A Random walk through (a few) 1,000,000 Things

A Story of Millions Interrogated Devices

Chris Rouland

Founder and CEO, Phosphorus Cybersecurity

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Printers

Phones

Cameras

Robotics

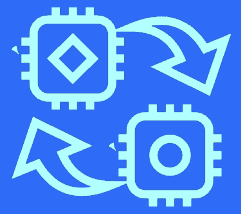
UPS

Wireless router

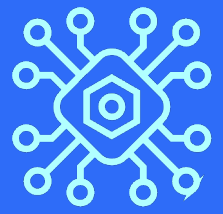
PDU

Door controller

What is xIoT?



Purpose-built firmware/HW



Network-connected

Can’t run Endpoint security

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Cloud Security

10 Million servers world-wide

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Endpoint Security

.57 desktops per person

World-wide desktops or laptops per person.

5 Billion desktops WW

Total computers with keyboards world-wide.

xIoT Security

50 Billion xIoT devices world-wide

Spanning IoT, OT, and Network Devices.

State of xIoT Security

The need to Find, Fix, and Monitor xIoT devices automatically.

78%

of Enterprise IoT devcies have a CVE of 8+

26%

of Enterprise IoT devices are end-of-life by their manufacturer

7 years

Average firmware age of an embedded device

50%

Of enterprise IoT/OT devices use default credentials

3-5

IoT devices per enterprise employee

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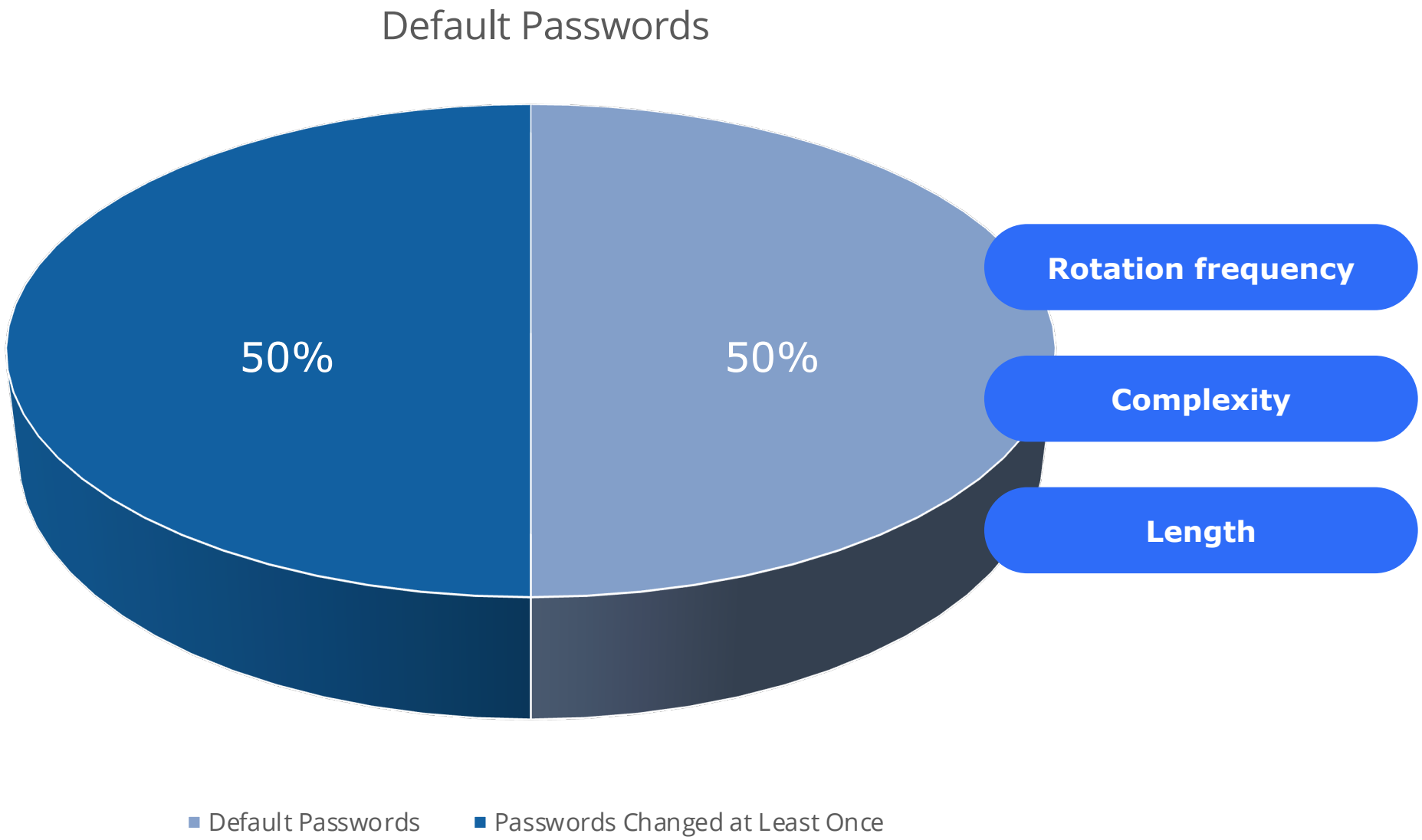
Phosphorus Research Stats



