Experiment-6

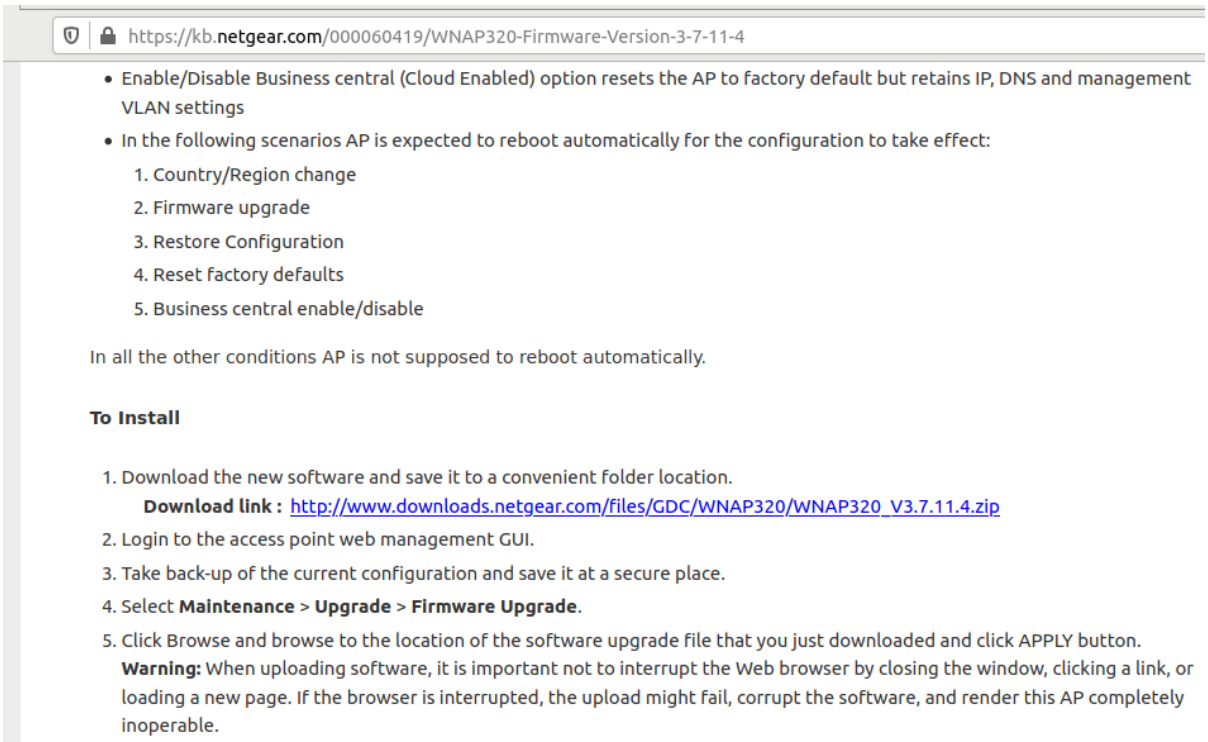
AIM: Finding a Remote Code Execution in IoTFirmware.

Step 1: First, we have to download the firmware name for that we have to visit the Netgear website.

Step 2: To download WNAP320-Firmware follow the below link.

- http://www.downloads.netgear.com/files/GDC/WNAP320/WNAP320_V3.7.11.4.zip

Step 3: In firmware WNAP320 we have to use the WNAP320-Firmware-Version-3-7-11-4 version.



https://kb.netgear.com/000060419/WNAP320-Firmware-Version-3-7-11-4

- Enable/Disable Business central (Cloud Enabled) option resets the AP to factory default but retains IP, DNS and management VLAN settings
- In the following scenarios AP is expected to reboot automatically for the configuration to take effect:
  1. Country/Region change
  2. Firmware upgrade
  3. Restore Configuration
  4. Reset factory defaults
  5. Business central enable/disable

In all the other conditions AP is not supposed to reboot automatically.

