Carnegie Mellon University
Software Engineering Institute

Cyber Hygiene: Why the Fundamentals Matter

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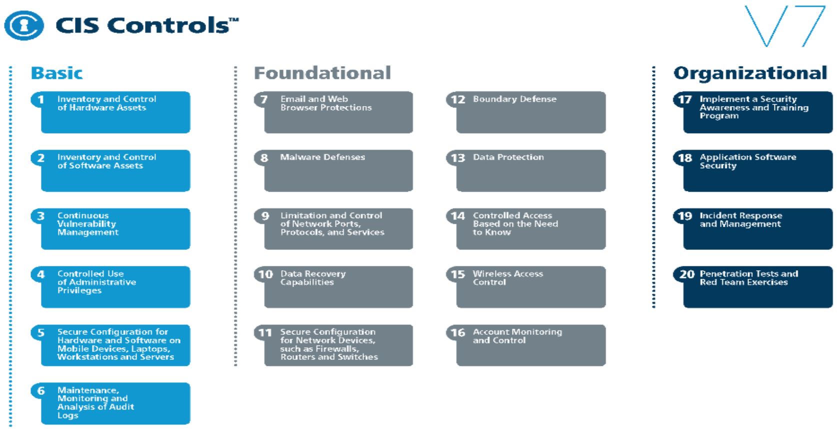
Definition

“Definition of Cyber Hygiene

Cyber hygiene is a reference to the **practices and steps** that users of computers and other devices take to maintain system health and improve online security. These practices are often part of a routine to ensure the safety of identity and other details that could be stolen or corrupted. Much like physical hygiene, cyber hygiene is regularly conducted to ward off natural deterioration and common threats.”

https://digitalguardian.com/blog/what-cyber-hygiene-definition-cyber-hygiene-benefits-best-practices-and-more

Hygiene as a Minimum Baseline



CIS Controls™

V7

Basic

1 Inventory and Control of Hardware Assets

2 Inventory and Control of Software Assets

3 Continuous Vulnerability Management

4 Controlled Use of Administrative Privileges

5 Secure Configuration for Hardware and Software on Mobile Devices, Laptops, Workstations and Servers

6 Maintenance, Monitoring and Analysis of Audit Logs

Foundational

7 Email and Web Browser Protections

8 Malware Defenses

9 Limitation and Control of Network Ports, Protocols, and Services

10 Data Recovery Capabilities

11 Secure Configuration for Network Devices, such as Firewalls, Routers and Switches

12 Boundary Defense

13 Data Protection

14 Controlled Access Based on the Need to Know

15 Wireless Access Control

16 Account Monitoring and Control

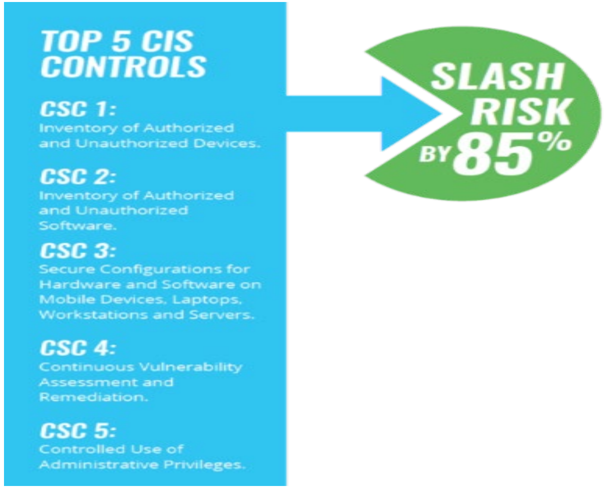
Organizational

17 Implement a Security Awareness and Training Program

18 Application Software Security

19 Incident Response and Management

20 Penetration Tests and Red Team Exercises



TOP 5 CIS CONTROLS

CSC 1: Inventory of Authorized and Unauthorized Devices.

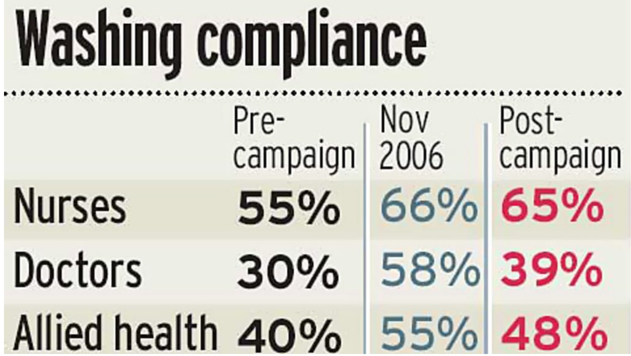
CSC 2: Inventory of Authorized and Unauthorized Software.

