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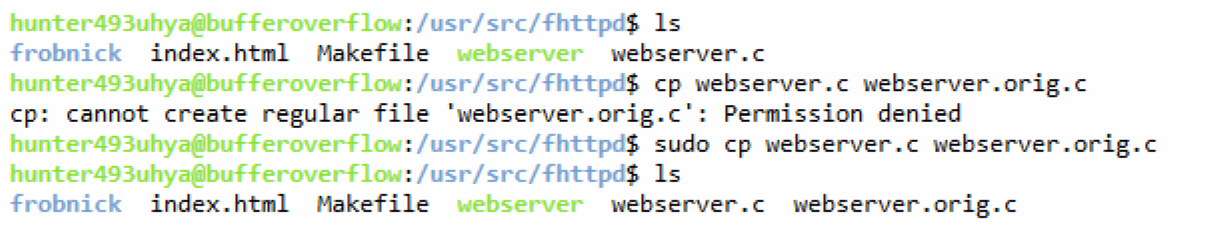
4.1.2:

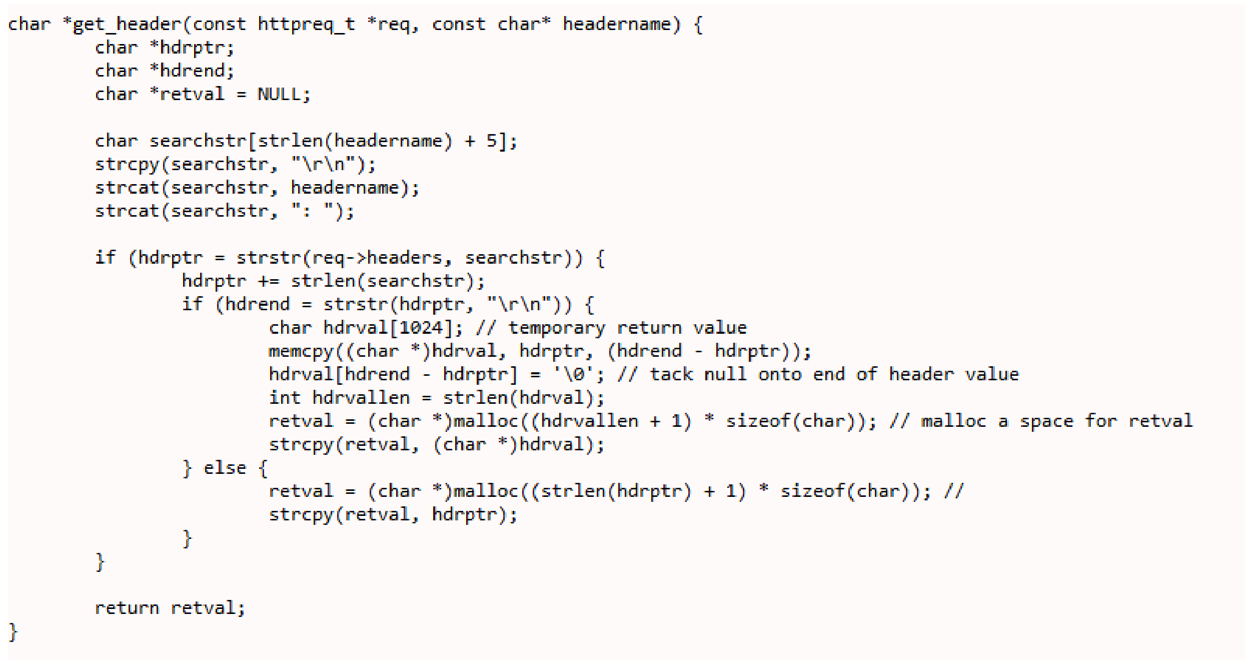
4.



```
hunter493uhya@bufferoverflow:/usr/src/fhttpd$ ls
frobnick  index.html  Makefile  webserver  webserver.c
hunter493uhya@bufferoverflow:/usr/src/fhttpd$ cp webserver.c webserver.orig.c
cp: cannot create regular file 'webserver.orig.c': Permission denied
hunter493uhya@bufferoverflow:/usr/src/fhttpd$ sudo cp webserver.c webserver.orig.c
hunter493uhya@bufferoverflow:/usr/src/fhttpd$ ls
frobnick  index.html  Makefile  webserver  webserver.c  webserver.orig.c
```

5.

