THE AUTOMATED
TEST FRAMEWORK

Test More.
Test Consistently.
Test Faster.
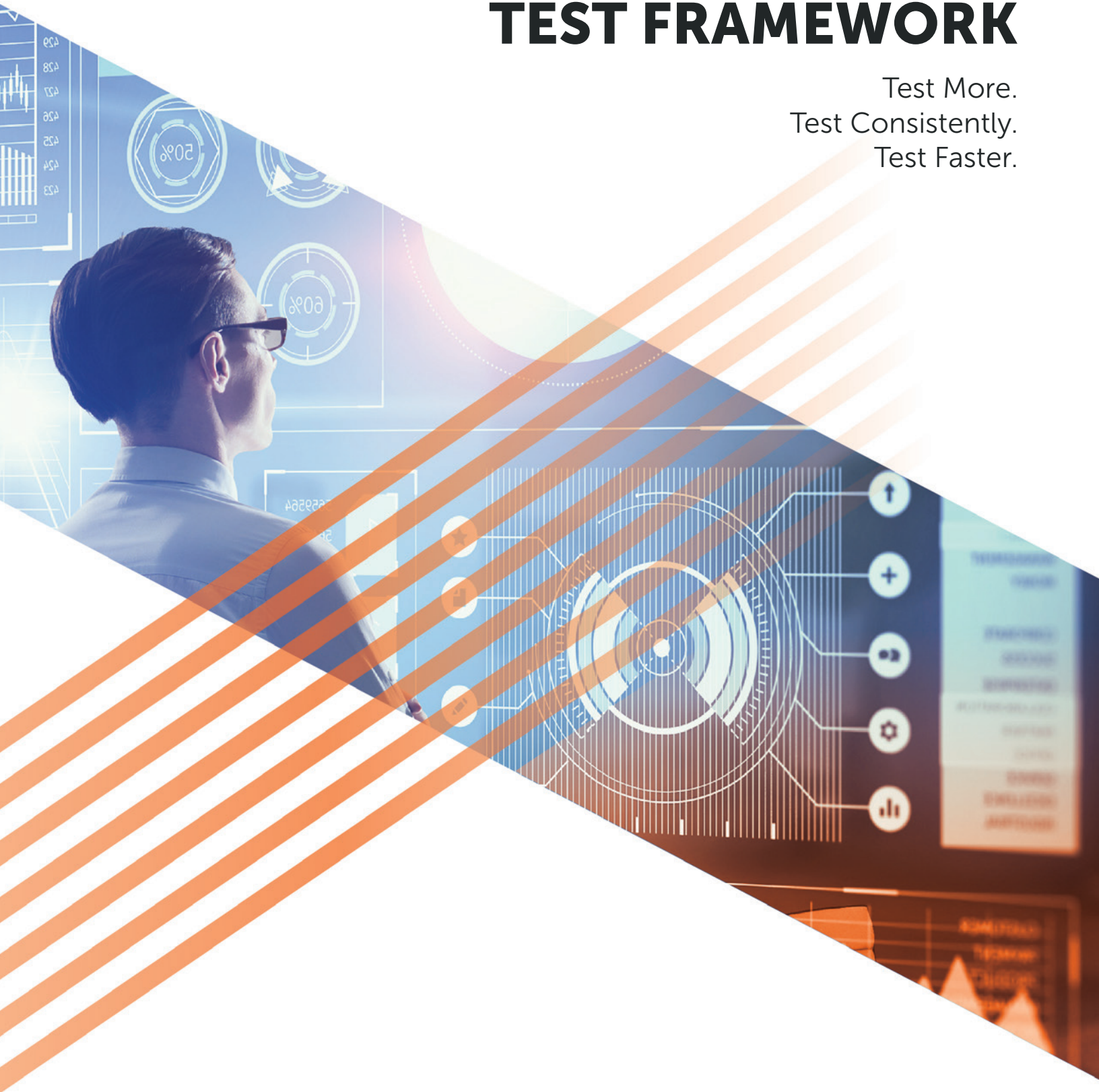
XCELERATE
SOLUTIONS

Secure Results.
Delivered.

xceleratesolutions.com

TABLE OF CONTENTS

Xcelerate developed the Automated Test Framework (ATF) to meet the escalating needs of our customers to accelerate security and system patching, validate new services, and ensure continued operations of existing critical business functionality. This paper provides an in-depth view of how the ATF works and the value that it can bring to your organization.

CONCEPT

Successful enterprise engineering requires a diligent testing cycle to ensure that new or updated capabilities do not interfere with ongoing operations. This includes

- Security Patches
- Commercial Off-The-Shelf (COTS) Products and Updates
- Government Off-The-Shelf (GOTS Products and Updates

Traditionally, this was handled by manual testers, including independent verifiers and key end users, assessing the system before a release was approved. Critical defects found here can result in delays or even cancellations of projects.

