Annex B
(normative)

Use of OID4VP to retrieve an mdoc

B.1 Mechanism description

B.1.1 General

This document supports presentation of mdoc using OID4VP, an extension to OAuth 2.0 as defined in Reference [8]. It enables the mdoc holder to present an mdoc directly to the mdoc reader. This document is an mdoc-specific profile of OID4VP defined in OID4VP, Draft 18. It clarifies mandatory-to-implement features for the options mentioned in OID4VP for the implementers who wish to present an mdoc response. Presentation of the mdoc shall use the same-device flow as defined in OID4VP, Section 3 with the Response Mode defined in OID4VP, Section 6.2.

NOTE 1 Cross-device flows are prone to engagement relay attacks which is the reason cross-device flow is not included in this document. This issue is not specific to OID4VP only.

NOTE 2 When implementing all requirements in Annex B, the mdoc acts as an OAuth 2.0 Authorization Server towards the remote mdoc reader which acts as an OAuth 2.0 Client. OID4VP uses the terms Verifier for OAuth 2.0 Client and Wallet for OAuth 2.0 Authorization Server.

B.1.2 Sequence diagram

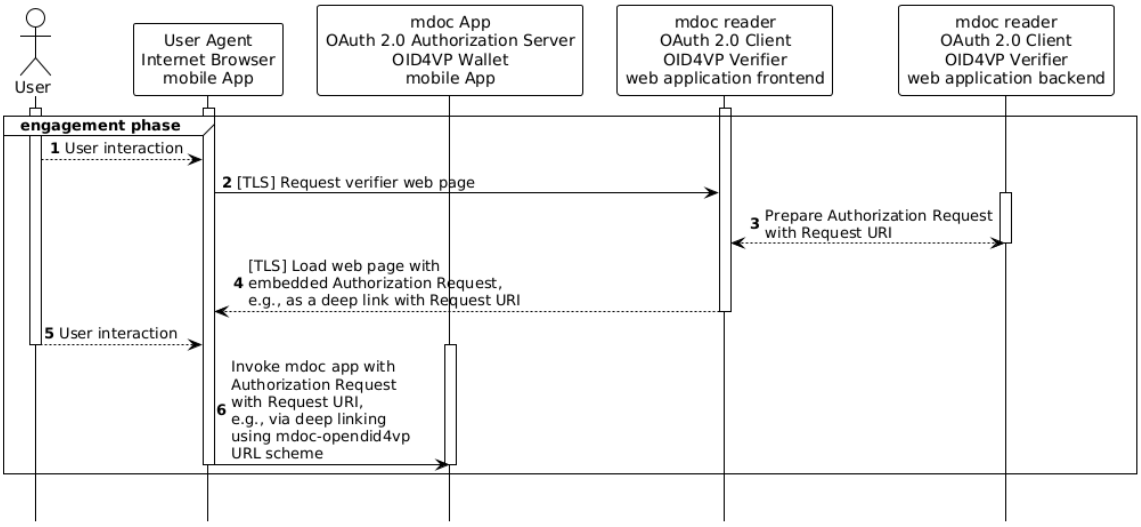

Figure B.1 — Engagement phase sequence diagram

Figure B.1 and Figure B.2 show the informative sequence diagram of the engagement phase and device retrieval phase. During the engagement phase, the mdoc receives the Authorization Request including the `request_uri` which is used by the mdoc to connect to the mdoc reader.

In steps 1 to 6, OID4VP does not define when the Request URI is generated and how the Authorization Request including the Request URI is presented on the web page. In step 4, a session was established between the user agent and the mdoc reader. In step 6, the user agent invokes the mdoc, for example, using the mdoc-openid4vp URL scheme and provides the Request URI as a URL query string parameter to the mdoc.

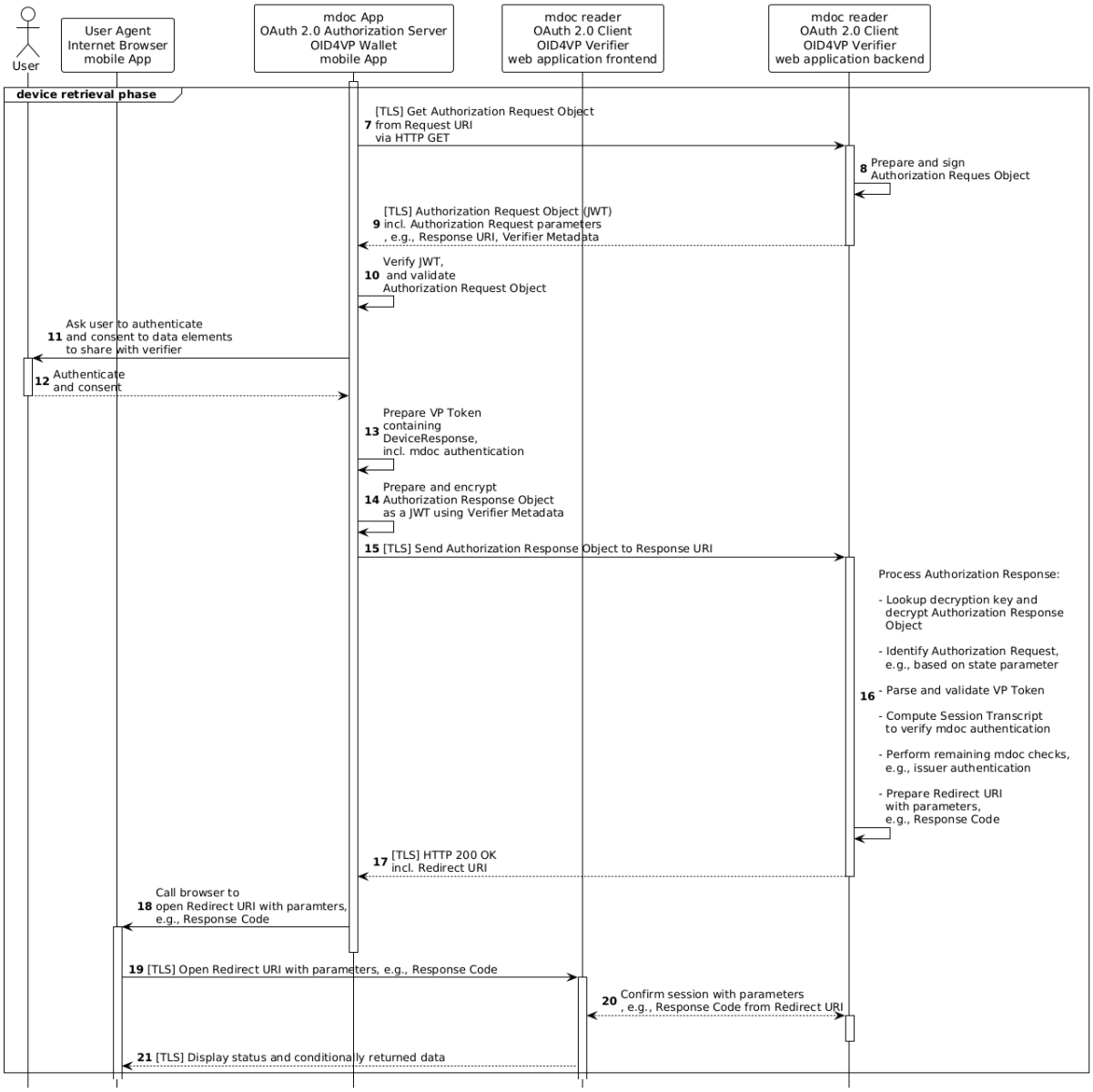

Figure B.2 — Device retrieval phase sequence diagram

During the device retrieval phase:

— In step 7, the mdoc fetches the Authorization Request Object from the Request URI received using a HTTP GET over Transport Layer Security (TLS) from the Request URI that was received in the Authorization Request (see B.4.2.2).

— In step 8, the mdoc reader receives the fetch request and then prepares and signs the Authorization Request Object associated with the Request URI (see B.4.2)

— In step 9, the mdoc reader returns the Authorization Request Object to the mdoc over TLS.

— In step 10, the mdoc verifies the JWT signature and validates the Authorization Request Object which includes determining whether the mdoc reader is trustworthy according to OID4VP, Section 5 and in RFC 9101:2021, Section 6.2.

