Building a Windows NT bastion host in practice

Stefan Norberg (stnor@sweden.hp.com)
HP Consulting

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Abstract

This paper presents a checklist for converting a default Windows NT installation to a bastion host. This document makes no or little attempt to explain or discuss the features it implements. Therefore I suggest that you read all the Knowledge Base articles in Appendix A and the referenced documents in Appendix C. If there is something you don’t understand after having read these articles, DO NOT CONTINUE. Read them again or look for additional assistance.

What is a Bastion Host?

A bastion host is a computer system that is exposed to attack, and may be a critical component in a network security system. Special attention must be paid to these highly fortified hosts, both during initial construction and ongoing operation. Bastion hosts can include:

- Firewall gateways
- Web servers
- FTP servers
- Name servers (DNS)
- Mail hubs
- Victim hosts (sacrificial lambs)

The American Heritage Dictionary defines a bastion as:

1. A projecting part of a rampart or other fortification. 2. A well-fortified position or area. 3. Something regarded as a defensive stronghold.

Marcus Ranum is generally credited with applying the term bastion to hosts that are exposed to attack, and its common use in the firewall community. In [1] he says:

> *Bastions are the highly fortified parts of a medieval castle; points that overlook critical areas of defense, usually having stronger walls, room for extra troops, and the occasional useful tub of boiling hot oil for discouraging attackers. A bastion host is a system identified by the firewall administrator as a critical strong point in the network's security. Generally, bastion hosts will have some degree of extra attention paid to their security, may undergo regular audits, and may have modified software.*

Bastion hosts are not general purpose computing resources. They differ in both their purpose and their specific configuration. A victim host may permit network logins so users can run untrusted services, while a firewall gateway may only permit logins at the system console. The process of configuring or constructing a bastion host is often referred to as hardening. The effectiveness of a specific bastion host configuration can usually be judged by answering the following questions:

- How does the bastion host protect itself from attack?
- How does the bastion host protect the network behind it from attack?

Extreme caution should be exercised when installing new software on bastion hosts. Very few software products have been designed and tested to run on these exposed systems. See [2] for a thorough treatment of bastion hosts.

Install NT

Start with a clean system. The machine should not be attached to a public network while doing the installation/configuration. If you have to have a network connection, make sure it's an isolated trusted network segment. Do not have any other operating systems installed on your bastion host. Install Windows NT 4.00 US-ENGLISH. Use only NTFS. If installing NT Server, make it a "stand-alone" member server. This server will not be able to participate in a domain environment. Do not install IIS 2.0. If you want to run IIS, install it from the NT option pack.
As for network protocols and services, install only TCP/IP and do not install additional network services.
Consider removing everything except WordPad in Add/Remove Programs -> Windows NT Setup.

Install software

Install any third party software. This might be a web server like IIS 4.0. To install IIS 4.0 you have to have SP3 or above already on the system. This doesn't change the fact that you have to re-install SP5 afterwards.

(Re-)Install the latest service pack

Install the latest service pack for Windows NT 4.00. At the time of writing, this is Service Pack 5. If you choose to make a backup of old files during the SP installation, be sure to remove the old files afterwards. We do not want to leave the possibly vulnerable binaries on the system.

Install available hotfixes

Install all available hotfixes. The hotfixes are available from ftp://ftp.microsoft.com/bussys/winnt/winnt-public/fixes/usa/nt40.

This is a list of fixes available (post-SP5) as of Sempember 1st 1999:

Q230677	Malformed Phonebook Entry Security Vulnerability in RAS Client
Q230681	RAS Credentials Saved when "Save Password" Option Unchecked
Q231337	NETDDE.EXE Fails to Relay WM_DDE_TERMINATE to Remote Clients
Q231457	Malformed Request Causes LSA Service to Hang
Q231605	Malformed Help File Causes Help Utility to Stop Responding
Q233303	RRAS Credentials Saved when "Save Password" Option Unchecked
Q233323	Exceeding MaxRequestThreads may Cause Windows NT to Hang
Q233335	Page Contents Visible When Certain Characters are at End of URL
Q234351	Memory Leak When Performance Counters Are Not Available
Q236359	Denial of Service Attack Using Unprotected IOCTL Function Call
Q237185	Dialer.exe Access Violation with Phone Entry more than 128 Bytes

Note that the list does not contain any application specific fixes – only Windows NT OS fixes.

