

WORLD METEOROLOGICAL ORGANIZATION

Workshop on Aircraft Observing System Data
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**WMO AMDAR PANEL WORKSHOP ON AIRCRAFT
OBSERVING SYSTEM DATA MANAGEMENT**

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**AIRCRAFT OBSERVING SYSTEM DATA MANAGEMENT - CURRENT STATUS AND
CONSIDERATIONS**

WMO Information System (WIS) Concept, Requirements of Observations Systems & Requirements of
AO DM Framework

(Submitted by The Secretariat)

SUMMARY AND PURPOSE OF DOCUMENT

This document outlines the WIS architecture and describes what is required of information providers to exchange information through the WIS.

ACTION PROPOSED

1. The Workshop is invited to note the information contained in the document.
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WMO INFORMATION SYSTEM (WIS) CONCEPT, REQUIREMENTS OF OBSERVATIONS SYSTEMS & REQUIREMENTS OF AO DM FRAMEWORK

INTRODUCTION

The WMO Information System (WIS) is at the heart of WMO technical activities. It provides mechanisms to allow users to discover that information is available, and for them to request the information, either as an immediate download or as a routine delivery, provided that the information supplier has provided appropriate facilities and the user is authorised to receive the information.

WMO intends that the WIS is used as the primary means of exchanging information between participants in WMO Programmes, and that as a core component of GEOSS it will also be used outside the traditional WMO community.

This document outlines the WIS architecture and describes what is required of information providers to exchange information through the WIS.

WMO Information System

AIMS OF WIS AND HOW THEY WILL BE ACHIEVED

The aims of WIS are simple:

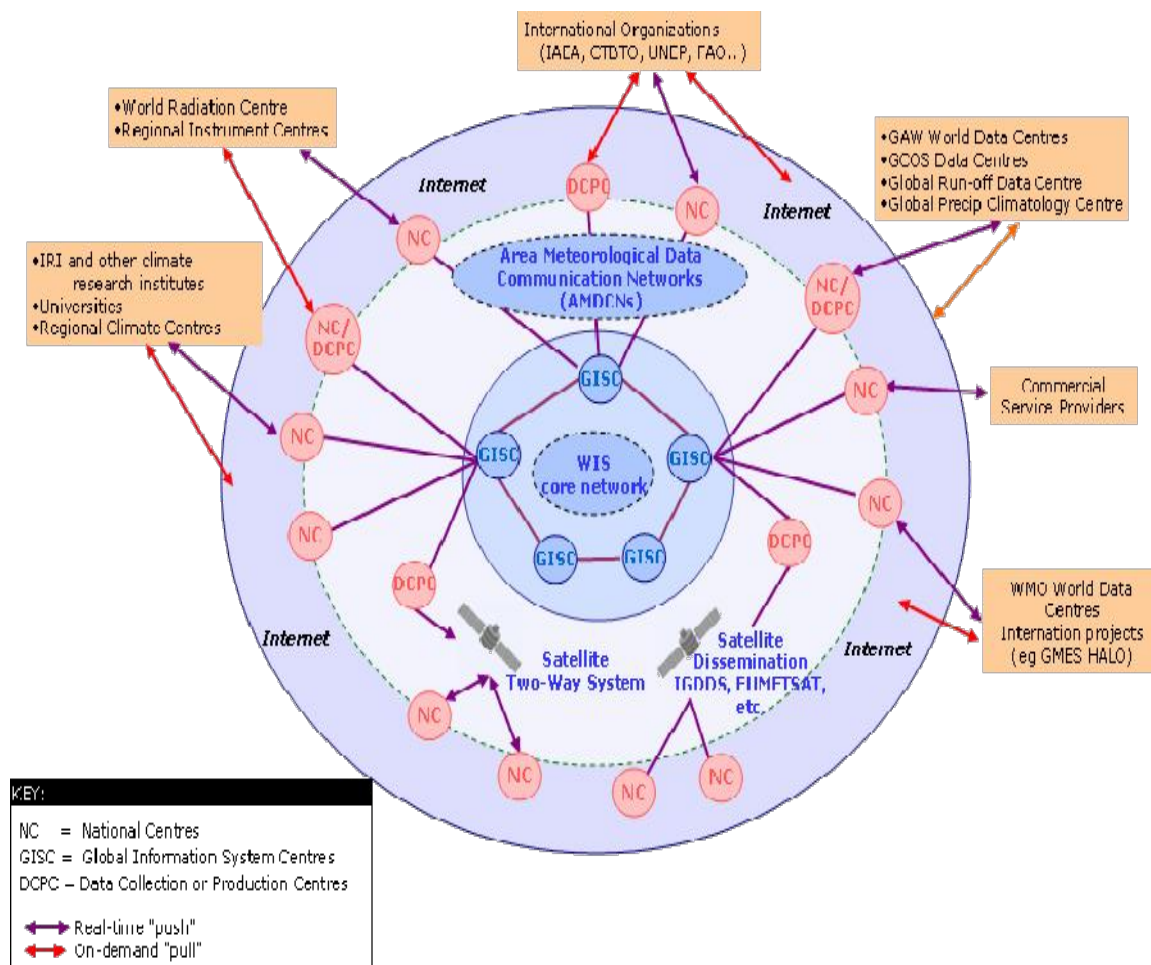
- to increase the visibility of data created by the WMO community
- to broaden the access to data
- to make WMO data more accessible to more communities
- to allow WMO Members to make use of data from other communities
- to simplify data use.

