SignaturGruppen

Nets MitID BROKER

Technical reference

for service providers

Version 0.9.5 2020

Table of Contents

Terminology

Term	Description
Nets MitID Broker (**NMB**)	Nets MitID Broker. Certified MitID Broker and general broker and identity provider for enterprise services.
Nets MitID Broker Administration web-interface (**ADM-UI**)	Nets MitID Broker Administration web-interface. Interface allowing configuration and administration of the integration
OpenID Connect (**OIDC**)	**OpenID Connect** 1.0 is an identity layer on top of the OAuth 2.0 protocol
OAuth	OAuth 2.0 is the industry-standard protocol for authorization. OAuth 2.0 focuses on client developer simplicity while providing specific authorization flows for web applications, desktop applications, mobile phones, and living room devices. This specification and its extensions are being developed within the IETF OAuth Working Group.
JWT (JSON Web Token)	JSON Web Tokens are an open, industry standard RFC 7519 method for representing claims securely between two parties.
JWS	JSON Web Signature (JWS) represents content secured with digital signatures or Message Authentication Codes (MACs) using JSON-based data structures. Cryptographic algorithms and identifiers for use with this specification are described in the separate JSON Web Algorithms (JWA) specification and an IANA registry defined by that specification. Related encryption capabilities are described in the separate JSON Web Encryption (JWE) specification.
JWE	JSON Web Encryption (JWE) represents encrypted content using JSON-based data structures. Cryptographic algorithms and identifiers for use with this specification are described in the separate JSON Web Algorithms (JWA) specification and IANA registries defined by that specification. Related digital signature and Message Authentication Code (MAC) capabilities are described in the separate JSON Web Signature (JWS) specification.
National Standard for Identiteters Sikringsniveauer (**NSIS**)	Collaboration for trust to digital identities and digital identity-services in Denmark.
MitID	National identity and authentication solution in Denmark.
NemID	National identity and authentication solution in Denmark. Is being replaced by MitID in 2021.
MitID Broker	Certified MitID Identity Broker. Trusted part of the MitID ecosystem.
NemLog-In3 (**NL3**)	NL3 plays a central role in Denmark's digital infrastructure by making it possible for Danish

	citizens and companies to log in to public self service solutions. NL3 provides the CA services for the Oces3 PKI.

Introduction

This document describes the technical integration with the Nets MitID Broker (NMB) and should be considered the primary resource when service providers integrate with the NMB.

The intended audiences are IT developers and IT architects.

General information, online demonstration, documentation (including newest version of this document) and example code is found at https://broker.signaturgruppen.dk.

Special note for this document: This document is under construction and subject to change. Some of the functionality described in this document, is not available yet.

Integrating to the Nets MitID Broker overview

This section is meant as a way for service providers to gain a quick overview of the technical requirements and development effort required to integrate with the NMB.

OpenID Connect

OpenID Connect (OIDC) is the primary protocol used when integrating with NMB. It allows almost all types of clients to integrate to NMB and supports for complex client scenarios like mobile apps.

OpenID Connect is fully supported and thus enables the widest range of clients to benefit from the services offered including, but not limited to, legacy OAuth clients, mobile apps, CRM portals like Microsoft Dynamics and Single Page Applications (SPA) written in JavaScript (client application).

It allows for any programming language to integrate via official OIDC patterns, by developing the integration or by using the examples and demos given as part of the documentation for the NMB.

OpenID Connect supports a strong security model, while retaining a large flexibility to support various flows and clients.

Enterprise features like Single Sign On/Out, session management, API authorization, Long Lived Sessions (using refresh tokens) and automatic discovery of services, endpoints and cryptographic material is all accessible through the NMB platform.

Administration web-interface and API

[Note: Not available for service providers in current version]

All administration and configuration for service providers is handled through the **Administration web-interface (ADM-UI)**, which allows service providers to configure their own services and clients, setup test-users, configure cryptographic settings like generating or uploading secrets for their clients and API resources, view and search logs etc.

ADM-UI will be the entry point for all configuration and setup of the integration and will provide a way to see logs, statistics, and other relevant information.

