Computer Security

In this section of notes you will learn about what security threats exist 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, which of the following people would should you accept it from and why?

A total stranger

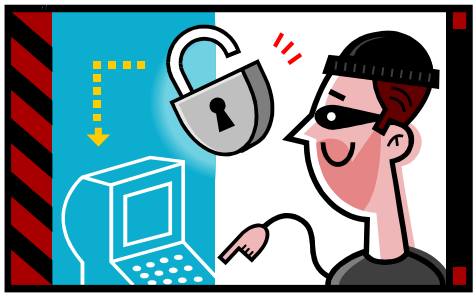
Someone you've only met on the Internet

Your best friend

This guy!!!

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.

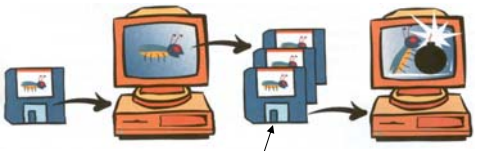


Malware ("Malicious Software")

- 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

Computer Virus

•Similar to a biological virus

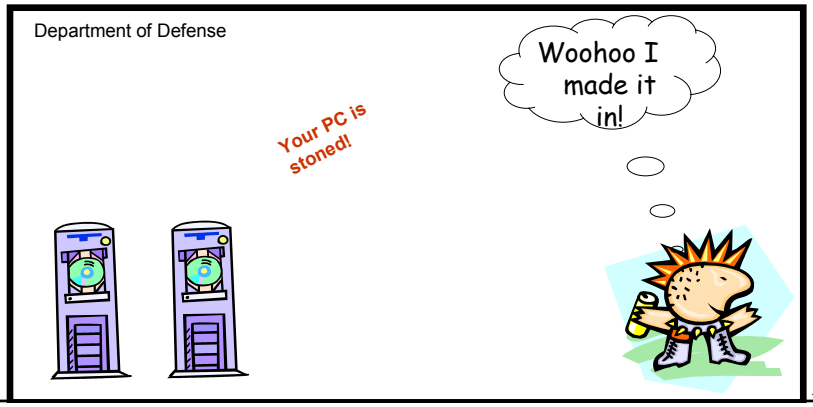


The infection and the replication process may produce noticeable symptoms

Computer Virus (2)

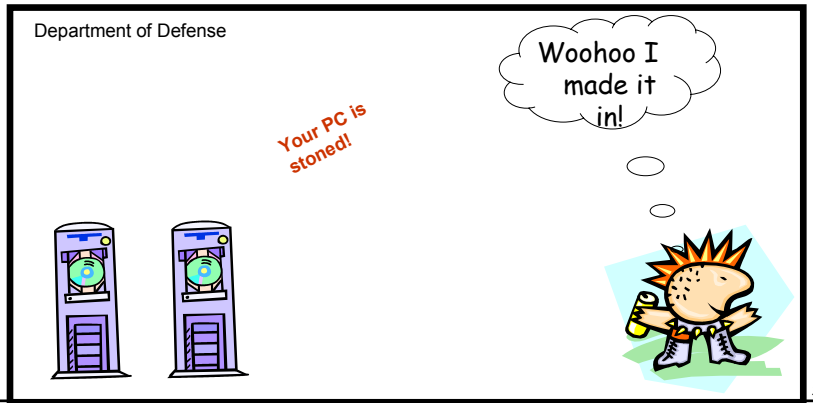
•For early virus writers the goal was simply infiltration of a computer or network.

At most the virus would result in some minor mischief



Computer Virus (3)

•Some viruses were designed to be malicious or were ‘mutated’ into a malicious version.



