

Computer Security

In this section you will learn about different types of security threats and how to reduce your risk. Also privacy issues that are relevant to security will be discussed.

Test

- You get a file attachment in a message, from which of the following people would you should you accept it and why?



A total stranger



Someone you've only met on the Internet

Colourbox.com



Your best friend

Colourbox.com



This guy!!!

Examples



From: James Tam
 (tamj@cpsc.ucalgary.ca)
 To: All students
 Subject: Surprise gift

Hi this is your course instructor. Everyone is a winner in my classes...you all get A+!

Hacker

- A generic term for a person that writes malicious software (e.g., a virus that damages your computer) or tries to break into a computer system.



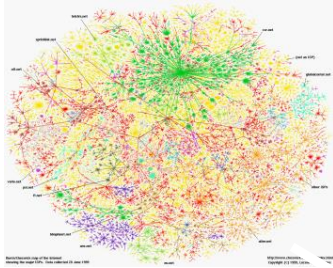
From: www.colourbox.com

One of many example today: "Hacker attack leaves women angry, worried"

A security breach that exposed such personal information as the addresses and birth dates of more than 160,000 women enrolled in a mammography registry is raising questions about protecting people's privacy while at the same time making information available for much-needed research, an expert on bioethics said....

...from the Winston Salem Journal

How To Guarantee Security Against Threats Such As Viruses



Disconnect your computer from the Internet

Leave your computer and devices off all the time

Put your computer in a vault



From: www.colourbox.com

How To Guarantee Security Against Threats Such As Viruses (2)

- “Simple”: just buy a brand new computer!
– Think again!

Superfish Adware
BY STEPHANIE MLDIT FEBRUARY 19, 2015 11:40AM EST 16 COMMENTS
Superfish uses a man-in-the-middle certificate to insert ads into Web browsers; Lenovo said it has been removed.
180 SHARES

A major security flaw has been discovered in Lenovo's consumer PCs.
New Lenovo PCs shipped between September and December were pre-installed with adware known as Superfish, which uses a man-in-the-middle certificate to

From PC mag (2015): <http://www.pcmag.com/article2/0,2817,2477006,00.asp>

How To Guarantee Security Against Threats Such As Viruses (3)

- “Simple”:

- “Simple solution #1”: Just ‘nuke’ my computer (wipe all the drives and reinstall everything)
- “Simple solution #2”: Use a computer with an operating system other than MS-Windows like MAC-OS or Linux.

(A reference about how computer hardware (non-Windows) can be infected with malicious software)

“Yet such high-tech techniques pose a more severe risk. They can, for instance, allow agencies to spy on Tails, the Linux-based secure operating system favoured by Snowden.”

From

<http://www.forbes.com/sites/thomasbrewster/2015/03/18/hacking-tails-with-rootkits/>

For more information on ‘infecting’ computer hardware with malicious software (CanWest security conference 2015)

<https://cansecwest.com/agenda.html>

How To Guarantee Security Against Threats Such As Viruses (4)

- Lesson:

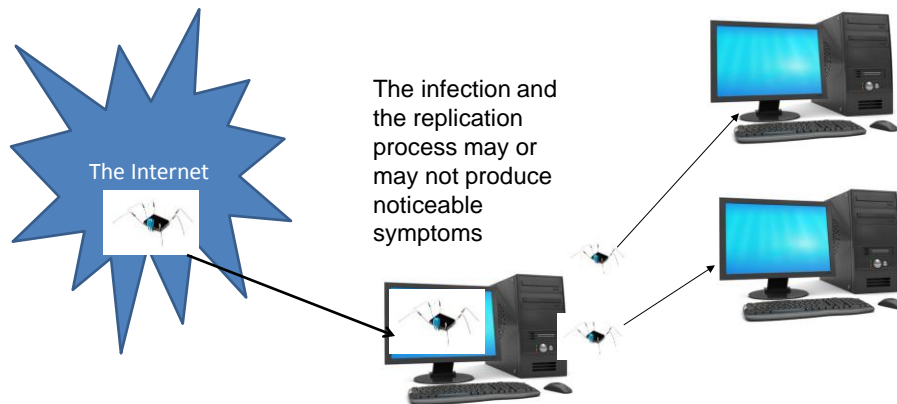
- You are never guaranteed to have 100% protection.
- Taking precautions (e.g., getting anti-virus software) provide a *reduced* chance of an infection or other security-related problem.

Malware (“Malicious Software”)

- A program designed to infiltrate or damage a computer.
- Most references to computer viruses are actually references to malware.
 - The distinction is important because programs written to protect you from a virus may not offer you full protection against other forms of malware (you need a specialized program)
- Categories of Malware:
 - Computer viruses
 - Worms
 - Macro Viruses
 - Trojans / Trojan Horses
 - Spyware
 - Note: there is much overlap between these categories e.g., a Trojan may also include spyware.

