MAS MEPS+ TECHNICAL ARCHITECTURE DESIGN

Industry Engagement Report

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1 Executive Summary

1.1 Background

With the current MAS Electronic Payments System ("MEPS+") entering its twelve year of operation, MAS intends to renew and replace it to address the needs of a rapidly changing payments landscape. Accenture was commissioned by the Monetary Authority of Singapore to design the Technical Architecture Blueprint for a future MEPS+ system.

The Technical Architecture Blueprint for the future MEPS+ is anchored on the following four key considerations of changes:

Future Payment Landscape:
Respond to the ever-changing structure of the financial systems

Accessibility:
Promote harmonisation, convergence with critical domestic and international payment systems

Resilient, Reliable & Secured:
Strengthen the resilience and reliability of the future MEPS+ system to minimize operational risks and external threats through a secure and resilient infrastructure

Enhanced Operational Efficiency:
Enhance operational efficiency of the future MEPS+ system by improving agility in capacity planning and overall ongoing operational support of the system

As part of the shaping and designing of the Technical Architecture Blueprint, a 3-pronged approach was undertaken in ensuring that the feedback ranging from the operational teams through to the visions of C-Suites are being incorporated.

- **CxO Connect:** Establish the C-suite's vision for the future of payments and understand their insights and inputs as a consumer of MEPS+ services.
- **Focus Group:** Serve as "Voice of Customers" to help address participants' interaction with the MEPS+ system and serve as "test board" for new concepts on the future MEPS+ system.
- **Industry Questionnaire:** Solicit feedback and inputs from various functional units including Business, Operations and Technology to help provide a more holistic shaping of the considerations for the future MEPS+ system.

This section summarises the quantitative responses and key takeaways from an Industry Questionnaire that was sent to participants of the MEPS+ on September 2018. On closure of the consultation on 5 October 2018, MAS received a total of 57 submissions from a wide range of stakeholders with varying perspectives on MEPS+ and the broader Singapore payments landscape.

The questions are grouped into three categories:

- General – common questions for RTGS, CAS and SGS
- RTGS – specific questions for RTGS, including payments settlement
- SGS – specific questions for the Government Securities, including settlement

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1.2 Summary of responses

The participants of MEPS+ were engaged on a variety of topics in the three broad categories mentioned above (General, RTGS and SGS). Majority of the topics were discussed at all three forums (CxO Connect, Focus Groups and Industry Questionnaire). The sections below represent some of the takeaways and quantitative results from the broader Participants group and the Domestic Systematically Important Banks (DSIBs).

1.2.1 General Topics

Key Considerations of change

Question 1:

Do you agree that the four key considerations are critical in shaping the MEPS+ NextGen[1]? Are there any other key themes that MAS should take into consideration?

[1]"NextGen" is the term explained and used in the Industry Questionnaire and refers to the future MEPS+ system

Key Takeaways

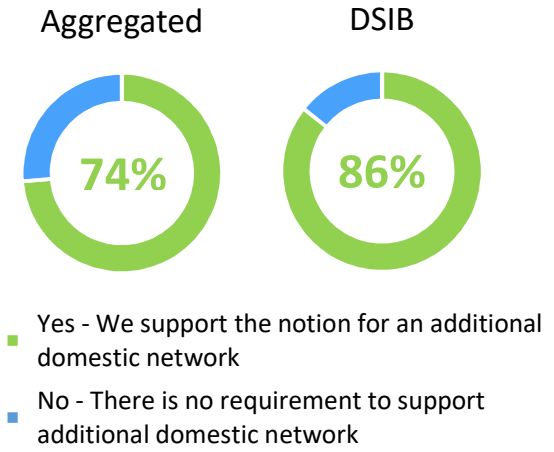
Majority of the participants expressed agreement for the four key considerations identified in shaping of the future MEPS+ system.

Further to the four key considerations, participants have also raised considerations around integration to new emerging technology such as Distributed Ledger Technology (DLT).

Alternate Domestic Network for Resilience

Question 2:

What are your thoughts and considerations around having an alternate domestic network for resiliency?



Key Takeaways

Participants generally supported the notion to have an alternate domestic network for resiliency due to the collective value to the industry as a whole; though clarity is required for the use cases and the interactions between the contingency system, the current retail payments (FAST) and the alternate domestic network.

While the responses suggest that there is value in having an alternate domestic network for resiliency, two key considerations are (a) cost consideration of maintaining an additional network which will increase the cost of clearing substantially and (b) testing effort required for industry wide testing and contingency drills on the alternate domestic network.

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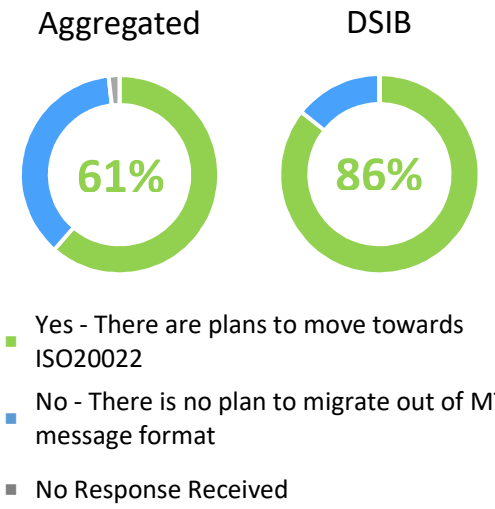
ISO20022 Message Format

Question 3:

Is your institution looking at moving towards ISO20022 message format in the next 2 to 3 years? If so, please also share if your institution is looking at having MX/MT translator available to support both message formats during the interim phase.



Key Takeaways

The responses suggest most financial institutions have plans to move towards ISO20022; Respondents have raised the need to be engaged early, as their organisations' systems may require enhancements that would require significant effort.

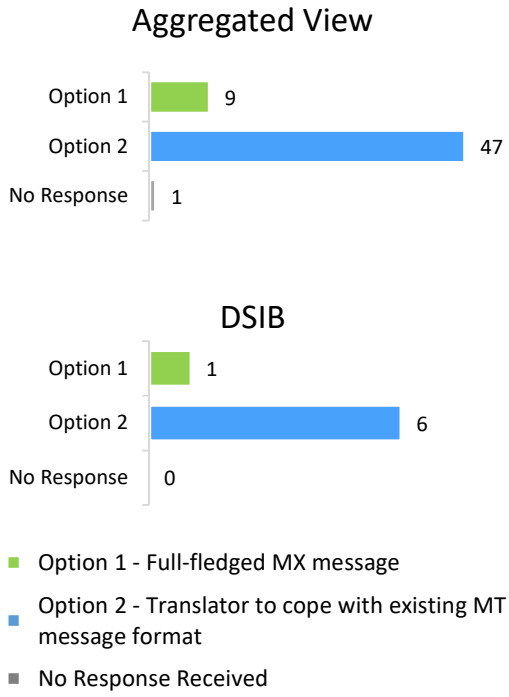
Respondents have also raised the need to align the launch of ISO20022 with the overall SWIFT industry wide plan.

Full-fledged MX message vs Decoupled Approach

Question 4:

Would your institution prefer (Option 1) to launch full-fledged MX messages alongside the future MEPS+ system OR (Option 2) to adopt a decoupled approach of having MEPS+ NextGen[1] launched with message translator to cope with the existing MT message format?

[1]"NextGen" is the term explained and used in the Industry Questionnaire and refers to the future MEPS+ system



Key Takeaways

Participants generally supported the notion to decouple the launch of the new MEPS+ system and the implementation of full-fledged MX message; reasons cited include the significant effort required for testing should both full-fledged MX messages and the next MEPS+ system be launched at the same time.

Separately, the overall SWIFT move onto ISO20022 format should also be factored into consideration to minimise the overall testing effort required by the industry and achieve synergy between the 2 initiatives.

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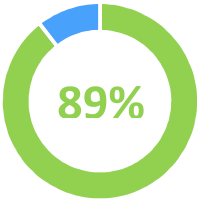
One-Stop Portal

Question 5:

Would the launch of a "one-stop portal" to retrieve reports, billing statements, raise service requests and perform searches etc be useful?
If your institution is supportive of "one-stop portal", please also share if there are any additional features that you would like to raise for consideration to be included in the portal.

Aggregated



DSIB

- Yes - "One-Stop Portal" will be useful
- No - We would prefer to receive statements via MASNET email

Key Takeaways

Majority of participants supported the notion to introduce a "One-Stop Portal" with integrated capabilities such as (a) Search and display near real time data, (b) APIs for data consumption, (c) Retrieve reports and bills, (d) Raise service requests to MAS.

Application Programming Interface

Question 6:

MAS is considering the provision of an Application Programming Interface (API) that would allow participants to access their own data in near real-time.
Would the sharing of data through an API be useful to your institution? If so, what types of data would be useful for your institution e.g. transactional data, user log on details?

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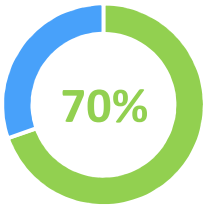

DSIB

- Yes - Allowing access to data via API will be useful
- No - We do not have plans to support API

Key Takeaways

Participants generally supported the notion of accessing data through the usage of APIs; respondents expressed the desire to receive updates to transactions on a "push" basis and respondents have also raised the need for controls and standards of APIs to be established to govern the consumption of data.

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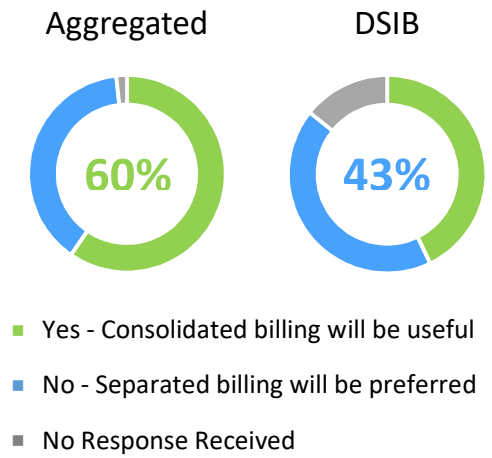
MEPS+ Billing Statements

Question 7:

Would participants find it useful to have consolidated billing across all the various services of MEPS+ NextGen[1]?
If your institution is supportive of consolidated billing statement, please also share if there are any additional features or information that you would like to raise for consideration to be included in consolidated billing statement (e.g. support various file format, billing statement cycle).

[1]"NextGen" is the term explained and used in the Industry Questionnaire and refers to the future MEPS+ system



Key Takeaways

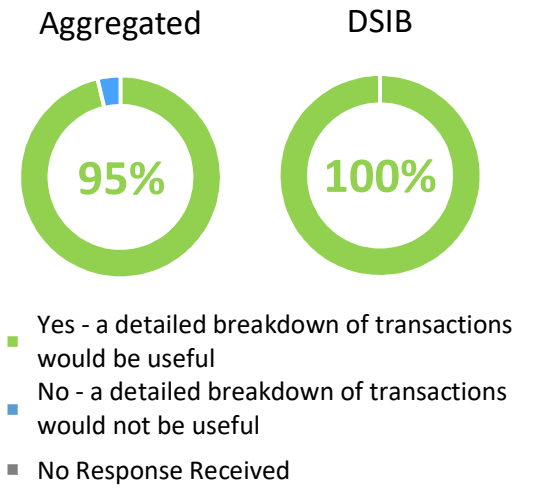
Responses have been evenly spread on the desire for consolidated billing and for separated billing.

Respondents expressed the wish to have the flexibility in choosing whether bills are consolidated or separated and in choosing the format of these bills (.csv, .xlsx or .PDF).

Detailed breakdown of Transactions as part of billing statement

Question 8:

MAS is looking at providing detailed breakdown of transactions as part of the billing statement. Would this be useful? If so, what would be the key information to be included in the Billing Statement?



Key Takeaways

Most respondents, and all DSIBs responded that they would like to receive detailed breakdown of transactions in the billing statement.

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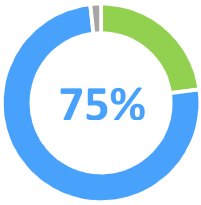
1.2.2 RTGS Topics

Account Structure

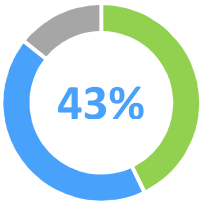
Question 1:

Would your institution be interested to create and manage sub-accounts within RTGS? For the usage of sub-accounts, please consider the implication of message queues, reconciliation and funds movement across sub-accounts.

Aggregated



DSIB



- Yes - Option of ability to support sub-accounts will be useful
- No - Current setup of having only 1 main RTGS account is sufficient
- No Response Received

Key Takeaways

A significant majority of respondents expressed that the current model of having a single, main RTGS account is sufficient, as this facilitates monitoring of liquidity positions.

