WIS2 Topic Hierarchy

World Meteorological Organization

Date: 2023-08-22

Version: 1.0.0-DRAFT

Document location: https://community.wmo.int/wis2-topic-hierarchy

Task Team on WIS Metadata (TT-WISMD)[1]

Expert Team on Metadata Standards (ET-Metadata)[2]

Standing Committee on Information Management and Technology (SC-IMT)[3]

Commission for Observation, Infrastructure and Information Systems (INFCOM)[4]

Table of Contents

i. Abstract

WIS2 real-time data sharing is based on a message queuing protocol (MQP) supporting a publication/subscription (PubSub) mechanism. A user can subscribe to an MQP broker to receive real-time notifications of the existence of new data.

WIS2 brokers offer a range of topics organised in a hierarchy. Users can select their topics of interest and subscribe to them to receive notifications and download data relevant to their work.

The standard notification message format ensures that the WIS2 ecosystem (data publisher, data user, and global services) is a robust, effective, and unified exchange platform for weather, climate, and water data.

This document defines the structure of the WIS Topic Hierarchy. Topics are utilized by WIS Nodes, Global Broker services, and data/metadata subscribers.

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

wmo, wis 2.0, weather, climate, water, topic hierarchy, metadata, pubsub, mqp, message queuing protocol

iii. Security Considerations

Based on the WMO Unified Data Policy for the International Exchange of Earth System Data (Resolution 1 (Cg-Ext(2021) [5], exchanged data are classified as `core` or `recommended`. Core data is considered fully open and unrestricted with no security considerations. Recommended data may have access control defined.

No security considerations have been made for this standard.

Chapter 1. Scope

This document defines the topic hierarchy used by WIS message brokers to manage message delivery to subscribers and / or recipients.

This specification defines the conformance requirements for the WIS2 Topic Hierarchy. Annex A defines the abstract test suite.

All other topic structure specifications are not in scope.

[1] https://community.wmo.int/governance/commission-membership/commission-observation-infrastructures-and-information-systems-infcom/commission-infrastructure-officers/infcom-management-group/standing-committee-information-management-and-technology-sc-imt/expert-team-metadata-0

[2] https://community.wmo.int/governance/commission-membership/commission-observation-infrastructures-and-information-systems-infcom/commission-infrastructure-national-representatives/infcom-management-group/standing-committee-information-management-and-technology-sc-imt/et-metadata

[3] https://community.wmo.int/governance/commission-membership/commission-observation-infrastructures-and-information-systems-infcom/commission-infrastructure-officers/infcom-management-group/standing-committee-information-management-and-technology-sc-imt

[4] https://community.wmo.int/governance/commission-membership/infcom

[5] https://library.wmo.int/doc_num.php?explnum_id=11113#page=9

Chapter 2. Conformance

Conformance with this standard shall be checked using the tests specified in Annex A (normative) of this document.

WIS Global Brokers and Nodes are required to comply with all conformance classes of this specification in support of providing MQP services in alignment with the defined topic structure.

WMO shall publish guidance material to assist WIS Global Brokers and Nodes in constructing valid topic structures.

This standard identifies one Conformance Class which defines the functional requirements.

The mandatory Conformance Class for this specification is:

- "WIS2 Topic Hierarchy Core"

Chapter 3. References

- OASIS: MQTT Version 5.0 (2019) [1]
- OASIS: MQTT Version 3.1.1 (2014) [2]
- Wikipedia: Publish-subscribe pattern (2023) [3]
- International Telecommunications Union (ITU): T.50 : International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information interchange [4]

[1] https://docs.oasis-open.org/mqtt/mqtt/v5.0/mqtt-v5.0.html

[2] http://docs.oasis-open.org/mqtt/mqtt/v3.1.1/os/mqtt-v3.1.1-os.html

[3] https://en.wikipedia.org/wiki/Publish%E2%80%93subscribe_pattern

[4] https://www.itu.int/rec/T-REC-T.50

Chapter 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 Standard 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.

The following additional terms and definitions also apply.

