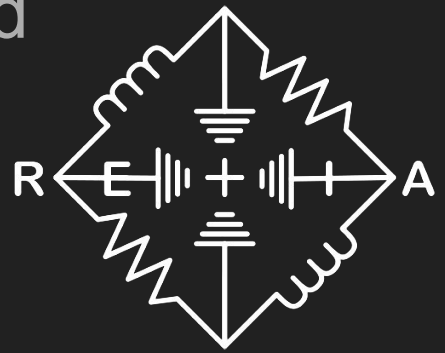
Wifi_Hacking_Self_Defense

4 Advanced Attacks Countered



Who Am I?

Hi! I’m Ash Wheeler:

- University Student in the US
- Primarily working on BioHacking using Open Hardware & Software
- Also exploring Wi-Fi and RFID Tools Based on Microcontrollers

Resources

- Example Github Repo: github.com/skickar/CatGotYourPassword
- Serial terminal: serialterminal.com
- Flashing Tool: nugget.dev
- Retia Discord: https://discord.gg/rjVJbauAUX

Attacking Yourself to Learn Defense

⛔ Getting attacked in the wild
⛔ Attacking Others to Learn What Vulnerable Systems Look Like

How do we Learn Safely and Ethically?

✅ Use Our Own Devices as a Lab
✅ Also Makes Your System More Secure

What are we learning?

- Covert Scanning of Wi-Fi Leaks & how to plug them
- Using Beacons to actively expose POI’s & Travel History
- Evil QR Codes & Hidden Network dangers
- Wi-Fi phishing attacks & how to spot them

Wi-Fi Leaks - Learn what networks are stored in a phone

- We’ll use passive Wi-Fi scanning to learn about a target Wi-Fi device
- This is undetectable and purely passive
- Nearby devices call out for recently joined networks
- This can expose a lot of information
- Requires no interaction with the target on our part

Beacon Swarms - Actively Extract Stored Networks

- We’ll create many fake Wi-Fi networks
- If nearby Wi-Fi devices have a matching network name stored, they try to connect
- We can use this information to identify VIP’s and where a person has traveled
- This is an active attack and can be detected

Poisoned QR Codes - Tag a phone for tracking & MITM

- This attack uses a QR code to inject an evil network into a Wi-Fi device
- The evil network allows a hacker to detect when you are nearby
- The hacker can also force your device to connect to an evil network at any time
- This allows for a man in the middle attack

Wi-Fi Phishing Attacks - Your Router Is Not Updating

- Wi-Fi Phishing is easy and effective
- Disable valid Wi-Fi network with deauth attack (we won’t do this part)
- Create a fake AP pretending to be from the router with no password
- When victim connects, a spoofed router login page appears
- Claims to be the router updating, asks for Wi-Fi password

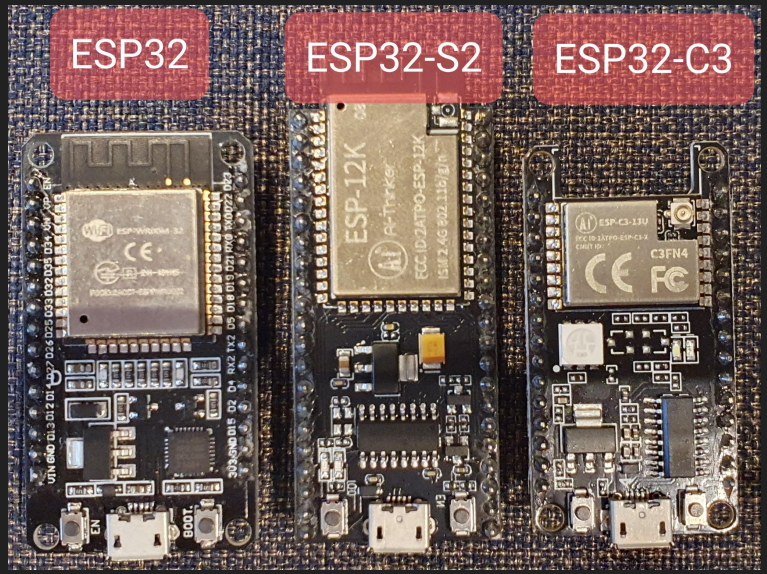
What is a Microcontroller?

