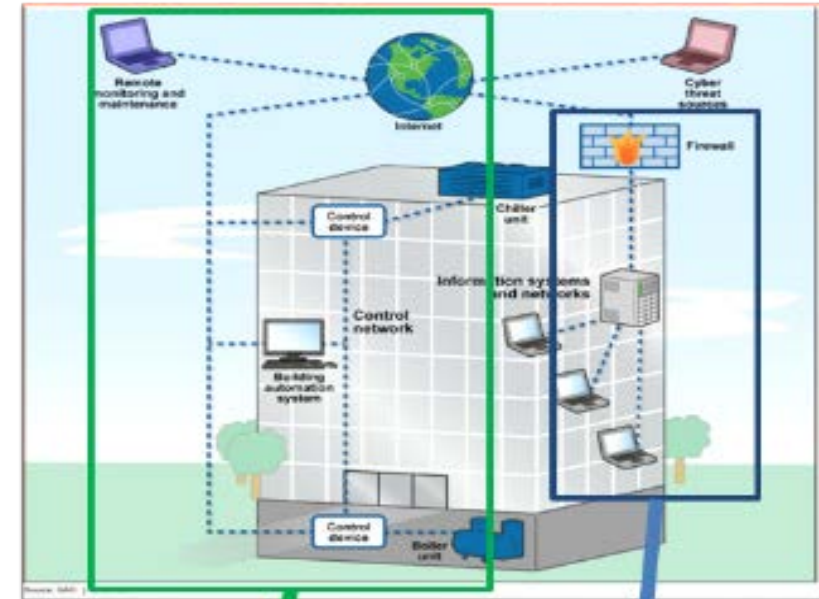




DoD Terminology Decision In Progress:

PIT, CS, PIT-CS, ICS, OT, SCADA, CPS, IoT, IIoT

- **PIT = Platform Information Technology**
- **CS = Control Systems**
- **PIT-CS = PIT Control Systems**
- **ICS = Industrial Control Systems**
- **OT = Operational Technology**
- **SCADA = Supervisory Control And Data Acquisition**
- **CPS = Cyber Physical Systems**
- **IoT = Internet of Things**
- **IIoT = Industrial IoT**



**PIT, CS,
ICS, OT,
SCADA,
CPS, IoT,
IIoT**

**Information
Systems**

Typically Lack Any Cyber Defenses; ~75% Use WIN XP



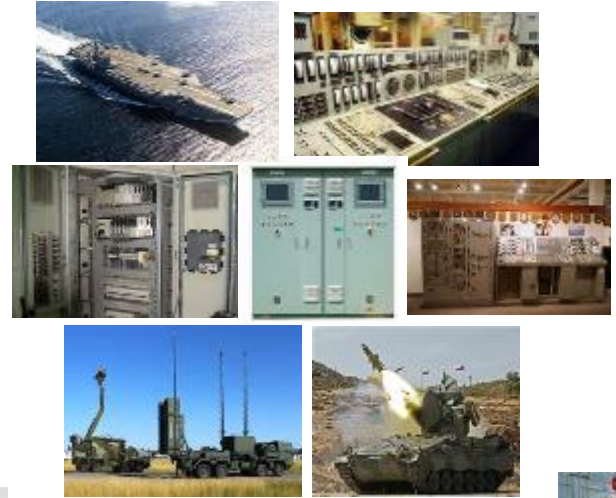
>500 Installations
>250K Buildings
>200K Structures

