



T+2 shortened settlement cycle update

The biggest challenge in moving toward T+2 settlement?

Testing

Ask people in the securities industry about T+2 and it doesn't take long to see a pattern:

"T+2 can be summarized as thorough analysis, changing very little, and testing comprehensively."

"We view this as a large but shallow pool of requirements that's going to require a lot of testing."

"With 150+ systems being touched at a large broker dealer, testing and release management remains the #1 concern on T+2."

"Although T+2 is 400 days away, there's only approximately 150 business days to get ready for industry testing."

T+2 shortened settlement cycle update

As Q2 2016 fades into the rearview mirror and the migration to the T+2 shortened settlement cycle gets closer, "testing" is the word of the hour. The Financial Industry Regulatory Authority (FINRA) and Municipal Securities Rulemaking Board (MSRB) have already released their rule changes for T+2. The US Securities and Exchange Commission (SEC) plans to announce its own preliminary rule changes soon. As such, organizations that don't already have a plan to test how well they will operate in the post T+2 ecosystem may find themselves far behind the curve.

To meet the targeted migration date of September 5, 2017, the T+2 Industry Implementation Playbook (T+2 Playbook) specifies that organizations should be completing internal system changes and process and procedure impact analysis by

Q3 of this year. And planning should start now for the testing phase that follows. On the road to a shortened settlement cycle, testing the affected areas is the biggest challenge. Starting early will be important: The process will be prolonged, vast, and expensive. It will also require significant coordination across a number of stakeholders, applications, and business functions.

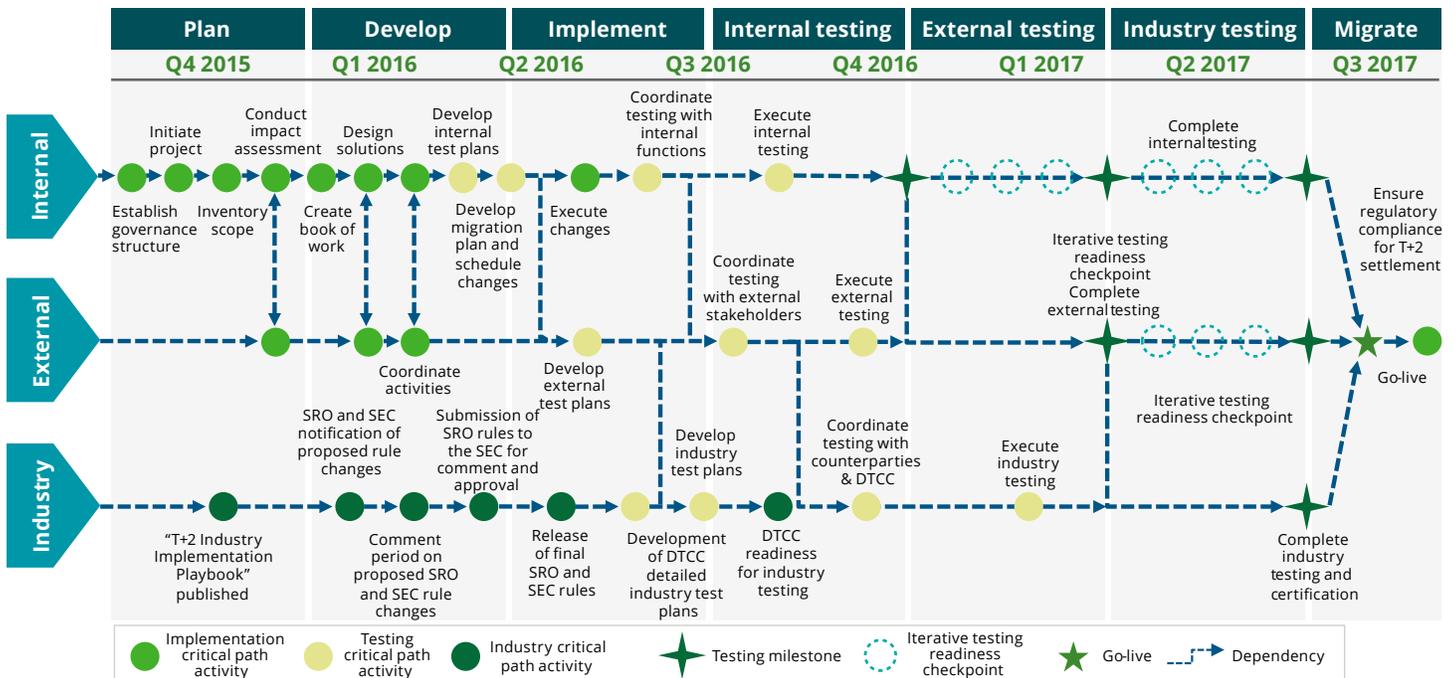
Testing will involve significant preparation and planning and will affect many parts of the organization. As part of test strategy and planning, testing roles and phases must be identified. Testing plans should be coordinated across applicable internal and external participants; test environments must be provisioned; test cases must be developed for the various testing phases; and test data must be planned and provisioned. Additionally, organizations

