



Interested in learning more about cyber security training?

SANS Institute InfoSec Reading Room

This paper is from the SANS Institute Reading Room site. Reposting is not permitted without express written permission.

Netcat - The TCP/IP Swiss Army Knife

Netcat is a powerful tool that every security professional should be familiar with. It should be used with caution. I would not recommend installing netcat on your production networks. I would suggest using it to test your firewall, and router configurations in a test environment. It can also be used to test your operating system lockdown procedures. Be certain that you have the authority to install and use netcat on your network before doing so. You might even want to review the source code to learn how Hobbit built n...

Copyright SANS Institute
Author Retains Full Rights

AD

DEEPARMOR®

Netcat – The TCP/IP Swiss Army Knife

Tom Armstrong

February 15, 2001

Overview

Netcat is a tool that every security professional should be aware of and possibly have in their 'security tool box'. In May/June of 2000, insecure.org conducted a survey of 1200 Nmap users from the Nmap-hackers mailing list to determine their favorite security tools. Netcat was the second most popular tool, not including Nmap¹. A quick search on securityportal (www.securityportal.com) found 166 matches of netcat. Most of the matches describe or use netcat in some way. Netcat is a utility that is able to write and read data across TCP and UDP network connections. If you are responsible for network or system security it is essential that you understand the capabilities of netcat.

Netcat should not be installed unless you have authority to do so. Never install any executable unless you can trust the provider. If possible review the source and compile it yourself. To be safe only use netcat in a test environment.

Hobbit (hobbit@avian.org) created netcat in 1995² as a feature-rich network debugging and exploration tool. Its purpose was to be able to create just about any type of network connection. According to Hobbit²-

Some of the features of netcat are:

- Outbound or inbound connections, TCP or UDP, to or from any ports
- Full DNS forward/reverse checking, with appropriate warnings
- Ability to use any local source port
- Ability to use any locally-configured network source address
- Built-in port-scanning capabilities, with randomizer
- Built-in loose source-routing capability
- Can read command line arguments from standard input
- Slow-send mode, one line every N seconds
- Optional ability to let another program service inbound connections

Some of the potential uses of netcat:

- Script backends
- Scanning ports and inventorying services
- Backup handlers
- File transfers
- Server testing and simulation
- Firewall testing
- Proxy gatewaying
- Network performance testing
- Address spoofing tests

- Protecting X servers
- 1001 other uses you`ll likely come up with

The original version of netcat was released to run on Unix and Linux. Weld Pond (weld@10pht.com) released the Windows NT version in 1998³. The source code is available for both versions.

Remote command prompt anyone?

On a Windows NT server issue the following command in the directory that contains netcat:

```
nc -l -p 1234 -d -e cmd.exe -L
```

This `-l` puts netcat into listen mode, the `-p 1234` tells netcat to use port 1234, the `-d` allows netcat to run detached from the console, the `-e cmd.exe` tells netcat to execute the `cmd.exe` program when a connection is made, and the `-L` will restart Netcat with the same command line when the connection is terminated.

On the client system issue the following command:

```
nc destination 1234
```

This command causes netcat to connect to the server named `destination` on port 1234. Immediately you are given a console connection to the destination server. Be careful! To exit the remote console session type:

```
exit
```

You will be returned to your own console and will be able to reconnect to the destination server because netcat was started on the destination server with the `-L` option.

FTP & drive mapping blocked?

To receive a file named `newfile` on the destination system start netcat with the following command:

```
nc -l -p 1234 >newfile
```

On the source system send a file named `origfile` to the destination system with the following command:

```
nc destination 1234 <origfile
```

Issue a ^C on the source system and your done. Be sure to check the file to be sure it is the same size as the original.

Hiding Netcat on Windows NT

Here are a few ways that a hacker could use to hide netcat on a system or use it behind a firewall:

- Rename the executable or recompile with a different name. Beware that using a copy of netcat that you aren't sure how the source was compiled is very dangerous. If possible review the source code and compile it yourself.
- Detach from the console option (-d)
- Use a port that is well known and allowed through any firewalls between the two systems.

Port Scanning

A scanning example from Hobbit is "nc -v -w 2 -z target 20-30". Netcat will try connecting to every port between 20 and 30 [inclusive] at the target, and will likely inform you about an FTP server, telnet server, and mailer along the way. The -z switch prevents sending any data to a TCP connection and very limited probe data to a UDP connection, and is thus useful as a fast scanning mode just to see what ports the target is listening on. To limit scanning speed if desired, -i will insert a delay between each port probe.⁴ Even though netcat can be used for port scanning it isn't its strength. A tool such as nmap is better suited for port scanning.

