

# Empower teams to support DevOps with Pega Infinity

How Pega sets your teams up for DevOps success

A PEGA  
WHITEPAPER



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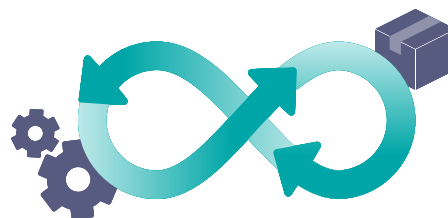
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Document: Pega Infinity DevOps: How DevOps and testing separate Pega from the pack  
Publication date: 2021

## Executive summary

With everything happening in the world today, more and more organizations are recognizing the tangible benefits that remote development teams bring. These days, developers may no longer share the same office space, but both their workload and efficiency remain the same or even greater.

Enterprise IT resources are increasingly scattered across a city, state, or the world. So how can you capitalize on a remote work model that provides flexibility to your teams, while maintaining control and delivering applications that ensure valuable results? The answer is short and simple: combined software development (Dev) and IT operations (Ops), or DevOps.



DevOps is fundamentally about increasing collaboration and speed of delivery, effectively reducing time to market (TTM). There is a perception that implementing DevOps is about finding the right tools or the latest, hottest technology and adopting it. However, at its very core, DevOps is about fundamental practices – such as continuous integration (CI), continuous delivery (CD), and continuous deployment (CD) – and fostering a collaborative culture between the teams involved.

The tools are there to empower teams and support these practices. Without this perspective and the resulting change in culture, adopting DevOps will only lead to automation of the application deployment from one environment to another – without improving TTM in any meaningful way. With Pega Infinity™, you'll find all the crucial DevOps capabilities built into a single, unique solution to significantly slash your TTM, boost productivity, and gain a competitive edge.

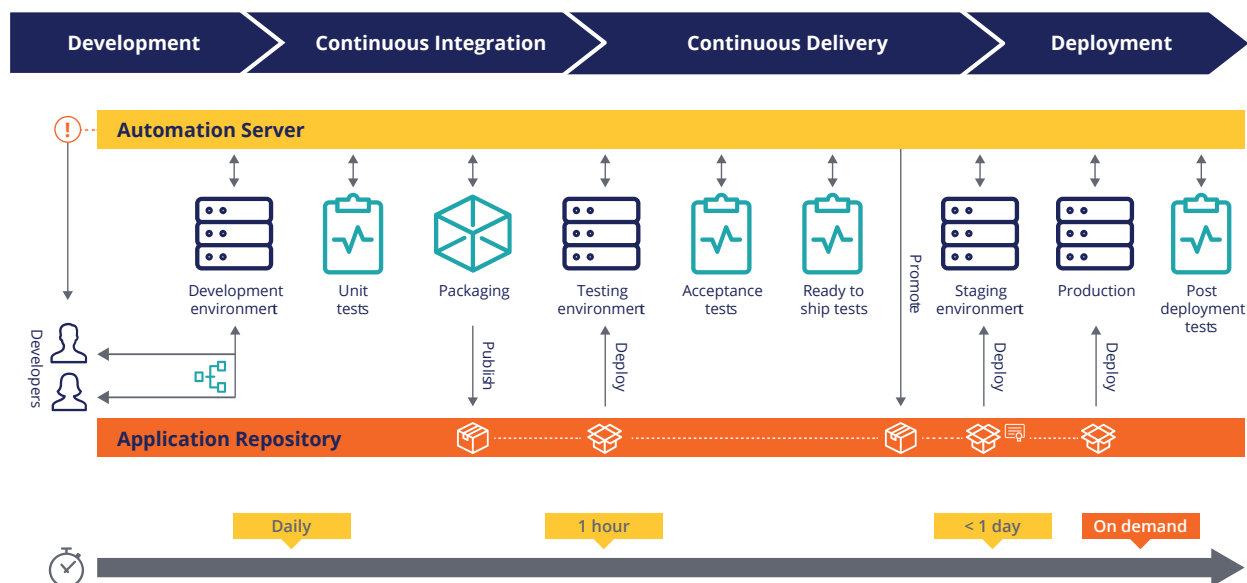
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**“Nearly half (47%) [of company leaders] said they intend to allow employees to work remotely full time going forward. For some organizations, flex time will be the new norm as 43% of survey respondents reported they will grant employees flex days, while 42% will provide flex hours.”**

Gartner, Gartner Return to the Workplace Benchmarking Against Your Peers Webinar Poll, (5 June, 2020)

