Mason Competitive Cyber

What gameplan?

The Announcement Slides

1. NCL Codes still available! Highly recommended for anyone trying to get their foot in the door with cyber stuff. DM Garrett Heckman for a code.
2. UMDCTF April 16-18 online. Unlimited size team. #umdctf2021
3. MasonCC elections! (Go vote and don’t hack the election).

So, we did pretty good

Qualifying Round Final Standings

1. George Mason University
2. University of Maryland Baltimore County (Team 1)
3. Liberty University
4. University of Pittsburgh
5. Old Dominion University
6. Millersville University
7. Northern Virginia Community College
8. Capitol Technology University

Round 45

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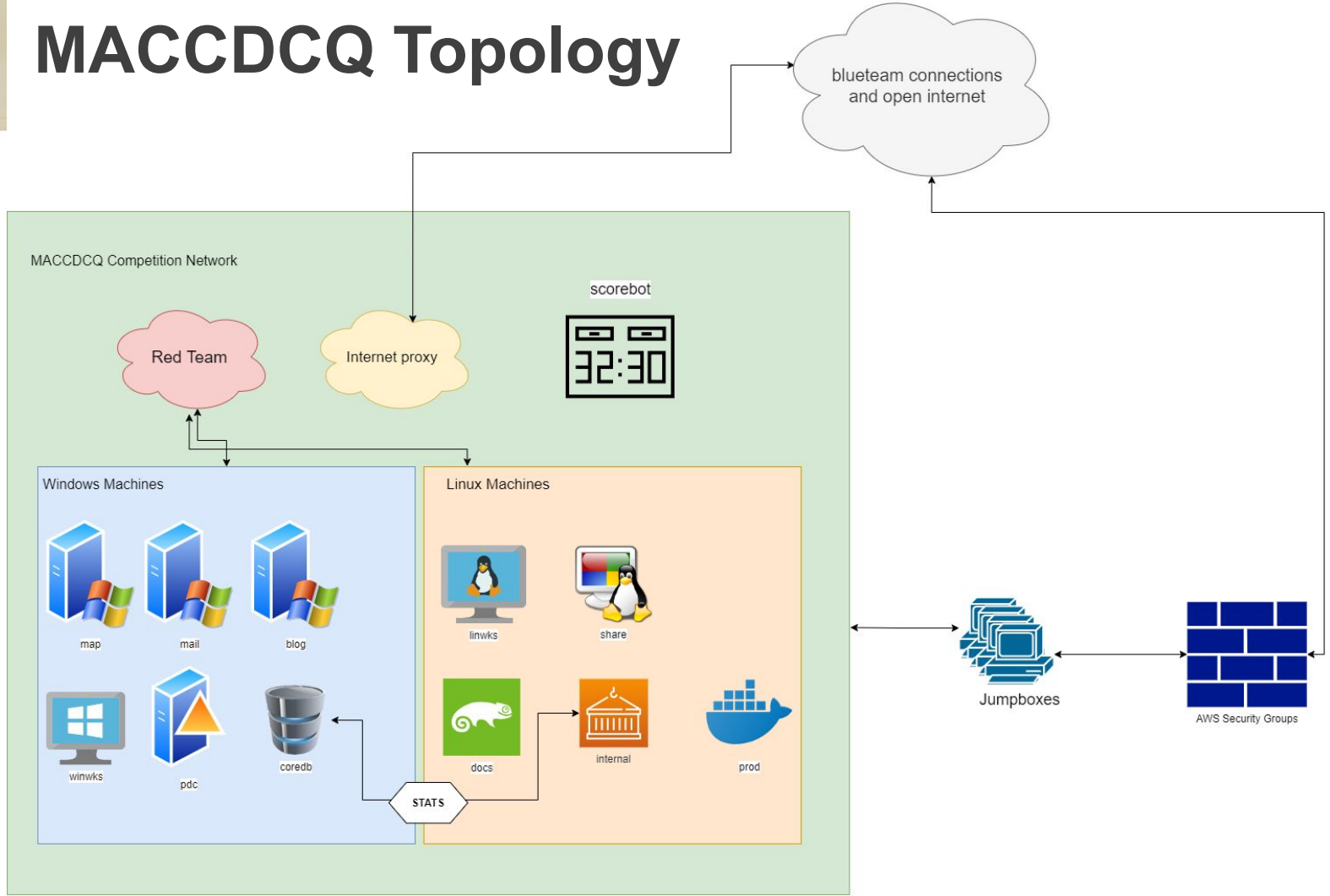
	team0	team1	team2	team3	team4	team5	team6	team7	team8	team9	team10	team11	team12	team13	team14	team15	team16	team17	team18	team19	team20	team21	team22	team23	team24	team25	team26
Current Score	175,500	114,290	90,270	56,630	112,750	96,920	137,540	108,310	103,010	64,620	111,370	109,580	129,030	119,590	116,480	91,950	74,830	89,370	98,670	129,880	94,350	123,720	109,720	96,680	100,720	119,440	174,700
Current Place	1	10	23	27	11	19	3	15	16	26	12	14	5	7	9	22	25	24	18	4	21	6	13	20	17	8	2
