OGC API - Joins - Part 1: Core

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i. Abstract

This document is the specification for the core module of the OGC API - Joins standard. The core module specifies a service interface that allows attribute data to be joined either with collections that are hosted on the server or directly with inputted geojson files. The joining of the datasets is executed via common identifiers that are available in both datasets. The OGC API - Joins core module supports also operations for viewing metadata and key values on collections that are available on the server. It contains also operations for accessing, updating and deleting the created joinsd.

CAUTION	This is a DRAFT version of the OGC API - Joins standard. This draft is not complete and there are open issues that are still under discussion.

ii. Keywords

The following are keywords to be used by search engines and document catalogues.

ogcdoc, OGC document, standard, Joins, API, openapi

iii. Preface

This document defines the core module of the OGC API - Joins standard. The specification is a multi-part document that can be extended by specifying extension modules to the core module.

This document does not suggest any updates to the OGC Abstract Specification

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iv. Submitting organizations

The following organizations submitted this document to the Open Geospatial Consortium (OGC):

- Finnish Geospatial Research Institute / National Land Survey of Finlad

v. Submitters

All questions regarding this submission should be directed to the editors or the submitters:

Name	**Affiliation**
Pekka Latvala *(editor)*	Finnish Geospatial Research Institute

1. Scope

This OpenGIS® standard specifies a Web API that defines the core module for the OGC API - Joins specification.

The specification contains operations for obtaining general information on the service implementation. It includes operations for accessing the API landing page, the API definition file and information on the service’s conformance to the standard.

It contains also functionalities for retrieving metadata and key values on the collections that are available on the server and operations for joining attribute data from attribute data files with these collections and accessing, updating and deleting the created joins.

The core module contains support for attribute data files in the CSV format and for spatial data files in the GeoJSON format. The support for other data formats may be defined in potential extension modules.

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2. Conformance

This standard defines 11 requirement / conformance classes.

The standardization targets of all conformance classes are "Web APIs."

The main requirements class is:

- Core.

The Core specifies requirements that all Web APIs have to implement.

The JSON encoding format is mandatory to be supported for service responses. In addition, the support for HTML encoding is recommended.

The CSV file input is mandatory to be supported for the join inputs. The GeoJSON file input may be supported for the file joining functionality.

The GeoJSON format is mandatory to be supported for the join outputs.

The Core does not mandate any encoding or format for the formal definition of the API. One option is the OpenAPI 3.0 specification and a requirements class has been specified in the OGC API - Common - Part 1.

The conformance class values defined in this core module are:

Table 1. Conformance classes defined in this module

Conformance class	**URI**
Core	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/core
Data joining	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/core/data-joining
File joining	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/core/file-joining
Join update	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/core/join-update
Join delete	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/core/join-delete
Input	
File uploading with Query	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/input/file-upload
File referencing with URL	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/input/http-ref
CSV file input	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/input/csv

GeoJSON file input	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/input/geojson
Output	
GeoJSON output for joined data	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson
Direct GeoJSON output for joined data	http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson-direct

In addition, the following conformance classes are used from the specifications OGC API - Common - Part 1 and OGC API - Common - Part 2.

Table 2. Conformance classes

Conformance class	URI
OGC API - Common - Part 1	
Core	http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core
Landing Page	http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/landing-page
OpenAPI 3.0	http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/oas30
OGC API - Common - Part 2	
Collections	http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/collections
Simple Query	http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/simple-query
HTML	http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/html
JSON	http://www.opengis.net/spec/ogcapi-common-2/1.0/conf/json

Conformance with this standard shall be checked using all the relevant tests specified in Annex A (normative) of this document. The framework, concepts, and methodology for testing, and the criteria to be achieved to claim conformance are specified in the OGC Compliance Testing Policies and Procedures and the OGC Compliance Testing web site.

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3. References

The following normative documents contain provisions that, through reference in this text, constitute provisions of this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

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- Heazel, C. (ed.): OGC: OGC 20-024, **OGC API - Common - Part 2: Geospatial Data** (in development), 2021. Available at: http://docs.opengeospatial.org/DRAFTS/20-024.pdf
- Open API Initiative (OAI): **The OpenAPI specification 3.0**, 2020. Available at: https://github.com/OAI/OpenAPI-Specification/blob/master/versions/
- Schema.org: http://schema.org/docs/schemas.html
- W3C: **HTML5**, W3C Recommendation. Available at: http://www.w3.org/TR/html5/

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4. Terms and Definitions

This document uses the terms defined in Sub-clause 5.3 of [OGC 06-121r9], which is based on the ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards. In particular, the word “shall” (not “must”) is the verb form used to indicate a requirement to be strictly followed to conform to this standard.

For the purposes of this document, the following additional terms and definitions apply.

4.1. attribute dataset

Dataset that contains attribute information that can be joined with a spatial dataset through common identifiers.

4.2. spatial dataset

Dataset that contains geometry information.

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5. Conventions and background

5.1. Identifiers

The normative provisions in this standard are denoted by the URI `http://www.opengis.net/spec/ogcapi-joins-1/1.0`.

All requirements and conformance tests that appear in this document are denoted by partial URIs which are relative to this base.

5.2. Link relations

To express relationships between resources, RFC 8288 (Web Linking) is used.

The link relation types that are used in this document are listed in Table 1.

Table 3. Link Relations

The following registered link relation types [IANA] are used in this document:	
Link Relation	**Purpose**
alternate	Refers to a substitute for this context. Refers to a representation of the current resource that is encoded using another media type (the media type is specified in the `type` link attribute).
describedby	Refers to a resource providing information about the link's context. Links to external resources that further describe the subject resource.
license	Refers to a license associated with this context.
next	Indicates that the link's context is a part of a series, and that the next in the series is the link target.
prev	Indicates that the link's context is a part of a series, and that the previous in the series is the link target.
self	Conveys an identifier for the link's context. A link to another representation of this resource.
service-desc	Identifies service description for the context that is primarily intended for consumption by machines. API definitions are considered service descriptions.
service-doc	Identifies service documentation for the context that is primarily intended for human consumption.
service-meta	Identifies general metadata for the context that is primarily intended for consumption by machines.
In addition the following link relation types are used for which no applicable registered link relation type could be identified:	
Link Relation	**Purpose**
dataset	Refers to a resource that is comprised of the metadata of the specific collection that is available on the server.
http://www.opengis.net/def/rel/ogc/1.0/conformance	Refers to a resource that identifies the specifications that the link's context conforms to.
http://www.opengis.net/def/rel/ogc/1.0/data	Indicates that the link's context is a distribution of a dataset

	that is an API and refers to the root resource of the dataset in an API.
keys	Refers to a resource that is comprised of metadata of the key fields of the collection represented by the link's context.
key-values	Refers to a resource that is comprised of key values of the collection's key field represented by the link's context.
joins	Refers to a resource that is comprised of the metadata of the created joins that are available on the server.
join	Refers to a resource that is comprised of the metadata of the specific join that is available on the server.
output	Refers to an output of the join operation that contains the joined dataset.

5.2.1. Response Schema for the Link Object

The individual hyperlink elements that make up a "links" elements are defined in the hyperlink schema, originally defined in the section 6.3 of the OGC API - Common - Part 1 specification.

Hyperlink Schema


```
{
    "$schema": "http://json-schema.org/draft-07/schema#",
    "title": "Link Schema",
    "description": "Schema for external references",
    "type": "object",
    "required": [
        "href",
        "rel"
        ],
    "properties": {
        "href": {
            "type": "string",
            "description": "Supplies the URI to a remote resource (or resource fragment).",
            "example": "http://data.example.com/buildings/123"
            },
        "rel": {
            "type": "string",
            "description": "The type or semantics of the relation.",
            "example": "alternate"
            },
        "type": {
            "type": "string",
            "description": "A hint indicating what the media type of the result of dereferencing the link should be.",
            "example": "application/geo+json"
            },
        "hreflang": {
            "type": "string",
            "description": "A hint indicating what the language of the result of dereferencing the link should be.",
            "example": "en"
            },
        "title": {
            "type": "string",
            "description": "Used to label the destination of a link such that it can be used as a human-readable
identifier.",
            "example": "Trierer Strasse 70, 53115 Bonn"
            },
        "length": {
            "type": "integer"
            }
        }
    }
```


5.3. Use of HTTPS

For simplicity, this document in general only refers to the HTTP protocol. This is not meant to exclude the use of HTTPS and

simply is a shorthand notation for "HTTP or HTTPS." In fact, most servers are expected to use HTTPS, not HTTP.

OGC Web API standards do not prohibit the use of any valid HTTP option. However, implementers should be aware that optional capabilities that are not in common use could be an impediment to interoperability.

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6. Overview

6.1. Encodings

This standard mandates the JSON encoding to be supported for service responses. In addition the support for HTML encoding is recommended.

The support for the GeoJSON format is mandatory for the joined data outputs.

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7. Requirements Class "Core"

Requirements Class	
http://www.opengis.net/spec/ogcapi-joins-1/1.0/req/core	
Target type	Web API
Dependency	OGC 19-072 (OGC - API - Common: Part 1)
Dependency	OGC 20-024 (OGC - API - Common: Part 2)
Dependency	RFC 2616 (HTTP/1.1)
Dependency	RFC 2818 (HTTP over TLS)
Dependency	RFC 3339 (Date and Time on the Internet: Timestamps)
Dependency	RFC 7578 Returning Values from Forms: multipart/form-data
Dependency	RFC 8288 (Web Linking)

7.1. Overview

The core requirements class contains the following functionalities:

The `Landing page` (path `/`) provides an entry point to the API. It contains links to:

- The `API definition` (link relations `service-desc` and `service-doc`).
- The `Conformance declaration` (path `/conformance`, link relation `http://www.opengis.net/def/rel/ogc/1.0/conformance`).
- The `Collections` (path `/collections`, link relation `http://www.opengis.net/def/rel/ogc/1.0/data`).
- The `Joins` (path `/joins`, link relation `joins`).

The `API definition` describes the capabilities of the server that can be used by clients to connect to the server or by development tools to support the implementation of servers and clients. Accessing the `API definition` using HTTP GET returns a description of the API. The API definition can be hosted on the API server(s) or a separate server.

The `Conformance declaration` states the conformance classes from standards or community specifications, identified by a URI, that the API conforms to. Clients can but are not required to use this information. Accessing the `Conformance declaration` using HTTP GET returns the list of URIs of conformance classes implemented by the server.

Accessing the `Collections` using HTTP GET returns a the list of datasets that are available on the server.

