War-Winning Capabilities … On Time, On Cost

Accreditation of Instrumentation Systems and a Few Ways Vendors Can Help

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U.S. AIR FORCE

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Overview

- RMF Accreditation Process
- RMF and Vendors
- Common Software Accreditation Issues
  - Increasing Risk
  - Unsupported Components
  - Vulnerable Components
  - Managing Components
  - Installation issues
  - Software Delivery
- Event Logging
- Non-Volatile Memory (NVM)
  - Characterize NVM
  - Isolating NVM
- Takeaways

RMF Accreditation Process

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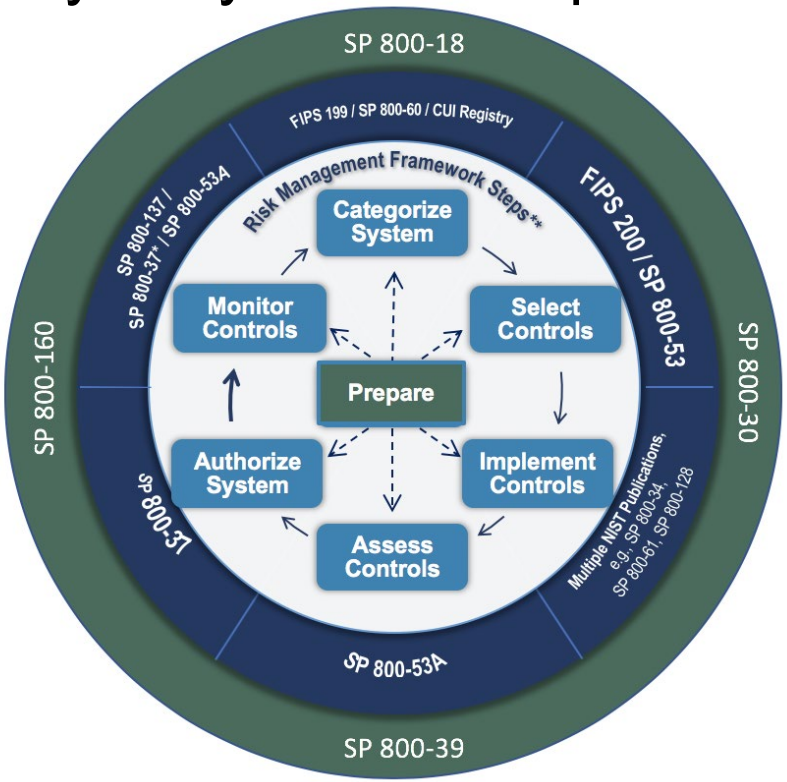
- **RMF and Authority To Operate (ATO) Accreditation**

  The DoD uses the NIST Risk Management Framework (RMF) to improve cybersecurity of systems. Steps include:

  – Prepare
  – Categorization
  – Select Controls
  – Implementation
  – Assess
  – Authorization (ATO)
  – Monitoring



https://csrc.nist.gov/Projects/Risk-Management/rmf-quick-start-guides

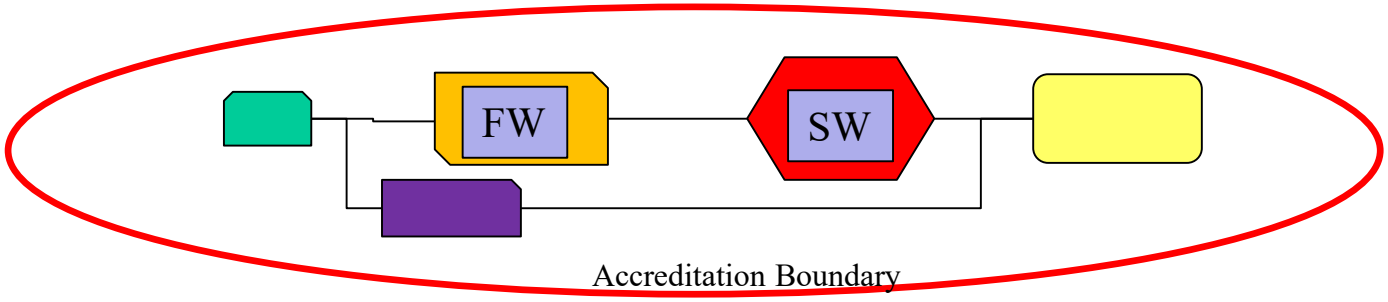
RMF Accreditation Process

- Controls in RMF
  - Aprx 1500 controls and enhancements categorized into 18 families
  - The design and configuration options of vendors products can help the DoD meet a sub-set of RMF controls
  - V5 out soon

