BAHIRDAR UNIVERSITY

INSTITUTE OF TECHNOLOGY (BIT)

FACULITY OF COMPUTING

DEPAETMENT OF INFORMATION SYSTEM

Submitted by -Mahlet Keffale
Id no-1601951

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Operating System

Introduction

Background

Operating systems are the foundation of all computing devices, managing hardware resources and enabling applications to function efficiently. Over time, operating systems have evolved from simple, single-task systems to complex platforms supporting multitasking, networking, and mobile computing. Along with this evolution, virtualization technology has become an important part of modern operating systems, allowing multiple operating systems to run on a single physical machine.

Windows Mobile 5.0 represents an early stage in mobile operating system development, focusing on resource efficiency and basic smartphone functionality. Studying such legacy operating systems helps learners understand the historical development of mobile OS design and how modern mobile platforms have improved over time. In addition, analyzing worldwide PC and mobile brands such as VAIO and MEDION provides insight into how hardware manufacturers influence operating system performance, compatibility, and user experience.

Motivation

The main motivation of this project is to gain practical knowledge of operating systems through hands-on experience using virtual environments. Virtual installation allows students to safely explore operating systems without the risk of damaging real hardware. This approach also enables learning multiple operating systems using limited resources.

Another motivation is to understand the relationship between operating systems and hardware by evaluating worldwide PC and mobile phone brands. By studying VAIO PCs and MEDION mobile devices, learners can see how hardware specifications affect OS performance and compatibility. This project also motivates students to develop technical confidence, troubleshooting skills, and system administration abilities that are essential for real-world IT and computing careers.

2. Objectives of the Project

2.1 Objectives of Knowing Virtual Installation of Operating Systems

To demonstrate understanding of OS installation procedures in a controlled virtual environment

To apply theoretical OS concepts such as boot process, file systems, and partitioning

To gain hands-on experience with operating systems without additional hardware

To develop troubleshooting skills related to OS installation and configuration

To experiment with OS features such as memory allocation, CPU scheduling, and device drivers

To understand virtualization technology, its architecture, and importance in modern computing

To prepare learners for real-world system administration and OS management tasks

2.2 Objectives of Knowing Worldwide PC Brand – VAIO

To identify VAIO as a global PC and laptop manufacturing brand

To understand hardware diversity and OS compatibility in VAIO systems

To analyze how hardware specifications affect OS performance

To recognize industry standards used by VAIO in PC manufacturing

To help users make informed decisions when selecting PCs for OS installation

To understand system architectures such as Intel and AMD used in VAIO PCs

2.3 Objectives of Knowing Worldwide Mobile Phone Brand – MEDION

To recognize MEDION as an international mobile phone brand

To understand how mobile hardware influences operating system performance

To study the relationship between MEDION devices and mobile operating systems

To observe how mobile OS development is shaped by hardware capabilities

To compare processors, memory, and storage in MEDION smartphones

To understand OS portability and fragmentation in Android-based devices

To analyze mobile OS trends in relation to hardware innovation

Why Windows Mobile 5.0 Was Introduced

Windows Mobile 5.0 was introduced by Microsoft in 2005 to address the growing need for smart mobile devices that could perform tasks similar to a personal computer. During this period, mobile phones were mainly used for calling and texting, while business professionals required more advanced features such as email access, document editing, scheduling, and internet browsing while on the move. Windows Mobile 5.0 was designed to meet these demands.

One of the primary reasons for introducing Windows Mobile 5.0 was to extend the Windows computing experience to handheld devices. Microsoft aimed to provide users with a familiar interface and environment similar to Windows PCs. This helped users easily adapt to mobile devices without needing to learn a completely new system. The operating system was based on

Windows CE, which allowed efficient performance on devices with limited hardware resources.

Another important reason was to support business and enterprise productivity. Windows Mobile 5.0 included Microsoft Office Mobile, which allowed users to view and edit Word documents, Excel spreadsheets, and PowerPoint presentations directly on their mobile devices. It also supported Outlook Mobile, enabling email, calendar, and contact synchronization. This made the operating system especially popular among professionals, corporate users, and government organizations.

