

Assignment 3
CPSC 526 Fall 2017
October 29, 2017

Mason Lieu	Shane Sims
ID: 10110089	ID: 00300601
Tutorial 04	Tutorial 04
mlieu@ucalgary.ca	shane.sims@ucalgary.ca

Contents

1	How to monitor HTTP	1
2	How to monitor SSH	2
3	How to monitor NetCat-to-NetCat	2
4	How to monitor backdoor server from Assignment 2	2
5	Supported logging formats	2
6	Sample output	3
6.1	Output - no logging	3
6.2	Output - raw	4
6.3	Output - strip	6
6.4	Output - hex	8
6.5	Output - autoN	9
6.6	Output - replace	10
6.7	Output - netcat-to-netcat communication	11

1 How to monitor HTTP

Terminal 1: Run the proxy server

```
python3 simpleProxyServer.py [log options] <source port> <web server URL> <destination port>
```

Web browser: Connect to the server

```
localhost:<source port>
```

2 How to monitor SSH

Terminal 1: Run the proxy server

```
python3 simpleProxyServer.py [log options] <source port> localhost 22
```

Terminal 2: Connect to the server through SSH

```
ssh localhost -p 22
```

3 How to monitor NetCat-to-NetCat

Terminal 1: Run NetCat to listen for incoming connections

```
nc -l <destination port>
```

Terminal 2: Run the proxy server

```
python3 simpleProxyServer.py [log options] <source port> localhost <destination port>
```

Terminal 3: Run NetCat

```
nc localhost <source port>
```

4 How to monitor backdoor server from Assignment 2

Terminal 1: Run backdoor server

```
python3 backdoor_server.py <destination port>
```

Terminal 2: Run the proxy server

```
python3 simpleProxyServer.py [log options] <source port> localhost <destination port>
```