must coordinate their software release management and testing plans with ongoing, parallel projects to be released on a T+3 settlement cycle. It's important to approach T+2 testing not only from a technology change perspective, but also from an end-to-end process perspective that covers all affected business and operational functions.

Implementation activities that should already be complete

The T+2 Playbook includes a timeline that spells out the key activities and milestones that lead toward an effective migration (Figure 1). According to the timeline, the development and execution of changes to systems and processes for the shortened settlement cycle should be complete by Q3 2016, and preparations for testing should be well under way.

Figure 1: T+2 Implementation timeline

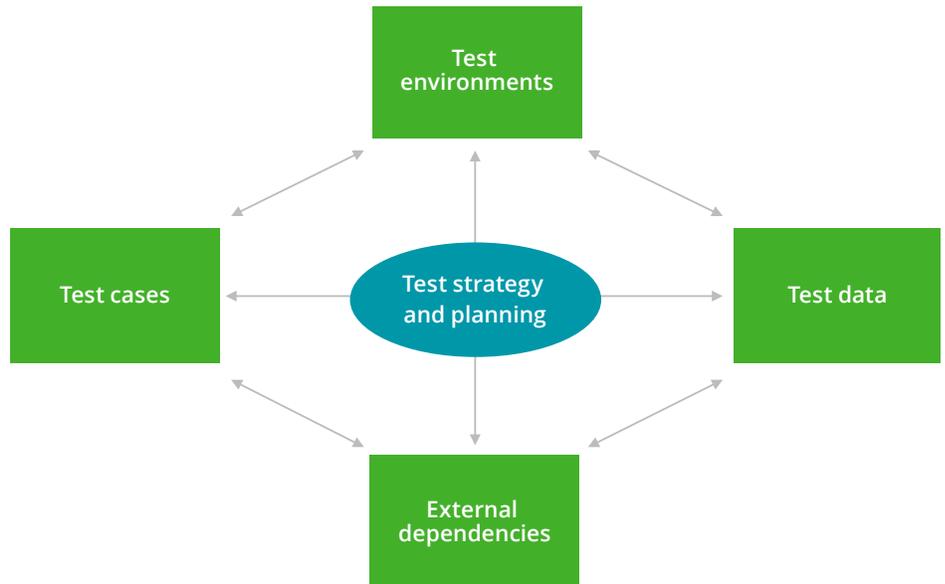


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Organizations that are on track have already begun planning for internal, external, and industry testing. As time and cost constraints won't allow most organizations a second attempt at testing, it will be critical to adopt an impact-driven testing strategy. Organizations should anticipate and preempt surprises such as test environment unavailability or lack of test data and, wherever possible, should adopt innovative solutions like test environment time slicing and containerization to reduce the cost and disruption the process will impose on regular business operations.

Are your T+2 testing efforts comprehensive? A few key questions can help (Figure 2).

Figure 2: T+2 Test strategy and planning framework



T+2 testing		Questions to ask yourself
Test strategy and planning		<ul style="list-style-type: none"> • How much or how little will you test? • With front-to-back testing, where does "front" start and "back" end? • Will you perform negative tests, or test for asset classes T+2 doesn't affect? • How will you stand up, manage, and provide air traffic control across a testing effort that spans multiple IT and operations groups across affected lines of business (e.g., investment banking, wealth management, asset management, custody) and their respective front-to-back functional areas? • Who are the test participants? • How do you track progress from development to testing to production deployment in a coordinated manner?
Test design	Test environments	<ul style="list-style-type: none"> • How will T+2 and T+3 processes share servers, databases, apps, and other infrastructure? • Should you build a dedicated T+2 environment? • How will projects that need a T+3 test environment operate between start and end of industry testing? • What are the key internal and external interfaces?
	Test cases	<ul style="list-style-type: none"> • Are your test cases covering cross lines of business and front-to-back integration points? • Are your test cases covering all affected operational processes? • How will you integrate your firm-specific test cases with industry and vendor provided test cases? • Have you considered leveraging test cases or test scripts from prior F2B testing efforts? • Have you planned for a regression test-pack?
	Test data	<ul style="list-style-type: none"> • How will you provide for front-to-back data lineage? • How will you segregate and manage data for the multiple scenarios testing will require? • What types of simulations will you need to mirror clients, service bureaus, and settlement agencies? • How will you mitigate breaks between systems?
	External dependencies	<ul style="list-style-type: none"> • What changes are the industry, service bureaus, and vendors making and how do they affect you? • How can you align your testing plans with the industry's T+2 migration? • How are you assessing and managing vendor and partner readiness?