Inexpensive Systems on Chips With A Variety Of Strengths and Weaknesses

<u>Examples:</u>

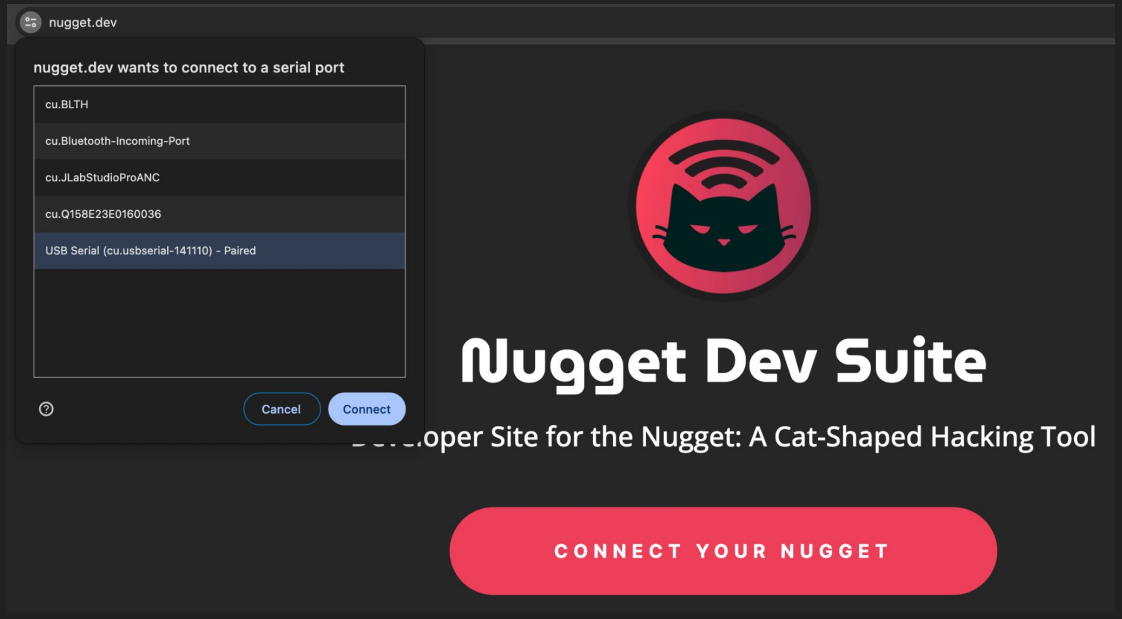
Esp8266- Wi-Fi Injection Capable Mc with 10 GPIO Pins

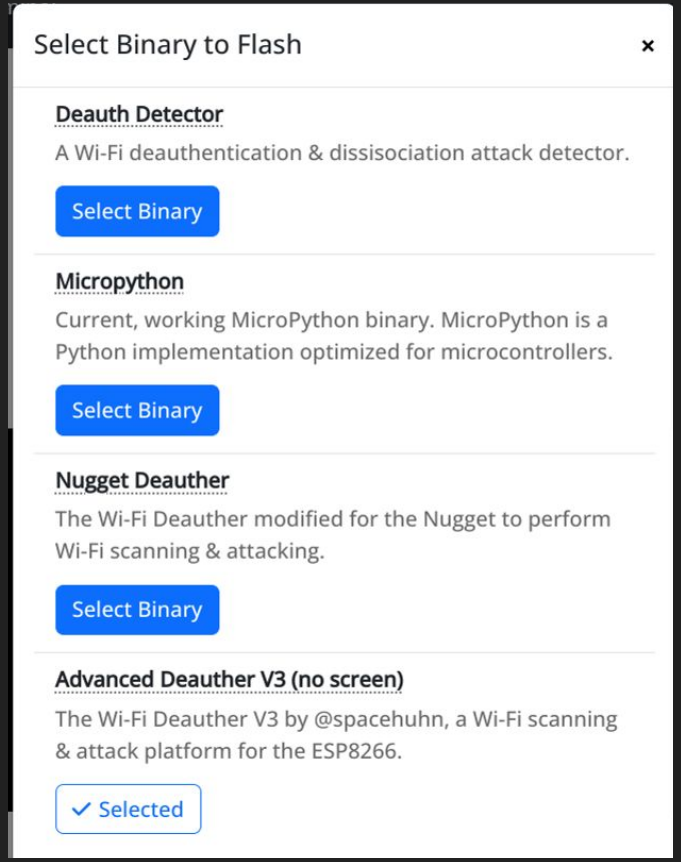
Esp32S2- Wi-Fi Enabled Mc with HID and USB



Setting Up the Wi-Fi Nugget

- Navigate to our flashing website www.nugget.dev in a Chrome based browser
- Plug in your Nugget via USB cable & click “Connect Your Nugget”
- Select your Nugget from the dropdown menu of serial devices