— In step 11, the mdoc authenticates the user and asks user to consent to sharing the requested data elements with the mdoc reader.

NOTE 1 This step can be implemented in different ways.

— In step 12, the user is authenticated and gives consent.

— In step 13, the mdoc generates mdoc authentication, generates the `DeviceResponse` and prepares the VP Token.

— In step 14, the mdoc prepares the Authorization Response parameters and encrypts the Authorization Response Object as a JWE using the Verifier Metadata from the Authorization Request Object (see B.4.2.3.2).

— In step 15, the mdoc sends the encrypted Authorization Response Object (JWT) to the Response URI provided in the Authorization Request Object.

— In step 16, the mdoc reader processes the Authorization Response Object.

  — First, the mdoc reader decrypts the JSON Web Encryption (JWE).

  — Then, the mdoc reader identifies the associated Authorization Request.

  — Then, the mdoc reader parses and validates the VP Token containing the `DeviceResponse`. This includes validation of contained document types and data elements.

  — Then, the mdoc reader computes the `SessionTranscript` to verify mdoc authentication.

  — Then, the mdoc reader performs issuer data authentication and other remaining checks.

  — Finally, the mdoc reader prepares a Redirect URI including parameters required to verify the session binding. This can be a Response Code associated with the session (see in OID4VP, Draft 18, section 11.2).

— In step 17, the mdoc reader returns the Redirect URI including parameters to the mdoc over TLS.

— In step 18, the mdoc directs the user agent to open the Redirect URI including potential parameters.

— In step 19, the user agent requests the Redirect URI including potential parameters from the mdoc reader over TLS. In this step, the user agent uses the existing session with the mdoc reader.

— In step 20, the mdoc reader receives the Redirect URI including potential parameters and confirms the request is associated with the existing session between the user agent and the mdoc reader. This could include the verification of additional parameters such as a Response Code. The mdoc reader looks up the status and potential data of the Authorization Response associated with the current Authorization Request (i.e. transaction) and session.

— In step 21, the mdoc reader returns the status and potential data to the user agent which then displays the data to the user.

NOTE 2 The AuthorizationRequest in the OID4VP protocol is sent directly from the request endpoint of the mdoc reader to the mdoc without any intermediary applications. Since this message requires TLS for transport layer encryption, the DeviceRequest does not use application layer encryption. The exposure of DeviceRequest is limited to the connection between the TLS termination endpoint and the mDL Reader application.

B.2 Wallet invocation

The mdoc reader has the choice of the following mechanisms to invoke a mdoc acting as a Wallet:

— custom URL scheme as an `authorization_endpoint` (e.g. `mdoc-openid4vp://` as defined in B.3.2.3.2);

— other mechanisms not described in this document.

B.3 Metadata exchange

B.3.1 General

OID4VP utilizes Wallet and Verifier Metadata, defined in OID4VP:2023, Section 8 and 9, to inform both the mdoc and the mdoc reader about each other's capabilities for the data exchange. This information includes details such as supported signature and encryption algorithms, and more.

The subsequent sections outline specific requirements and default values for Wallet and Verifier Metadata, particularly when the mdoc reader lacks prior knowledge of the invoked mdoc.

NOTE 1 The mdoc reader uses the Wallet Metadata, while the mdoc relies on the Verifier Metadata at different stages in the OID4VP flow.

NOTE 2 Since the OID4VP specification references the OAuth2 specification, all requirements in the Oauth2 specification with regards to HTTP connection settings and parameters apply to this profile as well.

B.3.2 Wallet Metadata

B.3.2.1 General

Before generating and sending an Authorization Request to the mdoc, an mdoc reader requires the Wallet Metadata.

B.3.2.2 Wallet Metadata parameters

An mdoc and mdoc reader shall support the following Wallet Metadata parameters as defined in Table B.1.

Table B.1 — Wallet Metadata parameters

Parameter name	Value defined in this profile	Reference
`issuer`	The value for `issuer` is the Wallet identifier.	[15]
`authorization_endpoint`	The value for `authorization_endpoint` is the OAuth 2 Authorization Endpoint where the mdoc reader sends the Authorization Request.	[15]
`response_types_supported`	The value for `response_types_supported` shall contain the `vp_token` Response Type as defined in OID4VP, Section 5.4.	[15]
`vp_formats_supported`	The value for `vp_formats_supported` shall contain the `mso_mdoc` Credential Format Identifier.	OID4VP, Draft 18, Section 8.1
`client_id_schemes_supported`	The value for `client_id_schemes_supported` shall contain the `x509_san_dns` Client Identifier scheme. For example, `[ "x509_san_dns" ]`.	OID4VP, Draft 18, Section 8.1

Parameter name	Value defined in this profile	Reference
`request_object_signing_alg_values_supported`	The value for `request_object_signing_alg_values_supported` shall contain all the request object signing algorithms that the mdoc supports.	RFC 9101
`authorization_encryption_alg_values_supported`	The value for `authorization_encryption_alg_values_supported` shall contain ECDH-ES and support all curves defined in Table B.8 unless the mdoc reader knows the set of curves that the mdoc that it interacts with supports.	[5]
`authorization_encryption_enc_values_supported`	The value for `authorization_encryption_enc_values_supported` shall at least contain `A256GCM`. For example, `[ "A256GCM" ]`.	[5]

B.3.2.3 Obtaining Wallet Metadata

B.3.2.3.1 General

An mdoc reader utilizing this specification has multiple options to obtain the Wallet Metadata of an mdoc, as defined in OID4VP:2023, Section 8.2:

— The mdoc reader has a static and pre-configured set of Wallet Metadata parameters of the mdoc (see B.3.2.3.2).

— Alternatively, the mdoc reader can obtain the Wallet Metadata of the mdoc dynamically, for example, using Reference [15] or other out-of-band mechanisms.

B.3.2.3.2 Static set of Wallet Metadata

The mdoc shall support the following static set of Wallet Metadata parameters bound to the mdoc-OID4VP scheme (`mdoc-openid4vp://`):

```
{
  "issuer": "https://self-issued.me/v2",
  "authorization_endpoint": "mdoc-openid4vp://",
  "response_types_supported": [
    "vp_token"
  ],
  "vp_formats_supported": {
    "mso_mdoc": {}
  },
  "client_id_schemes_supported": [
    "x509_san_dns"
  ],
  "authorization_encryption_alg_values_supported": [
    "ECDH-ES"
  ],
  "authorization_encryption_enc_values_supported": [
    "A256GCM"
  ]
}
```

request_object_signing_alg_values_supported is not present in the static wallet metadata, since the static wallet metadata gives no indication about which alg_values are supported by the mdoc for request object signing.

NOTE 1 `https://self-issued.me/v2` above is a symbolic string.

NOTE 2 In the static set of Wallet Metadata above, `mso_mdoc` does not contain any JSON members which indicates that the mdoc can support any of the supported cryptographic algorithms for issuer and mdoc authentication defined in ISO/IEC 18013-5.

NOTE 3 If the mdoc reader has no prior knowledge of the mdoc or if the mdoc reader cannot discover the Wallet Metadata dynamically, it is expected that the mdoc reader uses the static set of Wallet Metadata as defined above.

NOTE 4 In order for the mdoc to be able to interact with an mdoc reader, it has to support the alg_values used by that mdoc reader for request object signing."

B.3.2.3.3 mdoc-openid4vp URL scheme

This document registers the mdoc-openid4vp URI scheme defined in the IANA Uniform Resource Identifier (URI) Schemes registry, defined in Reference [13]:2023, Section B.3.2.3.1.

— URI scheme name: mdoc-openid4vp

— Status: permanent

— Applications/protocols that use this scheme name: the mdoc-openid4vp URI scheme is intended to be used by mobile document reader applications.

— Change controller: ISO/IEC JTC1/SC17

— Reference: ISO/IEC TS 18013-7 (this document)

B.3.3 Verifier Metadata

B.3.3.1 General

An mdoc needs the Verifier Metadata when generating and sending an Authorization Response to the mdoc reader.

An mdoc shall support receiving Verifier Metadata using the `client_metadata` Authorization Request parameter, as defined in OID4VP:2023, Section 5.

Both the mdoc and mdoc reader shall use the Verifier Metadata parameters from Table B.2.