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Buildings



Weapon Platforms



Operational Energy



Electrical and HVAC



Pumps and Motors



Nuclear



Typical Controller

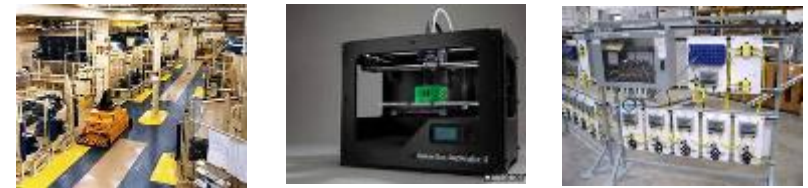
Vehicles/Charging



Medical

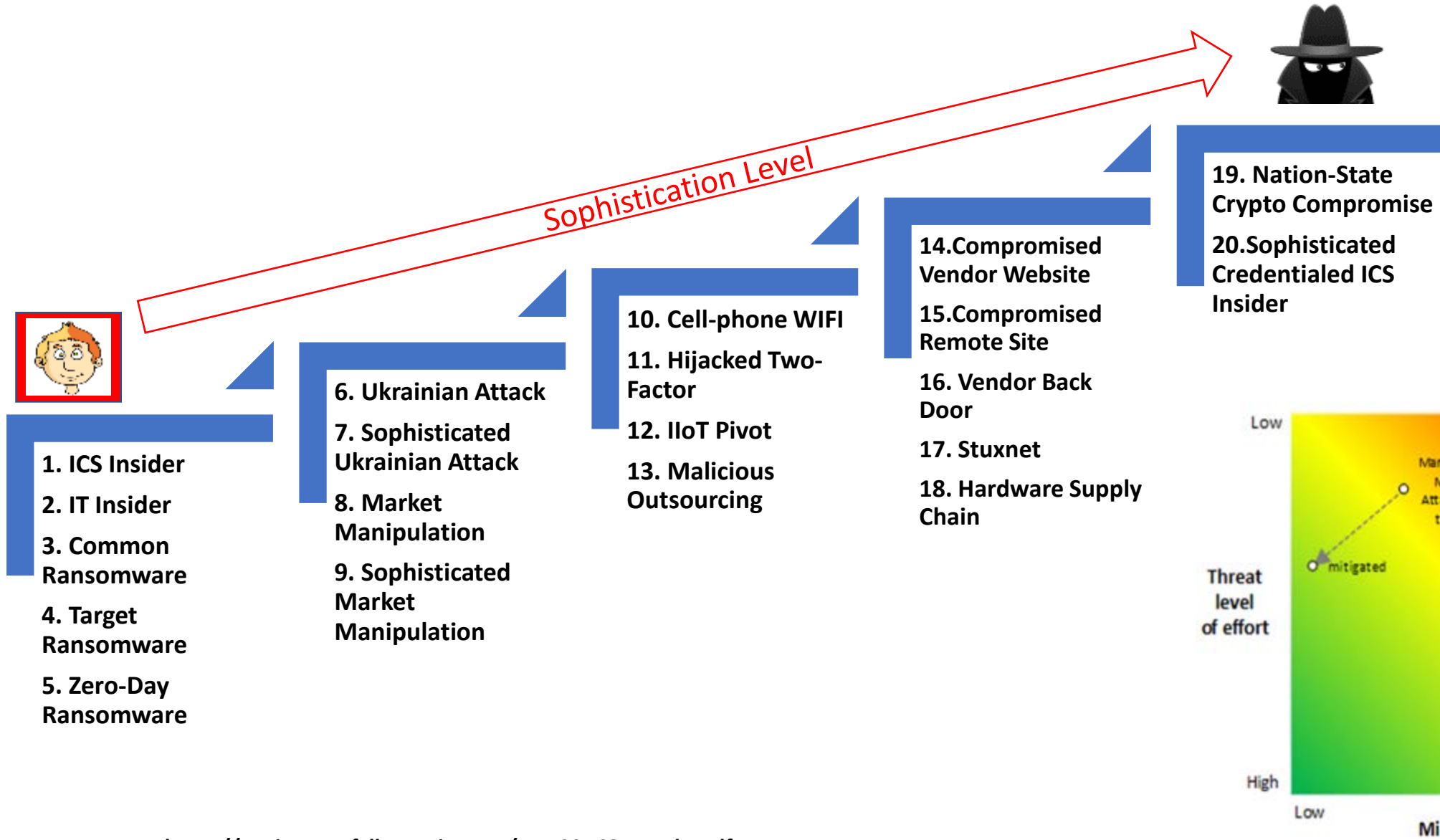


Manufacturing

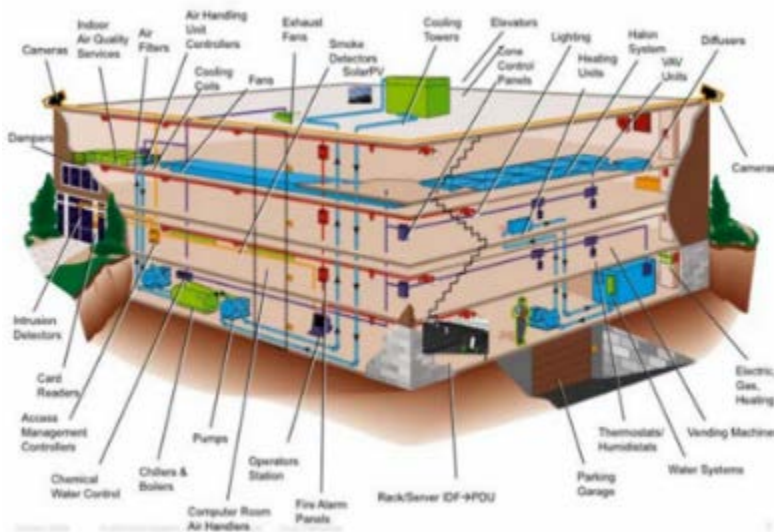


Same Commercial Devices Installed Across DoD Enterprise

Top 20 Attacks from Least to Most Sophisticated



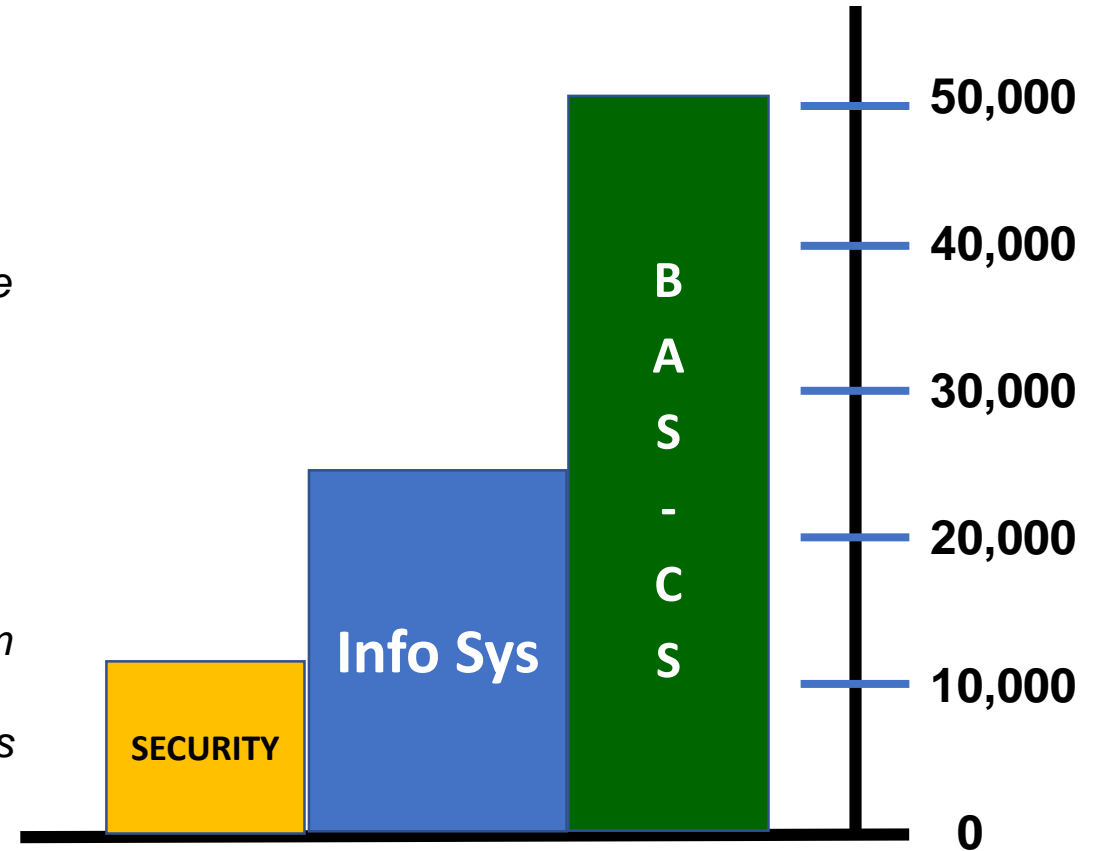
What's in Your 'Smart Building?'



- "Smart" / High Performance Green Buildings

- Since 2005 ~7,000+
- Example: 5,000 desks, 20 floors, ~2M sqft

- Fire Sprinkler System
- Interior Lighting Control
- Intrusion Detection
- Land Mobile Radios
- Renewable Energy Photo Voltaic Systems
- Shade Control System
- Smoke and Purge
- Physical Access Control
- Vertical Transport System (Elevators and Escalators)
- Advanced Metering Infrastructure
- Building Automation System
- Building Management Control
- CCTV Surveillance System
- CO2 Monitoring
- Digital Signage Systems
- Electronic Security System
- Emergency Management System
- Energy Management System
- Exterior Lighting Control Systems
- Fire Alarm System



3 Networks Independently Managed



Significant Impacts; Tools Easily Accessible and Unsophisticated

- **WannaCry** (*May'17*) – ransomware affecting Microsoft Windows millions of computers across 150 countries, halting manufacturing, transportation and telecommunications systems; many medical systems inoperable affecting health & safety
- **NotPetya** (*Jun'17*) – malware infected 10,000's of internet connected systems across 65 countries [Maersk shipping company halted operations in most of its 76 port terminals; loses exceeded \$300M, 4,000 new servers, 45,000 new PCs, 2,500 new apps]
- **Trisis** (*Aug'17*) – virus sabotaging physical safety mechanisms of Saudi Arabian oil, gas facility control systems [coding error prevented potential catastrophe]

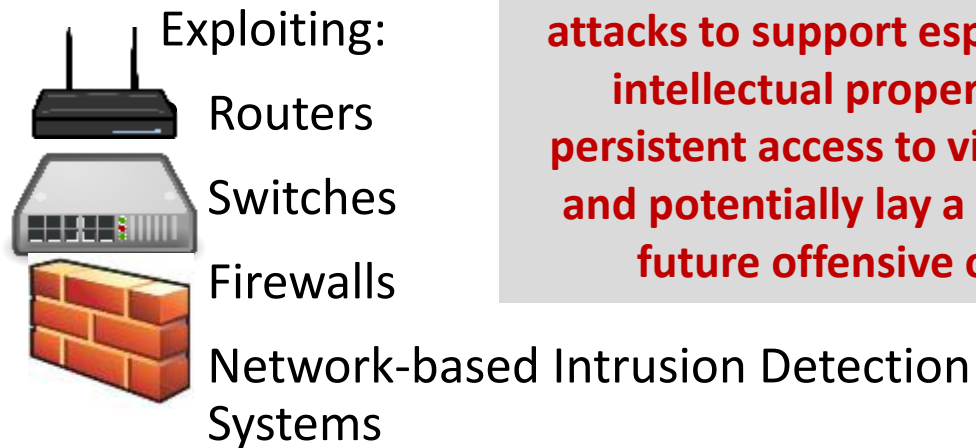
***Number Targeted Attacks Almost Doubled Since 2013;
Urgent Need to Understand Your “Connectedness”***

Russian State-Sponsored Cyber Actors Targeting Network Infrastructure Devices

- 16 April 2018 – DHS US CERT, FBI & UK's National Cyber Security Centre – Alert – **Russian State-sponsored actors establishing worldwide cyber exploitation of network devices**
- Targets primarily **government and private-sector orgs, critical infrastructure providers & internet service providers.**



FBI - actors are using compromised routers to conduct man-in-the-middle attacks to support espionage, extract intellectual property, maintain persistent access to victim networks, and potentially lay a foundation for future offensive operations.

