

IT SUPPORT AND OPERATING SYSTEMS

MICRO PROJECT REPORT

Submitted by

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in partial fulfilment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING



SCHOOL OF COMPUTING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

KALASALINGAM ACADEMY OF RESEARCH

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DECLARATION

We affirm that the micro project work titled “**IT SUPPORT AND OPERATING SYSTEMS**” being submitted in partial fulfilment for the award of the degree of **Bachelor of Technology in Computer Science and Engineering** is the original work carried out by us. It has not formed part of any other project work submitted for the award of any degree or diploma, either in this or any other University.

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This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

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Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A++" Grade



BONAFIDE CERTIFICATE

Certified that this project report **"IT SUPPORT AND OPERATING SYSTEMS"** is the Bonafide work of **"THAVVA JYOSHNA (9921004721)"** who carried out the Micro project work under my supervision.

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SCHOOL OF COMPUTING
COMPUTER SCIENCE AND ENGINEERING
MICRO PROJECT SUMMARY

Micro Project Title	IT SUPPORT AND OPERATING SYSTEMS	
Micro Project Team Members (Name with Register No)	THAVVA JYOSHNA - 9921004721	
Guide Name/Designation	Dr. M.Raja / Assistant Professor, Computer Science and Engineering	
Program Concentration Area	Information Technology Support, Operating Systems, and System Administration	
Technical Requirements	Windows	
Engineering standards and realistic constraints in these areas		
Area	Codes & Standards / Realistic Constraints	Tick ✓
Economic	Cost-effective IT solutions are essential to minimize expenses. Organizations use open-source software like Linux and virtualization to reduce hardware costs. Cloud computing also helps lower infrastructure expenses.	✓
Environmental	IT systems must focus on energy efficiency, e-waste management, and green computing. Using low-power hardware, optimizing software performance, and implementing cloud-based solutions reduce environmental impact.	✓
Social	Operating systems and IT support services should be accessible to all users, including those with disabilities. Ensuring data privacy, bridging the digital divide, and promoting user-friendly interfaces improve social impact.	✓
Ethical	IT systems must comply with data protection laws (GDPR, HIPAA), ensure fair AI algorithms, and follow ethical	✓

	cybersecurity practices. Protecting user privacy and preventing cyber threats is crucial.	
Health and Safety	Cybersecurity risks, eye strain reduction features, and ergonomic designs enhance user safety. IT professionals must also manage workplace stress and digital addiction concerns.	✓
Manufacturability	Operating systems must support various hardware components, maintain affordability, and ensure ethical labor practices in IT manufacturing. Compatibility across different devices is critical.	✓
Sustainability	Long-term IT sustainability focuses on energy-efficient computing, low-maintenance solutions, and eco-friendly hardware to reduce environmental impact while ensuring future scalability.	✓

ABSTRACT

The rapid growth of technology has made IT support and operating systems crucial for maintaining efficient computing environments. Organizations rely on IT infrastructure for seamless communication, data management, and security. Ensuring system reliability, scalability, and cybersecurity is essential in modern computing. IT support involves diagnosing and troubleshooting hardware and software issues, ensuring optimal system performance. It includes network configuration, IP addressing, and security implementations to protect against cyber threats. Proper system administration enhances productivity and minimizes downtime. Networking is a key component of IT support, encompassing DNS, DHCP, and firewall management. Effective network troubleshooting ensures stable connectivity, secure data transfer, and resource availability. Cybersecurity measures, such as authentication and encryption, are essential for protecting systems from unauthorized access. Operating systems manage hardware resources, process scheduling, memory allocation, and file system organization. They provide a user interface and support multitasking capabilities. Windows, Linux, and macOS each offer unique functionalities, requiring expertise in different system environments. Advanced technologies like virtualization and cloud computing optimize resource usage and scalability. Virtual machines (VMs) and containerization improve system efficiency and software deployment. Cloud services enable remote access, enhancing collaboration and reducing infrastructure costs. System monitoring tools help detect potential failures before they impact performance. Automation tools, such as PowerShell and Bash scripting, streamline administrative tasks and improve efficiency. Preventive maintenance ensures long-term system stability. Understanding IT support and operating systems is vital for managing modern computing infrastructures. As technology evolves, professionals must adapt to emerging trends in cybersecurity, artificial intelligence-driven automation, and cloud-based services. Mastery of these concepts ensures a secure, high-performing IT ecosystem.

KEYWORDS: IT support, operating systems, system administration, troubleshooting.

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LIST OF NPTEL/COURSE ERA/ UDEMY COURSES

S. NO.	COURSE NAME	COURSE DURATION	COURSE PLATFORM
1.	Technical Support Fundamentals	19 hours	Coursera
2.	Operating Systems and You: Becoming a Power User	27 hours	Coursera

CHAPTER – I

INTRODUCTION

Background:

The increasing reliance on computers and digital technology has made IT support and operating systems essential for modern businesses, organizations, and individuals. As computing environments become more complex, the demand for skilled IT professionals capable of managing, troubleshooting, and optimizing systems continues to grow. The evolution of operating systems and technical support practices has played a crucial role in shaping the way technology is maintained and secured today.

Historically, computing systems were limited to large mainframes that required specialized knowledge to operate and maintain. Early operating systems were designed to manage hardware resources and execute basic tasks, but they lacked user-friendly interfaces and automation capabilities. As personal computers became widespread in the 1980s and 1990s, operating systems like MS-DOS, Windows, macOS, and Linux emerged, making computing more accessible to individuals and businesses. With the introduction of graphical user interfaces (GUIs) and networking capabilities, IT support became more critical for managing software compatibility, hardware failures, and security vulnerabilities.

The rise of the internet and global connectivity further increased the complexity of IT support. Organizations needed to maintain large-scale networks, secure sensitive data, and ensure seamless communication between devices. As a result, technical support expanded beyond simple troubleshooting to include network administration, cybersecurity, cloud computing, and system automation. The development of advanced security protocols, virtualization technologies, and cloud-based infrastructure has transformed the way IT support is provided, allowing remote management, automated system monitoring, and real-time security updates.

