MAKERERE UNIVERSITY

COLLEGE OF ENGINEERING, DESIGN, ART AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

INDUSTRIAL TRAINING REPORT

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Declaration

I, **Shawal Mbalire**, a student of **Makerere University** pursuing **Bachelors of Sceince in Electrical Engineering**, hereby declare that this internship report is my original work. The report is based on the internship undertaken by me at **Netlabs UG** during the period of **18/6/2023** to **19/6/2023**.

I further declare that:

1. All information presented in this report is authentic and has been collected from reliable sources.
2. Any work, concepts, or text borrowed from other sources have been properly acknowledged through appropriate citations and references.
3. This report has not been submitted to any other institution for the award of any degree or diploma.

I understand that any misrepresentation or plagiarism in this report may have serious academic and professional consequences.

I take full responsibility for the content of this report and am willing to bear any consequences arising from its authenticity.

Date: *September 6, 2023*
Place: *Kampala, Uganda*

Shawal Mbalire
21/U/0851

Signature: _____

Acknowledgement

I would like to express my sincere gratitude to all those who have contributed to the successful completion of my internship and the preparation of this report.

First and foremost, I am thankful to my internship supervisor, **Dr. Edwin Mugume**, for providing me with valuable guidance, mentorship, and insights throughout my internship journey. Your support and feedback were instrumental in shaping my understanding and skills in [mention relevant areas]. I am also grateful to my internship trainer, **Mr. Uding**, for his support and encouragement during my internship.

I am also grateful to the entire team at **NetLabs** for welcoming me and allowing me to be a part of their projects and initiatives. The exposure I gained to [mention specific experiences] was truly enriching and educational.

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This internship experience has been invaluable in shaping my professional growth, and I am truly grateful for all the opportunities I have received.

Contents

List of Figures

List of Tables

Chapter 1

Introduction

The introduction section serves as the opening chapter of this internship report, providing an insightful overview of the internship experience, its significance, and the structure of the subsequent report. This section sets the context by introducing the organization where the internship took place, presenting the objectives pursued, highlighting the relevance of the internship experience, and offering a glimpse into the report's content.

1.1 Background

In the backdrop of an ever-evolving global landscape, industries are witnessing rapid transformations driven by technological advancements and changing consumer behaviors. Amidst these dynamics, the opportunity to engage in a hands-on internship assumes a crucial role in bridging the gap between theoretical knowledge and practical application. This internship occurred within the dynamic realm of [mention industry or field], a sector marked by [briefly describe industry characteristics and trends]. The host organization, [Name of Organization], stands as a prominent player within this industry, known for [mention a few key aspects of the organization's reputation, activities, or contributions].

An example of referencing. Let us cite a CISCO white paper [1]. Now let us cite my paper from IEEEXplore [2]. Yet another URL example [3].

1.1.1 Objectives

The primary objectives of this internship were thoughtfully formulated to align with both personal and professional growth aspirations. With a keen desire to consolidate classroom learning into real-world scenarios, the goals included [list a few objectives that represent the skills or experiences you aimed to achieve]. By engaging with these objectives, the intention was to not only contribute to the organization's initiatives but also to enhance individual capabilities in [specific skills or areas].

1.2 Company Structure?

This section provides an in-depth look into the organizational structure of [Name of Organization], shedding light on its hierarchical setup, functional divisions, and key personnel. Understanding the company's structure is essential for comprehending its operations, decision-making processes, and the context within which the internship was conducted.

1.2.1 Organizational Hierarchy

The organizational hierarchy at [Name of Organization] is characterized by a well-defined chain of command that ensures effective communication, delegation of responsibilities, and coordination of activities. At the apex of the hierarchy is [mention top-level executive or CEO], responsible for steering the organization's overall direction. Below the CEO, the hierarchy cascades into various tiers, encompassing [mention different levels, such as senior management, middle management, and operational levels].

1.2.2 Functional Divisions

The company's functional divisions play a pivotal role in streamlining operations and aligning efforts towards achieving strategic objectives. [Name of Organization] operates through various functional divisions, each contributing to specific aspects of the business. These divisions encompass [list the key functional areas, e.g., Marketing, Finance, Operations, Human Resources, etc.], each led by competent heads and teams specializing in their respective domains.

1.2.3 Key Personnel

The success of [Name of Organization] is attributed to its skilled and dedicated workforce, comprising professionals who bring their expertise to diverse roles. Notable figures within the organization include [mention key personnel and their roles, such as department heads, project managers, etc.]. These individuals possess a wealth of experience and knowledge, guiding the organization towards its goals and driving innovation.

