Remote Camera Security

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Internet Of Things (IoT)

Definition: Traditionally dumb devices that have been embedded with technology that allows them to communicate with the internet [1]

Definition: Cheap, dumb, devices that have been connected to the internet

Definition: Very vulnerable devices that we are connecting to the internet

Motivation

- Internet of Things (IoT) devices are becoming more and more popular [2]
- Need for increased security of connected IoT devices, particularly those with sensitive information like video feeds

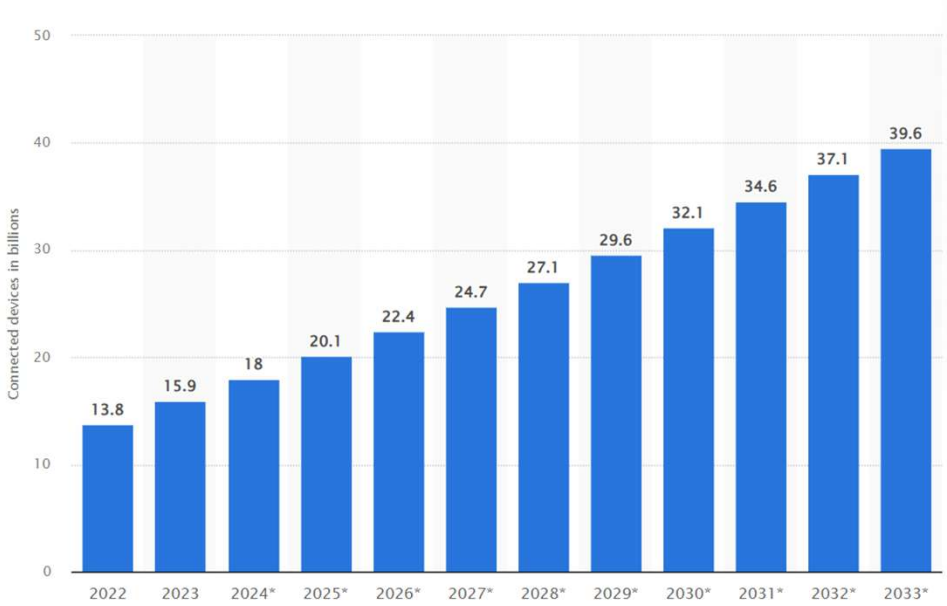


Image Source: [2]

Motivation

- Internet of Things (IoT) attacks are becoming more and more prominent
- Average number of IoT attacks per organization on a weekly basis:

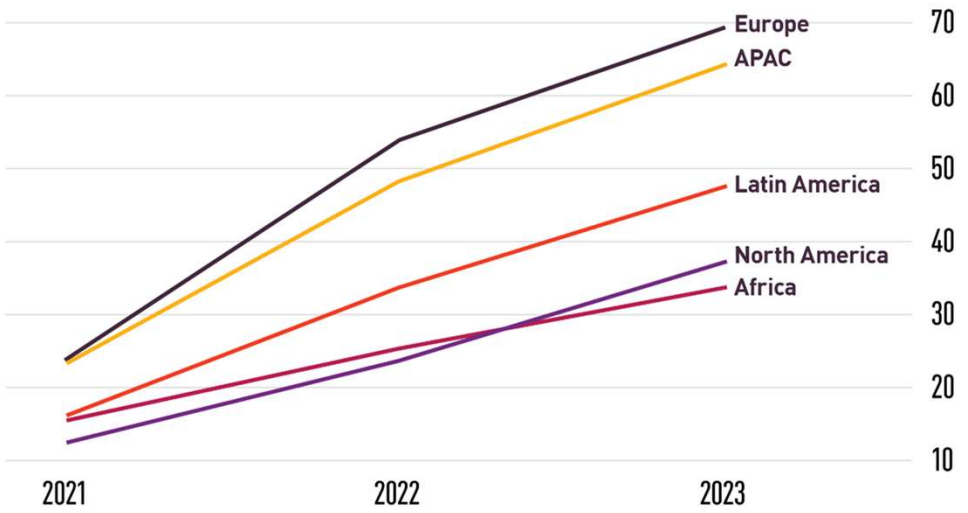


Image Source: [3]

