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NetCheck Test Cases: Input Traces and NetCheck Output

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NetCheck test cases: input traces and NetCheck output

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Introduction

Application failures due to network issues are some of the most difficult to diagnose and debug. This is because the failure may be due to in-network state or state maintained by a remote end-host, both of which are invisible to an application host. For instance, data may be dropped due to MTU issues [18], NAT devices and firewalls introduce problems due to address changes and connection blocking [11], default IPv6 options can cause IPv4 applications to fail [3], and default buffer size settings can cause UDP datagrams to be dropped or truncated [37].

This report presents the results of our work NetCheck [38]. In contrast with most prior approaches, NetCheck does not require application- or network-specific knowledge to perform its diagnoses, and no modification to the application or the infrastructure is necessary. NetCheck treats an application as a blackbox and requires just a set of system call (syscall) invocation traces from the relevant end-hosts. These traces can be easily collected at runtime with standard blackbox tracing tools, such as `strace`. To perform its diagnosis, NetCheck derives a global ordering of the input syscalls by simulating the syscalls against a network model. The model is also used to identify those syscalls that deviate from expected network semantics. These deviations are then mapped to a diagnosis by using a set of heuristics.

To detect and diagnose network problems, NetCheck uses a **global ordering** that it automatically reconstructs from the input set of blackbox host traces. A valid global ordering must preserve the local orders of host traces, and conform to the network API semantics. NetCheck reconstructs such a global ordering without relying on globally synchronized clocks or logical clocks [16, 20]. Instead, NetCheck uses a **heuristic algorithm** and a **network model** to simulate and check if a particular ordering of syscall invocations is feasible. As a result, NetCheck has a higher level of transparency and usability. The above steps are overviewed in Figure 1. NetCheck first orders the syscalls with a heuristic algorithm and a network model. Following this, NetCheck uses a diagnoses engine to compile any detected deviations from the network model into a diagnosis.

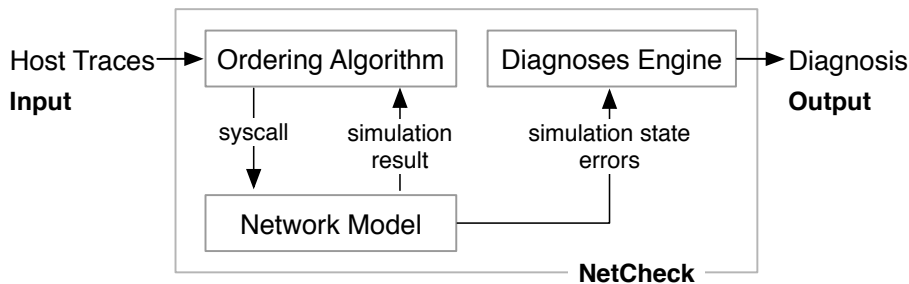


Figure 1: Overview of NetCheck.

NetCheck successfully classifies over 90% of failures when applied to execution traces of bugs impacting dozens of popular applications and protocols, including FTP, Python, VLC and Ruby. This report details the corresponding test cases that replicate these bugs. The test cases, code and traces in this report are also published on NetCheck’s website [25]. NetCheck uses a set of rules to diagnose network problems in applications, in both its network model and diagnoses engine components. The network model diagnoses low-level information (details in [1]), whereas the diagnoses engine performs post processing based on the state captured by the network model. The rules in the diagnoses engine are listed in Table 1.

In the rest of this document we show all of the test cases we created or verified. We start by showing all the unit tests for reproduced bugs from public bug trackers in Section 1. We demonstrate that NetCheck diagnosed known bugs across multiple projects with a rate of 95.7%. Next, Section 2 explains our experiments on the WITest testbed [2] to evaluate NetCheck’s ability to diagnose issues in real networks. For these experiments, we replicated and injected network-related bugs from the WEBrick tracker into the testbed. In this set of tests, NetCheck detected 90% of the injected bugs. In all test cases, the issues diagnosed by NetCheck are highlighted in red. In cases where calls are rejected, the issues are not highlighted, because the calls will be attempted at a later point.

Rule	Description
1. Unaccepted Connections	If a TCP connection has unaccepted (pending) connections, this is an indicator that the connecting host may be behind a middle box.
2. Ignored Accepts	No matching connect corresponding for an accept (middle-box indicator).
3. Connect Failure	Connect fails for reasons other than (1) or (2), indicating that a middle-box (e.g., NAT) is filtering network connections.
4. Connection Refused	Connection is refused to an address that is being listened on (middle-box indicator).
5. Nonblocking Connect Failure	A nonblocking connect never connects (middle-box indicator).
6. No Relevant Traffic	A host has outgoing traffic, but not to a relevant address, then the host is likely connecting through a proxy.
7. Datagram Loss	Reports an error in the trace summary if a significant (user-defined) fraction of datagrams are lost.
8. MTU	Datagrams larger than a certain size are dropped by the network.
9. Non-transitive Connectivity	A can communicate with B , and B can communicate with C . But A cannot communicate with C .

Table 1: NetCheck post-processing diagnoses. Example of Rule “(1) Unaccepted Connections”: When a client is behind a NAT: (i) the client uses a private IP, (ii) the peer socket address in server’s accept is not the client’s private IP. Example of Rule “(2) Ignored Accepts”: When a server is behind a NAT: (i) the server accepts a connection from client, (ii) the address/port in client’s connect call is different from server’s.

1 Unit Test for Reproduced Bugs

To determine how well NetCheck diagnosis network issues in applications, we targeted networked-related bugs that are small, reproducible, and have a known cause. We did not intentionally select bugs based on how NetCheck works. For each bug report, we reproduced the issue from the report description by writing code to cause the observed behavior. We wrote our tests in Python to make the tests portable across operating systems. The tests were run in a VM using VirtualBox. The host OS was Windows 7 and the guest OS was Ubuntu 12.04. For the traces that represented Windows and BSD, the unit tests were run on Linux and the network traces that exhibit different behaviors were modified to represent how the trace would have looked on Windows or BSD as was reported or observed on those systems.

We generated a total of 71 traces across 24 different categories of bugs. We then passed these traces to NetCheck. Table 2 lists a summary of NetCheck diagnostic performance. The unit tests are grouped into several different categories. Each unit test is not meant to generate an error, but rather to generate different behaviors under different circumstances. As seen in the table, NetCheck correctly identified 95.7% of the reported bugs.

Throughout the rest of this report, we use a specific format for each test, where there is (1) a command line to run NetCheck, (2) set of input trace files, one per host, and (3) NetCheck output produced after running the command line. We use test case 1.1.1 to demonstrate these three parts.

Bug category (number of traces)	Bugs detected & correctly diagnosed / # Bugs
bind_local_interface (2)	2 / 2
block_udp_close_socket (2)	1 / 1
block_tcp_close_socket (2)	1 / 1
broadcast_flag (2)	2 / 2
buffer_full (1)	1 / 1
invalid_port (3)	3 / 3
loopback_address (7)	0 / 0
multicast_issue (3)	3 / 3
multiple_bind (1)	1 / 1
nonblock_connect (13)	8 / 9
nonblock_flag_inheritance (2)	1 / 1
oob_data (5)	5 / 5
readline (1)	0 / 0
recvtimeo (1)	1 / 1
setsockopt_misc (3)	2 / 2
shutdown_reset (1)	0 / 1
sigstop_signal (3)	0 / 0
so_linger (5)	2 / 2
so_reuseaddr (2)	2 / 2
tcp_nodelay (3)	0 / 0
tcp_set_buf_size_vm (4)	4 / 4
udp_large_datagram_vm (2)	2 / 2
udp_set_buf_size_vm (2)	2 / 2
vary_udp_datagram (1)	1 / 1
Total Number of Traces: 71	44 / 46 (95.7%)

Table 2: NetCheck validation on reported network bugs.

1.1 bind_local_interface

Machines may have more than one IP. For example, a PC connected to both the Internet and a local network has at least three IPs (the external IP for use with the Internet, the local network IP (192.168.x.x, 10.0.x.x etc.) and the loopback address (127.0.0.1)). When a socket is bound to the local loopback address (127.0.0.1), one can only connect to that same address, as no other address exists in the loopback network [19]. This behavior is used in applications like MySQL, where the option `--bind-address=127.0.0.1` only accepts TCP connections on loopback interface [24].

This test case creates a scenario in which a socket bound to 127.0.0.1 tries to connect to a non-127.0.0.1 address. The two tests cover behavior on the Linux and Windows OSes.

1.1.1 Linux test

(1) Command line to run NetCheck:

```
python netcheck.py ./config_files/semantics/bind_local_linux.txt
```

(2) Set of input trace files, one per host:

Two traces, `bind_local.strace.linux.client` and `bind_local.strace.linux.server` must be in the same folder as the configuration file `bind_local_linux.txt`. Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("192.168.1.106")},
      16) = -1 EINVAL (Invalid argument)
close(3)                                = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("192.168.1.106")}, 16) = 0
listen(3, 1)                                = 0
accept(3, 0xbfc99dcc, [16])                  = ? ERESTARTSYS (To be restarted)
close(3)                                = 0
```

(3) NetCheck output produced after running the command line:

```
-----
Configuration
-----
```

```
host
trace A (bind_local.strace.linux.client)
trace B (bind_local.strace.linux.server)
ip 192.168.1.106
```

```
-----
Verifying Traces
-----
```

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '192.168.1.106', 12345), (0, None))
[Warning] trace A: ('connect_syscall', (0, '192.168.1.106', 12345), (-1, 'EINVAL?'))
```



```
=> EINVAL: TCP connect on socket bound to loopback to non-loopback IP.
trace A: ('close_syscall', (0,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('close_syscall', (0,), (0, None))
```

Done

Possible Problems Detected

* None

1.1.2 Windows test

```
python netcheck.py ./config_files/semantics/bind_local_windows.txt
```

Two trances, `bind_local.strace.windows.client` and `bind_local.strace.windows.server` must be in the same folder as configuration file `bind_local.linux.txt`. Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("192.168.1.106")}, 16)
= -1 ENETUNREACH (Network is unreachable)
close(3) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("192.168.1.106")}, 16) = 0
listen(3, 1) = 0
accept(3, 0xbfc99dcc, [16]) = ? ERESTARTSYS (To be restarted)
close(3) = 0
```

NetCheck output:

Configuration

```
host
trace A (bind_local.strace.windows.client)
trace B (bind_local.strace.windows.server)
ip 192.168.1.106
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '192.168.1.106', 12345), (0, None))
[Warning] trace A: ('connect_syscall', (0, '192.168.1.106', 12345), (-1, 'ENETUNREACH'))
=> EINVAL: TCP connect on socket bound to loopback to non-loopback IP.
trace A: ('close_syscall', (0,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('close_syscall', (0,), (0, None))
```

Done

Possible Problems Detected

* None

In the two tests above, NetCheck correctly detected that the reason for application failure is “TCP connect on socket bound to loopback to non-loopback IP”.

1.2 block_udp_close_socket

In these two tests, a UDP socket blocks on the `recvfrom()` call when either the `close()` or `shutdown()` call is made on the socket from a different thread. When `close()` is called, the socket keeps blocking indefinitely on `recvfrom()`, however when `shutdown()` is called, the `recvfrom()` call immediately returns an error [34, 35].

Note that the bug in this test case (and the similar bug in Skype in Section 6.3 of our paper [38]) is different from the `closethread` bug in Section 2.4. First, this test case `block_udp_socket` was generated with Python, where `recvfrom()` was hanging on `close()` call on the socket by another thread. The test case `closethread` (Section 2.4) was generated using Ruby, where another thread attempts to close the socket that is blocking on `read()` call. In the Skype bug, the situation was similar to `block_udp_socket` that the other thread tries to close the socket when the socket is calling `recvfrom()`, and both cases were detected by NetCheck. Further, the `closethread` bug occurred only in a Ruby-1.8.7 [12].

1.2.1 close() test

```
python netcheck.py ./config_files/semantics/block_udp_close.txt
```

Client trace:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("10.0.0.196")}, 16) = 0
recvfrom(3, <unfinished ...> <... recvfrom resumed> "Hello", 1024, 0, {sa_family=AF_INET,
sin_port=htons(39783), sin_addr=inet_addr("10.0.0.119")}, [16]) = 5
close(3) = 0
```

Server trace:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
sendto(3, "Hello", 5, 0, {sa_family=AF_INET, sin_port=htons(12345),
sin_addr=inet_addr("10.0.0.196")}, 16) = 5
close(3) = 0
```

NetCheck output:

```
-----
Configuration
-----
host
trace A (block_udp_close.strace.client)
trace B (block_udp_close.strace.server)
ip 10.0.0.196
-----
Verifying Traces
-----
```

```

trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('bind_syscall', (0, '10.0.0.196', 12345), (0, None))
[Don't Care] trace A: ('recvfrom_syscall', (0, 'Hello', 1024, 0, '10.0.0.119',
39783), (5, None))
trace A: ('close_syscall', (0,), (0, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
UDP socket B0 is sending to public address 10.0.0.196:12345
trace B: ('sendto_syscall', (0, 'Hello', 0, '10.0.0.196', 12345), (5, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

Network Configuration Issues

These traces have network activity, but do not appear to communicate with other traces: A

- * This may indicate that they are behind a NAT
- * It is also possible that there is a third party acting as a proxy or forwarding traffic

Please check if there are any NATs present which are not explicitly declared in the configuration file

- * If so, add them to configuration file and rerun NetCheck

UDP Traffic Statistics

Traffic from trace B to 10.0.0.196:12345

- * 1 datagrams sent, 0 datagrams received, 1 datagrams lost (100.00%)
- * 5 bytes sent, 0 bytes received, 5 bytes lost (100.00%)

Possible Problems Detected

- * There may be one or more NATs not declared in the configuration file
- * [Possible Network Misbehavior] All 1 datagrams sent from trace B to 10.0.0.196:12345 were lost

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.2.2 shutdown() test

```
python netcheck.py ./config_files/semantics/block_udp_shutdown.txt
```

Client trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("10.0.0.196")}, 16) = 0
recvfrom(3, <unfinished ...>
shutdown(3, 2 /* send and receive */) = -1 ENOTCONN (Transport endpoint is not connected)
<... recvfrom resumed> "", 1024, 0, {sa_family=AF_INET, sipx_port=htons(1024),
05000000:050000000000/[00]}, [16]) = 0
close(3) = 0

```

Server trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
sendto(3, "Hello", 5, 0, {sa_family=AF_INET, sin_port=htons(12345),
sin_addr=inet_addr("10.0.0.196")}, 16) = 5
close(3) = 0

```

NetCheck output:

```

-----
Configuration
-----
host
trace A (block_udp_shutdown.strace.client)
trace B (block_udp_shutdown.strace.server)
ip 10.0.0.196
-----

Verifying Traces
-----
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('bind_syscall', (0, '10.0.0.196', 12345), (0, None))
[Warning] trace A: ('shutdown_syscall', (0, 2), (-1, 'ENOTCONN'))
=> ENOTCONN: [Application Error] Attempted to shutdown a socket that is not connected.
trace A: ('close_syscall', (0,), (0, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
UDP socket B0 is sending to public address 10.0.0.196:12345
trace B: ('sendto_syscall', (0, 'Hello', 0, '10.0.0.196', 12345), (5, None))
trace B: ('close_syscall', (0,), (0, None))

Done
-----

UDP Traffic Statistics
-----
Traffic from trace B to 10.0.0.196:12345
* 1 datagrams sent, 0 datagrams received, 1 datagrams lost (100.00%)
* 5 bytes sent, 0 bytes received, 5 bytes lost (100.00%)
-----

Possible Problems Detected
-----
* [Possible Network Misbehavior] All 1 datagrams sent from trace B to
10.0.0.196:12345 were lost

For more details, adjust the variables defined in trace_output.py and
posix_output.py to change the level of output

```

1.3 block_tcp_close_socket

In these two tests, the TCP socket is blocking on the call `recv()` when the `close()` and `shutdown()` call is made on the socket from a different thread. When `close()` is called, the socket keeps blocking indefinitely on `recv()`, however when `shutdown()` is called, the `recv()` call immediately returns an error [12, 32, 33].

1.3.1 close() test

```
python netcheck.py -u block_tcp_close_client.strace block_tcp_close_server.strace
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EINPROGRESS (Operation now in progress)
poll([fd=3, events=POLLOUT], 1, 5000) = 1 ([fd=3, revents=POLLOUT])
getsockopt(3, SOL_SOCKET, SO_ERROR, [0], [4]) = 0
select(0, NULL, NULL, NULL, {10, 0}) = 0 (Timeout)
close(3) = 0

```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
bind(3, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16 <unfinished ...>
select(0, NULL, NULL, NULL, {3, 0} <unfinished ...>
listen(3, 1) = 0
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([{fd=3, revents=POLLIN}])
accept(3, {sa_family=AF_INET, sin_port=htons(51212), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
recv(4, <unfinished ...>
<... select resumed> ) = 0 (Timeout)
close(3) = 0
<... recv resumed> "", 1024, 0) = 0
close(4) = 0
```

NetCheck output:

Configuration

host
trace A (block_tcp_close_client.strace)
trace B (block_tcp_close_server.strace)

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 12345), (0, None))
[Notice] trace A: ('connect_syscall', (0, '127.0.0.1', 12345), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
trace A: ('close_syscall', (0,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('poll_syscall', ([0], [], [], 5000), ([[0], [], []], None))

No valid action:
[Error] trace B: ('accept_syscall', (0, '127.0.0.1', 51212), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
```

Network Configuration Issues

TCP server socket B0 (private address 127.0.0.1:12345) failed to find corresponding connects for 1 accept(s)
* There are 1 unmatched accepts from IP 127.0.0.1
* Trace B may be behind a NAT and port forwarding may be occurring

Several nonblocking connects may have failed to connect
* 1 nonblocking connects from trace A to 127.0.0.1:12345 were never observed to connect

Please check if there are any NATs present which are not explicitly declared in the configuration file
* If so, add them to configuration file and rerun NetCheck

Possible Problems Detected

* The model failed to process the entire trace
* There may be one or more NATs not declared in the configuration file

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.4 broadcast_flag

In these two unit tests, a broadcast message is sent on a socket without setting or using the `SO_BROADCAST` option and the call is unsuccessful. The tests capture the behavior on Linux and on Windows.

1.4.1 Linux test

```
python netcheck.py -u broadcast.strace.linux.client broadcast.strace.linux.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(36000), sin_addr=inet_addr("0.0.0.0")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
sendto(4, "HelloWorld", 10, 0, {sa_family=AF_INET, sin_port=htons(36000),
                               sin_addr=inet_addr("255.255.255.255")}, 16) = -1 EACCES (Permission denied)
close(4) = 0
```

Server trace:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
fcntl64(3, F_GETFL) = 0x2 (flags 0_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
bind(3, {sa_family=AF_INET, sin_port=htons(36000), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
poll([fd=3, events=POLLIN], 1, 5000) = 0 (Timeout)
close(3) = 0
```

NetCheck output:

```
-----
Configuration
-----
host
  trace A (broadcast.strace.linux.client)
  trace B (broadcast.strace.linux.server)
-----
Verifying Traces
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '0.0.0.0', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('0.0.0.0', 36000), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2, 0), (1, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('bind_syscall', (0, '0.0.0.0', 36000), (0, None))
trace B: ('poll_syscall', ([0], [], [], 5000), (0, 'Timeout'))
trace B: ('close_syscall', (0,), (0, None))
[Warning] trace A: ('sendto_syscall', (1, 'HelloWorld', 0, '255.255.255', 36000), (-1, 'EACCES'))
=> EACCES: [Application Error] Sockets's trying to broadcast a message
without using the broadcast flag.
trace A: ('close_syscall', (1,), (0, None))
-----
Done
-----
Possible Problems Detected
-----
* None
```

1.4.2 Windows test

```
python netcheck.py -u broadcast.strace.windows.client broadcast.strace.windows.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(48875), sin_addr=inet_addr("0.0.0.0")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
sendto(4, "HelloWorld", 10, 0, {sa_family=AF_INET, sin_port=htons(48875),
                               sin_addr=inet_addr("255.255.255.255")}, 16) = 10
close(4) = 0
```

Server trace:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
bind(3, {sa_family=AF_INET, sin_port=htons(48875), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "HelloWorld", 1024, 0, {sa_family=AF_INET, sin_port=htons(41618),
                                   sin_addr=inet_addr("192.168.1.105")}, [16]) = 10
close(3) = 0
```

NetCheck output:

```
-----
Configuration
-----
host
  trace A (broadcast.strace.windows.client)
  trace B (broadcast.strace.windows.server)
-----
Verifying Traces
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '0.0.0.0', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('0.0.0.0', 48875), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2, 0), (1, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('bind_syscall', (0, '0.0.0.0', 48875), (0, None))
trace B: ('poll_syscall', ([0], [], [], 5000), ([0], [], []), None))
[Don't Care] trace B: ('recvfrom_syscall', (0, 'HelloWorld', 1024, 0,
'192.168.1.105', 41618), (10, None))
trace B: ('close_syscall', (0,), (0, None))
UDP socket A1 is sending to public address 255.255.255.255:48875
[Warning] trace A: ('sendto_syscall', (1, 'HelloWorld', 0, '255.255.255.255', 48875), (10, None))
=> EACCES: [Application Error] Sockets's trying to broadcast a message
without using the broadcast flag.
trace A: ('close_syscall', (1,), (0, None))

Done
-----
Network Configuration Issues
-----
These traces have network activity, but do not appear to communicate with other
traces: B
  * This may indicate that they are behind a NAT
  * It is also possible that there is a third party acting as a proxy or
forwarding traffic

Please check if there are any NATs present which are not explicitly declared in
```

```

the configuration file
* If so, add them to configuration file and rerun NetCheck

-----
UDP Traffic Statistics
-----
Traffic from trace A to 255.255.255.255:48875
* 1 datagrams sent, 0 datagrams received, 1 datagrams lost (100.00%)
* 10 bytes sent, 0 bytes received, 10 bytes lost (100.00%)

-----
Possible Problems Detected
-----
* There may be one or more NATs not declared in the configuration file
* [Possible Network Misbehavior] All 1 datagrams sent from trace A to
255.255.255.255:48875 were lost

For more details, adjust the variables defined in trace_output.py and
posix_output.py to change the level of output

```

1.5 buffer_full

In this unit test, the sender sends a message on a socket with a full send buffer and fails.

```
python netcheck.py -u buffull.strace.linux.4190 buffull.strace.linux.4191
```

Sender trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(60041), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(60041), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
fcntl164(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl164(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0
send(5, "HelloWorld..."..., 10485760, 0) = 163840
send(5, "HelloWorld..."..., 10485760, 0) = 229376
send(5, "HelloWorld..."..., 10485760, 0) = 16384
send(5, "HelloWorld..."..., 10485760, 0) = -1 EAGAIN (Resource temporarily unavailable)
send(5, "HelloWorld..."..., 5242880, 0) = -1 ECONNRESET (Connection reset by peer)
close(5) = 0

```

Receiver trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(60041), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(55534), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
recv(4, "HelloWorld..HelloWorldHe", 8192, 0) = 8192
recv(4, "lloWorldHelloWorld..Hell", 8192, 0) = 8192
recv(4, "oHelloWorld..HelloW", 8192, 0) = 8192
recv(4, "orldHelloWorld..HelloWor", 8192, 0) = 8192
recv(4, "HelloWorld..HelloWorld", 8192, 0) = 8192
close(3) = 0
close(4) = 0

```

NetCheck output:

```
-----
Configuration
-----
```

```
host
```


trace A (buffull.strace.linux.4190)
trace B (buffull.strace.linux.4191)

Verifying Traces

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 60041), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 60041), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 60041), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 55534), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:60041)
trace A: ('connect_syscall', (1, '127.0.0.1', 60041), (0, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
TCP server socket B0 (private address 127.0.0.1:60041) returning socket B1, which is connected to socket A1 (public address 127.0.0.1:55534)
trace B: ('accept_syscall', (0, '127.0.0.1', 55534), (1, None))
[Call Rejected] trace B: ('recv_syscall', (1, 'HelloWorldHelloWorldHelloWorldHe...', 8192, 0), (8192, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
[Warning] trace A: ('send_syscall', (1, 'HelloWorldHelloWorldHelloWorldHe...', 0), (163840, None))
=> MSG->BUFSIZE: [Application Error] Sending this message has caused data in the buffer to exceed the buffer size.
trace B: ('recv_syscall', (1, 'HelloWorldHelloWorldHelloWorldHe...', 8192, 0), (8192, None))
trace B: ('recv_syscall', (1, 'lloWorldHelloWorldHelloWorldHell...', 8192, 0), (8192, None))
trace B: ('recv_syscall', (1, 'oWorldHelloWorldHelloWorldHelloW...', 8192, 0), (8192, None))
trace B: ('recv_syscall', (1, 'orldHelloWorldHelloWorldHelloWor...', 8192, 0), (8192, None))
trace B: ('recv_syscall', (1, 'ldHelloWorldHelloWorldHelloWorld...', 8192, 0), (8192, None))
[Warning] trace A: ('send_syscall', (1, 'HelloWorldHelloWorldHelloWorldHe...', 0), (229376, None))
=> MSG->BUFSIZE: [Application Error] Sending this message has caused data in the buffer to exceed the buffer size.
[Warning] trace A: ('send_syscall', (1, 'HelloWorldHelloWorldHelloWorldHe...', 0), (16384, None))
=> MSG->BUFSIZE: [Application Error] Sending this message has caused data in the buffer to exceed the buffer size.
[Notice] trace A: ('send_syscall', (1, 'HelloWorldHelloWorldHelloWorldHe...', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Call Rejected] trace A: ('send_syscall', (1, 'HelloWorldHelloWorldHelloWorldHe...', 0), (-1, 'ECONNRESET'))
=> CONN_NOT_CLOSED: The connection has not been closed yet.
trace B: ('close_syscall', (0,), (0, None))
[Call Rejected] trace A: ('send_syscall', (1, 'HelloWorldHelloWorldHelloWorldHe...', 0), (-1, 'ECONNRESET'))
=> CONN_NOT_CLOSED: The connection has not been closed yet.
[Notice] trace B: ('close_syscall', (1,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.
[Warning] trace A: ('send_syscall', (1, 'HelloWorldHelloWorldHelloWorldHe...', 0), (-1, 'ECONNRESET'))
=> EPIPE/ECONNRESET: The connection has been closed.
trace A: ('close_syscall', (1,), (0, None))

Done

TCP Connection Statistics

Connection from socket A1 (public address 127.0.0.1:55534) to socket B1 (public address 127.0.0.1:60041)
* Data sent to accepting socket B1: 409600 bytes sent, 40960 bytes received, 368640 bytes lost (90.0%)
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost
* [Possible Application Misbehavior] Data loss is most likely due to application behavior
* [Possible Application Misbehavior] socket A1 failed to send some data because the connection was closed

Possible Problems Detected

* [Possible Application Misbehavior] Trace A has 1 TCP connection(s) to 127.0.0.1:60041 with data left in the buffers
* [Possible Network Misbehavior] 3 different call(s) caused trace A to exceeded an expected buffer size

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.6 invalid_port

In these tests the client connects to a port that the server is not listening on. In the first test the client socket makes a blocking `connect()` call on Linux, in the second test the client socket makes a non-blocking `connect()` call on Linux, and in the third test the client socket makes a non-blocking `connect()` call on Windows (the behavior observed is different from the second case).

1.6.1 Linux blocking test

```
python netcheck.py -u connect_invalidport.strace.4373 connect_invalidport.strace.4374
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3  
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
getsockname(3, {sa_family=AF_INET, sin_port=htons(56064), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0  
close(3) = 0  
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4  
connect(4, {sa_family=AF_INET, sin_port=htons(56074), sin_addr=inet_addr("127.0.0.1")}, 16)  
= -1 ECONNREFUSED (Connection refused)  
close(4) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3  
bind(3, {sa_family=AF_INET, sin_port=htons(56064), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
listen(3, 1) = 0  
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)  
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0  
poll([{fd=3, events=POLLIN}], 1, 5000) = 0 (Timeout)  
close(3) = 0
```

NetCheck output:

Configuration

```
host  
trace A (connect_invalidport.strace.4373)  
trace B (connect_invalidport.strace.4374)
```

Verifying Traces

```
[Warning] trace A: ('connect_syscall', (1, '127.0.0.1', 56074), (-1, 'ECONNREFUSED'))  
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections.
```

Done

Network Configuration Issues

Trace A failed to connect to 127.0.0.1:56074 1 time(s) because the connection was refused

Possible Problems Detected

* None

1.6.2 Linux non-blocking test

```
python netcheck.py -u connect_invalidport2.strace.linux.client \  
    connect_invalidport2.strace.linux.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3  
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
getsockname(3, {sa_family=AF_INET, sin_port=htons(33362), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0  
close(3) = 0  
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4  
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)  
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0  
connect(4, {sa_family=AF_INET, sin_port=htons(33372),  
sin_addr=inet_addr("127.0.0.1")}, 16) = -1 EINPROGRESS (Operation now in progress)  
connect(4, {sa_family=AF_INET, sin_port=htons(33372), sin_addr=inet_addr("127.0.0.1")}, 16)  
= -1 ECONNREFUSED (Connection refused)  
close(4) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3  
bind(3, {sa_family=AF_INET, sin_port=htons(33362), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
listen(3, 1) = 0  
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)  
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0  
poll([{fd=3, events=POLLIN}], 1, 3000) = 0 (Timeout)  
close(3) = 0
```

NetCheck output:

Configuration

```
host  
trace A (connect_invalidport2.strace.linux.client)  
trace B (connect_invalidport2.strace.linux.server)
```

Verifying Traces

```
[Warning] trace A: ('connect_syscall', (1, '127.0.0.1', 33372), (-1, 'ECONNREFUSED'))  
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections.
```

Done

Network Configuration Issues

Trace A failed to connect to 127.0.0.1:33372 1 time(s) because the connection was refused

```
Several nonblocking connects may have failed to connect
* 1 nonblocking connects from trace A to 127.0.0.1:33372 were never observed to connect
```

```
-----
Possible Problems Detected
-----
```

```
* None
```

1.6.3 Windows non-blocking test

```
python netcheck.py -u connect_invalidport2.strace.linux.client \
    connect_invalidport2.strace.linux.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(33372), sin_addr=inet_addr("127.0.0.1")}, 16)
    = -1 EINPROGRESS (Operation now in progress)
connect(4, {sa_family=AF_INET, sin_port=htons(33372), sin_addr=inet_addr("127.0.0.1")}, 16)
    = -1 EINVAL (Invalid argument)
close(4) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(33362), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLIN}], 1, 3000) = 0 (Timeout)
close(3) = 0
```

NetCheck output:

```
-----
Configuration
-----
```

```
host
  trace A (connect_invalidport2.strace.windows.client)
  trace B (connect_invalidport2.strace.windows.server)
```

```
-----
Verifying Traces
-----
```

```
[Warning] trace A: ('connect_syscall', (1, '127.0.0.1', 33372), (-1, 'EINVAL'))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections.
```

```
Done
```

```
-----
Network Configuration Issues
-----
```

```
Trace A failed to connect to 127.0.0.1:33372 1 time(s) because the connection was refused
```

```
Several nonblocking connects may have failed to connect
* 1 nonblocking connects from trace A to 127.0.0.1:33372 were never observed to connect
```

```
-----
Possible Problems Detected
-----
```

```
* None
```

1.7 loopback address

In these unit tests, the calls `bind()` and `getaddrinfo()` are made with variations of the loopback address, such as '127.0.0.1', '0.0.0.0' and the empty string. Both Python and OSes, accept all variations of the loopback address without any error.

1.7.1 Bind to 0.0.0.0

```
python netcheck.py -u bind.0000.strace.3005 bind.0000.strace.3006
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(42574), sin_addr=inet_addr("0.0.0.0")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
socket(PF_INET, SOCK_DGRAM|SOCK_NONBLOCK, IPPROTO_IP) = 4
connect(4, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
gettimeofday({1346383887, 430717}, NULL) = 0
poll([{fd=4, events=POLLOUT}], 1, 0) = 1 ([fd=4, revents=POLLOUT])
send(4, "\320\360\1\0\0\1\0\0\0\0\0\0\0\0\5gmail\3com\0\0\1\0\1", 27, MSG_NOSIGNAL) = 27
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([fd=4, revents=POLLIN])
ioctl(4, FIONREAD, [59]) = 0
recvfrom(4, "\320\360\201\200\0\1\0\2\0\0\0\0\0\5gmail\3com\0\0\1\0\1\300\f\0\1\0\1\0\0\0w\0\4 \255\302
+5\300\f\0\1\0\1\0\0\0w\0\4\255\302+6", 1024, 0, {sa_family=AF_INET, sin_port=htons(53),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 59
close(4) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
connect(4, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("173.194.43.53")}, 16) = 0
getsockname(4, {sa_family=AF_INET, sin_port=htons(39449), sin_addr=inet_addr("192.168.1.106")}, [16]) = 0
connect(4, {sa_family=AF_UNSPEC, sa_data="\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"}, 16) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("173.194.43.54")}, 16) = 0
getsockname(4, {sa_family=AF_INET, sin_port=htons(54163), sin_addr=inet_addr("192.168.1.106")}, [16]) = 0
close(4) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(80), sin_addr=inet_addr("173.194.43.53")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(35730), sin_addr=inet_addr("192.168.1.106")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(42574), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
close(5) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(42574), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(57948), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
close(3) = 0
close(4) = 0
```

NetCheck output:

```
-----
Configuration
-----
host
trace A (bind.0000.strace.3005)
trace B (bind.0000.strace.3006)
-----
```

Verifying Traces

```
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '0.0.0.0', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('0.0.0.0', 42574), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('socket_syscall', (2, 2050, 0), (2, None))
[Don't Care] trace A: ('connect_syscall', (2, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [2], [], 0), (([], [2], []), None))
[Don't Care] trace A: ('send_syscall', (2, '\\320\\360\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0\\5gm...', 0),
(27, None))
[Don't Care] trace A: ('poll_syscall', ([2], [], [], 5000), (([2], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (2, '\\320\\360\\201\\200\\0\\1\\0\\2\\0\\0\\0\\0...',
1024, 0, '127.0.0.1', 53), (59, None))
trace A: ('close_syscall', (2,), (0, None))
trace A: ('socket_syscall', (2, 2, 0), (3, None))
[Don't Care] trace A: ('connect_syscall', (3, '173.194.43.53', 0), (0, None))
[Notice] trace A: ('getsockname_syscall', (3,), (('192.168.1.106', 39449), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket,
since it's only been created.
[Don't Care] trace A: ('connect_syscall', (3, '173.194.43.54', 0), (0, None))
[Notice] trace A: ('getsockname_syscall', (3,), (('192.168.1.106', 54163), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket,
since it's only been created.
trace A: ('close_syscall', (3,), (0, None))
[Don't Care] trace A: ('connect_syscall', (1, '173.194.43.53', 80), (0, None))
[Don't Care] trace A: ('getsockname_syscall', (1,), (('192.168.1.106', 35730), None))
[Don't Care] trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (4, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '0.0.0.0', 42574), (0, None))
[Sate Not Ready] trace A: ('connect_syscall', (4, '0.0.0.0', 42574), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or
refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Sate Not Ready] trace B: ('accept_syscall', (0, '127.0.0.1', 57948), (1, None))
=> NU_PENDING_CONN: There are no pending connections.
TCP socket A4 connecting to socket B0 (public address 0.0.0.0:42574)
* [Warning] Peer is an unspecified address '0.0.0.0', which is not portable
trace A: ('connect_syscall', (4, '0.0.0.0', 42574), (0, None))
TCP server socket B0 (private address 0.0.0.0:42574) returning socket B1, which is connected to socket A4
(public address 127.0.0.1:57948)

trace B: ('accept_syscall', (0, '127.0.0.1', 57948), (1, None))
trace A: ('close_syscall', (4,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))
-----
```

Done

TCP Connection Statistics

```
-----
Connection from socket A4 (public address 127.0.0.1:57948) to socket B1 (public address 0.0.0.0:42574)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A4: 0 bytes sent, 0 bytes received, 0 bytes lost
-----
```

Possible Problems Detected

```
-----
* None
-----
```

1.7.2 Bind to 127.0.0.1

```
python netcheck.py -u bind_127001.strace.3017 bind_127001.strace.3018
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(60005), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
socket(PF_INET, SOCK_DGRAM|SOCK_NONBLOCK, IPPROTO_IP) = 4
connect(4, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
poll([{fd=4, events=POLLOUT}], 1, 0) = 1 ([fd=4, revents=POLLOUT])
send(4, "\212\24\1\0\0\1\0\0\0\0\0\0\0\5gmail\3com\0\0\1\0\1", 27, MSG_NOSIGNAL) = 27
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([fd=4, revents=POLLIN])
recvfrom(4, "\212\24\201\200\0\1\0\2\0\0\0\0\5gmail\3com\0\0\1\0\1\300\f\0\1\0\1\0\0\0\36\0\4\255\302+ 5\300\f\0\1\0\1\0\0\0\36\0\4\255\302+6", 1024, 0, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("127.0.0.1")}, [16]) = 59
close(4) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
connect(4, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("173.194.43.53")}, 16) = 0
getsockname(4, {sa_family=AF_INET, sin_port=htons(34559), sin_addr=inet_addr("192.168.1.106")}, [16]) = 0
connect(4, {sa_family=AF_UNSPEC, sa_data="\0\0\0\0\0\0\0\0\0\0\0\0"}, 16) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("173.194.43.54")}, 16) = 0
getsockname(4, {sa_family=AF_INET, sin_port=htons(53268), sin_addr=inet_addr("192.168.1.106")}, [16]) = 0
close(4) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(80), sin_addr=inet_addr("173.194.43.53")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(35734), sin_addr=inet_addr("192.168.1.106")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(60005), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
close(5) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(60005), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(47527), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
close(3) = 0
close(4) = 0
```

NetCheck output:

----- Configuration

```
host
  trace A (./traces/bind_127001.strace.3017)
  trace B (./traces/bind_127001.strace.3018)
```

