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COMPLIANCE AUTOMATION

BRIDGING THE GAP BETWEEN DEVELOPMENT
AND INFORMATION SECURITY

COMPLIANCE AUTOMATION: BRIDGING THE GAP BETWEEN DEVELOPMENT AND INFORMATION SECURITY

Speed is nothing without control. DevOps makes software deployment faster but, without proper controls, that may mean that developers are also releasing security vulnerabilities more quickly. The increasing pace of rapid innovation is a necessity that will not be slowing down. Organizations must learn how to decrease risk by shipping software quickly, but with higher efficiency and lower risk. The solution is to stop treating information security as a bolt-on afterthought. Organizations can achieve both speed and safety by extending Agile, Lean, and DevOps (ALDO) principles to their information security teams and by adopting automation tools that build security into the development cycle.

DEVOPS IS THE NEW OPERATING MODEL

When applied, ALDO principles build high-velocity organizations that use streamlined processes and have the flexibility to respond quickly to changing situations. Continuous delivery puts those principles into practice in service of shipping software faster, safer, and more reliably. In particular, DevOps culture is practiced in the lion's share of IT organizations, with 74% of them being in some phase of DevOps adoption.

Despite its name, DevOps is about more than just the concerns of development and operations teams. DevOps is a cultural philosophy whose goal is to lower barriers between all teams that traditionally work in silos. That goal is accomplished by conveying information to all stakeholders quickly and effectively. The means is to use code, which becomes the source of truth and the mechanism by which teams communicate at scale.

Should your organization practice continuous delivery and follow ALDO principles? Most organizations already understand the value of moving fast so the response seems obvious. But when you ask those same organizations if they can deliver software continuously and still remain compliant with information security standards, their response is anything but obvious. That's because most information security teams don't have the tools to move at high velocity.

TOP PRIORITIES :

1



Faster deployment speed

2



Faster time to resolve service failures

3



Lower failure rate when deploying changes

4



More frequent deployments

5



Involving InfoSec earlier in the development process

6



Ability to deploy compliance remediations faster

DevOps practitioners in the 2017 Chef Survey placed InfoSec and compliance concerns at the bottom of their priority lists.

INFORMATION SECURITY LAGS BEHIND

Despite velocity gains in other parts of the IT organization, information security is still seen to inhibit agility and speed. Gartner reports that among IT operations professionals, 81% say they believe InfoSec policies slow them down. InfoSec professionals agree, with 77% sharing the same dismal view.ⁱⁱ

Further estimates are that, through 2020, 99% of vulnerabilities exploited will continue to be ones known by security and IT professionals for at least one year or more.ⁱⁱⁱ Verizon's Data Breach report shows that for the last three years, more than 88% of observed exploits can be accounted for by only nine known vulnerabilities.^{iv}

InfoSec policies are slow to implement, slow to audit, firmly situated in practices that pre-date the shift toward orienting around automation and high velocity. As a result, they are arguably ineffective.

ii Gartner—DevSecOps: How to Seamlessly Integrate Security Into DevOps 2016

iii Gartner—Predicts 2016: Threat and Vulnerability Management

iv Verizon—Data Breach Investigations Report 2017

Mature DevOps organizations have lowered collaboration barriers with InfoSec teams by extending the same code-driven practices pioneered by development and operations to information security as well. Industry data shows that the secret behind the success of high-performing DevOps teams is that they have expanded their scope to involve InfoSec in every phase of the software development process.

INFORMATION SECURITY BY THE NUMBERS

Organizations are starting to see the value of incorporating security earlier into the development cycle. In the past three years, organizations that test for security requirements throughout their software development processes have increased 80% (from 15% to 27%).^v However, there's still plenty room for improvement.

An estimated 64% of DevOps organizations also have regulatory standards to follow. Of those, 73% wait to assess compliance after development has already started, and 59% don't assess compliance until code is already running in production.^{vi}

That type of bolt-on approach to information security leads to higher levels of technical debt and rework as developed changes often require last minute modifications for acceptance, potentially exposing them to greater risk.



