



Products, Technical Solutions and & Contribution to the Mojaloop Community

08.03.2023



ThitsaWorks

1. Digitize

Core Banking System & Solutions

- Configurable cloud-based core banking system
- Digital Field Applications (DFAs) for loan officers
- Digital Identity (Thitsa Digital ID)
- Customized Reporting (Regulatory and MIS)

2. Payments

Real-time Payment Solutions

- Interoperable, Push Payment System (Mojaloop)
- Cross-border Payment and Cross Network Provider
- Thitsa Payment Portal (TPP) / Web-based Payment Platform
- Payment Scheme Governance and Hub Operations

3. Insight

Credit Intelligence Platform

- Microfinance Credit Information Exchange (MCIX)
- MCIX Credit Information APIs for Field Application

4. Access

Training for Financial Inclusion

- Digital Financial Literacy Training with MFIs
- Personal Budget Planner (Re21) and Loan Advisory
- Professional Training Platform (Money Management Academy) for MFI Staff

Speakers



Nyi Nyein Aye
Co-founder & CEO

26+ years of experience in financial inclusion, fintech, data exchange, business intelligence, real-time payment systems, finance, software development, public administration

MPA, Columbia University
MSc, City University of New York
BBA, City University of New York



Min Tha Gyaw
CSO

17+ years of experience in investment management, banking and microfinance sectors with leadership positions in strategy, corporate development, business development and partnerships

MBA, University of Chicago, Booth School of Business
Graduate Diploma, Johns Hopkins University, SAIS (Nanjing)
BA, Beloit College



Dr. Pyae Phyo Lwin
COO

10+ years of experience in microfinance sector in leadership positions, MFI operations, risk and credit management, real-time payment hub operations

MBA, European Global School University
MBBS, University of Medicine (1), Yangon



Aung Thaw Aye
CTO

13+ years of working experience as a Software Engineer/Architect in the telecommunication, payment systems, and software development industries and founded two IT startups in Myanmar and Singapore.

Bachelor of Computer Science (B.C.Sc), University of Computer Studies - Yangon



Our Journey with Mojaloop



Microfinance Use Cases

Disbursement and Repayment



Cross Border Remittance

SG-MM and SG-PH Corridors



Digitizing Agricultural Payments and Lending

Embedded Finance



Merchant Interoperability

Merchant Repository and QR Payments



Our Journey with Mojaloop



**Microfinance
Use Cases**



**Cross Border
Remittance**



**Digitizing Agricultural
Payments and Lending**

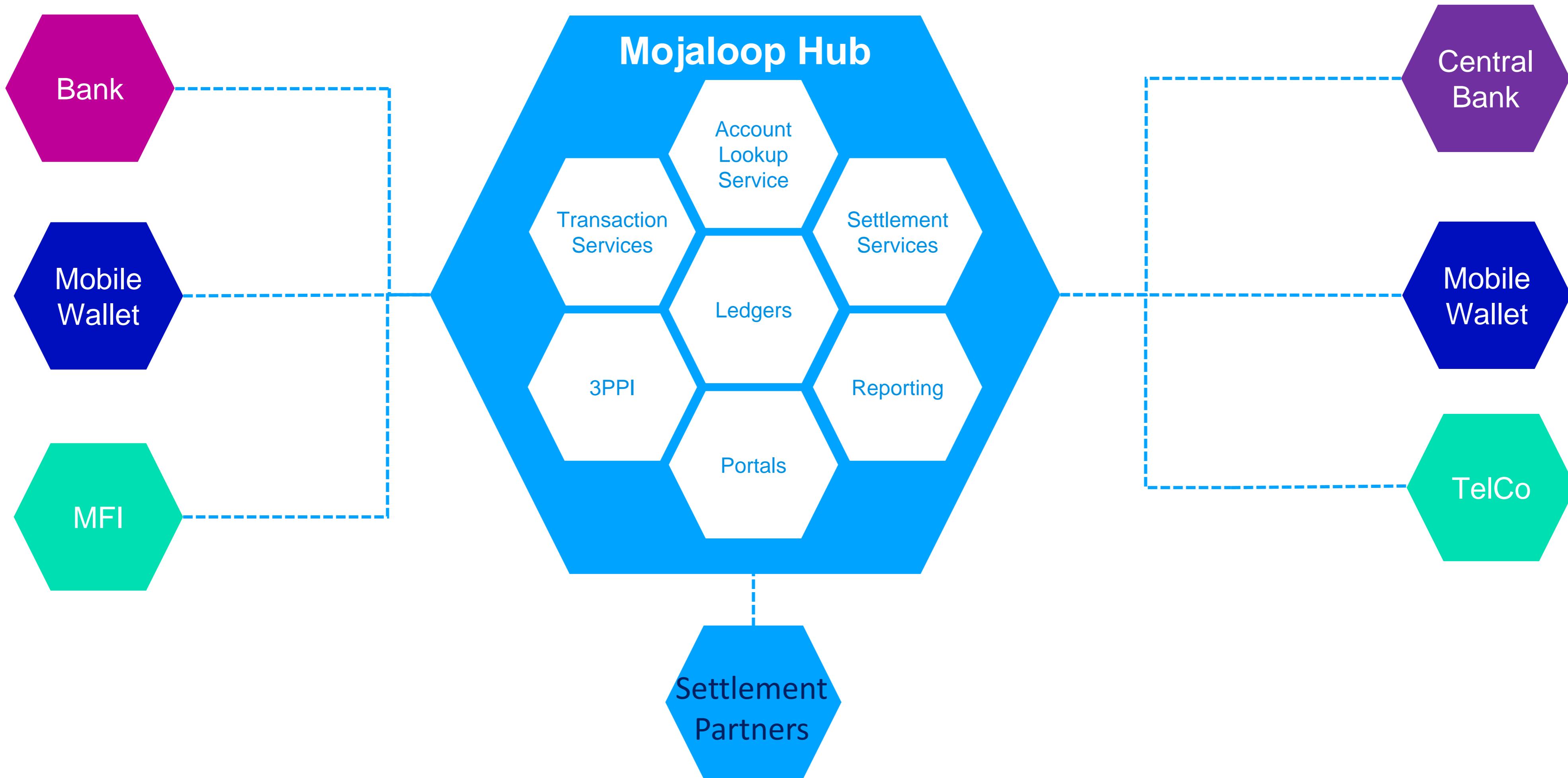


**Merchant
Interoperability**

BILL & MELINDA
GATES foundation



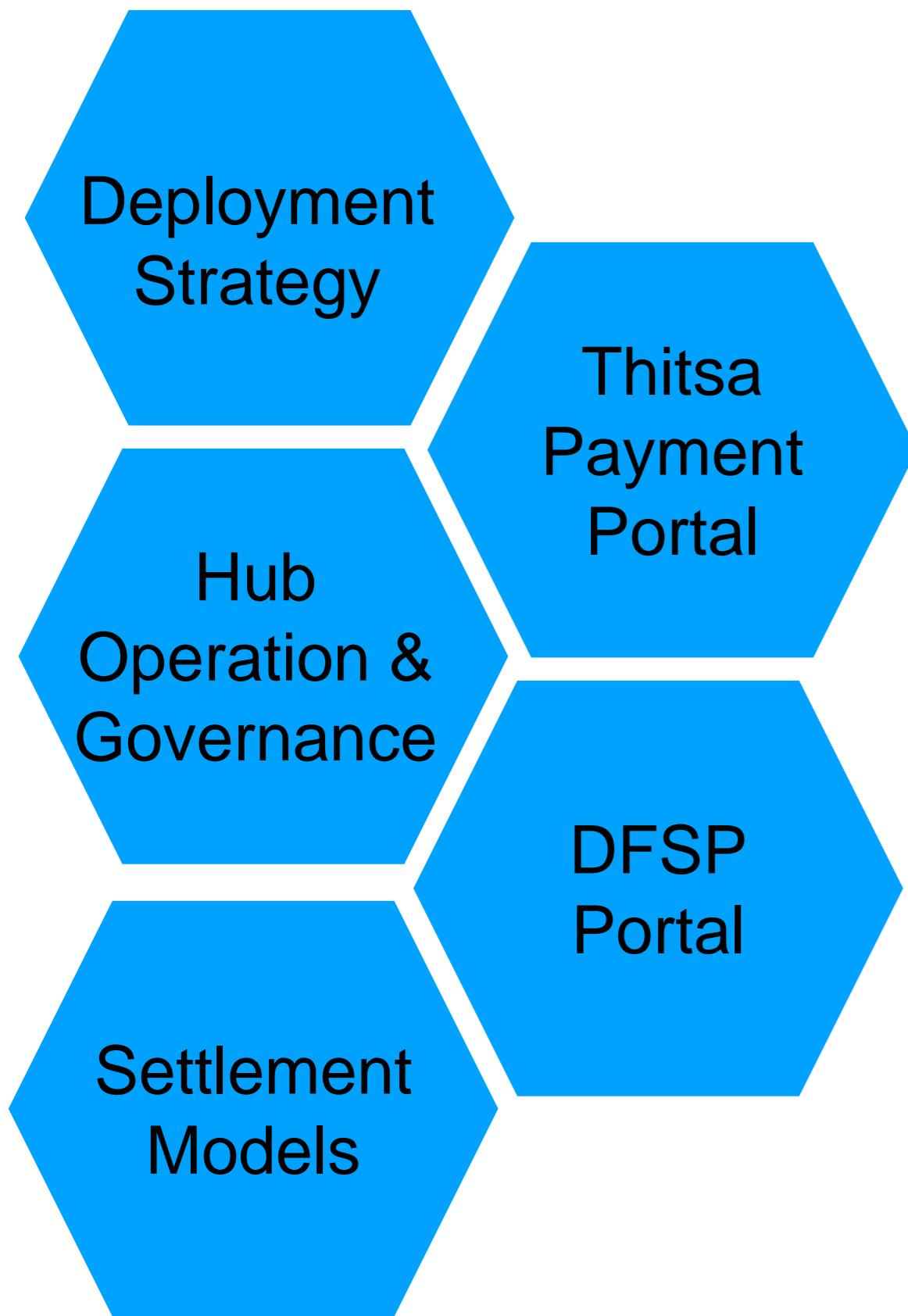
Products and Technology Solutions



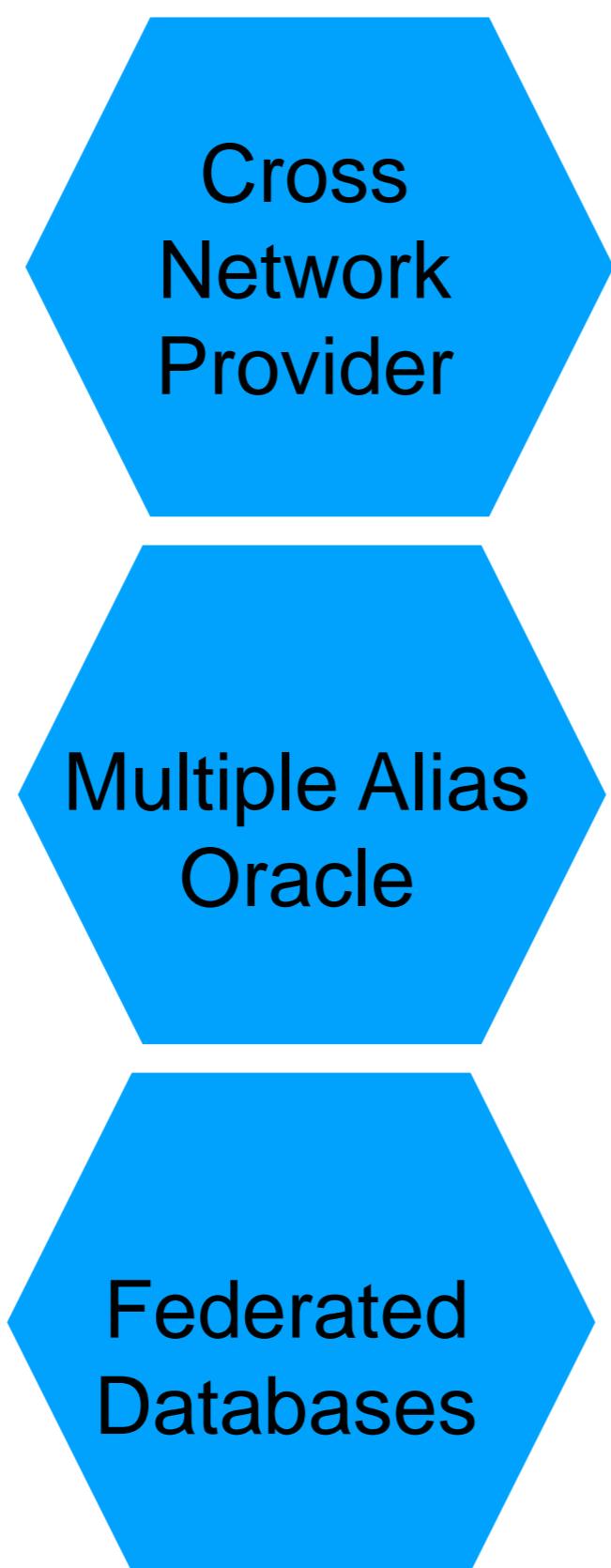


Products and Technology Solutions

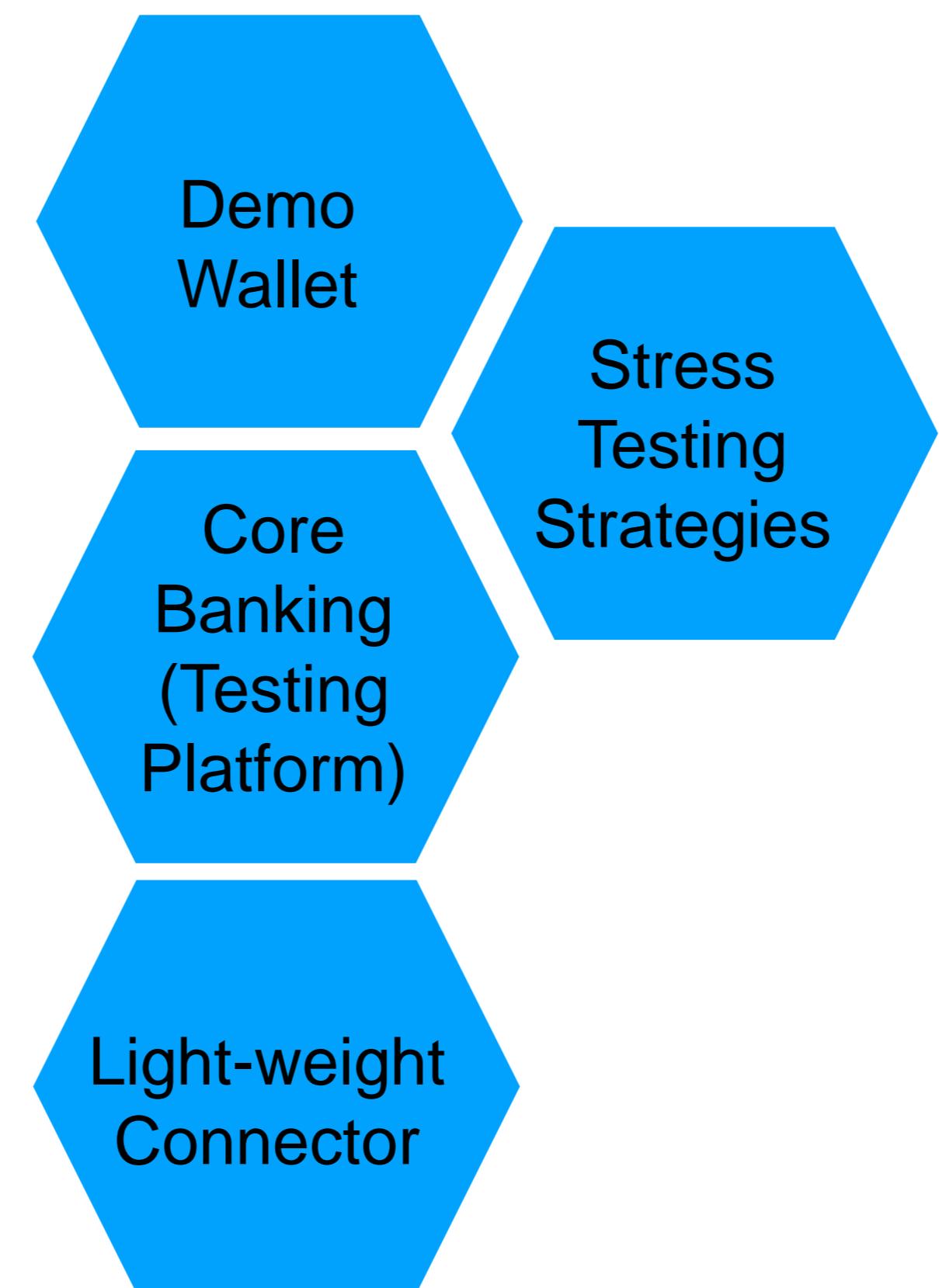
Hub Operation WynePay



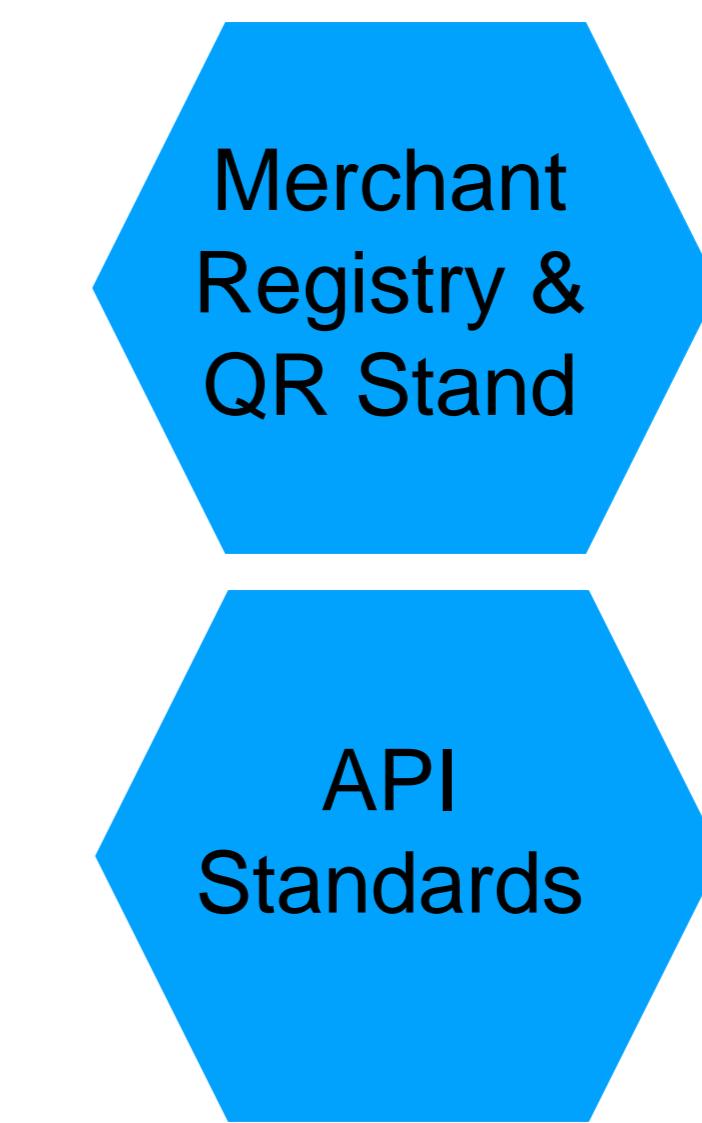
Cross Border Remittance



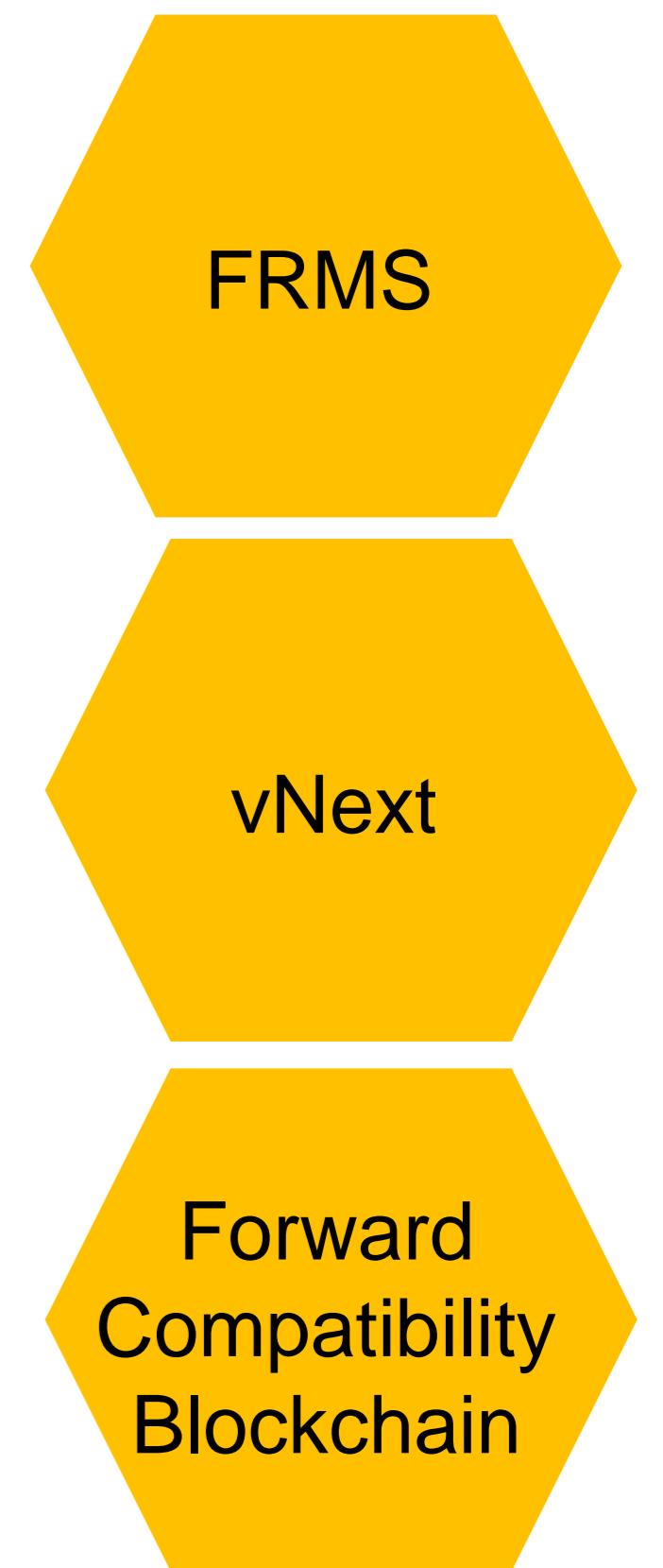
Things we wish we had when we started



Wallet Interoperability

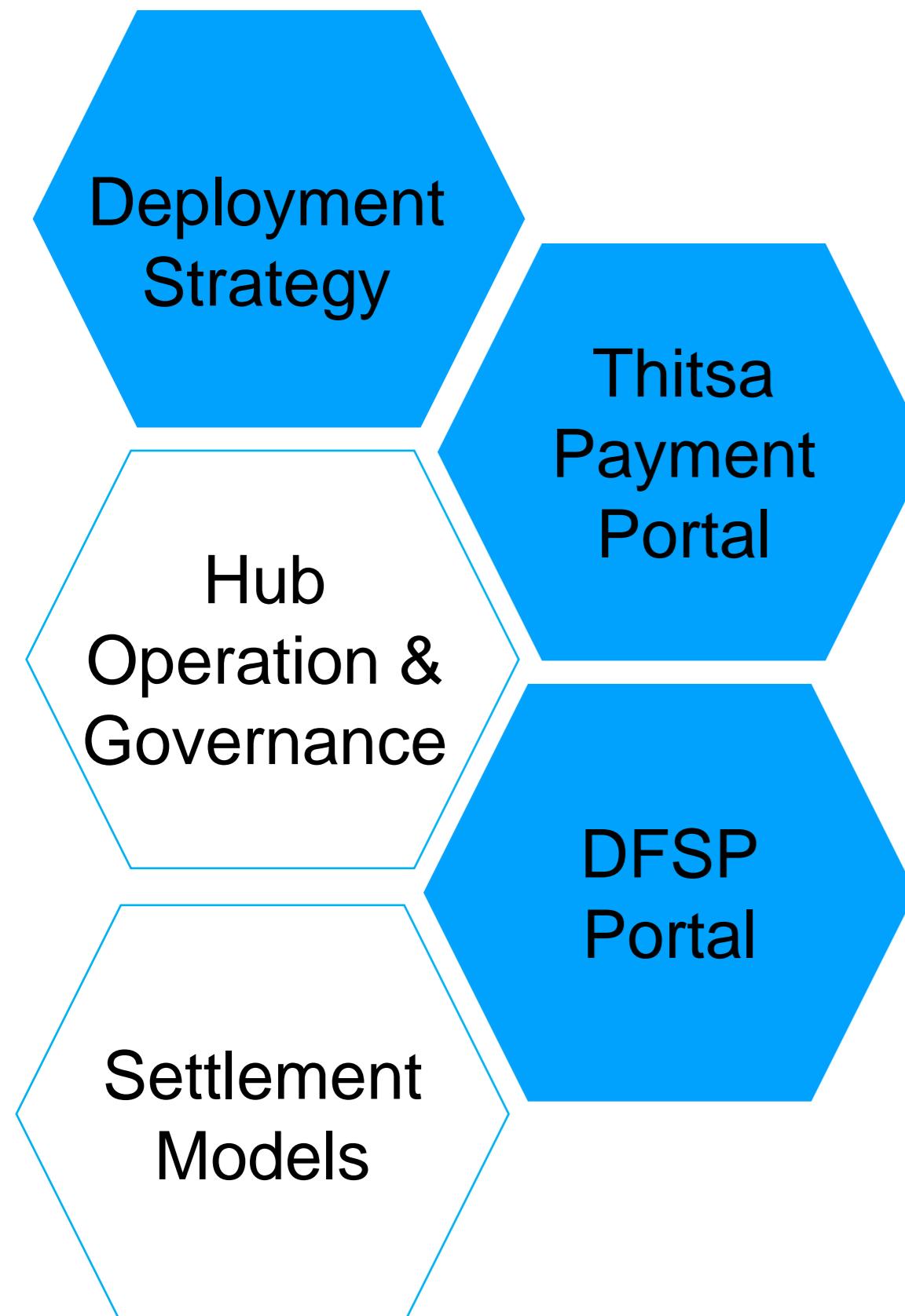


Soon (Very Soon)