Netcat + Encryption = Cryptcat⁵

Netcat is a useful tool as it is, but if someone were using it you would be able to at least get a feel for what they were doing. At least you could before Cryptcat! Cryptcat is the standard netcat enhanced with Bruce Schneier's twofish encryption. It can be found at www.farm9.com. Linux, OpenBSD, FreeBSD, and Windows versions are available. So much for sniffing any netcat traffic!

Command Option Overview⁶

Netcat accepts its commands with options first, then the target host, and everything thereafter is interpreted as port names or numbers, or ranges of ports in M-N's syntax. Netcat does not currently handle portnames with hyphens.

Option	Description
-d	Allows netcat to detach from the console on Windows NT.
-e	Executes a program if netcat is compiled with the <code>-DGAPING_SECURITY_HOLE</code> .
-i	Sets the interval time. Netcat uses large 8K reads and writes. This basically sends data one line at a time. This is normally used when data is read from files or pipes.

-g	Used to construct a loose-source-routed path for your connection. This is modeled after “traceroute”.
-G	Positions the “hop pointer” within the list.
-l	Forces netcat to listen for an inbound connection. An example “nc -l -p 1234 <filename” tells netcat to listen for a connection on port 1234 and once a connection is made to send the file named filename. The file is sent whether the connecting system wants it or not. If you specify a target host netcat will only accept an bound connection only from that host and if you specify one, only from the specified foreign source port.
-L	Restarts Netcat with the same command line that was used when the connection was started.. This way you can connect over and over to the same Netcat process.
-n	Forces netcat to only accept numeric IP addresses and to not do any DNS lookups for anything
-o	Used to obtain a hex dump file of the data sent either way, use “-o logfile”. The dump lines begin with “<” or “>” to respectively indicate “from the net” or “to the net”, and contain the total count per direction, and hex or ascii representations of the traffic.
-p	Required for outbound connections. The parameter can be numeric or a name as listed in the services file. If -p is not used netcat will bind to whatever unused port the systems gives it, unless the -r option is used.
-r	Causes port scanning to be done randomly. Normally it is done highest to lowest.
-s	Used to specify local network source address. Usage “-s ip-addr” or “-s name”.
-t	Enables netcat to respond to telnet option negotiation if netcat is compiled with -DTELNET parameter. Telnet daemons will get no useful answers, as they would from a telnet program.
-u	Tells netcat to use UDP instead of TCP.
-v	Controls the level of verbosity. <ul style="list-style-type: none"> • (without -n) netcat will do a full forward and reverse name and address lookup for the host, and warn you about the all-to-common problem of mismatched names in the DNS. • Usually want to use the -w 3, which limits the time spent trying to make a connection. • If multiple ports are given -v must be specified twice.
-w	Limits the time spent trying to make a connection.
-z	Prevents sending any data to a TCP connection and very limited probe data to a UDP connection. Use -i to insert a delay between each port probe. This is useful as a fast scanning mode just to see what ports the target is listening on.

Conclusion

Netcat is a powerful tool that every security professional should be familiar with. It should be used with caution. I would not recommend installing netcat on your production networks. I would suggest using it to test your firewall, and router configurations in a test environment. It can also be used to test your operating system lockdown procedures. Be certain that you have the authority to install and use netcat on your network before doing so. You might even want to review the source code to learn how Hobbit built netcat and how Weld Pond ported it to the Windows platform.

¹ Insecure.org, "Top 50 Security Tools"

URL: <http://www.insecure.org/tools.html> (August 21, 2000)

² Hobbit, "New tool available: Netcat"

URL: <http://lists.insecure.org/bugtraq/1995/Oct/0028.html> (October 28, 1995)

³ Weld Pond, "Netcat 1.10 for NT"

URL: <http://www.l0pht.com/~weld/netcat/readme.txt> (February 2, 1998)

⁴ Hobbit, "Netcat 1.10"

URL: <http://www.l0pht.com/~weld/netcat/readme.html> (March 20, 1996)

⁵ Farm9, "cryptcat = netcat + encryption"

URL: http://farm9.com/content/Free_Tools/Cryptcat (October 2, 2000)

