Pay By Account

Technology which allows contactless, in-store or online payments directly from bank account using banking or third-part app.

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Article

You can find more knowledge about products on this site.

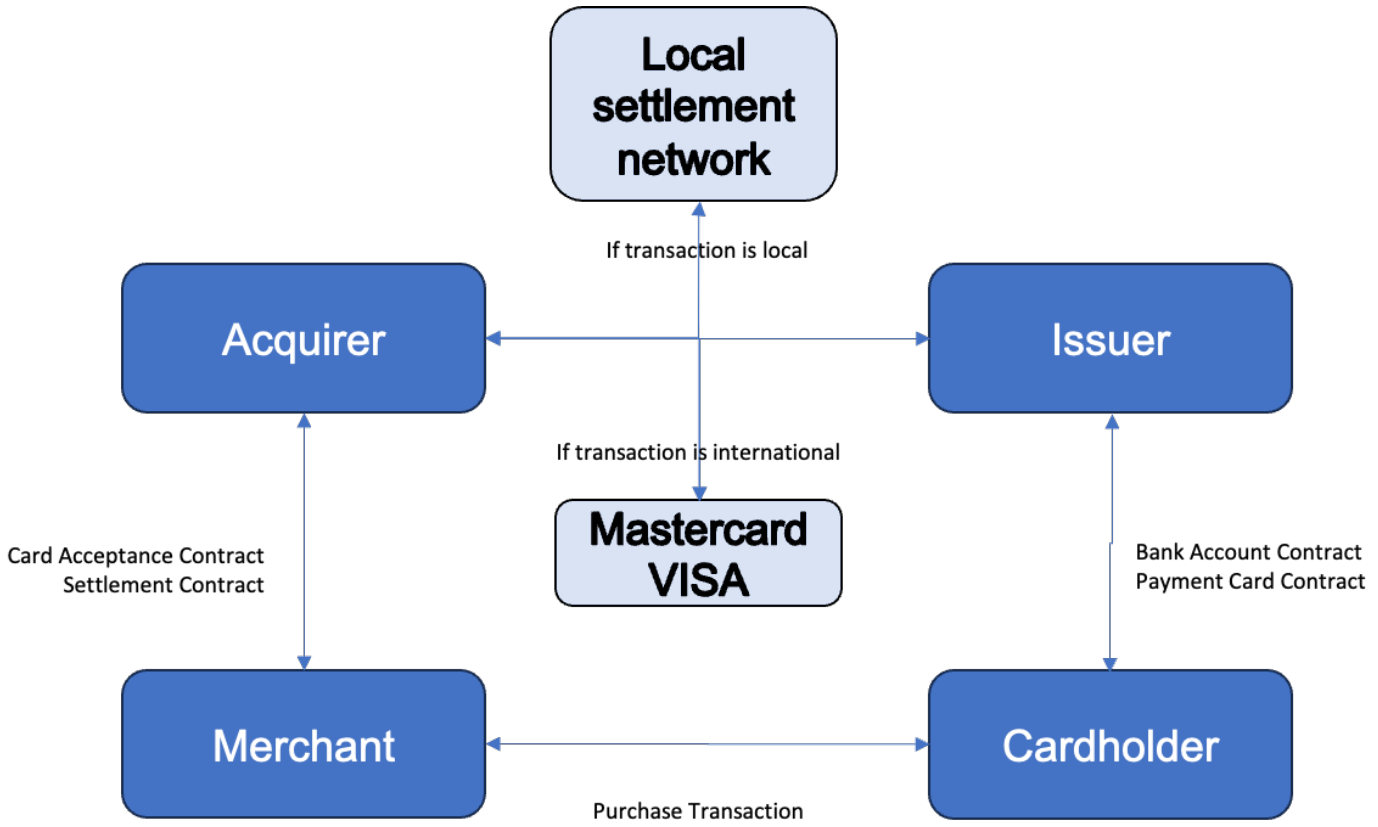
Article

Pay by Account - NFC from bank account

As we have done several Pay by Account projects, I would like to share some information on what is the best way to implement such a solution.

Pay by Account or - in other words - **mobile NFC payments directly from a bank account** is an important product development step for many local schemes. Usually it is not enough to enable money transfers, QR payments or bill payments, and it would be beneficial to make use of the global authorisation and clearing network of Mastercard and VISA. In such a case, users of local schemes like BLIK in Poland or PIX in Brazil could be using or are using mobile phones to pay globally.

The solution is not difficult to implement using virtual cards and some local settlement ideas. There are the following architectural components:



The key implementation steps are as follows:

1. Every user interested in using contactless, eCommerce, or inApp payments will get a hidden virtual payment token
2. The token will be tokenised at a mobile phone of the user (usually Issuer Wallet SDK) and will be used for payments on the standard Mastercard or VISA acceptance network
3. In case the token is used to do domestic transactions at acquirers and terminals integrated with a local scheme, the authorisation and clearing will be routed to a local scheme
4. In case the token is used for international transactions, globally, at any terminal in the world, the authorisation and clearing will happen via the standard Mastercard or VISA settlement network

To enable this project you need to have a virtual card issuer or card issuing processor with super low fees per card - test us :) You will also need some support from **Mastercard or VISA** to agree on such a processing mechanism. Additionally, certified SDKs and backend components for contactless payments will be necessary (we can provide as well).

There have already been several implementations of similar schemes in the world. We are happy to discuss this setup in more detail.

Thanks for reading.

Introduction

Mastercard Pay by Account is a technology which allows contactless, in-store or online payments directly from bank account using banking or third-part app. Whole solution is based on Mastercard Cloud-Based Payments. MCBP enables bank account number to be digitized and used for payments. VCP is solution which provides functionalities for digitization, user data management and payments needed for final customer to adopt Mastercard Pay by Account.

Overview

Abbreviations and Acronyms

This section explains a meaning of key terms and concepts used in this document:

Abberations	Description
AC	Application Cryptogram
AHI	Account Holding Institution
ACS	Access Control Server
API	Application Programming Interface
ARQC	Authorization Request Cryptogram
BAU	Business as Usual
CDCVM	Consumer Device Cardholder Verification Method
CL	Contactless
CVM	Cardholder Verification Method
FCM	Firebase Cloud Messaging
HCE	Host Card Emulation
HVT	High Value Transaction
IBAN	Bank Account Number
JWE	Json Web Encryption
JWT	Json Web Token
LVT	Low Value Transaction

MCBP	MasterCard Cloud Base Payment
MDC	Mobile Data Core
MDES	MasterCard Digital Enablement Service
MPA	Mobile Payment Application
NFC	Near Field Communication
PAN	Primary Account Number
PbA	Pay by Account
PIN	Personal Identification Number
POS	Point of Sale
RNS	Remote Notification Service
SaaS	Software as a Service
SDK	Software Development Kit
SUK	Single Use Key
TAV	Tokenization Authentication Value
TVC	Token Verification Code
VCP/UCP	Verestro Cloud Payments/(Formerly uPaid Cloud Payments)
VPN	Virtual Private Network

Terminology

Name	Description
Customer	Institution which is using Verestro products.
User	User which uses MPA.
Payment Instrument	Common name for card and IBAN.
Payment Token	Token in context of MCBP.
Trusted Identity	Signed user identifier by Customer server. Used to proof that authentication was performed for given user.
Online PIN	Online PIN is a type of CVM where a PIN is inserted on the POS device and verified by the Issuer on the backend.
IBAN Id	Bank account number id which is sha256Hex of bank account number.

PbA high level

This diagram shows high level components which are involved in whole solution.

PbA key components

Component	Description
MPA	Android Mobile Payment Application provides frontend interface to the User and uses part of Verestro Wallet SDK which is responsible for Pay by Account.
Verestro Wallet Server	Provides the backend services to support Mobile Payment Application via Verestro Wallet SDK and is responsible for managing users, devices, IBANs, Payment Tokens and communication with MDES, communication with Zapp for retrieving CVC2 and ACS. Wallet Server acts as Token Requestor on behalf of Account Holding Institution in context of digitization.
Verestro Wallet SDK	Provides all functionalities needed for MPA in Pay by Account project.
MDES	Token Service Provider which supports digitization(transforming the IBAN into payment token) and is responsible for management, generation and provisioning of transaction credentials into mobile devices to enable simpler and more secure digital payment experience.
Remote Notification Service	Wallet Server communicates with the MPA also using Remote Notification Service. For Android is used Firebase Cloud Messaging.
Zapp Processing Platform	Zapp is bank account processing platform which provides capability to bank to digitize consumer’s bank account, process and enable contactless, e-com and QR payments via digitized bank account. Zapp also stores Static Payment Token with CVC2.
ACS	Component which is part of 3DS transaction to support cardholder authentication.
AHI	AHI holds information about bank accounts and integrates with Zapp and Wallet Server. Can have various services with business responsibilities inside.

Verestro Cloud Payments Solution

Verestro Cloud Payments is solution which had been developed to facilitate adopting cloud-based payments for the Customers. VCP provides functionalities for User identification and verification, Payment Instruments digitization and User data management.

Solution consists of:

- server components:
  - Wallet Server - backend component,
  - Wallet Admin Panel - frontend component,
- mobile components:
  - Wallet SDK - Android libraries.

Implementation model

VCP for PbA should be implemented in model where Customer is owner of MPA. Verestro provides Wallet SDK and Wallet Server. Customer is responsible for direct User authentication and passes the result of the authentication to Wallet SDK. Online operations which need to be performed by User using Wallet Server require valid session on Wallet Server. To obtain user online session with Wallet Server, Customer needs to pass Trusted Identity.

Architecture

This diagram shows big picture of Verestro Cloud Payments architecture.

Server Components

Server components are applications which need to be deployed on remote server to make possible to connect them by network.

Deployment Models

Verestro offers two deployment models of server components. On-premise and SaaS.

SaaS - Server components are designed to be deploy in SaaS model. In this case everything is deployed and configured on Verestro side. Verestro is responsible for maintaining infrastructure, deploying applications and monitoring.

On-premise - Server components also can be deployed on Customer infrastructure. Applications are designed to be deployed using Kubernetes as system for automating deployment, scaling, and management of containerized applications. For more details please contact Verestro representative.

Mobile Components

Mobile components are dedicated for using on Android mobile devices.

