NEXT GEN DIGITAL CURRENCY

Presented to

MAS
Monetary Authority of Singapore

Presented by

IDS | Garranto

IDS

We are *INFORMATION DATA SYSTEMS Inc.*

Established in 1996, Head quartered in Michigan, USA.

IDS enables enterprises and governments accelerate adoption of new technologies, untangle complex issues that always emerge during digital evolution, and orchestrate ongoing innovation. IDS has delivered 5+ production grade enterprise blockchain applications in Supply chain management, Trade Finance, NFT Market place, Verification as a service, Blockchain as a service.

IDS envisions to make organizations more robust, resilient and enable them to mitigate risk by leveraging the power of Industry 4.0 technologies like AI, Blockchain, Cloud & Digital Twin.

WHO ARE WE?

Link

ONE of only 24 HCSPs in the world.

Garranto

WHO ARE WE?

We are
Garranto Pte. Ltd.

Established in 2016, Head quartered in Singapore.

Garranto is a Singapore based FinTech And HRTech organisation.

Notable Fintech achievements are conversational AI chatbot implementatioin for Standard Charted Bank, Singapore. Mobile financial services development for various financial institutions in Myanmar. Digital Transformation for HongLeong Bank in Malaysia. GRC/Data privacy consulting for Gojek, India.

A singapore Fintech Association member and onboarded on APIX platform.

CONTENTS

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Sd$ | Sungei X | sPay | sCard - The Next generation rCBDC platform

In recent years, central bank digital currency (CBDC), a new form of digitized sovereign currency, has risen to prominence and is in consideration for many central banks, ministries of finance and other institutions. rCBDC promises greater access, lower costs and better services in public interest.

Sungei X - CBDC(Sd$) platform as lifeline of digital economy

The name is inspired from Sungei river. Historically, the city of Singapore initially grew around the port as the river mouth became the centre of trade, commerce and finance. This new form of currency minted digitally by MAS can be taken as water at mouth of **digital currency river Sungei X** as lifeline of digital economy.

MAS as operator, overseer and catalyst of monetary system

The central bank digital currency is a direct claim on central bank alike cash. The structure, payment authentication, functionality, access and governance will decide the dynamics of monetary systems and market power. With Sungei X, MAS can effectively **regulate the flow** of digital currency through **programmable transaction pipelines**.

sPay | sCard

sPay is account based wallet powered by Sungei X Blockchain Network and linked to identified **resident of singapore** to enjoy privacy preserving financial services and **prosper with fountain of wealth**. sCard is physical card linked to wallet.

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Sungei X Launched The Future is Now

User Story 1 - One click Direct Benefit Transfer to residents.

10:00 AM

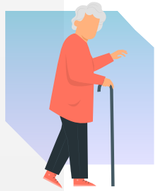
Ministry approaches **Sungei X(rCBDC Platform by MAS)** with a new scheme proposal and eligibility criteria. Scheme owner has **Sd$(rCBDC)** in their **sPay wallet**.

10:10 AM

MAS assigns a program owner to work with scheme owner to get funds in Sd$ dispersed through pre-defined **smart contract taking eligibility criteria as input**.

10:11 PM

With necessary approvals, scheme owner and program owner with **one click** digitally signs and executes smart contract on Sungei X platform.



10:30 PM

Direct benefit account(sPay wallet) of eligible beneficiaries will be credited with Singapore Digital Dollars(Sd$). Any left Sd$ after stipulated time will be auto debited to ministry's wallet.

User Story 2 - International Tourist visits Singapore

11:30 PM

International tourist lands at Singapore Changi Airport and gets immigration checks.

11:45 PM

Installs sPay wallet and gets KYC done through quick scan of passport and white card verified by immigration system.

11:50 PM

Tops up wallet using International debit/credit card, equivalent Sd$ will be credited.

11:55 PM

Books a local cab and pays Sd$ through the **Dynamic QR code** displayed by comfort cab driver and checks in Marina Bay Sands.

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Central Bank Challenges and Considerations

Central banks across the world are working on rCBDC POCs and Pilots. The intricacies of implementing CBDC are complex and the implications are wide-reaching. Here are 3 key challenges and considerations which are driving CBDC adoption as we understand.

1 Risk of currency substitution & Anonymity

The nature of money as medium of exchange of value is changing.

Cryptocurrencies and stable coins(private money) powered by Distributed Ledger Technology(DLT) may try to fragment the liquidity of monetary system and anonymity to avoid taxes | Money laundering etc.

Foreign digital currency displaces the domestic currency to the detriment of financial stability and monetary sovereignty.

2 Entrenched market power & Data concentration

Big techs entry into financial services and their direct interactions of users, creates data concentration.

Technology advances has created vicious cycle of network effect and entrenched market power.

Central banks are looking to drive technology, underlying market structure and data governance framework for public good.

3 Unbanked & Underbanked population

The anti competitive practices in payment system raised costs of financial services inspite of technological advancements,

Singapore has 2% of unbanked and apprx. 4 out of 10 singaporeans are underbanked in 2019.

Central banks wants to leverage rCBDC for greater access, availability and affordability of financial services.

Solution Approach of Sungei X

Central banks around the world are working to safeguard public trust in money and payments during this period of upheaval. To shape the payment system of the future, they are fully engaged in the development of retail and wholesale CBDCs, alongside other innovations to enhance conventional payment systems.

1 Digital currency issued by central bank

MAS can launch **Sd$(Singapore Digital dollar)** as a digital payment instrument, denominated in the national unit of account SIngapore dollar.

They can **reduce significant costs** in terms of printing, moving and managing cash flow. CBDC supports programmability for better visibility and controls.

With pluggable governance, technology stack and identity management, Sd$ can create faster low cost transactions and **counter currency substitution.**

2 Open payment system with competitive level playing field

Blockchain technology can break the data silos and put the **ownership of data in the hands of users.**

Privacy preserving and selective disclosure of transaction data with authorization of users create **competitive level playing field** for PSPs and Financial service providers.

With Sungei X, MAS can foster innovation and **counter weight the entrenchment of market power.**

E-commerce platforms like Amazon, Alibaba or anyone can choose to accept Sd$ on Sungei X for **broader adoption**.

3 Financial Inclusion

Sungei X leverages cryptographically protected secured public private key mapped to **National Identity Singpass/Corppass for KYC.**

sPay is smart phone wallet supports bidirectional **swap between fiat currency(S$) and digital currency(Sd$).**

Residents without bank account can create digital currency wallet with Singpass. sCard functionality is available for non smartphone users. They have access to **affordable financial services through SungeiX.**

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Sungei X - Features & Deliverables

Our solution is **MVP ready** and has best in class features and technical capabilities of **speed, scalability and security.** The platform has **service oriented architecture for seamless integration** with existing platforms.

Sungei X

1. **Controlled Decentralization** is our key value proposition.
2. **Role based access** controls in blend with existing organizational hierarchies and work flows.
3. **Hardware Security Module**(HSM) protected KMS(Key Management System).
4. Key value DB for **faster throughput.**
5. **Seamless integration** with Open banking networks(Core banking APIs) & Neo Banks.
6. Location based **Multi Cloud deployment** for faster execution.
7. **Dashboard** for Sd$ and Fiat Reserve management and cash flow analytics.
8. **Smart contract driven schemes** execution for Government.
9. Affordable financial services as a smart contract by Financial Service Providers(FSPs).

sPay

1. Next generation digital wallet with **Digital KYC** by Singpass/Corppass,
2. **2 Factor Authentication** secured by Blockchain.
3. **Dynamic QR** for better security.
4. **Pay with a Phone number**/NRIC/QR Code. International payments with a phone number.
5. **Quick Swap between** SGD(Fiat) and Sd$(Digital currency)
6. **Multi account support** for operating account, Direct benefit and child accounts up to 5 sub wallets.
7. **Small apps**(smart contracts) for e-promissory note, e-commerce, stocks, investments & insurance etc
8. **Can support ERC-20/BEP-20 stable coins** for holding and transactions in future as approved by regulators
9. **Freeze/Unfreeze**, Pin reset and many more.

sCard

1. Best in class **Payment card with ePaper display**.
2. **Password + Dynamic Pin** for better security protected by OATH - Time synced OTP(One time passcode).
3. **QR code** based transactions.
4. **Pin reset and Card block** functions at Community centres or at ATM Kiosk.
5. Durable **water proof card** with IP67 and RoHA compliant.

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Sungei X Solution Architecture

Connected End Points

- Mobile App
- Physical Card
- Validating Peers
- 3rd party Financial Service Providers
- Sing Pass/Corppass
- Corp Pass
- Immigration

User Groups

- Residents
- Business
- Visitors

Member Portal | sPay | sCard

- Dynamic QR
- Dashboard
- Payment Gateway
- Transaction Explorer
- Identity Management
- Cross Border Transfers
- Govt Grants/ Vouchers
- Swap Limits/ Controls
- Security Management
- AML/CFT
- Interoperability (Fiat<-> rCBDC)
- Freeze/ Unfreeze
- API INTERFACE

Programmability

- Smart Contracts
- Analytics
- Cloud
- P2P Network & Governance

Personas

- Surveillance Manager
- Central Bank
- Payment Service Providers
- Govt Scheme Owner
- Community Centres
- Financial Institutions
- E-commerce

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Sungei X | Problem – solution fit

INSTRUMENT

One Sd$ is pegged to one S$, with direct claim on MAS.

Account based type of CBDC tied to an identification scheme, such that all users need to identify themselves to access it.

Identity mapped to Government issued SingPass(Personal) & Corppass(Business).

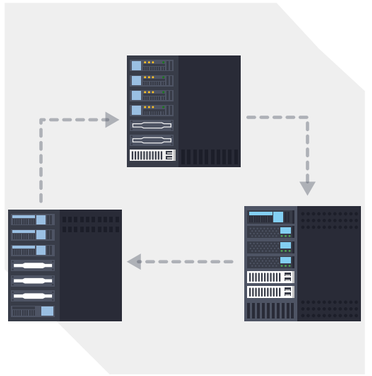
DISTRIBUTION

Two tier indirect rCBDC, where minting is by MAS and Distribution is by PSPs.

100 % reserves and non interest bearing rCBDC in Phase 1 & Interest bearing activated in phase 2.

Residents/Businesses/governments can swap their S$ to Sd$ from PSPs with in pre-auth limits for controlled distribution.

INFRASTRUCTURE



Permissioned Blockchain Network led by MAS, shared infrastructure by PSPs, Government bodies etc.

Surveillance and Intelligence for AML/CTF/Illicit transactions.

Interoperability with legacy system through secured APIs.

PSP - Payment service providers including FIs/NFIs based on licensing norms.

