

Edith Cowan University  
CSI1101  
Computer Security  
Assignment 1

Contemporary Issue Report

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# 1 Introduction

The Board of Directors at Blue Ink have recently become aware of the lack of computer security awareness and best practices amongst its employees. As a result, Blue Ink have requested that a sample Virtual Machine (VM) image of a typical computer within their organisation be analysed for security issues.

This report outlines the security issues identified during the analysis of Blue Ink's sample VM image. Vulnerabilities have been found with the operating system itself, and support software packaged with the operating system, such as the Internet browser and anti-virus application. Vulnerabilities have also been identified in user practices, such as no password required to log in to the operating system, storage of password manager master password in a plain-text file, and administrator user privileges for standard user accounts.

The security issues identified in this report must be addressed in order to mitigate as many security issues as possible.

## 1.1 Assumptions

- The computer is connected to WAN (Internet) and LAN
- A firewall is implemented to protect the network
- User "green" is a standard employee account

# 2 Security analysis

## 2.1 Operating system

### 2.1.1 Windows Vista Business x86 SP0

The VM image provided includes Windows Vista Business 32 bit (x86) Service Pack 0 (SP0) as its operating system. Windows Vista is considered to be an older operating system with extended support due to end on 11 April, 2017 (Microsoft, 2014). Service Pack 0 indicates that no service packs have been installed. In addition, SP0 support has ended on 13 April, 2010. End of support means that the operating system will "no longer receive security updates that can help protect your PC from harmful viruses, spyware, and other malicious software that can steal your personal information" (Microsoft, 2015).

Analysis of the VM image has shown that no service packs or security updates from Microsoft have been installed, leaving the operating system vulnerable to various exploits or attacks. For example, CVE-2008-0951 describes an "Execute Code" vulnerability in the operating system's Auto-run function, which allows arbitrary code on removable media to be executed when inserting either a CD-ROM or USB device (SecurityFocus, 2008). This vulnerability would allow a user-assisted attacker to include malicious code on a CD-ROM or USB hard drive, and insertion of the CD-ROM or USB hard drive by the victim would result in the execution of the malicious code.

Additionally, CVE-2007-5133 describes a "Denial of Service Overflow" vulnerability in Microsoft Windows Explorer. Windows Explorer's inability to handle malformed PNG image files can be exploited, causing the CPU to waste cycles which

results in an unresponsive system (SecurityFocus, 2007a). For example, a user-assisted attacker may send a victim a website link with an embedded malformed PNG image file, causing the computer to lock up when viewed by the victim.

Furthermore, CVE-2007-1658 describes a vulnerability in Windows Mail, an email application packaged with the operating system. The vulnerability allows a user-assisted attacker to send an email containing a “maliciously crafted link” to execute local files (SecurityFocus, 2007b).

As seen in the examples above, withholding the installation of operating system service pack and/or security updates leave the system open to various vulnerabilities. Installing regular operating system updates is a step towards a secure system, ensuring that the latest known vulnerabilities are patched, and should be performed regularly as best practice. Blue Ink should also note the end of extended support date. In approximately two years from the time of writing this report, no further security updates to the operating system will be supplied by the vendor. This will be a point to consider if any sensitive information is planned to be stored on these systems after the “end of support” date.

### 2.1.2 Internet Explorer 7

Internet Explorer 7 (IE 7) is the default browser included with Microsoft Vista. IE 7 is considered an older browser and will no longer receive support or security updates after 12 January, 2016 (Capriotti, 2014). Furthermore, since no service packs or security updates have been applied to the operating system itself, no security patches have also been applied to this browser, rendering the browser vulnerable to various attacks and exploits.

For example, CVE-2015-0067 describes a “Remote Memory Corruption” vulnerability for Internet Explorer versions 6 through 9. A remote user-assisted attacker may exploit this vulnerability by sending the victim a link to view a “specially crafted” web page which can then execute malicious code (SecurityFocus, 2015).

Additionally, CVE-2013-3918 describes a vulnerability in an ActiveX Class which allows an attacker to remotely execute code on a victim’s computer through a malicious website (Microsoft, 2013; Ozkan, 2013). Chen and Caselden (2013) assert that this particular vulnerability was exploited in a “watering hole” attack on a US based website. Visitors to the website were subject to a “drive-by download” enabled by the vulnerability, in order to propagate malware. Moran, Scott, Vashisht, and Haq (2013) have also found that the malware payload attacks the memory directly without writing to disk, and “generally cannot be detected by traditional anti-malware tools” (Wilson, 2013).

