Registry Key Security
Practical Assignment for GIAC Monterey 2000
Windows Security

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Windows system security and hardening best practices are based upon a layered approach consisting of operating system changes, file and directory permission modifications, registry key edits, auditing, physical security, and third party tools. An additional step to this layered approach to security is modification of the permissions on the systems registry.

Following normal best practices, verify all these procedures in a test environment prior to implementation on any production systems. Back-up all registry keys and update the ERD disk prior to starting these changes. Do not undertake this exercise unless you are comfortable working in REGEDT32, Microsoft Security Console and have a working knowledge of the registry.

Step 1: Ensure remote access to the registry is restricted

Although this is not a 'permissions of the registry' issue – it is too important as a 'permissions to the registry' issue to leave out or ignore.

- Δ Run *Regedt32*
- Δ Select *HKEY_LOCAL_MACHINE* in the local machine window
- Δ Drill down the *\System\CurrentControlSet\Control\SecurePipeServers* path
- Δ Create the *winreg* key if it is not present by,
- Δ Highlighting the *SecurePipeServers* key
- Δ Select **Add KEY** – from the **EDIT** menu
- Δ Enter "*winreg*" in the **Key Name:** field
- Δ Leave the **Class:** field blank
- Δ Click **OK** to close the **Add Key** window
- Δ Highlight the *winreg* key
- Δ Select **Add Value** – from the **Edit** menu
- Δ Enter "*RestrictGuestAccess*" for **Value Name:**
- Δ Select REG_DWORD from the **Data Type:** drop down list
- Δ Click **OK**
- Δ Enter *"1"* for the **Data:** value in the DWORD Editor
- Δ Click **OK**
- Δ Drill down the *\System\CurrentControlSet\Control\LSA* path
- Δ Highlight the *LSA* key
- Δ Select **Add Value** – from the **EDIT** menu
- Δ Enter "`RestrictAnonymous`" for Value Name
- Δ Select REG_DWORD from the **Data Type:** drop down list
- Δ Click **OK**
- Δ Enter "*1*" for the **Data:** value in the DWORD Editor
- Δ Click **OK**

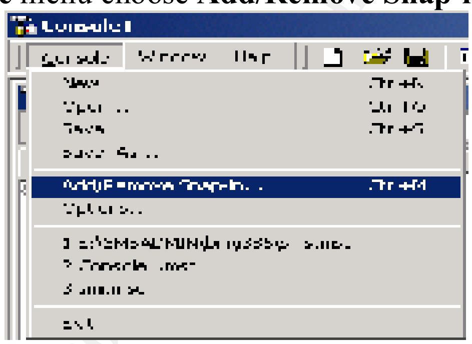
Step 2: **Security Configuration Manager (SCM)**

The SCM was included on the Windows NT Service Pack 4 CD-Rom or may be downloaded from Microsoft's FTP server at the following address: ftp://ftp.microsoft.com/bussys/winnt/winnt-public/tools/scm.

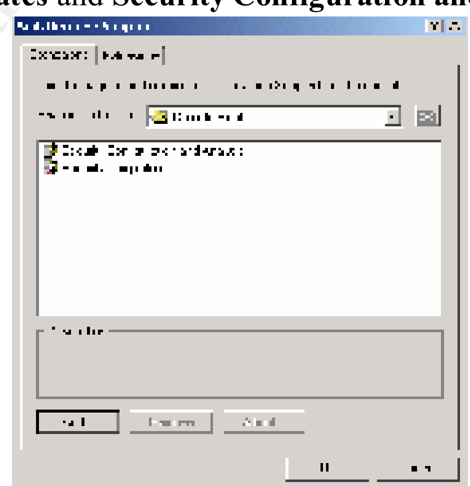
To install SCM – from a command prompt or from Windows NT Explorer – run the self-extracting file *scesp4i.exe*. To install both the GUI and command line tools, run *mssce.exe*. *Note – SCM is part of the Windows 2000 install. The command line tool allows for analysis of individual security areas as opposed to the entire configuration file. Additionally the results may be directed to a file for later review. Distributed system management tools may also use the command line tool to apply the configuration to remote or multiple systems.

