

Get there faster with Google Pay

Proposal by: Google + NXP



Agenda

1. Customer Opportunity
2. Customer Experience
3. Google + MIFARE 2GO Solution
4. Transit Operator Benefits
5. Technical Overview



Customer Opportunity

Why partnering with Google - NXP
will improve your customer's experience?

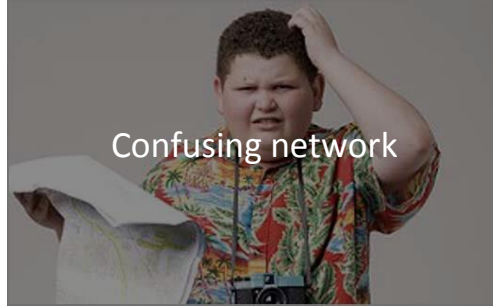


User research highlights primary concerns affecting commuter satisfaction with transit networks:



Complex fares

- Multiple fare options
- TVMs are not consistent and difficult to navigate



Confusing network

- Inherently confusing tunnel network without a map
- No consistent naming conventions for routes
- Navigating from one mode to another is confusing



Non realtime

- Key information (time, space, cost) is not available to users

Our Vision - Make it fast and easy for your customers to traverse your area



Amazing immersive
transit experience
on Android devices



We can achieve that vision by leveraging Google - NXP core assets to deliver the following:



Current schedule information

Provide real-time schedules before hand



Simplified fare selection

Help users buy the right ticket for their commute, whether in your app or directly from Google Pay



Advanced warning of ad hoc events

Alert your customers with real-time information as changes occur



Increased awareness

Ability to know & avoid peak travel times, find an empty seat



Simplified planning

Help navigate, predict arrival time



Reminders

Notifications of next stop and direction of travel information on hand

Customer Experience

Integrating with Google/NXP, will enable seamless integration of a virtual transit card into Google Pay, enabling exciting use cases now and in the future



Google Pay is everywhere. Preloaded on devices by major carriers with millions of credit and debit cards on file



Hundreds of millions
Of cards on file

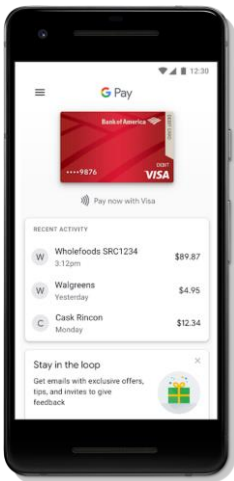


Saved to
Google Accounts

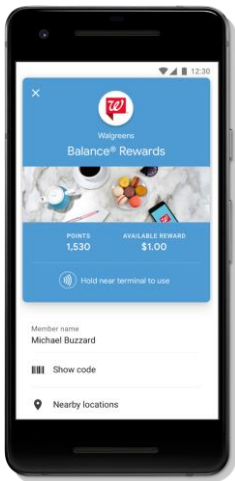


Ready to
pay everywhere

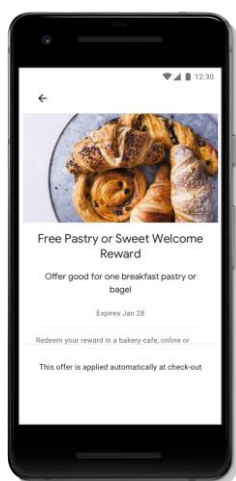
Google Pay is more than just about paying at stores and conveying loyalty and offers. It's also about paying for transit.



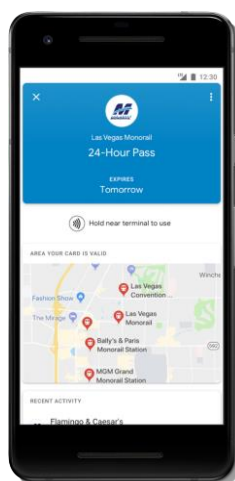
Payments



Loyalty

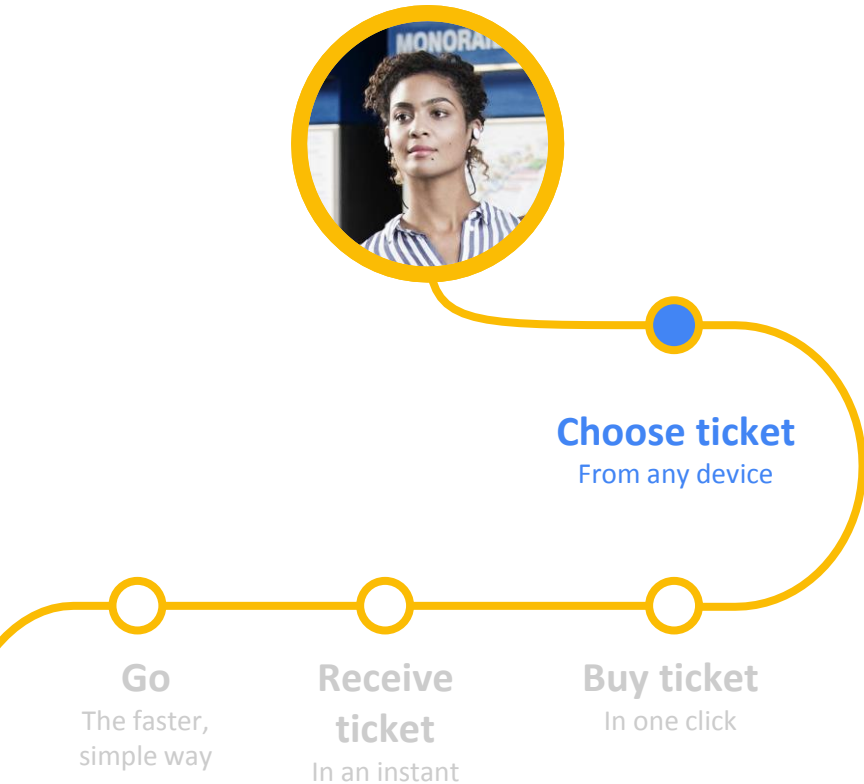


Offers



And now.... Transit

Google Pay provides options for users to purchase their transit tickets/cards from familiar or new channels



Meet the user
where they are today



Desktop



Mobile Web

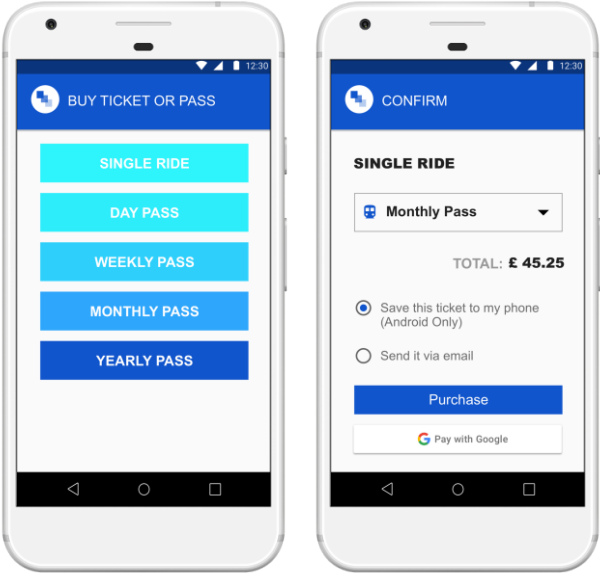
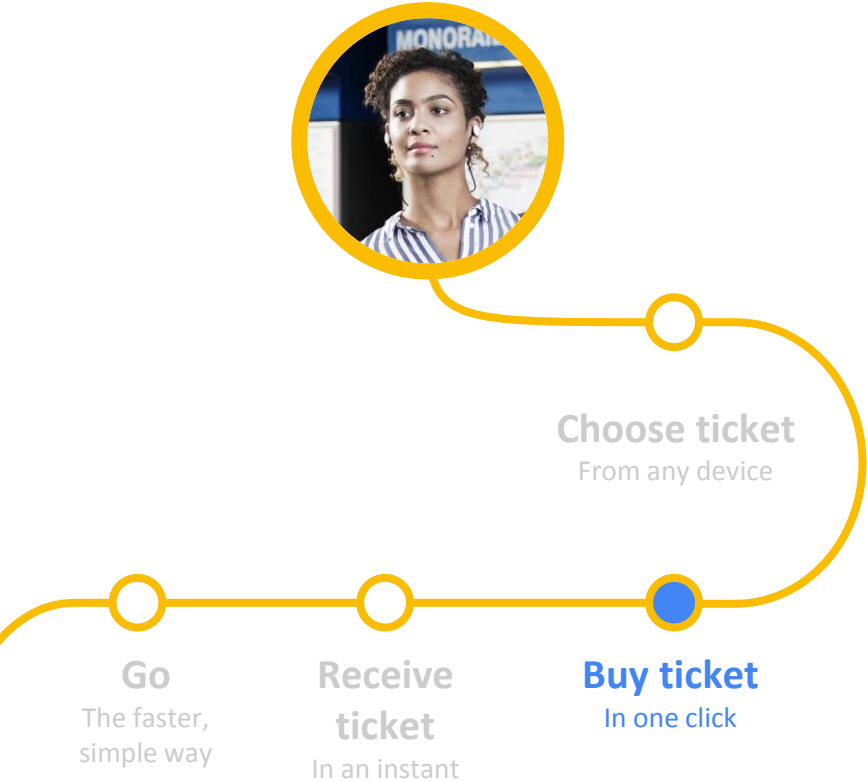


