Password Security

Module 8

Objectives

- Explain Authentication and Authorization
- Provide familiarity with how passwords are used
- Identify the importance of good password selection
- Examine why password policies are essential
- Develop guidelines for creating strong passwords
- Password Cracking Tools
- File Integrity

Authentication & Authorization

- Authentication
  - The process of verifying the digital identity of the sender of a communication, such as a request to log in
  - Establish a trust relationship between a provider of services and a consumer of services
- Authorization
  - Permissions granted to an authenticated user
- Authorization *follows* Authentication

http://en.wikipedia.org/wiki/Authentication

Authentication & Authorization

- Authentication methods
  - Something you have (a token, a swipe card, etc.)
  - Something you are (biometrics)
  - Something you know (a password)
  - Secure communication channel
- Authorization
  - By policies of an organization or operational requirements
  - Access control (Set of permissions granted)

How/Where Passwords are Used

- Controlling access to a resource
  - Computers
  - Cell Phones
  - On-line Accounts
  - Voicemail
  - Medical and Benefit phone access
  - Facility Access
  - Automated Teller Machines (ATM)
  - Etc.

Why Password Development is Important

- Passwords control access to private data and resources
- Attackers may capture a password file and crack it
  - Passwords stored as hash values
  - Cracker programs can run at their leisure
- Attackers may try to break into a live system
  - If a “time-out” policy is not implemented, they could try infinite times until they succeed
  - Many users have simple passwords or one associated with their life (profiling or social engineering can be used against them)
  - Some systems come with default passwords

Password Cracking

- Techniques
  - Brute Force – Every combination of letters, numbers, and characters possible
  - Dictionary – Words (and combinations of words) found in a specialized dictionary
- Assume a password of 7 alphabet characters in length
  - $\textit{MaxCombinations} = \textit{NumberAvailableChars}^{\textit{PasswordLength}}$
  - $\textit{MaxCombinations} = 26^{7} = 8{,}031{,}810{,}176$ *(8 Billion)*
- Example: A 3GHz processor, guessing 3 million passwords per second, will take approximately 45 minutes to guess the passwords

http://en.wikipedia.org/wiki/Password_strength

Password Cracking Tools

- Free password cracking programs
- Linux & Windows
  - Top 10 Tools - http://sectools.org/crackers.html
  - John the Ripper - http://www.openwall.com/john/
  - ophcrack - http://ophcrack.sourceforge.net/
- Windows only
  - Cain and Abel - http://www.oxid.it/cain.html

- Administrators often crack password son systems they manage to identify and change weak passwords

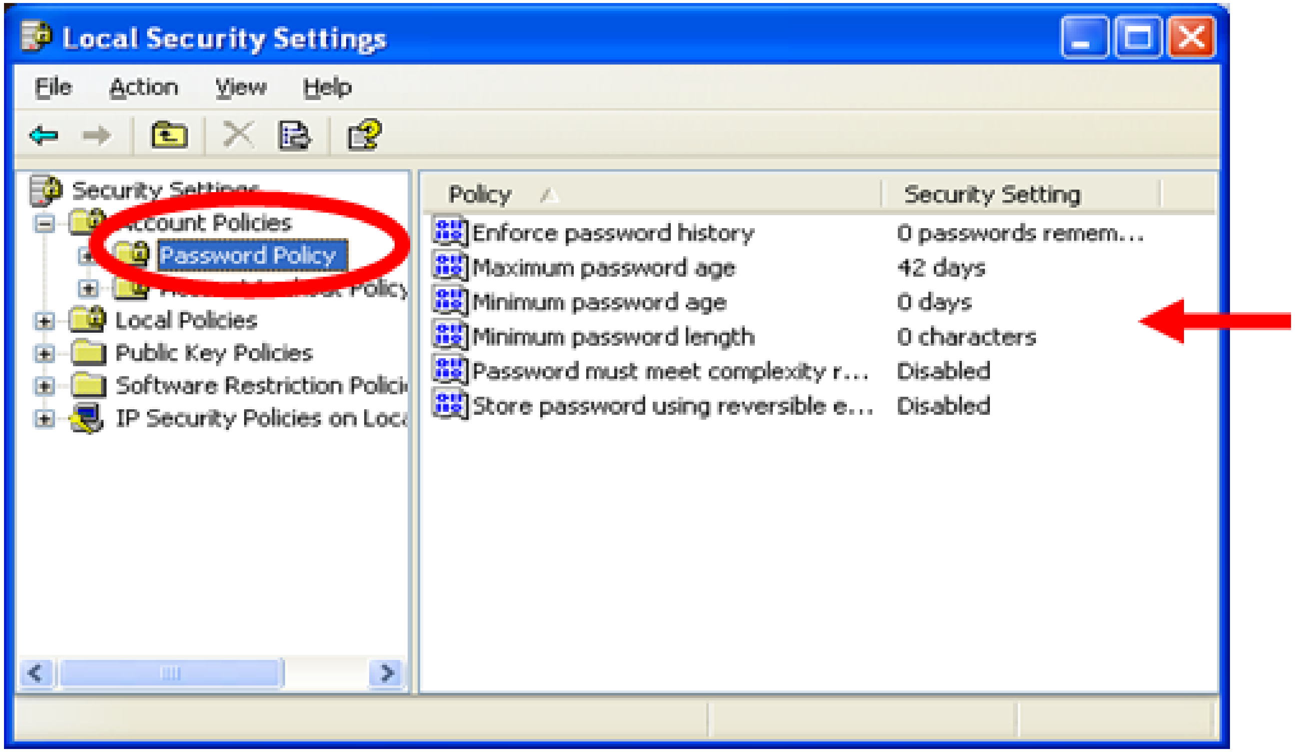
Guidelines for Developing Passwords

- Strong Passwords
  - 8 or more characters long
  - Have a combination of upper and lowercase letters, numbers, and special characters
  - Changed on a regular basis
  - Easy to remember and are not written down
  - Passphrases: Choose a line or two from a song or poem and use the first letter of each word. For example, “It is the East, and Juliet is the Sun'' becomes “IstE,@J1tS”
  - Not used over and over again for different programs and websites

