Please note: This is just one potential solution for the scenario in order to help guide students and encourage class discussion. Other working designs are feasible and would likely be considered and decided upon by the various stakeholders.

Achieving the Best in Children School District

Desktop Transformation Project



Detailed Design Document

Date

Prepared by:

Project Lead

Title

Company

# Project Overview

## Case Org Ex. 2

## Business Drivers

The organization is looking to deploy a large scale desktop and application virtualization solution. Currently, the environment . . . .

There are several business drivers in place at the organization that helped to drive the adoption of desktop and application virtualization technologies:

|  |  |  |
| --- | --- | --- |
| Priority | Business Driver | Description |
| 1 | Security | Must adhere to local government regulations |
| 2 | Cost reduction | Extend life of desktops, |
| 3 | Flexibility | BYOD, support newer OS and Applications, increase speed of application delivery |
| 4 | Management | No additional staff required, Resource deployment, Reduce operational costs, |
| 5 |  |  |

Based on the findings from the user segmentation analysis combined with the organization’s business priorities and project milestones, the organization has decided to proceed with this virtualization project. In order to provide a reliable, scalable, and robust solution, the organization and Citrix will work towards aligning existing use cases to an effective virtualization solution.

The organization has engaged Consulting to assist with the Assess, Design, and Deploy phases of the project. This document represents the **Detailed Design** **deliverable**. Throughout this process it will be updated, as needed. This document should be treated as a living document and continue to be maintained.

# Design

The conceptual architecture breaks the design into five distinct layers, which are as follows:

* User Layer: This layer details the user segments defined during the 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 shows how the user layer will connect to their desktop, which is hosted in the desktop layer of the architecture. Local users will often connect directly to Web Interface while remote users often connect via a set of firewalls that protect the internal environment. To bridge the firewalls, remote users will often connect with an SSL-VPN device (like Citrix Access Gateway).
* Desktop & Application (Resource) Layer: This layer contains the user’s virtual desktop, broken down into FlexCast models. It is subdivided into three components: Image, Applications and Personalization. Within each sub-layer, specifics are documented detailing the operating system, assigned policies, printing requirements, profile design and application requirements.
* Control Layer: This layer is responsible for managing and maintaining all other layers. It provides details on the controller requirements to support the entire solution. The Control layer is broken up into XenApp Farms, XenDesktop Sites, Provisioning Services Farms, and Infrastructure components. The XenApp Farm section focuses on the architecture required to support users of the Citrix XenApp environment. The XenDesktop Site section provides details on the components required to support the XenDesktop environment including catalogs and desktop groups. Finally, the Infrastructure Controllers are responsible for providing the underlying resources to support each component. These resources include databases, license servers, and Active Directory.
* Hardware Layer: This layer is responsible for the physical devices required to support the entire solution. It includes servers, processors, memory, storage devices. This layer is broken into three groups focused on providing the necessary resources for specific parts of the entire solution. One group of servers will support the XenApp (shared) components. A second group of servers will support the XenDesktop (VDI) components (if applicable). A final group of servers will support the underlying infrastructure for the entire environment, which is identified as the Control Layer.
* Operations Layer: The operations layer discusses several of the operational components of managing the Citrix environment. This includes Disaster Recovery as well as EdgeSight and Desktop Director components for monitoring of the environment.

# User Layer Design

## Case Organization Exercise 6

## Users

Addressing user requirements is critical to the success of the planned environment.

|  |  |  |
| --- | --- | --- |
| Decision Point | Design Decision | Notes |
| Number of Users (Total and Concurrent) | 69,580 (25,480 concurrent) | 30% of students + all Teachers, Admins and Support |
| Number of Remote Users | 6300 | Teachers and Administrators |
| Number of User Groups | 6 | T, HS, MS, ES, SA, SS |
| Is there required Access By Contractors / Partners | No |  |
| Common Working Hours | 8am to 4pm | However 24x7 availability requires 99.0% availability. |

### Endpoints

The organization’s endpoint ownership and lifecycle strategy is . . .