Terminal 3: Run NetCat

```
nc localhost <source port>
```

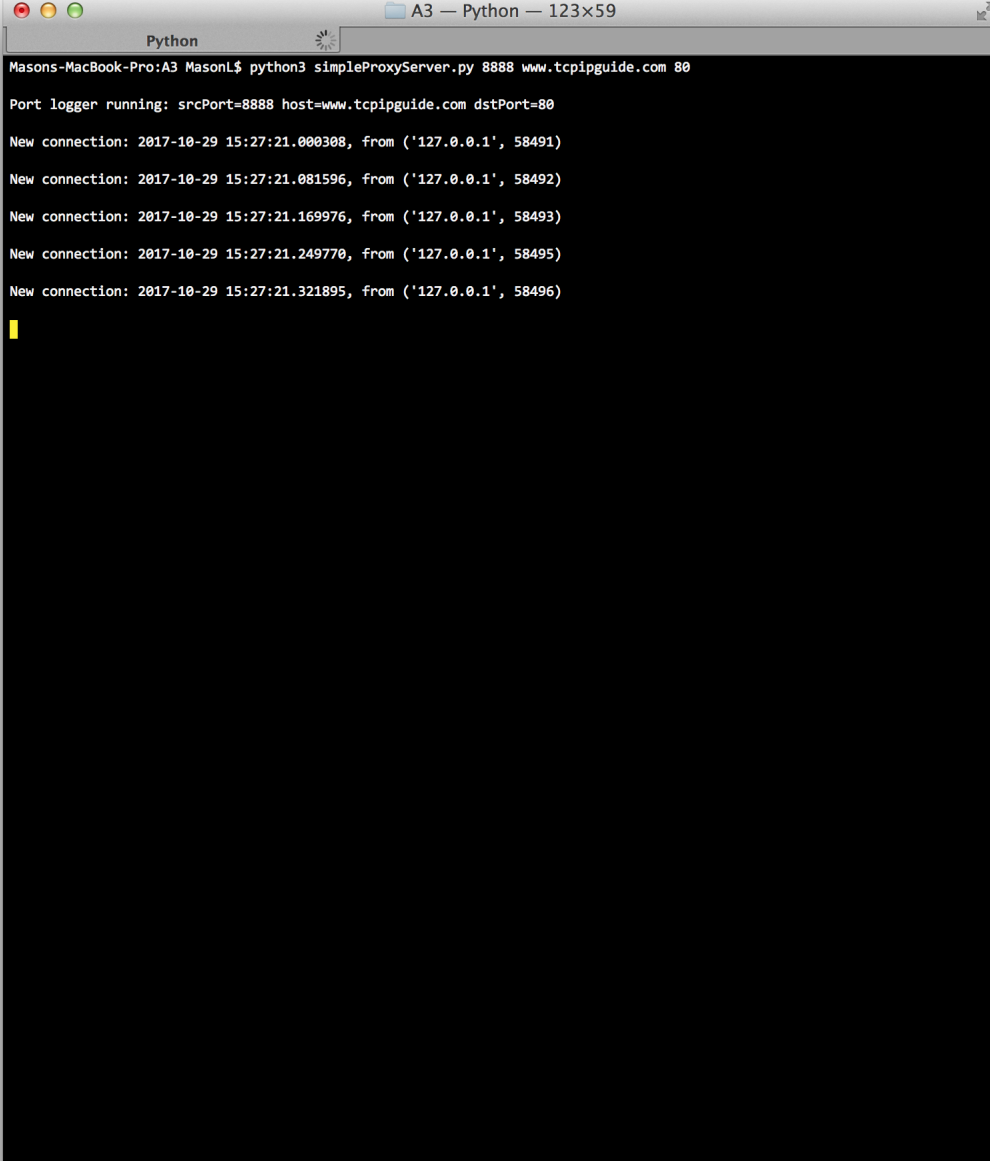
5 Supported logging formats

This program supports the following logging formats

1. -raw
2. -strip
3. -hex
4. -autoN
5. -replace

6 Sample output

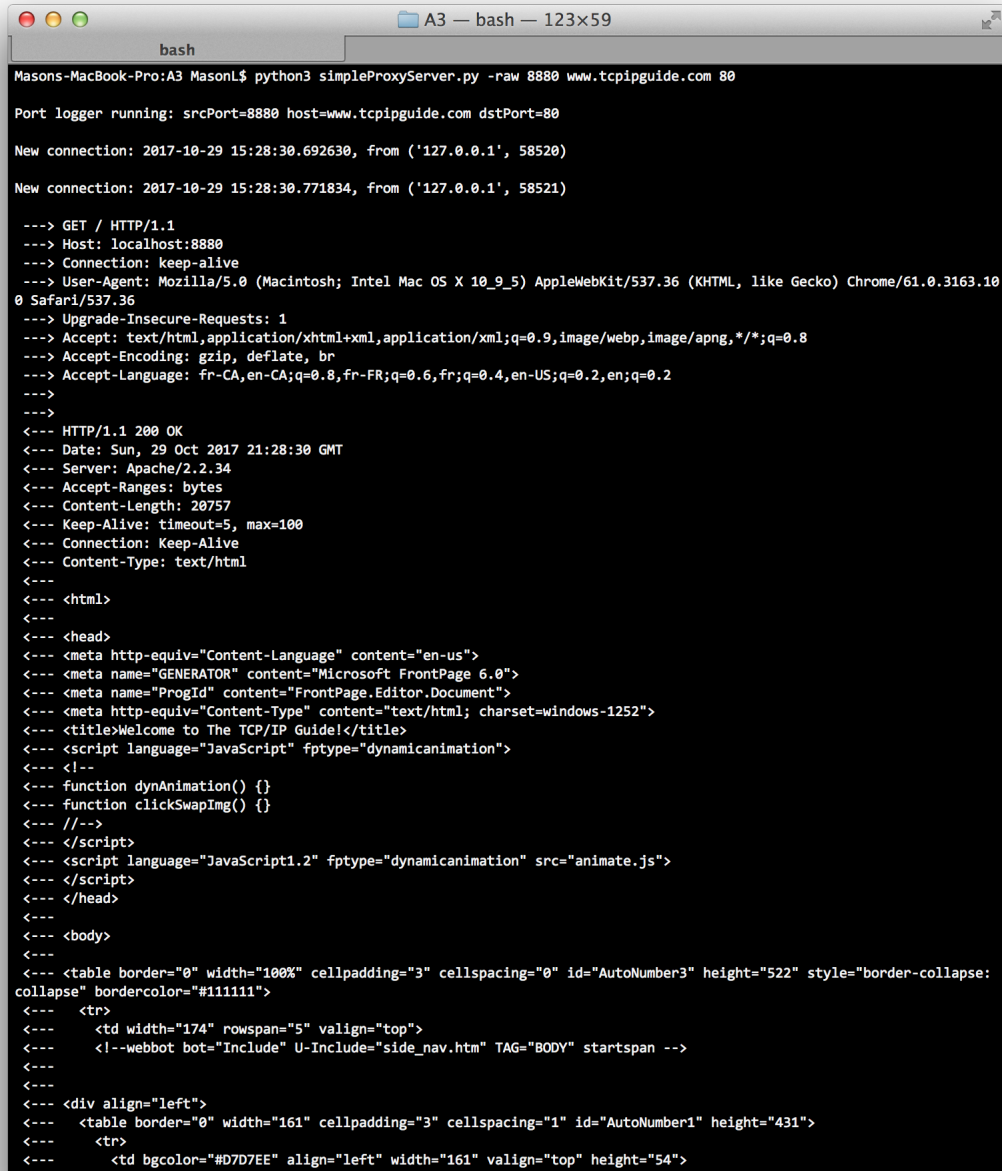
6.1 Output - no logging



```
Masons-MacBook-Pro:A3 MasonL$ python3 simpleProxyServer.py 8888 www.tcpipguide.com 80
Port logger running: srcPort=8888 host=www.tcpipguide.com dstPort=80
New connection: 2017-10-29 15:27:21.000308, from ('127.0.0.1', 58491)
New connection: 2017-10-29 15:27:21.081596, from ('127.0.0.1', 58492)
New connection: 2017-10-29 15:27:21.169976, from ('127.0.0.1', 58493)
New connection: 2017-10-29 15:27:21.249770, from ('127.0.0.1', 58495)
New connection: 2017-10-29 15:27:21.321895, from ('127.0.0.1', 58496)
█
```