Table B.2 — Verifier Metadata parameters

Parameter name	Value defined in this profile	Reference
`jwks`	The value for `jwks` contains the public key(s) of the mdoc reader. Each curve defined in Table B.8 shall be included unless the mdoc reader is aware of the set of keys supported by the mdoc it interacts with. The public keys are encoded as a JSON Web Key Set (JWKS) as defined in Reference [10]. The `jwks` shall contain the keys used for mdoc mac authentication as defined in ISO/IEC 18013-5. The keys used for this purpose shall set the "use" JWK paremeters to "enc" (see RFC 7515) and "kty", "crv" to the corresponding values of "kty", "crv" for each curve defined in Table B.8	[12]

Parameter name	Value defined in this profile	Reference
	unless the mdoc reader is aware of the set of keys supported by the mdoc it interacts with.	
`authorization_encrypted_response_alg`	The value for `authorization_encrypted_response_alg` is used for the value in the `alg` JWT (JWE) header parameter in the encrypted Authorization Response.	[5]
`authorization_encrypted_response_enc`	The value for `authorization_encrypted_response_enc` is used for the value in the `enc` JWT (JWE) header parameter in the encrypted Authorization Response.	[5]
`vp_formats`	The value for `vp_formats` shall include a JSON object with the key `mso_mdoc`.	OID4VP:2023, Section 9.1

Additional mechanisms to obtain the Verifier Metadata and Verifier Metadata parameters may be supported but are out-of-scope of this specification.

The mdoc reader is not required to pre-register with the mdoc.

B.4 Data Exchange

B.4.1 Data Model

The data model shall be used as specified in Clause 7.

B.4.2 Authorization request

B.4.2.1 General

The mdoc reader shall generate and deliver the Authorization Request as defined in OID4VP:2023, Section 5 to the mdoc and applies the additional rules of the OID4VP mdoc-specific profile defined in this document.

B.4.2.2 Engagement phase

The mdoc shall support receiving the OID4VP Authorization Request at the `authorization_endpoint` specified by the Wallet Metadata. The Authorization Request shall pass an Authorization Request Object by reference using the `request_uri` parameter as defined in RFC 9101.

The value for `request_uri` contains the HTTPS-based URL where the mdoc retrieves the Authorization Request Object that contains the Authorization Request parameters (see RFC 9101).

The following is a non-normative example of an Authorization Request using the mdoc-openid4vp scheme:

```
mdoc-openid4vp://  ?client_id=example.com
&request_uri=https%3A%2F%2Fexample.com%2F567545564
```

The `client_id` Authorization Request parameter is included in the Authorization Request as a percent-encoded (as defined in Reference [6]:2023, Section 2.1) URL query string parameter. The `client_id` is also included in the Authorization Request Object as defined in RFC 9101.

B.4.2.3 Device retrieval phase

B.4.2.3.1 General

The mdoc uses the `request_uri` Authorization Request parameter to retrieve the signed Authorization Request Object as defined in RFC 9101:2023, Section 5.2.3.

The following is a non-normative example of a HTTPS request to fetch the signed Authorization Request:

```
GET /567545564 HTTP/1.1  Host: example.com
```

The following is a non-normative example of the HTTPS response:

```
HTTP/1.1 200 OK  Date: Thu, 20 Aug 2020 23:52:39 GMT  Server: Apache/2.4.43 (example.com)
Content-type: application/oauth-authz-req+jwt  Content-Length: 797  Last-Modified: Wed, 19
Aug 2020 23:52:32 GMT  eyJ4NW...
```

NOTE The example above does not show the entire HTTP response body to improve readability. The HTTP response body contains the signed Authorization Request Object encoded as a JWT as defined in B.4.2.3.4.

B.4.2.3.2 Authorization Request parameters

The mdoc reader shall include the Authorization Request parameters from Table B.3 in the Authorization Request Object.

The Authorization Request Object may contain the `state` Authorization Request parameter as defined in Reference [8].

NOTE As defined in Reference [8]:2012, Section 3.1 the mdoc must ignore other unrecognized Authorization Request parameters.

Table B.3 — Authorization Request parameters (passed in Request Object)

Parameter Name	Value defined in this profile	Reference
`response_type`	The value for `response_type` is a Response Type value that is included in the Wallet Metadata parameter `response_types_supported`. For example, `vp_token`.	[8]
`presentation_definition`	The value for `presentation_definition` is the Presentation Definition object that specifies the mdoc data being requested. B.4.2.3.3 defines the content of the Presentation Definition object for this mdoc-specific profile of OID4VP.	OID4VP:2023, Section 5.1
`client_metadata`	The value for `client_metadata` is the Verifier Metadata parameter of the mdoc reader as defined in this document.	OID4VP:2023, Section 5
`nonce`	The value for `nonce` is a cryptographic nonce value and shall follow the requirements in B.5.3.	OID4VP:2023, Section 5
`client_id`	The value for `client_id` is the Client Identifier of the mdoc reader that corresponds to the Client Identifier scheme.	[8]
`client_id_scheme`	The value for `client_id_scheme` is a Client Identifier Scheme that is included in `client_id_schemes_supported` Wallet Metadata parameter, e.g., `x509_san_dns`.	OID4VP:2023, Section 5

Parameter Name	Value defined in this profile	Reference
response_mode	The value for response_mode shall be direct_post.jwt as defined in OID4VP, clause 6.3.1.	[8]
response_uri	The value for response_uri is the HTTPS URL that represents the HTTPS POST endpoint for submitting the encrypted Authorization Response required by the Response Mode direct_post.jwt.	OID4VP:2023, Section 6.2
aud	The value for aud is the audience of the Authorization Request Object and is set to the issuer Wallet Metadata parameter.	OID4VP:2023, Section 5.6

An example of of Authorization Request parameters included in an Authorization Request Object using the x509_san_dns Client Identifier scheme is provided in B.6.2.

B.4.2.3.3 Presentation Definition

A Presentation Definition object (as defined in OID4VP:2023, Section 5) used by this OID4VP mdoc-specific profile shall contain the JSON members from Table B.4.

Table B.4 — Presentation Definition JSON members

Presentation Definition JSON member	Value defined in this profile
id	The value for id is a JSON String that is unique in the Presentation Definition of the Authorization Request.
input_descriptors	The value for input_descriptors is a JSON array of Input Descriptor objects. The Presentation Definition shall have at least one Input Descriptor object.

Each Input Descriptor object in a Presentation Definition object shall contain the JSON members from Table B.5.

Table B.5 — Presentation Definition JSON members

Input Descriptor JSON member	Value defined in this profile
id	The value for id shall be set to the requested document type. This indicates that all requested data elements shall be selected from that document type. For example, ISO/IEC 18013-5 defines org.iso.18013.5.1.mDL as the document type for mDL. The Input Descriptor id shall be unique per Presentation Definition object. This implies that a document type can only be used once within the Presentation Definition. Example: "id": "org.iso.18013.5.1.mDL"
format	The value for format is a JSON object which shall contain a JSON object with the key mso_mdoc. mso_mdoc shall contain a JSON member alg that contains a list of supported algorithms for issuer and mdoc authentication (as defined in ISO/IEC 18013-5) as listed in Table B.8.
constraints	The value for constraints is a JSON object with the following JSON members: limit_disclosure, fields. limit_disclosure whose value shall be set to the JSON String value required.

Input Descriptor JSON member	Value defined in this profile

	`fields` is a JSON array of Field objects where each Field is a JSON object with the following JSON members: `path`, `intent_to_retain`.
	`path` is a JSON array where each entry is a JSON String containing a requested data element from the requested document type as follows: `$['<namespace>']['<data element identifier>']`. For example, to request a data element with an data element identifier `family_name` from the namespace `org.iso.18013.5.1`, the following JSON String is used: `$['org.iso.18013.5.1']['family_name']`.
	`intent_to_retain` whose value shall be set to `true` or `false`.
	Example:
	`"constraints": {`
	`  "limit_disclosure":"required",`
	`  "fields": [{`
	`  "path":[`
	`  "$['org.iso.18013.5.1']['family_name']"`
	`  ],`
	`  "intent_to_retain":true`
	`  }]`
	`}`

An mdoc and mdoc reader are only required to implement the syntax requirements related to the parameters of the Presentation Definition object that are specified in this document. An mdoc reader shall not include any parameters and values in the Presentation Definition object that are not defined in this document.