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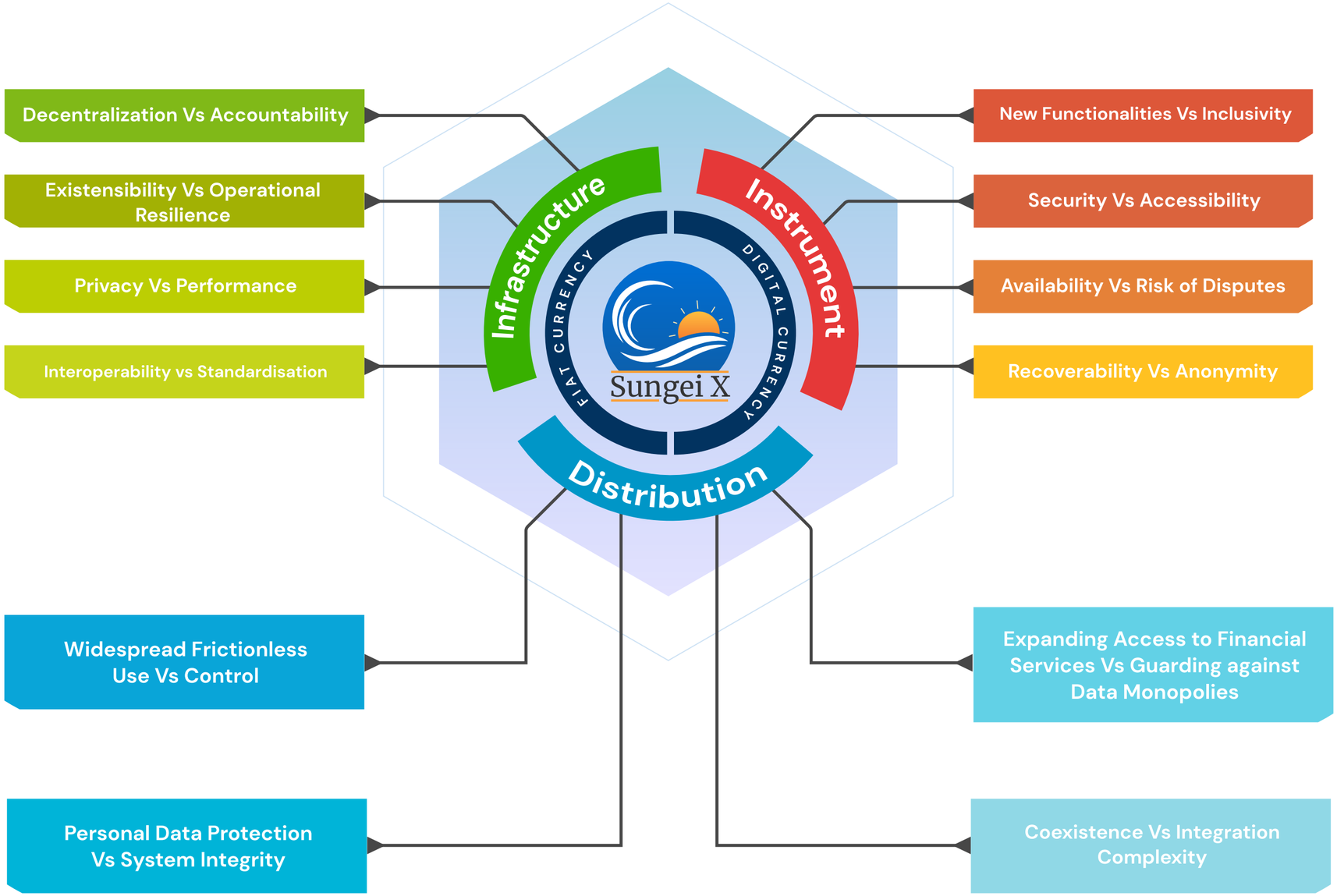
12 Problem statements as given by MAS



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INSTRUMENT

1 New Functionalities Vs Inclusivity

Sungei X - sPay or sCard wallet without need of bank account

sPay enables residents with a smartphone to create a digital wallet even though one doesn't have a bank account with KYC driven by SIngpass.

Non smartphone users can collect their sCard wallet, getting their KYC done by Community club/centres showing their NRIC. Community centre provides top up service for their day to day transactions.

They can also go to dedicated ATM Kiosks/AXS e-stations for bidirectional transfer between their rCBDC wallet and bank account. Sd$ top up service providers can be facilitated for better adoption. Community clubs/centres will offer pin reset functionality in case elderly/minors/disabled forget the pin.

Sungei X - Digital wallet supports direct benefit account (sub wallet) for receipt of direct benefit grants/subsidies.

Our solution solved the inclusivity problem by enabling automation and one click disbursal of government direct benefit transfers to all eligible residents.

Our solution brings new added functionalities by enabling programmability towards controlled spending by residents driven by Sd$ vouchers issued from time to time by government/businesses/corporate(CSR Initiative).

Residents can't swap their Sd$ of their Direct benefit account.

Transactions on direct benefit account are programmed for intended use only.

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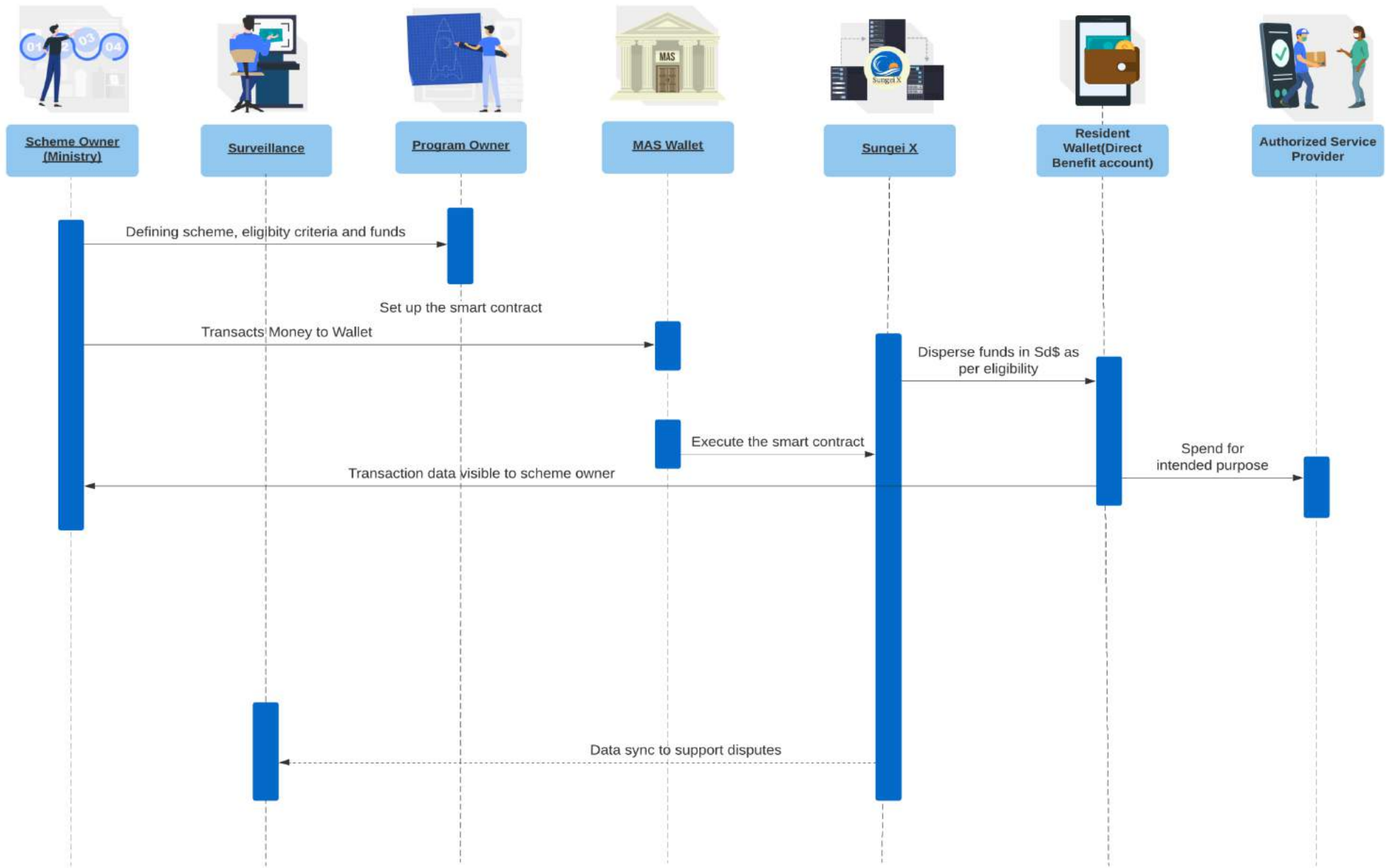
Direct benefit transfer to DB(Direct benefit) account of sPay wallet



Enabling automation and one click disbursal of government direct benefit transfers to all eligible residents.

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INSTRUMENT

2 Security vs Accessibility

Sungei X - sPay wallet supports Singpass/corpass login

To make it more accessible, we are leveraging the existing Singpass/Corppass authentication to enable login access to the wallet.

To avoid unauthorised transactions, transactions are authorized by a public private key pair protected by Blockchain.

Our solution is highly secured because all the transactions are cryptographically hashed.

If the user lost their smartphone/card, it's easy to freeze and register a new device/card.

Minors below 15 who don't have Singpass, the parent wallet can create a sub wallet with user name and pin based login with limits.

Sungei X - sPay & sCard uses Dynamic QR functionality to avoid illicit transactions

sPay generates Dynamic QR code with a combination Public key and balance of wallet. sCard has a display which generates dynamic QR with same logic. As soon as some one freezes the wallet, the latest QR code gets locked and no one can do unauthorized transactions.

sPay supports 2 factor authenticatio n singpass + pin for better security.

Dynamic QR gives protection from illicit transactions.

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INSTRUMENT

3 Availability Vs Risk of Disputes

Sungei X - sPay and sCard supports offline transactions

A user wallet is linked to only one device, which eliminates the scenario of users doing multiple offline transactions across multiple devices.

Authenticated users can do offline transactions within preauth limits to ensure that disputes can be mitigated when such offline transactions are honoured as devices go online. Once online all the offline transactions get synchronized and users can continue.

Use case scenario 1 - Offline smartphone driven wallet (Offline authentication - pin/pattern/fingerprint/biometric) and other online wallet (wired) within daily limits - Settlement confirmed through online line hand shake. The confirmation comes to an offline smartphone as it connects to the internet.

Use case scenario 2 - Offline Card to online smart phone wallet within daily limits - QR on the card will be scanned by smartphone and the receiver will get a request for a pin. Once authenticated the transaction settles.

Use case scenario 3 - Offline smartphone to offline smartphone(Pre auth limits - 80/20) - pin/biometric driven authentication of sender, pin driven acceptance of receiver and the transaction is confirmed. When one/both of the devices is online, the transaction will be settled. This will avoid disputes.

Use case scenario 4 - Offline card to offline smartphone (reduced Pre auth limits - 20/80) - only pin driven authentication of sender, pin driven acceptance of receiver and the transaction is confirmed. When the smartphone on the receiver end is online, the transaction will be settled. This will minimize disputes.

Use case scenario 5 - offline card to offline card - Not allowed currently. This feature can be given between hardware wallets in future.

