

CATENA-X
STANDARD



CX - 0001 EDC DISCOVERY API

PLATFORM CAPABILITY: DATA DISCOVERY SERVICES

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Note: Please specify the platform capability in the subject line

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RELEASE HISTORY

Version	Release Date	Description
1.0.0	30. November 2022	Initial version by Catena – X Association
1.0.1	6. March 2023	Addendum for Conformity Assessment added

Contents

- Introduction and Overview 4
- 1. Initial Situation 4
- 2. Consideration and specifications 5
 - 2.1. Considerations 5
 - 2.2. Specification - the EDC Discovery Service in Action 6
- 3. API of EDC Data Discovery Service 7
 - 3.1. INTERFACE 7
 - 3.2. IMPLEMENTATION 7
 - 3.3. Out of scope entites and information 8
- 4. Use Cases of using the EDC Discovery Service 8
- 5. Related standards 9

INTRODUCTION AND OVERVIEW

The need to create data standards for the whole automotive value chain and to encourage global data sharing is growing, but this is not just due to the formation of new industry networks (like Catena-X). The definition and introduction of a cross-industry standard for the discovering of EDC instances is crucial for the networking of OEMs, suppliers, consumers, and industrial partners to automatically look up services and data. *(Remark: The EDC is a separate component that is needed to enable a sovereign data exchange. For more details about the EDC, please refer to [Standardization SC-002])*

As the Catena-X network expands, a sizable amount of data assets will be available via EDC connection technology. It could be difficult to efficiently identify the proper EDC endpoint within the network. In order to immediately find EDC instances throughout the network, a BPN number inquiry will soon be required.

The following serves as the Platform Capability Data Discovery Services' technical documentation for the EDC Discovery Service. First, the EDC Discovery Service's beginning condition is laid out, highlighting the current problem with an efficient discovery. Next, the relationships between other objects and the EDC Discovery Service are laid up. The EDC Discovery API is then covered in detail in the documentation with examples. Finally, use cases are highlighted for using the EDC Discovery Service.

1. INITIAL SITUATION

Participants do not want their personal information made public. As a result, these may only be searched indirectly, which necessitates knowing or establishing who the data should be obtained from. Because no one wants to examine every EDC instance (load of the net, latency becomes ever larger with increasing number of participants, procedure does not scale thus). As a result, the number of EDC instances requested must be limited by suitable filters. As a result, subscribers must first determine who may have the data depending on their specific circumstances. This is performed by utilizing the EDC discovery service. The BPN number is currently the only criterion provided for restricting the EDC instances in question. *(Remark: The BPN is a unique, unchangeable identifier for Business Partners. Internally, the EDC uses the BPN [Standardization BPM-001] to query business partners)*

In the future the resolution BPN -> EDC instance might happen via the Gaia-X Self Descriptions (SD), but this is not yet feasible with the current version of the Gaia-X Trust Framework (v.22.04). As a result, the SD cannot be used now, and the only way that remains available is using the "ServiceOffering" at this time. But that is not optimal yet, especially for use cases involving decentralized Digital Twin registration or Traceability use case. They require a service to retrieve URL of EDC instances of interest related to a corporation defined by its Business Partner Number (BPN), but there will also be other cases when additional features could be needed to identify EDC instances of interest. Especially for the Traceability use case, where sometimes in the cause to identify a responsible EDC no BPN is provided.

Moreover, the GAIA-X Trustframework is still being developed. It is possible to query for data services, particularly EDC instances, even though not all necessary forms of Self Descriptions are described. Therefore, we must use the EDC Discovery Service as a workaround until the Trustframework of GAIA-X delivers all necessary Self Descriptions to properly query for data assets.

The EDC Discovery Service API aims to offer a quick and automatic approach of finding EDC instances and data services. As part of the EDC instance discovery process, it is essential to ensure interoperability with semantics and data sovereignty, compliance with GAIA-X and IDSA, support for private descriptions and private data services that are not visible to all participants, and the ability to find EDC instances for use cases like traceability and decentralized digital twin registry (DTR).