Results from the 2017 Chef Survey

^v Sonatype—DevSecOps Community Survey 2017

^{vi} Chef Software—Chef Survey 2017

Compliance policies exist to enforce application and data security. The more frequently audits occur and vulnerabilities are remediated, the lower the risk of attackers exploiting known vectors. Data shows that 75% of organizations only assess their application infrastructures for compliance on a quarterly (or longer) basis, with 46% of those organizations making assessments at an inconsistent rate. ^{vii}

And after a compliance violation or security vulnerability is discovered



15% of respondents need hours to remediate



30% need days



22% need weeks



6% need months

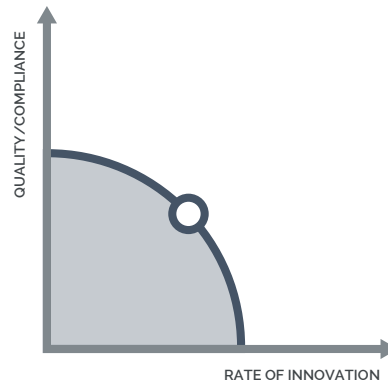
28% need weeks or months to remediate compliance violations or security vulnerabilities.

Further, if vulnerabilities or compliance violations are discovered, one in four organizations needs weeks or months to remediate them. In a world where dozens or even hundreds of builds a day are deployed to production, that response time is simply unacceptable for high-velocity organizations to stay competitive. The challenge is to reconcile the needs of InfoSec with the speed of continuous delivery.

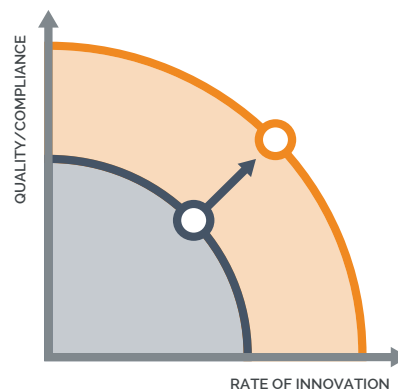
vii Chef Software—Chef Survey 2017

THE TENSION BETWEEN SPEED AND RISK

DevOps teams focus on shipping software fast and increasing speed, whereas InfoSec teams focus on mitigating risk. Historically, these goals have been viewed by the IT industry as diametrically opposed. If companies increased speed, they sacrificed quality and increased risk. If they focused on higher quality and lower risk, they sacrificed speed.



But years of industry data now show that this perception is a myth. High-performing DevOps teams scale both speed and quality by shifting compliance into the software development process as part of their daily work, rather than retrofitting security at the end.^{viii} Security becomes an integral part of continuous delivery because verifying compliance requirements is another part of automated testing processes that already occur.



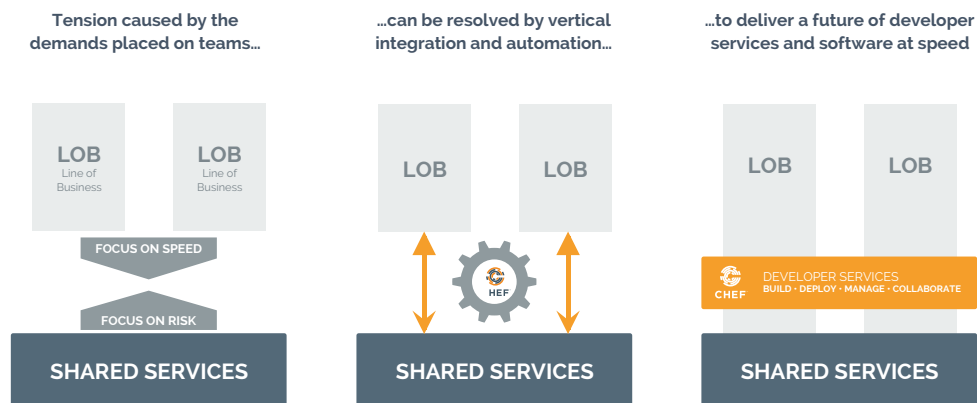
"Shift left" testing that integrates information security earlier in the development lifecycle (that is, compliance testing moves left on the project timeline) means that developers are more likely to find errors before reaching production.ⁱ By discovering compliance violations early

viii DORA—2016 State of DevOps Report

in the development phase instead of after feature development is complete, the amount of rework required by developers drops substantially. Using median average numbers, industry data suggests that small companies (no more than 250 staff) could experience yearly returns from avoiding unnecessary rework ranging from \$2.5M–\$4M based on cost savings, with returns scaling based on organizational size. Further, high-performing organizations stand to realize a potential 45X–50X gain in added value by reinvesting that gained time in developing new features.^{ix}

The problem organizations face here is that most information security tools aren't built for this purpose. They are not designed to be integral parts of a DevOps development process. They are too far removed from the typical developer's workflow and toolchain. To integrate information security into the development cycle, it's necessary to meet high-velocity teams where they already are: code-driven continuous delivery.