There are many more vulnerabilities identified for this version of Internet Explorer, and the list will continue to grow as they are found. The two examples above indicate the importance of installing security software updates regularly to ensure that known vulnerabilities and exploits are patched. It is also important to note that vendor support of Internet Explorer 7 will only continue for less than a year, from the time of writing this report. Consideration to update to a modern, supported browser is suggested to ensure the security of business data.

### 2.1.3 Windows Defender

Windows Defender is an anti-malware software included with Windows Vista. The lack of installed service packs or security updates for the operating system has left the included anti-malware software with a severely obsolete virus and malware signature list. The supplied VM image indicates that virus definitions for Windows Defender have not been updated since version 1.0.0.0 on 14 July, 2006.

In order for an anti-malware/virus application to protect a computer effectively, signatures for known viruses and malware must be updated frequently, so that the software is aware of current threats and can protect the system from them (Goodrich & Tamassia, 2011). In its current state, Windows Defender can only protect the system from threats that exist in the definitions list on or before the update.

In addition to the lack of virus definition updates, a virus test has been applied using the anti-malware test files from [www.eicar.org](http://www.eicar.org). Executable, plain-text and archive files which included signatures mimicking a virus were allowed to be downloaded through Internet Explorer 7 without being stopped by Windows Defender. The executable file was also able to be executed without any warnings from Windows Defender. An on-demand scan was then performed on the folder containing the test files, and no threats were found. This either indicates that little to no protection is provided by Windows Defender in its current state, or the eicar test files are not supported with this anti-malware application.

## 2.2 Applications

### 2.2.1 Fake anti-virus

The VM image includes a desktop shortcut for “Symantec AV Scanner”. The shortcut links to a html file which attempts to present itself as a legitimate anti-virus software. The “user interface” imitates an on-demand virus scan with a progress bar at 100% and declares “Scan complete! No threats Discovered!”.

The fake anti-virus software may provide the user a false sense of security, making the user believe the computer is protected, when in fact it is not. The origin of the fake anti-virus is also of concern, as it is possible to have been installed as a result of a malware infection. Removal of the desktop shortcut icon and related files is recommended to ensure that it does not provide the user a false sense of protection.

### 2.2.2 Adobe Reader 6.0.1

Adobe Reader 6.0.1 is installed in the VM image, allowing the user to view PDF files. Adobe Reader 6.0.1 is a legacy version of the application and has been identified with a number of vulnerabilities. For example, CVE-2011-2462 describes a vulnerability which allows a remote attacker to execute malicious code or cause a Denial of Service through memory corruption (Adobe, 2011).

Similarly, CVE-2009-3959 details a vulnerability where an attacker is able to execute arbitrary code by providing the victim with a malicious PDF file. When the PDF file is viewed, the code will be executed with the user’s system privileges or cause the victim’s application to crash (SecurityFocus, 2010; SecurityTracker, 2010).

These two examples are by no means the only vulnerabilities identified for Adobe Reader 6.0.1, but they illustrate the importance of not only applying updates for the operating system, but also for any installed software. Regularly updating Adobe

Reader to the latest version will mitigate the risk of any currently known vulnerabilities for that software.

### 2.2.3 OpenOffice.org 1.1.5

OpenOffice.org 1.1.5 is an open source productivity suite of applications comparable to Microsoft Office and is currently installed on the VM image. A number of vulnerabilities have been identified for version 1.1.5. For example, CVE-2006-2198 describes a vulnerability where an attacker can create a malicious document which when opened by the victim, will execute arbitrary macro code using the victim's user privileges without prompting the victim. The macro will execute even if the application has been configured to disable macros (MITRE, 2006a).

CVE-2006-2199 describes another vulnerability where the attacker can create a malicious Java Applet in an OpenOffice.org 1.1.5 document. When the document is loaded by the victim, the Java Applet will escape the Java runtime 'sandbox' and provide system wide access to the attacker with the victim's user privileges (MITRE, 2006b; SecurityTracker, 2006).

These two examples reiterate the need to regularly update installed software to mitigate the risks of any known vulnerabilities for the particular application.

### 2.2.4 mIRC 6.0

mIRC 6.0 is an Internet Relay Chat (IRC) client which is installed on the VM image. CVE-2002-1456 describes a "Buffer Overflow" vulnerability which allows an attacker to remotely execute arbitrary code through a flaw in a scripting identifier (Martin, 2002; MITRE, 2003).

