



CHES Replacement: New Scope and Implementation Plan

Response to consultation feedback

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Contents

Executive summary	3
Implementation timeline and Day 1 new scope	8
High-level timeline.....	8
Day 1 CHESS new scope.....	8
Ongoing stakeholder engagement on business requirements	10
Migration approach	10
Implementation roadmap.....	11
Technical documentation release and testing arrangements	12
Technical documentation release.....	12
Test environments and phases	12
Ongoing stakeholder engagement	15
Connectivity and Integration Working Group.....	15
Implementation and Transition Working Group.....	16
Technical solution for the CHESS replacement system	17
Connectivity options.....	17
Adoption of ISO 20022 messaging.....	18
DA platform and node access	18
Browser interface	20
Data API.....	20
Networking.....	20
Legacy topics	20
Non-functional requirements	20
Clearing and settlement interoperability.....	21
Appendix A: Information in each technical document release	22
Appendix B: Nature of testing phases	24
Acronyms	25

Executive summary

Background

ASX has been working since January 2016 with its technology partner Digital Asset to examine and test the ability of a distributed ledger technology (DLT) based system to underpin the replacement of CHESS. This process led to the decision in December 2017 to proceed with a DLT-based solution.

As well as providing a solid foundation for the provision of clearing, settlement and other post-trade services, it has become clear that DLT's highly secure environment, where permissioned users have real-time access to the data to which they are entitled, will enable ASX's customers or third-parties engaged by them to build new services across the market to generate significant value for customers.

The industry benefits of the DLT-based solution include: reduced risk, cost and complexity through improved record keeping; reduced need for reconciliation between multiple databases; more timely transactions and better quality source of truth data. Digital Asset's smart contract modelling language (DAML), combined with the DLT-based solution will over time, drive industry innovation and enable customers to develop an exciting new generation of products and services based around multi-party automated and simplified workflows.

On 27 April 2018, ASX released a consultation paper, *CHESS Replacement: New Scope and Implementation Plan*. The paper sought industry feedback on: the new and enhanced business functionality proposed for the new system; some redundant services that would be decommissioned; the draft plan for implementation of the new system; and the testing and transition arrangements. The paper also described the system's high-level technology architecture for the DLT-based model and connectivity options.

Feedback was invited from users and other stakeholders on the following questions to assist in planning for the delivery of the new system:

- Were there any important new business requirements that were not captured in the consultation paper that should be included?
- Was there specific feedback on the proposed testing and release management strategy and the proposed migration and implementation approach?
- Was there particular information that was needed to assist with transition planning?

Overview

A total of 41 written submissions were received representing the views of a wide range of stakeholder groups including: clearing and settlement participants; payment providers; back office technology vendors; market operators; share registries; and industry associations representing issuers, brokers and custodians.

ASX thanks those organisations for the time and effort taken in preparing their submissions. There was a considerable amount of information to digest, including a variety of suggestions that will continue to feed into the next stage of the process in developing the new system, particularly in relation to the implementation plan and detailed solution design.

This paper provides ASX's response to consultation feedback, including a summary of the responses received and details on the specific changes ASX will make to the new scope and implementation plan as a result of this feedback. It also responds to a number of the key issues and questions posed in the submissions and, where it is not possible to provide an answer at this time (because further detailed design and specification work has yet to be undertaken), provides an indication of when more information will become available.

ASX acknowledges that there is a desire for more detailed information in specific areas in order to further progress necessary planning and budgeting. ASX will provide this information when it is able – as outlined in the timetables in this document.

Many of the more detailed suggestions and comments raised by respondents in their submissions will also be addressed in the working groups to be established to support the new system's implementation and migration plans.

Overall the submissions were supportive of ASX’s approach to updating Australia’s equity post-trade infrastructure and reflected a strong interest in better understanding the potential benefits that a DLT-based system can offer. There was also broad support for the new features being implemented - although there was a range of views on their relative priorities.

A high-level summary on consultation feedback and ASX’s response is provided below.

Responding to feedback on the new scope and the proposed implementation timeline

ASX received strong feedback in its 2016 consultation on the proposed scope of the new system that users wanted new functionality that would deliver immediate benefits. This feedback was confirmed through subsequent industry working groups in 2017.

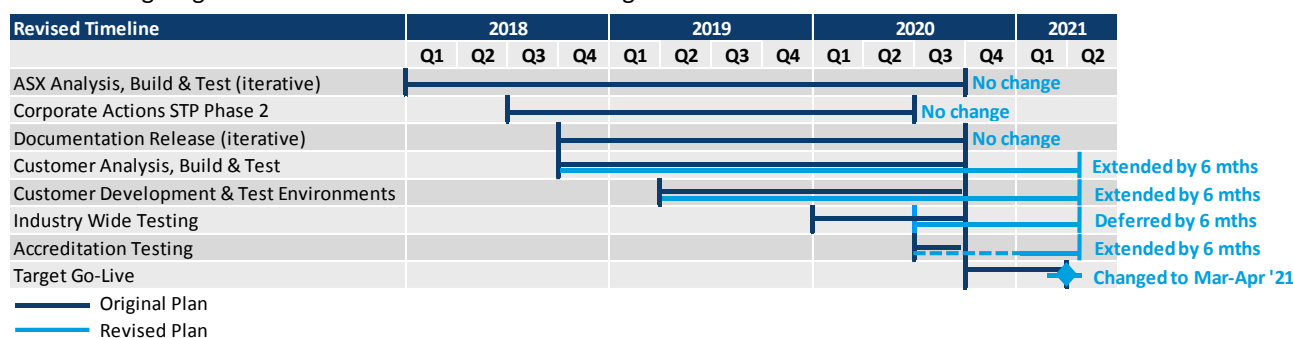
The proposed new scope released by ASX in April 2018 was designed to achieve this. While there was continued widespread support for delivering new scope on Day 1, respondents questioned whether the proposed implementation window of Q4 2020 to Q1 2021 was achievable given the significance of the technology change and the range of new scope being introduced.

ASX considered this feedback having regard to the priority respondents placed on these changes, the estimated reduction in development and testing effort (operational and technology) required by users, and the regulatory work that would need to be addressed prior to implementation.

As a result, ASX has modified the plan and will:

- defer implementation of seven new scope items from Day 1 to post-Day 1 and bring forward one new requirement in response to strong representations from a number of respondents;
- push back the earliest commencement date for the new system from Q4 2020 to target March-April 2021;
- provide an additional six months for user development and testing;
- defer commencement of industry-wide testing by six months; and
- extend mandatory accreditation by six months.

The following diagram sets out the revised timeline having taken into consideration all the feedback received.



A full list of the finalised Day 1 new scope can be found in the table on page 9.

Broad support for a single cutover weekend and suggested migration measures

A majority of respondents were supportive of, or expressed no specific objection to, the plan for a single cutover date to the new system. Several respondents noted the possible risks involved, particularly with regard to ensuring all users are ready by the go-live date. A few supported a more phased implementation approach.