These aims have to be met if meteorology, water and climate sciences are to meet the demands being placed on them. Operational weather forecasting needs a wider variety of information than before, seeking observations from communities that are on the border between operations and research, such as glacier or ozone observations. The Global Framework for Climate Services will lead to a need for more systematic exchange of climate information, and application areas, such as Health, are seeing the benefits from combining weather and climate information in their decision making processes to reduce costs and to save lives. WIS will make it easier to meet these challenges.

WHAT IS WIS?

WIS is intended to build on the success of the GTS, and is taking an evolutionary approach, adding new access and telecommunications technologies to those of the GTS while allowing existing GTS users to maintain an unbroken service. For those organizations already on the GTS, the WIS offers an opportunity to simplify their operations, but only if they wish. For those that have had difficulty in connecting to the GTS for technical or financial reasons, the WIS offers alternative approaches to the routine exchange of information.

The WIS Specifications (in the Manual on WIS¹) give the technical and procedural constraints that centres operating as information providers within WIS have to meet, and the Guide to the WIS² provides and guidance on how the WIS should operate.



The WIS is implemented at three types of information providing centre.

- GISCs (Global Information System Centres) hold the metadata catalogues, ensure that the regularly required information is passed rapidly and reliably around the world, and act as a conduit between the other types of centre and the rest of the world,
- DCPCs (Data Collection or Production Centres) are those with a specialist role; this may be in creating numerical products (such as ECMWF), collecting observations (such as EUMETSAT), or channelling information to the GISCs (the current Regional Telecommunications Hub role), or providing support for particular Programmes (such as the Arctic Data Centre³).
- NCs (National Centres) are centres that have a national responsibility; the National Meteorological Service will provide an NC, for example, but there may be others (such as an oceanographic centre). NCs will usually provide the main interface between national users and the WIS.

¹ Manual on WIS: <http://www.wmo.int/pages/prog/www/WIS/documents/Manual-on-WIS-en.pdf>

² Guide to WIS: <http://www.wmo.int/pages/prog/www/WIS/documents/Guide-to-WIS-en.pdf>

³ The Arctic Data Centre is operated by Met.No and is a WIS DCPC: <http://arcticdata.met.no/>

HOW DO DATA USERS INTERACT WITH THE WIS?

At the heart of the WIS, and the major difference between the WIS and the GTS, is the metadata catalogue. This contains a description of all the information and services that WMO Members wish to make available through the WIS. The metadata will allow users to discover that information exists, and tell them how they can access it. The metadata catalogue will be synchronised between all the GISCs.