To add SCM to the Microsoft Management Console (MMC) –

- Δ Run the MMC (*mmc.exe*)
- Δ From the **Console** menu choose **Add/Remove Snap-in**



- Δ Click **Add**
- Δ Select **Security Configuration Manager** (Windows 2000 users will add **Security Templates** and **Security Configuration and Analysis**)



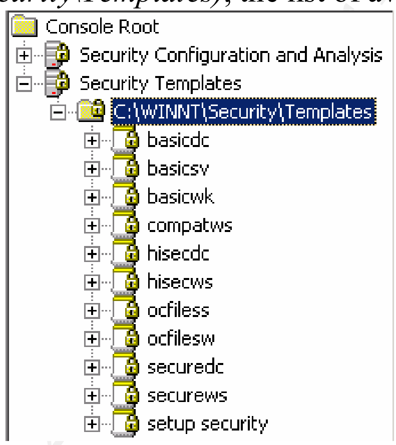
- Δ Click **OK**
- Δ Click **OK** again

Note * The SCM includes a set of pre-packaged configuration files. These files are located in *%SystemRoot%\Security\Templates.* These templates were designed for the three types of windows systems – workstation (wk), server (sv) and domain controller (dc), with three levels of available security – default (basic), compatible (comp) and secure (secur).

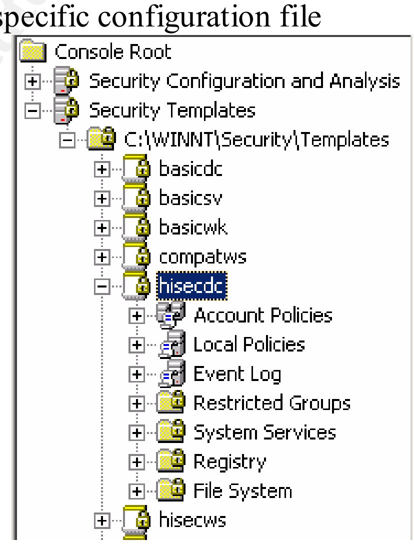
Step 3: Edit the configuration file

The security and settings of any of the templates may be modified. To modify a configuration file these steps should be taken.

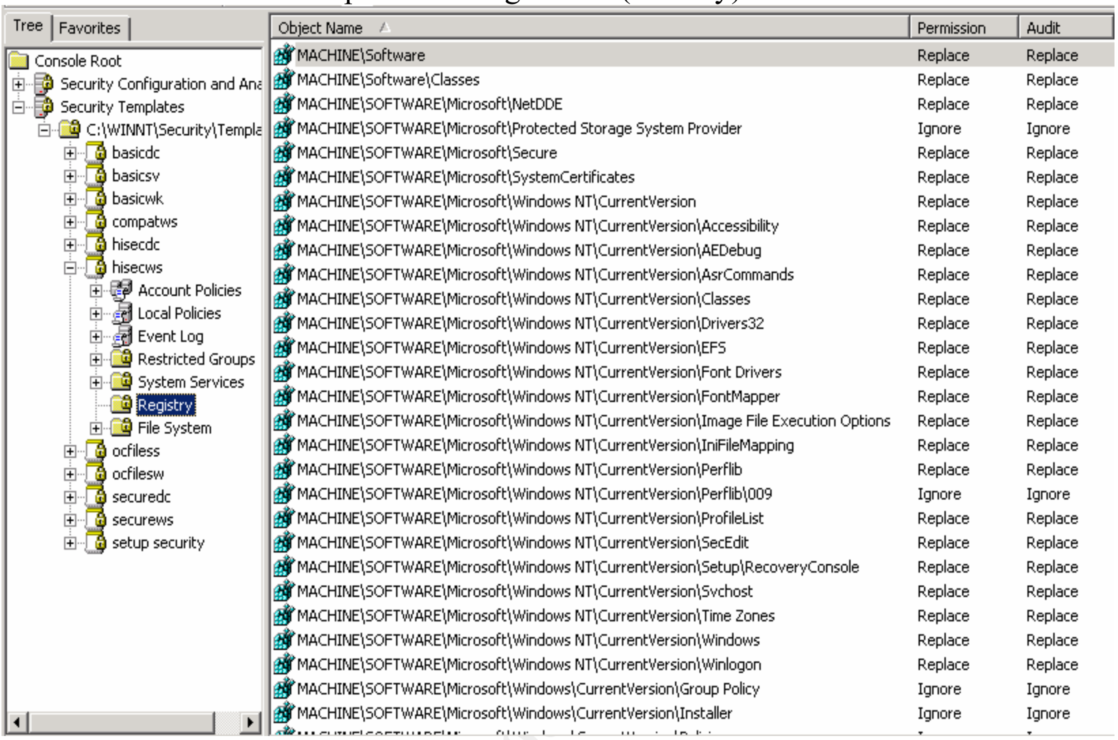
- Δ Within the MMC – double click on the **Security Configuration Manager** (Windows 2000 – **Security Templates**) node in the left pane
- Δ Double click the **Configurations** node (not required in Windows 2000)
- Δ Double click on the default configuration file directory (*%SystemRoot%\Security\Templates)*, the list of available files is revealed