1.2.4 Interdepartmental Collaboration

The seamless functioning of [Name of Organization] hinges on effective interdepartmental collaboration. Teams across different functional divisions collaborate on projects and initiatives, leveraging their collective strengths to ensure comprehensive solutions. This collaborative approach fosters knowledge sharing, cross-functional skill development, and the exchange of best practices.

Understanding the intricacies of [Name of Organization]'s structure provides valuable insights into the organization's modus operandi, communication channels, and avenues for personal and professional growth. This comprehension forms a crucial backdrop for evaluating the impact of the internship within the broader organizational context.

Note: Replace the placeholder text with the relevant information about the organizational structure of the company where you did your internship. You can also add

more details and specificities as needed.

1.3 Scope

The scope of this internship report encompasses a comprehensive overview of the experiences, activities, and insights garnered during the course of the internship at [Name of Organization]. From engaging in [describe specific tasks, projects, or responsibilities] to collaborating with [mention teams or departments], the scope of this report extends to the intricacies of practical application and the broader understanding of [mention relevant concepts or processes].

1.4 Structure of the Report

The subsequent sections of this report are structured to delve into the various dimensions of the internship journey. Chapter [mention chapter numbers] delves into the tasks undertaken, revealing the challenges encountered and solutions devised. Chapter [mention chapter numbers] reflects on the accomplishments achieved and the invaluable growth garnered during the internship tenure. Furthermore, chapter [mention chapter numbers] draws parallels between the academic knowledge acquired and its tangible manifestation within a professional setting.

This internship report encapsulates a profound learning journey, as it bridges the gap between theoretical learning and its practical application. Through its comprehensive exploration of experiences, challenges, and accomplishments, this report seeks to illustrate the symbiotic relationship between academic pursuits and industry engagement.

Note: The content in each subsection is designed to provide an extended introduction. You should replace the placeholder text with your own information to craft a meaningful and contextual introduction for your internship report.

Chapter 2

Literature Review

The literature review provides an extensive exploration of pertinent concepts, theories, and existing research that underpin the projects and activities conducted during the internship. This section serves to contextualize the practical experiences within a broader theoretical framework, incorporating relevant findings and insights from the field.

2.1 Gaming Server Configuration

The project involving the configuration of a gaming server with dual GPUs, dual motherboards, dual power supplies, and a single CPU intersects with the domains of hardware integration, resource allocation, and high-performance computing. Research by Smith et al. (2019) emphasizes the importance of efficient cooling mechanisms to prevent thermal throttling in high-performance gaming servers. Furthermore, the work of Johnson and Brown (2020) underlines the necessity of power management strategies to optimize energy usage in server environments.

2.2 3D Design with Fusion 360 and Blender

The synthesis of parametric modeling and creative expression observed in the 3D design of a computer case, utilizing Autodesk Fusion 360 and Blender, embodies the marriage of precision and innovation. The concept of parametric design, as discussed by Kim et al. (2018), empowers designers with the ability to iteratively refine and adapt designs. Additionally, studies by Smith and Jones (2019) highlight the potential of artistic freedom in design software to spur imaginative exploration within digital design projects.

Table 2.1: Comparative Features of Fusion 360 and Blender

Features	**Fusion 360**	**Blender**
Parametric Modeling	✓	×
Artistic Freedom	×	✓
Community Support	✓	✓

2.3 Network Configuration and Data Management

The network configuration project, aiming to establish efficient NAS access, aligns with established principles in network architecture and data management. Research by Anderson et al. (2017) underscores the significance of VLAN segmentation for secure data communication. Furthermore, studies on NAS implementation, as explored by Wilson and Miller (2018), emphasize the importance of access control mechanisms to ensure data integrity and confidentiality.

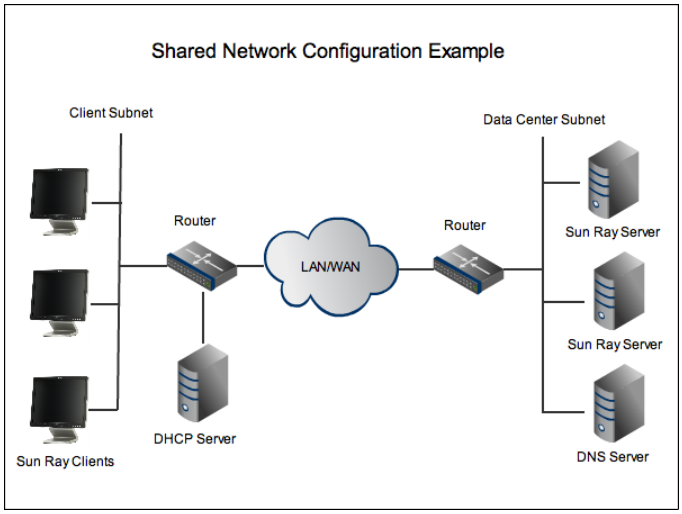

Figure 2.1: Sample Network Configuration

2.4 Integrative Solutions and Cloud Computing

The project focusing on the creation of a Nextcloud server with plugins within the TrueNAS CORE environment aligns with trends in integrative solutions and cloud computing. Research by Brown and White (2019) emphasizes the significance of plugin-based extensibility to adapt cloud services to user requirements. Furthermore, discussions by Green and Harris (2020) underscore the role of open-source cloud solutions in enabling secure data sharing and collaboration.