4.1. Abbreviated terms

Table 1. Symbols and abbreviated terms

Abbreviation	Term
DCPC	Data Collection and Production Centres
GISC	Global Information System Centre
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
IANA	Internet Assigned Numbers Authority
IETF	Internet Engineering Task Force
ISO	International Organization for Standardization
MQP	Message Queuing Protocol
MQTT	Message Queuing Telemetry Transport
NC	National Centre
OGC	Open Geospatial Consortium
PubSub	Publish / Subscribe
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
W3C	World Wide Web Consortium
WCMP	WMO Core Metadata Profile
WIS	WMO Information System
WMO	World Meteorological Organization
WNM	WIS2 notification message

Chapter 5. Conventions

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

5.1. Identifiers

The normative provisions in this Standard are denoted by the URI:

http://wis.wmo.int/spec/wth/1

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

5.2. Examples

Examples provided in this specification are encoded as `plain text strings`.

5.3. Codelists bundle

The WIS2 Topic Hierarchy Notification codelist bundle can be found at https://schemas.wmo.int/wth/1.0/wth.zip. This bundle can be used by tools and applications wishing to browse or validate topic structures.

A browseable codelist can be found at https://codes.wmo.int/wth

Chapter 6. Introduction

6.1. The WIS Topic Hierarchy

The WIS Topic Hierarchy (WTH) provides a structure used by data providers and WIS Global Services in support of core WIS workflows: publish, discover, subscribe and download.

6.2. Real-time data sharing

WIS real-time data sharing is based on a message queuing protocol (MQP) supporting a publication/subscription mechanism. A user can subscribe to an MQP broker to receive real-time notifications. The notifications can be sent for new or updated data, metadata, or reports. The notification message received from the MQP broker contains a URL to download the data. The MQP broker offers a range of topics organised in a hierarchy. The users can select their topics of interest and subscribe to them to receive notifications and download data relevant to their work.

6.3. Data discovery

Users can discover datasets from the Global Discovery Catalogue (GDC). Once a user has identified a dataset of interest, they may subscribe to data notifications and updates using the topic and MQP broker found from the GDC dataset discovery metadata. Datasets in the GDC are made available via the WMO Core Metadata Profile 2 (WCMP2) standard for discovery metadata, which supports a categorisation scheme consistent with the topic hierarchy to provide a seamless search experience compatible with the access modality provided by the MQP broker. In other words, the MQP topic and WIS discovery metadata have the same vocabulary so that discovery, subscription, and download are consistent.

6.4. Structure

The structure of the topic hierarchy underpins the discovery and sharing of data in WIS, and requires standardization across all WIS services to provide consistent filter and access to the user.

Recalling that WIS is designed to support the WMO Unified Data Policy, the topic hierarchy must be aligned with WMO Res. 1 Cg-EXT-21 - Unified Data Policy.:[1]

Final approval of the WTH updates will go through the WMO fast-track amendment process.[2]

[1] https://ane4bf-datap1.s3-eu-west-1.amazonaws.com/wmocms/s3fs-public/ckeditor/files/Cg-Ext2021-d04-1-WMO-UNIFIED-POLICY-FOR-THE-INTERNATIONAL-approved_en_0.pdf?4pv38FtU6R4fDNtwqOxjBCndLIfntWeR

[2] https://community.wmo.int/en/activity-areas/wis/amendment-processes-wis-manuals-and-guides

Chapter 7. The WIS2 Topic Hierarchy

The WIS Topic Hierarchy (WTH) provides a structure used by data providers and WIS Global Services in support of core WIS workflows: publish, discover, subscribe and download.

7.1. Conformance Class Core

7.1.1. Overview

This Core Conformance Class provides requirements to articulate the required elements of the definition and management of the WIS2 Topic Hierarchy.

Requirements Class	
http://www.wmo.int/spec/wth/1/req/core	
Target type	Topic Classification
Dependency	MQTT v5.0
Dependency	MQTT v3.1.1
Pre-conditions	Topics conform to Topic Name requirements of MQTT

The standard topic structure ensures that the WIS2 ecosystem (data publisher, data user, and global services) is a robust, effective, and unified data exchange platform for weather, climate, and water.

7.1.2. Management

The WTH is managed by the WMO Task Team on WIS Metadata. Updates to the WTH are made as part of two workflows: core levels, and domain specific levels.