Ticket App



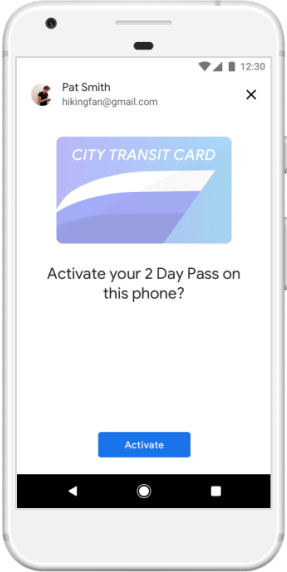
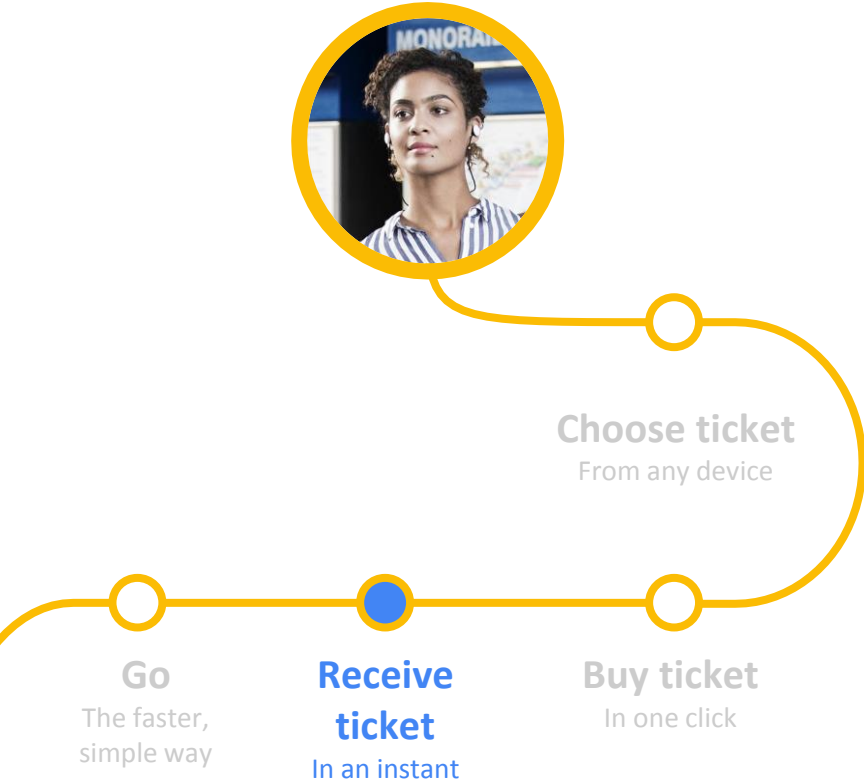
Native in Google Pay

Users can seamlessly buy tickets/cards in just a few clicks with a form of payment previously saved and verified in their Google account

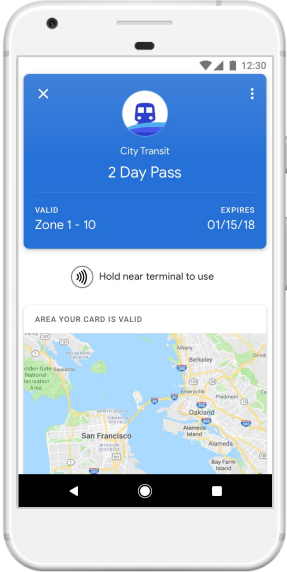


Your application or website

No need to wait in line. Users receive their tickets/cards instantly on their phone and they are ready to ride!

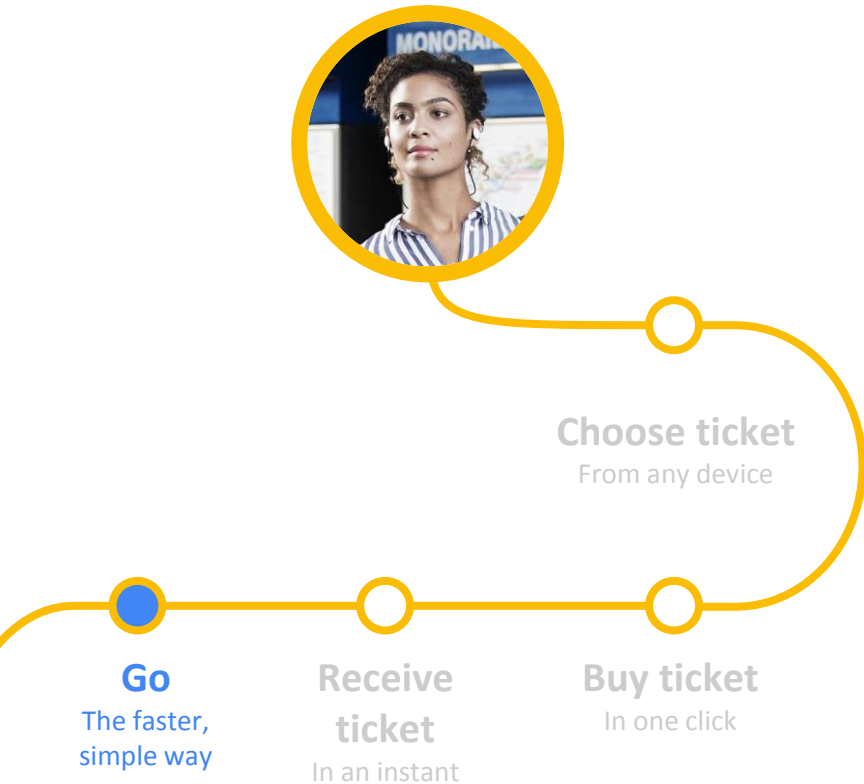


Save virtual card
to phone

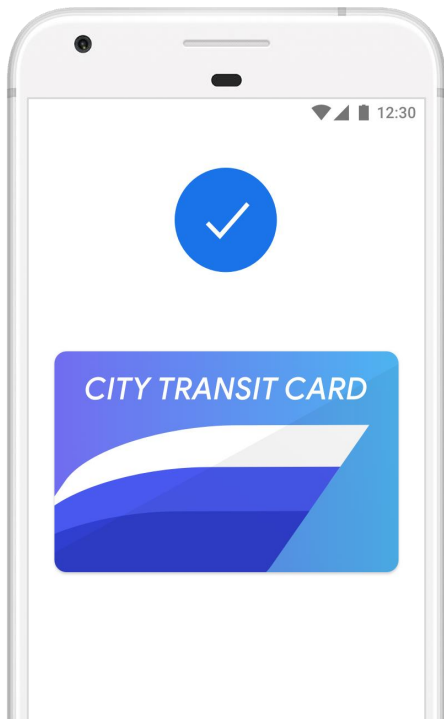


Virtual card instantly
provisioned to
Google Pay

No need to unlock the phone or open up an app. Users save time by holding the phone on the terminal for a simple, fast, reliable transaction



Hold at the terminal



Information such as where you can ride and links to refund and lost and found support is helpful to riders and can reduce incoming agency calls

Keep on track

With helpful ride info

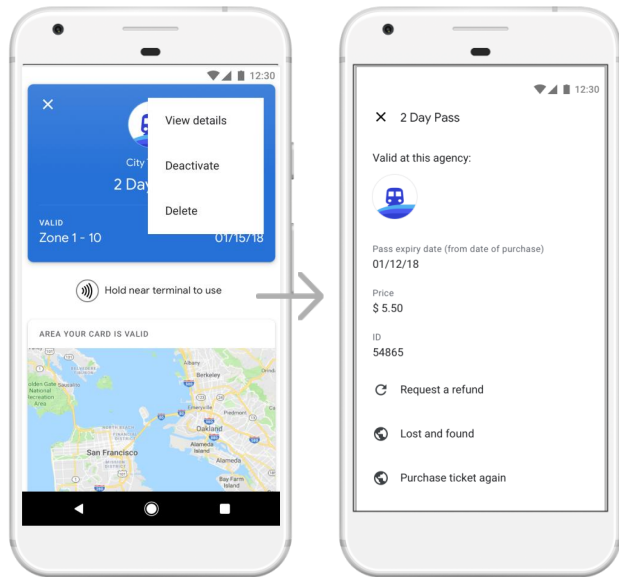
Stay in the loop

Get local transit info when you need it

Check your trips

On rich receipts

Rich data when you need it



Our live feed drives awareness to tourists and commuters - sending a “Get your pass” notification and educating users on how to ride with their phone

Keep on track

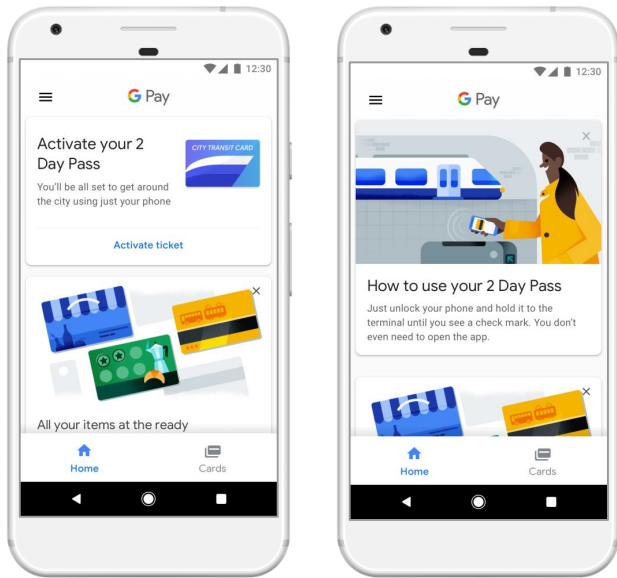
With helpful ride info

Stay in the loop

Get local transit info when you need it

Check your trips

On rich receipts



Digital rich receipts are provided to the user and help keep track of trips taken and monthly commuter expenses

