Enabled
DFS Targets	For RDSH: (Example Path names shown) Name: HSD-UPM • Path: \\File-Server1\HSD-UPM (D:\HSD-UPM,) Name: HSD-UserData • Description: Redirected profile folders, User Data For HVD: (Example Path names shown) Name: HVD-UPM • Path: \\File-Server1\HVD-UPM (D:\HVD-UPM,) Name: HVD-UserData • Description: Redirected profile folders, User Data •Path: \\File-Server1\ HVD-UserData

Table 25: DFS Namespace Configuration

SECTION 3: APPENDICES

Appendix A. Further Decision Points

This section defines elements of the Parallels Remote Application Server Solution which need further discussion with the customer and are customer-specific:

Decision Point	Decision/Description
Naming Convention	• Component nomenclature will need to be defined by the customer during the Analysis phase of the project

Database Information	• Microsoft SQL Version • Server name • Instance name • Port • Database name • Resource Capacity (CPU Memory Storage)
Microsoft Volume Licensing	Microsoft licensing of the target devices is a requirement for Parallels Remote Application Server Solution and will be based on the customer's existing Microsoft licensing agreement.
Microsoft RDS Licensing (Terminal Server CALS)	At least two Microsoft RDS License servers should be defined when using RDS workloads within the customer environment including the mode of operation: • Per user • Per device Once defined these configuration items will be deployed via Active Directory GPO.
Windows Pagefile	The final applications used and workload usage patterns required by the customer will influence the decision for the requirements and sizing of the Windows Pagefile. Further customer validation may be required, dependent on the sizing of the Pagefile and its associated storage footprint.
User Logon	The Active Directory Forest and domain will need to be discussed with the Customer to ensure sufficient capacity exists to support any additional authentication requirements the proposed solution may impose.
Active Directory Domain services	Group Policy is likely to be deployed to suit the requirements of the customer. Assuming the existing deployment meets best practices, the GPOs described within this Parallels Solution can be integrated into the customer environment or configurations may be added directly to existing GPOs. Reference to Minimum Security Baselines in the form of GPOs will be the customer's responsibility. GPOs described in this document in all cases must be integrated into the customer existing Active Directory.

Table 26: Further Decision Points

Appendix B. Network Switch Requirements

This section defines the network port requirements based on the number of Nutanix NX-3060 nodes that will be deployed.

To support IPMI/host management network, existing 100/1000 Mbps network switching infrastructure can be utilized to further minimize the integration and hardware acquisition costs associated with deploying this solution provided the following requirements are considered.

Switch Requirements

Requirements	Minimum Recommendation	Comments
10GbE NIC Ports	2 ports per Node	Hyper-V network traffic. Refer to the below Network Port Density Table for the scale out model
100/1000 Mbps	1 port per Node	IPMI host management traffic. Refer to the below Network Port Density Table for the scale out model
VLAN Support	802.1Q tagging	Capability to create VLANs
Stacking or Redundant Capabilities	Yes	Switches should be redundant
Uplink to Core or Upstream Switching	10GbE Uplink	Sufficient upstream bandwidth to Core network

Table 27: Network Requirements

Network Port Density

The below table defines the NIC Port density requirements with respect to the number of Nutanix NX-3060 nodes from a scale-out perspective, using 10 nodes[29] as an example.

Configuration	Value							
Number of RDSH / HVD Users								
# of RDSH Users	400	600	800	1,000	1,200	1,400	1,600	1,800
# of HVD Users	250	360	470	580	690	800	910	1,020
Hardware Specifics								
# of Nutanix NX-3060 Nodes	3	4	5	6	7	8	9	7
# of 10GbE Ports (Hyper-V)	6	8	10	12	14	16	18	20
# of 100/1000 Mbps Ports (IPMI)	3	4	5	6	7	8	9	10

Table 28: 10GbE and 100/1000 Mbps NIC Port Requirements

Appendix C. Nutanix NX-3000 Series Specifications

As per the information available from http://vv'\ivvv.nutanix.com/the-nutanix-solutionltech-specs/ for more information on every model (NX-1000, NX-3000, NX-6000 and NX-7000 series)

