

LAN DESIGN PROJECT

Description:

The company, DMLH, is moving their inventory to a distribution center.

Following a memo, a LAN floor plan & rack diagram have been created—as well as multiple PO's and their summary costs. As well as a summary of the ongoing costs.

**Matthew Merrill
INFO 300**

Note: There's a change in the organization of this project—ignore how, in the LAN Project Introduction, the 1 & 2nd bullets (Dlv 1 & 2) give instructions on how to present this project. The following table of contents is how this project will be organized, for better overall presentation:

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Project #1: Bill of Details and Network Diagrams for a Warehouse LAN

Projects that don't meet these minimum specs will not be accepted and will be docked daily for late submit until they do. Please get any questions answered in class well before the due date.

- Dlv #1 is two printed pages, one with only the wall plan for the warehouse printed to scale and the other with a network rack printed to scale. The front wall, with the entrance is 8 3/4 inches from the rear wall of the warehouse which is 6 inches across, nothing other will be accepted. Bring the printed pages to class to be collected on the due date. Put the two pages in a single pdf and attach it to an email to before class on the due date.
- Dlv #2 Required Parts: 1) Cover page describing the project. 2) Summary of purchase costs by vendor. 3) Summary of recurring costs by vendor or utility. 4) Warehouse Floorplan. 5) Network Rack Diagram. 6) Purchase orders for each vendor.
- Projects that do not have separate purchase orders prepared for each of the suppliers of hardware, software, and services will be rejected at first submission. Make sure to show the amount due for each supplier on their purchase order and also on the summaries of up-front purchase. It is not sufficient to provide one spreadsheet with a column for supplier. Excel has templates for purchase orders.
- Summarize up-front and recurring costs separately. Projects that do not provide these summaries in the customary format will be rejected at first submission. The Boss wants to be able to compare your up-front and on-going costs with others without getting out a calculator!
- Make sure the printed diagrams fill the pages and are easily usable as printed. The printed dimensions of the warehouse walls must be 8 3/4 X 6 inches. Make 'skeletons' of your floorplan and rack diagram and try printing them before putting much effort into the details and try printing them. Projects that can't be read as printed without a magnifier or do not fit on the printed page will be rejected at first submit
- On the floor plan, after drawing the walls place telecomm outlet symbols on the walls where each ethernet jack will be placed. Place them to avoid pulling jumpers along the wall, around a corner, or over the floor to connect equipment. After the telecomm outlets have been placed, put a wall segment in the network room to represent the rack, place a connection point on it and move it to the layer with the Telecomm outlets (data and flow terminals), then lock the walls and turn off their snap and glue. Use straight connectors between the connection point in the network closet and the telecomm outlets, and format them with curved bends. Represent the bundles and drop wires separately by bundling together the drops or by using a thicker connector to represent the bundle and peel each drop off it. Do not draw bundles or drops on top of the walls, keep them inside the premises and clearly visible.
- After placing equipment on the rack diagram, place connection points where each jumper connects to equipment or patch panel. **Use callouts or other neat technique to label each ethernet port with its IP assignment. Do not label the jumpers.** Format straight connectors with curved bends for jumpers, not thin or with right-angled bends. Avoid crossed connectors, kinks, and extra bends to make a neat drawing.

Two copies of your project are due: 1) A neatly printed copy not in a binder or folder or any kind, stapled at the upper left corner (instructor will have a heavy duty stapler if needed); 2) An 'electronic' copy as a single pdf that contains all requested parts: Floor plan with furnishings, premises wiring, and wall jacks; Rack diagram clearly indicating the DMZ and IP addresses; Purchase Orders; and an accurate Summary of Upfront and Ongoing Costs. Bring the printed copy to class on the due date and attach the electronic copy to an email to the instructor before class on the due date.

Specifications

Here's the [Memo From The Boss](#). Read it with a highlighter and come up with an accurate Bill of Details for the upfront purchase and recurring costs for running the system.

Specs for the project are delivered here, in the 'memo from the boss' link above, and some verbally in class. There are a couple of weeks to get questions answered in class, so please start early. Do not make up specifications or substitute another rack diagram or floorplan. I suggest that you design and detail other LAN projects of your own after this project has been completed so that you have more than one to show in your portfolio.

For many students, this is the first time considering what to buy or how hardware and software are priced and maintained. Looking for equipment that meets specs is an excellent way to learn.

It is better to buy most equipment from one or a couple of well-respected suppliers than it is to google separately for each component and make a big stack of purchase orders to unknown entities each with one or two components. CDW, Dell, HP, Tiger Direct, Walmart, and others can source almost all the equipment on one purchase order.

Gain product knowledge from the excellent descriptions and specifications at websites like dell.com, hp.com, cdi.com, cdw.com, blackbox.com, tigerdirect.com, or other on-line sources. Ask the instructor questions about what you find and the suitability for the LAN at hand, and the result will be a pro-quality piece for your portfolio. (We used to bring a stack of dozens of 'trade rags' to class for students to learn about products -- now the web is a much more accessible source.)

The network rack is put together similar to the DMZ sketched on the board in class, and another sketch is included in the Memo From The Boss just below.

The rack-mounted servers should be identical, each with a TByte of RAIDed DAS and rigged with at least three ethernet ports, so that any of them can take over the role of any of the others when a server fails. If you find a good deal on a server that doesn't have three or more ethernet ports make sure it has an expansion slot for a pci or pci-express dual or quad port ethernet adapter.

The sketch shows the servers as Application, Database, DMZ/Proxy, and Backup Servers. The three 'working' servers are synch'd to the backup server on the rack, and also to a backup server at the software house's secure hotsite via secure internet. In the event of the failure of one of the servers, or a local or regional disaster, there is a well-rehearsed procedure to change a couple of IP addresses and start appropriate services on one of hot backup servers so business can continue.

