

Infrastructure Project for a Public School



Team Alpha

TEAM MEMBERS

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Project Scope – IT Infrastructure for Public School

Infrastructure Upgrade:

- Establish new IDF wiring closets strategically located across the school premises.
- Set up Win 2019 Server, CISCO MS355-48X2-HW Cloud Managed MS355-48X2 Switch 48 Ports Managed and Patch Panel in each IDF for efficient local network management.
- Cisco MX250-HW Meraki MX250 Cloud Managed security appliance
- Extend the high-speed 100/1000 base T LAN throughout the entire school.
- Implement a 1000 BASE T Cat 7 uplink to the MDF.
- Network Topology and IP Addressing - Develop and implement a new IP addressing scheme for efficient network management.
- Switching Infrastructure: Install new core and access layer switches in each IDF and relevant network locations.
- Security Configuration: Configure VLANs, firewalls, and routers to ensure a secure and controlled network environment. Implement
- **Enhanced Learning Environment:** Provide high-speed access to CIS students across the school for IS IT course materials.

Project Timeline:

Deliver fully operational labs, classrooms, and network infrastructure within a timeline of **76 days**.

Migration Plan:

Develop and execute a migration plan to seamlessly transition existing servers/workloads to the new infrastructure.

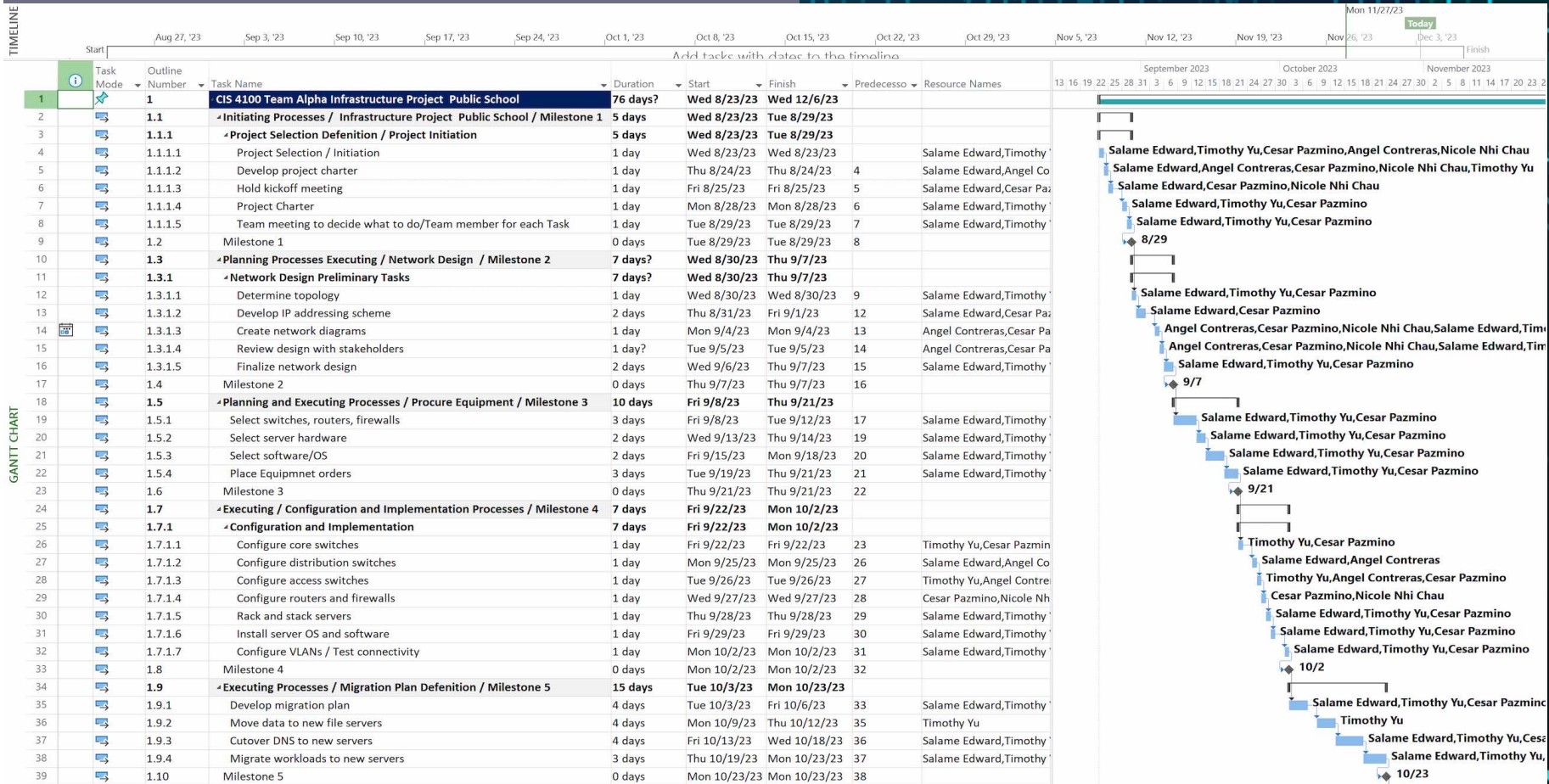
Cost: **\$2,137,580.00 usd**



Gantt Chart Milestone 1 - 4

TIMELINE

GANNT CHART



TIMELINE