Most information security tools are built for manual assessments: audit, penetration testing, vulnerability scanning, auth testing, and so on. These are vital information security functions. However, the security posture implemented by these tools is typically orthogonal to software development postures that use small automated tests with fast feedback loops that can be applied frequently during every phase of development.



Chef helps teams with conflicting demands align with common postures with vertical integration and Developer Services

Building quality and security into the daily work of software development means that they share responsibility for implementing their company's security posture. The problem is that in organizations with traditional silos, the distance between a developer making a decision about feature design and understanding how that feature runs in production is so vast that it's difficult to assign them that shared responsibility. The key, therefore, is to bridge that divide by managing your information security posture the same way you manage your development posture.

ix DORA—Forecasting The Value Of DevOps Transformations

COMPLIANCE AS CODE

A new breed of tools has emerged to help bridge that divide and resolve the tension between speed and risk. Tools that focus on managing compliance as code shift InfoSec assessments away from manual processes driven by three-ring binders full of policy documentation to a model where controls are instead expressed as executable, versionable, and human-readable code. These executable controls can be distributed as another set of tests any developer can incorporate into their existing workflow and toolchain.

This code-driven approach builds on existing methods for collaboration already used by DevOps teams. The distance between understanding feature development and understanding how that feature will run in production is shortened because every developer can easily reference what the security postures are, how their features should comply, and how to influence change if necessary—thereby creating a sense of ownership and responsibility that carries throughout their daily work.

Rather than being perceived as slow and ineffective, InfoSec teams can instead enable high-velocity continuous compliance by making pre-approved, easy to consume automated processes for development and operations that ensure security is built into every part of the software development cycle.

BRIDGING THE GAP WITH INSPEC

InSpec is an open-source testing framework for infrastructure with a human-readable language for specifying compliance, security and other policy requirements as tests. Teams can easily integrate these automated tests into any stage of their deployment pipeline. In effect, they can now treat compliance as code.

```
control 'ssh-1234' do
  impact 1.0
  title 'Server: Set protocol version to SSHv2'
  desc "
    Set the SSH protocol version to 2. Don't use legacy
    insecure SSHv1 connections anymore...
  "

  describe sshd_config do
    its('Protocol') { should eq 2 }
  end
end
```

An example of an InSpec control. Unlike many other compliance tools, it's extremely easy to understand.

Instead of relying on documents for compliance verification, InfoSec professionals describe compliance controls in the InSpec language. The resulting compliance profile can be shared across an organization as human-readable, versionable, executable code. Code becomes the source of truth and the mechanism by which teams communicate about information security requirements at scale.

InSpec allows teams to use and adjust industry-grade compliance benchmarks, such as the Center for Internet Security (CIS) standards as well as create their own original content. Information security policies are expressed in an executable format that any team can consume. In particular, compliance auditors can utilize these profiles to automate manual processes and begin to operate quickly and efficiently at scale. Treating compliance requirements as executable code removes the guesswork that exists when auditors must interpret policy and replaces it with consistency and transparency.

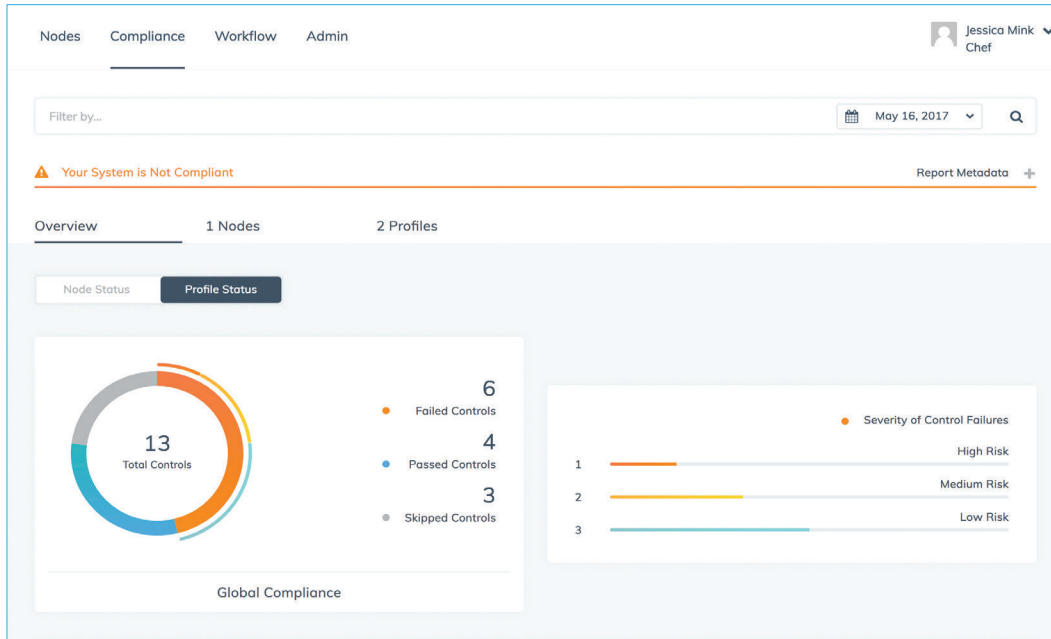
InfoSec teams can make these same profiles available for DevOps teams to use as a set of integration tests in their development work. DevOps engineers can fully understand auditor requirements by using these profiles as small automated tests that provide fast feedback loops and that can be applied frequently during every phase of development. For situations where a company's own policies differ from industry standards, InSpec allows developers to create overlay exceptions to existing profiles; a feature that lets DevOps engineers develop features without being blocked and provides a mechanism for collaborating with InfoSec on updating policy, thereby creating a sense of ownership and responsibility that carries throughout daily work.

