RED HAT SUMMIT

10 YEARS *and counting*

SAN FRANCISCO | APRIL 14-17, 2014

Applied SCAP

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45 MINUTES, 3 GOALS (+15 MIN Q&A)

1. Detail Security Automation Technology + Initiatives
   - Native Tooling [OpenSCAP]
   - Configuration Compliance [SCAP Security Guide]
   - Evolving Remediation Capabilities [currently, bash + puppet]

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2. Live Demo
   - Configuration Compliance Scanning
   - Patch & Vulnerability Scanning
   - Certification/Accreditation Paperwork Generation

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   - Configuration Compliance Scanning
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3. Discuss Roadmap (Gov't Plans, Packaging, Future Profiles)

FIRST, AN SCAP PRIMER

- A family of specifications managed by NIST
- Really a bunch of XML schema
  - which are data formats
  - so not a protocol at all, it turns out
  - openly defined, community developed, and *evolving*

… So, what kind of data do these formats organize?

FIRST, AN SCAP PRIMER

- Defines standardized formats … *okay, but why bother?*
- Because you'll get:
  - Standardized inputs (e.g. a compliance baseline, status query)
  - Standardized outputs (results)
- Provides the enterprise ***liberty*** with regard to product choices
  - Avoids vendor lock-in, enables interoperability
  - Provides common technical position to vendors
  - Federal procurement language *requires* SCAP support in some cases

SCAP Security Guide

https://fedorahosted.org/scap-security-guide/

Contributors Include...

OAK RIDGE
National Laboratory

TRESYS
TECHNOLOGY

LOCKHEED MARTIN

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

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In A Nutshell, SCAP Security Guide…

… has had 2,408 commits from 36 contributors, representing 224,872 lines of code

… took an estimated 43 years of effort (COCOMO model)

… has become upstream for all Red Hat STIGs, NIST NVD for JBoss, NSA's RHEL SNAC Guides

DISA STIG, Version 1, Release 2, Section 1.1:

“The consensus content was developed using an open source project called SCAP Security Guide. The project’s website is https://fedorahosted.org/scap-security-guide/.

Except for differences in formatting to accommodate the DISA STIG publishing process, the content of the RHEL6 STIG should mirror the SCAP Security Guide content with only minor divergences as updates from multiple sources work through the consensus process”

RHEL 5 STIG:

RHEL 6 STIG:

RHEL 7 STIG:

RHEL 5 STIG: 1,988 DAYS

RHEL 6 STIG:

RHEL 7 STIG:

RHEL 5 STIG: 1,988 DAYS

RHEL 6 STIG: 932 DAYS

RHEL 7 STIG:

RHEL 5 STIG: 1,988 DAYS

RHEL 6 STIG: 932 DAYS

RHEL 7 STIG: +/- 90 DAYS

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TECH + INITIATIVES

Native Tooling, Configuration Compliance, Evolving Remediation Capabilities

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TOOLS

VS

CONTENT

OpenSCAP

SCAP ACRONYM: XCCDF

- eXtensible Configuration Checklist Description Format
  - Human(ish) readable, format for configuration <Rule>s
  - <Rule>s selected to form <Profile>s
    - <refine-value>s

SCAP ACRONYM: OVAL

- Open Vulnerability and Assessment Language
  - Specifies how to get information about system configuration
  - Stores it in a structured, well defined format

XCCDF PROFILES

- Shipping as of 16-APR-2014:
  - C2S: Commercial baseline derived from CIS v1.2.0 [1] (go google “Amazon C2S”…)
  - CS2: RHEL6 baseline example for Intelligence Community
  - CSCF: NRO’s Centralized Super Computer Facility (CSCF) Baseline (cross domain controls from CNSSI 1253)
  - STIG: U.S. DoD RHEL6 baseline, produced by DISA FSO

[1] https://benchmarks.cisecurity.org/tools2/linux/CIS_Red_Hat_Enterprise_Linux_6_Benchmark_v1.2.0.pdf

REMEDIATION CAPABILITIES

- Bash first

```
<fix system="urn:xccdf:fix:script:sh">
  yum -y install screen
</fix>
```

REMEDIATION CAPABILITIES

- Bash first

- Soon(ish), puppet

```
<fix-group id="puppet-clip”
  system="urn:xccdf:fix:script:puppet xmlns="http://checklists.nist.gov/xccdf/1.1">

   <fix rule="disable_vsftp">class vsftp</fix>
   <fix rule="package_aide_installed">class aide</fix>

</fix-group>
```

<result>Error</result>

```
<rule-result idref="xccdf_moc.elpmaxe.www_rule_1”
 time="2013-03-22T19:15:11" weight="1.000000">

   <result>error</result>

   <message severity="info">
     Fix execution comleted and returned: 1
   </message>

   <message severity="info">
     Loaded plugins: auto-update-debuginfo, langpacks, presto,
     refresh-packagekit

     You need to be root to perform this command.
   </message>
 </rule-result>
```

<result>Fixed</result>

<rule-result idref="xccdf_moc.elpmaxe.www_rule_1” time="2014-03-22T19:16:03" weight="1.000000">
<result>fixed</result>
<message severity="info">Fix execution completed and returned: 0</message>
<message severity="info">
....
Remove 1 Package
Installed size: 53 k
Downloading Packages:
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
Erasing : 1:telnet-server-0.17-51.fc16.x86_64 1/1
Verifying : 1:telnet-server-0.17-51.fc16.x86_64 1/1

Removed:
telnet-server.x86_64 1:0.17-51.fc16
</message>

REMEDIATION REVIEW

- Bash first
- Soon(ish), puppet
- Reference Šimon Lukašík's blog for a great write-up: http://isimluk.livejournal.com/3573.html
- Thank you Peter Vrabec & Martin Preisler for the work on OpenSCAP!