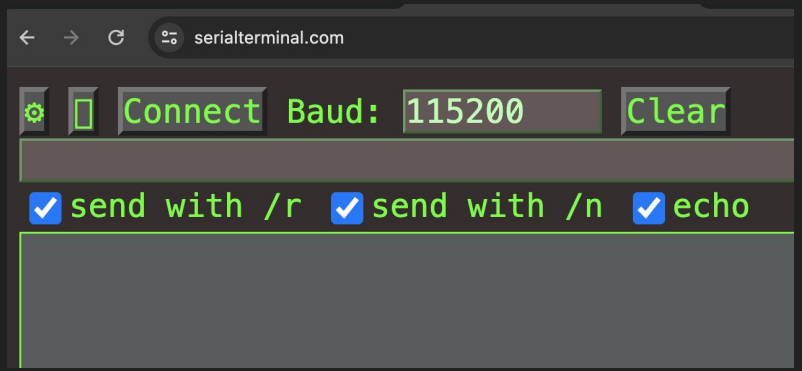
Flash the Headless Advanced Wi-Fi Deauther Binary

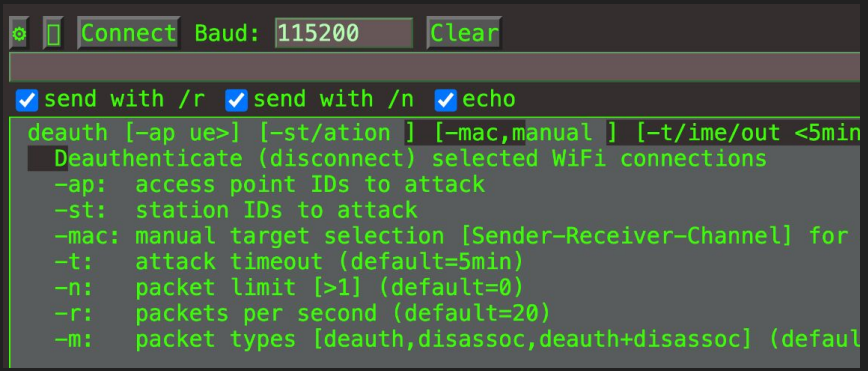
- Open a Chromium based browser and navigate to: nugget.dev
- Plug in Wi-Fi Nugget, Click “Connect Your Nugget”, Select Serial Port of Nugget
- Open Select Program Menu And Select Advanced Deauther V3
- Close Menu and “Program”

*Certain Systems may need to have Dialout Group added

Connect Via Serial terminal

- Navigate to serialterminal.com in a Chrome browser
- Unplug & Plug in your Nugget, set Baud to 115200, click “Connect”
- Select your Nugget from the dropdown menu of serial devices
- Type “help” and press return to test if the connection is working

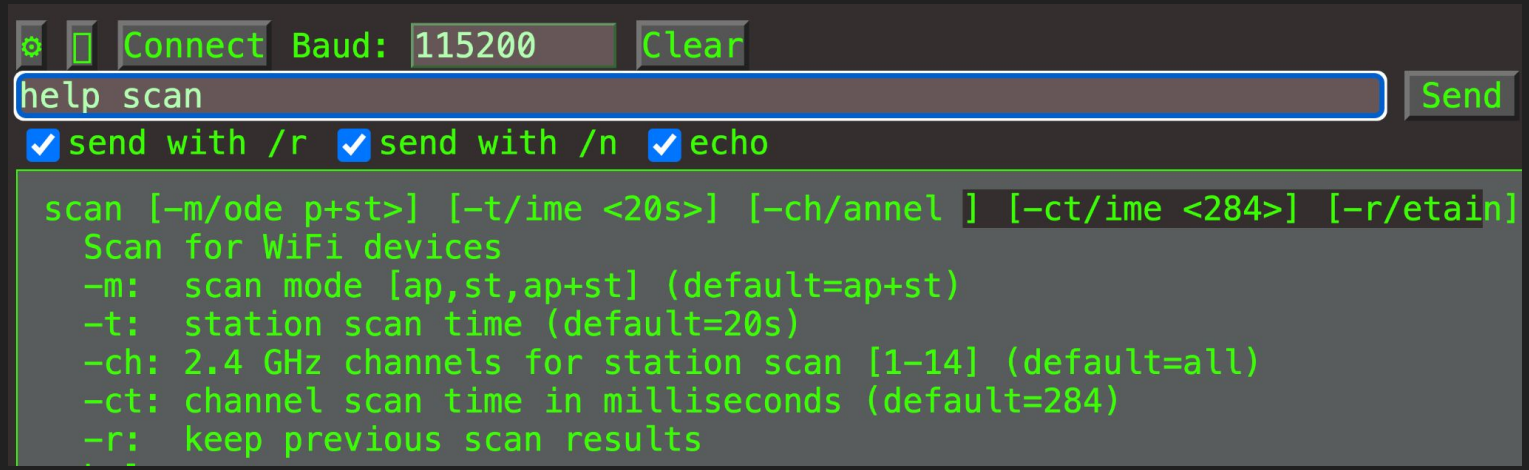




We’re set up!