INFOSEC MEETS DEVOPS WITH CHEF AUTOMATE

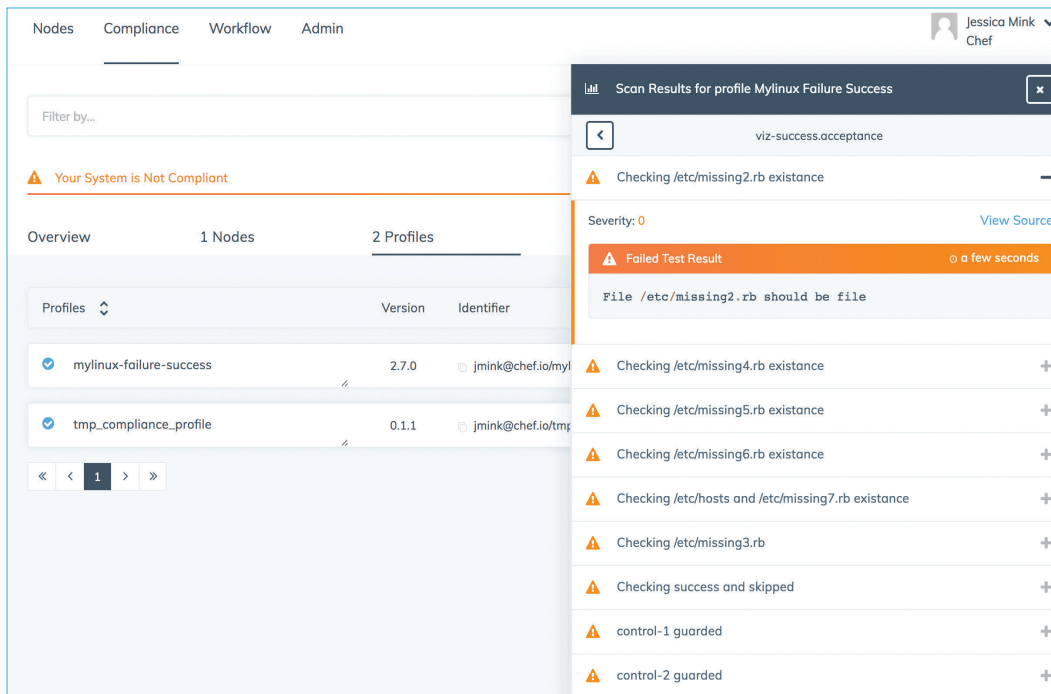
InSpec bridges the divide between development and information security by aligning both postures into a code-driven process. But applying InSpec to production applications requires more than integration into daily development work. It needs additional mechanisms that can account for compliance test coverage, provide audit visibility, allow for separation of duties, and remediate compliance violations quickly.

Compliance automation helps bridge the gap between development and information security teams, but without visibility into fleet-wide results it holds little value as an auditing tool. Chef Automate, Chef's continuous automation solution, includes multiple views for compliance reporting. These views allow you to visualize audit results across your estate. Visibility into audit

results helps InfoSec teams rapidly identify systems that deviate from compliance policy and collaborate with DevOps teams to provide a remediation.



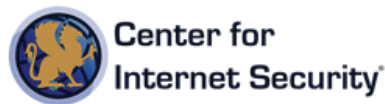
An example of overview results



An example of viewing scan results by profile.