ASX acknowledges this feedback, but remains of the view – informed by previous experience transitioning critical market infrastructure systems - that the single cutover weekend is the most appropriate solution and is lower risk than other alternatives such as running multiple systems in parallel.

Respondents proposed a number of very helpful suggestions to assist in managing a single cutover weekend including the provision of migration and conversion tools. They also requested more information on the process for HIN clean up and the migration of CHES holder registration details.

In response to this feedback, ASX will:

- create specific focus groups on HIN clean-up and the migration of CHES holder registration details; and
- work with users to develop tools to aid their migration and conversion activities.

Requests for early access to documentation, and more information on release management and testing

Many respondents raised a number of clarifying questions around the timeline for release management and the testing environments. They requested earlier access to system documentation, a detailed timetable for documentation release, a longer period between technical documentation release and commencement of testing, and more information on the types of testing in each environment.

In response to this feedback, ASX will provide:

- technical documentation at least three months prior to each incremental software release into the customer development environment. The first set of technical documentation will be released in December 2018 covering a subset of core clearing and settlement services;
- a rolling forward feature view of technical documentation at least six months in advance to assist with users' project planning; and
- six months additional software development and testing timing for users by pushing back the target go-live window to March-April 2021.

Support for ongoing stakeholder engagement

Many respondents commended ASX's approach on stakeholder engagement to date which has included a wide cross section of relevant users and stakeholders. Some respondents asked that with the project now underway, ASX increase engagement with issuers, investors, market operators and technology vendors.

Respondents were also keen to continue engaging with ASX to ensure that the right information is available to assist with internal planning and development work.

In response to this feedback, ASX confirms that it has plans in place to:

- expand the direct engagement with issuers that commenced in 2017 and also work closely with organisations including the Governance Institute of Australia and Australasian Investor Relations Association;
- extend existing engagement activities with institutional and retail investors, including through their relevant industry associations;
- continue to support the Approved Market Operators (AMOs) Working Group to address matters of specific interest to this group – e.g. connectivity of trading platforms to the new post-trade infrastructure;
- establish the Connectivity and Integration Working Group in September 2018 to facilitate a deeper understanding of different connectivity options and assist in the preparation of appropriate industry-wide material to support understanding and choice of connectivity options;
- establish the Implementation and Transition Working Group in the first quarter of 2019 to develop the detailed plan and related artefacts for the migration to the new system. This will include measures to mitigate risks around a single cutover weekend; and
- convene focus groups on new business requirements, where necessary, or other key aspects of the project where there is a need to drill down on detail not covered by the two working groups described above.

The following diagram sets out the timeline for the key stakeholder activities:

Stakeholder Engagement Timeline	2018				2019				2020				2021	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Focus Groups (on New Requirements)														
Connectivity & Integration Working Group (inc relevant Focus Groups)*														
Implementation & Transition Working Group (inc relevant Focus Groups)*														
Corporate Actions STP Phase II Working Group														
Business Committee														
Technical Committee														
Issuers & Investors														
AMOs														

* See page 16 for topics and content to be covered

Strong interest in exploring and understanding different connectivity options

To inform their decision making and planning, respondents requested more information on the DLT-based solution so they can understand the operational, governance, security and cost implications of different connectivity options, as well as the benefits of connecting and operating via a node (relative to non-node traditional message-based connection).

Access to DLT-nodes is being prioritised for existing clearing and settlement participants (and their CHES accredited vendors). ASX's first priority is to ensure that participants' connectivity requirements to ASX's critical infrastructure for the delivery of clearing, settlement and other post-trade services are satisfied in the lead up and transition to the new system. When clearing and settlement participants are sufficiently progressed with their chosen access method (node or non-node) to the new system, ASX will engage with other users who wish to explore the provision of other services by using a DLT-node.

In response to this feedback, ASX will augment its existing plan to:

- provide additional information and certainty on aspects of the new system, the different connectivity options and the net benefits associated with each;
- conduct a series of webinars in September and October 2018 to give an architectural overview of the technical solution and further details around the different connectivity options to respond to some of the most common questions;
- provide technical account management and day-to-day support for users to assist with their build and test activities. This is similar to the approach taken around the introduction of the new derivatives trading platform in 2017;
- conduct training, through ASX's technology partner, Digital Asset, on the Digital Asset Modelling Language Software Development Kit (DAML SDK)¹ for participants and their technology vendors;
 - the training explains the system's features and how users can develop their own applications to integrate with existing ASX DAML workflows and eventually author their own custom DAML workflows;
- offer no cost access for participants (and their current CHES-accredited technology vendors) to the managed node service via the customer development, industry-wide testing and pre-live production environments to allow them to investigate the potential benefits of node connectivity in the period leading up to the go-live of the new system;
- target the provision of a connectivity pricing framework (that will apply post go-live) prior to the commencement of testing for the managed node service offering; and
- provide a transition path to allow participants maximum flexibility with respect to integration.

¹ For organisations interested in downloading the DAML SDK Developer Preview, registrations are accepted at www.daml.com.

Managing data

There were a range of questions posed by respondents regarding how the DLT-based solution would impact data ownership - including circumstances where participants choose to commit additional information to the ledger.

The change in the technology that underpins the equity clearing, settlement and other post-trade services does not affect the existing ownership and governance of data.

The features of the new system do, however, provide an opportunity for ASX's customers to commit additional data to the ledger to develop new services. Given the opportunities for data sharing that will be available to ASX's customers through the replacement system, ASX recognises the importance of clarity on the management of data. ASX will engage with its customers with a view to instituting a data access framework to provide this clarity.

Conclusion

ASX appreciates the extensive feedback received to the consultation on the scope and implementation plan for CHES replacement. We have listened carefully and have made modifications to the new scope and implementation plan.

With these revisions ASX is confident that a successful market-wide implementation of the CHES replacement system will now be achieved.

We do not underestimate the challenge to replace CHES and transition the market to the new system. ASX's dedicated CHES replacement project and technical account management teams will support users through this critical industry-wide change program.

The focus now turns to providing users with the more detailed information necessary for them to further progress planning and development in preparation for the transition to the new system. There will continue to be significant collaboration with stakeholders over the entire project. ASX will ensure that further technical information, support and systems environments that customers and their vendors will need to connect to the new system are provided with sufficient lead times.

We look forward to working with the industry to deliver and transition to a state-of-the-art-system, which meets the needs of users and ensures that our financial market infrastructure continues to support the development of Australia's capital markets and economy into the future.

Thank you for your ongoing support.

Implementation timeline and Day 1 new scope

High-level timeline

Many respondents considered the proposed timeline for CHES replacement to be ambitious given the extent of the new features to be included as part of the Day 1 scope. Some respondents also noted competing demands for resources with other internal projects or market changes.