- Δ Double click on a specific configuration file

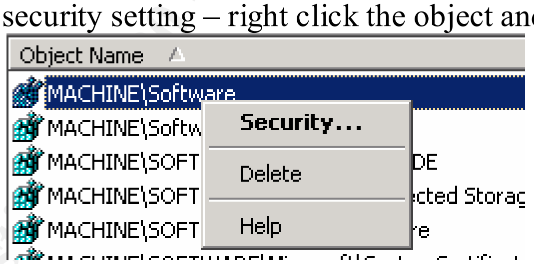


Δ Double click on a specific configuration (security) area



Δ Double click on the specific security object in the right pane to modify

Δ To modify the security setting – right click the object and choose **Security**



Δ Customize all settings required by your environment

Δ Delete all extra settings not required by your environment (this step will increase system performance in applying the setting – but not increase the security of the system)

Δ Save the customized configuration file by right clicking on the file and choosing **Save As**

Step 4: **Recommended edits**

All registry keys not listed are expected to maintain the inherited permissions of their parent key. Keys with "Ignore" are excluded from SCM configuration and retain their original permissions.

HKEY_CLASSES_ROOT\

	Administrators	Full Control
Key and subkeys	Creator/Owner	Full Control
* Alias to HKLM\SOFTWARE\Classes	System	Full Control
Contains file associations and Common Object Model (COM) associations	Authenticated Users	Read, Write, Execute

HKEY_CLASSES_ROOT\.hlp

	Administrators	Full Control
Key	System	Full Control
Contains help file associations	Authenticated Users	Read, Execute

HKEY_CLASSES_ROOT\helpfile

	Administrators	Full Control
Key	System	Full Control
Contains winhelp32 information	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\HARDWARE

	Administrators	Full Control
Key	Creator/Owner	Full Control
Contains data about the physical configuration	System	Full Control
of the machine	Authenticated Users	Read, Write, Execute, Delete

HKEY_LOCAL_MACHINE\SOFTWARE

	Administrators	Full Control
Key	Creator/Owner	Full Control
Contains data about the software installed	System	Full Control
of the machine	Authenticated Users	Read, Write, Execute, Delete

HKEY_LOCAL_MACHINE\SOFTWARE\Classes IGNORE

Key and subkeys Contains file associations and Common Object Model (COM) associations

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Cryptography

Key and subkeys	Administrators	Full Control
Contains management for CryptoAPI	System	Full Control
	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\NetDDE

Keys and subkeys	Administrators	Full Control
Contains settings for Network Dynamic Data Exchange, which is a protocol that allows Applications to exchange data	System	Full Control