Each `Collection` element in the Collections list can be accessed further in order to get the metadata on each indivual Collection by making an HTTP GET request at path `/collections/{collectionId}`.

Accessing the `Collection's Key Fields` using HTTP GET at path `/collections/{collectionId}/keys` provides information on the key fields of a Collection.

Accessing the `Collection's Key Field` using HTTP GET at path `/collections/{collectionId}/keys/{keyFieldId}` provides the key values of the specific key field. The data joining is executed through these key values.

Accessing the `Joins` using HTTP GET returns a the list of Joins that are available on the server.

New `Joins` can be created by making a HTTP POST query to the path `/joins`. This is done by joining attribute data from inputted attribute data file with the Collection available on the server. Attribute data can be also joined directly with inputted spatial data files.

Each `Join` element in the Joins list can be accessed further in order to get the metadata on each indivual Join by making an HTTP GET request at path `/joins/{joinId}`.

Each `Join` can be updated fully by meking a HTTP PUT request to path `/joins/{joinId}`. This is done by joining attribute data from inputted attribute data file with the Collection available on the server.

Each `Join` can be deleted by making a HTTP DELETE request to path `/joins/{joinId}`.

The core module contains support for:

- CSV format for the inputted attribute data files.
- GeoJSON format for the inputted spatial data files.

The Table 2 contains an overview of the operations specified in the core module.

Table 4. Overview of the resources definecd in the OGC API - Joins core module

Path	HTTP method	Description
/	GET	API landing page
/conformance	GET	API conformance declaration
/collections	GET	Returns metadata on the collections available on the server
/collections/{collectionId}	GET	Returns metadata on a specific collection available on the server
/collections/{collectionId}/keys	GET	Returns the key fields of a specific collection

Path	HTTP method	Description
/collections/{collectionId}/keys/{keyFieldId}	GET	Returns the key values of a specific key field of a specific collection
/joins	GET	Returns a list of the joins available on the server
/joins	POST	Creates a new join by joining attribute data from a inputted attribute data file with a specific collection or directly with an inputted spatial data file
/joins/{joinId}	GET	Returns metadata on a specific join
/joins/{joinId}	PUT	Updates fully a specific join
/joins/{joinId}	DELETE	Deletes a specific join

7.2. HTTP 1.1

Requirement 1	/req/core/http
A	The server SHALL conform to HTTP 1.1.
B	If the API supports HTTPS, then the API SHALL also conform to HTTP over TLS.

7.3. HTTP Status Codes

Table 3 lists the main HTTP status codes that clients should be prepared to receive. This includes support for specific security schemes or URI redirection. In addition, other error situations may occur in the transport layer outside of the server.

Table 5. Typical HTTP status codes

Status code	Description
200	A successful request.
201	The request was executed successfully and it resulted in one or more resources that were created.
204	A request was executed successfully and there is no additional content in the response payload body.
302	The target resource was found but resides temporarily under a different URI. A 302 response is not evidence that the operation has been successfully completed.
303	The server is redirecting the user agent to a different resource. A 303 response is not evidence that the operation has been successfully completed.
304	An entity tag was provided in the request and the resource has not changed since the previous request.
307	The target resource resides temporarily under a different URI and the user agent MUST NOT change the request method if it performs an automatic redirection to that URI.
308	Indicates that the target resource has been assigned a new permanent URI and any future references to this resource ought to use one of the enclosed URIs.
400	The server cannot or will not process the request due to an apparent client error. For example, a query parameter had

	an incorrect value.
401	The request requires user authentication. The response includes a WWW-Authenticate header field containing a challenge applicable to the requested resource.
403	The server understood the request, but is refusing to fulfill it. While status code 401 indicates missing or bad authentication, status code 403 indicates that authentication is not the issue, but the client is not authorized to perform the requested operation on the resource.
404	The requested resource does not exist on the server. For example, a path parameter had an incorrect value.
405	The request method is not supported. For example, a POST request was submitted, but the resource only supports GET requests.
406	Content negotiation failed. For example, the Accept header submitted in the request did not support any of the media types supported by the server for the requested resource.
500	An internal error occurred in the server.

The return status codes described in Table 3 do not cover all possible conditions. See IETF RFC 7231 for a complete list of HTTP status codes.

Permission 1	**/per/core/additional-status-codes**
A	Servers MAY implement additional capabilities provided by the HTTP protocol. Therefore, they MAY return status codes in addition to those listed in Table 3.

When the server encounters an error during the processing of the request , the server may wish to include information in addition to the status code in the response. Since Web API interactions are often machine-to-machine, a machine-readable report would be preferred. IETF RFC 7807 addresses this need by providing "Problem Details" response schemas for both JSON and XML.

Recommendation 1	**/rec/core/problem-details**
A	The server SHOULD include a "problem details" report in any error response in accordance with IETF RFC 7807.

7.4. Support for Cross-Origin Requests

If the data is located on another host than the webpage ("same-origin policy"), access to data from a HTML page is by default prohibited for security reasons. A typical example is a web-application accessing feature data from multiple distributed datasets.

Recommendation 2	**/rec/core/cross-origin**
A	If the server is intended to be accessed from a browser, cross-origin requests SHOULD be supported. Note that support can also be added in a proxy layer on top of the server.

Two common mechanisms to support cross-origin requests are:

- Cross-origin resource sharing (CORS)

- JSONP (JSON with padding)

7.5. API Landing Page

The HTTP GET operation at service root path `{root}/` returns the API landing page document. The API landing page provides a starting point for the use of the API and it contains links to:

- API definition document.
- Conformance information.
- Metadata on collections available on the server.
- Joins available on the server.

7.5.1. Request

Requirement 2	**/req/core/root-op**
A	The server SHALL support the HTTP GET operation on the URI `{root}/`.
B	The response to the HTTP GET request issued in A SHALL satisfy requirement /req/core/root-success.

7.5.2. Response

Requirement 3	**/req/core/root-success**
A	A successful execution of the operation SHALL be reported as a response with an HTTP status code `200`.
B	The content of that response SHALL be based upon Landing Page Schema. The response SHALL include links to following resources: • `/api` (link rel property value: `service-desc` or `service-doc`) • `/conformance` (link rel property value: `http://www.opengis.net/def/rel/ogc/1.0/conformance`) • `/collections` (link rel property value: `http://www.opengis.net/def/rel/ogc/1.0/data`) • `/joins` (link rel property value: `joins`)

7.5.2.1. Response Schema for the Landing Page

The landing page response is based on the following schema (from OGC - API - Common: Part 1 document).

Landing Page Schema

```
{
"$schema": "http://json-schema.org/draft-07/schema#",
"title": "Landing Page Schema",
"description": "JSON schema for the OGC API - Common landing page",
"type": "object",
"required": [
    "links"
    ],
"properties": {
    "title": {
        "title": "The title of the API.",
        "description": "While a title is not required, implementers are strongly advised to include one.",
        "type": "string"
        },
    "description": {
        "description": "A textual description of the API",
        "type": "string"
        },
    "attribution" : {
        "type" : "string",
        "title" : "attribution for the API",
        "description" : "The `attribution` should be short and intended for presentation to a user, for example, in a
corner of a map. Parts of the text can be links to other resources if additional information is needed. The string can
include HTML markup."
        },
    "links": {
        "description": "Links to the resources exposed through this API.",
        "type": "array",
        "items": {"$href": "link.json"}
        }
    },
    "additionalProperties": true
}
```

7.5.2.2. Service metadata

Servers are recommended to provide a set of service metadata that should identify the service and provide information about the service provider.

Recommendation 3	**/rec/core/root-service-metadata**
A	Services SHOULD provide one or more service metadata resources accessible by an HTTP GET operation.
B	The landing page SHOULD provide links to the service metadata resources using the relation type `service-meta`.
C	A successful execution of the operation SHOULD be reported as a response with an HTTP status code `200`.

7.5.3. Error Situations

See HTTP status codes for general guidance.

7.6. API Definition

Servers SHOULD provide an API Definition resource that describes the capabilities of the server. This resource can be used by client developers to understand the supported services, by software clients to connect to the server, and by development tools to support the implementation of servers and clients.

7.6.1. Request

Requirement 4	**/req/core/api-definition-op**
A	The server SHALL support the HTTP GET operation on all links from the landing page that have the relation type `service-desc`.

B	The server SHALL support the HTTP GET operation on all links from the landing page that have the relation type `service-doc`.
C	The responses to all HTTP GET requests issued in `A` and `B` SHALL satisfy the requirement /req/core/api-definition-success.

Recommendation 4	**/rec/core/api-definition-op**
A	The server SHOULD support the HTTP GET operation on the URI `{root}/api`.
B	The response to the HTTP GET request issued in A SHOULD satisfy the requirement /req/core/api-definition-success.

7.6.2. Response

Requirement 5	**/req/core/api-definition-success**
A	A successful execution of the operation SHALL be reported as a response with a HTTP status code `200`.
B	The content of that response SHALL be an API Definition document.
C	The API Definition document SHALL be consistent with the media type identified through HTTP content negotiation.
NOTE:	The -f parameter MAY be used to satisfy this requirement.

Recommendation 5	**/req/core/api-definition-oas**
A	If the API definition document uses the OpenAPI Specification 3.0, THEN The document SHOULD conform to the OpenAPI Specification 3.0 requirements class `http://www.opengis.net/spec/ogcapi-common-1/1.0/req/oas30` (defined in the OGC API - Common - Part 1 document).

7.6.3. Error Situations

See HTTP status codes for general guidance.

7.7. Declaration of Conformance Classes

The HTTP GET operation at path `{root}/conformance` returns a list of conformance classes that the server supports.

7.7.1. Request

Requirement 6	**/req/core/conformance-op**
A	The server SHALL support the HTTP GET operation at the path `{root}/conformance`.
B	The server SHALL support the HTTP GET operation on all links from the landing page that have the relation type

	http://www.opengis.net/def/rel/ogc/1.0/conformance.
C	The responses to all HTTP GET requests issued in A and B SHALL satisfy requirement /req/core/conformance-success.

7.7.2. Response

Requirement 7	/req/core/conformance-success
A	A successful execution of the operation SHALL be reported as a response with a HTTP status code `200`.
B	The content of that response SHALL be based upon Conformance Declaration Schema.

7.7.2.1. Response Schema for the Conformance Declaration

The schema for the conformance response is based on the following schema (from OGC API - Common - Part 1 document).

