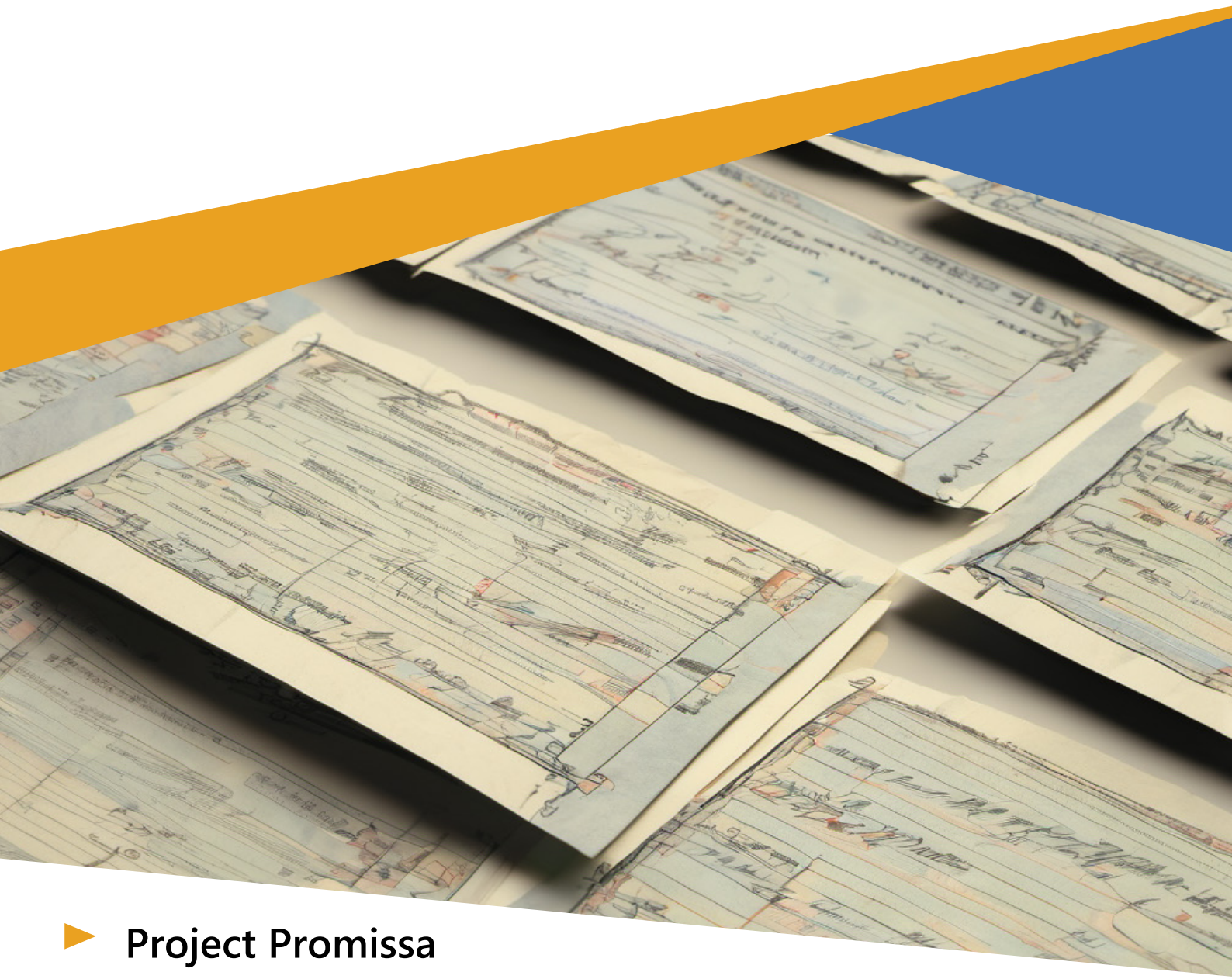

Project Promissa

Tokenisation of promissory notes

Final report

April 2025

BIS Innovation Hub
THE WORLD BANK
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Executive summary

The G20 has endorsed a roadmap towards better, bigger and more effective multilateral development banks (MDBs) (G20 (2024)). This roadmap, supported by the heads of 10 MDBs, aims to reform these institutions to address regional and global challenges more effectively (World Bank (2024a)). The roadmap, among other recommendations, provides suggestions to enhance MDBs' financing capacity.

Independently, but aligned with the roadmap goals, the BIS Innovation Hub, World Bank and Swiss National Bank are exploring how to make the funding processes of MDBs fit for the 21st century. Today, MDBs fund their activities in various ways, including through member subscriptions and contributions, which are usually paid in cash or by paper-based promissory notes. MDBs leverage these funds by issuing bonds or other financial instruments to expand their financing capacity. However, the current manual processes associated with the lifecycle events of paper-based promissory notes, such as issuance, encashment, updates and archiving, are time-consuming, cumbersome and require constant reconciliation.

Project Promissa reimagines the management of promissory notes by digitising financial commitments and putting them on a distributed ledger – a process known as tokenisation. The project built a proof of concept (PoC) platform for tokenised promissory notes, exploring several key features:

- **Single source of truth** – ensures real-time access to the true state of a promissory note (golden record)
- **Multiparty signatures** – to automate the manual handling of lifecycle events
- **Confidentiality** – ensures that records of the promissory notes are shared exclusively with the involved parties
- **Sovereignty** – preserves each party's ownership, control and decision-making authority over their promissory notes.

Project Promissa thoroughly examined technical feasibility and legal aspects in collaboration with central banks, ministries of finance and MDBs. The test results indicate that the PoC effectively addresses key pain points and provides value to all parties, pending further evaluation of the identified legal aspects.

The benefits demonstrated by the PoC have motivated project participants to consider the potential operationalisation of this solution. To this end, three areas require further work. First, the solution must meet additional requirements such as enabling individual access with appropriate controls (eg the four-eyes principle), handling unexpected situations or errors ("unhappy paths"), and offering ways to integrate with existing recordkeeping and payment systems. Second, the legal and compliance aspects of tokenising promissory notes must be further examined in each jurisdiction. Third, there needs to be a clear plan for who will run the platform, who will pay for it and how it will be managed.

Acronyms, abbreviations and definitions

ADB	Asian Development Bank
API	application programming interface
BISIH	Bank for International Settlements Innovation Hub
Daml	a smart contract language for building composable DLT applications
DLT	distributed ledger technology
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IFC	International Finance Corporation
IFI	international financial institution
IMF	International Monetary Fund
IOU	a phonetic abbreviation of the words "I owe you."
LLM	large language model
MDB	A multilateral development bank is an international financial institution chartered by two or more countries to encourage economic development in low- and middle-income economies.
MoF	ministry of finance
MVP	minimum viable product
PoC	proof of concept

1 Introduction

The G20 has endorsed a roadmap towards better, bigger and more effective multilateral development banks (MDBs) (G20 (2024)). This roadmap, supported by the heads of 10 MDBs, aims to reform these institutions to address regional and global challenges more effectively (World Bank (2024a)). The roadmap offers recommendations to enhance the financing capacity of MDBs and maximise their developmental impact.

Independently, but aligned with the roadmap goals, the BIS Innovation Hub (BISIH), the World Bank and the Swiss National Bank are, through Project Promissa, exploring how to make the funding processes of MDBs fit for the 21st century.

In the late 1960s and 1970s, financial markets adopted the immobilisation or dematerialisation of paper-based instruments (Norman (2008)).[1] This meant entrusting a central custodian with keeping the golden record in its vault or account. However, centralised recordkeeping requires that every party involved in a financial transaction receives updates via messages. Each party records these updates in separate local accounts that must be reconciled periodically—a cumbersome process that any seasoned middle or back office professional knows all too well.

Distributed ledger technology (DLT) is seen as the next major leap forward in financial markets. It eliminates the need for constant messaging and reconciliation and enables the programming and automation of many manual processes by establishing a single source of truth.

This is where Project Promissa comes in. It reimagines the management of promissory notes by digitising the notes and placing them on a distributed ledger—a process known as tokenisation.

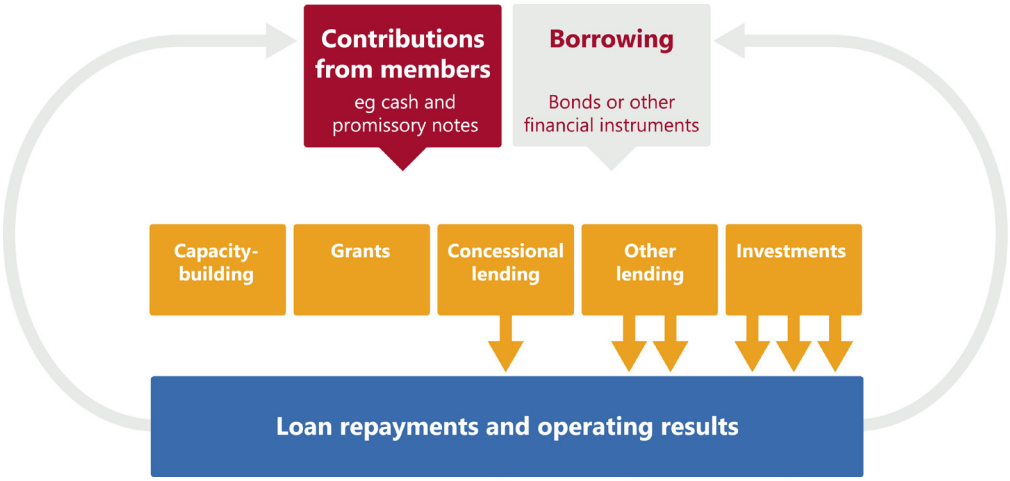
This report summarises the work carried out in Project Promissa. Sections 2 and 3 describe the funding model of MDBs and how promissory notes are used today. Section 4 discusses how tokenisation can increase the efficiency of promissory notes. Section 5 describes the proof of concept (PoC), followed by a description of its implementation and testing in Section 6. Section 7 discusses legal considerations. Section 8 presents the results, and Section 9 concludes with an outlook on potential future work.