Wallet SDK

Verestro provides Software Development Kit (SDK) called Wallet SDK which can be used in Mobile Payment Application. As a company, Verestro provides many products which can be used in single application. For that reason Wallet SDK is divided into separated modules which covers different functionalities. There are two main modules dedicated for Verestro Cloud Payments: MDC SDK and UCP SDK. MDC SDK is core Verestro module responsible for user data management: authentication, payment cards management - since these are main functionalities used in every product. UCP SDK is dedicated for performing digitization and payments using Payment Token. In payment context UCP SDK wraps Mastercard Cloud Based Payment SDK.

Requirements

Wallet SDK has some mandatory requirements to make it work:

- device cannot be rooted,
- Android OS image (ROM) should be genuine in version 6.0 (Marshmallow) or above,
- devices cannot have enabled debugging.

There are also some not mandatory requirements, but Customer needs to be aware of them to maintain functionalities:

- NFC module necessary for HCE payments,
- lock screen necessary for locally-verified user authentication.

Security

Wallet SDK was developed according to security requirements included in Security Guide MCBP SDK for Android. However Wallet SDK cannot guarantee full MPA protection and MPA must provide additional layer of security. More detailed information can be found in *Wallet SDK API.* Moreover all sensitive data are passed as chars or bytes arrays. Wallet SDK copies the arrays and clears that copies just after processing. MPA should clear provided sensitive data immediately after passing them to Wallet SDK.

MPA should provide mechanism for forcing application update in case of SDK security checks update.

Security Checks and Data Clearing

On Wallet SDK side are performed security checks which includes static code analysis protection and dynamic analysis protection. Security checks consists of:

- root access detection,
- hooking protection,
- debugging protection,
- custom ROM protection,
- data tampering protection,
- man in the middle protection.

Security checks are performed periodically, if Wallet SDK detects any of above things all data hold by Wallet SDK will be cleared and security report will be sent to Wallet Server. MPA will be informed about such detection.

Communication with Wallet Server

Communication from genuine applications which are installed on genuine devices is accepted by the Wallet Server. Wallet SDK at the very beginning performs authentication of application and device to Wallet Server. This authentication may takes advantage of Google Play Integrity which is 3-rd party trusted side in whole authentication. Google Play Integrity verifies device and sign information about device and application. Signed data from Play Integrity are sent to the Wallet Server. Wallet Server verifies data and allow or does not allow for further communication. Application is verified according preconfigured application certificate digest used for signing application.

Important: There is a limit of requests to Google Play Integrity API: 10 000 per day. If Customer predicts that there will be more installations per day then this limit needs to be increased during Google Project Setup.

Wallet SDK communicates with Wallet Server using TLS 1.2. Wallet SDK performs public key certificate pinning when it tries to establish connection with Wallet Server (similar with connection to MDES). Certificates for the pinning needs to be provided to SDK. Sensitive information are additionally encrypted and/or signed.

Versioning

Wallet SDK uses semantic versioning. It means that every release has own version which is MAJOR.MINOR.PATCH, where:

- MAJOR version increases when SDK has incompatible API changes,
- MINOR version increases when new functionality is added in a backwards compatible manner,
- PATCH version increases when new backwards compatible bug fixes are introduced.

MAJOR versions are supported 6 months and Customer needs to migrate to new version if they want to maintain support.

Remote Notification Processing

There are several processes where server sends message to client. Remote Notification Service(FCM) is used to deliver such message. Wallet SDK is responsible for remote message processing, however MPA is responsible for obtaining FCM registration token, handling FCM token update and receiving remote messages. Before passing remote message to SDK, MPA needs to verify if given message is dedicated for SDK by checking sender Id. Sender Id is configured during onboarding. Verestro will create new FCM project and provide data needed to obtain FCM token for given project. Due to observing some issues with FCM token refresh notification from FCM service, additional check of new token availability is recommended(eg. on application start). See more in *Wallet SDK API.*

Access

Wallet SDK is stored as artifacts in maven repository. Access there is provided during onboarding by Verestro representative using pgp encryption.

Configuration

Whole product has configuration which needs to be fulfilled. This configuration also consists of data which are set in MDES. More details are described in *Wallet Configuration*.

User Experience for Contactless Transactions

MDES offers a few options for customers for defining user experience for contactless transactions. Final option is the choice of CDCVM type (Mobile PIN, Locally-verified CDCVM) and CVM model (Always, Flexible, Card-like).

CDCVM Types

There are two types of Consumer Device Cardholder Verification Method (CDCVM) which are supported by MDES.

Mobile PIN CDCVM - A PIN value (4–8 digits) that the cardholder enters on the mobile device and that is validated online by MDES during the transaction authorization process. Since Locally-verified is mostly preferable option, Mobile PIN is out of scope.

Locally - verified CDCVM (custom) - A CDCVM entered on and validated by the consumer’s mobile device, for example system device PIN, pattern, password or biometric methods (such as fingerprint, iris or facial recognition). Swipe (slide to unlock) is not a valid cardholder verification method and must not be supported. These methods are commonly associated with a device unlock process and are validated on the cardholder’s mobile device. From SDK perspective there is only requirement to pass information whether transaction is authenticated or not but process of authentication is performed on Mobile Payment Application level. A Locally-verified CDCVM applies to all the payment tokens of a given Mobile Payment Application instance (“Wallet-level”). In some parts of system this type is also named as Custom.

CDCVM Models

For two CDCVM types customer can apply different user experience CVM Models.

- **Always**

In this model the card profiles supplied to the SDK are configured to indicate that the mobile device supports on-device cardholder authentication. When transactions are performed on a POS supporting CDCVM, the POS will delegate cardholder authentication to the mobile device the terminal will not request an Online PIN on the terminal. In POS which does not support CDCVM cardholder authentication is required using Online PIN. This model requires the cardholder’s mobile device to authenticate the cardholder for all transactions (LVT, HVT, Transit). CDCVM can be performed using either a Mobile PIN or a Locally-verified CDCVM. MPA is expected to decline any transaction for which cardholder authentication is not performed or is unsuccessful.

Below are presented sample diagrams which show how the transactions can look like:

Always LVT, HVT - single tap

Always LVT, HVT - double tap

- **Flexible**

In this model the card profile also indicates that the mobile device supports on device cardholder authentication Mobile PIN or Locally-verified CDCVM. However rather than applying authentication for every transaction the MPA defines flexible criteria such as allowing multiple transactions between each authentication. This criteria are often names as Lost & Stolen options or velocity checks. For transit transactions cardholder authentication is not expected.

Below are presented sample diagrams which show how the transactions can look like:

Flexible LVT

Flexible HVT - single tap

Flexible HVT, LVT with Velocity counters - double tap

Card-like

In this model the card profiles supplied to the SDK are configured to indicate that the mobile wallet is not capable of supporting on device cardholder verification. This means that when transactions are performed with a Point of Sale (POS) terminal, the POS will treat the transaction in the same way as a card transaction. Typically this means that low value transactions (LVTs) will be processed without additional user authentication and if supported, high value transactions will require an online PIN to be provided on POS. This model is put here just for general information, however it is not preferred for issuer wallets.

Below are presented sample diagrams which show how the transactions can look like:

Card like LVT

Card like HVT

Lost & Stolen options

The Lost & Stolen options are dedicated to control performing transactions allowed before requiring cardholder authentication. This limits fraud risk if the cardholder’s mobile device is lost or stolen. Lost & stolen options can be applied only for Flexible CDCVM. These options also are known as velocity check counters. Wallet SDK provides interface which is invoked during transaction. Transaction information like range, rich transaction type, amount are provided within this interface. MPA can implement various checks to support velocity check counters using transaction information. MPA for example can count LVT transactions and allow only some predefined number of LVT transactions without cardholder authentication.

Transit transactions

Transit transactions are transactions with given Merchant Category Code performed e.g. on traffic gates like: underground. It is up to Customer if wants to enable such transactions or not (option selected during MDES onboarding). Transit transactions are enabled in every CVM model, however for Always CDCVM needs to be performed for every transaction, for Card-Like and Flexible CDCVM can be skipped.

Use cases

Wallet SDK Initiated

This section describes use cases which are initiated from Wallet SDK.

Wallet SDK Setup

Setup of Wallet SDK (both modules UCP SDK and MDC SDK) is main step which needs to be made at the very beginning. MDC SDK should be always setup at first because it is core module. During setup main configuration should be provided. Moreover there is some configuration which is related with HCE payments: MPA should be registered as default application for payment (Tap & Pay) and also should implement HostApduService to emulate an NFC card inside an Android service component. Application has to consider scenario where is woken up by HostApduService. Please find more details in *Wallet SDK API* document.

mpa<--sdk: 4. result
@enduml

Pair Device on Wallet Server

This section describes pairing device process. Device pairing is process which authenticates device in context of given user. During this process device data and keys used in communication are exchanged with Wallet Server. To make possible device pairing, user needs to be already registered on the Wallet Server. Every device is identified by unique identifier. After every pairing device request, Wallet Server gives unique installation identifier. It means that particular installation of the application installed on particular device belongs to given user. Different users can use same device for separate installations. If any active installation on given device already exists during pairing device, Wallet Server will delete and create new installation in context of new user. Only one active installation is possible on particular device. Registration and device pairing is done by SDK during IBAN digitization process.

Pair Device By Trusted Identity

Pairing is done automatically during IBAN digitization process and Trusted Identity is part of data passed to digitization. Pairing is described separately to show how User authentication mechanism works. Only User who is authenticated on Wallet Server may access to its own data. During pairing device process Wallet Server check whether previously on given device was installation which had device Payment Tokens, during pairing these device Payment Tokens are deleted asynchronously.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
participant "User" as user
participant "MPA" as mpa

```
participant "Wallet SDK" as sdk
participant "Wallet Server" as ws
participant "MDES" as mdes
participant "AHI" as ahi
sdk->ws: 1. pairDeviceByTrustedIdentity\r(trustedIdentity, fcmRegistrationToken, deviceInfo)
activate sdk
activate ws
ws->ws: 2. verify trusted identity
alt isActiveInstallationOnGivenDevice
ws->ws: 3. deleteActiveInstallation
ws->mdes: 4. deleteDeviceTokens
activate mdes
deactivate mdes
note left: asynchronous
end
ws->ws: 5. createNewDeviceInstallationRecordForUser
ws-->sdk: 6. response\r (userSessionToken, installationId)
deactivate ws
sdk->sdk: 7. store userSessionToken
sdk-->mpa: 8. result
deactivate mpa
deactivate sdk
@enduml
```

IBAN Digitization

IBAN can be digitized for two different goals:

1. For contactless payments, in this scenario device Payment Token is created.
2. For e-commerce payments, in this scenario static Payment Token is created.