Modern enterprises aim to deliver test findings to developers as early as possible—while they are developing—resulting in a minimal number of issues discovered during acceptance testing and in production. This transformation, though, can be disrupted when there is not a streamlined mechanism for transitioning existing manual test cases into automated scripts that are integrated into the development environment.
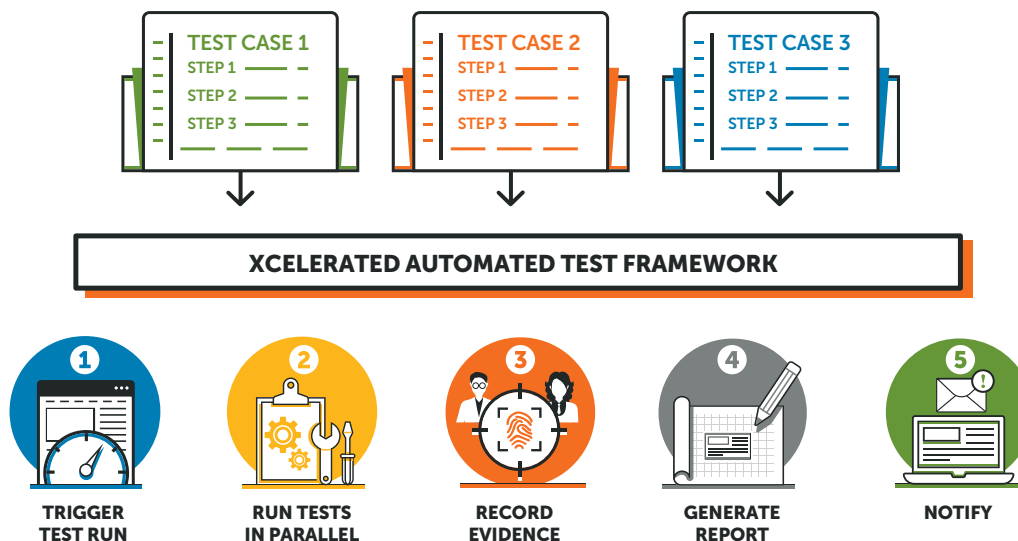

Figure 1. The Xcelerate Automated Test Framework automates previously manual test cases and provides real-time feedback on the results of test runs.

The Xcelerate ATF is an integrated, automated testing system that provides a means of rapidly migrating manual test cases into automated scripts that can be executed and alerted upon at any time. The core of the framework is a five step process: an event triggers the tests, the tests are run, evidence is recorded, custom reports are generated, and stakeholders are notified. Before discussing these steps, architecture, and case studies in detail, we will discuss the benefits of automated testing and the transformation of three different categories of tests: functionality, compatibility, and performance (load).

BENEFITS

Xcelerate views five key benefits of implementing an automated testing solution within any development or systems engineering enterprise:

1. REDUCE THE COSTS OF THE TESTING TEAM: By the nature of their role, testers must run the same scenarios (regression tests) over and over to ensure that updates to systems or services do not cause any disruption to the parts of the enterprise that are already in use. Depending on the complexity of these manual tests, this could take an hour or more to run a single test for a single update to a system or service. Automated testing takes this effort down to minutes or seconds.

2. IMPROVE THE INTEGRITY OF TEST RESULTS: Manual testing frequently results in situations where a bug cannot be reproduced, acceptance criteria are misinterpreted, or a tester simply clicks on the wrong button and therefore gets an unexpected result. Automated testing addresses these situations by eliminating human error from the equation. A robust automated testing platform will include evidence (e.g., screenshots) along with each test run to show just what happened when an error occurred.

3. IMPROVE ENTERPRISE SECURITY: System security patches and software upgrades are a frequent cause of disruption to ongoing operations. As a result, these critical releases are delayed while the test team runs a full suite of regression tests to validate that there will not be any interference with mission critical services. Automated regression tests can reduce a multi-day regression effort to minutes, enabling system owners to address cybersecurity vulnerabilities and threats with speed and confidence.

4. REDUCE PRODUCTION INCIDENTS: Integration testing is frequently one of the last activities that occurs in an enterprise environment. If engineering teams knew early on, though, that their efforts would cause failures between existing services and systems, then issues could be addressed before the user community ever experiences them. Automated testing provides that feedback to the engineers from the very beginning of their activities.

5. ACCELERATE DELIVERY OF NEW CAPABILITIES: Test teams may have an enormous backlog of systems and services to test: updates to existing software, new software for approval on a baseline, security patches, etc. With every new system that is incorporated, not only do all previous regression tests need to be run to ensure operations continues properly, but new test cases must be developed. A chief benefit of automated testing is allowing the testers to focus the majority of their effort on the new test cases, and entrusting the old tests to automation.