## The journey to Pega Infinity

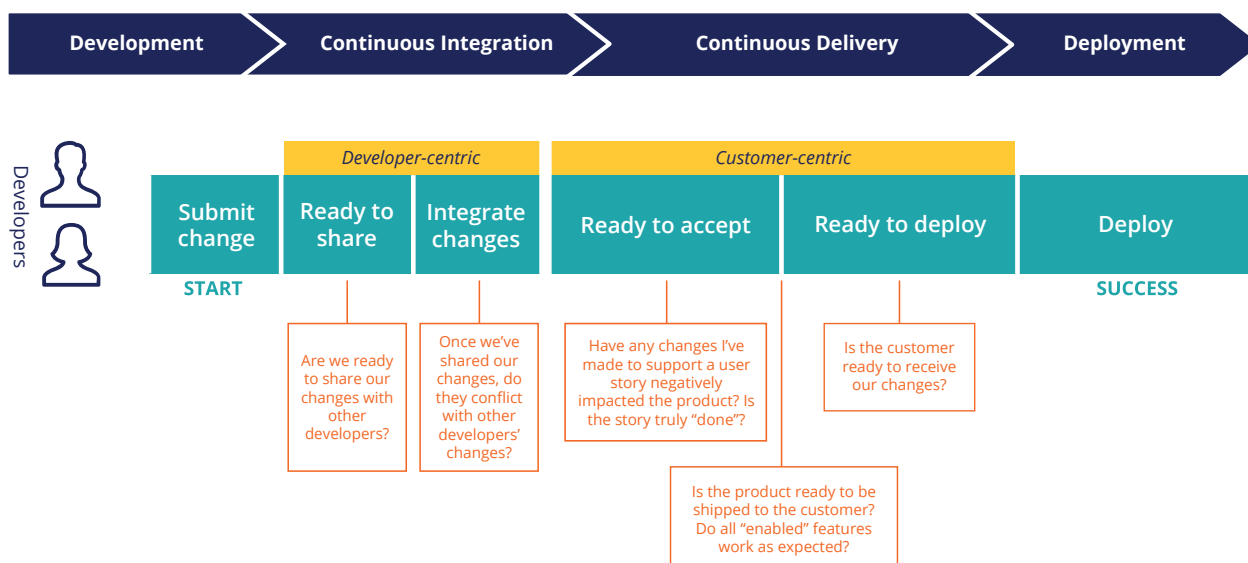
To begin the DevOps journey, first you need to define and implement a standard and repeatable deployment process that starts from the moment business requirements are captured and continues all the way to production, where the business value is derived.



This repeatable process needs to account for all of the following:

- Capturing business requirements
- Implementing these requirements in the application
- Validating and integrating these changes safely with other incoming changes and existing functionality
- Packing and promoting into higher environments
- Functional testing and validation
- Non-functional validation (performance or compliance)
- User-acceptance testing
- Production deployment

If along the way any issues should threaten the deployment, all relevant stakeholders should be notified so that the reported issue can be investigated and fixed. Tying all of those steps together into the fundamental DevOps practice is often represented as the continuous integration/continuous delivery (CI/CD) pipeline. This pipeline is designed to deliver application changes incrementally through short delivery cycles – gaining greater speed and frequency without compromising on quality.



An effective approach when you are starting to design this delivery process is to make sure the right questions are being asked and that answers are implemented at every stage in the CI/CD pipeline. You should then look to speed up this process through automation – this is where the tools and technology come into the picture.

The challenges with collaborative development, especially at scale, are another factor to consider. The efficient transfer of development projects between teams is absolutely vital to ensure quality development and deployment. However, without the right tools, the easy transfer becomes one of the most difficult things to manage in a deployment project.

It's also important that the application development artifacts are not separated – even if your teams are. You need a single source of truth for your application and deployment history; so if a problem arises, developers have all the information they need to rectify the problem.

## Pega Infinity has what your DevOps teams need

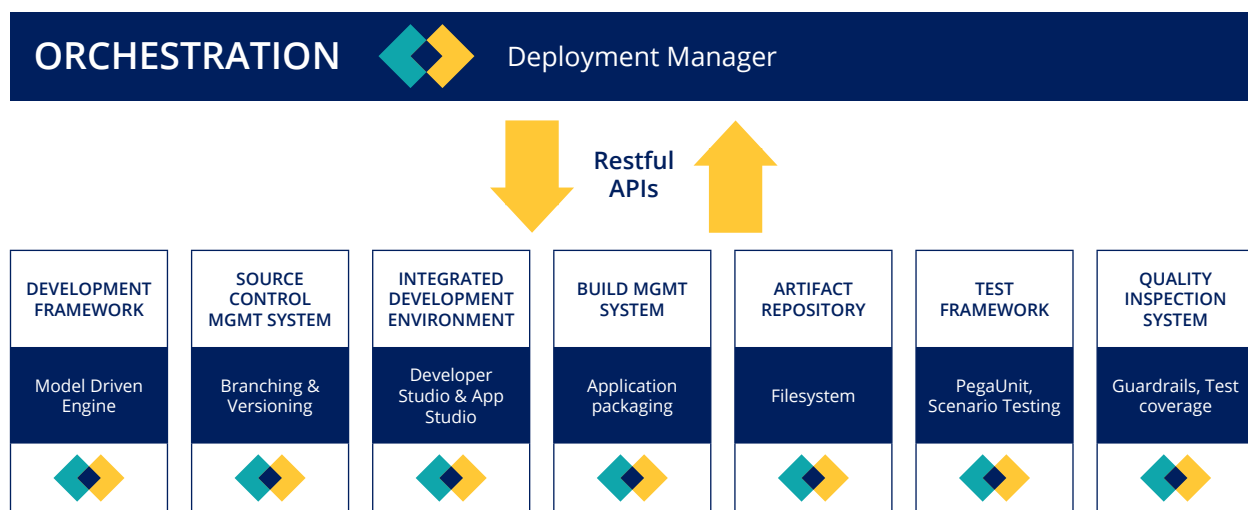
Pega Infinity provides the tools necessary to implement the fundamental practices of continuous integration, delivery, and deployment. Pega Deployment Manager enables a low-code, model-driven approach to configure and run CI/CD deployment pipelines for your applications. In addition to CI/CD support, Pega offers extensive automated testing capabilities to help speed up the DevOps process. Pega DevOps and automated testing even allow business users to take apps from development to testing to production – with just one click.