Up/Down Ratio	30 / 0	13 / 17	15 / 15	9 / 21	14 / 16	11 / 19	22 / 8	11 / 19	4 / 26	2 / 28	12 / 18	14 / 16	11 / 19	9 / 21	11 / 19	10 / 20	25 / 5	10 / 20	17 / 13	20 / 10	8 / 22	14 / 16	8 / 22	15 / 15	9 / 21	14 / 16	29 / 1
PDC_SMB	✔	✔	✔	✘	✘	✔	✔	✘	✘	✘	✔	✔	✔	✔	✔	✔	✔	✘	✔	✔	✘	✔	✘	✘	✔	✔	✔
PDC_DNS	✔	✘	✘	✔	✘	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘	✔	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔
PDC_LDAP	✔	✔	✔	✘	✘	✔	✔	✘	✘	✘	✔	✔	✔	✔	✔	✔	✔	✘	✔	✔	✘	✔	✘	✘	✔	✔	✔
COREDB_POSTGRES	✔	✘	✘	✘	✔	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔	✔	✘	✔	✘	✘	✘	✔	✘	✘	✔
COREDB_MYSQL	✔	✘	✘	✘	✔	✘	✔	✘	✘	✘	✘	✘	✘	✘	✔	✔	✔	✔	✔	✔	✘	✘	✔	✔	✘	✘	✔
COREDB_SSH	✔	✘	✔	✘	✘	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔	✔	✘	✘	✘	✘	✘	✘	✘	✘	✔
SHARE_NFS	✔	✘	✘	✘	✘	✘	✘	✔	✘	✔	✘	✘	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔
SHARE_FTP	✔	✘	✔	✘	✘	✘	✔	✔	✘	✔	✘	✘	✘	✘	✘	✘	✔	✘	✔	✘	✔	✘	✘	✔	✘	✔	✔
SHARE_SSH	✔	✘	✔	✘	✘	✘	✔	✔	✘	✘	✘	✘	✘	✔	✔	✘	✔	✘	✔	✔	✔	✘	✘	✔	✔	✘	✔
LINWKS_SSH	✔	✔	✘	✔	✔	✔	✔	✔	✘	✘	✔	✔	✔	✔	✔	✘	✔	✘	✔	✔	✔	✔	✘	✔	✔	✔	✔
LINWKS_VNC	✔	✔	✘	✔	✔	✔	✔	✔	✔	✘	✔	✔	✔	✔	✔	✘	✔	✔	✔	✔	✘	✔	✔	✔	✔	✔	✔
WINWKS_RDP	✔	✔	✔	✘	✘	✔	✔	✔	✘	✘	✘	✔	✔	✘	✘	✔	✔	✘	✘	✔	✘	✔	✔	✔	✔	✔	✔
WINWKS_SMB	✔	✔	✔	✘	✘	✔	✔	✔	✘	✘	✘	✔	✔	✘	✘	✘	✔	✘	✘	✘	✘	✔	✔	✔	✘	✔	✔
MAIL_RDP	✔	✔	✔	✔	✘	✔	✔	✘	✘	✘	✔	✔	✔	✘	✘	✔	✔	✘	✔	✔	✘	✔	✔	✘	✘	✔	✔