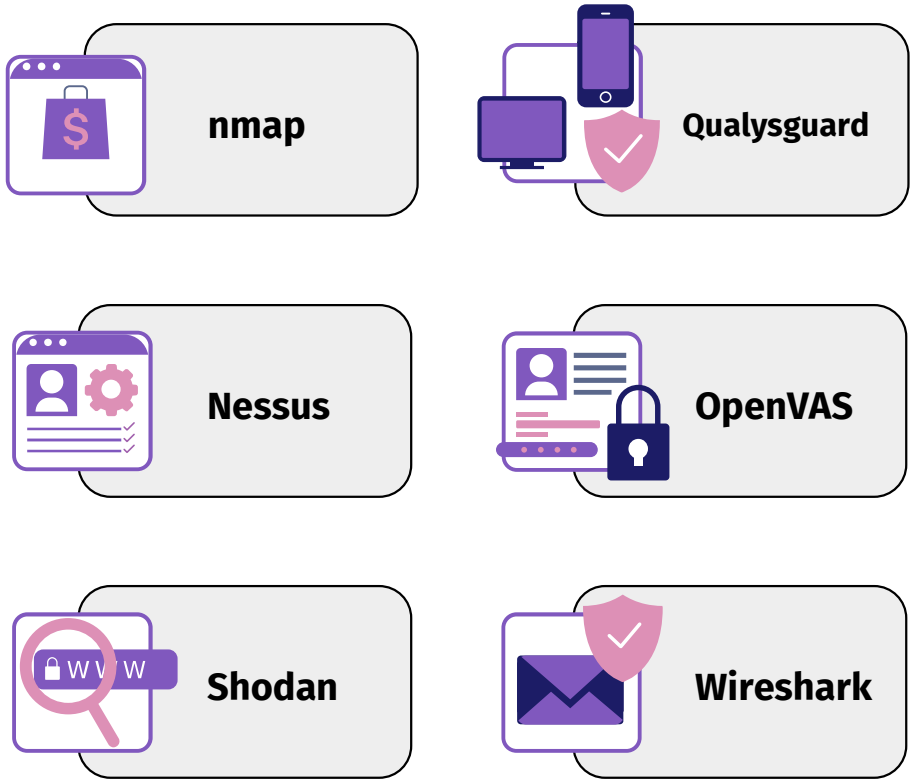
Our Technical Contribution

A toolset of basic scripts

- Scans a network
- Checks devices for known vulnerabilities
- Reports the results

Related Work

- There are other tools that can map network vulnerabilities
- We are curating a tool specifically for IoT cameras and associated vulnerabilities
- We want users to be able to recognize and fix vulnerable cameras that they may use in their homes



Finding Vulnerabilities

- Owlet Camera ($100)

Image Sources: [4], [5], [6]

Finding Vulnerabilities

- ~~Owlet Camera ($100)~~
- Galayou G2 ($17)
- Unnamed WiFi Camera ($7)

Image Sources: [4], [5], [6]

Finding Vulnerabilities

01

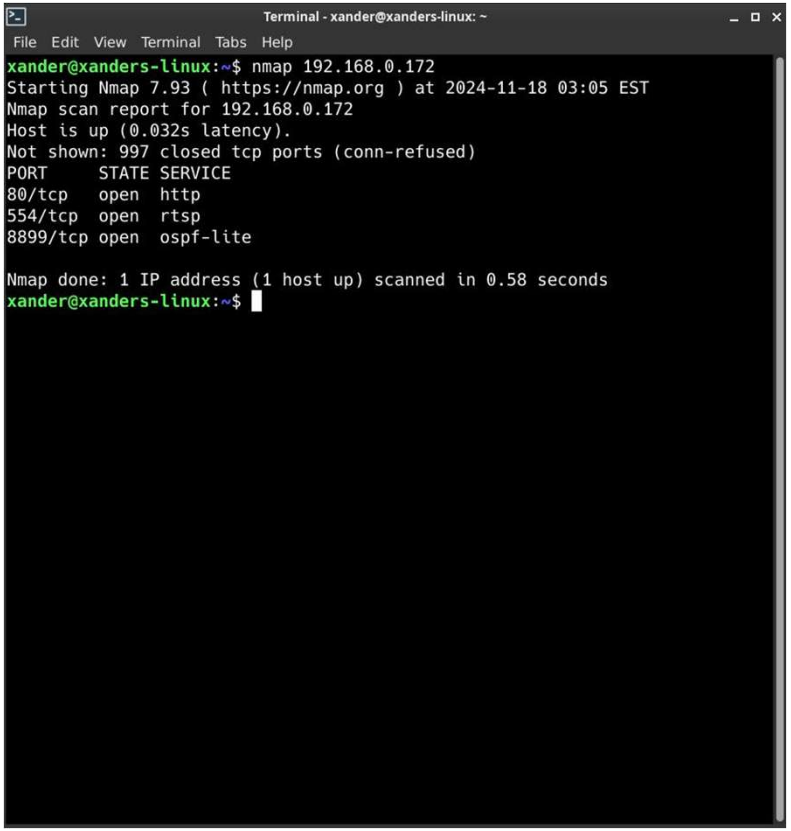
nmap

Scan the device for open ports.