Operating systems have also evolved to accommodate modern computing needs. Windows, Linux, and macOS now support multitasking, virtualization, and integration with cloud services, providing greater flexibility and efficiency. System administrators use scripting languages like PowerShell and Bash to automate tasks, manage resources, and enhance security. Additionally, modern IT environments leverage artificial intelligence and machine learning to predict system failures, optimize performance, and detect security threats before they become critical issues.

As businesses and individuals increasingly depend on technology for day-to-day operations,

understanding IT support fundamentals and operating systems has become a crucial skill. The ability to diagnose and resolve technical issues, maintain secure computing environments, and optimize system performance is essential for ensuring a reliable and efficient IT infrastructure.

Objectives:

- To understand the fundamentals of IT support, including troubleshooting, system maintenance, and user assistance.
- To explore the importance of operating systems in managing hardware, software, and user interactions.
- To compare the features, advantages, and use cases of Windows, Linux, and macOS.
- To discuss key networking concepts such as IP addressing, DNS, DHCP, and cybersecurity measures.
- To investigate virtualization and cloud computing technologies for optimizing IT resources.
- To analyze automation tools like PowerShell and Bash for efficient system administration.
- To explain the significance of system monitoring, log files, and preventive maintenance.
- To assess the role of technical support in ensuring business continuity and security.
- To explore emerging trends in IT support, such as AI, machine learning, and cybersecurity advancements.
- To provide recommendations for effective IT support strategies to maintain system reliability and performance.

Scope and Motivation:

This report covers the fundamental aspects of IT support and operating systems, highlighting their significance in maintaining stable and efficient computing environments. It explores the core functions of operating systems, including Windows and their role in managing hardware,

software, and their user interactions. Another important aspect covered is automation in IT support, where tools like PowerShell and Bash scripting help streamline administrative tasks and reduce manual effort. The report also delves into system monitoring and preventive maintenance strategies, ensuring that potential issues are identified and resolved before they impact performance. Furthermore, it assesses the impact of emerging technologies such as AI and machine learning on IT support and operating systems, offering insights into future advancements. Finally, best practices and strategic recommendations are provided to help organizations and professionals improve IT support operations across different sectors.

The rapid advancement of technology has made IT support and operating systems an integral part of business operations, education, and personal computing. As digital systems become increasingly complex, the need for effective system management and troubleshooting is more critical than ever. As the demand for skilled IT professionals continues to rise, gaining a strong foundation in operating systems and IT support is becoming essential for career growth. This report aims to provide valuable insights into the field, equipping readers with the knowledge needed to navigate and manage modern computing environments effectively. By understanding best practices and emerging trends, professionals can contribute to improving system reliability, security, and overall IT efficiency.

CHAPTER-II

LITERATURE REVIEW

Overview of related work:

Research on IT support and operating systems covers various aspects, including system administration, troubleshooting, cybersecurity, automation, and emerging technologies. Studies have compared operating systems like Windows, Linux, and macOS, focusing on their performance, security, and usability. IT support methodologies emphasize troubleshooting techniques, log analysis, and automation tools such as PowerShell and Bash to improve efficiency. Security-related studies highlight authentication, encryption, and threat mitigation strategies for protecting systems from cyber threats. Additionally, work on cloud computing and virtualization demonstrates their impact on resource optimization and remote IT support. Emerging advancements, including AI and machine learning, are being explored for predictive maintenance and automated troubleshooting. This report builds upon these studies to analyse key challenges and future developments in IT support and system management.

Review of similar projects:

"Virtualization Technologies for IT Support: A Review" by Mark Reynolds et al., 2018

This study explores the growing role of virtualization in IT support and system administration, emphasizing its impact on resource management, scalability, and operational efficiency. Virtualization enables multiple virtual machines (VMs) to run on a single physical server, allowing businesses to optimize hardware utilization while reducing costs. The research examines different virtualization technologies, including full virtualization, paravirtualization, and containerization, with a focus on their applications in enterprise IT environments. It also highlights how virtualization improves disaster recovery by enabling snapshot-based backups and seamless system migration. A key aspect of this study is the comparison between virtual machines and containerization technologies such as Docker and Kubernetes.

"Cybersecurity in IT Support: Best Practices and Threat Mitigation Strategies" by Robert-Smith et al., 2022

This study highlights the critical role of cybersecurity in IT support, emphasizing the need for

proactive security measures to protect systems from cyber threats. The research examines key security practices, including multi-factor authentication (MFA), encryption techniques, and network security protocols that enhance data protection. It discusses how firewalls, intrusion detection systems (IDS), and endpoint security solutions contribute to a robust IT security framework. The study also explores the importance of security awareness training for IT support teams, ensuring they can recognize and mitigate potential threats such as phishing attacks, ransomware, and insider threats.

"AI and Machine Learning in IT Support: Transforming Troubleshooting and Automation" by Li Chen et al., 2023

This study explores the transformative impact of artificial intelligence (AI) and machine learning (ML) in IT support, focusing on their ability to automate repetitive tasks and enhance troubleshooting efficiency. The research examines AI-driven tools that assist IT teams by analyzing system logs, detecting anomalies, and predicting potential failures before they cause disruptions. Machine learning models are trained to identify patterns in system behavior, enabling proactive maintenance and reducing downtime. Additionally, the study discusses the integration of AI with IT service management (ITSM) frameworks, where automated ticketing systems and self-healing networks streamline issue resolution.

"Exploring the Future of Operating Systems: Architectural Innovations and Kernel Development Trends" by Ashish Singh et al., 2024

This study explores the evolution of operating system (OS) architectures, focusing on the advancements in monolithic and microkernel designs. It analyzes how traditional monolithic kernels offer performance efficiency by integrating all essential services within the kernel space, while microkernels enhance modularity and security by running services in user space. The paper also investigates hybrid kernel approaches, which combine elements of both architectures to optimize system stability and flexibility. The research further delves into the development of real-time operating systems (RTOS) and their applications in mission-critical environments such as autonomous vehicles and industrial automation.

