

TOWARDS AN INTEGRATED GLOBAL DATA DISSEMINATION SERVICE

(Submitted by WMO)

Summary and purpose of document

This document recalls the scope of the Integrated Global Data Dissemination Service (IGDDS) which includes the various types of satellite data collection, inter-regional data exchange and data dissemination mechanisms such as Advanced Dissemination Means (ADM). Regarding data collection, it reports, in particular, on recent progress regarding the development of Regional ATOVS Relay Services (RARS) in Asia Pacific and in South American Regions, following the model of the EUMETSAT EARS. The document proposes further steps to be taken in order to complete the IGDDS in the framework of the future WMO Information System (WIS) that is described in WMO-WP-20, which implies in particular extending ADM coverage to all WMO Regions by January 2007 and ensuring full interoperability through a coordinated approach of metadata and of user management. The IGDDS, and broadly speaking the WIS, is also expected to be a core component of the Global Earth Observation System of Systems (GEOSS) developed within the ad hoc intergovernmental Group on Earth Observation (GEO).

ACTION PROPOSED

- (1) CGMS is invited to note the progress of several RARS initiatives and their coordination.
- (2) CGMS is invited to discuss the proposed way forward towards a full IGDDS that would be a component of the WIS and contribute to GEOSS objectives.

DISCUSSION

Background

1. The WMO Space Programme Implementation Plan, as reviewed at the fourth session of the High-level Consultative Meetings (CM-4) and approved by EC-LVI, contains a description of an Integrated Global Data Dissemination Service (IGDDS) as follows:
2. In view of the requirement for cost-optimized access to increasing volumes of data/products, access to satellite data and products by WMO Members will be through a composite system consisting of both Direct Broadcast (DB) from meteorological satellite systems and Advanced Dissemination Methods (ADM). ADM would be the baseline while DB reception would serve as a limited backup, as well as for those WMO Members unable to take advantage of the ADM service.
3. As the composition of the space-based Global Observing System evolves, the ADM concept offers enough scalability and flexibility to allow for the seamless inclusion of data/product sets from polar and geostationary operational satellites, as well as from relevant R&D environmental satellites. It is expected that the most demanding application utilizing this composite service would be NWP, and that NWP requirements could thus be taken as a benchmark for sizing the data communications infrastructure.
4. Several satellite operators have implemented, or have plans to implement ADM. For the time being the most advanced implementation appears to be EUMETCast by EUMETSAT. EUMETCast already disseminates data from polar and geostationary satellites, as well as from other meteorological data sources. By using K_u- and C-band, DVB services provide a dissemination service at very reasonable cost to both EUMETSAT and the users.
5. In order to ensure that these initiatives result in a dissemination system that is optimized with respect to the needs of the global user community, it is appropriate to consider the possible shape of an Integrated Global Data Dissemination Service which builds upon the ADM concept.
6. The creation of an Integrated Global Data Dissemination Service is central to the vision of an integrated space-based component of the GOS, as it will facilitate the access, in a seamless manner, to the complete range of data and products from this component of the GOS.
7. It is envisaged that the Integrated Global Data Dissemination Service will be constructed from dissemination services provided in five or six discrete dissemination service areas which, taken together, would provide an integrated data dissemination service to all WMO members around the globe.
8. In order to cope with the future data volume and geographical coverage requirements, and based on the current availability and footprint of commercial satellite communications services, it is expected that the communications architecture would require a mosaic of satellite communications services, augmented, as appropriate, by terrestrial means (e.g., the Internet).
9. As a starting point it is envisaged that each dissemination service area be delineated by a longitude band centred close to the orbital position of an operational geostationary meteorological spacecraft but, because of the dependency on the availability of commercial communications services, it would not be appropriate to be prescriptive concerning the precise longitude domains for each dissemination service area.
10. An approach was proposed, whereby the CGMS would be tasked to work out detailed implementation arrangements.

11. It was agreed that the coordination of the design and implementation of an Integrated Global Data Dissemination Service be handled as a specific WMO Space Programme project and monitored within both the CGMS and the Consultative Meetings

ET-SSUP discussions on ADM and IGDDS

12. In June 2004, the CBS Open Programme Area Group for Integrated Observing Systems (OPAG IOS) Expert Team on Satellite System Utilization and Products (ET-SSUP) discussed the concept to use regional ADMs as the baseline for distributing data and products from space systems in the context of the IGDDS as approved by the WMO Executive Council. The IGDDS would serve to connect the regional ADMs and would be part of the future WMO Information System (WIS). It was anticipated that WIS could also be a core component of the Global Earth Observation System of Systems (GEOSS) developed within the ad hoc intergovernmental Group on Earth Observation (GEO).

13. With regard to inter-regional data exchange, ET-SSUP suggested that a mechanism was required to organize data exchange between different regional systems in order to fulfil the requirements for data from other regions. The objective should be to meet the needs of the user communities, to manage the data flows, and optimize the use of the available bandwidth in avoiding redundant data transfer.