Offline card to offline card transactions are not supported.	Pre auth limits were set for all offline transactions for safety.
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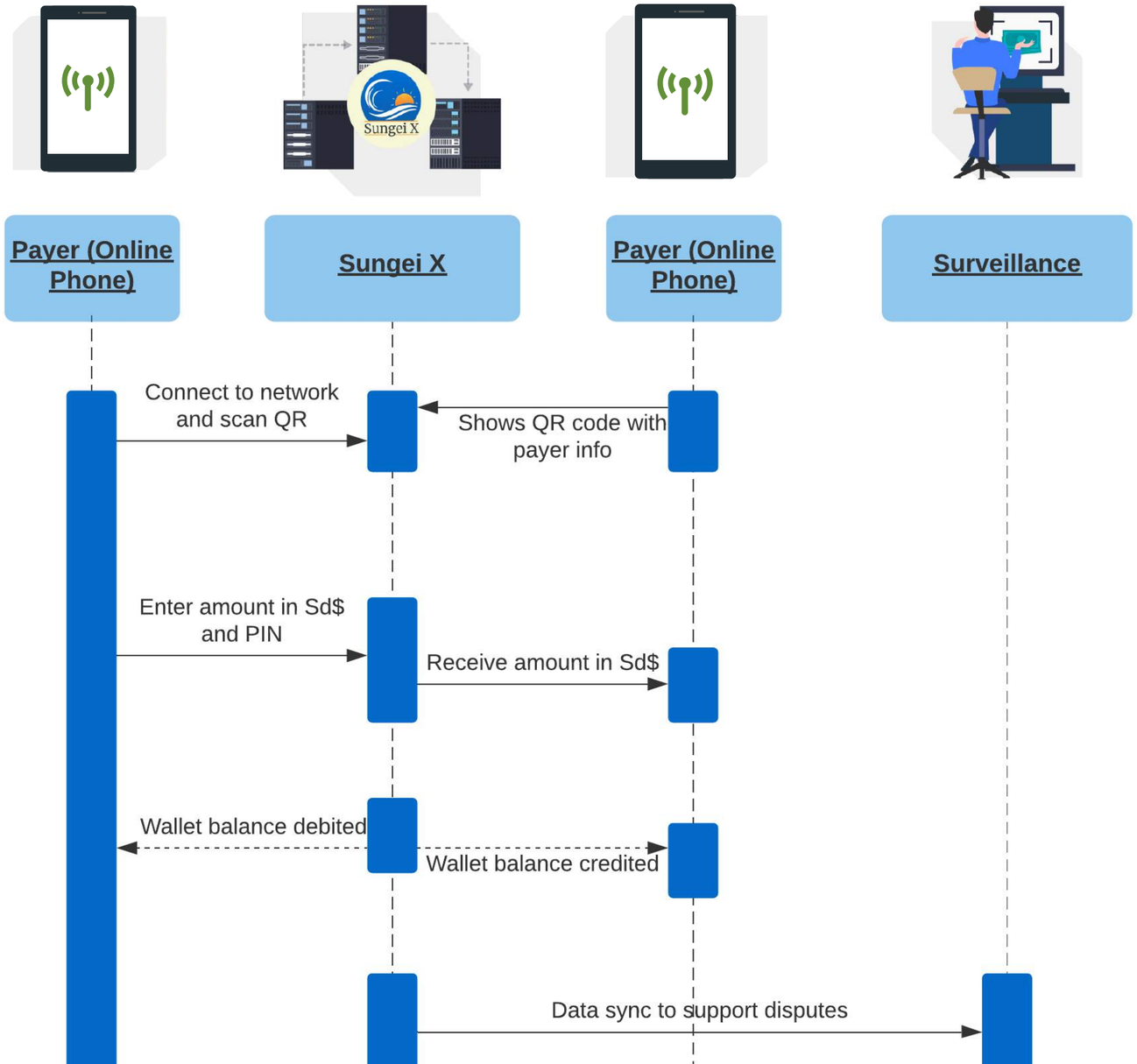
Online phone to online phone transaction flow



Online smartphone driven wallet and other online wallet within daily limits .Settlement happens through Sungei X. The confirmation comes to both the smartphones.

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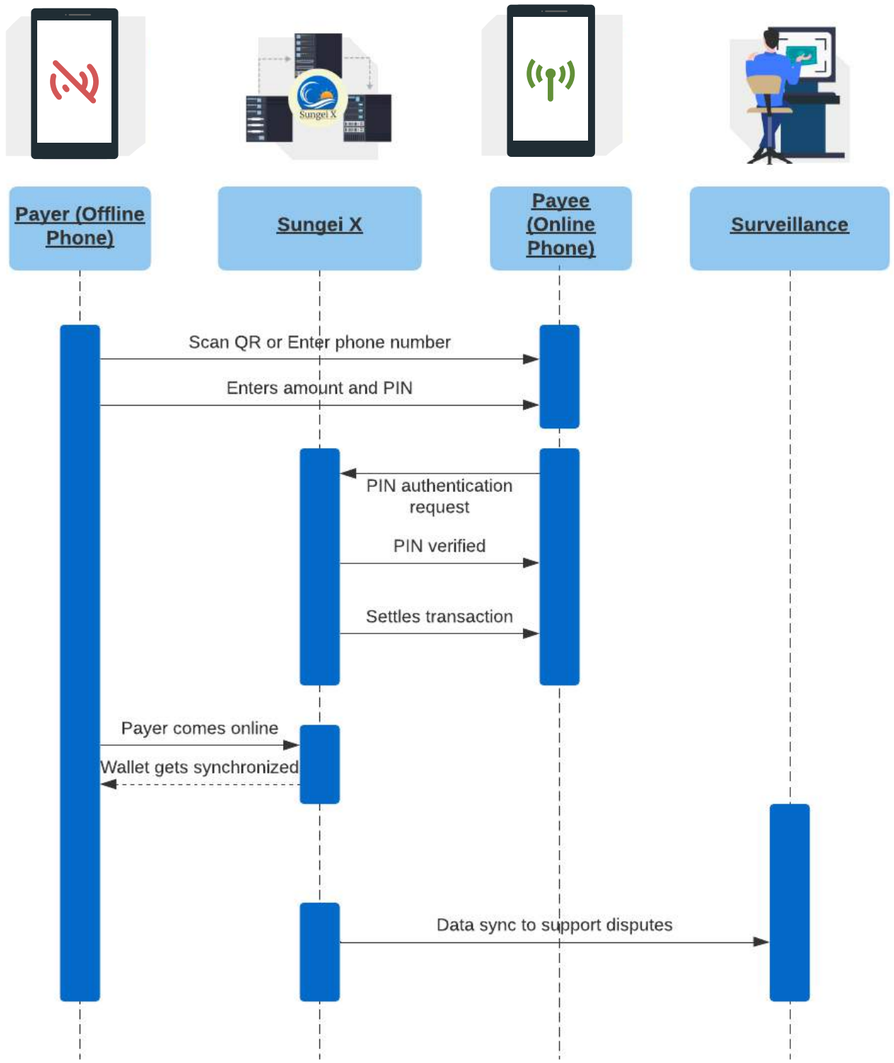
Offline smartphone wallet to Online smart phone wallet



Settlement confirmed through online line hand shake. The confirmation comes to an offline smartphone as it connects to the internet.

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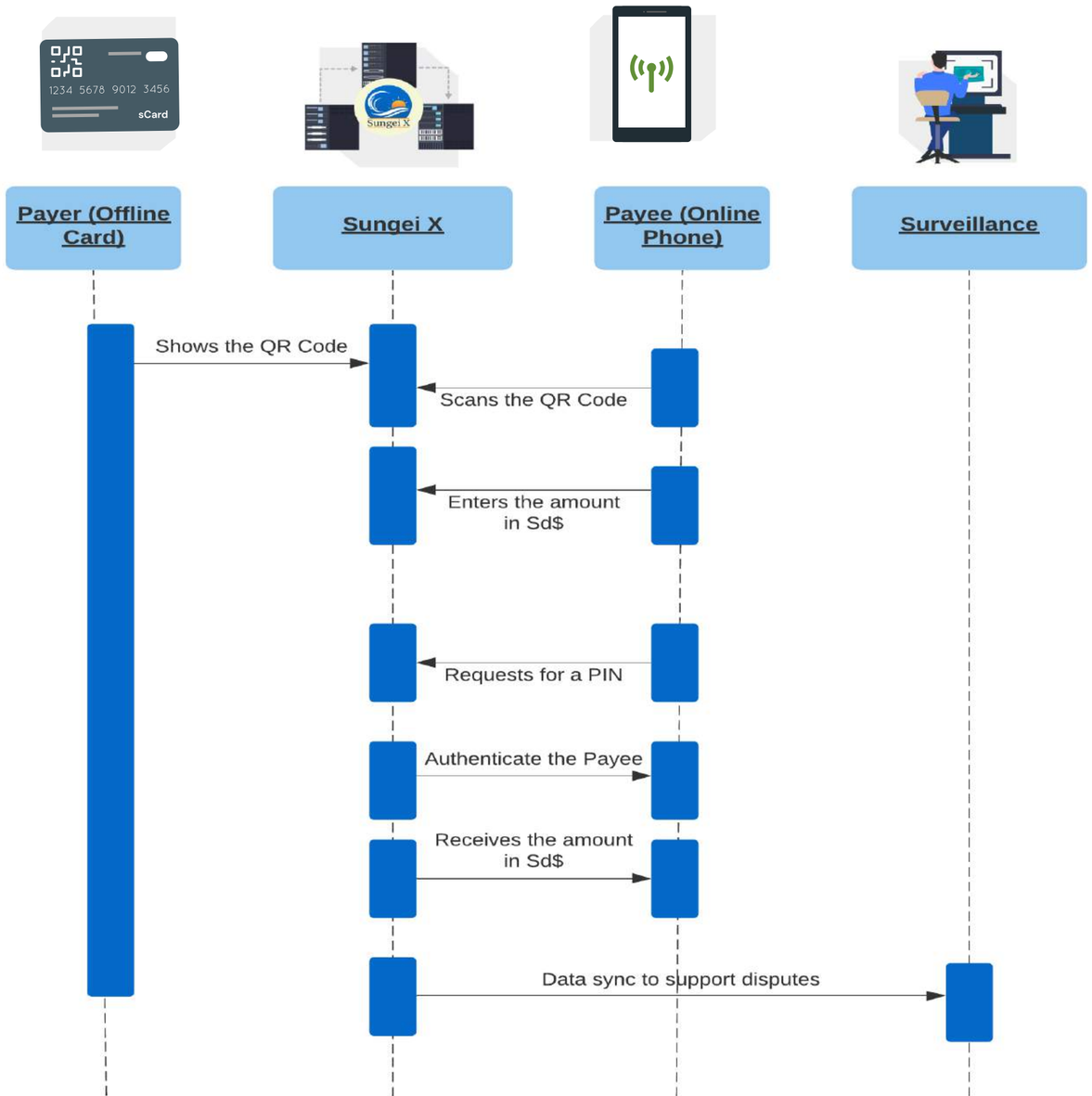
Offline card to online smart phone wallet



Offline Card to online smart phone wallet within daily limits - QR on the card will be scanned by smartphone and the receiver will get a request for a pin. Once authenticated the transaction settles.