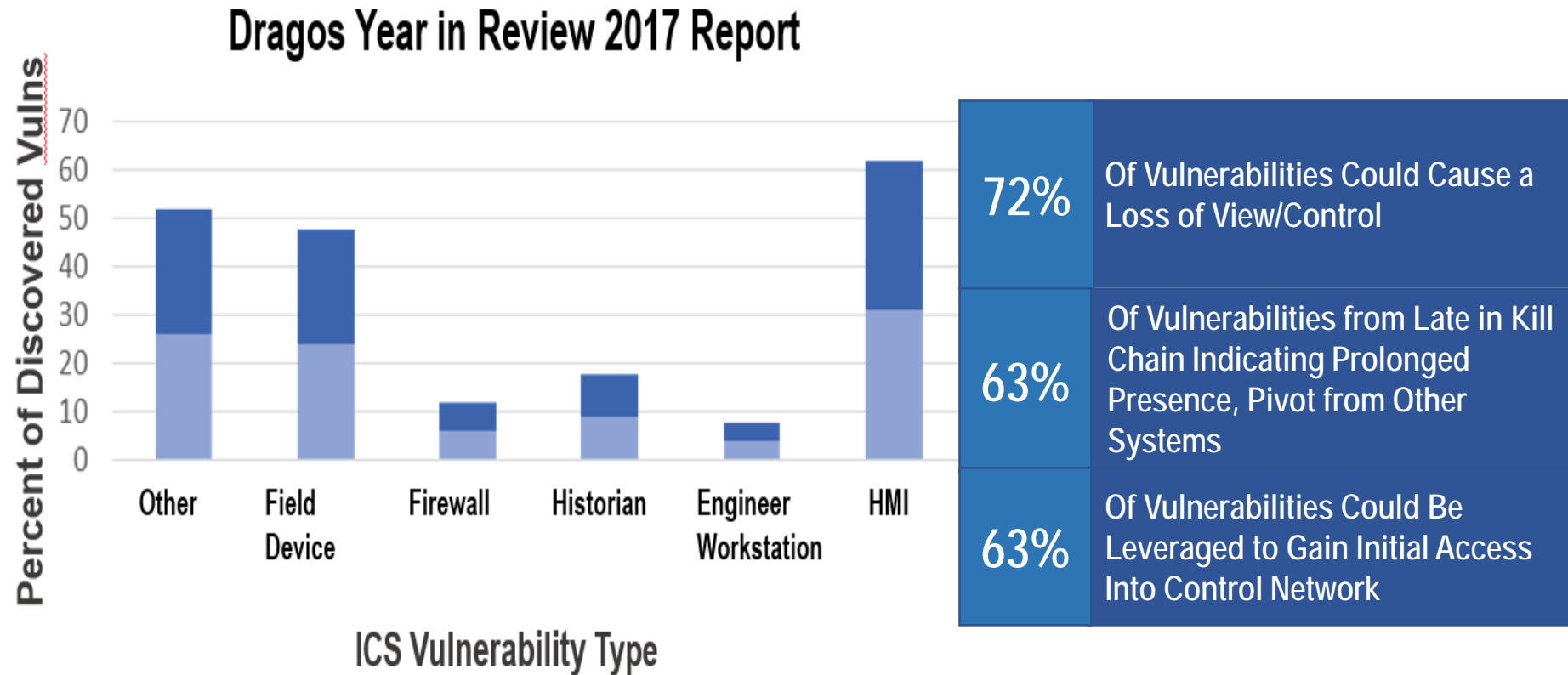


Russian "Trolling" Activity

Up 2,000% After Syrian Strike

Make sure that your router software is up-to-date and its password is secure

Cyber Threat to ICS Highest Yet – CS Threats



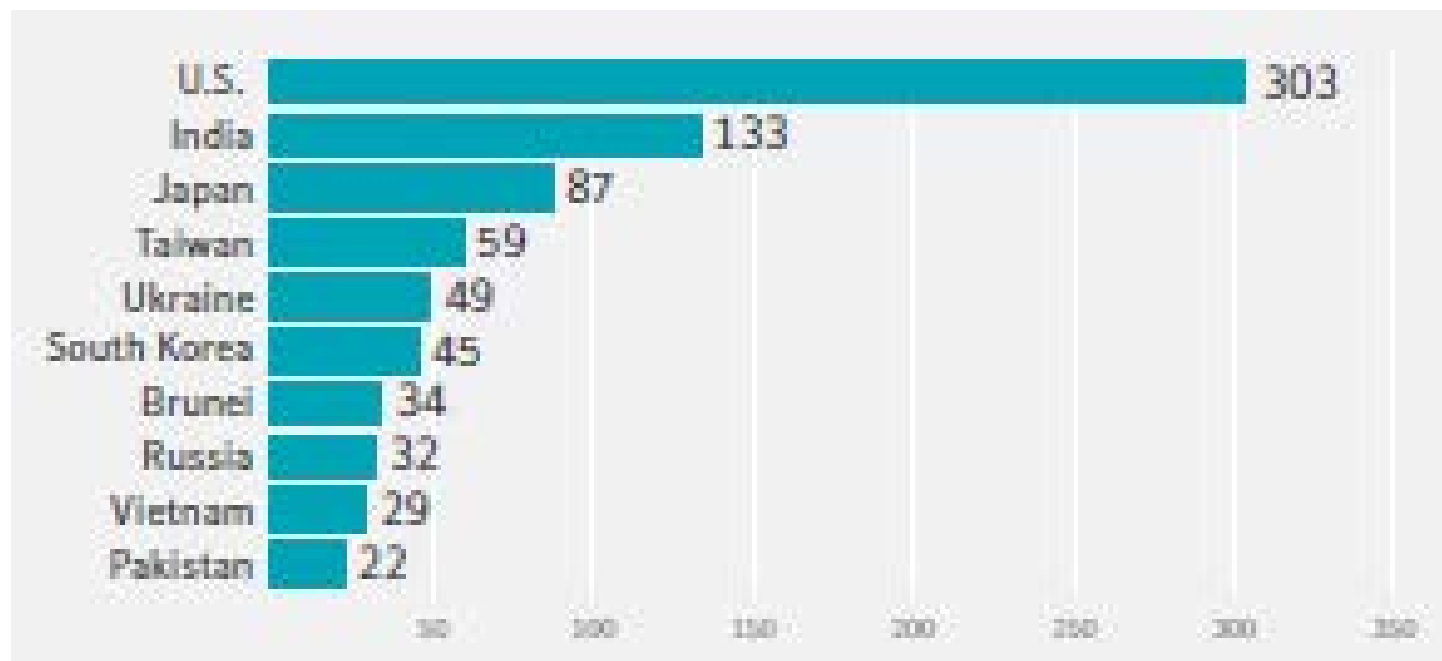
“We regrettably expect ICS operational losses and likely safety events to continue into 2018 and the foreseeable future”



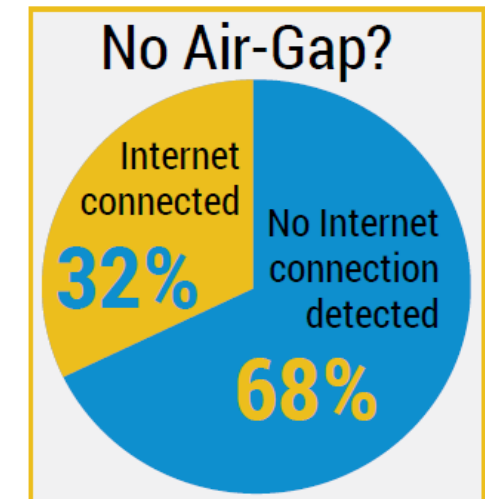
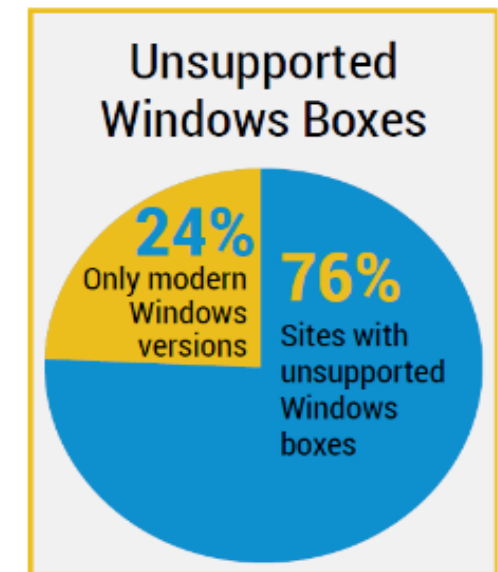
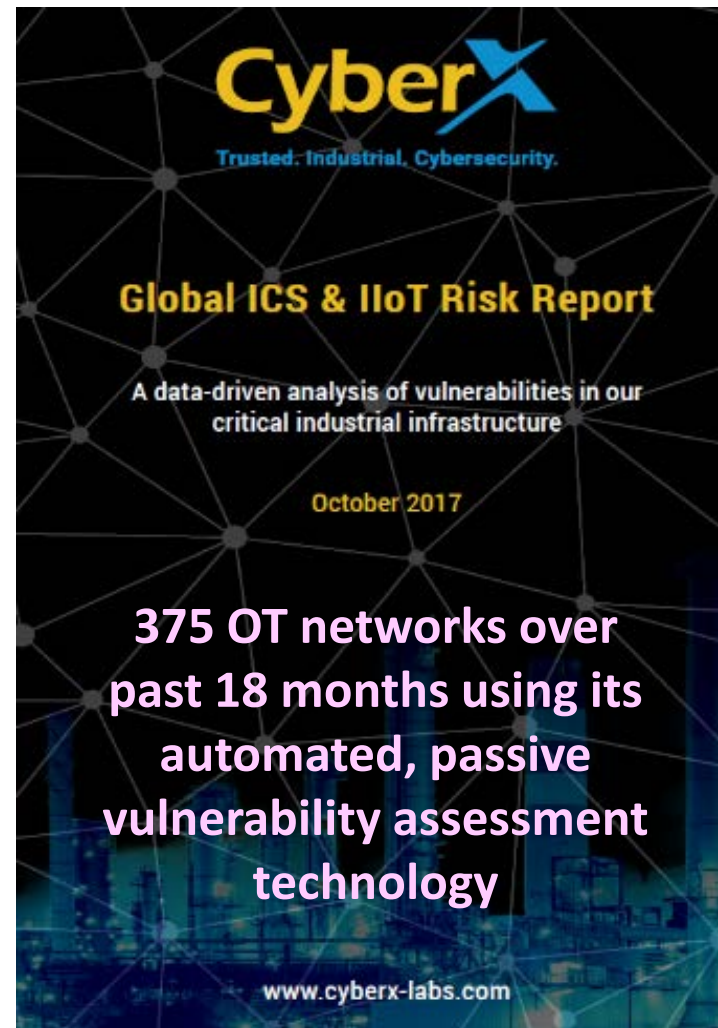
April 2018 Report