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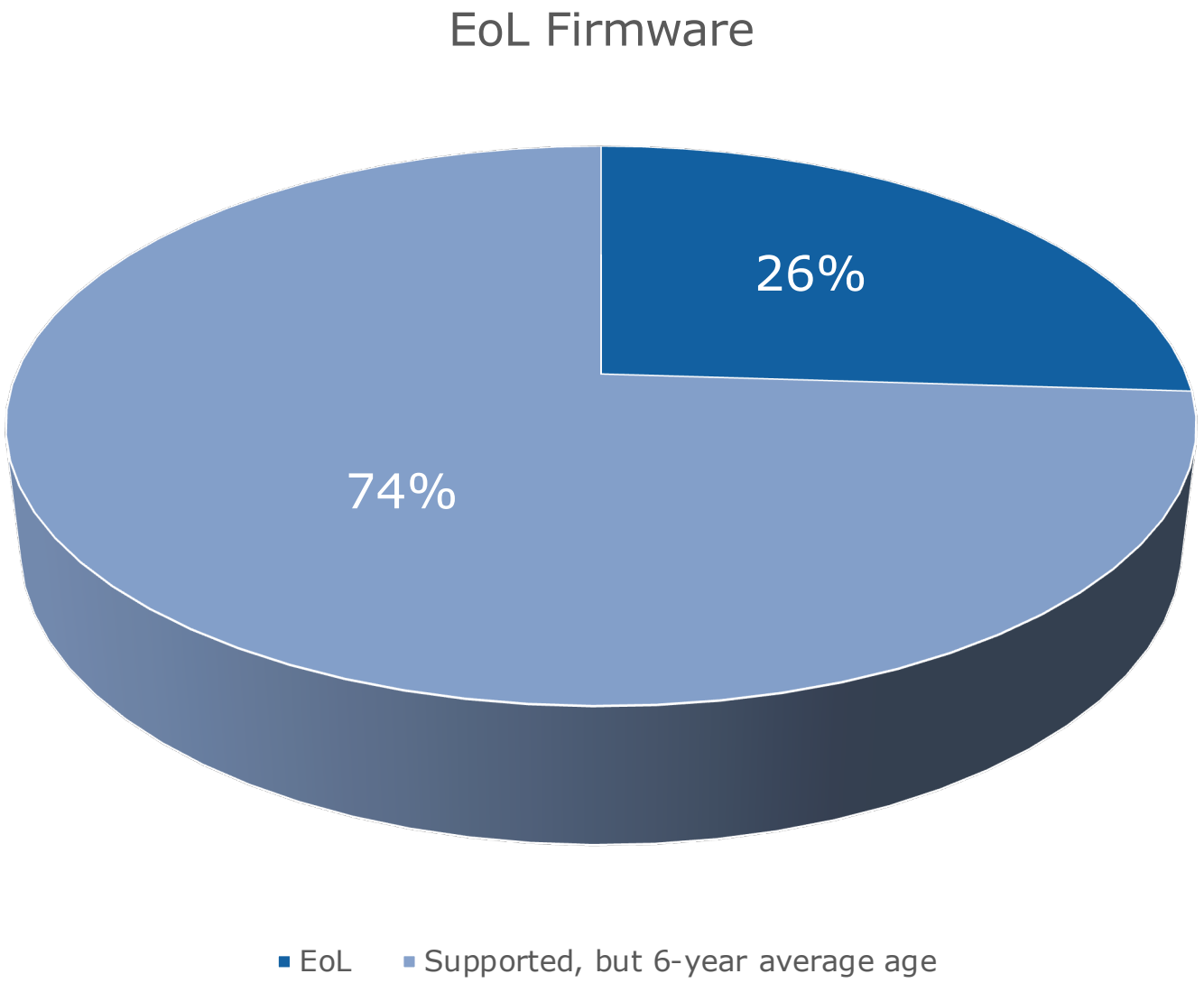
Phosphorus Research Stats



