# Guide to the WMO Information System

2015 edition

WEATHER CLIMATE WATER

WORLD
METEOROLOGICAL
ORGANIZATION

WMO-No. 1061

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**EDITORIAL NOTE**

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# INTRODUCTION

## Purpose of this Guide

1. In conjunction with the *Manual on the WMO Information System* (WMO-No. 1060) (*Manual on WIS*), the *Guide to the WMO Information System* (*Guide to WIS*) is designed to ensure adequate uniformity and standardization in the data, information and communication practices, procedures and specifications employed by Members of the World Meteorological Organization (WMO) in the operation of the WMO Information System (WIS) as it supports the mission of the Organization. The *Manual on WIS* contains standard and recommended practices, procedures and specifications. The *Guide to WIS* contains additional information concerning practices, procedures and specifications which Members are invited to follow or implement in establishing and conducting their arrangements in compliance with the WMO Technical Regulations and in developing meteorological and hydrological services.

2. Because WIS cuts across all related WMO disciplines, many other WMO practices, procedures and specifications intersect WIS. These are described in the relevant publications, for example, the *Guide on the Global Data-processing System* (WMO-No. 305) and the *Guide to the Global Observing System* (WMO-No. 488).

## Benefits of WIS

3. The WMO Information System provides an overarching approach to data and information management for all WMO and related international programmes, leveraging the long-standing collaborative culture of WMO, as well as new technologies.

4. WMO Members expect to realize specific benefits from WIS:

- Enhanced collection of critical data needed to monitor and predict aspects of the environment, including hazards;
- A catalogue of the full range of data and products, simplifying search and ensuring equitable access consistent with WMO policies;
- Enhanced availability of time-critical data and products at centres in all countries, ensuring the effective provision of services to their populations and economies;
- WMO private network (the WMO Global Telecommunication System (GTS)) open to other types of environmental data so that all programmes have stronger infrastructural support;
- Opportunities exploited with technological innovations as they become available.

# PART I. ORGANIZATION AND RESPONSIBILITIES

## 1.1 ORGANIZATION OF WIS

WMO Members implement and operate WIS using existing centres with some additional or modified capabilities. Centres participating in WIS are categorized as follows:

- Global Information System Centres (GISCs);
- Data Collection or Production Centres (DCPCs);
- National Centres (NCs).

See the *Manual on WIS*, Part III, for a description of the functions of the three types of WIS centre.

## 1.2 COMPLIANCE WITH REQUIRED WIS FUNCTIONS

As required by the *Technical Regulations*, Volume I, Part II, and the *Manual on WIS*, Part I and Part III, WIS centres shall comply with required WIS functions. This Guide contains additional guidance on practices, procedures and specifications for WIS functions, supplementing the standard and recommended practices, procedures and specifications set out in the *Manual on WIS*.

## 1.3 INTERACTION AMONG WIS CENTRES

As required by the *Manual on WIS*, 1.3, GISCs shall connect to each other through the WIS Core Network. Data, products and metadata shall flow to a GISC from DCPCs and from NCs within its area of responsibility. An illustration of likely interaction among WIS centres is provided in Figure 1 (below).

Note: Named centres are illustrative examples and do not amount to a complete list of likely WIS centres.

## 1.4 IMPLEMENTATION OF WIS

As required by the *Manual on WIS*, 1.4, WIS is implemented in two parallel parts: continued evolution of the GTS, and extension of WMO services through discovery, access and retrieval (DAR) facilities, as well as flexible timely delivery.

## 1.5 DISCOVERY, ACCESS AND RETRIEVAL FUNCTION

1.5.1 As required by *Technical Regulations*, Vol. I, Part II, and the *Manual on WIS*, 1.5, WIS is based on metadata catalogues describing data and products available across WMO, plus metadata describing dissemination and access options. The DAR function of WIS is the primary realization of the WIS comprehensive catalogue, maintained collaboratively by all WIS centres.

1.5.2 A typical user of WIS DAR should find available data and products using a web browser or other Internet tool. The searcher should be able to discover available data and products either by browsing the catalogue or by searching it, using discovery concepts such as subject keywords, geographic extent or temporal range.

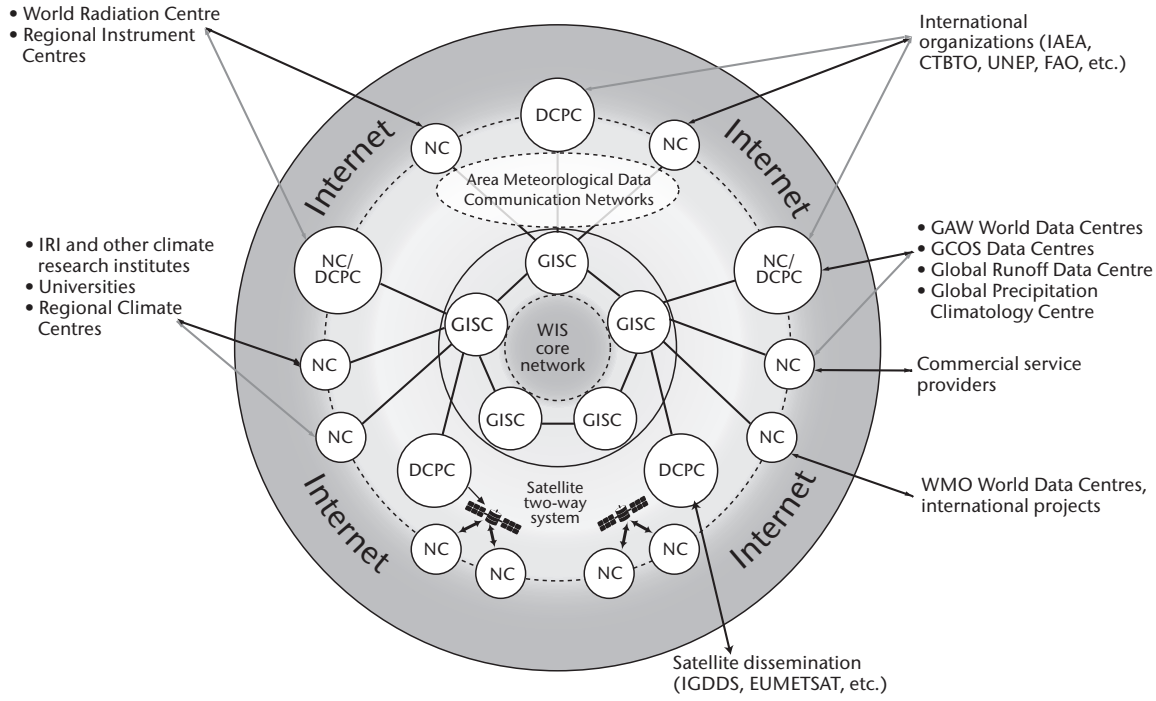
1.5.3 A typical user of WIS DAR should first receive a list of relevant items with associated metadata such as originator, data type, generation date and use constraints. Once the desired data or products have been identified, a user may request immediate retrieval ("pull") or subscription for recurring delivery ("push") if locally available, or be referred to another centre holding the item. The WIS centre having the item should then facilitate delivery through any of a broad range of online and offline transmission options. In the case of a subscription, the WIS centre should maintain further information to support recurring delivery.

## 1.6 ROBUSTNESS AND RELIABILITY OF COMPONENTS

As required by the *Manual on WIS*, 1.6, highly robust and reliable WIS components are essential to the operation of WIS. Indicators of performance are evaluated in the designation procedure for WIS centres to include assurance that data content flowing via WIS network technologies fully satisfies requirements for security, authenticity and reliability. Some specifications of service levels are identified within the *Manual on WIS* and this *Guide to WIS*, but further specifications can be anticipated.

## 1.7 COLLECTION AND DISSEMINATION SERVICES

1.7.1 See *Manual on WIS*, Part I, 1.7 for standard and recommended practices, procedures and specifications on this topic.




Key:

| | | | | | |
|---|---|---|---|---|---|
| CTBTO | = | Comprehensive Nuclear-Test-Ban Treaty Organization | GISC | = | Global Information System Centre |
| DCPC | = | Data Collection or Production Centre | IAEA | = | International Atomic Energy Agency |
| EUMETSAT | = | European Organization for the Exploitation of Meteorological Satellites | IGDDS | = | Integrated Global Data Dissemination Service |
| | | | IRI | = | International Research Institute for Climate and Society |
| FAO | = | Food and Agriculture Organization of the United Nations | NC | = | National Centre |
| | | | UNEP | = | United Nations Environment Programme |
| GAW | = | Global Atmosphere Watch | ⟷ | = | Real-time "push" |
| GCOS | = | Global Climate Observing System | ⟷ | = | On-demand "pull" |

**Figure 1. Types of WIS centres and typical interactions**

1.7.2 With regard to satellite-based data and products, the WMO Integrated Global Data Dissemination Service (IGDDS) addresses: user requirements; data concentration; interregional data exchange; data dissemination; data discovery; data access on request; data delivery to authorized users; and data management, including interoperable catalogue, quality of service monitoring and user support.

1.7.3 In addition to satellite-based data and products, IGDDS should distribute a basic subset of the information intended for global exchange.

1.7.4 The Integrated Global Data Dissemination Service calls for regional dissemination components linked in a global network for interregional data exchange. Each regional component should include a DCPC and should ensure routine dissemination by various means, including a satellite-based Digital Video Broadcast service covering its region.

## 1.8 COMPETENCIES OF PERSONNEL

1.8.1 The *Manual on WIS*, Part I, 1.8, recommends that Members operating WIS centres ensure that their centres have access to an adequate number of staff who have the required level of the WIS competencies defined in the *Technical Regulations* (WMO-No. 49), Volume I, Part V, and in the *Manual on WIS*, Appendix E.

1.8.2 WMO Information System centres need access to generic Information Technology and management competencies. Many training and development resources for these competencies are available from government or commercial sources, from libraries and the Internet.

1.8.3 WMO Information System centres also need access to competencies that are specific to the WIS. Guidance on how these competencies may be assessed and developed is provided in Appendix A to this Guide.

# PART II. DESIGNATION PROCEDURES FOR WIS CENTRES

## 2.1 GENERAL

Designation procedures for WIS centres are defined in the *Manual on WIS*, Part II. The Commission for Basic Systems (CBS) reviews relevant aspects of the *Manual on WIS* to ensure alignment of WIS user requirements, the WIS functional architecture and WIS compliance specifications. The Commission for Basic Systems is also developing monitoring procedures to complement the designation procedures of WIS and to ensure ongoing compliance of WIS centres with the agreed standards and practices.

## 2.2 PROCEDURE FOR A GLOBAL INFORMATION SYSTEM CENTRE

The procedure for designating a GISC is given in the *Manual on WIS*, Part II, 2.2, in keeping with *Technical Regulations*, Volume I, Part II. During the initial phase of WIS centre designation, CBS analyses GISC service offers and formulates a recommendation for designation.

## 2.3 PROCEDURE FOR A DATA COLLECTION OR PRODUCTION CENTRE

The procedure for designating a DCPC is given in the *Manual on WIS*, Part II, 2.3, in keeping with *Technical Regulations*, Volume I, Part II. During the initial phase of WIS centre designation, CBS determines which centres should be integrated in WIS, analyses DCPC service offers and formulates a recommendation.

## 2.4 PROCEDURE FOR A NATIONAL CENTRE

2.4.1 The procedure for designating an NC is given in the *Manual on WIS*, Part II, 2.4, in keeping with *Technical Regulations*, Volume I, Part II.

2.4.2 National Meteorological Centres are expected to be NCs. A WMO Member may also designate other centres as NCs.

2.4.3 In addition to the data and metadata requirements of an NC set out in the *Manual on WIS*, a typical NC should collect, generate or disseminate observational data and products, and provide certain observations and products intended for global dissemination or for regional or specialized distribution to other WIS centres.

2.4.4 The Study on Policy-level Implications of the Future WMO Information System (described in the *Abridged Final Report with Resolutions of the Fourteenth World Meteorological Congress* (WMO-No. 960), 3.1.2.11 of the general summary) asserts that the introduction of WIS will not result in new responsibilities or additional resource requirements for most Members. The stated expectation was that WIS would result in lower costs, especially for least-developed countries, through expanded use of commercial off-the-shelf technology and increased use of the Internet.

# PART III. FUNCTIONS OF WIS

## 3.1 ROLES IN AND REVIEW OF WIS FUNCTIONS

3.1.1 Roles in and review of WIS functions are given in the *Manual on WIS*, Part III, 3.1.

3.1.2 Each relevant process for establishing user requirements across WMO should link to the WIS user requirement process. For instance, observing programme needs should be incorporated into WIS requirements through linkage with the Rolling Review of Requirements in the *Manual on the Global Observing System* (WMO-No. 544).

3.1.3 Current WIS user requirements are described in a technical document available at http://wis.wmo.int/WIS-RRR.

## 3.2 LIST OF WIS FUNCTIONS

The WMO Information System centres collectively support the major WIS functions as described in the *Manual on WIS*, Part III, 3.2. The required standard interfaces to these functions are described in the *Manual on WIS*, Part IV.

## 3.3 FUNCTIONAL ARCHITECTURE OF WIS

The functional architecture of WIS is provided as supplementary guidance for WIS centres in a technical document available at http://wis.wmo.int/WIS-FuncArch. As shown in that document, the following list provides one possible method for dividing the required major WIS functions into more detailed functions.