- Scan - search the airwaves for Wi-Fi signals, display devices & access points
- Beacon - create the appearance of Wi-Fi networks that can’t be joined
- AP - create an evil Wi-Fi access point that can be joined

Use the “help” command to get more information on how to use each command:



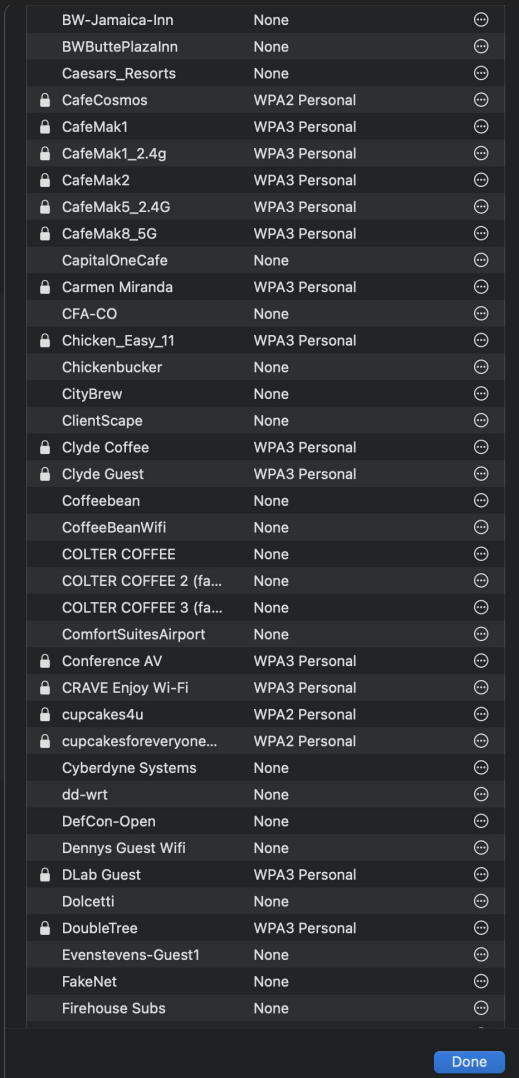
Lab #1: Detect & plug Wi-Fi Leaks in your devices

- We'll scan the airwaves to listen in on networks devices are calling out for
- Try a basic scan - just type "Scan"
- We'll do a more advanced scan to learn more about what's around us
- What might we not see? Connected Wi-Fi devices that aren't being used

```
[ ========== Scan Results ========== ]

[ ===== Access Points ===== ]
 ID SSID (Network Name)                RSSI Mode Ch BSSID (MAC Addr.) Vendor
=============================================================================

  0 *HIDDEN-NETWORK*                    -85 WPA2  6 90:4c:81:fa:bd:e0 HewlettP
  1 "POS411"                            -84 WPA*  6 90:4c:81:fa:bd:e1 HewlettP

  2 "CCA411"                            -86 WPA2  6 90:4c:81:fa:bd:e3 HewlettP
  3 "H-Rewards by IntercityHotel"       -85 Open  6 90:4c:81:fa:bd:e4 HewlettP

  4 "CORP"                              -86 WPA2  6 90:4c:81:fa:bd:e5 HewlettP
  5 *HIDDEN-NETWORK*                    -63 WPA2  1 90:4c:81:fc:03:80 HewlettP

  6 "POS411"                            -63 WPA*  1 90:4c:81:fc:03:81 HewlettP
  7 "DHOffice"                          -62 ?     1 90:4c:81:fc:03:82 HewlettP

  8 "CCA411"                            -62 WPA2  1 90:4c:81:fc:03:83 HewlettP
  9 "H-Rewards by IntercityHotel"       -61 Open  1 90:4c:81:fc:03:84 HewlettP

 10 "CORP"                              -63 WPA2  1 90:4c:81:fc:03:85 HewlettP
 11 "CORP-IoT"                          -63 WPA2  1 90:4c:81:fc:03:86 HewlettP

=============================================================================
Ch = 2.4 GHz Channel  ,  RSSI = Signal strengh  ,  WPA* = WPA & WPA2 auto mode
```

How many networks are in your phone?