MAIL_SMB	✔	✔	✔	✔	✘	✔	✔	✘	✘	✘	✔	✔	✘	✘	✘	✘	✘	✘	✔	✔	✘	✔	✔	✘	✘	✔	✔
MAP_HTTP	✔	✔	✔	✔	✔	✔	✔	✔	✔	✘	✔	✔	✘	✔	✔	✔	✘	✔	✘	✔	✔	✔	✘	✔	✘	✔	✔
MAP_HTTPS	✔	✘	✘	✘	✔	✔	✔	✔	✔	✘	✔	✔	✘	✔	✔	✔	✘	✔	✘	✔	✘	✔	✘	✘	✘	✔	✔
MAP_SSH	✔	✘	✔	✘	✘	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘	✔	✘	✘	✘	✔	✘	✘	✘	✘	✘	✘	✔
BLOG_HTTP	✔	✘	✘	✘	✔	✘	✔	✘	✔	✘	✔	✘	✘	✘	✔	✔	✔	✔	✔	✘	✔	✔	✔	✔	✔	✔	✔
BLOG_SMB	✔	✔	✔	✘	✘	✘	✔	✘	✘	✘	✔	✔	✔	✘	✘	✘	✘	✘	✔	✔	✘	✔	✘	✔	✘	✔	✔
INTERNAL_HTTP	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔	✘	✘	✔	✘	✘	✘	✔	✘	✘	✔
INTERNAL_SSH	✔	✔	✔	✔	✔	✔	✔	✔	✘	✘	✔	✔	✔	✔	✘	✘	✔	✘	✔	✘	✔	✔	✘	✔	✔	✘	✔
DOCS_HTTP	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔	✘	✘	✘	✔	✔	✘	✔	✘	✘	✘	✘	✘	✘	✘
DOCS_SSH	✔	✔	✔	✔	✔	✘	✘	✘	✘	✘	✔	✔	✘	✔	✔	✘	✔	✔	✔	✔	✔	✔	✔	✔	✔	✘	✔
PROD_HTTP_CART	✔	✘	✘	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔	✘	✔	✔	✘	✘	✘	✘	✘	✘	✔
PROD_HTTP_TICKET	✔	✘	✘	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔	✘	✔	✘	✘	✘	✘	✘	✘	✘	✔
PROD_HTTP_GIT	✔	✘	✘	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔
PROD_HTTP_FILE	✔	✘	✘	✘	✔	✘	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔	✘	✔	✘	✘	✘	✘	✘	✘	✘	✔
PROD_DOCKER	✔	✔	✔	✔	✔	✘	✔	✔	✘	✘	✘	✔	✔	✘	✔	✘	✔	✔	✔	✔	✔	✘	✘	✘	✘	✔	✔
STATS	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✘	✔	✘	✘	✔	✘	✘	✘	✔	✘	✘	✔