2. CONSIDERATION AND SPECIFICATIONS

2.1. Considerations

Sovereignty:

Participants do not want their information made public. As a result, these may only be searched indirectly, which requires knowing or figuring out from whom the data is to be obtained. Because one does not want to ask about every EDC instance (load of the net, latency becomes ever larger with increasing number of participants, procedure does not scale thus). As a result, the quantity of requested EDC instances must be constrained by appropriate filters. As a result, the subscribers must first identify potential data owners from their settings. For this, the EDC discovery service is employed. The BPN number is currently the only criterion provided for restricting the EDC instances in question.

Performance:

We will have a significant amount of data assets accessible through EDC connection technology as the Catena-X network grows. It may be challenging to quickly locate the correct EDC endpoint inside the network (without using broadcast or multicast). It will soon be necessary to query EDC instances across the network by BPN number for effective discoverability.

GAIA-X-Trustframework:

The GAIA-X-Trustframework is still in development. As long as not all of the required categories of Self Descriptions are specified in order to query for data services and, in particular, EDC instances. As a result, until the GAIA-X Trustframework delivers all required Self Descriptions to properly query for data assets, we must use the EDC Discovery Service as a workaround.

Please note that we do not specify a standard, but rather a reference implementation for the time being. This can be considered as a temporary solution that will be superseded by the search interface of a future GAIA-X Federated Catalog.

