BINDURA UNIVERSITY OF SCIENCE EDUCATION FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

A Network Management Suite For A University Setup (WOMEN'S UNIVERSITY IN AFRICA) With Simple Ip Subnet Calculator Tool , An Email Client And A Remote Desktop Application : System By

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A RESEARCH PROJECT SUBMITTED TO THE COMPUTER SCIENCE DEPARTMENT AT THE BINDURA UNIVERSITY OF SCIENCE EDUCATION IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE BACHELOR OF SCIENCE HONOURS DEGREE IN INFORMATION TECHNOLOGY

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Dedication

This project is dedicated to the Women's University in Africa, a place of empowerment, education, and innovation. It is with profound gratitude and admiration that I dedicate this project to the university and all the individuals who have been instrumental in its success. It is my sincere hope that this project contributes to the continued growth and success of Women's University in Africa.

Acknowledgements

I would like to Acknowledge my project supervisor Mr Musariwa, whose guidance and mentorship have been invaluable. Your wisdom, encouragement, and constructive feedback have guided me in making informed decisions and ensuring the project's success. I extend my deepest appreciation to the network administrators, Mr Chakadenga and IT staff at Women's University. Your expertise, insights, and collaboration have been invaluable throughout the development process. Your commitment to

maintaining a robust network infrastructure has inspired me to create a suite that meets your specific needs and challenges. I am grateful to my family especially my mother and friends for their unwavering support and understanding throughout this endeavour.

ABSTRACT

The Network Management Suite for Women's University in Africa is a comprehensive and tailored software solution aimed at optimizing network administration of the different campuses, communication, and remote access within the university's infrastructure. This project addresses the specific needs and challenges faced by the Women's University in Africa, offering a suite of modules including a Simple IP Subnet Calculator Tool, an Email Client, and a Remote Desktop Application.

The primary objective of this project is to provide a centralized platform that empowers the university's IT department to efficiently manage and monitor the network infrastructure while facilitating seamless communication and remote access for students, faculty, and staff. The Network Management Suite enhances the university's network administration capabilities, enabling administrators to efficiently manage user accounts, access controls, and network configurations. It incorporates real-time network monitoring and reporting tools that provide insights into network performance, bandwidth utilization, and device status. Proactive alerts and notifications help detect and resolve network issues promptly, minimizing downtime and ensuring a seamless network experience for all users.

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Chapter 1 Problem Identification

1.1 **Introduction**:

In managing its network infrastructure, communication, and remote access, Women's University in Africa faces many challenges. As a result of inefficiencies and limitations, the existing network management tools are either insufficient or require multiple disjointed solutions. Additionally, the lack of a dedicated IP subnet calculator tool, email client, and remote desktop application further hampers effective network administration and user experience.

The university's IT department struggles with manual IP subnet calculations, leading to IP address conflicts, inefficient utilization of resources, and difficulty in planning for network expansion. Communication within the university community relies on disparate email systems, causing fragmentation, security concerns, and limited collaboration. Furthermore, remote access to university resources is cumbersome, hindering efficient learning, teaching, and technical support.

To address these challenges, this project proposes the development of a Network Management Suite specifically tailored for Women's University in Africa and its numerous campuses namely Kadoma, Bulawayo, Mutare, Marondera, and Harare. This suite encompasses a Simple IP Subnet Calculator Tool, an Email Client, and a Remote Desktop Application to streamline network administration, communication, and remote access.

Solution to the current problem

Based on the investigation and understanding of the current system at Women's University in Africa, the proposed solution is the development of a comprehensive Network Management Suite. This suite addresses the identified challenges and provides a unified solution for network administration, communication, and remote access. The solution includes the following components:

Simple IP Subnet Calculator Tool:

i.   Develop a user-friendly IP subnet calculator tool integrated into the Network Management Suite.

Email Client:

i.   Create a dedicated email client within the Network Management Suite for Women's University in Africa.

ii.   Implement a secure and user-friendly interface that allows students, faculty, and staff to send, receive, and manage emails.

Remote Desktop Application:

i.   Develop a remote desktop application as part of the Network Management Suite, enabling secure remote access to university resources.

ii.   Implement robust authentication and encryption mechanisms to ensure data security during remote sessions.

Network Administration and Monitoring:

i.   Create a centralized platform within the Network Management Suite for network administration and monitoring.

ii.   The proposed solution aims to streamline network administration, enhance communication, and improve remote access capabilities at Women's University in Africa.

1.2 Background of the Study: Investigation and description of current system

The Network Management Suite for Women's University in Africa is a project aimed at developing a comprehensive solution to address the network management, communication, and remote access needs of the university.

Women's University in Africa, like many educational institutions, relies heavily on its network infrastructure for various activities such as academic research, administrative tasks, and communication among students, faculty, and staff.

The university's communication system relied on disparate email systems, causing fragmentation, security concerns, and limited collaboration among different departments and academic units. The lack of a unified email client hindered efficient communication and information sharing within the university community.

Remote access to university resources posed challenges for students, faculty, and staff. The existing methods, such as virtual private networks (VPNs) or remote desktop protocols, were cumbersome and lacked security features. This hindered efficient learning, teaching, and technical support, especially in situations where physical access to campus was restricted or limited.

1.3 Statement of the problem

The absence of a dedicated IP subnet calculator tool hampers the efficient allocation and management of IP addresses Manual calculations lead to errors, conflicts, and inefficient utilization of IP address resources.Also difficulties in planning for network expansion and addressing IP conflicts hinder the scalability and smooth operation of the university's network infrastructure.

Fragmented Communication System: The university currently relies on disparate email systems across different departments and academic units. And lack of integration and a unified email client results in fragmented communication and limited collaboration.

Inefficient email management, such as difficulties in accessing and organizing emails, hinder effective communication and hinder productivity.

Limited Remote Access Capabilities: As The existing remote access methods, such as VPNs or remote desktop protocols, are cumbersome and lack robust security features. Addressing these problems is essential to improve network management, communication, and remote access capabilities within Women's University in Africa. The proposed Network Management Suite, featuring a Simple IP Subnet Calculator Tool, an Email Client, and a Remote Desktop Application, aims to provide a comprehensive solution.

1.4 Research Objectives

Objectives of existing system

Effective Management, Monitoring, and Control of the University's Network Infrastructure: The current system seeks to provide tools and capabilities for efficient management, monitoring, and control of the university's network infrastructure. This involves activities like managing IP subnet addresses, setting up networks, resolving issues, and managing security.

Scalability and Expansion: The current setup seeks to accommodate the network infrastructure of the university as it develops and grows. Without sacrificing stability or performance, it should be able to handle growing numbers of users across numerous campuses, devices, and network resources.

User Support and Troubleshooting: The existing system aims to provide support services to users, including students, faculty, and staff, by offering troubleshooting assistance, network diagnostics, and timely resolution of network-related issues through remote diagnosis

Objectives of proposed system

In Order to be able to define the WUA system architecture, first dearly state what objectives driver system behavior at the same one of our objective is to create an experience, which is not only unique to the (user) client, but also makes him feel that he has loyal attachment to the system and approaches us whenever heshe needs.

Module and their Description

This project having Five Modules

1. Admin
2. Network Monitoring System
3. Remote Desktop Monitoring
4. E-Mail Client
5. IP Calculator

1.Admin

The Login module consists of username and password. This process is for authenisation.The user name and password is correct it is link into next page. This process is done in login.

2. Network Monitoring System:

The most of the Univesity's   connect more numbers of systems to form a network to make the work easier to share files and folders. While connecting to monitor the network system activities for secure purpose. This Project deals with monitoring the Network Screen Activities. It has two methodologies one for Client and another for Server. In the proposed system it introduces current session option to monitor the network systems at the same time and in the accesses folder option shows the username and user accessed folders. While client logins to the server, the Client IP Address and System names are added to the server. Server will display all the user names of students and staff, monitoring the particular Client Screen Activities like that currently opened screens, what are all the files created, modified and deleted

3. Remote Desktop Monitoring
Remote Desktop Services is one of Microsoft Windows components to access a remote computer through the network. Only the user interface of the application is presented at the client. Any input is redirected over to the remote computer over the network. At work,the Remote Desktop a great deal. It allows to login to a remote server to perform health checks, deploy applications, troubleshoot problems, etc. remote desktop is used often during WFH (work from home). .

4. E-Mail Client

Several choices for email client application provided, including a range of web email services. However, many people prefer to use a stand-alone application designed specifically for email since they sometimes have a better focus and features. Some people avoid the Microsoft Outlook application because of its historic vulnerability to viruses.   An application that runs on a personal computer or workstation and enables to send, receive and organize e-mail. It's called a client because e-mail systems are based on a client-server architecture. Mail is sent from many clients to a central server, which re-routes the mail to its intended destination.

5. IP Calculator Subnet

The calculator module certain process

- **Internet protocol**
- **Network type**

- **Calculate**

The calculate is used to calculate the network type and it class. The other process are prefix,net.mas,maximum number of host,network,broadcast,iprange,maximum number of subnets, wanted number of hosts.

Internet protocol:

The Internet protocol is used to know about the network type. The protocol is enter in the textbox and calculates. It will show the network type. If wrong protocol is entering in the textbox. It will show the error message.

Network type:

The Network used to describes the class.