Figure 1: No logging options selected

6.2 Output - raw



```
A3 — bash — 123x59
bash
Masons-MacBook-Pro:A3 MasonL$ python3 simpleProxyServer.py -raw 8880 www.tcpipguide.com 80

Port logger running: srcPort=8880 host=www.tcpipguide.com dstPort=80

New connection: 2017-10-29 15:28:30.692630, from ('127.0.0.1', 58520)

New connection: 2017-10-29 15:28:30.771834, from ('127.0.0.1', 58521)

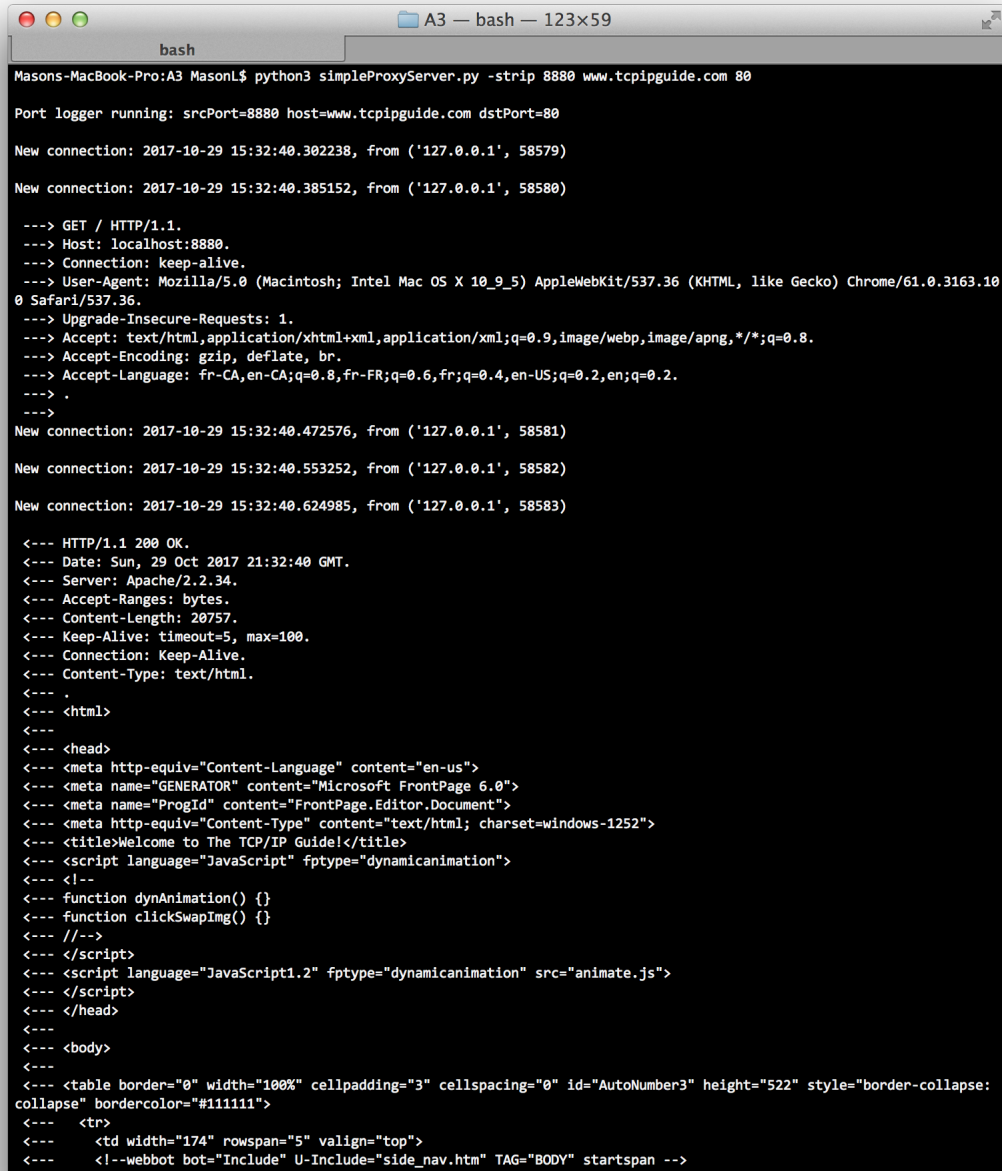
--> GET / HTTP/1.1
--> Host: localhost:8880
--> Connection: keep-alive
--> User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_9_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/61.0.3163.100 Safari/537.36
--> Upgrade-Insecure-Requests: 1
--> Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8
--> Accept-Encoding: gzip, deflate, br
--> Accept-Language: fr-CA,en-CA;q=0.8,fr-FR;q=0.6,fr;q=0.4,en-US;q=0.2,en;q=0.2
-->
<--- HTTP/1.1 200 OK
<--- Date: Sun, 29 Oct 2017 21:28:30 GMT
<--- Server: Apache/2.2.34
<--- Accept-Ranges: bytes
<--- Content-Length: 20757
<--- Keep-Alive: timeout=5, max=100
<--- Connection: Keep-Alive
<--- Content-Type: text/html
<---
<--- <html>
<---
<--- <head>
<--- <meta http-equiv="Content-Language" content="en-us">
<--- <meta name="GENERATOR" content="Microsoft FrontPage 6.0">
<--- <meta name="ProgId" content="FrontPage.Editor.Document">
<--- <meta http-equiv="Content-Type" content="text/html; charset=windows-1252">
<--- <title>Welcome to The TCP/IP Guide!</title>
<--- <script language="JavaScript" fptype="dynamicanimation">
<--- <!--
<--- function dynAnimation() {}
<--- function clickSwapImg() {}
<--- //-->
<--- </script>
<--- <script language="JavaScript1.2" fptype="dynamicanimation" src="animate.js">
<--- </script>
<--- </head>
<---
<--- <body>
<---
<--- <table border="0" width="100%" cellpadding="3" cellspacing="0" id="AutoNumber3" height="522" style="border-collapse: collapse; bordercolor="#111111">
<--- <tr>
<--- <td width="174" rowspan="5" valign="top">
<--- <!--webbot bot="Include" U-Include="side_nav.htm" TAG="BODY" startspan -->
<---
<---
<--- <div align="left">
<--- <table border="0" width="161" cellpadding="3" cellspacing="1" id="AutoNumber1" height="431">
<--- <tr>
<--- <td bgcolor="#07D7EE" align="left" width="161" valign="top" height="54">
```

Figure 2: Initialization of proxy server with raw formatting



Figure 3: Sample output in the middle of execution

6.3 Output - strip

A screenshot of a macOS terminal window titled "A3 — bash — 123x59". The terminal shows the execution of a Python script named "simpleProxyServer.py" with the command "python3 simpleProxyServer.py -strip 8880 www.tcpipguide.com 80". The output indicates that a port logger is running on srcPort=8880 and host=www.tcpipguide.com, with dstPort=80. It then shows several new connections from 127.0.0.1. The first connection shows an HTTP GET request for / HTTP/1.1. The response is an HTTP 200 OK status with various headers including Date, Server, Accept-Ranges, Content-Length, Keep-Alive, Connection, and Content-Type. The response body is an HTML document titled "Welcome to The TCP/IP Guide!". The terminal output is formatted with "strip" formatting, which uses color and bold text to highlight different parts of the output. The terminal window has a standard macOS title bar with red, yellow, and green window control buttons.

```
Masons-MacBook-Pro:A3 MasonL$ python3 simpleProxyServer.py -strip 8880 www.tcpipguide.com 80

Port logger running: srcPort=8880 host=www.tcpipguide.com dstPort=80

New connection: 2017-10-29 15:32:40.302238, from ('127.0.0.1', 58579)

New connection: 2017-10-29 15:32:40.385152, from ('127.0.0.1', 58580)

--> GET / HTTP/1.1.
--> Host: localhost:8880.
--> Connection: keep-alive.
--> User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_9_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/61.0.3163.100 Safari/537.36.
--> Upgrade-Insecure-Requests: 1.
--> Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8.
--> Accept-Encoding: gzip, deflate, br.
--> Accept-Language: fr-CA,en-CA;q=0.8,fr-FR;q=0.6,fr;q=0.4,en-US;q=0.2,en;q=0.2.
--> .
-->

New connection: 2017-10-29 15:32:40.472576, from ('127.0.0.1', 58581)

New connection: 2017-10-29 15:32:40.553252, from ('127.0.0.1', 58582)

New connection: 2017-10-29 15:32:40.624985, from ('127.0.0.1', 58583)

<--- HTTP/1.1 200 OK.
<--- Date: Sun, 29 Oct 2017 21:32:40 GMT.
<--- Server: Apache/2.2.34.
<--- Accept-Ranges: bytes.
<--- Content-Length: 20757.
<--- Keep-Alive: timeout=5, max=100.
<--- Connection: Keep-Alive.
<--- Content-Type: text/html.
<--- .
<--- <html>
<--- <head>
<--- <meta http-equiv="Content-Language" content="en-us">
<--- <meta name="GENERATOR" content="Microsoft FrontPage 6.0">
<--- <meta name="ProgId" content="FrontPage.Editor.Document">
<--- <meta http-equiv="Content-Type" content="text/html; charset=windows-1252">
<--- <title>Welcome to The TCP/IP Guide!</title>
<--- <script language="JavaScript" fptype="dynamicanimation">
<--- <!--
<--- function dynAnimation() {}
<--- function clickSwapImg() {}
<--- //-->
<--- </script>
<--- <script language="JavaScript1.2" fptype="dynamicanimation" src="animate.js">
<--- </script>
<--- </head>
<--- <body>
<--- <table border="0" width="100%" cellpadding="3" cellspacing="0" id="AutoNumber3" height="522" style="border-collapse: collapse" bordercolor="#111111">
<--- <tr>
<--- <td width="174" rowspan="5" valign="top">
<--- <!--webbot bot="Include" U-Include="side_nav.htm" TAG="BODY" startspan -->
```