To Install

1. Download the new software and save it to a convenient folder location.
   Download link : http://www.downloads.netgear.com/files/GDC/WNAP320/WNAP320_V3.7.11.4.zip
2. Login to the access point web management GUI.
3. Take back-up of the current configuration and save it at a secure place.
4. Select **Maintenance** > **Upgrade** > **Firmware Upgrade**.
5. Click Browse and browse to the location of the software upgrade file that you just downloaded and click APPLY button.
   Warning: When uploading software, it is important not to interrupt the Web browser by closing the window, clicking a link, or loading a new page. If the browser is interrupted, the upload might fail, corrupt the software, and render this AP completely inoperable.

Step 4: Open terminal & write ls/ cd tools/ ls firmware – analysis-toolkit Enter into cd tools for use of firmware analysis toolkit.

```
root@attifyos:/home/iot# ls
Arduino    Downloads  ghidra_scripts  package.json       sketchbook
bin        esp        go              package-lock.json  Templates
Desktop    esp32      Music           Pictures           tools
Documents  ex.txt     node_modules    Public             Videos
root@attifyos:/home/iot# cd tools/
root@attifyos:/home/iot/tools# ls
arduino                   gr-gsm              ook-decoder
baudrate                  gr-paint            openocd
bdaddr                    hackrf              qiling
bettercap                 inspectrum          radare2
buildroot-2019.02.9       jadx                rfcat_150225
burpsuite.jar             kalibrate-rtl       routersploit
create_ap                 killerbee           rtl_433
Cutter                    libbtbb-2018-12-R1  rtl-sdr
drivers                   libmpsse            scapy
dspectrumgui              liquid-dsp          spectrum_painter
dump1090                  LTE-Cell-Scanner    ubertooth-2018-12-R1
firmware-analysis-toolkit nmap                urh
ghidra_9.1.2_PUBLIC       node_modules
root@attifyos:/home/iot/tools# cd firmware-analysis-toolkit/
root@attifyos:/home/iot/tools/firmware-analysis-toolkit# ls
 binwalk      firmadyne     README.md  'WNAP320 Firmware Version 2.0.3.zip'
 fat.config   LICENSE       reset.py
```

Step 5: Enter into the firmware analysis toolkit we can show a list of directories in the firmware analysis toolkit. After that enters into fat.config file with the help of the cat command. After that,we can see sudo_password in fat.config

cat fat. Config

```
root@attifyos:/home/iot/tools# cd firmware-analysis-toolkit/
root@attifyos:/home/iot/tools/firmware-analysis-toolkit# ls
 binwalk      firmadyne     README.md  'WNAP320 Firmware Version 2.0.3.zip'
 fat.config   LICENSE       reset.py
 fat.py       qemu-builds   setup.sh
root@attifyos:/home/iot/tools/firmware-analysis-toolkit# cat fat.config
[DEFAULT]
sudo_password=attify
firmadyne_path=/home/iot/tools/firmware-analysis-toolkit/firmadyne
root@attifyos:/home/iot/tools/firmware-analysis-toolkit# ls
 binwalk      firmadyne     README.md  'WNAP320 Firmware Version 2.0.3.zip'
 fat.config   LICENSE       reset.py
 fat.py       qemu-builds   setup.sh
```

Step 6: Then enter into the ./fat.py file to see so many files are in the ./fat.py file. this file is used to gain the device to be accessible for all files & perform activities in the device.This fat creates an IP address to emulate the device.