This section describes process related to IBAN digitization.

Device Token Digitization

IBAN digitization via Wallet SDK is process which performs digitization of given IBAN which is assigned to given user for contactless payments. Device token is created in INACTIVE state just after digitization. After profile provisioning device Payment Token status is changed to ACTIVE.

Whole process of IBAN Digitization via Wallet SDK consists of some subprocesses, however whole complexity is behind the scene and MPA needs to call only one method to perform all needed steps. If any of the steps will fail, MPA will be notified and whole process can be retried. Since the mobile environment is not secure, Wallet Server expects signed data as JWT which should be passed via Wallet SDK.

It is possible to digitize many IBANs. For each IBAN, SDK digitization method should be called separately. One User (identified by user id) can have many IBANs and one IBAN can belong to many different Users.

In case when user (identified by user id) changes his device, whole process looks the same from MPA perspective.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant "MPA" as MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES as MDES
participant "AHI" as AHIS
User -> MPA: 1. enableNFCForIBAN
activate MPA
MPA -> AHIS: 2. createSignedAccountInfo
activate AHIS
AHIS -> AHIS: 3. signDataAsJwt \r (userId, iban(bank account number),\r
countryCode\rphone/email)
AHIS --> MPA: 4. response (signedAccountInfo)
deactivate AHIS
MPA -> MPA: 5. getFcmToken(walletFirebase)
MPA -> SDK: 6. UCP::digitizeIbanForDevice\r(signedAccountInfo, fcmToken, userLanguageCode)
activate SDK
SDK -> WS: 7. addUserWithIban\r (signedAccountInfo)
activate WS
WS -> WS: 8. createUserRecordAndIban
```

WS --> SDK: 9. response(userId, ibanId\r (sha256(iban(bank account number)))
SDK -> SDK: 10. isDevicePaired
alt isDevicePaired=false
SDK-> WS: 11. pairDeviceByTrustedIdentity\r(signedAccountInfo, fcmRegistrationToken, deviceInfo)
note over SDK, WS #1C1E3F: See Pair Device process for more details
else isDevicePaired=true
SDK -> WS: 12. loginByTrustedIdenitity
note over SDK, WS #1C1E3F: See Login process for more details
end
SDK -> SDK: 13. isDeviceRegisteredForPayment
alt isDeviceRegisteredForPayment=false
SDK -> WS: 14. getPkCertificate
WS -> MDES: 15. getPkCertificate
activate MDES
MDES --> WS: 16. response(pkCertificate)
WS --> SDK: 17. response(pkCertificate)
SDK -> SDK: 18. prepareDataForRegistration(pkCertificate)
SDK -> WS: 19. registerDeviceForPayment\r (paymentDeviceInfo, userSessionToken)
WS -> MDES: 20. registerMobilePaymentApplication\r (paymentDeviceInfo)
MDES --> WS: 21. response(mobileKeys,\r remoteManagementUrl)
WS --> SDK: 22. response(mobileKeys,\r remoteManagementUrl)
end
SDK -> WS: 23. digitizeIbanForDevice\r (ibanId, userSessionToken, userLanguageCode)
WS -> MDES: 24. checkEligibility(iban(bank account number)\r countryCode, ahiId, paymentAppIdForDevice,\r paymentAppInstanceId)
MDES --> WS: 25. response (eligibilityReceipt)
WS -> MDES: 26. digitize(eligibilityReceipt)
MDES --> WS: 27. response
deactivate MDES
WS --> SDK: 28. response\r (devicePaymentTokenInfo)
note over SDK, WS #1C1E3F: See Approved diagrams
deactivate WS
SDK --> MPA: 29. result
deactivate SDK
MPA --> User: 30. IBAN digitized, please wait for activation
deactivate MPA
@enduml

When digitization for DEVICE token is succeed, then profile provisioning takes place (See Profile Provisioning).

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF

```
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES as MDES
group DEVICE digitization Approved
MDES --> WS : 1. responseFromDigitization(tokenInfo)
activate MDES
activate WS
WS --> SDK : 2. response
activate SDK
SDK --> MPA : 3. result
activate MPA
MPA --> User : 4. result
MDES -> SDK : 5. provision
deactivate SDK
deactivate MPA
deactivate WS
deactivate MDES
... Profile Provisioning ...
note over MPA, MDES #1C1E3F: See Profile Provisioning diagram
end
@enduml
```

Static Token Digitization

IBAN digitization for a static token is a process where static Payment Token is created and can be used for e-commerce payments. Static Payment Token is created on MDES side where token PAN and expiration date is stored. Once token is created, MDES notifies Zapp which is responsible for

CVC2 generation and storing for this particular token. There could be some circumstances where Zapp will not receive such notification and CVC2 will be not generated. For that reason Wallet Server introduces mechanism to delete such tokens after some period of time(see Remove Static Tokens Without CVC2). Just after static token digitization token PAN and FPAN are enrolled to ACS(see Enroll Static Token to ACS).

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant "MPA" as MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES as MDES
participant "AHI" as AHIS
User -> MPA: 1. enableECommerceForIBAN
activate MPA
MPA -> AHIS: 2. createSignedAccountInfo
activate AHIS
AHIS -> AHIS: 3. signDataAsJwt \r (userId, iban(bank account number),\r
countryCode\rphone/email)
AHIS --> MPA: 4. response (signedAccountInfo)
deactivate AHIS
MPA -> MPA: 5. getFcmToken(walletFirebase)
MPA -> SDK: 6. UCP::digitizeIbanForStatic\r(signedAccountInfo, fcmToken, userLanguageCode)
activate SDK
SDK -> WS: 7. addUserWithIban\r (signedAccountInfo)
activate WS
```

WS -> WS: 8. createUserRecordAndIban
WS --> SDK: 9. response(userId, ibanId\r (sha256(iban(bank account number)))
SDK -> SDK: 10. isDevicePaired
alt isDevicePaired=false
SDK-> WS: 11. pairDeviceByTrustedIdentity\r(signedAccountInfo, fcmRegistrationToken, deviceInfo)
note over SDK, WS #1C1E3F: See Pair Device process for more details
else isDevicePaired=true
SDK -> WS: 12. loginByTrustedIdenitity
note over SDK, WS #1C1E3F: See Login process for more details
end
SDK -> SDK: 13. store userSessionToken
SDK -> WS: 14. digitizeIbanForStatic\r (ibanId, userSessionToken, userLanguageCode)
WS -> MDES: 15. tokenize(iban(bank account number)\r countryCode, ahiId)
activate MDES
MDES --> WS: 16. response
deactivate MDES
WS --> SDK: 17. response\r (staticPaymentTokenInfo)
deactivate WS
SDK --> MPA: 18. result
deactivate SDK
MPA --> User: 19. digitization succeed
deactivate MPA
@enduml

Enroll Static Token to ACS

When merchant initiates 3DS authentication for static token, depending on the AHI and market requirement, challenge or step up might be required to be performed for transaction used initiated using static token. For the Step-Up to be initiated, ACS needs to have the following information available prior to the authentication so it can map and initiate the step up:

- FPAN,
- token PAN/DPAN – used for 3DS_V1,
- User's credential required for the step-up (i.e, phone number/email).

To enable Step-Up all required information needs to be enrolled to ACS to perform the authentication challenge. Enrolment is done automatically and asynchronously after IBAN digitization for static token.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F

```
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant "MPA" as MPA
participant "Wallet Server" as WS
participant MDES as MDES
participant "ACS" as ACS
MDES --> WS: 1. response(staticToken)
activate MDES
activate WS
deactivate MDES
deactivate WS
WS -> MDES: 2. getTokenDetails(tokenUniqueReference)
activate WS
activate MDES
MDES --> WS: 3. response(FPAN, DPAN)
deactivate MDES
WS -> ACS: 4. enroll(FPAN, DPAN, phone/email)
activate ACS
ACS -->WS: 5. response
deactivate ACS
@enduml
```

Unenroll Static Token from ACS

Static token which is deleted is also unenrolled from ACS automatically.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
```

```
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant "MPA" as MPA
participant "Wallet Server" as WS
participant MDES as MDES
participant "ACS" as ACS
MDES --> WS: 1. response(staticTokenDeleted)
activate MDES
activate WS
deactivate MDES
deactivate WS
WS -> MDES: 2. getTokenDetails(tokenUniqueReference)
activate WS
activate MDES
MDES --> WS: 3. response(FPAN, DPAN)
deactivate MDES
WS -> ACS: 4. unEnroll(FPAN, DPAN, phone/email)
activate ACS
ACS -->WS: 5. response
deactivate ACS
@enduml
```

Handle Message From Server

In whole system there are processes where server needs to send messages to the device. Wallet Server has separate component which is responsible for sending messages to the device. This component uses different channels for message delivery. There are two channels: SSE(Server Sent Events) and RNS(Remote Notification Service). When message is ready for delivery, Wallet Server uses both channels to deliver such message. In first versions of Wallet Server only RNS was used, however sometimes messages were not delivered and to improve delivery new SSE channel was introduced. This channel helps in processes which start from the device and device expects message from the server. Moreover device checks messages which are still not delivered on actions where such messages are expected. Below diagram describes how delivery message process works and how needs to be handled on MPA side.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant "MPA" as MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant "RNS" as RNS
opt
SDK -> WS: 1. callActionAfterWhichMessageIsExpected
WS --> SDK: 2. response
SDK -> WS: 3. openSSEConnection
end
WS -> WS: messageReadyForDelivery
opt If device has opened connection
WS -> SDK: 4. deliverUsingSSE
end
WS -> RNS: 5. deliverMessage
RNS --> WS: 6. response
RNS -> MPA: 7. deliverMessage
MPA -> MPA: 8. checkWalletSenderId
MPA-> SDK: 9. MDC:CloudMessage#process(pushData)
SDK -> SDK: 10. deduplicateMessage
SDK -> WS: 11. acknowledgeMessage
WS --> SDK: 12. response
SDK -> SDK: 13. processMessage
...Obtain pending messages...
MPA -> SDK: 14. someActionWhereMessageMayBeStillPending
SDK -> SDK: 15. doAction
SDK ->> WS: 16. getPendingMessages
```