Microsoft Visio is required for the floorplan and rack diagrams. It's a component of MS Office Pro, and is a de facto standard tool for all kinds of diagrams in business, IS, and IT. It's available free thru the MSDNAA for students in INFO300. Please do not get the limited-use, free download from Microsoft's public site, do get the real Pro version from MSDNAA. Visio will also be used again in INFO361-Analysis & Design, INFO364-Database, and INFO465-Projects and in the advanced courses in all our tracks. Don't wimp out and use the Excel, Word, or PowerPoint drawing tools because they're all you know! The job will be much more difficult since you'll have to invent your own shapes and the diagrams won't be very Pro in appearance.

Excel, or other spreadsheet, makes it easy to do the Purchase Orders, there are templates built-in for them. A spreadsheet is also useful for the summaries of up-front costs and operating expenses. Most students put the final document together in Word and copy/paste the Visio diagrams and Excel bill of details into it, then export it to a pdf to make it easy for the boss, or a technical interviewer or manager, to use the document without owning Excel, Word, or Visio.

Memo: October 10th, 2019

To: Jay Thunder, MHS Network Admin
 Fr: The Boss
 Re: New Office & Warehouse for DMLH's Fulfillment Center for Music Historical Society & others

What's Up

Jay, a lot's been going on with the MHS and our competitors. The board wanted to keep this close during negotiations, which are complete. Now, we're ready to move our inventory, and our failed competitors' inventory, to a new fulfillment center in River City and ask you to get the orders together for the network down there and set aside time to travel and get it up and running for us.

We expect to take occupancy of this warehouse, which will be swept clean, by December 1st, then get it wired and the generator and a/c installed asap. The electrical and a/c is promised complete by November the 20th. You can set to work then to setup the LAN so we can start moving in and accepting shipments and stocking on or about the December 26th, in the lull after the holidays.

Plan the offices and diagram them with Suzy Smiley who will putting the orders together for desks, furnishing the break room, and telephones.

Background

Disc Media's Last Hoorah is the newly re-monikered for-profit counter-part for The Music Historical Society, which is a 501C3 not-for-profit operating as a fiduciary trust for the archives and collections of all kinds that have to do with the history of music. DMLH is quadrupling its warehouse space to take on inventory and customers from competitors and societies arranged around instruments like piano, organ, renaissance horns, strings, brass, and others who are leaving the music distribution and retail business, and have accepted our most favorable offers to salvage their inventory and accounts yet keep their goods available for lovers of their genre.

Soon, we'll have a detailed history of purchases by a couple million aficionados and musicians of almost all kinds of instruments and music all over the world, except contemporary pop, country, rock, &c. DMLH will continue to sell sheet music and scores, books, CDs, and DVDs and will expand its inventory of cassette and reel-to-reel tapes, plus add vinyl LPs back to the warehouse a couple decades after we abandoned them.

Symphonic, chamber, organ, vocal, and choral music recorded in large halls, churches, chambers, and other venues doesn't sound as good on digital media and we expect a decade or more of good sales in LP and tape along with CDs and DVDs. Audiophiles and professional musicians prefer analog recordings on vinyl or tape so we're adding these back to our extensive selection of CD and DVD from more than 300 suppliers in almost every country where music has a history.

From the new location we will fulfill on-line, mail, and telephone orders for MHS and the several other organizations whose inventory we carry. We will be stocking 12,000 CD/DVD titles, about 6,000 titles for sheet music & orchestral scores, and about 2,200 titles in vinyl and tape. Digital distribution rights have not been negotiated for nearly 90% of our titles, so as long as paper, disk, tape, and vinyl are desirable by musicians and music lovers we will carry on...

MHS will keep our present production facility and offices for staff and editor in Yankee Neck, move the Executive Director to the new warehouse, repurpose the old, inadequate warehouse, and move all our inventory to the new office/warehouse in River City. After setting it up, you'll admin and monitor it remotely. The network room won't need a desk, only the rack equipment, UPS, and VOIP/PBX and a table for a work area when needed. It will remain locked unless you request the manager to open it if hands-on are needed.

New Warehouse

The new warehouse is a 100' deep and 68' wide in a large warehouse building with a front entrance through a brick facade and the rear opening to a 16' deep, sheltered loading dock.

This block of fifteen large warehouses was built in the 1920's to support manufacturing and shipping from the nearby and long-abandoned ship and train terminals that are being renovated and refit for residential, retail, restaurants, offices, and data centers. These are handsome brick buildings with adequate parking in the front and alongside for crew and walk-in customers and easy access for trucks of all sizes. We expect more walk-in trade since we'll be in a better neighborhood than our old warehouse and River City has hundreds of members of MHS and other organizations we'll be working with.

The shelving units left behind by the prior tenant are ideal for our purposes. The prior tenant was an industrial parts distributor with a mix of mostly small parts, a few large parts handled on pallets, and lots of trade goods in cartons.

The larger area is made up of shelving units 18 inches deep and 4 feet wide, back to back, with a 4 foot aisle between them. These shelves have 11 inches of vertical clearance, and the units are 8 feet tall. The side wall at the end of the stand-alone shelving units has a solid wall of 18' deep shelves that have 17' clearance. There are three rolling stair units for access to higher shelves and over-stock kept on upper shelves and on top of the units near the manufacturer's items in stock-keeping sequence.

The smaller area at the rear of the warehouse was for palletized items and it fits our bins for sheet music and LPs. It has shelves that are 4 feet deep and wide, with the alley 6 feet wide to accommodate palletized items and a forklift or pallet jack, bolted together side-by-side, very sturdy. They have four feet of clearance on the floor under the first shelf, a shelf with 4 feet clear, and a top shelf.

Floor Plan & Rack Layout Sketches

Here is a sketch of the [**Floor Plan**](#) for the offices and warehouse.

Here is a sketch of the [**Rack Layout**](#) with the IP addressing scheme NPONet expects.

