netcat

Johannes Franken
<jfranken@jfranken.de>

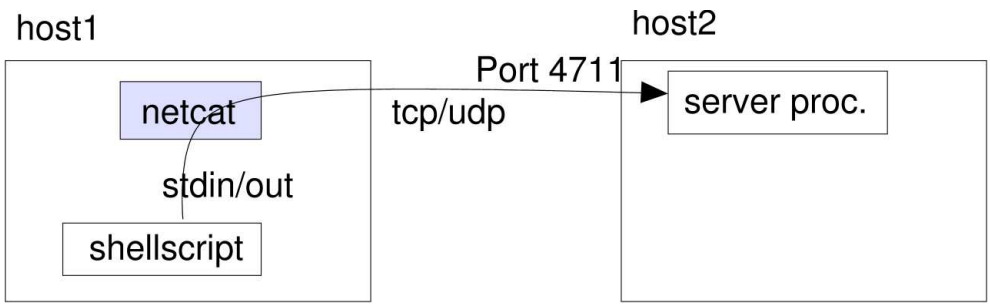
On this page I show example uses of **netcat** - a command line tool to create network connections over tcp or udp.

Contents

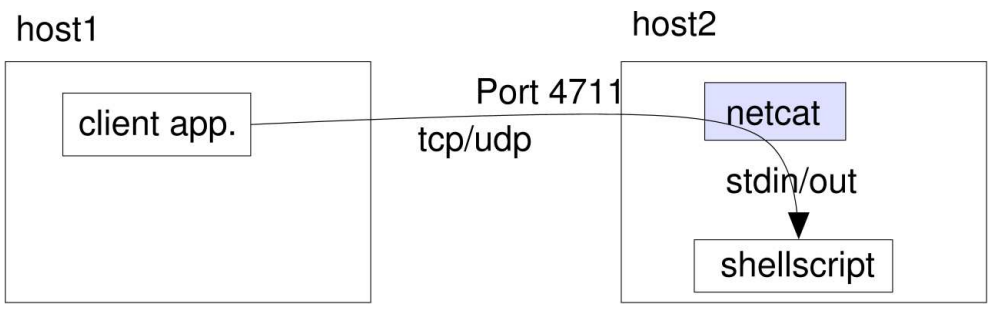
Intended purpose

With **netcat** you can talk to arbitrary tcp- or udp-connections via stdin/out, e.g. from a shellscript.

netcat can either setup the connections itself (client-mode):



or answer them (server-mode):



Additionally **netcat**'s client-mode can be used as a portscanner.

The following documentation correlates to **netcat** 1.10 from 1996-03-20, which still is the most up to date version today (2003).

Usage as client

Querying webservers

Try it yourself: When you query a webserver using shell redirection, telnet won't wait for the server's response, but abort the connection at the end of it's input:

```
$ printf 'GET / HTTP/1.0\n\n'  | telnet www.jfranken.de 80
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
Connection closed by foreign host.
$
```

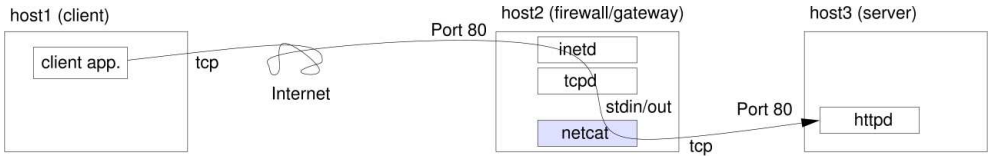
`netcat` performs better:

```
$ printf 'GET / HTTP/1.0\n\n'  | nc -w 10 www.jfranken.de 80
HTTP/1.0 200 OK
Server: thttpd/2.21b 23apr2001
Content-Type: text/html; charset=iso-8859-1
[...]
<HTML>
[...]
</HTML>
```

`netcat` will quit on the time when the connection closes down. the BTW: The parameter **`-w 10`** makes sure, that this happens maximum 10 seconds the after the the input has ended.

Forwarding ports

With **`netcat`** and inetd you can forward local ports to other hosts.



The following line in **`/etc/inetd.conf`** on host2 will locally provide host 3's port 80.

```
80 stream tcp nowait nobody /usr/bin/nc /usr/bin/nc -w 3 host3 80
```

If you like logging and access control, you can change the first **`/usr/bin/nc`** to **`/usr/sbin/tcpd`**.

