



## 2. Core Enhancements

### Leveraging OAuth2

Since OAuth2 and associated OAuth2 tokens represent a core element in current Open Banking APIs, the Direct Mode keeps the concept intact, while changing some details around the implementation. In practical terms, this means that in order to use Open Banking APIs, the calling service must first obtain an OAuth2 token associated with the particular user. This can be accomplished in two ways:

1. Through a slightly upgraded OAuth2 “Authorize” and login process. Note that this is the only operation that requires the use of the default SCA solution for the particular Open Banking implementation.
2. Through a new method which “emulates” a user login. This method **must** be restricted to internal bank services for setting up the Direct Mode API for a specific user. The primary application for this method is to support payment credentials initialized in processes not directly involving end-users, which for example applies to personalization of EMV cards.

In addition to internal bank services, the Direct Mode is (due to its *privileged* nature), only intended to be used by selected and contracted parties. Note though that services using the Direct Mode may expose APIs having fundamentally different characteristics, including being callable by PSD2-compliant TPPs.

*By building on OAuth2 and SCA, secure enrollment of virtual payment credentials by external or outsourced service providers can be performed without any prior knowledge of users.*

### Authenticating services using the Direct Mode

In order to *securely separate* services using the Standard Mode and the Direct Mode, the **recommended** way would be through the TPP client certificates where services using the Direct Mode would typically use client certificates issued by the bank itself using a dedicated PKI.

*Note that only after the user has successfully performed the one-time, “bootstrap” process (which is close to identical to login in the Standard Mode), the Direct Mode is actually enabled.*

### Static user identity

The primary enhancement needed is that a `static_user_identity` is established during the Direct Mode API initiation phase. This would in most cases be the same identity as used in other parts of a bank’s IT-system. The reason for this requirement is that *OAuth2 tokens may be renewed and there is also a need for an identity for logging and administration purposes.*

After this step has been performed the `static_user_identity` and the two associated OAuth2 tokens (primary and refresh), would typically be stored in a local database in the caller service in order to enable future Direct Mode sessions, which is required for payment operations.

*Design option:* since Direct Mode is operating at a higher privilege than the Standard Mode, OAuth2 tokens used by Direct Mode services may live longer, possibly even indefinitely.

## Human identity option

For certain use cases like the creation of virtual payment credentials, it would be beneficial if the initialization step also provided a human name.

The following printout shows an example of an enhanced OAuth2 authorization response:

```
{
  "access_token": "619763e4-cf77-4d2f-838e-1f6c6b634040",
  "token_type": "Bearer",
  "expires_in": 3600,
  "refresh_token": "da1bdd53-bed9-4cb7-9c62-0bbe0356d90b",
  "scope": "xyz",
  "static_user_identity": "479262777",
  "human_name": "Jane Doe"
}
```

The elements within the red rectangle are the ones described in this section.

Below is a *non-normative* database, here expressed in SQL code:

```
CREATE TABLE OAUTH2TOKENS (
  SUID          VARCHAR(50) NOT NULL UNIQUE,      -- Static User ID
  HumanName     VARCHAR(50) NULL,                  -- Optional human name
  AccessToken   CHAR(36)   NOT NULL UNIQUE,        -- For API access
  RefreshToken  CHAR(36)   NOT NULL UNIQUE,        -- For refreshing AccessToken
  Expires       TIMESTAMP  NOT NULL,               --
  PRIMARY KEY (SUID)
);
```

A background process is required for maintaining “freshness” of the OAuth2 tokens in the local database.

## 3. Calling Direct Mode APIs

To invoke an Open Banking API method in Direct Mode the caller must (in an application specific way), have obtained a `static_user_identity` that it uses to extract the currently associated OAuth2 token from the local database.