- **Class A:0:   127 255**
- **Class B:128:191 255**
- **ClassC:192:223 255**
- **ClassD:224:239 255**
- **ClassE:239:254 255**

Calculate:

The Calculate is used to calculate the internet protocol and network type.In this system Maximum number of subnet is display.Tthe proposed Network Management Suite for Women's University in Africa aims to achieve the following objectives:

1.   Streamlined IP Address Management: Develop a Simple IP Subnet Calculator Tool that automates the process of IP address allocation and subnetting. This objective ensures accurate IP address assignment, reduces conflicts, optimizes resource utilization, and simplifies network expansion planning.

2.   Unified and Efficient Communication: Implement an Email Client that integrates disparate email systems into a unified platform. This objective enhances communication and collaboration among students, faculty, and staff by providing a seamless and user-friendly email experience. It includes features such as efficient email composition, organization, search, and collaboration tools.

3.   Enhanced Remote Access Capabilities: Develop a Remote Desktop Application that enables secure and convenient remote access to university resources. This objective improves remote learning, teaching, and technical support by providing a user-friendly interface, robust security measures, and efficient access to applications, files, and desktop environments from anywhere, anytime.

4.   Comprehensive Network Monitoring: Integrate a Network Monitoring System into the suite to monitor the university's network infrastructure. This objective involves real-time monitoring of network devices, bandwidth utilization, performance metrics, and security events. It enables proactive identification and resolution of network issues, ensuring reliable and optimized network connectivity.

5.   User-Friendly Administration: Provide an Admin module within the Network Management Suite that offers a user-friendly interface for network administrators. This objective includes features such as centralized network configuration management, user access control, system

1.5 Literature Review

Network management: For optimum network performance, it is essential to monitor, configure, and troubleshoot the network infrastructure effectively. The two most often used network management frameworks are SNMP and ICMP. Real-time issue detection and resolution depend on network monitoring technologies, such as SNMP-based management systems..

Subnet Calculation: Subnet calculation plays a crucial role in network administration and design. Methods like VLSM and CIDR are employed for efficient subnet allocation and hierarchical network design. Subnet calculators simplify the process and ensure accurate IP address allocation.

Email clients: For contemporary businesses, feature-rich and secure email communication is essential. The topics of encryption and spam filtering are covered, along with email protocols including SMTP, POP, and IMAP. Email client software should have intuitive user interfaces, strong security features, and effective email management tools..

Remote Desktop Applications: Remote access to desktop environments offers flexibility and collaboration opportunities. Protocols such as RDP and VNC enable secure remote access, screen sharing, and file transfer. Efficient remote desktop applications enhance productivity and enable seamless collaboration.

1.6 Research Proposition/Hypothesis

1.7 Significance of study

1. Improved Network Management: By developing a Network Management Suite specifically tailored for Women's University in Africa, the study aims to enhance the efficiency and effectiveness of network management processes. This can lead to smoother network operations, improved

resource allocation, and better overall network performance.

2 Enhanced Communication and cooperation: The Network Management Suite's combination of an Email Client and Remote Desktop Application can significantly enhance staff, professor, and student communication and cooperation. This can make resources more accessible, information sharing more smooth, and workflows more effective.

3. Simplified IP Address Management: The suite includes a Simple IP Subnet Calculator Tool to help with the problems related to subnetting and IP address distribution. This solution can automate and streamline the procedure, lowering the possibility of mistakes and conflicts while maximizing the use of IP resources.

4. Tailored Solution for Women's University in Africa: By focusing on the specific needs and requirements of Women's University in Africa, the study offers a customized solution that aligns with the university's unique context and challenges. This can result in a more tailored and effective network management approach compared to generic solutions.

1.8 Assumptions

Assumptions are statements or conditions that are considered to be true, without being proven or verified. In the context of the project, the possible assumptions:

1. The network infrastructure of Women's University in Africa is compatible with the Network Management Suite and can support its functionalities without significant hardware or software upgrades.

2. The users (administrators, faculty, staff, and students) of Women's University in Africa have basic computer literacy and are able to adapt to and effectively utilize the features and functionalities of the Network Management Suite.

3 Sufficient resources (such as funding, time, and human resources) will be available to develop, implement, and maintain the Network Management Suite throughout the project duration and beyond.

4. The implementation of the Network Management Suite will not encounter significant resistance or opposition from stakeholders (e.g., university administration, IT department, users).

5. The Simple IP Subnet Calculator Tool included in the suite accurately calculates IP subnets and addresses without any computational errors.

6. The Email Client and Remote Desktop Application integrated into the Network Management Suite comply with relevant security and privacy standards to protect user data and ensure secure communication and remote access.

1.9 limitations

Limited Generalizability: The findings and conclusions of the study may be specific to Women's University in Africa and may not be directly applicable to other universities or educational institutions with different network management needs, infrastructures, or contexts.

Technical Constraints: The effectiveness and functionality of the Network Management Suite may be dependent on the existing network infrastructure, hardware, and software capabilities of Women's University in Africa. Limitations in these technical aspects may impact the performance or implementation of certain features or functionalities.

Resource Limitations: Constraints such as limited funding, time, or human resources may impact the development, implementation, and ongoing maintenance of the Network Management Suite. These limitations may affect the completeness, timeliness, or scalability of the solution.

Data Privacy and Security: The Email Client and Remote Desktop Application included in the suite may raise concerns regarding data privacy and security. Ensuring compliance with relevant privacy regulations and implementing robust security measures are critical to mitigate potential risks.

10.1 Definition of terms

Network Management Suite: A comprehensive software solution designed to monitor, manage, and optimize network infrastructure within an organization.

IP Subnet Calculator: A tool that assists in determining network addresses, subnet masks, and host ranges for IP (Internet Protocol) networks

Email Client: An application or program used to access, send, receive, and manage email messages.

Remote Desktop Application: A software program that allows users to access and control a remote computer or desktop environment from a local device.

University: An institution of higher education that offers academic programs and degrees across various disciplines.

Network Management: The process of administering, monitoring, and controlling computer networks to ensure their efficient and secure operation.

WUA : Women's University in Africa

Chapter 2

2.1 Introduction :Requirements Specification:

Data Requirements: identifies the specific data elements and their attributes that the Network Management Suite needs to manage. It includes details on network device information, user accounts, email data, and relevant network statistics

Processing Requirements: outline the specific functionalities and operations that the Network Management Suite should support. This includes network monitoring, configuration management, subnet calculation, email management, and remote desktop access.

Software Requirements: focus on the technical aspects of the Network Management Suite. This includes the required programming languages, frameworks, and tools for development. It also specifies the compatibility and integration requirements with existing systems or technologies at Women's University in Africa

The Requirements Specification section serves as a guide for the development team, helping them understand and fulfill the specific needs of Women's University in Africa

2.2 Requirements analysis:

Requirements analysis is a crucial phase in the development process of the Network Management Suite for Women's University in Africa. It involves a systematic investigation and understanding of the needs, goals, and constraints of the system to be developed..

During the requirements analysis phase, the following activities occur:

Elicitation: Engage with stakeholders, including administrators, IT staff, faculty, and students, to gather information about their needs and expectations for the Network Management Suite..

Requirements Documentation: Document the requirements in a structured and organized manner. Specify functional requirements that describe the system's desired behaviors and capabilities, such as network monitoring, device management, email composition and sending, and remote desktop control.

Requirements Traceability: Establish traceability between the requirements and other artifacts of the project, such as design documents, test cases, and implementation components. Maintain a traceability matrix to ensure that each requirement is properly addressed throughout the development lifecycle.

2.3 Data requirements

Data requirements are an important aspect of the Network Management Suite for Women's University in Africa. These requirements outline the specific data that the system needs to operate effectively. The key considerations for data requirements:

Access to network-related data, such as IP addresses, device configurations, network topology, traffic statistics, and performance metrics, is necessary for the Network Management Suite. The monitoring, evaluation, and management of the university's network infrastructure will be done using this data.

User Data: The system will require information about users, such as user profiles, authentication codes, and access rights. This information will be useful for managing users and ensuring safe access to the suite's features.Email Data: For the Email Client module, the system will require email data, including email addresses, message content, attachments, and metadata. This data will enable users to send, receive, and manage their emails within the suite.

Remote Desktop Data: The Remote Desktop Application will involve data related to remote connections, including session information, screen sharing data, and user interactions. This data will allow users to establish remote desktop connections and control remote computers.

2.4 Processing requirements:

Network Monitoring and Analysis: The system should be able to monitor and analyze network traffic, device performance, and other network-related metrics in real-time or near-real-time. This requires efficient data collection, processing, and analysis algorithms to handle the volume and velocity of network data.

IP Subnet Calculator: The IP subnet calculator tool should provide fast and accurate calculations for subnet masks, IP addresses, and network configurations. It should be capable of handling a large number of calculations quickly and provide results with minimal delay.

Email Client: The email client module should have efficient email processing capabilities, including sending, receiving, and organizing emails. It should support quick retrieval and storage of emails, perform searches, and handle email attachments effectively.

Remote Desktop Application: The remote desktop application should enable smooth and responsive remote desktop connections and control. It should have low latency and minimal lag to ensure a seamless user experience while interacting with remote desktops.

2.5 Software Requirements

Operating System: The Network Management Suite can be compatible with commonly used operating systems such as Windows, macOS, and Linux. It should support the latest versions of these operating systems to ensure broad accessibility and usability.

Programming Languages: The suite was developed using the C# programming language. The choice of programming language aligns with the development team's expertise and the requirements of the project.the appropriate ides to run the the code are rider and visual studios code

Network Monitoring Tools: The suite should integrate with established network monitoring tools and protocols, such as SNMP (Simple Network Management Protocol) or ICMP (Internet Control Message Protocol).