02

Exploit

Find vulnerable services.



Attacks

1 RTSP Brute Force

- “Real Time Streaming Protocol”
- Default Port 554
- Often has weak passwords
- Can be viewed with VLC

```
rtsp://username:password@ip:port/path
```

Attacks

2 FTP Brute Force

- “File Transfer Protocol”
- Default Port 21
- Often has weak passwords
- Can be accessed with a file explorer

```
ftp://username:password@ip:port/path
```

Attacks

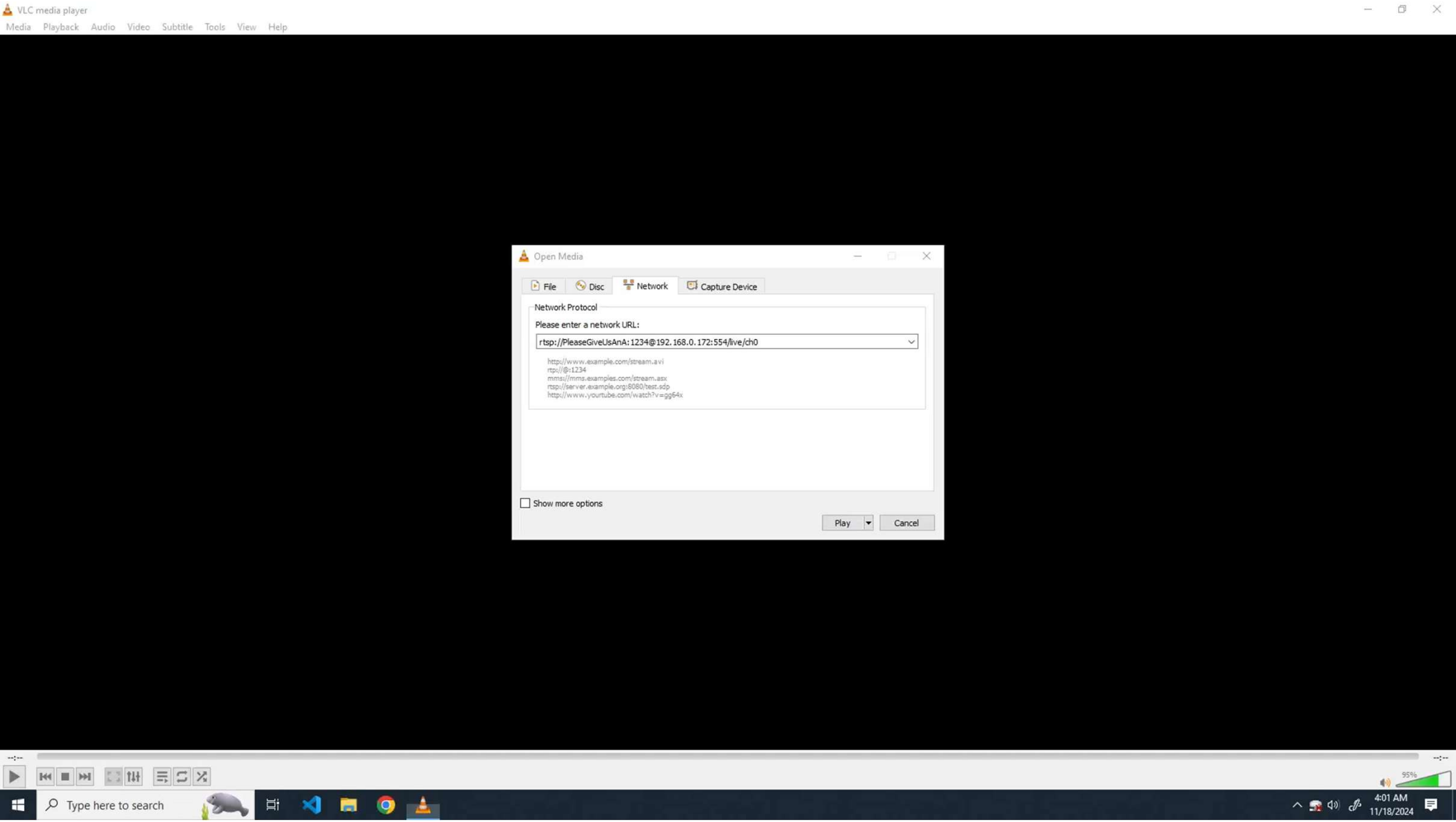
3 SSH Brute Force

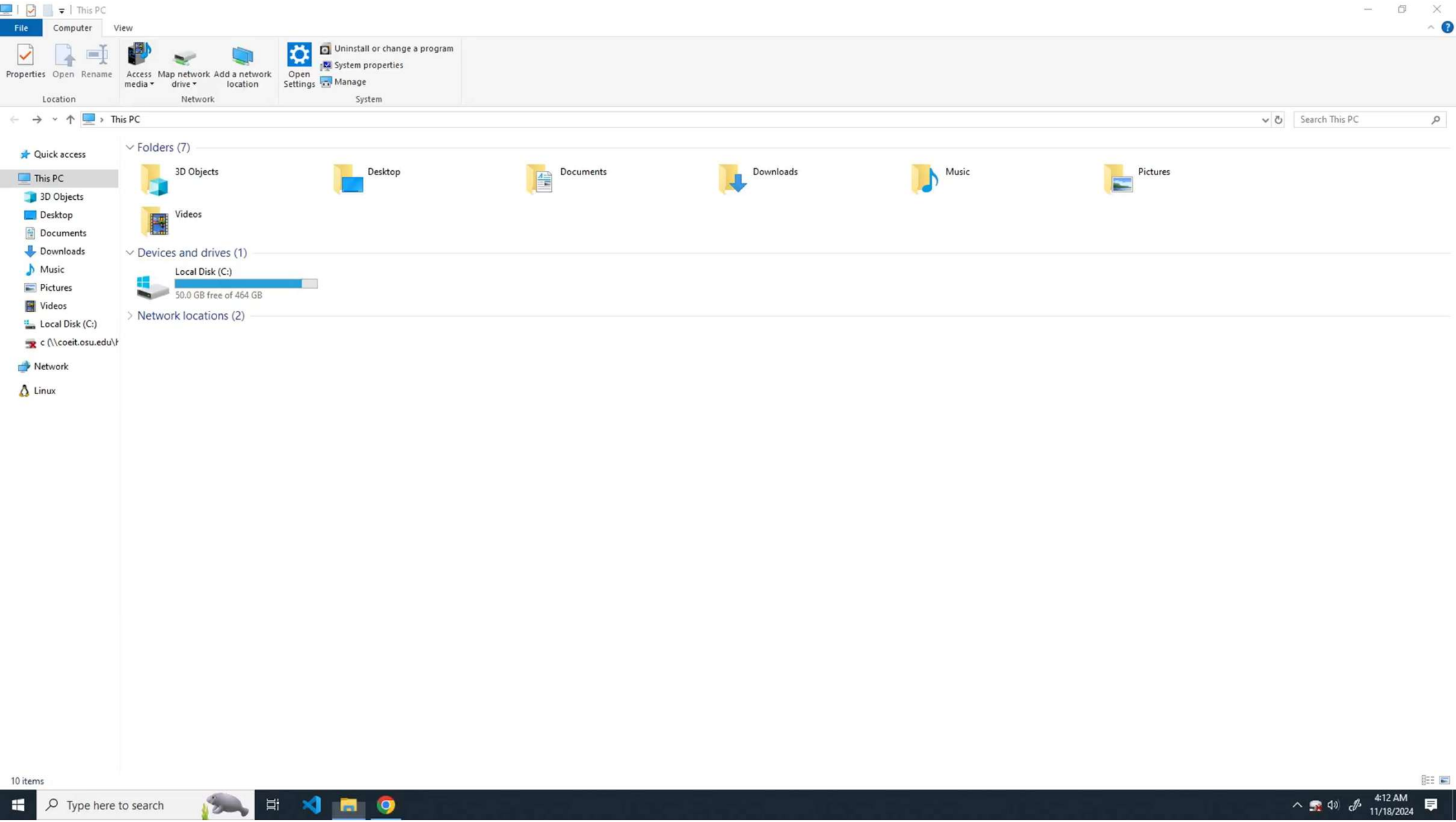
- “Secure Shell”
- Default Port 22
- Often has weak passwords
- Can be accessed with a terminal

```
ssh username@ip
```