Registry key / description	Group	Permission
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Ole		
Key and subkeys	Administrators	Full Control
Contains configuration for Object Linking	System	Full Control
and Embedding (OLE)	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\OS/2 Subsystems for NT		
Key and subkeys	Administrators	Full Control
Contains support for OS/2 standards	Creator/Owner	Full Control
* Best practice is for this key to be deleted	System	Full Control
	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Protected Storage System Provider		
Key and subkeys	IGNORE	
Used to protect user data – Inaccessible		
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Rpc		
Key and subkeys	Administrators	Full Control
Contains configuration for Remote Procedure	System	Full Control
Call (RPC)	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Secure		
Key and subkeys	Administrators	Full Control
Contains Microsoft application configuration	Creator/Owner	Full Control
data that should only be changed by an	System	Full Control
administrator	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows		
Key and subkeys	Administrators	Full Control
Contains the Win32 subsystem parameters	Creator/Owner	Full Control
	System	Full Control
	Authenticated Users	Read, Write, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Run		
Key and subkeys	Administrators	Full Control
Contains names of executables to be run	System	Full Control
each time the system is started	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\RunOnce		
Key and subkeys	Administrators	Full Control
Contains names of programs to be run	System	Full Control
the first time a user ever logs in	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\RunOnceEx		
Key and subkeys	Administrators	Full Control
Contains setup information for system components	System	Full Control
and Internet Explorer	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Shell Extensions

Key and subkeys	Administrators	Full Control
Contains all shell extension settings to extend the	Creator/Owner	Full Control
Windows NT interface	System	Full Control
	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Uninstall

Key and subkeys	Administrators	Full Control
Contains uninstall strings for all applications that	Creator/Owner	Full Control
can be removed by Add/Remove Programs	System	Full Control
	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT

Key and subkeys	Administrators	Full Control
Contains parameters used by the	Creator/Owner	Full Control
Windows NT operating system	System	Full Control
	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\AEDebug

Key and subkeys	Administrators	Full Control
Contains settings for Dr. Watson or	System	Full Control
other application debuggers	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Compaibility

Key and subkeys	Administrators	Full Control
Contains data for legacy applications not	Creator/Owner	Full Control
completely compatible with Windows NT	System	Full Control
	Authenticated Users	Read, Write, Execute

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Font Drivers

Key and subkeys	Administrators	Full Control
Contains drivers to display fonts	System	Full Control
	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Font Mapper

Key and subkeys	Administrators	Full Control
Contains settings for mappings of unavailable fonts	System	Full Control
To existing fonts	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Image File Execution Options

Key and subkeys	Administrators	Full Control
Contains parameters for viewing images	System	Full Control
	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\IniFileMappings		
Key and subkeys	Administrators	Full Control
Contains mappings for 16-bit Windows	System	Full Control
application initialization files	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Perflib		
Key and subkeys	Administrators	Full Control
Contains parameters for the performance library	System	Full Control
which collects data for performance monitor	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Perflib\009		
Key and subkeys	IGNORE	
Contains performance names and descriptions		
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Time Zones		
Key and subkeys	Administrators	Full Control
Contains time zone settings	System	Full Control
	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Winlogon		
Key and subkeys	Administrators	Full Control
Contains logon sequence controls	System	Full Control
	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Program Groups		
Key and subkeys	Administrators	Full Control
Contains information about former program groups	Creator/Owner	Full Control
if a pre-NT 4.0 operating system has been converted	System	Full Control
	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Secure		
Key and subkeys	Administrators	Full Control
Contains application configuration	Creator/Owner	Full Control
data that should only be changed by an	System	Full Control
administrator	Authenticated Users	Read, Execute
HKEY_LOCAL_MACHINE\SOFTWARE\Windows 3.1 Migration Status		
Key and subkeys	Administrators	Full Control
Contains data if the system has been upgraded from	Creator/Owner	Full Control
Windows 3.1 to Windows NT	System	Full Control
	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SecurePipeServers\winreg

Key and subkeys	Administrators	Full Control
The security permissions assigned to this key define which users have remote access to the registry. Default Windows NT Workstation installation does not define this key and does not restrict remote access to the registry. Windows NT Server permits only administrators' remote access to most of the registry. It is highly recommended that only administrators have remote access to the registry.	System	Full Control

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\LanmanServer\Shares

Key and subkeys	Administrators	Full Control
Contains settings for the local system shares	Creator/Owner	Full Control
	System	Full Control
	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Schedule

Key and subkeys	Administrators	Full Control
Contains settings for the scheduler service	Creator/Owner	Full Control
	System	Full Control
	Authenticated Users	Read, Execute

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\UPS

Key and subkeys	Administrators	Full Control
Contains information on the Uninterruptible Power	Creator/Owner	Full Control
Supply if installed	System	Full Control
	Authenticated Users	Read, Execute