----- Verifying Traces

```
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 60005), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('socket_syscall', (2, 2050, 0), (2, None))
[Don't Care] trace A: ('connect_syscall', (2, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [2], [], 0), ([], [2], [], None))
[Don't Care] trace A: ('send_syscall', (2, '\212\24\1\0\0\1\0\0\0\0\0\0\0\5gma...', 0), (27, None))
[Don't Care] trace A: ('poll_syscall', ([2], [], [], 5000), ([2], [], [], None))
[Don't Care] trace A: ('recvfrom_syscall', (2, '\212\24\201\200\0\1\0\2\0\0\0\0\5gmail\3com\0\0\1\0\1\300\f\0\1\0\1\0\0\0\36\0\4\255\302+ 5\300\f\0\1\0\1\0\0\0\36\0\4\255\302+6', 1024, 0, '127.0.0.1', 53), (59, None))
trace A: ('close_syscall', (2,), (0, None))
trace A: ('socket_syscall', (2, 2, 0), (3, None))
```

```

[Don't Care] trace A: ('connect_syscall', (3, '173.194.43.53', 0), (0, None))
[Notice] trace A: ('getsockname_syscall', (3,), (('192.168.1.106', 34559), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket,
since it's only been created.
[Don't Care] trace A: ('connect_syscall', (3, '173.194.43.54', 0), (0, None))
[Notice] trace A: ('getsockname_syscall', (3,), (('192.168.1.106', 53268), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket,
since it's only been created.
trace A: ('close_syscall', (3,), (0, None))
[Don't Care] trace A: ('connect_syscall', (1, '173.194.43.53', 80), (0, None))
[Don't Care] trace A: ('getsockname_syscall', (1,), (('192.168.1.106', 35734), None))
[Don't Care] trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (4, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 60005), (0, None))
[Call Rejected] trace A: ('connect_syscall', (4, '127.0.0.1', 60005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections
or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 47527), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A4 connecting to socket B0 (public address 127.0.0.1:60005)
trace A: ('connect_syscall', (4, '127.0.0.1', 60005), (0, None))
TCP server socket B0 (private address 127.0.0.1:60005) returning socket B1, which is connected to
socket A4 (public address 127.0.0.1:47527)
trace B: ('accept_syscall', (0, '127.0.0.1', 47527), (1, None))
trace A: ('close_syscall', (4,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

Done

-----
TCP Connection Statistics
-----
Connection from socket A4 (public address 127.0.0.1:47527) to socket B1 (public address 127.0.0.1:60005)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A4: 0 bytes sent, 0 bytes received, 0 bytes lost

-----
Possible Problems Detected
-----
* None

```

1.7.3 Bind to empty string

```
python netcheck.py -u bind_emptystring.strace.3033 bind_emptystring.strace.3034
```

NetCheck output:

```

-----
Configuration
-----
host
trace A (bind_emptystring.strace.3033)
trace B (bind_emptystring.strace.3034)

-----
Verifying Traces
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '0.0.0.0', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('0.0.0.0', 44145), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('socket_syscall', (2, 2050, 0), (2, None))

```



```

[Don't Care] trace A: ('connect_syscall', (2, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [2], [], 0), (([], [2], []), None))
[Don't Care] trace A: ('send_syscall', (2, '\\10\\357\\1\\10\\0\\1\\10\\0\\0\\0\\0\\0\\0\\5gma...', 0), (27, None))
[Don't Care] trace A: ('poll_syscall', ([2], [], [], 5000), (([2], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (2, '\\10\\357\\20i\\200\\0\\1\\0\\2\\0\\0\\0\\0\\0\\...',
1024, 0, '127.0.0.1', 53), (59, None))
trace A: ('close_syscall', (2,), (0, None))
trace A: ('socket_syscall', (2, 2, 0), (3, None))
[Don't Care] trace A: ('connect_syscall', (3, '173.194.43.54', 0), (0, None))
[Notice] trace A: ('getsockname_syscall', (3,), (('192.168.1.106', 59257), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
[Don't Care] trace A: ('connect_syscall', (3, '173.194.43.53', 0), (0, None))
[Notice] trace A: ('getsockname_syscall', (3,), (('192.168.1.106', 50343), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (3,), (0, None))
[Don't Care] trace A: ('connect_syscall', (1, '173.194.43.54', 80), (0, None))
[Don't Care] trace A: ('getsockname_syscall', (1,), (('192.168.1.106', 53491), None))
[Don't Care] trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (4, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '0.0.0.0', 44145), (0, None))
[State Not Ready] trace A: ('connect_syscall', (4, '0.0.0.0', 44145), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the
connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[State Not Ready] trace B: ('accept_syscall', (0, '127.0.0.1', 37320), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A4 connecting to socket B0 (public address 0.0.0.0:44145)
* [Warning] Peer is an unspecified address '0.0.0.0', which is not portable
trace A: ('connect_syscall', (4, '0.0.0.0', 44145), (0, None))
TCP server socket B0 (private address 0.0.0.0:44145) returning socket B1, which is connected to socket A4 (public
address 127.0.0.1:37320)
trace B: ('accept_syscall', (0, '127.0.0.1', 37320), (1, None))
trace A: ('close_syscall', (4,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

Connection from socket A4 (public address 127.0.0.1:37320) to socket B1 (public address 0.0.0.0:44145)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A4: 0 bytes sent, 0 bytes received, 0 bytes lost

Possible Problems Detected

* None

1.8 multicast_issue

These unit tests consist of variations on multicast issues, such as setting the IP_ADD_MEMBERSHIP and binding to a non-multicast address. In all cases, the server did not receive the message sent to the multicast address. The variations are specific to Linux and Windows.

1.8.1 Linux test

```
python netcheck.py -u multiCast_bug.strace.client multiCast_bug.strace.server
```

Client trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
sendto(4, "yo!", 3, 0, {sa_family=AF_INET, sin_port=htons(23456), sin_addr=inet_addr("224.1.0.1")}, 16) = 3
select(0, NULL, NULL, NULL, {1, 0}) = 0 (Timeout)
sendto(4, "yo!", 3, 0, {sa_family=AF_INET, sin_port=htons(23456), sin_addr=inet_addr("224.1.0.1")}, 16) = 3
select(0, NULL, NULL, NULL, {1, 0}) = 0 (Timeout)
sendto(4, "yo!", 3, 0, {sa_family=AF_INET, sin_port=htons(23456), sin_addr=inet_addr("224.1.0.1")}, 16) = 3
select(0, NULL, NULL, NULL, {1, 0}) = 0 (Timeout)
close(4) = 0

```

Server trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
setsockopt(3, SOL_IP, IP_ADD_MEMBERSHIP, "\340\1\0\1\177\0\0\1", 8) = 0
bind(3, {sa_family=AF_INET, sin_port=htons(23456), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
fcntl164(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl164(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLIN}], 1, 5000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 5000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 5000) = 0 (Timeout)
write(1, "Done\n", 5) = 5
close(3) = 0

```

NetCheck output:

Configuration

```

host
  trace A (multiCast_bug.strace.client)
  trace B (multiCast_bug.strace.server)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
trace B: ('setsockopt_syscall', (0, 1, 35, '\340\1\0\1\177\0\0\1'), (0, None))
trace B: ('bind_syscall', (0, '0.0.0.0', 23456), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('poll_syscall', ([0], [], [], 5000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 5000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 5000), (0, 'Timeout'))
trace B: ('close_syscall', (0,), (0, None))
UDP socket A0 is sending to public address 224.1.0.1:23456
trace A: ('sendto_syscall', (0, 'yo!', 0, '224.1.0.1', 23456), (3, None))
trace A: ('sendto_syscall', (0, 'yo!', 0, '224.1.0.1', 23456), (3, None))
trace A: ('sendto_syscall', (0, 'yo!', 0, '224.1.0.1', 23456), (3, None))
trace A: ('close_syscall', (0,), (0, None))

```

Done

UDP Traffic Statistics

```

Traffic from trace A to 224.1.0.1:23456
* 3 datagrams sent, 0 datagrams received, 3 datagrams lost (100.00%)
* 9 bytes sent, 0 bytes received, 9 bytes lost (100.00%)

```

Possible Problems Detected

```

* [Possible Network Misbehavior] All 3 datagrams sent from trace A to 224.1.0.1:23456 were lost

```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.8.2 Windows test

```
python netcheck.py -u multiCast_bug2.strace.windows.client \
```

multiCast_bug2.strace.windows.server

Client trace:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLOUT}], 1, 5000) = 1 ([fd=3, revents=POLLOUT])
sendto(3, "HelloWorld!", 11, 0, {sa_family=AF_INET, sin_port=htons(40000), sin_addr=inet_addr("224.0.0.1")}, 16) = 11
select(0, NULL, NULL, NULL, {1, 0}) = 0 (Timeout)
poll([{fd=3, events=POLLOUT}], 1, 5000) = 1 ([fd=3, revents=POLLOUT])
sendto(3, "HelloWorld!", 11, 0, {sa_family=AF_INET, sin_port=htons(40000), sin_addr=inet_addr("224.0.0.1")}, 16) = 11
select(0, NULL, NULL, NULL, {1, 0}) = 0 (Timeout)
poll([{fd=3, events=POLLOUT}], 1, 5000) = 1 ([fd=3, revents=POLLOUT])
sendto(3, "HelloWorld!", 11, 0, {sa_family=AF_INET, sin_port=htons(40000), sin_addr=inet_addr("224.0.0.1")}, 16) = 11
select(0, NULL, NULL, NULL, {1, 0}) = 0 (Timeout)
close(3) = 0
```

Server trace:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
setsockopt(3, SOL_IP, IP_ADD_MEMBERSHIP, "\340\0\0\1\177\0\0\1", 8) = -1 EINVAL (Invalid argument)
close(3) = 0
```

NetCheck output:

----- Configuration -----

```
host
trace A (multiCast_bug2.strace.windows.client)
trace B (multiCast_bug2.strace.windows.server)
```

----- Verifying Traces -----

```
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('fcntl_syscall', (0, 4, 2050), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [0], [], 5000), (([], [0], []), None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
[Warning] trace B: ('setsockopt_syscall', (0, 1, 35, '\340\0\0\1\177\0\0\1'), (-1, 'EINVAL'))
=> UNEXPECTED_SUCCESS: Model succeeded but implementation failed.
trace B: ('close_syscall', (0,), (0, None))
UDP socket A0 is sending to public address 224.0.0.1:40000
trace A: ('sendto_syscall', (0, 'HelloWorld!', 0, '224.0.0.1', 40000), (11, None))
[Don't Care] trace A: ('poll_syscall', ([], [0], [], 5000), (([], [0], []), None))
trace A: ('sendto_syscall', (0, 'HelloWorld!', 0, '224.0.0.1', 40000), (11, None))
[Don't Care] trace A: ('poll_syscall', ([], [0], [], 5000), (([], [0], []), None))
trace A: ('sendto_syscall', (0, 'HelloWorld!', 0, '224.0.0.1', 40000), (11, None))
trace A: ('close_syscall', (0,), (0, None))
```

Done

----- UDP Traffic Statistics -----

```
Traffic from trace A to 224.0.0.1:40000
* 3 datagrams sent, 0 datagrams received, 3 datagrams lost (100.00%)
* 33 bytes sent, 0 bytes received, 33 bytes lost (100.00%)
```

----- Possible Problems Detected -----

```
* [Possible Network Misbehavior] All 3 datagrams sent from trace A to 224.0.0.1:40000 were lost
```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.8.3 ipaddr test

python netcheck.py -u multiCast_ipaddr.strace

Input:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(12345),
sin_addr=inet_addr("127.0.0.1")}, 16) = 0
setsockopt(3, SOL_IP, IP_ADD_MEMBERSHIP, "\177\0\0\1\0\0\0\0", 8) = -1 EINVAL (Invalid argument)
close(3) = 0
```

NetCheck output:

```
-----
Configuration
-----
host
  trace A (./traces/multiCast_ipaddr.strace)
-----

Verifying Traces
-----
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 12345), (0, None))
[Warning] trace A: ('setsockopt_syscall', (0, 1, 35, '\177\0\0\1\0\0\0\0'), (-1, 'EINVAL'))
=> EINVAL: [Application Error] Trying to add multicast membership for a non-multicast IP.
trace A: ('close_syscall', (0,), (0, None))

Done

-----
Possible Problems Detected
-----
* None
```

1.9 multiple_bind

This test case first binds to the same IP address and port 10 times, then it calls `listen()` on the 10th socket that was bound to the (IP, port), followed by binding an 11th socket to the same (IP, port). The first 10 binds are all successful while the 11th bind is unsuccessful after the calls to `listen()`.

python netcheck.py -u multiple_bind.strace.bsd.6073

Input:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
bind(4, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
bind(5, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 6
bind(6, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 7
bind(7, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 8
bind(8, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 9
bind(9, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 10
bind(10, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 11
```

```

bind(11, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 12
bind(12, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 13
bind(13, {sa_family=AF_INET, sin_port=htons(12345), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EADDRINUSE (Address already in use)

close(13) = 0
close(3) = 0
close(4) = 0
close(5) = 0
close(6) = 0
close(7) = 0
close(8) = 0
close(9) = 0
close(10) = 0
close(11) = 0
close(12) = 0

```

NetCheck output:

Configuration

host
 trace A (./traces/multiple_bind.strace.bsd.6073)

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 12345), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
[Warning] trace A: ('bind_syscall', (1, '127.0.0.1', 12345), (0, None))
=> EADDRINUSE: [Application Error] Another socket is already bound to that address and port.
trace A: ('socket_syscall', (2, 1, 0), (2, None))
[Warning] trace A: ('bind_syscall', (2, '127.0.0.1', 12345), (0, None))
=> EADDRINUSE: [Application Error] Another socket is already bound to that address and port.
trace A: ('socket_syscall', (2, 1, 0), (3, None))
[Warning] trace A: ('bind_syscall', (3, '127.0.0.1', 12345), (0, None))
=> EADDRINUSE: [Application Error] Another socket is already bound to that address and port.
trace A: ('socket_syscall', (2, 1, 0), (4, None))
[Warning] trace A: ('bind_syscall', (4, '127.0.0.1', 12345), (0, None))
=> EADDRINUSE: [Application Error] Another socket is already bound to that address and port.
trace A: ('socket_syscall', (2, 1, 0), (5, None))
[Warning] trace A: ('bind_syscall', (5, '127.0.0.1', 12345), (0, None))
=> EADDRINUSE: [Application Error] Another socket is already bound to that address and port.
trace A: ('socket_syscall', (2, 1, 0), (6, None))
[Warning] trace A: ('bind_syscall', (6, '127.0.0.1', 12345), (0, None))
=> EADDRINUSE: [Application Error] Another socket is already bound to that address and port.
trace A: ('socket_syscall', (2, 1, 0), (7, None))
[Warning] trace A: ('bind_syscall', (7, '127.0.0.1', 12345), (0, None))
=> EADDRINUSE: [Application Error] Another socket is already bound to that address and port.
trace A: ('socket_syscall', (2, 1, 0), (8, None))
[Warning] trace A: ('bind_syscall', (8, '127.0.0.1', 12345), (0, None))
=> EADDRINUSE: [Application Error] Another socket is already bound to that address and port.
trace A: ('socket_syscall', (2, 1, 0), (9, None))
[Warning] trace A: ('bind_syscall', (9, '127.0.0.1', 12345), (0, None))
=> EADDRINUSE: [Application Error] Another socket is already bound to that address and port.
trace A: ('listen_syscall', (0, 1), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (10, None))
[Notice] trace A: ('bind_syscall', (10, '127.0.0.1', 12345), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (10,), (0, None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('close_syscall', (2,), (0, None))
trace A: ('close_syscall', (3,), (0, None))
trace A: ('close_syscall', (4,), (0, None))

```

```
trace A: ('close_syscall', (5,), (0, None))
trace A: ('close_syscall', (6,), (0, None))
trace A: ('close_syscall', (7,), (0, None))
trace A: ('close_syscall', (8,), (0, None))
trace A: ('close_syscall', (9,), (0, None))
```

Done

```
-----
Possible Problems Detected
-----
```

```
* None
```

1.10 nonblock_connect

A non-blocking `connect` is a common operation that does not behave consistently across different platforms. These 13 unit tests are multiple combinations of non-blocking `connect()` call followed by other non-blocking connects or non-blocking connect followed immediately by a `recv()` call. The behavior of the unit tests varies greatly between Linux and Windows and depends on the call timings.

For example, if multiple non-blocking connects are made to the same IP address and port, the outcome of the call may vary. The first `connect` call either succeeds or raises a “connection in progress” (`EINPROGRESS`) error on Linux systems or an “operation would block” (`EWOULDBLOCK`) error on Windows [26]. The next connect call may succeed or returns the error code “connection refused” (`ECONNREFUSED`) on Linux systems or “Invalid Argument” (`EINVAL`) on Windows. Furthermore, subsequent `recv` or `send` calls that follow a non-blocking `connect` call that raised `EINPROGRESS`, may either raise `ECONNREFUSED` or `EWOULDBLOCK` errors.

NetCheck correctly diagnosed 8 out of the 9 above cases (`nonblock_connect` category in Table 2). NetCheck fails in the case where the `connect` call raises `EWOULDBLOCK` followed by a `recv` raising `EWOULDBLOCK` while the connection is not fully established, even if the connection succeeds by the time `recv` is called. The `recv` call raises an error due to there being no data available after the connection has been established. Our NetCheck prototype considers any error raised by a `connect` call, other than `EWOULDBLOCK`, as a failure to establish a connection. The addition of timing data would help to improve our classification for this call. For example a non-blocking connect followed by another non-blocking connect would result in an `EINPROGRESS` error followed by an `ECONNREFUSED` or a successful connect. A `recv()` after a non-blocking connect may result in `ECONNREFUSED`, `EWOULDBLOCK`, or a receipt of a message.

1.10.1 recv after non-blocking connect on Linux: EINPROGRESS then ECONNREFUSED

```
python netcheck.py -u conn_progress_recv.strace.linux.client \
    conn_progress_recv.strace.linux.server
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(46354), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(46354), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EINPROGRESS (Operation now in progress)
recv(4, 0xa3aa26c, 1024, 0) = -1 ECONNREFUSED (Connection refused)
close(4) = 0

```

Sever trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(46354), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
close(3) = 0

```

NetCheck output:

```

-----
Configuration
-----
host
  trace A (conn_progress_recv.strace.linux.client)
  trace B (conn_progress_recv.strace.linux.server)
-----
Verifying Traces
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 46354), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 46354), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 46354), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Warning] trace A: ('recv_syscall', (1, None, 1024, 0), (-1, 'ECONNREFUSED'))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections.
trace A: ('close_syscall', (1,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('close_syscall', (0,), (0, None))

Done

-----
Network Configuration Issues
-----
Several nonblocking connects may have failed to connect
* 1 nonblocking connects from trace A to 127.0.0.1:46354 were never observed to connect

-----
Possible Problems Detected
-----
* None

```

1.10.2 recv after non-blocking connect on Windows: EWOULDBLOCK's

```

python netcheck.py -u conn_progress_recv.strace.windows.client \
  conn_progress_recv.strace.windows.server

```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(46354), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(46354), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EWOULDBLOCK (Operation would block)
recv(4, 0xa3aa26c, 1024, 0) = -1 EWOULDBLOCK (Operation would block)
close(4) = 0

```

Server trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(46354), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
select(0, NULL, NULL, NULL, {3, 0}) = 0 (Timeout)
listen(3, 1) = 0

```

NetCheck output:

Configuration

host
trace A (/traces/conn_progress_recv.strace.windows.client)
trace B (/traces/conn_progress_recv.strace.windows.server)

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 46354), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 46354), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 46354), (-1, 'EWOULDBLOCK'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Notice] trace A: ('recv_syscall', (1, None, 1024, 0), (-1, 'EWOULDBLOCK'))
=> EAGAIN/EWOULDBLOCK: No data was received.
trace A: ('close_syscall', (1,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

Network Configuration Issues

Several nonblocking connects may have failed to connect
* 1 nonblocking connects from trace A to 127.0.0.1:46354 were never observed to connect

Possible Problems Detected

* None

1.10.3 recv after non-blocking connect on Linux: EINPROGRESS then EAGAIN

```

python netcheck.py -u conn_progress_recv2.strace.linux.client \
conn_progress_recv2.strace.linux.server

```

Client trace:


```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(59593), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
fcntl64(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(5, {sa_family=AF_INET, sin_port=htons(59593), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EINPROGRESS (Operation now in progress)
recv(5, 0xa2f5274, 1024, 0) = -1 EAGAIN (Resource temporarily unavailable)
close(5) = 0

```

Sever:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(59593), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(60348), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
close(3) = 0
close(4) = 0

```

NetCheck output:

Configuration

host
trace A (./traces/conn_progress_recv2.strace.linux.client)
trace B (./traces/conn_progress_recv2.strace.linux.server)

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 59593), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 59593), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 59593), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Notice] trace A: ('recv_syscall', (1, None, 1024, 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was received.
trace A: ('close_syscall', (1,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 60348), (1, None))
=> NO_PENDING_CONN: There are no pending connections.

```

No valid action:

```

[Error] trace B: ('accept_syscall', (0, '127.0.0.1', 60348), (1, None))
=> NO_PENDING_CONN: There are no pending connections.

```

Network Configuration Issues

```

TCP server socket B0 (private address 127.0.0.1:59593) failed to find corresponding connects for 1 accept(s)
* There are 1 unmatched accepts from IP 127.0.0.1
* Trace B may be behind a NAT and port forwarding may be occurring

```

```

Several nonblocking connects may have failed to connect
* 1 nonblocking connects from trace A to 127.0.0.1:59593 were never observed to connect

```

```

Please check if there are any NATs present which are not explicitly declared in the configuration file
* If so, add them to configuration file and rerun NetCheck

```

Possible Problems Detected

```
-----
* The model failed to process the entire trace
* There may be one or more NATs not declared in the configuration file
```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.10.4 recv after non-blocking connect on Windows: EWOULDBLOCK then Success

```
python netcheck.py -u conn_progress_recv2.strace.windows.client \
    conn_progress_recv2.strace.windows.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(58304), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
fcntl64(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(5, {sa_family=AF_INET, sin_port=htons(58304), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EWOULDBLOCK (Operation would block)
recv(5, "Hello", 1024, 0) = 5
close(5) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(58304), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(41357), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
send(4, "Hello", 5, 0) = 5
close(3) = 0
close(4) = 0
```

NetCheck output:

```
-----
Configuration
```

```
host
trace A (conn_progress_recv2.strace.windows.client)
trace B (conn_progress_recv2.strace.windows.server)
```

```
-----
Verifying Traces
```

```
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 58304), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 58304), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 58304), (-1, 'EWOULDBLOCK'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Call Rejected] trace A: ('recv_syscall', (1, 'Hello', 1024, 0), (5, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections
or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:58304)
[Call Rejected] trace A: ('recv_syscall', (1, 'Hello', 1024, 0), (5, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the other side
```

```

has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:58304) returning socket B1, which is connected to
socket A1 (public address 127.0.0.1:41357)
trace B: ('accept_syscall', (0, '127.0.0.1', 41357), (1, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'Hello', 1024, 0), (5, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'Hello', 0), (5, None))
trace A: ('recv_syscall', (1, 'Hello', 1024, 0), (5, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket A1 (public address 127.0.0.1:41357) to socket B1 (public address 127.0.0.1:58304)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 5 bytes sent, 5 bytes received, 0 bytes lost

```

Possible Problems Detected

* None

1.10.5 recv after non-blocking connect on Linux: EINPROGRESS then Success

```
python netcheck.py -u conn_progress_recv3.strace.linux.client \
conn_progress_recv3.strace.linux.server
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(45961), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
fcntl64(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(5, {sa_family=AF_INET, sin_port=htons(45961), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EINPROGRESS (Operation now in progress)
recv(5, "", 1024, 0) = 0
close(5) = 0

```

Server trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(45961), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(52139), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
close(4) = 0
close(3) = 0

```

NetCheck output:

Configuration

```

host
trace A (conn_progress_recv3.strace.linux.client)
trace B (conn_progress_recv3.strace.linux.server)

```

Verifying Traces

```
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 45961), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 45961), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 45961), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Call Rejected] trace A: ('recv_syscall', (1, '', 1024, 0), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections
or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:45961)
[Call Rejected] trace A: ('recv_syscall', (1, '', 1024, 0), (0, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the other side
has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:45961) returning socket B1, which is connected to
socket A1 (public address 127.0.0.1:52139)
trace B: ('accept_syscall', (0, '127.0.0.1', 52139), (1, None))
[Call Rejected] trace A: ('recv_syscall', (1, '', 1024, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed
but recv/read returns 0 bytes.
trace B: ('close_syscall', (1,), (0, None))
trace A: ('recv_syscall', (1, '', 1024, 0), (0, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

TCP Connection Statistics

```
-----
Connection from socket A1 (public address 127.0.0.1:52139) to socket B1 (public address 127.0.0.1:45961)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost

```

Possible Problems Detected

```
-----
* None

```

1.10.6 recv after non-blocking connect on Windows: EWOULDBLOCK then Data in the Air

```
python netcheck.py -u conn_progress_recv3.strace.windows.client \
    conn_progress_recv3.strace.windows.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(45961), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
fcntl64(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(5, {sa_family=AF_INET, sin_port=htons(45961), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EWOULDBLOCK (Operation would block)
recv(5, "", 1024, 0) = 0
close(5) = 0
```

Server trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(45961), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(52139), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
close(4) = 0
close(3) = 0

```

NetCheck output:

```

-----
Configuration
-----
host
trace A (conn_progress_recv3.strace.windows.client)
trace B (conn_progress_recv3.strace.windows.server)
-----
Verifying Traces
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 45961), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 45961), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 45961), (-1, 'EWOULDBLOCK'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Call Rejected] trace A: ('recv_syscall', (1, '', 1024, 0), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections
or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:45961)
[Call Rejected] trace A: ('recv_syscall', (1, '', 1024, 0), (0, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the other side
has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:45961) returning socket B1, which is connected to
socket A1 (public address 127.0.0.1:52139)
trace B: ('accept_syscall', (0, '127.0.0.1', 52139), (1, None))
[Call Rejected] trace A: ('recv_syscall', (1, '', 1024, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed
but recv/read returns 0 bytes.
trace B: ('close_syscall', (1,), (0, None))
trace A: ('recv_syscall', (1, '', 1024, 0), (0, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))

Done
-----
TCP Connection Statistics
-----
Connection from socket A1 (public address 127.0.0.1:52139) to socket B1 (public address 127.0.0.1:45961)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost
-----
Possible Problems Detected
-----
* None

```

1.10.7 recv after non-blocking connect: EINPROGRESS then MSGNOTSENT

```

python netcheck.py -u conn_progress_recv_success.strace.client \
conn_progress_recv_success.strace.server

```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(48589), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(48589), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EINPROGRESS (Operation now in progress)
recv(4, "Hello", 1024, 0) = 5
close(4) = 0
```

Server trace:

```
bind(3, {sa_family=AF_INET, sin_port=htons(48589), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([{fd=3, revents=POLLIN}])
accept(3, {sa_family=AF_INET, sin_port=htons(40457), sin_addr=inet_addr("127.0.0.1")}, [16]) = 5
send(5, "Hello", 5, 0) = 5
close(3) = 0
close(5) = 0
```

NetCheck output:

----- Configuration -----

```
host
trace A (conn_progress_recv_success.strace.client)
trace B (conn_progress_recv_success.strace.server)
```

----- Verifying Traces -----

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 48589), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 48589), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 48589), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Call Rejected] trace A: ('recv_syscall', (1, 'Hello', 1024, 0), (5, None))
=> ECONREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections
or refused the connection request.

trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:48589)
[Call Rejected] trace A: ('recv_syscall', (1, 'Hello', 1024, 0), (5, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the other side
has not accepted the connection yet.

trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
[Call Rejected] trace A: ('recv_syscall', (1, 'Hello', 1024, 0), (5, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the other side
has not accepted the connection yet.

TCP server socket B0 (private address 127.0.0.1:48589) returning socket B1, which is connected to
socket A1 (public address 127.0.0.1:40457)

trace B: ('accept_syscall', (0, '127.0.0.1', 40457), (1, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'Hello', 1024, 0), (5, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'Hello', 0), (5, None))
trace A: ('recv_syscall', (1, 'Hello', 1024, 0), (5, None))
trace A: ('close_syscall', (1,), (0, None))
```

```
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))
```

Done

TCP Connection Statistics

```
Connection from socket A1 (public address 127.0.0.1:40457) to socket B1 (public address 127.0.0.1:48589)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 5 bytes sent, 5 bytes received, 0 bytes lost
```

Possible Problems Detected

* None

1.10.8 ECONNREFUSED on Linux

```
python netcheck.py -u conn_refused_recv.strace.linux.client \
conn_refused_recv.strace.linux.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(38317), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
connect(4, {sa_family=AF_INET, sin_port=htons(38317), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 ECONNREFUSED (Connection refused)
fcntl(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
recv(4, 0x948226c, 1024, 0) = -1 ENOTCONN (Transport endpoint is not connected)
close(4) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(38317), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
close(3) = 0
```

NetCheck output:

Configuration

```
host
trace A (conn_refused_recv.strace.linux.client)
trace B (conn_refused_recv.strace.linux.server)
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 38317), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 38317), (0, None))
[Warning] trace A: ('connect_syscall', (1, '127.0.0.1', 38317), (-1, 'ECONNREFUSED'))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections.
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Warning] trace A: ('recv_syscall', (1, None, 1024, 0), (-1, 'ENOTCONN'))
```

```

=> ENOTCONN: [Application Error] A receive is attempted on a connection-mode socket that is not connected.
trace A: ('close_syscall', (1,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

Network Configuration Issues

Trace A failed to connect to 127.0.0.1:38317 1 time(s) because the connection was refused
This address matches server socket B0, which was bound to 127.0.0.1:38317

Possible Problems Detected

* [Ambiguous Misbehavior] One or more connects to addresses that were being listened on failed.
This may be due to the timing of the connect and listen or may be due to a network issue.

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.10.9 ECONNREFUSED on Windows

```
python netcheck.py -u conn.refused.recv.strace.windows.client \
    conn.refused.recv.strace.windows.server
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(38317), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
connect(4, {sa_family=AF_INET, sin_port=htons(38317), sin_addr=inet_addr("127.0.0.1")}, 16)
    = -1 ECONNREFUSED (Connection refused)
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
recv(4, 0x948226c, 1024, 0) = -1 EWOULDBLOCK (Operation would block)
close(4) = 0

```

Server trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(38317), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
close(3) = 0

```

NetCheck output:

Configuration

```

host
trace A (conn_refused_recv.strace.windows.client)
trace B (conn_refused_recv.strace.windows.server)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 38317), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 38317), (0, None))

```



```
[Warning] trace A: ('connect_syscall', (1, '127.0.0.1', 38317), (-1, 'ECONNREFUSED'))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections.
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Warning] trace A: ('recv_syscall', (1, None, 1024, 0), (-1, 'EWOULDBLOCK'))
=> ENOTCONN: [Application Error] receive is attempted on a connection-mode socket that is not connected.
trace A: ('close_syscall', (1,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('close_syscall', (0,), (0, None))
```

Done

Network Configuration Issues

Trace A failed to connect to 127.0.0.1:38317 1 time(s) because the connection was refused
This address matches server socket B0, which was bound to 127.0.0.1:38317

Possible Problems Detected

* [Ambiguous Misbehavior] One or more connects to addresses that were being listened on failed.
This may be due to the timing of the connect and listen or may be due to a network issue.

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.10.10 send after non-blocking connect on Windows: EWOULDBLOCK then ECONNREFUSED

```
python netcheck.py -u connect_block_refused.strace.windows.client \
    connect_block_refused.strace.windows.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(46791), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
fcntl164(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl164(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(46791), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EWOULDBLOCK (Operation would block)
send(4, "Hello", 5, 0) = -1 ECONNREFUSED (Connection refused)
close(4) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(46791), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
select(0, NULL, NULL, NULL, {3, 0}) = 0 (Timeout)
listen(3, 1) = 0
fcntl164(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl164(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLIN}], 1, 3000) = 0 (Timeout)
close(3) = 0
```

NetCheck output:

Configuration

```
host
trace A (connect_block_refused.strace.windows.client)
trace B (connect_block_refused.strace.windows.server)
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 46791), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 46791), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 46791), (-1, 'EWOULDBLOCK'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Warning] trace A: ('send_syscall', (1, 'Hello', 0), (-1, 'ECONNREFUSED'))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections.
trace A: ('close_syscall', (1,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('poll_syscall', ([0], [], [], 3000), (0, 'Timeout'))
trace B: ('close_syscall', (0,), (0, None))
```

Done

Network Configuration Issues

```
Several nonblocking connects may have failed to connect
* 1 nonblocking connects from trace A to 127.0.0.1:46791 were never observed to connect
```

Possible Problems Detected

* None

1.10.11 connect after non-blocking connect: EISCONN

```
python netcheck.py -u connect_progress_connected.strace.client \
    connect_progress_connected.strace.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(40525), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(40525), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EINPROGRESS (Operation now in progress)
connect(4, {sa_family=AF_INET, sin_port=htons(40525), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(40525), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EISCONN (Transport endpoint is already connected)
close(4) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(40525), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLIN}], 1, 3000) = 1 ([{fd=3, revents=POLLIN}])
accept(3, {sa_family=AF_INET, sin_port=htons(52154), sin_addr=inet_addr("127.0.0.1")}, [16]) = 5
close(3) = 0
close(5) = 0
```

NetCheck output:

```
-----
Configuration
-----
host
trace A (connect_progress_connected.strace.client)
trace B (connect_progress_connected.strace.server)
-----

Verifying Traces
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 40525), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 40525), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 40525), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 40525), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections
or refused the connection request.

trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('poll_syscall', ([0], [], [], 3000), (([0], [], []), None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 52154), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:40525)
trace A: ('connect_syscall', (1, '127.0.0.1', 40525), (0, None))
TCP server socket B0 (private address 127.0.0.1:40525) returning socket B1, which is connected to
socket A1 (public address 127.0.0.1:52154)
trace B: ('accept_syscall', (0, '127.0.0.1', 52154), (1, None))
[Warning] trace A: ('connect_syscall', (1, '127.0.0.1', 40525), (-1, 'EISCONN'))
=> EISCONN: [Application Error] Socket is already connected.
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

Done
-----

TCP Connection Statistics
-----
Connection from socket A1 (public address 127.0.0.1:52154) to socket B1 (public address 127.0.0.1:40525)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost
-----

Possible Problems Detected
-----
* None
-----
```

1.10.12 connect after non-blocking connect: EINVAL

```
python netcheck.py -u connect_progress_invalid.strace.client \
    connect_progress_invalid.strace.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(49158), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
```

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(49158), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EINPROGRESS (Operation now in progress)
connect(4, {sa_family=AF_INET, sin_port=htons(49158), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EINVAL (Invalid Argument)
close(4) = 0

```

Sever trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(49158), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
select(0, NULL, NULL, NULL, {3, 0}) = 0 (Timeout)
listen(3, 1) = 0
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLIN}], 1, 3000) = 0 (Timeout)
close(3) = 0

```

NetCheck output:

Configuration

host
trace A (connect_progress_invalid.strace.client)
trace B (connect_progress_invalid.strace.server)

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 49158), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 49158), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 49158), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Warning] trace A: ('connect_syscall', (1, '127.0.0.1', 49158), (-1, 'EINVAL'))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections.
trace A: ('close_syscall', (1,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('poll_syscall', ([0], [], [], 3000), (0, 'Timeout'))
trace B: ('close_syscall', (0,), (0, None))

```

Done

Network Configuration Issues

Trace A failed to connect to 127.0.0.1:49158 1 time(s) because the connection was refused
This address matches server socket B0, which was bound to 127.0.0.1:49158

Several nonblocking connects may have failed to connect
* 1 nonblocking connects from trace A to 127.0.0.1:49158 were never observed to connect

Possible Problems Detected

* [Ambiguous Misbehavior] One or more connects to addresses that were being listened on failed.
This may be due to the timing of the connect and listen or may be due to a network issue.

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.10.13 connect after non-blocking connect: ECONNREFUSED

```
python netcheck.py -u connect_progress_refused.strace.client \
    connect_progress_refused.strace.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(49158), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(4, {sa_family=AF_INET, sin_port=htons(49158), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EINPROGRESS (Operation now in progress)
connect(4, {sa_family=AF_INET, sin_port=htons(49158), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 ECONNREFUSED (Connection refused)
close(4) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(49158), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
select(0, NULL, NULL, NULL, {3, 0}) = 0 (Timeout)
listen(3, 1) = 0
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLIN}], 1, 3000) = 0 (Timeout)
close(3) = 0
```

NetCheck output:

Configuration

```
host
  trace A (connect_progress_refused.strace.client)
  trace B (connect_progress_refused.strace.server)
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 49158), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 49158), (0, None))
[Notice] trace A: ('connect_syscall', (1, '127.0.0.1', 49158), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Warning] trace A: ('connect_syscall', (1, '127.0.0.1', 49158), (-1, 'ECONNREFUSED'))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections.
trace A: ('close_syscall', (1,), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('poll_syscall', ([0], [], [], 3000), (0, 'Timeout'))
trace B: ('close_syscall', (0,), (0, None))
```

Done

Network Configuration Issues

```
Trace A failed to connect to 127.0.0.1:49158 1 time(s) because the connection was refused
```

This address matches server socket B0, which was bound to 127.0.0.1:49158

Several nonblocking connects may have failed to connect

* 1 nonblocking connects from trace A to 127.0.0.1:49158 were never observed to connect

Possible Problems Detected

* [Ambiguous Misbehavior] One or more connects to addresses that were being listened on failed.
This may be due to the timing of the connect and listen or may be due to a network issue.

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.11 nonblock_flag_inheritance

In these two tests we set the server's socket option to non-blocking then called `accept()` on the socket. In BSD the accepted socket inherits the non-blocking flag, while on Linux it does not.

1.11.1 BSD test

```
python netcheck.py -u nonblock_flag_inheritance.strace.bsd.client \  
nonblock_flag_inheritance.strace.bsd.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3  
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
getsockname(3, {sa_family=AF_INET, sin_port=htons(42531), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0  
close(3) = 0  
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4  
connect(4, {sa_family=AF_INET, sin_port=htons(42531), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
send(4, "Hello World", 11, 0) = 11  
close(4) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3  
bind(3, {sa_family=AF_INET, sin_port=htons(42531), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)  
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0  
listen(3, 1) = 0  
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)  
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)  
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)  
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)  
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)  
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)  
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)  
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)  
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)  
accept(3, {sa_family=AF_INET, sin_port=htons(45136), sin_addr=inet_addr("127.0.0.1")}, [16]) = 5  
recv(5, 0xa3aa26c, 1024, 0) = -1 EWOULDBLOCK (Operation would block)  
recv(5, 0xa3aa26c, 1024, 0) = -1 EWOULDBLOCK (Operation would block)  
recv(5, 0xa3aa26c, 1024, 0) = -1 EWOULDBLOCK (Operation would block)  
recv(5, "Hello World", 1024, 0) = 11  
close(3) = 0  
close(5) = 0
```

NetCheck output:

```

-----
Configuration
-----
host
  trace A (./traces/nonblock_flag_inheritance.strace.bsd.client)
  trace B (./traces/nonblock_flag_inheritance.strace.bsd.server)
-----

Verifying Traces
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 42531), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 42531), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 42531), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 45136), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:42531)
trace A: ('connect_syscall', (1, '127.0.0.1', 42531), (0, None))
TCP server socket B0 (private address 127.0.0.1:42531) returning socket B1, which is connected
to socket A1 (public address 127.0.0.1:45136)
trace B: ('accept_syscall', (0, '127.0.0.1', 45136), (1, None))
[Warning] trace B: ('recv_syscall', (1, None, 1024, 0), (-1, 'EWOULDBLOCK'))
=> COULD_HAVE_BLOCKED: [Portability Issue] The socket inherited the nonblocking flag from the
server socket that returned it, which does not consistently happen across operating systems.
[Warning] trace B: ('recv_syscall', (1, None, 1024, 0), (-1, 'EWOULDBLOCK'))
=> COULD_HAVE_BLOCKED: [Portability Issue] The socket inherited the nonblocking flag from the
server socket that returned it, which does not consistently happen across operating systems.
[Warning] trace B: ('recv_syscall', (1, None, 1024, 0), (-1, 'EWOULDBLOCK'))
=> COULD_HAVE_BLOCKED: [Portability Issue] The socket inherited the nonblocking flag from the
server socket that returned it, which does not consistently happen across operating systems.
[Call Rejected] trace B: ('recv_syscall', (1, 'Hello World', 1024, 0), (11, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('send_syscall', (1, 'Hello World', 0), (11, None))
trace B: ('recv_syscall', (1, 'Hello World', 1024, 0), (11, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

Done
-----

TCP Connection Statistics
-----
Connection from socket A1 (public address 127.0.0.1:45136) to socket B1 (public address 127.0.0.1:42531)
* Data sent to accepting socket B1: 11 bytes sent, 11 bytes received, 0 bytes lost
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost
-----

Possible Problems Detected
-----
* None

```

1.11.2 Linux test

```
python netcheck.py -u nonblock_flag_inheritance.strace.linux.client \
  nonblock_flag_inheritance.strace.linux.server
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(42531), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
connect(4, {sa_family=AF_INET, sin_port=htons(42531), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
select(0, NULL, NULL, NULL, {5, 0}) = 0 (Timeout)
send(4, "Hello World", 11, 0) = 11
close(4) = 0

```

Sever trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(42531), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
listen(3, 1) = 0
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)
accept(3, 0xb70f9bac, [16]) = -1 EAGAIN (Resource temporarily unavailable)
accept(3, {sa_family=AF_INET, sin_port=htons(45136), sin_addr=inet_addr("127.0.0.1")}, [16]) = 5
recv(5, "Hello World", 1024, 0) = 11
close(3) = 0
close(5) = 0

```

NetCheck output:

Configuration

```

host
  trace A (nonblock_flag_inheritance.strace.linux.client)
  trace B (nonblock_flag_inheritance.strace.linux.server)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 42531), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 42531), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 42531), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 45136), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:42531)
trace A: ('connect_syscall', (1, '127.0.0.1', 42531), (0, None))
TCP server socket B0 (private address 127.0.0.1:42531) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:45136)
trace B: ('accept_syscall', (0, '127.0.0.1', 45136), (1, None))
[Call Rejected] trace B: ('recv_syscall', (1, 'Hello World', 1024, 0), (11, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not
yet been sent.
trace A: ('send_syscall', (1, 'Hello World', 0), (11, None))
trace B: ('recv_syscall', (1, 'Hello World', 1024, 0), (11, None))

```



```
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))
```

Done

TCP Connection Statistics

Connection from socket A1 (public address 127.0.0.1:45136) to socket B1 (public address 127.0.0.1:42531)
* Data sent to accepting socket B1: 11 bytes sent, 11 bytes received, 0 bytes lost
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost

Possible Problems Detected

* None

1.12 oob_data

These unit tests send multiple Out-Of-Band (OOB) data parts, some of which are not received by the client.