Test strategy and planning

During the T+2 transition, it will be important to strike the right balance between testing too much and testing too little. Organizations should plan early and be deliberate about defining testing scope, requirements, and types of testing, including systems, regression, negative, integration, front-to-back (F2B), external, industry, and user acceptance testing (UAT). Timing should

be deliberate: when to start each type of testing, when external parties will be ready to test, and when the organization will be ready to participate in industry testing. A leading practice in addressing these timing concerns is “book-end test planning”— industry testing in 2017 at one end, change execution and coding completion at the other, and all other testing activities completed in between.

A central T+2 testing project management office (PMO), or command center, with federated execution leads can help mitigate risks throughout the testing process. The command center will require industry knowledge and an understanding of T+2 concepts and testing depths so it can govern overall testing strategy formulation. PMO staff should also have a top-down understanding of the application landscape and strong awareness of application functionality.

T+2 testing should take place in phases: systems testing, integration testing, F2B testing, and industry testing (Figure 3). Different systems and processes will be in scope for each phase. Each organization should assess its T+2 book of work to determine the sequencing for internal testing phases, assess cross-phase dependencies, and develop a master test strategy and test plan. Testing phases should also integrate across workstreams and lines of business.

Figure 3: Test phases

	Objective	Involvement from			
		IT	QA	Bus/Ops	Ext. parties
<p>System testing</p> <ul style="list-style-type: none"> • Confirm that application level changes are in line with business and functional requirements • Focus testing scope on individual application-level changes vs. upstream and downstream interfaces 	<ul style="list-style-type: none"> • Confirm that application level changes are in line with business and functional requirements • Focus testing scope on individual application-level changes vs. upstream and downstream interfaces 	✓	✓		
<p>Integration testing</p> <ul style="list-style-type: none"> • Confirm cross-functional domain integration from a front to back trade lifecycle standpoint (from order capture and execution through settlement and post settlement processes) • Excludes testing with external vendors, services bureaus and DTCC 	<ul style="list-style-type: none"> • Confirm cross-functional domain integration from a front to back trade lifecycle standpoint (from order capture and execution through settlement and post settlement processes) • Excludes testing with external vendors, services bureaus and DTCC 	✓	✓		
<p>Front to back testing</p> <ul style="list-style-type: none"> • Confirm cross-functional domain integration from a front to back trade lifecycle standpoint (from order capture and execution through settlement and post settlement processes) • Excludes testing with external vendors, services bureaus and DTCC 	<ul style="list-style-type: none"> • Confirm cross-functional domain integration from a front to back trade lifecycle standpoint (from order capture and execution through settlement and post settlement processes) • Excludes testing with external vendors, services bureaus and DTCC 	✓	✓	✓	
<p>Industry testing</p>	<ul style="list-style-type: none"> • Confirm cross-functional domain integration from a front to back trade lifecycle standpoint (from order capture and execution through settlement and post settlement processes) • Excludes testing with external vendors, services bureaus and DTCC 	✓	✓	✓	✓

✓ = Primary involvement
✓ = Partial involvement

Test design

The command center should lead the definition of roles and responsibilities during T+2 implementation. It should design and develop test scenarios, test cases, and test data for non-standard test cycles and phases. If possible, organizations should consider using scripts and data sets from past F2B, system, and functional testing efforts. An organization that has a good repository of automated test cases can gain efficiencies through the entire testing phase by running regression over multiple testing cycles and phases.

The command center should also be responsible for standardizing and setting up the defect management process, developing and tracking to a code release plan, and establishing entry and exit criteria for testing.

All of this will require deep technical and environment management experience that covers test environment provisioning, application and interface knowledge,

and an understanding of interfaces and interdependencies. Organizations' test plans should include the identification and allocation of these resources. Some organizations may find it advisable not to begin testing until these test environments are acquired and provisioned.