Keep on track

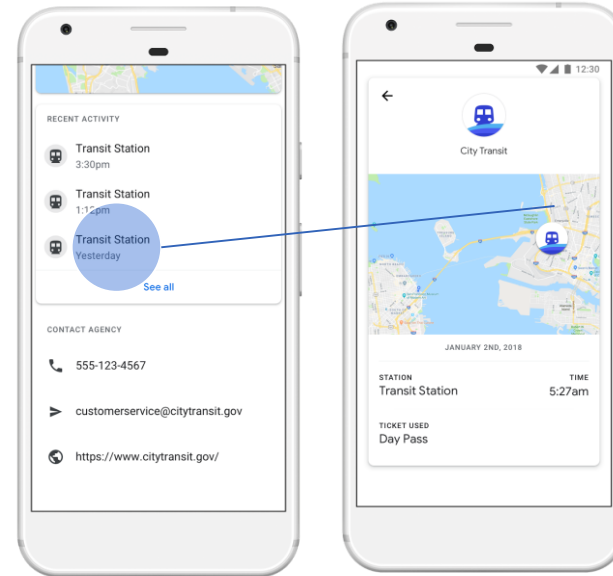
With helpful ride info

Stay in the loop

Get local transit info when you need it

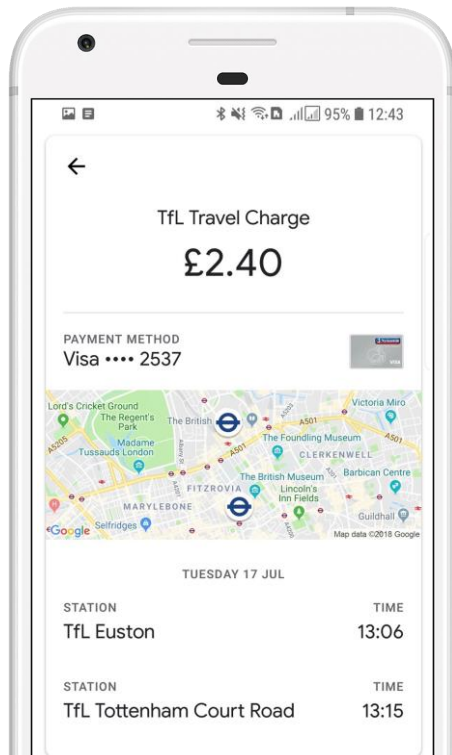
Check your trips

On rich receipts

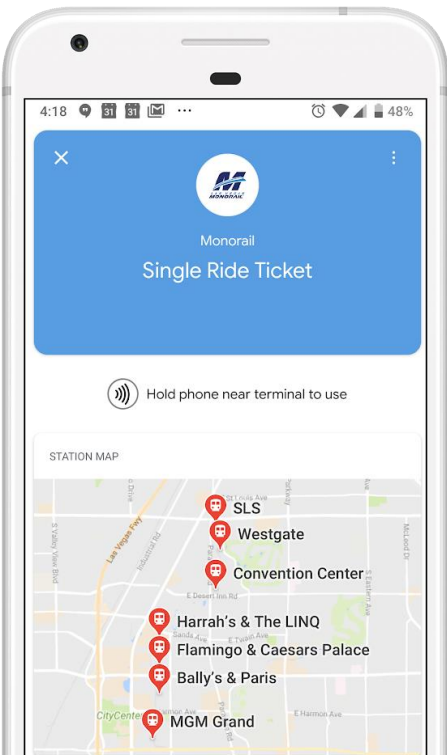


Recent Google Pay transit ticketing launches received buzz and excitement from the press and users alike

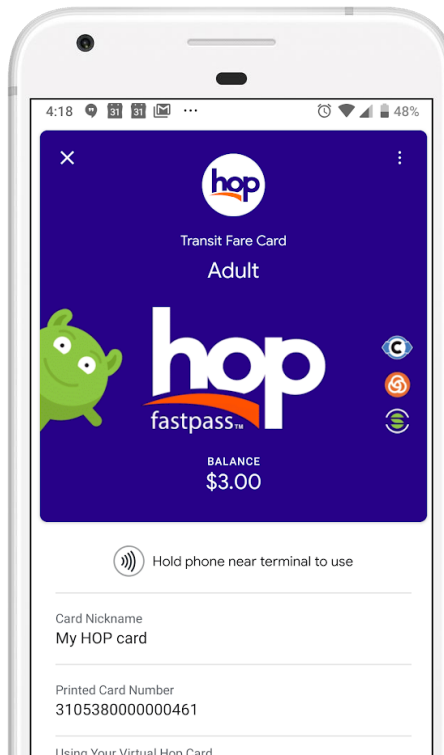
London



Las Vegas



Portland



Japan



Solution

Google Pay + MIFARE 2GO



Agencies face challenges that encourage deployment of mobile ticketing



High distribution
& cash collection costs

- Cost of paper / smart card issuance and distribution
- Capital of ticket vending machines
- Machine maintenance
- Cost of cash collection



Legacy hardware
difficult to upgrade

- Limited public service funding
- Limited connectivity to backend offices: no real-time connections
- Large, complex network which is difficult to upgrade



Reduction in ridership
& user satisfaction

- Unsatisfied users expect mobile ticketing to be available
- Users expecting ease of commute and on time arrivals
- Users choosing alternatives out of convenience e.g., rideshare

How can we help? We start with the scale of Android while helping you mitigate the burdensome complexity of mobile innovation

Android is the largest
operating system in
the world

Over 2 Billion active users



MIFARE the leading
non-EMV global
contactless scheme

Over 1.2B people on a daily basis

Tech Overview & Roles

All Android Devices

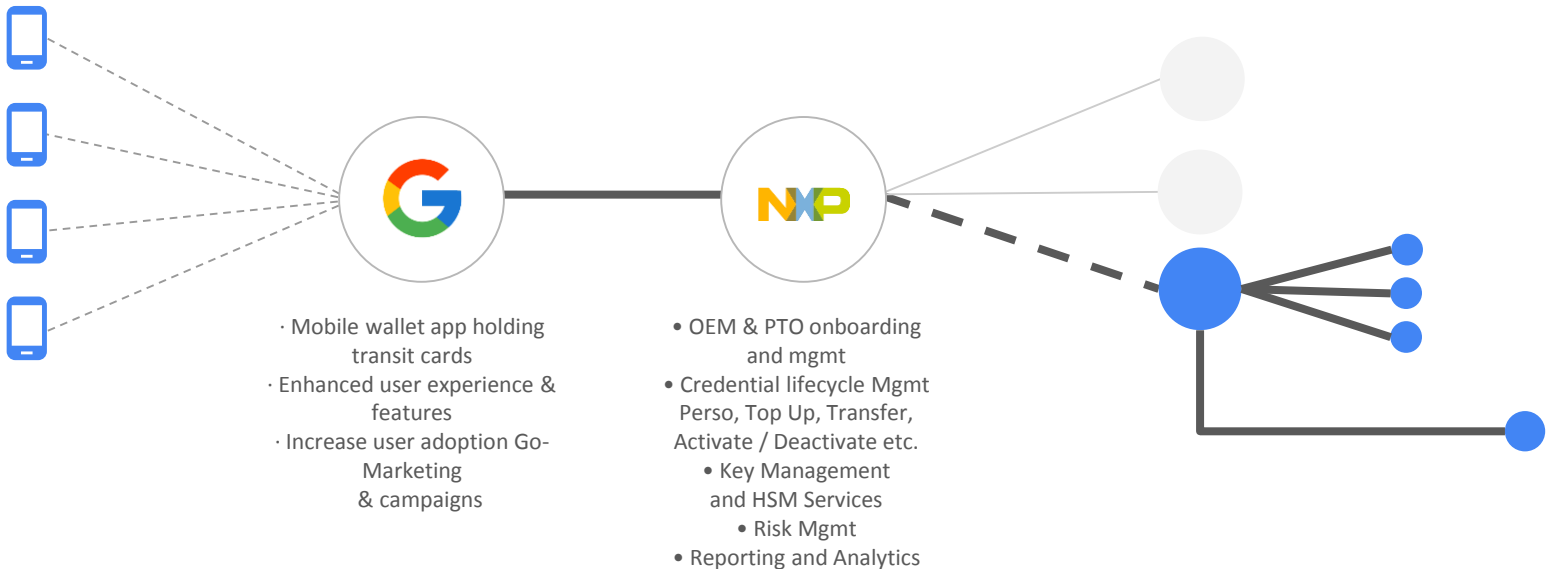
Google

Transit Hub Server

Transit Agency

Terminal

Ticket Retail



MIFARE 2GO is live and scalable



Maturity

- MIFARE 2GO platform is launched and live
- 24x7 L2 & L3 support
- Yearly uptime of >99.9%
- AOI response time is <700ms
- Hotfix within 5 hours
- 100% uptime since launch, no issue reported



Easy Onboarding

(Sandbox in 48 hours)

- Support all ticket form i.e Passes, Tickets, Stored Value
- Any form of DESFire Structure
- Support of all MIFARE DESFire command OTA
- Can digitize existing physical card with same business validations



Security

- Support multiple type of HSMs
- Support multiple key diversification
- Support multiple key types an crypto

Platform was designed specifically for the MIFARE ecosystem

End-to-End solution testing completed with multiple Transit Operations, System Integrators and Google Commercial launch and proof points already available

Transit Operator Benefits

Distribution, support, performance,
security, reliability, and more!



MIFARE 2GO - A Unique One-Stop-Shop

Mobile Solutions engineered for Service Providers since 25 years

MIFARE 2GO GLOBAL

Aggregating Smart City Applications

User Experience &
High adoption rate

Fast onboarding & high mobile
coverage Easy & Scalable

MIFARE infrastructure

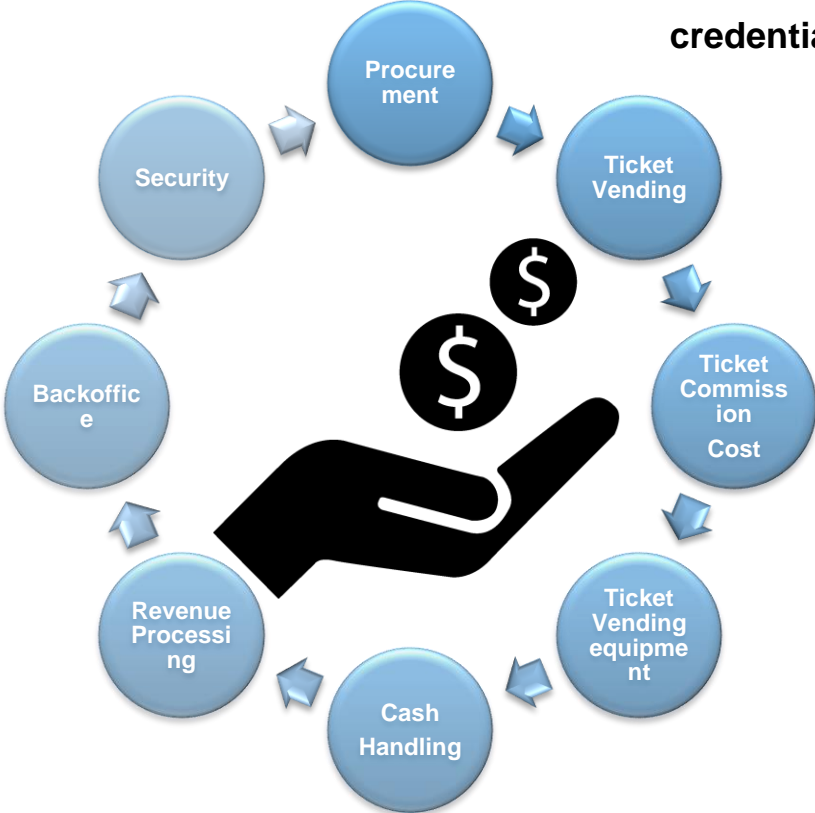
Ecosystem

- One Wallet for multiple applications ensuring fast deployment for higher user adoption by lowering fragmentation
- Non-payment driven solution built for Service consumers
- Value added services build around Service
- Independent mobile and wearable OEM coverage
- Full MIFARE support on all platforms (mobile and wearables)
- Fast onboarding (6 Months)
- >77% of Service Infrastructure is compatible with MIFARE 2GO
- >200 FTE (R&D, Integration, Marketing, Sale,...)
- >1000 MIFARE industry partners