Key findings over past 3 yrs:

- 90% of targeted attack groups are motivated by intelligence gathering
- Most active groups compromised an average of 42 organizations
- 71% of groups use spear-phishing emails as primary infection vector
- 29 % increase of recorded ICS vulnerabilities
- U.S. accounts for 27% of all targeted attack activity (most)



- 60% have plain-text passwords traversing their control networks
- 50% aren't running any AV protection
- Nearly 50% have at least one unknown or rogue device
- 20% have wireless access points
- 28% of all devices in each site are vulnerable
- 82% of industrial sites are running remote management protocols



“They’re testing out red lines, what they can get away with. You push and see if you’re pushed back. If not, you try the next step.” *Thomas Rid, Professor of War Studies at King’s College London*

Researchers Publish Default Passwords for 372 Industrial Control Systems (ICS) Devices

Fusion (FS)

Critical Infrastructure (CI)

August 10, 2017 03:38:00 PM, 17-00008865, Version: 1

Executive Summary

- CRITIFENCE published the supervisory control and data acquisition (SCADA) Default Password Database (SDPD), a collection of default credentials for 372 products from 80 vendors.
- Default password databases and other open-source tools make it easier for malicious actors to target internet-connected industrial control systems (ICS).
- We encourage ICS asset owners to identify default passwords in their systems, particularly for connected devices listed in SDPD, and modify them where operationally feasible.

Threat Detail

Researchers Publish SCADA Default Password Database

CRITIFENCE, an industrial control systems (ICS) cyber security company, published the [SCADA Default Password Database](#) (SDPD), a collection of default credentials for 372 ICS products from 80 vendors.

*Default
Passwords Found
... Again:
370 Products /
80 Vendors*

Shodan

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SHODAN

The search engine for Buildings

Shodan is the world's first search engine for Internet-connected devices.

Create a Free Account

Getting Started


SHANGHAI



SHODAN

"default password"

TOP COUNTRIES



United States	7,391
China	2,281
India	1,906
Saudi Arabia	1,481
Argentina	1,263

TOP SERVICES

Telnet	23,987
HTTP	4,179
FTP	3,357
HTTP (8080)	1,058
HTTP (81)	445

TOP ORGANIZATIONS

NTT America	2,739
Telecom Argentina S.A.	1,109
SaudiNet	839
TATA Communications	585
Comcast Cable	489

TOP OPERATING SYSTEMS

Linux 2.6.x	15
Linux 2.4.x	7
Windows 7 or 8	1
Linux 3.x	1

Total results: 33,575

161.58.142.58
vsd175.securesites.net
NTT America
Added on 2016-03-16 11:19:56 GMT
United States, Englewood
[Details](#)

61.19.28.98
The Communication Authority of Thailand.
Added on 2016-03-16 11:18:54 GMT
Thailand
[Details](#)

60.173.217.8
China Telecom Anhui
Added on 2016-03-16 11:18:40 GMT
China, Hefei
[Details](#)

61.16.177.1
mum-estato-1-177-16-61.direct.net.in
Direct Internet
Added on 2016-03-16 11:18:25 GMT
India, Mumbai
[Details](#)

Please enter username/password

User Name

Password ?

Login Cancel

[forgot password?](#)

Home	Zone 1	Zone 3	CWS	1st/Mezz
AHU-1	Zone 2	Zone 4	HWS	2nd

Bank Chilled Water System

Outside Temp 70.99 °F

CT Enable Off

CT Status Off

Parking		Mechanical		Tenants			
L5	L6	Roof	L23	L24	L25	L26	
L3	L4	Lease Lobby	L19	L20	L21	L22	
L1	L2	Level 6	L15	L16	L17	L18	
P1		Level 7	L11	L12	L13	L14	
P3	P2	Fitness Center	L7	L8	L9	L10	

Alarms Equipment

77.0 °F
Fair
54 % Rh

Documentation

- Sequences
- Manuals
- Data Sheets
- Control Drawings

Schedules

- HVAC

History

Home Graphics Summary Weather

VA Medical Clinic

Outside Air Temperature

Outside Air Humidity



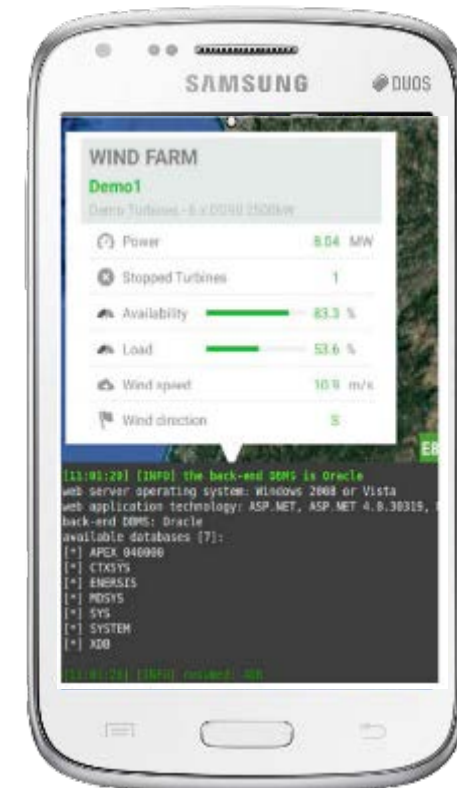
Never Attribute Evil When Stupid is Still Available

Just Because You Can Control via Mobile Devices.....



Top 5 security weaknesses:

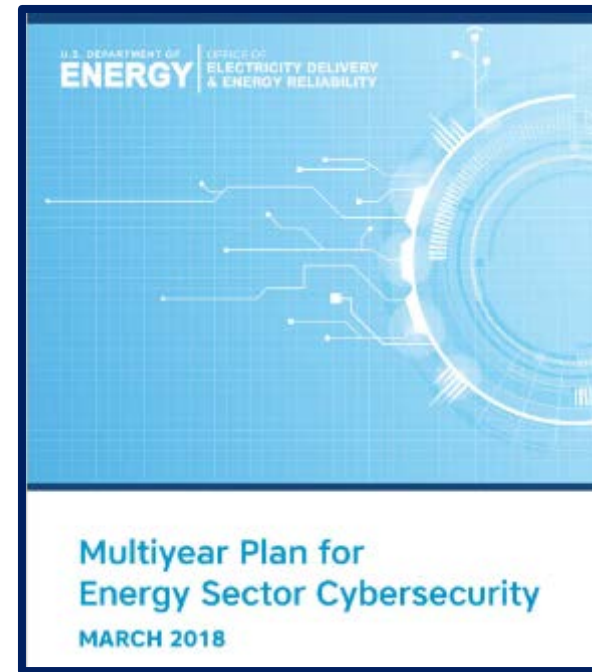
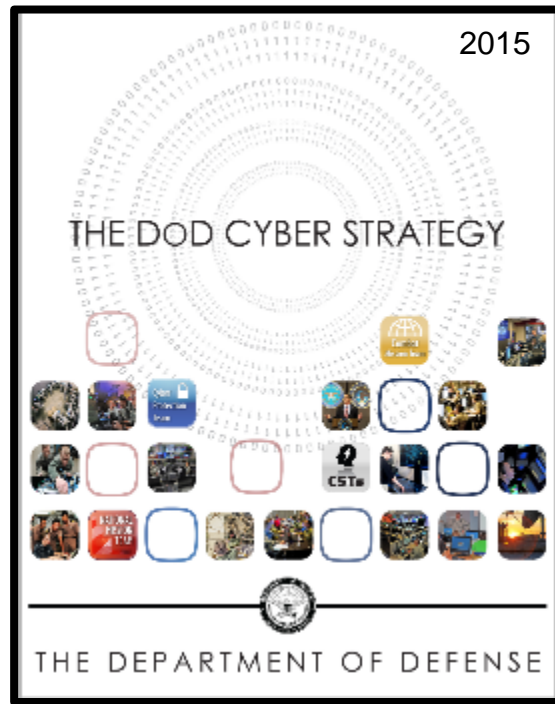
- 94% code tampering
- 59% insecure authorization
- 53% reverse engineering
- 47% insecure data storage
- 38% insecure communication



“Why should anyone have the power to control a 2 GW power plant, or the entire production line of an automobile factory, from a cell phone, while stopped at a traffic light?”

