**Project Report**



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| **Product Name** | Higher Diploma in Software Engineering (HDSE) |
| **Qualification Name** | Higher Diploma in Software Engineering |
| **Project title** | **Principles and Design of Networked Systems** |
| **Module Name (HDSE)** | IT Systems & Networks |

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| **Student name** | | **Assessor name** | |
| Abarca, Francis Roel L. | | Grace Bee Cho Tok | |
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| **Learner declaration** |
| I certify that the work submitted for this assignment is my own and research sources are fully acknowledged.  Student signature: Date:7/26/24 |

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# Project Background

Swift & Bacon Publishers (SBP) Ltd is a medium-sized company specializing in the publication of scientific and technical books and journals. SBP operates from two office buildings and supports a hybrid working model, allowing employees to work both remotely and on-site. The organization consists of four subject-specific Publishing Teams, each managed by a Publishing Team Leader (PTL) and supported by up to 20 Publishing Editors (PEs). SBP's network infrastructure includes secure servers for managing manuscripts and publishing content, with a need to maintain high security and efficient data handling.

Given the company's recent shift towards hybrid working, SBP plans to close one office building and reconfigure the remaining building to support both on-site and remote work. This reconfiguration involves setting up a secure, efficient, and robust network infrastructure that caters to the needs of employees working from home and those who choose to work from the office.

1. **Project Objective**

* Improve Remote Working
* Reconfigure Infrastructure
* Upgrade Network
* Better Security
* Networking Solutions

1. **Requirement Specification**

* **Network Infrastructure (Top Floor, Middle Floor, Ground Floor)**
* **Remote Work Capabilities: Company Issued Laptop and VPN Server**
* **Security**
* **Connectivity**
* **Data Management**
* **Employee Management**

# Task 1

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| **Network Types** | **Benefits** | **Constraints** | **Example** |
| **Wired** | - Lower Latency  - Faster Speeds  - More Reliable | - Requires careful planning and routing of cables  - Use of Physical Cables | - Ethernet (LAN)  - Fiber-Optic Cables (SFP)  - Copper |
| **Wireless** | - More Convenient  - Less Cable Management  - Quicker to Deploy | - More Expensive  - Susceptible to Interference  - Less Secure  - Higher Latency compared to Wired | - Wi-Fi  - Cellular  - UWB |
| **Hybrid** | - Best of Both Worlds  - Having the speed when you need it and the convenience when you don’t.  - Flexible | - Complex Network Management  - Costly to Deploy and Maintain  - Requiring multiple hardware | - Home Networks (Wired LAN for PC and Wireless for Phones)  - Corporate Networks (Wired LAN for Office PCs and Wireless for Company Issued Laptops) |

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| **Network Standards** | **Benefits** | **Constraints** | **Purpose** | **List of Layers** |
| **OSI Model** | - Standardized framework for interoperability and communication between different systems.  - Helps in troubleshooting by segmenting functions into layers. | - Theoretical model, not directly used in networking  - Some layers are not strictly defined or overlap with TCP/IP | Defines networking functions in a layered approach to help understand and design communication protocols. | - Physical  - Data Link  - Network  - Transport  - Session  - Presentation  - Application |
| **TCP/IP Model** | - Practical and simplified framework for real-world network communication  - Maps directly to protocols widely used on the internet. | - Less detailed compared to OSI.  - Does not distinguish as many layers, making it less modular. | Provides end-to-end communication specifying how data should be packetized, addressed, transmitted, routed, and received. | - Interface  - Internet  - Transport  - Application |
| **802.x** | - Includes various networking standards (e.g., 802.3 is Ethernet and 802.11 for Wi-Fi)  - Provides specifications for physical and data link control. | - Limited to LAN technologies  - Focus is on hardware-level implementation. | Specifies protocols for implementing Local Area Networks (LAN) and Wireless Networks (WLAN). | Common Standards:  - 802.3 (Ethernet) focuses on Physical and Data Link layers.  - 802.11 (Wi-Fi) focuses on wireless communication. |

**Impact of Network Topology, Communication, and Bandwidth Requirements**

Network Topology

Network topology refers to the layout of connected devices in a network. The topology has a direct impact on performance, scalability, and reliability.

**Advantages and Disadvantages of Common Topologies:**

1. **Bus Topology:** 
   * **Advantages:**
   * **Disadvantages:**
2. **Star Topology:**
   * **Advantages:**
   * **Disadvantages:**
3. **Ring Topology:**
   * **Advantages:**
   * **Disadvantages:**
4. **Mesh Topology:**
   * **Advantages:**
   * **Disadvantages:**

# Task 2

Task Statement :

Task Solution :

Task 3

**Task Statement :**

Task Solution :

# Task 4

Task Statement :

Task Solution :



# Bibliography