A1 Collect observations, generate products, create metadata and archive information

A11 Collect, generate and archive national information and create metadata

A111 Collect national observations

A112 Check meteorological content of products and observations

A113 Archive

A114 Generate national products

A115 Generate metadata

A116 Unpack information

A117 Verify correct telecommunication attributes of information

A12 Collect, generate and archive regional, programme-related and specialized information, and create metadata

A121 Collect regional, specialized and programme-related observations

A122 Check meteorological content of observations

A123 Archive

A124 Generate regional, specialized and programme-related products

A125 Generate metadata

A126 Unpack information

A127 Verify correct telecommunication attributes of information

A13 Collect and cache global information

A131 Unpack information

A132 Associate information with DAR metadata

A133 Verify correct communication attributes of information

A134 Maintain and make available the cache of global information for 24 hours

A2 Assign user role

A3 Maintain and expose catalogue of services and information

A31 Search DAR Metadata Catalogue

A32 Maintain and expose consolidated DAR Metadata Catalogue

A33 Maintain dissemination metadata catalogue in accordance with authorized subscriptions

A4 Authorize access to information for users

A5 Deliver information to users (internal and external)

A51 Schedule and control activities

A511 Derive time-driven (synchronous) activity schedule and list of event-driven (asynchronous) activities

A512 Monitor events

A513 Resolve any activity scheduling conflicts, reflecting relative service priorities

A52 Package information for delivery

A53 Deliver information

A6 Manage system performance

A61 Non-real-time performance monitoring

A611 Analyse traffic trends

A612 Analyse performance against requirements and service-level agreements

A62 Real-time performance monitoring

A621 Real-time monitoring of telecommunication network

A622 Real-time monitoring of the application content

## 3.4 DATA FLOW AMONG WIS FUNCTIONS

3.4.1 The functional architecture of WIS (see 3.3 above) models data flow among required WIS functions and illustrative subordinate functions. The model uses Integration Definition for Function Modelling (IDEF0), a data-flow diagramming technique that illustrates relationships between system components, at levels ranging from general processes to specific technology interfaces.

3.4.2 Figure 2 presents an IDEF0 functional decomposition of the major WIS functions, labelled A1 to A6. Data flows are inherited between levels of the diagrams and are labelled as I1, I2, I3 for inputs and O1, O2 for outputs.

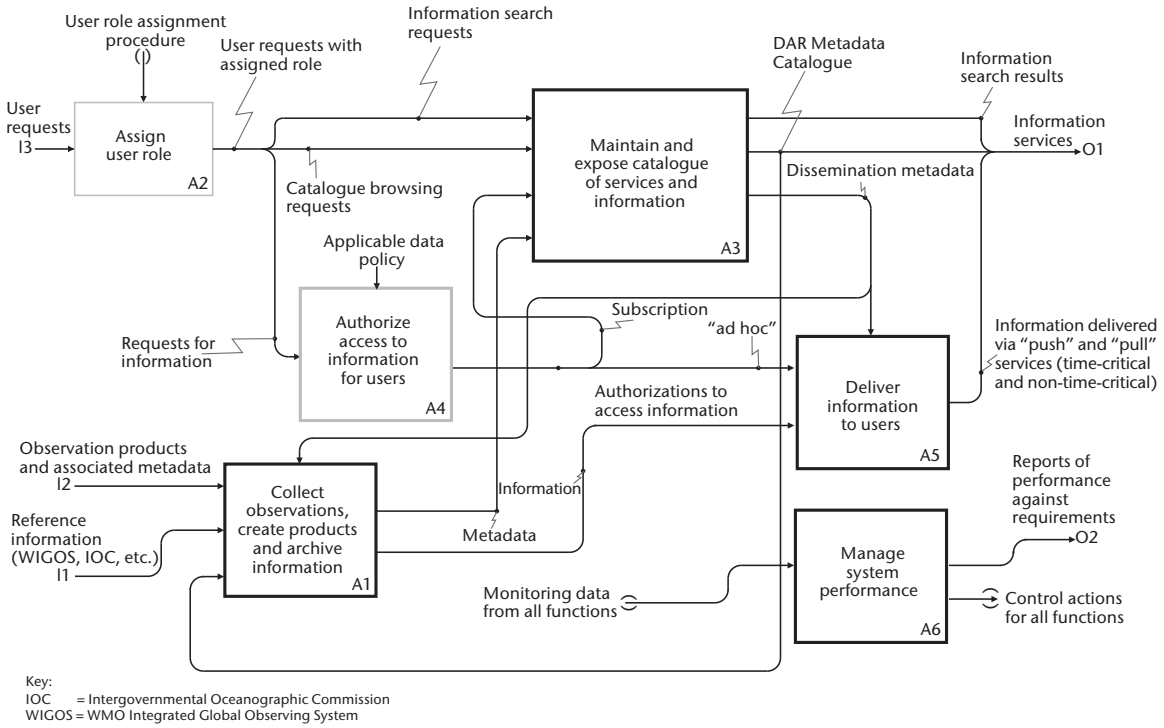



**Figure 2. Data-flow model of the WIS functional architecture**

## 3.5 FUNCTIONAL REQUIREMENTS OF A GISC

There are no general recommendations in addition to the statements in the *Manual on WIS*, Part III, 3.5.

## 3.6 FUNCTIONAL REQUIREMENTS OF A DCPC

There are no general recommendations in addition to the statements in the *Manual on WIS*, Part III, 3.6.

## 3.7 FUNCTIONAL REQUIREMENTS OF AN NC

There are no general recommendations in addition to the statements in the *Manual on WIS*, Part III, 3.7.

# PART IV. WIS TECHNICAL SPECIFICATIONS

## 4.1 GENERAL

As specified in the *Manual on WIS*, Part IV, 4.1, there are 15 WIS technical specifications (WIS-TechSpecs) that should be regarded as "mandatory if applicable", i.e. the technical specification is required wherever the interface applies. A summary of the applicability of each WIS Technical Specification by type of WIS centre is given in Table 1 below. Supplementary details are provided in WMO Information System Compliance Specifications of GISC, DCPC and NC (see also *Manual on WIS*, Appendix D). Use cases associated with each WIS Technical Specification are provided in Appendix B. They describe how the interface should behave. Test cases, which are designed to check whether the interface is working properly, are provided in Appendix C.

**Table 1. WIS interface technical specifications**

| *Interface technical specification identifier* | *Interface technical specification name* | *Required for:* | | |
|---|---|---|---|---|
| | | *NC* | *DCPC* | *GISC* |
| WIS-TechSpec-1 | Uploading of metadata for data and products | ✓ | ✓ | ✓ |
| WIS-TechSpec-2 | Uploading of data and products | ✓ | ✓ | ✓ |
| WIS-TechSpec-3 | Centralization of globally distributed data | | | ✓ |
| WIS-TechSpec-4 | Maintenance of user identification and role information | ✓ | ✓ | ✓ |
| WIS-TechSpec-5 | Consolidated view of distributed identification and role information | | | ✓ |
| WIS-TechSpec-6 | Authentication of a user | | ✓ | ✓ |
| WIS-TechSpec-7 | Authorization of a user role | | ✓ | ✓ |
| WIS-TechSpec-8 | DAR Metadata (WIS Discovery Metadata) Catalogue search and retrieval | | ✓ | ✓ |
| WIS-TechSpec-9 | Consolidated view of distributed DAR Metadata (WIS Discovery Metadata) Catalogues | | | ✓ |
| WIS-TechSpec-10 | Downloading files via dedicated networks | ✓ | ✓ | ✓ |
| WIS-TechSpec-11 | Downloading files via non-dedicated networks | ✓ | ✓ | ✓ |
| WIS-TechSpec-12 | Downloading files via other methods | ✓ | ✓ | ✓ |
| WIS-TechSpec-13 | Maintenance of dissemination metadata | | ✓ | ✓ |
| WIS-TechSpec-14 | Consolidated view of distributed dissemination metadata catalogues | | | ✓ |
| WIS-TechSpec-15 | Reporting on quality of service | ✓ | ✓ | ✓ |

## 4.2 WIS-TECHSPEC-1: UPLOADING OF METADATA FOR DATA AND PRODUCTS

### 4.2.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications given in the *Manual on WIS*, Part IV, 4.2.

### 4.2.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface should make use of a mix of dedicated and public network services, including public or private Internet with Transmission Control Protocol/Internet Protocol (TCP/IP), which may include encryption.

### 4.2.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for two functions: A1 (A11 for NCs or A12 for DCPCs), which deals with collection of data, generation of information and creation of discovery metadata, and A3 (as carried by the GISC), dealing with maintenance and exposure of a catalogue of services and information.

### 4.2.4 Additional notes

This interface builds on existing GTS practice, adding the particular standard format for WIS metadata about data, products and services. Centres should be aware that metadata uploaded to a GISC could take up to 24 hours to be synchronized across all GISCs. Thus, when a datum or product has to be distributed less than 24 hours after publication of its metadata, a centre must transmit the metadata directly to its principle GISC via the GTS or using a method already agreed with the GISC.

## 4.3 WIS-TECHSPEC-2: UPLOADING OF DATA AND PRODUCTS

### 4.3.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.3.

### 4.3.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface is associated with dedicated bandwidth and high reliability and should make use of the GTS. This can incorporate private Internet with TCP/IP and may include encryption. In some cases, IGDDS satellite uplinks may be employed.

### 4.3.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for two functions: A1 (A11 for NCs or A12 for DCPCs), which deals with collection of data, generation of information and creation of discovery metadata, and A5, dealing with delivery of information to users.

### 4.3.4 Additional notes

This interface builds on existing GTS practice, supplemented with other file-transfer mechanisms such as the Internet. Although it is required that data arrive only after their associated metadata, a grace period of two minutes is allowed before the data file is regarded as erroneous.

## 4.4 WIS-TECHSPEC-3: CENTRALIZATION OF GLOBALLY DISTRIBUTED DATA

### 4.4.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.4.

### 4.4.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface is associated with dedicated bandwidth and high reliability and should make use of the GTS. This can incorporate private Internet with TCP/IP and may include encryption.

### 4.4.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A134 – Maintain and make available the cache of global information for 24 hours.

### 4.4.4 Additional notes

4.4.4.1 The set of WMO data and products required to be cached for 24 hours at the GISCs is information intended for global exchange. This does not encompass all the material handled by IGDDS.

4.4.4.2 Although the cache of data and products intended for global exchange is required to be current across all GISCs to within 15 minutes, warnings must be current to within two minutes.

4.4.4.3 The cache size is expected to grow by one gigabyte per day. The cache needs to be highly accurate and the system for logical centralization needs to be affordable and robust; single points of failure and complex procedures are not acceptable.

## 4.5 WIS-TECHSPEC-4: MAINTENANCE OF USER IDENTIFICATION AND ROLE INFORMATION

### 4.5.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.5.

### 4.5.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface should make use of public network services, including Internet with TCP/IP, which may include encryption and other privacy protection for identified individuals, as required by national legislation.

### 4.5.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for two functions: A2 – Assign user role, and A4 – Authorize access to information for users.

#### 4.5.4 Additional notes

For updating the identification and role information concerning candidate or current users of WIS, WIS centres should support two kinds of maintenance facility: a file-upload facility for batch updating (adding, replacing or deleting identification and role records treated as separate files), and an online form for changing individual identification and role entries (adding, changing or deleting elements in a record, as well as whole records).

### 4.6 WIS-TECHSPEC-5: CONSOLIDATED VIEW OF DISTRIBUTED IDENTIFICATION AND ROLE INFORMATION

#### 4.6.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.6.

#### 4.6.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface should make use of a mix of dedicated and public network services, including public or private Internet with TCP/IP, which may include encryption and other privacy protection for identified individuals, as required by national legislation.

#### 4.6.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for two functions: A2 – Assign user role; and A4 – Authorize access to information for users.

### 4.7 WIS-TECHSPEC-6: AUTHENTICATION OF A USER

#### 4.7.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.7.

#### 4.7.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface should make use of a mix of dedicated network and public network services, including public or private Internet with TCP/IP, which may include encryption and other privacy protection for identified individuals, as required by national legislation.

#### 4.7.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A2 – Assign user role.

#### 4.7.4 Additional notes

In a typical design for this interface, the client sends to the authentication server a request for a particular user whose identification and credentials are included in the request. The

authentication server checks the consolidated identification and role information resource for WIS and responds. That response either confirms or denies that the identified user has provided sufficient credentials.

## 4.8 WIS-TECHSPEC-7: AUTHORIZATION OF A USER ROLE

### 4.8.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.8.

### 4.8.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, within the constraints of dedicated bandwidth and service reliability levels, this interface should make use of public network services, including Internet with TCP/IP, which may include encryption.

### 4.8.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A4 – Authorize access to information for users.

### 4.8.4 Additional notes

In a typical design for this interface, the client sends to the authorization server a request for a particular user whose identification is included in the request. The authorization server checks the consolidated identification and role information resource for WIS and responds. That response either contains a list of the authorized roles for the user or denies that the identified user has any authorized role.

## 4.9 WIS-TECHSPEC-8: DAR METADATA (WIS DISCOVERY METADATA) CATALOGUE SEARCH AND RETRIEVAL

### 4.9.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.9.

### 4.9.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, within the constraints of bandwidth and service reliability levels, this interface should make use of public network services, including Internet with TCP/IP, which may include encryption.

### 4.9.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A3 – Maintain and expose catalogue of services and information.

#### 4.9.4 Additional notes

The procedures for designation of a GISC or DCPC require that both types of WIS centre maintain data, product and service catalogues in the WMO-agreed standard format and facilitate access to them. Network services should therefore be treated as a type of WIS product that can be discovered through the DAR Metadata Catalogue.

Note: The WIS SRU Implementers Note is available at http://wis.wmo.int/WISSRU.

## 4.10 WIS-TECHSPEC-9: CONSOLIDATED VIEW OF DISTRIBUTED DAR METADATA (WIS DISCOVERY METADATA) CATALOGUES

#### 4.10.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.10.

#### 4.10.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface should make use of a mix of dedicated and public network services, including public or private Internet with TCP/IP, which may include encryption.