IDF Intermediate Distribution Frame

IDF Overview:

- Intermediate Distribution Frame (IDF) serves as a crucial component in the IT infrastructure.
- Acts as a centralized point for network connectivity and distribution within a specific geographical area or floor.
- Minimizes the distance between end-user devices and network resources, optimizing performance.

Rack 1: Switches & Router:

- Primary function: Housing network switches.
- Switches manage local area network (LAN) traffic efficiently.
- Enables segmentation of network for better traffic control and security.

Rack 2: Switches & Router:

- Dedicated space for routers responsible for wide area network (WAN) connectivity.
- Routers handle inter-network communication, ensuring seamless data flow between different networks.
- Provides a gateway for external connectivity and internet access.

Network Redundancy:

- Incorporates redundancy mechanisms to ensure continuous network availability.
- Redundant power supplies and network links enhance reliability and fault tolerance.

The diagram illustrates the physical layout of Rack 1 and Rack 2. Rack 1 contains SchoolSW-A1 through SchoolSW-A8, SchoolASA-5515-A, SchoolSA-MX250-A, and ISP-AT&T CPE. Rack 2 contains SchoolSW-B1 through SchoolSW-B8, SchoolASA-5515-B, SchoolSA-MX250-B, ISP-Verizon CPE, and POTS (analog). Connections are shown for ISP-Verizon Fiber and ISP-AT&T Fiber. Above the racks, a wiring closet contains an IDF, a patch panel, and a router, with numbered connections (1-5) linking them to the racks.