"Operating System Design: Concepts, Challenges, and Future Trends" by Jańabaev Islambek Kuanishbaevich, 2025

This research paper provides a comprehensive analysis of modern operating system (OS) design, focusing on fundamental concepts such as memory management, process scheduling, and file system organization. The study explores how memory allocation strategies, including paging and segmentation, optimize resource usage and prevent fragmentation. Additionally, it examines process scheduling algorithms, such as round-robin and priority-based scheduling, which ensure efficient CPU utilization. The paper also reviews advancements in file system architecture, comparing traditional hierarchical file structures with modern distributed and cloud-based file systems that enhance data accessibility and redundancy.

CHAPTER-III

IMPLEMENTATION

An operating system (OS) is a software program that acts as an intermediary between the computer hardware and the user or application software. It provides a platform for running and managing computer programs, coordinating system resources, and facilitating communication between software and hardware components.

The primary functions of an operating system:

An operating system (OS) is essential for managing computer resources and providing a user interface. It performs **process management** by scheduling and executing multiple tasks efficiently, ensuring optimal CPU utilization. **Memory management** is another critical function, as the OS allocates and deallocates memory to different processes, preventing conflicts and improving performance. Additionally, the OS handles **file system management**, organizing and securing data storage while providing easy access to files. It also manages **device communication** through drivers, allowing seamless interaction between hardware and software components. The **user interface**, whether graphical or command-line-based, enables users to interact with the system effectively. Moreover, the OS ensures **security and access control** by implementing authentication, encryption, and permissions to protect user data. It also facilitates **networking**, allowing computers to communicate over networks using standardized protocols. Lastly, the OS plays a crucial role in **error detection and handling**, identifying and resolving system malfunctions to maintain stability and reliability. These functions together ensure the smooth operation of a computer system.

History of operating systems:

The history of operating systems (OS) dates back to the early days of computing and has evolved through several generations.

In the **1940s and early 1950s**, the first computers operated without an OS, as they were manually programmed using machine language. Early computers like the ENIAC required users to manually configure hardware and input data using punched cards.

By the **1950s and 1960s**, batch processing systems emerged, allowing users to submit jobs that were executed sequentially. The introduction of mainframe computers led to the development

of the first OS, such as IBM's **GMOS (General Motors Operating System)** in the mid-1950s. This era also saw the emergence of multiprogramming, where multiple jobs could be processed simultaneously to improve efficiency.

The **1970s** marked a significant shift with the rise of time-sharing systems, which allowed multiple users to interact with a computer simultaneously. This led to the development of UNIX in 1969 by **Ken Thompson and Dennis Ritchie** at Bell Labs, which laid the foundation for modern operating systems. Around the same time, Microsoft introduced **MS-DOS** in the early 1980s, which became the foundation for later Windows OS versions.

The **1980s and 1990s** saw the rise of graphical user interfaces (GUI), making computers more user-friendly. Apple's **Macintosh System Software** (1984) and Microsoft's **Windows** (1985) revolutionized personal computing by introducing visually intuitive interfaces. Linux, an open-source OS, was also introduced in 1991 by **Linus Torvalds**, offering an alternative to proprietary systems.

From the **2000s to the present**, operating systems have continued to evolve with advancements in cloud computing, mobile devices, and security features. The rise of mobile OS like **Android** (by Google) and **iOS** (by Apple) transformed how people interact with technology. Today, OS development focuses on performance, security, and cross-platform compatibility, with innovations like **virtualization, cloud-based systems, and AI-driven automation** playing a crucial role in modern computing.

Functions of an operating system:

An operating system (OS) is essential software that manages computer hardware and software resources while providing services for user applications. It performs several key functions to ensure efficient and secure operation.

One of its primary functions is process management, which involves creating, scheduling, and terminating processes. The OS ensures that multiple tasks can run simultaneously through multitasking and efficient CPU scheduling. Memory management is another crucial function, as the OS allocates and deallocates memory to different processes, preventing conflicts and ensuring optimal utilization of system resources.

The OS also handles file system management, organizing and securing data storage while enabling users to create, read, modify, and delete files. Additionally, device management allows communication between the system and peripheral devices like printers, USB drives, and network adapters using appropriate drivers.

A key role of the OS is user interface management, which provides either a command-line interface (CLI) or graphical user interface (GUI) to facilitate user interactions. Security is another critical function, as the OS implements access control, authentication, and encryption mechanisms to protect system data and user privacy.

Modern operating systems also support networking, enabling computers to connect and communicate over networks using protocols like TCP/IP. Furthermore, they include error detection and handling mechanisms to identify and resolve hardware or software failures, ensuring system stability and reliability.

Process management

Process management is one of the core functions of an operating system (OS), responsible for handling the execution of multiple processes efficiently. A process is a program in execution, and process management ensures that system resources such as the CPU and memory are allocated fairly while maintaining system stability and performance.

Key Functions of Process Management:

1. **Process Creation and Termination** – The OS creates new processes when a program is executed and terminates processes once they complete or encounter errors.
2. **Process Scheduling** – The OS determines which processes should run at a given time using scheduling algorithms such as First-Come, First-Served (FCFS), Shortest Job Next (SJN), Round Robin, and Priority Scheduling.
3. **Context Switching** – When multiple processes execute simultaneously, the OS saves the current process state and loads another, allowing multitasking.
4. **Process Synchronization** – In a multi-process environment, processes may need to communicate and share resources. The OS uses synchronization mechanisms like semaphores and mutex locks to prevent race conditions and deadlocks.