#### 4.10.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A3 – Maintain and expose catalogue of services and information.

## 4.11 WIS-TECHSPEC-10: DOWNLOADING FILES VIA DEDICATED NETWORKS

#### 4.11.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.11.

#### 4.11.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface is associated with dedicated bandwidth and high reliability and should make use of GTS and IGDDS satellite broadcast. This can incorporate private Internet with TCP/IP and may include encryption.

#### 4.11.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A5 – Deliver information to users.

## 4.12 WIS-TECHSPEC-11: DOWNLOADING FILES VIA NON-DEDICATED NETWORKS

### 4.12.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.12.

### 4.12.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface should not use a non-dedicated network for operation-critical data. Otherwise, within the constraints of bandwidth and service reliability levels, this interface should make use of public network services, including Internet with TCP/IP, which may include encryption. This interface should also make use of IGDDS satellite broadcast (at radio or television frequencies).

### 4.12.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A5 – Deliver information to users.

## 4.13 WIS-TECHSPEC-12: DOWNLOADING FILES VIA OTHER METHODS

### 4.13.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.13.

### 4.13.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface should not use a non-dedicated method for operation-critical data. Otherwise, this interface is associated with requirements for delivery using methods other than data-telecommunication networks. Delivery via voice lines and postal services in paper or digital media are also included.

### 4.13.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A5 – Deliver information to users.

## 4.14 WIS-TECHSPEC-13: MAINTENANCE OF DISSEMINATION METADATA

### 4.14.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.14.

### 4.14.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface should make use of a mix of dedicated and public network services, including public or private Internet with TCP/IP, which may include encryption.

### 4.14.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A3 – Maintain and expose catalogue of services and information.

### 4.14.4 Additional notes

4.14.4.1 For updating the dissemination metadata, WIS centres should support two kinds of maintenance facility: a file-upload facility for batch updating (adding, replacing or deleting metadata records treated as separate files), and an online form for changing individual entries (adding, changing or deleting elements in a record, as well as whole records).

4.14.4.2 Initially, the first version of DAR metadata was created from *Weather Reporting* (WMO-No. 9), Volume C1, which is a form of dissemination metadata, and other sources. Because full transition of WMO centres to the discovery and dissemination metadata will occur over some time, it must be ensured that changes are recorded in both the DAR metadata and in Volume C1.

## 4.15 WIS-TECHSPEC-14: CONSOLIDATED VIEW OF DISTRIBUTED DISSEMINATION METADATA CATALOGUES

### 4.15.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.15.

### 4.15.2 Types of collection and dissemination service

To provide a quality of service that meets user requirements, this interface should make use of a mix of dedicated and public network services, including public or private Internet with TCP/IP, which may include encryption.

### 4.15.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A3 – Maintain and expose catalogue of services and information.

## 4.16 WIS-TECHSPEC-15: REPORTING ON QUALITY OF SERVICE

### 4.16.1 Applicable standards

The following information is in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part IV, 4.16.

### 4.16.2 Types of collection and dissemination service

This interface should make use of public network services, including Internet with TCP/IP, which may include encryption.

### 4.16.3 Function interfaces

In the WIS functional architecture, this WIS technical specification acts as an interface for function A6 – Manage system performance.

### 4.16.4 Additional notes

4.16.4.1 Agreements on service levels can be anticipated eventually for WIS operations. These should include data and network security, as well as performance and reliability.

4.16.4.2 Performance reports could be generated efficiently by having each WIS centre upload its reports to a single analysis site within a fixed-time window.

# PART V. METADATA GUIDANCE

Note: This part of the Guide is being developed and will contain information on the creation and management of discovery metadata in relation to WIS, in addition to the standard and recommended practices, procedures and specifications laid out in the *Manual on WIS*, Part V. The latest guidance is available at http://wis.wmo.int/md_index.

For more details on the WMO metadata profile, visit http://wis.wmo.int/WCMPpart1/WCMPpart1 and http://wis.wmo.int/WCMPpart1/WCMPpart2.

# PART VI. OPERATIONAL GUIDANCE

## 6.1 GENERAL

The *Manual on WIS* defines practices and procedures based on specific standards, defined in Part IV of the Manual, which are to be used by centres contributing to WIS. This part of the Guide contains information on the agreed operational practices that are considered to be stable and slow to change. Other guidance on agreed or recommended practices for WIS centres may be found at http://wis.wmo.int/WIS_Operations.

## 6.2 GISC SUPPORT TO NCS AND DCPCS

A GISC is expected to provide the following support to the centres (NCs and DCPCs) in its area of responsibility.

### 6.2.1 Operation coordination

6.2.1.1 Each GISC should organize regular meetings with the WIS National and WIS Centre Focal Points for those centres belonging to its Area Meteorological Data Communication Network (AMDCN), in order to coordinate the implementation, operation and improvement of the AMDCN and to ensure it meets WIS requirements.

6.2.1.2 Each GISC should maintain business continuity plans and handover arrangements to ensure continued service to the NCs and DCPCs in its area of responsibility, especially for the collection and distribution of data and products.

### 6.2.2 Technical support

6.2.2.1 Each GISC should provide technical consultation on implementing and improving WIS functionality, such as search and management of metadata, to the centres in its area of responsibility.

6.2.2.2 Each GISC should support the centres in its area of responsibility in creating and maintaining WIS discovery metadata, in adopting recommended data formats as well as in monitoring activities.

### 6.2.3 Capacity-building support

Each GISC should develop and provide training courses with reference to the WIS competencies and the WMO Information System Training and Learning Guide (Appendix A) to meet the capacity-development requirements of the centres in its area of responsibility.

## 6.3 GISC BACKUP PROCEDURES

The *Manual on WIS*, Part III, 3.5.9.2, requires GISCs to maintain arrangements with one or more backup GISCs that include, as a minimum, the collection and dissemination of information for its AMDCN to be taken up by another GISC in case of an incapacitating system failure.

Note: Responsibilities of the backup GISC are limited to the centres designated in the backup agreement with the GISC.

### 6.3.1 Backup services

6.3.1.1 Data collection and distribution must continue without interruption to and from centres in the area of the GISC being backed up. Where a centre's routine receipt of data is through subscription (e.g. GTS push), the backup GISC must have a current list of data to be sent to each centre or provide a place for the centres to come and get the data (e.g. GISC Cache).

6.3.1.2 Centres may be unable to change their GTS subscriptions during a period of back up operation, and any changes to subscriptions might not be maintained when normal operations resume.

6.3.1.3 Changes to metadata will not be possible during a backup period.

6.3.1.4 Any ad hoc changes made during a backup period may need to be redone after return to normal operations.

### 6.3.2 User information

6.3.2.1 If there is a need to exchange user information between GISCs in support of backup, proper security measures should be taken based on the agreement between the two GISCs. However, the centres concerned should ensure that the backup GISC has sufficient information for sending and collecting data from the centres being supported during a backup period.

6.3.2.2 Ad hoc changes to subscriptions, including additions or deletions of subscribers, should be avoided while in backup mode. Any ad hoc changes made during a backup period may need to be redone after return to normal operations.

### 6.3.3 Networks

Global Information System Centres need to ensure network connectivity to centres in the AMDCN of the GISC they are backing up. This may be through dedicated links, such as GTS, or over the Internet. Such connectivity should be in line with the *Guide to Information Technology Security* (WMO-No 1115) and the *Guide to Virtual Private Networks (VPN) via the Internet between GTS centres* (WMO-No 1116), as applicable.

## 6.4 PROCEDURES FOR CHANGING THE PRINCIPAL GISC

6.4.1 The principal GISC for each centre is listed in the *Manual on WIS*, Appendix B. The recommended procedure for NCs and DCPCs changing their principal GISC is provided in the annex to this paragraph (Appendix D).

6.4.2 Once notified that the new principal GISC is ready, the centre shall start using the WIS services of the new principal GISC, in particular the service of uploading and managing the WIS discovery metadata for its data and products.

## 6.5 GUIDELINES FOR MIGRATING WIS DISCOVERY METADATA RECORDS FROM ONE GISC TO ANOTHER

6.5.1 A corollary of the recommendations for the exchange of metadata, contained in the *Manual on WIS*, Part IV, 4.10, is that any NC or DCPC can upload its metadata records only to its principal GISC. Not applying this rule will lead to unnecessary duplication of WIS discovery metadata. The annex to this paragraph (Appendix D) describes the procedures that should be followed in the event of a centre changing its principal GISC.

6.5.2 The principles defined in the annex to paragraph 6.5.1 can also apply to a GISC providing temporary backup metadata management services to a centre's principal GISC.

## 6.6 PROCEDURE FOR ROLLING REVIEW OF WIS CENTRES

6.6.1 The *Manual on WIS*, Part II, 2.2.4 and 2.3.4, define how Members hosting GISCs and DCPCs are required to demonstrate to CBS their ability to provide WIS services in compliance with GISC or DCPC functions and responsibilities.

6.6.2 The Commission for Basic Systems recognizes that for WIS to remain fully functional regular reviews of each NC, DCPC and GISC are required, ensuring their ongoing compliance with the *Manual on WIS*. Recommended practices for this rolling review are provided in the annex to this paragraph (Appendix D).

# APPENDIX A. WMO INFORMATION SYSTEM TRAINING AND LEARNING GUIDE

## 1. INTRODUCTION

1.1 This guide is designed to assist trainers in the development and running of training courses for WIS personnel and to show learners what is expected of them. As this is a guide, it is not mandatory to follow its directions precisely. There may be more appropriate ways to teach or learn something. However, it is essential that the learning outcomes are met.

1.2 This guide is not a syllabus. A syllabus is essentially a list of topics without indications of learning outcomes or how the learning is to be demonstrated. With a competency-based approach, the focus is on learners acquiring and demonstrating the required competencies.

1.3 This guide covers the whole gamut of competencies required of people working with WIS. It is important to note that these are the competencies required in a large WIS centre where they would normally be shared across a number of staff. Although different WIS centres may require the same competencies, the components, complexity and depth of each may vary. Furthermore, an individual competency or component may not be required at a particular centre (if the corresponding task is not performed there) or by all individuals within the centre.

1.4 Thus, the training should be tailored to each individual's needs. These learning needs will depend on what is required of staff to perform their work and what competencies and skills they already possess (recognition of prior competence). Training should fill these gaps, not cover all of the possible content.

1.5 It is possible that not all of the competencies are required in a small centre. In any case, each individual working with WIS has to show competence in performing the tasks required of them. Where staff already possess the necessary skills and are able to demonstrate competence against the assessment criteria they will be exempt from the corresponding sections of the training course.

## 2. IN AND OUT OF SCOPE

Staff are expected to have standard professional skills and capabilities. The emphasis here is on WIS specific skills. Training in generic skills such as using information and communication technology (ICT) systems and standard applications, networking, carrying out maintenance, using databases and managing projects would normally be outsourced or be part of a person's training prior to working in the centre. The same applies to team work and generic management skills.

## 3. ASSESSMENT

3.1 It is essential to ensure that learning is transferred from the learning environment to operations. Assessment should thus simulate the operational conditions as closely as practicable. The emphasis is on what people are able to do, under the conditions in which they are required to do it, and with the tools they would normally use, rather than on what they know.

3.2 Examples of suitable assessment types include:

(a) Demonstrated performance;

(b) Portfolio of examples of work they have done;

(c) Recognition of prior competence;

(d) Evaluation of supervisor certifying their competencies, based on evidence of prior performance or work under supervision.

3.3 As competencies need to be maintained on an ongoing basis, continuing assessment may be required. This would normally be on a periodic basis at a frequency appropriate for the particular competency.

3.4 Competency-based assessment means that staff are deemed capable of performing the job, not that they receive a pass mark of say 60%.

## 4. TYPES OF TRAINING

4.1 This document is not meant to prescribe how training should be performed but to offer some suggestions. Any mode of training is acceptable, as long as it is effective and the outcomes can be assessed against the required competencies; hence it will depend on the competency to be assessed, the size of the WIS centre, available resources and other factors.

4.2 Forms of training include:

(a) Working under supervision (on the job);

(b) Mentoring;

(c) Self-directed study;

(d) Internal or external courses (online or classroom), especially for generic skills;

(e) Scenario-based activities, including use cases;

(f) Role plays, especially for external interactions.

## 5. KEY LEARNING RESOURCES

The key publications, along with their references, explaining the operation of WIS are:

(a) *Manual on the WMO Information System* (WMO-No. 1060);

(b) *Guide to the WMO Information System* (WMO-No. 1061).

## 6. UPDATING OF THE GUIDE

As the training for WIS evolves it is expected that this guide will evolve with it. Suggestions about ways to improve this document and ideas about how the training can be conducted are always welcome and should be sent to: wis-help@wmo.int.

## 7. COMPETENCIES

Seven competencies across four basic functional areas have been identified as follows:

**Infrastructure**

1. Manage the physical infrastructure
2. Manage the operational applications

**Data**

3. Manage the data flow
4. Manage data discovery

**External interactions**

5. Manage interaction among WIS centres
6. Manage external user interactions

**Overall service**

7. Manage the operational service

## COMPETENCY 1: MANAGE THE PHYSICAL INFRASTRUCTURE

### Competency description

Prepare, plan, design, procure, implement and operate the physical infrastructure, networks and applications required to support the WIS centre.

Many of the skills required here are generic ICT skills and will have already been acquired as part of prior education and training or will be provided by hardware and system suppliers.

### Performance components

***Management of information technology operations***

1a. Maintain the system in optimal operational condition by setting and meeting service levels, including:

- Configuration;
- Preventative and corrective maintenance and servicing;
- Equipment replacement or upgrade;
- Networking and processing capacity;
- System monitoring and reporting procedures, and corrective actions;

1b. Provide contingency planning and operation backup and restoration;

*Management of facilities*

1c. Manage physical site security;

1d. Manage physical site environmental control.

