Simple Policy Transfer Binding - a DRAFT version

This is a binding for a very simple approach to return data only when a given policy has been signed. It can be easily applied to e.g. AAS (Asset Administration Shell).

General - TODO

This IDS protocol binding is clearly syncronous instead of async communication in the regular `https` binding.

TODO

As described in Information Model - Offer, the offer MUST NOT include a `target` because it gets it implicitly from its eclosing context.

On the other hand, an `agreement` MUST include a `target` which identifies exactly 1 `asset`.

Binding state machine

1: HEAD request

2: HEAD response with 'Policy' Http header containing a URL with hash identifier of the policy (in case only 1 policy is allowed) OR 'Dataset' header with a link to a dcat dataset endpoint from which a policy can be selected.

3: Consumer signs policy hash and sends it as Http Header 'Policy' field (jwt)

4: Provider sends Http status code other than 403 Forbidden. That can be any status code that might happen during a data transfer

Data Space decision (1 of the following options) in the 'Policy' Http header in the Response:

Provider sends policy hash applying to the data response (no link to the request)

Provider sends cross-signed policy (response linked to the request)

Provider sends the cross-signed policy + content hash (response linked to the request AND data content)

5: Consumer checks response 'Policy' header and terminates the protocol state machine.

Provider_Finalized state does NOT exist in this binding.

Any Http error status code terminates the protocol state machine.

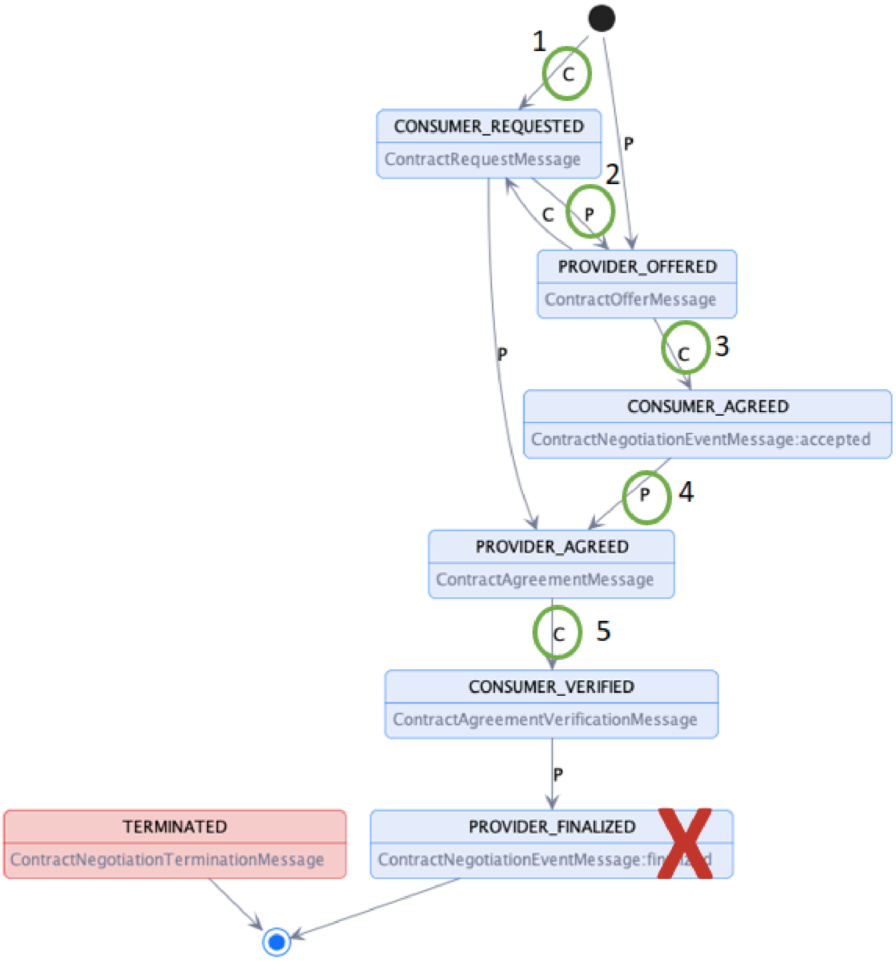


Figure 1: State Machine

State machine can also be started with 3) alternatively.

