## Solution Provider Poster Sponsors

Through their sponsorship, the technology providers below helped bring this poster to the SANS community. Sponsorship had no connection with the rankings of product measurement capabilities.

| | |
|---|---|
| accelops | *Going Beyond SIEM* |
| ALIEN VAULT | *CIS Critical Security Controls – Accelerated & Simplified* |
| BELARC | *Securing the Enterprise – Enterprise-wide, Standards-based Continuous Monitoring of Automated Security Controls* |
| IBM | *Maintaining Continuous Compliance – A New Best-Practice Approach* |
| LogRhythm The Security Intelligence Company | *The Ransomware Threat: A How-To Guide on Preparing for and Detecting an Attack Before It's Too Late* |
| RAPID7 | *Top 7 Security Controls to Prioritize* |
| skybox security | *Attack Your Attack Surface – How to Reduce Your Exposure to Cyber Attacks with an Attack Surface Visualization Solution* |
| Symantec | *2016 Internet Security Threat Report* |
| tenable network security | *CIS Critical Security Controls: Technical Control Automation* |

SANS

# Monitoring and Measuring the CIS Critical Security Controls

POSTER

*Products and Strategies for Continuously Monitoring and Improving Your Implementation of the CIS Critical Security Controls*

THE CENTER FOR INTERNET SECURITY (CIS)

# CRITICAL SECURITY CONTROLS V6.0

### CSC 19
**Incident Response and Management**

Protect the organization's information, as well as its reputation, by developing and implementing an incident response infrastructure (e.g., plans, defined roles, training, communications, management oversight).

### CSC 20
**Penetration Tests and Red Team Exercises**

Test the overall strength of an organization's defenses (technology, processes, and people) by simulating the objectives and actions of an attacker.

### CSC 1
**Inventory of Authorized and Unauthorized Devices**

Actively manage (inventory, track, and correct) all hardware devices on the network so that only authorized devices are given access, and unauthorized and unmanaged devices are identified and prevented from gaining access.

### CSC 2
**Inventory of Authorized and Unauthorized Software**

Actively manage (inventory, track, and correct) all software on the network so that only authorized software is installed and can execute, and unauthorized and unmanaged software is located and prevented from installation or execution.

### CSC 3
**Secure Configurations for Hardware and Software on Mobile Devices, Laptops, Workstations, and Servers**

Establish, implement, and actively manage (track, report on, and correct) the security configuration of laptops, servers, and workstations using a rigorous configuration management and change control process in order to prevent attackers from exploiting vulnerable services and settings.

### CSC 18
**Application Software Security**

Manage the security lifecycle of all in-house developed and acquired software in order to prevent, detect, and correct security weaknesses.

### CSC 4
**Continuous Vulnerability Assessment and Remediation**

Continuously acquire, assess, and take action on new information in order to identify vulnerabilities, and to remediate and minimize the window of opportunity for attackers.

### CSC 17
**Security Skills Assessment and Appropriate Training to Fill Gaps**

Identify the specific knowledge, skills, and abilities needed to support defense of the enterprise; develop and execute an integrated plan to assess, identify and remediate gaps, through policy, organizational planning, training, and awareness programs for all functional roles in the organization.


### CSC 5
**Controlled Use of Administrative Privileges**

Track, control, prevent, and correct the use, assignment, and configuration of administrative privileges on computers, networks, and applications.

### CSC 16
**Account Monitoring and Control**

Actively manage the lifecycle of system and application accounts – their creation, use, dormancy, deletion – in order to minimize opportunities for attackers to leverage them.

### CSC 6
**Maintenance, Monitoring, and Analysis of Audit Logs**

Collect, manage, and analyze audit logs of events that could help detect, understand, or recover from an attack.

### CSC 15
**Wireless Access Control**

Track, control, prevent, and correct the security use of wireless local area networks (LANS), access points, and wireless client systems.

### CSC 7
**Email and Web Browser Protections**

Minimize the attack surface and the opportunities for attackers to manipulate human behavior through their interaction with web browsers and email systems.

### CSC 14
**Controlled Access Based on the Need to Know**

Track, control, prevent, correct, and secure access to critical assets (e.g., information, resources, systems) according to the formal determination of which persons, computers, and applications have a need and right to access these critical assets based on an approved classification.

### CSC 8
**Malware Defenses**

Control the installation, spread, and execution of malicious code at multiple points in the enterprise, while optimizing the use of automation to enable rapid updating of defense, data gathering, and corrective action.