5. Inter-Process Communication (IPC) – The OS facilitates communication between processes using message passing, shared memory, and signals, ensuring data exchange and coordination.
6. Deadlock Prevention and Handling – The OS detects and resolves deadlocks, where two or more processes wait indefinitely for resources held by each other, using methods like resource allocation graphs and deadlock avoidance algorithms.
7. Process States – Every process transitions through different states:
 - New: Process is being created.
 - Ready: Process is waiting for CPU allocation.
 - Running: Process is currently executing.
 - Waiting: Process is waiting for an event (e.g., I/O operation).
 - Terminated: Process has finished execution.

Process scheduling:

Process scheduling is a critical function of an operating system (OS) that manages the execution of multiple processes by efficiently allocating CPU time. It ensures that all processes receive fair access to system resources while optimizing performance. The OS employs three types of schedulers: the long-term scheduler controls the number of processes in memory, the short-term scheduler decides which process runs next on the CPU, and the medium-term scheduler temporarily removes processes to reduce system load. Processes are managed through different queues, including the job queue (all system processes), the ready queue (processes waiting for CPU execution), and the waiting queue (processes awaiting I/O operations). To determine process execution order, the OS uses various scheduling algorithms. First-Come, First-Served (FCFS) executes processes in order of arrival, while Shortest Job Next (SJN) prioritizes the process with the shortest execution time, reducing waiting time but risking starvation for longer processes. Round Robin (RR) assigns a fixed time slice to each process, ensuring fairness but causing frequent context switches. Priority scheduling executes higher-priority processes first, while Multilevel Queue Scheduling categorizes processes into queues with different scheduling policies. Multilevel Feedback Queue Scheduling dynamically adjusts priority levels for efficiency and fairness. The primary goals of process scheduling

include maximizing CPU utilization, reducing waiting time, increasing system throughput, and ensuring fair execution for all processes, making it essential for multitasking and system responsiveness.

Here are some commonly used processes scheduling algorithms:

First-Come, First-Served (FCFS): In this algorithm, the process that arrives first is selected for execution first. It follows a non-preemptive approach, meaning once a process starts running, it will continue until it completes or voluntarily yields the CPU.

Shortest Job Next (SJN) or Shortest Job First (SJF): This algorithm selects the process with the shortest burst time or execution time next. It aims to minimize the average waiting time and provides better turnaround time for shorter processes.

Round Robin (RR): Round Robin is a preemptive scheduling algorithm that assigns each process a fixed time quantum or time slice. Processes are executed in a cyclic manner, with each process receiving the CPU for a specific time period before being preempted.

Priority Scheduling: Each process is assigned a priority, and the process with the highest priority is selected for execution next. Priority can be assigned based on various criteria, such as the nature of the task, deadline urgency, or user-defined priority levels.

Process synchronization

It is a crucial aspect of operating systems that ensures multiple processes execute concurrently without causing conflicts, data inconsistencies, or race conditions. When multiple processes access shared resources, synchronization mechanisms help coordinate their execution to maintain system stability and data integrity.

In a multiprogramming environment, processes often need to **share data or communicate**, leading to potential issues such as **race conditions**, where the outcome depends on the unpredictable sequence of execution. To handle this, the OS provides synchronization mechanisms like **semaphores, mutex locks, and monitors** to control process execution order. **Semaphores** are integer variables used to signal resource availability and prevent multiple processes from accessing a shared resource simultaneously. **Mutex locks** allow only one process to access a resource at a time, ensuring mutual exclusion. **Monitors** are high-level

synchronization constructs that encapsulate shared variables and the operations that access them, preventing conflicts.

Another major challenge in process synchronization is **deadlocks**, where two or more processes wait indefinitely for resources held by each other. The OS uses **deadlock prevention, avoidance, and detection techniques** to resolve such issues. Additionally, synchronization plays a vital role in **inter-process communication (IPC)**, allowing processes to coordinate through shared memory or message passing mechanisms.

Deadlocks

A **deadlock** occurs when two or more processes are unable to proceed because each is waiting for a resource held by another process. This situation causes indefinite blocking and can halt system execution, especially in multi-process environments where resources like files, memory, or devices are shared.

Conditions for Deadlock:

A deadlock arises only if the following four **Coffman's conditions** hold simultaneously:

- **Mutual Exclusion** – A resource can be used by only one process at a time.
- **Hold and Wait** – A process holding at least one resource is waiting for additional resources held by other processes.
- **No Preemption** – A resource cannot be forcibly taken from a process; it must be released voluntarily.
- **Circular Wait** – A set of processes form a circular chain, where each process waits for a resource held by the next process in the chain.

Methods for Handling Deadlocks:

Operating systems use different strategies to manage deadlocks:

- **Deadlock Prevention** – Ensures at least one of the four deadlock conditions never holds, such as requiring all resources to be requested at once or enforcing a strict order for resource allocation.

- **Deadlock Avoidance** – Uses resource allocation techniques like the **Banker's Algorithm**, which checks if granting resources will keep the system in a safe state.
- **Deadlock Detection and Recovery** – The OS periodically detects deadlocks using a **wait-for graph** and resolves them by terminating processes or preempting resources.
- **Ignoring Deadlocks** – Some systems, like UNIX and Windows, use the **Ostrich Algorithm**, where deadlocks are ignored because they rarely occur and are difficult to handle efficiently.

File Systems:

A **file system** is a fundamental component of an operating system that manages data storage, organization, retrieval, and security on storage devices such as hard drives, SSDs, and USB drives. It enables structured data storage by organizing files into directories and maintaining metadata like file names, sizes, permissions, and timestamps.

Functions of a File System:

The file system performs essential functions such as file creation, reading, writing, modification, and deletion while ensuring efficient space management and access control through user permissions. It organizes files into directories for easy navigation and prevents unauthorized access through security mechanisms.

Types of File Systems:

- **Hierarchical File Systems (HFS)** use a tree-like directory structure for better organization.
- **Network File Systems (NFS)** allow remote file access over a network.
- **Journaling File Systems** like NTFS and Ext4 prevent data corruption by logging changes before they are written to disk.
- **Distributed File Systems (DFS)** spread data across multiple storage devices for fault tolerance and improved availability.