TRANSFORMING FROM TRADITIONAL TO MODERN TESTING

Three of the most common regression and integration test categories are functionality, compatibility, and performance (load) testing.

FUNCTIONALITY TESTING validates that the features of systems, services, and applications continue to work the way that the business expects them to work. These types of tests are generally the highest priority and most numerous.

Through the ATF, we convert the manual steps (click on a button, verify a display, etc.) to automated scripts. Instead of human validation, the scripts capture evidence in the form of screenshots that functionality has not been affected.

COMPATIBILITY TESTING validates that web sites continue to remain accessible and display properly after security patches, upgrades, or other software has been installed. Manual testing of this can fall short due to varying client configurations, including browsers, security settings, and screen resolutions. Xcelerate's automated scripts enable concurrent assessments of web site compatibility across differing client configurations.

PERFORMANCE TESTING, also known as load testing, validates both that applications or services function properly when many users are interacting with them and that response times are acceptable per business needs. This is an area that is frequently omitted or underperformed in traditional testing environments due to the complexity of load testing, the resources required, and reliance on subjective measurements. The ATF provides the capability to spin up any number of mock users, have them perform a designated set of actions, and then free up those resources once the important data are captured. By measuring performance for each step in the test case, we provide accurate and actionable feedback for stakeholders and the engineering and development teams.

ATF FUNCTIONAL COMPONENTS

As soon as a manual test is incorporated into the ATF, it is ready to run on demand and deliver results in real-time. The ATF follows a five step process, beginning with an event that triggers a test run and ending with notifications to designated stakeholders.

XCELERATED AUTOMATED TEST FRAMEWORK

1 **TRIGGER TEST RUN**

2 **RUN TESTS IN PARALLEL**

3 **RECORD EVIDENCE**

4 **GENERATE REPORT**

5 **NOTIFY**

Trigger Run Test

The ATF is configurable to run on demand or whenever configurable events occur in the enterprise. Some common use cases include:

- Run all tests every weekend
- Run a designated subset of tests nightly
- Run affected tests whenever an application's source code changes
- Run tests whenever a system is ready for independent verification & validation (IV&V)

This flexibility enables Xcelerate to tailor the ATF to the particular business needs of your enterprise so you can realize positive returns from an automated testing solution.

Run Tests in Parallel Tests

Whether run manually or run by machine, testing takes time. If tests can be run concurrently, though, the overall calendar time before feedback is received by the developers can be minimized. The ATF serves as an orchestration engine, delegating test activities to different assigned systems and ensuring that those activities have no effect upon one another or upon other functions in the enterprise. By scaling the ATF based on the quantity, complexity, and computing power required by your test scenarios, we can deliver feedback at the scope and rate that your enterprise needs to achieve mission success.

Record Evidence

Manually testing can frequently be further slowed by the need for individuals to manually take screenshots and attach them to test reports. The ATF handles this automatically, capturing all the details that you need to be confident in the successful execution of test cases, and attaching those details to the records for each individual test run.

Generate Report

Even after all tests have been run, it can take days to compile those test results into the proper reporting format. The ATF supports customization of report formats and automatically aggregates the results of all tests executing during a test run. When a test run is finished, results and evidence are captured in a format specific to your mission needs.

Notify

Finally, the ATF is configured to issue notifications to stakeholders immediately whenever new test results are available. This eliminates delays that can be caused when key staff are unavailable to issue these types of memos or notices.

The Automated Test Framework | 6

ARCHITECTURE

The foundation of the ATF (Figure 2) is the Framework Layer, which is responsible for controlling test execution, storing test results, generating reports, notifying users, and providing the management user interface. The timing and order of all these activities is handled by the Orchestrator, which has responsibility for interpreting the specifications of the automated test engineers. The integrated Scheduler processes timing configurations that the engineers specify to execute different test scenarios based on events.
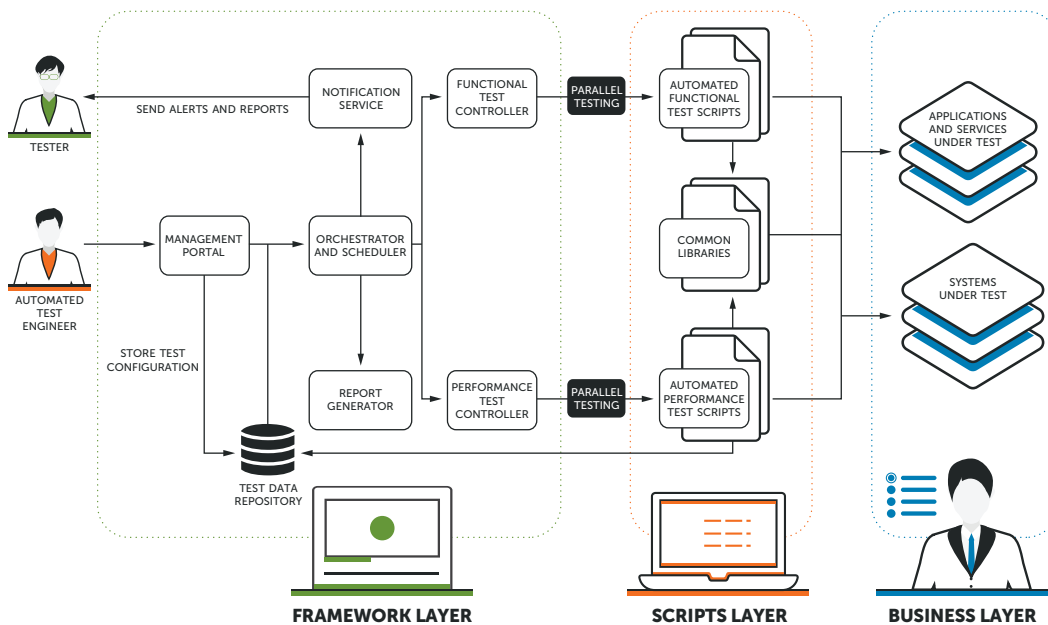