**Knowledge and skill requirements**

- General ICT skills;
- Operation, configuration and maintenance of equipment and applications;
- Recognized information technology service management frameworks;
- Current technologies and emerging trends;
- Service level agreements.

**Learning outcomes**

Staff will be able to:

- Maintain the system in optimal operational condition;
- Plan for upgrades and operation backup and restoration;
- Maintain site security and environmental control.

Staff will learn:

- WIS specific systems;
- WIS site security policies;
- Service level agreements for the centre.

**Learning activities**

To learn how to perform the required tasks staff may:

- Attend training sessions run by providers of systems and other tools or by other training providers;
- Respond to typical monitoring reports;
- Apply WIS site security measures and respond to typical incidents;
- Apply WIS site environmental control measures and respond to typical incidents.

**Assessment**

Staff must be able to:

- Configure and maintain system components;
- Respond to monitoring reports;

- Apply WIS site security measures and respond to typical incidents;
- Apply WIS site environmental control measures and respond to typical incidents.

**Key learning resources**

- Manufacturers' handbooks and guides;
- Documentation of centre's facilities;
- WIS/GTS manuals and guides;
- Tools to monitor system security;
- WIS security policies;
- WIS environmental control policies.

## COMPETENCY 2: MANAGE THE OPERATIONAL APPLICATIONS

**Competency description**

Prepare, plan, design, procure, implement and operate the applications required to support the WIS functions.

Many of the skills required here are generic ICT skills and will have already been acquired as part of prior education and training or will be provided by suppliers of applications.

**Performance components**

2a. Meet service levels by maintaining applications in optimal operational condition through:

- Configuration of applications;
- Monitoring and responding to applications' behaviour;
- Preventative and corrective maintenance;
- Replacement or upgrade of applications;

2b. Provide contingency planning and application backup and restoration;

2c. Ensure data integrity and completeness in the event of system failure;

2d. Ensure system security.

**Knowledge and skill requirements**

- General ICT skills;
- Operation, configuration and maintenance of applications;
- Recognized information technology service management frameworks;

- Current technologies and emerging trends;
- WIS functions and requirements;
- WIS security policies.

**Learning outcomes**

Staff will be able to:

- Operate, configure and maintain applications;
- Monitor applications and take corrective action;
- Apply and test WIS security protocols.

Staff will learn:

- WIS applications specific to the centre;
- WIS system security policies and procedures.

**Learning activities**

To learn how to perform the required tasks staff may:

- Attend training sessions run by providers of systems and other tools or by other training providers;
- Initiate monitoring and reporting procedures and respond to typical monitoring reports;
- Apply WIS site security measures and respond to typical incidents.

**Assessment**

Staff must be able to:

- Configure and maintain system components;
- Respond to monitoring reports;
- Apply site security measures and respond to typical incidents.

**Key learning resources**

- Documentation of centre's applications;
- WIS/GTS manuals and guides;
- Tools to monitor system security;
- WIS security policies.

## COMPETENCY 3: MANAGE THE DATA FLOW

### Competency description

Manage the collection, processing and distribution of data and products through scheduled and on-demand services.

### Performance components

3a. Ensure collection and distribution of data and products as per data policy;

3b. Publish data and products;

3c. Subscribe to data and products;

3d. Encode, decode, validate and package data and products;

3e. Create, update and maintain data flow catalogues;

3f. Manage connectivity between centres;

3g. Control the data flow to meet service levels.

### Knowledge and skill requirements

- System and network monitoring and viewing tools;
- Data formats and protocols;
- Licensing and data policies;
- Message and file switching systems.

### Learning outcomes

Staff will be able to:

- Transfer data and products between their centre, other WIS centres and external users;
- Request data and respond to data requests using ad hoc and routine delivery mechanisms;
- Maintain quality standards (service levels) by monitoring, and responding to, traffic flow, missing data and products, errors and service messages;
- Apply relevant data policies to data and products;
- Identify appropriate formats for data and product exchange;
- Write and read data in WIS formats using their centre's tools.

Staff will learn:

- Data representations used in WIS and when to apply them;
- WMO data policies and how they apply to data in WIS;

- The structure of the WIS and GTS and how to use reference documents to identify and interpret the routing plans and protocols they will need to use;
- The interfaces of their centre's WIS applications, the information they use to modify their behaviour, and the tools available to control the operation of the applications to achieve service levels;
- How to use a WIS centre interface to find and request data for delivery by ad hoc request and by subscription;
- How WIS handles backup and how GTS handles alternative routings to maintain continuity of data flows.

**Learning activities**

To learn how to perform the required tasks staff may:

- Connect to a WIS centre to search for information, select a dataset and download a copy from the cache;
- Using a WIS centre interface, create, modify and delete a subscription for routine delivery of a dataset;
- Use the software tools of their centre's WIS application to exchange information between computers;
- Assess data flows by analysing monitoring reports from their applications;
- Investigate how data policy (including WMO Resolutions 40 (Cg-XII) and 25 (Cg-XIII)) is applied to data published by their centre;
- Use tools provided at their centre to view information in different formats and convert data between these formats.

**Assessment**

Staff must be able to:

- Go to a WIS centre, find data, download them immediately, subscribe for regular delivery and cancel the subscription;
- Use a GTS switch to move data between training computers and control the flow.

**Key learning resources**

***Data policies***

- Resolution 40 (Cg-XII) – WMO policy and practice for the exchange of meteorological and related data and products including guidelines on the relationships in commercial meteorological activities;
- Resolution 25 (Cg-XIII) – Exchange of hydrological data and products;
- Resolution 60 (Cg-17) – WMO policy for the international exchange of climate data and products to support the implementation of the Global Framework for Climate Services;
- The centre's data policies.

***GTS data exchange***

*Manual on the Global Telecommunication System* (WMO-No. 386), Attachments II-5, II-6, II-7, II-15 and II-16.

***Data representations***

- *Manual on Codes* (WMO-No. 306), Volume I.1; Volume I.2 and Volume I.3;
- Guidance on migration to table driven code forms available at http://www.wmo.int/pages/prog/www/WMOCodes.html;
- Tools used at the centre to read, write, convert, validate and display information in Table Driven Code Forms;
- Sample data for reading and writing in Table Driven Code Forms.

***WIS discovery, access and retrieval***

- *Manual on the WMO Information System* (WMO-No. 1060), Part I, 1.7 and Appendix D (WIS-TechSpec-2, -10, -11 and -12);
- *Guide to the WMO Information System* (WMO-No. 1061);
- User account at a GISC and PC with Internet connection.

***Managing GTS data exchange***

- *Manual on the Global Telecommunication System* (WMO-No. 386);
- *Weather Reporting* (WMO-No. 9), Volume C1;
- Global Telecommunication System routing tables;
- Training environment on message and file switch;
- World Weather Watch quantity monitoring statistics.

***Security of data exchange***

- *Guide to Virtual Private Networks (VPN) via the Internet between GTS centres* (WMO-No. 1116);
- *Guide to Information Technology Security* (WMO-No. 1115).

***Network management***

- Network management tool and associated documentation;
- System error reports and event viewing tools.

## COMPETENCY 4: MANAGE DATA DISCOVERY

### Competency description

Create and maintain discovery metadata records describing services and information, and upload them to the WIS Discovery Metadata Catalogue.

Each datum and product record held within WIS must have metadata associated with it so that it can be found and understood. These metadata records are held in a catalogue for discovery, access and retrieval (DAR).

### Performance components

4a. Create and maintain discovery metadata records describing products and services;

4b. Add, replace or delete metadata records within the catalogue;

4c. Ensure that all information and service offerings from a WIS centre have complete, valid and meaningful discovery metadata records uploaded to the catalogue.

### Knowledge and skill requirements

- Knowledge of WMO and ISO documentation sufficient to create complete and valid metadata;
- Metadata entry and management tools;
- Policies;
- Discovery metadata concepts and formats;
- Written English.

### Learning outcomes

Staff will be able to:

- Use standard WIS tools to create discovery metadata from descriptions supplied by users;
- Add, replace or delete metadata records within the catalogue.

Staff will learn:

- The role of metadata in discovery, access and retrieval of data and products;
- Approved metadata formats;
- How to identify content that is mandatory, acceptable or inapplicable;
- Use of metadata creation tools;
- How to access and modify a catalogue;
- How data flow within, to and from their centre;
- About the tools that allow users to input descriptions.

### Learning activities

To learn how to perform the required tasks staff may:

- Create metadata records based on sample descriptions for a range of data and products typical of their WIS centre;
- Insert such records into a catalogue, replace them with records that have been changed and delete them.

### Assessment

Staff must be able to demonstrate:

- Successful creation of metadata records for typical products;
- Competence in publishing and deleting metadata catalogue records.

### Key learning resources

- *Manual on the WMO Information System* (WMO-No. 1060), Part IV, 4.10, and Appendix D (WIS-TechSpec-9), and Part V and Appendix C;
- WIS metadata guidance;
- Metadata entry and management tools;
- Samples of how to complete typical metadata records;
- Metadata policies and WIS metadata guidelines;
- ISO 19100 series: ISO standards on geographic information.

## COMPETENCY 5: MANAGE INTERACTION AMONG WIS CENTRES

### Competency description

Manage relationships and compliance between the participants' centre and other WIS centres.

### Performance components

5a. Exchange information with other centres on operational matters;

5b. Facilitate registration of new WIS centres;

5c. Facilitate registration of new data and products by other WIS centres;

5d. Create and respond to WIS service messages, including GTS.

### Knowledge and skill requirements

- Knowledge of current exchanges and requirements for notification of operational changes;

- Procedures and practices for registration of other centres and their data and products;
- Service level agreements;
- Written English.

**Learning outcomes**

Staff will be able to:

- Facilitate registration of new WIS centres and their data and products;
- Keep other WIS centres informed of the status of services, incidents and requests;
- Monitor and respond to service level reports;
- Manage subscriptions.

Staff will learn:

- About current exchanges and requirements for notification of operational changes;
- What type of data, products and services are available at their centre;
- Procedures and practices for registration of other centres and their data and products;
- Procedures and practices for notifying other centres about operational changes and service availability.

**Learning activities**

To learn how to perform the required tasks staff may carry out the above activities with the help of software, tools and guidance as used in their operational environment, either in a classroom or under supervision on the job.

**Assessment**

Staff must be able to:

- Respond to a request for registration of a new centre and its data and products;
- Prepare notifications of typical operational scenarios;
- Respond to typical notifications from other WIS centres.

**Key learning resources**

- *Manual on the Global Telecommunication System* (WMO-No. 386);
- *Manual on the WMO Information System* (WMO-No. 1060), Part II; Part IV, 4.5, 4.7, 4.8, 4.9 and 4.14, and Appendix D (WIS-TechSpec- 4, - 6, - 7, - 8 and - 13);
- *Guide to the WMO Information System* (WMO-No. 1061);
- *Weather Reporting* (WMO-No.9), Volume C1;

- *Exchanging Meteorological Data* (WMO No. 837).

**Local resources**

- Service level agreements (as used by the participants' centre);
- Frequently Asked Questions (FAQ) documents (for the user);
- WIS software user guides;
- Guidelines for services available at WIS centre;
- Data policy and associated guidance material;
- First-line support procedures and guides;
- User database (for contact information);
- Case tracking and customer management;
- WIS user management;
- WIS subscription management;
- Monitoring dashboard for WIS components.

## COMPETENCY 6: MANAGE EXTERNAL USER INTERACTIONS

**Competency description**

Ensure that users, including other centres, data providers and subscribers, can publish and access data and products through WIS.

**Performance components**

6a. Register data providers and subscribers and maintain a service agreement;

6b. Set and register access criteria;

6c. Provide systems and support for users to publish and access data and products;

6d. Manage user relations to ensure a high satisfaction level.

**Knowledge and skill requirements**

- Data policies;
- External WIS interface;
- WIS registration and monitoring tools and policies;
- User support documentation and help files;
- Written English.

**Learning outcomes**

Staff will be able to:

- Register new WIS users and providers, setting roles, access authorizations and levels;
- Create and amend WIS user subscriptions;
- Use WIS tools to assist users and providers in resolving problems;
- Create and respond to WIS service messages, including GTS;
- Undertake first-line investigation and diagnosis;
- Manage incidents and requests: log them, categorize and prioritize them, escalate as appropriate and close them when the user is satisfied;
- Keep users informed of the status of services, incidents and requests;
- Gather information and report on user and provider satisfaction;
- Assist users in uploading and accessing data;
- Identify potential problems in services and implement improvements.

Staff will learn:

- What type of data, products and services are available at their centre;
- How WIS applications, including discovery, access and retrieval (DAR) should be used;
- How to apply data policies;
- How to interact effectively with users and providers.

**Learning activities**

To learn how to perform the required tasks staff may:

- Register users (data providers and subscribers) and set access authorizations and levels using the same software, tools and guidance as in their operational environment;
- Role play user interactions.

**Assessment**

Staff must be able to:

- Register typical data providers and users;
- Ensure that users are able to upload and access data;
- Respond to typical incidents.

**Key learning resources**

- *Manual on the Global Telecommunication System* (WMO-No. 386);

- *Manual on the WMO Information System* (WMO-No. 1060), Part II; Part IV, 4.5, 4.7, 4.8, 4.9 and 4.14, and Appendix D (WIS-TechSpec-4, -6, -7, -8 and -13);
- *Guide to the WMO Information System* (WMO-No. 1061);
- *Weather Reporting* (WMO-No. 9), Volume C1;
- *Exchanging Meteorological Data* (WMO-No. 837).