Computer Virus

- Similar to a biological virus

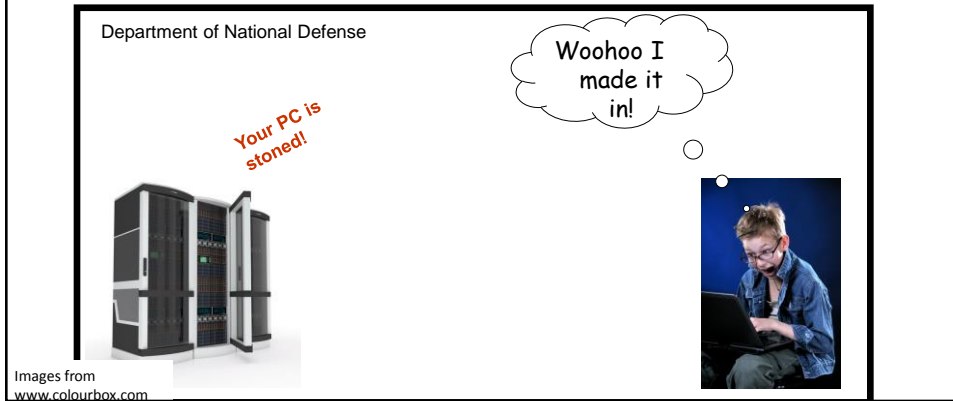


Images from: www.colourbox.com

Computer Virus: Objective

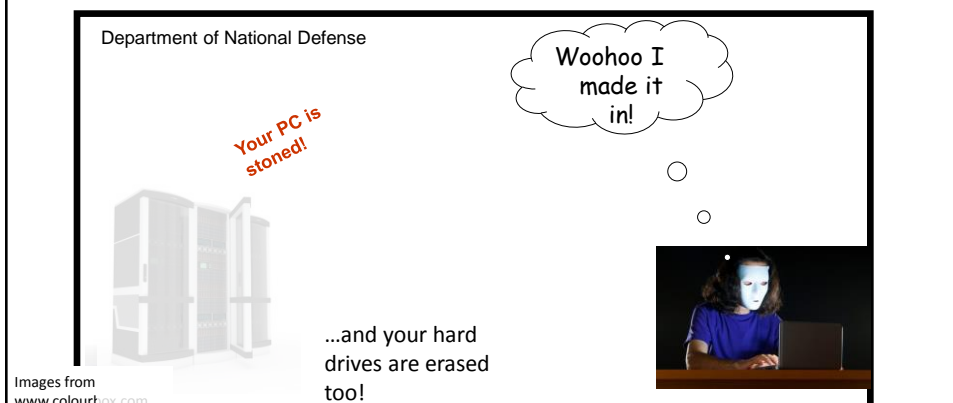
- For early virus writers the goal was simply infiltration of a computer or network.

At most the virus would result in some minor mischief



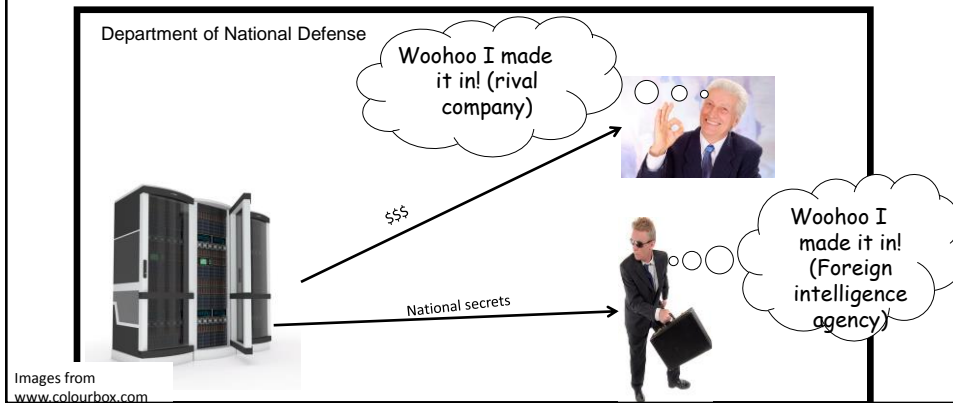
Computer Virus: Objective (2)

- Some viruses were designed to be malicious or were 'mutated' into a malicious version.



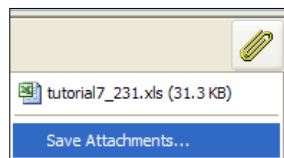
Computer Virus: Objective (4)

- Now a virus infection may be related to business or national espionage.
 - This means that ‘serious’ resources can be put into ‘hacking’.

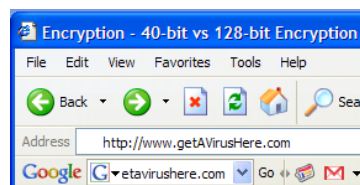


Computer Virus: Spread

- Require human-intervention to spread:
 - Opening email attachments



- Web-based: just going to a website can result in a infection “drive-by download”



Computer Virus: Avoiding?