Common File Systems:

Several file systems are widely used in modern computing.

- **FAT32** is a simple file system commonly used in USB drives but lacks advanced security features.
- **NTFS (New Technology File System)** is the default for Windows and supports encryption, large files, and journaling.
- **Ext4 (Fourth Extended File System)** is the standard Linux file system, known for its efficiency and reliability.
- **APFS (Apple File System)** is optimized for macOS, offering fast file access and encryption.

Folders in Operating Systems

A **folder**, also known as a **directory**, is a logical structure used by operating systems to organize and manage files efficiently. It acts as a container for storing files and other subfolders, helping users maintain an orderly file system. Folders make it easier to locate, access, and manage data by grouping related files together.

Functions of Folders

Folders play a crucial role in organizing the file system. They allow users to categorize files based on their purpose, making file retrieval faster and more efficient. Folders also help in managing permissions and security, as access rights can be assigned to specific folders to restrict unauthorized use. Additionally, they improve system performance by reducing file system clutter and allowing better disk space management.

Types of Folders

Folders can be classified based on their role in the operating system. Root folders are the top-level directories in a file system (e.g., C:\ in Windows or / in Linux). System folders store essential operating system files required for booting and functioning. User folders contain personal files, such as documents, pictures, and downloads. Temporary folders hold temporary data that is automatically deleted after a certain period. Hidden folders store system-critical data that is not visible to users by default.

Folder Operations

Users can perform various operations on folders, such as creating, renaming, moving, copying, deleting, and setting permissions. Modern operating systems provide graphical user interfaces (GUIs) and command-line tools (e.g., `mkdir`, `rmdir` in Linux) to manage folders efficiently.

Relationship Between Folders and Operating Systems:

A folder, also known as a directory, is an essential component of an operating system (OS) that helps in organizing and managing files efficiently. The OS provides a structured way to store, access, and manage files using folders, ensuring better file organization, security, and retrieval.

Creating, modifying, and removing files and folders in Windows:

In Windows, files and folders are managed using an interface program called File Explorer. File Explorer presents files and folders in a hierarchical tree-like structure, and makes it easy to perform tasks like creating, copying, moving and deleting files. You can open File Explorer using either of these two ways:

- Click on the File Explorer icon, which can be found on the Windows taskbar.
- Or search for the app "File Explorer" in the search bar, and press Enter on your keyboard.
- On the left-hand-side panel of File Explorer, a Quick access list of folders is shown. You can add folders to Quick access by dragging them there.
- You can remove folders from Quick access by right clicking and selecting Unpin from Quick Access.

In Windows, storage volumes are referenced by a single letter. Usually, Windows is installed on the C:\ drive, but storage volumes can be designed by any letter between A-Z. On the Windows virtual machine, all files and folders in a Windows system are rooted at C:\ By clicking on “This PC” on the left of File Explorer, a list of disks mounted on the Windows system is shown. In the example below, only one disk, mounted at the default location C:\, is shown. You can access files inside that disk by double clicking on it.

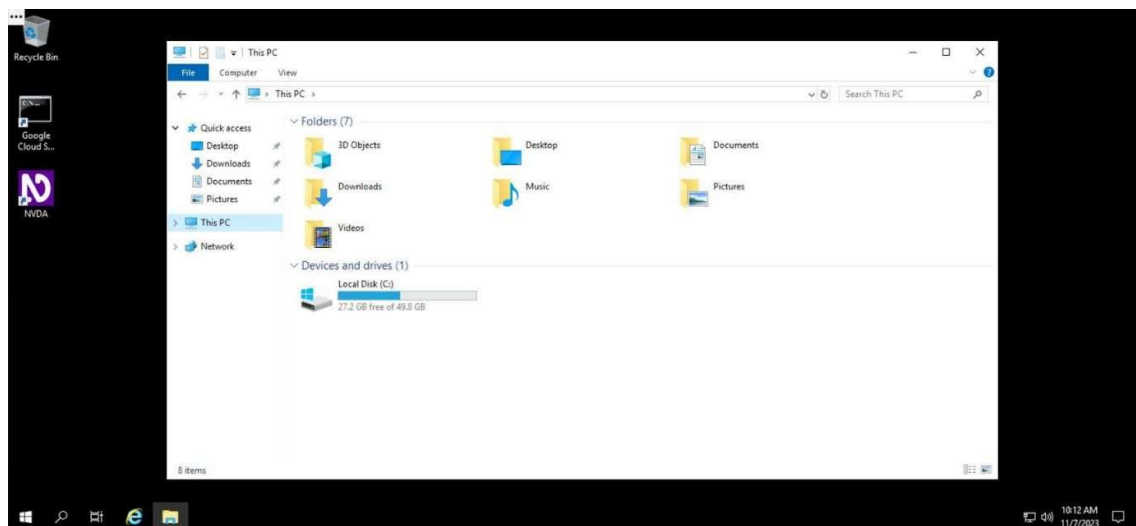


Fig-1: Opening file explorer

Create files and folders:

To create a file or folder, you'll first navigate to the location where you want to create the file or folder. Navigate to the Desktop folder by double clicking on it from File Explorer.

- Inside the desktop folder, which is initially empty, right click anywhere in the white space, select New, and then select Folder.
- File Explorer will provide you with an editable text field, which you can use to name your new folder.
- In this example, let's call our folder, "My New Folder". Type this name into the editable field.
- After typing in the name, press Enter.
- The new folder is successfully created.