**Local resources**

- Service level agreements (as used by their centre);
- FAQ documents (for the user);
- WIS software user guides;
- Guidelines for services available at WIS centre;
- Data policy and associated guidance material;
- First-line support procedures and guides;
- User database (for contact information);
- Case tracking and customer management;
- WIS user management;
- WIS subscription management;
- Monitoring dashboard for WIS components.

## COMPETENCY 7: MANAGE THE OPERATIONAL SERVICE

### Competency description

Ensure the quality and continuity of the service.

This is essentially a management role ensuring that the WIS system operates as required, now and in the future. Some of the skills required are generic management skills, rather than WIS specific, and would be taught or learnt elsewhere.

### Performance components

7a. Coordinate all WIS functions and activities of the centre;

7b. Ensure and demonstrate compliance with regulations and policies;

7c. Monitor and meet quality and service performance standards;

7d. Ensure service continuity through risk management and planning and implementation of service contingency, backup and restoration. Ensure data continuity in the event of system failure;

7e. Plan and coordinate the delivery of new functionalities.

**Knowledge and skill requirements**

- General management skills;
- Overview of local and external WIS operations and associated service agreements;
- WIS regulations and policies;
- Functional specifications;
- Written English.

**Learning outcomes**

Staff will be able to:

- Ensure that the WIS centre meets quality and service performance standards;
- Identify the challenges and issues to be addressed;
- Foster compliance with WIS framework.

Staff will learn:

- Functions and responsibilities of the WIS centre;
- WIS quality and service performance standards;
- Methods to manage quality, risk and operational service;
- How to monitor quality and service performance standards;
- How to analyse, demonstrate and report quality and service performance at the WIS centre;
- How to maintain troubleshooting, backup and restoration procedures;
- How to plan and coordinate the delivery of new functionalities and improvements;
- How to integrate new technologies and developments;
- How to update the regulatory documents;
- How to maintain service agreements;
- How to plan monitoring resources;
- How to align budget restrictions with human resources demands.

**Learning activities**

To learn how to perform the required tasks staff may:

- Monitor quality and service performance standards;
- Analyse quality and service performance in the WIS centre;

- Demonstrate and report quality and service performance;
- Maintain troubleshooting, backup and restoration procedures;
- Plan and coordinate the delivery of new functionalities;
- Keep timely records, as required.

**Assessment**

Staff must be able to:

- Demonstrate successful WIS service;
- Plan replacement and upgrade of equipment and applications to meet new functionalities and requirements.

**Key learning resources**

- *Technical Regulations* (WMO-No. 49), Volume I;
- Resolution 40 (Cg-XII) – WMO policy and practice for the exchange of meteorological and related data and products including guidelines on the relationships in commercial meteorological activities;
- Resolution 25 (Cg-XIII) – Exchange of hydrological data and products;
- Resolution 60 (Cg-17) – WMO policy for the international exchange of climate data and products to support the implementation of the Global Framework for Climate Services;
- *Manual on the Global Telecommunication System* (WMO-No. 386);
- *Manual on the WMO Information System* (WMO-No. 1060), Part IV, 4.16, WIS-TechSpec-15;
- *Guide to the WMO Information System* (WMO-No. 1061);
- WIS demonstration procedures and guidelines;
- Monitoring reports;
- Audit reports.

# APPENDIX B. WIS TECHNICAL SPECIFICATIONS – USE CASES

## General

1. This appendix provides the use cases for major WIS functions relating to the WIS Technical Specifications as described in the *Manual on the WMO Information System* (WMO-No. 1060), Part IV. Use cases are designed to help system developers understand how the system is supposed to operate, given certain preconditions and reactions to decisions during processing.

2. The content of most of the use cases given in this appendix follows closely the work of the SIMDAT project led by the European Centre for Medium-Range Weather Forecasting. The form of the use cases follows the general guidance of the Unified Modelling Language (UML). It also uses a specific template derived from an example published by Karl E. Wiegers (with permission granted to use, modify and distribute the template).

3. Table 2 provides a key to the elements of the Use Case template as used herein.

**Table 2. Key to elements in the Use Case template**

| | |
|---|---|
| Use Case goal | A brief description of the reason for and outcome of the Use Case, or a high-level description of the sequence of actions and the outcome of executing the Use Case. |
| Actors | An actor is a person or other entity, external to the system under consideration, that interacts with the system: the person or entity that will be initiating the Use Case or will participate in completing it. Different actors often correspond to different users or roles, selected from the customer community that will use the product. |
| Trigger | An event that initiates the Use Case such as an external business event, a system event or the first step in the normal flow. |
| Preconditions | Activities that must take place, or any conditions that must be true, before the Use Case can be started. |
| Post-conditions | The state of the system once the Use Case has been completed. |
| Normal flow | Detailed description of the user actions and system responses during execution of the Use Case under normal, expected conditions. This dialogue sequence will ultimately lead to the accomplishment of the goal stated in the Use Case name and description. |
| Alternative flows | Other, legitimate usage scenarios that can take place within the Use Case under consideration. |
| Exceptions | Anticipated error conditions that could occur during execution of the Use Case, and how the system is to respond to those conditions; the Use Case execution fails for some reason. |
| Includes | Other Use Cases that are included ("called") by the Use Case being described (this is to avoid repeating the text of those use cases that are subsets of several other use cases with common functionality). |
| Notes and issues | Additional comments about the Use Case and any remaining open issues that must be resolved. It is useful to identify who will resolve each such issue and by what date. |

Note: The DAR Metadata Catalogue holds WIS Discovery Metadata records.

### Use Case B.1 – Providing metadata for data or products

| | |
|---|---|
| Use Case goal | Metadata for any data or products provided by the DCPC or GISC are entered or updated in the DAR Metadata Catalogue of the DCPC or GISC. |
| Actors | Metadata originator (NC or DCPC) and metadata catalogue publisher (DCPC or GISC) |

| | |
|---|---|
| Preconditions | (1) The metadata originator is authorized to update the DAR Metadata Catalogue for the associated file(s);<br>(2) The metadata originator has the necessary information and the ability to update the DAR Metadata Catalogue for the associated file(s);<br>(3) The metadata catalogue publisher supports facilities for authorized metadata originators to update the metadata for the associated file(s). |
| | The DAR Metadata Catalogue has changes made by the metadata originator. |
| Normal flow | The authorized metadata originator uses a facility supported by the metadata catalogue publisher to update the DAR Metadata Catalogue for the associated file. Typically, two kinds of maintenance facilities are supported:(a) a file upload facility for "batch" updating (adding, replacing or deleting metadata records treated as separate files); and (b) an online form for changing metadata records treated as entries in the DAR Metadata Catalogue (adding, changing or deleting elements in a record as well as whole records). The metadata catalogue publisher maintains the updated DAR Metadata Catalogue as a searchable resource offered to all authorized searchers (see Use Case B.6). The metadata catalogue publisher also shares the metadata as part of the logically centralized but physically distributed catalogue across WIS centres. |
| Notes and issues | This set of actions is a simple extrapolation from existing GTS practice, adding the particular standard format for WIS metadata. |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

### Use Case B.2 – Uploading data or products to DCPC or GISC

| | |
|---|---|
| Use Case goal | Data or products are sent as files to a DCPC or GISC. |
| Actors | Data sender (NC or DCPC) and data receiver (DCPC or GISC) |
| Preconditions | (1) Appropriate metadata to be associated with the file is already available in the DAR Metadata Catalogue of the DCPC or GISC (if not, see Use Case B.3);<br>(2) The data sender is authorized to send the files to the data receiver;<br>(3) The data receiver supports a method for uploading the files, which the data sender is able to use. |
| Post-conditions | The data or products uploaded by the data sender are received and stored by the data receiver. |
| Normal flow | The data sender uses his authorized access to send the files using an appropriate transmission method supported by the data receiver. Typically, the transmission is accomplished using GTS or a file transfer method available over the Internet. A file naming convention or other agreed mechanism is used to make an association between the file and its metadata. |
| Notes and issues | This set of actions builds on existing GTS practice, supplemented with other file transfer mechanisms such as the Internet. |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

### Use Case B.3 – Controlling metadata association to data or products

| | |
|---|---|
| Use Case goal | To confirm that metadata for a datum or product file at the DCPC or GISC already exists in the DAR Metadata Catalogue before the data or products are available. |
| Actors | Data sender (NC or DCPC) and data receiver (DCPC or GISC) |
| Preconditions | (1) Datum or product has been sent as a file from a data sender (Use Case B.1);<br>(2) DAR Metadata Catalogue includes all updates (Use Case B.2). |
| Post-conditions | An error is reported when there is no confirmation that a given file is associated correctly with its metadata in the DAR Metadata Catalogue. |

| | |
|---|---|
| Normal flow | On receipt of a file containing a datum or product, the data receiver checks the current DAR Metadata Catalogue to confirm that the file has an associated metadata record. If such a record is not found within two minutes of receipt of the file, an error message is sent to the data sender. |
| Notes and issues | This control action addresses the situation wherein data arrives before its associated metadata. Rather than rejecting the file immediately, a grace period of two minutes is allowed before the data file is regarded as erroneous. |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

### Use Case B.4 – Managing cache of data across GISCs

| | |
|---|---|
| Use Case goal | GISCs manage a logically centralized collection containing at least a 24-hour cache of data and products agreed by WMO for routine global exchange. |
| Actors | Data administrators at each of the GISCs |
| Preconditions | (1) At each GISC, the cache of data and products received from NCs and DCPCs in its area of responsibility is up to date;<br>(2) Transmission and control mechanisms across GISCs are available;<br>(3) All data administrators are authenticated and authorized as needed. |
| Post-conditions | The cache of data and products is accessible as a logically centralized collection that includes current data and products at each GISC. |
| Normal flow | A data administrator monitors the transmission methods and control mechanisms that enable a logically centralized view of the physically distributed cache of data and products. Depending on the methods in place, a data administrator takes various corrective actions whenever the cache is not available as required. |
| Notes and issues | At this point in WIS system design, it has not been decided how the GISCs will accomplish centralization of the cache. |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

### Use Case B.5 – Maintaining identification and role information for WIS users

| | |
|---|---|
| Use Case goal | Internal and external users of WIS can be identified for their authentication, and their role information is maintained as needed so that they can be authorized to perform specific functions. |
| Actors | Internal and external users of WIS and people in charge of authentication and authorization at WIS centres. |
| Preconditions | (1) Administrators have agreed authentication policies delineating the credentials required to establish identity of a WIS user;<br>(2) Administrators have agreed authorization policies delineating which roles are authorized to perform each WIS action;<br>(3) Administrators have mechanisms to create and maintain the identification information needed for authentication of users of WIS;<br>(4) Administrators have mechanisms to create and maintain the role information needed for authorization of authenticated users of WIS. |
| Post-conditions | WIS centres collectively have the ability to authenticate each user of WIS and authorize them to perform all of the functions appropriate to their role, and only those functions. |
| Normal flow | Identification and role information about candidate or current users of WIS is to be recorded through facilities controlled by WIS centres. Typically, two kinds of facilities should be supported: (a) a file upload facility for "batch" updating (adding, replacing or deleting the identification and role records as separate files); and (b). an online form for changing identification and role records (adding, changing or deleting elements in a record as well as whole records). Administrators of authentication and authorization at WIS centres share the updated identification and role information as a resource available as needed across WIS centres. |

| | |
|---|---|
| Notes and issues | At this point in WIS system design, it has not yet been decided which mechanisms will be used for handling identification and role information as needed across WIS centres. |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

### Use Case B.6 – Discovering data or products

| | |
|---|---|
| Use Case goal | A user of WIS finds available WMO data or products that he wants to receive. |
| Actors | Data searcher |
| Preconditions | (1) The DAR Metadata Catalogue is accessible for browsing or searching;<br>(2) The GISC infrastructure provides a unified catalogue view to the user (i.e. the catalogue is logically centralized although physically distributed). |
| Post-conditions | The data searcher has the information needed to select relevant data or products. |
| Normal flow | The data searcher discovers available WMO data and products by browsing the DAR Metadata Catalogue or by searching it using discovery concepts such as subject keywords, geographic extent and temporal range. As a result of browsing or searching, the data searcher gets a relevance-ordered list of data and products including data or product metadata such as data origin, data type, generation date, availability and use constraints. |
| Notes and issues | At this point in WIS system design, multiple methods can be envisioned for logically centralizing the physically distributed DAR Metadata Catalogue. |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

### Use Case B.7 – Ad hoc request for data or products ("pull")

| | |
|---|---|
| Use Case goal | A user of WIS requests WMO data or products on an ad hoc basis. |
| Actors | User of WIS centres |
| Preconditions | (1) The desired data or products have been identified by the user of WIS;<br>(2) The user of WIS has been authenticated and authorized to retrieve the desired data or products from the WIS centre;<br>(3) Delivery uses one of the supported mechanisms for the transmission of the desired data or products, within the published service level commitment of the WIS centre. |
| Post-conditions | Data or products are readied for delivery to the user of WIS according to the service level commitment of the WIS centre. |
| Normal flow | Once the user has identified the desired data or products, he/she requests delivery on a one-time basis (Use Case B.8 covers the alternate choice, recurring delivery). The WIS centre authenticates the user and checks authorization for delivery of the products according to the user's role. The WIS centre then sets up delivery through any of a broad range of online and offline options (delivery options are described in Use Case B.9). |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

### Use Case B.8 – Subscribing to data or products ("push")

| | |
|---|---|
| Use Case goal | A user of WIS can subscribe to receive data or products on a recurring basis. |
| Actors | User of WIS centre |

| | |
|---|---|
| Preconditions | (1) The desired data or products have been identified by the user of WIS;<br>(2) The user of WIS has been authenticated and authorized to retrieve the desired data or products from the WIS centre;<br>(3) Delivery is achievable through one of the supported mechanisms for the transmission of the desired data or products, within the published service level commitment of the WIS centre. |
| Post-conditions | Data or products are readied for delivery to the user of WIS according to the service level commitment of the WIS centre. |
| Normal flow | Once the user has identified the desired data or products, he/she requests a subscription to receive the data or products on a recurring basis (Use Case B.7 covers the alternate choice, one-time delivery). The WIS centre authenticates the user and checks authorization for delivery of the product according to the user's role. The WIS centre then sets up delivery through any of a broad range of online and offline options (described in Use Case B.9). As necessary, the WIS centre updates the dissemination metadata associated with the subscription (Use Case B.10). |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

