

**ITS / DOT Quality Assurance/Quality Control and
Release and Deployment Process for DOT Vendor
Contract Solutions
C004309 – Attachment 20**

1. Purpose of this Document

The purpose of this document is to outline the ITS / DOT QA/QC, Environment Usage and Release/ Deployment process for DOT Vendor Contract Solutions. This document will specifically address the *teams and their roles/responsibilities as well as the process for ANY DOT solution*.

Overview

To fulfill the Project, Project Lite, Enhancement and Operational needs for any DOT solution the Quality Assurance / Quality Control best practice will follow the Release and Deployment process as outlined in this document.

Release and Deployment Management aims to plan, schedule and control the movement of releases to test and live environments. The primary goal of this process is to ensure that the integrity of the live environment is protected and that the correct components are released.

Solution testing includes, but is not limited to:

- validation of solution functions against business and technical requirements,
- performance of solution functions and security features; and
- how the solution interoperates with all interfaces in terms of accuracy and performance.

Release and Deployment applies to all Environments and include, but are not limited to:

- Release packages must be created by the Vendor for DOT Contract solutions and provided to the ITS Application Development Lead for DOT who is responsible for Release record creation.
- Release packages will **ONLY** be deployed in any ITS environment by the ITS Deployment Specialist for DOT.
- Vendor for DOT Contract solutions must provide detailed release and deployment notes / instructions / steps that include:
 - New/All code features/enhancements included in the Release
 - Bug fixes (if any) included in the Release
 - Test cases/Scenarios and expected test results to be executed as part of said Release
 - Confirm new features/hot fixes included as part of the Release do not break the existing business processes
 - Separate DDL and DML scripts associated to said Release

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Acceptance Test Plans apply to all Environments and include, but are not limited to:

- The Vendor **must** prepare a test plan document which defines the levels of testing to be performed (e.g. unit testing, solution integration testing). This document should include the appropriate metrics e.g. no showstopper defects, entry and exit criteria to different environments. The test plan document must be approved by NYSDOT and ITS project team prior to acceptance testing.
- The Vendor **must** prepare and document test plans which must include expected results and validation techniques for performance, functionality, interoperability, backup and restore procedures, and high availability design requirements.
- The Vendor, the DOT/ITS project team and DOT Program area(s) must participate in the execution of all testing.
- The Vendor in conjunction with the ITS project team **must** provide a full and complete audit trail for all acceptance testing, defect tracking and the requisite reporting from this audit trail.

2. Process and Environment Usage

The ITS QA/QC Lead for DOT is responsible for facilitating, coordinating, and managing all Testing for all DOT solutions.

ITS provides the tools required to support all testing and security scanning as outlined below.

Any solution developed and/or implemented for use by or on behalf of NYS must undergo vulnerability scanning as described in NYS-S15-002 (<https://its.ny.gov/document/vulnerability-scanning-standard>) prior to final release/deploy into production. This standard addresses pre-deployment scans, implementation scans, and frequency of scans (determined by the solutions information classification and connectivity/accessibility). This standard also provides remediation timeframe expectations based on risk and severity of identified vulnerability.

Un-remediated vulnerabilities **must** have a formal remediation plan and documented approval from the ITS ISO for DOT, the DOT CISO and the DOT Cyber Risk Coordinator whom are responsible for DOT's risk management mitigations.

NYSDOT / ITS Technical Environments

The NYSDOT technical environment is managed by the Office of Information Technology Services (ITS) at the NYS Data Center, College of Nanoscale, Science and Engineering (CNSE) building located in the NYS University Campus in Albany. The computer hardware and databases used in support of the resulting solution shall be configured to support multiple processing environments that are logically separated by Stealth COIs (Community of Interest), and in some cases, physically separated. The

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logical separation is required for security as the NYS Data Center is a shared services environment, and multiple tiers are required to prevent ongoing development and testing activities from conflicting with one another, or with the production system, and allows the controlled implementation of new functionality and software patches. The NYSDOT/ITS technical environment consists of four logical and physical tiers: Development, Test, Quality Assurance (Staging), and Production.

NYSDOT / ITS Technical Environment Access Rules

The Development environment is the **ONLY** environment where Vendors for DOT Contract solutions and ITS Application Development Developers for DOT could have access / permissions.

Vendors can have the base applications installed in the Development Environment on-prem and use that environment to configure and/or customize; or, use their off-site Development Environment.

If configuration and/or customization is done on-prem, the Vendor and the ITS Application Development Developers will have the appropriate access/permissions to fulfill their duties. These resources will also perform Unit testing and resolution of defects as described in Section A below. The result will be a Release package to move application and data to the next environment.

