CMSC 426
Principles of Computer Security

Security Features of Windows
(and a bit of Linux)

Today's Topics

- Hardening
- Windows hardening methods
  - Defender, automatic updates, security and group policy, etc.
- Linux hardening methods
  - SELinux

- **<u>On Thursday:</u>**
  - How to attack and get around these techniques

Hardening

What is Hardening?

- Securing a system against attack, often using things that are built-in or already available on the system

- Examples of hardening:
  - Reducing avenues of attack
  - Patching known vulnerabilities
  - Using encryption
  - Installing security measures
    - Firewall, anti-virus software
  - User-end (strong passwords, etc.)

Windows Features

Windows “Defender” Firewall

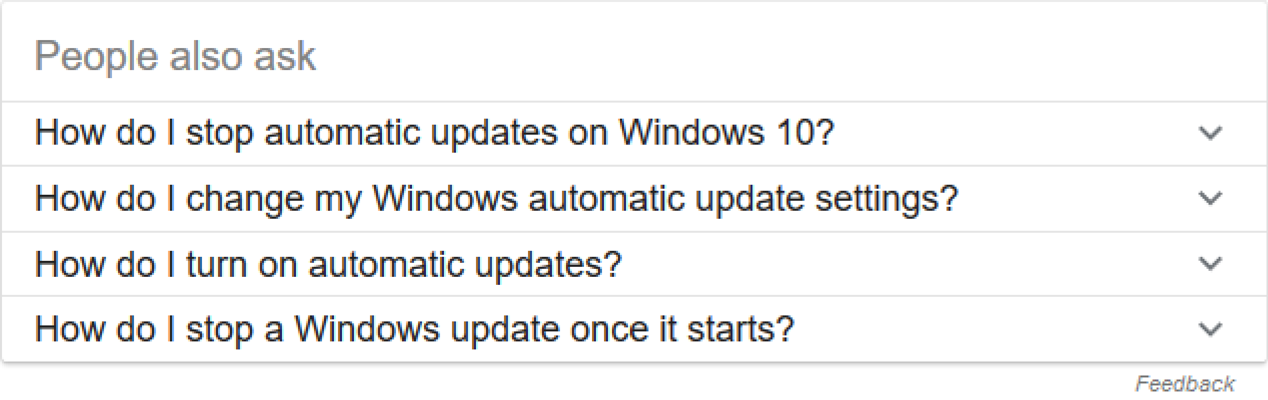
- Sets the policy for inbound and outbound network traffic

- By default, every network connection has the firewall enabled
    - Only default exception is machines on local network
- Both outgoing and ingoing and ingoing have it enabled
    - Which one is more vulnerable to attack?

- Thanks to the default state, the network connection is protected immediately, with no window of vulnerability

Windows Automated Updates

- Automatically downloads and installs patches for the OS



People also ask

How do I stop automatic updates on Windows 10?

How do I change my Windows automatic update settings?

How do I turn on automatic updates?

How do I stop a Windows update once it starts?

Feedback

- Patches include fixes related to:
  - Bugs and issues (performance, etc.)
  - New features (updates to IE, etc.)
  - Security fixes and vulnerabilities

Microsoft Security Essentials (MSE)

- Anti-virus software that provides protection against malware

- Provides real-time protection
  - Monitors activity on the system
  - Scans new files as they are downloaded or created
  - If threat is detected, attempts to disable

- ***Ethics***: since it comes pre-installed with Windows, is this a violation of competition law?

Windows Defender

- Replaces Microsoft Security Essentials in Windows 8 and up
  - Before that, Defender only protected against spyware
- Switches itself off when third-party anti-virus is installed
  - Can still optionally perform periodic checks in this situation
- Checks files from IE/Edge as they are downloaded
- “Block at First Sight” uses machine learning to predict whether a file is malicious

Security Policy

- Allows configuration of nearly all Windows security settings

- Examples:
  - Password policy (min length, char types, etc.)
  - Guest accounts, lock out timer, etc.
  - LM, NTLM, and SAM settings
  - Access to machine via local
  - Shared desktop
  - Backup scheduling and restoring files

Group Policy

- Allows network administrators to configure the security settings for an entire network of machines from one central location
  - Can also allow control of user accounts on a single machine
- Settings are stored in “Group Policy Objects”

- Policy examples:
  - Users may only run specific programs
  - Users may not have access to specific drives
  - Users may be prohibited from running as program as administrator

Auditing

- Administrators can configure Windows to record different types of operating system activity

- Activity examples:
  - Logon and logoff events
  - Changes made to user accounts
  - Changes made to security policies
  - Launching of applications
  - Users being granted or denied access to something
  - Windows starting up or shutting down

Security Log

- These audited events are written to a security log

- After a breach of security or a malware attack, the security log can be examined for information/evidence
  - Is actually admissible in court as evidence
  - Also possible to write false events to the log, but few accounts have the privilege to do that

- Very important for accountability

User Account Control (UAC)

- Helps prevent unauthorized changes to the operating system

- The age-old question: “Do you want to allow the following program to make changes to this computer?”

- Mitigates the effects of dumb users, as well as malware
  - If the account attempting to make changes is not an administrator, the changes are either not allowed, or a PIN or an admin’s password must be entered

Windows File Protection (WFP)

- Present on Windows 2000 and XP
- Ensures critical system files are not deleted or replaced
  - Windows keeps backups of these files in the location **`C:\WINDOWS\System32\DllCache`**
  - If a file is deleted or replaced, the OS restores it from that location
- Uses authenticode digital signatures (*i.e.*, file signing) to identify publisher and check for modifications to files

Windows Resource Protection (WRP)

- Improved version of WFP in Windows Vista and beyond
- Like WFP, protects essential system files
- Also protects critical registry keys and folders
  - Admins no longer have full permissions to interact with system files
  - Full access is only granted to TrustedInstaller

BitLocker

- Full disk encryption
  - Available in most professional and enterprise versions of Windows, starting with Vista
- Older versions only encrypt the OS disk volume
  - Newer versions can encrypt the entire disk
- Uses AES 128 or 256, and Cipher Block Chaining mode (CBC)
- Unique CBC “chain” on each sector of the disk
  - Why do this?
  - Don’t have to re-encrypt the entire disk to save something