|  |
| --- |
| North Central Michigan College |
| Server Room Proposal |
| Server Primer: Project 1 |

|  |
| --- |
| Sierra Smith  10-5-2017 |

**Objective:**

To set up a main server room for a new facility for our hospital. This Proposal will outline the main server room requirements, along with HVAC and electrical requirements to fit our new 20,000 sq. ft. Building. These Severs will manage 800 users, 350 workstations and Citrix XenDesktop for 500 workstations. We Will also focus on high storage demands so that medical images can be accessed from the network. We Will also be fulfilling the requirements of 99.999 reliability, which will be focused around the use of backup generators and the likes.

**Layout:**



The main server room will be a 10ft by 20ft room that will hold the electrical panels, HVAC control panels, and the server racks with the equipment.

**Servers:**

To fulfill the requirements we have selected the [Lenovo TS RD350 x/2.1 8C 16GB](https://www.newegg.com/Product/Product.aspx?Item=9SIAEGP6409319&cm_re=ts_rd350_x-_-0ZK-00B4-00256-_-Product) Server. We will be purchasing 3 of these and use virtualization to divide up the work between the servers. One server will hold the DNS Server, Network server, and Group Policy system. The second one will contain the mail server, and Xen Server, to manage the Citrix XenDesktops. The final Server will be used for the Directly Attached Storage, Clinical Information System (CIS), Radiology Information System (RIS), and the Picture Archive and Communication System (PAC).

**Server Specifications:**

**Product Description:** Lenovo ThinkServer RD350 70QK - Xeon E5-2620V4 2.1 GHz - 16 GB - 0 GB  
**Type:** Server - rack-mountable  
**Height (Rack Units):** 1U  
**Localization:** United States  
**Server Scalability:** 2-way  
**Processor:** 1 x Intel Xeon E5-2620V4 / 2.1 GHz ( 3 GHz ) ( 8-core )  
**Processor Main Features:** Hyper-Threading Technology, Intel Turbo Boost Technology 2  
**Cache Memory:** 20 MB  
**Cache Per Processor:** 20 MB  
**RAM:** 16 GB (installed) / 256 GB (max) - DDR4 SDRAM - ECC - 2133 MHz  
**Storage Controller:** SATA ( SATA 6Gb/s ) ( ThinkServer RAID 110i )  
**Server Storage Bays:** Hot-swap 3.5"  
**Hard Drive:** No HDD  
**Graphics Controller:** ASPEED AST2400  
**Video Memory:** 16 MB  
**Networking:** GigE  
**Power:** AC 120/230 V ( 50/60 Hz )  
**Power Redundancy:** Optional  
**OS Provided:** No operating system  
**Dimensions (WxDxH):** 19 in x 30.8 in x 1.7 in  
**Weight:** 28.66 lbs.

For more information on specifications please click [here](https://lenovopress.com/lp0091-thinkserver-rd350-e5-2600-v4).

**Storage:**

This specific server has Hot-swap capable storage bays, which means that we will have to purchase storage for these. The upside to having the Hot-swap capable storage bays is that at any point we can switch in a larger storage to expand the size of the server. This will allow us to be expandable as the business requires. As such we have selected to order 6 solid state drives, 2 for each server, to begin with. This will be provided by the [Lenovo ThinkServer Gen 5 Solid State Drive (SSD)](https://www.newegg.com/Product/Product.aspx?Item=9SIAE485VU6777). This will allow each server to have a total of 480 GB’s of storage to run the necessary virtualized servers, with room to grow.

**Storage Specifications:**

**Product Name** 4XB0G45743

**Product Type** Solid State Drive

**Drive Interface** SATA

**Drive Width** 3.5"

**Drive Interface Standard** 6Gb/s SATA

**Drive Type** Internal

**Storage Capacity** 240 GB

**Hot Swappable** Yes

**ROHS Compliant**

For more information on specifications please click [here.](https://www.newegg.com/Product/Product.aspx?Item=9SIAE485VU6777)

**Directly Attached Storage:**

We will be using a Directly Attached Storage structure to store all the data for the system. It will have its own backup system within the storage. This will be fulfilled with the [Lenovo Storage D1224 SFF Single ESM Disk](https://lenovopress.com/lp0512-lenovo-storage-d1212-d1224-drive-enclosures). As this has removable storage space we will be dividing the storage in thirds. One third will be usable storage while the other two thirds will be used as a backup system. We will be using the same backup method as we use for the servers where the first third will hold last week’s full back up and the second third will be used to create the partial backups throughout the week, finishing with the full back up and be switched out weekly.