Detailed descriptions in the following sections

Catalog Binding

1 Introduction

This specification defines a HTTP method binding for the Catalog Protocol.

This binding does explicitly remove the `/catalog` endpoint! It rather provides individual endpoints, mainly RESTful endpoints to query `policies` or `datasets` from. A `dataset` can contain multiple `policies`.

The resource itself is discovered via an out-of-band process. E.g. using a AAS (asset administration shell) registry or any other lookup system to identify the desired resource.

2 Path Bindings

2.1 `catalog/request` endpoint

NOT valid for this binding and replaced with

2.2 HTTP HEAD request to the resource

A HTTP *HEAD* request to the desired resource returns no content / body, but only headers. The response header contains either:

Option 1 An https binding compliant `dataset` endpoint:

```
HEAD https://servername/myresource/12345

Dataset: https://servername/catalog/dataset/1
```

The `Dataset` Header field contains the information which `Dataset` / `Asset` is relevant for this resource. This needs to be fetched. It contains a list of `offers`:

```
GET https://servername/catalog/dataset/1

{
    // dcat dataset structure, including offers with policies
}
```

Prerequisite 1: policies inside the dataset must be identifiable by a unique hash / hash url for the later shortened negotiation / transfer process.

Prerequisite 2: The `target` istself *MUST NOT* be part of the policy! The binding between policy AND resource happens in a different

manner. It is an implicit binding by the context of the requested resource

Option 2: A Policy-Hash Endpoint, pointing to a policy that applies to the content of that resource, hashed and thus uniquely identifiable. This option is a short-hand option in case only 1 policy is possible with the requested resource and the consumer doesn't have a way to select from a list ('. . . take it or leave it. . . '):

```
HEAD https://servername/myresource/12345

Policy: https://servername/policies/sha256-123X
```

2.3 `catalog/datasets{id}` endpoint

Same as in the https binding. Only relevant for *Option 1.*

TODO: quniquely identifiable policies in the form of hasehed URLs TODO: `target` *MUST NOT* be part of the policy TODO: example

2.4 `policies/{policy_hash}` endpoint

Extends the `dcat catalog` by a `policy repository` Returns the policy content via the requested policy hash.

Contract Negotiation Binding

Introduction

A negotiation process WITH *counter offers* is out of scope! The typical case is that a provider sets the policies that neeed to be accepted.

The `negotiation` is mainly a consumer internal decision whether to accept one of the offers or not and subsequently signing the policy-hash (url).

Transfer Binding

Introduction

The transfer is initiated with a HTTP *GET* request to the resource.

It needs to contain a signed policy requested via the `catalog` process before.

Authorization

Request:

```
GET https://servername/myresource/12345

Policy: base64(signed(jwt(payload: 'policy-sha256-123X)))
```

JWT payload example:

```
{
    "policy": "https://servername/policies/sha256-123X",
    "audience": "https://servername/myresource/12345"
}
```

Response:

```
Header:
Policy: https://servername/policies/sha256-123X

Payload:
{
    "hello": "world"
}
```

The provider can easily store the `Policy` JWT for later prove that the consumer consumed a specific resource (`audience`) under a given (signed) usage policy.

Optionally, the response can be signed, too, for the consumer to have a prove which policy was required to being applied to the recieived data.

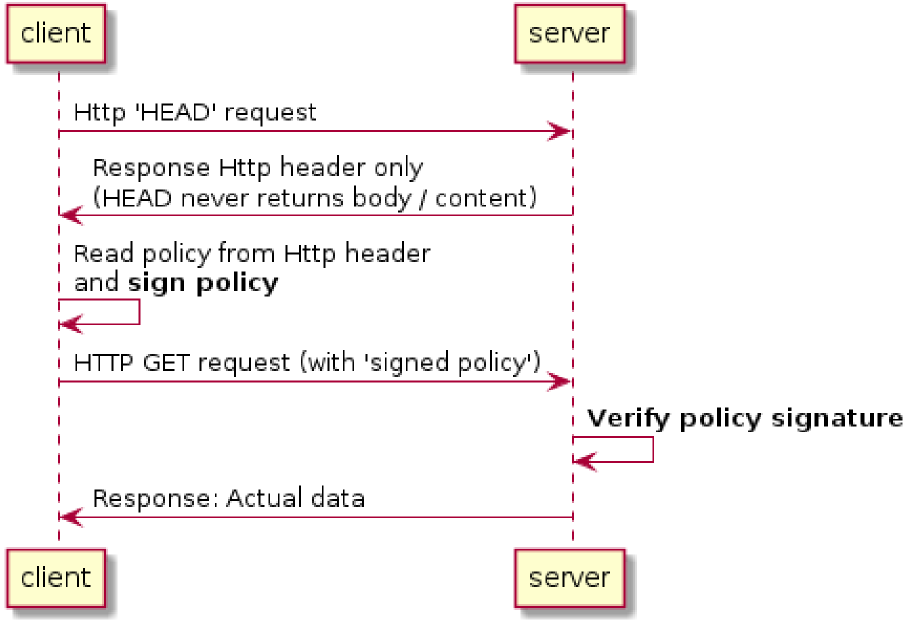
```
Header:
Policy: provider_signature(consumer_policy_token, Policy)

Payload:
{
    "hello": "world"
}
```

