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Personal Computer Checker

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ABSTRACT

All undergraduate students of Computer Science and Information Technology in University of Malaya are required to do their final year project. So the students will apply what they had learned in the university to their final year project. This project is to develop an application which is called Personal Computer Checker, PC Checker. This tool is used for administrating the entire computer system either in the local computer or remote computer. It also acted like administrator to help users to administrate their system.

Consequently, PC Checker is an "administration tool" that will make users to easier handle the system problems in Windows ME/2000/XP operating system. It also makes Windows XP operating system easier in administration. Basically, PC Checker will act as an "administrator" in the computer system. It will display operating system information and hardware data and specifications. It also displays many different types of information about your local machine or a remote machine on the network like software or products in computer which based on WMI Installed Applications Classes. Besides, PC Checker will display services currently running on the system computer. Users can only dynamically control the services by the popup menu on the list view. Lastly, it also displays processes currently running on the system computer, which users that started the process, CPU utilization, and memory usage. User can terminate the processes in the local computer or remote computer especially the processes using the large memory usage in the system

The Rapid Application Development (RAD) with Prototyping approach was selected for the development process because the strengths of both the RAD and Prototyping can be combined in a single project and reduces the risk involved. The programming languages that are used to develop the system are VB .Net c# and Windows API method. Microsoft Windows ME/2000/XP has been chosen as the operating system.

ACKNOWLEDGEMENT

First, I would like to especially thank to Faculty Computer Science and Information Technology, University of Malaya because providing undergraduate students the opportunity to do their final year project. Thorough this final year project, I have learned more and gain more experience knowledge during researching and complete this project.

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Besides, I also would like to thank to my moderator, Mr. Liew Chee Sun, because of giving me so many advices and spend valuable times with this project, commenting beneficial ideas on PC Checker application.

Furthermore, my special thanks to Mr. Wong Wai Kit, Head of Operation Technical and Engineering Department in my current working company, giving me so many advices and teaching me in developing PC Checker application.

Finally, a gratitude to my family and friends who give fully support and passionate encouragement to me along the PC Checker development.

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Chapter 1 – Project Introduction

1.1 Project Overview

Nowadays, many problems occur in the personal computer especially the virus problems, vulnerabilities and mis-configurations in computer. Especially for the new computer users, some of them will misconfigure their login and file access password, ignore the daily updates and the vulnerabilities of the software. It occur many problems and those problems may become more and more serious until the operating system in computer totally hanging out. Personal Computer Checker also called "PC Checker" which has been created to help the new computer users and fit the market need.

1.2 Project Objectives

This tool is used to scan the Windows-based personal computer for common system vulnerabilities and mis-configurations. It also scans for missing security updates or daily updates in Windows.

PC Checker's objectives are listed as below:

- Provides a more powerful, user friendly, securable, reliable and pragmatic program to computer users to administrate their computer.
- Provide classical and convenient tool to users.
- Enhance the administration in the system.

Basically, this tool will check for the following:

- Check for unnecessary services are running
- Check for the processes are running in the system
- Checker for the hardware information in the computer system
- Checker for the software information in the computer system

After checking and scanning these, the computer users will know the availability of the hardware in the system and the version of the software.

1.3 Problems Statement

Normally new users will encounter problems because of lack of computing knowledge. They even do not know the root causes of the problems. Most of them ignore some common system updates and configuration. It will cause their computer infected by virus, worm and Trojan. Other than that, intruder will hack in easily if the users ignore the security setting and updates. For example, most of the users do not enable internet connection firewall when they are accessing internet. It may give a good opportunity to those who are trying to hack in the computer or the system. Besides, some of the users just set few numbers or character as their password. This will make others gain access in the computer easily by just trying to guess the weak password. Next, some unnecessary services are running in the computer will slow down the performance of the system. Sometimes this problem will cause the system overflow. Without updating the system security flaws, the system will expose to attackers and virus.

1.4 Project Scope

The target users of this tool are the computer users, especially the administrator in the company or lab. Based on the coding tools of this program, this tool only can be used in Windows ME, 2000 and XP. It can not be used in other platforms because of the functionalities. The functionalities are written based on Windows ME, 2000 and XP only.

For example:

Password – password generator will assist users to reset the weak password and give suggestion to users to replace the weak password by creating strong password.

Anti-Virus Notification – updates notification alert to prompt and remind users about the last virus updates.

Windows Services – service checker will scan the services which are unnecessary services running in the system. If detected, it will halt the unnecessary program.

Security – it will check the internal firewall connection is enabling when users access internet. If disable, it will remind users to enable the firewall.

1.5 Project Limitation

Every programs or applications have their limitation. Of course, this tool has it own limitation such as:

- It only expected running in Windows background. It can not be used in other platform like Linux or Unix.
- For updating new anti-viruses, it should well-communicate with anti-virus software. But this tool only updating the Windows patch files and enable the firewall when access to internet.
- The functions of PC Checker are written based on Windows ME, 2000, XP. It can not run fully function in Windows 95/98 because different operating system contains different system files.
- Besides, the tool has been created using Microsoft Visual Basic .NET c#.

1.6 Project Expectation

PC Checker is developed to help the beginning computer users to maintain and check the mis-configuration and vulnerabilities in Windows XP Professional Edition operating system. It provides a more powerful, user friendly, securable, reliable and pragmatic program to remind users administrate and monitor their computer. Besides that, it protects the system infected by new-born-viruses and enhances the administration in the system. Basically, it includes few major modules which are computer security, system security, Windows daily updates and application control.

1.7 Report Layout

Chapter 1 – Introduction

- This chapter gives some reviews in the background information on the project and the introduction of the Personal Computer Checker system which includes the functions for checking the for file system type on hard drives, unnecessary services are running, internet connection firewall is enable, automatic updates is enable, file integration, weak password and daily updates.

Chapter 2 – Literature Review

- This chapter presents the literature reviews in developing and researching the project which includes analysis and researches on the existing system, domains, tools, techniques and methodologies available. This chapter also includes some command on the out coming tool.

Chapter 3 – Methodology

- This chapter will present the elaboration further on the techniques and methodologies used in the researches on solving project problems and limitations. Besides, it also has some discussion on the systematic approach used in developing the project with emphasis on the chosen process model.

Chapter 4 – System Analysis

- This chapter reviews understanding on the current problems and also capturing the functional, non functional requirements and the hardware and software requirements of the project. Furthermore, this chapter also discusses and analysis the adopted system development methodology.

Chapter 5 - System Design

- This chapter discusses and seeks thoroughly the design of the proposed system, which includes integration of all modules into a system that has the functionalities. I will also do the specification of the requirements and elaboration on the system design, modules of the system and user interface design.

Chapter 6 – System Implementation

- This chapter discusses the implementation of the system, elaboration of coding approach the styles adopted in making the project success.

Chapter 7 – System Testing

- This chapter will discuss the testing of the system upon completion of the coding phase. It also summarizes the unit and integration testing of proposed system. Solutions bugs are listed and fixed.

Chapter 8 – System Evaluation

- This chapter discusses the problems and limitations encountered in the project. It will also discusses the system strengths, solutions of the problems, constraints in short, knowledge and experience gained. Lastly, the discussion of the future enhancement to the proposed project will be summarizes.

1.8 Summary

First chapter basically descript briefly reviews to this project which is named Personal Computer Checker, PC Checker. It contains project overview, objectives, problem statement, scopes, limitation, expectation and report layout. Form this chapter we can roughly understand how the system works.

Chapter 2 – Literature Review

2.1 Introduction of Literature Review

PC checker also named as Personal Computer checker. This program provides many securities measures in Windows XP operating system. Basically, this chapter is to make researches in the collecting information resources, ingenious ideas and superior technologies from existing administrator tool in the market nowadays. Thurs, the development of PC Checker will become more completed because of overcoming the weakness of existing tools in the market. Besides, literature review is reaching on existing security administration tools in current market. The discussion issues would be the computer security issue, password security issue, computer virus security issue and administration issue. Besides that, the brief researching in current market security tools

would be done such as Microsoft Baseline Security Analyzer, Advance Administrator Tool by G-Lock software, PC Security by Tropical Software, Tweak Manager by Win-Guide Network, Tweak XP by Total-Idea Software and Security Administrator Tool by Ixis Research. After that, analyzing in these security applications will be done based on the strengths and weakness, Similarities and differences.

2.2 Background Study

2.2.1 Computer Security Issue

Securing any computer must be achieved without any compromise to these three basic concepts: confidentiality, integrity and availability.

There are three primary goals of security:

1. To protect *confidentiality* by ensuring private information is kept private.
2. To ensure data *integrity* by preventing data from being inappropriately changed or deleted.
3. To ensure data *availability* by making sure services are available and uninterrupted, that data can be accessed whenever it is needed and that data can be restored quickly.

Protecting confidentiality means at a minimum secrecy, keeping passwords out of the wrong hands; preventing access to financial information and circulation information; and protecting private user's data such as documents and email. We should always follow the principle of least privilege, which states that the user has been given only the privileges that they need to perform their jobs or tasks. For instance, if a user only needs to check or print out their email using a library's Internet connection, they have no need (and should have no ability) to access the operating system files of that print server. [2]

Protecting data integrity means ensuring that we can recognize and recover from breaches of integrity and that we can protect systems from viruses, worms, and Trojan horses. It also means we should prevent deliberate alteration of documents, websites,

operating system files, and it certainly means we should allow only appropriate physical access to computers. [3]

Ensuring data availability means we should know how to recognize and defend against denial-of-service attacks, viruses, worms, use good backup and recovery procedures and ensure service is not interrupted during routine hardware and software maintenance.

Besides, availability in computer security also means that the assets are accessible to the authorized parties in a timely manner or as determined by the system requirements. The failure to meet this goal is called a denial of service.

Therefore, computer security must at least ensure:

Confidentiality

- Users can feel confident that their electronic privacy is being protected: others can not edit their documents even view it, access their email, or view a record of their internet searches. Password security should be applied in this part.
- Users can feel confident their documents, applications and data would not be accessed inappropriately by other users.
- All network users can have a reasonable assumption of privacy. This privacy can not be disturbed by adware, spyware or network intruders using hacker tools. Firewall and Intruder Detection System should be applied here.

Integrity

- Users can be confident that their documents will not be infected by viruses, Trojan horses or other malicious code. To protect the system not be infected, users have to install anti-virus.
- Patrons can expect that applications and other software will function properly so their documents would not be corrupted.

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Availability

- Computers which demand little maintenance will be available for anyone who wants to use them when the library is open. So, each user should have their own password when they log in each time.
- Other users would not be able to delete and edit applications and system files that might cause a computer to suddenly malfunction. So in the directory that which saving the system files should not be expose to the users but only for administrator.
- Computers will be protected against viruses spread by users' diskettes or by internet-borne viruses and Trojans that can cause damage to system computers. Users should scan the diskettes by anti-virus software before open it.

2.2.2 Password Security Issue

Password security has always been an important issue in security computing. Many computer users nowadays have to set and create a password for network accounts, online services, and premium web sites. According from the password security issue, users should not leave their passwords on a paper because it will leave an opportunity to those who always look for users' accounts vulnerability.

Besides, some of the new users choose the same password for different applications, which makes life easy for intruders of all kinds. Passwords are one of the fundamental methods we use to verify our identity. So we should not choose the same password for different log-in. it will make the hackers take for granted to hack our accounts easily. Essentially serving as the keys to a lock, passwords help protect against unauthorized access to our computing accounts and data. There are stronger authentication methods. However, passwords have found their way into mainstream use, guarding our email accounts, instant messaging accounts and online bank accounts.

Hackers/Crackers sometimes make use of backdoor or "Trojan" programs that enter the system through the internet, most especially through email. For example, sometimes we

will receive some emails sent by the unknown sender to ask us to open it. When we just open the email, our username and password will be sent to the unknown sender who called hackers. This is a popular hacking skill that always used by the beginning hackers. Besides sending email, password crackers also use another way such as just sit and wait while scanning the internet until someone with a computer they have infected logs on to the Internet and voila! They have the login details and the precious password at their disposal. Hackers nowadays do not concentrate on the databases of internet service provider because hacking into personal computers of people with individual accounts is easier to execute and harder to detect.

In order to prevent and protect our computing account and our privacy, we should take all the necessary precautions in securing our passwords:

1. Do not use simple or obvious passwords that may easily be associated with us. Such as our birthday date, name, parents' name, or boyfriend/girlfriend's name.
2. Choose a password that would be easy for us to remember, but hard for others to crack and hack in.
3. Never write down our password in a piece of paper or in our dairy.
4. Always change the initial password given by our ISP administrator and change it frequently, at least once every two months.
5. Beware of viewing attachments on our emails as they might contain hacker programs/viruses that could access our login/email passwords. Always scan these attachments before viewing them. If detect any suspicious email, just delete it immediately.

Besides that, there are some steps we should be careful when choosing and creating a password:

- *Do not use only words or numbers* - we should never use only numbers or words in a password.

  Examples:

  915113

fahsam

allan

- *Do not use recognizable words* - words such as proper names, dictionary words or even terms from television shows or novels should be avoided, even if they are book ended with numbers.

  Examples:

  Johntoh12

  HP-9

  amargedon123

- *Do not use words in foreign languages* - password cracking programs often check against word lists that encompass dictionaries of many languages.

  Examples:

  cheguevara

  theamo

  1dumbKopf

- *Do not use hacker terminology* - in our password, many word lists include LEET speak.

  Examples:

  H4X0R

  1337

- *Does not use personal information* - steer clear of personal information. If the attacker knows who we are, they will have an easier time figuring out our password if it includes information such as:

  User's himself/herself name

  The names of pets

  The names of family members

  Any birth dates

  Handphone number or zip code

- *Do not invert recognizable words* - good password checkers always reverse common words, so inverting a bad password does not make it any more secures.

Examples:

R0X4H

nauj

9-DS

- *Do not write down our password* - never store our password on paper. It is much safer to memorize it.
- *Do not use the same password for all log-in* - it is important that we make separate passwords for each log-in. This way is to prevent when one system is compromised, all of our machines will not be immediately at risk.

For a clever and smart computer user, they should consider several steps before creating a password:

- *Make the password at least eight characters long* - the longer the password is, the better.
- *Mix upper and lower case letters* - by mixing cases, we will enhance the strength of the password.
- *Mix letters and numbers and character* - adding numbers to passwords, especially when added to the middle (not just at the beginning or the end), can enhance password strength. Such as "ch1ck3n@@r1c3"
- *Pick a password we can remember* - the best password in the world does we little good if we cannot remember it. So use acronyms or other mnemonic devices to aid in memorizing passwords.

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2.2.3 Computer Virus Security Issue

A virus is a program or even just a small piece of computer code that loads itself onto computer without our knowledge or consent, and then executes instructions that can damage our files and even delete them. Viruses can use up the computer's memory, can prevent it from booting, and will spread to other computers via infected diskettes or through internet. [8]

Worms are viruses that spread over networks and the Internet, often by hiding within email attachments or already infected network directories. They can quickly replicate by exploiting commonly used programs such as email address books.

Trojans infect our computer by hiding inside otherwise innocuous programs such as games, or they can arrive via email. While they do not replicate as worms and viruses do, they can be just as destructive as viruses.

An irritating but less devastating cousin of viruses is the hoax. A hoax usually takes the form of an email that arrived form someone we know, warning us of a terrifying virus that is spreading, and then asks us to forward the email to others. While not destructive in themselves, hoaxes act like viruses and worms in that they spread rapidly and consume bandwidth. [9]

Every computer should be running some form of antivirus software. There are many antivirus software in existing market nowadays. Users should choose the antivirus software wisely. There are so many different ways to move information into a computer that it is impossible to guard every one. Instead, a centralized protection program running on each machine has to guard against virus intrusions.

Here are some basic steps to take for preventing our personal computer affected by viruses:

1. The first line of defense is to buy and install anti-virus software on computer. Viruses can so easily be spread when users open the files in some unknown diskettes. Just scan the diskettes by antivirus software before open it.
2. Configure the anti-virus software to clean infected files. If a virus is rapidly spreading, we should probably change that option to delete infected files on the computers for the duration of the crisis.
3. Update the Virus Definition Lists (called DATs) immediately and regularly thereafter. The hackers out there are always looking for new ways to cause trouble, so today's safe PC could be tomorrow's nightmare. Anti-virus software vendors regularly release updated lists of DATs. When choosing anti-virus software for our system, it is important to remember that not all vendors provide these DATs for free. Some companies charge a minimal fee to download them after our initial license period has expired. [8]
4. Update the anti-virus software immediately after installation with any service packs and patches, and keep it up to date. Some DATs do not work well with older anti-virus software.
5. Protect the computer against boot viruses by always changing the boot order in the computer's BIOS setup.
6. Ensure computers are less attractive to viruses by keeping them updated with appropriate operating system and application patches.
7. Protect networks by minimizing the number of network shares (directories on a server that have been made accessible to other computers on the network via a process called sharing) and then restricting access to only those who really need it. [8]

2.2.4 Vulnerabilities Security Issue

Vulnerabilities are security flaws or holes within a product through which hackers can infiltrate or attack a company's network or a personal computer. These holes can provide access to data, operating systems or other valuable areas within a corporate network.

Vulnerabilities can occur when a particular combination of your technologies do not work properly when used together. Vulnerabilities can also be the result of an oversight in software production by the manufacturer. Any vulnerability is potentially a target for intrusion or other malicious activity. The key is to patch, and to patch early, before intruders use details of the exploit to gain access to the system. When identifying vulnerabilities, it is important to make sure we do not overlook systems that are perceived as "less critical". Many intrusions are the result of entry through seemingly less critical, and as a result, less patched devices. Once access is gained, the intruder will use that as a springboard into more critical applications. Remember that anything that is exposed is mission critical. Without patching, computers are unprotected from some of the most common exploits. These and other threats spread swiftly, due in part to known vulnerabilities that went unpatched. [10]

Although there is much vulnerability in computer systems and networks today, the main vulnerabilities that are likely to cause harm are:

1. Default software installations
2. Ineffective use of authentication
3. Patches not applied
4. Too many open ports and services running
5. Not analyzing incoming packets
6. Backups not maintained and verified
7. Lack of protection against malicious code

If a system is occurred vulnerabilities and users ignore for that, the basic of attacks from intruder are included:

1. *Probes and scans* - attempts to gain access or discover information about remote computers.
2. *Account compromise* - discovery of user accounts and their passwords.
3. *Packet sniffing* - capturing data that is sent across a network; the data can contain sensitive information like passwords can be viewed by the sniffer.
4. *Denial of service* - flooding a network with requests that can overwhelm it and ultimately make a computer slow down or ultimately crash.
5. *Malicious code* - Trojan horses, worms, viruses.
6. *Spoofing* - making a computer look like a "trusted computer".