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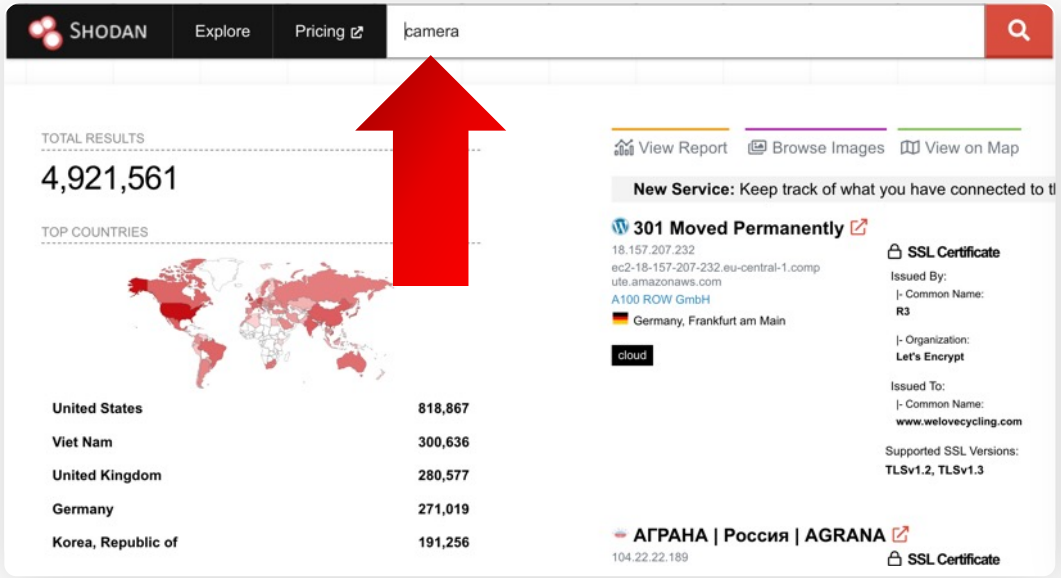