WS --> SDK: 17. response
SDK -> SDK: do actions from 10 to 13

@enduml

Update RNS Token

Wallet Server is responsible for sending push notifications to the Wallet SDK. For that reason RNS token is passed to Wallet Server during pairing device or in some cases is obtained by SDK from MPA whenere is needed. However this token can be updated. MPA will be notified when token is being updated and then needs to obtain new RNS token and update via Wallet SDK on Wallet Server. Retrieving push notifications and RNS tokens is responsibility of the MPA.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant "Remote Notification Service" as RNS
activate RNS
RNS -> MPA: 1. onTokenRefresh
deactivate RNS
activate MPA
MPA -> MPA: 2. obtainNewToken(walletFirebase)
MPA -> SDK: 3. MDC::updateRegistrationToken(newRNSToken)
activate SDK
SDK -> WS: 4. updateRNSToken(deviceInstallationId, newRNSToken)

activate WS
WS -> WS: 5. updateRNSToken
WS --> SDK: 6. response
deactivate WS
SDK --> MPA: 7. result
deactivate SDK
deactivate MPA
deactivate RNS
@enduml

Profile Provisioning

During this process digitized card profile is delivered to the device. This process is triggered automatically after successful digitization where outcome is APPROVED or REQUIRE_ADDITIONAL_AUTHENTICATION. It is not possible to retry provisioning itself. To retry provisioning, previous token needs to be deleted and new digitization called hence when SDK reports that provisioning has failed then given token is automatically deleted and User can perform digitization once again. During process there is few point of failures and provisioning can be not finished at all. In this scenario Payment Tokens which are not provisioned for long period of time are delete by Wallet Server (see Removing Not Provisioned Tokens). From User perspective it can be good approach to treat digitization and provisioning as one process and inform User about steps(if User has to wait long time without any information then can treat this as some failure). From MPA perspective can be also good approach to wait for provisioning status as long as User stays on view dedicated to it. If User wants to cancel the process because provisioning status is not available for long period of time it is recommended to delete Payment Token(see Delete Payment Token via SDK) once User click cancel or back. Thanks to deletion, new digitization can be called and User does not have to wait until Payment Token is deleted by Wallet Server due to lack of provisioning.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold

```
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES as MDES
MDES->WS: 1. sendRemoteNotificationMessage(mdesRemoteMessage)
activate MDES
deactivate MDES
activate WS
WS-> SDK: 2. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
activate SDK
SDK-> MDES: 3. provision
activate MDES
MDES --> SDK: 4. response(cardProfile)
SDK-> MDES: 5. notify provisioning result
MDES --> SDK: 6. response
deactivate MDES
SDK -> SDK: 7. store card profile
SDK -> WS: 8. confirmProvisioningStatus(SUCCESS/FAILURE)
activate WS
alt FAILURE
WS -> MDES: 9. deleteToken
activate MDES
MDES --> WS: 10. response
deactivate MDES
WS --> SDK: 11. response
SDK -> SDK: 12. deleteToken
SDK -> MPA: 13. onProvisioningFailure
activate MPA
MPA -> User: 14. please try again
deactivate MPA
else SUCCESS
WS --> SDK: 15. response
deactivate WS
SDK -> MPA: 16. onProvisioningSuccess(paymentInstrument)
deactivate SDK
activate MPA
MPA -> User: 17. card digitized successfully
deactivate MPA
end
@enduml
```

Transaction Credentials Replenishment

Transaction Credentials are unique per transactions keys that are used to calculate cryptograms in transactions. Each set of credentials is linked with a unique Application Transaction Counter (ATC). Each set of credentials can only be used for one transaction. There is a limit (set on MDES onboarding) of transaction credentials stored on device. There are several types of replenishment:

- Initial
- Automatic
- Manual

Transaction Credentials - Automatic Replenishment

After every transaction Wallet SDK checks if number of transaction credentials is below, preconfigured during SDK setup, threshold. If yes then SDK will call replenish. During replenish process transaction credentials are being delivered to mobile application.

```
SDK-> MDES: 2. requestSession
activate MDES
MDES--> SDK: 3. response
MDES-> WS: 4. sendRemoteNotificationMessage(mdesRemoteMessage)
deactivate MDES
activate WS
WS -> SDK: 5. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
end
SDK-> MDES: 6. replenish
activate MDES
MDES-> MDES: 7. checkIfPaymentTokenIsActive
MDES-->SDK: 8. response(transactionCredentials)
deactivate MDES
SDK->MPA: 9. onReplenishSuccess(paymentInstrument)
deactivate SDK
@enduml
```

Transaction Credentials - Initial Replenishment

There are scenarios when automatic replenishment is not possible (lack of internet connection) and number of transaction credentials decrease to 0. In such case MPA should handle NO_TRANSACTION_CREDENTIALS error from transaction listener, show user proper alert and call replenish method manually. MPA can also check number of transaction credentials at any other time and do manual replenishment. It is not recommended call manual replenishment if number of transaction credentials is above threshold since in such case SDK will manage that.

Initial replenishment is process which starts directly after successful token activation. Wallet SDK is notified by Wallet Server using push notification or refreshing payment instruments. No action is needed by MPA.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
```

```
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES as MDES
WS -> SDK: 1. notifyTokenUpdated(Active)
activate WS
deactivate WS
activate SDK
alt Request session if required
SDK-> MDES: 2. requestSession
activate MDES
MDES--> SDK: 3. response
MDES-> WS: 4. sendRemoteNotificationMessage(mdesRemoteMessage)
deactivate MDES
activate WS
WS-> SDK: 5. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
end
SDK-> MDES: 6. replenish
activate MDES
MDES-> MDES: 7. checkIfPaymentTokenIsActive
MDES-->SDK: 8. response(transactionCredentials)
deactivate MDES
SDK -> MPA: 9. onReplenishSuccess(paymentInstrument)
deactivate SDK
@enduml
```

Transaction Credentials - Manual Replenishment

There are scenarios when automatic replenish is not possible (user is not able to connect with Internet) and after some number of transactions, transaction credentials number will decrease to 0. In such case MPA should handle NO_TRANSACTION_CREDENTIALS error from transaction listener, show user proper alert and call replenish method manually. MPA can also check number of transaction credentials at any other time.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
```

```
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES as MDES
MPA -> SDK: 1. UCP::replenishCredentials(paymentInstrumentId)
activate MPA
deactivate MPA
activate SDK
alt Request session if required
SDK-> MDES: 2. requestSession
activate MDES
MDES--> SDK: 3. response
MDES-> WS: 4. sendRemoteNotificationMessage
deactivate MDES
activate WS
WS-> SDK: 5. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
end
SDK-> MDES: 6. replenish
activate MDES
MDES-> MDES: 7. checkIfPaymentTokenIsActive
MDES-->SDK: 8. response(transactionCredentials)
deactivate MDES
SDK -> MPA: 9. onReplenishSuccess(paymentInstrument)
deactivate SDK
@enduml
```

Transacting

Wallet SDK provides functionalities to make contactless payments (using HCE) and e-commerce using static Payment Token data.

Contactless Transaction

Contactless transaction uses Android HCE. On MPA side HostApduService should be implemented. Depending on chosen CDCVM and on how transaction is started, user experience is different and MPA should interact with Wallet SDK in different way. The final decision about transaction processing belongs to MPA. Wallet SDK provides transaction information and based on that and User authentication, MPA can advise to proceed, decline or require authentication(if User should be authenticated but was not). For contactless transaction Wallet SDK provides result of transaction. This result is only from the communication between MPA and Terminal. Transaction Processing with Payment Network is done separately (see Transaction Processing). Also after every contactless transaction, Transaction Credentials Replenishment is performed automatically by SDK if needed(see Transaction Credentials - Automatic Replenishment).

NOTE: The way of authentication depends on MPA. For transaction User may also choose specific card. If no card is chosen, SDK will use the one which is set as default for contactless payments. Whenever user is authenticated or chose card for payment MPA should pass this information when *onContactlessPaymentStarted* is called.

As was described above, the final decision(PROCEED, DECLINE, AUTHENTICATION_REQUIRED) for given transaction is taken on MPA side based on transaction information and User authentication. Because of that reason there could be different scenarios which may occur and transaction experience will be single or double tap.

Sample scenarios:

- User can be already authenticated and if MPA will not decline transaction then will be processed as single tap,
- velocity check counters can be applied and even if User was not authenticated MPA can decide to proceed transaction without authentication, taking decision based on transaction information,
- User was not authenticated but MPA recognised transaction as authentication needed. MPA returns AUTHENTICATION_REQUIRED decision and and SDK informs MPA that authentication is needed.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F

```
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "HostApduService" as HAS
participant "Wallet SDK" as SDK
participant Terminal as TER
opt User selects particular card for payment
MPA -> User: 1. showCards
activate MPA
User -> MPA: 2. selectCard
deactivate MPA
end
User -> MPA: 3. pay
User -> TER : 4. contactless 1st tap
activate TER
loop
TER -> HAS: 5. processCommandApdu(commandApdu, extras)
activate HAS
HAS -> SDK: 6. UCP::Pay#processHceApduCommand(apdu, extras)
activate SDK
group Select PPSE
SDK -> MPA: 7. onContactlessPaymentStarted()
activate MPA
MPA -> MPA: 8. checkIsUserAuthenticated
alt isAuthenticated=true
MPA -> SDK: 9. UCP::Pay#setUserAuthenticatedForPayment(paymentInstrumentId, pin?)
end
alt selectedCard == null
SDK -> SDK: 10. useDefaultPaymentInstrumentForContactless
else selectedCard != null
MPA -> SDK: 11. UCP::Pay#selectForPayment(selectedPaymentInstrumentId)
deactivate MPA
end
end
group Generate AC command
SDK -> MPA: 12. getFinalDecisionForTransaction(isUserAuthenticated,recommendedAdvice, trxInfo)
activate MPA
MPA -> MPA: 13. checkTrxAndAuthentication
```