Another consideration is that many organizations are subject to regulatory compliance standards as well as their own internal information security policies. Developing and maintaining a complete set of controls as both regulatory and internal policies change is critical for ensuring the security of production applications.

Compliance profiles that follow CIS benchmarks are available as part of a Chef Automate subscription. Further, organizations may selectively customize which industry standard controls are applicable to their environment by using InSpec dependency constructs. This hybrid approach allows teams to focus on managing their specific implementation of compliance controls while leveraging Chef's ongoing management of industry-wide standards as an upstream source.



Chef Automate ships with profiles for:



Amazon Linux
2014.09 / 2015.03



CentOS
6 / 7



HP UX
11i



IBM AIX
5.3 / 6.1 / 7.1



RHEL
6 / 7



SLES
11 / 12



Ubuntu Server
12.04 / 14.04



Windows
7 / 8 / 10 / 2012 / 2012R2

Detection of compliance violations and security vulnerabilities is only one side of the management equation. In the regularly repeating detect and repair cycle, InSpec is how issues are detected. A separate automated repair solution, such as Chef, should be used in production to implement remediations. While InSpec is a completely separate tool that works independently of Chef, the chef-client does contain integrations that are useful when working in tandem. These include the ability to manage test and repair operations from a single location and compatibility with ecosystem tools commonly used by Chef developers.

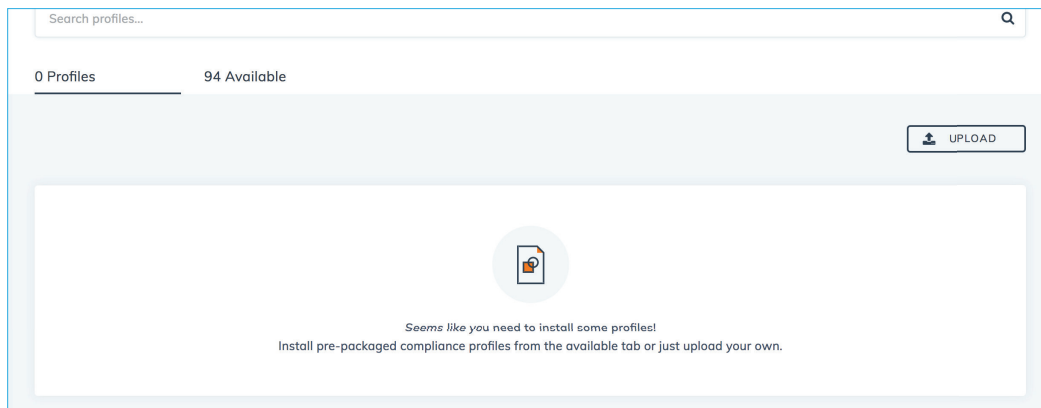
InSpec can be used in conjunction with Chef client or it can be used in isolation for environments with regulatory requirements that demand a separation of duties between compliance auditing and system management. With Chef Automate, InfoSec teams can initiate remote system scans on an ad-hoc or scheduled basis. This separation of duties ensures that separate checks originating from different teams occur, but from one central location so that barriers to collaboration between developers and InfoSec are still lowered.

CONTINUOUSLY DELIVERING COMPLIANCE

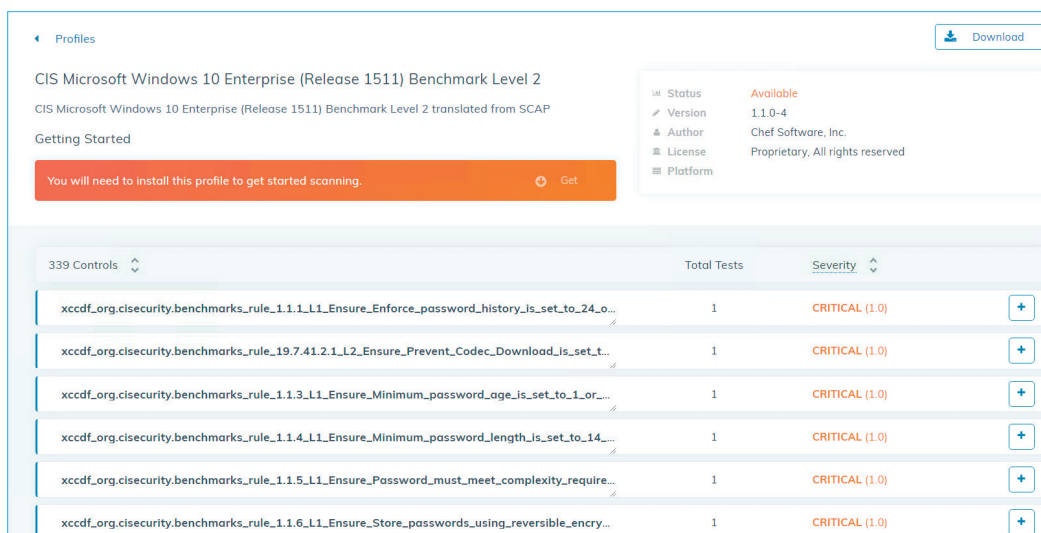
As an introductory example, the scenario below illustrates how Chef Automate can be used by both InfoSec and DevOps teams to continuously deliver code that is compliant with information security standards.

