SE 4352

Software Architecture and Design

Fall 2018

Module 9

Importance of Information Security

- The internet allows an attacker to attack from anywhere on the planet.

- Security is Everyone's Responsibility.

- Risks caused by poor security knowledge and practice:
  - Identity Theft
  - Monetary Theft
  - Legal Ramifications (for yourself and companies)
  - Termination if company policies are not followed

- According to www.SANS.org , the top vulnerabilities available for a cyber criminal are:
  - Web Browser
  - IM Clients
  - Web Applications
  - Excessive User Rights

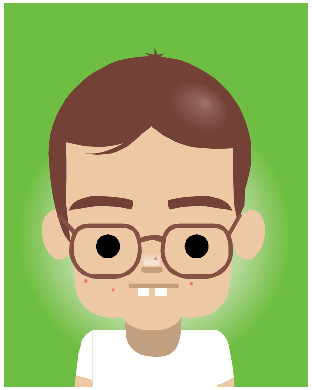
Security vs Safety

Security: We must protect our computers and data in the same way that we secure the doors to our homes.

Safety: We must behave in ways that protect us against risks and threats that come with technology.

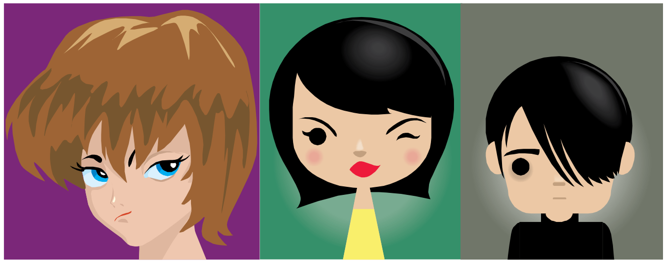
User Awareness

Computer Criminals



Cracker:
Computer-savvy programmer creates attack software

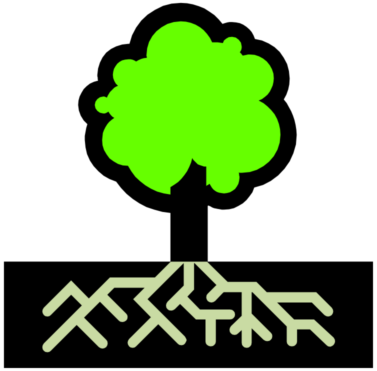
Script Kiddies: Unsophisticated computer users who know how to execute programs



Criminals:
Create & sell bots -> spam
Sell credit card numbers,…

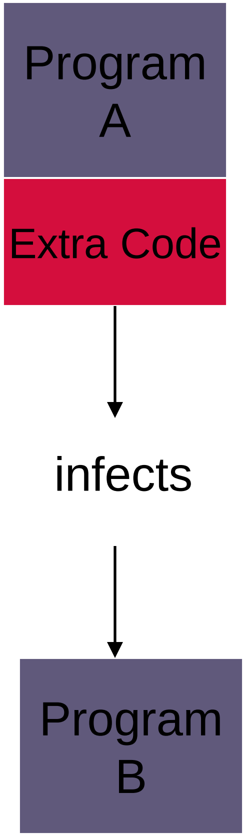
Leading Threats

- Virus
- Worm
- Trojan Horse / Logic Bomb
- Social Engineering
- Rootkits
- Botnets / Zombies



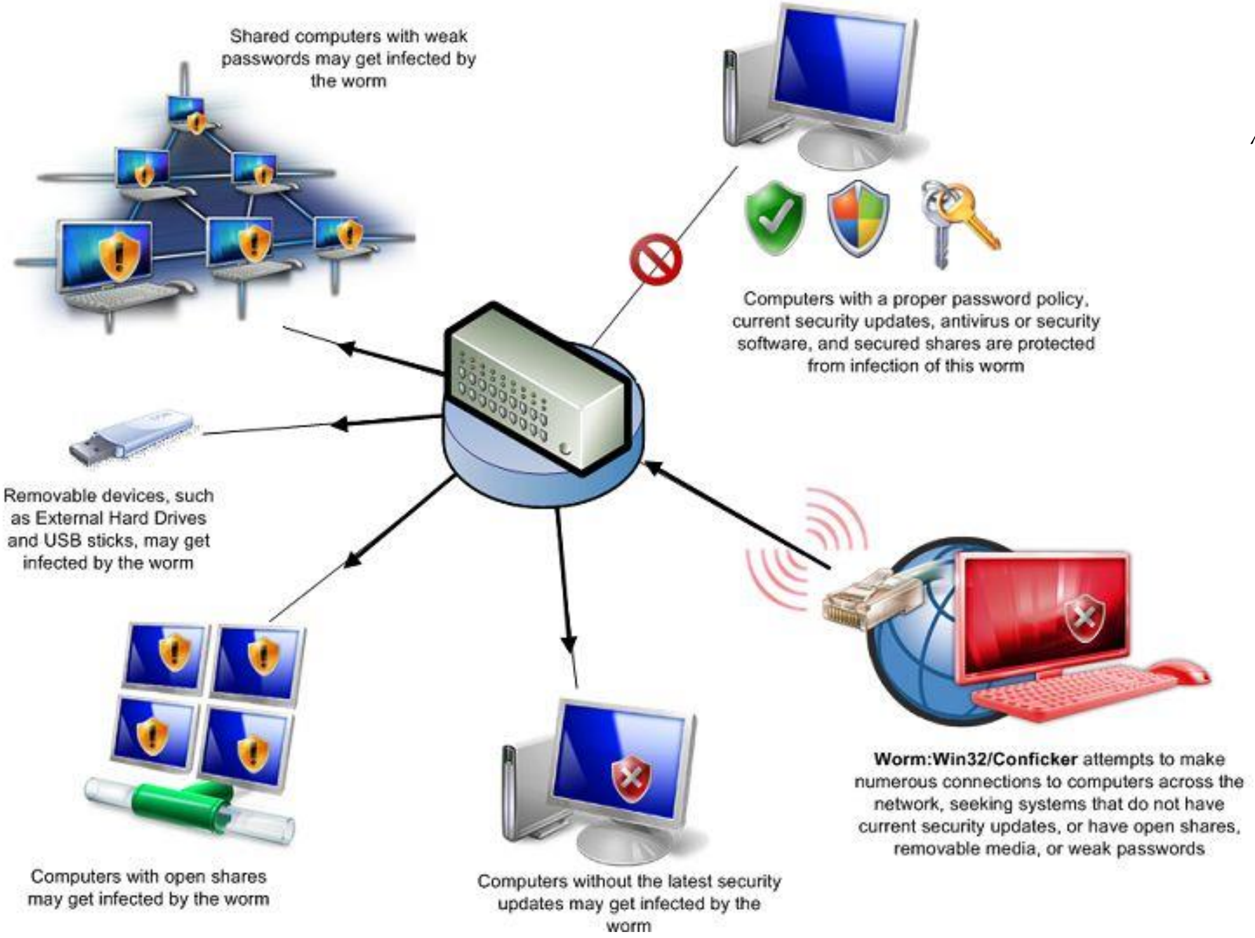
Virus

- A virus attaches itself to a program, file, or disk
- When the program is executed, the virus activates and replicates itself
- The virus may be benign or malignant but executes its payload at some point (often upon contact)
  - Viruses result in crashing of computers and loss of data.



Worm

- Independent program which replicates itself and sends copies from computer to computer across network connections. Upon arrival the worm may be activated to replicate.



Shared computers with weak passwords may get infected by the worm

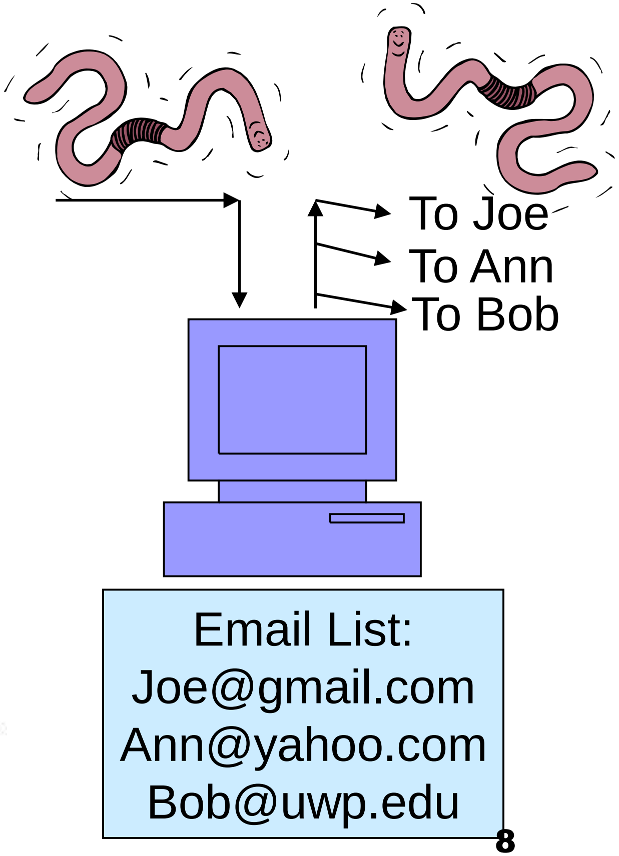
Computers with a proper password policy, current security updates, antivirus or security software, and secured shares are protected from infection of this worm

Removable devices, such as External Hard Drives and USB sticks, may get infected by the worm

Worm:Win32/Conficker attempts to make numerous connections to computers across the network, seeking systems that do not have current security updates, or have open shares, removable media, or weak passwords

Computers with open shares may get infected by the worm

Computers without the latest security updates may get infected by the worm



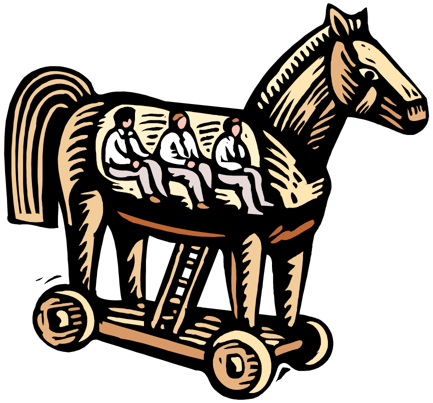
To Joe
To Ann
To Bob

Email List:
Joe@gmail.com
Ann@yahoo.com
Bob@uwp.edu

Logic Bomb/Trojan Horse

- **Logic Bomb:** Malware logic executes upon certain conditions. Program is often used for legitimate reasons.
  - Employee triggers a database erase when he is fired.

- **Trojan Horse:** Masquerades as beneficial program while quietly destroying data or damaging your system.
  - Download a game: Might be fun but has hidden part that emails your password file without you knowing.



Social Engineering

- Social engineering manipulates people into performing actions or divulging confidential information. Similar to a confidence trick or simple fraud, the term applies to the use of deception to gain information, commit fraud, or access computer systems.

Phone Call: This is John, the System Admin. What is your password?