Respondents suggested a number of strategies to minimise the size and scope of the change to be included in the Day 1 release. The suggestions encompassed extending the implementation timeline and/or deferring some, or all, new or changed business functionality to focus on the significant technology/connectivity changes being implemented.

This feedback indicated that some new business requirements needed to be sequenced over a longer time frame and as a result, ASX has modified the plan and will:

- push back the earliest commencement date for the new system from Q4 2020 to target March-April 2021; and
- defer implementation of seven new scope items from Day 1 to post-Day 1 and bring forward one new requirement in response to strong representations from a number of respondents.

Day 1 CHES new scope

The consultation paper set out approximately 50 new business requirements and the decommissioning of some redundant CHES functionality.

While there was general support for this new functionality, there was a common view in responses that too much new functionality was being proposed to be implemented in too short a timeframe. It was argued that this would result in increased complexity and risk across project phases and in the implementation timeframe.

At the same time, some respondents supported ASX bringing forward some particular requirements into the Day 1 release that were not initially planned for inclusion.

In response to this feedback ASX will:

- defer the implementation of the following seven new business requirements identified in the consultation paper for inclusion in the initial Day 1 scope to post-Day 1:
 - 2.2.1 Account Information – Common Investor Number
 - 2.2.7 Pre-settlement – Bilateral transaction matching (relating to pre-matched status only)
 - 2.2.10 Pre-settlement – Single access point to validate Securityholder Reference Number (SRN)
 - 2.2.12 Settlement – Settlement message enhancements (relating to opt out for certain messages only)
 - 2.2.13 Settlement – Settlement in foreign currencies
 - 2.2.19 Corporate actions – Transfer of cum entitlement balance
 - 2.2.20 Reporting – Continuous holding balance information
- include one additional new feature in the Day 1 release:
 - 2.5.5 Linking bilateral settlements (incoming 101 to outgoing 101) - originally out-of-scope.

The business requirements to be deferred were based on: mixed levels of support from respondents; the likely complexity which would involve significant operational and development resources for users; and the range of regulatory issues that would need to be addressed prior to implementation. At a technical level, the new system is expected to be able to support most of these deferred business requirements by Day 1 but ASX will not require users to have developed to these new requirements for Day 1 go-live.

There was only one business requirement that received strong support from a number of respondents for inclusion - linking bilateral settlements (incoming 101 to outgoing 101). Feedback received also helped ASX to better define this business requirement. It allows the settlement of bilateral instructions to be linked, with the performance of each contingent on the other. For example, where a 'linked' instruction involving the receipt of securities by a settlement

participant failed, a corresponding 'linked' instruction involving the delivery of securities by the settlement participant would also fail.

Apart from the changes referenced above, ASX will implement the features listed in the consultation paper. The following table sets out the proposed timing of the new functionality that will be implemented as part of CHES replacement. No changes have been proposed to the timing of those measures being progressed through separate processes, i.e. through the Corporate Action STP Phase 2 project or as ASX business as usual initiatives.

To be implemented on Day 1	To be implemented via releases post-Day 1	To be implemented separately to CHES replacement
Account information <ul style="list-style-type: none"> Additional investor information Centralised data capture and storage Standardised registration details Pre-settlement <ul style="list-style-type: none"> Settlement lock for CHES holdings Bilateral transaction matching (other than pre-matched status) Transfer of novated equity transactions between CPs Additional preliminary payment notifications Settlement lock for issuer sponsored holdings Settlement <ul style="list-style-type: none"> Non-batch DVP bilateral settlement Settlement message enhancements (other than opt out for certain messages) Optional early client settlement Auto-borrow Linking bilateral settlements Corporate actions <ul style="list-style-type: none"> Electronic DRP and BSP elections Electronic acceptance of entitlement offers Electronic payment for entitlement offers Reporting <ul style="list-style-type: none"> Electronic provision of holding statements and notifications mFund <ul style="list-style-type: none"> Real-time cash settlement, 'hold' status and transfer capability Sharing of investor details and automation of regular payments 	Account information <ul style="list-style-type: none"> Aggregated view of holdings Common investor number Pre-settlement <ul style="list-style-type: none"> Bilateral transaction matching (pre-matched status only) Single access point to validate SRNs Settlement <ul style="list-style-type: none"> Settlement message enhancement (opt out for certain messages only) Settlement in foreign currencies Corporate actions <ul style="list-style-type: none"> Electronic processing of dividend claims Electronic proxy voting Transfer of cum entitlement balance Reporting <ul style="list-style-type: none"> Continuous holding balance information Participant structures <ul style="list-style-type: none"> Participant models for clearing and settlement services 	Corporate Actions STP Phase 2 <ul style="list-style-type: none"> Electronic single access point for corporate action event info Transparency through the life cycle of corporate actions Standardised DRP and BSP elections ISIN for entitlement in non-renounceable rights issues Spin-offs involving entitlements in securities in foreign jurisdictions Share purchase plans Review deferred settlement trading processes ASX business as usual <ul style="list-style-type: none"> Transfer between sub-registers – custodian off-market transfers Corporate actions - takeover offers

* Green – Added into Day 1 implementation

* Red – Moved to post-Day 1 implementation

The new system will be able to support, at a technical level, all the finalised Day 1 scope. However, whether the functionality of all of these requirements is available to users by Day 1 still remains dependent on addressing any

associated risk and regulatory implications, including having obtained the relevant regulatory clearances. The level of risk and regulatory impact varies across the new requirements and so, for some of the requirements there is greater uncertainty that these can be addressed by Day 1. For example, the linking of bilateral settlements requires consideration of the potential impacts on current prioritisation of CCP batch instructions and settlement certainty for novated transactions.

ASX can also confirm that the existing CHES functionality that was proposed to be decommissioned in the new system will be removed.

Ongoing stakeholder engagement on business requirements

Many respondents provided ASX with detailed and constructive feedback on the new business requirements, including examples where the business requirement could be expanded or narrowed to deliver the desired functionality or suggestions about how it may be best delivered. There were requests for additional information on the operation of some of the new features as well as interest in being included in the solution design process.

In response to this feedback ASX will:

- convene focus groups on some new features prior to ASX releasing the corresponding technical documentation. These groups will focus initially on Day 1 business requirements before turning their attention to post-Day 1 measures. Membership of focus groups will vary depending on the particular expertise required and the frequency necessary to support the project timeline and the release of technical documentation at least three months prior to each incremental software drop into the customer development environment.

Migration approach

Many respondents were supportive, or expressed no specific view, on the plan for a single cutover date to the new system. However several noted the possible risks involved, particularly with regard to ensuring all users are ready by the go-live date. They recognised that appropriate planning and testing had to be in place to ensure overall market preparedness in order to maintain the integrity and stability of the market during that period.

