An

Industrial Oriented Mini Project Report

On

AUTOMATED SYSTEM MAINTENANCE AND CLEANUP TOOL

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Jawaharlal Nehru Technological University, Hyderabad

For the partial fulfillment of requirements for the award of the degree in

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING

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CERTIFICATE

This is to certify that the Industrial Oriented Mini Project Report entitled **"AUTOMATED SYSTEM MAINTENANCE AND CLEANUP TOOL"** is being submitted by **P.THIRUPATHI REDDY (22275A0402), M.AMANI (22275A0404), P.AKSHITHA (22275A0405), R.RAMANA (22275A0406), V.NIKITHA (22275A0409)** in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Computer Science And Engineering to the Jyothishmathi Institute of Technology And Science, Karimnagar, during academic year 2024-2025, is a Bonafide work carried out by them under my guidance and supervision.

The results presented in this Project Work have been verified and are found to be satisfactory. The results embodied in this Project Work have not been submitted to any other University for the award of any other degree or diploma.

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DECLARATION

We hereby declare that the work which is being presented in this dissertation entitled, "**AUTOMATED SYSTEM MAINTENANCE AND CLEANUP TOOL**", submitted towards the partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science And Engineering, Jyothishmathi Institute of Technology & Science**, Karimnagar is an authentic record of our own work carried out under the supervision of**,** Assistant professor, Department of CSE Jyothishmathi Institute of Technology and Science, Karimnagar.

To the best of our knowledge and belief, this project bears no resemblance with any report submitted to JNTUH or any other University for the award of any degree or diploma.

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ABSTRACT

As computers accumulate temporary files, cache data, and unused directories over time, overall system performance and available storage space can degrade significantly. Manual system maintenance is often overlooked by users due to its repetitive nature and the risk of accidentally deleting important files. This project presents a System Cleanup Automation Tool that addresses these challenges by automating system cleanup tasks with user-centric safeguards. The tool performs scheduled deletion of temporary files, empty folders, and recycle bin contents while integrating a user-defined whitelist mechanism to protect critical paths. A unique feature of this tool is its email-based confirmation workflow, which requires user cansent before executing scheduled cleanup, thereby preventing unintentional data loss. Users receive reminder notifications and can confirm cleanup via email. The entire system is managed through a graphical user interface (GUI) built with Tkinter, providing easy access to configuration settings such as cleanup schedule, email credentials, and whitelist editing. Additionally, the tool monitors disk usage and provides feedback on the impact of each cleanup operation through desktop notifications and visual status updates. This intelligent, customizable, and user-confirmed automation approach enhances system hygiene while prioritizing data safety and user control.

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LISTOFABBREVIATIONS

GUI	Graphical User Interface
JSON	JavaScript Object Notation
OS	Operating System
SMTP	Simple Mail Transfer Protocol
DLL	Dynamic-Link Library
TMP	Temporary File
DB	Database
IDE	Integrated Development Environment
Log	Log File (used for recording events/actions)
AppData	Application Data Directory
CRLF	Carriage Return Line Feed (Windows line ending)
UTF-8	Unicode Transformation Format- 8 bit
%TEMP%	Environment Variable for Temporary Directory

CHAPTER 1
INTRODUCTION

1.1 PROJECT OVERVIEW

The System Cleanup Automation Tool is a Python-based utility designed to help users maintain their computer's performance by automating routine system cleanup tasks. Over time, systems accumulate unnecessary files such as temporary data, empty folders, and items in the recycle bin, which can lead to reduced storage space and slower performance. This tool addresses those issues by executing scheduled cleanup operations while incorporating advanced safety features to protect important user data.

One of the key features of this project is its customizable scheduling system, which allows users to define specific days and times when cleanup should occur. Unlike traditional automation tools, this system includes a unique email-based confirmation mechanism: before executing a scheduled cleanup, the tool sends an email to the user. Only when the user replies with a “YES” does the tool proceed with the cleanup according to scheduled time. This helps prevent accidental deletion and ensures that the user remains in full control of the process.

To further protect user data, the tool includes a whitelist system, allowing users to specify files or directories that should never be deleted. This adds an extra layer of safety and personalization to the cleanup routine. All configurations, including email settings, scheduling, and whitelist management, are handled through a user-friendly graphical interface built using Python’s Tkinter library. The interface provides clear options and visual feedback, making it accessible even for users with limited technical experience.

Additionally, the tool offers real-time disk usage analysis before and after cleanup, along with desktop notifications to inform the user about the results of the operation. Designed to work on both Windows and Linux platforms, the System Cleanup Automation Tool combines automation with user oversight, offering a reliable, intelligent, and secure way to manage system maintenance.

1.2 PROJECT PURPOSE

The primary purpose of the **Automated System Maintenance and Cleanup Tool** is to simplify and automate the process of system maintenance by removing unnecessary files that consume storage and impact system performance. Over time, computers accumulate temporary files, residual data, empty folders, and recycled items that users often forget to clear manually. This project aims to automate these cleanup tasks in a safe, user-friendly, and intelligent manner.

The tool is designed to run scheduled cleanup operations without requiring constant user involvement, yet it ensures data safety through a confirmation mechanism and a customizable whitelist. By sending email-based confirmation requests before each scheduled cleanup, the tool empowers users with final control over automated actions. This reduces the risk of accidental file deletion, especially for users who store important data across various system directories.

Additionally, the project aims to enhance system performance, optimize disk usage, and promote consistent device hygiene through proactive maintenance. It bridges the gap between full automation and user awareness by combining backend scripting, email services, and a graphical user interface. The ultimate goal is to provide a reliable, configurable, and safe solution that encourages routine system care without requiring technical expertise from the user.

1.3 PROJECT SCOPE

The Automated System Maintenance and Cleanup Tool is a desktop-based application designed to operate within a personal or small-scale organizational computing environment. Its scope includes the identification and removal of unnecessary system files—such as temporary files, recycles bin contents, and empty directories—to improve disk space usage and overall system performance. The tool is particularly beneficial for users who do not regularly perform manual cleanup and prefer scheduled, automated maintenance.

The project focuses on creating a safe and intelligent cleanup mechanism that combines

automation with user control. This is achieved through an email-based confirmation system, ensuring that the cleanup process only executes after the user explicitly approves it. The tool also provides a whitelist feature that allows users to protect important files or directories from accidental deletion, offering a high level of customization and security.

The application is built using Python and is cross-platform compatible, supporting both Windows and Linux systems. Its graphical user interface (GUI), developed with Tkinter, makes it accessible to non-technical users by allowing them to easily configure schedules, update email credentials, manage whitelist files, and monitor upcoming cleanups.

While the current scope is limited to local system cleanup and user notifications, the architecture leaves room for future enhancements such as remote cleanup capabilities, cloud integration, AI-driven recommendations, or chatbot-based interfaces. This makes the tool not only useful in its current form but also scalable for advanced use cases in the future.

1.4 PROJECT FEATURES

- **Automated System Cleanup:** The tool automatically deletes temporary files, empties the recycle bin, and removes empty folders from user-specified locations (e.g., Downloads). This helps free up disk space and improve system performance without manual effort.
- **Scheduled Cleanup with Custom Timings:** Users can define specific days and times for the cleanup to run. The scheduling feature supports multiple days in a week and a customizable time slot, making maintenance truly hands-free and consistent.
- **Email-Based Confirmation System:** Before performing any scheduled cleanup, the tool sends an email asking for user confirmation. Cleanup only proceeds if the user replies with "YES," offering a secure, fail-safe mechanism to prevent unintended deletions.
- **Whitelist Protection:** Users can create and manage a whitelist of folders or files that should never be deleted. This ensures important data is preserved even during automated cleanup runs.
- **Disk Usage Reporting:** The tool shows before-and-after disk usage statistics to help users see the actual impact of each cleanup, including percentage of space freed.

- **Desktop Notifications:** Post-cleanup desktop alerts notify users of successful execution, skipped runs, or canceled operations based on email confirmation status.
- **User-Friendly GUI:** Built using Tkinter, the graphical interface allows users to configure settings, edit the whitelist file, and view the next scheduled cleanup—no command-line usage required.
- **Configuration File Management:** All user preferences (email addresses, schedule, whitelist path, etc.) are stored in a JSON config file, making the system easily portable and editable.
- **Cross-Platform Compatibility:** The tool supports both Windows and Linux systems, adapting to platform-specific cleanup methods such as TEMP path detection and recycle bin management.

CHAPTER 2

LITERATURE REVIEW

System cleanup and automation tools have gained popularity as users increasingly demand streamlined ways to maintain performance and manage storage without manual effort. The evolution of such tools is well-documented in various research studies and practical applications, especially in the areas of automation, usability, and data safety.

- **"Automated System Maintenance and File Management":** Researchers and software developers have long explored the importance of routine system maintenance in preserving device performance. According to a study by Kumar and Mehta (2018), unattended accumulation of temporary files, residual data, and unused directories contributes to disk space wastage and system slowdown. Automation tools are shown to be effective in addressing this issue, particularly when integrated with scheduled routines that reduce the burden on users.
- **"User-Centric Design in System Utilities":** A study by Sharma and Patel (2019) emphasizes the importance of user-centric design in system utility applications. The research highlights that tools with customizable options and clear feedback mechanisms (such as logs or usage stats) are better accepted by users. In this context, the inclusion of features like whitelisting and graphical interfaces enhances the usability and safety of automated cleanup tools.
- **"Email-Based Authentication and Control Systems":** Integrating email communication for system control has been examined in several smart applications. According to Ahmad et al. (2020), email-based confirmation methods can serve as reliable and secure interfaces for user interaction, especially when mobile or remote responses are necessary. This aligns with the project's feature of email-based cleanup confirmation to ensure informed execution.
- **"Data Loss Prevention and Safe Automation":** Prior studies have also pointed out the risks associated with automation in file deletion. Mishra and Raj (2017) suggest that incorporating data protection mechanisms—such as whitelists or confirmation layers—significantly reduces user resistance and error rates. The System Cleanup Automation

Tool adopts this recommendation by implementing both whitelisting and manual confirmation workflows.

- **“Schedule-Based Task Execution in Desktop Environments”:** According to a survey by Li and Zhang (2016), tools that leverage schedule-based automation (like corn jobs or task schedulers) for repetitive tasks improve operational efficiency and user satisfaction. This project builds on that idea by using the schedule module in Python to manage and execute timed cleanups seamlessly.
- **“Disk Monitoring and Resource Tracking Tools”:** Yamada and Nguyen (2018) conducted a comprehensive review of disk usage tracking utilities and their role in system performance optimization. They concluded that integration of real-time disk usage metrics helps inform users about the impact of cleanup operations, thus enhancing trust and transparency.
- **“Lightweight Email Clients in Python Automation”**: A study by Rahman and Tiwari (2021) demonstrated how lightweight email modules like smtplib and imaplib can be securely used in automation tools for alerts, confirmations, and user communication. This reinforces the approach used in this project for two-way email-based control.

CHAPTER 3

EXISTING & PROPOSED SYSTEM

3.1 EXISTING SYSTEM

Most users currently rely on manual or semi-automated methods for maintaining their system's storage and cleanliness. This includes using built-in utilities like Windows Disk Cleanup or Linux terminal commands, as well as third-party software like CCleaner. These methods require the user to initiate cleanups manually or set up limited schedules. Additionally, there is no built-in system for alerting the user prior to cleanup or protecting important files from being deleted. Logging of cleanup activity, reminders, and remote confirmations are also absent in these conventional approaches.

Communication about upcoming cleanups is non-existent, which means users may not be aware of when their systems are scheduled for maintenance. There is also no integration with user communication channels like email for confirmations or alerts. Most of these tools lack intelligent file protection mechanisms such as a user-defined whitelist, making it possible for important or sensitive files to be removed unintentionally. Overall, the current ecosystem of cleanup tools offers fragmented functionality with little user interaction or control.