MPA --> SDK: 14. result(advice)
deactivate MPA
end
SDK --> HAS: 15. responseApdu
HAS --> TER: 16. responseApdu
deactivate HAS
end
alt advice=AUTHENTICATION_REQUIRED
SDK -> MPA: 17. onAuthRequiredForContactless(paymentInstrument, trxInfo)
activate MPA
MPA -> User: 18. show authentication view with trx info
User -> MPA: 19. authenticate
User -> TER: 20. contactless 2nd tap
loop
TER -> HAS: 21. processCommandApdu(commandApdu, extras)
activate HAS
HAS -> SDK: 22. UCP::Pay#processHceApduCommand(apdu, extras)
group Select PPSE
SDK -> MPA: 23. onContactlessPaymentStarted()
MPA -> MPA: 24. checkIsUserAuthenticated
alt isAuthenticated=true
MPA -> SDK: 25. UCP::Pay#setUserAuthenticatedForPayment(paymentInstrumentId, pin?)
end
alt selectedCard == null
SDK -> SDK: 26. useDefaultPaymentInstrumentForContactless
else selectedCard != null
MPA -> SDK: 27. UCP::Pay#selectForPayment(selectedPaymentInstrumentId)
end
end
group Generate AC command
SDK -> MPA: 28. getFinalDecisionForTransaction(isUserAuthenticated=true,recommendedAdvice, trxInfo)
MPA -> MPA: 29. checkTrxAndAuthentication
MPA --> SDK: 30. result(PROCEED)
end
SDK --> HAS: 31. responseApdu
HAS --> TER: 32. responseApdu
deactivate HAS
deactivate TER
end
end
SDK -> MPA: 33. onContactlessPaymentCompleted(paymentInstrument, trxInfo, trxResult)
deactivate SDK
MPA -> User: 34. show trx info view
deactivate MPA
...Transaction Processing ...
note over HAS #1C1E3F: See Transaction Processing diagram

...Transaction Credentials Automatic Replenishment ...
note over HAS #1C1E3F: See Transaction Credentials Automatic Replenishment diagram
@enduml

Transaction Processing

Transaction Processing starts after contactless communication between terminal and MPA. Then transaction authorization is performed. During this authorization ARQC is validated. After authorization MDES notifies Wallet Server about the result of the authorization and sends transaction information. Transaction information is sent to MPA using Remote Notification Service.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant Terminal as TER
participant "Payment Network" as PN
participant MDES
participant Zapp
participant AHI
TER -> PN: 1. authorizeTransaction(tokenPAN, cryptogram)
activate PN
activate TER
PN -> MDES: 2. detokenize
activate MDES
MDES -> MDES: 3. lookup token mapping
MDES --> PN: 4. response(PAN)

```
deactivate MDES
PN -> Zapp: 5. authorize(PAN)
activate Zapp
Zapp -> AHI: 6. authorize
activate AHI
AHI --> Zapp: 7. response
deactivate AHI
Zapp --> PN: 8. response
deactivate Zapp
PN --> TER: 9. response
deactivate TER
PN -> MDES: 10. storeTransactionDetails
deactivate PN
activate MDES
MDES -> WS: 11. pushTransactionDetails
deactivate MDES
activate WS
alt store transaction enabled
WS -> WS: 12. storeTransaction
end
WS-> SDK: 13. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
activate SDK
SDK -> MPA: 14. onNewTransaction(trxDetails)
deactivate SDK
activate MPA
MPA -> User: 15. showSystemNotification(trxDetails)
deactivate MPA
@enduml
```

Web/E-com Transaction

In this process Wallet Server provides static token payment data for given IBAN id and user id, required for e-commerce transaction. Payment data contains static data like: token PAN, expiration date, CVC2. There might be scenario where even after successful IBAN digitization for static token, Zapp did not receive from MDES notification and static token payment date are not available. In such case User needs to be asked to wait additional time and Wallet Server responds with STATIC_TOKEN_PAYMENT_DATA_NOT_AVAILABLE error.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
```

```
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
box "Consumer mobile android device" #white
participant "Merchant App" as MA
participant "MPA" as MPA
participant "Wallet SDK" as SDK
end box
participant "Wallet Server" as WS
participant "AHI" as AHIS
participant Zapp
participant "Acquirer Gateway" as AG
User -> MA: 1. checkOut
activate MA
MA -> MPA: 2. openMPA
activate MPA
MPA --> User: 3. requestAuthentication
User -> MPA: 4. presentCredentials
MPA -> AHIS: 5. authenticate
activate AHIS
AHIS --> MPA: 6. response
MPA -> MPA: 7. prepareOrderUI
MPA --> User: 8. requestToConfirmOrderAndAuthorizePayment
User -> MPA: 9. confirmPayment
MPA -> AHIS: 10. createSignedIbanInfo
AHIS -> AHIS: 11. signDataAsJwt\r (userId, ibanId(sha256(bank account number))
AHIS --> MPA: 12. response(signedIbanInfo)
deactivate AHIS
MPA -> SDK: 13. UCP::getStaticTokenPaymentData(signedIbanInfo)
activate SDK
SDK -> WS: 14. getStaticTokenPaymentData(signedIbanInfo)
activate WS
WS -> WS: 15. getStaticTokenUniqueReferenceForMdes(userId, ibanId)
WS -> Zapp: 16. searchToken(tokenUniqueReference)
activate Zapp
```

Zapp --> WS: 17. response(tokenPAN, expDate, CVC2)
deactivate Zapp
WS --> SDK: 18. response(tokenPAN, expDate, CVC2)
deactivate WS
SDK --> MPA: 19. result
deactivate SDK
MPA-->MA: 20. result
deactivate MPA
MA -> AG: 21. submitAuthTransaction(tokenPAN, expDate, CVC2)
activate AG
AG-> AG: 22. bauAuthTransactionFlow
AG--> MA: 23. confirmAuthStatus
deactivate AG
MA--> User: 24. confirmOrder
deactivate MA
deactivate Zapp
@enduml

Setting Defaults for Payment

SDK manages default Payment Instrument for contactless payments. After digitization, if there is no default Payment Instrument, SDK sets digitized Payment Instrument after activation as default. In case where there are more than one active Payment Instruments and current default Payment Instrument is deleted or suspended, the SDK will set first active Payment Instrument as default. Default Payment Instrument can be changed at any time. Only active Payment Instrument can be set as default.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F

}
actor User
participant MPA
participant "Wallet SDK" as SDK
MPA->User: 1. payment instrument list
activate MPA
User->MPA: 2. choose default for contactless payment)
MPA->SDK: 3. UCP::setDefaultForContactless(paymentInstrumentId)
activate SDK
SDK-> SDK: 4. storeDefault
SDK-->MPA: 5. result
deactivate MPA
deactivate SDK
@enduml

Login on Wallet Server

User data are protected by User session token which is issued by Wallet Server after providing authentication factor. Authentication factor is provided first in pairing device and then session is created. Since session has limited period of validity, it needs to be refreshed using login on Wallet Server methods.

Login on Wallet Server using Trusted Identity

In the Integrated implementation model User authentication doesn't occur directly on Wallet Server. Wallet Server will require User authentication when some user data will be requested. If User session token is no longer valid, SDK will return USER_UNATHORIZED error. In such case Trusted Identity needs to be prepared on AHI server and sent via Wallet SDK in loginByTrustedIdentity method. MPA can decide whether ask User to provide authentication data or not. The latter case regards situation when user is already authenticated and Trusted Identity can be immediately returned from AHI based on already valid session on AHI side. During login process Wallet Server checks if given device still exists, if not then responds with CANT_FIND_DEVICE status which is interpreted on SDK side as given device is deleted and all local data stored on SDK side are cleared.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F

```
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant "AHI" as Issuer
MPA -> SDK: 1. invoke API
activate MPA
activate SDK
SDK -> WS: 2. invoke API
activate WS
WS --> SDK: 3. response(USER_UNATHORIZED)
deactivate WS
SDK --> MPA: 4. result(USER_UNATHORIZED)
MPA->User: 5. show authenticate view
User->MPA: 6. put authentication data
MPA->Issuer: 7. authenticate
activate Issuer
Issuer -> Issuer: 8. generateTrustedIdentity - signed user id
Issuer --> MPA: 9. response(trustedIdentity)
deactivate Issuer
MPA-> SDK: 10. MDC::loginByTrustedIdentity(trustedIdentity)
SDK-> WS: 11. loginByTrustedIdentity(trustedIdentity)
activate WS
WS -> WS: 12. check if device exists
alt device exists
WS-> WS: 13. verify trusted identity
WS --> SDK: 14. response(userSessionToken)
SDK -> SDK: 15. store(userSessionToken)
SDK-->MPA: 16. result
MPA -> SDK: 17. invoke API
else device not exists
WS --> SDK: 18. response(CANT_FIND_DEVICE)
deactivate WS
SDK -> SDK: 19. clearAllLocalData
SDK --> MPA: 20. result(CANT_FIND_DEVICE)
deactivate MPA
deactivate SDK
```

... Pair device ...
note over MPA, WS #1C1E3F: See Pairing Device diagram
MPA -> SDK: 21. invoke API
end
@enduml

Getting Payment Instrumets

After digitization process, payment instrument is stored in UCP SDK module of Wallet SDK. Payment instrument in context of UCP SDK is digitized IBAN and contains information like:

- id (specified id which helps MPA to identify payment instrument which was digitized from MPA),
- status,
- transaction credentials count,
- paymentTokenId,
- staticTokenInfo.

MPA can get information about all Payment Instruments from the Wallet SDK at any time. Payment instruments will be retrieved only from local storage that is part of SDK. Payment Tokens for Payment Instruments can be refreshed/pulled from Wallet Server on demand. This scenario should be considered only when User e.g. makes swipe to refresh.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User

```
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
MPA->SDK: 1. UCP::getAllPaymentInstruments(refresh)
activate MPA
alt refresh = true
activate SDK
SDK -> WS: 2. getAllPaymentTokens(userSessionToken)
activate WS
WS -> SDK: 3. response(deviceAndStaticPaymentTokens)
deactivate WS
SDK -> SDK: 4. updateLocalStorage
end
SDK --> MPA: 5. result(paymentInstrumentList)
deactivate SDK
deactivate MPA
@enduml
```

Getting Transaction History

It is possible that transaction history will be stored on Wallet Server for infinite time. This should be specified during onboarding. If this options is enabled, MPA can retrieve transaction history for given user and filtering. Transactions are returned in corresponding parts for better user experience. If next part is available then response from previous part contain information needed for requesting next part. MPA should check if next part is not empty and then make another request.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
```

```
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
loop next != null
MPA->SDK: 1. MDC::getTransactionHistory(limit, next?, ...)
activate MPA
activate SDK
SDK -> WS: 2. getTransactionHistory(limit, next?, userSessionToken, ...)
activate WS
WS -> SDK: 3. response(transactionHistoryList, next?)
deactivate WS
SDK --> MPA: 4. result(transactionHistoryList, next?)
deactivate SDK
deactivate MPA
end
@enduml
```

Payment Token Lifecycle Management via SDK

Payment Token lifecycle management can be done via SDK.