CSC 3: Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations and Servers.

CSC 4: Continuous Vulnerability Assessment and Remediation.

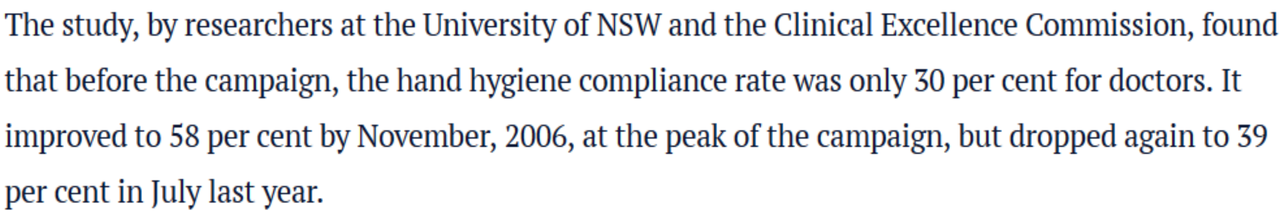
CSC 5: Controlled Use of Administrative Privileges.

Hygiene Requires Institutionalization



Washing compliance

	Pre-campaign	Nov 2006	Post-campaign
Nurses	55%	66%	65%
Doctors	30%	58%	39%
Allied health	40%	55%	48%



The study, by researchers at the University of NSW and the Clinical Excellence Commission, found that before the campaign, the hand hygiene compliance rate was only 30 per cent for doctors. It improved to 58 per cent by November, 2006, at the peak of the campaign, but dropped again to 39 per cent in July last year.

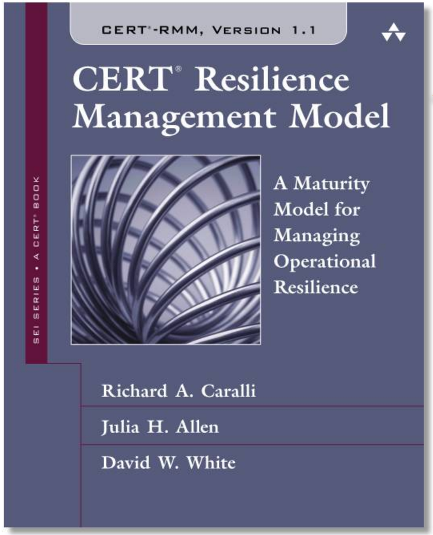
Source: https://www.smh.com.au/national/in-the-washup-doctors-forget-about-hygiene-20091018-h303.html

Operational Resilience Defined

Resilience: The physical property of a material when it can return to its original shape or position after deformation that does not exceed its elastic limit *[wordnet.princeton.edu]*

Operational resilience: The ***emergent*** property of an ***organization*** that can ***continue to carry out its mission*** after ***disruption*** that ***does not exceed*** its ***operational*** limit[CERT-RMM]

CERT Resilience Management Model



CERT®-RMM, Version 1.1

CERT® Resilience Management Model

A Maturity Model for Managing Operational Resilience

Richard A. Caralli

Julia H. Allen

David W. White

SEI SERIES • A CERT® BOOK

Framework for managing and improving operational resilience

http://www.cert.org/resilience/

"…an extensive super-set of the things an organization could do to be more resilient."

- CERT-RMM adopter

Core Principle and Focus of CERT-RMM

Premise at the core of CERT-RMM

**The ability of the organization to sustain operations in the face of operational risk is highly influenced by the quality of the process used to ensure assets remain protected
and sustained.**

Focus of CERT-RMM

Transforming some (emergent) quality of the organization, called operational resilience, focuses on the processes or activities that support operational resilience management system.

