



412th Test Wing



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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Integrity - Service - Excellence



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**



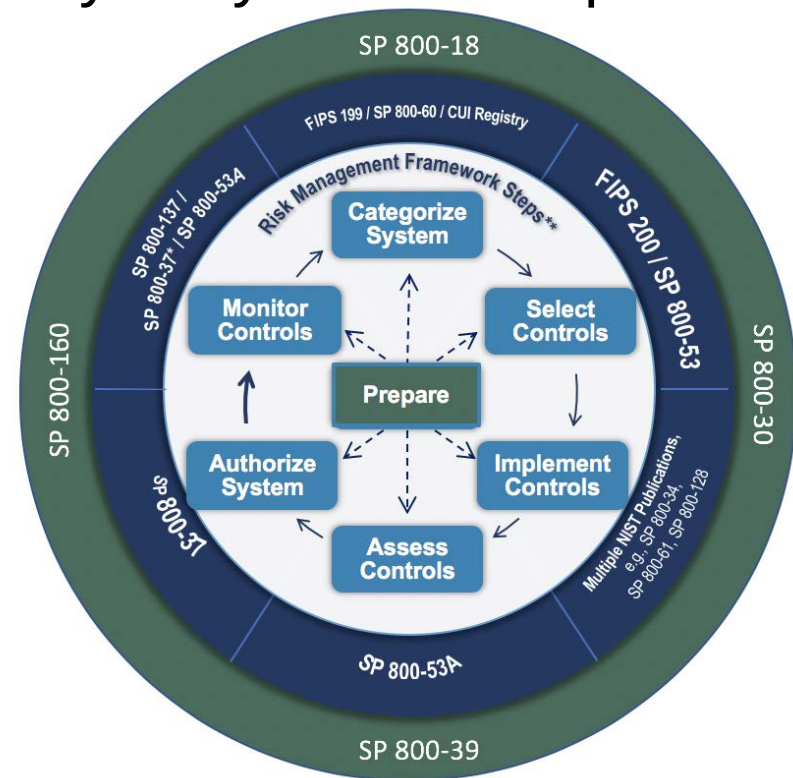
RMF Accreditation Process



- **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





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

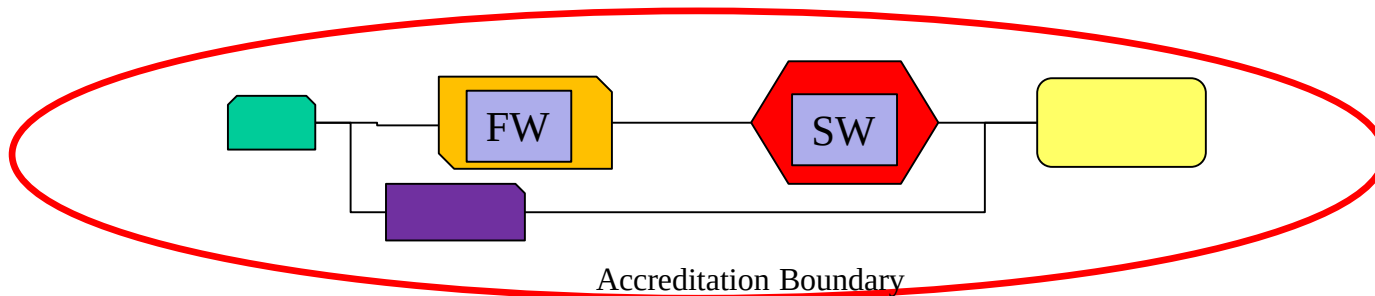
<https://nvd.nist.gov/800-53/Rev4>



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

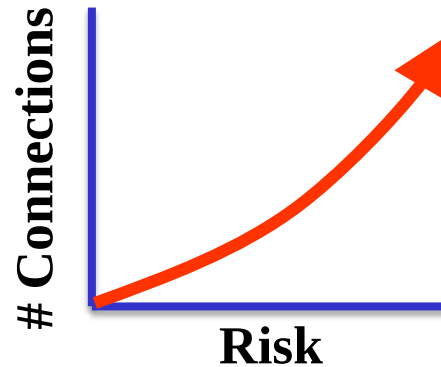
- ☐ Command Line Interface
- ☒ Web Interface
- ☒ Standalone database
- ☐ Network Database
- ☒ 2 Event Logging Level



Software – Increasing Risk



- 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



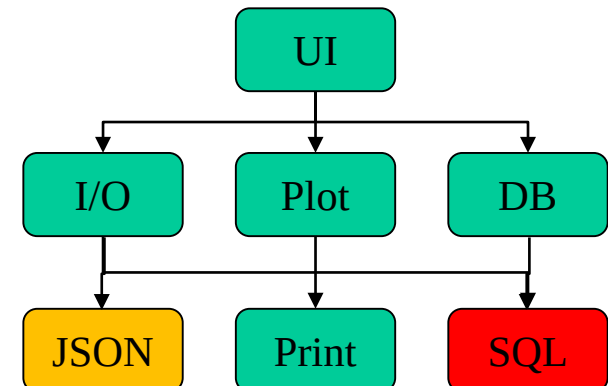
- **Unsupported Software Components, Common Findings**
 - Outdated Microsoft Visual C++ Redistributables
 - Outdated Java JRE or JDK (Java SE version)
 - Outdated ActiveX Components
 - Outdated Adobe Reader, Acrobat, Flash
 - Outdated OpenSSL
 - 0.9.8, 1.0.0 and 1.0.1 versions are now out of support
 - 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
 - ...





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)



- **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 pw0ned
- **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)



- **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>

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