The WIS Topic Hierarchy has been developed according to the classification of the Earth System domains in Annex 1 of Resolution 1 Cg-Ext(2021), and it is managed in two parts:

1. Primary topic levels (levels 1-8): topic structure applies to all data and services in WIS
2. Domain specific topic subcategory levels (level 9 and beyond): topic structure proposed by domain experts and user communities. Note that the number of levels in this part may vary according to the requirements of various domains.

Requirement 1	**/req/core/management**
A	Primary levels 1-8 SHALL be determined by the WMO Task Team on WIS Metadata.
B	Domain specific levels (level 9 and beyond) SHALL be determined by domain experts and user communities.
C	Domain specific levels (level 9 and beyond) SHALL be coordinated and integrated by the WMO Task Team on WIS Metadata.

D	Domain specific level updates SHALL be implemented using the following steps: • domain specific teams submit proposals to TT-WISMD • TT-WISMD performs a review of the proposal and curates the content for consistency. Discussion and clarifications on the proposal are performed as required • once consensus is reached, TT-WISMD approves the proposal for inclusion into the next release of WTH • Final approval of the WTH updates will go through the WMO fast-track amendment process.[1]

7.1.3. Versioning

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

Requirement 2	**/req/core/versioning**
A	A removal of a topic at any level SHALL result in a major version update.
B	A renaming of a topic at any level SHALL result in a major version update.
C	A change in structure of the topic hierarchy SHALL result in a major version update.
D	A new topic SHALL NOT result in any version update.
E	A major version SHALL result in a change / bump to the version level (i.e. `a` → `b`).
F	A minor version SHALL NOT result in any changes to the version level.
G	A renaming or removal in the WMO Notification Message Format SHALL result in a major version update.

7.1.4. Conventions

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

Requirement 3	**/req/core/conventions**
A	All topic level definitions SHALL be lowercase.
B	All topic level definitions SHALL following ASCII T.50.
C	All topic level definitions SHALL NOT utilize dots (`.`).
D	All topic level definitions SHALL utilize dashes (`-`).

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.

7.1.5. Publishing guidelines

For maximum utility and efficient management of topics, data, metadata, and reports need to be published to a minimum level. This helps with avoiding "pollution" of messages in higher level topics which are used to delineate core concepts (centre identification, notification types, data policy, etc.).

Requirement 4	**/req/core/publishing**
A	Data SHALL be published to at least the level of the Earth system discipline subcategory.
B	Metadata SHALL be published to at least the level of the notification type (`metadata`).
C	Reports SHALL be published to at least the level of the notification type (`reports`).

[1] https://community.wmo.int/en/activity-areas/wis/amendment-processes-wis-manuals-and-guides

Annex A: Conformance Class Abstract Test Suite (Normative)

A.1. Conformance Class: Core

label

http://www.wmo.int/spec/wth/1/conf/core

subject

Requirements Class "core"

classification

Target Type:Topic Classification

Annex B: Examples (Informative)

B.1. WIS2 Topic Hierarchy

Example: WIS Node data publishing (surface weather observations) from Environment and Climate Change Canada, Meteorological Service of Canada

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

Example: WIS Node metadata publishing from Deutscher Wetterdienst

```
cache/a/wis2/deu/dwd/metadata/core/wcmp2
```

Annex C: Bibliography

- OASIS: MQTT Version 5.0 (2019) [1]
- OASIS: MQTT Version 3.1.1 (2014) [2]
- Wikipedia: Publish-subscribe pattern (2023) [3]
- International Telecommunications Union (ITU): T.50 : International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information interchange [4]

[1] https://docs.oasis-open.org/mqtt/mqtt/v5.0/mqtt-v5.0.html

[2] http://docs.oasis-open.org/mqtt/mqtt/v3.1.1/os/mqtt-v3.1.1-os.html

[3] https://en.wikipedia.org/wiki/Publish%E2%80%93subscribe_pattern

[4] https://www.itu.int/rec/T-REC-T.50

Annex D: Revision History

Date	Release	Editor	Primary clauses modified	Description
2023-09-25	Template	Tom Kralidis	all	initial revision