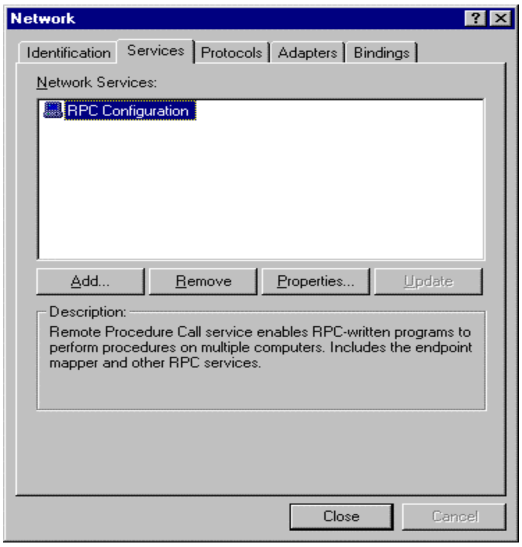
Remove unused network services

Remove all unused services with the Network application in the Control Panel. This should leave you with a configuration like the picture to the right.

Only the RPC configuration for the port mapper (RpcSs) is left. IIS will not start without it.

Note that when you remove the Workstation service, you will get a message every time you start the Network application in Control Panel: "Windows NT Networking is not installed. Do you want to install it now?" Ignore this question by answering NO.

Another caveat is that User Manager for Domains (usrmgr.exe) stops working when the Workstation service is not running. Replace it with User Manager (musrmgr.exe) from NT Workstation.



Network Services:

RPC Configuration

Description:
Remote Procedure Call service enables RPC-written programs to perform procedures on multiple computers. Includes the endpoint mapper and other RPC services.

Disable NETBIOS

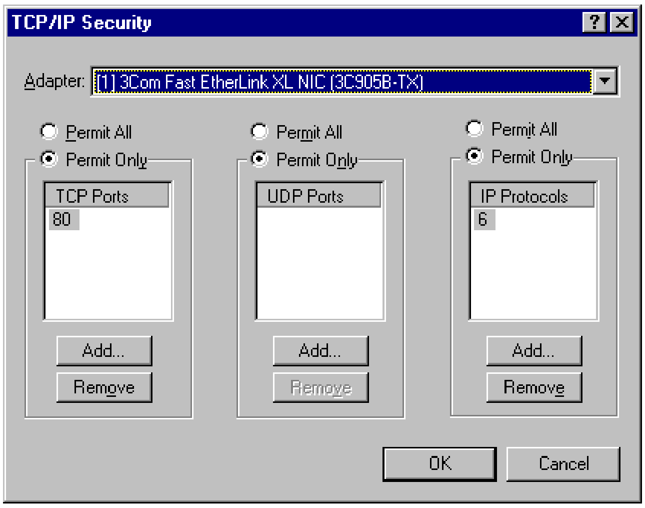
By unbinding the WINS Client in the Network application from all adapters, we get rid of all listeners on the NETBIOS ports. Network -> Bindings -> All protocols -> WINS Client -> Disable.

Also disable the WINS Client driver in Control Panel -> Devices -> WINS Client -> Disable.

Configure TCP/IP filters

Configure TCP/IP-security by specifying the ports that are allowed inbound (TCP or UDP) on each network adapter. This is done in the Network application -> Protocols -> TCP/IP -> Advanced -> Enable Security -> Configure.

Skip this step if you are to install another packet filtering software on this host later on.



Adapter: [1] 3Com Fast EtherLink XL NIC (3C905B-TX)

○ Permit All
● Permit Only
TCP Ports
80

○ Permit All
● Permit Only
UDP Ports

○ Permit All
● Permit Only
IP Protocols
6

Example: Web-server

The configuration shown to the right allows only connections to tcp/80.

No UDP is accepted. IP protocol 6 is TCP.