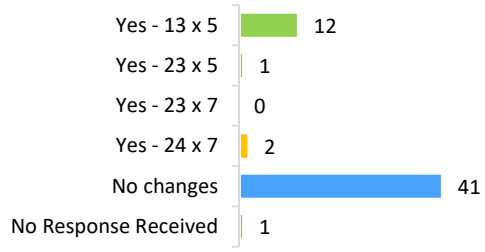
Should the sub-account feature be introduced for RTGS, respondents mentioned that the feature should not be mandatory, and should be accompanied with the capabilities to ease operational challenges such as consolidated view of the total balances, auto-sweeping between accounts, having different identifiers to tag different BIC codes.

Extended Operating Hours

Question 2:

Does your institution require extended operating hours for RTGS services on business days? If so, what would be the ideal extended operating hours 13x5 (9am to 10pm Mondays to Fridays), 23x5, 23x7, or 24x7 and what would be the purpose of these extended operating hours with an indication of the volume and value of such transactions?

Aggregated



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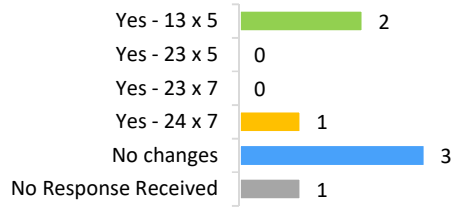

Key Takeaways

Majority of the participants do not support the notion of having extended operating hours. The overall cost of extending the operating hours needs to be balanced against the business case for the industry ecosystem, as additional resources will be required to support extended operating hours.

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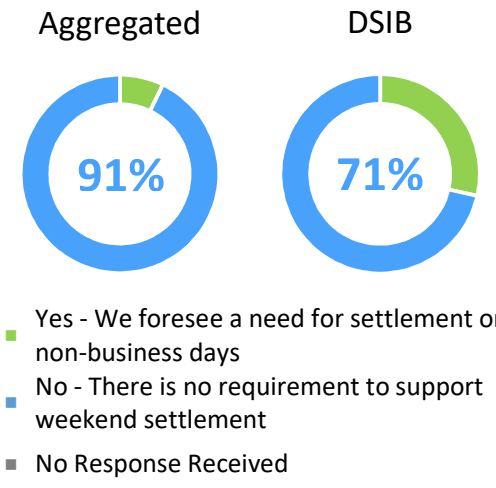
Non-Business Day

Question 3:

Does your institution have a requirement to have settlement on non-business days for RTGS services? If so, what would be the purpose of doing so and what are the expected volume and value of such transactions?



Key Takeaways

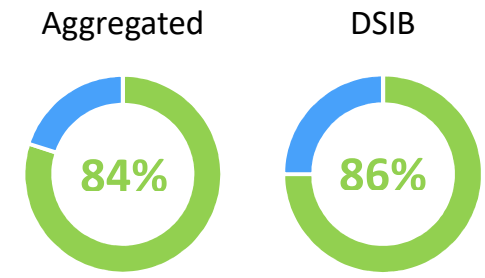
A clear majority of respondents expressed that there would be no need for the future MEPS+ system to support payments settlement on non-business days; those who have supported the notion of weekend settlement mentioned that the function would be to support FAST settlements and to better manage risks.

Net Debit Cap Auto Top-Up

Question 4:

Would an automated top-up of Net Debit Cap (NDC) for G3/FAST transactions, based on pre-defined business rule, be useful to participants?

If your institution is supportive of automated top-up of Net Debit Cap (NDC), please share any considerations or preferred business rule (e.g. auto top-up upon 20% remaining Net Debit Cap) to initiate automated top-up of the Net Debit Cap.



** Response from FAST participants only*

- Yes - Automated top-up of Net Debit Cap is useful
- No - We do not see any need for automated top-up of Net Debit Cap

Key Takeaways

Participants generally supported the notion of having an automated top-up of Net Debit Cap, while safeguards such as the ability to define the percentage of Net Debit Cap threshold, top up percentage and notification would be required.

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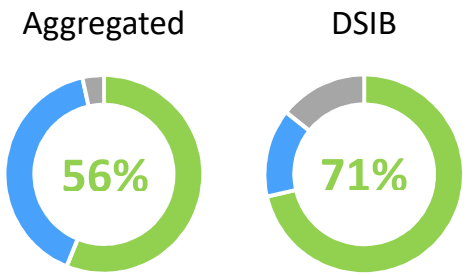
Multi-Currency

Question 5:

What is the business case for your institution to push for multi-currency clearing and settlement in Singapore? Please also share your key operational considerations if multi-currency is being cleared and settled in Singapore.



- Yes - Domestic clearing and settlement of foreign currency is useful
- No - We will continue to rely on Correspondent banking or internal network for foreign currency clearing
- No Response Received

Key Takeaways

Participants are generally split on whether there is a business case for multiple currencies to be made available in Singapore; banks that were receptive towards having multi-currency clearing and settlement mentioned that they would like to have USD cleared, with most highlighting that this would only be useful if there are enough participants on the system.

Key considerations for the launch of multi-currency RTGS include (a) availability of liquidity, (b) currency holiday, (c) operational hours, (d) membership of banks to be part of the foreign currency RTGS ecosystem.

Foreign Currency to be considered for clearing and settlement

Question 6:

Please share the top three foreign currencies for which your institution would be interested to participate in if the clearing and settlement is conducted in Singapore.

Key Takeaways

The top 3 foreign currencies to be considered for clearing and settlement in Singapore include USD, EUR and RMB.

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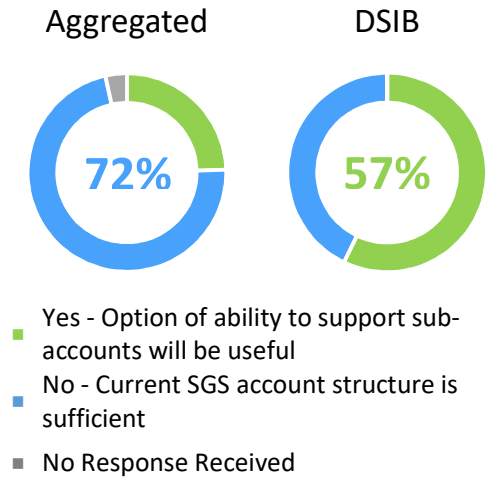
1.2.3 SGS Topics

Account Structure

Question 1:
Would your institution be interested to create and manage sub-accounts within SGS e.g. allowing for the creation of sub-accounts in Trade and Customer accounts?

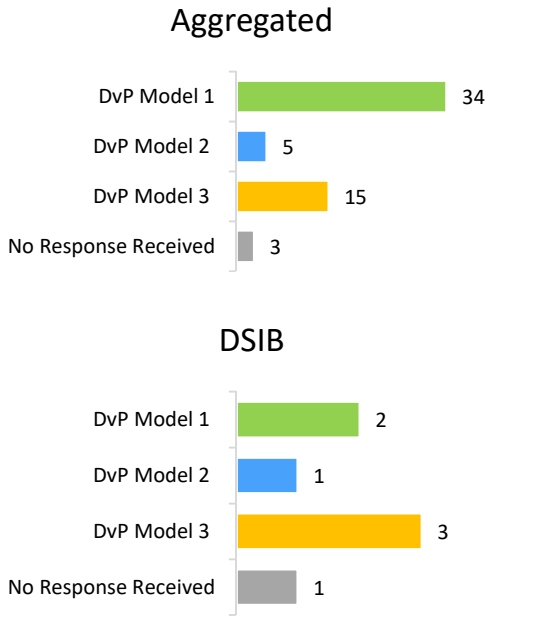


Key Takeaways
The notion of sub-accounts did not garner support amongst the general respondents, while the larger domestic players generally supported it. Participants have also raised concerns around managing sub-accounts holdings; this would be mitigated by the usage of unique sub-account identifiers and ability to send statements directly to beneficiaries of the sub-accounts.

It would also be important to consider the need to create sub-accounts for holding securities that would be used by the auto drawdown ILF, should it be introduced in the future MEPS+ system.

DVP Models

Question 2:
Which DvP Model would your bank prefer most?



Key Takeaways
Respondents generally supported the notion of keeping DvP Model 1, while DvP Model 3 was favoured by larger domestic players. Amongst the respondents, many have raised questions surrounding the settlement risk of DvP Model 3.

Should DvP Model 3 be adopted in the future MEPS+ system, risk mitigation technique(s) should be employed such as the use of priority queues that settles transactions on a real time, gross basis i.e. DvP Model 1.

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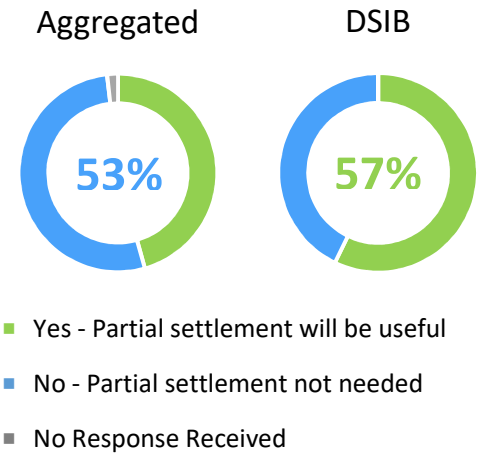
Partial settlement of SGS transactions

Question 3:

Would introducing partial settlement of SGS transactions be useful to your bank?



Key Takeaways

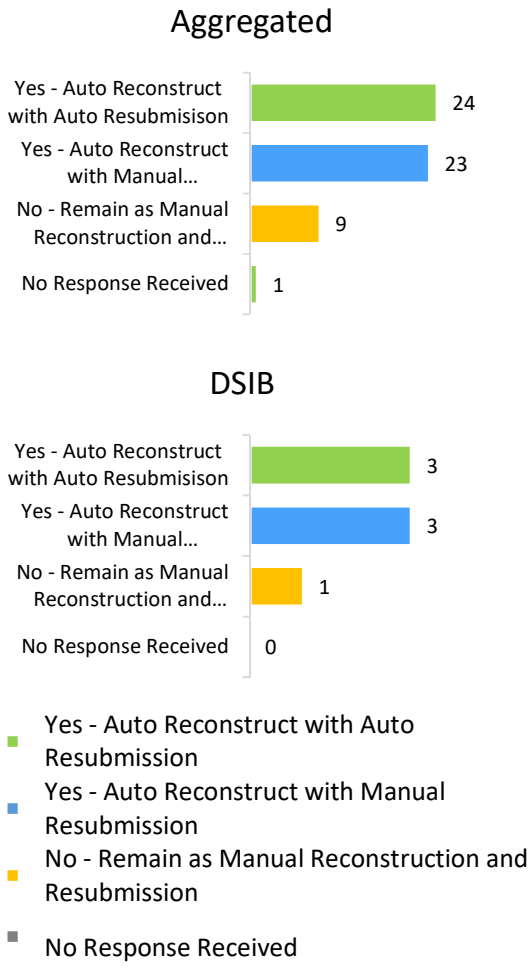
Participants generally do not support the notion to introduce partial settlement and would prefer their transactions settled either in full or not at all.

Most responses by participants that do not favour partial settlement indicated that SGS is held for the purpose of fulfilling the regulatory requirements and would not use the partial settlement functionality.

Automated handling of failed messages

Question 4:

When transactions fail, should messages be automatically reconstructed or resubmitted in the following business day?



Key Takeaways

While participants generally supported the notion to automate the auto reconstruction of failed messages to ease the operational pain-points, there is a need to evaluate the overall cost-benefit of doing so, as the current understanding is that the volume of failed transactions is low.

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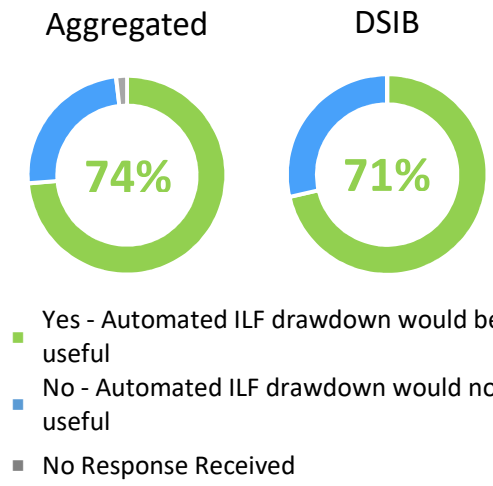
Automated drawdown for Intraday Liquidity Facility

Question 5:

Would an automated drawdown functionality for Intraday Liquidity Facility (ILF) be useful to improve liquidity management for participants? If so, please also share any considerations on such an automated drawdown capability.