— Andrew Ginter, VP Industrial Security Waterfall Security Solutions

Strategies... Good for the Long Term



Vision: By **2023**, the Department of Homeland Security will have improved national cybersecurity risk management by increasing security and resilience across government networks and critical infrastructure; decreasing illicit cyber activity; improving responses to cyber incidents; and fostering a more secure and reliable cyber ecosystem through a unified departmental approach, strong leadership, and close partnership with other federal and nonfederal entities.



DoD's Three Primary Cyber Missions:

<p>Defend DoD networks, systems, and information</p>	<p>Defend the U.S. homeland and U.S. national interests against cyberattacks of significant consequence</p>	<p>Provide cyber support to military operational and contingency plans</p>

Cyber Mission Force: 133 teams by 2018

State and non-state actors threaten disruptive and destructive attacks against the United States and conduct cyber-enabled theft of intellectual property to undercut the United States' technological and military advantage. DoD must develop its cyber forces and strengthen its cyber defense and cyber deterrence posture.

<p>National Mission Teams Defend the United States and its interests against cyberattacks of significant consequence.</p>	<p>13 teams</p>
<p>Cyber Protection Teams Defend priority DoD networks and systems against priority threats.</p>	<p>68 teams</p>
<p>Combat Mission Teams Provide support to Combatant Commands by generating integrated cyberspace effects in support of operational plans and contingency operations.</p>	<p>27 teams</p>
<p>Support Teams Provide analytic and planning support to the National Mission and Combat Mission teams.</p>	<p>25 teams</p>

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Who Defends FRCS?

- “U.S. Cyber Command is not “optimized” today to combat information operations orchestrated by foreign powers”

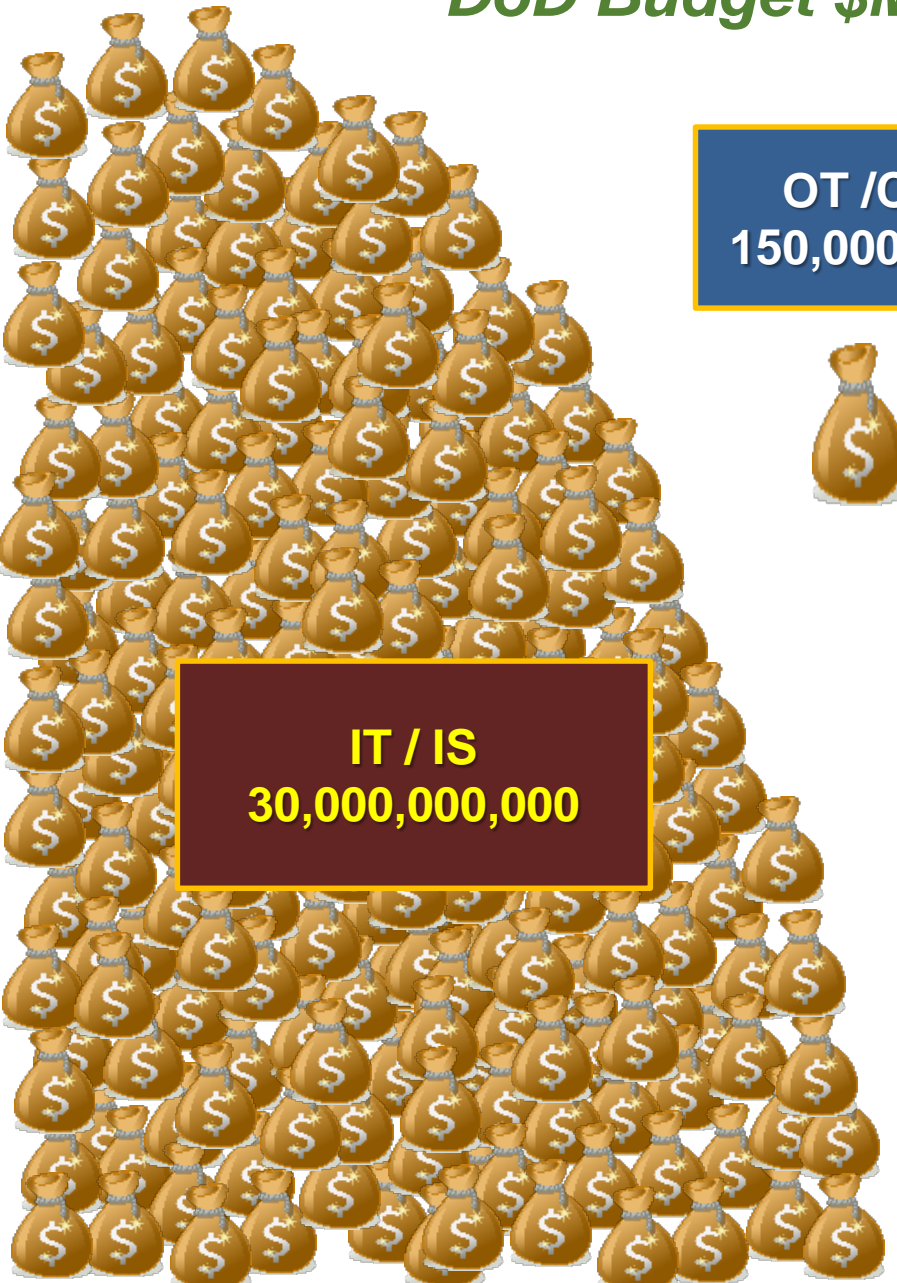


- “NSA we’re focused externally, Cyber Command we’re largely focused externally. So I will monitor bots, infrastructure external to the U.S., but one of the phenomenon we’re beginning to see is a migration of capabilities from external infrastructure — that we’ve been aware of and observing for some time — the way this is going to go next in my mind is you’re going to see this in domestic manipulation. And that is a part now that no, I am not really involved with,” Rogers said.
16 May 2017 SASC Hearing