2.2. SPECIFICATION - THE EDC DISCOVERY SERVICE IN ACTION

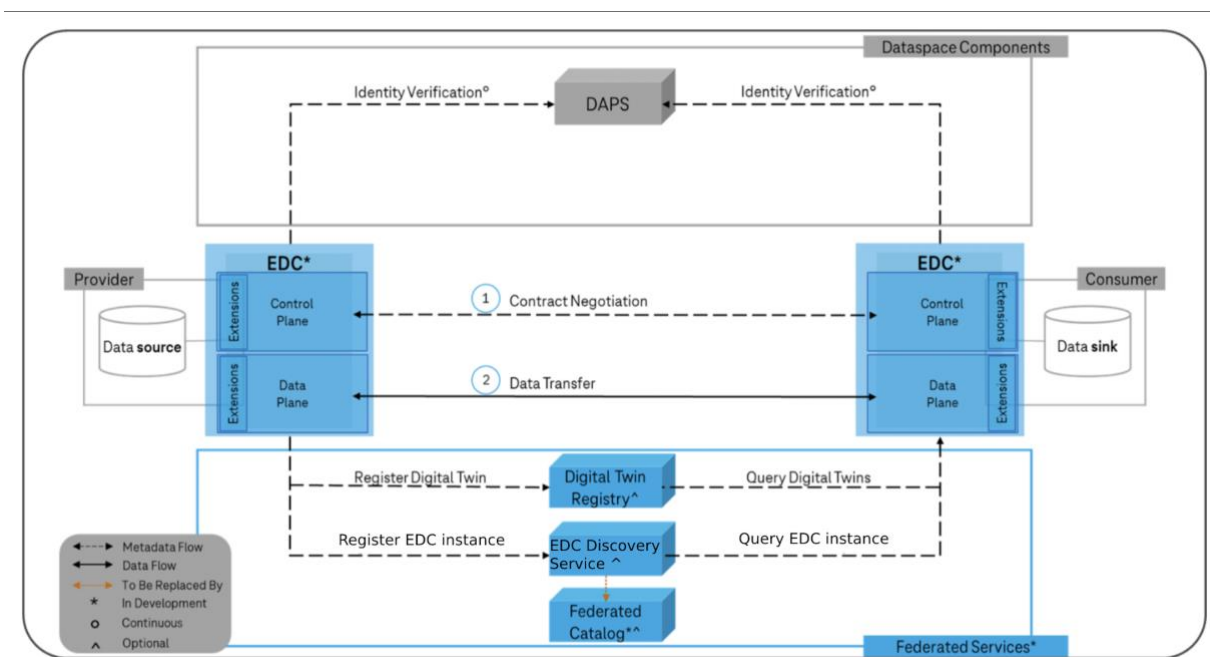


FIGURE 1 MAIN COMPONENTS

The diagram above depicts a high-level overview of the EDC Discovery Service workflow. Both connectors must be registered within an identity provider, such as DAPS, which can register assets and expose them to a metadata

broker for other connectors to find. The consumer can then obtain contract offers from the provider and begin contract negotiations.

The EDC Discovery Service: During the onboarding process of EDC instances, the instance will be registered at EDC Discovery Service. This service can be requested to provide the link for EDC instances queried by BPN number. Please note that in the future some other attributes could be extended to support querying by other attributes as well.

Federated catalog: The federated catalog is used by the provider to offer their assets within the dataspace. The consumer uses the federated catalog to search for available assets. Both the provider and consumer use self-descriptions to list and search for assets in the federated catalog, which are made publicly available. Digital twin registry. A digital twin is the virtual representation of an asset.

The Digital Twin Registry: is used for a provider to register their digital twins, as well as asset implementation and identifiers for a digital twin. Additionally, consumers can search for these digital twins and receive information about them and their endpoints.

3. API OF EDC DATA DISCOVERY SERVICE

3.1. INTERFACE

The EDC / dataspace discovery interface is a CX network public available endpoint which can get used to retrieve EDC endpoints and the related BPNs, as well as search for endpoints via the BPN. Please note that EDC API Version considered is 0.1.0

To be provided attributes (Focus only on BPN for Release 2)

- BPNL, or
- BPNS, or
- BPNA contains the complete data set (name and address).

Please note that in the future (i.e., starting from Release 3) some other attributes could be extended to support querying by other attributes as well.

3.2. IMPLEMENTATION

The EDC discovery endpoint can get triggered via technical as well as real users, if relevant roles are available.

Please note that EDC API Version considered is 0.1.0

Endpoint: POST: /api/administration/connectors/discovery

Request body

The request body is expecting a list of BPNs for which the EDC endpoint should get be fetched. Please add minimum one BPN.

```
[  
  "BPNL....",  
  "BPNL...."  
]
```

Response structure

```
[  
  {  
    "bpn": "bpn number (aggregated)"  
    "connectorEndpoint":  
      [  
        "string (connectorUrl from table portal.connectors)",  
        "string (connectorUrl from table portal.connectors)"  
      ]  
  }  
]
```

in case of an empty response, no EDC is found for the requested BPNs

3.3. OUT OF SCOPE ENTITES AND INFORMATION


The following entities or information are currently out of scope for the EDC Discovery Service API

- Establishing a kind of name convention for artifacts of data/service offering to enable filtering of them. This might be investigated as Task of PI6, and is not available yet
- Service Discovery intends to query for offers using GAIA-X standards based on Self Descriptions.

4. USE CASES OF USING THE EDC DISCOVERY SERVICE

The aim of Catena-X is to enable an EDC-integrated, decentralized deployment of digital twin registries, keeping the data as close to the data owners as feasible. One key component to achieving data sovereignty is decentralization. Decentralized registries will be a feature of future PIs, thus solutions and use cases must adapt. However, the practicality of a decentralized solution must be proven via an End to End scenario prior to starting a Catena-X global deployment. We intend to concentrate more particularly on the following elements:

- a. Decentralized Registries require Digital Twins to be discovered in a three-step approach.
 - i. First find the EDCs of potential Digital Twin owners.
 - ii. Second, query those EDCs for their Digital Twin Registry
 - iii. Third discover the twin in that respective registry or registries.