These are both right rough sketches but they're likely accurate since I'm fresh from meetings. Please get them cleaned up and ready for NPONet to approve, and installers to use.

NPONet Application Software and Support

NPONet will be facilitating the launch of the network at our new fulfillment center. We met with Guy Shick from NPONet today and arrived at a purchase price of \$43,000 for their NPONet software package, 12 user license, & installation of firewall software. Annual maintenance will be 12% of that.

Also, we agreed on a price of \$9,000 for them to do the conversion and take-on of items, customer accounts, and order history from our failed competitors' and other suppliers' databases. NPONet will also work to scrape our current inventory from the pages of our Yahoo store so we can abandon it. With the sales from our new warehouse, we would be paying Yahoo more than \$120,000 a year if we continued with them, so this will cover costs for the NPONet software and network.

NPONet will maintain a hotsite for us and handle remote transaction logging at their secure facility for \$200 per month in addition to the 12% annual maintenance fee. Please get a PO together for NPONet: 11210 Rose Hill Rd; Phantomia, MA 09129.

Electrical Service & A/C

NPONet discovered on their site visit that there are three ground circuits in the warehouse space and one is not working at all. We'll need to remedy that since it would fry our LAN for sure.

Also, we're getting a natural gas generator to provide as much up-time as we can afford at our location, where there is a history of momentary power fluctuations and outages a few times a year.

We've engaged River City Environmental, 17 Argyle Court, River City, VG 23285 to do this work. They've agreed on: \$8,200 for a 22KW natural gas generator and its ATS installed near the power and DMARC shed on the shipping dock; \$4,750 to install a new ground stake at the shipping dock face, a new meter and main panel, and tie all our electrical outlets to it; \$5,000 to install the new dual zone air-conditioning and get vents working in toilets, network room, and kitchen; and \$1,000 to add four 20amp circuits to the network room and up to ten more outlets where they may be needed in the offices or warehouse.

Personal Computers

We need several 'low powered' PCs for desks and benches, and one beefed up workstation for Advertising/Publishing.

Find a deal on 'low powered' PCs mentioned below, which don't need to be super-powerful and dual-core Celeron, early Core, or AMD will work. Get at least 8 Gigs of RAM. Splurge on larger HD monitors for the front-office if you'd like. See specs below for the workstation.

Network Room

The network room must be physically secured and rigged with a secure DMZ firewalling scheme for the LAN and secured server network. We need to meet and exceed PCI standards for security and privacy since we're the custodian of customers' payment card data. Please get a PO together for PCI Compliance, Inc; 10000 N. Boston Rd; Farmington, Mass 09876. They will provide initial audit and their monitoring software and services for \$2,000 to start, plus \$400 in advance for the first year's services and \$400 per year after the first.

Find a network rack with power management built-in, or put one together. It needs a rack-mounted ATS and two UPSs at least 2.5KVA.

We need 4 identical x86-64 servers, AMD or Intel, each with at least three ethernet interfaces and a pair of 1 TByte SAS disks mirrored in a RAID 1. These will be rigged as: DMZ firewall/router/proxy, secure application & web server, database server, and a backup server that stays in synch with the other servers and can replace any of the other four machines if/when needed. See the attached sketch for the rack layout and jumpering.

All four machines need RHE licenses and will be managed using RedHat's on-line utilities. along with other MHS servers. Two of the \$349/per two socket versions will suffice if you get single-socket servers for the rack. Get a PO together for this please, and plan to renew them yearly.

NPONet provides remote hot-site and remote transaction logging as part of their on-going service agreement, as mentioned above.

We'll do full-backups on weekends and incremental backups and dump local transaction logs to LTO tape nightly.

Get two rack-mounted LTO tape drives and 200 smaller capacity LTO tapes similar to HP C7975A LTO Ultrium 5 (1.5/3.0 TB) or Maxell 183906 10-Pack LTO Ultrium 4 Tape Cartridge LTO-4 800GB/1.6TB. See if you can find a source for less than \$20 per tape. Get a set of tape labels. One drive will backup the advertising computer and the other will get the application, database, and DMZ servers. NPONet will check a tape for readability monthly, so plan to do that. The manager and other employees will be loading and labelling tapes, monitored automatically by in the system health checks.

United Security Vaults will pick up and drop off tapes on weekdays for \$350 per month for up to 300 tapes. They'll put them in their tape storage robot and make them available for secure, near-line access for routine audits and system health checks.

A VOIP/PBX Controller, all the phones, and the secretary's phone console are already on order from Rochester Alarms on the office budget, so you don't need to issue a PO for this. The VOIP controller will be hung on the wall near the network rack and it's VOIP port connected to the LAN switch's uplink port.

The Internet port on the VOIP Controller is connected to the DMZ/Proxy's ethernet port 0.

We'll start off with the two T3s, one for pure data by VOCAD/GigaPath for \$350/mo and the other from Cavalier provisioned for their VOIP service for \$775. The Cavalier contract includes unlimited long-distance and local calling through their SIP service to complement our VOIP controller. The T3s come to the DMARC in a utility shed built onto the shipping dock adjacent to ours, and they enter the DMARC shed from opposite ends of the warehouse block to help ensure redundancy if a circuit is cut.

Wireless Access Point for Inventory Cart ≠ Employees' Devices: Get a separate DSL circuit and wireless modem from Verizon to support the inventory cart and employee's phones. We don't want WiFi attached to our network at all since any PC is likely to be used for customers' credit cards and personal information. The inventory notebook and employees will be using VPN to access NPONet securely. We are close enough to the telco switch that we can get 15 MBytes bandwidth for \$89 per month and neighbors report good service. Wire the DSL Modem/WAP directly to the NID in the DMARC shed. Set the WAP's firewall to only handle established connections and add the MAC addresses of employee's devices to the access control list.