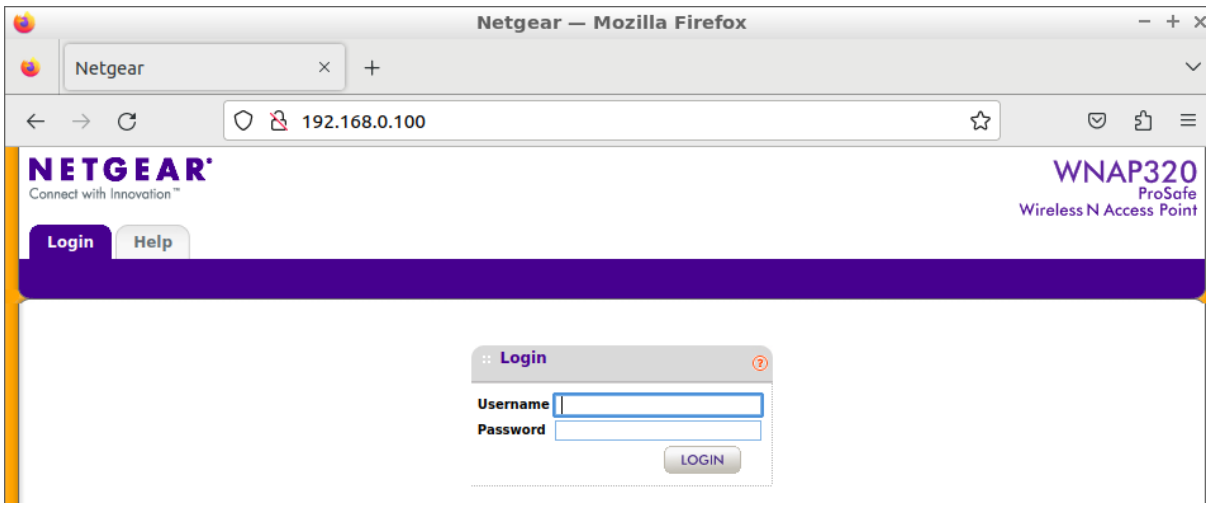
./fat.py 'file path'

```
root@attifyos:/home/iot/tools/firmware-analysis-toolkit# ./fat.py '/home/iot/Dow
nloads/rootfs.squashfs'

                                 __          _
                                / _|        | |
                               | |_    __ _  | |_
                               |  _|  / _` | | __|
                               | |   | (_| | | |_
                               |_|    \__,_|  \__|

                Welcome to the Firmware Analysis Toolkit - v0.3
    Offensive IoT Exploitation Training http://bit.do/offensiveiotexploitation
                  By Attify - https://attify.com  | @attifyme

[+] Firmware: rootfs.squashfs
[+] Extracting the firmware...
[+] Image ID: 11
[+] Identifying architecture...
[+] Architecture: mipseb
[+] Building QEMU disk image...
[+] Setting up the network connection, please standby...
```

Step 7: After performing fat create that is create an IP address to emulate IoT devices.

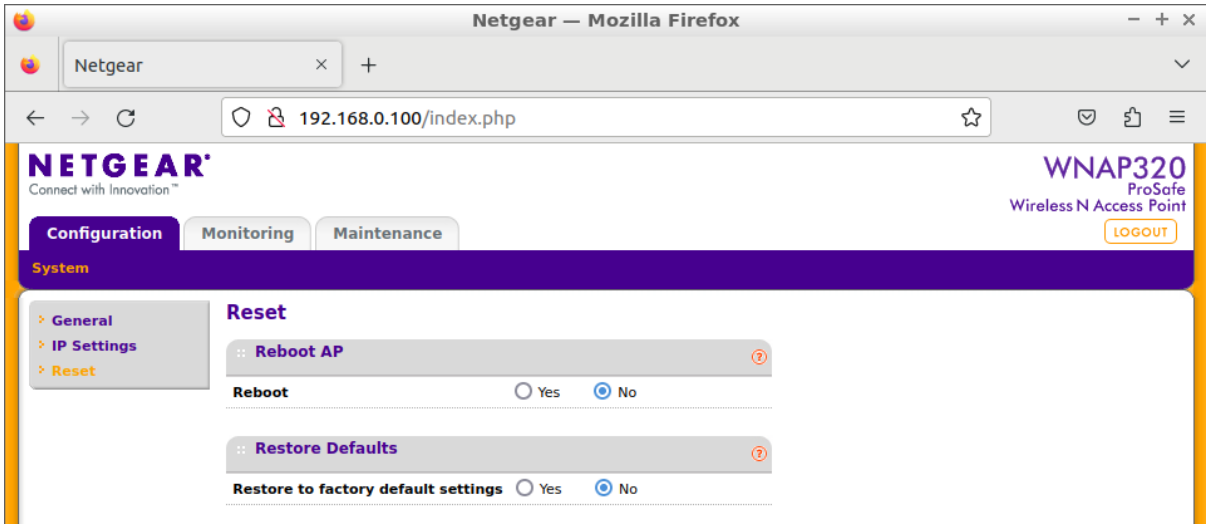
This IP address runs into a browser that can show a login page of the DIR-300 device.