### SCA and consent exemption

In the Direct Mode the Open Banking API (after the initial setup), is assumed to be called by services which *securely authenticate users* (or accounts associated with specific users), as well as cater for possible consents. Due to that, the Open Banking API when called in Direct Mode **must not** request SCA or consents. However, to maintain proper API order, the caller must still call the same APIs and use the same parameters (with the exceptions described in the next section), as it would using the Standard Mode.

## APIs exposed by Direct Mode services

A side effect of decoupling services from the core Open Banking API is that APIs exposed by services using the Direct Mode may have entirely different characteristics like:

- Using legacy formats like XML.
- Using other security solutions and cryptographic algorithms.
- Using synchronous mode where for example a payment operation may only require a single request.

## 4. Sample Operation

Below is an example of how a payment operation can be performed using the NextGenPSD2 API.

### Payment request

```
POST /v2/payments/credit-transfers?app-id=177262db3b8475473b8b702c8ea4eaa136 HTTP/1.1
User-Agent: Java HttpClient 1.3
Host: psd2.example-bank.com
Date: Mon, 20 May 2020 10:33:40 GMT
PSU-IP-Address: 203.48.103.79
PSU-IP-Port: 8442
PSU-Http-Method: GET
PSU-User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64)
```

```
TPP-Redirect-URI: https://example-ttp.com/paymentsuccess
TPP-Nok-Redirect-URI: https://example-ttp.com/operationfailed
```

```
X-Request-ID: e0229fa5-98ce-48aa-90b9-1e088083b7de
Authorization: Bearer e378ce15-a4cf-441c-82b1-9b61861ec248
Content-Type: application/json
Content-Length: 4563
```

```
{
  "creditorAccount": {
    "iban": "FR7630002111110020050012733"
  },
  "debtorAccount": {
    "iban": "FR7630004003200001019471656"
  },
  "debtorAccountStatementText": "payback time!",
  "instructedAmount": {
    "amount": "152.00",
    "currency": "EUR"
  }
}
```

The shadowed elements would not be used or emitted since they have no use in the Direct Mode.

*Continued on the next page....*

## Payment response

```
HTTP/1.1 201 Created
Content-Type: application/json
Content-Length: 967

{
  "transactionStatus": "ACTC",
  "paymentId": "0762e6c2-8a67-4a71-9217-b033afc0a77b",
  "_links": {
    "scaStatus": {
      "href": "/v2/payments/0762e6c2-8a67-4a71-9217-b033afc0a77b/..."
    },
    "scaRedirect": {
      "href": "https://psd2.example-bank.com/performsca..."
    },
    "self": {
      "href": "/v2/payments/0762e6c2-8a67-4a71-9217-b033afc0a77b"
    },
    "status": {
      "href": "/v2/payments/0762e6c2-8a67-4a71-9217-b033afc0a77b/status"
    }
  }
}
```

The payment response would preferably not include the shadowed SCA-related elements since they do not apply to the Direct Mode.

## 5. Login Emulation Method

Since *this method is not a part of a public-facing API*, the caller **must** be *securely distinguished* from “regular” Direct Mode callers. How this is accomplished is up to the implementation. Viable methods include specific TLS certificate trust list in the associated end-point as well as firewall rules. In all cases, the login emulation method would be provided through a simple REST service.

### Request:

HTTP method: POST  
URL: `https://{host}/{path}/login-emulation/{static_user_identity}`  
HTTP body: empty

### Response:

```
HTTP/1.1 200 OK
Content-Type: application/json
Content-Length: nnn

{
  "access_token": "OAuth2 access token",
  "token_type": "Bearer",
  "expires_in": OAuth2 expiration value,
  "refresh_token": "OAuth2 refresh token",
  "scope": "xyz"
}
```