- “Solution”: Just don’t go to *bad* websites
 - “Trusted websites may inadvertently be used as part of a virus attack.
- Examples:
 - Facebook Virus Infecting 'Friends' List: Prompts Users to Download Video
 - <http://www.canada.com/globaltv/ontario/story.html?id=48291ac4-f3c5-465c-b172-80299e4ca5dc>
 - Provocative messages from your contacts that tempts viewers to follow a link:


Legitimate message from a friend or a virus?



Computer Virus: Avoiding?


- Also it’s not just personal accounts that can be hacked but also the entire website itself or the company’s computers/database.
 - <http://www.ibtimes.com/hacks-cost-sony-pictures-entertainment-15-million-investigation-cleanup-costs-1850048>
 - <http://money.cnn.com/2014/01/10/technology/security/target-hack-tips/index.html>

Useful Side Note: Evaluating Security Of Facebook Links









Norton Safe Web for Facebook 

Your account is currently protected by Norton Auto-Scan. Auto-Scan On Auto-Scan Off

We have examined your Facebook Newsfeed and scanned each link shared within past 24 hours.

Newsfeed scanning complete. 

Links Checked: 30 link(s) shared to you with in past 24 hours.

Norton Secured		19	
Safe		9	
Caution		0	
Warning		0	
Untested		2	

Worms

- Unlike a virus a Worm can spread without human intervention.
 - Many worms have automatically infected computers e.g., ‘Slammer’ (2003)

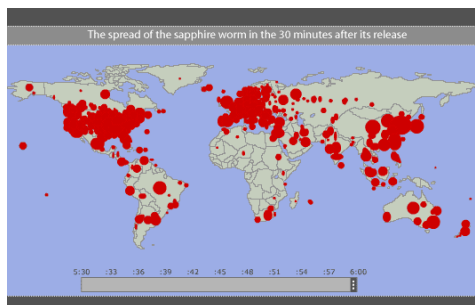


Image and facts from www.pbs.org (Accessed in 2015)

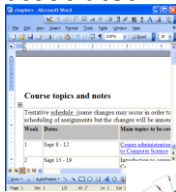
- At it's peak Slammer doubled in size every 8.5 seconds
 - Within 10 minutes it infected 90% of the worlds vulnerable host computers
- For detailed information (Symantec anti-virus)
 - http://www.symantec.com/security_response/writeup.jsp?docid=2003-012502-3306-99

Worm: Consequences Of An Infection

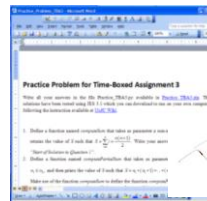
- Worms are designed to automatically spread themselves (ties up computer resources trying to infect other computers).
- They may have other negative effects similar to a virus.
 - “My computer is so slow”
 - My computer is acting ‘funny’

Macro Viruses

- Macros can be added to many types of documents.
 - They provide useful functions e.g., allow for some tedious tasks to be automated.
- A macro virus is a malicious program that’s imbedded as a macro in a file.
- Macro viruses replicate through the application that’s associated with the file (e.g., an MS-Word document).



Original document: infected



Documents made with that application contain the infection

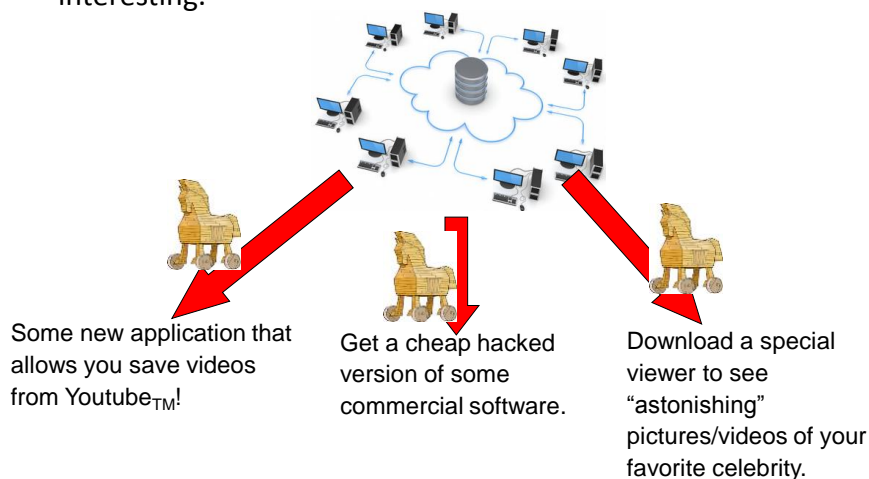
Consequences Of Getting A Macro Virus Infection

- All documents produced by the program infected by the macro virus will now have a macro virus attached.
- Anyone else who reads the document will also get infected.
- In addition to the infection of documents produced by the host program, other negative effects may occur that are similar to a regular virus infection.
- (An example from VBA programming)
 - **Word document containing the macro:** markingProgram.docm
 - 'Creates a new word document based on the 'normal' template
 - 'Create a variable 'wordDocument' to refer to the newly created 'document
 - Set wordDocument = Documents.Add("Normal.dot")

Trojans / Trojan Horse



- They are imbedded in a program or file that looks useful or interesting.



