NET 455 Project Report

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May 2022

Submitted in Partial Fulfillment of the Requirements for NET 455
Network Systems Administration
Seneca College
May 2022

Contents

1 Introduction

Modern systems require robust processing power, advanced graphics capabilities, and sufficient system memory to keep pace with increasing technological innovation. Legacy systems, often used by businesses established decades ago, struggle to run current applications and are vulnerable to security threats such as cyberattacks. Upgrading to modern systems is essential for businesses to adapt to evolving environments, ensuring performance and security to deliver critical services and products effectively.

2 Hardware and Operating Systems

2.1 Workstations

2.1.1 Recommended Requirements

Based on the company's requirements to run Adobe Premiere Pro, Adobe Photoshop, Adobe After Effects, and Microsoft Office 2021, the recommended workstation specifications are:

- **Operating System**: Windows 11 (required for Adobe Premiere Pro version 22.0 and later)
- **GPU**: MSI NVIDIA GeForce RTX 3050 VENTUS 2X 8GB GDDR6, NVIDIA driver version 472.12 or later
- **Processor**: Intel 7th Gen or AMD Ryzen/Threadripper 2000 series
- **RAM**: Lenovo 32GB DDR4 3200MHz ECC RDIMM Memory
- **Storage**: SSD with at least 9GB free space
- **Monitor**: 1920x1080 resolution or higher
- **Sound Card**: ASIO protocol or Microsoft driver compatible
- **Printer**: Brother MFC-L2710DW series (wireless)

2.1.2 Existing Systems Evaluation

The existing systems running Windows 7 are inadequate, as Adobe software requires Windows 10 or 11 (preferably 11 for version 22.0+). Upgrading existing systems costs approximately CAD 1,824 per unit, while new workstations cost around CAD 2,500. A hybrid approach—upgrading half the systems and purchasing new PCs for the remainder—balances cost efficiency with technological advancement.

2.1.3 Vendor Comparison

- **Dell**: Workstations cost CAD 2,100–3,000, meeting all required specifications.
- **HP**: Workstations cost CAD 2,000–2,800, offering similar specs with better multitasking and faster Intel CPUs.

2.1.4 Chosen Vendor

HP is selected due to its lower cost, higher reliability, greater memory capacity, and superior multitasking capabilities compared to Dell.

2.1.5 Workstation OS Comparison

- **Windows 10**
  - **Pros**: Widely used, supports gaming, robust security, free upgrade from Windows 7/8, cost CAD 50–280, support until October 2025.
  - **Cons**: Mandatory updates, privacy concerns, some legacy apps unavailable.
- **Windows 11**
  - **Pros**: Supports Android apps, modern UI, cost CAD 30–200, enhanced multitasking.
  - **Cons**: More bugs, limited taskbar functionality, requires high-end GPUs.
- **macOS**
  - **Pros**: Streamlined UI, better hardware integration, robust security updates.
  - **Cons**: Expensive, limited gaming support, fewer app store options.

2.1.6 Chosen Workstation OS

Windows 11 is chosen as it supports all required Adobe software versions, is cost-effective compared to macOS, and meets the client's performance needs.

2.2 Servers

2.2.1 Recommended Requirements

The recommended server is the Lenovo ThinkSystem ST550 Tower Server:

- **Processor**: 2x 2nd Gen Intel Xeon Platinum, up to 22 cores per CPU
- **GPU Support**: Up to 2x GPUs
- **Memory**: Up to 12x TruDDR4 RDIMM slots
- **Drive Bays**: 4
- **Expansion Slots**: Up to 6x PCIe Gen 3 (with 2 processors)

2.2.2 Vendor Comparison

- **Lenovo ThinkSystem ST550**: CAD 9,048, superior processor and memory capacity.
- **Dell**: Higher cost, less competitive processor performance.

2.2.3 Chosen Server

The Lenovo ThinkSystem ST550 is chosen for its cost-effectiveness, superior processor, and ample memory for large file transfers.