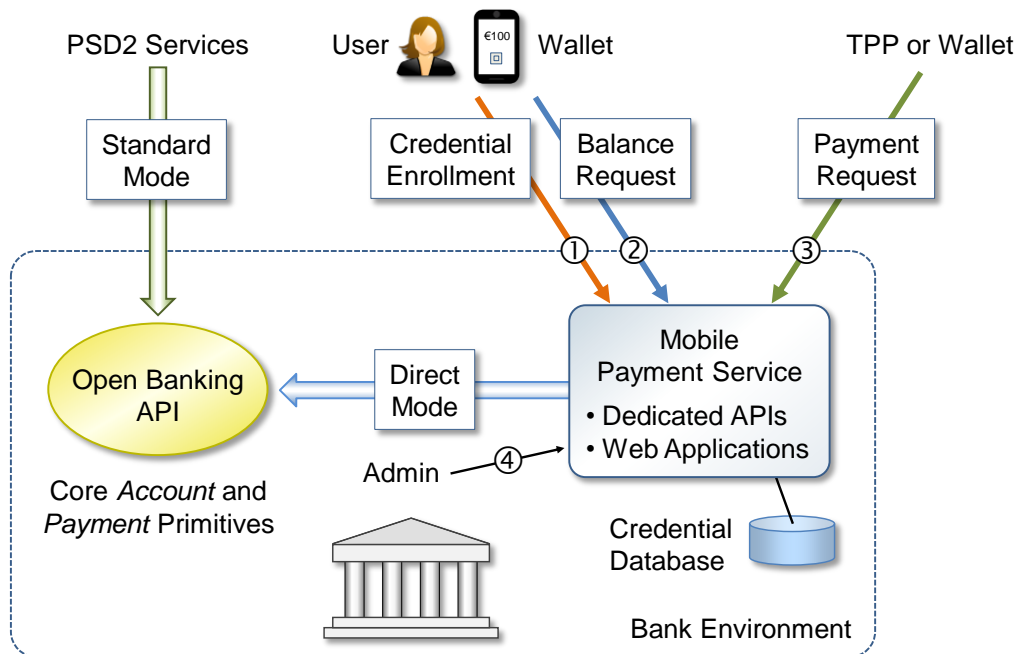
The `login-emulation` method would presumably be integrated in the OAuth2 core, which should setup a link between the user (`static_user_identity`) and return associated freshly generated tokens in the same way as if the user was authenticated. These tokens would in turn be stored in a service specific database like the one outlined in section 3. [Calling Direct Mode APIs](#). Human name (if applicable), is assumed to be known by the caller.

## 6. Security Considerations

Services using the Direct Mode **must** *carefully protect token databases* from illegitimate access to OAuth2 tokens since they effectively are *persistent user impersonation handles*. Encrypting tokens and using an HSM for authorizations would reduce the attack space as well as making backups less interesting. Using databases with built-in support for encryption is another alternative.

## 7. Application Notes

Below is an overview of a mobile payment application, showing how the Direct Mode can be utilized:



- ① Credential enrollment typically starts by the user invoking a specific *enrollment URL* via the mobile Web browser. After invocation, the user is required to authenticate using an SCA method provided by the bank. If the login is successful, the payment service receives OAuth tokens as described in section 2. **Core Enhancements**. During an *optional* next step, the enrollment application may offer the user a list of accounts (using AIS methods) to select from as target for the payment credential. Finally, the enrollment service provisions one or more payment credentials to the wallet. The characteristics of payment credentials and their storage are out of scope for this note.
- ② An account balance request like above departs from the regular Open Banking scenario since it originates from the mobile wallet, *needing no TPP*. This is effectively a subset of mobile banking. An account balance request would use AIS methods. How balance requests are secured is out of scope for this note.
- ③ A payment request would use PIS methods. For merchant-initiated payments, the invocation would typically be performed by a TPP, while P2P payments would be invoked by a wallet or mobile banking application. Although a TPP and wallet can both use payment request, *they would most likely not use the same external API*. How payment requests are secured is out of scope for this note.
- ④ Administration interfaces are usually provided through Web applications. Administration tasks include credential management like revoking credentials associated with lost mobile phones. Transaction monitoring is normally a part of a payment service as well. Ideally, administrators should be authenticated by the bank's standard solution for employees.