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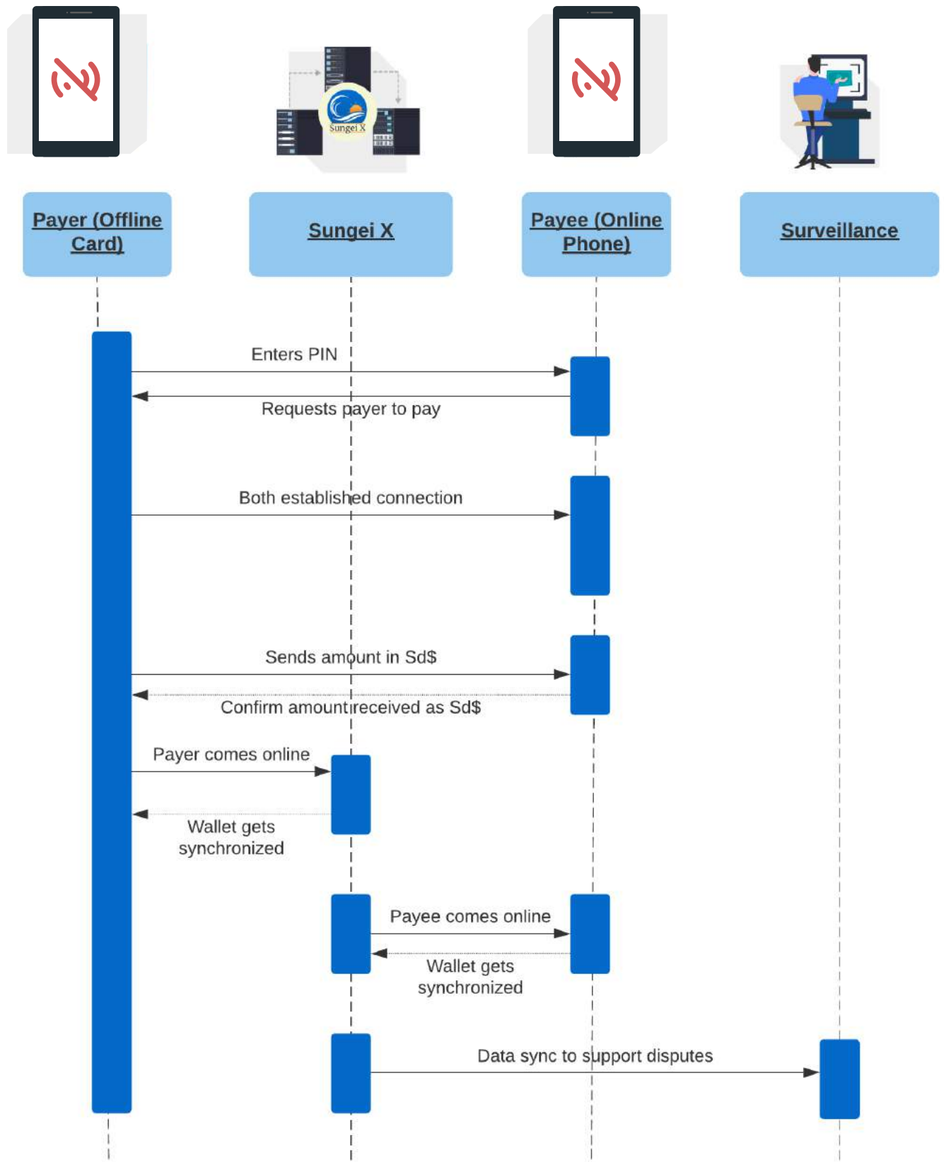
Offline smartphone to offline smartphone(Pre auth limits - 80/20)



Pin/biometric driven authentication of sender, pin driven acceptance of receiver and the transaction is confirmed. When one/both of the devices is online, the transaction will be settled. This will avoid disputes.

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INSTRUMENT

4 Recoverability Vs Anonymity

Sungei X - Cryptographic recovery without compromising on Anonymity

For password recovery, sPay has a 2 step authentication mechanism one through a secret pin and an associated private key on blockchain. User Identifier (NRIC/FIN/IPN) at the time of KYC, is hashed and a pin associated with it is stored. Associated Mobile number and Email ID gets OTP for reset password.

No information pertaining to the user is stored on the network and all transactions and their associated sender/receiver information are masked addressing the anonymity.

If Smartphone and private key is lost - Request to freeze the wallet and no transactions can happen in the lead time, till you re-authenticate using a different handset with their singpass/corppass. If someone tries to initiate a transaction with another online wallet, it gets rejected.

If smartphone and pin is lost, went offline - Request to Freeze the wallet and transactions within the pre auth limit will be honoured till the user re-authenticate using a different handset with their singpass/corppass.If someone tries to initiate a transaction with another online wallet, a panic message will disable the app on the offline lost smartphone preventing any further misuse.

If Offline card - The card and pin is lost - Get the card associated wallet frozen and get the pin changed at the community centre to limit the illicit transactions within the reduced pre-auth limits.

In case both phone & pin is lost, All transactions done till freeze will be honoured.

No personal identification information is stored. Hash of ID is stored for preserving anonymity.

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DISTRIBUTION

5 Widespread Frictionless Use Vs Control

Sungei X - MAS can set swap limits and cross border payment limits

We propose to set limits at various levels to the flow of CBDC's and fiat outflows from banks.

1. Top Up(Swap between S$ and Sd$) Limits for Individual & Businesses to avoid digital run on bank. Above limits, users can approach bank for payment facilitation.
2. Hard and Soft Limits for Commercial banks in terms of reserves and swapping CBDC to Fiat. Initially we propose non-interest bearing CBDC which will encourage users to use CBDC for their day to day transactions(domestic & cross border) for speed and cost benefits.

   Eventually the interest bearing function of CBDC will be enabled for adoption rCDBC for financial services. With interest bearing function activated, we anticipate a 2 way approach

   a) Expansion = Interest rate(Fiat)< Interest rate(CBDC) for encouraging rCBDC adoption.
   b) Contraction = Interest rate(Fiat)> Interest rate(CBDC) for minimizing rCBDC holding.

3. Cross border cash flow controls through mCBDC reserve pre-auth limits.
4. Scheme owner & Program owner swap controls and eligibility criteria.

For phase 1, It will be static limit function. Phase 2, limits will be algorithmic based on supply demand at any given point of time.

Interest rates of Fiat and CBDC can be adjusted to expand or narrow down digital currency flow.

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DISTRIBUTION

6 Personal Data Protection Vs System Integrity

Sungei X – Privacy preserving Login & Selective disclosure with authorization of user. The user is the owner of the data

All the transactions are recorded in the tamper proof way in order to maintain the integrity of the system using DLT technology. Every wallet user can only view their transaction data and as the authentication is being facilitated by Singpass/Corppass, we don't store any personal identification data.

To safeguard the transactions from Business/commercial banks/central bank, additional layers of authentication such as RSA will be incorporated with dynamic pins and dynamic QR functionality. Hardware Executable Environment and Hardware secured wallets are facilitated for high volume users.

For the purpose of bringing down the fraudulence and recovering illicit transactions, the Surveillance Manager (Inspection & Supervisory) of the central bank can track and trace for investigation and freeze the wallets. As per PDPA, the necessary permissions will be taken from users at the time of creation of wallet and well defined formalities as per governance dictated by the consortium.

If the system detects misuse of transactions of a single wallet across geo-locations under a permissible time, it will soft block the wallet and raise an alert to Surveillance Manager (Inspection & Supervisory) for due diligence.

Singpass/Corpass based Login. For Pin recovery, we store hashed value of NRIC for user identity at the time of reset.

Surveillance dashboard for inspection and supervisory in case of disputes.

DISTRIBUTION

7 Expanding Access to Financial Services Vs Guarding against Data Monopolies

Sungei X - Smart contract functionality for Financial service providers & Data access controlled by users

In addition to pay/receive/top up functions, we bring the features of payment services for government taxes, utility bills and small apps for various service providers to integrate their payment jobs to be executed through a giro kind of service driven by smart contracts. This enables the individuals to set auto pay to various service providers all at one place.

Businesses/corporates can replace physical cheque based transactions with SLA driven smart contracts for automatic transfer of rCBDC, when conditions in contract are fulfilled. This enables Trade Finance, Banks, Insurance and other financial service providers to create various business services as a smart contract for users(Individuals/businesses) to avail all services with trusted Quality of Service and Financial Inclusion. All B2B and B2C financial service providers will have a level playing field for creating innovative Fintech products and services.

FIs will be able to monetize the services provided on the platform. All the transactions are peer to peer, though all the nodes of FIs participate in the consensus to validate transactions they can't view the personal identification.Transaction amount can also be masked with ZKP.

Today payment gateway service providers/ wallets have huge volumes of consumer data in terms of who they are, what they buy and where they shop. With our solution, the ownership of transaction data is in the hands of wallet users and no one can access it without their permission. This prevents the Data Monopolies and financial service providers from misusing/selling/unauthorized accessing of data on the network.

Users can authorise for selective disclosure of data. FSPs can monetize the intelligence derived from the vast pool of data available and share the benefits to users as incentive(Air drop).

Financial service providers can leverage Sungei X shared infrastructure for providing Financial services as a smart contract.

Data monetization as a service as authorized by users, guarding against data monopolies.

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DISTRIBUTION

8 Coexistence Vs Integration Complexity

Sungei X - MAS mints and FIs/NFIs swaps between fiat and digital currency

We have chosen the Design approach of the “Two tier indirect rCBDC” issuance and adoption. Our solution facilitates the governance model where all the incumbent financial institutions distribute the CBDC to the end users and the Central Bank can do that during emergency times or for facilitating direct benefit transfer for residents.

Our technology design by choice is modular and has a service oriented architecture for easy integration with legacy systems and all users(Individuals & Businesses) can do bidirectional swap between fiat and rCBDC through all payment gateways which support credit and debit card providers like (Visa/MasterCard/American Express/UPI/Diners), PayNow, Payment wallets like (GrabPay), eNETS, PayLah etc.

The existing banks and their consortiums can leverage this new blockchain network for seamless transactions with data privacy, quick settlements and finality.

In view of elderly/minors/diabled we are also proposing the community centres to help creation of wallets, top up and freeze services and act as validation peers by maintaining nodes in the network.

The incumbant FIs/NFIs role is to facilitate swap and can participate in consortium.

With Blockchain, one connection to networks gives connection to all other stakeholders without hassle of one to one connections.

INFRASTRUCTURE

9 Decentralization Vs Accountability

Sungei X - MAS can give consortium membership licenses and benefits proportional to the participation and services

We propose a two tier consortium private permissioned blockchain network under the leadership of the central bank, with a mix of validating peers and commiting peers within the BFSI sector as well as Government bodies such as CPF, IRAS, MoM, MoF, MoH, MCCY,HDB,MSF etc for better decentralization.

The infrastructure is distributed with respect to their physical location, this will reduce the impact of natural calamities/Single point of failure.

As the network components are owned by various independent organizations, decentralization will bring the protection from hacking/51% attacks as the data is immutable and distributed.

The proportion of number of nodes to be maintained and how many and their locations will be the secret sauce to avoid single point of failure and collusion attacks.

Accountability can be made proportional to the service offerings and the stake in the benefits among the stakeholders. Consortium members can get transaction fees from swaping, transactions, Merchants and financial services providers as per tier in which they maintain infrastructure.

The proportion and number of nodes to be maintained by consortium members is the secret suace.

MAS can issue licenses with shared roles and responsibilities. Onboarding as easy as choosing a licence type and connect nodes.

INFRASTRUCTURE

10 Existensibility Vs Operational Resilience

Sungei X – Modular architecture for seamless upgrades as per organization type and role type

The number of validating peers in the organizations will be set more than one for better availability and operational resilience.

Our application architecture is built with functional elements such as organization type and role type design to cater for easy extensibility of functionalities without any system changes.

Any new feature is auto synced across the whole network for continuous improvement as well as zero impact on consensus.

Flexibility to add new policies and schemes with easy programmability as smart contracts to CBDC Instrument, Distribution and Infrastructure levels.

Modular architecture and DLT enables for easy upgrades throughout the network.

Smart contract standard templates can be developed and enforced for extensibility of services.

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INFRASTRUCTURE

11 Privacy Vs Performance

Sungei X - Pluggable consensus mechanism for performance and Cryptographic hash functions for masking personal information

No user personal identification data is stored safeguarding the privacy of each user as well as the transactions.

