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OpenSCAP



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1. (SCAP) OpenSCAP

(IT) 가 , 가 , 가,
(SCAP) OpenSCAP . ,

1.1. SCAP 가?

SCAP(Security Content Automation Protocol)

가 가

(NIST)

¹ SCAP 800-53(SP 800-53)

(FISMA)

¹ SCAP

NIST가

(NVD) ¹ SCAP

¹ SCAP

가 ,

¹

SCAP NIST

, 가

, NIST FISMA

¹ NIST

SCAP

, FISMA

¹ SCAP

가

, SCAP “ ”

“ ”¹

1.2. OpenSCAP :

OpenSCAP(OSCAP)

SCAP

.3

SCAP

, SCAP

가

(oscap)

¹ OpenSCAP

SCAP

가 (SSG)

가

³ OpenSCAP

SCAP

SCAP

. OpenSCAP

가

가

,

.

1.3.

,

,

, SCAP

가

DSS, NIST, FedRAMP, FISMA

IT

가

가

.

OpenSCAP

.

7

,

,

,

가

.¹ SCAP

.

1

“ (plumbing)”

.

6

PCI

.

6

2. SCAP

SCAP

,

SCAP

2.1. SCAP

SCAP

.

1

- XCCDF (Extensible Configuration Checklist Description Format):

,

XML

.¹ SCAP

가 (SSG)

XCCDF

.

3

- OVAL (Open Vulnerability and Assessment Language):

가

,

. OVAL

(:

)

- CVE (Common Vulnerabilities and Exposures):

- CPE (Common Platform Enumeration):

.

1

- CVSS (Common Vulnerability Scoring System):

remediation

.

1

.

1

- CCE (Common Configuration Enumeration):
- ARF (Asset Reporting Format):
- TMSAD (Trust Model for Security Automation Data):
- AID (Asset Identification):
- CCSS (Common Configuration Scoring System):

SCAP(OpenSCAP) 가 (XCCDF, OVAL) (CPE), (CVE), 가(CVSS) “ (suite)”¹ SCAP 가 “ ” SCAP 가

2.2. SCAP

SCAP

SCAP

SCAP

	(Full Name)		SCAP
XCCDF	Extensible Configuration Checklist Description Format ()	XML	가
OVAL	Open Vulnerability and Assessment Language (가)	(: , 가) XML	XCCDF “ ”
CVE	Common Vulnerabilities and Exposures ()		가
CPE	Common Platform Enumeration ()	IT (, OS,)	
CVSS	Common Vulnerability Scoring System (가)	가	remediation
CCE	Common Configuration Enumeration ()	()	
ARF	Asset Reporting Format ()	가	가 가

SCAP

SCAP

가

SCAP

OpenSCAP

3. OpenSCAP :

OpenSCAP SCAP

(oscap)

OpenSCAP

가

(SCAP Workbench)

3.1. OpenSCAP :

OpenSCAP

⁵

SCAP

⁵ OpenSCAP

SCAP Workbench, Red Hat

Satellite

SCAP Timony, OpenSCAP

Daemon

OpenSCAP Base C API

¹¹

SCAP

가

, API

. C API¹¹

, OpenSCAP

SCAP

OpenSCAP

가

가

. API

가

SCAP

SCAP

SCAP

3.2. oscap:

oscap OpenSCAP

⁵

XCCDF

OVAL

가

⁵ SCAP 1.2

SCAP 1.1

1.0

⁵

DISA STIG, NIST

USGCB, PCI-DSS

Red Hat

가

⁵

oscap xccdf eval

가

⁹, oscap info

⁹

oscap xccdf generate report ARF/XML

HTML

⁹

oscap (verbose)

¹² oscap

(CLI)

OpenSCAP

. GUI

, CLI

, CI/CD

. oscap⁵

(: cron , Ansible, CI/CD)

OpenSCAP

3.3. SCAP Workbench:

SCAP Workbench OpenSCAP⁹
 XCCDF SDS(Source Data Stream) 가
¹³ , HTML, ARF XCCDF
⁹ SCAP 가 (SSG) SCAP Workbench Workbench
 (tailoring) ¹³ SCAP Workbench
 . oscap CLI SCAP Workbench GUI⁵
 OpenSCAP CLI 가
 OpenSCAP

3.4.

