



Interested in learning
more about security?

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

Build your business'
breach action plan.

START NOW

 **LifeLock**
BUSINESS SOLUTIONS

No one can prevent all identity theft. © 2016
LifeLock, Inc. All rights reserved. LifeLock
and the LockMan logo are registered
trademarks of LifeLock, Inc.

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 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 for a full list of all Upcoming SANS Events by Location](#)

Rocky Mountain Fall 2017	Denver, COUS	Sep 25, 2017 - Sep 30, 2017	Live Event
SANS Baltimore Fall 2017	Baltimore, MDUS	Sep 25, 2017 - Sep 30, 2017	Live Event
Data Breach Summit & Training	Chicago, ILUS	Sep 25, 2017 - Oct 02, 2017	Live Event
SANS Copenhagen 2017	Copenhagen, DK	Sep 25, 2017 - Sep 30, 2017	Live Event
SANS London September 2017	London, GB	Sep 25, 2017 - Sep 30, 2017	Live Event
SANS Oslo Autumn 2017	Oslo, NO	Oct 02, 2017 - Oct 07, 2017	Live Event
SANS DFIR Prague 2017	Prague, CZ	Oct 02, 2017 - Oct 08, 2017	Live Event
SANS Phoenix-Mesa 2017	Mesa, AZUS	Oct 09, 2017 - Oct 14, 2017	Live Event
SANS October Singapore 2017	Singapore, SG	Oct 09, 2017 - Oct 28, 2017	Live Event
Secure DevOps Summit & Training	Denver, COUS	Oct 10, 2017 - Oct 17, 2017	Live Event
SANS Tysons Corner Fall 2017	McLean, VAUS	Oct 14, 2017 - Oct 21, 2017	Live Event
SANS Brussels Autumn 2017	Brussels, BE	Oct 16, 2017 - Oct 21, 2017	Live Event
SANS Tokyo Autumn 2017	Tokyo, JP	Oct 16, 2017 - Oct 28, 2017	Live Event
SANS Berlin 2017	Berlin, DE	Oct 23, 2017 - Oct 28, 2017	Live Event
SANS Seattle 2017	Seattle, WAUS	Oct 30, 2017 - Nov 04, 2017	Live Event
SANS San Diego 2017	San Diego, CAUS	Oct 30, 2017 - Nov 04, 2017	Live Event
SANS Gulf Region 2017	Dubai, AE	Nov 04, 2017 - Nov 16, 2017	Live Event
SANS Miami 2017	Miami, FLUS	Nov 06, 2017 - Nov 11, 2017	Live Event
SANS Milan November 2017	Milan, IT	Nov 06, 2017 - Nov 11, 2017	Live Event
SANS Amsterdam 2017	Amsterdam, NL	Nov 06, 2017 - Nov 11, 2017	Live Event
SANS Paris November 2017	Paris, FR	Nov 13, 2017 - Nov 18, 2017	Live Event
Pen Test Hackfest Summit & Training 2017	Bethesda, MDUS	Nov 13, 2017 - Nov 20, 2017	Live Event
SANS Sydney 2017	Sydney, AU	Nov 13, 2017 - Nov 25, 2017	Live Event
SANS London November 2017	London, GB	Nov 27, 2017 - Dec 02, 2017	Live Event
SANS San Francisco Winter 2017	San Francisco, CAUS	Nov 27, 2017 - Dec 02, 2017	Live Event
SIEM & Tactical Analytics Summit & Training	Scottsdale, AZUS	Nov 28, 2017 - Dec 05, 2017	Live Event
SANS Khobar 2017	Khobar, SA	Dec 02, 2017 - Dec 07, 2017	Live Event
SANS Munich December 2017	Munich, DE	Dec 04, 2017 - Dec 09, 2017	Live Event
European Security Awareness Summit & Training 2017	London, GB	Dec 04, 2017 - Dec 07, 2017	Live Event
SANS Austin Winter 2017	Austin, TXUS	Dec 04, 2017 - Dec 09, 2017	Live Event
SANS Frankfurt 2017	Frankfurt, DE	Dec 11, 2017 - Dec 16, 2017	Live Event
SANS Bangalore 2017	Bangalore, IN	Dec 11, 2017 - Dec 16, 2017	Live Event
SANS SEC504 at Cyber Security Week 2017	OnlineNL	Sep 25, 2017 - Sep 30, 2017	Live Event
SANS OnDemand	Books & MP3s OnlyUS	Anytime	Self Paced