

Testing infrastructure using Chef InSpec

Overview

In this tutorial, we will use [Chef InSpec](#) to perform testing against our infrastructure.

InSpec can be used to perform local or remote tests and compliance validation for auditing purposes.

Description

The working unit of InSpec is a [profile](#) that provides a versioned structure containing checks (i.e. tests); related checks are grouped in "control" blocks. Control is similar to having a high-level rule composed of multiple checks.

In order to check for compliance, the profile along with all respective controls (and corresponding checks) can be run against the local or remote infrastructure; it's also possible to run a single control file.

We'll use the profile [dev-sec/linux-baseline](#) that is available in InSpec's supermarket and run it against a remote host.

Please have a look at the control named "os-11".

https://raw.githubusercontent.com/dev-sec/linux-baseline/master/controls/os_spec.rb

```
#
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# limitations under the License.
#
# author: Christoph Hartmann
# author: Dominik Richter
# author: Patrick Muench

login_defs_umask = attribute('login_defs_umask', value: os.redhat? ? '077' : '027', description: 'Default umask
to set in login.defs')

login_defs_passmaxdays = attribute('login_defs_passmaxdays', value: '60', description: 'Default password
maxdays to set in login.defs')
login_defs_passmindays = attribute('login_defs_passmindays', value: '7', description: 'Default password mindays
to set in login.defs')
login_defs_passwarnage = attribute('login_defs_passwarnage', value: '7', description: 'Default password warnage
(days) to set in login.defs')

shadow_group = 'root'
shadow_group = 'shadow' if os.debian? || os.suse? || os.name == 'alpine'
container_execution = begin
  virtualization.role == 'guest' && virtualization.system =~ /^(lxc|docker)$/
rescue NoMethodError
  false
end

blacklist = attribute(
  'blacklist',
  value: suid_blacklist.default,
  description: 'blacklist of suid/sgid program on system'
)

control 'os-01' do
  impact 1.0
```

```

    title 'Trusted hosts login'
    desc "hosts.equiv file is a weak implemenation of authentication. Disabling the hosts.equiv support helps to
prevent users from subverting the system's normal access control mechanisms of the system."
    describe file('/etc/hosts.equiv') do
        it { should_not exist }
    end
end

control 'os-02' do
    impact 1.0
    title 'Check owner and permissions for /etc/shadow'
    desc 'Check periodically the owner and permissions for /etc/shadow'
    describe file('/etc/shadow') do
        it { should exist }
        it { should be_file }
        it { should be_owned_by 'root' }
        its('group') { should eq shadow_group }
        it { should_not be_executable }
        it { should_not be_readable.by('other') }
    end
    if os.redhat? || os.name == 'fedora'
        describe file('/etc/shadow') do
            it { should_not be_writable.by('owner') }
            it { should_not be_readable.by('owner') }
        end
    else
        describe file('/etc/shadow') do
            it { should be_writable.by('owner') }
            it { should be_readable.by('owner') }
        end
    end
    if os.debian? || os.suse?
        describe file('/etc/shadow') do
            it { should be_readable.by('group') }
        end
    else
        describe file('/etc/shadow') do
            it { should_not be_readable.by('group') }
        end
    end
end

control 'os-03' do
    impact 1.0
    title 'Check owner and permissions for /etc/passwd'
    desc 'Check periodically the owner and permissions for /etc/passwd'
    describe file('/etc/passwd') do
        it { should exist }
        it { should be_file }
        it { should be_owned_by 'root' }
        its('group') { should eq 'root' }
        it { should_not be_executable }
        it { should be_writable.by('owner') }
        it { should_not be_writable.by('group') }
        it { should_not be_writable.by('other') }
        it { should be_readable.by('owner') }
        it { should be_readable.by('group') }
        it { should be_readable.by('other') }
    end
end

control 'os-04' do
    impact 1.0
    title 'Dot in PATH variable'
    desc 'Do not include the current working directory in PATH variable. This makes it easier for an attacker to
gain extensive rigths by executing a Trojan program'
    describe os_env('PATH') do
        its('split') { should_not include('') }
        its('split') { should_not include('.') }
    end
end