|  |  |  |
| --- | --- | --- |
| Client Devices | Design Decision | Notes |
| Type of Physical Endpoint Devices (including mobile Devices) | Tablets, Smart Phones, Desktops, Laptops, Thin Clients |  |
| Device Ownership | Admin, Teachers | Smart devices (smart phones and tablets) are owned by teachers. All other devices are owned by Support |
| Client Device Operating System(s) | XP, Windows7, iOS, OSX, Android, Windows Embedded – Thin PC, |  |
| Special User Permissions | None |  |

## Case Organization Exercise 7

## Receiver

Citrix Receiver is an easy-to-install software client that lets you access your desktops, applications and data easily and securely from any device, including smartphones, tablets, PCs and Macs. Working with a Citrix-enabled IT infrastructure, Receiver gives you the mobility, convenience and freedom you need to get your work done. The Receiver deployment and update strategy includes . . .

|  |  |  |
| --- | --- | --- |
| Decision Point | Design Decision | Notes |
| Citrix Windows Plug-in Type(s) and Version | Citrix Receiver – latest version | Some remote users may require AG Plugin for NetScaler 10 |
| Citrix Plug-in Deployment | Merchandising server, Storefront, manual, Receiver configured via e-mail provisioning |  |

## Resource Requirements

FlexCast model(s) were identified in the assessment of the organization. They are:

|  |  |  |
| --- | --- | --- |
| User Group | Flexcast Model | Notes |
| T | VDI Streamed |  |
| SA | VDI Streamed |  |
| SS | VDI Streamed |  |
| HS | VDI Streamed |  |
| MS | Hosted Shared |  |
| ES | Hosted Shared |  |
|  |  |  |

## During the Desktop Transformation Assessment, users were categorized into several different user groups according to their primary location, application set, performance requirements, offline application usage, and level of redundancy required. Based on the findings from the Assessment phase, each user group that requires a hosted VDI desktop will make use of one of the following specifications:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| User Group | Desktop Type | Users per Core | Number of vCPUs per user | Memory (GB)  Per user | Storage (GB)  Per user | Average IOPS (Steady State) |
| T | Pooled / Streamed | 5 | 2 | 8 | 5 | TBD |
| SA | Pooled / Streamed | 8 | 2 | 2 | 5 | TBD |
| SS | Pooled / Streamed | 8 | 2 | 2 | 5 | TBD |
| HS | Pooled / Streamed | 5 | 2 | 8 | 5 | TBD |

IOPS will be determined during application and user testing

Amount of raw IOPS = (# function write IOPS \* write penalty) + number of functional read IOPS

|  |  |
| --- | --- |
| RAID Level | Write Penalty |
| 0 | 1 |
| 1 | 2 |
| 5 | 4 |
| 10 | 2 |

# Access Layer

## Case Organization Exercise 8

## Access

The access layer provides details on the external and internal access planned for the Citrix environment. The Access strategy includes . . .

### Internal Access

|  |  |  |
| --- | --- | --- |
| Decision Point | Design Decision | Notes |
| Solution | Storefront | (Web interface) |
| Version | 2.1 |  |
| Location | ATBIC |  |
| Hardware | Virtual Server | Hosted on Hyper-V |
| Operating System | 2012 |  |
| Number of Servers | 2 – configured in a Storefront Server Group |  |
| Redundancy | Yes | 2 Servers used, 2 can support all connections |
| Encryption | SSL | SSL encryption on XML is encrypted between SF and DDCs |
| Load Balancing Strategy | NetScaler LB |  |
| High Availability Strategy | Each SF VM must be on a different Hyper-V host. Hypervisor HA enabled. |  |
| Administration |  |  |

### External Access

|  |  |  |
| --- | --- | --- |
| Decision Point | Design Decision | Notes |
| Solution | NetScaler Gateway |  |
| Version | 10.1 |  |
| Deployment Location | DMZ |  |
| Hardware | MPX 11500 |  |
| Operating System |  |  |
| Number of Servers / Appliances | 2 |  |
| Administration |  |  |
| Load Balancing Strategy | Load balance Storefront servers, LDAP servers and two-factor authentication servers |  |
| High Availability Strategy | Active / Passive |  |

