|  |  |  |
| --- | --- | --- |
| WEATHER CLIMATE WATER | **World Meteorological Organization**  **COMMISSION FOR OBSERVATION, INFRASTRUCTURE AND INFORMATION SYSTEMS**  **Third Session** 15 to 19 April 2024, Geneva | **INFCOM-3/Doc. 8.3(1)** |
| Submitted by: Chair of SC-IMT  28.II.2024  **DRAFT 1** |

**AGENDA ITEM 8: TECHNICAL DECISIONS**

**AGENDA ITEM 8.3: WMO Information System**

# amendments to the manual on the WMO Information System (WMO-No. 1060)

|  |
| --- |
| **Summary** |
| **Document presented by:** Chair of the Standing Committee on Information Management and Technology (SC-IMT),  **Strategic objective 2024–2027:** 2.2  **Financial and administrative implications:** within the parameters of the Strategic and Operating Plans 2024–2027  **Key implementers:** INFCOM, RAs  **Time frame:** 2024-2027  **Action expected:** Review the proposed draft recommendation |

# DRAFT RECOMMENDATION

## Draft Recommendation 8.3(1)/1 (INFCOM-3)

### Amendments to the Manual on the WMO Information System

THE COMMISSION FOR OBSERVATION, INFRASTRUCTURE AND INFORMATION SYSTEMS,

**Recalling**

1. [Resolution 25 (Cg-19)](https://library.wmo.int/idviewer/67177/208) − Technical Regulations of the WMO Information System 2.0,
2. [Resolution 34 (EC-76)](https://library.wmo.int/idviewer/66258/1147) − Implementation plan update of the WMO Information System 2.0,

**Reaffirming**

1. The compelling need to implement a WIS 2.0 to support the WMO Unified Data Policy ([Resolution 1 (Cg-Ext(2021))](https://library.wmo.int/idviewer/57850/9) − WMO Unified Policy for the International Exchange of Earth System Data), the Global Basic Observing Network ([Resolution 2 (Cg-Ext(2021)](https://library.wmo.int/idviewer/57850/29)) − Amendments to the Technical Regulations related to the establishment of the Global Basic Observing Network) and the Early Warnings for All initiative ([Resolution 4 (Cg-19)](https://library.wmo.int/idviewer/67177/61) − United Nations Early Warnings for All initiative),
2. The urgent need to develop the required technical and regulatory framework to enable the international exchange of data by all the disciplines and domains, as required by the WMO Unified Data Policy ([Resolution 1 (Cg-Ext(2021))](https://library.wmo.int/idviewer/57850/9)),

**Recognizing** the need to provide a consolidated body of technical regulations and guidance to allow Members to prepare for the operational implementation of WIS 2.0 starting in January 2025,

**Noting** the successful completion of the WIS 2.0 pilot phase and the progress of the pre-operational phase as reported in [INFCOM-3/INF. 8.3(2b)](https://meetings.wmo.int/INFCOM-3/InformationDocuments/Forms/AllItems.aspx),

**Recommends** to the Executive Council the adoption of the amendments to the *[Manual on the WMO Information System, Volume II – WMO Information System 2.0](https://library.wmo.int/records/item/68731-manual-on-the-wmo-information-system-volume-ii-wmo-information-system-2-0?offset=4)*(WMO-No. 1060) throughthe draft resolution provided in the [annex](#_Annex_to_draft_1) to the present recommendation.

\_\_\_\_\_\_\_\_\_\_\_\_

[Annex: 1](#_Annex_to_draft_1)

## Annex to draft Recommendation 8.3(1)/1 (INFCOM-3)

**Draft Resolution ##/1 (EC-78)**

THE EXECUTIVE COUNCIL,

**Recalling**

1. [Resolution 25 (Cg-19)](https://library.wmo.int/idviewer/67177/208) − Technical Regulations of the WMO Information System 2.0,
2. [Resolution 34 (EC-76)](https://library.wmo.int/idviewer/66258/1147) − Implementation plan update of the WMO Information System 2.0,

**Recognizing** the need to provide a consolidated body of technical regulations and guidance to allow the Members to prepare for the operational implementation of WIS 2.0 starting in January 2025,

**Noting** the successful completion of the WIS 2.0 pilot phase and the progress of the pre-operational phase as reported in [INFCOM-3/INF. 8.3(2b)](https://meetings.wmo.int/INFCOM-3/InformationDocuments/Forms/AllItems.aspx),

**Having examined** Recommendation 8.3(1)/1 (INFCOM-3),

**Having agreed** Recommendation 8.3(1)/1 (INFCOM-3),

**Decides** to adopt the amendments to the [*Manual on the WMO Information System, Volume II – WMO Information System 2.0*](https://library.wmo.int/records/item/68731-manual-on-the-wmo-information-system-volume-ii-wmo-information-system-2-0?offset=4)(WMO-No. 1060) provided in the [annex](#_Annex_to_draft_3) to the present resolution;

**Urges** Members to prepare their infrastructure and operations for the implementation of WIS 2.0 as described in the [*Manual on the WMO Information System*](https://library.wmo.int/records/item/68731-manual-on-the-wmo-information-system-volume-ii-wmo-information-system-2-0?offset=4) (WMO-No. 1060) and the [*Guide to the WMO Information System*](https://library.wmo.int/records/item/28988-guide-to-the-wmo-information-system?offset=1)(WMO-No. 1061);

**Requests** Secretary-General to publish the amended version of the [*Manual on the WMO Information System*](https://library.wmo.int/records/item/68731-manual-on-the-wmo-information-system-volume-ii-wmo-information-system-2-0?offset=4) (WMO-No. 1060) in the [annex](#_Annex_to_draft_3) to the present resolution.

\_\_\_\_\_\_\_\_\_\_\_\_

[Annex: 1](#_Annex_to_draft_3)

## Annex to draft Resolution ##/1 (EC-78)

## Amendments to the *Manual on the WMO Information System* (WMO-No. 1060)

## Volume II – WMO Information System 2.0

The following amendments are proposed:

1. Changes to Manual
2. Addition of Appendix D: WIS2 Topic Hierarchy
3. Addition of Appendix E: WIS2 Notification Message
4. Addition of Appendix F: WMO Core Metadata Profile (version 2)

### 1. Changes to [*Manual on the WMO Information System, Volume II – WMO Information System 2.0*](https://library.wmo.int/records/item/68731-manual-on-the-wmo-information-system-volume-ii-wmo-information-system-2-0?offset=4)(WMO-No. 1060)

**PART I. ORGANIZATION AND RESPONSIBILITIES**

1.2 Organization of WIS

1.2.4 ~~GISCs~~ WIS centres may operate one or more global services that collectively ensure the discovery of and access to data within all regions.

…

**PART II. DESIGNATION PROCEDURES AND WIS CENTRES**

**2.1 GENERAL**

2.1.2 As required by the *[Technical Regulations](https://library.wmo.int/records/item/35722-technical-regulations?offset=3)* (WMO-No. 49), Volume I, Part II, 1.2.3, Congress and the Executive Council shall consider the designation of GISCs and DCPCs based on the recommendations of the Commission for Observation, Infrastructure and Information Systems (INFCOM). The development of INFCOM recommendations includes consultation and coordination with the Commission for Weather, Climate, Water and Related Environmental Services and Applications (SERCOM) and ~~relevant technical commissions that are responsible for the WMO and related international programmes concerned, as well as with~~ the regional associations, as appropriate.

…

**2.5** PERFORMANCE REVIEW~~AUDIT~~ **OF WIS CENTRES**

**2.5.1 Background**

2.5.1.1 The ongoing performance of WIS relies on the continued compliance of WIS centres with agreed standards and practices. To this end, GISCs, DCPCs and NCs should have a performance review ~~an audit~~ of their compliance with WIS standards and practices.

**2.5.2 Responsibility**

2.5.2.1 Members are responsible for ensuring that their centres remain compliant with WIS standards and practices. INFCOM will oversee and support the performance review ~~audit~~ process with the aim of confirming a centre’s compliance on a regular basis.~~every eight years for NCs and DCPCs and every four years for GISCs.~~

**2.5.3 Procedure**

~~Note: Further information on the audit of WIS centres is provided in the Guidance on Technical Specifications of WIS 2.0.~~

…

**PART III. FUNCTIONS OF WIS**

**3.5 FUNCTIONAL REQUIREMENTS OF A GISC**

~~3.5.4.4 Each GISC shall participate in the work of the Task Team on GISC (TT-GISC) to optimize the global operational performance and sustainability of WIS.~~

…

**3.6 FUNCTIONAL REQUIREMENTS OF A WIS NODE**

**3.6.2 Provide access to data and discovery metadata**

Note: More information on the standardized topic structure is provided in Appendix D. ~~the Guidance on Technical Specifications of WIS 2.0.~~

…

**3.7 FUNCTIONAL REQUIREMENTS OF GLOBAL SERVICES**

**3.7.2 Provision of global service components**

3.7.2.1 A WIS centre may provide one or more global service components (Global Broker, Global Cache, Global Discovery Catalogue, Global Monitor).

~~Note: The procedure for designating a WIS centre to provide a global service component is described in the Guidance on Technical Specifications of WIS 2.0.~~

…

**3.7.5 Functional requirements of a Global Cache**

3.7.5.6 A Global Cache shall retain a copy of the discovery metadata records and core data it stores for a duration compatible with the real-time or near-real-time schedule of the data and not less than 24 hours.

~~3.7.5.7 A Global Cache shall replace a discovery metadata record if an updated version is available.~~

~~3.7.5.8 A Global Cache shall retain a copy of a discovery metadata record until a notification is received indicating that the record should be removed.~~

3.7.5.7~~9~~ A Global Cache shall publish notifications via its Message Broker about copies of the discovery metadata records and core data it makes available. A Global Cache shall use a standardized topic structure when publishing notifications.

…

**3.7.6 Functional requirements of a Global Discovery Catalogue**

3.7.6.8 A Global Discovery Catalogue shall publish an archive resource once per day, containing all discovery metadata records valid at that time.