Conformance Declaration Schema

```
{
"$schema": "http://json-schema.org/draft-07/schema#",
"title": "Conformance Declaration Schema",
"description": "This schema defines the resource returned from the /Conformance path",
"type": "object",
"required": [
    "conformsTo"
    ],
"properties": {
    "conformsTo": {
        "type": "array",
        "description": "conformsTo is an array of URIs.  Each URI should correspond to a defined OGC Conformance class.
Unrecognized URIs should be ignored",
        "items": {
            "type": "string",
            "example": "http://www.opengis.net/spec/ogcapi-common-1/1.0/conf/core"
            }
        }
    }
}
```

7.7.3. Error Situations

See HTTP status codes for general guidance.

7.8. Collections

The HTTP GET operation at path `{root}/collections` returns metadata on the collections that are available on the server.

7.8.1. Request

Requirement 8	/req/core/collections-get-op
A	The server SHALL support the HTTP GET operation at path `{root}/collections`.

Permission 2	/per/core/collections-get-op-simple-query
A	The server MAY support the Simple Query Requirements Class (defined in the OGC API - Common - Part 2 document): • http://www.opengis.net/spec/ogcapi-common-2/1.0/req/simple-query

	The Simple Query Requirements Class defines the following HTTP query parameters: • `bbox` • `datetime` • `limit`

7.8.2. Response

Requirement 9	**/req/core/collections-get-success**
A	A successful execution of the operation SHALL be reported as a response with a HTTP status code `200`.
B	The content of that response SHALL be based upon the Collections schema.

Requirement 10	**/req/core/collections-get-op-bbox-unsupported**
A	If the `bbox` parameter is provided by the client but it is not supported by the server, then the server SHALL process the request as if the parameter had not been provided.

Requirement 11	**/req/core/collections-get-op-datetime-unsupported**
A	If the `datetime` parameter is provided by the client but it is not supported by the server, then the server SHALL process the request as if the parameter had not been provided.

Requirement 12	**/req/core/collections-get-op-limit-unsupported**
A	If the `limit` parameter is provided by the client but it is not supported by the server, then the server SHALL process the request as if the parameter had not been provided.

7.8.2.1. Response Schema for the Collections

The response is based on the following schema (from OGC - API - Common: Part 2 document).

Collections Schema

```
{
"$schema": "http://json-schema.org/draft-07/schema#",
"title": "Collections Schema",
"description": "This schema defines the resource returned from /collections path.",
"type": "object",
"required": [
    "links",
    "collections"
    ],
"properties": {
    "links": {
        "type": "array",
        "items": {"$href": "link.json"}
        },
    "timeStamp": {
        "type": "string",
        "format": "date-time"
        },
    "numberMatched": {
        "type": "integer",
        "min": "0"
        },
    "numberReturned": {
        "type": "integer",
        "min": "0"
        },
    "collections": {
        "type": "array",
        "items": {"$href": "collectionDesc.json"}
        }
    }
}
```

This schema is further constrained by the following requirements and recommendations.

To support hypermedia navigation, the `links` property must be populated with sufficient hyperlinks to navigate through the whole dataset.

Requirement 13	**/req/core/collections-get-success-links**
A	A `200`-response SHALL include the following links in the `links` property of the response: • A link to this response document (relation: `self`), • A link to the response document in every other media type supported by the service (relation: `alternate`).
B	All links SHALL include the `rel` and `type` link parameters.

Additional information may be available to assist in understanding and using this dataset. Links to those resources should be provided as well.

Recommendation 6	**/rec/core/collections-get-success-descriptions**
A	If external schemas or descriptions exist that provide additional information about the structure or semantics for the resource, a `200`-response SHOULD include links to each of those resources in the links property of the response (relation: `describedby`).
B	The `type` link parameter SHOULD be provided for each link. This applies to resources that describe the whole dataset.

The `timeStamp` property of the Collections response indicates when the response was generated.

Requirement 14	/req/core/collections-get-success-timeStamp
A	If a property `timeStamp` is included in the response, the value SHALL be set to the time when the response was generated.

The `collections` property of the Collections response provides a description of each individual collection hosted by the server. These descriptions are based on the Collection Schema.

Requirement 15	/req/core/collections-get-success-items
A	For each dataset collection provided by the server, metadata describing that collection SHALL be provided in the `collections` property of the Collections response.
B	The content of that response SHALL comply with the requirements in the http://www.opengis.net/spec/ogcapi-common-2/1.0/rm/collection Requirements Class described in section `Collection Resource Definition` in the OGC - API - Common: Part 2 document).

Permission 3	/per/core/collections-get-success-items
A	To support servers with many collections, servers MAY limit the number of items in the property `collections`.

Requirement 16	/req/core/collections-get-success-items-links
A	For each collection resource included in the response, the `links` property of the collection SHALL include an item for each supported encoding with a link to the collection resource (relation: `dataset`).
B	All links SHALL include the `rel` and `type` properties.

7.8.3. Error Situations

See HTTP status codes for general guidance.

7.9. Collection

The HTTP GET operation at path `{root}/collections/{collectionId}` returns metadata on a specific collection available on the server.

7.9.1. Request

Requirement 17	/req/core/collections-collectionid-get-op
A	The server SHALL support the HTTP GET operation at path `{root}/collections/{collectionId}`.
B	The parameter `collectionId` is each `id` property in the `collections` response (JSONPath: `$.collections[*].id`).

7.9.2. Response

Requirement 18	/req/core/collections-collectionid-get-success
A	A successful execution of the operation shall be reported as a response with a HTTP status code `200`.
B	The content of that response SHALL comply with the requirements in the http://www.opengis.net/spec/ogcapi-common-2/1.0/rm/collection Requirements Class described in section `Collection Resource Definition` in the OGC - API - Common: Part 2 document) with additions described in the Response Schema for the Collection section of this document.
C	The content of that response SHALL be consistent with the content for this collection in the `/collections` response. That is, the values for `id`, `title`, `description` and `extent` SHALL be identical.

7.9.2.1. Response Schema for the Collection

The Collection response is based on the following schema (from OGC - API - Common: Part 2 document).

Collection Resource Schema

```
{
  "$schema": "http://json-schema.org/draft-07/schema#",
  "title": "Collection Resource Schema",
  "description": "This schema defines the resource returned from /collections/{collectionId}.",
  "type": "object",
  "required": [
      "id",
      "links"
      ],
  "properties": {
      "id": {
          "description": "identifier of the collection used, for example, in URIs",
          "type": "string"
          },
      "title": {
          "description": "human readable title of the collection",
          "type": "string"
          },
      "description": {
          "description": "a description of the members of the collection",
          "type": "string"
          },
      "attribution" : {
          "type" : "string",
          "title" : "attribution for the collection",
          "description" : "The `attribution` should be short and intended for presentation to a user, for example, in a
corner of a map. Parts of the text can be links to other resources if additional information is needed. The string can
include HTML markup."
          },
      "links": {
          "type": "array",
          "items": {"$href": "link.json"}
          },
      "extent": {"$href": "extent.json"},
      "itemType": {
          "description": "An indicator about the type of the items in the collection.",
          "type": "string"
          },
      "crs": {
          "description": "the list of coordinate reference systems supported by the API; the first item is the default
coordinate reference system",
          "type": "array",
          "items": {
              "type": "string"
              },
          "default": [
              "http://www.opengis.net/def/crs/OGC/1.3/CRS84"
              ],
          "example": [
              "http://www.opengis.net/def/crs/OGC/1.3/CRS84",
              "http://www.opengis.net/def/crs/EPSG/0/4326"
              ]
          }
      }
}
```


The additions to the requirements defined in the http://www.opengis.net/spec/ogcapi-common-2/1.0/rm/collection Requirements Class described in section `Collection Resource Definition` in the OGC - API - Common: Part 2 document are descbided below.

Item Type

The collections defined by this core module provide information on their key fields and key values.

Requirement 19	**/req/core/rc-md-items-type**
A	If the key field metadata and the key values of the key fields of the collection can be accessed by a client, then the `itemType` property SHOULD be included in the collection resource to indicate the type of the collection. The value of the `itemType` property SHOULD be `dataset`.

Links

To support hypermedia navigation, the links property must be populated with sufficient hyperlinks to navigate through the whole

dataset.

Requirement 20	/req/core/rc-md-items-links
A	`200`-response SHALL include the following links in the `links` property of the response: • A link to this response document (relation: `self`) • A link to the response document in every other media type supported by the service (relation: `alternate`) • A link to key fields metadata of this collection (relation: `keys`)
B	All links SHALL include the `rel` and `type` properties.

Additional information may be available to assist in understanding and using this dataset. Links to those resources should be provided as well.

Requirement 21	/req/core//rc-md-items-descriptions
A	If external schemas or descriptions exist that provide additional information about the structure or semantics of the collection, a `200`-response SHOULD include links to each of those resources in the `links` property of the response (relation: `describedby`).
B	The `type` link parameter SHOULD be provided for each link.

7.9.3. Error Situations

See HTTP status codes for general guidance.

If the parameter `collectionId` does not exist on the server, the status code of the response will be `404`. (see Table 3).

7.10. Collection's Key Fields

The HTTP GET operation at path `{root}/collections/{collectionId}/keys` returns a list of key fields of a specific collection.

7.10.1. Request

Requirement 22	/req/core/collections-collectionid-keys-op
A	The server SHALL support the HTTP GET operation at the path `{root}/collections/{collectionId}/keys`.
B	The parameter `collectionId` is each id property in the collections response (JSONPath: `$.collections[*].id`).

7.10.2. Response

Requirement 23	/req/core/collections-collectionid-keys-success
A	A successful execution of the operation SHALL be reported as a response with a HTTP status code `200`.

B	The content of that response SHALL be based on the Collection's Key Fields Schema.

7.10.2.1. Response Schema for the Collection's Key Fields

Collection's Key Fields Schema

```
schema:
  $ref: '#/components/schemas/CollectionKeysResponseObject'

CollectionKeysResponseObject:
  required:
  - keys
  - links
  type: object
  properties:
    links:
      type: array
      items:
        $ref: '#/components/schemas/Link'
    keys:
      type: array
      items:
        $ref: '#/components/schemas/CollectionKeysObject'

CollectionKeysObject:
  required:
  - id
  - isDefault
  - links
  type: object
  properties:
    isDefault:
      type: boolean
    language:
      type: string
    id:
      type: string
    links:
      type: array
      items:
        $ref: '#/components/schemas/Link'
```

isDefault

Information on the Collection's default key field for the data joins. Value `true` indicates the default key field.