HKEY_USERS\.DEFAULT

Key and subkeys	Administrators	Full Control
Profile that is used while the Windows NT	System	Full Control
CTL-ALT-DEL Logon Message is displayed	Authenticated Users	Read, Execute

HKEY_USERS\.DEFAULT\Software\Microsoft\NetDDE

Key and subkeys	Administrators	Full Control
Settings for Network Dynamic Data Exchange, which is a protocol that allows applications to exchange data	System	Full Control

HKEY_USERS\.DEFAULT\Software\Microsoft\Protected Storage Systems Provider

Key and subkeys	IGNORE	
Used to protect user data – inaccessible		

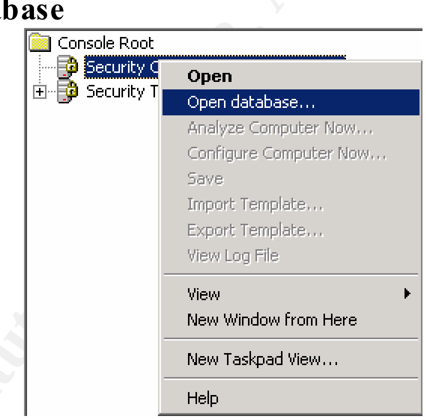
HKEY_USERS\.DEFAULT\Software\Microsoft\Windows|CurrentVersion\Policies

Key and subkeys	Administrators	Full Control
Used to manage Recreational Software Advisory	Creator/Owner	Full Control
Council (RASC) ratings	System	Full Control
	Authenticated Users	Read, Execute

Step 5: **Assigning the configuration to a database**

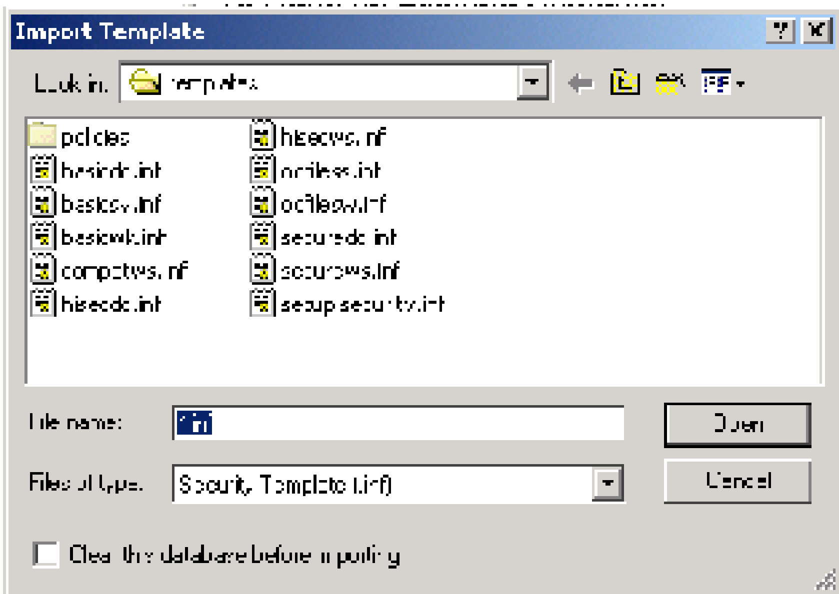
After completing the creation of your ".inf" file, you can analysis and configure the system. The creation of the ".inf" file can be done from any Windows NT or Windows 2000 system, and applied to other systems as needed. The security analysis and configuration may be performed from the GUI or from a command line. The command line allows you to create a batch file and perform these actions on multiple systems or at a predetermined interval using the scheduler service or a third-party tool. *Always remember to completely test the configuration file prior to applying it to a production box as a loss in performance and/or functionality may result.