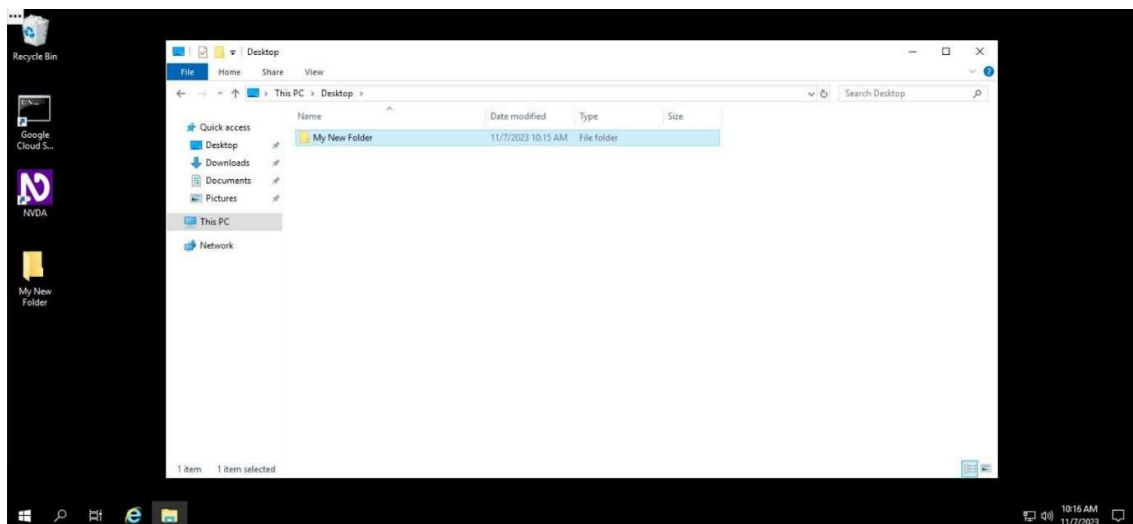


Fig-2: Creating file

Copy, move and rename files and folders:

Copying, moving, and renaming files and folders works similarly in Windows. To copy a folder to another destination, you first need to access the folder in its current location. Then, use File Explorer to select "copy", navigate to the destination directory, and use File Explorer to select "paste".

- You'll copy the Images folder into the Pictures folder.

- Use File Explorer to navigate to the folder C:\Users.
- In this directory, you'll see a folder named Images and another named Pictures.
- To copy the Images folder to the Pictures folder:
- Right click on the Images folder and select Copy.
- Navigate into the Pictures directory by double clicking on it.
- Right click on the white space in the Pictures directory, and select Paste.
- The folder will now be copied to the Pictures folder.

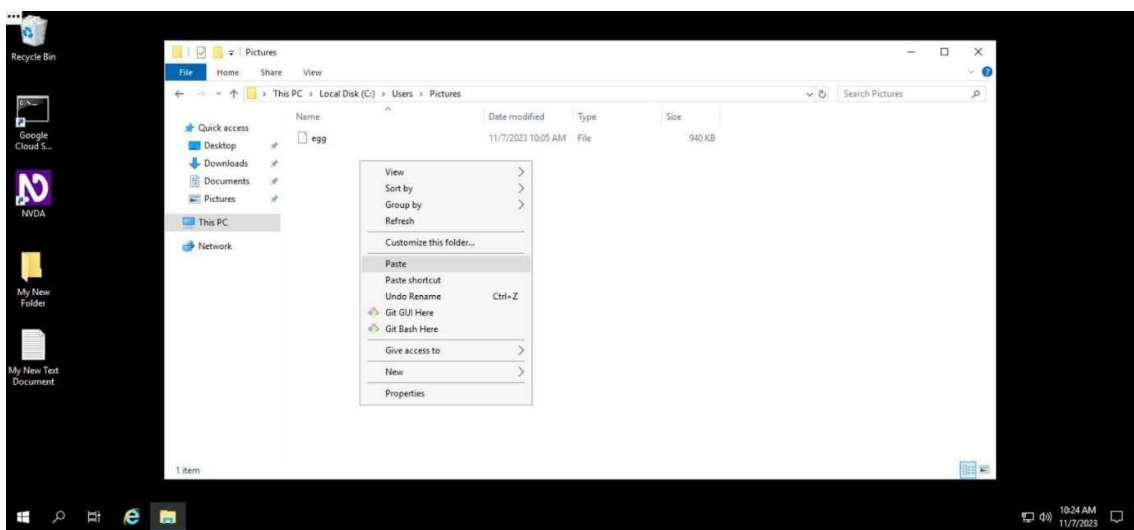


Fig-3: Copy, move and renaming a file

Deleting files and folders:

Deleting files and folders is a common task in operating systems, allowing users to remove unnecessary data and free up storage space. The steps vary slightly depending on the OS and whether you use a graphical interface (GUI) or command-line interface (CLI).

- Open File Explorer (Win + E).
- Navigate to the file/folder you want to delete.
- Right-click on the file or folder and select "Delete".
- The item moves to the Recycle Bin (not permanently deleted yet).
- To permanently delete it, open the Recycle Bin, right-click the file/folder, and choose "Delete Permanently" or click "Empty Recycle Bin".