Email: ABC Bank has noticed a problem with your account…

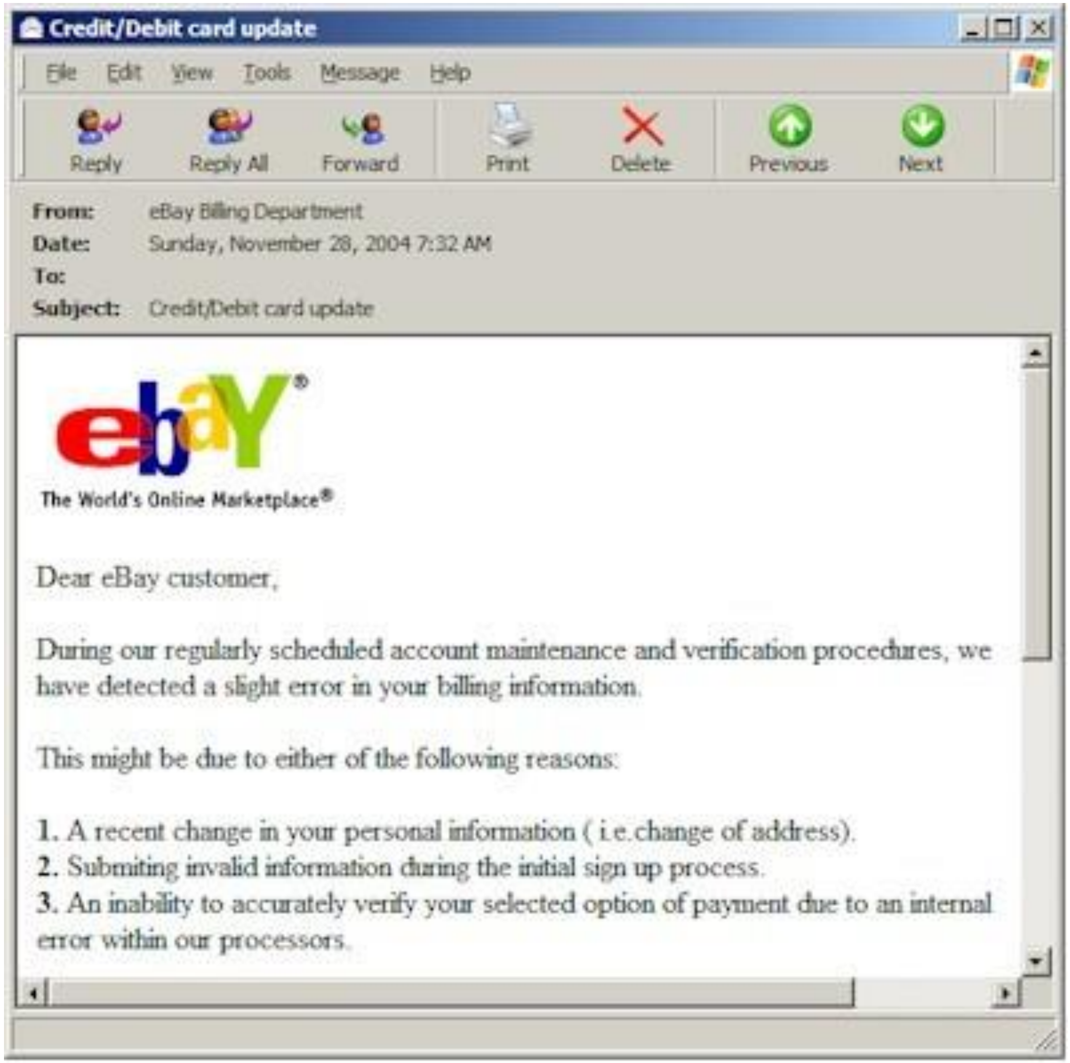
In Person: What ethnicity are you? Your mother’s maiden name?

I have come to repair your machine…

and have some software patches

Phishing = Fake Email

- **Phishing**: a 'trustworthy entity' asks via e-mail for sensitive information such as SSN, credit card numbers, login IDs or passwords.



From: eBay Billing Department
Date: Sunday, November 28, 2004 7:32 AM
To:
Subject: Credit/Debit card update

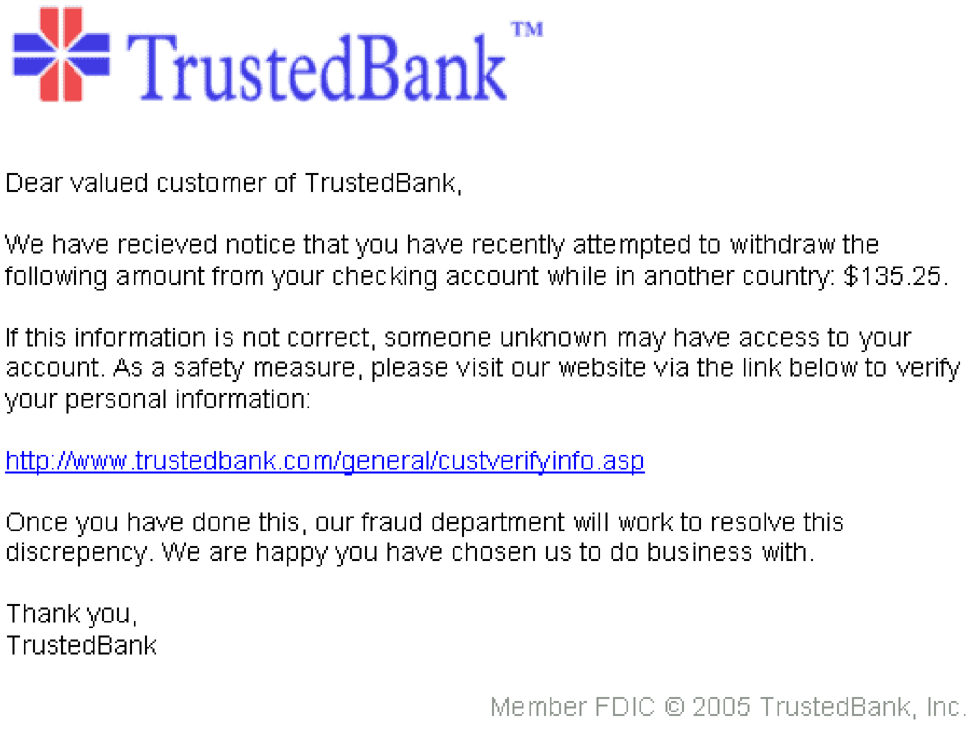
Dear eBay customer,

During our regularly scheduled account maintenance and verification procedures, we have detected a slight error in your billing information.

This might be due to either of the following reasons:

1. A recent change in your personal information (i.e.change of address).
2. Submiting invalid information during the initial sign up process.
3. An inability to accurately verify your selected option of payment due to an internal error within our processors.

Pharming = Fake Web Pages



TrustedBank™

Dear valued customer of TrustedBank,

We have recieved notice that you have recently attempted to withdraw the following amount from your checking account while in another country: $135.25.

If this information is not correct, someone unknown may have access to your account. As a safety measure, please visit our website via the link below to verify your personal information:

http://www.trustedbank.com/general/custverifyinfo.asp

Once you have done this, our fraud department will work to resolve this discrepency. We are happy you have chosen us to do business with.

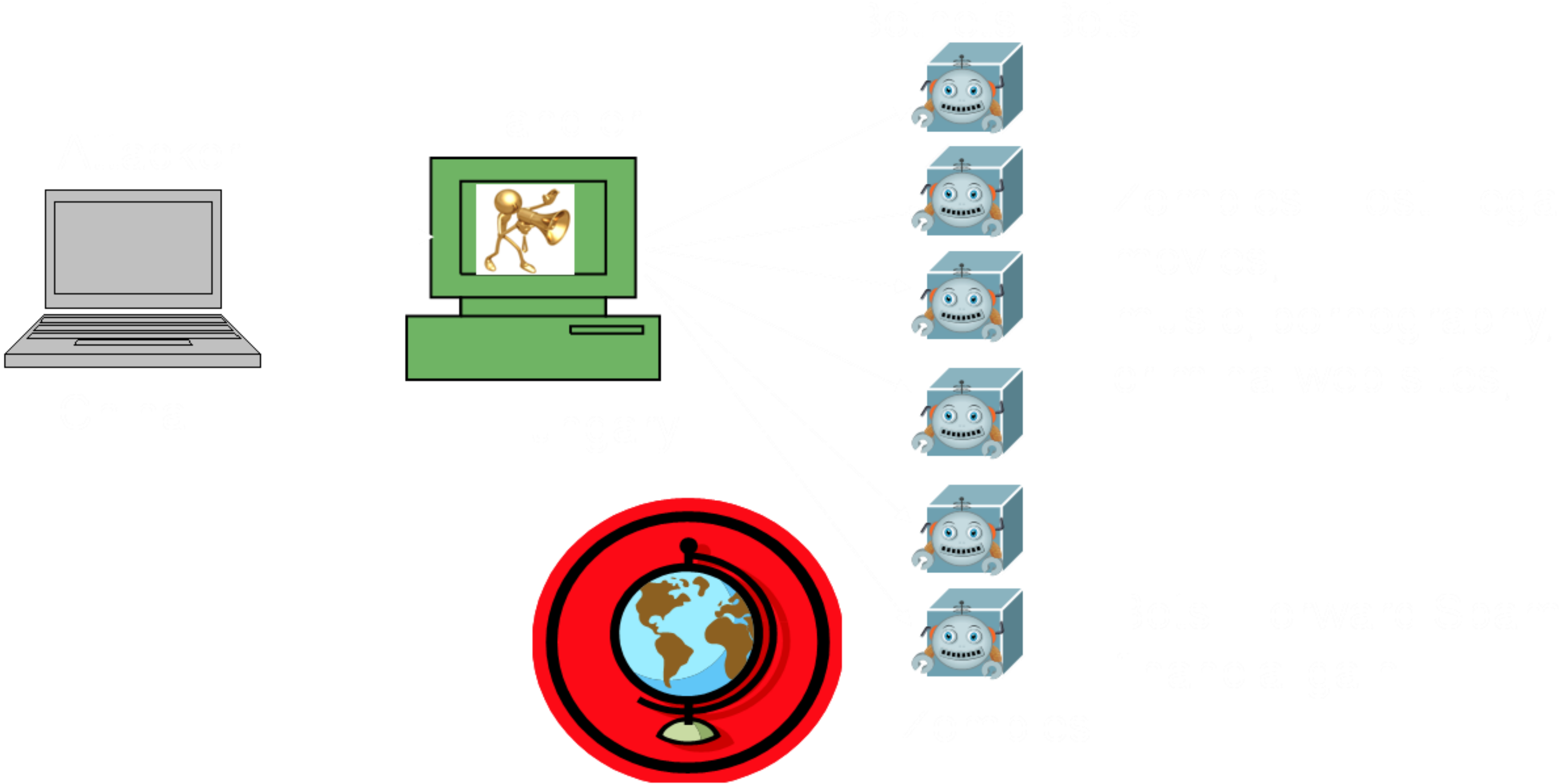
Thank you,
TrustedBank

Member FDIC © 2005 TrustedBank, Inc.

- The link provided in the e-mail leads to a fake webpage which collects important information and submits it to the owner.
- The fake web page looks like the real thing
  - □ Extracts account information

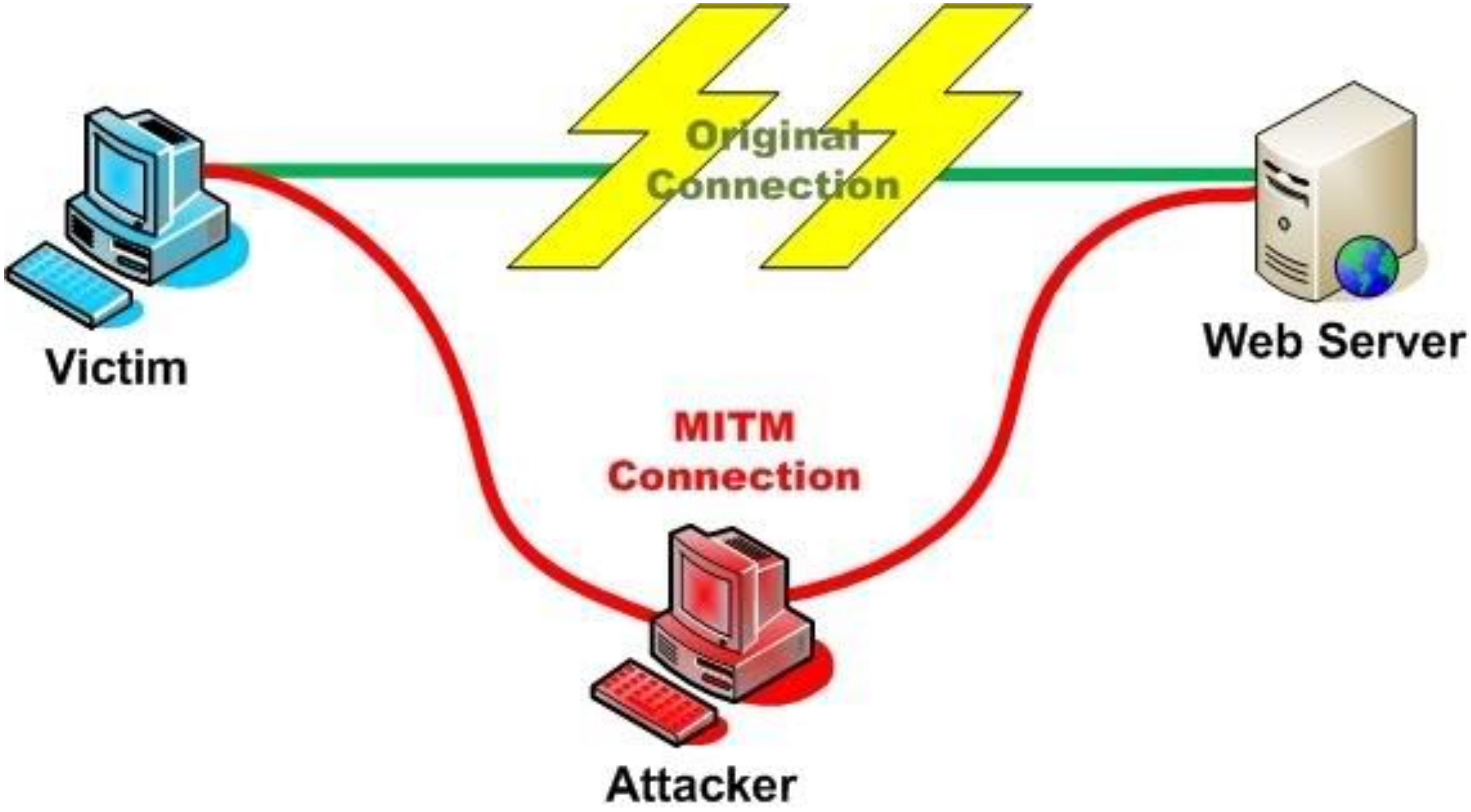
BotNet

- A **botnet** is a large number of compromised computers that are used to create and send spam or viruses or flood a network with messages as a denial of service attack.
- The compromised computers are called **zombies**



Man In The Middle Attack

- An attacker pretends to be your final destination on the network. If a person tries to connect to a specific WLAN access point or web server, an attacker can mislead him to his computer, pretending to be that access point or server.