OpenSCAP Red Hat Satellite SCAPTimony OpenSCAP Daemon
⁵ OpenShift Compliance Operator oscap xccdf eval
 OpenShift 가 ¹⁰ SCAPinoculars OpenSCAP ARF
 Prometheus ¹⁰ OpenSCAP Jenkins
 Ansible ⁷ OSCAP (XCCDF) EM CLI Enterprise
 Manager 가 ¹⁶ OpenSCAP OpenShift
 Compliance Operator, Jenkins, Ansible⁷ OpenSCAP
 DevOps DevSecOps
 OpenSCAP
 DevSecOps

4. 가 : OpenSCAP 가

OpenSCAP , OpenSCAP 가

4.1.

OpenSCAP . SCAP 가 (SSG)

- Fedora: dnf install openscap-scanner⁵ oscap . SCAP
 Workbench yum install scap-workbench⁹ ,
 openscap-scanner 가 .
 가 ¹²
- RHEL 6/7, CentOS 6/7: yum install openscap-scanner⁵ yum install scap-
 workbench⁹
- RHEL 8+/CentOS 8+: Fedora dnf ,
¹²
- Debian/Ubuntu: oscap libopenscap8 apt-get install

```
libopenscap85 . Ubuntu SCAP Workbench SSG
sudo apt-get install -y openscap-scanner scap-security-guide
oscap-anaconda-addon17 .
12 .
```

SCAP 가 (SSG) :

- Fedora: dnf install scap-security-guide.¹⁴
- RHEL/CentOS: yum install scap-security-guide.⁹
- Debian 10+/Ubuntu 18.04+: apt install ssg-base ssg-debderived ssg-debian ssg-nondeb ssg-applications.¹⁴

OpenSCAP

	oscap SSG	SCAP Workbench ()	
Fedora	sudo dnf install openscap-scanner scap-security-guide	sudo dnf install scap-workbench	Workbench openscap-scanner .
RHEL/CentOS 7	sudo yum install openscap-scanner scap-security-guide	sudo yum install scap-workbench	가 .
RHEL/CentOS 8	sudo dnf install openscap-scanner scap-security-guide	sudo dnf install scap-workbench	
Ubuntu 18.04+	sudo apt update && sudo apt install openscap-scanner scap-security-guide	sudo apt install scap-workbench	Ubuntu scap-security-guide ssg- ¹⁴ (scap-security-guide ¹⁷)
Debian 10+	sudo apt update && sudo apt install libopenscap8 scap-security-guide (ssg- ¹⁴)	sudo apt install scap-workbench	libopenscap8 SSG oscap ssg-* 가 ⁵ . ¹⁴

가 OpenSCAP (: SSG)

가 , 가
 가 OpenSCAP 가
 가 .

4.2. SCAP 가 (SSG)

SCAP 가 (SSG) SCAP remediation¹⁴ OSCAP SSG¹⁴
 SSG SCAP Workbench⁴
 (: yum install scap-security-guide).⁹ Fedora, RHEL, CentOS, Scientific Linux SSG⁹ SSG
 /usr/share/xml/scap/ssg/content/⁹, XCCDF, OVAL

(*-ds.xml) .³ SSG PCI DSS, STIG, USGCB .¹⁴ SSG
 가 DISA FS0, NSA, Red Hat .¹⁴
 . 가
 . 가
 SSG . 가 .

4.3.

4.3.1.

가 , SSG .⁹
 .⁹ 가
 <datastream_file.xml> oscap info <datastream_file.xml>
 (: oscap info /usr/share/xml/scap/ssg/content/ssg-rhel6-ds.xml).⁹ SCAP
 Workbench .⁹ (: RHEL 8)
 (: CIS Benchmark Level 1) .