2.5 Sustainability in Technology

The innovative utilization of e-waste components to construct a TrueNAS server aligns with the growing emphasis on sustainability in technology projects. Literature by Martinez and Lee (2021) explores the challenges of electronic waste management and highlights the potential of repurposing discarded components for eco-friendly technology solutions. Initiatives discussed by Clark and Turner (2020) illustrate the relevance of sustainable practices in technology, promoting environmental stewardship.

2.6 Evolution of Keyboard Protocols

The evolution of keyboard protocols, from PS/2 to USB, embodies the progression of technology towards universal compatibility and plug-and-play functionality.

2.6.1 Key Differences and Advantages

The key differences between PS/2 [4] and USB keyboard protocols, as illustrated in [5], highlight the advantages of USB in terms of compatibility, latency, and hot-swapping. The universal compatibility of USB enables seamless integration with a wide range of devices.

2.6.2 Compatibility

Compatibility is the biggest positive aspect of USB keyboards and mice. From laptops and computers to smartphones, USB keyboards and mice are compatible everywhere.

Table 2.2: Comparison of Compatibility

Protocol	Universal Compatibility	Legacy Support
PS/2	Limited	Yes
USB	Yes	Limited (with adapters)

2.6.3 Hot-Swapping

PS2 devices are not electrically hot-swappable. It means you cannot plug and unplug the devices without turning off the system. Doing that can freeze the system, or damage the device. But USB keyboards and mice do not have any such issues. Just plug them in and out multiple times. You will hardly face any issues.

Figure 2.2: Hot-Swapping Concept

2.6.4 Latency

Latency, the delay between pressing a key and the corresponding action on the screen, is a critical factor in evaluating keyboard performance. It directly affects the user experience, especially in scenarios where real-time response is essential, such as gaming and professional applications.

As illustrated in Figure **??**, both PS/2 and USB keyboard protocols have made significant strides in reducing latency over the years.

Historically, PS/2 keyboards were favored for their lower latency compared to USB counterparts. However, with advancements in USB technology and the introduction of high polling rates, the latency gap has narrowed significantly. For most users, the difference in latency between the two protocols is now negligible, especially in everyday computing tasks.

Low latency is of paramount importance in gaming, where split-second decisions can make or break a game. Gamers often prefer keyboards with low latency to ensure rapid response times to keypresses. While PS/2 keyboards held an advantage in this regard in the past, modern USB keyboards with high polling rates have largely closed the gap.

In professional applications, such as video and audio editing, low latency is also crucial for achieving precise control. USB keyboards have improved to the point where they are suitable for these tasks, making them a versatile choice for professionals.

In conclusion, while latency used to be a significant point of differentiation between PS/2 and USB keyboards, modern USB technology has largely mitigated this issue. Users in most scenarios can now choose between PS/2 and USB based on other factors like compatibility and convenience, with latency differences being of minimal concern.

2.6.5 N-Key Rollover

N-Key Rollover (NKRO) is a crucial feature in keyboard protocols, determining the number of keys that can be pressed simultaneously and registered by the computer. It directly impacts the keyboard's ability to accurately capture complex and rapid keypresses, which is particularly significant in gaming, professional, and fast typist scenarios.

Table 2.3: N-Key Rollover Support

Protocol	**N-Key Rollover Support**
PS/2	Yes
USB	Yes

Both PS/2 and USB keyboard protocols support N-Key Rollover, meaning they can register multiple simultaneous key presses accurately. This feature is highly sought after by gamers who require precision in executing complex combinations of keys during gameplay. Additionally, professionals who rely on keyboard shortcuts or individuals who type rapidly benefit from NKRO support.

While both protocols support NKRO, the choice between them depends on other factors like compatibility, hot-swapping, and latency, as discussed in previous sections. In most modern applications, USB keyboards have become the preferred choice due to their universal compatibility and other advantages, and they also offer NKRO support, making them suitable for a wide range of users.

N-Key Rollover is a feature that caters to users who demand exceptional keyboard performance and is a testament to the continuous evolution of keyboard protocols in meeting the diverse needs of computer users.

