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Open Geospatial Consortium

OGC API - DISCRETE GLOBAL GRID SYSTEMS - PART 1: CORE

STANDARD
Implementation

CANDIDATE SWG DRAFT

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Editor: Dr. Matthew Brian John Purss, Jérôme Jacovella-St-Louis

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I ABSTRACT

This specification defines building blocks which can be used as part of a Web API to retrieve geospatial data for a specific area, time and resolution of interest, based on a specific Discrete Global Grid System (DGGS) and indexing scheme, as defined in OGC Abstract Topic 21, as well to query the list of DGGS zones from which data is available and/or matching a specify query (in combination with other building blocks defining queries, such as a filter defined using the OGC Common Query Language (CQL2).

II KEYWORDS

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

ogcdoc, OGC document, API, openapi, html, ogcapi

III PREFACE

NOTE: OGC API standards define modular API building blocks to spatially enable Web APIs in a consistent way. The OpenAPI specification is used to define the API building blocks.

OGC API – Discrete Global Grid Systems provides API building blocks to retrieve data and query zones based on Discrete Global Grid Systems (DGGS) concepts defined in OGC Abstract Topic 21. Additional parts for *OGC API – Discrete Global Grid Systems* may be defined in the future to provide additional capabilities.

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Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

IV SECURITY CONSIDERATIONS

No security considerations have been made for this document.

V SUBMITTING ORGANIZATIONS

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

- Pangaea Innovations Pty. Ltd.
- Ecere Corporation

VI SUBMITTERS

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

Name	Affiliation
Matthew Brian John Purss (editor)	Pangaea Innovations Pty. Ltd.
Jérôme Jacovella-St-Louis (editor)	Ecere Corporation

1

SCOPE

1 SCOPE

NOTE: Insert Scope text here. Give the subject of the document and the aspects of that scope covered by the document.

2

CONFORMANCE

2 CONFORMANCE

This standard defines XXXX.

Requirements for N standardization target types are considered:

- AAAA
- BBBB

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.

In order to conform to this OGC® interface standard, a software implementation shall choose to implement:

- Any one of the conformance levels specified in Annex A (normative).
- Any one of the Distributed Computing Platform profiles specified in Annexes TBD through TBD (normative).

All requirements-classes and conformance-classes described in this document are owned by the standard(s) identified.

3

NORMATIVE REFERENCES

3 NORMATIVE REFERENCES

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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4

TERMS AND DEFINITIONS

4 TERMS AND DEFINITIONS

This document uses the terms defined in OGC Policy Directive 49, 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 document and OGC documents do not use the equivalent phrases in the ISO/IEC Directives, Part 2.

This document also uses terms defined in the OGC Standard for Modular specifications (OGC 08-131r3), also known as the ‘ModSpec’. The definitions of terms such as standard, specification, requirement, and conformance test are provided in the ModSpec.

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

This document uses the terms defined in Sub-clause 5.3 of OGC06-121r9, 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. example term

term used for exemplary purposes

Note 1 to entry: An example note.

Example Here’s an example of an example term.

[**SOURCE:** ISO 19101-1:2014]

5

CONVENTIONS

5 CONVENTIONS

This sections provides details and examples for any conventions used in the document. Examples of conventions are symbols, abbreviations, use of XML schema, or special notes regarding how to read the document.

5.1. Identifiers

The normative provisions in this standard are denoted by the URI

`http://www.opengis.net/spec/{standard}/{m.n}`

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

6

DGGS – CORE CONFORMANCE CLASS

6 DGGS — CORE CONFORMANCE CLASS

Paragraph

6.1. Clauses not containing normative material sub-clause 1

Paragraph

6.2. Clauses not containing normative material sub-clause 2

7

DGGS – DATA RETRIEVAL CONFORMANCE CLASS

7 DGGS — DATA RETRIEVAL CONFORMANCE CLASS

The Data Retrieval conformance class allows to retrieve data from a specific Discrete Global Grid System (DGGS) in a particular indexing scheme from an individual zone. It describes an HTTP GET operation, as well as its response. The selected DGGS is listed as available and described in the Core conformance class, and conforms to OGC Topic 21.

The data for a particular zone is retrieved based on a URI template including a variable representing a Zone ID.

The resource from which data is retrieved can either be for a particular collection of geospatial data, for a dataset as a whole, or in connection with *OGC API — Processes — Part 3: Workflows & Chaining*, the output of a processing workflow.