After entering login credentials like Username & password. Username & password shows in emulating process use of FAT.



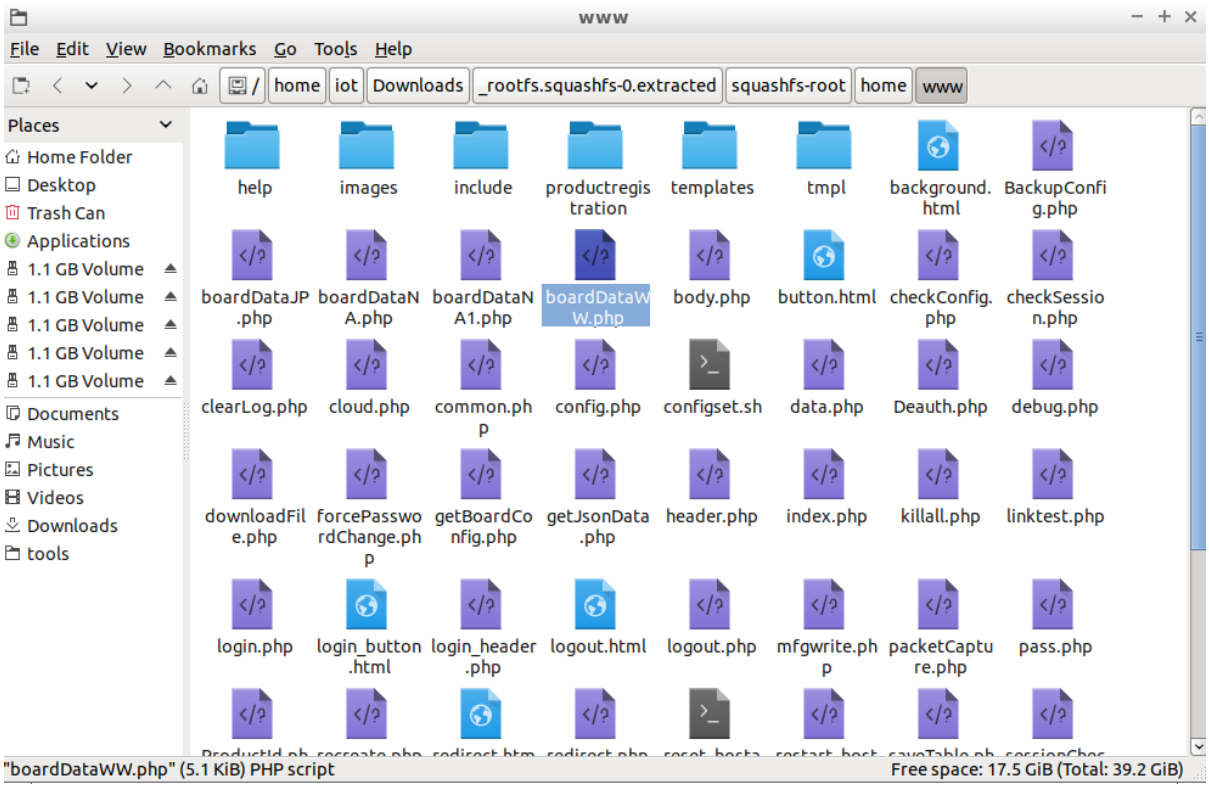
Step 8: After entering the Username & password we can redirect to the page of this device for emulating that's IoT device. we can access files & perform any activity on this device.