Delete Device Payment Token via SDK

Device Payment Token can be deleted using SDK.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
```

```
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
User -> MPA: 1. Delete payment token
activate MPA
MPA -> SDK: 2. UCP::delete(paymentInstrumentId, reason)
deactivate MPA
activate SDK
SDK -> WS: 3. deletePaymentToken(userSessionToken, paymentTokenId, reason)
activate WS
WS -> MDES: 4. Delete token
activate MDES
MDES -> MDES: 5. Delete token mapping
MDES --> WS: 6. response
deactivate MDES
WS --> SDK: 7. response
deactivate WS
alt Request session if required
SDK -> MDES: 8. request session
activate MDES
MDES --> SDK: 9. response
MDES -> WS: 10. sendRemoteNotificationMessage
deactivate MDES
activate WS
WS -> SDK: 11. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
end
SDK -> MDES: 12. delete(tokenUniqueReference)
activate MDES
MDES --> SDK: 13. response
deactivate MDES
SDK -> SDK: 14. Delete transaction credentials, card profile
SDK -> MPA: 15. onPaymentInstrumentStatusChanged(id, status)
deactivate SDK
MPA --> User: 16. show update view
deactivate MPA
@enduml
```

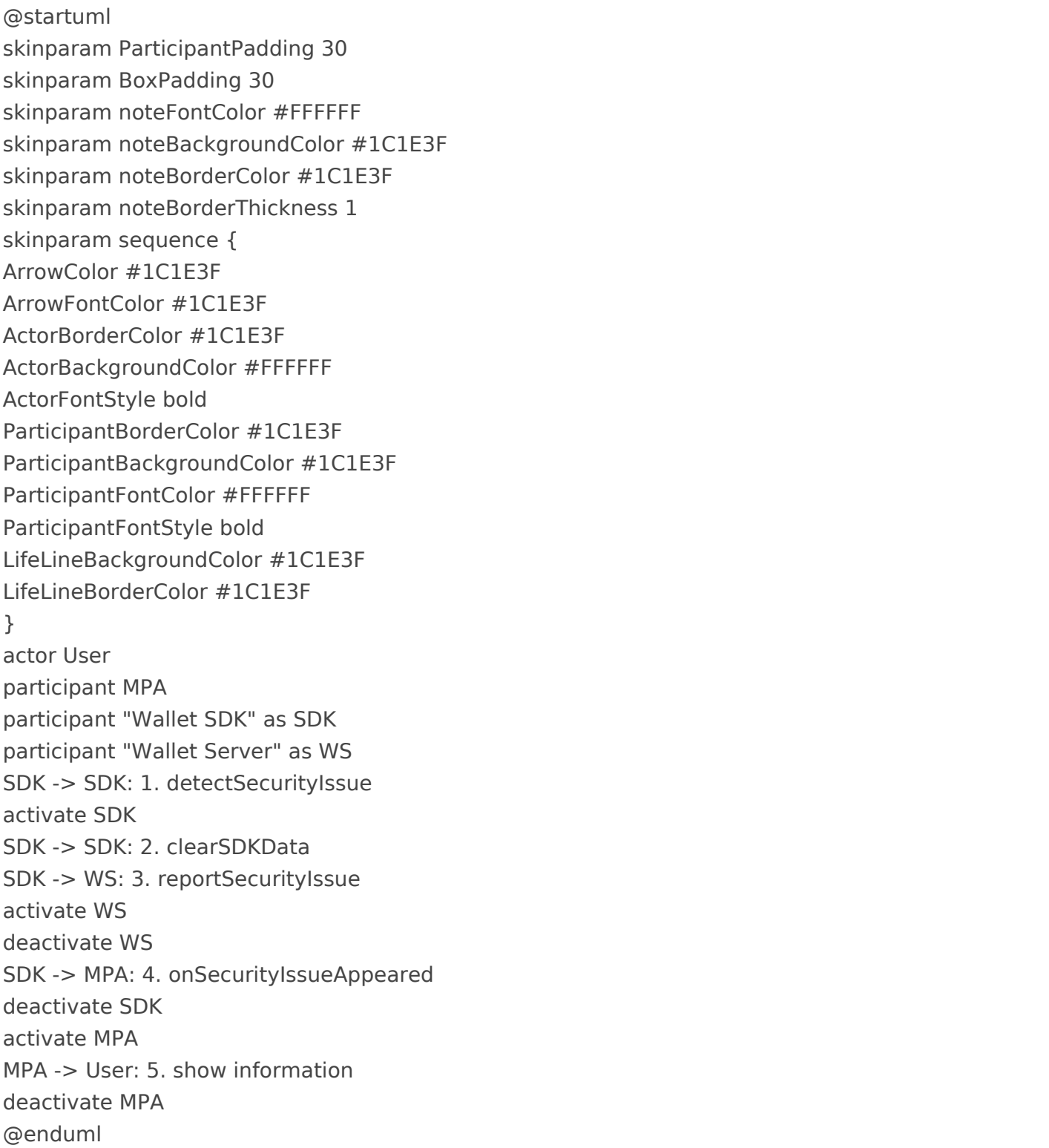
Delete Static Token via SDK

A User may report that given static token was compromised or just to disable e-commerce payments. To do that SDK exposes method for static token deletion. After token deletion all corresponding data are deleted from acs (see Unenroll Static Token from ACS).

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
User -> MPA: 1. Report compromised static token
activate MPA
MPA -> SDK: 2. UCP::deleteStaticToken(paymentInstrumentId)
activate SDK
SDK -> WS: 3. Delete payment token(userSessionToken, paymentTokenId)
activate WS
WS -> MDES: 4. Delete token
activate MDES
MDES -> MDES: 5. Delete token mapping
MDES --> WS: 6. response
deactivate MDES
WS --> SDK: 7. response
deactivate WS
SDK --> MPA: 8. result
deactivate SDK
MPA --> User: 9. result
deactivate MPA
deactivate WS
...Unenroll static token...
note over WS, MDES #1C1E3F: See Unenroll Static Token Diagram
@enduml
```

Errors Reporting

Wallet SDK performs some security checks to prevent data stole. When any issue is detected, Wallet SDK reports error to Wallet Server and clears own data - all Payment Tokens, Device and User information will be removed from local storage. MPA should inform user about incident. MPA should not perform more actions on SDK until application restart. When any SDK method is called it finishes with error and status SECURITY_EVENT_OCCURRED.



Device Unpairing

Unpairing device clears all modules data and report that fact only if possible to server. If server receives this signal then removes all device data including provisioned device Payment Tokens. If not then data are cleared locally only - similar like during app uninstallation. This can be used for scenario when MPA does not want to use SDK at all or for scenario when MPA supports switching between users accounts on the same installation. If MPA detects that new User is trying to log into application in case when previous had digitized cards, immediately should clear all data from previous, since SDK stores data in context of one User only.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
MPA -> SDK: 1. MDC::unpairDevice
activate MPA
activate SDK
opt
SDK -> WS: 2. unpairDevice
activate WS
WS --> SDK: 3. response
deactivate WS
end
SDK -> SDK: 4. clearAllData
SDK --> MPA: 5. result
```

deactivate SDK
deactivate MPA
@enduml

Wallet Server VCP Issuer API Initiated

This section describes use cases which are initiated from server VCP Issuer API which is dedicated only for IBANs.

IBAN Digitization via Server

IBAN can be also digitized via Server API for static token. After digitization static token is enrolled to ACS(see Enroll Static Token to ACS).

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant "AHI App" as AHIAPP
participant "AHI Server API " as AHIS
participant "Wallet Server" as WS
participant MDES
User -> AHIAPP: 1. openBankApplication
activate AHIAPP
AHIAPP --> User: 2. requireAuthentication
User -> AHIAPP: 3. presentAuthCredentials
AHIAPP -> AHIS: 4. authenticate

```
activate AHIS
AHIS -> AHIS: 5. authenticate
AHIS --> AHIAPP: 6. response
AHIAPP -> AHIAPP: 7. isPbAEnabled
AHIAPP -->User: 8. presentPbAT&C
AHIAPP -> AHIS: 9. digitizeBankAccountNumber
AHIS -> AHIS: 10. signDataAsJwt\r (userId, iban(bank account number),\r
countryCode,\remail/phone)
AHIS -> WS: 11. digitizeIbanForStatic(signedAccountInfo)
activate WS
WS -> WS: 12. createUserRecordAndIban
WS -> MDES: 13. tokenize(iban(bank account number)\r countryCode, ahiId)
activate MDES
MDES --> WS: 14. response
deactivate MDES
WS --> AHIS: 15. response
deactivate WS
AHIS --> AHIAPP: 16. response
deactivate AHIS
AHIAPP -> User: 17. digitization succeed
deactivate AHIAPP
...Enroll static token to ACS...
note over WS, MDES #1C1E3F: See Enroll Static Token diagram
@enduml
```

Web/E-commerce Transaction via Server

In this process Wallet Server provides for given User Id and IBAN id static payment data needed for e-commerce transaction.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
```