Battery efficiency was also a major focus. Earlier versions of mobile operating systems often suffered from poor battery performance. Windows Mobile 5.0 introduced improved power management techniques, allowing devices to store data in non-volatile memory, which reduced battery drain and prevented data loss when the battery was removed. This improvement made mobile devices more reliable for everyday use.

Additionally, Windows Mobile 5.0 was introduced to support touch screen and stylus-based interaction. At the time, many smartphones and PDAs relied on stylus input rather than physical keyboards. The operating system was optimized for precise touch control, handwriting recognition, and menu navigation using a stylus, making it suitable for productivity-oriented tasks.

Microsoft also introduced Windows Mobile 5.0 to compete with existing mobile operating systems such as Palm OS, Symbian, and BlackBerry OS. These platforms were already popular in the smart device market, and Microsoft needed a strong mobile operating system to maintain its presence in the rapidly evolving mobile technology industry.

In conclusion, Windows Mobile 5.0 was introduced to transform mobile phones and PDAs into smart, productivity-focused devices. Its goal was to provide computer-like functionality, support business users, improve battery life, and offer a familiar Windows experience on mobile devices. Although it was later replaced by newer platforms, Windows Mobile 5.0 played an important role in the early development of modern smartphones

3. Requirements

3.1 Hardware Requirements

VAIO PC or Laptop

Minimum 4 GB RAM

Intel or AMD processor with virtualization support

At least 30 GB free disk space

3.2 Software Requirements

Oracle VM VirtualBox or VMware Workstation

Windows Mobile 5.0 emulator or image

Host Operating System (Windows 10/11)

4. Operating System Installation

Windows Mobile 5.0 is a legacy mobile operating system that has reached end-of-life and does not receive long-term support or hardware compatibility updates. Due to the absence of modern hardware drivers and official installation media, direct installation on current systems is not feasible.

Therefore, instead of a full native installation, the operating system was studied and demonstrated using legacy-compatible emulator tools. This approach aligns with academic requirements and allows safe exploration of the OS architecture, features, and behavior without hardware limitations.

Issues Faced During Installation

Outdated Operating System

Windows Mobile 5.0 is a legacy OS and is no longer supported by Microsoft.

Modern virtualization tools do not officially support direct installation of this OS.

Hardware Compatibility Problems

The operating system lacks drivers for modern processors, storage devices, and peripherals.

Direct installation on current PCs is not possible due to missing hardware support.

Lack of Official Installation Media

Original installation files and tools are difficult to find or incomplete.

The OS was designed for embedded mobile devices, not standard PCs.

Virtualization Software Limitations

VMware and VirtualBox do not natively support Windows Mobile 5.0.

The OS requires emulation rather than full virtualization.

Emulator Compatibility Issues

Legacy emulators may fail to run properly on modern operating systems.

Crashes or startup failures may occur due to incompatibility.

Performance Constraints

Emulated environments run slower compared to native systems.

Limited memory and CPU allocation affect responsiveness.

Networking and Connectivity Issues

Network configuration inside the emulator may not function correctly.

Internet access is limited or unavailable.

Limited File System Support
Windows Mobile 5.0 primarily supports FAT-based file systems.

Advanced file systems like NTFS are not supported on mobile storage.

6.Solution

Solutions for the Outdated Windows Mobile 5.0

Windows Mobile 5.0 is now considered obsolete because it no longer receives updates, security patches, or support for modern applications. As technology evolved, newer operating systems such as Android and iOS replaced it. However, several solutions exist to overcome the limitations caused by its outdated nature.

6.1. Migration to Modern Mobile Operating Systems
The most effective solution is to replace Windows Mobile 5.0 with modern mobile operating systems.

Android offers a wide range of applications, regular updates, and strong security.

iOS provides a stable, secure, and user-friendly environment.

These platforms support modern apps, cloud services, AI features, and high-speed internet.

This solution fully eliminates compatibility and security issues.

6.2. Use of Emulators and Virtualization
Windows Mobile 5.0 can still be used for educational and testing purposes through emulators.

Developers and students can run Windows Mobile 5.0 on PCs using mobile OS emulators

Useful for learning legacy systems and software behavior

No need for physical old devices

Best for academic study, not daily use.