INFOSEC SELECTS A PROFILE

To safeguard their Windows server, an InfoSec team from Acme Inc. decides to use CIS Benchmark Level 2 for Microsoft Windows 10 Enterprise. In order to jumpstart their development experience, they download the corresponding InSpec profile via their Chef Automate server. The profile contains controls that ensure any Microsoft Windows 10 Enterprise server implements every setting described in CIS Benchmark Level 2.



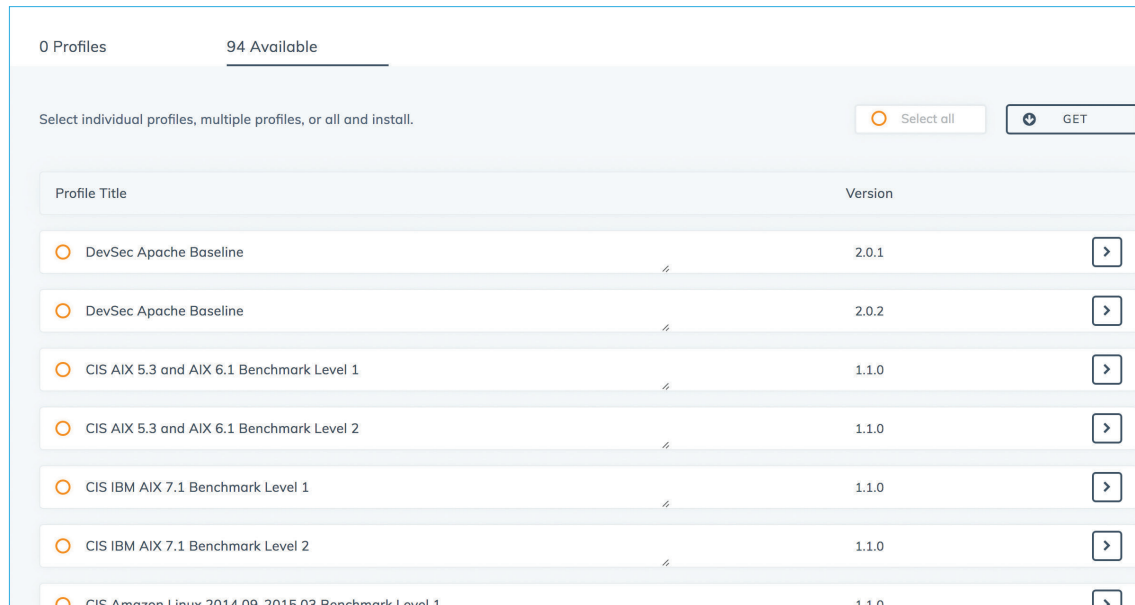
Users can download pre-packaged profiles to create their own.



Browse profiles and select the one appropriate for your information security needs.

INDUSTRY BENCHMARKS ARE CUSTOMIZED

As an example, the InfoSec team decides that the industry benchmarks are not restrictive enough for Acme Inc. requirements. CIS Benchmark Level 2 requires a minimum password length of 14 characters. The team decides that a minimum password length of at least 24 characters is sufficient for their needs.



Any of the pre-packaged profiles included with Chef Automate can be customized to fit your organizational requirements.

Instead of creating a new custom implementation of CIS Benchmark Level 2, a cross-functional team writes an InSpec profile that imports all rules from CIS Benchmark Level 2, but modifies the control for minimum password length to at least 24 characters. The new profile is named 'Acme Implementation of CIS Benchmark 2', committed to source control, and it becomes the new company standard for compliance.

A DEVOPS TEAM TESTS CHANGES DURING DEVELOPMENT

Elsewhere in the company, a DevOps team is developing a new application that will run on Microsoft Windows 10 Enterprise servers. Their application requires a system level user account and the DevOps team automates logic to create that account via their application deployment code. However, their code sets an arbitrary password that is 16 characters long.