Computer Virus (3)

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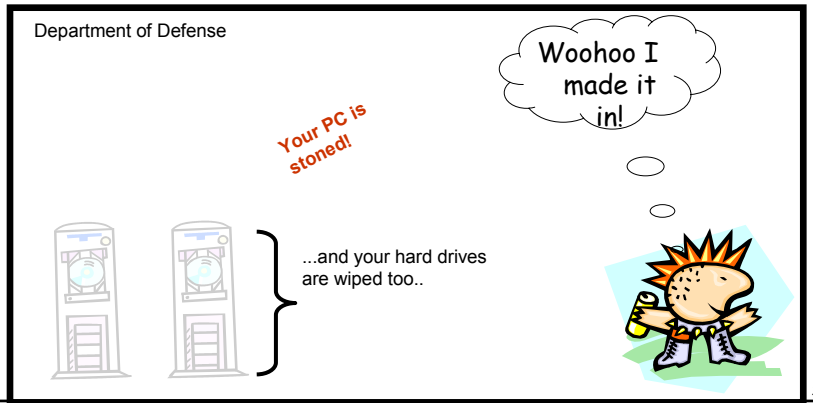
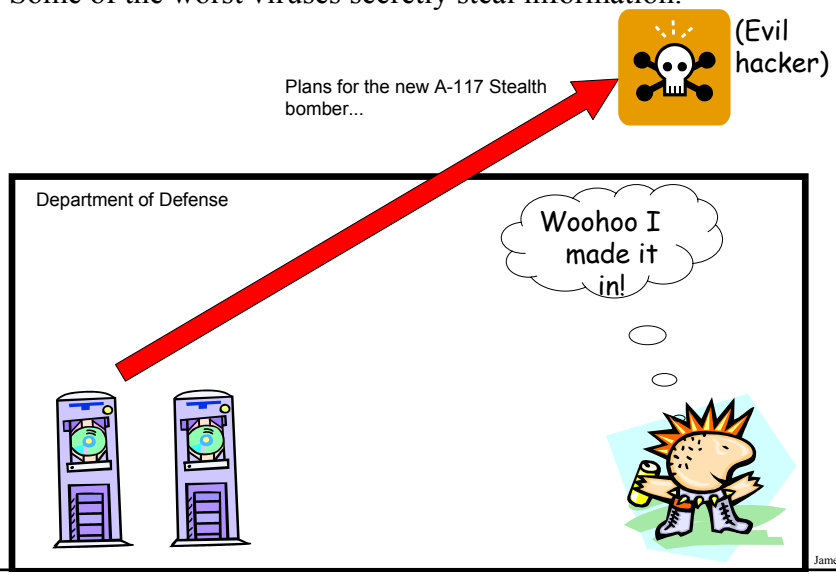


Computer Virus (4)

•Some of the worst viruses secretly steal information.



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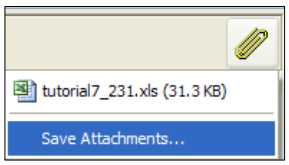
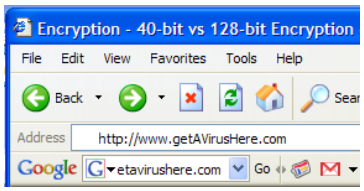
Computer Virus (5)

•Require human-intervention to spread.

- Email attachments



- Web-based



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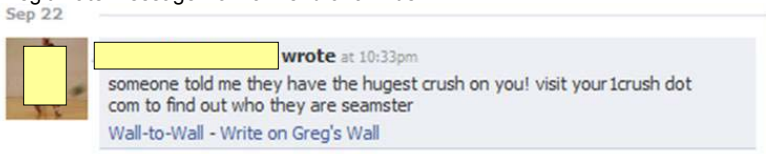
Computer Virus (6)

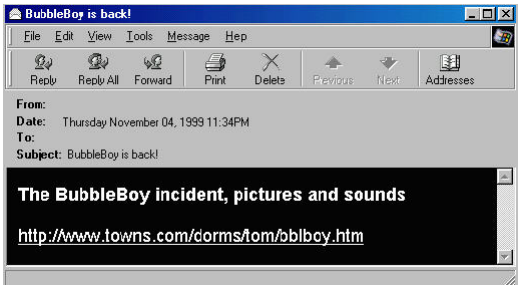
- Trusted websites may unfortunately be used as part of a virus attack.
- Example:
  - Facebook Virus Infecting 'Friends' List: Prompts Users to Download Video
    - http://www.canada.com/globaltv/ontario/story.html?id=48291ac4-f3c5-465c-b172-80299e4ca5dc
  - Provocative messages from your contacts that tempts viewers to follow a link:

Legitimate message from a friend or a virus?



