Cybersecurity

Brute Force Offline Lab

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Brute Force Lab

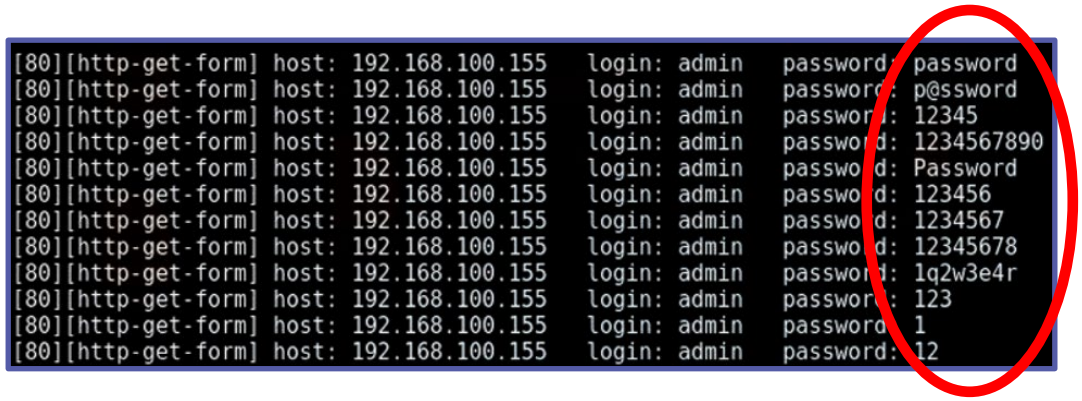
- Materials needed
  - Kali Linux Virtual Machine
- Software Tool used
  - JTR (John the Ripper)
    - Password cracking tool (pre-installed on Kali OS)

Objectives Covered

- Security+ Objectives (SY0-601)
  - Objective 1.2 - Given a scenario, analyze potential indicators to determine the type of attack
    - Password Attacks
      - Brute Force
        - Offline
  - Objective 4.1 - Given a scenario, use the appropriate tool to assess organizational security
    - Password crackers

What is a Brute Force Attack?

- A brute force attack is a form of password attack where the attack attempts to guess a password by trying many passwords in the attempt to guess the correct password



Notice all the passwords being used in hopes of finding the right password for the system

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The Brute Force Lab

- Setup Environment
- Create example users
- Set example passwords
- Locate password file
- Change Permissions
- Launch the Attack
- More Hashes
- Observe results

```
┌──(kali@10.15.85.231)-[~/Desktop]
└─$ john shadow
Created directory: /home/kali/.john
Using default input encoding: UTF-8
Loaded 1 password hash (sha512crypt, crypt(3) $6$ [SHA512 256/256 AVX2 4x])
Cost 1 (iteration count) is 5000 for all loaded hashes
Will run 2 OpenMP threads
Proceeding with single, rules:Single
Press 'q' or Ctrl-C to abort, almost any other key for status
Almost done: Processing the remaining buffered candidate passwords, if any.
Proceeding with wordlist:/usr/share/john/password.lst, rules:Wordlist
0g 0:00:00:07 0.67% 2/3 (ETA: 18:20:52) 0g/s 562.8p/s 562.8c/s 562.8C/s ran
gers..burton
```

Setup Environment

- Log into your range
- Open the Kali Linux Environment
  - You should be on your Kali Linux Desktop

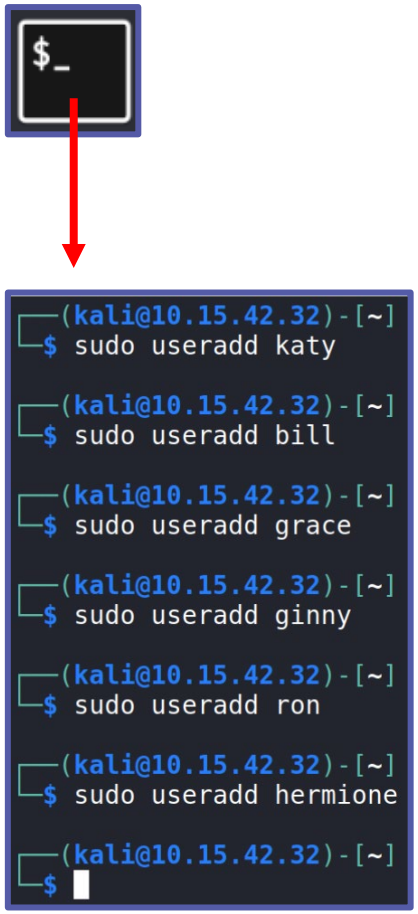
Create Users

- In your Kali VM open a terminal by clicking on the terminal icon at the top left corner
- Create a user on the system:

  `sudo useradd katy`

  - This command creates a user named “katy”
- Create additional users by using the following command:

  `sudo useradd bill`
- Create at least 3 users
- Remember the users' names - you will need these to set passwords for them



Adding users to a system

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Set Passwords

- Use the following command to set a password for each account:
  - The following command starts the prompt to set a password for the user katy

    `sudo passwd katy`
- Enter the password at the prompt "Enter new UNIX password:"
  - Set the password to be one from the list of the names you added to the dictionary file earlier!
- Repeat this step for all user accounts you created.

```
┌──(kali@10.15.42.32)-[~]
└─$ sudo passwd katy
New password:
Retype new password:
passwd: password updated successfully

┌──(kali@10.15.42.32)-[~]
└─$ sudo passwd bill
New password:
Retype new password:
passwd: password updated successfully
```

Adding passwords to users

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Locate Hashed Passwords

- Display the hashed passwords:

  `sudo cat /etc/shadow`

If you see a y instead of 6, make sure to pay attention to the note on slide 12

```
┌──(kali@10.15.42.32)-[~]
└─$ sudo cat /etc/shadow
root:$6$ZE6UeFEDfOKzKm60$I2/jnJLiLtGgn.P3E1Sp1EtJ2o2mE
3IQdJfqDevkzXLPGLjcVoBrIgk3Hll6sYxljFnbuyZZYnPzyrwEF/
3:0:99999:7:::
daemon:*:18775:0:99999:7:::
bin:*:18775:0:99999:7:::
sys:*:18775:0:99999:7:::
```

```
katy:$6$xfnohPviejHR7YDo$g88DpaQM5G7voS4SBTgPIe7L9Vw5UMqFE
iCesaOFwBt384vxgcll22vSla5RtY2xza8vYL9nYKFCC.YjA6DRq1:1954
1:0:99999:7:::
bill:$6$JoK3DkD.rOaE91b/$FGx5TtFZFepkINf/JpTptdoAuJyS02WkL
rxSV6f7EIRPKuc4zq4MZzAcqy9FU7/9xvlCNC/NIrriTjd34EASI.:1954
1:0:99999:7:::
grace:$6$FBsEQgF/OT6CpfxU$4HGDhFeD/vvNfyZz76Imnc/gxfMlWGF.
XnbYFWrFurjzPJ9p1dtUUP8Xp8YusWJ4sRfJS3Y6xx6QSNrDECdiL1:195
41:0:99999:7:::
ginny:$6$QaDZJKTnmvXn3MpN$CCC71PnpEkEAEVQ1TuupRXPaR1klaIyv
R3FZXyf4CbJP/beL8.y0VBMjApH12t6iVlriixWh./wSjEaHWR4lE0:195
41:0:99999:7:::
ron:$6$r62jEnIUSbZaWjJY$A49UvC0iTLWN6TQfF6UxYtq3oH7WdZu7IM
Qc8q9lgA/gbbHbZdDgyjJhP09ZsQUp8k0yVXvCe7VqyDrj5DZO80:19541
:0:99999:7:::
hermione:$6$16VbUnnJIBTBrWH2$MyZ/CaBeH9ZHPIZhC9EjsqRDXM3gE
UE8RrClPQ3WcfG1h/kSHZ3eskGKWmX5DUBVc0oMUdmk.AM06eJ8q.LAc.:
19541:0:99999:7:::
```

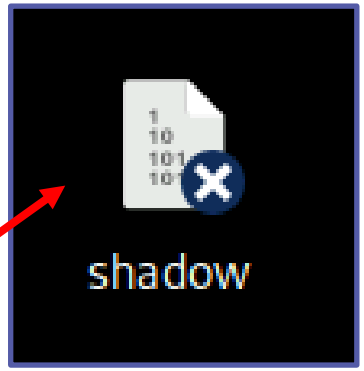
- Passwords are stored in the **`shadow`** file located in the **`/etc`** directory

Move Hashed Passwords

- Copy the **shadow** file to your Desktop using the following command:

```
sudo cp /etc/shadow /home/kali/Desktop
```

```
┌──(kali@10.15.42.32)-[~]
└─$ sudo cp /etc/shadow /home/kali/Desktop
```



Verify the shadow document appears on the Desktop

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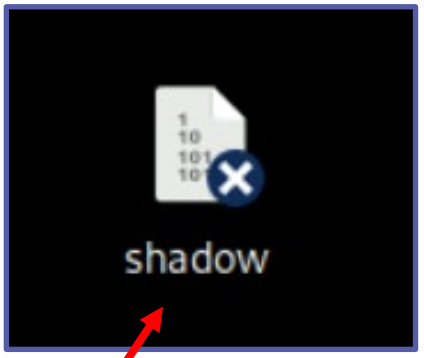
Change Permissions