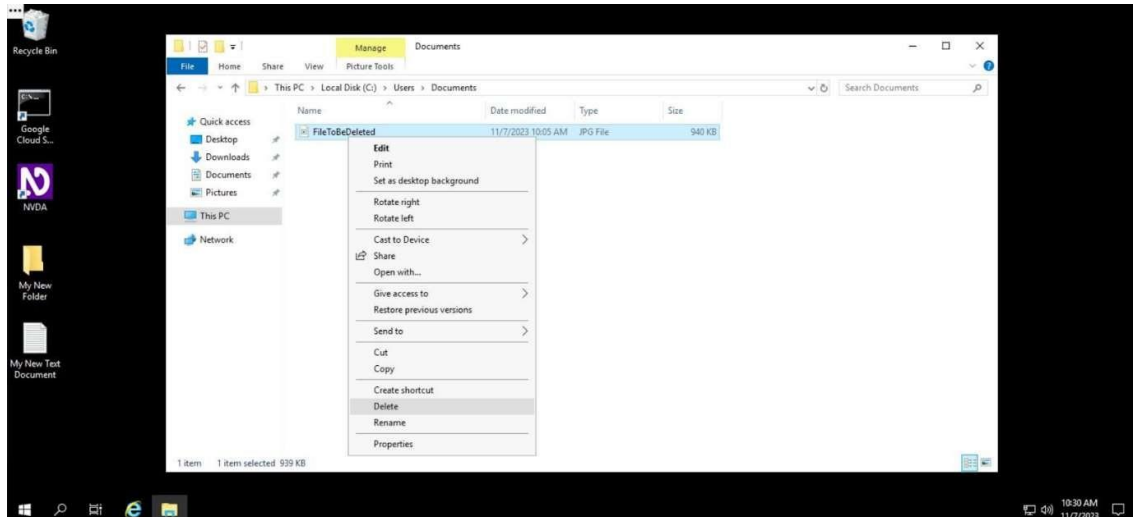


Fig-4: Deleting file

Searching through files:

Searching for files efficiently is an essential feature in any operating system (OS). Most modern OSs provide graphical user interfaces (GUI) and command-line interface (CLI) tools to help users locate files quickly.

- Open File Explorer (Win + E).
- Navigate to the folder where you want to search.
- Type the file name or keyword in the search bar (top-right corner).
- Press Enter, and Windows will display matching files.
- Use filters like Date modified, Type, and Size to refine results.

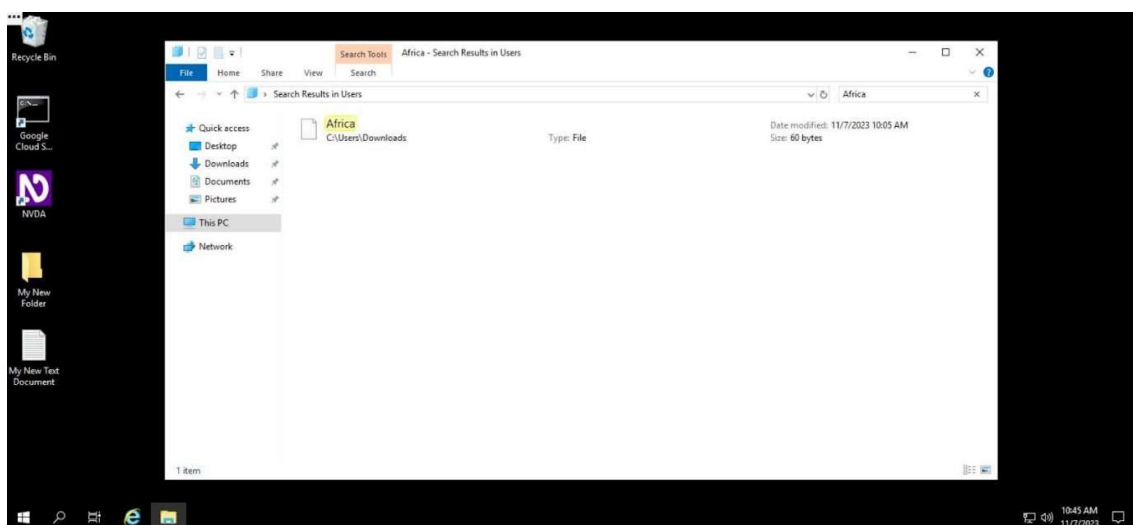


Fig-5: Searching through a file

Emerging Trends in Operating Systems:

Operating systems (OSs) are continuously evolving to meet the demands of modern computing environments. With advancements in hardware, cloud computing, artificial intelligence (AI), and security, OS developers are integrating new technologies to improve performance, scalability, and security. Below are some of the key emerging trends in operating systems.

Cloud-Based Operating Systems

With the rise of cloud computing, cloud-based OSs have gained popularity. These OSs rely on internet-based services rather than local hardware for storage and processing. This reduces hardware dependency, allows remote accessibility, and lowers costs for businesses and individuals. Examples of cloud-based OSs include Chrome OS, Windows 365, and Amazon Workspaces.

AI-Driven Operating Systems

Artificial intelligence (AI) and machine learning (ML) are being integrated into modern OSs to enhance automation, security, and user experience. AI helps in predictive analytics, voice recognition (e.g., Cortana, Siri, Google Assistant), and system optimization. AI-driven task scheduling improves CPU efficiency and enables automated power management, enhancing battery life on mobile devices.

IoT-Enabled Operating Systems

The rapid growth of the Internet of Things (IoT) has led to the development of specialized operating systems designed for smart devices, sensors, and embedded systems. These OSs are lightweight, power-efficient, and capable of real-time processing. Some notable examples include TinyOS, RIOT, Google Fuchsia, and FreeRTOS. IoT-enabled OSs play a crucial role in smart homes, healthcare, and industrial automation.

Edge Computing Integration

Edge computing focuses on processing data closer to the source instead of relying on centralized cloud servers. Operating systems are now being optimized for edge computing to reduce latency and improve real-time decision-making. This trend is especially beneficial for applications like autonomous vehicles, industrial automation, and smart surveillance systems, where fast data processing is essential.

Containerization and Virtualization

Containerization and virtualization are becoming essential for modern operating systems. These technologies improve system performance, security, and scalability by isolating applications in lightweight environments. Examples include Docker, Kubernetes, and Windows Subsystem for Linux (WSL). Container-based applications enhance portability, making it easier to deploy software across different platforms without compatibility issues.

Enhanced Security Features

With increasing cybersecurity threats, operating systems are integrating advanced security mechanisms to protect user data and system integrity. The Zero Trust Security Model ensures continuous authentication instead of relying on a single login. Additionally, modern OSs incorporate hardware-based security, such as Trusted Platform Modules (TPM), to enable secure booting. AI-driven threat detection is also being used to monitor and prevent potential cyberattacks.

