The future of RTP systems: The case for 3P payment initiation

Mojaloop Phase Four Conference

January 2020

hannia@, zelidrag@

How many of you have heard of ?
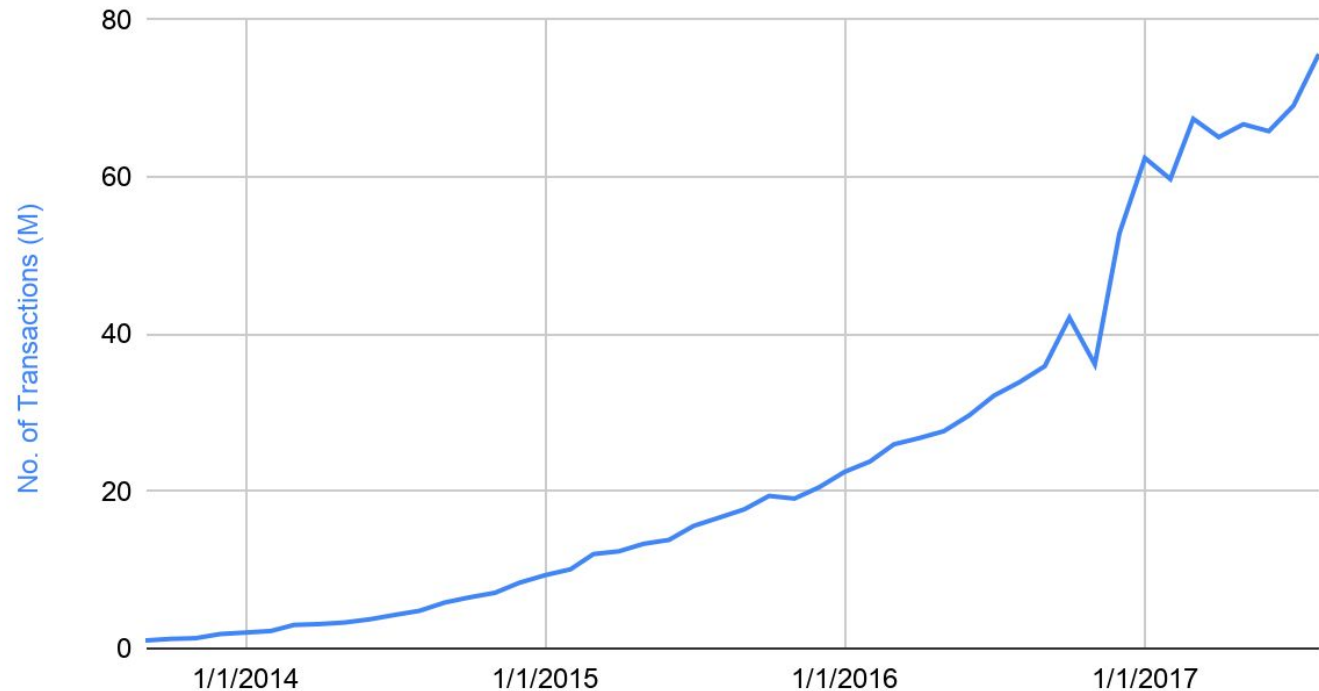
IMPS

IMMEDIATE PAYMENT SERVICE

India's RTP system, launched Nov 2010
High banked population
Government support to digitize
Support for pay to phone number

Modest Growth

IMPS IMMEDIATE PAYMENT SERVICE **Volume per Month**

No. of Transactions (M)

80 — 60 — 40 — 20 — 0

1/1/2014   1/1/2015   1/1/2016   1/1/2017

Source: National Payments Corporation of India (NPCI)

How many of you have heard of ?

API layer for third parties to initiate payments over the RTP system
Launched Aug 2016
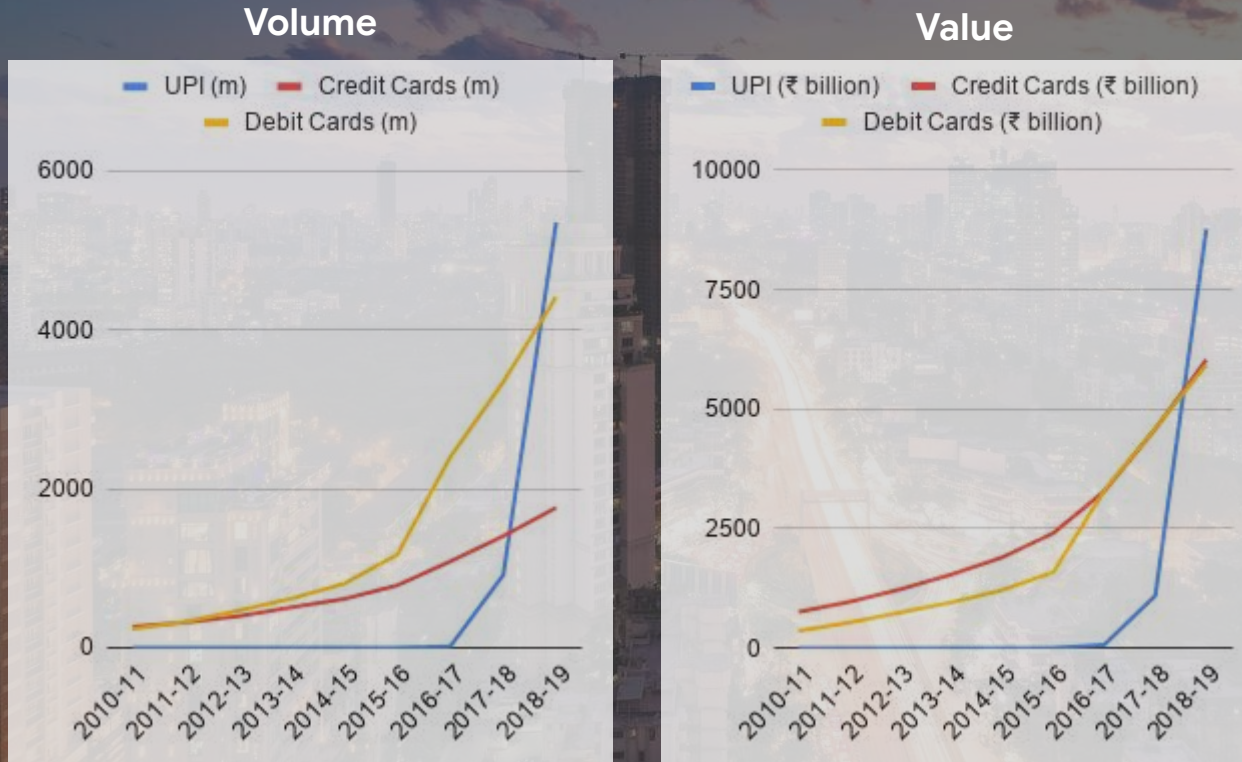
UPI's explosive growth