RootKit

- Upon penetrating a computer, a hacker installs a collection of programs, called a **rootkit**.

- May enable:
  - Easy access for the hacker (and others)
  - Keystroke logger

- Eliminates evidence of break-in

- Modifies the operating system

Password Cracking: Dictionary Attack & Brute Force

Pattern	Calculation	Time to Guess
Personal Info: interests, relatives		Manual 5 minutes
Social Engineering		Manual 2 minutes
American Dictionary		< 1 second
4 chars: lower case alpha	26^4	
8 chars: lower case alpha	26^8	
8 chars: alpha	52^8	
8 chars: alphanumeric	62^8	3.4 min.
8 chars alphanumeric +10	72^8	12 min.
8 chars: all keyboard	95^8	2 hours
12 chars: alphanumeric	62^{12}	96 years
12 chars: alphanumeric + 10	72^{12}	500 years
12 chars: all keyboard	95^{12}	
16 chars: alphanumeric	62^{16}	

Data Breach Notification Law

- Restricted data includes:
  - Social Security Number
  - Driver’s license # or state ID #
  - Financial account number (credit/debit) and access code/password
  - DNA profile (Statute 939.74)
  - Biometric data
- In US, HIPAA protects:
  - Health status, treatment, or payment

Break-In Detection

- Symptoms:
  - Antivirus software detects a problem
  - Pop-ups suddenly appear (may sell security software)
  - Disk space disappears
  - Files or transactions appear that should not be there
  - System slows down to a crawl
  - Unusual messages, sounds, or displays on your monitor
  - Stolen laptop (1 in 10 stolen in laptop lifetime)
  - Your mouse moves by itself
  - Your computer shuts down and powers off by itself
  - Often not recognized

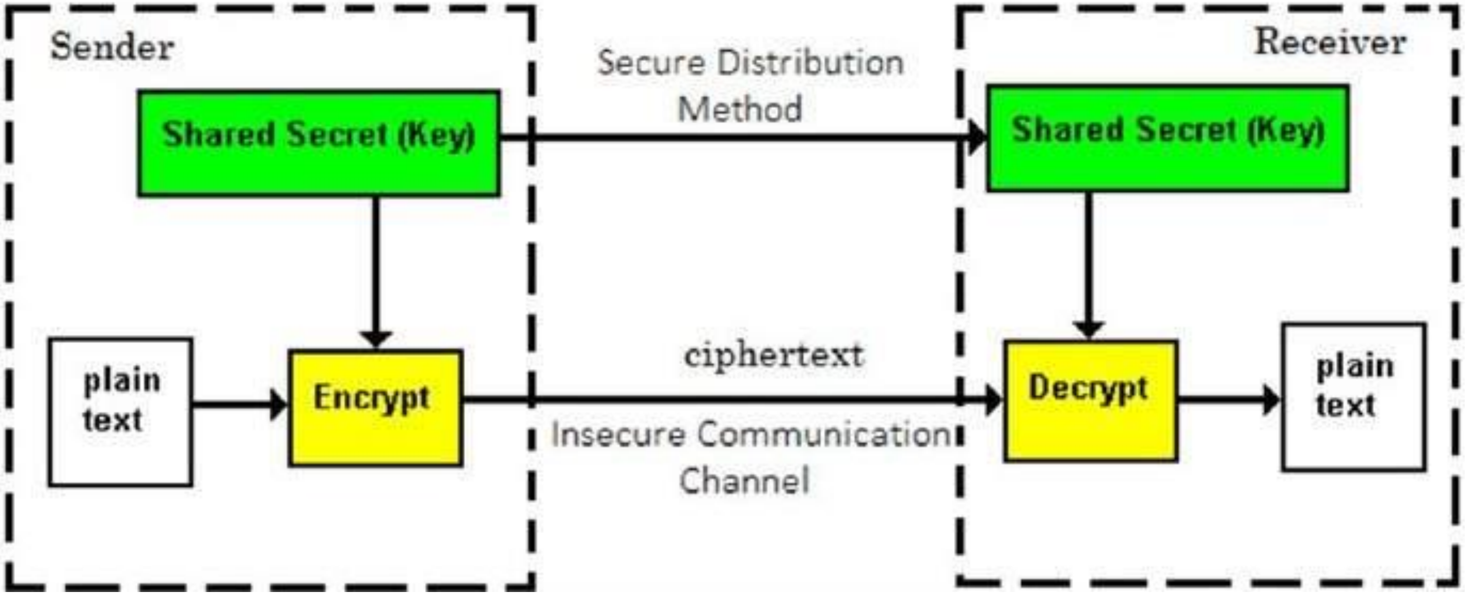
Malware Detection

- Spyware symptoms:
  - Change to your browser homepage/start page
  - Ending up on a strange site when conducting a search
  - System-based firewall is turned off automatically
  - Lots of network activity while not particularly active
  - Excessive pop-up windows
  - New icons, programs, favorites which you did not add
  - Frequent firewall alerts about unknown programs trying to access the Internet
  - Bad/slow system performance

Safe & Secure User Practices

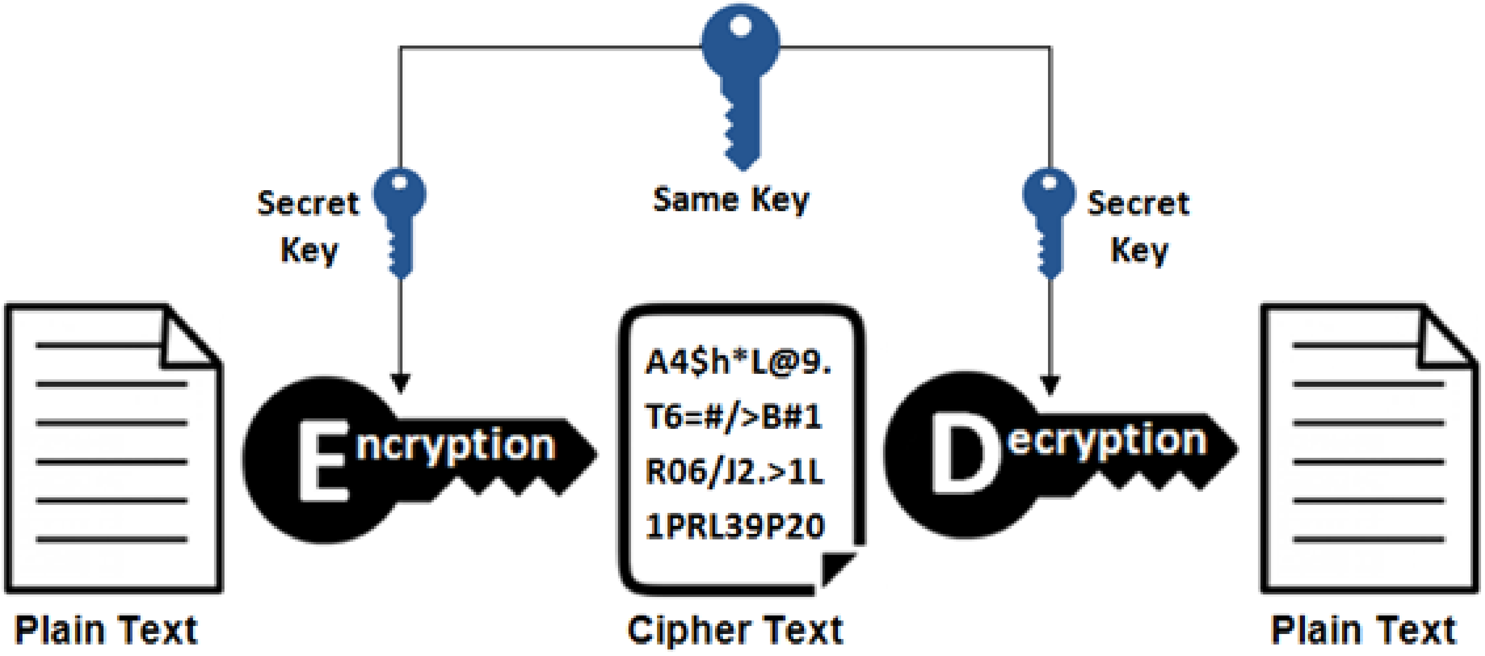
Secure Message Transfer

- The ability to reliability exchange messages between sender and receiver while hiding its contents from third parties.
- Encryption / Decryption in the security of local computers.
- Encrypted messages (cipher text) is transmitted across insecure channels i.e. the internet.



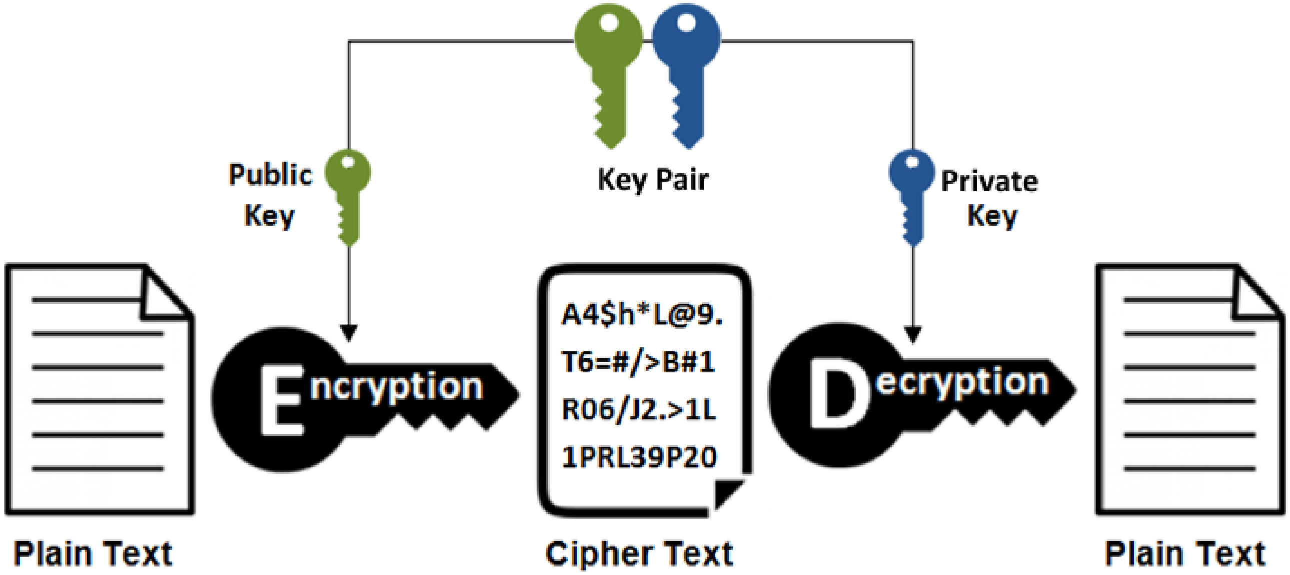
Single Shared Key Symmetric Encryption

- A single key, shared between sender and receiver, is used to encrypt and decrypt the message to be securely transmitted between two parties.