[1] One of the reasons for these activities was the "paperwork crisis" of the New York Stock Exchange. In the mid-1960s, a sharp increase in trading at the New York Stock Exchange overwhelmed back offices, creating a backlog of unsettled trades. This led to the forced closure of trading on Wednesdays for months to help back offices catch up and enabled organised crime syndicates to loot securities amid the chaos (New York Stock Exchange (1971)).

2 Multilateral development banks

An MDB is an international financial institution (IFI) owned by multiple sovereign governments with a public policy mandate to support development, typically in low- and middle-income economies (Moody's (2020)). Most MDBs either operate in specific regions or focus on specific economic sectors. Examples of MDBs include the World Bank, the African Development Bank, the Asian Development Bank (ADB), the European Bank for Reconstruction and Development, the Inter-American Development Bank and the Islamic Development Bank.

Funding of MDBs Graph 1



Source: World Bank (2024b); authors' elaboration.

MDBs help countries achieve various development goals by providing grants, concessional loans, and other forms of lending and investment across multiple projects. Their experienced staff enable them to offer capacity-building, policy advice, technical assistance and training on a wide range of topics.

MDBs fund their activities through member subscriptions and contributions, which are usually paid in cash or by paper-based promissory notes. These contributions bolster MDBs' equity, enabling them to issue bonds or other financial instruments and expand their financing capacity. Finally, income from loan repayments and operating results are typically reused to fund ongoing operations (Graph 1).

Promissory notes play a notable role in supporting MDBs, such as the World Bank, whose principal institutions are the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA). This report helpfully explains the promissory notes process by illustrating its active use in the context of IDA, the concessional lending arm of the World Bank. IDA replenishes its resources every three years to support development initiatives in low income economies.

In the IDA20 replenishment cycle, $23.5 billion in contributions is expected from 59 member countries, which is being leveraged to generate a replenishment envelope of $93 billion (World Bank (2021)). Of the $23.5 billion in donor contributions, approximately 60% is expected to be paid by promissory notes, making them an essential instrument for ensuring the availability of resources.

3 Promissory notes

A *promissory note* is an unconditional written promise, signed by the *promisor*, to pay a specified sum of money to the *promisee* upon demand or at a fixed or determinable future time (League of Nations (1930)).

Promissory notes have a long history and their origin is a subject of debate (Rabinowitz (1956)). Over time, the instrument has undergone considerable changes and evolution in form and function. As a *credit instrument*, promissory notes facilitate borrowing by allowing the issuer to obtain funds while agreeing to repay the creditor. The unconditional promise to pay gives the creditor a high degree of legal enforceability in the event of a dispute (Court of Justice of the European Union (2018)). Promissory notes can also be used to settle debts directly as a substitute for cash, serving as a *payment instrument*. For example, the Bank of England (1969) argued that promissory notes were the forerunners of banknotes, which still contain traces of them.[2]

Today, MDBs, such as the World Bank, use promissory notes as a payment instrument to settle contributions from their member countries. They are typically non-negotiable, non-interest-bearing and payable on demand according to a predefined schedule. In this pure form, they are also just referred to as notes (International Bank for Reconstruction and Development (1944); International Development Association (1960)) or as IOUs.[3]

In the case of the World Bank, a promissory note typically requires a custodian in addition to the promisor (the member country's government) and the promisee (the World Bank). This custodian is often the member country's central bank or, in some exceptional cases, a designated financial institution, such as a commercial bank. The custodian's role is to safekeep the physical promissory note. It typically also acts as a *payment agent* to settle payments as they come due.[4]

[2] The banknote of the Bank of England bears almost the same wording as that which appeared hundreds of years ago on a promissory note: "I promise to pay the bearer on demand the sum of ten pounds. London, for the Governor and Company of the Bank of England." Signed by the Chief Cashier.

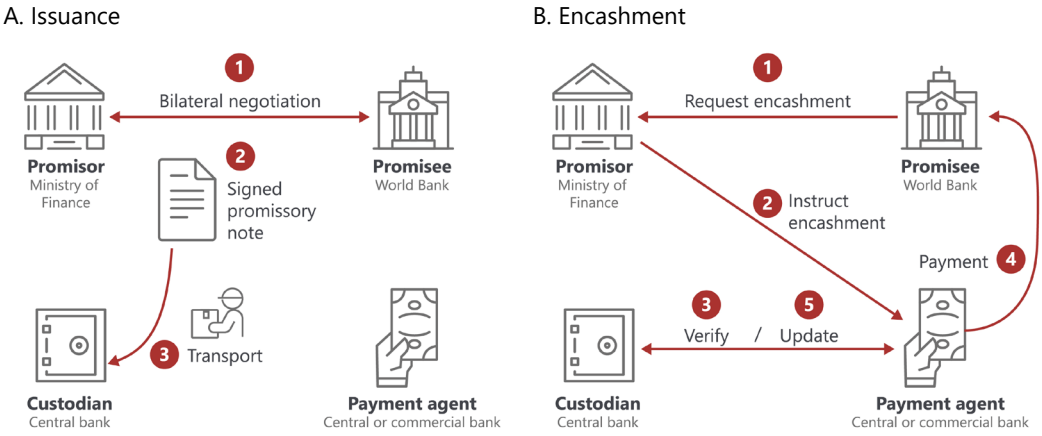
[3] In principle, an IOU only acknowledges that a debt exists, whereas a promissory note also specifies the timing of repayment and consequences if repayment fails.

[4] The process outlined here primarily applies to World Bank entities; however, other MDBs may use different methods and procedures.

Issuance and encashment are two of the most significant events in the lifecycle of a promissory note (Graph 2). Once the member country has made a financial commitment and negotiated and agreed upon a payment schedule with the World Bank (1), the Ministry of Finance (MoF) or responsible ministry[5] issues and signs a paper-based promissory note (2) and delivers it to the custodian (3). A copy of the promissory note and a copy of the custodian's deposit confirmation are also submitted to the World Bank (Graph 2.A).

The encashment process begins with an encashment request from the World Bank to the member country's MoF (1). After verification, the MoF instructs the payment agent, typically the country's central bank or a designated financial institution, to pay the encashed amount to the World Bank. Upon verification by the custodian (3), the payment agent initiates the payment to the World Bank (4) and the custodian[6] updates the promissory note balance (5) by manually endorsing it (Graph 2.B).

Promissory notes: issuance and encashment — Graph 2

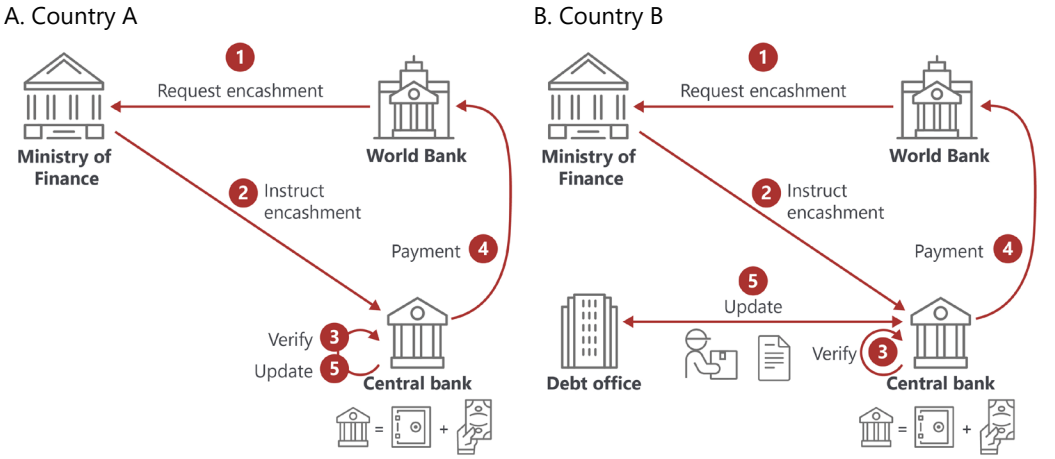


While the overall process is broadly similar across countries, there are nuances in how promissory notes are handled (Graph 3). For example, in many countries, the central bank performs both the custodian and payment agent functions (Graph 3.A). Still, different departments are involved within the central bank, so verifying and updating the promissory note are internal processes.