Those that were not in favour of the single cutover approach suggested ASX consider a phased approach. A small number of respondents suggested that ASX consider, for example, an initial technology change out based on the core clearing, settlement and other post-trade services followed by a separate implementation of the enhanced business requirements.

Respondents also proposed a number of other constructive measures to assist in managing the risk of a single cutover weekend including the need for migration and conversion tools. This included regular and transparent reporting on the status of all users, what steps will be taken should a user not be ready and how outstanding transactions will be managed. In addition, more information was requested on the process for HIN clean-up and the migration of CHES holder registration details.

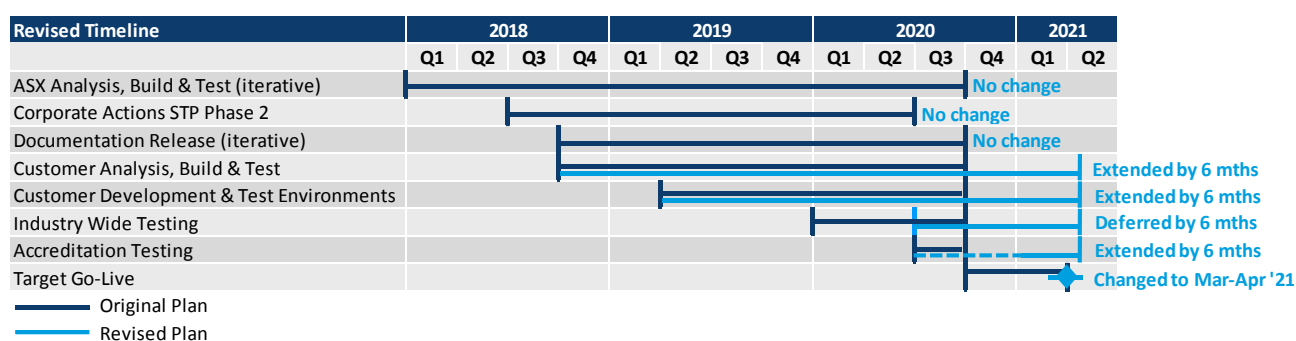
In response to this feedback ASX will:

- work with stakeholders to better explain why ASX considers, based on previous experience transitioning critical market infrastructure system, that a single cutover weekend is a lower risk than alternatives such as running multiple systems in parallel;
- use the feedback already received, in conjunction with the Implementation and Transition Working Group, to define the migration process in detail. This will include:
 - what tools can be made available to assist users with their migration and conversion activities;
 - plan for periodic check points, in the form of market updates, on progress and a clear definition on go-live criteria;
 - develop detailed plans on managing previously scheduled transactions prior to go-live including the impact on open corporate actions and the cash margining over the cutover period, to provide a clean migration;

- avoid specific go-live dates around end-of-year technology freezes, peak corporate action activity and other periods where there are high levels of operational activity;
- clarify what level of accreditation will be required if a vendor system has already been accredited;
- create a specific focus group on HIN clean-up, to consider the criteria and how it will be communicated to the registered holder; and
- create a specific focus group on the migration of CHES holder registration details. This will include providing specific information around how holder registration details in the current format would map to the new ISO 20022 format.

Implementation roadmap

The following diagram sets out the revised high level timeline for the different elements of the project between now and the proposed go-live window of March-April 2021. The changes to the timeline that have been incorporated in response to feedback received during this consultation include reducing Day 1 scope, allocating additional time for users software development and testing and extending the period of time for accreditation testing.



More details on the documentation release arrangements and testing environments are provided in the next section.

Technical documentation release and testing arrangements

Technical documentation release

Many respondents expressed interest in having earlier access to technical documentation so they could better understand the nature of the changes proposed, make more informed choices around connectivity options, and to assist with their internal planning and budgetary processes.

A number of submissions suggested that the proposed time period between release of documentation and the availability of a development test bed environment for development and testing was insufficient for their software development purposes.

Respondents also had many questions and constructive suggestions in response to the proposed testing and release management strategy, including requesting a detailed timeline outlining when different functionality/documentation would be released and the process for accreditation testing.

In response to this feedback ASX will:

- take an iterative approach to the release of the technical documentation to facilitate users' development and testing of the new system;
 - technical documentation will be made available in tranches at least three months prior to each incremental software drop into the CDE to allow users to familiarise themselves with those aspects in advance of the functionality becoming available for users who wish to commence testing;
 - there is no expectation that all users will want to commence testing when the test environments open;
- publish the first tranche of technical documentation in December 2018. ASX can now confirm the functionality delivered in this documentation release will include:
 - reference data, such as account and security setup;
 - settlement instructions:
 - unilateral demand transfers – non-batch;
 - unilateral settlement instructions – batch;
 - bilateral demand transfers – non batch FOP (free of payment); and
 - bilateral DVP settlement instructions – batch; and
 - real-time settlement of bilateral DvP demand transfers – non-batch - in the new system, with simulation of the payment system;
- make available a rolling forward feature view of technical documentation at least six months in advance to assist with users' project planning;
- ensure the replacement technical documentation provides full coverage of subjects including message specifications, process flows and procedures, as well as identification of change between the current and future systems; and
- make available other documentation, for example connectivity, the overall architecture of the new system and disaster recovery.

Detail on the nature of the information that will be provided in each tranche of the technical documentation is set out in Appendix A.

Test environments and phases

Respondents also had many questions and constructive suggestions in response to the proposed testing and release management strategy, including requesting a detailed timeline outlining when different functionality/documentation