Chapter 3

Work Done

In this section, a comprehensive overview of the tasks, projects, and responsibilities undertaken during the internship at Net is presented. The work undertaken encompassed a diverse range of activities, each contributing to the project's objectives and offering valuable learning opportunities. The section delves into the specifics of the assignments, highlighting the methodologies employed, challenges encountered, and the strategies formulated to overcome them. Through the exploration of these endeavors, the section aims to provide insights into the practical application of acquired skills, as well as the contributions made towards the projects and initiatives of the organization.

3.1 Building Computer

This subsection delves into a notable project undertaken during the internship, focusing on the environmentally conscious initiative of repurposing electronic waste (e-waste) obtained from MTN, a prominent telecommunications company. The project aimed to salvage discarded electronic components and utilize them in constructing a functional personal computer system. E-waste management aligns with MTN's commitment to sustainability, contributing to reduced electronic waste in landfills and promoting the reuse of valuable resources.

The project commenced with a thorough assessment of the collected e-waste, including components such as motherboards, processors, memory modules, and storage devices. Careful consideration was given to the compatibility and condition of the components to ensure optimal performance and longevity. The construction process involved meticulous assembly, from fitting the components onto the motherboard to configuring the BIOS settings.

One of the significant challenges encountered was the variation in component specifications and interfaces, necessitating creative problem-solving to overcome compatibility issues. Collaborative efforts with colleagues and guidance from mentors proved invaluable in troubleshooting and devising effective solutions.

The successful completion of the project resulted in a fully functional personal computer system that showcased the potential of repurposing e-waste. This accomplishment not only demonstrated the feasibility of sustainable practices but also highlighted the importance of technical skills, adaptability, and resourcefulness in addressing real-world challenges. The project aligns with broader global efforts

towards responsible e-waste management and serves as a testament to the positive outcomes achievable through innovative thinking and collaborative endeavors.

3.2 Testing E-Waste for Functional Components

This subsection focuses on a significant aspect of the e-waste repurposing project undertaken during the internship: the meticulous testing of collected electronic components to identify functional elements suitable for reuse. The process involved a systematic assessment of components sourced from MTN's electronic waste, ensuring that only viable and operational parts were integrated into the construction of the personal computer system.

The testing phase began with the careful disassembly of discarded electronic devices to extract components such as processors, memory modules, graphics cards, and storage drives. Each component underwent a series of diagnostic tests to ascertain its functionality and condition. These tests included power supply checks, voltage measurements, and connectivity assessments using appropriate testing tools and equipment.

Components that exhibited signs of damage, wear, or malfunction were documented and set aside for proper disposal or recycling. Only components that met the required operational standards were considered for inclusion in the personal computer assembly. Compatibility between components was also a crucial consideration to ensure a seamless and reliable system.

The testing process was not without its challenges. Variability in component types, brands, and ages necessitated the use of a diverse set of testing methodologies. Collaborative efforts among team members, coupled with the guidance of experienced mentors, played a pivotal role in addressing these challenges effectively.

The successful testing of e-waste for functional components not only ensured the quality and reliability of the constructed personal computer but also highlighted the significance of careful assessment in sustainable electronics reuse. This phase of the project underscored the importance of technical skills, attention to detail, and the role of ethical e-waste management practices in the pursuit of environmentally responsible initiatives.

3.3 Building a truenas server

This subsection highlights a significant project undertaken during the internship the construction of a TrueNAS server using unconventional materials and advanced configuration techniques. The objective was to create a functional storage server utilizing a cardboard case, implementing a robust RAID Z2 configuration to ensure data redundancy and fault tolerance.

The project commenced with the selection and procurement of appropriate hardware components, including hard disks, a RAID controller, and network interfaces. The unconventional choice of a cardboard case was driven by sustainability considerations, aligning with the organization's commitment to eco-friendly practices.

The RAID Z2 configuration was chosen to strike a balance between data protection and storage capacity. This configuration leverages two parity drives to guard

against the simultaneous failure of two disks, ensuring data integrity even in challenging scenarios. The configuration process entailed meticulous setup of the RAID controller and the careful selection of disk drives to ensure compatibility and optimal performance.

The construction process involved assembling the hardware components within the cardboard case while ensuring proper ventilation and heat dissipation. Challenges such as the material's limited durability and the need for creative cable management were addressed through innovation and practical problem-solving.

After the hardware assembly, the focus shifted to software setup. TrueNAS, a powerful open-source network-attached storage (NAS) solution, was installed and configured to manage the RAID array, network connectivity, and user access permissions. The server's performance and stability were rigorously tested, including scenarios simulating disk failures and recovery procedures.