< Either sketch the design or use a program such as Visio to build the design>

### Session and Authentication

|  |  |  |
| --- | --- | --- |
| Decision Point | Design Decision | Notes |
| Primary Authentication | LDAP |  |
| Secondary Authentication | Two factor | Unknown which product at this point |
| Session Policy 1 | Native Receiver |  |
| Session Policy 2 | Mobile Devices |  |
| Session Policy 3 | Web based Devices |  |
| Session Policy 4 |  |  |

### Bandwidth

The bandwidth required for this Access Strategy is . . .

|  |  |  |
| --- | --- | --- |
| User Group’s Workload | Primary Activity | Average Bandwidth (Kbps) |
| Teacher | Open GL (CAD) | TBD |
| SA | Open GL (CAD) | TBD |
| SS | Open GL (CAD) | TBD |
| HS | Open GL (CAD) | TBD |
| MS | Light (Typing Training) | TBD |
| ES | Light (Typing Training) | TBD |
|  |  |  |

Based on the concurrent number of connected users and the average bandwidth as stated in the table above the maximum concurrent network bandwidth required is . . .

TBD

# Resource Layer

## Case Organization Exercise 9

## Desktops

The desktop layer focuses on the design considerations for the user’s desktop, which must provide users with the right set of applications, capabilities and resources based on their needs. The user requirements obtained during the Assess phase and refined during the Design phase are used as the basis for the desktop design recommendations.

A machine catalog consists of either virtual machines on a hypervisor server or physical machines in your datacenter. Machines within the catalog serve as a resource pool and are organized into Delivery Groups to which users are assigned.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Catalog Name | Desktop Type | Workload Type | Number of Desktops/Servers | Operating System | OS Type (32 or 64 bit) | Disk Space |
| Win7-HS | Hosted VDI Streamed | OpenGL | 25,000 (based on using personal vDisk) | Windows 7 | 64bit | 5 GB for write cache – local storage) |
| Win7-AdminStaff (Teachers, SS and SA) | Hosted VDI  Streamed | OpenGL/SAP | 6,580 | Windows 7 | 64bit | 5 GB for write cache – local storage) |
| Hosted-MS | Hosted Server Apps - Streamed | Math | 100 Servers (5,000 CCU) | Server 2012 | 64bit | 25 GB (write cache – local storage) |
| Hosted-ES | Hosted Server Apps - Streamed | Math/Typing | 138 Servers (6,900 CCU) | Server 2012 | 64bit | 25 GB (write cache –local storage) |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

Delivery groups are based on the machine catalog(s) and define the allocation of virtual desktops to users and user groups. A single delivery group can be based on a fraction of a machine catalog as well as multiple machine catalogs.

|  |  |  |  |
| --- | --- | --- | --- |
| Delivery Group Name | Folder Redirection | Profile Size | Allocated Users and Groups |
| Teachers | Yes | TBD | Teachers |
| SA | Yes | TBD | SA |
| SS | No | TBD | SS |
| HS | Yes | TBD | HS |
| MS | No | TBD | MS |
| ES | No | TBD | ES |

Determining the specifications for each group of hosted desktops requires a proper balance between performance and allocation. The image definition strategy is . . .

### Personalization

Providing the right level of personalization requires an understanding of the needs for the user group. Personalization decisions must be weighed against user location, data center connectivity and security requirements. In this document, personalization covers the following focus areas:

* Profile design for retention of personalization settings
* Policy design for usability or security configurations
* Printing design

With the right combination of technologies such as profiles, group policies, and printing, a user group can receive a desktop where user-level changes range from a complete deletion to complete persistence. Profile requirements are described in the following table.

|  |  |  |
| --- | --- | --- |
| User Group | Profile Requirement | Notes |
| Teachers | Hybrid | Citrix UPM with folder Redirection |
| SA | Hybrid | Citrix UPM with folder Redirection |
| SS | Hybrid | Citrix UPM with folder Redirection |
| HS | Hybrid | Citrix UPM with folder Redirection |
| MS | None |  |
| ES | None |  |

### Profile Design

The first area of focus for personalization is the user profile design. Each user group, regardless of the required level of personalization, should have a profile. The profile design determines how the user’s settings will or will not persist across sessions. Part of the profile design includes folder redirection as a way to better optimize the profile. Windows XP and Windows Server 2003 utilize v1 based profiles while Windows 7, Windows 8, and Windows Server 2008 use v2 based profiles, which are not natively compatible, so they should be separated. The following table provides the design decisions for user profiles.

