TLP:CLEAR

Carnegie Mellon University
Software Engineering Institute

The Four Pillars of Cybersecurity

FIRST 2023

JUNE 9, 2023

Laurie Tyzenhaus
CERT Coordination Center

This material is based upon work funded and supported by the Department of Homeland Security under Contract No. FA8702-15-D-0002 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center sponsored by the United States Department of Defense.

DM23-0555

Agenda

- The Pillars
- Strategic Goals
- Operational Options
- Future Considerations

TLP:CLEAR

TLP:CLEAR

Carnegie Mellon University
Software Engineering Institute

The Four Pillars

Pillars

1. Coordinated Vulnerability Disclosure (CVD)
2. Secure Updates – How does the vendor provide updates?
3. Software Bill of Materials (SBOM)
4. End of Life/Security Support – How long will the vendor support your key devices or software?

Coordinated Vulnerability Disclosure

FIRST

Vulnerability Coordination SIG

Vulnerability Reporting and Data Exchange SIG

CERT/CC: Coordinated Vulnerability Disclosure (CVD) is the process of gathering information from vulnerability finders, coordinating the sharing of that information between relevant stakeholders, and disclosing the existence of software vulnerabilities and their mitigations to various stakeholders including the public.

ISO/IEC 30111:2019(E): Information technology – Security techniques – Vulnerability handling processes

ISO/IEC 29147:2018(E): Information technology – Security techniques – Vulnerability disclosure

TLP:CLEAR

CVD - How to implement a CVD program?

Carnegie Mellon University Software Engineering Institute

- Hire a service provider - Vulnerability Disclosure Platform/program
  - Different than “coordinated”
  - Global services available & used by many companies (US Dept of Defense)

- Create your own!
  - The ability to receive vulnerability reports from anywhere
  - The technical team to review and test to validate the vulnerability
  - Develop and TEST the fix!
  - Deploy the update, patch, fix & publish a report or advisory.
    - Be clear whether this update will mitigate (reduce the risk of the vul) or remediate (remove the vul completely)

TLP:CLEAR

Secure Updates

Carnegie Mellon University Software Engineering Institute

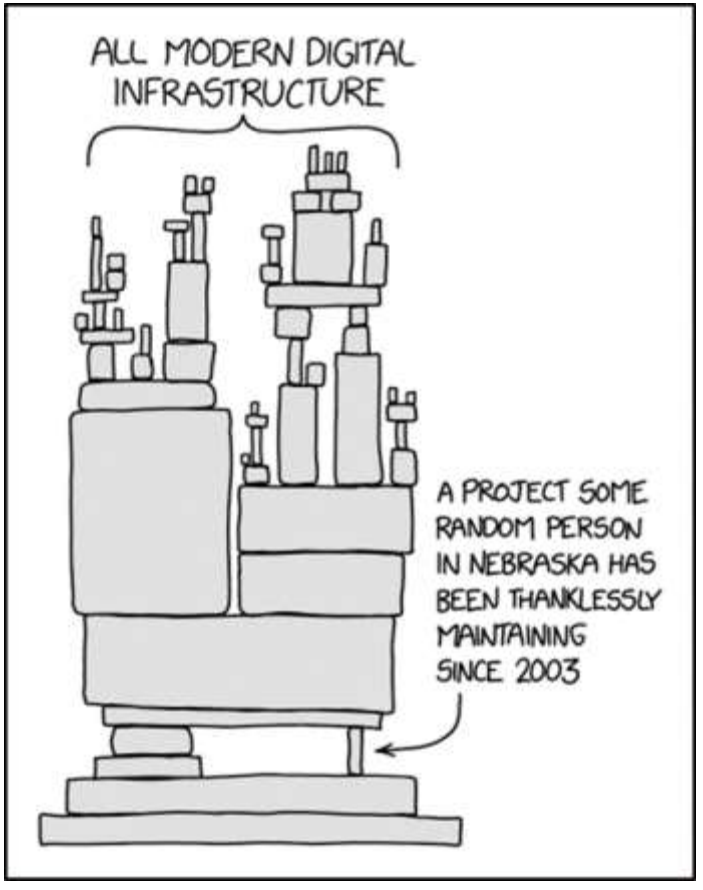
Updates need to be:

- Available over any network
- Automatic notification
- Securely distributed
  - Digital Signatures are not enough
- Reduced Risk?
  - Update notification via a different channel?
  - Scheduled updates?
  - Publish to a private security list?
- Independent infrastructure for local testing!