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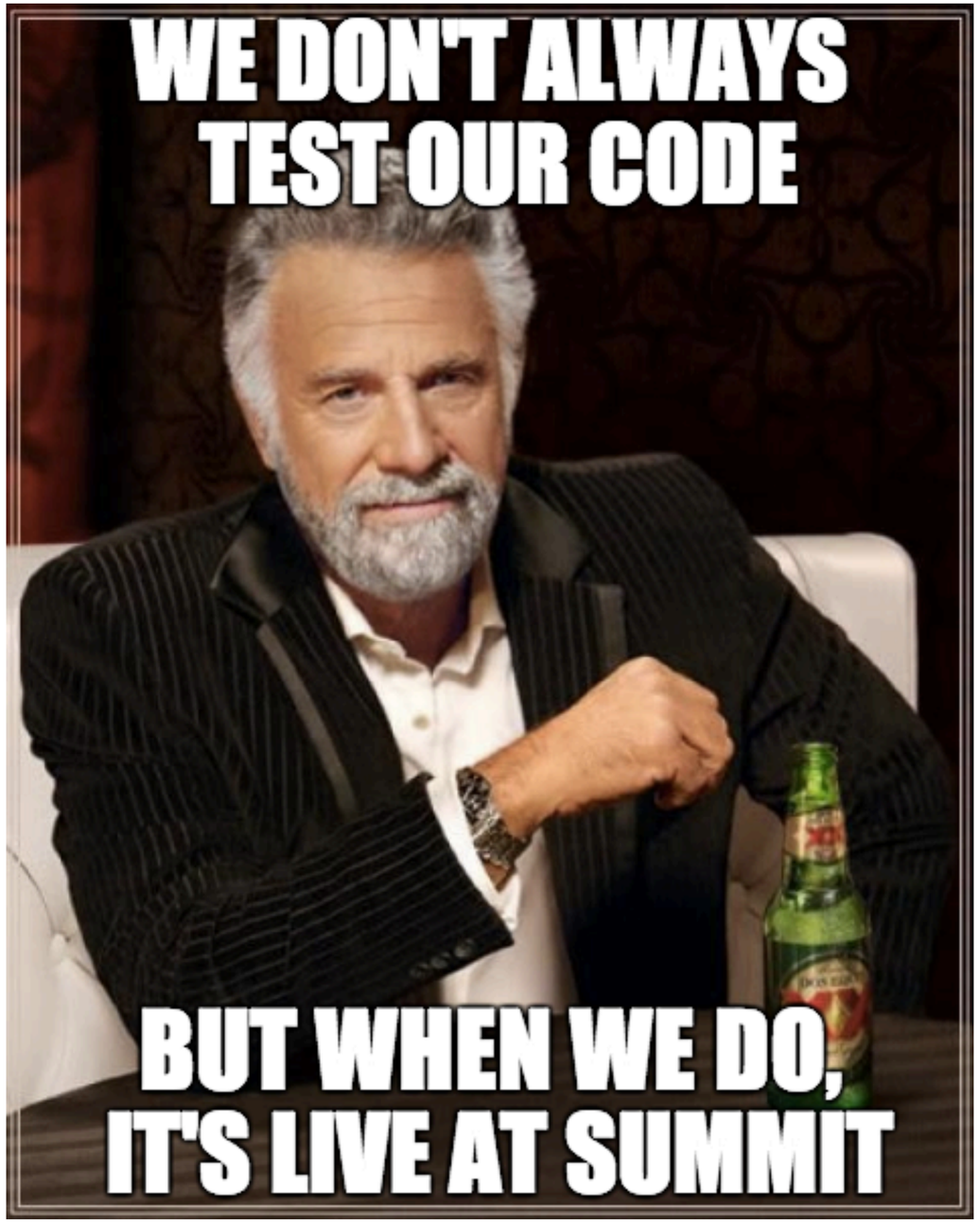
LIVE DEMO

Patch & vuln. Scanning, configuration baseline scanning, Certification & Accreditation Paperwork Generation


WE DON'T ALWAYS
TEST OUR CODE
BUT WHEN WE DO,
IT'S LIVE AT SUMMIT

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ROADMAP

Gov’t Initiatives, SSG Packaging, Future Profiles

Government Initiatives

- Continuous Diagnostics and Mitigations (CDM) http://www.dhs.gov/cdm
- SCAP path forward
- Evaluation + Configuration activities for Certification and Accreditation

RPM Packaging

- Currently in EPEL, both Fedora and RHEL
  (thank you, Jan Lieskovsky!)