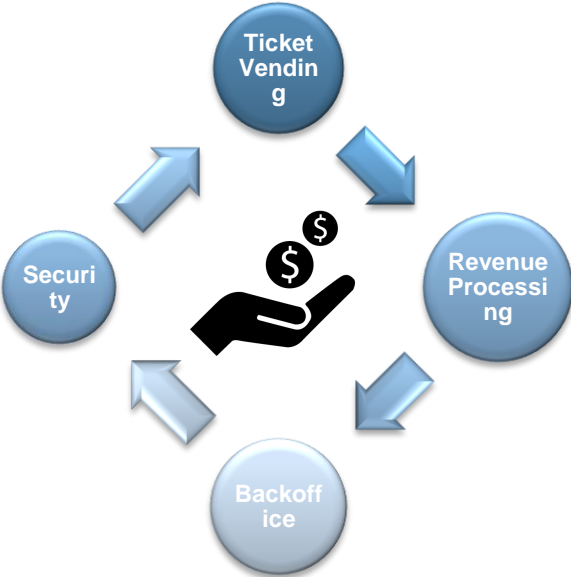


MIFARE 2GO brings cost efficiency

Traditional



Mobile



MIFARE Technology – engineered for Service Providers

Solutions for Service Providers since 25 years

MIFARE 2GO GLOBAL

Technology is owned by the Service agency

- Credential ownership stays with the agency
- Customer ownership stays with the agency
- BYOD

Cost efficiency

- No reoccurring costs to certify backend or frontend
- Freedom to introduce any new fare models
 - e.g. from Stored Value to ABT

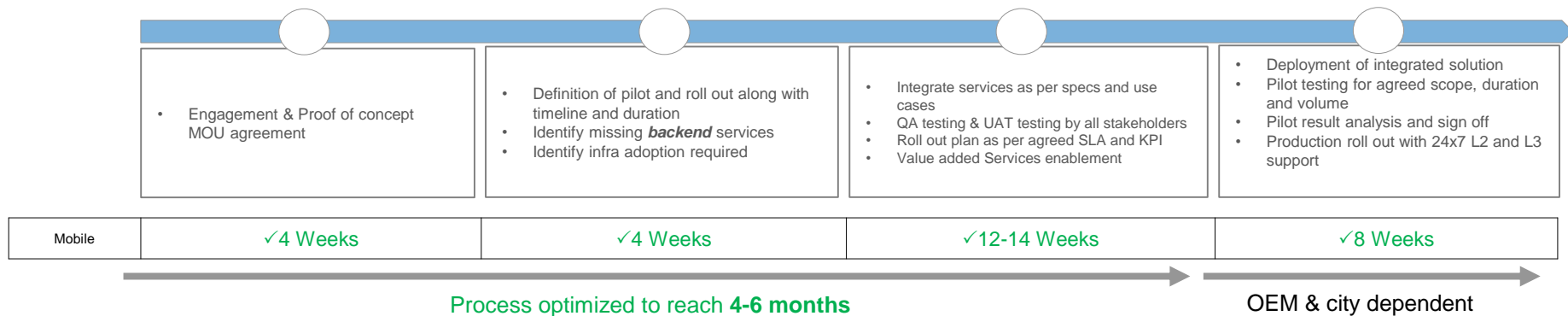
Sustainable Investment

- Technology grows with the Service ecosystem
- New formfactor support out of design
- No reintegration needed with new OEMs

Smart City

- AX is enabling new biz models for agencies
 - Monetize your customer base
- Access for Service Providers to the global MIFARE Ecosystem of 40 different applications

Fast deployment & high adoption rates



Strong value of the Google+NXP Integration (1 of 2)



Strong additional value of Google+NXP Integration (2 of 2)



Distribution

- Access to Google's:
 - Owned and operated properties e.g.,
 - Google Maps, Home, Assistant
- Partnerships with OEMs and Carriers (e.g.,
- Google Pay preloaded on 100 million + devices)
- Future-proof support for evolving form factors and devices (e.g., Fitbit, Garmin)



Performance

- Industry leading security model supported by Google and NXP MIFARE DESFire on the device and cloud
- Fully invested by executive management of Google and NXP



Proven Security

- One transaction protocol (DESFire) across all platforms
- Retrofit into your existing infrastructure
- System-level OS integration enables accelerated and reliable card conveyance



Value

- Future features will come as transparent SW update as part of the continuously driven innovation on user experience
- Extensive (free) digital marketing campaigns across Google channels to drive mobile adoption
- Google Pay call center serves as first line support for mobile ticket operations; 24/7 on-call engineers monitoring Google's systems



Strong User Focus

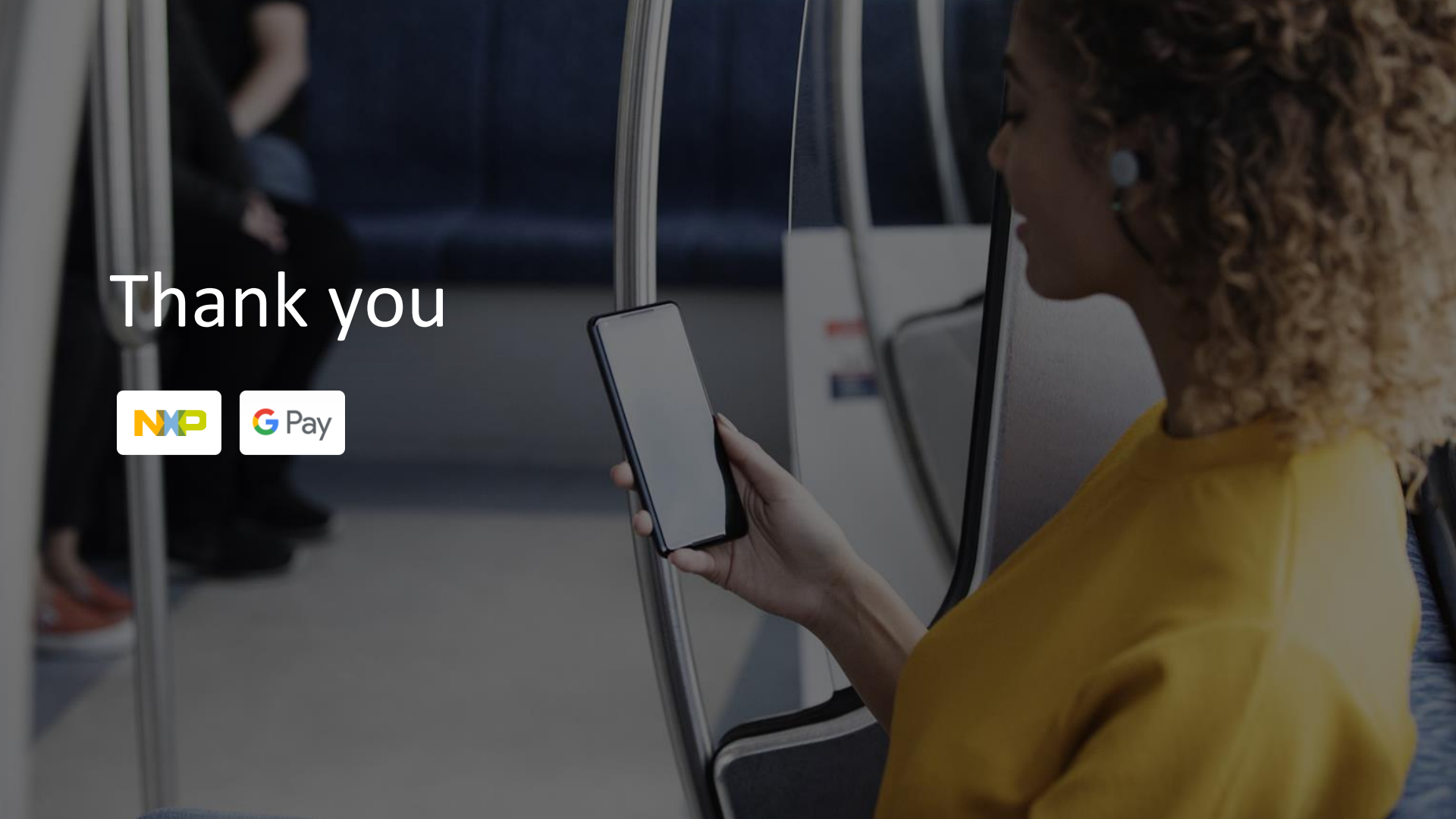
- Tight integration with Google enhanced features e.g., live feed, geo-notifications, etc.
- Strong user relationships with existing accounts, credit cards on file, and Google Play Services installed



Device Coverage

Seamless and reliable tap experience tested by Google across entire Android ecosystem