26 Process Areas in 4 Categories

Engineering

ADM	Asset Definition and Management
CTRL	Controls Management
RRD	Resilience Requirements Development
RRM	Resilience Requirements Management
RTSE	Resilient Technical Solution Engineering
SC	Service Continuity

Enterprise Management

COMM	Communications
COMP	Compliance
EF	Enterprise Focus
FRM	Financial Resource Management
HRM	Human Resource Management
OTA	Organizational Training and Awareness
RISK	Risk Management

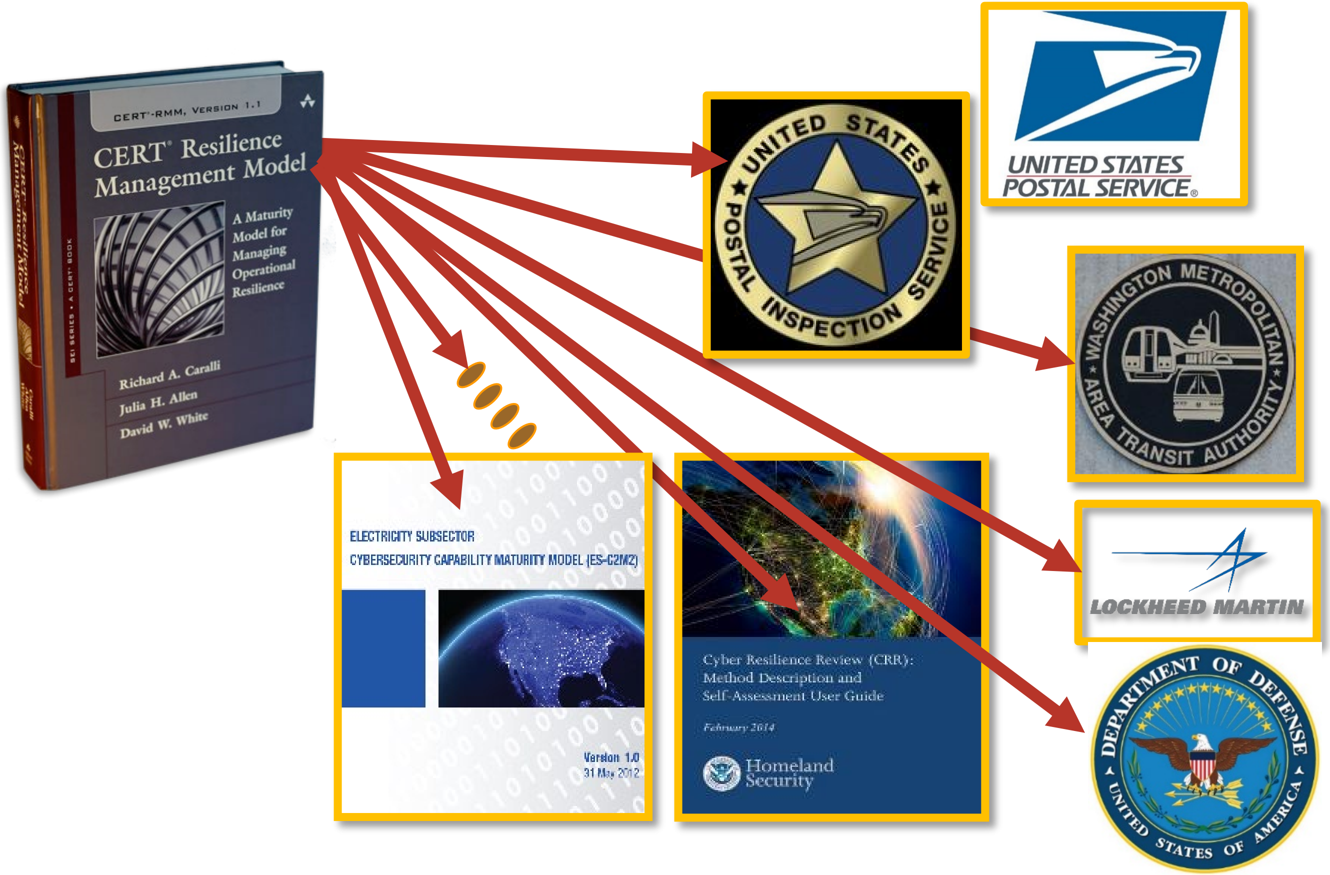
Operations

AM	Access Management
EC	Environmental Control
EXD	External Dependencies Management
ID	Identity Management
IMC	Incident Management and Control
KIM	Knowledge and Information Management
PM	People Management
TM	Technology Management
VAR	Vulnerability Analysis and Resolution

Process Management

MA	Measurement and Analysis
MON	Monitoring
OPD	Organizational Process Definition
OPF	Organizational Process Focus