**…**

**4.3 WIS-TECHSPEC-2: PUBLISHING DATA AND DISCOVERY METADATA**

4.3.5 Notifications indicating the availability and access URL of new or updated data or discovery metadata shall be published to a Message Broker using the format and protocol specified in the Appendix E. ~~Guidance on Technical Specifications of WIS 2.0.~~

4.3.6 Notifications indicating the removal of a dataset from WIS shall be published to a Message Broker using the format and protocol specified in Appendix E.~~the Guidance on Technical Specifications of WIS 2.0.~~

**…**

**4.4 WIS-TECHSPEC-3: OPERATING A GLOBAL BROKER**

4.4.2 At least one Global Broker shall subscribe to notifications published from each WIS node and Global Cache according to the standardized topic structure specified in Appendix D. ~~The topic structure and process to allocate WIS nodes and Global Caches to Global Brokers are described in the Guidance on Technical Specifications of WIS 2.0.~~

…

**4.5 WIS-TECHSPEC-4: OPERATING A GLOBAL CACHE**

4.5.5 Based on its received notifications, a Global Cache shall download discovery metadata records from WIS nodes or other Global Caches and store them for a minimum duration of 24 hours. ~~until receipt of a notification requesting deletion of those discovery metadata records.~~

**…**

**4.6 WIS-TECHSPEC-5: OPERATING A GLOBAL DISCOVERY CATALOGUE**

4.6.10 A Global Discovery Catalogue shall create an archive of all valid discovery metadata records at least once per day. This archive resource shall be openly accessible.

4.6.11 A Global Discovery Catalogue shall publish notifications to a Message Broker indicating the availability of a discovery metadata archive resource. Notifications shall include the URL for downloading the archive resource from the Global Discovery Catalogue.

**…**

**4.7 WIS-TECHSPEC-6: MANAGING OPERATIONS OF THE WIS**

~~4.7.4 Specialized incident management portals fulfilling the requirements prescribed in the Technical Regulations shall collect and display metrics to support data management within a particular domain or programme.~~

4.7.4~~5~~ GISCs with the support of Global Services shall coordinate the incident management process described in the ~~Guidance on Technical Specifications of WIS 2.0~~Guide to WIS (WMO-No. 1061), Volume II to satisfy the required service level.

**…**

**PART V. WIS DISCOVERY METADATA**

**5.1 GENERAL**

5.1.2 The WIS2 Core Metadata Profile (WCMP2) for discovery metadata is specified in Appendix F.

~~Note: More information on discovery metadata is provided in the Guidance on Technical Specifications of WIS 2.0.~~

**…**

**PART VI. INFORMATION MANAGEMENT**

**6.1 MANAGING INFORMATION AND COMMUNICATION TECHNOLOGY OPERATIONS**

~~6.1.1 WIS centres should participate in the WIS IT Security Incident Response Process specified in the Guide to the WMO Information System (WMO-No. 1061), Part VII, Appendix F to the extent permitted by national regulations, policies and procedures.~~

6.1.1~~2~~ All Members should follow the guidance provided in ~~Part VI of~~ the Guide to the WMO Information System (WMO-No. 1061), Volume II and use appropriate information management processes to generate, share, use, archive and dispose of information supporting WMO and partner organization programmes.

~~6.1.3 Information management practices shall include: documentation, governance, quality assurance and competency development.~~

~~6.1.4 Members should apply the guidance provided in the Guidance on Technical Specifications of WIS 2.0.~~

**….**

### 2. Addition of Appendix D: WIS2 Topic Hierarchy

**APPENDIX D: WIS2 TOPIC HIERARCHY**

The normative provisions in this standard are denoted by the http://wis.wmo.int/spec/wth/1 URI. All requirements in this document are denoted by partial URIs which are relative to this base and examples are represented with shaded text.

**1. REQUIREMENTS CLASS "CORE"**

|  |  |
| --- | --- |
| URI | http://wis.wmo.int/spec/wth/1/req/core |
| Target type | Topic classification |
| Dependency | [MQTT v5.0](#MQTT5) |
| Dependency | [MQTT v3.1.1](#MQTT3) |
| Pre-conditions | Topics conform to Topic Name requirements of MQTT |

**1.1 Overview**

The WIS2 Topic Hierarchy (WTH) is composed of primary topics (levels 1-7) and sub-discipline specific topics (levels 8 and beyond).

The primary topics apply to all data and resources in WIS. They are relational, meaning that any combination of the values in each level can be used to construct a topic applicable to a notification. See table below.

The sub-discipline topics are proposed by domain experts and user communities. These levels are a hierarchical representation of the dataset and the number of levels in this part may vary according to the requirements of various domains.

The representation is encoded as a simple text string of values in each topic level separated by a /.

*Examples*

origin/a/wis2/ca-eccc-msc/data/core/weather/surface-based-observations/synop

origin/a/wis2/ca-eccc-msc/data/recommended/atmospheric-composition/experimental/space-based-observation/geostationary/solar-flares

**Table. WTH primary topic levels**

|  |  |  |
| --- | --- | --- |
| **Level** | **Name** | **Description** |
| 1 | channel | Location of where the data originates from (data providers are origin and global services cache) |
| 2 | version | Alphabetical version of the topic hierarchy, currently: a |
| 3 | system | Fixed value of wis2 for WIS2 |
| 4 | centre-id | Acronym as specified by member and endorsed by the PR of the country and WMO |
| 5 | notification-type | WIS2 notification types (data or metadata) |
| 6 | data-policy | Data policy as defined by the WMO Unified Data Policy (core and recommended) |
| 7 | earth-system-discipline | Seven high-level categories as defined by the WMO Unified Data Policy, Annex 1: (atmospheric-composition, climate, cryosphere, hydrology, ocean, space-weather, or weather) |

**1.2 Publishing**

For maximum utility and efficient management of topics, it is recommended that data and metadata are published to a detailed level of the topic hierarchy. This helps avoid the "pollution" of messages under the primary topics. Note that each discipline has a sub-discipline topic named experimental for publication to provisional topics.

|  |  |
| --- | --- |
| **Requirement 1** | **/req/core/publishing** |
| A | Data shall not be published with a topic that is not defined in this specification. |
| B | Data shall be published to at least the level of the sub-discipline topic (level 8 or beyond). |
| C | Metadata shall be published to at least the level of the notification type (metadata). |

|  |  |
| --- | --- |
| **Recommendation 1** | **/rec/core/publishing** |
| A | The topic experimental should be used as a temporary approach until a given sub-discipline topic is approved. |

|  |  |
| --- | --- |
| **Permission 1** | **/per/core/publishing** |
| A | Metadata may be published at any level at or below the notification type (metadata). |
| B | Data may be published with the experimental topic and include any sub-discipline topics which are not yet approved. |

**1.3 Management**

The primary levels and sub-discipline specific levels are managed differently to maintain stability and allow for flexibility.

|  |  |
| --- | --- |
| **Requirement 2** | **/req/core/management** |
| A | Primary topics (levels 1 to 7) shall be determined by WMO. |
| B | Sub-discipline topics (level 8 and beyond) shall be proposed by domain experts and user communities. |
| C | Sub-discipline topics (level 8 and beyond) shall be defined using a hierarchical approach. |
| D | Sub-discipline topics (level 8 and beyond) shall be coordinated and integrated by WMO. |

|  |  |
| --- | --- |
| **Requirement 3** | **/req/core/releasing** |
| A | The addition of a new centre identifier shall trigger an immediate stable release of WTH updates, which is not required to align with the WMO fast-track approval procedure. |
| B | Immediate stable releases shall only contain changes resulting from a new value in the centre-id topic. |
| C | Updates to the primary levels and other major revisions will go through the WMO standard procedure. |
| D | Updates to the sub-discipline topics (level 8 and beyond) will go through the WMO fast-track approval procedure. |

**1.4 Versioning**

The topic hierarchy version helps data providers and data consumers with change management and transition in relation to updates.

|  |  |
| --- | --- |
| **Requirement 4** | **/req/core/versioning** |
| A | A minor version shall not result in any changes to the version level. |
| B | A major version shall result in a change to the version level (for example, a becomes b). |
| C | Removal of a topic at any level shall result in a major version update. |
| D | Renaming of a topic at any level shall result in a major version update. |
| E | A change in the structure of the topic hierarchy shall result in a major version update. |
| F | A renaming or removal in the WMO Notification Message encoding shall result in a major version update. |
| G | A new topic shall not result in any version update. |
| H | A new centre identifier shall not result in any version update. |

**1.5 Conventions**

All levels of the topic hierarchy are defined in a consistent manner to support a normalized and predictable structure.

|  |  |
| --- | --- |
| **Requirement 5** | **/req/core/conventions** |
| A | Topic level definitions shall be lowercase. |
| B | Topic level definitions shall be encoded in [IRA T.50](https://www.itu.int/rec/T-REC-T.50). |
| C | Topic level definitions shall not utilize dots (.). |
| D | Topic level definitions shall utilize dashes (-) to separate words (such as sea-ice). |
| E | All topic level definitions at a given level shall be unique. |
| F | The topic structure levels imply a fixed sequence and shall not be re-ordered. |

**1.6 Centre identification**

The centre identifier (centre-id) is an acronym as specified by the member and endorsed by the PR of the country and WMO. It is a single identifier comprised of a top-level domain (TLD) and centre name. It represents the data publisher, distributor or issuing centre of a given dataset, data product, data granule or other resource.

|  |  |
| --- | --- |
| **Requirement 6** | **/req/core/centre-id** |
| A | A centre identifier shall not be used by more than one WIS2 Node or Global Service. |
| B | A centre identifier shall be formatted as tld-centre-name, where:   * The tld string is based on a TLD as defined by [IANA](https://data.iana.org/TLD) for the relevant country or international organization * The centre-name string is based on a centre name |
| C | The test TLD shall be used only for WIS internal system testing purposes. |

|  |  |
| --- | --- |
| **Recommendation 2** | **/rec/core/centre-id** |
| A | Organizations operating with a gov or similar TLD should use the TLD based on their country to define the TLD component of their centre identifier. |
| B | International organizations operating with int, org or similar TLD should reuse these to define the TLD component of their centre identifier. |
| C | Organizations wishing to test their WIS2 Node or Global Service may provide the -test suffix to their centre identifier (for example, int-org1-test). |

|  |  |
| --- | --- |
| **Permission 2** | **/per/core/centre-id** |
| A | A centre identifier’s centre-name component may contain dashes. |
| B | Larger organizations providing multiple centres may use dashes in the centre-name component to further delineate a centre function (for example, int-org1-nwp, int-org1-ozone). |
| C | A centre providing a WIS service may further qualify the function within the centre-name component (for example, int-org1-global-cache). |