**Storage Specifications:**

**Storage** Capacity (per D1212 enclosure—up to 8 enclosures supported per HBA port)

Up to 10.8TB – 10,000rpm HDDs; Up to 120TB

**Expandability** (via Daisy-Chain)

Up to 8 D1212 units per SAS Chain

**RAID Support**

RAID 0, 1, 5, 6, 10, 50, 60 (HBA-dependent)

**Power Supplies and Fans**

Two 580W (1+1) hot-swap/redundant 80 Plus Gold power supplies; two integrated fans per power supply

**Back Panel Connectors**

Each expansion module (x2) includes 1 Ethernet management port, 3x MiniSAS HD Connector (SFF 8644), It can be configured as in/ingress or out/egress port by SAS zoning mode setting.

**Form Factor / Dimensions / Weight**

2U/Height: 87.9mm (3.5 in.); Width: 443mm (17 in.); Depth: 630mm (24.8 in.); Weight: max. 24kg (57.2lbs)

For more information on the specifications please click [here](https://download.lenovo.com/parts/ThinkCentre/lenovo_storage_d1212_ds.pdf).

**Backup:**

We also want to be able to create and securely save our data in the form of backups. In this we have decided to go with the [PowerVault 114X LTO6](http://www.dell.com/en-us/work/shop/dell-emc-data-storage-and-backup/powervault-114x-tape-rack-enclosure/spd/powervault-114x/bvcwsk2?selectionState=eyJGUHJpY2UiOjQxOTYuODQsIk9DIjoiYnZjd3NrMiIsIlF0eSI6MSwiTW9kcyI6W3siSWQiOjEsIk9wdHMiOlt7IklkIjoiMTRYNjIiLCJQcmljZSI6MzU3Ni40OH1dfSx7IklkIjo3MywiT3B0cyI6W3siSWQiOiJMNk0xMFBLIiwiUHJpY2UiOjI3Ni41OX1dfSx7IklkIjoyMCwiT3B0cyI6W3siSWQiOiIxMkdCMk0yIiwiUHJpY2UiOjI0OC4zN31dfV19) and store the tapes in an undisclosed area off site. This backup as 2 tape spots and is designed to sit on a rack so we will need 2 of these to cover all our servers. Each one will back up a physical server and a full backup will be stored off site weekly. We will have two tapes for each backup, one to be stored off site with last week’s full backup and the second one to be doing daily partial backs and a final full back up before it is swapped with the first tape. We will also be purchasing a 10 pack of tapes for these backups as well.

**Backup Specifications:**

**Internal Drive**1.69" (h) x 5.83 (w) x 8.29" (d)  
Weight (3lbs 9 oz.)  
**External Drive**  
2.56"(h)x 8.74"(w) x 12.87"(d)  
Weight(9.7lbs)

**Drive Controller**

Serial Attached SCSI (SAS) at 6Gb/s  
SAS 6Gb HBA

**Tape Backup Technology:**

Space: 6GBs

Compression: drives support 2.5:1

For more information on specifications please click [here](http://www.vallex.am/products/powervault/pvaul_114t_specs.pdf).

**Server Rack**

We are also looking at a server rack to hold all our servers and equipment. To hold all our equipment, we need at least 18U of Rackspace. As with everything else we want to make sure we have room on our racks so that we can expand. In this case we are going with two [Great Lakes Case 18u 4 Post Racks](https://www.rackmountsolutions.net/great-lakes-case-4p36-1224-29-17u-4-post-rack/). One of these would hold all our equipment, but leave us with no room to expand. We will be dividing the equipment evenly between the two racks. These are also open on all 4 sides so we can get to the plug ins easier. We could use a more expensive rack that is enclosed and locks, but with the security of our room, and security practices we do not need to spend the extra.

**Server Rack Specifications**

Manufacturer Great Lakes Case

Rack Units (Size U) 18

Thread Type 12-24 Tapped

Usable Depth (Inches) 29

Weight Capacity 1,500 lb.

External Width (Inches) 20.31

External Depth (Inches) 32

External Height (Inches) 36

Internal Width (Inches) 19.00 (EIA Compliant)

For more information on specifications please click [here.](https://www.rackmountsolutions.net/great-lakes-case-4p36-1224-29-17u-4-post-rack/)

**Generator and Electricity:**

We will need a backup generator incase the power goes out. With the way generators work, with a surge of power, we will have to keep in mind surge protection with in the server room. The generator that we chose for our backup will be the [Diesel Generator from CAT](http://pts-media.com/wpp/Caterpillar/Caterpillar%20Diesel%20Generator%20Set%20-%20C15%20400%20ekw%20Standby%20Tier3%20Griffin%2060%20Hz_%20EMCP4.pdf).