In order to keep computers up to date with patches, we should:

1. Create and maintain a list of all operating systems and applications used in the library.
2. If applications or operating systems do not have automatic updating features, discover sources of information about vulnerabilities and their patches or install a computer administrative tool to remind users update their patches.
3. Decide how we will monitor those sources. Many of them have mailing lists that we can subscribe to as well as websites.
4. If we receive an email notification of a problem or of a patch being available, be sure to evaluate it for applicability. For instance, the vulnerability may only exist if a certain application is installed. If we do not use that application, we do not need to apply the patch.
5. Decide when to install the patch.
    - Some patches are so vital that we should install immediately, even if it means interrupting service.
    - Other patches can wait until the computer is not busy.
6. Keep an archive of all patches and updates in a central, backed-up location.

2.2.5 Network Security Issue

There is no definitive blueprint for designing a secure network. Network security has to be custom tailored to fit the needs of network. Firewall is a system designed to prevent unauthorized access to or from a private network. A firewall is considered a first line of defense in protecting private information. Firewall will block all the packets when it just detects the incoming or outgoing suspicious packets. Normally firewall works with Intruder Detection System (IDS) together. When IDS detect some suspicious login or packets going in or sending out, even suspicious filename of an email, IDS will pop out an alert message to inform the computers' users. After that, users will do some configuration to block the suspicious activities in the computer.

Firewalls can be implemented in both hardware and software, or a combination of both. Firewalls are frequently used to prevent unauthorized Internet users from accessing private networks connected to the Internet, especially *intranets*. All messages entering or leaving the intranet pass through the firewall, which examines each message and blocks those that do not meet the specified security criteria. [13]

To prevent our personal computer from exposed to internet, we need to install and configure a basic firewall to our computer although we are not share our network with others. Firewalls are an essential part of network security. They are used to protect our internal network from external threats that can compromise our data, assets and resources and even our reputation. A firewall is usually deployed so that everyone entering or leaving our network must pass through it, rather like the drawbridge of a medieval castle surrounded by a moat. Like a drawbridge, a firewall is only as good as those who operate it. If a firewall is not set up properly it may let attackers scan our ports, service ports and even hacking in our system. Furthermore, as the citizens of ancient Troy discovered, attacks often come from within. But despite its limitations, a firewall is still the most effective way to protect a network which must be connected to the Internet. [12]

The firewalls usually used are Cisco PIX, Check Point NG, Symantec Firewall and etc. Basically, firewalls can be categorized into three types today which are software firewalls, hardware routers and wireless routers.

- *Software firewalls* – a good choice for single or personal computers. It works well with Windows 98, Windows ME, and Windows 2000. It is not necessary on Windows XP because XP has a built-in-firewall.
- *Hardware routers* – a good choice for home networks that will be connected to the internet. It usually has at least four network ports to connect other computers together.
- *Wireless routers* – if we are planning to use a wireless network, we will need a wireless router. Only a few wireless routers come equipped with a built-in-firewall. It allows to us connect computers, portable computers, personal desk assistants and printer without using wiring.

In addition, firewalls can perform the following functions depending on their type:

1. Route packets from the inside network to other networks, and vice versa.
2. Translate the IP addresses of an internal network to addresses the Internet recognizes.
3. Keep a record of network traffic that has passed through the firewall that can be used for other purposes.
4. Divide a network into segments according to differing security needs.
5. Protect the internal network from attack by external sources.
6. Prohibit access from the internal network to outside sources; in effect, forcing compliance with your organization's Acceptable Use Policy or Security Policy.

2.3 Current Market Security Applications Study

2.3.1 Microsoft Baseline Security Analyzer

Microsoft Baseline Security Analyzer (MBSA) is a free tool designed for checking/scanning Windows-based computers for common security misconfigurations and generates individual security reports for each computer that it scans. MBSA is free download software in internet.

MBSA suitable runs in such operating system like Windows Server 2003, Windows 2000, and Windows XP. MBSA can scans for security vulnerabilities on computers that run Windows NT 4.0, Windows 2000, Windows XP, and Windows Server 2003. MBSA scans for common security misconfigurations in Windows, Internet Information Services (IIS), SQL Server, Internet Explorer, and Microsoft Office. MBSA also scans for missing security updates in Windows, IIS, SQL Server, Internet Explorer, Windows Media Player, Exchange Server, Microsoft Data Access Components (MDAC), Microsoft XML (MSXML), Microsoft virtual machine (VM), Content Management Server, Commerce Server, BizTalk Server, Host Integration Server, and Office (local scans only).

MBSA can be executed via command line or graphical user interface. In either instance we can specify hostnames, IP address (including IP ranges), or domain names that we would like to scan. Output is presented on a per host basis via an html interface built into MBSA. Data is saved in XML format on the MBSA host machine. But the one of the disadvantages is we only can run local scans on computers that run Windows XP Home Edition or Windows XP Professional if the computer uses the simple file sharing model.

Here are some basic requirements to run the MBSA in a local computer:

- Windows Server 2003, Windows 2000, or Windows XP.
- Internet Explorer 5.01 or later.
- An XML parser is required for the tool to function correctly. Microsoft recommends that you use the most recent version of the MSXML parser. See the notes later in this article about how to obtain an XML parser

separately. On Windows 2000 systems that do not have MSXML 3.0 or later installed, Setup does not continue until the user installs the latest MSXML parser.

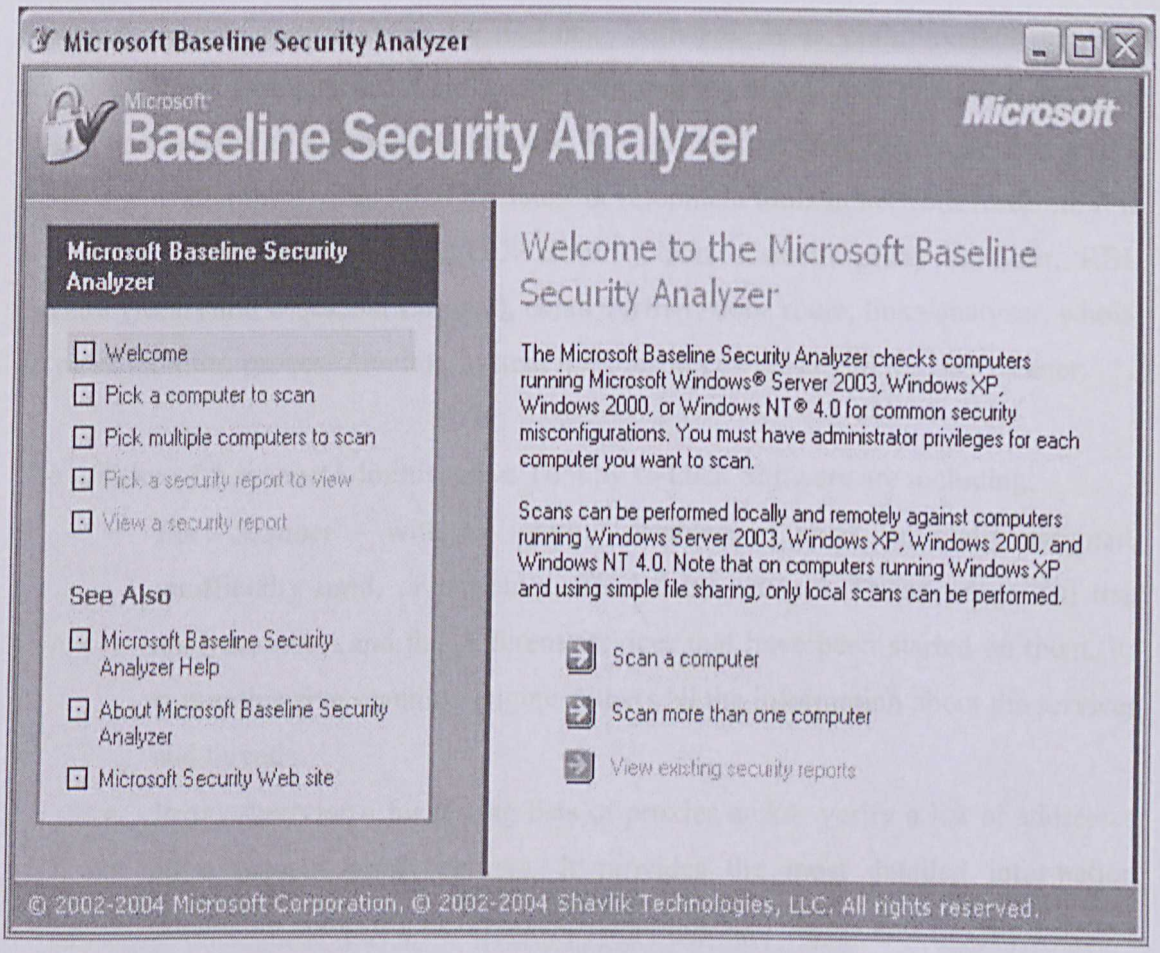
- The Workstation service and the Server service must be running.
- You must have the World Wide Web Service to perform local IIS administrative vulnerability checks.

The advantages of using the MBSA are the scanning parts on our system are optional. We can turn some of the scanning parts on or off before start scanning. The MBSA's interface is user-friendly interface. It is suitable for new computer users to run and configure it.

The scanning parts are included:

- *Windows operating system checks* – after checking the Windows operating system, the scanning report will be stored on the computer where the tool is installed in the %userprofile%\SecurityScans folder. Users must use Windows Explorer to rename or delete scans that are created by the tool in this folder.
- *IIS checks* – The IIS 6.0 Common Files are required on the local machine that is used to remotely scan an IIS 6.0 server. The IIS 6.0 Common Files can be used to also scan earlier versions of IIS machines (for example, IIS 5.0). However, the IIS 5.0 Common Files cannot be used to remotely connect to and scan a computer that is running IIS 6.0.
- *SQL checks* – the tool checks for vulnerabilities on each instance of SQL Server that it finds on the computer. It performs all the individual SQL checks on each instance.
- *Security update checks* – By default, a security update scan that we carry out from the MBSA GUI or from Mbsacli.exe scans and reports missing updates that Windows Update marks as critical security updates (also known as *baseline* critical security updates). All security-related security updates are scanned and reported on.

- *Password checks* – The password checks can add a lot of time to a scan, depending on the computer role and the number of user accounts on the computer. Additionally, attempts to check individual accounts for weak passwords can add Security log entries (logon or logoff events) if auditing is enabled on the computer. MBSA resets any account lockout policies that are detected on the computer so that no individual user accounts are locked out during the password check. This check is not performed on domain controllers.



MBSA's Primary Interface

2.3.2 Advance Administrative Tools by G-Lock Software

Nowadays, many users have completely ignoring network security. When we access to the Internet via a cable modem, DSL, or even a dial-up connection, intruders or hackers are always knocking on our virtual front door, giving our system the once-over. To protect our data, privacy and valuable computer system, we need an administrative tool. An administrative tool investigates and gathers information about our computer, network status, and service availability. It will give protection to our computer such as giving utilization of tools to check open ports, proxies, email lists, Internet applications, and general system information.

Advance Administrative Tool by G-Lock Software is a multithreaded network diagnostic tool. It investigates and gathers information about your computer, network status, and service availability. Its purpose is to accumulate data pertaining to network status and availability, using all of the latest development tools in network research. It is a 12-in-1 utility, including TCP/UDP security port scanner, proxy analyzer, RBL Locator (RealTime BlackList Locator), email verifier, trace route, links analyzer, whois, network monitor, process monitor, system info, resource viewer and registry cleaner.

The utilities of Advance Administrative Tool by G-Lock Software are including:

- *Port Scanner* – with an internal database of ports (officially assigned, unofficially used, or currently affected by network Trojan programs) that analyzes hosts and the different services that have been started on them. Its comprehensive scanning engine gathers all the information about the services and threads.
- *Proxy Analyzer* – for testing lists of proxies and/or verify a list of addresses on a present proxy servers. It provides the most detailed information obtainable about the proxy itself, including, its headers and locations. It is a fully loaded tool for managing proxy lists (with anonymous proxy rating).
- *RBL Locator* – is a special tool, designed to quickly search for an IP address in DNS-Based spam databases. RBL Locator checks a given IP address

against the most known blacklists. It will help us to determine if we are listed as a "bad actor" on any of the shared blacklists.

- *Email Verifier* – is unique solution for the "message delivery error". We do not need to disturb our clients and friends anymore to verify whether or not their e-mail addresses are still valid. Email Verifier connects directly to their SMTP server and checks it for us. Nothing is sent to the recipient, while their SMTP address is verified.
- *Trace Route* – shows the path a packet sent from our machine to some other machines on the network takes as it hops from router to router. It will show the IP address and the actual name of each router, line-by-line.
- *Links Analyzer* – a new state-of-the-art utility that scans all URLs and IE Favorites and notifies when any link has been changed or has become invalid. It also doubles as a navigation tool and makes it very easy to find what we are looking for eliminating the need to search inside folders.
- *Network Monitor* – shows an extremely large amount of supplementary information about the outbound and inbound network connections, additionally, Advance Administrative Tool Network Monitor maps open ports to the owning application (for Windows NT/2000/XP only). Network Monitor is useful in diagnosing networks and monitoring computer's network connections.
- *Process Monitor* – if we want to get a small bit of information on the processes and applications loaded into personal computer's memory, including sniffers and hooks, look carefully in Administrative Tool Network Process Monitor.
- *Whois* – a useful network information utility that allows us to find out all the available information about IP addresses, host names, location, NSP name, administrator and technical support contact information of any Internet address.
- *System Information* – collects and displays system configuration information. Support technicians require specific information about computer when they

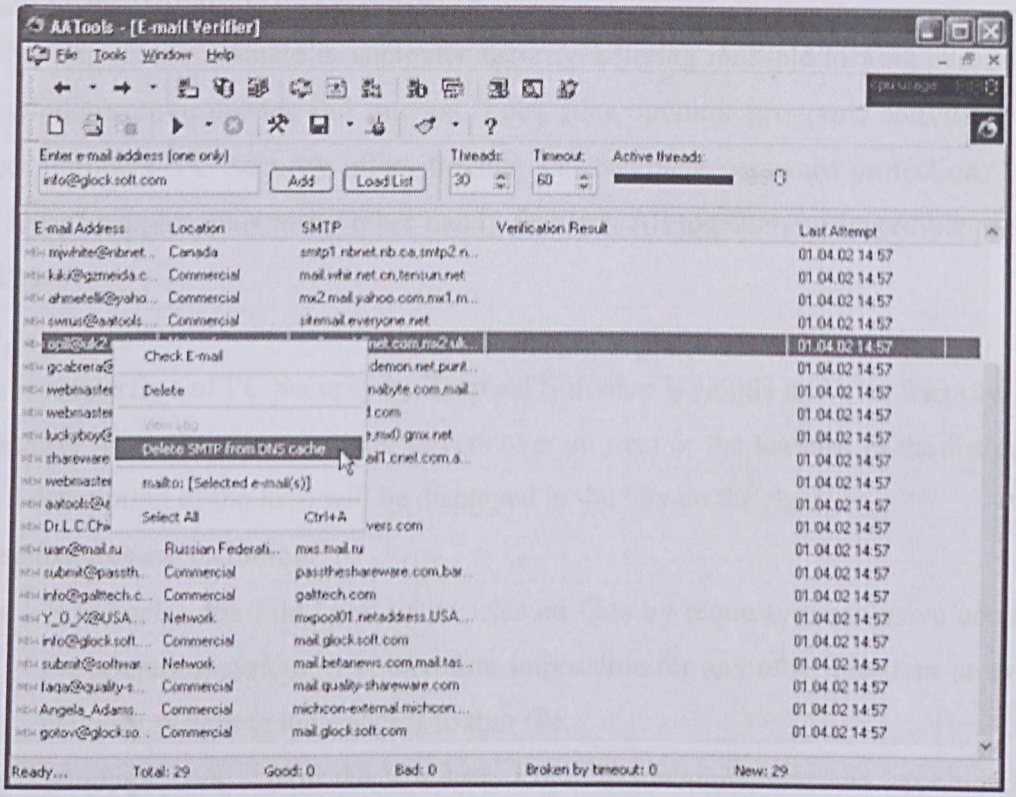
are troubleshooting our configuration. We can use System Information to quickly find the data they need to resolve our system problem.

- *Resource Viewer* – is intended for viewing of resources of executable files (with the extension .exe and .dll). It is displays comprehensive information about program resources including dialogs, icons, strings and more. Resource Viewer can also be used to save resources of any selected modules on the hard disk.
- *Registry Cleaner* – is designed to clean up unnecessary registry entries in registry. The use of Registry Cleaner increases computer's performance speeds up the loading of operation system and reduces the number of failures.

Besides protecting our data, privacy and valuable computer system, we need to protect our network too. To secure our network, we need to lock down applications that are not required by any function we currently use. To do this effectively, we need to know what ports are available and what application is utilizing them. So, that is the reason we need to install Advance Administrative Tools which is created by G-Lock Software. We can know which active ports are using in our system through Advance Administrative Tool. Advance Administrative Tool's interface will display the services that are active on all ports and it will also map the ports in use to the respective applications (this feature is available under Windows NT/2000/XP) providing a simple and easy solution to tracking application to port maps. This mapping is extremely useful while monitoring unwanted connections, investigating suspected trojans, viruses, and possible backdoors intrusions.

These are the features of Advance Administrative Tool:

- Multithread, providing users high performance on checking.
- Every scanner can obtain information from a single host, or from all hosts in range IP addresses as well as work with list of hosts and IP addresses.
- All information shown by program may be saved to *.txt files.
- Highly intuitive interface provides easy operation for users



Advance Administrative Tool's interface

Finally, Advance Administrative Tool provides a range of utilities that can help us troubleshoot our systems, improve network security and optimize internet communications.

2.3.3 PC Security by Tropical Software

PC Security is the ultimate in computer security, offering multiple locking systems for the windows environment and internet. Lock files, monitor programs activities, even detect intruders. PC Security offers flexible and complete password protection, "Drag and Drop" support, plus many other handy features. All together, an incredible security package.