Talking to mailrelays

In my talk about ssh-tunnelling you can see a config file for exim, which forwards mails to certain domains over a mail relay using ssh and **`netcat`**:

```
# at bottom of TRANSPORT CONFIGURATION : ############################

# Transport, which tunnels mails over ssh to my smarthost
ssh:
  driver = pipe

  # talk regular smtp to the pipe (qmail approved :-) )
  bsmtp = all
  bsmtp_helo = true
  use_crlf = true
  prefix = "
  suffix = "

  # connect to my mail server's smtp port.
  # must authenticate without password
  command = ssh johannes.our-isp.org netcat -w 1 localhost smtp
  user = jfranken

  # ssh failure handling: kill hanging sessions,
  # retry and tell me on failures
  timeout = 300s
  temp_errors = 1
  return_fail_output = true

# at top of ROUTERS CONFIGURATION: ############################
t_online:
  driver = domainlist
  transport = ssh
  route_list = "^t-online\.(de|at|com)|t-dialin\.net$ ;\
                ^mail.com$                           ;\
                ^lists.sourceforge.net$              ;\
                ^bigpond.com$                        ;\
                ^aol.com$                            ;\
                ^mathematik.tu-darmstadt.de$         ;"
```

The interesting point about this configuration is the cognition, that I can use any host, for which I have ssh access, as a mail relay.

Determining a remote DNS server's software

You can remotely determine the software a remote DNS server is running on:

```
$ dig @pns.dtag.de version.bind. txt CHAOS|grep -i "^V"
VERSION.BIND.           0S CHAOS TXT    "BIND 8.3.4"
```

Of course, you can also do that with bash and **`netcat`**:

```
$ whatdns() {
   printf 'begin-base64 644 -\np8IBAAABAAAAAAAAB3ZlcnNpb24EYmluZAAAEAADCg==\n====’|
   uudecode| nc -uw 1 $1 domain | strings| tail -1; }
$ whatdns pns.dtag.de
BIND 8.3.4
$ whatdns 141.2.1.1
4.9.7
```

Usage as server

When you type

```
PROGRAM | nc -l -p PORT -w TIMEOUT
```

or

```
nc -l -p PORT -w TIMEOUT | PROGRAM
```

1. **netcat** will wait for exactly one connection to port **PORT**, then
2. attach to PROGRAM's out- or input and
3. wait maximum **TIMEOUT** seconds for the connection to abort.

For ports below 1024, you need to be root.

If the port should be bidirectional (do input as well as output), you can type

```
nc -l -p PORT -e PROGRAM
```

Unfortunately **netcat** cannot pass parameters to PROGRAM, so you might need to supply a 2-lines shellscript in most cases.

Because **netcat** quits at the end of the connection, it can only service one connection. Use the following 3-lines shellscript, if you want **netcat** to accept multiple (successive or concurrent) sessions:

```
$ cat <<'EOF'>mydemon
#!/bin/bash
export port=${port:-$1} # inherit $1 as $port
nc -l -p $port -e $0 &  # await further connections on this port
[ $1 ]|| PROGRAM        # do the work (not for the first invocation)
EOF
$ chmod +x mydemon
$ ./mydemon 3000
$
```

The **-e** parameter will only work, if **netcat** has been compiled with the option **-DGAPING_SECURITY_HOLE** set. For Debian GNU/Linux 3.0, this is true.

Remote shell demon

With the following shellscript, you can start your personal remote shell demon:

```
#!/bin/bash
# pershd - personal shell demon
# 2003-02-17 Johannes Franken  - jfranken@jfranken.de

# on first invocation, export $PW and $port to subshells
export PW port
if [ $1 ] ; then
        port=$1
        echo -n pass:
        read PW
fi

# do we know the port to listen on?
if [ ! $port ]; then
        echo USAGE: $0 port ;
        exit;
fi

# wait for further connections (veiling params)
echo "-l -p $port -e $0" | nc 2>/dev/null &
[ $1 ] && exit; # first invocation exit here

# ask for password
unset p
until [ "$p" = "$PW" ]; do
        echo -n pass:
        read p
done

# received good password. present a shell
bash --noediting -i
```

When I start this script, it asks me to tell it a password and then waits for connections in the background:

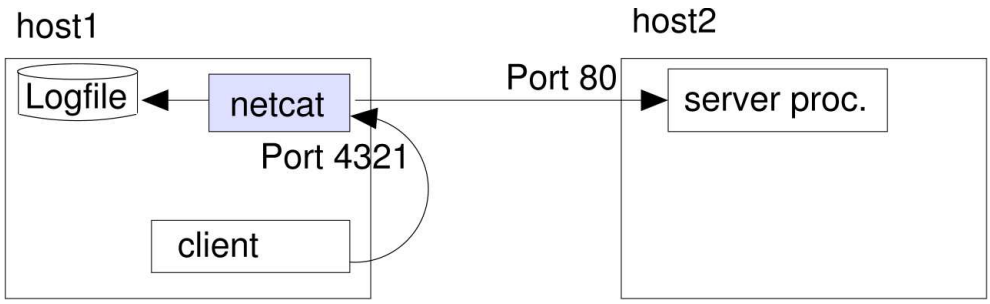
```
jfranken@tp:~$ ./pershd 1234
pass:secret
jfranken@tp:~$
```