Figure 4: Initialization of proxy server with strip formatting

```
A3 — Python — 123x59
Python
<--- </p>
<--- <!--webbot bot="Include" i-checksum="38707" endspan --></td>
<--- </tr>
<--- </table>
<---
<--- </body>
<---
<--- </html>
--> GET /images/features/btn_featuresdown.gif HTTP/1.1.
--> Host: localhost:8888.
--> Connection: keep-alive.
--> User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_9_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/61.0.3163.100 Safari/537.36.
--> Accept: image/webp,image/apng,image/*,*/*;q=0.8.
--> Referer: http://localhost:8888/news.htm.
--> Accept-Encoding: gzip, deflate, br.
--> Accept-Language: fr-CA,en-CA;q=0.8,fr-FR;q=0.6,en-US;q=0.4,en;q=0.2.
--> .
<--- HTTP/1.1 200 OK.
<--- Date: Sun, 29 Oct 2017 21:33:55 GMT.
<--- Server: Apache/2.2.34.
<--- Last-Modified: Fri, 19 Dec 2003 20:20:46 GMT.
<--- ETag: "34b-3cedb133c2380".
<--- Accept-Ranges: bytes.
<--- Content-Length: 843.
<--- Keep-Alive: timeout=5, max=93.
<--- Connection: Keep-Alive.
<--- Content-Type: image/gif.
<--- .
<---
<--- GIF89a.....
.....w....|t.og{aZlSM}E@M73=&.....!.....@.A.....r.l:..
.tj.....X.z....V`...x.n....dSQ.....
<--- ..
<--- .....|t.....
<--- .....!.....3.3+.)...../-D...KD.Y.DX....3...((...8w..5D.C..X...P.b.
<--- ..Q"p.....g|T".K....+...../^(.aBA...*Xl..F.07..aB...GSth.....
<--- .[...Q...N.F..4mP..d..J..X.)k=U .....`a.d..P.:|1..0.....fY.#...+Ba&.....K...l.R.B?...SwdY,d.U....L_H...o
X.a./b.Q..xc..xV..E..]z9..+....<...n...}.E..@.....h...&...6...F(l..Hp.#|A..t.h.. .(.$.h..(....'V...%....d
`..8....<...@.)..D....'P..L6...PF)..TVi..Xf.%.%....).d.i.h....l....A..;
--> GET /features.htm HTTP/1.1.
--> Host: localhost:8888.
--> Connection: keep-alive.
--> Upgrade-Insecure-Requests: 1.
--> User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_9_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/61.0.3163.100 Safari/537.36.
--> Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8.
--> Referer: http://localhost:8888/news.htm.
--> Accept-Encoding: gzip, deflate, br.
--> Accept-Language: fr-CA,en-CA;q=0.8,fr-FR;q=0.6,en-US;q=0.4,en;q=0.2.
--> .
<--- HTTP/1.1 200 OK.
<--- Date: Sun, 29 Oct 2017 21:34:00 GMT.
<--- Server: Apache/2.2.34.
<--- Accept-Ranges: bytes.
<--- Content-Length: 16046.
<--- Keep-Alive: timeout=5, max=92.
```