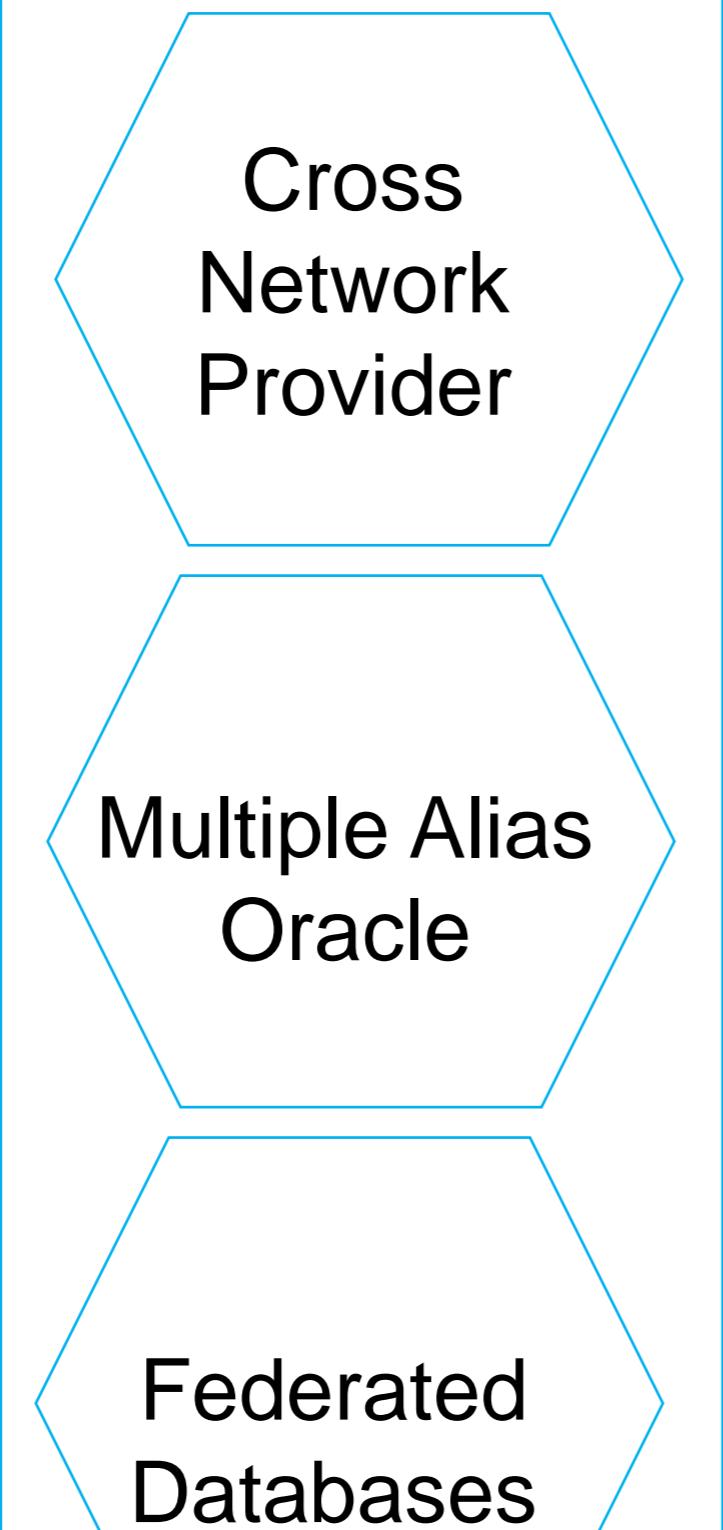


Products and Technology Solutions

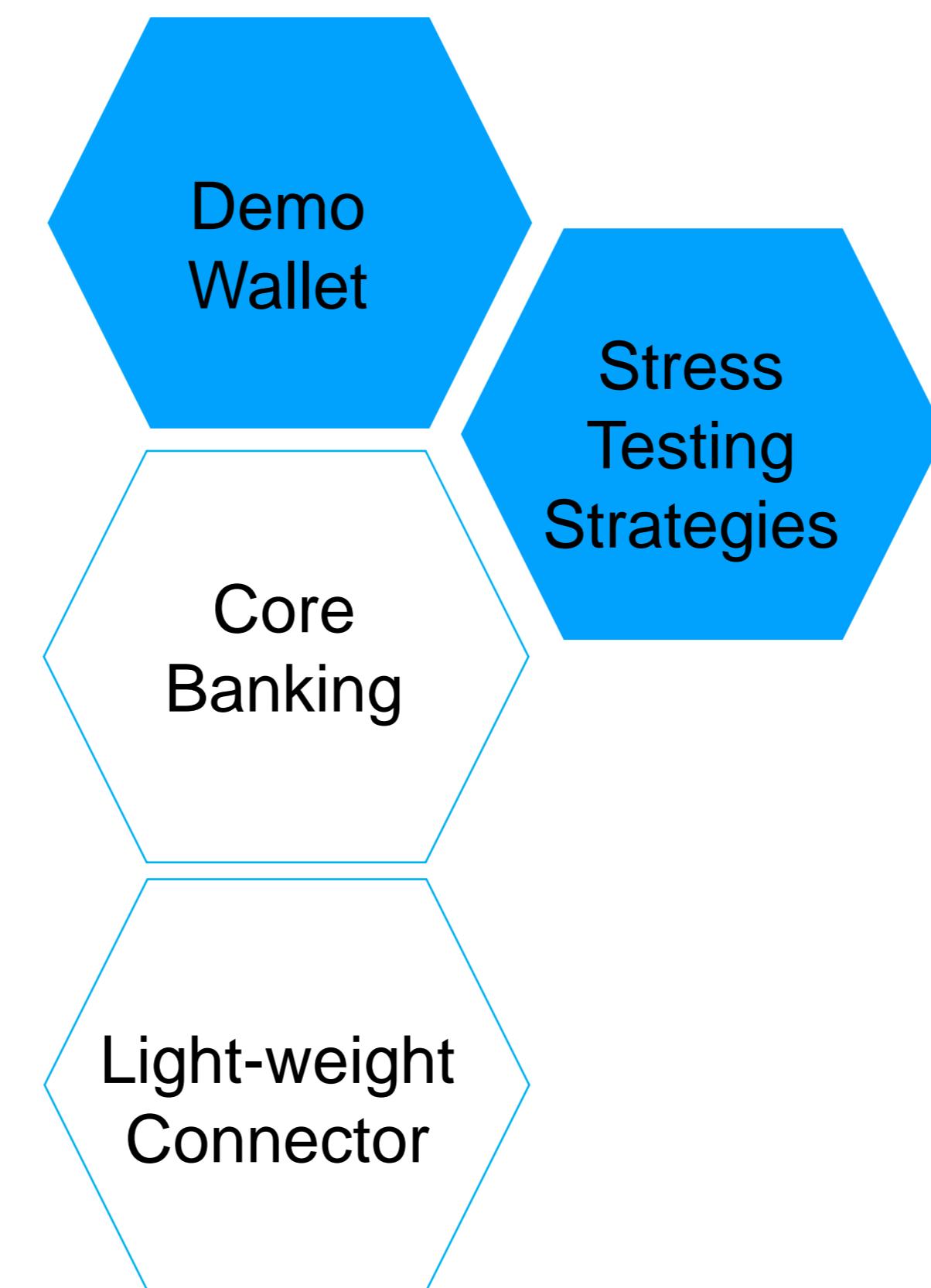
Hub Operation WynePay



Cross Border Remittance



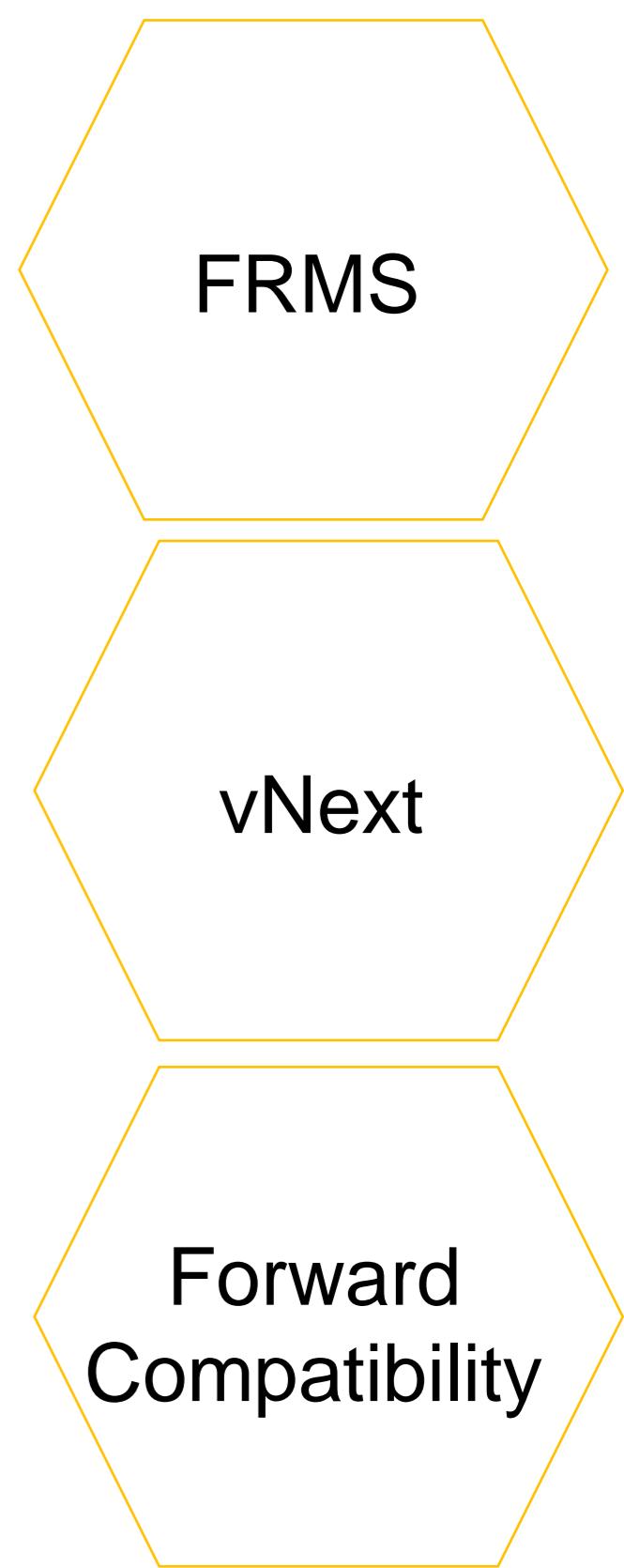
Things we wish we had when we started



Wallet Interoperability



Soon (Very Soon)





Contributions to the community ...

**Will ThitsaWorks Open Source these
Solutions ?**



Expectation

We won't go into technical detail

This presentation is designed to generate follow up discussions

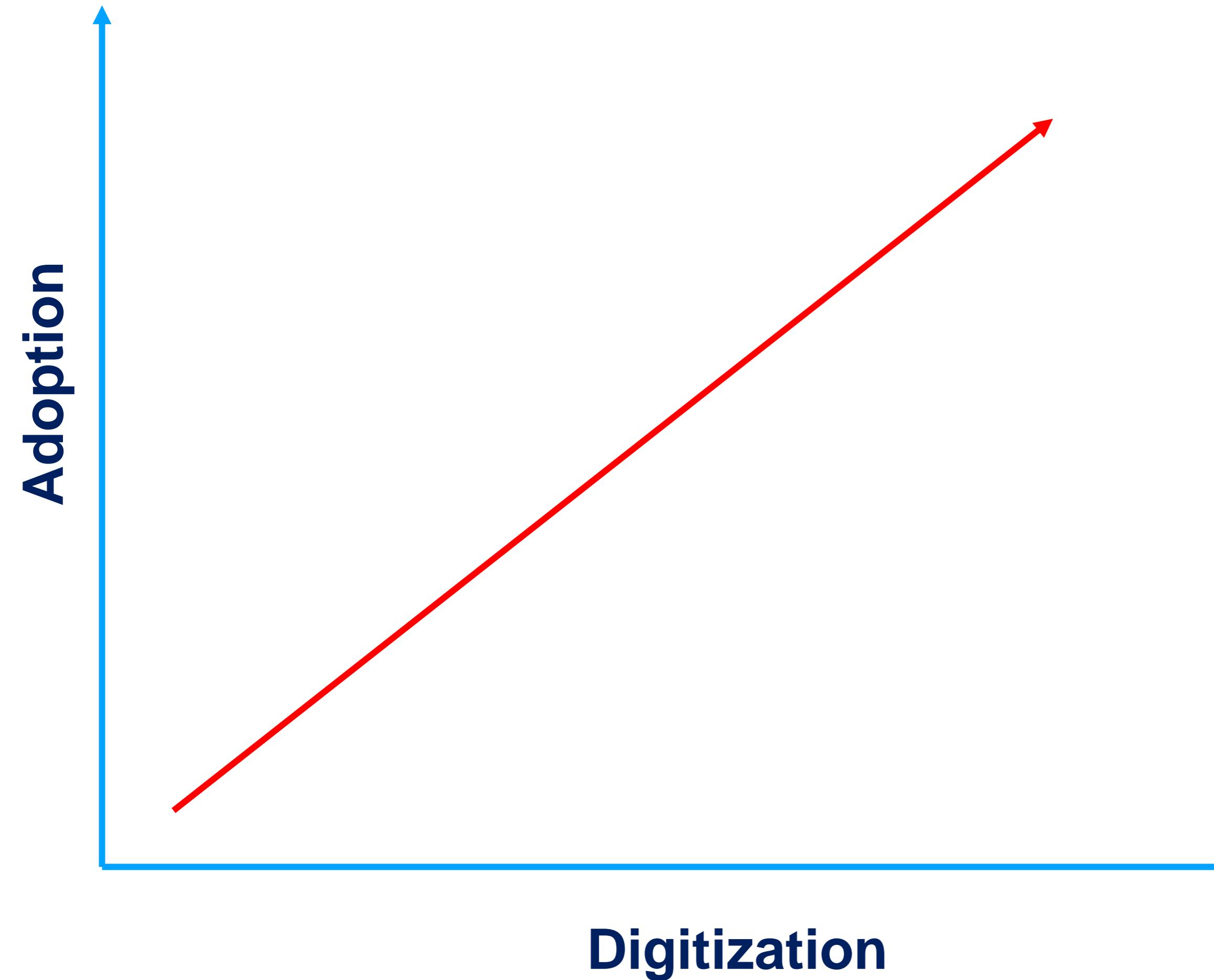
Pls come talk to us or call for tech details



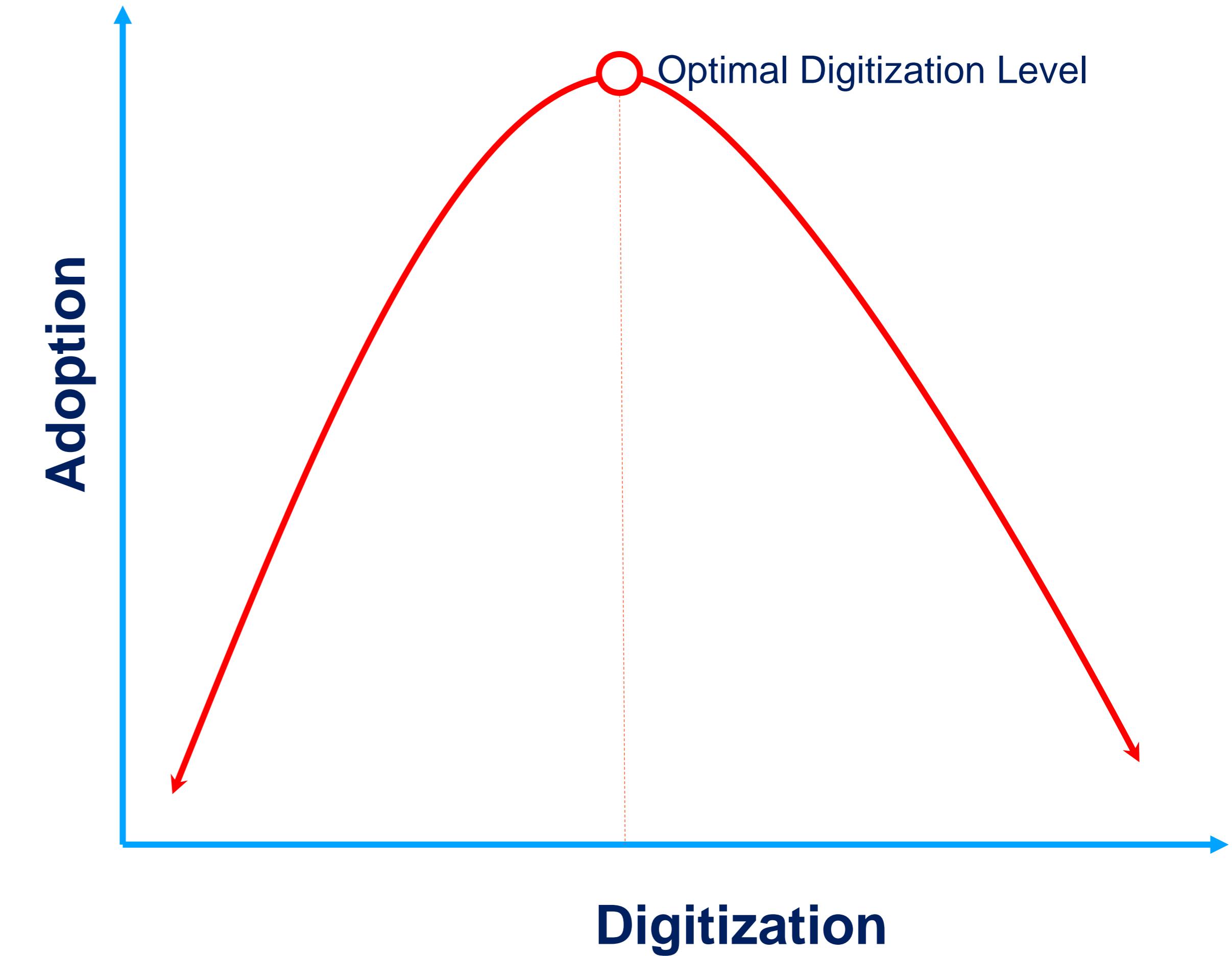
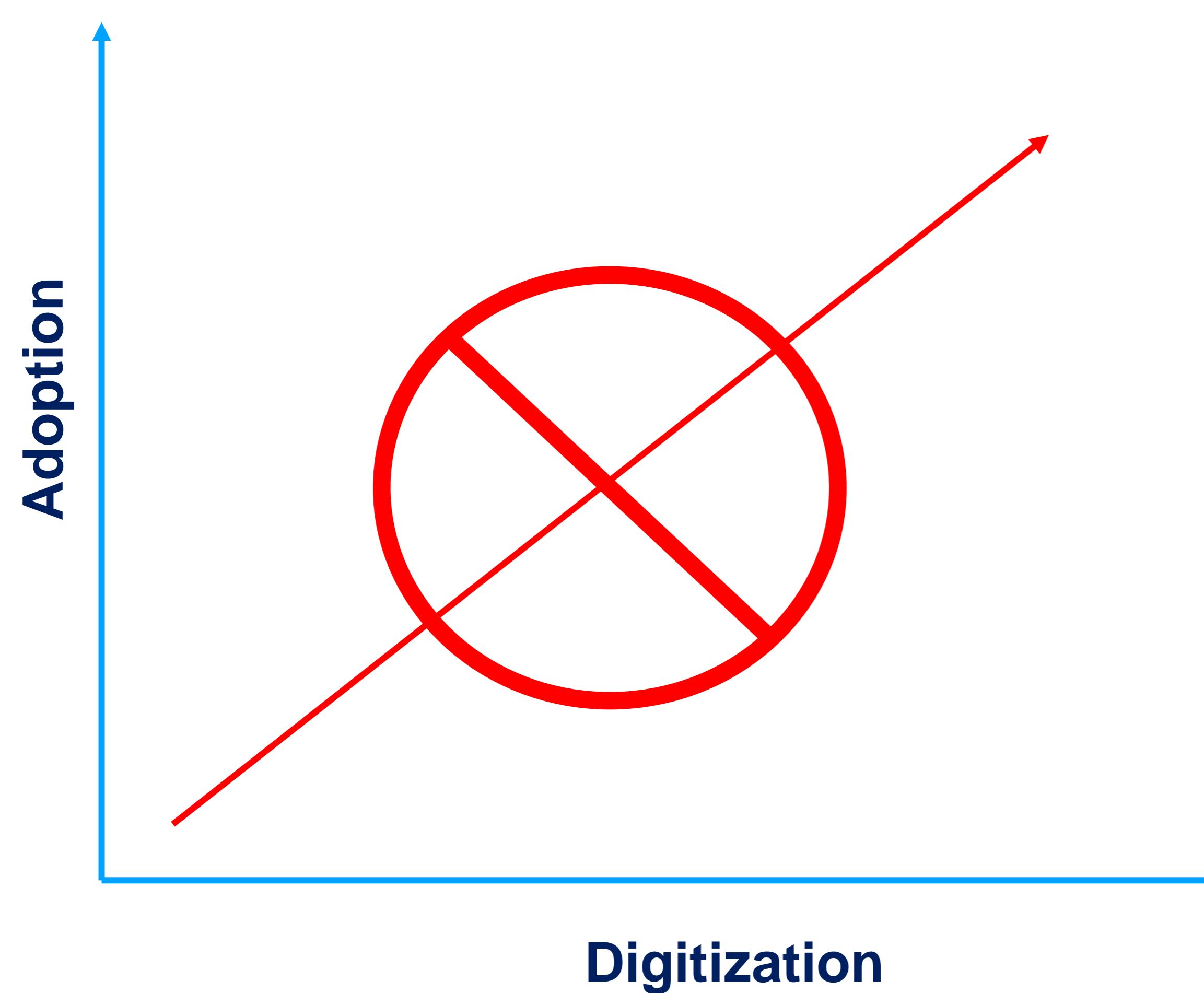
Design Considerations



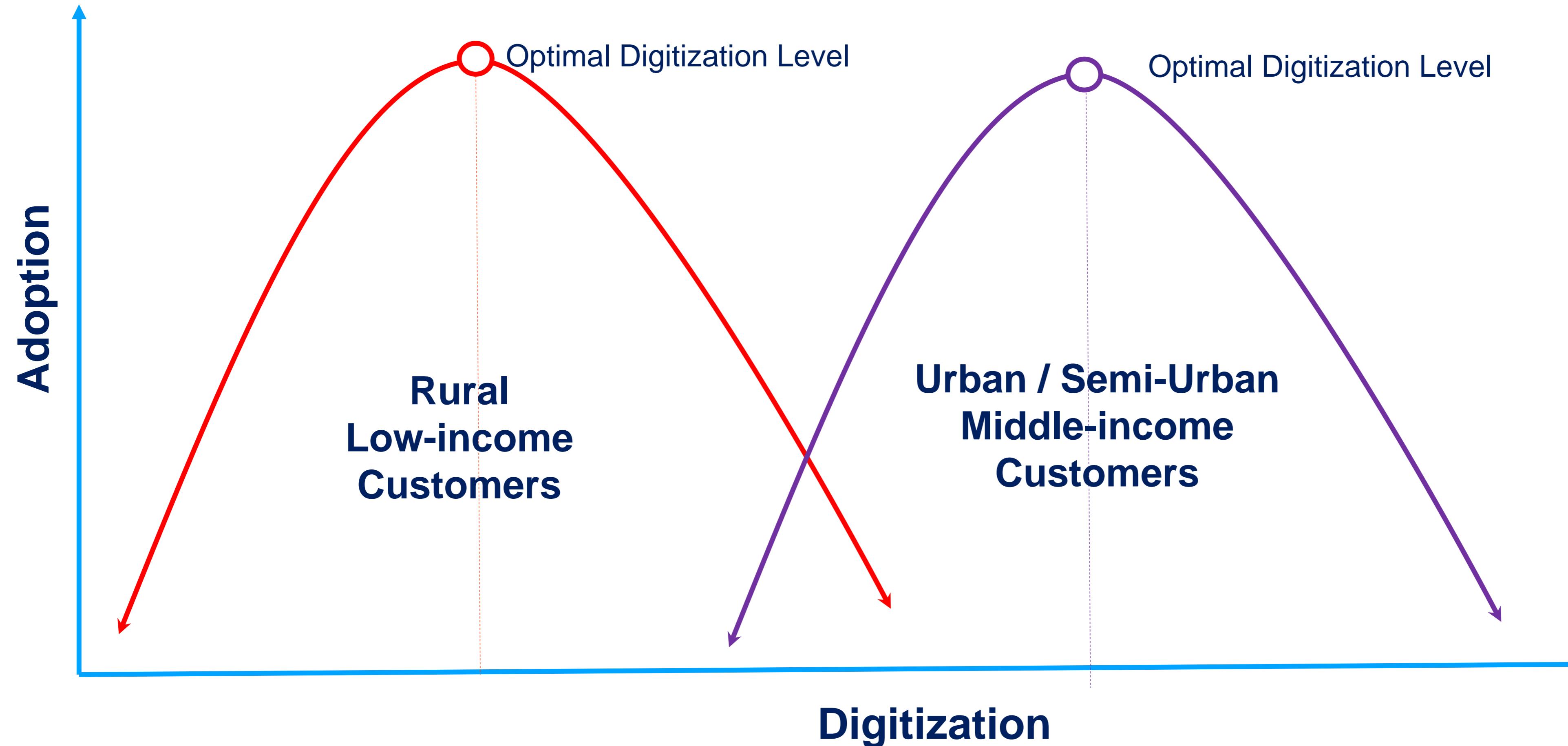
Lessons Learned – Digitization for Inclusion



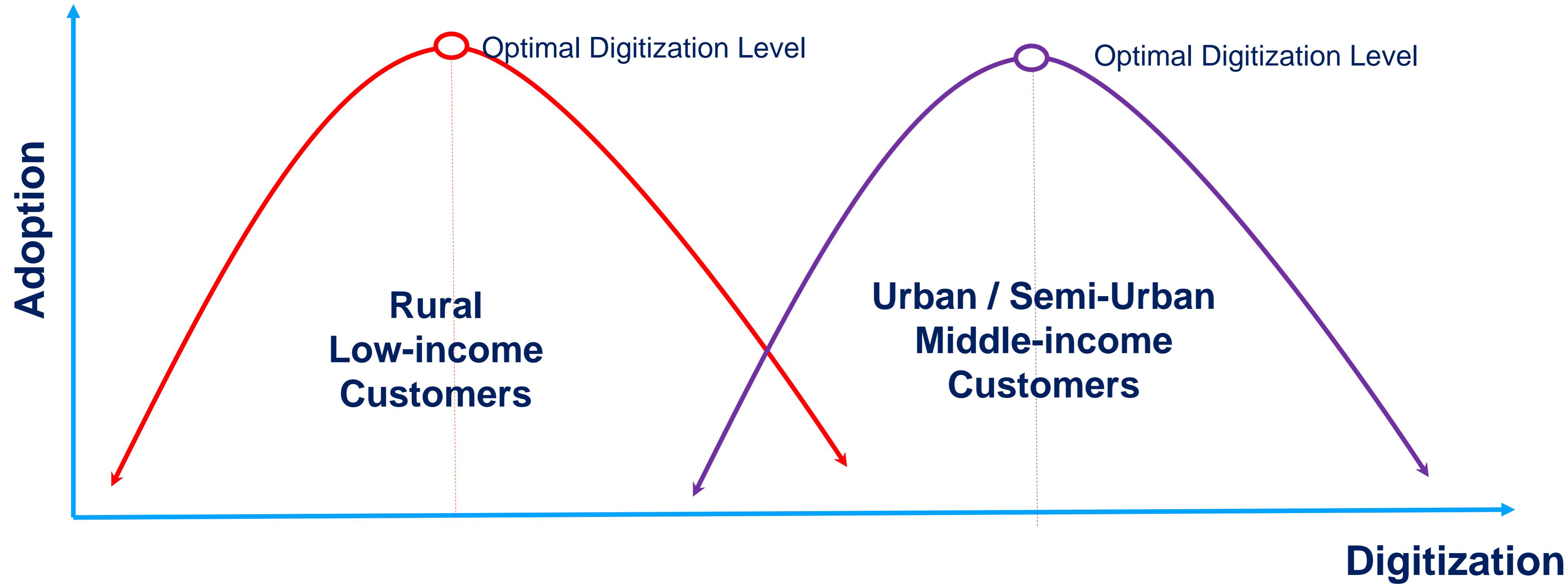
Lessons Learned – Digitization for Inclusion



Lessons Learned – Digitization for Inclusion



Lessons Learned – Digitization for Inclusion



MFIs and
Rural Banks

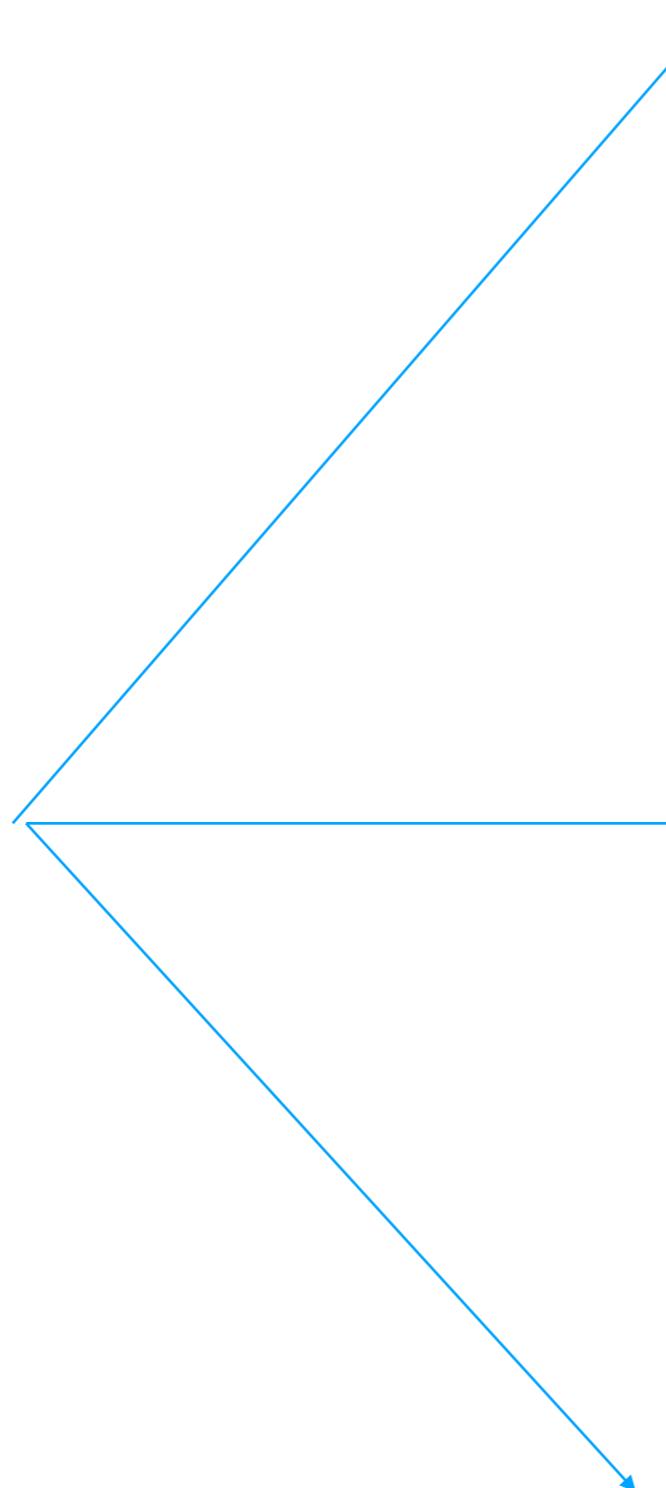


Wallets

How we view Mojaloop



Mojaloop can be used to build different things



YOUR clients will
be the best source
of insight for what
to build

What should we build ?