Disable unused services

Everything should be disabled but the following (excluding any applications we want running on the system of course).

Disabling all but the services below is a good idea.

- EventLog
- NT LM Security Support Provider
- Protected Storage
- Remote Procedure Call (RPC) Service

The processes that should be running are these:

smss.exe	Session Manager
csrss.exe	Client Server Subsystem
winlogon.exe	The logon process
services.exe	The main service handler process
pstores.exe	Protected storage
lsass.exe	Local Security Authority
rpcss.exe	The RPC end-point mapper
explorer.exe	The Explorer GUI
loadwc.exe	Explorer related
nddeagnt.exe	Explorer related

Encrypt the system accounts database

Run the syskey.exe utility (with the key on disk option). This will provide protection against password cracking tools like L0pht Crack (http://www.l0pht.com/).

Apply policies and ACLs

Run the Microsoft Security Configuration Editor (SCE) in command line mode. The command line version of this tool is included in the hpnt*,zip archive. This SCE is a part of the service pack 4 CD. Our configuration file is called bastion.inf. This file is an ASCII text file. You can take a look at it in your favorite editor, but it's best viewed with the SCE Microsoft Management Console snap-in.

```
C:> secedit /configure /cfg bastion.inf /db %TEMP%\secedit.sdb /verbose /log %TEMP%\scelog.txt
```

This will make a number of changes to your configuration. Here is a summary of the most significant changes:

Account policies

Password policy	
Enforce password uniqueness by remembering last passwords	6
Minimum password age	2
Maximum password age	42
Minimum password length	10
Complex passwords (passfilt.dll)	Enabled
User must logon to change password	Enabled
Account lockout policy	
Account lockout count	5
Lockout account time	Forever
Reset lockout count after	720 mins

Local policies

Audit policy	
Audit account management	Success, Failure
Audit logon events	Success, Failure
Audit object access	Failure
Audit policy change	Success, Failure
Audit privilege use	Failure
Audit process tracking	No auditing
Audit system events	Success, Failure
User rights assignment	
SeAssignPrimaryTokenPrivilege	No one
SeAuditPrivilege	No one
SeBackupPrivilege	Administrators
SeCreatePagefilePrivilege	Administrators
SeCreatePermanentPrivilege	No one

SeCreateTokenPrivilege	No one
SeDebugPrivilege	No one
SeIncreaseBasePriorityPrivilege	Administrators
SeIncreaseQuotaPrivilege	Administrators
SeInteractiveLogonRight	Administrators
SeLoadDriverPrivilege	Administrators
SeLockMemoryPrivilege	No one
SeNetworkLogonRight	No one
SeProfileSingleProcessPrivilege	Administrators
SeRemoteShutdownPrivilege	No one
SeRestorePrivilege	Administrators
SeSecurityPrivilege	Administrators
SeShutdownPrivilege	Administrators
SeSystemEnvironmentPrivilege	Administrators
SeSystemProfilePrivilege	Administrators
SeSystemTimePrivilege	Administrators
SeTakeOwnershipPrivilege	Administrators
SeTcbPrivilege	No one
SeMachineAccountPrivilege	No one
SeChangeNotifyPrivilege	Everyone
SeBatchLogonRight	No one
SeServiceLogonRight	No one

Event log settings

The Application, System and Security logs are configured to be up to 100MB each. They will overwrite events as needed, but only entries older than 30 days. Anonymous access to the logs is disabled.

Registry Values

The policy will also apply the following changes to the registry.