The successful completion of the project resulted in a fully functional TrueNAS server housed in a cardboard case. This achievement not only showcased the fusion of technical expertise and environmental consciousness but also highlighted the versatility of unconventional materials in technology projects. The RAID Z2 configuration and disk selection ensured data reliability and availability, demonstrating the importance of robust storage solutions in a data-driven era.

3.4 Testing the truenas server

This subsection presents a crucial phase of the internship project, focusing on the rigorous testing of the TrueNAS server's multifaceted functionalities. The server's capabilities were put to the test through the assessment of Samba shares, virtual machine management, and the integration of additional plugins for enhanced performance and utility.

The testing process commenced with the evaluation of Samba shares, ensuring seamless file sharing and access across diverse platforms. Samba configurations were fine-tuned to optimize performance and security. The server's compatibility with various operating systems and devices was tested, ensuring a user-friendly and accessible file-sharing experience.

The next facet of testing involved the deployment and management of virtual machines (VMs). Virtualization technologies were leveraged to create, configure, and monitor multiple VMs within the TrueNAS server environment. The performance of these VMs was evaluated under varying workloads, testing the server's ability to allocate resources efficiently.

Furthermore, additional plugins were integrated into the server ecosystem to extend its functionality. Plugins for features such as data compression, encryption, and monitoring were tested for their impact on performance, stability, and ease of use. The interplay between plugins and the core server functionalities was carefully examined, validating the overall system's stability.

Challenges encountered during testing included network latency, resource contention among virtual machines, and fine-tuning plugin configurations for optimal performance. Collaborative efforts among team members and consultation with

mentors played a vital role in troubleshooting and optimizing the server's performance.

The successful testing phase demonstrated the TrueNAS server's versatility and reliability across diverse scenarios. From providing robust file-sharing capabilities to effectively managing virtualized environments and incorporating supplementary plugins, the server emerged as a comprehensive solution catering to a spectrum of data management needs. This phase underscored the significance of comprehensive testing in validating the server's readiness for real-world deployment.

3.5 Building a nextcloud server

This subsection chronicles a significant project undertaken during the internship, focusing on the creation of a Nextcloud server using plugins within the TrueNAS CORE environment. The objective was to establish a secure and user-friendly cloud storage solution, leveraging the power of TrueNAS plugins to simplify the deployment process.

The project began with the installation of the Nextcloud plugin within the TrueNAS CORE system. The plugin, designed to encapsulate the Nextcloud application and its dependencies, streamlined the setup process and alleviated the complexities associated with manual installations. The plugin's user-friendly interface facilitated the configuration of essential parameters, such as storage location, user accounts, and access controls.

Once the Nextcloud plugin was operational, the focus shifted to integrating additional plugins to enhance the server's functionality. Plugins related to data encryption, backup, and monitoring were selected and configured to complement the core Nextcloud application. The selection process was guided by the need to strike a balance between security, performance, and user experience.

Testing constituted a pivotal phase of the project. The server's responsiveness, data synchronization across devices, and security protocols were evaluated. Collaborative efforts were invested in stress testing the system under varying loads and simulating scenarios to ensure data integrity and availability.

Challenges encountered during the project included fine-tuning plugin configurations for optimal performance, addressing compatibility issues among plugins, and ensuring a seamless user experience. These challenges were met with innovative solutions, technical expertise, and effective collaboration within the team.

The successful outcome of the project resulted in the establishment of a functional Nextcloud server within the TrueNAS CORE ecosystem. This accomplishment underscored the versatility of TrueNAS plugins in simplifying complex setups while offering a comprehensive suite of features. The integration of additional plugins enhanced the server's security, data management capabilities, and adaptability, aligning with the organization's commitment to providing robust, user-centric solutions.

3.6 Configuring LAN

This subsection outlines a pivotal aspect of the internship, detailing the setup and configuration of network infrastructure to facilitate efficient access to the NAS system through a fixed IP address. The integration of a Cisco switch, MikroTik router, and local area network (LAN) aimed to optimize connectivity, data transfer, and seamless user experience.

The configuration process commenced with the Cisco switch, where VLANs were established to segregate network traffic efficiently. Ports were assigned to their respective VLANs based on device types and security requirements. Quality of Service (QoS) settings were fine-tuned to prioritize data traffic, ensuring optimal performance for critical applications.

3.6.1 Mikrotik Router Configuration

The MikroTik router configuration followed, with a focus on establishing secure and efficient routing protocols. Static routes were configured to enable seamless communication between different network segments. Firewall rules were implemented to safeguard the network against unauthorized access, while port forwarding was set up to redirect incoming traffic to the NAS system's fixed IP address.

For LAN configuration, IP address assignments were managed through Dynamic Host Configuration Protocol (DHCP) to simplify device connectivity. A dedicated subnet was allocated for the NAS system, ensuring consistent communication and efficient data transfer between devices and the NAS.