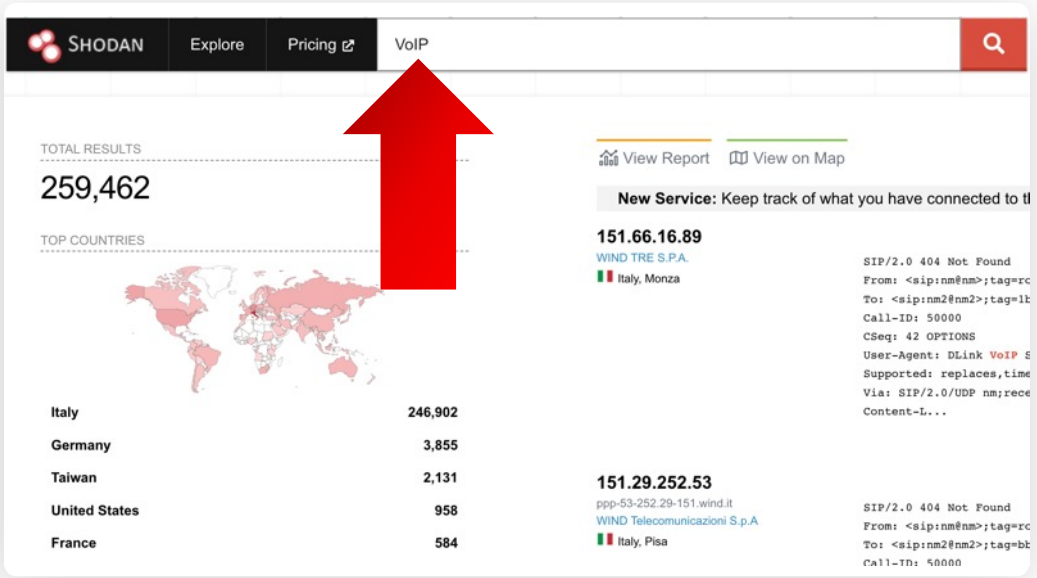

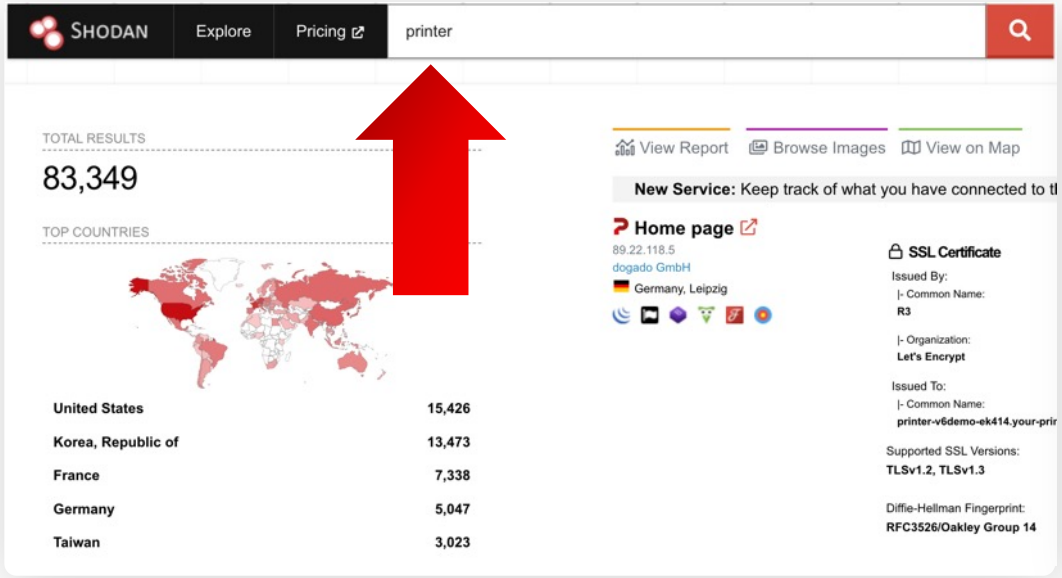

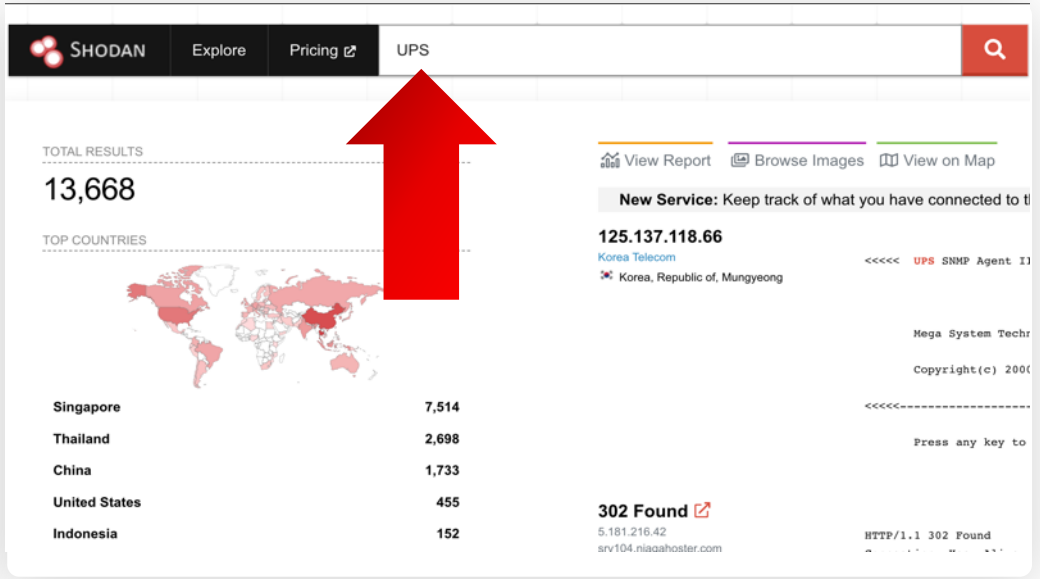

xIoT Security Today = IT Security In 1995

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