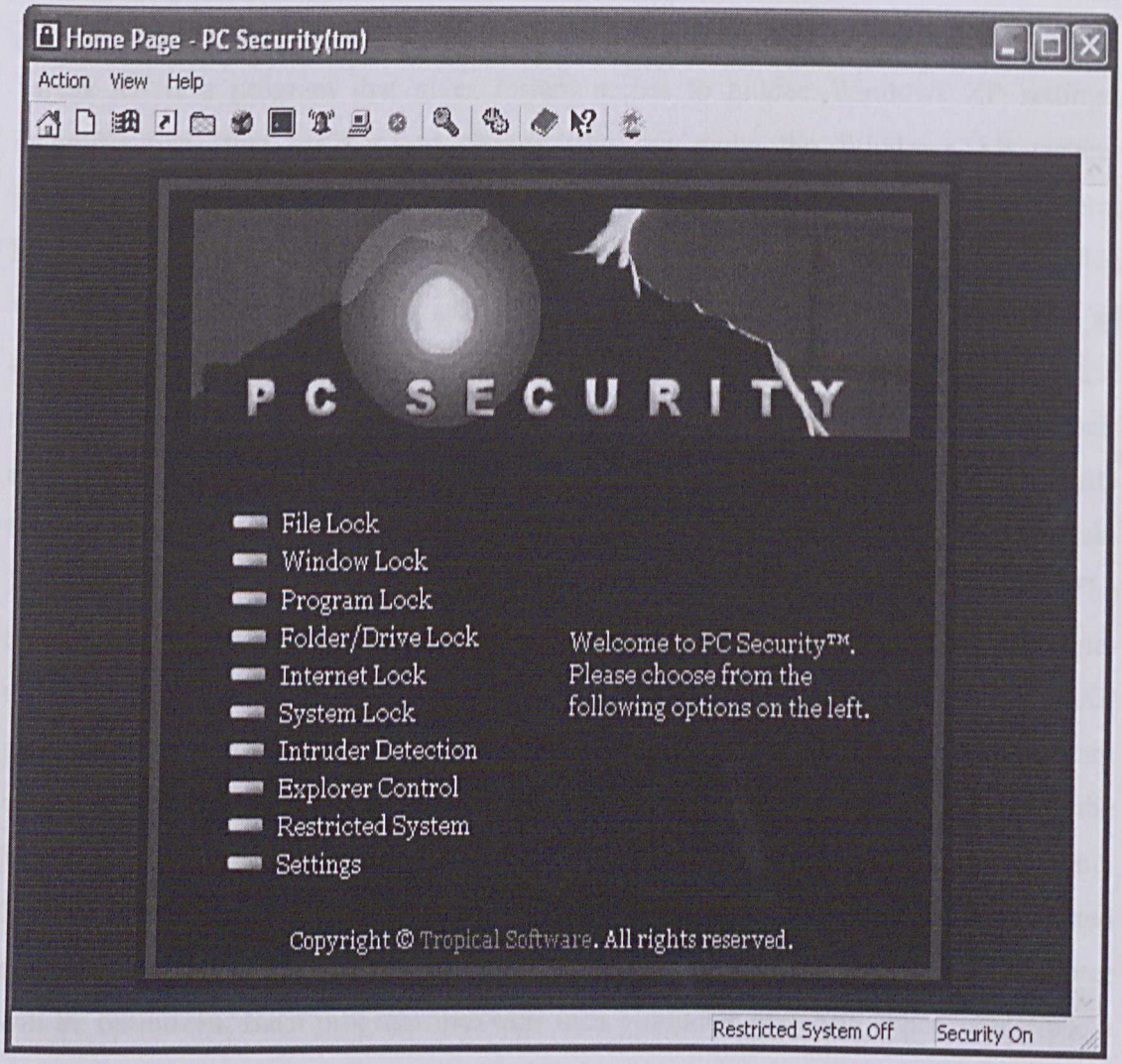
The user interface of PC Security by Tropical Software is simple and user friendly. This is because when the mouse pointer hovers over an item or the features in the list on the left, a description of the item will be displayed in the box on the right.

Those features are including:

- *File Lock* – the File Lock locks selected files by requesting exclusive use from the operating system. It is therefore impossible for any other program or even a network system to have access to that file.
- *Windows Lock* – with the Windows Lock, the administrator can have windows close, disable, prompt for a password, or disappear by giving PC Security "Titles Patterns". A Title Pattern is just a words or group of words set with an action. Once a Title Pattern is set, any window that opens with that pattern in it is title will be subject to the defined action. These affected windows will then be listed in the "Windows Titles Found" list (except those set to "Always Close").
- *Shortcut/Program Lock* – locks selected programs by requesting exclusive use from the operating system. It is therefore impossible for anyone else to access the program even on a network system.
- *Folder Lock* – locks selected drives and folders. It is therefore impossible for any other program or even a network system to have access to the drives and folders and their contents.
- *Internet Lock* – provides various ways of controlling Internet access. Once activated every program accessing the Internet causes PC Security to pop up a screen with information of what program is trying to access the internet and whether the program is acting as a server or a client. Internet connection can be password protected on a program to program basis allowing the user to choose

which programs always access the Internet, never access the Internet, always asking before accessing the Internet or requiring a password for accessing the Internet.

- *System Lock* – allows the user to select the times in which the computer should be locked. The times must be used in two or more blocks (begin and end), and all consecutive times must be selected as well. The System Lock locks the entire computer. No mouse or keyboard entry will be accepted until the right password is entered.
- *Intruder Detection* – when someone types a specified number of wrong passwords, the Intruder Detection takes control and triggers the following:
    1. Alarm
    2. Desktop Lock
    3. Warning Message
    4. Encrypt specified folders and files (needs Private Encryptor)
    5. Shred specified folders and files (needs Private Encryptor)
- *Explorer Control* – a powerful desktop management tool that can limit the access of unauthorized users. It works by locking various functions of the Desktop, Start Button, Control Panel and Printers. When used in combination with the Restricted System, allows for powerful protection against accidental and malicious damage when the computer is in a public place or in the hands of children.
- *Restricted System* – allows for setting the system to be safe to use in a public setting. With this screen you can limit the programs that will run in the system by placing them in the Permitted Programs list. When active, only the programs in the Permitted Programs list are allowed to run in the machine.
- *Context Menu* – With the Explorer Control Menu, we can lock, unlock and even unlock and launch files, folders and programs right from the Windows Explorer, the Desktop and the Start Menu. [14]



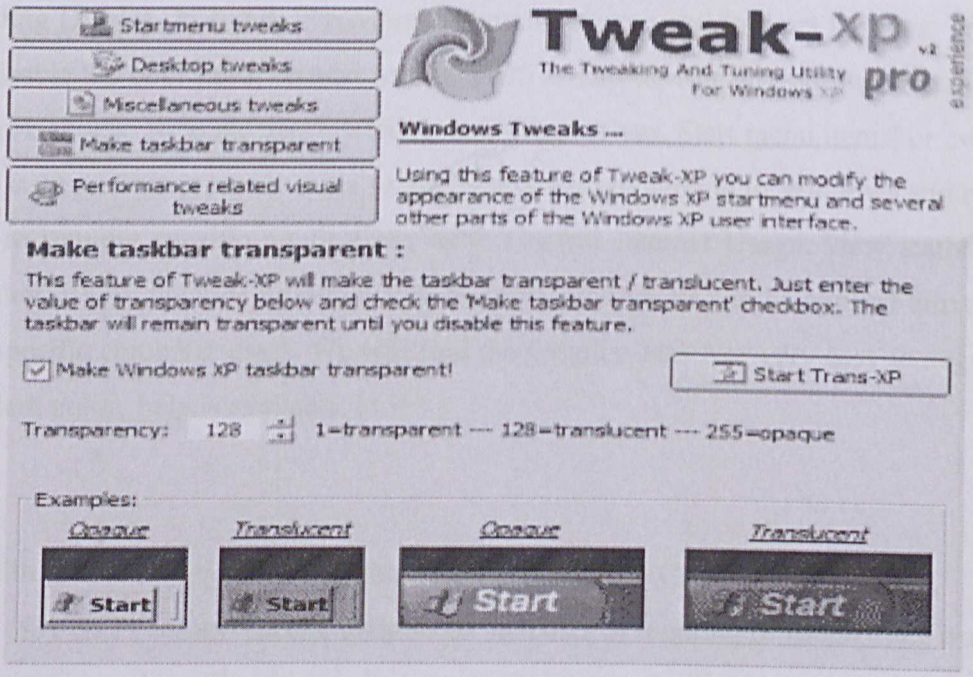
PC Security's interface

2.3.4 Tweak XP by Total-Idea Software

Tweak-XP is a program that gives instant access to hidden Windows XP settings, including ones that are hard to change. We can make the Windows XP taskbar transparent, tweak lots of desktop settings, customize the Start menu, and enable several hidden performance options. Blocking banner ads and internet explorer Pop-Up Windows will increases internet surfing speed. Tweak-XP has a pre-defined list of ad and pop-up servers whose banners and pop-ups simply would not be loaded when running Internet Explorer. Tweak-XP checks the integrity of ZIP files, and repair damaged archives while Windows XP includes the ability to perform simple ZIP file functions. We can even convert simple ZIP archives into auto-extracting files. Tweak-XP includes hardware tweaks for the most popular CPU's and display adaptors. The System Optimization Wizard will automatically inspect computer's hardware, and fine-tune the Windows XP settings so that processing speed will be optimized. Tweak-XP gives control over what programs are launched when starting computer. The program will give users access to programs that are launched because of obscure entries in the Windows XP Registry for letting users easily manage the programs in the Start menu. Tweak-XP lets users remove those annoying programs that users have never wanted running in the background. With a single mouse click, physical memory in computer will be optimized. Each program that runs uses computer memory. When user close a program, often it leaves code fragments in memory and, over time, Windows session runs slower and slower. The system will run more quickly and efficiently after Tweak-XP clean out the leftovers. Tweak-XP will optimize internet connection speed. Its built-in table of the most popular Internet Service Providers' configurations contains information that increasing throughput, whether using a dial-up connection or a faster broadband connection.

Besides that, Tweak-XP bundles 37 different utilities into one. It was developed to combine both tweaking and optimizing features to increase the speed of Windows XP system. All settings can be done without the need for any technical knowledge, since Tweak-XP informs the user in detail about each option. Features include desktop tweaking, Internet Explorer tweaking, connection speed optimization, virtual desktops,

Outlook tweaks, hardware tweaks, cache optimization and much more. Tweak-XP also allows creating a RAM drive and virtual drives. Additional utilities include a secure file shredder, password generator, zip file repair tool, folder protection, registry cleaner and others. [15]



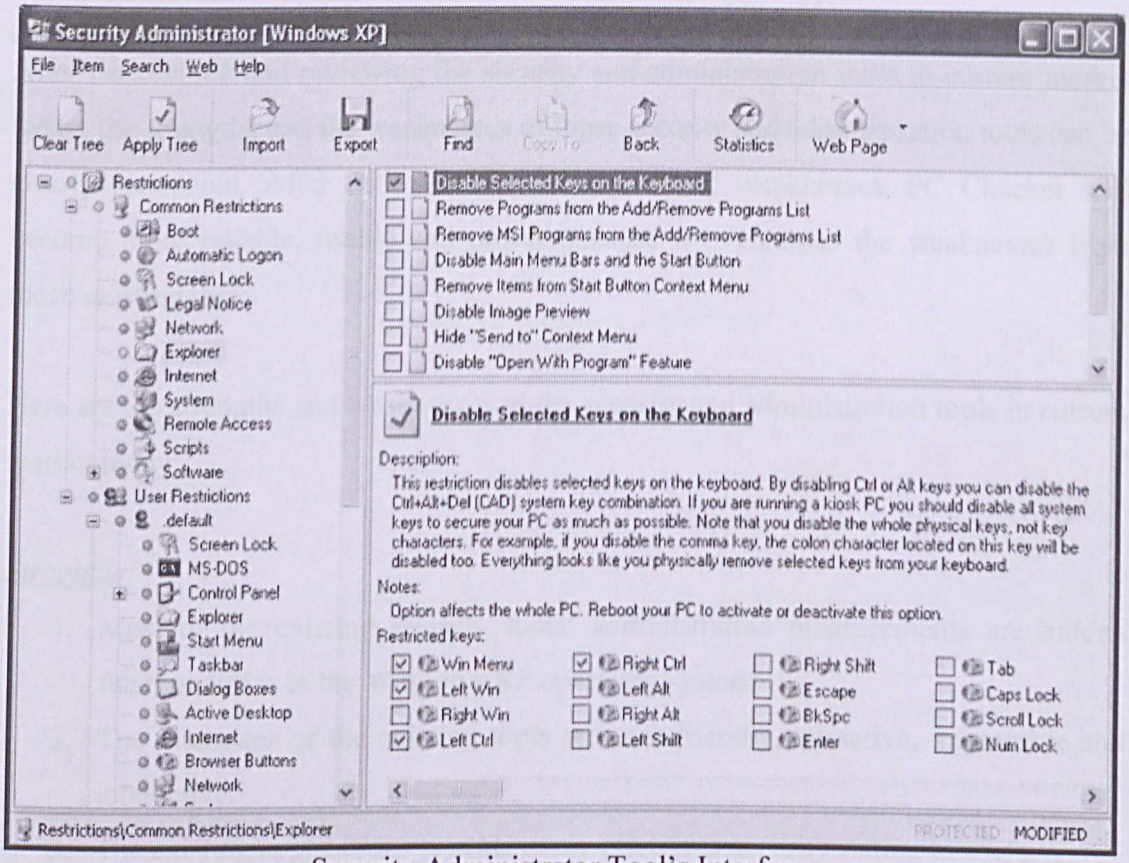
Tweak-XP's Interface

2.3.5 Security Administrator Tool by Ixis Research

Security Administrator Tool is a program that protecting computer and restricting access to internet. This nice password-protected security utility enables us to impose a variety of access restrictions to protect privacy and stop others from tampering with computer. It can deny access to each individual component of several Control Panel applets, including Display, Network, Passwords, Printers, System and Internet Options. We also can disable the boot keys, context menus, DOS windows, Registry editing, Internet and Network access. Hide the desktop icons, individual drives, Start menu items, or even the entire taskbar. This program can also apply password protection to Windows and restrict users to running specific applications only, Control Internet Usage, view statistics of computer use by the kids or employees. Security restrictions can be applied universally or to specific computer users. We will find the program interface very easy to negotiate. Excellent online help is available. [15]

The utilities of Security Administrator Tool by Ixis Research are including:

- *Spy on PC users* – accumulate some statistics of working of users. Each user has its own log file where its statistics is saved. The program accumulates information about each user session, namely starting time, completion time, and applications, which a user was using.
- *Lock personal computer with password* – the password will be applied to all PC users, so all users will use this password to get through the built-in screen-lock every time desktop is locked with the built-in screen-lock. If users want to use different passwords for different PC users, set up individual passwords for each user listed in the tree.
- *Restriction between users in the tree* - copy all restrictions to other users, just select a root user item in the tree then click the right mouse button and select the item CopyTo from the context menu. The dialog box with the user list will appear on the screen, and all we need is to check all users, which will accept restrictions of the selected user.



Security Administrator Tool's Interface

2.4 Strengths and Weaknesses

After researching and reviewing the security and administration tools in current market today, the strengths and the weaknesses of those security and administration tools can be clearly stated out. After listing out the strengths and weaknesses, PC Checker will become more reliable, usable and power because it overcomes the weaknesses from those existing tools.

Here are the strengths and weaknesses of the security and administration tools in current market today:

Strengths

1. Most of the existing security tools' administration measurements are hidden functionalities in the Windows XP operating system.
2. The interfaces of the existing tools are user-friendly, attractive, impressive and interactive.
3. The existing applications provide many effectives security setting to users.
4. The security checking is almost done in perfectly in all existing tools.

Weaknesses

1. First of all, most of the existing security tools in the market are commercial software or shareware.
2. The authentication is not too strict in the application when other users try to alter or edit the setting of computer.
3. It is a single user support profile in multiple support operating systems.
4. Most of them are only can install in one operating system. Such as MBSA only can install in Windows but can not be installed in UNIX or Linux.
5. It can be uninstalled through add/remove program in Control Panel.
6. Most of the security tools use much computer jargons. It will make difficulties for the new computer users on using it.

7. The encryption technique is not used in the installed files and folders on operating system. This will give opportunity to others to edit or delete the folders and files.

2.5 Similarities and Differences

Nowadays, most of the security and administration tools in the current market are similar with each others. Only the user interfaces are designed differently. So, I will list down the similarities and differences between PC Checker and the current security tools.

Similarities

1. PC Checker is designed almost similar with others security tools in current market such as checking for file system type on hard drives, unnecessary services are running, and processes are running either in a local computer or remote computer.
2. A user friendly interface will be designed on PC Checker application.
3. Only can be installed in one operating system.
4. It designed to scan a personal computer and in a network environment host.

Differences

1. When user needs to run the PC Checker application, he or she need to key in password to log in.
2. PC Checker will minimize the computer jargons to make conveniences to the beginning users.
3. The most important is PC Checker is free software.
4. Users can only uninstall the PC Checker inside the application.

2.6 Application Development Tool Study

The reviewing of application development tools in existing current market will be done in this topic. The application development tool can be divided into two parts, one is operating system platform and another is programming language.

Before choosing the most suitable development tools to develop PC Checker application, researching will be done in these development tools in the current market.

2.6.1 Application Operating System Platform

Microsoft Windows

Windows is a graphical windowing operating system created by Microsoft in the early 1980s. Microsoft Windows is a family of operating system for personal computer. This operating system is made for the new computer users or even who have never used a computer before. Windows is categorized in many versions such as Windows 95, 98, 2000, NT, ME and the latest version is Windows XP.

Windows XP will be the mainly focused in this topic because it is user friendly. It guides new users everything and then restricts the extent to which users can user any program. Besides user friendly interface, Windows XP also has many advantages in stability, performance and usability.

Windows XP is the version of the Microsoft Windows operating system that follows Microsoft Windows 2000 and Microsoft Windows Me and replaces both. Windows XP is based on the Windows 2000 code base and inherits that operating system's reliability and performance. Windows XP also inherits and enhances the new features of the Windows Me operating system: system restores, Windows Media Player, Windows image acquisition, and so forth. [16]

Basically, Windows XP is the operating system that created based on Windows 2000 but it is better than Windows 2000 because it built on the strengths of Windows 2000. Windows XP has two editions: Home Edition and Professional Edition.

Professional Edition is for the users who involve in businesses because it offer the functionality needed for companies and other businesses.

Home Edition is for the users who just use in consumer way. It is evaluated from Windows ME by enhancing some features like support for digital media and the new computer sharing capabilities of fast user switching.

Advantages

- User friendly interface.
- Better performance on many systems.
- Easier and more capable networking.
- Integrated CD-R/RW playback and burn features.
- Remote assistance tool aids troubleshooting and control of remote PCs.

Disadvantages

- Users just can install Windows XP in one PC only.
- The license of Windows XP is expansive for private users.
- Nags users to sign up for Passport Web account
- Heavy system requirements

Linux

Linux is an operating system which is similar UNIX operating system but not identical. Linux is designed to provide personal computer users a free and very low cost operating system if compare with the traditional operating system such as Microsoft Windows, Sun Solaris, IBM AIX and etc.

Linux is a remarkably complete operating system, including a graphical user interface, an X Window System, TCP/IP, the Emacs editor, and other components usually found in a comprehensive UNIX system. Although copyrights are held by various creators of Linux's components, Linux is distributed using the Free Software Foundation's copy left stipulations that mean any modified version that is redistributed must in turn be freely available. [18]

Besides that, Linux is contributed publicly open and extendible. It is because it conforms to the Portable Operating System Interface standard user and programming interfaces, developers can write programs that can be ported to other operating systems. The availability for Linux is one of the advantages because it suitable for most of the major microprocessor platform such as Alpha, Intel, PowerPC and Sparc. According on the availability and free, more and more companies today are using Linux as main operating system.