http://go.nutanix.com/rs/nutanix/images/Nutanix_Spec_Sheet.pdf

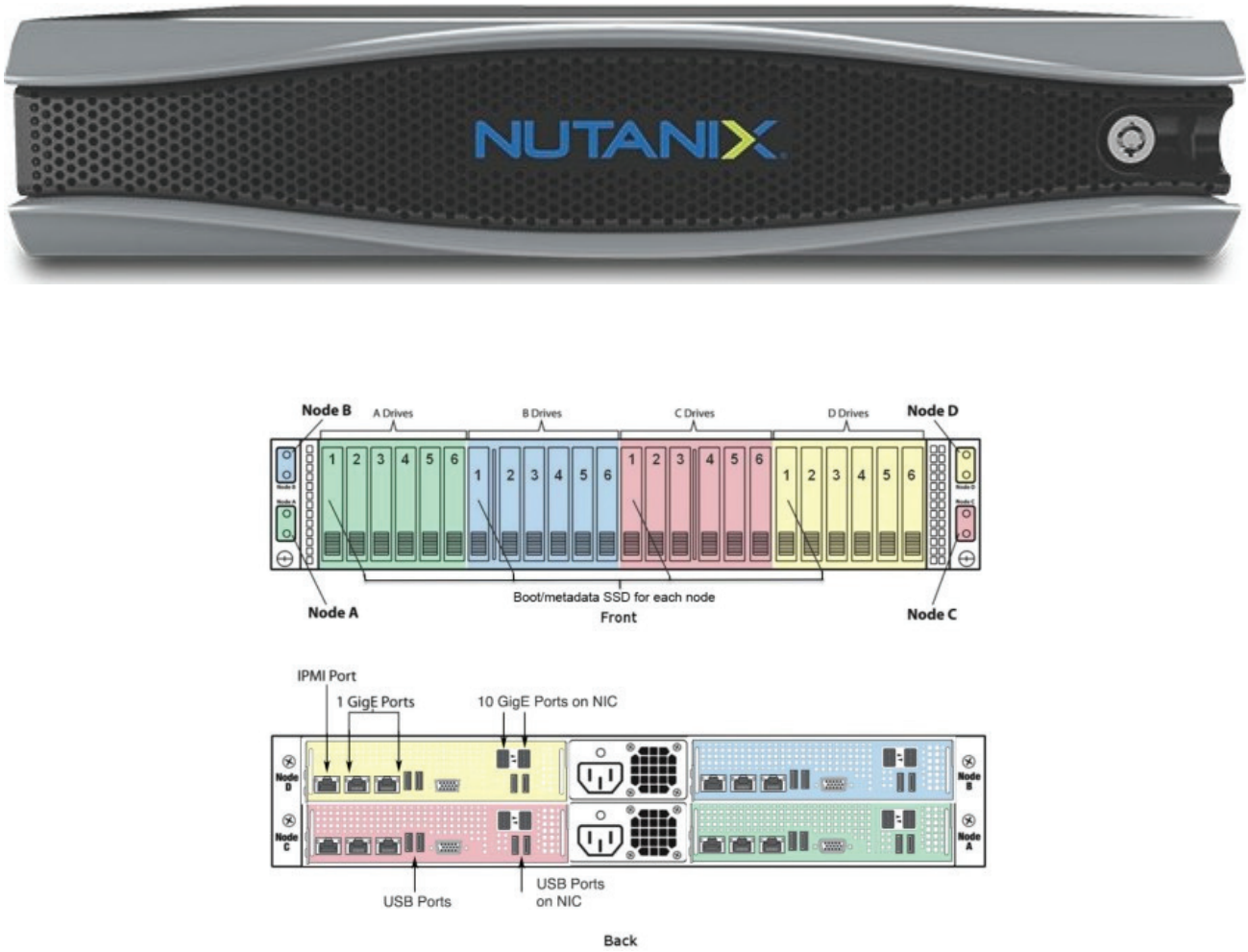


Figure 25. Nutanix NX-3000 Front and Rear View of Chassis depicting Nodes 1 to 4 (Nodes A to D)