- Check your device’s trusted network list
- I am the instructor of this class and I still had 4 vulnerable networks when I checked
- You should delete any open Wi-Fi networks or set them not to auto-connect
- Do this. We’ll wait.
- ANY of these networks can sell you out, It only takes one



Let’s Scan for Data Leaks

- Use this advanced scan: **scan -m st -ch 1-12 -t 60 -ct 5000**

```
# help scan

scan [-m/ode p+st>] [-t/ime <20s>] [-ch/annel ] [-ct/ime <284>] [-r/etain]
  Scan for WiFi devices
  -m:  scan mode [ap,st,ap+st] (default=ap+st)
  -t:  station scan time (default=20s)
  -ch: 2.4 GHz channels for station scan [1-14] (default=all)
  -ct: channel scan time in milliseconds (default=284)
  -r:  keep previous scan results
```

What do you see?

- Try modifying the scan to stay on channels 1, 6 & 11

```
# scan -m st -ch 6 -t 60 -ct 5000

[ ===== Scan for Stations ===== ]
Scan time:    1min
Channel time: -
Channels:     6,


Type 'stop scan' to stop the scan

 ID Pkts RSSI Vendor   MAC-Address       AccessPoint-SSID                  AccessPoint-BSSID Probe-Requests
=============================================================================================================
  -    6  -54          46:3c:76:15:52:f8                                                    ""NetworkName""
                                                                                            "%p%s%s%s%s%n"
                                                                                            "Sable Coffee"
                                                                                            "WhompusNugget"
                                                                                            "grizzlyguest"
                                                                                            "wolfram432"
  -   16  -54          46:3c:76:15:52:f8                                                    ""NetworkName""
                                                                                            "%p%s%s%s%s%n"
                                                                                            ".RSACONFERENCE"
                                                                                            "Philz Coffee"
                                                                                            "Sable Coffee"
                                                                                            "WhompusNugget"
                                                                                            "grizzlyguest"
                                                                                            "wolfram432"
  -   26  -50          4e:73:cd:cf:8c:b6                                                    ""NetworkName""

                                                                                            "%p%s%s%s%s%n"
                                                                                            ".RSACONFERENCE"
                                                                                            "Philz Coffee"
                                                                                            "Sable Coffee"
                                                                                            "WhompusNugget"
                                                                                            "WrenGuest"
                                                                                            "grizzlyguest"
                                                                                            "wolfram432"
```

Lab #2: Tracking With Beacon Swarms

- Beacons - Advertisements To Devices For Wi-Fi networks
- Beacon Swarm - Creating Clones of Popular Networks en Masse
- Scanning for Requests to Join, We can Identify Users Of VIP Target Networks, Such as Government Employees

beacon "SSID_1","SSID_2"... -mon

- beacon - Loops sending of target beacons to create beacon swarm
- “SSID_x” - Sets the target names, works 20 or (sometimes)more networks
- -mon - Tells the tool to scan for devices attempting to join the advertised networks

```
> help beacon

# help beacon

beacon -ssid/s  [-bssid,from ] [-receiver,to ] [-enc/ryption ] [-ch/annel <1>] [-r/ate <10>] [-auth,m/on/itor]
  Send WiFi network advertisement beacons
  -ssid: network names (SSIDs) for example: "test A","test B"
  -from: BSSID or sender MAC address (default=random)
  -to:   receiver MAC address (default=broadcast)
  -enc:  encryption [open,wpa2] (default=open)
  -ch:   2.4 GHz channel(s) [1-14] (default=1)
  -r:    packets per second per SSID (default=10)
  -m:    scan for authentications
  -save: save probe requests from auth. scan
  -t:    attack timeout (default=5min)
```