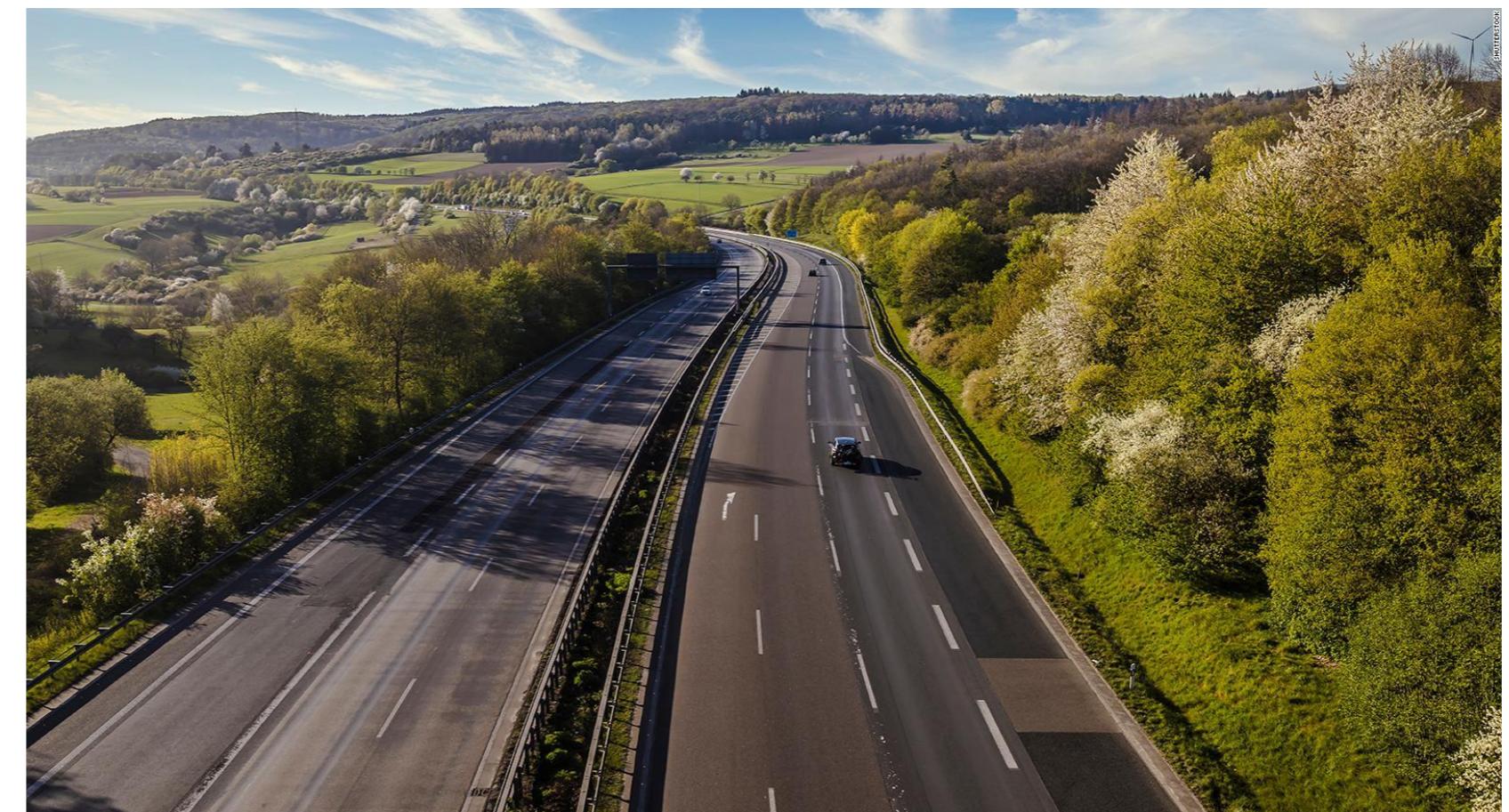
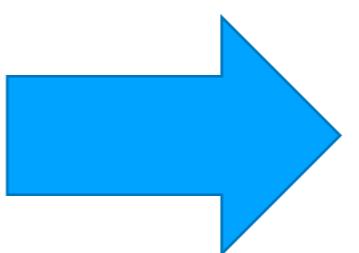




We are building in the environment where ...

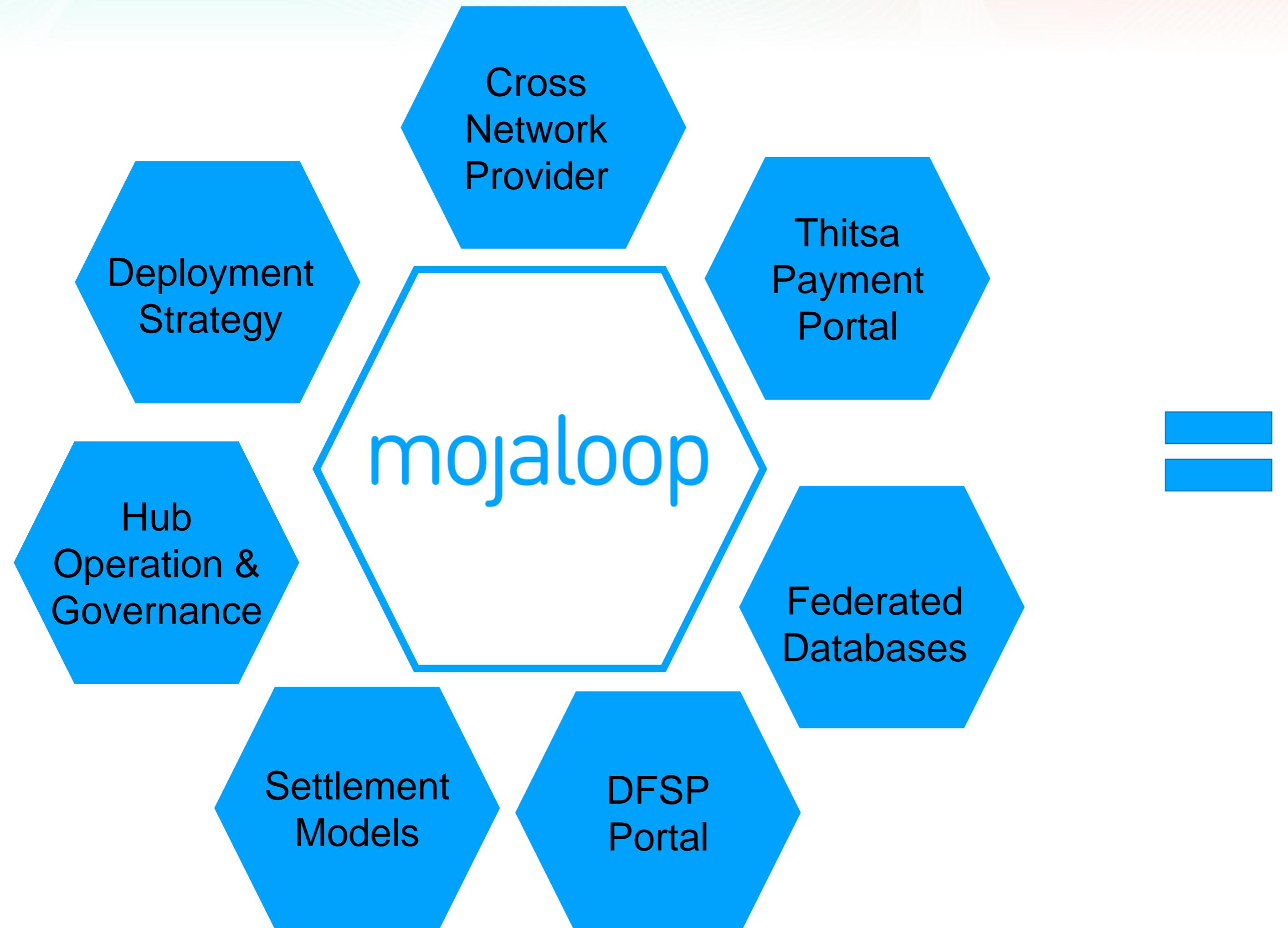
- Internet Connectivity can be limited
- Power / Electricity can be inconsistent
- Not all end users will have smart phones – and many users will share one
- Not all DFSPs are adequately digitized (i.e. core banking, API capabilities, etc.)
- Internal capacity of DFSPs can be constrained
- Regulatory reporting requirements can be extensive (and multiple regulators)
- Infrastructure preference of DFSPs (or that of regulators) can varies (lack of standardization)

What should we build ?

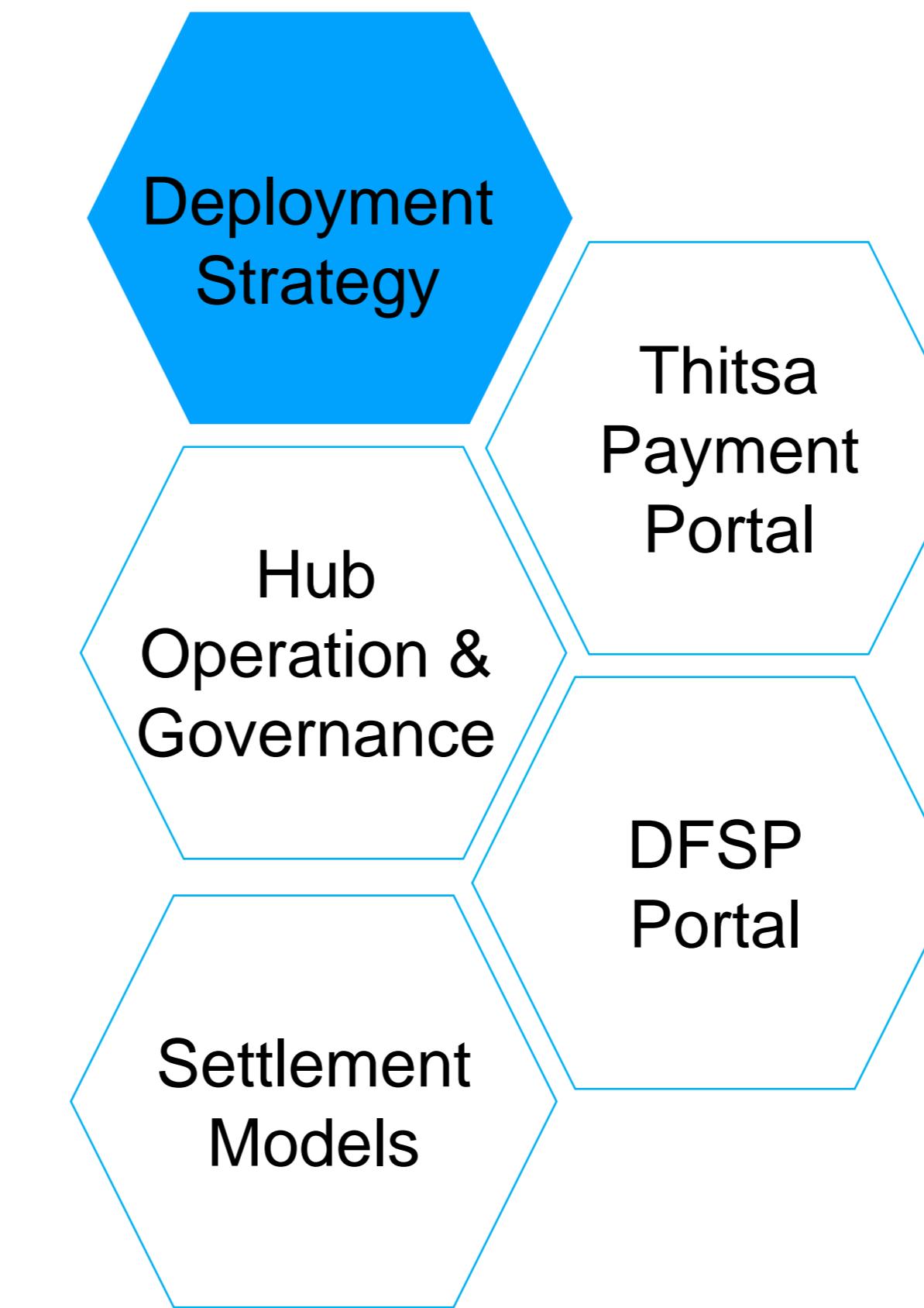


- Open Finance
- API-Driven

Thitsa Works with Mojaloop

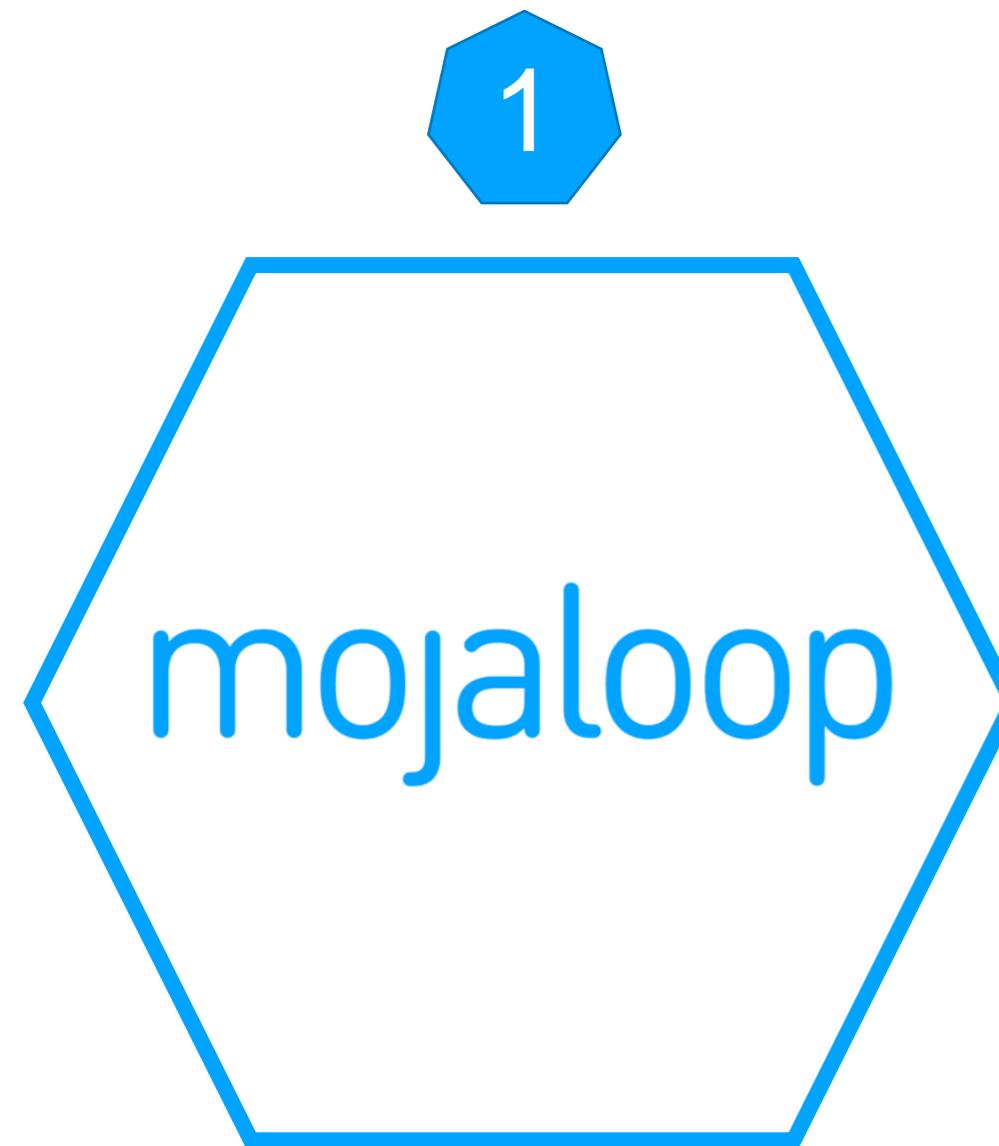


Hub Operation





Deployment Experience



WynePay

- Deployment
- Upgrades



MAS POC SG-PH, SG-MM

Planned but did not
deployed as
requirement changed



Cross Border Remittance POC

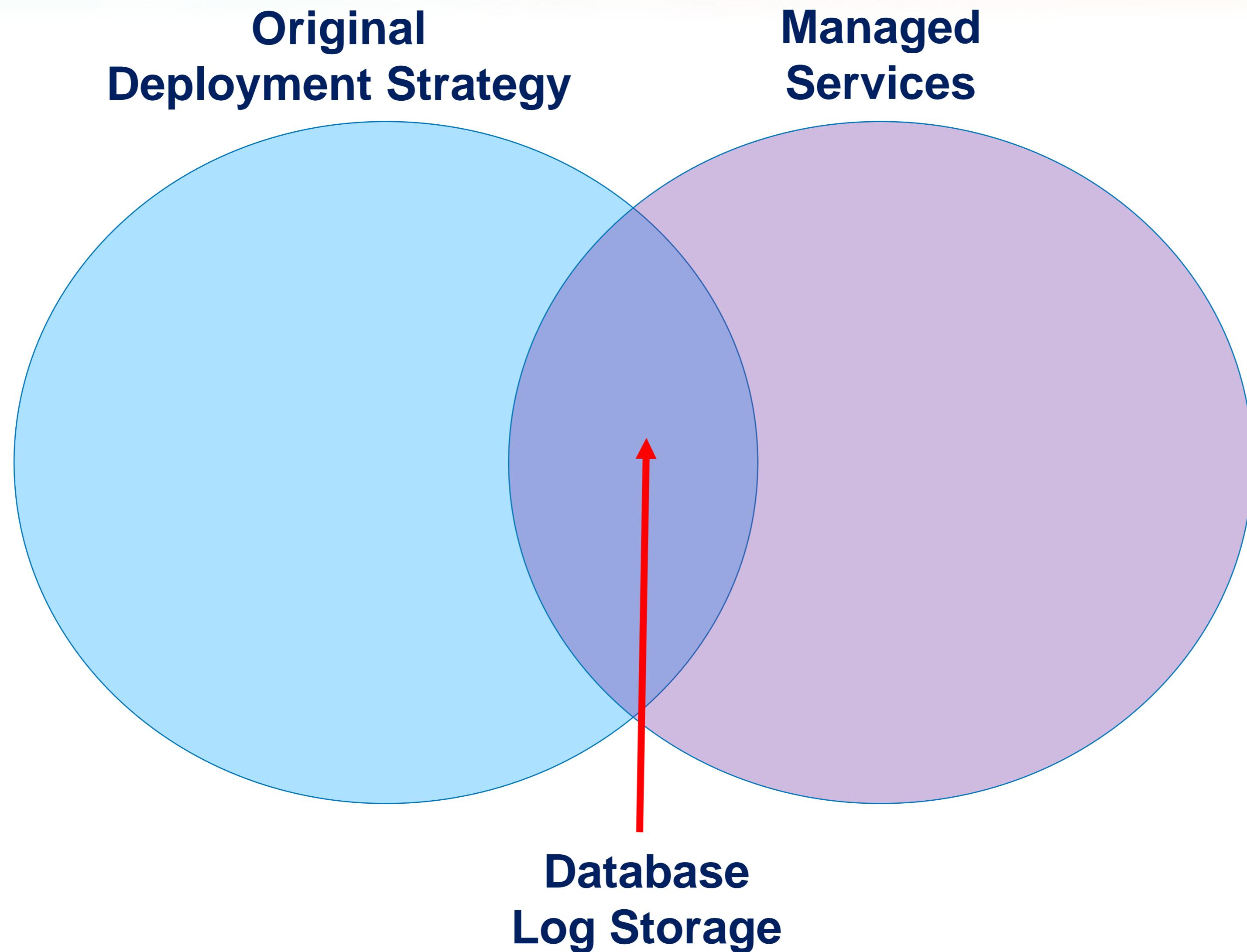
Deployment – 3 days
Mojaloop + CNP



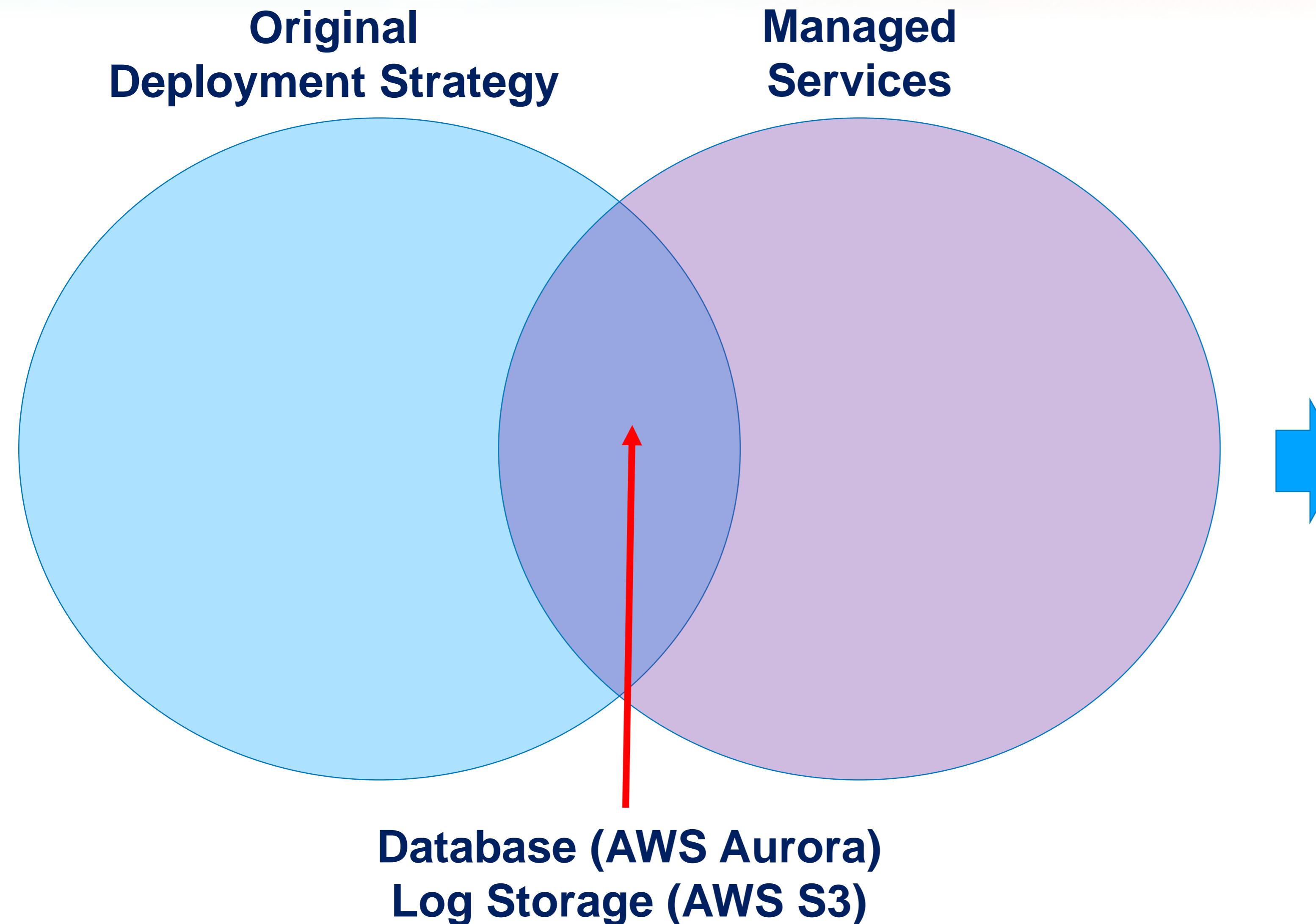
Wallets Interoperability (Planning)

Replacing bilateral
integrations with
standardized APIs

Infra as Code (IAC), Managed Service, etc ...

