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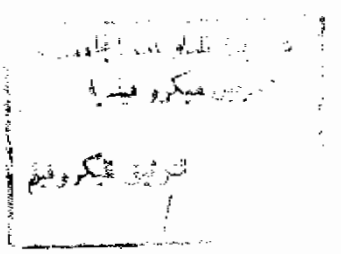

On Computer Security

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Master Degree of Computer Science

By

Abd El Nasser Hassan Ahmed Odah

Supervised by

Dr. Fayed Fayek Mohamed Ghaleb
Dr. Mohamed Sadek Esmaiel

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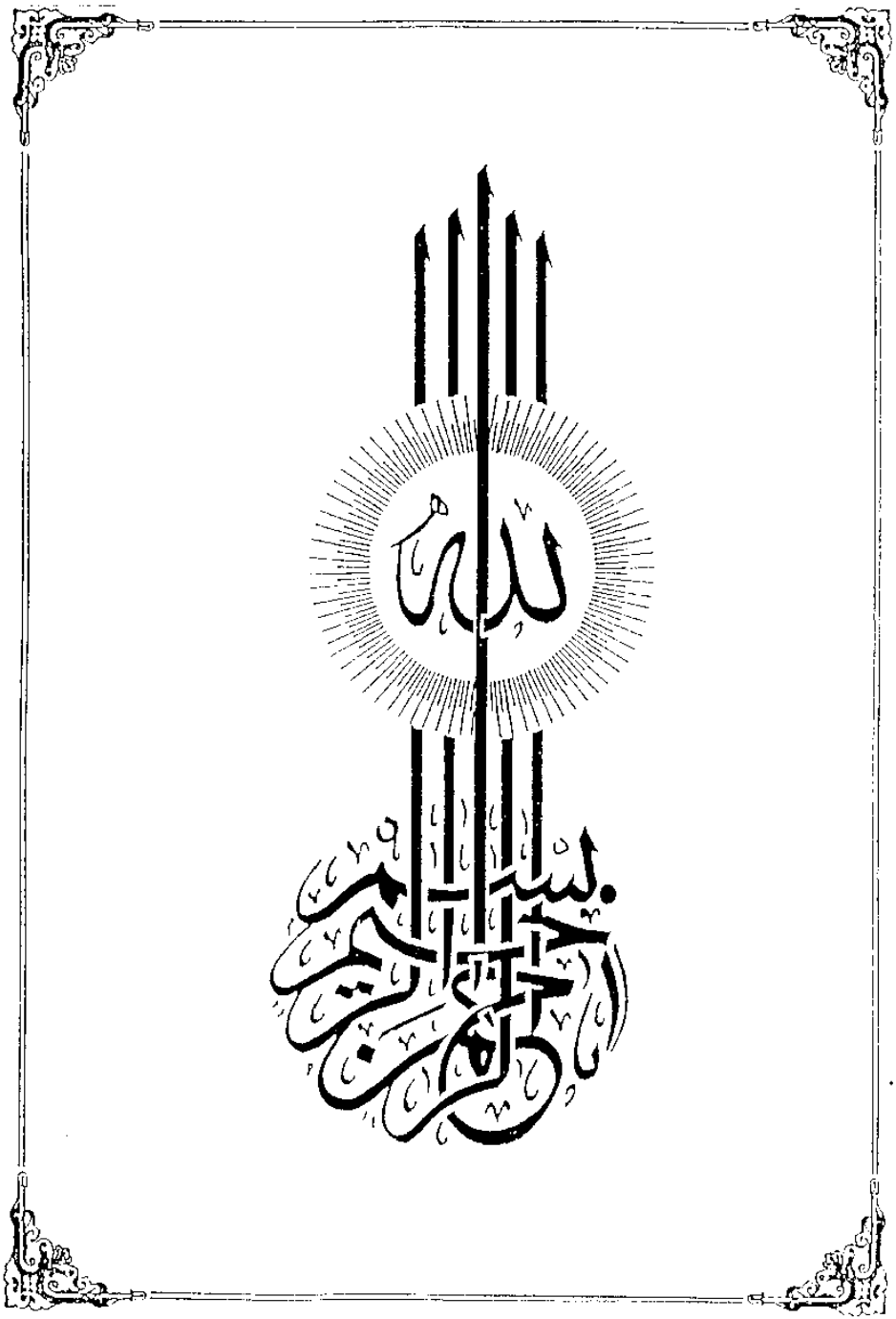

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Preface

Electronic computers have evolved from exiguous experimental enterprises in the 1940s to prolific practical data processing systems in the 1990s. As we come to rely on these systems to process and store data, we have also come to wonder about their ability to protect valuable data.

Computer security is the science and study of methods of protecting data in computer and communication systems from unauthorized disclosure and modification.

The goal of this thesis is to study the computer security based on three main component parts - privacy, integrity and availability. Privacy implies the property of preventing the disclosure of information to unauthorized parties, either as a result of accident or of deliberate attack. Integrity implies the prevention of unauthorized alteration of information, again either as a result of accident or of deliberate attack. Availability implies ensuring that a system is available to authorized users at all times intended by the system owner; denial of service as a result of deliberate attack is one of the conditions to be protected against here.