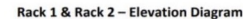
Rack 1 & Rack 2 – Elevation Diagram

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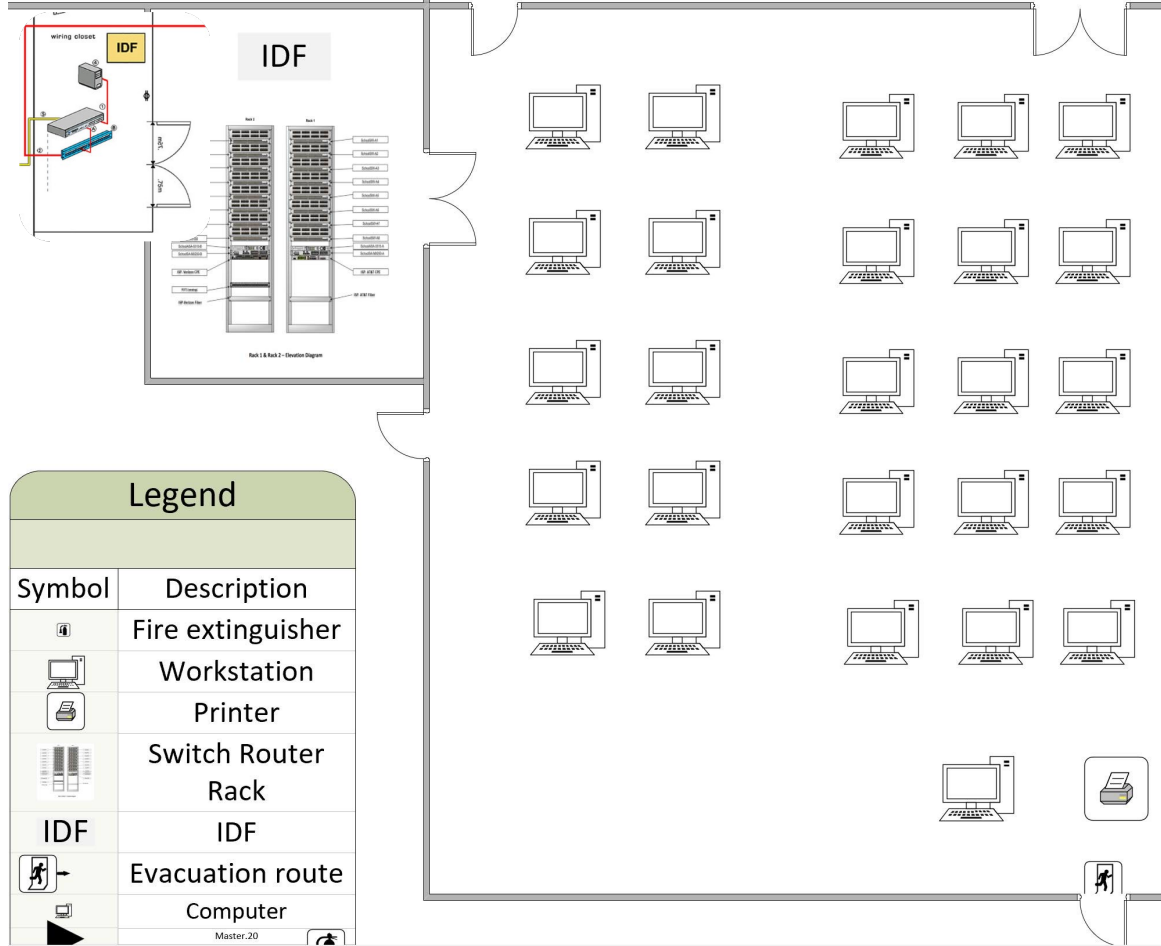
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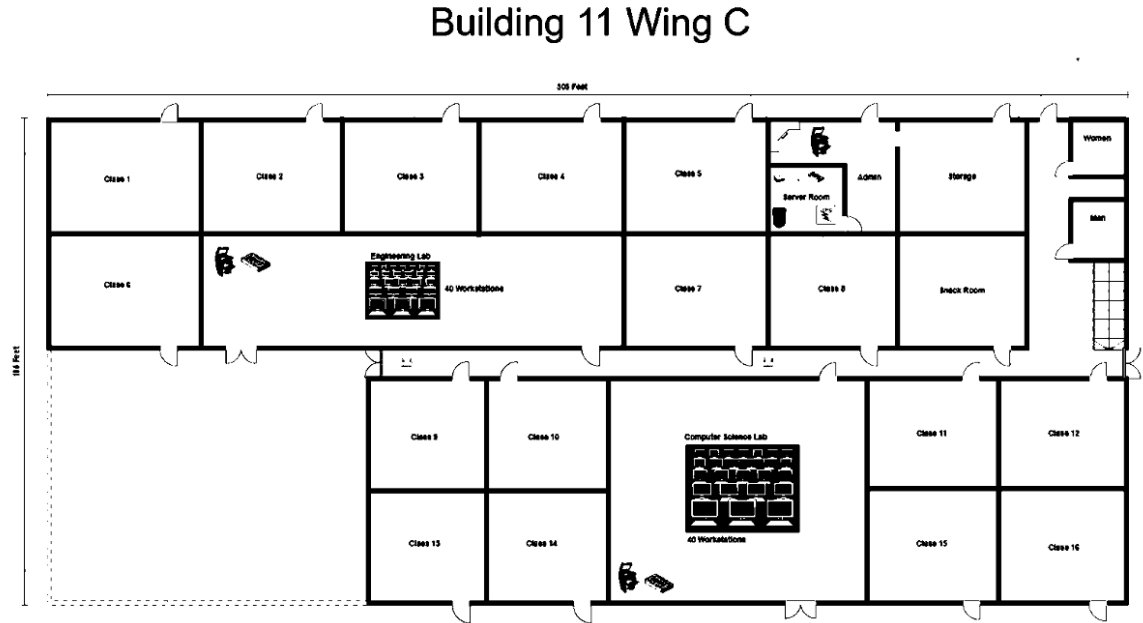
Class-Room Floor Plan