- b. This will require some additional information to be added to a discovery request in addition to the UUID of a twin.
 - i. Best case: BPN of the owner of the Digital Twin is known and the query has only to be made to the EDCs of that BPN and subsequently to its Digital Twin Registries
 - ii. Worst case: Only knowing the UUID will result in a complete broadcast request to 275k+ members as per planning for each request  as the UUID is non-structured and does not hold any information for any kind of segmentation.

5. RELATED STANDARDS

The following standards are related to or typically used by the EDC Discovery Service API:

- CX - 0018 ECLIPSE DATA SPACE CONECTOR (EDC)
- CX - 0010 BUSINESS PARTNER NUMBER (BPN)

ADDENDUM FOR CONFORMITY ASSESSMENT

DISCLAIMER

The following pages are not part of the standard documentation.

CATENA-X
ADDENDUM FOR CONFORMITY
ASSESSMENT



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TABLE OF CONTENTS

About this Document & Motivation	1
Disclaimer & Liability.....	2
Revisions & Update.....	2
Copyright & Trademarks	3
Abstract.....	4
1 Introduction	5
1.1 Audience & Scope	5
1.2 Context.....	5
1.3 Architecture Overview	6
1.4 Conformance.....	6
1.5 Proof of conformity.....	7
1.6 Examples	7
1.7 Terminology	10
2 EDC Discovery API [NORMATIVE]	10
2.1 Preconditions and dependencies.....	11
2.2 API Specification	11
2.2.1 API Endpoints & resources	11
2.2.2 Available Data Types.....	12
2.2.3 EDC Data Asset Structure	12
2.2.4 Error Handling.....	12
3 References	13
3.1 Normative References	13

ABOUT THIS DOCUMENT & MOTIVATION

The **standards of the Catena-X data ecosystem** define how the exchange of data and information in our network works. They are the basis for ensuring that the technologies, components, and processes used are developed and operated according to uniform rules.

The addendum for conformity assessment clarifies the requirements and scope for each standard. It contains conformity assessment criteria (CAC) that specify how a participant can receive a certificate for the correct application of the standard.

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ABSTRACT

The definition and introduction of a cross-industry standard for the discovering of EDC instances is crucial for the networking of OEMs, suppliers, consumers, and industrial partners to automatically look up services and data. In a high competing eco systems data are the new oil. Even meta data on data offerings can provide business sensitive information. Hence even meta data for data offerings will be secured via an EDC endpoint.

As the Catena-X network expands, a sizable amount of data assets will be available via EDC connection technology. It could be difficult to efficiently identify the proper EDC endpoint within the network.

To be GAIA-X compliant each EDC endpoint must provide a Self Description (SD) of type ServiceOffering. Based on these SD a Data & Service Discovery Service must be provided to easily look up suitable EDC instances to query data offerings efficiently.

1 INTRODUCTION

Participants do not want their personal information made public. As a result, these may only be searched indirectly, which necessitates knowing or establishing who the data should be obtained from. Because no one wants to examine every EDC instance (load of the net, latency becomes ever larger with increasing number of participants, procedure does not scale thus). As a result, the number of EDC instances requested must be limited by suitable filters. As a result, subscribers must first determine who may have the data depending on their specific circumstances. This is performed by utilizing the EDC discovery service. The Business Partner Number (BPN) is currently the only criterion provided for restricting the EDC instances in question.

This standard has not the scope and intention to be a general solution pattern to search and discover any service and data offer. It is limited to look up the EDC instance in front of these service and data offerings.

1.1 AUDIENCE & SCOPE

This section is non-normative

This standard is relevant for the following roles:

- Data Provider / Consumer
- Business Application Provider
- Core Service Provider
- Onboarding Service Provider
- Enablement Service Provider

For now, the EDC Discovery API is limited to filter suitable EDC instances based on BPN number providing data and service offerings. This document describes the relevant API endpoint to be created by an operating company to enable EDC discovery by supported criterions (currently on the BPN number).