KEY	*Type*	*Value*
MACHINE\System\CurrentControlSet\Control\Print\Providers\LanMan Print Services\AddPrintDrivers	REG_DWORD	1
MACHINE\System\CurrentControlSet\Services\Rdr\Parameters\EnablePlainTextPassword	REG_DWORD	0
MACHINE\System\CurrentControlSet\Services\LanManServer\Parameters\AutoDisconnect	REG_DWORD	15
MACHINE\System\CurrentControlSet\Services\LanManServer\Parameters\AutoShareWks	REG_DWORD	0
MACHINE\System\CurrentControlSet\Services\LanManServer\Parameters\AutoShareServer	REG_DWORD	0
MACHINE\System\CurrentControlSet\Services\LanManServer\Parameters\EnableForcedLogOff	REG_DWORD	1
MACHINE\System\CurrentControlSet\Services\LanManServer\Parameters\RequireSecuritySignature	REG_DWORD	1
MACHINE\System\CurrentControlSet\Services\LanManServer\Parameters\EnableSecuritySignature	REG_DWORD	1
MACHINE\System\CurrentControlSet\Services\Rdr\Parameters\RequireSecuritySignature	REG_DWORD	1
MACHINE\System\CurrentControlSet\Services\Rdr\Parameters\EnableSecuritySignature	REG_DWORD	1
MACHINE\System\CurrentControlSet\Services\Netlogon\Parameters\RequireSignOrSeal	REG_DWORD	1
MACHINE\System\CurrentControlSet\Services\Netlogon\Parameters\SealSecureChannel	REG_DWORD	1
MACHINE\System\CurrentControlSet\Services\Netlogon\Parameters\SignSecureChannel	REG_DWORD	1
MACHINE\System\CurrentControlSet\Control\Lsa\RestrictAnonymous	REG_DWORD	1
MACHINE\System\CurrentControlSet\Control\Session Manager\ProtectionMode	REG_DWORD	1
MACHINE\System\CurrentControlSet\Control\Lsa\LmCompatibilityLevel	REG_DWORD	5
MACHINE\Software\Microsoft\Windows NT\CurrentVersion\Winlogon\LegalNoticeText	REG_SZ	This is a private system. Unauthorized use is prohibited.
MACHINE\Software\Microsoft\Windows NT\CurrentVersion\Winlogon\LegalNoticeCaption	REG_SZ	Hardened by HP Consulting
MACHINE\Software\Microsoft\Windows NT\CurrentVersion\Winlogon\DontDisplayLastUserName	REG_SZ	1
MACHINE\System\CurrentControlSet\Control\Lsa\CrashOnAuditFail	REG_DWORD	1
MACHINE\System\CurrentControlSet\Control\Session Manager\Memory Management\ClearPageFileAtShutdown	REG_DWORD	1
MACHINE\Software\Microsoft\Windows NT\CurrentVersion\Winlogon\CachedLogonsCount	REG_SZ	0
MACHINE\Software\Microsoft\Windows NT\CurrentVersion\Winlogon\AllocateFloppies	REG_SZ	1
MACHINE\Software\Microsoft\Windows NT\CurrentVersion\Winlogon\AllocateCDRoms	REG_SZ	1

MACHINE\System\CurrentControlSet\Control\Lsa\AuditBaseObjects	REG_DWORD	1
MACHINE\System\CurrentControlSet\Control\Lsa\SubmitControl	REG_DWORD	0
MACHINE\System\CurrentControlSet\Control\Lsa\FullPrivilegeAuditing	REG_BINARY	1
MACHINE\Software\Microsoft\Windows NT\CurrentVersion\Winlogon\ShutdownWithoutLogon	REG_SZ	0
MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\DisableIPSourceRouting	REG_DWORD	1

File system and Registry Access Control Lists

The ACLs applied to the file system and the registry are identical to what Microsoft ships as the ”Highly secure workstation” template in SCE. For details check the bastion.inf file with the SCE snap-in in MMC.

Administrator account

The bastion.inf policy renames the Administrator account to ”root”. This should be changed to something unique for your environment. Make sure to have a strong password on the Administrator account as well.

Remove unused and potentially dangerous components

If an attacker gains access to the bastion host it is crucial that the attacker doesn’t get extra help to establish a back door or gain access to other systems. Therefore it’s good practice to remove unused binaries from the bastion host. The downside of doing this is that it may slow down the administrators as well. Use your judgement here.