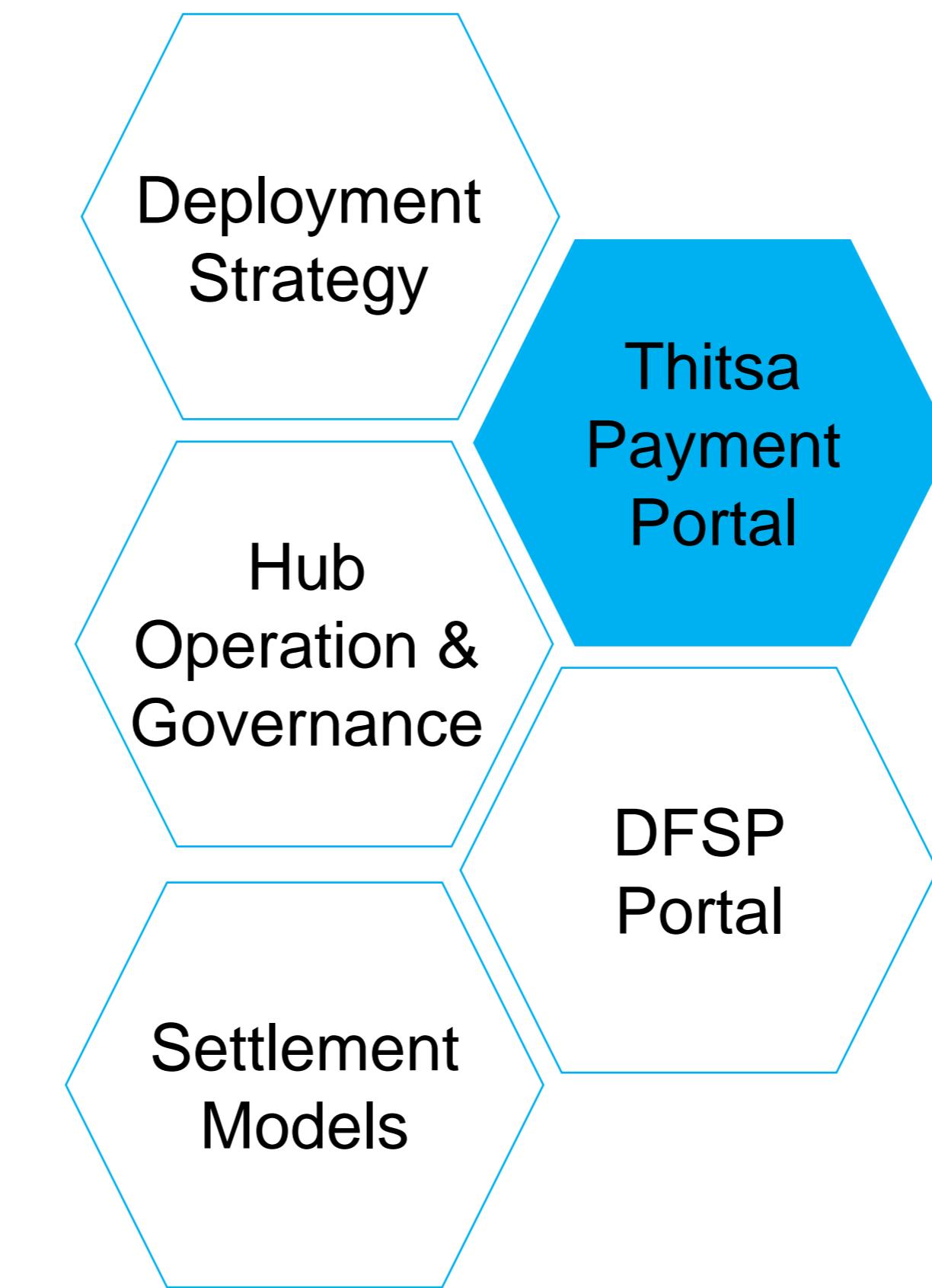


ThitsaWorks' Deployment Approach



- Reporting Requirements (Regulatory and MIS) – Heavy
- DFSP Portal (Real-time Settlement Transparency)
- Performance / Stability of Hub
- Data Analytics (Predictive)
- FRMS (Fraud Risk Management System)
- Redundancy / Disaster Recovery (DR – regulatory requirement in some areas)

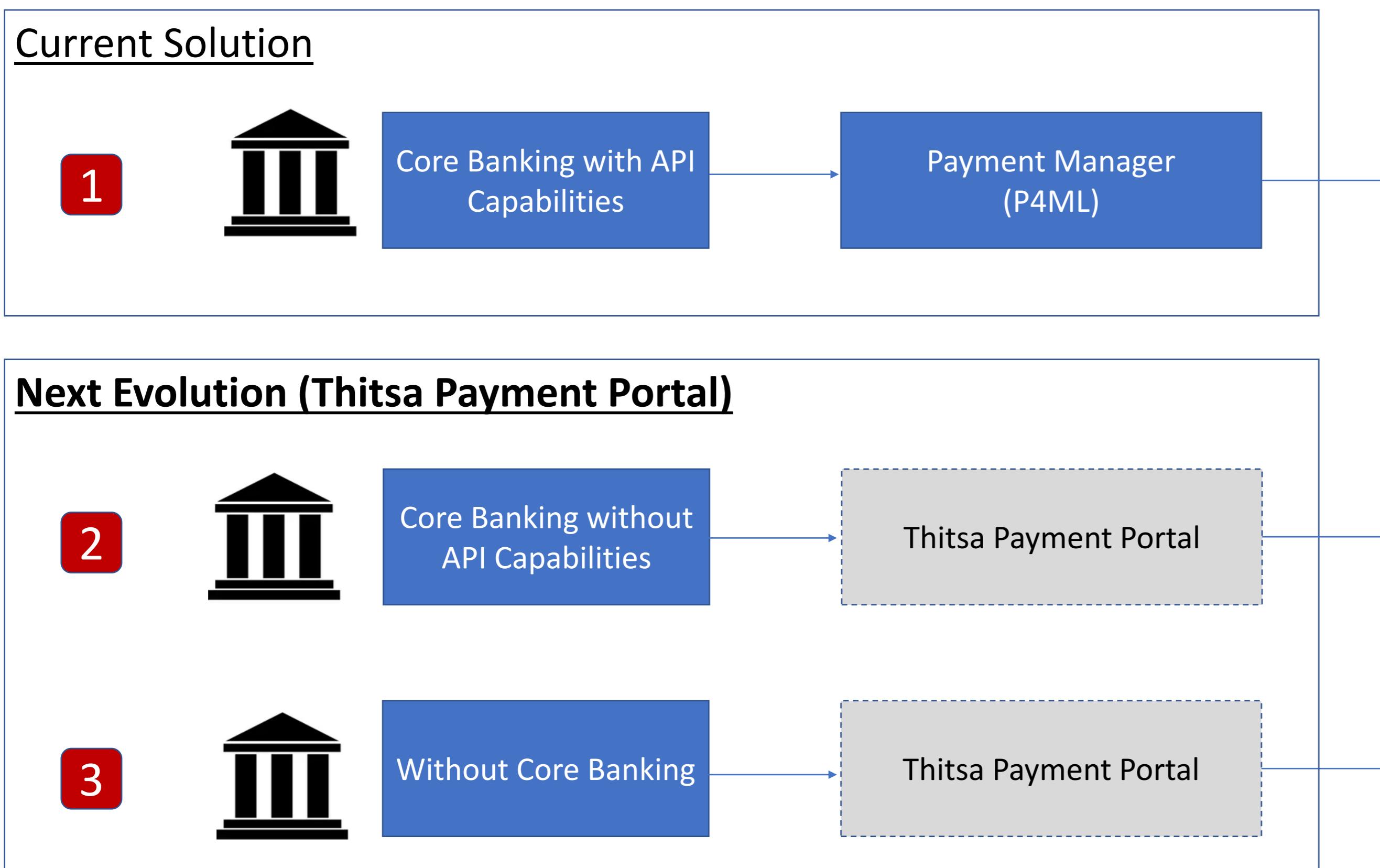
Hub Operation



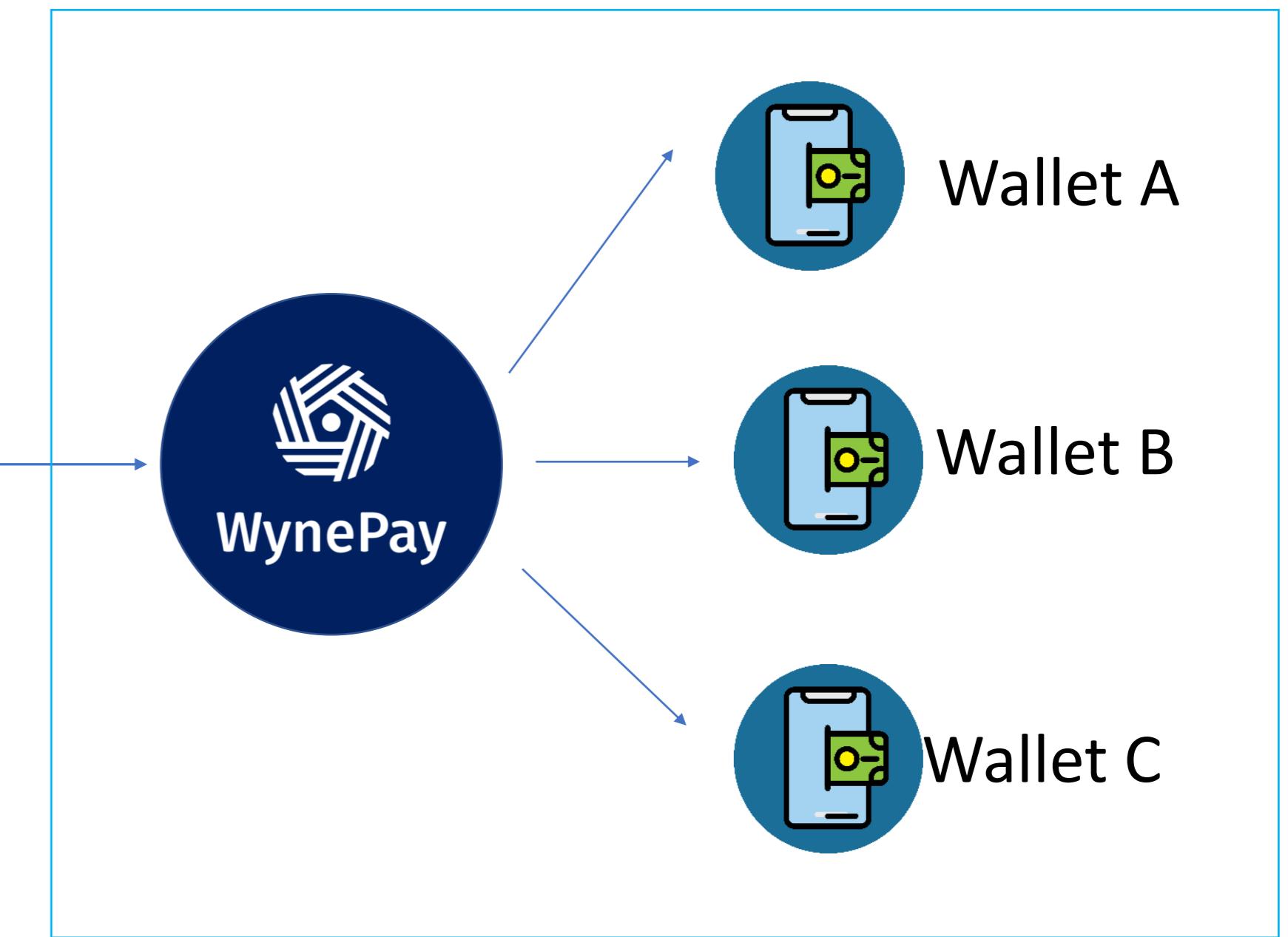
Interledger
FOUNDATION

Onboarding ALL DFSPs (Ecosystem and Scale)

Different Type of MFIs Connection Solutions

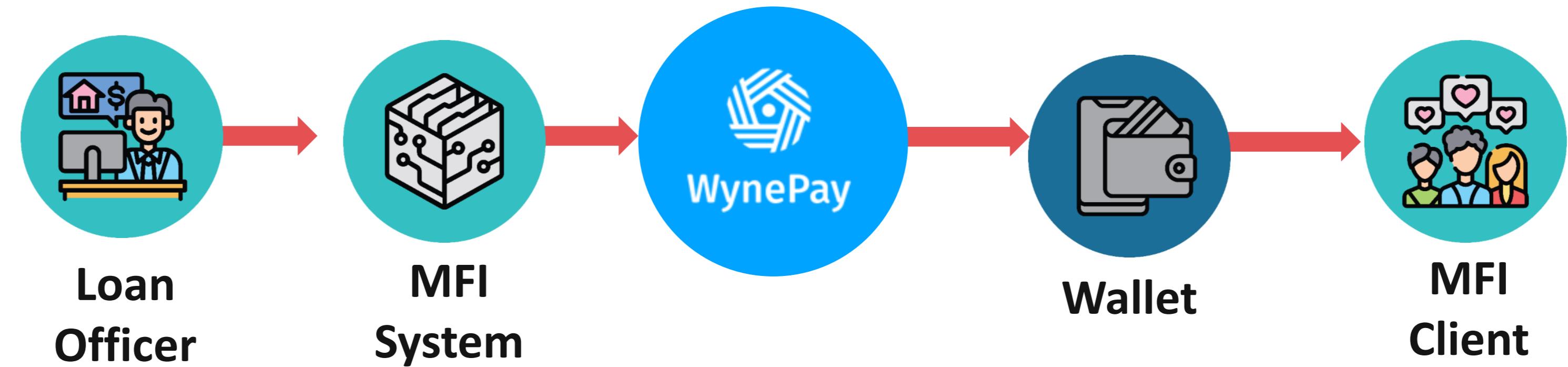


Interoperable Payment/Wallet System for Loan Disbursement and Repayment

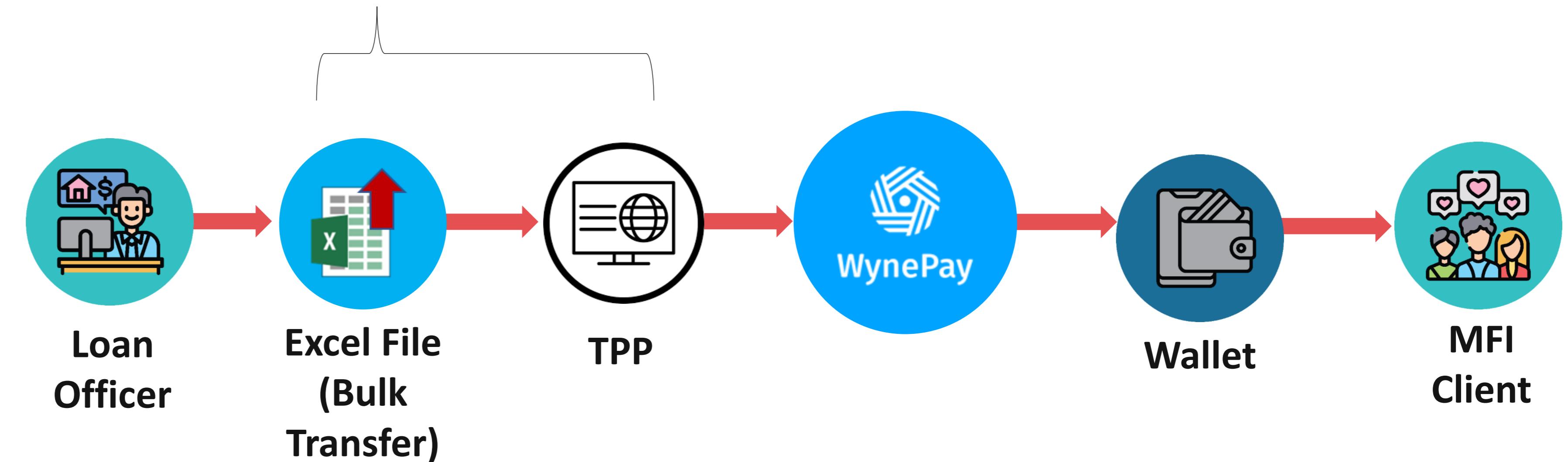


Thitsa Payment Portal (Disbursement)

MFIs with
API-capable CBS

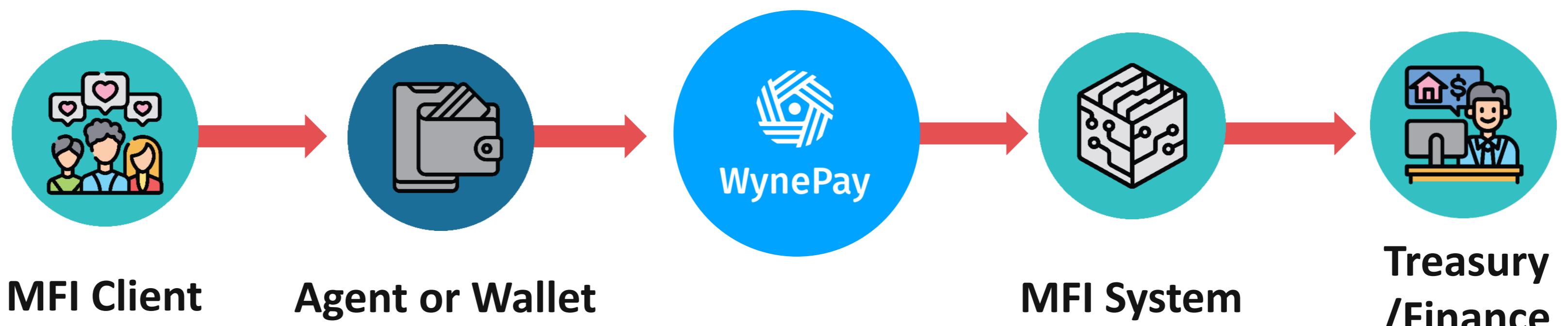


MFIs without
API-capable CBS

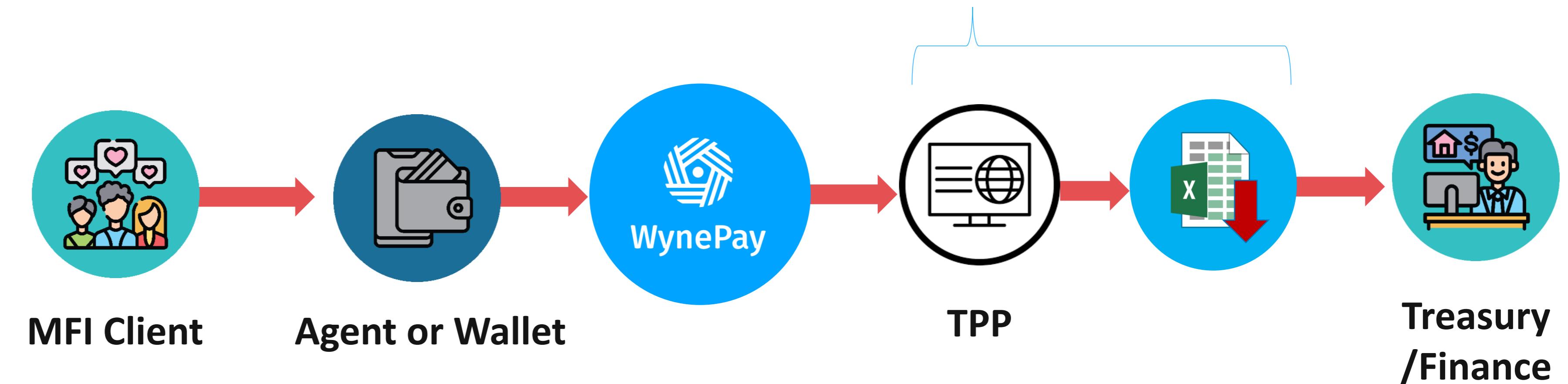


Thitsa Payment Portal (Repayment)

MFIs with
API-capable CBS

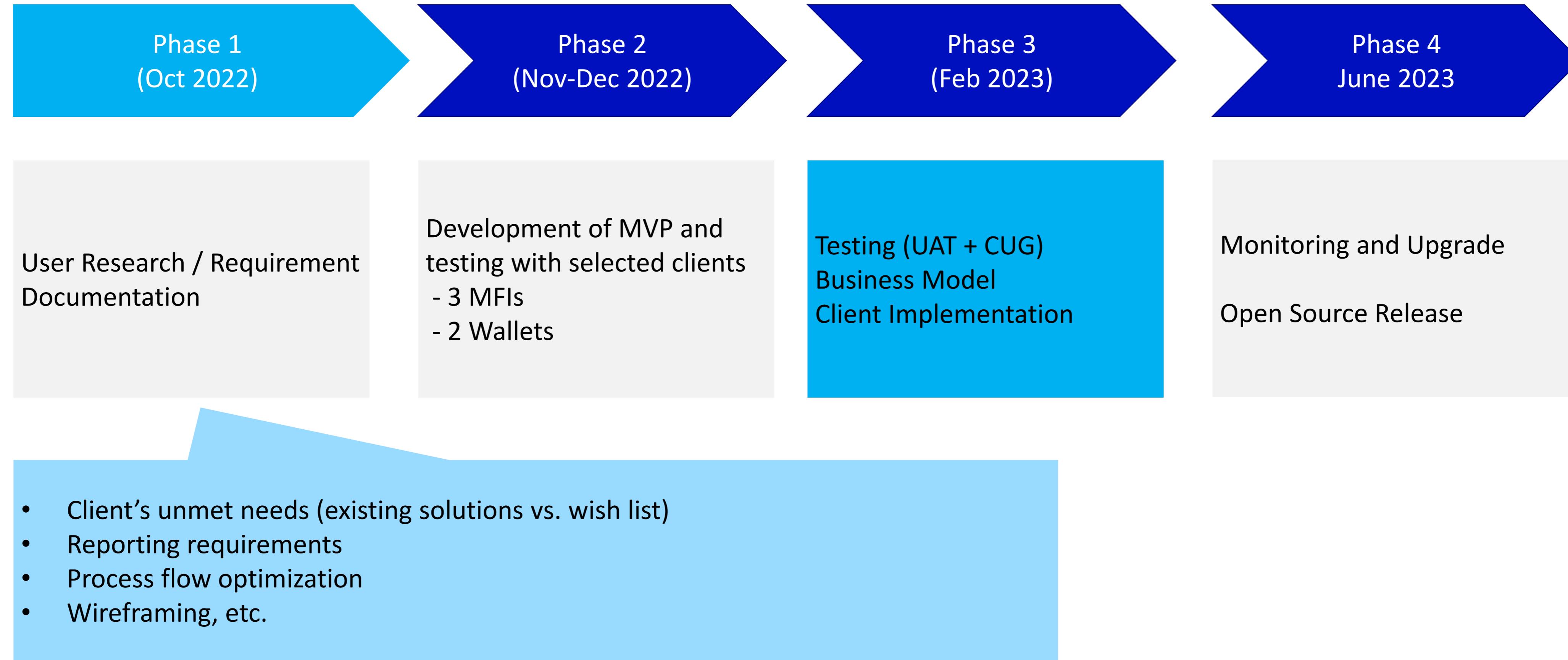


MFIs without
API-capable CBS





Development Process



Product Key Features

- **Tight Security**

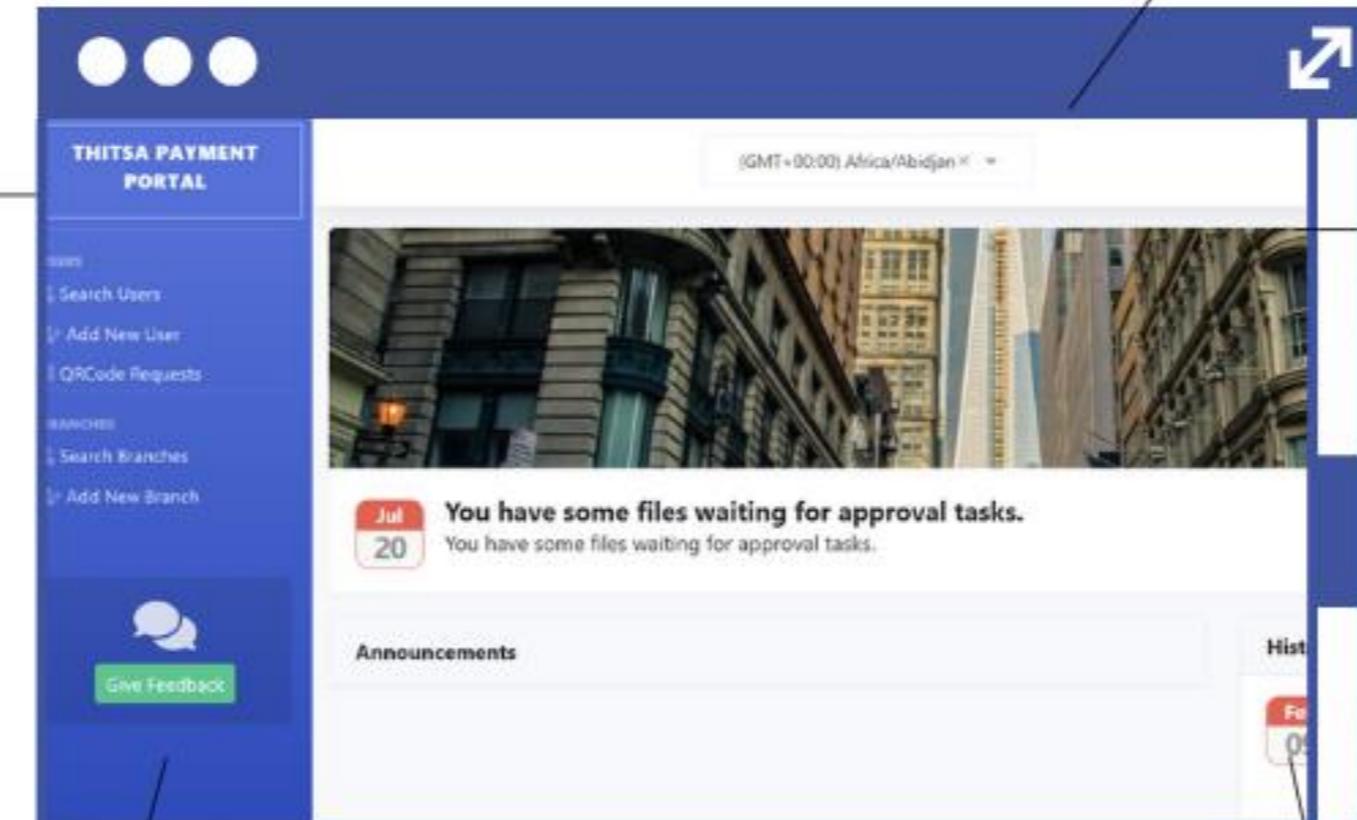
Two factor authentication

- **Search/Download transaction**

Batch (files)

Transactions

- Disbursement transactions
- Received transactions



- **User Management**

Attribute based access control system
Branches and actions

- **Payment procedure in two steps**

Maker and Checker

- **Different bulk payment types**

Repayment

Disbursement



User Management

THITSA PAYMENT PORTAL

(GMT+00:00) Africa/Abidjanx

Zar Chi Tun

First Name * Organization

Middle Name **Default Branch ***

Last Name * **Username ***

Full Name **Password ***

Phone * **Confirm Password ***

Job Title **Is Active? ***

Email *

This user is for an account manager.
Only 1 account manager allowed

*Password must be at least 8 chars with at least 1 upper case, 1 number and 1 special char.

Add Permission Copy Permission

Branch * Select All
Actions *

- Make Payment
- Delete Payment
- Make Loan Disbursement
- Approve Payment
- Reject Payment
- Download Payment
- View Loan Disbursement
- Make Batch Search
- Make Batch Search Payment
- Make Batch Search Info
- View Batch Details

Confirm

Main Page - - Maker Role

Users can do repayment and disbursement by uploading files.

THITSA PAYMENT PORTAL

TRANSFER/UPLOAD

- Bulk Payment
- Upload Info

SEARCH

- Batch
- Transaction

Give Feedback



YANGON - INSEIN - Branch 1 ▾ (GMT+00:00) Africa/Abidjan x

qalpp maker

Jul 20 You have some files waiting for approval tasks.
You have some files waiting for approval tasks.

Announcements

History

Feb 09 You have some files waiting for approval tasks.
You have some files waiting for approval tasks.