In addition to vulnerabilities in the software, IRC clients share similar risks of malware propagation as email. Attackers may send links through private messages or in chatrooms, using social engineering to convince a victim to open malicious web pages or files, or may even send files directly through IRC's file-sharing capabilities. Therefore the risks involved in the use of IRC in a business environment must be considered before continuing its use.

## 2.3 User practices

### 2.3.1 Account locking

The VM image does not require a password while the operating system boots up, and automatically logs in to user "green". This would allow a local attacker to gain access to the system with user "green" privileges, simply by booting up the computer.

Additionally, the screen saver is not password locked. If the computer is left on while the victim is away from the computer, a local attacker would gain system wide access with user "green" privileges with ease.

### 2.3.2 Passwords

Keepass, an open-source password manager is installed in the VM image. While it is generally recommended to use a password manager, the storage of the master password in a plain-text file is not. The master password was found to be stored in

a plain-text file inside the user "Documents" directory. If access to this folder was gained, the file could easily be read by an attacker and all passwords stored in the password manager would be compromised.

It is suggested that the practice of storing any passwords in plain-text files to stop. If passwords are to be stored, they should be placed inside an encrypted file, or within the password manager itself.

### 2.3.3 User privileges

The default user account (automatically logged in at boot-up without requiring a password) is "green" has administrator rights. It is assumed that this user is a standard employee and should not require administrator privileges to the system. If an attacker were to gain access to the computer through this user, the attacker would gain access with administrator rights to the system.

Additionally, User Account Control (UAC) has been disabled for this user. UAC is a Windows Vista function which assists in protecting the computer by helping to "prevent unauthorized changes to your computer". UAC will notify the user and request permission before any system changing actions are performed (Microsoft, n.d.). Generally, accounts with administrator privileges are authorized to approve such changes. While this option is disabled, changes made by malware could be made without knowledge of the user.

The elevated privileges of a normal user such as "green" coupled with the disabling of UAC allows an attacker to gain administrator rights and make system changes without alerting the user.

## 3 Conclusion

In conclusion, a number of security issues have been identified in the operating system, installed applications and user practices during the analysis of Blue Ink's VM image. The current operating system, Windows Vista Business does not have any service packs or security updates installed. Known vulnerabilities for the current version of the operating system and bundled browser, Internet Explorer 7, have not been patched due to the lack of installed updates. The end of support date for the operating system and Internet browser must also be considered as no further security updates will be provided by the vendor.

In addition, bundled anti-malware software, Windows Defender, does not have up-to-date virus definitions, therefore leaving the computer unprotected from current threats. Windows Defender was also tested with [www.eicar.org](http://www.eicar.org) pseudo-viruses, and was not able to detect them.

A fake anti-virus resides on the computer. The origin of which is unknown, but potentially could have been installed by malware, luring the user with a false sense of protection. Furthermore, installed software such as Adobe Reader and OpenOffice have not been updated to their latest version. These legacy versions have been identified with vulnerabilities and leave the system open to attack if not updated.

Access to IRC clients must also be re-considered. In addition to software vulnerabilities, IRC clients share similar risks of malware propagation as email. Attackers can easily share malicious links or files through IRC.

User practices have also been found not to follow security best practices. The computer boots into the operating system without asking for an account password, and logs into an administrator account by default. The screen-saver is also not protected by password. These practices leave the computer vulnerable to local attackers.

A user has also been found to store a password manager's master password in a plain-text file. If the computer were to be compromised by an attacker, the master password would be easily accessed, and therefore all passwords stored in the password manager would also be compromised.

Finally, standard users are being provided with administrator privileges. If such an account were to be compromised, the attacker could potentially inherit the user's elevated access. The disabling of UAC also lead to muted notifications if system changes were made by malware.

In order to mitigate these security issues, this report suggests that frequent operating system and application updates must be installed along with updates to Windows Defender virus definitions. The fake anti-virus must be removed and replaced, or depend solely on an updated Windows Defender. mIRC should be removed from the computer to avoid malicious links and files and passwords of any kind should not be stored in plain-text files. Normal users should not be provided with administrator rights and UAC should not be disabled.



## 4 Glossary

- ActiveX:
- Auto-run:
- Denial of Service:
- Firewall:
- HTML:
- IRC:
- Java:
- Java Applet:
- LAN:
- PDF:
- Sandbox:
- SP0: Service Pack 0 (zero), no service pack updates installed for the base operating system
- User assisted:
- Virtual Machine:
- WAN:
- Watering hole attack:
- x86: 32-bit operating system
- Zero-day:

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