Images from www.colourbox.com

Consequences Of A Trojan Infection

- A Trojan tricks users into infecting their computer by “letting in” the malicious program
 - E.g., you install what you think is a useful program only to have a malicious program bundled in
- The backdoor program can have negative effects similar to a virus infection.

Protection Against These Forms Of Malware

- Malware discussed so far
 - Viruses
 - Worms
 - Macro Viruses
 - Trojans / Trojan Horses

Protection Against These Forms Of Malware

- Use an anti-virus program:
 - Something is better than nothing (some are free!)
 - Many Internet providers give something out for free if you're a subscriber
 - But try to get a program from an established company (better than a free version or a version produced by a smaller or less experienced company).
 - McAfee: <http://www.mcafee.com>
 - Norton: <http://www.norton.com>
 - Kaspersky: www.kaspersky.com
 - Windows (Windows security essentials is available for free download while Windows defender is built into Windows 8+):
<http://windows.microsoft.com/en-CA/windows/security-essentials-download>
 - But make sure that you *update your program and the virus definitions* on a regular basis.

Spyware



From www.colourbox.com

- Secretly gathers information about your computer and computer usage and transmits this information back to the author.
- In some cases the process may be fairly legitimate in other cases it may be more nefarious.
- Spyware may also take the form of a program that is installed with another (potentially useful) program making it similar to a Trojan.

From the software usage agreement from some company 'X':

(From Internet Privacy for Dummies "The first spyware?")

"You hereby grant company X [*JT: actual name removed*] the right to access and use the used computing power and storage space on your computer/s and/or Internet access or bandwidth for the aggregation of content and use in distributed computing."

Spyware (2)

- Some forms of spyware are relatively benign and record generic information about your computer.
- However some forms of spyware record and transmit *highly* confidential information.
 - Some do this by recording and sending all the text that you enter with the infected computer.
 - Others may be more selective (e.g., it recognizes when you're about enter information into a password field and only send passwords and other login information).
 - A few may even transmit as a live video your computer desktop and send the video to the creator of the spyware.



From www.colourbox.com

What Does Spyware Information Look Like?

- A program that records to a file what you are currently doing on your computer.
- (This is not meant as 'spyware' but instead is used to help troubleshoot technical problems.
 - "What did the user do?"
 - (Windows 7: Problem Steps Recorder)

Protecting Against Spyware

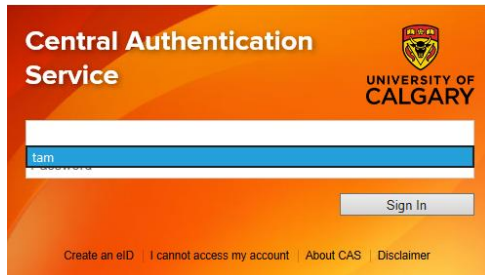
- Some anti-virus programs have begun to expand their services to protect against spyware.
- However there are programs that are dedicated solely to protecting against spyware.
- Some examples:
 - Ad Aware: www.lavasoft.com
 - Spy Sweeper: www.webroot.com
 - Spybot: www.spybot.com
- Similar to an anti-virus program you should *update your anti-spyware program and the spyware definitions* on a regular basis.

Keystroke Loggers

- A specialized form of spyware
- Record some or all of the information entered on a keyboard.
- They may be used for fairly legitimate purposes:
 - Trouble shooting errors
 - Monitoring and evaluating employee performance
 - Crime prevention
- A keystroke logger can be hardware or software based.
- Keystroke loggers can also be a form of spyware that was unknowingly installed.

Preventing/Mitigating The Effect Of Keystroke Loggers

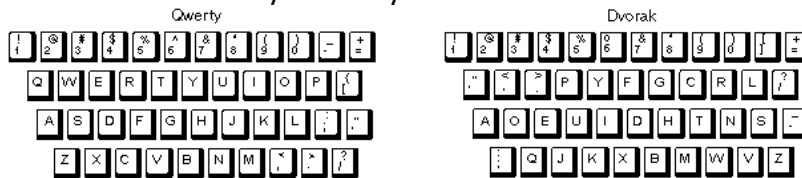
- Install an anti-spyware program.
- Get a firewall: monitors and controls traffic coming into or out of your network
- Minimize the typing of sensitive information with automatic form fillers:



- Use one-time passwords or change your passwords frequently.

Preventing/Mitigating The Effect Of Keystroke Loggers (2)

- Use an alternative keyboard layout:



- Fully custom keyboard layouts can be created using tools like the Microsoft Keyboard Layout Creator.

Preventing/Mitigating The Effect Of Keystroke Loggers (3)

- Using low tech methods can also be fairly effective for some keystroke loggers by 'scrambling' the text entered or by minimizing (or avoiding altogether) the amount of text actually *typed in*.