3.2 EXISTING SYSTEM DISADVANTAGES

- Lack of automation
- No confirmation mechanism
- No whitelist functionality
- No user alerts or reminders
- Limited scheduling capabilities

3.3 PROBLEM STATEMENT

Manual system maintenance and cleanup tasks, such as deleting temporary files, clearing the recycle bin, and removing empty folders, are often overlooked by users, leading to reduced system performance, low disk space, and cluttered storage. Existing methods either require technical knowledge or do not provide safeguards against accidental data loss. Furthermore, users may forget to review important directories before cleanup, resulting in the unintentional deletion of valuable files. There is a need for an automated, user-friendly, and customizable cleanup solution that includes features such as file whitelisting, scheduled cleanup with email reminders, and confirmation-based execution to ensure safe and efficient system maintenance.

3.4 PROPOSED SYSTEM

The proposed system is an intelligent, automated system maintenance and cleanup tool designed to help users maintain their computer systems efficiently and safely. It allows users to schedule regular system cleanup tasks, such as deleting temporary files, clearing the recycle bin, and removing empty folders, without manual intervention. To prevent accidental deletion of important files, the system includes a whitelist feature where users can mark safe files or directories that should never be deleted.

The tool also sends email reminders to the user, prompting them to review the whitelist. Additionally, the cleanup process only proceeds after the user confirms it via email, ensuring full control and safety. The user interface (GUI) makes it easy to configure email settings, schedule cleanup times, and edit the whitelist. Overall, the system combines automation, user safety, and simplicity to improve system performance and storage management.

3.5 PROPOSED SYSTEM ADVANTAGES

- Automated Cleanup
- Whitelist Protection
- Email Reminder & Confirmation
- User-Friendly Interface

- Improved System Performance
- Customizable Scheduling
- Cross Platform Support
- Low Resource Usage

CHAPTER 4

SYSTEM REQUIREMENTS

4.1 SOFTWARE REQUIREMENTS

Software requirements specify the logical characteristics of each interface and software component of the system. The following are the software requirements for the System Cleanup Automation Tool:

- **Operating System:** Windows 7 or above / Linux (Ubuntu or similar)
- **Programming Language:** Python
- **Libraries/Modules:** tkinter, schedule, psutil, plyer, smtplib, imaplib, email, json, datetime
- **GUI Framework:** Tkinter (Python's built-in GUI library)
- **Notification System:** plyer (for desktop notifications)
- **Email Integration:** SMTP (for sending confirmation), IMAP (for reading confirmation replies)

These requirements ensure a lightweight, efficient, and automated system cleanup environment that offers a user-friendly interface with smart scheduling and email confirmation features.

4.2 HARDWARE REQUIREMENTS

Hardware requirements specify the physical components necessary for installing and running the System Cleanup Automation Tool efficiently. The following are the hardware requirements:

• **Processor:** Intel Core i3 or higher
•**RAM:** Minimum 4 GB
• **Hard Disk:** At least 100 MB of free space
• **Display:** 1024x768 resolution or higher
• **Input Devices:** Standard keyboard and mouse

CHAPTER 5

PROJECT DESCRIPTION

The System Cleanup Automation Tool is a smart, cross-platform desktop application developed using Python, designed to automate system maintenance tasks. Its primary purpose is to clean unnecessary files such as temporary files, empty folders, and recycle bin contents to free up storage space and optimize system performance.

One of the key features of this tool is its Whitelist Protection System, which ensures that important files and folders specified by the user are never deleted accidentally during cleanup operations. This adds a layer of safety and control over the automation process.

The tool integrates a scheduling system, allowing users to set specific days and times for cleanup operations. Before performing any cleanup, the system sends an automated email to the user requesting confirmation. Cleanup proceeds only if the user replies with “YES,” and also scheduled time ensuring that no changes are made without user consent. This two-step verification makes the process both secure and user-aware.

The intuitive GUI, built with Tkinter, allows users to easily manage email settings, schedule configurations, and whitelist paths. Notifications are delivered using the Plyer module, and disk usage statistics before and after cleanup are shown to help users monitor system performance.

This tool is ideal for users who want an efficient, customizable, and reliable way to maintain their system’s health without having to perform manual cleanup tasksrepeatedly.

5.1 MODULES

1. **Cleanup Module:** This is the core module of the project responsible for removing unnecessary files to free up disk space and improve system performance. It includes:

- Deleting temporary files from system-defined temp directories.
- Clearing the recycle bin or trash.
- Removing empty folders (especially from common download or user directories). This module strictly avoids deleting files listed in the whitelist.

2. **Whitelist Management Module:** This module ensures critical files or folders are protected from accidental deletion. Features include:

- Reading and updating the whitelist from a specified text file.
- Allowing users to edit the whitelist via the GUI.
- Implementing path validation to ensure safe operations.

3. **Scheduling Module:** This module handles the automated scheduling of cleanup tasks. It includes:

- User-defined day(s) and time(s) for scheduled cleanup.
- Background execution using the schedule library.
- Calculation and display of the next scheduled cleanup.

4. **Email Notification & Confirmation Module:** This module manages secure communication to ensure user confirmation before cleanup. Features include:

- Sending a confirmation email with “YES” instructions.
- Reading user replies via IMAP to verify confirmation.
- Proceeding or canceling the cleanup can be done by stop cleanup button in Gui. This adds a layer of safety before performing potentially destructive operations.

5. **Graphical User Interface (GUI) Module:** Built using Python’s Tkinter library, this module provides user interaction with the application. It includes:

- Buttons for stopping cleanup and accessing settings.
- Entry fields for email configuration, schedule time, and whitelist file path.

- Displaying the current system configuration and next scheduled run.

6. **Disk Usage & Notification Module:** This module is responsible for monitoring and informing the user about cleanup results. Features include:

- Calculating disk usage before and after the cleanup using the psutil library.
- Sending system tray notifications to summarize disk space recovered.
- Displaying alerts or messages upon completion or cancellation.

CHAPTER 6

SYSTEM DESIGN

6.1 SYSTEM ARCHITECTURE

Project Architecture Overview

The architecture of the System Cleanup Automation Tool is designed to provide a user-friendly, secure, and automated environment for managing temporary file cleanup on a user's computer. It is structured into the following layers and components:

1. **Presentation Layer (User Interface)**

- Built using Python's Tkinter library. Allows users to configure settings such as:
  - Email credentials
  - Cleanup schedule
  - Whitelist file location
- Provides options to manually trigger cleanup or edit configuration.
- Displays notifications and status updates.

2. **Configuration Management**

- Stores user preferences and system settings in a JSON file (config. json).
- Handles default values if the file is missing or incomplete.
- Ensures settings persist between sessions.

3. **Scheduler and Event Handler**

- Uses the schedule module to define when cleanup should occur.
- Runs in a separate thread to avoid blocking the GUI.

4. **Email Confirmation System**

- Uses smtplib to send email alerts to the user.
- Uses imaplib to check for user confirmation.

5. **Cleanup Engine**

- Executes the actual cleanup tasks, including:
    - Deleting temporary files
    - Removing empty folders
    - Clearing the recycle bin
- Cross-checks each path with the whitelist before deletion.

6. **Whitelist Manager**

- Stores a list of file or folder paths that should never be deleted.
- Ensures safety by skipping any whitelisted items during cleanup.

7. **Notification System**

- Uses the plyer library to display desktop notifications.
- Notifies the user about:
    - Successful cleanups
    - Cancelled operations
    - Errors or missing confirmations

8. **File System Interface**

- Interfaces with the local file system to perform file operations.
- Accesses directories like %TEMP%, Recycle Bin, and downloads (if configured).

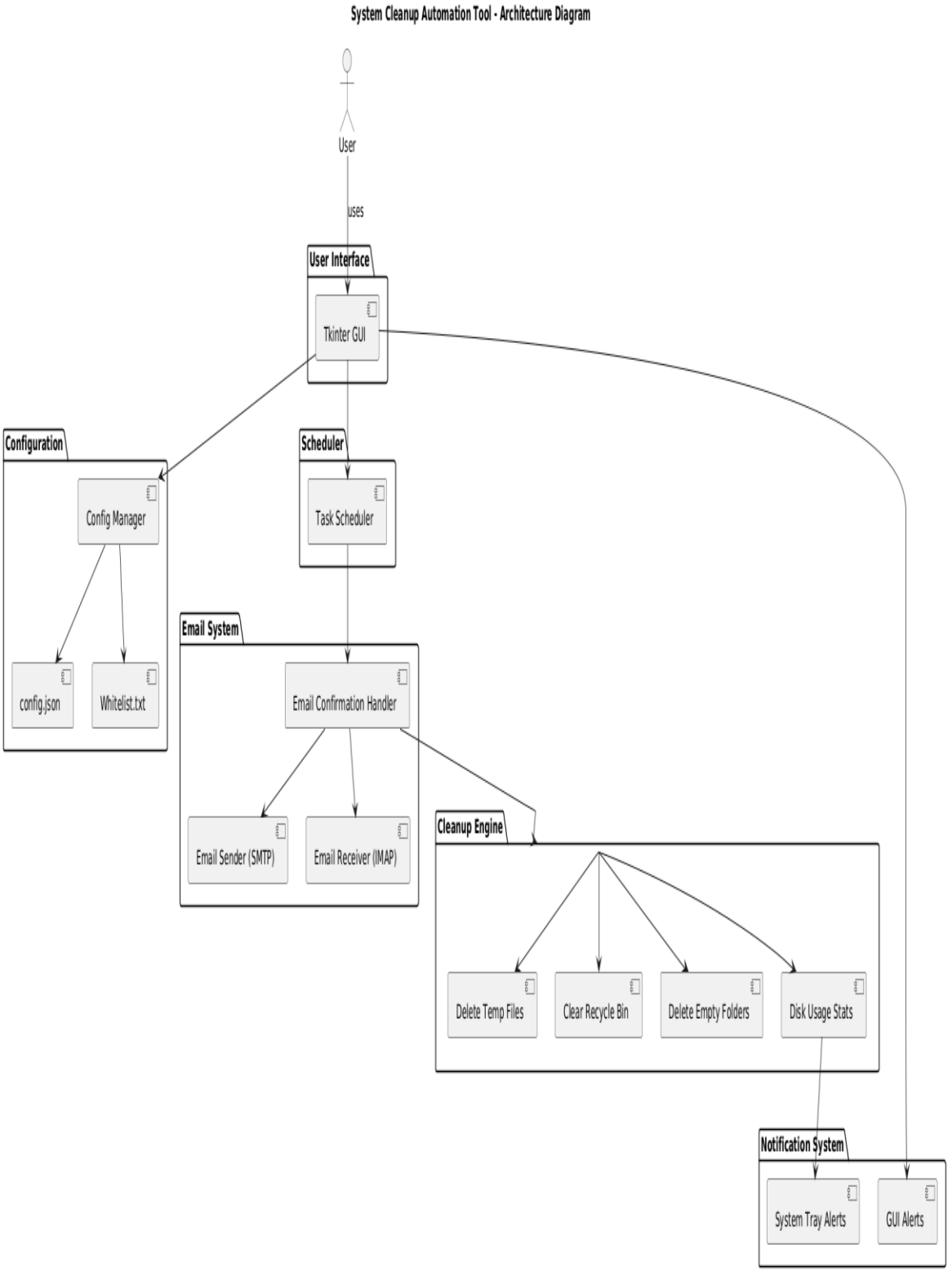

Fig6.1: System Architecture

6.2 DATA FLOW DESIGN

A Data Flow Diagram (DFD) is a graphical representation of the flow of data within a system or process. It is a modeling technique that shows how data moves through processes and how it is stored, transformed, or exchanged within a system. DFDs are often used in system analysis and design to visualize and understand the data processing and flow of information in a structured manner.

