

■ mojaloop

Mifos Lab Update

June 2019

Edward Cable, The Mifos Initiative
Istvan Molnar, DPC Consulting Hungary



Agenda

- Vision for Mifos Lab
- Mifos Participation In Community
- Mojaloop Traction in Mifos Ecosystem
- Accelerating Community Adoption of Mojaloop
- Mifos Focus Areas
- API Gateway Implementation



Who is Mifos?



FinTech non-profit leveraging the cloud, mobile, and open source community to transform the delivery of digital financial services to the world's 3 billion underbanked and unbanked.

Why Mifos & Mojaloop

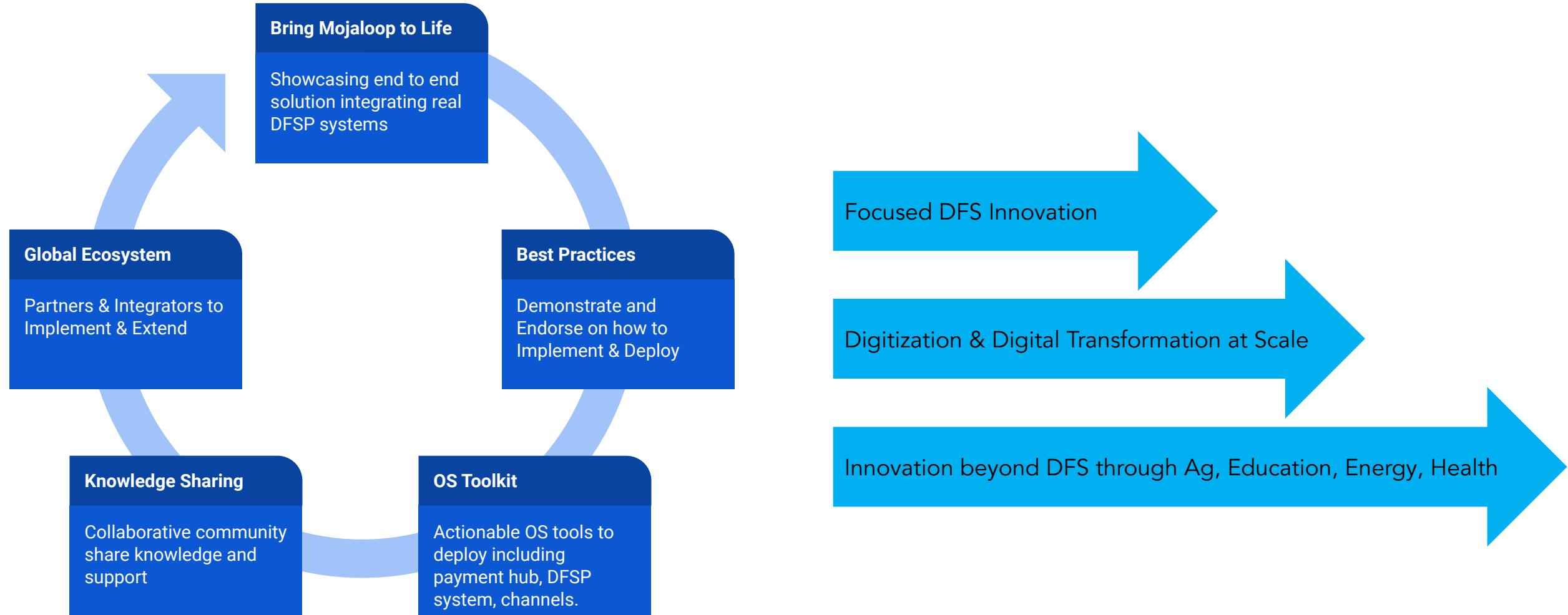
- Highly Complementary Open Source Systems
- Mifos/Fineract - Full Stack Banking Platform
 - Core Banking, Account & Wallet Management, Portfolio Management, Accounting, Business Intelligence, KYC
 - Mifos can be configured as a digital retail bank, an MFI, a savings group management solution, a mobile wallet provider, a savings cooperative, a marketplace lender, a digital credit solution, etc
- Mojaloop - Payment switch and Guiding Principles
 - Payment API, Interoperability, Central Directory



End to End Open Source Architecture for Digital
Financial Services



Vision of Mifos Innovation Lab



Mojaloop provides the Digital Rails, Mifos is the
mojaloop locomotive fueling innovation on top of it.

Participation in Community

- Regularly attend and participate in Scrum of Scrum meetings
- Participate in Design Authority Board
 - Helped to surface that on-us transactions were currently being blocked and led to discussion on Design Authority Board
- QR Code Specifications and Standards for Bank of Tanzania and TIPS
- Discussion around Fraud Management Architecture & POC
- Sharing knowledge on managing HFOSS communities with Kim and Paula

Mojaloop Traction in Mifos Ecosystem

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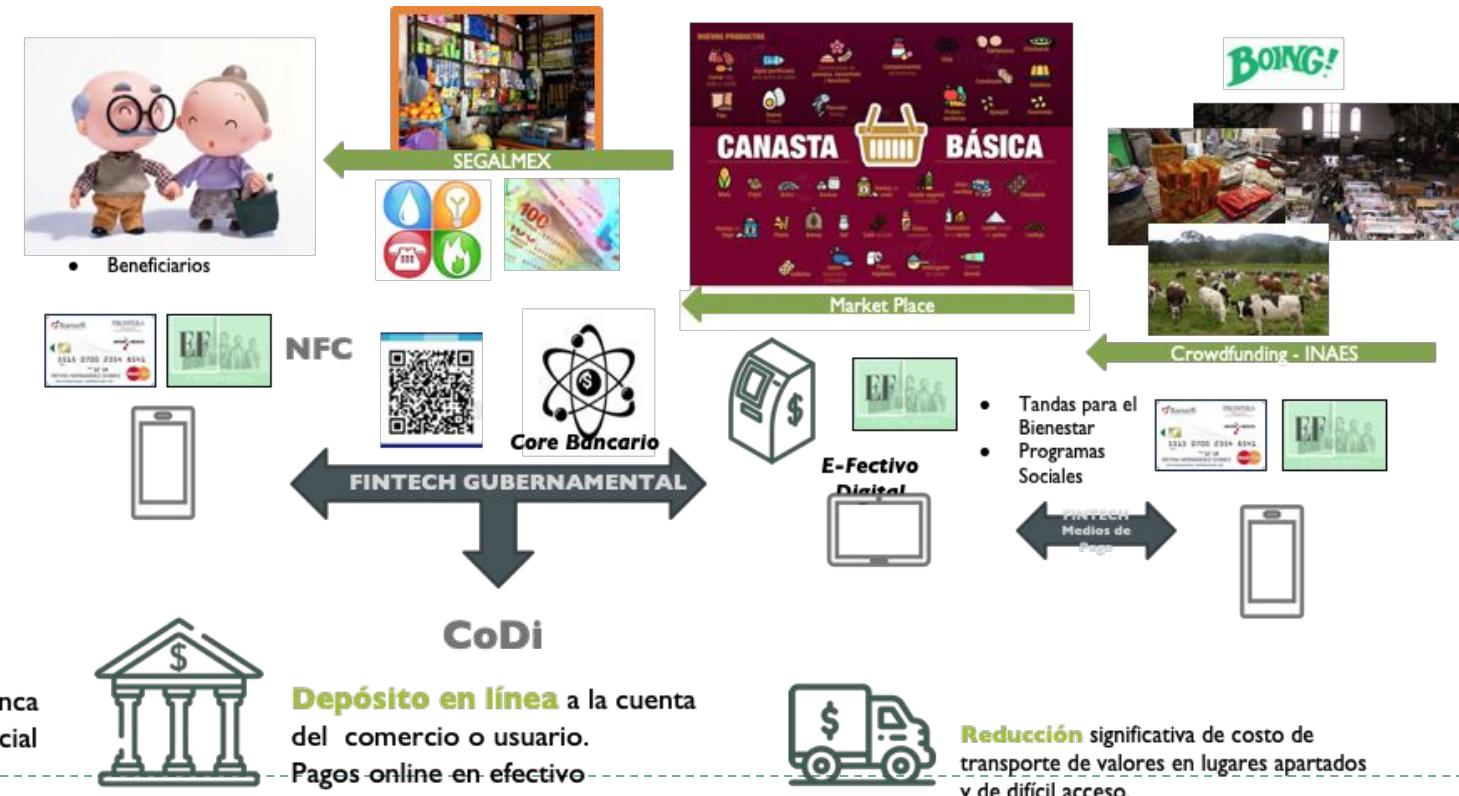
Interest Level within Mifos Ecosystem