**2. WIS2 TOPIC HIERARCHY RESOURCES**

**2.1 WMO Codes Registry**

|  |  |  |
| --- | --- | --- |
| **Level** | **Topic** | **URI** |
| 1 | channel | <https://codes.wmo.int/wis/topic-hierarchy/channel> |
| 2 | version | <https://codes.wmo.int/wis/topic-hierarchy/version> |
| 3 | system | <https://codes.wmo.int/wis/topic-hierarchy/system> |
| 4 | centre-id | <https://codes.wmo.int/wis/topic-hierarchy/centre-id> |
| 5 | notification-type | <https://codes.wmo.int/wis/topic-hierarchy/notification-type> |
| 6 | data-policy | <https://codes.wmo.int/wis/topic-hierarchy/data-policy> |
| 7 | earth-system-discipline | <https://codes.wmo.int/wis/topic-hierarchy/earth-system-discipline> |
| 8 | atmospheric-composition | <https://codes.wmo.int/wis/topic-hierarchy/atmospheric-composition> |
| climate | <https://codes.wmo.int/wis/topic-hierarchy/climate> |
| cryosphere | <https://codes.wmo.int/wis/topic-hierarchy/cryosphere> |
| hydrology | <https://codes.wmo.int/wis/topic-hierarchy/hydrology> |
| ocean | <https://codes.wmo.int/wis/topic-hierarchy/ocean> |
| space-weather | <https://codes.wmo.int/wis/topic-hierarchy/space-weather> |
| weather | <https://codes.wmo.int/wis/topic-hierarchy/weather> |

**2.2 WMO schemas server**

A zipped directory of all topics is published at <https://schemas.wmo.int/wth/a>. This bundle can be used by tools and applications wishing to browse or validate topic structures.

### 3. Addition of Appendix E: WIS2 Notification Message

**APPENDIX E: WIS2 NOTIFICATION MESSAGE**

WIS2 Notification Message (WNM) is an extension of the OGC API - Features standard and shall be encoded in GeoJSON. The normative provisions in this standard are denoted by the base URI (http://wis.wmo.int/spec/wnm/1) and requirements are denoted by partial URIs relative to this base. Property names, values and examples are represented with shaded text in this document.

**1. REQUIREMENTS CLASS "CORE"**

|  |  |
| --- | --- |
| URI | http://wis.wmo.int/spec/wnm/1/req/core |
| Target type | Notification metadata |
| Dependency | The JavaScript Object Notation (JSON) Data Interchange Format [(IETF RFC8259 (2017))](https://datatracker.ietf.org/doc/html/rfc8259) |
| Dependency | [JSON Schema](https://json-schema.org) (2022) |
| Dependency | The GeoJSON Format [(IETF: RFC-7946 (2016))](https://datatracker.ietf.org/doc/html/rfc7946) |
| Dependency | OGC API - Features - Part 1: Core corrigendum [(OGC: OGC 17-069r)](https://docs.opengeospatial.org/is/17-069r4/17-069r4.html) |
| Pre-conditions | The record conforms to GeoJSON (RFC7946) |

**1.1 Overview**

The table below provides an overview of the set of properties that may be included in a WNM.

**Table. WNM core properties**

|  |  |  |
| --- | --- | --- |
| **Property** | **Requirement** | **Description** |
| id | **required** | A universally unique identifier of the message (see [Identifier](#X308bfe473ee20a8b70bcf19a3157dd310a3e83c)) |
| type | **required** | A fixed value denoting the record as a GeoJSON Feature (see [GeoJSON compliance](#X5e28e14fdfddd2331fc620dd83e8ab5967db685)) |
| version | **required** | Version of message specification (see [Version](#Xbe84a4e4fc72b0fc9f958f069279ff01f30498d)) |
| geometry | **required** | Geospatial location associated with the data or metadata (see [Geometry](#Xbad2348b222628778fc4c270aca1624dd0b6699)) |
| properties.pubtime | **required** | The date and time of when the notification was published (see [Properties / Publication Time](#X09bc182be109cd1b026833a928cb865f6eae247)) |
| properties.data\_id | **required** | Unique identifier of the data as defined by the data producer (see [Properties / Data Identification](#data_id)) |
| properties.metadata\_id | optional | Identifier for associated discovery metadata record to which the notification applies (see [Properties / Metadata identification](#metadata_id)) |
| properties.producer | optional | Identifies the provider that initially captured and processed the source data, in support of data distribution on behalf of other Members (see [Properties / Producer](#X05c0093adc8aaf1b6743d9476120aabed273e6d)) |
| properties.datetime | optional | Identifies the reference date and time of the data instance to which the notification is relayed (see [Properties / Temporal description](#X555c362766c3d78e98026f75e6b46033c5c86fc)) |
| properties.start\_datetime | optional | Identifies the start date and time of the data being published (see [Properties / Temporal description](#X555c362766c3d78e98026f75e6b46033c5c86fc)) |
| properties.end\_datetime | optional | Identifies the end date and time of the data being published (see [Properties / Temporal description](#X555c362766c3d78e98026f75e6b46033c5c86fc)) |
| properties.cache | optional | Indicates whether the data in the notification should be cached (if not specified, the default value is true) (see [Properties / Cache](#X54c20229d60913feda7e19b54ecf6df048a8c1e)) |
| properties.integrity | optional | Specifies a checksum to be applied to the data to ensure that the download is accurate (see [Properties / Integrity](#X63667a76a4a069cb267ed492847a28c13efba22)) |
| properties.content | optional | Used to embed small products inline within the message (see [Properties / Content](#X3d61faf701d7a8b5b37a05c4dc80477c1f94d6f)) |
| links | **required** | Online linkages for data retrieval or additional resources associated with the dataset (see [Links](#X1d7673d1972ef78546ac031bb8b3bfe7ca8f8ab)) |

**1.2 Message size**

The WIS2 Notification Message allows for the transmission of messages in a compact manner and includes the ability to embed content inline as required (see [Properties / Content](#X3d61faf701d7a8b5b37a05c4dc80477c1f94d6f)).

|  |  |
| --- | --- |
| **Requirement 1** | **/req/core/message\_size** |
| A | A WNM message shall not exceed 8192 bytes. |

**1.3 GeoJSON compliance**

The WIS2 Notification Message schema is based on *GeoJSON* (RFC7946) and its associated information model. Compliant messages are therefore compliant with *GeoJSON*.

|  |  |
| --- | --- |
| **Requirement 2** | **/req/core/validation** |
| A | Each WNM shall validate without error against the WNM schema. |
| B | Each WNM shall provide id, type, geometry and properties properties for GeoJSON compliance (see [2.2 WMO schemas server](#_2.2_WMO_schemas)) |
| C | Each WNM record type property shall be set to a fixed value of Feature for GeoJSON compliance. |

**1.4 Identifier**

A universally unique identifier of the message using the UUID standard ([RFC4122](https://datatracker.ietf.org/doc/html/rfc4122)). The identifier is generated by the originator of the message. It provides the anti-loop feature that is needed to ensure that the message will be seen once by all Global Brokers. It remains the same throughout the lifetime of the message in the WIS2 ecosystem.

The [Properties / Data Identification](#data_id) is retained to ensure traceability and consistency of the same resource.

*Example*

"id": "31e9d66a-cd83-4174-9429-b932f1abe1be"

|  |  |
| --- | --- |
| **Requirement 3** | **/req/core/identifier** |
| A | The id property shall be a Universally Unique Identifier (UUID). |

**1.5 Version**

The version property provides the version of WNM that the message conforms to.

|  |  |
| --- | --- |
| **Requirement 4** | **/req/core/version** |
| A | A WNM shall provide information on version conformance via the version property. |
| B | The version property shall be fixed to v1.0 for this version of the specification. |

**1.6 Geometry**

The type of geometry in a notification message may be Point or Polygon. It can also be type null if the geometry cannot be derived.

*Example. Point*

{

...

"geometry": {

"type": "Point",

"coordinates": [

6.146255135536194,

46.223296618227444

]

}

...

}

*Example. Point with elevation*

{

...

"geometry": {

"type": "Point",

"coordinates": [

6.146255135536194,

46.223296618227444,

392

]

}

...

}

*Example. Polygon*

{ **...** **"geometry"**: { **"type"**: "Polygon", **"coordinates"**: [[ [-7.75,40.43], [-7.75,78.46], [71.91,78.46], [71.91,40.43], [-7.75,40.43] ]] } **...**}

*Example. null*

{  
 ...  
 "geometry": null  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 5** | **/req/core/geometry** |
| A | A WNM record shall provide ONE geometry property to convey the geospatial properties of a notification using a geographic coordinate reference system (World Geodetic System 1984 [WGS 84]) and longitude and latitude decimal degree units. |
| B | The geometry property shall only provide one of a Point or Polygon geometry, or a null value when a geometry value is unknown or cannot be determined. |

|  |  |
| --- | --- |
| **Permission 1** | **/per/core/geometry** |
| A | The geometry property may provide a third element (height) as per clause 4 of the GeoJSON specification. |

**1.7 Properties / Publication Time**

The pubtime property identifies the date/time when the notification was first posted or published by the originator. The date/time is encoded in RFC3339 format with the UTC timezone (Z).

The publication date/time is critical for subscribers to prevent message loss in providing awareness of how far behind the publisher they may be.

The pubtime property is also valuable for change detection as part of updates and deletion notifications.

Ensuring pubtime is properly managed for updates and deletions is important for data and metadata download workflows. For example, an out-of-date pubtime can lead to errors for clients when managing updates or deletions in their local copies of data. An update with newer pubtime and identical datetime indicates a newer version of the data or metadata.

"properties": {  
 ...  
 "pubtime": "2022-03-20T04:50:18.314854383Z"  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 6** | **/req/core/pubtime** |
| A | A WNM shall provide a properties.pubtime property. |
| B | The properties.pubtime property shall be in RFC3339 format. |
| C | The properties.pubtime property shall be in UTC timezone. |
| D | The properties.pubtime property shall be set to the current time by the original publisher of the notification. |
| E | The properties.pubtime property shall be set to the current time also for notifications about updates or deletions. |
| F | The properties.pubtime property shall not be modified by any intermediaries. |

**1.8 Properties / Data Identification**

The data\_id property uniquely identifies the data described by the notification and is defined by the data producer. A data producer may use an identification scheme of their choice.