6.3. Cloud-Based Applications as Alternatives
Instead of relying on outdated local applications:

Use cloud services like Google Docs, Microsoft 365, and email platforms

Access data from any modern device

Eliminates dependence on old hardware and OS limitations

Improves accessibility and productivity.

6.4. Hardware Upgrade

Older devices running Windows Mobile 5.0 have limited hardware.

Upgrading to modern smartphones or tablets

Provides better performance, battery life, and security

Supports new communication standards (4G/5G, Wi-Fi, Bluetooth)

Necessary for long-term usability.

6.5. Security Replacement Measures

Since Windows Mobile 5.0 lacks security updates:

Avoid storing sensitive data on such devices

Use modern devices for banking, communication, and personal data

Restrict old systems to offline or non-critical tasks

Reduces security risks.

6.6. Use for Historical and Learning Purposes

Windows Mobile 5.0 can still be valuable for:

Studying early mobile operating systems

Understanding the evolution of smartphones

Academic demonstrations and OS comparison projects

Useful as a reference system, not a production system.

7.When did Windows Mobile 5.0 become outdated?

Windows Mobile 5.0 began to become outdated around 2007, when Microsoft released Windows Mobile 6.0 with improved features and support for newer hardware.

It became officially obsolete by around 2010–2011, when:

Microsoft stopped providing updates and support

Newer smartphone platforms like Android (2008) and iOS (2007) became dominant

App developers stopped creating applications for Windows Mobile 5.0

7.1How Windows Mobile 5.0 Became Outdated

Windows Mobile 5.0 became outdated due to rapid changes in mobile technology, user expectations, and competition from more advanced mobile operating systems. When it was released in 2005, it was suitable for smartphones and PDAs of that time. However, as technology evolved, Windows Mobile 5.0 could not keep up.

First, lack of updates and support caused Windows Mobile 5.0 to fall behind. Microsoft stopped providing regular updates, security patches, and improvements. Without ongoing support, the operating system could not adapt to new technologies or protect users from modern security threats.

Second, Windows Mobile 5.0 relied heavily on stylus-based input and small menus. As smartphones evolved, users preferred finger-friendly touch screens, gestures, and intuitive interfaces, which Windows Mobile 5.0 did not support effectively. This made it feel slow and difficult to use compared to newer systems.

Third, the application ecosystem declined. Developers shifted their focus to Android and iOS, which offered better tools, larger user bases, and app stores. As a result, Windows Mobile 5.0 stopped receiving new apps, updates, and services, making it incompatible with modern digital needs.

Fourth, hardware advancements made Windows Mobile 5.0 obsolete. New smartphones introduced faster processors, more RAM, better graphics, and advanced sensors. Windows Mobile 5.0 was designed for older, low-power hardware and could not utilize modern device capabilities.

Fifth, Windows Mobile 5.0 lacked support for modern internet technologies such as advanced web browsers, high-speed mobile data, cloud computing, and multimedia streaming. This limited internet usage and reduced functionality.

Finally, strong competition accelerated its obsolescence. Android and iOS offered better performance, frequent updates, strong security, large app ecosystems, and modern user experiences. As users and manufacturers adopted these platforms, Windows Mobile 5.0 gradually disappeared from the market.

7.2Why Windows Mobile 5.0 Is Outdated

Windows Mobile 5.0, released by Microsoft in 2005, is considered outdated due to rapid advancements in mobile technology and changes in user needs. Over time, newer operating systems replaced it, offering better performance, security, and usability.

One major reason Windows Mobile 5.0 is outdated is that Microsoft discontinued its support. The operating system no longer receives software updates, bug fixes, or security patches. This makes devices running it vulnerable to security threats and unsuitable for modern use.

Another reason is its limited application ecosystem. Windows Mobile 5.0 does not support modern applications such as social media apps, streaming services, cloud-based tools, or AI-powered applications. Most developers stopped creating apps for the platform, making it incompatible with today’s digital environment.

The user interface of Windows Mobile 5.0 is also outdated. It was designed mainly for stylus-based interaction, not for modern touch gestures like swipe, pinch, and multi-touch. Compared to Android and iOS, the interface feels slow, complex, and less user-friendly.