CERT-RMM Applications and Derivatives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A Maturity Model for Managing Operational Resilience
Richard A. Caralli
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SEI Series • A CERT® Book
United States Postal Inspection Service
United States Postal Service®
Washington Metropolitan Area Transit Authority
Lockheed Martin
Department of Defense United States of America
Electricity Subsector
Cybersecurity Capability Maturity Model (ES-C2M2)
Version 1.0
31 May 2012
Cyber Resilience Review (CRR): Method Description and Self-Assessment User Guide
February 2014
Homeland Security

Cyber Hygiene and RMM

- Minimum expected baseline of expected capabilities
- Contained within the Goals and Practices of RMM v1.2
- Aligned with other standards of practice (e.g., CIS Top 20, and NIST CSF)
- A total of 11 Goals and 43 Practices
- Ecosystem of related processes
- Measures the maturity (institutionalization) of the practices

Cyber Hygiene – A Baseline Set of Practices

Cybersecurity hygiene are practices that are used to manage the most common and pervasive cybersecurity risks faced by organizations today.

1. Identify and prioritize key organizational services, products and their supporting assets.
2. Identify, prioritize, and respond to risks to the organization’s key services and products.
3. Establish an incident response plan.
4. Conduct cybersecurity education and awareness activities.
5. Establish network security and monitoring.
6. Control access based on least privilege and maintain the user access accounts.
7. Manage technology changes and use standardized secure configurations.
8. Implement controls to protect and recover data.
9. Prevent and monitor malware exposures.
10. Manage cyber risks associated with suppliers and external dependencies.
11. Perform cyber threat and vulnerability monitoring and remediation.

Sources:

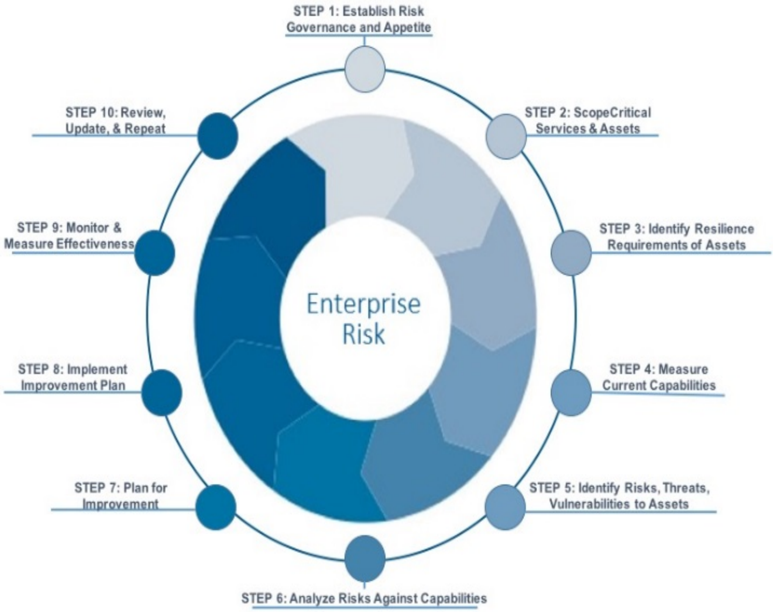
- Center for Internet Security (CIS) aka SANS 20 – 20 Critical Security Controls
- Cybersecurity Framework – National Institute of Standards and Technology (NIST)
- Resilience Management Model – Carnegie Mellon University, Software Engineering Institute (SEI)
- UK Government Communications Headquarters (GCHQ) – 10 Steps to Cybersecurity
- European Union Agency for Network and Information Security (ENISA) – Whitepaper and Strategy
- InfoSec Institute (Australia) – The Importance of Cyber Hygiene in Cyberspace

Cyber Hygiene Goal-1

Hygiene 1 – Identify and Prioritize Key Organizational Services, Products, and Their Supporting Assets

- Establish Organizational Services (EF:SG1.SP3)
  - Business Services
  - Check your mission statement
- Inventory Assets (ADM:SG1.SP1)
  - People
  - Technology
  - Information
  - Facilities

Cyber Hygiene Goal-2


STEP 1: Establish Risk Governance and Appetite
STEP 2: ScopeCritical Services & Assets
STEP 3: Identify Resilience Requirements of Assets
STEP 4: Measure Current Capabilities
STEP 5: Identify Risks, Threats, Vulnerabilities to Assets
STEP 6: Analyze Risks Against Capabilities
STEP 7: Plan for Improvement
STEP 8: Implement Improvement Plan
STEP 9: Monitor & Measure Effectiveness
STEP 10: Review, Update, & Repeat
Enterprise Risk