- SSG scheduled to ship in RHEL 6.6
  - https://bugzilla.redhat.com/show_bug.cgi?id=1038655

- RHEL 7 GA

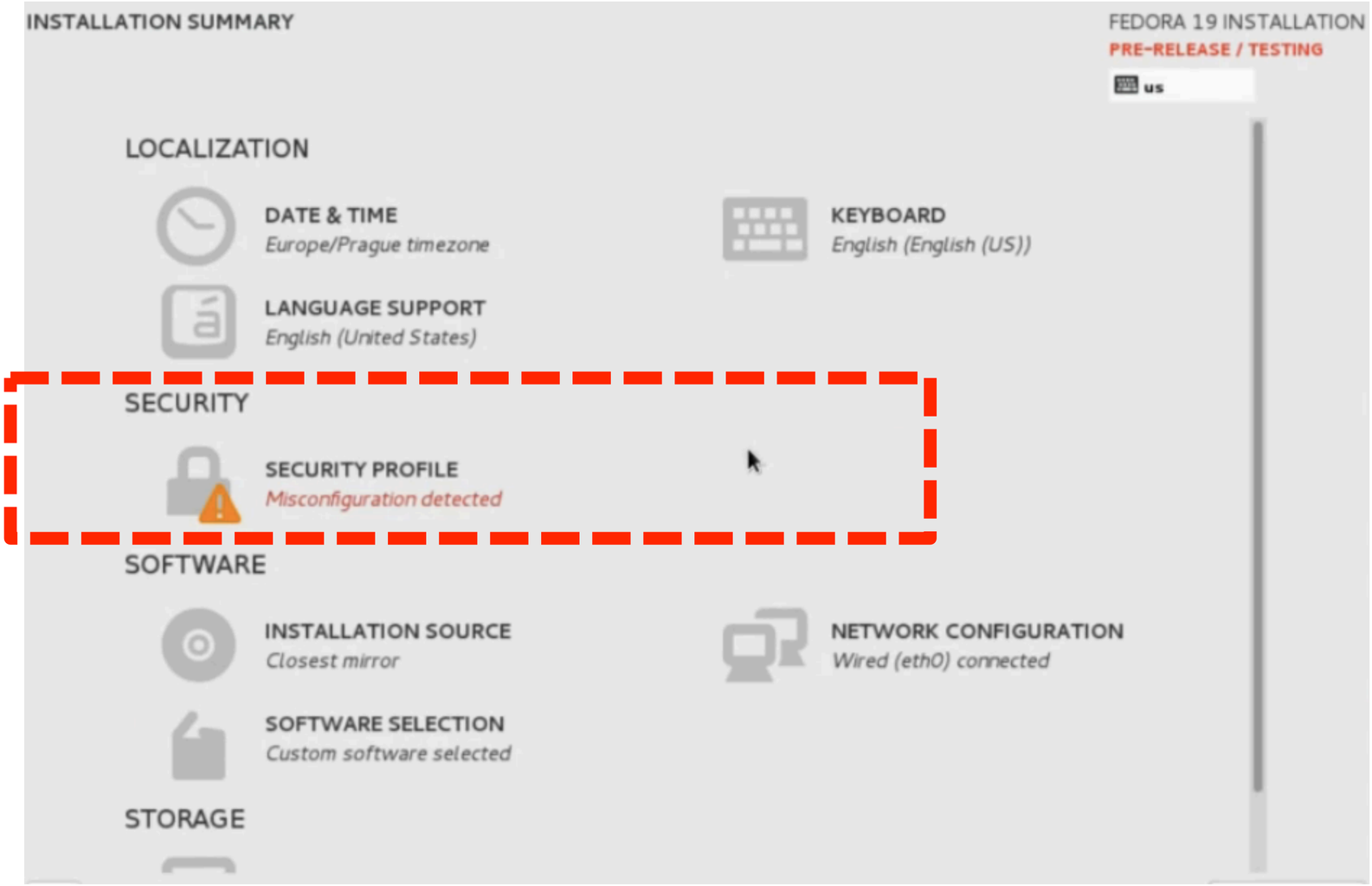
SCAP + Anaconda Integration

- <fix> elements targeting installation process
- Kickstart support allowing specification of SCAP content
- UI screen(s) that provide ways to set values
- Project started as Vratislav Podzimek's masters thesis
  http://is.muni.cz/th/324874/fi_m/?lang=en (thanks, Vratislav!)
- https://fedorahosted.org/oscap-anaconda-addon/