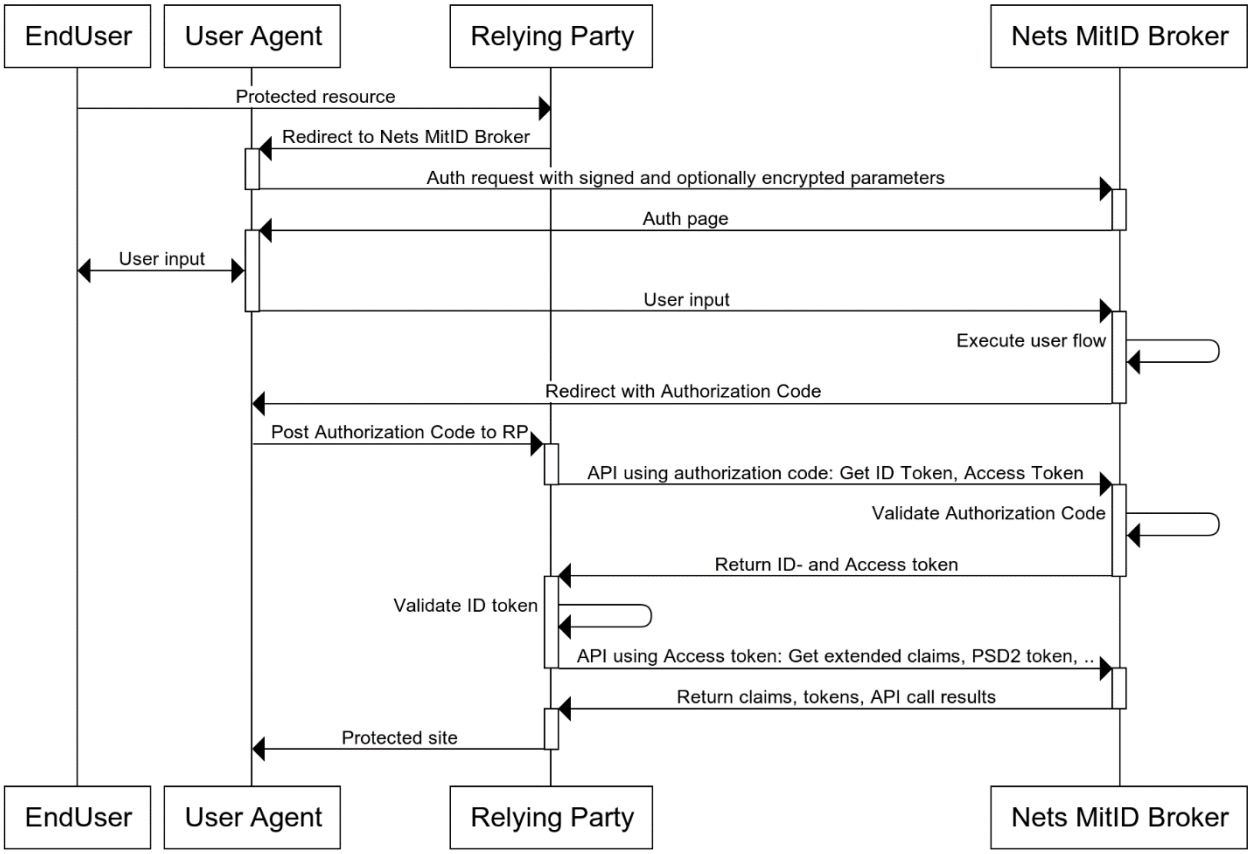
Web and app client integration

This section describes the overall integration for client applications for the NMB.

OpenID Connect

The NMB is integrated with the service providers web pages and apps using OpenID Connect.

An example of a user-flow is illustrated here.



The flow is conceptually the same in both full-page redirect and pop-up variants and is started by redirecting the user to the NMB authorization endpoint with the required request parameters.

For the Authorization Code flow, a secure and preregistered client is required for allowing the exchange of the authorization code for ID- and access tokens. For the rest of the API calls, the access token (which has an expiry) is used for authorization from the service provider to the NMB.

The OIDC client used by the service provider has one or more preregistered 'login URLs', which determines where the user will be returned to with the authorization code. The same OIDC client will typically have one or more client secrets, protecting all API calls from the client to the NMB, including the exchange of the authorization code to tokens.

OpenID Connect client

An OpenID Connect flow is initiated by a secure and preconfigured client. A client in this context, is a unique configuration specifying the allowed flows, available endpoints, APIs, features etc.

When a service integrates with the NMB, one or more clients defines the technical integration from the service providers services to the NMB platform.

The clients are created and configured in ADM-UI and is used directly by the integrating systems when interfacing with the OpenID Connect specification.

A client consists of (non-exhaustive list):

- Client ID: unique identifier

- Client Secrets: Symmetric or asymmetric keys for communication
- Redirect URL list: List of approved URLs for flow control
- Logout URL list: List of approved URLs for flow control

Behind the scenes, a client is mapped to an allowed set of features, scopes, and parameters that the specific client can include in an authorization request. The flow will fail if a client requests anything not whitelisted for the client.

Specific flow control configuration like encryption requirement for requests is configured through ADM-UI and is tied to the client but will not be part of the integrating client values. Note that most settings tied to the client exists only through ADM-UI and can be updated dynamically without changing the integrating systems configuration of the client.

Access to APIs is done through the same mechanisms by using the access tokens from supported user flows or by directly getting access to APIs by getting specific API access tokens from the Token Endpoint (secured by client secrets and configured access).

ADM-UI handles all this configuration and allows the generation of a JSON file with a valid OpenID Connect configuration for a client making it easy to hand out the configured client configuration to projects or for direct use with one of the supplied integrations clients.

OpenID Connect Authorization Code flow

This describes the basics of an OpenID Connect flow with NemID or MitID using NMB.

1. The end user accesses the service provider site with a request to log on.
2. The end user browser is redirected to NMB to begin identification. Sample identification request: **https://netsbroker.mitid.dk/op/connect/authorize?client_id=<client_id>&response_type=code &redirect_uri=<redirect_uri>&scope=openid mitid ssn&state=<state>&nonce=<nonce>acr_values=**https://data.gov.dk/concept/core/nsis/Low**&idp_ values=mitid**
3. End user identification is initiated towards a selected eID. The end user supplies his/her credentials.
4. NMB redirects the end user to the service provider **redirect_uri** by appending the query string ?code=<authorization code>. Similarly, the nonce and state parameters, as sent by the customer, are also appended to the **redirect_uri**.
5. The service provider (backend) requests the ID-, access- (and additional optional) tokens based on the authorization code.

Example requests

(URL encoding removed, and line breaks added for readability)

Authorization request

```
GET /connect/authorize?
    client_id=client1&
    scope=openid mitid&
    response_type=code&
    redirect_uri=https://myapp/callback&
    state=abc&
    nonce=xyz
```

Authorization Code Token endpoint example

```
POST /connect/token
```

```
client_id=client1&
client_secret=secret&
grant_type=authorization_code&
code=hdh922&
redirect_uri=https://myapp.com/callback
```

Secure vs. public OpenID Connect client

If an OpenID Connect client is configured with a client secret and is required to use this secret when communicating with the Token endpoint, the client is considered a secure client. If the client has no client secret and can retrieve tokens from the Token endpoint without a client secret, it is considered a public client.

Not all clients are configured as a secure client as some applications, like mobile apps, are inherently public and it does not make sense to share a secret across all instances of the mobile application. Instead the security is based on control on the redirect URL and by using the OIDC PKCE extension.

If able, an application should always have a secure client controlled by a backend application – but in some scenarios the OIDC integration is done client-side.

The NMB platform supports all variants and the security for all models can be tailored to fit the application in question.

Code, Hybrid and Implicit flows

The recommended OIDC flow is the Code Authorization flow, which does only communicate the issued tokens via the Token endpoint (backend to backend).

If the ID token or the access token is required in the user redirect response, the Hybrid or Implicit flows is supported.

This is configured in ADM-UI and supports allowing a client to request the ID token or access token in the redirect response.

See [OIDC] for reference.

Signing request parameters

The OpenID Connect Request Object specifies a “**request”** parameter serialized as a signed and optionally encrypted JWT token holding (most) of the parameters for the flow.

When using the Request Object parameter, most of the parameters will be included inside JWT token instead of passed as separate query parameters in the authorization flow.

Using the Request Object parameter is optional but is recommended for flows with transactional fees, like MitID.