Requirement 24	**/req/core/collection-collectionsid-keys-default-key**
A	Exactly one object in the response's `keys` array SHALL have the `isDefault` property value `true`.

language

Language in which the key field's key values are written (if applicable to the key field). The format of the language field follows the ISO 639-1 language code values.

id

Identifier of the key field.

links

To support hypermedia navigation, the `links` property must be populated with sufficient hyperlinks to navigate through the collection's key fields' key values.

Description of the `links` property of the `CollectionKeysResponseObject`:

Requirement 25	**/req/core/collections-collectionid-keys-links**

A	`200`-response SHALL include the following links in the `links` property of the response: • A link to this response document (relation: `self`). • A link to the response document in every other media type supported by the service (relation: `alternate`).
B	All links SHALL include the `rel` and `type` properties.

Description of `links` property of the `CollectionKeysObject`:

Requirement 26	**/req/core/collections-collectionid-keys-items-links**
A	`200`-response SHALL include a following link in the `links` property for each key field included in the response's `keys` array: • A link to the key field's key values response document (relation: `key-values`).
B	The links SHALL include the `rel` and `type` properties.

7.10.3. Error Situations

See HTTP status codes for general guidance.

If the parameter `collectionId` does not exist on the server, the status code of the response will be `404`. (see Table 3).

7.11. Collection's Key Field

The HTTP GET operation at path `{root}/collections/{collectionId}/keys/{keyFieldId}` returns a list of key values of a specific key field of a specific collection.

7.11.1. Request

Requirement 27	**/req/core/collections-collectionid-keys-keyfieldid-get-op**
A	The server SHALL support the HTTP GET operation at the path `{root}/collections/{collectionId}/keys/{keyFieldId}`.
B	The parameter collectionId is each `id` property in the `collections` response (JSONPath: `$.collections[*].id`).
C	The parameter `keyFieldId` is each `id` property in the `collection's key fields` response (JSONPath: `$.keys[*].id`).

D	The server MAY support the query parameter `key` to filter the results by key value. The `key` parameter SHALL possess the following characteristics (using an OpenAPI Specification 3.0 fragment):
	`name: key`
	`in: query`
	`required: false`
	`schema:`
	`  type: string`

E	The server MAY support the query parameter `limit` to limit the number of key values that can be returned in a single response.
	
	The `limit` parameter SHALL possess the following characteristics (using an OpenAPI Specification 3.0 fragment):
	
	`name: limit`
	`in: query`
	`required: false`
	`schema:`
	`  type: integer`
	`  minimum: 1`
	`  maximum: 10000`
	`  default: 1000`

Note:	The values for minimum, maximum and default are only examples and MAY be changed.

7.11.2. Response

Requirement 28	**/req/core/collections-collectionid-keys-keyfieldid-get-success**
A	A successful execution of the operation SHALL be reported as a response with a HTTP status code `200`.
B	The content of that response SHALL be based on the Collection's Key Field Schema.

7.11.2.1. Parameter Limit

The number of returned key values depends on the server and the value of the `limit` parameter.

The client can request a limit to the number of key values returned in a response by using the `limit` parameter. The `limit` parameter indicates the maximum number of key values which should be included in a single response.

The server may have a default value for the limit and a maximum limit.

Requirement 29	**/req/core/collections-collectionid-keys-keyfieldid-get-success-limit-response**
A	If the `limit` parameter is provided by the client and supported by the server, then the response SHALL not contain more resources than specified by the `limit` parameter.
B	If the service specifies a maximum value for the `limit` parameter, the response SHALL not contain more resources than this maximum value.

Requirement 30	**/req/core/collections-collectionid-keys-keyfieldid-get-success-limit-unsupported**
A	If the `limit` parameter is provided by the client but it is not supported by the server, then the server SHALL process the request as if the parameter had not been provided.

7.11.2.2. Paged response

If the number of items in the `keys` array of the response is less than or equal to the requested/default/maximum limit then the server will include a link to the next set of results.

Permission 4	**/per/core/collections-collectionid-keys-keyfieldid-get-success-server-limit**
A	If a server is configured with a maximum response size, then the server MAY page responses which exceed that threshold.

Recommendation 7	**/rec/core/collections-collectionid-keys-keyfieldid-get-success-server-limit**
A	Clients SHOULD be prepared to handle a paged response even if they have not specified a `limit` parameter in their query.

The effect of the `limit` parameter is to divide the response into a number of pages. Each page (except for the last) contains the specified number of entities. The response contains the first page. Additional pages can be accessed through hyperlink navigation.

Recommendation 8	**/rec/core/collections-collectionid-keys-keyfieldid-get-success-next-1**
A	A `200`-response SHOULD include a link to the next "page" (relation: `next`), if more resources have been selected than returned in the response.

Recommendation 9	**/rec/core/collections-collectionid-keys-keyfieldid-get-success-next-2**
A	Dereferencing a `next` link SHOULD return additional resources from the set of selected resources that have not yet been returned.

Recommendation 10	**/rec/core/collections-collectionid-keys-keyfieldid-get-success-next-3**
A	The number of resources in a response to a `next` link SHOULD follow the same rules as for the response to the original query and again include a `next` link, if there are more resources in the selection that have not yet been returned.

Providing `prev` links supports navigating back and forth between pages, but depending on the implementation approach it may be too complex to implement.

Permission 5	**/per/core/collections-collectionid-keys-keyfieldid-get-success-prev**
A	A response to a `next` link MAY include a `prev` link to the resource that included the `next` link.

If the server response does not contain all of the key values that match the selection parameters, then the client must be informed of that fact.

Requirement 31	**/req/core/collections-collectionid-keys-keyfieldid-get-success-paged-response**

A	If the number of key values in the `keys` element is less than the number that match the selection paarameters, then the `numberMatched` and `numberReturned` properties SHALL be included in the response.

The `numberMatched` property of the response indicates the number of key values that are available in the server that match the selection parameters in the request.

Requirement 32	**/req/core/collections-collectionid-keys-keyfieldid-get-success-numberMatched**
A	If a property `numberMatched` is included in the response, the value SHALL be identical to the number of hosted key values that meet the selection parameters provided by the client.
B	A server MAY omit this information in a response, if the information about the number of matching resources is not known or difficult to compute.

The number of key values included in a response may be a subset of the number matched. In that case, the `numberReturned` property of the response indicates the number of key values returned in this "page" of the response.

Requirement 33	**/req/core/collections-collectionid-keys-keyfieldid-get-success-numberReturned**
A	If a property `numberReturned` is included in the response, the value SHALL be identical to the number of items in the `keys` array in the response document.
B	A server MAY omit this information in a response, if the information about the number of resources in the response is not known or difficult to compute.

7.11.2.3. Response Schema for the Collection's Key Field

Collection's Key Field Schema

```
schema:
  $ref: '#/components/schemas/CollectionKeysKeyFieldResponseObject'

CollectionKeysKeyFieldResponseObject:
  required:
  - keys
  - links
  type: object
  properties:
    links:
      type: array
      items:
        $ref: '#/components/schemas/Link'
    keys:
      type: array
      items:
        $ref: '#/components/schemas/KeyObject'
    numberMatched:
      type: integer
    numberReturned:
      type: integer

KeyObject:
  required:
  - key
  type: object
  properties:
    key:
      type: string
    title:
      type: string
```

keys

Array of key objects.

numberMatched

The number of key values that are available in the server that match the selection parameters in the request.

numberReturned

The number of key values returned in the response.

key

Key value.

links

To support hypermedia navigation, the links property must be populated with sufficient hyperlinks.

Requirement 34	**/req/core/collection-collectionid-keys-keyfieldid-links**
A	`200`-response SHALL include the following links in the links property of the response: • A link to this response document (relation: `self`). • A link to the response document in every other media type supported by the service (relation: `alternate`).
B	All links SHALL include the `rel` and `type` properties.

title

Human-readable description of the key value.

7.11.3. Error Situations

See HTTP status codes for general guidance.

If the parameter `collectionId` does not exist on the server, the status code of the response will be `404`. (see Table 3).

If the parameter `keyFieldId` does not exist on the server, the status code of the response will be `404`. (see Table 3).

7.12. Joins

The HTTP GET operation at path `{root}/joins` returns a list of joins that are available on the server.

7.12.1. Request

Requirement 35	**/req/core/joins-get-op**
A	The server SHALL support the HTTP GET operation at the path `{root}/joins`.

B	The server MAY support the query parameter `limit` to limit the number of resources that can be returned in a single response. The `limit` parameter SHALL possess the following characteristics (using an OpenAPI Specification 3.0 fragment):
	
	`name: limit`
	`in: query`
	`required: false`
	`schema:`
	`  type: integer`
	`  minimum: 1`
	`  maximum: 1000`
	`  default: 10`

Note:	The values for minimum, maximum and default are only examples and MAY be changed.

C	The server MAY support the query parameter `datetime` to filter the returned joins by their execution timestamp. The `datetime` parameter SHALL possess the following characteristics (using an OpenAPI Specification 3.0 fragment):
	
	`name: datetime`
	`in: query`
	`required: false`
	`schema:`
	`  type: string`
	
	Temporal geometries are either a date-time value or a time interval. The parameter value SHALL conform to the following syntax (using ABNF):
	
	`interval-closed = date-time "/" date-time`
	`interval-open-start = "../" date-time`
	`interval-open-end = date-time "/.."`
	`interval = interval-closed / interval-open-start / interval-open-end`
	`datetime = date-time / interval`
	
	The syntax of date-time is specified by RFC 3339, 5.6.
	
	Open ranges in time intervals at the start or end are supported using a double-dot (..) or an empty string for the start/end..

7.12.2. Response

Requirement 36	**/req/core/joins-get-success**

A	A successful execution of the operation SHALL be reported as a response with a HTTP status code `200`.
B	The content of that response SHALL be based on the Joins Schema.

7.12.2.1. Parameter Limit

The number of returned joins depends on the server and the value of the `limit` parameter.

The client can request a limit to the number of joins returned in a response by using the `limit` parameter. The `limit` parameter indicates the maximum number of joins which should be included in a single response.

The server may have a default value for the limit and a maximum limit.

Requirement 37	**/req/core/joins-get-success-limit-response**
A	If the `limit` parameter is provided by the client and supported by the server, then the response SHALL not contain more resources than specified by the `limit` parameter.
B	If the service specifies a maximum value for the `limit` parameter, the response SHALL not contain more resources than this maximum value.

Requirement 38	**/req/core/joins-get-success-limit-unsupported**
A	If the `limit` parameter is provided by the client but it is not supported by the server, then the server SHALL process the request as if the parameter had not been provided.