### Use Case B.9 – Downloading data or products from a WIS centre

| | |
|---|---|
| Use Case goal | A user of WIS receives from a WIS centre, on an ad hoc or subscription basis, data or products transmitted as files. |
| Actors | User of WIS and WIS centre |
| Preconditions | (1) Data or products are ready for delivery to the authenticated and authorized user, as requested through one of the supported transmission mechanisms, according to the service level commitment of the WIS centre;<br>(2) For subscription delivery, the WIS centre has access to subscription information in the Dissemination Metadata Catalogue (see Use Case B.10). |
| Post-conditions | Selected data or products are received by the user of WIS. |
| Normal flow | The WIS centre sends files containing the requested data or products, using an appropriate transmission method, as indicated in the associated subscription information accessible through the Dissemination Metadata Catalogue. Typically, the transmission is accomplished using GTS or a file transfer method available over the Internet, such as HTTP, OpenDap, FTP, SFTP, GFTP and e-mail). In any case, transmission must be efficient and reliable (checksum and error recovery mechanisms are required as a minimum). |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

### Use Case B.10 – Providing dissemination metadata

| | |
|---|---|
| Use Case goal | Metadata concerning delivery specifics of subscription(s) to data and products from a DCPC or GISC are created or updated in the Dissemination Metadata Catalogue. |
| Actors | The subscription registrar (NC or DCPC) and dissemination catalogue publisher (DCPC or GISC) |
| Preconditions | (1) The subscription registrar is authorized to update the Dissemination Metadata Catalogue for the given subscription(s);<br>(2) The subscription registrar has the necessary information and the ability to update the Dissemination Metadata Catalogue for the given subscription(s);<br>(3) The dissemination catalogue publisher supports facilities for authorized subscription registrars to update the metadata for the given subscription(s). |
| Post-conditions | The Dissemination Metadata Catalogue has changes made by the subscription registrar. |

| | |
|---|---|
| Normal flow | The authorized subscription registrar uses a facility supported by the Dissemination Metadata Catalogue publisher to update the Dissemination Metadata Catalogue for the given subscription(s). Typically, two kinds of maintenance facility are supported:(a) a file upload facility for "batch" updating (adding, replacing or deleting metadata records treated as separate files); and (b). an online form for changing metadata records treated as entries in the Dissemination Metadata Catalogue (adding, changing or deleting elements in a record as well as whole records). The Dissemination Metadata Catalogue publisher maintains the updated Dissemination Metadata Catalogue as a reference resource accessible as part of a logically centralized but physically distributed catalogue across WIS centres. |
| Notes and issues | At this point in WIS system design, it has yet to be decided how each Dissemination Metadata Catalogue publisher will communicate changes to each physically distributed part of the logically centralized Dissemination Metadata Catalogue. |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

### Use Case B.11 – Reporting quality of service across WIS centres

| | |
|---|---|
| Use Case goal | Managers of WIS centres receive performance reports of operations against agreed quality of service indicators. |
| Actors | WIS centre managers |
| Preconditions | (1) Measurable quality of service indicators are agreed;<br>(2) Schedule of reporting and specifics of reporting formats are agreed. |
| Post-conditions | WIS centre managers have the performance information needed to manage WIS operations across the range of GISC, DCPC and NC services. |
| Normal flow | Following a mutually agreed schedule, all WIS centre managers send performance reports of operations against agreed quality of service indicators. |
| Notes and issues | It can be anticipated that WIS will eventually have agreements that address quality of service requirements. These should include data and network security as well as performance and reliability. CBS is investigating monitoring processes and reviewing established procedures for the World Weather Watch. |
| Last updated | 30 June 2014 |
| Last updated by | WMO Secretariat |

# APPENDIX C. WIS DEMONSTRATION TEST CASES

## General

1. This appendix provides the test cases for major WIS functions relating to the WIS technical specifications (TechSpecs) as described in the *Manual on the WMO Information System* (WMO-No. 1060), Part IV. The WIS demonstration test cases differ from the Use Cases in that they are designed to check whether a process is correct, by looking at the particular input, and whether the result is as expected.

2. The guidelines for DCPCs and GISCs on how to demonstrate their compliance with the requirements established by CBS are available online at http://www-db.wmo.int/WIS/centres/guidance.doc.

3. Guidance for NCs on how to work with their principal GISC to demonstrate their compliance is included in regional WIS implementation plans available at http://wis.wmo.int/R-WISIP.

4. In order to be WIS compliant, all centres should be able to complete the demonstration test cases that are applicable to the services they provide. Demonstration test cases are based on the WIS Technical Specifications defined in the *Manual on the WMO Information System* (WMO-No. 1060), Part IV and Appendix D, and on the Use Cases detailed in this Guide, Appendix B.

5. There are six test cases for GISCs, labelled WIS-TC1 to WIS-TC6. All, except for WIS-TC4, are also relevant to DCPCs where they are applicable. The six test cases are described in Part 1 of this appendix.

6. There are three test cases for NCs, labelled NC-TC1 to NC-TC3, which are described in Part 2 of this appendix.

## Part 1 – WIS demonstration test cases for GISCs and DCPCs

| Test case name: WIS Demonstration Test Case 1 | |
|---|---|
| Uploading of metadata for data and products to DAR catalogue | |
| Test case ID | WIS-TC1 |
| Component | Metadata management |
| Purpose of test | |
| To validate the functions of adding, updating and deleting metadata records provided by other WIS centres<br><br>All metadata records must be checked against the relevant schemas (i.e. a record should be rejected if it does not fit the corresponding schema).<br><br>NOTE 1: The term "upload" refers to the movement of metadata records between the WIS centre that provides the metadata and the WIS centre that manages the DAR catalogue. Uploading can actually be implemented as a "pull" initiated from the DAR catalogue site or as a "push" initiated by the metadata provider.<br>NOTE 2: Those functionalities can be implemented through:<br>• A web interface allowing registered users to manage their metadata interactively;<br>• A machine-to-machine interface allowing automated batch processing of metadata.<br><br>It is necessary that GISCs implement both methods. | |
| Relevant technical specifications | |
| • WIS-TechSpec-1: Uploading of metadata for data and products<br>• WIS-TechSpec-8: DAR Metadata (WIS Discovery Metadata) Catalogue search and retrieval | |
| Preconditions | |
| 1. There is a network connection (dedicated and/or public) with other WIS centre(s);<br>2. A file upload facility for collecting metadata from other WIS centre(s) is available;<br>3. A fully functional DAR catalogue is available;<br>4. There is a registered user/process that is authorized to manage the metadata of a given WIS centre;<br>5. There is a web interface with the DAR catalogue that allows searches (see WIS-TC6). | |

Test steps

| | *Description* | *Expected results* | *Actual results* |
|---|---|---|---|
| 1 | An authorized user/process adds a valid metadata record to the DAR catalogue. | The metadata record is found when browsing/searching the DAR catalogue. | |
| 2 | An authorized user/process modifies a record in the DAR catalogue. | The modification is immediately visible when browsing/searching the DAR catalogue. | |
| 3 | An authorized user/process deletes a record from the DAR catalogue. | The deleted record is not found when browsing/searching the DAR catalogue. | |
| 4 | An authorized user/process attempts to upload an invalid metadata record. | The user/process is informed that the metadata record is invalid. The addition/update operation is aborted. The DAR catalogue is unchanged. | |

| | | | |
|---|---|---|---|
| 5 | An authorized user/process attempts to upload a record with a unique identifier which is already in the DAR catalogue.<br><br>NOTE: It is essential to ensure that an update is an edit, not an accidental duplication. | The DAR catalogue does not contain records with duplicate identifiers. Either:<br>1. The new metadata record replaces the old one, which disappears from the catalogue. The new metadata record is found when browsing/searching the catalogue;<br>or:<br>2. The user/process is notified of the fact that the record is a duplicate. The addition/update operation is aborted. The DAR catalogue is unchanged. | |
| 6 | Access control – No unauthorized addition (1): An unauthorized user/process tries to add a metadata record to the DAR catalogue. | A non-authorized user/process is not allowed to add a metadata record to the DAR catalogue. | |
| 7 | Access control – No unauthorized addition (2): A WIS centre user/process tries to add to the DAR catalogue a metadata record representing data from another WIS centre. | A user/process is not able to add a metadata record representing data from another WIS centre to the DAR catalogue. | |
| 8 | Access control – No unauthorized modification (1): An unauthorized user/process tries to modify a metadata record in the DAR catalogue. | A non-authorized user/process is not able to modify a metadata record in the DAR catalogue. | |
| 9 | Access control – No unauthorized modification (2): A WIS centre user/process tries to modify a metadata record belonging to another WIS centre, which is held in the DAR catalogue. | A user/process is not able to modify a metadata record belonging to another WIS centre, which is held in the DAR catalogue. | |
| 10 | Access control – No unauthorized deletion (1): An unauthorized user/process tries to delete a metadata record from the DAR catalogue. | A non-authorized user/process is not able to delete a metadata record from the DAR catalogue. | |
| 11 | Access control – No unauthorized deletion (2): A WIS centre user/process tries to delete from the DAR catalogue a metadata record belonging to another WIS centre, which the user/process is not authorized to edit. | A user/process is not able to delete from the DAR catalogue a metadata record that belongs to another WIS centre. | |

| | | | | | |
|---|---|---|---|---|---|
| Centre | | Organization | | Country | |
| Test Date | | | | | |

| Test case name: WIS Demonstration Test Case 2 | | | | | | |
|---|---|---|---|---|---|---|
| Synchronizing DAR catalogues among GISC nodes | | | | | | |
| Test case ID | WIS-TC2 | | | | | |
| Component | Metadata management | | | | | |
| Purpose of test | | | | | | |
| (a) To validate the synchronization of DAR Metadata Catalogues among GISC nodes via a synchronization protocol, so that GISCs will have a global view of metadata;<br>(b) To test GISC to GISC synchronization (between separate centres);<br>(c) To assess the timeliness (accuracy) of synchronization.<br>This test should complement the mechanism for adding, changing and deleting metadata tested in WIS-TC1. | | | | | | |
| Relevant technical specifications | | | | | | |
| • WIS-TechSpec-1: Uploading of metadata for data and products<br>• WIS-TechSpec-8: DAR Metadata (WIS Discovery Metadata) Catalogue search and retrieval<br>• WIS-TechSpec-9: Consolidated view of distributed DAR Metadata (WIS Discovery Metadata) Catalogues | | | | | | |
| Preconditions | | | | | | |
| 1. A network connection (dedicated and/or public) with the other GISC(s) exists;<br>2. A DAR catalogue already populated is available at each GISC participating in the test;<br>3. A facility for synchronizing metadata with the other GISC(s) is available. | | | | | | |
| Test steps | | | | | | |
| | *Description* | *Expected results* | *Actual results* | | | |
| 1 | Synchronize the DAR metadata catalogue. | Identical content of the DAR Metadata Catalogues of the GISCs participating in the test: identical number of records, list of unique identifier and a random selection of records. | | | | |
| 2 | Add new metadata record at GISC 1. | The uploaded metadata record is added to the DAR Metadata Catalogue of the other GISC(s) participating in the test. | | | | |
| 3 | Update metadata record at GISC 1. | The updated metadata record is added to the DAR Metadata Catalogue of the other GISC(s) participating in the test. | | | | |
| 4 | Delete from GISC 1 one of its metadata file records. | The concerned metadata record is deleted from the DAR Metadata Catalogue of the other GISC(s) participating in the test. | | | | |
| 5 | Delete from GISC 1 the metadata file record that doesn't belong to it. | The concerned metadata record is uploaded to the DAR Metadata Catalogue of GISC1 from the DAR Metadata Catalogue of the other GISC(s) participating in the test. | | | | |
| Repeat steps 2–5 making the changes specified at each GISC in turn and check that each change is propagated to the other GISCs. | | | | | | |
| Centre | | Organization | | Country | | |
| Test date | | | | | | |

| Test case name: WIS Demonstration Test Case 3 | | | | | |
|---|---|---|---|---|---|
| Uploading and downloading of data between WIS centres | | | | | |
| Test case ID | WIS-TC3 | | | | |
| Component | Data upload and download | | | | |
| Purpose of test | | | | | |
| To validate the upload and download of data and products and the metadata associated with them | | | | | |
| Relevant technical specifications | | | | | |
| • WIS-TechSpec-2: Uploading of data and products<br>• WIS-TechSpec-10: Downloading files via dedicated networks<br>• WIS-TechSpec-11: Downloading files via non-dedicated networks<br>• WIS-TechSpec-12: Downloading files via other methods | | | | | |
| Preconditions | | | | | |
| 1. A network connection (dedicated and/or public) with other WIS centres exists;<br>2. File upload and download facilities such as FTP, e-mail and HTTP are available;<br>3. Data for upload or download are available;<br>4. DAR facilities are available at GISCs. | | | | | |
| Test steps | | | | | |
| | *Description* | *Expected results* | *Actual results* | | |
| 1 | (a) Upload a file that is associated with a metadata record in the DAR catalogue of one GISC to another GISC;<br>(b) Use DAR facilities to search the metadata then retrieve the file. | (a) The uploaded file has been delivered to the GISC and matches the corresponding metadata;<br>(b) The file can be downloaded. | | | |
| 2 | For GISCs only:<br>(a) Upload a file which is not associated with a metadata record in the DAR catalogue of one GISC to another GISC;<br>(b) Later, upload the metadata record associated with the file to the other GISC;<br>(c) Use DAR facilities to search the metadata and retrieve the file. | (a) The uploaded file has been delivered to the GISC;<br>(b) The DAR catalogue is updated with the new record. The file received earlier is associated with the metadata;<br>(c) The file can be downloaded. | | | |
| Centre | | Organization | | Country | |
| Test date | | | | | |