Other Electronic Counter-Measures Against Malware


- Defensive measures discussed thus far:
 - Getting a good anti-virus program
 - Getting a good anti-spyware program
- Update your operating system (not only for Windows) and key software (e.g., web browsers and programs that run into conjunction with them such as programs that play videos, email readers, MS-Office).
 - Some forms of Malware take advantage of vulnerabilities in the operating system and anti-virus programs and anti-spyware programs are ineffective against them e.g., the Sasser Worm (2004).
 - Updates for Windows and other programs may not only fix bugs and add new features but can also patch these security vulnerabilities.
- Get a firewall (and turn it on/configure the security settings).
 - Software firewalls may get turned off (consider a hardware firewall)

Non-Electronic Based Defenses

- (Note this list is far from comprehensive).
- Be cautious of all email attachments.
- Be cautious going to unfamiliar websites.
 - Some programs (e.g., McAfee) and web sites evaluate websites.

[WareClient.com - Home of WareZ 3](#) 
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Non-Electronic Based Defenses (2)

- Some search engines (e.g., Google) may block access to sites that may


Warning - visiting this web site may harm your computer!

You can learn more about harmful web content and how to protect your computer at [StopBadware.org](#).

Suggestions:

- [Return to the previous page](#) and pick another result.
- Try another search to find what you're looking for.

Or you can continue to at your own risk.

Advisory provided by 

From [www.codinghorror.com](#)

Non-Electronic Based Defenses (3)

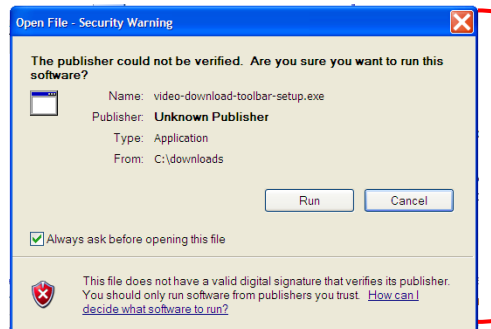
- Only download software from sites that you are familiar with or ones that have a good reputation.
- Alternatively look for software reviewed from reputable sites
 - e.g., www.tomshardware.com, www.pcmag.com
 - These sites may or may not provide direct downloads but at least you will have the names of programs that you can then search for.

Non-Electronic Based Defenses (4)

- Some types of files are riskier than others.
- One way of determining the risk level is to examine the file suffix / file extension (furthest on the right and follows the period in the name of the file).
- Files with the following extensions are dangerous to download: .exe, .pif, and .scr (source: www.microsoft.com)
- Lower risk file types: .txt, .bmp, .jpg and .gif
- Some viruses use files with two extensions to make dangerous files look like safe files e.g., Document.txt.exe or Photos.jpg.exe
 - (This is similar to how “.doc” files can be disguised to appear as “.docx” documents (VBA macro programming section).
- A more complete list:
 - <https://technet.microsoft.com/en-us/library/cc179163%28v=office.14%29.aspx>

Non-Electronic Based Defenses (4)

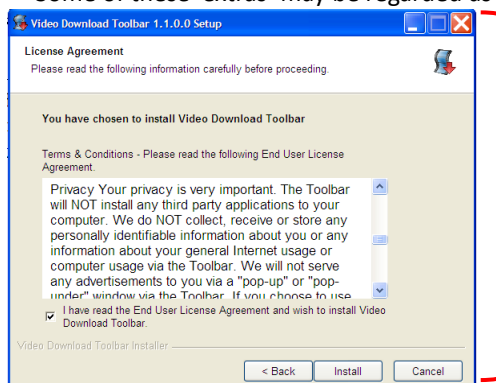
- When you install the program check the publisher information.
 - Installing software from known publishers increases your risk.
 - The identity of 'known' publishers is electronically certified by companies such as VeriSign.



Example software with an 'unknown' publisher (but this particular example isn't necessarily malware).

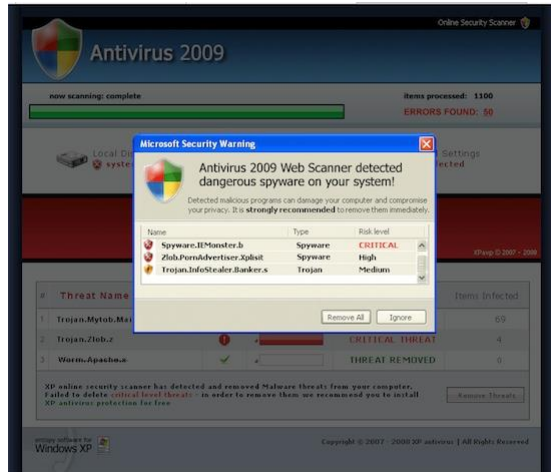
Non-Electronic Based Defenses (5)

- When you install the program read the Terms of Use.
 - Sometimes buried in the text is an implicit agreement to include additional programs or features along with the program that you are installing.
 - Some of these 'extras' may be regarded as Spyware.



An example license agreement for the "terms of use" for the software. (This example isn't necessarily malware).

Is This A Trap? How To Avoid?