*Example.*

"properties": {  
 ...  
 "data\_id": "wis2/ma-marocmeteo/data/core/weather/surface-based-observations/synop/WIGOS\_0-504-1-60288\_20240210T130000"  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 7** | **/req/core/data\_id** |
| A | A WNM shall provide a properties.data\_id property. |
| B | The properties.data\_id property shall be unique within the scope of the relevant dataset. |

|  |  |
| --- | --- |
| **Recommendation 3** | **/rec/core/data\_id** |
| A | The properties.data\_id property should NOT use an opaque id. It should be encoded with meaningful values to support client-side filtering. |

|  |  |
| --- | --- |
| **Permission 1** | **/per/core/data\_id** |
| A | The properties.data\_id property may contain a valid WIS2 topic, without the channel and version. |

**1.9 Properties / Metadata identification**

The metadata\_id property uniquely identifies the associated discovery metadata record. This property is an important linkage between a WCMP2 dataset discovery metadata record and the related data notifications. The inclusion of this property allows a subscriber to consult additional documentation of the dataset and understand the access control applied to the data.

*Example.*

"properties": {  
 ...  
 "metadata\_id": "urn:wmo:md:can:eccc-msc:observations.swob"  
 ...  
}

|  |  |
| --- | --- |
| **Recommendation 4** | **/rec/core/metadata\_id** |
| A | A WNM should provide a properties.metadata\_id property that identifies the associated WCMP2 dataset discovery metadata record. See requirement for metadata identification in WCMP2. |

**1.10 Properties / Producer**

The producer property identifies the provider that initially captured and processed the source data, in support of data distribution on behalf of other Members.

*Example.*

"properties": {  
 ...  
 "producer": "fra"  
 ...  
}

|  |  |
| --- | --- |
| **Recommendation 5** | **/rec/core/producer** |
| A | A WNM should provide a properties.producer property when publishing data on behalf of other Members. |

**1.11 Properties / Temporal description**

The datetime property identifies the date and time of the data (for example, when a measurement was observed). When a data or metadata is updated or deleted, this value should identify the original data or metadata, which can be significantly different from the current time.

The start\_datetime and end\_datetime properties identify a temporal extent (for example, the start and end times of an NWP forecasting period).

All dates and times are encoded in RFC3339 format with the UTC timezone (Z).

A null value can also be used if a temporal description of the data cannot be derived.

*Example. Temporal instant*

"properties": {  
 ...  
 "datetime": "2022-03-20T04:45:00Z"  
 ...  
}

*Example. Temporal extent*

"properties": {  
 ...  
 "start\_datetime": "2022-03-20T04:45:00Z",  
 "end\_datetime": "2022-03-22T04:45:00Z"  
 ...  
}

*Example. No temporal description*

"properties": {  
 "datetime": null,  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 8** | **/req/core/temporal** |
| A | A WNM shall provide a temporal description by either a properties.datetime property or both the properties.start\_datetime and properties.end\_datetime properties. |
| B | The temporal description shall be in RFC3339 format. |
| C | The temporal description shall be in the UTC timezone. |
| D | The temporal description shall be set to null (using only properties.datetime) when a temporal description cannot be derived. |

**1.12 Properties / Cache**

All core data, by default, is cached by Global Cache services.

However, a data producer can use the properties.cache value to request Global Cache services to not cache their core data granule.

*Example. Specifying data not to be cached*

"properties": {  
 "cache": false,  
 ...  
}

|  |  |
| --- | --- |
| **Permission 2** | **/per/core/cache** |
| A | A WNM may specify whether the data should be cached via the properties.cache property. |

**1.13 Properties / Integrity**

For data verification, it is recommended to include data integrity information via the integrity property. Providing this information will allow data consumers to ensure that a given data granule has not been corrupted during download.

The method property provides a format of the hashing method used to enable an integrity check of the data. The preferred values are sha256, sha384, sha512, sha3-256, sha3-384, and sha3-512.

The value property provides the result of the hashing method in base64 encoding.

*Example.*

"properties": {  
 ...  
 "integrity": {  
 "method": "sha512",  
 "value": "CPvTLiOfYRgfL3YNF/KKElwamwvLQwnzd96VnF2WoYuuH+hVIbwFSPQHHd/qa/fNVUBckviC5/HZs3Nx2jXEsA=="  
 }  
 ...  
}

|  |  |
| --- | --- |
| **Recommendation 6** | **/rec/core/integrity** |
| A | A WNM should provide a properties.integrity property, consisting of a method property identifying the hashing method (sha256, sha384, sha512, sha3-256, sha3-384, sha3-512) and a value property of the hashing result, when it can be easily derived. |

**1.14 Properties / Content**

The content property allows for the inclusion of data in the notification message when the encoded data is smaller than 4096 bytes. The limit considers the data encoding. That is, if the data are encoded in a form that changes the size, the resulting size must be less than 4096 bytes.

The encoding property provides the character encoding of the data (UTF-8, Base64, or gzip), the gzip encoding means that the data are compressed using algorithm defined in RFC1952 and consequently converted to text using Base64 encoding.

The value property provides the data in accordance with the encoding property.

The size property provides the size, in bytes, of the data in its original unencoded form, therefore this value shall not be directly compared with the size limit.

*Example.*

"properties": {  
 ...  
 "content": {  
 "encoding": "utf-8",  
 "value": "encoded bytes from the file",  
 "size": 457  
 }  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 9** | **/req/core/content** |
| A | For data whose resulting size in the encoded form is greater than 4096 bytes, notifications shall not provide inline via `+properties.content.value+`.  Note that the encoding may both enlarge the data size (for example when binary data, such as BUFR, is Base64 encoded), as well as reduce the size (for example, when XML data are compressed with `gzip`). |

|  |  |
| --- | --- |
| **Recommendation 7** | **/rec/core/content** |
| A | A WNM should provide a content property, consisting of an encoding property (either utf-8, base64, or gzip), a value property of the data, as well as a size property with the length of the data. |

|  |  |
| --- | --- |
| **Permission 3** | **/per/core/content** |
| A | For data whose resulting size (after possible compression) is less than 4096 bytes, notifications may provide the data inline via properties.content.value. |

**1.15 Links**

The links array property consists of one or more objects providing URLs to access data.

Each link object provides:

* an href property with a fully qualified link to access the data
* a rel property providing an [IANA link relation](https://www.iana.org/assignments/link-relations/link-relations.xhtml) or [WIS link relation](http://codes.wmo.int/wis/link-relations) describing the relationship between the link and the message
* a type property providing the media type of the data
* a length property providing the length (in bytes) indicating the size of the data
* a security property providing a description of the access control mechanism applied (for example, recommended data with restrictions)

Links are used to communicate new data or metadata notifications. Links can also communicate when data or metadata has been deleted or invalidated.

*Example. Canonical link*

"links": [{

"href": "https://example.org/data/4Pubsub/92c557ef-d28e-4713-91af-2e2e7be6f8ab.bufr4",

"rel": "canonical",

"type": "application/x-bufr"

}]

*Example. Multiple links*

"links": [{

"href": "https://example.org/data/4Pubsub/92c557ef-d28e-4713-91af-2e2e7be6f8ab.bufr4",

"rel": "canonical",

"type": "application/x-bufr"

}, {

"href": "https://example.org/oapi/collections/my-dataset/items/my-data-granule",

"rel": "item",

"type": "application/json"

}]

|  |  |
| --- | --- |
| **Requirement 10** | **/req/core/links** |
| A | A WNM shall provide a links array property. |
| B | The links array property shall contain at least one link with, at a minimum, the href and rel properties. |
| C | The links for core data shall not require further action in order to download the resource. |
| D | The links shall be HTTP, HTTPS, FTP or SFTP. |
| E | For new data and metadata notifications, the links array property shall provide at least one link with an IANA link relation of canonical to clearly identify the preferred access link. |
| F | For data or metadata update notifications, the links array property shall provide at least one link with a link relation of update to clearly identify the preferred access link. |
| G | For data or metadata deletions, the links array property shall provide at least one link with a link relation of deletion to clearly identify data which has been deleted or removed. |

|  |  |
| --- | --- |
| **Recommendation 8** | **/rec/core/links** |
| A | A WNM should provide links using secure protocols such as HTTPS and SFTP, with HTTPS being the preferred option. |
| B | The link property should provide a length property to communicate the size of a given data download in advance of a data download workflow when the size of the data is known or can be easily derived. |
| C | The link relation of deletion should NOT be used for communicating a rolling data archive. |

|  |  |
| --- | --- |
| **Permission 4** | **/per/core/links** |
| A | A WNM links array property may provide link objects which reference APIs or Web Accessible Folders (WAF). |

**1.15.1 Access control**

For recommended data, WNM links may also provide links to resources that implement access control in support of authentication and authorization. In secure data use cases, a user needs to be able to detect access-controlled data as part of data discovery and evaluation. The example demonstrates how to express access control using HTTP basic authentication for a given data access service.

*Example. Access controlled link*

"links": [{  
 "rel": "data",  
 "type": "application/json",  
 "title": "link to WAF endpoint",  
 "href": "https://example.org/data/secure-data",  
 "security": {  
 "default": {  
 "type": "http",  
 "scheme": "basic",  
 "description": "Please contact the data provider for accessing this secured resource."  
 }  
 }  
}]

**1.16 Additional properties**

A WIS2 Notification Message can be extended as required for organizational purposes by adding properties (of any type) in the message. Additional properties do not break compliance with this specification.

*Example.*

"properties": {  
 ...  
 "\_comment": {  
 "validationErrors": [  
 "error 1",  
 "error 2"  
 ]  
 }  
 ...  
}

|  |  |
| --- | --- |
| **Permission 5** | **/per/core/additional\_properties** |
| A | A WNM may provide additional properties of any type in any part of the document as needed. |

**2. WIS2 NOTIFICATION MESSAGE RESOURCES**

**2.1 WMO Codes Registry**

* <http://codes.wmo.int/wis/link-relations>

**2.2 WMO schemas server**

Validation, examples and other resources are published at <https://schemas.wmo.int/wnm>.

### 4. Addition of Appendix F: WMO Core Metadata Profile

**APPENDIX F: WMO CORE METADATA PROFILE (VERSION 2)**

WMO Core Metadata Profile (WCMP) is an extension of the OGC API - Features standard and shall be encoded in GeoJSON. The normative provisions in this standard are denoted by the base URI (http://wis.wmo.int/spec/wcmp/2) and requirements are denoted by partial URIs relative to this base. Property names, values and examples are represented with shaded text in this document.