Key Takeaways

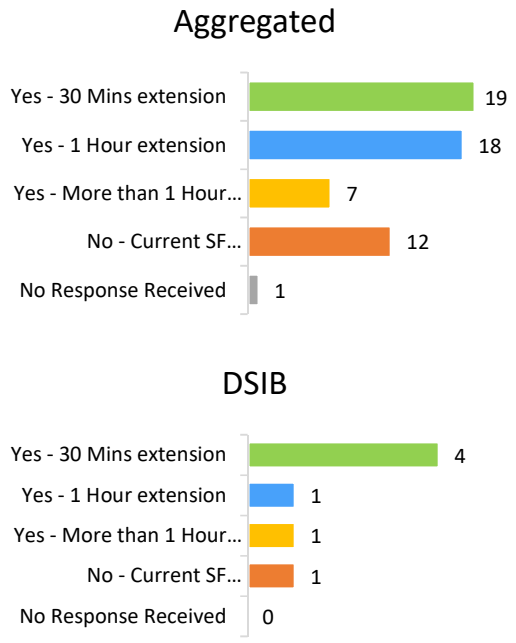
Participants generally supported the notion to have an automated drawdown functionality for Intraday Liquidity Facility (ILF).

Key operational items to consider as part of the detailed solutioning include requiring institutions to have a Global Master Repurchase Agreement with MAS, to have an account structure for institutions to earmark collaterals to be used for ILF purposes, have business rules and parameters to trigger the drawdown and allowing participants to directly manage the activation / de-activation of automated drawdown.

Standing Facility Operating Window

Question 6:

Is there a need to have a longer operating window to initiate Standing Facility (SF) drawdown e.g. 30 Mins extension?



Key Takeaways

Participants generally supported the notion to extend the operating window for Standing Facility drawdown where the start time for tapping on Standing Facility should commence earlier to allow banks to utilise SF funds to settle the last scheduled interbank payments at 1730hrs.

To further streamline the transition from Intraday Liquidity Facility (ILF) to Standing Facility (SF), automating the rollover will be beneficial for the industry.

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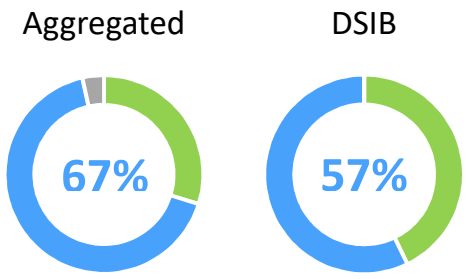
Asset Classes for collaterals consideration

Question 7:

What additional asset classes would your institution be interested to use as collaterals for the Standing Facility (SF)? Please also share any considerations on the usage of current collaterals and any additional collaterals that are suggested.



Key Takeaways

Generally, participants indicated that the current list of collaterals are sufficient for Standing Facility purpose.

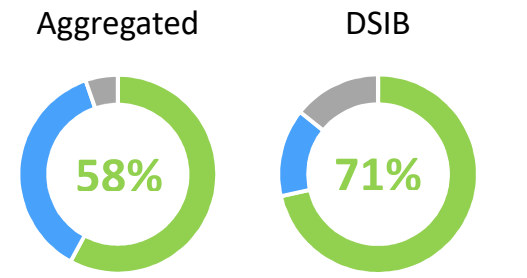
Participants that indicated the need for a wider set of collaterals cited the inclusion of SGD corporate securities, covered bonds, FCY denominated supra-nationals and other collaterals custodised by CDP.

To operationalise the extension of asset classes to be considered for collaterals for Standing Facility, MAS will need to consider having standing arrangement with the various custodians on the mechanism to transfer ownership of collaterals to MAS during the repo duration.

Term and Open Repos

Question 8:

Term and open repos allow participants to borrow funds on an extended period beyond the conventional overnight tenor. On top of the current overnight tenor for repo under the Standing Facility (SF), would the introduction of Term repos and Open repos be useful to your institution? If so, which tenors would be preferred and how should these be priced? Please provide explanations/rationale for each suggestion on tenors and price.



Key Takeaways

Generally, participants supported the notion of offering Term and Open repo facilities, citing the deeper and enhanced overall liquidity in Singapore banking system in the long run, helping to build up the Secured Funding curve.

Term repos would also further reduce interest rate uncertainty especially in the event of a systemic or idiosyncratic liquidity requirement expected to persist for a few days.

Based on the comments offered in the responses, Term repos should be for a duration ranging from 1 week to 6 months.

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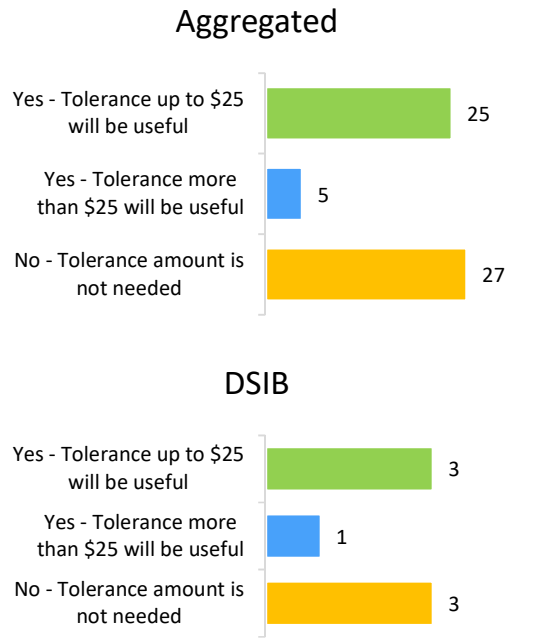
Tolerance Limit

Question 9:

Would the implementation of matching based on a tolerance limit be useful? If so, what is the proposed tolerance amount for consideration.



Key Takeaways

While there are benefits with establishing tolerance limits framework, participants are split on the need to implement matching tolerance with the key feedback indicating that the typical deviation is in the range of cents rather than the proposed $25 limit due to rounding error during the generation of trade instructions.

Implementation of tolerance limit matching will likely introduce reconciliation issues on the banks' internal platforms due to the differences in the booked and settled amount and this need to be factored into consideration as part of the banks' system capabilities to minimise the false-positive reconciliation breaks.

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2 Key Overview of Industry Questionnaire Response

This section summarises the responses to the 25 questions posed in MAS MEPS+ Industry Questionnaire sent to participants on September 2018. On closure of the consultation on 5 October 2018, MAS received a total of 57 submissions from a wide range of stakeholders with varying perspectives on MEPS+ and the broader Singapore payments landscape.

The responses provided insights and aided the formation of thoughts and designs in the future MEPS+ system. In the Industry Questionnaire, MAS undertook to respect the indications of respondents who regarded the information provided as confidential, to the extent permitted by law. The results shown here are therefore presented in aggregate form only, and no responses have been individually identified.

The key takeaways are based on an analysis of the responses by the project team; the key takeaways do not consider every single response, as some responses may not be aligned to the overall industry view.

All participants were requested to provide answers in a quantitative measure, and to supplement these measures with justifications from the angle of business, technology and operations. The quantitative survey responses are represented in the chart diagrams, while the qualitative responses aggregated responses across major themes and considerations.

Questions and their corresponding responses have been grouped into three categories, General, RTGS and SGS. The General category are questions that are relevant for both RTGS and SGS, and the latter two categories are for questions specific to the respective domains.

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2.1 General Topics

2.1.1 Key considerations of change

Question 1:

Do you agree that the four key considerations are critical in shaping the MEPS+ NextGen[1]? Are there any other key themes that MAS should take into consideration?

[1]"NextGen" is the term explained and used in the Industry Questionnaire and refers to the future MEPS+ system

Key Takeaways

Majority of the participants expressed agreement towards the four key considerations identified in shaping of the future MEPS+ system.

Further to the four key considerations, participants have also raised considerations around integration to new emerging technology such as Distributed Ledger Technology (DLT).

Business Considerations

The new system should have the ability to:

- Support major currencies and react to industry requirements;
- Operate on flexible infrastructure to promote ease of adoption and to enable agility amongst participants in a dynamic payment landscape;
- Connect to other RTGS systems in the region particularly ASEAN countries; and
- Optimize liquidity and reduce "idle funds" within the banking system to promote higher velocity of funds within the ecosystem.

As MEPS+ typically operates on a cost recovery model, the new system should also take into consideration the overall cost to deliver, including the required investment and the cost efficiency for the industry.

Review the need for more participation models and more categories of participants other than financial institutions and financial market infrastructures.

Operations Considerations

The new system should have the ability to:

- Automate testing to reduce the overall manual intervention and support required for Industry testing;
- Incorporate and support centralized compliance screening;
- Integrate with emerging new technology such as Distributed Ledger Technology (DLT);
- Allow for direct transfers of securities between Reserve and Trading accounts in the SGS account, instead of requiring the action to be triggered via a SWIFT message;
- Provide real time dashboard for participants to monitor the status of incoming funds from remitting banks to improve throughput ratio;
- Monitor intra-day liquidity position with a focus on bi-lateral counterparty exposure; and

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- Monitor the execution efficacy and speed, from payment release to confirmation of clearance (SWIFT GPI).

Technology Considerations

The new system should have the ability to:

- Support dynamic password management and adopt industry standards using password vault technology;
- Provision for gateway compatibility and interoperability to allow for ease of integration for future technology such as Distributed Ledger Technology (DLT);
- Standardise payment message format;
- Support automated testing tools to perform message consistency check and integration touch points validation;
- Monitor and provide alert through continuous system service monitoring; and
- Allow for audit log of privileged account activities to be made available for a longer retention period.

Disparate payment landscape where currently MEPS+, FAST and IBG are separately maintained applications resulting in constant separate refreshes of OS, security cards and upgrades that happen multiple times during the year.

Standard modularised configuration for infrastructure and application should be introduced to reduce complexity.

Implementation should consider a phased approach to ensure smooth migration onto the new system.

Transition planning should be planned well in advance to allow for internal budgetary cycles and cost approvals. The transition path should be well documented and well communicated.

Participants should have access to an augmented level of technical support during the migration phase.

Other Business Line Considerations

Incorporate new technological developments within the FinTech / RegTech space to:

- Reduce the need for reconciliations;
- Introduction digital concepts for Know Your Customer (KYC) processes; and
- Enhance security and speed.

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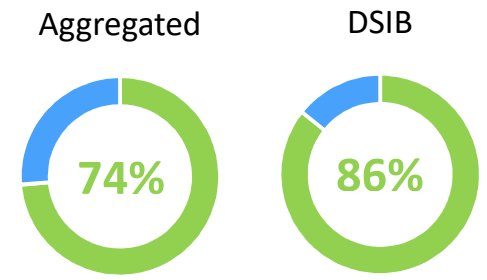
2.1.2 Alternate Domestic Network for Resilience

Question 2:
What are your thoughts and considerations around having an alternate domestic network for resiliency?



Key Takeaways
Participants generally supported the notion to have an alternate domestic network for resiliency due to the collective value to the industry as a whole; though clarity is required for the use cases and the interactions between the contingency system, the current retail payments (FAST) and the alternate domestic network.

While the responses suggest that there is value in having an alternate domestic network for resiliency, two key considerations are (a) cost consideration of maintaining an additional network which will increase the cost of clearing substantially and (b) testing effort required for industry wide testing and contingency drills on the alternate domestic network.

Business Considerations
FAST rail as an alternate for resiliency with the due consideration around settlement handling and the payment limits.

Alternate domestic network should be compatible to read the existing network file formats so that switching is seamless.

Cost of maintaining an additional network will increase the cost of clearing substantially and the introduction of an additional network introduces another point of entry for would-be attackers.

Operations Considerations
The alternate domestic network needs to support the following considerations:

- Support the same MT / MX messages format;
- Support seamless backend switch from primary network (SWIFT) to alternate domestic network;
- Reconciliation to prevent any loss of payment instructions;
- Allow users to access the current balances real-time to manage the liquidity and avoid MCB breaches; and
- Allow users to manually update transactions via authenticated means, replicating SWIFT capability and security.

Testing consideration on the effort required for industry testing and contingency drills on the alternate domestic network need to be balanced against the benefits of having an alternate domestic network.

Consideration to revert to manual handling i.e. MAS to accept physical requests in case of contingency situations to avoid huge cost investment for an alternate domestic network arrangement.

Technology Considerations
The alternate domestic network needs to support the following considerations:

- Consider riding on FAST rail;
- Services embedded as a utility to minimise architectural changes;
- Seamless switching between main and alternative network to ensure data integrity and transaction can be reconciled;
- Complexity and cost to set up and maintain the alternate domestic network; and

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- Messages sent through the "primary network" (SWIFT) and the alternate domestic network must be of the same format and have similar responses from the host system.

Alternate domestic network should offer similar security controls to the current SWIFT network using a combination of PKI, SWIFTNet Link and network VPN to achieve encryption, authentication and non-repudiation at application, messaging and network level.

Cost effectiveness is key in the design of the alternate domestic network to reduce cost redundancy and minimise any additional infrastructure costs to Banks.

Participants with SWIFT connection outside of Singapore might require additional internal work to "route" payment messages back into Singapore to be able to connect to the domestic network.