1.12.1 MSG_DONT_MATCH: lost data

```
python netcheck.py -u recv_oob1.linux.5673 recv_oob1.linux.5674
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(49472), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(49472), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, "Hell", 1024, 0) = 4
recv(5, "World", 1024, 0) = 5
close(5) = 0
```

Sever trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(49472), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(52312), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
send(4, "Hello", 5, MSG_OOB) = 5
send(4, "World", 5, 0) = 5
close(3) = 0
close(4) = 0
```

NetCheck output:

Configuration

host
trace A (recv_oob1.linux.5673)
trace B (recv_oob1.linux.5674)

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
```

```

trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 49472), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 49472), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 49472), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 52312), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:49472)
trace A: ('connect_syscall', (1, '127.0.0.1', 49472), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'Hell', 1024, 0), (4, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:49472) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:52312)
trace B: ('accept_syscall', (0, '127.0.0.1', 52312), (1, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'Hell', 1024, 0), (4, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
[Warning] trace B: ('send_syscall', (1, 'Hello', 1), (5, None))
=> EOPNOTSUPP: [Application Error] Some bit in the flags argument is inappropriate for the socket type.
[Call Rejected] trace A: ('recv_syscall', (1, 'Hell', 1024, 0), (4, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'World', 0), (5, None))
[Warning] trace A: ('recv_syscall', (1, 'Hell', 1024, 0), (4, None))
=> MSG_DONT_MATCH: [Possible Network Misbehavior] Message trying to be received does
not match the data already sent by socket A1. Ignoring future traffic
on this connection since we can't recover.
[Don't Care] trace A: ('recv_syscall', (1, 'World', 1024, 0), (5, None))
[Don't Care] trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
[Don't Care] trace B: ('close_syscall', (1,), (0, None))

```

Done

Possible Problems Detected

* None

1.12.2 MSG_DONT_MATCH: truncated data

```
python netcheck.py -u recv_oob2.linux.5682 recv_oob2.linux.5683
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(51923), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(51923), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, "o", 1024, MSG_OOB) = 1
recv(5, "Hell", 1024, 0) = 4
close(5) = 0

```

Sever trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(51923), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(60517), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
send(4, "Hello", 5, MSG_OOB) = 5
send(4, "World", 5, 0) = 5

```

```
close(3) = 0
close(4) = 0
```

NetCheck output:

Configuration

host
trace A (recv_oob2.linux.5682)
trace B (recv_oob2.linux.5683)

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 51923), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 51923), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 51923), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 60517), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:51923)
trace A: ('connect_syscall', (1, '127.0.0.1', 51923), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'o', 1024, 1), (1, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:51923) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:60517)
trace B: ('accept_syscall', (0, '127.0.0.1', 60517), (1, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'o', 1024, 1), (1, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
[Warning] trace B: ('send_syscall', (1, 'Hello', 1), (5, None))
=> EOPNOTSUPP: [Application Error] Some bit in the flags argument is inappropriate for the socket type.
[Call Rejected] trace A: ('recv_syscall', (1, 'o', 1024, 1), (1, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'World', 0), (5, None))
[Warning] trace A: ('recv_syscall', (1, 'o', 1024, 1), (1, None))
=> MSG_DONT_MATCH: [Possible Network Misbehavior] Message trying to be received does
not match the data already sent by socket A1. Ignoring future traffic
on this connection since we can't recover.
[Don't Care] trace A: ('recv_syscall', (1, 'Hell', 1024, 0), (4, None))
[Don't Care] trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
[Don't Care] trace B: ('close_syscall', (1,), (0, None))
```

Done

Possible Problems Detected

* None

1.12.3 MSG_DONT_MATCH: EINVAL

```
python netcheck.py -u recv_oob3.linux.5688 recv_oob3.linux.5689
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
```

```

bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(58404), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(58404), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, "o", 1024, MSG_OOB) = 1
recv(5, 0x870c2f4, 1024, MSG_OOB) = -1 EINVAL (Invalid argument)
close(5) = 0

```

Sever trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(58404), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(58854), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
send(4, "Hello", 5, MSG_OOB) = 5
send(4, "World", 5, 0) = 5
close(3) = 0
close(4) = 0

```

NetCheck output:

Configuration

```

host
trace A (recv_oob3.linux.5688)
trace B (recv_oob3.linux.5689)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 58404), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 58404), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 58404), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 58854), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:58404)
trace A: ('connect_syscall', (1, '127.0.0.1', 58404), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'o', 1024, 1), (1, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:58404) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:58854)
trace B: ('accept_syscall', (0, '127.0.0.1', 58854), (1, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'o', 1024, 1), (1, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
[Warning] trace B: ('send_syscall', (1, 'Hello', 1), (5, None))
=> EOPNOTSUPP: [Application Error] Some bit in the flags argument is inappropriate for the socket type.
[Call Rejected] trace A: ('recv_syscall', (1, 'o', 1024, 1), (1, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'World', 0), (5, None))
[Warning] trace A: ('recv_syscall', (1, 'o', 1024, 1), (1, None))
=> MSG_DONT_MATCH: [Possible Network Misbehavior] Message trying to be received does
not match the data already sent by socket A1. Ignoring future traffic
on this connection since we can't recover.
[Don't Care] trace A: ('recv_syscall', (1, None, 1024, 1), (-1, 'EINVAL'))
[Don't Care] trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
[Don't Care] trace B: ('close_syscall', (1,), (0, None))

```

Done

Possible Problems Detected

* None

1.12.4 MSG_DONT_MATCH: UNEXPECTED_FAILURE

```
python netcheck.py -u recv.oob4.linux.5695 recv.oob4.linux.5696
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(41328), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(41328), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, 0x9b2f2f4, 1024, MSG_OOB) = -1 EINVAL (Invalid argument)
recv(5, 0x9b2f2f4, 1024, MSG_OOB) = -1 EINVAL (Invalid argument)
close(5) = 0
```

Sever trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(41328), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(60627), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
send(4, "Hello", 5, 0) = 5
send(4, "World", 5, 0) = 5
close(3) = 0
close(4) = 0
```

NetCheck output:

Configuration

```
host
trace A (recv.oob4.linux.5695)
trace B (recv.oob4.linux.5696)
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 41328), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 41328), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 41328), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 60627), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:41328)
trace A: ('connect_syscall', (1, '127.0.0.1', 41328), (0, None))
[Warning] trace A: ('recv_syscall', (1, None, 1024, 1), (-1, 'EINVAL'))
=> UNEXPECTED_FAILURE: Recv failed unexpectedly.
[Warning] trace A: ('recv_syscall', (1, None, 1024, 1), (-1, 'EINVAL'))
=> UNEXPECTED_FAILURE: Recv failed unexpectedly.
TCP server socket B0 (private address 127.0.0.1:41328) returning socket B1, which is
```

```

connected to socket A1 (public address 127.0.0.1:60627)
trace B: ('accept_syscall', (0, '127.0.0.1', 60627), (1, None))
trace B: ('send_syscall', (1, 'Hello', 0), (5, None))
trace B: ('send_syscall', (1, 'World', 0), (5, None))
[Notice] trace A: ('close_syscall', (1,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket A1 (public address 127.0.0.1:60627) to socket B1 (public address 127.0.0.1:41328)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 10 bytes sent, 0 bytes received, 10 bytes lost (100.00%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior

```

Possible Problems Detected

```

* [Possible Application Misbehavior] Trace A has 1 TCP connection(s) to 127.0.0.1:41328
with data left in the buffers

```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.12.5 MSG_DONT_MATCH: out of order

```
python netcheck.py -u recv_oob5.linux.5701 recv_oob5.linux.5702
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(33779), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(33779), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, "d", 1024, MSG_OOB) = 1
recv(5, "HelloWorl", 1024, 0) = 9
close(5) = 0

```

Sever trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(33779), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(45467), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
send(4, "Hello", 5, 0) = 5
send(4, "World", 5, MSG_OOB) = 5
close(3) = 0
close(4) = 0

```

NetCheck output:

Configuration

```

host
trace A (recv_oob5.linux.5701)
trace B (recv_oob5.linux.5702)

```

Verifying Traces

```

-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 33779), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 33779), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 33779), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 45467), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:33779)
trace A: ('connect_syscall', (1, '127.0.0.1', 33779), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'd', 1024, 1), (1, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:33779) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:45467)
trace B: ('accept_syscall', (0, '127.0.0.1', 45467), (1, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'd', 1024, 1), (1, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'Hello', 0), (5, None))
[Warning] trace A: ('recv_syscall', (1, 'd', 1024, 1), (1, None))
=> MSG_DONT_MATCH: [Possible Network Misbehavior] Message trying to be received does
not match the data already sent by socket A1. Ignoring future traffic
on this connection since we can't recover.
[Don't Care] trace A: ('recv_syscall', (1, 'HelloWorl', 1024, 0), (9, None))
[Don't Care] trace A: ('close_syscall', (1,), (0, None))
[Don't Care] trace B: ('send_syscall', (1, 'World', 1), (5, None))
trace B: ('close_syscall', (0,), (0, None))
[Don't Care] trace B: ('close_syscall', (1,), (0, None))

Done

```

```

-----
Possible Problems Detected
-----

```

```
* None
```

1.13 readline

In this test, we treat a socket as a file and call `readline()` on the file descriptor. We sent the messages 'Hello' followed by the message 'World\n' but the receiver only received 'World\n'. We found that this was a bug in Python [27], as the system call showed that both of the messages have been received.

```
python netcheck.py -u readline.strace.2787 readline.strace.2788
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(56450), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(56450), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
send(5, "Hello ", 6, 0) = 6
send(5, "World\n", 6, 0) = 6
close(5) = 0

```

Sever trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(56450), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(48573), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([fd=4, events=POLLIN], 1, 2000) = 1 ([fd=4, revents=POLLIN])
recv(4, "Hello ", 8192, 0) = 6
poll([fd=4, events=POLLIN], 1, 2000) = 0 (Timeout)
poll([fd=4, events=POLLIN], 1, 2000) = 1 ([fd=4, revents=POLLIN])
recv(4, "World\n", 8192, 0) = 6
close(3) = 0
close(4) = 0

```

NetCheck output:

Configuration

```

host
  trace A (readline.strace.2787)
  trace B (readline.strace.2788)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 56450), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 56450), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 56450), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 48573), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:56450)
trace A: ('connect_syscall', (1, '127.0.0.1', 56450), (0, None))
TCP server socket B0 (private address 127.0.0.1:56450) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:48573)
trace B: ('accept_syscall', (0, '127.0.0.1', 48573), (1, None))
trace B: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Call Rejected] trace B: ('poll_syscall', ([1], [], [], 2000), ([[1], [], []], None))
=> NETWORK_ERROR_B1: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('send_syscall', (1, 'Hello ', 0), (6, None))
trace B: ('poll_syscall', ([1], [], [], 2000), ([[1], [], []], None))
trace B: ('recv_syscall', (1, 'Hello ', 8192, 0), (6, None))
trace B: ('poll_syscall', ([1], [], [], 2000), (0, 'Timeout'))
[Call Rejected] trace B: ('poll_syscall', ([1], [], [], 2000), ([[1], [], []], None))
=> NETWORK_ERROR_B1: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('send_syscall', (1, 'World\n', 0), (6, None))
trace B: ('poll_syscall', ([1], [], [], 2000), ([[1], [], []], None))
trace B: ('recv_syscall', (1, 'World\n', 8192, 0), (6, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket A1 (public address 127.0.0.1:48573) to socket B1 (public address 127.0.0.1:56450)
* Data sent to accepting socket B1: 12 bytes sent, 12 bytes received, 0 bytes lost
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost

```

Possible Problems Detected

* None

1.14 recvtimeo

In this test we set a timeout using the `SO_RCVTIMEO` option, then immediately called `getsockopt()` on `SO_RCVTIMEO` and received a different value from the one we set using `setsockopt()`.

```
python netcheck.py -u recvtimeo.strace.5095 recvtimeo.strace.5096
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(57836), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
getsockopt(5, SOL_SOCKET, SO_RCVTIMEO, "\0\0\0\0\0\0", [8]) = 0
setsockopt(5, SOL_SOCKET, SO_RCVTIMEO, "\3\0\0\0\7\207\0\0", 8) = 0
getsockopt(5, SOL_SOCKET, SO_RCVTIMEO, "\3\0\0\0\240\214\0\0", [8]) = 0
setsockopt(5, SOL_SOCKET, SO_RCVTIMEO, "\3\0\0\0\240\214\0\0", 8) = 0
getsockopt(5, SOL_SOCKET, SO_RCVTIMEO, "\3\0\0\0\240\214\0\0", [8]) = 0
connect(5, {sa_family=AF_INET, sin_port=htons(57836),
sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, 0x8a0beac, 1024, 0) = -1 EAGAIN (Resource temporarily unavailable)
close(5) = 0
```

Sever trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(57836), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(53385), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
close(3) = 0
close(4) = 0
```

NetCheck output:

Configuration

```
host
  trace A (recvtimeo.strace.5095)
  trace B (recvtimeo.strace.5096)
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 57836), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
[Warning] trace A: ('getsockopt_syscall', (1, 65535, 4102), ('\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0', None))
=> UNEXPECTED_RETURN_VALUE: Model returned \0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0
trace A: ('setsockopt_syscall', (1, 65535, 4102, '\3\0\0\0\0\7\207\0\0'), (0, None))
[Warning] trace A: ('getsockopt_syscall', (1, 65535, 4102), ('\3\0\0\0\0\240\214\0\0', None))
=> UNEXPECTED_RETURN_VALUE: Model returned \3\0\0\0\7\207\0\0
trace A: ('setsockopt_syscall', (1, 65535, 4102, '\3\0\0\0\0\240\214\0\0'), (0, None))
trace A: ('getsockopt_syscall', (1, 65535, 4102), ('\3\0\0\0\0\240\214\0\0', None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 57836), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 57836), (0, None))
```

```

=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or
refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 53385), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:57836)
trace A: ('connect_syscall', (1, '127.0.0.1', 57836), (0, None))
[Warning] trace A: ('recv_syscall', (1, None, 1024, 0), (-1, 'EAGAIN'))
=> EXPECTED_BLOCKING: [Network Misbehavior] Socket does not have the nonblocking flag set.
TCP server socket B0 (private address 127.0.0.1:57836) returning socket B1, which is connected to
socket A1 (public address 127.0.0.1:53385)
trace B: ('accept_syscall', (0, '127.0.0.1', 53385), (1, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

Done

```

TCP Connection Statistics

```

Connection from socket A1 (public address 127.0.0.1:53385) to socket B1 (public address 127.0.0.1:57836)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost

```

Possible Problems Detected

```
* None
```

1.15 setsockopt_misc

These tests involved setting various socket options that caused network misbehaviors such as setting an option after closing the socket or setting an option that triggers sending a reset packet. NetCheck was able to detect all of these misbehaviors.

1.15.1 setsockopt_afterclose

Setting socket option after socket has been closed from a different thread.

```
python netcheck.py -u setsockopt_afterclose.strace.5036 \
setsockopt_afterclose.strace.5037
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(42215), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(42215), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
setsockopt(5, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
send(5, "HelloWorld", 10, 0) = 10
setsockopt(5, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
close(5) = 0

```

Server trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(42215), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(39268), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4

```

```
close(3)          = 0
close(4)          = 0
```

NetCheck output:

Configuration

```
host
trace A (setsockopt_afterclose.strace.5036)
trace B (setsockopt_afterclose.strace.5037)
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 42215), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 42215), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 42215), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 39268), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:42215)
trace A: ('connect_syscall', (1, '127.0.0.1', 42215), (0, None))
trace A: ('setsockopt_syscall', (1, 65535, 4, 1), (0, None))
TCP server socket B0 (private address 127.0.0.1:42215) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:39268)
trace B: ('accept_syscall', (0, '127.0.0.1', 39268), (1, None))
trace A: ('send_syscall', (1, 'HelloWorld', 0), (10, None))
trace A: ('setsockopt_syscall', (1, 65535, 4, 1), (0, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
[Notice] trace B: ('close_syscall', (1,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.
```

Done

TCP Connection Statistics

```
Connection from socket A1 (public address 127.0.0.1:39268) to socket B1 (public address 127.0.0.1:42215)
* Data sent to accepting socket B1: 10 bytes sent, 0 bytes received, 10 bytes lost (100.00%)
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost
* [Possible Application Misbehavior] Data loss is most likely due to application behavior
```

Possible Problems Detected

```
* [Possible Application Misbehavior] Trace A has 1 TCP connection(s) to 127.0.0.1:42215
with data left in the buffers
```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.15.2 setsockopt_reset: Linux test

```
python netcheck.py -u setsockopt_reset.strace.linux.client \
    setsockopt_reset.strace.linux.server
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(34338), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(34338), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
fcntl64(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0
close(5) = 0

```

Sever trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(34338), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(43931), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
setsockopt(4, SOL_SOCKET, SO_LINGER, {onoff=1, linger=0}, 8) = 0
close(4) = 0
close(3) = 0

```

NetCheck output:

Configuration

host
trace A (setsockopt_reset.strace.linux.client)
trace B (setsockopt_reset.strace.linux.server)

Verifying Traces

```

trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 34338), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 43931), (1, None))
=> NO_PENDING_CONN: There are no pending connections.

```

```

No valid action:
[Error] trace B: ('accept_syscall', (0, '127.0.0.1', 43931), (1, None))
=> NO_PENDING_CONN: There are no pending connections.

```

Network Configuration Issues

```

TCP server socket B0 (private address 127.0.0.1:34338) failed to find corresponding connects for 1 accept(s)
* There are 1 unmatched accepts from IP 127.0.0.1
* Trace B may be behind a NAT and port forwarding may be occurring

```

```

Please check if there are any NATs present which are not explicitly declared in the configuration file
* If so, add them to configuration file and rerun NetCheck

```

Possible Problems Detected

```

* The model failed to process the entire trace
* There may be one or more NATs not declared in the configuration file

```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.15.3 setsockopt_reset: Solaris test

```

python netcheck.py -u setsockopt_reset.strace.solaris.client \
    setsockopt_reset.strace.solaris.server

```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(34338), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(34338), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
fcntl64(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(5, F_SETFL, O_RDWR|O_NONBLOCK) = -1 EINVAL (Invalid Argument)
close(5) = 0

```

Sever:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(34338), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(43931), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
setsockopt(4, SOL_SOCKET, SO_LINGER, {onoff=1, linger=0}, 8) = 0
close(4) = 0
close(3) = 0

```

NetCheck output:

Configuration

host
trace A (setsockopt_reset.strace.solaris.client)
trace B (setsockopt_reset.strace.solaris.server)

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 34338), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 34338), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 34338), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 43931), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:34338)
trace A: ('connect_syscall', (1, '127.0.0.1', 34338), (0, None))
[Warning] trace A: ('fcntl_syscall', (1, 4, 2050), (-1, 'EINVAL'))
=> UNEXPECTED_SUCCESS: Model succeeded but implementation failed.
TCP server socket B0 (private address 127.0.0.1:34338) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:43931)
trace B: ('accept_syscall', (0, '127.0.0.1', 43931), (1, None))
trace B: ('setsockopt_syscall', (1, 65535, 128, (1, 0)), (0, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket A1 (public address 127.0.0.1:43931) to socket B1 (public address 127.0.0.1:34338)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost

```

Possible Problems Detected

* None

1.16 shutdown_reset

In this test, the receiving socket called `shutdown` after receiving a reset packet from the server. The current implementation of NetCheck is not able to differentiate between a reset packet sent explicitly and one that occurred due to network misbehavior.

```
python netcheck.py -u shutdown_reset.strace.client shutdown_reset.strace.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(55051), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(55051), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
shutdown(5, 2 /* send and receive */) = -1 ENOTCONN (Transport endpoint is not connected)
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(36615), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(42885), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
close(4) = 0
close(3) = 0
```

NetCheck output:

Configuration

host
trace A (shutdown_reset.strace.client)
trace B (shutdown_reset.strace.server)

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 55051), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 36615), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 55051), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 42885), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 55051), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.

No valid action:
[Error] trace B: ('accept_syscall', (0, '127.0.0.1', 42885), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
[Error] trace A: ('connect_syscall', (1, '127.0.0.1', 55051), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
```

Network Configuration Issues

TCP server socket B0 (private address 127.0.0.1:36615) failed to find corresponding connects for 1 accept(s)
* There are 1 unmatched accepts from IP 127.0.0.1
* Trace B may be behind a NAT and port forwarding may be occurring

Trace A failed to connect to 127.0.0.1:55051 1 time(s) because the connection was refused

Please check if there are any NATs present which are not explicitly declared in the configuration file
* If so, add them to configuration file and rerun NetCheck

Possible Problems Detected

* The model failed to process the entire trace
* There may be one or more NATs not declared in the configuration file

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.17 sigstop_signal

These tests send the SIGSTOP signal to the application while the socket is blocking on some call. In all cases the trace has the ERESTARTSYS error returned by the call. A future invocation of the call executes successfully.

1.17.1 accept_sigstop

```
python netcheck.py -u accept_sigstop.strace.2767 \  
    accept_sigstop.strace.2768
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3  
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
getsockname(3, {sa_family=AF_INET, sin_port=htons(34461), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0  
close(3) = 0  
select(0, NULL, NULL, NULL, {30, 0}) = ? ERESTARTNOHAND (To be restarted)  
--- SIGSTOP (Stopped (signal)) @ 0 (0) ---  
--- SIGSTOP (Stopped (signal)) @ 0 (0) ---  
select(0, NULL, NULL, NULL, {18, 952517})+++ killed by SIGKILL +++
```

Sever trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3  
bind(3, {sa_family=AF_INET, sin_port=htons(34461), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
listen(3, 1) = 0  
accept(3, 0xb708bbac, [16]) = ? ERESTARTSYS (To be restarted)  
--- SIGSTOP (Stopped (signal)) @ 0 (0) ---  
accept(3, <unfinished ...>  
+++ killed by SIGKILL +++
```

NetCheck output:

Configuration

```
host  
trace A (accept_sigstop.strace.2767)  
trace B (accept_sigstop.strace.2768)
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))  
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
```

```

trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 34461), None))
trace A: ('close_syscall', (0,), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 34461), (0, None))
trace B: ('listen_syscall', (0, 1), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

```

-----
Possible Problems Detected
-----

```

* None

1.17.2 recv_sigstop

```
python netcheck.py -u recv_sigstop.strace.2826 recv_sigstop.strace.2827
```

Client strace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(40569), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(40569), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, 0xa2542c4, 1024, 0) = ? ERESTARTSYS (To be restarted)
--- SIGSTOP (Stopped (signal)) @ 0 (0) ---
--- SIGSTOP (Stopped (signal)) @ 0 (0) ---
recv(5, +++ killed by SIGKILL +++

```

Sever strace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(56679), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(56679), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
select(0, NULL, NULL, NULL, {30, 0}) = ? ERESTARTNOHAND (To be restarted)
--- SIGSTOP (Stopped (signal)) @ 0 (0) ---
select(0, NULL, NULL, NULL, {17, 961359}) <unfinished ...>
+++ killed by SIGKILL +++

```

NetCheck output:

```

-----
Configuration
-----

```

```

host
  trace A (recv_sigstop.strace.2826)
  trace B (recv_sigstop.strace.2827)

```

```

-----
Verifying Traces
-----

```

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 40569), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 40569), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 40569), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 56679), (1, None))

```



```

=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:40569)
trace A: ('connect_syscall', (1, '127.0.0.1', 40569), (0, None))
[Warning] trace A: ('recv_syscall', (1, None, 1024, 0), (-1, 'ERESTARTSYS'))
=> UNEXPECTED_FAILURE: Recv failed unexpectedly.
TCP server socket B0 (private address 127.0.0.1:40569) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:56679)
trace B: ('accept_syscall', (0, '127.0.0.1', 56679), (1, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket A1 (public address 127.0.0.1:56679) to socket B1 (public address 127.0.0.1:40569)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 0 bytes sent, 0 bytes received, 0 bytes lost

```

Possible Problems Detected

* None

1.17.3 recvfrom_sigstop

```
python netcheck.py -u recvfrom_sigstop.3013 recvfrom_sigstop.3014
```

Client trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(44233), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
select(0, NULL, NULL, NULL, {30, 0}) = ? ERESTARTNOHAND (To be restarted)
--- SIGSTOP (Stopped (signal)) @ 0 (0) ---
--- SIGSTOP (Stopped (signal)) @ 0 (0) ---
select(0, NULL, NULL, NULL, {11, 681710}) = 0 (Timeout)
sendto(4, "Hello World", 11, 0, {sa_family=AF_INET, sin_port=htons(44233),
  sin_addr=inet_addr("127.0.0.1")}, 16) = 11
close(4) = 0

```

Server trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(44233), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recvfrom(3, 0xb67008f4, 1024, 0, 0xb704fc3c, 0xb704fc38) = ? ERESTARTSYS (To be restarted)
--- SIGSTOP (Stopped (signal)) @ 0 (0) ---
recvfrom(3, "Hello World", 1024, 0, {sa_family=AF_INET, sin_port=htons(57633),
  sin_addr=inet_addr("127.0.0.1")}, [16]) = 11
write(1, "[Server] Received: Hello World\n", 31) = 31
close(3) = 0

```

NetCheck output:

Configuration

```

host
trace A (recvfrom_sigstop.3013)
trace B (recvfrom_sigstop.3014)

```

Verifying Traces

```
-----  
trace A: ('socket_syscall', (2, 2, 0), (0, None))  
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))  
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 44233), None))  
trace A: ('close_syscall', (0,), (0, None))  
trace A: ('socket_syscall', (2, 2, 0), (1, None))  
trace B: ('socket_syscall', (2, 2, 0), (0, None))  
trace B: ('bind_syscall', (0, '127.0.0.1', 44233), (0, None))  
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'Hello World', 1024, 0, '127.0.0.1', 57633), (11, None))  
=> MSGNOTSENT: The message has not been sent yet.  
UDP socket A1 is sending to public address 127.0.0.1:44233  
trace A: ('sendto_syscall', (1, 'Hello World', 0, '127.0.0.1', 44233), (11, None))  
trace A: ('close_syscall', (1,), (0, None))  
UDP socket B0 (private address 127.0.0.1:44233) is receiving from socket A1 (public address 127.0.0.1:57633)  
trace B: ('recvfrom_syscall', (0, 'Hello World', 1024, 0, '127.0.0.1', 57633), (11, None))  
trace B: ('close_syscall', (0,), (0, None))
```

Done

UDP Traffic Statistics

```
-----  
Traffic from 127.0.0.1:57633 to 127.0.0.1:44233  
* 1 datagrams sent, 1 datagrams received, 0 datagrams lost  
* 11 bytes sent, 11 bytes received, 0 bytes lost  
-----
```

Possible Problems Detected

```
-----  
* None  
-----
```

1.18 so_linger

These tests set the `SO_LINGER` flag on a socket. On BSD this flag is ignored and the network behavior is not the expected behavior. The two tests set `SO_LINGER` and `SO_DONTLINGER`, respectively.

1.18.1 set_sodontlinger: BSD test

```
python netcheck.py -u set_sodontlinger.strace.bsd.client \  
    set_sodontlinger.strace.bsd.server
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3  
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
getsockname(3, {sa_family=AF_INET, sin_port=htons(54919), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0  
close(3) = 0  
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5  
connect(5, {sa_family=AF_INET, sin_port=htons(54919), sin_addr=inet_addr("127.0.0.1")}, 16) = 0  
fcntl64(5, F_GETFL) = 0x2 (flags O_RDWR)  
fcntl64(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0  
select(0, NULL, NULL, NULL, {5, 0}) = 0 (Timeout)  
recv(5, "Hello...Hello", 120000, 0) = 63120  
recv(5, "Hello...Hello", 120000, 0) = 59760  
recv(5, "Hello...HelloHell", 120000, 0) = 98304  
recv(5, "", 120000, 0) = 0  
close(5) = 0
```

Server trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(54919), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(53090), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
setsockopt(4, SOL_SOCKET, SO_LINGER, {onoff=0, linger=0}, 8) = -1 EINVAL (Invalid Argument)
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 16384
send(4, "Hello...Hello", 40960, 0) = -1 EAGAIN (Resource temporarily unavailable)
send(4, "World", 5, 0) = -1 EAGAIN (Resource temporarily unavailable)
close(4) = 0
close(3) = 0

```

NetCheck output:

Configuration

```

host
  trace A (set_sodontlinger.strace.bsd.client)
  trace B (set_sodontlinger.strace.bsd.server)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 54919), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 54919), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 54919), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 53090), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:54919)
trace A: ('connect_syscall', (1, '127.0.0.1', 54919), (0, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (63120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:54919) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:53090)
trace B: ('accept_syscall', (0, '127.0.0.1', 53090), (1, None))
trace B: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Warning] trace B: ('setsockopt_syscall', (1, 65535, 128, (0, 0)), (-1, 'EINVAL'))
=> UNEXPECTED_SUCCESS: Model succeeded but implementation failed.
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (63120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (63120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (63120, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0),
(59760, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))

```

```

trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (59760, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0),
(98304, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0),
(98304, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0),
(98304, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (16384, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (98304, None))
[Call Rejected] trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.
[Notice] trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Call Rejected] trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.
[Notice] trace B: ('send_syscall', (1, 'World', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Call Rejected] trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.

trace B: ('close_syscall', (1,), (0, None))
trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket A1 (public address 127.0.0.1:53090) to socket B1 (public address 127.0.0.1:54919)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 221184 bytes sent, 221184 bytes received, 0 bytes lost

```

Possible Problems Detected

* None

1.18.2 set_sodontlinger: Linux test

```
python netcheck.py -u set_sodontlinger.strace.linux.client \
set_sodontlinger.strace.linux.server
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(54919), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(54919), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
fcntl64(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0
recv(5, "Hello...Hello", 120000, 0) = 63120
recv(5, "Hello...Hello", 120000, 0) = 59760
recv(5, "Hello...HelloHell", 120000, 0) = 98304
recv(5, "", 120000, 0) = 0
rt_sigaction(SIGINT, {SIG_DFL, [], 0}, {0x8148260, [], 0}, 8) = 0

```

```
close(5) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(54919), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(53090), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
setsockopt(4, SOL_SOCKET, SO_LINGER, {onoff=0, linger=0}, 8) = 0
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 16384
send(4, "Hello...Hello", 40960, 0) = -1 EAGAIN (Resource temporarily unavailable)
send(4, "World", 5, 0) = -1 EAGAIN (Resource temporarily unavailable)
close(4) = 0
close(3) = 0
```

NetCheck output:

----- Configuration -----

```
host
trace A (set_sodontlinger.strace.linux.client)
trace B (set_sodontlinger.strace.linux.server)
```

----- Verifying Traces -----

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 54919), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 54919), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 54919), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 53090), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:54919)
trace A: ('connect_syscall', (1, '127.0.0.1', 54919), (0, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (63120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:54919) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:53090)
trace B: ('accept_syscall', (0, '127.0.0.1', 53090), (1, None))
trace B: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('setsockopt_syscall', (1, 65535, 128, (0, 0)), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (63120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (63120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (63120, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (59760, None))
```

```

=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (59760, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (98304, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (98304, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (98304, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (16384, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (98304, None))
[Call Rejected] trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.
[Notice] trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Call Rejected] trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.
[Notice] trace B: ('send_syscall', (1, 'World', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Call Rejected] trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.
trace B: ('close_syscall', (1,), (0, None))
trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

TCP Connection Statistics

Connection from socket A1 (public address 127.0.0.1:53090) to socket B1 (public address 127.0.0.1:54919)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 221184 bytes sent, 221184 bytes received, 0 bytes lost

Possible Problems Detected

* None

1.18.3 set_solinger: BSD test

```
python netcheck.py -u set_solinger.strace.bsd.client set_solinger.strace.bsd.server
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(39252), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(39252), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
fcntl164(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl164(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0
select(0, NULL, NULL, NULL, {5, 0}) = 0 (Timeout)
recv(5, "Hello...HelloHe", 8192, 0) = 8192
recv(5, "lloHello...HelloHel", 8192, 0) = 8192
recv(5, "oHello...HelloH", 8192, 0) = 8192
recv(5, "elloHello...HelloHel", 8192, 0) = 8192
recv(5, "loHello...Hello", 8192, 0) = 8192
recv(5, "Hello...HelloHe", 8192, 0) = 8192

```

```

recv(5, "lloHello...Hell", 8192, 0) = 8192
recv(5, 0x92dd634, 8192, 0) = -1 ECONNRESET (Connection reset by peer)
close(5) = 0

```

Sever trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(39252), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(43451), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
setsockopt(4, SOL_SOCKET, SO_LINGER, {onoff=1, linger=0}, 8) = -1 EINVAL (Invalid Argument)
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = -1 EAGAIN (Resource temporarily unavailable)
send(4, "World", 5, 0) = -1 EAGAIN (Resource temporarily unavailable)
close(4) = 0
close(3) = 0

```

NetCheck output:

Configuration

```

host
  trace A (set_solinger.strace.bsd.client)
  trace B (set_solinger.strace.bsd.server)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 39252), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 39252), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 39252), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 43451), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:39252)
trace A: ('connect_syscall', (1, '127.0.0.1', 39252), (0, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
8192, 0), (8192, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:39252) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:43451)
trace B: ('accept_syscall', (0, '127.0.0.1', 43451), (1, None))
trace B: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Warning] trace B: ('setsockopt_syscall', (1, 65535, 128, (1, 0)), (-1, 'EINVAL'))
=> UNEXPECTED_SUCCESS: Model succeeded but implementation failed.
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
8192, 0), (8192, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 8192, 0), (8192, None))
trace A: ('recv_syscall', (1, 'lloHelloHelloHelloHelloHelloHell...', 8192, 0), (8192, None))
trace A: ('recv_syscall', (1, 'oHelloHelloHelloHelloHelloHelloH...', 8192, 0), (8192, None))
trace A: ('recv_syscall', (1, 'elloHelloHelloHelloHelloHelloHel...', 8192, 0), (8192, None))

```

```

trace A: ('recv_syscall', (1, 'loHelloHelloHelloHelloHelloHello...', 8192, 0), (8192, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHelloHe...', 8192, 0), (8192, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHelloHe...', 8192, 0), (8192, None))
trace A: ('recv_syscall', (1, 'lloHelloHelloHelloHelloHelloHell...', 8192, 0), (8192, None))
[Warning] trace A: ('recv_syscall', (1, None, 8192, 0), (-1, 'ECONNRESET'))
=> UNEXPECTED_FAILURE: Recv failed unexpectedly.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
[Warning] trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
=> MSG_>_BUFSIZE: [Application Error] Sending this message has caused data in the buffer to exceed the buffer size.
[Notice] trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Notice] trace B: ('send_syscall', (1, 'World', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Notice] trace A: ('close_syscall', (1,)), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.
trace B: ('close_syscall', (1,)), (0, None))
trace B: ('close_syscall', (0,)), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket A1 (public address 127.0.0.1:43451) to socket B1 (public address 127.0.0.1:39252)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 204800 bytes sent, 57344 bytes received, 147456 bytes lost (72.00%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior

```

Possible Problems Detected

```

* [Possible Application Misbehavior] Trace A has 1 TCP connection(s) to 127.0.0.1:39252 with data left in the buffers
* [Possible Network Misbehavior] 1 different call(s) caused trace B to exceeded an expected buffer size

```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.18.4 set_solinger: Linux test

```
python netcheck.py -u set_solinger.strace.linux.client set_solinger.strace.linux.server
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(39252), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(39252), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
fcntl164(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl164(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0
select(0, NULL, NULL, NULL, {5, 0}) = 0 (Timeout)
recv(5, "Hello...HelloHe", 8192, 0) = 8192
recv(5, "lloHello...HelloHell", 8192, 0) = 8192
recv(5, "oHello...HelloH", 8192, 0) = 8192
recv(5, "elloHello...HelloHel", 8192, 0) = 8192
recv(5, "loHello...Hello", 8192, 0) = 8192
recv(5, "Hello...HelloHe", 8192, 0) = 8192
recv(5, "lloHello...HelloHell", 8192, 0) = 8192
recv(5, 0x92dd634, 8192, 0) = -1 ECONNRESET (Connection reset by peer)
close(5) = 0

```

Sever trace:


```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(39252), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(43451), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
setsockopt(4, SOL_SOCKET, SO_LINGER, {onoff=1, linger=0}, 8) = 0
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = -1 EAGAIN (Resource temporarily unavailable)
send(4, "World", 5, 0) = -1 EAGAIN (Resource temporarily unavailable)
close(4) = 0
close(3) = 0

```

NetCheck output:

Configuration

```

host
  trace A (set_solinger.strace.linux.client)
  trace B (set_solinger.strace.linux.server)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 39252), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 39252), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 39252), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 43451), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:39252)
trace A: ('connect_syscall', (1, '127.0.0.1', 39252), (0, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
8192, 0), (8192, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:39252) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:43451)
trace B: ('accept_syscall', (0, '127.0.0.1', 43451), (1, None))
trace B: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('setsockopt_syscall', (1, 65535, 128, (1, 0)), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 8192, 0), (8192, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 8192, 0), (8192, None))
trace A: ('recv_syscall', (1, 'lloHelloHelloHelloHelloHelloHell...', 8192, 0), (8192, None))
trace A: ('recv_syscall', (1, 'oHelloHelloHelloHelloHelloHelloH...', 8192, 0), (8192, None))
trace A: ('recv_syscall', (1, 'elloHelloHelloHelloHelloHelloHel...', 8192, 0), (8192, None))
trace A: ('recv_syscall', (1, 'loHelloHelloHelloHelloHelloHello...', 8192, 0), (8192, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 8192, 0), (8192, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 8192, 0), (8192, None))
trace A: ('recv_syscall', (1, 'lloHelloHelloHelloHelloHelloHell...', 8192, 0), (8192, None))
[Warning] trace A: ('recv_syscall', (1, None, 8192, 0), (-1, 'ECONNRESET'))
=> UNEXPECTED_FAILURE: Recv failed unexpectedly.