1.2 CONTEXT

This section is non-normative

The EDC Discovery API is used to search and find service and data offerings. In a network of network this is the most crucial topic to build value added data services and data chains.

1.3 ARCHITECTURE OVERVIEW

This section is non-normative

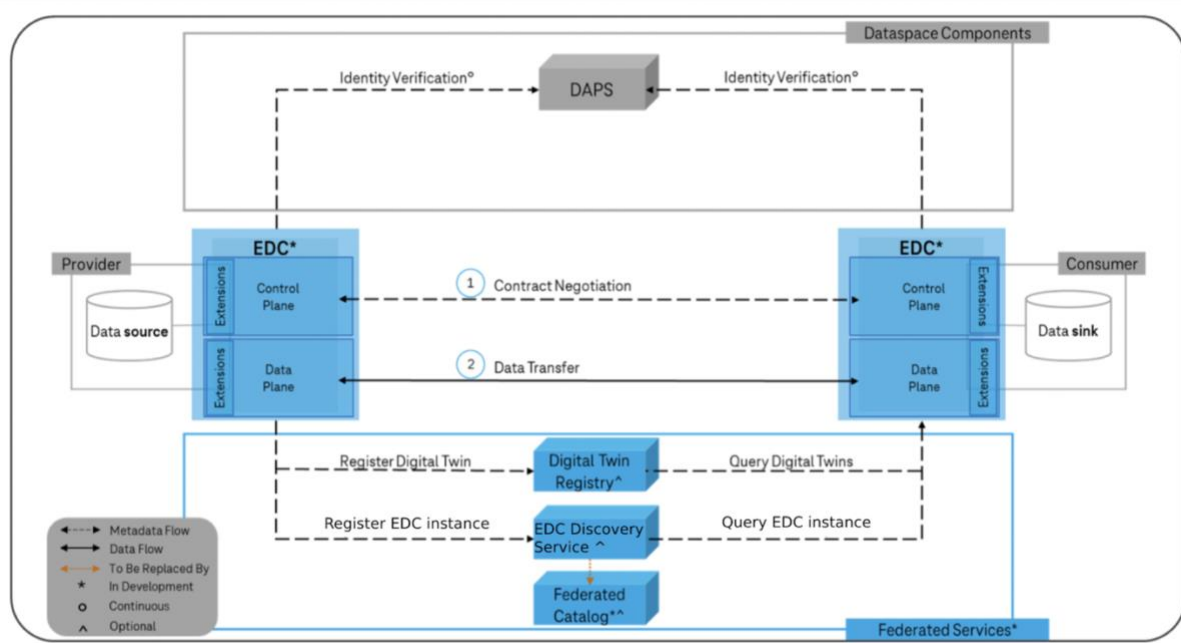


Figure 1 Main Components

In Figure 1 a high-level overview of the EDC Discovery Service workflow is sketched. Both connectors must be registered within an identity provider, such as a Dynamic Attribute Provisioning Service (DAPS). Any data provider can register assets and expose them to a metadata broker (Federated Catalog) for other consuming connectors to find. For Registration Self Descriptions of Type LegalPerson and ServiceOffering for the providing EDC instance must be registered at the federated catalog. Via EDC Discovery Service the EDC instance can be queried via BPN number, which is part of the SD artifacts. Finally, the consumer can obtain contract offers from the provider and begin contract negotiations. The federated Catalog will be the storage of SD and the EDC Discovery Service the query API to retrieve URL of EDC instance of interest. The Digital Twin Registry in the picture is a potential decentral component which might be hidden behind a data providing EDC. Then any consumer has to identify the providing EDC to get access to the DTR behind that EDC.

1.4 CONFORMANCE

As well as sections marked as non-normative, all authoring guidelines, diagrams, examples, and notes in this specification are non-normative. Everything else in this specification is normative.