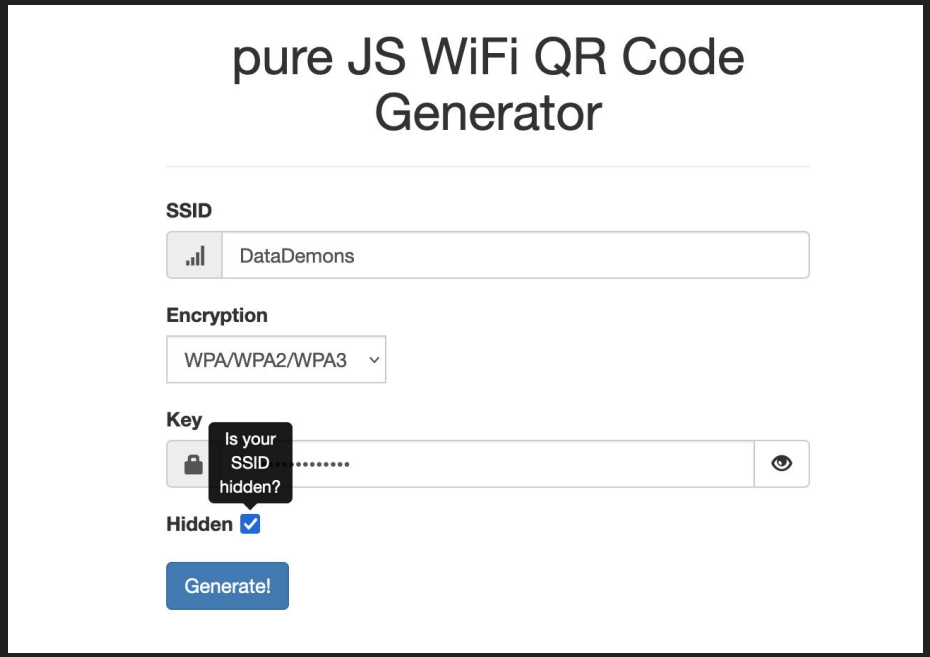
```
[ ===== Authentication Scan ===== ]
Scan time:     5min
Channels:      1,
Channel time:  -
Beacon Mode:   On

Save stations: No
BSSID filter:  0

Type 'stop auth' to stop the scan

RSSI Ch Vendor   MAC-Address       SSID                                BSSID
================================================================================
 -74  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -72  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -74  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -71  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -66  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -71  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -68  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -70  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -69  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -70  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -67  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -68  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -67  1          fe:23:2d:09:0e:53 "Ace Hotel"                         00:0a:73:a2:dd:d3
 -48  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -49  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -50  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -53  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -52  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -52  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -49  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -49  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -50  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -50  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -52  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
 -50  1          06:06:e7:96:78:50 "Americas Best Value Inn"           00:0a:73:a2:dd:d4
```

Example Attack Result

Lab #3: Wi-Fi Attacks with Evil QR Codes

- Let’s make an evil QR code
- We can encode different information in QR codes
- For this example, we’ll be making a Wi-Fi QR code
- This format is sneaky because we can add data the user can’t see
- We’re going to add the “hidden” flag to this QR code

Qifi.org: Browser Based QR Generator



Wi-Fi

WIFI:S:DataDemons;T:WPA;P:mysecretpassword;H:true;

Let’s Tag Our Device - Create Your Own QR Code

Run this while scanning your QR code:
scan -m st -ch 1-12 -t 60 -ct 5000

```
[ ===== Scan for Stations ===== ]
Scan time:    1min

Channel time: 5s
Channels:     1,2,3,4,5,6,7,8,9,10,11,12,

Type 'stop scan' to stop the scan

 ID Pkts RSSI Vendor   MAC-Address       AccessPoint-SSID                  AccessPoint-BSSID Probe-Requests
=============================================================================================================
  -    4  -59          52:4f:f5:b1:ec:31                                                     "HiddenNet"
                                                                                            "IrishTracker"
  -    2  -63          2e:b8:b6:36:12:18                                                     "DataDemons"
  -    6  -60          36:9e:63:6f:d7:cd                                                     "DataDemons"
                                                                                            "HiddenNet"
                                                                                            "IrishTracker"
  -    2  -53          ae:8d:47:50:db:34                                                     "DataDemons"
  -    6  -49          82:dd:99:f4:3d:db                                                     "DataDemons"
                                                                                            "HiddenNet"
                                                                                            "IrishTracker"
```

Remediation

- Don’t scan QR codes you don’t trust
- Regularly check your saved networks and delete any unrecognized nets to ensure System Security