Linux is sometimes suggested as a possible publicly-developed alternative to the desktop predominance of Microsoft Windows. Although Linux is popular among users already familiar with UNIX, it remains far behind Windows in numbers of users. However, its use in the business enterprise is growing. [18]

Here are the advantages of using Linux today:

- Free downloading
- Much less problem like crashing of an application to bring down the operating system. It considers is a stable operating system nowadays.
- Extremely powerful

- Linux servers are often up for hundreds of days compared with the regular reboots required with a Windows system. It is more reliable than other operating systems.
- C, C++, Fortran compilers, toolkits such as Qt and scripting languages such as Perl are come with Linux's development environment.
- Networking facilities are excellent. Linux has built in network facilities like share CPU; modems which these facilities are not available in Windows 95.
- Easily upgrade and maintaining.
- Supports multiple processors.

Disadvantages of using Linux:

- Hard to learn by the new computer users.
- Not user friendly.
- Some hardware is created specifically for Windows but not for Linux.
- Hardware drivers are sometimes hard to obtain.

UNIX

UNIX is an operating system that can run in multiprocessing. It was created by AT&T Bell Laboratories in late 1960s. UNIX has been created for orchestrating the various parts of the computer such as processor, on-board memory, disk drives, keyboards, monitor and etc to perform useful tasks. It is an operating system kernel that will run on just any hardware. Some simple utilities like copies files, complex utilities like shell that allows users to issue command to the operating system.

The kernel is the core of the UNIX operating system. Basically, the kernel is a large program that is loaded into memory when the machine is turned on, and it controls the allocation of hardware resources from that point forward. The kernel knows what hardware resources are available (like the processor(s), the on-board memory, the disk drives, network interfaces, etc.), and it has the necessary programs to talk to all the devices connected to it. [19]

Here are some reasons why users use UNIX as their operating system:

- UNIX is free downloading software.
- It provides excellent programming environment. C, C++, Fortran and Java compilers along with development tools are available for free in UNIX.
- Many free applications are built-in in UNIX operating system.
- Web server, FTP server and file server are available for free in UNIX.
- Multiple users can simultaneously use a single computer running UNIX. Different users can even access the same file at the same time!
- Running UNIX just need a low powerful computer.

But everything also has their disadvantages behind their benefit:

- UNIX is hard to install.
- It hard to learn by the new users.
- UNIX not a user friendly operating system.
- It harder to maintain and upgrade than other operating systems.
- Many home used applications could not run under UNIX.

2.6.2 Application Programming Language

Visual Basic Programming Language

Visual Basic Programming Language is a programming language that developed by Microsoft. It is a very controversial language because it was developed based on Basic computer language and was expanded upon to allow the easy programming of windows applications. Visual Basic was designed to be a simple, provides a graphical programming environment and a paint metaphor for developing user interfaces and many features found in traditional languages.

All versions of VB allow the user to not worry about the intricate details of the actual windows allowing the programmer to concentrate on actually writing novel or new code that made the software you were writing different. As user will probably have noticed most software windows look the same (with minimize, close button etc), VB allows user to forget about programming these buttons and just used standardized code. VB allows the programmer to work in a "visual workshop" where the programmer can drag and drop different window elements into their programs before defining their meaning with the aid of a few drop down boxes. [19]

Here are some disadvantages for Visual Basic today:

- Visual Basic is an interpreted language which again slows the execution of user program down.
- Large libraries are required for the Visual Basic program to enable they work on PC. It needs a lot of memory.
- Visual Basic does not allow many modern techniques like Object Oriented programming.
- Programmers hard to troubleshoot when a bug arises.
- Visual Basic is not portable and can not be used on non-Windows systems.

Visual Basic .NET Programming Language

Visual Basic .NET (VB .Net) programming language is a migration programming language of Visual Basic (VB). Basically, we also can say that VB .Net is evaluated from VB programming language. After evolution, VB .NET framework will have great impact on almost all Microsoft technology developers. Under the .NET framework, VB.NET applications are packaged as self-contained, self-describing, versioned assemblies. People who have been working with Visual Basic will feel more impact as .NET changes the way Visual Basic used to work.

The most obvious are desktop applications can be much more easily converted to Web Based applications using the Web Forms paradigm of .NET made available through VB.NET.

XML Web Services creation and integration as facilitated by the .NET platform are readily available through VB.NET. This makes the creation of hosted applications easier, thereby providing wider access to proprietary intellectual property. XML and web services also enable Enterprise Application Integration through standard methodologies as available through the Microsoft family of .NET servers. [19]

Visual Basic .NET advantages are:

- VB .Net is totally object oriented.
- It supports for named indexers.
- It has various legacy VB functions.
- Easier coding because of the existence of the .NET Framework Class Library.
- More powerful without C++.
- Language interoperability.

There are only two disadvantages since VB .Net is published:

- Performance – VB .NET framework is obviously going to affect performance because it will put extra overhead on.

- Learning curve – users can not write VB .Net coding unless they learn either one technique like C#, C++ or MC++.

Windows Management Instrumentation (WMI)

Windows Management Instrumentation (WMI) is a component of the Microsoft Windows operating system and is the Microsoft implementation of Web-Based Enterprise Management (WBEM), which is an industry initiative to develop a standard technology for accessing management information in an enterprise environment. WMI uses the Common Information Model (CIM) industry standard to represent systems, applications, networks, devices, and other managed components. You can use WMI to automate administrative tasks in an enterprise environment.

WMI can be used in all Windows-based applications, and is most useful in enterprise applications. System administrators can find information about using WMI on TechNet, and in various books about WMI.
WMI is designed for programmers who use C/C++, the Microsoft Visual Basic® application, or a scripting language that has an engine on Windows and handles Microsoft ActiveX objects. C++ or C# developers need some familiarity with COM programming. To develop managed code providers using the .NET Framework.

Java Programming Language

Java programming language is a completely object oriented language that developed by Sun Microsystems. It is a high-level programming language. It is created based on first version of C++. It is most likely the same with C++ but explicitly leaves out features of C and C++ that are confusing or unreliable.

Java is compiled into a special machine code that is then interpreted. Java code does not perform as fast as C++. The interpreter however protects the machine on which it is running from errors that can break operating systems in C++. Further the same (compiled) code can run on many different systems: Compile-Once-Run-Anywhere. So a Java program can be transmitted across a network to a machine of a different type,

with a different operating system, and different graphic user interface. There it will run safely and securely (in theory) and look-and-feel as if it was programmed for that system. Doing this with C++ is extremely expensive. [18]

A format file called bytecode which complies Java source code file, can execute in Java interpreter. This complied Java code can run on most computers because Java interpreters and runtime environments, existing for most operating systems such as Windows, UNIX and Macintosh.

Here are some advantages for Java programming language:

- Java is simple if compare with other object oriented programming languages because it has replaced the complexity of multiple inheritances in C++ with a simple structure called interface.
- It is distributed because it makes distributed computing easy with the networking capability that is inherently integrated into it.
- It is portability because it is independent for any platform.
- It is reliability because Java provides multiple levels of reliability measures.
- Besides that, Java also is a object oriented, robust, secure, architecture neutral, high performance and dynamic programming language.

But sometimes Java also will face some problems like:

- Single implementation inheritance.
- Single argument method dispatch.
- Primitive types distinct from objects.
- Casting required.
- No extensible syntax.
- Poor iteration or collection integration.

2.7 Summary

This chapter discuss about the existing security application in current market, application development tools such as operating system platform and application programming languages. Besides that, the strengths and weaknesses of the current market tools will be discussed on this chapter too. The similarities and differences between PC Checker and current market security tools also would be listed in literature review. After gathered the useful and resourceful information, I can determine which development tools will more suitable before going further to develop PC Checker.

Chapter 3 – Methodology

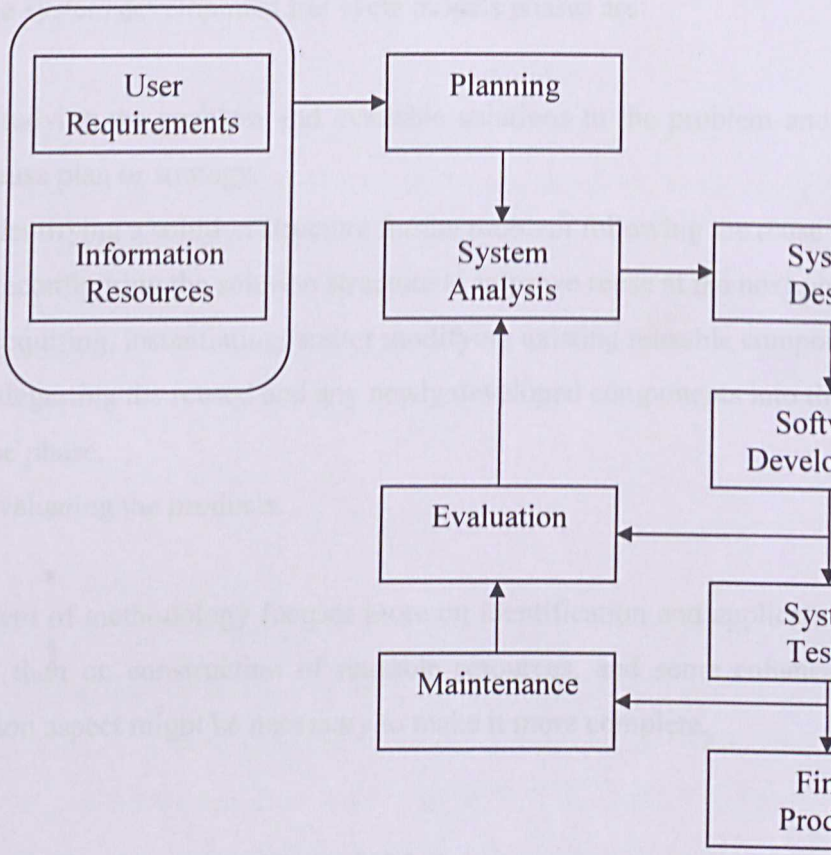
3.1 Introduction to Methodology

This chapter will be discussing and reviewing in the methodology of software development life cycle models. Besides of the methodology, few types of system development models will be detailed discuss here.

Methodology is a body of practices, procedures and rules that used by the developer who work in a discipline or engage in an inquiry or a set of working methods. When applied to the craft of software development, the key words in this generic definition of methodology are "procedures" and "discipline". When defining a software development methodology, developer needs to focus first on developing the process and documenting the procedures necessary to successfully complete a software development cycle.

When once developer understands a process of developing the software, many parts of the process can be automated settled. From many of the software development life cycle models, developer needs to analysis which model should be used to develop the software because different system of methods and rules need a different software development life cycle model.

Basically, there is no method that perfectly suits the needs of a system development project. So normally then basic phases that we need to apply in the software development are listed at below:



Process Development Modeling

3.2 Concept of Methodology

The concept of methodology is based on the system development life cycle models which each phase to identify reuse activities. The reuse activities that are common across the system development life cycle models phases are:

1. Studying the problem and available solutions to the problem and developing a reuse plan or strategy.
2. Identifying a solution structure for the problem following the reuse plan.
3. Reconfiguring the solution structure to improve reuse at the next phase.
4. Acquiring, instantiating, and/or modifying existing reusable components.
5. Integrating the reused and any newly developed components into the products for the phase.
6. Evaluating the products.

The concept of methodology focuses more on identification and application of reusable resources than on construction of reusable resources, and some enhancements in the construction aspect might be necessary to make it more complete.

3.3 Software Development Life Cycle Models

This section will discuss few types of software development life cycle models and also reviewing the most commonly used process models in developing software. Software development also known as a process that to ensure the product software develops in successive way. Basically, the process includes some phases are planning, preparation of requirements and objectives, business and system analysis, logical/physical and coding design, implementation and maintenance.

Typically, the phases of software development are:

1. Identified the software requirements
2. Software requirements analysis
3. System analysis and software design
4. coding design (programming)

5. Testing
6. Maintenance

Identify the software requirements

The first step is to identify the software requirements before starting the system development. The analyst in charge of system planning will collect first constructs a mental model of the requirements and problems that may be faced. Then, the analyst generally divides the system up into:

- the PEOPLE who are affected
- what DATA will be collected
- the ACTIVITIES to be performed
- the NETWORKS

Software requirements analysis

After that, in the software requirements analysis phase, customer side will be visited by the development team. The development team studies their system and investigates the need for possible software automation in the given system. After feasibility studying their system, a document that holds the different specific recommendations will furnished by the development team. It includes the personnel assignments, costs, project schedule and target dates.

System analysis and software design

The traditional step of building a software application is system analysis. According to this phase, the overall structure of the software is defined. System analysis and software design are very crucial in the whole development cycle. Any glitch in the design phase could be very expensive to solve in the later stage of the software development.

Coding design (programming)

This is the most difficult part of the whole system development. The system design must be translated into a machine-readable form. So the different high level programming languages are used for coding and the codes have to be generated by the compiler,

interpreter and debuggers in such programming tools. The most commonly programming languages used today are C, C++, C#, Java and Pascal.

Testing

The step following is testing for the codes. The program testing started when the code just generated. Different testing methodologies are available to unravel the bugs that were committed during the previous phases. Different testing tools and methodologies are already available.

Maintenance

When the software delivery to the customer side, the software definitely undergo change. This is because some unexpected input values could make the change happened. The changes in the system could directly affect the software operations.

Before the software is going to be developed, developer might determine which system development model should be used. There are several system development life cycle models are commonly used today.

The below are some briefly description of system development life cycle models:

- *Rapid Application Development (RAD)* – a model based on the concept that better products can be developed more quickly by using workshops or focus groups to gather system requirements, prototyping and reiterative testing of designs, rigid adherence to schedule and less formality of team communications.
- *Prototyping* – a prototype (an early approximation of a final system or product) is built and tested in this model. Then it is reworked as necessary until an acceptable prototype is finally achieved from which the complete system or product can now be developed.
- *Waterfall* – is a classical SDLC model with a linear and sequential method that has goals for each development phase. The waterfall model simplifies task scheduling, because there are no iterative or overlapping steps. One drawback of the waterfall is that it does not allow for much revision.

- *Joint Application* Development (JAD) – a model involves the client or end user in the design and development of an application, through a series of collaborative workshops called *JAD sessions.*
- *Spiral* – this model of development combines the features of the prototyping model and the waterfall model. The spiral model is favored for large, expensive, and complicated projects.
- *Synchronize and Stabilize* – a model involves teams working in parallel on individual application modules, frequently synchronizing their code with that of other teams and stabilizing code frequently throughout the development process.

3.3.1 Rapid Application Development (RAD)

Nowadays, in response to the faster pace of economy, rapid application development has become a popular route for accelerating systems development. Rapid application development (RAD) techniques emphasize extensive user involvement in the rapid and evolutionary construction of working prototypes of a system to accelerate the system development process. RAD is sometimes called a spiral approach because repeatedly spiral through the phases to construct a system in various degrees of completeness and complexity.

The basic concepts of RAD are:

1. To more actively involve system users in the analysis, design and construction activities.
2. To organize systems development into a series of focus, intense workshops jointly involving system owners, users, analysts, designers and builders.
3. To accelerate the requirements analysis and design phases through an iterative construction approach.
4. To reduce the amount of time until the users begin to see a working system.

RAD depends upon continuous, high quality, production. The optimal is a team of users, acquirers and developers who can communicate effectively and successfully develop

their products without schedule delays or cost over runs. The core of the team should be full participants in project planning.

RAD uses prototype to accelerate requirements analysis and system design. A prototype is a smaller-scale, representative or working model of the users' requirements or a proposed design for an information system. The reasons of using RAD are:

- To converge early toward a design acceptable to the customer and feasible for the developers.
- To limit a project's exposure to the forces of change.
- To save development time, possibly at the expense of economy or product quality.

The basic principle behind prototyping is that users know what they want when they see it working. In RAD, a prototype eventually evolves into the final information system. The following are the principle of RAD:

1. In certain situations, a usable 80% solution can be produced in 20% of the time that would have been required to produce a total solution.
2. In certain situations, the business requirement for a system can be fully satisfied even if some of its operation requirements are not satisfied.
3. In certain situations, the acceptability of a system can be assessed against the agreed minimum useful set of requirements rather than all requirements.

Besides that, we also should consider the problems that addressed by RAD today are with conventional methods, there is a long delay before the customer gets to see any results, development can take so long that the customer's business has fundamentally changed by the time of system is ready for use and there is nothing until 100% of the process is finished, then 100% of the software is delivered.

The RAD approach offers several advantages:

- It is useful for projects in which user requirements are uncertain or imprecise.
- It encourages active user and management participation. This increase end-user enthusiasm for the project.
- Projects have higher visibility and support because of the extensive user involvement throughout the process.
- Users and management see working, software-based solution more rapidly than in model-driven development.
- Testing and training is a natural by-product of the underlying prototyping approach.
- The iterative approach is a more "natural" fit because change is an expected factor during development.
- It reduces risk because developer tests the technical solution iteratively instead of making a wholesale commitment to any solution.

3.3.2 Prototyping

Prototyping is a technique for quickly building a functioning, but incomplete model of the information system using rapid application development (RAD) tools. It has become the design technique of choice for many system designers. Prototypes typically evolve into the final version of the system or application. The main theme is to build a first, simplified version of the system and seek feedback from the different groups of people involved in order to come up with a second, better system. This is repeated until the system meets the clients' conditions of acceptance.

There are variations on the theme of prototyping that can be exploited to enhance the probability of project success. For example, a development team may consider the following approaches:

- Creating the user interface without the actual data processing part of the system. This gives everyone the opportunity to adjust early in the project. However, bear in mind that this could still be a significant effort. In fact, 80 to 90 percent of any business system code goes to the user interface.

- Creating only one or a few subsystems with their respective functionality implemented.
- Using an existing system to demonstrate the components that will be implemented.

The following steps comprise the prototyping model:

- *Requirements* – Collection of available requirements at the time.
- *Design* – Once the initial layer of requirements information is collected, it is integrated into a new or existing design to form a prototype.
- *Prototype Creation/Modification* – Design is used to create a prototype of the system. This may mean creating a prototype or modifying one.
- *Assessment* – The prototype is presented to the customer for review. Comments and suggestions are recorded from the customer.
- *Prototype Refinement* - Information gathered from the customer is integrated into the prototype to refine it.
- *Systems Implementation* – In most cases, the system is rewritten once requirements are understood.

There are still a few challenges posed by the prototyping model. For instance, prototyping can lead to false expectations. This is a situation created by the customer thinking the system is ready to roll out. The customer does not see the work that has to be done internally such as database normalization and the like.

In addition, prototyping can lead to poor system design. Rapid development may lead to poor choices, especially when we have to "grow" the software. At some point, in may become obvious that our choice of data structures was not general enough, and needs to be changed. Such effects are not as rare as we would like them to be.

A variation of this model is to perform RAD, or Rapid Application Development. RAD requires strict time limits on each phase and relies on tools that enable quick development.

3.4. Requirement Elicitation

The determination of the development application model to develop the PC Checker is deeply researching in several places. Various techniques are applied in development PC checker and the resources information is collected from internet, library, information room in FSKTM and brainstorming.