In the context of the System Cleanup Automation Tool, the DFD illustrates the key components, data sources, and processes involved in automating the cleanup of unwanted files from a user's system, while protecting important data using a whitelist and confirmation mechanism.

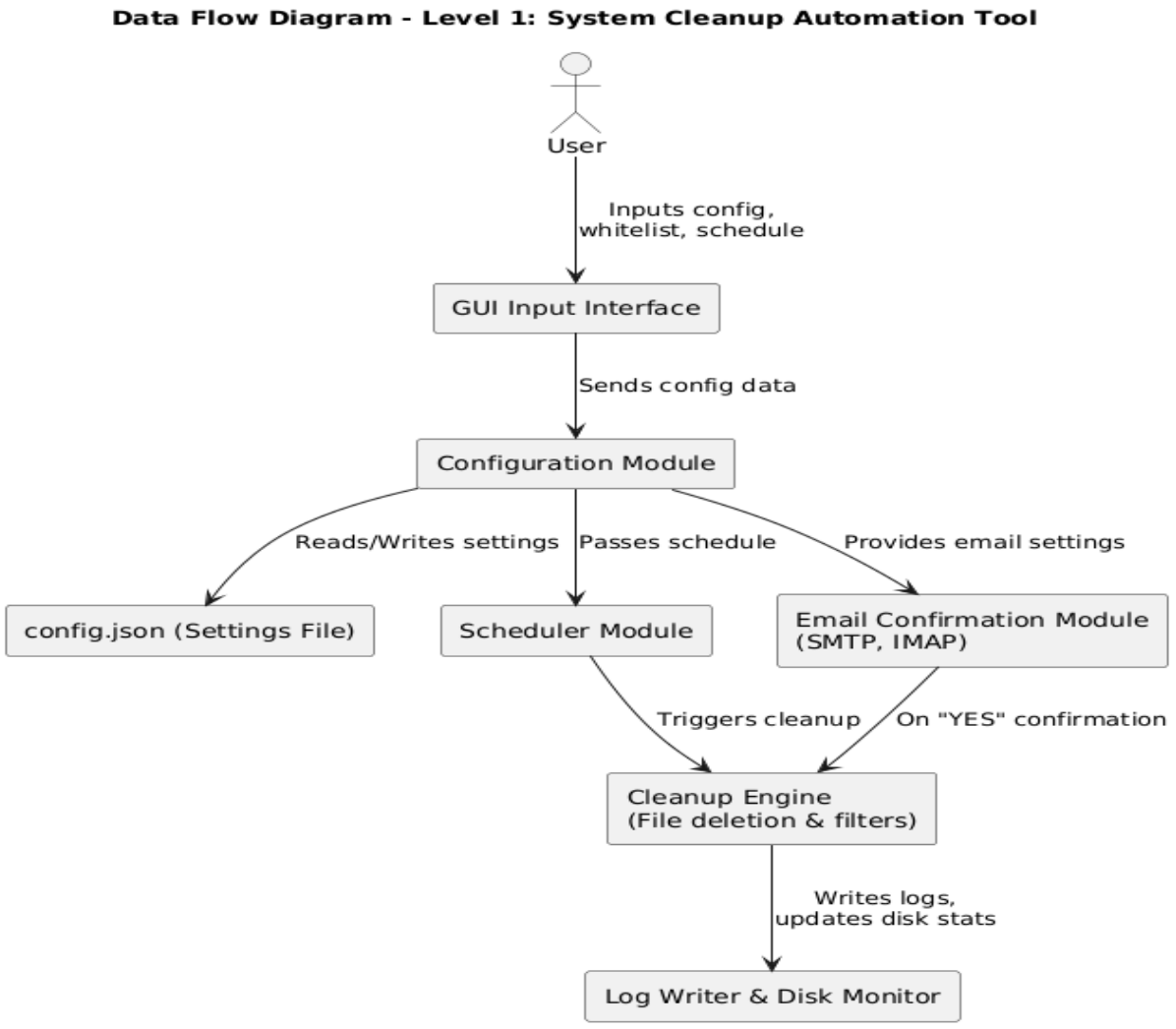

Figure6.2: Data Flow Diagram

6.3 UML DESIGN

In UML, the diagrams can be broadly categorized into two main types: structural diagrams and behavioral diagrams.

1. **Structural Diagram**

   Structural diagrams in UML focus on representing the static structure of a system. They showcase the components that make up the system and their relationships. The following are different structural diagrams:

   1. Class diagram
   2. Object diagram
   3. Component diagram
   4. Deployment diagram

2. **Behavioral Diagram**

   Behavioral diagrams primarily capture the dynamic facet of the system. UMLhasthesubsequent5varietiesofbehavioraldiagrams.

   They are

   1. Use case diagram
   2. Sequence diagram
   3. Collaboration diagram
   4. State chart diagram
   5. Activity diagram

6.3.1 Class Diagram

Class diagrams are designed using a syntax that mirrors those traditionally employed in programming languages. This resemblance fosters a familiar environment for developers, there by facilitating an easier and more intuitive diagram creation process.

This design approach is not only succinct but also enables the creation of representations that are both concise and expressive. Moreover, it allows for the portrayal of relationships between classes through a syntax that echoes that of sequence diagrams, paving the way for a fluid and insightful depiction of class interactions.

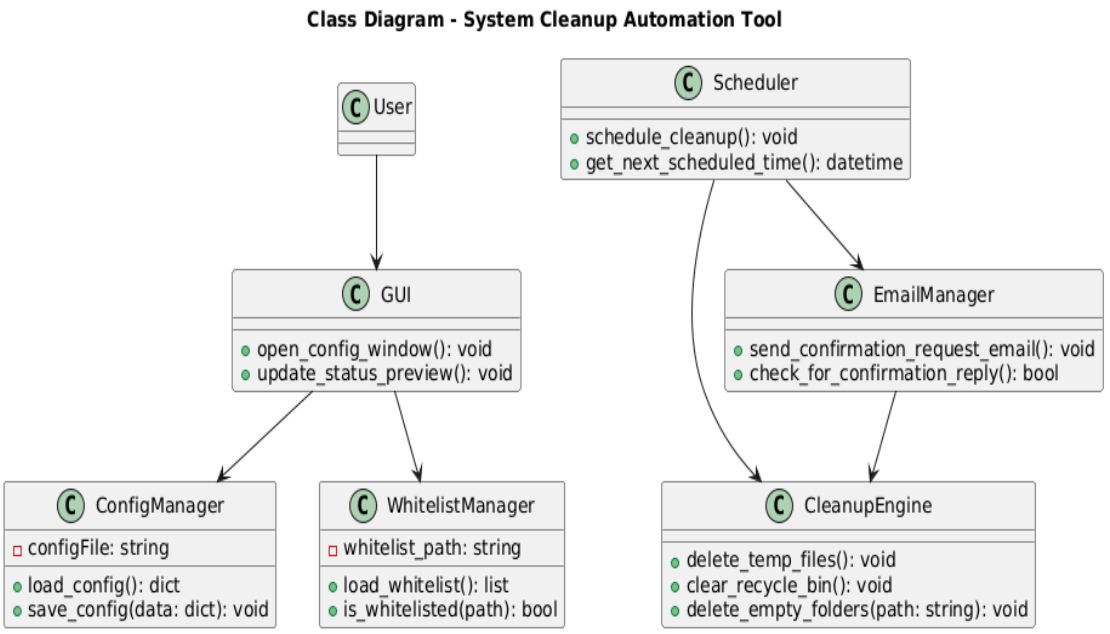

Figure6.3: Class Diagram

6.3.2 Object diagram

An object diagram is a graphical representation that showcases objects and their relationships at a specific moment in time. It provides a snapshot of the system's structure, capturing the static view of the instances present and their associations.

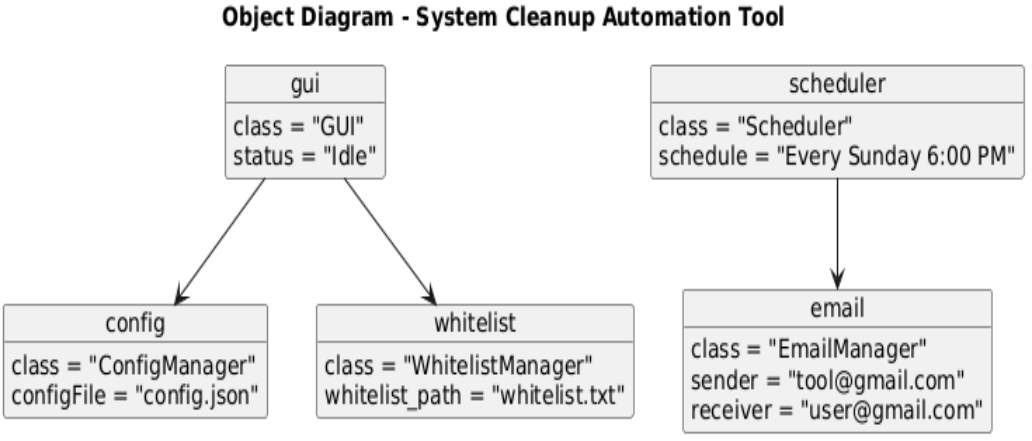

Figure6.4: Object Diagram

6.3.3 Component diagram

A component diagram is a type of structural diagram used in UML (Unified Modeling Language) to visualize the organization and relationships of system components. These diagrams help in breaking down complex systems into manageable components, show casing their inter dependencies, and ensuring efficient system design and architecture.