Public / Private Key Encryption

- A party wishing to receive secure messages generates two keys (a key-pair) using a key-pair generator:
  - □ Public Key: Is provided to anyone wishing to send a secure message and is used to encrypt the message into cypher text.
  - □ Private Key: Is used to decrypt cypher text messages encrypted with the public key.



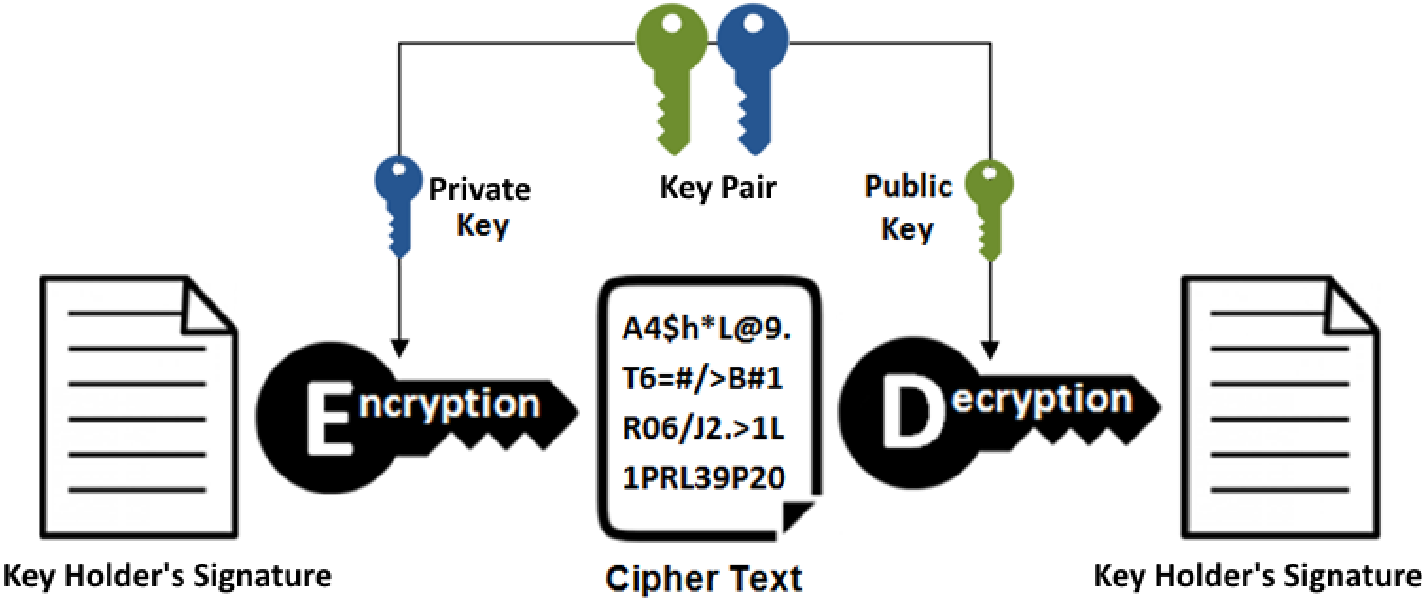
Public / Private Key Encryption

- The public key can be “sent in the open”.
  - Solving the problem of symmetric key distribution.
- The private key is held in secret.
  - The assumption is that only the key pair’s owner has access to their private key.

- This is asymmetric encryption in that a message can be encrypted / decrypted in only one direction.
  - A message encrypted with the public key can only be decrypted using the private key.
  - A message encrypted with the private key can only be decrypted using the public key.

Public / Private Key Authentication

- Using a private key to *sign* a document for the purpose of verifying the identity of the document originator.
  - □ To send signed legal documents.
  - □ To authenticate identity to remote servers e.g. AWS SSH.



Message Authentication

- The signer’s private key is used to generate a signature that can only be ‘opened’ by the signer’s public key.

- The document’s signature can be verified by anyone with the signer’s public key.
  - Because the public key is not secret, a signed document can be verified by anyone.

- How can either party be certain that the document was not modified in transit?
  - A hash of the document can be generated and encrypted using the sender’s private key.

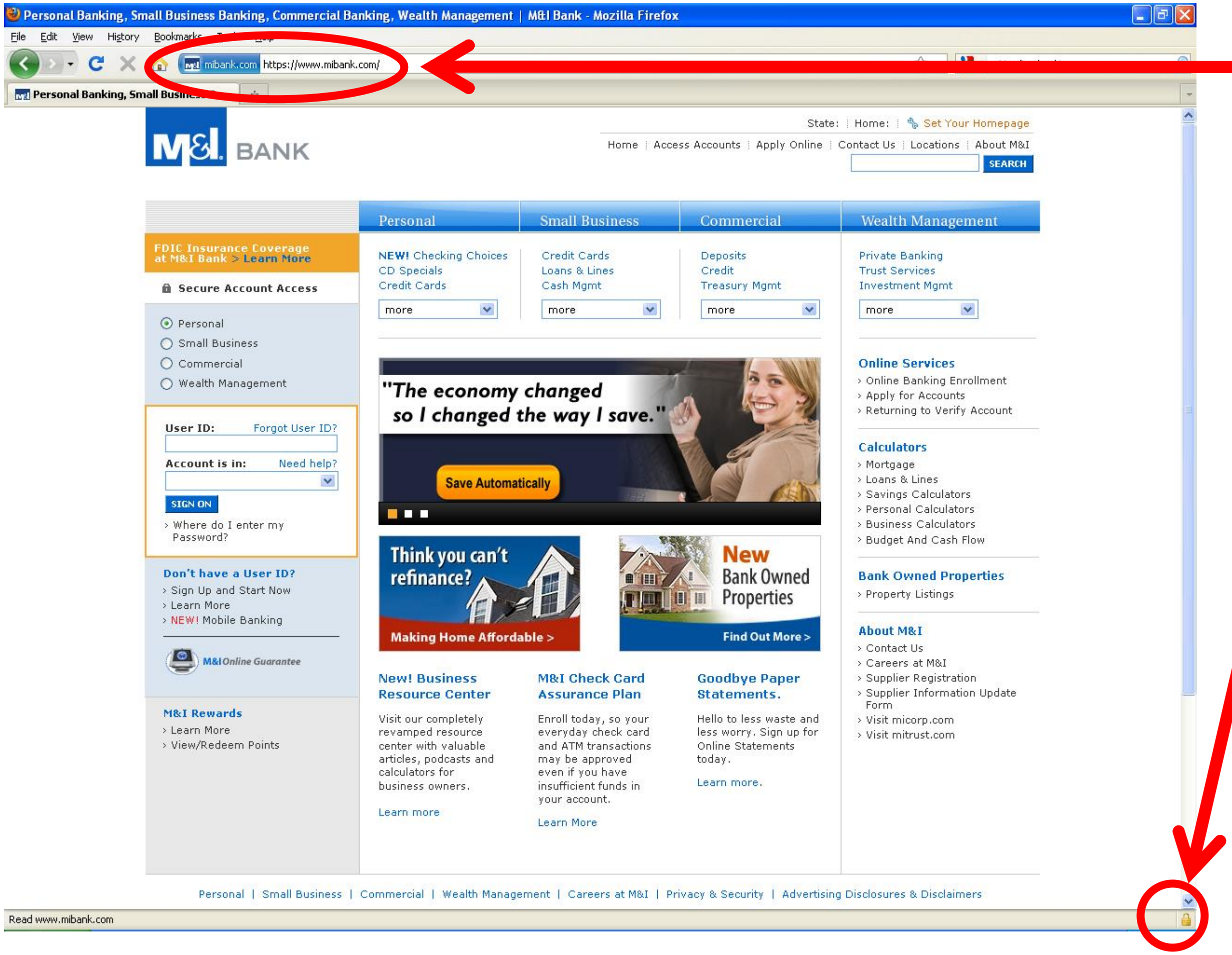
Hashing Functions

- A hashing function takes input data (e.g. a document) and generates a hash value that is unique to the data.

- If the document is hashed by the originator, and the hash value is securely sent with the document, its hash can verified by the receiver.
    - Even slight changes to the document during transit will generate a different hash value at the receiver.

Secure Online Banking & Business

- Always use secure browser to do online activities.
- Frequently delete temp files, cookies, history, saved passwords etc.



Personal Banking, Small Business Banking, Commercial Banking, Wealth Management | M&I Bank - Mozilla Firefox

https://www.mibank.com/

Personal Banking, Small Business

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Secure Account Access

● Personal
○ Small Business
○ Commercial
○ Wealth Management

User ID: Forgot User ID?

Account is in: Need help?

SIGN ON

› Where do I enter my Password?

Don't have a User ID?
› Sign Up and Start Now
› Learn More
› NEW! Mobile Banking

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NEW! Checking Choices
CD Specials
Credit Cards
more

Credit Cards
Loans & Lines
Cash Mgmt
more

Deposits
Credit
Treasury Mgmt
more

Private Banking
Trust Services
Investment Mgmt
more

"The economy changed so I changed the way I save."

Save Automatically

Think you can't refinance?
Making Home Affordable >

New Bank Owned Properties
Find Out More >

New! Business Resource Center
Visit our completely revamped resource center with valuable articles, podcasts and calculators for business owners.
Learn more

M&I Check Card Assurance Plan
Enroll today, so your everyday check card and ATM transactions may be approved even if you have insufficient funds in your account.
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https://