- Δ The SCM uses a database to store configurations for both the analysis and application of the configuration. A best practice is to create a new database for each analysis and configuration. Import operations can append to or overwrite the database information. Appending is the default setting, but may cause confusion and/or unwanted combining of configurations. Check the "Overwrite existing configuration in database" to avoid this problem.
- Δ To open an existing or new database in the SCM GUI. Right click on the **Database** node
- Δ Select **Open Database**



- Δ Enter the name of the database you wish to create – or the name of an existing database.
- Δ Click **Open**
- Δ If a new database name was entered the system will automatically prompt you to enter the configuration file to import.
- Δ If you use an existing database – right click on the **Database** node – choose **Import Configuration**

Δ In the **Select Configuration to Import** dialog box – choose the ".inf" file you just created.



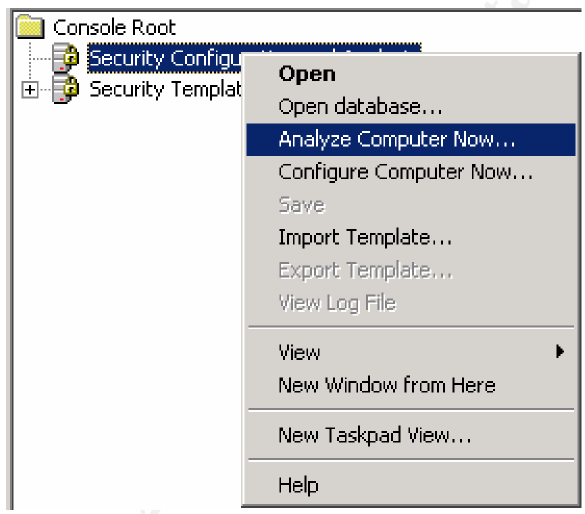
Δ Check the **Overwrite existing configuration in database** box to remove all previous stetting stored in the database. (Windows 2000 users – **Clear this database before importing)**

Δ Click **Open**.

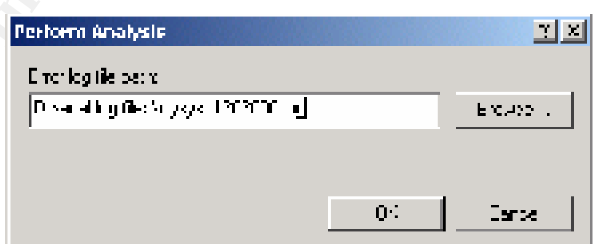
Step 6: **Performing the analysis**

The analysis is actually run against the database, which is using the configuration file(s) ".inf" that have been imported. The current system settings are compared to the configuration settings in the configuration files and the results are stored back into the database. Both the current settings and the configuration settings are then displayed side by side and additional modifications to the configuration setting may be made and saved back to the ".inf" file.

- Δ From the SCM in MMC right click on the **Database** node
- Δ Select **Analyze System Now**



- Δ Enter an error log file path into the **Perform Analysis** dialog box. The log information is appended to the specified log file. You must specify a new file name if you want a new or separate log to be created.



- Δ Click **OK**
- Δ Examine and modify the settings as needed.

Step 6a: **Performing the Analysis from the command line**

To perform these same actions from the command line, use the following syntax. This syntax may be used in a batch file.

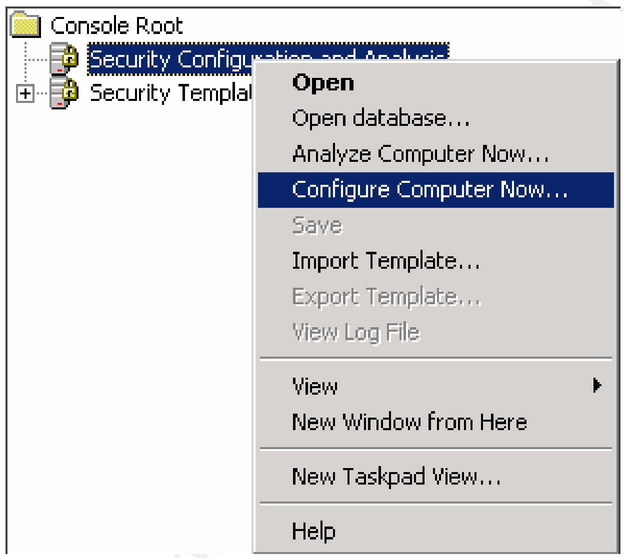
Secedit /analyze [/cfg filename*] [/db* filename*] [/log* logpath*] /verbose [/quiet] [/overwrite] [>> results_file]*