Thank you









Technical Overview

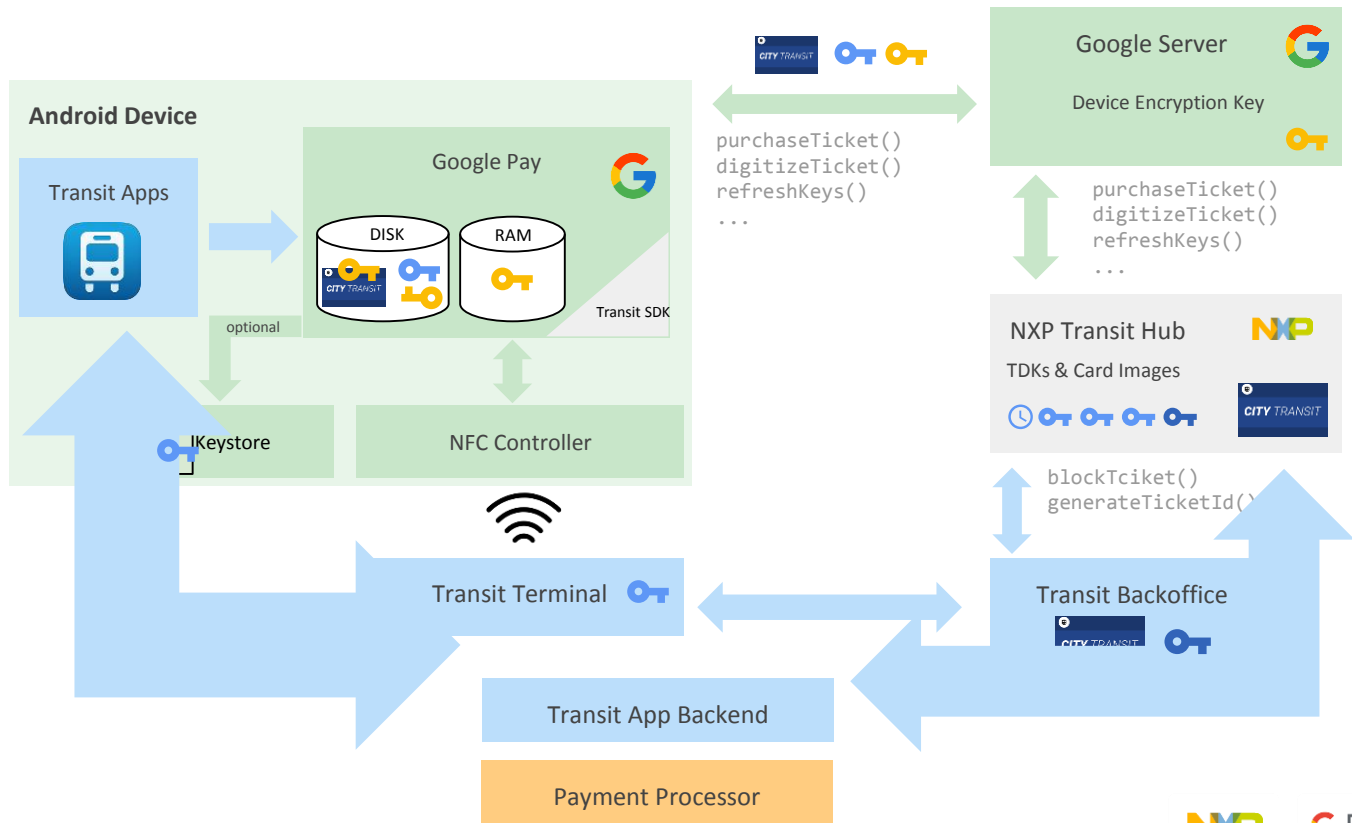
What does this look like?



Technical Architecture

Legend

-  Transit Master Key
-  Transit Diversified Key (TDK)
-  Device Encryption Key
-  Short-lived TDK
-  Encrypted TDK
-  Card Image



Infrastructure changes required to enable transit

1. Transit Hub Backend Integration

Ticket structure sharing

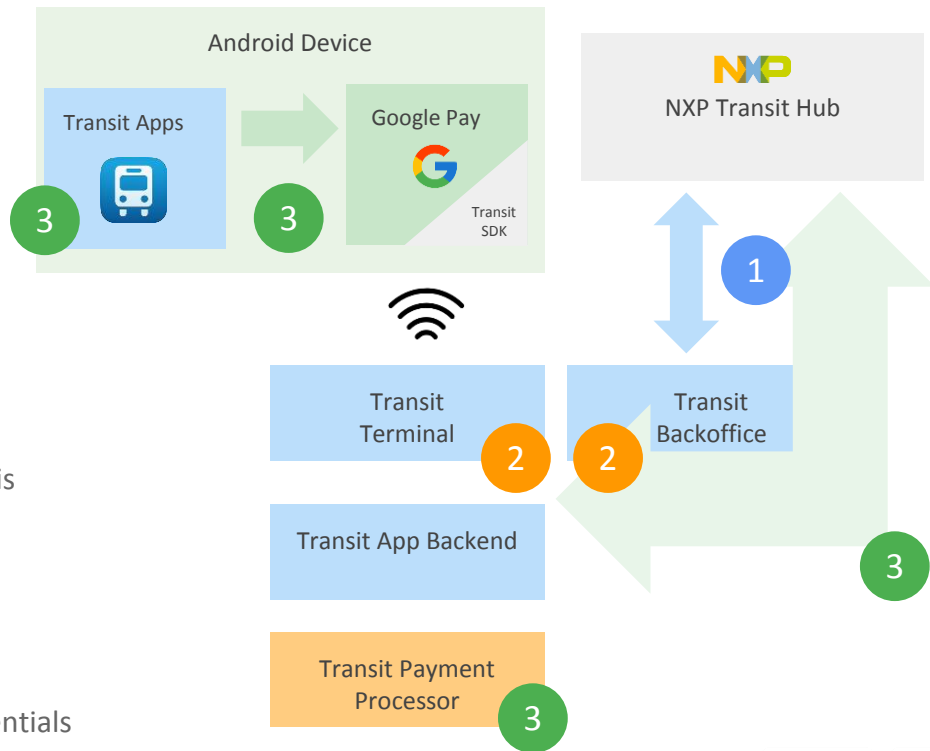
- Key handling
- Policy configuration
- Transit txn data, and more...

2. Transit Terminal & Back-office Update

- Transit Terminal Update
 - ISO Compatibility + ISO SELECT
 - FCI-Based card identification
 - Mobile master key
 - Key expiration check
- (likely existing) Back-office: Geo-temporal logs analysis

3. Digital ticket purchase and S2AP support

- Update Transit app UX to support mobile purchase
- Update Transit app to support S2GP
- Update Transit app backend to get ticket reference
- Update payment processor to decrypt payment credentials



Ticket Purchase Flow

Transit App Purchase

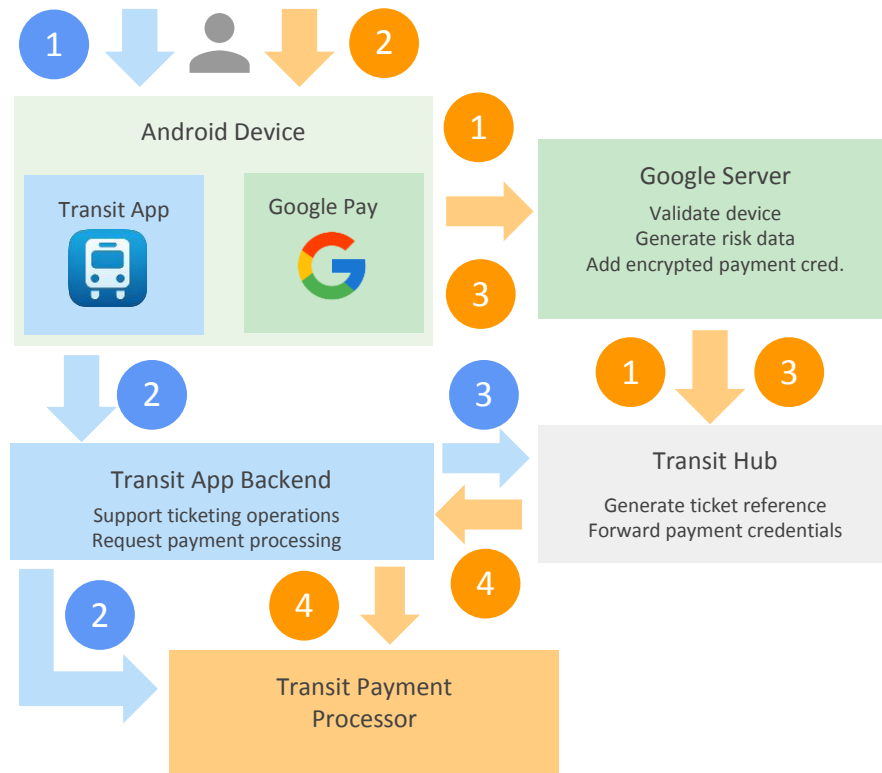
1. User selects the ticket to purchase, form of payment and the "S2GP" option
2. Transit App Backend request auth for ticket purchase via current payment processor
3. Transit App backend request ticket reference from Transit Hub for future tokenization

Postcondition Ticket is ready to be digitized via S2GP (support for Transit App, email, sms, etc).

Google Pay Purchase

1. GP gets ticketing options from Transit Hub
2. User selects ticket and FoP
3. Google Server validates the device, generates risk data, adds payment credentials to the request and forwards the info to the Transit Hub
4. Transit Hub validates risk data and forwards info to Transit Backend for purchase processing
5. After purchase is confirmed, Transit hub creates ticket reference and sends it to Google Pay.

Postcondition Ticket is ready to be digitized via GP



Process ticket purchase

Ticket Digitization Flow

Precondition User has purchased a ticket and wants to digitize / download to android

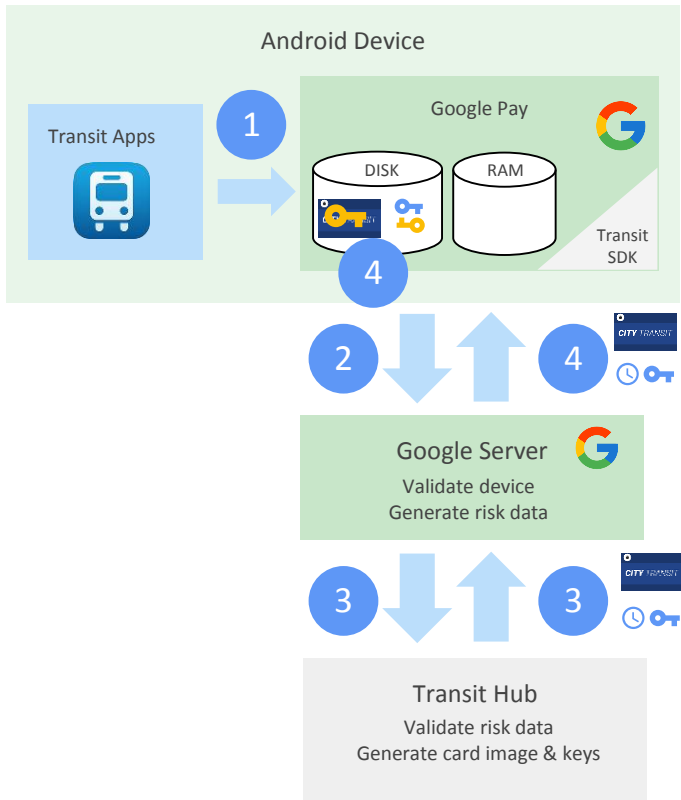
1. User triggers S2GP flow via transit app to digitize ticket.

Note: this step is skipped if the ticket is purchased via Google Pay.