Symbol showing enhanced security

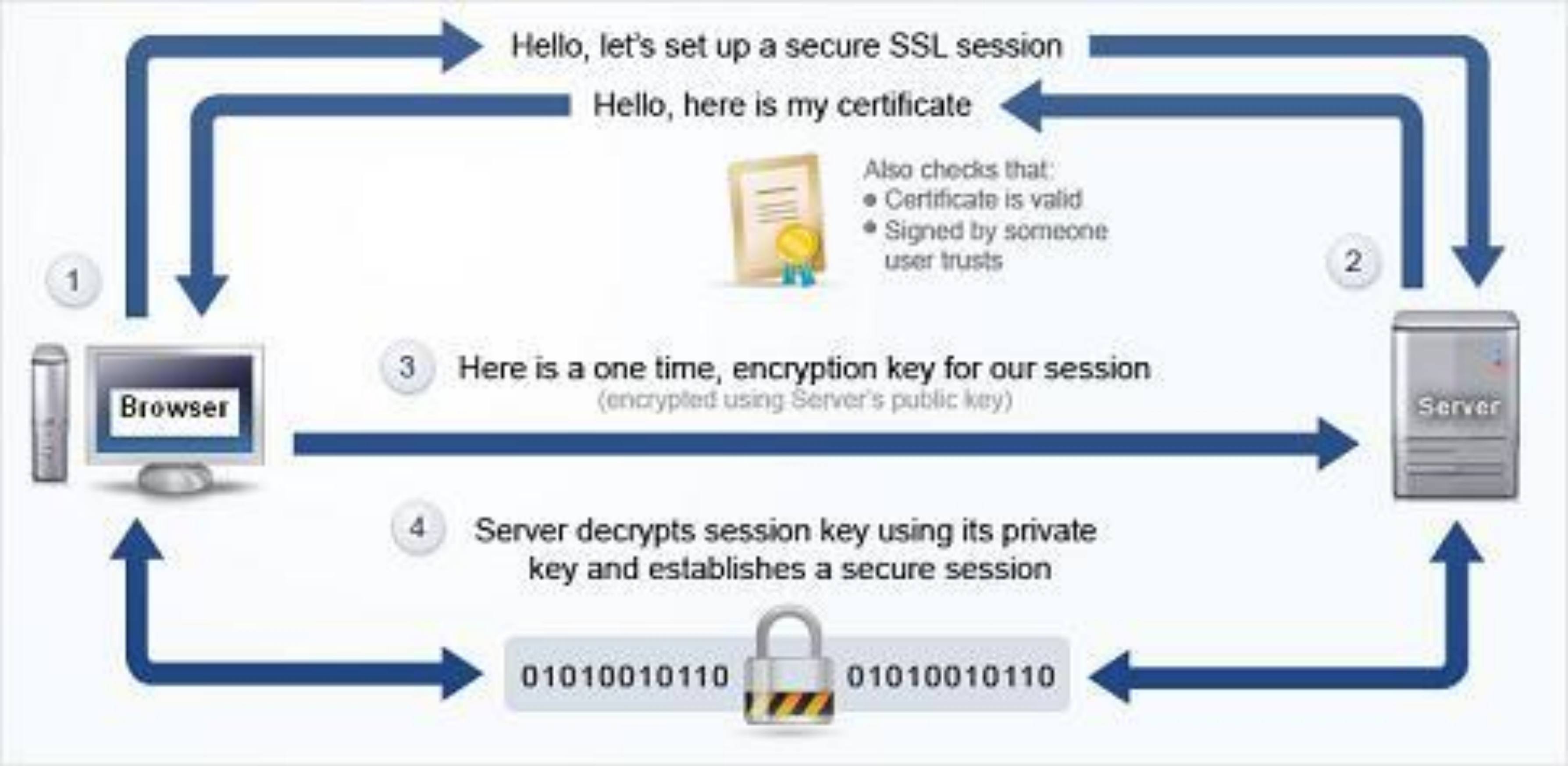
Secure Web Communication using SSL

- Secure Socket Layer (SSL) creates an encrypted two-way channel between the client and server.
  - Third parties are unable to read the contents of the channel.
- When an SSL channels is used by a browser it is referred as the HTTPS protocol.
- SSL uses a combination of Public-Private Key and Symmetric Encryption.
  - Symmetric algorithms are orders of magnitude faster than PPK.

The Process of Establishing a SSL Connection

- The client requests the server to start an SSL connection.
  - Services using SSL are generally located at port 443.
- The server sends the client its public key in a certificate.
- The client generates a one-time shared key to be used to encrypt the traffic between client and server. The key is encrypted using the server’s PK and sent to the server.
- Having securely exchanged the shared key, the client and server can now use a faster asymmetric algorithm to encrypt the data transmitted over the “Secured Socket”.

The Process of Establishing a SSL Connection



1 Hello, let's set up a secure SSL session

2 Hello, here is my certificate

Also checks that:
- Certificate is valid
- Signed by someone user trusts

3 Here is a one time, encryption key for our session
(encrypted using Server's public key)

4 Server decrypts session key using its private key and establishes a secure session

Network Services

- Network services are provided by applications (process) installed on a server (machine) at an address & port number.
- Clients access a service by first connecting to the application.
  - Machines have internet (IP) addresses.
  - Applications are installed *at ports* on the machine.
- For example, HTTP services is an application (e.g. Apache) running on a publically-accessible machine at port 80.
  - Port 80 is the default port for HTTP services.
  - Browsers (clients) open a connection (socket) to the HTTP service using the machine's address and port 80.

Public and Private Networks & Addresses

- An Internet Protocol Address (IPv4) is made up of four groups of 8-bit numbers (xx.xx.xx.xx).
  - IPv6 defines an address using eight groups of 16-bit numbers.

- Networks are classified as either Public or Private.
- The Internet standards committee has set aside certain ranges of addresses for private networks.
  - One such range is the Class C address 192.168.xx.xx.
  - Machines inside the enterprise (or home) network are on a private network e.g. 192.168.0.12 .

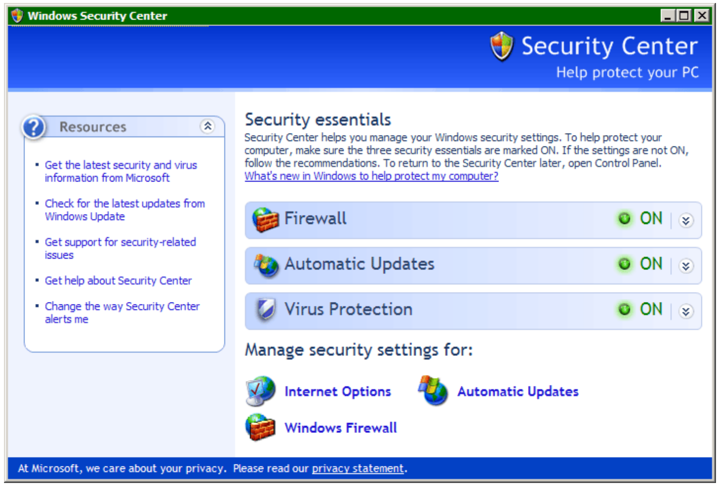
- The internet's routers will not pass packets addressed to private networks.

Restricting Network Access to Services

- Many network services run on a typical machine (server).
  - Some services are intended for public access.
  - Some services should only be accessible from within the enterprise
- Secure Shell (SSH) is an example of a restricted service.
  - SSH provides machine-level access for the enterprise’s operators allowing them to perform maintenance on the server.
  - SSH could also provide a channel through which ‘hackers’ can break into a server, steal information, disrupt services, etc.
- A mechanism is needed that allows external access to public services but denies external access to restricted service.

Firewall

- A firewall acts as a wall between your computer/private network and the internet. Hackers may use the internet to find, use, and install applications on your computer. A firewall prevents hacker connections from entering your computer.
- Filters packets that enter or leave your computer



- Get the latest security and virus information from Microsoft
- Check for the latest updates from Windows Update
- Get support for security-related issues
- Get help about Security Center
- Change the way Security Center alerts me

Security essentials

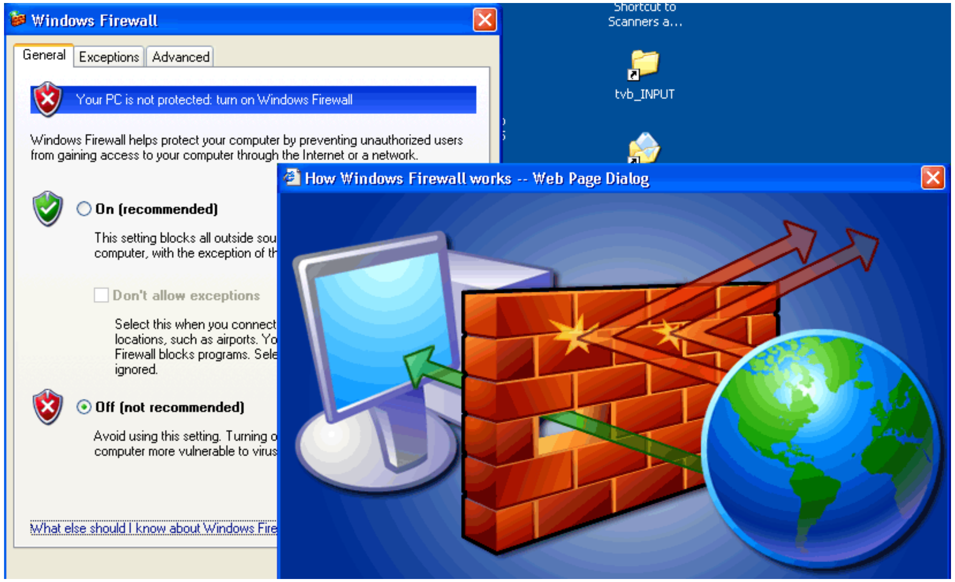
Security Center helps you manage your Windows security settings. To help protect your computer, make sure the three security essentials are marked ON. If the settings are not ON, follow the recommendations. To return to the Security Center later, open Control Panel.
What's new in Windows to help protect my computer?

Firewall	ON
Automatic Updates	ON
Virus Protection	ON

Manage security settings for:

Internet Options   Automatic Updates
Windows Firewall

At Microsoft, we care about your privacy. Please read our privacy statement.


Windows Firewall
General
Exceptions
Advanced
Shortcut to Scanners a...
tvb_INPUT
How Windows Firewall works -- Web Page Dialog

Your PC is not protected: turn on Windows Firewall

Windows Firewall helps protect your computer by preventing unauthorized users from gaining access to your computer through the Internet or a network.

○ On (recommended)

This setting blocks all outside sou computer, with the exception of th

□ Don't allow exceptions

Select this when you connect locations, such as airports. Yo Firewall blocks programs. Sele ignored.

● Off (not recommended)

Avoid using this setting. Turning o computer more vulnerable to virus

What else should I know about Windows Fire

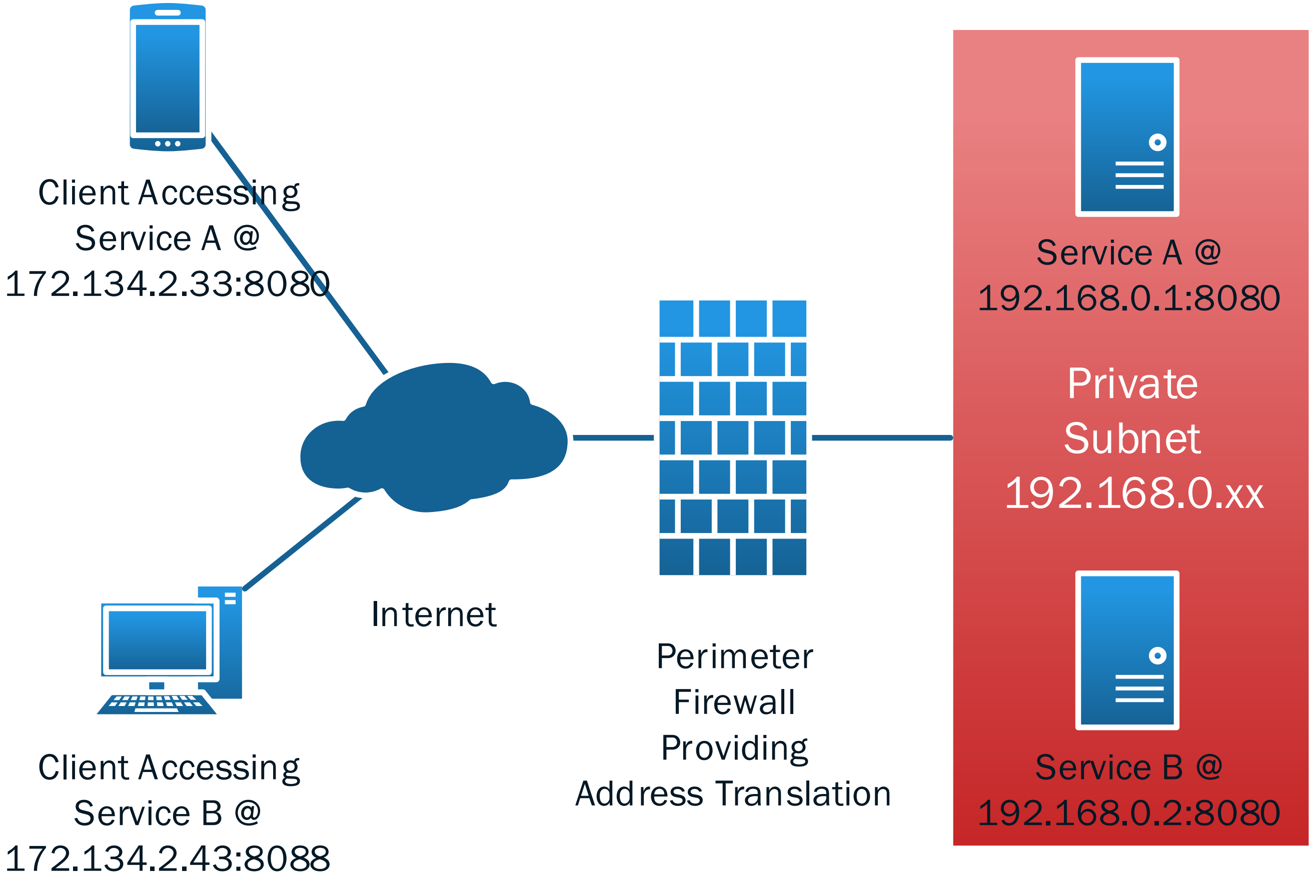
Security Tactic: Firewalls

- A Firewall is a machine / server that acts as a *gate keeper* between the public internet and machines running in the enterprise's private networks.
  - □ A Firewall / Router provides several network management services

A Firewall can be:

- □ Purchased as a standalone network appliance from vendors such as Cisco. This is the best but more expensive alternative.
- □ Installed and configured on machines running general-purpose operating systems such as BSD or Linux.