⁶ Hobbit, "Netcat 1.10"

URL: <http://www.l0pht.com/~weld/netcat/readme.html> (March 20, 1996)



Upcoming SANS Training

[Click here to view a list of all SANS Courses](#)

SANS Las Vegas 2019	Las Vegas, NVUS	Jan 28, 2019 - Feb 02, 2019	Live Event
SANS Security East 2019	New Orleans, LAUS	Feb 02, 2019 - Feb 09, 2019	Live Event
SANS SEC504 Stuttgart February 2019	Stuttgart, DE	Feb 04, 2019 - Feb 09, 2019	Live Event
SANS Anaheim 2019	Anaheim, CAUS	Feb 11, 2019 - Feb 16, 2019	Live Event
SANS Northern VA Spring- Tysons 2019	Tysons, VAUS	Feb 11, 2019 - Feb 16, 2019	Live Event
SANS London February 2019	London, GB	Feb 11, 2019 - Feb 16, 2019	Live Event
SANS FOR610 Madrid February 2019 (in Spanish)	Madrid, ES	Feb 11, 2019 - Feb 16, 2019	Live Event
SANS Dallas 2019	Dallas, TXUS	Feb 18, 2019 - Feb 23, 2019	Live Event
SANS New York Metro Winter 2019	Jersey City, NJUS	Feb 18, 2019 - Feb 23, 2019	Live Event
SANS Scottsdale 2019	Scottsdale, AZUS	Feb 18, 2019 - Feb 23, 2019	Live Event
SANS Secure Japan 2019	Tokyo, JP	Feb 18, 2019 - Mar 02, 2019	Live Event
SANS Zurich February 2019	Zurich, CH	Feb 18, 2019 - Feb 23, 2019	Live Event
SANS Riyadh February 2019	Riyadh, SA	Feb 23, 2019 - Feb 28, 2019	Live Event
Open-Source Intelligence Summit & Training 2019	Alexandria, VAUS	Feb 25, 2019 - Mar 03, 2019	Live Event
SANS Reno Tahoe 2019	Reno, NVUS	Feb 25, 2019 - Mar 02, 2019	Live Event
SANS Brussels February 2019	Brussels, BE	Feb 25, 2019 - Mar 02, 2019	Live Event
SANS Baltimore Spring 2019	Baltimore, MDUS	Mar 02, 2019 - Mar 09, 2019	Live Event
SANS Training at RSA Conference 2019	San Francisco, CAUS	Mar 03, 2019 - Mar 04, 2019	Live Event
SANS Secure India 2019	Bangalore, IN	Mar 04, 2019 - Mar 09, 2019	Live Event
SANS St. Louis 2019	St. Louis, MOUS	Mar 11, 2019 - Mar 16, 2019	Live Event
SANS Secure Singapore 2019	Singapore, SG	Mar 11, 2019 - Mar 23, 2019	Live Event
SANS San Francisco Spring 2019	San Francisco, CAUS	Mar 11, 2019 - Mar 16, 2019	Live Event
SANS London March 2019	London, GB	Mar 11, 2019 - Mar 16, 2019	Live Event
SANS SEC504 Paris March 2019 (in French)	Paris, FR	Mar 18, 2019 - Mar 23, 2019	Live Event
SANS Munich March 2019	Munich, DE	Mar 18, 2019 - Mar 23, 2019	Live Event
ICS Security Summit & Training 2019	Orlando, FLUS	Mar 18, 2019 - Mar 25, 2019	Live Event
SANS Secure Canberra 2019	Canberra, AU	Mar 18, 2019 - Mar 23, 2019	Live Event
SANS Norfolk 2019	Norfolk, VAUS	Mar 18, 2019 - Mar 23, 2019	Live Event
SANS Doha March 2019	Doha, QA	Mar 23, 2019 - Mar 28, 2019	Live Event
SANS Jeddah March 2019	Jeddah, SA	Mar 23, 2019 - Mar 28, 2019	Live Event
SANS Madrid March 2019	Madrid, ES	Mar 25, 2019 - Mar 30, 2019	Live Event
SANS SEC560 Paris March 2019 (in French)	Paris, FR	Mar 25, 2019 - Mar 30, 2019	Live Event
SANS Dubai January 2019	OnlineAE	Jan 26, 2019 - Jan 31, 2019	Live Event
SANS OnDemand	Books & MP3s OnlyUS	Anytime	Self Paced