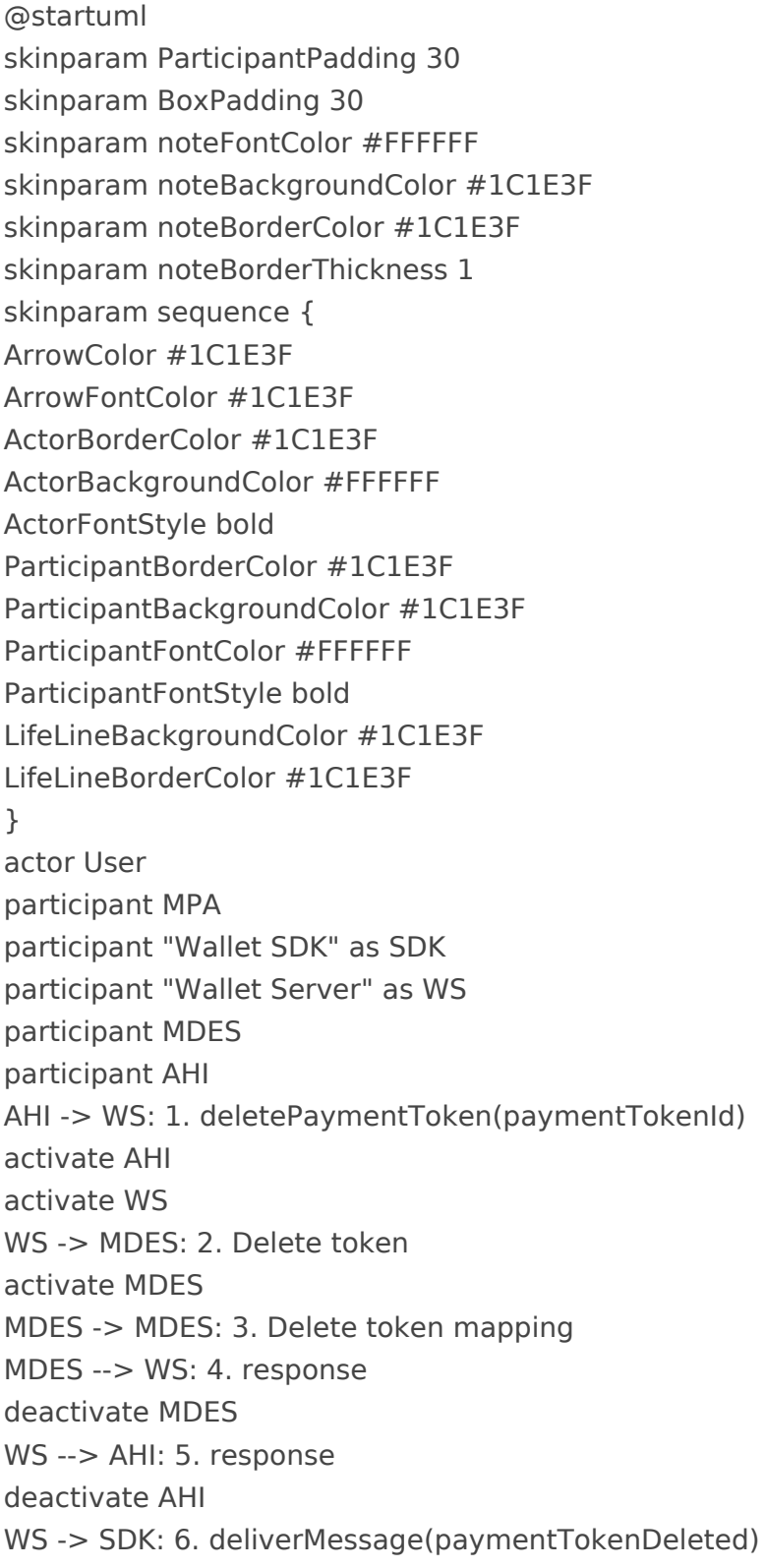
```
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant "Merchant App" as MA
participant "AHI App" as AHIAPP
participant "AHI Server API " as AHIS
participant "Wallet Server" as WS
participant Zapp
participant "Acquirer Gateway" as AG
User -> MA: 1. checkOut
activate MA
MA -> AHIAPP: 2. openAhiApp
activate AHIAPP
AHIAPP --> User: 3. requestCredentials
User -> AHIAPP: 4. presentCredentials
AHIAPP -> AHIS: 5. authenticate
activate AHIS
AHIS --> AHIAPP: 6. response
AHIAPP -> AHIAPP: 7. prepareOrderUI
AHIAPP --> User: 8. requestToConfirmOrderAndAuthorizePayment
User -> AHIAPP: 9. confirmPayment
AHIAPP -> AHIS: 10. confirmPayment
AHIS -> AHIS: 11. signDataAsJwt(userId, ibanId(sha256(bank account number))
AHIS -> WS: 12. getStaticTokenPaymentData(signedIbanInfo)
activate WS
WS -> WS: 13. getStaticTokenUniqueReferenceForMdes(userId, ibanId)
WS -> Zapp: 14. searchToken(tokenUniqueReference)
activate Zapp
Zapp --> WS: 15. response(tokenPAN, expDate, CVC2)
deactivate Zapp
WS --> AHIS: 16. response(tokenPAN, expDate, CVC2)
deactivate WS
AHIS --> AHIAPP: 17. response
deactivate AHIS
AHIAPP-->MA: 18. response
deactivate AHIAPP
MA -> AG: 19. submitAuthTransaction(tokenPAN, expDate, CVC2)
activate AG
AG-> AG: 20. bauAuthTransactionFlow
AG--> MA: 21. confirmAuthStatus
deactivate AG
MA--> User: 22. confirmOrder
deactivate MA
@enduml
```

Payment Token Lifecycle Management via Server

This section describes payment token lifecycle management performed via Server.

Delete Device Payment Token via Server

Device Payment Token can be deleted using server API.



deactivate WS
NOTE LEFT: See: Handle Message From Server
activate SDK
deactivate WS
deactivate MDES
alt Request session if required
SDK -> MDES: 7. request session
activate MDES
MDES --> SDK: 8. response
MDES -> WS: 9. sendRemoteNotificationMessage
deactivate MDES
activate WS
WS -> SDK: 10. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
deactivate MPA
end
SDK -> MDES: 11. delete(tokenUniqueReference)
activate MDES
MDES --> SDK: 12. response
deactivate MDES
SDK -> SDK: 13. Delete transaction credentials, card profile
SDK -> MPA: 14. onPaymentInstrumentStatusChanged(id, status)
deactivate SDK
MPA --> User: 15. show update view
deactivate MPA
@enduml

Delete Static Payment Token via Server

Static token may also be deleted via Server API. After token deletion, static token related data are unenrolled from ACS(see Unenroll Static Token from ACS).

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F

```
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant "Wallet Server" as WS
participant MDES
participant AHI
User -> AHI: 1. Report compromised static token
activate AHI
AHI -> WS: 2. deleteStaticToken(paymentTokenId)
activate WS
WS -> MDES: 3. Delete token
activate MDES
MDES -> MDES: 4. Delete token mapping
MDES --> WS: 5. response
deactivate MDES
WS --> AHI: 6. result
deactivate AHI
deactivate WS
deactivate WS
...Unenroll static token...
note over WS, MDES #1C1F3E: See Unenroll Static Token Diagram
@enduml
```

Suspend Device Payment Token via Server

Payment Token can be suspended using server API.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
```

```
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
participant AHI
AHI -> WS: 1. suspendPaymentToken(paymentTokenId)
activate AHI
activate WS
WS -> MDES: 2. suspendToken(tokenUniqueReference)
activate MDES
MDES -> MDES: 3. suspendToken
MDES --> WS: 4. response
deactivate MDES
WS --> AHI: 5. response
deactivate AHI
WS -> SDK: 6. deliverMessage(paymentTokenSuspended)
deactivate WS
activate SDK
NOTE LEFT: See: Handle Message From Server
SDK -> SDK: 7. suspendToken
SDK -> MPA: 8. onPaymentInstrumentStatusChanged(id, status)
deactivate WS
deactivate SDK
deactivate MPA
@enduml
```

Suspend Static Payment Token via Server

Static token may be suspended via Server.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
```

```
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
participant "Wallet Server" as WS
participant MDES
participant "AHI" as AHI
AHI -> WS: 1. suspendStaticToken(paymentTokenId)
activate AHI
activate WS
WS -> MDES: 2. Suspend token
activate MDES
MDES -> MDES: 3. Suspend token
MDES --> WS: 4. response
deactivate MDES
WS --> AHI: 5. response
deactivate AHI
deactivate WS
deactivate WS
@enduml
```

Unsuspend Device Payment Token via Server

Payment Token can be unsuspended using server API.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
```

```
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
participant AHI
AHI -> WS: 1. unsuspendPaymentToken(paymentTokenId)
activate AHI
activate WS
WS -> MDES: 2. unuspendToken(tokenUniqueReference)
activate MDES
MDES -> MDES: 3. checkPermissions
MDES -> MDES: 4. unsuspendToken
MDES --> WS: 5. response
deactivate MDES
WS --> AHI: 6. response
deactivate AHI
WS -> SDK: 7. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
activate SDK
deactivate WS
SDK -> SDK: 8. activateToken
SDK -> MPA: 9. onPaymentInstrumentStatusChanged(id, status)
deactivate WS
deactivate SDK
... Replenishment ...
note over SDK, MDES #1C1E3F: Just after token activation transaction credentials replenishment is performed by SDK\r. See Transaction Credentials Automatic Replenishment diagram
@enduml
```

Unsuspend Static Payment Token via Server

Static token may be unsuspended via Server.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
```

ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
participant "Wallet Server" as WS
participant MDES
participant "AHI" as AHI
AHI -> WS: 1. unsuspendStaticToken(paymentTokenId)
activate AHI
activate WS
WS -> MDES: 2. Unsuspend token
activate MDES
MDES -> MDES: 3. Unsuspend token
MDES --> WS: 4. response
deactivate MDES
WS --> AHI: 5. response
deactivate AHI
deactivate WS
deactivate WS
@enduml

Getting Payment Tokens

AHI can retrieve information about Payment Tokens via Server.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF

```
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant "Wallet Server" as WS
participant "AHI " as AHIS
AHIS -> WS: 1. getPaymentTokens(ibanId)
activate WS
activate AHIS
WS --> AHIS: 2. response(paymentTokens)
deactivate WS
deactivate AHIS
@enduml
```

Update Email/Phone

With static token User credentials(phone/email) are enrolled to ACS. User can change those credentials and this change needs to be updated on ACS side.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant "AHI " as AHIS
participant "Wallet Server" as WS
participant ACS
AHIS -> WS: 1. updateUser(userId, phone/email)
activate WS
```

activate AHIS
WS --> AHIS: 2. response
deactivate AHIS
WS -> WS: 3. getAllEnrolledStaticTokensForGivenUser
loop For every enrolled static token
WS -> ACS: 4. update(FPAN, DPAN, phone/email)
activate ACS
ACS --> WS: 5. response
deactivate ACS
end
deactivate WS
@enduml

Wallet Server Initiated

Remove Static Tokens Without CVC2

Wallet Server checks after IBAN digitization for static token whether static token has CVC2 available on the Zapp side, since there might be scenarios where even static token is created on MDES side, it is not created on the Zapp side. If it is not available for some period of time, Wallet Server deletes static token, unenrolls from ACS and User have to digitize IBAN for static token once again.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F