- Canada
 - Mifos and Mojaloop Stack were part of the toolkit available to participants of LCUC Hackathon sponsored by Microsoft for 14 largest credit unions in Canada.
- Uganda - Kanzu Code
 - Mifos partner in Uganda working on Mojaloop-powered solution to enable wallet to wallet transfers leveraging Mojaloop and Mifos as back-end.
 - Current focus on in-country transfers with a POC by September but goal is for cross-currency and cross-border transfers as well as funding accounts from banks and cards.
 - Followed Mifos AWS setup to help understand different services and stand up their AWS environment



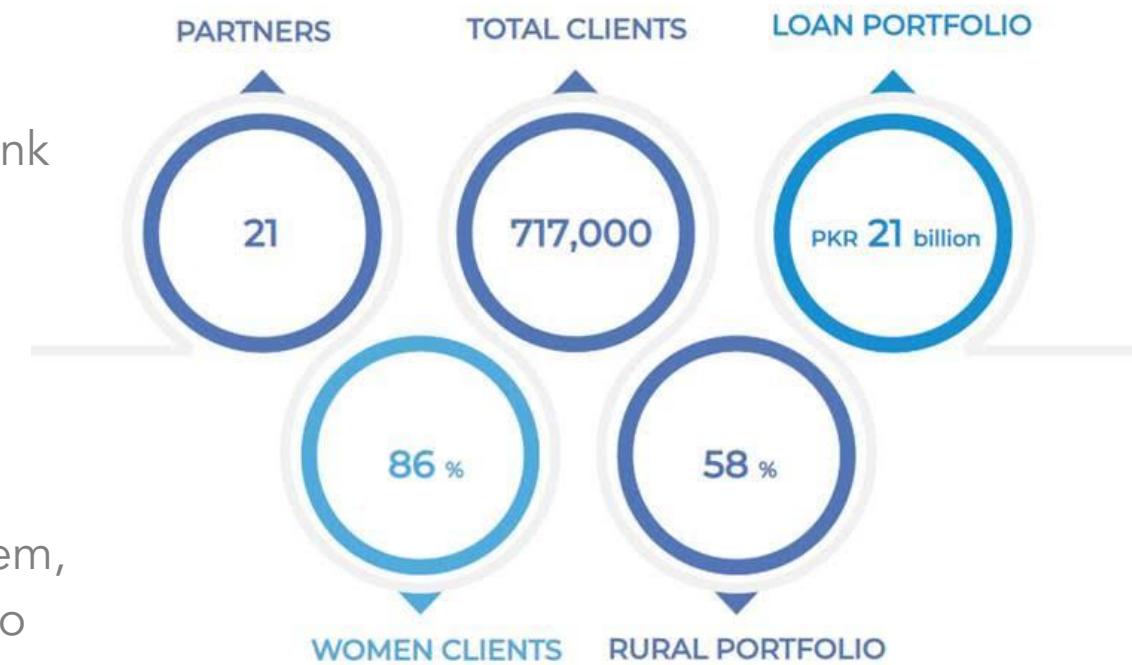
Mexico - Marketplace for INEAS

- Need
 - Government Institution - INAES, National Institute of Social Economy, creates and funds cooperatives
 - Need to build a B2B marketplaces and support Integration Centers where members can withdraw social program/benefits via ATMs



Pakistan - PMIC Supported by Paysys Labs

- Need:
 - Established by government of Pakistan to serve underserved & reach rural populations where penetration of commercial banks and large-scale MFIs is low.
 - Owned by three shareholders, Pakistan Poverty Alleviation Fund, Karandaaz, & KFW Development Bank
 - Need multi-tenant hosted core banking system to transform & digitize operations of MFIs they provide liquidity for.
- Solution:
 - First deployment of Mojaloop in Pakistan
 - Paysys Labs would deploy Mifos as core banking system, payment hub to connect to Mojaloop and Mojaloop to enable transactions between customers of PMIC MFIs
 - Timeline is to kick off deployment and integrate Mojaloop with 2 MFIs in next six months.

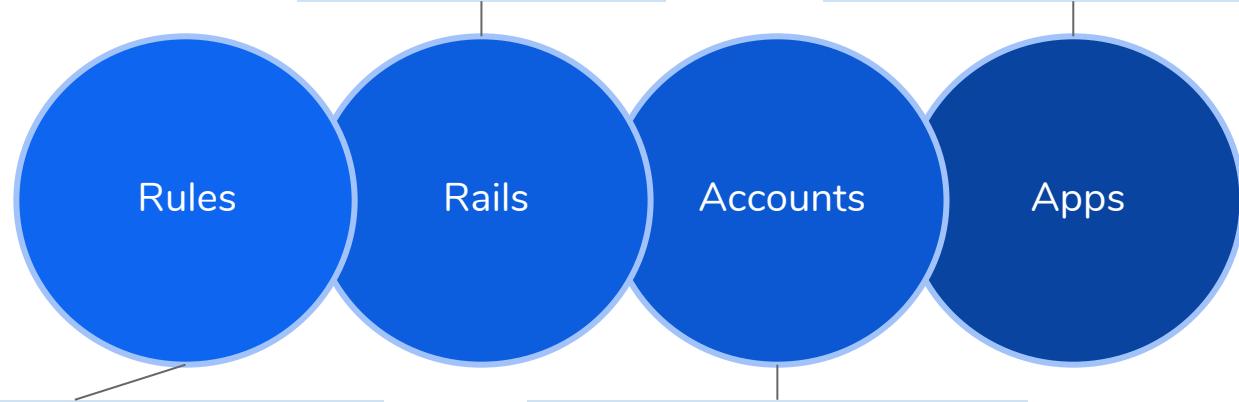


Accelerating Community Adoption

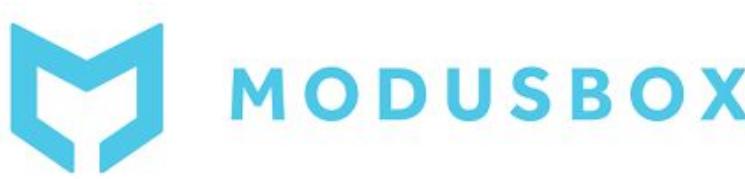
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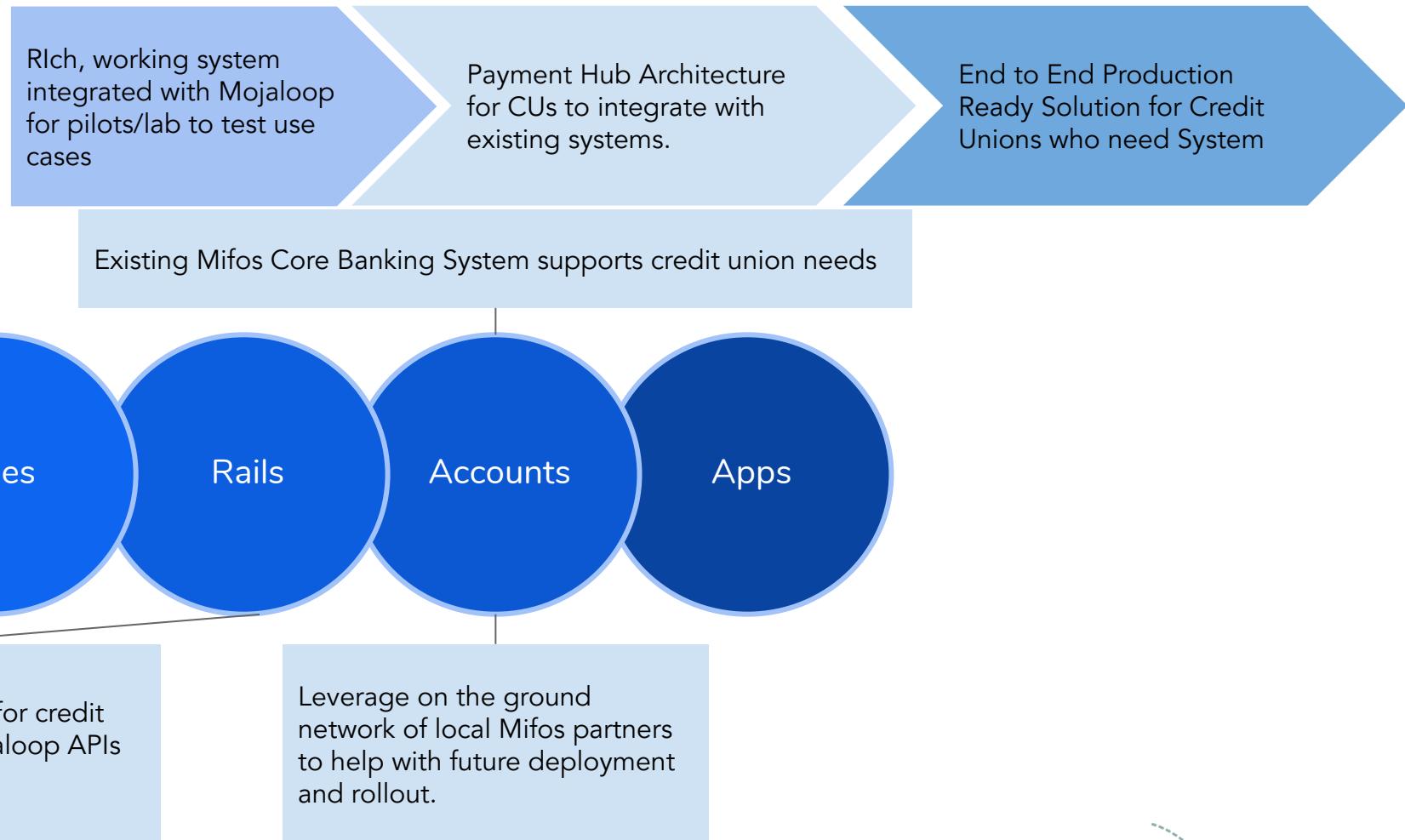
Accelerate MFI & SACCO Participation in TIPS