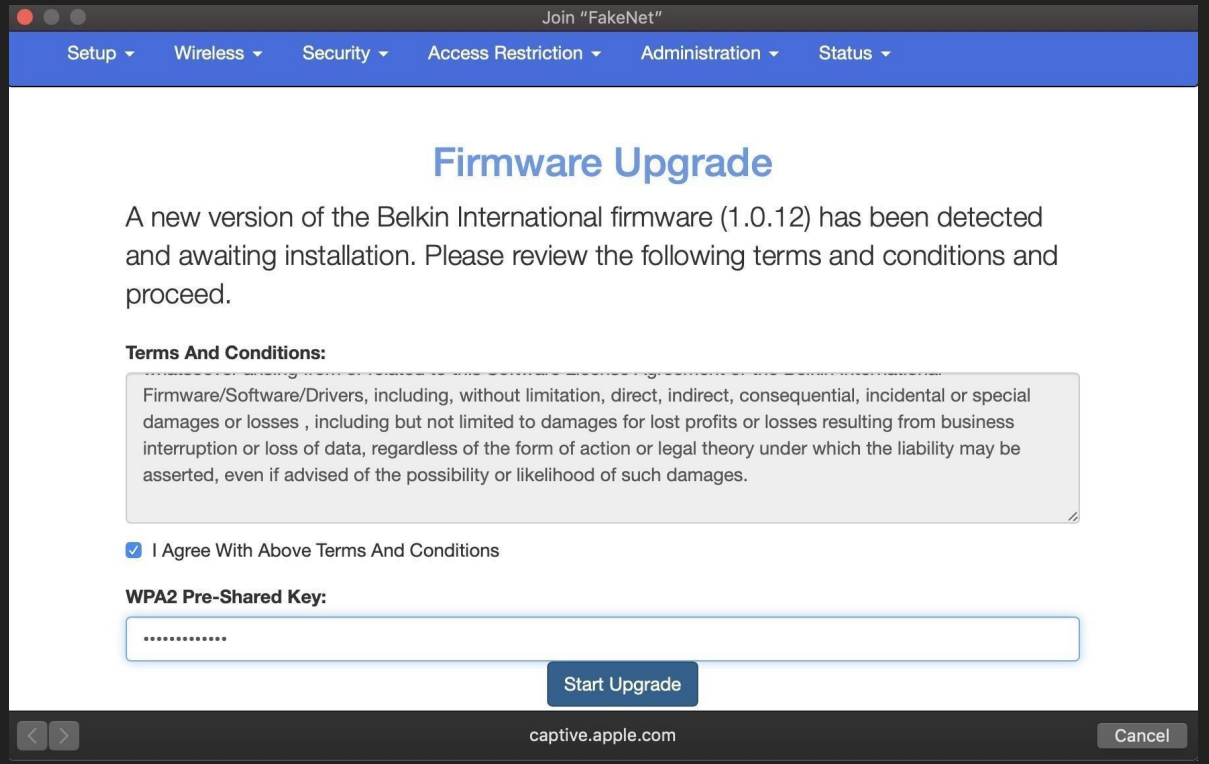
❗You Just Infected Your Device, Clear that Tracker out

Lab 4: Catching Wi-Fi phishing attacks

- Wi-Fi phishing is part social engineering, part hacking
- First, the hacker kicks the victim off their real network
- Then, the hacker makes an evil AP with the same name as the target network
- The evil AP has no password and pretends to be the router updating
- If the victim connects, the evil AP asks for the Wi-Fi password
- It claims to need this for a security update, but is actually the opposite

Real Phishing Page

- A Security researcher was compromised by this Phishing Network Page in the wild
- OS “sign into Network” Serve on mobile makes this look authentic



Let’s create a phishing network

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Let’s create a phishing network

```
# help ap

ap -s/sid  [-p/assword ] [-hidden] [-ch/annel <1>] [-b/ssid >]
  Start access point
  -s:  SSID network name
  -p:  Password with at least 8 characters
  -h:  Hidden network
  -ch: Channel (default=1)
  -b:  BSSID MAC address (default=random)
```

Let’s create a phishing network

Type this command, replacing the SSID with your own:
ap “RotSehenAberGehen”

Now, connect with your phone to the AP.
Do you get a popup?

Once you connect, you should see a notification like this.

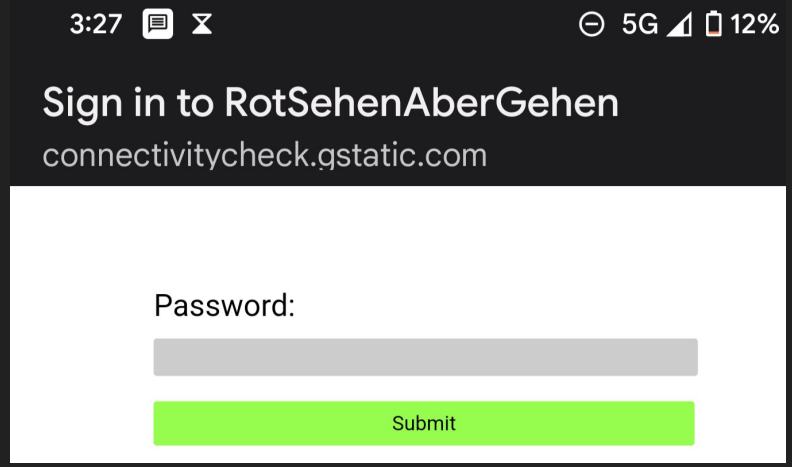
```
# ap RotSehenAberGehen

[ ========== Access Point ========== ]
SSID:       RotSehenAberGehen
Password:
Mode:       Open
Hidden:     False
Channel:    1
BSSID:      00:00:2c:c6:14:cd

Type 'stop ap' to stop the access point
[ ==================== Connections ==================== ]
IP-Address    MAC-Address       URL
=========================================================

192.168.4.100 92:f6:99:15:ba:2f /generate_204
192.168.4.100 92:f6:99:15:ba:2f /generate_204
192.168.4.100 92:f6:99:15:ba:2f /generate_204
192.168.4.100 92:f6:99:15:ba:2f /favicon.ico
192.168.4.100 92:f6:99:15:ba:2f /generate_204
```

Password Stealing Time

This example page is not weaponized

Type in a fake password.

