Windows NT/2000/XP Security Mechanisms

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Security Classes

or « Is Windows really so unsecure and buggy as people think? »

Security Classes

- US DoD (Department of Defense) Trusted Computer System Evaluation Criteria (Orange Book)
- Range:
  - D (minimal protection) to
  - A (verified protection)

Security Classes (2)

- Common Criteria is a newer metering of computer system security, based on EALs (Evaluation Assurance Level)
  - “The Common Criteria represents the outcome of a series of efforts to develop criteria for evaluation of IT security that are broadly useful within the international community.”
- Ranges from EAL1 (-) to EAL7 (+)

Security Classes (3)

- Windows NT : C1
- Windows NT with resource kit : C2
- Windows 2000 with SP3 and networking hotfix : C2, EAL4 after lots of effort

- What does this mean?

Security Classes (4)

- C1 : fairly good security
- C2 : quite good security
- EAL4 : currently the best level that any « common use » OS can reach

Security Mechanisms

or « What are the secrets behind the desktop… »

Boot Process

- Unlike in Windows 95/98, security begins in the very beginning
- NT loader writes over the interrupt vector table
- All writes to hard drive boot records are disabled
- Interrupts protected by virtual devices

Logon Process

Logon Process (2)

- Ctrl-Alt-Del shows the logon prompt
- SAS (Secure Attention Sequence)
- Pressing these keys calls the security subsystem and stops all user programs
- Then, username and password are asked
- GINA (Graphical Identification and Authentication) can also be used

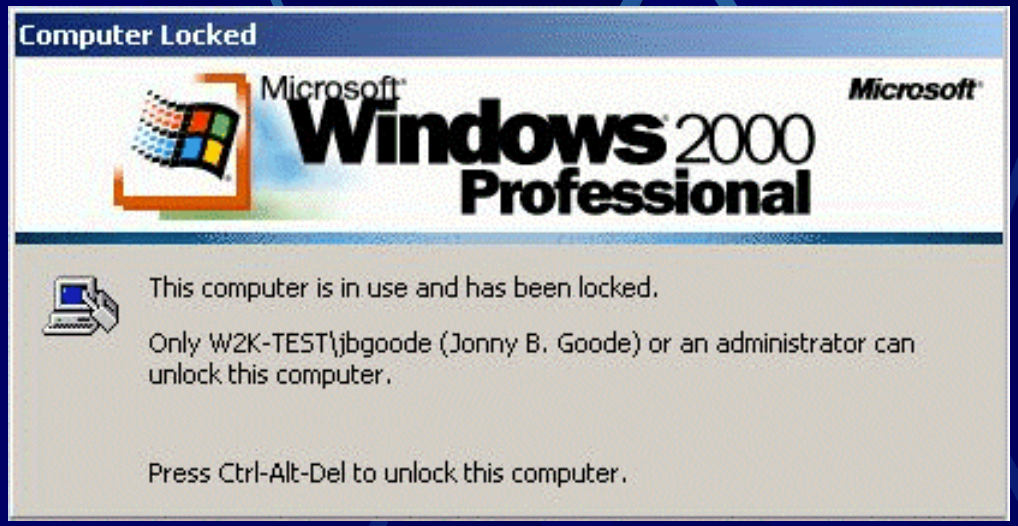
Logon Process (3)

- For local user, password is checked with SAM (Security Account Manager)
- For roaming user, password is checked in the domain server, using Kerberos
- If logon is allowed, user gets a token, describing his rights during the session

User Groups

- Different rights are given to a user, depending of the group he belongs to
  - Administrators
  - Backup Operators
  - Power Users
  - Users
  - Guests

Computer Lock



Computer Lock (2)

- Once a user is logged on, he can lock the computer
- His processes are still running, but all user inputs are blocked
- The user can resume the session by entering his password

Computer Lock (3)

- An administrator can log off the user by entering his own credentials, but he cannot resume the session
- If the computer is shut down when locked, the lock reappears when it is again powered

File Systems

- FAT (File Allocation Table) format was developed in 1976 by Bill Gates, and is now supported by all Microsoft OSes.
- No security parameters in FAT
- NTFS (New Technology File System) is supported by Windows NT, 2000, XP

NTFS Details

- NTFS has many advantages
  - Faster for large file systems
  - Supports bigger files
  - Supports access control given by permissions to files and directories
  - Supports file ownership and compression
  - Supports encryption and user quotas since Windows 2000

NTFS Details (2)

- File access rights can be given to a folder but also to a single file, and are related to a group or a single user
- These permissions are stored in the ACL (Access Control List)
- User's token contains a SID (security identifier) used in NTFS permissions

NTFS Permissions

- When a user tries to access a NTFS resource, there is a loop through ACEs (Access Control Entities).
  The loop stops if:
  - there is a Deny for the SID
  - there is an Allow for the SID
  - or the end of ACL is encountered
- If allowed, the user gets a handle to the resource

NTFS Encryption

- Uses the Encryption Certificates as keys for the expanded Data Encryption Standard (DESX) algorithm
- It is possible to encrypt single files, but also whole folders
- Only the user that encrypts a file can decrypt it

NTFS File Streams

- NTFS supports several streams in the files
- It makes possible, for example, to have properties attached to a file
- However, none of the programs shipped with Windows can make use of this property
- The stream may be accessed by typing FileName:StreamName

NTFS File Streams (2)

- If you are curious, try this in a command window of your NT/2000/XP box:
  - echo Hidden stream > Test.txt:hidden
  - type Test.txt *doesn't show anything*
  - more < Test.txt:hidden *shows: Hidden stream*
  - However, when you look at the file size, it says 0.
- It is possible to store any kind of data in a stream… could you expect that a file that reports size 0 may contain a lot of things?

Windows Registry

- In DOS there are files like config.sys, autoexec.bat, win.ini, system.ini, protocol.ini
- Since Windows NT all this is in Registry in %SystemRoot%\System32\Config directory as files called hives
- For it's own safety, it is recommended to install Windows on a NTFS partition, to avoid unwanted users to play with the registry files

Auditing

- Auditing allows the administrators to know almost everything that users are doing with the computer
- Many resources can be audited, such as NTFS files and folders, printers, registry keys…
- One should avoid to over-audit, since it would report a really big amount of events

Network security

- Without going into details, Windows 2000 includes some useful network security features:
  - IPsec
    - Explained on 8th of April
  - Firewalling
    - Explained on 29th of April

Want more information?

- Last year's lecture slides about Windows NT security
  - http://www.netlab.hut.fi/opetus/s38153/k2002/slides/S38153_lecture5.pdf
- US DoD Orange Book
  - http://www.radium.ncsc.mil/tpep/library/rainbow/5200.28-STD.html
- Evaluation Assurance Level
  - http://www.commoncriteria.org/
- NTFS encryption
  - http://www.brienposey.com/kb/working_with_ntfs_encryption.asp
- Microsoft Technet Security Resources
  - http://www.microsoft.com/technet/treeview/default.asp?url=/technet/security/default.asp

Thank You

Note: this work hasn't been in any way sponsored by Bill Gates ☺