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This lab took me about 1 hours to do. I did attend the lab session.

Sole portion

- 成功了，示例如图

```
DEBUG: minnow outbound stream to 192.168.0.50:57889 has been fully acknowledged.
DEBUG: minnow TCP connection finished cleanly.
done.
Exiting... done.
(base) li@li-System-Product-Name:~/projects/minnow/build$ ./apps/endoend server cs144.keithw.org 3000
DEBUG: Network interface has Ethernet address 02:00:00:69:ec:c7 and IP address 172.16.0.1
DEBUG: Network interface has Ethernet address 02:00:00:39:bf:bc and IP address 10.0.0.172
DEBUG: adding route 172.16.0.0/12 => (direct) on interface 0
DEBUG: adding route 10.0.0.0/8 => (direct) on interface 1
DEBUG: adding route 192.168.0.0/16 => 10.0.0.192 on interface 1
DEBUG: Network interface has Ethernet address 16:35:b1:d3:72:17 and IP address 172.16.0.100
DEBUG: minnow listening for incoming connection...
DEBUG: minnow new connection from 192.168.0.50:57889.
aaa
bbb
DEBUG: Outbound stream to 172.16.0.100 finished.
DEBUG: minnow outbound stream to 192.168.0.50:57889 finished (0 seqnos still in flight).
DEBUG: minnow outbound stream to 192.168.0.50:57889 has been fully acknowledged.
ccc
DEBUG: minnow inbound stream from 192.168.0.50:57889 finished cleanly.
DEBUG: Inbound stream from 172.16.0.100 finished.
DEBUG: minnow waiting for clean shutdown... ^C
```

- 成功了，示例如图

```
(base) li@li-System-Product-Name:~/projects/minnow/build$ ./apps/endoend server cs144.keithw.org 4090 < /tmp/big.txt
DEBUG: Network interface has Ethernet address 02:00:00:9c:65:3a and IP address 172.16.0.1
DEBUG: Network interface has Ethernet address 02:00:00:33:c4:cd and IP address 10.0.0.172
DEBUG: adding route 172.16.0.0/12 => (direct) on interface 0
DEBUG: adding route 10.0.0.0/8 => (direct) on interface 1
DEBUG: adding route 192.168.0.0/16 => 10.0.0.192 on interface 1
DEBUG: Network interface has Ethernet address 32:ea:b0:3b:99:6f and IP address 172.16.0.100
DEBUG: minnow listening for incoming connection...
DEBUG: minnow new connection from 192.168.0.50:61848.
DEBUG: minnow inbound stream from 192.168.0.50:61848 finished cleanly.
DEBUG: Inbound stream from 172.16.0.100 finished.
DEBUG: Outbound stream to 172.16.0.100 finished.
DEBUG: minnow outbound stream to 192.168.0.50:61848 finished (63000 seqnos still in flight).
DEBUG: minnow outbound stream to 192.168.0.50:61848 has been fully acknowledged.
DEBUG: minnow TCP connection finished cleanly.
done.
Exiting... done.
(base) li@li-System-Product-Name:~/projects/minnow/build$ ./apps/endoend client cs144.keithw.org 4091 > /tmp/big-received.txt < /dev/null
DEBUG: Network interface has Ethernet address 02:00:00:7d:50:a5 and IP address 192.168.0.1
DEBUG: Network interface has Ethernet address 02:00:00:0b:e0:1c and IP address 10.0.0.192
DEBUG: adding route 192.168.0.0/16 => (direct) on interface 0
DEBUG: adding route 10.0.0.0/8 => (direct) on interface 1
DEBUG: adding route 172.16.0.0/12 => 10.0.0.172 on interface 1
DEBUG: Network interface has Ethernet address 8a:ec:35:63:1b:24 and IP address 192.168.0.50
DEBUG: Connecting from 192.168.0.50:61848...
DEBUG: minnow connecting to 172.16.0.100:1234...
DEBUG: minnow successfully connected to 172.16.0.100:1234.
DEBUG: Outbound stream to 172.16.0.100 finished.
DEBUG: minnow outbound stream to 172.16.0.100:1234 finished (0 seqnos still in flight).
DEBUG: minnow outbound stream to 172.16.0.100:1234 has been fully acknowledged.
DEBUG: minnow inbound stream from 172.16.0.100:1234 finished cleanly.
DEBUG: Inbound stream from 172.16.0.100 finished.
DEBUG: minnow waiting for clean shutdown... ^C
```

```
(base) li@li-System-Product-Name:/tmp$ sha256sum /tmp/big.txt
6f30fa45a2f8b22df0e7baa7df19d95dfe6662029a11e639659b97abc2ed2406 /tmp/big.txt
(base) li@li-System-Product-Name:/tmp$ sha256sum /tmp/big-received.txt
6f30fa45a2f8b22df0e7baa7df19d95dfe6662029a11e639659b97abc2ed2406 /tmp/big-received.txt
```