Token Signing

There are multiple existing signing approaches. It's up to the dataspace to decide which one applies. The following section is a non-normative list of examples:

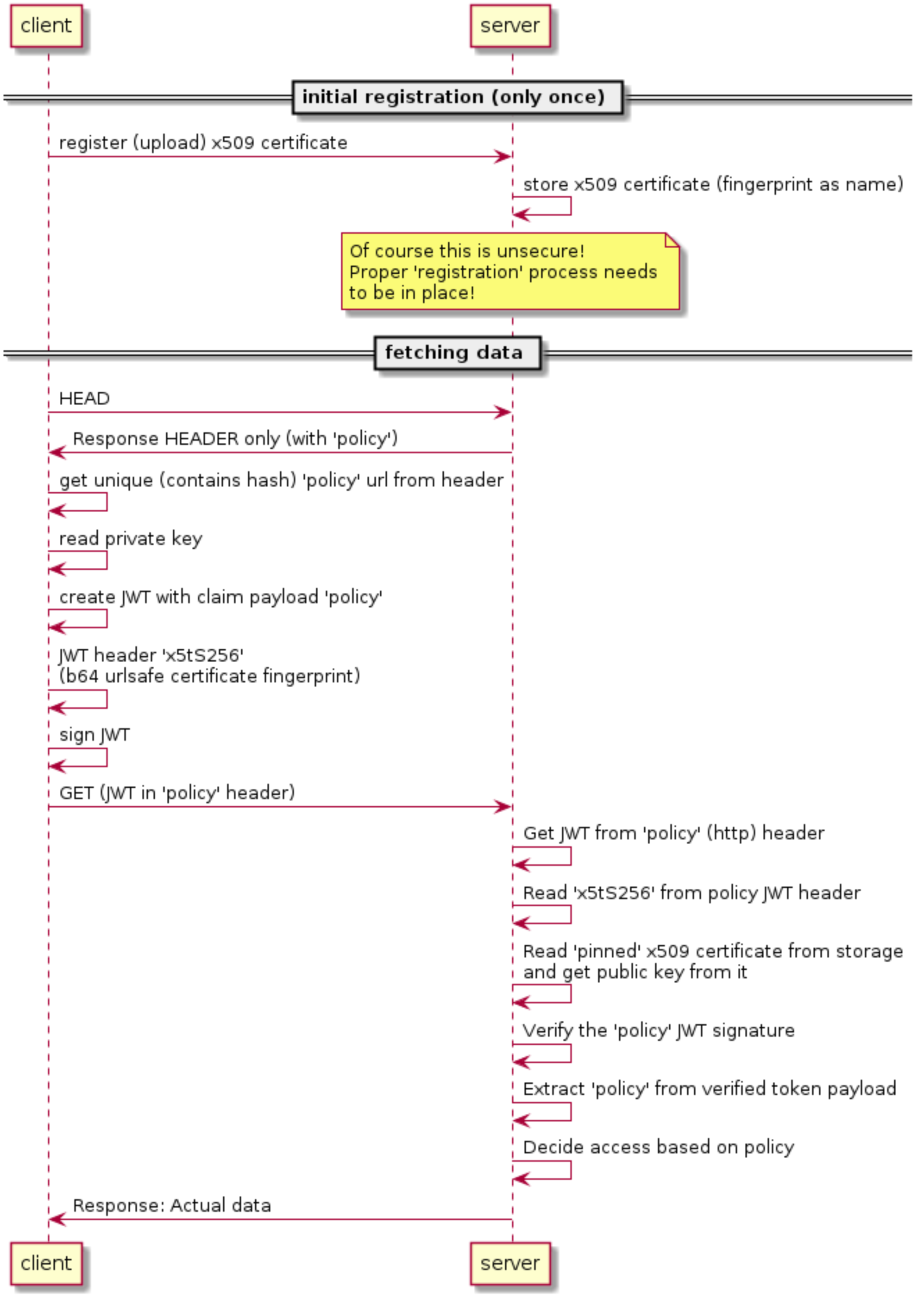
General Flow


client
server
Http 'HEAD' request
Response Http header only
(HEAD never returns body / content)
Read policy from Http header
and **sign policy**
HTTP GET request (with 'signed policy')
Verify policy signature
Response: Actual data
client
server

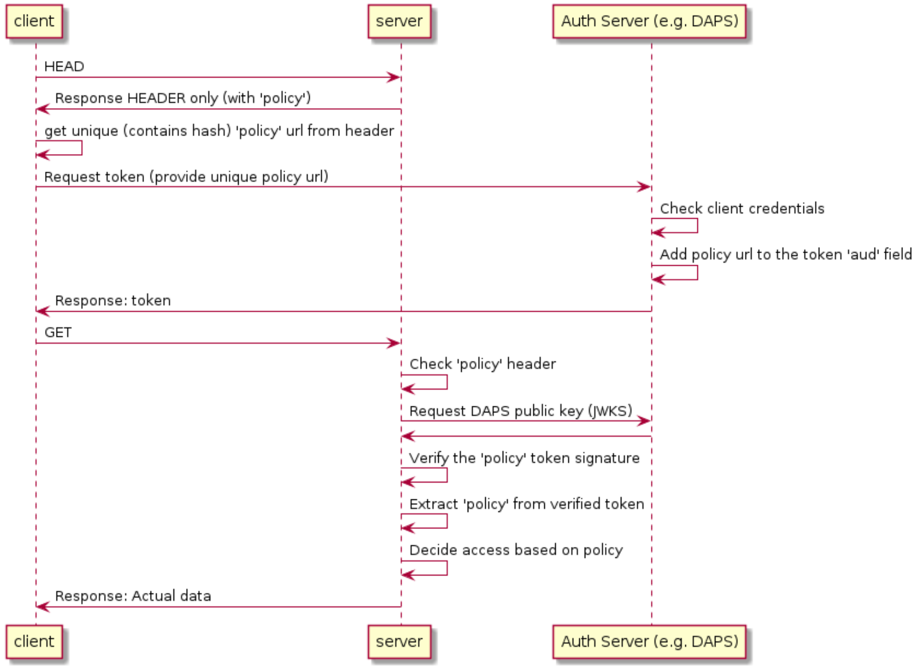
x509 with trusted root CA

TODO

x509 with pinned certificates


client
server
initial registration (only once)
register (upload) x509 certificate
store x509 certificate (fingerprint as name)
Of course this is unsecure!
Proper 'registration' process needs
to be in place!
fetching data
HEAD
Response HEADER only (with 'policy')
get unique (contains hash) 'policy' url from header
read private key
create JWT with claim payload 'policy'
JWT header 'x5tS256'
(b64 urlsafe certificate fingerprint)
sign JWT
GET (JWT in 'policy' header)
Get JWT from 'policy' (http) header
Read 'x5tS256' from policy JWT header
Read 'pinned' x509 certificate from storage
and get public key from it
Verify the 'policy' JWT signature
Extract 'policy' from verified token payload
Decide access based on policy
Response: Actual data
client
server

indirect signing via an auth server, e.g. DAPS


client
server
Auth Server (e.g. DAPS)
HEAD
Response HEADER only (with 'policy')
get unique (contains hash) 'policy' url from header
Request token (provide unique policy url)
Check client credentials
Add policy url to the token 'aud' field
Response: token
GET
Check 'policy' header
Request DAPS public key (JWKS)
Verify the 'policy' token signature
Extract 'policy' from verified token
Decide access based on policy
Response: Actual data
client
server
Auth Server (e.g. DAPS)

SSI based signing

TODO

SSI with Verifiable Credentials signing

TODO