**1. REQUIREMENTS CLASS "CORE"**

|  |  |
| --- | --- |
| URI | http://wis.wmo.int/spec/wcmp/2/req/core |
| Dependency | The JavaScript Object Notation (JSON) Data Interchange Format [(IETF RFC8259 (2017))](https://datatracker.ietf.org/doc/html/rfc8259) |
| Dependency | [JSON Schema](https://json-schema.org) (2022) |
| Dependency | The GeoJSON Format [(IETF: RFC-7946 (2016))](https://datatracker.ietf.org/doc/html/rfc7946) |
| Dependency | OGC API - Features - Part 1: Core corrigendum [(OGC: OGC 17-069r)](https://docs.opengeospatial.org/is/17-069r4/17-069r4.html) |
| Pre-conditions | The record conforms to OGC API - Records - Core: Part 1: Requirements Class: Record Core |

**1.1 Overview**

The table below provides an overview of the set of properties that may be included in a WCMP record.

**Table. WCMP record core properties**

|  |  |  |
| --- | --- | --- |
| **Property** | **Requirement** | **Description** |
| id | **required** | A unique identifier of the dataset (see [Identifier](#X308bfe473ee20a8b70bcf19a3157dd310a3e83c)) |
| type | **required** | A fixed value denoting the WCMP record as a GeoJSON Feature (see [Validation](#X6c8ff279ae0c1bdfb37bb6344105bb8007f162a)) |
| conformsTo | **required** | The version of WCMP associated that the record conforms to (see [Conformance](#X863352c0a208a97f96d5316c8b110d03a11946f)) |
| properties.type | **required** | The resource type described by the WCMP record (see [Properties / Type](#X5f04a09c9b33d9ad8b2a9841bb08b741ed45545)) |
| properties.title | **required** | A human-readable name of the dataset (see [Properties / Title](#Xc6b1df124ed066472c346a268f1ec7b7d26026d)) |
| properties.description | **required** | A free-text summary description of the dataset (see [Properties / Description](#Xc7f0267ce03598a201629ab7353ae638cff484d)) |
| properties.keywords | optional | Keywords, tags or key phrases (see [Properties / Keywords](#Xf2dc2c0b395f0755e4a1f1b30c4e1dc9ef7bfb5)) |
| properties.themes | **required** | Classifiers, categories and controlled vocabularies (see [Properties / Themes](#Xa986f7d448c9ef419533f887d91e348bf639c21)) |
| geometry | **required** | Geospatial location associated with the dataset, in a geographic coordinate reference system (see [Geospatial extent](#X35a334403f938723739025300a4eafb7282eb26)) |
| time | **required** | Temporal extent associated with the dataset (see [Temporal extent](#X588a05d06ef6be52311cc5cfafec95f7fa5aa17)) |
| additionalExtents.spatial | optional | Additional geospatial extents in other coordinate reference systems (see [Additional geospatial extents](#X3ef0ec9863efeeaa922c5d391305a481c050bfa)) |
| additionalExtents.temporal | optional | Additional time instants or periods (see [Additional temporal extents](#X722e1c46ae3e0b90d914a68f0ef7f90696f916d)) |
| properties.contacts | **required** | Contact information for the dataset (see [Properties / Contacts](#X2bdeca71a76171919cce52ccfe875d512944a72)) |
| properties.version | optional | Version or edition of the dataset (see [Properties / Version](#X6dfb460a270a93b831f8e7239bbb62d3e8cef6b)) |
| properties.externalIds | optional | Persistent identifiers or handles for the dataset (see [Properties / Persistent identifiers](#X36daa86e8eca49ae6522f49310ca557b5f7a027)) |
| properties.created | **required** | The date that the WCMP record was created (see [Properties / Record creation date](#X3743c39a0218b3c0ad43194440965896f7c8443)) |
| properties.updated | optional | The date that the WCMP record was updated (see [Properties / Record update date](#Xa2fa2d054e18d0a85e6c71d2fddc4efdaef2423)) |
| properties.status | optional | The operational status of the dataset (see [Properties / Status](#Xe6333e3a5186d33c5cff13e42b2cb0fa9a63ef3)) |
| properties.wmo:dataPolicy | **conditional** | Classification code of core or recommended based on the [WMO Unified Data Policy](https://library.wmo.int/idurl/4/58009). **Required** for datasets (see [Properties / WMO data policy](#X9bf66d91514f28153c162b19c3062cce12a6395)) |
| properties.rights | optional | A statement that concerns all rights not addressed by the license such as a copyright statement (see [Properties / WMO data policy](#X9bf66d91514f28153c162b19c3062cce12a6395)) |
| links | **required** | Online linkages to data retrieval or additional resources associated with the dataset (see [Links and distribution information](#links-distribution)) |
| linkTemplates | optional | Online link templates for dynamic / API access (see [Templated links](#X5420af2afac69caf319df612af7e0a638020666)) |
| properties.\* | optional | Additional properties as needed (see [Additional properties](#X2b145b5a935ac6e14f7d0458519266699c26f66)) |

**1.2. WCMP record representation**

WCMP record can be represented in various ways internally, in WIS systems and software tools, but its external representation is GeoJSON.

|  |  |
| --- | --- |
| **Recommendation 1** | **/rec/core/media\_type** |
| A | The media type assigned to a WCMP record, when transported through a protocol that supports it, should be application/geo+json. |

**1.3 Validation**

The WCMP record schema is based on *OGC API - Records - Part 1: Core: Requirements Class: Record Core* schema and the associated information model. WCMP records compliant with WCMP schema are therefore compliant with the *OGC API - Records* record schema.

|  |  |
| --- | --- |
| **Requirement 1** | **/req/core/validation** |
| A | Each WCMP record shall validate without error against the WCMP schema. |
| B | Each WCMP record shall provide id, type, geometry and properties properties for GeoJSON compliance. |
| C | The type property shall be set to a fixed value of Feature for GeoJSON compliance. |

**1.4 Identifier**

The id property is a unique identifier of the dataset. A record identifier is essential for querying and identifying records within the GDC.

*Example*

"id": "urn:wmo:md:ca-eccc-msc:observations.swob"

|  |  |
| --- | --- |
| **Requirement 2** | **/req/core/identifier** |
| A | A WCMP record SHALL provide an identifier via the id property. |
| B | The id property SHALL have the following notation: urn:x-wmo:md:{centre\_id}:{local\_identifier}. |
| C | The centre\_id SHALL be based on the associated vocabulary specified in the WIS [topic hierarchy](#wis2-topic-hierarchy). |
| D | The id property SHALL include a local identifier as defined by the data publisher. The local identifier SHALL NOT have spaces or special or accented characters. |

|  |  |
| --- | --- |
| **Permission 1** | **/rec/core/identifier** |
| A | The local identifier may also have colons (:) as required by the data publisher. |

**1.5 Conformance**

The conformsTo property to identifies the version of the WCMP standard that the metadata record conforms to. Conformance identification is valuable for version detection and handling of content.

*Example*

"conformsTo": [  
 "http://wis.wmo.int/spec/wcmp/2/conf/core"  
]

|  |  |
| --- | --- |
| **Requirement 3** | **/req/core/conformance** |
| A | A WCMP record shall provide information on conformance via the OARec record conformsTo property. |
| B | The `conformsTo` property shall advertise conformance to WCMP. |

**1.6 Properties / Type**

The type property identifies the type of resource that the metadata record describes using values from the resource type codelist. While most metadata records will be set to dataset, WCMP can also describe additional resources, such as services and processes.

A dataset is the primary granularity of a WCMP record describing a collection of data granules.

A service is an API or Web service providing a discovery, visualization, or access mechanism that operates on data.

A process is a workflow or execution to provide custom functionality to calculate a given output or product.

*Example*

"properties": {  
 ...  
 "type": "dataset"  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 4** | **/req/core/type** |
| A | A WCMP record shall provide a properties.type property. |
| B | The properties.type property shall be a valid code from the [WIS resource type](https://codes.wmo.int/wis/resource-type) codelist. |

**1.7 Properties / Title**

The title property is a human-readable name of the dataset.

*Example*

"properties": {  
 ...  
 "title": "Surface weather observations"  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 5** | **/req/core/title** |
| A | A WCMP record shall provide a properties.title property. |

**1.8 Properties / Description**

The description property is a free-text summary of the dataset.

*Example*

"properties": {  
 ...  
 "description": "Surface observations measured at the automatic and manual stations of the Environment and Climate Change Canada and partners networks, either for a single station or for the stations of specific provinces and territories (last 30 days)."  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 6** | **/req/core/description** |
| A | A WCMP record shall provide a properties.description property. |

**1.9 Properties / Keywords**

The keywords property is a list of keywords, tags or specific phrases associated with the resource, but are not referenced to a particular vocabulary or knowledge organization system.

*Example*

"properties": {  
 ...  
 "keywords": [  
 "surface",  
 "observations",  
 "weather",  
 "real-time"  
 ]  
 ...  
}

|  |  |
| --- | --- |
| **Recommendation 1** | **/rec/core/keywords** |
| A | A WCMP record should provide a properties.keywords property, as a list of freeform text or tags that are not based on a controlled vocabulary. |

**1.10 Properties / Themes**

The themes property is a list of concepts that are referenced to a vocabulary or knowledge organization system used to classify the resource.

A theme’s scheme property provides a remote reference to a controlled vocabulary, codelist or knowledge organization system.

A concept’s id provides an identifier for the given concept, as well as optional title, description and url properties to further describe the concept as desired.

A concept’s optional url property can provide a remote reference to a given concept (for example, to an online ontology or code registry).

A WCMP metadata record can have one or more themes.