2. Google Pay requests ticket digitization. Google Server validates that the device is not compromised, generates risk data (eg, age of the account) and forwards the request to the Transit Hub

3. The Transit Hub validates the risk data and decides if the operation is considered safe (potentially in collaboration with the corresponding transit agency). If safe, the Transit Hub creates a Transit Bundle containing the information to emulate a physical card / ticket

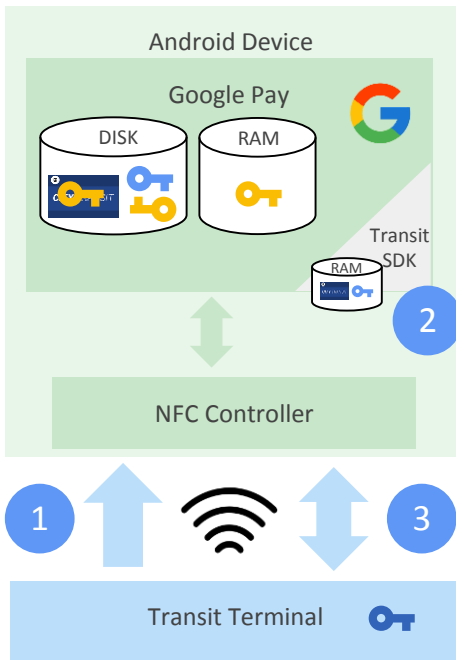
4. The Transit Bundle is propagated to the Android app and stored locally on the device (either encrypted at risk or leveraging hardware / keystore). At this point, the card is ready to be used



Ticket Conveyance Flow

Precondition The user has purchased and digitized a ticket into Google Pay

1. The user taps the Android device against a transit reader
2. Google Pay identifies that a transit NFC session has started and loads the corresponding Transit Bundle onto a compatible SDK (ie, implementing the transit reader protocol, eg Mifare)
3. From there on, the SDK and the reader communicate back and forth as per the transit protocol
4. Once the session is over, the SDK provides an updated Transit Bundle to be stored by Google Pay for future transactions.



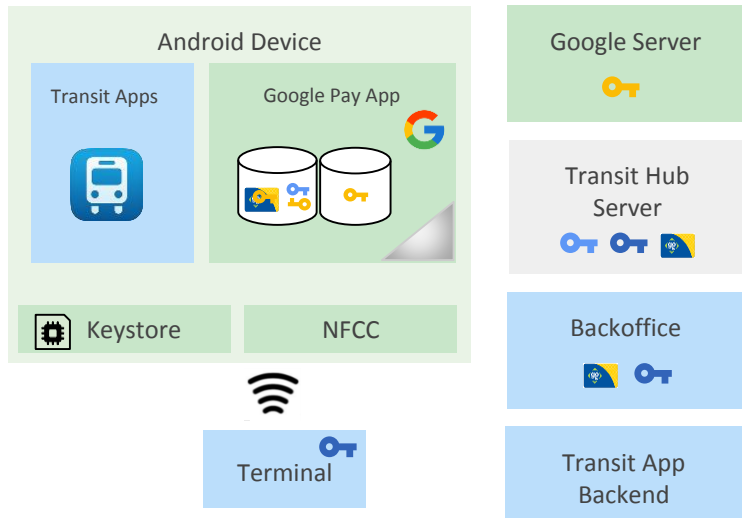
Security Considerations

How are transit DKs protected ?

- Device root check
- Leverage Google Pay's device specific keys (DEKs) approach
- Use short lived DKs
- Leverage Android hardware backed Keystore APIs
- Risk Data

Regardless of the approach, security needs to be complemented by transit agencies / SIs fraud control mechanisms

Proposed Architecture

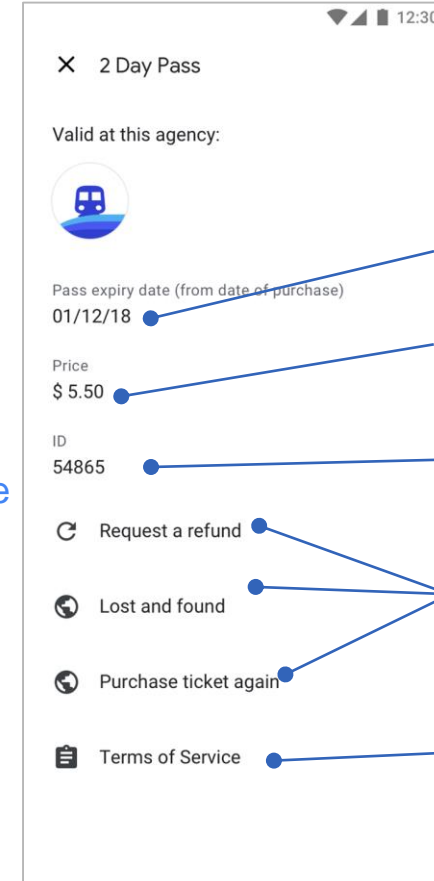
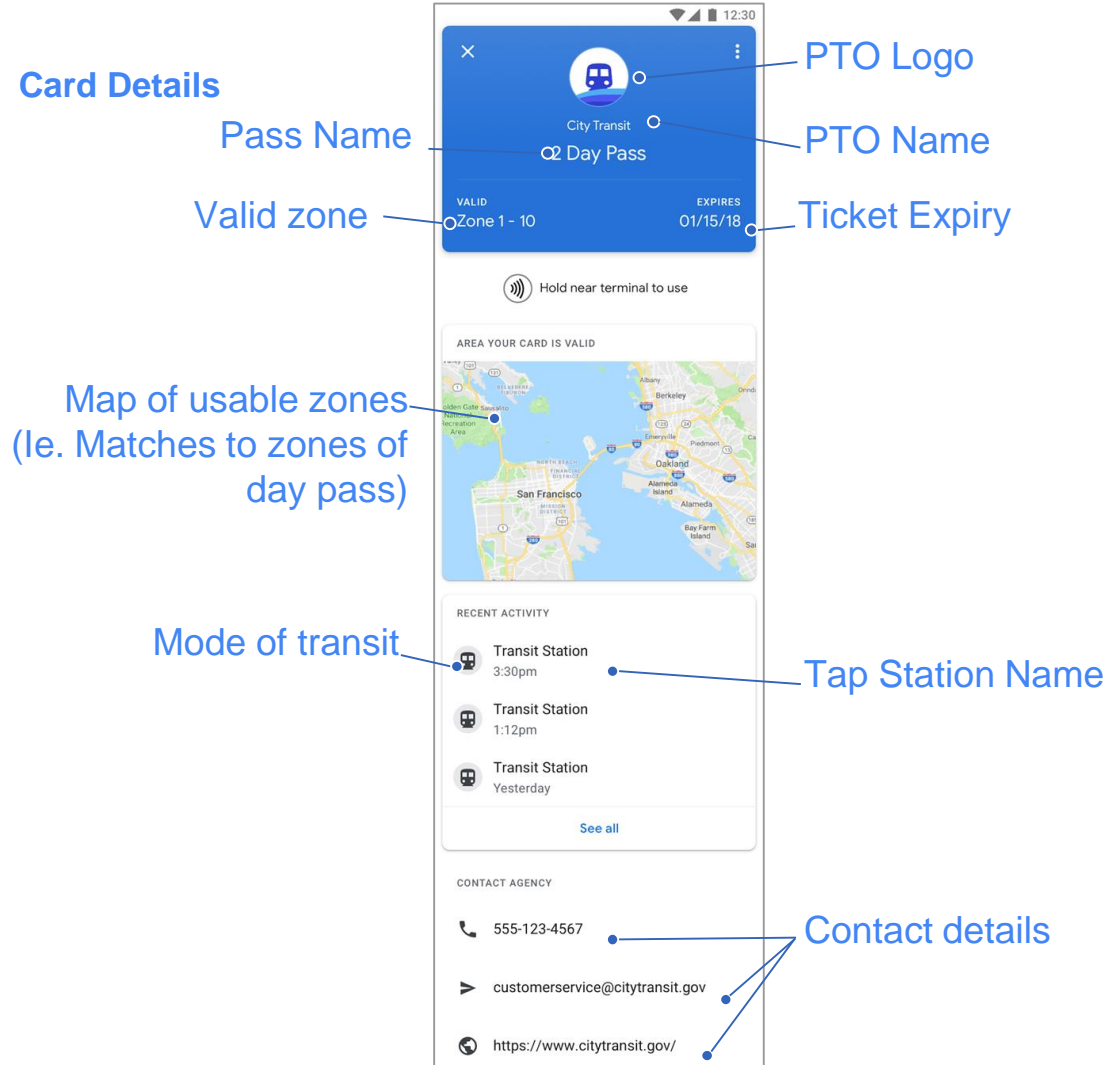