```

```

trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
[Warning] trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
=> MSG->_BUFSIZE: [Application Error] Sending this message has caused data in the buffer to exceed the buffer size.
[Notice] trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Notice] trace B: ('send_syscall', (1, 'World', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Notice] trace A: ('close_syscall', (1,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.
trace B: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket A1 (public address 127.0.0.1:43451) to socket B1 (public address 127.0.0.1:39252)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 204800 bytes sent, 57344 bytes received, 147456 bytes lost (72.00%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior

```

Possible Problems Detected

```

* [Possible Application Misbehavior] Trace A has 1 TCP connection(s) to 127.0.0.1:39252 with data left in the buffers
* [Possible Network Misbehavior] 1 different call(s) caused trace B to exceeded an expected buffer size

```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.18.5 set_solinger2: BSD test

```
python netcheck.py -u set_solinger2.strace.bsd.client set_solinger2.strace.bsd.server
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(54919), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(54919), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
fcntl64(5, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(5, F_SETFL, O_RDWR|O_NONBLOCK) = 0
recv(5, "Hello...Hello", 120000, 0) = 63120
recv(5, "Hello...Hello", 120000, 0) = 59760
recv(5, "Hello...HelloHell", 120000, 0) = 98304
recv(5, "", 120000, 0) = 0
close(5) = 0

```

Sever trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(54919), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(53090), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
setsockopt(4, SOL_SOCKET, SO_LINGER, {onoff=0, linger=0}, 8) = 0
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 40960
send(4, "Hello...Hello", 40960, 0) = 16384

```

```

send(4, "Hello...Hello", 40960, 0) = -1 EAGAIN (Resource temporarily unavailable)
send(4, "World", 5, 0) = -1 EAGAIN (Resource temporarily unavailable)
close(4) = 0
close(3) = 0

```

NetCheck output:

Configuration

```

host
  trace A (set_solinger2.strace.bsd.client)
  trace B (set_solinger2.strace.bsd.server)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 54919), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 54919), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 54919), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 53090), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:54919)
trace A: ('connect_syscall', (1, '127.0.0.1', 54919), (0, None))
trace A: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (63120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:54919) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:53090)
trace B: ('accept_syscall', (0, '127.0.0.1', 53090), (1, None))
trace B: ('fcntl_syscall', (1, 4, 2050), (0, None))
trace B: ('setsockopt_syscall', (1, 65535, 128, (0, 0)), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (63120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (63120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (63120, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (59760, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (59760, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (98304, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (40960, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...',
120000, 0), (98304, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (16384, None))
trace A: ('recv_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 120000, 0), (98304, None))

```

```

[Call Rejected] trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.
[Notice] trace B: ('send_syscall', (1, 'HelloHelloHelloHelloHelloHelloHe...', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Call Rejected] trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.
[Notice] trace B: ('send_syscall', (1, 'World', 0), (-1, 'EAGAIN'))
=> EAGAIN/EWOULDBLOCK: No data was sent.
[Call Rejected] trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
=> NETWORK_ERROR_A1: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.

trace B: ('close_syscall', (1,), (0, None))
trace A: ('recv_syscall', (1, '', 120000, 0), (0, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket A1 (public address 127.0.0.1:53090) to socket B1 (public address 127.0.0.1:54919)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 221184 bytes sent, 221184 bytes received, 0 bytes lost

```

Possible Problems Detected

* None

1.19 so_reuseaddr

In these two unit tests, the `SO_REUSEADDR` flag is set to bind multiple sockets to the same (IP, port). The two tests show the difference in behavior between Linux and BSD. In one case we were able to bind a second socket to the same (IP, port) using the `SO_REUSEADDR` option, in the other case we were not able to do so.

1.19.1 No error

```
python netcheck.py -u so_reuseaddr.strace.5148
```

Input:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(49979), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
setsockopt(3, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(3, {sa_family=AF_INET, sin_port=htons(49979), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
setsockopt(4, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(4, {sa_family=AF_INET, sin_port=htons(49979), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
close(3) = 0
close(4) = 0

```

NetCheck output:

Configuration

```
-----
host
  trace A (so_reuseaddr.strace.5148)
-----
```

Verifying Traces

```
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 49979), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('setsockopt_syscall', (1, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (1, '127.0.0.1', 49979), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
[Warning] trace A: ('bind_syscall', (2, '127.0.0.1', 49979), (0, None))
=> EADDRINUSE: [Portability Issue] Another socket is already bound to that address and
port, and the conflicting socket is using SO_REUSEADDR to allow rebinding,
which is not portable
trace A: ('close_syscall', (1,), (0, None))
trace A: ('close_syscall', (2,), (0, None))
-----
```

Done

Possible Problems Detected

```
-----
* None
-----
```

1.19.2 EADDRINUSE

```
python netcheck.py -u so_reuseaddr2.strace.5153
```

Input:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(39019), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(39019), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 4
setsockopt(4, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(4, {sa_family=AF_INET, sin_port=htons(39019), sin_addr=inet_addr("127.0.0.1")}, 16)
= -1 EADDRINUSE (Address already in use)
close(3) = 0
close(4) = 0
```

NetCheck output:

Configuration

```
-----
host
  trace A (so_reuseaddr2.strace.5153)
-----
```

Verifying Traces

```
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 39019), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('bind_syscall', (1, '127.0.0.1', 39019), (0, None))
-----
```

```

trace A: ('socket_syscall', (2, 1, 0), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
[Notice] trace A: ('bind_syscall', (2, '127.0.0.1', 39019), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (1,), (0, None))
trace A: ('close_syscall', (2,), (0, None))

```

Done

Possible Problems Detected

* None

1.20 tcp_nodelay

In these unit tests, we set the TCP_NODELAY option on a UNIX socket. The error returned is different between Linux, Mac and NetBSD.

1.20.1 Linux test

```
python netcheck.py -u tcp_nodelay.strace2.linux.4051 tcp_nodelay.strace2.linux.4052
```

Client trace:

```

socket(PF_FILE, SOCK_STREAM, 0) = 3
connect(5, {sa_family=AF_FILE, path="temp_unix_socket_file.txt"}, 27) = 0
setsockopt(5, SOL_TCP, TCP_NODELAY, [1], 4) = -1 EOPNOTSUPP (Operation not supported)
close(5) = 0

```

Server trace:

```

socket(PF_FILE, SOCK_STREAM, 0) = 3
bind(3, {sa_family=AF_FILE, path="temp_unix_socket_file.txt"}, 27) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_FILE, NULL}, [2]) = 4
select(0, NULL, NULL, NULL, {1, 0}) = 0 (Timeout)
close(3) = 0

```

NetCheck output:

Configuration

```

host
trace A (tcp_nodelay.strace2.linux.4051)
trace B (tcp_nodelay.strace2.linux.4052)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
[Notice] trace A: ('setsockopt_syscall', (0, 6, 1, 1), (-1, 'EOPNOTSUPP'))
=> UNKNOWN_LEVEL: We don't handle this level.
trace A: ('close_syscall', (0,), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Warning] trace B: ('listen_syscall', (0, 1), (0, None))
=> EDESTADDRREQ: [Application Error] The socket is not bound to a local address,
and the protocol does not support listening on an unbound socket.
trace B: ('close_syscall', (0,), (0, None))

```

Done

Possible Problems Detected

* 1 call(s) to getsockopt, setsockopt, fcntl, or ioctl used options which are not currently handled

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.20.2 Mac test

python netcheck.py -u tcp_nodelay.strace2.mac.4051 tcp_nodelay.strace2.mac.4052

Client trace:

```
socket(PF_FILE, SOCK_STREAM, 0) = 3
connect(5, {sa_family=AF_FILE, path="temp_unix_socket_file.txt"}, 27) = 0
setsockopt(5, SOL_TCP, TCP_NODELAY, [1], 4) = -1 ENOPROTOOPT (Protocol not available)
close(5) = 0
```

Server trace:

```
socket(PF_FILE, SOCK_STREAM, 0) = 3
bind(3, {sa_family=AF_FILE, path="temp_unix_socket_file.txt"}, 27) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_FILE, NULL}, [2]) = 4
select(0, NULL, NULL, NULL, {1, 0}) = 0 (Timeout)
close(3) = 0
```

NetCheck output:

Configuration

host
trace A (tcp_nodelay.strace2.mac.4051)
trace B (tcp_nodelay.strace2.mac.4052)

Verifying Traces

trace A: ('socket_syscall', (2, 1, 0), (0, None))
[Notice] trace A: ('setsockopt_syscall', (0, 6, 1, 1), (-1, 'ENOPROTOOPT'))
=> UNKNOWN_LEVEL: We don't handle this level.
trace A: ('close_syscall', (0,), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Warning] trace B: ('listen_syscall', (0, 1), (0, None))
=> EDESTADDRREQ: [Application Error] The socket is not bound to a local address,
and the protocol does not support listening on an unbound socket.
trace B: ('close_syscall', (0,), (0, None))

Done

Possible Problems Detected

* 1 call(s) to getsockopt, setsockopt, fcntl, or ioctl used options which are not currently handled

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.20.3 BSD test

python netcheck.py -u tcp_nodelay.strace2.bsd.4051 tcp_nodelay.strace2.bsd.4052

Client trace:

```

socket(PF_FILE, SOCK_STREAM, 0) = 3
connect(5, {sa_family=AF_FILE, path="temp_unix_socket_file.txt"}, 27) = 0
setsockopt(5, SOL_TCP, TCP_NODELAY, [1], 4) = -1 EINVAL (Invalid Argument)
close(5) = 0

```

Server trace:

```

socket(PF_FILE, SOCK_STREAM, 0) = 3
bind(3, {sa_family=AF_FILE, path="temp_unix_socket_file.txt"}, 27) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_FILE, NULL}, [2]) = 4
select(0, NULL, NULL, NULL, {1, 0}) = 0 (Timeout)
close(3) = 0

```

NetCheck output:

```

-----
Configuration
-----
host
  trace A (tcp_nodelay.strace2.bsd.4051)
  trace B (tcp_nodelay.strace2.bsd.4052)
-----
Verifying Traces
-----
trace A: ('socket_syscall', (2, 1, 0), (0, None))
[Notice] trace A: ('setsockopt_syscall', (0, 6, 1, 1), (-1, 'EINVAL'))
=> UNKNOWN_LEVEL: We don't handle this level.
trace A: ('close_syscall', (0,), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Warning] trace B: ('listen_syscall', (0, 1), (0, None))
=> EDESTADDRREQ: [Application Error] The socket is not bound to a local address,
and the protocol does not support listening on an unbound socket.
trace B: ('close_syscall', (0,), (0, None))

Done
-----
Possible Problems Detected
-----
* 1 call(s) to getsockopt, setsockopt, fcntl, or ioctl used options which are not currently handled

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

```

1.21 tcp_set_buf_size_vm

In these tests we used a combination of setting the options `SO_SNDBUF` and `SO_RCVBUF` and attempted to send and receive messages bigger than the set values for the buffer sizes. These tests show that we were able to send and receive messages larger than the set buffer size. These behaviors were observed when run in a VM.

1.21.1 tcp_set_sendbuf_size_vm

```

python netcheck.py -u tcp_set_sendbuf_size_vm.strace.12825 \
  tcp_set_sendbuf_size_vm.strace.12826

```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0

```



```

getsockname(3, {sa_family=AF_INET, sin_port=htons(36067), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(36067), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, "H...HH", 2048, 0) = 2048
close(5) = 0

```

Server trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(36067), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(38422), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
setsockopt(4, SOL_SOCKET, SO_SNDBUF, [1024], 4) = 0
send(4, "H...HH", 2048, 0) = 2048
close(3) = 0
close(4) = 0

```

NetCheck output:

Configuration

host
trace A (tcp_set_sendbuf_size_vm.strace.12825)
trace B (tcp_set_sendbuf_size_vm.strace.12826)

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 36067), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 36067), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 36067), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 38422), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:36067)
trace A: ('connect_syscall', (1, '127.0.0.1', 36067), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...',
2048, 0), (2048, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:36067) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:38422)
trace B: ('accept_syscall', (0, '127.0.0.1', 38422), (1, None))
trace B: ('setsockopt_syscall', (1, 65535, 4097, 1024), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...',
2048, 0), (2048, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
[Warning] trace B: ('send_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...', 0), (2048, None))
=> MSG->_BUFSIZE: [Application Error] Sending this message has caused data in the
buffer to exceed the buffer size.
trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...', 2048, 0), (2048, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

```
Connection from socket A1 (public address 127.0.0.1:38422) to socket B1 (public address 127.0.0.1:36067)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 2048 bytes sent, 2048 bytes received, 0 bytes lost
```

```
-----
Possible Problems Detected
-----
```

```
* [Possible Network Misbehavior] 1 different call(s) caused trace B to exceeded an expected buffer size
```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.21.2 tcp_set_sendbuf2_size_vm

```
python netcheck.py -u tcp_set_sendbuf2_size_vm.strace.13166 \
    tcp_set_sendbuf2_size_vm.strace.13167
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(34745), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(34745), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, "H...HH", 4096, 0) = 4096
close(5) = 0
```

Server trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(34745), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
setsockopt(3, SOL_SOCKET, SO_SNDBUF, [1024], 4) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(46888), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
getsockopt(4, SOL_SOCKET, SO_SNDBUF, [2048], [4]) = 0
send(4, "H...HH", 4096, 0) = 4096
close(3) = 0
close(4) = 0
```

NetCheck output:

```
-----
Configuration
-----
```

```
host
  trace A (tcp_set_sendbuf2_size_vm.strace.13166)
  trace B (tcp_set_sendbuf2_size_vm.strace.13167)
```

```
-----
Verifying Traces
-----
```

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 34745), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 34745), (0, None))
trace B: ('setsockopt_syscall', (0, 65535, 4097, 1024), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 34745), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 46888), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:34745)
```

```

trace A: ('connect_syscall', (1, '127.0.0.1', 34745), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...',
4096, 0), (4096, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:34745) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:46888)
trace B: ('accept_syscall', (0, '127.0.0.1', 46888), (1, None))
[Warning] trace B: ('getsockopt_syscall', (1, 65535, 4097), (2048, None))
=> UNEXPECTED_RETURN_VALUE: Model returned 1024
[Call Rejected] trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...',
4096, 0), (4096, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
[Warning] trace B: ('send_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...', 0), (4096, None))
=> MSG->BUFSIZE: [Application Error] Sending this message has caused data in the buffer to exceed the buffer size.
trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...', 4096, 0), (4096, None))
trace A: ('close_syscall', (1,), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

Connection from socket A1 (public address 127.0.0.1:46888) to socket B1 (public address 127.0.0.1:34745)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 4096 bytes sent, 4096 bytes received, 0 bytes lost

Possible Problems Detected

* [Possible Network Misbehavior] 1 different call(s) caused trace B to exceeded an expected buffer size

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.21.3 tcp_set_rcvbuf_size_vm

```
python netcheck.py -u tcp_set_rcvbuf_size_vm.strace.12831 \
tcp_set_rcvbuf_size_vm.strace.12832
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(52259), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
setsockopt(5, SOL_SOCKET, SO_RCVBUF, [1024], 4) = 0
connect(5, {sa_family=AF_INET, sin_port=htons(52259), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, "H...HH", 2048, 0) = 1120
close(5) = 0

```

Server trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(52259), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(49781), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
send(4, "H...HH", 2048, 0) = 2048
close(3) = 0
close(4) = 0

```

NetCheck output:

Configuration

host
trace A (tcp_set_rcvbuf_size_vm.strace.12831)
trace B (tcp_set_rcvbuf_size_vm.strace.12832)

Verifying Traces

```
trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 52259), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('setsockopt_syscall', (1, 65535, 4098, 1024), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 52259), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 52259), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 49781), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:52259)
trace A: ('connect_syscall', (1, '127.0.0.1', 52259), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...',
2048, 0), (1120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:52259) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:49781)
trace B: ('accept_syscall', (0, '127.0.0.1', 49781), (1, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...',
2048, 0), (1120, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...', 0), (2048, None))
trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...', 2048, 0), (1120, None))
[Notice] trace A: ('close_syscall', (1,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))
```

Done

TCP Connection Statistics

```
Connection from socket A1 (public address 127.0.0.1:49781) to socket B1 (public address 127.0.0.1:52259)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 2048 bytes sent, 1120 bytes received, 928 bytes lost (45.31%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior
```

Possible Problems Detected

```
* [Possible Application Misbehavior] Trace A has 1 TCP connection(s) to 127.0.0.1:52259 with data left in the buffers
```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.21.4 tcp_set_rcvbuf2.size_vm

```
python netcheck.py -u tcp_set_rcvbuf2.size_vm.strace.13002 \  
tcp_set_rcvbuf2.size_vm.strace.13003
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(46388), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 5
setsockopt(5, SOL_SOCKET, SO_RCVBUF, [1024], 4) = 0
connect(5, {sa_family=AF_INET, sin_port=htons(46388), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recv(5, "H...HH", 2048, 0) = 560
close(5) = 0

```

Server trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(46388), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
listen(3, 1) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(38614), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
send(4, "H...HH", 2048, 0) = 2048
close(3) = 0
close(4) = 0

```

NetCheck output:

Configuration

```

host
trace A (tcp_set_rcvbuf2_size_vm.strace.13002)
trace B (tcp_set_rcvbuf2_size_vm.strace.13003)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 1, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 46388), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 0), (1, None))
trace A: ('setsockopt_syscall', (1, 65535, 4098, 1024), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 46388), (0, None))
[Call Rejected] trace A: ('connect_syscall', (1, '127.0.0.1', 46388), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace B: ('listen_syscall', (0, 1), (0, None))
[Call Rejected] trace B: ('accept_syscall', (0, '127.0.0.1', 38614), (1, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket A1 connecting to socket B0 (public address 127.0.0.1:46388)
trace A: ('connect_syscall', (1, '127.0.0.1', 46388), (0, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...',
2048, 0), (560, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the
other side has not accepted the connection yet.
TCP server socket B0 (private address 127.0.0.1:46388) returning socket B1, which is
connected to socket A1 (public address 127.0.0.1:38614)
trace B: ('accept_syscall', (0, '127.0.0.1', 38614), (1, None))
[Call Rejected] trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...',
2048, 0), (560, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace B: ('send_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...', 0), (2048, None))
trace A: ('recv_syscall', (1, 'HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH...', 2048, 0), (560, None))
[Notice] trace A: ('close_syscall', (1,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

```

-----
Connection from socket A1 (public address 127.0.0.1:38614) to socket B1 (public address 127.0.0.1:46388)
* Data sent to accepting socket B1: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket A1: 2048 bytes sent, 560 bytes received, 1488 bytes lost (72.66%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior

```

```

-----
Possible Problems Detected
-----

```

```

* [Possible Application Misbehavior] Trace A has 1 TCP connection(s) to 127.0.0.1:46388 with data left in the buffers

```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.22 udp_large_datagram_vm

In these tests we sent large UDP datagrams over loopback. We noticed that there was a high data loss rate (about 70%). This is observed when the tests are run in a VM.

1.22.1 Single large datagram

```
python netcheck.py udp_large_datagram_vm.txt
```

Client trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("192.168.1.106")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(59836), sin_addr=inet_addr("192.168.1.106")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
sendto(4, "A...AA", 100000, 0, {sa_family=AF_INET, sin_port=htons(59836), sin_addr=inet_addr("192.168.1.106")}, 16)
= -1 EMSGSIZE (Message too long)
close(4) = 0

```

Server trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(59836), sin_addr=inet_addr("192.168.1.106")}, 16) = 0
fcntl164(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl164(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
close(3) = 0

```

NetCheck output:

```

-----
Configuration
-----

```

```

host
  trace A (udp_large_datagram_vm.strace.13302)
  trace B (udp_large_datagram_vm.strace.13303)
ip 192.168.1.106

```

```

-----
Verifying Traces

```

```

-----
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('bind_syscall', (0, '192.168.1.106', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('192.168.1.106', 59836), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2, 0), (1, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
trace B: ('bind_syscall', (0, '192.168.1.106', 59836), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('close_syscall', (0,), (0, None))
[Warning] trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0,
'192.168.1.106', 59836), (-1, 'EMSGSIZE'))
=> UNEXPECTED_FAILURE: Sendto failed unexpectedly.
trace A: ('close_syscall', (1,), (0, None))

```

Done

```

-----
Possible Problems Detected
-----

```

* None

1.22.2 Multiple large datagrams

python netcheck.py udp_large_datagram2_vm.txt

Client trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("192.168.1.106")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(37608), sin_addr=inet_addr("192.168.1.106")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
sendto(4, "A...A", 65000, 0, {sa_family=AF_INET, sin_port=htons(37608),
sin_addr=inet_addr("192.168.1.106")}, 16) = 65000
close(4) = 0

```

Server trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(37608), sin_addr=inet_addr("192.168.1.106")}, 16) = 0
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLIN}], 1, 1000) = 1 ([{fd=3, revents=POLLIN}])
recvfrom(3, "...AA", 65000, 0, {sa_family=AF_INET, sin_port=htons(54604),
sin_addr=inet_addr("192.168.1.106")}, [16]) = 65000
poll([{fd=3, events=POLLIN}], 1, 1000) = 1 ([{fd=3, revents=POLLIN}])
recvfrom(3, "...AA", 65000, 0, {sa_family=AF_INET, sin_port=htons(54604),
sin_addr=inet_addr("192.168.1.106")}, [16]) = 65000
poll([{fd=3, events=POLLIN}], 1, 1000) = 1 ([{fd=3, revents=POLLIN}])
recvfrom(3, "...AA", 65000, 0, {sa_family=AF_INET, sin_port=htons(54604),
sin_addr=inet_addr("192.168.1.106")}, [16]) = 65000
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
poll([{fd=3, events=POLLIN}], 1, 1000) = 0 (Timeout)
close(3) = 0

```

NetCheck output:

Configuration

```

host
trace A (udp_large_datagram2_vm.strace.13363)
trace B (udp_large_datagram2_vm.strace.13364)
ip 192.168.1.106

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('bind_syscall', (0, '192.168.1.106', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('192.168.1.106', 37608), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2, 0), (1, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
trace B: ('bind_syscall', (0, '192.168.1.106', 37608), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('poll_syscall', ([0], [], [], 1000), ([[0], [], []], None))
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...',
65000, 0, '192.168.1.106', 54604), (65000, None))
=> MSGNOTSENT: The message has not been sent yet.
UDP socket A1 is sending to public address 192.168.1.106:37608
trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '192.168.1.106',
37608), (65000, None))
UDP socket B0 (private address 192.168.1.106:37608) is receiving from socket A1 (public
address 192.168.1.106:54604)
trace B: ('recvfrom_syscall', (0, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 65000, 0,
'192.168.1.106', 54604), (65000, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 1000), ([[0], [], []], None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...',
65000, 0, '192.168.1.106', 54604), (65000, None))
=> MSGNOTSENT: The message has not been sent yet.
trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '192.168.1.106', 37608),
(65000, None))
trace B: ('recvfrom_syscall', (0, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 65000, 0, '192.168.1.106',
54604), (65000, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 1000), ([[0], [], []], None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 65000,
0, '192.168.1.106', 54604), (65000, None))
=> MSGNOTSENT: The message has not been sent yet.
trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '192.168.1.106', 37608), (65000, None))

```



```

trace B: ('recvfrom_syscall', (0, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 65000, 0, '192.168.1.106', 54604), (65000, None))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('poll_syscall', ([0], [], [], 1000), (0, 'Timeout'))
trace B: ('close_syscall', (0,), (0, None))
[Warning] trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '192.168.1.106', 37608), (65000, None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] Poll/Select returned nothing although there is
'data in the air'!!
trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '192.168.1.106', 37608), (65000, None))
trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '192.168.1.106', 37608), (65000, None))
trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '192.168.1.106', 37608), (65000, None))
trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '192.168.1.106', 37608), (65000, None))
trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '192.168.1.106', 37608), (65000, None))
trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '192.168.1.106', 37608), (65000, None))
trace A: ('close_syscall', (1,), (0, None))

```

Done

UDP Traffic Statistics

```

Traffic from 192.168.1.106:54604 to 192.168.1.106:37608
* 10 datagrams sent, 3 datagrams received, 7 datagrams lost (70.00%)
* 650000 bytes sent, 195000 bytes received, 455000 bytes lost (70.00%)

```

Possible Problems Detected

* None

1.23 udp_set_buf_size_vm

In these tests we used a combination of setting the options `SO_SNDBUF` and `SO_RCVBUF` on a UDP socket. The tests then send and receive datagrams larger than the set values for the buffer sizes. These tests show that we were able to send and receive datagrams larger than the set buffer sizes. These behaviors are observed when the tests are run inside a VM.

1.23.1 udp_set_sendbuf_size_vm

```
python netcheck.py -u udp_set_sendbuf_size_vm.strace.12619 \
    udp_set_sendbuf_size_vm.strace.12620
```

Client trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(60638), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
setsockopt(4, SOL_SOCKET, SO_SNDBUF, [1024], 4) = 0
sendto(4, "A..AA", 2048, 0, {sa_family=AF_INET, sin_port=htons(60638),
sin_addr=inet_addr("127.0.0.1")}, 16) = 2048
close(4) = 0

```

Server trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(60638), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
recvfrom(3, "A..AA", 2048, 0, {sa_family=AF_INET, sin_port=htons(55946),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 2048
close(3) = 0

```

NetCheck output:

```

-----
Configuration
-----
host
trace A (udp_set_sendbuf_size_vm.strace.12619)
trace B (udp_set_sendbuf_size_vm.strace.12620)

-----
Verifying Traces
-----
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 60638), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2, 0), (1, None))
trace A: ('setsockopt_syscall', (1, 65535, 4097, 1024), (0, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 60638), (0, None))
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...',
2048, 0, '127.0.0.1', 55946), (2048, None))
=> MSGNOTSENT: The message has not been sent yet.
UDP socket A1 is sending to public address 127.0.0.1:60638
[Warning] trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '127.0.0.1',
60638), (2048, None))
=> MSG_>BUFSIZE: [Portability Issue] The socket is trying to send a message larger than its
send buffer size, which is not portable.

trace A: ('close_syscall', (1,), (0, None))
UDP socket B0 (private address 127.0.0.1:60638) is receiving from socket A1 (public address 127.0.0.1:55946)
trace B: ('recvfrom_syscall', (0, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 2048, 0,
'127.0.0.1', 55946), (2048, None))
trace B: ('close_syscall', (0,), (0, None))

Done

-----
UDP Traffic Statistics
-----
Traffic from 127.0.0.1:55946 to 127.0.0.1:60638
* 1 datagrams sent, 1 datagrams received, 0 datagrams lost
* 2048 bytes sent, 2048 bytes received, 0 bytes lost

-----
Possible Problems Detected
-----
* [Possible Network Misbehavior] 1 different call(s) caused trace A to exceeded an expected buffer size

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

```

1.23.2 udp_set_rcvbuf_size_vm

```

python netcheck.py -u udp_set_rcvbuf_size_vm.strace.12681 \
udp_set_rcvbuf_size_vm.strace.12682

```

Client trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(57837), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0

```

```

close(3) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
sendto(4, "A...AA", 2048, 0, {sa_family=AF_INET, sin_port=htons(57837),
                               sin_addr=inet_addr("127.0.0.1")}, 16) = 2048
close(4) = 0

```

Server trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(57837), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
setsockopt(3, SOL_SOCKET, SO_RCVBUF, [1024], 4) = 0
recvfrom(3, "A...AA", 2048, 0, {sa_family=AF_INET, sin_port=htons(58292),
                               sin_addr=inet_addr("127.0.0.1")}, [16]) = 2048
close(3) = 0

```

NetCheck output:

```

-----
Configuration
-----
host
  trace A (udp_set_rcvbuf_size_vm.strace.12681)
  trace B (udp_set_rcvbuf_size_vm.strace.12682)
-----
Verifying Traces
-----
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 57837), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2, 0), (1, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 57837), (0, None))
trace B: ('setsockopt_syscall', (0, 65535, 4098, 1024), (0, None))
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...',
                                             2048, 0, '127.0.0.1', 58292), (2048, None))
=> MSGNOTSENT: The message has not been sent yet.
UDP socket A1 is sending to public address 127.0.0.1:57837
trace A: ('sendto_syscall', (1, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 0, '127.0.0.1', 57837), (2048, None))
trace A: ('close_syscall', (1,), (0, None))
UDP socket B0 (private address 127.0.0.1:57837) is receiving from socket A1 (public address 127.0.0.1:58292)
[Warning] trace B: ('recvfrom_syscall', (0, 'AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA...', 2048, 0, '127.0.0.1',
                                             58292), (2048, None))
=> MSG->_BUFSIZE: [Portability Issue] The socket is receiving a message larger than its receive buffer
size, which is not portable.
trace B: ('close_syscall', (0,), (0, None))
Done
-----
UDP Traffic Statistics
-----
Traffic from 127.0.0.1:58292 to 127.0.0.1:57837
* 1 datagrams sent, 1 datagrams received, 0 datagrams lost
* 2048 bytes sent, 2048 bytes received, 0 bytes lost
-----
Possible Problems Detected
-----
* [Possible Network Misbehavior] 1 different call(s) caused trace B to exceeded an expected buffer size

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

```

1.24 vary_udp_datagram

In this test the client sends UDP datagrams with varying size: from 32 bytes to 16,384 bytes. The server listens for datagrams of size 1024 only. The server

receives the entire datagrams if they are smaller than or equal to 1024 bytes. For the larger datagrams, the server receives only the first 1024 bytes of each datagram.

1.24.1 Case 1

python netcheck.py -u vary_udpdatagram.strace.3270 vary_udpdatagram.strace.3271

Client trace:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
sendto(3, "Ahoy...Ahoy", 32, 0, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 32
sendto(3, "Ahoy...Ahoy", 64, 0, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 64
sendto(3, "Ahoy...Ahoy", 128, 0, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 128
sendto(3, "Ahoy...Ahoy", 256, 0, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 256
sendto(3, "Ahoy...Ahoy", 512, 0, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 512
sendto(3, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 1024
sendto(3, "Ahoy...Ahoy", 2048, 0, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 2048
sendto(3, "Ahoy...Ahoy", 4096, 0, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 4096
sendto(3, "Ahoy...Ahoy", 8192, 0, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 8192
sendto(3, "Ahoy...Ahoy", 16384, 0, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 16384
close(4) = 0
close(3) = 0
```

Server trace:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
bind(4, {sa_family=AF_INET, sin_port=htons(39451), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([{fd=4, revents=POLLIN}])
recvfrom(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(35076), sin_addr=inet_addr("127.0.0.1")}, [16]) = 32
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([{fd=4, revents=POLLIN}])
recvfrom(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(35076), sin_addr=inet_addr("127.0.0.1")}, [16]) = 64
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([{fd=4, revents=POLLIN}])
recvfrom(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(35076), sin_addr=inet_addr("127.0.0.1")}, [16]) = 128
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([{fd=4, revents=POLLIN}])
recvfrom(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(35076), sin_addr=inet_addr("127.0.0.1")}, [16]) = 256
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([{fd=4, revents=POLLIN}])
recvfrom(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(35076), sin_addr=inet_addr("127.0.0.1")}, [16]) = 512
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([{fd=4, revents=POLLIN}])
recvfrom(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(35076), sin_addr=inet_addr("127.0.0.1")}, [16]) = 1024
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([{fd=4, revents=POLLIN}])
recvfrom(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(35076), sin_addr=inet_addr("127.0.0.1")}, [16]) = 1024
```

```

poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([{fd=4, revents=POLLIN}])
recvfrom(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(35076),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 1024
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([{fd=4, revents=POLLIN}])
recvfrom(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(35076),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 1024
poll([{fd=4, events=POLLIN}], 1, 5000) = 1 ([{fd=4, revents=POLLIN}])
recvfrom(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(35076),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 1024

```

NetCheck output:

Configuration

```

host
  trace A (vary_udpdatagram.strace.3270)
  trace B (vary_udpdatagram.strace.3271)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 39451), None))
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2, 0), (1, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 39451), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy',
1024, 0, '127.0.0.1', 35076), (32, None))
=> MSGNOTSENT: The message has not been sent yet.
UDP socket A1 is sending to public address 127.0.0.1:39451
trace A: ('sendto_syscall', (1, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy', 0, '127.0.0.1', 39451), (32, None))
UDP socket B0 (private address 127.0.0.1:39451) is receiving from socket A1 (public address 127.0.0.1:35076)
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy', 1024, 0, '127.0.0.1', 35076), (32, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...',
1024, 0, '127.0.0.1', 35076), (64, None))
=> MSGNOTSENT: The message has not been sent yet.
trace A: ('sendto_syscall', (1, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 39451), (64, None))
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 35076), (64, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...',
1024, 0, '127.0.0.1', 35076), (128, None))
=> MSGNOTSENT: The message has not been sent yet.
trace A: ('sendto_syscall', (1, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 39451), (128, None))
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 35076), (128, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...',
1024, 0, '127.0.0.1', 35076), (256, None))
=> MSGNOTSENT: The message has not been sent yet.
trace A: ('sendto_syscall', (1, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 39451), (256, None))
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 35076), (256, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...',
1024, 0, '127.0.0.1', 35076), (512, None))
=> MSGNOTSENT: The message has not been sent yet.
trace A: ('sendto_syscall', (1, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 39451), (512, None))
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 35076), (512, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoyAhoy...',
1024, 0, '127.0.0.1', 35076), (512, None))

```

```

1024, 0, '127.0.0.1', 35076), (1024, None))
=> MSGNOTSENT: The message has not been sent yet.
trace A: ('sendto_syscall', (1, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 39451), (1024, None))
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 35076), (1024, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...',
1024, 0, '127.0.0.1', 35076), (1024, None))
=> MSGNOTSENT: The message has not been sent yet.
trace A: ('sendto_syscall', (1, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 39451), (2048, None))
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...',
1024, 0, '127.0.0.1', 35076), (1024, None))
=> MSGNOTSENT: The message was not sent, but may have been truncated from a longer message.
trace A: ('sendto_syscall', (1, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 39451), (4096, None))
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...',
1024, 0, '127.0.0.1', 35076), (1024, None))
=> MSGNOTSENT: The message was not sent, but may have been truncated from a longer message.
trace A: ('sendto_syscall', (1, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 39451), (8192, None))
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...',
1024, 0, '127.0.0.1', 35076), (1024, None))
=> MSGNOTSENT: The message was not sent, but may have been truncated from a longer message.
trace A: ('sendto_syscall', (1, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 39451), (16384, None))
trace A: ('close_syscall', (1,), (0, None))
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...',
1024, 0, '127.0.0.1', 35076), (1024, None))
=> MSGNOTSENT: The message was not sent, but may have been truncated from a longer message.