We can change or modify the data of this device.



Step 9: Then we have to check their php files for remote access. then we can find the boardDataWW.php vulnerable file.

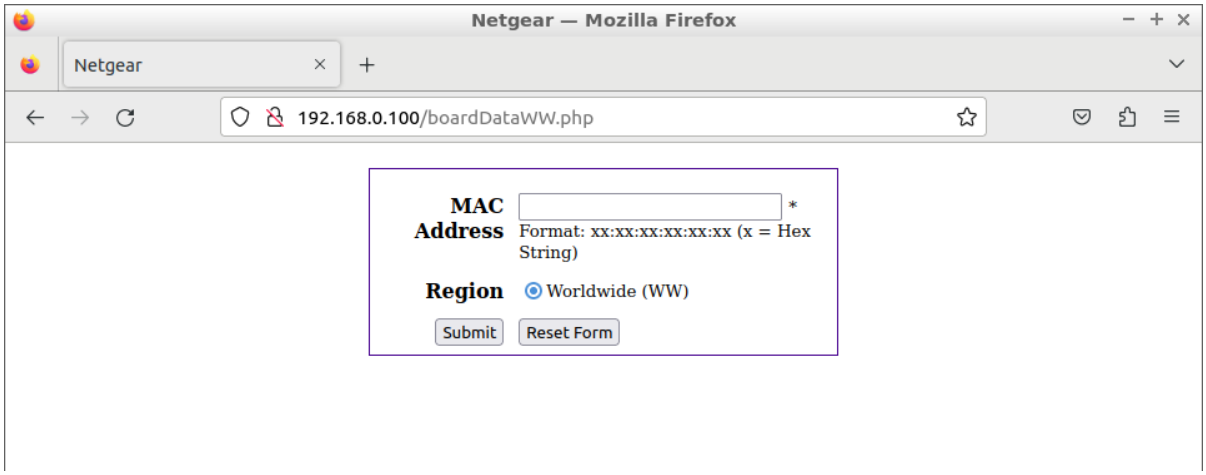
Path : ***rootfs.squashfs-root/ squashfs-root/ home/ www / boardDataWW.php***



Step 10: We have to open file & find a vulnerable code in file.