Firewall Providing Address Translation from Public Internet to Private Enterprise Networks



Translating Public Addresses into Private Network Addresses

- Services accessible from the public internet are made available at public addresses.
  - The firewall is installed at those public internet addresses.
  - Servers are installed behind the firewall at private addresses.
- The Firewall translates public addresses to private addresses hosted in the enterprise’s private network.
  - According to the firewall’s configuration, a network packet addressed to the firewall’s public address will be forwarded to a private address (machine) running in the enterprise’s private network.

How Does a Firewall Secure the Private Network?

- Traffic in the private network is restricted to only the network.
  - Private Class C addresses (192.168.xx.xx) will by rejected by the internet’s infrastructure (routers).
  - So public clients cannot directly address the servers in the private network.

- The firewall will filter (reject) any IP packets whose destination address in not in its translation configuration.
  - The firewall will reject a packet from the public network addressed to 172.134.2.33:22 (SSH) because no public to private translation has been configured.

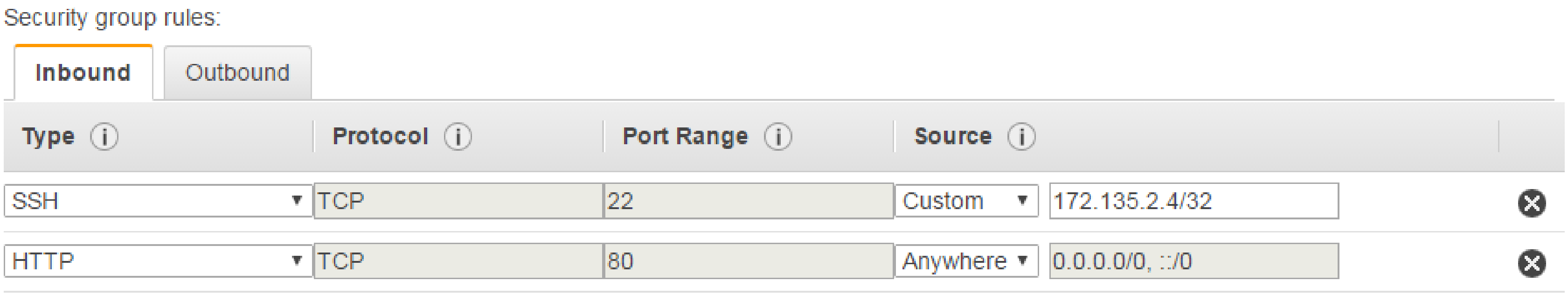
Firewall Configuration

- A firewall is configured by:

  1. Initially blocking all traffic from the public internet.

  2. Selectively allowing address / port combinations though.

- AWS Security Groups are Firewall Rules for associated EC2 servers.
  - Every EC2 server maintains its own firewall.



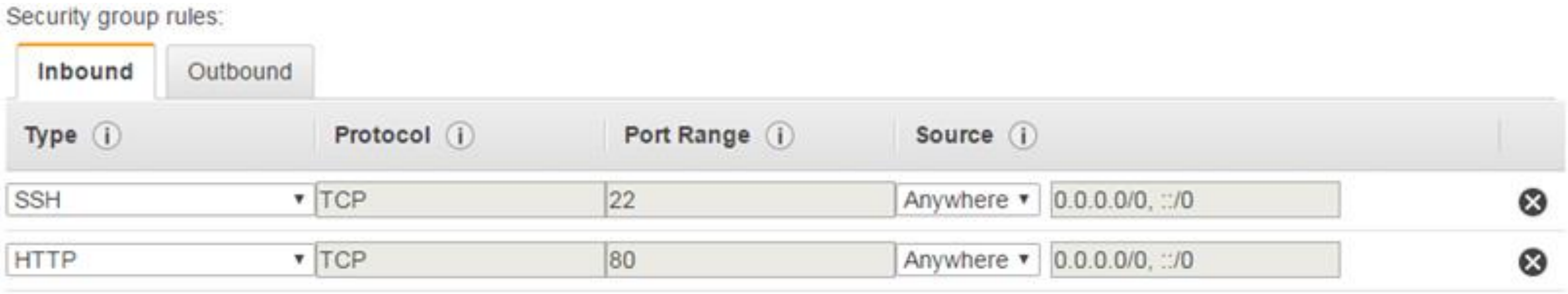
Security group rules:

Inbound | Outbound

Type	Protocol	Port Range	Source		
SSH ▾	TCP	22	Custom ▾	172.135.2.4/32	⊗
HTTP ▾	TCP	80	Anywhere ▾	0.0.0.0/0, ::/0	⊗

Example AWS Security Groups

- Allows both HTTP and SSH traffic from anywhere (Bad Idea).



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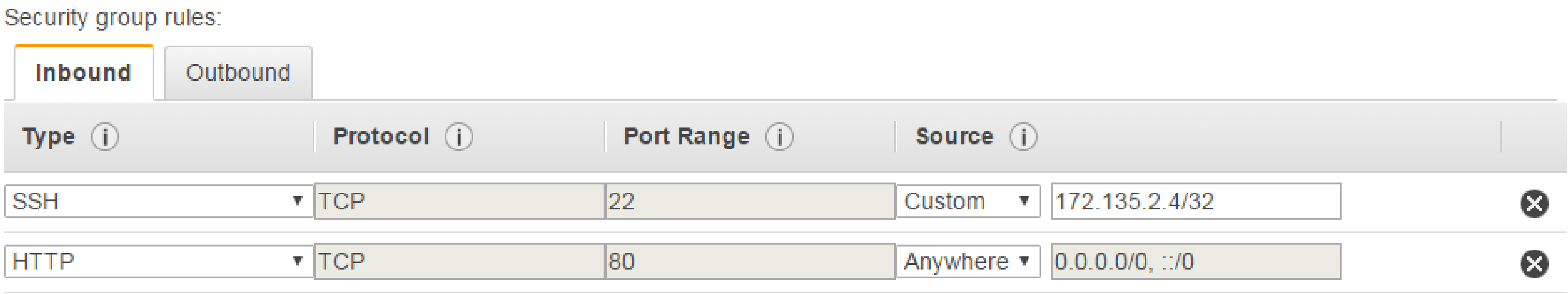
SSH ▾	TCP	22	Anywhere ▾	0.0.0.0/0, ::/0	⊗
HTTP ▾	TCP	80	Anywhere ▾	0.0.0.0/0, ::/0	⊗

- Allows HTTP from anywhere but restricts SSH to a specific public address used by the site operators.



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HTTP ▾	TCP	80	Anywhere ▾	0.0.0.0/0, ::/0	⊗

With this level of protection, how are intrusions into private networks (hacks) accomplished?

- By exploiting bugs or incorrect configurations of the firewall.
- By the installation of intrusion software from within the enterprise.
  - Typically by an employee or someone with access to the internal network.

- To make hacks of critical information more difficult to accomplish, what can be done?

With this level of protection, how are intrusions into private networks (hacks) accomplished?

- By exploiting bugs or incorrect configurations of the firewall.
- By the installation of intrusion software from within the enterprise.
  - Typically by an employee or someone with access to the internal network.

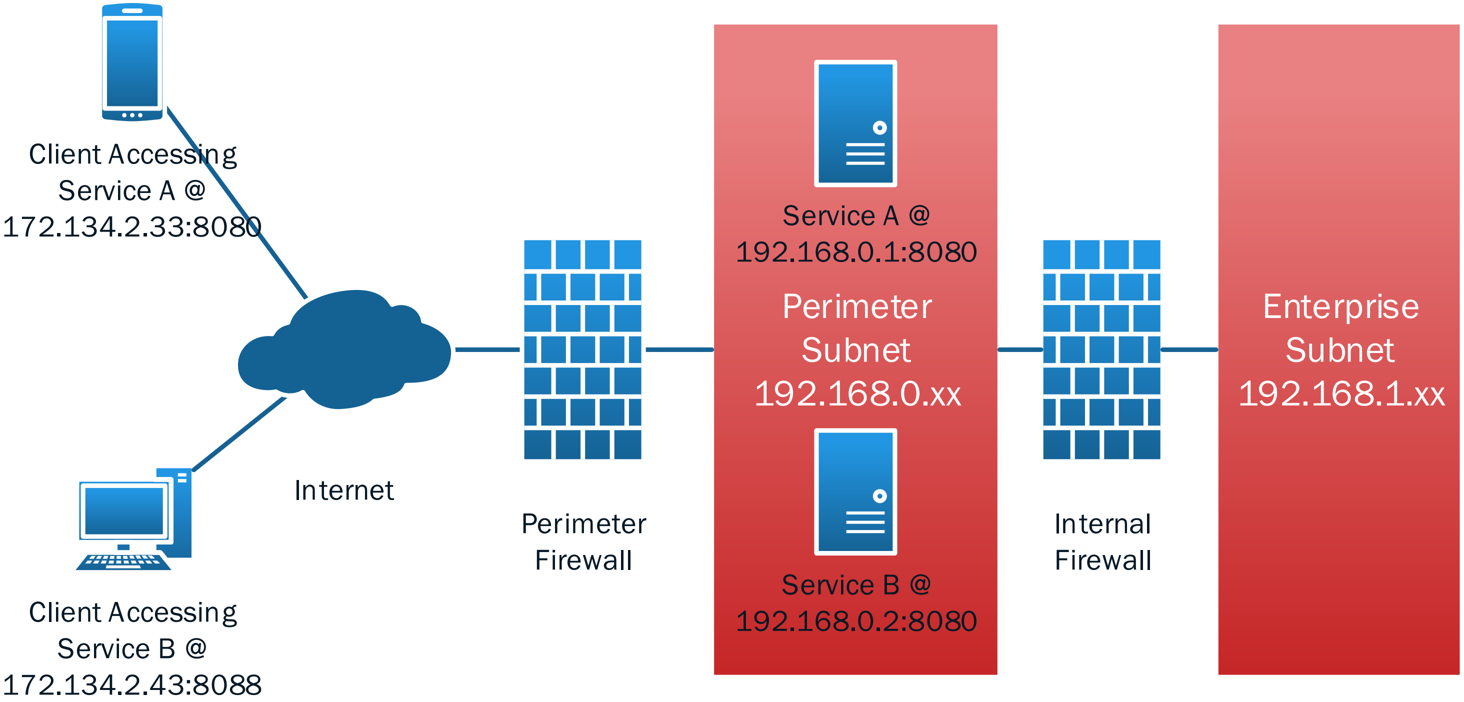
- To make hacks of critical information more difficult to accomplish, two levels of firewall protection are placed in the private network.
  - A Perimeter Firewall between the public network and the machines hosting the services.
  - A Internal Firewalls between the public-facing machines and enterprise’s private network.

The Perimeter Network or DMZ

- Two firewalls allow the creation of a *Perimeter Network* that contains the machines exposed to the public internet.

- The perimeter network lies between the perimeter firewall that faces the public network and internal firewalls that protect the enterprise’s private network.

The addition of a Perimeter Sub-Network



Advantages of a Perimeter Subnet (DMZ)

- If intruders gain access to the DMZ though the perimeter firewall, they are blocked from access the enterprise network by the internal firewall.