Jan 27 You have some files waiting for approval tasks.
You have some files waiting for approval tasks.

Jan 27 You have some files waiting for approval tasks.
You have some files waiting for approval tasks.



Bulk Payment (Disbursement) – Maker Role

THITSA PAYMENT PORTAL

TRANSFER/UPLOAD

- Bulk Payment
- Upload Info

SEARCH

- Batch
- Transaction

Give Feedback



YANGON - INSEIN - Branch 1 ▾ (GMT+00:00) Africa/Abidjanx ▾ qalpp maker

Jul 20 You have some files waiting for approval tasks.
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Announcements

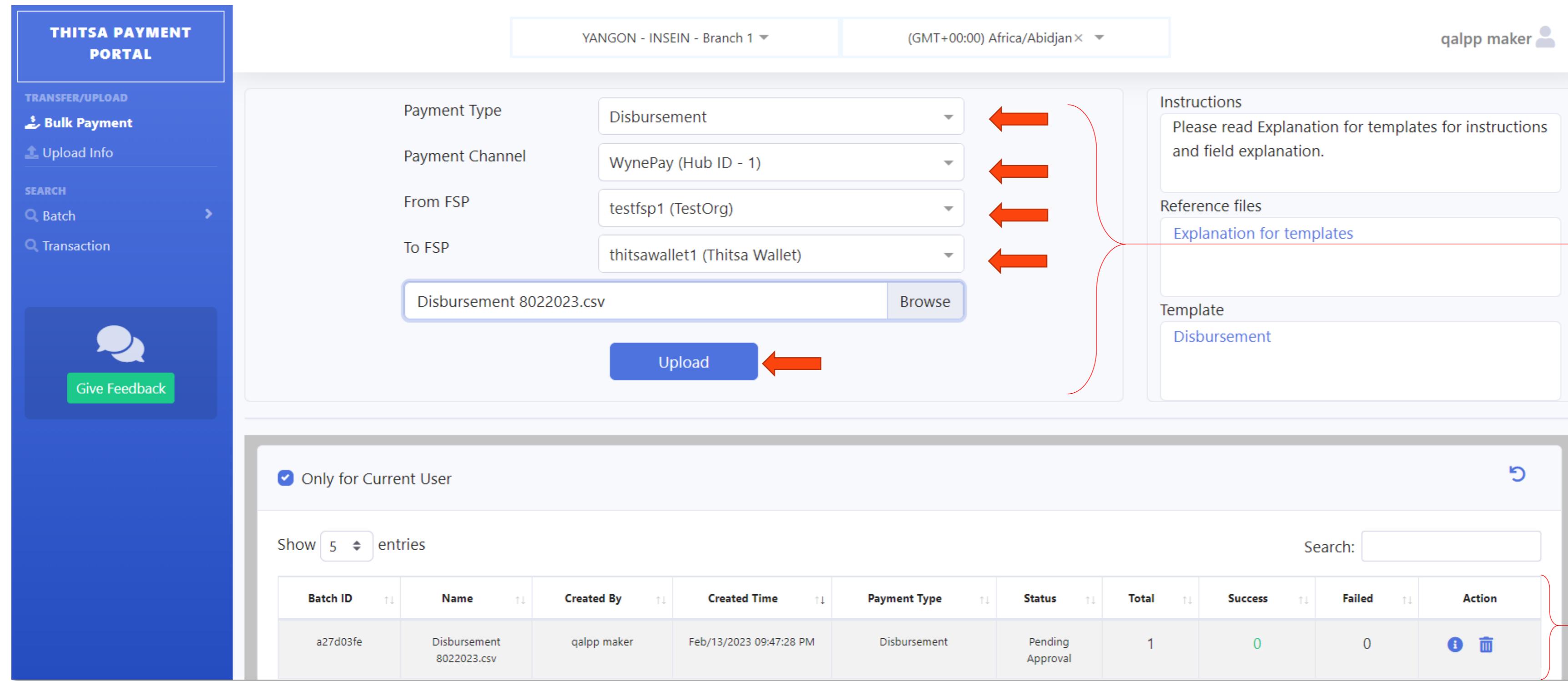
History

Feb 09 You have some files waiting for approval tasks.
You have some files waiting for approval tasks.

Jan 27 You have some files waiting for approval tasks.
You have some files waiting for approval tasks.

Jan 27 You have some files waiting for approval tasks.
You have some files waiting for approval tasks.

Bulk Payment (Disbursement) – Maker Role



THITSA PAYMENT PORTAL

TRANSFER/UPLOAD

- Bulk Payment**
- Upload Info**

SEARCH

- Batch**
- Transaction**

Give Feedback

YANGON - INSEIN - Branch 1 (GMT+00:00) Africa/Abidjan

qalpp maker

Payment Type: Disbursement

Payment Channel: WynePay (Hub ID - 1)

From FSP: testfsp1 (TestOrg)

To FSP: thitsawallet1 (Thitsa Wallet)

Disbursement 8022023.csv

Instructions: Please read Explanation for templates for instructions and field explanation.

Reference files: Explanation for templates

Template: Disbursement

Upload

Only for Current User

Show 5 entries

Batch ID	Name	Created By	Created Time	Payment Type	Status	Total	Success	Failed	Action
a27d03fe	Disbursement 8022023.csv	qalpp maker	Feb/13/2023 09:47:28 PM	Disbursement	Pending Approval	1	0	0	Info Delete

Users can see the error details of the data as soon as they upload the file if the data is invalid or incorrectly formatted

If there is some maintenance on the data (for instance, if the maker wants to change the amount before approving), users can also delete the file before approving the file by checker and upload it again after updating.

Bulk Payment (Repayment) – Maker Role

THITSA PAYMENT PORTAL

TRANSFER/UPLOAD

- Bulk Payment
- Upload Info

SEARCH

- Batch
- Transaction


[Give Feedback](#)

YANGON - INSEIN - Branch 1 ▾ (GMT+00:00) Africa/Abidjan x ▾ qalpp maker



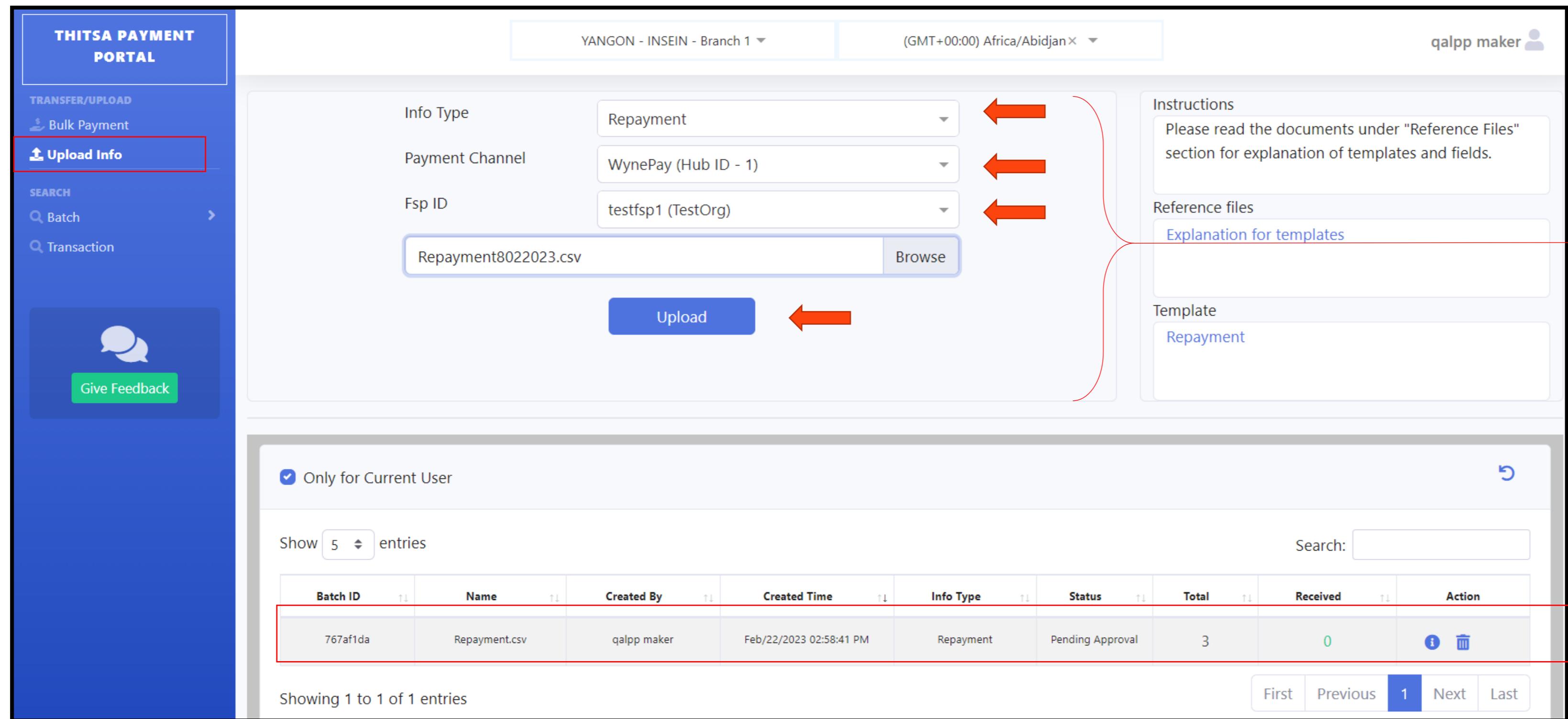
Jul 20 You have some files waiting for approval tasks.
You have some files waiting for approval tasks.

Announcements

History

Feb 09	You have some files waiting for approval tasks. You have some files waiting for approval tasks.
Jan 27	You have some files waiting for approval tasks. You have some files waiting for approval tasks.
Jan 27	You have some files waiting for approval tasks. You have some files waiting for approval tasks.

Bulk Payment (Repayment) – Maker Role



THITSA PAYMENT PORTAL

TRANSFER/UPLOAD

- Bulk Payment
- Upload Info**

SEARCH

- Batch
- Transaction

Give Feedback

YANGON - INSEIN - Branch 1 (GMT+00:00) Africa/Abidjan

qalpp maker

Info Type: Repayment

Payment Channel: WynePay (Hub ID - 1)

Fsp ID: testfsp1 (TestOrg)

File Input: Repayment8022023.csv

Upload

Instructions:
Please read the documents under "Reference Files" section for explanation of templates and fields.

Reference files: [Explanation for templates](#)

Template: Repayment

Batch ID	Name	Created By	Created Time	Info Type	Status	Total	Received	Action
767af1da	Repayment.csv	qalpp maker	Feb/22/2023 02:58:41 PM	Repayment	Pending Approval	3	0	Edit Delete

Showing 1 to 1 of 1 entries

Users can see the error details of the data as soon as they upload the file if the data is invalid or incorrectly formatted

If there is some maintenance on the data (for instance, if the maker wants to change the amount before approving), users can also delete the file before approving the file by checker and upload it again after updating.

Main Page - Checker Role

Users can check and approve the list of files uploaded from the maker role.



THITSA PAYMENT
PORTAL

TASK
Task >
Batch Action History >

SEARCH
Batch >
Transaction

Give Feedback

YANGON - INSEIN - Branch 1 ▾ (GMT+00:00) Africa/Abidjan x Zar Chi Tun 2



You have some files waiting for approval tasks.
You have some files waiting for approval tasks.

Announcements

History

Feb 21 You have some files waiting for approval tasks.
You have some files waiting for approval tasks.

Feb 20 You have some files waiting for approval tasks.
You have some files waiting for approval tasks.

Feb 19 You have some files waiting for approval tasks.



Task – Checker Role

THITSA PAYMENT PORTAL

TASK

- Task
- Batch Action History

SEARCH

- Batch
- Transaction

Give Feedback

YANGON - INSEIN - Branch 1 ▾ (GMT+00:00) Africa/Abidjanx ▾ Zar Chi Tun 2

Show 5 entries Search:

Batch ID	Name	Created By	Created Time	Payment Type	Status	Total	Success	Failed	Action
a27d03fe	Disbursement 8022023.csv	qalpp maker	Feb/13/2023 09:47:28 PM	Disbursement	Pending Approval	1	0	0	i
302d9e44	27JanDisbursementFile1.csv	Ingyin maker	Jan/27/2023 02:54:20 PM	Disbursement	Pending Approval	1	0	0	i
f52a65e2	DisbursementValid2000.csv	Yinminn QA33	Jan/24/2023 09:48:30 AM	Disbursement	Pending Approval	2000	0	0	i
9b633993	Disbursement with empty record qa.csv	Phyo Testqa1	Jan/18/2023 10:00:48 AM	Disbursement	Pending Approval	1	0	0	i
d03bdc40	Disbursement 2.csv	Phyo Testqa2	Jul/28/2022 03:38:47 PM	Disbursement	Pending Approval	8	0	0	i

Showing 1 to 5 of 13 entries

First Previous [1](#) [2](#) [3](#) Next Last

Powered by ThitsaWorks
Version 1



Task Details – Checker Role

THITSA PAYMENT PORTAL

- TASK**
 - Task
 - Batch Action History
- SEARCH**
 - Batch
 - Transaction

Give Feedback

Batch ID	Name	Created By	Created Time	Payment Type	Status	Total	Success	Failed	Action
a27d03fe	Disbursement 8022023.csv	qalpp maker	Feb/13/2023 09:47:28 PM	Disbursement	Pending Approval	1	0	0	i
302d9e44	27JanDisbursementFile1.csv	Ingyin maker	Jan/27/2023 02:54:20 PM	Disbursement	Pending Approval	1	0	0	i
f52a65e2	DisbursementValid2000.csv	Yinminn QA33	Jan/24/2023 09:48:30 AM	Disbursement	Pending Approval	2000	0	0	i
9b633993	Disbursement with empty record qa.csv	Phyo Testqa1	Jan/18/2023 10:00:48 AM	Disbursement	Pending Approval	1	0	0	i
d03bcd40	Disbursement 2.csv	Phyo Testqa2	Jul/28/2022 03:38:47 PM	Disbursement	Pending Approval	8	0	0	i

Show 5 entries Search:

Showing 1 to 5 of 13 entries First Previous

Powered by ThitsaWorks Version 1

VANGON - INSEIN - Branch 1 (GMT+00:00) Africa/Abidjan Zar Chi Tun 2

Batch ID: a27d03fe-33f7-4115-a2d3-ba9003daa4dc **Status**: Uploaded

Name: Disbursement 8022023.csv **Total Amount**: 10.00 MMK

From FSP: testfsp1 **Total Records**: 1

To FSP: thitsawallet1 **Comment**:

Payment Type: Disbursement **Payment Channel**: WynePay

Created By: qalpp maker **Created Time**: Feb/13/2023 09:47:28 PM

Download File

Action Approve Reject

Comment * (Maximum 128 characters)

Submit **Cancel**



Batch Action History

THITSA PAYMENT PORTAL

TASK

- Task
- Batch Action History

SEARCH

- Batch
- Transaction

Give Feedback

YANGON - INSEIN - Branch 1 ▾ (GMT+06:30) Asia/Vanagon × Zar Chi Tun 2

Action History (Payment)

Show 5 entries Search:

Batch Name	Uploaded By	Actioned By	Created Date	Status	Total	Success	Failed	Actions
Disbursement 8022023.csv	qalpp maker	Zar Chi Tun 2	Feb/13/2023 03:17:28 PM	Processed	1	0	1	i

Showing 1 to 1 of 1 entries First Previous 1 Next Last



Batch Search

THITSA PAYMENT PORTAL

TRANSFER/UPLOAD
[Bulk Payment](#)
[Upload Info](#)

SEARCH
[Batch](#) >
[Transaction](#)

[Give Feedback](#)

YANGON - INSEIN - Branch 1 ▾ (GMT+00:00) Africa/Abidjan ▾ Zar Chi Tun 1

Batch ID	Batch ID	Status	Status
Created By	Created By	Payment Type	Disbursement
Created Date	From - To	Payment Channel	Payment Channel
Actioned By	Actioned By	To FSP	To FSP
Actioned Date	From - To	Has Failed Records	Has Failed Records
Total Records	Minimum	Maximum	
Total Amount	Minimum	Maximum	

[Search](#) [Reset](#)

Only for Current User [↶](#)

Show 5 entries [Search:](#)

Batch ID	Name	Created By	Created Time	Payment Type	Status	Total	Success	Failed	Action
134988e7	20FebDisbursement.csv	Ingyin maker	Feb/20/2023 12:40:15 PM	Disbursement	Processed	1	0	1	\$ i
a27d03fe	Disbursement 8022023.csv	qalpp maker	Feb/13/2023 09:47:28 PM	Disbursement	Pending Approval	1	0	0	i trash
302d9e44	27JanDisbursementFile1.csv	Ingyin maker	Jan/27/2023 02:54:20 PM	Disbursement	Pending Approval	1	0	0	i trash

- Status**
- Validating
 - Pending Approval
 - Processed



Batch Search Detail

THITSA PAYMENT PORTAL

YANGON - INSEIN - Branch 1 (GMT+00:00) Africa/Abidjan Zar Chi Tun 1

BULK PAYMENT
Upload Info

SEARCH
Batch
Transaction

Give Feedback

Batch ID: 134988e7-e37f-429a-b51a-b4324ac31b3f
 Status: Processed
 Total Amount: 200,000.00 MMK
 Total Records: 1
 Comment: Approve
 Success: 0
 Failed: 1
 Approved By: Ingyin checker
 Approved Time: Feb/20/2023 12:43:00 PM

Search: 20FebDisbursement.csv

Batch ID	Name	Created By	Created Time	Payment Type	Status	Total	Success	Failed	Action
134988e7	20FebDisbursement.csv	Ingyin maker	Feb/20/2023 12:40:15 PM	Disbursement	Processed	1	0	1	
a27d03fe	Disbursement 8022023.csv	qaapp maker	Feb/13/2023 09:47:28 PM	Disbursement	Pending Approval	1	0	0	
302d9e44	27JanDisbursementFile1.csv	Ingyin maker							

Show 5 entries

(Show) Transaction Details



Transaction Search Detail

THITSA PAYMENT PORTAL

TRANSFER/UPLOAD
Bulk Payment
Upload Info

SEARCH
Batch
Transaction **Transaction**

Give Feedback

YANGON - INSEIN - Branch 1 ▾ (GMT+00:00) Africa/Abidjan ▾ Zar Chi Tun 1

Transaction Type: Disbursement * **←**

Filters

Payment Channel *	Requested Date *	From FSP	To FSP
WynePay	From - To	From FSP	To FSP
Batch ID	Payee Name	Transaction Status	Payee UniqueID
Batch ID	Payee Name	Transaction Status	Payee UniqueID
Processed Date	Account Type	Account ID	Hub TransferID
From - To	Account Type	Account ID	Hub TransferID
Reference ID	Total Amount		
Reference ID	Minimum	Maximum	

Search **Reset**

Disbursement Transactions **Download**

Show 5 entries **Search:**

From-FSP	To-FSP	Payee UniqueID	Payee Name	Account Type	To AccountID	Amount	Status	Requested Date	Processed Date	Note	HubTransferID	HubStatus	PayeeType	ReferencID	ReferenceNote	Action
TestFsp1	mmdokdollar	12/BaHaNa(N)654369	U Ba 49	MobileNo	09965966288	1.00	Success	2022-07-27	2022-07-27	Succeed	b46accb3-c54b-485f-8bf3-fb7726f37e06	Success	CONSUMER	979375731	Loan Disbursement	i
TestFsp1	mmdokdollar	12/BaHaNa(N)654369	U Ba 49	MobileNo	09965966288	1.00	Success	2022-07-27	2022-07-27	Succeed	a055b77b-df52-443b-bbf4-76cb84e953d6	Success	CONSUMER	979375731	Loan Disbursement	i
TestFsp1	mmdokdollar	3/KaDaNa(N)123502	U Ba 49	MobileNo	09965966288	1.00	Success	2022-07-27	2022-07-27	Succeed	4bc8f0fa-3a06-4221-ac69-c93df22e2d74	Success	CONSUMER	979375731	Loan Disbursement	i

Transaction Search Detail

THITSA PAYMENT PORTAL

YANGON - INSEIN - Branch 1 (GMT+00:00) Africa/Abidjan

TRANFER/UPLOAD

- Bulk Payment
- Upload Info

SEARCH

- Batch
- Transaction

Give Feedback

Transaction Type: Disbursement

Filters

Payment Channel *	Requested Date *	From FSP	To FSP
WynePay	From - To	From FSP	To FSP
Batch ID	Payee Name	Transaction Status	Payee UniqueID
Batch ID	Payee Name	Transaction Status	Payee UniqueID
Processed Date	Account Type	Account ID	Hub TransferID
From - To	Account Type	Account ID	Hub TransferID
Reference ID	Total Amount		
Reference ID	Minimum	Maximum	

Search Reset

Disbursement Transactions

Show 5 entries

From-FSP	To-FSP	Payee UniqueID	Payee Name	Account Type	To AccountID	Amount	Status	Requested Date	Processed Date	Note	HubTransferID	HubStatus	PayeeType	ReferenceID	ReferenceNote	Action
TestFsp1	mmdokdollar	12/BaHaNa(N/654369	U Ba 49	MobileNo	09965966288	1.00	Success	2022-07-27	2022-07-27	Succeed	b46ac0c5-54b-403b-8bf5-fb772697e06	Success	CONSUMER	979375731	Loan Disbursement	View
TestFsp1	mmdokdollar	12/BaHaNa(N/654369	U Ba 49	MobileNo	09965966288	1.00	Success	2022-07-27	2022-07-27	Succeed	a055977b-df52-4dd6-bc44-7ec0846953d6	Success	CONSUMER	979375731	Loan Disbursement	View
TestFsp1	mmdokdollar	3/KaDaNa(N/123502	U Ba 49	MobileNo	09965966288	1.00	Success	2022-07-27	2022-07-27	Succeed	4bc0f09c-3a0e-421-ac69-c93df2a2d74	Success	CONSUMER	979375731	Loan Disbursement	View

Download

Please select columns to download

Select All

From-Fsp
 To-Fsp
 Payee Unique ID
 Payee Name
 Account Type
 To AccountID
 Amount
 Status
 Requested Date
 Processed Date
 Note
 HUB TransferID
 HUB Status
 Payee Type
 Reference ID
 Reference Note

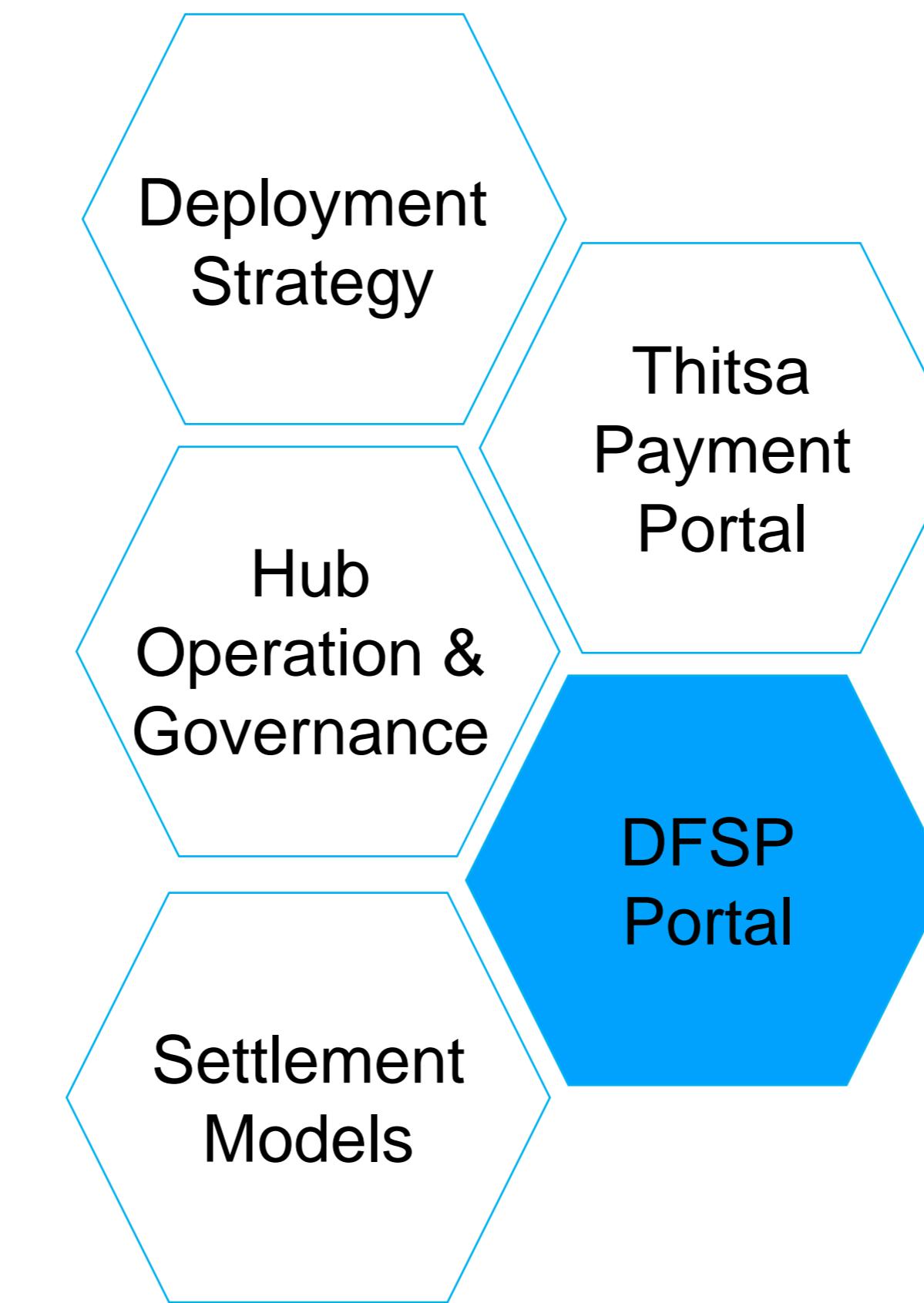
Confirm Cancel

Testing Participants and Procedure

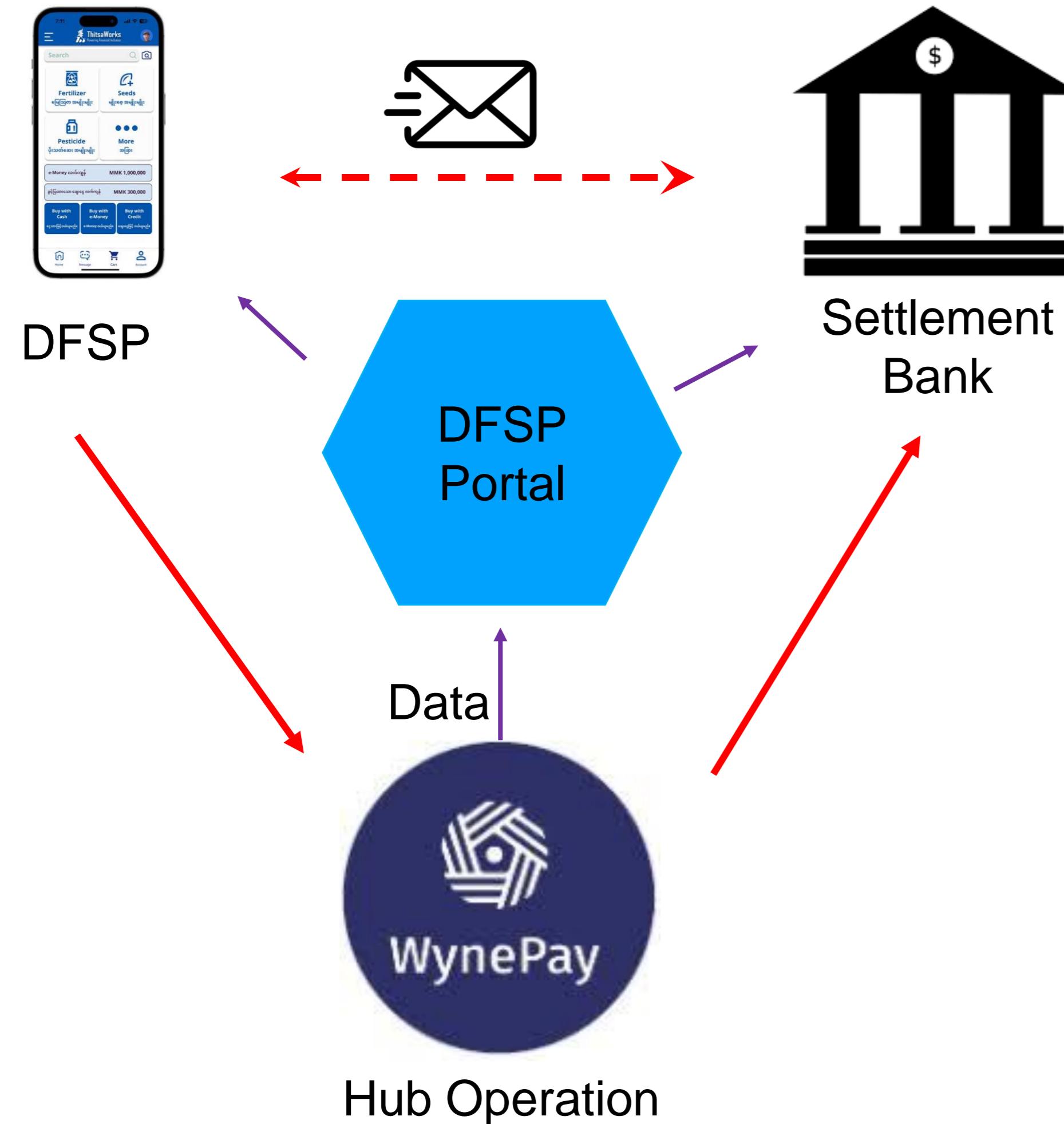
- Facilitator
 - ThitsaWorks
- Participants
 - 2 MFIs
- Tasks
 - Repayment use case
 - Disbursement use case