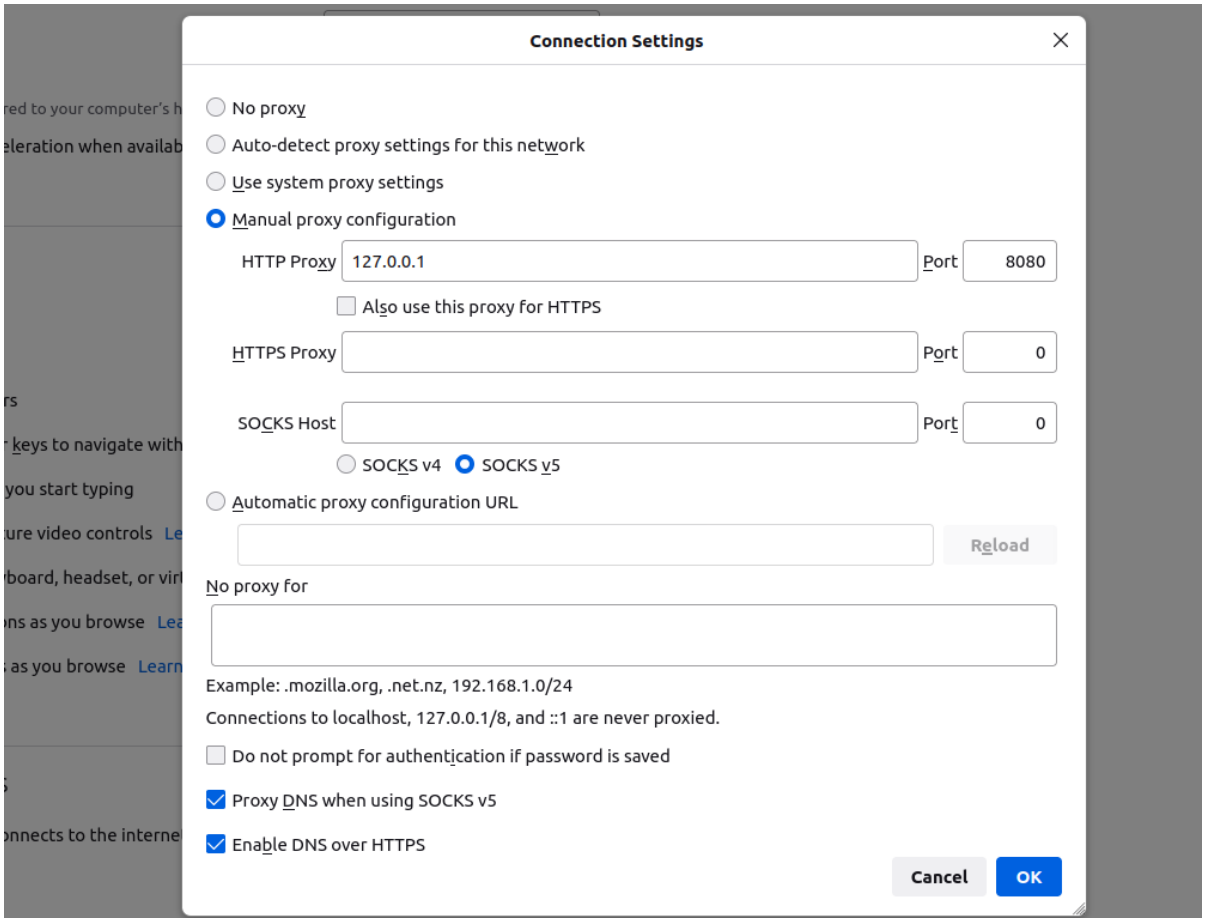
```
$flag=false;
$msg='';
function validateCommandArg($mac_address, $region){
    if (array_search($region,Array('WW'=>'0','NA'=>'1','JP'=>'2'))!==false && ereg("^
        return true;
    else
        return false;
}
if (!empty($_POST['writeData'])) {
    $macAddress = escapeshellcmd($_POST['macAddress']);
    $reginfo = escapeshellcmd($_POST['reginfo']);
    if (!empty($macAddress) && !empty($reginfo)) {
        //echo "test ".$_REQUEST['macAddress']." ".$_REQUEST['reginfo'];
        //exec("wr_mfg_data ".$_REQUEST['macAddress']." ".$_REQUEST['reginfo'],
        if(validateCommandArg($macAddress,$reginfo))
            exec("wr_mfg_data -m ".$macAddress." -c ".$reginfo,$dummy,$res);

        if ($res==0) {
            conf_set_buffer("system:basicSettings:apName netgear".substr($_POST
            conf_save();
            $msg = 'Update Success!';
            $flag = true;
```

Step 11: After find vulnerable file we have go to website &write 192.168.0.100/boardDataWW.php so we can see the boardDataWW page.