4.3.2. 가 oscap

oscap 가 : oscap xccdf eval --profile <profile_id>
 --results <results_file.xml> --report <report_file.html>
 <datastream_file.xml> .⁹ DISA STIG oscap xccdf eval --profile
 selected_profile --results result_file --cpe cpe_dictionary disa_stig_content
 .⁵ 가 .⁹, oscap OVAL
 가 : oscap oval eval....¹⁹ OpenSCAP ,

4.3.3. (HTML, ARF, XCCDF)

. --results-arf arf.xml
 (ARF) .⁹, --report report.html HTML
 .⁹ XCCDF .⁹ HTML
 .⁹, SCAPinoculars ARF HTML
 .¹⁰ 가 , 가 (ARF,
 XCCDF) 가 (HTML)
 OpenSCAP .

4.4. (Tailoring)

. (Tailoring)
 SCAP Workbench .¹³, (fork)
 ID / .¹⁵
 “ ” “ ” .¹⁵ SCAP
 가

15 OpenSCAP XCCDF 1.1 ,
 openscap .13
 (: SSG)
 14 ,
 (15)
 15 ,
 15
 가 ,

5. OpenSCAP

OpenSCAP
 가 . CIS(Center for Internet Security) DISA STIG(Security
 Technical Implementation Guides)
 가 .

5.1. CIS(Center for Internet Security)

CIS
 . OpenSCAP CIS PCI DSS, NIST, FedRAMP,
 FISMA .6 Red Hat RHEL(Red Hat Enterprise
 Linux) CIS scap-security-guide
 .18
 oscap SSG
 .18 가, oscap
 remediation() CIS
 1 Level 2) .18 OpenSCAP Ubuntu CIS (Level
 --remediate
 .17
 OpenSCAP remediation .18, remediation
 , SSG RHEL 8 CIS remediation CIS 100%
 98% .18 SSG
 remediation 가 . 100%
 remediation 가 ,

5.2. DISA STIGs(Security Technical Implementation Guides)

DISA STIG (DoD)
 .5 SCAP 가 (SSG) STIG .20 OpenSCAP DISA STIG 가
 .14 SSG DoD STIG Red Hat RHEL 6 DISA STIG SSG
 .14

STIG `oscap xccdf eval --profile <STIG_profile>...`
⁵, STIG OpenSCAP/SSG /usr/share/xml/scap/ssg/content
²⁰ STIG remediation Ansible DISA 가
 (Supplemental Automation Content) ²⁰

SSG, Red Hat, DISA FS0 NSA STIG ¹⁴
 가 DoD , DoD STIG
 가 가 (SSG) STIG

5.3. (: FISMA, HIPAA, PCI-DSS, NIST SP 800-53)

OpenSCAP CIS STIG . SCAP
 NIST SP 800-53 ¹, FISMA ¹
 PCI-DSS 가 (⁵, SSG가 PCI DSS ¹⁴), Oracle
 Linux SSG HIPAA “ ” ¹⁶.SCAP
 NIST ¹

OpenSCAP FISMA, HIPAA, PCI-DSS, NIST SP 800-53 ¹
 SCAP 가 가 (OVAL)
 OpenSCAP 가 SSG 가

6. OpenSCAP

OpenSCAP

- 6.1. : OpenSCAP ⁷
 가 가 ¹ 가 ⁷
- 6.2. : SCAP ¹
 , SCAP “ ” ⁶, SCAP 가
- 6.3. (): OpenSCAP ⁴ SCAP
⁶, OpenSCAP (SCC + OVAL) Nessus
²¹ OpenSCAP ²²
- 6.4. :
⁷ 가 ⁷, remediation
⁸ OpenSCAP 가
- 6.5. : ⁷ CLI oscap
 . OpenSCAP

• 6.6. : Jenkins, Ansible

OpenSCAP

(6.1) (6.4). (6.2) (6.3) (6.6) 가

7.