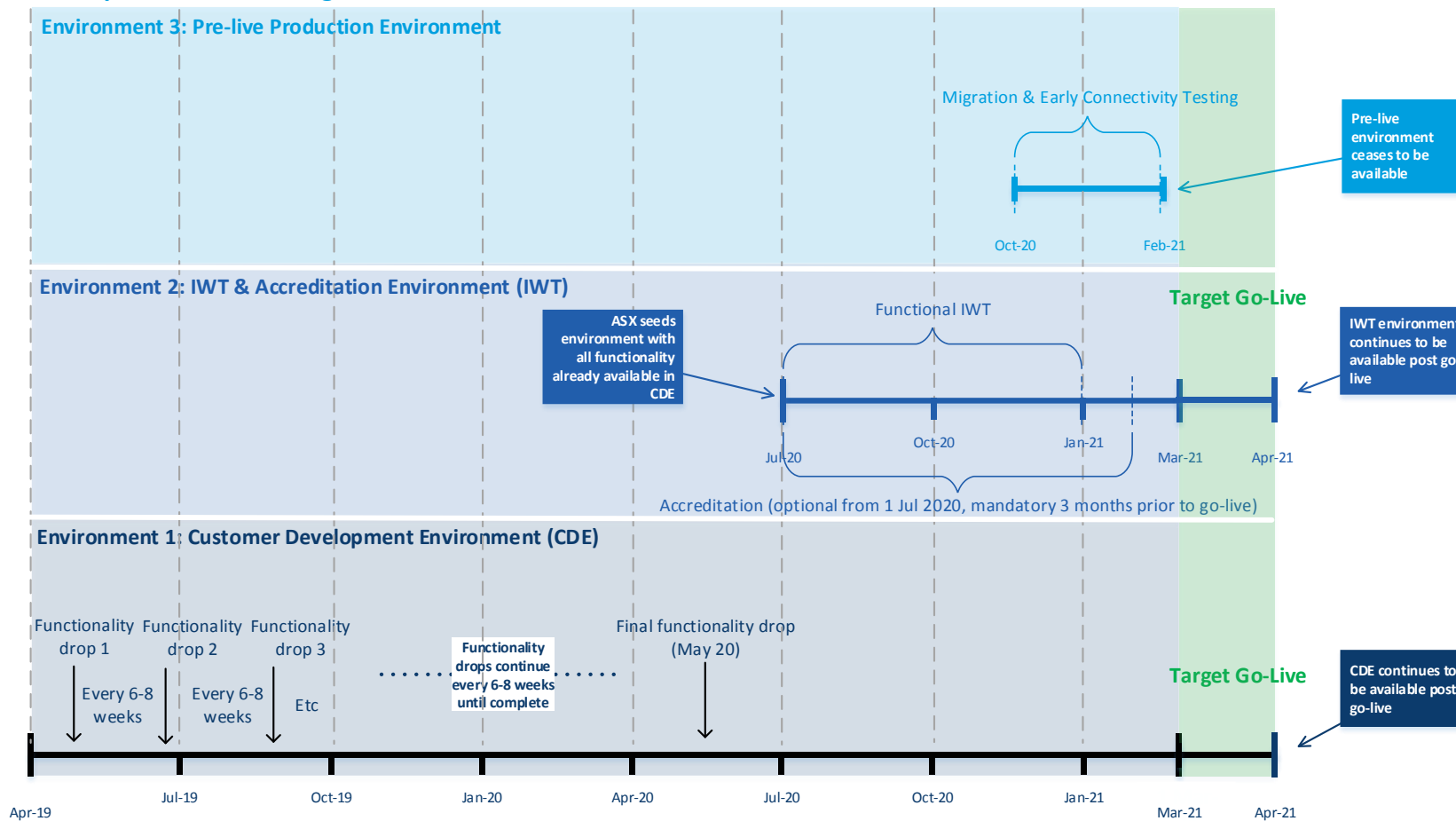
would be released and the process for accreditation testing. Respondents also wanted to understand the availability of the Customer Development Environment (CDE) and Industry-Wide Testing (IWT) environments after go-live.

In response to this feedback ASX will:

- publish a more detailed timeline for test environments and test phases, as outlined in the diagram overleaf;
- make the CDE testing environment available from April 2019;
- release functionality in iterative cycles of 6-8 weeks, targeting all functionality being available in CDE by May 2020;
- keep the CDE available for testing during IWT and accreditation testing as well as post go-live;
- make IWT available from July 2020. ASX will seed this environment with all functionality (already available in CDE by this point in time). Phases of testing to be conducted in this environment include:
 - functional IWT, for end to end testing with upstream systems, from July 2020 – December 2020 (inclusive);
 - accreditation (system accreditation), which will be optional from July 2020, and become mandatory from three months prior to go-live. ASX anticipates that accreditation will be due one month prior to go-live;
- support the availability of the IWT environment post go-live;
- make the Pre-Live Production Environment available from mid-October 2020, allowing use of this environment for migration and connectivity testing;
- maintain the same code across all three environments (as applicable) - i.e. in the event of any defect fixes, releases would be coordinated across the three environments;
- provide details on how the new system will be seeded with the data migrated from CHES;
- publish information on the testing conducted by ASX to minimise regression and re-tests;
- clarify how testing between participants will work in the IWT environment;
- provide regular updates on testing progress throughout the project lifecycle;
- communicate the level of technical support ASX will provide during testing; and
- confirm the process of accreditation testing and if each connectivity option has to be accredited separately.

Further detail on each test phase, including in which environment testing will be conducted, the testing objective and testing approach can be found in Appendix B.

CHES replacement – testing environments



Ongoing stakeholder engagement

Many respondents commended ASX's engagement with stakeholders, including appreciating the opportunity to contribute to the new features through a series of industry working groups over a six month period in 2017. They also indicated stakeholder engagement should continue through the development, testing and implementation phases leading up to the go-live of the new system. Some respondents suggested that with the project now underway engagement with particular groups should be expanded, including issuers, investors, market operators, registries and vendors.

There was a high level of interest from respondents in participating in the two new working groups, Connectivity and Integration and Implementation and Transition - referenced in ASX's consultation paper. These working groups will operate in a similar manner to those convened during 2017. ASX will appoint working group members, convene, set the agenda for, and chair meetings for each working group.

Focus groups will be convened on a variety of topics where there is a need to spend additional time drilling down on detail outside of the two broader working groups. For example, the Implementation & Transition working group will engage separate focus groups on cleaning up dormant CHES holders from the system and on the migration of CHES holder registration details to the new standard.

In addition, as outlined on page 10, focus groups will also be convened, where appropriate, on some new features of the new system prior to ASX releasing the corresponding technical documentation. Membership of focus groups will vary depending on the particular expertise required. The frequency will be as required to support the project timeline.

ASX will also continue to support the Approved Market Operators (AMOs) Working Group to address matters of specific interest to this group - e.g. connectivity of trading platforms to the new post-trade infrastructure.

The working groups and focus groups will operate in addition to the Business Committee and Technical Committee on ISO 20022. Some submissions commented on the membership of the Business Committee – the main user governance forum for clearing and settlement participants (including their representative bodies) and market operators. ASX annually reviews the membership of the Business Committee to ensure it continues to represent those stakeholder groups.

ASX will continue, and expand, its engagement with the issuer and investor community across a broad cross-section of listed entities, institutional investors and retail investor associations. ASX will continue the issuer engagement activities it commenced in 2017 and work closely with organisations including, the Governance Institute of Australia and Australasian Investor Relations Association. Investors will also be further engaged directly and through any relevant industry associations.

Connectivity and Integration Working Group

The Connectivity and Integration Working Group will commence with a series of webinars in September and October 2018 to provide an architectural overview of the technical solution and further details around the different connectivity options. This forum aims to provide a broad range of interested parties more details about the solution as well as respond to some of the most common questions posed during the consultation process.

Topics to be covered in the webinars include:

- CHES replacement architectural overview
- Overview of the connectivity options available
- Guiding principles for connectivity choices
- ISO messaging overview
- Comparison between direct and indirect connectivity
- Reporting overview

The working group meetings will commence shortly following these webinars. At a minimum, membership will include back office system vendors and participants operating their own back office proprietary solution. Attendees for each session may vary based on the topics to be discussed.