- Weak Passwords
  - Contains your name, friends name, favorite pet, sports team, etc.
  - Contains publicly accessible information about yourself, such as social security number, license numbers, phone numbers, address, birthdays, etc.
  - Words found in a dictionary of any language
  - Made of all numbers or all the same letter
  - Never changed
  - Written down
  - Shared with others

Windows XP

- Set password policies to enforce strong passwords
  - Click Start -> Control Panel -> Administrative Tools -> Local Security Policy
  - Click the plus sign (+) to the left of Account Policies. You will see these 2 categories: Password Policy and Account Lockout Policy.
  - Click on Password Policy



Policy	Security Setting
Enforce password history	0 passwords remem...
Maximum password age	42 days
Minimum password age	0 days
Minimum password length	0 characters
Password must meet complexity r...	Disabled
Store password using reversible e...	Disabled

Windows XP

- Best Practices are stated below
  - Enforce password history: 5 passwords
    - This security setting determines the number of unique new passwords that have to be associated with a user account before an old password can be reused. The value must be between 0 and 24 passwords.
    - This policy enables administrators to enhance security by ensuring that old passwords are not reused continually.
  - Maximum password age: 30 to 90 days
    - This security setting determines the period of time (in days) that a password can be used before the system requires the user to change it.
    - Best practices state passwords should expire every 30 to 90 days, depending on the environment. This limits an attacker’s amount of time to crack a user's password and have access to network resources.
  - Minimum password age: 5 days
    - This security setting determines the period of time (in days) a password must be used before it can be changed.
    - Without a minimum password age, users can cycle through passwords repeatedly until they get to an old favorite.

Windows XP

- Minimum password length: 8 characters
  - This security setting determines the least number of characters a password may contain.
  - The longer a password is, the harder it is for an attack to crack.
- Password must meet complexity requirements? Yes
  - This security setting requires all passwords meet complexity requirements. For example, passwords must include special characters, capitalized, numeric, etc.
  - The more complex a password, the harder for an attack to crack.
- Store password using reversible encryption for all users in the domain? Disable
  - This setting allows applications using protocols that must have the user's clear text password for authentication purposes.
  - These passwords are not really encrypted, but do use a hash to store them, essentially leaving them as vulnerable as plain text. This policy should never be enabled.
- Note: These are best practices for normal user accounts. Administrative level and Power Users may have more stringent settings.

Ubuntu

- Set password policies to enforce strong passwords
- Password values are controlled in the file */etc/pam.d/common-password*
  - Minimum Password Length – set to 8
    - By default, Ubuntu requires a minimum password length of 4 characters
    - To adjust the minimum length to 8 characters add the ‘`minlen = <x>`’ parameter to the pam_unix configuration in the /etc/pam.d/common-password file
      - Example
        - `password required pam_cracklib.so retry=3 minlen=8 difok=3`

Ubuntu

- Password History (reuse)
  - Create an empty /etc/security/opasswd file for storing old user passwords
  - Set permissions to opasswd to the same as the /etc/shawdow file
  - Enable password history by adding the “`remember=<x>`” to the pam_unix configuration in the /etc/pam.d/common-password file
    - Example
      - `password required pam_unix.so md5 remember=12 use_authtok`
    - The value of the "`remember`" parameter is the number of old passwords to store for a user

Ubuntu

- Password aging parameters can be set in */etc/login.defs*
- Password Expiration
  - Needs a minimum and maximum password age forcing users to change their passwords when they expire
    - `PASS_MIN_DAYS` – Set to 7 days
      - Minimum number of days allowed between password changes
    - `PASS_MAX_DAYS` – Set from 30 to 90 days
      - Maximum number of days a password may be used
    - `PASS_WARN_AGE` – Set to 14 days
      - Number of days warning given before a password expires

Password Policy Best Practices

- Password policies are critical to the security posture of your organization
- Best Practices across the board
  - Number of times a password can be reused
    - Passwords should not be cycled more than 3 to 5 uses
  - Password should expire/be changed
    - Every 90 days for user account
    - Every 30 days for an administrator account
  - Minimum length requirement
    - 8 characters
  - Complexity requirements
    - Upper and lower case, special character and numbers
  - All passwords should be encrypted when stored

Password Policy Best Practices

- Educate users
  - Communicate to users that they will never be asked for their password over the phone, by the helpdesk, etc.
  - This helps prevent social engineering attacks
  - Make sure users do not use the same passwords for all of their login IDs
  - Users should not write down or share passwords

List of References

- http://en.wikipedia.org/wiki/Authentication
- http://www.duke.edu/~rob/kerberos/authvauth.html
- http://en.wikipedia.org/wiki/Password_strength
- http://www.computerhope.com/issues/ch000300.htm
- http://tigger.uic.edu/~mbird/password.html
- http://sectools.org/crackers.html