This thesis consists of an introduction, six chapters, and one appendix. Introduction (chapter 0 "The Need For Security") starts by a historical background then presents the physical security and technological countermeasures.

Here is a brief summary of other chapters:

- **Chapter 1,** ***Access Controls***, describes the basic principles of mechanisms that control access by subjects(e.g., users or programs) to objects (e.g., files and records).

- **Chapter 2,** ***How to Design an Effective Auditing Subsystem,*** summarizes the auditing subsystem requirements for a CMW, and an effective method for building these subsystems.

- **Chapter 3,** ***Understanding DES "The Data Encryption Standard"***, describes both the classical and modern encryption algorithms, including a full detail understanding the DES and public-key algorithms.

- **Chapter 4,** ***Viruses and Trojan Horses,*** gives the definitions of virus , types of viruses, and the prevention/detection of viruses. This chapter includes a comparison of virus protection products.

- **Chapter 5,** ***A Model of Access Control Policy,*** introduces a general model for access control policy for sensitive information.

- **Chapter 6,** A source code program, ***"Access Control on IBM/PC."***

- **References**

- **Appendix A,** A glossary of security terms.

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Chapter

0

Introduction

"The Need for Security"

Chapter 0
Introduction
The Need for Security

0.1 Historical Background

The 1940s and '50s

Early computers were operated by the same individuals who programmed and repaired them. These pioneers were not so concerned about the security of information as they were with simply getting these huge vacuum tube-equipped machines to execute the desired instructions. Security revolved primarily around limiting physical access to prevent outsiders from tampering with the hardware, and maintaining environmental cooling systems essentially to these heat-generating electromechanical monsters.

The development of the transistor in the late 1950s made smaller, faster, and more versatile computers possible. Both the public and private sectors began to realize the importance of computers.

The 1960s - Computer Security

As the transistor revolutionized the computer industry, the capabilities of computers appeared almost limitless. Large mainframe computer environments were considered showcases, proudly displayed to employees and customers primarily to impress everyone with the technological prowess of the organization.

In the late 1960s, organizations that increasingly relied on their computers for day-to-day business realized that showcasing this asset was not in their best interest. Threats of violence against government, corporate, and educational computer operations centers caused these organizations to secure the computer operations facility, an attitude now referred to as the "fortress mentality."

The term *computer security* implied protection of the computer itself. Physical security was the primary concern. Security measures included fire protection and site access control. Since batch oriented application required very limited interface by users, computer operators were the only human interface other than programmers or vendor personnel. *Security of the information was not perceived as the most critical issue.*

The introduction of silicon-based technology in the latter half of the decade made possible the concentration of many transistors on one integrated circuit. This dramatic improvement in computer technology provided for smaller,more reliable,and less expensive computers.

This advance made computers available to all those who had previously been unable to justify their use.The result was another sharp increase in the number of computer applications.

The 1970s - Data Security

Increases in productivity and benefits of instant access to large amounts of data shifted the focus of security from physical control of the mainframe computer to control of data. The shift to *data security* was accompanied by implementation of simple password control capabilities coupled with enhanced physical security measures, such as Halon fire suppression system,off-site storage of data and software, and disaster recovery planning.

Continued improvement of the technology provided faster, less expensive computers communications hardware. User demand for interactive systems mushroomed. Online realtime applications, designed to permit many users access to the same data, began batch systems and spurred user demand for faster development of online interactive systems.

To circumvent the lengthy lead times required in large centralized date processing environments,users turned to minicomputers and the newly introduced personal computers. End-user computing requirements began to drive the data processing industry.

The 1980s / 1990s Information security

The stage is now set for *information security*. Mainframe computers, minicomputers, and microcomputers are essential equipment in businesses, schools, and government offices throughout the world. Midrange systems and microcomputers, with expanding internal storage capabilities, store huge quantities of information. Low-cost personal computers are often used to access mainframe information.

Data stored on mainframe computers now can be accessed through telephone lines by many users.

The concentration of complete processes,and the reliance upon timely and accurate information,has mandated that the focus of security shift from data to information.

The future of computers is already becoming quite clear. Continued reliance on mainframe and distributed computing systems together with expansion of end-user computing systems and networks , demonstrate that the sky is the limit for use of computer technology. Decisions made and actions taken as a result of computerized output, however, are only as good as the information input.

Information integrity, confidentiality, and availability, must be maintained in order to ensure the quality and accuracy of the end result. Appropriate information security measures can reduce organizational exposures and vulnerabilities.

Information security is really the protection of information integrity, availability, and confidentiality.

The Year 2000 and Beyond

What's next? Some say that the buzzword of future is "knowledge security."

Artificial intelligence, miniaturization of hardware and firmware components, light speed-type data communications rates, interactions between systems and networks, as well as other developments, will serve as building blocks for the gathering, concentration,and application of human knowledge.

0.2 Physical Security

Most experts agree that physical security expenditures should concentrate on the following:

1- Physical access control measures for both outsiders and unauthorized insiders;
2- Preventing, detecting, and limiting damage due to water leakage; and
3- Protection against loss of operational capabilities due to electrical power failure or fluctuations.

It is important to understand, that meaningful information security can only be achieved after appropriate physical security measures have been implemented.