An example of an Authorization Request is provided in B.6.2.

When data elements from multiple document types are requested, separate Input Descriptor objects per document type shall be present.

B.4.2.3.4 Client Identifier scheme

The mdoc reader shall select a Client Identifier scheme for the Authorization Request that is supported by the Wallet Metadata.

B.4.2.3.5 Authorization Request signing

The mdoc reader shall select a Client Identifier scheme that requires Authorization Request signing.

If the selected Client Identifier scheme requires Authorization Request signing, e.g. `x509_san_dns`, the mdoc reader shall encode the Authorization Request parameters as a signed Authorization Request Object encoded as a JWT. The Authorization Request Object shall contain and set the Authorization Request parameter `require_signed_request_object` to `true`. The signed Authorization Request Object shall contain an `alg` JWT (JWS) header parameter that matches one of the supported signature algorithms specified by the `request_object_signing_alg_values_supported` Wallet Metadata parameter.

For the `x509_san_dns` Client Identifier scheme, the Client Identifier shall be a DNS name and match a `dNSName` Subject Alternative Name (SAN) according to RFC 5280 entry in the leaf certificate passed with the Authorization Request Object. The Authorization Request Object shall be signed with the private key corresponding to the public key in the leaf X.509 certificate of the certificate chain added to the `x5c` JWT (JWS) header parameter of the signed Authorization Request Object. The Wallet shall validate the signature and the trust chain of the X.509 certificate. All Verifier metadata other than the public key shall be obtained from the

client_metadata parameter. If the Wallet can establish trust in the Client Identifier authenticated through the certificate, e.g. because the Client Identifier is contained in a list of trusted Client Identifiers, it may allow the client to freely choose the response_uri Authorization Request parameter value. If not, the FQDN of the response_uri value shall match the Client Identifier.

NOTE 1 The certificates included in the x5c JWT (JWS) header parameter are base64-encoded (RFC 4648:2006, Section 4) and not base64url-encoded. Further note that if the certificate chain includes only one certificate, the x5c JWT (JWS) header parameter is a JSON array with one entry.

NOTE 2 Since AuthorizationRequest in OID4VP is signed, a trust anchor is needed to enable trust in the signature. Self-signed mdoc reader certificates can support trust when they are already present in the mdoc via an out-of-band manner (which effectively elevates such a certificate to a trust anchor) e.g. dynamic registration.

B.4.3 Authorization Response

B.4.3.1 General

The mdoc shall generate and deliver the Authorization Response as defined in OID4VP:2023, Section 6 to the mdoc reader and applies the additional rules of the OID4VP mdoc-specific profile defined in this document.

The Authorization Response is sent to the response_uri endpoint as defined in OID4VP:2023, Section 6.3.1 using the Response Mode direct_post.jwt. The Authorization Response is encoded as a JWT (JWE) without nesting (see B.4.3.3.2). The JWT (JWE) is included in the response parameter as defined in OID4VP:2023, Section 6.3.1.

The following is a non-normative example of an Authorization Response sent to the response_uri endpoint:

```
  POST /post HTTP/1.1     Host: example.org     Content-Type: application/x-www-form-
urlencoded       response=eyJra...9t2LQ
```

NOTE The example above does not show the entire value for the response Authorization Response parameter to improve readability.

The response of the response_uri endpoint shall include the redirect_uri parameter as defined in OID4VP:2023, Section 6.2.

B.4.3.2 Authorization Response parameters

An Authorization Response shall include the Authorization Response parameters from Table B.6.

If present, the mdoc shall copy the state Authorization Request parameter from the Authorization Request Object to the Authorization Response Object (as defined in Reference [8]).

The Authorization Response is delivered encrypted to the mdoc reader encoded as a JWT using JWE compact serialization (see B.4.3.3.2).

Table B.6 — Authorization Response parameters

Parameter Name	Value defined in this profile	Reference
vp_token	The value for vp_token shall contain the base64url-encoded-without-padding DeviceResponse data structure as defined in ISO/IEC 18013-5.	OID4VP:2023, Section 6.1
presentation_submission	The value for presentation_submission shall contain the Presentation Submission object as described in B.4.3.3.	OID4VP:2023, Section 6.1

An example of the Authorization Response Object Parameters can be found in B.6.6.

B.4.3.3 Presentation Submission

B.4.3.3.1 General

A Presentation Submission object (as defined in OID4VP:2023, Section 6.1) used by this OID4VP mdoc-specific profile shall contain the JSON members from Table B.7.

Table B.7 — Presentation Submission JSON members

Presentation Submission JSON member	Value defined in this profile
`id`	The value for `id` is a String with a value that is unique in the Authorization Response.
`definition_id`	The value for `definition_id` corresponds to the `id` value of the Presentation Definition object in the Authorization Request.
`descriptor_map`	The value for `descriptor_map` shall be a JSON array of Descriptor Map objects with one or more entries where each entry corresponds to an Input Descriptor object in the Authorization Request. Each Descriptor Map is a JSON object with the following JSON members: `id`, `format`, `path`. The value for each `id` corresponds to the `id` value of the Input Descriptor object the Descriptor Map object corresponds to. The value for `format` shall be the static JSON String value `mso_mdoc`. The value for `path` shall be the static JSON String value `$` if the VP Token contains a single JSON String or JSON object.

An example of a Presentation Submission object referring to a VP Token with a single entry representing a `DeviceResponse` with a single document type can be found in B.6.4.

B.4.3.3.2 Authorization Response encryption

The mdoc shall encode the Authorization Response as a JWT (JWE only) as defined in OID4VP:2023, Section 6.3. The JWT uses the JWE compact serialization as defined in Reference [9]:2015, Section 3.1.

NOTE The JWT does not contain a nested JWS.

To generate the JWE, the mdoc shall use the `jwks`, `authorization_encrypted_response_alg` and `authorization_encrypted_response_enc` from the Verifier Metadata. The JWE shall encrypt a JSON Object containing the Authorization Response parameters from Table B.6. The mdoc shall generate a new JWE Initialization Vector (IV) for each encryption operation.

For example, if the `authorization_encrypted_response_alg` is set to `ECDH-ES` and `authorization_encrypted_response_enc` is set to `A256GCM`, this means Eliptic Curve Diffie-Hellman in Direct Key Agreement mode as specified in Reference [11] is used to encrypt the payload of the JWE.

The `jwks` Authorization Request parameter is used to convey the ephemeral public key information of the mdoc reader to the mdoc which is required for key agreement. The mdoc generates a new ephemeral key pair and sets the value for the `epk` JWT (JWE) header parameter to the public key of the generated key pair-encoded as a JSON Web Key (see Reference [10]). When generating the ephemeral key pair, the mdoc has to ensure that the curve of the `epk` matches the curve of the mdoc reader public key specified by the `crv` and `kty` JSON members (as defined in Reference [10]) of the JWK.

The mdoc reader shall set the `use` JWK parameter (public key use) to the static JSON String value `enc` and set the `alg` JWK parameter to the static JSON String value `ECDH-ES` to indicate which JWK in the `jwks` Authorization Request parameter can be used for key agreement to encrypt the response (see Reference [10]).

The mdoc shall support at least one of the cryptographic curves as defined in Table B.8. The mdoc reader shall support all of the cryptographic curves defined in Table B.8.

The mdoc shall set the `apu` JWT (JWE) header parameter to the base64url-encoded-with-no-padding value of the `mdocGeneratedNonce` of the `SessionTranscript` as defined in B.4.4.

The mdoc shall set the `apv` JWT (JWE) header parameter to the base64url-encoded-with-no-padding value of the utf-8 encoded nonce Authorization Request parameter from the Authorization Request Object.

The mdoc shall set the `kid` JWT (JWE) header parameter to the value of the `kid` JWK parameter of the public key that was used for key agreement to encrypt the response.

An example of the JWT (JWE) header of an encrypted Authorization Response can be found in B.6.8.

An example of an encrypted Authorization Response encoded as a JWT (JWE) can be found in B.6.7.

B.4.3.4 Error Handling

Error handling shall be supported as defined in OID4VP.