Internet

Most of the useful information in development PC Checker is collected from internet. This draws to the research on the World Wide Wed. Besides most of the information is up-to-date, many researching reports according the system development models also could be found through internet. I just need to keep in the key words in the text box of the search engine, in a second of time many related information will be displayed in font of me. It saves time for me to gather what information that I need. Through internet technology, I can learn form the information which I had filtered in the search engine, especially from e-books and e-journals.

Information Room in FSKTM

This is the primary place that I always stayed to collected information for my thesis report. The past thesis report from the seniors are very useful for me to develop PC Checker system. At least I can have a basic review in writing the thesis report and some useful experiences from final students in writing my report. For example, the methodology of this chapter and the system development model that most popular used are Rapid Development Application (RAD) after analyzing a lot of the past thesis.

Library

Besides collecting information and resourceful data form internet, the second place that I had always been is library. A lot of related information and books are available in library such as references book, articles and journals. Most of the information of the software development life cycle models is collected in library and it helps in developing the PC Checker system.

Brainstorming

Brainstorming is a technique for generating ideas during group discussion. I just can generate some ideas after discussing my thesis with my lecturer supervisor and my friends. It helps generating as many ideas as possible in a short time whether it is good or bad ideas without any analysis until all the ideas have been exhausted. No matter how, it will give impact in improving for the development of PC Checker program.

3.5 Summary

Methodology is a system/process used to develop software system for the software developers. Rapid Application Development (RAD) is used to develop PC Checker application. RAD can reduce risks during PC Checker development because testing phase will always perform after a module just created. Requirement elicitation would be mentioned here because it mentions about many of the useful information are gathered from Internet, information room of FSKTM, library or even brainstorming.

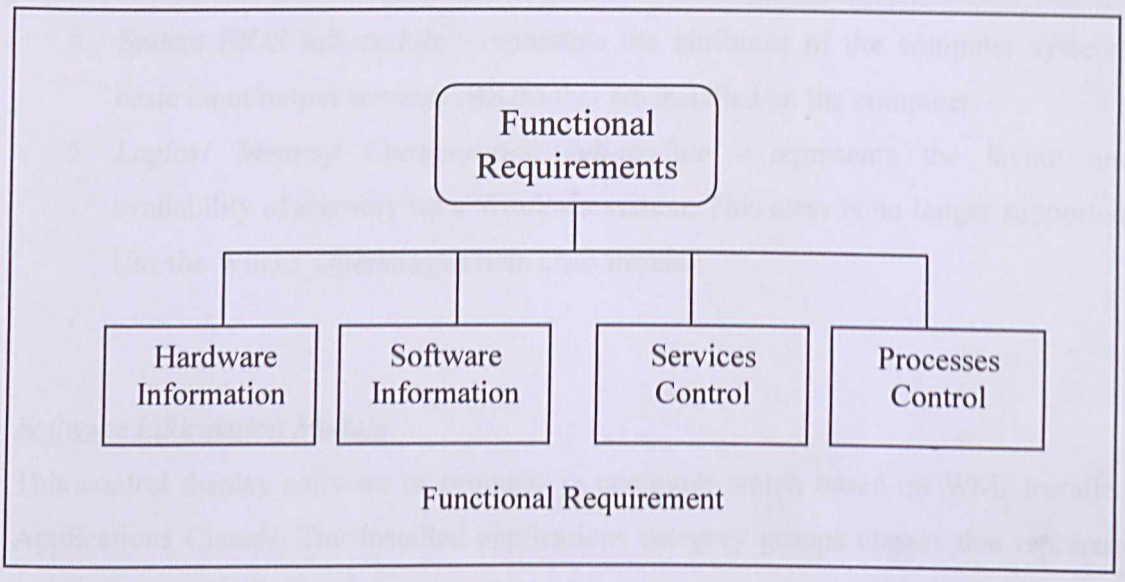
Chapter 4 – System Analysis

4.1 Introduction to System Analysis

System analysis is a problem solving technical which decomposes a system into its component pieces for the purpose of studying how well those component parts work and interact to accomplish their purpose. System analysis also is the one of the early phases in system development where it identifies functional and non-functional requirements of the system. Development tools, languages and environment will be discussed and determine for the development of the purpose system.

4.2 Functional Requirement

Functional requirement is a statement of the services or functions that a system should provide, how the system reacts to particular inputs and how the system should behave in particular situations. Besides what the system should do, it also stated what the system should not do. It also describes the system's behavior. Furthermore, functional requirement also explains how the system should be given certain stimuli. In short, the functional requirement may state out what the system should do. In the functional requirement, it contains four main modules which are hardware information control module, software information control module, services control module and processes control module.



Hardware Information Module

This control display operating system information and hardware data and specifications. It also displays many different types of information about your local machine or a remote machine on the network. The hardware information is based on WMI Computer Hardware Classes. The computer hardware information category groups classes that represent hardware related objects. Examples include input devices, hard disks, expansion cards, video devices, networking devices, and system power. It includes 5 sub-modules.

1. *Operating System sub-module* - represents an operating system installed on a Win32 computer system. Any operating system that can be installed on a Win32 system is a descendent (or member) of this class. If the computer has multiple operating systems installed, this class returns only an instance for the currently active operating system.
2. *Computer system sub-module* - represents a computer system operating in a Windows environment.
3. *Processor sub-module* - represents a device that can interpret a sequence of machine instructions on a computer running a Windows operating system. On a multiprocessor machine, one instance of the Win32_Processor class exists for each processor.

4. *System BIOS sub-module* - represents the attributes of the computer system's basic input/output services (BIOS) that are installed on the computer.
5. *Logical Memory Configuration sub-module* - represents the layout and availability of memory on a Windows system. This class is no longer supported. Use the Win32_OperatingSystem class instead.

Software Information Module

This control display software or products in computer which based on WMI Installed Applications Classes. The Installed applications category groups classes that represent software-related objects. Access to these objects is supported by Microsoft Windows Installer technology. Examples of objects in this category are installed products, file specifications, registration actions, and so on. In this module will only display 1 sub-module.

1. *Product sub-module* – represents products as they are installed by Windows Installer. A product generally correlates to one installation package.

Services Control Module

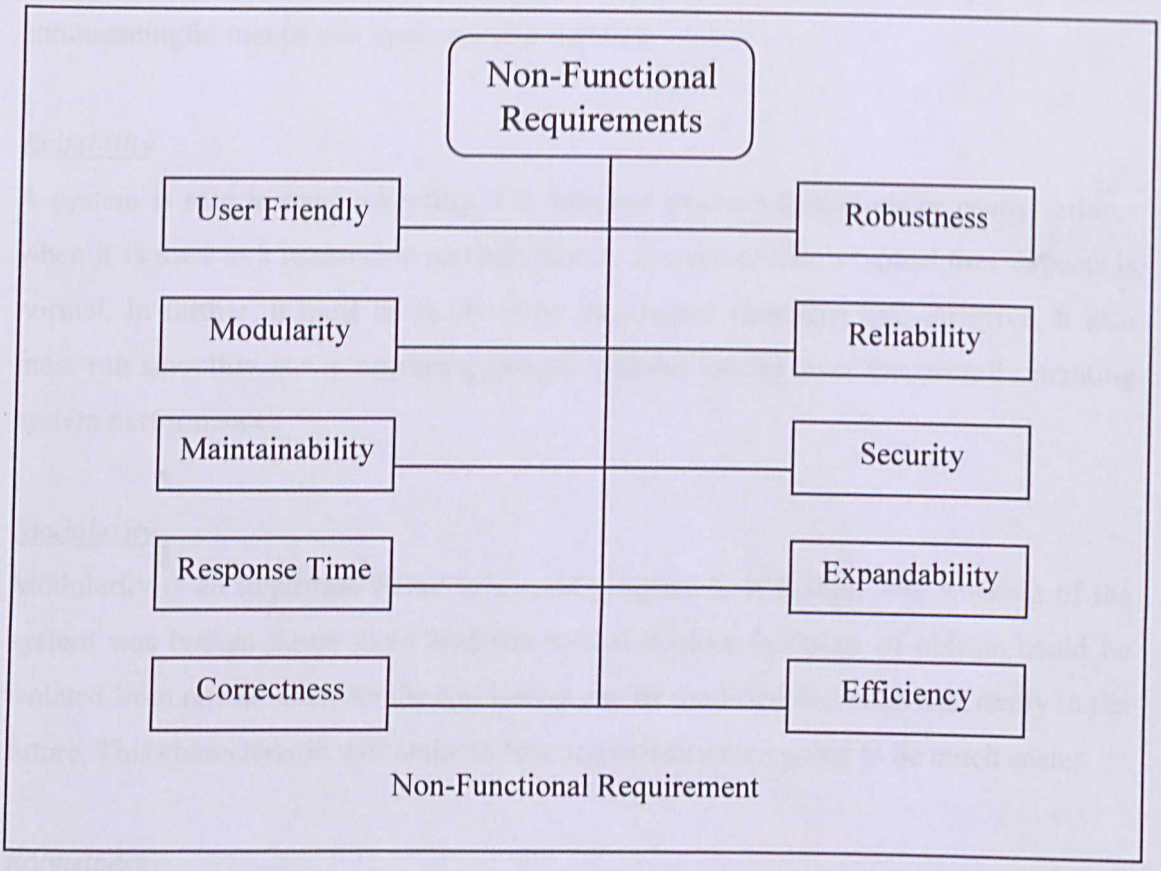
This module displays services currently running on the system computer. User can only dynamically control the services by the popup menu on the list view.

Processes Control Module

This module displays processes currently running on the system computer, user that started the process, CPU utilization, and memory usage. User can terminate the processes in the local computer or remote computer especially the processes use the big memory usage in the system.

4.3 Non-Functional Requirement

Non-functional requirement describes the constraints imposed on the PC Checker system. It includes user friendly interface, reliability, modularity, robustness, maintainability, security, expandability, response time, efficiency and correctness.



Non-Functional Requirement

User Friendly

User interface design creates an effective communication medium between human and computer. Therefore, it is very important to make sure that the interfaces fulfill user-friendliness so that is would not cause trouble to user. GUI design principles such as user familiarity and consistency shall be taken into considerations. The usage of intuitive and meaningful menus and icons are also required.

Reliability

A system is said to have reliability if it does not produce dangerous or costly failures when it is used in a reasonable manner, that is, in manner that a typical user expects is normal. In further, it must be easily to be maintained simplicity and effective. It also must run smoothly in the operating system, without turning over the overall operating system performance.

Modularity

Modularity is an important factor to a good programming design. The working of the system was broken down in to modules so that distinct functions of objects could be isolated from one another. So the application can be modified and enhanced easily in the future. This characteristic will make testing and maintenance going to be much easier.

Robustness

The system must be able to retain operating in the occurrence of failures or unexpected errors. For instance, the user errors can be detected in the system testing phase. In this phase, the measures provide quality of robustness to meet the system expectations, avoid unnecessary disaster and reduce the possibility of failures during the implementation of the system.

Maintainability

The system is also required to have the ability to be maintained and expanded for future enhancement. Therefore this system is to be developed using common languages such as Visual Basic 6 where users and developers can learn the languages easily or even get

some references point from other people who can provide them with relevant information. If the system is developed not using the good programming practices, the maintainability would become very difficult.

Security

The PC Checker has a password-log-in interface to allow the only authorized user to conduct the application. The security measure is to minimize the risk of the data exposure to unauthorized users.

Expandability

The degree to which architectural, data or procedural design can be extended. This means the system can be able to be expandable in the future.

Response Time

The desired information or functionality ought to be available instantly to the user at any point of time. The users should not be kept waiting for a long time.

Efficiency

Efficiency is understood as the ability of a process procedure to be called or accessed unlimited to produce similar performance outcomes at an acceptable or credible speed.

Correctness

A system must operate correctly or it provides little value to its users. Correctness is the degree to which the software performs its required function. To ensure this application quality, lots of testing and trial-and-errors will be carrying out.

4.4 Technology Consideration

This sub-title is listing down the current technology that used to develop the PC Checker application. It developed by most common technology today which are using Microsoft Visual Basic 6 programming language and Windows Host Script (WSH) to program the code. PC Checker is developed and used in Windows XP Professional Edition only.

4.4.1 Operating System Platform

Windows XP Professional Edition

Windows XP is the version of the Microsoft Windows operating system that follows Microsoft Windows 2000 and Microsoft Windows Me and replaces both. It is more customizable than previous version including visual themes that let users change the whole appearance of Windows in an instant. That is the window-dressing, but underneath are some significant improvements.

Besides that, Windows XP Professional Edition includes all the features of Windows XP Home Edition, and adds support for dual processors; encrypt able file system, offline folders, the Remote Desktop as described above, and extra administration features that come into play when connected to a Windows server domain. It is demanding on hardware, and it would be a mistake to install it on less than Microsoft's recommended minimum. There is also activation to consider, a mildly annoying anti-piracy measure that requires users to obtain a code from Microsoft for full installation and in future if users reinstall or make major system changes.

Benefits of Windows XP Professional Edition

1. Provides a dependable computing experience for users.
2. Device drivers will be the most robust drivers available which will ensure maximum system stability.
3. Users will experience higher levels of system uptime.
4. Provides built-in firewall.
5. Contribute to improve system integrity, manageability and ultimately.
6. Higher level of protection from hackers and intruders.
7. Reliable and most popular operating system in the world.
8. Easily change settings and identify security issues.

4.4.2 Application Programming Language

Microsoft VB.NET c#

C# is a new language created by Microsoft and submitted to the ECMA for standardization. This new language was created by a team of people at Microsoft led by Anders Hejlsberg . Interestingly, Hejlsberg is a Microsoft Distinguished Engineer who has created other products and languages, including Borland Turbo C++ and Borland Delphi. With C#, they focused on taking what was right about existing languages and adding improvements to make something better.

C# is a powerful and flexible programming language. Like all programming languages, it can be used to create a variety of applications. Your potential with C# is limited only by your imagination. The language does not place constraints on what you can do. C# has already been used for projects as diverse as dynamic Web sites, development tools, and even compilers.

C# was created as an object-oriented programming (OOP) language. Other programming languages include object-oriented features, but very few are fully object-oriented. In my book you can learn how C# compares to some of these other programming languages. My book also covers what it means to use an object-oriented language as well as the details of doing object-oriented programming with C#.

C# is a language derived from C and C++, but it was created from the ground up. Microsoft started with what worked in C and C++ and included new features that would make these languages easier to use. Many of these features are very similar to what can be found in Java. Ultimately, Microsoft had a number of objectives when building the language. These objectives can be summarized in the claims Microsoft makes about C#:

- C# is simple.
- C# is modern.
- C# is object-oriented.

In addition to Microsoft's reasons, there are other reasons to use C#:

- C# is powerful and flexible.
- C# is a language of few words.
- C# is modular.
- C# will be popular.

Microsoft Visual Basic 6

Visual Basic is a high level programming language evolved from the earlier DOS version called Basic. Basic means Beginners' Allpurpose Symbolic Instruction Code. It is a fairly easy programming language to learn. The codes look a bit like English Language.

Visual Basic is a visual and events driven programming language. These are the main divergence from the old Basic. In Basic, programming is done in a text-only environment and the program is executed sequentially. In Visual Basic, programming is done in a graphical environment. Because users may click on a certain object randomly, so each object has to be programmed indepently to be able to response to those actions. Therefore, a Visual Basic program is made up of many subprograms, each has its own program codes, and each can be executed indepently and at the same time each can be linked together in one way or another.

Below are some advantages for Visual Basic 6:

- It is a very simple and particularly as the executable code for the structure of the Visual Basic.
- It is an interactive development environment for programmers today.
- Comprehensive interactive and context-sensitive online help systems are provided by Visual Basic.
- Users do not have to learn scripting or manipulate HTML tags to develop a highly functional Web-based application because they can leverage their knowledge of Visual Basic and use the Visual Basic programming environment.

- System does not need to download large components to run the application will lessen download time and therefore reduce network load.
- Users easily maintain application state.
- Users debug IIS and DHTML applications using Visual Basic's standard debugging tools.

Windows Script Host, WSH Script

Windows Script Host is a program executer built into new versions of Windows that allows automation of computer operations. It is a powerful scripting solution that enables users to do everything that is possible with batch files. It is also flexible enough to support other languages.

WSH has built-in support for Visual Basic Scripting Edition (VBScript) and JavaScript. With the addition of 3rd party components, WSH also supports PERL, TCL, and other languages. The advantage of using these languages in WSH (instead of in their stand-alone executors) is the increased level of control made available over the computer, such as direct file system support, and database connectivity.

Adobe Photoshop 7.0

Adobe Photoshop 7.0 provides a comprehensive toolset, unmatched precision and powerful creative options to help to create professional quality images for web, print and emerging media such as wireless devices. When using Photoshop, it will make PC Checker more completed in graphical design.

4.5 System Requirement

Processor	Pentium III 500 MHZ and above
Operating System	Windows XP Professional Edition
Memory	Minimum 64 RAM
Hard Disk	Minimum 5MB space

4.6 Summary

This chapter determines the functional and non-functional requirements. The functional requirements can be categorized in 4 major parts namely computer security, system security, Windows security and application control module. Each module includes 2 sub-modules which are deployed in PC Checker application. Besides that, non-functional requirements are considered which are user friendly interfaces, modularity, reliability, response time, correctness, robustness, maintainability, security, expandability and efficiency. The technology tools that used to develop PC Checker application also considered in this chapter which are Microsoft VB.NET c#, Microsoft Visual Basic 6, Windows Script Host, Adobe Photoshop 7 and Windows XP Professional Edition platform. System requirement used to deploy PC Checker application are determined too in this chapter.

Chapter 5 – System Design

5.1 Introduction to System Design

System design is a process to convert the conceptual ideas from requirement specification in system analysis into detailed computer-based solution. It is also known as physical design. The contrast between system analysis and system design is the technical problem. In system design phase, requirements that gather during system analysis will be translated into technical representation of the system. The output of the system design would serve as an abstraction or blueprint of the implementation phases.