```
}
actor User
participant "Wallet Server" as WS
participant MDES
participant Zapp
WS -> WS: 1. getStaticTokensWithoutConfirmedCVC2OnZapp
activate WS
WS -> Zapp: 2. searchToken(tokenUniqueReference)
activate Zapp
Zapp --> WS: 3. response
deactivate Zapp
alt CVC2 available on Zapp
WS -> WS: 4. confirmStaticTokenHasCVC2
else CVC2 not available
alt CVC2 not available for some period of time
WS -> MDES: 5. deleteStaticToken
activate MDES
MDES --> WS: 6. response
deactivate MDES
deactivate WS
note over WS, MDES #1C1E3F: Unenroll Static Token from ACS
end
end
@enduml
```

Removing Not Provisioned Device Tokens

Wallet Server checks periodically device Payment Tokens and verify if provisioning is completed. These Payment Tokens which have provisioning status in progress for long period of time are deleted automatically and from User perspective process needs to be started again.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
```

```
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
WS -> WS: 1. find not provisioned payment tokens for a\r long period of time
activate WS
loop Not provisioned payment tokens for a long period of time
WS -> MDES: 2. Delete token
activate MDES
MDES -> MDES: 3. Delete token mapping
MDES --> WS: 4. response
deactivate MDES
WS -> SDK: 5. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
activate SDK
alt Request session if required
SDK -> MDES: 6. request session
activate MDES
MDES --> SDK: 7. response
MDES -> WS: 8. sendRemoteNotificationMessage
deactivate MDES
activate WS
WS -> SDK: 9. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
end
SDK -> MDES: 10. delete(tokenUniqueReference)
activate MDES
MDES --> SDK: 11. response
deactivate MDES
SDK -> SDK: 12. Delete transaction credentials, card profile
SDK -> MPA: 13. onPaymentInstrumentStatusChanged(id, status)
deactivate SDK
end
deactivate MPA
@enduml
```

Wallet Server Admin API Initiated

Admin Device Deletion

During this process all data related to given device are deleted. Payment Tokens are deleted asynchronously.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
participant "Admin Panel" as AP
AP -> WS: 1. deleteDevice(deviceInstallationId)
activate AP
activate WS
WS --> AP: 2. response
deactivate AP
loop All device Payment Tokens for given device
WS -> MDES: 3. delete token
activate MDES
MDES --> WS: 4. response
deactivate MDES
deactivate WS

end
@enduml

Admin Device Token Deletion

Device Payment Token can be deleted via admin panel.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
participant "Admin Panel" as AP
AP -> WS: 1. deletePaymentToken(paymentTokenId)
activate AP
activate WS
WS -> MDES: 2. Delete token
activate MDES
MDES -> MDES: 3. Delete token mapping
MDES --> WS: 4. response
deactivate MDES
WS --> AP: 5. response
deactivate AP
WS -> SDK: 6. deliverMessage(paymentTokenDeleted)
NOTE LEFT: See: Handle Message From Server
deactivate WS

activate SDK
deactivate MDES
alt Request session if required
SDK -> MDES: 7. request session
activate MDES
MDES --> SDK: 8. response
MDES -> WS: 9. sendRemoteNotificationMessage
deactivate MDES
activate WS
WS -> SDK: 10. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
end
SDK -> MDES: 11. delete(tokenUniqueReference)
activate MDES
MDES --> SDK: 12. response
deactivate MDES
SDK -> SDK: 13. Delete transaction credentials, card profile
SDK -> MPA: 14. onPaymentInstrumentStatusChanged(id, status)
deactivate SDK
MPA --> User: 15. show update view
deactivate MPA
@enduml

Admin Device Token Suspension

Payment Token can be suspended via admin panel.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F

```
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
participant "Admin Panel" as AP
AP -> WS: 1. suspendToken(paymentTokenId)
activate WS
activate AP
WS -> MDES: 2. suspend token
activate MDES
MDES -> MDES: 3. Suspend token
MDES --> WS: 4. response
deactivate MDES
WS --> AP: 5. response
deactivate AP
WS -> SDK: 6. deliverMessage(paymentTokenSuspend)
NOTE LEFT: See: Handle Message From Server
deactivate WS
activate SDK
SDK -> SDK: 7. suspend
SDK -> MPA: 8. onPaymentInstrumentStatusChanged(id, status)
deactivate SDK
deactivate MPA
@enduml
```

Admin Device Token Unsuspension

Payment Token can be unsuspended via admin panel.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
```

```
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
participant "Admin Panel" as AP
AP -> WS: 1. unsuspendToken(paymentTokenId)
activate WS
activate AP
WS -> MDES: 2. unsuspend token
activate MDES
MDES -> MDES: 3. Unsuspend token
MDES --> WS: 4. response
deactivate MDES
WS --> AP: 5. response
deactivate AP
WS -> SDK: 6. deliverMessage(paymentTokenUnsuspend)
NOTE LEFT: See: Handle Message From Server
deactivate WS
activate SDK
SDK -> SDK: 7. activate
SDK -> MPA: 8. onPaymentInstrumentStatusChanged(id, status)
deactivate SDK
deactivate MPA
... Replenishment ...
note over SDK, MDES #1C1E3F: Just after token activation transaction credentials replenishment is performed by SDK\r. See Transaction Credentials Automatic Replenishment diagram
@enduml
```

Admin IBAN Deletion

IBAN is stored in context of given User. Because of that IBAN is always deleted in context of User which belongs to. If other User also has the same IBAN then it is not deleted.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
```

```
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
participant "Admin" as AP
AP -> WS: 1. deleteIban(userId, ibanId)
activate AP
activate WS
WS -> WS: 2. deleteIbanForUser
WS --> AP: 3. response
deactivate AP
WS -> WS: 4. getAllPaymentTokensForUserAndIban
loop All Payment Tokens for given User and IBAN
WS -> MDES: 5. Delete token
activate MDES
MDES -> MDES: 6. Delete token mapping
MDES --> WS: 7. response
deactivate MDES
alt Device Payment Token
WS -> SDK: 8. deliverMessage(paymentTokenDeleted)
NOTE LEFT: See: Handle Message From Server
deactivate WS
activate SDK
deactivate MDES
alt Request session if required
SDK -> MDES: 9. request session
activate MDES
MDES --> SDK: 9. response
MDES -> WS: 14. sendRemoteNotificationMessage
deactivate MDES
activate WS
```

```
WS -> SDK: 10. deliverMessage(mdesRemoteMessage)
NOTE LEFT: See: Handle Message From Server
deactivate WS
end
SDK -> MDES: 11. delete(tokenUniqueReference)
activate MDES
MDES --> SDK: 12. response
deactivate MDES
SDK -> SDK: 13. Delete transaction credentials, card profile
SDK -> MPA: 14. onPaymentInstrumentStatusChanged(id, status)
deactivate SDK
MPA --> User: 15. show update view
deactivate MPA
else Static Payment Token
note over WS, MDES #1C1E3F: Unenroll Static Token from ACS
end
end
@enduml
```

Admin Static Token Deletion

Static Payment Token may be deleted via admin panel.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
participant "Wallet Server" as WS
```

```
participant MDES
participant "Admin Panel" as AP
AP -> WS: 1. deleteStaticToken(paymentTokenId)
activate AP
activate WS
WS -> MDES: 2. Delete token
activate MDES
MDES -> MDES: 3. Delete token mapping
MDES --> WS: 4. response
deactivate MDES
WS --> AP: 5. response
deactivate AP
deactivate WS
deactivate WS
...Unenroll static token...
note over WS, MDES #1C1E3F: See Unenroll Static Token Diagram
@enduml
```

Admin Static Token Suspension

Static Payment Token may be suspended via admin panel.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
participant "Wallet Server" as WS
participant MDES
participant "Admin Portal" as AP
AP -> WS: 1. suspendStaticToken(paymentTokenId)
```

activate AP
activate WS
WS -> MDES: 2. Suspend token
activate MDES
MDES -> MDES: 3. Suspend token
MDES --> WS: 4. response
deactivate MDES
WS --> AP: 5. response
deactivate AP
deactivate WS
deactivate WS
@enduml

Admin Static Token Unsuspension

Static Payment Token may be unsuspended via admin panel.

@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
participant "Wallet Server" as WS
participant MDES
participant "Admin Panel" as AP
AP -> WS: 1. unsuspendStaticToken(paymentTokenId)
activate AP
activate WS
WS -> MDES: 2. Unsuspend token
activate MDES
MDES -> MDES: 3. Unsuspend token

```
MDES --> WS: 4. response
deactivate MDES
WS --> AP: 5. response
deactivate AP
deactivate WS
deactivate WS
@enduml
```

Admin User Deletion

During this process all data related to given User are deleted. Payment Tokens are deleted asynchronously.

```
@startuml
skinparam ParticipantPadding 30
skinparam BoxPadding 30
skinparam noteFontColor #FFFFFF
skinparam noteBackgroundColor #1C1E3F
skinparam noteBorderColor #1C1E3F
skinparam noteBorderThickness 1
skinparam sequence {
ArrowColor #1C1E3F
ArrowFontColor #1C1E3F
ActorBorderColor #1C1E3F
ActorBackgroundColor #FFFFFF
ActorFontStyle bold
ParticipantBorderColor #1C1E3F
ParticipantBackgroundColor #1C1E3F
ParticipantFontColor #FFFFFF
ParticipantFontStyle bold
LifeLineBackgroundColor #1C1E3F
LifeLineBorderColor #1C1E3F
}
actor User
participant MPA
participant "Wallet SDK" as SDK
participant "Wallet Server" as WS
participant MDES
participant "Admin Panel" as AP
AP -> WS: 1. deleteUser(userId)
activate AP
activate WS
WS -> WS: 2. delete ibans, devices
WS --> AP: 3. response
deactivate AP
loop All Payment Tokens for given User
```

WS -> MDES: 4. delete token
activate MDES
MDES --> WS: 5. response
alt Static Token
note over WS, MDES #1C1E3F: Unenroll Static Token from ACS
end
deactivate WS
deactivate MDES
end
@enduml