To remove DOS, Win16, OS/2 and Posix sub systems

KEY	*Type*	*Value*
MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\SubSystems\Optional	REG_BINARY	00 00
MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\SubSystems\Os2	N/A	REMOVE THIS KEY
MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\SubSystems\Posix	N/A	REMOVE THIS KEY
MACHINE\SYSTEM\CurrentControlSet\Control\WOW	N/A	REMOVE THIS KEY

Delete the following files:

```
%SystemRoot%\system32\ntvdm.exe
%SystemRoot%\system32\krnl386.exe
%SystemRoot%\system32\psxdll.dll
%SystemRoot%\system32\psxss.exe
%SystemRoot%\system32\posix.exe
%SystemRoot%\system32\os2.exe
%SystemRoot%\system32\os2ss.exe
%SystemRoot%\system32\os2srv.exe
%SystemRoot%\system32\os2 (directory)
```

Note that some Win32 applications still have 16-bit installation programs. For example Firewall-1 3.0. Removing the Win16 or DOS subsystem will obviously break these programs. The system will claim it’s unable to find the executable you are trying to run.

Other potential dangerous tools

```
%SystemRoot%\system32\nbtstat.exe
%SystemRoot%\system32\tracert.exe
%SystemRoot%\system32\telnet.exe
%SystemRoot%\system32\tftp.exe
%SystemRoot%\system32\rsh.exe
%SystemRoot%\system32\rcp.exe
%SystemRoot%\system32\rexec.exe
%SystemRoot%\system32\finger.exe
%SystemRoot%\system32\ftp.exe
```

Open Ports

Though it’s possible to make Windows NT stop listening on all ports, many applications rely on RPC loop back communication, especially those from Microsoft. ***For example Internet Information Server 4.0 breaks if you***

disable the RPC client or server. However, if you do not need RPC you can disable it by removing the following keys in the registry:

KEY	*Type*	*Value*
MACHINE\ Software\Microsoft\RPC\ClientProtocols\ncacn_ip_tcp	N/A	REMOVE THIS KEY
MACHINE\ Software\Microsoft\RPC\ClientProtocols\ncacn_ip_udp	N/A	REMOVE THIS KEY
MACHINE\ Software\Microsoft\RPC\ServerProtocols\ncacn_ip_tcp	N/A	REMOVE THIS KEY
MACHINE\ Software\Microsoft\RPC\ServerProtocols\ncacn_ip_udp	N/A	REMOVE THIS KEY

This will leave you with no open ports whatsoever on your bastion host.

```
C:\>netstat -an

Active Connections

  Proto  Local Address          Foreign Address        State

C:\>
```

If you do need RPC, the RPC end-point mapper service (RpcSs.exe) will open up some ports.

Output of netstat on my test system:

```
C:\>netstat -an

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            0.0.0.0:0              LISTENING
  TCP    0.0.0.0:135            0.0.0.0:0              LISTENING
  TCP    0.0.0.0:1027           0.0.0.0:0              LISTENING
  TCP    0.0.0.0:1028           0.0.0.0:0              LISTENING
  TCP    127.0.0.1:1025         0.0.0.0:0              LISTENING
  TCP    127.0.0.1:1025         127.0.0.1:1028         ESTABLISHED
  TCP    127.0.0.1:1026         0.0.0.0:0              LISTENING
  TCP    127.0.0.1:1028         127.0.0.1:1025         ESTABLISHED
  UDP    0.0.0.0:135            *:*

C:\>
```

We will have to live with this. The TCP/IP security filters should deny any connection attempts made to those ports.

Test of TCP/IP security filters

Let's try the TCP/IP security filters. First I configured the filters to allow only tcp/80 and udp/1111. Then I fired up listeners with netcat (http://www.l0pht.com/~weld/netcat/) on tcp/80,81 and udp/1110,1111. To test I used netcat to try to connect to the server on the listener ports.