No valid action:
[Error] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 35076), (1024, None))
=> MSGNOTSENT: The message was not sent, but may have been truncated from a longer message.

```

UDP Traffic Statistics

```

Traffic from 127.0.0.1:35076 to 127.0.0.1:39451
* 10 datagrams sent, 6 datagrams received, 4 datagrams lost (40.00%)
* 32736 bytes sent, 2016 bytes received, 30720 bytes lost (93.84%)

```

Possible Problems Detected

```
* The model failed to process the entire trace
```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

1.24.2 Case 2

```
python netcheck.py -u vary_udpdatagram.strace.5161 \
    vary_udpdatagram.strace.5162
```

Client trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(47357), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 4
sendto(4, "Ahoy..Ahoy", 32, 0, {sa_family=AF_INET, sin_port=htons(47357),
sin_addr=inet_addr("127.0.0.1")}, 16) = 32
sendto(4, "Ahoy..Ahoy", 64, 0, {sa_family=AF_INET, sin_port=htons(47357),
sin_addr=inet_addr("127.0.0.1")}, 16) = 64
sendto(4, "Ahoy..Ahoy", 128, 0, {sa_family=AF_INET, sin_port=htons(47357),
sin_addr=inet_addr("127.0.0.1")}, 16) = 128
sendto(4, "Ahoy..Ahoy", 256, 0, {sa_family=AF_INET, sin_port=htons(47357),
sin_addr=inet_addr("127.0.0.1")}, 16) = 256

```

```

sendto(4, "Ahoy...Ahoy", 512, 0, {sa_family=AF_INET, sin_port=htons(47357),
sin_addr=inet_addr("127.0.0.1")}, 16) = 512
sendto(4, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(47357),
sin_addr=inet_addr("127.0.0.1")}, 16) = 1024
sendto(4, "Ahoy...Ahoy", 2048, 0, {sa_family=AF_INET, sin_port=htons(47357),
sin_addr=inet_addr("127.0.0.1")}, 16) = 2048
sendto(4, "Ahoy...Ahoy", 4096, 0, {sa_family=AF_INET, sin_port=htons(47357),
sin_addr=inet_addr("127.0.0.1")}, 16) = 4096
sendto(4, "Ahoy...Ahoy", 8192, 0, {sa_family=AF_INET, sin_port=htons(47357),
sin_addr=inet_addr("127.0.0.1")}, 16) = 8192
sendto(4, "Ahoy...Ahoy", 16384, 0, {sa_family=AF_INET, sin_port=htons(47357),
sin_addr=inet_addr("127.0.0.1")}, 16) = 16384
close(4) = 0

```

Server trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
bind(3, {sa_family=AF_INET, sin_port=htons(47357), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
fcntl(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(33850),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 32
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(33850),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 64
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(33850),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 128
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(33850),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 256
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(33850),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 512
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(33850),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 1024
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(33850),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 1024
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(33850),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 1024
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "Ahoy...Ahoy", 1024, 0, {sa_family=AF_INET, sin_port=htons(33850),
sin_addr=inet_addr("127.0.0.1")}, [16]) = 1024
poll([{fd=3, events=POLLIN}], 1, 5000) = 0 (Timeout)
close(3) = 0

```

NetCheck output:

Configuration

```

host
trace A (vary_udpdatagram.strace.5161)
trace B (vary_udpdatagram.strace.5162)

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('bind_syscall', (0, '127.0.0.1', 0), (0, None))
trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 47357), None))
trace A: ('close_syscall', (0,), (0, None))

```

```

trace A: ('socket_syscall', (2, 2, 0), (1, None))
trace A: ('socket_syscall', (2, 2, 0), (2, None))
trace B: ('socket_syscall', (2, 2, 0), (0, None))
trace B: ('bind_syscall', (0, '127.0.0.1', 47357), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
UDP socket A2 is sending to public address 127.0.0.1:47357
trace A: ('sendto_syscall', (2, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 47357), (32, None))
UDP socket B0 (private address 127.0.0.1:47357) is receiving from socket A2 (public address 127.0.0.1:33850)
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 33850), (32, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
trace A: ('sendto_syscall', (2, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 47357), (64, None))
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 33850), (64, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
trace A: ('sendto_syscall', (2, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 47357), (128, None))
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 33850), (128, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
trace A: ('sendto_syscall', (2, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 47357), (256, None))
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 33850), (256, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
trace A: ('sendto_syscall', (2, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 47357), (512, None))
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 33850), (512, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
trace A: ('sendto_syscall', (2, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 47357), (1024, None))
trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 33850), (1024, None))
[Notice] trace B: ('poll_syscall', ([0], [], [], 5000), (([0], [], []), None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but poll sees something.
trace A: ('sendto_syscall', (2, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 47357), (2048, None))
trace A: ('sendto_syscall', (2, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 47357), (4096, None))
trace A: ('sendto_syscall', (2, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 47357), (8192, None))
trace A: ('sendto_syscall', (2, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 0, '127.0.0.1', 47357), (16384, None))
trace A: ('close_syscall', (2,), (0, None))
trace A: ('close_syscall', (1,), (0, None))

```

No valid action:

```

[Error] trace B: ('recvfrom_syscall', (0, 'AhoyAhoyAhoyAhoyAhoyAhoyAhoy...', 1024, 0, '127.0.0.1', 33850), (1024, None))
=> MSGNOTSENT: The message was not sent, but may have been truncated from a longer message.

```

UDP Traffic Statistics

```

Traffic from 127.0.0.1:33850 to 127.0.0.1:47357
* 10 datagrams sent, 6 datagrams received, 4 datagrams lost (40.00%)
* 32736 bytes sent, 2016 bytes received, 30720 bytes lost (93.84%)

```

Possible Problems Detected

* The model failed to process the entire trace

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

2 Unit Test for Injected Network Bugs

WEBrick [36] is an HTTP server library for Ruby that is widely used for developing Ruby-on-Rails applications. To test NetCheck’s effectiveness at diagnosing bugs in WEBrick, we reproduced bugs derived from our own experiences and from the Ruby bug tracker and collected execution traces from the affected systems, which we ran through NetCheck. The results are reported in Table 3, which shows that NetCheck is able to identify the main issue in 18 of 20 traces. Unless otherwise specified, all hosts are running Ubuntu Linux (either 11.04, 11.10, or 12.04).

Note that from Table 3, NetCheck has a false positive rate of 3% (1/38). The false positive occurred in the `firewall` case in Section 2.6. In this test case, when a firewall on the server side is configured to drop a connection, an error code `ERESTARTSYS` was returned by client side `connect()` call, meaning the TCP connection failed and the client will retry this syscall again. This is equivalent to a timeout at the client side, which can also be caused by the server being too busy to accept the connection. Therefore, in this case, NetCheck did not have enough information to distinguish its diagnoses in this case compared to a normal server timeout.

Bug	Total number of diagnoses	Bug detected	Incorrect diagnoses
bind6	1	✓	0
bind6-2	1	✓	0
clientpermission	2	✓	0
closethread	3	✗	0
conn0	1	✓	0
firewall	2	✓	1
gethostbyaddr	1	✗	0
httpprox1	1	✓	0
httpprox2	1	✓	0
keepalive	1	✓	0
local	3	✓	0
max1	3	✓	0
maxconn	4	✓	0
maxconn2	6	✓	0
mtu	2	✓	0
multibyte	2	✓	0
noread	1	✓	0
permission	1	✓	0
portfwd	1	✓	0
special	1	✓	0
Total:	38	18/20 (90%)	1/38 (3%)

Table 3: NetCheck’s classification of controlled network bugs. The total number of diagnoses are all the issues detected by NetCheck. The ✓/✗ indicate the success/failure of NetCheck in diagnosing the root cause of the bug. Incorrect diagnoses are false positives.

2.1 bind6

This bug (and its dual, `bind6-2`), are meant to reflect the varying semantics of binding a socket to the `::` address [17]. On recent Microsoft Windows operating systems, binding a socket to `::` only binds to the IPv6 addresses. On Linux, a socket bound to `::` will bind to both IPv6 and IPv4 addresses (unless `/proc/sys/net/ipv6/bindv6only` is set to 1, in which case a socket bound to `::` will only listen for IPv6 requests). Debian defaults to `bindv6only = 1` [15].

This issue can cause program failures, e.g., if a developer expects that a program bound to `::` will listen on IPv4 addresses, and it doesn't. The failures include security issues, such as when a developer expects that a program bound to `::` is only listening on IPv6 addresses, and does not take any steps to secure IPv4 addresses [4, 5].

Note that NetCheck assumes the Linux behavior (a socket bound to `::` is bound to IPv6 and IPv4 addresses), so if a host is listening on `::`, NetCheck should expect connections to that host's IPv4 address to succeed. However, it will print a warning about the non-portability of `::`.

In this trace, the observed behavior is the Windows / Debian behavior (a socket bound to `::` is only bound to IPv6 addresses). Note that this `bindv6only` option breaks the networking stack in Java, which produces a "network unreachable" exception [6, 7]. Other broken applications include Eclipse [8], VNC [9], and Google Go [10].

Trace information:

- On the server, run the following: `sysctl -w net.ipv6.bindv6only=1`.
- Server is at IPv4 address 128.238.66.220, and is running a WEBrick server that is listening on `::` (port 3005).
- Client is at 128.238.255.159, and uses `wget` to download a file from the WEBrick server at 128.238.66.220:3005 (using the server's IPv4 address).

To run NetCheck:

```
python netcheck.py wb-bind6.txt
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("128.238.66.220")}, 16)
                                                    = -1 ECONNREFUSED (Connection refused)
close(3)                                          = 0
```

Server trace:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(59376), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
connect(3, {sa_family=AF_UNSPEC, sa_data="\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"}, 16) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("10.0.0.200")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(47287), sin_addr=inet_addr("10.0.0.200")}, [16]) = 0
close(3)                                          = 0
socket(PF_INET6, SOCK_STREAM, IPPROTO_TCP) = 3
```

```

setsockopt(3, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(3, {sa_family=AF_INET6, sin6_port=htons(3005), inet_pton(AF_INET6, "::", &sin6_addr), sin6_flowinfo=0,
sin6_scope_id=0}, 28) = 0

listen(3, 5) = 0
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_GETFD) = 0
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = ? ERESTARTNOHAND (To be restarted)
--- SIGINT (Interrupt) @ 0 (0) ---
close(3) = 0

```

NetCheck output:

Configuration

```

host
  trace A: server (wb-bind6-server.trace)
  ip 128.238.66.220
host
  trace B: client (wb-bind6-client.trace)
  ip 128.238.255.159

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '127.0.0.1', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 59376), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
[Don't Care] trace A: ('connect_syscall', (0, '10.0.0.200', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('10.0.0.200', 47287), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (1, None))
trace A: ('setsockopt_syscall', (1, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (1, '::', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Warning] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (-1, 'ECONNREFUSED'))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections.
trace B: ('close_syscall', (0,), (0, None))
trace A: ('listen_syscall', (1, 5), (0, None))
trace A: ('select_syscall', ([1], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (2, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([1], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace A: ('close_syscall', (1,), (0, None))

```

Done

Network Configuration Issues

```

Trace B failed to connect to 128.238.66.220:3005 1 time(s) because the connection was refused
  This address matches server socket A1, which was bound to [::]:3005
  * [Warning] Addresses '128.238.66.220' and '::' are not the same IP version

```

Possible Problems Detected

* [Ambiguous Misbehavior] One or more connects to addresses that were being listened on failed.
This may be due to the timing of the connect and listen or may be due to a network issue.

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

2.2 bind6-2

In this trace, the observed behavior is the default Linux behavior (a socket bound to :: is bound to IPv6 and IPv4 addresses). See bind6 above for more information. For trace generation, run the following on the server: `sysctl -w net.ipv6.bindv6only=1`.

To run NetCheck:

```
python netcheck.py wb-bind6-2.txt
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("128.238.66.220")}, 16) = 0
select(4, NULL, [3], NULL, {900, 0}) = 1 (out [3], left {899, 999994})
write(3, "GET /index.html HTTP/1.1\r\nUser-Agent: Wget/1.13.4 (linux-gnu)\r\nAccept:
/*\r\nHost: 128.238.66.220:3005\r\nConnection: Keep-Alive\r\n\r\n", 129) = 129
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 983248})
recvfrom(3, "HTTP/1.1 200 OK \r\nEtag: 4a6055-bf-5005a367\r\nConnection: Keep-Alive\r\nLast-Modified:
Tue, 17 Jul 2012 17:39:51 GMT\r\nContent-Type: text/html\r\nDate: Mon, 23 Jul 2012 17:12:37
GMT\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2010-08-16)\r\nContent-Length: 191\r\n\r\n", 511,
MSG_PEEK, NULL, NULL) = 246
read(3, "HTTP/1.1 200 OK \r\nEtag: 4a6055-bf-5005a367\r\nConnection: Keep-Alive\r\nLast-Modified:
Tue, 17 Jul 2012 17:39:51 GMT\r\nContent-Type: text/html\r\nDate: Mon, 23 Jul 2012 17:12:37
GMT\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2010-08-16)\r\nContent-Length: 191\r\n\r\n", 246) = 246
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 999917})
read(3, "<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN\" \"http://www.w3.org/TR/html4/loose.dtd\">
<n<html>\n<head>\n<title>Sample web page</title>\n</head>\n<body>\nHello World\n</body>\n</html>\n", 191) = 191
close(3) = 0
```

Server trace:

```
socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(44359), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
connect(3, {sa_family=AF_UNSPEC, sa_data="\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"}, 16) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("10.0.0.200")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(45116), sin_addr=inet_addr("10.0.0.200")}, [16]) = 0
close(3) = 0
socket(PF_INET6, SOCK_STREAM, IPPROTO_TCP) = 3
setsockopt(3, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(3, {sa_family=AF_INET6, sin6_port=htons(3005), inet_pton(AF_INET6, "::", &sin6_addr),
sin6_flowinfo=0, sin6_scope_id=0}, 28) = 0
listen(3, 5) = 0
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_GETFD) = 0
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 1 (in [3], left {1, 542144})
accept(3, {sa_family=AF_INET6, sin6_port=htons(59738), inet_pton(AF_INET6, "::ffff:128.238.38.66",
&sin6_addr), sin6_flowinfo=0, sin6_scope_id=0}, [28]) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
fcntl64(4, F_GETFD) = 0
getpeername(4, {sa_family=AF_INET6, sin6_port=htons(59738), inet_pton(AF_INET6, "::ffff:128.238.38.66",
```



```
--- SIGINT (Interrupt) @ 0 (0) ---
close(3) = 0
```

NetCheck output:

Configuration

```
host
trace A: server (wb-bind6-2-server.trace)
ip 128.238.66.220
host
trace B: client (wb-bind6-2-client.trace)
ip 128.238.38.66
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '127.0.0.1', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 44359), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
[Don't Care] trace A: ('connect_syscall', (0, '10.0.0.200', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('10.0.0.200', 45116), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (1, None))
trace A: ('setsockopt_syscall', (1, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (1, '::', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Call Rejected] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the
connection request.
trace A: ('listen_syscall', (1, 5), (0, None))
trace A: ('select_syscall', ([1], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (2, 0)), ([1], []))
[Call Rejected] trace A: ('accept_syscall', (1, ' '::ffff:128.238.38.66', 59738), (2, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A1 (public address 128.238.66.220:3005)
* [Warning] Addresses '128.238.66.220' and ':' are not the same IP version
trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
[Don't Care] trace B: ('select_syscall', ([], [0], [], (900, 0)), ([], [0]))
TCP server socket A1 (private address [::]:3005) returning socket A2, which is connected to socket B0
(public address [::ffff:128.238.38.66]:59738)
* [Warning] Address ' '::ffff:128.238.38.66' is an IPv4 address mapped to IPv6
trace A: ('accept_syscall', (1, ' '::ffff:128.238.38.66', 59738), (2, None))
trace A: ('fcntl_syscall', (2, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET /index.html HTTP/1.1\r\nUser...'), (129, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (2,), ((' '::ffff:128.238.38.66', 59738), None))
trace A: ('socket_syscall', (2, 2050, 0), (3, None))
[Don't Care] trace A: ('connect_syscall', (3, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [3], [], 0), ([], [3], [], None))
[Don't Care] trace A: ('send_syscall', (3, '\\t\\365\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0\\00266...'), 0), (44, None))
[Don't Care] trace A: ('poll_syscall', ([3], [], [], 5000), ([3], [], [], None))
[Don't Care] trace A: ('recvfrom_syscall', (3, '\\t\\365\\201\\200\\0\\1\\0\\0\\1\\0\\0\\0\\0\\0...',
1024, 0, '10.0.0.200', 53), (79, None))
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), ([2], []))
trace A: ('select_syscall', ([1, 2], [], [], (0, 499766)), ([2], []))
trace A: ('select_syscall', ([1, 2], [], [], (1, 999819)), ([2], []))
trace A: ('read_syscall', (2, 'GET /index.html HTTP/1.1\r\nUser...', 4096), (129, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (2,), ((' '::ffff:128.238.38.66', 59738), None))
trace A: ('socket_syscall', (2, 2050, 0), (4, None))
[Don't Care] trace A: ('connect_syscall', (4, '10.0.0.200', 53), (0, None))
```

```

[Don't Care] trace A: ('poll_syscall', ([], [4], [], 0), (([], [4], []), None))
[Don't Care] trace A: ('send_syscall', (4, '\\361W\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\000266\\...', 0), (44, None))
[Don't Care] trace A: ('poll_syscall', ([4], [], [], 5000), (([4], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (4, '\\361W\\201\\200\\0\\1\\0\\1\\0\\0\\0\\0\\000...', 1024, 0, '10.0.0.200', 53), (79, None))
trace A: ('close_syscall', (4,), (0, None))
trace A: ('getsockname_syscall', (2,), (('::ffff:128.238.66.220', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (5, None))
[Don't Care] trace A: ('connect_syscall', (5, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [5], [], 0), (([], [5], []), None))
[Don't Care] trace A: ('send_syscall', (5, '\\301\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\003220...', 0), (45, None))
[Don't Care] trace A: ('poll_syscall', ([5], [], [], 5000), (([5], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (5, '\\301\\201\\203\\0\\1\\0\\0\\0\\0\\0\\0\\000...', 1024, 0, '10.0.0.200', 53), (45, None))
trace A: ('close_syscall', (5,), (0, None))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([1], [2], [], (1, 990511)), ([], [2]))
[Don't Care] trace A: ('select_syscall', ([1], [2], [], (1, 990388)), ([], [2]))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (2, 'HTTP/1.1 200 OK \\r\\nEtag: 4a6055...', (246, None))
[Don't Care] trace A: ('select_syscall', ([1], [2], [], (1, 989544)), ([], [2]))
[Don't Care] trace A: ('select_syscall', ([1], [2], [], (1, 989425)), ([], [2]))
trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
trace B: ('recvfrom_syscall', (0, 'HTTP/1.1 200 OK \\r\\nEtag: 4a6055...', 511, 2, '', 0), (246, None))
trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \\r\\nEtag: 4a6055...', 246), (246, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (2, '<!DOCTYPE html PUBLIC "-//W3C//...', (191, None))
[Call Rejected] trace A: ('select_syscall', ([1], [2], [], (0, 499953)), ([2], []))
=> NETWORK_ERROR_A2: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
[Call Rejected] trace A: ('select_syscall', ([1], [2], [], (0, 499953)), ([2], []))
=> NETWORK_ERROR_A2: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('read_syscall', (0, '<!DOCTYPE html PUBLIC "-//W3C//...', 191), (191, None))
[Call Rejected] trace A: ('select_syscall', ([1], [2], [], (0, 499953)), ([2], []))
=> NETWORK_ERROR_A2: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('close_syscall', (0,), (0, None))
trace A: ('select_syscall', ([1], [2], [], (0, 499953)), ([2], []))
trace A: ('select_syscall', ([1], [2], [], (1, 986158)), ([2], []))
trace A: ('read_syscall', (2, '', 4096), (0, None))
trace A: ('close_syscall', (2,), (0, None))
trace A: ('select_syscall', ([1], [], [], (1, 985162)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([1], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace A: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

```
-----  
Connection from socket B0 (public address [::ffff:128.238.38.66]:59738) to socket A2  
(public address 128.238.66.220:3005)  
* Data sent to accepting socket A2: 129 bytes sent, 129 bytes received, 0 bytes lost  
* Data sent to connected socket B0: 437 bytes sent, 437 bytes received, 0 bytes lost  
-----
```

Possible Problems Detected

```
-----  
* None  
-----
```

2.3 clientpermission

In this trace, the client connects to a WEBrick server to download a file, but does not have permission to write the downloaded file to the disk. This is an application-layer issue.

Trace information:

- On the client, run the following¹:

```
touch file.txt  
chmod a-w file.txt
```

- Server is at IPv4 address 128.238.66.220, and is running a WEBrick server that is listening on port 3005.
- Client is at 128.238.38.67, and uses wget to download a file from the WEBrick server at 128.238.66.220:3005.

To run NetCheck:

```
python netcheck.py wb-clientpermission.txt
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3  
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("128.238.38.71")}, 16) = 0  
select(4, NULL, [3], NULL, {900, 0}) = 1 (out [3], left {899, 999991})  
write(3, "GET /file.txt HTTP/1.1\r\nUser-Agent: Wget/1.13.4 (linux-gnu)\r\nAccept: */*\r\nHost:  
128.238.38.71:3005\r\nConnection: Keep-Alive\r\n\r\n", 126) = 126  
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 990857})  
recvfrom(3, "HTTP/1.1 200 OK \r\nDate: Wed, 25 Jul 2012 23:28:42 GMT\r\nServer: WEBrick/1.3.1  
(Ruby/1.8.7/2011-06-30)\r\nConnection: Keep-Alive\r\nContent-Type: text/plain\r\nContent-Length:  
156809786\r\nLast-Modified: Sun, 22 Jul 2012 20:18:13 GMT\r\nEtag: 12827d-958ba3a-500c6005\r\n\r\n",  
511, MSG_PEEK, NULL, NULL) = 258  
read(3, "HTTP/1.1 200 OK \r\nDate: Wed, 25 Jul 2012 23:28:42 GMT\r\nServer: WEBrick/1.3.1  
(Ruby/1.8.7/2011-06-30)\r\nConnection: Keep-Alive\r\nContent-Type: text/plain\r\nContent-Length:  
156809786\r\nLast-Modified: Sun, 22 Jul 2012 20:18:13 GMT\r\nEtag: 12827d-958ba3a-500c6005\r\n\r\n",  
258) = 258  
close(3) = 0
```

Server trace:

```
socket(PF_INET6, SOCK_DGRAM, IPPROTO_IP) = 3  
connect(3, {sa_family=AF_INET6, sin6_port=htons(3005), inet_pton(AF_INET6, ":::", &sin6_addr),  
sin6_flowinfo=0, sin6_scope_id=0}, 28) = 0  
getsockname(3, {sa_family=AF_INET6, sin6_port=htons(52594), inet_pton(AF_INET6, ":::", &sin6_addr),
```

¹Note that this will not work on an NTFS file system.

Configuration

```
ignore 127.0.0.1,53
host
  trace A: server (wb-clientpermission-server.trace)
  ip 128.238.38.71
host
  trace B: client (wb-clientpermission-client.trace)
  ip 128.238.38.67
```

Verifying Traces

```
trace A: ('socket_syscall', (30, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '::', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,)), ((':::1', 52594), None)
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('connect_syscall', (0, '0.0.0.0', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,)), (('::ffff:127.0.0.1', 34143), None)
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,)), (0, None)
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), ([], [1], [], None))
[Don't Care] trace A: ('sendto_syscall', (1, '\225\212\1\0\0\1\0\0\1\0\0\0\0\0\0\0\001...', 0, '', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), ([1], [], [], None))
[Don't Care] trace A: ('recvfrom_syscall', (1, '\225\212\205\203\0\1\0\0\1\0\0\0\0\0...', 1024, 0, '127.0.0.1', 53), (118, None))
trace A: ('close_syscall', (1,)), (0, None)
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Call Rejected] trace B: ('connect_syscall', (0, '128.238.38.71', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (3, None))
trace A: ('setsockopt_syscall', (3, 65535, 4, 1), (0, None))
[Notice] trace A: ('bind_syscall', (3, '::', 3005), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (3,)), (0, None)
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.38.67', 49112), (4, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 128.238.38.71:3005)
trace B: ('connect_syscall', (0, '128.238.38.71', 3005), (0, None))
[Don't Care] trace B: ('select_syscall', ([], [0], [], (900, 0)), ([], [0]))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A4, which is connected to socket B0 (public address 128.238.38.67:49112)
trace A: ('accept_syscall', (2, '128.238.38.67', 49112), (4, None))
trace A: ('fcntl_syscall', (4, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET /file.txt HTTP/1.1\r\nUser-A...', (126, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (4,)), (('128.238.38.67', 49112), None)
trace A: ('socket_syscall', (2, 2050, 0), (5, None))
[Don't Care] trace A: ('connect_syscall', (5, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [5], [], 0), ([], [5], [], None))
[Don't Care] trace A: ('sendto_syscall', (5, '\225\310\1\0\0\1\0\0\1\0\0\0\0\0\002...', 0, '', 0), (44, None))
[Don't Care] trace A: ('poll_syscall', ([5], [], [], 5000), ([5], [], [], None))
[Don't Care] trace A: ('recvfrom_syscall', (5, '\225\310\205\200\0\1\0\1\0\0\0\0\0...', 1024, 0, '127.0.0.1', 53), (79, None))
trace A: ('close_syscall', (5,)), (0, None)
```

```

trace A: ('select_syscall', ([4], [], [], (0, 0)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (0, 499887)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (1, 999911)), ([4], []))
trace A: ('read_syscall', (4, 'GET /file.txt HTTP/1.1\r\nUser-A...', 4096), (126, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (4,), (('128.238.38.67', 49112), None))
trace A: ('socket_syscall', (2, 2050, 0), (6, None))
[Don't Care] trace A: ('connect_syscall', (6, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [6], [], 0), (([], [6], []), None))
[Don't Care] trace A: ('sendto_syscall', (6, '\\225\\11\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\0026...', 0, '', 0), (44, None))
[Don't Care] trace A: ('poll_syscall', ([6], [], [], 5000), (([6], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (6, '\\225\\22\\205\\200\\1\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\0027...', 1024, 0, '127.0.0.1', 53), (79, None))
trace A: ('close_syscall', (6,), (0, None))
trace A: ('getsockname_syscall', (4,), (('128.238.38.71', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (7, None))
[Don't Care] trace A: ('connect_syscall', (7, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [7], [], 0), (([], [7], []), None))
[Don't Care] trace A: ('sendto_syscall', (7, '\\5d\\11\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\00271\\00...', 0, '', 0), (44, None))
[Don't Care] trace A: ('poll_syscall', ([7], [], [], 5000), (([7], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (7, '\\5d\\205\\200\\1\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\1\\0\\0027...', 1024, 0, '127.0.0.1', 53), (79, None))
trace A: ('close_syscall', (7,), (0, None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 993605)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 993520)), ([], [4]))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (4, 'HTTP/1.1 200 OK \\r\\nDate: Wed, 2...', (258, None))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 992509)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 992434)), ([], [4]))
trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
trace B: ('recvfrom_syscall', (0, 'HTTP/1.1 200 OK \\r\\nDate: Wed, 2...', 511, 2, '', 0), (258, None))
trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \\r\\nDate: Wed, 2...', 258), (258, None))
trace A: ('write_syscall', (4, "Project Gutenberg's The Best Ame...", (4096, None))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 990764)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 990712)), ([], [4]))
trace A: ('write_syscall', (4, 'e first comments of settlers upo...', (4096, None))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 989454)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 989382)), ([], [4]))
[Call Rejected] trace A: ('write_syscall', (4, 'tly suggested by her story, _Mrs...'), (-1, 'ECONNRESET'))
=> CONN_NOT_CLOSED: The connection has not been closed yet.
[Notice] trace B: ('close_syscall', (0,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.
[Warning] trace A: ('write_syscall', (4, 'tly suggested by her story, _Mrs...'), (-1, 'ECONNRESET'))
=> EPIPE/ECONNRESET: The connection has been closed.
trace A: ('close_syscall', (4,), (0, None))
trace A: ('select_syscall', ([2], [], [], (1, 987008)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))

```

```

trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace A: ('close_syscall', (2,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket B0 (public address 128.238.38.67:49112) to socket A4 (public address 128.238.38.71:3005)
* Data sent to accepting socket A4: 126 bytes sent, 126 bytes received, 0 bytes lost
* Data sent to connected socket B0: 8450 bytes sent, 258 bytes received, 8192 bytes lost (96.95%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior
* [Possible Application Misbehavior] socket A4 failed to send some data because the connection was closed

```

Possible Problems Detected

```

* [Possible Application Misbehavior] Trace B has 1 TCP connection(s) to 128.238.38.71:3005 with data left in the buffers

```

For more details, adjust the variables defined in `trace_output.py` and `posix_output.py` to change the level of output

2.4 closethread

If a blocking call is in progress on a socket in one thread and another thread closes the same socket, will the thread in the blocking call know this and raise an exception, or will it continue to block forever? The behavior of the socket API in this situation varies across different implementations [12].

Trace Information:

- WEBrick server is listening on 128.238.66.220:3005.
- The client runs the following Ruby script:

```

#!/usr/bin/ruby

require 'socket'
require 'thread'

host = 'omfserver-witest.poly.edu'
port = 3005

@sock = TCPSocket.open host, port

```

```

x = Thread.new do
  sleep(5)
  @sock.close
  puts "Closed socket"
end

@sock = TCPSocket.open host, port

@sock.print "GET /file.txt HTTP/1.1\r\n"
@sock.puts "\r\n"
while line = @sock.readline
  #puts line.chop
end

@sock.close

```

To run NetCheck:

```
python netcheck.py wb-closethread.txt
```

For simplicity, repetitive calls or calls that are not relevant are omitted.

Configuration

```

host
  trace A: server (wb-closethread-server.trace)
  ip 128.238.66.220
host
  trace B: client (wb-closethread-client.trace)
  ip 128.238.255.159

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '127.0.0.1', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 60170), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('10.0.0.200', 60931), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 6), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
[Notice] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Call Rejected] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
.....
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.255.159', 46930), (3, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2), (0, None))
trace B: ('socket_syscall', (2, 1, 6), (1, None))
trace B: ('fcntl_syscall', (1, 4, 2050), (0, None))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A3, which is connected to socket B0 (public address 128.238.66.220:3005)
trace A: ('accept_syscall', (2, '128.238.255.159', 46930), (3, None))
trace A: ('fcntl_syscall', (3, 4, 2050), (0, None))
[Notice] trace B: ('connect_syscall', (1, '128.238.66.220', 3005), (-1, 'EINPROGRESS'))

```

```

=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
TCP socket B1 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (1, '128.238.66.220', 3005), (0, None))
trace B: ('fcntl_syscall', (1, 4, 2), (0, None))
trace B: ('write_syscall', (1, 'GET /file.txt HTTP/1.1\r\n\r\n'), (24, None))
trace B: ('write_syscall', (1, '\r\n\r\n'), (2, None))
[Call Rejected] trace B: ('select_syscall', ([1], [], [], (4, 997056)), ([1], []))
=> NETWORK_ERROR_B1: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (3,), (('128.238.255.159', 46930), None))
trace A: ('socket_syscall', (2, 2050, 0), (4, None))
trace A: ('close_syscall', (4,), (0, None))
trace A: ('select_syscall', ([3], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 3], [], [], (0, 499756)), ([2], []))
trace A: ('select_syscall', ([2, 3], [], [], (0, 499633)), ([2], []))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A5, which is connected to socket B1 (public address 128.238.66.220:3005)
trace A: ('accept_syscall', (2, '128.238.255.159', 46931), (5, None))
trace A: ('fcntl_syscall', (5, 4, 2050), (0, None))
[Call Rejected] trace B: ('select_syscall', ([1], [], [], (4, 997056)), ([1], []))
=> NETWORK_ERROR_B1: [Possible Network Misbehavior] No data 'in the air' but select sees something.
.....
trace A: ('write_syscall', (5, 'HTTP/1.1 200 OK \r\n\r\nServer: WEBr...'), (258, None))
trace B: ('select_syscall', ([1], [], [], (4, 997056)), ([1], []))
trace B: ('read_syscall', (1, 'HTTP/1.1 200 OK \r\n\r\nServer: WEBr...'), (4096), (258, None))
[Call Rejected] trace B: ('select_syscall', ([1], [], [], (4, 986376)), ([1], []))
=> NETWORK_ERROR_B1: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (5, "Project Gutenberg's The Best Ame..."), (4096, None))
trace B: ('select_syscall', ([1], [], [], (4, 986376)), ([1], []))
trace B: ('read_syscall', (1, "Project Gutenberg's The Best Ame...", (4096), (1448, None))
trace B: ('select_syscall', ([1], [], [], (4, 982218)), ([1], []))
trace B: ('read_syscall', (1, 'es that did not contain the elem...', (4096), (1448, None))
trace B: ('select_syscall', ([1], [], [], (4, 981606)), ([1], []))
trace B: ('read_syscall', (1, 'fore \r\n\r\n"professional\r\n\r\nliterary ...', (4096), (1200, None))
[Call Rejected] trace B: ('select_syscall', ([1], [], [], (4, 981106)), ([1], []))
=> NETWORK_ERROR_B1: [Possible Network Misbehavior] No data 'in the air' but select sees something.
.....
trace A: ('write_syscall', (5, '-tm\r\n\r\n\r\nProject Gutenberg-tm ...'), (4096, None))
trace B: ('select_syscall', ([1], [], [], (0, 5306)), ([1], []))
trace B: ('read_syscall', (1, '-tm\r\n\r\n\r\nProject Gutenberg-tm ...'), (4096), (1448, None))
trace B: ('select_syscall', ([1], [], [], (0, 2801)), ([1], []))
trace B: ('read_syscall', (1, 'eductible to the full extent\r\n\r\n...', (4096), (1448, None))
trace B: ('select_syscall', ([1], [], [], (0, 2477)), ([1], []))
trace B: ('read_syscall', (1, ' up\r\n\r\nwith these requirements. ...', (4096), (1200, None))
trace B: ('select_syscall', ([1], [], [], (0, 1991)), (0, 'Timeout'))
trace B: ('select_syscall', ([1], [], [], (0, 0)), (0, 'Timeout'))
[Warning] trace A: ('write_syscall', (5, 'h anyone. For thirty years, he ...'), (4096, None))
=> NETWORK_ERROR_B1: [Possible Network Misbehavior] Poll/Select returned nothing although there is 'data in the air'!!
[Call Rejected] trace A: ('write_syscall', (5, ' standard.\r\n\r\n\r\n\r\nIn view of the...'), (-1, 'EPIPE'))
=> CONN_NOT_CLOSED: The connection has not been closed yet.
[Notice] trace B: ('close_syscall', (1,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.
[Warning] trace A: ('write_syscall', (5, ' standard.\r\n\r\n\r\n\r\nIn view of the...'), (-1, 'EPIPE'))
=> EPIPE/ECONNRESET: The connection has been closed.
[Call Rejected] trace A: ('select_syscall', ([2, 3], [], [], (0, 0)), ([3], []))
=> NETWORK_ERROR_A3: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('close_syscall', (0,), (0, None))
trace A: ('select_syscall', ([2, 3], [], [], (0, 0)), ([3], []))
trace A: ('select_syscall', ([2, 3], [], [], (0, 0)), ([3], []))
trace A: ('close_syscall', (5,), (0, None))
trace A: ('select_syscall', ([2, 3], [], [], (1, 17322)), ([3], []))
trace A: ('read_syscall', (3, '', 4096), (0, None))
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (1, 16377)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('close_syscall', (2,), (0, None))

```

Done

TCP Connection Statistics

```
Connection from socket B0 (public address 128.238.255.159:46930) to socket A3 (public address 128.238.66.220:3005)
* Data sent to accepting socket A3: 0 bytes sent, 0 bytes received, 0 bytes lost
* Data sent to connected socket B0: 0 bytes sent, 0 bytes received, 0 bytes lost
Connection from socket B1 (public address 128.238.255.159:46931) to socket A5 (public address 128.238.66.220:3005)
* Data sent to accepting socket A5: 26 bytes sent, 26 bytes received, 0 bytes lost
* Data sent to connected socket B1: 4428034 bytes sent, 4423938 bytes received, 4096 bytes lost (0.09%)
* [Ambiguous Misbehavior] Data loss may be due to network conditions, such as filtering or network delay,
  but may also be due to delay in application itself
* [Possible Application Misbehavior] socket A5 failed to send some data because the connection was closed
```

Possible Problems Detected

```
* [Ambiguous Misbehavior] Trace B has 1 TCP connection(s) to 128.238.66.220:3005 with unreceived data
  not detected by poll or select
```

For more details, adjust the variables defined in `trace_output.py` and `posix_output.py` to change the level of output

2.5 conn0

The semantics of the address 0.0.0.0 varies across platforms. On Mac / Linux platforms, packets addressed to 0.0.0.0 are routed to the loopback interface (127.0.0.1). On Windows hosts, the address 0.0.0.0 is not valid as a destination address, and raises an error [13, 14].

Trace Information:

- Server is at IPv4 address 128.238.66.220, and is running a WEBrick server that is listening on 0.0.0.0, port 3005.
- Client runs the following script (note that we must use a custom script rather than a tool like `wget`. `wget` will throw an error at the address 0.0.0.0, but it is an application-layer error):

```
#!/usr/bin/ruby1.9.1

require 'socket'
require 'thread'

host = '0.0.0.0'
port = 3005

@sock = TCPSocket.open host, port
@sock.print "GET /index.html\r\n"
#@sock.print "GET /index.html HTTP/1.1\r\n"
@sock.print "\r\n"

while line = @sock.readline
  puts line
  break if @sock.eof?
end

@sock.shutdown
```

To run NetCheck:

```
python netcheck.py wb-conn0.txt
```

Client trace:


```

socket(PF_INET, SOCK_STREAM, IPPROTO_TCP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
write(5, "GET /index.html\r\n", 17) = 17
write(5, "\r\n", 2) = 2
read(5, "<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" http://www.w3.org/TR/html4/loose.dtd">\n<html>\n<head>\n<title>Local Web Page</title>\n</head>\n<body>\nHi there\n</body>\n</html>\n", 8192) = 187
read(5, "", 8192) = 0
shutdown(5, 2 /* send and receive */) = 0
close(5) = 0

```

Server trace:

```

socket(PF_INET6, SOCK_DGRAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET6, sin6_port=htons(3005), inet_pton(AF_INET6, "::", &sin6_addr), sin6_flowinfo=0, sin6_scope_id=0}, 28) = 0
getsockname(3, {sa_family=AF_INET6, sin6_port=htons(57237), inet_pton(AF_INET6, "::1", &sin6_addr), sin6_flowinfo=0, sin6_scope_id=0}, [28]) = 0
connect(3, {sa_family=AF_UNSPEC, sa_data="\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"}, 16) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
getsockname(3, {sa_family=AF_INET6, sin6_port=htons(55760), inet_pton(AF_INET6, "::ffff:127.0.0.1", &sin6_addr), sin6_flowinfo=0, sin6_scope_id=0}, [28]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM|SOCK_NONBLOCK, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
poll([{fd=3, events=POLLOUT}], 1, 0) = 1 ([fd=3, revents=POLLOUT])
sendto(3, "\2761\1\0\0\1\0\0\0\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0\0\0\1", 38, MSG_NOSIGNAL, NULL, 0) = 38
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "\2761\205\203\0\1\0\0\0\1\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0\0\0\1\0010\7in-addr\4arpa\0\0\6\0\1\0\0\16\20\0006\nwins-vm-01\4poly\3edu\0\nhostmaster\300K\0\0\0\1\0\0\3\204\0\0\2X\0\1Q\200\0\0\16\20", 1024, 0, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("127.0.0.1")}, [16]) = 118
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_TCP) = 3
setsockopt(3, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
listen(3, 5) = 0
fcntl(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(3, F_GETFD) = 0
socket(PF_INET6, SOCK_STREAM, IPPROTO_TCP) = 4
setsockopt(4, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(4, {sa_family=AF_INET6, sin6_port=htons(3005), inet_pton(AF_INET6, "::", &sin6_addr), sin6_flowinfo=0, sin6_scope_id=0}, 28) = -1 EADDRINUSE (Address already in use)
close(4) = 0
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 1 (in [3], left {0, 762191})
accept(3, {sa_family=AF_INET, sin_port=htons(39321), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
fcntl(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
fcntl(4, F_GETFD) = 0
getpeername(4, {sa_family=AF_INET, sin_port=htons(39321), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
select(6, [4], [], [], {0, 0}) = 1 (in [4], left {0, 0})
select(6, [3 4], [], [], {0, 499814}) = 1 (in [4], left {0, 499807})
select(5, [3 4], [], [], {1, 999842}) = 1 (in [4], left {1, 999836})
read(4, "GET /index.html\r\n\r\n", 4096) = 19
getpeername(4, {sa_family=AF_INET, sin_port=htons(39321), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
getsockname(4, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
write(4, "<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" http://www.w3.org/TR/html4/loose.dtd">\n<html>\n<head>\n<title>Local Web Page</title>\n</head>\n<body>\nHi there\n</body>\n</html>\n", 187) = 187

```