Worms

- Unlike a virus a Worm can spread without human intervention.



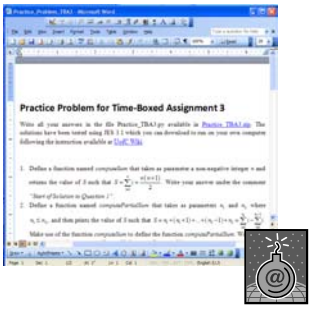
Worm: Consequences Of An Infection

- Worms are designed to automatically spread themselves (ties up computer resources).
- They may have negative effects similar to a virus.

Macro Viruses

- Macros can be added to many types of documents.
- 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.

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.

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Trojans / Trojan Horse

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

Some new application that allows you save videos from Youtube$_{TM}$!

Get a cheap hacked version of some commercial software.

Download a special viewer to see "astonishing" pictures/videos of your favorite celebrity.

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Consequences Of A Trojan Infection

- A Trojan tricks users into infecting their computer with a potentially useful program.
- But included with the useful program is an attached backdoor program that 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
- 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
    - Microsoft: http://www.microsoft.com/security_essentials/default.aspx
    - (Also recall that U of C students and staff get free access to – an older – version of McAfee: http://www.ucalgary.ca/it/security/antivirus)

Protection Against These Forms Of Malware (2)

- But make sure that you *update your program and the virus definitions* on a regular basis.

Spyware

- 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)

"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.

James Tam

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
  - Windows defender: http://www.microsoft.com/windows/products/winfamily/defender
- Similar to an anti-virus program you should *update your anti-spyware program and the spyware definitions* on a regular basis.

James Tam

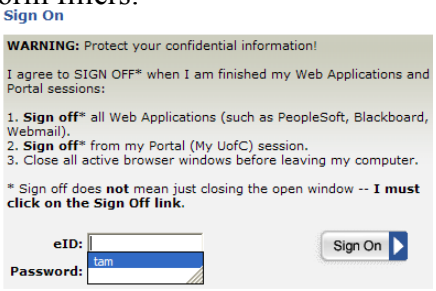
Keystroke Loggers

- 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.

James Tam

Preventing/Mitigating The Effect Of Keystroke Loggers

- Install an anti-spyware program.
- Get a firewall.
- Minimize the typing of sensitive information with automatic form fillers:



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

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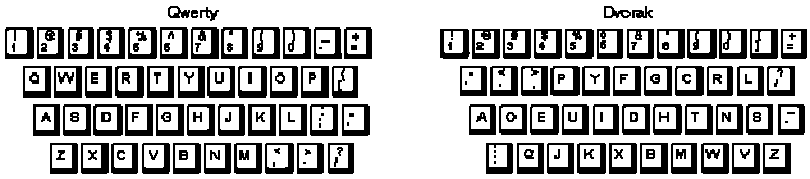
Preventing/Mitigating The Effect Of Keystroke Loggers (2)

- 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)

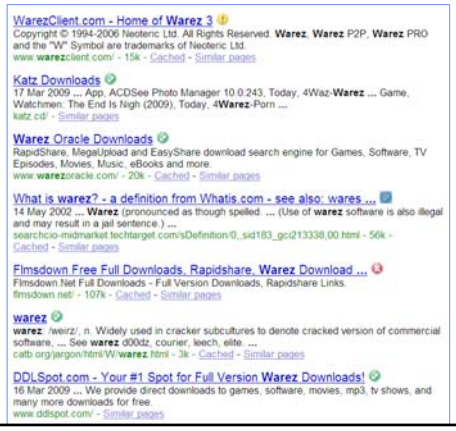
- Using low tech methods can also be fairly effective for some keystroke loggers by 'scrambling' the text entered or by minimizing (or avoiding altogether) the amount of text actually *typed in*.

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 (e.g., 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).