Until recently, DevOps journeys have been challenging – requiring deep technical expertise and alignment between people, process, and technology. Fortunately, Pega Infinity is highly optimized to help ease DevOps adoption and facilitate team collaboration. This paves the way for organizations of different sizes and from diverse industries to reap the benefits of speed-to-market applications, which provide true value and reduced development costs.

## Pega DevOps made easy

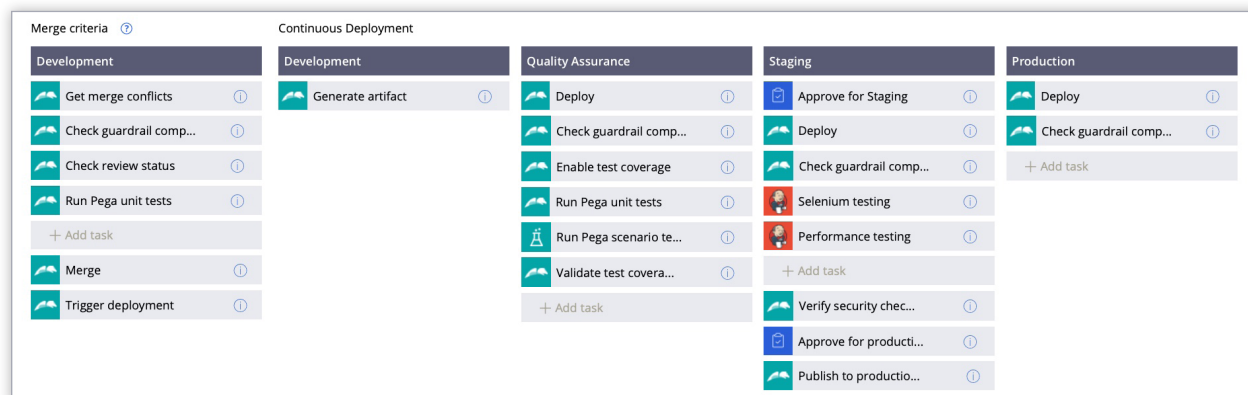
Whether you're new to DevOps or just getting started, Pega effectively helps make DevOps easy and simplifies adoption for your organization, empowering your team to employ continuous delivery, integration, and deployment best practices – across all of your Pega applications.

### DevOps Made Easy architecture



Through each stage of the development cycle, Pega provides a built-in suite of DevOps capabilities designed to help you strengthen a culture of collaboration, drive success, and deliver high-quality applications.

**Pega Deployment Manager** integrates seamlessly with Pega Infinity to quickly move from development to testing to deployment.



It provides out-of-the-box, best-practice-based application deployment pipelines that are easily configured and customized through a low-code, model-driven experience. This enables you to get started quickly with a standardized, automated, and repeatable process, ensuring predictable, high-quality releases.

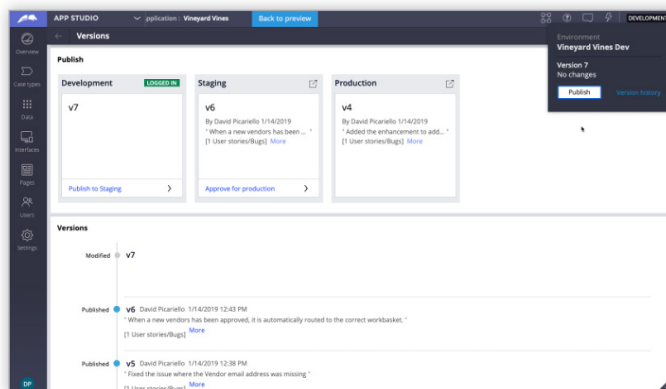
These deployment pipelines come with built-in support for the following:

- Seamless branch validation and merge for developer changes
- Automated application packaging and distribution to higher environments
- Enforcement of quality gates such as guardrail scores and test coverage
- Ability to run Pega automated tests
- Adherence to security compliance via the application security checklist
- Power to roll back changes in an environment upon failure
- Built-in configurable notification for all pipeline events

Pega automated testing provides teams with the tools to quickly and easily create test cases to be incorporated into automated testing plans. Users may group tests into a test suite to run multiple cases – in a defined order that ensures high-quality releases.<sup>1</sup>

## Empowering the citizen developer

The power of Pega lies in democratizing application development by enabling citizen developers and business users to collaborate using our low-code Pega Platform™. Citizen developers are likely to use App Studio to define a case lifecycle to address the latest user feedback without having to wait on IT – or a business user might use 1:1 Operations Manager to author strategies and offers for their marketing clients. This is where the real benefits of deep integration in Pega Infinity's Deployment Manager come into play; it enables all stakeholders and contributors to be part of the DevOps process like no other products can.



Citizen developers have the ability to publish directly into an application deployment pipeline straight from App Studio and can manage the process all the way to production with the appropriate Lead System Architect (LSA) review. All the while the deployment pipeline can be monitored by the application administrator from Deployment Manager to handle any issues that arise.

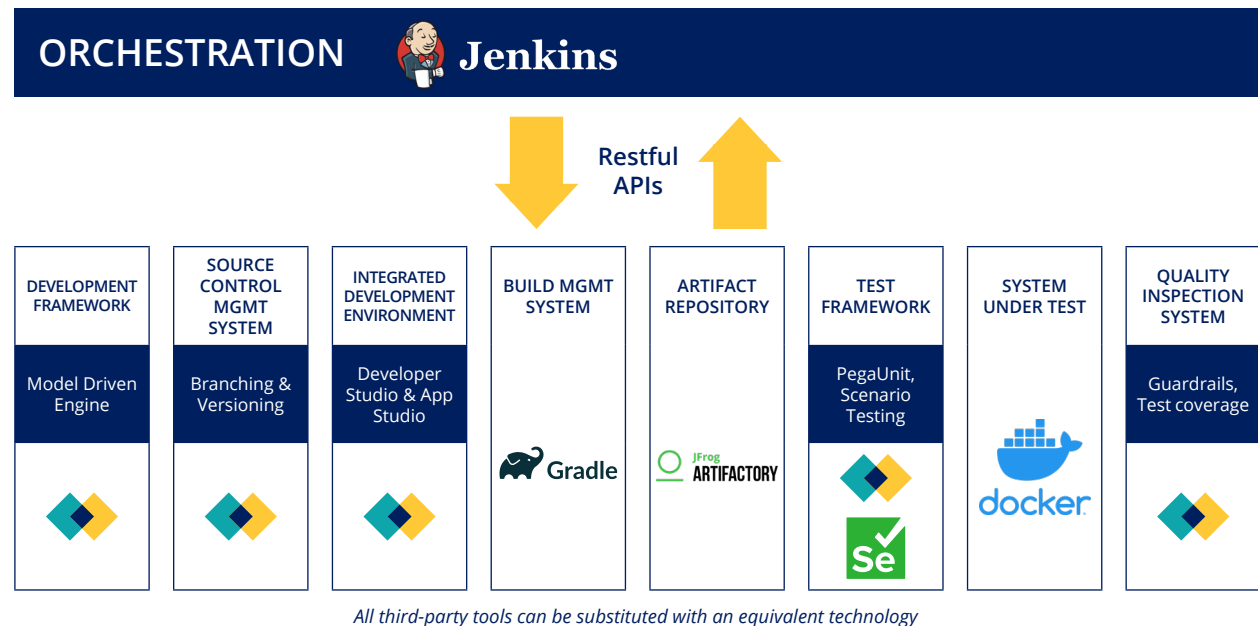
App Studio users are presented with a user-friendly pipeline representation from which they can monitor the progress of their changes and take any actions necessary. This integration empowers the citizens developers to participate in the deployment process directly, while the application administrators or IT monitor and set the gates for deploying to production – tearing down silos across the board.

<sup>1</sup> See the *Testing strategy* section for additional details on automated testing.



## Using third-party tools

### Open DevOps architecture



Open DevOps integration allows for building a deployment pipeline using third-party tools to automate branch merging, application packaging and deployment, test execution, and quality metric enforcement. Pega Infinity provides an open platform with all the necessary hooks and service APIs for effective, open DevOps integration – by using popular third-party tools such as Jenkins and Microsoft Azure DevOps.

Pega's open DevOps enables you to use your existing tools to deploy Pega applications – so that your tried-and-true deployment processes will seamlessly work together. We make it easy for you to use your existing tools to deploy Pega applications faster and quickly realize the true value of our technology.