```

close(4) = 0
select(5, [3], [], [], {1, 991553}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = ? ERESTARTNOHAND (To be restarted)
--- SIGINT (Interrupt) @ 0 (0) ---
close(3) = 0

```

NetCheck output:

Configuration

```

ignore 127.0.0.1,53
host
trace A: server (wb-conn0-server.trace)
trace B: client (wb-conn0-client.trace)

```

Verifying Traces

```

trace A: ('socket_syscall', (30, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '::-', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::1', 57237), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('connect_syscall', (0, '0.0.0.0', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::ffff:127.0.0.1', 55760), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), ([[], [1], []], None))
[Don't Care] trace A: ('sendto_syscall', (1, '\\2761\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0010\\0...', 0, '', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), ([[], [1], []], None))
[Don't Care] trace A: ('recvfrom_syscall', (1, '\\2761\\205\\203\\0\\1\\0\\0\\1\\0\\0\\00...', 1024, 0, '127.0.0.1', 53), (118, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 6), (0, None))
[Call Rejected] trace B: ('connect_syscall', (0, '0.0.0.0', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (3, None))
trace A: ('setsockopt_syscall', (3, 65535, 4, 1), (0, None))
[Notice] trace A: ('bind_syscall', (3, '::-', 3005), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '127.0.0.1', 39321), (4, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 0.0.0.0:3005)
* [Warning] Peer is an unspecified address '0.0.0.0', which is not portable
trace B: ('connect_syscall', (0, '0.0.0.0', 3005), (0, None))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A4, which is connected to socket B0 (public address 127.0.0.1:39321)
trace A: ('accept_syscall', (2, '127.0.0.1', 39321), (4, None))
trace A: ('fcntl_syscall', (4, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET /index.html\r\n'), (17, None))
trace B: ('write_syscall', (0, '\r\n'), (2, None))
[Call Rejected] trace B: ('read_syscall', (0, '<!DOCTYPE html PUBLIC "-//W3C//...', 8192), (187, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('getpeername_syscall', (4,), (('127.0.0.1', 39321), None))
trace A: ('select_syscall', ([4], [], [], (0, 0)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (0, 499814)), ([4], []))

```

```

trace A: ('select_syscall', ([2, 4], [], [], (1, 999842)), ([4], []))
trace A: ('read_syscall', (4, 'GET /index.html\r\n\r\n', 4096), (19, None))
[Call Rejected] trace B: ('read_syscall', (0, '<!DOCTYPE html PUBLIC "-//W3C//...', 8192), (187, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('getpeername_syscall', (4,), (('127.0.0.1', 39321), None))
trace A: ('getsockname_syscall', (4,), (('127.0.0.1', 3005), None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 994143)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 993989)), ([], [4]))
[Call Rejected] trace B: ('read_syscall', (0, '<!DOCTYPE html PUBLIC "-//W3C//...', 8192), (187, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('write_syscall', (4, '<!DOCTYPE html PUBLIC "-//W3C//...', (187, None))
trace B: ('read_syscall', (0, '<!DOCTYPE html PUBLIC "-//W3C//...', 8192), (187, None))
[Call Rejected] trace B: ('read_syscall', (0, '', 8192), (0, None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.
trace A: ('close_syscall', (4,), (0, None))
trace A: ('select_syscall', ([2], [], [], (1, 991553)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace B: ('read_syscall', (0, '', 8192), (0, None))
trace A: ('close_syscall', (2,), (0, None))
trace B: ('shutdown_syscall', (0, 2), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket B0 (public address 127.0.0.1:39321) to socket A4 (public address 0.0.0.0:3005)
* Data sent to accepting socket A4: 19 bytes sent, 19 bytes received, 0 bytes lost
* Data sent to connected socket B0: 187 bytes sent, 187 bytes received, 0 bytes lost

```

Possible Problems Detected

```
* None
```

2.6 firewall

In this experiment, the server is configured with iptables rules to drop incoming traffic from the client. Note that the results would be different if the firewall was configured to reject traffic rather than drop traffic.

Trace Information:

- The server is at IP address 128.238.66.220, and is listening with WEBrick server on port 3009. The following iptables rules were set on the server:

```
iptables -I INPUT -p tcp --destination-port 3009 -s 128.238.255.159 -j DROP
```
- The client is at 128.238.255.159 and uses wget to download a file from the WEBrick server at 128.238.66.220:3009.

To run NetCheck:

```
python netcheck.py wb-firewall.txt
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(3009), sin_addr=inet_addr("128.238.66.220")}, 16)
= ? ERESTARTSYS (To be restarted)
close(3)
= 0

```

Server trace:

```

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(55115), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
connect(3, {sa_family=AF_UNSPEC, sa_data="\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"}, 16) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("10.0.0.200")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(35876), sin_addr=inet_addr("10.0.0.200")}, [16]) = 0
close(3)
= 0
socket(PF_INET, SOCK_DGRAM|SOCK_NONBLOCK, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("10.0.0.200")}, 16) = 0
poll([{fd=3, events=POLLOUT}], 1, 0) = 1 ([fd=3, revents=POLLOUT])
send(3, "\330\1\0\0\1\0\0\0\0\0\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0\0\0\1", 38, MSG_NOSIGNAL) = 38
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "\330\201\203\0\1\0\0\0\0\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0\0\0\1", 1024, 0,
{sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("10.0.0.200")}, [16]) = 38
close(3)
= 0
socket(PF_INET, SOCK_STREAM, IPPROTO_TCP) = 3
setsockopt(3, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(3, {sa_family=AF_INET, sin_port=htons(3009), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
listen(3, 5)
= 0
fcntl64(3, F_GETFL)
= 0x2 (flags O_RDWR)
fcntl64(3, F_GETFL)
= 0x2 (flags O_RDWR)
fcntl64(3, F_GETFD)
= 0
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = ? ERESTARTNOHAND (To be restarted)
close(3)
= 0

```

NetCheck output:

Configuration

```

host
trace A: server (wb-firewall-server.trace)
ip 128.238.66.220
host
trace B: client (wb-firewall-client.trace)
ip 128.238.255.159

```

Verifying Traces

```

trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '127.0.0.1', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 55115), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
[Don't Care] trace A: ('connect_syscall', (0, '10.0.0.200', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('10.0.0.200', 35876), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), (([], [1], []), None))
[Don't Care] trace A: ('send_syscall', (1, '\330\1\0\0\1\0\0\0\0\0\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0\0\0\1', 38), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), (([1], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (1, '\330\201\203\0\1\0\0\0\0\0\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0\0\0\1', 1024, 0, '10.0.0.200', 53), (38, None))

```

```

trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3009), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Warning] trace B: ('connect_syscall', (0, '128.238.66.220', 3009), (-1, 'ERESTARTSYS'))
=> UNEXPECTED_FAILURE: TCP connect failed with an unexpected error.
trace B: ('close_syscall', (0,), (0, None))
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace A: ('close_syscall', (2,), (0, None))

```

Done

Network Configuration Issues

```

Trace B failed to connect to 128.238.66.220:3009 1 time(s) with an unknown error
This address matches server socket A2, which was bound to 0.0.0.0:3009

```

Possible Problems Detected

```

* [Possible Network Misbehavior] One or more connects failed with an unknown error.
This may be due to something filtering connection, for example a firewall.

```

For more details, adjust the variables defined in `trace_output.py` and `posix_output.py` to change the level of output

2.7 gethostbyaddr

This experiment shows a limitation of NetCheck with regard to socket API calls that are not native system calls. In this experiment, a `gethostbyaddr` call hangs for some time and then returns NULL.

However, `gethostbyaddr` it is not a native system call, it calls a library routine (e.g., `avahi` on Ubuntu Linux). NetCheck only models native system calls, so it cannot detect this issue.

To run NetCheck:

```
python netcheck.py wb-avahi.txt
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("128.238.66.220")}, 16) = 0
select(4, NULL, [3], NULL, {900, 0}) = 1 (out [3], left {899, 999993})
write(3, "GET /index.html HTTP/1.1\r\nUser-Agent: Wget/1.13.4 (linux-gnu)\r\nAccept: */*\r\nHost:
128.238.66.220:3005\r\nConnection: Keep-Alive\r\n\r\n", 129) = 129
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 984248})
recvfrom(3, "HTTP/1.1 200 OK \r\nEtag: 4a6055-bf-5005a367\r\nConnection: Keep-Alive\r\nDate:
Tue, 17 Jul 2012 17:40:25 GMT\r\nContent-Length: 191\r\nLast-Modified: Tue, 17 Jul 2012
17:39:51 GMT\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2010-08-16)\r\nContent-Type: text/html\r\n\r\n",
511, MSG_PEEK, NULL, NULL) = 246
read(3, "HTTP/1.1 200 OK \r\nEtag: 4a6055-bf-5005a367\r\nConnection: Keep-Alive\r\nDate: Tue, 17 Jul 2012
17:40:25 GMT\r\nContent-Length: 191\r\nLast-Modified: Tue, 17 Jul 2012 17:39:51 GMT\r\nServer:
WEBrick/1.3.1 (Ruby/1.8.7/2010-08-16)\r\nContent-Type: text/html\r\n\r\n", 246) = 246
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 999994})
read(3, "<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">\n<html>\n<head>\n<title>Sample web page</title>\n</head>\n<body>\nHello World\n</body>

```

Verifying Traces

```
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '127.0.0.1', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 48037), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
[Don't Care] trace A: ('connect_syscall', (0, '10.0.0.200', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('10.0.0.200', 52789), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), (([], [1], []), None))
[Don't Care] trace A: ('send_syscall', (1, 'Y\\6\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\001001...', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), (([1], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (1, 'Y\\6\\205\\203\\0\\1\\0\\0\\0\\1\\0\\001001...',
1024, 0, '10.0.0.200', 53), (117, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Call Rejected] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.255.159', 51743), (3, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
[Don't Care] trace B: ('select_syscall', ([], [0], [], (900, 0)), ([], [0]))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A3, which is connected to socket B0
(public address 128.238.255.159:51743)
trace A: ('accept_syscall', (2, '128.238.255.159', 51743), (3, None))
trace A: ('fcntl_syscall', (3, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET /index.html HTTP/1.1\\r\\nUser...', (129, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (3,), (('128.238.255.159', 51743), None))
trace A: ('socket_syscall', (2, 2050, 0), (4, None))
[Don't Care] trace A: ('connect_syscall', (4, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [4], [], 0), (([], [4], []), None))
[Don't Care] trace A: ('send_syscall', (4, '\\311\\204\\1\\0\\0\\1\\0\\0\\0\\0\\0\\003...', 0), (46, None))
[Don't Care] trace A: ('poll_syscall', ([4], [], [], 5000), (([4], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (4, '\\311\\204\\201\\200\\0\\1\\0\\0\\1\\0\\0\\0...',
1024, 0, '10.0.0.200', 53), (81, None))
trace A: ('close_syscall', (4,), (0, None))
trace A: ('select_syscall', ([3], [], [], (0, 0)), ([3], []))
trace A: ('select_syscall', ([2, 3], [], [], (0, 499774)), ([3], []))
trace A: ('select_syscall', ([2, 3], [], [], (1, 999836)), ([3], []))
trace A: ('read_syscall', (3, 'GET /index.html HTTP/1.1\\r\\nUser...', 4096), (129, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (3,), (('128.238.255.159', 51743), None))
trace A: ('socket_syscall', (2, 2050, 0), (5, None))
[Don't Care] trace A: ('connect_syscall', (5, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [5], [], 0), (([], [5], []), None))
[Don't Care] trace A: ('send_syscall', (5, 'q\\313\\1\\0\\0\\1\\0\\0\\0\\0\\0\\003159...', 0), (46, None))
[Don't Care] trace A: ('poll_syscall', ([5], [], [], 5000), (([5], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (5, 'q\\313\\201\\200\\0\\1\\0\\0\\1\\0\\0\\0...',
1024, 0, '10.0.0.200', 53), (81, None))
trace A: ('close_syscall', (5,), (0, None))
trace A: ('getsockname_syscall', (3,), (('128.238.66.220', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (6, None))
[Don't Care] trace A: ('connect_syscall', (6, '10.0.0.200', 53), (0, None))
```



```

[Don't Care] trace A: ('poll_syscall', ([], [6], [], 0), (([], [6], []), None))
[Don't Care] trace A: ('send_syscall', (6, 'i\\250\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0\\003220...', 0), (45, None))
[Don't Care] trace A: ('poll_syscall', ([6], [], [], 5000), (([6], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (6, 'i\\250\\204\\203\\0\\1\\0\\0\\0\\0\\1\\0\\0\\00...', 1024, 0, '10.0.0.200', 53), (115, None))
trace A: ('close_syscall', (6,), (0, None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [3], [], (1, 989068)), ([], [3]))
[Don't Care] trace A: ('select_syscall', ([2], [3], [], (1, 988947)), ([], [3]))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (3, 'HTTP/1.1 200 OK \\r\\nEtag: 4a6055...', (246, None))
[Don't Care] trace A: ('select_syscall', ([2], [3], [], (1, 988161)), ([], [3]))
[Don't Care] trace A: ('select_syscall', ([2], [3], [], (1, 988052)), ([], [3]))
trace B: ('recvfrom_syscall', ([0], [], [], (900, 0)), ([0], []))
trace B: ('recvfrom_syscall', (0, 'HTTP/1.1 200 OK \\r\\nEtag: 4a6055...', 511, 2, '', 0), (246, None))
trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \\r\\nEtag: 4a6055...', 246), (246, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (3, '<!DOCTYPE html PUBLIC "-//W3C//...', (191, None))
[Call Rejected] trace A: ('select_syscall', ([2], [3], [], (0, 499951)), ([3], []))
=> NETWORK_ERROR_A3: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
[Call Rejected] trace A: ('select_syscall', ([2], [3], [], (0, 499951)), ([3], []))
=> NETWORK_ERROR_A3: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('read_syscall', (0, '<!DOCTYPE html PUBLIC "-//W3C//...', 191), (191, None))
[Call Rejected] trace A: ('select_syscall', ([2], [3], [], (0, 499951)), ([3], []))
=> NETWORK_ERROR_A3: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('close_syscall', (0,), (0, None))
trace A: ('select_syscall', ([2], [3], [], (0, 499951)), ([3], []))
trace A: ('select_syscall', ([2], [3], [], (1, 983753)), ([3], []))
trace A: ('read_syscall', (3, '', 4096), (0, None))
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (1, 982705)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace A: ('close_syscall', (2,), (0, None))

```

Done

TCP Connection Statistics

Connection from socket B0 (public address 128.238.255.159:51743) to socket A3 (public address 128.238.66.220:3005)
* Data sent to accepting socket A3: 129 bytes sent, 129 bytes received, 0 bytes lost
* Data sent to connected socket B0: 437 bytes sent, 437 bytes received, 0 bytes lost

Possible Problems Detected

* None

2.8 httpprox1

In this experiment, the client is configured to use an HTTP proxy instead of accessing the WEBrick server directly. From the network traffic point of view, this looks similar to a client using a NAT.

Trace Information:

- The server is at IP address 128.238.38.71, and is listening with WEBrick server on port 3005.
- The client is at configured to use a proxy for HTTP connections. The HTTP proxy is running on port and has address 10.0.0.200 on the network facing the client, and 128.238.66.220 on network facing the server.

To run NetCheck:

```
python netcheck.py wb-httpprox1.txt
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(3128), sin_addr=inet_addr("10.0.0.200")}, 16) = 0
select(4, NULL, [3], NULL, {900, 0}) = 1 (out [3], left {899, 999990})
write(3, "GET http://128.238.38.71:3005/index.html HTTP/1.0\r\nUser-Agent: Wget/1.12 (linux-gnu)\r\nAccept:
*/*\r\nHost: 128.238.38.71:3005\r\n\r\n", 127) = 127
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 989750})
recv(3, "HTTP/1.0 200 OK\r\nContent-Length: 84\r\nContent-Type: text/html\r\nETag: 12829c-54-500da7a2\r\nDate:
Wed, 25 Jul 2012 23:39:39 GMT\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2011-06-30)\r\nLast-Modified: Mon, 23
Jul 2012 19:36:02 GMT\r\nX-Cache: MISS from localhost\r\nX-Cache-Lookup: MISS from localhost:3128\r\nVia:
1.0 localhost (squid/3.1.11)\r\nConnection: close\r\n\r\n", 511, MSG_PEEK) = 346
read(3, "HTTP/1.0 200 OK\r\nContent-Length: 84\r\nContent-Type: text/html\r\nETag: 12829c-54-500da7a2\r\nDate:
Wed, 25 Jul 2012 23:39:39 GMT\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2011-06-30)\r\nLast-Modified: Mon, 23
Jul 2012 19:36:02 GMT\r\nX-Cache: MISS from localhost\r\nX-Cache-Lookup: MISS from localhost:3128\r\nVia:
1.0 localhost (squid/3.1.11)\r\nConnection: close\r\n\r\n", 346) = 346
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 999990})
read(3, "<html>\n<head>\n<title>Local Web Page</title>\n</head>\n<body>\nHi there\n</body>\n</html>\n", 84) = 84
close(3) = 0
```

Server trace:

```
socket(PF_INET6, SOCK_DGRAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET6, sin6_port=htons(3005), inet_pton(AF_INET6, ":", &sin6_addr), sin6_flowinfo=0,
sin6_scope_id=0}, 28) = 0
getsockname(3, {sa_family=AF_INET6, sin6_port=htons(52189), inet_pton(AF_INET6, "::1", &sin6_addr), sin6_flowinfo=0,
sin6_scope_id=0}, [28]) = 0
connect(3, {sa_family=AF_UNSPEC, sa_data="\0\0\0\0\0\0\0\0\0\0\0\0"}, 16) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
getsockname(3, {sa_family=AF_INET6, sin6_port=htons(59543), inet_pton(AF_INET6, "::ffff:127.0.0.1", &sin6_addr),
sin6_flowinfo=0, sin6_scope_id=0}, [28]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM|SOCK_NONBLOCK, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
poll([{fd=3, events=POLLOUT}], 1, 0) = 1 ([fd=3, revents=POLLOUT])
sendto(3, "y\270\1\0\0\1\0\0\0\0\0\0010\0010\0010\0010\0010\7in-addr\4arpa\0\0\0\0\1", 38, MSG_NOSIGNAL, NULL, 0) = 38
poll([{fd=3, events=POLLIN}], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "y\270\205\203\0\1\0\0\0\1\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0\0\0\1\0010\7in-addr\4arpa\0\0\0\0\6
\0\1\0\0\16\20\0006\nwins-vm-01\4poly\3edu\0\nhostmaster\300K\0\0\0\1\0\0\3\204\0\0\2X\0\1Q\200\0\0\16\20",
1024, 0, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("127.0.0.1")}, [16]) = 118
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_TCP) = 3
```



```

12829c-54-500da7a2\r\nDate: Wed, 25 Jul 2012 23:39:39 GMT\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2011-06-30)
\r\nLast-Modified: Mon, 23 Jul 2012 19:36:02 GMT\r\n\r\n", 245) = 245
select(6, [3 5], [], [], {1, 993541}) = 1 (in [5], left {1, 993537})
select(6, [3 5], [], [], {1, 993487}) = 1 (in [5], left {1, 993463})
read(5, "<html>\n<head>\n<title>Local Web Page</title>\n</head>\n<body>\nHi there\n</body>\n</html>\n", 4096) = 84
select(6, [3], [4], [], {1, 993197}) = 1 (out [4], left {1, 993191})
select(6, [3], [4], [], {1, 993142}) = 1 (out [4], left {1, 993138})
write(4, "<html>\n<head>\n<title>Local Web Page</title>\n</head>\n<body>\nHi there\n</body>\n</html>\n", 84) = 84
close(5) = 0
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(6, [4], [], [], {0, 0}) = 0 (Timeout)
close(3) = 0

```

NetCheck output:

Configuration

```

ignore 127.0.0.1,53
host
trace A: server (wb-httpprox1-server.trace)
ip 128.238.38.71
host
trace B: client (wb-httpprox1-client.trace)
ip 128.238.38.67

```

Verifying Traces

```

trace A: ('socket_syscall', (30, 2, 0), (0, None))
trace A: ('connect_syscall', (0, ':', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::1', 52189), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('connect_syscall', (0, '0.0.0.0', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::ffff:127.0.0.1', 59543), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), (([], [1], []), None))
[Don't Care] trace A: ('sendto_syscall', (1, 'y\270\1\0\0\1\0\0\0\0\0\0\0\0010\0...', 0, '', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), (([1], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (1, 'y\270\205\203\0\1\0\0\0\1\0\0\00...',
1024, 0, '127.0.0.1', 53), (118, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Don't Care] trace B: ('connect_syscall', (0, '10.0.0.200', 3128), (0, None))
[Don't Care] trace B: ('select_syscall', ([], [0], [], (900, 0)), ([], [0]))
[Don't Care] trace B: ('write_syscall', (0, 'GET http://128.238.38.71:3005/in...', (127, None))
[Don't Care] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
[Don't Care] trace B: ('recv_syscall', (0, 'HTTP/1.0 200 OK\r\nContent-Lengt...', 511, 2), (346, None))
[Don't Care] trace B: ('read_syscall', (0, 'HTTP/1.0 200 OK\r\nContent-Lengt...', 346), (346, None))
[Don't Care] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
[Don't Care] trace B: ('read_syscall', (0, '<html>\n<head>\n<title>Local Web...', 84), (84, None))
[Don't Care] trace B: ('close_syscall', (0,), (0, None))
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (3, None))
trace A: ('setsockopt_syscall', (3, 65535, 4, 1), (0, None))
[Notice] trace A: ('bind_syscall', (3, ':', 3005), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Don't Care] trace A: ('accept_syscall', (2, '128.238.66.220', 40607), (4, None))
[Don't Care] trace A: ('fcntl_syscall', (4, 4, 2050), (0, None))

```



```

trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2, 4], [], [], (0, 499998)), (-1, 'ERESTARTNOHAND'))
[Don't Care] trace A: ('select_syscall', ([4], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('close_syscall', (2,), (0, None))
[Don't Care] trace A: ('select_syscall', ([4], [], [], (0, 337426)), (-1, 'EBADF'))
[Don't Care] trace A: ('select_syscall', ([4], [], [], (0, 337057)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([4], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('close_syscall', (4,), (0, None))

```

Done

Network Configuration Issues

These traces have network activity, but do not appear to communicate with other traces: A, B
 * This may indicate that they are behind a NAT
 * It is also possible that there is a third party acting as a proxy or forwarding traffic

Please check if there are any NATs present which are not explicitly declared in the configuration file
 * If so, add them to configuration file and rerun NetCheck

Possible Problems Detected

* There may be one or more NATs not declared in the configuration file

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

2.9 httpprox2

In this experiment, the client is configured to use an HTTP proxy instead of accessing the WEBrick server directly. This time, the HTTP proxy already has a cached copy of the document, so it does not contact the WEBrick server at all. From the network traffic point of view, this looks similar to the case where the “wrong” server responds to a request

Trace Information:

- The server is at IP address 128.238.38.71, and is listening with WEBrick server on port 3005.
- The client is at configured to use a proxy for HTTP connections.
- The HTTP proxy is running on port and has address 10.0.0.200 on the network facing the client, and 128.238.66.220 on network facing the server.

To run NetCheck:

```
python netcheck.py wb-httpprox2.txt
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(3128), sin_addr=inet_addr("10.0.0.200")}, 16) = 0
select(4, NULL, [3], NULL, {900, 0}) = 1 (out [3], left {899, 999989})
write(3, "GET http://128.238.38.71:3005/index.html HTTP/1.0\r\nUser-Agent: Wget/1.12 (linux-gnu)\r\nAccept:
  */*\r\nHost: 128.238.38.71:3005\r\n\r\n", 127) = 127
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 999563})
recv(3, "HTTP/1.0 200 OK\r\nContent-Length: 84\r\nContent-Type: text/html\r\nETag: 12829c-54-500da7a2\r\nDate:
  Wed, 25 Jul 2012 23:39:39 GMT\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2011-06-30)\r\nLast-Modified: Mon, 23
  Jul 2012 19:36:02 GMT\r\nAge: 14\r\nX-Cache: HIT from localhost\r\nX-Cache-Lookup: HIT from localhost:3128\r\nVia:
  1.0 localhost (squid/3.1.11)\r\nConnection: close\r\n\r\n<html>\n<head>\n<title>Local Web Page</title>\n</head>

```



```

trace A: ('socket_syscall', (30, 2, 0), (0, None))
trace A: ('connect_syscall', (0, ' '::', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::1', 59369), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('connect_syscall', (0, '0.0.0.0', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::ffff:127.0.0.1', 54817), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), (([], [1], []), None))
[Don't Care] trace A: ('sendto_syscall', (1, '\\234\\232\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0\\001...', 0, '', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), (([1], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (1, '\\234\\232\\205\\203\\0\\1\\0\\0\\0\\1\\0\\0...', 1024, 0, '127.0.0.1', 53), (118, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Don't Care] trace B: ('connect_syscall', (0, '10.0.0.200', 3128), (0, None))
[Don't Care] trace B: ('select_syscall', ([], [0], [], (900, 0)), ([], [0]))
[Don't Care] trace B: ('write_syscall', (0, 'GET http://128.238.38.71:3005/in...', (127, None))
[Don't Care] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
[Don't Care] trace B: ('recv_syscall', (0, 'HTTP/1.0 200 OK\\r\\nContent-Lengt...', 511, 2), (437, None))
[Don't Care] trace B: ('read_syscall', (0, 'HTTP/1.0 200 OK\\r\\nContent-Lengt...', 353), (353, None))
[Don't Care] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
[Don't Care] trace B: ('read_syscall', (0, '<html>\\n<head>\\n<title>Local Web...', 84), (84, None))
[Don't Care] trace B: ('close_syscall', (0,), (0, None))
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (3, None))
trace A: ('setsockopt_syscall', (3, 65535, 4, 1), (0, None))
[Notice] trace A: ('bind_syscall', (3, ' '::', 3005), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace A: ('close_syscall', (2,), (0, None))

```

Done

Network Configuration Issues

These traces have network activity, but do not appear to communicate with other traces: A, B
 * This may indicate that they are behind a NAT
 * It is also possible that there is a third party acting as a proxy or forwarding traffic

Please check if there are any NATs present which are not explicitly declared in the configuration file
 * If so, add them to configuration file and rerun NetCheck

Possible Problems Detected

* There may be one or more NATs not declared in the configuration file

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

2.10 keepalive

Some things appear to be network issues because the developer does not fully understand a platform or protocol — for example, differences in behavior be-


```

trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 6), (0, None))
[Call Rejected] trace B: ('connect_syscall', (0, '127.0.0.1', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or
refused the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (3, None))
trace A: ('setsockopt_syscall', (3, 65535, 4, 1), (0, None))
[Notice] trace A: ('bind_syscall', (3, '::', 3005), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '127.0.0.1', 39322), (4, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 127.0.0.1:3005)
trace B: ('connect_syscall', (0, '127.0.0.1', 3005), (0, None))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A4, which is connected to socket B0
(public address 127.0.0.1:39322)
trace A: ('accept_syscall', (2, '127.0.0.1', 39322), (4, None))
trace A: ('fcntl_syscall', (4, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET /index.html HTTP/1.1\r\n\r\n', (26, None))
trace B: ('write_syscall', (0, '\r\n\r\n', (2, None))
[Call Rejected] trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \r\n\r\nDate: Mon, 2...', 8192), (246, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('getpeername_syscall', (4,), (('127.0.0.1', 39322), None))
trace A: ('select_syscall', ([4], [], [], (0, 0)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (0, 499819)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (1, 999835)), ([4], []))
trace A: ('read_syscall', (4, 'GET /index.html HTTP/1.1\r\n\r\n\r\n', 4096), (28, None))
[Call Rejected] trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \r\n\r\nDate: Mon, 2...', 8192), (246, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('getpeername_syscall', (4,), (('127.0.0.1', 39322), None))
trace A: ('getsockname_syscall', (4,), (('127.0.0.1', 3005), None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 994165)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 994018)), ([], [4]))
[Call Rejected] trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \r\n\r\nDate: Mon, 2...', 8192), (246, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('write_syscall', (4, 'HTTP/1.1 200 OK \r\n\r\nDate: Mon, 2...', (246, None))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 993110)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 992974)), ([], [4]))
trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \r\n\r\nDate: Mon, 2...', 8192), (246, None))
[Call Rejected] trace B: ('read_syscall', (0, '<!DOCTYPE html PUBLIC "-//W3C//...', 8192), (187, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('write_syscall', (4, '<!DOCTYPE html PUBLIC "-//W3C//...', (187, None))
trace A: ('select_syscall', ([2, 4], [], [], (0, 499997)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (0, 499997)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (0, 499997)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (0, 488354)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([4], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (0, 10474)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (0, 499997)), (0, 'Timeout'))

```



```

trace A: ('select_syscall', ([2, 4], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([4], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], (0, 50328)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (0, 0)), (0, 'Timeout'))
trace B: ('read_syscall', (0, '<!DOCTYPE html PUBLIC "-//W3C/...', 8192), (187, None))
[Call Rejected] trace B: ('read_syscall', (0, '', 8192), (0, None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] Data 'in the air' or connection not
closed but recv/read returns 0 bytes.
trace A: ('close_syscall', (4,), (0, None))
trace A: ('select_syscall', ([2], [], (1, 947448)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], (2, 0)), (0, 'Timeout'))
trace B: ('read_syscall', (0, '', 8192), (0, None))
trace A: ('close_syscall', (2,), (0, None))
trace B: ('shutdown_syscall', (0, 2), (0, None))
trace B: ('close_syscall', (0,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket B0 (public address 127.0.0.1:39322) to socket A4 (public address 127.0.0.1:3005)
* Data sent to accepting socket A4: 28 bytes sent, 28 bytes received, 0 bytes lost
* Data sent to connected socket B0: 433 bytes sent, 433 bytes received, 0 bytes lost

```

Possible Problems Detected

```
* None
```

2.11 local

In this experiment, the client is misconfigured so that the hostname of the server on which WEBrick is hosted resolves to another address (in this case, the local 127.0.0.1 address). The client's HTTP request is answered, but not by the server it expects. This is a network error, and is classified as such by NetCheck.

To run NetCheck:

```
python netcheck.py wb-local.txt
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("128.238.66.220")}, 16) = 0
select(4, NULL, [3], NULL, {900, 0}) = 1 (out [3], left {899, 999996})
write(3, "GET /index.html HTTP/1.1\r\nUser-Agent: Wget/1.13.4 (linux-gnu)\r\nAccept: */*\r\nHost:
128.238.66.220:3005\r\nConnection: Keep-Alive\r\n\r\n", 129) = 129
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 998239})

```



```

trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
TCP socket B0 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
[Don't Care] trace B: ('select_syscall', ([], [0], [], (900, 0)), ([], [0]))
trace A: ('write_syscall', (0, 'GET /index.html HTTP/1.1\r\nUser...', (129, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('close_syscall', (2,), (0, None))
trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
[Call Rejected] trace B: ('recvfrom_syscall', (0, 'HTTP/1.1 200 OK \r\nContent-Type...', 511, 2, '', 0), (433, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the other side has not accepted
the connection yet.

```

```

No valid action:
[Error] trace B: ('recvfrom_syscall', (0, 'HTTP/1.1 200 OK \r\nContent-Type...', 511, 2, '', 0), (433, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the other side has not accepted
the connection yet.

```

Network Configuration Issues

```

TCP server socket A2 (private address 0.0.0.0:3005) has 1 unaccepted connection(s)
* There are 1 unaccepted connection(s) from trace B to 128.238.66.220:3005
* Since the traces could not be fully processed, this alone may not be significant
* The connecting sockets may have connected to an entirely different server socket

```

Possible Problems Detected

```

* The model failed to process the entire trace
* [Possible Network Misbehavior] Connections intended for the socket in trace A listening on 0.0.0.0:3005 may have
been accepted elsewhere

```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

2.12 max1

In this experiment, a WEBrick server is configured to only serve a single HTTP request at a time. Subsequent requests are not served until the first request is completed, and may time-out while waiting, but this should not raise an error.

Trace Information:

- The server is at 128.238.38.71 and is running a WEBrick server listening on port 3005.
- The WEBrick server is configured to only serve a single request at a time:

```
#!/usr/bin/ruby
```

```

require 'webrick'
include WEBrick
s = HTTPServer.new(
  :MaxClients => 1,
  :Port => 3005,
  :DocumentRoot => Dir::pwd
)
trap("INT"){ s.shutdown }
s.start

```

- A client at 128.238.38.67 connects to the server and starts downloading a large (10MB) file.
- While this first download is going on, a second client at 128.238.66.220 connects to the server and requests the same file. The client is configured to time out and give up if the server does not respond within 2 seconds:

```
wget -q0- --timeout=2 --tries=1 http://128.238.38.71:3005/index.html
```

To run NetCheck:

```
python netcheck.py wb-max1.txt
```

Configuration

```

ignore 127.0.0.1,53
host
  trace A: server (wb-max1-server.trace)
  ip 128.238.38.71
host
  trace B: client1 (wb-max1-client1.trace)
  ip 128.238.38.67
host
  trace C: client2 (wb-max1-client2.trace)
  ip 128.238.66.220

```

Verifying Traces

```

trace A: ('socket_syscall', (30, 2, 0), (0, None))
trace A: ('connect_syscall', (0, ':::', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), ((':::1', 51257), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('connect_syscall', (0, '0.0.0.0', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::ffff:127.0.0.1', 57482), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace C: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Call Rejected] trace C: ('connect_syscall', (0, '128.238.38.71', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the connection request.
[Call Rejected] trace B: ('connect_syscall', (0, '128.238.38.71', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (3, None))
trace A: ('setsockopt_syscall', (3, 65535, 4, 1), (0, None))

```

```

[Notice] trace A: ('bind_syscall', (3, '::', 3005), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.38.67', 48931), (4, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket C0 connecting to socket A2 (public address 128.238.38.71:3005)
trace C: ('connect_syscall', (0, '128.238.38.71', 3005), (0, None))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.38.67', 48931), (4, None))
=> NO_PENDING_CONN: There are no pending connections from that peer address.
trace C: ('write_syscall', (0, 'GET /index.html HTTP/1.0\r\nUser...', (126, None))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.38.67', 48931), (4, None))
=> NO_PENDING_CONN: There are no pending connections from that peer address.
trace C: ('select_syscall', ([0], [], [], (2, 0)), (0, 'Timeout'))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.38.67', 48931), (4, None))
=> NO_PENDING_CONN: There are no pending connections from that peer address.
TCP socket B0 connecting to socket A2 (public address 128.238.38.71:3005)
trace B: ('connect_syscall', (0, '128.238.38.71', 3005), (0, None))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A4, which is connected to socket B0
(public address 128.238.38.67:48931)
trace A: ('accept_syscall', (2, '128.238.38.67', 48931), (4, None))
trace A: ('fcntl_syscall', (4, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET /xaa HTTP/1.1\r\nUser-Agent:...', (121, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (2, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (4,), (('128.238.38.67', 48931), None))
trace A: ('socket_syscall', (2, 2050, 0), (5, None))
trace A: ('close_syscall', (5,), (0, None))
trace A: ('select_syscall', ([4], [], [], (0, 0)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (0, 499907)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (1, 999908)), ([4], []))
trace A: ('read_syscall', (4, 'GET /xaa HTTP/1.1\r\nUser-Agent:...', 4096), (121, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (2, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (4,), (('128.238.38.67', 48931), None))
trace A: ('socket_syscall', (2, 2050, 0), (6, None))
trace A: ('close_syscall', (6,), (0, None))
trace A: ('getsockname_syscall', (4,), (('128.238.38.71', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (7, None))
trace A: ('close_syscall', (7,), (0, None))
[Notice] trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
=> NETWORK_ERROR_A2: [Possible Network Misbehavior] Available connection but select sees nothing.
.....
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (2, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (4, 'HTTP/1.1 200 OK \r\nContent-Leng...', (270, None))
trace B: ('select_syscall', ([0], [], [], (2, 0)), ([0], []))
trace B: ('recvfrom_syscall', (0, 'HTTP/1.1 200 OK \r\nContent-Leng...', 511, 2, '', 0), (270, None))
trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \r\nContent-Leng...', 270), (270, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (2, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (4, "Project Gutenberg's The Best Ame...", (4096, None))
[Notice] trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
=> NETWORK_ERROR_A2: [Possible Network Misbehavior] Available connection but select sees nothing.
.....
[Notice] trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
=> NETWORK_ERROR_A2: [Possible Network Misbehavior] Available connection but select sees nothing.
.....
trace A: ('write_syscall', (4, ' not because Morris was\r\n\nespec...', (4096, None))
trace B: ('read_syscall', (0, '-especially the former--of\r\n\ngo...', 8192), (8192, None))
trace B: ('select_syscall', ([0], [], [], (2, 0)), ([0], []))
[Call Rejected] trace B: ('read_syscall', (0, 'well-balanced whole.\r\n\nStyle is...', 8192), (8192, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('write_syscall', (4, 'ter window in the second floor o...', (4096, None))
trace B: ('read_syscall', (0, 'nd was\r\n\nentirely unconscious o...', 8192), (8192, None))
trace B: ('select_syscall', ([0], [], [], (2, 0)), ([0], []))
[Call Rejected] trace B: ('read_syscall', (0, 'n the harness.\r\n\n\r\n\n"Then you...', 2864), (2864, None))

```


2.13 maxconn

In this test a client used the Apache benchmark tool to make multiple concurrent connections to a WEBrick HTTP server. Although this was done under 'normal' network conditions, NetCheck indicates (incorrectly) that a network error was present.

This reveals a limitation of NetCheck: when there are multiple non-blocking connect calls from a single client to a server, NetCheck cannot ordinarily match client-side sockets to its corresponding server-side socket, and may draw the wrong conclusions.

This limitation may be overcome by modifying the source code of the application so that the client calls `getsockname()` on every socket that connects to the server. Then both the client trace and the server trace includes the client port number, which makes connection matching trivial.

To run NetCheck:

```
python netcheck.py wb-maxconn.txt
```

Configuration

```
host
  trace A: server (wb-maxconn-server.trace)
  ip 128.238.66.220
host
  trace B: client (wb-maxconn-client.trace)
  ip 128.238.255.159
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '127.0.0.1', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 56900), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('10.0.0.200', 58809), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
[Notice] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
trace B: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Notice] trace B: ('connect_syscall', (1, '128.238.66.220', 3005), (-1, 'EINPROGRESS'))
=> OVERLAPPING_CONNECTIONS: This trace already has one or more nonblocking connects pending,
which may mean that the corresponding accepts are improperly matched.
[Call Rejected] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections
or refused the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.255.159', 44175), (3, None))
```

```

=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A3, which is connected to
socket B0 (public address 128.238.255.159:44175)
trace A: ('accept_syscall', (2, '128.238.255.159', 44175), (3, None))
trace A: ('fcntl_syscall', (3, 4, 2050), (0, None))
trace B: ('write_syscall', (0, ''), (0, None))
trace B: ('write_syscall', (0, 'GET /index.html HTTP/1.0\r\nHost...'), (97, None))
TCP socket B1 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (1, '128.238.66.220', 3005), (0, None))
trace B: ('write_syscall', (1, ''), (0, None))
trace B: ('write_syscall', (1, 'GET /index.html HTTP/1.0\r\nHost...'), (97, None))
TCP socket B2 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (2, '128.238.66.220', 3005), (0, None))
trace B: ('write_syscall', (2, ''), (0, None))
trace B: ('write_syscall', (2, 'GET /index.html HTTP/1.0\r\nHost...'), (97, None))
TCP socket B3 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (3, '128.238.66.220', 3005), (0, None))
trace B: ('write_syscall', (3, ''), (0, None))
trace B: ('write_syscall', (3, 'GET /index.html HTTP/1.0\r\nHost...'), (97, None))
.....
[Call Rejected] trace B: ('read_syscall', (2, 'HTTP/1.1 200 OK \r\nLast-Modifie...', 8192), (241, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because the other side
has not accepted the connection yet.
trace A: ('getpeername_syscall', (3,), (('128.238.255.159', 44175), None))
trace A: ('socket_syscall', (2, 2050, 0), (4, None))
trace A: ('close_syscall', (4,), (0, None))
[Warning] trace A: ('select_syscall', ([3], [], [], (0, 0)), (0, 'Timeout'))
=> NETWORK_ERROR_A3: [Possible Network Misbehavior] Data 'in the air' but select sees nothing.
.....
trace A: ('close_syscall', (12,), (0, None))
trace A: ('select_syscall', ([3, 5, 7, 9, 11], [], [], (0, 0)), ([3, 5, 7, 9], []))
.....
trace A: ('read_syscall', (9, 'GET /index.html HTTP/1.0\r\nHost...', 4096), (97, None))
[Call Rejected] trace B: ('read_syscall', (2, 'HTTP/1.1 200 OK \r\nLast-Modifie...', 8192), (241, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('getpeername_syscall', (9,), (('128.238.255.159', 44178), None))
trace A: ('socket_syscall', (2, 2050, 0), (13, None))
trace A: ('close_syscall', (13,), (0, None))
trace A: ('getsockname_syscall', (9,), (('128.238.66.220', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (14, None))
trace A: ('close_syscall', (14,), (0, None))
trace A: ('select_syscall', ([2, 3, 5, 7, 11], [], [], (0, 0)), ([2, 3, 5, 7, 11], []))
trace A: ('read_syscall', (7, 'GET /index.html HTTP/1.0\r\nHost...', 4096), (97, None))
.....
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], ()), ([2], []))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A23, which is connected to
socket B5 (public address 128.238.255.159:44180)
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.255.159', 44240), (103, None))
=> NO_PENDING_CONN: There are no pending connections.
trace B: ('close_syscall', (3,), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (50, None))
trace B: ('fcntl_syscall', (50, 4, 2050), (0, None))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.255.159', 44240), (103, None))
=> NO_PENDING_CONN: There are no pending connections.
[Notice] trace B: ('connect_syscall', (50, '128.238.66.220', 3005), (-1, 'EINPROGRESS'))
=> OVERLAPPING_CONNECTS: This trace already has one or more nonblocking connects pending,
which may mean that the corresponding accepts are improperly matched.
.....
trace A: ('close_syscall', (171,), (0, None))
[Warning] trace A: ('select_syscall', ([151], [], [], (0, 0)), (0, 'Timeout'))
=> NETWORK_ERROR_A151: [Possible Network Misbehavior] Data 'in the air' but select sees nothing.
.....
[Warning] trace B: ('read_syscall', (70, 'HTTP/1.1 200 OK \r\nLast-Modifie...', 8192), (241, None))
=> MSG_DONT_MATCH: [Possible Network Misbehavior] Message trying to be received does not match
the data already sent by socket B70. Ignoring future traffic on this connection since we can't recover.

```

```

.....
[Warning] trace A: ('select_syscall', ([189, 191, 151], [], [], (0, 0)), (0, 'Timeout'))
=> NETWORK_ERROR_A189: [Possible Network Misbehavior] Data 'in the air' but select sees nothing.
.....
[Call Rejected] trace A: ('select_syscall', ([189, 191, 193, 195, 151], [], [], (0, 499157)), ([195], []))
=> NETWORK_ERROR_A195: [Possible Network Misbehavior] No data 'in the air' but select sees something.
[Call Rejected] trace B: ('read_syscall', (74, 'HTTP/1.1 200 OK \\r\\nLast-Modifie...', 8192), (241, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.