https://nvd.nist.gov/800-53/Rev4

RMF Accreditation Process

- **The DoD Accredits Systems**
  - **Systems are made up of components and software**
  - **Systems are accredited, individual components are not accredited**
  - **The Approving Official (AO) is a senior member of the DoD**
  - **When making a accreditation decision, AO consider the cybersecurity of the components-software-processes, the sensitivity of the system, and the threat environment**



RMF and Vendors

- **Talk with your customers to understand which controls they need vendor help to implement**
  - **Cost vs. benefit tradeoff**
- **Provide options so customers can:**
  - **Install only required components to reduce attack surface and the number of controls that need to be addressed**
  - **Configure features that implement controls such as event logging, enhanced authentication methods…**

Order Form

Replaceable Firmware Module
Manual Firmware Update Switch

Installation Options

- [ ] Command Line Interface
- [x] Web Interface
- [x] Standalone database
- [ ] Network Database
- [2] Event Logging Level

Software – Increasing Risk

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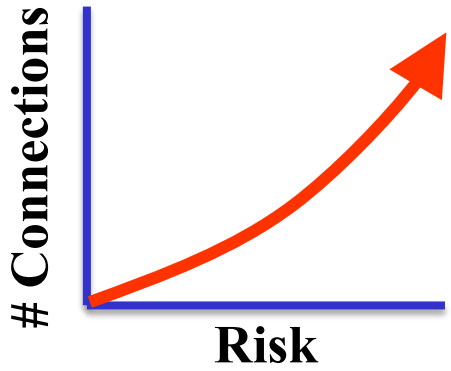
- Increase in network connectivity is increasing risk



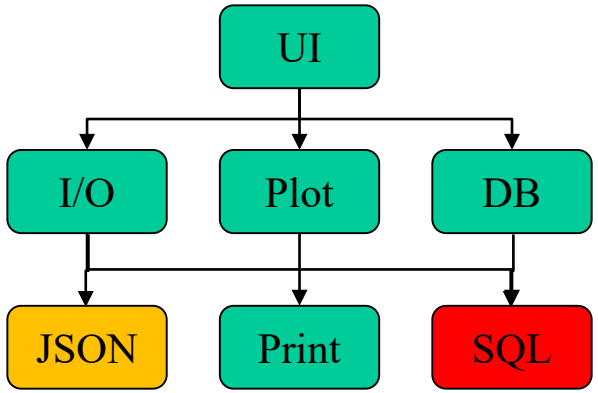
- RMF addresses software vulnerabilities
  - SI-2 Flaw Remediation
  - SA-22 Unsupported System Components
- The following accreditation issues are derived from system accreditation efforts, Risk Mitigation Boards (RMB), and software approval activities

Software - Unsupported Components

- **Unsupported Software Components, Common Findings**
  - **Outdated Microsoft Visual C++ Redistributables**
  - **Outdated Java JRE or JDK (Java SE version)**
  - **Outdated ActiveX Components**
  - **Outdated Adobe Reader, Acrobat, Flash**
  - **Outdated OpenSSL**
    - **0.9.8, 1.0.0 and 1.0.1 versions are now out of support**
    - **1.0.2 series out of support on 31st December 2019**
    - **1.1.0 series out of support on 11th September 2019**
  - **Outdated Apache Webserver**
  - **Outdated SSH Components**
  - **…**

Software - Vulnerable Components

- Vulnerable 3rd Party SW Components, Common Findings
  - Microsoft 2010 Visual C++ Redistributables
    - CVE-2010-3190, CVE-2010-3190, (upgrade to latest version)
  - Microsoft ActiveX Components
    - mscomct2.ocx, CVE-2008-4255,
    - richtx32.ocx, CVE-2008-0237
  - Adobe Products
    - Too many CVE to list
  - Java
    - Too many CVE to list
  - …