Out of Band mechanism i.e. MAS to accept physical requests in case of contingency situations to avoid huge cost investment for an alternate domestic network arrangement.

An option may be to have a domestic SWIFT service that conducts messaging services for Singapore on a business-as-usual basis, similar to the operating model used in India.

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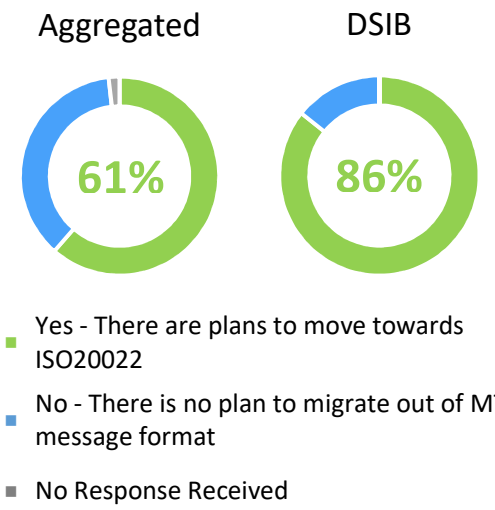
2.1.3 ISO20022 Message Format

Question 3:

Is your institution looking at moving towards ISO20022 message format in the next 2 to 3 years? If so, please also share if your institution is looking at having MX/MT translator available to support both message formats during the interim phase.



Key Takeaways

The responses suggest most financial institutions have plans to move towards ISO20022; Respondents have raised the need to be engaged early, as their organisations' systems may require enhancements that would require significant effort.

Respondents have also raised the need to align the launch of ISO20022 with the overall SWIFT industry wide plan.

Operations Considerations

Focus on aligning the move to MX with SWIFT's timeline to reduce the effort required for Operations to conduct multiple rounds of testing.

Focus on harmonising message format across the various payment types e.g. GIRO, FAST as part of the overall move towards ISO20022.

Useful to have a MX / MT translator as the entire ecosystem may not be ready to accept MX format on the launch day of the future MEPS+ system.

Technology Considerations

Migration from FIN MT to ISO20022 will involve adaptation of in-house and vendor systems, either on current systems or addition of translator until all the internal applications can process ISO20022 natively. Early availability of technical specification, such as fields mapping from MT to MX equivalent is key to product adaptation.

Allocation of longer test window for this major message transformation is important to facilitate extensive regression tests and concurrent support for MT and MX by MAS will help facilitate phase implementation and smoothen the transition.

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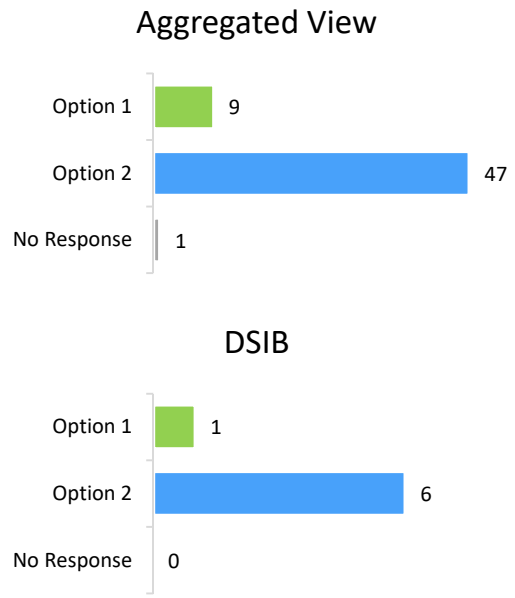
2.1.4 Full-fledged MX message vs Decoupled Approach

Question 4:

Would your institution prefer (Option 1) to launch full-fledged MX messages alongside the MEPS+ NextGen[1] OR (Option 2) to adopt a decoupled approach of having MEPS+ NextGen launched with message translator to cope with the existing MT message format?

[1]"NextGen" is the term explained and used in the Industry Questionnaire and refers to the future MEPS+ system



Key Takeaways

Participants generally supported the notion to decouple the launch of the new MEPS+ system and the implementation of full-fledged MX message; reasons cited include the significant effort required for testing should both full-fledged MX messages and the next MEPS+ system be launched at the same time.

Separately, the overall SWIFT move onto ISO20022 format should also be factored into consideration to minimise the overall testing effort required by the industry and achieve synergy between the 2 initiatives.

Operations Considerations

Decoupled approach is preferred as it will be a more prudent approach as not all Financial Institutions across domestic and foreign markets will migrate onto ISO20022 format at the same time. Similarly, there are also other types of MT message other than MT202 and MT103 which are still widely used for communication with corporate clients and correspondent banks which means that the bank will need to operate with the two standards concurrently.

Phased approach is more feasible and practical, although it can create resource concerns on industry-wide testing and the frequency of testing which will be driven by the number of phases.

Technology Considerations

Timeline should be synchronised with the SWIFT ISO20022 migration timeline to achieve synergy between the 2 initiatives.

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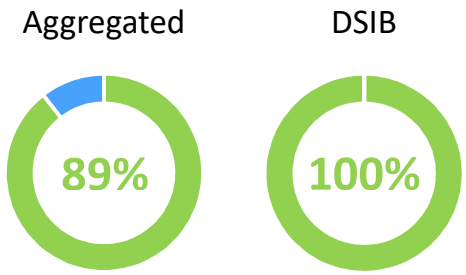
2.1.5 One-Stop Portal

Question 5:

Would the launch of a "one-stop portal" to retrieve reports, billing statements, raise service requests and perform searches etc be useful?

If your institution is supportive of "one-stop portal", please also share if there are any additional features that you would like to raise for consideration to be included in the portal.



Key Takeaways

Majority of participants supported the notion to introduce a "One-Stop Portal" with integrated capabilities such as (a) Search and display near real time data, (b) APIs for data consumption, (c) Retrieve reports and bills, (d) Raise service requests to MAS.

Business Considerations

One Stop portal should have the ability to

- Include real time transaction status
- Provide a range of basic API that can be consumed by the participants
- Retrieve information such as transactions, balances, cash and security positions
- Provide notification for corporate events such as issuance, coupon payment
- Provide updates on internal process such as batch run timing, availability of reports
- Download of extracted data in various formats to allow for ease of downstream integration and reconciliation
- Provide a proper channel in raising service requests and getting help through a chatbot

Operations Considerations

One Stop portal should have the ability to

- Enable participants to interact via a "secure chat channel" e.g. Symphony
- Support a notice board where MAS announcements such as Industry wide testing announcement, scheduled system disruption can be published
- Calculate and present Minimum Cash Balance to the participant
- Provide a dashboard showing the status of all messages by queues
- Customise, query reports and dashboards
- Support report scheduler with ability to auto generate and auto send reports via email
- Perform flexible search functionality and filters
- Set up and send alert notifications based on thresholds set by the Bank
- Extract data in various formats e.g. CSV, TXT, PDF
- Maintain user access set-ups for different user groups
- Support the retention of data in accordance with statutory standards
- Tracking of adherence to Graduated Payment Schedule
- Raise requests through e-submission instead of physical form submission
- Perform self-service functionality such as password reset
- Store all the relevant documentation and related MEPS+ software for ease of retrieval

One Stop portal should have the ability to provide analytics information around

- Lowest and highest RTGS balance value and time for the day

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- Total amount received from each individual counterparty
- View by hourly incoming and outgoing funds
- Trend analysis for Graduated Payment Schedule

Technology Considerations

Automate data feed to help facilitate auto reconciliation process, such as regular reconciliation of MEPS+ level 2 user account with Identity Management solutions.

Data exchange channel will need to be secured and aligned with industry security guidelines and SWIFT Customer Security Controls framework. Infrastructure capability and bandwidth needs to be assessed and considered as huge volume of data flow may clog up the network bandwidth.

User access to One Stop Portal must be secured by means that are cost-effective and strong enough (e.g. 2FA, dynamic encryption) and not requiring an isolated user workstation.

Database Audit Trail report is currently only available on the first working day of the month during End-of-Day and contains data for the previous month only – information should be made available in real-time and to contain data for up to one year for extraction.

Other Business Line Considerations

From Cyber Security perspective, authentication should be with two-factor Authentication (2FA) and all network connection must be encrypted.

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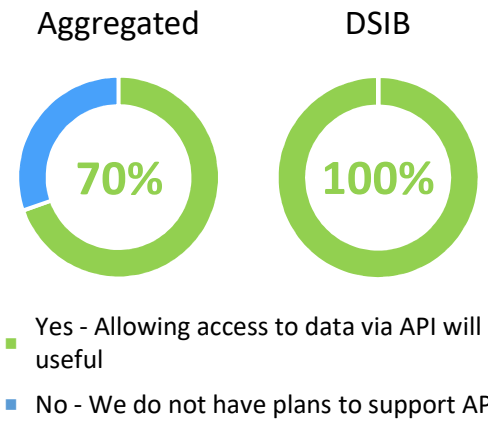
2.1.6 Application Programming Interface

Question 6:

MAS is considering the provision of an Application Programming Interface (API) that would allow participants to access their own data in near real-time.
Would the sharing of data through an API be useful to your institution? If so, what types of data would be useful for your institution e.g. transactional data, user log on details?



Key Takeaways

Participants generally supported the notion of accessing data through use of APIs; respondents expressed the desire to receive updates to transactions on a "push" basis and respondents have also raised the need for controls and standards of APIs to be established to govern the consumption of data.

Business Considerations

Data which will be of use to business includes

- Transaction data and status
- Incoming and outgoing transactions flows
- Pending payments
- Turnaround time
- Charges levied by clearing system
- SGS holdings
- Balances
- Reference data (instruments, coupon events)

Operations Considerations

Data which will be of use to Ops includes

- Transactional data including settlement status, time logs
- Liquidity data around available balances, balances falling below threshold
- Balances for regulatory tracking and monitoring
- Trade audit trail displaying the date and time stamp
- Include other MEPS+ participant data with information such as sending BIC, applicant and beneficiary details masked to facilitate data analytics
- Users logon details
- Graduated Payment Schedule

Technology Considerations

API governance controls and standards need to be established alongside with the publishing of the data definitions.

Updates to transactions should be pushed out in messages to MEPS participants. The messages sent out should be tagged with a running number so that if an external system misses a message, the system can query for the messages bearing the missing sequence numbers.

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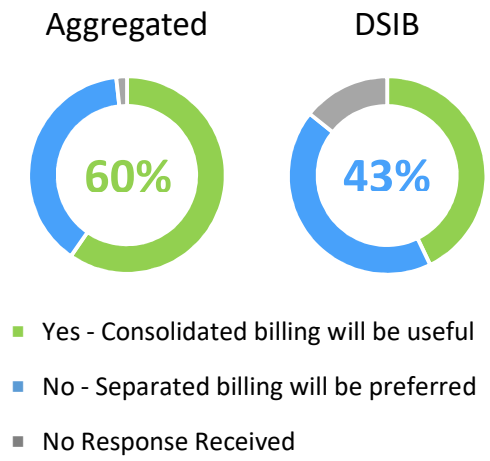
2.1.7 MEPS+ Billing Statements

Question 7:

Would participants find it useful to have consolidated billing across all the various services of MEPS+ NextGen[1]?

If your institution is supportive of consolidated billing statement, please also share if there are any additional features or information that you would like to raise for consideration to be included in consolidated billing statement (e.g. support various file format, billing statement cycle).

[1]"NextGen" is the term explained and used in the Industry Questionnaire and refers to the future MEPS+ system



Key Takeaways

Responses have been evenly spread on the desire for consolidated billing and for separated billing.

Respondents expressed the wish to have the flexibility in choosing whether bills are consolidated or separated and in choosing the format of these bills (.csv, .xlsx or .PDF).

Business Considerations

Participants should continue to have the option to access consolidated as well as separated billing statements as operations may not be sufficiently integrated and there may be parts of the business where client data and information needs to be contained to only specific functions of the banks.

The billing module should support different file formats and provide detailed, summary and historical views.

Logical grouping of billing statement by certain payment parameters / references will be useful to ease internal reconciliation or allocation.

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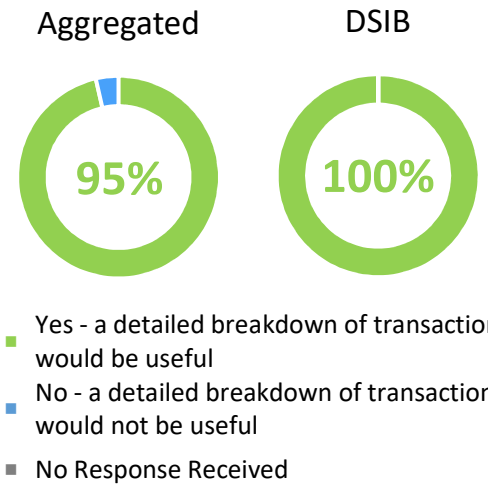
2.1.8 Detailed breakdown of Transactions as part of billing statement

Question 8:
MAS is looking at providing detailed breakdown of transactions as part of the billing statement. Would this be useful? If so, what would be the key information to be included in the Billing Statement?