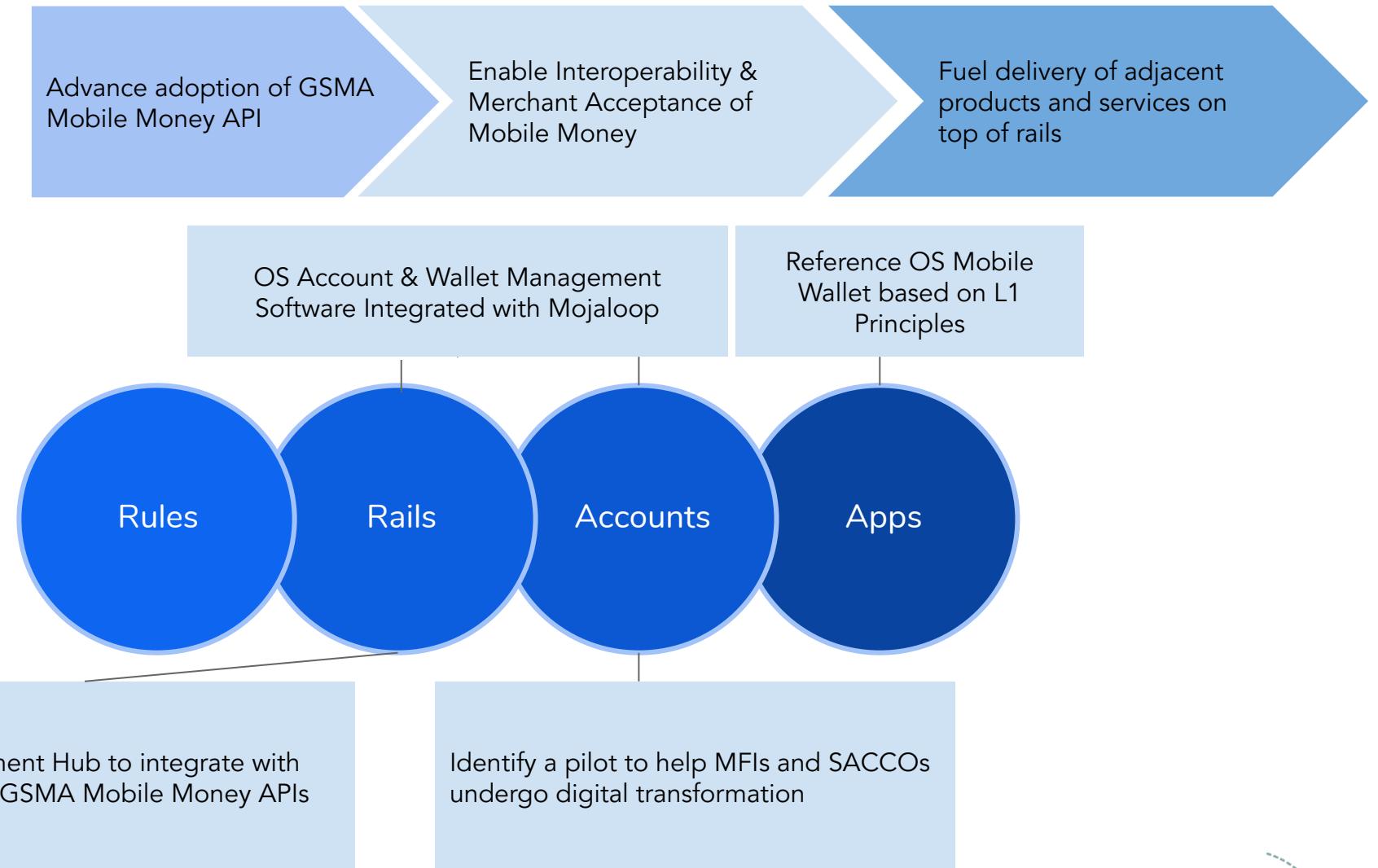
Accelerate WOCCU Digital Financial Inclusion Project



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Exploring How Mifos Can Support Vision & Goals of GSMA Lab



Mifos Focus Areas

mojaloop



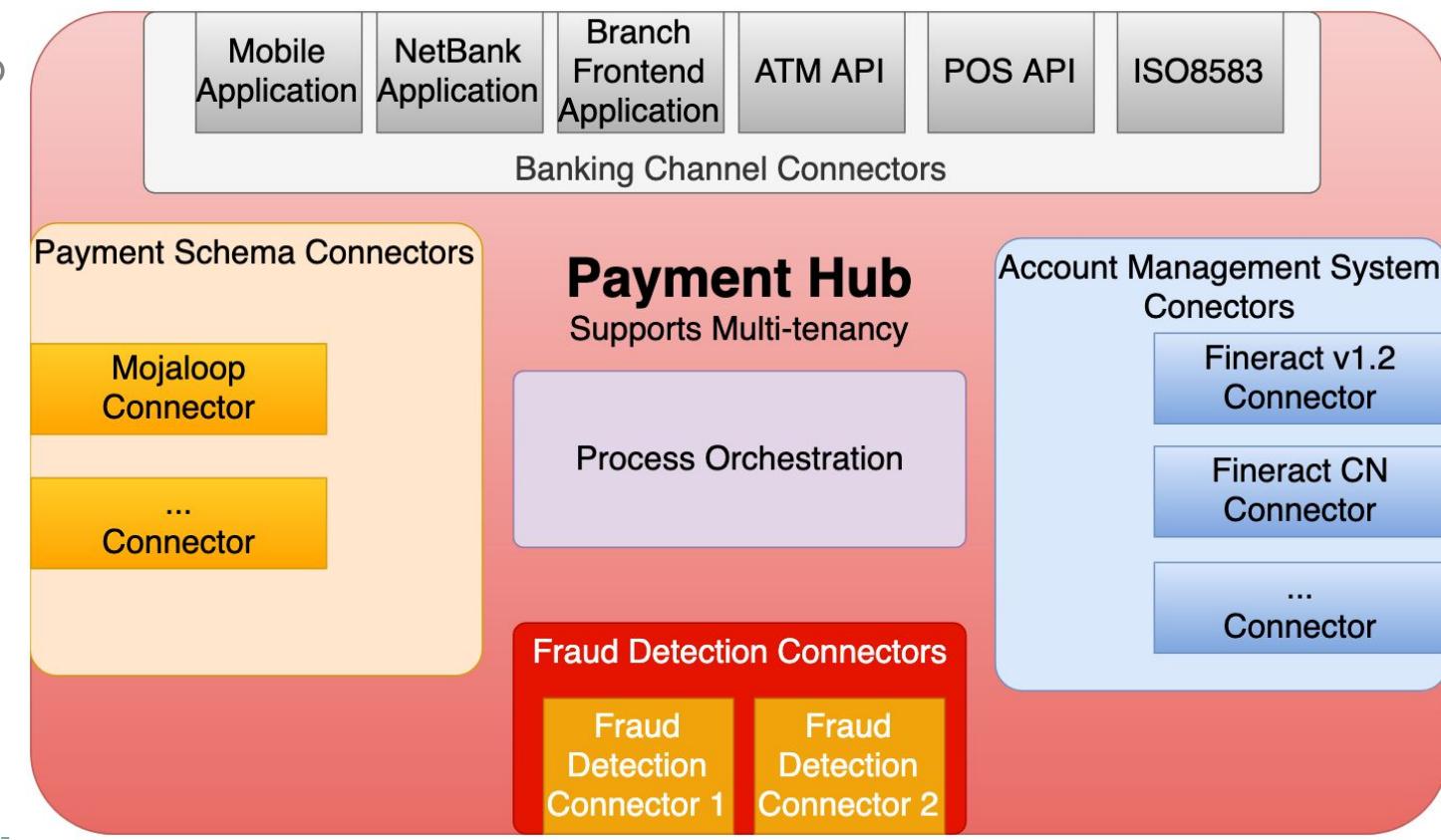
Design and Launch Global Lab Environment