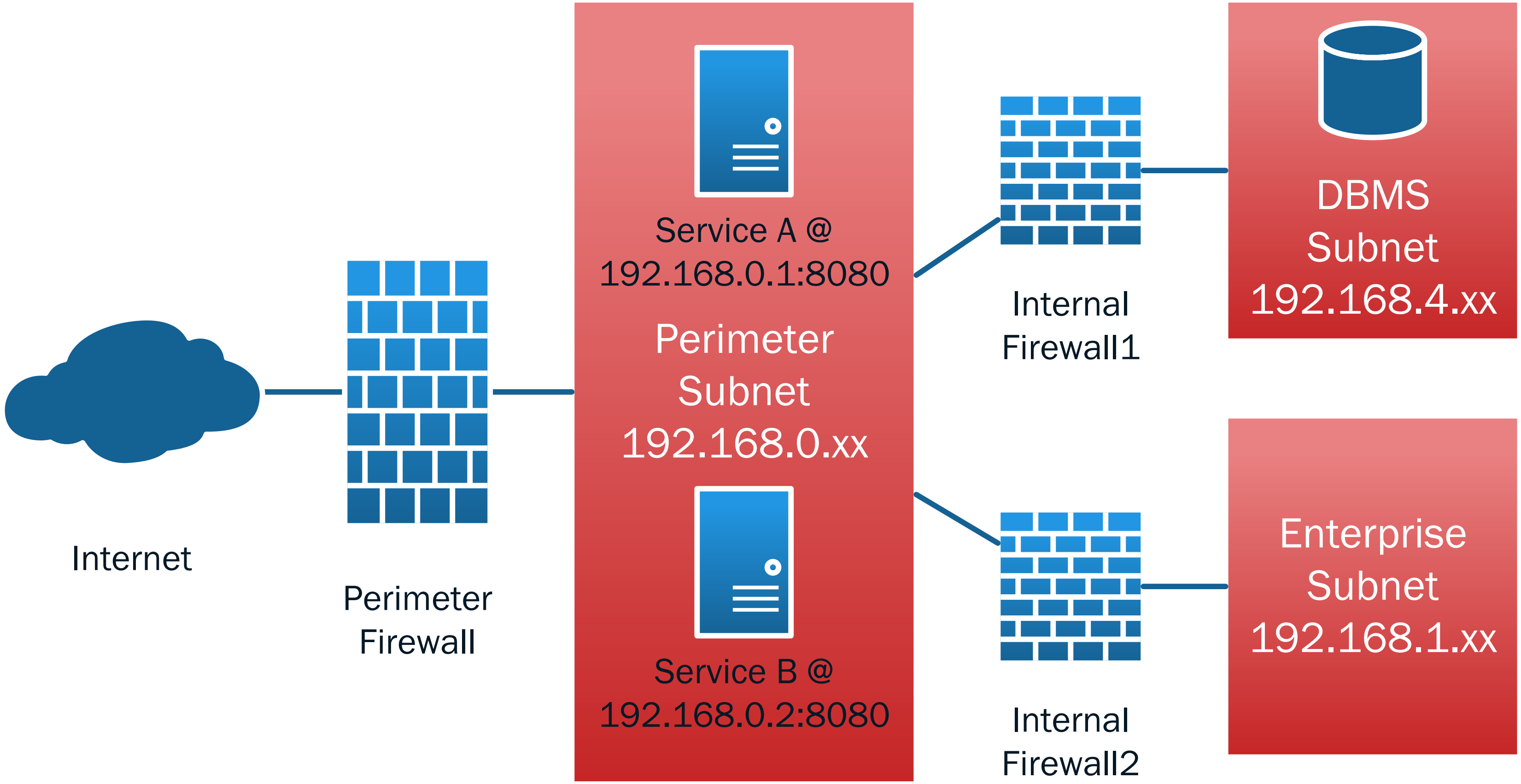
- Rules in the internal firewall can deny access to the perimeter servers from inside the enterprise network.
  - This help to protect those servers from attacks from inside the enterprise.

Protecting Sensitive Information From Intrusions Within the Enterprise

- Assume a DBMS containing critical data e.g. credit cards.
- It is common to place these servers in a separate private network (subnet) inside the enterprise.

- In this example, the use of multiple firewalls allows the creation of a subnet containing the Credit Card DBMS that can only be accessed from inside the perimeter subnet.
  - Machines on the enterprise network cannot access the protected DBMS Subnet.

The Addition of Protected Subnetworks



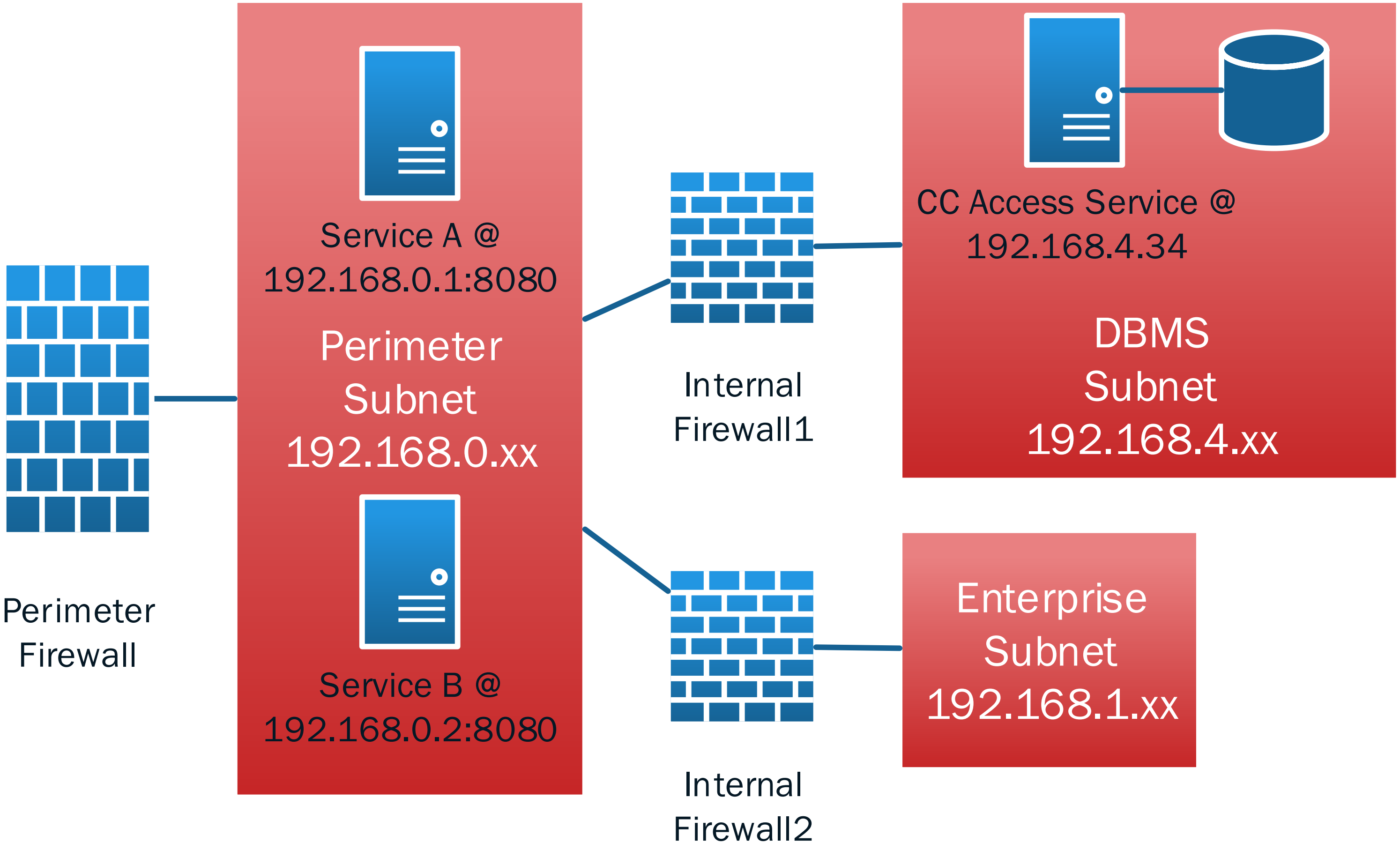
Advantages of Protected Subnets

- If intruders gain access to the DMZ though the perimeter firewall, they are blocked from accessing the protected subnet.
  - The protected subnet’s firewall rules can be more specific in terms of the servers allowed to access the DBMS.
- Affords the protected subnet (DBMS) an even better level of protection from attacks from inside the enterprise network.

Providing Access to Sensitive Information

- Some access to sensitive information is required to provide the system’s required services.
  - The Customer Service Rep requires access to a customer’s credit card information to manage the customer’s relationship.
- The previous design allows unrestricted access to the DBMS from within the Perimeter Subnet.
  - Making it vulnerable to access from hacks within the perimeter.
- System services can be designed to provide limited access to sensitive information.
  - The next slide shows a Credit Card Access Service that provides limited access to CC information.

The Addition of Protected Services



Service A @ 192.168.0.1:8080

Perimeter Subnet 192.168.0.xx

Service B @ 192.168.0.2:8080

Perimeter Firewall

Internal Firewall1

Internal Firewall2

CC Access Service @ 192.168.4.34

DBMS Subnet 192.168.4.xx

Enterprise Subnet 192.168.1.xx

Application Security Tactics

- Application Security Tactics are concerned with protecting sensitive information hosted by services from access by unauthorized applications and personnel.

- Access to sensitive services (e.g. CC Service) is restricted to specific roles assigned to client / users.
  - For example, a customer service representative logs into an internal web application.
  - Their ID is associated with a role that allows the client access to the sensitive services.

Role-Based Security

- The process of gaining access to a protected service is defined in two steps:
- Authentication
  - The use of IDs and Passwords to authenticate the user’s identity i.e. determine that the user (client) is who they claim to be.
- Authorization
  - Assign roles to users that determine the services / information they are permitted to access.
  - Roles are maintained by the same services that authenticated the user’s identity.

Multiple layers of Service Protection

- A system can maintain as many roles as needed to protect access to several sensitive services.
- For example, a ecommerce site may have these roles:
  - CSClerk has limited access a Customer’s name and purchase history.
  - CSSupervisor can access CSClerk data plus the Customer’s personal information i.e. credit cards, drivers license number, etc.
  - ProductMngt role provides access to services that manage the products and categories maintained by the site.

- The use of multiple roles allows architects to design services that provide targeted access to sensitive information
  - Providing a user / client access to only the information needed to perform a given role / responsibility in the system.

Role-based Access to Services

- Access to a server is allowed / denied to a user or client based on the roles assigned by the system administrators.
- The authorization process works something like:
  - 1. The user / client connects to an application and invokes a specific service hosted by the application.
  - 2. The application accesses the roles assigned to the client to determine whether the request should be executed.
  - 3. If the client has the needed role, the request is executed.
  - 4. Else if the client does not have the needed role, the client’s service request is denied with an error (exception).

Implementing Role-based Access with Application Containers

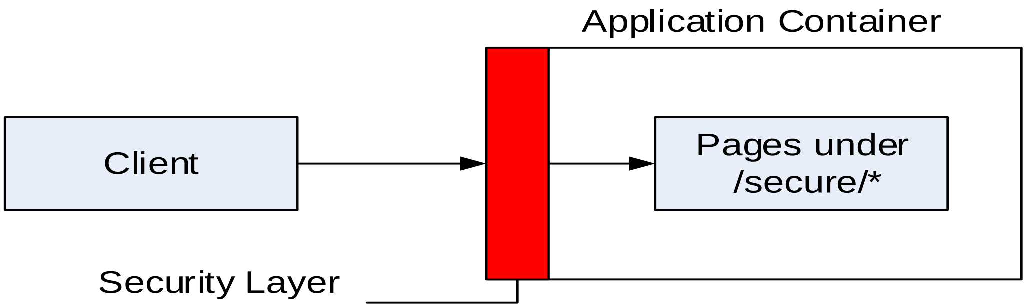
- Application Container is an enterprise service installed and run on a machine.
  - Tomcat is an example of a popular container for Java apps.
- Web services are <u>deployed</u> in Application Containers.
  - The resources that make up the web service is bundled into a single deployment unit i.e. .war files.
  - Access to individual resources contained in the application can be restricted based on the role assigned to the user making the request.

WAR File Deployment Descriptor

```
<?xml version="1.0" encoding="UTF-8"?>
<web-app version="2.5">
  <security-role>
    <role-name>manager</role-name>
  </security-role>
  <security-constraint>
    <web-resource-collection>
       <web-resource-name>management pages</web-resource-name>
            <url-pattern>/secure/*</url-pattern>
            <url-pattern>/mixed/secure3.jsp</url-pattern>
        </web-resource-collection>
        <auth-constraint>
            <role-name>manager</role-name>
        </auth-constraint>
    </security-constraint>
</web-app>
```

Container-Based Authorization

- Application are deployed into containers with information that includes the roles that are allowed access specific services.
  - When the service is accessed, the container verifies that the client's authentication includes the roles required by the service configuration and denies access to the service if the user roles are not found.