Hygiene 2 – Identify, Prioritize, and Respond to Risks to the Organization’s Key Services and Products

- Establish Risk Measurement Criteria (RISK:SG2.SP2)
  - Physical Safety
  - Regulatory
  - Customer Satisfaction
  - Brand Damage
  - Etc.
- Identify Service-Level Risks (RISK:SG3.SP2)
- Evaluate Risks (RISK SG4.SP1)
- Develop Risk Disposition Strategy (RISK:SG4.SP3)
- Identify and Assess Risks Due to External Dependencies (EXD:SG2.SP1)
  - Their vulnerabilities are ***YOUR*** vulnerabilities

Cyber Hygiene Goal-3

- Hygiene 3 – Establish an Incident Response Plan
  - Plan for Incident Management (IMC:SG1.SP1)
  - NIST 800-61
    - Prepare
    - Detection & Analysis
    - Containment, Eradication, & Recovery
    - Post Incident Activity

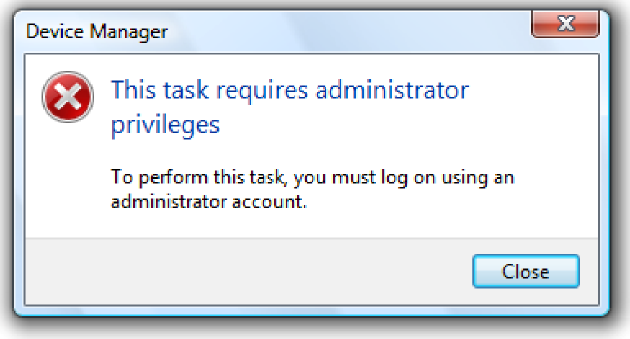
Cyber Hygiene Goal-4

- Hygiene 4 – Conduct Cybersecurity Education and Awareness Activities
  - Establish Awareness Needs (OTA:SG1.SP1)
  - Perform Awareness Activities (OTA:SG2.SP1)
  - Establish Training Needs (OTA:SG3.SP1)
  - Deliver Training (OTA:SG4.SP1)

Cyber Hygiene Goal-5

- Hygiene 5 – Establish Network Security and Monitoring
  - Discover Vulnerabilities (VAR:SG2.SP2)
  - Analyze Vulnerabilities (VAR:SG2.SP3)
  - Perform Configuration Management (TM:SG4.SP2)
  - Perform Release Management (TM:SG4.SP4)
  - Establish Monitoring Requirements (MON:SG1.SP3)
  - Establish Collection Standards and Guidelines (MON:SG2.SP2)
  - Collect and Record Information (MON:SG2.SP3)

Cyber Hygiene Goal-6



This task requires administrator privileges

To perform this task, you must log on using an administrator account.

- Hygiene 6 – Control Access Based on Least Privilege and Maintain the User Access Accounts
  - Enable Access (AM:SG1.SP1)
  - Periodically Review and Maintain Access Privileges (AM:SG1.SP3)
  - Categorize Information Assets (KIM:SG1.SP2)
  - Control Access to Information Assets (KIM:SG4.SP2)

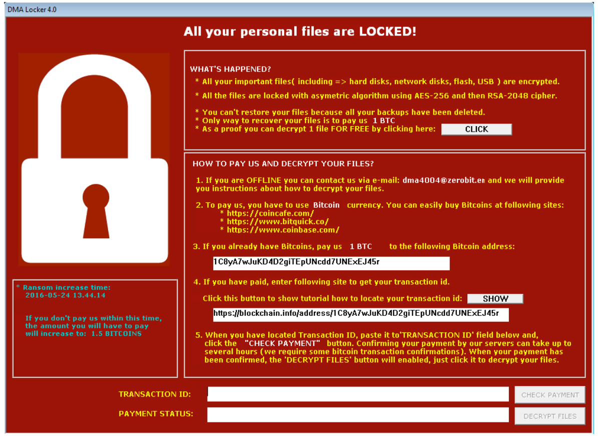
Cyber Hygiene Goal-7

- Hygiene 7 – Manage Technology Changes and Use Standardized Secure Configurations
  - Perform Configuration Management (TM:SG4.SP2)
  - Perform Change Control and Management (TM:SG4.SP3)
  - Perform Release Management (TM:SG4.SP4)

Cyber Hygiene Goal-8

- Hygiene 8 – Implement Controls to Protect and Recover Data
  - Develop and Document Service Continuity Plans (SC:SG3.SP2)
  - Develop Testing Program and Standards (SC:SG5.SP1)
  - Exercise Plans (SC:SG5.SP3)
  - Measure the Effectiveness of the Plans in Operation (SC:SG6.SP2)
  - Control Access to Information Assets (KIM:SG4.SP2)
  - Control Modification of Information Assets (KIM:SG5.SP1)
  - Perform Information Duplication and Retention (KIM:SG6.SP1)
  - Perform Planning to Sustain Technology Assets (TM:SG5.SP1)
  - Manage Technology Asset Maintenance (TM:SG5.SP2)

Cyber Hygiene Goal-9



All your personal files are LOCKED!