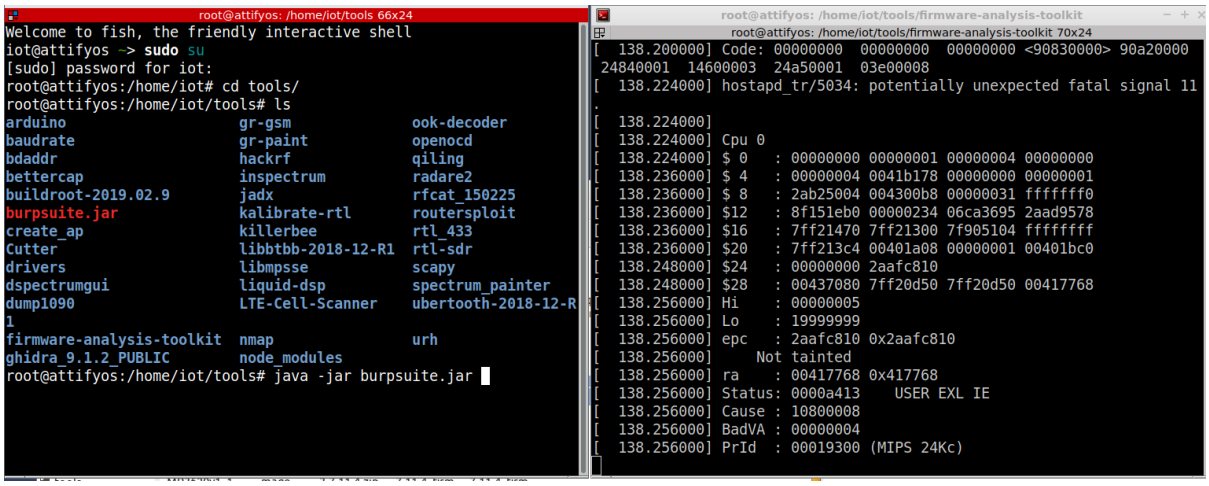
Step 12: We have to do proxy settings for the exploit website. We have to go manual proxy settings.

- Path : Mozilla Firefox/ preferences/network setting/manual proxy configuration
- HTTP proxy : 127.0.0.1
- Port : 8080

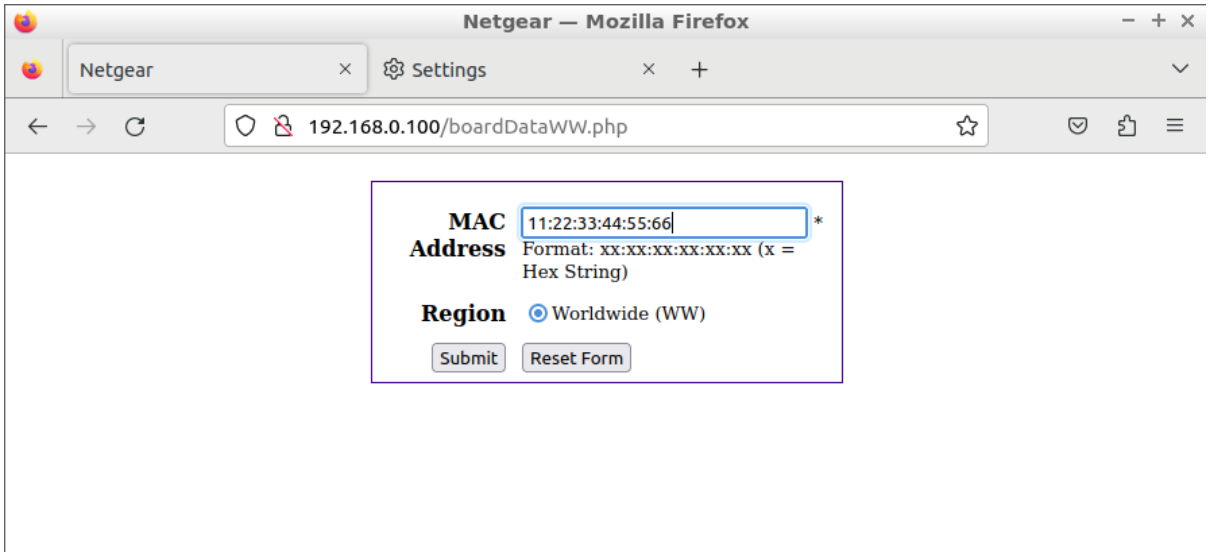


Step 13: We have to open burpsuite for intercept website . we have to write command java -jar burpsuite.jar in terminal .