This working group will provide a forum for ASX to explain the connectivity options, networks, the security layer, testing and the associated technical documentation before more detail is provided to all industry stakeholders. Topics to be covered in the working group are listed below. Further topics, including focus groups, may be added based on stakeholder requirements.

Topics	Content to be covered
Connectivity options	<ul style="list-style-type: none"> • Direct DAML integration, indirect integration (SWIFTNet, AMQP, and Browser), multi-channel connectivity
Data access and reporting	<ul style="list-style-type: none"> • Message and data API based reporting, direct reporting via node based data services
Browser overview	<ul style="list-style-type: none"> • Use cases, supported functionality
Tailored sessions for different groups	<ul style="list-style-type: none"> • Clearing and Settlement providers, payment providers, issuers and share registries
Networks	<ul style="list-style-type: none"> • ASX Net, Internet VPN, SWIFTNet
Security layer	<ul style="list-style-type: none"> • Security model overview, terminology, ISO 20022 signing, channel specific encryption/authentication/authorisation
ISO 20022 messaging	<ul style="list-style-type: none"> • Key message differences between the old and new platform, specific focus on message definitions, new functionality
Non-functional	<ul style="list-style-type: none"> • Availability and resilience, recoverability, transactionality, performance, scalability, disaster recovery, provision of test facilities
Documentation	<ul style="list-style-type: none"> • Technical and environment overview, testing phases

Implementation and Transition Working Group

The working group will support users' implementation and transition plans. The group will have input to the development of implementation plans in advance of them being rolled out industry-wide. This work will commence in the first quarter of 2019.

Topics to be covered in this working group are listed below. Further topics, including focus groups, may be added based on stakeholder requirements.

Topics	Content to be covered
Planning	<ul style="list-style-type: none"> • Migration strategy, plan, and risk mitigations
Testing	<ul style="list-style-type: none"> • Test facilities (CDE, IWT and PPE), migration rehearsal
Accreditation and attestation	<ul style="list-style-type: none"> • Vendors, participants and other users
HINs	<ul style="list-style-type: none"> • HIN clean-up
Registration details	<ul style="list-style-type: none"> • Migration of registration details to new standard, users will be able to review any changes to registration details in the pre-live environment (PPE)
Go-live weekend	<ul style="list-style-type: none"> • Pre-requisites, migration weekend tasks, verifications for go/no go, rollback process in the event of no-go, post go-live serious incident management plan

Technical solution for the CHES replacement system

While not within the scope of the consultation, a number of respondents requested more detail on the technical solution in order to facilitate their understanding of the costs and benefits of different connectivity options. Feedback and common questions posed by respondents on the technical design and non-functional requirements are set out below.

Connectivity options

Some respondents indicated a preference for a specific connectivity option. However, many indicated that they require additional technical detail and information on the relative cost of different options before they can make a decision. They requested that this information be provided as soon as practicable. Several respondents requested a more detailed explanation of the differences between traditional message-based and node-based integration – specifically the benefits of connecting via a node.

In response to this feedback ASX will:

- hold a series of webinars in September and October 2018 to provide an overview of the technical solution and further details around the different connectivity options. This will provide a broad range of interested parties with more details around the solution as well as respond to some of the common questions posed during the consultation response process;
- examine detailed issues related to the nature of different connectivity options and the net benefits associated with different approaches with stakeholders in the Connectivity and Integration working group. This will include exploring each connectivity option in more detail, a drill down on the differences between ISO 20022 XML messaging and direct DAML integration, and the benefits of taking a node;
- assist clearing and settlement participants in the period leading up to the go-live of the new system to investigate how node connectivity will operate and to assess the potential benefits to them by:
 - offering no cost access for participants (and their current CHES-accredited technology vendors) to the managed node service via the CDE, IWT and pre-live production environments to allow them to investigate the potential benefits of node connectivity in the period leading up to the go-live of the new system; and
 - targeting the provision of a detailed connectivity pricing framework (that will apply post go-live) prior to the commencement of testing for the managed node service offering;
- provide a clearer articulation of the benefits of taking a node which include:
 - the elimination of the need to reconcile data between a participant's data store and that of ASX's for the distributed data;
 - access to the real-time current state of this data;
 - the additional applications a firm can build (or have a third-party provide to them) to access and transact on their permissioned data; and
 - the ability to create multi-party automated workflows;
- explain all user integration channels:
 - issuer and clearing and settlement participant transaction processing will use ISO 20022 XML message syntax, except for direct DAML integration, which uses a DAML representation of the XML message. This ensures that the same transaction services can be executed identically, regardless of which integration channel is used; and
- design the system to facilitate maximum flexibility with respect to integration. This means users will be able to submit transactions via any of the different connectivity options for which they are authorised. For example, a user could submit some transactions via a traditional messaging channel, some via direct DAML integration, and some via the browser portal.

Adoption of ISO 20022 messaging

The consultation paper outlined the work being undertaken to adopt the ISO 20022 messaging standard for the system that replaces CHES.

While ASX did not specifically seek feedback on ASX's decision to adopt ISO 20022 messaging in place of CHES proprietary messaging for the new system, many respondents noted their support for the change.

Some respondents cited the potential benefits the shift could offer in terms of interoperability opportunities (including with other market infrastructures) as well as specific benefits to their own organisations. A number of respondents also commented on the ongoing need (post implementation) for ASX to formalise an annual standards review and change process via scheduled releases to ensure the ISO 20022 message set employed by the replacement system remains contemporary.

In response to this feedback ASX will:

- formalise an annual standards review and change process via scheduled releases, as outlined in the consultation paper;
- continue to work through the adoption process with key stakeholders primarily via the ISO 20022 Technical Committee;
- publish draft and finalised ISO 20022 usage guidelines for relevant stakeholders' information as part of the technical documentation releases; and
- examine the network connectivity options to be made available for ISO 20022-based transactions through the Connectivity and Integration Working Group.

DA platform and node access

There was strong interest in the DA platform and nodes from respondents, with questions on the managed node service, DAML, ledger data, ledger transaction interfaces and ledger query interfaces.

Managed node service

Respondents were interested in who had responsibility for managing a node, and had questions regarding performance, connectivity, monitoring and archiving. ASX can clarify that participants with direct access to a node will be largely shielded from the maintenance and technical aspects of the solution outside of the connectivity layer between themselves and ASX.