REQUIREMENTS CLASS 1	
TARGET TYPE	DGGS Data Retrieval
PREREQUISITE	http://www.opengis.net/spec/ogcapi-common-1/1.0/req/core
LABEL	http://www.opengis.net/spec/ogcapi-dggs-1/0.0/req/data-retrieval

7.1. Retrieving data from a zone

The following requirements describe how a client can retrieve data from a single DGGS zone at the resource path …/`dggs/{dggsId}/zones/{zoneId}/data`.

7.1.1. Operation

REQUIREMENT 1	
LABEL	/req/data-retrieval/single-zone-data-op
STATEMENT	Operation for retrieving data from a single DGGS zone:
A	The operation SHALL support an HTTP GET operation at a resource path ending with …/`dggs/{dggsId}/zones/{zoneId}/data`.

REQUIREMENT 1	
B	The operation SHALL satisfy requirement /req/data-retrieval/rc-zone-depth-definition.
C	The operation SHALL provide a templated link to this resource path using the link relation type http://www.opengis.net/def/rel/ogc/1.0/dggs-zone-data.

7.1.2. Response

REQUIREMENT 2	
LABEL	/req/data-retrieval/single-zone-data-response
STATEMENT	For the response to a query retrieving data for a single DGGS zone:
A	The response of the HTTP GET operation SHALL have a status code of 200.
B	The content of the response SHALL be a data packet corresponding precisely to the area covered by the DGGS zone.
C	The response SHALL satisfy requirement /req/data-retrieval/rc-zone-depth-response.
D	The selection of an encoding for the response SHALL be consistent with HTTP content negotiation.

7.1.3. Parameter `zone-depth`

REQUIREMENT 3	
LABEL	/req/data-retrieval/zone-depth-parameter
STATEMENT	Parameter to specify the DGGS resolution levels beyond the specified DGGS zone's hierarchy level to include in the response, when retrieving data for that zone
A	The implementation SHALL support a `zone-depth` parameter for the HTTP GET operation on a resource path ending with …/`dggs/{dggsId}/zones/{zoneId}/data`.
B	The implementation SHALL accept the following types of values for the `zone-depth` parameter: • A single positive integer value — representing a specific zone depth to return (e.g., `zone-depth=5`); • A range of positive integer values in the form "{low}-{high}" — representing a continuous range of zone depths to return (e.g., `zone-depth=1-8`); or, • A comma separated list of at least two (2) positive integer values — representing a set of specific zone depths to return (e.g., `zone-depth=1,3,7`). Some or all of these forms of the

REQUIREMENT 3	
	`zone-depth` parameter may not be supported with particular data packet encodings (the data encoding may support a fixed depth, a range of depths, and/or an arbitrary selection of depths).
C	For each zone depth to be included in the response, the interpretation of a selected depth (whether requesting a single depth, a range of depths, or a list of depths) SHALL be: • 0 corresponding to a single set of range (properties / field) value(s) for the requested zone, • 1 corresponding to all zones of the next deeper hierarchy level associated with the requested zone by the indexing scheme, • .. • *n* corresponding to all zones for the *n*'th deeper level in the hierarchy level associated with the requested zone by the indexing scheme.
D	The association of zones of deeper hierarchy levels with the requested zone SHALL be based on the DGGS reference system, which takes into consideration both the grid definition as well as the indexing system in use for the DGGS resource.
E	If a `zone-depth` is specified, the operation SHALL return the data at the resolution(s) / scale(s) specified.
F	If the `zone-depth` parameter is omitted, the default value described in the DGGS reference system resource (.../`dggs/{dggsId}`) SHALL be assumed by the server, in accordance with the capabilities of the data packet encoding. This default value which could be any valid value and/or form as defined above (single depth, range of depths, or list of depths).

NOTE 1: A use case for a `zone-depth` of 0 would be to query the single set of values for a specific DGGS zone.

NOTE 2: For use cases such as visualization and performing analysis over a certain area, a non-zero `zone-depth` would normally be used to avoid an overwhelming number of server round-trips. In this case, more than a single value would be returned for each zone request, with values returned for descendent zones at `zone-depth` levels deeper than the requested zone's level. For example, requesting data for a level 10 zone with a `zone-depth` of 8 would return individual values for each level 18 zones contained within that level 10 zone being requested.