USCC’s Role Does NOT Include Securing ALL Control Systems

DoD Budget \$M

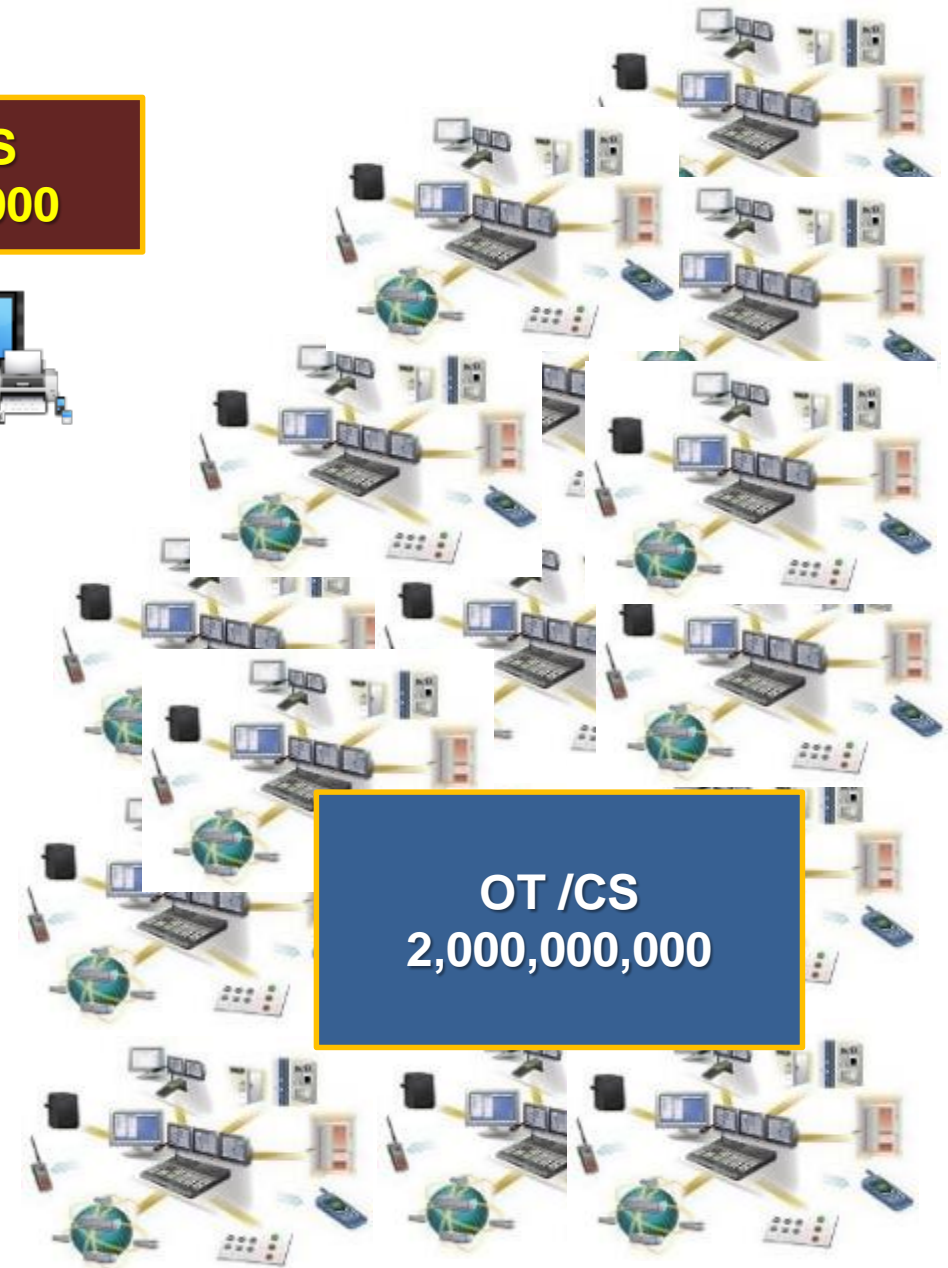
DoD # of Devices



OT / CS
150,000,000



IT / IS
30,000,000,000



IT / IS
8,000,000



OT / CS
2,000,000,000


```

#configuration cisco-gen105
swlshport mode vlan 283
swlshport mode access
swlshport voice vlan 84
swlshport port-security maximum
swlshport port-security maximum vlan access
swlshport port-security maximum vlan voice
swlshport port-security mac-address sticky
swlshport port-security mac-address sticky 0014.473e.e8d3 vlan voice
set queue bandwidth shape 10 10 20
set queue bandwidth shape 10 0 0
mls qos trust device cisco-phone
mls qos trust port
!
auto qos voip cisco-phone
do! ipsec authentication
do! port-control auto
do! timeout reauth-period 30
do! reauth-notification
upgrading-leave portE0/1

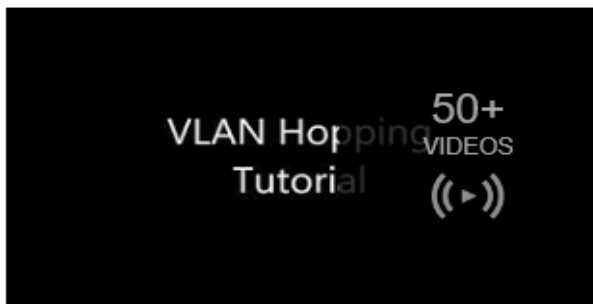
```

6:17

anonymous vice vlan hacking

rhanem youssef

5 years ago • 348 views

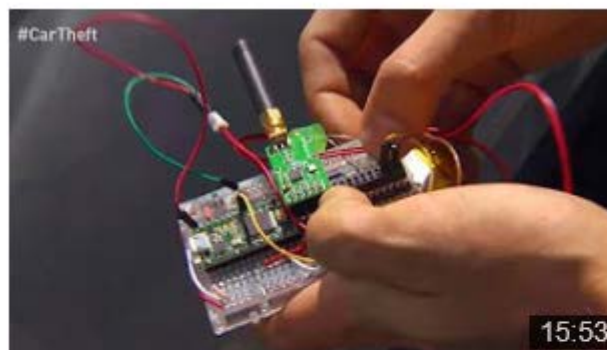
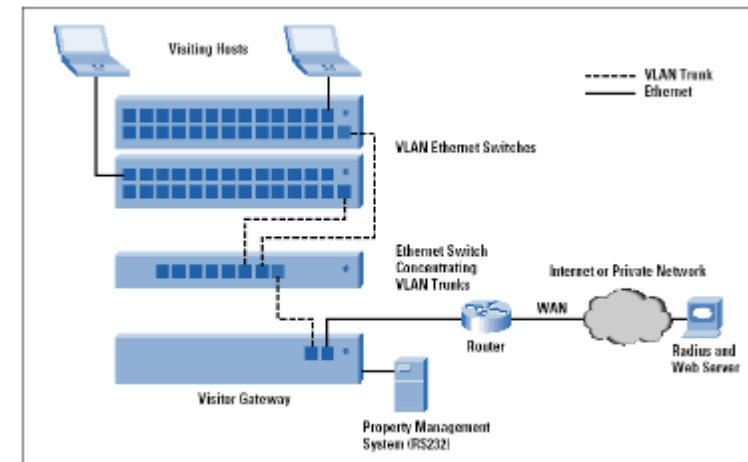


Mix - VLAN Hopping - Switch Spoofing Attack and Mitigation Tutorial

YouTube

VLAN Hopping - Switch Spoofing Attack and Mitigation Tutorial 2:10

MicroNugget: CAM Table Overflow Attack and How To Prevent It 8:49



High-tech car theft: How to hack a car (CBC Marketplace)

CBC News ✓

2 years ago • 1,355,391 views

We go on the hunt for the mysterious device police believe those thieves are using to steal your car. To read more: <http://www.cbc.ca>