2.6 Hardware specifications

Server: It hosts the Network Management Suite on a dedicated server. To fulfill the needs of the suite's data management and processing, the server should have enough computing power, memory, and storage. For effective performance, a multi-core processor with enough of RAM, like an Intel Xeon or AMD Ryzen, is recommended.

Network Devices: The project entails managing and monitoring network devices that are a part of the infrastructure of the university. Access points, switches, and other network equipment that are interoperable are therefore crucial. For efficient monitoring and control, these devices should implement common network protocols like SNMP.

Storage Devices: Adequate storage devices, such as hard drives or solid-state drives (SSDs), are required to store the suite's data and logs. The storage capacity should be sufficient to accommodate the expected volume of network data and ensure efficient retrieval when needed.

Workstations: In order to use the Network Management Suite, administrators and users need workstations. These workstations should have the necessary hardware, such as a powerful processor, enough RAM, and a suitable display resolution. They should also support the suite's compatible operating system and have network connectivity.

Chapter 3 Design

3.1 Introduction to the Design:

A key factor in guaranteeing the efficient management and monitoring of the university's network infrastructure is the design of the Network Management Suite for Women's University in Africa. The Simple IP Subnet Calculator Tool, an Email Client, and a Remote Desktop Application are just a few of the components that are included into the network administration suite's modular design. These modules integrate perfectly to offer network administrators and IT employees a complete solution.This Network Management Suite seeks to improve overall network performance by streamlining network administration procedures, enhancing network visibility, and utilizing a methodical and user-centered design approach.
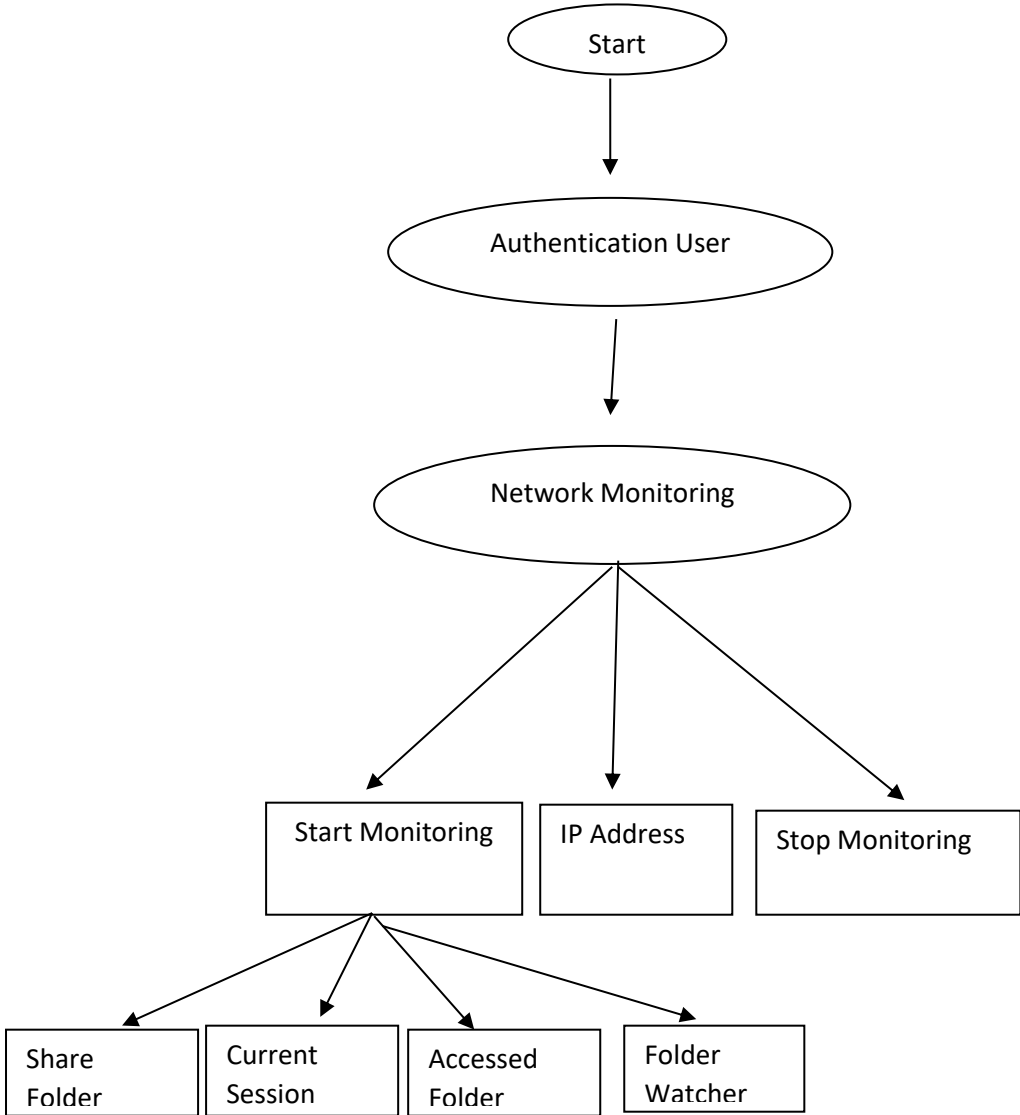
3.2 User interface

The Network Management Suite for Women's University in Africa's user interface design is an essential component because it directly affects the system's usability and user experience. The user interface needs to be simple to understand, visually appealing, and navigable. user interface design factors to take into account:
Navigation that is Consistent and Intuitive: The user interface of the Network Management Suite should have a consistent layout and navigational
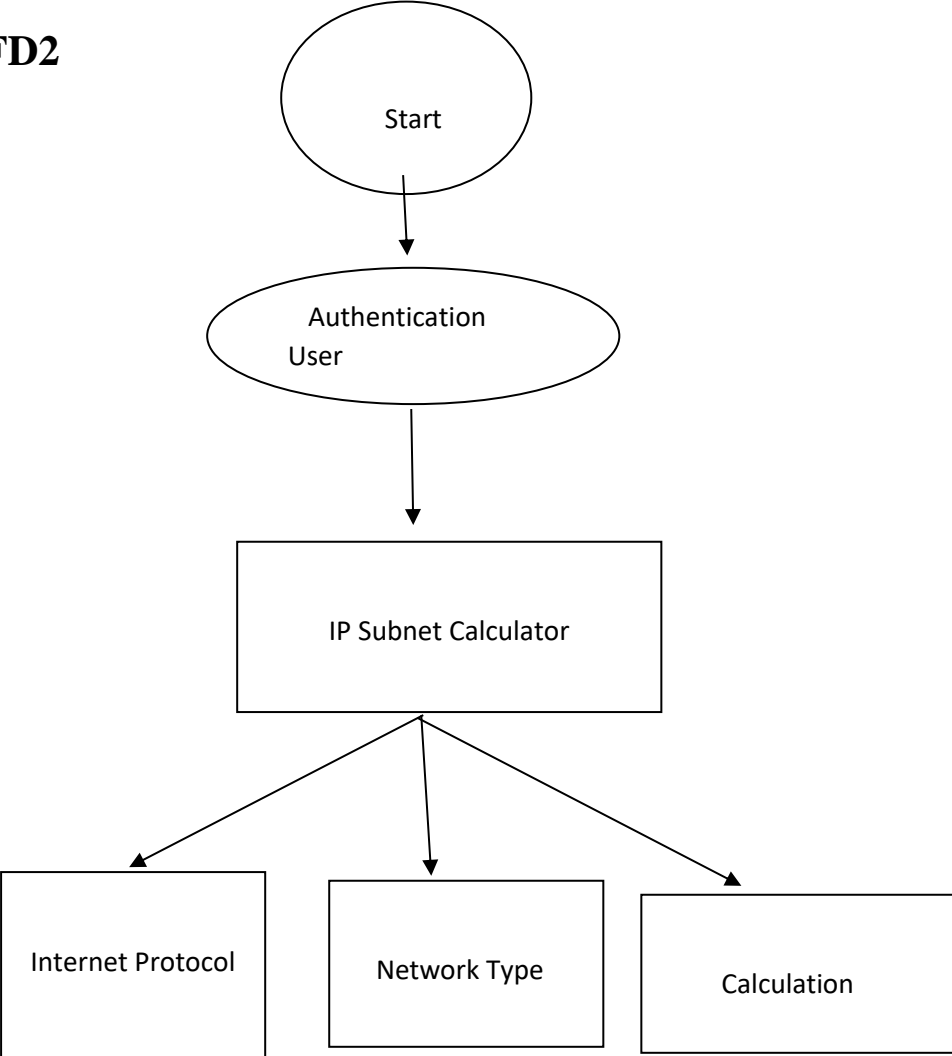
structure.

Make sure the user interface is responsive and adaptive to various screen sizes and devices by using responsive design. This is crucial if users

intend to utilize desktop, laptop, or mobile devices to access the system.

Create a dashboard view that summarizes the network's key performance indicators (KPIs) and other pertinent information.SimpleMenus and

Right-Click Functionality: Implement contextual menus and right-click functionality to provide quick access to common actions and options.

DFD-1

Start

Authentication User

Network Monitoring

Start Monitoring | IP Address | Stop Monitoring

Share Folder | Current Session | Accessed Folder | Folder Watcher

23

DFD2

Start

Authentication
User

IP Subnet Calculator

Internet Protocol

Network Type

Calculation

3.3 Input and output design

Input and output design is an important aspect of the Network Management Suite for Women's University in Africa as it determines how users interact with the system and how information is presented to them. Here are considerations for the input and output design:

Input Design:

Design input forms that are simple, well-organized, and user-friendly. Use the proper placeholders and labels to direct users toward providing the necessary data.