BHIM-UPI transactions

~70x growth

1B +

Launch of **G** Pay

17M

August
2017

October
2019

Digital payments volume now ~10% of GDP

UPI, Credit Cards, Debit Card Growth

Volume

Value

Google Pay in India

67M

2019 monthly
active users

$110B

2019 transaction
value annualised

Google

Data as of Sept 2019

3P access is not new...

[EU] Regulations enabling open APIs can drive innovation

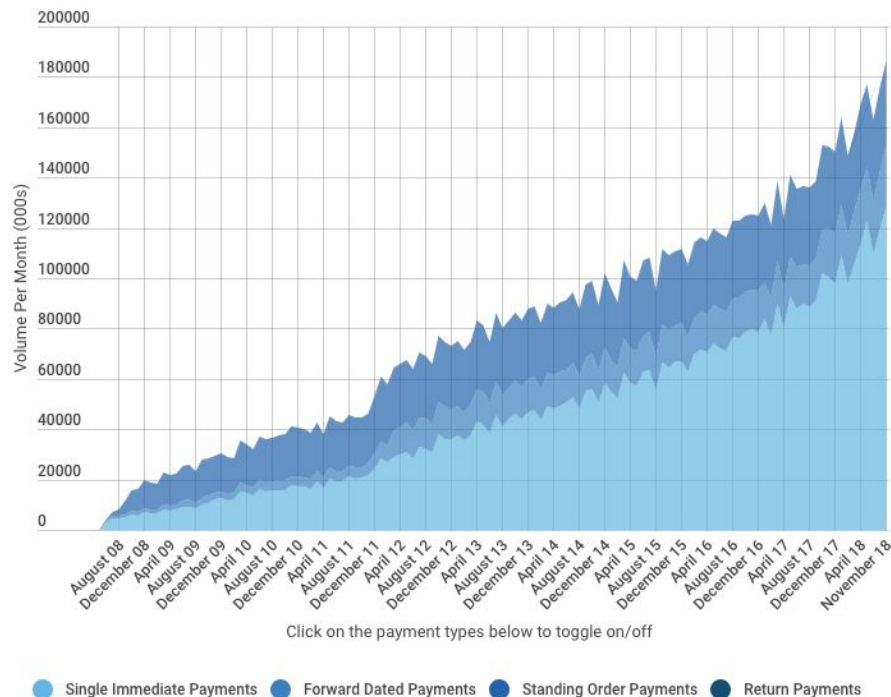**Infrastructure foundations & open regulations** allowed ecosystem growth

UK FPS transactions grew
18x to 180M per month in 10 yrs

Development of instant payments systems
- UK: Faster Payments System
- EU: SEPA instant credit transfer (in all countries by 2020)

Open banking under PSD2 regulation
- Banks must open APIs so technology players can
  - initiate payments
  - get account information

Volume Per Month (000s)

200000
180000
160000
140000
120000
100000
80000
60000
40000
20000
0

August 08, December 08, April 09, August 09, December 09, April 10, August 10, December 10, April 11, August 11, December 11, April 12, August 12, December 12, April 13, August 13, December 13, April 14, August 14, December 14, April 15, August 15, December 15, April 16, August 16, December 16, April 17, August 17, December 17, April 18, November 18

Click on the payment types below to toggle on/off

● Single Immediate Payments ● Forward Dated Payments ● Standing Order Payments ● Return Payments

1

How is open banking doing in Europe?

The UK has not "seen the hockey stick of growth in disruptive new players everybody was predicting. Everybody was expecting PSD2 to happen and all these companies would be fighting with each other to provide services to customers." (source)

PISPs: 5, AISPs: 40+

Open banking: why the revolution is behind schedule

Written by FinTech Futures 2nd May 2019

Money 20/20 Europe 2019: Is Open Banking a complete fiasco?

04 June 2019

Europe begins Open Banking era in subdued style

Learnings from Europe

\+ Single license for a tech player → use APIs of any bank
\+ Tech player → initiate payments and read account information
\+ Free to end users

\- Authentication only on bank surface breaks user experience.*
\- 3Ps must individually integrate with each bank, even with standardized APIs (in the UK)

*According to the European Commission, the Euro Retail Payment Board, the CGAP and the FIDO Alliance

What about Southeast Asia?

Simple RTP through phone directories… ▶ Coupled with removal of digital txn fee in '18, TH's Promptpay txns **grew 26x to 166M per month in 9 yrs**

SEA markets built directories to map phone #s to bank accounts

- Users can simply enter in a friend's phone number to send a payment.
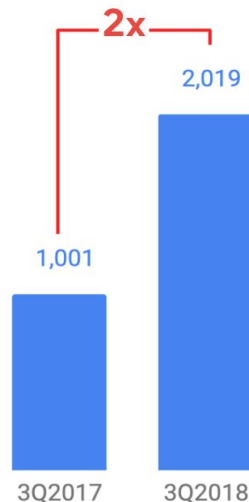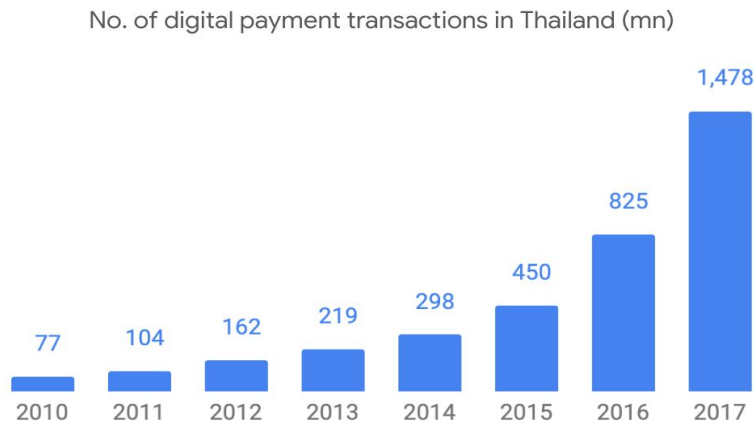- In some cases, users can also pay to national ID or unique merchant identifier