Get nice, _managed_, rack-mountable 10/100/1Gig switches with uplink ports for the LAN and DMZ. Get both the same, or select from a line like NetGear that has the same manager's interface on switches from 8-port through 32.

Three IP networks are involved: We have a block of 6 fixed, public IP addresses on the 162.243.30 subnet from 71.121.19.9 through 162.243.19.15. 19.9 is for the gateway router in the VOIP controller, and 19.10 is for the DMZ/Proxy's port 0. The others may be used in the future. The LAN for the office will run on 192.168.1 with .1 as the router/gateway. Assign office machines starting with 192.168.1.100. The secured LAN for servers is 10.0.1 with 10.0.1.1 as the gateway for that cluster of machines: The DBMS server is at 10.0.1.10, App server is at 1.11, and Backup is 1.12.

Ethernet/IP Assignments:

- DMZ/Proxy:
 - eth0--71.129.19.10 is our public IP, associated with our DMLH web and mail servers, connects to the Internet port on the VOIP controller, which serves as the gateway at our border and will be configured with IP as 71.129.19.9.
 - eth1--192.168.1.1 will attach to the LAN switch for the office & warehouse, will be used as the gateway for these machines.
 - eth2--10.0.1.1 will attach to the uplink port on the 'secure switch' for the network for app, database and backup servers.
- Database server eth0: 10.0.1.10
- App/Web server eth0: 10.0.1.11
- Backup server eth0: 10.0.1.12

Disable DHCP and assign static IP addresses in the warehouse and offices starting at 192.168.1.100. Record the MAC addresses as you set up the machines, to loaded into the DMZ's access control list.

NPONet's Shick will be in touch with you as you set up and prove the firewall, proxy, and VPN. Send him a copy of the floorplan and rack diagram so they he and his crew can advise and consent about the network, in which they'll share administration and audit.

When the installation is complete get in touch with PCICompliers.com so they can audit as we start up.

Receiving

The receiving bench needs a low-powered PC, a portable barcode scanner, and a barcode printer to print barcode labels for the several items that arrive with no barcode. NPONet asks us to use Zebras for barcode printers for compatibility with their label-printing features.

The receiving bench shelves are filled with environmentally-friendly plastic jackets for items we don't want to mark with a barcode label.

An HP or Lexmark B/W Laser needs to be attached to the network on the end of the receiving bench for printing receivers, inventory count sheets, and other paperwork. It will be used as a backup printer for picking lists if needed.

Shipping

There is a two-foot wide shelf over the shipping desk where the printers will be placed. The shipping bench needs four low-powered Windows PCs, Celeron or Duron or cheap dual-core is OK, with 4 or 8 GBytes of RAM. They should all have serial, ethernet and multiple USB-2 ports to be compatible with printers and scanners, they'll all run Windows:

- One will act as 'the shipping computer' and connect to the scale, mailing machine, and label printers. It needs to run on two-port KVM switch with the Shipping 1 computer. It may be placed on a shelf below the shipping bench. It will run UPS ConnectShip and FedEx Ship Manager for orders where the customer requests UPS or FedEx so fulfillment crew will rarely use it directly. It serves as the printer-driver for the two 4" thermal printers for 4X7 UPS and FedEx labels. One thermal printer loaded with 2 X 4 labels for USPS will be the most used, with postage printed by the Pitney-Bowes mailer.
- The shipping computer makes the current scale reading available via the LAN and is integrated with NPONet's app so USPS labels and postage are printed automatically when the ACH authorizes payment.
- Three low-powered PCs with barcode scanners for each of the 6-foot work areas on the shipping bench. Usually there are one or two picking and shipping, the 3rd work is for rushes.
- The USB label printers and scale will be moved from our existing warehouse.
- The Pitney-Bowes mailing machine needs an ethernet jack, too. We will be moving our current machine to the new warehouse.
- A b/w laser printer for printing picking lists.

Our rather conservative board insists, probably wisely, on a piece of paper being printed for every movement of inventory. These are archived face-down, in rough date sequence, in storage boxes, sampled by auditors, and taken off-site periodically.

Inventory Cart

The cart in the warehouse will be used most days for inventory management, cycle counts, and putting up stock. It needs a big notebook computer with a numeric keypad, a USB barcode scanner, and a USB Zebra barcode printer.

Find a built-for-purpose cart with a big battery power supply that will keep it running for an 8-hour shift.

To connect it to the network, place the Verizon DSL/WiFi in the ceiling at the center of the warehouse. Connect it directly to the DSL circuit in the DMARC room adjacent to our space.

The cart will be used daily for cycle-counts and can serve as another receiving station when there are a lot of shipments.

Front Offices and Secretary

In the ED's offices, Sales, and Secretary's desk we need desktop PCs running Windows, low-end please, not much power needed, large, HD LCD panels will be nice, 24-inches or larger. The manager and secretary each need a multi-function ink-jet printer with scanner to handle correspondence and local printing. Budget 4 sets of ink-jet cartridges per year for each of these printers.

A VOIP Fax goes on the workbench for customers and suppliers who still use fax.

Advertising/Publishing

The Advertising/Publishing desk needs special equipment to handle graphics for print and web. Get a nice, big, fast

Workstation with two CPU sockets and two very quick 8+ core CPUs plus dual graphics cards. 32 Gigs of RAM + a pair of 30-inch ultra hi def monitors.

Find an 11X17 Epson EcoTank for proofing adverts & booklets. Add an 11X17 scanner, or find an all-in-one like the ET-16500.

Get the pro versions of PhotoShop, Premier, and Quark Express.

Purchase a UPS, 300VA or better, for each PC, and a couple of big ones of 1500 VA or better in the computer room for the servers and the network equipment. Budget to replace the batteries in each UPS every year. This warehouse has relatively 'dirty' power, but the neighborhood very rarely has power out, only once or twice a year in recent years.