[5] In most countries, the ministry of finance (MoF) serves as the promisor. However, in some cases, another ministry within the government may take on this role. Throughout the report, we will use "MoF" to refer to the promisor, with the understanding that this role may be fulfilled by another responsible ministry.

[6] In some cases where an encashment schedule is not included or agreed upon, such as for capital subscription payments, updates would be handled by the MoF either issuing a new paper promissory note in exchange or requiring a manual endorsement of the promissory note.

Promissory notes: encashment across two countries Graph 3



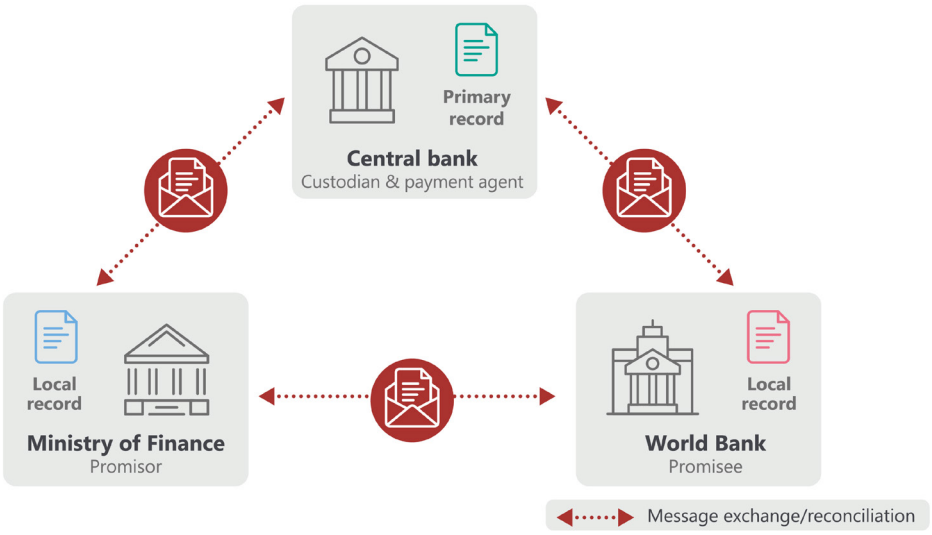
A member country could also have its central bank serve as both custodian and payment agent, but it would not be authorised to update the promissory note (Graph 3.B). Thus, the promissory note is transported between the central bank and the debt office of the MoF, located in different cities, after each encashment. The debt office updates the note and returns it to the central bank.

4 The case for tokenisation

While the current arrangement provides operational control for individual sovereign nations to make subscription and contribution payments to the World Bank, the reliance on a paper-based instrument makes the process time-consuming and cumbersome, and requires constant reconciliation.

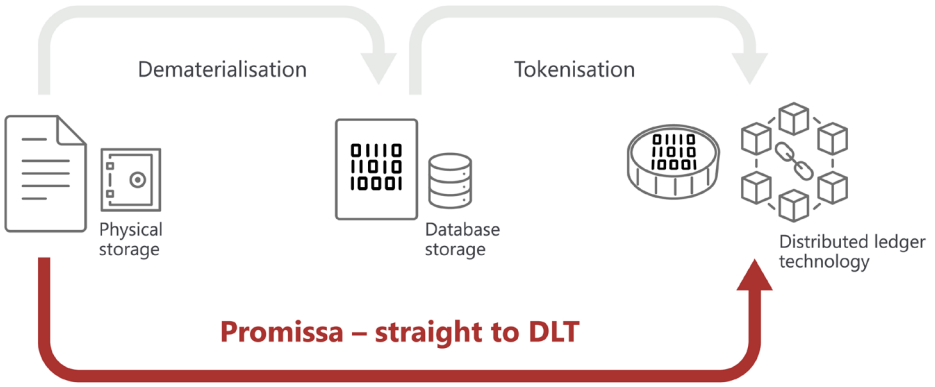
The primary driver of these pain points is that each party maintains a separate record of the promissory note's status, requiring constant message exchanges at every stage of the lifecycle and frequent, time-consuming reconciliation across all parties (Graph 4). This issue is further exacerbated by the fact that the primary record primarily exists on paper, stored in a vault. It necessitates manual handling of lifecycle events such as exchanging wet signatures, physically transporting documents and endorsing the promissory note upon encashment. This increases the risk of errors due to manual handling and makes the record vulnerable to physical damage or loss.

Pain point: reconciliation and messaging Graph 4



Project Promissa transforms promissory notes through tokenisation and DLT. Tokenisation is defined as the "process of generating and recording a digital representation of traditional assets on a programmable platform" (BIS and CPMI (2024)). Moving directly from paper-based promissory notes skips the intermediate step of first converting them into digital (but non-tokenised) formats – a process known as dematerialisation (Graph 5).

Implemented solution Graph 5



Distributed ledger technology (DLT) naturally addresses the pain points associated with traditional promissory notes through its core features: a shared single source of truth, multiparty signature consensus updates and data immutability. The shared or single source of truth ensures that all parties involved in the lifecycle of a promissory note have access to a single, accurate and up-to-date version of the data. This eliminates the need for time-consuming reconciliations, enhancing both efficiency and transparency.

The consensus mechanism, which facilitates multiparty signatures, enables transparent and rapid management of lifecycle events. It ensures that all stakeholders agree on the secure and efficient execution of key actions, such as payments or updates to the promissory notes.

Finally, the immutable nature of records stored on a distributed ledger assures that once recorded, information cannot be unilaterally or inappropriately altered, providing a reliable and tamper-proof record. This also provides an audit trail that ensures trust and accountability throughout the promissory note's lifecycle.

5 The proof of concept

The project developed a proof of concept (PoC) platform for tokenised promissory notes. It examines how such a platform can support the lifecycle of promissory notes, the roles of the three relevant actors, automate manual processes, and provide a single source of truth in a distributed deployment with immutable data structures while maintaining confidentiality.

5.1 Objectives and scope

The Promissa PoC aims to enhance operational efficiency by streamlining and expediting key events in the promissory note lifecycle, including issuance, encashment, updates and archiving. The PoC seeks to provide the MoF and their custodian with operational and data *sovereignty* and *confidentiality* from non-involved parties. Additionally, the PoC aims to increase *transparency* for all parties involved by enabling them to observe all actions in real time. It provides MDBs with a comprehensive overview of all activities related to promissory notes across contributing countries while the MoF and their custodian retain full oversight and control over all promissory notes across multiple MDBs (Annex A).

Payments made as part of the encashment or any negotiations that may occur before issuing a promissory note are outside the scope of this PoC.

5.2 Use cases

The POC implements five use cases that cover the full lifecycle of a promissory note. The use cases are:

I. **Issuance:** the creation of a promissory note token to settle financial commitments made by the government.

II. **Custody:** the assignment of a promissory note token to a custodian, who may change during its lifecycle.

III. **Scheduled encashment:** the scheduled automatic triggering of encashment.

IV. **Updates:** any changes to information on the promissory note token, including modifications to the scheduled encashment, entering a new non-scheduled encashment or changes to the currency.

V. **Archiving:** the storage of fully encashed inactive promissory note tokens.

To ensure the relevance of the Promissa PoC, special consideration was made to support the integration of existing paper-based promissory notes into the platform. As such, the PoC supports both *native* and *non-native* promissory note tokens. Native promissory note tokens are the primary source of truth for issuance and recordkeeping. In contrast, non-native promissory note tokens reflect a paper-based promissory note, which remains the prevailing source of truth in the event of a discrepancy.

Non-native promissory note tokens offer limited benefits because they still rely on paper-based promissory notes and inherit many of today's pain points. Thus, they are intended as a transitional solution towards the use of native promissory note tokens, which were the primary focus of this PoC.

5.3 Roles

The Promissa platform provides functionality to support the use cases mentioned above through the roles typically assigned to three different institutions.

The MoF or responsible ministry, in its role as promisor: (1) approves issuance, encashment, updates and archiving of promissory note tokens (use cases I, III, IV and V); and (2) receives notifications and sees all information on promissory note tokens of which it is the promisor.