With this password I can now access my shell from remote hosts:

```
$ nc tp.jfranken.de 1234
pass:secret
jfranken@tp:~$
jfranken@tp:~$ exit
exit
$
```

Capturing network traffic

Sniffing tools like **tcpdump**, **snoop**, **iptraf** or **ethereal** are quite popular for debugging network applications. But in order to use them, you need to be root. With **netcat** you can also capture network connections as a normal user: just point your application to a local netcat, which loggs everything and then forwards it to the server.



To do so, just replace the term **PROGRAM** in the above mydemon-script with

```
netcat -o /tmp/sniffer.‘date +%s.$$‘ tp.jfranken.de 80
```

and call it with parameter 4321. **netcat** will now create a logfile for each access to that port in your **/tmp**-directory.

For example: After I had opened **http://localhost:4321** with my browser, there was the following logfile:

```
$ cat /tmp/sniffer.1045474262.5864
> 00000000 47 45 54 20 2f 20 48 54 54 50 2f 31 2e 31 0d 0a # GET / HTTP/1.1..
> 00000010 55 73 65 72 2d 41 67 65 6e 74 3a 20 4f 70 65 72 # User-Agent: Oper
> 00000020 61 2f 36 2e 31 31 20 28 4c 69 6e 75 78 20 32 2e # a/6.11 (Linux 2.
[...]
< 00000000 48 54 54 50 2f 31 2e 31 20 32 30 30 20 4f 4b 0d # HTTP/1.1 200 OK.
< 00000010 0a 53 65 72 76 65 72 3a 20 74 68 74 74 70 64 2f # .Server: thttpd/
< 00000020 32 2e 32 31 62 20 32 33 61 70 72 32 30 30 31 0d # 2.21b 23apr2001.
< 00000030 0a 43 6f 6e 74 65 6e 74 2d 54 79 70 65 3a 20 74 # .Content-Type: t
[...]
< 00002180 0a 3c 2f 46 52 41 4d 45 53 45 54 3e 0a 3c 2f 48 # .</FRAMESET>.</H
< 00002190 54 4d 4c 3e 0a                                  # TML>.
```

Copying directory trees over some internet

With **netcat**, (gnu)tar and bash, you can copy directory trees from one host to another. The files are transfered compressed and with all their attributes (permissions/modification times).

To receive a file, I let **netcat** listen on port 51330, and redirect it’s output to a **tar**:

```
$ alias receive=’nc -vlp 51330 | tar xzvp’
$ receive
listening on [any] 51330 ...
```

On the sending host you call a shell function, which tars the given files/directories and sends them to port 51330 at the receiving host.

```
$ send() { j=$*; tar cpz ${j/%${!#}/}|nc -w 1 ${!#} 51330;}
$ send dir* tp.jfranken.de
```

For those not familiar with bash-o-magic:

- **${!#}** returns the last parameter (the hostname),
- **${j/%${!#}/}** any others (list of files or directories).

Usage as portscanner

Used like this, **`netcat`** will test some host for open ports:

```
nc -vz PARAMETER hostname PORTRANGES
```

Possible values for **`PARAMETER`** are:

Parameter	Meaning
`-v`	show the closed ports as well
`-w` <seconds>	timeout for connection setup
`-u`	udp instead of tcp. Best used together with **`-w`**
`-r`	try the ports in random order
`-i` <seconds>	delay after each tested port

Examples for a tcp- and an udp-scan:

```
$ nc -vz www.jfranken.de 1-1024
www.jfranken.de [195.88.176.20] 443 (https) open
www.jfranken.de [195.88.176.20] 110 (pop3) open
www.jfranken.de [195.88.176.20] 80 (www) open
www.jfranken.de [195.88.176.20] 53 (domain) open
www.jfranken.de [195.88.176.20] 25 (smtp) open
www.jfranken.de [195.88.176.20] 22 (ssh) open
$
$ nc -vz -vur -i 1 -w 2 localhost 1024 108-112
localhost [127.0.0.1] 1024 (?) open
localhost [127.0.0.1] 109 (pop2) : Connection refused
localhost [127.0.0.1] 112 (?) : Connection refused
localhost [127.0.0.1] 111 (sunrpc) open
localhost [127.0.0.1] 110 (pop3) : Connection refused
localhost [127.0.0.1] 108 (?) : Connection refused
 sent 0, rcvd 0
```

Links to advanced topics

- The netcat(1) manpage
- The netcat README file