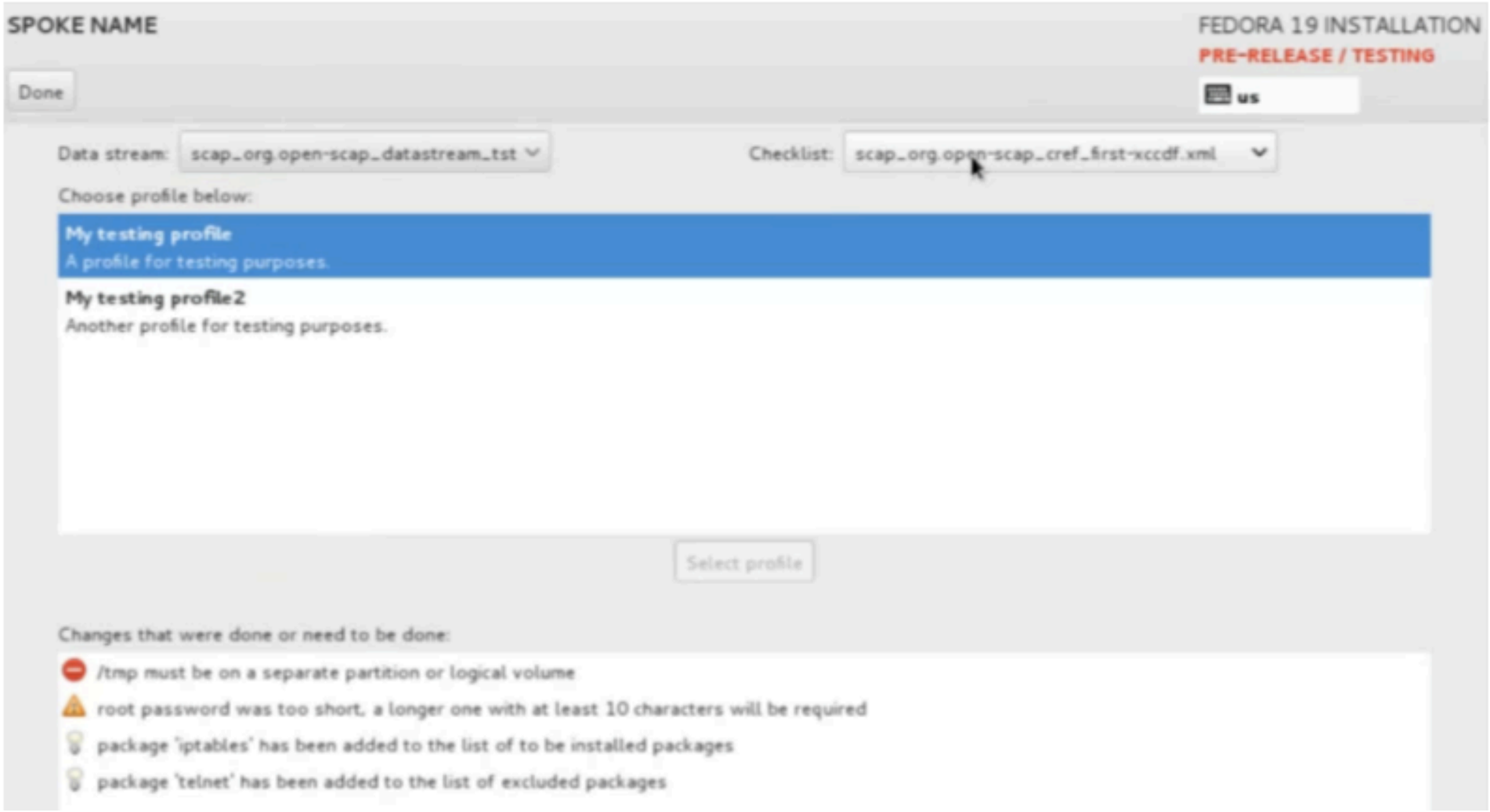
SCAP + Anaconda Integration (1 / 3)

```
 1 this is a simple kickstart file for testing OSCAP addon's features
 2
 3 # values saving a lot of clicks in the GUI
 4 lang en US.UTF-8
 5 keyboard --xlayour=us --vckeymap=us
 6 timezone Europe/Prague
 7 rootpw aaaaa
 8 bootloader --location=mbr
 9 clearpart --initlabel --all
10 autopart --type=plain
11
12 %packages
13 vim
14 %end
15
16 %addon org_fedora_oscap
17         content-type = archive
18         content-url = http://192.168.122.1/xccdf_content.zip
19         profile = xccdf_com.stig-rhel6-server
20         xccdf-path = xccdf.xml
21 %end
```

SCAP + Anaconda Integration (2 / 3)



SCAP + Anaconda Integration (3 / 3)