Scoring Points in CCDC

- Keep your services running
- Keep the Red Team suppressed
- Deliver Injects complete them on time

MACCDCQ Topology



Defending a flat network

- Assume the Red Team is everywhere, always
- No insights on border traffic or capability to block at the gateway
- Also, no single point of failure for the Red Team to attack

CCDC 2020 vs 2021

Hostname	IP Addr	OS	Score Services
judge	192.168.X.209	Win 2019	No Scored Service - NO local/jumpbox RDP access
pdc	192.168.X.10	Win 2012 R2	445, 88, 53, 389
coredb	192.168.X.11	Win 2012 R2	5432, 3306, 22
share	192.168.X.12	RHEL 8	2049, 111, 21, 22
linwks	192.168.X.21	Ubuntu 18	22, 5901
winwks	192.168.X.22	Win 2016	3389, 445
mail	192.168.X.23	Win 2016	3389, 445
map	192.168.X.35	Win 2012 R2	80, 443, 22
blog	192.168.X.36	Win 2012 R2	80, 445
internal	192.168.X.37	Amazon Linux 2	80, 22
docs	192.168.X.80	SUSE 15	80, 22
prod	192.168.X.88	Ubuntu 20.04	8080, 8888, 80, 8081, 2375

Service Checks

Team	Service Name	Last Check Status
Team 8	ad-dns	Passed
Team 8	bind-dns	Passed
Team 8	ecom-http	Passed
Team 8	mail-pop3	Passed
Team 8	mail-smtp	Passed
Team 8	phantom-https	Passed
Team 8	splunk-http	Passed

Windows

Total of 6 Windows machines to defend

PDC : 445 (SMB), 53 (DNS), 389 (LDAP)

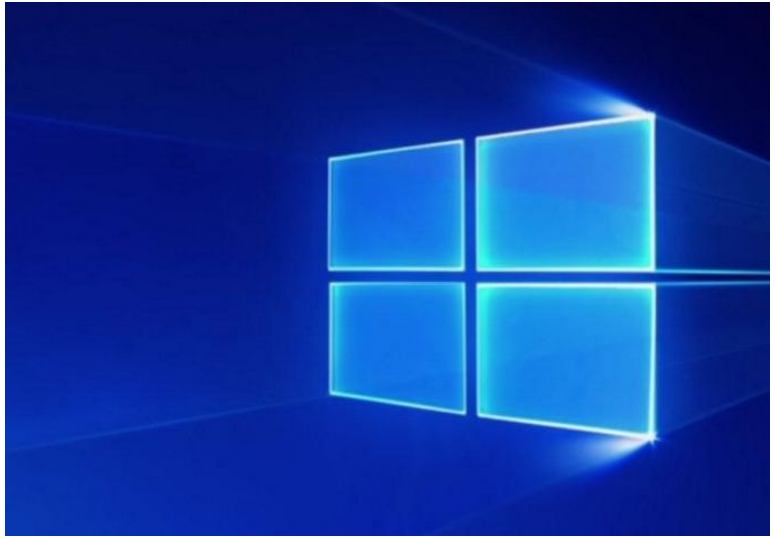
CoreDB: 5432 (Postgresql), 3306 (MySQL), 22 (SSH)

WinWks: 3389 (RDP), 445 (SMB)

Mail: 3389 (RDP), 445 (SMB)

Map: 80 (HTTP), 443 (HTTPS), 22 (SSH)

Blog: 80 (HTTP), 445 (SMB)



Windows - By the numbers

Red Team had around **14** attacker shells at once

- That is 14 more than what you want !!!

We killed over **100** attacker shells throughout the 6 machines

- Yes, we counted...

Discovered around **16** different malicious IPs (usually reflectors)

- IP blocking was not allowed though :(

Eventually, we made it impossible for Red Team to get back in

- But they won’t stop!

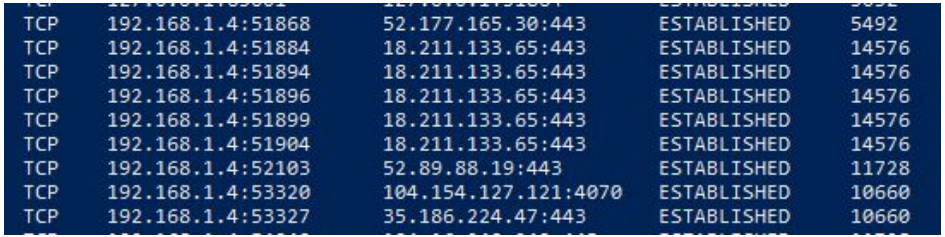
Useful Windows Hunting Commands

Netstat -NATB - Identify processes that are making outbound connection (We should know all the connections going outbound)