Implement validation tests on input fields to ensure data integrity. Validation and Error Handling. Send out clear error messages when users enter inaccurate or insufficient information.

Make use of drop-down menus or selection lists for fields that have predefined alternatives. This can facilitate speedy and precise decision-making for users.

Output Design:

Clear and Concise Display: Present information in a clear and concise manner to enhance readability. Use appropriate fonts, colors, and formatting to differentiate between different types of information.

Relevant and Contextual Information: Display only relevant information to avoid overwhelming users with excessive data. Customize the output based on user roles or permissions to provide context-specific information.

Data Visualization: Use charts, graphs, or visual representations to convey complex data or trends effectively. Visualizing data can aid in quick comprehension and decision-making.

3.4 Database design

Network Monitoring System Module:

i. Device table: Stores information about the network devices, including device ID, device type, IP address, location, and status.

ii. Log table: Records log entries for network events, such as device connectivity, disconnections, and errors. It includes fields like log ID, device.

Remote Desktop Monitoring Module:

i. Remote User table contains information about the users who access the remote desktop feature, including user ID, username, password, and sever address or the IPv4 address

ii. Session table: Tracks the active remote desktop sessions, including session ID, user ID, connected device ID, start time, and end time.

Email Client Module:

i. Email Account table: Stores details about the email accounts used by the university, including account ID, email address, username, password, and server settings.

ii. Inbox table: Stores the received emails, including fields like email ID, sender, recipient, subject, content, timestamp, and read status.

IP Calculator Module:

i. Subnet table: Stores information about the IP subnets used in the university network, including subnet ID, subnet mask, network address, and available IP range.

3.5 Processes design

User Management Process:

i.   User Authentication: Verifies the user's credentials during login to grant access to the system.

ii.   User Roles and Permissions: Assigns appropriate roles and permissions to users based on their responsibilities and access requirements.

Network Monitoring Process:

i.   Device Discovery: Scans the network to discover and identify connected computers, collecting information such as IP address, MAC address, and device type.

ii.   Device Status Monitoring: Regularly checks the status and availability of network devices, monitoring factors like connectivity, response time, and bandwidth usage.

Remote Desktop Process:

i.   Session Establishment: Facilitates the establishment of remote desktop sessions between authorized users and target devices.

ii.   Remote Desktop Control: Enables users to remotely access and control desktops or applications running on remote devices.

Email Management Process:

i.   Composing and Sending Emails: Enables users to create and send emails to recipients within or outside the university.

IP Calculation Process:

i.   Subnet Calculation: Performs calculations to determine the appropriate IP subnet masks and network addresses based on the given IP address range and required number of subnets.

ii.   IP Allocation: Assigns available IP addresses to network devices within the defined subnets, keeping track of allocated devices

3.6 The ER diagram
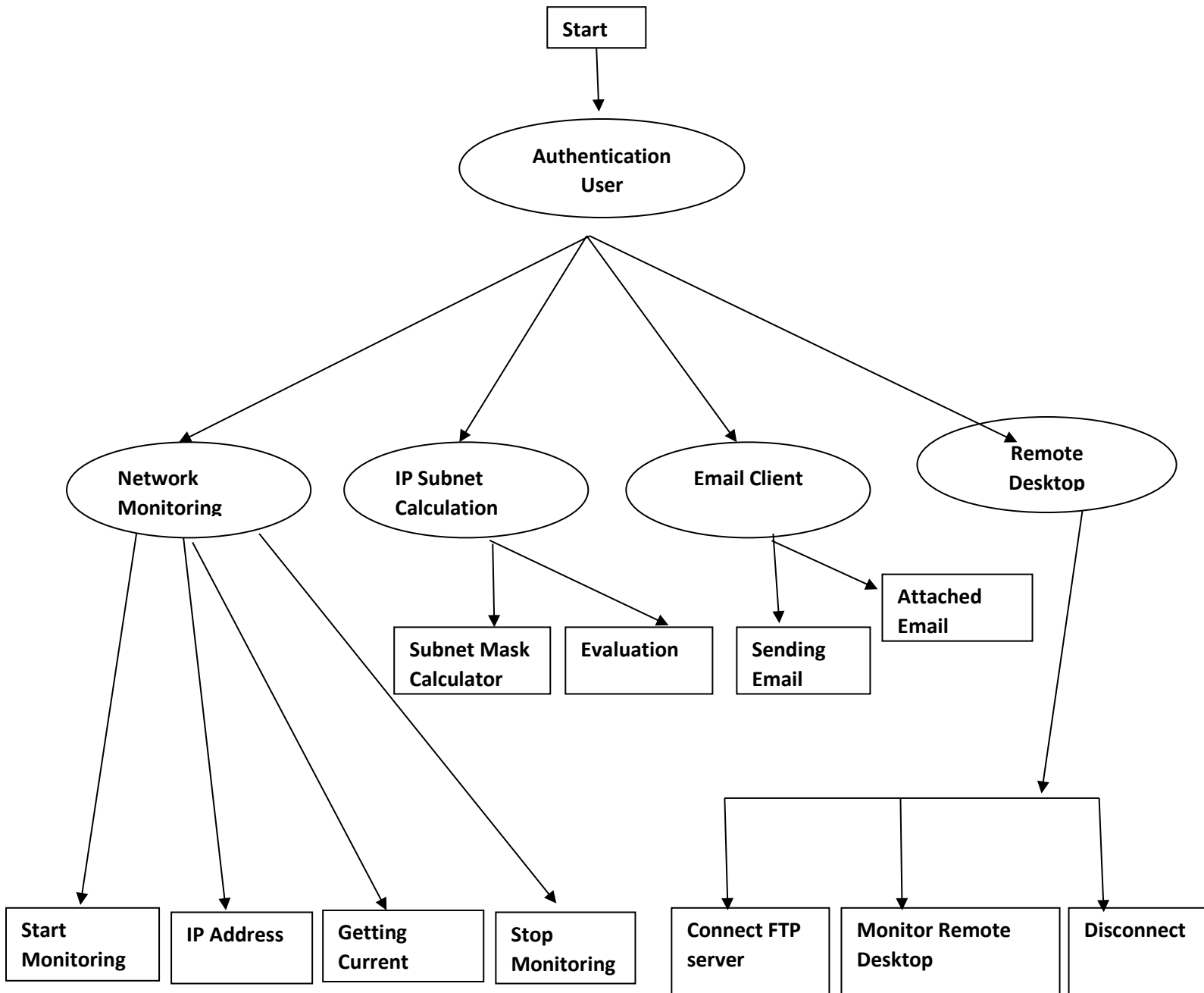
3.7 Use Case Diagram
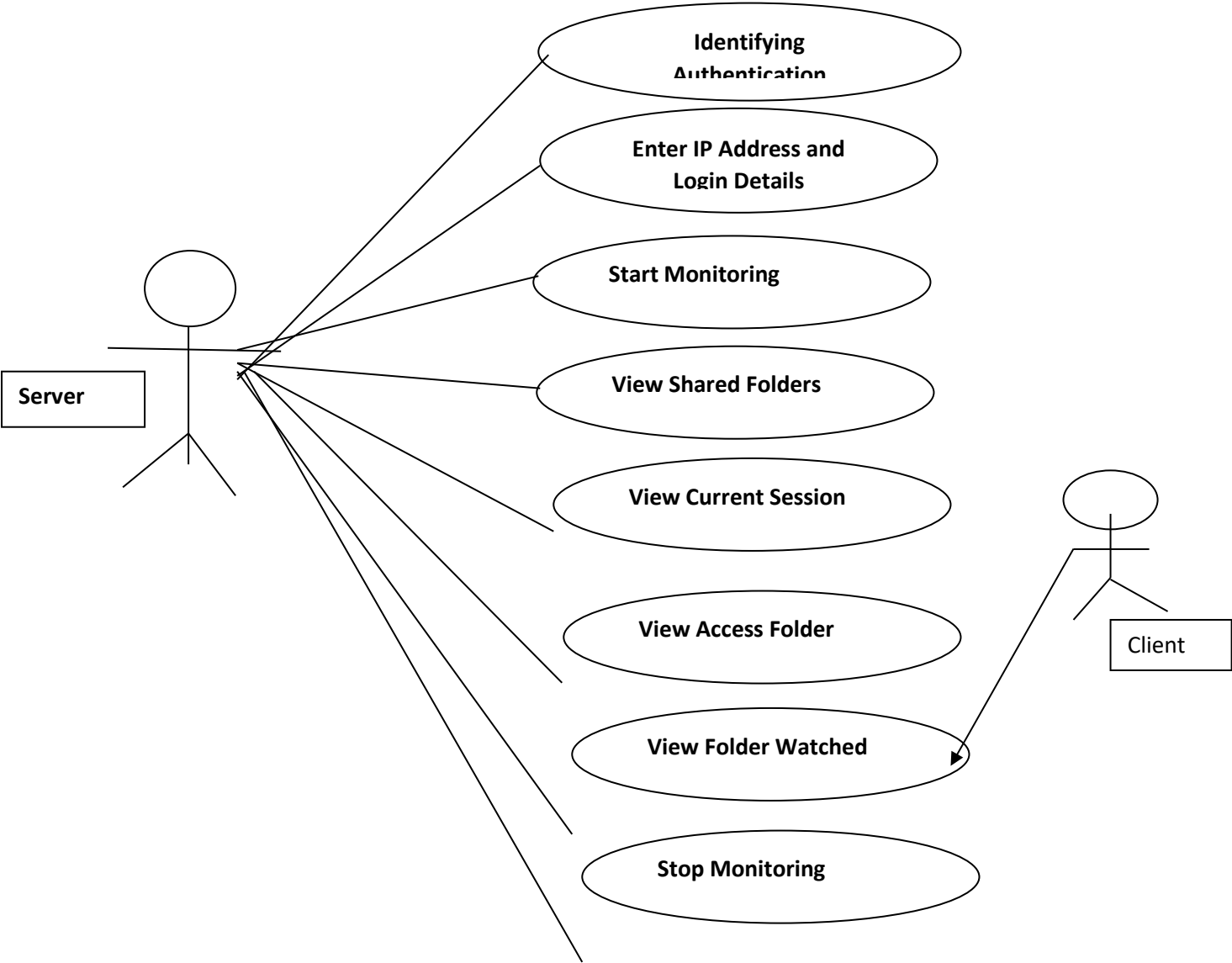
Chapter 4: Coding and Testing

4.1 Introduction

The goal of this phase is to translate the design of the system into code using different programing languages. The phase is concerned with software translating design specification into the source code. Predefined coding guidelines and standards are followed so as to come up with a standard software.