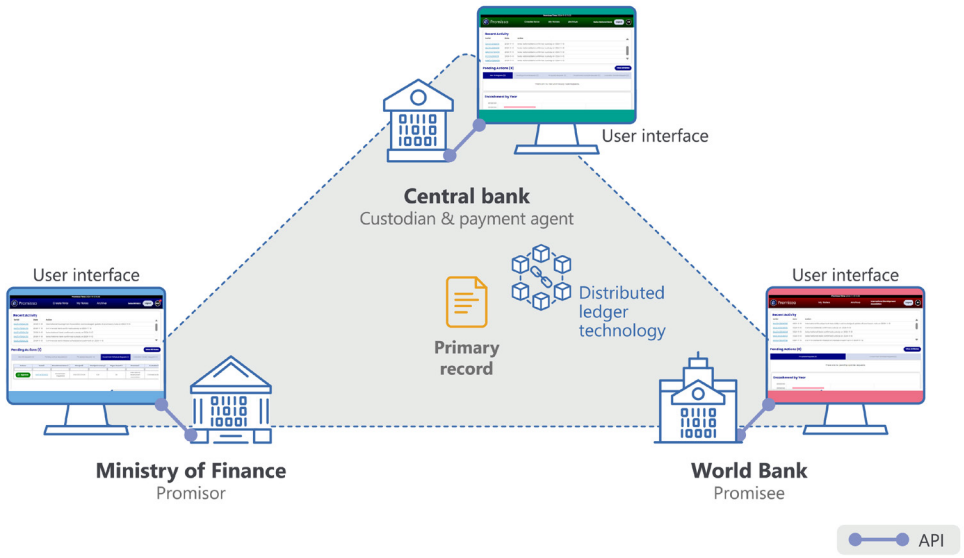
The MDB, in its role as promisee: (1) acknowledges encashment or updates of promissory note tokens (use cases III and IV); and (2) receives notifications and sees all information about promissory note tokens for which it is the promisee.

The central bank, in its role as custodian and payment agent: (1) confirms custody and encashment of the promissory note tokens (use cases II and III); and (2) receives notifications and can access all information on promissory note tokens of which it is the custodian.

5.4 Solution design

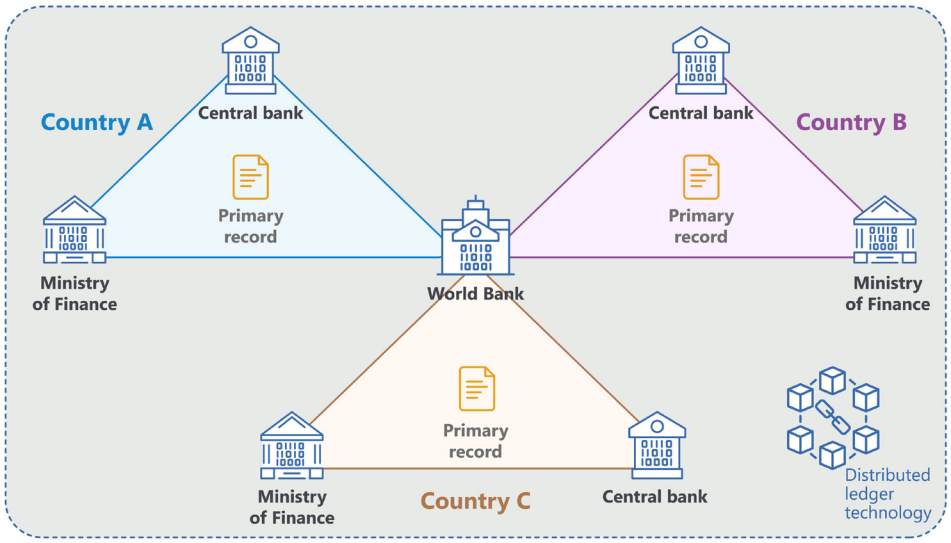
The platform consists of independently deployable nodes for each participant running shared smart contracts with multiparty signatures for validation. This creates the base of the shared distributed ledger technology. Additionally, an API connects a front-end interface to the node to view and trigger actions on the platform (Graph 6). Lastly, all elements are containerised and deployable via cloud-based environments.

Promissa: high-level architecture Graph 6



The implemented solution ensures confidentiality through data distribution management. Allowing each participant to access only the data relevant to them while restricting access to unrelated data. For example, the World Bank can view all outstanding promissory notes issued to it by various promisors but cannot access those issued to other MDBs, such as the ADB. Similarly, the MoF or central bank can view all promissory notes issued by their country to multiple MDBs but cannot view those issued by other promisors (Graph 7).

Promissa: high-level architecture Graph 7



Box A: Canton protocol

The Canton protocol is the distributed ledger technology (DLT) underlying Project Promissa. It comprises participant nodes, Daml smart contract language, and synchroniser nodes.

Participant nodes contain a ledger that stores the state of specific promissory notes. These nodes run Daml smart contracts that define business workflows, ensuring that promissory notes are updated in accordance with use case-specific rules defined for each. These rules specify who can issue, provide custody services, encash, update and archive promissory notes, as well as who must approve, confirm or acknowledge actions in various workflows. This is implemented using **multiparty signatures**, a process that involves multiple parties collaborating to create a single, unified digital signature for a transaction. Additionally, Daml smart contracts define data-sharing rules that provide granular control over confidentiality.

The Canton protocol ensures a **single source of truth** by maintaining a unified data set that is synchronised across all parties involved in the promissory note. As a result, each participant accesses the same, up-to-date data, eliminating discrepancies caused by fragmented or inconsistent records. Canton guarantees **immutability** by recording transactions in a tamper-proof manner. Once a transaction is validated and added to the ledger, any changes to the shared state require the consensus of all parties involved in the transaction that produced it, preserving the reliability and accuracy of historical data.

Synchroniser nodes sequence and timestamp messages, distributing them on a need-to-know basis to ensure confidentiality. It shares specific promissory note data only with the relevant counterparty nodes: the promisor, the promisee and the custodian. The data and updates regarding a promissory note are invisible to uninvolved platform participants. Additionally, because the participant is running their own node, they maintain ownership, control and decision-making power over their operations and data – a principle referred to as **operational and data sovereignty**. Synchroniser nodes can be dynamically chosen at a transaction level and can be run by a single operator or in a decentralised manner.

6 Implementation and testing

Project Promissa brought together participants from seven countries to test the platform.[7] Each country participated through its central bank and, in some cases, its MoF. Finally, the MDBs were represented by ADB and three institutions from the World Bank Group: IBRD, IDA and International Finance Corporation (IFC).

The solution reflected this participant structure by running 19 nodes. Each participating country controlled two separate nodes— – one by the MoF and the other by the central bank – resulting in 14 nodes for the seven countries. Additionally, MDBs managed four nodes, with one node controlled by a fictional commercial bank that acted as a custodian for various use cases.

All five use cases described in Section 5.2 were tested by simulating 90 days of activity over the course of 90-minute sessions, accelerating the clock to 1,440 times the normal speed. During each testing session, the MoF and the central bank of a country, along with an MDB, actively participated and performed their roles as described in Section 5.3 in respect of the life cycles of two types of promissory notes (Graph 8 and Graph 9).[8] Seven test sessions were conducted and feedback was collected to enhance the PoC.

6.1 Promissory note with scheduled encashment

The process begins with the central bank acting as custodian, creating a promissory note with an encashment schedule (1) (Graph 8). Once the MoF approves the creation of the promissory note, the issuance and custody use cases are concluded (2).[9]

The MoF receives a notification when a payment is due according to the encashment schedule. Upon MoF validation (3), the central bank is notified of the payment due. After processing the payment, the central bank confirms the encashment (4). Finally, the MDB acknowledges the receipt of payment, concluding the "scheduled encashment" use case (5).

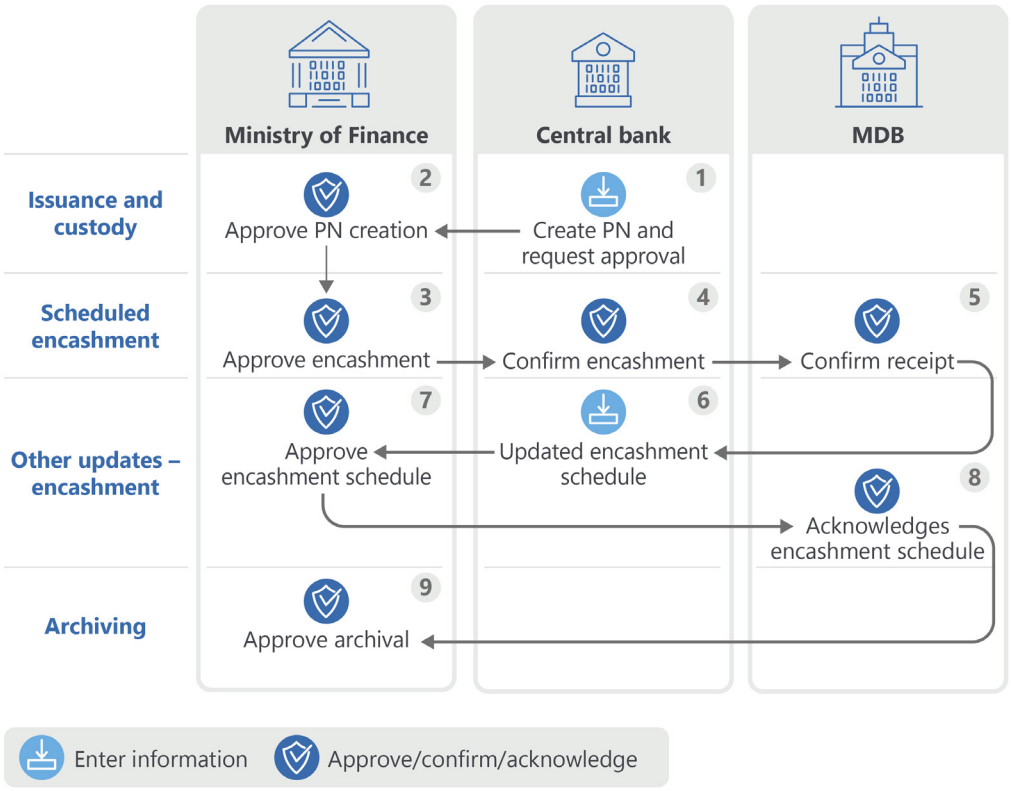
In certain situations, the parties may wish to modify the scheduled payments based on negotiations conducted outside the platform. Once agreed upon, the central bank updates the encashment schedule (6). For this update to be valid, the new encashment schedule must be approved by the MoF (7) and acknowledged by the MDB (8), which concludes the "updates" use case.