|  |  |  |  |
| --- | --- | --- | --- |
| User Group | Profile Type | Profile size | Redirected Folders |
| Teachers | Hybrid | 4 GB | Desktop  AppData (Local)  Documents |
| SA | Hybrid | 4 GB | Desktop  AppData (Local)  Documents |
| HS | Hybrid | 4 GB | Desktop  AppData (Local)  Documents |
|  |  |  |  |

### Policy Design

There are two types of policies in a Citrix virtual environment:

* Citrix policies for configuring Citrix specific user and desktop/server settings
* Microsoft group policies for configuring user experience and lockdown settings

The general approach for Citrix policies in the organization is . . .

To create a Baseline policy that applies to all users and a baseline policy that applies to all desktops/servers. The baseline policy will generally contain basic security and optimization settings. For those user groups or servers/desktops that require an alternative configuration (such as WAN users or high security users), one-off policies will be configured and applied to the user group or set of desktops/servers as needed. Microsoft group policies will serve to customize Windows based settings for the desktop / servers.

### Printing Design

Printing is often an important environmental requirement and should be seamless to users. Determining how printers are created within a session and what print drivers to use are the base design decisions that all solutions must answer.

The printing strategy includes . . . using the Citrix Universal Print Driver (UPD) exclusively within the XenDesktop environments with the following configurations:

* Auto-create all client printers
* Disable automatic installation of inbox printer drivers
* Indirect print job routing

Also, print drivers that are not compatible with the Citrix UPD will be installed on the XenDesktop desktops on a case by case basis. As additional requirements are uncovered during build and test, they will be incorporated.

**Only high school, teachers/admin and support will print documents**

## Case Organization Exercise 10

## Applications

Having an accurate list of applications is important to providing a desktop environment that meets the needs of each user. Each application must be delivered into the solution in the most appropriate way, typically based on a particular application category, defined as follows:

* Common: Applications used by a majority of the users (greater than 75%)
* Anomalous: Applications used by a minority of users (less than 75%)
* Resource Intensive: Applications with high computing requirements like 1+ GB of RAM or more than 50% of CPU resources.
* Technically Challenging: Applications that are complex to setup, have extensive dependencies on other applications or have specialized configurations.

Applications can be delivered to the user’s desktop by one of the following methods:

* Install: The application is part of the base desktop image. Every user receiving the image also receives the application. Typically, common applications (antivirus software, management utilities, Citrix clients/plug-ins, Windows shell integrated applications, dependency applications) are installed into the base image.
* Stream/App-V: The application is delivered, via the network, to the desktop just-in-time. The application is not technically installed into the OS, but executes within a temporary runtime environment. Applications are only visible to users who are granted access.
* Host: The application is hosted from a set of Citrix XenDesktop servers. This provides a more tightly-controlled application environment. Applications are only visible to users who are granted access. Technically challenging applications are often delivered via the hosted model.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Installed Applications | Expected Version | Application Delivery Method | | | Category | Special Requirements |
| Office | 2010 | | VDI Images | | Common | Proximity to Exchange Server |
| Adobe Reader | 10 | | | VDI Images |  | None |
| CAD |  | | | VDI Images |  | High Graphics Requirement |
| SAP |  | | | VDI Images |  | Only works online connected to LAN |
| Math Plus | 2009 | | | Hosted |  | None |
| Typing Practice | 2009 | | | Hosted |  |  |
|  |  | | |  |  |  |
|  |  | | |  |  |  |
|  |  | | |  |  |  |

# Control Layer

## Case Organization Exercise 11

## Desktop Delivery

The control layer provides the design decisions for the underlying infrastructure supporting the desktop layer. Specific Control Layer components and design decisions are based on the completed design of the above layers (User, Access and Desktop).

### XenDesktop Site Configuration

VDI Desktop Controllers, also known as XenDesktop controllers, are responsible for enumerating, allocating, assigning and maintaining VDI (Pooled and Dedicated) and Remote PC based virtual desktops. VDI Desktop Controllers within a single data center are grouped together into a XenDesktop site, which functions as a single administrative entity.