4.2 Technical documentation: System code
4.2.1 Email client code :

Email designer.cs

```
namespace Networks

{

    partial class Email

    {

        /// <summary>

        /// Required designer variable.

        /// </summary>

        private System.ComponentModel.IContainer components = null;
```

```
/// <summary>

/// Clean up any resources being used.

/// </summary>

/// <param name="disposing">true if managed resources should be disposed; otherwise, false.</param>

protected override void Dispose(bool disposing)

{

    if (disposing && (components != null))

    {

        components.Dispose();

    }

    base.Dispose(disposing);

}
```

4.2.2 IP calculator
IP Tool.cs

using System;

using System.Net;

namespace Networks

{

    /// <summary>

    /// Summary description for IPTool.

    /// </summary>

    public class IPTool

    {

        // first (0x00) only for fill - so array starts with bit 1

        static byte [] bit = { 0x00, 0x01, 0x02, 0x04, 0x08, 0x10, 0x20, 0x40, (byte)0x80 }

4.2.3 Network Monitor snippet
Form1.designer.cs

```csharp
namespace Networks

{

    partial class Form1

    {

        /// <summary>

        /// Required designer variable.

        /// </summary>

        private System.ComponentModel.IContainer components = null;



        /// <summary>

        /// Clean up any resources being used.

        /// </summary>

        /// <param name="disposing">true if managed resources should be disposed; otherwise, false.</param>
```

4.2.4 Remote Desktop snippet
RemoteDesktop.designer.cs

```
namespace Networks

{

    partial class RemoteDesktop

    {

        /// <summary>

        /// Required designer variable.

        /// </summary>

        private System.ComponentModel.IContainer components = null;



        /// <summary>

        /// Clean up any resources being used.

        /// </summary>
```

4.2.5 Login snippet

Login.Designer.cs

```csharp
namespace Networks

{

    partial class Login

    {

        /// <summary>

        /// Required designer variable.

        /// </summary>

        private System.ComponentModel.IContainer components = null;


        /// <summary>

        /// Clean up any resources being used.
```

/// </summary>

4.2.6 Main snippet.

Main.Designer.cs

```csharp
namespace Networks

{

    partial class Main

    {

        private System.ComponentModel.IContainer components = null;


        /// <param name="disposing">true if managed resources should be disposed; otherwise, false.</param>

        protected override void Dispose(bool disposing)

        {

            if (disposing && (components != null))

            {
```

```
        components.Dispose();
```

4.2.7 program snippet

using System;

using System.Collections.Generic;

using System.Linq;

using System.Windows.Forms;

namespace Networks

{

   static class Program

   {

     /// <summary>

     /// The main entry point for the application.

     /// </summary>

     [STAThread]

     static void Main()   }

4.3 Unit and System Testing: plan and results

System testing involves user training system testing and successful running of the developed proposed system. The user tests the developed system and changes are made according to their needs. The testing phase involves the testing of developed system using various kinds of data.

4.4 User testing: plan and results

An elaborate testing of data is prepared and the system is tested using the test data. While testing, errors are noted and the corrections are made. The corrections are also noted for the future use. The users are trained to operate the developed system.

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Chapter 5: Implementation/Deployment

5.1 Introduction:

Implementation and deployment are crucial stages in the software development lifecycle as they involve transforming the developed code into a fully functional system that can be used by the university community. This chapter highlights the significance of a smooth implementation and successful deployment, which ultimately determine the effectiveness and usability of the Network Management Suite.

The produced code has to be configured and integrated with the current university infrastructure as part of the implementation procedure. This involved configuring the required hardware and software elements, connecting to the network devices, and making sure the system was compatible with the university's network architecture. Both on-premises deployment inside the university's network and cloud-based deployment for remote access were included in the deployment strategy.

5.2 Conversion Plan:

To enable a seamless transition from the current system to the new solution, the implementation and deployment of the Network Management Suite for Women's University in Africa require a well-defined conversion plan. This conversion plan explains the procedures and actions involved in the implementation and deployment process, ensuring that the university's network operations will be affected as little as possible. An illustration of an implementation/deployment conversion plan is as follows: **Project Initiation:**

i.   Define the project scope, objectives, and timeline.

ii.   Establish the project team, including stakeholders, project manager, and implementation specialists.

Hardware and Software Setup:

Acquire the necessary hardware and software components required for the Network Management Suite implementation.

    i.   Install and configure the servers, switches, routers, and other network devices as per the project requirements.

    ii.   Set up the database servers and ensure proper connectivity with the network devices.

    iii.   Software Installation and Configuration:

    iv.   Install the Network Management Suite software on the designated servers.

    v.   Configure the software according to the specific needs of Women's University in Africa.

    vi.   Establish integration with existing systems, such as email servers, remote desktop applications, and IP subnet calculators.

Data Migration:

    i.   Analyze the existing data and develop a data migration strategy.

    ii.   Extract relevant data from the current system and transform it into the appropriate format for the Network Management Suite.

    iii.   Import the migrated data into the new system, ensuring data integrity and accuracy.

Network Integration and Testing:

    i.   Connect the Network Management Suite with the university's network infrastructure.

    ii.   Conduct thorough testing to ensure seamless integration and compatibility.

    iii.   Verify the functionality of network monitoring, remote desktop access, IP subnet calculator, and email client modules.

User Training and Support:

    i.   Develop comprehensive user training materials and conduct training sessions for university staff members.

    ii.   Provide ongoing support and assistance to users during the implementation and deployment phase.

    iii.   Address any questions or concerns raised by users and provide timely resolutions.

Deployment and Go-Live:

    i.   Plan the deployment schedule to minimize disruption to network operations.

    ii.   Communicate the deployment plan and schedule to all stakeholders and users.

    iii.   Execute the deployment process, ensuring a smooth transition from the old system to the new Network Management Suite.

    iv.   Monitor the system's performance and address any post-deployment issues or glitches.

Post-Deployment Evaluation:

    i.   Evaluate the effectiveness of the implemented system and gather feedback from users.

    ii.   Identify areas of improvement and address any remaining issues or enhancements.

5.3 User manual

1. Firstly we login as shown in fig1,The login page :here is the first page as the system opens and requires correct credentials to login hence using admin as both username and password

2. Then we navigate to the Main_network in Fig2 it is the network that is providing to the server the connection

3. The sharefolder as shown in Fig3.Here descriibe, path, location and status health f the specific folders within the connected server

4. Then proceed to to navigate to Network-Monitoring section displayed in Fig3. Network-Monitoring hence the Main monitoring is where the 5. network can be monitored provided the IP and user name of the server

6. Then Current Session is located and shown in Fig4. This provides information on currently connected nodes or devices to the network

7. Then The Folder Watcher monitors one or more folders on the computer for new file and is on Fig 5 in the appendix

8. The Ipsubnet can be found on Fig6. And it is a small piece of a large network hence small pieces of the current network

9. One of the most complex tool is the Ipsubnet mask calculation shown on Fig7. In the appendix and so to calculate the number of possible subnets that can allocated on the connection

10. Then the flagship feature is the Remote Desktop shown on Fig8 it is used to virtually view another computer in another location and connect to it as if it were local

11. Then finally while using remote desktop connection server 1 is connected as shown in Fig9Then server 2 is connected in fig10 in the appendix

12. And lastly the email client is navigated and as shown on fig11 on the appendix it is used to send email directly to desired recipient also attachments can be sent instantly

5.4 User Training Schedule

There will be an implementation of user training. Instructor-led trainings will be performed where the trainers will meet the trainees at the same place and train them using several tools like overheard projectors.

Date	Personnel involved	Content	Objectives
05/02/23	Student	Logging into the system	To assess the level of user knowledge that is required to use the system
		General use of the system	To enlighten the user on how to use the system
10/02/23	Staff/lecturer	Logging into the system	To assess the level of user knowledge that is required to use the system
		General use of the system	To assess system compatibility

5.5 Post implementation

Post implementation types of maintenance:

  i. **Preventive Maintenance** – Maintenance is done before the system fails. The system is analyzed periodically to detect any signs of worn-out components before the system fails completely.
  ii. **Adaptive maintenance** – Each time the system is updated or new hardware is introduced, maintenance is done to ensure that there are no compatibility issues that distracts the smooth functioning of the virtual pharmacy system

Chapter 6: Evaluation and Conclusion

6.1 Introduction

The systems' last assessment, analysis, include

Effectiveness: The Network Management Suite successfully managed and monitored the network infrastructure for the university. It offered secure remote desktop access, precise IP subnet calculations, real-time monitoring features, and smooth email communication. The project scope's requirements were effectively met by the suite.