```

```

control 'os-05' do
  impact 1.0
  title 'Check login.defs'
  desc 'Check owner and permissions for login.defs. Also check the configured PATH variable and umask in login.defs'
  describe file('/etc/login.defs') do
    it { should exist }
    it { should be_file }
    it { should be_owned_by 'root' }
    its('group') { should eq 'root' }
    it { should_not be_executable }
    it { should be_readable.by('owner') }
    it { should be_readable.by('group') }
    it { should be_readable.by('other') }
  end
  describe login_defs do
    its('ENV_SUPATH') { should include('/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin') }
    its('ENV_PATH') { should include('/usr/local/bin:/usr/bin:/bin') }
    its('UMASK') { should include(login_defs_umask) }
    its('PASS_MAX_DAYS') { should eq login_defs_passmaxdays }
    its('PASS_MIN_DAYS') { should eq login_defs_passmindays }
    its('PASS_WARN_AGE') { should eq login_defs_passwarnage }
    its('LOGIN_RETRIES') { should eq '5' }
    its('LOGIN_TIMEOUT') { should eq '60' }
    its('UID_MIN') { should eq '1000' }
    its('GID_MIN') { should eq '1000' }
  end
end

control 'os-05b' do
  impact 1.0
  title 'Check login.defs - RedHat specific'
  desc 'Check owner and permissions for login.defs. Also check the configured PATH variable and umask in login.defs'
  describe file('/etc/login.defs') do
    it { should_not be_writable }
  end
  describe login_defs do
    its('SYS_UID_MIN') { should eq '201' }
    its('SYS_UID_MAX') { should eq '999' }
    its('SYS_GID_MIN') { should eq '201' }
    its('SYS_GID_MAX') { should eq '999' }
  end
  only_if { os.redhat? }
end

control 'os-06' do
  impact 1.0
  title 'Check for SUID/ SGID blacklist'
  desc 'Find blacklisted SUID and SGID files to ensure that no rogue SUID and SGID files have been introduced into the system'

  describe suid_check(blacklist) do
    its('diff') { should be_empty }
  end
end

control 'os-07' do
  impact 1.0
  title 'Unique uid and gid'
  desc 'Check for unique uids gids'
  describe passwd do
    its('uids') { should_not contain_duplicates }
  end
  describe etc_group do
    its('gids') { should_not contain_duplicates }
  end
end

control 'os-08' do

```

```

impact 1.0
title 'Entropy'
desc 'Check system has enough entropy - greater than 1000'
describe file('/proc/sys/kernel/random/entropy_avail').content.to_i do
  it { should >= 1000 }
end
end

control 'os-09' do
  impact 1.0
  title 'Check for .rhosts and .netrc file'
  desc 'Find .rhosts and .netrc files - CIS Benchmark 9.2.9-10'
  output = command('find / -maxdepth 3 \( -iname .rhosts -o -iname .netrc \) -print 2>/dev/null | grep -v \'^find:\')
  out = output.stdout.split(/\r?\n/)
  describe out do
    it { should be_empty }
  end
end

control 'os-10' do
  impact 1.0
  title 'CIS: Disable unused filesystems'
  desc '1.1.1 Ensure mounting of cramfs, freevxfs, jffs2, hfs, hfsplus, squashfs, udf, FAT'
  only_if { !container_execution }
  efi_dir = inspec.file('/sys/firmware/efi')
  describe file('/etc/modprobe.d/dev-sec.conf') do
    its(:content) { should match 'install cramfs /bin/true' }
    its(:content) { should match 'install freevxfs /bin/true' }
    its(:content) { should match 'install jffs2 /bin/true' }
    its(:content) { should match 'install hfs /bin/true' }
    its(:content) { should match 'install hfsplus /bin/true' }
    its(:content) { should match 'install squashfs /bin/true' }
    its(:content) { should match 'install udf /bin/true' }
    # if efi is active, do not disable vfat. otherwise the system
    # won't boot anymore
    unless efi_dir.exist?
      its(:content) { should match 'install vfat /bin/true' }
    end
  end
end

control 'os-11' do
  impact 1.0
  title 'Protect log-directory'
  desc 'The log-directory /var/log should belong to root'
  describe file('/var/log') do
    it { should be_directory }
    it { should be_owned_by 'root' }
    its(:group) { should match(/^root|syslog$/) }
  end
end

```

To run InSpec against a remote host and produce a JUnit XML report that can be submitted to Xray, we may use the following command.

```
inspec supermarket exec dev-sec/linux-baseline -t ssh://jira:jira@192.168.56.102 --reporter junit:junit.xml
```

After successfully running the Test Case and generating the JUnit XML report (e.g., [junit.xml](#)), it can be imported to Xray (either by the REST API or by using one of the available CI addons or even through **Import Execution Results** action within the Test Execution).