If configuration and/or customization is done off-site (not in the NYS Data Center), the Vendor will have access/permissions to the on-prem Development Environment. And, they must perform Unit testing in the off-site and on-prem development environments and resolution of defects as described in Section A below. The test and defect resolution results must be included with the Release package and notes for ITS Deployment within the on-prem hosted Development Environment.

Solutions that do not require configuration and/or customization can be installed in the Test Environment on-prem. The selected Vendor will develop fully tested installation and data migration scripts (aka Release Packages) for the ITS teams to move applications and data to the Quality Assurance/Staging and Production Tiers.

A. Development Environment

The Development Environment in the NYS Data Center is the environment where the Vendors will develop, modify, and test software code. The Development environment is the **ONLY** environment where Vendors will have appropriate access / permissions. The development environment is used to perform Unit testing.

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Unit testing is the most 'micro' scale of testing and is used to validate whether the small units of the application are working as per the requirements or not.

The scripts are written and performed by the Vendor, as they require detailed knowledge of the internal program design, and cover things like statements, branches, conditions and paths.

Unit tests should also include the preliminary testing of interfaces (exchanges of data or control) with other DOT or non-DOT solutions.

The Release package from the Vendor must contain detailed notes/instructions/steps including, but not limited to:

- All code applicable to the Release
- Separate DDL and DML scripts appropriate to said Release
- Detail of new features/enhancements included in the Release
- Detail of Bug fixes (if any) included in the Release
- Test cases/Scenarios and test results to be executed as part of the Release
- Confirmation that New features/hot fixes included as part of the Release do not break the existing business processes in the environment

The ITS Application Development Lead acting as ITS Release Specialist is responsible for accepting the Release package from the Vendor, and ensuring that all requirements as stated above are complete.

- If complete, the Release record will be created with all necessary tasks and assignments.
- If not complete, the Release package will be rejected and sent back to the Vendor with documented requirements to make complete.

Vendors will perform full Unit testing to ensure ALL business functionality developed as part of said Release / Deploy tests successfully. The Vendors are responsible to triage and resolve ALL failed testing prior to requesting to release and deploy to the next non-production tier.

ITS QA/QC Lead will perform 'smoke testing' (aka build verification testing). This process helps to test whether all the environment aspects are running successfully and whether the build is stable or not and justifies if the build can be confirmed / authorized for Release and Deployment to the next non-production environment.

The completion of the Smoke Test task by the ITS QA/QC Lead indicates approval to Release and Deploy to the next non-production environment.

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B. Test Environment

This environment is used for Functionality, User Interface, Integration and Regression testing. Functionality testing is a collaborative effort by the Vendor, ITS Application Development Developers and DOT Core testers which requires no knowledge of the internal design. It is software testing that evaluates the solution's overall compliance with its specified functional requirements and behavior versus the expectations of the customer.

Testing for this environment includes:

- a. **Functionality testing (aka Specifications-based testing)** - Validating the system against the functional specifications and verifies the features against specified set of user specifications.

Role: Vendor, ITS Application Development Lead, ITS QA/QC Lead, and DOT Core testers.

- b. **User Interface testing** - Verification that the Graphical User Interface (GUI) meets its written specifications, including look and feel ('user-friendliness'), handicap compliance, drop downs, lists of values, validity checking, etc.

Role: Vendor, ITS CTO Application Development Lead, ITS QA/QC Lead, and DOT Core testers.

- c. **Integration testing** – Verification that individual modules of the application when combined and tested as a group to verify the functionality after combining different modules.

Role: Vendor, ITS Application Development Lead, ITS QA/QC Lead, and DOT Core testers.

- d. **Regression testing** - Regression testing focuses on finding defects (previously working functionality that has stopped working) after changes to the code or the operating environment have taken place. The extent of testing will depend on the magnitude of the changes in the Release and/or the level of risk to NYSDOT should the software fail.

ITS strives to fashion easily repeatable, preferably automated, tests to help streamline regression testing efforts. A sanity test, or sanity check, is a basic

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type of regression test used to quickly assure that the application or solution works as expected.

Role: Vendor, ITS Application Development Lead, ITS QA/QC Lead, and DOT Core testers.

The Vendors are responsible to triage and resolve **ALL** failed testing prior requesting to release and deployment to the next non-production tier.

ITS QA/QC Lead will perform 'smoke testing' (aka build verification testing). This process helps to test whether all the environment aspects are running successfully and whether the build is stable or not and justifies if the build can be confirmed / authorized for Release and Deployment to the next non-production environment.

The completion of the Smoke Test task by the ITS QA/QC Lead indicates approval to Release and Deploy to the next non-production environment.