The GISCs will present the metadata catalogue to users in ways that allow them to search for metadata and, when they have discovered datasets that meet their requirements, will provide information on how to obtain the information. For information that is regularly exchanged around the world, it will be possible for users to download the current data immediately (if they are authorised to receive the data), or to request that the information is delivered to them when it becomes available (through a subscription service). In other cases, the metadata record may contain information on how to request the information or link to a request service, for example at a DCPC.

Data owners are responsible for creating the metadata records for their own data. The metadata records that are being used to initialise the metadata catalogue are being generated automatically from the information held about data exchanged on the GTS. Although technically correct, this is not often helpful to those outside the operational meteorology community. For WIS to be successful, data owners need to take care in crafting their metadata so that it is easily recognised and understood by the user communities for their metadata. Those datasets with the “best” metadata are those that are most likely to be used.

PROVIDING DATA TO THE WIS

One of the objectives of the WIS is to increase the amount of information available for exchange. This means that the methods of providing data have to be more flexible than for the GTS, but there also have to be constraints on who is able to insert what types of information, otherwise it would not be possible to meet the quality or performance objectives for the WIS.

The route for inserting information into WIS is through a National Centre or Data Collection or Production Centre. Whereas for the GTS this would usually involve having dedicated telecommunications networks, the arrangements for WIS will be more flexible. The actual arrangement will depend on the particular NC or DCPC and the arrangements agreed by the sponsoring WMO Programme, but centres have already implemented ways of accepting information by email from authorised addresses, transfer using authenticated ftp to a server at the NC or DCPC, and upload using a web site.

A prime need of WIS is for information to be understandable by a broad user community. This means that the format of data exchanged by the WIS has to be publicly available and agreed by the Programme sponsoring the data collection. In addition to the Traditional Alphanumeric Codes and the Table Driven Code Forms (GRIB and BUFR) exchanged on the GTS, the Commission for Basic Systems has already agreed that NetCDF will be a major data format used in the WIS, and is looking towards the exchange of information in XML. To facilitate translation between formats, CBS will be using the concept of a “data model” as it evolves its data representations. If a WMO Programme has sponsored a data representation it may be used in WIS, but data contributors are encouraged to limit the variety of formats used to reduce the workload on data users. IPET-DRC is the team that develops the WMO data representations; although within CBS, from which the majority of its members have been drawn in the past, it is an Inter-Programme Expert Team and has a responsibility, within the resources available to it, for meeting the needs of all WMO Programmes, especially for changes to the Table Driven Code Forms.

The final requirement for data producers is to provide one or more metadata records describing the data set that they are providing. A key point is that the metadata describes a dataset, not individual data records, and that it is only for discovery, access and retrieval purposes. More detailed metadata

(for example about instrument characteristics or observing practices) are from a WIS perspective a dataset in their own right. Data that are provided in real time are normally considered as an (unfinished) dataset, but it is conceivable that in other cases a dataset could contain a single observation. The objective of the WIS metadata is to allow users, who are probably not experts in the same field as the originator, to discover the existence of information and to form an initial judgement on whether it is relevant to what they are trying to achieve. Writing good metadata contains an element of making sure that the technical details are right, but the most important aspect is ensuring that the keywords and descriptions are meaningful to a broad readership.

Exchanging observations through the WMO Information System

DESCRIBING THE OBSERVATIONS – WIS DISCOVERY METADATA

WIS discovery metadata uses the WMO Core Profile of the ISO 19115 standard. All datasets that are exchanged through the WIS must have an associated WIS discovery metadata record. This allows users to find the dataset, learn a little about it, and find out how to get access to it.

Table 1 shows the elements that are required for a WIS discovery metadata record. Some elements that are optional in the ISO standard are mandatory within WIS (for example, because WIS is an operational system that uses the metadata records to drive some of its processes, it requires that every metadata record has a reference identifier that is unique within WIS). The table also lists the additional discovery metadata elements that are proposed by the Open Geospatial Consortium for aviation discovery metadata that may be adopted by ICAO. More information about the WIS discovery metadata standard is available from http://www.wmo.int/pages/mediacentre/press_releases/pr_831_en.html.