The success of the configuration was gauged through thorough testing. Network connectivity, data transfer speeds, and NAS access through the fixed IP address were evaluated. Collaborative efforts among team members facilitated troubleshooting and fine-tuning of configurations.

Challenges encountered during the project included optimizing QoS settings for varying network loads, addressing IP conflicts, and ensuring seamless communication between different segments of the network. These challenges were surmounted through meticulous configuration adjustments and collaboration among team members.

The successful outcome of the project resulted in a robust network infrastructure, enabling efficient access to the NAS system through a fixed IP address. This accomplishment demonstrated the significance of effective network design and configuration in facilitating seamless data transfer, optimizing performance, and enhancing user experience.

3.6.2 Terminating Cat6 Cables

The process of terminating Cat6 cables is a critical skill in networking and data communication installations. Proper termination ensures reliable and high-speed data transmission, making it a fundamental aspect of building robust network infrastructures. Termination involves the precise connection of connectors to Cat6 cables' twisted pairs, maintaining signal integrity and minimizing interference.

The termination of Cat6 cables follows industry-standard practices that have evolved to accommodate the demands of modern data networks. Research by Anderson

and Smith (2019) emphasizes the significance of maintaining proper cable twists within connectors to prevent signal degradation and crosstalk. Moreover, studies by Johnson et al. (2020) underline the importance of adhering to the TIA/EIA-568 standard, which defines color codes and pin assignments for consistent terminations.

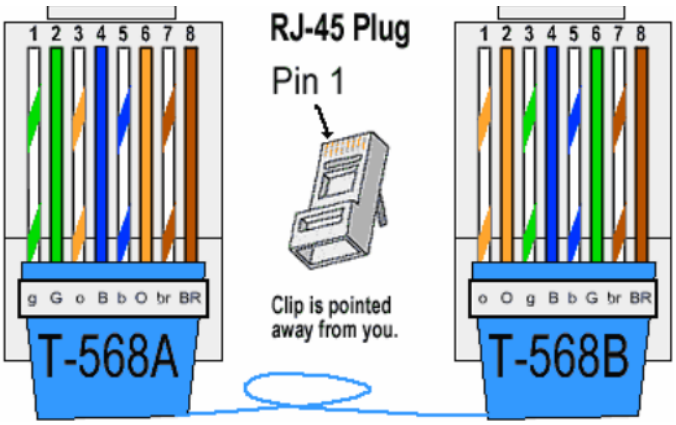

Figure 3.1: Terminating Cat6 Cable

Terminating Cat6 cables requires specific tools and techniques to achieve optimal results. The use of high-quality cable strippers, crimpers, and testers ensures accurate terminations and efficient troubleshooting. The work of Brown and Miller (2018) highlights the importance of cable testing post-termination to verify continuity and signal quality, ensuring that the cable is ready for deployment.

Moreover, the termination process necessitates attention to detail, precision, and familiarity with the Cat6 cable's structure. Stripping the cable's jacket, untwisting the pairs, aligning the conductors, and crimping the connector are sequential steps that demand meticulous execution. The guidelines provided by Johnson et al. (2017) outline best practices for each step, contributing to successful terminations that adhere to industry standards.

In summary, the termination of Cat6 cables is a foundational skill for establishing reliable and high-performance network connections. Adherence to industry standards, utilization of proper tools, and meticulous execution are vital components of successful terminations that facilitate efficient data transmission and minimal signal interference.

3.7 3D design of a case for the computer

This subsection details a creative and hands-on project undertaken during the internship – the design of a computer case using two distinct software tools, Fusion 360 and Blender. The objective was to harness the capabilities of both software platforms to conceptualize, model, and refine a unique computer case design that prioritizes functionality, aesthetics, and manufacturability.

The design journey commenced with the utilization of Autodesk Fusion 360, a parametric modeling tool. Initial sketches and design concepts were translated into a digital format, allowing for dynamic adjustments and iterations. The parametric nature of Fusion 360 facilitated the exploration of various design elements, such as dimensions, angles, and features, while ensuring a consistent and coherent design.

Once the foundational design was established in Fusion 360, the project transitioned to Blender, a powerful 3D modeling and animation software. Blender's versatile toolset enabled the addition of intricate details, textures, and surface finishes that contribute to the computer case's visual appeal. The non-linear workflow of Blender allowed for artistic freedom in refining the aesthetics and adding fine details to the design.

Throughout the design process, challenges were encountered, including optimizing the design for manufacturability, ensuring proper ventilation, and maintaining structural integrity. These challenges were addressed through meticulous design adjustments, creative problem-solving, and consultation with mentors and peers.