The attacker can easily receive it!




```
# ap RotSehenAberGehen

> Stopped access point

[ ========= Access Point ========= ]
SSID:       RotSehenAberGehen
Password:
Mode:       Open
Hidden:     False
Channel:    1
BSSID:      00:03:2a:b6:78:cd

Type 'stop ap' to stop the access point
[ ================== Connections ================== ]
IP-Address     MAC-Address        URL
=================================================
192.168.4.100 92:f6:99:15:ba:2f /generate_204
192.168.4.100 92:f6:99:15:ba:2f /generate_204
192.168.4.100 92:f6:99:15:ba:2f /generate_204
192.168.4.100 92:f6:99:15:ba:2f /favicon.ico
192.168.4.100 92:f6:99:15:ba:2f /generate_204
192.168.4.100 92:f6:99:15:ba:2f /generate_204?password=ILoveToJaywalk4Lyfe
192.168.4.100 92:f6:99:15:ba:2f /favicon.ico
192.168.4.100 92:f6:99:15:ba:2f /generate_204
192.168.4.100 92:f6:99:15:ba:2f /generate_204
```

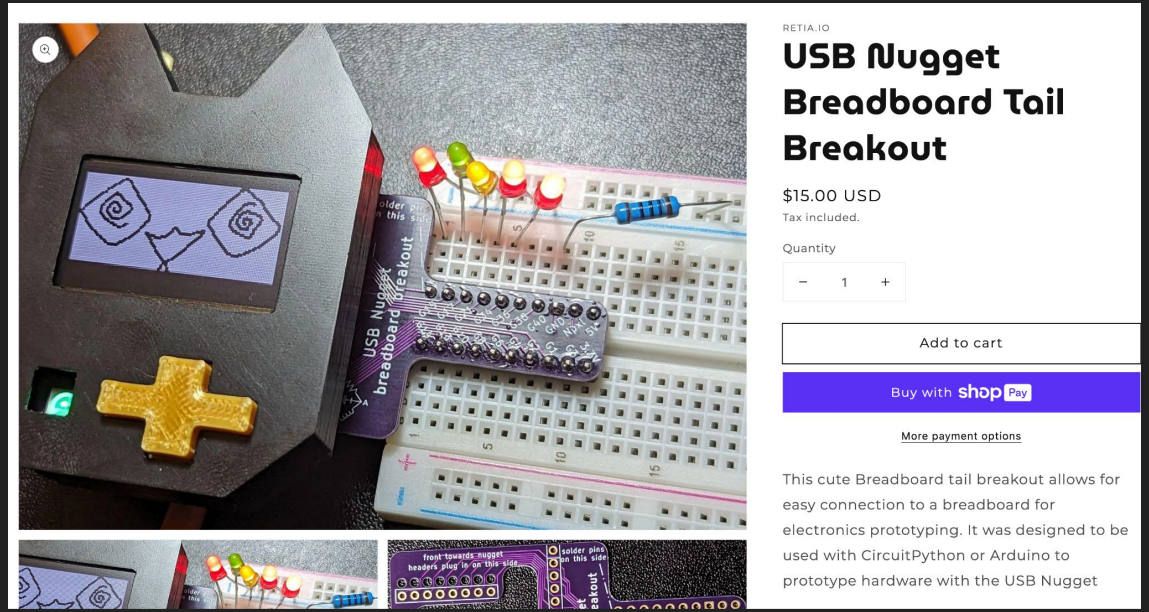
Self Defense Tips

- Never join an open network with the same name as your home or work Wi-Fi network
- Never type your Wi-Fi network password into a website
- Delete any open Wi-Fi networks & set other networks to not auto-join
- Use a VPN to prevent an evil network from snooping or modifying traffic
- Do not add networks via QR code. Use a QR scanner that shows the raw text and verify it isn’t a hidden network
- Don’t use hidden networks

Teach a friend!

We have kits on Retia.io and discounts for instructors teaching classes!

- Nuggets
- Add-ons
- Online classes



Keep in Touch

Want to learn more? You can find us here:

- Discord: https://discord.gg/rjVJbauAUX
- Store: Retia.io
- Nugget Flasher: Nugget.dev
- Livestreams: youtube.com/@SecurityFWD