An option is available to enforce the use of the Request Object parameter for all authentication flows for a client via ADM-UI.

Signing the Request Object parameter must be done with one of the configured client secrets.

Encrypting the Request Object parameter can be done with a specific key configured for the client.

See [ROBJ] for reference and specification.

User flows

User flows represent the UI flow and experience the end-user will see and interact with when authenticating, giving consent etc.

This section describes the general integration and setup for end-user flows for services provided by the NMB platform.

User flow parameters

This section describes how to control and select various parameters for setting up and controlling the user flow.

This section will cover the structure used by the rest of this document for the request and result for user flows as well as the general parameters applicable for all user flows.

Required authorization request parameters:

Parameter	**Description**
client_id	Identifier of the client.
response_type	Authorization Code flow, Hybrid flow and Implicit flows are supported, as specified in [OIDC].
redirect_uri	URI that the response will be sent to when authentication is finished. Must be from a list of preregistered URLs for this client.
scope	Space separated list of scopes that client is requesting authorization for. **openid** must be included for all requests.

Supported authorization request parameters are listed below. See [OIDC] for reference.

Parameter	**Description**
nonce	String value used to associate a client session with an ID Token, and to mitigate replay attacks. Must be unique per request per client.
state	Opaque value used to maintain state between the request and the callback.
request	This parameter enables OpenID Connect requests to be passed in a single, self-contained parameter and to be optionally signed and/or encrypted. It represents the request as a JWT whose claims are the request parameters. It is recommended for clients able to start flows with associated fees. This parameter can be made mandatory for a client in ADM-UI. See section 6 in [OIDC].
request_uri	This parameter enables OpenID Connect requests to be passed by reference, rather than by value. The **request_uri** value is a URL using the https scheme referencing a resource containing a Request Object value, which is a JWT containing the request parameters. This parameter can be made mandatory for a client in ADM-UI.

	See section 6 in [OIDC].
claims	Section 5.5 in [OIDC] specifies how to request individual claims and specifying parameters that apply to the requested claims. This is done by setting the **claims** request parameter as specified. The **claims** parameter value is represented in an OAuth 2.0 request as UTF-8 encoded JSON (which ends up being form-url-encoded when passed as an OAuth parameter). When used in a Request Object value, the JSON is used as the value of the **claims** member.
language	Sets the end-user language. Possible values are • **da** (Danish) • **en** (English) • **gl** (Greenlandic)
prompt	Space delimited, case sensitive list of ASCII string values that specifies whether the Authorization Server prompts the end-user for reauthentication. Possible values are • **none** (default) • **login** (force full login) • **select_account** (** under consideration) Refer to the [OIDC] for reference.

Supported identity provider parameters. See the Identity Providers section for available options.

Parameter	**Description**
idp_params	Identity provider parameters. Custom parameter supported by NMB to enable customization of the specific identity provider flows. See the Identity Providers section for reference. The **idp_params** parameter value is represented in an OAuth 2.0 request as UTF-8 encoded JSON (which ends up being form-url-encoded when passed as an OAuth parameter). When used in a Request Object value, the JSON is used as the value of the **idp_params** member.
acr_values	Requested Authentication Context Class Reference values. Space-separated string that specifies the **acr** values that the NMB is being requested to use for processing this authentication request, with the values appearing in order of preference.
ial_values	Identity Assurance Level values.

	Space-separated string that specifies the **ial** values that the NMB is being requested to use for processing this authentication request, with the values appearing in order of preference.
amr_values	Requested Authentication Method References values. Space-separated string that specifies the **amr** values that the NMB is being requested to use for processing this authentication request, with the values appearing in order of preference.
idp_values	Identity provider list. Space-separated string that specifies the **idp** values that the NMB is being requested to use for processing this authentication request, with the values appearing in order of preference. If not set, all possible identity providers configured for the client will be made available to the end-user.
identitytype_values	Identity type. Space-separated string that specifies the **identitytype** values that the NMB is being requested to use for processing this authentication request, with the values appearing in order of preference.

Reauthentication

As a general mechanism, NMB will always try to optimize the user experience and steps required from the end-user for an authentication flow. If a user has an active session with NMB and enters a new authentication flow, the existing session will under certain conditions be re-usable and only trigger additional actions needed from the end-user to fulfill the requested parameters.

Step-up

If an end-user has an active session at NMB and a new authentication flow is initiated requesting a higher **acr** value, the end-user will *may* enter a step-up flow. This is automatically handled by NMB based on the active session and the requested authentication.

Note, that step-up flows only make sense when requesting a reauthentication from the same identity provider.

An example of a step-up flow would be sending the user for authentication to a higher NSIS Level of Assurance, e.g. the user earlier authenticated for NSIS Low and then a new authorization request is made for NSIS Substantial.

The user will automatically enter a step-up flow (unless requested otherwise) letting the user select the appropriate electronic identification device to complete the step-up.

This way the service only needs to express what the result should be without having to take previous flows and authentications into consideration.

Requesting additional scopes

When requesting additional scopes for an existing user session only the required verifications and user-steps are invoked.

If the requesting client can request the additional scope, the existing session will be reused to issue a new session with the requested scopes. If the scope triggers end-user interaction, like a consent-flow, the user will be prompted for action, but the user will not have to reauthenticate unless required.

Authentication Error Response

If the end-user denies the request or the end-user authentication fails, NMB informs the service provider (client) by using the error response parameters defined in Section 4.1.2.1 of [OAuth].

A list of error codes and descriptions will be made available in this document.

Scopes

Scopes are passed as a space separated list of string values in the **scope** authorization request parameter and determine the requested authorizations as well as the requested user claims.

A scope has the following functions

- Maps to a list of user claims for the ID token and UserInfo endpoint
- Is mapped directly to the issued access token **scope** claim.
- Grants authorization for API access by setting relevant values in the access token **aud** claim.
- Some scopes trigger certain user flows or end-user actions such as required end-user consents.
- Client must be allowed to use the scopes requested.

Nets MitID Broker API's

Special notes: The OpenAPI/Swagger documentation is not released yet.

NMB exposes several APIs. This document describes the principles behind how the API's work.

All APIs are provided as REST API's, exposed over HTTPS (HTTP/1.1 protected by TLS 1.2 or higher).