- Need:
 - Community needs a single point of entry for ecosystem with smooth user experience
 - Regulators to address their concerns
 - Participants and hub operators to test and explore use cases
 - Innovation sandbox for fintechs to test out APIs
 - Unify disparate lab environments
- Results
 - Set of robust demonstrable tools that go beyond current simulators.
 - Central, Securely Accessible, Continually Maintained Lab for Hackathons, etc.
 - Global Mojaloop Hub connected to other labs (Mifos, GSMA, COIL, WOCCU, etc.) to test out cross-hub, cross-border, and cross-currency transactions.
- To Do
 - Integrate newly developed API Gateway by OSS team and developer portal
 - Integrate robust simulator tool
 - Configure lab global environment with connections to other labs



Payment Hub as an Open Source Asset for the Community

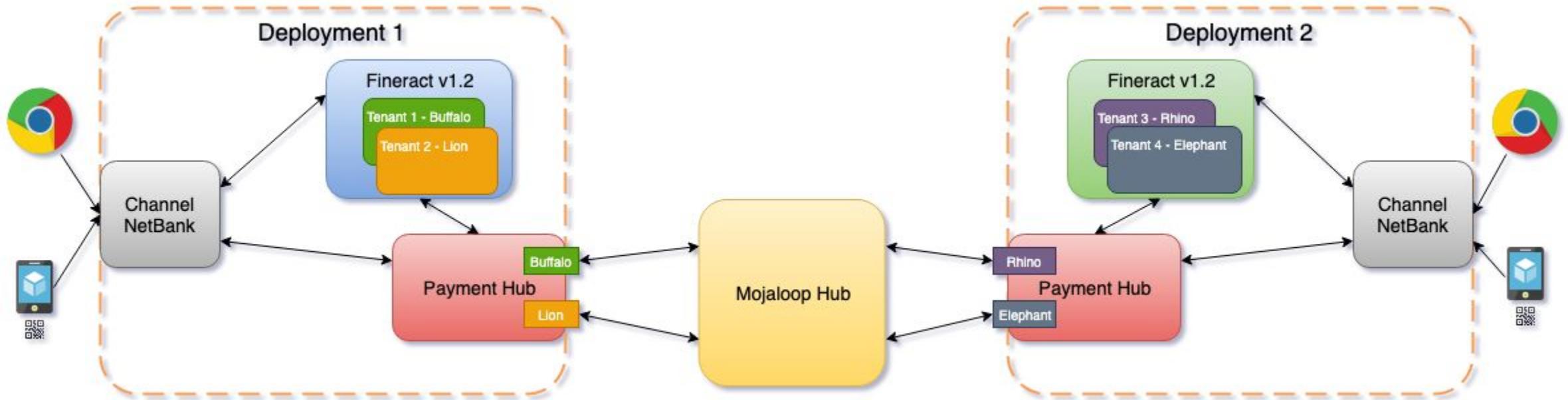
- The role of a payment hub to connect:
 - Financial Institution channels (Mobile, Internet, Branch, Callcenter, ATM, POS)
 - Account Management System (AMS / Core banking platform)
 - Payment Schemes, such as Mojaloop
- Need
 - Consistent Way to Connect to Mojaloop
 - Effective Operational Participation
- Additional Capabilities
 - DFSP-level fraud monitoring
 - Bulk Transfer Campaign Management
 - Operational Monitoring
 - Manages the identifier – account
 - Trigger notifications
- Built on proven open-source technology:
 - Java, SpringBoot
 - Apache Camel



Lab environment - Hackathon



Logical model of hackathon lab environment



The hackathon user groups

Which user groups the environment could support:

- Hard Core Techies
 - Calling Mojaloop interfaces directly, do not care about the Accounts, Account Management System (AMS)
 - Testing out capabilities of the Hub, understanding the APIs in detail
- Reuse and innovate
 - Use the Payment Hub simplified interface to do the actual transactions to connect the channel, the AMS and Mojaloop
 - Focus on customer journey, improved experience
- The Fintechs
 - DFSP? Switch? What??? Why??? Don't care.
 - Give me some simple APIs to inquire about the customer accounts and let me initiate payments or process customer transaction history for meaningful insights
 - Does not care about Account Management Systems, Payment Hubs, Mojaloop Hub, Settlement