In response to the feedback ASX confirms:

- access to nodes will be prioritised for existing clearing and settlement participants (and their CHES accredited vendors). This priority will ensure that ASX focuses on the needs of participants' to manage the continuity of their clearing and settlement services to the market in the lead up and transition to the new system;
- when clearing and settlement participants are sufficiently progressed with their chosen access method (node or non-node) to the new system, ASX will engage with other non-clearing and settlement participants to discuss access to the new system via a node;
- that clearing and settlement participants who connect to the new system via ISO 20022 messaging, not via a node, will connect via ASX Net or SWIFTNet;
- nodes will only be offered as an ASX-hosted managed service in an Australian located datacentre. ASX will control the eligibility, governance and on-boarding of all eligible node users similar to the mechanism used today for access to CHES; and
- the managed node service will include:
 - secure access to: transaction services using direct DAML integration (optional); and data/reporting services to support ad-hoc query and analytics capabilities (optional);

- network, server, DA platform, database infrastructure, storage, support and maintenance;
- change management (new releases of DA platform, DAML contract libraries, layered products, security patching);
- high availability;
- inter-site redundancy;
- disaster recovery; and
- capacity and incident management.

DAML and DAML SDK

Several respondents noted they were keen to engage with ASX and Digital Asset to gain a better understanding of DAML and the DAML Software Development Kit (SDK), and wanted to understand if DAML integration would be allowed for Day 1. Some respondents were also seeking technical documentation to help make a decision on their preferred connectivity option.

In response to the feedback ASX:

- reiterates that users will have the option to interact directly with DAML workflows defined by ASX;
 - direct DAML integration uses a DAML representation of the corresponding ISO 20022 XML messages, so the same interface documentation can be shared between the message-based and direct DAML integration models;
 - the specific documentation on how to directly integrate with DAML will form part of the connectivity documentation; and
- will continue to provide training (in the first instance to existing clearing and settlement participants and their technology vendors), through ASX's partner Digital Asset, on the DAML SDK that explains the system's features and how users can develop their own applications using the DA application framework to integrate with existing ASX DAML workflows and eventually author their own custom DAML workflows.

Data governance

There were a range of questions posed by respondents around how the DLT-based solution would impact on data ownership, access (including by authorised third-parties), governance, security and pricing including in circumstances where users wish to commit additional information to the ledger.

It is important to note that the use of DLT to underpin the equity clearing and settlement service does not affect the existing ownership and governance of equity clearing, settlement and other post-trade data. The new technology does, however, provide an opportunity in the future for users to decide to commit additional data to the ledger to develop new services.

Given the opportunities for data sharing that will be available to ASX's customers and given the importance of clarity on the management of data, ASX will:

- engage with its customers with a view to instituting a data access framework to provide this clarity;
- investigate, and expect to offer, several overlay technologies to present the underlying data in ways suitable for querying and reporting. For example, the ability to query entitled current state and historical data with SQL and/or a data API; and
- ensure continuous integrity of data on a node by cryptographically reconciling the data received to the evidences within the global synchronisation log. In other words, there is no need for users to do that again independently of the platform.

Browser interface

Respondents posed a number of questions on browser optionality and capabilities of the new system. For example, is the secure browser portal optional or mandatory, and does it allow for ad-hoc queries against the data store?

In response to this feedback ASX confirms the browser portal will be optional. For users that intend on using the browser for business continuity planning purposes only, for extra security, access can be set-up but disabled until ASX receives a request for it to be activated. The browser will support the full transaction set and reporting equivalent of CHES demand reporting.

Data API

There were several questions on the data API including requests for more detailed information on formats, costs and types of data that can be requested.

In response to this feedback ASX:

- confirms that initially the scope of the data API will be as an alternate delivery channel to traditional messaging for the equivalent of existing CHES demand reporting. Over time, the scope of the data API could be increased to include additional capabilities; and
- will discuss with the Connectivity and Integration Working Group the demand for delivery of reporting via the conventional message-based delivery channel as well as confirm the specific format.

Networking

A few respondents asked ASX to confirm if only ASX Net can be used to access nodes or whether this may be opened up to other providers.

ASX confirms that only ASX Net will be supported for access to the managed node services. This is to facilitate the highest levels of security for the core transaction service and system data.

Legacy topics

Respondents confirmed the need for historical data to be available post-migration.

In response to this feedback ASX is assessing the feasibility of migrating CHES history so that it can be made available in the new system.

Non-functional requirements

Respondents were interested in better understanding a number of non-functional aspects of the new system.

Availability and resilience

Respondents asked a number of questions relating to availability and resilience of the new system. For example will participants need to match the availability of the new system and would the market come to a halt if a user's node is down?

In response to this feedback ASX:

- confirms that although the operating hours for business and transaction services have yet to be finalised, users can expect key timings will remain similar to existing arrangements;
- confirms a single user node going offline will not impact the remainder of the DA platform capabilities. Once a node does come back online it will catch-up and resume normal processing;
- will publish operating hours and cut-off timings for the new features, such as the non-batch based bilateral settlement, as part of the documentation release for those features;
- confirms participants will not be required to mirror the extended availability of the new platform outside the normal management of their settlement obligations (which should not change); and

- confirms there are no plans to amend trading hours as part of the CHES replacement project.

Security

A few respondents had some general questions around the security design for the new system.

In response to this feedback, ASX will provide further details on the security design for CHES replacement during the Connectivity & Integration Working Group. ASX is using a comprehensive security framework covering eight different facets of system security. ASX also expects to complete a follow-up independent security review closer to the go-live date.



Each integration channel or service is subject to its own specific security measures. However, ASX can confirm the following general measures will apply:

- ISO 20022 signing will be used where appropriate;
- all channels are encrypted and authenticated. This includes inter and intra node communications; and
- browser portal users are subject to two factor authentication and four eyes workflow for transaction submission.

Clearing and settlement interoperability

A few respondents raised questions about the interoperability of the new post-trade system and requested additional information on how this would work in practice.

In response to this feedback ASX has:

- committed, through its Code of Practice for Cash Equities Clearing and Settlement, to provide access to its clearing and settlement infrastructure on transparent and non-discriminatory terms; and
- indicated that there would be no technical limits (or barriers to entry) for other service providers wishing to connect to the CHES replacement system. It is likely that such a connection would be facilitated through ISO 20022-based messaging or an XML-based link. In the absence of a clearer indication of the nature of the link the other service provider is seeking, it is not possible to be precise about the most efficient mechanism for establishing that link.

Appendix A: Information in each technical document release

Documentation to support Customer Development Environment (CDE) testing

Each tranche of technical documentation released to support CDE testing will include the following information.

Synopsis

The synopsis provides an overview of new, enhanced and/or retired functionality pertaining to the new system, relevant to the technical documentation release. It summarises significant changes to business processes and procedures, highlighting changes to messaging protocol, including FIX, ISO 20022, plus the various connectivity and integration approaches.

Glossary

The glossary defines the concepts, roles and activities for participation within the ASX cash equity market; updating existing terminology and defining new terms specific to the new system.

ASX Post-Trade Services Guidelines

The ASX Post-Trade Services Guidelines provides market participants and organisations with an understanding of the process and procedures inherent in the new system. Further, the guidelines identify message requirements relevant to the operational procedures and include links to the messaging suite documentation.