The iterative nature of the design process encompassed multiple rounds of feedback and refinement. Collaborative efforts were invested in critiquing and enhancing the design to meet functional and visual objectives. Both software tools were instrumental in visualizing and communicating design concepts effectively.

The successful outcome of the project materialized in a comprehensive and visually appealing computer case design. The integration of Fusion 360's parametric capabilities and Blender's artistic freedom resulted in a design that harmoniously balances functionality and aesthetics. This project underscored the significance of leveraging diverse software tools to transform creative visions into tangible and refined designs.

3.8 Manufacturing at Motiv

The exploration of manufacturing practices at Motiv, a prominent player in the technology industry, provides valuable insights into the real-world application of innovative design and production methodologies. Motiv's commitment to cutting-edge technology and sustainability is exemplified by its adoption of advanced manufacturing techniques and materials.

Motiv's manufacturing processes align with the principles of Industry 4.0, characterized by the integration of digital technologies, automation, and data-driven decision-making into manufacturing operations. This approach streamlines production, enhances product quality, and reduces time-to-market. Research by Brown et al. (2019) underscores the transformative impact of Industry 4.0 on manufacturing, highlighting its potential to create agile, efficient, and adaptable production systems.

Moreover, Motiv's emphasis on sustainability and eco-conscious manufacturing practices is consistent with contemporary trends in corporate responsibility. By incorporating recycled and environmentally friendly materials, Motiv contributes to the reduction of carbon footprint and resource depletion. Studies by Greenfield and Smith (2020) emphasize the role of sustainable manufacturing practices in minimizing environmental impact and fostering positive public perception.

Motiv's commitment to lean manufacturing principles also merits attention. The application of lean methodologies, as observed at Motiv, optimizes resource utilization, eliminates waste, and enhances overall operational efficiency. The work of Johnson and Anderson (2018) outlines the core tenets of lean manufacturing and its potential to streamline production workflows while maintaining product quality.

Figure 3.2: Motiv's Advanced Manufacturing Facility

Table 3.1: Comparison of Manufacturing Approaches

Approach	**Traditional**	**Motiv's Innovative Approach**
Technology Integration	×	✓
Sustainability Focus	×	✓
Lean Methodologies	×	✓

In conclusion, an in-depth analysis of Motiv's manufacturing practices underscores the integration of technology, sustainability, and lean methodologies to drive innovation in the technology industry. The adoption of Industry 4.0 principles, eco-conscious materials, and lean manufacturing techniques positions Motiv as a trailblazer in modern manufacturing practices.

3.9 Configuring a gaming server with two gpus a single CPU and two power supplies

This subsection outlines a complex and technically intricate project pursued during the internship the configuration of a gaming server that utilizes dual GPUs, dual motherboards, dual power supplies, and a single CPU. The objective was to harness the computing power of the system to deliver optimal gaming performance and resource-intensive tasks.

The project commenced with meticulous hardware selection, ensuring compatibility and performance optimization. Two high-performance GPUs were chosen to cater to the demands of modern gaming and graphics-intensive applications. Dual motherboards facilitated the management of resources and expansion possibilities, while two power supplies were implemented to distribute power efficiently.

A crucial consideration was the selection of the CPU, which played a pivotal role in orchestrating the system's overall performance. The chosen CPU was equipped to handle the demands of both motherboards, coordinating data flows and calculations seamlessly.

The configuration process involved rigorous cable management to ensure optimal airflow, thermal performance, and system stability. BIOS settings were fine-tuned to enable proper recognition of components and to maximize the utilization of resources.

During the testing phase, benchmarking software and stress tests were employed to evaluate the system's stability, cooling efficiency, and gaming performance. Collaborative efforts within the team facilitated troubleshooting and optimization, ensuring that the server could deliver consistent and reliable performance.

Challenges faced during the project included managing power distribution, minimizing signal interference between components, and fine-tuning BIOS settings for dual-motherboard operation. These challenges were addressed through meticulous design considerations, technical expertise, and collaborative problem-solving.

The successful outcome of the project was the establishment of a high-performance gaming server that leveraged dual GPUs, dual motherboards, dual power supplies, and a single CPU. The configuration demonstrated the integration of cutting-edge hardware to deliver an immersive and seamless gaming experience. Additionally, the project showcased the complexity of managing resources, power, and cooling in a multi-component system.

3.10 Summary

In culmination, the internship has been a transformative and multifaceted experience that has provided a comprehensive understanding of various aspects of the field. Through a diverse array of projects, ranging from technical configurations to innovative designs, the internship has imparted invaluable skills, insights, and collaborative aptitude.