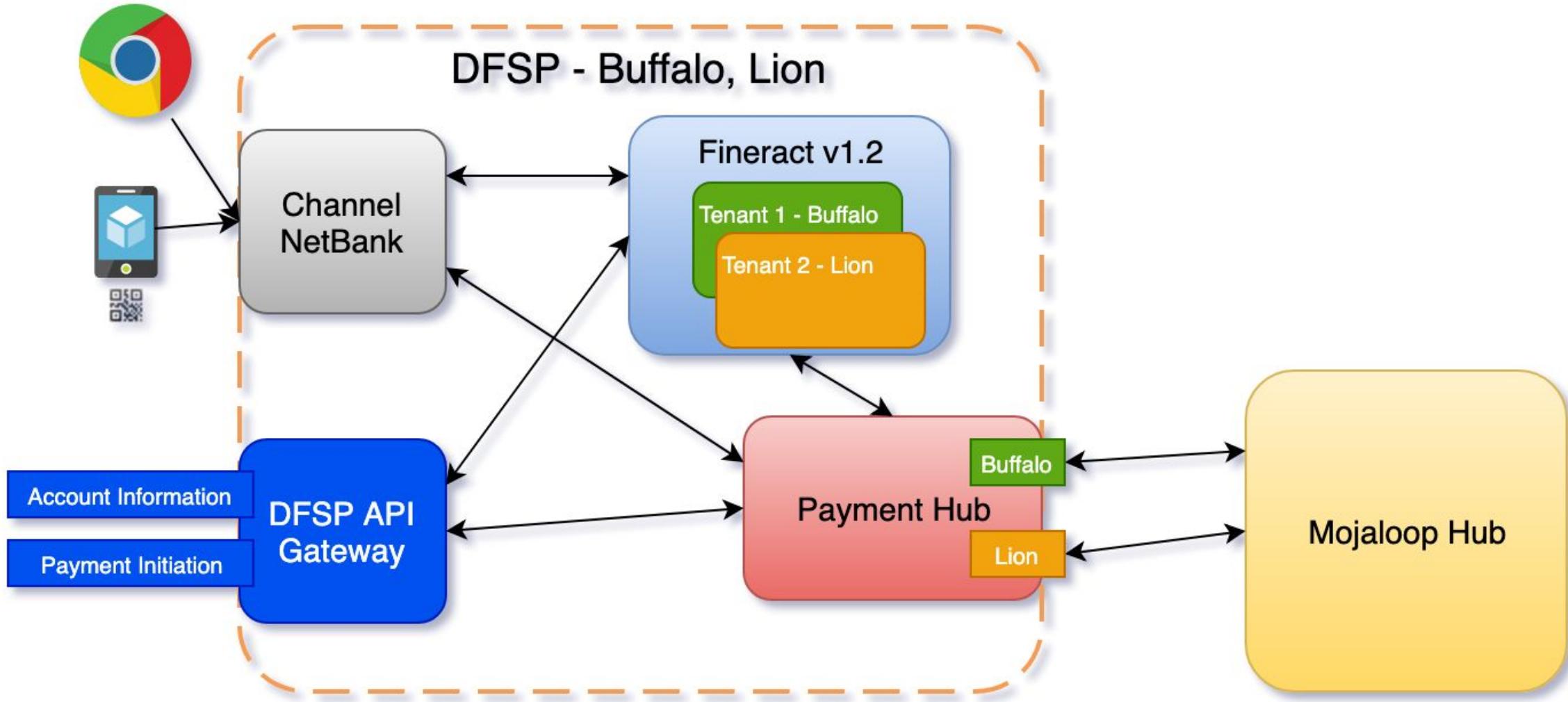


How to serve the user groups

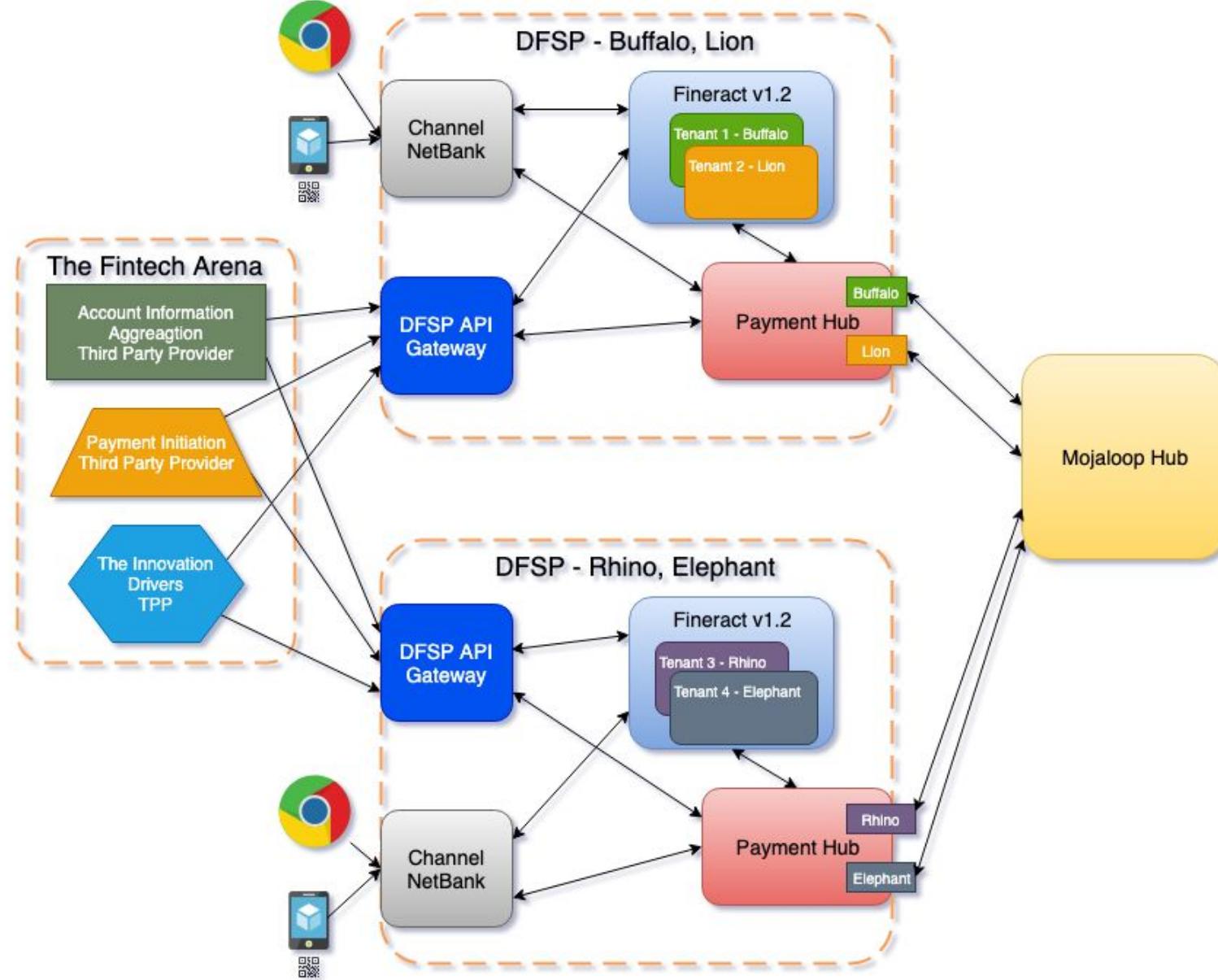
- Hard Core Techies
 - Mojaloop is available to be invoked
 - Improvement: keep it updated, but always in sync with the connecting components
- Reuse and innovate
 - Payment Hub is available, integrated with Mifos AMS, provides simple API to initiate a payment
 - Improvement: keep adding support for the additional use-cases, such as bulk, request to pay
- The Fintechs
 - **Not served yet -> To be served**
 - Improvement: provide a DFSP API Gateway to standardize and simplify their access to the Banking infrastructure. DFSPs are just a utility service provider to enable their innovation.



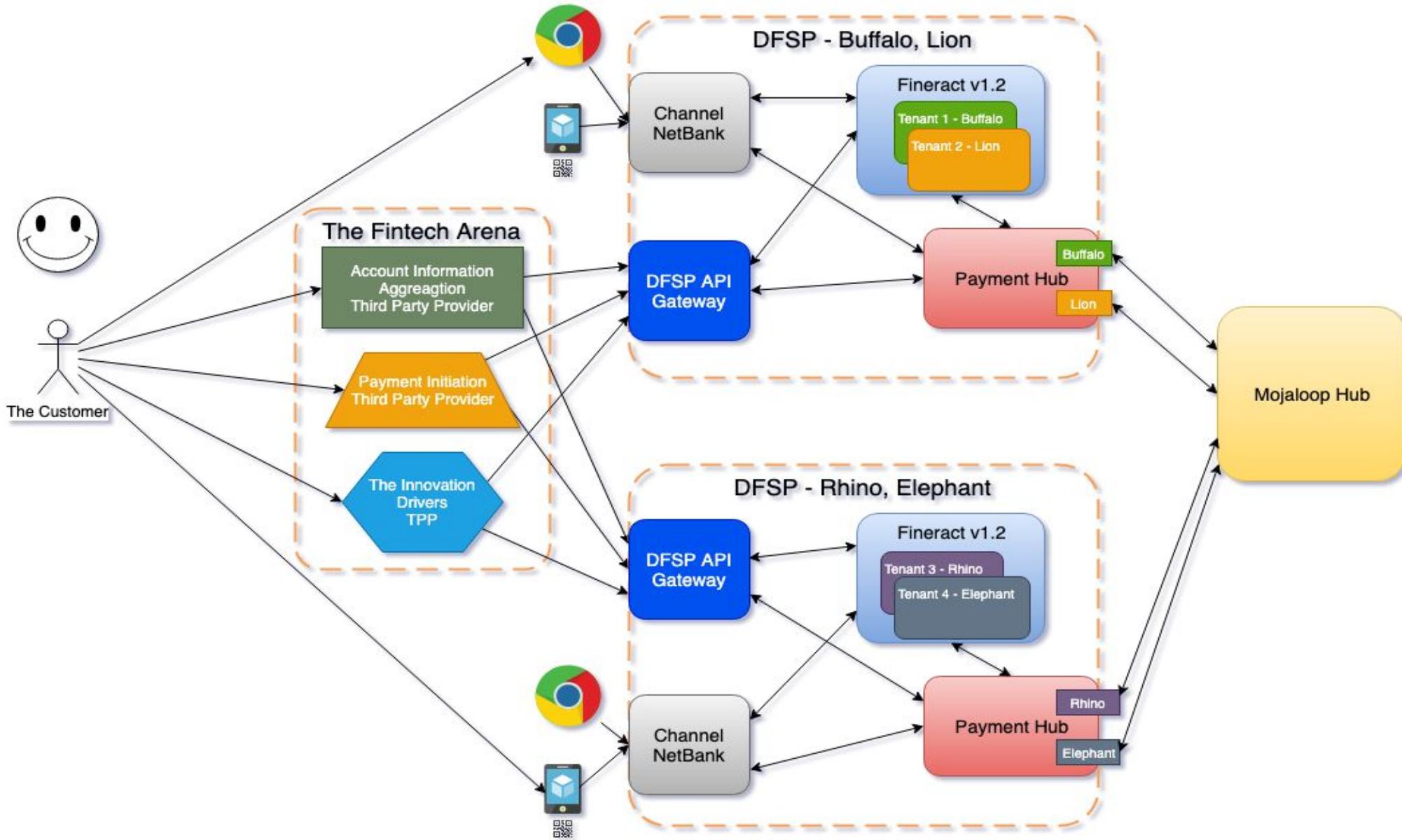
Openbanking API - DFSP API Gateway



Openbanking API - DFSP API Gateway - TPP focus



Openbanking API - DFSP API Gateway - Customer focus



DFSP API Gateway

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Open Banking API

“Open Banking is the secure way to give providers access to your financial information.”
“It opens the way to new products and services that could help customers and small to medium-sized businesses get a better deal. It could also give you a more detailed understanding of your accounts, and help you find new ways to make the most of your money.”