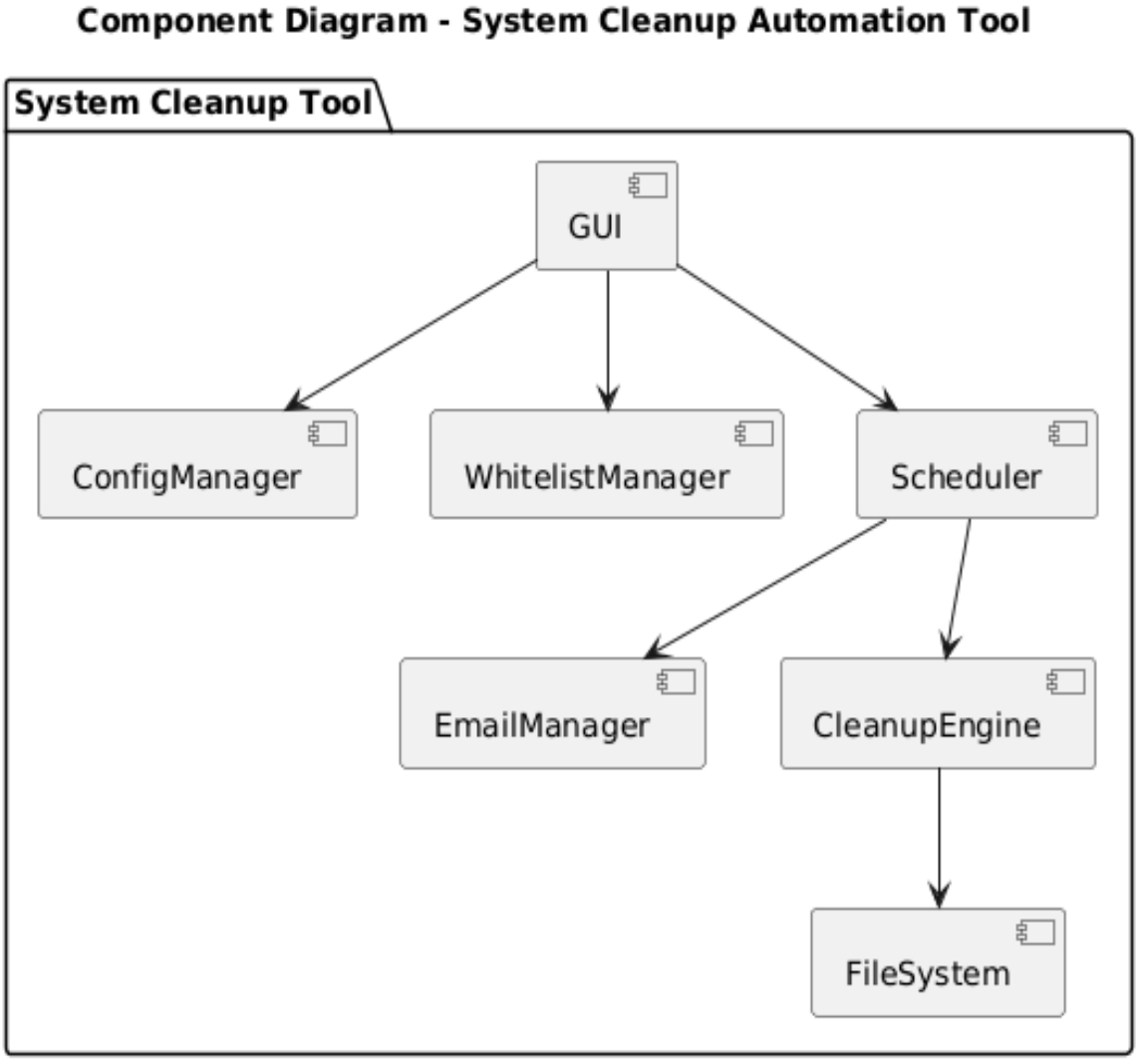

Figure6.5: Component Diagram

6.3.4 Deployment diagram

A Deployment Diagram is a type of diagram that visualizes the architecture of systems, showcasing how software components are deployed onto hardware. It provides a clear picture of the distribution of components across various nodes, such as servers, workstations, and devices.

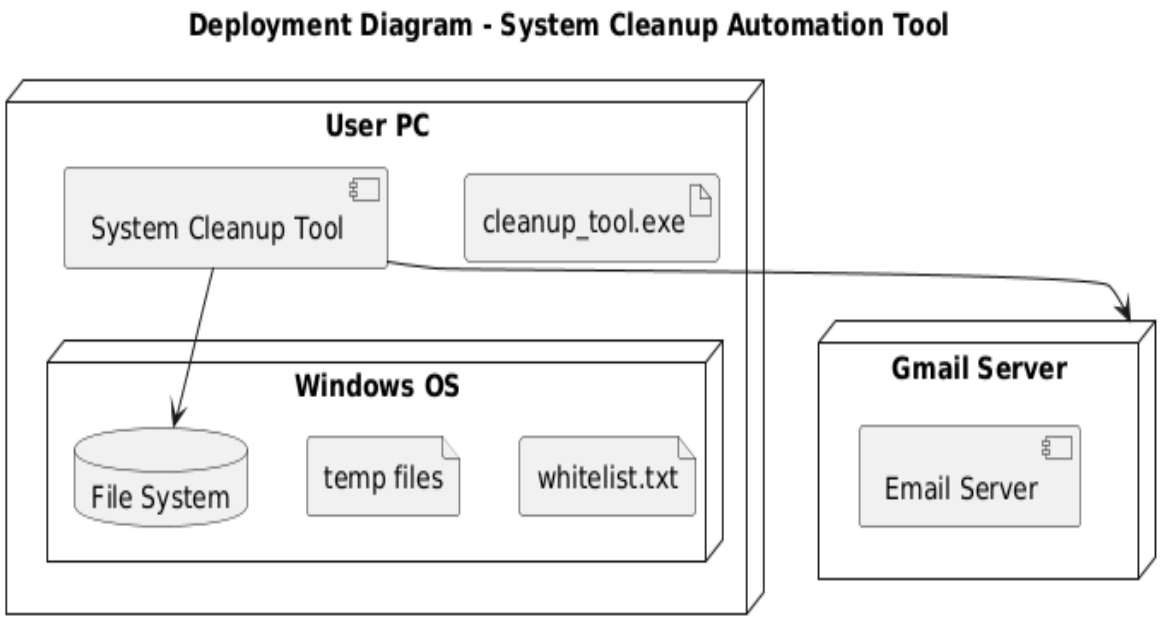

Figure6.6: Deployment Diagram

6.3.5 Use Case Diagram

A use case diagram is a visual representation used in software engineering to depict the interactions between system actors and the system itself. It captures the dynamic behavior of a system by illustrating its use cases and the roles that interact with them. These diagrams are essential in specifying the system's functional requirements and understanding how users will interact with the system. By providing a high-level view, use case diagrams help stakeholders understand the system's functionality and its potential value.

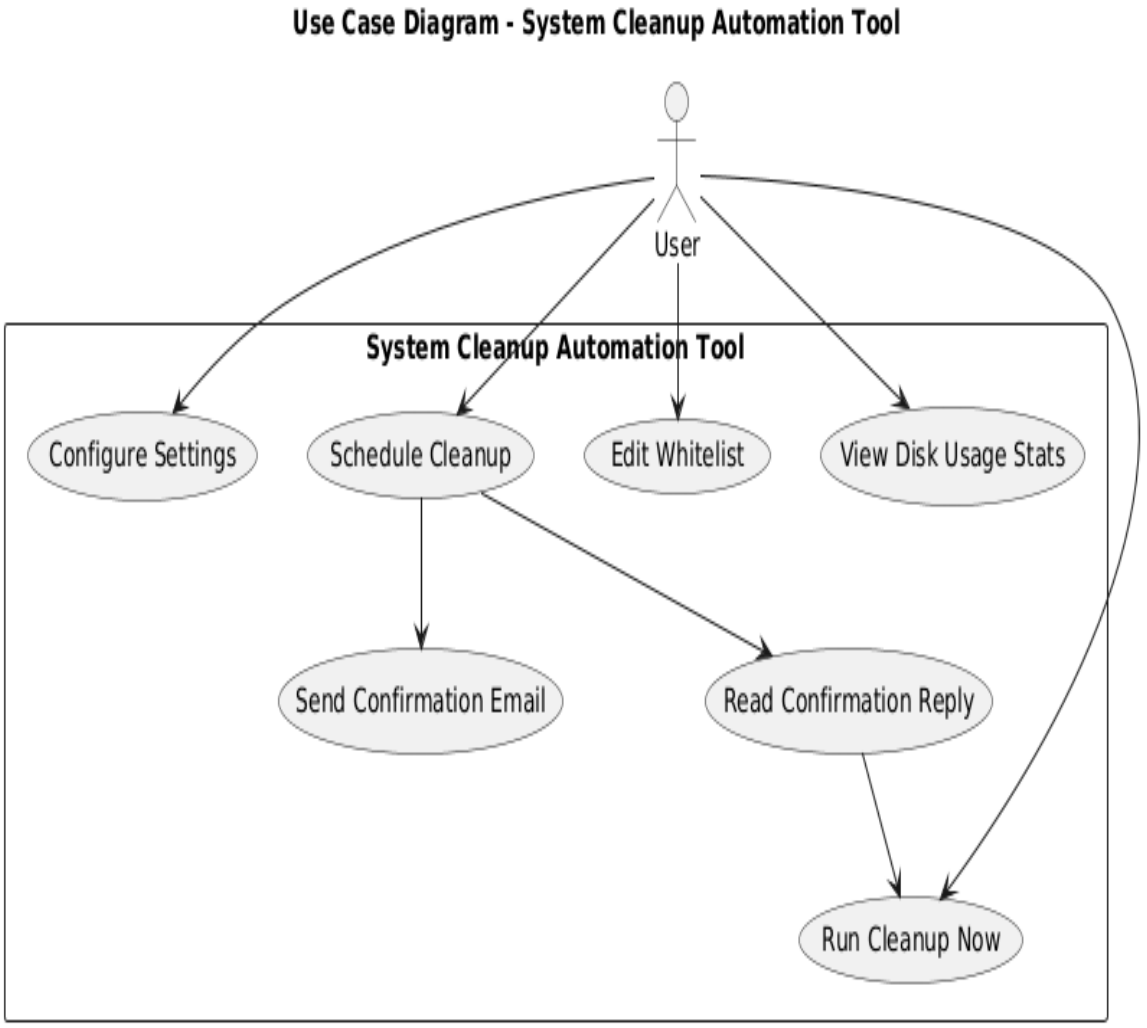

Figure6.7: Use Case Diagram

6.3.6 Sequence Diagram

A sequence diagram merely depicts interaction between objects in an exceedingly serial order i.e., the order during which these interactions turn up. We will conjointly use terms event diagrams or event eventualities to consult with a sequence diagram. These diagrams are widely employed by businessmen and software package developers to document and perceive needs for brand new and existing systems

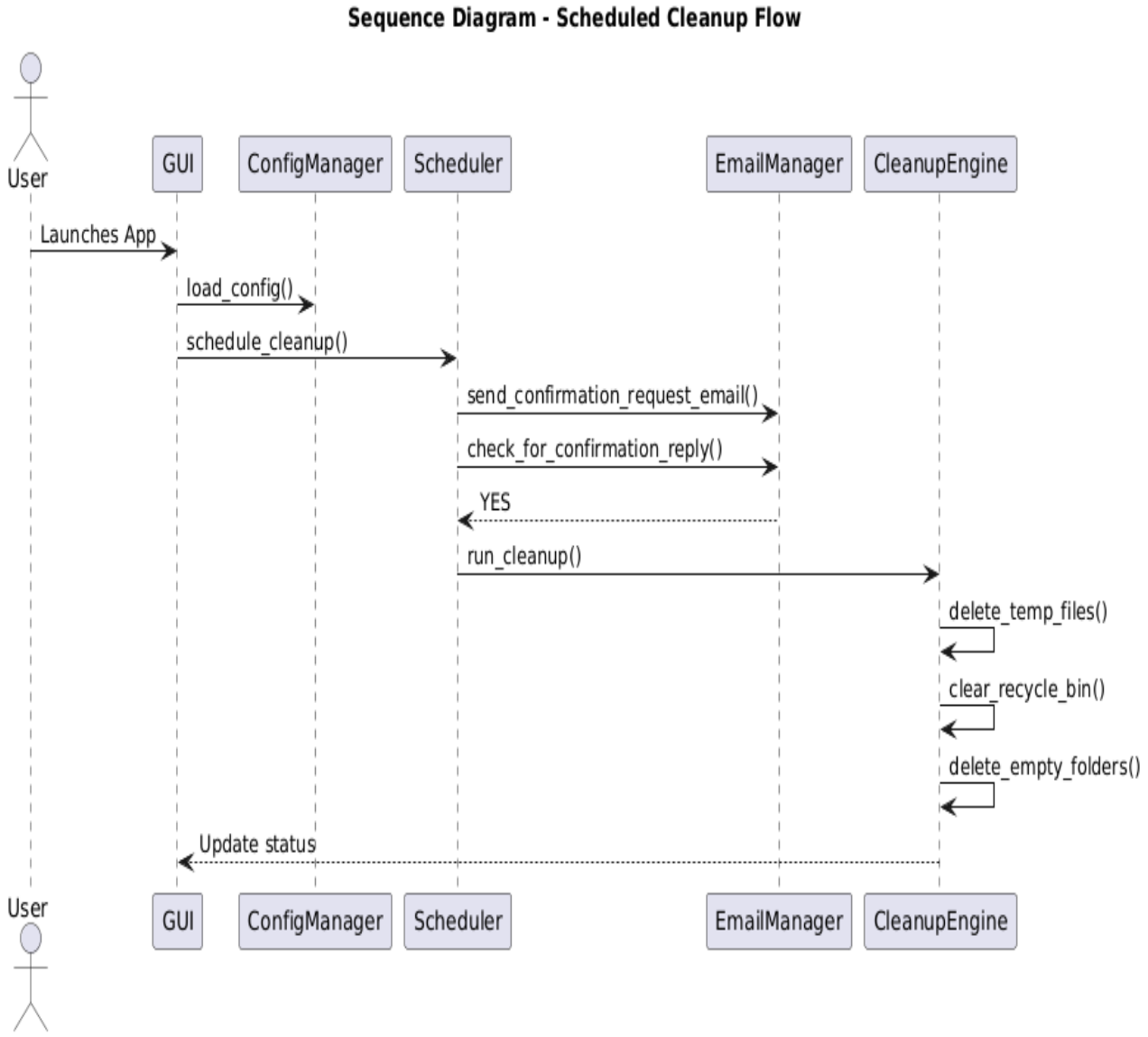

Figure6.8: Sequence Diagram

6.3.7 Activity Diagram

ActivityDiagramsrepresenttheflowofactivitieswithinaprocessorworkflow.They focus on actions, decisions, and control flows.