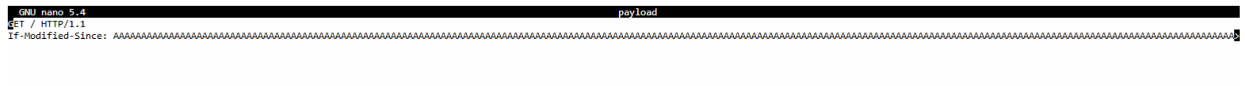
We found a buffer overflow vulnerability in the *get_header function, since 1024 chars are assigned to the header size, but we can make a longer header.



```c
char *get_header(const httpreq_t *req, const char* headername) {
        char *hdrptr;
        char *hdrend;
        char *retval = NULL;

        char searchstr[strlen(headername) + 5];
        strcpy(searchstr, "\r\n");
        strcat(searchstr, headername);
        strcat(searchstr, ": ");

        if (hdrptr = strstr(req->headers, searchstr)) {
                hdrptr += strlen(searchstr);
                if (hdrend = strstr(hdrptr, "\r\n")) {
                        char hdrval[1024]; // temporary return value
                        memcpy((char *)hdrval, hdrptr, (hdrend - hdrptr));
                        hdrval[hdrend - hdrptr] = '\0'; // tack null onto end of header value
                        int hdrvallen = strlen(hdrval);
                        retval = (char *)malloc((hdrvallen + 1) * sizeof(char)); // malloc a space for retval
                        strcpy(retval, (char *)hdrval);
                } else {
                        retval = (char *)malloc((strlen(hdrptr) + 1) * sizeof(char)); //
                        strcpy(retval, hdrptr);
                }
        }

        return retval;
}
```

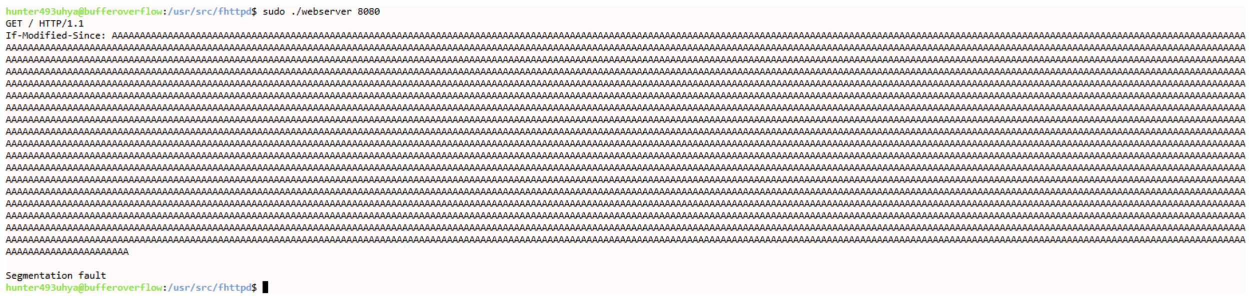
7.

Here is a payload I made with 4000 “A”s, far longer than the allocated header size in *get_header.



```
  GNU nano 5.4                                        payload
GET / HTTP/1.1
If-Modified-Since: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA>
```

By running exploit.sh, we successfully created a Segmentation fault in our webserver.



```
hunter493uhya@bufferoverflow:/usr/src/fhttpd$ sudo ./webserver 8080
GET / HTTP/1.1
If-Modified-Since: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
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Segmentation fault
hunter493uhya@bufferoverflow:/usr/src/fhttpd$ 
```
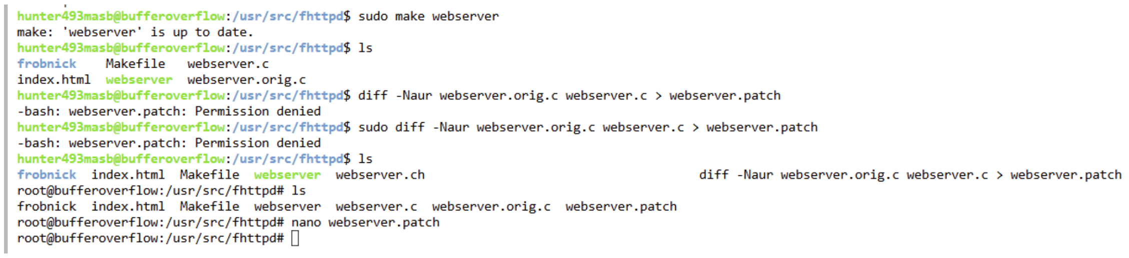

8 & 9.

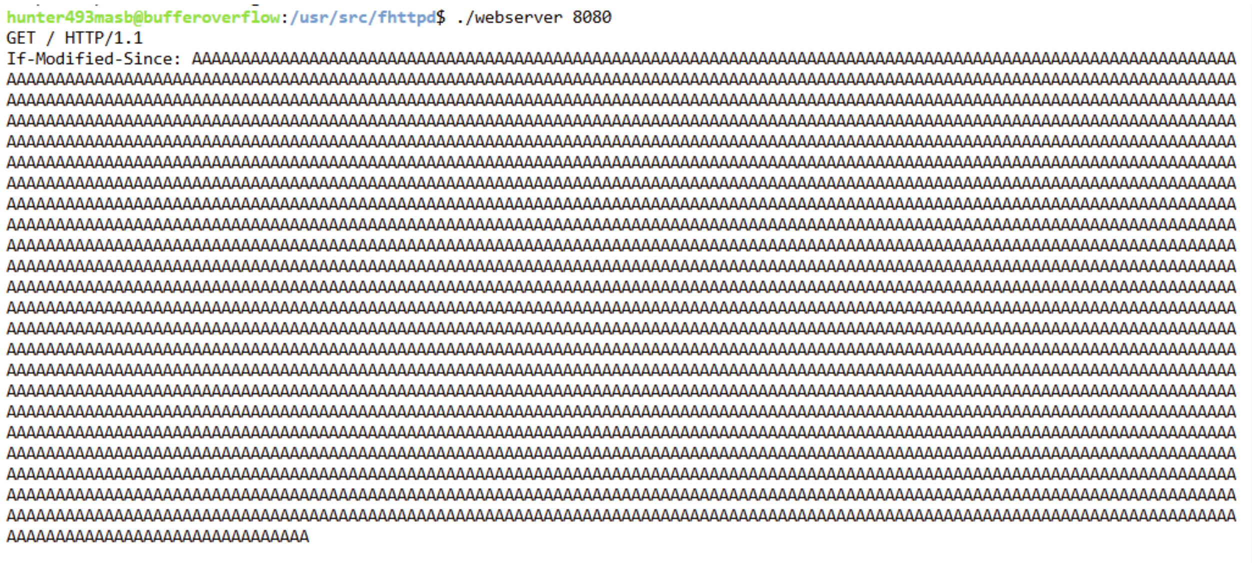
When the header size is longer than 1024 bytes,there is a buffer overflow that causes a segmentation fault. In order to prevent it, I calculate the length of the header,and check whether it's out of bounds or not. If the length exceeds the buffer size,then set the length to buffer size-1 because we need to keep one byte for '\0'.