Hub Operation



Reporting and Reconciliation Process



Current

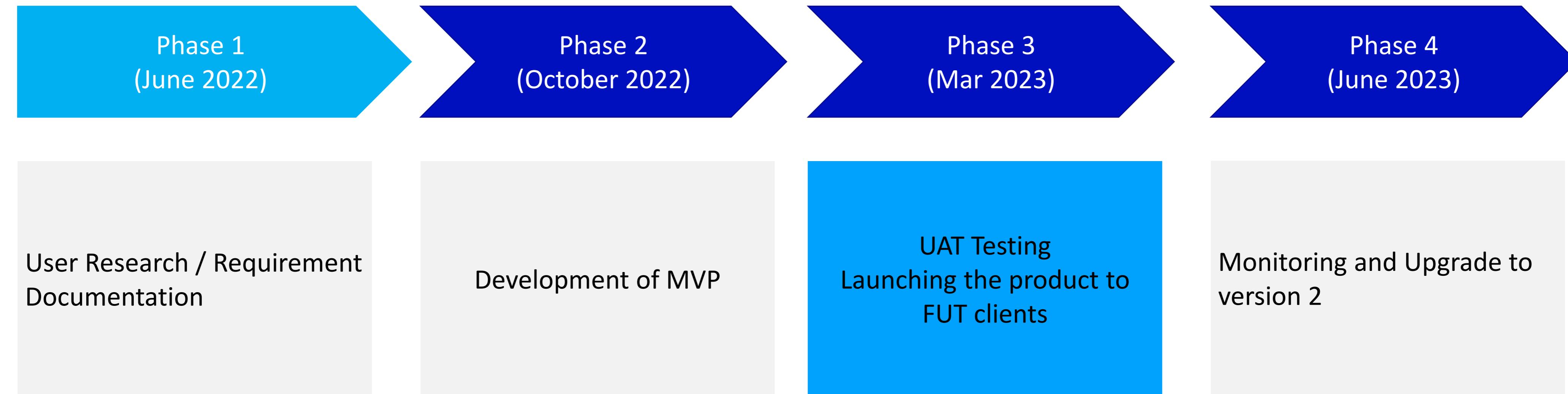
- Report generation and transmission (email) is a manual process for Hub Operator
- Tolerable in FUT Stage, but getting increasingly difficult with more Wallets and MFIs joining

DFSP Portal

- Automate all report generation, customization, etc.
- (TURST) All DFSPs (MFIs and Wallets) have real-time data settlement process through the portal
- Better experience for DFSPs
- Reduce work load, error for Hub Operator (efficient functioning of the hub)



Development Process

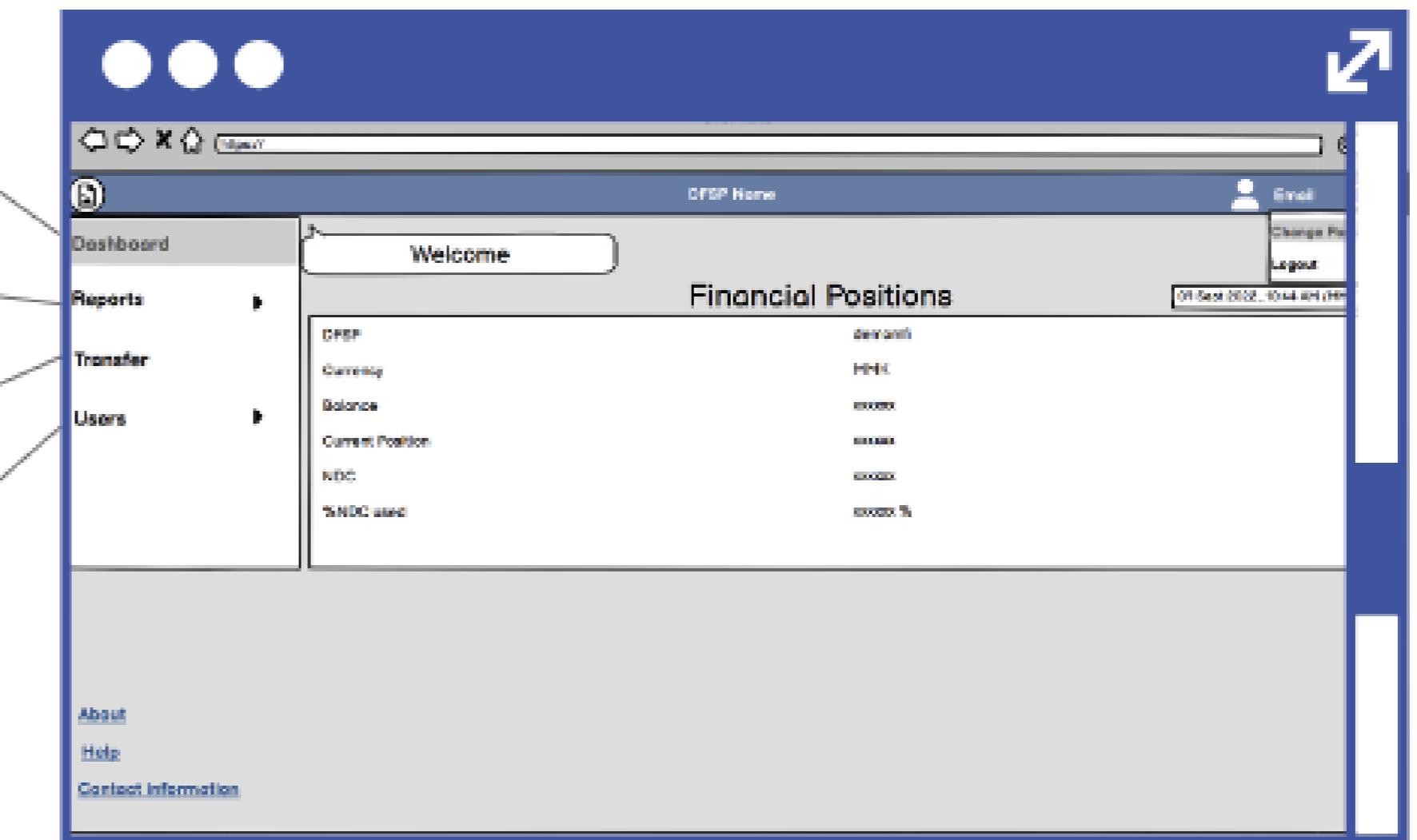


Product Key Features

● Dashboard

Monitor DFSP's Financial Positions

- Balance
- Current position
- NDC



● Reports

Generate reports daily, weekly or monthly

- Default settlement reports
- Custom reports

● Transfer

Troubleshoot the transfer details

● User management

Role-based access control (RBAC)

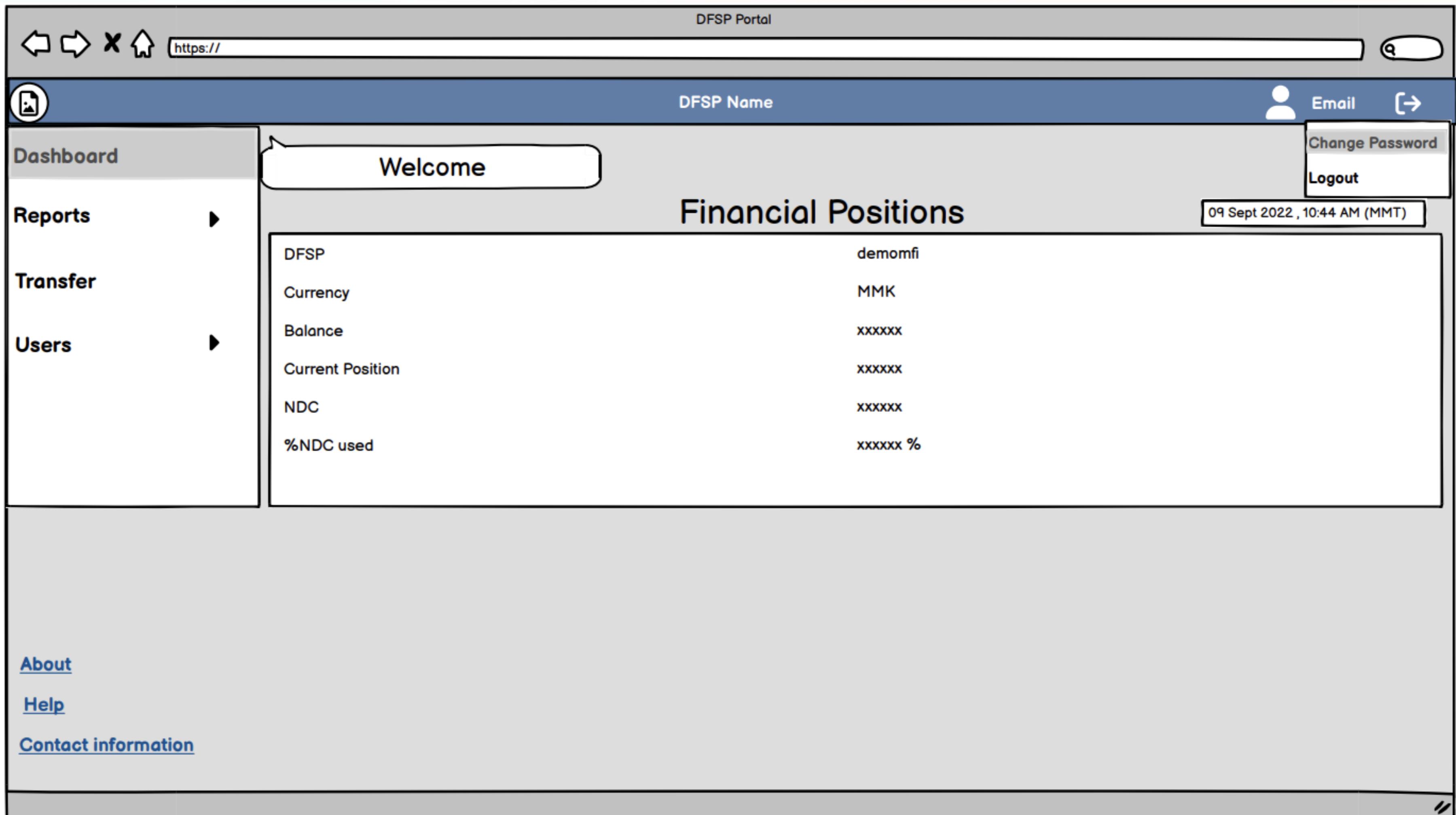
- Admin role
- Operation role



Login Page

A screenshot of a web browser showing the DFSP Portal for Mojaloop login page. The title bar says "DFSP Portal". The main content area has a dark blue header with the text "DFSP Portal for Mojaloop". Below this is a white sign-in form with the heading "Sign in to your account". It contains fields for "Email" and "Password", each with a red placeholder text "Email/Password". Below the password field is a "Sign in" button with a red background and white text. At the bottom of the page, there's a section titled "Announcements" with two items: "5, March 2020" and "11, January 2019", each followed by a redacted text block.

Dashboard



The screenshot shows the DFSP Portal dashboard. The top navigation bar includes a back/forward button, a search bar with "https://", and a user profile icon with "Email" and a right arrow. The main header says "DFSP Name". On the left, a sidebar has "Dashboard" selected, followed by "Reports", "Transfer", and "Users". A "Welcome" message is displayed in a box. The central area is titled "Financial Positions" and shows the following data:

DFSP	demonomfi
Currency	MMK
Balance	xxxxxx
Current Position	xxxxxx
NDC	xxxxxx
%NDC used	xxxxxx %

At the bottom, there are links for "About", "Help", and "Contact information". The date and time "09 Sept 2022, 10:44 AM (MMT)" are also visible.

Company Profile

DFSP Portal

https://

DFSP Name

Dashboard

Reports

Transfer

Users

About

Help

Contact information

Company Information

Company Profile

Company Name <input type="text" value="Name"/>	Business Contact Name <input type="text" value="Name"/>	IT Contact Name <input type="text" value="Name"/>
Company Address <input type="text" value="Address"/>	Position <input type="text" value="Title"/>	Position <input type="text" value="Title"/>
Company Phone <input type="text" value="09XXXXXX"/>	Email Address <input type="text" value="Email"/>	Email Address <input type="text" value="Email"/>
	Business Contact Phone <input type="text" value="09XXXXXX"/>	IT Contact Phone <input type="text" value="09XXXXXX"/>

Liquidity Profile

Liquidity Account Name <input type="text" value="Name"/>
Liquidity Account Number <input type="text" value="xxxx xxxx xxxx xxxx"/>
Currency <input type="text" value="MMK"/>

Edit

Reports

DFSP Portal

[https://](#)

DFSP Name [Email](#) [→]

[Dashboard](#) [Users](#)

	Name	Roles/Permission	Status	
DFSP Settlement Details Report	[REDACTED]	Dashboard, Reports	Active	
DFSP Settlement Report	[REDACTED]	Dashboard, Reports	Active	
DFSP Settlement Statement Report	[REDACTED]	Dashboard, Reports, Audit	Inactive	
DFSP Transactions for Fee Settlement	[REDACTED]	Dashboard, Reports, Audit	Inactive	

[About](#) [Help](#) [Contact information](#)

Settlement Reports

DFSP Portal

DFSP Name

Dashboard Reports Transfer Users

DFSP Settlement Details Report

Fspid: {{autopopulate fpid}}

Start Date: 26/05/2022

End Date: 26/05/2022

Settlement ID: 299

Run:

About [Help](#) [Contact information](#)

DFSP Portal

DFSP Name

Dashboard Reports Transfer Users

DFSP Settlement Report

Fspid: {{autopopulate fpid}}

Start Date: 26/05/2022

End Date: 26/05/2022

Settlement ID: 299

Run:

About [Help](#) [Contact information](#)

Custom Reports

DFSP Portal

https://

DFSP Name

Email

Dashboard

Reports

Fspid: {{autopopulate fspid}}

Start Date: / /

End Date: / /

Run
XLSX
CSV

About

Help

Contact information

DFSP Portal

https://

DFSP Name

Email

Dashboard

Reports

Start Date: / /

From DFSP: []

End date: / /

To DFSP: []

TimezoneOffset: []

Run
XLSX
CSV

About

Help

Contact information

Transfer Details

DFSP Portal

https://

DFSP Name Email

Transfer Overview

Transfer ID Payer FSPID Payer ID Type Payee ID Value
 Past 24 hour Payee FSPID Payee ID Type Payer ID Value
 04 Sept 2022 12:00 Currency Clear Filter
 09 Sept 2022 12:00 Transfer State Find Transfer

Transfer ID	State	Type	Currency	Amount	Payer DFSP	Payee DFSP	Settlement Batch
XXXX-XXXX	Committed	Committed	MMK	1000	XXXXXX	XXXXXX	XXXXXX
XXXX-XXXX	Committed	Committed	MMK	1000	XXXXXX	XXXXXX	XXXXXX

Dashboard Reports Transfer Users About Help Contact information

DFSP Portal

https://

DFSP Name Email

Transfers Overview

Basic Information

Transfer ID: 20122ba5-59d6-4707-825r-33e7b063bfbb Transfer State: COMMITTED Transfer Type: TRANSFER

Amount: 1000 Currency: MMK Date Submitted: 2023-02-14T16:33:20

Payer: MSISDN 09419295353 Payer DFSP: mmdmoney

Payee: ACCOUNT_ID 105000000390 Payee DFSP: visionfund

Settlement Batch ID: 199

Close

Dashboard Reports Transfer Users About Help Contact

User Management

DFSP Portal

https://

DFSP Name

Dashboard

Reports

Transfer

Users

Users

Emails	Name	Roles/Permission	Status
[REDACTED]	[REDACTED]	Dashboard, Reports	Active
[REDACTED]	[REDACTED]	Dashboard, Reports, Audit	Inactive

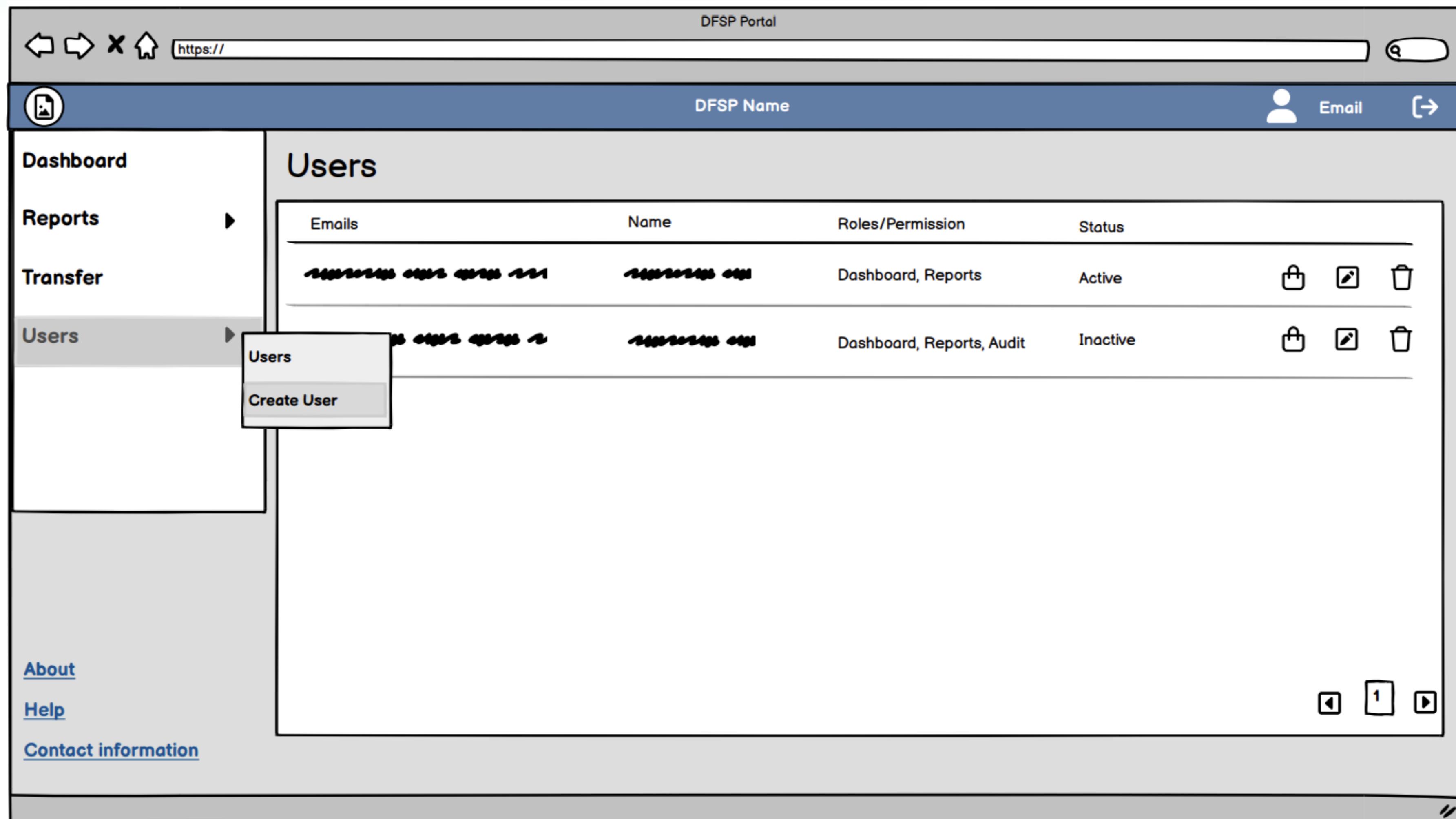
Create User

About

Help

Contact information

1



User Management

DFSP Portal

https://

DFSP Name

Email

Dashboard

Reports

Transfer

Users

About

Help

Contact information

Create User

Email: xxxx

First Name: xxxx

Last Name: xxxx

Password:

Confirmed password:

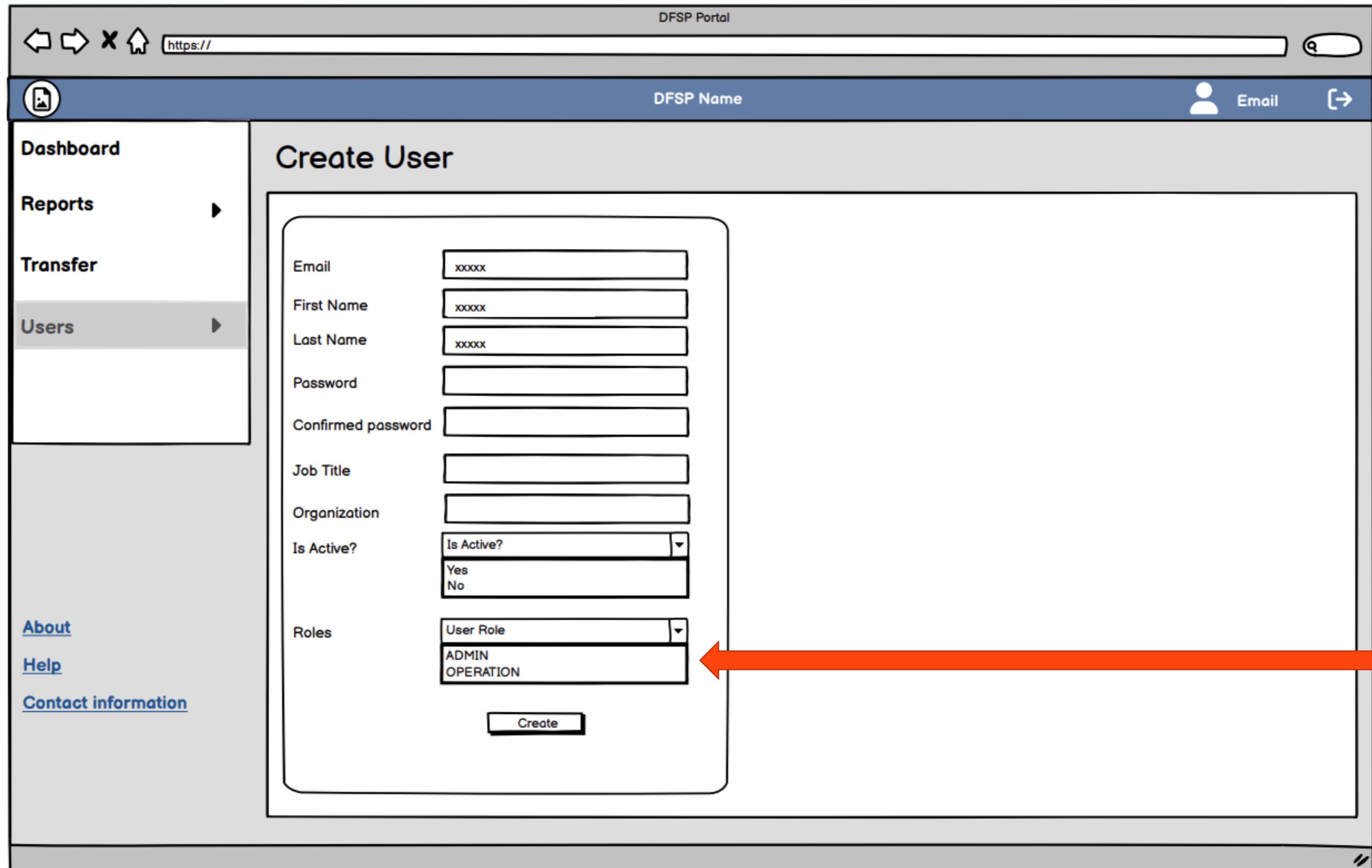
Job Title:

Organization:

Is Active? (Yes/No)

Roles: User Role (ADMIN, OPERATION)

Create

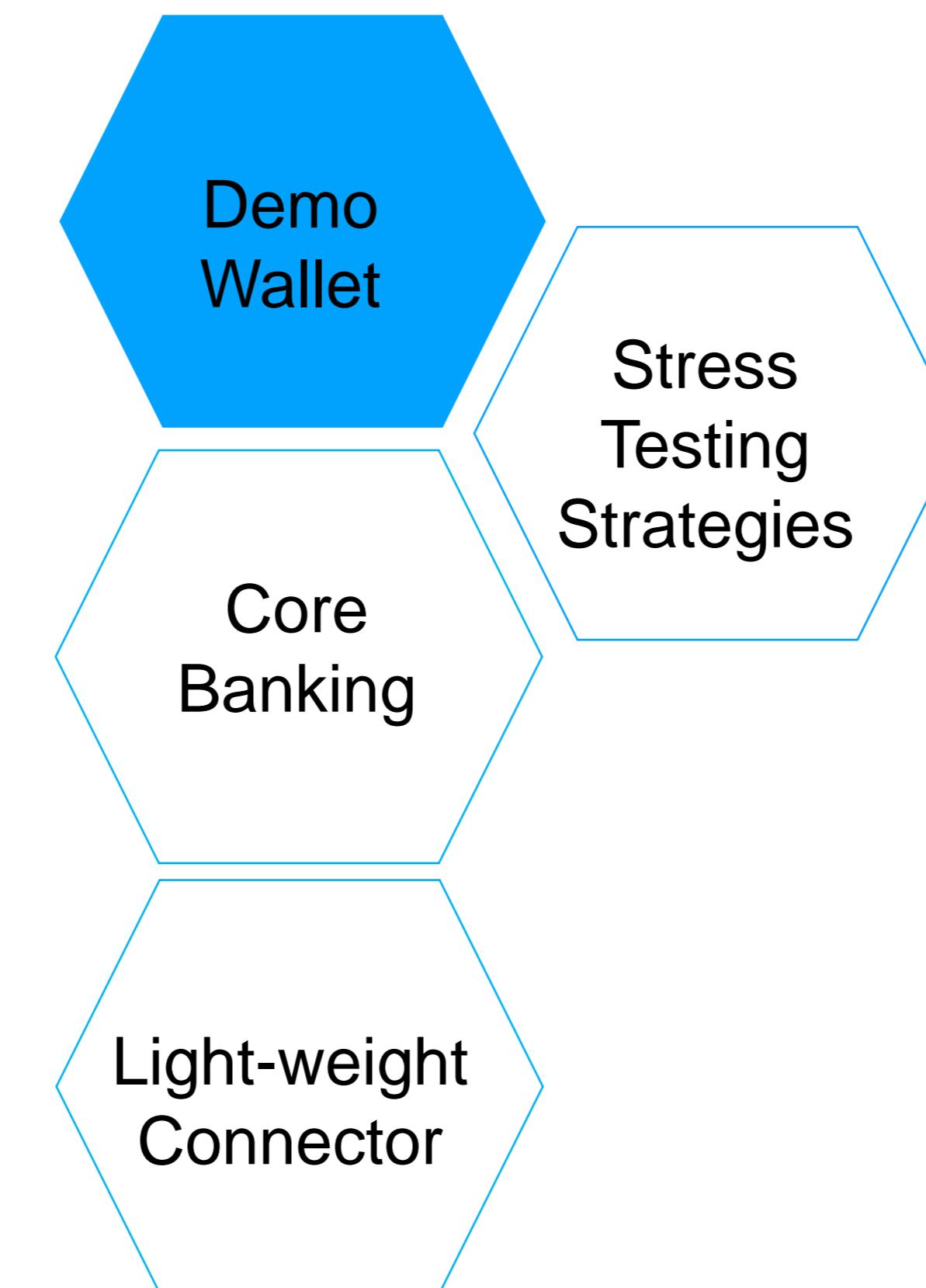


Roles

- Admin role (for Hub Operator)
- Operation (for DFSP)



Things we wish we had when we started





Objective, Advantages and Available features

Objective

- For simulation purpose between two DFSPs for all use cases.