[7] The countries involved were Austria, Georgia, Germany, India, Saudi Arabia, South Africa and Switzerland.

[8] In some cases, the country was represented by the central bank only. In such cases, the BISIH took on the role of the MoF.

[9] Note that the platform allows the central bank or the MoF to create the promissory note to reflect the different divisions of labour between central bank and MoF across countries. However, it is always the MoF that finally needs to approve the issuance and the central bank that needs to accept custody.

Use cases of promissory notes with scheduled encashment Graph 8



Finally, once all payments have been made and the promissory note is fully encashed, the MoF receives a notification to approve archiving the promissory notes (9). Once this is done, the central bank is no longer a custodian, concluding the "archiving" use case.

6.2 Promissory note with non-scheduled encashment and reassignment of custodian

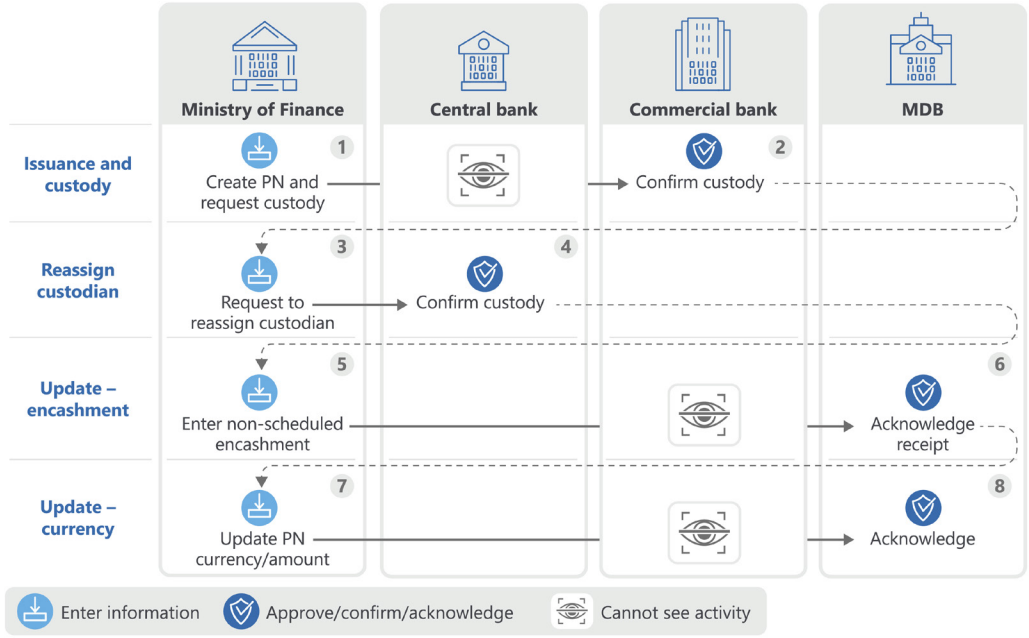
The process begins with the MoF issuing a promissory note and selecting a commercial bank as the custodian (1) (Graph 9).[10] Once the commercial bank confirms custody, the use cases for the promissory note's "issuance" and "custody" are concluded (2).

[10] Selecting a commercial bank as a custodian is not linked to any specific type of promissory note. This case was chosen specifically to test the "reassigning a custodian" use case. The involvement of commercial banks as custodians for the World Bank is exceptional. In the World Bank's case, additional rules apply in respect of the eligibility and selection of promissory note custodians which are not central banks. This selection process is completed outside the Promissa platform. Accordingly, the MoF's designation of a commercial bank as a custodian in this case is solely an operational step on the Promissa platform, undertaken only after all necessary authorisations regarding the custodian's acceptability have been obtained and agreed upon by the relevant parties.

After some time, the MoF reassigns the promissory note's custody by sending a request to a central bank (3). The central bank then confirms custody (4), completing the reassignment of the "custody" use case.

Subsequently, two types of updates were tested. First, the MoF can propose a non-scheduled encashment (5), effective only after the MDB acknowledges it (6). Second, the MoF can suggest changes to the currency or amount (7), which in both cases also require an acknowledgement from the MDB to take effect (8). This completes both types of "updates" use cases.

Use cases of promissory notes with non-scheduled encashment Graph 9



7 Legal considerations

The tokenisation of promissory notes raises several legal issues that must be addressed before potentially moving Promissa to production. As part of this project, legal aspects were analysed to understand the current legal framework of promissory notes across jurisdictions and identify potential challenges and opportunities throughout the lifecycle of tokenised promissory notes. The aim was to assess the degree of complexity and the likelihood and direction of possible solutions rather than to provide definitive answers.

Various legal aspects were identified and discussed through a questionnaire and a subsequent roundtable with participants from MDBs, selected central banks and MoFs. During this process, the following legal aspects emerged as requiring further clarification: the legal status of tokenised promissory notes; the rights of holders; MDB privileges and immunities; the permissibility and legality of tokenised

promissory notes for participants; central bank roles; and platform governance (Annex B).

If promissory notes are used as a means of payment *vis-à-vis MDBs*, particular circumstances apply which in turn affect the legal assessment. These include the fact that the transactions are largely based on international treaties, the issuing parties are public sector entities and the notes are non-negotiable. Against this background, the results from the jurisdictions examined suggest that the legal challenges associated with tokenisation tend to be less significant or more solvable than those posed by the tokenisation of financial instruments issued by private sector entities and circulating in the free market. However, the above-listed legal aspects must be examined and resolved prior to moving to the production phase.

Accordingly, the key legal issues identified during this preliminary review appear to be manageable.

8 Results

Project Promissa thoroughly examined the desirability, technical feasibility and legal aspects of tokenising promissory notes in the context of MDBs. The PoC demonstrates that tokenising promissory notes is desirable, as it effectively addresses key pain points and provides added value for all parties involved. Additionally, the tokenisation of promissory notes is technically feasible, with no major issues identified during the testing of the platform.

8.1 Does Promissa address the pain points?

As described in Section 6, the tests show that the Promissa platform meets the minimum requirements: it supports all relevant lifecycle events of promissory notes, accommodates the roles of the three key actors and ensures confidentiality.

However, to be desirable, the platform must also address the pain points of the current process – the management of paper-based promissory notes is time-consuming, cumbersome and requires constant reconciliation – as described in Section 4. The testing showed that the platform enables the management of tokenised promissory notes in a significantly more efficient, faster and simpler way than the existing paper-based system. The following four features contribute to this improvement.

First, one of DLT's most important features is that it ensures that users have access to a **single source of truth**. This provides participants with instant access to a consistent and reliable data set, eliminating the need for resource-intensive and time-consuming messaging and reconciliation – thereby enhancing the overall efficiency and speed of individual actions.

Second, **multiparty signatures** enable the necessary governance arrangement between MoF, central bank and MDB, as changes to a promissory note will only be valid when all relevant parties have approved them. Combined with the single source of truth feature, this enables the transparent, fast and simple management of lifecycle events across multiple parties.

Third, as DLTs provide an **immutable record** of current and past changes, the platform simplifies the verification and auditing processes, fostering trust and reliability among parties.

Finally, the front end provides MDBs, central banks and MoFs with a **comprehensive overview of all activities** related to promissory notes across all contributing countries and MDBs, respectively. The testing participants highly valued such a quick and up-to-date view of recent activities, pending actions and forecast statistics (Annex A).

8.2 Is it technically feasible?

Project Promissa demonstrated the technical feasibility of tokenising promissory notes on a DLT that supports their full lifecycle, preserves confidentiality and accommodates the roles of MoFs, central banks and MDBs.

Importantly, the project demonstrated that smart contracts are flexible enough to replicate various workflows, meeting country- and MDB-specific requirements.

8.3 What are the legal challenges?

The tokenisation of promissory notes raises legal issues that need to be addressed before moving to a production environment. The initial analysis focused on understanding the current legal framework and identifying potential challenges and opportunities in the lifecycle of tokenised notes, aiming to gauge complexity and possible solutions (Annex B).

Specific circumstances, including reliance on international treaties, issuance by public sector entities and the non-negotiability of the notes, influence the use of promissory notes instead of cash payments to MDBs. In this context, legal challenges to tokenised notes are less severe than for traditional financial instruments issued by private sector entities and circulating in free trade.