Key Takeaways
Most respondents, and all DSIBs responded that they would like to receive detailed breakdown of transactions in the billing statement.

Operations Considerations
Detailed Billing Information should include

- itemized billing for each service line e.g. subscription charges
- Fee code and fee rate per transaction
- Transaction codes e.g. RTGS, SGS
- Time block and Time of the message
- Transaction quantity
- Value Date
- Transaction Date
- Message Types
- Transaction Reference Number
- MAS transaction Reference
- Sender Reference
- Tax Rate and Amount

Detailed Billing Information for RTGS should include

- Transaction reference in field 20 and 21
- Message type
- Amount / Currency
- Value date
- Charges amount for each transaction

Detailed Billing Information for SGS should include

- Transactions by accounts
- Transaction reference
- ISIN code
- Quantity
- Settlement date
- Trade date
- Charge amount

Consolidated billing should include

- Breakdown of volume and unit price
- Transaction details
- Due date of invoice
- Frequency of billing

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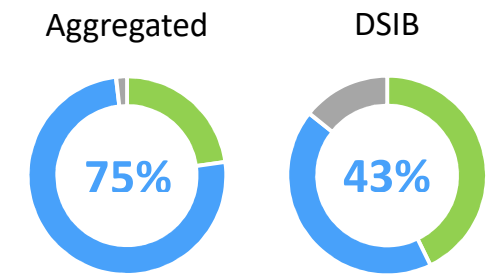
2.2 RTGS Topics

2.2.1 Account Structure

Question 1:

Would your institution be interested to create and manage sub-accounts within RTGS? For the usage of sub-accounts, please consider the implication of message queues, reconciliation and funds movement across sub-accounts.



Key Takeaways

A significant majority of respondents expressed that the current model of having a single, main RTGS account is sufficient, as this facilitates monitoring of liquidity positions.

Should the sub-account feature be introduced for RTGS, respondents mentioned that the feature should not be mandatory, and should be accompanied with the capabilities to ease operational challenges such as consolidated view of the total balances, auto-sweeping between accounts, having different identifiers to tag different BIC codes.

Business Considerations

Management of liquidity under 1 centralised account will be more efficient compared to monitoring different liquidity positions across multiple accounts. If sub-account capabilities are to be introduced, there should be flexibility for participants to decide if they will proceed to utilise the functionality.

One possible business case consideration for sub-accounts within RTGS is to support and facilitate settlement by CDP for DVP transactions. To further enrich the capabilities and features of sub-account, participants can consider allowing authorised user to transfer funds from the sub-account to another MEPS+ participant account to facilitate settlement handling.

Operations Considerations

If sub-accounts are introduced, the following features will be required:

- Consolidated view of the total balances for funding and liquidity management
- Auto-sweeping between accounts based on parameters set by the Bank
- Elimination of the current account and the ability to use the RTGS account for all cash movements including charges
- Transfer of funds function between sub-accounts is available in the system itself without the need for SWIFT
- Ability to configure, on a consolidated basis for the handling of MT 950 statements
- Beneficial to have different identifiers (account numbers) with the ability to tag a different BIC Code to the sub-account such that it can route SWIFT statements to the different BIC code

Key concerns on the usage of sub-account, is the need to monitor multiple liquidity positions and reconciliation across multiple accounts. This sub-account structure should only be “optional” for participants such that they can choose to subscribe or not depending on the needs.

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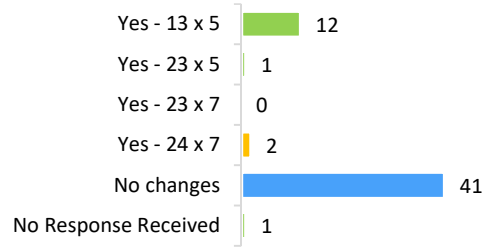
2.2.2 Extended Operating Hours

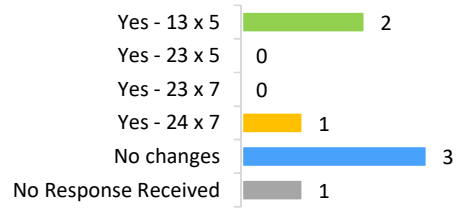
Question 2:

Does your institution require extended operating hours for RTGS services on business days? If so, what would be the ideal extended operating hours 13x5 (9am to 10pm Mondays to Fridays), 23x5, 23x7, or 24x7 and what would be the purpose of these extended operating hours with an indication of the volume and value of such transactions?

Aggregated



DSIB



- Yes - 13 x 5 (9AM to 10PM) Monday - Friday
- Yes - 23 x 5 (9AM to 8AM) Monday - Friday
- Yes - 23 x 7 (9AM to 8AM) Monday - Sunday
- Yes - 24 x 7 Monday – Sunday
- No - Current MEPS+ operating hours are sufficient
- No Response Received

Key Takeaways

Majority of the participants do not support the notion of having extended operating hours. The overall cost of extending the operating hours needs to be balanced against the business case for the industry ecosystem, as additional resources will be required to support extended operating hours.

Key considerations to launch extended operating hours include (a) accessibility to funding options, (b) resources required to support the entire ecosystem and (c) implication on the banks' internal end of day batch runs.

Extended operating hours should also come into consideration should there be a direction to internationalise SGD.

Business Considerations

Considerations to extending MEPS+ operating hours include

- Accessibility to funding options (e.g. interbank, liquidity facilities) beyond the current operating hours to ensure that banks comply with their Minimum Cash Balance (MCB) requirement. Without that access, banks will have to keep additional surplus balances which may be left idle if there are no payments / outflows during the extended hours
- Additional resources required to support the ecosystem ranging from Front Office through to Ops and Technology support
- Implication on the banks' end of day batch runs as they are dependent on the final closing position of MEPS+

If MEPS+ Operating hours are extended, this will

- Facilitate payment after the current clearing window time and reduce the risk of settlement failure from customers and counterparties
- Extending operating hours will potentially allow Global clients to have a better cut-off time
- Support an additional clearing window to support a third cycle for FAST settlement for better risk management
- As SGS market sees more international investors using EUROClear for settlement,

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the extension of cut-off time will reduce the likelihood of failed trades

Operations Considerations

Considerations to extending MEPS+ operating hours include

- Availability of liquidity in the evening
- Changes required to the current support model and potential increase in operating costs
- Impact on MCB requirement
- Cost effectiveness as banks would have to maintain sufficient cash buffer which is not ideal

Justification why extension of operating hours is not required:

- Regardless of how far the extended hours go, it would never be sufficient because late payment requests tend to be largely behavior driven
- From a payments system standpoint, FAST is available 24/7 which can help to bridge the gap if there is a need for payment services outside of MEPS+ operating hours
- For International trade transactions, outgoing / incoming payment in SGD is effected / received when it is Singapore bank working day. Henceforth, it may not require 24x7 capability for such international trade transactions.

Instead of extending operating hours, MAS should look at alterative clearing mechanism or cycle that can ease the crunch or high utilization of system during peak timing as experienced currently.

Technology Considerations

If operating hours are extended, participating banks should be allowed downtime to manage their respective maintenance / upgrades, etc to their infrastructure.

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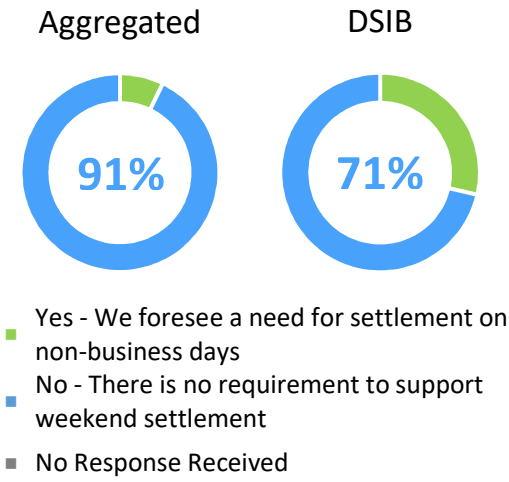
2.2.3 Non-business day

Question 3:

Does your institution have a requirement to have settlement on non-business days for RTGS services? If so, what would be the purpose of doing so and what are the expected volume and value of such transactions?



Key Takeaways

A clear majority of respondents expressed that there would be no need for the future MEPS+ system to support payments settlement on non-business days; those who have supported the notion of weekend settlement mentioned that the function would be to support FAST settlements and to better manage risks.

Business Considerations

Non-business days settlement will be useful to support FAST settlement for better risk management.

Operations Considerations

Features to consider for non-business days include:

- Ability to top-up of G3 collateral account due to debit cap being close to / over utilisation limits
- Automated mechanism that can allow participant to move fund from its current account to fund any unexpected insufficient clearing obligation over non-business days

There will be a need to put a cap on such transactions for the compliance of MAS regulatory ratios as there will be no availability of market and standing facility to tap in the event of such liability do exceed the buffer of the bank's MCB.

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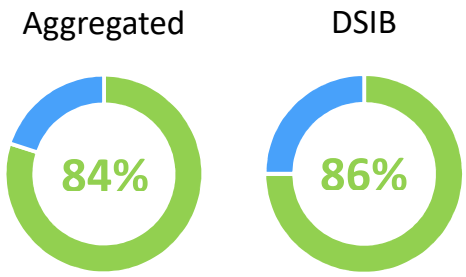
2.2.4 Net Debit Cap Auto Top-Up

Question 4:

Would an automated top-up of Net Debit Cap (NDC) for G3/FAST transactions, based on pre-defined business rule, be useful to participants?

If your institution is supportive of automated top-up of Net Debit Cap (NDC), please share any considerations or preferred business rule (e.g. auto top-up upon 20% remaining Net Debit Cap) to initiate automated top-up of the Net Debit Cap.



* Response from FAST participants only

- Yes - Automated top-up of Net Debit Cap is useful
- No - We do not see any need for automated top-up of Net Debit Cap

Key Takeaways

Participants generally supported the notion of having an automated top-up of Net Debit Cap, while safeguards such as the ability to define the percentage of Net Debit Cap threshold, top up percentage and notification would be required.

Business Considerations

Implementation considerations to include:

- Rules and business parameters which may impact the priority of other mandatory or time critical payments (SGS, MAS payments, CLS)
- Feature in the system infrastructure or process involving drawing on excess MCB (above min 2% or a bank determined level) or an automated Standing Facility Repo using High Quality Liquid Assets (HQLAs) under custody in MEPS+
- Each participant has the flexibility to set their own business rules on the NDC top-up and notification alert settings
- Rules for auto-top up may vary from an absolute amount increase to a variable increment subject to a predetermined cap (which itself may be variable for e.g. Cap at the amount of cash balance in excess of MCB)

Operations Considerations

Allow banks to define the percentage of the Net Debit Cap threshold trigger point and the top-up percentage.

Provide an alert when Net Debit Cap threshold set by the Bank has reached for better monitoring and a confirmation alert sent to the Bank once top up is done.

Draw upon the availability of funds in the RTGS / CAS account with the consideration of the requirement of minimum cash balance that cannot be breached.

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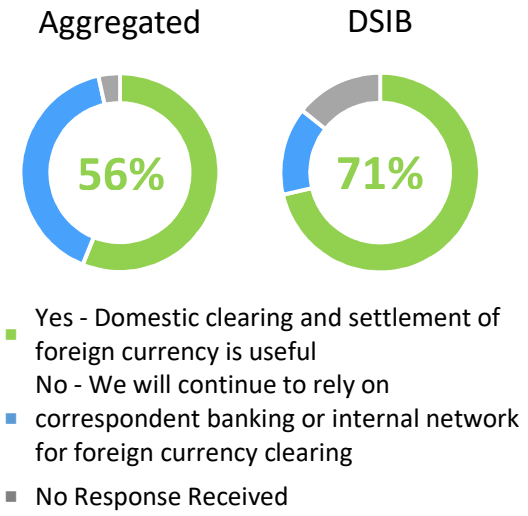
2.2.5 Multi-Currency

Question 5:

What is the business case for your institution to push for multi-currency clearing and settlement in Singapore? Please also share your key operational considerations if multi-currency is being cleared and settled in Singapore.



Key Takeaways

Participants are generally split on whether there is a business case for multiple currencies to be made available in Singapore; banks that were receptive towards having multi-currency clearing and settlement mentioned that they would like to have USD cleared, with most highlighting that this would only be useful if there are enough participants on the system.

Key considerations for the launch of multi-currency RTGS include (a) availability of liquidity, (b) currency holiday, (c) operational hours, (d) membership of banks to be part of the foreign currency RTGS ecosystem.