Figure 5: Sample output in the middle of execution

6.4 Output - hex

```
A3 — Python — 123x59
Python
Masons-MacBook-Pro:A3 MasonL$ python3 simpleProxyServer.py -hex 8880 www.tcpipguide.com 80

Port logger running: srcPort=8880 host=www.tcpipguide.com dstPort=80

New connection: 2017-10-29 15:36:52.341849, from ('127.0.0.1', 58625)

New connection: 2017-10-29 15:36:52.420107, from ('127.0.0.1', 58626)

----> 00000000 47 45 54 20 2f 20 48 54 54 50 2f 31 2e 31 5c 72 |GET / HTTP/1.1\r|
----> 00000016 5c 6e 48 6f 73 74 3a 20 6c 6f 63 61 6c 68 6f 73 |\nHost: localhos|
----> 00000032 74 3a 38 38 38 30 5c 72 5c 6e 43 6f 6e 6e 65 63 |t:8880\r\nConnec|
----> 00000048 74 69 6f 6e 3a 20 6b 65 65 70 2d 61 6c 69 76 65 |tion: keep-alive|
----> 00000064 5c 72 5c 6e 55 73 65 72 2d 41 67 65 6e 74 3a 20 |\r\nUser-Agent: |
----> 00000080 4d 6f 7a 69 6c 6c 61 2f 35 2e 30 20 28 4d 61 63 |Mozilla/5.0 (Mac|
----> 00000096 69 6e 74 6f 73 68 3b 20 49 6e 74 65 6c 20 4d 61 |intosh; Intel Ma|
----> 00000112 63 20 4f 53 20 58 20 31 30 5f 39 5f 35 29 20 41 |c OS X 10_9_5) A|
----> 00000128 70 70 6c 65 57 65 62 4b 69 74 2f 35 33 37 2e 33 |ppleWebKit/537.3|
----> 00000144 36 20 28 4b 48 54 4d 4c 2c 20 6c 69 6b 65 20 47 |6 (KHTML, like G|
----> 00000160 65 63 6b 6f 29 20 43 68 72 6f 6d 65 2f 36 31 2e |ecko) Chrome/61.|
----> 00000176 30 2e 33 31 36 33 2e 31 30 30 20 53 61 66 61 72 |0.3163.100 Safar|
----> 00000192 69 2f 35 33 37 2e 33 36 5c 72 5c 6e 55 70 67 72 |1/537.36\r\nUpgr|
----> 00000208 61 64 65 2d 49 6e 73 65 63 75 72 65 2d 52 65 71 |ade-Insecure-Req|
----> 00000224 75 65 73 74 73 3a 20 31 5c 72 5c 6e 41 63 63 65 |uests: 1\r\nAcce|
----> 00000240 70 74 3a 20 74 65 78 74 2f 68 74 6d 6c 2c 61 70 |pt: text/html,ap|
----> 00000256 70 6c 69 63 61 74 69 6f 6e 2f 78 68 74 6d 6c 2b |plication/xhtml+|
----> 00000272 78 6d 6c 2c 61 70 70 6c 69 63 61 74 69 6f 6e 2f |xml,application/|
----> 00000288 78 6d 6c 3b 71 3d 30 2e 39 2c 69 6d 61 67 65 2f |xml;q=0.9,image/|
----> 00000304 77 65 62 70 2c 69 6d 61 67 65 2f 61 70 6e 67 2c |webp,image/apng,|
----> 00000320 2a 2f 2a 3b 71 3d 30 2e 38 5c 72 5c 6e 41 63 63 |/*;q=0.8\r\nAcc|
----> 00000336 65 70 74 2d 45 6e 63 6f 64 69 6e 67 3a 20 67 7a |ept-Encoding: gz|
----> 00000352 69 70 2c 20 64 65 66 6c 61 74 65 2c 20 62 72 5c |ip, deflate, br\|
----> 00000368 72 5c 6e 41 63 63 65 70 74 2d 4c 61 6e 67 75 61 |\r\nAccept-Langua|
----> 00000384 67 65 3a 20 66 72 2d 43 41 2c 65 6e 2d 43 41 3b |ge: fr-CA,en-CA;|
----> 00000400 71 3d 30 2e 38 2c 66 72 2d 46 52 3b 71 3d 30 2e |q=0.8,fr-FR;q=0.|
----> 00000416 36 2c 66 72 3b 71 3d 30 2e 34 2c 65 6e 2d 55 53 |6,fr;q=0.4,en-US|
----> 00000432 3b 71 3d 30 2e 32 2c 65 6e 3b 71 3d 30 2e 32 5c |;q=0.2,en;q=0.2\|
----> 00000448 72 5c 6e 5c 72 5c 6e |\r\n\r\n|

New connection: 2017-10-29 15:36:52.491979, from ('127.0.0.1', 58627)

New connection: 2017-10-29 15:36:52.570894, from ('127.0.0.1', 58629)

New connection: 2017-10-29 15:36:52.642553, from ('127.0.0.1', 58630)

<--- 00000000 48 54 54 50 2f 31 2e 31 20 32 30 30 20 4f 4b 5c |HTTP/1.1 200 OK\|
<--- 00000016 72 5c 6e 44 61 74 65 3a 20 53 75 6e 2c 20 32 39 |\r\nDate: Sun, 29|
<--- 00000032 20 4f 63 74 20 32 30 31 37 20 32 31 3a 33 36 3a | Oct 2017 21:36:|
<--- 00000048 35 32 20 47 4d 54 5c 72 5c 6e 53 65 72 76 65 72 |52 GMT\r\nServer|
<--- 00000064 3a 20 41 70 61 63 68 65 2f 32 2e 32 2e 33 34 5c |: Apache/2.2.34\|
<--- 00000080 72 5c 6e 41 63 63 65 70 74 2d 52 61 6e 67 65 73 |\r\nAccept-Ranges|
<--- 00000096 3a 20 62 79 74 65 73 5c 72 5c 6e 43 6f 6e 74 65 |: bytes\r\nConte|
<--- 00000112 6e 74 2d 4c 65 6e 67 74 68 3a 20 32 30 37 35 37 |nt-Length: 20757|
<--- 00000128 5c 72 5c 6e 4b 65 65 70 2d 41 6c 69 76 65 3a 20 |\r\nKeep-Alive: |
<--- 00000144 74 69 6d 65 6f 75 74 3d 35 2c 20 6d 61 78 3d 31 |timeout=5, max=1|
<--- 00000160 30 30 5c 72 5c 6e 43 6f 6e 6e 65 63 74 69 6f 6e |00\r\nConnection|
<--- 00000176 3a 20 4b 65 65 70 2d 41 6c 69 76 65 5c 72 5c 6e |: Keep-Alive\r\n|
<--- 00000192 43 6f 6e 74 65 6e 74 2d 54 79 70 65 3a 20 74 65 |Content-Type: te|
<--- 00000208 78 74 2f 68 74 6d 6c 5c 72 5c 6e 5c 72 5c 6e 3c |xt/html\r\n\r\n<|
<--- 00000224 68 74 6d 6c 3e 5c 6e 5c 6e 3c 68 65 61 64 3e 5c |html>\n\n<head>|
<--- 00000240 6e 3c 6d 65 74 61 20 68 74 70 2d 65 71 75 69 |<meta http-equi|
```