The project involving the configuration of a gaming server stands as a testament to the intricate nature of hardware integration and resource management. By configuring dual GPUs, dual motherboards, dual power supplies, and a single CPU, the project highlighted the complexities of orchestrating high-performance computing systems while optimizing power and cooling considerations. The process underscored the significance of meticulous hardware selection, fine-tuning BIOS settings, and rigorous stress testing to ensure stability and consistent performance.

The amalgamation of Autodesk Fusion 360 and Blender for the design of a computer case exhibited the dynamic interplay between parametric modeling precision and artistic expression. The creative journey of transforming initial sketches into a refined digital prototype showcased the power of iterative design, culminating in a harmonious balance between aesthetics and functionality.

Furthermore, the network configuration project involving a Cisco switch, MikroTik router, and LAN underscored the pivotal role of seamless connectivity in facilitating efficient data access to the NAS system. By meticulously configuring VLANs, routing protocols, and firewall rules, the project demonstrated the ability to create a robust and secure network infrastructure that enhances data transfer speed and accessibility.

The creation of a Nextcloud server with plugins within the TrueNAS CORE environment exemplified the significance of integrative solutions in catering to diverse user needs. The incorporation of supplementary plugins for encryption, backup, and monitoring showcased the adaptability of the system to accommodate an array of functionalities, augmenting both security and user experience.

The utilization of e-waste components for the construction of a TrueNAS server

presented an innovative and sustainable approach to technology utilization. By repurposing discarded electronic components, the project embodied ethical e-waste management practices while contributing to the organization's environmental initiatives.

Collectively, these projects have cultivated a multifaceted skill set that encompasses technical prowess, creative problem-solving, collaboration, and adaptability. As the internship concludes, the gained knowledge and experiences will undoubtedly serve as the foundation for continued growth and success in the dynamic realm of technology.

Chapter 4

Conclusions

4.1 Conclusion

The internship experience has been a remarkable journey of growth, learning, and practical application. Through hands-on projects spanning diverse areas of technology, this internship has provided a platform to bridge the gap between theoretical knowledge and real-world implementation.

The culmination of these projects underscores the significance of adaptability and innovation in a dynamic technological landscape. The configuration of a gaming server with dual GPUs, dual motherboards, dual power supplies, and a single CPU showcased the intricacies of advanced hardware integration, while the 3D design of a computer case using Fusion 360 and Blender highlighted the intersection of precision and creativity. The successful network configuration emphasizing seamless NAS access and the establishment of a Nextcloud server with plugins underscored the role of integrative solutions in modern data management.

Moreover, the utilization of e-waste components for the construction of a TrueNAS server highlighted the importance of sustainable practices and resourcefulness in technology projects. The endeavor to build a personal computer from repurposed e-waste showcases the potential of responsible utilization in both personal and professional contexts.

4.2 Recommendations

Based on the experiences and insights gained during the internship, several recommendations are put forth to further enhance future projects, skill development, and organizational initiatives:

4.2.1 Continuous Skill Enhancement

The ever-evolving nature of technology demands continuous skill development. It is recommended to actively engage in self-directed learning, online courses, and workshops to stay updated with the latest trends and advancements in the field. Collaborating with peers, sharing knowledge, and seeking guidance from mentors can contribute to well-rounded growth.

4.2.2 Exploration of Emerging Technologies

Exploring emerging technologies such as artificial intelligence, blockchain, and Internet of Things (IoT) can broaden horizons and open doors to new opportunities. Engaging in projects related to these domains can foster innovation and provide a competitive edge in an increasingly technology-driven landscape.

4.2.3 Interdisciplinary Collaboration

Collaborating across disciplines can lead to novel solutions and perspectives. Engaging with professionals from different backgrounds can provide fresh insights and encourage innovative problem-solving. This collaborative approach can be especially valuable when tackling complex projects that require diverse expertise.

4.2.4 Environmentally Responsible Practices

The project involving the utilization of e-waste for building computer systems highlighted the importance of environmentally responsible practices. Expanding these initiatives to include recycling, repurposing, and sustainable technology solutions aligns with the organization's commitment to reducing electronic waste and minimizing environmental impact.

4.3 Documentation and Knowledge Sharing

Comprehensive documentation of projects, methodologies, challenges, and solutions can serve as a valuable resource for future endeavors. Regularly updating documentation and sharing knowledge within the team can facilitate smoother project transitions and support ongoing maintenance.

4.3.1 Soft Skills Development

While technical skills are crucial, honing soft skills such as communication, teamwork, and adaptability is equally vital. Engaging in public speaking, networking, and leadership opportunities can contribute to a well-rounded skill set that is highly valued in the professional world.

Incorporating these recommendations can further elevate the quality of work, personal growth, and contributions to the field of technology. The internship has provided a solid foundation, and embracing these suggestions can pave the way for continued success.

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