339 Controls	Total Tests	Severity
xccdf_org.cisecurity.benchmarks_rule_1.1.1.L1.Ensure_Enforce_password_history_is_set_to_24_or_more_passwor...	1	CRITICAL (1.0)
xccdf_org.cisecurity.benchmarks_rule_19.7.41.2.1.L2.Ensure_Prevent_Codec_Download_is_set_to_Enabled: (L2) E...	1	CRITICAL (1.0)

(L2) Ensure 'Prevent Codec Download' is set to 'Enabled'

This setting controls whether Windows Media Player is allowed to download additional codecs for decoding media files it does not already understand. The recommended state for this setting is: Enabled. Rationale: This has some potential for risk if a malicious data file is opened in Media Player that requires an additional codec to be installed. If a special codec is required for a necessary job function, then that codec should be tested and supplied by the IT department in the organization.

[View Code](#)

```

control "xccdf_org.cisecurity.benchmarks_rule_19.7.41.2.1.L2.Ensure_Prevent_Codec_Download_is_set_to_Enabled" do
  title "(L2) Ensure 'Prevent Codec Download' is set to 'Enabled'"
  desc "
    This setting controls whether Windows Media Player is allowed to download additional codecs for decoding media files it does not already understand.

    The recommended state for this setting is: Enabled.

    Rationale: This has some potential for risk if a malicious data file is opened in Media Player that requires an additional codec to be installed. If a special codec is required for a necessary job function, then that codec should be tested and supplied by the IT department in the organization.
  "
  impact 1.0
  registry_key((hive: 'HKEY_USERS').children(/S-1-5-21-[0-9]+-[0-9]+-[0-9]+-[0-9](3))\{Ss}[Oo][Ff][Tt][Ww][Aa][Rr][Ee]\Policies\Microsoft\WindowsMediaPlayer/) each do |entry|
    describe registry_key(entry) do
      its("PreventCodecDownload") { should cmp == 1 }
    end
  end
end

```

Compliance results can be viewed in aggregate, or filtered/sorted by status and severity.

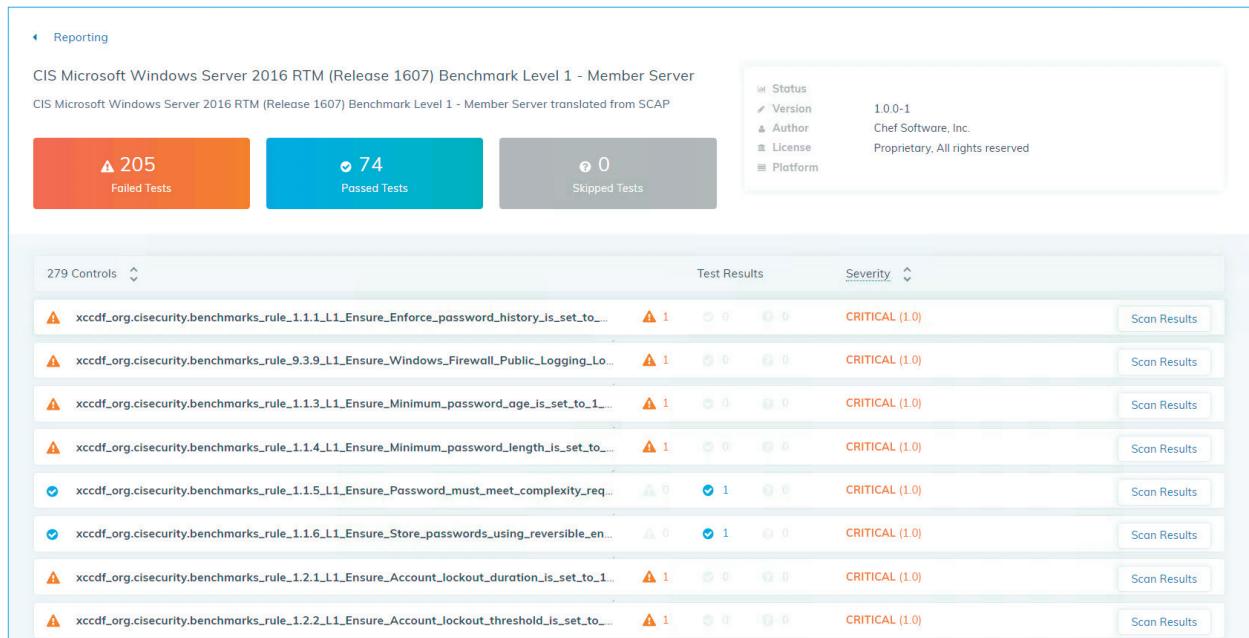
During the initial phase of development—local development— a developer from the DevOps team sets a dependency on 'Acme Implementation of CIS Benchmark 2' in their code since that is the known company wide standard for compliance.