7.12.2.2. Parameter datetime

Requirement 39	**/req/core/joins-get-success-datetim**
A	If the `datetime` parameter is provided by the client and supported by the server, then only joins that have a `timeStamp` property that intersects the temporal information in the `datetime` parameter SHALL be part of the result set.

7.12.2.3. Paged response

If the number of items in the `joins` array of the response is less than or equal to the requested/default/maximum limit then the server will include a link to the next set of results.

Permission 6	**/per/core/joins-get-success-server-limit**
A	If a server is configured with a maximum response size, then the server MAY page responses which exceed that threshold.

Recommendation 11	**/rec/core/joins-get-success-server-limit**
A	Clients SHOULD be prepared to handle a paged response even if they have not specified a `limit` parameter in their query.

The effect of the `limit` parameter is to divide the response into a number of pages. Each page (except for the last) contains the specified number of entities. The response contains the first page. Additional pages can be accessed through hyperlink navigation.

Recommendation 12	**/rec/core/joins-get-success-next-1**
A	A `200`-response SHOULD include a link to the next "page" (relation: `next`), if more resources have been selected than returned in the response.

Recommendation 13	**/rec/core/joins-get-success-next-2**
A	Dereferencing a `next` link SHOULD return additional resources from the set of selected resources that have not yet been returned.

Recommendation 14	**/rec/core/joins-get-success-next-3**
A	The number of resources in a response to a `next` link SHOULD follow the same rules as for the response to the original query and again include a `next` link, if there are more resources in the selection that have not yet been returned.

Providing `prev` links supports navigating back and forth between pages, but depending on the implementation approach it may be too complex to implement.

Permission 7	**/per/core/joins-get-success-prev**
A	A response to a `next` link MAY include a `prev` link to the resource that included the `next` link.

If the server response does not contain all of the joins that match the selection parameters, then the client must be informed of that fact.

Requirement 40	**/req/core/joins-get-success-paged-response**
A	If the number of joins in the `joins` element is less than the number that match the selection paarameters, then the `numberMatched` and `numberReturned` properties SHALL be included in the response.

The `numberMatched` property of the response indicates the number of joins that are available in the server that match the selection parameters in the request.

Requirement 41	**/req/core/joins-get-success-numberMatched**
A	If a property `numberMatched` is included in the response, the value SHALL be identical to the number of joins that meet the selection parameters provided by the client.
B	A server MAY omit this information in a response, if the information about the number of matching resources is not known or difficult to compute.

The number of joins included in a response may be a subset of the number matched. In that case, the `numberReturned` property of the response indicates the number of joins returned in this "page" of the response.

Requirement 42	**/req/core/joins-get-success-numberReturned**
A	If a property `numberReturned` is included in the response, the value SHALL be identical to the number of items in the `joins` array in the response document.
B	A server MAY omit this information in a response, if the information about the number of resources in the response is not known or difficult to compute.

7.12.2.4. Response schema for the Joins

Joins Schema

```
schema:
  $ref: '#/components/schemas/JoinsResponseObject'

JoinsResponseObject:
  required:
  - joins
  - links
  type: object
  properties:
    links:
      type: array
      items:
        $ref: '#/components/schemas/Link'
    joins:
      type: array
      items:
        $ref: '#/components/schemas/JoinsObject'
    numberMatched:
      type: integer
    numberReturned:
      type: integer
    timeStamp:
      type: string
      format: date-time

JoinsObject:
  required:
  - id
  - links
  - timeStamp
  type: object
  properties:
    id:
      type: string
    timeStamp:
      type: string
      format: date-time
    links:
      type: array
      items:
        $ref: '#/components/schemas/Link'
```

joins

The `joins` property of the response provides a description of each individual join hosted by the server.

Requirement 43	**/req/core/joins-get-success-items**
A	For each join resource accessible through the server, metadata describing that join SHALL be provided in the property `joins`.

links

To support hypermedia navigation, the `links` property must be populated with sufficient hyperlinks to navigate through the joins.

Property `links` in the `JoinsResponseObject`:

Requirement 44	/req/core/joins-get-success-links
A	`200`-response SHALL include the following links in the `links` property of the response: • A link to this response document (relation: `self`) • A link to the response document in every other media type supported by the service (relation: `alternate`)
B	All links SHALL include the `rel` and `type` properties.

Property `links` in the `JoinsObject`:

Requirement 45	/req/core/joins-get-success-items-links
A	For each item included in the `joins` array in the response, the `links` property of that item SHALL include a link for each supported encoding to the join resource (relation: `join`).
B	All links SHALL include the `rel` and `type` properties.

id

Identifier of the join.

numberReturned

The number of joins that are available in the server that match the selection parameters in the request.

numberMatched

The number of joins returned in the response.

timeStamp

Property `timeStamp` in the `JoinsResponseObject`:

Requirement 46	/req/core/collections-get-success-timeStamp
A	If a property `timeStamp` is included in the response, the value SHALL be set to the time when the response was generated.

Property `timeStamp` in the `JoinsObject`:

The time when the join was generated.

7.12.3. Error Situations

See HTTP status codes for general guidance.

7.13. Join Creation

The HTTP POST operation at path `{root}/joins` creates a new join.

The operation contains two joining modes:

1. Joining attribute data from an inputted attribute data file with a collection hosted on the server.
2. Joining attribute data from an inputted attribute data file directly with a spatial dataset file provided with the query.

The core module contains support for the CSV format for the attribute data files and for the GeoJSON format for the spatial data files.

The joins are executed via common key values that are available in both datasets.

If the attribute dataset contains additional key values that are not available in the collection or spatial dataset, they will be not included to the joined output. The extension modules may alter this behavior.

7.13.1. Request

Requirement 47	**/req/core/joins-post-op**
A	The server SHALL support the HTTP POST operation at path `{root}/joins`.
B	The server SHALL support the `join-type` parameter value `hosted`.
C	The server MAY support the `join-type` parameter value `file`.
D	The request is made as a multipart/form-data request. The request SHALL contain the header: • Content-Type: multipart/form-data;
E	If the attribute dataset file is uploaded with the query, it SHALL contain the header • Content-Disposition: form-data; filename="[attribute dataset file's name]"; name="attribute-dataset-file";
F	If the spatial dataset file is uploaded with the query, it SHALL contain the header: • Content-Disposition: form-data; filename="[spatial dataset file's name]"; name="spatial-dataset-file";
G	The input data files SHALL be encoded with the `UTF-8` encoding.
H	The server SHALL support the GeoJSON output format for the joined data in the `join-type` parameter value `hosted`.
I	The server MAY support any other output formats for the joined data in the `join-type` parameter value `hosted`
J	The server MAY support a optional direct GeoJSON response for the joined data for the `join-type` parameter value `hosted`. In this case, the server returns the joined data directly to the client in the GeoJSON format instead of the join response document. The direct GeoJSON output can be requested with the *output-formats* parameter value: `http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson-direct`.

K	If the server supports the `join-type` parameter value `file`, it SHALL support the GeoJSON output format for the joined dataset.

Common Form Data Parameters for the join-type Parameter Values 'hosted' and 'file'

Requirement 48	**/req/core/joins-post-common-parameters**

A

Name	**Description**	**Type and values**	**Required**
join-type	The type of join.	String, values: {'hosted', 'file'}	Mandatory
execution-type	The join execution type.	String, value: {'synchronous'}	Optional[a]
attribute-dataset-format	The format of the attribute dataset.	String	Mandatory[b]
attribute-dataset-file	The attribute dataset file (uploaded file).	File	Optional[c]
attribute-dataset-url	The attribute dataset URL.	URL	Optional[c]
attribute-dataset-key	The key field in the attribute dataset that contains the key values.	String	Mandatory[d]
attribute-dataset-data-value-list	Fields in the attribute dataset that contain the attribute values that will be joined.	String, separated by commas	Mandatory[e]
csv-file-delimiter	The delimiter character used in the CSV file.	String	Optional[f]

Name	Description	Type and values	Required
csv-file-contains-header-row	Information on the existence of header row in the CSV file.	Boolean values: {true, false}	Optional[g]

[a] The core module supports only the value 'synchronous', other values may be defined in the extension modules.

[b] The core module contains support for the value: 'csv'.

[c] One of the parameters: *attribute-dataset-file* or *attribute-dataset-url* is mandatory to be used with the operation. The *attribute-dataset-file* parameter can be used for uploading an attribute dataset file to the server. The *attribute-dataset-url* parameter can be used for providing the attribute dataset file through URL link. If both parameters are provided in the query, the server SHALL send HTTP exception `400`.

[d] The key field in the attribute dataset that contains the key values. For CSV format, this value is the column number that contains the key values (counting starts from 0).

[e] For CSV format, the values are the column numbers that contain the attribute values that will be joined (counting starts from 0).

[f] The *csv-file-delimiter* parameter is mandatory to be used with the *attribute-dataset-format* parameter value: 'csv'. The parameter is not required for other formats that may be defined in the extension modules.

[g] The *csv-file-contains-header-row* parameter is optional to be used with the *attribute-dataset-format* parameter value: 'csv'. The parameter is not required for other formats that may be defined in the extension modules. Values: (*true*, *false*). If parameter is not provided in the request, default value *false* is used. If parameter has value *true*, CSV file's header is assumed to be on the first row of the CSV file and data values are assumed to start from the second row. If parameter has value *false*, the data values are assumed to start from CSV file's first row.

Form Data Parameters for join-type Parameter Value 'hosted'

Requirement 49	/req/core/joins-post-op-hosted-parameters

A

Name	Description	Type and values	Required
output-formats	List of output formats for the joined data that will be included to the response document.	String, separated by commas	Optional[a]

Name	Description	Type and values	Required
include-join-metadata	Includes the joinInformation element to the response document.	Boolean, values: {true, false}	Optional[b]
collection-id	The value of the `id` attribute of the collection available on the server, to which the attribute data will be joined.	String	Mandatory
collection-key	The value of the `id` attribute of the key field of the collection that will be used in the join operation.	String	Optional[c]
collection-crs	The coordinate referense system of the joined dataset output.	String	Optional[d]

[a] Comma-separated list of the outputs that will be included to the response document. The output formats that the server supports SHALL be listed in the server's conformance declaration. If the parameter value is not provided in the request, a default value

http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson

is used. If the server supports the direct geojson response for the join it SHALL support the value

http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson-direct.

[b] If parameter is not provided in the request, a default value *false* is used. The parameter is not used with the `output-formats` parameter value

http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson-direct

[c] If the `collection-key` parameter is not provided in the request, a default key field value of the collection will be used in the join operation.

