

计网 Lab0 实验报告

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一、 程序结构与设计

Webget:首先创建 address 对象与 socket 对象，之后 socket 连接该 address，同时把 socket 视为一个文件描述符，向其中写入字符串来发送请求，然后读出字符串来接收回复，最终关闭 socket

An in-memory reliable byte stream: 首先在 Bytestream 中设置状态 (buffer, 累计 push 字节数等)，然后实现 Reader 和 Writer 的各种方法。Push 直接把 buffer 与 data 连接并保证 buffer 长度不超过容量即可，Pop 直接删除 buffer 前 len 个字符即可 (不足 len 个则删除所有字符)，peek 方法直接返回整个 buffer, close 方法设置 closed=1, 其余方法都根据要求读取状态即可。

二、 实现挑战

本实验实现挑战主要在于 Webget 实现时读懂每个接口的作用，明白作用之后实现并不难。此外还有 byte stream 实现时出现的 AddressSanitizer: DEADLYSIGNAL 错误，该错误在查询 FAQ 之后用 `echo 0 | sudo tee /proc/sys/kernel/randomize_va_space` 禁止 linux 地址空间布局随机化 ASLR 之后成功解决。

三、 残留的 BUG

```
tongyf@tongyf-virtual-machine:~/Desktop/minnow$ cmake --build build --target check0
Test project /home/tongyf/Desktop/minnow/build
  Start 1: compile with bug-checkers
1/10 Test #1: compile with bug-checkers ..... Passed    0.21 sec
  Start 2: t_webget
2/10 Test #2: t_webget ..... Passed    1.13 sec
  Start 3: byte_stream_basics
3/10 Test #3: byte_stream_basics ..... Passed    0.01 sec
  Start 4: byte_stream_capacity
4/10 Test #4: byte_stream_capacity ..... Passed    0.02 sec
  Start 5: byte_stream_one_write
5/10 Test #5: byte_stream_one_write ..... Passed    0.03 sec
  Start 6: byte_stream_two_writes
6/10 Test #6: byte_stream_two_writes ..... Passed    0.02 sec
  Start 7: byte_stream_many_writes
7/10 Test #7: byte_stream_many_writes ..... Passed    0.15 sec
  Start 8: byte_stream_stress_test
8/10 Test #8: byte_stream_stress_test ..... Passed    0.04 sec
  Start 37: compile with optimization
9/10 Test #37: compile with optimization ..... Passed    0.11 sec
  Start 38: byte_stream_speed_test
        ByteStream throughput: 0.61 Gbit/s
10/10 Test #38: byte_stream_speed_test ..... Passed    0.24 sec

100% tests passed, 0 tests failed out of 10

Total Test time (real) = 1.96 sec
Built target check0
```

暂未发现残留的 bug.

四、 实验结果

终端抓取网页:

```
tongyf@tongyf-virtual-machine:~/Desktop$ telnet cs144.keithw.org http
Trying 104.196.238.229...
Connected to cs144.keithw.org.
Escape character is '^J'.
GET /hello HTTP/1.1
Host: cs144.keithw.org
Connection: close

HTTP/1.1 200 OK
Date: Thu, 12 Sep 2024 05:59:14 GMT
Server: Apache
Last-Modified: Thu, 13 Dec 2018 15:45:29 GMT
ETag: "e-57ce93446cb64"
Accept-Ranges: bytes
Content-Length: 14
Connection: close
Content-Type: text/plain

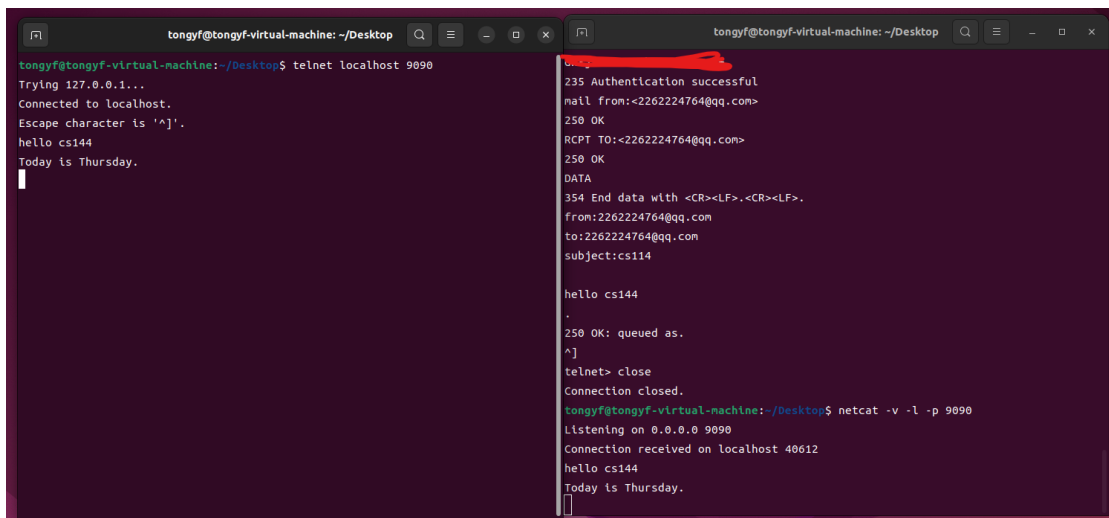
Hello, CS144!
Connection closed by foreign host.
```