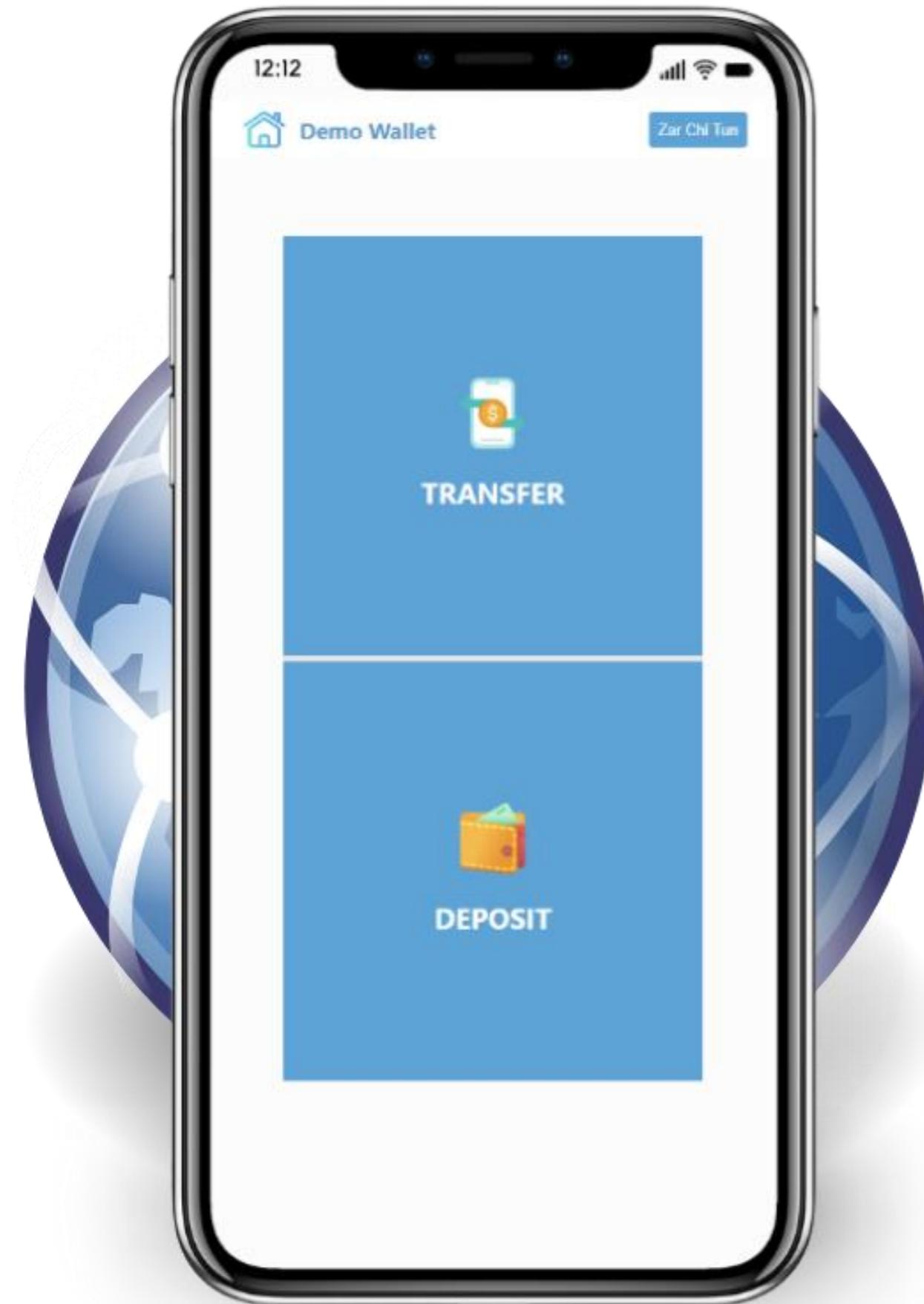
Advantages

- Being able to test as own wallet
- Being able to customize for new use cases
- Can check balances after each transactions
- Have appointed core connector to be able to track all logs

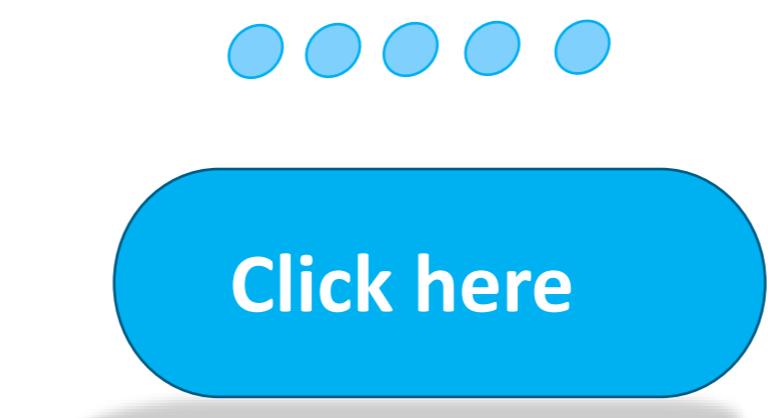
Available features

- Being able to register own account
- Being able to do transactions with other DFSPs using either ACCOUNDID or MSISDN
- Being able to deposit balance to account

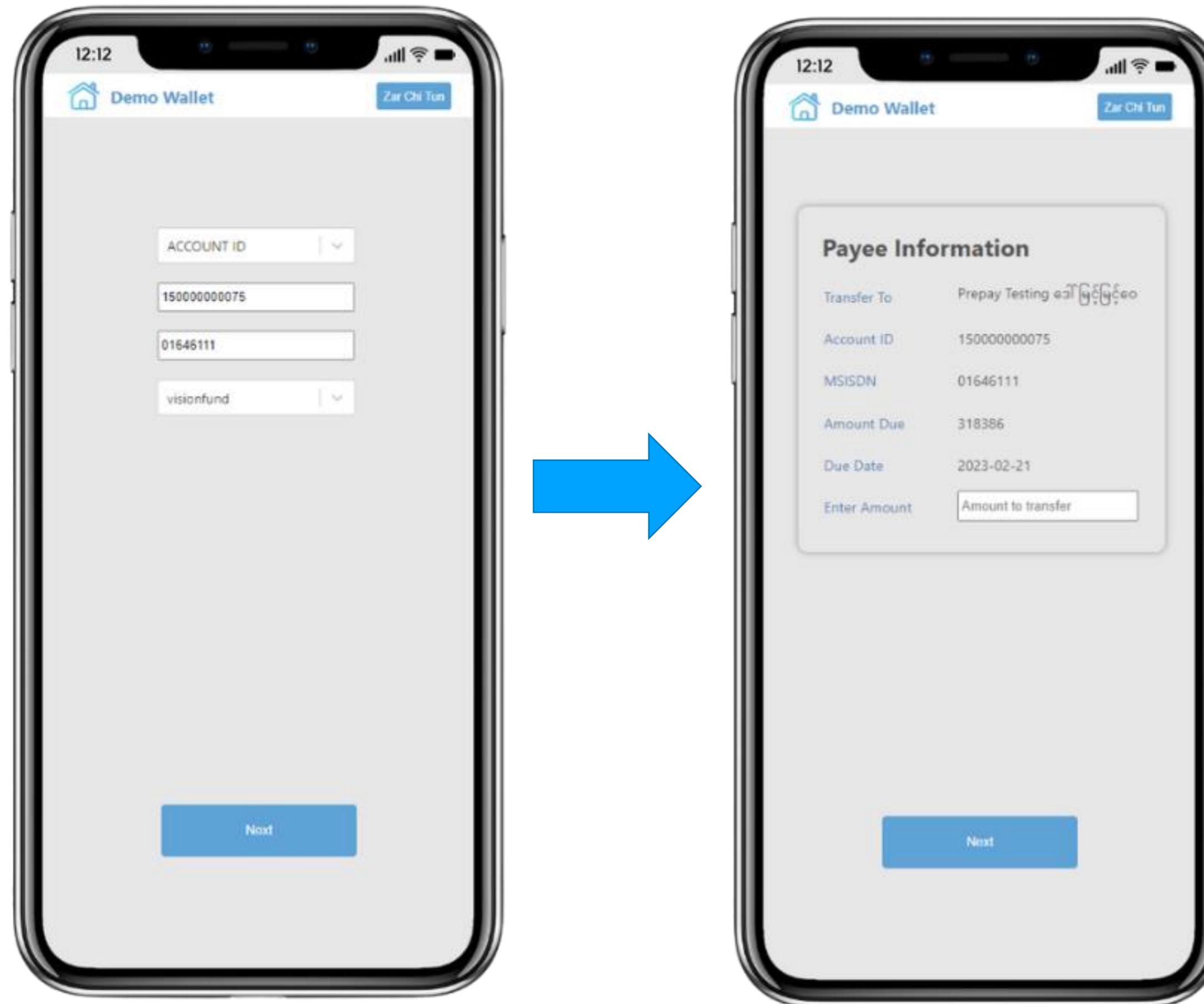
Current UI Design



Demo Wallet Mockup



Party Lookup Service



```

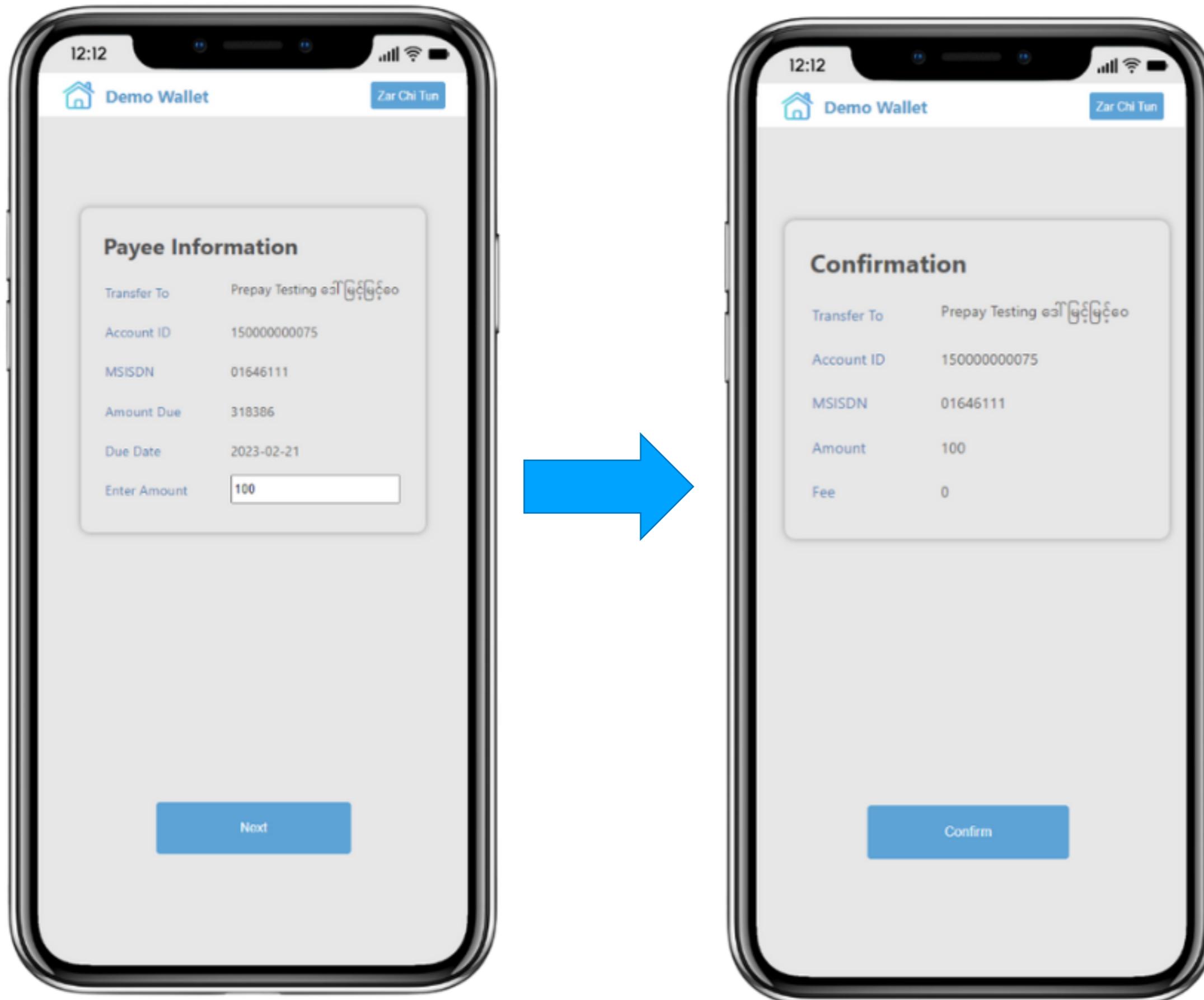
▼ {homeTransactionId: "fa14a50a-0196-41e2-835a-42d7464cce9c",...}

homeTransactionId: "fa14a50a-0196-41e2-835a-42d7464cce9c"
  ▶ payee: {name: "Prepay Testing ດັບໂຫຼດເກີດ", msisdn:
    "01646111",...}

  transferId: "7ddf575d-61fc-442a-a486-7d2995935b3a"

```

Quote Service



```

▼ {headers: {Accept: ["application/json, application/*+json"],  

  Accept-Encoding: ["gzip"],...},...}  

  ► body: {homeTransactionId: "fa14a50a-0196-41e2-835a-  

    42d7464cce9c",...}  

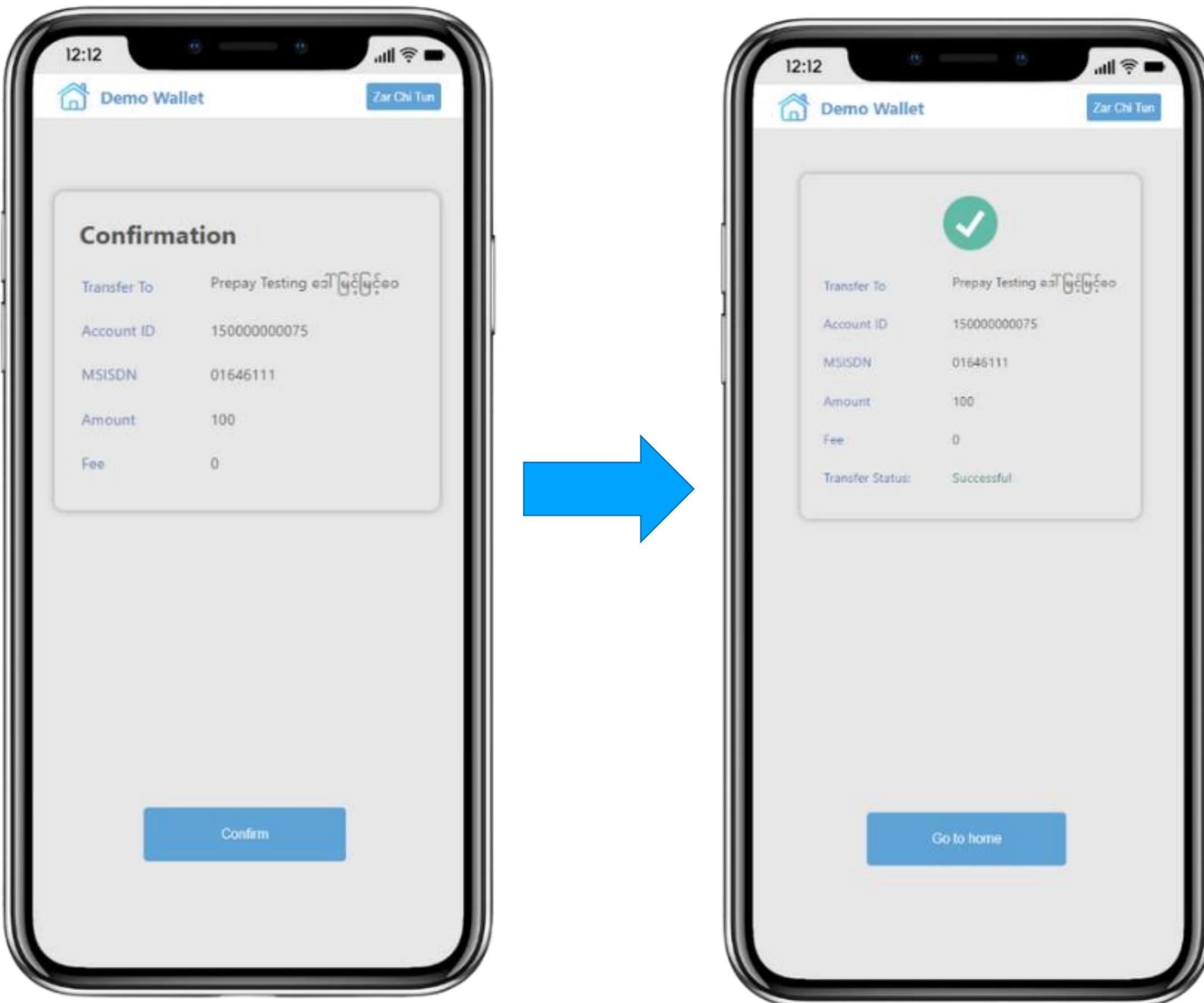
  ► headers: {Accept: ["application/json, application/*+json"],  

  Accept-Encoding: ["gzip"],...}  

  statusCode: "OK"  

  statusCodeValue: 200
  
```

Transfer Service



```

▼ {headers: {Accept: ["application/json, application/*+json"],
             Accept-Encoding: ["gzip"],...},...}

▶ body: {homeTransactionId: "fa14a50a-0196-41e2-835a-
         42d7464cce9c",...}

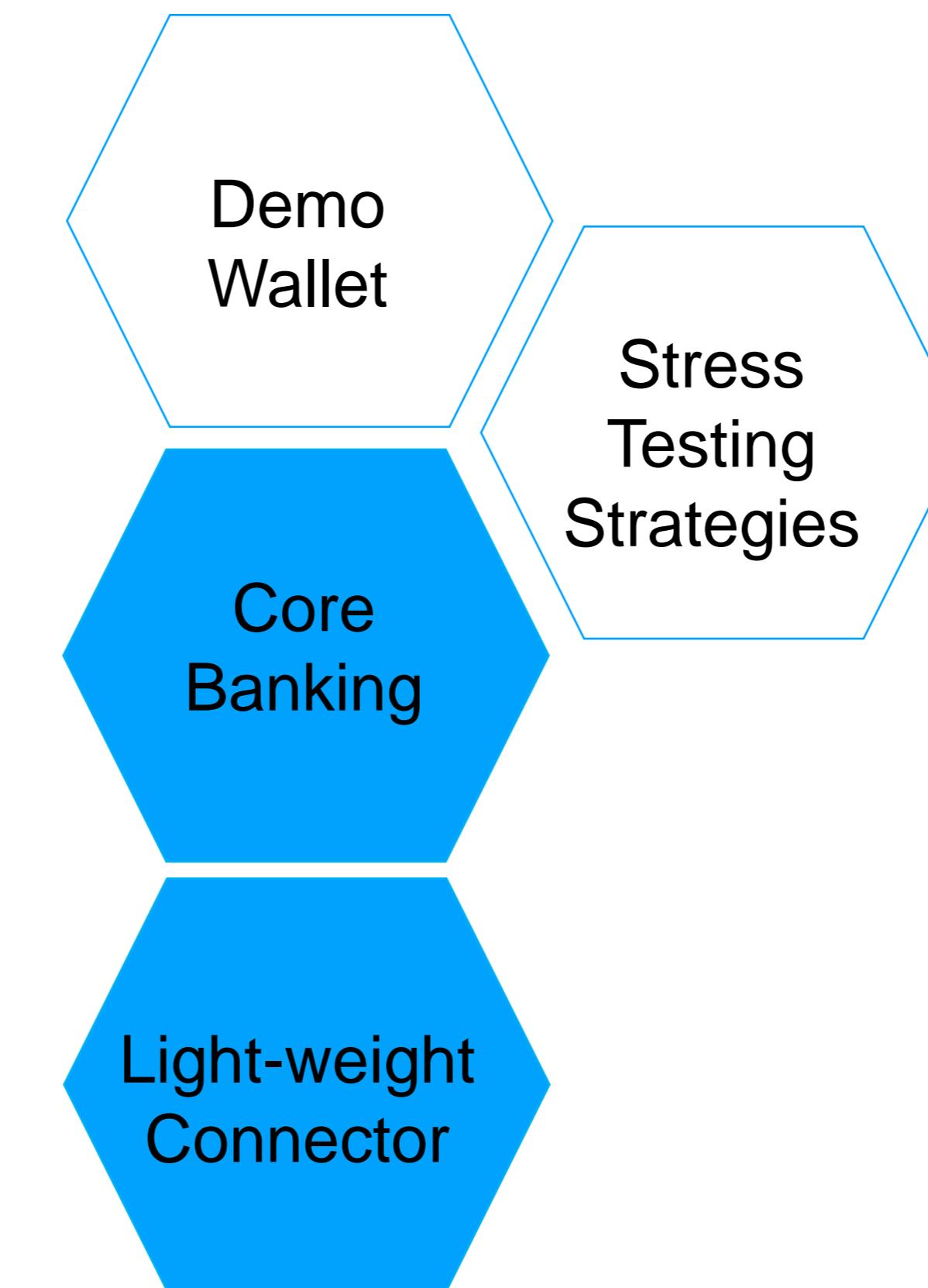
▶ headers: {Accept: ["application/json, application/*+json"],
            Accept-Encoding: ["gzip"],...}

statusCode: "OK"

statusCodeValue: 200
  