Usability: The Network Management Suite's user interface was simple to use and intuitive. Accessing and navigating the functionalities of the suite was simple for administrators and users. The email client, remote desktop application, and subnet calculator tool were all well-designed, allowing for effective task execution and increasing efficiency.

6.2 Evaluation of the system

Impact on Network Management: Women's University's network management procedures were greatly enhanced by the deployment of the Network Management Suite. Network administrators may maintain proactive network device monitoring, quickly spot and resolve problems, and guarantee optimal network performance. IP address distribution and subnet design were made easier by the subnet calculator tool. The remote desktop application improved remote access capabilities, while the email client allowed for easy communication between staff members.

The Women's University in Africa's network management demands were successfully met by the Network Management Suite project. Network efficiency and productivity have significantly increased thanks to the suite's efficient monitoring and administration features, as well as the built-in subnet calculator tool, email client, and remote desktop program. The project's goals were achieved by offering a thorough network management solution that was suited to the university's needs.**6.4 Future Plans**

Enhancements to Features: The Network Management Suite's features must be continuously developed and improved in order to stay up with changing network technologies and market trends. The IP subnet calculator's capability will be expanded, the email client's functionality will be improved with new features, and the remote desktop program will get a smoother user interface in the future.

Optimizing performance when scaling: Make sure the Network Management Suite can scale successfully as the university's network expands and changes. The performance of the suite will be improved in the future to support greater numbers of network devices, larger data quantities, and increased network traffic. Implementing distributed architectures, load balancing methods, and database optimization approaches may be required.

6.5 Conclusion

The Women's University of Africa's Network Management Suite project was successful in putting in place a complete solution to efficiently manage the university's network infrastructure. The initiative has met its goals and given staff and network administrators a useful tool. User satisfaction, performance assessment, and effect analysis all show how well the technology has benefited the university's network management procedures. The Network Management Suite will continue to be a crucial resource for Women's University in Africa with continued assistance and advancement. On the basis of the project's evaluation, the following conclusions can be made:.

The difficulties in maintaining the network infrastructure at the institution have been successfully addressed by the Network Management Suite. To simplify network management procedures, it offers key utilities including network monitoring, remote desktop access, IP subnet calculators, and email clients.

The program operates in accordance with the limitations set forth in each user's browser. The application can yet be improved such that it is highly interactive and beneficial to already-existing applications.By reducing input, the application appeases both the business and the students. Transactions now move more quickly than before.

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References

1. https://purplesec.us/learn/network-security-management/.
2. https://www.office1.com/blog/network-management-a-guide-and-best-practices
3. Women's University in Africa
4. https://datatracker.ietf.org/doc/html/rfc6632
5. https://www.inflectra.com/Ideas/Topic/Requirements-Definition.aspx
6. https://ops.fhwa.dot.gov/publications/fhwahop13046/sec6.htm
7. https://www.ofnisystems.com/services/validation/user-requirement-specifications/
8. https://teachcomputerscience.com/client-server-architecture/
9. https://nap.nationalacademies.org/read/23660/chapter/7
10. https://trendexmexico.com/biznes/6603-effektivnost-upravleniya-kriterii-effektivnosti-upravleniya-predpriyatiem.html
11. https://businessyield.com/management/network-systems-management/
12. https://www.section.io/engineering-education/getting-started-with-network-management/

Book Reference

1. Professional ASP.NET MVC 1.0 (Wrox Programmer to Programmer) Rob Conery, Scott Hanselman, Phil Haack, Scott Guthrie Publisher: Wrox

2. ASP.NET 3.5 Unleashed Stephen Walther Publisher: Sams

3.Programming ASP.NET 3.5 Jesse Liberty, Dan Maharry, Dan Hurwitz Publisher: O'Reilly Media, Inc.

Appendix

Fig1.Login

Fig2.Main_network
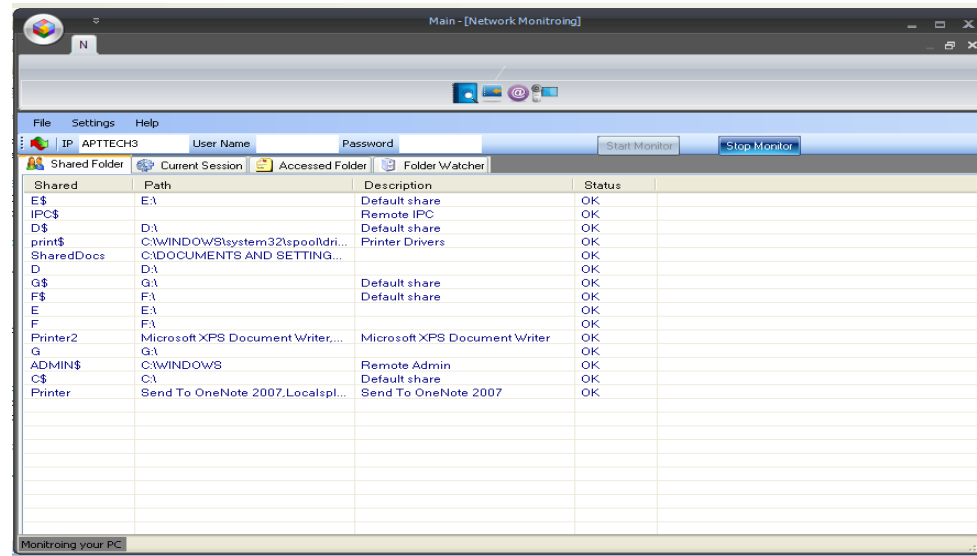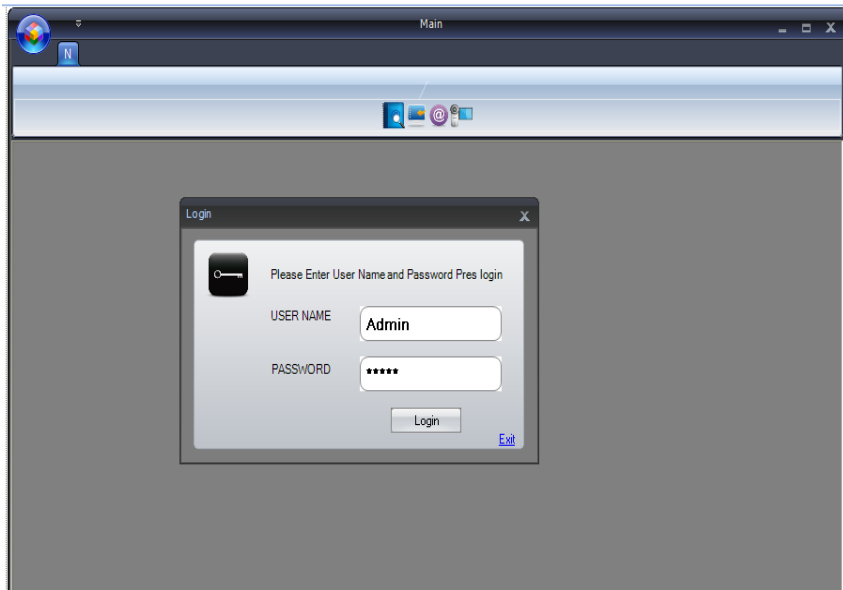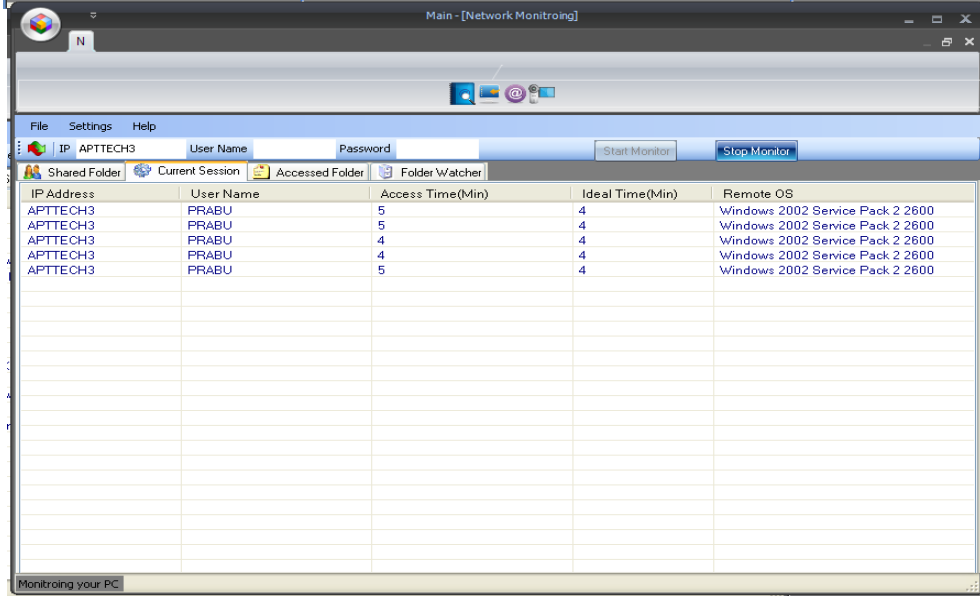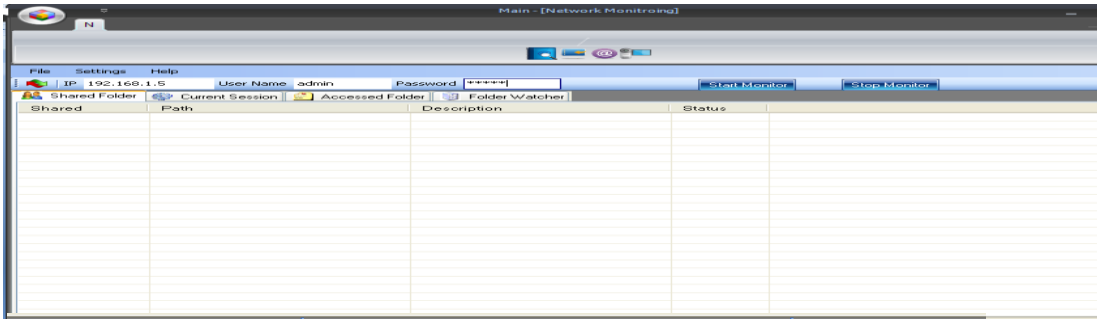
Fig3.Sharefolder