B.4.4 Session Transcript

The `SessionTranscript` as defined in ISO/IEC 18013-5 shall be used with the following changes:

— `DeviceEngagementBytes` is replaced with `null`,

— `EReaderKeyBytes` is replaced with `null`

The Handover element is defined as:

```
Handover = OID4VPHandover
OID4VPHandover = [
   clientIdHash.
   responseUriHash.
   nonce
]
clientIdHash = bstr
responseUriHash = bstr

clientIdToHash = [
    clientId,
    mdocGeneratedNonce
]

responseUriToHash = [
    responseUri,
    mdocGeneratedNonce
]

mdocGeneratedNonce = tstr
clientId = tstr
responseUri = tstr
nonce = tstr
```

where `clientIdHash` is the SHA-256 hash of `clientIdToHash` and `responseUriHash` is the SHA-256 hash of the `responseUriToHash`.

The mdoc shall set the value for `mdocGeneratedNonce` to a cryptographically random number with sufficient entropy (see B.5.3).

`clientId` shall be the `client_id`, `responseUri` shall be the `response_uri` and `nonce` shall be the `nonce` Authorization Request parameter from the Authorization Request Object.

An example of the SessionTranscript can be found in B.6.9.

B.4.5 mdoc MAC authentication

To perform mdoc MAC authentication as defined in ISO/IEC 18013-5, the mdoc shall use on of the ephemeral public keys from the "jwks" Verifier Metadata parameter as the "EReaderKey.Pub" with having the "use" JWK parameter set to "enc".

NOTE "EReaderKey.Pub" acts as input to ECKA-DH to compute the shared secret to derive the MAC Key.

B.5 Security mechanisms

B.5.1 General

The following security architecture goals from 6.4.4.1 apply:

— Security mechanisms a), b) and c) apply directly.

— Security mechanism d) applies by sending the Authorization Response encrypted to the mdoc reader.

— The security mechanism defined in e) does not apply, however the protection against relayed engagement information is still achieved. The mdoc reader must maintain a binding between the user session bound and the `nonce` Authorization Request parameter. When the end-user is redirected back to the mdoc reader with the same `nonce` (included in `SessionTranscript`), the mdoc reader can detect whether there was no MITM attack.

B.5.2 Cryptographic curves

Besides the requirements for cryptographic algorithms from ISO/IEC 18013-5 for the mdoc and mdoc reader.

An mdoc and mdoc reader shall use one of the ECDH and/or signature algorithms from Table B.8 for Request signing and Response encryption / decryption. The mdoc reader shall support all curves and algorithms defined in Table B.8 for response object decryption.

Table B.8 — Cryptographic curves

Definition	Specification	Key type (`kty` value)	Signature algorithm (`alg` value)	Curve identifier (`crv` value)	Purpose
NIST P-256	Reference [11]	`EC`	`ES256`	`P-256`	ECDSA/ECDH
NIST P-384	Reference [11]	`EC`	`ES384`	`P-384`	ECDSA/ECDH
NIST P-521	Reference [11]	`EC`	`ES512`	`P-521`	ECDSA/ECDH
BrainpoolP256r1	Reference [7]	`EC`	`ESB256`	`BP-256`	ECDSA/ECDH

Definition	Specification	Key type (`kty` value)	Signature algorithm (`alg` value)	Curve identifier (`crv` value)	Purpose
			(with SHA-256)		
BrainpoolP320r1	Reference [7]	`EC`	`ESB320` (with SHA-384)	`BP-320`	ECDSA/ECDH
BrainpoolP384r1	Reference [7]	`EC`	`ESB384` (with SHA-384)	`BP-384`	ECDSA/ECDH
BrainpoolP512r1	Reference [7]	`EC`	`ESB512` (with SHA-512)	`BP-512`	ECDSA/ECDH
Curve25519	Reference [14]	`OKP`	`EdDSA`	`Ed25519/X25519`	EdDSA/ECDH
Curve448	Reference [14]	`OKP`	`EdDSA`	`Ed448/X448`	EdDSA/ECDH

B.5.3 Entropy of the nonce

The mdoc `DeviceResponse` is securely bound to a particular session based on the fact that the nonces are not learned or guessed by the attacker. As such, nonces shall be an unpredictable random or pseudorandom value. Nonces shall have a minimum entropy of 16 bytes. A new nonce value shall be chosen for each transaction.

NOTE This applies to `nonce` and `mdocGeneratedNonce`.

B.6 Examples

B.6.1 OID4VP example — Presentation Definition

The following is an example of the Presentation Definition.

```
--------------------------------
Example: Presentation Definition
--------------------------------
{
  "id": "mDL-sample-req",
  "input_descriptors": [
    {
      "id": "org.iso.18013.5.1.mDL",
      "format": {
        "mso_mdoc": {
          "alg": [
            "ES256",
            "ES384",
            "ES512",
            "EdDSA",
            "ESB256",
            "ESB320",
            "ESB384",
            "ESB512"
          ]
        }
      },
```

```
"constraints": {
  "fields": [
    {
      "path": [
        "$['org.iso.18013.5.1']['birth_date']"
      ],
      "intent_to_retain": false
    },
    {
      "path": [
        "$['org.iso.18013.5.1']['document_number']"
      ],
      "intent_to_retain": false
    },
    {
      "path": [
        "$['org.iso.18013.5.1']['driving_privileges']"
      ],
      "intent_to_retain": false
    },
    {
      "path": [
        "$['org.iso.18013.5.1']['expiry_date']"
      ],
      "intent_to_retain": false
    },
    {
      "path": [
        "$['org.iso.18013.5.1']['family_name']"
      ],
      "intent_to_retain": false
    },
    {
      "path": [
        "$['org.iso.18013.5.1']['given_name']"
      ],
      "intent_to_retain": false
    },
    {
      "path": [
        "$['org.iso.18013.5.1']['issue_date']"
      ],
      "intent_to_retain": false
    },
    {
      "path": [
        "$['org.iso.18013.5.1']['issuing_authority']"
      ],
      "intent_to_retain": false
    },
    {
      "path": [
        "$['org.iso.18013.5.1']['issuing_country']"
      ],
      "intent_to_retain": false
    },
    {
      "path": [
        "$['org.iso.18013.5.1']['portrait']"
      ],
      "intent_to_retain": false
    },
    {
      "path": [
```

```
              "$['org.iso.18013.5.1']['un_distinguishing_sign']"
            ],
            "intent_to_retain": false
          }
        ],
        "limit_disclosure": "required"
      }
    }
  ]
}
```

B.6.2 OID4VP example — Authorization Request Object parameters

The following is an example of the Authorization Request Object parameters. In this example and subsequent examples, the mdoc reader only contains a key for a single curve in the jwks structure. This is permissible only because for these examples it is assumed the mdoc reader is aware of the set of keys supported by the mdoc with which it is interacting.

```
-----------------------------------------------
Example: Authorization Request Object parameters
-----------------------------------------------
{
  "aud": "https://self-issued.me/v2",
  "response_type": "vp_token",
  "presentation_definition": {
    "id": "mDL-sample-req",
    "input_descriptors": [
      {
        "id": "org.iso.18013.5.1.mDL",
        "format": {
          "mso_mdoc": {
            "alg": [
              "ES256",
              "ES384",
              "ES512",
              "EdDSA",
              "ESB256",
              "ESB320",
              "ESB384",
              "ESB512"
            ]
          }
        },
        "constraints": {
          "fields": [
            {
              "path": [
                "$['org.iso.18013.5.1']['birth_date']"
              ],
              "intent_to_retain": false
            },
            {
              "path": [
                "$['org.iso.18013.5.1']['document_number']"
              ],
              "intent_to_retain": false
            },
            {
              "path": [
                "$['org.iso.18013.5.1']['driving_privileges']"
              ],
              "intent_to_retain": false
            },
```

```
          {
            "path": [
              "$['org.iso.18013.5.1']['expiry_date']"
            ],
            "intent_to_retain": false
          },
          {
            "path": [
              "$['org.iso.18013.5.1']['family_name']"
            ],
            "intent_to_retain": false
          },
          {
            "path": [
              "$['org.iso.18013.5.1']['given_name']"
            ],
            "intent_to_retain": false
          },
          {
            "path": [
              "$['org.iso.18013.5.1']['issue_date']"
            ],
            "intent_to_retain": false
          },
          {
            "path": [
              "$['org.iso.18013.5.1']['issuing_authority']"
            ],
            "intent_to_retain": false
          },
          {
            "path": [
              "$['org.iso.18013.5.1']['issuing_country']"
            ],
            "intent_to_retain": false
          },
          {
            "path": [
              "$['org.iso.18013.5.1']['portrait']"
            ],
            "intent_to_retain": false
          },
          {
            "path": [
              "$['org.iso.18013.5.1']['un_distinguishing_sign']"
            ],
            "intent_to_retain": false
          }
        ],
        "limit_disclosure": "required"
      }
    }
  ]
},
"client_metadata": {
  "jwks": {
    "keys": [
      {
        "kty": "EC",
        "use": "enc",
        "crv": "P-256",
        "x": "xVLtZaPPK-xvruh1fEClNVTR6RCZBsQai2-DrnyKkxg",
        "y": "-5-QtFqJqGwOjEL3Ut89nrE0MeaUp5RozksKHpBiyw0",
        "alg": "ECDH-ES",
```

```
          "kid": "P8p0virRlh6fAkh5-YSeHt4EIv-hFGneYk14d8DF51w"
        }
      ]
    },
    "authorization_encrypted_response_alg": "ECDH-ES",
    "authorization_encrypted_response_enc": "A256GCM",
    "vp_formats": {
      "mso_mdoc": {
        "alg": [
          "ES256",
          "ES384",
          "ES512",
          "EdDSA",
          "ESB256",
          "ESB320",
          "ESB384",
          "ESB512"
        ]
      }
    }
  },
  "state": "34asfd34_34$34",
  "nonce": "abcdefgh1234567890",
  "client_id": "example.com ",
  "client_id_scheme": "x509_san_dns",
  "response_mode": "direct_post.jwt",
  "response_uri": "https://example.com/12345/response"
}
```