### Open DevOps

Integrate Pega with existing COE toolchains

**Maven**

**Gradle**

**XebtaLabs DEPLOY**

**docker**

**Se**

**S3**



**TC**

**sonatype**

**JFrog ARTIFACTORY**

**REST-assured**

**JUnit**

**puppet**

## Multiteam parallel development

From its very inception, Pega was designed to support the needs of both small and large development projects, providing robust development capabilities – so you can gain the tools to facilitate process changes among multiple developers. The Pega design-time environment, called Dev Studio, includes a fully integrated version control system that supports check-in, check-out, and rollback at the individual model level.

The checked-out models stay on the server and are tested in context of other models that have been checked in – without affecting other users. During testing, there's no need to sync application branches to your local machine and then re-sync changes to a source control system. Additionally, Pega provides a change history for all application models so that users can restore previous versions of individual models.

### How Pega supports your branch strategy

A good branch strategy is the basis of any good DevOps deployment. Branches allow your organization to develop software with multiple teams – in parallel – within a version-controlled environment. Pega supports this as part of a CI/CD pipeline, enabling you to use branches in development environments where multiple teams contribute to a single application. What's important to note is that the version control and branching functionality are built right into the Pega development environment. Your team can develop one feature in a branch while another team develops a feature in a different branch – even if they share the same base rulesets.

And you can still work with branches – even after you create branches and rules in them. For example, you can create reviews for branches to ensure that they are guardrail compliant. And after feature development is complete, you can merge the changes you made for all features into the base ruleset.

Pega supports check-in and check-out on rules within your Pega application. To avoid accidental rule changes or conflicts (which might result from multiple developers working on the same rule), perform a check-out so that you can lock and safely change the rule. By checking a rule out before editing, you avoid unwanted rule changes – saving you time so that you can maintain a better-quality application.

## Application testing

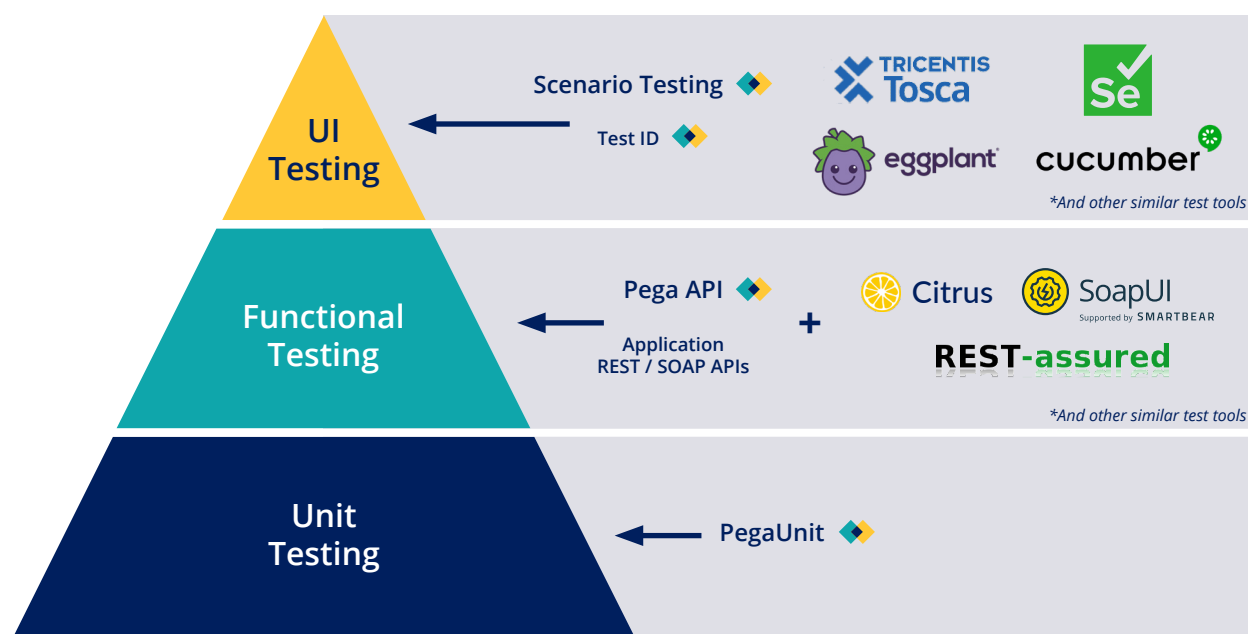
Having an effective automation test suite for your application in your continuous delivery DevOps pipeline is important. It ensures that the features and changes you deliver to your customers are of high quality and do not introduce regressions. Pega offers several capabilities to perform continuous testing and deliver high-quality applications as part of your CI/CD deployment pipelines. These application testing capabilities enable both developers and business users to launch and maintain automated tests that cater to various testing needs, all while continuously monitoring the application quality to take corrective action early in the cycle.