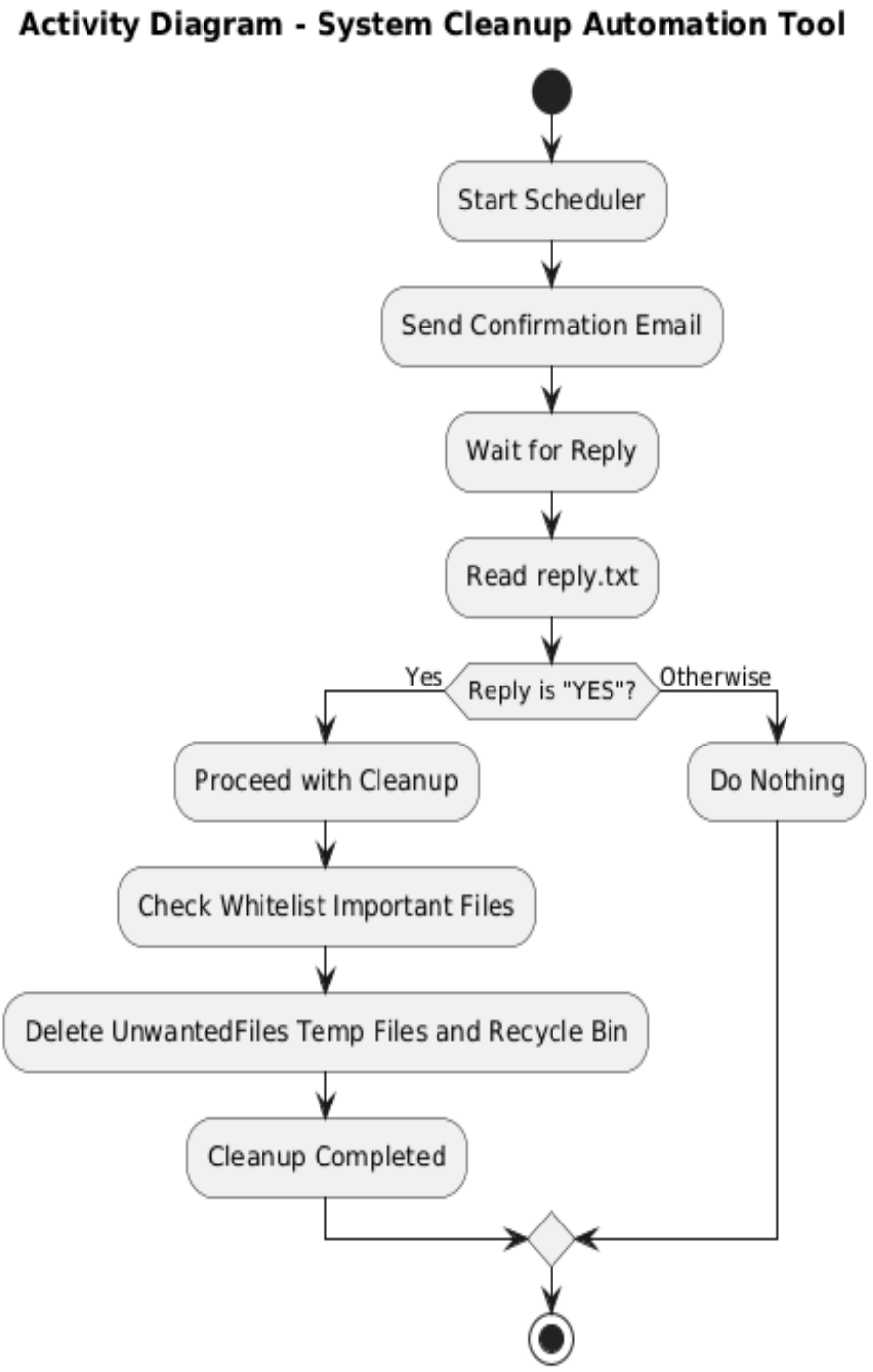

Figure6.9: Activity Diagram

6.3.8 State Diagram

State diagrams provide a visual representation of the various states a system or an

object can be in, as well as the transitions between those states. They are essential in modeling the dynamic behavior of systems, capturing how they respond to different events over time. State diagrams depict the system's life cycle, making it easier to understand, design, and optimize its behavior.

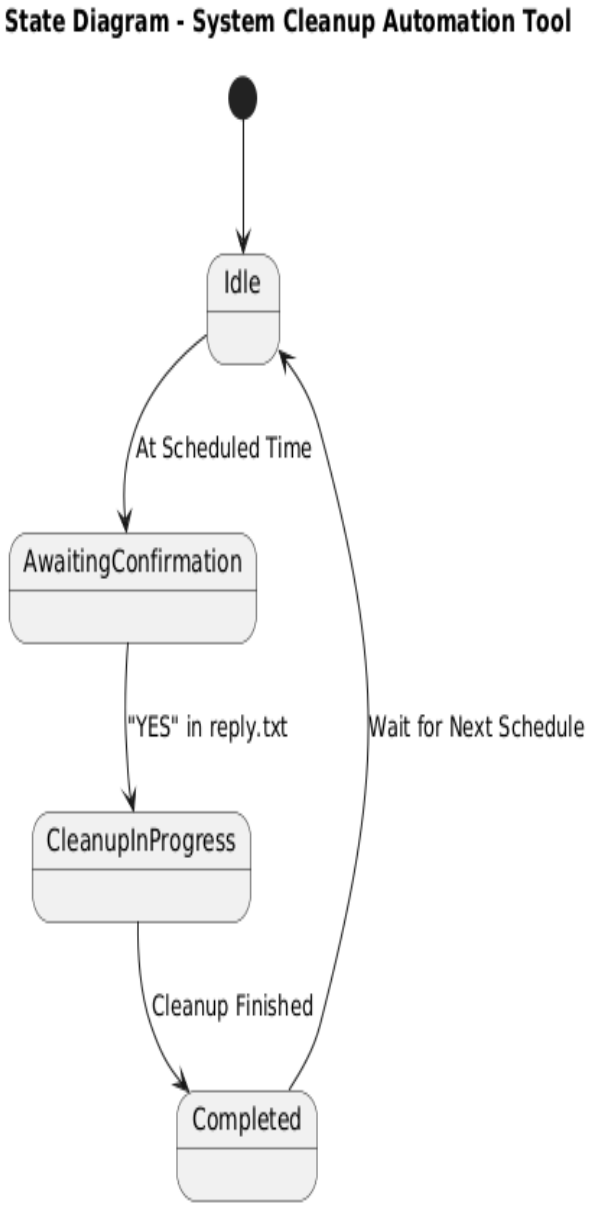

Figure6.10: State Diagram

6.3.9 Timing Diagram

A Timing Diagram in UML is a specific type of interaction diagram that visualizes the timing constraints of a system. It focuses on the chronological order of events, showcasing how different objects interact with each other over time. Timing diagrams are especially useful in real-time systems and embedded systems to understand the behavior of objects throughout a given period.

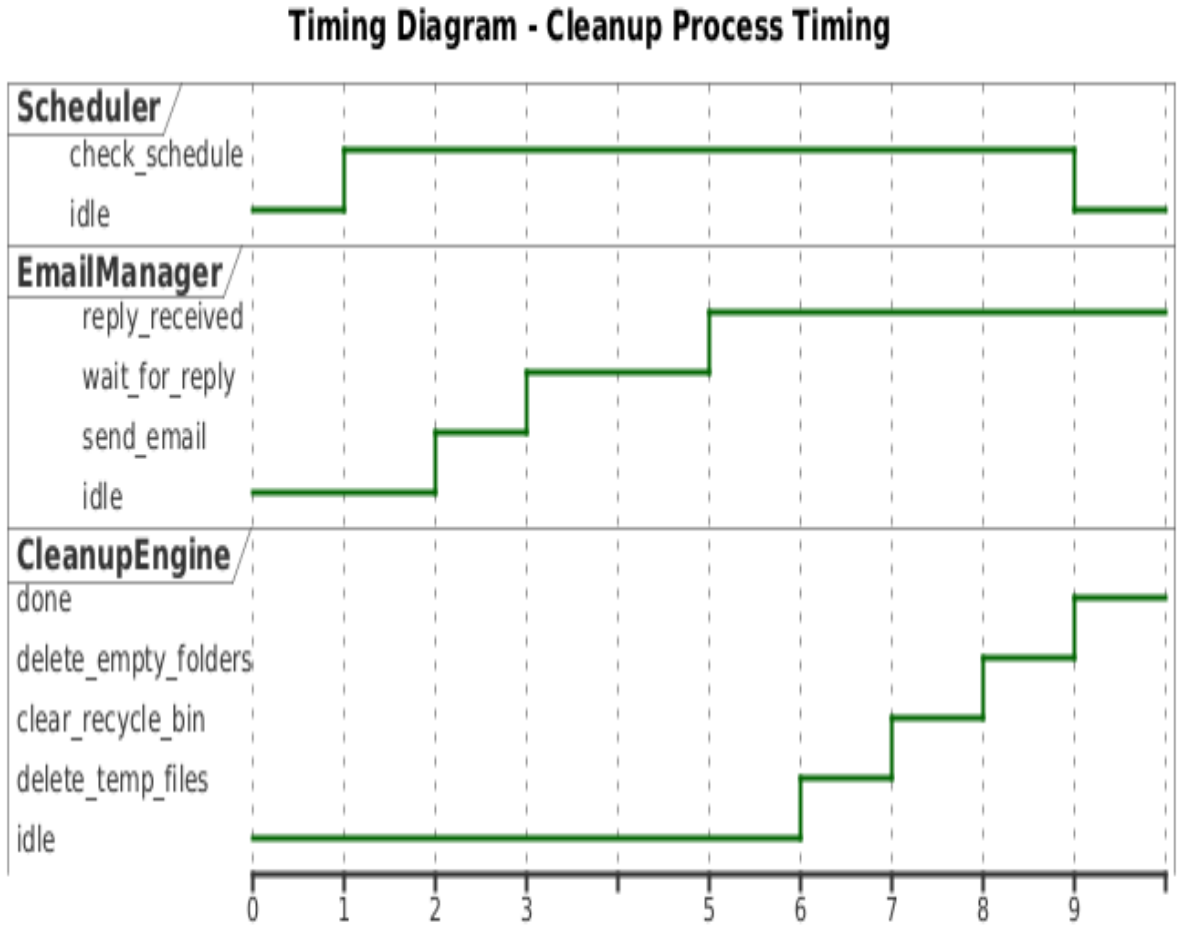

Figure6.11: Timing Diagram

CHAPTER 7
SOFTWARE SPECIFICATIONS

7.1 Introduction

This document outlines the functional and non-functional software requirements and specifications for the "System Cleanup Automation Tool"—a Python-based desktop application that automates disk cleanup processes, including temporary file deletion, recycle bin clearing, and empty folder removal. It includes a whitelist system to protect important files and an email-based confirmation mechanism before scheduled cleanup operations.