CC



Watch thieves steal car by hacking keyless tech

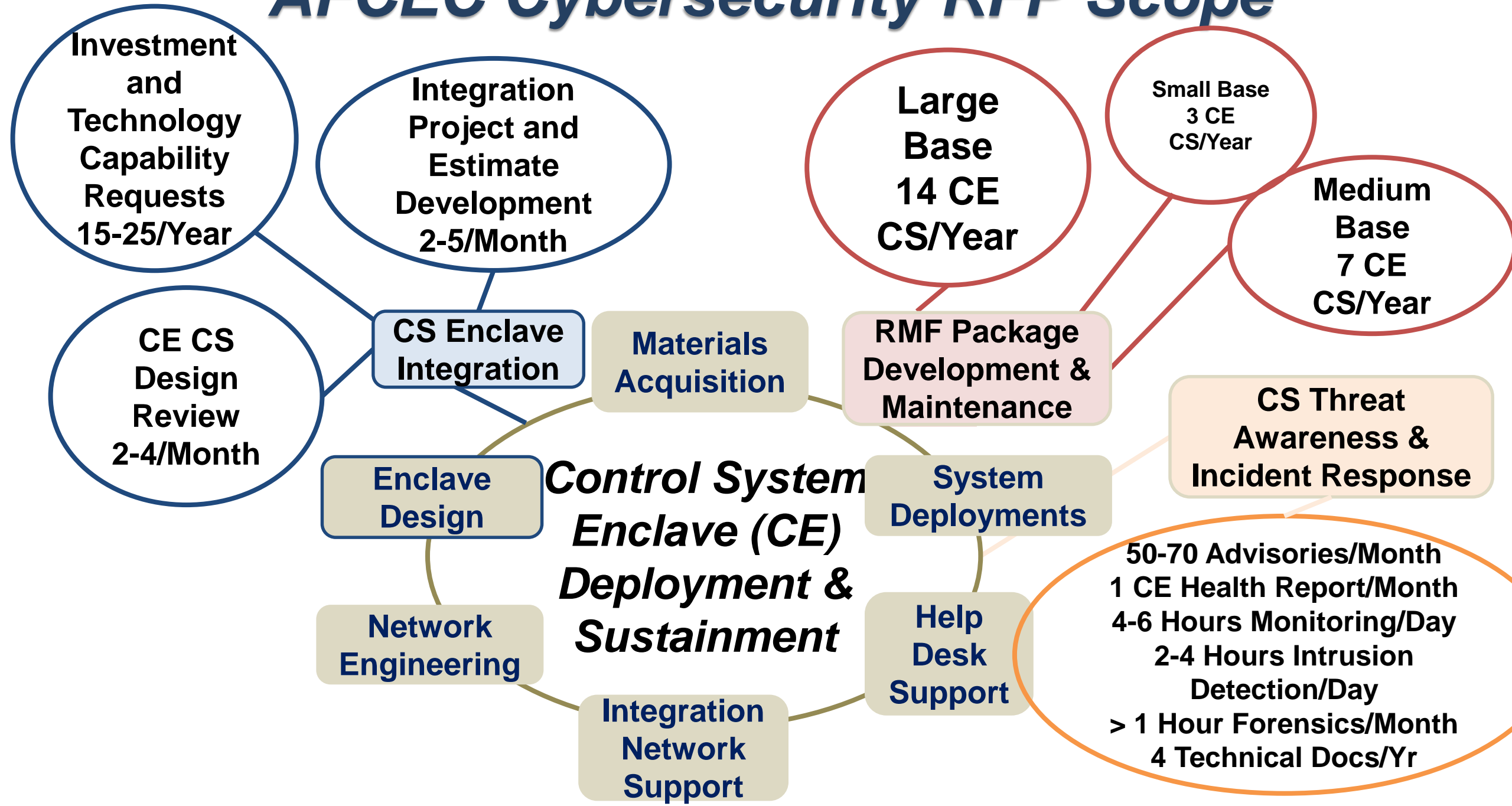
CNNMoney ✓

4 months ago • 112,327 views

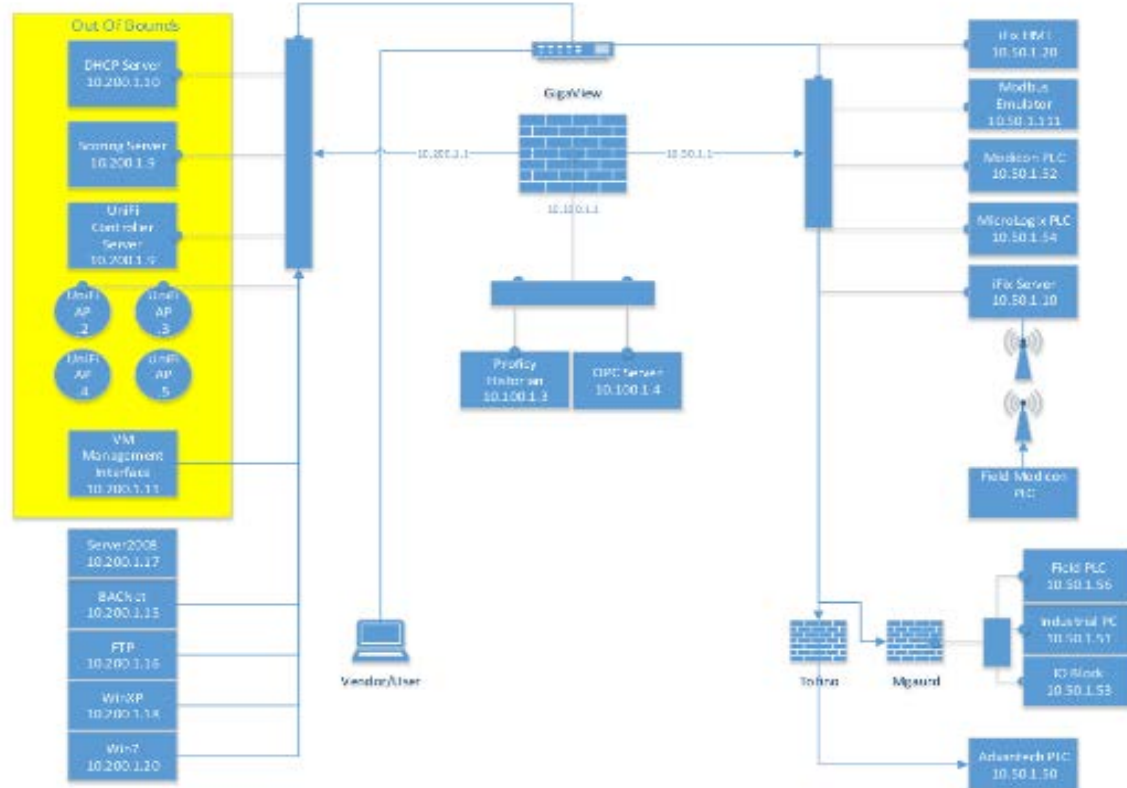
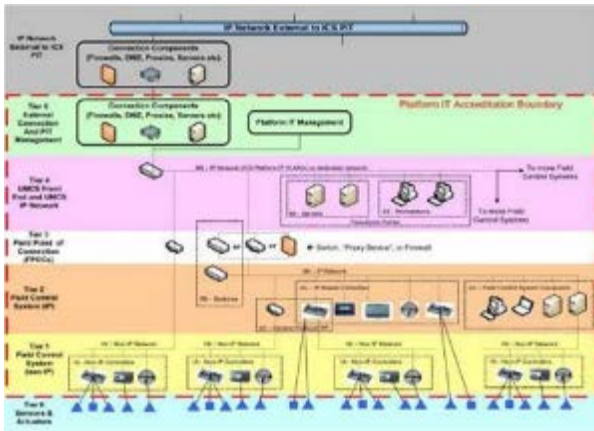
Police in West Midlands, UK have released footage of criminals stealing a car by relaying a signal from the key inside the home, to

AFCEC Cybersecurity RFP Scope

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SCADA Security Scientific Symposium (S4) Target Network



- Corporate Zone
- Domain Controller
- FTP Server
- Windows 7 Workstation
- Windows XP Workstation
- BACnet Controller
- DMZ
- Advantech OPC Server
- Proficy Historian
- Control Zone
- iFix Server
- iFix HMI
- Schneider Electric Modicon PLCs
- Allen Bradley MicroLogix PLC
- ADAM Advantech PLC

Recommendation	Exploitation	Process	Forensics	Protection
100	100	100	100	200
100	100	200	200	500
200	200	200	500	700
300	300	300	600	
200	400	300	1000	
300	500	500		
300	600	600		

Team Name



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Casino Hacked Via Thermometer

Thermometer in lobby
aquarium hacked to pull high
roller database to the cloud



Ski Lift Control Panel Unprotected

- April 26, 2018 – Innsbruck Australia Ski Lift control panel – accessible to anyone on the internet – could manipulate the lift’s speed, cable tension, & distance between passenger cabins.
- ***Use Shodan to discover and classify OT devices!***

What's Your Cyber 'Risk' or 'Trust' Score?

- **Bitsight** bitsighttech.com
 - **Risk Recon** riskrecon.com
 - **Security Scorecard** securityscorecard.com
 - **Upguard** upguard.com
 - **Others...**
- All use public information & network signatures for FICO score-like rating approximating relative risk
 - Enables intelligence for evaluation of critical suppliers, vendors, and others in the industry
 - Augments Business Intelligence Unit and Security Operations Center; ques alerts to potential cyber or physical threats to our supply chains and internal infrastructure
 - Each vendor's approach & scores roughly similar
 - Need to verify accuracy – may detect one or more notables that were not really present in the enterprise under evaluation (e.g. a sub-domain or IP address not really associated with the target)
 - **Benefit / Objectives**: Credibility when approaching supplier/partner with a security issue; avoid false positives & decrease time to investigate and mitigate

SECURITY RATING LEGEND: **ADVANCED (900-740)** **INTERMEDIATE (740-640)** **BASIC (640-250)**

Company	Trend	Rating
[REDACTED]		580
[REDACTED]		630
[REDACTED]		720
[REDACTED]		710
[REDACTED]		770
[REDACTED]		710
[REDACTED]		680
[REDACTED]		600
[REDACTED]		650
[REDACTED]		380

Company	Trend	Rating
[REDACTED]		750
[REDACTED]		760
[REDACTED]		750
[REDACTED]		660
[REDACTED]		590
[REDACTED]		750
[REDACTED]		730
[REDACTED]		490
[REDACTED]		560

ABOUT BITSIGHT

BitSight Technologies' mission is to provide organizations with the insight they need to proactively identify, quantify and mitigate security risk. The company's platform continuously collects and analyzes vast amounts of external evidence on security behaviors in order to help organizations make timely, data driven risk management decisions. Based in Cambridge, MA, BitSight Technologies was founded in 2011. For more information, please visit www.bitsighttech.com or follow BitSight on Twitter @BitSight.

BITSIGHT

Security Rating Report

PORTFOLIO STATISTICS

COMPANIES

19

IP ADDRESSES

9,868,600

INDUSTRIES

5

MEDIAN SECURITY RATING

660

RANGE OF SECURITY RATINGS

380-770

security risk. The company's platform continuously collects and analyzes vast amounts of external evidence on security behaviors in order to help organizations make timely, data driven risk management decisions. Based in Cambridge, MA, BitSight Technologies was founded in 2011. For more information, please visit www.bitsighttech.com or follow BitSight on Twitter @BitSight.