- 25 PCs Classroom
- IDF Server Closet
- Legend
- Type of PC Lenovo



Building 11 - Wing C Floor Plan

- 18 Class Rooms
- 25 Workstation each
- 2 Computer Labs
- 40 Workstation each
- IDF - Server Room
- I.T. Admin Office



Work-Stations

Lenovo Workstations feature the superior reliability and innovative capabilities that engineering, and architecture students require to build, model, and create modern structures.

Lenovo ThinkStation P3 Tiny combines simple and efficient design with professional-level power. With a total volume of just 1L, powered by Intel vPro® with 13th Gen Intel® Core™ processors and NVIDIA® discrete graphics. It can also support up to six independent displays.

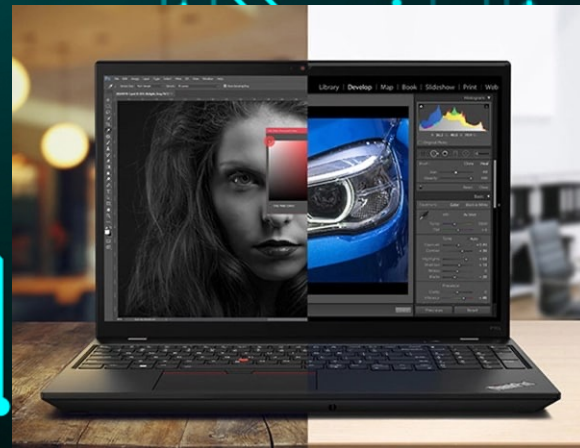
- Lenovo ThinkStation P3 Tiny Workstation Intel 30H 13th Generation Intel® Core™ i7-13700T vPro® Processor (E-cores up to 3.60 GHz P-cores up to 4.80 GHz)
- NVIDIA® T1000 8GB GDDR6
- 32 GB DDR5-4800MHz (SODIMM)
- 1 TB SSD M.2 2280 PCIe Gen4 Performance TLC Opal
- Lenovo ThinkVision T32p-20 31.5" 4K Monitor



Laptop Portable Workstations

ThinkPad P16s Gen 2 (16" Intel) has an Ultra Performance Mode to optimize power and maximize output. It has an array of ports, including Thunderbolt™ 4, and lightning-quick WiFi. ThinkPad P16s Gen 2 (16" Intel) is protected by ThinkShield. A suite of hardware and software solutions, it works together to safeguard your mobile workstation and data. It includes the discrete Trusted Platform Module (dTPM) to encrypt your data, an optional biometric fingerprint reader to log in quickly

- ThinkPad P16s Gen 2 Intel (16") Mobile Workstation – Black
- 13th Generation Intel® Core™ i7-1360P Processor (E-cores up to 3.70 GHz P-cores up to 5.00 GHz)
- Windows 11 Pro 64
- NVIDIA® RTX™ A500 Laptop GPU 4GB GDDR6
- 32 GB LPDDR5X-4800MHz (Soldered)
- 1 TB SSD M.2 2280 PCIe Gen4 Performance TLC Opal
- 16" WQUXGA (3840 x 2400), OLED, Anti-Reflection/Anti-Smudge, Non-Touch, HDR 500, 100%DCI-P3, 400 nits