A popup comes up looking like something legitimate from Windows. How do you avoid installing malware when you see this window?

From: www.thegeekreview.com

Scareware

- In-and-of itself this is not necessarily a malicious program.
- It's an authentic looking message giving you a fake warning about problems with your computer.
 - Virus infection
 - Damaged operating system files slowing down your computer



From: <http://www.symantec.com>

Scareware (2)

Typically pops up while browsing a web site.

- It may simply be an elaborate ruse to get people to try their product.
- In other cases trying to remove a problem that doesn't exist may actually create new problems:
 - Malware infection
 - Credit card theft
- Try closing your browser or even rebooting your computer and see if the messages persist.
- Examine the messages carefully, are they originating from a security program currently installed on your computer?
 - E.g., "Tam secureguard sez' u r infected"
 - Try running your own anti-virus software and see if the "security software" shows up as an infection.

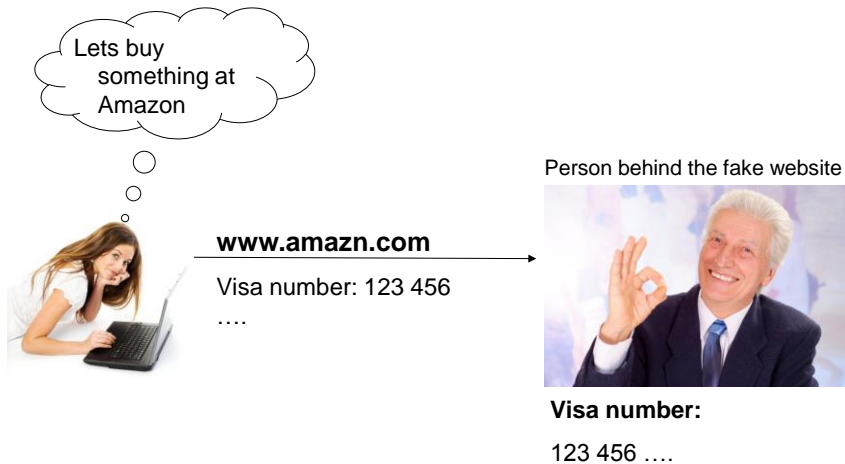
Information On Avoiding Scareware Pitfalls

- Example tips (From Microsoft):
 - Promises of money for little or no effort.
 - Deals that sound too good to be true.
 - Alarmist messages and threats of account closures.
 - Check the return email address
 - Don't click on the links provided to 'fix' the problem
 - Use common sense e.g., would a computer tech administrator require personal information to 'verify your email account information'
 - Requests to donate to a charitable organization after a disaster that has been in the news.
 - Just donate directly via the website rather than using the email
 - Bad grammar and misspellings.
- For more information:
 - <http://www.microsoft.com/security/pc-security/antivirus-rogue.aspx>

Some Security Issues While Browsing The Web

- Incorrect web site names
- Browser hijacking
- Storing financial information
- Saving previously entered data

Incorrect Website Names



Incorrect Website Names

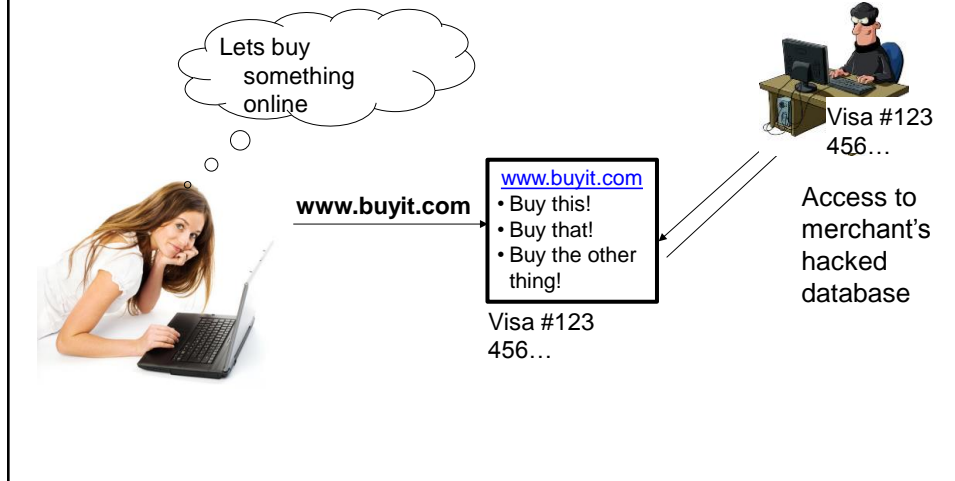
- How to mitigate
- Use a reputable search engine to find the desired website
- “Favorite” or “bookmark” websites and then access the website using this way rather than typing it manually each time.