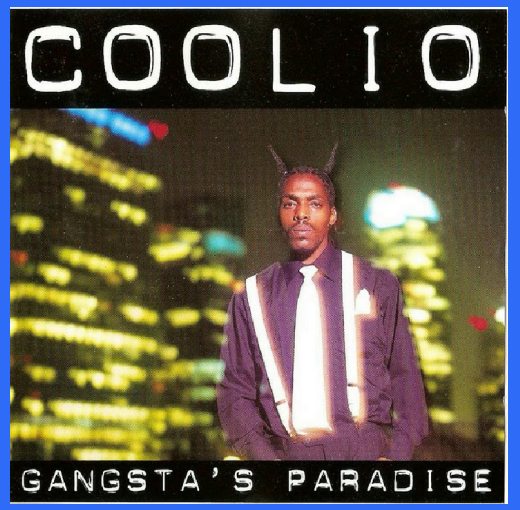

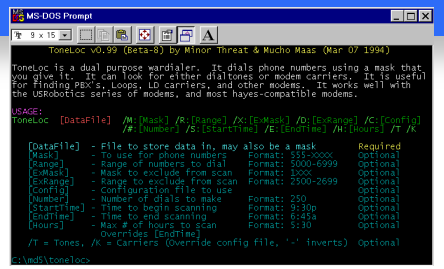

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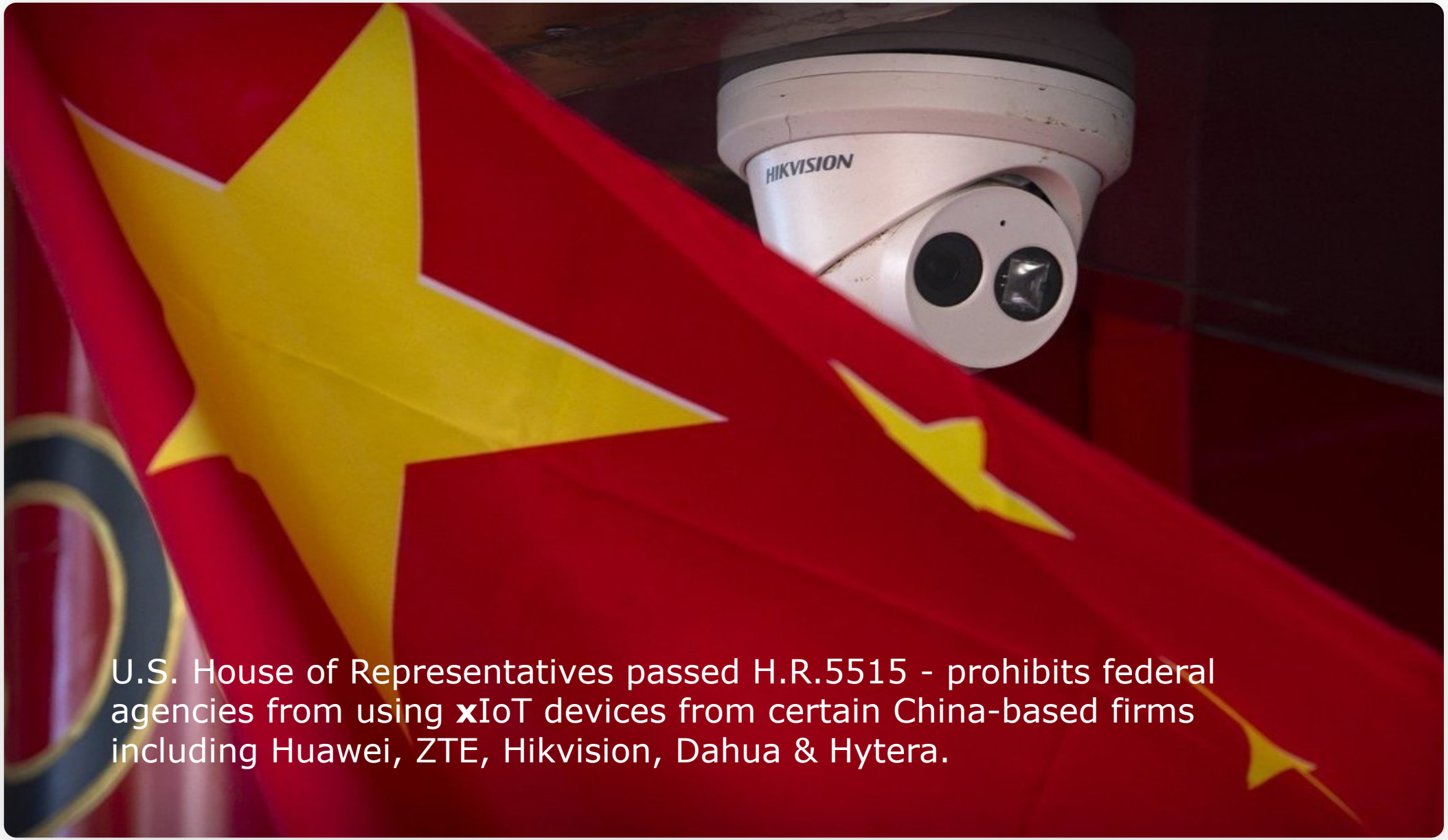
Banned Chinese xIoT Devices