SCAP Workbench

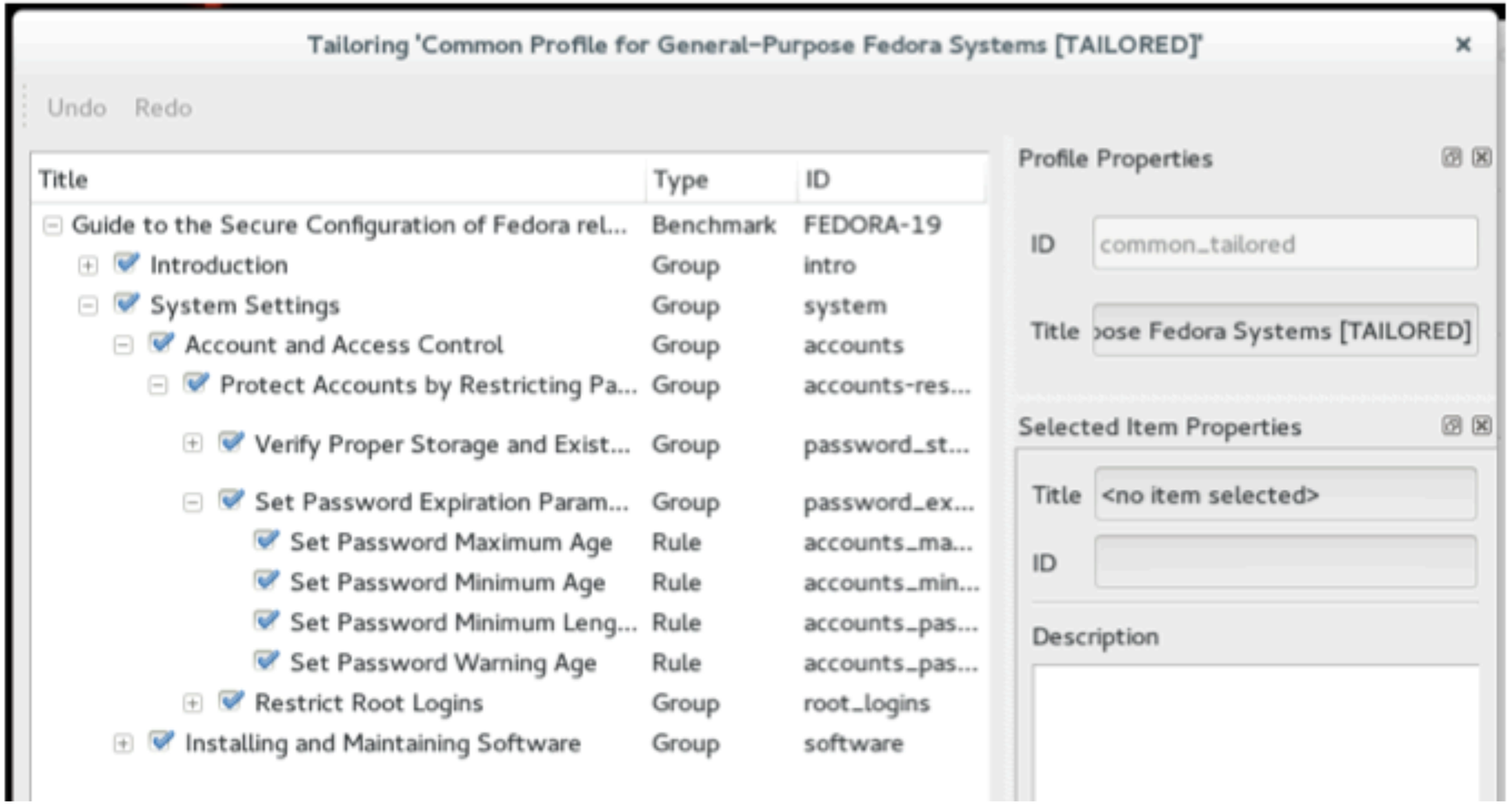
GUI tool that serves as an SCAP scanner and provides tailoring functionality.

Primary Goals:

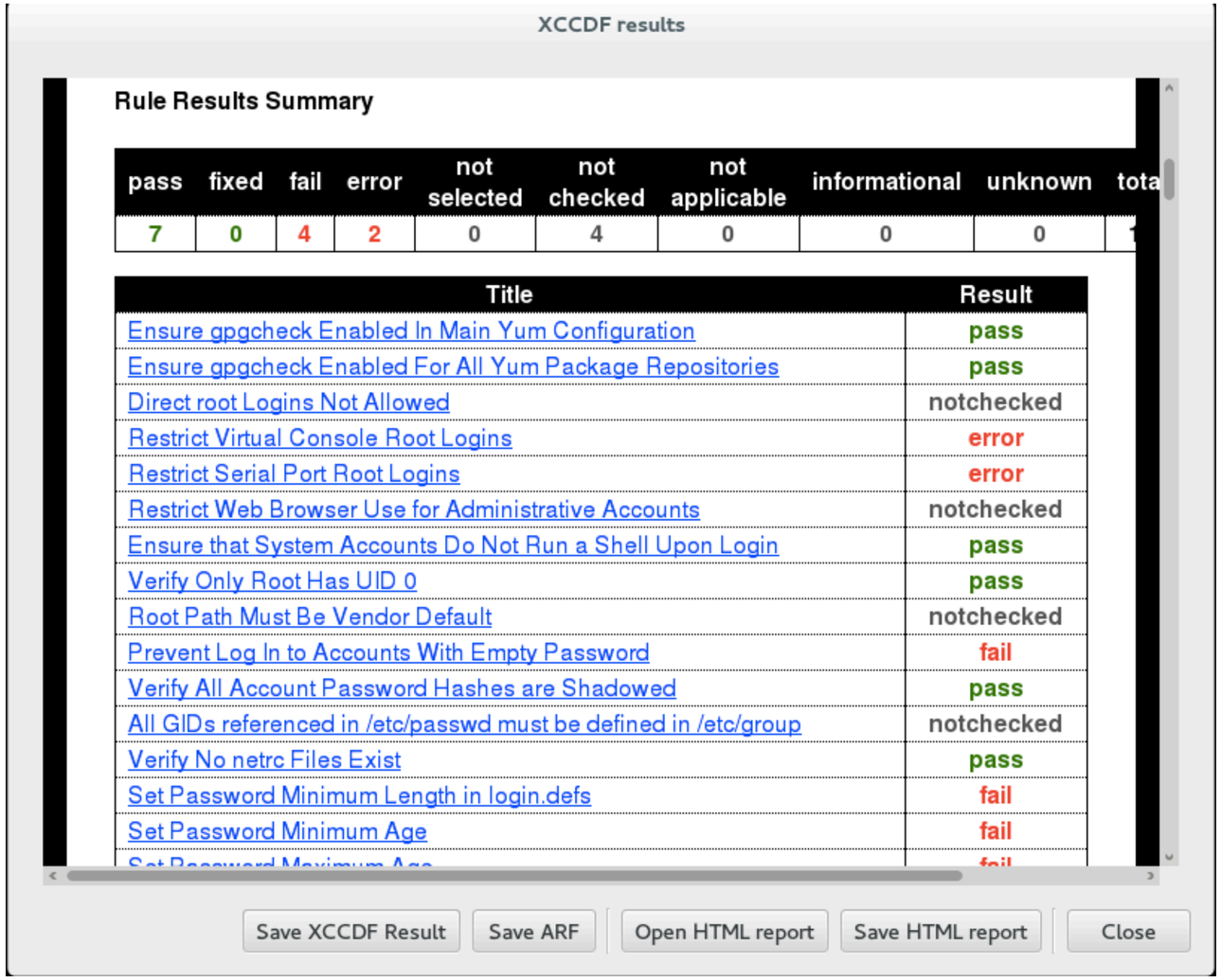
- Lower the initial barrier of using SCAP.
- Great for hand-tuning content before enterprise deployment (e.g. via spacewalk/RHN Satellite)