TLP:CLEAR

Software Bill of Materials (SBoM)

- Supply Chain is a problem
  - Upstream
    - Who do you purchase products from?
    - What else is built into the product?
  - Downstream
    - Who is buying your 'finished' products?
    - Where/How are your products utilized?
- Does your company have an SBoM?
  - How complete is it?
  - When was it last updated?



https://xkcd.com/2347/

End of Life, End of product support

- How long will the product last?
- How long will the producer support the product, supplying security and functional updates?

Strategic Goals

Long term planning to obtain a desired goal.

Strategic Goals – CSIRTs, Companies, Vendors/suppliers

- You believe cybersecurity is a serious problem and we must act.
- You wish to avoid cyber attacks.
- You are willing to fund and otherwise support cybersecurity measures.

Operational Plans

Creating operational or action plans to provide the direction to obtain the strategic goals.

Operational Plans - CSIRTs

1. Is funding available to implement the Pillars?
2. Would Governmental requirements be a catalyst or a deterrent?
3. Determine the work involved in implementing the Pillars? Identify which of the Pillars are the easiest for you to implement.
   - CVD
   - Secure Updates
   - SBoM – Software Bill of Materials
   - End of Life/Security Support

Operational Plans

- Supply the purchasing department with guidelines/requirements that align with the strategic goals.
  - Can the questions on the acquisition forms be altered to include:
    - Does this company have a security web portal? (provide URL)
    - Do they issue CVEs for the vulnerabilities in their products?
    - Are they a CVE Numbering Authority (CNA)?
    - How are updates and upgrades announced to the customers?
    - How are supply chain records managed?

TLP:CLEAR

Operational Plans

- Provide the documentation which demonstrates your company's support of cybersecurity. Develop a web portal which supports the:
  - Intake of vulnerability reports;
  - lists updates and upgrades and how to obtain the software;
  - provides a location to retrieve the SBoM or supply chain information; and
  - notifies the customer _in advance_ of end of support.

- Do the suppliers have these capabilities?

TLP:CLEAR

TLP:CLEAR

Carnegie Mellon University
Software Engineering Institute

Future Considerations

Another Pillar?

Vendors are requesting a

Proof Of Concept

CISA has a Known Exploited Vulnerabilities catalog with a web portal:
https://www.cisa.gov/known-exploited-vulnerabilities-catalog

TLP:CLEAR

Future Considerations

- International Standards Organization (ISO) is where the Strategic and Operational guidance is developed, debated, and finalized.
  - Participate to have your voice heard!

- NIST should update the Cybersecurity Framework to include:
  - vulnerability report intake capability,
  - mitigation or remediation of the vulnerability and,
  - alerting customers of the need to update or patch.

Future Considerations

- Encourage transparency to allow the consumer/customer to conduct their own assessment of their NIST Cybersecurity Framework compliance status.

- SBoM is only a starting place! Consider how companies can develop a PBoM (Production (or product)) Bill of Materials.

  - The PBoM could include **the __entire__ production cycle** and *identify dependencies*.
  - This type of information could support the customer in determining if they're vulnerable!

TLP:CLEAR

URLs

CVD

https://resources.sei.cmu.edu/library/asset-view.cfm?assetid=503330

https://www.cisa.gov/coordinated-vulnerability-disclosure-process

https://www.microsoft.com/en-us/msrc/cvd

https://www.cisa.gov/resources-tools/resources/vulnerability-disclosure-policy-vdp-platform-fact-sheet

SBOM

https://www.cisa.gov/sbom

https://ntia.gov/page/software-bill-materials

TLP:CLEAR

More URLs

Software End of life/ End of support

CMU/SEI:

Beyond NIST SP 800-171: 20 Additional Practices in CMMC

https://insights.sei.cmu.edu/blog/beyond-nist-sp-800-171-20-additional-practices-cmmc/

NIST:

Secure Software Development Framework:

https://csrc.nist.gov/Projects/ssdf

Asset Management:

https://nvlpubs.nist.gov/nistpubs/specialpublications/nist.sp.1800-5.pdf

TLP:CLEAR

URLs

Secure Updates

Trusted Computing Group:

https://trustedcomputinggroup.org/resource/tcg-guidance-for-secure-update-of-software-and-firmware-on-embedded-systems/

BSI – Bund: Software Updates – A Pillar of IT Security:

https://www.bsi.bund.de/EN/Themen/Verbraucherinnen-und-Verbraucher/Informationen-und-Empfehlungen/Cyber-Sicherheitsempfehlungen/Updates-Browser-Open-Source-Software/Wichtige-Softwareupdates/wichtige-softwareupdates_node.html

Questions?

Laurie Tyzenhaus

Senior Member of the Technical Staff

Email: latyzenhaus@cert.org

TLP:CLEAR