The tcpdump output below shows the behavior of the filter function with SP4.

```
UDP packets to port 1110 (blocked) shows no output on the netcat listener.
22:54:14.041112 arp who-has 10.0.0.43 tell 10.0.0.5
22:54:14.041171 arp reply 10.0.0.43 is-at 0:10:5a:e6:cf:74
22:54:14.041240 10.0.0.5.1252 > 10.0.0.43.1110: udp 10
22:54:16.909514 10.0.0.5.1252 > 10.0.0.43.1110: udp 11

UDP packets to port 1111 (unblocked) shows output on the netcat listener.
22:58:30.045340 10.0.0.5.1254 > 10.0.0.43.1111: udp 10
22:58:32.807513 10.0.0.5.1254 > 10.0.0.43.1111: udp 11

UDP packets to port 1111 (unblocked) with no netcat listener sends ICMP udp port unreachable.
23:00:39.497178 10.0.0.43 > 10.0.0.5: icmp: 10.0.0.43 udp port 1111 unreachable
23:00:39.725978 10.0.0.5.1255 > 10.0.0.43.1111: udp 2
23:00:39.726038 10.0.0.43 > 10.0.0.5: icmp: 10.0.0.43 udp port 1111 unreachable
23:00:39.979497 10.0.0.5.1255 > 10.0.0.43.1111: udp 5

TCP connect to port 80 (unblocked) shows output on the netcat listener.
23:03:05.220808 10.0.0.5.1264 > 10.0.0.43.http: S 52482:52482(0) win 8192 <mss 1460> (DF) [tos
0x10]
23:03:05.220922 10.0.0.43.http > 10.0.0.5.1264: S 61918:61918(0) ack 52483 win 8760 <mss 1460>
(DF)
23:03:05.221044 10.0.0.5.1264 > 10.0.0.43.http: . ack 1 win 8760 (DF) [tos 0x10]
23:03:07.289221 10.0.0.5.1264 > 10.0.0.43.http: P 1:7(6) ack 1 win 8760 (DF) [tos 0x10]
23:03:07.395725 10.0.0.43.http > 10.0.0.5.1264: . ack 7 win 8754 (DF)
23:03:11.146798 10.0.0.5.1264 > 10.0.0.43.http: P 7:8(1) ack 1 win 8760 (DF) [tos 0x10]
23:03:11.301110 10.0.0.43.http > 10.0.0.5.1264: . ack 8 win 8753 (DF)
23:03:11.960993 10.0.0.5.1264 > 10.0.0.43.http: R 52490:52490(0) win 0 (DF) [tos 0x10]
```

TCP connect to port 81 (blocked) shows no output on the netcat listener. NT sends RST.

```
23:23:43.669792 10.0.0.5.1286 > 10.0.0.43.81: S 52552:52552(0) win 8192 <mss 1460> (DF) [tos
0x10]
23:23:43.669857 10.0.0.43.81 > 10.0.0.5.1286: R 0:0(0) ack 52553 win 0
23:23:44.168936 10.0.0.5.1286 > 10.0.0.43.81: S 52552:52552(0) win 8192 <mss 1460> (DF) [tos
0x10]
23:23:44.168995 10.0.0.43.81 > 10.0.0.5.1286: R 0:0(0) ack 1 win 0
23:23:44.669639 10.0.0.5.1286 > 10.0.0.43.81: S 52552:52552(0) win 8192 <mss 1460> (DF) [tos
0x10]
23:23:44.669697 10.0.0.43.81 > 10.0.0.5.1286: R 0:0(0) ack 1 win 0
23:23:45.170337 10.0.0.5.1286 > 10.0.0.43.81: S 52552:52552(0) win 8192 <mss 1460> (DF) [tos
0x10]
23:23:45.170392 10.0.0.43.81 > 10.0.0.5.1286: R 0:0(0) ack 1 win 0
```

Conclusion

The TCP/IP security filters works well on Windows NT 4 .0 SP4.
If the filters are enabled, NT will ignore UDP-packets and TCP connection attempts will be reset on the denied ports.

Secure the application

The last step is to make a security review of the application that is going to run on the system. This might include NTFS ACLs/Auditing and checking with application vendor for known holes and workarounds or patches.

Summary

Now your system is reasonably secured. The only way of breaking into it over the network (as far as I can tell) is by exploiting a vulnerability in the applications running on the host (or the MS IP-stack possibly) to run arbitrary code that opens up the system.