2.2.4 Server OS Comparison

Specification	Windows Server 2019/2022	Linux
Storage	32 GB	20 GB
RAM	512 MB	16 GB
Processor Speed	1.4 GHz	GHz dual-core
Price (Basic)	CAD 100–150	CAD 25–35

Table 1: Server OS Comparison

2.2.5 Chosen Server OS

Windows Server 2019/2022 is selected for its global support, lower system requirements, and advanced features, despite being slightly more expensive than Linux.

2.3 Other Networking Devices

2.3.1 Network Security Devices

A SonicWall TZ470 firewall is recommended:

- **Features**: NAT, VPN, PAT, VLAN support, DoS attack prevention, jumbo frame support, DHCP server, bandwidth control, IPv4 support.
- **Purpose**: Protects sensitive data by filtering traffic and preventing unauthorized access.

Other devices to consider: Intrusion Protection System (IPS), Unified Threat Management (UTM), Network Access Control, Email Security Gateways, VPN Gateways.

2.3.2 Network Monitoring and Management

OpManager by ManageEngine is recommended for monitoring network performance, with servers, switches, and routers for management.

2.3.3 Client-Requested Devices

- File Server
- Remote Access Server
- DNS Server
- DHCP Server

2.3.4 Additional Devices for Functional Network

Switches, routers, and modems are essential for network functionality.

2.3.5 Additional Equipment

Hubs, bridges, Ethernet cabling, patch panels, connectors, and wireless access points.

3 Network Topology

3.1 Topology Options

- **Bus Topology**
  - **Pros**: Easy installation, low cost, minimal cabling, easy to manage/expand.
  - **Cons**: Backbone-dependent, congested during busy periods, single-direction data flow.
- **Ring Topology**
  - **Pros**: Low collision rate, cost-effective, dual-ring redundancy.
  - **Cons**: Single node failure disrupts network, high maintenance.
- **Star Topology**
  - **Pros**: Easy to manage, durable, low cable usage.
  - **Cons**: Switch-dependent, limited by switch ports.
- **Tree Topology**
  - **Pros**: Scalable, easy to manage.
  - **Cons**: Root node-dependent, requires expertise and extensive cabling.
- **Mesh Topology**
  - **Pros**: High-speed, secure, durable.
  - **Cons**: High cable usage, complex setup.

3.2 Chosen Topology

Bus topology is recommended due to its low cost, minimal cabling, and ease of installation, suitable for the company's needs.

3.3 Redundancy

Redundancy ensures data flow continuity during failures. Reasons for implementation:

- **Cost-Cutting**: Bus topology reduces implementation costs.
- **Hardware Redundancy**: Single main line connects devices.
- **Data Redundancy**: Enhances security and backup options.
- **Restructure**: Supports expansion without workforce reduction.

3.4 Wi-Fi Solution

3.4.1 Comparison

- **Aruba Wireless**: Easy deployment, scalable, good GUI, but limited visibility and occasional update issues.
- **Cisco Wireless**: Reliable, secure, easy management, but expensive and lacks cloud-based management.

3.4.2 Chosen Solution

Cisco Wireless is selected for its reliability and user satisfaction, despite higher costs.

4 Backup Solutions

4.1 Backup Solution Types

- **Tape**: Reliable for long-term storage, but slow and expensive.
- **Optical Storage**: Cost-effective, portable, but prone to damage.
- **SD Cards**: Compact, but expensive and less durable.
- **Flash Drives**: Convenient, but vulnerable to viruses.
- **Hard Drives/SSDs**: Affordable, high capacity, but prone to damage.
- **NAS Drives**: High capacity, shareable, but firmware-dependent.

4.2 Backup Solution to Implement

External SSDs for each workstation are recommended for incremental backups and archiving deleted files, offering protection against internal damage despite higher costs.