The critical design element for the VDI Desktop Controllers is to provide enough computing resources for managing the virtual desktops. By scaling up (adding more resources to a server) or scaling out (adding more servers), the number of users a XenDesktop site can support increases.

The XenDesktop site configuration is . . .

The XenDesktop site will be comprised of three dedicated Desktop Controllers that will serve to broker desktop and application connections, manage desktop registrations, and provide XML load balancing within the environment. Average concurrent user load should be roughly 25,000 users.

The following represents the planned deployment of the Desktop Delivery.

Based on the size of the proposed environment, the following design was created for the XenDesktop site:

|  |  |  |
| --- | --- | --- |
| Category | Design Decision | Notes |
| Sites per Data Center | 1 Site |  |
| Site Name(s) | ATBIC\_Site |  |
| Server Type (Physical or Virtual) | Virtual |  |
| Controllers per Site | 4 |  |
| CPU Allocation | 4 vCPU |  |
| RAM Allocation | 8gb |  |
| Storage Allocation | Standard O/S partition |  |

## Infrastructure

The infrastructure for the solution provides a set of common components, namely a database, license server, and Active Directory, used by the entire solution.

### Database

The database servers must be designed in such a way as to provide adequate resources and availability for the rest of the environment.

|  |  |  |
| --- | --- | --- |
| Category | Design Decision | Notes |
| SQL Version | 2008 R2 |  |
| Redundancy | Mirrored |  |
| Number of Servers | 3 | Primary SQL Server, Secondary SQL server, Witness Server |
| Server Type (Physical or Virtual) | Virtual |  |
| CPU Allocation | 8 per server |  |
| RAM Allocation | 16GB Per Server |  |
| Storage Allocation | 150 GB SSD or 15k SAS | Director Database may consume more storage. Will need to be monitored. |
| Database Backup Mode | Full |  |

#### 

### Licensing

The licensing component (Microsoft and Citrix) grants each user access to the environment, as long as enough licenses are available. In addition, the type of license can also grant/deny different levels of functionality.

|  |  |  |
| --- | --- | --- |
| Category | Design Decision | Notes |
| License Server Version (Citrix and Microsoft) | Latest Citrix license server version |  |
| Redundancy (Yes/No) | Yes | VM level backup |
| Number of Servers | 1 | One Server only allowed |
| Server Type (Physical or Virtual) | Virtual |  |
| CPU Allocation | 2 |  |
| RAM Allocation | 4 |  |
| Storage Allocation | 40GB |  |
| License Type | Concurrent |  |

### Active Directory

Microsoft Active Directory acts as the directory services infrastructure. The Active Directory version and structure are . . .

There are four child domains under the parent domain. The Citrix environment will reside in the example.com child domain. Both the domain and forest functional levels are Windows Server 2008 R2. New OUs have been created for the Citrix environment within the existing OU structure. These OUs will have inheritance blocked as to not have existing GPOs affect the log on time and user experience within the Citrix environment.

## Case Organization Exercise 12

## Networking, Storage and Provisioning

Integrating the XenDesktop infrastructure into an organization´s networking environment is a critical part of a desktop virtualization project, which needs detailed assessment and planning, as XenDesktop is highly dependent on network connectivity and performance.

The Networking integration strategy includes . . .

Each HP Proliant DL 360 G8 server will be presented with 2 x 10 Gbps NICs. The PVS traffic will flow within a single server rack or across two separate physical racks in the case of a failover. All servers will be connected to two end of row Brocade VDX 8770 switches. Link Aggregation (LACP) will be configured for this environment in order to take advantage of aggregating the NICs together for a total of 20 Gbps as well as load balancing and failover capabilities.

The data center has 10 Gbps backbone connectivity to the core switches and within the data center. There are 4 Gbps links between schools and connections from schools and other remote sites vary from 1.5 Mbps (T1) connections to 250 Mbps. Latency between the various locations does not exceed 10 milliseconds. There are 1 Gbps links to desktops on the LAN and a few 10/100 Mbps switches exist at the remote sites but there are plans to upgrade these switches.