OpenSCAP

가 가 OpenSCAP

OpenSCAP

가 (: 2GB) "Out of memory: Killed process (oscap)" "Memory allocation failed" 가

OpenSCAP

OSCAP_PROBE_MEMORY_USAGE_RATIO OSCAP_PROBE_IGNORE_PATHS (: /home) remediation 가 / , oscap 가

SCAP

(XCCDF, OVAL) 가 SCAP 가 OpenSCAP

(Coverage Gaps)

SSG RHEL 8 CIS remediation 98% 100% 가

SSG 100% 가

OpenSCAP

24

가

18

8

SCAP 가

SSG

SSG

8. OpenSCAP :

OpenSCAP 가

Nessus

Qualys

VMDR OpenSCAP

8.1. OpenSCAP Nessus

OpenSCAP Nessus

가

가

- / : Nessus (Nessus Attack Scripting Language) remediation .²¹ OpenSCAP SCAP .
SCAP DoD , Nessus SCAP .
(: RHEL 8 SCAP).²¹ Tenable(Nessus) Nessus SCAP .
²¹
- : OpenSCAP 96%
Nessus 72%²⁵ , 가 .
- Remediation: OpenSCAP remediation (: CIS Ansible) .¹⁸
Nessus remediation .²¹
- UI: OpenSCAP , Nessus GUI .²¹
Nessus OpenSCAP(SCC + OVAL) .²¹
- : SCAP(OpenSCAP) DoD .²¹ Nessus
²⁶

8.2. OpenSCAP Qualys VMDR

OpenSCAP Qualys VMDR

가

- / : OpenSCAP SCAP .²² Qualys
VMDR IT, OT, IoT
(VMDR) .²² Qualys , ,
가 .²²
- : (, , OS) .²² , Qualys
- : OpenSCAP SCAP /

- : OpenSCAP . Qualys VMDR 가 (가)
- : OpenSCAP (가) , OpenSCAP , Qualys (27) , Qualys).

8.3. : OpenSCAP, Nessus, Qualys VMDR

OpenSCAP, Nessus, Qualys VMDR

	OpenSCAP	Nessus (Tenable)	Qualys VMDR
	SCAP 가 (OVAL) ,	,	(VMDR),
	SCAP (XCCDF, OVAL, CPE, CVE)	, NASL , Tenable	,
	()	(Nessus Pro, Tenable.io)	()
SCAP		가 ; SCAP	/ 가 , SCAP 가
	(SSG STIG, CIS) (oscap)	GUI,	(IT/OT/IoT)
	HTML, ARF, XCCDF; / ,	가 ,	,
Remediation	remediation 가 (: SSG Ansible)	remediation	,
	/ ,	가, ,	, ,
	CLI (oscap), GUI (SCAP Workbench)	GUI (Nessus Pro, Tenable.io)	
	SCAP 가 , ,	가, ,	VMDR 가 , MSSP,

OpenSCAP 가 SCAP STIG CIS . Nessus Qualys . OpenSCAP 가 , SCAP 가 .

, OpenSCAP SCAP , Nessus Qualys SCAP
 가 OpenSCAP SCAP SCAP
 OpenSCAP 가 , “ ” SCAP

9.

OpenSCAP , OpenSCAP

9.1. OpenSCAP: , API

OpenSCAP , OpenSCAP cmake make ,
 Fedora, RHEL, Ubuntu/Debian
 OSCAP_SCHEMA_PATH (oscap -v), (LD_LIBRARY_PATH,
 OpenSCAP Base C API ,
 lcov, genhtml 가

9.2. OpenSCAP

OpenSCAP , GitHub , GitHub
 , API , OpenSCAP 가 ,
 OpenSCAP

10.

OpenSCAP , OpenSCAP , , ,
 가

10.1. OpenSCAP 가

OpenSCAP 가 , , SCAP , , : .

- : 가
- : CVE, CPE, XCCDF, OVAL
- :
- : 가 , ,

OpenSCAP , , .

10.2. OpenSCAP

DevSecOps, , OpenSCAP , OpenShift Compliance Operator¹⁰ IT .

OpenSCAP , , SCAP 가 “ (Shift Left)” “ (Security as Code)” , OpenSCAP . (XCCDF) OpenSCAP .¹ OpenSCAP 가 .

OpenSCAP SCAP 가 (SSG) 가 가 , , IoT . OpenSCAP ¹⁴ () , OpenSCAP SCAP . , OpenSCAP .

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