Business Considerations

USD is the most popular foreign currency transferred between banks in Singapore. It would be highly beneficial to have USD clearing via MEPS+ system so that USD transfers within Singapore banks can be done quickly and efficiently. The current USD cheque volume is relatively high which can be reduced by introducing USD MEPS+ clearing. Potentially MAS can consider appointing a domestic USD clearing agent who can support deep USD liquidity required for this arrangement.

Multi-currency payment wallets are gaining traction. If the currencies are consolidated in Singapore, we should also see an increase in liquidity, which is good for banks, and for the overall Singapore's banking system.

Supporting multi-currency will also help to bridge the current gap on the PTS2 project of SGX where the ability to support multi-currency (esp. AUD / HKD / CNY) clearing and settlement would allow CDP to return residual funds after the batch run of the DVP model.

Key considerations include

- Availability of liquidity
- Currency holiday
- Operational hours and what restrictions this would place for foreign currency settlement versus the differences in the cut-off times for the markets they operate in.
- Increased complexity and potential credit risk in the case the Foreign Currency account is not held with MAS
- Routing of funds to correct clearing accounts
- Rules to manage which clearing accounts to be used for which transactions
- Management of liquidity positions across these multi-currency accounts
- Forex requirements around local treasury

Operations Considerations

There must be enough liquidity of the foreign currencies if foreign banks choose not to participate.

FIs should have the option to clear foreign currency through MAS or their existing correspondent banks set up.

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Bank will require significant investment in system changes and resources to support multi-currency clearing systems.

Segregating RTGS and foreign currency payments as single currency clearing settlement, facilitates monitoring and reconciliation of RTGS and correspondent accounts.

FX conversion rates for Minimum Cash Balance (MCB) calculations should be applied.

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2.2.6 Foreign Currency to be supported for clearing and settlement

Question 6:

Please share the top three foreign currencies for which your institution would be interested to participate in if the clearing and settlement is conducted in Singapore.

Key Takeaways

The top 3 foreign currencies to be considered for clearing and settlement in Singapore include USD, EUR and RMB.

Business Considerations

CNH is already available for clearing and settlement in Singapore and would be useful if the settlement can be integrated.

Most of the non-SGD payments are outside Singapore thus it is not expected that having a foreign currency RTGS will help the local business.

Based on the Hong Kong Treasury experience dealing with multi-currency RTGS, having domestically cleared foreign currencies is troublesome for liquidity management / funding. USD payments often get gridlocked / standoffs due to limited domestic payments stream. This is also compounded by the different cut-off times between domestic & global payments systems.

Operations Considerations

JPY & AUD are currencies with earlier cut-off times (that is both countries are ahead of Singapore in terms of time), so extending the cut-off time by an hour or two hours for JPY and AUD will be beneficial as payments can be made up till a later cut-off time. To illustrate, the cut-off time for JPY payment to a JPY correspondent is 9am, with the new system, if there is an ability to pay counterparties up till 11am, there would be an advantage of 2 hours gained by operations to effect the JPY payments.

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2.2.7 Other Feedback and Inputs

Question 7:

Please share if there are any other features / capabilities that your institution would like to raise for consideration for the MEPS+ NextGen[1] (RTGS)? In your response, please attribute each feature/ capability to the consideration of change (e.g. Future Landscape/ Accessibility/ Resiliency, Reliability and Security/ Enhanced Operational Efficiency) and respective business line e.g. front office/business, settlement operations, technology, etc.

[1]"NextGen" is the term explained and used in the Industry Questionnaire and refers to the future MEPS+ system

Hong Kong Payment Landscape Review

It may seem ideal to follow Hong Kong's payment landscape where their RTGS include HKD, USD, CNH and EUR. Depending on whether the bank is a direct participant for that currency, the cost of using RTGS is not always cheaper for customers. It also makes the payment option more complicated – for example, some MT202Cov messages need to be sent by RTGS. If Singapore will expand the RTGS currency, cost and flexibility should be considered for smaller banks.

Additionally, based on the experience with the Hong Kong Treasury in dealing with multi-currency RTGS, having domestically cleared foreign currencies is troublesome for liquidity management / funding. Hong Kong has this for USD and payments often get gridlocked / standoffs. This is a result of the domestic payments stream being limited and isolated from all other payments. This is also compounded by the different cut-off times between domestic & global payments systems.

Industry Testing

- Automated testing rather than manually executed industry wide testing

Capabilities for consideration

- Standing facility trades should be executed / affirmed using the system
- MAS should be able to debit / credit the Bank systematically without the need for MT320 trade confirmations
- Status of payment at receiving bank's end to be available in portal real time so that sending bank know if payment is credited to beneficiary's account or returned (SWIFT GPI)
- MEPS+ Participants to return funds without the need of using SWIFT message

Final Clearing Number

- Need for consistent clearing time for banks to receive the final clearing number – expectation is for all banks to receive the numbers by 1800hrs

Alert and Notifications

- Auto Alert message to MEPS+ user when balance is below MCB

Reports

- 'Download User Profile Report' to include user group against the list of users

Funds Allocation

- Expand capabilities to have Funds Allocation / earmark function to include a wider range of obligations e.g. CLS pay-ins, cash settlement for Singapore Government Securities, priority payments on top of the standard function for net cheque, FAST and counterparty.
- Earmarking criteria to include (a) Allocation amount, (b) Date & time Currency, (c) Allocation identifier Description, (d) Allocation priority

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User Interface Design

- Reflect the 3% of the qualifying liabilities figure to be shown in MEPS+ RTGS account position page for easy reference
- Current available balance to be reflected on the same page as the transactions details
- Auto-calculate and reflect the regulatory numbers such that participant can make use of the system for monitoring directly instead of performing their own calculation
- Settlement information screen to be more user friendly with full details of settlement instructions, preferably with the same SWIFT format

Returns Reporting

- For any return reporting requested by MAS whereby that data is available in MEPS+, the future MEPS+ system should allow MAS to self-service and directly retrieve the information

Incorporating MAS Money Market Ops (MMO) into the future MEPS+ system

- Optimize the drills to be less frequent but be more comprehensive
- Drills should have least impact to BAU activities, therefore, preferably to conduct during weekends

Screening and Transaction Monitoring

- Centrally facilitate the screening and transaction monitoring for AML and fraud protection especially for foreign currencies, and every participant (especially non-banks) don't need to invest in such infrastructure individually

PvP capabilities

- Introduce and support PvP platform to avoid settlement risk where 2 currencies involved are settled simultaneously (SGD, USD, EUR, JPY and CNH at the very least)
- Settlement of transactions is final and irrevocable.
- Accept unilateral PVP instructions from financial market infrastructure such as CCP, so that settlement of pre-matched transactions can proceed without the need for another round of matching

Resiliency, Reliability and Security

- Robust and regular monitoring on system health / performance such that any latency can trigger notification to users directly

Payment landscape integration

- Reduce and coordinate all system upgrades / patches with other Singapore payment systems for efficiency and ease of maintenance

Connecting RTGS globally

- If multi-currency is being cleared and settled in Singapore consider extending RTGS to connect with other international payment systems such as CNH, USD, EUR, HKD

User Access Matrix

- Allow more flexibility in terms of access to RTGS, SGS & CAS module via role-based approach to ensure users are only allowed to access on a "need to know" basis

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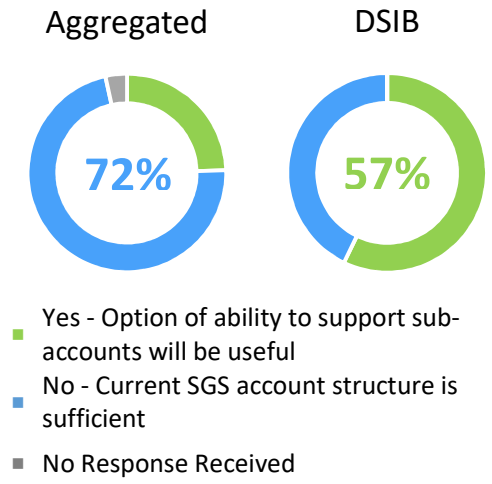
2.3 SGS Topics

2.3.1 Account Structure

Question 1:
Would your institution be interested to create and manage sub-accounts within SGS e.g. allowing for the creation of sub-accounts in Trade and Customer accounts?



Key Takeaways
The notion of sub-accounts did not garner support amongst the general respondents, while the larger domestic players generally supported it. Participants have also raised concerns around managing sub-accounts holdings; this would be mitigated by the usage of unique sub-account identifiers and ability to send statements directly to beneficiaries of the sub-accounts.

It would also be important to consider the need to create sub-accounts for holding securities that would be used by the auto-drawdown ILF, should it be introduced in the future MEPS+ system.

Business Considerations
Sub-accounts provide the flexibility to support both ring-fencing via segregated sub-accounts and omnibus accounts to cater to different client needs. Alongside with the sub-accounts, there should be ability to send statements directly to beneficiaries of the sub-accounts.

Liquidity challenges of operating sub-accounts need to be factored into consideration.

Operations Considerations
Creation of sub-accounts within Customer or Trade accounts will result in an increase in the message flow especially when it involves movements between two sub-accounts within CUS / TRD. This structure may not be beneficial for clients if fees are imposed for intra-transfers as the benefits of sub-account structure resides mainly in performing reconciliations.

Operational challenges of monitoring and performing reconciliation for multiple sub-accounts.

Banks should be given the flexibility to create their own sub-accounts without the need for forms submission.

Where sub-accounts can be set up, it would be beneficial to have different identifiers (account number) for each with the ability to tag a different BIC Code to the sub-account and having the ability to be able to route SWIFT statements for each sub account to different BIC codes.

Technology Considerations
System should cater to sending statements and advices to multiple BIC11 of the same institution.

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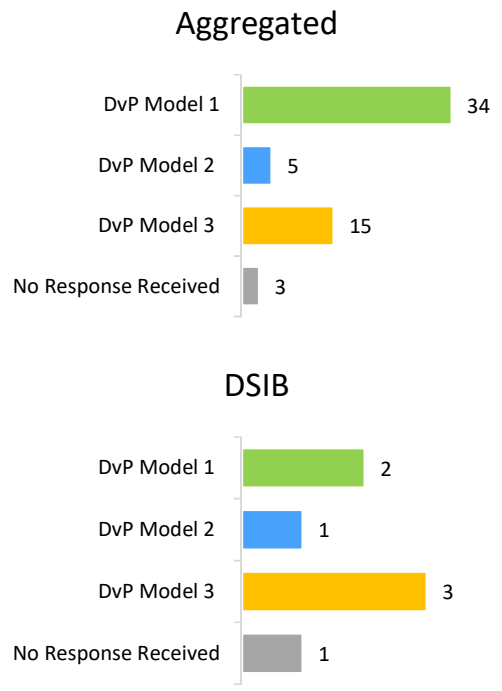
2.3.2 DvP Models

Question 2:
Which DvP Model would your bank prefer most?



Key Takeaways
Respondents generally supported the notion of keeping DvP Model 1, while DvP Model 3 was favoured by larger domestic players. Amongst the respondents, many have raised questions surrounding the settlement risk of DvP Model 3.

Should DvP Model 3 be adopted in the future MEPS+ system, risk mitigation technique(s) should be employed such as the use of priority queues that settles transactions on a real time, gross basis i.e. DvP Model 1.

Business Considerations
On DvP Model 3, the Settlement Risk failure will be greatly reduced. And the consumption of settlement risk limits may potentially be lowered due to the net settlement exposure to the counterparty which will give rise to better efficiency in managing operational risk of bonds operations in the system.

Consider supporting a hybrid model where DVP Model 1 runs continuously while DVP Model 3 runs on a periodical basis.

Operations Considerations
For DvP Model 3 to operate efficiently, the following needs to be considered:

- Robust reporting system and multiple batch runs will be required
- Efficient and automated means of identifying the netted instructions to facilitate funding, settlement status updates and reconciliation
- Number of planned settlement window throughout the day
- Netting should be performed within the same operating account (for example Trading accounts)
- For customer accounts, there should also be the option of DvP Model 1

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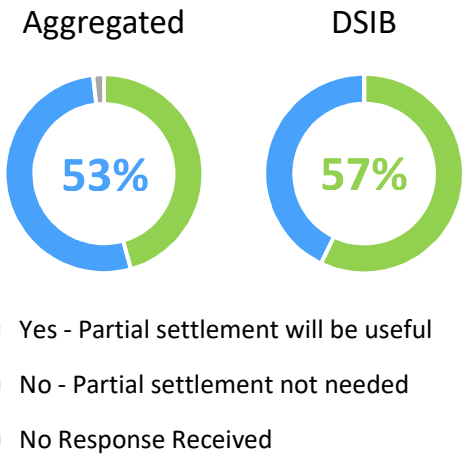
2.3.3 Partial settlement of SGS transactions

Question 3:
Would introducing partial settlement of SGS transactions be useful to your bank?