/cfg --- Path to the .inf file that will be appended to the database prior to the analysis
/db --- Path the database that SCE will perform the analysis against. If this variable is not set than the last database used in analysis or configuration is used. The system default database is *%systemroot%\security\database\secedit.sdb.*
/log --- Path to the log file for the process. If this file is not specified, the progress information will be output to the console.
/verbose --- Specify detailed progress information.
/quiet --- Suppress screen and log output.
/overwrite --- This will overwrite the named database with the configuration file information. This is a recommended switch to avoid unwanted combinations of configurations.
>> results_file --- This is the name and path of the file you wish to contain the results of the analysis. This file allows you to analysis at any time and review the results later.

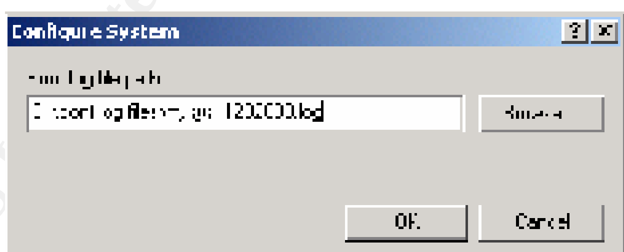
Step 7: **Configuring the system**

Some errors may result during the configuration if specific registry keys do not exist on the system, but are included in the .inf file. This is a normal condition due to the generic nature of the .inf files that were included in the SCM, and should cause no alarm.

- Δ From the SCM GUI – right click on the **Database** node
- Δ Select **Configure Now**



- Δ Enter the error log file path into the **Configure System** dialog box



- Δ Click **OK**
- Δ Reboot the system.

Step 7a: **Configuring the system using the command line**

To configure a system from the command line – use the following syntax

Secedit /configure [/cfg filename*] [/db* filename*] [/log* logpath*] /verbose [/quiet] [/overwrite] [areas* Areas*]*

/cfg --- Path to the .inf file that will be appended to the database prior to the analysis
/db --- Path the database that SCE will perform the analysis against. If this variable is not set than the last database used in analysis or configuration is used. The system default database is *%systemroot%\security\database\secedit.sdb.*
/log --- Path to the log file for the process. If this file is not specified, the progress information will be output to the console.
/verbose --- Specify detailed progress information.
/quiet --- Suppress screen and log output.
/overwrite --- This will overwrite the named database with the configuration file information. This is a recommended switch to avoid unwanted combinations of configurations.
/areas --- This will apply specific areas of the .inf file – for registry permissions use "**REGKEYS**" – if this switch is not used then all areas of the .inf will be applied.

Step 8: **Insure configurations remain constant**

Once all settings have been made and applied – each system should be checked periodically to ensure the current system configuration has not changed. This can be scripted thru batch file analysis and reviewed either manually or thru automated means. This provides an additional means to monitor for intrusions based on both the analysis of the security configuration and by use of auditing.

References:

Guide to Securing Microsoft Windows NT Networks
National Security Agency : Report number C4-008R-99
Guide to Windows NT Security
Charles B Rutstein – McGraw Hill – ISBN 0-07-057833-8
Windows NT Security Handbook
Tom Sheldon – Osborne McGraw Hill – ISBN 0-07-882240-8
Windows 2000 Security
Roberta Bragg – New Riders – ISBN 0-7357-0991-2
Microsoft Windows 2000 Server Administrator's Companion
Russel Crawford – Microsoft press – ISBN 1-57231-891-8
Windows NT System Administration
Aeleen Frisch – O'Reilly – ISBN 1-56592-274-3
Microsoft TechNet
Multiple months and Knowledge Base articles
Securing Windows NT Step-by-Step
Jennifer Kolde, Jason Fossen – SANS Institute 2000

Other GIAC Research papers to help shed light on this same topic or tools:

Securing Windows NT
Andrew Kjell Nielsen
IT Services security plan –
GIAC NT
Don Michelli
Securing Microsoft IIS 5 using Windows 2000 Internet Server Security Configuration Tool
George M. Garner Jr.
Limiting Anonymous Logon/Network Access to Named Pipes and Shares
John W. Albright