Design option 1: Controlled decentralization of validation of transactions - In this scenario, the central bank maintains a secured pool of servers which validates the transactions on the network and publish the batch of transactions to private permissioned blockchain network under the leadership of the central bank, with validating peers within the BFSI sector as well as Government bodies such as CPF, IRAS, MoM, MoF, MoH, MCCY,HDB,MSF etc for better decentralization. Higher throughput can be achieved.

Design option 2: Complete decentralization of validation of transactions - In this scenario,all the endorsing peers will participate in the consensus. Lower throughput due to complete decentralization.

a. PoA consensus mechanism- Central Bank and Government owned banks as endorsing peers.

b. BFT consensus mechanism -Central Bank, Government bodies and Government owned banks, Private commercial banks as endorsing peers.

c. Pure proof of stake claims to solve the trilemma problem(Exploring).

Hash functions are being used to store and map any personal identification information.

2 Design choices as to decide between decentralization vs scalability.

IDS & Garranto

12 Interoperability vs Standardisation

Sungei X - Interoperability with mCBDC or Non CBDC can be facilitated by partner Instant payment service providers of respective countries

We have a holistic approach for interoperability and cross border payments between Singapore rCBDC and Foreign rCBDC/Currency. With rCBDC, a Singapore resident can do a cross border transaction using the International receiver's mobile number.

Endorsement from central banks is required above a certain limit agreed by both the central banks.

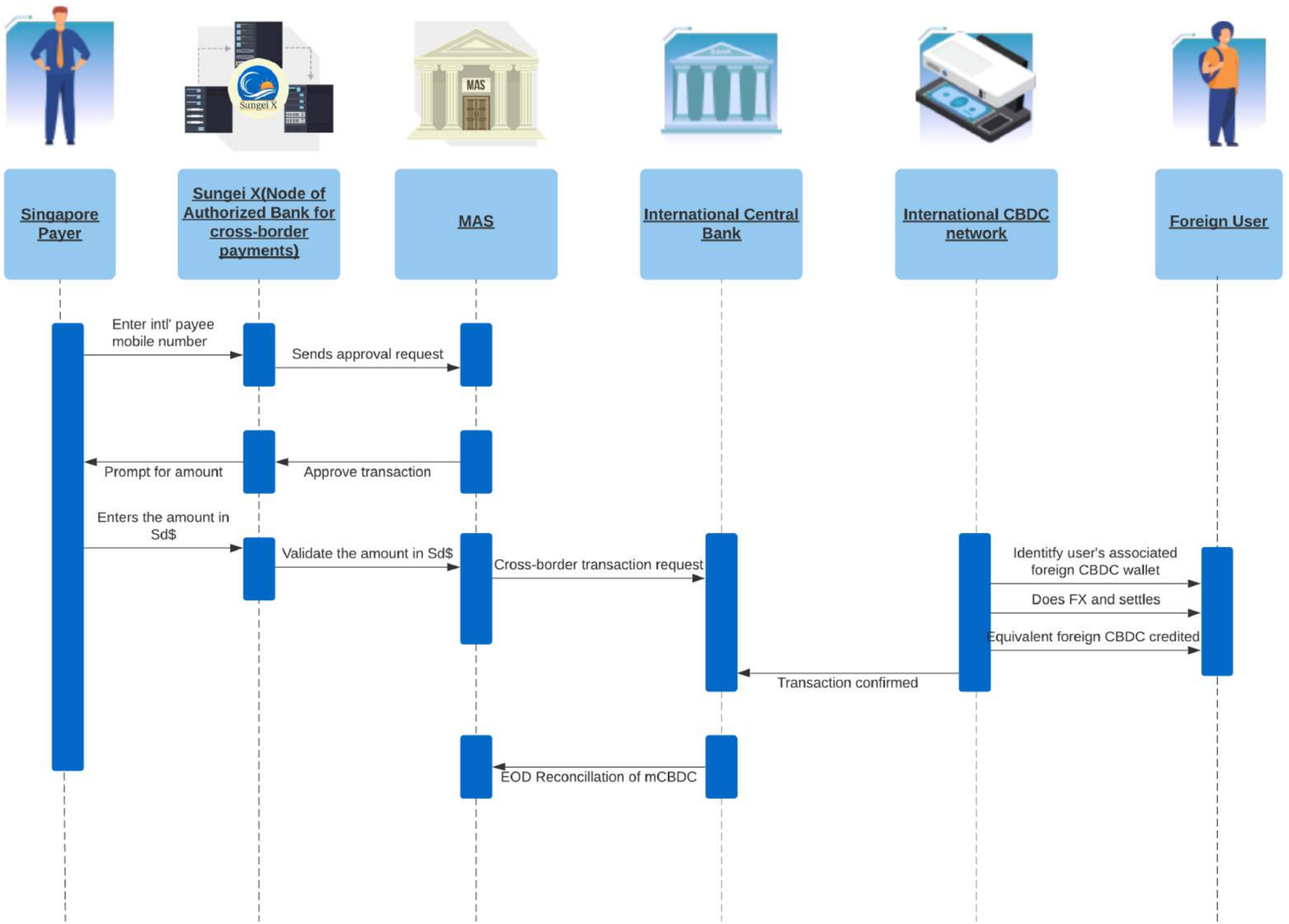
Use case scenarios 1 - Singapore user(Transaction initiate transaction to a Foreign Mobile number) ---> Node of Authorized bank(Singapore) for cross border payments(Will receive transaction request, does FX and validate the message signing by authorized user) ---> Node of International partner bank(Will identify wallet(Foreign CBDC) associated with input number and settles) ---> International beneficiary receives Foreign CDBC in their wallet.

Use case scenarios 2 - Singapore user(Transaction initiate transaction to a Foreign Mobile number) ---> Node of Authorized bank(Singapore) for cross border payments(Will receive transaction request and validate the message signing by authorized user) ---> Node of International partner bank(Will identify that there is no CBDC wallet(Foreign CBDC) associated with input number, but identifies a fait account, does FX and settles) ---> International beneficiary receives Fiat currency to their account.

Unified Identity management standards is yet to be built at scale.

DLT can eliminate the one to one connections an can give transaction pipelines with various banks.

Cross border transactions - mCBDC



Singapore residents can seamlessly transact to forigners through international mobile number and International CBDC network shall identify the associated wallet and credit equivalent foreign CBDC.

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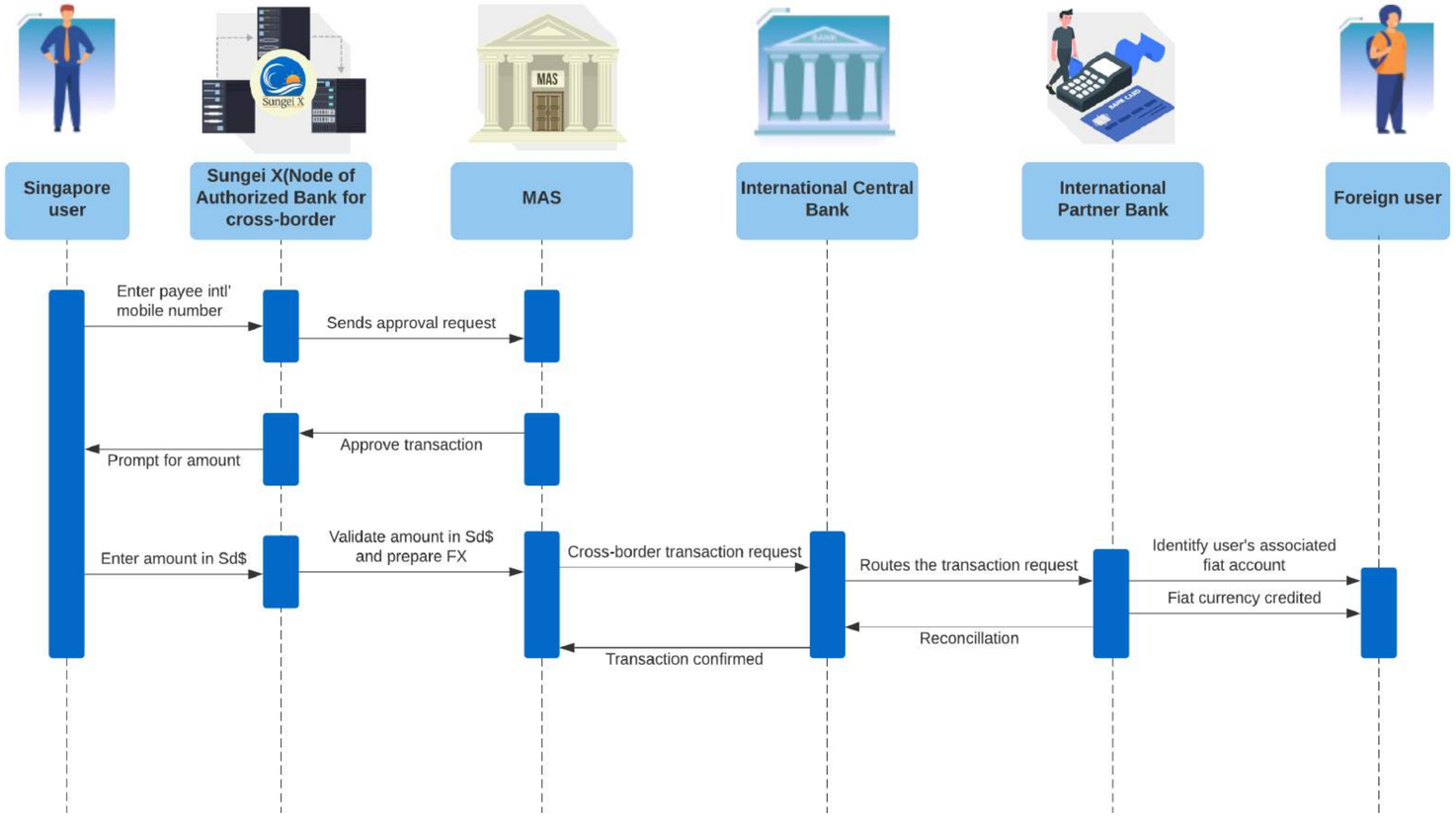
Cross border transactions - CBDC to Non-CBDC



Singapore residents can seamlessly transact to foreigners through international mobile number and International partner bank shall identify the associated bank account and settle transaction.

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Sungei X - Consortium Control Tower

L3 Execution
Let's Make it Happen

Process Execution

- Disseminating Information for surveillance
- Monitoring Execution Compliance
- Continuos Improvement + New Service Design

L2 Analytics
Why is this happening?
What could happen next?
How to Improve?

Surveillance, Intelligence & Rapid Response

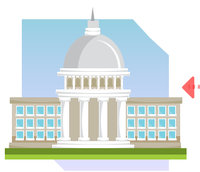
- Disputes resolution
- Design better government schemes based on usage patterns
- Risk Analysis & Response Management

L1 Visibility
What is happening now?