4.3 Pricing Breakdown

- **OneDrive**: CAD 153.80/year (Unlimited)
- **Seagate HDD**: 1TB CAD 59.99, 2TB CAD 74.99, 4TB CAD 114.99
- **iCloud**: 50GB CAD 1.29/month, 200GB CAD 3.99/month, 2TB CAD 12.99/month

5 ISP, Web Hosting, and Email Services

5.1 ISP Comparison

- **Bell Gigabit Fibe**
  - **Gigabit Fibe 3.0**: 3Gbps, CAD 125.00/month
  - **Gigabit Fibe 1.5**: 1.5Gbps, CAD 110.00/month
  - **Gigabit Fibe 500**: 500Mbps, CAD 105.00/month

- **Rogers Ignite**
  - **Ignite 25**: 25Mbps, CAD 94.99/month
  - **Ignite 50**: 50Mbps, CAD 149.99/month

Chosen ISP: Bell is selected for its variety of plans and lower costs compared to Rogers.

5.2 Web Hosting

- **HostUpon**
  - **Shared Hosting**: CAD 4.95/month
  - **VPS**: CAD 6.95/month
  - **Dedicated Servers**: CAD 99.95/month

Chosen Vendor: HostUpon is selected for its competitive pricing and Canadian-based support.

5.3 Email Service

- **Microsoft Outlook**: Free, includes web versions of Office tools, calendar sharing.
- **Gmail**: Cloud-based, custom addresses, but requires paid plans for advanced features.

Chosen Service: Outlook is selected for its free access and integration with Microsoft tools.

5.4 Pricing Breakdown

Device/Service	Quantity	Price (CAD)	URL
Brother MFC-L2710DW	1	290	`https://www.google.com/...`
ThinkSystem ST550 Server	1	9,048	`https://www.google.com/...`
Windows Server 2019/22	1	501	`https://www.microsoft.com/...`
Windows 11 Home	26	189.99/unit	`https://www.bestbuy.ca/...`
Intel/AMD Processor	26	170/unit	`https://www.google.com/...`
Lenovo 32GB RAM	26	375/unit	`https://www.lenovo.com/...`
MSI NVIDIA RTX 3050	26	400/unit	`https://www.lenovo.com/...`
Sound Blaster Audigy RX	26	80/unit	`https://www.newegg.ca/...`
Monitors, Keyboards, etc.	26	10,000 (approx.)	`https://www.bestbuy.ca/...`
OneDrive	1	153.60/year	`https://products.office.com/...`
Bell Web Hosting	1	468/year	`https://www.bellmts.ca/...`
Microsoft Outlook	1	Free	`https://support.microsoft.com/...`
Bell Gigabit Fibe	1	1,380/year	`https://www.bell.ca/...`

Table 2: Pricing Breakdown

6 Virtualization

6.1 Virtualization Software Comparison

- **VMware vSphere Hypervisor**: Free, supports server consolidation, small footprint (144MB), high reliability.
- **Microsoft Azure**: Scalable, cost-effective, robust security and monitoring features.

Chosen Solution: Azure is selected for its broader feature set and global support.

6.2 Windows Server Licensing

- **Server Licenses**: Core-based, minimum 8 core licenses per server.
- **Client Access Licenses (CALs)**: Based on users/devices.

7 Network Design

7.1 Network Diagram

[Placeholder: Detailed network diagram showing connections via Cat 6 cables, switches, and routers.]

7.2 Server Rack Diagram

[Placeholder: Diagram of server rack layout including ThinkSystem ST550.]

7.3 Office Floor Plan

All wiring uses Cat 6 cables through walls with RJ-45 Ethernet ports in each room. The LAN connects via switches to the router, with wireless connectivity for printers.

8 Conclusion

This report outlines a comprehensive network solution tailored to the company's needs, balancing performance, cost, and scalability. The proposed hardware, software, and network configurations ensure efficient operations and future-proofing.

9 Work Distribution

- Lovish Shangari: Section 1, Introduction, Project Background (24 marks)
- Manav Dhingra: Sections 2, 3, Conclusion, Work Distribution (24 marks)
- Mehak Chawla: Sections 4, 5, References (26 marks)
- Jehkaran Singh: Section 6, Formatting, Table of Contents, Title Page (22 marks)

10 References

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