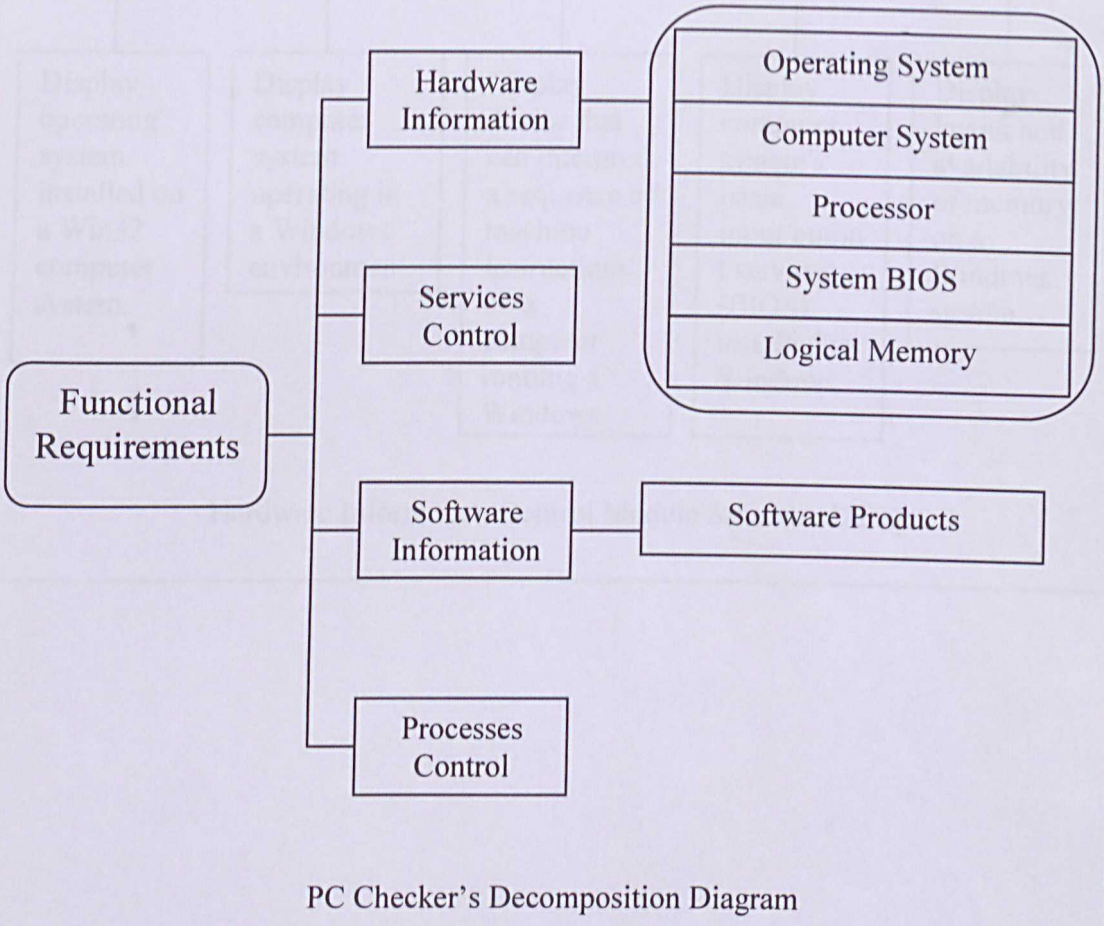
5.2 System Structure Design

Structure design is a process-centered technique that transforms the structured analysis models into good software design models. Structured design introduced a modeling tool called structure charts/decomposition diagram, used to illustrate software structure to fulfill system requirements. [System Analysis and Design Methods 5th Edition, Whitten Bentley Dittman]

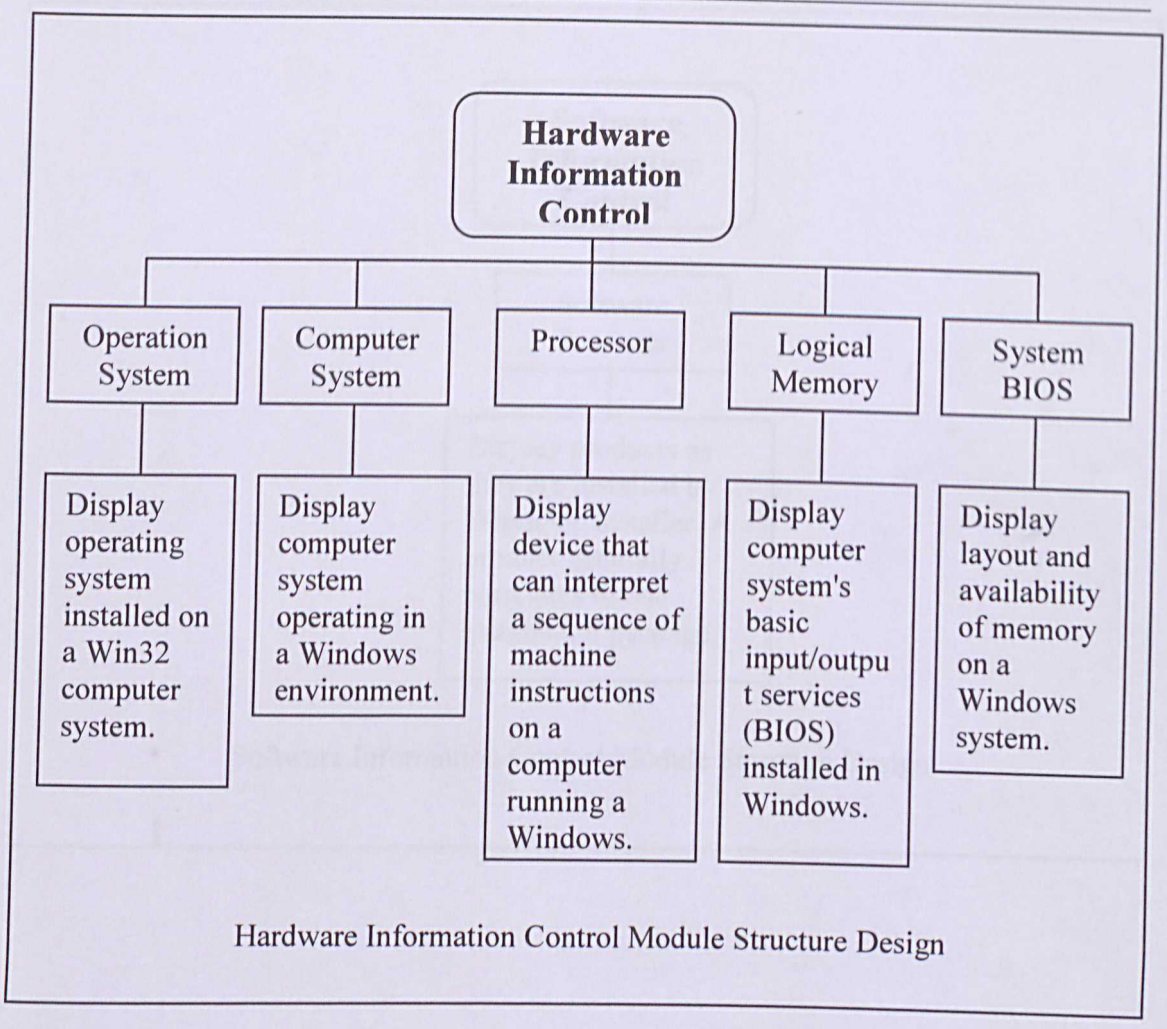
System structure of PC Checker can be categorized in 4 major modules which are hardware information control module, software information control module, services control module and processes control Module. The design of these modules is top down design because it will make PC Checker application much easier to maintain and implement.

Here are the structure design charts for the 4 major modules:

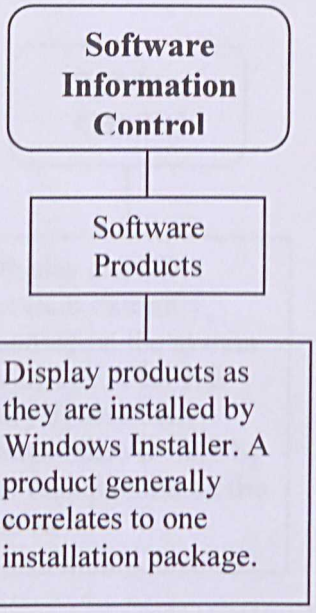
1. Hardware information control module structure design.
2. Software information control module structure design.
3. Services control module structure design.
4. Processes control module structure design.



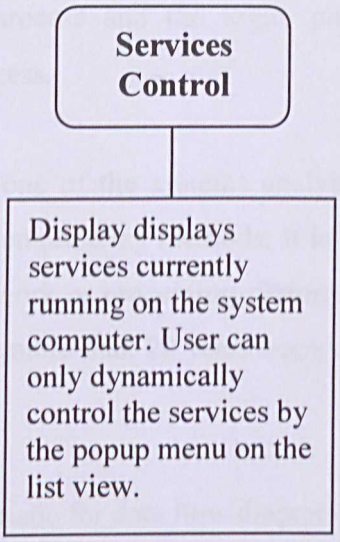
PC Checker's Decomposition Diagram



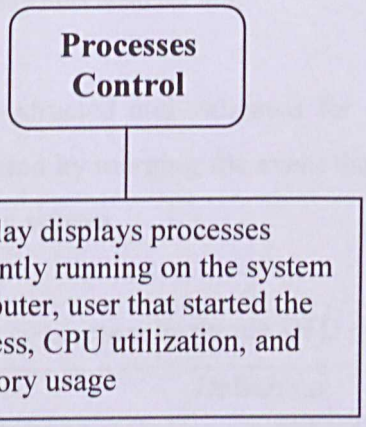
Hardware Information Control Module Structure Design



Software Information Control Module Structure Design



Services Control Module Structure Design



Processes Control Module Structure Design

5.3 System Process Modeling

Process modeling is a technique for organizing and documenting the structure and flow of data through a system's process and the logic, policies and procedures to be implemented by a system's process.

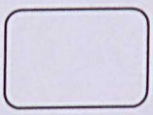
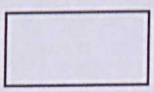
Data Flow Diagram (DFD) is one of the systems analysis processes modeling which originated in classical software engineering methods. It is a tool that depicts the flow of data through a system and the work or processing performed by that system. Data flow diagrams have been popular for more than 20 years because it is extremely simple, ease in use and easy to learn.

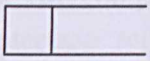
There are some special characteristic for data flow diagram:

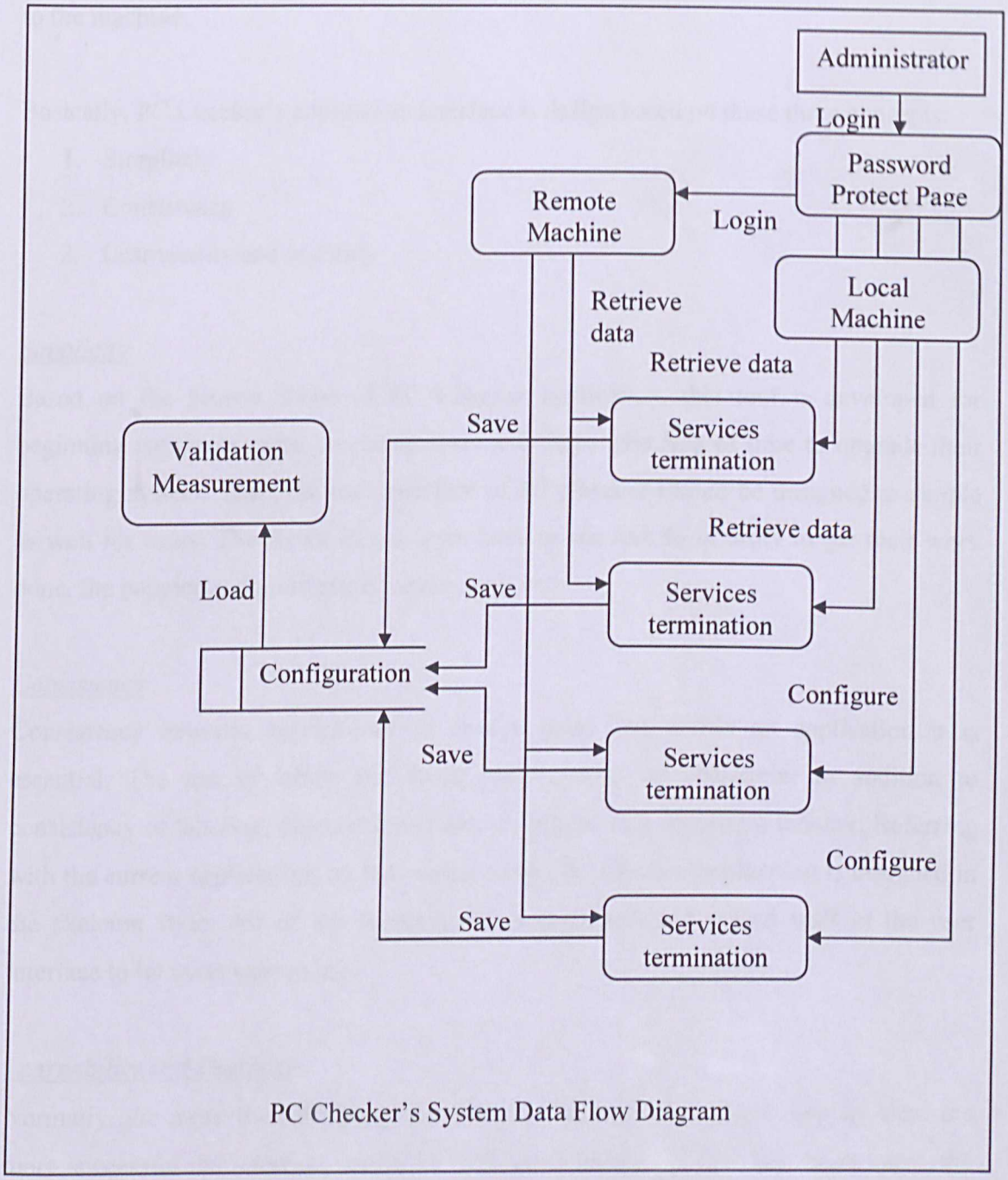
- Processes on a data flow diagram can operate in parallel. Thus, several processes might be executing or working simultaneously.
- Data flow diagram show the flow of data through the system. The arrows represent paths down which data can flow.
- Data flow diagram can show processes that have dramatically different timing. For example, a single DFD might include processes that happen hourly, daily, weekly, yearly and no-demand.

Optionally, an event diagrams is constructed and validated for each structure design. System data flow diagram is constructed by merging the event diagrams. This data flow diagram shows the "big picture" of the system.

There are only three symbols and one connection in simple DFD model:

Symbol	Definition
	Represent processes or work to be done.
	Represent external agents; the boundary of the system.

	Represent data stores, files or databases.
	Data flows or inputs and outputs.



PC Checker's System Data Flow Diagram

5.4 User Interface Design

User Interface refers to the methods and devices that are used to accommodate interaction between machines and the human beings who use them. User interfaces can take on many forms, but always accomplish two fundamental tasks: communicating information from the machine to the user, and communicating information from the user to the machine.

Basically, PC Checker's application interface is design based on these three concepts:

1. Simplicity
2. Consistency
3. Learnability and usability

Simplicity

Based on the project scope of PC Checker application, this tool is developed for beginning computer users, freelance users and those who lack of time to upgrade their operating system. Thus, the user interface of PC Checker should be designed as simple as well for users. The fewer things users have to see and do in order to get their work done, the happier and more effective they will be.

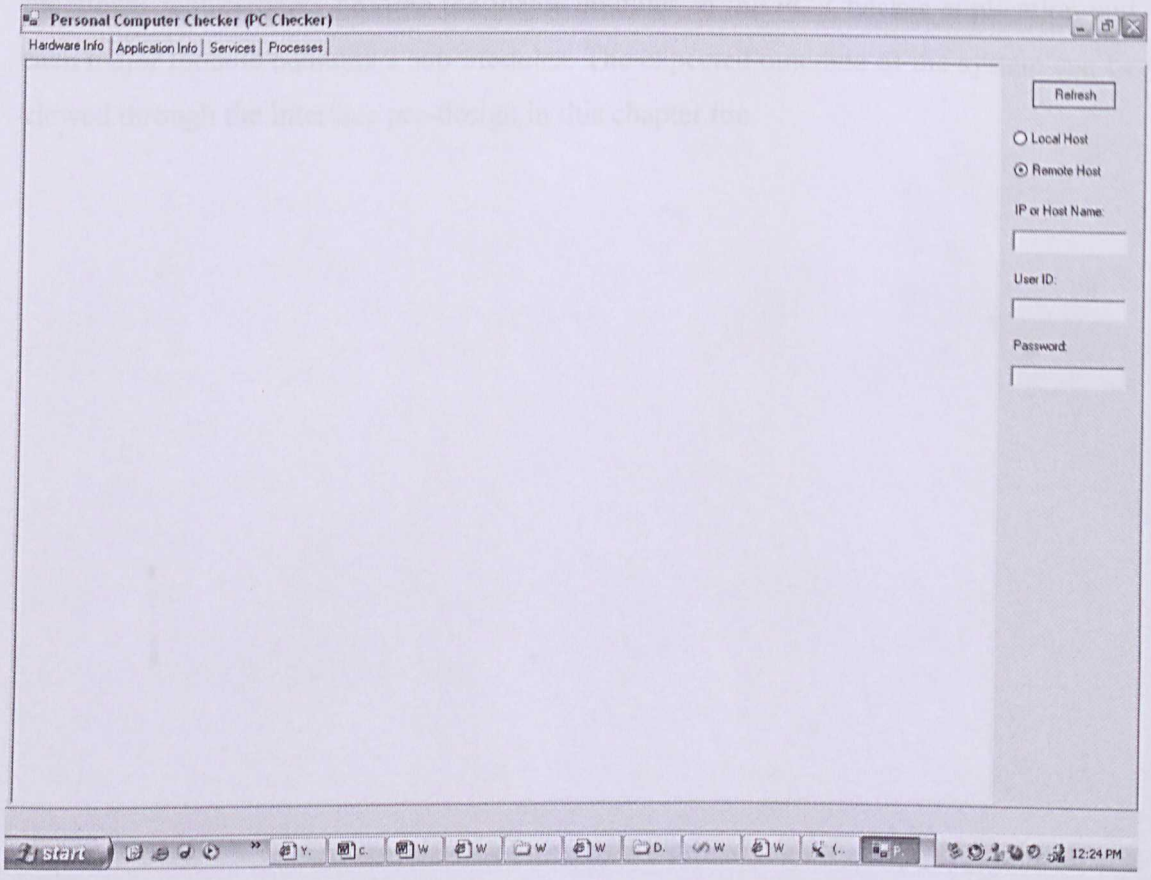
Consistency

Consistency between applications is always good, but within an application it is essential. The use of labels and icons must always be consistent. In addition to consistency of labeling, objects should also be placed in a consistent manner. Referring with the current applications on the market today, PC Checker application is designed in the skeleton style. All of the functions are categorized and placed well in the user interface to let users ease in use.

Learnability and Usability

Normally, the more the interface walks the user through the system step by step, the more successful the interface would be. But based on the PC Checker target users, the user interface should be designed as ease of operation for the first-time user. Thus,

descriptions of functionalities will be shown on the user interface too. This will make the first-time users learn easier on this tool.



PC Checker's Interface

This is a PC Checker application pre-plan user interface design. The concepts of user interface design are based on simplicity, consistency, learnability and usability.

The four major modules are placed on the left-hand side of the user interface. After clicking one of the major modules, the selection sub-modules of each major module will be shown on the right-hand side. The descriptions of the sub-modules will also be displayed on the bottom of right-hand side when users just move the mouse's pointer on the sub-modules. Besides that, a one click button that named as "Exit" button is created to terminate the PC Checker application.

5.5 Summary

System design plays an important role in the Rapid Application Development (RAD). Functional requirements in chapter 4 will be fully implemented in system design. The functional requirements become the major modules in the PC Checker application and each major module contains 2 sub-modules. The expected outcome of the system can be viewed through the interface pre-design in this chapter too.