Servers

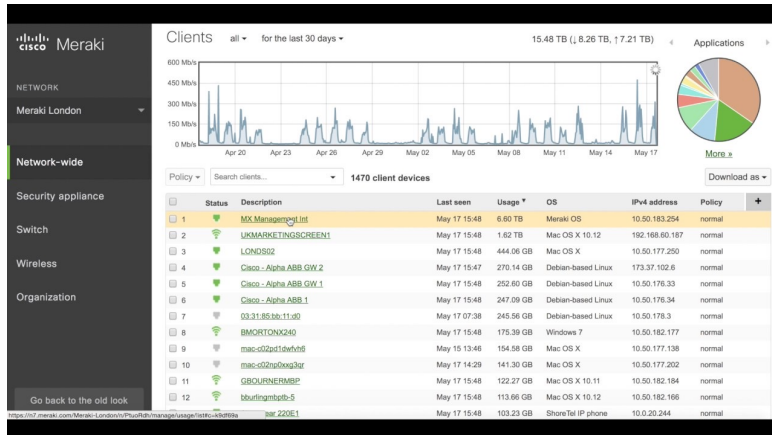
ThinkEdge SE450 Edge Servers

- Equipped with a 3rd Gen Intel' Xeon' Platinum processor for all the processing power needed to enable AI Workloads at the Edge
- Compact and ruggedized form factor for space-constrained and harsh environments
- Enhanced physical security with physical tamper protection, hardware- integrity with the latest TPM technology and full data protection with self-encrypted storage options
- Complete out-of-band management option from a local or remote wireless network

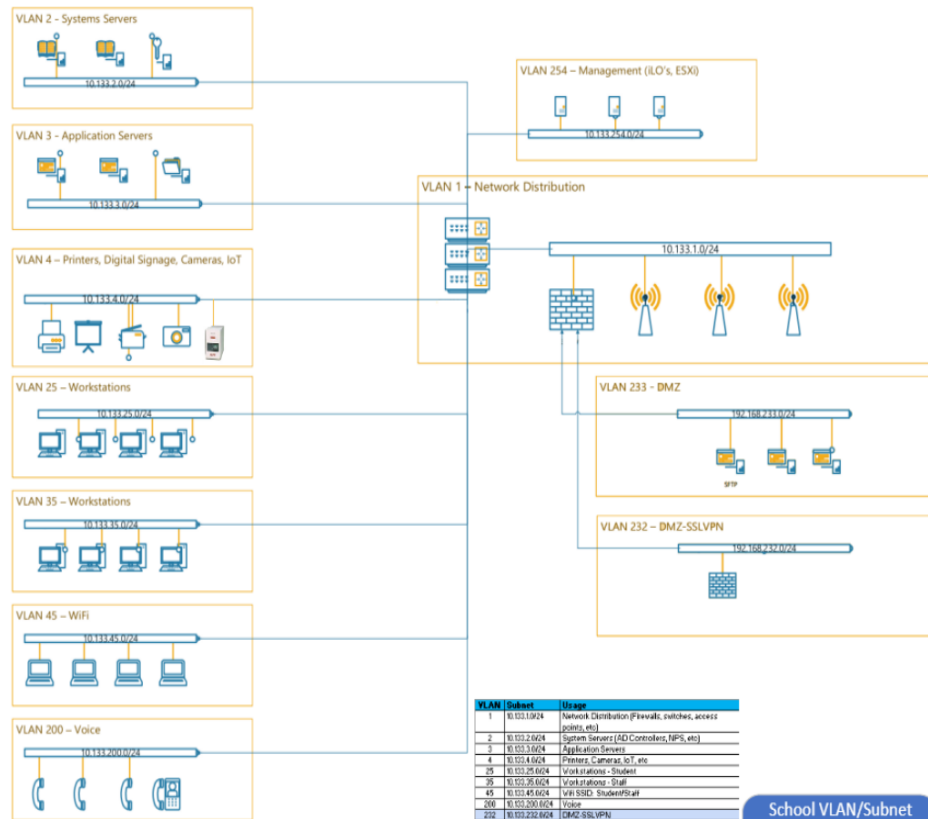


Meraki Switches & Security Appliances

- MS355 and MX250
- Cloud-managed
 - Configurations saved to the cloud
 - Accessible from anywhere



IP Addressing - VLAN



VLAN	Subnet	Usage
1	10.133.1.0/24	Network Distribution (Firewalls, switches, access points, etc)
2	10.133.2.0/24	System Servers (AD Controllers, NPS, etc)
3	10.133.3.0/24	Application Servers
4	10.133.4.0/24	Printers, Cameras, IoT, etc
25	10.133.25.0/24	Workstations - Student
35	10.133.35.0/24	Workstations - Staff
45	10.133.45.0/24	Wifi SSID: Student/Staff
200	10.133.200.0/24	Voice
232	10.133.232.0/24	DMZ-SSLVPN
233	10.133.233.0/24	DMZ (sftp gateway, security systems, etc)
234	10.133.234.0/24	DMZ-AV - Digital Signages, Room Schedulers, etc
255	10.133.255.0/24	Management Interfaces - iLO's, etc.

