

NIST SPECIAL PUBLICATION 1800-31A

Improving Enterprise Patching for General IT Systems:

Utilizing Existing Tools and Performing Processes in Better Ways

Volume A:
Executive Summary

Alper Kerman
Murugiah Souppaya
Kevin Stine

National Cybersecurity Center of Excellence
Information Technology Laboratory

Mark Simos
Sean Sweeney
Microsoft
Redmond, Washington

Karen Scarfone
Scarfone Cybersecurity
Clifton, Virginia

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NIST
National Institute of
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1 Executive Summary

2 For decades, cybersecurity attacks have highlighted the dangers of having computers with unpatched
3 software. Even with widespread awareness of these dangers, however, keeping software up-to-date
4 with patches remains a problem. Deciding how, when, and what to patch can be difficult for any
5 organization. Each organization must balance security with mission impact and business objectives by
6 using a risk-based methodology. To address these challenges, the NCCoE is collaborating with
7 cybersecurity technology providers to explore approaches for improving enterprise patching practices
8 for general information technology (IT) systems. These practices are intended to help your organization
9 improve its security and reduce the likelihood of data breaches with sensitive personal information and
10 other successful compromises. The practices can also play an important role as your organization
11 embarks on a journey to zero trust.

12 CHALLENGE

13 There are a few root causes for many data breaches, malware infections, ransomware attacks, and other
14 security incidents, and known—but unpatched—vulnerabilities in software is one of them.
15 Implementing a few security hygiene practices, such as patching operating systems, applications, and
16 firmware, can prevent many incidents from occurring, lowers the potential impact of incidents that do
17 occur, and increases the cost to the attacker. Unfortunately, security hygiene is easier said than done.
18 Despite widespread recognition that patching is effective and attackers regularly exploit unpatched
19 software, many organizations do not adequately patch. There are myriad reasons why, not the least of
20 which are that it's resource-intensive and that the act of patching can reduce system and service
21 availability. Many organizations struggle to prioritize patches, test patches before deployment, and
22 adhere to policies for how quickly patches are applied in different situations. Delaying patch deployment
23 gives attackers a larger window of opportunity.

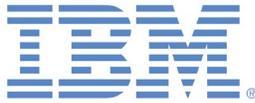
This practice guide can help your organization:

- overcome common obstacles involving enterprise patching for general IT systems
- achieve a comprehensive security hygiene program based on existing standards, guidance, and publications
- enhance its recovery from incidents that occur, and minimize the impact of incidents on the organization and its constituents

24 SOLUTION

25 To address these challenges, the NCCoE is collaborating with cybersecurity technology providers to
26 develop an example solution. It will demonstrate how tools can be used to 1) implement the inventory
27 and patching capabilities organizations need to handle both routine and emergency patching situations,
28 as well as 2) implement workarounds, isolation methods, or other alternatives to patching. The solution
29 will also demonstrate recommended security practices for patch management systems themselves.

30 The NCCoE is assembling existing commercial and open source tools to aid with the most challenging
 31 aspects of patching. The NCCoE is building upon previous NIST work documented in *NIST Special*
 32 *Publication (SP) 800-40 Revision 3, Guide to Enterprise Patch Management Technologies* and *NIST SP*
 33 *800-184, Guide for Cybersecurity Event Recovery*.

Collaborator	Security Capability or Component
	Asset discovery and inventory; network access control; network policy enforcement
	Hardware and firmware inventory; firmware vulnerability assessment; firmware integrity monitoring; firmware software updates
	Asset discovery and inventory; security policy enforcement
	Asset inventory; configuration management; software updates; vulnerability scanning for source code as part of a DevOps pipeline
	Security policy enforcement; vulnerability scanning and reporting; software discovery and inventory; firmware vulnerability assessment and policy enforcement
	Asset discovery; configuration management; software updates
	Asset discovery and inventory; vulnerability scanning and reporting
	Vulnerability scanning and remediation; configuration management; software updates

34 While the NCCoE is using commercial and open source products to address this challenge, the practice
 35 guide will not endorse these particular products, nor will it guarantee compliance with any regulatory
 36 initiatives. Your organization's information security experts should identify the products that will best
 37 integrate with your existing tools and IT system infrastructure. Your organization can adopt this solution
 38 or one that adheres to these guidelines in whole, or you can use this guide as a starting point for
 39 tailoring and implementing parts of a solution.

40 HOW TO USE THIS GUIDE

41 Depending on your role in your organization, you might use this guide in different ways:

42 **Business decision makers, including chief information security and technology officers** can use this
43 part of the guide, *NIST SP 1800-31A: Executive Summary*, to understand the drivers for the guide, the
44 cybersecurity challenge we address, our approach to solving this challenge, and how the solution could
45 benefit your organization. Business decision makers can also use *NIST SP 800-40 Revision 4 (Draft)*,
46 [Guide to Enterprise Patch Management Planning: Preventive Maintenance for Technology](#). It
47 complements the implementation focus of this guide by recommending creation of an enterprise
48 strategy to simplify and operationalize patching while also reducing risk.

49 **Technology, security, and privacy program managers** who are concerned with how to identify,
50 understand, assess, and mitigate risk can use *NIST SP 1800-31B: Security Risks and Capabilities*, which
51 describes what we built and why, including the risk analysis performed and the security capabilities
52 provided by the example implementation. *NIST SP 800-40 Revision 4 (Draft)*, [Guide to Enterprise Patch
53 Management Planning: Preventive Maintenance for Technology](#) may also be helpful.

54 **IT professionals** who want to implement an approach like this can make use of *NIST SP 1800-31C: How-
55 To Guides*, which provide specific product installation, configuration, and integration instructions for
56 building the example implementation, allowing you to replicate all or parts of this project.

57 **SHARE YOUR FEEDBACK**

58 You can view or download the guide at [https://www.nccoe.nist.gov/projects/building-blocks/patching-
59 enterprise](https://www.nccoe.nist.gov/projects/building-blocks/patching-enterprise). Help the NCCoE make this guide better by sharing your thoughts with us as you read the
60 guide. If you adopt this solution for your own organization, please share your experience and advice
61 with us. We recognize that technical solutions alone will not fully enable the benefits of our solution, so
62 we encourage organizations to share lessons learned and best practices for transforming the processes
63 associated with implementing this guide.

64 To provide comments or to learn more by arranging a demonstration of this example implementation,
65 contact the NCCoE at cyberhygiene@nist.gov.

66 **COLLABORATORS**

67 Collaborators participating in this project submitted their capabilities in response to an open call in the
68 Federal Register for all sources of relevant security capabilities from academia and industry (vendors
69 and integrators). Those respondents with relevant capabilities or product components signed a
70 Cooperative Research and Development Agreement (CRADA) to collaborate with NIST in a consortium to
71 build this example solution.

72 Certain commercial entities, equipment, products, or materials may be identified by name or company
73 logo or other insignia in order to acknowledge their participation in this collaboration or to describe an
74 experimental procedure or concept adequately. Such identification is not intended to imply special
75 status or relationship with NIST or recommendation or endorsement by NIST or NCCoE; neither is it
76 intended to imply that the entities, equipment, products, or materials are necessarily the best available
77 for the purpose.