PAY NOW
SG

DuitNow
MY

พร้อมเพย์ PromptPay
TH

No. of digital payment transactions in Thailand (mn)

Year	Value
2010	77
2011	104
2012	162
2013	219
2014	298
2015	450
2016	825
2017	1,478

2x

Period	Value
3Q2017	1,001
3Q2018	2,019

SEA's approach: Simple RTP through phone directories

- Users use their bank apps to pay

- Because of varying user experiences, concentration is mostly in P2P transactions

- Users are still not using this payment method for merchant payments

Singapore

Malaysia

Thailand

Why was India so successful?

India leveraged **3P tech players to turbo charge growth**

UPI transactions **grew 67x to 1.15B per month in 2 yrs**

UPI made it easy for 3P tech players to initiate payments on the RTP system

Single API integration enabling tech players to move money for 140+ banks

Authentication on tech player's surface allows for better user experience and drives adoption

1B+

17M

Launch of G Pay

August 2017

October 2019
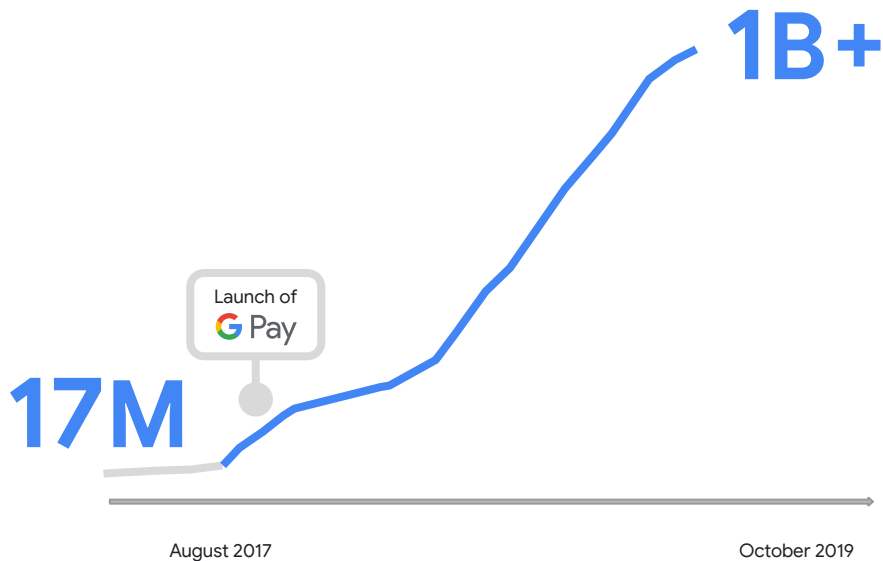
3Ps can build unique user experiences and use cases
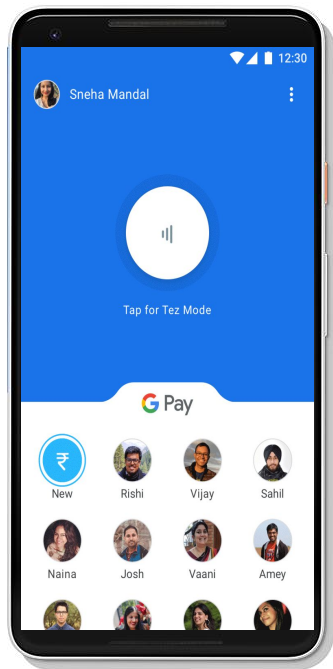
G Pay India

Conversational UI

Built on UPI

Partner with Banks

All Things Money

Power Businesses, Large and Small
- Spot Platform

Hot off the press...
We have collated our recommendations

Real-Time Payments
Systems &
Third Party Access

A perspective from
Google Payments

November 2019

Google

Our technical recommendations for RTP Networks

- Authentication and adequate trust delegation important to find balance between safety and convenience for adoption

- Third party access: Standardized APIs the best way to provide access to both FIs and third parties

- National addressing database: Identifiers that are (i) Easy to remember, (ii) Easy to share without risk, (iii) Interoperable (e.g., email addresses, phone numbers)

- Tiered KYC: Build tiered levels of KYC/ AML for consumers and smaller merchants; upgrade KYC with scale

- Conveyance mechanisms: Build ecosystem for multiple ways of transacting, including QR Codes & NFC

What problems are we trying to solve in Mojaloop?

3rd Party Payment Initiation

The proposal contains the list of concrete modifications to Mojaloop API and the Switch architecture for adding support for non-ledger holding participants, PISPs, to the RTP network. The 3rd party payment initiation flow is similar to "request-to-play" flows which ML already supports.

Account registry which enables conveyance mechanisms

Add ability to hide the sensitive financial accounts details (i.e. PAN) from PISP and its users. This is driven by explicit account registration step in which "virtual" account numbers/handles are generated.

Consent architecture

The ability for a third party app to get verifiable consent from the user for authentication and authorization. This allows the third party app to do actions which previously could only be done from a financial institution app.
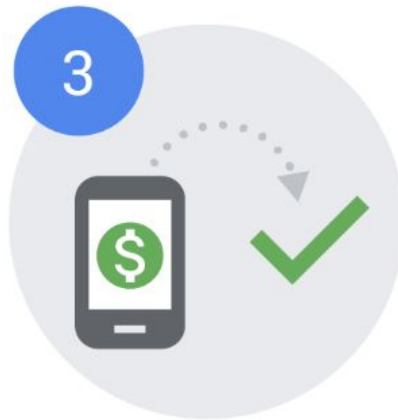
User Journeys

1
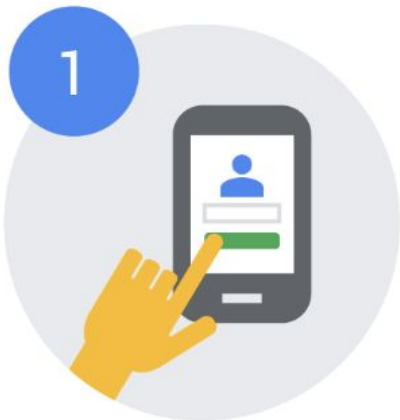
User registration
Establishes strong device binding between the digital identity and the device which is mapped to an RTP identifier in the RTP system.