- 无需改动任何代码。

Group portion

- 我的lab partner是李帅，学号502024330027。
- 成功了，示例如图

```
DEBUG: Network interface has Ethernet address 02:00:00:55:bf:fe and IP address 172.16.0.1
DEBUG: Network interface has Ethernet address 02:00:00:1c:6f:1e and IP address 10.0.0.172
DEBUG: adding route 172.16.0.0/12 => (direct) on interface 0
DEBUG: adding route 10.0.0.0/8 => (direct) on interface 1
DEBUG: adding route 192.168.0.0/16 => 10.0.0.192 on interface 1
DEBUG: Network interface has Ethernet address ba:26:9e:b4:b7:5c and IP address 172.16.0.100
DEBUG: minnow listening for incoming connection...
DEBUG: minnow new connection from 192.168.0.50:47473.
hello
hi
DEBUG: Outbound stream to 172.16.0.100 finished.
DEBUG: minnow outbound stream to 192.168.0.50:47473 finished (0 seqnos still in flight).
DEBUG: minnow outbound stream to 192.168.0.50:47473 has been fully acknowledged.
aaa
```

```

DEBUG: Network interface has Ethernet address 02:00:00:ae:14:ab and IP address 192.168.0.1
DEBUG: Network interface has Ethernet address 02:00:00:2d:6a:a2 and IP address 10.0.0.192
DEBUG: adding route 192.168.0.0/16 => (direct) on interface 0
DEBUG: adding route 10.0.0.0/8 => (direct) on interface 1
DEBUG: adding route 172.16.0.0/12 => 10.0.0.172 on interface 1
DEBUG: Network interface has Ethernet address 62:88:3a:61:f0:29 and IP address 192.168.0.50
DEBUG: Connecting from 192.168.0.50:47473...
DEBUG: minnow connecting to 172.16.0.100:1234...
DEBUG: minnow successfully connected to 172.16.0.100:1234.
hello
hi
DEBUG: minnow inbound stream from 172.16.0.100:1234 finished cleanly.
DEBUG: Inbound stream from 172.16.0.100 finished.
aaa

```

- 成功了，示例如图

```

DEBUG: Network interface has Ethernet address 02:00:00:fd:2c:94 and IP address 172.16.0.1
DEBUG: Network interface has Ethernet address 02:00:00:28:a9:1d and IP address 10.0.0.172
DEBUG: adding route 172.16.0.0/12 => (direct) on interface 0
DEBUG: adding route 10.0.0.0/8 => (direct) on interface 1
DEBUG: adding route 192.168.0.0/16 => 10.0.0.192 on interface 1
DEBUG: Network interface has Ethernet address 8a:ef:eb:1c:c0:a5 and IP address 172.16.0.100
DEBUG: minnow listening for incoming connection...
DEBUG: minnow new connection from 192.168.0.50:16739.
DEBUG: minnow inbound stream from 192.168.0.50:16739 finished cleanly.
DEBUG: Inbound stream from 172.16.0.100 finished.
DEBUG: Outbound stream to 172.16.0.100 finished.
DEBUG: minnow waiting for clean shutdown... DEBUG: minnow outbound stream to 192.168.0.50:16739 finished (63000 seqnos still in flight).
DEBUG: minnow outbound stream to 192.168.0.50:16739 has been fully acknowledged.
DEBUG: minnow TCP connection finished cleanly.
done.
Exiting... done.

```

```

DEBUG: Network interface has Ethernet address 02:00:00:54:70:60 and IP address 192.168.0.1
DEBUG: Network interface has Ethernet address 02:00:00:14:d5:77 and IP address 10.0.0.192
DEBUG: adding route 192.168.0.0/16 => (direct) on interface 0
DEBUG: adding route 10.0.0.0/8 => (direct) on interface 1
DEBUG: adding route 172.16.0.0/12 => 10.0.0.172 on interface 1
DEBUG: Network interface has Ethernet address ca:f8:8d:62:6d:e4 and IP address 192.168.0.50
DEBUG: Connecting from 192.168.0.50:16739...
DEBUG: minnow connecting to 172.16.0.100:1234...
DEBUG: minnow successfully connected to 172.16.0.100:1234.
DEBUG: Outbound stream to 172.16.0.100 finished.
DEBUG: minnow outbound stream to 172.16.0.100:1234 finished (0 seqnos still in flight).
DEBUG: minnow outbound stream to 172.16.0.100:1234 has been fully acknowledged.
DEBUG: minnow inbound stream from 172.16.0.100:1234 finished cleanly.
DEBUG: Inbound stream from 172.16.0.100 finished.
DEBUG: minnow waiting for clean shutdown... DEBUG: minnow TCP connection finished cleanly.
done.
Exiting... done.

```

```
6f30fa45a2f8b22df0e7baa7df19d95dfe6662029a11e639659b97abc2ed2406 big.txt
```

```
6f30fa45a2f8b22df0e7baa7df19d95dfe6662029a11e639659b97abc2ed2406 big-received.txt
```

- 无需改动任何代码

## Creative portion

- 无。