7.2 Functional Requirements

7.2.1. Scheduled Cleanup

- The system allows users to configure specific days and times for cleanup.
- The scheduler triggers an email asking for confirmation before running the cleanup.

7.2.2. Cleanup Features

- Deletes temporary files in system temp directory (/tmp or %TEMP %).
- Clears the Recycle Bin (Windows) or Trash directory (Linux).
- Removes empty folders in user-defined directories (default: ~/Downloads).

7.2.3. Whitelist Management

- Supports loading and editing a whitelist file containing paths to protect from deletion.
- Paths listed in the whitelist are excluded from all deletion processes.
- GUI allows editing and browsing of the whitelist file

7.2.4. Email Notification System

- Sends confirmation request email before scheduled cleanup.
- Checks Gmail inbox for "YES" response to proceed.
- Sends desktop notification about the cleanup result.

7.2.5. Graphical User Interface (GUI)

- Allows manual trigger of cleanup process.
- Provides a settings window to configure email credentials, schedule, and whitelist.
- Displays current configuration and next scheduled cleanup time.

7.3 Non-Functional Requirements

7.3.1 Usability

- User-friendly interface using Tkinter.
- Clear messaging, tooltips, and error handling via pop-up dialogs.

7.3.2. Portability

- Works on Windows and Linux operating systems.
- Requires Python 3.x and specific libraries (psutil, schedule, plyer, etc.).

7.3.3. Security

- Does not store sensitive passwords in plain text outside the local machine.
- App password is required for secure Gmail access (via SMTP and IMAP).
- Whitelist is user-controlled and editable only through the UI or whitelist file.

7.3.4. Performance

- Runs cleanup in a separate thread so that the GUI remains responsive.
- Lightweight memory and CPU usage during idle and active states.

7.3.5. Reliability

- Exception handling is implemented to skip inaccessible files or folders.
- Logs cleanup actions and sends status notifications.

7.4 Software and Hardware Requirements

7.4.1. Software

- Python 3.7+

Required Libraries:

- tkinter
- psutil
- plyer
- schedule
- smtplib
- imaplib
- email
- Json
- shutil
- os, datetime, threading, subprocess

7.4.2. Hardware

- Minimum 1 GB RAM
- Minimum 100 MB disk space for running the application
- nternet connection (for email-based confirmation)

7.5 Constraints

- Gmail must allow less secure app access or use an App Password.
- Confirmation response email must use specific keywords (YES).
- Cleanup is only executed after positive confirmation.

CHAPTER 8
IMPLEMENTATION

1. Overview

This project is a cross-platform desktop automation tool that performs scheduled system cleanup tasks, such as removing temporary files, clearing the recycle bin, and deleting empty folders. It uses a whitelist to protect important files and integrates email confirmation. The application features a user-friendly GUI built with Tkinter and supports scheduling using the schedule library.

2. Modules and Their Implementation

2.1. Configuration Management (config. json)

- Purpose: Stores email credentials, cleanup schedule, and whitelist file path.
- Implementation:
    - load_config () reads the config.json file and fills missing fields with defaults.
    - save_config (config_data) writes updated configurations to the file.

2.2. Whitelist Manager (whitelist.txt)

- Purpose: Prevent deletion of important files/folders during cleanup.
- Implementation:
    - load_whitelist () reads the whitelist paths from the specified file.
    - is_whitelisted (path, whitelist) checks if a file/folder is protected.

2.3. Cleanup Functions

A. delete_temp_files ()

- Removes files from the system's temporary directory (TEMP or /tmp).
- Skips files present in the whitelist.

B. clear_recycle_bin ()

- Clears the recycle bin using PowerShell on Windows or trash folder on Linux.

C. delete_empty_folders (path)

- Traverses the given path (e.g., Downloads) and removes empty directories not in the whitelist.

D. get_disk_usage_percent ()

- Uses psutil to return the system's disk usage before and after cleanup.

2.4 Email Confirmation System

- send_confirmation_request_email (): Sends an email prompting the user to confirm cleanup.
- check_for_confirmation_reply (): Connects to the inbox via IMAP and looks for responses to confirmation email with "YES".

2.5 Scheduler (using schedule library)

- schedule cleanup ():
    - Sets up weekly/daily cleanup based on schedule days and schedule time from config.
    - Calls scheduled job ().
- scheduled job ():
    - Sends email request for confirmation.
    - Calls run cleanup () if confirmation is YES.

2.6 GUI (Tkinter)

Main Window:

- "Run Cleanup Now" button → Calls run cleanup ().
- "Settings" button → opens a new window for email/schedule/whitelist config.

Settings Window:

- Allows user to:
  - Set sender/receiver email and app password.
  - Select schedule time and days.
  - Browse/edit whitelist file.
- Uses save_config () and writes whitelist file upon save.

Status Panel:

- Displays current config and next scheduled cleanup using update_status_preview ().

2.7 Notifications

- send notification (): Displays system tray notification using plyer.
- run cleanup () displays before/after disk usage using message box.

3 Threading

- schedule cleanup () runs in a separate thread to prevent GUI blocking: threading. Thread (target=schedule cleanup, daemon=True). start ()

4 Platform Compatibility

- Uses platform. System () to determine whether to run Windows or Linux-specific commands.
- Paths and environment variables are handled accordingly.

5 Error Handling

- Whitelist read/write operations are wrapped in try-except blocks.
- Email operations and file deletions handle exceptions gracefully and log errors if any

CODE

```
import os
import shutil
import smtplib
import json
import tkinter as tk
from tkinter import messagebox, filedialog, scrolledtext
import schedule
import threading
import time
import psutil
from email.message import EmailMessage
import datetime
from plyer import notification
import re
import platform  # For platform detection

CONFIG_FILE = "config.json"
HISTORY_FILE = "deleted_files.log"
LOCK_FILE = "cleanup.lock"
STOP_FLAG = False
CLEANUP_THREAD = None



def load_config():
    if os.path.exists(CONFIG_FILE):
        with open(CONFIG_FILE, "r") as f:
            return json.load(f)
    return {}
```

```
def save_config(config):
    with open(CONFIG_FILE, "w") as f:
        json.dump(config, f, indent=4)


def notify(title, message):
    print(f"{title}: {message}")
    notification.notify(
        title=title,
        message=message,
        app_name="SysCleanupTool",
        timeout=5
    )
    with open("events.log", "a") as log:
        log.write(f"{datetime.datetime.now()}: {title} - {message}\n")


def send_email(subject, body, config):
    msg = EmailMessage()
    msg["Subject"] = subject
    msg["From"] = config["sender_email"]
    msg["To"] = config["receiver_email"]
    msg.set_content(body)

    with smtplib.SMTP_SSL("smtp.gmail.com", 465) as smtp:
        smtp.login(config["sender_email"], config["app_password"])
        smtp.send_message(msg)


def send_confirmation_email():
    config = load_config()
    try:
```

```
        scheduled_time_12hr = datetime.datetime.strptime(config['scheduled_time'],
"%H:%M").strftime("%I:%M %p")
    except ValueError:
        scheduled_time_12hr = config['scheduled_time']

    subject = "System Cleanup Alert"
    body = (
        f"This is a confirmation and reminder for your scheduled system cleanup.\n"
        f"Scheduled Time: {config['scheduled_day']} at {scheduled_time_12hr}\n\n"
        f"Please check your whitelist and reply with YES to proceed.\n"
    )
    try:
        send_email(subject, body, config)
        notify("Email Sent", "Confirmation email sent for scheduled cleanup.")
        return True
    except Exception as e:
        notify("Email Failed", f"Failed to send confirmation email: {e}")
        return False


def empty_recycle_bin():
    system = platform.system()
    try:
        if system == "Windows":
            import winshell
            winshell.recycle_bin().empty(confirm=False, show_progress=False, sound=False)
        elif system == "Darwin":  # macOS
            os.system("rm -rf ~/.Trash/*")
        elif system == "Linux":
            os.system("rm -rf ~/.local/share/Trash/files/*")
        return True
    except Exception as e:
        notify("Recycle Bin Error", f"Failed to empty recycle bin: {e}")
        return False
```

```
def perform_cleanup():
    global STOP_FLAG, CLEANUP_THREAD
    STOP_FLAG = False

    if os.path.exists(LOCK_FILE):
        notify("Cleanup Running", "A cleanup process is already in progress.")
        return

    open(LOCK_FILE, "w").close()
    config = load_config()
    whitelist_path = config.get("whitelist_path", "")
    whitelist = []
    if os.path.exists(whitelist_path):
        with open(whitelist_path, "r") as f:
            whitelist = [line.strip() for line in f.readlines()]

    deleted_files = []
    for path in [os.getenv("TEMP"), os.getenv("TMP"), "/tmp"]:
        if path and os.path.exists(path) and not STOP_FLAG:
            for root, _, files in os.walk(path):
                for file in files:
                    if STOP_FLAG:
                        break
                    filepath = os.path.join(root, file)
                    if not any(filepath.startswith(w) for w in whitelist):
                        try:
                            os.remove(filepath)
                            deleted_files.append(filepath)
                        except:
                            pass

    if not STOP_FLAG:
```

```
        if empty_recycle_bin():
            deleted_files.append("Recycle Bin Emptied")

    if deleted_files:
        with open(HISTORY_FILE, "a") as log:
            for f in deleted_files:
                log.write(f"{datetime.datetime.now()}: {f}\n")

    if os.path.exists(LOCK_FILE):
        os.remove(LOCK_FILE)

    if STOP_FLAG:
        notify("Cleanup Stopped", "System cleanup was stopped by user.")
        messagebox.showinfo("Cleanup Stopped", "System cleanup was stopped by user.")
    else:
        notify("Cleanup Done", "System cleanup completed successfully.")
        messagebox.showinfo("Cleanup Complete", "System cleanup completed successfully.")

    CLEANUP_THREAD = None


def stop_cleanup():
    global STOP_FLAG, CLEANUP_THREAD
    STOP_FLAG = True
    if os.path.exists(LOCK_FILE):
        os.remove(LOCK_FILE)
    if CLEANUP_THREAD and CLEANUP_THREAD.is_alive():
        CLEANUP_THREAD.join(timeout=1)
    notify("Cleanup Stopped", "Cleanup process has been stopped by user.")
    messagebox.showinfo("Cleanup Stopped", "The cleanup process has been stopped
successfully.")


def check_email_reply():
```

```
    print("Checking email reply logic here... (mocked for demo)")
    return not STOP_FLAG


def is_valid_time_format(time_str):
    return re.match(r"^\d{2}:\d{2}(:\d{2})?$", time_str) is not None


def schedule_cleanup():
    global CLEANUP_THREAD
    config = load_config()
    schedule.clear()
    scheduled_day = config.get("scheduled_day")
    scheduled_time = config.get("scheduled_time")

    if not scheduled_day or not scheduled_time or not is_valid_time_format(scheduled_time):
        notify("Invalid Schedule", f"Scheduled time '{scheduled_time}' is invalid or missing.")
        return

    def task():
        global CLEANUP_THREAD
        if not STOP_FLAG and (CLEANUP_THREAD is None or not
CLEANUP_THREAD.is_alive()):
            cleanup_thread = threading.Thread(target=perform_cleanup)
            cleanup_thread.start()
            CLEANUP_THREAD = cleanup_thread

    try:
        getattr(schedule.every(), scheduled_day.lower()).at(scheduled_time).do(task)
    except Exception as e:
        notify("Scheduling Error", f"Failed to schedule cleanup: {e}")
        return

    def run_scheduler():
```

```
        while True:
            schedule.run_pending()
            time.sleep(1)

    scheduler_thread = threading.Thread(target=run_scheduler, daemon=True)
    scheduler_thread.start()


def get_disk_usage():
    usage = psutil.disk_usage('/')
    return f"Disk Usage: {usage.percent}% ({usage.used // (2 ** 30)}GB used of {usage.total
// (2 ** 30)}GB)"


def show_settings_window():
    config = load_config()

    def save_and_send():
        config["sender_email"] = sender_email_entry.get()
        config["app_password"] = app_password_entry.get()
        config["receiver_email"] = receiver_email_entry.get()
        config["whitelist_path"] = whitelist_path_entry.get()
        config["scheduled_day"] = day_var.get()
        config["scheduled_time"] = time_entry.get()

        save_config(config)
        schedule_cleanup()

        if send_confirmation_email():
            messagebox.showinfo("Success", "Configuration saved and confirmation email sent.")
        else:
            messagebox.showerror("Error", "Failed to send confirmation email.")

    def browse_whitelist():
```

```
    path = filedialog.askopenfilename()
    if path:
        whitelist_path_entry.delete(0, tk.END)
        whitelist_path_entry.insert(0, path)

def edit_whitelist():
    path = whitelist_path_entry.get()
    if os.path.exists(path):
        edit_win = tk.Toplevel(window)
        edit_win.title("Edit Whitelist")
        text = scrolledtext.ScrolledText(edit_win, width=60, height=20)
        text.pack()
        with open(path, "r") as f:
            text.insert(tk.END, f.read())

        def save_text():
            with open(path, "w") as f:
                f.write(text.get("1.0", tk.END))
            edit_win.destroy()

        tk.Button(edit_win, text="Save", command=save_text).pack()

win = tk.Toplevel(window)
win.title("Settings")

tk.Label(win, text="Sender Email").grid(row=0, column=0)
sender_email_entry = tk.Entry(win, width=40)
sender_email_entry.insert(0, config.get("sender_email", ""))
sender_email_entry.grid(row=0, column=1)

tk.Label(win, text="App Password").grid(row=1, column=0)
app_password_entry = tk.Entry(win, show="*", width=40)
app_password_entry.insert(0, config.get("app_password", ""))
app_password_entry.grid(row=1, column=1)
```

```
    tk.Label(win, text="Receiver Email").grid(row=2, column=0)
    receiver_email_entry = tk.Entry(win, width=40)
    receiver_email_entry.insert(0, config.get("receiver_email", ""))
    receiver_email_entry.grid(row=2, column=1)

    tk.Label(win, text="Whitelist Path").grid(row=3, column=0)
    whitelist_path_entry = tk.Entry(win, width=40)
    whitelist_path_entry.insert(0, config.get("whitelist_path", ""))
    whitelist_path_entry.grid(row=3, column=1)
    tk.Button(win, text="Browse", command=browse_whitelist).grid(row=3, column=2)
    tk.Button(win, text="Edit", command=edit_whitelist).grid(row=3, column=3)

    tk.Label(win, text="Scheduled Day").grid(row=4, column=0)
    day_var = tk.StringVar(value=config.get("scheduled_day", "Monday"))
    tk.OptionMenu(win, day_var, *["Monday", "Tuesday", "Wednesday", "Thursday",
"Friday", "Saturday", "Sunday"]).grid(
        row=4, column=1)

    tk.Label(win, text="Scheduled Time (HH:MM)").grid(row=5, column=0)
    time_entry = tk.Entry(win, width=20)
    time_entry.insert(0, config.get("scheduled_time", "12:00"))
    time_entry.grid(row=5, column=1)

    tk.Button(win, text="Save Settings", command=save_and_send).grid(row=6, column=0,
columnspan=2, pady=10)


def show_history():
    history_win = tk.Toplevel(window)
    history_win.title("Deleted Files History")
    text = scrolledtext.ScrolledText(history_win, width=80, height=20)
    text.pack()
    if os.path.exists(HISTORY_FILE):
```

```
        with open(HISTORY_FILE, "r") as f:
            text.insert(tk.END, f.read())

    def clear_history():
        open(HISTORY_FILE, "w").close()
        text.delete("1.0", tk.END)

    tk.Button(history_win, text="Clear History", command=clear_history).pack()



# Main window setup
window = tk.Tk()
window.title("System Cleanup Automation Tool")

tk.Label(window, text="System Cleanup Tool", font=("Arial", 16)).pack(pady=10)
tk.Button(window, text="Settings", width=20,
command=show_settings_window).pack(pady=5)
tk.Button(window, text="View Deleted File History", width=25,
command=show_history).pack(pady=5)
tk.Button(window, text="Stop Cleanup", width=20, command=stop_cleanup,
bg="#ff9999").pack(pady=5)
tk.Label(window, text=get_disk_usage()).pack(pady=10)

schedule_cleanup()
window.mainloop()
```