8

DGGS – ZONE QUERY CONFORMANCE CLASS

8 DGGS — ZONE QUERY CONFORMANCE CLASS

8.1. Requirement Class DGGS — Zone Query

The Zone Query conformance class allows to request the list of DGGS zones from a specific Discrete Global Grid System (DGGS) in a particular indexing scheme for which there is data available, or matching a particular query (e.g., using a filtering parameter). It describes an HTTP GET operation, as well as its response. The selected DGGS is listed as available and described in the Core conformance class, and conforms to OGC Topic 21. The list of zones from a Web API using this conformance class can either be for a particular collection of geospatial data, for a dataset as a whole, or in connection with *OGC API — Processes — Part 3: Workflows & Chaining*, the output of a processing workflow.

REQUIREMENTS CLASS 2	
TARGET TYPE	Implementation Specification
PREREQUISITES	http://www.example.org/req/blah /req/data-retrieval
LABEL	http://www.opengis.net/spec/ABCD/m.n/req/zone-query

8.1.1. Retrieve the list of zones

The following requirements describe how a client can retrieve the list of zones from which data is available at the resource path …`/dggs/{dggsId}/zones`.

8.1.1.1. Operation

REQUIREMENT 4	
LABEL	/req/zone-query/list-zones-op
STATEMENT	For retrieving a list of DGGS zones:
A	The Implementation SHALL support an HTTP GET operation at a resource path ending with …`/dggs/{dggsId}/zones`.

REQUIREMENT 4	
B	The Implementation SHALL provide a link to this resource path using the link relation type http://www.opengis.net/def/rel/ogc/1.0/dggs-zone-query.

8.1.1.2. Response

REQUIREMENT 5	
LABEL	/req/zone-query/zones-list-response
STATEMENT	For the response to a query requesting a list of DGGS zones:
A	The response of the HTTP GET operation SHALL have a status code of 200.
B	The content of the response SHALL be a list of zones fully covering where data is available (in the case where the resource is associated with a particular dataset), and matching any additional query parameters specified by the client (e.g., a filtering query parameter), without any redundancy.
C	Unless the zones is a compact list of zones (see `compact-zones` parameter), the zones returned SHALL all be of the same DGGS hierarchy level.
D	The selection of an encoding for the returned list of zones SHALL be consistent with HTTP content negotiation.
E	The implementation SHALL support at minimum a JSON encoding (media type `application/json`) where each zone ID is specified as a string within an array of zones assigned to a `zones` property within a JSON object (e..g, `{ "zones": [ "1-E-14", "1-E-15", "1-F-14", "1-F-15", "1-F-16" ] }`.

8.1.2. `zone-level` parameter

The following requirements describe how a client can specify the DGGS hierarchy level at which to retrieve the list of zones.

8.1.2.1. Parameter

REQUIREMENT 6	
LABEL	/req/zone-query/zone-level-parameter
STATEMENT	For specifying a level at which to return a list of DGGS zones:

REQUIREMENT 6	
A	The Implementation SHALL support a `zone-level` query parameter for the zone query operation (resource path ending with …/`dggs/{dggsId}/zones`).

8.1.2.2. Response

REQUIREMENT 7	
LABEL	/req/zone-query/zones-list-response
STATEMENT	For the response to querying a list of DGGS zones using `zone-level` query parameter:
A	If a compact zones list is used (the default), the zones returned in the response SHALL be of the DGGS hierarchy level specified by the `zone-level` query parameter, or of a lower hierarchy level standing in for a compact representation of multiple zones at the requested hierarchy level.
B	If a compact zones list is not used, the zones returned in the response SHALL be of the DGGS hierarchy level specified by the `zone-level` query parameter.

8.1.3. `compact-zones` parameter

By default, implementations return a compact list of zones where children zones fully covering a parent are recursively replaced by the parent zones, allowing to express large areas in a much more compact list of zones. The following requirements describe how a client can disable returning a compact list of zones.

8.1.3.1. Parameter

REQUIREMENT 8	
LABEL	/req/zone-query/compact-zones-parameter
STATEMENT	For specifying whether to return a compact list of zones:
A	The Implementation SHALL support a boolean `compact-zones` query parameter for the zone query operation (resource path ending with …/`dggs/{dggsId}/zones`), where a value of `true` corresponds to the default behavior when the paramter is not specified, and a value of `false` disables the use of compact-zones in the response.