Chapter 6 – Implementation

6.1 Introduction to Implementation

System implementation in software development is a process to convert system requirements into program codes. The initial stage of system implementation involves setting up the development environment. This includes setting up development tools to facilitate the system implementation.

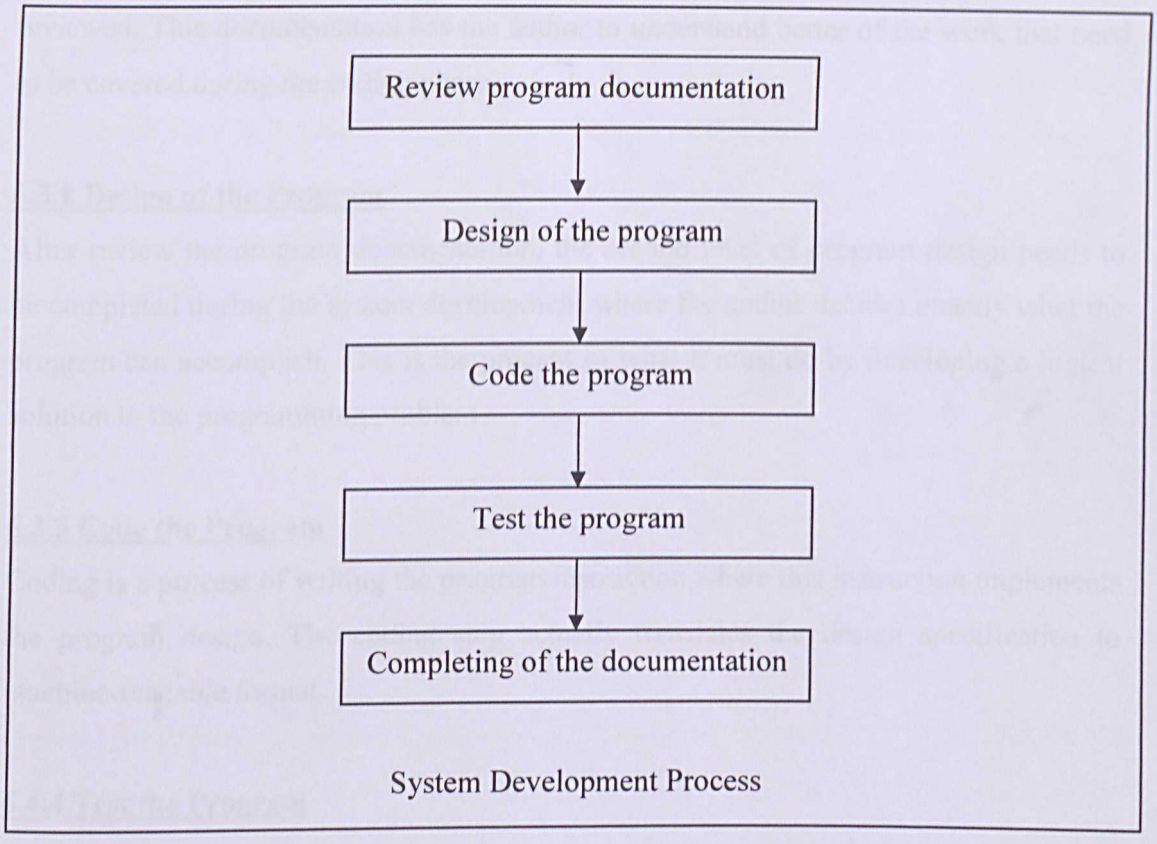
Generally, the development environment is suited according to different development phases, which can be categorized into system design, system development and report writing process.

6.2 Program Development

The design must be translated into the form that can be understood by the machine. The code generation step performs this task. If design is performed in a detailed manner, code generation can be accomplished mechanically.

6.3 System Development Process

The system development process of PC Checker is shown as below:



System Development Process

6.3.1 Review Program Documentation

The program documentation that was prepared during the early phases needs to be reviewed. This documentation has the author to understand better of the work that need to be covered during the coding phase.

6.3.2 Design of the Program

After review the program documentation, the second level of program design needs to be completed during the system development where the author decides exactly what the program can accomplish. This is the process of what it must do by developing a logical solution to the programming problem.

6.3.3 Code the Program

Coding is a process of writing the program instruction where this instruction implements the program design. The coding step actually translates the design specification to machine-readable format.

6.4.4 Test the Program

During the level program testing, the program processes actual data and produces information on which user will be relying on. The testing involved most are unit testing and integration testing.

6.4.5 Completing of the Documentation

Completing the program is essential for the successful operation and maintenance of the system. This documentation includes the system's user manual that may be needed by most of the customer as well as the system administrator.

6.4 Coding Techniques

The technique used in developing the system is called the top-down approach, stepwise refinement approach. It is essential for developing a well-structured program.

Top-down Approach involves building the high level software modules that are refined into functions and procedures. That means the higher-level modules to be coded first before the lower level modules. The codes in the lower modules contain only an entry and an exit. A module with such characteristic is called a shell. The higher level modules will reference the lower ones if they are coded and available. Reference to a shell will result in an empty action.

This approach will ensure that the most important modules will be developed and tested first. It also gives a preliminary version of the system sooner.

6.5 Coding Principles

Several principles are applied during the development of the system to ensure that the quality and proper structure in the code generated. These principles include of the following:

- *Readability* - It is very important when it comes to the future enhancement of the system by other people. Code should be easily read and understood. To achieve this, comments can be used to explain the module or code. Meaningful variables and labels will also be helpful in reading the code.
- *Maintainability* - Code should be to read, corrected and revised. Codes that perform functions for one module should be grouped together and try as much as possible to achieve high cohesion and loose coupling.
- *Robustness* - Code should be robust in terms of handling errors and responding by displaying appropriate error messages and try to avoid system failure.

6.6 System Coding

VB. NET like any other scripting language is generally easier and faster to code compared to structure and compiler languages. VB. NET supports full object-oriented constructs to enable more reusable code. Language features include full implementation inheritance, encapsulation, and polymorphism.

In the PC Checker application, a control library has been created which contains the user controls. The four user controls are as follows:

1. *Hardware Information Control* – Hardware Information control display many different types of information about your local machine or a remote machine on the network. It first establishes a ConnectionOptions object with the UserName and Password properties set. Then it creates a ManagementScope object with the local or remote host name and the ConnectionOptions object as the parameters.

```
//Connect to the remote computer
ConnectionOptions co = new ConnectionOptions();

//get user and password
if (textUserID.Text.Trim().Length   > 0)
{
      co.Username = textUserID.Text;
      co.Password = textPassword.Text;
}

//Point to machine
System.Management.ManagementScope ms = new
System.Management.ManagementScope("\\\\" + stringMachineName +
"\\root\\cimv2", co);

//Query remote computer across the connection
oq = new System.Management.ObjectQuery("SELECT * FROM
Win32_OperatingSystem");
query = new ManagementObjectSearcher(ms,oq);

queryCollection = query.Get();
foreach ( ManagementObject mo in queryCollection)
{
//create child node for operating system
createChildNode(nodeCollection, "Operating System: " +
mo["Caption"]);
createChildNode(nodeCollection, "Version: " + mo["Version"]);
createChildNode(nodeCollection, "Manufacturer : " +
mo["Manufacturer"]);
createChildNode(nodeCollection, "Computer Name : " +mo["csname"]);
createChildNode(nodeCollection, "Windows Directory : " +
mo["WindowsDirectory"]);
createChildNode(nodeCollection, "Serial Number : " +
mo["SerialNumber"]);
}
```

2. *Software Information Control* - This control display software or products in computer which based on WMI Installed Applications Classes. The Installed applications category groups classes that represent software-related objects. Access to these objects is supported by Microsoft Windows Installer technology.

```
//Connect to the remote computer
ConnectionOptions co = new ConnectionOptions();

//get user and password
if (textUserID.Text.Trim().Length   > 0)
{
      co.Username = textUserID.Text;
      co.Password = textPassword.Text;
}

//Point to machine
System.Management.ManagementScope ms = new
System.Management.ManagementScope("\\\\" + stringMachineName +
"\\root\\cimv2", co);

//Query remote computer across the connection
oq = new System.Management.ObjectQuery("SELECT * FROM
Win32_Product");
query = new ManagementObjectSearcher(ms,oq);

queryCollection = query.Get();
foreach ( ManagementObject mo in queryCollection)
{
//create child node for operating system
createChildNode(nodeCollection, "Caption : " + mo["Caption"]);
createChildNode(nodeCollection, "Description : "
+mo["Description"]);
createChildNode(nodeCollection, "Vendor : " + mo["Vendor"]);
createChildNode(nodeCollection, "Version : " + mo["Version"]);
createChildNode(nodeCollection, "Indentify Number : " +
mo["IdentifyingNumber"]);
createChildNode(nodeCollection, "Install Date : " +
mo["InstallDate"]);
createChildNode(nodeCollection, "Package Cache : "
+mo["PackageCache"]);

}
```

3. *Services Control* – the Services Control uses the query SELECT * FROM Win32_Service to retrieve all the services information are running in the system. To start or stop a service, a popup menu has been created dynamically.

```
System.Windows.Forms.ListView listViewObject =
(System.Windows.Forms.ListView) sender;
      ContextMenu mnuContextMenu = new ContextMenu();
      MenuItem menuItem = new MenuItem();
      ManagementObjectCollection queryCollection;

//check if right button
if (e.Button == System.Windows.Forms.MouseButtons.Right)
      {
//get service name
ServiceName = listViewObject.GetItemAt(e.X, e.Y).Text;
//set list view item
ServiceItem = listViewObject.GetItemAt(e.X,e.Y);
//create popup menu
listViewObject.ContextMenu = mnuContextMenu;
      try
      {
      //get specific service object
queryCollection = getServiceCollection("SELECT * FROM Win32_Service
Where Name = '" + ServiceName + "'");
      foreach ( ManagementObject mo in queryCollection)
      {
      //create menu depending on service state
      if (mo["Started"].Equals(true))
      {
      menuItem.Text = "Stop";
      //set action property
      ServiceAction = "StopService";
      }
      else
      {
      menuItem.Text = "Start";
      ServiceAction = "StartService";
      }

      mnuContextMenu.MenuItems.Add(menuItem);
      // Add functionality to the menu items using the Click event.
      menuItem.Click  += new
System.EventHandler(this.menuItem_Click);
      }
}
catch (Exception e1)
      {
            MessageBox.Show("Error: " + e1);
      }
}
}
```

4. *Processes Control* - The Process control display the system running processes, user that started the process, CPU utilization, and memory usage.

```
//get system processes collection
queryCollection = getProcessCollection("SELECT * FROM
Win32_Process");

//create dictionary for processes
foreach ( ManagementObject mo in queryCollection)
{
processInfo = new ProcessesDictionary.ProcessesInfo();
structProcess = new ProcessesDictionary.structProcessInfo();
structProcess.stringName = mo["Name"].ToString();
structProcess.stringProcessID = mo["ProcessID"].ToString();
structProcess.stringParentProcessID =
mo["ParentProcessID"].ToString();
}
//check if the call was successful
if (completionHandlerObj.ReturnObject["returnValue"].ToString() ==
"0")
//get process user name
structProcess.stringUserName =
completionHandlerObj.ReturnObject.Properties["User"].Value.ToString
();
else
//failed
structProcess.stringUserName = "";
//get operating system
string stringOS = "";
int intWinXP = 0;
queryCollection = getProcessCollection("SELECT * FROM
Win32_OperatingSystem");
foreach(ManagementObject mo in queryCollection)
      {
      //look for Windows 2000 Operating system
      stringOS = mo["Caption"].ToString();
      intWinXP = stringOS.LastIndexOf("XP");
      }
      if (intWinXP >= 0)
      {
      //get process CPU and memory usage for XP machine
      queryCollection1 = getProcessCollection("SELECT * FROM
Win32_PerfFormattedData_PerfProc_Process");
      }
      else
      {
      //get process CPU and memory usage for 2000 and NT machine
      queryCollection1 = getProcessCollection("SELECT * FROM
Win32_PerfRawData_PerfProc_Process");
      }
```

6.7 Summary

This chapter describes the implementation methods used for the PC Checker application. In this application implementation phase, nearly all the design phases that have been presented and directed toward a final objective that needs to translate representation of system into a form that can be understood by computer.

Chapter 7 – Testing

7.1 Introduction to Testing

The main function of testing is to establish the presence of defects in a program and to judge whether the program is usable in real application. Nevertheless, testing can only demonstrate the presence of errors. It cannot show that there is no error in the program. Therefore, a more suitable approach must be chosen to reduce the possibility of errors in a program.

Very few programs perform correctly in the first time they are written. Also, the requirements for the software often change during the development process. The program must be rewritten thoroughly to make sure that it is working properly and well performing. Testing and debugging are important processes used in system development to discover a defect or bug that is present in the product. Usually, these two processes are carried out incrementally in conjunction with the system implementation.

Bottom-up approach is adopted in system testing for PC Checker. Each module at the lowest level of the system hierarchy is tested individually. Then, all the tested modules would be related to the next module testing. This approach is repeated until all the modules are tested successfully.

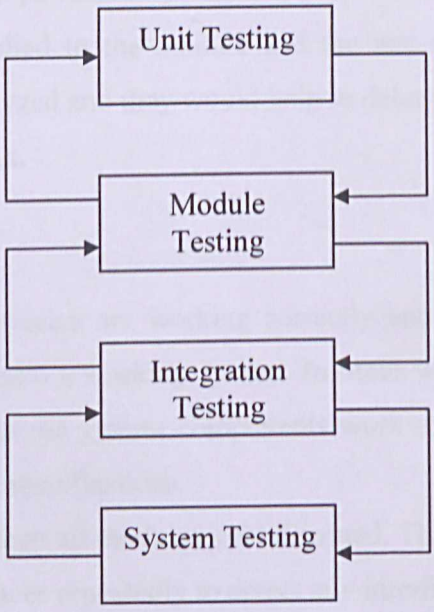
7.2 Testing Process

In an ideal situation, users hopes the programs can work properly and produce the desired outputs once it has been written and run. Unfortunately, this is impossible all the time. Certain errors and faults surely embedded in certain formulas, activities, and algorithms not realized by the programmers.

Several reasons that cause the faults and errors in the system had been identified:

1. The specification may be wrong or have a missing requirement and this produce the undesired output.
2. The system design may not correctly to illustrate out the process and user interface.
3. The system specifications have some requirements that are impossible to get it done due to the limitations of the development tools such as the usage of multimedia elements in the form and the memory storage in the computer.
4. The program code may be wrong like missing important functions, variables or formulas.
5. The algorithms of the processing were not reality and logical errors were embedded in the source code.
6. Faults may found in the program designs and user interface.

Generally, the testing process can be shown in the following:



Testing Process

7.2.1 Unit Testing

Unit test is the process to test the individual component to ensure that they function properly. Each component is tested independently without the interference from other system components. Unit test is performed concurrently with the development process. Techniques used during the process of performing unit testing are as follows:

- *Code Review* - Before a .NET project is compiled into a class, codes are reviewed line by line to discover any syntax error as well as semantic error. If errors are discovered, they are corrected immediately.
- *Compilation of Class* - This method is faster compared to code review techniques and it is efficient in discovering errors. During the compilation, the Java compiler will detect type of errors in a program and display the error type as well as the line number in which the error occurs.

7.2.2 Module Testing

Module testing is performed without other system modules. A module consists of a collection of dependent components to perform a particular task or function. Different possible test cases are applied to the module and the test results would be verified. Unusual results will be analyzed and they would help in debugging sub-modules in order to produce the desired output.

7.2.3 Integration Testing

When the individual components are working correctly and meet the objective, these components are combined into a working system. In other words, integration testing is the process of verifying that the system components work together as described in the system and program design specifications.

Integration test is needed when all modules are integrated. The main focus in integration test is to navigate the interfaces repeatedly to detect any interface mismatch problem.

Several important aspects are checked to ensure that the flow of the data in PC Checker is well organized and are user friendly to all the system users.

7.2.4 System Testing

The last testing procedure done is system testing. Testing the system is very different from unit testing and integration testing. The objective of unit testing and integration testing is to ensure that the code has implemented the design properly. In other words, the code is written to do what the design specifications intended. In system testing, a very different objective is to be achieved, that is to ensure that the system does what the users want it to do.

The sub-systems are integrated to make the entire system. Therefore, the main purpose in system testing is to find errors that result from unanticipated interactions between sub-systems. Besides, it is used to validate whether the system meets its functional and non-functional requirement.

Problems might occur by the time the new developed system is integrated to existing system.

7.3 Type of Faults

When no obvious fault exists, program is tested to isolate more faults by creating conditions where the code does not react as planned. Therefore, it is important to know the kind of faults to seek. Faults can be categorized as below:

1. *Algorithmic Fault* - Algorithmic faults occur when a component's algorithm or logic does not produce the proper output for a given input because something is wrong with the processing steps. These faults are easy to spot by reading through the program (call desk checking) or by submitting input data from each of the different classes of data that we expect the program to receive during its regular working.
2. *Syntax Fault* - Syntax fault can be checked while parsing for algorithmic faults. This will ensure that the construct of programming language is need properly.
3. *Documentation Fault* - When the documentation does not match what the application does, the application has documentation faults. Usually, documentation is derived from the system design and provides a clear description of what the programmer would like the program to do, but the implementation of these functions is faulty. Such faults can lead to other faults later.

7.4 Summary

Testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. Unit, integration and system testing has been carried out for PC Checker. At the end of the testing phase, the system should be able to perform the tasks required and free of some errors.

Chapter 8 – System Evaluation and Conclusion

8.1 Introduction

Evaluation is the ultimate phase of developing a system and an important phase before delivery the system to the end user. System evaluation is implemented by more than simply comparing the information obtained with the information which is expected. It was related to user environment, attitudes, information priorities and several other concerns that are to be considered carefully before effectiveness can be concluded. At all phases of the system approaches, evaluation is a process that occurs continuously, drawing on a variety of sources and information.

8.2 System Strengths

This application is evaluated systematically as follow:

- Security – PC Checker is implemented with security login. Login is required before using this system. Then login screen requires user identification and password only.
- Simple and user friendly interface - all forms are kept simple in PC Checker. So, it provides a user-friendly system to the user for fast learning and ease to use.
- Less computer jargons - PC Checker will minimize the computer jargons to make conveniences to the beginning users.
- Remoting control – PC Checker can switch on/off the services remotely. Besides, it also can terminate the processes with using large CPU usage in the system.

8.3 System Limitation

Below are the limitations for the PC Checker:

- Slow respond time - the searching process will take more time because the system will search the database and then generated the search result in a list view to the user. Besides, retrieving database remotely also cause the respond time problem.
- Only support English – PC Checker will only use English as single communication language as English is the international language. Other languages are not included in the application.
- Limited Function - This system is lack of some useful functions
- Limited in operating system – PC Checker only can run smoothly in Windows ME/2000/XP. It also can not connected the machine which has been installed the Windows Service Pack 2.