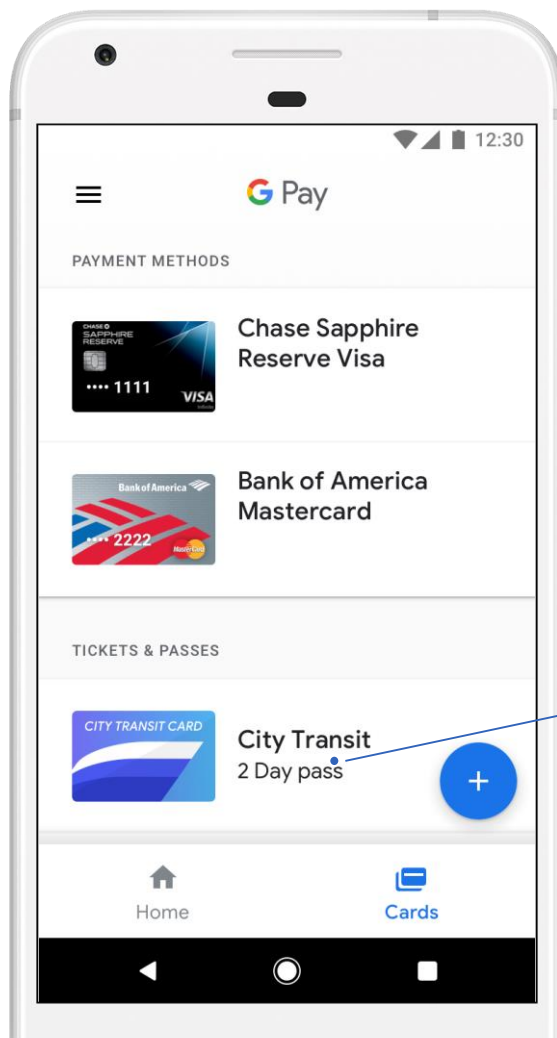
Thank you



Backup User Experience Slides

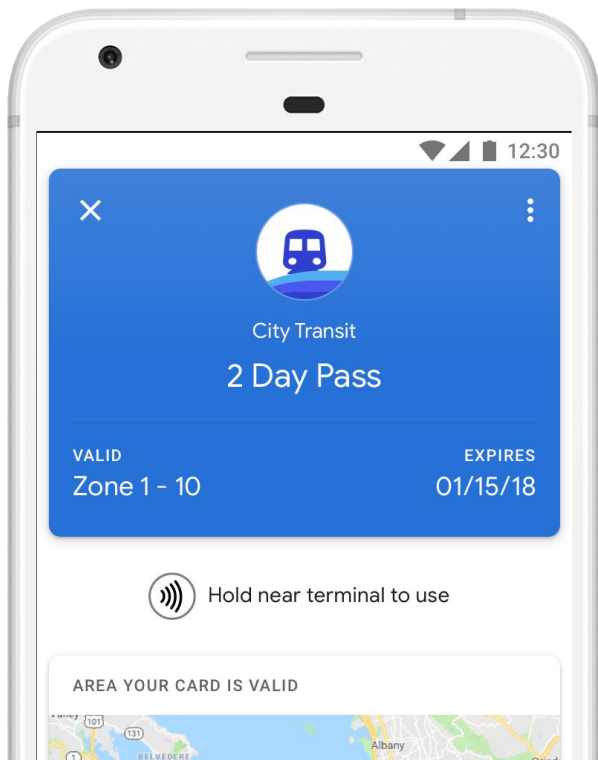
Card Details



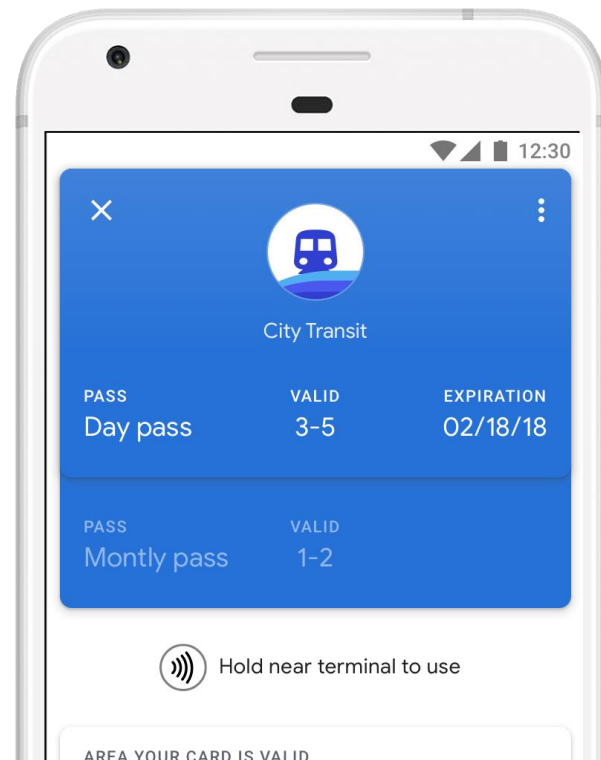


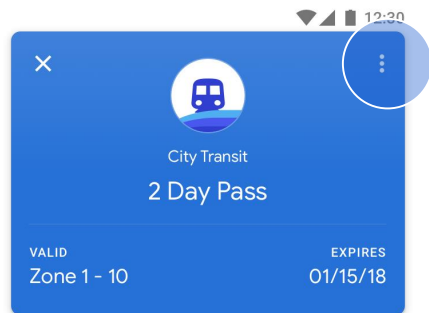
Show passes
inside the card

One Pass

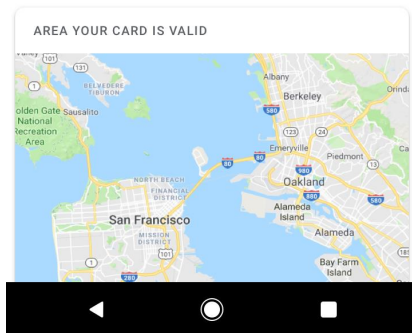


Two Passes

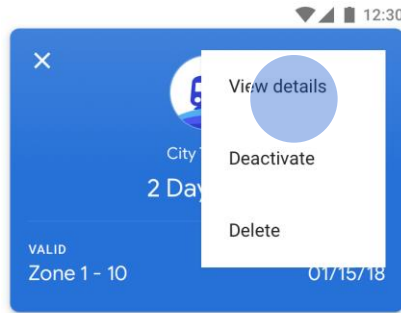




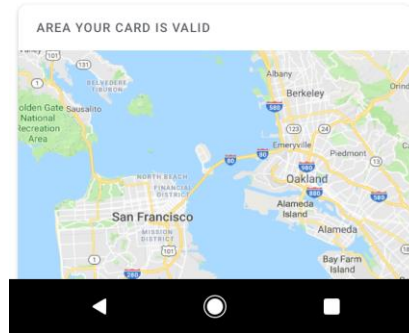
Hold near terminal to use



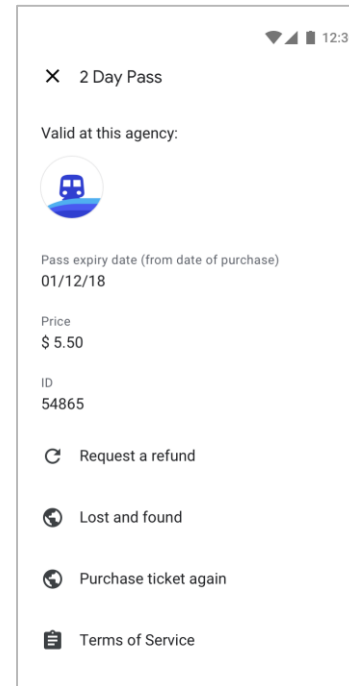
Card Details



Hold near terminal to use

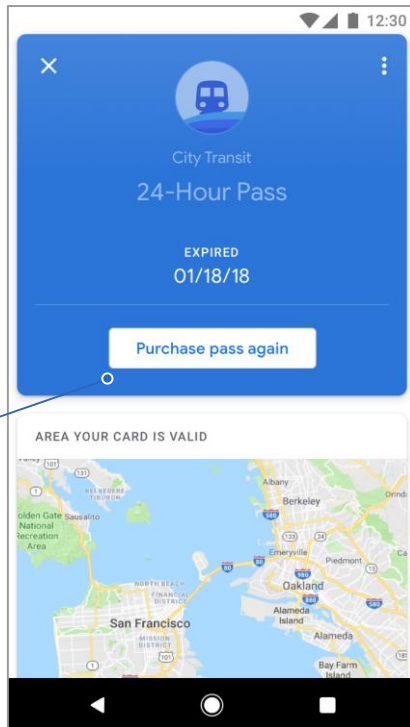


More options

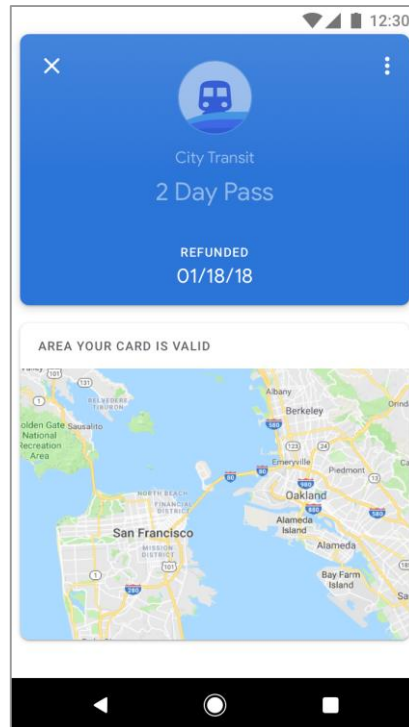


Ticket Details

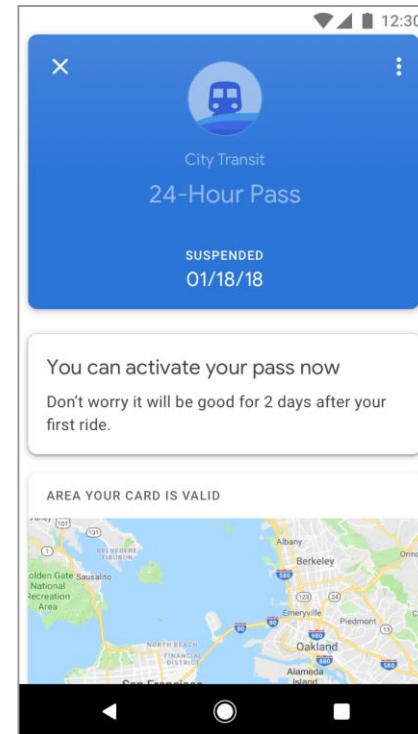
Your app



Ticket Expires

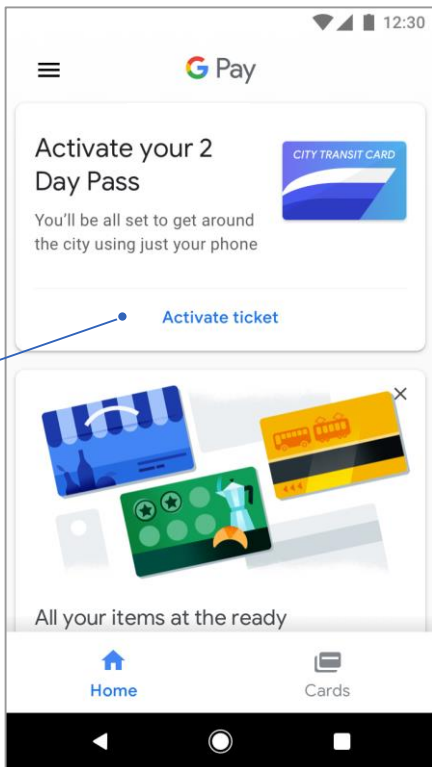


Ticket Refunded

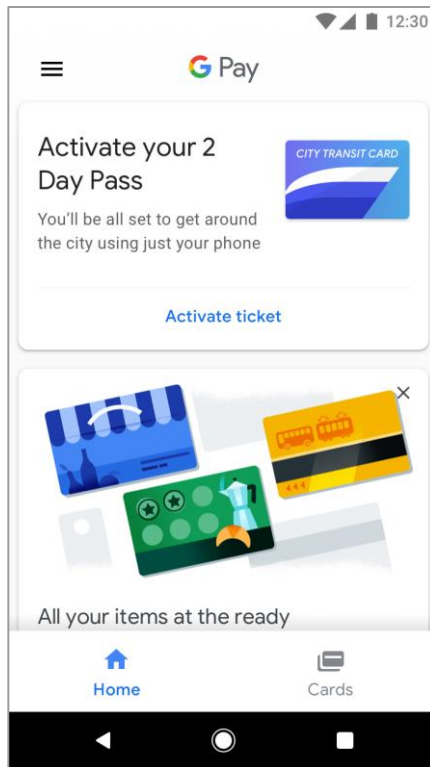


Ticket Suspended

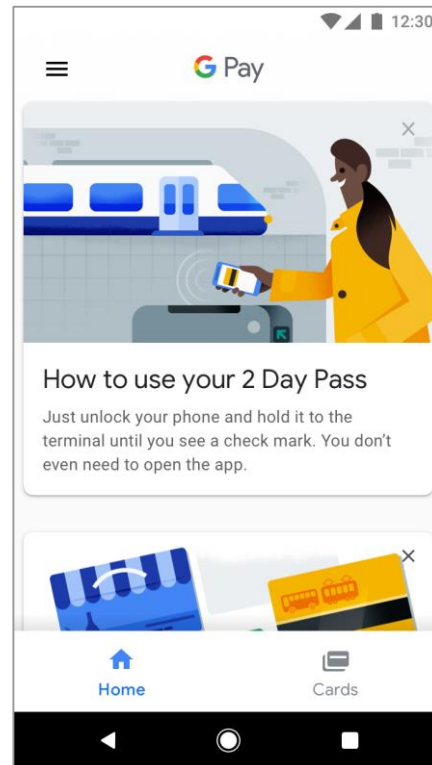
Points to
your app



Help users find your App

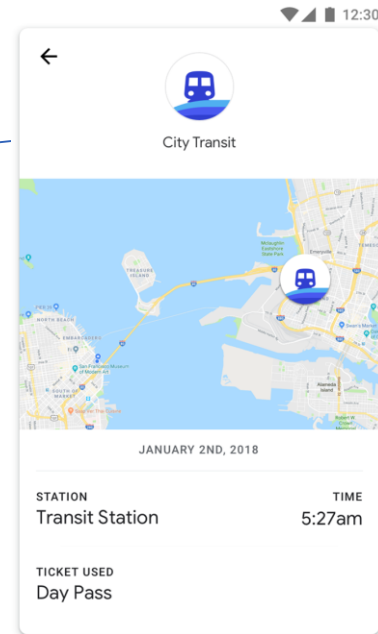
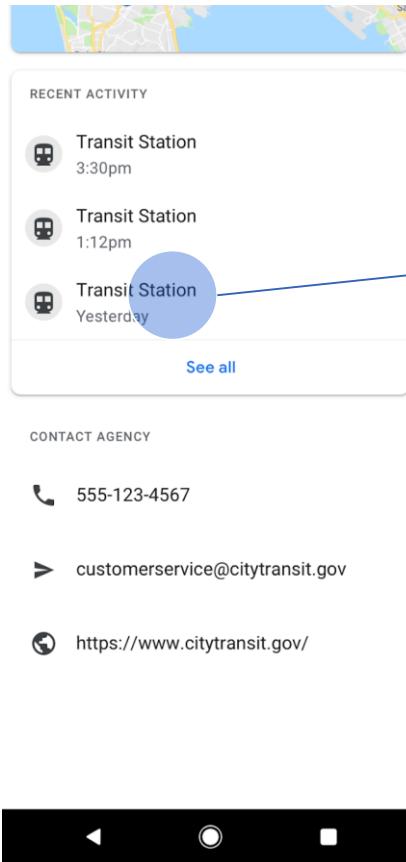


Help users get ready to
ride

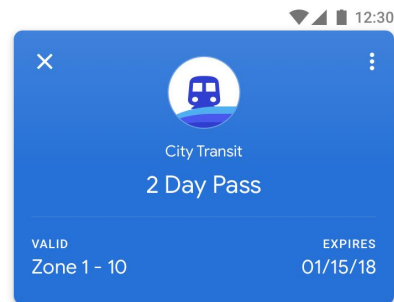


Education on how to user
their phone

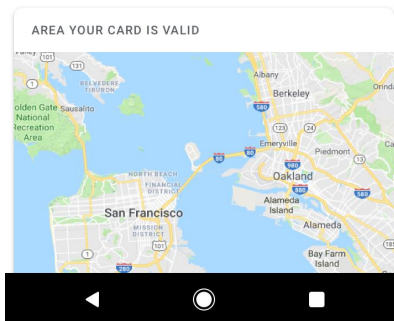