## Testing strategy

The recommended test automation strategy for Pega applications is to:

- Develop your automation test suite based on industry best practices for test automation
- Create your test cases when you are developing your application and its rules, so when your application is complete, it is ready for automated testing
- Build up your automation test suite by using Pega Infinity capabilities and industry test solutions
- Run the right set of tests at different stages of your delivery pipeline
- Test early and test often

To make industry best practices for test automation easier to understand, they can be presented as a test pyramid.



Test types at the bottom of the pyramid are the least expensive to run, easiest to maintain, take the least amount of time to run, and should represent the greatest number of tests in the test suite. Test types at the top of the pyramid are the most expensive to run, hardest to maintain, take the most time to run, and should represent the least number of tests in the test suite. The higher up the pyramid you go, the higher the overall cost and the lower the benefits.

With all the tools and integrations that Pega provides, your organization can effectively and seamlessly perform automated testing and achieve benefits including:

- Reducing costs as tests can be created, then executed again and again
- Eliminating the need for human intervention in the testing process
- Ensuring your tests are consistent from version to version
- Deploying faster since automated tests execute much faster than manual tests

## Unit testing

For each created or updated rule, developers create fast unit test cases with support for setting up test data and mocking or stubbing external integrations. These unit tests run very fast and can quickly and easily be run on every check-in, increasing the confidence in the implementation and reducing the burden on regression testing. And as with all things Pega – there is never a need to write code.

Left: Decision table used for performing complex logic within a Pega case. Right: Report on test case for the decision table.

**Decision Table: CheckEligibilityforCreditCard [Available]**  
 CL: UPlus-UPlus\_CS-Work-CreateAccount ID: CheckEligibility

	Conditions	Actions
	Annual salary	Return
if	>150000	→ Platinum
else if	>100000	→ Gold
else if	>35000	→ Silver
otherwise		→ Rejected

**Test Case: TC\_EligibilityTest1 [Available]**  
 CL: UPlus-UPlus\_CS-Work-CreateAccount ID: TC\_EligibilityTest1 RS: UPlus\_Test-01-01-01

**Test failed!** [View details](#)  
 Rule run time: 0.001sec

Description:  
 Run and verify CheckEligibilityforCreditCard decision table with following parameters, <:;>

Disable

**Expected results**

Assertion type  Multiple input combinations

Annual salary	RETURN
200000	Platinum
120000	Gold
25000	Rejected
35001	Silver

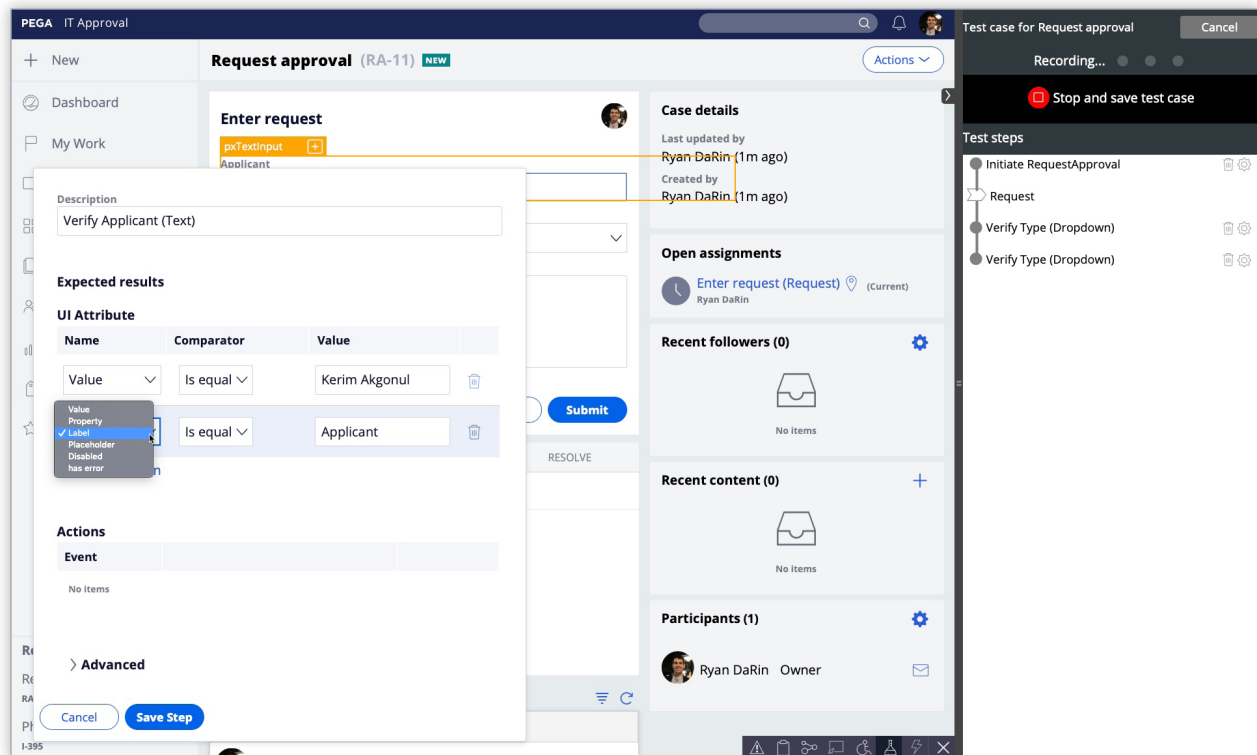
[+ Add](#)