Test environments

Market participants will be called upon to provision and maintain multiple test environments, each of which will need the required functional and system capabilities. The Depository Trust & Clearing Corporation's (DTCC's) current testing environment will become the T+2 test environment, and a separate T+3 test environment will be created for current in-flight projects whose release dates fall before Q3 2017.

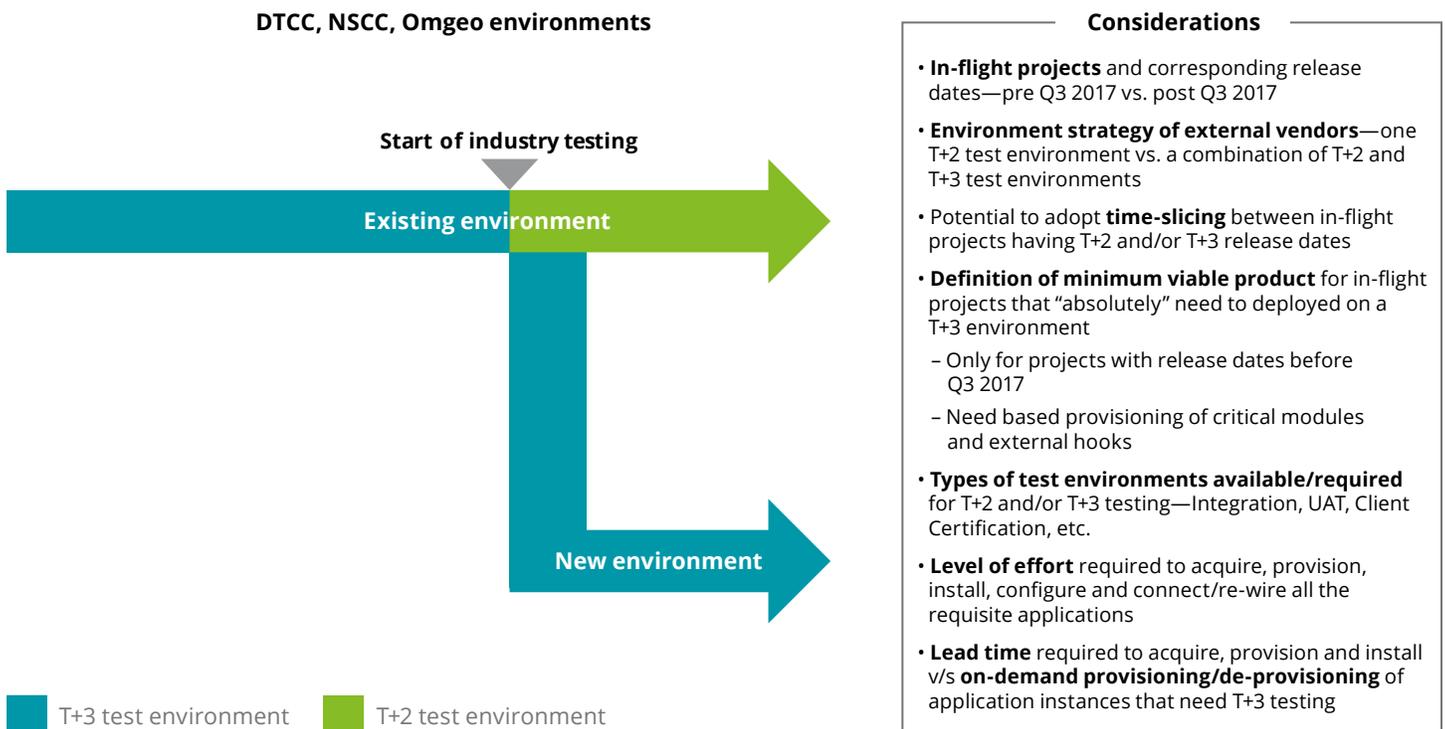
Organizations will need to verify that their external test environments are ready to handle the capacity for T+2 industry testing, and they should plan for time slicing between in-flight projects in the current test

environment. They should also consider the implications for business as usual (BAU) testing processes, such as client certification and ad-hoc testing (Figure 4).

The new T+3 test environment will have a limited lifespan and organizations should determine how much to invest in and how many systems it will need. IT will need to consider the level of effort it will take to acquire, provision, install, configure, and connect—or rewire—all the requisite applications in the T+3 environment, as well as the different types of T+3 environments that may need to co-exist, such as integration, UAT, and client certification. The new DTCC T+3 environment will be a minimum viable product for in-flight projects with minimal external hooks and business development applications.