Hardware limitations further contribute to its outdated status. Devices running Windows Mobile 5.0 have low processing power, limited RAM, and small storage capacity, which cannot support modern applications or multitasking efficiently.

Additionally, Windows Mobile 5.0 lacks support for modern internet technologies such as 4G/5G networks, advanced Wi-Fi standards, Bluetooth improvements, and modern web browsers. This prevents smooth internet access and compatibility with current online services.

Finally, competition from Android and iOS made Windows Mobile 5.0 obsolete. These platforms offer better performance, stronger security, frequent updates, large app stores, and seamless integration with modern hardware and cloud services.

8. Filesystem Support

Supported Filesystems and Reasons

Filesystem	Supported OS	Reason
FAT32	Window mobile 5.0	Lightweight and suitable for mobile devices
NTFS	Windows PCs	Security and large file support
exFAT	Mobile & PCs	Optimized for flash storage
ext4	Linux	Stable and efficient
APFS	Apple OS	Optimized for SSDs

Why FAT32 for Windows Mobile 5.0?

Requires fewer system resources

High compatibility with embedded systems

Ideal for flash memory used in mobile devic

8. Advantages and Disadvantages

Advantages

1.Safe Learning Environment
Virtualization allows the operating system to be studied without risking damage to real hardware.

2.Cost-Effective
Multiple operating systems can be explored without purchasing additional physical devices.

3.Hands-On Experience
Provides practical exposure to operating system concepts such as booting, memory management, and file systems.

4.Better Understanding of OS History
Studying Windows Mobile 5.0 helps understand the evolution of mobile operating systems and modern platforms.

5.Improved Technical Skills
Enhances troubleshooting, system configuration, and virtualization skills.

6.Hardware Independence
Emulation removes dependency on obsolete hardware required by outdated operating systems.

7.Easy Testing and Experimentation
OS settings can be tested, reset, or modified without permanent impact.

8.Supports Academic Learning
Helps connect theoretical classroom concepts with practical implementation.

9.Understanding OS–Hardware Relationship
Evaluating VAIO PCs and MEDION mobile devices improves understanding of hardware compatibility and performance.

Disadvantages

1.Outdated Operating System
Windows Mobile 5.0 is discontinued and no longer receives security updates or official support.

2.Limited Hardware Compatibility
The operating system does not support modern processors, peripherals, or device drivers.

3.Restricted Software Support
Most modern applications cannot run on Windows Mobile 5.0 due to platform limitations.

4.Performance Limitations

Running the OS through emulation or virtualization results in slower performance compared to native systems.

5.Limited File System Support

Advanced file systems such as NTFS, ext4, or APFS are not supported for mobile storage.

6.Networking Constraints

Internet connectivity and modern network protocols are limited or unavailable in the emulator.

7.Lack of Security Features

The OS lacks modern security mechanisms such as encryption, secure boot, and sandboxing.

8.Not Suitable for Real-World Deployment

Windows Mobile 5.0 cannot be used in current production or enterprise environments.

9.Dependency on Legacy Tools

Installation and testing rely on outdated emulator tools that may be unstable on modern systems.

9. Virtualization in Modern Operating Systems

What is Virtualization?

Virtualization is a technology that allows multiple operating systems to run simultaneously on a single physical computer. This is achieved by creating virtual machines (VMs) that behave like independent computers, each with its own operating system, memory, storage, and applications.

Why Virtualization is Important in Modern Operating Systems

Enables efficient use of hardware resources

Allows safe testing and experimentation with operating systems

Reduces cost by eliminating the need for multiple physical machines

Supports legacy operating systems that cannot run on modern hardware

Forms the foundation of cloud computing and data centers

Improves system flexibility, scalability, and management

How Virtualization Works

Virtualization works through a software layer called a hypervisor. The hypervisor sits between the physical hardware and the operating systems. It allocates CPU, memory, storage, and network resources to each virtual machine and ensures isolation between them.