CHAPTER 9
SOFTWARE TESTING

The purpose of testing this project is to verify that the system cleanup operations, email notifications, whitelist protection, and scheduling functionality behave correctly and reliably across different platforms and environments. The testing involves functional, integration, and system testing methodologies.

UNIT TESTING

Unit testing is the process of testing individual components or functions of a software application in isolation. The goal is to ensure that each function behaves as expected

Component	Test Objective	Tools Used
load_config ()	Ensure config is loaded with defaults when fields are missing	Unit test
load whitelist ()	Validate proper reading of whitelist.txt and handle missing file gracefully	Unit test
is whitelisted(path)	Confirm path matching works as expected	Unit test
delete_temp_files ()	Remove only non-whitelisted files	mock, tempfile
clear_recycle_bin ()	Trigger system recycles bin cleanup safely	platform-specific

INTEGRATION TESTING

Integration testing checks how multiple components or modules of a system interact with each other. It ensures that the integrated units (e.g., config manager + email manager) work

together as intended.

Test Case	Description
Email Confirmation Round Trip	Simulate sending and receiving confirmation email (YES)
Scheduler Triggering Cleanup	Verify that scheduler correctly triggers cleanup on configured time
Whitelist + Cleanup Integration	Ensure whitelisted paths are not deleted during full cleanup
GUI & Backend Communication	Validate saving settings through GUI updates config. json and whitelist file

SYSTEM TESTING

System testing is a high-level test where the entire system is tested as a whole. It validates the complete and integrated software product to ensure it meets the specified requirements

Test Scenario	Expected Outcome
Stop Cleanup	Cleanup should be stopped, notification should say "Cleanup Cancelled"
Receive "YES" Confirmation Email Before Cleanup	Cleanup should execute and show freed disk space
Empty Whitelist, Run Manual Cleanup	All deletable files/folders should be cleaned except system-locked ones
Edit Whitelist File Through GUI	Updated paths must be respected during next cleanup
Cross-Platform Behavior	Tool should function on both Windows and Linux

MANUAL TESTING

Manual testing involves manually operating the software as an end user would, to identify any unexpected behavior or bugs that may not be easily caught through automation.

UI Element	**Test**
Stop Cleanup Now	Should stop cleanup
Settings	Opens configuration window without crashing
Schedule Time/Day Change	Reflected in config and next run preview updates
Whitelist Editor	Allows saving and editing whitelist entries
Browse Button	Opens file explorer and populates selected file

GUI TESTING

GUI testing checks the user interface elements like buttons, input fields, dialogs, and how they interact with the underlying application logic.

SMOKE TESTING

Smoke testing is a quick round of tests run to ensure the basic functionalities of the system are working. It’s often done after a build or deployment.

Example:

- After launching the app, verifying that the GUI loads, the settings window opens, and disk usage is displayed.

REGRESSION TESTING

Regression testing is done after code changes to ensure that the existing functionality still works and that no new bugs have been introduced.

Example:

- After modifying the whitelist logic, all previous cleanup and email features are re-tested to ensure they haven’t broken.

CHAPTER10

RESULTS

System Cleanup Tool – Cleanup in Progress Interface

The Figure10.1 displays the main interface of the System Cleanup Automation Tool during an active cleanup session. It includes options to access settings, view deleted file history, and stop the cleanup process. The tool also shows real-time disk usage statistics—80.5% in use (78GB out of 97GB). This interface helps users monitor and manage system cleanup efficiently.

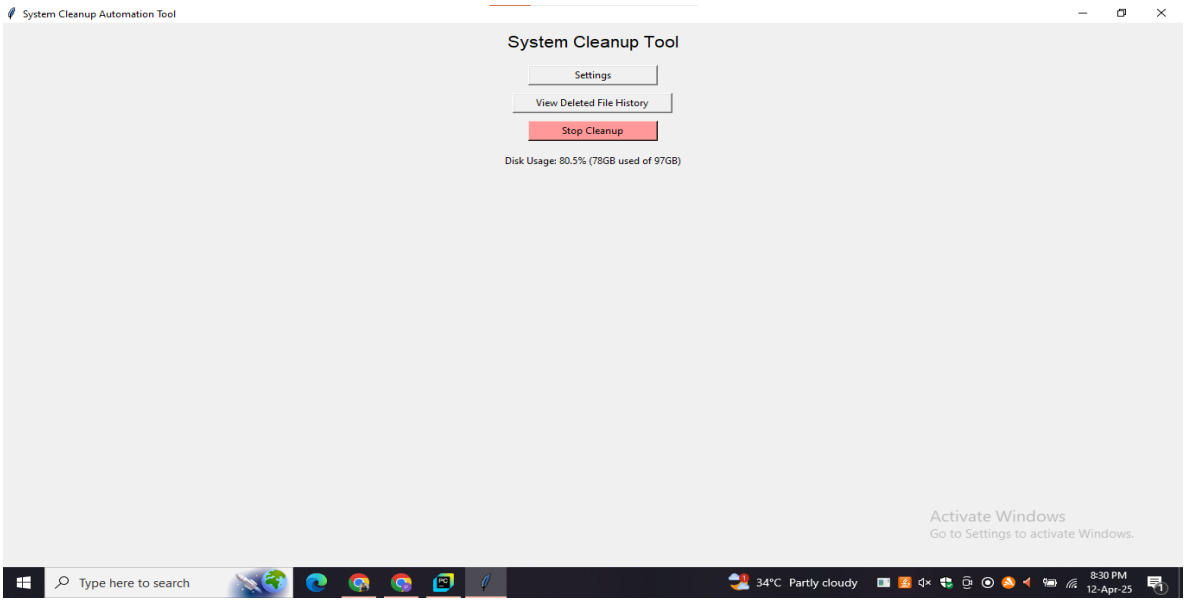

Figure10.1: System Cleanup Tool – Cleanup in Progress Interface

System Cleanup Tool – Settings Configuration Window

The Figure10.2 shows the Settings panel of the System Cleanup Automation Tool. Users can configure sender and receiver email credentials, set the cleanup schedule (day and time), and specify a whitelist file path. The whitelist section allows users to exempt specific directories from deletion during cleanup, ensuring important files are preserved. This interface supports email alerts and flexible scheduling for automated system maintenance.