School VLAN/Subnet

Design 12/5/2023

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	10.133.252.0/23	

Budget Chart

Item	Units	Cost ea.	Total Cost	URL (Click link to view)	Labor Est.
Workstations - ThinkStation P3 Tiny Workstation	250	\$1,629.00	\$407,250.00	ThinkStation P3 Tiny Workstation	\$14,000.00
Monitors - ThinkVision 31.5 inch Monitor-T32p-20	250	\$449.00	\$112,250.00	ThinkVision 31.5 inch Monitor - T32p-20	\$ 14,000.00
Laptops - ThinkPad P16s Gen 2 Intel (16") Mobile Workstation-Black	34	\$1,949.00	\$1,949.00	ThinkPad P16s Gen 2 Intel (16") Mobile Workstation - Black	\$14,000.00
Server - ThinkEdge SE450 Edge Server	4	\$3,386.76	\$13,547.04	ThinkEdge SE450 Edge Server	\$10,750.00
Server Rack - Tripp Lite (SR42UB) Rack Equipment	24	\$1,608.25	\$38,598.00	Tripp Lite (SR42UB) Rack Equipment	\$4,000.00
Switches - CISCO MS355-48X2-HW Cloud Managed MS355-48X2 Switch 48 Ports Managed Rack-Mountab	144	\$8,300.00	\$1,195,200	CISCO MS355-48X2-HW Cloud Managed MS355-48X2 Switch 48 Ports Managed Rack-Mountab	\$8,200.00
Router - Cisco MX250-HW Meraki MX250 Cloud Managed security appliance new	34	\$2,385.00	\$81,090	Cisco MX250-HW Meraki MX250 Cloud Managed security appliance new	\$8,200.00
UPS	1	\$1,595.07	\$1,595.07	APC SMT2200RM2UC 2200 VA 1980 Watts	\$2,200.00
Licenses	25	\$199.99	\$4,975	Windows 11 Pro License	\$4,276.00
Licenses	4	\$1,069.00	\$4,276	Windows Server 2022 License	\$1,000.00
Licenses	81	\$249.99	\$20,249.19	Office Home & Business 2021	\$800.00
HP All-in-One Color Laser Printer	3	\$ 819.00	\$2,457.00	HP All-in-One Color Laser Printer	\$300.00
Cat 6a Cabling 1000 ft rolls	2	\$209.99	\$419.98	Monoprice 1000' 23AWG Cat6a	\$3,000.00
RJ-45 connectors 50 pk	4	\$74.95	\$299.80	Everest Media Solutions 90° Angled CAT6A Jack	\$4,000
Firewall	2	\$2,401.97	\$4,804.00	Cisco Firepower 1120 (FPR1120-ASA-K9)	\$200.00
Wireless Access points	2	\$1,183.99	\$2,367.98	Cisco Catalyst 9120AXE 802.11ax 5.38 Gbit/s	\$400.00
Card Reader Door Access System (INS)	1	\$6,000.00	\$6,000.00		\$4,000
Total	865.00	\$47,979.00	\$1,995,576.00		\$94,025.00
				Grand Total	\$2,137,580.00

Recap

1. *Objective:*
 - Modernize IT Infrastructure in a public school.
 - Enhance learning with high-speed network access.
2. *Scope:*
 - New IDF wiring closets and 100/1000 base T LAN.
 - 1000 BASE T CAT 7 uplink to MDF.
 - IP Scheme, core/access switches, VLANs, firewalls and routers.
3. *Hardware and Software*
 - Classroom : 25 Lenovo PCs/ room, ThinkVision monitors.
 - Servers: ThinkEdge SE450 for AI and data protection.
 - Network: CISCO MS355 and MX250 Switches.
4. *Budget Timelines*
 - Total Budget: \$2,137,580
 - Duration: 76 days
5. *Key Milestones*
 - IDF Installation
 - Classroom and lab setup
 - Server and network infrastructure deployment
 - Migration and testing phase.
6. *Future Steps*
 - Ongoing maintenance and updates
 - Training for staff and students.



Thanks!
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