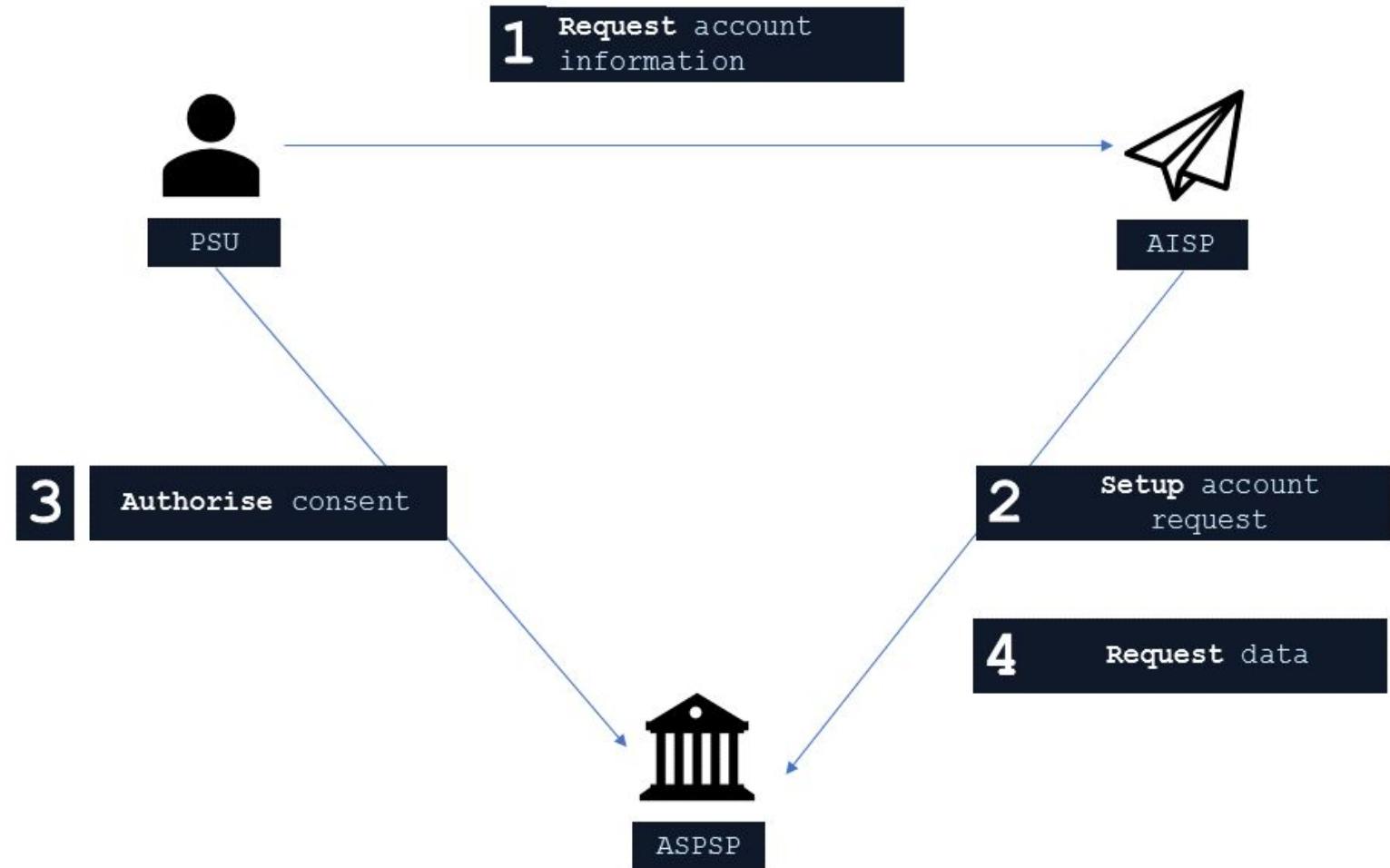
Enable third parties (fintechs) to access multiple DFSPs APIs using a standardised mechanism.

Terminology used:

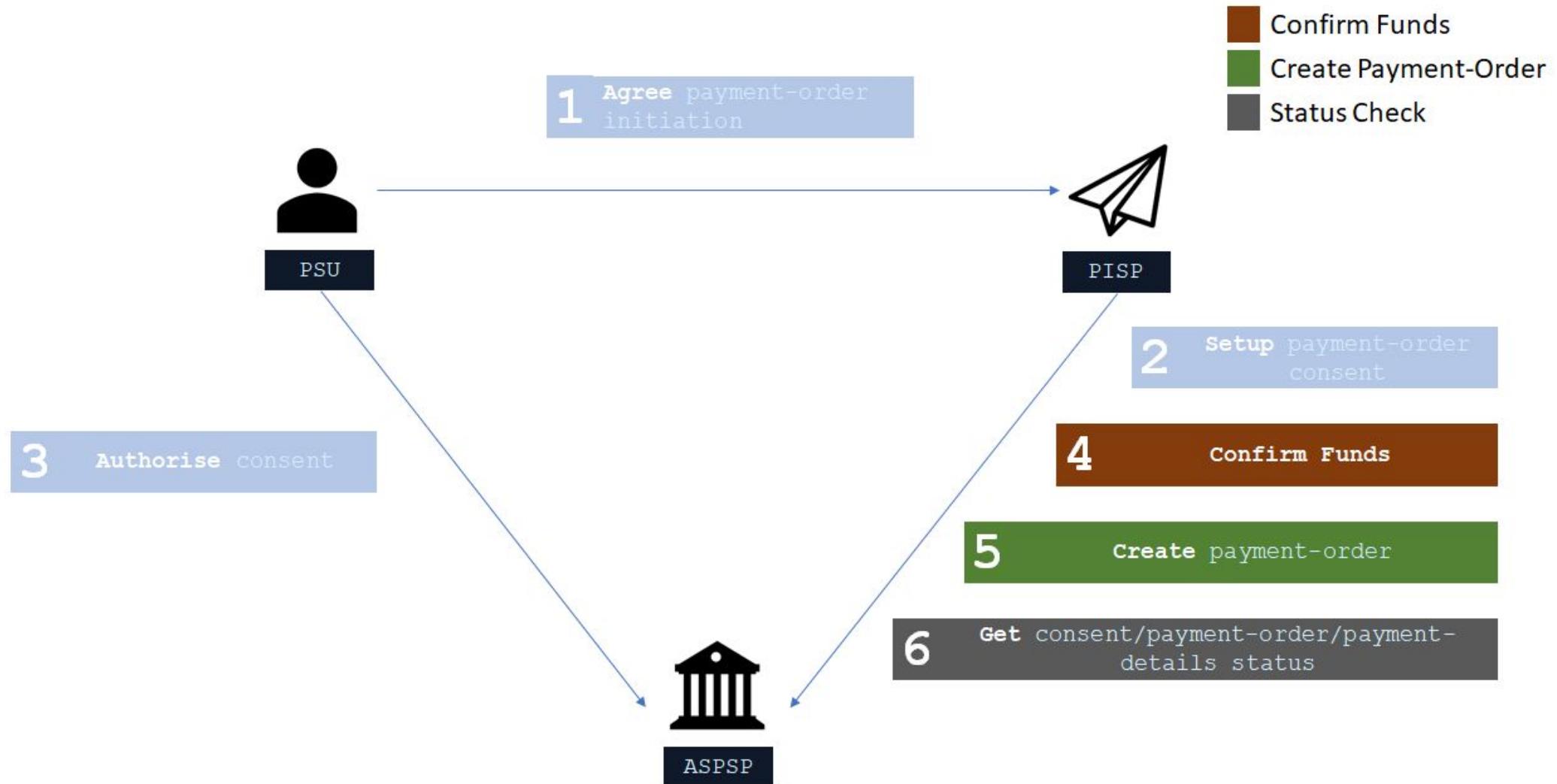
- ASPSP - Account Servicing Payment Service Provider - DFSP
- PSU - Payment Service User - account holder at one or multiple ASPSP
- AISP - Account Information Service Provider
- PISP - Payment Initiation Service Provider