Figure 6: Initialization of proxy server with hex formatting

6.5 Output - autoN

```
A3 — bash — 123x59
bash
Masons-MacBook-Pro:A3 MasonL$ python3 simpleProxyServer.py -autoN 30 8888 www.tcpipguide.com 80

Port logger running: srcPort=8888 host=www.tcpipguide.com dstPort=80

New connection: 2017-10-29 15:39:15.871428, from ('127.0.0.1', 58646)

New connection: 2017-10-29 15:39:15.953720, from ('127.0.0.1', 58647)

--> GET / HTTP/1.1\r\nHost: localhos
--> t:8888\r\nConnection: keep-alive
--> \r\nUser-Agent: Mozilla/5.0 (Mac
-->intosh; Intel Mac OS X 10_9_5)
--> AppleWebKit/537.36 (KHTML, li
--> ke Gecko) Chrome/61.0.3163.100
--> Safari/537.36\r\nUpgrade-Insecu
--> re-Requests: 1\r\nAccept: text/h
--> tml,application/xhtml+xml,appl
--> ication/xml;q=0.9,image/webp,i
--> mage/apng,*/*;q=0.8\r\nAccept-En
--> coding: gzip, deflate, br\r\nAcc
--> ept-Language: fr-CA,en-CA;q=0.
--> 8,fr-FR;q=0.6,fr;q=0.4,en-US;q
--> =0.2,en;q=0.2\r\n\r\n
New connection: 2017-10-29 15:39:16.041709, from ('127.0.0.1', 58648)

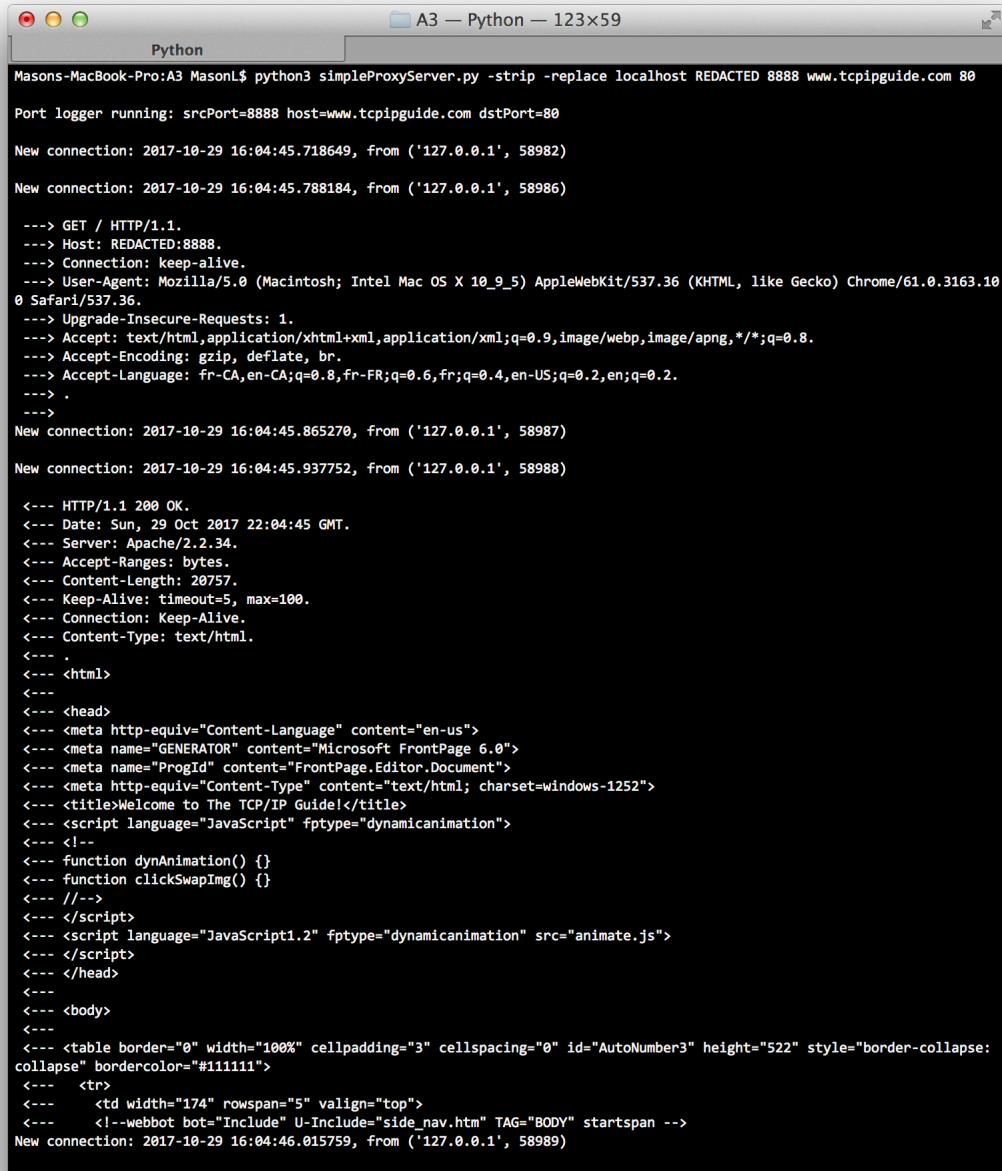
New connection: 2017-10-29 15:39:16.123697, from ('127.0.0.1', 58650)

New connection: 2017-10-29 15:39:16.201673, from ('127.0.0.1', 58651)

<--- HTTP/1.1 200 OK\r\nDate: Sun, 29
<--- Oct 2017 21:39:15 GMT\r\nServer
<--- : Apache/2.2.34\r\nAccept-Ranges
<--- : bytes\r\nContent-Length: 20757
<--- \r\nKeep-Alive: timeout=5, max=1
<--- 00\r\nConnection: Keep-Alive\r\nCo
<--- ntent-Type: text/html\r\n\r\n<html
<--- >\r\n<head>\r\n<meta http-equiv="Co
<--- ntent-Language" content="en-us
<--- ">\r\n<meta name="GENERATOR" cont
<--- ent="Microsoft FrontPage 6.0">
<--- \r\n<meta name="ProgId" content="
<--- FrontPage.Editor.Document">\r\n<m
<--- eta http-equiv="Content-Type"
<--- content="text/html; charset=wi
<--- ndows-1252">\r\n<title>Welcome to
<--- The TCP/IP Guide\r\n</title>\r\n<sc
<--- ript language="JavaScript" fpt
<--- ype="dynamicanimation">\r\n<!--\r\nf
<--- unction dynAnimation() {\r\n\r\nf
<--- unction clickSwapImg() {\r\n\r\nf
<--- /script>\r\n<script language="Jav
<--- aScript1.2" fptype="dynamicanani
<--- mation" src="animate.js">\r\n</sc
<--- ript>\r\n</head>\r\n\r\n<body>\r\n<table
<--- border="0" width="100%" cellpa
<--- dding="3" cellspacing="0" id="
<--- AutoNumber3" height="522" styl
<--- e="border-collapse: collapse"
<--- bordercolor="#111111">\r\n <tr>\r\n
```