[d] The value of the parameter SHALL be listed in the collection's `crs` array if the collection contains geometries. If omitted, the first value of the `crs` array off the collection will be used.

Form Data Parameters for join-type Parameter Value 'file'

Requirement 50	/req/core/joins-post-op-file-parameters
A	

Name	Description	Type and values	Required
spatial-dataset-format	The format of the spatial dataset.	String	Mandatory[a]
spatial-dataset-file	The spatial dataset file (uploaded file)	File	Optional[b]
spatial-dataset-url	A URL link to the spatial dataset file	URL	Optional[b]
spatial-dataset-key	The path to the key field in the spatial dataset file that contains key values. Example: 'features.properties.key'	String	Mandatory

[a] The core module contains support for the format:

http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson.

[b] One of the parameters: *spatial-dataset-file* or *spatial-dataset-url* is mandatory to be used with the operation. The *spatial-dataset-file* parameter can be used for uploading the spatial dataset file to the server. The *spatial-dataset-url* parameter can be used for providing the spatial dataset file through URL link. If both parameters are provided in the query, the server SHALL send HTTP exception `400`.

7.13.2. Response

Requirement 51	/req/core/joins-post-success
A	A successful execution of the operation for the `join-type` parameter value `hosted` with other `output-format` parameter values other than http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson-direct SHALL be reported as a response with a HTTP status code `201`.
B	The content of the response in `A` is based on the Join Schema.
C	A successful execution of the operation for the `join-type` parameter value `hosted` for the output format http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson-direct SHALL be reported as a response with a HTTP status code `200`.
D	The content of the response in `C` SHALL be the joined dataset in the GeoJSON

	format.
E	A successful execution of the operation for the `join-type` parameter value `file` SHALL be reported as a response with a HTTP status code `200`.
F	The content of the response in `E` SHALL be the joined dataset in the GeoJSON format.

Requirement 52	**/req/core/joins-post-attribute-data-file-csv-multiple-keys**
A	If the attribute data file is in CSV format and it contains multiple rows with the same key value, the value is used in the join operation from the row where it is encountered first.

Requirement 53	**/req/core/joins-joinid-post-success-attribute-data-file-csv-attribute-names**
A	If the attribute data file is in CSV format and it contains the header row, the names for the joined attributes SHALL be the values of the joined columns from the header row.
B	If the attribute data file is in CSV format and it doesn't contain a header row, the server SHALL generate the names for the joined attributes.

7.13.2.1. Response schema for the Join Creation

The response shema for queries that create a join resource is expressed with the Join Shema.

For repsonses that produce a GeoJSON output, the response is a GeoJSON file that contains also the joined attributes.

7.13.3. Error Situations

See HTTP status codes for general guidance.

7.14. Join

The HTTP GET operation at path `{root}/joins/{joinId}` returns metadata on a specific join that is available on the server.

7.14.1. Request

Requirement 54	**/req/core/joins-joinid-get-op**
A	The server SHALL support the HTTP GET operation at the path `/joins/{joinId}`.
B	The parameter `joinId` is each id property in the `joins` response (JSONPath: `$.joins[*].id`).

7.14.2. Response

Requirement 55	**/req/core/joins-joinid-get-success**
A	A successful execution of the operation SHALL be reported as a response with a HTTP status code `200`.

B	The content of that response SHALL be based on the Join Schema.

7.14.2.1. Response Schema for the Join

Join Schema

```
schema:
  $ref: '#/components/schemas/JoinResponseObject'

JoinResponseObject:
  required:
  - join
  - links
  type: object
  properties:
    links:
      type: array
      items:
        $ref: '#/components/schemas/Link'
    join:
      $ref: '#/components/schemas/JoinObject'

JoinObject:
  required:
  - id
  - inputs
  - outputs
  - timeStamp
  type: object
  properties:
    id:
      type: string
    timeStamp:
      type: string
      format: date-time
    inputs:
      $ref: '#/components/schemas/JoinInputsObject'
    outputs:
      type: array
      items:
        $ref: '#/components/schemas/Link'
    joinInformation:
      $ref: '#/components/schemas/JoinInformationObject'

JoinInputsObject:
  required:
  - attributeDataset
  - collection
  type: object
  properties:
    attributeDataset:
      type: string
    collection:
      type: array
      items:
        $ref: '#/components/schemas/Link'

JoinInformationObject:
  type: object
  properties:
    numberOfMatchedCollectionKeys:
      type: integer
    numberOfUnmatchedCollectionKeys:
      type: integer
    numberOfAdditionalAttributeKeys:
      type: integer
    matchedCollectionKeys:
      type: array
      items:
        type: string
    unmatchedCollectionKeys:
      type: array
      items:
        type: string
    additionalAttributeKeys:
      type: array
      items:
        type: string
    duplicateAttributeKeys:
      type: array
      items:
        type: string
    numberOfDuplicateAttributeKeys:
      type: integer
```

links

To support hypermedia navigation, the `links` property must be populated with sufficient hyperlinks.

Requirement 56	**/req/core/joins-joinid-links**
A	A `200`-response SHALL include the following links in the `links` property of the response: • A link to this response document (relation: `self`) • links to this document in other supported media types (link rel: `alternate`)
B	All links SHALL include the `rel` and `type` properties.

join

The metadata on the join.

id

Unique identifier for the join resource.

timeStamp

The time when the join was generated.

inputs

Input datasets that were used in the join operation.

attributeDataset

Name or URL of the input attribute data file.

collection

A `link` object that contains information on the collection that was used in the join operation.

Requirement 57	**/req/core/joins-joinid-inputs-collection**
A	A `200`-response SHALL include the following links in the `links` property of the `collection` property of the response: • A link to the `collection` resource that was used in the join operation in every supported media type (relation: `dataset`).
B	All links SHALL include the `rel` and `type` properties.

outputs

Links to the produced outputs that contain the joined data.

Requirement 58	**/req/core/joins-joinid-outputs**
A	A `200`-response SHALL include the following links in the `links` property of the `outputs` property of the response: • A link to each produced output for the data join operation (relation: `output`)

B	All links SHALL include the `rel` and `type` properties.

joinInformation

Information on the execution of the data join operation

numberOfMatchedCollectionKeys

The number of collection's key values, to which attribute data was joined successfully.

numberOfUnmatchedCollectionKeys

The number of collection's key values, to which attribute data couldn´t be joined.

numberOfAdditionalAttributeKeys

The number of additional key values in the attribute dataset that were not available in the collection.

matchedCollectionKeys

List of collection's key values that were successfully joined with attribute data

unmatchedCollectionKeys

List of collection's key values, to which attribute data couldn´t be joined.

additionalAttributeKeys

List of key values in the attribute data file that were not available in the collection's key field.

duplicateAttributeKeys

List of duplicate keys in the attribute data file.

numberOfDuplicateAttributeKeys

The number of keys in the attribute data file that had duplicate entries.

7.14.3. Error Situations

See HTTP status codes for general guidance.

If the parameter `joinId` does not exist on the server, the status code of the response will be `404`. (see Table 3).

7.15. Join Update

The HTTP PUT operation at path `{root}/joins/{joinId}` updates fully the specific join.

The operation contains functionality for joining attribute data from an inputted attribute data file with a collection hosted on the server.

The core module contains support for the CSV format for the attribute data files.

The joins are executed via common key values that are available in both datasets.

If the attribute dataset contains additional key values that are not available in the collection, they will be not included to the joined output. The extension modules may alter this behavior.

7.15.1. Request

Requirement 59	**/req/core/joins-joinid-put-op**
A	The server MAY support the HTTP PUT operation at path

	`{root}/joins/{joinId}`.
B	The parameter `joinId` is the `id` property in the `joins` response (JSONPath: $.joins.id).
C	The request is made as a multipart/form-data request. The request SHALL contain the header: • Content-Type: multipart/form-data;
D	If the attribute dataset file is uploaded with the query, it SHALL contain the header • Content-Disposition: form-data; filename="[attribute dataset file's name]"; name="attribute-dataset-file";
E	The input data files SHALL be encoded with the `UTF-8` encoding.
F	The server SHALL support the GeoJSON output format for the joined data.
G	The server MAY support any other output formats for the joined data.

Request's Form Data Parameters

Requirement 60	**/req/core/join-joinid-put-op-parameters**

A

Name	**Description**	**Type and values**	**Required**
execution-type	The join execution type.	String, value: {'synchronous'}	Optional[a]
attribute-dataset-format	The format of the attribute dataset.	String	Mandatory[b]
attribute-dataset-file	The attribute dataset file (uploaded file).	File	Optional[c]
attribute-dataset-url	The attribute dataset URL.	URL	Optional[c]
attribute-dataset-key	The key field in the attribute dataset that contains the key values.	String	Mandatory[d]
attribute-dataset-data-value-list	Fields in the attribute dataset that contain the attribute values	String, separated by commas	Mandatory[e]

Name	Description	Type and values	Required
	that will be joined.		
csv-file-delimiter	The delimiter character used in the CSV file.	String	Optional[f]
csv-file-contains-header-row	Information on the existence of header row in the CSV file.	Boolean, values: {true, false}	Optional[g]
include-join-metadata	Includes the joinInformation element to the response document.	Boolean, values: {true, false}	Optional[h]
output-formats	List of output formats for the joined data that will be included to the response document.	String, separated by commas	Optional[i]
collection-id	The value of the `id` attribute of the collection available on the server, to which the attribute data will be joined.	String	Mandatory
collection-key	The value of the `id` attribute of the key field of the collection that will be used in the join operation.	String	Optional[j]
collection-crs	The coordinate referense system of the joined dataset output.	String	Optional[k]

[a] The core module supports only the value 'synchronous', other values may be defined in

Name	Description	Type and values	Required
[b] The core module contains support for the values: 'csv'.			

[c] One of the parameters: *attribute-dataset-file* or *attribute-dataset-url* is mandatory to be used with the operation. The *attribute-dataset-file* parameter can be used for uploading an attribute dataset file to the server. The *attribute-dataset-url* parameter can be used for providing the attribute dataset file through URL link. If both parameters are provided in the query, the server SHALL send HTTP exception `400`.

[d] The key field in the attribute dataset that contains the key values. For CSV format, this value is the column number that contains the key values (counting starts from 0).

[e] For CSV format, the values are the column numbers that contain the attribute values that will be joined (counting starts from 0).

[f] The *csv-file-delimiter* parameter is mandatory to be used with the *attribute-dataset-format* parameter value: 'csv'. The parameter is not required for other formats that may be defined in the extension modules.