The exposed API's are:

- **Broker API**: Identity based API's supporting authentication and authorizations, including OpenID Connect endpoints and the CPR-Match API. The Broker API is published partially through the Swagger specification and partially through the OpenID Connect Discovery endpoint.
- **Administration API**: The administration API supporting all administrative and support functionalities also available via ADM-UI. Use of this API is optional.
- **Privilege API**: Supporting a privilege API available for all Service Providers as a stand-alone service. Used internally by NMB for all relevant services. This enables service to setup roles and permissions across internal and external services. Compatible with and based on the OIO Basic Privilege Profile [OIO PRIV]

API specification

All APIs are specified according to the OpenAPI 3.0 specification (previously known as "Swagger"). In practice this means that the API's are described in machine-readable YAML documents, describing the resources exposed in the API's, the available methods etc. as well as human-readable descriptions of the API. The YAML files can be then be used by tooling to create API-specific clients and stubs or be used as input into tools for API testing. They can also be used for generating documentation. The API documentation is delivered in the form of HTML files generated from the YAML specifications

Error Handling

Errors are reported using HTTP error codes. Each API function documents the error codes that may be returned. In addition, a JSON error object is returned that provides further information on the error. The structure of this error object is described in the YAML files for the specific API.

API Versioning and Backwards Compatibility

Whenever an API is updated, a new version of the specification and the documentation is published. All API specifications are versioned. The guiding principle for the evolution of the API is that all updates are made to avoid “breaking changes”, i.e. changes that cause problems for clients that were developed according to previous versions. Thus, new functionality is mainly exposed as new resources or new attributes/fields in existing data structures. Only if imperative, to ensure the security or future maintainability, breaking API changes will be introduced. Because of this principle, users of the API are required to ignore fields in data structures that they don’t recognize, unless otherwise noted in the documentation. Furthermore, the users of the API are to rely only on documented behavior, and to ignore absence of resources or functionality that is not documented. The documentation will state documented behavior as requirements.

In the documentation API’s are versioned as a semantic versioning scheme (“major.minor.revision”). Breaking changes are signaled by increasing the major version number. This is expected to be a rare occurrence after the development phase is over. If only the minor or the revision number is updated, existing clients targeting the major version number will be compatible with the new version of the API. The URL’s exposed by the API contain, as their first sub-resource, a version number which reflects the major version. This is initially “v1”, reflecting the first version of the API. If no breaking changes are introduced, this number will stay at “v1.

OAuth 2.0 Authorization Framework

All API’s are protected using the OAuth 2.0 authorization framework [OAuth].

The Token endpoint is the entry point for getting access- or service tokens issued, which is then used as authorization bearer tokens.

Access tokens are retrieved from end-user authentication flows or via the “Client Credentials Grant” type flows at the Token endpoint. Service tokens are always retrieved from the Token endpoint using the “Client Credentials Grant” type flow.

Broker API – OpenID Connect endpoints

In this section the available OpenID Connect endpoints will be listed.

All listed endpoints in this section will conform to the OpenID Connect specification and will be listed in the Discovery endpoint.

Discovery endpoint

The “OpenID Connect Discovery” endpoint. See [OIDC-DISC] for reference.

NMB uses OpenID Connect Discovery which allows for automatic retrieval and dynamic changes of endpoints, cryptographic primitives, supported scopes and other features.

The Discovery endpoint is found at

- [Authority URL]/.well-known/openid-configuration

The Authority URL for the NMB will be listed here for each available environment.

Environment	Authority URL
Pilot test	https://brokertest.signaturgruppen.dk/op

UserInfo endpoint

For most user authentication flows, the resulting access token provides access to the UserInfo endpoint. The endpoint is specified in the Discovery endpoint and returns the full user-claims list issued for the end user for the authentication context.

For identity scopes, user-claims will be available via the UserInfo endpoint. Some specific user-claims is also available in the ID token – these are explicitly described in the relevant identity provider section in this document.

A result from the User Info endpoint after a successful MitID authentication flow with scope=”openid mitid ssn” could look like this:


```
{
 “sub”                                : "bab646bb-8608-4ac7-ac42-cee4ad490600",
 “mitid_uuid”                         : “af0196a3-6c61-464d-ab04-6394191a753d”,
 “mitid.age”                          : “32”,
 “mitid.ial_identity_assurance_level” : “MEDIUM”,
 “da.cpr”                             : “12345678-1111”,
 “mitid.common_name”                  : “Hans Hansen”,
}
```


The response format of the UserInfo endpoint can be configured in ADM-UI to enable a signed and/or encrypted response as specified in [OIDC] section 5.3.2.

Issued tokens

This section describes the available tokens issued by NMB. All tokens are issued via the **Token endpoint** by the **Code Authorization Grant** or the **Client Credentials Grant**.

Some integrations will get tokens via the end-user browser (Hybrid- and Implicit flows).

User flow authentication result

A user flow results in the following tokens

- **ID token**: Describing the authenticated end-user.
- **Access token**: Providing REST API access to configured endpoints on behalf of the end-user
- **Service token (optional)**: Token for one or more specific API’s.
- **Refresh token (optional)**: Providing ability to maintain a long-lived session by re-acquiring access tokens using the refresh token.

ID-, access- and service tokens comply with the [JWT] specification.

Access- and service tokens are not meaningful outside the audience of the token. Access tokens can be configured to include access and authorization for both internal and external REST API’s. Often the access token is used for accessing the UserInfo endpoint at NMB.

Refresh tokens are opaque and thus not meaningful outside the scope of NMB. See the OpenID Connect specification for reference on how to use the refresh tokens.

Client Credentials (backend to backend)

Services can get tokens from the Token endpoint by authenticating directly using their client credentials and allows for issuing tokens for services directly.

The following tokens can be issued:

- **Service token**: Token for one or more specific API's.

ID token

The ID token will contain additional claims based on the end-user identity provider. These additional claims are explained under the specific identity provider in this document.

ID tokens issued include the claims listed below with values as specified.