DTCC isn't the only player. Vendors are developing dedicated T+2 test environments as well, and organizations will need to hook up to these new environments for external testing prior to industry testing.

Figure 4: Test environment considerations



Test cases

Successful T+2 testing is heavily dependent on developing the right set of test cases in line with the objectives of corresponding testing phases. The test cases for system testing should focus on application-level changes including screen and field changes (e.g., settlement date defaults), business logic changes (e.g., ex-date derivations), and reporting changes (e.g., confirmation of settlement-specific attributes such as settlement cycle). The test cases for integration testing should focus on testing key interfaces and data interchange between closely aligned systems (e.g., data feeds between order capture and order execution systems, or order execution systems and trade validation services). The test cases for front-to-back and industry testing should specifically focus on front-to-back trade flow from order capture to execution to settlement and post-settlement processes. Industry testing, in particular, should test for seamless connectivity with external vendors, service bureaus, and DTCC systems by integrating their published test scenarios with internal test cases and, in parallel, focus on validating all related operational processes (e.g., margin management, reporting, and reconciliations). As applicable, firms should leverage test packs produced for other F2B testing initiatives, specifically for regression testing critical existing features and functionalities.

Test data

The effectiveness of T+2 testing will depend on sourcing the required data sets and having consistent links through testing. Organizations will have to factor in how long it will take to provision data across F2B systems, and they should consider simulations for scenarios such as various corporate actions and failed trades.

During industry testing, all organizations will use designated CUSIPs issued by DTCC for scripted conditions. They will need to use common data sets during testing and be careful that the same DTCC CUSIPs are not already being used in test environments.

Organizations will also face data-related complexities, such as false positives in F2B testing, and triaging bad test data in test environments will likely take a large amount of time and effort. The following data-related requirements should be considered when planning for T+2 testing:

Critical requirement	Description
Data framing	<ul style="list-style-type: none"> • Testing teams will have to earmark their test data and avoid data loss and overrides • Data earmarking is critical if the same test environment is utilized for both T+2 and T+3 testing <ul style="list-style-type: none"> – T+2 testing should focus on a specific set of CUSIPs – T+3 testing should be conducted in parallel with other tactical and strategic enhancements
Scenario-specific data	<ul style="list-style-type: none"> • Specific data will be required for validating unique application functionalities. For example, corporate actions testing will require data with ex-dates and record dates during the testing window.
Data simulation	<ul style="list-style-type: none"> • To test multiple scenarios, corner cases, and exceptions, certain transaction data and events will have to be simulated to mirror client, industry, and service bureau actions. For example, allocation instructions will have to be manufactured to test allocation functionality.
Data consistency	<ul style="list-style-type: none"> • All teams will need to maintain and use the same clusters of T+2 data to overcome complex and heterogeneous systems coupled with different file formats having multiple touch points.
Data administration	<ul style="list-style-type: none"> • The central data team will have to plan and govern test data activities from implementation through deployment • Key test data activities include mapping data to scenarios, responding to data requests, avoiding data overrides, and not allowing data to become exhausted by a test cycle and unavailable for subsequent testing
Market data	<ul style="list-style-type: none"> • Testing environments will need to be connected to real-time market data for security prices, corporate actions, and other market events



External dependencies

Despite the best efforts of your organization to prepare, design, and execute testing plans, multiple external factors will likely influence your testing. Understanding the impact of external changes to internal systems and processes is critical to designing test scenarios and coordinating environments and data.

The readiness of external parties, such as vendors, service bureaus, and market data providers, will also drive test planning. Vendors are in the process of finalizing their own development and test plans, and organizations should communicate with their vendors now to influence the outcome. Changes to vendor processes, systems, and data, if any, will be similar to key financial market utilities—and will need to be tested.

Each organization's situation will be unique in terms of the complexity of changes, implementation timeframe, code versus configuration changes, and testing plans. After vendor interactions, individual testing plans will have to factor in the impacts and associated remediation timelines. Plans will also have to account for other trading partners and counterparties and their readiness and willingness to participate in testing.

Finally, organizations will need to transition from internal and external testing to DTCC and industry testing. Due to the central role DTCC and its subsidiaries have in support of post-trade infrastructure in the US, much of the industry testing will involve testing with Depository Trust Company (DTC), National Securities Clearing Corporation (NSCC), and Omgeo participants. In February 2016, DTCC released a document¹ outlining its high-level testing framework, and recently released their detailed testing requirements.² DTC and NSCC will be requested to certify their own T+2 readiness prior to migration to T+2.