Figure 2. The Framework Layer is the core of the Xcelerate ATF, running and reporting on functional and performance tests of business applications, services, and systems.

The Functional Test Controller and Performance Test Controller are responsible for running tests in parallel against the applications, services, and systems that are configured to be under test during the current test run. They notify the Orchestrator after the current tests have been completed and results have been persisted to the Test Data Repository. The Orchestrator then automatically requests the generation of reports and requests that they be sent to the users (i.e., testers) as soon as they are ready.

APPLICATIONS

The ATF can be applied to a vast array of situations where testing is required. The samples below illustrate just some of what Xcelerate can deliver in support of your mission through enterprise-grade test automation.

Operating System Upgrade

A customer has noted that Microsoft plans to stop issuing security patches for the version of Windows that they are running in their enterprise. If they upgrade their enterprise to the latest version without validating functionality of their current applications and services, then their users will not be able to perform their mission critical activities. This could have implications far beyond their department. Our customer opts to use the Xcelerate ATF to rapidly build automated tests to validate that their applications, services, and web sites will continue to work properly, not just for this version of Windows, but for subsequent releases, as well. Our customer is not only able to ensure that they can upgrade Windows successfully, but they have accelerated approvals of future major and minor patches as well.

Security Patching Overload

An agency recognizes that there are more cybersecurity threats than ever before, and they are assessing whether they can accelerate the deployment of patches for Information Assurance Vulnerability Alerts (IAVA). Currently, after the engineering team builds the requisite patches, it takes the testing team one week to ensure that no services are affected and receive approval by the agency for deployment. By using the ATF to automate the functionality testing of affected systems, the testing team is able to reduce the time from one week to less than a day. Furthermore, the ATF generates a report in the format that the government needs to approve the patch deployment and improve the security posture of the enterprise.

Regular System Malfunctions During Surge Periods

For years, an organization has experienced an increased number of incidents during surge periods, when the number of active users of mission services increases significantly. The operations team has long handled this by throttling user activity, rebooting systems, and publishing emergency patches. The organization has always wanted robust load / scalability testing, and they have decided to take a proactive approach to validating the performance of each service under load and determine exactly where the bottlenecks are.

By adding automated performance testing scripts to the Xcelerate ATF, the organization is able to identify problem areas and refocus maintenance efforts. Additionally, the ATF executes these tests—with no extra manual effort—early and often during new development to identify performance issues before they make it to production. This has led to a reduction in incidents, improved end user satisfaction, and increased reliability of mission critical functionality.

XCELERATE
SOLUTIONS

Secure Results.
Delivered.

FOR MORE INFORMATION ON OUR
AUTOMATED TEST FRAMEWORK
CONTACT:

eti@xceleratesolutions.com

ABOUT XCELERATE SOLUTIONS

We exist to create innovative solutions that deliver results, manage risk from individuals to systems, and *xcelerate* time to value. Across our three practices — Enterprise Technology & Innovation; Project, Program & Portfolio Management; and Enterprise Process Management — we optimize efficiency and effectiveness and enhance the security and resilience of America's personnel, physical and cyber infrastructure.

PHONE 703.462.1500 **SOCIAL** @XLR8Solutions xceleratesolutions.com

HEADQUARTERS 8405 Greensboro Drive, Suite 930 McLean, VA 22102

afaq
ISO 9001
Quality
AFNOR CERTIFICATION

CMMISVC/3℠
Exp. 2018-10-09 / Appraisal #25322

afaq
ISO 27001
Information
Security
AFNOR CERTIFICATION