Browser Hijacking

- A program that takes over your web browser:
 - Changes your default home page
 - Changes your favorites/bookmarks in your browser
 - Causes a storm of pop-up windows to appear
 - Redirects the browser to certain web pages
 - Redirects the browser away from certain web pages (e.g., websites run by companies that product anti-virus software)
- Common sources
 - ‘Free’ software (Trojan)
 - Email attachments
 - Drive-by downloads (covered earlier)

Storing Financial Information

- Even if you enter your information at the correct web site the convenience must be balanced out vs. security concerns:



Storing Financial Information (2)

- Balance the convenience of having this information stored with the merchant (so you don't have fill it) and the additional security (foiling spyware such as keystroke loggers) vs. the probability of having it stolen from the merchant.
- Consider:
 - The size of the merchant (large with the resources to spend money on security vs. a tiny home business).
 - The merchant's reputation and history (keep in mind that quite often merchants legally don't have to disclose security breaches).
 - Any security measures that they care to describe (specific measures, e.g., 128 bit encryption, rather than just vague guarantees about protecting your information).

Saving Previously Entered Information

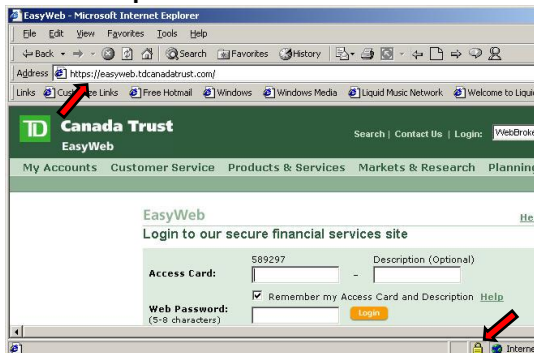
- Even storing information on your own computer must balance convenience against *some* security concerns.



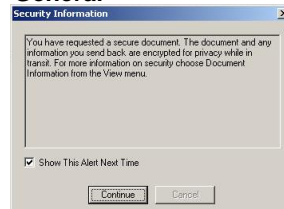
Transmitting Information On The Internet

- Many protocols transmit packets in an unencrypted format.
 - Email
 - Http
- Indicators that a web page employs encryption

Internet Explorer



General

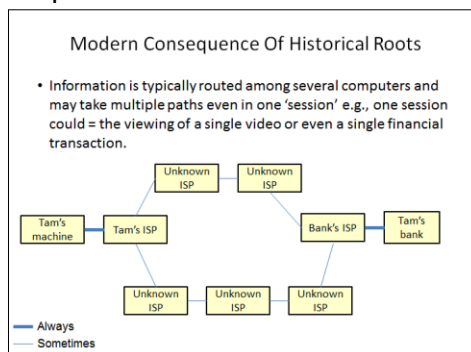


What Is Encryption?

- “Scrambling” information sent across a network (or the Internet)
- Example:
 - Original message: MARY HAD A LITTLE LAMB
 - Encrypted message: LZQX GZC Z KHSSKD KZLA
- The sending computer encrypts the information
- The encrypted information is sent along the network/Internet
- The receiving computer decrypts the information

Why Bother With Encryption?

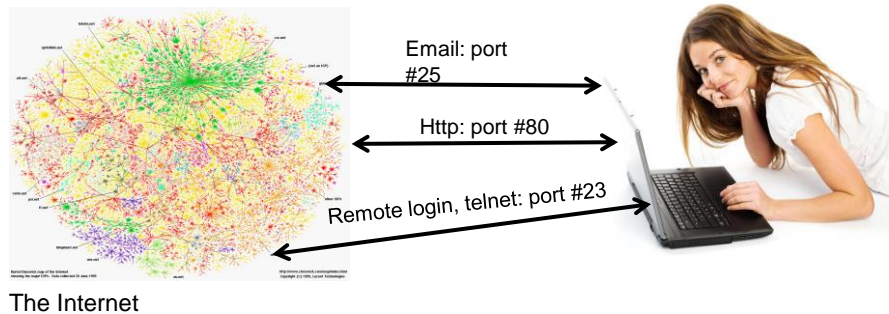
- I “trust” the website that I am dealing with!
- Keep in mind how the Internet is set up:



- Good encryption (128 bit) means that the administrators of the intermediate computers cannot view the information (if the encryption is good)

Interacting With Parts Of The Internet

- The World Wide Web (WWW) is only one part of the Internet (albeit a very popular part).
- There are other parts (e.g., file transfers, email etc.)
- Your computer interacts with these parts of the Internet through that computer's 'logical ports' (numbers)



Evaluating The Effectiveness Of Your Firewall

- Firewalls may help to secure your computer by blocking ports with security problems.
 - General rule of thumb: if you don't use a port then don't open it for access with your firewall.
- If you are unsure of how to configure your firewall:
 - Use the default or recommended configuration
 - Use a trusted source to evaluate the security of your firewall
 - Example "Shields up"
 - <https://www.grc.com/x/ne.dll?bh0bkyd2>
 - Some firewalls do all or most of the configuration of the ports for you (e.g., Norton).