*Example. Themes object with GRIB2 codes*

"properties": {  
 ...  
 "themes": [  
 {  
 "concepts": [  
 {  
 "id": "0-0-0",  
 "title": "Temperature",  
 "url": "http://codes.wmo.int/grib2/codeflag/4.2/0-0-0"  
 },  
 {  
 "id": "0-1-1",  
 "title": "Relative humidity",  
 "url": "http://codes.wmo.int/grib2/codeflag/4.2/0-1-1"  
 },  
 {  
 "id": "0-2-2",  
 "title": "u-component of Wind",  
 "url": "http://codes.wmo.int/grib2/codeflag/4.2/0-2-2"  
 },  
 {  
 "id": "0-2-3",  
 "title": "v-component of Wind",  
 "url": "http://codes.wmo.int/grib2/codeflag/4.2/0-2-3"  
 }  
 ],  
 "scheme": "http://codes.wmo.int/grib2/codeflag/4.2"  
 }  
 ]  
 ...  
}

*Example. Themes object with BUFR4 codes*

"themes": [  
 {  
 "concepts": [  
 {  
 "id": "001",  
 "title": "Temperature/air temperature",  
 "url": "http://codes.wmo.int/bufr4/b/12/001"  
 },  
 {  
 "id": "003",  
 "title": "Dewpoint temperature",  
 "url": "http://codes.wmo.int/bufr4/b/12/003"  
 }  
 ],  
 "scheme": "http://codes.wmo.int/bufr4/b"  
 }  
]

*Example. Themes object with of the earth-system-discipline from the WMO Topic Hierarchy*

"properties": {  
 ...  
 "themes": [  
 {  
 "concepts": [{  
 "id": "weather",  
 "title": "Weather",  
 "url": "http://codes.wmo.int/wis/topic-hierarchy/earth-system-discipline/weather"  
 }],  
 "scheme": "http://codes.wmo.int/wis/topic-hierarchy/earth-system-discipline"  
 }  
 ]  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 7** | **/req/core/themes** |
| B | A WCMP record shall provide at least one themes property. |
| C | Each themes property shall provide at least one concept property. |
| D | Each themes property shall provide a scheme property that refers to a controlled vocabulary or thesaurus. |
| E | A WCMP record describing a dataset shall provide a themes property identifying all applicable Earth system disciplines as defined in the [WIS2 Topic Hierarchy](http://codes.wmo.int/wis/earth-system-discipline). |

|  |  |
| --- | --- |
| **Requirement 8** | **/req/core/themes\_wis2\_global\_service** |
| A | A WCMP record describing a WIS2 global service shall provide a themes property identifying all Earth system disciplines as defined in the [WIS2 Topic Hierarchy](http://codes.wmo.int/wis/earth-system-discipline). |
| B | A WCMP record describing a WIS2 global service shall provide a themes property identifying the service type provided. |

|  |  |
| --- | --- |
| **Recommendation 2** | **/rec/core/granularity** |
| A | A WCMP record should describe dataset parameters and variables as themes/concepts with an associated controlled vocabulary. |

|  |  |
| --- | --- |
| **Permission 2** | **/per/core/themes** |
| A | A WCMP record may provide as many themes/concepts as applicable to describe the themes of a given dataset. |

**1.11 Geospatial and temporal extents**

**1.11.1 Geospatial extent**

The geometry property is the general bounding spatial extent of the dataset in the geographic coordinate system. Geospatial bounding extents provide a useful indicator of the location of the dataset to facilitate search and map displays in the GDC.

*Examples*

"geometry": {  
 "type": "Polygon",  
 "coordinates": [[  
 [-142.23, 28.03],  
 [-142.23, 82.56],  
 [-52.16, 82.56],  
 [-52.16, 28.03],  
 [-142.23, 28.03]  
 ]]  
}

"geometry": {  
 "type": "Point",  
 "coordinates": [-79.38, 43.65]  
}

"geometry": null

|  |  |
| --- | --- |
| **Requirement 9** | **/req/core/extent\_geospatial** |
| A | A WCMP record shall provide one geometry property to convey the geospatial properties of a dataset using a geographic coordinate reference system (World Geodetic System 1984 [WGS 84]) and longitude and latitude decimal degree units. |
| B | The geometry coordinates shall be integer or float data types. |
| C | The geometry property shall provide the value of null when geometry cannot be derived. |

|  |  |
| --- | --- |
| **Recommendation 3** | **/rec/core/extent\_geospatial\_point** |
| A | For datasets based on a geometry without a calculated area (for example, single station point), a WCMP record should provide the GeoJSON geometry as a Point type. |

|  |  |
| --- | --- |
| **Recommendation 4** | **/rec/core/extent\_geospatial\_precision** |
| A | Geometry coordinates should have a level of precision of at least 2 or more decimal places. |

|  |  |
| --- | --- |
| **Recommendation 5** | **/rec/core/extent\_geospatial\_wis\_2\_global\_service** |
| A | For a WIS2 Global Service, a WCMP record should provide the GeoJSON geometry as a Polygon type with a WGS84 bounding geometry of -180 (west longitude), -90 (south latitude), 180 (east longitude), 90 (north latitude). |

**1.11.2 Additional geospatial extents**

The additionalExtents.spatial property is for other geospatial extents associated with the dataset. For example, it may be useful for non-geographic data or for describing multiple sub-areas of a dataset. The additionalExtents.spatial.bbox property provides the ability to list one to many minimum bounding geometries for a given dataset, where:

* The minimum longitude is the westernmost coordinate of the limit of the dataset extent, expressed in longitude decimal degrees as a signed number between -180 and 180, less than or equal to maximum longitude.
* The minumum latitude is the southernmost coordinate of the limit of the dataset extent, expressed in latitude decimal degrees as a signed number between -90 and 90, less than or equal to maximum latitude.
* The maximum longitude is the easternmost coordinate of the limit of the dataset extent, expressed in longitude decimal degrees as a signed number between -180 and 180, greater than or equal to minimum longitude.
* The maximum latitude is the northernmost coordinate of the limit of the dataset extent, expressed in latitude decimal degrees as a signed number between -90 and 90, greater than or equal to minimum latitude.

This property also facilitates catalogue searches with geospatial predicate (within extent, etc.).

*Example*

"additionalExtents": {  
 "spatial": {  
 "bbox": [  
 [-142, 42, -52, 84]  
 ],  
 "crs": "http://www.opengis.net/def/crs/OGC/1.3/CRS84"  
 }  
}

|  |  |
| --- | --- |
| **Permission 3** | **/per/core/extent\_geospatial** |
| A | A WCMP record may provide multiple additionalExtents.spatial.bbox item properties to express additional geospatial extents in other coordinate reference systems. |
| B | The geometry property may provide a third element (height) as per clause 4 of the GeoJSON specification. |

**1.11.3 Temporal extent**

The time property describes the general bounding extent of the dataset and the temporal resolution.

Temporal extents provide a useful indicator of the date and time period of the dataset and facilitates temporal searching in the GDC.

In addition, the temporal resolution provides a useful indicator of the data update frequency (for example, for real-time datasets). If only times are given for the interval, it is implicitly assumed that those are recurring every day.

In cases where no time indication can be derived, it is applicable to state the value of null.

*Examples*

"time": {  
 "date": "2021-10-30"  
}

"time": {  
 "timestamp": "2021-10-30T11:11:11Z"  
}

"time": {  
 "interval" : ["2020-10-30", "2021-10-30"],  
 "resolution": "P1D"  
}

"time": {  
 "interval" : ["T00Z", "T23Z"],  
 "resolution": "PT1H"  
}

"time": {  
 "interval": ["2018-04-22", ".."],  
}

"time": null

To ensure clarity, an additional human-readable explanation is given in the properties.description. Further time-related characteristics (for example, frequency of modifications, available data, etc.) should be added in properties.themes.

Some cases might be more complex due to the product’s characteristics. If necessary, further granularity can be indicated by the additionalExtents.temporal property (see [Additional temporal extents](#X722e1c46ae3e0b90d914a68f0ef7f90696f916d)).

*Example. Complex time indication*

"time": {  
 "interval" : ["2018-04-22", ".."]  
},  
"additionalExtents": {  
 "temporal": {  
 "interval": [  
 [  
 "T00Z",  
 "PT180H"  
 ],  
 [  
 "T12Z",  
 "PT180H"  
 ]  
 ],  
 "resolution": "PT6H",  
 "trs": "http://www.opengis.net/def/trs/ISO-8601"  
 }  
}

*Example. Complex time indication further described with themes property*

"properties": {  
 ...  
 "description": "ICON-EPS 0.5 deg x 0.5 deg regular lat/lon grid, up to +180h every 6h, runs 00/12 UTC, various parameter, various level, various threshold",  
 "themes": [  
 {  
 "concepts": [  
 {"id": "continual"}  
 ],  
 "scheme": "https://standards.iso.org/iso/19139/resources/gmxCodelists.xml#MD\_FrequencyCode"  
 }  
 ]  
}

|  |  |
| --- | --- |
| **Requirement 10** | **/req/core/extent\_temporal** |
| A | A WCMP record shall provide one time property using the Gregorian calendar. |
| B | The time property shall provide either one date, timestamp, interval, or the value of null when a conformant time cannot be derived. |
| C | All non-null time values shall be valid ISO8601 representations or .. for an open-ended extent. |

|  |  |
| --- | --- |
| **Recommendation 6** | **/rec/core/extent\_temporal** |
| A | For datasets with known or discrete intervals, a WCMP record should provide the temporal resolution (time.resolution) as a valid ISO 8601 duration (for example, P1D). |
| B | For complex temporal extents, a WCMP record should also provide a human-readable explanation in properties.description to promote clarification and unambiguity. |
| C | To distinguish maintenance or update frequency, those should be included in properties.themes. |

|  |  |
| --- | --- |
| **Recommendation 7** | **/rec/core/extent\_service** |
| A | For WCMP records describing a service or API, a time value of null may be provided. |

**1.11.4 Additional temporal extents**

The additionalExtents.temporal property is for describing other temporal extents associated with the dataset. For example, it may be useful to represent multiple time instances or to identify other temporal reference systems. Temporal extents can be fully bound or open in either direction. An additionalExtents.temporal.resolution property is able express the temporal granularity at which a given dataset’s data is measured, generated, or reported.

*Example*

"additionalExtents": {  
 "temporal": {  
 "interval": [  
 [  
 "T00Z",  
 "PT180H"  
 ],  
 [  
 "T12Z",  
 "PT180H"  
 ]  
 ],  
 "resolution": "PT6H",  
 "trs": "http://www.opengis.net/def/trs/ISO-8601"  
 }  
}

|  |  |
| --- | --- |
| **Permission 4** | **/per/core/extent\_temporal** |
| A | A WCMP record may provide multiple additionalExtents.temporal item properties to express additional temporal extents in other temporal reference systems. |

**1.12 Properties / Contacts**

The contacts property is the information associated with one or more responsible parties of the resource.