[g] The *csv-file-contains-header-row* parameter is optional to be used with the *attribute-dataset-format* parameter value: 'csv'. The parameter is not required for other formats that may be defined in the extension modules. Values: (*true*, *false*). If parameter is not provided in the request, default value *false* is used. If parameter has value *true*, CSV file's header is assumed to be on the first row of the CSV file and data values are assumed to start from the second row. If parameter has value *false*, the data values are assumed to start from CSV file's first row.

[h] If parameter is not provided in the request, a default value *false* is used.

[i] Comma-separated list of the outputs that will be included to the response document. The output formats that the server supports SHALL be listed in the server's conformance declaration. If the parameter value is not provided in the request, a default value

http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson

is used.

[j] If the `collection-key` parameter is not provided in the request, a default key field value of the collection will be used in the join operation.

[k] The value of the parameter SHALL be listed in the collection's `crs` array if the collection contains geometries. If omitted, the first value of the `crs` array off the collection will be used.

7.15.2. Response

Requirement 61	/req/core/joins-joinid-put-success
A	A successful execution of the operation SHALL be reported as a response with a HTTP status code `200`.

B	The content of that response is based on the Join Schema.

Requirement 62	/req/core/joins-joinid-put-attribute-data-file-csv-multiple-keys
A	If the attribute data file is in CSV format and it contains multiple rows with the same key value, the value is used in the join operation from the row where it is encountered first.

Requirement 63	/req/core/joins-joinid-put-attribute-data-file-csv-attribute-names
A	If the attribute data file is in CSV format and it contains the header row, the names for the joined attributes SHALL be the values of the joined columns from the header row.
B	If the attribute data file is in CSV format and it doesn't contain a header row, the server SHALL generate the names for the joined attributes.

7.15.2.1. Response schema for the Join Update

The response shema for the join update is expressed with the Join Shema.

7.15.3. Error Situations

See HTTP status codes for general guidance.

If the parameter `joinId` does not exist on the server, the status code of the response will be `404`. (see Table 3).

7.16. Join Delete

The HTTP DELETE operation at path `{root}/joins/{joinId}` deletes the specific join from the server.

7.16.1. Request

Requirement 64	/req/core/joins-joinid-delete-op
A	The server MAY support the HTTP DELETE operation at the path `{root}/joins/{joinId}`.
B	The parameter `joinId` is the `id` property in the `joins` response (JSONPath: `$.joins.id`).

7.16.2. Response

Requirement 65	/req/core/joins-joinid-delete-success
A	A successful execution of the operation SHALL be reported as a response with a HTTP status code `204`.
B	The body of the response body SHALL be empty.

7.16.2.1. Response schema for the Join Delete

The response of the operation is empty.

7.16.3. Error Situations

See HTTP status codes for general guidance.

If the parameter `joinId` does not exist on the server, the status code of the response will be `404`. (see Table 3).

---

8. Requirements Classes for Encodings

8.1. Overview

This clause specifies three requirements classes for encodings to be used by the OGC API - Joins implementations.

- HTML
- JSON
- GeoJSON

The support for the JSON encoding class is mandatory and the support for HTML encoding class is recommended. The support for the GeoJSON format for the joined data output is mandatory.

8.1.1. Requirements Class "HTML"

Geographic information that is only accessible in formats like GeoJSON or GML has two issues:

- The data is not discoverable using the most common mechanism for discovering information, that is the search engines of the Web,
- The data can not be viewed directly in a browser - additional tools are required to view the data.

Therefore, sharing data on the Web should include publication in HTML. To be consistent with the Web, it should be done in a way that enables users and search engines to access all data.

This is discussed in detail in document Spatial Data on the Web Best Practices. This standard therefore recommends supporting HTML as an encoding.

Requirements Class	
http://www.opengis.net/spec/ogcapi-joins-1/1.0/req/html	
Target type	Web API
Dependency	Requirements Class "Core"
Dependency	HTML5
Dependency	Schema.org

Requirement 66	**/req/html/definition**
A	Every `200`-response of an operation of the server SHALL support the media type `text/html`.

Requirement 67	**/req/html/content**

A	Every `200`-response of the server with the media type `text/html` SHALL be a HTML5 document that includes the following information in the HTML body: • All information identified in the schemas of the Response Object. in the HTML `<body/>`, and • All links in HTML `<a/>` elements in the HTML `<body/>`.

Recommendation 15	**/rec/html/schema-org**
A	A `200`-response with the media type `text/html`, SHOULD include Schema.org annotations.

8.1.2. Requirements Class "JSON"

JSON is a text syntax that facilitates structured data interchange between programming languages. It is commonly used for Web-based software-to-software interchanges. The support for JSON is mandatory for OGC API - Joins implementations.

Requirements Class	
http://www.opengis.net/spec/ogcapi-joins-1/1.0/req/json	
Target type	Web API
Dependency	Requirements Class "Core"
Dependency	IETF RFC 8259: The JavaScript Object Notation (JSON) Data Interchange Format
Dependency	JSON Schema

Requirement 68	**/req/json/definition**
A	Every `200`-response of an operation of the server SHALL support the media type `application/json`.

Requirement 69	**/req/json/content**
A	Every `200`-response with the media type `application/json` SHALL include, or link to, a payload encoded according to the JSON Interchange Format.
B	The schema of all responses with the media type `application/json` SHALL conform with the JSON Schema specified for that resource.

8.1.3. Requirements Class "GeoJSON"

Requirements Class	
http://www.opengis.net/spec/ogcapi-joins-1/1.0/req/geojson	
Target type	Web API
Dependency	Requirements Class "Core"

Dependency	IETF RFC 8259: The JavaScript Object Notation (JSON) Data Interchange Format
Dependency	GeoJSON

Requirement 70	/req/geojson/definition
A	The server SHALL support the GeoJSON format for the joined data outputs.

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9. Media Types

JSON media types that would typically be supported by a server that supports JSON are:

- `application/geo+json` for joined data outputs, and
- `application/json` for all other resources.

The typical HTML media type for all "web pages" in a server would be `text/html`.

9.1. Joined Dataset Outputs

Requirement 71	/req/core/joined-dataset-outputs
A	The server implementations SHALL support the media type `application/geo+json` as the format for the joined dataset outputs.
B	The server implementations MAY support any other media type the as the format for the joined dataset outputs.

9.2. Problem Details Media Types

Recommendation 16	/rec/core/problem-details-media-type
A	The server implementations SHOULD support for the RFC 7807 Problem Details response body the media type ``application/problem+json`.

Annex A: Abstract Test Suite (Normative)

A.1. Conformance Class "Core"

Conformance Class	
http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/core	
Target type	Web API
Requirements class	Requirements Class "Core"

A.1.1. Landing Page {root}/

Abstract Test 1	**/ats/core/root-op**
Test Purpose	Validate that the landing page can be retrieved from the expected location.
Requirement	/req/core/root-op /req/core/root-success
Test Method	1. Issue an HTTP GET request to the URL `{root}/`. 2. Validate that the document was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/root-success.

Abstract Test 2	**/ats/core/root-success**
Test Purpose	Validate that a landing page complies with the required structure and contents.
Requirement	/req/core/root-success
Test Method	Validate the landing page for all supported media types using the landing page schema. 1. Validate that the landing page includes a `service-desc` and/or `service-doc` link to an API Definition. 2. Validate that the landing page includes a `http://www.opengis.net/def/rel/ogc/1.0/conformance` link to the conformance class declaration. 3. Validate that the landing page includes a `http://www.opengis.net/def/rel/ogc/1.0/data` link to the metadata on collections. 4. Validate that the landing page includes a `joins` link to the joins metadata.

A.1.2. API Definiton path {root}/api (link)

Abstract Test 3	**/ats/core/api-definition-op**

Test Purpose	Validate that the API definition document can be retrieved from the expected location.
Requirement	/req/core/api-definition-op /req/core/api-definition-success
Test Method	DO FOR EACH `service-desc` and `service-doc` link on the landing page: 1. Issue a HTTP GET request to the link. 2. Validate that a document was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/api-definition-success DONE

Abstract Test 4	**/ats/core/api-definition-success**
Test Purpose	Validate that the API definition complies with the required structure and contents.
Requirement	/req/core/api-definition-success
Test Method	Validate the API definition document against an appropriate schema document.

A.1.3. Conformance {root}/conformance

Abstract Test 5	**/ats/core/conformance-op**
Test Purpose	Validate that a conformance declaration can be retrieved from the expected location.
Requirement	/req/core/conformance-op /req/core/conformance-success
Test Method	DO FOR EACH `http://www.opengis.net/def/rel/ogc/1.0/conformance` link on the landing page: 1. Issue an HTTP GET request for the link. 2. Validate that a document was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/conformance-success. DONE 1. Issue an HTTP GET request to the path `{root}/conformance`. 2. Validate that a document was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/conformance-success.

Abstract Test 6	**/ats/core/conformance-success**

Test Purpose	Validate that the conformance declaration response complies with the required structure and contents.
Requirement	/req/core/conformance-success
Test Method	1. Validate the response document against conformance schema. 2. Validate that the document lists all OGC API conformance classes the server implements

A.1.4. Collections {root}/collections

Abstract Test 7	**/ats/core/collections-get-op**
Test Purpose	Validate that the information about collections can be retrieved from the expected location.
Requirement	/req/core/collections-get-op /req/core/collections-get-success
Test Method	1. Issue an HTTP GET request wihout query parameters to the URL `{root}/collections`. 2. Validate that a document was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/collections-get-success

Abstract Test 8	**/ats/core/collections-get-success**
Test Purpose	Validate that the Collections content complies with the required structure and contents.
Requirement	/req/core/collections-get-success /req/core/collections-get-success-links /req/core/collections-get-success-timeStamp /req/core/collections-get-success-items
Test Method	1. Validate that the response document complies with /req/core/collections-get-success-links 2. Validate that the response document complies with /req/core/collections-get-success-timeStamp 3. Validate that the response document complies with /req/core/collections-get-success-items 4. Validate the Collections resource for all supported media types using the schema Collections schema.

A.1.5. Collection {root}/collections/{collectionId}

Abstract Test 9	**/ats/core/collections-collectionid-get-op**

Test Purpose	Validate that a collection information can be retrieved from the expected location.
Requirement	/req/core/collections-collectionid-get-op /req/core/collections-collectionid-get-success
Test Method	1. For every Collection describe in the Collections content, issue a HTTP GET request to the URL `{root}/collections/{collectionId}` where {collectionId} is the `id` property of a collection. 2. Validate that a Collection was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/collections-collectionid-get-success.