General Ways Of Increasing Your Computer Security

- Install an anti-virus program from a reputable company.
 - Update the definitions on a regular basis.
- Install an anti-spyware program from a reputable company.
 - Update the definitions on a regular basis.
- Add a firewall.
 - Make sure that it's properly configured.
- Update your operating system and programs on a regular basis.
 - The updates not only provide bug/error fixes but may also patch up security flaws.

General Ways Of Increasing Your Computer Security (2)

- If your computer appears to be acting abnormal then you may try scanning for suspicious processes.
- Use utilities like the Task Manager to see what processes are running and if unfamiliar ones are taking up most of your processor time.

Privacy And The Internet

- Is it a big deal?
- Think of all the public figures whose past online activity have come back to haunt them.
- Here's a few extreme cases that effected people who weren't public figures:
 - Unrepentant on Facebook? Expect jail time (from CNN:
 - <http://www.cnn.com/2008/CRIME/07/18/facebook.evidence.ap/index.html>)
 - Teacher arrested for pro-Columbine blog post
 - <http://www.cnn.com/2007/US/law/12/04/blog.arrest.ap/index.html>
- If you're not a public figure then is privacy and information listed online important to you?
 - Planning to ever apply for a job that is important to you?
 - <http://www.management-issues.com/2006/10/27/research/your-digital-dirt-can-come-back-to-haunt-you.asp>
 - Ever planning to go on a date?

Privacy And The Internet (2)

- The Internet (and especially the web) is not a private place.
- What you (or someone else) posts there is not only viewable by the world at large but is likely to remain available (in some form) even should the offending information be removed.
 - E.g. 1, search engines often save old information about web sites
 - E.g. 2, there are specific web sites that provide archived versions of the web that go back many years.
 - E.g. 3, the terms of use for some web sites imply that any content (text, pictures, videos) uploaded to their site by users may be available indefinitely even if the user later removes the content from the site.

Posting Information

- While providing and sharing personal details is one of the main benefits of social networking sites such as Facebook, MySpace, Twitter etc. this must be balanced out vs. the potential costs of providing too much information.
 - Providing too much information about your personal details may make you a target of identity theft.
 - It may also make it easier for direct marketers to target their wares (because they know your likes and dislikes).
 - There is also the possibility of becoming the target of crime.
- This isn't to say that you should never post anything online, just *think about the potential consequences*.
- Also pay attention to *what other people post about you!*
 - E.g., "Tagged" online images of you.

Posting Information (2)

- The more information that you post about yourself the more vulnerable that you may become.
 - "The sinister side of social networking", CNN:
<http://www.cnn.com/2007/WORLD/europe/09/07/ww.sinistersocial/index.html>
- Posting one of the following in isolation may not be a problem but the more pieces of information that are posted the more problems that may arise.
 - Information that you should be less willing to give out to everyone:
 - Your financial information e.g., Social Insurance number, credit card and bank information (obvious?).
 - Your address and/or phone numbers.
 - Your full name (you might want to check what information can someone get from this with even a simple web search).

Posting Information (3)

- (Potentially sensitive information that is less obvious):
 - “Entertaining” pictures of yourself.
 - Your likes and dislikes e.g., favorite color, make and model of your first car, your pet’s name etc.
 - Information about yourself that isn’t financially related or providing contact information e.g., your pet’s name, mother’s maiden name
 - Your full date of birth (or partial birth date along with your age).
 - Status information e.g., announcing online that you will be out of town for a period of time while at the same time there’s clues (direct or indirect) about where you live.

Online Privacy: Considerations

- Your “real” friends have as much personal information about you online that they have in the real world.
 - What’s the problem with posting personal details?
- Don’t forget though that the web site operator also has access to this information
 - Providing this information to your online friends may be the same as giving it the website administrators.
 - Read their terms of use because they may be allowed to share this information to other companies)
 - Or ‘app’ or websites that you ‘like’ may be able to access your personal details

Online Privacy: Considerations (2)

- Keep in mind that your friends may also be subject to identity theft.
 - Did your real-world friend actually set up the account and is the one who is currently using it or does someone else have access to it).
 - Your friend could get 'hacked'.
 - Keep these two points in mind as you post (even if you set 'friend's only' access to your online account
 - Finally even if the account of your online friend is indeed accessed only by your friend and if you think that your friend may never be hacked (big if) consider your friend's security settings
 - In the past Facebook would allow for insecure (http) login
 - Not encrypted!
 - It was only after a few years of operation that logins can only be done securely (https)

After This Section You Should Now Know

- What is malware
 - What are some common categories of malware
 - How do the different forms of malware get onto your computer
 - What are the consequences of having a malware infection on your computer
 - How to protect against malware
- Electronic and non-electronic defensive measures against malware
- What is scareware and how it can be a security threat
- What are some common web-based security issues and how to mitigate some of them
- What is a browser cookie
- What are the different types of cookies and how do they differ

After This Section You Should Now Know (2)

- What is a logical port and how do firewalls increase security by closing ports
- What is encryption and how does it tie into security
- General ways of increasing the security of your computer
- The importance of protecting your online privacy
- What is the potential cost of having your personal information online
- How to minimize the risks of providing information online