Tasklist - view current running process

net user / net localgroup - Look at users and groups on the system

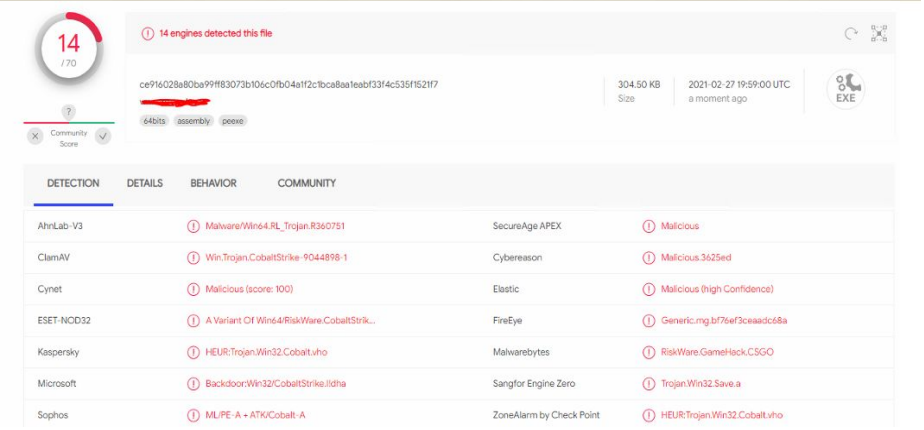
Reviewing windows event log to perform forensics. Not good enough to know that our machine is infected, but **how** it was infected.

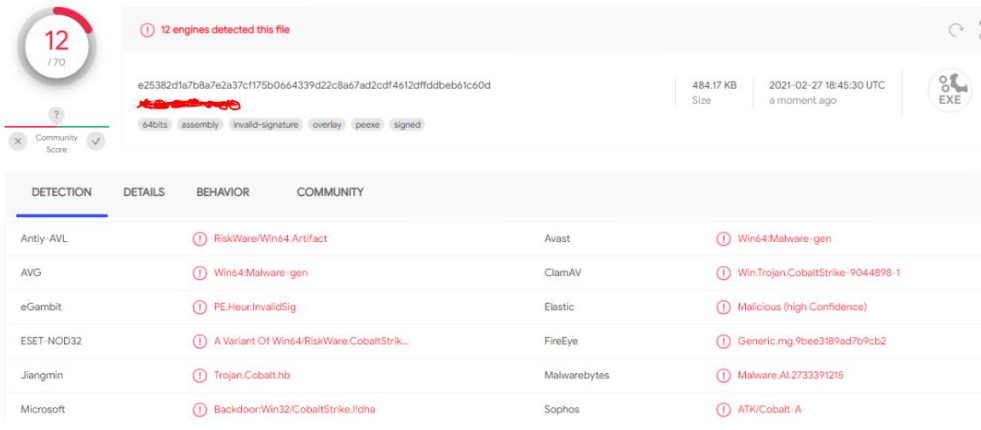


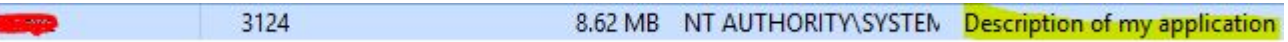
TCP	192.168.1.4:51868	52.177.165.30:443	ESTABLISHED	5492
TCP	192.168.1.4:51884	18.211.133.65:443	ESTABLISHED	14576
TCP	192.168.1.4:51894	18.211.133.65:443	ESTABLISHED	14576
TCP	192.168.1.4:51896	18.211.133.65:443	ESTABLISHED	14576
TCP	192.168.1.4:51899	18.211.133.65:443	ESTABLISHED	14576
TCP	192.168.1.4:51904	18.211.133.65:443	ESTABLISHED	14576
TCP	192.168.1.4:52103	52.89.88.19:443	ESTABLISHED	11728
TCP	192.168.1.4:53320	104.154.127.121:4070	ESTABLISHED	10660
TCP	192.168.1.4:53327	35.186.224.47:443	ESTABLISHED	10660