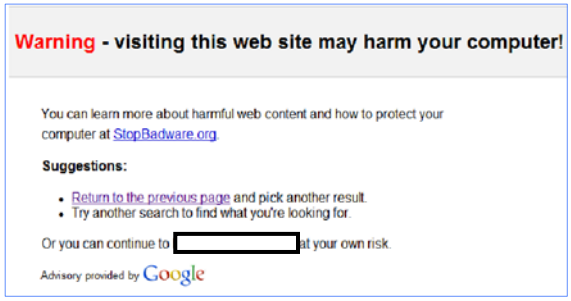
Non-Electronic Based Defenses

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



Non-Electronic Based Defenses (2)

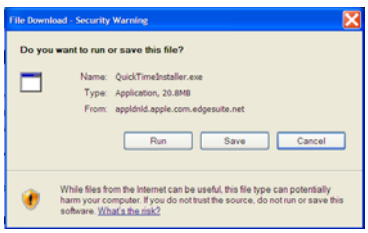
- Some search engines (e.g., Google) may block access to sites that may infect or otherwise harm your computer.



From www.codinghorror.com

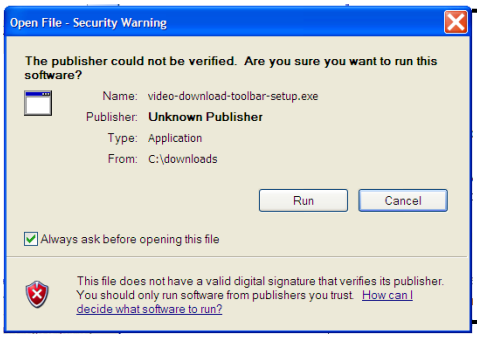
Non-Electronic Based Defenses (3)

- Only download software from sites that you are familiar with or ones that have a good reputation.
  - e.g., www.cnet.com
- To be extra safe, when you download software from the Internet save it to your computer rather than installing it directly from the website.
  - Saving it first allows you to scan it with anti-virus and anti-spyware software prior to running and installing it.



Non-Electronic Based Defenses (4)

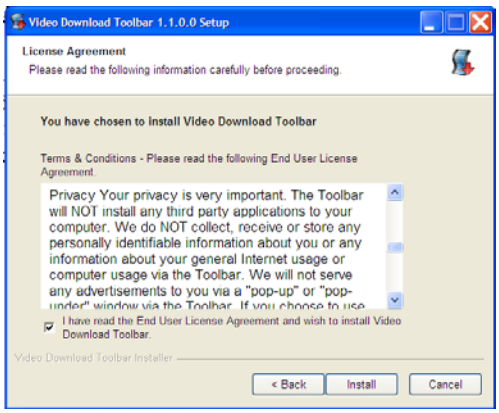
- When you install the program check the publisher information.
  - Installing software from known publishers increases your risk.
  - The identity of 'known' publishers is electronically certified by companies such as VeriSign.



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).

Scareware

- In-and-of itself it's 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

Some Security Issues While Browsing The Web

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

Incorrect Website Names

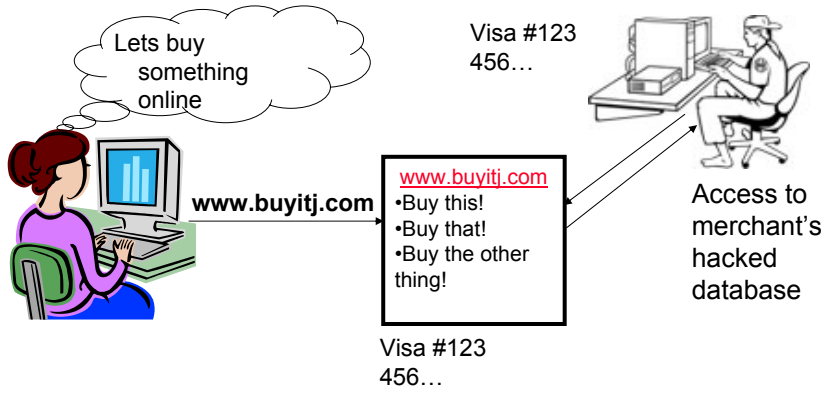
Browser Hijacking

- 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
  - Prevents the browser from reaching other pages

- Common sources
  - 'Free' software
  - Email attachments
  - Drive-by downloads