Pega provides unit tests for all critical application logic and expression rules, which include:

- Activities
- Collections
- Data transforms
- Decision trees
- Flows
- Report definitions
- When rules
- Case types
- Data pages
- Decision tables
- Declare expressions
- Map values
- Strategies

## End-to-end scenario testing

Without writing a single line of code, business users can leverage the automated scenario testing capability to verify the end-user experience. The end user input is captured as the test data that will be executed on subsequent test runs for UI and portal testing. This means that your employees who will be using the application can be part of the process creating automated regression test cases.



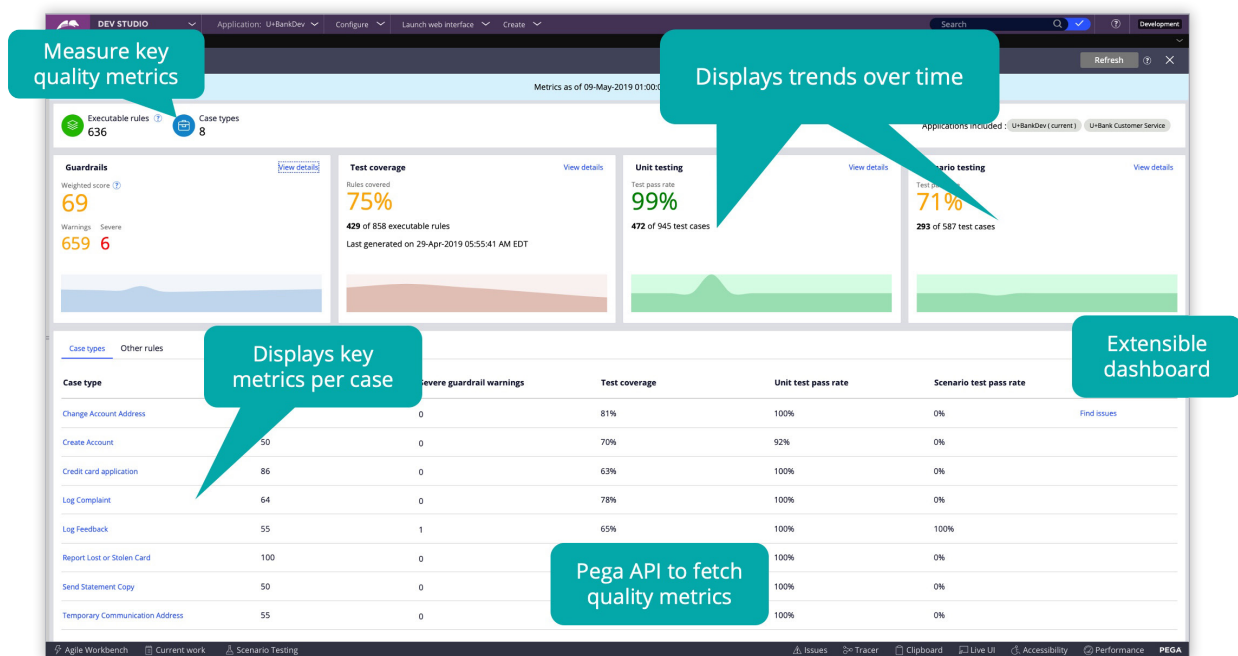
These business users can test either a specific case type or an entire portal by clicking Scenario Testing in the run-time toolbar to open the test recorder.

When you use the test recorder and hover over a testable element, an orange highlight indicates that the element can be tested. Interactions are recorded in a visual series of steps and the execution of a test step can include a delay.

These unit tests and scenario tests verifying the user experience can all be automatically run in the deployment pipeline to ensure that updates do not break your Pega application and lead to a production stoppage. Additionally, Pega testing provides details for each test case as to whether your testing succeeded. Deployment Manager supports executing these tests and gating the pipeline based on the test results, making it easy to incorporate this into your deployment process.

## The Application Quality dashboard

Many automated test applications provide a detailed text-based list of testing errors. Yet Pega makes it even easier to understand and take action by providing more detail in a graphic format. Pega Infinity includes our Application Quality dashboard, which quickly identifies areas within your application that need improvement by displaying metrics related to your application's health.