| Test case name: WIS Demonstration Test Case 4 | | | | | |
|---|---|---|---|---|---|
| Centralization of globally distributed data (applies only to GISCs) | | | | | |
| Test case ID | WIS-TC4 | | | | |
| Component | 24-hour cache at GISC | | | | |
| Purpose of test | | | | | |
| To validate the completeness of the 24-hour cache:<br>• Finding a current datum or product originating from another centre via the GISC DAR search mechanism, and retrieving that item from the GISC cache;<br>• Providing a document describing how the GISC will ensure that it holds a complete cache for 24 hours, including performance metrics. | | | | | |
| Relevant technical specifications | | | | | |
| • WIS-TechSpecs-3: Centralization of globally distributed data<br>• WIS-TechSpecs-8: DAR Metadata (WIS Discovery Metadata) Catalogue search and retrieval | | | | | |
| Preconditions | | | | | |
| 1. A network connection (dedicated and/or public) exists;<br>2. A DAR catalogue already populated with metadata of the 24-hour data for global exchange is available;<br>3. DAR facilities are available through a portal;<br>4. A cache with at least the last 24 hours of data for global exchange is available. | | | | | |
| Test steps | | | | | |
| | *Description* | *Expected results* | *Actual results* | | |
| 1 | Search catalogue for data/products from other centres and programs in other areas, and retrieve selected data or products. | The selected data/products can be retrieved from the GISC. | | | |
| 2 | Search catalogue for data/products that are 6 hours old and retrieve selected data or products. | The selected data/products can be retrieved from the GISC. | | | |
| 3 | Search catalogue for data/products that are 12 hours old and retrieve selected data or products. | The selected data/products can be retrieved from the GISC. | | | |
| 4 | Search catalogue for data/products that are 18 hours old and retrieve selected data or products. | The selected data/products can be retrieved from the GISC. | | | |
| 5 | Search catalogue for data/products that are 24 hours old and retrieve selected data or products. | The selected data/products can be retrieved from the GISC. | | | |
| Centre | | Organization | | Country | |
| Test date | | | | | |

| Test case name: WIS Demonstration Test Case 5 | | | |
|---|---|---|---|
| Maintenance of user roles, authorization and authentication | | | |
| Test case ID | WIS-TC5 | | |
| Component | Management of users and access | | |
| Purpose of test | | | |
| To create and run a variety of user types | | | |
| Relevant technical specifications | | | |
| • WIS-TechSpec-4: Maintenance of user identification and role information<br>• WIS-TechSpec-6: Authentication of a user<br>• WIS-TechSpec-7: Authorization of a user role<br>• WIS-TechSpec-13: Maintenance of dissemination metadata | | | |
| Preconditions | | | |
| 1. A WIS centre is entitled to provide access to users (i.e. it has received the approval of the Permanent Representative of the user's country);<br>2. The user interface is via the Internet (i.e. web page). | | | |
| Test steps | | | |
| | *Description* | *Expected results* | *Actual results* |
| 1 | Provide access for an external user to search metadata. | Temporary users can search metadata, but can neither access data from the GISC or cache, nor subscribe to data. | |
| | The user:<br>(a) goes to search the web page;<br>(b) searches for metadata;<br>(c) tries to access data. | The user:<br>(a) has access to the search page;<br>(b) user finds metadata;<br>(c) is referred to the authorization page at data source and cannot access data without an authorized user role. | |
| 2 | Create accounts with access to WIS metadata and data for authorized users of a WMO centre. | Two accounts have been created: one with access to metadata only, the other with the ability to access the centre subscription service or ad hoc request from the cache. | |

| | | | |
|---|---|---|---|
| | The user:<br>(a) goes to the registered user web page;<br>(b) is required to login or create an account;<br>(c) registers the account and selects the role of valid "WMO member" with authority to access WIS data (for example, from WMO NC);<br>(d) enters login details;<br><br>(e) makes metadata search;<br>(f) tries to access WMO globally available data from the centre;<br>(g) tries to access additional data at centre for which he/she has no authorization;<br><br>(h) tries to access data or products at another site;<br>(i) subscribes to data for future delivery from centre;<br>(j) returns to another session and reuses login to search or subscribe;<br>(k) edits subscription details;<br><br>(l) cancels a subscription;<br><br>(m) logs out or leaves centre's site and tries to return to a bookmarked page at a later date to access data. | The user:<br>(a) has access to the login page;<br>(b) if new, has to create an account;<br>(c) is able to create an account as a "WMO member". He/she receives a user login (for instance, a code via email or an encrypted symbol);<br>(d) has logged in as a "WMO member", can search and download data from cache and has access to subscription services;<br>(e) finds metadata;<br>(f) accesses data from the centre;<br><br>(g) is informed that she/he is not authorized to access these data and is referred to the access page where she/he can request a change of user role or can login again as another user;<br>(h) is referred to the authorization page at the other site;<br>(i) receives scheduled data via agreed method at agreed time;<br><br>(j) maintains access with the same access rights;<br><br>(k) has subscription details that are updated and reflected in subsequent deliveries;<br>(l) has subscription details that are updated and receives no further deliveries;<br>(m) is directed to the registered user login page. | |
| 3 | The user checks status of account and subscriptions. | The user can view his account and subscription details, including past, current and future transactions. | |

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| Centre | | Organization | | Country | |
| Test date | | | | | |

| Test case name: WIS Demonstration Test Case 6 | | | |
|---|---|---|---|
| DAR Metadata (WIS Discovery Metadata) Catalogue search and retrieval | | | |
| Test case ID | WIS-TC6 | | |
| Component | DAR Metadata Catalogue | | |
| Purpose of test | | | |
| To assess the functionality of the DAR Metadata Catalogue | | | |
| Relevant technical specifications | | | |
| WIS-TechSpec-8: DAR Metadata (WIS Discovery Metadata) Catalogue search and retrieval | | | |
| Preconditions | | | |
| 1. The DAR catalogue is loaded with a representative number of WMO core metadata records for a variety of data and products; in particular, the records should represent several time ranges (climate and real-time), several geographical extents (from point to global coverage) and several disciplines (meteorology, hydrology, etc.), when applicable, for the functions of the candidate centre (GISC, DCPC, etc.);<br>2. A web-based user interface is made available on the open Internet to provide access to the DAR catalogue;<br>3. There exists a registered user that is allowed to retrieve some data and/or products;<br>4. The number of records returned may be subject to size limits of the system (e.g. 1000 record limit). | | | |
| Test steps | | | |
| | *Description* | *Expected results* | *Actual results* |
| 1 | Browsing | Any record in the DAR catalogue is reachable by browsing. | |
| 2 | Free-text search: The user inputs one or more words in a web form and submits the request. | All records containing the required words are retrieved. If the user is allowed to select a Boolean operation between the results, the outcome should reflect this condition. | |
| 3 | Geographic search: The user inputs a rectangular geographical area (using a form or a map). | Retrieval of all records that are contained in the area or that overlap with the area, depending on the implementation (the user should be aware of the matching algorithm used). The system handles the poles and the date line properly. | |
| 4 | Time search: The user inputs either a time interval or a point in time in a web form. | Retrieval of all records representing a time interval or point in time that are contained in or overlap with the requested interval or point in time, depending on the implementation (the user should be aware of the matching algorithm used). | |
| 5 | A combination of the above searches: A user can select a combination of any two or all of the above simultaneously. | Records that match all the selected criteria are retrieved. | |
| 6 | Invalid search | The user receives a clear error message. | |
| 7 | Search/Retrieval via URL (SRU) in accordance with ISO 23950 SRU protocol | The above searches will produce the same results when the SRU protocol is used. | |

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| 8 | Visualization of metadata | The user is able to select a metadata record when browsing or from a search result list. The record is rendered in a human readable form. | |
| 9 | Selection and retrieval of data: The user tries to select and retrieve specific data. | The user is able to select data and products either when browsing or from a search result list or when visualizing a meta record. The user is presented with a means to select instances that are associated with the chosen record. The system provides a retrieval/referral mechanism that will allow the user to receive the data, noting that the data may be available from another site. | |

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| Centre | | Organization | | Country | |
| Test date | | | | | |

## Part 2 – WIS Demonstration Test Cases for NCs

| Test Case name: NC Demonstration Test Case 1 | | | |
|---|---|---|---|
| Uploading of discovery metadata for data and products to the DAR catalogue | | | |
| Test case ID | NC-TC1 | | |
| Component | Metadata management | | |
| Purpose of test | | | |
| To validate the functions of adding, updating and deleting metadata records provided by an NC to its principal GISC<br><br>All metadata records must be checked against the relevant schemas. A record should be deleted if it does not fit its corresponding schema.<br><br>NOTE 1: The term "upload" refers to the movement of metadata records between the National Centre that provides the metadata and the WIS centre that manages the DAR catalogue hosted by the principal GISC. Uploading can actually be implemented as a "pull" initiated from the DAR catalogue site, or as a "push" initiated by the metadata provider;<br>NOTE 2: Those functionalities can be implemented through:<br>• A web interface allowing registered users to manage their metadata interactively;<br>• A machine-to-machine interface allowing automated batch processing of metadata.<br><br>All GISCs support both methods. NCs may choose one or both methods. | | | |
| Relevant technical specifications | | | |
| • WIS-TechSpec-1: Uploading of metadata for data and products<br>• WIS-TechSpec-8: DAR Metadata (WIS Discovery Metadata) Catalogue search and retrieval | | | |
| Preconditions | | | |
| 1. A network connection (dedicated and/or public) exists between the NC and GISC;<br>2. The GISC has a file upload facility for collecting metadata from other WIS centres;<br>3. The GISC has a fully functional DAR catalogue;<br>4. The GISC has a registered user/process that is authorized to manage metadata of a given WIS centre;<br>5. The GISC has a web interface with the DAR catalogue that allows searches (see WIS-TC6). | | | |
| Test steps | | | |
| | *Description* | *Expected results* | *Actual results* |
| 1 | An authorized user/process adds a valid metadata record to the DAR catalogue. | The metadata record is found when browsing/searching the DAR catalogue. | |
| 2 | An authorized user/process modifies a record from the DAR catalogue. | The modification is immediately visible when browsing/searching the DAR catalogue. | |
| 3 | An authorized user/process deletes a record in the DAR catalogue. | The deleted record is not found when browsing/searching the DAR catalogue. | |

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|---|---|---|---|
| 4 | An authorized user/process attempts to upload an invalid metadata record. | The user/process is informed that the metadata record is invalid. The addition/update operation is aborted. The DAR catalogue is unchanged. | |
| 5 | An authorized user/process attempts to upload a record with a unique identifier that is already in the DAR catalogue.<br><br>NOTE: It is essential to ensure that an update is an edit and not an accidental duplication. | The DAR catalogue does not contain records with duplicate identifiers. Either:<br>1. The new metadata record replaces the old one, which is deleted from the catalogue. The new metadata record is found when browsing/searching the catalogue;<br>or:<br>2. The user/process is notified that the record is a duplicate. The addition/update operation is aborted. The DAR catalogue is unchanged. | |
| 6 | Access control – No unauthorized addition (1): An unauthorized user/process tries to add a metadata record to the DAR catalogue. | A non-authorized user/process is not able to add a metadata record to the DAR catalogue. | |
| 7 | Access control – No unauthorized addition (2): A WIS centre user/process tries to add a metadata record representing data from another WIS centre to the DAR catalogue. | A WIS centre user/process is not able to add a metadata record representing data from another WIS centre to the DAR catalogue. | |
| 8 | Access control – No unauthorized modification (1): An unauthorized user/process tries to modify a metadata record in the DAR catalogue. | A non-authorized user/process is not able to modify a metadata record in the DAR catalogue. | |
| 9 | Access control – No unauthorized modification (2): A WIS centre user/process tries to modify a metadata record belonging to another WIS centre, which is held in the DAR catalogue. | A WIS centre user/process is not able to modify a metadata record belonging to another WIS centre, which is held in the DAR catalogue. | |
| 10 | Access control – No unauthorized deletion (1): An unauthorized user/process tries to delete a metadata record from the DAR catalogue. | A non-authorized user/process is not able to delete a metadata record from the DAR catalogue. | |
| 11 | Access control – No unauthorized deletion (2): A WIS centre user/process tries to delete from the DAR catalogue a metadata record belonging to another WIS centre, which the user/process is not authorized to edit. | A WIS user/process is not able to delete from the DAR catalogue a metadata record belonging to another WIS centre, which the user/process is not authorized to edit. | |