Fig4. Network-Monitoring

Fig5.Current Session
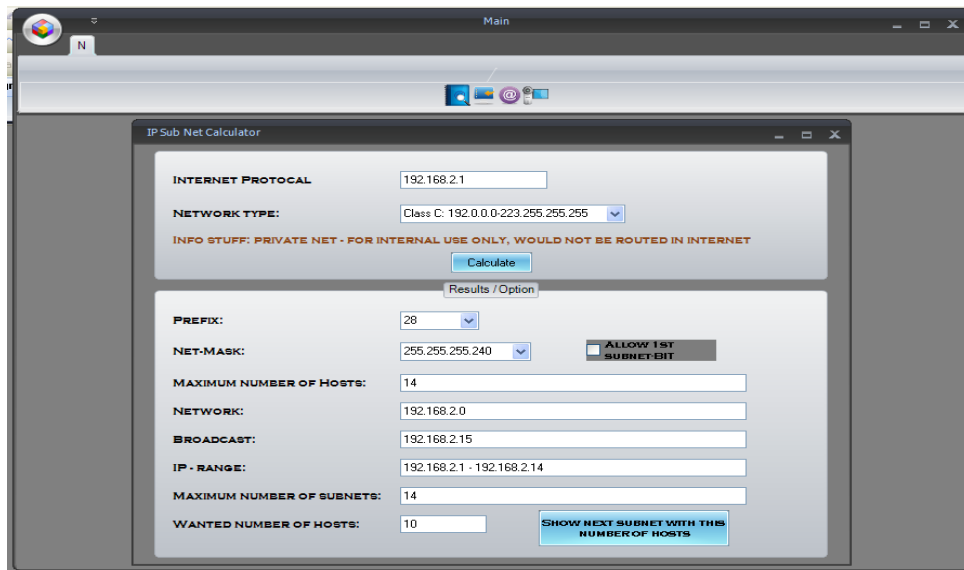
Fig6.Ipsubnet
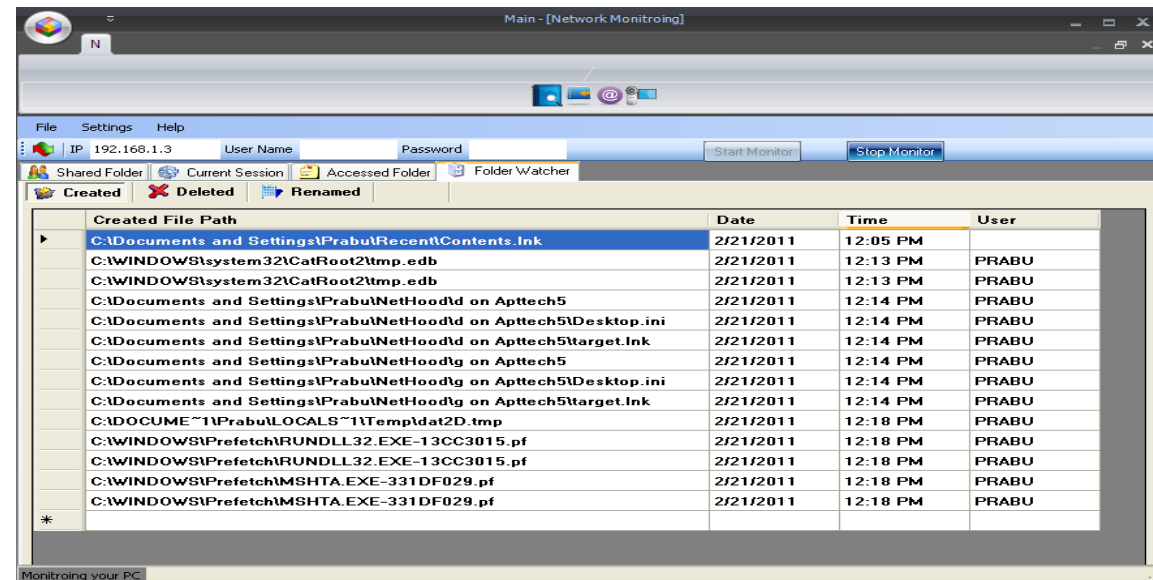
Fig7.Folder Watcher
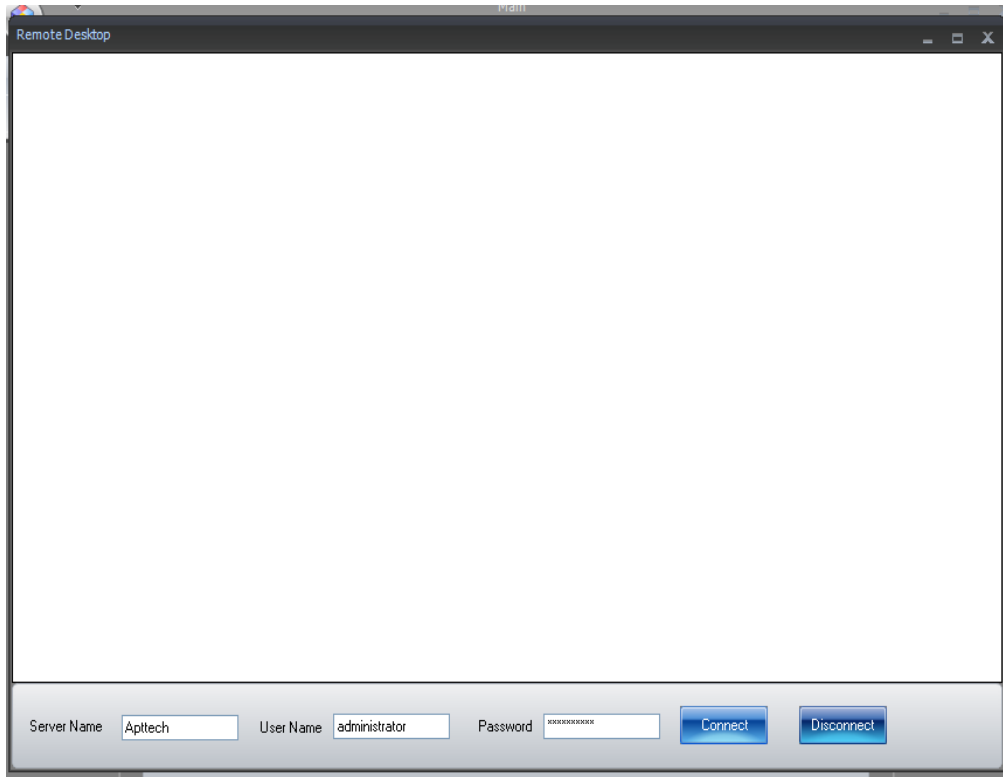
Fig8.Remote Desktop