Nonetheless, through preliminary discussions with participants from MDBs, selected central banks and MoFs, the following legal aspects emerged as requiring further clarification: the legal status of tokenised promissory notes; the rights of holders; MDB privileges and immunities; the permissibility and legality of tokenised promissory notes for participants; central bank roles; and platform governance.

9 Conclusions and next steps

Project Promissa examines ways to enhance the recording and management of promissory notes issued by member countries to the World Bank and other MDBs. Today, these promissory notes are recorded on paper and held in custody by the central bank. The management of these promissory notes is time-consuming, cumbersome and requires constant reconciliation.

Project Promissa built a PoC platform for tokenised promissory notes on distributed ledger technology and tested the following key features with several central banks, ministries of finance and MDBs:

- **Single source of truth** – ensures real-time availability of the true state of promissory notes (golden record), eliminating the need for messages and reconciliation between involved parties.

- **Multiparty signatures** – automates manual approval processes and speeds up the handling of lifecycle events from weeks to seconds, including the issuance, encashment and archiving of promissory notes.

- **Confidentiality** – ensures that records of the promissory notes are shared exclusively with the involved parties.

- **Sovereignty** – preserves each party's ownership, control and decision-making authority over its promissory notes.

9.1 Next steps

The results demonstrate that the PoC is desirable, as it effectively addresses key pain points and delivers value to all parties involved. Further, the PoC is technically feasible, with no major issues identified in the tokenisation of promissory notes, subject to further study of the legal aspects identified in the preliminary review.

Project Promissa is the first step in exploring the tokenisation of promissory notes. It successfully demonstrates the desirability and feasibility of tokenisation and has made progress in researching the legal viability. This has motivated project participants to consider the potential operationalisation of this solution. To this end, three areas in which further work is needed are highlighted.

First, Project Promissa is a PoC. Additional functional and non-functional requirements must be met to make it operational. Functional requirements would include individual access with appropriate controls (eg the four-eyes principle), handling unexpected situations or errors ("unhappy paths"), and offering ways to integrate with existing recordkeeping and payment systems (Annex C). Non-functional requirements include information security and availability.

Second, the legal and compliance aspects of tokenising promissory notes need to be further explored in each jurisdiction.

Third, a different governance and operating model would need to be chosen, answering the questions of who will run the platform, who will pay for it and how it will be managed.

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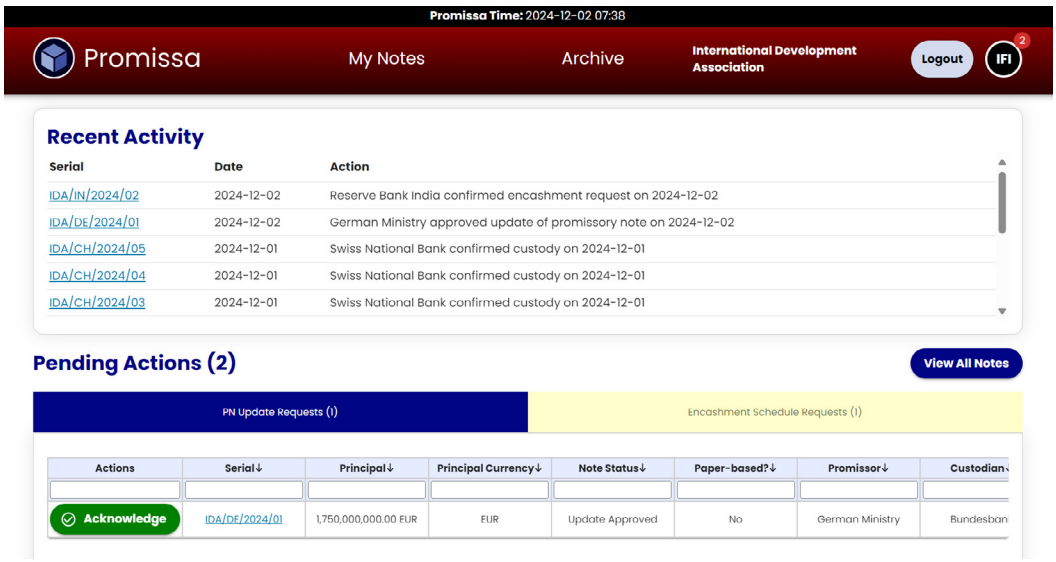
Annex A: Front-end screenshots

The Promissa platform landing page provides the World Bank's International Development Association (IDA) with a centralised and streamlined view of all promissory note activities across participating countries (Graph A.1):

- **Recent activity:** IDA can monitor real-time updates on all promissory note activities globally, ensuring complete visibility across member countries.
- **Pending actions:** a dedicated section highlights tasks requiring the World Bank's attention for timely action and acknowledgement:
    - **Promissory note update requests:** the German MoF proposes adjusting the encashment schedule. The update will take effect only after the World Bank acknowledges it.

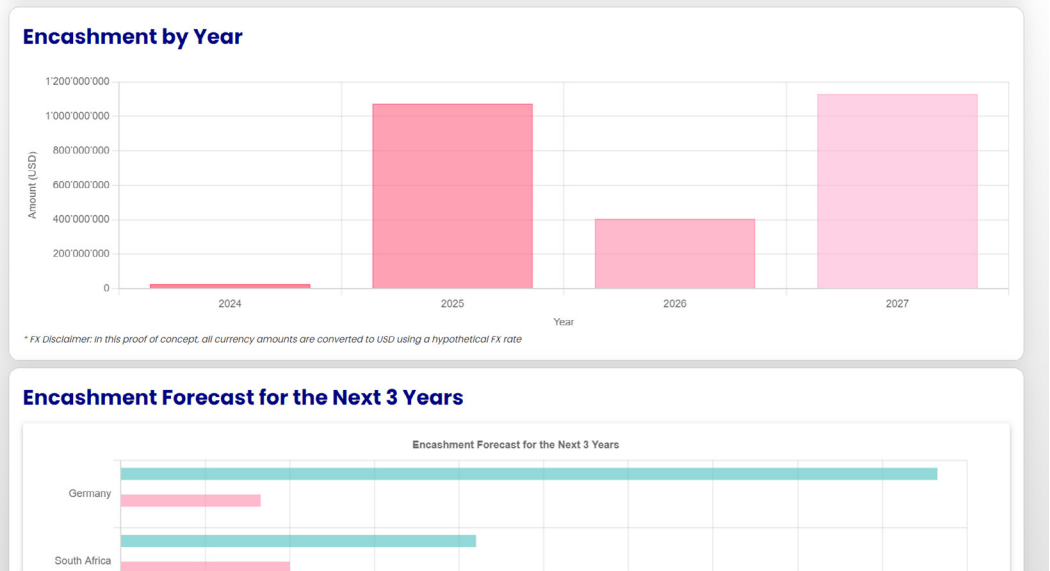
This centralised functionality enhances operational efficiency, ensures transparency and facilitates prompt collaboration between IDA and member countries.

Landing page for IDA (I) Graph A.1



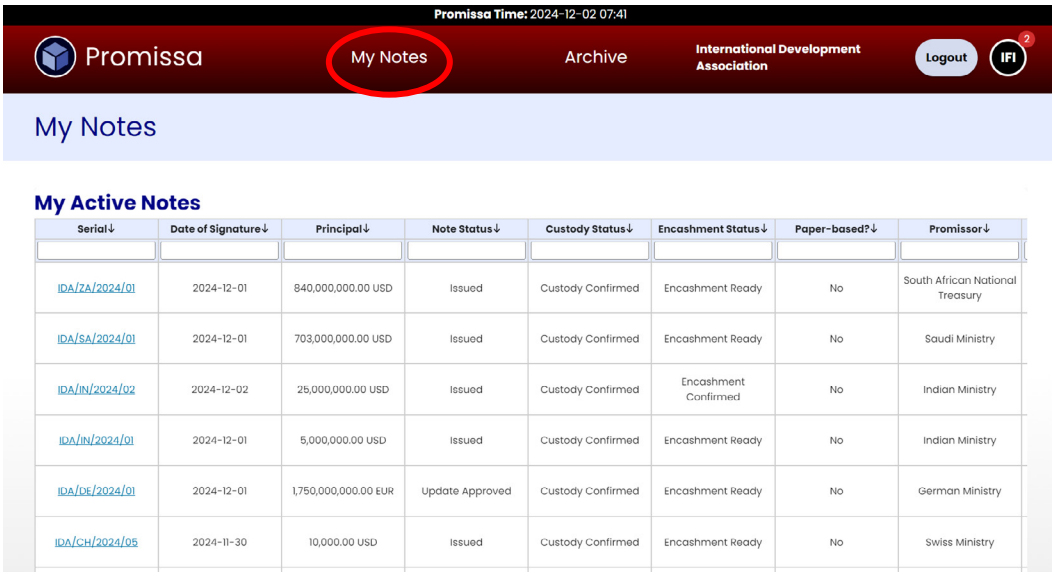
Encashment by year gives an overview of payments combined for all countries, including forecasts. Further down, IDA can see the encashment forecast for each country (Graph A.2).