When the developers first run their local integration tests, their code fails. The team reads the error message and clearly sees that the problem is that they do not meet the standard for minimum password length. They remediate the issue in their code immediately, while it is still in local development. The change is simple and fast to implement and fixes a problem caught long before it reaches production.

Having addressed the issue, the developer runs their local integration tests again and their tests pass. The developer commits their working code to source control.

USING CHEF AUTOMATE TO VERIFY COMPLIANCE

Committing the change to source control initiates a new build via Chef Automate. The build pipeline runs basic verification tests to ensure this change meets organizational standards. One of the tests is to run the controls from the 'Acme Implementation of CIS Benchmark 2' profile against the build to ensure that all compliance requirements are met. This automated step independently verifies that any proposed change is properly vetted before promoting it further in the pipeline.



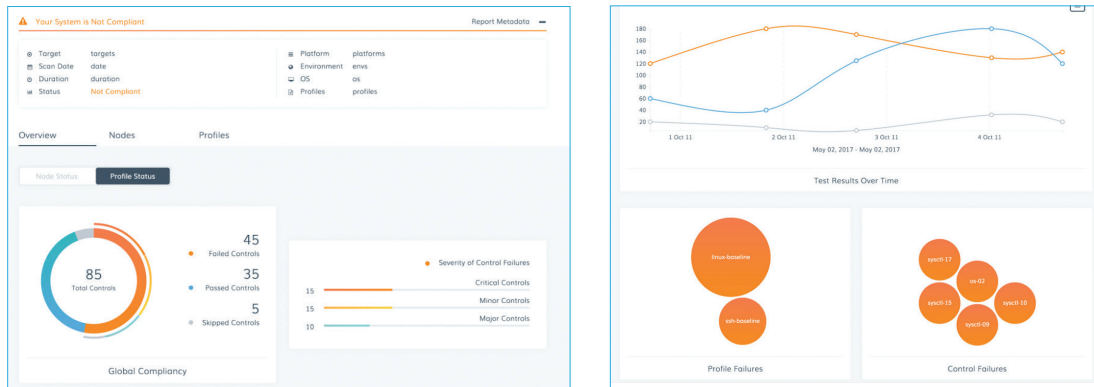
Compliance assurance results appear across different environments, such as Acceptance.

When the automated testing is complete, the team in charge of promoting changes to production can confirm change meets organizational compliance standards via the Chef Automate UI. After a proper code review, they release the new application code using Chef Automate and it gets delivered to production.

INFOSEC VERIFIES PRODUCTION COMPLIANCE

The InfoSec team has scheduled continuous compliance assessments using the suite of tools available in Chef Automate to independently verify that all production systems are in compliance with Acme Inc's implementation of CIS Benchmark 2. To do this, they use InSpec and execute a remote check that applies all controls in the 'Acme Implementation of CIS Benchmark 2' profile once an hour across the entire fleet.

Since compliance assurance data is available in the Chef Automate visibility dashboard, any team can easily spot any failures across their fleet and drill down for specific details. Because all development compliance requirements were met early in the development phase, the InfoSec team does not find any problems and they can customize reports to display their findings.



Example of an estate-wide view.

A SIMPLE EXAMPLE

While this is a deliberately simplified example, it does demonstrate a basic workflow where DevOps and InfoSec teams work together and share the responsibility of maintaining compliance at the speed of continuous delivery. While the way each team uses these tools may be different, they all use the same set of criteria to evaluate needs in their individual domains. The divide between development and information security is bridged by aligning the posture of both using a shared code-driven process.

INFORMATION SECURITY WITH AGILITY AND SPEED

By embracing automation and code-driven communication, InfoSec teams can meet high-velocity teams where they are by actively encouraging agility and speed rather than inhibiting it. When compliance is code, development and InfoSec teams can collaborate via pre-approved, easy to consume, automated processes that can be built into every part of the development cycle. DevOps organizations can extend this model into an approach where compliance is continuously assessed and remediations are continuously deployed. Any organization can practice continuous delivery and follow ALDO principles while reducing risk and remaining compliant with information security standards.

To find out more about implementing continuous compliance in your organization, go to <https://www.chef.io/solutions/compliance/>.