Key Takeaways
Participants generally do not support the notion to introduce partial settlement and would prefer their transactions settled either in full or not at all.

Most responses by participants that do not favour partial settlement indicated that SGS is held for the purpose of fulfilling the regulatory requirements and would not use the partial settlement functionality.

Business Considerations
Flexibility needs to be in place to determine if a trade should be considered for partial or full settlement and the agreement will require agreement of the two counterparties.

Operations Considerations
Partial settlement will help to reduce costs of late settlements with only the genuine failing part(s) of an instruction remaining outstanding as opposed to the full instruction.

Partial settlements can only work for segregated sub-accounts with a sole beneficial owner but not for omnibus sub-accounts with multiple beneficial owners.

Partial settlement will be extremely useful particularly for broker community. SGX is introducing partial settlement as part of PTS2. Further sharing sessions with SGX to understand the detailed PTS2 implementation challenges should be conducted should be incorporated in the future MEPS+ system.

The future MEPS+ system must be able to provide the status update on the different parts of a single instruction be it partially settled or failing and identify which parts are for which. Failing which this will result in increased difficulty in monitoring and reconciling partial settlement.

Partial settlements should be permitted as an option for investors to bilateral agree, but the default should be no partial settlements.

Partial settlement will cause increased risk of cashflow breaks, securities holdings breaks and uncertain agreement between a financial institution and a counterparty which may breach compliance from the financial institution's perspective.

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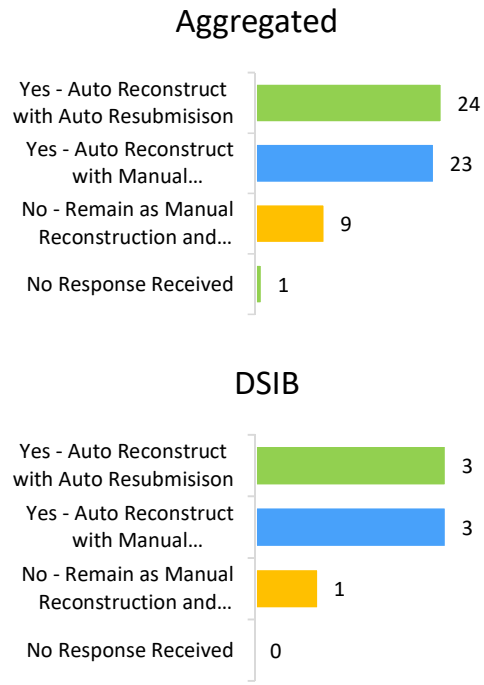
2.3.4 Automated handling of failed messages

Question 4:
When transactions fail, should messages be automatically reconstructed or resubmitted in the following business day?



Key Takeaways
While participants generally supported the notion to automate the auto reconstruction of failed messages to ease the operational pain-points, there is a need to evaluate the overall cost-benefit of doing so, as the current understanding is that the volume of failed transactions is low.

Operations Considerations
Controls need to be in place to either move the failed transactions for the next value date or possibly have them placed in a queue that can act as an intermediate checkpoint before they are being released for processing.

Current state of having a purge in the system by end of day should also remain as an option.

There is no one-size fit all solution for the handling of failed messages as the failure need to be analysed on a case by case basis

- If failure is due to lack of securities – auto-reconstruction and release is useful
- If failure is due to mismatch – auto-reconstruction of messages is useful, however, this should go through a review process before the messages are being released. Not all failed trades are bound to be settled the next day. If instruction remains unmatched due to counterparty's missing or details not matched, the auto created instruction will not be of value.

SGX approach allows for auto-rollover for X no. of days if the instructions failed to settle on settlement date. In this case, there is no need for automatic reconstruction / submission of messages in the next business day.

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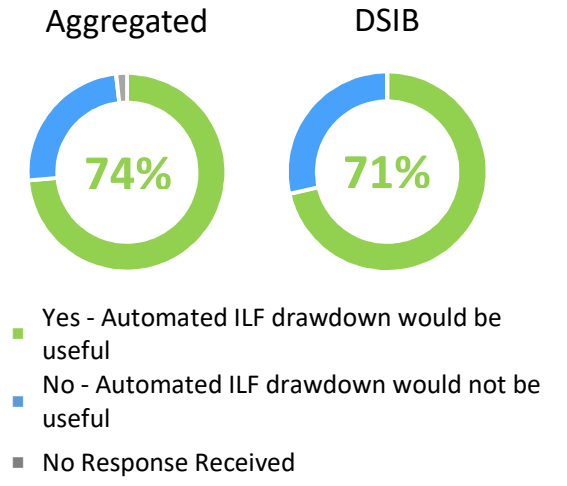
2.3.5 Automated Drawdown for Intraday Liquidity Facility

Question 5:

Would an automated drawdown functionality for Intraday Liquidity Facility (ILF) be useful to improve liquidity management for participants? If so, please also share any considerations on such an automated drawdown capability.



Key Takeaways

Participants generally supported the notion to have an automated drawdown functionality for Intraday Liquidity Facility (ILF).

Key operational items to consider as part of the detailed solutioning include requiring institutions to have a Global Master Repurchase Agreement with MAS, to have an account structure for institutions to earmark collaterals to be used for ILF purposes, have business rules and parameters to trigger the drawdown and allowing participants to directly manage the activation / de-activation of automated drawdown.

Business Considerations

As part of the automation capability, the future MEPS+ system should also consider the automation of drawdown of excess Singapore Government Securities (SGS) if the minimum cash balance is below 2 percent of the limit as at closing.

Business parameters and rules need to be defined such as the cap on the notional amount to be drawdown and the dedicated pool of collateral which can be used for Intraday Liquidity Facilities (ILF) that are not needed for any other purposes by the institution.

There is a potential issue that the ILF may be triggered when there is only a short term intraday mismatch and the automated drawdown might result in the reduction of the HQLA and intraday liquidity stress metric.

Facility to automate the automation of ILF should be SWIFT enabled to provide the institution with visibility on the intraday movements, as the current infrastructure consumes this data for funding, reporting and monitoring purposes.

Automated ILF would ease system gridlocks. Current ILF reversal time is 5.30pm. Might be prudent to have ILF reversed at clearing time, as the window between 5.30pm and final clearing number could potentially be subject to further gridlock due to payment timing.

The system should continuously perform the following throughout the settlement window:

- Determines the cash position (considering both payment and DVP transactions)
- Determines the security position
- If there is cash shortage, for each security where there is excess, activate ILF, delivering security in exchange of cash
- If there is cash surplus and security shortage, redeem ILF
- If there is surplus security in one ISIN and shortage in another ISIN, swap the security pledged as collateral for ILF
- For a proper functioning money market, MEPS participants should be allowed to be the lenders of ILF. The system should automatically assign the requests to lender with the best rate. Concerns about counterparty risk can be mitigated through novation of the transaction to CCP

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Operations Considerations

For Intraday Liquidity Facility (ILF) access, participants need to have a Global Master Repurchase Agreement in place with MAS.

Participants should have the option to directly manage the activation / deactivation of ILF.

If securities such as SGD corporate bonds are included as collateral for Intraday Liquidity Facility, there needs to be integration with Central Securities Depositories (CSDs) such as CDP to facilitate the automation process.

The current settlement model for Standing Facility (SF) drawdown is not in line with the market practice – currently an MT320 is required for MAS to release the cash to the participating banks. Settlement for Standing Facility drawdown should operate on DVP model to simplify the process given the very short window given to the banks to send in their instructions.

While the drawdown of ILF is automated, the future MEPS+ system should also consider introducing automated settlement capabilities once there are sufficient funds in place with due notification provided to participants.

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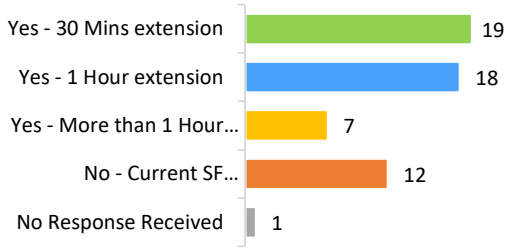
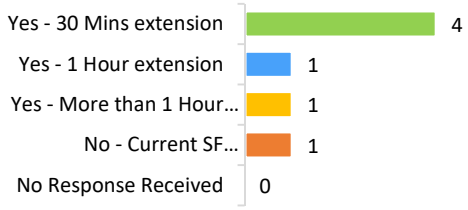
2.3.6 Standing Facility Operating Window

Question 6:
Is there a need to have a longer operating window to initiate Standing Facility (SF) drawdown e.g. 30 Mins extension?

Aggregated



DSIB



- Yes - More than 1 Hour extension
- Yes - 1 Hour extension
- Yes - 30 Mins extension
- No - Current SF operating window is sufficient
- No Response Received

Key Takeaways
Participants generally supported the notion to extend the operating window for Standing Facility drawdown where the start time for tapping on Standing Facility should commence earlier to allow banks to utilise SF funds to settle the last scheduled interbank payments at 1730hrs.

To further streamline the transition from Intraday Liquidity Facility (ILF) to Standing Facility (SF), automating the rollover will be beneficial for the industry.

Business Considerations
The Standing Facility window should start earlier, and the window should be extended as well. This will enable the funds to be settled earlier in case of a need to tap on the Standing Facility to settle transactions, since the market settles interbank payments by 5:30pm. This also allows for the transition from ILF to SF, instead of having a time gap between the facilities.

Outstanding loans for Intraday Liquidity Facility (ILF) should be automatically translated into Standing Facility and with the automatic processing, this can do away with the need for a manual operating window.

Operations Considerations
Current Standing Facility drawdown window is very short and starts only after the interbank market closes.

One-hour extension of the Standing Facility drawdown window would make it operationally more viable and hence give participant banks more confidence to tap on Standing Facility more often for liquidity / funding purpose, and hence help to reduce the systemic liquidity risk in Singapore banking system.

Process for Standing Facility drawdown should be streamlined to remove the need for faxing trade confirmations and instead rely on either email or eDoc confirmation.

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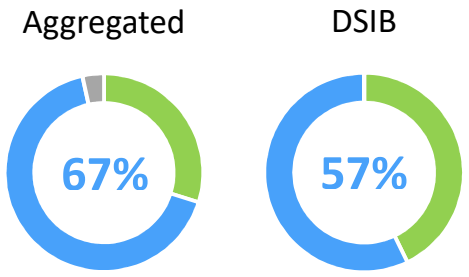
2.3.7 Asset Classes for Collateral consideration

Question 7:
What additional asset classes would your institution be interested to use as collaterals for the Standing Facility (SF)? Please also share any considerations on the usage of current collaterals and any additional collaterals that are suggested.



- Yes - Refer to Asset Classes listing below
- No - Current listing of collateral is sufficient for SF purposes
- No Response Received

Key Takeaways
Generally, participants indicated that the current list of collateral is sufficient for Standing Facility purpose.

Participants that indicated the need for a wider set of collateral cited the inclusion of SGD corporate securities, covered bonds, FCY denominated supra-nationals and other collaterals custodised by CDP.

To operationalise the extension of asset classes to be considered for collateral for Standing Facility, MAS will need to consider having standing arrangement with the various custodians on the mechanism to transfer ownership of collateral to MAS during the repo duration.

Business Considerations
Additional asset classes to be considered include:

- USD or foreign currencies issuances by highly rated institutions in Singapore
- Investment grade SGD corporate securities, other than those currently accepted under the Standing Facility
- Covered Bonds
- Foreign Currency Denominated Supra-nationals
- Agency Bonds that are AAA rated
- ASEAN Govt Bonds
- Blue chip stocks and REITS custodised by CDP
- G7 Government securities
- Cash in various currencies accepted as collateral by CCP, including USD and JPY
- US Treasuries in exchange for SGD (cross currency collateral repo)

Operations Considerations
Additional asset classes to be considered include:

- US Treasury Securities
- Japanese Government Bonds
- French Treasury Bills
- German Treasury Bills

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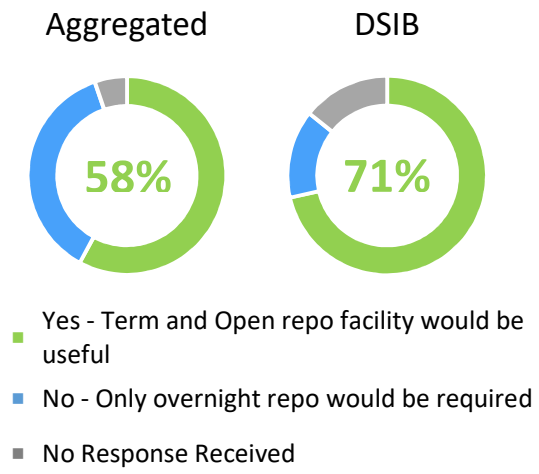
2.3.8 Term and Open Repos

Question 8:

Term and open repos allow participants to borrow funds on an extended period beyond the conventional overnight tenor. On top of the current overnight tenor for repo under the Standing Facility (SF), would the introduction of term repos and open repos be useful to your institution? If so, which tenors would be preferred and how should these be priced? Please provide explanations/rationale for each suggestion on tenors and price.