For more information please click [here.](http://pts-media.com/wpp/Caterpillar/Caterpillar%20Diesel%20Generator%20Set%20-%20C15%20400%20ekw%20Standby%20Tier3%20Griffin%2060%20Hz_%20EMCP4.pdf)

**Uninterrupted Power Supply (UPS):**

The UPS is used to keep the system running in case of a power outage while the generator is booting up. The one we have selected for the company is the [APC Smart UPS SRT 192](http://www.apc.com/shop/us/en/products/APC-Smart-UPS-SRT-192V-5kVA-and-6kVA-RM-Battery-Pack/P-SRT192RMBP). This one will run for about an hour which gives plenty of time for the generator to boot.

**System Specifications:**

**Battery type:** Maintenance-free sealed Lead-Acid battery with suspended electrolyte: leakproof

**Battery mounting:** Standalone battery stack

**Expected Battery Life (years)** 3 - 5

**RBC Quantity:** 2

**Physical**

**Maximum Height:**5.1inches (130mm, 13.0cm)

**Maximum Width** 17.0inches (432mm, 43.2cm

**Maximum Depth:** 26.88inches (682mm, 68.27cm)

**Rack Height:** 3U

**Net Weight:** 200.2lbs. (91.0kg)

**Operating Environment:** 32 - 104 °F (0 - 40 °C)

**Operating Relative Humidity:** 0 - 95% no %

**Operating Elevation:** 0-10000ft (0-3000meters

**Storage Temperature:** -15 - 45 °C

**Storage Relative Humidity:**0 - 95% no %

**Storage Elevation**: 0-50000ft (0-15000meters)

To view more information on this, click [here.](http://www.apc.com/shop/us/en/products/APC-Smart-UPS-SRT-192V-5kVA-and-6kVA-RM-Battery-Pack/P-SRT192RMBP)

**HVAC Systems:**

To maintain our server room, we will need to implement an HVAC system to keep the room static free, temperate, and fire resistant. To do this we will need to meet certain specifications.

**Air Conditioning**: The air conditioning unit must be able to move 12.5 tons of air per hour.High Estimate:150,000 BTU

To see how calculation was figured please click [here.](http://openxtra.org/article/calculating-size-server-room-air-conditioner)

Below you will see a guideline to the prices of the equipment required to get our main server room up and running efficiently. As this is a guideline it does not account for taxes, warranty, fees or shipping and handling

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Product | Price | Quantity | Total |
| Server | [Lenovo TS RD350 x/2.1 8C 16GB](https://www.newegg.com/Product/Product.aspx?Item=9SIAEGP6409319&cm_re=ts_rd350_x-_-0ZK-00B4-00256-_-Product) | **$978** | **3** | **$2,934\*** |
| Solid State Drives | [Lenovo ThinkServer Gen 5 Solid State Drive (SSD)](https://www.newegg.com/Product/Product.aspx?Item=9SIAE485VU6777) | **$135** | **6** | **$810\*** |
| Backup | [PowerVault 114X LTO6](http://www.dell.com/en-us/work/shop/dell-emc-data-storage-and-backup/powervault-114x-tape-rack-enclosure/spd/powervault-114x/bvcwsk2?selectionState=eyJGUHJpY2UiOjQxOTYuODQsIk9DIjoiYnZjd3NrMiIsIlF0eSI6MSwiTW9kcyI6W3siSWQiOjEsIk9wdHMiOlt7IklkIjoiMTRYNjIiLCJQcmljZSI6MzU3Ni40OH1dfSx7IklkIjo3MywiT3B0cyI6W3siSWQiOiJMNk0xMFBLIiwiUHJpY2UiOjI3Ni41OX1dfSx7IklkIjoyMCwiT3B0cyI6W3siSWQiOiIxMkdCMk0yIiwiUHJpY2UiOjI0OC4zN31dfV19) | **$4,196.84** | **2** | **$8,393.68\*** |
| DAS | [Lenovo Storage D1224 SFF Single ESM Disk](https://lenovopress.com/lp0512-lenovo-storage-d1212-d1224-drive-enclosures) | **$4,445** | **1** | **$4,445\*** |
| Storage Racks | [Great Lakes Case 18u 4 Post Racks](https://www.rackmountsolutions.net/great-lakes-case-4p36-1224-29-17u-4-post-rack/) | **$330** | **2** | **$660\*** |
| UPS | [APC Smart UPS SRT 192](http://www.apc.com/shop/us/en/products/APC-Smart-UPS-SRT-192V-5kVA-and-6kVA-RM-Battery-Pack/P-SRT192RMBP) | **$1,225** | **1** | **$1,225** |

To summarize we will be spending an estimate of $20,000 to get our main server room running. This does not include the price of setting up an HVAC system, fire suppression, making sure we have the correct electrical panels to prevent power surges, generators, cables, access points within the building, and additional server rooms. We have left room throughout the planning process so that we can expand at any point if we do not have enough room for all the data.