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| Centre | | Organization | | Country | |
| Test Date | | | | | |

| Test case name: NC Demonstration Test Case 2 | | | | | |
|---|---|---|---|---|---|
| Uploading and downloading of data between WIS centres | | | | | |
| Test case ID | NC-TC2 | | | | |
| Component | Uploading and downloading of data | | | | |
| Purpose of test | | | | | |
| To validate the upload and download of data and products and the associated metadata | | | | | |
| Relevant technical specifications | | | | | |
| • WIS-TechSpec-2: Uploading of data and products<br>• WIS-TechSpec-10: Downloading files via dedicated networks<br>• WIS-TechSpec-11: Downloading files via non-dedicated networks<br>• WIS-TechSpec-12: Downloading files via other methods | | | | | |
| Preconditions | | | | | |
| 1. A network connection (dedicated and/or public) exists between an NC and a GISC (including via RTH where relevant);<br>2. File upload and download facilities such as FTP, e-mail and HTTP are available;<br>3. Data are available for upload or download;<br>4. DAR facilities are available at GISC. | | | | | |
| Test steps | | | | | |
| | *Description* | | *Expected results* | | *Actual results* |
| 1 | (a) Upload a file that is associated with a metadata record in the DAR catalogue of a GISC to another GISC;<br>(b) Use DAR facilities to search the metadata and retrieve the file. | | (a) The file has been uploaded to the other GISC and matches the corresponding metadata;<br>(b) The file can be downloaded. | | |
| Centre | | Organization | | Country | |
| Test date | | | | | |

| Test case name: NC Demonstration Test Case 3 | | | |
|---|---|---|---|
| Maintenance of user roles, authorization and authentication | | | |
| Test case ID | NC-TC3 | | |
| Component | Management of users and access | | |
| Purpose of test | | | |
| To create and run a variety of user types<br><br>NOTE: A centre may use the GISC user control interface. | | | |
| Relevant technical specifications | | | |
| • WIS-TechSpec-4: Maintenance of user identification and role information<br>• WIS-TechSpec-6: Authentication of a user<br>• WIS-TechSpec-7: Authorization of a user role<br>• WIS-TechSpec-13: Maintenance of dissemination metadata | | | |
| Preconditions | | | |
| 1. The centre is entitled to provide access to users (i.e. it has received the approval of the Permanent Representative of the user's country);<br>2. A process is in place for an NC to authorize its users to use the GISC with appropriate access levels;<br>3. The user interface is via the Internet (i.e. web page). | | | |
| Test steps | | | |
| | *Description* | *Expected results* | *Actual results* |
| 1 | Provide access for an external user to search metadata. | A temporary user can search metadata, but can neither access data from the GISC or cache, nor subscribe to data. | |
| | The user:<br>(a) goes to search the web page;<br>(b) searches for metadata;<br>(c) tries to access data. | The user:<br>(a) has access to the search page;<br>(b) finds metadata;<br>(c) is referred to the authorization page at data source. He/she cannot access data without an authorized user role. | |
| 2 | Create accounts with access to WIS metadata and data for a WMO centre authorized user. | Two user accounts have been created: one with access to metadata only, the other with access to the centre subscription service or ad hoc request from the cache. | |

| | | | |
|---|---|---|---|
| | The user:<br>(a) goes to the registered user web page;<br>(b) is required to login or create an account;<br>(c) registers the account and selects the role of valid "WMO member" with authority to access WIS data (for example, from a WMO NC);<br>(d) enters login details;<br><br>(e) searches for metadata;<br>(f) tries to access WMO globally available data from the centre;<br>(g) tries to access additional data at centre for which he/she has no authorization;<br><br>(h) tries to access data or products at another site;<br>(i) subscribes to data for future delivery from centre;<br>(j) returns to another session and reuses login to search or subscribe;<br>(k) edits subscription details;<br><br>(l) cancels a subscription;<br><br>(m) logs out or leaves the centre's site and tries to return to a bookmarked page at a later date to access data. | The user:<br>(a) has access to the login page;<br>(b) if new, has to create an account;<br>(c) is able to create an account as a "WMO member" and receives a user login (for example, a code via e-mail or an encrypted symbol);<br><br>(d) is logged in. As a "WMO member", she/he can search and download data from the cache and has access to subscription services;<br>(e) finds metadata;<br>(f) accesses data from the centre;<br><br>(g) is informed that he/she is not authorized to access the data and is referred to the access page where he/she can request a change of user role or login again as another user;<br>(h) is referred to the authorization page at the other site;<br>(i) receives scheduled data via agreed method at agreed time;<br>(j) maintains access with the same access rights;<br><br>(k) has subscription details that are updated and reflected in subsequent deliveries;<br>(l) has subscription details that are updated and receives no further deliveries;<br>(m) is directed to the registered user login page. | |
| 4 | The user checks the status of his/her account and subscriptions. | The user can view his/her account and subscription details, including past, current and future transactions. | |
| … | | | |

| | | | | | |
|---|---|---|---|---|---|
| Centre | | Organization | | Country | |
| Test date | | | | | |

# APPENDIX D. ANNEXES TO PARAGRAPHS 6.4.1, 6.5.1 AND 6.6.2

## ANNEX TO PARAGRAPH 6.4.1: PROCEDURE FOR CHANGING PRINCIPAL GISC

1. The centre (NC/DCPC) wishing to change its principal GISC should consult with its present and proposed principal GISCs and receive the agreement of the latter.

2. The centre should check the communication network connectivity to the chosen GISC and ensure that the bandwidth is sufficient to send and receive all data without undue delays.

3. The centre should send a letter, endorsed by the Permanent Representative of its host country with WMO, to the WMO Secretary-General, with a copy to its current principal GISC. The letter should state the centre's choice of new principal GISC and include endorsement of the arrangement by the new principal GISC. The letter should also ask the Secretary-General to communicate that change to the regional association responsible for the centre and to the GISCs concerned where these are not in the same region as the centre.

4. The WMO Secretariat shall inform CBS of the change, with copy to the original and new principal GISC, and ask the Commission to prepare an update to the *Manual on WIS,* Appendix B.

5. The WMO Secretariat should update the WIS centres database (http://wis.wmo.int/wiscentresdb) and the WMO Country Profile Database (http://www.wmo.int/cpdb).

6. The new principal GISC should coordinate with the associated GISC(s) to make arrangements for the backup service.

7. The new principal GISC should liaise with the previous principal GISC to take over responsibility for the discovery metadata records describing the data and products of the centre that has been transferred (see section 6.5 of this Guide).

8. The new principal GISC should notify all operational GISCs of the change to its area of responsibility.

## ANNEX TO PARAGRAPH 6.5.1: GUIDELINES FOR MIGRATING METADATA RECORDS FROM ONE GISC TO ANOTHER

### 1. Scenario and use case

Consider the migration of metadata between two GISCs: GISC A and GISC B. GISC B is becoming operational and starting metadata management for National Centre X as its principal GISC. Accordingly, GISC A, which has been providing the WIS Interim Metadata Management Service for National Centre X, is ending this service. Practically, a set of metadata records owned by National Centre X needs to be moved from the Open Archive Initiative (OAI) set provided by GISC A (also referred to as WIS-GISC-A) to that provided by GISC B (WIS-GISC-B).

## 2. Operational guidelines

### 2.1. *Giving notice to other GISCs*

GISCs A and B jointly give one-week notice to other operational GISCs that they will transfer the metadata management from GISC A to B, with the list of location indicators (CCCC) in the case of metadata records that are associated with GTS messages. This notification is necessary because other GISCs need to make configuration changes, before they start harvesting new records, so that each CCCC belongs to specific OAI sets.

### 2.2. *Deleting and adding records at GISCs A and B*

#### 2.2.1 Deleting records from GISC A

This should be done by using the procedure for deleted records described in The Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH), subsection 2.5.1 (http://wis.wmo.int/oaiprotocol), not by simply deleting records from the database, so that harvesters of other GISCs can harvest the deletion information through the ordinary incremental harvesting.

If GISC A needs to delete these records completely from its database, it must do so only after other GISCs have completed harvesting the deletion.

#### 2.2.2 Adding records to GISC B

This should be done with an accurate date stamp, which allows harvesters of other GISCs to gain the added records through the ordinary incremental harvesting.

### 2.3. *Track harvesting by other GISCs*

GISCs A and B make sure that other GISCs harvest the change correctly, otherwise they need to ask for manual adjustments.

## 3. References

The Open Archives Initiative Protocol for Metadata Harvesting, http://wis.wmo.int/oaiprotocol.

# ANNEX TO PARAGRAPH 6.6.2: RECOMMENDED PRACTICES FOR THE ROLLING REVIEW OF WIS CENTRES

Note: If the structure of CBS changes, all references to Open Area Programme Group (OPAG), Implementation Coordination Team (ICT), Expert Team (ET) or Task Team (TT) are intended to apply to successors of the named bodies.

## 1. Background

The Commission for Basic Systems is responsible for certification of WIS centres' compliance with the WIS technical specifications defined in the *Manual on WIS*, Appendix D. The Commission for Basic Systems will maintain, within its OPAG on Information Systems and Services (OPAG-ISS) structure (or its successor), a task team to coordinate audits and certification of WIS centres. For the purpose of this Guide, the task team or its equivalent group of experts is referred to as the Task Team on Centre Audit and Certification (TT-CAC).

## 2. Auditing and certification

Auditors and certifiers shall be or shall become members of TT-CAC. New members must have relevant technical or audit experience (the nomination form is at http://wis.wmo.int/Expert-Form). They must be members (core or associate) of an OPAG-ISS expert team or have written commitment of the Permanent Representative of their country with WMO allowing them to participate as members of the TT-CAC. New members will be mentored by a nominated existing expert. Note that regional diversity of members of TT-CAC is essential.

Access to TT-CAC workspace and online databases is restricted to TT-CAC and the WMO Secretariat.

### 2.1 *GISC audits*

The Task Team on Centre Audit and Certification, on behalf of CBS, is responsible for audit and certification of GISCs.

A GISC should be audited by two experts, one of whom must have previous experience of auditing GISCs. Auditors should be from a different region than that of the GISC.

Travel and per diem should be at the GISC's expense and arranged through WMO.

#### 2.1.1 Scope of GISC audits

Full audits will cover all aspects of WIS compliance and shall include site visits using practices in line with those of the ISO 9000 series standards.

Interim audits will focus on a particular subset of topics. Actual elements to be focused on will be determined by the Implementation Coordination Team on Information Systems and Services (ICT-ISS) or its delegated expert team in coordination with ICT-ISS members. Centres will be told in advance on which subset of topics the interim audit will focus. Possible areas for review in interim audits include:

(a) GISC to GISC backup;

(b) Security;

(c) Monitoring;

(d) Quality of service provided by the WIS;

(e) WIS core network (e.g. in 2014, this was the Regional Meteorological Data Communication Network – Next generation);

  (i) Connectivity and management;

  (ii) Cacheing of "Globally distributed data" content;

(f) Management of the GISC area of responsibility;

  (i) Capacity development;

  (ii) The AMDCN connecting the GISC to NCs and DCPCs in its area;

    a. Cacheing of "Area of responsibility" content;

  (iii) Participation in WIS coordination and planning mechanisms (e.g. CBS Inter-programme Expert Teams, Expert Teams and Task Teams).

### 2.2 *DCPC certification*

Data Collection or Production Centres are to be certified by the TT-CAC. Where a DCPC is not using the infrastructure of its principal GISC, and its principal GISC is operational, it can be certified by TT-CAC once the principal GISC has performed the necessary tests. However, if the principal GISC is not operational, the TT-CAC will arrange for a suitable GISC to perform the tests. Where a DCPC uses the infrastructure of its principal GISC, it is certified as a part of the GISC certification process.

The certification of a DCPC requires only one TT-CAC coordinator, who will ask a GISC to undertake tests with the DCPC. It is expected that the centre's principal GISC will undertake those tests.

### 2.3 *Verification of compliance of NCs*

Compliance of NCs is the responsibility of the Permanent Representative with WMO of the Member accountable for the centre. Verification of compliance of an NC should be done by its principal GISC. The Task Team on Centre Audit and Certification will monitor the NC compliance process in consultation with NCs and GISCs.

## 3. The review cycle

The review cycle should start from the date of CBS endorsement. For centres endorsed before 1 January 2012 (the date on which WIS became operational) the cycle will start on 1 January 2012. Audits should take place within the calendar year in which the cycle ends and their timing will need to be coordinated with the experts called upon to undertake them.

The CBS endorsement date should be recorded in the WIS centre database. The date on which the centre became operational should also be recorded if known.

Similarly to an ISO 9001:2008 audit process, the GISC audit will follow the principle of alternating intermediate and full audits aligned with the CBS/EC four-year cycle:

(a) Intermediate audit (interim, four years): a mid-cycle review of performance and compliance to provide, if necessary, opportunities to introduce corrective actions well in advance of a full audit;

(b) Full audit (every second audit, i.e. every eight years): this audit will result in a recommendation for confirmation or cancellation of endorsement.

### 3.1 *Review of DCPCs*

The DCPC review cycle will be eight years. Reviews will cover all aspects of WIS compliance.

### 3.2 *Review of NCs*

Review of NC compliance is the responsibility of the Permanent Representative with WMO of the Member responsible for the Centre in liaison with the NC and its principal GISC.

## 4. Ad hoc audits or reviews

An ad hoc audit or review can be requested by the president of CBS due, for example, to non-conformance causing problems with WIS operations.

### 5. Audit or review outcome

The outcome of the audit or review will be categorized as "endorsed", "endorsed with qualification" or "not endorsed". Audit or review recommendations will be provided to the president of CBS and to the Director of WIS.

### 6. Format of report

The Task Team on Centre Audit and Certification will use a template for final reports, although the content will reflect the areas audited.

### 7. Public notification of type of CBS endorsement

The endorsement of CBS is based on continued successful audit outcomes. Centre endorsements are published only as "CBS endorsed" with no public declaration of whether endorsement was with "qualifications".

Details of reviews and audits of centres are confidential. Auditors will have access to the previous reports on a centre in order to perform their role.

### 8. Review of audits with qualification

Global Information System Centres that were "endorsed with qualifications" have two years from the date of the audit to demonstrate that they have taken remedial action on the points of qualification.

The Task Team on Centre Audit and Certification will investigate GISCs that were "endorsed with qualifications" and have not demonstrated that they have taken remedial action within two years of the date of audit. The Task Team should report to CBS on progress in addressing the aspects that incurred the "qualification", and can recommend to CBS that it revokes its endorsement.

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