WHAT'S HAPPENED?

* All your important files(including => hard disks, network disks, flash, USB) are encrypted.
* All the files are locked with asymetric algorithm using AES-256 and then RSA-2048 cipher.

* You can't restore your files because all your backups have been deleted.
* Only way to recover your files is to pay us 1 BTC
* As a proof you can decrypt 1 file FOR FREE by clicking here:

HOW TO PAY US AND DECRYPT YOUR FILES?

1. If you are OFFLINE you can contact us via e-mail: dma4004@zerobit.en and we will provide you instructions about how to decrypt your files.
2. To pay us, you have to use Bitcoin currency. You can easily buy Bitcoins at following sites:
   - https://coincafe.com/
   - https://www.bitquick.co/
   - https://www.coinbase.com/
3. If you already have Bitcoins, pay us 1 BTC to the following Bitcoin address:
   1C8yA7wJuKD4D2giTEpUNcdd7UNExEJ45r
4. If you have paid, enter following site to get your transaction id.
   Click this button to show tutorial how to locate your transaction id:
   https://blockchain.info/address/1C8yA7wJuKD4D2giTEpUNcdd7UNExEJ45r
5. When you have located Transaction ID, paste it to'TRANSACTION ID' field below and, click the "CHECK PAYMENT" button. Confirming your payment by our servers can take up to several hours (we require some bitcoin transaction confirmations). When your payment has been confirmed, the 'DECRYPT FILES' button will enabled, just click it to decrypt your files.

* Ransom increase time:
2016-05-24 13.44.14

If you don't pay us within this time, the amount you will have to pay will increase to: 1.5 BITCOINS

TRANSACTION ID:

PAYMENT STATUS:

- Hygiene 9 – Prevent and Monitor Malware Exposures
  - Collect, Document, and Preserve Event Evidence (IMC:SG2.SP3)
  - Analyze and Triage Events (IMC:SG2.SP4)
  - Establish and Implement Controls (TM:SG2.SP2)
  - Establish Monitoring Requirements (MON:SG1.SP3)
  - Establish Collection Standards and Guidelines (MON:SG2.SP2)

Cyber Hygiene Goal-10

- Hygiene 10 – Manage Cyber Risks Associated with Suppliers and External Dependencies
  - Identify External Dependencies (EXD:SG1.SP1)
  - Prioritize External Dependencies (EXD:SG1.SP2)
  - Establish Resilience Specifications for External Dependencies (EXD:SG3.SP2)
  - Monitor External Entity Performance (EXD:SG4.SP1)

Cyber Hygiene Goal-11

- Hygiene 11 – Perform Cyber Threat and Vulnerability Monitoring and Remediation
  - Identify Sources of Vulnerability Information (VAR:SG2.SP1)
  - Discover Vulnerabilities (VAR:SG2.SP2)
  - Analyze Vulnerabilities (VAR:SG2.SP3)
  - Manage Exposure to Vulnerabilities (VAR:SG3.SP1)

Questions

Conquered Cyber Hygiene, What Next?

Review the SEI plan for improvement guide

Assess your policies, plans, processes, and procedures through a lightweight tool such as the Cyber Resilience Assessment

Determine your greatest needs and map out a plan to improve

- Consider using a maturity model for guidance
  - Progressing your capabilities (crawl -> walk -> jog -> run -> sprint)
  - Institutionalize your processes (write down what you do, do what you wrote down. Define policies, assign resources, etc.)

Resources

Software Engineering Institute Website:

https://www.sei.cmu.edu/

CERT Resilience Management Model

https://resources.sei.cmu.edu/library/asset-view.cfm?assetid=508084

Cyber Risk and Resilience Blog:

https://insights.sei.cmu.edu/

SEI Training

https://www.sei.cmu.edu/education-outreach/courses/index.cfm