Abstract Test 10	**/ats/core/collections-collectionid-get-success**
Test Purpose	Validate that the Collection content complies with the required structure and contents.
Requirement	/ats/core/collections-collectionid-get-success-content
Test Method	1. Validate the structure and content of the response document using collection schema. 2. Verify that the content of the response is consistent with the content for this Resource Collection in the `/collections` response. That is, the values for `id`, `title`, `description` and `extent` are identical.

Abstract Test 11	**/ats/core/collections-collectionid-get-success-content**
Test Purpose	Validate that a Collection document complies with the required structure and values.
Requirement	<<,/req/collections/collection-definition>> <<,/req/collections/rc-md-items-links>> <<,/req/collections/rc-md-extent>>
Test Method	FOR a each Collection document, validate: 1. That the Collection document includes an `id` property. 2. That the Collection document complies with /ats/collections/rc-md-items-links 3. That any extent properties included in the Collection document comply with /collections/rc-md-extent 4. Validate the content of the Collection document for all supported media types using the Collection schema and test /ats/json/content.

A.1.6. Collection Key Fields {root}/collections/{collectionId}/keys

Abstract Test 12	**/ats/core/collections-collectionid-keys-op**

Test Purpose	Validate that the information on Collection's key fields' can be retrieved from the expected location.
Requirement	/req/core/collections-collectionid-keys-op /req/core/collections-collectionid-keys-success
Test Method	1. For a Collection (path `{root}/collections/{collectionId}`), issue an HTTP GET request to the URL `{root}/collections/{collectionId}/keys` where {collectionId} is the `id` property of a Collection. 2. Validate that a document was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/collections-collectionid-keys-success

Abstract Test 13	**/ats/core/collections-collectionid-keys-success**
Test Purpose	Validate that the response complies with the required structure and contents.
Requirement	/req/core/collections-collectionid-keys-success
Test Method	1. Validate that the response document complies with Collection Key Fields schema. 2. Validate that the response document complies with /req/core/collection-collectionsid-keys-default-key 3. Validate that the response document complies with /req/core/collection-collectionsid-keys-links 4. Validate that the response document complies with /req/core/collections-collectionid-keys-items-links

A.1.7. Collection Key Field {root}/collections/{collectionId}/keys/{keyFieldId}

Abstract Test 14	**/ats/core/collections-collectionid-keys-keyfield-op**
Test Purpose	Validate that the key values of a Collection's key field can be retrieved from the expected location.
Requirement	/req/core/collections-collectionid-keys-keyfieldid-op.
Test Method	1. For every key field of a Collection described in the Collection's key fields response `{root}/collections/{collectionId}/keys/`, issue an HTTP GET request to the URL `{root}/collections/{collectionId}/keys/{keyFieldId}` where {collectionId} is the `id` property for a Collection and {keyFieldId} is the `id` property of a collection's key field. 2. Validate that a document was returned with a status code `200`. 3. Validate the contents of the returned document using test: /ats/core/collections-collectionid-keys-keyfieldid-success.

Abstract Test 15	/ats/core/collections-collection-keys-keyfield-success
Test Purpose	Validate that the Collection key field's response complies with the required structure and contents.
Requirement	/req/core/collections-collectionid-keys-keyfieldid-success
Test Method	1. Validate that the response document complies with Collection Key Field schema Collection Key Field schema. 2. Validate that the response document complies with /req/core/collections-collectionid-keys-keyfieldid-success-limit-response. 3. Validate that the response document complies with /req/core/collection-collectionid-keys-keyfieldid-links.

A.1.8. Joins {root}/joins

Abstract Test 16	/ats/core/joins-get-op
Test Purpose	Validate that the information about Joins can be retrieved from the expected location.
Requirement	/req/core/joins-get-op /req/core/joins-get-success
Test Method	1. Issue an HTTP GET request to the URL `{root}/joins`. 2. Validate that a document was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/joins-get-success

Abstract Test 17	/ats/core/joins-get-success
Test Purpose	Validate that the joins content complies with the required structure and contents.
Requirement	/req/core/joins-get-success /req/core/joins-get-success-items /req/core/collections-get-success-timeStamp /req/core/joins-links /req/core/joins-get-success-joins-joinobject-links
Test Method	Validate that the response document complies with Joins Schema.

A.1.9. Join Creation {root}/joins

Abstract Test 18	/ats/core/joins-post-op
Test Purpose	1. Validate that the attribute data can be joined from an attribute dataset file with a Collection available on the server from the expected location. 2. Validate that if the server supports it, that the data can be joined from an attribute dataset file with a Collection available on the server with a direct

	GeoJSON output from the expected location. 3. Validate that the data can be joined from an attribute dataset file directly with a inputted GeoJSON file from the expected location, if the server supports the file joining.
Requirement	/req/core/joins-post-op /req/core/joins-post-common-parameters /req/core/joins-post-op-hosted-parameters /req/core/joins-post-op-file-parameters /req/core/joins-post-success

Test Method	**Data joining to a Collection**
	
	1. Issue an HTTP POST request to the URL `{root}/joins` where
	  ◦ The request contains the header: `Content-Type: multipart/form-data;`
	  ◦ The form data parameter `joinType` has the value `hosted`.
	  ◦ The form data parameter `collectionId` is the `id` property of a collection (from query `{root}/collections`).
	2. Validate that a document was returned with a status code `201`.
	3. Validate the contents of the returned document using test /ats/core/joins-post-success
	
	Data joining to a Collection with a direct GeoJSON output
	
	If the server supports the data joining to a Collection with a direct GeoJSON output:
	
	1. Issue an HTTP POST request to the URL `{root}/joins` where
	  ◦ The request contains the header: `Content-Type: multipart/form-data;`
	  ◦ The form data parameter `joinType` has the value `hosted`.
	  ◦ The form data parameter `collectionId` is the `id` property of a collection (from query `{root}/collections`).
	  ◦ The form data parameter `outputFormats` has the value `http://www.opengis.net/spec/ogcapi-joins-1/1.0/conf/output/geojson-direct`.
	2. Validate that a document was returned with a status code `200`.
	3. Validate the contents of the returned document using test /ats/core/joins-post-success
	
	Data joining to a Inputted Spatial Data Files
	
	If the server supports the data joining with inputted Spatial Data files:
	
	1. Issue an HTTP POST request to the URL `{root}/joins` where
	  ◦ The request contains the header: `Content-Type: multipart/form-data;`
	  ◦ The form data parameter `joinType` has the value `file`.

	2. Validate that a document was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/joins-post-success

Abstract Test 19	**/ats/core/joins-post-success**
Test Purpose	Validate that the data join response complies with the required structure and contents.
Requirement	/req/core/joins-post-success
Test Method	**Data joining to a Collection** 1. Validate that the response document complies with the Join Schema. 2. Validate that the response document contains the joined data in all the requested output formats that are supported by the server. **Data joining to a Collection with a direct GeoJSON output** 1. Validate that the response is a valid GeoJSON document and it contains the attribute data that were joined from the attribute dataset file. **Data joining to a Inputted Spatial Data Files** 1. Validate that the response is a valid GeoJSON document and it contains the attribute data that were joined from the attribute dataset file.

A.1.10. Join {root}/joins/{joinId}

Abstract Test 20	**/ats/core/joins-joinid-get-op**
Test Purpose	Validate that the information about a join can be retrieved from the expected location.
Requirement	/req/core/joins-joinid-get-op /req/core/joins-joinid-get-success
Test Method	1. For a list of joins (path `{root}/joins`), issue an HTTP GET request to the URL `{root}/joins/{joinId}` where {joinId} is the `id` property of a join. 2. Validate that a document was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/joins-joinid-get-success.

Abstract Test 21	**/ats/core/joins-joinid-get-success**
Test Purpose	Validate that the Join content complies with the required structure and contents.
Requirement	/req/core/joins-joinid-get-success
Test Method	Validate that the response document complies with Join schema.

A.1.11. Join Update {root}/joins/{joinId}

Abstract Test 22	**/ats/core/joins-joinid-put-op**
Test Purpose	Validate that the Join can be updated fully with attribute data from an attribute dataset file data from expected location.
Requirement	/req/core/joins-joinid-put-op /req/core/join-joinid-put-op-parameters /req/core/joins-joinid-put-success
Test Method	1. Issue an HTTP PUT request to the URL `{root}/joins/{joinId}` where: ◦ {joinId} is the `id` property of a Join (from HTTP GET query `{root}/joins/{joinId}`). ◦ The request contains the header: `Content-Type: multipart/form-data;` ◦ The form data parameter `collectionId` is the `id` property of a Collection (from query `{root}/collections`). 2. Validate that a document was returned with a status code `200`. 3. Validate the contents of the returned document using test /ats/core/joins-joinid-put-success

Abstract Test 23	**/ats/core/joins-joinid-put-success**
Test Purpose	Validate that the data can be joined from an attribute dataset file with a specific spatial dataset.
Requirement	/req/core/joins-joinid-put-success
Test Method	1. Validate that the response document complies with Join Schema. 2. Validate that the response document contains the joined data in all the requested output formats that are supported by the server.

A.1.12. Join Delete {root}/joins/{joinId}

Abstract Test 24	**/ats/core/joins-joinid-delete-op**
Test Purpose	Validate that the join can be deleted from the expected location.
Requirement	/req/core/joins-joinid-delete-op
Test Method	1. Issue an HTTP DELETE request to the URL `{root}/joins/{joinId}` where {joinId} is the `id` property of a join (from query `{root}/joins/{joinId}`). 2. Validate that a document was returned with a status code `204`. 3. Validate the contents of the returned document using test /ats/core/joins-joinid-delete-success

Abstract Test 25	**/ats/core/joins-joinid-delete-success**

Test Purpose	Validate that the join was deleted from the server.
Requirement	/req/core/joins-joinid-delete-success
Test Method	1. Validate that the join has been deleted from the server by issuing an HTTP GET request to the URL `{root}/joins/{joinId}` where {joinId} is the same `id` property of the join that was used in the delete request. 2. Validate that the server sent a response code `404`.

Annex B: Revision History

Date	Release	Editor	Primary clauses modified	Description
2021-11-30	1.0.0-SNAPSHOT	P. Latvala	all	Updated chapters 2 and 7
2021-11-24	1.0.0-SNAPSHOT	P. Latvala	all	Initial version

Annex C: Bibliography

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- Open Geospatial Consortium (OGC) / World Wide Web Consortium (W3C): **Spatial Data on the Web Best Practices**, Edited by J. Tandy, L. van den Brink and P. Barnaghi. 2017. Available at: https://www.w3.org/TR/sdw-bp/.

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