NOTE While this example contains the state claim in the request, the subsequent response examples are made for a request where that state claim is not present.

```
-----------------------------------------------------------------------
Example: Static Private Reader Key JWK corresponding to 'x5c' JWT Header
-----------------------------------------------------------------------
{
  "kty": "EC",
  "kid": "Cv_aKIPqB8mkHqcJGUFq7zawf5vAyA6xv3PdJpJY1V8",
  "crv": "P-256",
  "x": "Xy4fnFl6uX1kX_QsKPFUZKfQADji2j91Aot2GNVQxxw",
  "y": "THuUCf0wJej--eKovzxUUSLU-1P04Nog1UhdkUWM6tg",
  "d": "5SOi-q3lIENTg-pyKeh3Vxhvu7IgYRm-IHPis2vfP8c"
}
```

B.6.3 OID4VP example — Authorization Request Object

The following is an example of the Authorization Request Object.

```
-------------------------------------------------------
Example: Authorization Request Object JWT (JAR) Header
-------------------------------------------------------
{
  "x5c": [
    "MIICPzCCAeWgAwIBAgIUDmBXx7+19KhwjltDbBW4BE0CRREwCgYIKoZIzj0EAwIwaTELMAkGA1UEBhMC
VVQxDzANBgNVBAgMBlV0b3BpYTENMAsGA1UEBwwEQ2l0eTESMBAGA1UECgwJQUNNRSBDb3JwMRAwDgYDVQQLD
AdJVCBEZXB0MRQwEgYDVQQDDAtleGFtcGxlLmNvbTAeFw0yMzEwMDMxNDQ5MzhaFw0yNDA5MjMxNDQ5MzhaMG
kxCzAJBgNVBAYTAlVUMQ8wDQYDVQQIDAZVdG9waWExDTALBgNVBAcMBENpdHkxEjAQBgNVBAoMCUFDTUUgQ29
ycDEQMA4GA1UECwwHSVQgRGVwdDEUMBIGA1UEAwwLZXhhbXBsZS5jb20wWTATBgcqhkjOPQIBBggqhkjOPQMB
BwNCAARfLh+cWXq5fWRf9Cwo8VRkp9AAOOLaP3UCi3YY1VDHHEx7lAn9MCXo/vniqL88VFEi1PtT9ODaINVIX
ZFFjOrYo2swaTAdBgNVHQ4EFgQUxv6HtRQk9q7ASQCUqOqEun5S8QQwHwYDVR0jBBgwFoAUxv6HtRQk9q7ASQ
CUqOqEun5S8QQwDwYDVR0TAQH/BAUwAwEB/zAWBgNVHREEDzANggtleGFtcGxlLmNvbTAKBggqhkjOPQQDAgN
IADBFAiBt5/maixJyaWNKG8W9dAePhvhh5OHjswJaEjcyYiqoogIhANwTGTdg12REzQMfQSXTSVtNp1jjJMPs
ipqR7kIK1JdT"
```

```
  ],
  "typ": "JWT",
  "alg": "ES256"
}

------------------------------------------------------------
Example: Authorization Request Object encoded as JWT (JAR)
------------------------------------------------------------
eyJ4NWMiOlsiTUlJQ1B6Q0NBZVdnQXdJQkFnSVVEbUJYeDcrMTlLaHdqbHREYkJXNEJFMENSUkV3Q2dZSUtvW
kl6ajBFQXdJd2FURUxNQWtHQTFVRUJoTUNWVlF4RHpBTkJnTlZCQWdNQmxWMGIzQnBZVEVOTUFzR0ExVUVCd3
dFUTJsMGVURVNNQkFHQTFVRUNnd0pRVU5OUlNCRGIzSndNUkF3RGdZRFZRUUxEQWRKVkNCRVpYQjBNUlF3RWd
ZRFZRUUREQXRsZUdGdGNHeGxMbU52YlRBZUZ3MHlNekV3TURNeE5EUTVNemhhRncweU5EQTVNak14TkRRNU16
aGFNR2t4Q3pBSkJnTlZCQVlUQWxWVU1ROHdEUVlEVlFRSURBWlZkRzl3YVdFeERUQUxCZ05WQkFjTUJFTnBkS
Gt4RWpBUUJnTlZCQW9NQ1VGRFRVVWdRMjl5Y0RFUU1BNEdBMVVFQ3d3SFNWUWdSR1Z3ZERFVU1CSUdBMVVFQX
d3TFpYaGhiWEJzWlM1amIyMHdXVEFUQmdjcWhrak9QUUlCQmdncWhrak9QUU1CQndOQ0FBUmZMaCtjV1hxNWZ
XUmY5Q3dvOFZSa3A5QUFPT0xhUDNVQ2kzWVkxVkRISEV4N2xBbjlNQ1hvL3ZuaXFMODhWRkVpMVB0VDlPRGFJ
TlZJWFpGRmpPcllvMnN3YVRBZEJnTlZIUTRFRmdRVXh2Nkh0UlFrOXE3QVNRQ1VxT3FFdW41UzhRUXdId1llEV
lIwakJCZ3dGb0FVeHY2SHRSUWs5cTdBU1FDVXFPcUV1bjVTOFFRd0R3WURWUjBUQVFIL0JBVXdBd0VCL3pBV0
JnTlZIUkVFRHpBTmdndGxlR0Z0Y0d4bExtTnZiVEFLQmdncWhrak9QUVFEQWdOSUFEQkZBaUJ0NS9tYWl4Snl
hV05LRzhXOWRBZVBodmhoNU9IanN3SmFFamN5WWlxb29nSWhBTndUR1RkZzEyUkV6UU1mUVNYVFNWdE5wMWpq
Sk1Qc2lwcVI3a0lLMUpkVCJdLCJ0eXAiOiJKV1QiLCJhbGciOiJFUzI1NiJ9.eyJhdWQiOiJodHRwczovL3Nl
bGYtaXNzdWVkLm1lL3YyIiwicmVzcG9uc2VfdHlwZSI6InZwX3Rva2VuIiwicHJlc2VudGF0aW9uX2RlZmlua
XRpb24iOnsiaWQiOiJtREwtc2FtcGxlLXJlcSIsImlucHV0X2Rlc2NyaXB0b3JzIjpbeyJpZCI6Im9yZy5pc2
8uMTgwMTMuNS4xLm1ETCAiLCJmb3JtYXQiOnsibXNvX21kb2MiOnsiYWxnIjpbIkVTMjU2IiwiRVMzODQiLCJ
FUzUxMiIsIkVkRFNBIiwiRVNCMjU2IiwiRVNCMzIwIiwiRVNCMzg0IiwiRVNCNTEyIl19fSwiY29uc3RyYWlu
dHMiOnsiZmllbGRzIjpbeyJwYXRoIjpbIiRbJ29yZy5pc28uMTgwMTMuNS4xJ11bJ2JpcnRoX2RhdGUnXSJdL
CJpbnRlbnRfdG9fcmV0YWluIjpmYWxzZX0seyJwYXRoIjpbIiRbJ29yZy5pc28uMTgwMTMuNS4xJ11bJ2RvY3
VtZW50X251bWJlciddIl0sImludGVudF90b19yZXRhaW4iOmZhbHNlfSx7InBhdGgiOlsiJFsnb3JnLmlzby4
xODAxMy41LjEnXVsnZHJpdmluZ19wcml2aWxlZ2VzJ10iXSwiaW50ZW50X3RvX3JldGFpbiI6ZmFsc2V9LHsi
cGF0aCI6WyIkWydvcmcuaXNvLjE4MDEzLjUuMSddWydleHBpcnlfZGF0ZSddIl0sImludGVudF90b19yZXRha
W4iOmZhbHNlfSx7InBhdGgiOlsiJFsnb3JnLmlzby4xODAxMy41LjEnXVsnZmFtaWx5X25hbWUnXSJdLCJpbn