- Container-based protection is provided by the container and requires no explicate code to enforce role-based security.

Application-Based Authorization

- While container-based authorization is simple to deploy and maintain, it lack fine-grain control over how clients are given access to services.

- The application architects may decide to incorporate security checks directly into their application.
  - If the container's security is not specific enough to implement the needed features.
  - If the application is not deployed in a container.

- For example, requirements may call for access to be allowed during specific times or restrictions on what can be requested of a service.

Implementing Authorization in the Application

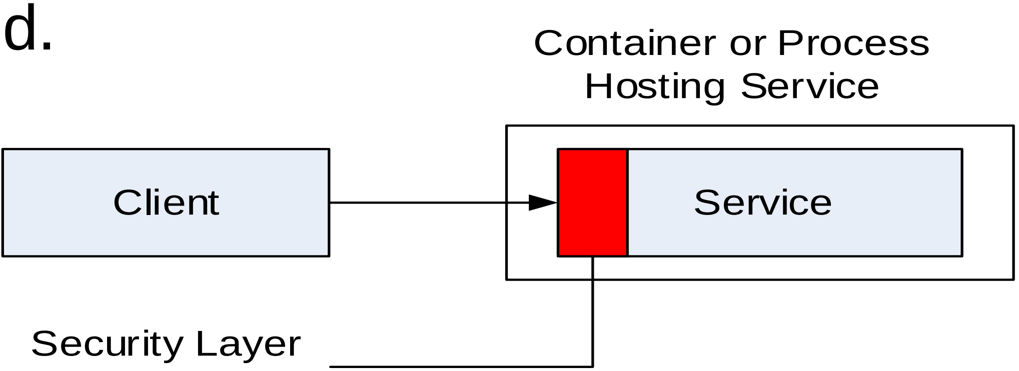
- Authorization checks are coded directly into the service implementation.
  - Role-based access checks are embedded directly into the application code…
  - and combined with other information (time of day) to determine whether to provide access.

- Developers use libraries that provide access to the clients authentication information including assigned roles.
  - This technique is far more complex to implement but provides increased flexibility enforcing access rules.

Application-Based Authorization

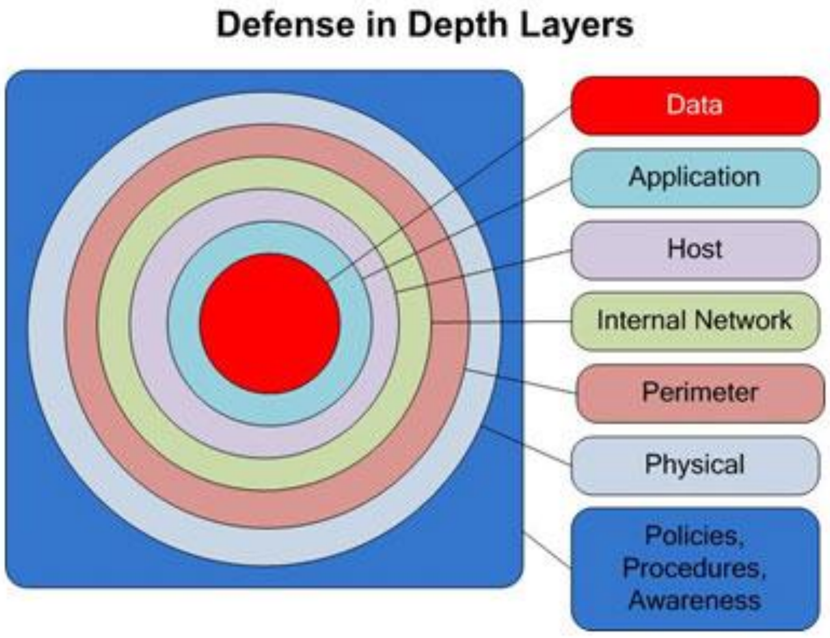
- Application-based security is implemented with libraries and services integrated into the application's design and code.
  - See the Java Apache Shiro project.

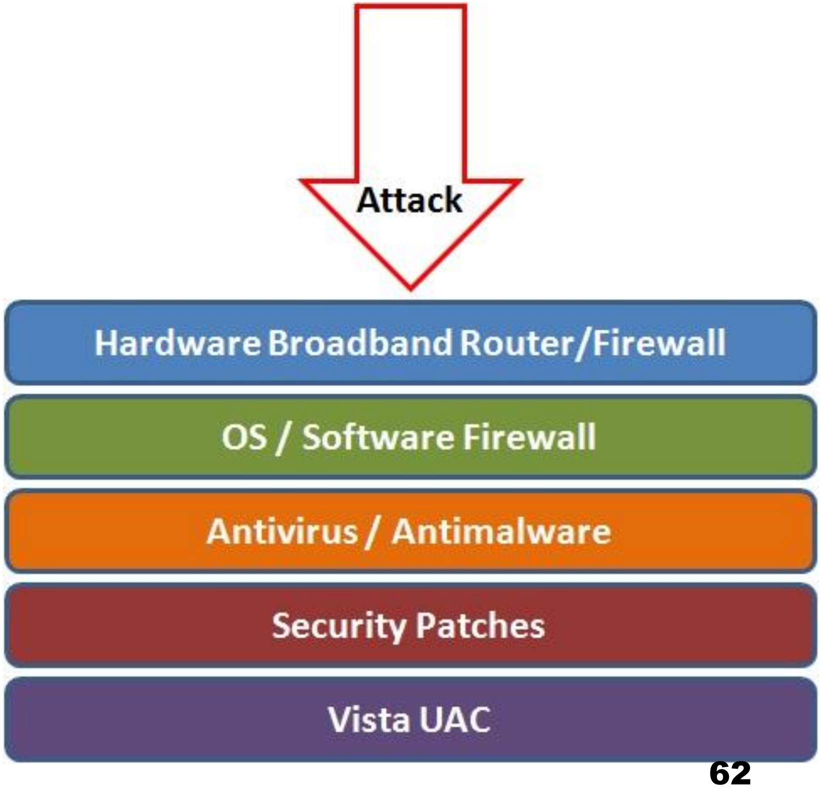
- Gives the architect full control over how services are accessed.



Security: Defense In Depth

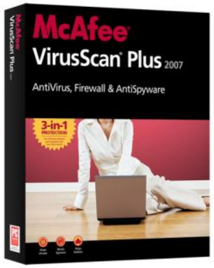
Defense in depth uses multiple layers of defense to address technical, personnel and operational issues.

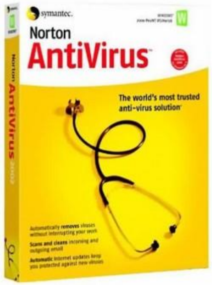




Anti-Virus & Anti-Spyware

- Anti-virus software detects malware and can destroy it before any damage is done
- Install and maintain anti-virus and anti-spyware software
- Be sure to keep anti-virus software updated
- Many free and pay options exist



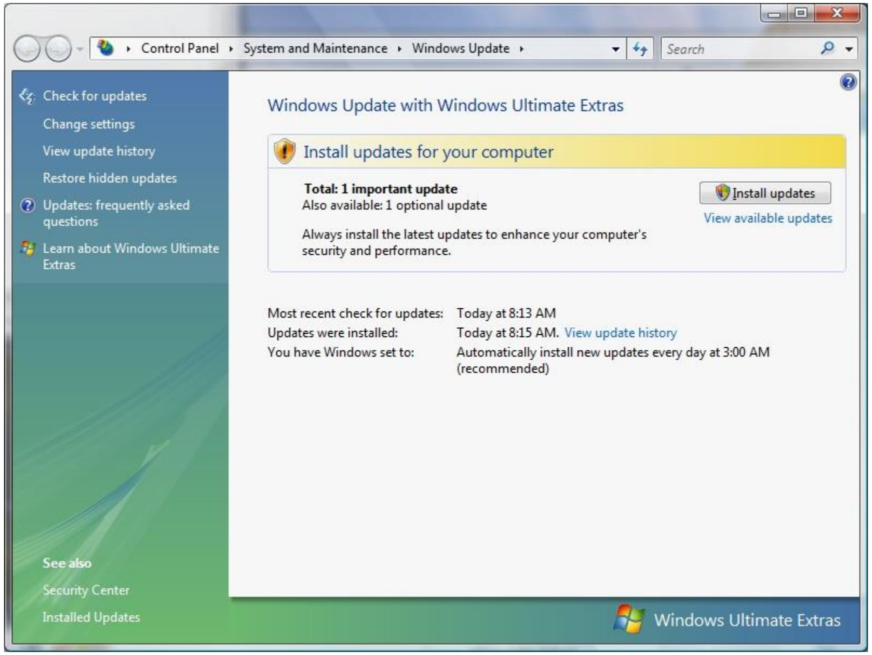


Protect Your Operating System

- Microsoft regularly issues patches or updates to solve security problems in their software. If these are not applied, it leaves your computer vulnerable to hackers.

- The Windows Update feature built into Windows can be set up to automatically download and install updates.

- Avoid logging in as administrator



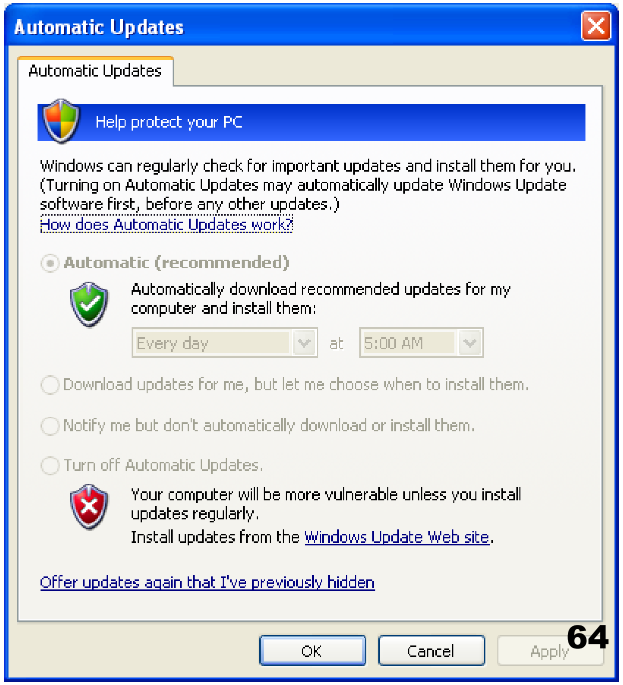
Windows Update with Windows Ultimate Extras

Install updates for your computer

Total: 1 important update
Also available: 1 optional update

Always install the latest updates to enhance your computer's security and performance.

Most recent check for updates: Today at 8:13 AM
Updates were installed: Today at 8:15 AM. View update history
You have Windows set to: Automatically install new updates every day at 3:00 AM (recommended)



Help protect your PC

Windows can regularly check for important updates and install them for you. (Turning on Automatic Updates may automatically update Windows Update software first, before any other updates.)
How does Automatic Updates work?

● Automatic (recommended)
Automatically download recommended updates for my computer and install them:
Every day at 5:00 AM

○ Download updates for me, but let me choose when to install them.

○ Notify me but don't automatically download or install them.

○ Turn off Automatic Updates.
Your computer will be more vulnerable unless you install updates regularly.
Install updates from the Windows Update Web site.

Offer updates again that I've previously hidden

Creating A Good Password

Combine 2 unrelated words	Mail + phone = m@!lf0n3
Abbreviate a phrase	My favorite color is blue= Mfciblue
Music lyric	Happy birthday to you, happy birthday to you, happy birthday dear John, happy birthday to you. hb2uhb2uhbdJhb2u

Password Recommendations

- Never use ‘admin’ or ‘root’ or ‘administrator’ as a login for the admin

- A good password is:

  - **private**: it is used and known by one person only
  - **secret**: it does not appear in clear text in any file or program or on a piece of paper pinned to the terminal
  - **easily remembered**: so there is no need to write it down
  - **at least 8 characters, complex**: a mixture of at least 3 of the following: upper case letters, lower case letters, digits and punctuation
  - **not guessable** by any program in a reasonable time, for instance less than one week.
  - **changed regularly**: a good change policy is every 3 months

- Beware that someone may see you typing it. If you accidentally type your password instead of your login name, it may appear in system log files