Claim	Value
iss	Identifier for the issuer as an URL using https scheme.
jti	A unique identifier for the token, which can be used to prevent reuse of the token.
sub	NMB specific UUID representing the authenticated end-user. Primary end-user identifier.
aud	Audience(s) that this ID Token is intended for.
exp	Expiration time on or after which the ID Token MUST NOT be accepted for processing.
iat	Time at which the JWT was issued. Its value is a JSON number representing the number of seconds from 1970-01-01T0:0:0Z as measured in UTC until the date/time.
auth_time	Time when the end-user authentication occurred. Its value is a JSON number representing the number of seconds from 1970-01-01T0:0:0Z as measured in UTC until the date/time.
nonce	String value used to associate a Client session with an ID Token, and to mitigate replay attacks. The value is passed through unmodified from the Authentication Request to the ID Token.
amr	Authentication method reference
acr	Authentication Context Class Reference. Represents the Authenticated Level of Assurance (LoA). The [NSIS] framework forms the basis for how NMB handles LoA for authentications, but the available **acr** values are not restricted to the values specified in [NSIS]. Refer to the specific identity providers for a list of possible **acr** values.
ial	Identity Assurance Level Strength of the Identity registration process. Identity Assurance Level can be higher than the acr/LoA value, as the identity can be

	enrolled/registered at a higher level, than the achieved authentication level for a specific session. If the ial is not known, this value is not set.
idp	Identity provider who issued the underlying identity. Refer to the specific identity providers for a list of possible **idp** values.
identitytype	One of • private • professional • test
spec_ver	0.9 for this version. (Still under development)

Example of an ID token payload (decoded) from a MitID Identity Provider:


```
{
 "sub"                              : "bab646bb-8608-4ac7-ac42-cee4ad490600",
 "mitid.uuid"                       : "7027a386-aa7c-4dd6-93de-ebffd670f8b5",
 "mitid.ial_identity_assurance_level" : "MEDIUM",
 "iss"                              : "https://netsbroker.mitid.dk",
 "jti"                              : "5964f27b-7a7c-4f3d-99fe-aee934f03397",
 "aud"                              : "9ad129c2-0341-40e4-a184-b834272217dd",
 "nonce"                            : "3f0fc970-9727-4b3f-9f30-78793487ac7b",
 "auth_time"                        : 1311261123,
 "acr"                              : "https://data.gov.dk/concept/core/nsis/Low",
 "amr"                              : "mitid.password",
 "identitytype"                     : "private",
 "idp"                              : “mitid”,
 "iat"                              : 1311290550,
 "exp"                              : 1311291550,
 "spec_ver"                         : “0.9”
}
```


Default expiry for ID tokens is 5 minutes.

Access token

The resulting access tokens authorizes the bearer on the behalf of the user. Unless otherwise configured for the client, the resulting access token provides authorization for the NMB UserInfo endpoint resulting in the full list of claims issued to the user for the authentication in question.

Depending on configuration, capabilities, roles, permissions and granted access for the client, the access token can authorize the client on behalf of the user to

- Access specified API’s from NMB, like the Privilege API.
- Access internal API’s (i.e. internal to the Organization/Service in question)
- Access external API’s (exchange **access token** for a **service token** at the Token endpoint)

Default expiry for access tokens is 1 hour.

Service token

If allowed, a service can exchange the retrieved access token for a service token at the Token endpoint or retrieve a service token using the Client Credentials Grant.

Service tokens is simply bearer authorization tokens for specific API's protected by the NMB infrastructure.

Configuration and permissions for service tokens are setup via the ADM-UI and allows authorization to external API's on behalf of the end-user or service in question.

ADM-UI enables configuration of permissions between organizations and services in this way using the Privilege API backing the NMB infrastructure.

Default expiry for service tokens is 1 hour.

Refresh token

If the client is allowed for long-lived sessions, refresh tokens are issued when requesting the **offline_access** scope.

Refresh token expiry and other properties are configured in ADM-UI.

Security

This section will cover supported cryptographic algorithms, supported TLS versions, certificate pinning and other security related issues.

OpenID Connect provides a high level of security, but for some application require additional security hardening. This section will cover the available options.

All algorithms specified in this section is specified in [JWA].

PKCE

Proof Key for Code Exchange by OAuth Public Clients (PKCE) is an extension to the Authorization Code flow to prevent certain attacks and to be able to securely perform the OAuth exchange from public clients.

This is prevalent and recommended when integrating to NMB from a mobile (Android and iOS) platform and allows the initiating app to be the only one who is able to retrieve the issued tokens, even though the client is a public client.

PKCE is fully supported. See [PKCE] for reference.

TLS certificate authorities

This section will include the list of publicly trusted CAs issuing certificates for all NMB endpoints.

This information can be used to pin trust for the CAs issuing the TLS certificates used by the NMB platform.

Server certificate validation for TLS

When calling any of the NMB API's or endpoints the integrity of the TLS certificate presented can be verified using the following checks

- That the host name indicated in the certificate matches the host name of the API's URL
- That the presented certificate is issued by one of the publicly trusted CA's listed in the documentation
- That the certificate is within its validity period
- That the signature in the certificate is valid

As an example, this can be used to verify the validity of the signing keys available from the Discovery endpoint.

Nets MitID Broker signing keys

Unless otherwise specified or configured all signed tokens issued by NMB will be signed by an HSM protected key at compliance level supporting the [FIPS 140-2] level 3 or equivalent.

All publicly available certificates are found through the OpenID Connect Discovery endpoint (TLS protected).

When signing tokens, NMB will use the algorithm **ES256** (ECDSA using P-256 and SHA-256) or stronger.

Pinning signing certificates

The signing certificates used for all signed tokens will only be changed if required. This would include if the signing key is somehow compromised.

There will be support for getting upcoming signing certificate change notifications by email or by other mechanism via a bilateral agreement with NMB. It is expected, that signing certificates will be changed only if required due to security concerns.

The signing certificates will be self-signed with a very long time-to-live (10+ years).

The signing certificates will be made available through our documentation and through the agreed communication channels, allowing pinning of the specific certificates.

Supported HTTPS/TLS versions

All endpoints will require TLS 1.2 or higher.

The general guidelines and requirements for MitID Brokers will be adhered to, as a minimum and updated continuously.

JWT, JWS and JWE tokens

JWS (JSON Web Signature) and JWE (JSON Web Encryption) are the signed and encryption versions of JWT (JSON Web Token).

NMB always uses the JWS/JWE compact serialization format.

Note, that JWT tokens are always represented as either JWS or JWE.

Supported signing and encryption algorithms for JWS and JWE tokens

If not otherwise specified, the following algorithms are supported for signing- and encryption operation of JWS and JWE tokens.