https://fedorahosted.org/scap-workbench/

SCAP Workbench（1 / 2）



SCAP Workbench（2 / 2）




WE CAN DO MORE
WHEN WE WORK
TOGETHER

SUPPLEMENTAL

Helpful Links

Helpful Links (to community projects)

- SCAP Security Guide: https://fedorahosted.org/scap-security-guide/
- OpenSCAP: http://open-scap.org/
- OSCAP Anaconda: https://fedorahosted.org/oscap-anaconda-addon/
- SCAP Workbench: https://fedorahosted.org/scap-workbench/

Helpful Links (to government baselines)

- DISA's Security Technical Implementation Guides (STIGs)
  http://iase.disa.mil/stigs/

- NIST National Checklist Program Repository
  http://web.nvd.nist.gov/view/ncp/repository

- NSA Security Configuration Guides
  http://www.nsa.gov/ia/mitigation_guidance/security_configuration_guides/

Helpful Links (to communities of interest)

- Red Hat's Government Security User Group (gov-sec)
  http://www.redhat.com/mailman/listinfo/gov-sec

- Military Open Source Software (Mil-OSS)
  http://mil-oss.org/

Replicating the Demo

- *Assumes RHEL 6 and EPEL already enabled!*
- *Assumes httpd installed, DocumentRoot /var/www/html/*
- *My IP was 10.211.55.3. Change as appropriate.*
- *This is meant to replicate the demo, not fully explain it.*
  Come to Summit next year!

Step 1: Install

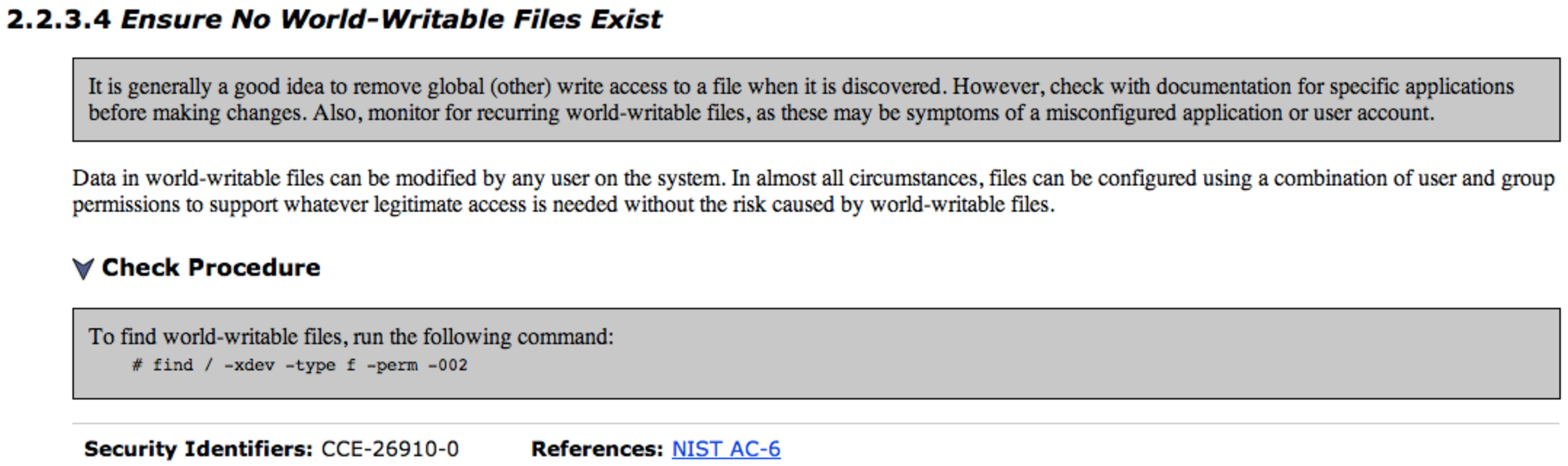
```
$ yum install scap-security-guide

$ rpm –ql scap-security-guide
. . .
/usr/share/doc/scap-security-guide-0.1/rhel6-guide.html
. . .
/usr/share/man/en/man8/scap-security-guide.8.gz
. . .
/usr/share/xml/scap/ssg/content
. . .
/usr/share/xml/scap/ssg/content/ssg-rhel6-ds.xml
```

Step 2: Review Prose Guide

$ cp /usr/share/doc/scap-security-guide-0.1/*.html /var/www/html

$ firefox http://10.211.55.3/rhel6-guide.html

- Review “Check Procedure,” “Security Identifiers,” “References”



2.2.3.4 *Ensure No World-Writable Files Exist*

It is generally a good idea to remove global (other) write access to a file when it is discovered. However, check with documentation for specific applications before making changes. Also, monitor for recurring world-writable files, as these may be symptoms of a misconfigured application or user account.