### WAN Connectivity

There are redundant WAN links between each of the fifty (50) schools and the data center. The connectivity of the WAN links is listed in the following table:

|  |  |
| --- | --- |
| WAN Link | Connectivity |
| Inter-site WAN links | 0.5 Gbps |
| Data Center | 25 Gbps |

### Storage

## Enterprise storage decisions determine where virtual disks, user data and profile data are housed. User profiles and user data must be easily accessible to the XenDesktop virtual desktops in order to ensure a fast response time. Other virtual desktop storage requirements such as virtual disk images and write cache file need to be considered.

|  |  |  |
| --- | --- | --- |
| Category | Design Decision | Notes |
| User Data | Redirected |  |
| User Profile Data | Hybrid |  |
| Storage Type | SAN |  |
| Connectivity | FC |  |
| Physical Location | DataCenter |  |
| Backup | Secondary SAN |  |

### Storage Estimate

The following storage will be provisioned to support the organization’s users:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | Size (GB) | LUNs (GB/Tier) | Attached | Notes |
| SQL | 80 GB | 1 x 40GB (Tier 2)  1 x 40 GB (Tier 2)  Total = 80 GB | Virtual Servers | Separate LUN for databases and transaction log |
| Virtual Servers | 25 GB | 10 x 25 GB | Virtual Servers |  |
| Shared desktops & persistent desktops | 20 GB |  | Virtual Servers |  |
| vDisk store |  | 1x 100 GB |  |  |
| vDisk backup |  | 1x 100 GB |  |  |
| Total |  | 14 LUNs |  |  |

### Provisioning Services

Citrix Provisioning Services (PVS) uses streaming technology to simplify the deployment of virtual and physical desktops. Computers are provisioned and re-provisioned in real-time from a single shared-disk image. In doing so, administrators can completely eliminate the need to manage and patch individual systems. Instead, all image management is performed on the master image.

### Site/Farm details

Based on the size of the proposed environment, the details of the Provisioning Services farm design are as follows:

|  |  |  |
| --- | --- | --- |
| Category | Design Decision | Notes |
| Number of images | 4 | One PVS image for MS/ES Hosted Application Servers, Three PVS images for HS, Teachers and Support Staff |
| Number of PVS Farms | 1 |  |
| Sites per Farm | 1 |  |
| PVS Servers per Site | 4 |  |
| Server Type (Physical or Virtual) | Virtual |  |
| CPU Allocation | 4 vCPU |  |
| RAM Allocation | 96 GB |  |
| Storage Allocation (server) | 50 GB |  |
| Network Capacity | 10 Gbps |  |

### Database Considerations

The database is an important component to the availability of the Provisioning Services farm. In order to provide the right level of fault tolerance for the Provisioning Services farm, the following design decisions have been made:

|  |  |  |
| --- | --- | --- |
| Category | Design Decision | Notes |
| Database Size | <500 mb |  |
| Database Redundancy | Cluster of 2x SQL |  |
| Database Instance Name(s) | PVS\_DB |  |
| Offline Mode (enabled?) | Yes |  |
| Database Backup Mode | Daily, weekly |  |

### vDisk Storage

Storage of the images is important for providing an optimized and efficient environment. The following outlines the key decisions for vDisk storage.

|  |  |  |
| --- | --- | --- |
| Category | Design Decision | Notes |
| Number of vDisk Stores | 1 |  |
| Storage Type | FC SAN |  |
| Storage Size | 1 TB |  |
| Write Cache Placement | VM’s local hard drives |  |
| Write Cache Size | 5 GB for Win7, 25 GB for Server 2012 |  |
| VDisk format (fixed-sized or dynamic) | Fixed |  |
| Storage RAID | Raid 1 |  |

### Boot Process

Each target device must receive the image via the specified boot process. The following design decisions outline the process and the designed redundancy.

|  |  |  |
| --- | --- | --- |
| Category | Design Decision | Notes |
| Boot Process | DHCP (PXE option 60), TFTP |  |
| Bootstrap Redundancy (Yes or No) | Yes | Four PVS servers will be added as logon servers. |

## Machine Creation Services

MCS delivers centralized images to one or more virtual desktops. The images are contained within the hypervisor pool and then thin provisioned as needed. The thin provisioned virtual desktops utilize identity management functionality to overcome the security identity (SID) requirements typical with cloning.

|  |  |  |
| --- | --- | --- |
| Category | Design Decision | Notes |
| Number of images | N/A |  |
| Location of master image | N/A |  |
| Machine Types | N/A |  |
| Number of Virtual Desktops | N/A |  |
| Storage | N/A |  |
| Identity disk details | N/A |  |
| Differencing disk details | N/A |  |

# Hardware Layer

## Case Organization Exercise 13

## Hardware

The fifth layer of the design phase is the Hardware Layer. The hardware layer defines the type and amount of physical resources are required to support the solution. Specific Hardware Layer components and design decisions are based on the completed design of the above layers (User, Access, Desktop and Control).