### CSC 13
**Data Protection**

Prevent data exfiltration, mitigate the effects of exfiltrated data, and ensure the privacy and integrity of sensitive information.

### CSC 12
**Boundary Defense**

Detect, prevent, and correct the flow of information-transferring networks of different trust levels with a focus on security-damaging data.

### CSC 11
**Secure Configurations for Network Devices such as Firewalls, Routers, and Switches**

Establish, implement, and actively manage (track, report on, and correct) the security configuration of network infrastructure devices using a rigorous configuration management and change control process in order to prevent attackers from exploiting vulnerable services and settings.

### CSC 10
**Data Recovery Capability**

Properly back up critical information with a proven methodology for timely recovery.

### CSC 9
**Limitation and Control of Network Ports, Protocols, and Services**

Manage (track, control, and correct) the ongoing operational use of ports, protocols, and services on networked devices in order to minimize windows of vulnerability available to attackers.

## The CIS Critical Security Controls Are the Core of the NIST Cybersecurity Framework

In February 2015, the President issued Executive Order (EO) 13636, Improving Critical Infrastructure Cybersecurity, directing National Institute of Standards and Technology (NIST) to develop a voluntary framework based on existing standards. This has become known as the NIST Cybersecurity Framework or CSF. At the time this poster was produced (Summer 2016) Version 1.0 was the latest version, but NIST has announced that revisions based on community comments would be released in 2017.

Like all frameworks, the NIST CSF does not specify any priority of security controls or recommend sequences of actions. That is where the Critical Security Controls shine – they map directly to the CSF core requirements and provide a realistic and community-driven risk management approach for making sure your security program will be both effective and efficient against real-world threats.

The chart below maps the Center for Internet Security (CIS) Critical Security Controls (Version 6.0) into the most relevant NIST CSF (Version 1.0) Core Functions and Categories. If you are using the NIST CSF, the mapping (thanks to James Tarala) lets you use the Critical Security Controls to prioritize measuring and monitoring the most important core NIST Framework elements.

| CIS Critical Security Controls (V6.0) | NIST Core Framework | Cybersecurity Framework (CSF) Core | | | | |
|---|---|---|---|---|---|---|
| | | Identify | Protect | Detect | Respond | Recover |
| 1 Inventory of Authorized and Unauthorized Devices | ID.AM-1 ID.AM-3 ID.AM-4 PR.DS-3 | AM | | | | |
| 2 Inventory of Authorized and Unauthorized Software | ID.AM-2 PR.DS-6 | AM | | | | |
| 3 Secure Configuration of End-User Devices | PR.IP-1 | | IP | | | |
| 4 Continuous Vulnerability Assessment & Remediation | ID.RA-1 PR.IP-12 DE.CM-8 RS.MI-3 ID.RA-2 | RA | | CM | MI | |
| 5 Controlled Use of Administrative Privileges | PR.AC-4 PR.AT-2 PR.MA-2 PR.PT-3 | | AC | | | |
| 6 Maintenance, Monitoring, and Analysis of Audit Logs | PR.PT-1 DE.DP-1 DE.DP-3 DE.DP-5 DE.AE-3 DE.DP-2 DE.DP-4 | | | AE | AN | |
| 7 Email and Web Browser Protections | PR.IP-1 | | PT | | | |
| 8 Malware Defense | PR.PT-2 DE.CM-4 DE.CM-5 | | PT | CM | | |
| 9 Limitation & Control of Network Ports, Protocols, and Service | PR.AC-5 DE.AE-1 | | IP | | | |
| 10 Data Recovery Capability | PR.IP-4 | | | | | RP |
| 11 Secure Configuration of Network Devices | PR.AC-5 PR.IP-1 PR.PT-4 | | IP | | | |
| 12 Boundary Defense | PR.AC-3 PR.AC-5 PR.MA-2 DE.AE-1 | | | DP | | |
| 13 Data Protection | PR.AC-5 PR.DS-2 PR.DS-5 PR.PT-2 | | DS | | | |
| 14 Controlled Access Based on Need to Know | PR.AC-4 PR.DS-1 PR.PT-2 PR.AC-5 PR.DS-2 PR.PT-3 | | AC | | | |
| 15 Wireless Access Control | | | AC | | | |
| 16 Account Monitoring and Control | PR.IP-4 | | AC | CM | | |
| 17 Security Skills Assessment and Appropriate Training | PR.AT-1 PR.AT-3 PR.AT-4 PR.AT-5 PR.AT-2 | | AT | | | |
| 18 Application Software Security | PR.AC-1 PR.AC-4 PR.PT-3 | | IP | | | |
| 19 Incident Response and Management | PR.IP-10 DE.CM-1-7 RS.AN-1-4 RC.RP-1 DE.AE-2 RS.RP-1 RS.MI-1-2 RC.IM-1-2 DE.AE-4 RS.CO-1-5 RS.IM-1-2 RC.CO-1-3 DE.AE-5 | | | AE | RP | |
| 20 Penetration Tests and Red Team Exercises | | | | | IM | IM |