*Example. Contacts object with all contact details*

"properties": {  
 ...  
 "contacts": [{  
 "identifier": "ECCC",  
 "organization": "Government of Canada; Environment and Climate Change Canada; Meteorological Service of Canada",  
 "name": "National Inquiry Response Team",  
 "phones": [{  
 "value": "+18199972800"  
 }],  
 "emails": [{  
 "value":"enviroinfo@ec.gc.ca"  
 }],  
 "addresses": [{  
 "deliveryPoint": [ "77 Westmorland Street, suite 260" ],  
 "city": "Fredericton",  
 "administrativeArea": "NB",  
 "postalCode": "E3B 6Z4",  
 "country": "Canada"  
 }],  
 "links": [{  
 "href": "https://example.org/about",  
 "rel": "about",  
 "type": "text/html"  
 }],  
 "contactInstructions": "email",  
 "roles": ["producer", "host"]  
 }]  
 ...  
}

*Example. Contacts object with URL to the relevant homepage*

"properties": {  
 ...  
 "contacts": [{  
 "organization": "Government of Canada; Environment and Climate Change Canada; Meteorological Service of Canada",  
 "links": [{  
 "href": "https://example.org/about",  
 "rel": "about",  
 "type": "text/html"  
 }],  
 "roles": ["producer"]  
 }]  
}

|  |  |
| --- | --- |
| **Requirement 11** | **/req/core/contacts** |
| A | A WCMP record shall provide at least one contact via the properties.contacts property. |
| B | The properties.contacts shall provide an organization property. |
| C | The roles property, when specified, shall provide a role type from the WCMP role type codelist. |

|  |  |
| --- | --- |
| **Permission 5** | **/per/core/contacts** |
| A | The properties.contacts property may provide more than one contact via multiple objects or a single contact object with multiple roles. |

**1.13 Properties / Version**

The version property is the version or edition of the dataset. Datasets may be versioned by an organization, for example, the version of an NWP model or a processing chain/workflow, and data providers can make this information available when there are multiple versions of a dataset over time.

*Example*

"properties": {  
 ...  
 "version": "0.1.0"  
 ...  
}

|  |  |
| --- | --- |
| **Permission 6** | **/per/core/version** |
| A | A WCMP record may provide a properties.version property to describe the version of a given dataset. |

**1.14 Properties / Persistent identifiers**

The externalIds property is a persistent (or handle) identifier used to provide a long-lasting reference to a digital resource. Persistent identifiers are commonly used for scientific publications and datasets.

Examples of persistent identifiers include, but are not limited to:

* Digital Object Identifiers ([DOI](https://doi.org))
* Archival Resource Key ([ARK](https://arks.org))
* [Handle](https://handle.net)

*Example. Persistent identifiers*

"properties": {  
 ...  
 "externalIds": [{  
 "scheme": "https://doi.org",  
 "value": "10.14287/10000001"  
 }, {  
 "scheme": "https://handle.net",  
 "value": "2381/12775"  
 }, {  
 "scheme": "https://arks.org",  
 "value": "ark:/13030/tf5p30086k"  
 }]  
 ...  
}

*Example. Online citation*

"links": [  
 {  
 "rel": "cite-as",  
 "title": "Cite as: WMO/GAW Ozone Monitoring Community, World Meteorological Organization-Global Atmosphere Watch Program (WMO-GAW)/World Ozone and Ultraviolet Radiation Data Centre (WOUDC) [Data]. Retrieved [YYYY-MM-DD], from https://woudc.org. A list of all contributors is available on the website. doi:10.14287/10000004",  
 "type": "text/html",  
 "href": "https://dx.doi.org/10.14287/10000004"  
 }  
]

|  |  |
| --- | --- |
| **Recommendation 8** | **/rec/core/pids** |
| A | A WCMP record should provide persistent identifier references via items in the properties.externalIds array property, where the value of scheme is based on an established persistent identifier scheme (such as https://doi.org, https://arks.org, https://handle.net, etc.), and the value property is the persistent identifier (for example, https://dx.doi.org/10.14287/10000001). |

|  |  |
| --- | --- |
| **Permission 7** | **/per/core/pids** |
| A | A WCMP record may provide a persistent identifier to cite research or resource identification using a persistent identifier scheme/framework. |
| B | A WCMP record may provide a persistent identifier as a link object with rel=cite-as if there is an online citation or reference. |

**1.15 Properties / Record creation date**

The created property is a single date that the WCMP metadata record was created. Note that this date is not the start or end time of a given dataset. See [Temporal extent](#X588a05d06ef6be52311cc5cfafec95f7fa5aa17) for more information on defining dataset temporal extents.

*Example*

"properties": {  
 ...  
 "created": "2021-06-12T23:45:24Z"  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 12** | **/req/core/record\_creation\_date** |
| A | A WCMP record shall provide a single properties.created property. |
| B | The properties.created property shall not be repeated or used to document change history. |

**1.16 Properties / Record update date**

The updated property is the date that the WCMP metadata record was last updated. Note that this date is not the start or end time of a given dataset. See [Temporal extent](#X588a05d06ef6be52311cc5cfafec95f7fa5aa17) for more information on defining dataset temporal extents.

*Example*

"properties": {  
 ...  
 "updated": "2022-06-12T18:52:39Z"  
 ...  
}

|  |  |
| --- | --- |
| **Recommendation 9** | **/rec/core/record\_update\_date** |
| A | A WCMP record should provide a properties.updated property when a record has been updated since its initial creation. |

**1.17 Properties / Status**

The status property identifies the lifecycle of a given dataset.

"properties": {  
 "status": {  
 "id": "operational",  
 "title": "dataset is in 24/7 operation",  
 "url": "https://example.org/my-vocab"  
 }  
}

|  |  |
| --- | --- |
| **Recommendation 10** | **/rec/core/status** |
| A | A WCMP record should provide a properties.status property to identify the operational status of a given dataset. |
| B | A WCMP record should provide a properties.status.id property to identify the concept of the status (see Annex D for possible codelists to use). |
| C | A WCMP record should provide a properties.status.title property to provide a human readable title for the concept. |
| D | A WCMP record should provide a properties.status.description property to provide a human readable description for the concept. |
| E | A WCMP record should provide a properties.status.url property to provide further description of the concept via the given URI. |

**1.18 Properties / WMO data policy**

The wmo:dataPolicy property is a codelist that identifies the classification of the dataset exchange as described by [WMO Unified Data Policy](https://library.wmo.int/idurl/4/58009) for the international exchange of Earth system data. The codelist values are core or recommended. The wmo:dataPolicy property is required if the metadata record describes a dataset.

Licensing and copyright are expressed via the links property (see [Distribution information](#X4beeed0c4fbfcc34f46c37d8f47acf8619530c0)), providing access, license and attribution details as required. Conditions on use of the data should be indicated for transparency and clarification.

*Example. Core data*

"properties": {  
 ...  
 "wmo:dataPolicy": "core"  
 ...  
}

*Example. Recommended data*

"properties": {  
 ...  
 "wmo:dataPolicy": "recommended"  
 ...  
}

It is useful to add provider-specific details to have the most detailed information about data policy and additional conditions.

*Example. Recommended data with additional conditions and provider-specific details*

"properties": {  
 ...  
 "wmo:dataPolicy": "recommended"  
 ...  
},  
"links": [{  
 "rel": "license",  
 "href": "https://example.org/license",  
 "type": "text/html",  
 "title": "EUMETSAT DATA LICENSING"  
}]

*Example. License for recommended data in the public domain*

"properties": {

...

"wmo:dataPolicy": "recommended"

...

},

"links": [{

"rel": "license",

"href": "https://creativecommons.org/publicdomain/zero/1.0/",

"type": "text/html",

"title": "CC0 1.0 Deed | CC0 1.0 Universal | Creative Commons"

}]

To express rights not addressed by a license, the rights property can be used as follows:

*Example. Rights*

"properties": {  
 ...  
 "rights": "Users are granted free and unrestricted access to this data, without charge and with no conditions on use. Users are requested to attribute the producer of this data. WMO Unified Data Policy (Resolution 1 (Cg-Ext 2021))."  
 ...  
}

|  |  |
| --- | --- |
| **Requirement 13** | **/req/core/data\_policy** |
| A | When the properties.type property is dataset, the record shall provide exactly one properties.wmo:dataPolicy property. |
| B | The properties.wmo:dataPolicy property shall be core or recommended. |
| C | When the properties.wmo:dataPolicy property is recommended, data licensing shall be provided by at least one links item with link relations (rel) of license. |

|  |  |
| --- | --- |
| **Recommendation 11** | **/rec/core/data\_policy\_conditions** |
| A | Additional conditions represented by a links item should also provide a title property to include human-readable information about the link. |
| B | To express any conditions on use of a given dataset, the properties.rights property should be used. |
| C | For core data or recommended data compatible with free and unrestricted principles, properties.rights should be declared with exactly the following statement:  Users are granted free and unrestricted access to this data, without charge and with no conditions on use. Usersare requested to attribute the producer of this data. WMO Unified Data Policy (Resolution 1 (Cg-Ext 2021)) |
| D | For core or recommended data not in the public domain, a copyright statement should be expressed as either a properties.rights statement or a link object with rel=copyright. |

|  |  |
| --- | --- |
| **Permission 8** | **/per/core/data\_policy** |
| A | For core data (when properties.wmo:dataPolicy property is core), attribution licensing may be provided as needed. |
| B | For core data (when properties.wmo:dataPolicy is core) or recommended data (when properties.wmo:dataPolicy is recommended, and the data is compatible with free and unrestricted principles), a license or public domain statement that is compatible with free and unrestricted principles (such as, [Creative Commons CC0](https://creativecommons.org/publicdomain/zero/1.0/)) may be expressed as a link object with the license link relation. |
| C | For core data (when properties.wmo:dataPolicy is core) or recommended data (when properties.wmo:dataPolicy is recommended, a copyright statement may be expressed in properties.rights |
| D | For core data (when properties.wmo:dataPolicy is core) or recommended data (when properties.wmo:dataPolicy is recommended, a link object may be expressed with rel=copyright. |

**1.19 Links and distribution information**

**1.19.1 Overview**

The links property describes URLs and APIs for accessing the dataset or for subscribing to dataset notifications. Links are the primary mechanism for interacting with the data and provide an "actionable" workflow to enhance and improve the user experience with "less clicks" for subscriptions and downloads.