Storing Financial Information

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

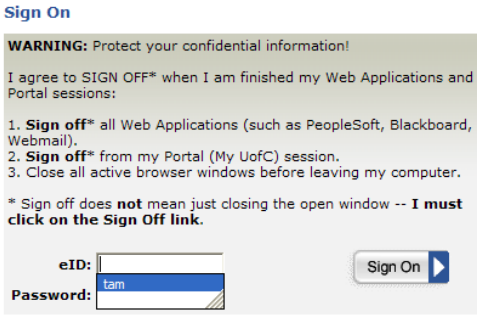


Storing Financial Information (2)

- 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 option to spend lots of 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

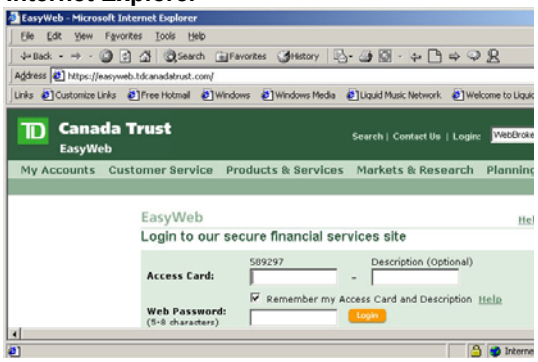
- Even storing information on your own computer must balance convenience against *some* security concerns.



Transmitting Information On The Internet

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

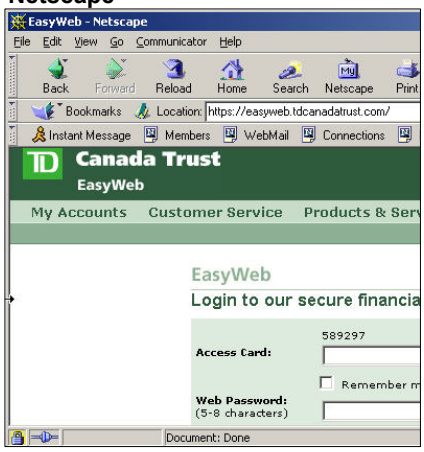
Internet Explorer



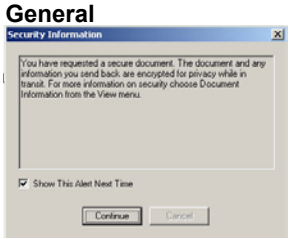
Transmitting Information On The Internet (2)

- Indicators that a web page employs encryption (continued):

Netscape

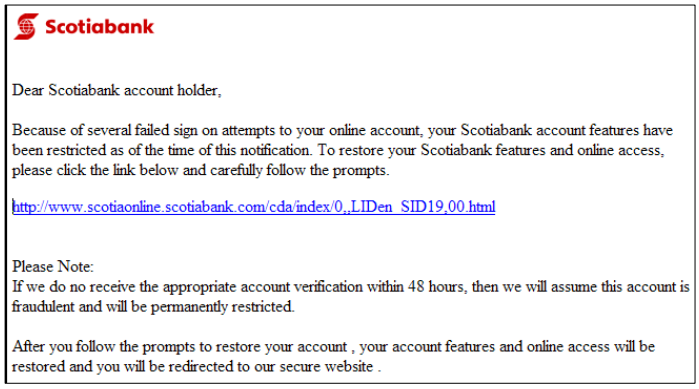


General



Phishing

- Typically it's defined as fraudulent attempts to obtain private information.
- Original attempts at phishing appear quite primitive by today's standards.



Scotiabank

Dear Scotiabank account holder,

Because of several failed sign on attempts to your online account, your Scotiabank account features have been restricted as of the time of this notification. To restore your Scotiabank features and online access, please click the link below and carefully follow the prompts.

http://www.scotiaonline.scotiabank.com/cda/index/0,,LIDen_SID19,00.html

Please Note:
If we do no receive the appropriate account verification within 48 hours, then we will assume this account is fraudulent and will be permanently restricted.