Real - Time Visibility

- Dashboard + Transaction Explorer
- Smart Contract Driven Operations

Stakeholder Integration



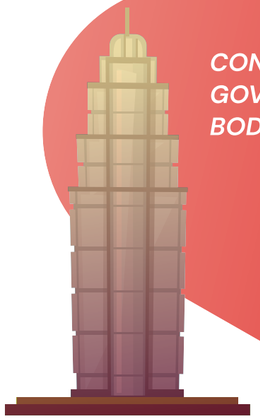
Government

MAS

Banks (FIs/NFIs)

Payment Service Providers

Financial Service Providers



CONSORTIUM GOVERNANCE BODY

- Policy and Reserve Management
- Membership and licenses
- Surveillance & Intelligence
- Cost Management

- Artificial Intelligence
- Blockchain
- Cloud
- Analytics
- Mobile

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Services Stack

RAPID

Enhanced Responsivesness
Proactive Prevention
Quick payment Processing

SCALABLE

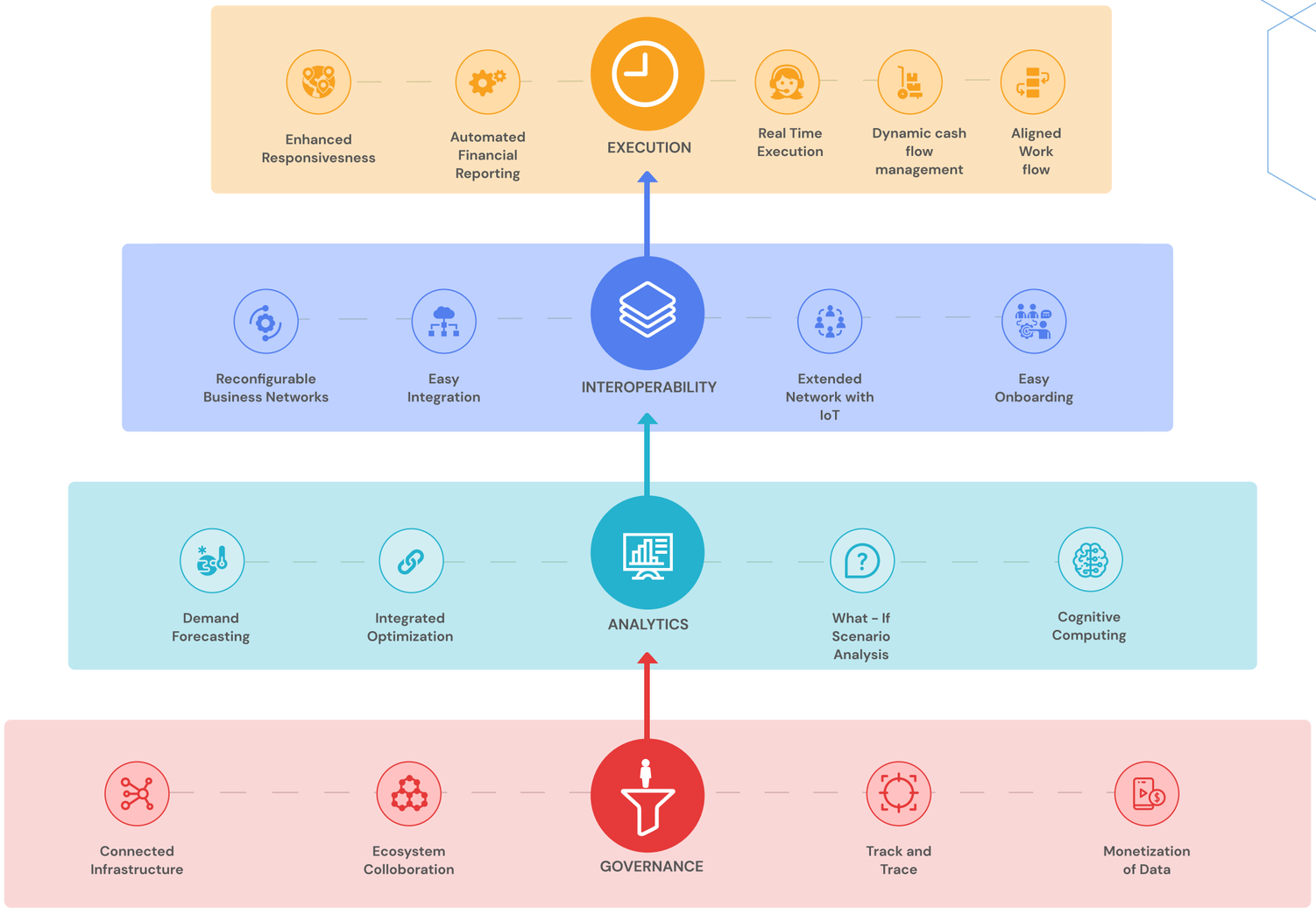
Maximum Efficiency
Organizational Flexibility
Highly-evolved operating models

INTELLIGENT

Actionable Insights
Automated Execution
Shared Processes

CONNECTED

Real - Time Visibilty
Seamless Colloboration
Personalized Experiences



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Technology Stack

Sungei X

Layer	Technology
Front End	Angular.js
Back End	Node.js & Web3.js
Blockchain	Hyperledger Besu
Consensus	IBFT 2.0 - POA consensus
Cryptography	secp256k1
Cloud	AWS
Off chain Data	Mongo DB
Token standard	ERC-20

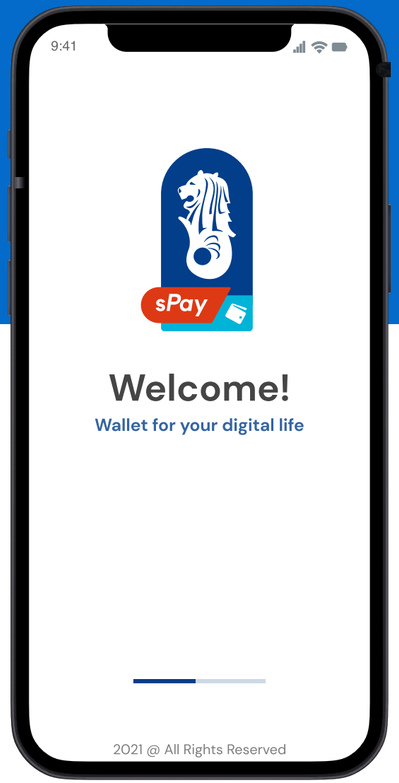
sPay Wallet

Layer	Technology
iOS App	Native iOS
Language	Swift 5
Development	Mac OS Bigsur
IDE	X Code 12.5
Android App	Native Android
Language	Java
IDE	Android Studio

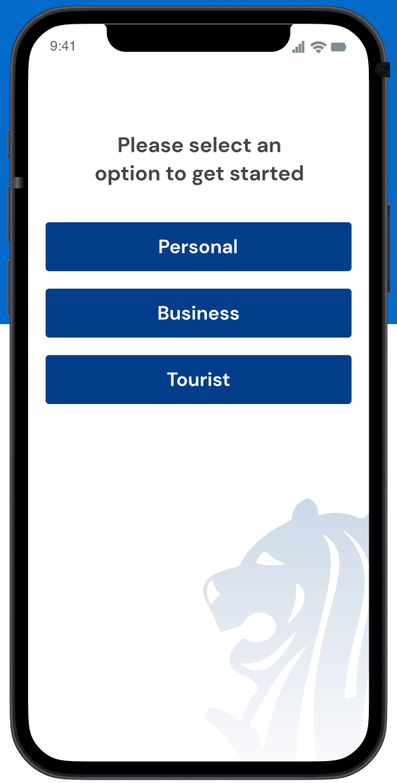
sCard

Layer	Technology
Display	6 digit ePaper screen
Durability	IP67
Dynamic pin	OATH time synced OTP
Expected Lifetime	15k OTP
Compliance	ISO 7810

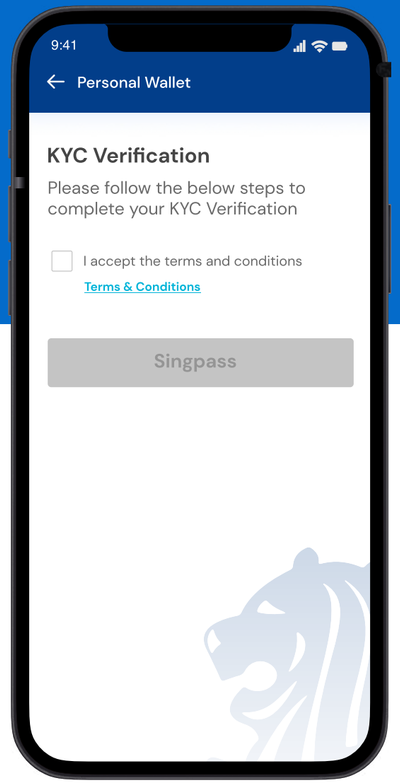
sPay App walk through – 1



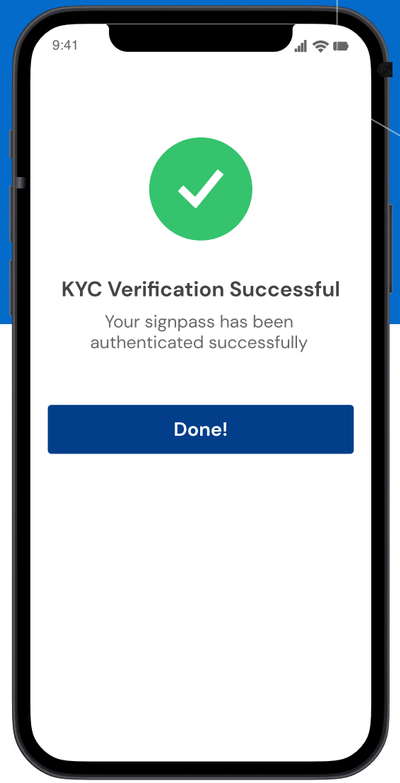
Splash screen



Sign up for Individuals, Businesses and Tourists



KYC authentication by Singpass/Corppass



KYC Successful and User sets Security pin for recovery

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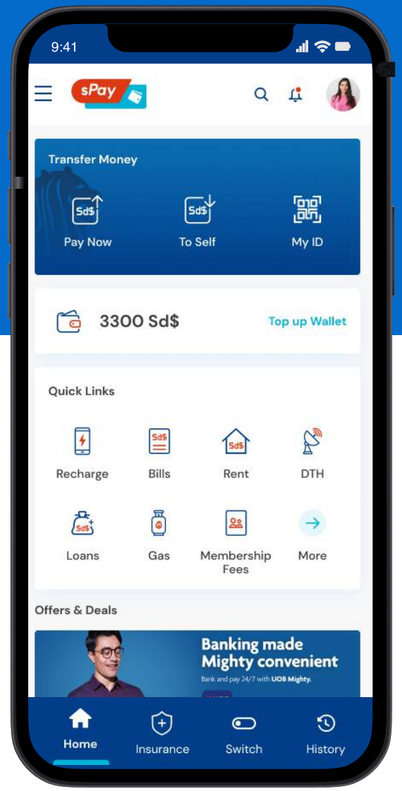
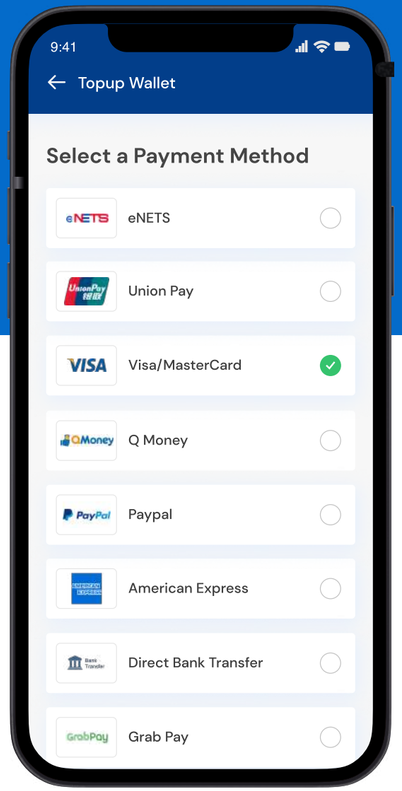
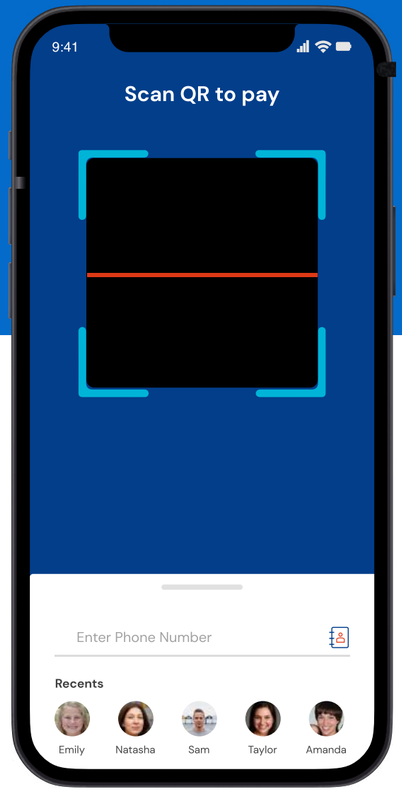
sPay App walk through – 2