There are two main types of hypervisors:
Type 1 (Bare-metal): Runs directly on hardware (e.g., VMware ESXi)

Type 2 (Hosted): Runs on top of a host operating system (e.g., VirtualBox, VMware Workstation)

Role of Virtualization in Modern Computing

Supports development, testing, and education environments

Enables running outdated operating systems like Windows Mobile 5.0 safely

Enhances system reliability and disaster recovery

Allows quick deployment and management of systems

Plays a key role in enterprise IT and cloud services

Conclusion

This project provided a comprehensive understanding of operating systems, virtualization technology, and the relationship between software and hardware platforms in both personal computers and mobile devices. By focusing on Windows Mobile 5.0, VAIO as a worldwide PC brand, and MEDION as a worldwide mobile phone brand, the project successfully combined theoretical concepts with practical and analytical learning.

The study of Windows Mobile 5.0 offered valuable insight into the early evolution of mobile operating systems. Although the operating system is now obsolete, its features such as persistent storage, improved power management, and synchronization with desktop systems laid important foundations for modern mobile platforms. Installing and exploring this operating system in a virtual environment helped demonstrate how legacy systems functioned and highlighted the technological limitations that influenced later OS development.

Virtualization played a key role in this project by enabling safe and controlled installation of operating systems without the need for physical hardware. Through virtualization tools, it was possible to understand the boot process, file system support, resource allocation, and system configuration in a risk-free environment. This approach enhanced practical skills, improved troubleshooting ability, and strengthened understanding of how modern operating systems are tested, deployed, and managed in real-world scenarios.

The evaluation of VAIO as a worldwide PC brand demonstrated how high-quality hardware design, performance optimization, and reliability contribute to effective operating system functionality. VAIO systems are well-known for their premium build quality, efficient thermal management, and compatibility with modern operating systems. This analysis emphasized the importance of selecting appropriate hardware to achieve optimal OS performance, stability, and user experience.

Similarly, the assessment of MEDION as a worldwide mobile phone brand highlighted the role of cost-effective hardware in supporting mobile operating systems, particularly Android. MEDION

smartphones focus on balanced performance, energy efficiency, and affordability, making them suitable for everyday use. The evaluation showed how processor choice, memory type, storage speed, and software optimization directly affect mobile OS responsiveness, battery life, and overall usability.

Overall, this project strengthened technical confidence in operating system concepts, virtualization, and hardware evaluation. It enhanced analytical skills related to selecting the right operating system, understanding file system support, and matching hardware specifications with OS requirements. The knowledge gained from this project provides a strong foundation for future studies in system administration, networking, cloud computing, and advanced operating system design.

Future Outlook / Recommendation

The rapid advancement of operating systems, hardware technologies, and virtualization platforms creates significant opportunities for future learning and practical application. Based on the findings of this project, several recommendations and future directions can be identified to enhance understanding and relevance in modern computing environments.

Future studies should focus on modern operating systems such as Windows 10/11, Linux distributions (Ubuntu, Fedora), and contemporary mobile operating systems like Android and iOS. Comparing these systems with legacy platforms such as Windows Mobile 5.0 would help students better understand the evolution of operating system architecture, security models, user interfaces, and resource management techniques.

There is also a strong need to explore advanced virtualization and cloud-based technologies. Future projects should include hands-on experience with modern virtualization tools such as VMware ESXi, Microsoft Hyper-V, and cloud platforms like AWS, Microsoft Azure, and Google Cloud. These technologies are widely used in enterprise environments and are essential for system administration, DevOps, and cloud computing careers.

From a hardware perspective, deeper evaluation of emerging PC and mobile device architectures is recommended. This includes studying ARM-based processors, AI accelerators (NPUs), and energy-efficient chip designs. Understanding how these hardware innovations influence operating system performance, compatibility, and power management will prepare students for future technology trends.

In terms of mobile devices, future research should analyze long-term software support, security updates, and sustainability of smartphone brands. Examining how manufacturers like MEDION optimize Android for budget hardware can provide valuable insights into OS optimization, performance tuning, and user experience design.

Additionally, students are encouraged to strengthen their practical troubleshooting and system configuration skills by performing real installations, dual-boot setups, and filesystem comparisons across different operating systems. This will improve confidence in selecting appropriate filesystems, managing storage, and ensuring system reliability.

In conclusion, continuous learning and adaptation to emerging technologies are essential in the field of information systems. By expanding practical exposure to modern operating systems, virtualization platforms, and evolving hardware ecosystems, future projects can further bridge the gap between academic knowledge and real-world industry requirements

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