2

Bank account binding
Establish a binding between the device, RTP identifier, and a bank account.
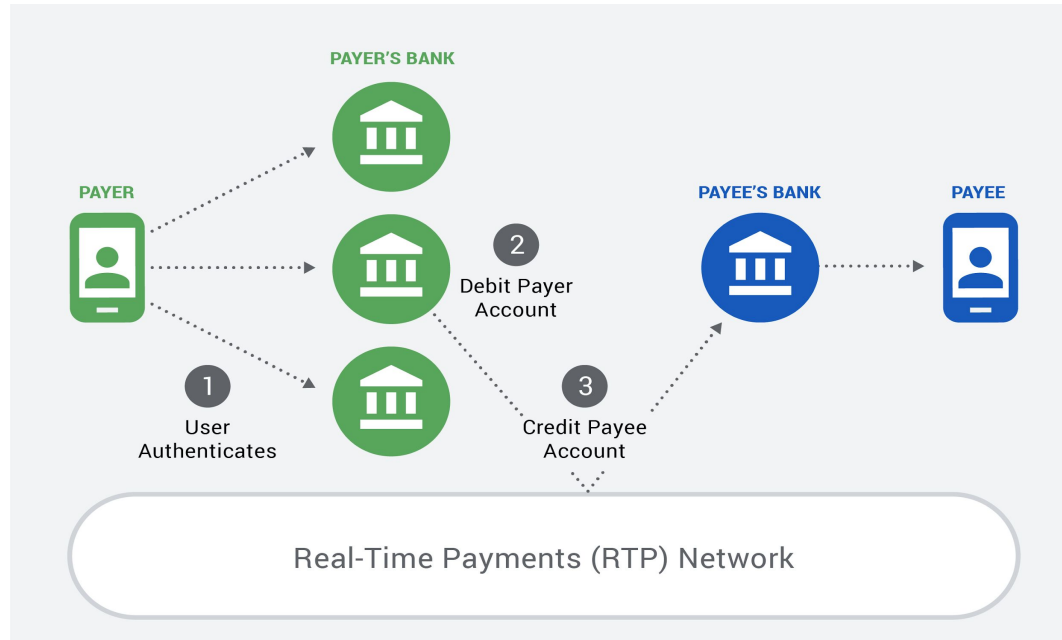
3

Payment
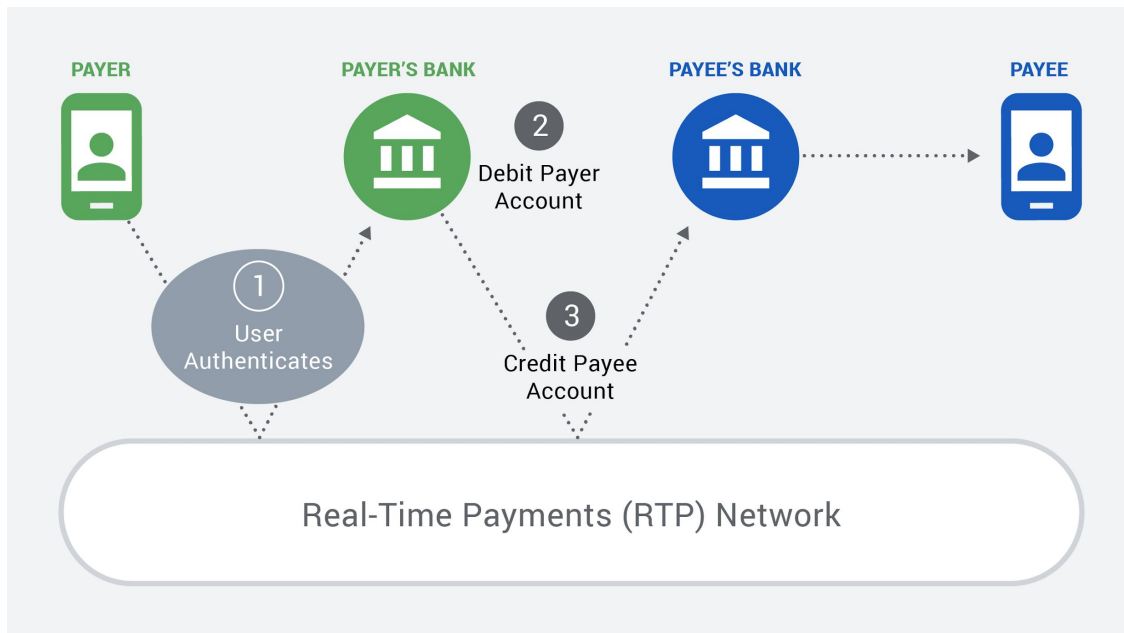The payment initiation request comes from a trusted device. An additional factor can be triggered as necessary.
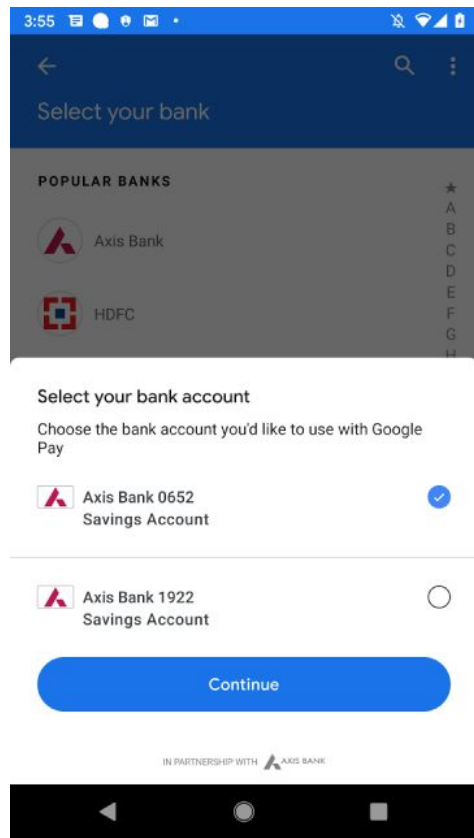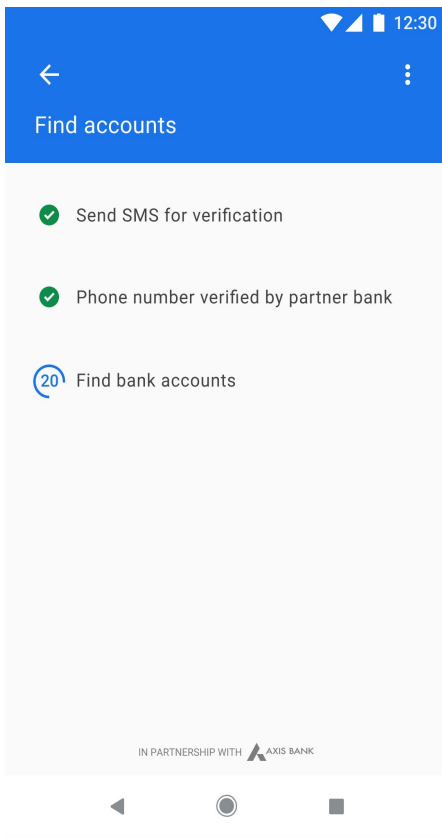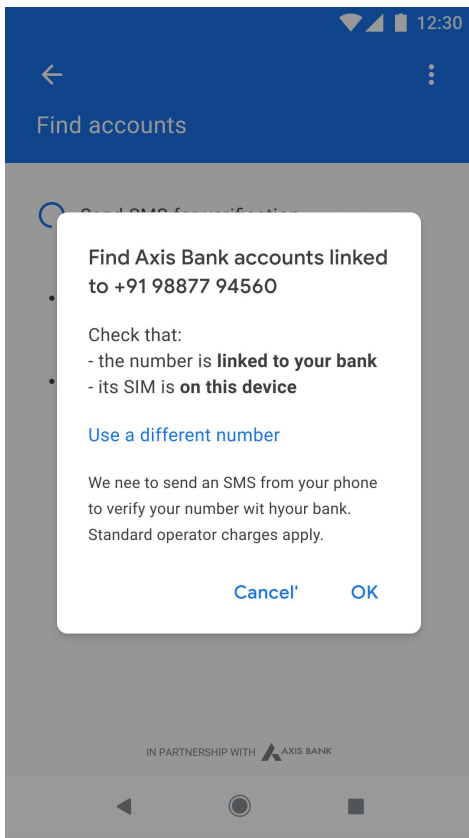
Third Party Support, Approach #1