RlbnRfdG9fcmV0YWluIjpmYWxzZX0seyJwYXRoIjpbIiRbJ29yZy5pc28uMTgwMTMuNS4xJ11bJ2dpdmVuX25
hbWUnXSJdLCJpbnRlbnRfdG9fcmV0YWluIjpmYWxzZX0seyJwYXRoIjpbIiRbJ29yZy5pc28uMTgwMTMuNS4x
J11bJ2lzc3VlX2RhdGUnXSJdLCJpbnRlbnRfdG9fcmV0YWluIjpmYWxzZX0seyJwYXRoIjpbIiRbJ29yZy5pc
28uMTgwMTMuNS4xJ11bJ2lzc3VpbmdfYXV0aG9yaXR5J10iXSwiaW50ZW50X3RvX3JldGFpbiI6ZmFsc2V9LH
sicGF0aCI6WyIkWydvcmcuaXNvLjE4MDEzLjUuMSddWydpc3N1aW5nX2NvdW50cnknXSJdLCJpbnRlbnRfdG9
fcmV0YWluIjpmYWxzZX0seyJwYXRoIjpbIiRbJ29yZy5pc28uMTgwMTMuNS4xJ11bJ3BvcnRyYWl0J10iXSwi
aW50ZW50X3RvX3JldGFpbiI6ZmFsc2V9LHsicGF0aCI6WyIkWydvcmcuaXNvLjE4MDEzLjUuMSddWyd1bl9ka
XN0aW5ndWlzaGluZ19zaWduJ10iXSwiaW50ZW50X3RvX3JldGFpbiI6ZmFsc2V9XSwibGltaXRfZGlzY2xvc3
VyZSI6InJlcXVpcmVkIn19XX0sImNsaWVudF9tZXRhZGF0YSI6eyJqd2tzIjp7ImtleXMiOlt7Imt0eSI6IkV
DIiwidXNlIjoiZW5jIiwiY3J2IjoiUC0yNTYiLCJ4IjoieFZMdFphUFBLLXh2cnVoMWZFQ2xOVlRSNlJDWkJz
UWFpMi1Ecm55S2t4ZyIsInkiOiItNS1RdEZxSnFHd09qRUwzVXQ4OW5yRTBNZWFVcDVSb3prc0tIcEJpeXcwI
iwiYWxnIjoiRUNESC1FUyIsImtpZCI6IlA4cDB2aXJSbGg2ZkFraDUtWVNlSHQ0RUl2LWhGR25lWWsxNGQ4RE
Y1MXcifV19LCJhdXRob3JpemF0aW9uX2VuY3J5cHRlZF9yZXNwb25zZV9hbGciOiJFQ0RILUVTIiwiYXV0aG9
yaXphdGlvbl9lbmNyeXB0ZWRfcmVzcG9uc2VfZW5jIjoiQTI1NkdDTSIsInZwX2Zvcm1hdHMiOnsibXNvX21k
b2MiOnsiYWxnIjpbIkVTMjU2IiwiRVMzODQiLCJFUzUxMiIsIkVkRFNBIiwiRVNCMjU2IiwiRVNCMzIwIiwiR
VNCMzg0IiwiRVNCNTEyIl19fSwicmVxdWlyZV9zaWduZWRfcmVxdWVzdF9vYmplY3QiOnRydWV9LCJzdGF0ZS
I6IjM0YXNmZDM0XzM0JDM0IiwibW9uY2UiOiJhYmNkZWZnaDEyMzQ1Njc4OTAiLCJjbGllbnRfaWQiOiJleGF
tcGxlLmNvbSIsImNsaWVudF9pZF9zY2hlbWUiOiJ4NTA5X3Nhbl9kbnMiLCJyZXNwb25zZV9tb1RlIjoiZGly
ZWN0X3Bvc3Quand0IiwicmVzcG9uc2VfdXJpIjoiaHR0cHM6Ly9leGFtcGxlLmNvbS8xMjM0NS9yZXNwb25zZ
SJ9.soGhN5x6f5vkFE7iPVrqCwpXooek2lnjfI2N68FGW9rTwv3MKSkOZaMs5jfjbRh91P-M7JSTXrqoM3Ban
DLy1Q

-----------------------------------------
Example: Ephemeral Private Reader Key JWK
-----------------------------------------
{
  "kty": "EC",
  "d": "_Hc7lRd1Zt8sDAb1-pCgI9qS3oobKNa-mjRDhaKjH90",
  "use": "enc",
  "crv": "P-256",
  "x": "xVLtZaPPK-xvruh1fEClNVTR6RCZBsQai2-DrnyKkxg",
  "y": "-5-QtFqJqGwOjEL3Ut89nrE0MeaUp5RozksKHpBiyw0",
  "alg": "ECDH-ES",
```

```
  "kid": "P8p0virRlh6fAkh5-YSeHt4EIv-hFGneYk14d8DF51w"
}

----------------------------------------
Example: Ephemeral Public Reader Key JWK
----------------------------------------
{
  "kty": "EC",
  "use": "enc",
  "crv": "P-256",
  "x": "xVLtZaPPK-xvruh1fEClNVTR6RCZBsQai2-DrnyKkxg",
  "y": "-5-QtFqJqGwOjEL3Ut89nrE0MeaUp5RozksKHpBiyw0",
  "alg": "ECDH-ES",
  "kid": "P8p0virRlh6fAkh5-YSeHt4EIv-hFGneYk14d8DF51w"
}
```

B.6.4 OID4VP example — Presentation Submission

The following is an example of the Presentation Submission structure

```
--------------------------------
Example: Presentation Submission
--------------------------------
{
  "definition_id": "mDL-sample-req",
  "id": "mDL-sample-res",
  "descriptor_map": [
    {
      "id": "org.iso.18013.5.1.mDL",
      "format": "mso_mdoc",
      "path": "$"
    }
  ]
}
```

B.6.5 OID4VP example — VP token

The following is an example of the VP token:

```
-----------------
Example: VP Token
-----------------
o2ZzdGF0dXMAZ3ZlcnNpb25jMS4waWRvY3VtZW50c4GjZ2RvY1R5cGV1b3JnLmlzby4xODAxMy41LjEubURMb
GRldmljZVNpZ25lZKJqZGV2aWNlQXV0aKFvZGV2aWNlU2lnbmF0dXJlhEOhASag9lhAZIIUI8retZS5btJ9TG
yaMt7j1nQm1DUy5FyG_98yKOOWNOtizwY41CipQOMGZ5d7Plh722-YQrSCpZTNBIYjxmpuYW1lU3BhY2Vz2Bh
BoGxpc3N1ZXJTaWduZWSiamlzc3VlckF1dGiEQ6EBJqEYIVkCYDCCAlwwggIBoAMCAQICCkdSCck8KAChX_8w
CgYIKoZIzj0EAwIwRTELMAkGA1UEBhMCVVMxKTAnBgNVBAMMIElTTzE4MDEzLTUgVGVzdCBDZXJ0aWZpY2F0Z
SBJQUNBMQswCQYDVQQIDAJOWTAeFw0yNDA0MjgyMTAyMjNaFw0yNTA3MjkyMTAyMjNaMEQxCzAJBgNVBAYTAl
VTMSgwJgYDVQQDDB9JU08xODAxMy01IFRlc3QgQ2VydGlmaWNhdGUgRFNDMQswCQYDVQQIDAJOWTBZMBMGByq
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B.6.6 OID4VP example — Authorization Response Object parameters

The following is an example of the Authorization Response Object parameters:

```
-------------------------------------------------
Example: Authorization Response Object parameters
-------------------------------------------------
```

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0VmFsdWVlU21pdGjYGFhbpGhkaWdlc3RJRARmcmFuZG9tUOTooDeEwCnlGLbbzY-ver5xZWxlbWVudElkZW50
aWZpZXJvZG9jdW1lbnRfbnVtYmVybGVsZW1lbnRWYWx1ZWhBQkNEMTIzNNgYWFWkaGRpZ2VzdElECmZyYW5kb
21Q_ctRuMUlAkselcS8sFjbJHFlbGVtZW50SWRlbnRpZmllcm9pc3N1aW5nX2NvdW50cnlsZWxlbWVudFZhbH
VlYlVT2BhYW6RoZGlnZXN0SUQGZnJhbmRvbVC_I_4SIn8VRu_qWxcclHpNcWVsZW1lbnRJZGVudGlmaWVycWl
zc3VpbmdfYXV0aG9yaXR5bGVsZW1lbnRWYWx1ZWZOWSxVU0HYGFjvpGhkaWdlc3RJRAJmcmFuZG9tUFoPu1Ae
76m2ftDBo8H1DU9xZWxlbWVudElkZW50aWZpZXJyZHJpdmluZ19wcml2aWxlZ2VzbGVsZW1lbnRWYWx1ZYKja
mlzc3VlX2RhdGXZA-xqMjAyMC0wMS0wMWtleHBpcnlfZGF0ZdkD7GoyMDI1LTAxLTAxdXZlaGljbGVfY2F0ZW
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2ZWhpY2xlX2NhdGVnb3J5X2NvZGViQkXYGFhdpGhkaWdlc3RJRANmcmFuZG9tUADrjtIGo37dMzctfKHT9J1x
ZWxlbWVudElkZW50aWZpZXJ2dW5fZGlzdGluZ3Vpc2hpbmdfc2lnbmxlbGVtZW50VmFsdWVjVVNB"
}
```

B.6.7 OID4VP example — Authorization Response Object encoded as JWT (JARM)

The following is an example of the Authorization Response Opbject encoded as JWT (JARM):

```
-------------------------------------------------------------
Example: Authorization Response Object encoded as JWT (JARM)
-------------------------------------------------------------
eyJhbGciOiJFQ0RILUVTIiwiZW5jIjoiQTI1NkdDTSIsImFwdSI6Ik1USXpORFUyTnpnNU1HRmlZMlJsWm1kb
yIsImFwdiI6IllXSmpaR1ZtWjJneE1qTTBOVFkzT0RrdyIsImtpZCI6IlA4cDB2aXJSbGg2ZkFraDUtWVNlSH
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ur4p7OiUyKZw63lEJCO23APUdfaGGJpmWW14G01GE0r3MAO6H_wDnrAUjiZGigPW1OaIrss68x7vC6rxcmh44
uwjoqTmAV5vSo7P_e-wiv5gMeFdLr7lvts7SsIh-ddb0cl_fEWMVs864xIHVyygvkd5fjb8a79PVx9ckfFSRr
3FeCItN-N7mY2HjLONhRmX3w2nD9B0AmxvKGmtolZww7VPx26IXv-FLCW_KjR8kanLVH5m_4Xx1moyF4lC7Nm
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```

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```
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```

B.6.8 OID4VP example — Authorization Response Object JWT (JARM) Header

The following is an example of the Authorization Request Object JWT (JARM) Header:

```
-----------------------------------------------------
Example: Authorization Response Object JWT (JARM) Header
-----------------------------------------------------
{
  "alg": "ECDH-ES",
  "enc": "A256GCM",
  "apu": "MTIzNDU2Nzg5MGFiY2RlZmdo",
  "apv": "YWJjZGVmZ2gxMjM0NTY3ODkw",
  "kid": "P8p0virRlh6fAkh5-YSeHt4EIv-hFGneYk14d8DF51w",
  "epk": {
    "kty": "EC",
    "crv": "P-256",
    "x": "laKMaRZltDtdJV0fmSivSI2dhGyOJilIZcXjdsheEfM",
    "y": "jwiLJu_o4PlxGg0RS3zjjT7g3mNcydj5Vc0n5Neby0Y"
  }
}

--------------------------------------
Example: Ephemeral Public MDOC Key JWK
--------------------------------------
{
  "kty": "EC",
  "crv": "P-256",
  "x": "laKMaRZltDtdJV0fmSivSI2dhGyOJilIZcXjdsheEfM",
  "y": "jwiLJu_o4PlxGg0RS3zjjT7g3mNcydj5Vc0n5Neby0Y",
}

--------------------------------------
Example: Ephemeral Private MDOC Key JWK
--------------------------------------
{
  "kty": "EC",
  "crv": "P-256",
  "x": "laKMaRZltDtdJV0fmSivSI2dhGyOJilIZcXjdsheEfM",
  "y": "jwiLJu_o4PlxGg0RS3zjjT7g3mNcydj5Vc0n5Neby0Y",
  "d": "va3rO9wvZrIqD27Se3t7R6DVbx6cHiKdzsXVyxQJP90"
}
-------------------------
Example: IACA Certificate
-------------------------
-----BEGIN CERTIFICATE-----
MIICGjCCAb+gAwIBAgIKfqh/NIWv9JsIdDAKBggqhkjOPQQDAjBFMQswCQYDVQQG
EwJVUzEpMCcGA1UEAwwgSVNPMTgwMTMtNSBUZXN0IENlcnRpZmljYXRlIElBQ0Ex
```

```
CzAJBgNVBAgMAk5ZMB4XDTI0MDQyODIxMDIyM1oXDTM0MDQyODIxMDIyNFowRTEL
MAkGA1UEBhMCVVMxKTAnBgNVBAMMIElTTzE4MDEzLTUgVGVzdCBDZXJ0aWZpY2F0
ZSBJQUNBMQswCQYDVQQIDAJOWTBZMBMGByqGSM49AgEGCCqGSM49AwEHA0IABC8v
9/5utIwwLrN/qe54sga0FSNIJGO/NO9YKWGSUWylElRskOUD7WAK9UKplzQNck3k
FeJSKUAyliG4RSIbgnyjgZYwgZMwEgYDVR0TAQH/BAgwBgEB/wIBADAOBgNVHQ8B
Af8EBAMCAQYwHQYDVR0OBBYEFEz/lSXgZZtQ7BxDClpyjcQbTTrPMB0GA1UdEgQW
MBSBEmV4YW1wbGVAaXNvbWRsLmNvbTAvBgNVHR8EKDAmMCSgIqAghh5odHRwczov
L2V4YW1wbGUuY29tL0lTT21ETC5jcmwwCgYIKoZIzj0EAwIDSQAwRgIhAMu3vC2e
eEW6r+Naqcd6NMxD1NQsA8ipV4QOe4Zl0xAzAiEA6l1vXXBXfcSULjOzw+PIrZop
gJGXXkNfK5h7jN9NVKY=
-----END CERTIFICATE-----
```

B.6.9 OID4VP example — SessionTranscript

The following is an example of the SessionTranscript:

```
-------------------------------------------------------------
Example: OID4VPHandover CBOR Hex
-------------------------------------------------------------
835820DA25C527E5FB75BC2DD31267C02237C4462BA0C1BF37071F692E7DD93B10AD0B5820F6ED8E3220D
3C59A5F17EB45F48AB70AEECF9EE21744B1014982350BD96AC0C5726162636465666768313233343536 37
383930

-------------------------------------------------------------
Example: SessionTranscript CBOR Hex
-------------------------------------------------------------
83F6F6835820DA25C527E5FB75BC2DD31267C02237C4462BA0C1BF37071F692E7DD93B10AD0B5820F6ED8
E3220D3C59A5F17EB45F48AB70AEECF9EE21744B1014982350BD96AC0C5726162636465666768313233334
353637383930
```