Operating systems are continuously evolving to adapt to new technological advancements and security challenges. Emerging trends like cloud computing, AI, IoT, edge computing, and enhanced security are shaping the future of OS development. These advancements aim to improve performance, efficiency, and user experience, ensuring that operating systems remain relevant in an ever-changing digital landscape.

CHAPTER-IV

RESULTS & DISCUSSION

IT Support Implementation:

The implementation of IT support methodologies and operating systems in various computing environments has demonstrated significant improvements in system efficiency, security, and overall performance. Through structured troubleshooting approaches and automation tools, IT support has reduced downtime, minimized system failures, and enhanced user productivity. The integration of network management strategies, including IP addressing, DNS configurations, and firewall implementations, has strengthened connectivity and security in enterprise environments.

Virtualization technologies have played a crucial role in optimizing IT infrastructure, allowing multiple operating systems and applications to run on a single hardware platform. The deployment of virtual machines (VMs) and containerized environments, such as Docker and Kubernetes, has improved resource utilization and simplified system administration. Additionally, automation tools like PowerShell and Bash scripting have significantly reduced manual intervention in repetitive tasks, streamlining system configurations and updates.

Analysis of Operating System Performance:

The comparison of different operating systems—Windows, Linux, and macOS—revealed unique strengths and limitations in system administration, security, and usability. Windows remains widely used for enterprise applications due to its user-friendly interface and extensive software compatibility. Linux, with its open-source nature, is preferred for server environments, offering strong security and customization options. macOS, known for its stability and seamless integration with Apple hardware, is commonly used in creative and professional settings.

Performance testing of operating systems in virtualized environments indicated that Linux-based systems demonstrated better resource efficiency and lower overhead when deployed on cloud platforms. Windows performed well in enterprise environments that rely on Active Directory and centralized IT management.

Impact of AI and Automation in IT Support:

Artificial Intelligence (AI) and Machine Learning (ML) have significantly enhanced IT support operations. AI-powered chatbots and virtual assistants have improved customer support by handling common troubleshooting queries, reducing the workload on IT staff. Predictive maintenance algorithms have been effective in identifying potential hardware and software failures, enabling proactive issue resolution. AI-driven security tools have strengthened system protection by detecting and mitigating cyber threats in real-time.

The adoption of automation in IT support has resulted in faster response times, improved accuracy in diagnosing technical issues, and enhanced overall system reliability. Automated patch management and software updates have minimized vulnerabilities, reducing the risk of security breaches. Additionally, self-healing systems, enabled by AI-driven diagnostics, have contributed to uninterrupted business operations by resolving system errors without human intervention.

Cybersecurity Enhancements in IT Support:

Security measures implemented in IT support have shown a considerable impact in safeguarding data and preventing cyberattacks. The deployment of multi-factor authentication (MFA), encryption techniques, and intrusion detection systems (IDS) has significantly reduced the risk of unauthorized access. Case studies of recent cybersecurity incidents indicate that organizations using proactive security strategies experience fewer breaches and recover faster from attacks.

The implementation of Zero Trust security models has further enhanced IT security by continuously verifying user identity and access permissions. Additionally, network segmentation strategies have minimized the impact of potential intrusions, ensuring that threats remain contained within isolated system components.

Discussions:

The results of this study confirm that IT support and operating systems play a crucial role in maintaining a secure, efficient, and scalable computing environment. The integration of

automation, AI, and cybersecurity measures has greatly improved IT infrastructure management. The findings suggest that organizations adopting these technologies experience reduced operational costs, improved system uptime, and enhanced data security.

The future of IT support is expected to evolve further with advancements in AI-driven automation, cloud-based IT solutions, and enhanced security frameworks. The continuous development of operating systems will focus on improving system resilience, performance optimization, and seamless integration with emerging technologies such as quantum computing and edge computing.

CHAPTER-V

CONCLUSION

Operating systems have undergone significant transformations over the years, adapting to the evolving needs of users and technological advancements. The emergence of **cloud computing, AI, IoT, edge computing, virtualization, and enhanced security measures** has significantly impacted OS development. These advancements aim to improve **performance, scalability, security, and user experience** while ensuring efficient resource utilization across various platforms. Modern operating systems now cater to a wide range of computing environments, from personal devices to large-scale enterprise systems and embedded IoT solutions. As technology continues to evolve, OSs will remain at the core of digital ecosystems, ensuring seamless integration between hardware, software, and user applications.

FUTURE SCOPE

The future of operating systems will be shaped by continuous **innovation and adaptation** to emerging trends. **AI-powered operating systems** will become more self-sufficient, automating system optimizations, predictive maintenance, and user personalization. **Quantum computing** is expected to introduce entirely new OS architectures designed to handle quantum-based processing, significantly enhancing computational power for scientific research and cryptography. Security enhancements will remain a critical focus, with future OSs incorporating **zero-trust security models, blockchain authentication, and AI-driven cybersecurity solutions** to prevent advanced cyber threats. Additionally, **edge computing and 5G networks** will enable real-time data processing, reducing latency for applications like **autonomous vehicles, smart cities, and industrial automation**.

Furthermore, the rise of **universal and cross-platform OSs** will facilitate seamless interaction between different devices and ecosystems, improving interoperability. The increasing adoption of **serverless computing and microservices architectures** will also drive the need for more lightweight and modular OS designs. As technology progresses, operating systems will continue to evolve, making computing environments more intelligent, efficient, and secure, ultimately shaping the future of digital transformation.

COURSE CERTIFICATION

Technical Support Fundamentals -



Operating Systems and You: Becoming a Power User -



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MICRO PROJECT AUDIT REPORT

This is to certify that the micro project work entitled "TITLE OF THE PROJECT" categorized as an internal project done by Thavva Jyoshna of the Department of Computer Science and Engineering, under the guidance of Dr.M.Raja during the Even semester of the academic year 2024 - 2025 are as per the quality guidelines specified by IQAC.

Quality Grade

Deputy Dean (IQAC)

Administrative Quality Assurance

Dean (IQAC)

APPENEDIX

(Project Code)