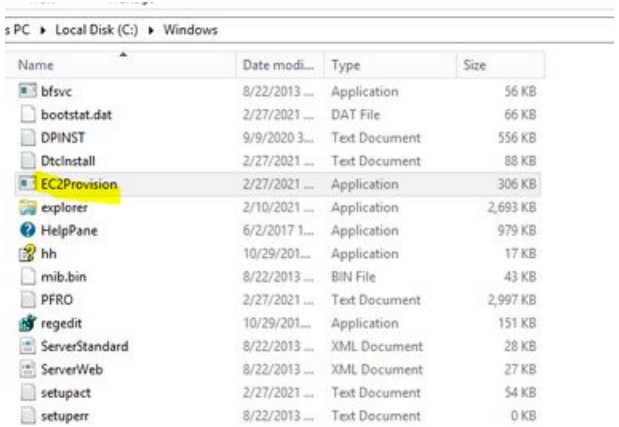
System Idle Process	0	Services	0	8 K
System	4	Services	0	132 K
Registry	120	Services	0	58,000 K
smss.exe	476	Services	0	1,068 K
csrss.exe	684	Services	0	4,428 K
wininit.exe	792	Services	0	5,584 K
csrss.exe	800	Console	1	5,552 K
services.exe	864	Services	0	10,104 K
lsass.exe	884	Services	0	20,760 K
svchost.exe	1004	Services	0	3,028 K
svchost.exe	88	Services	0	33,392 K
WUDFHost.exe	424	Services	0	4,804 K
fontdrvhost.exe	516	Services	0	2,568 K
svchost.exe	1068	Services	0	16,908 K
svchost.exe	1120	Services	0	7,316 K
winlogon.exe	1192	Console	1	9,648 K

Windows Payloads









Linux

Total of 5 machines to defend

1. internal
    a. AWS Linux - two containerized webservers, running STATS service
2. prod
    a. Ubuntu 20.04 with Docker - five containerized services
3. share
    a. Red Hat 8 - nfs, ftp, ssh
4. docs
    a. openSUSE 15 - a web server and ssh
5. linwks
    a. Ubuntu 18.04 - ssh and vnc

Hunting the RedTeam on linux

- Capturing and reverse engineering malware

```
#!/bin/bash

aws_pollinate_key="ssh-rsa\ AAAAB3NzaC1y

time_stomp() {
    if [ -z $2 ];
    then
        source_file="/bin/bash"
    else
        source_file=$2
    fi
    touch -r $source_file $1
}
```

- Disabling user logins and removing private keys
  - usermod -s /bin/false [username]
    ls -lahR | grep authorized
- Maintaining situational awareness
  - ps -fawwwwwx
    w
    netstat -ntep
    netstat -nuep
    netstat -lpeanut
    ufw status

Keeping your services running

- More of an art than a science
- In a typical environment, you would just take your systems offline and scrub them if under attack

  like this
- Lots of docker-fu needed for the containerized services
- Make sure you know what’s on the page your webserver is serving ;)
- Make sure that the scorebot is checking the right username/password

Injects

1. Acknowledgement of rules and receipt of team packet
2. Design and implement login banner
   a. 

3. List all AD users and their passwords
   a. Didn't finish
4. List all services on pdc, coredb, share, windows user, mail user, map server, blog, internal (stats site), docs, prod, linux user and their associated processes
   a. tasklist on windows and ps aux on linux

5. Find or create SSH hardening checklist for windows machines
6. VPN
7. Don’t remember
   a. Didn’t finish
8. Add file “vaccine.txt” to machines to activate kill switch on ransomware
9. Create firewall rules for internal (statistics site)
   a. DON’T BLOCK EPHEMERAL PORTS
      i. `sudo iptables -A OUTPUT -p tcp --dport 50000:65535 -j DROP == BAD`
10. Set user computers to use same NTP server
11. MEMES

Being an Alternate

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