The listed options here, is the complete list of supported algorithms sending JWS or JWE tokens to NMB.

Note that the signing and encryption operations follow the standards for [JWS] and [JWE].

ECDSA signatures with ES256, ES384 and ES512.

RSASSA-PKCS1-V1_5 signatures with: RS256, RS384 and RS512.

RSASSA-PSS signatures (probabilistic signature scheme with appendix) with: PS256, PS384 and PS512.

HMAC signing algorithms: HS256, HS384, or HS512

RSASSA-PKCS1-V1_5 encryption with: RSA1_5

RSAES OAEP encryption with: RSA-OAEP

ECDH-ES encryption with: ECDH-ES

Direct symmetric encryption with: A128CBC, A256CBC, A128GCM, A256GCM

Verification of tokens

ID token

The basic checks are often implemented by the OIDC client library used for the integration.

Required

To verify the authentication response the following steps are performed, the OIDC specification defines the basic validation here: https://openid.net/specs/openid-connect-core-1_0.html#IDTokenValidation.

It is required that the expected restrictions for **acr, ial**, **amr**, **idp** and **identitytype** are validated as part of verifying the ID token.

Access- and service token

Access- and service tokens are not verified by the client application, but by receiving services who use these tokens for authorization.

This will be covered in detail in a later version.

Verification of UserInfo endpoint response

Required

Due to the possibility of token substitution attacks the UserInfo response is not guaranteed to be about the end-user identified by the sub (subject) element of the ID Token. The sub claim in the UserInfo response MUST be verified to exactly match the sub claim in the ID Token; if they do not match, the UserInfo response values MUST NOT be used.

Optional

Additional measures can be made by pinning the TLS certificates or by requesting a signed response.

Identity Providers

This section covers the available identity providers available via NMB.

Multiple identity providers

It is possible to specify multiple identity providers for a single user flow through NMB.

A client can be configured for multiple identity providers as a default or specify more than one identity provider in the **idp_values** request parameter.

NMB will automatically let the user select the preferred identity provider for the current flow.

As an example, setting the **idp_values** parameter to “**mitid nemid”** enables the user to login with either MitID or NemID.

Identity Provider parameters

Specific settings supported by identity providers are set by including the idp_params request parameter in the authorization request.

The idp_params parameter value is represented in an OAuth 2.0 request as UTF-8 encoded JSON (which ends up being form-url-encoded when passed as an OAuth parameter). When used in a Request Object value, the JSON is used as the value of the idp_params member.

The top-level members of the idp_params request JSON object are:

- [**idp**]: The idp in question (same value as the idp parameter).
  The available options are found in the specific identity provider section in this document.

An example idp_params request is as follows:

```
{
  "idp_params":
  {
       "mitid": {"username_hint": “john42”, referencetext: “Transfer X to Y”},
       "nemid": {“remember_userid”: true, “transaction_ctx”: “Transfer X to Y”}
  }
}
```

Resulting claims

The resulting authentication flow from any identity provider will result in at least an ID token and an access token. The basic user claims are always included in the ID token while the full list of user claims is available through the UserInfo endpoint.

See the ID token section in this document for details on the basic ID token claims.

Unless otherwise stated, user claims are available through the UserInfo endpoint. In each identity provider section, additional claims included in the tokens for these providers will be explicitly stated.

MitID Demo

The MitID Demo flow emulates the MitID flow and will ask for a username and a password. Any value entered is accepted and the resulting ID token **sub** claim will be the entered username.

All clients can invoke this flow.

To enable the demo flow, set the **idp_values** request parameter to **mitid_demo**.

The resulting **acr** claim will always be set to https://broker.signaturgruppen.dk/loa/demo/0.

Supported parameters

Request parameter	Description
acr_values	Supported values: • https://broker.signaturgruppen.dk/loa/demo/0
idp_values	mitid_demo
identitytype_values	Supported values: • test

Scope	Description
mitid	The following claims will be returned (with dummy values). • mitid.uuid • mitid.date_of_birth • mitid.age • mitid.cpr_name • mitid.identity_name • mitid.ial_identity_assurance_level
ssn	The following claims will be returned¨ • dk.cpr

ID token claims

Claim value	Possible values (dummy values)
identitytype	test
idp	mitid_demo
acr	https://broker.signaturgruppen.dk/loa/demo/0
ial	https://broker.signaturgruppen.dk/loa/demo/0
mitid.uuid	Service Provider scoped unique MitID identity UUID. This is the primary identity identifier returned from the MitID Core. For the same MitID identity and the same Service Provider, this will be the same UUID for each session.

MitID

The MitID identity provider is the official Danish national electronic identity, replacing NemID.

More information is found here: https://digst.dk/it-loesninger/mitid/.

MitID follows the "National Standarder for Identiteters Sikringsniveauer" (NSIS) and all MitID flows is mapped to one of authentication Level of Assurance's (LoA) found in the NSIS specification: https://digst.dk/it-loesninger/nemlog-in/det-kommende-nemlog-in/vejledninger-og-standarder/nsis-standarden/.

Level of Assurance (LoA) in MitID

A MitID flow will always result in a NSIS defined LoA value (Low, Substantial or High) set in the **acr** claim.

The default is Substantial, but this can be controlled by setting the appropriate value in the acr_values request parameter.

Setting the requested LoA to Low will allow the user to authenticate with the approved 1-factor options for MitID flows, most commonly resulting in the username + password combination. If the user to select other options, the resulting LoA might be higher than Low.

Setting the requested LoA to Substantial or High will enforce a higher Authentication Assurance Level (AAL) and often result in the username + MitID App combination.

It is not possible to restrict the user's choice of authenticators nor is it possible to control which authenticator the user initially gets presented, thus the **amr_values** request parameter is not supported.