Data in world-writable files can be modified by any user on the system. In almost all circumstances, files can be configured using a combination of user and group permissions to support whatever legitimate access is needed without the risk caused by world-writable files.

Check Procedure

To find world-writable files, run the following command:

```
# find / -xdev -type f -perm -002
```

Security Identifiers: CCE-26910-0 **References:** NIST AC-6

Step 3: JBoss, too!

$ firefox http://10.211.55.3/JBossEAP5_Guide.html

JBoss by Red Hat

Security Benchmark JBoss Enterprise Application Platform 5.x

Status: accepted Date: 2012-07-06

Notice

This content was developed by Red Hat, Inc. for use by JBoss Enterprise Application Platform 5.x Administrators and is released under the GNU Lesser General Public License v3.
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Table of Contents

Step 4: XCCDF vs DATASTREAMS

```
$ grep "<Profile" /usr/share/xml/scap/ssg/content/ssg-rhel6-ds.xml
  <Profile id="xccdf_org.ssgproject.content_profile_CS2”>
  <Profile id="xccdf_org.ssgproject.content_profile_stig-rhel6-server-upstream">
```

```
$ grep "<Profile" /usr/share/xml/scap/ssg/content/ssg-rhel6-xccdf.xml
  <Profile id="CS2”>
  <Profile id="stig-rhel6-server-upstream”>
```

Step 5: Run a scan!

```
$ sudo oscap xccdf eval --profile C2S \
  --cpe /usr/share/xml/scap/ssg/content/ssg-rhel6-cpe-dictionary.xml \
  --report /var/www/html/summit-report.html \
  --results /var/www/html/summit-results.xml \
  /usr/share/xml/scap/ssg/content/ssg-rhel6-xccdf.xml
```

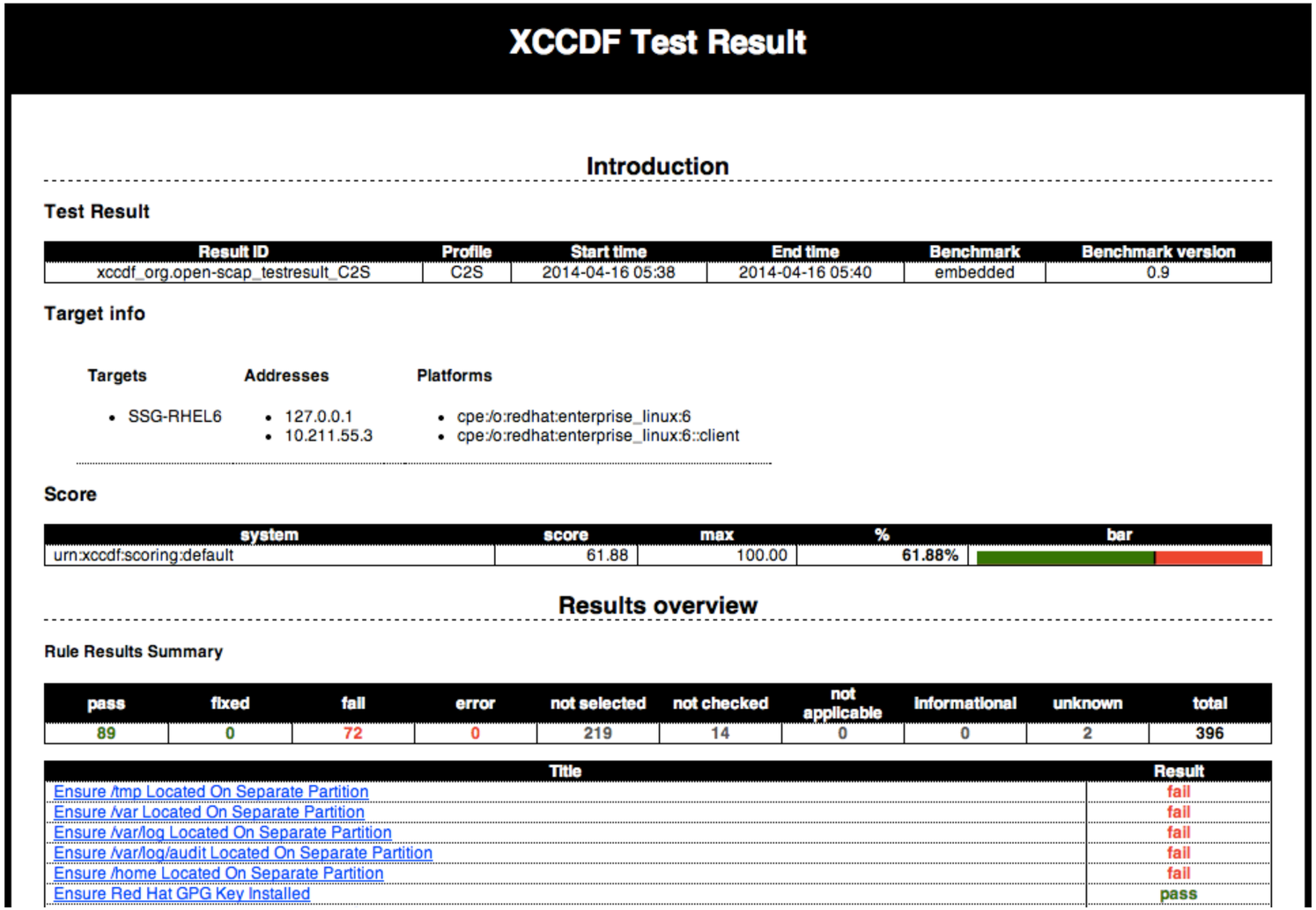
Console Output:

- Pass
- Fail
- “notchecked”: (a) not applicable; (b) no OVAL associated
  … and unclear which reason!