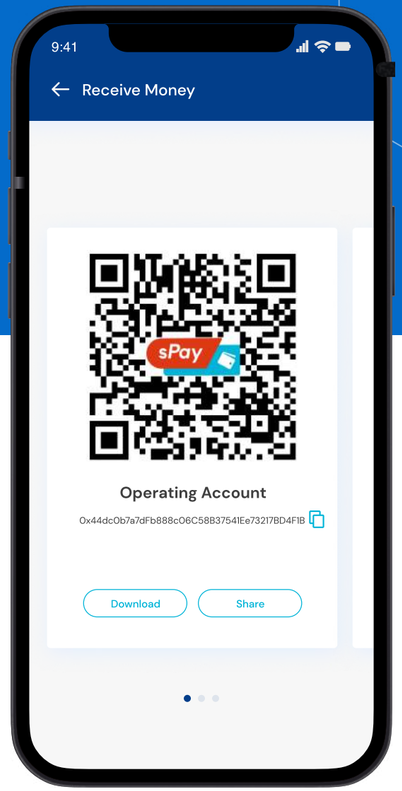
Home screen to access wallet services



Top Up to swap your SGD to Sd$ through various payment options



Send Sd$ through QR/NRIC/Phone Number



Receive through QR sPay code

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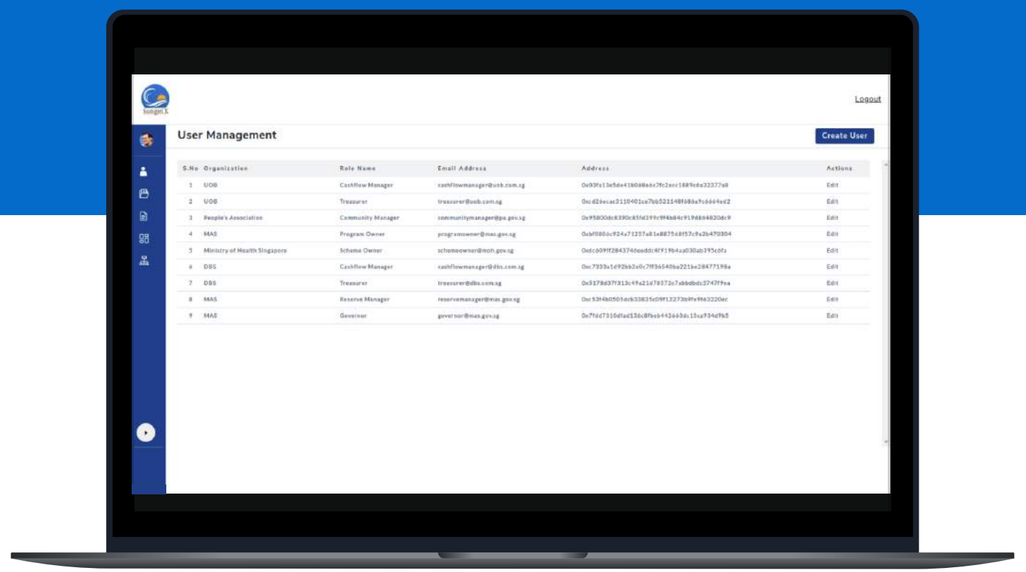
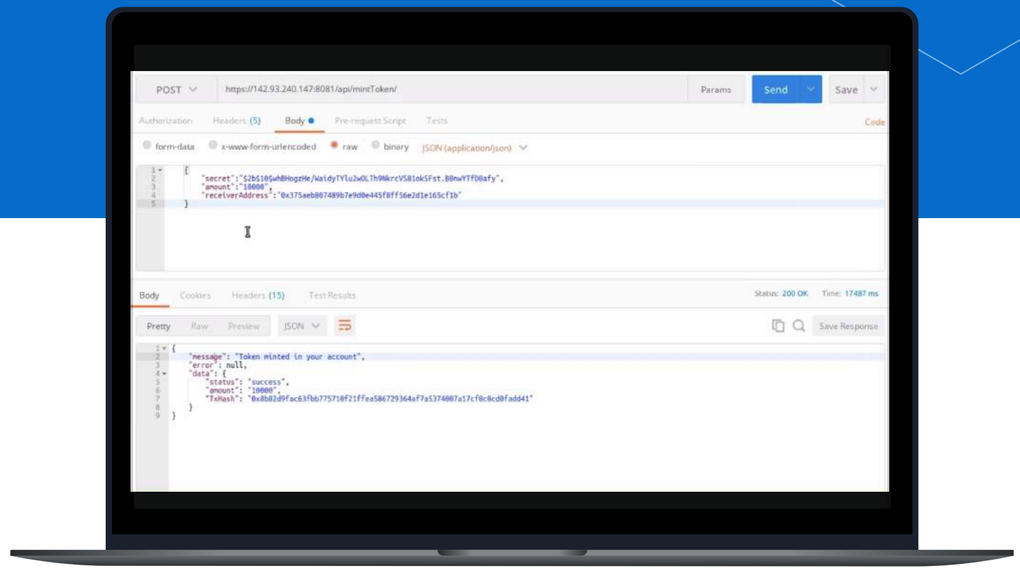
Sungei X Web application walk through – 1



User Management on Sungei X



Mint and Transfer

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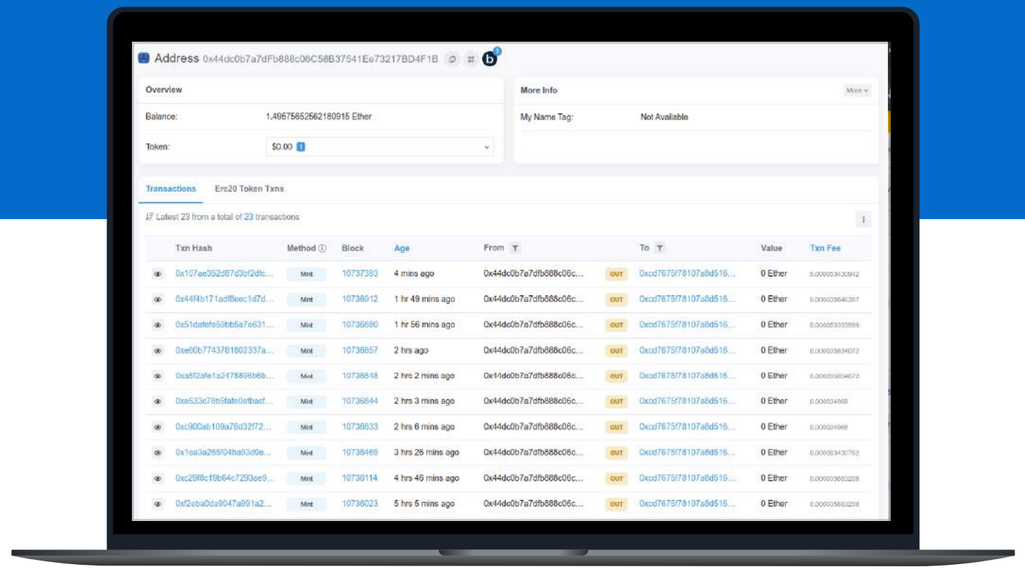
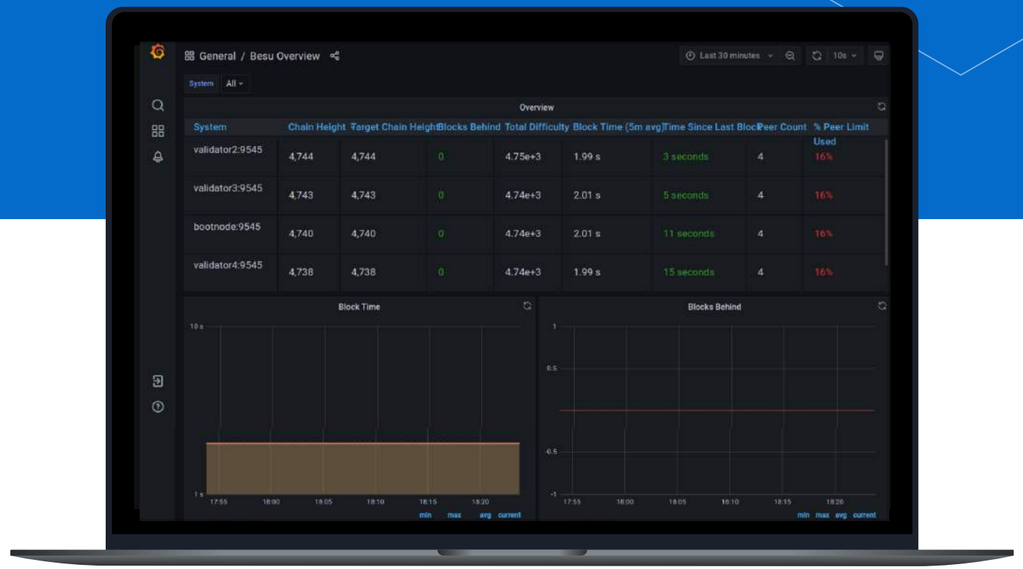
Sungei X Web application walk through – 2



Transaction Explorer



Network Infrastructure Dashboard

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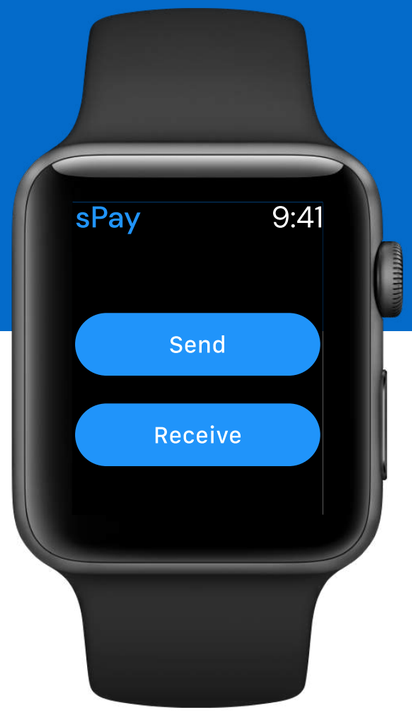
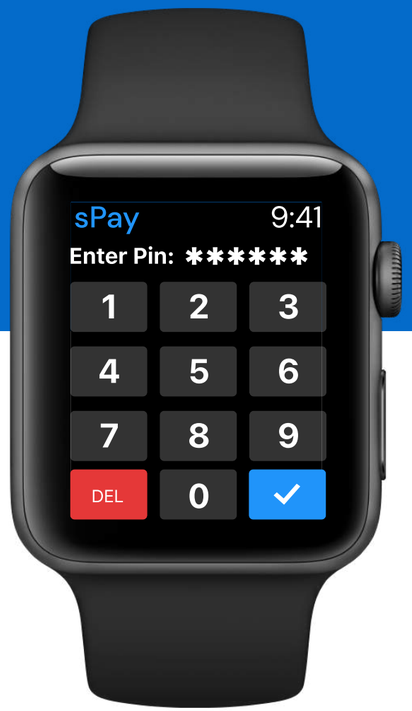
sPay Smartwatch App Walkthrough



Send | Receive

Send Sd$ through
Phone number



Enter pin and
confirm

Receive through QR
sPay code

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Our MVP Journey so far

MAS announced Global CBDC Challenge - 28th June.