Figure 7: Initialization of proxy server with autoN formatting where n = 30

6.6 Output - replace



```
Masons-MacBook-Pro:A3 MasonL$ python3 simpleProxyServer.py -strip -replace localhost REDACTED 8888 www.tcpipguide.com 80

Port logger running: srcPort=8888 host=www.tcpipguide.com dstPort=80

New connection: 2017-10-29 16:04:45.718649, from ('127.0.0.1', 58982)

New connection: 2017-10-29 16:04:45.788184, from ('127.0.0.1', 58986)

--> GET / HTTP/1.1.
--> Host: REDACTED:8888.
--> Connection: keep-alive.
--> User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_9_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/61.0.3163.100 Safari/537.36.
--> Upgrade-Insecure-Requests: 1.
--> Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8.
--> Accept-Encoding: gzip, deflate, br.
--> Accept-Language: fr-CA,en-CA;q=0.8,fr-FR;q=0.6,fr;q=0.4,en-US;q=0.2,en;q=0.2.
--> .
-->

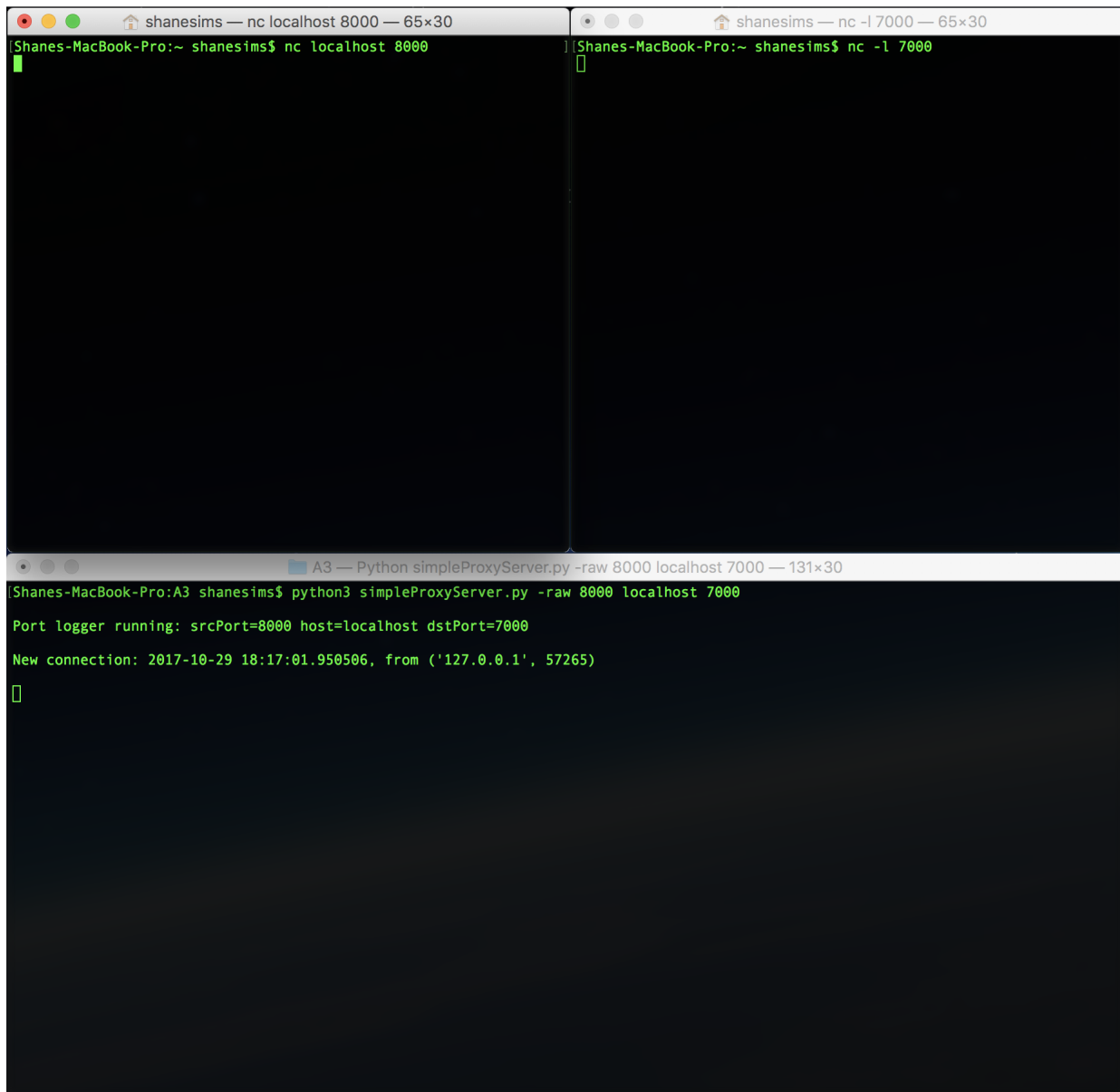
New connection: 2017-10-29 16:04:45.865270, from ('127.0.0.1', 58987)

New connection: 2017-10-29 16:04:45.937752, from ('127.0.0.1', 58988)

<--- HTTP/1.1 200 OK.
<--- Date: Sun, 29 Oct 2017 22:04:45 GMT.
<--- Server: Apache/2.2.34.
<--- Accept-Ranges: bytes.
<--- Content-Length: 20757.
<--- Keep-Alive: timeout=5, max=100.
<--- Connection: Keep-Alive.
<--- Content-Type: text/html.
<--- .
<--- <html>
<---
<--- <head>
<--- <meta http-equiv="Content-Language" content="en-us">
<--- <meta name="GENERATOR" content="Microsoft FrontPage 6.0">
<--- <meta name="ProgId" content="FrontPage.Editor.Document">
<--- <meta http-equiv="Content-Type" content="text/html; charset=windows-1252">
<--- <title>Welcome to The TCP/IP Guide!</title>
<--- <script language="JavaScript" fptype="dynamicanimation">
<--- <!--
<--- function dynAnimation() {}
<--- function clickSwapImg() {}
<--- </script>
<--- <script language="JavaScript1.2" fptype="dynamicanimation" src="animate.js">
<--- </script>
<--- </head>
<---
<--- <body>
<---
<--- <table border="0" width="100%" cellpadding="3" cellspacing="0" id="AutoNumber3" height="522" style="border-collapse: collapse" bordercolor="#111111">
<--- <tr>
<--- <td width="174" rowspan="5" valign="top">
<--- <!--webbot bot="Include" U-Include="side_nav.htm" TAG="BODY" startspan -->
New connection: 2017-10-29 16:04:46.015759, from ('127.0.0.1', 58989)
```

Figure 8: Initialization of proxy server with replace formatting. All instances of 'localhost' replaced with 'REDACTED'