The key words MAY, MUST, MUST NOT, OPTIONAL, RECOMMENDED, REQUIRED, SHOULD and SHOULD NOT in this document are to be interpreted as described in [BCP 14 \[RFC2119\]](#) [\[RFC8174\]](#) when, and only when, they appear in all capitals, as shown here.

1.5 PROOF OF CONFORMITY

This section is non - normative

All participants and their solutions will need to prove, that they conform with the Catena-X standards. To validate that the standards are applied correctly, Catena-X employees Conformity Assessment Bodies (CABs).

- The Service Operator MUST provide an onboarding process for participants and EDC instances. According to CX - 0006 Registration and initial onboarding
- The implemented service MUST use an SD storage like SD-Hub or Federated Catalogue for storing the SD documents provided during the onboarding process.
- The provided SD documents MUST be GAIA-X compliant, i.e. MUST provide a compliance credential issued from GAIA-X AISBL.
- The implemented service SHOULD use the SD storage as source of truth.

A test case will be, that an EDC instance has to be onboarded for a specific participant identified by a BPN. The SD for the EDC must be visible in the supported SD storage. The query against this new registered EDC instance for the given BPN should provide the connector url as stated in the SD document.

1.6 EXAMPLES

SD for Legal Person

```
{
  "id": https://compliance.gaia-x.eu/.well-known/participant.json,
  "@context": [
    https://www.w3.org/2018/credentials/v1,
    https://registry.gaia-x.eu/v2206/api/shape/files?file=participant&type=jsonld,
    https://raw.githubusercontent.com/eclipse-tractusx/sd-factory/main/src/main/resources/verifiablecredentials.jsonld/sd-document-v22.10.jsonld,
    https://w3id.org/vc/status-list/2021/v1
  ],
  "type": [
    "VerifiableCredential",
    "LegalPerson"
  ],
  "issuer": "did:sov:Bq3Nk9Z7sT8KeqNCnG4PrB",
  "issuanceDate": "2022-09-23T23:23:23.235Z",
  "credentialSubject": {
    "ctxsd:bpn": "1234",
    "id": "did:web:compliance.gaia-x.eu",
    "gx-participant:name": "Gaia-X AISBL",
    "gx-participant:legalName": "Gaia-X European Association for Data and Cloud AISBL",
    "gx-participant:registrationNumber": {
      "gx-participant:registrationNumberType": "local",
      "gx-participant:registrationNumberNumber": "0762747721"
    },
    "gx-participant:headquarterAddress": {
      "gx-participant:addressCountryCode": "BE",
      "gx-participant:addressCode": "BE-BRU",
      "gx-participant:streetAddress": "Avenue des Arts 6-9",
      "gx-participant:postalCode": "1210"
    }
  },
}
```



```

],
"type":
  "VerifiableCredential",
  "ServiceOfferingExperimental"
],
"id": "https://compliance.gaia-x.eu/.well-known/serviceComplianceService.json",
"issuer": "did:web:delta-dao.com",
"issuanceDate": "2022-09-25T23:23:23.235Z",
"credentialSubject": {
  "id": "https://compliance.gaia-x.eu/.well-known/serviceComplianceService.json",
  "gx-service-offering:providedBy": "https://compliance.gaia-x.eu/.well-known/participant.json",
  "gx-service-offering:name": "Gaia-X Lab Compliance Service",
  "gx-service-offering:description": "The Compliance Service will validate the shape and content of Self Descriptions. Required fields and consistency rules are defined in the Gaia-X Trust Framework.",
  "gx-service-offering:webAddress": "https://compliance.gaia-x.eu/",
  "gx-service-offering:termsAndConditions": [
    {
      "gx-service-offering:url": "https://compliance.gaia-x.eu/terms",
      "gx-service-offering:hash": "myrandomhash"
    }
  ],
  "gx-service-offering:gdpr": [
    {
      "gx-service-offering:imprint": "https://gaia-x.eu/imprint/"
    },
    {
      "gx-service-offering:privacyPolicy": "https://gaia-x.eu/privacy-policy/"
    }
  ],
  "gx-service-offering:dataProtectionRegime": [
    "GDPR2016"
  ],
  "gx-service-offering:dataExport": [
    {
      "gx-service-offering:requestType": "email",
      "gx-service-offering:accessType": "digital",
      "gx-service-offering:formatType": "mime/png"
    }
  ],
  "gx-service-offering:dependsOn": [
    "https://compliance.gaia-x.eu/.well-known/serviceManagedPostgreSQLOVH.json",
    "https://compliance.gaia-x.eu/.well-known/serviceManagedK8sOVH.json"
  ],
  "ctxsd:connector-url": "https://myconnector.de"
},
"proof": {
  "type": "JsonWebSignature2020",
  "created": "2022-09-25T22:36:50.274Z",
  "proofPurpose": "assertionMethod",
  "verificationMethod": "did:web:compliance.gaia-x.eu",
  "jws": "eyJhbGciOiJIUzI1NiIsImI2NCI6ZmFsc2UsImNyZXQlOiI119..Chbzpl0-4S3sobkKXyBjfx6pm74xLHInOmruHU0--3HpMcrfKldeJQPYLrUWsEJ1HIjMUqxE6QymZRxxFuR1AJKy2nwyM3S5sFX9YJ8bepBcf6q-nWGTDX-jh8wuyX3lwrG94aJnTBBYKPLCovSiZ9BURR3cwiSHczBlM7iP90ee5roHOtI-eoqSBYrYaynTaK5eQawfT-20dXYgqVPSRJAK2KD5AqEM8KU7x6nnP6-shgSNBIEC1fAOTfAEUYkcrK8Tn4BTaH02Hn03B90S1MwyAWwBzrnmS915CFY4BiHsp9Tz7pt016c8HB8HE7gqoXndk7DUhzgNE2mRbHuLg"
}
},
"complianceCredential": {
  "@context": [
    "https://www.w3.org/2018/credentials/v1"
  ],
  "type":