Step 6: HTML Results

$ firefox /var/www/html/summit-report.html

Step 6: HTML Results



XCCDF Test Result

Introduction

Test Result

Result ID	Profile	Start time	End time	Benchmark	Benchmark version
xccdf_org.open-scap_testresult_C2S	C2S	2014-04-16 05:38	2014-04-16 05:40	embedded	0.9

Target info

Targets	Addresses	Platforms
• SSG-RHEL6	• 127.0.0.1 • 10.211.55.3	• cpe:/o:redhat:enterprise_linux:6 • cpe:/o:redhat:enterprise_linux:6::client

Score

system	score	max	%	bar
urn:xccdf:scoring:default	61.88	100.00	61.88%	

Results overview

Rule Results Summary

pass	fixed	fail	error	not selected	not checked	not applicable	informational	unknown	total
89	0	72	0	219	14	0	0	2	396

Title	Result
Ensure /tmp Located On Separate Partition	fail
Ensure /var Located On Separate Partition	fail
Ensure /var/log Located On Separate Partition	fail
Ensure /var/log/audit Located On Separate Partition	fail
Ensure /home Located On Separate Partition	fail
Ensure Red Hat GPG Key Installed	pass

Step 6: HTML Results

Result for Verify that All World-Writable Directories Have Sticky Bits Set

Result: fail

Rule ID: **sticky_world_writable_dirs**

Time: **2014-04-16 05:39**

Severity: **low**

When the so-called 'sticky bit' is set on a directory, only the owner of a given file may remove that file from the directory. Without the sticky bit, any user with write access to a directory may remove any file in the directory. Setting the sticky bit prevents users from removing each other's files. In cases where there is no reason for a directory to be world-writable, a better solution is to remove that permission rather than to set the sticky bit. However, if a directory is used by a particular application, consult that application's documentation instead of blindly changing modes.
To set the sticky bit on a world-writable directory *DIR*, run the following command:

```
# chmod +t DIR
```

Failing to set the sticky bit on public directories allows unauthorized users to delete files in the directory structure.

The only authorized public directories are those temporary directories supplied with the system, or those designed to be temporary file repositories. The setting is normally reserved for directories used by the system, by users for temporary file storage (such as `/tmp`), and for directories requiring global read/write access.

Security identifiers

- CCE-26840-9

Remediation script

```
               df --local -P | awk {'if (NR!=1) print $6'} \
| xargs -I '{}' find '{}' -xdev -type d \
\( -perm -0002 -a ! -perm -1000 \) 2>/dev/null \
| xargs chmod a+t
```

results overview

Step 7: XML Results

$ firefox /var/www/html/summit-results.xml

/CCE-27024-9

```
<rule-result idref="package_aide_installed" time="2014-04-16T05:39:00" severity="medium" weight="1.000000">
  <result>fail</result>
  <ident system="http://cce.mitre.org">CCE-27024-9</ident>
  <check system="http://oval.mitre.org/XMLSchema/oval-definitions-5">
    <check-content-ref name="oval:ssg:def:244" href="ssg-rhel6-oval.xml"/>
  </check>
</rule-result>
```

Step 8: Remediation

/CCE-27024-9 (← type that again)

note the <fix> tag!

```
<rationale xmlns:xhtml="http://www.w3.org/1999/xhtml" xml:lang="en-US">
    The AIDE package must be installed if it is to be available for integrity checking.
</rationale>
<ident system="http://cce.mitre.org">CCE-27024-9</ident>
<fix xmlns:xhtml="http://www.w3.org/1999/xhtml" system="urn:xccdf:fix:script:sh">
    yum -y install aide
</fix>
<check system="http://oval.mitre.org/XMLSchema/oval-definitions-5">
  <check-content-ref name="oval:ssg:def:244" href="ssg-rhel6-oval.xml"/>
</check>
```

Step 8: Remediation

```
$ oscap xccdf generate fix --result-id xccdf_org.open-scap_testresult_C2S \
  /var/www/html/summit-results.xml \
  > /var/www/html/summit-script.sh.txt
```

```
#!/bin/bash
# OpenSCAP fix generator output for benchmark: Guide to the Secure Configuration of Red Hat
Enterprise Linux 6


# Generating fixes for all failed rules in test result 'xccdf_org.open-scap_testresult_C2S'.

# XCCDF rule: disable_prelink
# CCE-27221-1
#
# Disable prelinking altogether
#
if grep -q ^PRELINKING /etc/sysconfig/prelink
then
  sed -i 's/PRELINKING.*/PRELINKING=no/g' /etc/sysconfig/prelink
else
  echo -e "\n# Set PRELINKING=no per security requirements" >> /etc/sysconfig/prelink
  echo "PRELINKING=no" >> /etc/sysconfig/prelink
fi

#
# Undo previous prelink changes to binaries
#
/usr/sbin/prelink -ua
```