Messaging Suite

This is a package of documents specific to ISO 20022 and FIX messaging. The ISO 20022 messaging package will include:

a. ISO 20022 Messaging Catalogue

The ISO 20022 messaging catalogue explains how to create financial messages to communicate with ASX. This document covers the new messaging standards that have been adopted. It includes message scope, message purpose, message flows (UML diagrams), sender and receiver details and any message pre-requisites. This document also links to the ASX collection of detailed ISO 20022 Usage Guidelines made available on the SWIFT MyStandards web platform.

b. ISO 20022 Usage Guidelines

Usage Guidelines (or schemas for each message) will be accessible from the SWIFT MyStandards web platform. Each guideline provides field definitions that include meanings, allowable data values, message samples and schemas.

c. ISO 20022 SWIFT MyStandards User Guide

ASX will provide a guide to assist users to access and use the SWIFT MyStandards web platform and the CHES replacement suite of usage guidelines. The guide will also provide information on how to access and use the associated readiness portal for sample message testing.

d. ISO 20022 Technical Manual

The ISO 20022 Technical Manual describes the structure and conventions of an ISO 20022 message. This document covers the business message collections, business message attributes, the business application header, elements, naming conventions, formats and tags. Message code samples are also included.

e. ISO 20022 Cross Reference Guide

A list of the ISO 20022 messages that will replace current CHES messages. It also includes de-scoped and new messages.



f. ASX Proprietary Code List

The ASX Proprietary Code List provides a simple way to detail the various code sets (i.e. field values) that will be utilised in the messages. In most circumstances ASX will not embed the code sets within the message schemas (usage guidelines), and this will allow for the update of code sets without needing a change to existing messages. ASX will deploy an appropriate process to advise users in advance of any changes to code sets.

g. ASX Error Code List

A list of common error codes sent back to the sender when a message fails schema and/or business validation.

These documents and the availability of the SWIFT MyStandards web platform will enable users to commence early development and testing of their ISO 20022 message suite.

[FIX messaging package](#)

Explains how to create financial messages to communicate with the ASX using the FIX protocol. This document covers the messaging standards that ASX has adopted for trade and price information. It includes message scope, message purpose, and field definitions and mapping.

[Connectivity and Integration](#)

Provides technical details on the various connectivity and integration opportunities, including network, security, messaging transports, managed node services and direct DAML integration.

[CDE Test Documentation](#)

Provides details of the functional test scope, supporting test data, simulators/ harnesses, defect definitions, release notes and available environment support.

Documentation for Future Test Phases

[Industry Wide Testing \(IWT\) Documentation](#)

Documentation will be provided in tranches to support testing requirements for IWT from early Q2 2020. In addition, early connectivity and migration testing (supported in production environment) documentation will be provided.

This documentation will outline information needed to facilitate IWT including test scope, timelines highlighting mandatory accreditation period post IWT, procedures, schedules, connectivity details, escalation process, resolution management and entry/exit criteria defined.

[Accreditation Testing Documentation](#)

Documentation will be issued in Q2 2020 to support mandatory accreditation testing from January 2021.

This documentation will outline the mandatory tests/activities to be performed for successful accreditation in the IWT environment. This includes test cases, test procedures, test day schedule, support and escalation process, issue and resolution management and success criteria defined.

Appendix B: Nature of testing phases

The table below provides further detail on each test phase, including in which environment testing will be conducted, the testing objective and testing approach.

Testing phase	Environment	Objective	Approach
Vendor and user development Users and vendors to assess and design changes needed for internal systems to be able to migrate to DLT platform	Customer development environment (CDE)	Validate different connectivity options and daily processing schedules (with simulators) Users to implement changes to internal systems, interfaces and communication links as required Users to undertake functional testing of their internal systems and interfaces Users to update internal operating processes and procedures Users to achieve internal audit/operational sign-off for all system and procedural changes	Functionality delivered incrementally every 6-8 weeks Users and vendors will be provided with release notes, information with regards to various connectivity options (including nodes) Users and vendors to design, build and test system changes based on documentation made available along with CDE environment Users and vendors to re-engineer operating procedures as required Project team to provide technical support to users/vendors during this phase User/vendor development progress to be tracked
Industry-wide testing (IWT) Confirm the ability of users and vendors to interact with the exchange, designed to ensure successful operation of all activities on the DLT platform	Industry-wide testing environment (IWT)	IWT would be production-like environment with upstream systems available To validate technical and operational readiness, allow familiarisation with the new platform within a simulated operational context to reduce the risks of issues on go-live.	Users and vendors will validate the process and procedures, internal systems, connectivity options in IWT (production like) environment that would have been developed as part of CDE environment IWT provides the ability to interact with other participants to replicate production behaviour. The environment will be maintained as per production schedule
Early connectivity and migration testing Confirm the ability of users/vendors to interact with the exchange on pre-live production environment NB. Pre-live production environment will eventually be production environment	Pre live production environment	During the IWT phase a pre live production environment will be made available for users to perform: <ul style="list-style-type: none"> early connectivity; and migration rehearsals. 	This phase of testing will confirm users are able to connect to the desired connectivity option. This environment will be utilised for day-0 migration dress rehearsals
Accreditation testing Confirm users and vendors successful development to provided specifications Details of responsibilities will be provided in due course	Industry-wide testing environment (IWT)	IWT environment utilised from January 2021 for mandatory accreditation testing. Users will utilise the test documentation issued by ASX	Using the test documentation provided: <ul style="list-style-type: none"> conduct comprehensive testing between ASX, users and vendors; complete a 24-hour processing cycle throughout the test period; and require vendors/users to advise ASX of the outcome of processing of all related clearing and settlement activities on the new platform

Acronyms

AMO	Approved Market Operator
AMQP	Advanced Message Queuing Protocol
API	Application Programming Interface
ASIC	Australian Securities and Investments Commission
ASX	Australian Securities Exchange
BAU	Business As Usual
BSP	Bonus Share Plan
CDE	Customer Development Environment
CHES	Clearing House Electronic Subregister System
DA	Digital Asset
DAML	Digital Asset Modelling Language
DAML SDK	DAML Software Development Kit
DLT	Distributed Ledger Technology
DRP	Dividend Reinvestment Plan
DvP	Delivery versus Payment
EIS	CHES External Interface Specification
FIX	Financial Information eXchange Protocol
FoP	Free of Payment
HIN	CHES Holder Identification Number
ISIN	International Securities Identification Number
ISO	International Organisation for Standardisation
IWT	Industry Wide Testing
NFR	Non-Functional Requirements
NPP	New Payments Platform
NTP	New Trading Platform
PPE	Pre-Live Production Environment
SRN	Securityholder Reference Number
STP	Straight-Through Processing
VPN	Virtual Private Network
XML	eXtensible Markup Language