```

```

    "VerifiableCredential",
    "ServiceOfferingCredentialExperimental"
  ],
  "id": "https://catalogue.gaia-x.eu/credentials/ServiceOfferingCredentialExperimental/1664145414932",
  "issuer": "did:web:compliance.gaia-x.eu",
  "issuanceDate": "2022-09-25T22:36:54.932Z",
  "credentialSubject": {
    "id": "https://compliance.gaia-x.eu/.well-known/serviceComplianceService.json",
    "hash": "eeac8a9b5b6750f13fbc548299b22b73d6beea13f19e71856d0027b5cd42069c"
  },
  "proof": {
    "type": "JsonWebSignature2020",
    "created": "2022-09-25T22:36:54.932Z",
    "proofPurpose": "assertionMethod",
    "jws": "eyJhbGciOiJIUzI1NiIsImI2NCI6ZmFsc2UsImNyaXQiOlsiYjY0Ii19..SibPFxPtfsKP439SjoKo5VtmU_EpgsfuEjghCt_8sG2fUYT6s9CTY8jyEniGUkK7BIWnIYNsuuKud1NBD27kwzdTy6bZX9Jq00aAaCpgZAZ9v1p7oFZF3ysLcERmBAixzGUjL0sny06Mu7IRCcDYVhLyd6f10vUGtH2I6T9u6UZL8cN1advRYKd4BSumAp5d4cCG-7cg7DCqPXk_M8cTvU8mDeXvXfciv7sIqvkwqd2L-T4kbxmPTCY3r3wPoVHGBDa3Gnntwkz3_aVInjbtchH-Wm1DpCPv1hTv4uZNenNZVw7xsx1_o0voJJLSGt1YNhW4rk2oDxr4qie3S-Zgw",
    "verificationMethod": "did:web:compliance.gaia-x.eu"
  }
}
}

```

1.7 TERMINOLOGY

This section is non-normative

The following terms are especially relevant for the understanding of the standard:

Business Partner Number (BPN)

A BPN is the unique identifier of a partner within Catena-X.