## Defining Continuous Monitoring

National Institute of Standards and Technology (NIST) 800-137 is the U.S. government's guide to "Information Security Continuous Monitoring for Federal Information Systems and Organizations." It defines continuous monitoring as:

> "…ongoing awareness of information security, vulnerabilities, and threats to support organizational risk management decisions.…The terms 'continuous' and 'ongoing' in this context mean that security controls and organizational risks are assessed and analyzed at a frequency sufficient to support risk-based security decisions to adequately protect organization information. Data collection, no matter how frequent, is performed at discrete intervals."

The SANS simplified version of this is to:

- Establish and measure **meaningful security metrics**
- Monitor those metrics **frequently enough to minimize incident impact**
- **Take action** rapidly, efficiently and effectively to improve overall security

The CIS Critical Security Controls have proven to be an effective starting point for selecting key security metrics. A frequent question is "how frequently is continuous?" NIST 800-137 points to yet another complex document, SP 800-37 "Guide for Applying the Risk Management Framework to Federal Information Systems" for a risk-based methodology for making this decision. But there is an easier way.

| Frequency (FedRAMP) | 800-53 Control | CIS Critical Security Control |
|---|---|---|
| Continuous and Ongoing | Auditable Events | (6) Maintenance, Monitoring, Analysis of Logs |
| | Component Inventory | (1) Inventory of Devices |
| | Incident Reporting | (19) Incident Response and Management |
| | Vulnerability Scanning | (4) Continuous Vulnerability Assessment & Remediation |
| Weekly | Audit Review, Report | (6) Maintenance, Monitoring, Analysis of Logs |
| Monthly | Vulnerability Scanning | (4) Continuous Vulnerability Assessment & Remediation |
| | Securing State Monitoring | (6) Maintenance, Monitoring, Analysis of Logs |
| | Flaw Remediation | (3) Secure Configurations |
| | Software/Info Integrity | (2) Software Inventory |
| | Least Functionality | (9) Limitation & Control of Network Ports, Services |

A simpler approach: The GSA Federal Risk and Authorization Program (**FedRAMP**) has established continuous monitoring guidelines for certifying and monitoring cloud services as being secure enough for unclassified use by federal government agencies. FedRAMP defines which security controls should be monitored monthly, weekly, or on an ongoing basis (as frequently as possible, or driven by changes.)

## Collecting Meaningful Security Data – Monitoring the Right Stuff

Security monitoring has no value on its own unless it leads to meaningful action to prevent or reduce damage from cyber attacks. More prevention, faster detection, and more accurate response require measuring different CIS Critical Security Controls to reduce vulnerabilities, detect and mitigate attacks, and optimize incident response and restoration. SANS has mapped the Critical Controls across the CyberDefense lifecycle.

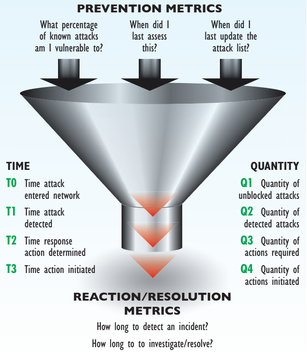
CYBER DEFENSE LIFECYCLE

CIS CRITICAL SECURITY CONTROLS

| Resource Hardening | Privilege and Access Management | Attack Detection/Mitigation | Compromise Detection, Response, Recovery, and Reporting |
|---|---|---|---|
| Hardware and Software Inventory CSC1 & CSC2 | Admin Privileges CSC5 | Malware Defenses CSC7 & CSC8 | Data Recovery CSC10 |
| Secure Configurations CSC3, CSC9, CSC11 & CSC15 | Controlled Access CSC14 | Boundary Defense CSC12 | Audit CSC6 |
| Vulnerability Assessment & Application Security CSC4 & CSC18 | Account Managing CSC16 | | Data Protection CSC13 |
| | | | Incident Response CSC19 |

**People and Processes**
The Critical Security Controls include a number of security areas that focus on people and processes and are applicable across the entire lifecycle: **CSC17** – Security Skills Assessment and Training; **CSC20** – Penetration Testing and Red Team Exercises

The values you measure should include both quantity and time – how quickly you detect new misconfigurations, vulnerabilites, attacks, etc. is just as important as how many there are. Similarly, business damage is minimized (and often prevented) if intrusion detection and mitigation processes can move rapidly.