8.4 Future Enhancement

System development is a dynamic process and changes must be expected. Due to the limitation of this system, there are a few suggestions that may be useful to future enhancement of the e-veterinary system. The suggestions are as below:

- Enhance the connection – PC Checker should be connected with the Windows Service Pack 2. Furthermore, it should retrieve any data or information remotely even though the any security configuration is restricted in the remote computer.
- More functions - Extend the functionality of the system that helps in direct budget calculation and generate the analysis and report.
- Suit in all OS – PC Checker should be enhanced until can run smoothly in all operating system.

8.5 Obstacles Faced

The problems encountered in this project were various. Most of them can be narrowed down to a single cause: lack of knowledge and guidance on Visual Basic .Net programming or in some cases forcing the extension of the leaning curve. The following are some of the major problems encountered.

- Difficulty in choosing development tool and programming language

As mention in earlier sections, a lot of development tools and programming languages can be use to develop PC Checker application such as Visual Basic, Visual C++, Java and so on. Choosing the suitable development technology and tool proves to be a critical process as all tools has its strength and weakness. Besides that, availability of the required tools for development is also a major consideration.

- Inexperience in the chosen programming language

Since there was little knowledge of programming in Visual Basic .Net, there was an uncertainty in programming on how to organize the codes. Besides that, Visual Basic .Net were never been taught to implement such application.

- Insufficient development time

There are still a lot of features that can be built into PC Checker to make it more useful. Due to the time constraint, PC Checker was only implemented on the basic features and functionality in retrieving and controlling hardware/software information, services and processes in computer system.

8.6 Knowledge and Experience Gained

From the beginning of this project until the final documentations, a number of problems have occurred and experiences are learned from there. This project gave me a lot of benefits and invaluable knowledge such as using Microsoft Visual Basic .Net and other multimedia tools. Besides that, there are few extra valuable experiences gained from this project:

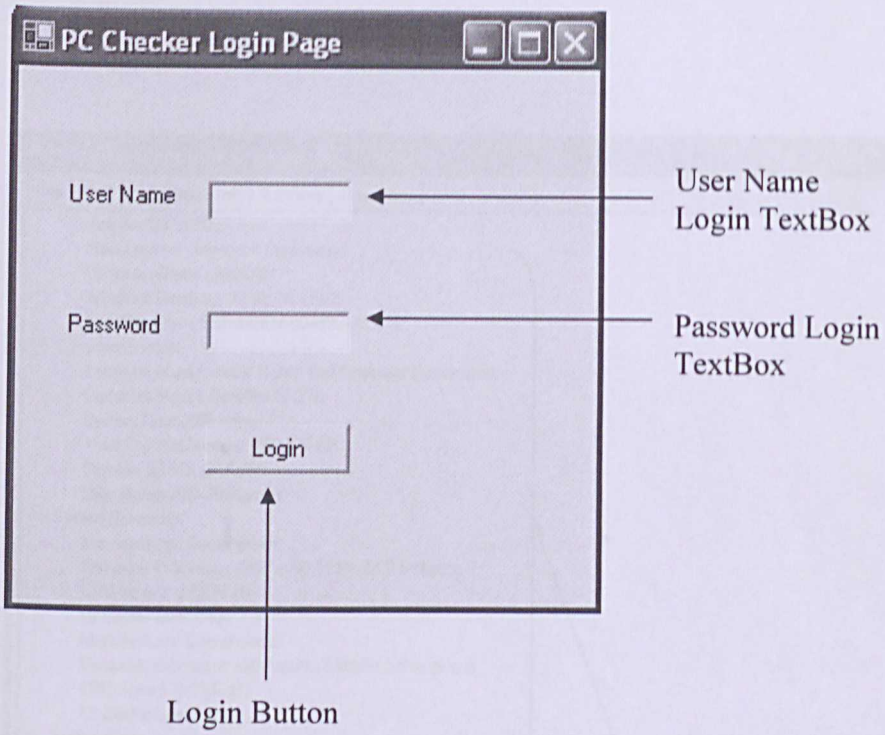
- Learn how to manage a project as in time and resource
- Concept on how to integrate and fully utilize various technologies into developing system
- Cultivated skills in writing documentations and reports
- Being exposed to the real system development environment especially dealing with users
- Boost self-confidence, self-esteem and good communication skill
- Learn to work independently

8.7 Conclusion

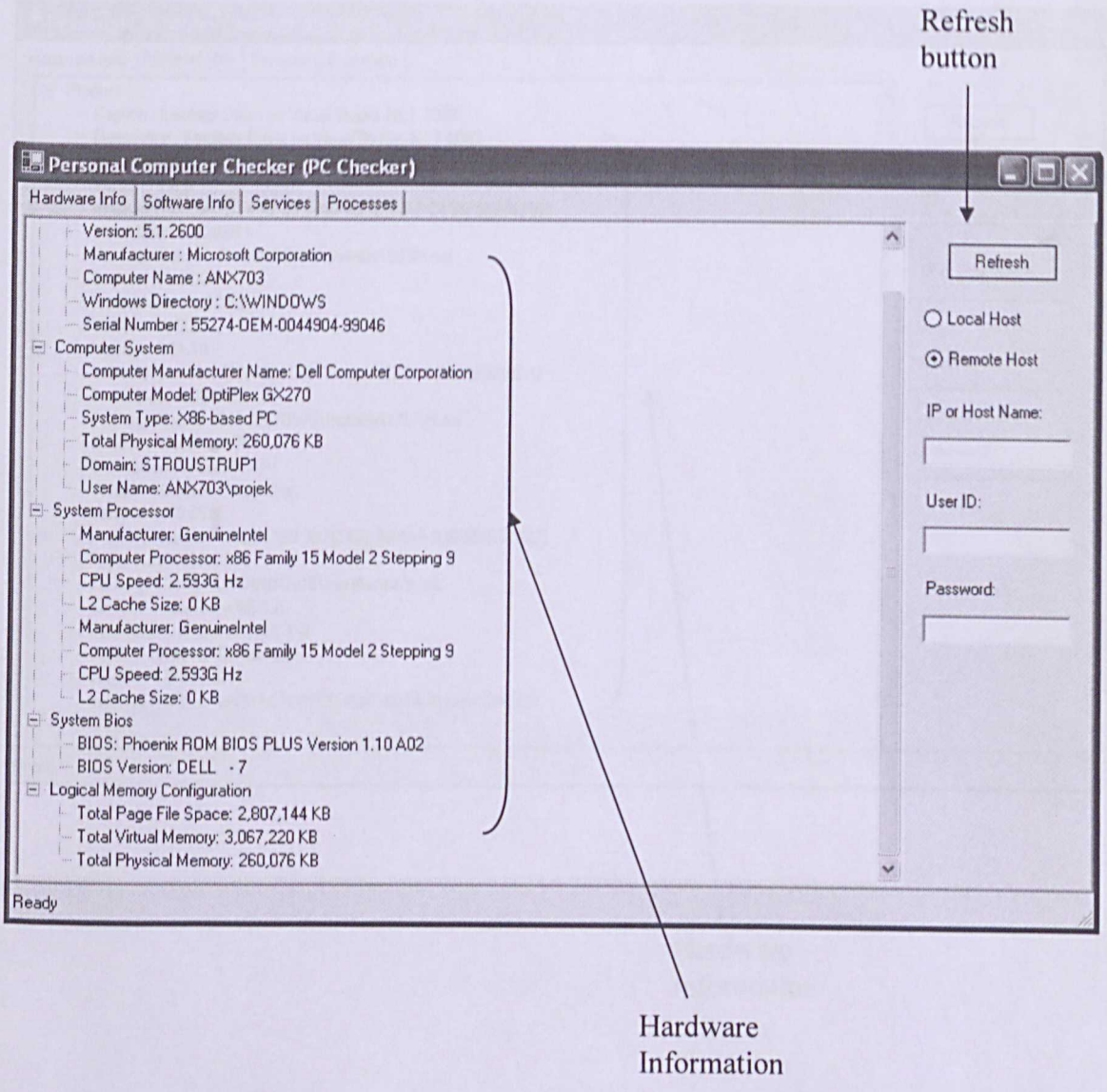
From this project, I realized that there are still lot things to learn especially in this fast growing world of information technology age because the knowledge that we obtained in University is just provides the foundation for us to face the future challenge. Last but not least, this project has armed me with invaluable knowledge and experience in building a full application. In addition, I have chance to apply what I had learned from the last three years in University into my project.

APPENDIX – USER MANUAL

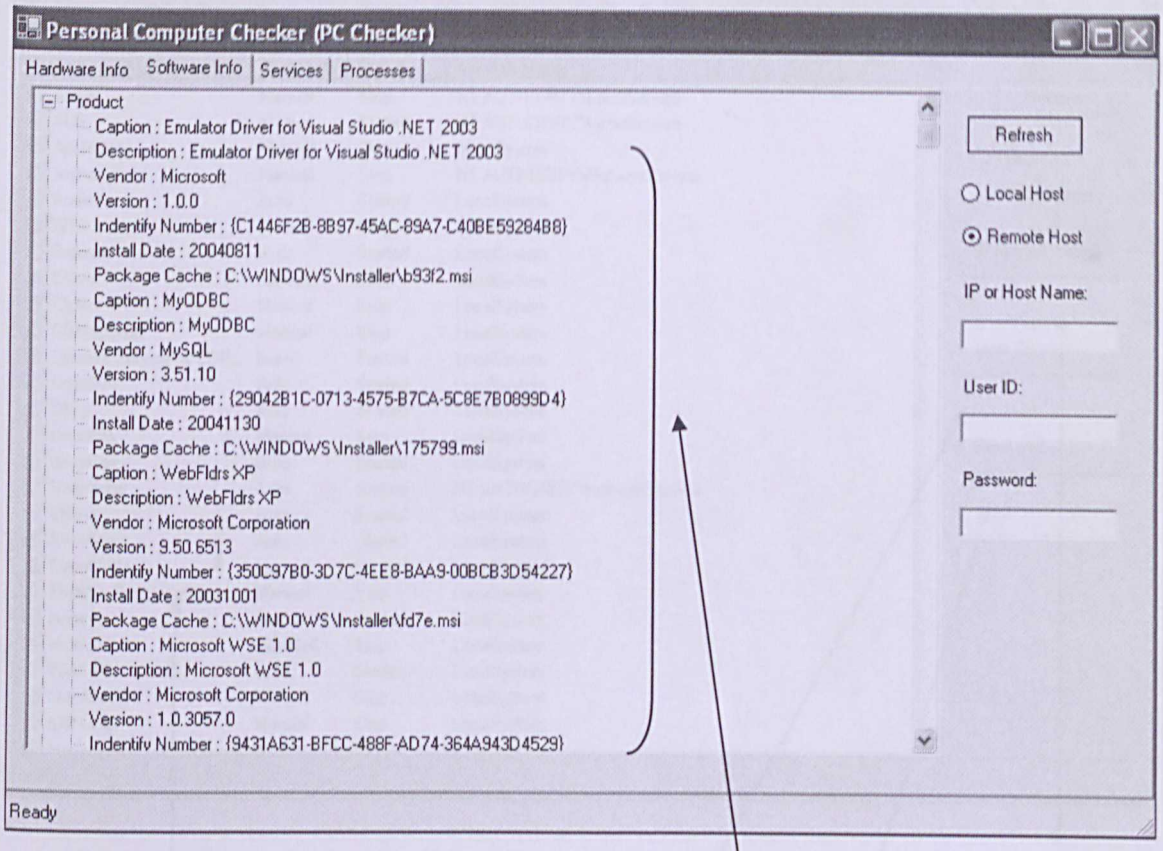
1. Login Page – User need to input the username and password in the login page when the application is starting.



2. Hardware Information Control – when the users click on the Refresh button, PC Checker will retrieve the system database from the local computer or remote computer (hardware information).

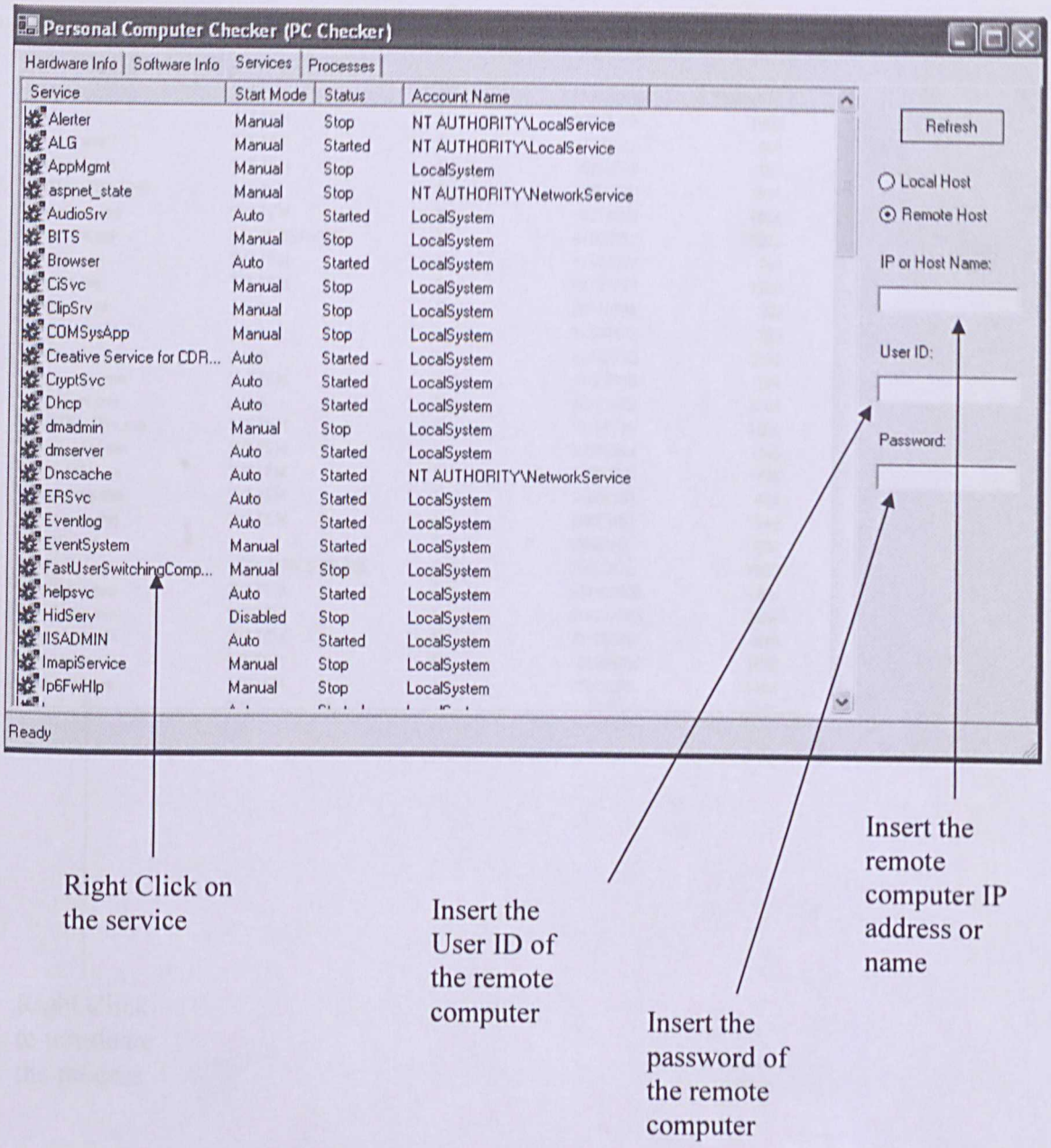


3. Software Information Control - when the users click on the Refresh button, PC Checker will retrieve the system database from the local computer or remote computer (software information).

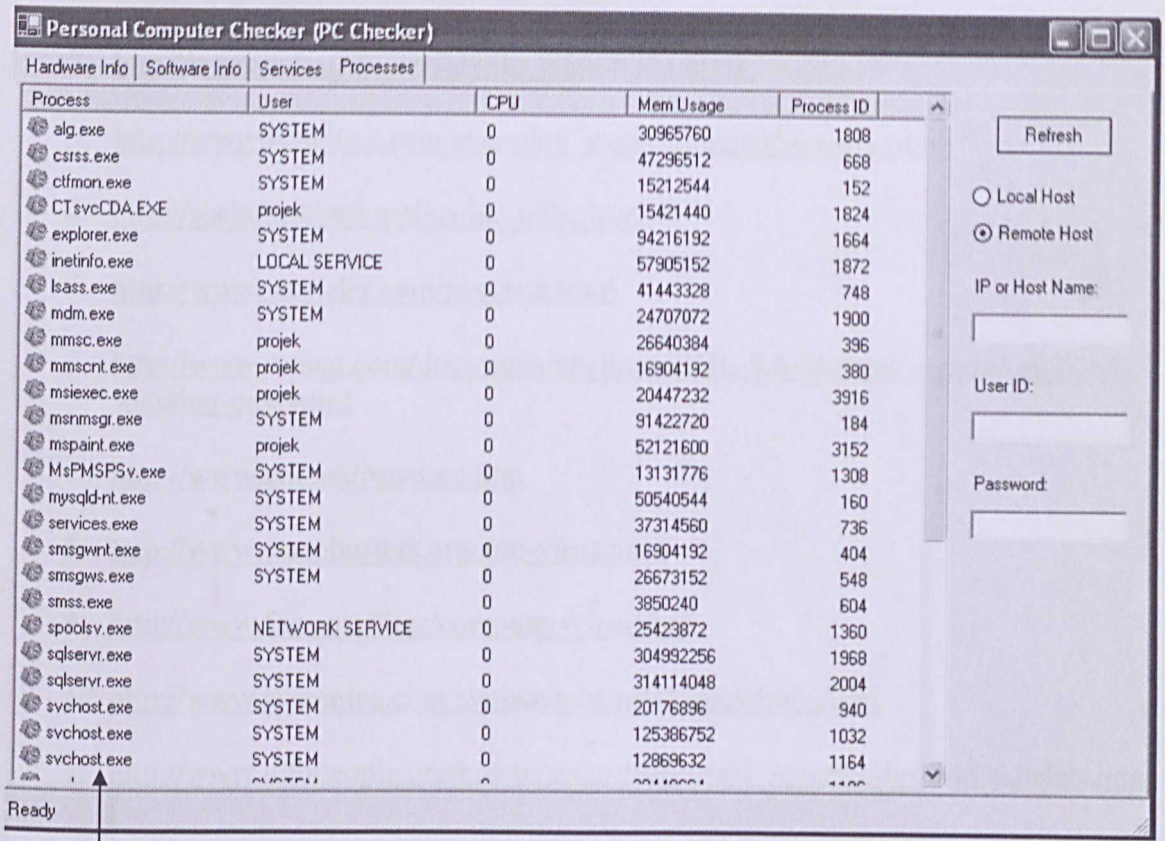


Hardware Information

4. Services Control – when user right click on the service, a popup menu will displayed on the list view to let users dynamically control the service.



5. Processes Control – users can right click on the process to terminate the process either in local computer or remote computer



Right Click to terminate the process

REFFERENCES

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