C. Quality Assurance / Staging Environment

This environment is supposed to mimic and simulate the Production environment. Real Business Data should be used in order to include complexities and variations of data or the volume of data, whenever the Confidentiality rating in the InfoClass permits.

This environment is used for solution interface, integration and functional testing comprising Performance, Recovery, and Operational testing. Integration and Functional testing validate that all necessary interfaced services and components will function as designed in the Production Environment.

Testing for this environment includes:

- a. **Performance/Load testing** – A set of tests (stress, load, etc.) used to determine the stability of the solution under a variety of operational conditions, from normal to extreme, often to a breaking point. Performance tests seek to reveal the solution's robustness, availability, and error handling under heavy loads to ensure that the software doesn't crash due to insufficient resources (memory, disk space, number of connections, network capacity, etc.), high concurrency, denial of service attacks and the like. Performance tests are also used to determine the speed or effectiveness of a computer, network, software program, or device.

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Role: Vendor, ITS Application Development Lead, ITS QA/QC Lead, DOT Program area(s) UAT testers, and ITS TaaS.

- b. **User Acceptance testing** - User acceptance is the point in time when the customer, using as a basis the collective results of prior testing and exposure to the solution, acknowledges that the solution meets the predefined business criteria for the Release and may move to the next phase of an implementation.

Role: Vendor, ITS CTO Application Development Lead, ITS QA/QC Lead, and DOT Program area(s) UAT testers

- c. **Security testing** – Vulnerability scanning will be performed by the ITS ISO team. If the solution is a web application, an In-depth Web Application Scan will be performed. The ITS ISO team will generate a summary of findings, provide remediation suggestions, and be able to associate a severity value to each vulnerability discovered.

The Vendor in conjunction with the ITS teams are responsible for remediating Critical and High Vulnerabilities prior to an authorized release to the production environment. The ITS ISO will confirm all remediations are successfully completed, hence authorizing deployment to the Production tier.

Role: Vendor, ITS Application Development Lead, ITS QA/QC Lead, DOT Program area(s) UAT testers, and ITS ISO

- d. **Solution Interface testing** - Solution Interface testing seeks to validate the quality of the interfaces between independent solutions. This includes ALL exchanges of data or control and file extracts and/or reports into the solution being tested, as well as to all other internal and external solutions.

Role: Vendor, ITS Application Development Lead, ITS QA/QC Lead, and DOT Program area(s) UAT testers.

- e. **Regression testing** - Regression testing focuses on finding defects (previously working functionality that has stopped working) after changes to the code or the operating environment have taken place. The extent of testing will depend on the magnitude of the changes and/or the level of risk to NYSDOT should the software fail.

ITS strives to fashion easily repeatable, preferably automated, tests to help streamline regression testing efforts. A sanity test, or sanity check, is a basic type

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of regression test used to quickly assure that the application or solution works as expected.

Role: Vendor, ITS Application Development Lead, ITS QA/QC Lead, and DOT Program area(s) UAT testers.

- f. **Recovery testing** - The activity of testing how well an application is able to recover from crashes, hardware failures, and other similar problems.

Role: Vendor, ITS Application Development Lead, ITS QA/QC Lead, and DOT Program area(s) UAT testers.

- g. **Operational testing** - Verifies that all components that were insufficiently tested, or were not tested at all, during prior phases are functioning as intended, including: VDI, GIS, SAML v2.0, OPENID, AD, ODI, mobile devices, Tableau, etc.

Role: Vendor, ITS Application Development Lead, ITS QA/QC Lead, and DOT Program area(s) UAT testers.

The Vendors are responsible to triage and resolve ALL failed testing prior to requesting to release and deployment to the Production Environment.

ITS QA/QC Lead will perform 'smoke testing' (aka build verification testing). This process helps to test whether all the environment aspects are running successfully and whether the build is stable or not and justifies if the build can be confirmed / authorized for Release and Deployment to the next non-production environment.

The completion of the Smoke Test task by the ITS QA/QC Lead indicates approval to Release and Deploy to the Production environment.

D. Production Environment

The Production Environment is the "live" environment. The production environment is the final endpoint in the release and deployment process and should host the full business solution including all integrated modules that have been authorized to be deployed from the Quality Assurance / Staging Environment.