Common Vulnerabilities and Exposures (CVE) https://cve.mitre.org/

Software – Managing Components

- Supporting 3rd Party Components
  - AO generally want "adequate maintenance & support"
  - No agreed upon definition of this requirement
  - When asked, describe how you support 3rd party components
- Good Practices
  - Have a complete inventory of 3rd party software
  - Monitor for bugs and updates
  - Incorporate security patches soon after publication
  - Upgrade/replace/remove components that are no longer supported
  - Try to use system-managed components, or allow system administrators to update components

Software – Installation Issues

- Non-standard firewall rules
  - Firewall rule with “Any” is an issue for some AO
  - Use standard ports, protocols and services
    - DoDI 8551.01 (https://iase.disa.mil/ppsm, sections may require a CAC login)
- Software Installation Locations
  - Software should install in the proper C:\Program Files for Windows
  - Follow the Linux file system hierarchy standard
- Do not write data to non-standard locations
  - Writing to the root of C:\ is not accepted
  - Self Modifying Code is a security risk

Software – Installation Issues

- Running software as Admin is not advised
  - Software must be executable as regular user
  - Security+ certifications may be required for admin
- Windows Operating Systems Not Named “10”
  - Windows 8 is unsupported
  - Windows 7 support ends Jan 4th 2020
  - Windows 10 1607 unsupported, 1703 Oct 2019
- Hard coded passwords are not allowed

Software – Delivery

- RMF addresses the secure delivery of firmware and software (SI-7)
- Secure methods for delivering firmware/software
  - Secure software update process
    - See https://cwe.mitre.org/data/definitions/494.html
  - Checksum delivered via separate channel
    - Don't transmit the checksum using the same system used to host the software
    - Win10 use *CertUtil –hashfile Infile [HashAlgorithm]*
  - Physical delivery
- Firmware to be installed/updated over a network
  - Consider an option that requires a physical presence for updating firmware: switch, jumper, separate port…

Event Logging

- RMF Addresses Continuous Monitoring
  - Audit and Accountability control family
    - AU-1 thru AU-16
- Allow customers to configure event logging
  - Log device specific events
    - recording on/off, camera resolution changes…
  - Log configuration changes
  - Log firmware or software upgrades
  - Log device usage
    - admin logins, starts, stops…

Non-Volatile Memory (NVM)

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- **NVM Cybersecurity Issues**
  - **NVM is a potential pathway for information to be transported between security boundaries**
  - **A greater use of third party parts and software has increased risk**
  - **Consider ramifications to NVM if firmware is p0wned**
- **Characterize NVM**
  - **Look deeper into designs to identify all NVM, provide detailed descriptions in the Letter of Volatility**
  - **Understand and document how NVM can be written-to, or read-from, via software, identify pathways**
  - **There will be a greater emphasis on providing documentation that supports Letters of Volatility**

Non-Volatile Memory (NVM)

- **Provide tools to examine and/or validate NVM**
  - Some customers may require the ability to examine the contents of NVM or use checksums to validate the contents of NVM
  - Used when sending and receiving equipment
- **Encryption**
  - Encrypting NVM data and zeroing the key may be an option
  - Acceptance of this method is system and AO dependent
  - Talk with your customers
- **Allow for Customer Applied Firmware Updates**
  - Sending equipment with NVM back to the manufacture for firmware updates constraints customers
  - Consider methods to allow firmware updates to easily take place at customer locations

Non-Volatile Memory (NVM)

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- **Localize NVM in Removable Packaging**
  - **To ease physical protection requirements, the ability to move equipment between security boundaries, and the ability to send equipment back for repair, consider localizing NVM in removable packaging**
  - **Data recorder Removable Media Modules (RMM) is a good example for bulk data**
  - **For internal NVM such as firmware loads, configuration data, and maintenance logs, consider USB flash devices, SD cards, daughter cards, or removable chips**
  - **Consider designs that allow removing NVM without extracting the device from the SUT**
  - **As always, talk to your customers**

Takeaways

- The configuration of products can help or hinder the accreditation of instrumentation systems
  - Talk with customers
  - Provide options that assist RMF accreditation
- Software
  - Manage software components
  - Chose secure software installation practices
  - Provide secure delivery of firmware and software
- Characterize NVM, Removable NVM, NVM Tools
- Resources and Ideas
  - Secure coding class for developers
  - CWE https://cwe.mitre.org/index.html