Account and Transaction Flow



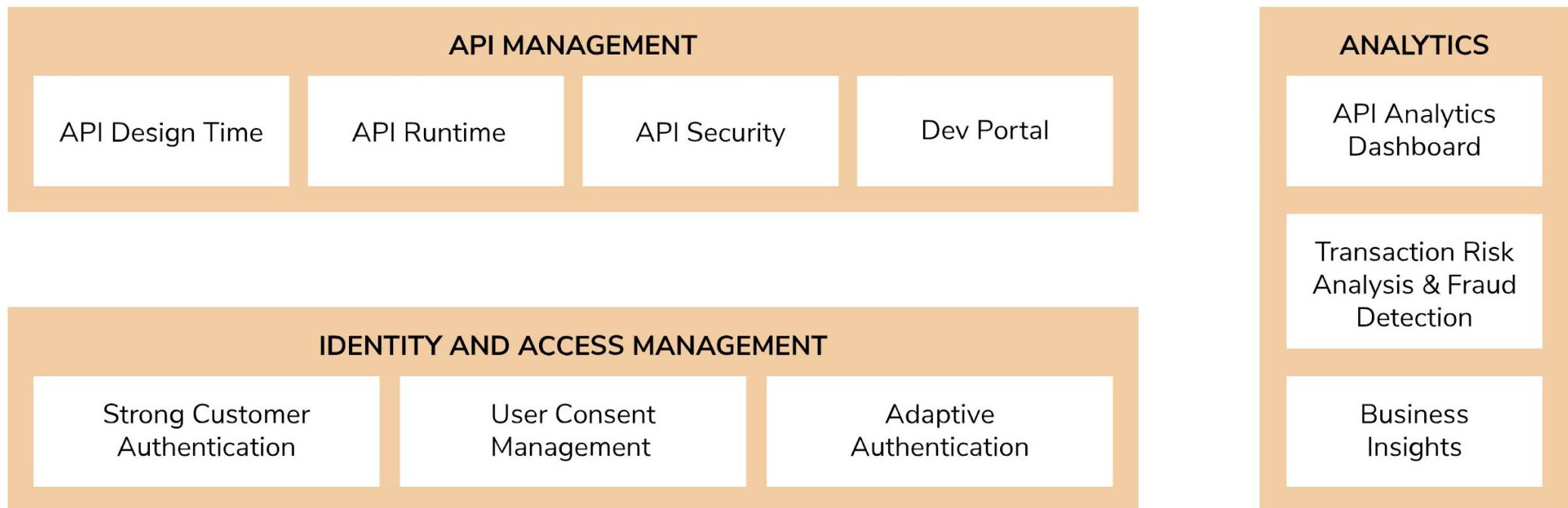
Payment Initiation Flow



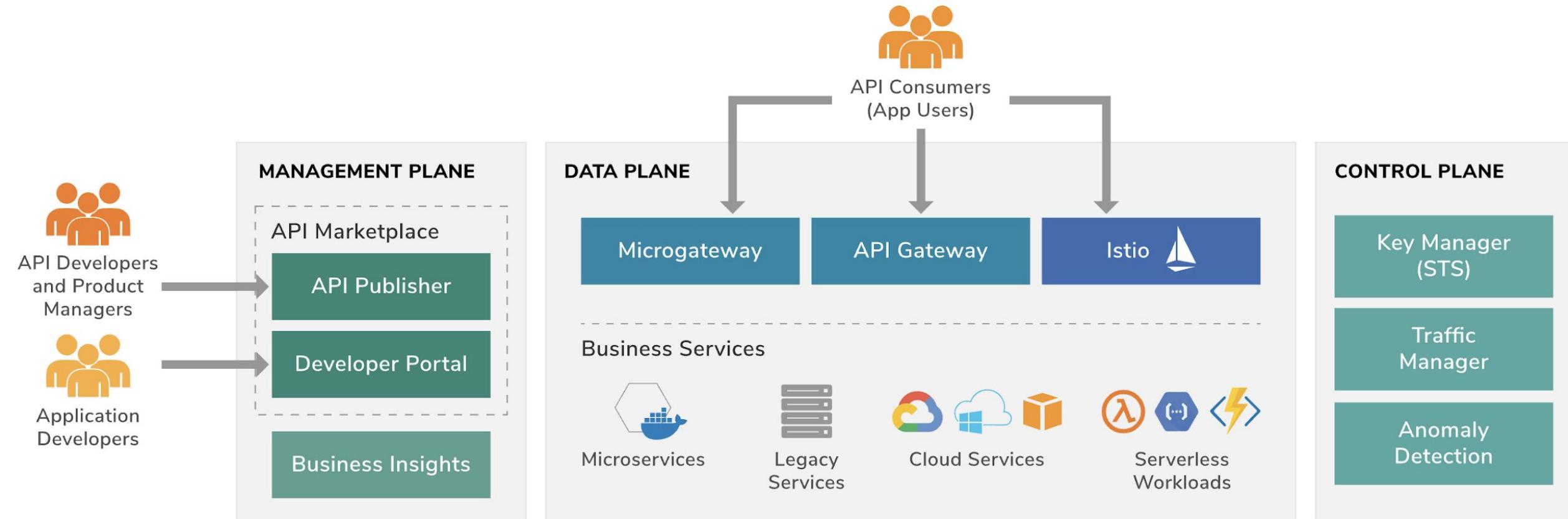
WSO2 API Elements

WSO API Manager

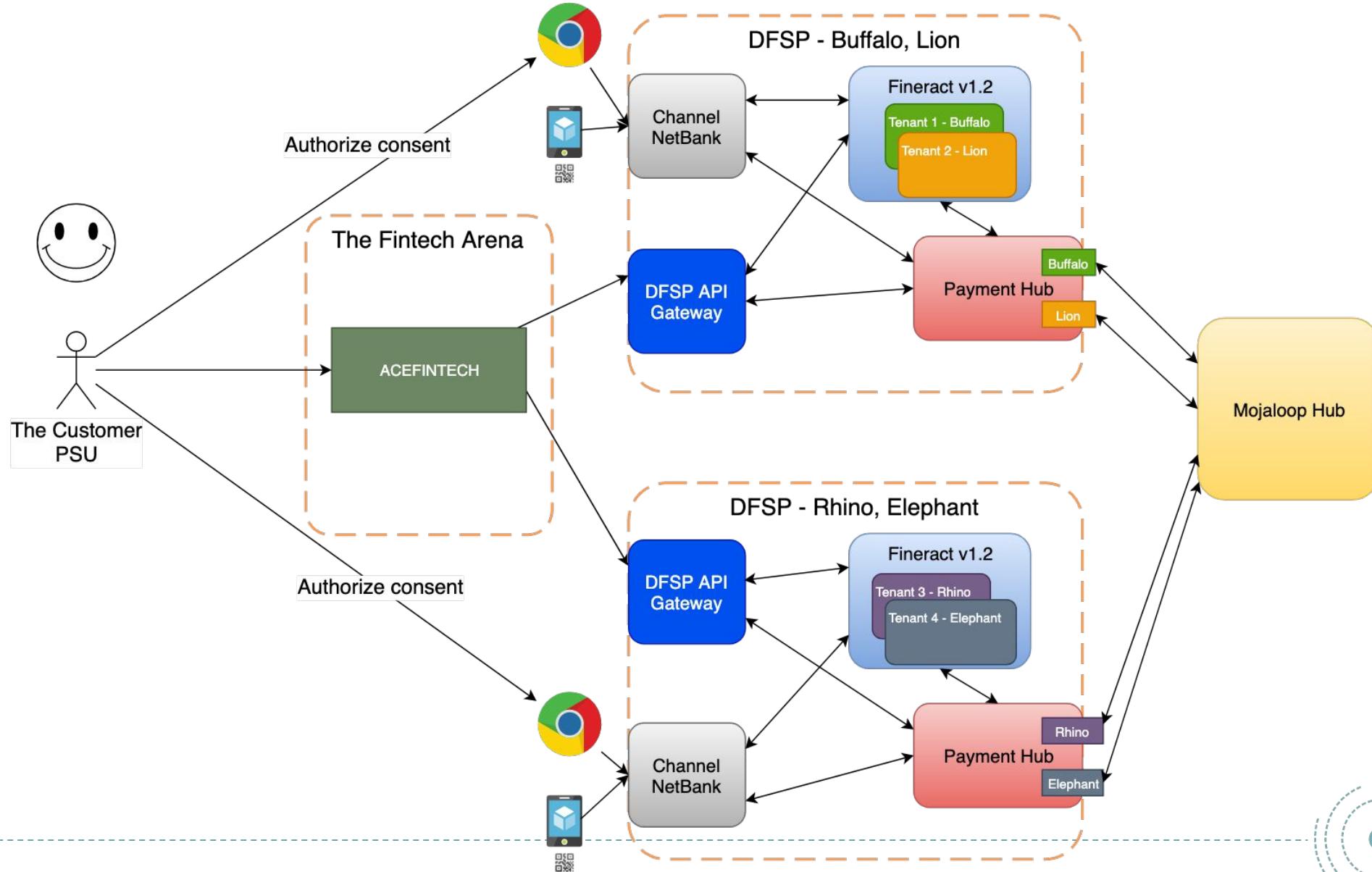
- Publisher (to publish APIs)
- Store (Developer portal; Sandbox)
- Identity and Access Management



WSO2 API Manager



The extended lab environment



ASPSP - DFSP to publish its API

The screenshot shows a browser window titled "API Publisher Listing - Google Chrome" displaying the WSO2 API Publisher interface. The URL in the address bar is <https://api.lion.mlabs.dpc.hu:9443/publisher/>. The page title is "WSO2 API Publisher". The top navigation bar includes links for "Inbox", "Setup", "wso2", "WSO2", "Gettin", "CORS", "Hacka", "API", "Hacka", and a "+" button. Below the navigation bar is a toolbar with icons for "Apps", "Chrome Remo...", "arch | Alvicom...", "Tamás @ Munka", "REAMO: Basel...", "open0", and "Other bookmarks". On the right side of the header is a user profile icon for "admin". The main content area has a dark header with "HOME / APIs" and a blue navigation bar with "APIS" selected, along with "ANALYTICS" and "MANAGE ALERT TYPES" options. The main content area is titled "All APIs" and features a search bar. A single API entry is listed: "AccountTrans..." (version v3.1.2, created by admin, 1 User, PUBLISHED). The API card includes edit and delete icons. At the bottom of the page is the footer "WSO2 API Manager | © 2019 WSO2 Inc."

WSO2 API Store - Access API for Fintechs

Sign Up - Google Chrome

https://api.lion.mlabs.dpc.hu:9443/store/site/pages/sign-up.jsp

WSO2 API STORE

Create your Account

Username * acfintech Characters left: 20

Password * Retype Password *

First Name * ACE Last Name * Rintch

Email * acfintech@apc.hu

View Additional Details

After successful sign in, we use a cookie in your browser to track your session. You can refer our [Cookie Policy](#) for more details.