Demo

1. RTSP Brute Force
2. FTP Brute Force


VLC media player
Media Playback Audio Video Subtitle Tools View Help
Open Media
File Disc Network Capture Device
Network Protocol
Please enter a network URL:
rtsp://PleaseGiveUsAnA:1234@192.168.0.172:554/live/ch0
http://www.example.com/stream.avi
rtp://@:1234
mms://mms.examples.com/stream.asx
rtsp://server.example.org:8080/test.sdp
http://www.yourtube.com/watch?v=gg64x
Show more options
Play
Cancel
95%
Type here to search
4:01 AM
11/18/2024


This PC
File
Computer
View
Properties
Open
Rename
Location
Access media
Map network drive
Add a network location
Network
Open Settings
Uninstall or change a program
System properties
Manage
System
This PC
Search This PC
Quick access
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
Network
Linux
Folders (7)
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Devices and drives (1)
Local Disk (C:)
50.0 GB free of 464 GB
Network locations (2)
10 items
Type here to search
4:12 AM
11/18/2024

Evaluation

- The results of the attacks are summarized in a report
- An example is shown
- Presents metrics for a local network (networks with few devices)
- If the same network is scanned, the results are consistent

```
Starting scan at 2024-11-18 02:07:31
scan report for 192.168.0.0/24

192.168.0.172
PORT    SERVICE         ATTACK
80      http            -
554     rtsp            VULNERABLE
8899    ospf-lite       -

192.168.0.209
PORT    SERVICE         ATTACK
80      http            -
554     rtsp            VULNERABLE
8899    ospf-lite       -

192.168.0.197
PORT    SERVICE         ATTACK
21      ftp             VULNERABLE
6789    ibm-db2-admin   -

192.168.0.196
PORT    SERVICE         ATTACK
135     msrpc           -
139     netbios-ssn     -
445     microsoft-ds    -
5357    wsdapi          -
```

Evaluation and Conclusion

Easy To Interpret Results

We found vulnerabilities

Number Of Vulnerabilities

My network had 3 vulnerabilities, but the wider internet will have more

Cheap Devices

Consumers *are* using devices that do not prioritize security

Lessons, Problems, and Future Work

More Attacks

There are *many* more vulnerabilities to find

FUTURE

Many Devices

Some devices are more secure than others

PROBLEM

Minimal Docs

Net securty is its own field. Attacks are hard to find.

LESSON

Shodan.io

- Our tool scans a local network, but these vulnerabilities also exist on the internet
- A tool like Shodan.io can be used to find them
- 24,689 potentially vulnerable cameras
  - 9,788 do not have a password


speed33 camera
2024-11-18 23:05:52
South Korea
Republic of Seoul


Pavilion of Pickleball
2024-11-18 19:48:38
POP
United States
Chicago, IL


2024-11-18 14:24:16
IP Camera
Italy
Naples


2024-11-18 21:28:50
IP Camera
United States
Garner, NC


2024-11-19 03:52:40
IP Camera
Japan
Kawasaki


2024-11-18 17:50:41
IP Camera
China
Shanghai


2024-11-18 10:38:06
IP Camera
China
Qingdao


2024-11-18 19:21:59
IP Camera
Japan
Kumamoto


2024-11-13 16:31:44
IP Camera
United States
Ashland, OH


2024-11-05 06:53:38
IP Camera
United States
North Canton, OH


2024-11-09 02:55:13
IP Camera
United States
Hamilton, OH

Citations

Articles:

[1] Gillis, Alexander S., et al. “What Are IOT Devices?: Definition from TechTarget.” Search IoT, TechTarget, 21 Aug. 2023, www.techtarget.com/iotagenda/definition/IoT-device.

[2] “How the Internet of Things (IOT) Became a Dark Web Target – and What to Do about It.” World Economic Forum, www.weforum.org/stories/2024/05/internet-of-things-dark-web-strategy-supply-value-chain/. Accessed 18 Nov. 2024.

[3] Martin, James. “How Many Cyber Attacks Occur Each Day? (2024).” Exploding Topics, Exploding Topics, 30 Sept. 2024, explodingtopics.com/blog/cybersecurity-stats.

Images:

[4] “Owlet CAM® 2.” Owlet US, owletcare.com/products/owlet-cam-2. Accessed 18 Nov. 2024.

[5] Amazon.Com : Galayou Indoor Security Camera 2K, www.amazon.com/Indoor-Security-Galayou-Storage-Assistant/dp/ B0B1T8T1WD. Accessed 18 Nov. 2024.

[6] Amazon.Com : Outdoor 5G Light Bulb Home Security Camera, www.amazon.com/High-Brain-Camera-Wireless-Security/dp/B09PVD729J. Accessed 18 Nov. 2024.

** All RTSP camera images (slides 19-29) came from shodan.io searches*

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