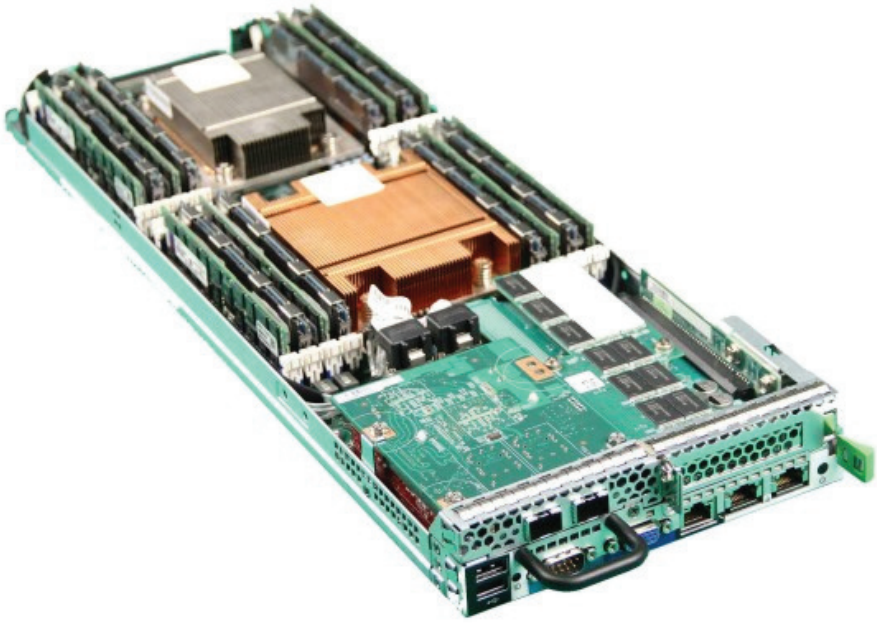


Figure 26. Nutanix NX-3000 Series Node – Physical View

Appendix D. Arista Networks Switch Specifications

Arista 7150S Series

The Arista 7150S series represents the industry's leading ultra-low latency 1RU 1/10/40GbE layer 2/3/4 wire speed switch family, offering a unique combination of performance, advanced functionality and extensive on-board resources.

Designed to suit the requirements of demanding environments such as ultra-low latency financial ECNs, HPC clusters and cloud data centers, the class-leading deterministic latency from 350ns is coupled with a set of advanced tools for monitoring and controlling mission critical environments.

Feature and benefits of the 7150S series

- Dynamic Buffer Allocation – Packet memory is dynamically allocated on demand to congested interfaces, to avoid packet loss. Packet buffering is important when a microburst or transient in-cast condition causes contention of an egress interface
- Latency and Application Analysis (LANZ) – Detect, capture, stream microbursts and transient congestion at microsecond rates
- Advanced Multi-port Mirroring – Avoid costly SPAN/TAP aggregators with in-switch capturing, filtering and time-stamping
- Wire-speed VXLAN Gateway – Enabling next generation data center virtualization
- Wire-speed Low Latency NAT – Reduce NAT latency by 10s of microseconds vs traditional high latency solutions
- IEEE 1588 Precision Time Protocol (PTP) – Provides hardware-based timing for accurate in- band time distribution with nanosecond accuracy
- Agile Ports – Adapt from 10GbE to 40GbE without costly upgrades. Configure 4x10GbE into a single 40GbE interface for connection to native 40GbE interfaces

Arista 7048T-A

The Arista 7048 switch offers unmatched performance for high-density data center deployments. With 48 100/1000BASE-T and four 1/10GbE SFP+ ports, the switch delivers a non-blocking design with 40 Gbps of uplink bandwidth. The 7048 switch forwards at layer 2/3/4 with low latency at wire speed. Redundant power and cooling options along with a robust software architecture provide the foundation for a data center class product. The switch comes with both front-to-back and back- to- front airflow options for energy efficiency. All SFP+ ports accommodate a full range of 10GbE Twinax copper cables and optical 1/10GbE transceivers.

Configuration	7048
Product – Front View	
Ports	48 x 100/1000Base-T RJ-45 4 x 1/10GbE SFP+
Throughput	176Gbps
Packets/Second	132 Mpps
Latency (64 byte frame)	3 sec
Packet Buffer Memory	768MB
100/1000 Management Ports	1
Hot-swap Power Supplies	2 (1+1 redundant)
Hot-swappable Fans	4 (N+1 redundant)
Reversible Airflow Option	Yes
Typical / Max Power Draw	174 / 212 W

Appendix E. References

Parallels

Information	URL
Parallels Remote Application Server	http://www.parallels.com/products/ras/remote-application-server/
Parallels Remote Application Server download	http://www.parallels.com/products/ras/download/server/
Parallels Remote Application Server client download	http://www.parallels.com/products/ras/download/client/

Arista

Information	URL
Arista 7150S	http://www.arista.com/assets/data/pdf/Datasheets/7150S_Datasheet.pdf
Arista 7048T-A	http://www.arista.com/assets/data/pdf/Datasheets/7048T-A_DataSheet.pdf
Arista EOS	http://www.arista.com/assets/data/pdf/EOSWhitepaper.pdf
Cloud Networking Designs	http://go.arista.com/l/12022/2013-11-05/jt893/12022/97352/Arista_Cloud_Networks.pdf
Software Driven Cloud Networks	http://go.arista.com/l/12022/2012-03-08/qz2/12022/1411/SDCNWhitepaper.pdf
MLAG Configuration	https://eos.arista.com/mlag-basic-configuration/
VXLAN	http://go.arista.com/l/12022/2012-07-25/31s92/12022/32531/VXLAN_white_paper_revised_August_2012.pdf

Nutanix

Information	URL
Nutanix Product Info	http://www.nutanix.com/resources/product-info/#nav
Nutanix Tech Note - Performance	http://go.nutanix.com/TechNoteNutanixPerformance_LP.html
Nutanix Tech Note - Shadow Clone	http://go.nutanix.com/TechGuide-Nutanix-ShadowClones_LP.html
Nutanix Tech Note - System Scalability	http://go.nutanix.com/TechNoteNutanixSystemScalbility_LP.html