U.S. House of Representatives passed H.R.5515 - prohibits federal agencies from using **x**IoT devices from certain China-based firms including Huawei, ZTE, Hikvision, Dahua & Hytera.

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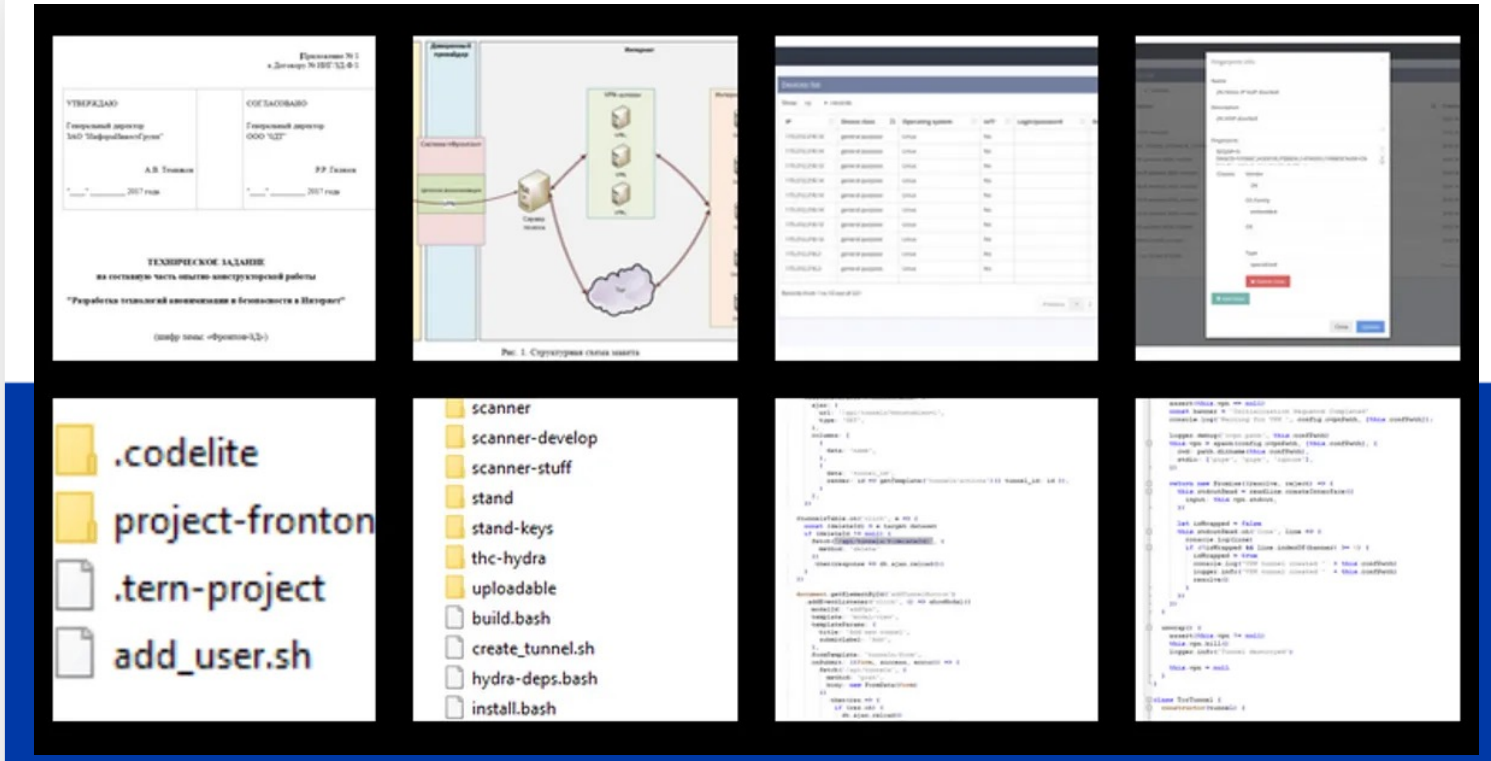
Russian xIoT Hacking Tool