- Predefined API standard
  - Mandating that all banks must comply
  - Lowers the friction, but Third Parties need to integrate with each bank
  - Example: UK with Open Banking

Third Party Support, Approach #2 (<u>preferred</u>)

- Central API for Secure Client Authentication
  - Exposed directly from the RTP system (or via its partner service)
  - One integration point for all 3Ps, works with all financial institutions
  - Example: UPI in India

Screen 1 — Select your bank

Select your bank

- Axis Bank
- HDFC
- ICICI Bank
- State Bank of India
- Allahabad Bank
- Andhra Bank
- Bank of Maharashtra
- Bank of Baroda

Screen 2 — Find accounts (dialog)

Find accounts

Find Axis Bank accounts linked to +91 98877 94560

Check that:
- the number is **linked to your bank**
- its SIM is **on this device**

Use a different number

We nee to send an SMS from your phone to verify your number wit hyour bank. Standard operator charges apply.

Cancel'   OK

IN PARTNERSHIP WITH AXIS BANK

Screen 3 — Find accounts

Find accounts

- Send SMS for verification
- Phone number verified by partner bank
- 20 Find bank accounts

IN PARTNERSHIP WITH AXIS BANK

Screen 4 — Select your bank account

3:55

Select your bank

POPULAR BANKS

- Axis Bank
- HDFC

Select your bank account

Choose the bank account you'd like to use with Google Pay

- Axis Bank 0652
  Savings Account   ✓
- Axis Bank 1922
  Savings Account   ◯

Continue

IN PARTNERSHIP WITH AXIS BANK

UPI SDK

Mojaloop & Other Entities

Bob's FSP uses an identty provider to authenticate its customers.

Identity Provider

Bob's has an online account with the identiry provider.

Bob owns a smartphone.

Hi! I am Bob.

Bob's FSP

Customer	Balance
======================	
....	
bob@foo.com.......$8,560.32	
....	
....	

Bob is a customer of a FSP.

Bob owns an account at the FSP.

Bob uses a popilar payment app from a PISP.

PISP

The PISP manages and provides backend services for payment app Bob is using on his phone.

Bob's FSP is a **participant** on ML Switch.

The PISP is a **participant** on ML Switch.

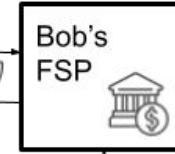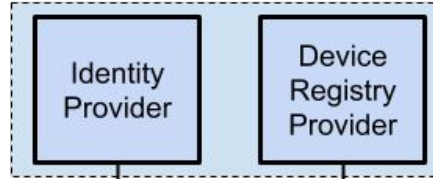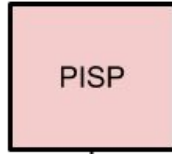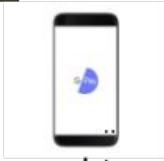ML Switch @ Reserve Bank of ...

Payment Initiation Service Provider as defined in PSD2:

"PISP is a service to initiate a payment order at the request of the payment service user with respect to a payment account held at another payment service provider."

Google

Device Registration

Device Registry Provider

- Stores **end-user device registration records**, which contain
  - Public key part of the **account/device binding** key-pair,
  - **Identifier of financial account** held at an FSP,
  - **Conveyable (maybe even human-readable) party+account identifiers** (i.e. *alice.smith@gpay*),

- Provides following services to the RTP network:
  - Assists ALS in **party/account resolution** (+ list FSP accounts)
  - Allows FSP to **verify transaction authorizations**.