Make files and Create webserver.patch to show the fixing details:



```
hunter493masb@bufferoverflow:/usr/src/fhttpd$ sudo make webserver
make: 'webserver' is up to date.
hunter493masb@bufferoverflow:/usr/src/fhttpd$ ls
frobnick    Makefile   webserver.c
index.html  webserver  webserver.orig.c
hunter493masb@bufferoverflow:/usr/src/fhttpd$ diff -Naur webserver.orig.c webserver.c > webserver.patch
-bash: webserver.patch: Permission denied
hunter493masb@bufferoverflow:/usr/src/fhttpd$ sudo diff -Naur webserver.orig.c webserver.c > webserver.patch
-bash: webserver.patch: Permission denied
hunter493masb@bufferoverflow:/usr/src/fhttpd$ ls
frobnick  index.html  Makefile  webserver  webserver.ch                                    diff -Naur webserver.orig.c webserver.c > webserver.patch
root@bufferoverflow:/usr/src/fhttpd# ls
frobnick  index.html  Makefile  webserver  webserver.c  webserver.orig.c  webserver.patch
root@bufferoverflow:/usr/src/fhttpd# nano webserver.patch
root@bufferoverflow:/usr/src/fhttpd# 
```

After running the modified webserver.c,there is no buffer overflow:



```
hunter493masb@bufferoverflow:/usr/src/fhttpd$ ./webserver 8080
GET / HTTP/1.1
If-Modified-Since: AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
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```
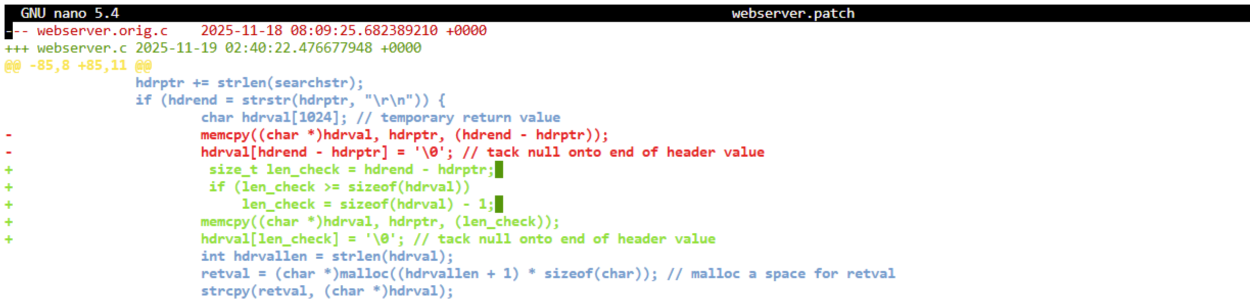

Webserver.patch:



```
  GNU nano 5.4                                                                               webserver.patch
--- webserver.orig.c    2025-11-18 08:09:25.682389210 +0000
+++ webserver.c 2025-11-19 02:40:22.476677948 +0000
@@ -85,8 +85,11 @@
                hdrptr += strlen(searchstr);
                if (hdrend = strstr(hdrptr, "\r\n")) {
                        char hdrval[1024]; // temporary return value
-                       memcpy((char *)hdrval, hdrptr, (hdrend - hdrptr));
-                       hdrval[hdrend - hdrptr] = '\0'; // tack null onto end of header value
+                        size_t len_check = hdrend - hdrptr;
+                        if (len_check >= sizeof(hdrval))
+                            len_check = sizeof(hdrval) - 1;
+                       memcpy((char *)hdrval, hdrptr, (len_check));
+                       hdrval[len_check] = '\0'; // tack null onto end of header value
                        int hdrvallen = strlen(hdrval);
                        retval = (char *)malloc((hdrvallen + 1) * sizeof(char)); // malloc a space for retval
                        strcpy(retval, (char *)hdrval);
```