Supported parameters

Request parameter	Description
acr_values	One or more can be specified • https://data.gov.dk/concept/core/nsis/Low • https://data.gov.dk/concept/core/nsis/Substantial (default) • https://data.gov.dk/concept/core/nsis/High
idp_values	**mitid**
ial_values	One or more can be specified • https://data.gov.dk/concept/core/nsis/Low • https://data.gov.dk/concept/core/nsis/Substantial (default) • https://data.gov.dk/concept/core/nsis/High

Supported identity provider parameters

Identity Provider parameters (mitid)	Description
username_hint	Type: string. MitID username which will allow for prefilling the username in the username step. The user will have the option to select another username.
referencetext	Type: Base64 encoded string. The reference text containing the transaction content (e.g. “Transfer <amount> to <ac-count>”). This text will be displayed to the user in all MitID flows inside the MitID client. It will be shown to the user in the MitID app. It is limited to 160 characters.
transactiontext	Type: JSON. The transaction text is presented to the end-user as part of the MitID flow and allows service providers to provide a transactional context for the MitID flow. The top-level members of the **transactiontext** request JSON object are: • value: The text or html to display in Base64 encoding. • type: One of [**text**, **html**]. The **transactiontext** parameter value is represented as UTF-8 encoded JSON (which ends up being form-url-encoded when passed as a request parameter).

Scope	Description
mitid	List of claims: • mitid.uuid • mitid.date_of_birth • mitid.age • mitid.cpr_name • mitid.identity_name • mitid.ial_identity_assurance_level
ssn	Social Security Number. List of claims: • dk.cpr
trans_ctx	Transaction context. List of claims: • **trans_ctx** *Will be cached for the duration of the access token issued for this transaction. It will not be available from the UserInfo endpoint with access tokens issued for long-lived sessions i.e. from refresh tokens, after the initial access token has expired.* *New transactions within the same end-user session will overwrite the trans_ctx value.* A UTF-8 encoded JSON including the following top-level members (if a value is present): • **mitid.referencetext** Passthrough of the MitID **referencetext** identity provider parameter. • **mitid.transactiontext** Passthrough of the MitID **transactiontext** identity provider parameter. • **mitid.riskdata** MitID Risk data. *Set if allowed and configured for the client*.

ID Token identity claims

Claim value	Possible values
identitytype	private
idp	**mitid**
acr	One of • https://data.gov.dk/concept/core/nsis/Low • https://data.gov.dk/concept/core/nsis/Substantial • https://data.gov.dk/concept/core/nsis/High
ial	One of • https://data.gov.dk/concept/core/nsis/Low • https://data.gov.dk/concept/core/nsis/Substantial • https://data.gov.dk/concept/core/nsis/High

amr	The list of authenticators used to achieve the resulting LoA. The list is a space separated list of string values. Possible values are: • mitid.password • mitid.code_token • mitid.code_reader • mitid.code_app • mitid.code_app_enchanced • mitid.u2f_token
mitid.uuid	Service Provider scoped unique MitID identity UUID for the end-user. This is the primary identity identifier returned from the MitID Core. For the same MitID identity and the same Service Provider, this will be the same UUID for each session.

MitID CPR flow

NOTE: The way CPR is handled in MitID might change. The solution described here, is based on the current documentation available from MitID.

CPR is available from MitID flows if you are a public service provider. In this scenario, NMB will set **dk.cpr** in the result, if requested via the **ssn** scope.

If you are a private service provider, the user's CPR will not be available from the MitID system. In this scenario, a CPR Match service is provided (see MitID CPR Match API), available for MitID Brokers making it possible to match an active MitID session and CPR and verify if the supplied CPR matches the authenticated MitID identity and thus making it possible to verify if a MitID identity has the given CPR.xxxxxx

NMB implements this as a natural part of the MitID flow and will ask the user for CPR when the service provider requests CPR with the **ssn** scope.

The end-user will have the option (consent) to have the CPR stored for later use for the same service provider and thus allows the end-user to avoid having to enter the CPR when authenticating for the same service provider again.

*Note, that it is supported to request CPR via the CPR flow by reauthenticating a user with the additional **ssn** scope. In this case, NMB will reuse the active MitID session and ask the user for CPR (but not ask for login), do the required CPR Match verification, and return the CPR to the service. This enables services to only ask for CPR using the CPR flow when needed for specific users.*

MitID CPR Match API

NOTE: The way CPR is handled in MitID might change. The solution described here, is based on the current documentation available from MitID.

The Broker API supports a "MitID CPR Match API" that allows services to match a CPR with a MitID authentication from NMB.

In this way, services can ask the user for CPR and then call the API with the access token retrieved from NMB for the user authentication as authorization header.

This also allows services to verify that an already known CPR matches the MitID identity in question.

NemLog-In3

NOTE: Subject to change. Integration not initiated yet.

https://en.digst.dk/digitisation/nemlog-in/

NemLog-in is a common log-on solution which gives access to the public authority self-service solutions both in the municipalities, regions, and the government.

With NemLog-in you only need to log on once to identify yourself to all the various public authority self-service solutions. With your NemLog-in, you have access to many different service providers and public services.

Request parameter	**Description**
acr_values	Possible values • https://data.gov.dk/concept/core/nsis/Low • https://data.gov.dk/concept/core/nsis/Substantial (default) • https://data.gov.dk/concept/core/nsis/High
idp_values	**nemlogin**
identitytype_values	Possible values • private • professional

Scope	**Description**
nemlogin	List of claims: • nemlogin.ial • nemlogin.aal • nemlogin.name • nemlogin.given_name • nemlogin.family_name • nemlogin.email Only for professional identities: • nemlogin.auth_to_repr • nemlogin.p_number • nemlogin.se_number • nemlogin.persistent_id • nemlogin.cvr • nemlogin.org_name
ssn	Social Security Number. List of claims: • dk.cpr • dk.cpr_uuid
nemlogin.priviledges	List of claims: • nemlogin.priv Only Danish public service providers can request this scope.
organization	• organization.number • organization.name

ID Token identity claims

Claim value	Possible values
identitytype	One of • private • professional Private identities are mapped from NemLog-In persons. NemLog-In specifies **person** and **professional** as identity types.
idp	**nemlogin**
acr	One of • https://data.gov.dk/concept/core/nsis/Low • https://data.gov.dk/concept/core/nsis/Substantial • https://data.gov.dk/concept/core/nsis/High
ial	One of • https://data.gov.dk/concept/core/nsis/Low • https://data.gov.dk/concept/core/nsis/Substantial • https://data.gov.dk/concept/core/nsis/High
amr	Not set. Special note: NemLog-In specifies the assurance level in the **amr** claim returned to the NMB. This is mapped to the resulting **acr** claim (see above).