Self Description (SD)

Gaia-X requires all providers to describe themselves and their service offerings using standardized, machine-readable metadata called Self-Descriptions. Such Self-Descriptions will for example include information like the address of a company, a specific service description or certificates and labels.

Additional terminology used in this standard can be looked up in the glossary on the association homepage.

2 EDC DISCOVERY API [NORMATIVE]

The EDC discovery endpoint can get triggered via technical as well as real users, if relevant roles are available.

For technical user, a company can request the user creation with the technical user creation feature inside the portal.

All participants and their solutions will need to proof, that they are conform with the Catena-X standards. To validate that the standards are applied correctly, Catena-X employees Conformity Assessment Bodies (CABs).

- The Service Operator **MUST** provide an onboarding process for participants and EDC instances.
- According to CX - 0006 Registration and initial onboarding
- The implemented service **MUST** use an SD storage like SD-Hub or Federated Catalogue for storing the SD documents provided during the onboarding process.
- The provided SD documents **MUST** be GAIA-X compliant, i.e. **MUST** provide a compliance credential issued from GAIA-X AIBSL.
- The implemented service **SHOULD** use the SD storage as source of truth.

A test case will be, that an EDC instance has to be onboarded for a specific participant identified by a BPN. The SD for the EDC must be visible in the supported SD storage. The query against this new registered EDC instance for the given BPN should provide the connector url as stated in the SD document.

2.1 PRECONDITIONS AND DEPENDENCIES

The self-description documents used as data source **MUST** be GAIA-X compliant, i.e. adhering to the GAIA-X Trustframework in the currently supported version in Catena-X (usually the latest published version and the version before). In addition, these SD documents **MUST** be registered at an SD storage like SD-Hub or Federated Catalogue.

2.2 API SPECIFICATION

2.2.1 API Endpoints & resources

The EDC Discovery API **MUST** be implemented as specified in the openAPI documentation as stated here: [https://....](https://...)

Endpoint: POST: `/api/administration/connectors/discovery`

Request body

the request body is expecting a list of BPNs for which the EDC endpoint should get be fetched. Please add minimum one BPN.

```
[  
  "BPNL.....",  
  "BPNL...."  
]
```

Response structure

```
[
```

```

{
  "bpn : "BPNL....."
  "connectorEndpoint":
    [
      "http://some.example.url",
      "http://some.other-example.url"
    ]
},
{
  "bpn : "BPNL....."
  "connectorEndpoint": "http://some.example.url"
}
]

```

in case of an empty response, no EDC is found for the requested BPNs

For each bpn an own response object is provided. In case of multiple EDC instances for one bpn an array is returned (first result set) otherwise a single value (second result set)

2.2.2 Available Data Types

The API MUST use JSON as the payload transported via HTTP.

2.2.3 EDC Data Asset Structure

This API do not have to be accessed via an EDC instance but can be queried from any authorized participant or service directly.

2.2.4 Error Handling

HTTP standard response codes that MUST be used.

2.2.4.1 Error Messages & Explanation

The following http response codes MUST be defined for HTTP POST endpoints:

Code	Description
200	Discovery request finished successfully
400	Request body was malformed
401	Not authorized
403	Forbidden
405	Method not allowed

3 REFERENCES

3.1 NORMATIVE REFERENCES

Following Standards are used within this standard:

- GAIA-X Trustframework: <https://gaia-x.eu/wp-content/uploads/2022/05/Gaia-X-Trust-Framework-22.04.pdf>
- CX – 0010 BUSINESS PARTNER NUMBER
- CX - 0006 REGISTRATION AND INITIAL ONBOARDING