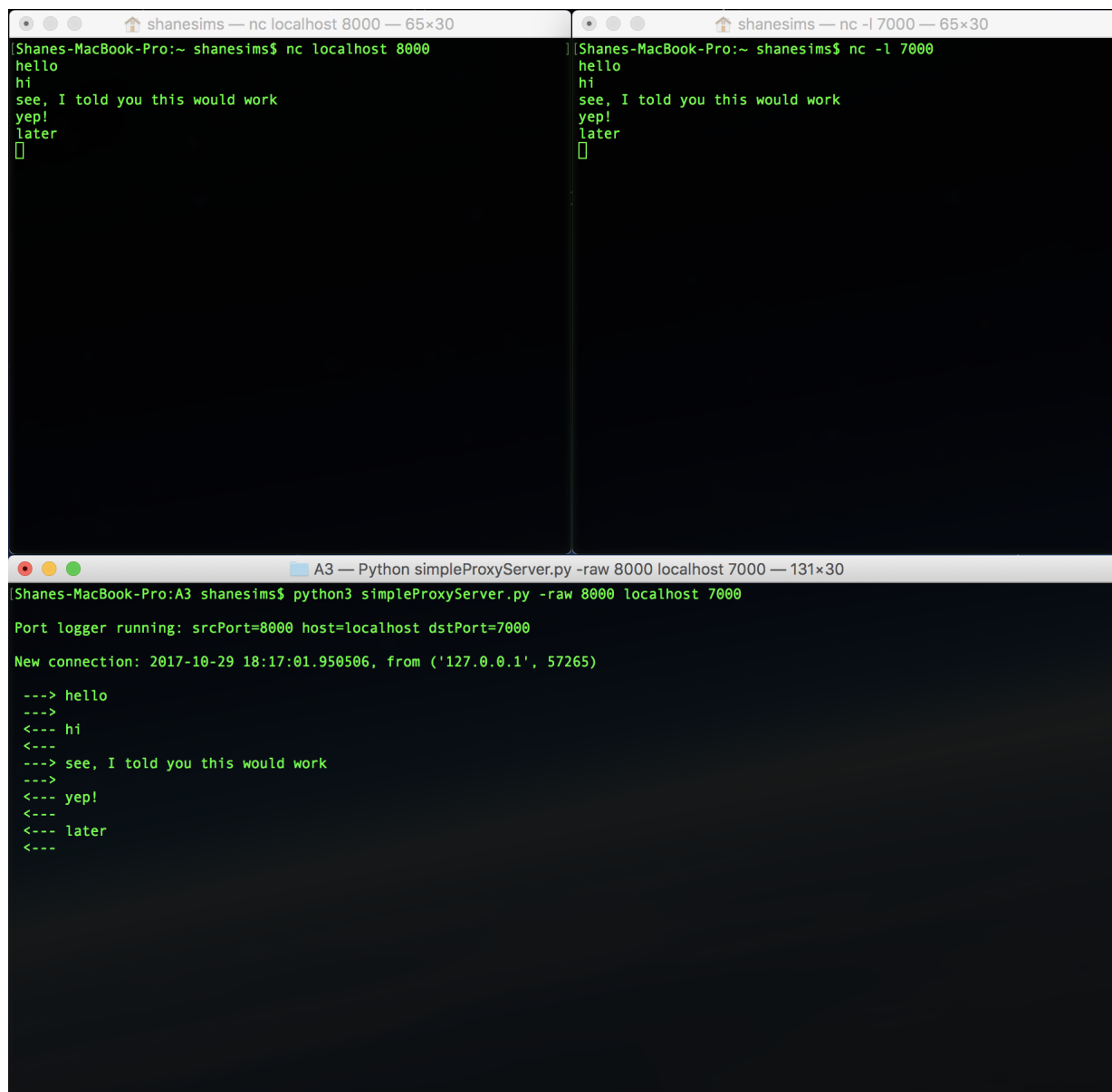
6.7 Output - netcat-to-netcat communication



The image displays three terminal windows from a macOS environment, arranged in a grid. The top-left window is titled 'shanesims — nc localhost 8000 — 65x30' and shows the command 'nc localhost 8000' being entered. The top-right window is titled 'shanesims — nc -l 7000 — 65x30' and shows the command 'nc -l 7000' being entered. The bottom window is titled 'A3 — Python simpleProxyServer.py -raw 8000 localhost 7000 — 131x30' and shows the command 'python3 simpleProxyServer.py -raw 8000 localhost 7000' being entered. The output of this command shows the port logger running and a new connection from 127.0.0.1.

```
shanesims$ nc localhost 8000
shanesims$ nc -l 7000
A3$ python3 simpleProxyServer.py -raw 8000 localhost 7000
Port logger running: srcPort=8000 host=localhost dstPort=7000
New connection: 2017-10-29 18:17:01.950506, from ('127.0.0.1', 57265)
```

Figure 9: Initialization of proxy (bottom), netcat server (top-right), and netcat client (top-left)



The image displays three terminal windows from a macOS environment, illustrating a network proxy setup. The top-left window, titled 'shanesims — nc localhost 8000 — 65x30', shows a netcat listener on port 8000 receiving a connection. The top-right window, titled 'shanesims — nc -l 7000 — 65x30', shows a netcat listener on port 7000. The bottom window, titled 'A3 — Python simpleProxyServer.py -raw 8000 localhost 7000 — 131x30', shows a Python script acting as a proxy between the two netcat listeners. The proxy server logs the connection and relays the conversation between the client and the destination.

```
Shanes-MacBook-Pro:~ shanesims$ nc localhost 8000
hello
hi
see, I told you this would work
yep!
later
[]

Shanes-MacBook-Pro:~ shanesims$ nc -l 7000
hello
hi
see, I told you this would work
yep!
later
[]

A3 — Python simpleProxyServer.py -raw 8000 localhost 7000 — 131x30
Shanes-MacBook-Pro:A3 shanesims$ python3 simpleProxyServer.py -raw 8000 localhost 7000
Port logger running: srcPort=8000 host=localhost dstPort=7000
New connection: 2017-10-29 18:17:01.950506, from ('127.0.0.1', 57265)

--> hello
-->
<-- hi
<--
--> see, I told you this would work
-->
<-- yep!
<--
<-- later
<--
```

Figure 10: Sample output in the middle of execution