- Who operates such service?
  - Ideally, the operator of the ML Switch runs DRP (there could be "decentralized" design where each FSP runs its own).

Account Lookup Flow
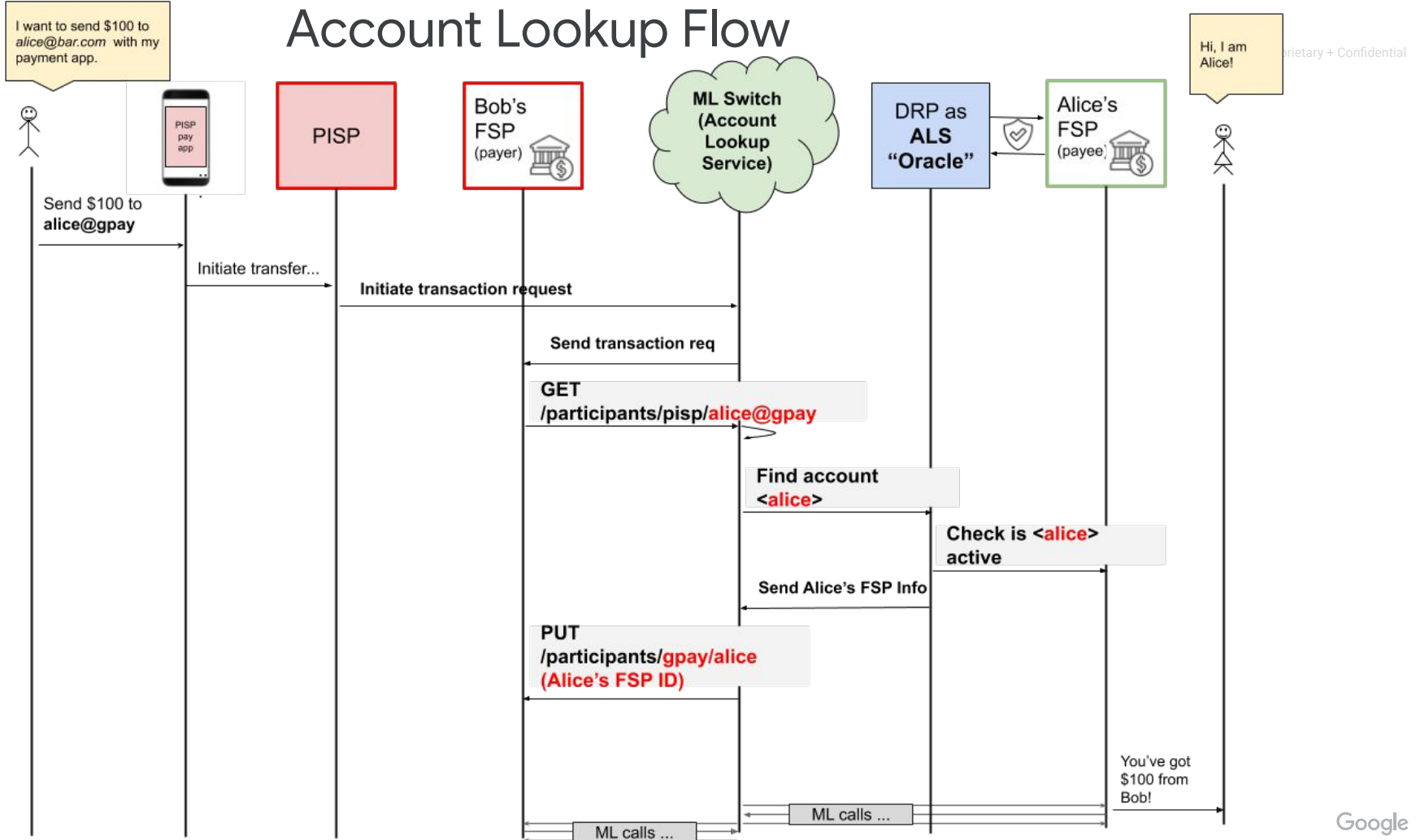
Payment Request Flow

I want to send $100 to *alice@bar.com* with my payment app.

PISP pay app

PISP

Bob's FSP (payer)

Device Registry Provider

ML Switch @ Reserve Bank of ...

Alice's FSP (payee)
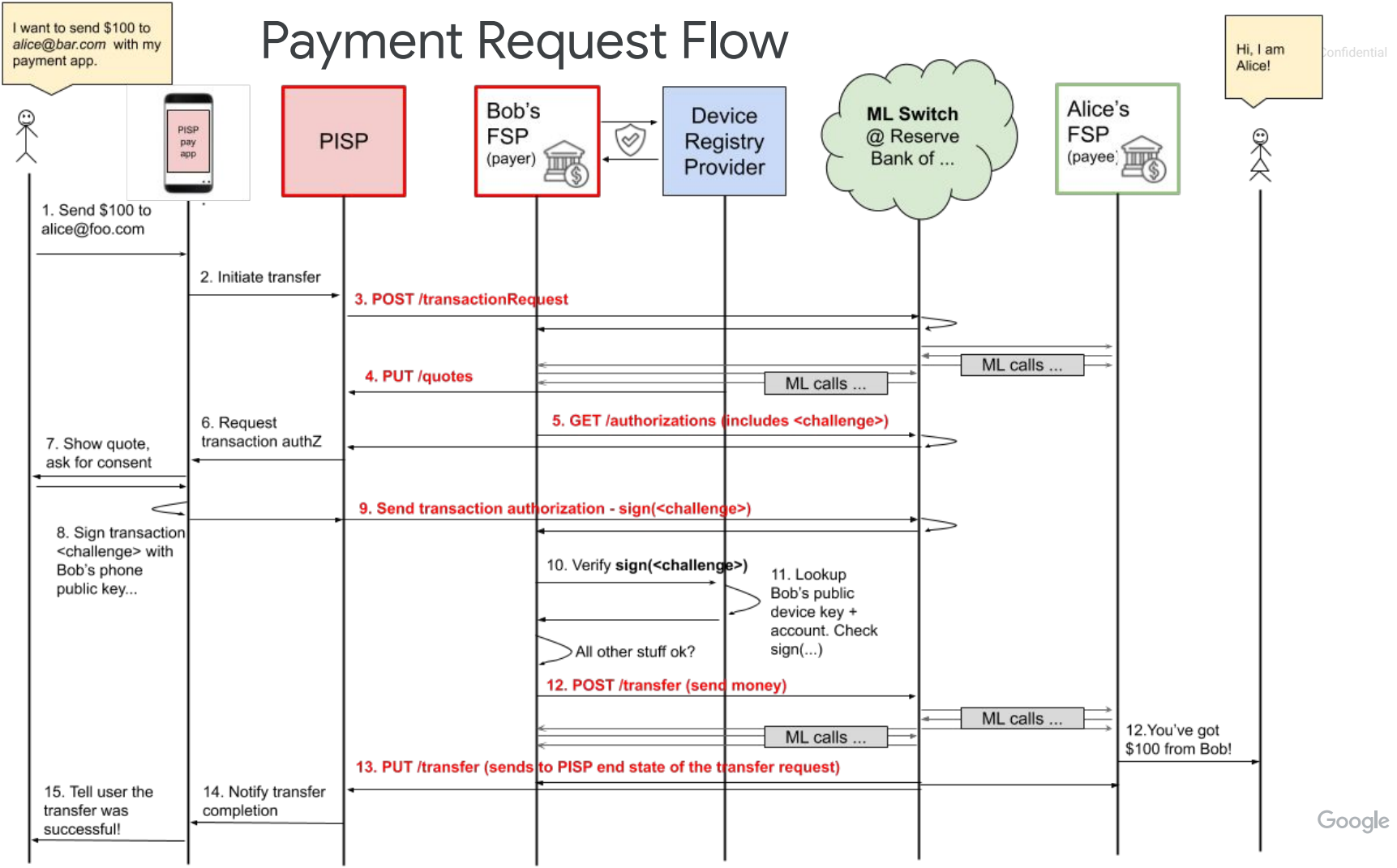
Hi, I am Alice!