IDS Inc and Garranto Pte. Ltd came together and formed the A Team with Product leaders, Blockchain architects. Application developers and Fintech domain experts.

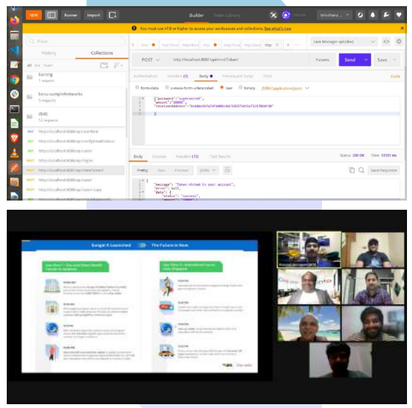
24 hour rCBDC Hackathon - 10th and 11th July.

12 Member team and advisors worked for **12 hours each** on weekends virtually, architected the solution and the dev started.

12 hour rCBDC Bootcamp - 17th and 18th July

The team continued to work and another exciting weekend, the development came to a shape - **New Logo, New App screen and First mint executed**.

It's almost done - 23rd July



The proposal presentation is almost done and the **sPay app develpment is done,** finishing the web application in hurry. The extension announced.

Little better - 29th July

The Proposal presentation and MVP is ready to be submitted and **eagerly waiting for results to be part of acceleration program.**

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Our Execution plan

Sprint 1
30th Aug - 10th Sep

Add on FIs & Govt. Schemes

1. Integration with FIs.
2. Data modelling for government schemes.
3. Tooling.
4. Define API specifications.

**Sprint 1 on MVP*

Sprint 2
13th Sep - 24th Sep

Onboard Residents

1. Role based dashboards for MAS, FIs and Government users.
2. Encashment and EOD reconciliation.
3. Swap functionality between Banks and users.
4. Andriod App development.
5. Smart contract templates for government schemes.
6. Payment gateway Integration.
7. Block explorer.

Sprint 3
27th Sep - 8th Oct

Enhance Govt. Schemes

1. Central bank and FIs role wise work flows -1.
2. Send and Receive Sd$ for users.
3. Limits configuaration (Hard & Soft limits)
4. Deploy government schemes with MultiSig functionality.

Sprint 4
11th Oct - 22nd Oct

Surveillance & Monitoring

1. Surveillance manager dashboard.
2. Central bank role wise work flows -2
3. VAPT testing

Sprint 5
25th Oct - 5th Nov

Fine tune & Finalize

1. **End to end Integration.**
2. **Pilot run with FIs.**
3. **Preperation for Demo day.**

DEMO DAY
8 Nov 21

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CONCLUSION & SUMMARY

1 We are **one of the only 24 Hyperledger certified service providers** trusted by our clients and has **experience and expertise** to design, develop and deliver enterprise grade Blockchain applications.

2 We have **MVP ready** and has a **magnificent team** who are purpose driven and highly capable to deliver the platform as envisioned. Guided by advisors with **global know how** to drive the development in right direction.

3 We have chosen stable **open source platform Hyperledger Besu** supported by The Linux Foundation, for **cost effectiveness** and rich features it supports.

4 Sungei X is **Resilient, Efficient and Secured** by Design. It supports **APIs for seamless integration** with 3rd party Neo banks, payment and financial service providers as well as e-commerce players etc.

5 We have used the **best code practices** for better performance, operational efficiency and **Zero tolerance for failure**. Capabilities in Industry 4.0 technologies like AI, Data Analytics, DevOps etc.

6 Last but not the least, We have the **shared vision for Financial Inclusion** to bring affordable financial services to **unbanked and under banked.**

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Our Magnificent Team

Aravind Voruganti

Product Leader

1. An Alumnus of IIIT Hyderabad & Liverpool Business School, UK.
2. IBM Certified Blockchain Solution Advisor.
3. SAP Certified Integration Solution Advisor.

He is Vice President for Blockchain Practice and Products at IDS Inc. An experienced Product Leader and has Expertise as **Blockchain Solution Architect** with a demonstrated history of working on **7+ Blockchain technology projects and products** in Supply chain, Supply Chain Finance, Telecom, Air Cargo operations, CBDC and HR Verification as a service domains,working with MNCs and Startups.

A **Subject Matter Expert** and Corporate trainer, who **trained 1250+ Working Professionals, Educators and Engineers in Blockchain** through exceptional presentations packed with uniquely designed content and Insights. Skilled in Research and Development (R&D), Innovation, Capacity building, Community Development, Product Management, and Blockchain.

Mannamu Sreeman

Fintech Evangelist

Mannamu Sreeman is Founder CEO of Garranto Pte. Ltd. and a serial entrepreneur with Fintech experience.
He worked for major financial organisations in Singapore around 15 years.Blockchain enthusiast and **worked on various blockchain initiatives in UBS and Cognizant.**

Singapore Fintech association member, Industry 4.0 Leader and active Leader in various Fintech initiatives in Asia. He is an **author/co-author for various POC blockchain publications in Cognizant and Financial blogger**, article writer on Financial initiatives.

His vast domain knowledge of financial services and Fintech experience has shaped Sungei X towards Viable solution.

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Our Magnificent Team

Soppadandi Trilochana Chary

Blockchain Architect

Trilochana chary has built **production grade enterprise DApps** on both public and private blockchains like Ethereum & Hyperledger Fabric in the domains of **FinTech - Trade Finance, Digital Identity, Token Offering, Crypto Payments, Hardware wallets and Multi token swap**. He has **build Belrium Blockchain from scratch leveraging open source Lisk protocol.**

His journey in **blockchain space started in 2013** when he was attempting to solve peer to peer payments transactions. He has spent significant time building solutions in the payments industry using blockchain based protocols,**Invoice factoring**. he used to head technology for an Indian blockchain startup. His previous experience includes working with l**arge volumes of data, algorithms, data mining, distributed systems and general artificial intelligence**. He is passionate about new technology and is particularly intrigued by the potential of Blockchain.

Vanamali Somanchi,

Solution Delivery Manager

He is certified PMP, SCM, MSP, P3O, ITIL, SAFe Agile Leader.

21 years rich exposure across various Industries including Ministries, Government Divisions,Organs of State, Statutory Board, **Banking and Insurance.**

Over 8 yrs in the Banking and Fintech Space. Worked on solutions ranging from Product/ Project delivery, Issuing and Acquiring enablement as well as creating scalable solutions around Loyalty.

Key drive is to **understand Customer's needs, beyond what is articulated in the requirements**, addressing areas for improvement/ enhancement, working closely with the Customer representatives to better serve the users' needs.

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Our Magnificent Team

Dr Sindhu Bhaskar

Fintech Advisor

Dr. Sindhu Bhaskar is the Chairman and CEO of EST Group. EST Global Inc., is an enterprise based in the **MIT ecosystem**, incorporated and operating from **Cambridge Innovation Center**, MIT, USA. Dr. Sindhu has worked his career of **30+ years to global leadership in transforming the financial ecosystem through digital evolution**, fintech revolution, and financial inclusion.

Dr. Sindhu, a New Age Technology Evangelist, is on a mission to create the new development mantra wherein the driving engine is the digital **composite banking**. **Financial inclusion** shall shore up the country's economy and growth-quotient.

Piyush Sharma

Digital Transformation Leader & Advisor

Global CEO | Board-Member | C-Suite Advisor | Leadership Facilitator | LifeCoach | Professor | TEDx Speaker

He is a global tech, media and entrepreneurial leader with a reputation for value creation and catalytic growth. He was fortunate to mark out a life of success as Board-Member and CEO of multi-billion-dollar organisations in the last few assignments of my **20-plus years of corporate life.**

He has multi-faceted industry experience across Consumer, Digital, Technology, Consulting, and Media industries. He had direct experience of **leading business transformations**, innovating new growth models, **launching digital disruptions**, effecting turnarounds, delivering mergers, acquisitions & divestitures, and building brands, businesses and value. He has delivered **end-to-end digital and business transformation** and worked with large Indian and MNC companies reporting to boards and/or chairman.

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Our Magnificent Team

Dr Wolfgang Wagner

Industry 4.0 Advisor

Prof. Dr. Wolfgang Wagner is an internationally well trained management consultant and top management business leader with fast project experiences in the Auto Industry, Chemicals and Strategy&Process Consulting. He lived and worked in US, Japan, Europe and nearly 20 years in China.

Currently focusing on China and South East Asia, he today **consults in Industry 4.0** and automotive.

He is an advisor to guide us on industry best practices and industry 4.0 insights.

Contributors

Seguri Rangareddy
Full stack Developer

Nikhil Muripala
Product Designer (UI/UX)

Kishore Goutham
Blockchain Research Analyst

Adabala Surya Prakash
App developer

Gomathi
Blockchain Developer

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Global CBDC Landscape

PROOF OF CONCEPT	
Currency	**Country**
E-cedi	Ghana
Mauritius CBDC	Mauritus
Digital Yen	Japan
Digital lira	Turkey
South Korea CBDC	South Korea
SOV	Marshall Islands
e-krona	Sweden
Ithanon-LionRock	Thailand
LionRock	Hong Kong
e-hryvnia	Ukraine

PILOT	
Currency	**Country**
Ubin	Singapore
Jamaica CBDC	Jamaica
Dcash	Eastern Carribean
Khokha	South Africa
France CBDC	France
e-CNY	China
Jasper	Canada
Aber	UAE
e-Peso	Uruguay
Digital Tende	Kazhakstan

LAUNCHED	
Currency	**Country**
Sand Dollar	Bahamas`

Many more countries are experimenting.

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9. Cashless - China's Digital Currency by Richard Turrin
10. A Global look at CBDC by KPMG — Link
11. Designing a Central Bank Digital Currency with Support for Cash-like Privacy — Link
12. CBDC Tracker — Link
13. CBDC Hub — Link
14. CBDC Use cases — Link
15. Sungei - The Singapore River — Link

IDS & Garranto

REVIEW COMMENTS

Julian Gordon
Vice President(APAC)-
Hyperledger Foundation,

It’s great presentation. It is clearly apparant from the slides that lot of efforts were put in place for the solution. All the best.

Piyush Sharma
Digital Transformation
Leader & Advisor

Your proposal is looking great. As I was glancing through the presentation and various questions/comments/observations/doubts that were coming to my mind - I realised that by the end of the presentation they were all sorted. So my compliments first for a job very well done. Not only is it thorough and methodical but also it is so well presented aesthetically and design wise.

Dr Sindhu Bhaskar
Fintech Advisor

The proposal has striked the balance between the problem statements given by MAS.
Over all good job. Good Luck.

IDS & Garranto

IDS | Garranto