Deployment Planning checklist:

1. Prepare Plan –

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- a. ITS Project Manager confers with all DOT, ITS and Vendor teams needed to support the deployment to determine tasks, resource assignments, duration of tasks, and availability of resources to determine production deployment date and timeslot
 - b. ITS Project Manager drafts End User Communication of outage, if needed; and the 'go-live' date and details for End Users to start using the solution, and provides to DOT Sponsor for distribution
 - c. ITS Project Manager ensures Vendor, DOT and ITS team all review and agreed to the plan
2. Formulate a Roll back Plan
- a. ITS Project Manager prepare and document tasks and resources to roll back to previous version should production go down after deployment
 - b. ITS Project Manager document the Roll back testing plan including who is responsible and that they are available.
 - c. ITS Project Manager ensures Vendor, DOT and ITS team all review and agreed to the plan
3. Prep Environment
- a. ITS Solution Architect ensures all network configurations are in place or if needed to be in place at the same time as deployment, determine what is needed, who is responsible, submit appropriate service requests, and confirm that the resources are available during the deployment date and timeslot.
 - b. Vendor provides SSL Certs ready to deploy with the application.
 - c. ITS Solution Architect setups monitoring and alerts should the system have issues after deployment including traffic spikes (CPU, Cache, etc) where ITS and the Vendor need to triage and resolve prior to business impact.
 - d. Vendor setup Logging for debugging use should issues arise during deployment.
 - e. ITS Project Manager ensures Vendor, DOT and ITS team all review and agreed to the plan

Testing for this environment includes:

a. Acceptance testing –

- 1. **Execution deployment.** Pushing the software into the environment.

Role: ITS Deployment Specialist

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2. **Confirming deployment.** Acceptance testing to validate customer requirements are met and solution delivers all new features/bug fixes/enhancements as documented in the Release.

Role: DOT Program area(s)

The ITS QA/QC Lead will perform 'smoke testing'. This process helps to test whether all the environment aspects are running successfully and whether the build is stable or not and justifies if the build has been successfully deployed to the Production environment.

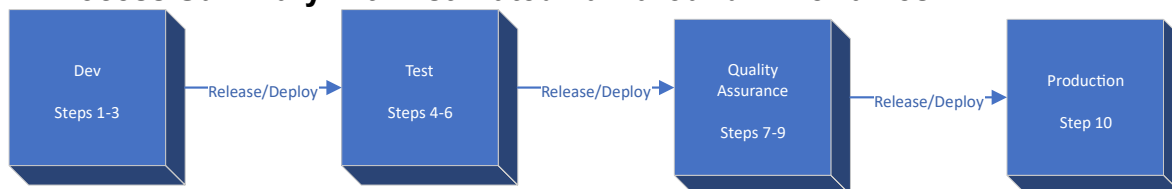
Note that the ITS QA/QC Lead may not always be able to perform full testing in the Production Environment due to the need to use real data and transactions.

The final step is to obtain DOT Executive Sponsor and DOT Sponsor signoff / acceptance of the Release package into Production.

The Production Environment is the operational environment. Per NYS-S15-002 (https://its.ny.gov/sites/default/files/documents/nys-s15-002_vulnerability_scanning_1.pdf), Vulnerability Scans are run periodically in accordance with the applicable application risk rating. A Vulnerability Scan will be run supported by ITS tools.

The Vendors are responsible for analyzing and remediating **ALL** Critical and High-Risk Vulnerabilities until resolved in accordance with the aforementioned standard.

E. Process Summary with Estimated Turnaround Timeframes



1. Release package is deployed to Dev Environment. Estimated turnaround time to deploy is 1 business day.
2. Perform testing as outlined under the Development environment section AND triage / resolve ALL failed testing. Estimated turnaround time is 2 business days but could be shorter or longer depending on complexity.
3. ITS QA/QC Lead will perform 'smoke testing' to confirm / authorize Release and Deployment to the next non-production environment. Estimated turnaround time for authorization is less than 1 business day.

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4. Release package is deployed to Test Environment. Estimated turnaround time to deploy is 1 business day.
5. Perform testing as outlined under the Test environment section AND triage / resolve ALL failed testing. Estimated turnaround time is 2 business days but could be shorter or longer depending on complexity.
6. ITS QA/QC Lead will perform 'smoke testing' to confirm / authorize Release and Deployment to the next non-production environment. Estimated turnaround time for authorization is less than 1 business day.
7. Release package is deployed to Quality Assurance Environment. Estimated turnaround time to deploy is 1 business day.
8. Perform testing as outlined under the Quality Assurance environment section AND triage / resolve ALL failed testing. Estimated turnaround time is 10 business days but could be shorter or longer depending on complexity.
9. ITS QA/QC Lead will perform 'smoke testing' to confirm / authorize Release and Deployment to the Production environment. Estimated turnaround time for authorization is less than 1 business day.
10. Release package is deployed to Production environment. Turnaround time for Deployment is dependent on the Deployment Planning checklist.