Landing page for IDA (II) Graph A.2



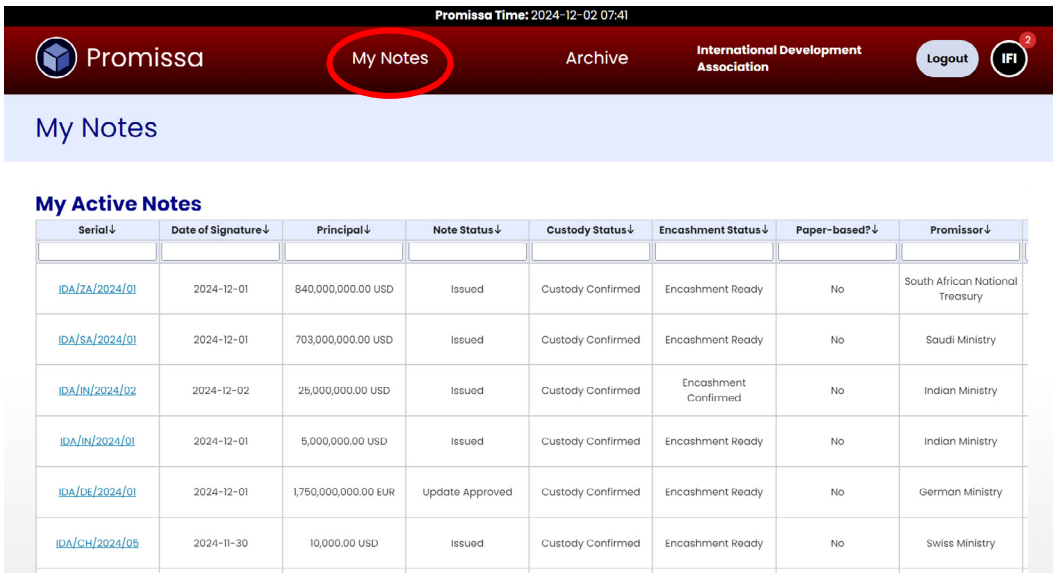
The Promissa platform enables users to explore detailed information as needed. Under "my notes" (red oval in Graph A.3), users can view a comprehensive list of all current promissory notes issued to the IDA (Graph A.4). A search bar and ordering feature enable quick navigation through the list.

"My notes" view (I) Graph A.3



Serial	Date of Signature	Principal	Note Status	Custody Status	Encashment Status	Paper-based?	Promissor
IDA/ZA/2024/01	2024-12-01	840,000,000.00 USD	Issued	Custody Confirmed	Encashment Ready	No	South African National Treasury
IDA/SA/2024/01	2024-12-01	703,000,000.00 USD	Issued	Custody Confirmed	Encashment Ready	No	Saudi Ministry
IDA/IN/2024/02	2024-12-02	25,000,000.00 USD	Issued	Custody Confirmed	Encashment Confirmed	No	Indian Ministry
IDA/IN/2024/01	2024-12-01	5,000,000.00 USD	Issued	Custody Confirmed	Encashment Ready	No	Indian Ministry
IDA/DE/2024/01	2024-12-01	1,750,000,000.00 EUR	Update Approved	Custody Confirmed	Encashment Ready	No	German Ministry
IDA/CH/2024/05	2024-11-30	10,000.00 USD	Issued	Custody Confirmed	Encashment Ready	No	Swiss Ministry

"My notes" view (II) Graph A.4



Serial	Date of Signature	Principal	Note Status	Custody Status	Encashment Status	Paper-based?	Promissor
IDA/ZA/2024/01	2024-12-01	840,000,000.00 USD	Issued	Custody Confirmed	Encashment Ready	No	South African National Treasury
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IDA/IN/2024/02	2024-12-02	25,000,000.00 USD	Issued	Custody Confirmed	Encashment Confirmed	No	Indian Ministry
IDA/IN/2024/01	2024-12-01	5,000,000.00 USD	Issued	Custody Confirmed	Encashment Ready	No	Indian Ministry
IDA/DE/2024/01	2024-12-01	1,750,000,000.00 EUR	Update Approved	Custody Confirmed	Encashment Ready	No	German Ministry
IDA/CH/2024/05	2024-11-30	10,000.00 USD	Issued	Custody Confirmed	Encashment Ready	No	Swiss Ministry

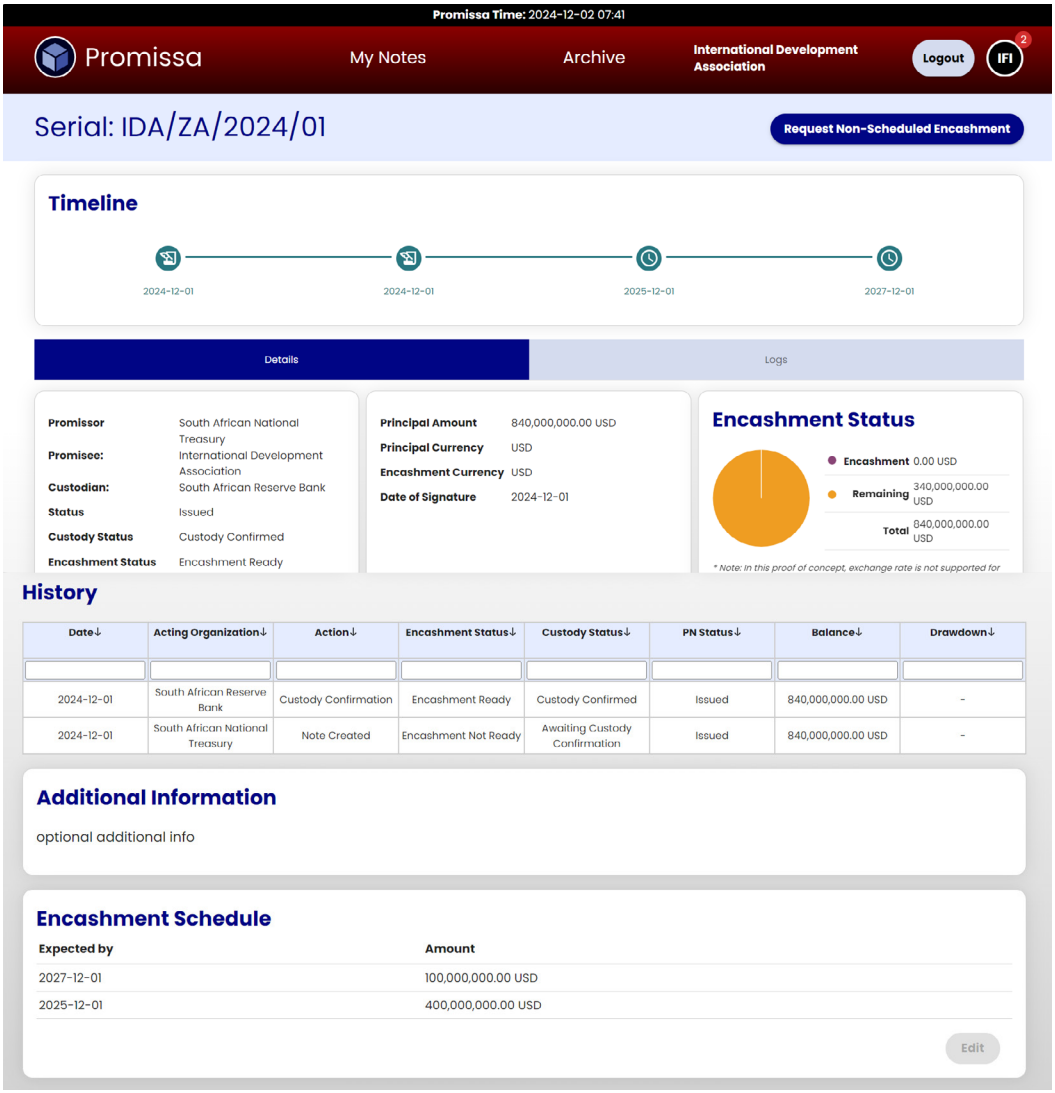
Clicking on the serial number of any promissory note provides access to detailed information offering insights into its history, status and future trajectory (Graph A.5):

- **Timeline overview:** displays key milestones chronologically, including creation, custody confirmation and other significant events.

- **Current status and future projections:** provides up-to-date information on the promissory note's current condition and highlights scheduled future encashments for proactive planning and monitoring.

These features enable users to seamlessly transition between high-level summaries and detailed insights, thereby enhancing transparency, operational efficiency and data-driven decision-making.

View details of promissory notes Graph A.5



Annex B: Relevant legal aspects

Based on a questionnaire on the use of governmental promissory notes (and other types of IOUs) and a subsequent *virtual roundtable* with central banks, ministries of finance and multilateral development banks (MDBs), the following eight key issues were identified as requiring further exploration before implementing Promissa.

The first key issue is determining the *permissible forms of IOUs*. It became apparent that the pertinent legal basis is primarily governed by public international law.[11] It was further held that for tokenised IOUs to be treated as equivalent under international law to paper-based forms, the promisor's IOUs would have to be represented in a valid, unconditional, evidentiary and enforceable manner. These results, in turn, are primarily dependent on the domestic law (both private and public) of the promisor. The recognition of tokenised promissory notes would also have a bearing on their legal treatment by the participants and this, in turn, may be dependent on the recognition of digital assets more broadly in a relevant legal system.