```



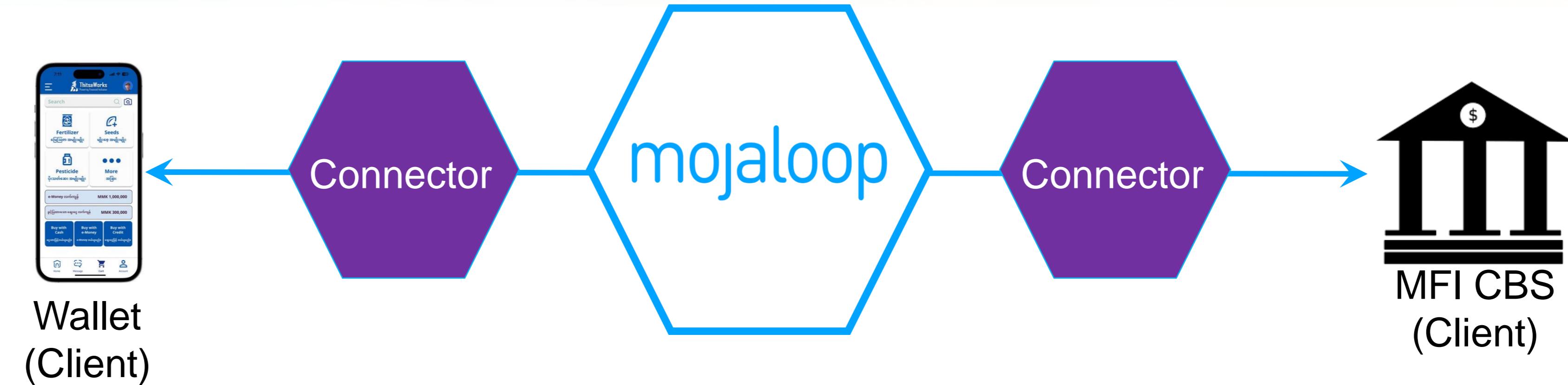
Things we wish we had when we started



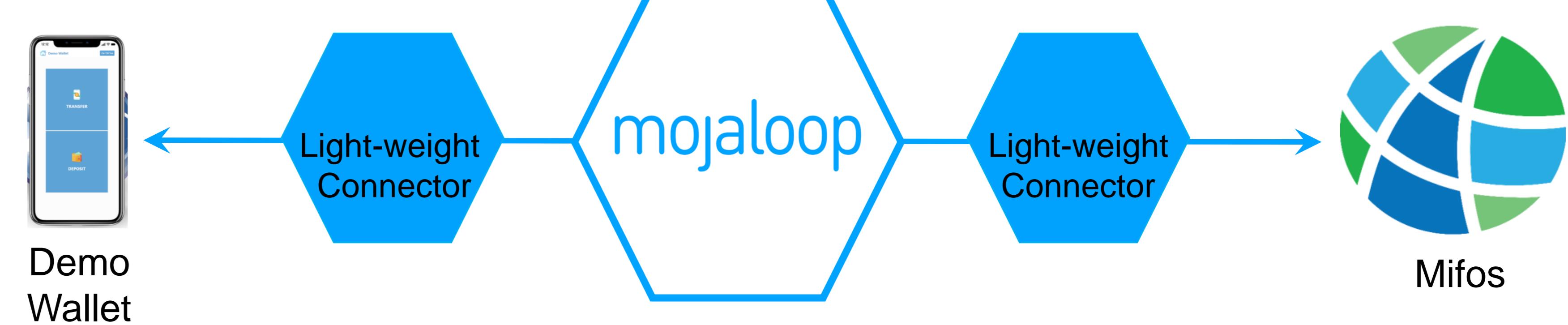


End to End Demo + POC

Current

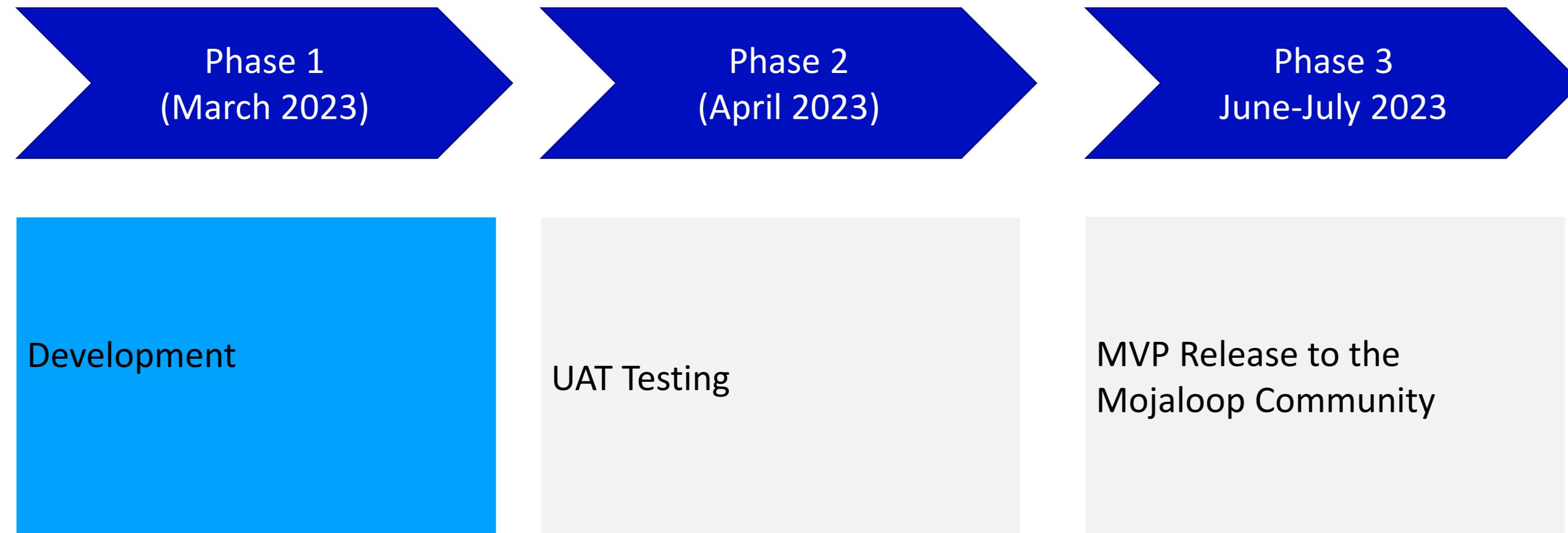


Future



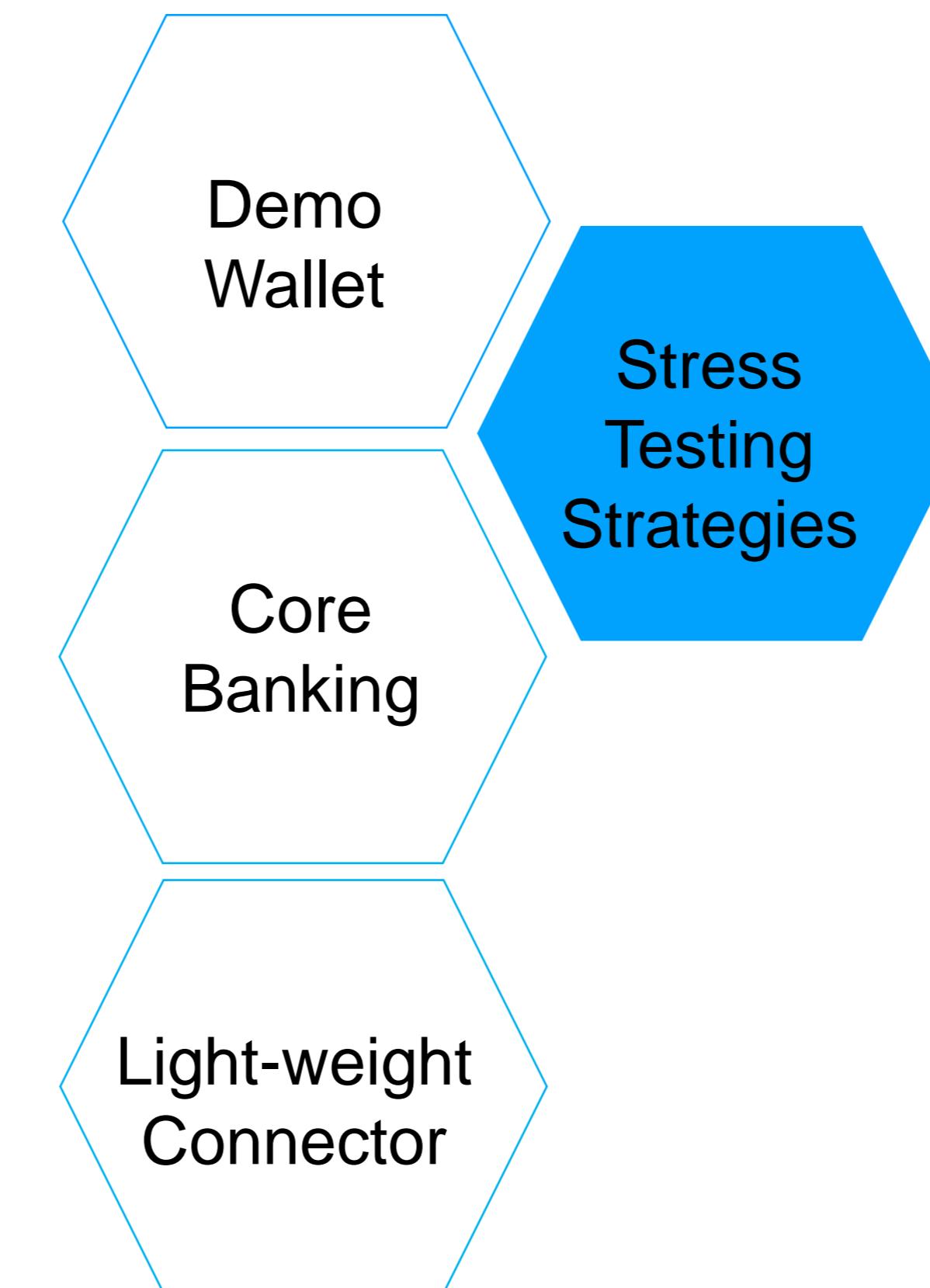


Development Process – Connector





Things we wish we had when we started



Objective and Tools

Objective

To test the expected usage of a hub by simulating multiple transactions concurrently.

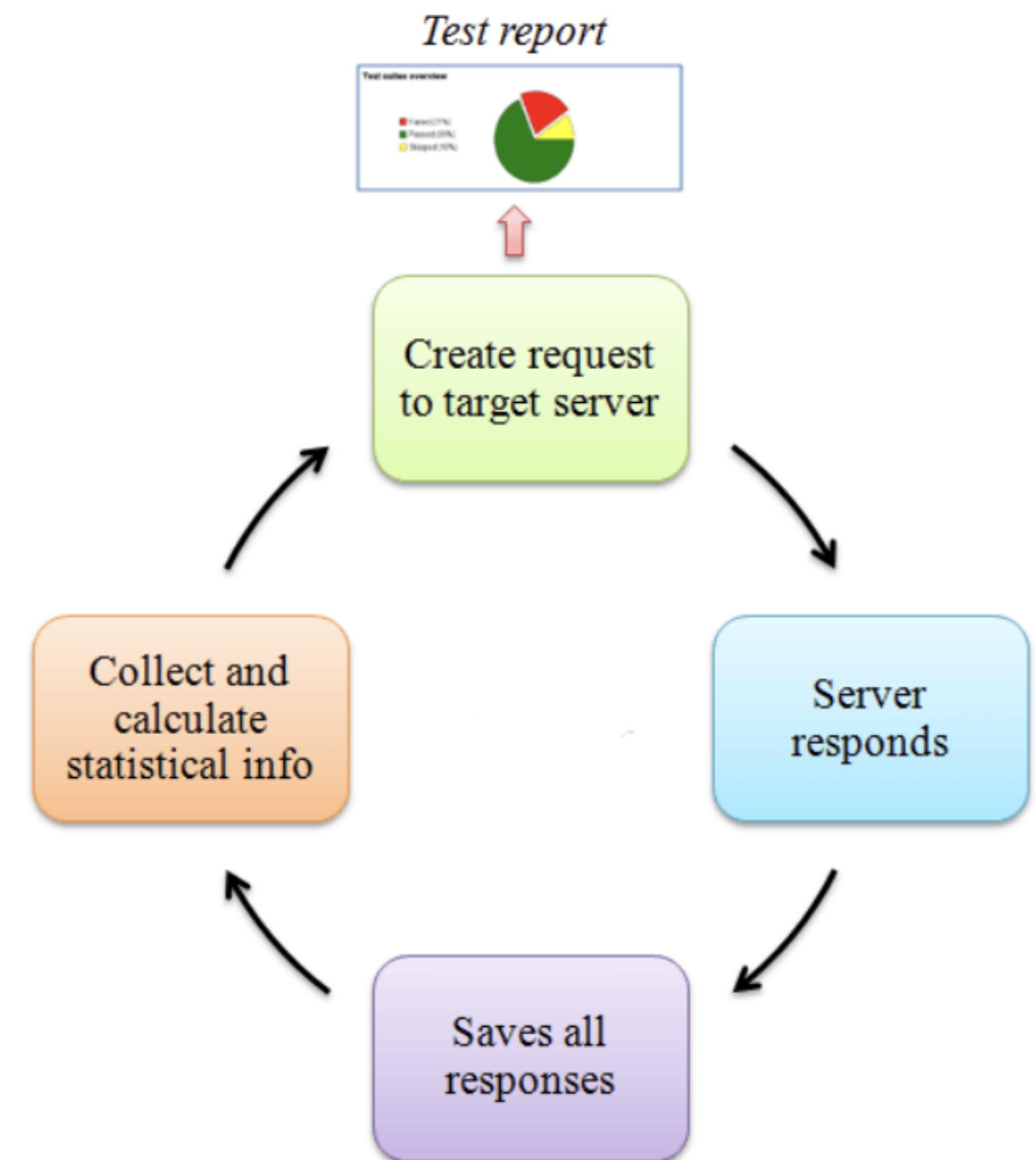
Load Testing Tool

The tool that has been used as the load testing tool is -



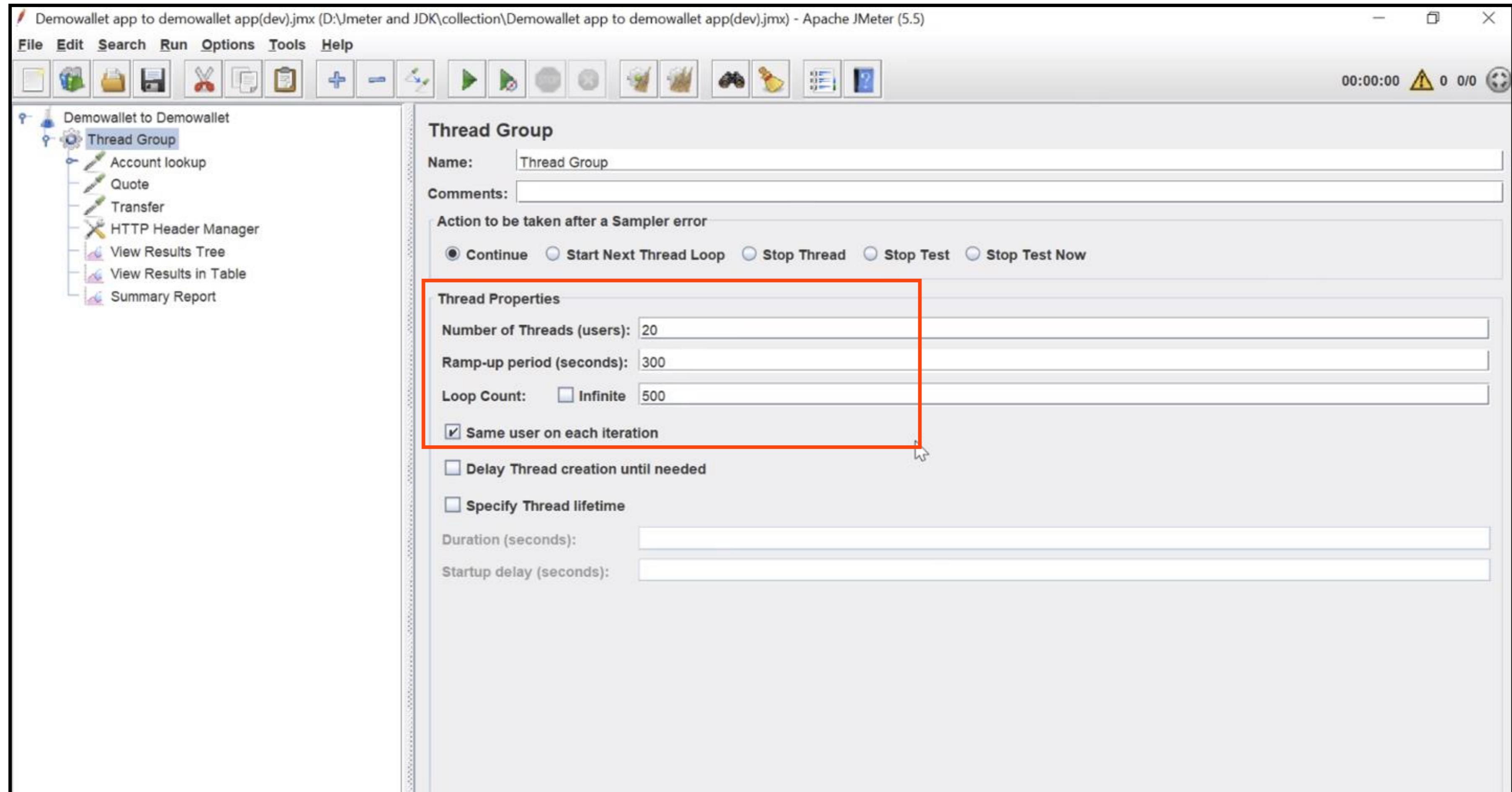
- Ability to load and performance test many different applications/server/protocol types
- Full-featured Test IDE that allows fast Test Plan recording
- CLI mode to load test from any Java-compatible OS
- A complete and ready to present dynamic HTML report
- Easy correlation through the ability to extract data from most popular response formats, HTML, JSON, XML or any textual format
- Complete portability and 100% Java purity
- Full multithreading framework
- Caching and offline analysis/replaying of test results

Apache JMeter – Workflow



Apache JMeter – Load Testing

Loop Setting

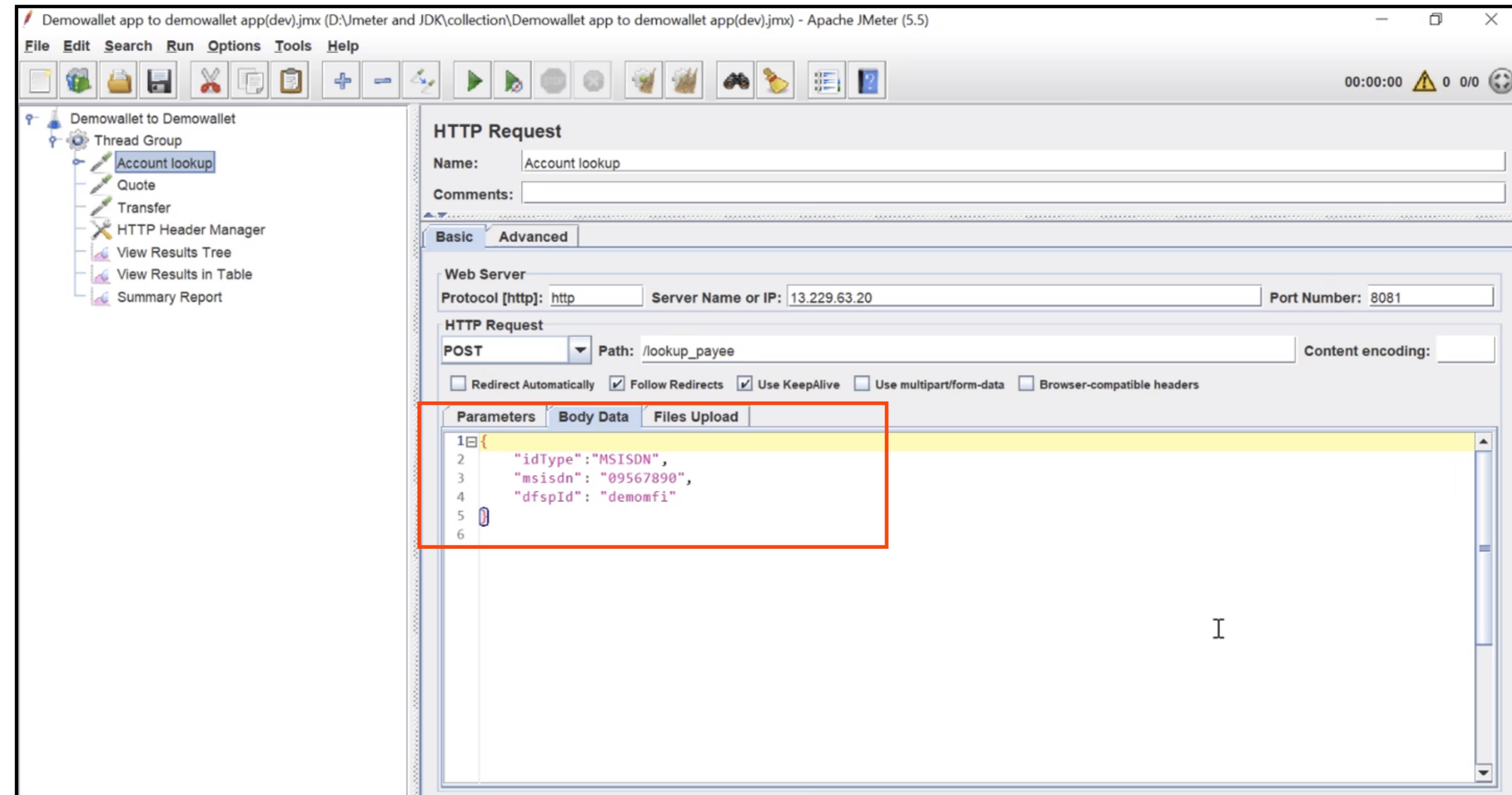


The screenshot shows the Apache JMeter 5.5 interface with the following details:

- Title Bar:** Demowallet app to demowallet app(dev).jmx (D:\Jmeter and JDK\collection\Demowallet app to demowallet app(dev).jmx) - Apache JMeter (5.5)
- Toolbar:** Standard JMeter tool icons.
- Left Panel:** Project tree showing "Demowallet to Demowallet" and a selected "Thread Group" node. Sub-items include Account lookup, Quote, Transfer, HTTP Header Manager, View Results Tree, View Results in Table, and Summary Report.
- Right Panel: Thread Group Configuration**
 - Name:** Thread Group
 - Comments:** [Empty]
 - Action to be taken after a Sampler error:** Continue (radio button selected)
 - Thread Properties:**
 - Number of Threads (users):** 20
 - Ramp-up period (seconds):** 300
 - Loop Count:** Infinite 500
 - Same user on each iteration** (checkbox selected, highlighted with a red border)
 - Delay Thread creation until needed** (checkbox unselected)
 - Specify Thread lifetime** (checkbox unselected)
 - Duration (seconds):** [Empty]
 - Startup delay (seconds):** [Empty]

Apache JMeter – Load Testing

Account Lookup



The screenshot shows the Apache JMeter 5.5 interface with the following details:

- Title Bar:** Demowallet app to demowallet app(dev).jmx (D:\Jmeter and JDK\collection\Demowallet app to demowallet app(dev).jmx) - Apache JMeter (5.5)
- Toolbar:** Standard JMeter tool icons.
- Timeline:** Shows 00:00:00, 0 errors, 0/0 samples.
- Left Panel (Tree View):**
 - Demowallet to Demowallet
 - Thread Group
 - Account lookup (selected)
 - Quote
 - Transfer
 - HTTP Header Manager
 - View Results Tree
 - View Results in Table
 - Summary Report
- Central Panel (HTTP Request Configuration):**
 - Basic Tab:**
 - Web Server: Protocol [http]: http, Server Name or IP: 13.229.63.20, Port Number: 8081
 - HTTP Request: Method: POST, Path: /lookup_payee
 - Checkboxes: Redirect Automatically, Follow Redirects, Use KeepAlive, Use multipart/form-data, Browser-compatible headers
 - Advanced Tab:** Not visible in the screenshot.
 - Parameters Tab (highlighted with a red box):**

```

1 {
2   "idType": "MSISDN",
3   "msisdn": "09567890",
4   "dfspId": "demomfi"
5
6

```
 - Body Data Tab:** Not visible in the screenshot.
 - Files Upload Tab:** Not visible in the screenshot.

Apache JMeter – Load Testing

Quote

JMeter app to demowallet app(dev).jmx (D:\Jmeter and JDK\collection\Demowallet app to demowallet app(dev).jmx) - Apache JMeter (5.5)

File Edit Search Run Options Tools Help

Demowallet to Demowallet

- Thread Group
- Account lookup
- Quote**
- Transfer
- HTTP Header Manager
- View Results Tree
- View Results in Table
- Summary Report

HTTP Request

Name: Quote

Comments:

Basic Advanced

Web Server

Protocol [http]: http Server Name or IP: Port Number: 8081

HTTP Request

POST Path: /submit_quote Content encoding:

Redirect Automatically Follow Redirects Use KeepAlive Use multipart/form-data Browser-compatible headers

Parameters	Body Data	Files Upload
<pre>1 { 2 "transferId": "\${var}", 3 "acceptParty": true, 4 "amount": "20" 5 6 }</pre>		

Apache JMeter – Load Testing

Transfer

Demowallet app to demowallet app(dev).jmx (D:\Jmeter and JDK\collection\Demowallet app to demowallet app(dev).jmx) - Apache JMeter (5.5)

File Edit Search Run Options Tools Help

Demowallet to Demowallet

- Thread Group
- Account lookup
- Quote
- Transfer**
- HTTP Header Manager
- View Results Tree
- View Results in Table
- Summary Report

HTTP Request

Name: Transfer

Comments:

Basic Advanced

Web Server

Protocol [http]: http Server Name or IP: Port Number: 8081

HTTP Request

POST Path: /confirm_transfer Content encoding:

Redirect Automatically Follow Redirects Use KeepAlive Use multipart/form-data Browser-compatible headers

Parameters	Body Data	Files Upload
1 { 2 "transferId": "\${var}", 3 "acceptQuote": true 4 }		

Apache JMeter – Load test Summary result

16.87%
failed

Demowallet app to demowallet app(dev).jmx (D:\Jmeter and JDK\collection\Demowallet app to demowallet app(dev).jmx) - Apache JMeter (5.5)

File Edit Search Run Options Tools Help

03:01:58 0 0/20

Summary Report

Name: Summary Report

Comments:

Write results to file / Read from file

Filename D:\Jmeter and JDK\result\Dev\demowalletsummary3.csv Browse... Log/Display Only: Errors Successes Configure

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB...	Sent KB/sec	Avg. Bytes
Account lookup	10000	2293	91	60029	5758.72	2.50%	55.0/min	0.41	0.31	453.5
Quote	10000	2309	56	31119	4597.66	5.14%	55.0/min	1.07	0.33	1195.1
Transfer	10000	15931	55	37152	7540.52	16.87%	55.0/min	1.13	0.31	1261.7
TOTAL	30000	6844	55	60029	8850.77	8.17%	2.7/sec	2.60	0.95	970.1



Apache JMeter – Load test summary result

- Total Success transaction count = 8313
- Total failed transaction count = 1687

Common failed reason

```
{"statusCode":"500","message":"Unknown - no mojaloopError  
message  
present","localeMessage":"Unknown","detailedDescription":"C  
annot access 'timeout' before initialization"}}
```

```
{"statusCode":"504 Gateway Timeout: \"\\"statusCode\\":  
\"2004\\"", "message": "Time Out. Please try again  
later.\", \"localeMessage\": , \"detailedDescription\": \"Timeout requesting  
quote for transfer 7b65d12f-f9a7-45c6-a963-  
15288745f5f7\"}", "message": "504 Gateway Timeout: \"\\"statusCode\\":  
\"2004\\"", "message": "Time Out. Please try again  
later.\", \"localeMessage\": , \"detailedDescription\": \"Timeout requesting  
quote for transfer 7b65d12f-f9a7-45c6-a963-15288745f5f7\"}
```

```
{"statusCode": "504 Gateway Timeout: \"\\"statusCode\\":  
\"2004\\"", "message": "Time Out. Please try again  
later.\", \"detailedDescription\": \"Timeout waiting for fulfil for transfer  
4b28eebf-90ac-41fa-89ca-060bdffd7886\"\"", "message": "504  
Gateway Timeout: \"\\"statusCode\\"": \"2004\\"", "message": \"Time  
Out. Please try again  
later.\", \"localeMessage\": , \"detailedDescription\": \"Timeout waiting  
for fulfil for transfer 4b28eebf-90ac-41fa-89ca-060bdffd7886\""}  
77
```

Environment Setup



Setup

- Update API gateways to accept 100 requests per second
- Scale out the account lookup services
- Scale out central_ledger services
- Scale up Mongodbs services to be able accept the load test

Specifications

- AWS
- Worker size = m5.large*6
- Master size = t2.medium*3
- DB (AWS Aurora) size = db.t3.medium*2

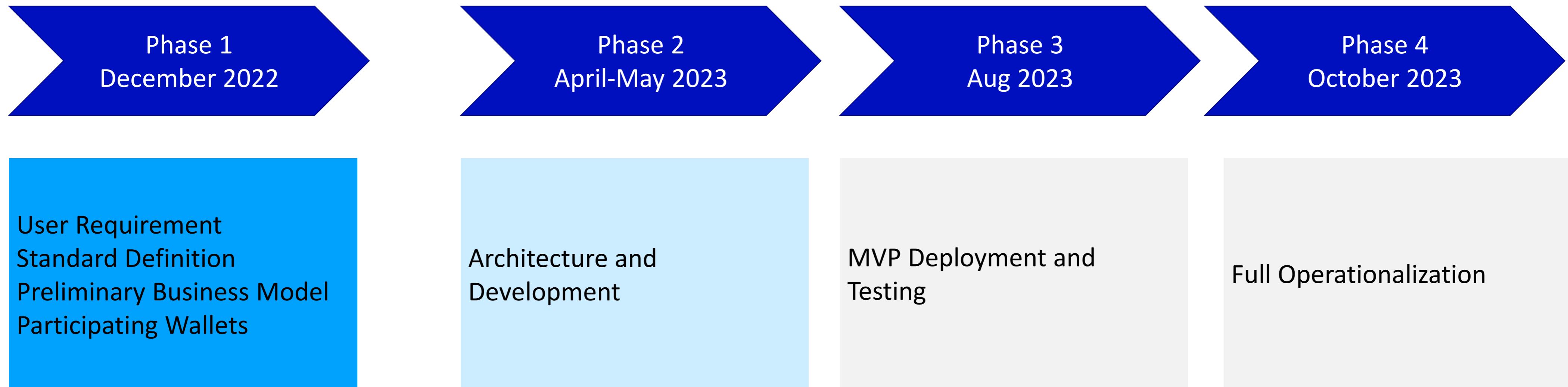


Merchant Repository and Dynamic QR



Interoperability Initiative

- Client-led initiative to develop merchant interoperability
- Long and winding road to interoperability but Framework emerging



- + 3.0 million unique Datapoints as Registry
- Very similar framework and features



Time for us to Give Back to the community



**Microfinance
Use Cases**



**Cross Border
Remittance**



**Digitizing Agricultural
Payments and Lending**



**Merchant
Interoperability**

BILL & MELINDA
GATES foundation