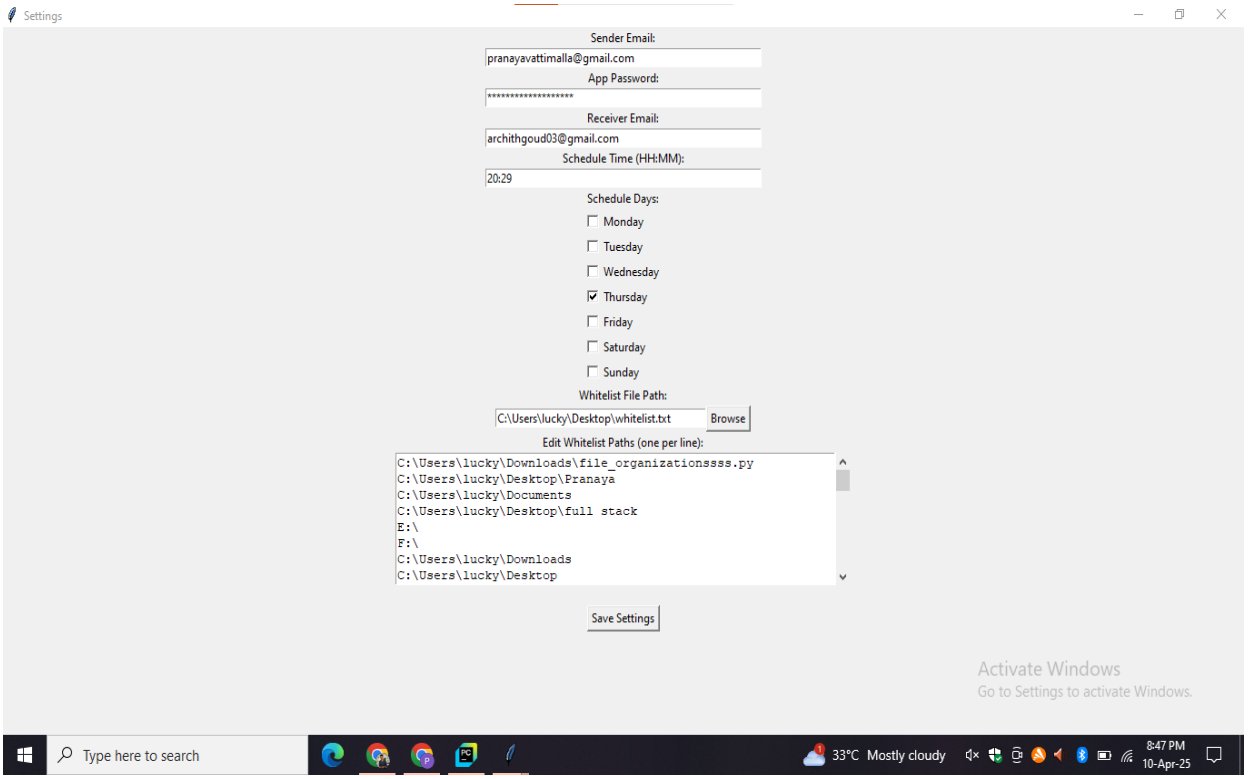

Figure10.2: System Cleanup Tool – Settings Configuration Window

Configuration Success Notification

The Figure10.3 displays a success dialog from the System Cleanup Automation Tool. It confirms that the user's configuration settings have been saved successfully and a confirmation email has been sent to the designated recipient. This feature helps verify proper email setup and scheduling parameters.

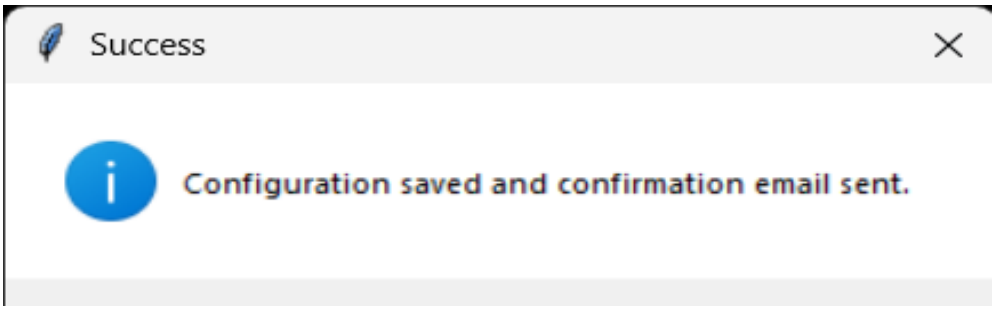

Figure10.3: Configuration Success Notification

Email Confirmation for System Cleanup

The Figure10.4 shows an email thread where the system requests user confirmation for a scheduled cleanup task. The user responds with "Yes" to proceed, ensuring the cleanup will execute as planned.

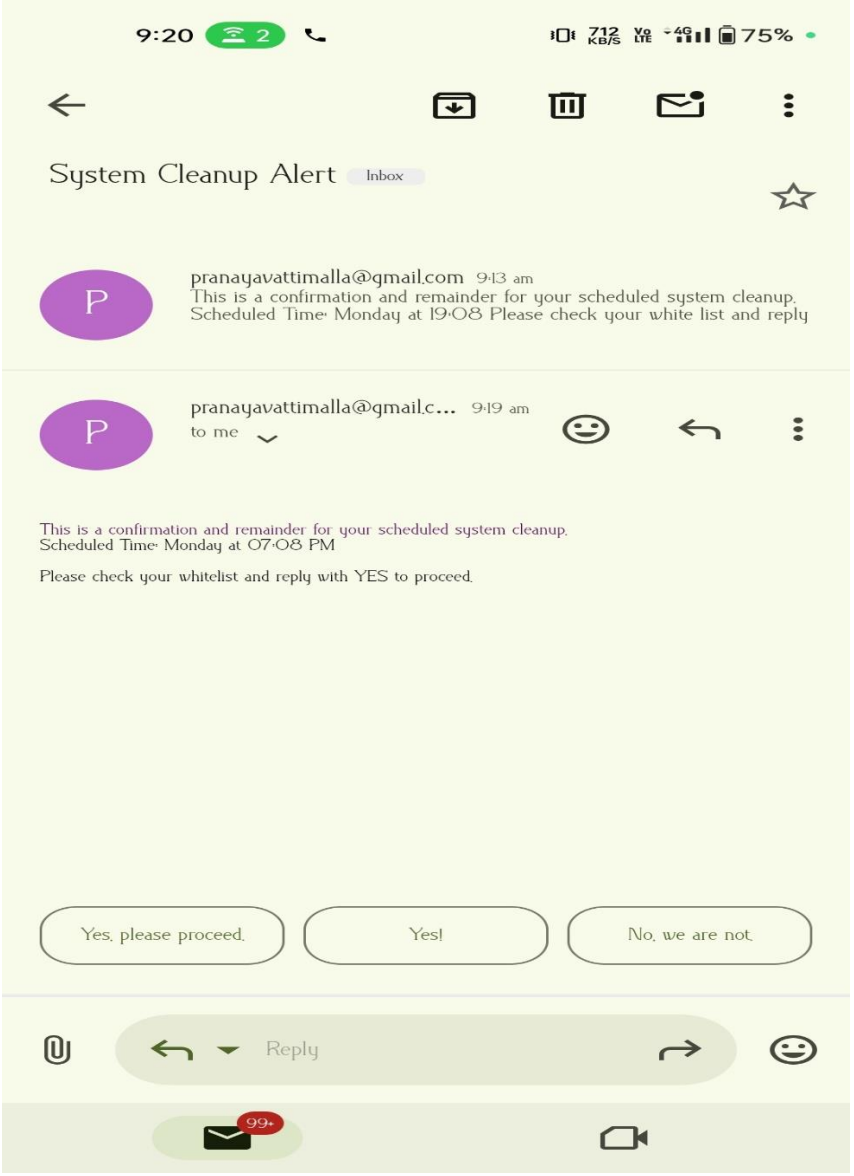

Figure10.4: Email Confirmation and Remainder

System Cleanup Confirmation

The Figure10.5 shows a notification indicating the successful completion of the system cleanup process. It confirms that all targeted unnecessary files have been removed as per the configuration, helping to free up disk space and improve system performance.

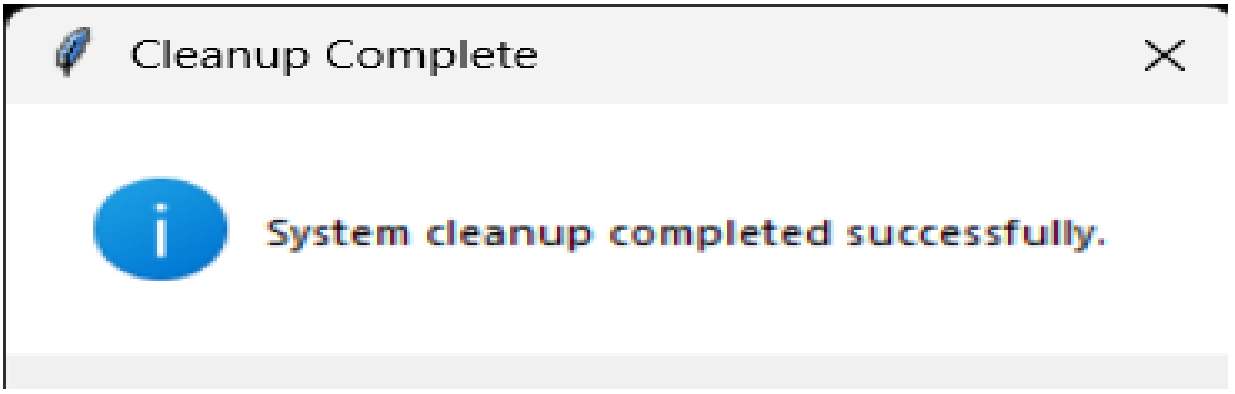

Figure10.5: System Cleanup Confirmation

Cleanup Process Stopped

The Figure10.6 displays a system notification confirming that the cleanup process has been successfully halted. It indicates user intervention or system control to pause or stop ongoing cleanup operations without errors.

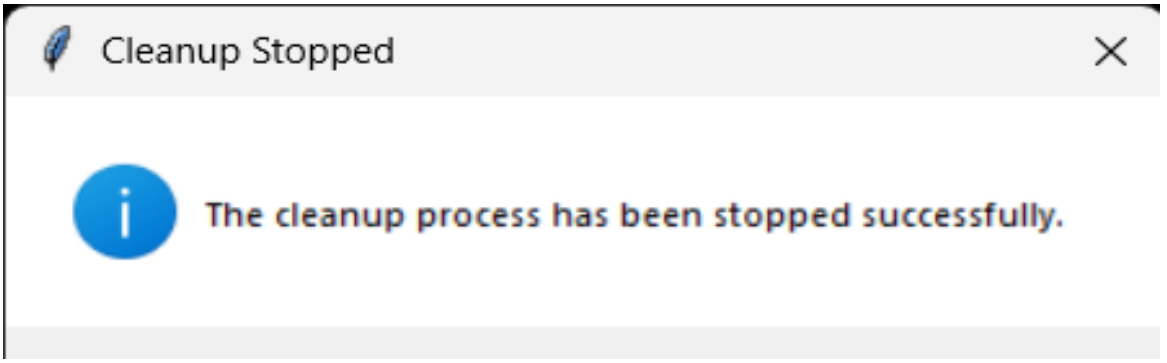

Figure10.6: Cleanup Process Stopped

CHAPTER 11

CONCLUSION

11.1 CONCLUSION

The Automated System Maintenance Cleanup Tool provides a reliable and efficient solution for maintaining optimal system performance by automating the removal of temporary files, logs, and other redundant data. Through an intuitive Tkinter-based graphical user interface, users can manage cleanup schedules, define whitelists, and receive email confirmations before proceeding with operations.

The tool not only simplifies routine maintenance but also promotes user awareness and email confirmation mechanism and dynamic scheduling. Overall, the project successfully integrates Python scripting, GUI development, and email handling to deliver a practical desktop utility that contributes to better system health and disk space management.

CHAPTER 12

FUTURE SCOPE

12.1 FUTURE SCOPE

1. Cross-Platform Support
2. Desktop App Integration
3. AI-Powered Cleanup
4. Voice Assistant Integration

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