- Navigate to the Desktop

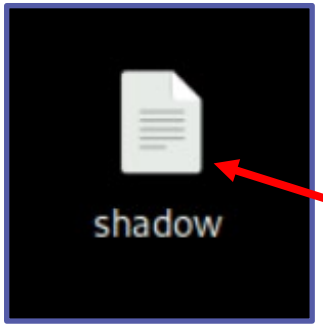
  `cd Desktop`

- Change the permissions on the shadow file

  `sudo chmod 777 shadow`



Verify the shadow document appears on the Desktop



Verify the blue icon is removed from the shadow document

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Launching the JTR Attack

- In order to launch the attack, use the following command:

  `john shadow`

- This will run *John the Ripper* on the `shadow` file and start working to crack the passwords
- Press **space** while the attack is working to see what passwords *John the Ripper* is currently trying
- Note this will take some time, depending on the strength of the passwords

Please Note: If you don't see the 6 with the loaded passwords, try the following:

`john shadow --format=crypt`

```
┌──(kali@10.15.42.32)-[~]
└─$ sudo john /etc/shadow
Created directory: /root/.john
Using default input encoding: UTF-8
Loaded 7 password hashes with 7 different salts (sha512cry
pt, crypt(3) $6$ [SHA512 256/256 AVX2 4x])
Cost 1 (iteration count) is 5000 for all loaded hashes
Will run 2 OpenMP threads
Proceeding with single, rules:Single
Press 'q' or Ctrl-C to abort, almost any other key for sta
tus
katy             (katy)
bill12           (bill)
```

```
Remaining 4 password hashes with 4 different salts
Press 'q' or Ctrl-C to abort, almost any other key for status
thomas17         (thomas)
1g 0:00:00:15 96.86% 1/3 (ETA: 15:42:20) 0.06493g/s 625.9p/s 626.1c/s 626.1C/s h
olly1933..999991932
1g 0:00:00:17 0.20% 2/3 (ETA: 18:01:47) 0.05720g/s 589.4p/s 626.2c/s 626.2C/s fr
odo..barbara
```

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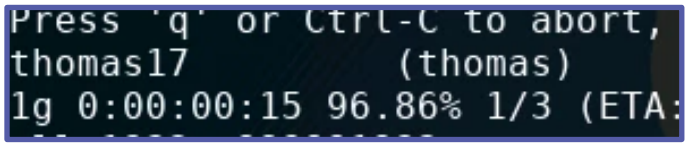
Seeing the Results

- Notice that a found password will display the result while JTR is running
  - The following example found "`thomas17`" to be the password for the user "`thomas`"
  - Not a very secure password was it?
- You can wait for JTR to finish, or press **CTRL+C** to stop the attack.
- The following command will show all the passwords that have been solved

  `john shadow --show`




```
┌──(kali@10.15.42.32)-[~/Desktop]
└─$ john shadow --show
root:password:19373:0:99999:7:::
katy:katy:19541:0:99999:7:::
bill:bill12:19541:0:99999:7:::
grace:harrypotter:19541:0:99999:7:::
ginny:starwars:19541:0:99999:7:::

5 password hashes cracked, 2 left
```

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More Hashes

- Open a new Terminal and navigate to the lab folder

```
cd /home/kali/CourseFiles/Cybersecurity/brute-force-lab
```

- Display the hashes
  - **`cat hashes`**
    - Notice there are 20 password hashes
- Crack the hashes
  - **`john hashes`**

```
┌──(kali@10.17.12.96)-[~/CourseFiles/Cybersecurity/brute-force-lab]
└─$ john hashes
Using default input encoding: UTF-8
Loaded 20 password hashes with 20 different salts (sha512crypt, cry
pt(3) $6$ [SHA512 256/256 AVX2 4x])
Cost 1 (iteration count) is 5000 for all loaded hashes
Will run 2 OpenMP threads
Proceeding with single, rules:Single
Press 'q' or Ctrl-C to abort, almost any other key for status
zakaria          (zakaria)
tea17            (tea)
aaron98          (aaron)
```

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How to Defend Against a Brute Force Attack?

- Strong Passwords
  - Why is a longer password stronger? (D0e5 w31rd sp3LLing M4tt3r?)
  - Why were some passwords solved before others?
- Increasingly longer delay between failed attempts
  - Slow down the attacker. (10s, 15s, 30s, 45s, 1minute between attempts.)
- Lockout after __ failed attempts
  - Account will eventually lock. User will need contact support to regain access.
- Two-Factor Authentication
  - Why would these help secure your password?
- What are some other ways of defending against a brute force attack?