I hereby confirm that I have read and understood the [Privacy Policy](#).

Sign Up Cancel

WSO2 API Manager 2.6.0 © 2019 WSO2 Inc.

API Store - AccountTransactionAPI - Google Chrome

https://api.lion.mlabs.dpc.hu:9443/store/apis/info?name=AccountTransactionAPI&version=v3.1.2&provider=admin#/Accounts/GetAccounts

APIS APPLICATIONS FORUM ANALYTICS MANAGE ALERTS

string (header) x-fapi-customer-ip-address - The PSU's IP address

x-fapi-interaction-id An RFC4122 UID used as a correlation id.

string (header) x-fapi-interaction-id - An RFC4122 UID used as a correlation id

Authorization * required An Authorisation Token as per https://tools.ietf.org/html/rfc6750

string (header) Bearer weqrwertwert

Execute Clear

Responses Response content type application/json; charset=utf-8

Curl

```
curl -k -X GET "https://api.lion.mlabs.dpc.hu:8243/open-banking/v3.1/aisp/v3.1.2/accounts" -H "accept: application/json; charset=utf-8" -H "Authorization: Bearer 8369e838-6f47-3b53-8c6b-5d4b4fd1156"
```

Request URL

https://api.lion.mlabs.dpc.hu:8243/open-banking/v3.1/aisp/v3.1.2/accounts

Server response

Code	Details
401	Error: Response body <ams:fault xmlns:ams="http://wso2.org/apimanager/security"> <ams:code>900901</ams:code> <ams:message>Invalid Credentials</ams:message> <ams:description>Access failure for API: /open-banking/v3.1/aisp/v3.1.2, version: v3.1.2 status: (900901) - Invalid Credentials. Make sure you have given the correct access token</ams:description> </ams:fault> Response headers content-type: application/xml; charset=UTF-8

Responses

Code	Description
200	Accounts Read Example Value Model {}



API Store - AccountTransactionAPI - Google Chrome

Inbox (9) | Inbox (7) | My Drive | Setup A... | wso2w... | wso2-C... | WSO2-... | Getting... | CORS SU... | Hackath... | API Stor... | Hackath... | +

← → 🔍 https://api.lion.mlabs.dpc.hu:9443/store/apis/info?name=AccountTransactionAPI&version=v3.1.2&provider=admin

Apps Chrome Remo... arch | Alvicom... Tamás @ Munka REAMO: Basel... opten0 Inbox (79) - sip... 20190520 20190522 20190529 Consent Other bookmarks

WSO2 API Store

APIS APPLICATIONS FORUM ANALYTICS MANAGE ALERTS

GO BACK

AccountTransactionAPI - v3.1.2

A

Version: v3.1.2
By: admin
Updated: 21/Jun/2019 19:24:33 PM GMT
Status: PUBLISHED
Rating: ★★★★★ 0

Applications Select Application...
Tiers Unlimited

Subscribe

Overview API Console Documentation SDKs Forum

Production and Sandbox Endpoints

Production and Sandbox URLs:

<http://api.lion.mlabs.dpc.hu:8280/open-banking/v3.1/aisp/v3.1.2>

<https://api.lion.mlabs.dpc.hu:8243/open-banking/v3.1/aisp/v3.1.2>

Description

Swagger for Account and Transaction API Specification

Share

Social Sites Embed Email

f t g+ digg

Comments

Characters left: 450

Add

No comments yet



API Store - AccountTransactionAPI - Google Chrome

Inbox (9) × Inbox (7) × My Drive × Setup A × wso2 w × wso2-C × WSO2- × Getting × CORS su × Hackath × API Stor × Hackath × +

← → ⌂ https://api.lion.mlabs.dpc.hu:9443/store/apis/info?name=AccountTransactionAPI&version=v3.1.2&provider=admin#tab1

apps Chrome Remo... arch | Alvicom... Tamás @ Munka REAMO: Basel... opten0 Inbox (79)-sip... 20190520 20190522 20190529 Consent Other bookmarks

WSO2 API Store

APIS APPLICATIONS FORUM ANALYTICS MANAGE ALERTS

GO BACK

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A

Version: v3.1.2
By: admin
Updated: 21/Jun/2019 19:24:33 PM GMT
Status: PUBLISHED
Rating: ★★★★☆

Applications Select Application...
Tiers Unlimited

Subscribe

Overview API Console Documentation SDKs Forum

Try ACE Fintech App v1.0
Using Production Key

Set Request Header Authorization : Bearer 8369e836-6f47-3b53-8c6b-5d4b4af1156

Swagger (/swagger.json)

Account Access

POST /account-access-consents Create Account Access Consents

GET /account-access-consents/{ConsentId} Get Account Access Consents

DELETE /account-access-consents/{ConsentId} Delete Account Access Consents

Accounts

GET /accounts Get Accounts

GET /accounts/{AccountId} Get Accounts

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https://api.lion.mlabs.dpc.hu:9443/store/apis/info?name=AccountTransactionAPI&version=v3.1.2&provider=admin#tab1

35

API Store - AccountTransactionAPI - Google Chrome

Inbox (9) | Inbox (7) | My Drive | Setup A... | wso2 w... | wso2 - C... | WSO2 - C... | Getting | CORS su... | Hackath... | API Stor... | Hackath... | +

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Apps | Chrome Remo... | arch | Alvicom... | Tamás @ Munka | REAMO: Basel... | opten0 | Inbox (79)-sip... | 20190520 | 20190522 | 20190529 | Consent | Other bookmarks

APIS | GO BACK

APPLICATIONS

FORUM

ANALYTICS

MANAGE ALERTS

Account Access

POST /account-access-consents Create Account Access Consents

GET /account-access-consents/{ConsentId} Get Account Access Consents

DELETE /account-access-consents/{ConsentId} Delete Account Access Consents

Accounts

GET /accounts Get Accounts

Parameters

Name Description

x-fapi-auth-date The time when the PSU last logged in with the TPP.
string
(header)
All dates in the HTTP headers are represented as RFC 7231 Full Dates. An example is below:
Sun, 10 Sep 2017 19:43:31 UTC

x-fapi-customer-ip-address The PSU's IP address if the PSU is currently logged in with the TPP.
string
(header)

x-fapi-interaction-id An RFC4122 UID used as a correlation id.
string
(header)

Authorization * required An Authorisation Token as per <https://tools.ietf.org/html/rfc6750>
string
(header)

Responses

Code Description

200 Accounts Read

Response content type application/json; charset=utf-8

Example Value Model

```
{ "Data": { "Account": [ ] } }
```

Interaction for the payment service user (PSU)

The image consists of five screenshots illustrating the interaction flow for a payment service user (PSU) through a mobile application interface.

- Login Screen:** Shows a message "You are not logged in." and a "Login" button. Below it are fields for "Username" (tppuser) and "Password" (*****), followed by a "Login" button with a right-pointing arrow icon.
- Connected Banks Screen:** Displays the user's profile "John Smith" at the top. Below it is a section titled "CONNECTED BANKS" showing two entries: "Rhino Bank Ltd." and "Buffalo Bank Ltd.". A blue "Add Bank" button is located at the bottom right.
- Accounts Screen:** Shows the user's profile "John Smith" at the top. Below it is a section titled "ACCOUNTS" listing four accounts:
 - Bills Credit: 1230.00 GBP
 - Household Debit: 57.36 GBP
 - Bills Credit: 1230.00 GBP
 - Household Debit: 57.36 GBPA blue "Add Account" button is located at the bottom right.
- Account Details Screen:** Shows detailed information for one of the accounts. It includes:
 - Nickname: Bills
 - Status: Enabled
 - Owner: Mr Kevin
 - Type: Credit
 - Amount: 1230.00 GBP
 - Credit line amount: 1000.00 GBPA back arrow icon is located at the top left.
- Supported Banks Screen:** Displays the user's profile "John Smith" at the top. Below it is a section titled "SUPPORTED BANKS" showing four entries:
 - Lion Bank Ltd. (with icon)
 - Elephant Bank Ltd. (with icon)
 - Rhino Bank Ltd. (with icon)
 - Buffalo Bank Ltd. (with icon)



Thank You

- Márta Jankovics, Tamás Sipos and colleagues at DPC to implement the software
- Miller Abel
- Kim Walters

Edward Cable

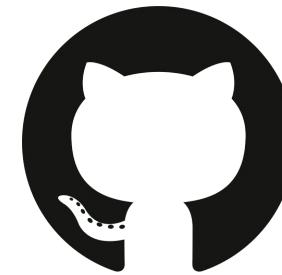
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github.com/openMF
github.com/openMF/payment-hub
github.com/openMF/mobile-wallet
github.com/apache/fineract
fineract.apache.org