mask   calculation
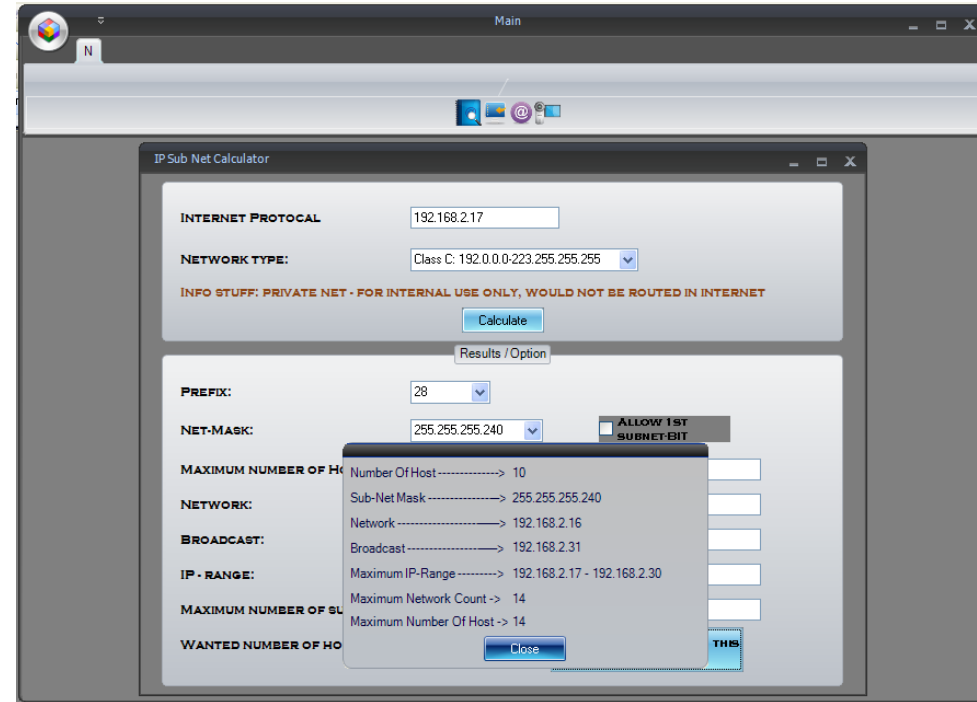
Fig9.Ipsubnet
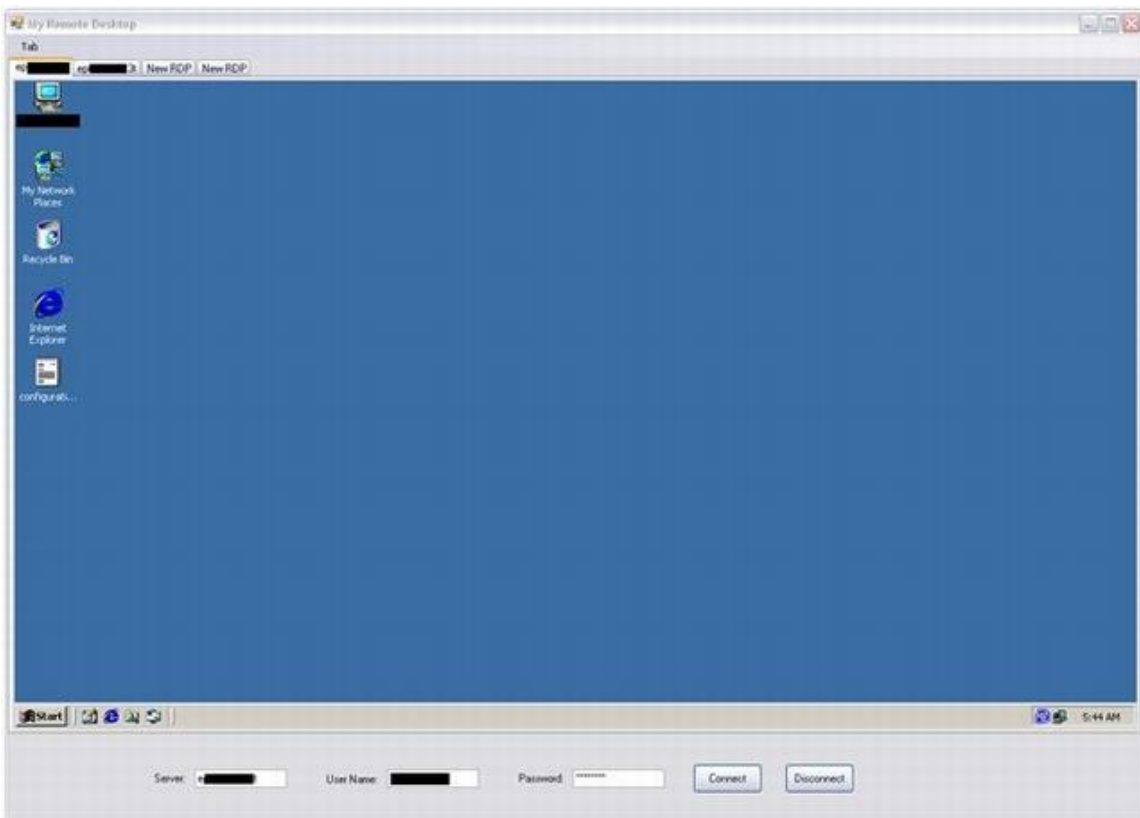
Fig9.Server 1
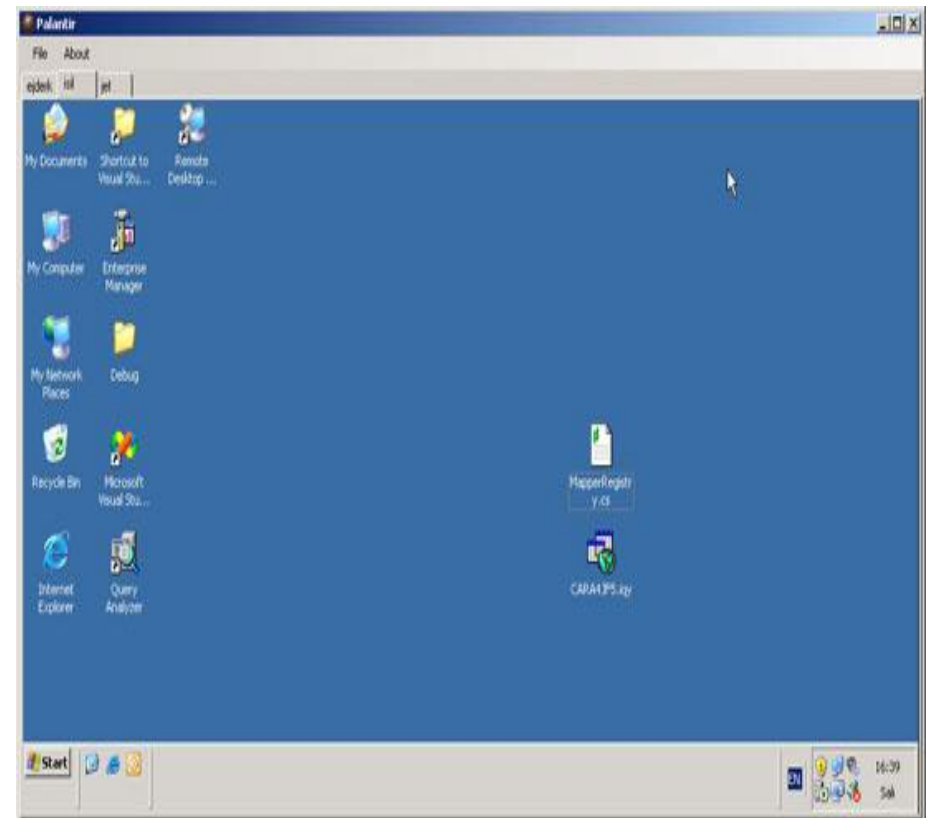
Fig10.Server 2
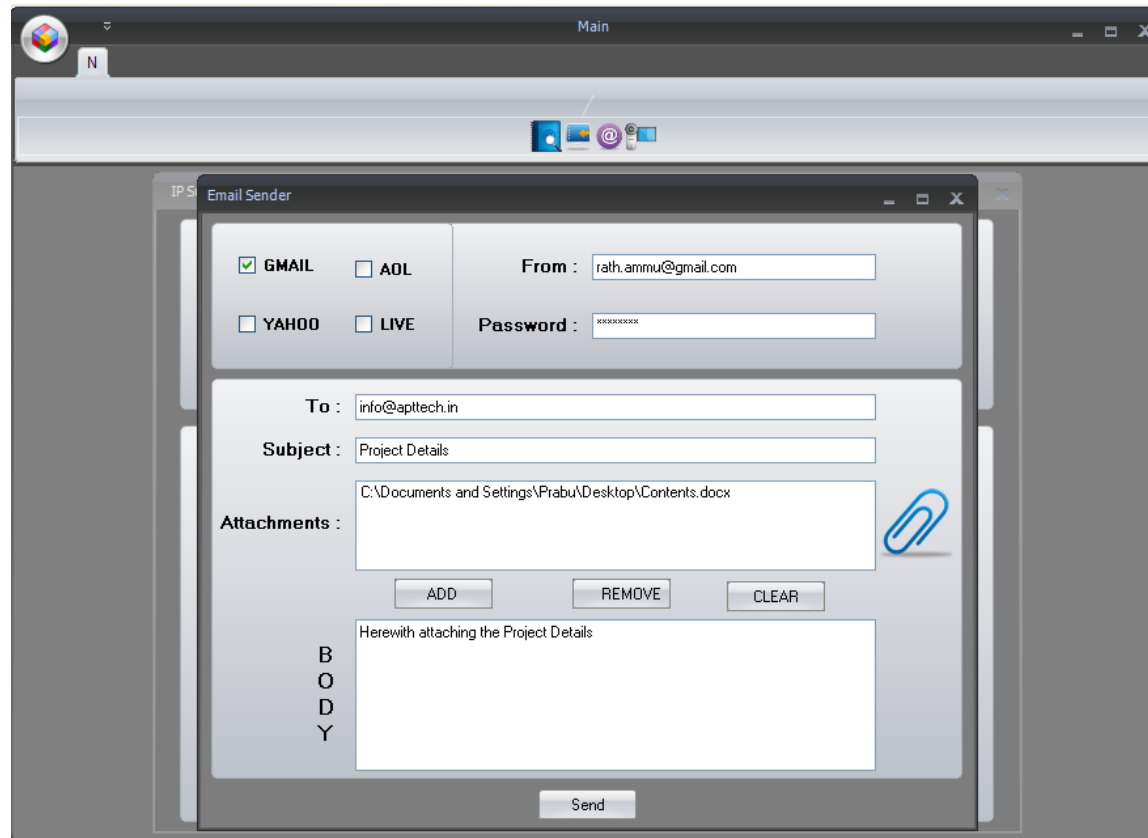
Fig11.E-Mail Client

BIBLIOGRAPHY

► http:www.15seconds.comissue041020.htm

► http:www.a1vbcode.comapp-3619.asp

► http:www.aspcode.netASPNET-301-redirect.aspx

► http:www.aspcode.netMaster-pages-in-ASP-free-template-engine.aspx