### Hypervisor Configuration

The hypervisor selected for the project is . . . Hyper-V III (Server 2012).

### Resource Pool Information

The number of distinct types of resource pools and their characteristics are . . .

### Physical Hardware

The organization will . . . be standardizing on HP DL360P hardware for the Citrix environment. Each 1U DL360 will have the following specifications:

* 2 Xeon® E5-2690 8-core processors, (16 cores total)
* 384 GB RAM
* 10 - 300GB 15K SAS drives configured in RAID 10 (XA & XD) or RAID 6 (Infrastructure)
* 2 GB RAID Controller cache

### Infrastructure Pool

The infrastructure pool will be used to host critical infrastructure components and virtual machines within the environment.

|  |  |
| --- | --- |
| Category | Infrastructure Hardware |
| Number of Physical Servers | 2 |
| Number of Virtual Machines | 16 |
| Number of Pools/Clusters | 1 |
| VM Storage Location | Local |
| SAN Storage | FC SAN for Provisioning Services vDisk storage |
| RAID Configuration | 1 |
| Utilizable storage per host | 1 TB |

### Hypervisor Hosts

The following represent the Hypervisor hosts in the Infrastructure Pool:

|  |  |
| --- | --- |
| Pool Name | Hosts |
| Portland01 | PORDC001 |
| … | … |
|  |  |

### Virtual Machines

|  |  |  |  |
| --- | --- | --- | --- |
| Component | Quantity | Specifications | OS |
| StoreFront Server | 2 | vCPU: 2  RAM: 4 GB  Disk: 60 GB | Windows Server 2012 |
| XenDesktop Controller | 4 | vCPU: 4  RAM: 8 GB  Disk: 25 GB | Windows Server 2012 |
| Provisioning Services (or Machine Creation Services) | 4 | vCPU: 4  RAM: 96 GB  Disk: 50 GB | Windows Server 2012 |
| Director | 2 | vCPU: 4  RAM: 8 GB  Disk: 25 GB | Windows Server 2012 |

### VDI Pools

The VDI Pool will be used to host provisioned XenDesktop virtual desktops and servers within the environment.

|  |  |
| --- | --- |
| Category | XenDesktop Hardware |
| Number of Physical Servers | 490 |
| Number of Virtual Machines | 31,818 |
| Number of Pools/Clusters | 40 |
| VM Storage Location | FC SAN |
| RAID Configuration | Raid 1 |
| Utilizable storage per host | 1 TB |

#### Virtual Machines

The following represents a summary of the virtual machine configuration for the VDI Pool.

|  |  |  |  |
| --- | --- | --- | --- |
| Purpose | Quantity | Specifications | Operating System |
| Desktops | 31,580 | vCPU: 2  RAM: 2 GB  Write Cache Disk: 5 GB | Windows 7 (streamed by Provisioning Services) |
| Hosted App servers | 238 | vCPU: 4  RAM: 48 GB  Write Cache Disk: 25 GB | Windows 2012 (streamed by Provisioning Services) |
|  |  |  |  |
|  |  |  |  |

# Operations Layer

## Case Organization Exercise 14

## Migration Approach

In order for this virtualization project to be successful, the migration strategy is . . .

### Monitoring

Monitoring the new environment enables administrators to address issues proactively. By having an in depth understanding of current and expected behavior of the various components, administrators are better equipped to discover an issue before it impacts the user community.

### Director

Director is a web-based tool that enables IT support and help desk teams to monitor a XenDesktop environment, troubleshoot issues before they become system-critical, and perform support tasks for end users.

### Studio

Studio allows administrators to configure their environments and provide users with access to applications and desktops.