终端发送 email:

```
tongyf@tongyf-virtual-machine:~/Desktop$ telnet smtp.qq.com smtp
Trying 109.244.198.105...
Connected to smtp.qq.com.
Escape character is '^J'.
220 newxmesmtplgicsvrsza10-0.qq.com XMail Esmtpp QQ Mail Server.
HELO qq.com
250-newxmesmtplgicsvrsza10-0.qq.com-11.137.201.48-48962882
250-SIZE 73400320
250 OK
auth login
334 VXNlcm5hbWU6
[REDACTED]
334 UGFzc3dvcmQ6
[REDACTED]
235 Authentication successful
mail from:<2262224764@qq.com>
250 OK
RCPT TO:<2262224764@qq.com>
250 OK
DATA
354 End data with <CR><LF>.<CR><LF>.
from:2262224764@qq.com
to:2262224764@qq.com
subject:cs114

hello cs144
.
250 OK: queued as.
^J
telnet> close
Connection closed.
tongyf@tongyf-virtual-machine:~/Desktop$
```

终端中监听和连接：



The image shows two terminal windows side-by-side. The left window is titled 'tongyf@tongyf-virtual-machine: ~/Desktop' and shows a telnet session to localhost 9090. The user connects and sends 'hello cs144', receiving the response 'Today is Thursday.'. The right window is also titled 'tongyf@tongyf-virtual-machine: ~/Desktop' and shows a netcat listener on 0.0.0.0 9090. It receives a connection from localhost 40612, which sends 'hello cs144' and 'Today is Thursday.'. The netcat window also shows an email header being received from 2262224764@qq.com.

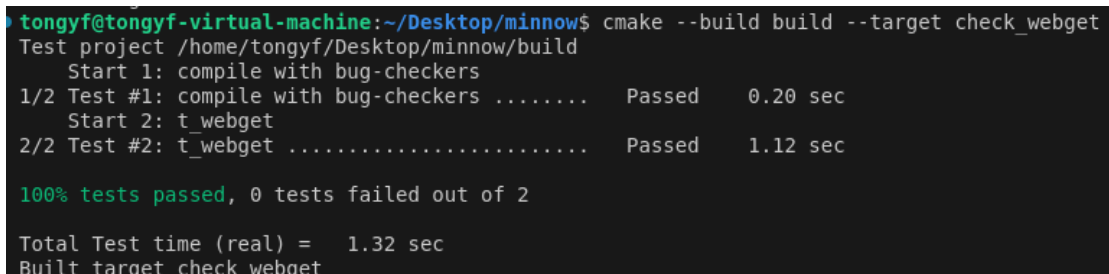
```
tongyf@tongyf-virtual-machine: ~/Desktop
tongyf@tongyf-virtual-machine:~/Desktop$ telnet localhost 9090
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
hello cs144
Today is Thursday.

tongyf@tongyf-virtual-machine: ~/Desktop
tongyf@tongyf-virtual-machine:~/Desktop$ netcat -v -l -p 9090
Listening on 0.0.0.0 9090
Connection received on localhost 40612
hello cs144
Today is Thursday.

235 Authentication successful
mail from:<2262224764@qq.com>
250 OK
RCPT TO:<2262224764@qq.com>
250 OK
DATA
354 End data with <CR><LF>.<CR><LF>.
from:2262224764@qq.com
to:2262224764@qq.com
subject:cs114

hello cs144
.
250 OK: queued as.
^]
telnet> close
Connection closed.
```

Webget:



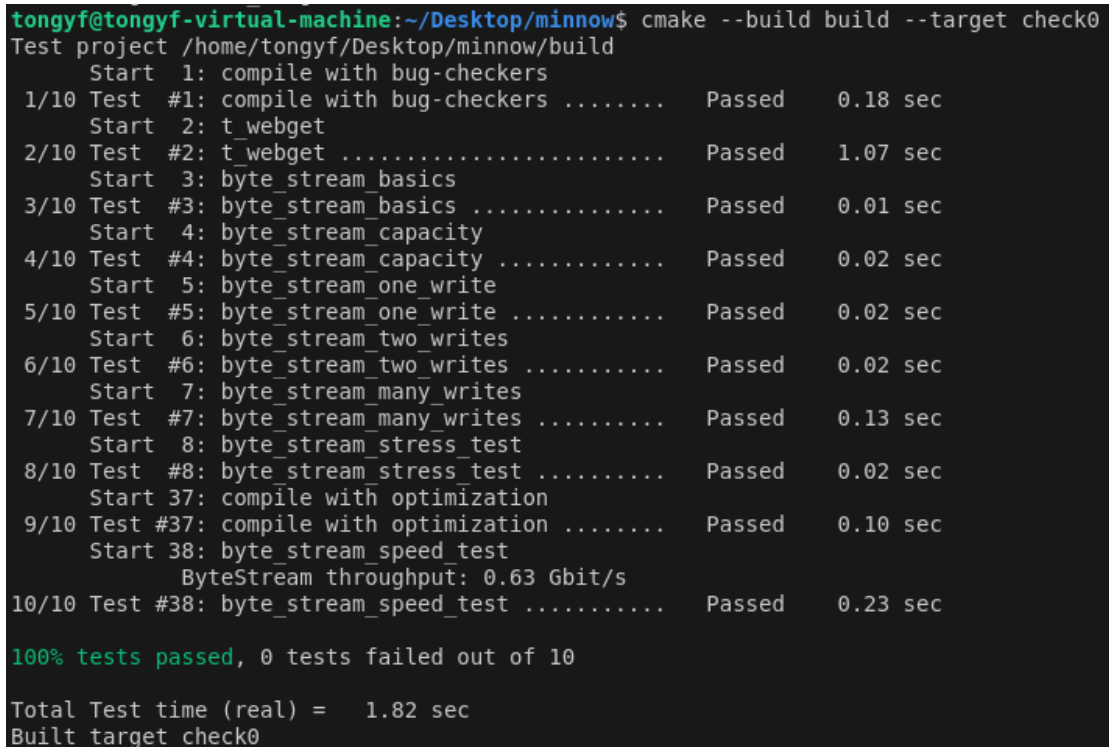
The image shows a terminal window titled 'tongyf@tongyf-virtual-machine: ~/Desktop/minnow\$'. It shows the output of a cmake command to build and test the 'webget' target. The tests passed, with a total test time of 1.32 seconds.

```
tongyf@tongyf-virtual-machine:~/Desktop/minnow$ cmake --build build --target check_webget
Test project /home/tongyf/Desktop/minnow/build
Start 1: compile with bug-checkers
1/2 Test #1: compile with bug-checkers ..... Passed    0.20 sec
Start 2: t_webget
2/2 Test #2: t_webget ..... Passed    1.12 sec

100% tests passed, 0 tests failed out of 2

Total Test time (real) = 1.32 sec
Built target check_webget
```

Byte stream:



The image shows a terminal window titled 'tongyf@tongyf-virtual-machine: ~/Desktop/minnow\$'. It shows the output of a cmake command to build and test the 'check0' target. The tests passed, with a total test time of 1.82 seconds. The output includes details for 10/10 tests, including byte stream basics, capacity, one write, two writes, many writes, stress test, and speed test.

```
tongyf@tongyf-virtual-machine:~/Desktop/minnow$ cmake --build build --target check0
Test project /home/tongyf/Desktop/minnow/build
Start 1: compile with bug-checkers
1/10 Test #1: compile with bug-checkers ..... Passed    0.18 sec
Start 2: t_webget
2/10 Test #2: t_webget ..... Passed    1.07 sec
Start 3: byte_stream_basics
3/10 Test #3: byte_stream_basics ..... Passed    0.01 sec
Start 4: byte_stream_capacity
4/10 Test #4: byte_stream_capacity ..... Passed    0.02 sec
Start 5: byte_stream_one_write
5/10 Test #5: byte_stream_one_write ..... Passed    0.02 sec
Start 6: byte_stream_two_writes
6/10 Test #6: byte_stream_two_writes ..... Passed    0.02 sec
Start 7: byte_stream_many_writes
7/10 Test #7: byte_stream_many_writes ..... Passed    0.13 sec
Start 8: byte_stream_stress_test
8/10 Test #8: byte_stream_stress_test ..... Passed    0.02 sec
Start 37: compile with optimization
9/10 Test #37: compile with optimization ..... Passed    0.10 sec
Start 38: byte_stream_speed_test
ByteStream throughput: 0.63 Gbit/s
10/10 Test #38: byte_stream_speed_test ..... Passed    0.23 sec

100% tests passed, 0 tests failed out of 10

Total Test time (real) = 1.82 sec
Built target check0
```