What we’ve done here is basically rendered our system inoperable from a management perspective. Windows NT does not provide us with remote logging. NT based remote administration tools like the Event Viewer and Server Manager are based on NETBIOS and the problem with NETBIOS is that it’s considered a no go in perimeter networks. This is because everything runs in NETBIOS (SMB/CIFS, management and other applications based on named pipes) which means you cannot limit traffic to a host in router access control lists in a granular way. Hence we have to find other - preferably standardized - ways of administering and monitoring the Windows NT host.

HP Consulting

HP Consulting has world-class security consultants experienced in building perimeter networks in a secure, manageable and highly available manner. Contact us if you are interested in our services. Send an email to Mikael Johansson (mijo@sweden.hp.com).

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Change history

Version	*Changes*
1.3	Instructions on how to turn off RPC-related ports. Thanks to Andy Stewart for this one. Added a reference to a new KB article (Q218473) and some other minor stuff.
1.2	Inserted note about Win16 Install Shields. Note about Remove everything in Add/Remove Programs -> Windows NT Setup. Note about backups while installing SP's. Updated the list of hotfixes
1.14	Updated list of hotfixes and added a reference to the IIS checklist.
1.13	Added the new SP5 feature DisableIPSourceRouting.
1.12	Updated list of hotfixes and corrected a minor typo.
1.11	Changed registry value LMCompatibilityLevel from "2" to "5" to force NTLMv2. Thanks to Phil Cox for pointing this out.
1.1	Updated for Service Pack 5.
1.01-1.02	Minor changes. Thanks to Vincent Maret.
1.0	Initial release.

Appendix A: Relevant MS Knowledge Base articles

Microsoft Support Knowledge Base is available on the Internet at http://support.microsoft.com/support/search. Use "Search for a specific article ID number" and type in the PSS ID number.

PSS ID Number	*Name of article*
Q93362	C2 Evaluation and Certification for Windows NT
Q101063	Windows NT Logon Welcome, Displaying Warning Message
Q114463	Hiding the Last Logged On Username in the Logon Dialog
Q114817	No Shutdown Button in Windows NT Server Welcome Screen
Q140058	How To Prevent Auditable Activities When Security Log Is Full
Q142641	Internet Server Unavailable Because of Malicious SYN Attacks
Q143164	INF: How to Protect Windows NT Desktops in Public Areas
Q143474	Restricting Information Available to Anonymous Logon Users
Q143475	Windows NT System Key Permits Strong Encryption of the SAM
Q146906	How To Secure Performance Data in Windows NT
Q147706	How to Disable LM Authentication on Windows NT
Q151082	HOWTO: Password Change Filtering & Notification in Windows NT
Q153094	Restoring Default Permissions to Windows NT System Files
Q155363	HOWTO: Regulate Network Access to the Windows NT Registry
Q161372	How to Enable SMB Signing in Windows NT
Q161990	How to Enable Strong Password Functionality in Windows NT
Q166992	Standard Security Practices for Windows NT
Q172925	INFO: Security Issues with Objects in ASP and ISAPI Extensions
Q172931	Cached Logon Information
Q174840	Disabling Buttons in the Windows NT Security Dialog Box
Q176820	Differences Between 128-bit and 40-bit versions of SP3 & SP4
Q187506	List of NTFS Permissions Required for IIS Site to Work
Q195227	SP4 Security Configuration Manager Available for Download
Q214752	Adding Custom Registry Settings to Security Configuration Editor
Q217336	TCP/IP Source Routing Feature Cannot Be Disabled
Q218473	Restricting Changes to Base System Objects