Execute

All prerequisite planning and design activities should be complete before testing begins. With numerous teams and systems involved in testing, multiple testing windows, and myriad defect management tools and procedures, orchestration and coordination will present complexities. The availability of test environments and data may also present challenges.

Organizations will need to provision data and simulation scenarios, such as corporate actions, and execute all requisite test scripts. During execution, the command center should be responsible for monitoring the overall progress of testing, including test coverage and completion levels, and managing defect triage and resolution. The PMO should develop a T+2 test progress dashboard to assist with the timely and detailed tracking of test execution results and monitoring of defects.

Transition

To make the jump, organizations will need to execute on their code release approach. This can be done by cold code or parameterized release into production. They will have to perform smoke tests and validation tests in production environments. Line of business and functional certification should be completed, followed by final sign-off from the organization. The command center should monitor post-production changes and assess readiness for T+2.

Comprehensive testing can help mitigate the operational, financial, reputational, brand, and other risks associated with the transition to the shortened settlement cycle. T+2 implementation should be considered an essential maintenance project—and, as with any other such effort, adequate due diligence will lead to a smooth transition to the shortened settlement cycle. Deloitte, based on its deep knowledge of the T+2 Playbook approach, F2B testing depth, and industry experience, is well-positioned to support your T+2 testing efforts.

¹ T+2 Test Approach: DTCC's High Level Testing Framework, February 2016

² T+2 Testing Approach: Detailed Testing Framework, July 2016

Contact us:

Robert Walley

Principal | Deloitte Advisory

Deloitte & Touche LLP
Email: rwalley@deloitte.com

Mike Wade

Managing Director | Deloitte Advisory

Deloitte & Touche LLP
Email: miwade@deloitte.com

James Weber

Managing Director | Deloitte Advisory

Deloitte & Touche LLP
Email: jamweber@deloitte.com

Sriram Gopalakrishnan

Managing Director

Deloitte Consulting LLP
Email: sgopalakrishnan@deloitte.com

Special thanks to our authors:

Christopher Acosta, Specialist Leader | Deloitte Advisory, Deloitte & Touche LLP; Ritesh Biswas, Senior Manager | Deloitte Consulting LLP; John Sjosten, Specialist Master | Deloitte Advisory, Deloitte & Touche LLP; Narayanan Raman, Manager | Deloitte Consulting LLP; Marcus Schulz, Senior Consultant | Deloitte Advisory, Deloitte & Touche LLP; and Christian McNally, Consultant | Deloitte Advisory, Deloitte & Touche LLP

Deloitte is well-qualified to support your T+2 implementation

Leading organizations in the financial services industry have engaged Deloitte to assist with their organizations' T+2 initiatives. Our deep knowledge of the T+2 Playbook approach—combined with our advanced tools and in-depth understanding of cross-functional impacts—can help accelerate implementation and migration. In addition, our approach to testing and our ability to manage and sequence complex dependencies can help you reduce implementation risk and lays a strong foundation for effective implementation.

Active leadership on T+2

- Deloitte facilitated the creation of the Industry Steering Committee's T+2 Playbook
- We developed detailed implementation timelines, milestones, and dependencies in response to the SEC letter
- Our leadership team will be actively engaged with the Industry Steering Committee and your peer institutions throughout the full implementation lifecycle

Deep understanding of financial institutions

- We are a trusted resource to whom companies around the world turn with their most strategic implementations
- We have a strong track record in securities operations and technology

Leading industry knowledge

- Your engagement leader and advisory team will bring their extensive experience in institutional and retail brokerage, asset management, custody, and exchanges
- Deloitte will provide a dedicated team of professionals with knowledge and experience in trading, clearance, settlement, asset servicing, client reporting, technology, and regulation

T+2 Testing Center for Excellence

- Deloitte has built a repository of 200+ test cases that organizations can use to jumpstart any T+2 testing program
- The set of test cases can be customized, installed, and bolted onto existing testing toolsets, then serve as a one-stop shop for all your T+2 testing needs
- The solution has out-of-box reports and plans that can monitor progress and provide a bird's-eye view of how testing is progressing along the multiple dimensions
- Our onshore and offshore staff have first-hand experience by executing T+2 related engagements

Testing capabilities from the ground up

- Deloitte has managed functional, regression, and UAT testing for recent industry regulatory requirements at leading financial institutions
- Based on our established testing capabilities, we have built automated processes, frameworks, and tools for test planning, test case generation, and defect management

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