Graph Type

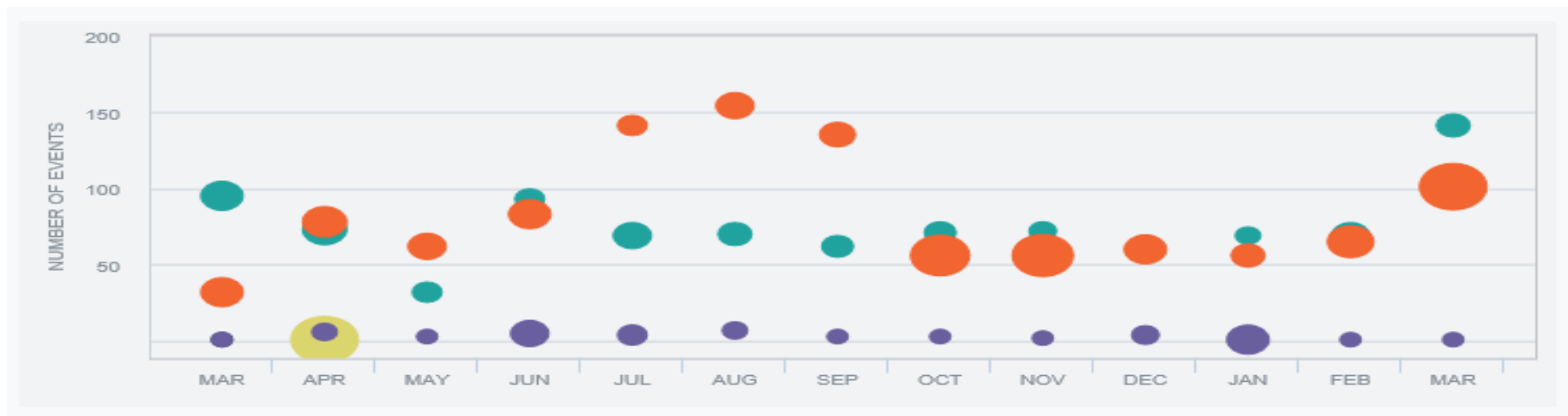
Compromised Systems Details – 2,096 events over 12 months

Distribution

Duration

Volume

This graph displays the number of compromised systems events per month, broken down by type. The size of the bubbles corresponds to the average duration for those events.



Show:

All

Botnet Infections
1,079 events

Spam Propagation
41 events

Malware Servers
1 event

Potentially Exploited
974 events

Unsolicited Communications
1 event

Show events from:

 to

Filter By Tags

Click infection names for remediation instructions

Type	Location	Start	End	Days	Details	collapse all	expand all
<input type="checkbox"/> Botnet Infections	RU	03-29-2018	03-29-2018	1	Infection: Ghokswa		Details
<input type="checkbox"/> Potentially Exploited	US	03-28-2018	03-28-2018	1	Infection: Grayware		Details
<input type="checkbox"/> Botnet Infections	RU	03-28-2018	03-28-2018	1	Infection: Pykspa		Details
<input type="checkbox"/> Botnet Infections	RU	03-28-2018	03-28-2018	1	Infection: Ghokswa		Details
<input type="checkbox"/> Botnet Infections	ES	03-28-2018	03-28-2018	1	Infection: Necurs		Details
<input type="checkbox"/> Botnet Infections	RU	03-27-2018	03-27-2018	1	Infection: Ramnit		Details
<input type="checkbox"/> Potentially Exploited	RU	03-27-2018	03-27-2018	1	Infection: Dealply		Details

File Sharing category distribution

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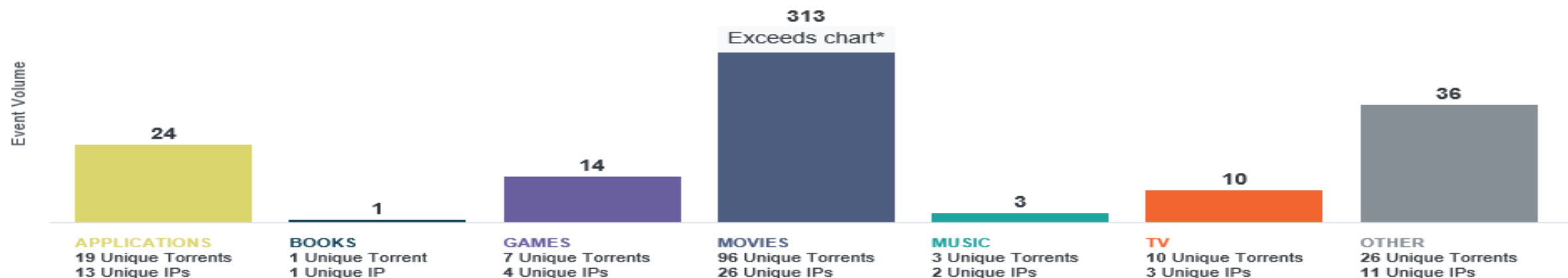
File Sharing events indicate the number of times in the past 60 days that file sharing activity occurred, sorted by torrent category. Each event represents one IP address sharing one torrent per day.



in the **bottom 10%** of all companies

File Sharing – 401 events over the past 60 days 40 unique IPs observed

*Data which exceeds the chart is on a scale too large to display accurately with other categories in the space provided and has been shortened to fit.



Search From to Filter Results: Only Impacts Grade

Filter By Tags

File Sharing Category	Start	End	Impacts Grade	Days	Whitelisted
<input type="checkbox"/> Applications	03-29-2018	03-29-2018		1	No
<input type="checkbox"/> Music	03-28-2018	03-28-2018		1	No
<input type="checkbox"/> Movies	03-27-2018	03-27-2018		1	No

Best Practices to Cyber Secure Control Systems

Mission Assurance Senior Steering Group Control Systems Working Group



- Develop Password Policies
- Security Awareness and Training
- Patch Management
- Maintenance Activities
- Modem Connection
- Network Design
- Securing Host Systems

Advanced Cyber Industrial Control System Tactics, Techniques, Procedures

Detection

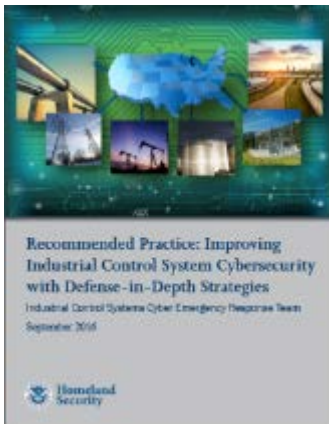
- Routine Monitoring, Inspection, Identification of adversarial presence, Documentation, Notifications

Mitigation

- Protect the information network, Acquire and protect data for analysis, Maintain operations during an active attack

Recovery

- Identify mission priorities, Acquire and protect data for analysis, Systematically Recover each affected device, Systematically reintegrate devices, processes, and network segments, Test and verify system to ensure devices are not re-infected



Seven Strategies to Defend ICSs



UNCLASSIFIED
Discussion



Q WHAT WILL THE
WARRIOR-GUARDIAN
OF THE FUTURE
LOOK LIKE?

CYBER
ATTACKS
AHEAD

DoD & Commercial Resources

DoD CIO Knowledge Service (requires CAC) <https://rmfks.osd.mil/login.htm>

Department of Defense Advanced Control System Tactics, Techniques, and Procedures (TTPs) 2018:
<https://www.cybercom.mil/ICSTTP/Forms/AllItems.aspx>

UFC 4-010-06 CYBERSECURITY OF FACILITY-RELATED CONTROL SYSTEMS Sept 2016
<https://wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-4-010-06>

Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) [info & funding solicitations]
<https://serdp-estcp.org/Investigator-Resources/ESTCP-Resources/Demonstration-Plans/Cybersecurity-Guidelines>

DoD OASD(EI&E) and Federal Facilities Council (FFC), under the National Research Council (NRC) sponsored a 3-day Building Control System Cyber Resilience Forum in Nov '15.
http://sites.nationalacademies.org/DEPS/FFC/DEPS_166792

DoDI 5000.02 Cybersecurity in the Defense Acquisition System Jan 2017
http://www.dtic.mil/whs/directives/corres/pdf/500002_dodi_2015.pdf

Whole Building Design Guide website cyber references
<http://www.wbdg.org/resources/cybersecurity>

Tools
<https://ics-cert.us-cert.gov/alerts/ICS-ALERT-14-176-02A>
<https://ics-cert.us-cert.gov/tips/ICS-TIP-12-146-01B>

Workshops / Building Control Systems Cyber Security Training
<http://hpac.com/training/workshop-what-do-when-building-control-systems-get-hacked-set>

Industrial Control Systems Joint Working Group (ICSJWG_
<https://ics-cert.us-cert.gov/Industrial-Control-Systems-Joint-Working-Group-ICSJWG>