java -jar burpsuite.jar

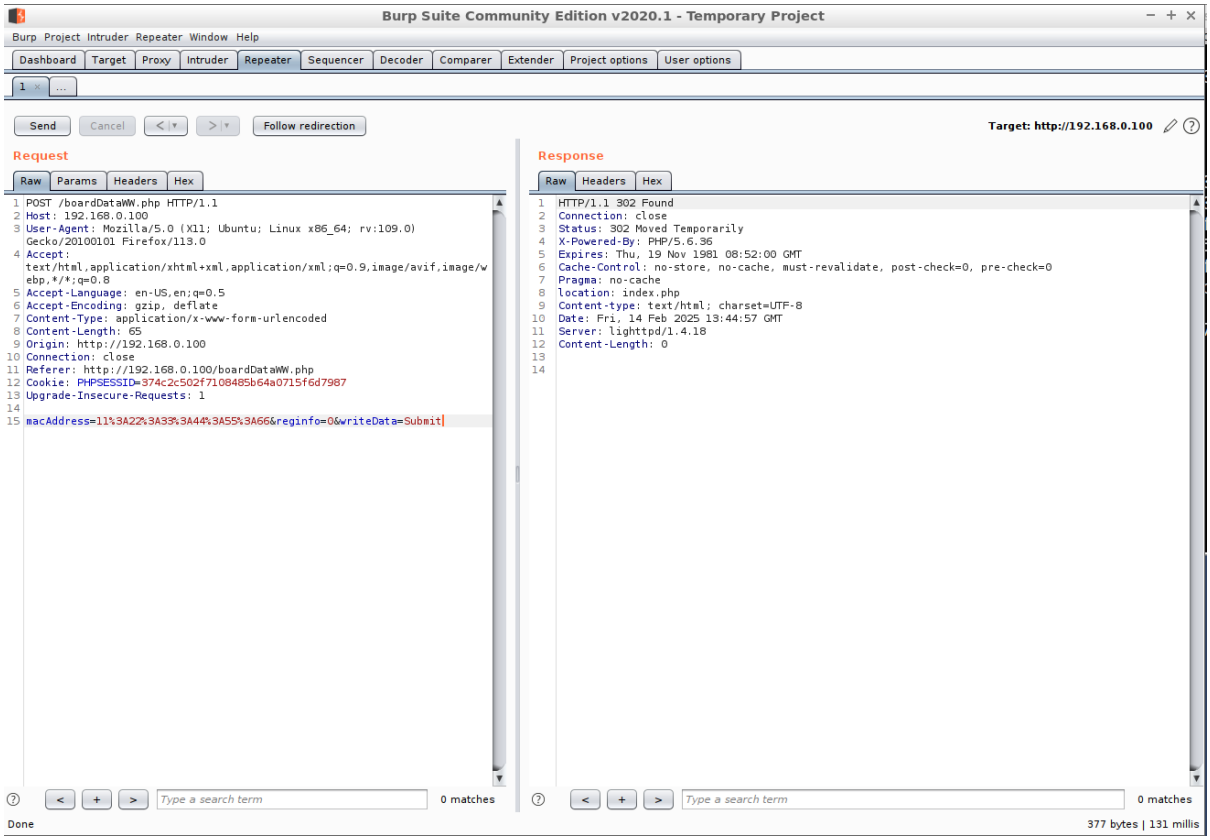


Step 14: After that intercept off of burp suite. Go to website, enter a MAC Address on it then on intercept in burp suite. So we can see MAC address in a proxy. Then select a whole code & send it to repeater .



Step 15: After send a code to repeater , we can see MAC address which we can enter into website page. With use of this code we can get remote code execution of website.

- We can change a MAC address into malicious script or code. With use of this malicious script or code we can gain remote access of website.



Conclusion: By using the burp suite we can exploit this vulnerable code but we can't do it due to the security perspective. We can perform remote code access with the use of WNAP320 firmware, Netgear website & burp suite.