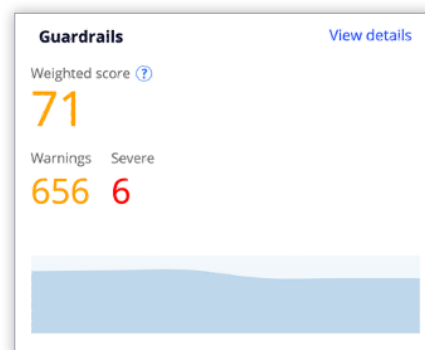
To better help you understand the health of your Pega applications, the dashboard includes four charts:

- Guardrails or compliance score
- Test coverage
- Unit testing
- Scenario testing

### Guardrails

Guardrails are guidelines for achieving optimal performance, reusability, and maintainability in your application. A low guardrail score means that your application is not in compliance with Pega Infinity applications' best practices. This may introduce brittleness into your application and make it harder to upgrade.

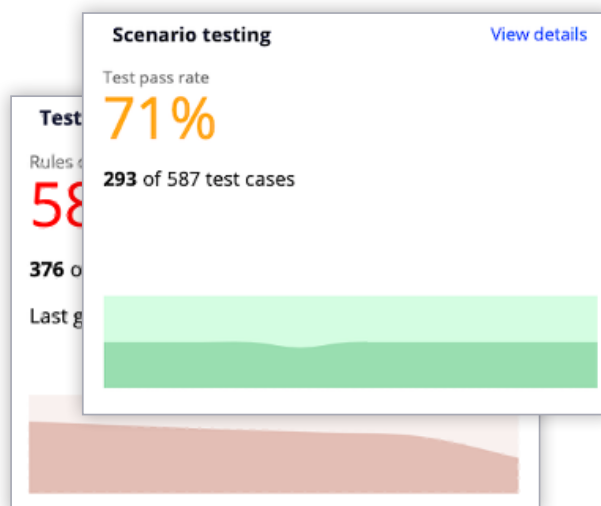
Using the dashboard, you may quickly view your application's guardrail compliance score and see the number and severity of guardrail violations that were found in your application. You can then improve your compliance score and overall quality by investigating and resolving the violations.



## Test coverage

Test coverage is a chart that is used to improve the quality of your application and identify how many executable rules are covered by tests. As rules are executed in the testing, the coverage report indicates whether test cases exist. The user is provided a detailed list of rules that include a test case – so that a low score can be raised quickly.

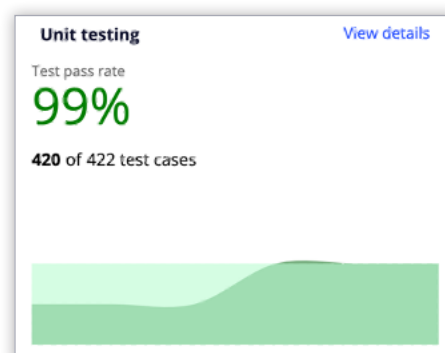
This coverage report also shows how the coverage metric changes over time – by running test coverage sessions, merging reports, and analyzing coverage trends.



## Unit testing

Unit tests are typically developed by the application developers along with the new functionality. They validate the smallest meaningful units of functionality and logic that can be tested quickly and provide fast feedback.

Getting a high pass rate, tracked by the unit testing metric, is critical and meaningful as it ensures that all core building blocks of the application are working as designed – simplifying the testing that is necessary later in the deployment process.



## Scenario testing

Scenario testing executes tests against a user interface to verify that the end-to-end scenarios are functioning correctly. Pega supports built-in scenario testing and includes a built-in test recorder to create functional and useful acceptance tests – rather than writing complex code.

This metric tracks the pass rate of these scenario acceptance tests over time and is a great way to get an understanding of how effectively the end-to-end functionality of the application is being tested over time.

## Putting it all together

Now you know how Pega supports fundamental DevOps CI/CD/CD practices and how it makes your software delivery more efficient. DevOps is also about the people and collaboration, not just the tools and technology. You must also account for the cultural changes that embracing DevOps will bring.

One of the biggest barriers to adopting these practices is figuring out where to start and which tools to use to implement these practices. Use the built-in Pega DevOps as well as test automation capabilities and tools like Deployment Manager to deploy Pega applications faster – reducing costs and increasing efficiency. Doing so will enable your organization to realize the value from your Pega applications in a matter of weeks – not months or years.





## About Pegasystems

Pega delivers innovative software that crushes business complexity. From maximizing customer lifetime value to streamlining service to boosting efficiency, we help the world's leading brands solve problems fast and transform for tomorrow. Pega clients make better decisions and get work done with real-time AI and intelligent automation. And, since 1983, we've built our scalable architecture and low-code platform to stay ahead of rapid change. Our solutions save people time, so our clients' employees and customers can get back to what matters most.

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