The machine labeled 'big color laser/binder' in the front office needs to be a color laser that can handle several paper bins, at least two 11X17 and two 8 1/2X11. It needs a finishing/binding attachment that can staple at the corner, edge, or center of 11X17 pages so we can print covers & contents for 8 1/2 X 11 catalogs or booklets and direct mail pieces.

Budget for the toner to print approx 6,000 pages per month. These will be small batches for the customers who we've discovered or suspect like mailed pieces better than email.

Many of the customers we'll be serving do not use The Internet (folks who play instruments 300-years old resist such innovations) so we'll be preparing customized catalogs for them at least quarterly, a mix of graphics and text. We have had and expect continued excellent response from these, where the failed competitors have ignored this market segment for some years.

Premises Wiring

The old network wiring doesn't go to our network room, and will be scrapped.

We're using VOIP phones, so each phone is plugged into the LAN and the PC is plugged into the phone. Shipping and receiving stations each get one jack, plus a jack for the shipping computer and the serial label printer attached to the LAN for the application server.

Bubba's Networking quoted a low \$40 a drop plus \$100 for the service call for the premises wiring since the building is easy to wire, mostly exposed to the 14' ceiling in the warehouse area, with a ceiling dropped in over the office at 9'. Bubba's will supply a patch panel and they will provide the CAT6 cabling and wall jacks.

Get enough jumpers to plug in all the Phones/PCs, printers.

The Manager, Secretary, and Ad desks in front office need two pairs of jacks each. Take care to place desks and jacks so that no jumpers are pulled across the floor or require long runs along the baseboard. The Sales desk only needs one jack.

Make sure to show the location of each wall jack with a Telecomm outlet symbol so your diagram can be handed to We Be Wiring when they show up to install the premises wiring. In all places, take care to put the jacks where there will be no jumper pulled across the floor..

Purchasing Docs, Rack Diagram, Floorplan

Please get good-looking documents together from these rough sketches and words. Use Visio to make a clear and accurate floorplan with the telecomm symbol at each LAN jack and drop wires. Make a separate detailed rack diagram that clearly shows the rack, servers, VOIP, patch panel and switches, and how the ethernet ports are addressed and jumpered.

Make a _purchase order for each supplier_ so I can get them signed off.

On a separate report show a line item for each supplier with the up front purchase costs and a total. In another section of the report, show the budget for annual operations. Set aside 12% of the purchase price for maintenance if it's not included in the purchase price, and include it in the annual operations. Do not mix purchase and maintenance!

If I've been unclear in any way, please get your questions asked and answered.