- “Fronton,” designed by contractors for Russian FSB
- Targets **x**IoT devices for C&C
- Digital Revolution hacking group discovered & released it
- Now available on torrents & the usual places

Russian State Hackers Target xIoT

Internet-accessible xIoT

Two default passwords
One unpatched vulnerability

Internal Enterprise Environment

Sniff traffic with tcpdump Scan & expand Enumerate administrative groups

Strontium APT28 - aka Fancy Bear aka SoFancy - Linked to Russian Intelligence GRU

Microsoft Threat Intelligence

Discovered by the Microsoft Threat Intelligence Center

Russian State Hackers Target Routers

VPNFilter Malware

Compromised through extraneous services like remote management that were running with default passwords

- Traffic capture
- Firmware wiping – destroying router
- Post reboot malware persistence

500,000

infected business & home routers: Linksys, MikroTik, Netgear, QNAP, & TP-Link

Discovered by Cisco

Russian State Hackers Target Net. Devices

A separate attack

- Remote login with default username & password
- Initial boot credentials
- Undocumented user account with privilege level 15
- Full access to all commands & changes

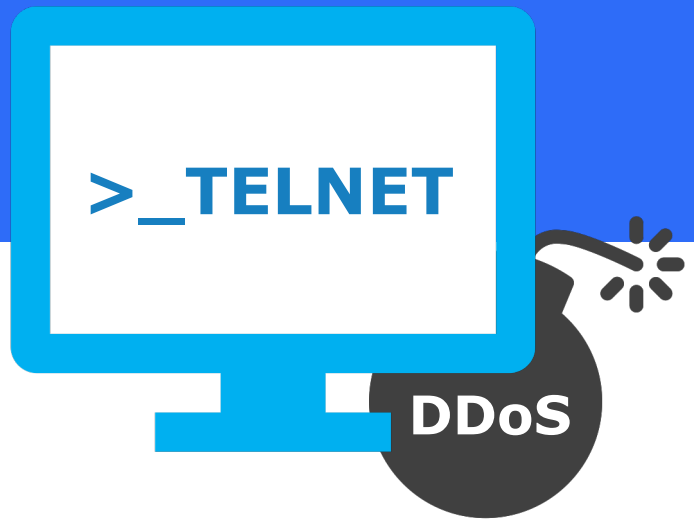
Russian Dragonfly Cyber Unit targets millions of Cisco network devices with port TCP 4786 (Smart Install) open

Exfiltrate configurations over TFTP, execute commands, replace the IOS images, and set up accounts

Patch the firmware, turn of extraneous services & manage credentials correctly…& eat your vegetables

Mirai Botnet

Actual brand not pictured



Default & eight common passwords

SONY

PayPal reddit

GitHub NETFLIX

PayPal, Twitter, Reddit, Sony, Netflix, GitHub

Russian xIoT Botnet Takedown

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RSOCKS Botnet

Industrial Control Systems (OT), Network Gear, Enterprise **x**IoT…

Millions of compromised devices operated by Russian cybercriminals & leased ~$30/day

Law enforcement from the US, UK, Germany & Netherlands participated in the takedown

APTs Achieving Persistence with xIoT: QuietExit

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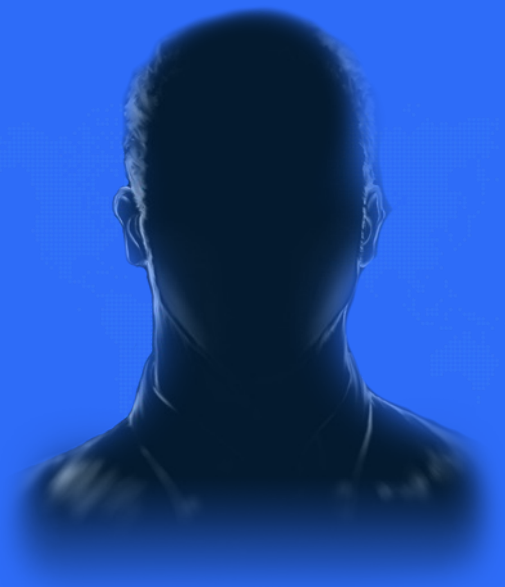