The data originator is responsible for defining the scope of a dataset. For example the data collected during an experimental observing campaign could be described as a single dataset with a single metadata record in WIS (though the centre holding the dataset may wish to hold more detailed metadata records in addition to those it exchanges through WIS).

To avoid creating a new metadata record each time an observation or forecast is made, WIS describes the series of bulletins or files that are generated by an operational system as a single dataset, described by a metadata record that has as its end date an indicator to say that the dataset is still being extended. So, for example, the real time distribution AMDAR observations collected by an AMDAR processing centre might form a single dataset; the metadata record should state that only the observations currently being exchanged operationally will be available. The same observations may be archived at a centre, and this archive dataset would have a different metadata record – because it would be possible to retrieve historical as well as current observations.

Metadata records are created by the data owner, normally a NC or DCPC. The NC or DCPC is responsible for negotiation with their principal GISC how to upload the metadata records to the GISC, and the method for ensuring uniqueness of the metadata identifier within WIS will form part of that negotiation. In practice, GISCs provide standard tools for uploading metadata, and it is highly likely that the negotiations amount to agreement on which of the standard tools will be used.

PROVIDING OBSERVATIONS FOR ROUTINE EXCHANGE

Exchanging information through the WIS could be as simple as providing a metadata record that points to the data producer's website, from which users can download the data. However, that is of limited use for routine operational exchange.

NCs and DCPCs are each associated with a principal GISC. They publish their data for global exchange through the GISC. If the centre is already on the GTS, this can be done through the standard GTS procedures. If, however, the centre is not on the GTS, or if the GTS is not considered appropriate for providing the information to the GISC, the GISC will offer several alternatives, including ftp, email and interactive data upload. As for the metadata, the method of providing operational data to the GISC should be discussed with the GISC.

Metadata for interpreting the observations

Those using observations usually need more information about the observation than is provided with the observation itself, especially for observations that are exchanged operationally. This "interpretation" metadata is not required by the WIS, and from the WIS perspective would be a dataset in its own right, with its own WIS discovery metadata. The WIS discovery metadata record for the observations might refer to the dataset containing the interpretation metadata, but this is not a requirement of WIS.

WIGOS is developing a standard for interpretation metadata, and the Workshop is encouraged to contribute its requirements for describing aviation observations to the Expert Team on WIGOS metadata.

Table 1: Summary of elements in WIS Discovery Metadata, with a comparison to the ISO 19115 Core metadata and the proposed Aviation Metadata standard being developed by the Open Geospatial Consortium. Key: M=Mandatory, O=Optional, C=Conditional (in an optional component is present, then an associate conditional component may be required), -=In ISO standard but not a Core component, x=extension to ISO standard.

Element	ISO	WMO	Aviation	Comment
Dataset title	M	M	M	
Dataset reference date	M	M	M	
Dataset responsible party	O	O	O	
Geographic location of the dataset	C	M	C	WIS requires as a minimum that a bounding box is provided.
Dataset language	M	M	M	
Dataset character set	C	C	C	
Dataset topic category	M	M	M	
Dataset descriptive keywords	-	M	O	The ISO Topic Category includes WIS information within a single topic, so the descriptive keywords (from a recognised list) are used to help WIS users discover information sources.
Spatial resolution of the dataset	O	O	O	
Abstract describing the dataset	M	M	M	
Distribution format	O	O	O	
Additional extent information for the dataset (vertical and temporal)	O	O	O	
Spatial	O	O	O	

Element	ISO	WMO	Aviation	Comment
representation type				
Reference system	O	O	O	
Lineage	O	O	O	
Online resource	O	O	O	
Metadata file identifier	O	M	O	Metadata file identifiers must be unique within WIS.
Metadata standard name	O	O	O	
Metadata standard version	O	O	O	
Metadata language	C	C	C	
Metadata character set	C	C	C	
Metadata point of contact	M	M	M	
Metadata date stamp	M	M	M	
Accuracy of numerical data	-	-	M	May best be included in the dataset rather than in the metadata. OGC still debating this topic.
Cyclic Redundancy Check	x	x	M	This would cause problems with the WIS approach to metadata.
Temporal reference system	x	x	M	Might be achieved by mapping across several ISO 19115 items