No valid action:
[Error] trace A: ('select_syscall', ([189, 191, 193, 195, 151], [], [], (0, 499157)), ([195], []))
=> NETWORK_ERROR_A195: [Possible Network Misbehavior] No data 'in the air' but select sees something.
[Error] trace B: ('read_syscall', (74, 'HTTP/1.1 200 OK \\r\\nLast-Modifie...', 8192), (241, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.

```

Network Configuration Issues

Several nonblocking connects may have failed to connect
 * 27 nonblocking connects from trace B to 128.238.66.220:3005 were never observed to connect

TCP Connection Statistics

Connection from socket B0 (public address 128.238.255.159:44175) to socket A3 (public address 128.238.66.220:3005)
 * Data sent to accepting socket A3: 97 bytes sent, 97 bytes received, 0 bytes lost
 * Data sent to connected socket B0: 432 bytes sent, 432 bytes received, 0 bytes lost

Connection from socket B8 (public address 128.238.255.159:44198) to socket A35 (public address 128.238.66.220:3005)
 * Data sent to accepting socket A35: 97 bytes sent, 97 bytes received, 0 bytes lost
 * Data sent to connected socket B8: 432 bytes sent, 0 bytes received, 432 bytes lost (100.00%)
 * [Possible Application Misbehavior] Data loss is most likely due to application behavior

Connection from socket B63 (public address 128.238.255.159:44252) to socket A151 (public address 128.238.66.220:3005)
 * Data sent to accepting socket A151: 97 bytes sent, 0 bytes received, 97 bytes lost (100.00%)
 * Data sent to connected socket B63: 0 bytes sent, 0 bytes received, 0 bytes lost
 * [Possible Application Misbehavior] Data loss is most likely due to application behavior

Possible Problems Detected

- * The model failed to process the entire trace
- * [Possible Application Misbehavior] Trace B has 16 TCP connection(s) to 128.238.66.220:3005 with data left in the buffers
- * Trace B has simultaneously occurring nonblocking connects, which may mean that the corresponding accepts are improperly matched

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

2.14 maxconn2

This trace is equivalent to the maxconn case, but in maxconn2 a large file was requested instead of a small file.

To run NetCheck:

```
python netcheck.py wb-maxconn.txt
```

Configuration

```

host
trace A: server (wb-maxconn2-server.trace)
ip 128.238.66.220
host
trace B: client (wb-maxconn2-client.trace)

```

ip 128.238.255.159

Verifying Traces

```
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '127.0.0.1', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 45441), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('10.0.0.200', 39314), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
[Notice] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
trace B: ('socket_syscall', (2, 1, 0), (1, None))
trace B: ('fcntl_syscall', (1, 4, 2050), (0, None))
[Notice] trace B: ('connect_syscall', (1, '128.238.66.220', 3005), (-1, 'EINPROGRESS'))
=> OVERLAPPING_CONNECTS: This trace already has one or more nonblocking connects pending,
which may mean that the corresponding accepts are improperly matched.
.....
[Call Rejected] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for
connections or refused the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
.....
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.255.159', 44698), (3, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A3, which is
connected to socket B0 (public address 128.238.255.159:44698)
trace A: ('accept_syscall', (2, '128.238.255.159', 44698), (3, None))
trace A: ('fcntl_syscall', (3, 4, 2050), (0, None))
trace B: ('write_syscall', (0, ''), (0, None))
trace B: ('write_syscall', (0, 'GET /file.txt HTTP/1.0\r\nHost: ...'), (95, None))
.....
TCP socket B44 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (44, '128.238.66.220', 3005), (0, None))
trace B: ('write_syscall', (44, ''), (0, None))
trace B: ('write_syscall', (44, 'GET /file.txt HTTP/1.0\r\nHost: ...'), (95, None))
[Call Rejected] trace B: ('read_syscall', (1, 'HTTP/1.1 200 OK \r\nLast-Modifie...', 8192), (253, None))
=> MSGNOTSENT: [Possible Network Misbehavior] The message was not sent, because
the other side has not accepted the connection yet.
trace A: ('getpeername_syscall', (3,), (('128.238.255.159', 44698), None))
trace A: ('socket_syscall', (2, 2050, 0), (4, None))
trace A: ('close_syscall', (4,), (0, None))
[Warning] trace A: ('select_syscall', ([3], [], [], (0, 0)), (0, 'Timeout'))
=> NETWORK_ERROR_A3: [Possible Network Misbehavior] Data 'in the air' but select sees nothing.
trace A: ('select_syscall', ([2, 3], [], [], (0, 499669)), ([2], []))
trace A: ('select_syscall', ([2, 3], [], [], (0, 499545)), ([2], []))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A5, which is connected
to socket B1 (public address 128.238.255.159:44699)
trace A: ('accept_syscall', (2, '128.238.255.159', 44699), (5, None))
trace A: ('fcntl_syscall', (5, 4, 2050), (0, None))
.....
trace A: ('socket_syscall', (2, 2050, 0), (13, None))
trace A: ('close_syscall', (13,), (0, None))
trace A: ('getsockname_syscall', (3,), (('128.238.66.220', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (14, None))
trace A: ('close_syscall', (14,), (0, None))
```



```

trace A: ('socket_syscall', (2, 2050, 0), (25, None))
trace A: ('close_syscall', (25,), (0, None))
trace A: ('getsockname_syscall', (23,), (('128.238.66.220', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (26, None))
trace A: ('close_syscall', (26,), (0, None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), ([2], []))
.....
[Warning] trace A: ('write_syscall', (23, 'HTTP/1.1 200 OK \\r\\nLast-Modifie...'), (253, None))
=> EPIPE/ECONNRESET: The connection has been closed.
trace A: ('select_syscall', ([2, 39], [], [], (0, 0)), ([2, 39], []))
trace A: ('select_syscall', ([39], [], [], (0, 0)), ([39], []))
trace A: ('read_syscall', (39, 'GET /file.txt HTTP/1.0\\r\\nHost: ...', 4096), (95, None))
trace A: ('getpeername_syscall', (39,), (('128.238.255.159', 44740), None))
trace A: ('socket_syscall', (2, 2050, 0), (41, None))
trace A: ('close_syscall', (41,), (0, None))
trace A: ('getsockname_syscall', (39,), (('128.238.66.220', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (42, None))
trace A: ('close_syscall', (42,), (0, None))
[Warning] trace A: ('write_syscall', (27, 'HTTP/1.1 200 OK \\r\\nLast-Modifie...'), (253, None))
=> EPIPE/ECONNRESET: The connection has been closed.
.....
trace A: ('select_syscall', ([2], [27], [], (0, 0)), ([2], [27]))
trace A: ('select_syscall', ([2], [27], [], (0, 0)), ([2], [27]))
trace A: ('select_syscall', ([2], [27], [], (0, 0)), ([2], [27]))
trace A: ('select_syscall', ([2], [27, 35], [], (0, 0)), ([2], [27, 35]))
trace A: ('select_syscall', ([2], [27, 35], [], (0, 0)), ([2], [27, 35]))
trace A: ('select_syscall', ([2], [27, 35], [], (0, 0)), ([2], [27, 35]))
trace A: ('close_syscall', (23,), (0, None))
trace A: ('select_syscall', ([2], [27, 35], [], (0, 0)), ([2], [27, 35]))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A43, which is connected
to socket B10 (public address 128.238.255.159:44741)
trace A: ('accept_syscall', (2, '128.238.255.159', 44741), (43, None))
trace A: ('fcntl_syscall', (43, 4, 2050), (0, None))
trace A: ('getpeername_syscall', (43,), (('128.238.255.159', 44741), None))
trace A: ('socket_syscall', (2, 2050, 0), (44, None))
trace A: ('close_syscall', (44,), (0, None))
trace A: ('select_syscall', ([43], [27, 35], [], (0, 0)), ([43], [27, 35]))
trace A: ('select_syscall', ([43], [27, 35], [], (0, 0)), ([43], [27, 35]))
trace A: ('select_syscall', ([43], [27], [], (0, 0)), ([43], [27]))
trace A: ('select_syscall', ([43], [27, 31], [], (0, 0)), ([43], [27, 31]))
[Warning] trace A: ('write_syscall', (27, "Project Gutenberg's The Best Ame..."), (-1, 'EPIPE'))
=> EPIPE/ECONNRESET: The connection has been closed.
trace A: ('close_syscall', (27,), (0, None))
trace A: ('select_syscall', ([43], [31], [], (0, 0)), ([43], [31]))
.....
trace A: ('read_syscall', (43, 'GET /file.txt HTTP/1.0\\r\\nHost: ...', 4096), (95, None))
trace A: ('getpeername_syscall', (43,), (('128.238.255.159', 44741), None))
trace A: ('socket_syscall', (2, 2050, 0), (45, None))
trace A: ('close_syscall', (45,), (0, None))
trace A: ('getsockname_syscall', (43,), (('128.238.66.220', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (46, None))
trace A: ('close_syscall', (46,), (0, None))
[Warning] trace A: ('write_syscall', (35, 'HTTP/1.1 200 OK \\r\\nLast-Modifie...'), (253, None))
=> EPIPE/ECONNRESET: The connection has been closed.
.....
[Notice] trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
=> NETWORK_ERROR_A2: [Possible Network Misbehavior] Available connection but select sees nothing.
.....
[Warning] trace A: ('write_syscall', (43, 'HTTP/1.1 200 OK \\r\\nLast-Modifie...'), (253, None))
=> EPIPE/ECONNRESET: The connection has been closed.
.....
[Warning] trace A: ('select_syscall', ([47, 49, 51, 53, 55], [], [], (0, 0)), (0, 'Timeout'))
=> NETWORK_ERROR_A47: [Possible Network Misbehavior] Data 'in the air' but select sees nothing.
.....
trace A: ('close_syscall', (2,), (0, None))
trace A: ('select_syscall', ([47, 49, 51, 53, 55], [], [], (0, 329988)), ([55], []))
.....
trace A: ('read_syscall', (53, 'GET /file.txt HTTP/1.0\\r\\nHost: ...', 4096), (95, None))

```

```

trace A: ('getpeername_syscall', (53,), (('128.238.255.159', 44709), None))
trace A: ('socket_syscall', (2, 2050, 0), (57, None))
trace A: ('close_syscall', (57,), (0, None))
.....
[Warning] trace A: ('write_syscall', (53, 'HTTP/1.1 200 OK \\r\\nLast-Modifie...'), (253, None))
=> EPIPE/ECONNRESET: The connection has been closed.
.....
trace A: ('close_syscall', (51,), (0, None))
trace A: ('close_syscall', (49,), (0, None))
[Warning] trace A: ('write_syscall', (47, "Project Gutenberg's The Best Ame..."), (-1, 'EPIPE'))
=> EPIPE/ECONNRESET: The connection has been closed.
trace A: ('close_syscall', (55,), (0, None))
trace A: ('close_syscall', (53,), (0, None))
trace A: ('close_syscall', (47,), (0, None))

Done

-----
Network Configuration Issues
-----
TCP server socket A2 (private address 0.0.0.0:3005) has 12 unaccepted connection(s)
* There are 12 unaccepted connection(s) from trace B to 128.238.66.220:3005
* The connecting sockets may have connected to an entirely different server socket

Several nonblocking connects may have failed to connect
* 22 nonblocking connects from trace B to 128.238.66.220:3005 were never observed to connect

-----
TCP Connection Statistics
-----
Connection from socket B0 (public address 128.238.255.159:44698) to socket A3 (public address 128.238.66.220:3005)
* Data sent to accepting socket A3: 95 bytes sent, 95 bytes received, 0 bytes lost
* Data sent to connected socket B0: 1523965 bytes sent, 1470717 bytes received, 53248 bytes lost (3.49%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior
* [Possible Application Misbehavior] socket A3 failed to send some data because the connection was closed
.....
Connection from socket B5 (public address 128.238.255.159:44703) to socket A23 (public address 128.238.66.220:3005)
* Data sent to accepting socket A23: 95 bytes sent, 95 bytes received, 0 bytes lost
* Data sent to connected socket B5: 253 bytes sent, 0 bytes received, 253 bytes lost (100.00%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior
* [Possible Application Misbehavior] socket A23 failed to send some data because the connection was closed
.....

-----
Possible Problems Detected
-----
* [Possible Network Misbehavior] Connections intended for the socket in trace A listening on 0.0.0.0:3005
  may have been accepted elsewhere
* [Possible Application Misbehavior] Trace B has 16 TCP connection(s) to 128.238.66.220:3005 with data
  left in the buffers
* Trace B has simultaneously occurring nonblocking connects, which may mean that the corresponding accepts
  are improperly matched

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

```

2.15 mtu

This trace was gathered on a network that suffers from the MTU black hole problem. Small packets (such as those in the TCP handshake or the HTTP GET request) will traverse the network successfully, but large packets (such as those in the body of an HTTP response) will be dropped by the network. This issue (partial data loss) is detected by NetCheck and classified as a network problem.

The trace has a second network-related issue: the client in this trace is behind a NAT. To run NetCheck:

```
python netcheck.py wb-mtu.txt
```

Configuration

```
host
  trace A: server (wb-mtu-server.trace)
  ip 128.238.66.220
host
  trace B: client (wb-mtu-client.trace)
  ip 192.168.0.8
  nat 192.168.0.8 => 128.238.38.67
```

Verifying Traces

```
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '127.0.0.1', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 34044), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
[Don't Care] trace A: ('connect_syscall', (0, '10.0.0.200', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('10.0.0.200', 53283), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), (([], [1], []), None))
[Don't Care] trace A: ('send_syscall', (1, 't\\371\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0\\0010\\0...', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), (([1], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (1, 't\\371\\201\\203\\0\\1\\0\\0\\0\\0\\0\\0\\0\\00...',
1024, 0, '10.0.0.200', 53), (38, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Call Rejected] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused
the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.38.67', 51186), (3, None))
=> NO_PENDING_CONNS: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
[Don't Care] trace B: ('select_syscall', ([], [0], [], (10, 0)), ([], [0]))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A3, which is connected to socket B0
(public address 128.238.38.67:51186)
* [Warning] The client is behind a NAT
trace A: ('accept_syscall', (2, '128.238.38.67', 51186), (3, None))
trace A: ('fcntl_syscall', (3, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET /file.txt HTTP/1.0\r\nUser-A...', (125, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (10, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (3,), (('128.238.38.67', 51186), None))
trace A: ('socket_syscall', (2, 2050, 0), (4, None))
[Don't Care] trace A: ('connect_syscall', (4, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [4], [], 0), (([], [4], []), None))
[Don't Care] trace A: ('send_syscall', (4, '$\\324\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0\\00267\\...', 0), (44, None))
[Don't Care] trace A: ('poll_syscall', ([4], [], [], 5000), (([4], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (4, '$\\324\\201\\203\\0\\1\\0\\0\\0\\0\\0\\0\\0\\00...',
1024, 0, '10.0.0.200', 53), (44, None))
```



```

[Don't Care] trace A: ('select_syscall', ([2], [3], [], (1, 985000)), ([], [3]))
trace A: ('write_syscall', (3, 'e first comments of settlers upo...'), (4096, None))
trace A: ('select_syscall', ([2], [3], [], (1, 981672)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (1, 999950)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (1, 999952)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (1, 999954)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (1, 999954)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (1, 999954)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (1, 999957)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [3], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [3], [], (1, 999945)), (-1, 'ERESTARTNOHAND'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
trace A: ('close_syscall', (2,), (0, None))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 207440)), (-1, 'EBADF'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], ()), (-1, 'ERESTARTNOHAND'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], ()), (-1, 'ERESTARTNOHAND'))
[Don't Care] trace A: ('select_syscall', ([], [3], [], (0, 0)), (0, 'Timeout'))
trace A: ('close_syscall', (3,), (0, None))
[Notice] trace B: ('close_syscall', (0,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.

```

Done

TCP Connection Statistics

```

Connection from socket B0 (public address 128.238.38.67:51186) to socket A3 (public address 128.238.66.220:3005)
* Data sent to accepting socket A3: 125 bytes sent, 125 bytes received, 0 bytes lost
* Data sent to connected socket B0: 8450 bytes sent, 258 bytes received, 8192 bytes lost (96.95%)
* [Ambiguous Misbehavior] Data loss may be due to network conditions, such as filtering or network delay, but
  may also be due to delay in application itself

```

Possible Problems Detected

```

* [Ambiguous Misbehavior] Trace B has 1 TCP connection(s) to 128.238.66.220:3005 with unreceived data not
  detected by poll or select

```

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

2.16 multibyte

On some versions of Ruby, WEBrick uses size to calculate the content-length in the HTTP header. It gives the wrong value for responses with multibyte characters, and the result is that the client does not download the entire file that is requested [21, 22].

Trace Information:

- To replicate this bug, we reverted the changes described here [23] on the

Ruby installation on the server.

- The server ran the following WEBrick script:

```
#!/usr/bin/ruby1.9.1
# encoding: utf-8

require 'webrick'

include WEBrick

hello_proc = lambda do |req, resp|
  resp['Content-Type'] = "text/html"
  resp.body = %{
    <html>
      <head>
        <title> , Rails! </title>
      </head>
      <body>
        <h1> , Rails! </h1>
        <p>
          Mon Jan 28 14:14:13 +0200 2008
        </p>
        <p>
          <a href="/say/goodbye">!</a>
        </p>
      </body>
    </html>
  }
end

hello = HTTPServlet::ProcHandler.new(hello_proc)

s = HTTPServer.new(:Port => 3000)
s.mount("/", hello)

trap("INT"){ s.shutdown }
s.start
```

- The client ran `wget -q0- http://localhost:3000/`
- Both were on the same host, so the client and server IP address is 127.0.0.1.

To run NetCheck:

```
python netcheck.py wb-multibyte.txt
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(3000), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
select(4, NULL, [3], NULL, {900, 0}) = 1 (out [3], left {899, 999995})
write(3, "GET / HTTP/1.1\r\nUser-Agent: Wget/1.13.4 (linux-gnu)\r\nAccept: */*\r\nHost:
localhost:3000\r\nConnection: Keep-Alive\r\n\r\n", 114) = 114
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 994456})
recvfrom(3, "HTTP/1.1 200 OK \r\nContent-Type: text/html\r\nServer: WEBrick/1.3.1
(Ruby/1.9.3/2011-10-30)\r\nDate: Mon, 23 Jul 2012 20:25:07 GMT\r\nContent-Length:
302\r\nConnection: Keep-Alive\r\n\r\n", 511, MSG_PEEK, NULL, NULL) = 174
read(3, "HTTP/1.1 200 OK \r\nContent-Type: text/html\r\nServer: WEBrick/1.3.1
(Ruby/1.9.3/2011-10-30)\r\nDate: Mon, 23 Jul 2012 20:25:07 GMT\r\nContent-Length:
302\r\nConnection: Keep-Alive\r\n\r\n", 174) = 174
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 999580})
read(3, "\n <html>\n <head>\n <title> \320\237\321\200\320\270\320\262\320\265\321\202,
Rails! </title>\n </head>\n <body>\n <h1> \320\237\321\200\320\270\320\262\320\265\321\202,
```

```

Rails! </h1>\n      <p>\n          \320\241\320\265\320\271\321\207\320\260\321\201 Mon Jan 28 14:14:13
+0200 2008\n      </p>\n          <p>\n          \320\235\320\260\321\201\321\202\320\260\320\273\320\276
\320\262\321\200\320\265\320\274\321\217\n          <a href="/say/goodbye/">\320\277\320\276\320\277
\321\200\320\276\321\211\320\260\321\202\321\214\321\201\321\217!", 302) = 302
close(3)          = 0

```

Server trace:

```

socket(PF_INET6, SOCK_DGRAM, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET6, sin6_port=htons(3000), inet_pton(AF_INET6, "::", &sin6_addr),
sin6_flowinfo=0, sin6_scope_id=0}, 28) = 0
getsockname(5, {sa_family=AF_INET6, sin6_port=htons(57050), inet_pton(AF_INET6, "::1",
&sin6_addr), sin6_flowinfo=0, sin6_scope_id=0}, [28]) = 0
connect(5, {sa_family=AF_UNSPEC, sa_data="\0\0\0\0\0\0\0\0\0\0\0\0\0\0"}, 16) = 0
connect(5, {sa_family=AF_INET, sin_port=htons(3000), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
getsockname(5, {sa_family=AF_INET6, sin6_port=htons(45900), inet_pton(AF_INET6, "::ffff:127.0.0.1",
&sin6_addr), sin6_flowinfo=0, sin6_scope_id=0}, [28]) = 0
close(5)          = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_TCP) = 5
setsockopt(5, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(5, {sa_family=AF_INET, sin_port=htons(3000), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
listen(5, 5)      = 0
fcntl(5, F_GETFD) = 0
socket(PF_INET6, SOCK_STREAM, IPPROTO_TCP) = 6
setsockopt(6, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(6, {sa_family=AF_INET6, sin6_port=htons(3000), inet_pton(AF_INET6, "::", &sin6_addr),
sin6_flowinfo=0, sin6_scope_id=0}, 28) = -1 EADDRINUSE (Address already in use)
close(6)          = 0
accept(5, {sa_family=AF_INET, sin_port=htons(40830), sin_addr=inet_addr("127.0.0.1")}, [16]) = 6
fcntl(6, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(6, F_SETFL, O_RDWR|O_NONBLOCK) = 0
fcntl(6, F_GETFD) = 0
select(6, [5], NULL, NULL, [2, 0] <unfinished ...>
getpeername(6, {sa_family=AF_INET, sin_port=htons(40830), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
select(7, [6], NULL, NULL, {0, 500000}) = 1 (in [6], left {0, 499996})
read(6, "GET / HTTP/1.1\r\nUser-Agent: Wget/1.13.4 (linux-gnu)\r\nAccept: */*\r\nHost: localhost:3000\r\nConnection:
Keep-Alive\r\n\r\n", 8192) = 114
getpeername(6, {sa_family=AF_INET, sin_port=htons(40830), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
getsockname(6, {sa_family=AF_INET, sin_port=htons(3000), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
write(6, "HTTP/1.1 200 OK \r\nContent-Type: text/html\r\nServer: WEBRick/1.3.1 (Ruby/1.9.3/2011-10-30)\r\nDate:
Mon, 23 Jul 2012 20:25:07 GMT\r\nContent-Length: 302\r\nConnection: Keep-Alive\r\n\r\n", 174 <unfinished ...>
write(6, "\n <html>\n <head>\n <title> \320\237\321\200\320\270\320\262\320\265\321\202, Rails! </title>\n
</head>\n <body>\n <h1> \320\237\321\200\320\270\320\262\320\265\321\202, Rails! </h1>\n <p>\n
\320\241\320\265\320\271\321\207\320\260\321\201 Mon Jan 28 14:14:13 +0200 2008\n </p>\n <p>\n
\320\235\320\260\321\201\321\202\320\260\320\273\320\276 \320\262\321\200\320\265\320\274\321\217\n
<a href="/say/goodbye/"> \320\277\320\276\320\277\321\200\320\276\321\211\320\260\321\202\321\202\321
\214\321\201\321\217!</a>\n </p>\n </body>\n </html>\n ", 343) = 343
select(7, [6], NULL, NULL, {0, 500000}) = 1 (in [6], left {0, 499726})
read(6, 0x7fec40001e10, 8192) = -1 ECONNRESET (Connection reset by peer)
close(6)          = 0
select(6, [5], NULL, NULL, [2, 0] <unfinished ...>
close(5)          = 0

```

NetCheck output:

Configuration

```

host
  trace A: server (wb-multibyte-server.trace)
  trace B: client (wb-multibyte-client.trace)

```

Verifying Traces

```

trace A: ('socket_syscall', (30, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '::', 3000), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::1', 57050), None))

```



```

=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('connect_syscall', (0, '0.0.0.0', 3000), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::ffff:127.0.0.1', 45900), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (1, None))
trace A: ('setsockopt_syscall', (1, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (1, '0.0.0.0', 3000), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Call Rejected] trace B: ('connect_syscall', (0, '127.0.0.1', 3000), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the
connection request.
trace A: ('listen_syscall', (1, 5), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
[Notice] trace A: ('bind_syscall', (2, '::', 3000), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (2,), (0, None))
trace A: ('select_syscall', ([1], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([1], [], [], (2, 0)), ([1], []))
[Call Rejected] trace A: ('accept_syscall', (1, '127.0.0.1', 40830), (3, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A1 (public address 127.0.0.1:3000)
trace B: ('connect_syscall', (0, '127.0.0.1', 3000), (0, None))
[Don't Care] trace B: ('select_syscall', ([], [0], [], (900, 0)), ([], [0]))
TCP server socket A1 (private address 0.0.0.0:3000) returning socket A3, which is connected to socket B0
(public address 127.0.0.1:40830)
trace A: ('accept_syscall', (1, '127.0.0.1', 40830), (3, None))
trace A: ('fcntl_syscall', (3, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET / HTTP/1.1\r\nUser-Agent: Wg...', (114, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (3,), (('127.0.0.1', 40830), None))
trace A: ('select_syscall', ([3], [], [], (0, 500000)), ([3], []))
trace A: ('read_syscall', (3, 'GET / HTTP/1.1\r\nUser-Agent: Wg...', 8192), (114, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (3,), (('127.0.0.1', 40830), None))
trace A: ('getsockname_syscall', (3,), (('127.0.0.1', 3000), None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (3, 'HTTP/1.1 200 OK \r\nContent-Type...', (174, None))
trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
trace B: ('recvfrom_syscall', (0, 'HTTP/1.1 200 OK \r\nContent-Type...', 511, 2, '', 0), (174, None))
trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \r\nContent-Type...', 174), (174, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (3, '\n <html>\n <head>\n ...'), (343, None))
[Call Rejected] trace A: ('select_syscall', ([3], [], [], (0, 500000)), ([3], []))
=> NETWORK_ERROR_A3: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
[Call Rejected] trace A: ('select_syscall', ([3], [], [], (0, 500000)), ([3], []))
=> NETWORK_ERROR_A3: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('read_syscall', (0, '\n <html>\n <head>\n ...', 302), (302, None))
[Call Rejected] trace A: ('select_syscall', ([3], [], [], (0, 500000)), ([3], []))
=> NETWORK_ERROR_A3: [Possible Network Misbehavior] No data 'in the air' but select sees something.
[Notice] trace B: ('close_syscall', (0,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.
trace A: ('select_syscall', ([3], [], [], (0, 500000)), ([3], []))
[Warning] trace A: ('read_syscall', (3, None, 8192), (-1, 'ECONNRESET'))
=> UNEXPECTED_FAILURE: Recv failed unexpectedly.
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([1], [], [], (2, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([1], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
[Notice] trace A: ('shutdown_syscall', (1, 2), (0, None))
=> ENOTCONN: [Application Error] Attempted to shutdown a socket that is not connected.
trace A: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

Connection from socket B0 (public address 127.0.0.1:40830) to socket A3 (public address 127.0.0.1:3000)
* Data sent to accepting socket A3: 114 bytes sent, 114 bytes received, 0 bytes lost
* Data sent to connected socket B0: 517 bytes sent, 476 bytes received, 41 bytes lost (7.93%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior

Possible Problems Detected

* [Possible Application Misbehavior] Trace B has 1 TCP connection(s) to 127.0.0.1:3000 with data left in the buffers

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

2.17 noread

In this trace, the client makes a TCP connection to a WEBrick server and sends an HTTP GET request, but then shuts down without calling `read()` on the socket. This is a logical application error.

Trace Information:

- The server is on 128.238.38.71 and is running a WEBrick server that listens on port 3005.
- The client is at IP 128.238.38.67 and runs the following script:

```
#!/usr/bin/ruby

require 'socket'
require 'thread'

host = '128.238.38.71'
port = 3005

@sock = TCPSocket.open host, port
@sock.print "GET / HTTP/1.0\r\n"
@sock.shutdown
```

To run NetCheck:

```
python netcheck.py wb-noread.txt
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_TCP) = 3
fcntl(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(3, F_SETFL, O_RDWR|O_NONBLOCK) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("128.238.38.71")}, 16)
= -1 EINPROGRESS (Operation now in progress)
select(4, NULL, [3], [3], NULL) = 1 (out [3])
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("128.238.38.71")}, 16) = 0
fcntl(3, F_SETFL, O_RDWR) = 0
fcntl(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(3, F_GETFL) = 0x2 (flags O_RDWR)
write(3, "GET / HTTP/1.0\r\n", 16) = 16
shutdown(3, 2 /* send and receive */) = 0
close(3) = 0
```

Server trace:


```

        \1\0\0\3\204\0\27\ffraidy-lucid\4poly\3edu\0", 1024, 0, {sa_family=AF_INET, sin_port=htons(53),
        sin_addr=inet_addr("127.0.0.1")}, [16]) = 79
close(5) = 0
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3 4], [], [], {1, 996319}) = 1 (in [4], left {1, 996314})
read(4, "", 4096) = 0
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(6, [3], [4], [], {1, 994834}) = 1 (out [4], left {1, 994827})
select(6, [3], [4], [], {1, 994768}) = 1 (out [4], left {1, 994764})
write(4, "HTTP/1.1 200 OK \r\nContent-Length: 84\r\nConnection: close\r\nContent-Type: text/html\r\nServer:
WEBrick/1.3.1 (Ruby/1.8.7/2011-06-30)\r\nDate: Wed, 25 Jul 2012 22:43:35 GMT\r\nLast-Modified:
Mon, 23 Jul 2012 19:36:02 GMT\r\nEtag: 12829c-54-500da7a2\r\n\r\n", 240) = 240
select(6, [3 5], [], [], {1, 994571}) = 1 (in [5], left {1, 994567})
select(6, [3 5], [], [], {1, 994512}) = 1 (in [5], left {1, 994508})
select(6, [3], [4], [], {1, 994307}) = 1 (out [4], left {1, 994303})
select(6, [3], [4], [], {1, 994233}) = 1 (out [4], left {1, 994229})
write(4, "<html>\n<head>\n<title>Local Web Page</title>\n</head>\n<body>\nHi there\n</body>\n</html>\n",
84) = 84
close(4) = 0

```

NetCheck output:

```

-----
Configuration
-----
ignore 127.0.0.1,53
host
  trace A: server (wb-noread-server.trace)
  ip 128.238.38.71
host
  trace B: client (wb-noread-client.trace)
  ip 128.238.38.67
-----
Verifying Traces
-----
trace A: ('socket_syscall', (30, 2, 0), (0, None))
trace A: ('connect_syscall', (0, ':', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::1', 39977), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('connect_syscall', (0, '0.0.0.0', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::ffff:127.0.0.1', 36020), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), (([], [1], []), None))
[Don't Care] trace A: ('sendto_syscall', (1, 'J\27\1\0\0\1\0\0\0\0\0\0\0\0\0010\00...', 0, '', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), (([1], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (1, 'J\27\205\203\0\1\0\0\0\0\1\0\0\001...',
1024, 0, '127.0.0.1', 53), (118, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 6), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2050), (0, None))
[Notice] trace B: ('connect_syscall', (0, '128.238.38.71', 3005), (-1, 'EINPROGRESS'))
=> EINPROGRESS: The socket is nonblocking and the connection cannot be completed immediately.
[Don't Care] trace B: ('select_syscall', ([], [0], [0], ()), ([], [0]))
[Call Rejected] trace B: ('connect_syscall', (0, '128.238.38.71', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused
the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))

```

```

trace A: ('socket_syscall', (30, 1, 6), (3, None))
trace A: ('setsockopt_syscall', (3, 65535, 4, 1), (0, None))
[Notice] trace A: ('bind_syscall', (3, ' '::', 3005), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.38.67', 48700), (4, None))
=> NO_PENDING_CONNN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 128.238.38.71:3005)
trace B: ('connect_syscall', (0, '128.238.38.71', 3005), (0, None))
trace B: ('fcntl_syscall', (0, 4, 2), (0, None))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A4, which is connected to socket B0
(public address 128.238.38.67:48700)
trace A: ('accept_syscall', (2, '128.238.38.67', 48700), (4, None))
trace A: ('fcntl_syscall', (4, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET / HTTP/1.0\r\n', (16, None))
trace A: ('getpeername_syscall', (4,), (('128.238.38.67', 48700), None))
trace A: ('socket_syscall', (2, 2050, 0), (5, None))
[Don't Care] trace A: ('connect_syscall', (5, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [5], [], 0), ([], [5], [], None))
[Don't Care] trace A: ('sendto_syscall', (5, '&\\304\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\00267\\...', 0, '', 0), (44, None))
[Don't Care] trace A: ('poll_syscall', ([5], [], [], 5000), ([5], [], [], None))
[Don't Care] trace A: ('recvfrom_syscall', (5, '&\\304\\205\\200\\0\\1\\0\\1\\0\\0\\0\\0\\000...',
1024, 0, '127.0.0.1', 53), (79, None))
trace A: ('close_syscall', (5,), (0, None))
trace A: ('select_syscall', ([4], [], [], (0, 0)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (0, 499907)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (1, 999908)), ([4], []))
trace A: ('read_syscall', (4, 'GET / HTTP/1.0\r\n', 4096), (16, None))
trace A: ('getpeername_syscall', (4,), (('128.238.38.67', 48700), None))
trace A: ('socket_syscall', (2, 2050, 0), (6, None))
[Don't Care] trace A: ('connect_syscall', (6, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [6], [], 0), ([], [6], [], None))
[Don't Care] trace A: ('sendto_syscall', (6, '\\362\\370\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\002...', 0, '', 0), (44, None))
[Don't Care] trace A: ('poll_syscall', ([6], [], [], 5000), ([6], [], [], None))
[Don't Care] trace A: ('recvfrom_syscall', (6, '\\362\\370\\205\\200\\0\\1\\0\\1\\0\\0\\0\\0\\000...',
1024, 0, '127.0.0.1', 53), (79, None))
trace A: ('close_syscall', (6,), (0, None))
trace A: ('getsockname_syscall', (4,), (('128.238.38.71', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (7, None))
[Don't Care] trace A: ('connect_syscall', (7, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [7], [], 0), ([], [7], [], None))
[Don't Care] trace A: ('sendto_syscall', (7, '\\352\\236\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\002...', 0, '', 0), (44, None))
[Don't Care] trace A: ('poll_syscall', ([7], [], [], 5000), ([7], [], [], None))
[Don't Care] trace A: ('recvfrom_syscall', (7, '\\352\\236\\205\\200\\0\\1\\0\\1\\0\\0\\0\\0\\000...',
1024, 0, '127.0.0.1', 53), (79, None))
trace A: ('close_syscall', (7,), (0, None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Call Rejected] trace A: ('select_syscall', ([2, 4], [], [], (1, 996319)), ([4], []))
=> NETWORK_ERROR_A4: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('shutdown_syscall', (0, 2), (0, None))
trace A: ('select_syscall', ([2, 4], [], [], (1, 996319)), ([4], []))
trace A: ('read_syscall', (4, '', 4096), (0, None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 994834)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 994768)), ([], [4]))
[Warning] trace A: ('write_syscall', (4, 'HTTP/1.1 200 OK \\r\\nContent-Leng...', (240, None))
=> EPIPE/ECONNRESET: The connection has been closed.
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 994307)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 994233)), ([], [4]))
[Warning] trace A: ('write_syscall', (4, '<html>\\n<head>\\n<title>Local Web...', (84, None))
=> EPIPE/ECONNRESET: The connection has been closed.
trace A: ('close_syscall', (4,), (0, None))

```

```

trace A: ('select_syscall', ([2], [], [], (1, 992684)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace A: ('close_syscall', (2,), (0, None))
[Notice] trace B: ('close_syscall', (0,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.