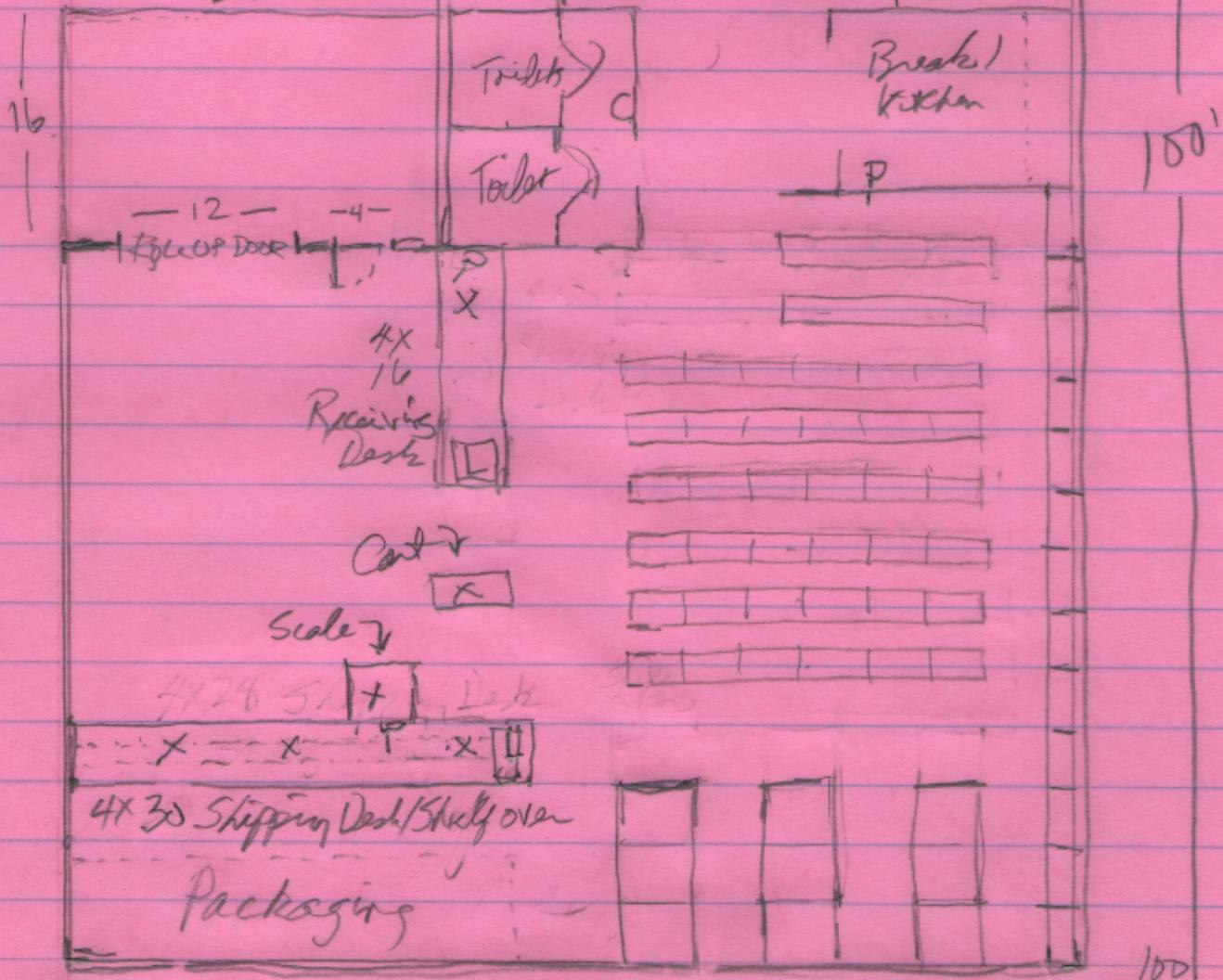
44

DMLH
Spring '19
New
Warehouse

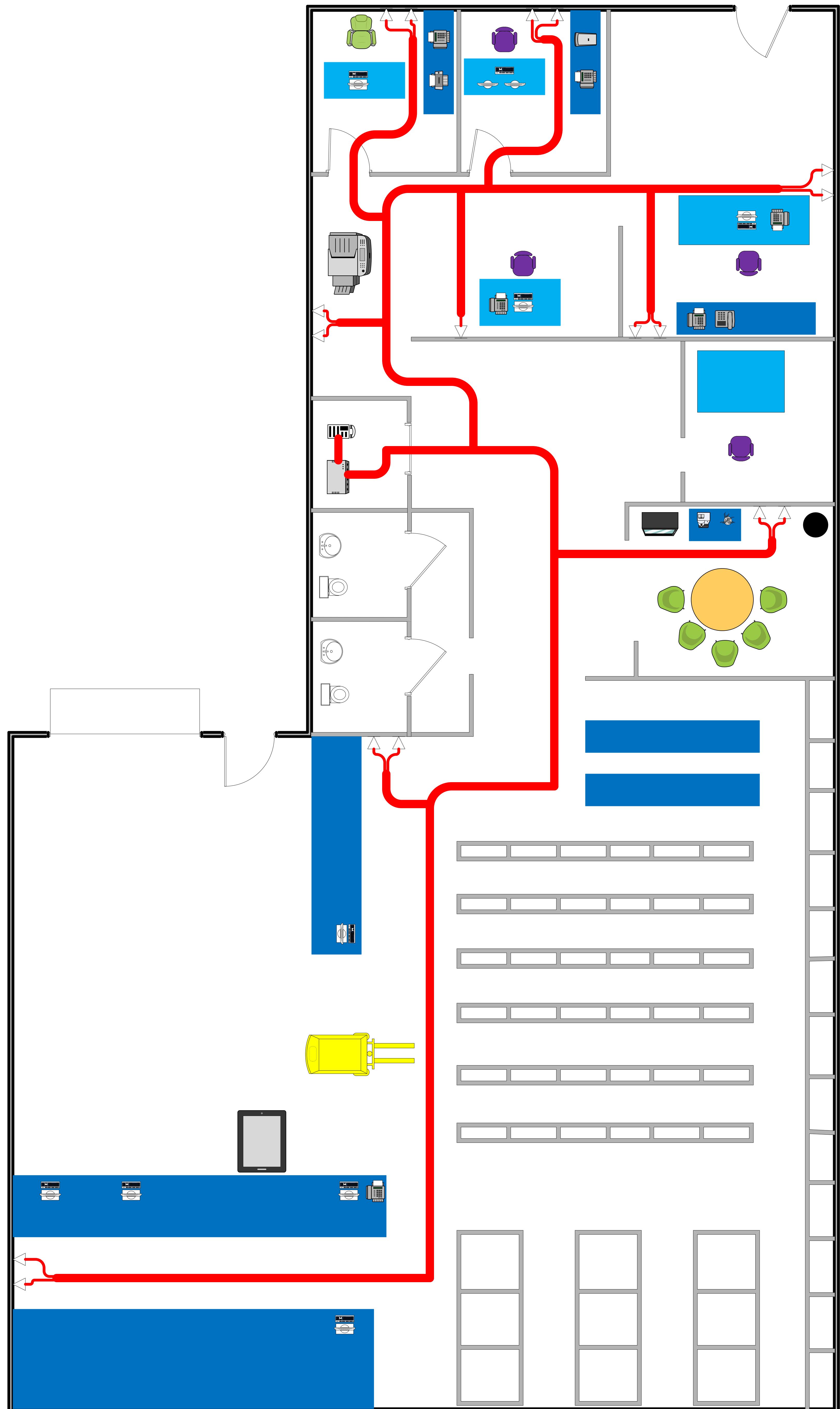
New ground
Second
Floor



24



68



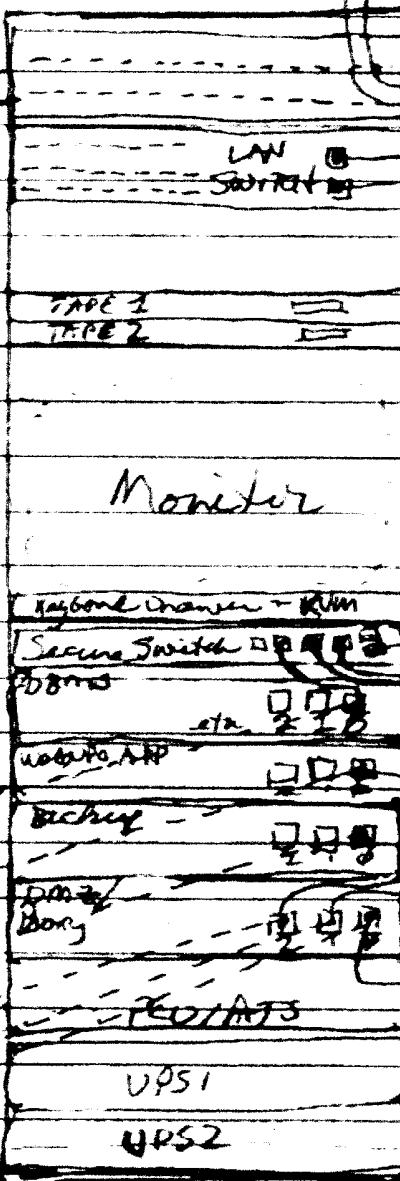
Assign LAN IPs

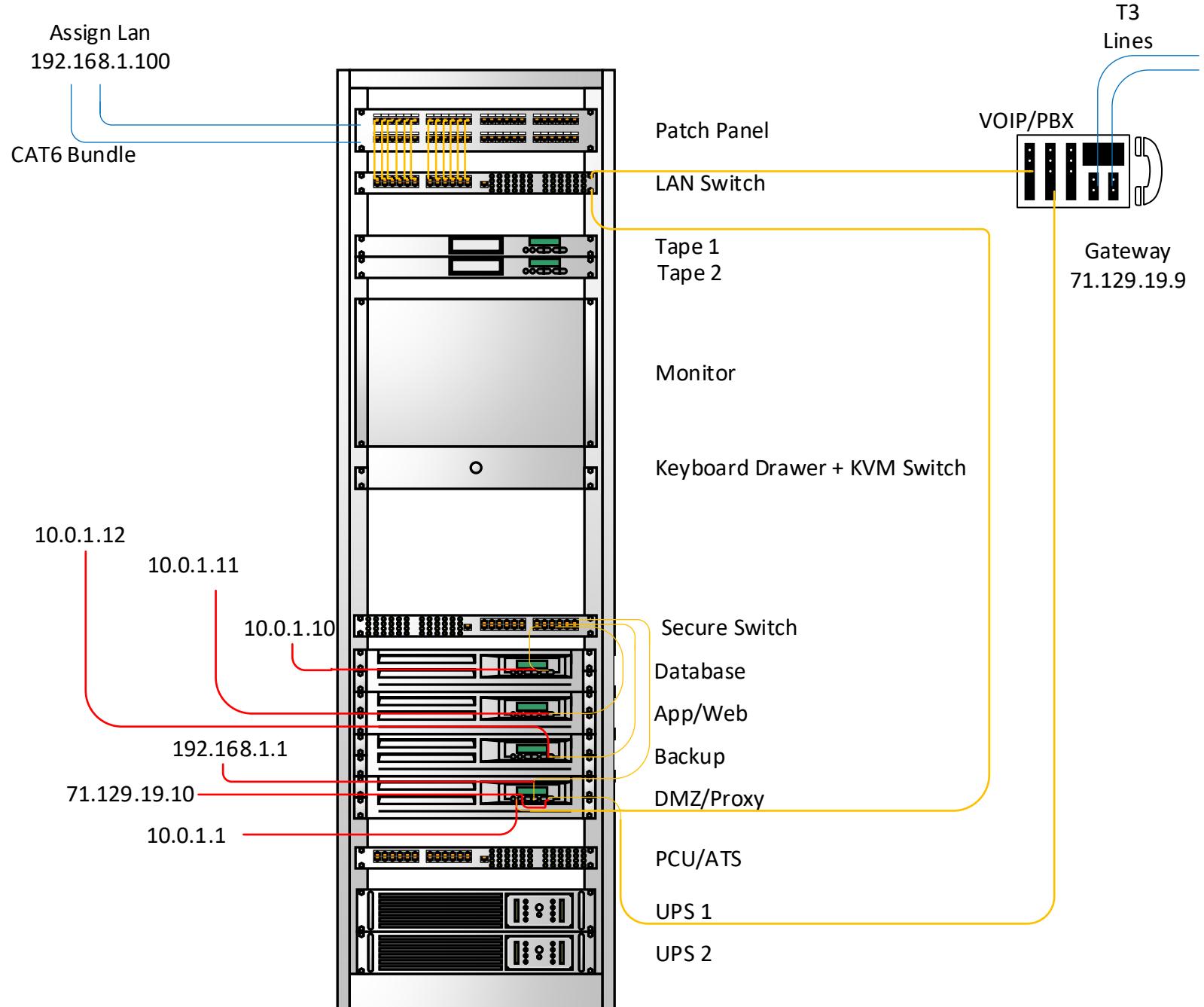
Bundled

CAT6
To WHSB
& OFFICES

from 192.168.1.100

T3





DMLH

2019 Purchase Cost Summary

Supplier

Adobe
River City Environmental
Quark
Amazon
HP
Bubba's Networking
Printers, Copers & More
PCI Compliance, Inc.
Alibaba
Red Hat
The Cavalier
United Security Vaults
VOCAD/Giga Path
Verizon
APC
Dell
Uline
HPONet
Cisco-Eagle Dallas

Total Costs

480
18,760
295
33,053
11,914
140
6,478
2,400
300
698
775
4,200
4,200
490
4,200
20,612
5,679
54,688
2,677

Total \$ 172,039.00

DMLH

2019 Recurring Cost Summary

Supplier

NPONet
Adobe
Quark
Dell
PCI
Compliance, Inc.
Red Hat
United Security Vaults
VOCAD/GigaP ath
The Cavalier
Verizon
Amazon

Total Costs

2,688
480
295
2,990
400
698
4,200
4,200
775
240
224

Total \$ 17,190.00

DMLH

PURCHASE ORDER

Vendor:

Adobe
7930 Jones Branch Dr.
McLean, VA 22102

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
ADOB-3523	Adobe Photoshop	1	240	240	240
ADOB-3442	Adobe Premier	1	240	240	240

Total \$480

DMLH

PURCHASE ORDER

Vendor:

Alibaba
400 South El Camino Real
San Mateo, CA 94402

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
ALIB-3925	UPSs (at least 2.5KVA)	2		150	300

Total 300

DMLH

PURCHASE ORDER

Vendor:

Amazon
410 Terry Ave.
N Seattle, WA 98109

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
AMZN-3921	Network Rack	1	1090	1090	1090
AMZN-4931	LTO Tape Drives (1 10-pack is \$14 per tape)	200	136	27200	27200
AMZN-5924	10/10/1000 Gig Switch	1	15	15	15
AMZN-8343	multi-function ink-jet printer	2	1,799	3598	3598
AMZN-2912	Fax	1	196	196	196
AMZN-9281	Ethernet Jack	1	39	39	39
AMZN-7391	notebook comp with numeric keypad	1	691	691	691
AMZN-7192	Ink-jet cartridges	1	56	224	224

Total

\$33,053.00

DMLH

PURCHASE ORDER

Vendor:

APC
132 Fairgrounds Rd
West Kingston, RI 02892

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
APCT-4924	Servers	4	1,050	4200	4200
Total					4,200

DMLH

PURCHASE ORDER

Vendor:

Bubba's Networking
587 E. Doam Rd.
Richmond, VA 23234

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
BUBA-4732	Premise Wiring of Building	1		140	140

Total \$140.00

DMLH

PURCHASE ORDER

Vendor:

Cisco-Eagle Dallas
2120 Valley View Lane
Dallas, TX 75234

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
CISC-3853	Cart with battery supply	1		2,677	2,677

Total

\$ 2,677.00

DMLH

PURCHASE ORDER

Vendor:

Dell Inc.
 1 Dell Way
 Round Rock, Texas 78682

Ship to:

Disc Media's Last Hurrah
 301 W. Main St.
 Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
DELL-3984	Precision 7920 Tower Workstation	1		2,939	2,939
A6861056	Photo Scanner	1		220	220
AA198970	Eco Tank	1		550	550
A6993995	1500VA	4		250	1,000
A0429490	300VA (1 for each computer)	9		91	819
APCRBC133	UPS Battery Replacement	13		230	2990
DELL-1924	Tape Labels	1		120	120
DELL-0392	Servers	4		1089	4356
DELL-9293	Tape Drives	2		3809	7618

Total

\$20,612.00

DMLH

PURCHASE ORDER

Vendor:

HP Inc.
 1501 Page Mill Road
 Palo Alto, CA 94304

Ship to:

Disc Media's Last Hurrah
 301 W. Main St.
 Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
HPHP-5839	Toner capable of printing 7,000 page per month	11		203	2233
HPHP-5532	11 x 17 in sheets of paper (15 each)	40		85	3400
HPHP-4391	8.5 x 11 in sheets of paper (15 each)	223		27	6021
HPHP-3924	HP B/W Laser Printer	2		130	260

Total \$11,914.00

DMLH

PURCHASE ORDER

Vendor:

NPONet
 11210 Rose Hill Rd
 Phantomia, MA 09129

Ship to:

Disc Media's Last Hurrah
 301 W. Main St.
 Richmond VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
2345-NPON	NPONet Soft Ware Package, 12 user license and installation of fire wall software	1	43,000	43,000	43,000
3215-NPON	Conversion and take-on of items, customer accounts, and order history from failed competitor's and other supplier's databases	1	9,000	9,000	9,000
5832-NPON	Maintain hostsite and handle remote transaction logging at their facility	1	200	12	2,688
				Total	\$54,688

DMLH

PURCHASE ORDER

Vendor:

PCI Compliance, Inc.
10000 N. Boston Rd
Farmington, MA

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
PCIC-3914	Provide initial audit wth their monitoring software and services	1		2,400	2,400
				Total	\$ 2,400.00

DMLH

PURCHASE ORDER

Vendor:

Printers, Copers & More
105 Harrison Avenue
Harrison, NJ 07029

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
PCAM-4829	Kyocera Taskalfa	1		6478	6478

Total \$6,478

DMLH**PURCHASE ORDER****Vendor:**

Quark Software Inc.
1225 17th Street, Suite 2050
Denver, CO 80202

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
QUAR-2418	QuarkXPress Advantage	1	295	295	295
Total					\$ 295.00

DMLH

PURCHASE ORDER

Vendor:

Red Hat
100 East Davie St
Raleigh, North Carolina 27601

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
REDH-3921	Red Hat services	2		349	698

Toal

\$ 698.00

DMLH

PURCHASE ORDER

Vendor:

River City Environmental
17 Argyle Court
Richmond, VA 23285

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
1639-RVAE	22KW Natural Gas Generator and its ATS installed near the power and DMARC shed on the shipping dock	1		8,200	8,200

DMLH

PURCHASE ORDER

Vendor:

River City Environmental
17 Argyle Court
Richmond, VA 23285

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
5939-RVAE	Install a new ground stake at the shipping dock face, a new meter and main panel, and tie all our electrical outlets to it	1		4,750	4,750

DMLH

PURCHASE ORDER

Vendor:

River City Environmental
17 Argyle Court
Richmond, VA 23285

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
4838-RVAE	Install the new dual zone air-conditioning and get vents working in toilets, network room, and kitchen	1		5,000	5,000

DMLH

PURCHASE ORDER

Vendor:

River City Environmental
 17 Argyle Court
 Richmond, VA 23285

Ship to:

Disc Media's Last Hurrah
 301 W. Main St.
 Richmond, VA 23220

Part #	Description	Qty	Unit Cost	Extended Cost	Total
3952-RVAE	Add four 20amp circuits to the network room and up to ten more outlets where they may be needed in the offices or warehouse.	1		1,000	1,000

Total

\$18,760.00

DMLH**PURCHASE ORDER****Vendor:**

The Cavalier
392 Jimmy Rd
Richmond, VA 23210

Ship to:

Disc Media's Last Hurrah
301 W. Main St.
Disc Media's Last Hurrah

Part #	Description	Qty	Unit Cost	Extended Cost	Total
CAVA-3921	T3 VOIP Service	1		775	775

Total

\$ 775.00