CSCs-Monitoring_v1_7-16

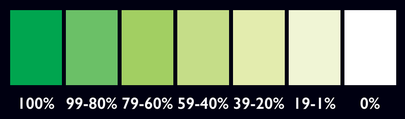
# PROVEN SOLUTIONS TO

# Monitor and Measure

## THE CIS CRITICAL SECURITY CONTROLS

SANS surveyed industry vendors in March 2016, using the Center for Internet Security (CIS) document "A Measurement Companion to the CIS Critical Security Controls (Version 6)" dated October 2015 as the baseline. The "heat map" shaded areas represent totalling the number of measurements a vendor said YES to and divided by the total number of measurements listed for that Critical Control. SANS did not independently test the products. Products change frequently, and the information represented on this poster is current as of May 2016. Check with the vendors to get the latest information.

### Product Matrix Heat Map Key




***How to use this chart:***

There are two factors to keep in mind when evaluating products for monitoring and measuring your implementation of the CIS Critical Security Controls:

1) No single product measures all sub-controls defined in the CIS Critical Security Controls.

2) Your gap assessment probably found that you are already using some security (or IT operations) products to measure some of the Controls.

Driven by your gap assessment and implementation plan, decide which CIS Critical Security Controls require enhanced measuring and monitoring capabilities.

Use the Proven Solutions Heat Map to select those products that cover all or most of your needs and then evaluate and compare those products to best meet the security demands of your business or mission.

CIS CRITICAL SECURITY CONTROLS

| SOLUTION PROVIDERS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rapid7 | | | | | | | | | | | | | | | | | | | | | |
| Splunk | | | | | | | | | | | | | | | | | | | | | |
| Tenable | | | | | | | | | | | | | | | | | | | | | |
| IBM Big Fix | | | | | | | | | | | | | | | | | | | | | |
| AlienVault | | | | | | | | | | | | | | | | | | | | | |
| Skycure | | | | | | | | | | | | | | | | | | | | | |
| IBM QRadar | | | | | | | | | | | | | | | | | | | | | |
| Tripwire CCM | | | | | | | | | | | | | | | | | | | | | |
| Imperva | | | | | | | | | | | | | | | | | | | | | |
| Tripwire Enterprise | | | | | | | | | | | | | | | | | | | | | |
| Beyond Security | | | | | | | | | | | | | | | | | | | | | |
| Tripwire Connect/SI Hub | | | | | | | | | | | | | | | | | | | | | |
| Tripwire Log Center | | | | | | | | | | | | | | | | | | | | | |
| Belarc | | | | | | | | | | | | | | | | | | | | | |
| Skybox Security | | | | | | | | | | | | | | | | | | | | | |
| Cisco StealthWatch | | | | | | | | | | | | | | | | | | | | | |
| EIQ Networks | | | | | | | | | | | | | | | | | | | | | |
| Lumeta | | | | | | | | | | | | | | | | | | | | | |
| Uplevel Security | | | | | | | | | | | | | | | | | | | | | |
| Tripwire IP 360 | | | | | | | | | | | | | | | | | | | | | |
| Infoblox | | | | | | | | | | | | | | | | | | | | | |
| Avecto | | | | | | | | | | | | | | | | | | | | | |
| FireEye TAP | | | | | | | | | | | | | | | | | | | | | |
| HexisCyber | | | | | | | | | | | | | | | | | | | | | |
| Invincea | | | | | | | | | | | | | | | | | | | | | |
| FireEye NX | | | | | | | | | | | | | | | | | | | | | |
| FireEye IA | | | | | | | | | | | | | | | | | | | | | |
| FireEye EX | | | | | | | | | | | | | | | | | | | | | |
| FireEye ETP | | | | | | | | | | | | | | | | | | | | | |
| FireEye HX | | | | | | | | | | | | | | | | | | | | | |
| FireEye PX | | | | | | | | | | | | | | | | | | | | | |