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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 .¹ SCAP
(NIST) 800-53(SP 800-53)
¹ (FISMA)
¹ SCAP
NIST가 (NVD) .¹ SCAP
,
.
.
¹ SCAP
가 ,
¹ SCAP
NIST , 가 , NIST FISMA
¹ NIST SCAP
, FISMA
SCAP
가 , SCAP “ ”
“ ”¹
.

1.2. OpenSCAP :

OpenSCAP(OSCAP) SCAP .³ SCAP
, SCAP
¹ OpenSCAP SCAP 가 (SSG) 가 (oscap)
³ OpenSCAP SCAP
,

가

SCAP

가

OpenSCAP

,

,

1.3.

,

,

가

SCAP

가

“ (plumbing)”

PCI

DSS, NIST, FedRAMP, FISMA

IT

가

가

OpenSCAP

가

7

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 (:)

1

• CVE (Common Vulnerabilities and Exposures):

1

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

3.1. OpenSCAP :

OpenSCAP .⁵
SCAP SCAPTimony, OpenSCAP
SCAP Workbench, Red Hat Satellite
Daemon .⁵ OpenSCAP Base C API
SCAP .¹¹ 가
, API , OpenSCAP SCAP . C API¹¹ OpenSCAP
가 , 가
. API 가
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
oscap (verbose) ¹² oscap
(CLI)
. GUI OpenSCAP , CI/CD
. oscap⁵ , CLI
(: 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
⁹ (tailoring) ¹³ SCAP Workbench
 . oscap CLI SCAP Workbench GUI⁵
 OpenSCAP CLI 가
 OpenSCAP 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
 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 scanner openscap- .
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- ssg-security-guide ¹⁴ (¹⁷)
Debian 10+	sudo apt update && sudo apt install libopenscap8 scap-security-guide (¹⁴ ssg-)	sudo apt install scap-workbench	libopenscap8 oscap SSG ssg-* 가 ⁵ ¹⁴

가 OpenSCAP (: SSG)

. , 가

가 OpenSCAP

, 가

4.2. SCAP 가 (SSG)

SCAP 가 (SSG) SCAP , remediation¹⁴ OSCAP SSG⁴ SSG SCAP Workbench (: 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, USGCB¹⁴ SSG
 가 DISA FSO, NSA, Red Hat¹⁴
 . 가
 SSG 가 .

4.3.

4.3.1.

가 , SSG⁹
 .⁹ 가
 <datastream_file.xml> oscan info <datastream_file.xml>
 (: oscan info /usr/share/xml/scap/ssg/content/ssg-rhel6-ds.xml).⁹ SCAP
 Workbench⁹ (: RHEL 8)
 (: CIS Benchmark Level 1)

4.3.2. 가 oscan

oscan 가 : oscan xccdf eval --profile <profile_id>
 --results <results_file.xml> --report <report_file.html>
 <datastream_file.xml>.⁹ DISA STIG oscan xccdf eval --profile
 selected_profile --results result_file --cpe cpe_dictionary disa_stig_content
 .⁵ 가 , oscan OVAL
 가 : oscan 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 Workbench¹³, (fork)
 ID /¹⁵
 “ ” “ ”¹⁵ SCAP
 가

OpenSCAP XCCDF 1.1

openscap

(: SSG)

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 . Red Hat RHEL(Red Hat Enterprise Linux) CIS scap-security-guide

oscap SSG

remediation()

1 Level 2)

Ansible

OpenSCAP Ubuntu

CIS (Level

--remediate

OpenSCAP remediation

, SSG RHEL 8 CIS

98%

remediation 가

remediation 가

5.2. DISA STIGs(Security Technical Implementation Guides)

DISA STIG (DoD)

OpenSCAP

SCAP 가 (SSG) STIG

SSG DoD STIG Red Hat

DISA STIG 가

RHEL 6 DISA STIG SSG

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)
 SSG가
 OpenSCAP 가 SSG 가

6. OpenSCAP

OpenSCAP

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

- 6.6. : Jenkins, Ansible ⁷

OpenSCAP (6.1) (, 6.3) 가 , (6.4). (6.2) (6.6) , , 가 . , 가 .

7.

OpenSCAP 가 가 . OpenSCAP

OpenSCAP 가 (: 2GB) ²⁴ “Out of memory: Killed process (oscap)” “Memory allocation failed” 가 ²⁴ / , / ²⁴ .

OSCAP_PROBE_MEMORY_USAGE_RATIO , OSCAP_PROBE_IGNORE_PATHS (: /home) , remediation , , oscap ²⁴ 가 / 가 .

SCAP

가 ⁸ SCAP (XCCDF, OVAL) , 가 (²⁴ “ 가 ” OpenSCAP , SCAP , , .

(Coverage Gaps)

SSG RHEL 8 CIS remediation 98% ¹⁸ 100% 가 , CIS “ ” ¹⁸ . SSG 100% 가 , .

OpenSCAP

가

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

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 /

가

- : OpenSCAP . Qualys IT, OT, IoT 가
- : OpenSCAP . Qualys VMDR (가
- : OpenSCAP () . Qualys (가) , OpenSCAP , 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		; SCAP 가	, SCAP / 가 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 SCAP STIG CIS
가
Nessus Qualys
OpenSCAP
가 가

, OpenSCAP SCAP , Nessus Qualys SCAP
가
21
OpenSCAP SCAP
가
가
OpenSCAP
" SCAP

9.

OpenSCAP

OpenSCAP

9.1. OpenSCAP: , , API

OpenSCAP , OpenSCAP
12
OpenSCAP cmake make
Fedora, RHEL, Ubuntu/Debian
12
(oscap -v), (LD_LIBRARY_PATH,
OSCAP_SCHEMA_PATH) 12 OpenSCAP Base C API 11,
OpenSCAP
lcov, genhtml 가 12

9.2. OpenSCAP

OpenSCAP , GitHub 18 GitHub
12
12, API 11, 18
OpenSCAP 가
가 OpenSCAP

10.

OpenSCAP
가 OpenSCAP , , , ,
가

10.1. OpenSCAP 가

OpenSCAP 가 , SCAP ,

가 :

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

OpenSCAP ,

10.2. OpenSCAP

DevSecOps, OpenSCAP

OpenShift Compliance Operator¹⁰

OpenSCAP 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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