 Calculator / CALC-6099

Execution results - junit.xml - [1578015226058]

EditCommentSynchronize Tests from...More

Stop ProgressResolve IssueClose IssueAdmin

Details

Type:Test Execution

Status:IN PROGRESS (View Workflow)

Priority:Medium

Resolution:Unresolved

Affects Version/s:None

Fix Version/s:None

Component/s:None

Labels:None

Test Environments:None

Test Plan:None

Description

Execution results imported from external source

Tests

+ Add

Overall Execution Status

69PASS41FAIL2TODO

TOTAL TESTS: 112

Each check is mapped to a Generic Test in Jira, and the **Generic Test Definition** field contains the name of the profile followed by the name of the control and some text derived from the assertion being done in the *describe* and inner *it* block.

The Context section contains information about the profile name.

Calculator / Test Execution: CALC-6099 / Test: CALC-6095

File /var/log is expected to be owned by "root"

Export Test as Text

Return to Test Execution

Previous

Next

No defects yet...

No evidence yet...

Execution Details

Test Description

None

Test Details

Test Type:Generic

Definition:linux-baseline.os-11.File /var/log is expected to be owned by "root"

Results

Context	Output	Duration	Status
TestSuite linux-baseline	-	4.449 ms	PASS

Tips

It may be useful to have a Test Plan with all these checks organized hierarchically, so you can track compliance at multiple levels.

1. create an empty Test Plan
2. import the results, so you'll have a Test Execution
3. go to the Test Plan issue screen and add the Test Execution
4. organize the Tests within the Test Plan Board

The screenshot shows the JIRA interface for a Test Plan Board titled "Board for Test Plan CALC-6101". The left sidebar displays a hierarchical tree view with folders: "All" (112), "Orphans" (0), "Board" (112), "os" (58), "package" (10), and "sysctl" (44). The main panel shows a list of test items, each with a status (PASS or FAIL) and a "FAIL" button. The items are organized by the "sysctl" folder.

Item ID	Test Description	Status
CALC-5987	Kernel Parameter net.ipv4.icmp_ratemask value is expected to eq 88089	FAIL
CALC-5988	Kernel Parameter net.ipv4.conf.all.accept_source_route value is expected to eq 0	PASS
CALC-5989	Kernel Parameter net.ipv6.conf.default.max_addresses value is expected to eq 1	FAIL
CALC-5991	Kernel Parameter net.ipv4.ip_forward value is expected to eq 0	PASS
CALC-5992	Kernel Parameter net.ipv6.conf.default.autoconf value is expected to eq 0	FAIL
CALC-5995	Kernel Parameter net.ipv4.conf.all.accept_redirects value is expected to eq 0	FAIL
CALC-5996	Kernel Parameter net.ipv6.conf.default.router_solicitations value is expected to eq 0	FAIL
CALC-6005	Kernel Parameter net.ipv4.tcp_syncookies value is expected to eq 1	PASS
CALC-6006	Kernel Parameter net.ipv6.conf.all.accept_redirects value is expected to eq 0	FAIL

Learn more

To organize the Tests in the Board of the Test Plan, you may use filters based on the Generic Test Definition field, filtering by the name of the profile plus the name of the control.

The screenshot shows the JIRA interface for a Test Plan Board titled "Board for Test Plan CALC-6101". The left sidebar displays a hierarchical tree view with folders: "All" (112), "Orphans" (0), "Board" (112), "os" (58), "package" (10), and "sysctl" (44). The main panel shows a list of test items, each with a status (PASS or FAIL) and a "FAIL" button. The items are organized by the "sysctl" folder. A red arrow points to the "Filter" button in the top right corner. A JQL search dialog is open, showing the search criteria: "Generic Test Definition" ~ "linux-baseline.package".

JQL Search: "Generic Test Definition" ~ "linux-baseline.package"

Then you can easily move the Tests that matter to the folder that you want.

References

- <https://www.inspec.io/>
- <https://www.inspec.io/docs/>
- <https://learn.chef.io/modules/try-inspec#/>
- <http://www.anniehedgie.com/inspec/>
- <https://medium.com/gsktech/always-on-compliance-with-inspec-e3015a229be4>
- <https://github.com/dev-sec/linux-baseline>