Appendix B - List of Ports Used by Windows NT version 4.0

Function	*Static ports*
Windows NT	
Browsing	UDP:137,138
DHCP Lease	UDP:67,68
DHCP Manager	TCP:135
Directory Replication	UDP:138 TCP:139
DNS Administration	TCP:135
DNS Resolution	UDP:53
Event Viewer	TCP:139
File Sharing	TCP:139
Logon Sequence	UDP:137,138 TCP139
NetLogon	UDP:138
Pass Through Validation	UDP:137,138 TCP:139
Performance Monitor	TCP:139
PPTP	TCP:1723 IP Protocol:47 (GRE)
Printing	UDP:137,138 TCP:139
Registry Editor	TCP:139
Server Manager	TCP:139
Trusts	UDP:137,138 TCP:139
User Manager	TCP:139
WinNT Diagnostics	TCP:139
WinNT Secure Channel	UDP:137,138 TCP:139
WINS Replication	TCP:42
WINS Manager	TCP:135
WINS Registration	TCP:137
Convoy Clustering (WLBS)	
Convoy	UDP:1717
WLBS	UDP:2504
Exchange	
Client/Server Comm.	TCP:135
Exchange Administrator	TCP:135
IMAP	TCP:143
IMAP (SSL)	TCP:993
LDAP	TCP:389
LDAP (SSL)	TCP:636
MTA - X.400 over TCP/IP	TCP:102
POP3	TCP:110
POP3 (SSL)	TCP:995
RPC	TCP:135
SMTP	TCP:25
NNTP	TCP:119
NNTP (SSL)	TCP:563
Terminal Server	
RDP Client (Microsoft)	TCP:3389 (Pre Beta2:1503)
ICA Client (Citrix)	TCP:1494

DCOM RPC high ports

By default DCOM dynamically allocates one high port (>1023) per process. There is a way to limit the port mapper to only a specific range of ports. You must decide how many ports you want to allocate, which is equivalent to the number of simultaneous DCOM processes through the firewall. You must open all of the UDP and TCP ports corresponding to the port numbers you choose. In addition, you must open TCP/UDP 135, which is used for RPC End Point Mapping, among other things. In addition, you must tell DCOM which ports you reserved using the following registry key:

```
HKEY_LOCAL_MACHINES\Software\Microsoft\Rpc\Internet
```

You probably will have to create this key.

Here is an example of how to restrict DCOM to a range of 10 ports:

```
Named value: Ports
Type: REG_MULTI_SZ
Setting: Range of port. Can be multiple lines such as: 3001-3010 135.

Named value: PortsInternetAvailable
Type: REG_MULTI_SZ
Setting: "Y"

Named value: UseInternetPorts
Type: REG_MULTI_SZ
Setting: "Y"
```

Appendix C – References

#	Document	Author(s)	Where
1	Thinking About Firewalls V2.0: Beyond Perimeter Security	Marcus J. Ranum	http://www.clark.net/pub/mjr/pubs/think/index.htm
2	Building Internet Firewalls	D. Brent Chapman and Elizabeth D. Zwicky	O'Reilly & Associates ISBN: 1-56592-124-0
3	Securing Windows NT Installation	Microsoft Corporation	http://www.microsoft.com/ntserver/security/exec/overview/Secure_NTInstall.asp
4	Building a Bastion Host Using HP-UX 10	Kevin Steves	http://people.hp.se/stevesk/security/bastion.html
5	Microsoft Internet Information Server 4.0 Security Checklist	Microsoft Corporation	http://www.microsoft.com/security/products/iis/CheckList.asp

Appendix D – Acknowledgements

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Hans Jönsson (HP Support) for assisting me with practical tests and being supportive in a UNIX-loving environment.

Kevin Steves (HP Consulting) for writing an excellent paper on making a bastion host of HP-UX [4] and correcting my confused attempts to write about this subject in English.

All people (on the 'net) who have provided me with feedback. Keep it coming!

Appendix E – Files included in this archive

This document is available for free as an Adobe Acrobat PDF. It's available from

http://people.hp.se/stnor

Additional files included are:

File name	*Description*	*MD5 hash*
bastion.inf	The security template	1a09e855e0ea35fbc8513d9fd46a07dc
secedit.exe	Microsoft Security Configuration Manager – command line version	e2c64f52418f90212999930a339fd342
scedll.dll	The SCE core DLL	1bd8ce63c98b97b2b5769dff39b71801
esent.dll	Extensible Storage Engine DLL – required to run SCE	6a07e37421e03ca3bdf5983f0a73ce69

Appendix F – About the author

Stefan Norberg has been working as technical consultant for six years with UNIX and Windows NT infrastructure. He mainly works with security related consulting in Internet environments. Stefan holds a MCSE+Internet certification and is a Microsoft Certified Trainer. You can reach him at stnor@sweden.hp.com.