Rich Receipts



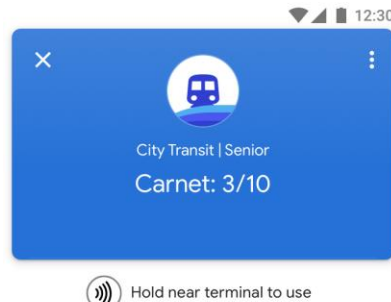
Types of tickets



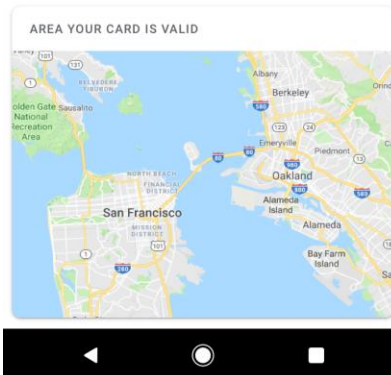
Hold near terminal to use



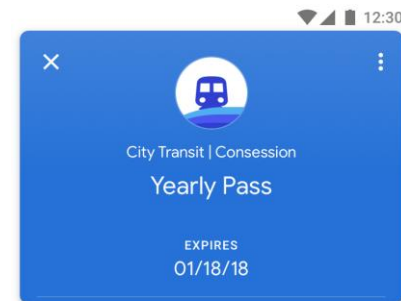
Standard Adult Pass from
Zone to Zone



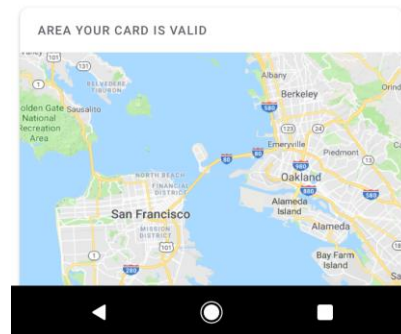
Hold near terminal to use



Senior 10 ticket carnet



Hold near terminal to use



Disabled annual pass

Purchase Ticket

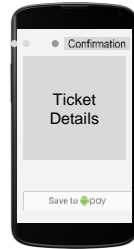
Meet the user where they are today

3rd Party Website



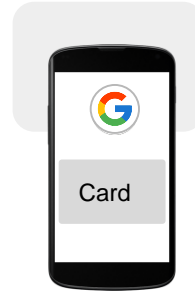
G Pay | Save to phone

3rd Party Application



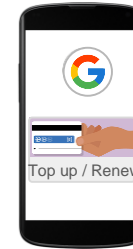
G Pay | Save to phone

Existing cards



G Pay | Save to phone

Google Pay



G Pay | Save to phone

In-Store / TVM



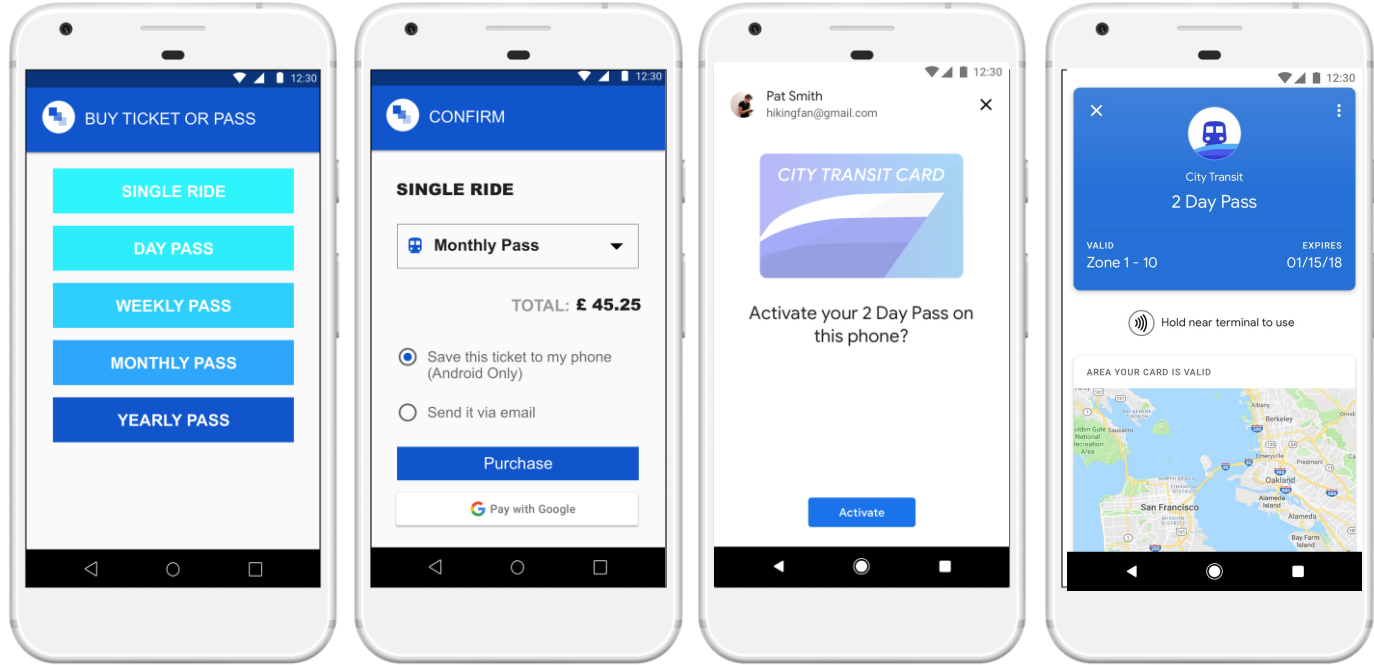
G Pay | Save to phone

Purchase Ticket



**Digital ticket
vending machine**
using mobile phone

Instant issuance
into your mobile
wallet



Your application or website

Save ticket to the phone

Ticket instantly provisioned
to Google Pay

Start journey

Fast easy conveyance using mobile phone
without need open an app, or even unlock