8.1.3.2. Response

REQUIREMENT 9	
LABEL	/req/zone-query/compact-zones-response
STATEMENT	For the response to querying a list of DGGS zones using `compact-zones` query parameter:
A	When the `compact-zones` parameter is to false, the zones list response SHALL NOT be a compact list, and SHALL explicitly list every individual zone at the requested or default DGGS hierarchy level.
B	When the `compact-zones` parameter is to true (or unspecified), the zones list response SHALL be a compact list, where children zones completely covering the area of a parent zone SHALL be replaced by that parent zone, in a recursive manner all the way to the lowest DGGS hierarchy level.

8.1.4. Paging capability and `limit` parameter

The following requirements describe how a client can specify a limit to the number of zones to be returned and page through large list of zones as multiple requests and responses.

8.1.4.1. Parameter

REQUIREMENT 10	
LABEL	/req/zone-query/limit-parameter
STATEMENT	For specifying a limit to how many zones should be returned in a zone query:
A	The Implementation SHALL support a parameter `limit` integer query parameter, with a minimum value of 1.

8.1.4.2. Response

REQUIREMENT 11	
LABEL	/req/zone-query/limit-response
STATEMENT	For the response to a zone query:

REQUIREMENT 11	
A	The response SHALL not contain more zones than specified by the optional `limit` parameter (if specified).
B	If the API definition specifies a maximum value for the `limit` parameter, the response SHALL not contain more zones than this maximum value.
C	If the value of the `limit` parameter is larger than the maximum value, this SHALL NOT result in an error (but instead be replaced by the maximum as the parameter value).
D	If using compact zones, the parent zones SHALL count as a single zone, rather than the number of children zones they stand in for.
E	If an implementation does not return the full list of zones for the request, a link with relation type `next` SHALL be included in a `links` array property of the response, which a client can request to resume listing the zones.

9

MEDIA TYPES FOR ANY DATA ENCODING(S)

9 MEDIA TYPES FOR ANY DATA ENCODING(S)

A section describing the MIME-types to be used is mandatory for any standard involving data encodings. If no suitable MIME type exists in http://www.iana.org/assignments/media-types/index.html then this section may be used to define a new MIME type for registration with IANA.

A

ANNEX A (INFORMATIVE) CONFORMANCE CLASS ABSTRACT TEST SUITE (NORMATIVE)

A

ANNEX A (INFORMATIVE) CONFORMANCE CLASS ABSTRACT TEST SUITE (NORMATIVE)

NOTE: Ensure that there is a conformance class for each requirements class and a test for each requirement (identified by requirement name and number)

A.1. Conformance Class A

A.1.1. Requirement 1

REQUIREMENT A.1	
TEST PURPOSE	Verify that…
TEST METHOD	Inspect…

A.1.2. Requirement 2

B

ANNEX B (INFORMATIVE) TITLE

B

ANNEX B (INFORMATIVE) TITLE

NOTE: Place other Annex material in sequential annexes beginning with “B” and leave final two annexes for the Revision History and Bibliography

C

ANNEX C (INFORMATIVE) REVISION HISTORY

C

ANNEX C (INFORMATIVE) REVISION HISTORY

Table C.1

DATE	RELEASE	EDITOR	PRIMARY CLAUSES MODIFIED	DESCRIPTION
2021-05-17	0.1	Matthew Purss	all	initial version
2022-07-22	0.2	Jerome St Louis	all	Renamed Part 1 to core — github commit — 316d37f
2022-07-22	0.3	Jerome St Louis	all	Initial set up of conformance classes clauses — github commit — b76073c
2022-07-26	0.4	Gobe Hobona	all	Fixes problem that was breaking auto-build — github commit — a13c2a8
2022-10-04	0.5	Jerome St Louis	7-Data Retrieval	Initial take at Data Retrieval Conformance Class — github commit — b67f290
2022-11-11	0.6	Jerome St Louis	7-Data Retrieval	Split multi-done retrieval into separate conformance class — github commit — 06a4260
2022-11-11	0.7	Jerome St Louis	8-zone query	Initial progress on Zone Query conformance class — github commit — a208502
2022-11-11	0.8	Jerome St Louis	21-038; 0-front material	Added preface, abstract, Jerome added as editor — github commit — 71e76c6
2022-11-11	0.9	Jerome St Louis	7-Data Retrieval	Clarification regarding resolution — github commit — c43bfad
2022-11-11	0.10	Jerome St Louis	8-zone query	Clarifications — github commit — cee3685
2023-02-17	0.11	Jerome St Louis	7-Data Retrieval	Added zone-depth parameter — github commit — 2b8fa58

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BIBLIOGRAPHY

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[2] *OGC: OGC Testbed 12 Annex B: Architecture* (2015).