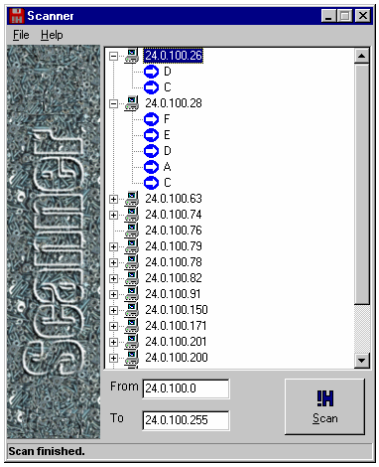
After you follow the prompts to restore your account , your account features and online access will be restored and you will be redirected to our secure website .

Phishing (2)

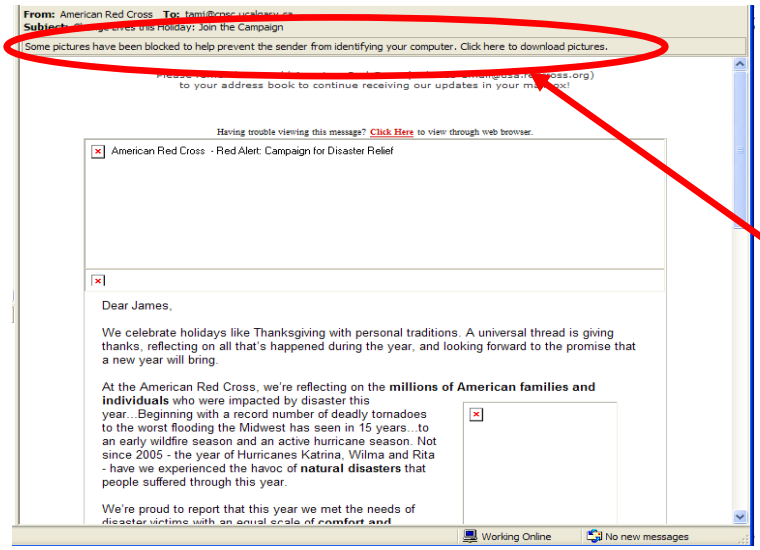
- Today's phishing scams are more insidious:
  - Virus laden web site
  - Worms that activate with an email

Always-On Connections Provides An Easier Target

- Some malicious programs constantly scan computers on the Internet for vulnerabilities (insecure connections):



Letting Your IP Address Out Can Make You A Target

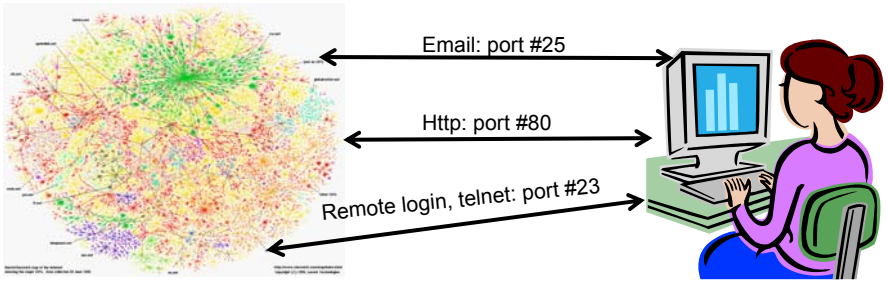


Often blocked for a good reason

JT's note: this particular email is actually safe.

Interacting With Parts Of The Internet

- Reminder: 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 it's logical ports.



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 e.g., http://www.grc.com/freepopular.htm

General Ways Of Increasing The Security Of Your Computer

- 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.
- Avoid leaving your computer on all the time (you present a fixed target).
- 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.
- 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 balanced out vs. the potential costs of providing too much information.
  - Providing too 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.
- One other approach is to provide varying levels of access to your personal information and online activities:
  - Your "real" friends have as much personal information about you online that they have in the real world (don't forget though that the web site operator also has access to this information – read their terms of use because they may be allowed to share this information to other companies)
  - Your "online/virtual" friends have restricted access to your online information.
  - But 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).

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 phishing and how does it occur
- How knowledge of your IP address by another can increase your risk

After This Section You Should Now Know (2)

- What is a logical port and how do firewalls increase security by closing ports
- 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