Compromise & C2 Tunnel

Data exfiltration

API calls on-prem & in the cloud

Data retrieval

Exchange

Office 365

UNC3524 was published by Mandiant on May 2nd, 2022 & labeled "QuietExit"

Associated with Russian Espionage Threat Actors: APT 28 Fancy Bear & APT 29 Cozy Bear

It exfiltrates executive, corporate development, M&A, and security staff data – 18 month+ dwell time

General PLC Exploits

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- Real Time OS (RTOS)
- VxWorks & OS-9
- C++ & Python
- (1) Runtime on embedded device
- (2) Editor – laptop for writing programs
- (3) SCADA GUI – monitor

- Critical
- Hyper-connected
- Modern & legacy protocols
- Poor user documentation
- Proprietary encryption
- Depreciation over decades
- Unmaintained
- Mostly no authentication
- No integrity (tamper away)
- No confidentiality (plain text)

Interruption
blast messages, it's simple so you can easily DoS a PLC (flood w/ 1,000 msg./sec.)

Interception
read the message, there is no encryption across the network

Modification
change the message, like a bump in the wire, modify the content and resend

Injection
make your own message (Modbus/TCP frame), all messages are welcome

KVM Switches

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Running Ubuntu Linux v10 from ~October 2010 (current release is v21.1 as of October 2021)

Totally unpatched with hundreds of vulnerabilities

Lights Out Management Controls

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Three common types of lights out management controllers including HP, Dell, & Supermicro

They are IoT devices running their own OS and applications (Linux or VxWorks)

Server Cabinets & Racks

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UPS backup, cooling, cable management & tamper sensors

Passwords are usually default; old firmware with critical CVEs

Physical Access Controllers

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During a POV we could lock and unlock 6,400 doors at a FS company

Nortek Security & Control systems had several CVSS scores of 9.8/10 & 10/10

Allowing remote, unauthenticated, and low-skill exploitation for full control

Printers

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Black Hat 2019: critical level vulnerabilities were discovered in 10,000 printer brands/types/versions

Promiscuous & multi-vector access with everything on by default and default credentials

Some of the most targeted assets by state sponsored attackers

VoIP Phones & Video Conf. Systems

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Some run Android OS and have undocumented SSH with default credentials

A beacon of hope: one customer had 31,000 phones and “only” 700 had critical CVEs

15 Stock Exchange Atomic Clocks

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Knew about six of them

No CVEs

WHICH xIoT DEVICE TYPE IS THE #1 BIGGEST OFFENDER?

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Security Cameras

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The #1 worst offender; running Linux such as BusyBox; some ship with malware preloaded

Everyone has them; nobody knows who's responsible: IT, IT Sec., Facilities, Corp. Sec., Network Ops…

Beyond Enterprise xIoT

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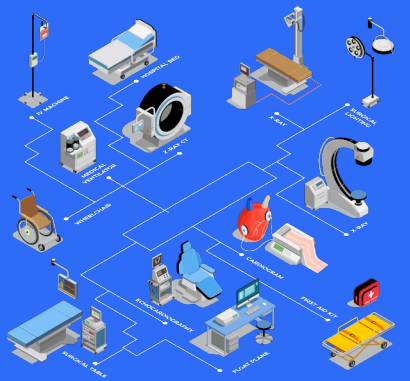
Internet of Battlefield Things (IoBT)

Industrial Internet of Things (IIoT)



Internet of Healthcare Things (IoHT)

Smart Ships

Smart Buildings & Cities

Network Gear

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Summary

Organizations don’t know what things they have.

So, they don’t know what things to fix.

They don’t have the ability to fix things at scale.

They aren’t monitoring things to keep them fixed.

This is leaving **x**IoT and IT/cloud assets at risk.

It’s resulting in data theft, destruction, spying, ransomware…

Phosphorus ordr Zingbox NOZOMI NETWORKS Kaseya ARMIS

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Thank you!

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