NemID

NOTE: Integration with NemID is under development and this specification will be updated with additional parameters when integration gets more mature. Expect changes to this section.

The NemID identity provider is the official Danish national electronic identity, being replaced by MitID.

Supported parameters

Request parameter	Description
acr_values	• https://data.gov.dk/concept/core/nsis/Substantial
ial_values	• https://data.gov.dk/concept/core/nsis/Substantial
idp_values	**nemid**

amr_values	The following options are supported • nemid.otp (default) • nemid.keyfile If all options are set, the user will be able to choose between the two NemID client variants: NemID OTP and NemID key file. NemID OTP is mostly used for private identities. NemID key file is mostly used for professional identities. The amr_values list is a prioritized list. The first option in the list will be the choice initially presented to the user and the prioritized order determines the UX behavior for the user.

Supported identity provider parameters

Identity Provider parameters (nemid)	**Description**
remember_userid	Type: bool (default: false) If true, the user is shown the option to “remember me” in the NemID OTP client.
code_app_trans_ctx	Type: string. Up to 100 characters. Showed in the NemID Code App if the end-user choses the NemID Code App when authenticating.

Scope	**Description**
nemid	User claims for NemID, that does not require consent. List of claims: • nemid.common.name • nemid.pid • nemid.rid • nemid.dn • nemid.ssn • nemid.email
nemid.poces_to_cvr	Enables NemID Private to Business flow. List of claims: • nemid.auth_to_repr
ssn	Social Security Number. List of claims: • dk.cpr
organization	• organization.number • organization.name
trans_ctx	Transaction context. List of claims: • **trans_ctx**

	Will be cached for the duration of the access token issued for this transaction. It will not be available from the UserInfo endpoint with access tokens issued for long-lived sessions i.e. from refresh tokens, after the initial access token has expired. *New transactions within the same end-user session will overwrite the trans_ctx claim value.* A UTF-8 encoded JSON including the following top-level members (if a value is present): • **nemid.code_app_trans_ctx** Passthrough of the NemID **code_app_trans_ctx** identity provider parameter. • **nemid.xmldsig** The resulting NemID XMLDSig (signed XML).

ID Token identity claims

Claim value	**Possible values**
Identitytype	• private • professional Private identities are identifiable by their global NemID PID, found in the **nemid.pid** claim. Professionals are employees, and have a unique NemID RID, found in the **nemid.rid** claim. The NemID RID paired with the CVR from the employer forms the primary identifier for NemID professional identities.
idp	**nemid**
acr	• https://data.gov.dk/concept/core/nsis/Substantial
ial	• https://data.gov.dk/concept/core/nsis/Substantial
amr	One of the following: • nemid.otp • nemid.keyfile
nemid.ssn	NemID subject serial number. Format for private identities: “PID:xxxxxx-xxxxxxx-xxxxx” Format for professional identities: “RID:xxxxx-CVR:xxxxx”
nemid.auth_to_repr	“NemID Privat til Erhverv” Authorized to represent. Contains the Danish company CVR number, who the private identity can represent.

NemID CPR

In the current version of NemID, CPR is available from NemID flows if you are a public service provider. In this scenario, NMB will set **dk.cpr** in the result, if requested via the **ssn** scope.

If you are a private service provider, the user’s CPR will not be available from the MitID system. In this scenario, a CPR Match service is provided (using the service providers NemID agreement) making it possible to match

a NemID PID and CPR and verify if the supplied PID and CPR matches and thus making it possible to verify if a NemID identity has the given CPR.

NMB implements this as a natural part of the MitID flow and will ask the user for CPR when the service provider requests CPR with the **ssn** scope.

If the user has accepted, that the CPR is stored for later use (user consent) and returned to the service provider, the user will not have to enter CPR for subsequent MitID flows for the same service provider.

NemID CPR Match API

The Broker API supports a “NemID CPR Match API” that allows services to match a CPR with a NemID authentication from the NMB.

In this way, services can ask the user for CPR and then call the API with the access token retrieved from NMB for the user authentication as authorization header.

This also allows services to verify that an already known CPR matches the NemID identity in question.

NemID Privat til Erhverv (authorized to represent)

The “NemID Privat til Erhverv” service is available via NMB using the **nemid.poces_to_cvr** scope (client must be allowed to do so).

This allows the end-user to use his Private NemID to represent a company of which he or she is in full control. NMB will handle all the end-user interaction and return the selected company identifier in the **nemid.auth_to_repr** claim.

References

1. [OIDC] “OpenID Connect core”: https://openid.net/specs/openid-connect-core-1_0.html
2. [OIDC-DISC] “OpenID Connect Discovery”: https://openid.net/specs/openid-connect-discovery-1_0.html
3. [ROBJ] “Passing Request Parameters as JWTs”: https://openid.net/specs/openid-connect-core-1_0.html#JWTRequests
4. [JWT] “JWT specification”: https://tools.ietf.org/html/rfc7519
5. [JWS] “JWS specification”: https://tools.ietf.org/html/rfc7515
6. [JWE] “JWE specification”: https://tools.ietf.org/html/rfc7516
7. [JWA] ”JWA specification”: https://tools.ietf.org/html/rfc7518
8. [NSIS] ”National Standard for Identiteters Sikringsniveauer 2.0.1”: https://digst.dk/it-loesninger/nemlog-in/det-kommende-nemlog-in/vejledninger-og-standarder/nsis-standarden/
9. [OAuth] “The OAuth 2.0 Authorization Framework”: https://tools.ietf.org/html/rfc6749
10. [OAuth Native] “OAuth 2.0 for Native Apps”: https://tools.ietf.org/html/rfc8252
11. [Chrome Ext Tabs] “Chrome custom tabs”: https://developer.chrome.com/multidevice/android/customtabs
12. [PKCE] “Proof Key for Code Exchange”: https://tools.ietf.org/html/rfc7636
13. [JWT JWS JWE] “JWT, JWS and JWE”: https://medium.facilelogin.com/jwt-jws-and-jwe-for-not-so-dummies-b63310d201a3
14. [OIO PRIV] ”OIO Basic Privilege Profile”: https://digst.dk/media/20999/oiosaml-basic-privilege-profile-1_2.pdf
15. [OIOSAML] ”OIOSAML 3.0.1”: https://digst.dk/media/21892/oiosaml-web-sso-profile-301.pdf