Confidential

1. Send $100 to alice@foo.com

2. Initiate transfer

3. POST /transactionRequest

ML calls ...

4. PUT /quotes

ML calls ...

5. GET /authorizations (includes <challenge>)

6. Request transaction authZ

7. Show quote, ask for consent

9. Send transaction authorization - sign(<challenge>)

8. Sign transaction <challenge> with Bob's phone public key...

10. Verify **sign(<challenge>)**

11. Lookup Bob's public device key + account. Check sign(...)

All other stuff ok?

12. POST /transfer (send money)

ML calls ...

ML calls ...

12. You've got $100 from Bob!

13. PUT /transfer (sends to PISP end state of the transfer request)

15. Tell user the transfer was successful!

14. Notify transfer completion

Google

Multifactor Transaction Authorization

- FIDO: Android(Go) certified from N+, client and <u>WebAuthentication</u> API

- This PISP model supports various authentication factors:
  - **Possession**: The private key part of the device<->account binding key-pair which is securely stored on the phone.
    - Fallback: if the phone's key store is not HW-backed, (in FIDO, U2F authenticator attestation key is missing), then require additional OTP or PIN verification.

  - **Inherent**: FIDO mandates biometrics (face unlock, fingerprint).
    - Fallback: on cheaper phones without biometric HW capabilities, Android shows the system lock screen (PIN/swipe).

Transaction Authorization, with even more factors...

- On top of U2F, authorization could be augmented to include additional factors such as:
  - **Knowledge**: If amount > X, additionally require user to provide their **PIN** (which will be added to the signed response)

  - Geo **Location**: Include long+lat in authorization reply.
    - Require FSPs to trust the PISP or RTP network to verify non-rooted state of the user device (Android has a remote attestation service which FSP could use for that).

Quick Summary of Mojaloop Changes

1) Device<->account binding process is driven by a new type of service - Device Registry Provider (DRP),
2) DRP provides account resolution services to ALS, maps registered device<->account identifiers to the actual FSP accounts,
3) There is a new type of *participants* - PISPs,
4) PISPs can initiate transaction requests, which is verified by
5) New multi-factor transaction authorization ideally based on U2F (FIDO)
6) The FSPs rely on the DRP for authorization verification
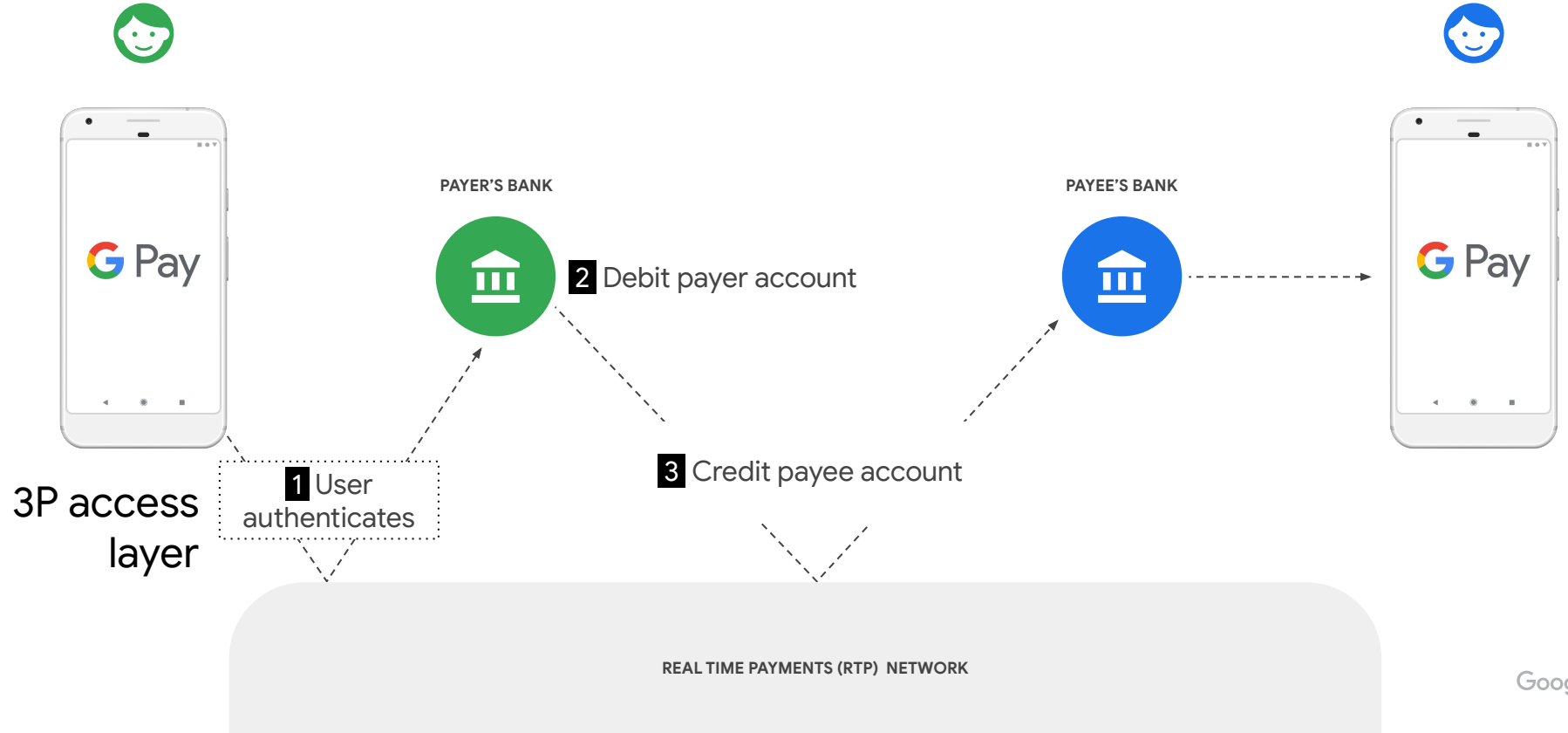
3PPI proposal can be found at:

http://**bit.ly/mojaloop-pisp**

PAYER'S BANK

PAYEE'S BANK

2 Debit payer account

3P access layer

1 User authenticates

3 Credit payee account

REAL TIME PAYMENTS (RTP) NETWORK

Google

Coming soon: Mexico

Mexico followed the Southeast Asia model

CODI QR system

What's next for Mexico?

Google is deeply engaged with the Central Bank of Mexico

BANCO DE MÉXICO

Google has been collaborating on

- Securely opening instant payments system to third party apps

- How end users can securely authenticate on a third party app

- How third parties can securely send instructions to the payment system

- How to design the best user experience

Banxico is designing something like India's UPI, but with added security, including recommendations provided by Google.

Google's Technical Recommendations

- **Allow refunds:** Refunds important alongside user-to-merchant purchases, in accordance with individual merchants' policies and without user interaction; require unique identifier linked to original transaction
- **Clear & traceable merchant settlement:** Transfer information related to taxes, fees & transaction identifiers
- **Conveyance mechanisms:** Build ecosystem for multiple ways of transacting, including QR Codes & NFC
- **Tiered KYC:** Build tiered levels of KYC/ AML for consumers and smaller merchants; upgrade KYC with scale
- **Deterministic status of transactions:** Ensure each transaction reaches terminal state (Success or Failure in real time.)
- **Idempotency:** Incorporate idempotency ID for each transaction so same transaction is not executed twice when networks are unstable and unreliable.

Google's Technical Recommendations

- National addressing database: Identifiers that are (i) Easy to remember, (ii) Easy to share without risk, (iii) Interoperable (e.g., email addresses, phone numbers)
- Authentication and adequate trust delegation important to find balance between safety and convenience
- Third party access: Standardized APIs the best way to provide access to both FIs and third parties
- Transactions: Start with real time Push with a plan to introduce pull (or request)
- Enable Mandates: Allow users to delegate permission to the merchant to pull money directly from their accounts. with restrictions (overall money exposure, time frequency, revocation)

Payment app

Auth app

Payment app server

Payments
Network

Financial
institution
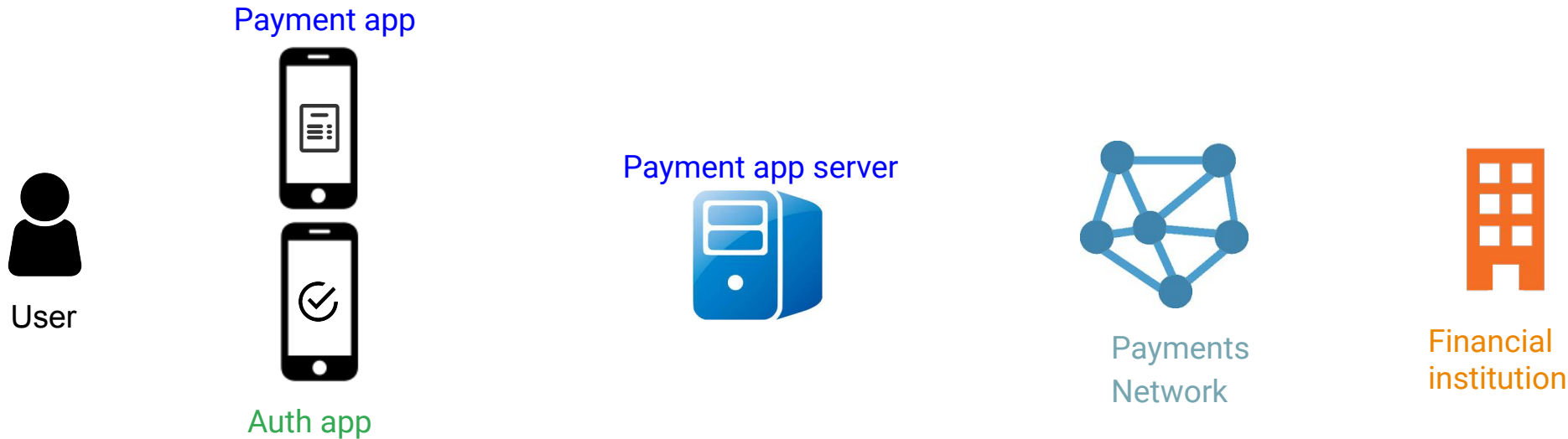
User

-        payment app
- Payment app   auth app
- Auth app
- Payment app   payment app

                  network   financial institution

User Journeys

auth app

Financial Institution (FI) Account

FI account(s)

FI

FI