The second key issue is the domestic legal basis for the issuance of governmental IOUs as a contribution to an international financial institution.[12] Depending on the jurisdiction, some legal bases are quite general in terms of their responsibilities, instruments and forms, while others are very specific.

A third key issue is domestic *signature rules* and the stages at which they could be relevant (issuance, encashment and redemption). Such rules define the responsibilities and conditions (eg delegation and collective signature) and the permissible forms (eg wet ink).[13] In general, in jurisdictions that recognise a (qualified) digital signature, an entirely paperless process linked to a (non-native) tokenised note is already a legally feasible minimum viable product.

The fourth key issue concerns *rights arising from an IOU* (against the promisor) for both paper-based and tokenised IOUs. A range of possible national legal bases for such IOUs have been identified, such as financial market laws and securities laws. Some jurisdictions have provisions for electronic IOUs (intermediated forms or PDFs with qualified electronic signatures) and some have already introduced

[11] First and foremost, the statutes of the promise (the international financial institution's articles of agreement or other establishing treaty), which usually contain a specific interpretation procedure for cases of doubt, as well as subsequent specific resolutions (eg of its board of governors) with their specific conditions for a particular contribution.

[12] There exists a great deal of variation in this respect, with the basis in some jurisdictions being a general finance act and in others specific international development/contribution acts, sometimes in conjunction with international treaties. Some legal bases are permanent, while others are enacted annually.

[13] Here, too, the range is wide, with some jurisdictions not having specific provisions on electronic forms and some recognising qualified electronic signatures as equivalent to handwritten signatures (eg eID). While some signature rules can be found in specific government and administration acts or in public finance management acts, others are only geared to private law and can, at best, be applied by analogy to government IOUs.

specific provisions for tokenised IOUs,[14] with some following a model law.[15] For government-issued IOUs, it will need to be clarified, at least in civil law jurisdictions that distinguish between public and private law, whether the aforementioned legal bases are directly applicable or applied by analogy. It should be noted that, in general, the paper-based versions in use today are not classic promissory notes either.

The fifth key issue relates to *rights in an IOU*. This pertains to proprietary rights[16] (against third parties) in paper-based and tokenised IOUs. For paper-based forms, the mode of acquisition is typically achieved through endorsement and transfer of possession, with the central bank acting as the designated depository on behalf of the promisee – often in conjunction with legal title and a bona fide power of disposal. The first legal systems have already clarified the proprietary rights for native forms. In the absence of a specific provision, the entitlement arising from the token, in conjunction with the technical power of disposal, is decisive in protecting the promisee's position.

The sixth key issue relates to the *privileges and immunities of MDBs* in connection with the use of governmental IOUs in lieu of cash payments in both paper-based and tokenised forms. International financial institutions enjoy privileges and immunities. This arises from their articles of agreement (or other establishing treaty) as well as from the domestic law of the host country. Generally, the resulting inviolability extends beyond property. Rather, the privileges and immunities explicitly include "property, documents and correspondence" so that intangible forms are also covered. The uncompromising continuation of this inviolability in a tokenised environment, including vis-à-vis involved third parties such as commercial banks, system contractors and the platform owner, and even with regard to pure data flows, was identified as a key issue, if not the main one.

The *role of central banks* is the seventh key issue. Their dual role as designated depository and for encashment remains essential. However, in a distributed ledger environment, some of the functions of safekeeping and taking possession of IOUs on behalf of the promisee are likely to be implemented by technical features in the future.

Finally, questions of *ownership, operation and governance of a platform* for tokenised IOUs is the eighth key issue. Such questions were identified as warranting attention as a matter of priority. For example, responsibilities and critical functions

[14] Eg England and Wales and Northern Ireland (Property (Digital Assets etc) Bill submitted 2024, pending); Luxembourg (Blockchain I, II and III Laws with Bill IV submitted); France (PACTE Act); the United States (new Article 12 UCC, so far enacted in 25 of 50 States); and Switzerland (DLT Act 2021 amending a set of existing laws, among them Article 973d et seq in the Code of Obligations, on ledger-based securities).

[15] The UNCITRAL Model Law on Electronic Transferable Records of 2017 has been adopted in nine States (2018: Bahrain; 2021: Belize, Kiribati, Paraguay, Singapore and United Arab Emirates; 2022: Papua New Guinea; 2024: East Timor and France). The United Kingdom has domestic legislation based on the model law, namely the Electronic Trade Documents Act 2023.

[16] The terminology is in accordance with the Unidroit Principles on Digital Assets and Private Law, 4 October 2023 (www.unidroit.org/work-in-progress/digital-assets-and-private-law), relating to assets as objects of disposition and acquisition, and the assertion of interest in those assets against third parties (without addressing whether such legal title is considered property in the classical sense under domestic law).

must be agreed upon, as well as the operating and maintenance model for managing the platform, supporting tools and governance principles.

Annex C: Workshop summary on the future of Promissa

This is a summary of a workshop titled "Project Promissa – what's next?" held at the Bank for International Settlements in Basel on 18 November 2024.

Goals of the workshop

The participants worked in teams during the Promissa workshop to generate:

- **expansion ideas** by identifying new opportunities, including potential use cases and functionalities, and
- **implementation ideas** by prioritising key platform features and integration opportunities to define the next steps for successfully implementing Project Promissa.

Expansion ideas

During this first activity, each team was asked to:

I. Generate new *expansion ideas* for the current platform. Consider innovative features, improvements or use cases that could enhance its functionality.

II. Select the top three most promising or impactful ideas and set them out on *"idea napkins"*.

As a result, various teams generated more than 15 different "idea napkins" and presented them to the workshop participants. These multiple ideas can be grouped into the following four categories:

1. **Payment leg:** many users suggested that the platform could support payments related to the promissory notes, including currency conversion and faster, more effective payout tracking, by either integrating with existing systems (eg SWIFT) or providing on-chain payments.
2. **New use cases:** the platform could be extended to include other types of loan agreements for trusts or serve as an alternative platform to fund development initiatives.
3. **Reporting capabilities and data analytics:** users desire advanced on-platform analytics for insights into their promissory notes, which could include supporting current reporting duties and more flexible data analytics such as a large language model query-based interface.
4. **Supporting functionalities:** many functionalities were identified as providing value, including legal validity evaluation capabilities, secondary markets for

promissory notes, notifications, integration with existing systems and the four-eyes principle.

Implementation ideas

During this second activity, each team was asked to:[17]

I. Identify and prioritise the *key features* that should be included in a minimum viable product – the simplest platform version with essential features.

II. Brainstorm and discuss how the new platform can be *integrated* into existing processes. Identify which internal and external systems require attention to ensure seamless integration and alignment.

As a result, the following key features were suggested:

1. **User access and security:** the platform should ensure secure access through individual logins, two-factor authentication and automatic logout after a specified time. User roles are managed through a maker-checker process, observer roles and the four-eyes principle, ensuring accountability and control. Finally, the platform should be System and Organization Controls (SOC) 2 capable.[18]

2. **Workflow and process management:** the platform should support the modification and cancellation of promissory notes, as well as the handling of "unhappy paths". Features such as replenishment metadata and support for non-native promissory notes (where the paper-based promissory note remains) should be included.

3. **Data, reporting and documentation:** the platform should provide tools for reporting, data export and a consistent taxonomy. File upload/download, a document repository and promissory note templates streamline documentation and compliance.

The following systems were deemed to be important to be integrated with:

A. **Payment and transaction systems:** SWIFT, real-time gross settlement (RTGS), foreign exchange rate systems and core banking systems.

B. **Communication and notification systems:** email or any other messaging system notifications.

[17] Out of scope were non-functional requirements (such as availability and security), legal questions, compliance, governance and financial aspects of any potential future Promissa platform.

[18] SOC 2 is a framework established by the American Institute of Certified Public Accountants (AICPA) that evaluates a service organisation's controls related to security, availability, processing integrity, confidentiality and privacy (www.aicpa-cima.com).

C. **Access and role management systems.**

D. **Data and record management:** archiving system and enterprise resource planning (ERP).

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The participants represented the following institutions:

- **Asian Development Bank**
- **Austria** – Central Bank of the Republic of Austria and Federal Ministry of Finance
- **Georgia** – National Bank of Georgia
- **Germany** – Deutsche Bundesbank
- **India** – Reserve Bank of India
- **International Monetary Fund** (observer)
- **Liechtenstein** – Financial Market Authority
- **Saudi Arabia** – Saudi Central Bank
- **South Africa** – South African Reserve Bank and National Treasury
- **Switzerland** – Swiss National Bank, State Secretariat for Economic Affairs and Swiss Agency for Development and Cooperation
- **World Bank** – International Bank for Reconstruction and Development, International Development Association and International Finance Corporation[20]

[20] The contributions in this work by the staff of the World Bank do not necessarily reflect the views of the World Bank, its Board of Executive Directors or the governments they represent.

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