```

Done

TCP Connection Statistics

```

Connection from socket B0 (public address 128.238.38.67:48700) to socket A4 (public address 128.238.38.71:3005)
* Data sent to accepting socket A4: 16 bytes sent, 16 bytes received, 0 bytes lost
* Data sent to connected socket B0: 324 bytes sent, 0 bytes received, 324 bytes lost (100.00%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior
* [Possible Application Misbehavior] socket A4 failed to send some data because the connection was closed

```

Possible Problems Detected

```

* [Possible Application Misbehavior] Trace B has 1 TCP connection(s) to 128.238.38.71:3005 with data left in the buffers

```

For more details, adjust the variables defined in `trace_output.py` and `posix_output.py` to change the level of output

2.18 permission

In this trace, the client connects to a WEBrick server to download a file, but the WEBrick process does not have permission to read the requested file and crashes.

Trace information:

- On the server, run the following (note that this will not work on NTFS file systems):

```

touch file.txt
chmod a-r file.txt

```

- Server is at IPv4 address 128.238.66.220, and is running a WEBrick server that is listening on port 3005.
- Client is at 128.238.255.159, and uses `wget` to download a file from the WEBrick server at 128.238.66.220:3005.

To run NetCheck:

```
python netcheck.py wb-permission.txt
```

Client trace:

```

socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("128.238.66.220")}, 16) = 0
select(4, NULL, [3], NULL, {900, 0}) = 1 (out [3], left {899, 999995})
write(3, "GET /file.txt HTTP/1.1\r\nUser-Agent: Wget/1.13.4 (linux-gnu)\r\nAccept: */*\r\nHost: 128.238.66.220:3005\r\nConnection: Keep-Alive\r\n\r\n", 127) = 127
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 985478})
recvfrom(3, "HTTP/1.1 500 Internal Server Error \r\nEtag: 414026-958ba3a-5005a893\r\nDate: Sun, 22 Jul 2012 20:47:30 GMT\r\nLast-Modified: Tue, 17 Jul 2012 18:01:55 GMT\r\nContent-Type: text/html; charset=ISO-8859-1\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2010-08-16)\r\nContent-Length: 156809786\r\nConnection: close\r\n\r\n", 511, MSG_PEEK, NULL, NULL) = 291
read(3, "HTTP/1.1 500 Internal Server Error \r\nEtag: 414026-958ba3a-5005a893\r\nDate: Sun, 22 Jul 2012

```

```

20:47:30 GMT\r\nLast-Modified: Tue, 17 Jul 2012 18:01:55 GMT\r\nContent-Type: text/html;
charset=ISO-8859-1\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2010-08-16)\r\nContent-Length:
156809786\r\nConnection: close\r\n\r\n", 291) = 291
close(3) = 0

Server trace:

socket(PF_INET, SOCK_DGRAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(50825), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
connect(3, {sa_family=AF_UNSPEC, sa_data="\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"}, 16) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(0), sin_addr=inet_addr("10.0.0.200")}, 16) = 0
getsockname(3, {sa_family=AF_INET, sin_port=htons(35272), sin_addr=inet_addr("10.0.0.200")}, [16]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM|SOCK_NONBLOCK, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("10.0.0.200")}, 16) = 0
poll([fd=3, events=POLLOUT], 1, 0) = 1 ([fd=3, revents=POLLOUT])
send(3, "F\305\1\0\0\1\0\0\0\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0\0\0\1", 38, MSG_NOSIGNAL) = 38
poll([fd=3, events=POLLIN], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "F\305\201\203\0\1\0\0\0\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0\0\0\1", 1024, 0,
{sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("10.0.0.200")}, [16]) = 38
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_TCP) = 3
setsockopt(3, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
listen(3, 5) = 0
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(3, F_GETFD) = 0
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 1 (in [3], left {1, 414388})
accept(3, {sa_family=AF_INET, sin_port=htons(45654), sin_addr=inet_addr("128.238.255.159")}, [16]) = 4
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl64(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
fcntl64(4, F_GETFD) = 0
getpeername(4, {sa_family=AF_INET, sin_port=htons(45654), sin_addr=inet_addr("128.238.255.159")}, [16]) = 0
socket(PF_INET, SOCK_DGRAM|SOCK_NONBLOCK, IPPROTO_IP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("10.0.0.200")}, 16) = 0
gettimeofday({1342990050, 596043}, NULL) = 0
poll([fd=5, events=POLLOUT], 1, 0) = 1 ([fd=5, revents=POLLOUT])
send(5, "\366\274\1\0\0\1\0\0\0\0\0003159\003255\003238\003128\7in-addr\4arpa\0\0\0\0\1", 46,
MSG_NOSIGNAL) = 46
poll([fd=5, events=POLLIN], 1, 5000) = 1 ([fd=5, revents=POLLIN])
recvfrom(5, "\366\274\201\200\0\1\0\1\0\0\0\0003159\003255\003238\003128\7in-addr\4arpa\0\0\0\0\1\300
\0\0\0\1\0\0\0X\0\27\ffraidy-lucid\4poly\3edu\0", 1024, 0, {sa_family=AF_INET, sin_port=htons(53),
sin_addr=inet_addr("10.0.0.200")}, [16]) = 81
close(5) = 0
select(6, [4], [], [], {0, 0}) = 1 (in [4], left {0, 0})
select(6, [3 4], [], [], {0, 499753}) = 1 (in [4], left {0, 499750})
select(5, [3 4], [], [], {1, 999817}) = 1 (in [4], left {1, 999814})
read(4, "GET /file.txt HTTP/1.1\r\nUser-Agent: Wget/1.13.4 (linux-gnu)\r\nAccept: */*\r\nHost:
128.238.66.220:3005\r\nConnection: Keep-Alive\r\n\r\n", 4096) = 127
getpeername(4, {sa_family=AF_INET, sin_port=htons(45654), sin_addr=inet_addr("128.238.255.159")}, [16]) = 0
socket(PF_INET, SOCK_DGRAM|SOCK_NONBLOCK, IPPROTO_IP) = 5

```


close(3) = 0

NetCheck output:

----- Configuration -----

host
trace A: server (wb-permission-server.trace)
ip 128.238.66.220
host
trace B: client (wb-permission-client.trace)
ip 128.238.255.159

----- Verifying Traces -----

```
trace A: ('socket_syscall', (2, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '127.0.0.1', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('127.0.0.1', 50825), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
[Don't Care] trace A: ('connect_syscall', (0, '10.0.0.200', 0), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('10.0.0.200', 35272), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), ([], [1], [], None))
[Don't Care] trace A: ('send_syscall', (1, 'F\\305\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0010\\0...', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), ([1], [], [], None))
[Don't Care] trace A: ('recvfrom_syscall', (1, 'F\\305\\201\\203\\0\\1\\0\\0\\0\\0\\0\\0\\00...',
1024, 0, '10.0.0.200', 53), (38, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Call Rejected] trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused
the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.255.159', 45654), (3, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 128.238.66.220:3005)
trace B: ('connect_syscall', (0, '128.238.66.220', 3005), (0, None))
[Don't Care] trace B: ('select_syscall', ([], [0], [], (900, 0)), ([], [0]))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A3, which is connected to socket B0
(public address 128.238.255.159:45654)
trace A: ('accept_syscall', (2, '128.238.255.159', 45654), (3, None))
trace A: ('fcntl_syscall', (3, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET /file.txt HTTP/1.1\r\nUser-A...', (127, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (3,), (('128.238.255.159', 45654), None))
```

```

trace A: ('socket_syscall', (2, 2050, 0), (4, None))
[Don't Care] trace A: ('connect_syscall', (4, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [4], [], 0), (([], [4], []), None))
[Don't Care] trace A: ('send_syscall', (4, '\\366\\274\\1\\0\\0\\1\\0\\0\\0\\0\\0\\003...'), 0), (46, None))
[Don't Care] trace A: ('poll_syscall', ([4], [], [], 5000), (([4], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (4, '\\366\\274\\201\\200\\0\\1\\0\\1\\0\\0\\0\\0...', 1024, 0, '10.0.0.200', 53), (81, None))
trace A: ('close_syscall', (4,), (0, None))
trace A: ('select_syscall', ([3], [], [], (0, 0)), ([3], []))
trace A: ('select_syscall', ([2, 3], [], [], (0, 499753)), ([3], []))
trace A: ('select_syscall', ([2, 3], [], [], (1, 999817)), ([3], []))
trace A: ('read_syscall', (3, 'GET /file.txt HTTP/1.1\\r\\nUser-A...', 4096), (127, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (3,), (('128.238.255.159', 45654), None))
trace A: ('socket_syscall', (2, 2050, 0), (5, None))
[Don't Care] trace A: ('connect_syscall', (5, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [5], [], 0), (([], [5], []), None))
[Don't Care] trace A: ('send_syscall', (5, '^j\\1\\0\\0\\1\\0\\0\\0\\0\\0\\003159\\00...'), 0), (46, None))
[Don't Care] trace A: ('poll_syscall', ([5], [], [], 5000), (([5], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (5, '^j\\201\\200\\0\\1\\0\\1\\0\\0\\0\\0\\00315...'), 1024, 0, '10.0.0.200', 53), (81, None))
trace A: ('close_syscall', (5,), (0, None))
trace A: ('getsockname_syscall', (3,), (('128.238.66.220', 3005), None))
trace A: ('socket_syscall', (2, 2050, 0), (6, None))
[Don't Care] trace A: ('connect_syscall', (6, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [6], [], 0), (([], [6], []), None))
[Don't Care] trace A: ('send_syscall', (6, '\\316(\\1\\0\\0\\1\\0\\0\\0\\0\\0\\003220...'), 0), (45, None))
[Don't Care] trace A: ('poll_syscall', ([6], [], [], 5000), (([6], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (6, '\\316(\\201\\203\\0\\1\\0\\0\\0\\0\\0\\0\\00...'), 1024, 0, '10.0.0.200', 53), (45, None))
trace A: ('close_syscall', (6,), (0, None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [3], [], (1, 990389)), ([], [3]))
[Don't Care] trace A: ('select_syscall', ([2], [3], [], (1, 990263)), ([], [3]))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (3, 'HTTP/1.1 500 Internal Server Err...'), (291, None))
[Don't Care] trace A: ('select_syscall', ([2], [3], [], (1, 989974)), ([], [3]))
[Don't Care] trace A: ('select_syscall', ([2], [3], [], (1, 989860)), ([], [3]))
trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
trace B: ('recvfrom_syscall', (0, 'HTTP/1.1 500 Internal Server Err...', 511, 2, '', 0), (291, None))
trace B: ('read_syscall', (0, 'HTTP/1.1 500 Internal Server Err...', 291), (291, None))
trace A: ('write_syscall', (3, '<!DOCTYPE HTML PUBLIC "-//W3C//...'), (333, None))
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (1, 988236)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))

```

```

trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace A: ('close_syscall', (2,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (7, None))
[Don't Care] trace A: ('connect_syscall', (7, '10.0.0.200', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [7], [], 0), (([], [7], []), None))
[Don't Care] trace A: ('send_syscall', (7, '\\316\\326\\i\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0\\001...', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([7], [], [], 5000), (([7], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (7, '\\316\\326\\201\\203\\0\\1\\0\\0\\0\\0\\0\\0...',
1024, 0, '10.0.0.200', 53), (38, None))
trace A: ('close_syscall', (7,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (8, None))
trace A: ('setsockopt_syscall', (8, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (8, '0.0.0.0', 3005), (0, None))
trace A: ('listen_syscall', (8, 5), (0, None))
trace A: ('select_syscall', ([8], [], [], (2, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([8], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace A: ('close_syscall', (8,), (0, None))
[Notice] trace B: ('close_syscall', (0,), (0, None))
=> NONEMPTY_BUFFERS: Socket's closed while there is data in the buffer.

```

Done

TCP Connection Statistics

Connection from socket B0 (public address 128.238.255.159:45654) to socket A3 (public address 128.238.66.220:3005)
* Data sent to accepting socket A3: 127 bytes sent, 127 bytes received, 0 bytes lost
* Data sent to connected socket B0: 624 bytes sent, 291 bytes received, 333 bytes lost (53.37%)
* [Possible Application Misbehavior] Data loss is most likely due to application behavior

Possible Problems Detected

* [Possible Application Misbehavior] Trace B has 1 TCP connection(s) to 128.238.66.220:3005 with data left in the buffers

For more details, adjust the variables defined in trace_output.py and posix_output.py to change the level of output

2.19 portfwd

The server in this experiment is behind a router that does NAT and port forwarding. If the IP and port information are provided in the config file, NetCheck is still able to process the trace.

Trace Information:

- The server has public IP 96.250.21.150 and private IP 192.168.1.50. It is running a WEBrick server listening on port 3005 locally, which is mapped to port 3001 on the router.
- The client is at 128.238.66.220 and runs

```
wget -q0- http://96.250.21.150:3001/index.html
```

To run NetCheck:

```
python netcheck.py wb-portfwd.txt
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(3001), sin_addr=inet_addr("96.250.21.150")}, 16) = 0
select(4, NULL, [3], NULL, {900, 0}) = 1 (out [3], left {899, 999997})
write(3, "GET /index.html HTTP/1.0\r\nUser-Agent: Wget/1.12 (linux-gnu)\r\nAccept: */*\r\nHost:
 96.250.21.150:3001\r\nConnection: Keep-Alive\r\n\r\n", 126) = 126
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 883361})
recv(3, "HTTP/1.1 200 OK \r\nConnection: Keep-Alive\r\nContent-Type: text/html\r\nContent-Length:
 187\r\nDate: Mon, 23 Jul 2012 04:18:56 GMT\r\nLast-Modified: Tue, 17 Jul 2012 17:44:52 GMT\r\nEtag:
 11490f-bb-5005a494\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2011-06-30)\r\n\r\n", 511, MSG_PEEK) = 246
read(3, "HTTP/1.1 200 OK \r\nConnection: Keep-Alive\r\nContent-Type: text/html\r\nContent-Length:
 187\r\nDate: Mon, 23 Jul 2012 04:18:56 GMT\r\nLast-Modified: Tue, 17 Jul 2012 17:44:52 GMT\r\nEtag:
 11490f-bb-5005a494\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2011-06-30)\r\n\r\n", 246) = 246
select(4, [3], NULL, NULL, {900, 0}) = 1 (in [3], left {899, 947104})
read(3, "<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/
 loose.dtd">\n<html>\n<head>\n<title>Local Web Page</title>\n</head>\n<body>\nHi there\n</body>\n
</html>\n", 187) = 187
```

Server trace:

```
socket(PF_INET6, SOCK_DGRAM, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET6, sin6_port=htons(3005), inet_pton(AF_INET6, "::", &sin6_addr),
 sin6_flowinfo=0, sin6_scope_id=0}, 28) = 0
getsockname(3, {sa_family=AF_INET6, sin6_port=htons(57937), inet_pton(AF_INET6, "::1", &sin6_addr),
 sin6_flowinfo=0, sin6_scope_id=0}, [28]) = 0
connect(3, {sa_family=AF_UNSPEC, sa_data="\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0\0"}, 16) = 0
connect(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
getsockname(3, {sa_family=AF_INET6, sin6_port=htons(54778), inet_pton(AF_INET6, "::ffff:127.0.0.1",
 &sin6_addr), sin6_flowinfo=0, sin6_scope_id=0}, [28]) = 0
close(3) = 0
socket(PF_INET, SOCK_DGRAM|SOCK_NONBLOCK, IPPROTO_IP) = 3
connect(3, {sa_family=AF_INET, sin_port=htons(53), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
poll([fd=3, events=POLLOUT], 1, 0) = 1 ([fd=3, revents=POLLOUT])
sendto(3, "\23\203\1\0\0\1\0\0\0\0\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0f\0\1", 38,
 MSG_NOSIGNAL, NULL, 0) = 38
poll([fd=3, events=POLLIN], 1, 5000) = 1 ([fd=3, revents=POLLIN])
recvfrom(3, "\23\203\201\203\0\1\0\0\0\1\0\0\0010\0010\0010\0010\7in-addr\4arpa\0\0f\0\1\300
 \24\0\6\0\1\0\0\5\1\0008\1b\17in-addr-servers\300\34\5nstld\4iana\3org\0w\335\322\217\0
 \0\7\10\0\0\3\204\0\t:\200\0\0\16\20", 1024, 0, {sa_family=AF_INET, sin_port=htons(53),
 sin_addr=inet_addr("127.0.0.1")}, [16]) = 106
close(3) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_TCP) = 3
setsockopt(3, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(3, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("0.0.0.0")}, 16) = 0
listen(3, 5) = 0
fcntl(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(3, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(3, F_GETFD) = 0
socket(PF_INET6, SOCK_STREAM, IPPROTO_TCP) = 4
setsockopt(4, SOL_SOCKET, SO_REUSEADDR, [1], 4) = 0
bind(4, {sa_family=AF_INET6, sin6_port=htons(3005), inet_pton(AF_INET6, "::", &sin6_addr),
 sin6_flowinfo=0, sin6_scope_id=0}, 28) = -1 EADDRINUSE (Address already in use)
close(4) = 0
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = 1 (in [3], left {1, 519677})
accept(3, {sa_family=AF_INET, sin_port=htons(33655), sin_addr=inet_addr("128.238.66.220")}, [16]) = 4
fcntl(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(4, F_GETFL) = 0x2 (flags O_RDWR)
fcntl(4, F_GETFD) = 0x2 (flags O_RDWR)
fcntl(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
```

Configuration

```
ignore 127.0.0.1,53
host
  trace A: server (wb-portfwd-server.trace)
  ip 192.168.1.50
  nat 192.168.1.50,3005 => 96.250.21.150,3001
host
  trace B: client (wb-portfwd-client.trace)
  ip 128.238.66.220
```

Verifying Traces

```
trace A: ('socket_syscall', (30, 2, 0), (0, None))
trace A: ('connect_syscall', (0, '::-', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), ((':::1', 57937), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('connect_syscall', (0, '0.0.0.0', 3005), (0, None))
[Call Rejected] trace A: ('getsockname_syscall', (0,), (('::ffff:127.0.0.1', 54778), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), ([], [1], [], None))
[Don't Care] trace A: ('sendto_syscall', (1, '\\23\\203\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0010...', 0, '', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), ([1], [], [], None))
[Don't Care] trace A: ('recvfrom_syscall', (1, '\\23\\203\\201\\203\\0\\1\\0\\0\\0\\1\\0\\0\\...',
1024, 0, '127.0.0.1', 53), (106, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 0), (0, None))
[Call Rejected] trace B: ('connect_syscall', (0, '96.250.21.150', 3001), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or
refused the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (3, None))
trace A: ('setsockopt_syscall', (3, 65535, 4, 1), (0, None))
[Notice] trace A: ('bind_syscall', (3, '::-', 3005), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '128.238.66.220', 33655), (4, None))
=> NO_PENDING_CONNN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 96.250.21.150:3001)
* [Warning] The server is behind a NAT
trace B: ('connect_syscall', (0, '96.250.21.150', 3001), (0, None))
[Don't Care] trace B: ('select_syscall', ([], [0], [], (900, 0)), ([], [0]))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A4, which is connected to socket B0
(public address 128.238.66.220:33655)
trace A: ('accept_syscall', (2, '128.238.66.220', 33655), (4, None))
trace A: ('fcntl_syscall', (4, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET /index.html HTTP/1.0\\r\\nUser...', (126, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (4,), (('128.238.66.220', 33655), None))
[Warning] trace A: ('select_syscall', ([4], [], [], (0, 0)), (0, 'Timeout'))
=> NETWORK_ERROR_A4: [Possible Network Misbehavior] Data 'in the air' but select sees nothing.
trace A: ('select_syscall', ([2, 4], [], [], (0, 499829)), ([4], []))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2, 4], [], [], (1, 985736)), ([4], []))
trace A: ('read_syscall', (4, 'GET /index.html HTTP/1.0\\r\\nUser...', 4096), (126, None))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
```

```

=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('getpeername_syscall', (4,)), (('128.238.66.220', 33655), (None))
trace A: ('getsockname_syscall', (4,)), (('192.168.1.50', 3005), (None))
trace A: ('socket_syscall', (2, 2050, 0), (5, (None)))
[Don't Care] trace A: ('connect_syscall', (5, '127.0.0.1', 53), (0, (None)))
[Don't Care] trace A: ('poll_syscall', ([], [5], [], 0), ([], [5], []), (None))
[Don't Care] trace A: ('sendto_syscall', (5, '\\353\\221\\1\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\002...', 0, '', 0), (43, (None)))
[Don't Care] trace A: ('poll_syscall', ([5], [], [], 5000), ([5], [], []), (None))
[Don't Care] trace A: ('recvfrom_syscall', (5, '\\353\\221\\201\\203\\0\\1\\1\\0\\0\\0\\0\\0\\0...',
1024, 0, '127.0.0.1', 53), (43, (None)))
trace A: ('close_syscall', (5,)), (0, (None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 931290)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 931131)), ([], [4]))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (4, 'HTTP/1.1 200 OK \\r\\nConnection: ...'), (246, (None)))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 929686)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 929554)), ([], [4]))
trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
trace B: ('recv_syscall', (0, 'HTTP/1.1 200 OK \\r\\nConnection: ...', 511, 2), (246, (None)))
trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \\r\\nConnection: ...', 246), (246, (None)))
[Call Rejected] trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace A: ('write_syscall', (4, '<!DOCTYPE html PUBLIC "-//W3C//...'), (187, (None)))
[Call Rejected] trace A: ('select_syscall', ([2], [4], [], (0, 499997)), ([4], []))
=> NETWORK_ERROR_A4: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('select_syscall', ([0], [], [], (900, 0)), ([0], []))
[Call Rejected] trace A: ('select_syscall', ([2], [4], [], (0, 499997)), ([4], []))
=> NETWORK_ERROR_A4: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('read_syscall', (0, '<!DOCTYPE html PUBLIC "-//W3C//...'), (187), (187, (None)))
[Call Rejected] trace A: ('select_syscall', ([2], [4], [], (0, 499997)), ([4], []))
=> NETWORK_ERROR_A4: [Possible Network Misbehavior] No data 'in the air' but select sees something.
trace B: ('close_syscall', (0,)), (0, (None))
trace A: ('select_syscall', ([2], [4], [], (0, 499997)), ([4], []))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [4], [], (1, 831722)), ([4], []))
trace A: ('read_syscall', (4, '', 4096), (0, (None)))
trace A: ('close_syscall', (4,)), (0, (None))
trace A: ('select_syscall', ([2], [], [], (1, 829530)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace A: ('close_syscall', (2,)), (0, (None))

```

Done

TCP Connection Statistics

```
Connection from socket B0 (public address 128.238.66.220:33655) to socket A4 (public address 96.250.21.150:3001)
* Data sent to accepting socket A4: 126 bytes sent, 126 bytes received, 0 bytes lost
* Data sent to connected socket B0: 433 bytes sent, 433 bytes received, 0 bytes lost
```

```
-----
Possible Problems Detected
-----
```

```
* None
```

2.20 special

On some versions of Ruby, WEBrick fails if it receives a request with a URI that contains certain characters (such as the “[” character). This is an application error and not a network error, but it can masquerade as a network error [28, 29, 30, 31].

Trace Information:

- The client ran the following script:

```
#!/usr/bin/ruby1.9.1

require 'socket'

host = '127.0.0.1'
port = 3005

@sock = TCPSocket.open host, port
@sock.print "GET /test&&test.txt HTTP/1.0\r\n"
@sock.print "\r\n"

while line = @sock.readline
  puts line
  break if @sock.eof?
end

@sock.print "GET /test|test.txt HTTP/1.0\r\n"
@sock.print "\r\n"

while line = @sock.readline
  puts line
  break if @sock.eof?
end

@sock.shutdown
```

To run NetCheck:

```
python netcheck.py wb-special.txt
```

Client trace:

```
socket(PF_INET, SOCK_STREAM, IPPROTO_TCP) = 5
connect(5, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
write(5, "GET /test&&test.txt HTTP/1.0\r\n", 30) = 30
write(5, "\r\n", 2) = 2
read(5, "HTTP/1.1 200 OK \r\nConnection: close\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2011-06-30)\r\nLast-Modified: Mon, 23 Jul 2012 19:11:48 GMT\r\nContent-Length: 6\r\nEtag: 128299-6-500da1f4\r\nDate: Mon, 23 Jul 2012 19:15:05 GMT\r\nContent-Type: text/plain\r\n\r\n", 8192) = 239
read(5, "Hello\r\n", 8192) = 6
read(5, "", 8192) = 0
socket(PF_INET, SOCK_STREAM, IPPROTO_TCP) = 6
connect(6, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("127.0.0.1")}, 16) = 0
write(6, "GET /test|test.txt HTTP/1.0\r\n", 29) = 29
```



```

select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(6, [3], [4], [], {1, 996376}) = 1 (out [4], left {1, 996370})
select(6, [3], [4], [], {1, 996284}) = 1 (out [4], left {1, 996280})
write(4, "HTTP/1.1 200 OK \r\nConnection: close\r\nServer: WEBrick/1.3.1 (Ruby/1.8.7/2011-06-30)\r\nLast-Modified:
Mon, 23 Jul 2012 19:11:48 GMT\r\nContent-Length: 6\r\nEtag: 128299-6-500da1f4\r\nDate: Mon, 23 Jul 2012
19:15:05 GMT\r\nContent-Type: text/plain\r\n\r\n", 239) = 239
select(6, [3 5], [], [], {1, 996060}) = 1 (in [5], left {1, 996055})
select(6, [3 5], [], [], {1, 996001}) = 1 (in [5], left {1, 995997})
read(5, "Hello\n", 4096) = 6
select(6, [3], [4], [], {1, 995234}) = 1 (out [4], left {1, 995229})
select(6, [3], [4], [], {1, 995155}) = 1 (out [4], left {1, 995151})
write(4, "Hello\n", 6) = 6
close(4) = 0
accept(3, {sa_family=AF_INET, sin_port=htons(39696), sin_addr=inet_addr("127.0.0.1")}, [16]) = 4
fcntl(4, F_GETFL) = 0x2 (flags 0_RDWR)
fcntl(4, F_GETFL) = 0x2 (flags 0_RDWR)
fcntl(4, F_GETFL) = 0x2 (flags 0_RDWR)
fcntl(4, F_SETFL, O_RDWR|O_NONBLOCK) = 0
fcntl(4, F_GETFD) = 0
getpeername(4, {sa_family=AF_INET, sin_port=htons(39696), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
select(6, [4], [], [], {0, 0}) = 1 (in [4], left {0, 0})
select(6, [3 4], [], [], {0, 499902}) = 1 (in [4], left {0, 499898})
select(5, [3 4], [], [], {1, 999910}) = 1 (in [4], left {1, 999906})
read(4, "GET /test/test.txt HTTP/1.0\r\n\r\n", 4096) = 31
getpeername(4, {sa_family=AF_INET, sin_port=htons(39696), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
getsockname(4, {sa_family=AF_INET, sin_port=htons(3005), sin_addr=inet_addr("127.0.0.1")}, [16]) = 0
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(6, [3], [4], [], {1, 997467}) = 1 (out [4], left {1, 997461})
select(6, [3], [4], [], {1, 997377}) = 1 (out [4], left {1, 997373})
write(4, "HTTP/1.1 400 Bad Request \r\nConnection: close\r\nServer: WEBrick/1.3.1
(Ruby/1.8.7/2011-06-30)\r\nContent-Length: 288\r\nDate: Mon, 23 Jul 2012 19:15:05
GMT\r\nContent-Type: text/html; charset=ISO-8859-1\r\n\r\n", 198) = 198
select(6, [3], [4], [], {1, 997158}) = 1 (out [4], left {1, 997153})
select(6, [3], [4], [], {1, 997056}) = 1 (out [4], left {1, 997052})
write(4, "<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0//EN">\n<HTML>\n <HEAD><TITLE>Bad Request</TITLE></HEAD>\n
<BODY>\n <H1>Bad Request</H1>\n bad URI '/test/test.txt'.\n <HR>\n <ADDRESS>\n
WEBrick/1.3.1 (Ruby/1.8.7/2011-06-30) at\n fraidy-lucid:3005\n </ADDRESS>\n </BODY>\n</HTML>\n",
288) = 288
close(4) = 0
select(5, [3], [], [], {1, 996001}) = 0 (Timeout)
select(5, [3], [], [], {0, 0}) = 0 (Timeout)
select(4, [3], NULL, NULL, {2, 0}) = ? ERESTARTNOHAND (To be restarted)
close(3) = 0

```

NetCheck output:

```

-----
Configuration
-----
ignore 127.0.0.1,53
host
  trace A: server (wb-special-server.trace)
  trace B: client (wb-special-client.trace)
-----
Verifying Traces
-----
trace A: ('socket_syscall', (30, 2, 0), (0, None))
trace A: ('connect_syscall', (0, ':', 3005), (0, None))
[Notice] trace A: ('getsockname_syscall', (0,), (('::1', 58453), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.
trace A: ('connect_syscall', (0, '0.0.0.0', 3005), (0, None))
[Notice] trace A: ('getsockname_syscall', (0,), (('::ffff:127.0.0.1', 57598), None))
=> STATE_CREATED: [Application Error] No addr/port have been assigned to the socket, since it's only been created.

```

```

trace A: ('close_syscall', (0,), (0, None))
trace A: ('socket_syscall', (2, 2050, 0), (1, None))
[Don't Care] trace A: ('connect_syscall', (1, '127.0.0.1', 53), (0, None))
[Don't Care] trace A: ('poll_syscall', ([], [1], [], 0), (([], [1], []), None))
[Don't Care] trace A: ('sendto_syscall', (1, '\\34\\245\\1\\0\\0\\1\\0\\0\\0\\0\\0\\0\\0010...', 0, '', 0), (38, None))
[Don't Care] trace A: ('poll_syscall', ([1], [], [], 5000), (([1], [], []), None))
[Don't Care] trace A: ('recvfrom_syscall', (1, '\\34\\245\\205\\203\\0\\1\\0\\0\\0\\1\\0\\0\\...', 1024, 0, '127.0.0.1', 53), (117, None))
trace A: ('close_syscall', (1,), (0, None))
trace A: ('socket_syscall', (2, 1, 6), (2, None))
trace A: ('setsockopt_syscall', (2, 65535, 4, 1), (0, None))
trace A: ('bind_syscall', (2, '0.0.0.0', 3005), (0, None))
trace B: ('socket_syscall', (2, 1, 6), (0, None))
[Call Rejected] trace B: ('connect_syscall', (0, '127.0.0.1', 3005), (0, None))
=> ECONNREFUSED: [Ambiguous Misbehavior] The target address was not listening for connections or refused the connection request.
trace A: ('listen_syscall', (2, 5), (0, None))
trace A: ('socket_syscall', (30, 1, 6), (3, None))
trace A: ('setsockopt_syscall', (3, 65535, 4, 1), (0, None))
[Notice] trace A: ('bind_syscall', (3, ' '::', 3005), (-1, 'EADDRINUSE'))
=> EADDRINUSE: The address is already in use.
trace A: ('close_syscall', (3,), (0, None))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (2, 0)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '127.0.0.1', 39695), (4, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B0 connecting to socket A2 (public address 127.0.0.1:3005)
trace B: ('connect_syscall', (0, '127.0.0.1', 3005), (0, None))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A4, which is connected to socket B0 (public address 127.0.0.1:39695)
trace A: ('accept_syscall', (2, '127.0.0.1', 39695), (4, None))
trace A: ('fcntl_syscall', (4, 4, 2050), (0, None))
trace B: ('write_syscall', (0, 'GET /test&&test.txt HTTP/1.0\\r\\n', (30, None))
trace B: ('write_syscall', (0, '\\r\\n', (2, None))
[Call Rejected] trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \\r\\nConnection: ...', 8192), (239, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('getpeername_syscall', (4,), (('127.0.0.1', 39695), None))
trace A: ('select_syscall', ([4], [], [], (0, 0)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (0, 499885)), ([4], []))
trace A: ('select_syscall', ([2, 4], [], [], (1, 999899)), ([4], []))
trace A: ('read_syscall', (4, 'GET /test&&test.txt HTTP/1.0\\r\\n...', 4096), (32, None))
[Call Rejected] trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \\r\\nConnection: ...', 8192), (239, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('getpeername_syscall', (4,), (('127.0.0.1', 39695), None))
trace A: ('getsockname_syscall', (4,), (('127.0.0.1', 3005), None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 996376)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 996284)), ([], [4]))
[Call Rejected] trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \\r\\nConnection: ...', 8192), (239, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('write_syscall', (4, 'HTTP/1.1 200 OK \\r\\nConnection: ...', (239, None))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 995234)), ([], [4]))
[Don't Care] trace A: ('select_syscall', ([2], [4], [], (1, 995155)), ([], [4]))
trace B: ('read_syscall', (0, 'HTTP/1.1 200 OK \\r\\nConnection: ...', 8192), (239, None))
[Call Rejected] trace B: ('read_syscall', (0, 'Hello\\n', 8192), (6, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('write_syscall', (4, 'Hello\\n', (6, None))
trace B: ('read_syscall', (0, 'Hello\\n', 8192), (6, None))
[Call Rejected] trace B: ('read_syscall', (0, '', 8192), (0, None))
=> NETWORK_ERROR_B0: [Possible Network Misbehavior] Data 'in the air' or connection not closed but recv/read returns 0 bytes.
trace A: ('close_syscall', (4,), (0, None))

```

```

trace A: ('select_syscall', ([2], [], [], (1, 993619)), ([2], []))
[Call Rejected] trace A: ('accept_syscall', (2, '127.0.0.1', 39696), (5, None))
=> NO_PENDING_CONN: There are no pending connections.
trace B: ('read_syscall', (0, '', 8192), (0, None))
trace B: ('socket_syscall', (2, 1, 6), (1, None))
[Call Rejected] trace A: ('accept_syscall', (2, '127.0.0.1', 39696), (5, None))
=> NO_PENDING_CONN: There are no pending connections.
TCP socket B1 connecting to socket A2 (public address 127.0.0.1:3005)
trace B: ('connect_syscall', (1, '127.0.0.1', 3005), (0, None))
TCP server socket A2 (private address 0.0.0.0:3005) returning socket A5, which is connected to socket B1
(public address 127.0.0.1:39696)
trace A: ('accept_syscall', (2, '127.0.0.1', 39696), (5, None))
trace A: ('fcntl_syscall', (5, 4, 2050), (0, None))
trace B: ('write_syscall', (1, 'GET /test|test.txt HTTP/1.0\r\n', (29, None))
trace B: ('write_syscall', (1, '\r\n', (2, None))
[Call Rejected] trace B: ('read_syscall', (1, 'HTTP/1.1 400 Bad Request \r\nCon...', 8192), (198, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('getpeername_syscall', (5,), (('127.0.0.1', 39696), None))
trace A: ('select_syscall', ([5], [], [], (0, 0)), ([5], []))
trace A: ('select_syscall', ([2, 5], [], [], (0, 499902)), ([5], []))
trace A: ('select_syscall', ([2, 5], [], [], (1, 999910)), ([5], []))
trace A: ('read_syscall', (5, 'GET /test|test.txt HTTP/1.0\r\n\r\n...', 4096), (31, None))
[Call Rejected] trace B: ('read_syscall', (1, 'HTTP/1.1 400 Bad Request \r\nCon...', 8192), (198, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('getpeername_syscall', (5,), (('127.0.0.1', 39696), None))
trace A: ('getsockname_syscall', (5,), (('127.0.0.1', 3005), None))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [5], [], (1, 997467)), ([], [5]))
[Don't Care] trace A: ('select_syscall', ([2], [5], [], (1, 997377)), ([], [5]))
[Call Rejected] trace B: ('read_syscall', (1, 'HTTP/1.1 400 Bad Request \r\nCon...', 8192), (198, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('write_syscall', (5, 'HTTP/1.1 400 Bad Request \r\nCon...', (198, None))
[Don't Care] trace A: ('select_syscall', ([2], [5], [], (1, 997158)), ([], [5]))
[Don't Care] trace A: ('select_syscall', ([2], [5], [], (1, 997056)), ([], [5]))
trace B: ('read_syscall', (1, 'HTTP/1.1 400 Bad Request \r\nCon...', 8192), (198, None))
[Call Rejected] trace B: ('read_syscall', (1, '<!DOCTYPE HTML PUBLIC "-//W3C//...', 8192), (288, None))
=> MSGNOTSENT: [Possible Network Misbehavior] Message trying to be received has not yet been sent.
trace A: ('write_syscall', (5, '<!DOCTYPE HTML PUBLIC "-//W3C//...', (288, None))
trace B: ('read_syscall', (1, '<!DOCTYPE HTML PUBLIC "-//W3C//...', 8192), (288, None))
[Call Rejected] trace B: ('read_syscall', (1, '', 8192), (0, None))
=> NETWORK_ERROR_B1: [Possible Network Misbehavior] Data 'in the air' or connection not closed but
recv/read returns 0 bytes.
trace A: ('close_syscall', (5,), (0, None))
trace A: ('select_syscall', ([2], [], [], (1, 996001)), (0, 'Timeout'))
trace A: ('select_syscall', ([2], [], [], (0, 0)), (0, 'Timeout'))
[Don't Care] trace A: ('select_syscall', ([2], [], [], (2, 0)), (-1, 'ERESTARTNOHAND'))
trace B: ('read_syscall', (1, '', 8192), (0, None))
trace A: ('close_syscall', (2,), (0, None))
trace B: ('shutdown_syscall', (1, 2), (0, None))
trace B: ('close_syscall', (0,), (0, None))
trace B: ('close_syscall', (1,), (0, None))

```

Done

TCP Connection Statistics

```

Connection from socket B0 (public address 127.0.0.1:39695) to socket A4 (public address 127.0.0.1:3005)
* Data sent to accepting socket A4: 32 bytes sent, 32 bytes received, 0 bytes lost
* Data sent to connected socket B0: 245 bytes sent, 245 bytes received, 0 bytes lost
Connection from socket B1 (public address 127.0.0.1:39696) to socket A5 (public address 127.0.0.1:3005)
* Data sent to accepting socket A5: 31 bytes sent, 31 bytes received, 0 bytes lost
* Data sent to connected socket B1: 486 bytes sent, 486 bytes received, 0 bytes lost

```

Possible Problems Detected

* None

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