The links property may also describe URLs for related documentation, related data, or visual images of the dataset.

The table below provides an overview of the properties of a link object.

**Table. Link properties**

|  |  |  |
| --- | --- | --- |
| **Property** | **Requirement** | **Description** |
| href | **Required** | The link destination or target, or URL. |
| rel | Optional | The relationship that the link bears in the context of the WCMP record. This is a controlled vocabulary defined in the [IANA link relations](https://www.iana.org/assignments/link-relations/link-relations.xhtml) table or [WIS link type](https://codes.wmo.int/wis/link-type) codes (see [Table. Link relation selection](#Xf98e04de67bba7ef0ca9a454026c8b18cfdce45)). |
| type | Optional | The media (or MIME) type of the format of the link. |
| hreflang | Optional | The language of the content in the link. |
| title | Optional | A human-readable name for the link (can be used for display on search / discovery web portals). |
| Channel | **Conditional** | For data made available via MQTT, the topic to which a user may subscribe to for notifications and access. |
| Security | Optional | For access-controlled data, a description of the access control mechanism applied (see [Access control](#X0816bbae025f082caaf5aa16c47b09f1cd4e88e)). |
| Distribution | Optional | Value added information about the link to further assist the user (additional document, typical file size, etc.) (see [Distribution information](#X4beeed0c4fbfcc34f46c37d8f47acf8619530c0)). |

For recommended data, the links property may also provide links to services that implement access control in support of authentication and authorization. In secure data use cases, a user needs to be able to detect access-controlled data as part of data discovery and evaluation.

*Example. Access controlled link*

"links": [{  
 "rel": "data",  
 "type": "application/json",  
 "title": "link to WAF endpoint",  
 "href": "https://example.org/data/secure-data",  
 "security": {  
 "default": {  
 "type": "http",  
 "scheme": "basic",  
 "description": "Please contact the data provider for accessing this secured resource."  
 }  
 }  
}]

*Example. Two link objects providing both search and MQTT subscription information*

"links": [  
 {  
 "rel": "search",  
 "type": "text/html",  
 "title": "WOUDC - Data - Station List",  
 "href": "https://example.org/data/stations"  
 },  
 {  
 "rel" : "items",  
 "type" : "application/geo+json",  
 "title": "WIS2 notification service",  
 "href" : "mqtts://example.org",  
 "channel": "cache/a/wis2/ca-eccc-msc/data/core/weather/surface-based-observations"  
 }  
]

*Example. A links object providing an API capability*

"links": [  
 {  
 "rel": "service",  
 "type": "application/json",  
 "title": "OGC API - Features service",  
 "href": "https://example.org/api"  
 }  
]

*Example. A links object providing a browse graphic*

"links": [  
 {  
 "rel": "preview",  
 "type": "image/png",  
 "title": "Browse graphic",  
 "href": "https://example.org/path/to/browse.png"  
 }  
]

**1.19.2 Templated links**

Templated links allow for specifying a pattern of a link in support API interaction (where parameter values are variable).

*Example. A templated link object of a WMS service providing API access to images*

"linkTemplates": [{  
 "rel": "item",  
 "type": "image/png",  
 "title": "Eumetview",  
 "uriTemplate": "https://example.org/geoserver/ows?service=WMS&request=GetMap&version=1.3.0&layers=msg\_fes:ir108&styles=&format={format}&crs={crs}&bbox={bbox}&width={width}&height={height}",  
 "variables": {  
 "crs": {  
 "description": "...",  
 "type": "string",  
 "enum": [  
 "EPSG:4326",  
 "EPSG:3857"  
 ]  
 },  
 "bbox": {  
 "description": "...",  
 "type": "array",  
 "items": {  
 "type": "number",  
 "format": "double"  
 },  
 "minItems": 4,  
 "maxItems": 4  
 },  
 "width": {  
 "description": "...",  
 "type": "number",  
 "format": "integer",  
 "minimum": 600,  
 "maximum": 5000  
 },  
 "height": {  
 "description": "...",  
 "type": "number",  
 "format": "integer",  
 "minimum": 600,  
 "maximum": 5000  
 },  
 "format": {  
 "description": "...",  
 "type": "string",  
 "enum": [  
 "image/geotiff",  
 "image/geotiff8",  
 "image/gif",  
 "image/jpeg",  
 "image/png; mode=8bit"  
 ]  
 },  
 "sampleRequest": "https://example.org/geoserver/ows?service=WMS&request=GetMap&version=1.3.0&layers=msg\_fes:ir108&styles=&format=image/jpeg&crs=EPSG:4326&bbox=-77,-77,77,77&width=800&height=800"  
 }  
}]

|  |  |
| --- | --- |
| **Requirement 14** | **/req/core/links** |
| A | A WCMP record shall provide a links property. |
| B | The links property shall contain at least one link to the data access service allowing users to download the data. |
| C | The links property shall contain a Web Accessible Folder (WAF) OR an API link for non-real-time data (such as climate records or hydrometric data archives). |
| D | The links property shall contain access control information for data, products, and services that require authentication or authorization. |
| E | For representing MQTT links, the URI scheme shall be mqtt (default port 1883) or mqtts (default port 8883) for secure TLS encrypted connections. |
| F | The links property shall provide the channel property of the MQTT topic for real-time data under which the data publication notifications will be accessible from the WIS2 Global Broker, following the WIS2 topic hierarchy. |
| G | The links property shall include a valid [IANA link relation](https://www.iana.org/assignments/link-relations/link-relations.xml) or [WIS link type](https://codes.wmo.int/wis/link-type) code. |

|  |  |
| --- | --- |
| **Recommendation 12** | **/rec/core/links** |
| A | A WCMP record’s links should be provided using secure protocols (such as, HTTPS, MQTTS, etc.). |
| B | The links property should provide a type property with a valid media type from IANA or as designated by WMO. |

|  |  |
| --- | --- |
| **Permission 9** | **/per/core/links** |
| A | The links property may contain a Web Accessible Folder (WAF) OR an API link for real-time data. |

**1.19.3 Distribution information**

The distribution property provides information about the format of the dataset, associated documentation and representative examples of the dataset.

Additional distribution information is added to allow more comprehensive discovery services.

*Example. Links object with the complete distribution information*

"links": [{  
 "rel": "search",  
 "type": "text/html",  
 "title": "EUMETSAT Datastore",  
 "href": "https://example.org/data/map/EO:EUM:DAT:MSG:MSG15-RSS",  
 "distribution": {  
 "availableFormats": [{  
 "name": "native",  
 "description": "This is sent in a compressed Submission Information Package (SIP) by default.",  
 "numberOfFiles": "288 per day",  
 "typicalFilesize": "60 MB",  
 "typicalFilename": "MSG3-SEVI-MSG15-0100-NA-20130208102743.243000000Z-1051616.zip",  
 "samples": {  
 "href": "https://example.org/data/access/MSG3-SEVI-MSG15-0100-NA-20130208102743.243000000Z-1051616.zip"  
 },  
 "documentation": [{  
 "rel": "alternate",  
 "type": "text/html",  
 "title": "SIP documentation and tools",  
 "href": "https://www.eumetsat.int/formats#SIP"  
 }]  
 }]  
 }  
}]

|  |  |
| --- | --- |
| **Recommendation 13** | **/rec/core/distribution** |
| A | A WCMP record should describe additional distribution information with the links.distribution property to qualify a given service link. This information should be used to build the discovery information and allow the user to find and choose the appropriate service for accessing the data. |
| B | The links.distribution.availableFormats property should describe the different formats that can be retrieved using the service link. |
| C | The links.distribution.availableFormats.name property should describe the available format short name. |
| D | The links.distribution.availableFormats.description should describe the associated format. |
| E | The links.distribution.availableFormats.typicalFilename should describe the filenames that are available from the service link. |
| F | The links.distribution.availableFormats.typicalFilesize should describe the typical filesize available from the service link. |
| G | The links.distribution.availableFormats.numberOfFiles should describe the typical number of files received during a given period (day, month, …​) when using the service link. It should follow the pattern X per day, X per month. |
| H | The links.distribution.availableFormats.documentation should be a link for accessing the documentation associated with the format. |
| I | The links.distribution.availableFormats.samples should be an array of direct links to representative samples of the data. |

**1.19.4 Access control**

WCMP record links may also provide links to services that implement access control in support of authentication and authorization. In secure data use cases, a user needs to be able to detect access-controlled data as part of data discovery and evaluation. The example demonstrates how to express access control using HTTP Basic Authentication for a given data access service.

*Example*

"links": [{  
 "rel": "data",  
 "type": "application/json",  
 "title": "link to WAF endpoint",  
 "href": "https://example.org/data/secure-data",  
 "security": {  
 "default": {  
 "type": "http",  
 "scheme": "basic",  
 "description": "Please contact the data provider for accessing this secured resource."  
 }  
 }  
}]

**1.19.5 Link relation selection**

Link relations are very important and provide valuable context to help clarify the semantics of a given link or URL.

The table below provides guidance on which link relation to use to identify common types of links to data and services.

**Table. Link relation selection**

|  |  |
| --- | --- |
| **Link type** | **Link relation (**rel=**)** |
| Online data archive | archives |
| Online documentation | about |
| OpenAPI endpoint (such as, JSON or YAML) | service-desc |
| OpenAPI endpoint in HTML (such as, Swagger, ReDoc) | service-doc |
| OGC WMS, WFS, WCS, CSW, WPS Capabilities | service-desc |
| A single link providing numerous data granules | items |
| A link providing a single data granule | item |
| A link to numerous stations that the dataset is based on | stations |
| A link to a single station that the dataset is based on | station |
| citation | cite-as |
| A search portal or web application | search |
| A zipfile of data, or bulk download | enclosure |
| A browse graphic of a dataset | preview |
| An OGC API endpoint providing a collection description | collection |

**1.20 Additional properties**

A WCMP record can be extended as required for organizational purposes by adding properties (of any type) in the record. Additional properties do not break compliance to WCMP.

*Example.*

"properties": {  
 ...  
 "approvalStatus": "approved"  
 "\_comment": {  
 "validationErrors": [  
 "error 1",  
 "error 2"  
 ]  
 }  
 ...  
}

|  |  |
| --- | --- |
| **Permission 10** | **/per/core/additional\_properties** |
| A | A WCMP record may provide additional properties of any type in any part of the document as needed. |

\_\_\_\_\_\_\_\_\_\_\_\_