Key Takeaways

Generally, participants supported the notion of offering Term and Open repo facilities, citing the deeper and enhanced overall liquidity in Singapore banking system in the long run, helping to build up the Secured Funding curve.

Term repos would also further reduce interest rate uncertainty especially in the event of a systemic or idiosyncratic liquidity requirement expected to persist for a few days.

Based on the comments offered in the responses, Term repos should be for a duration ranging from 1 week to 6 months.

Business Considerations

The offering of Term and Open repo will help to deepen and enhance the liquidity (on a secured basis) in Singapore banking system, which will help to build a secured funding curve that global Central Banks have been promoting in recent years to help build the Secured Funding curve.

Term repos would further reduce interest rate uncertainty especially in the event of a systemic or idiosyncratic liquidity requirement expected to persist for a few days.

Suggested tenor for Term Repo should include options for 1 week, 2 weeks, 1 month, 3 months and 6 months.

Pricing for Term Repo could consider drawing reference on the following with spread

- Respective Standing Facility
- Swap Offer Rate (SOR)
- MAS bill
- MMO rates

Currently repos are limited up to a maximum of SGD50 million and it would be good if the limit can be further extended to around SGD75 million for a start. These changes will allow the business more flexibility for market making.

Term repo should be commercially transacted between market participants and MAS should be the lender of last resort. Overnight repo with MAS should be automatically rolled over based on the overall liquidity needs of the participants.

Operations Considerations

Suggested tenor for Term Repo should include options for overnight, 1 week and 2 weeks.

Pricing for Term Repo could consider drawing reference to the Swap Offer Rate (SOR) with spread OR mark-to-market MAS bill effective rate based on the latest tender.

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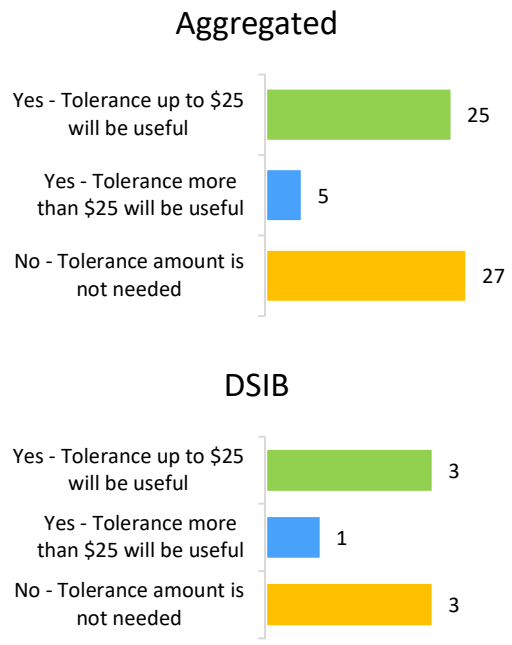
2.3.9 Tolerance Limit

Question 9:
Would the implementation of matching based on a tolerance limit be useful? If so, what is the proposed tolerance amount for consideration.



Key Takeaways
While there are benefits with establishing tolerance limits framework, participants are split on the need to implement matching tolerance with the key feedback indicating that the typical deviation is in the range of cents rather than the proposed $25 limit due to rounding error during the generation of trade instructions.

Implementation of tolerance limit matching will likely introduce reconciliation issues on the banks' internal platforms due to the differences in the booked and settled amount and this need to be factored into consideration as part of the banks' system capabilities to minimise the false-positive reconciliation breaks.

Business Considerations
Small tolerance for matching might be useful due to the rounding differences in settlement proceeds (in the instances where the rounding convention of some securities traded could be different e.g. "Price 3 decimals" versus "Yield 3 decimals" basis). However, if such tolerance amount is acceptable, it may have impact to the bank's operating platform and system enhancement would be required to handle the potential reconciliation issues.

Operations Considerations
Tolerance limit up to $25 is deemed to be excessive and participants would like to collectively come together to define the allowable Tolerance Limit – feedback from participant points towards typical mismatches are in cents differences due to rounding error.

Consider introducing capability to allow participants to have their discretion to determine their specific tolerance amount. For OTC transactions, the consideration in seller's instruction should prevail provided that the difference is within buyer's tolerance.

Reconciliation issues might arise due to the implementation of tolerance limit resulting in differences in the booked amount and settled amount.

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2.3.10 Other Feedback and Inputs

Question 10:

Please share if there are any other features / capabilities that your institution would like to raise for consideration for the MEPS+ NextGen[1] (SGS)? In your response, please attribute each feature/ capability to the (e.g. Future Landscape/ Accessibility/ Resiliency, Reliability and Security/ Enhanced Operational Efficiency) and respective business line e.g. front office/business, settlement operations, technology, etc.

[1]"NextGen" is the term explained and used in the Industry Questionnaire and refers to the future MEPS+ system

Future Payment Landscape
Initiative should take into consideration the ongoing developments within CDP, ICSD and Future of Singapore post-trade infrastructure projects to ensure a seamless and integrated solution.

There should be an alignment of the domestic Securities Depositories settlement systems (CDP) and the International Securities Depositories settlement systems to facilitate cross border settlements and improve operational efficiency.

Enhance Operational Efficiency
Notifications: Participants should receive advance notification of Corporate Actions at least one week before payment date. Participants would like to receive Corporate action notification (MT564) and Corporate Action Confirmation (MT566) for the coupon / redemption event – this enables participants to reconcile the expected cash amount with their internal system.

Notifications: Receive Settlement Allegement (MT578) for any alleged trades facing participants.

Cut-off time: Extend MLA cut off time from current 10:30AM to 12:00PM.

Cut-off time: Having a standard cut off time with international market will help to reduce failed trades with foreign counterparties in different time zones.

Capabilities: Allow participants to transfer SGS from trade account to reserve account via Bank Browse instead of SWIFT instructions.

Capabilities: Allow amendment / cancellation to Standing Facility (SF) trades that have settled. Currently the new SF process only accepts swift type with NEWT and rejects swifts sent for amendment and cancellations.

As a result, banks are not able to make any changes to the booked SF trades should the need arise even though MEPS+ has not closed for the day.

Process Flow: New Auction for SGS bonds / MAS bills / T-bills to be available in MEPS+ once auction result is out to prevent bank from having swift messages rejected in MEPS+ due to ISIN not available.

Audit Logs: DB and Audit archive logs to be kept for 14 days or more.

User Access Matrix: Allow one user ID to access multiple member codes – this will be relevant to banks having multiple entities.

Communication: Availability of secured chatroom where members can send messages to each other to eliminate pre-matching or chasers via phone.

User Interface Design
Dashboard to display outstanding transactions with all different status, such as unmatched, insufficient securities for settlement.

Dashboard should also be customised for TRD and CUS and should not be co-mingled to ease the presentation of data.

Settlement Handling Capabilities
Settlement between MEPS+ and non-MEPS+ participants should be either Receive vs Payment (RVP) or Delivery vs Payment (DVP). Currently FOPs are transferred to the counterparty without the requirement for matching of instructions and this increases settlement risk and turnaround time.

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Cater for settlement of security denominated in major foreign currencies such as USD and EUR.

Consider the inclusion of settlement of SGD corporate securities as CDP can only support Free of Payment (FoP) as it does not handle the fund flow.

Accept cash and securities instructions from Financial Market Infrastructure without the need for matching, as the transactions are already pre-matched in the FMI.

In batch settlement, a set of priority rules should be applied in optimising settlement, including age and size. Priority should also be given to settle instructions from FMI, e.g., CDP, to better protect the FMI.

Allow participants to link settlement instructions and indicate the dependency (e.g. before, after, with).

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3 Annex

3.1 Glossary

Acronym / Term	Description
API	Application Programming Interface – Communication protocols which enables communications between components in a system, and between systems in an eco-system.
Auto Drawdown	The automated triggering of a collateralized liquidity facility to increase the cash available to a financial institution.
CDP	The Central Depository (Pte) Limited, a subsidiary of The Singapore Stock Exchange – CDP is the securities depository in Singapore, and stores securities on behalf of its customers.
Cross Border	Transactions or arrangements between Singapore and a different country and/or jurisdiction.
Clearing	The process of updating the accounting books of parties involved in a transaction.
CLS	Continuous Linked Settlement is a method in which foreign exchange transactions are settled on a Payment vs Payment basis.
CxO	A Q&A forum with the C-suite of Domestic Systematically Important Banks. The representatives include the Chief Operating Officer, Chief Information Officer, Group head of Technology, Group head of Operations, Group Enterprise Architect, Head of Cash & Liquidity Management, Head of Payments.
DLT	Distributed Ledger Technology is where a ledger is consensus of replicated, shared and synchronised digital data that may be spread across multiple geographical locations (or jurisdictions).
DSIB	Domestic Systemically Important Banks (D-SIBs) are banks that are assessed to have a significant impact on the stability of the financial system and proper functioning of the broader economy. All banks in Singapore will be assessed for their systemic importance annually based on their size, interconnectedness, substitutability and complexity.
DvP Models	Delivery versus Payment Models refer to the three models set out by BIS, published in 1992 by a study group. These are models for the settlement of security trade transactions against money.
FAST	FAST (Fast And Secure Transfers) is a new electronic funds transfer service that allows a secure and almost immediate transfer of Singapore Dollar (SGD) funds between accounts held in the 20 participating banks in Singapore.
Focus Group	A series of Design thinking workshops held in August and September 2018, with representatives from selected participating banks to shape, ideate and co-create key functionalities for the future MEPS+ system.
FOP	Free of payment (FOP) is a delivery of securities which is not linked to a corresponding transfer of funds.
GIRO	General Interbank Recurring Order (GIRO) is an automated electronic payment service which allows you to make monthly payment to the billing organisation (BO) from your bank account directly.
HQLA	High Quality Liquid Assets means any asset which satisfies the requirements set out by MAS to be included as high-quality liquid assets for the purposes of computing the

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Acronym / Term	Description
	LCR and is available on the bank's balance sheet as at the end of the day immediately preceding the 30-day LCR horizon.
IBG	IBG is a paperless system that allows a customer of a participating bank to transfer funds, through direct debits and credits, to the accounts of customers of any participating bank.
ICSD	A central securities depository (CSD) is a specialist financial organization holding securities such as shares either in certificated or uncertificated (dematerialized) form so that ownership can be easily transferred through a book entry rather than the transfer of physical certificates.
ILF	Intraday Liquidity Facility allows eligible counterparties to obtain Singapore dollars ("SGD") on an intraday and collateralised basis, to cater to situations where there are unusually large payments or large receipts within the same day. It facilitates the settlement of payments and helps to prevent system gridlocks owing to timing mismatch.
ISO20022/MX Messaging format	The new messaging format which allows for a larger amount of data to be transferred between parties.
Matching Tolerance	The variance dollar amount required between a sending instruction and a corresponding receiving instruction. If the matching tolerance is set at zero, the two instructions would need to match exactly before it is processed further.
MASNET	MASNET is the communication network set up to provide efficient and secured communication and data exchange services between MAS and the financial institutions.
MEPS+	MAS Electronic Payments System, the current system which consists of SGS, RTGS and CAS.
MEPS+ NextGen	The future MAS Electronic Payments System which will be introduced; which is being studied in this phase.
Net Debit Cap	The maximum amount of settlement allowed for FAST transactions clearing by a Financial Institute. This amount may be raised or lowered based on the amount collateralized by a bank.
One-Stop Portal	A channel in which users can access information and services offered by MAS.
Operating hours	The business hours when a transaction can be settled.
PKI	A system that manages encryption keys and identity information for the human and mechanical components of a network that participates in secured communications.
Repurchase Agreements (Repos)	A "Repo" transaction is one in which the seller agrees to sell a security at a certain price, with the commitment to repurchase that security from the buyer at a predetermined price at some mutually agreed future date.
RTGS	Real-time gross settlement (RTGS) system used for large-value SGD interbank fund transfers.
Settlement	The actual exchange of cash transactions, and in some cases, the exchange of cash with securities.
SF	Standing Facility is a two-sided discount window that allows eligible counterparties to borrow Singapore dollars ("SGD") on an overnight and collateralised basis, or deposit SGD on an overnight basis. It helps to reduce day-to-day SGD interest rate volatility and enhances market confidence that liquidity needs will be met in times of stress.

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Acronym / Term	Description
SGS	Singapore Government Securities (SGS) are debt instruments of the Government of Singapore. These debt instruments are backed by the full credit of the Singapore Government.
SWIFT GPI	SWIFT Global Payments Innovation (GPI) enables banks to provide end-to-end payments tracking.

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