14. Such mechanism exists in some cases:

- Asia Pacific Satellite Data Exchange and Utilization Forum;
- North America Europe Data Exchange Requirements Group;

15. Additional mechanisms may be needed to address data exchanges involving other partners.

16. ET-SSUP felt that ADMs and the IGDDS approach could contribute, as pilot projects, to the gradual implementation of the WIS;

Regional ATOVS Retransmission Service (RARS) Activities during 2004

17. The thirty-second session of the Co-ordination Group for Meteorological Satellites (CGMS-XXXII) held in May 2004 noted that the EUMETSAT ATOVS Retransmission Service (EARS) had increased real time access for ATOVS data three- to four-fold in much of the Northern Hemisphere and with less than 30 minutes delay of availability. Near real time access to ATOVS data is important for Global Data Processing Systems, as well as for WMO Members with NWP capabilities. Access to near real time ATOVS data is also important for other important WMO activities such as implementation planning by the Commission for Basic Systems (CBS) for redesign (evolution) of the Global Observing System and THORPEX. CGMS-XXXII noted that EARS was an extremely effective example of an advanced dissemination method (ADM - previously referred to as "alternative" dissemination method) and asked whether the service could be expanded into other Northern Hemisphere regions, as well as extended to cover the Southern Hemisphere. To that end, CGMS encouraged the WMO Space Programme to contact CGMS Members and potential regional participants to form local consortia to develop regional ATOVS Retransmission Services (RARS) in a similar fashion.

18. During the fifty-sixth session of the WMO Executive Council, informal discussions with representatives from WMO Members with HRPT receiving systems in the Southern Hemisphere (South America, Southern Africa, Australasia and others) indicated a strong desire to further investigate establishing RARSs. The WMO Space Programme will act as the catalyst to further the discussions necessary to establish RARSs, as well as IGDDS. During the side discussion, EUMETSAT indicated a willingness to share and maintain the pre-processing ATOVS AVHRR Processing Package (AAPP) software with any new RARS reception facility.

19. A preliminary survey was sent to CGMS satellite operators and WMO Members in September 2004 with HRPT receiving stations with the expectation that regional services could be established, and to inform them of potential regional partners. The survey invited the recipients to consider the establishment of a regional ATOVS Retransmission Service (RARS). The invitation was extended to all potential participants both in terms of regional satellite operators and those WMO Members who own and operated HRPT stations capable of receiving direct readout ATOVS data. The survey also reported on the discussions held within ETSSUP.

20. A CGMS/WMO RARS workshop had been held on 16-17 December 2004 and hosted by EUMETSAT at its Headquarters in Darmstadt, Germany to discuss possibilities towards the development of RARS and IGDDS. At the workshop, a number of currently unfulfilled user requirements for ATOVS data were identified around the globe. In order to meet some of these unfulfilled user requirements, two RARS were proposed during the workshop: South American RARS; and Asia-Pacific RARS. The proposal for a South American RARS was still somewhat preliminary, with a follow-on meeting planned to discuss implementation responsibilities, before any final decisions are taken regarding the architecture. The implementation of an Asia-Pacific RARS was expected to start in the near future and its possible architecture was outlined during the RARS workshop.

21. The workshop also discussed the appropriate level of processing of ATOVS data within a RARS. It noted that a key element for the successful use of sounding products from a RARS in Numerical Weather Prediction is that the RARS applies a fully consistent pre-processing scheme to the whole data set with concatenation of individual passes from the local stations, removing any duplication of data resulting of the overlap between local acquisition area, the HIRS calibration being applied only to the concatenated orbit pass. Therefore, data should be collected from individual stations at level 1a or below, processed at regional centres up to level 1c and disseminated in 1c BUFR format for use by NWP centres.

22. Based on the very positive experience of the RARS workshop, it was recommended that the IGDDS project be refined within the WMO Space Programme Implementation Plan to include the objective of coordinating and facilitating the establishment of a global network of Regional ATOVS Retransmission Systems, with a particular focus on Inter-regional data exchange and on standardization in the areas of:

- product processing software usage;
- product formats;
- quality-tagging of data;
- service management.
- ensuring consistency with the IGDDS concept.

23. It was anticipated that this objective will be achieved through the organization of RARS workshops, together with technical coordination activities.

24. At the Sixth Asia-Pacific Satellite Data Exchange and Utilization (APSDEU) meeting held in Seoul, Republic of Korea in June 2005, the architecture of the Asia-Pacific RARS was further consolidated, an Asia-Pacific RARS coordinator was nominated and an implementation plan was sketched. In the short-term, APSDEU decided to implement a first phase including a baseline network of 12 HRPT stations and up to 4 processing nodes (Melbourne, Tokyo, Beijing and Seoul), with data concentration and dissemination via FTP over the GTS. This telecommunications solution should meet the immediate needs of the ATOVS user community. In a second phase, further stations would be added and other dissemination modes would be considered. A third phase could involve the expansion of the Asia-Pacific RARS to include other data types beyond ATOVS. Advanced dissemination methods would be a prerequisite if the scope of the system were to be expanded to include additional products, such as AVHRR data, with its more diverse user community.

25. This point had been emphasized at the workshop, and the need for the architecture of the Asia-Pacific RARS to be compatible with a future evolution to an IGDDS-type dissemination solution had been stressed. Currently, in the Asia-Pacific area, no regional dissemination system has been established that is totally consistent with the IGDDS concept. However, some national systems partially meet the needs (e.g., the Chinese DVB system on China Star which has some similarities with EUMETCast). During the course of the workshop some commercial broadcast systems were identified which had a footprint that seemed to cover the Asia-Pacific region.

26. A WMO RA III RARS Workshop was held in Buenos Aires, Argentina, 6-7 September 2005. The purpose of this workshop was to further define the proposal for a South American RARS that had been tentatively outlined at the CGMS/WMO RARS workshop held in Darmstadt, 16-17 December 2004.

27. At this workshop in Buenos Aires, a further 9 HRPT stations (6 in Brazil and 3 in Chile) were identified for possible inclusion within the RA III RARS collection network. Also, Brazil kindly offered to host a RARS processing and distribution centre. In addition, the participants of the workshop clearly recognised the need to appoint an RA III RARS Coordinator who could represent the RA III RARS on matters relating to the global RARS network (and would participate in the global RARS workshops).

28. As this workshop was not a decision-making forum, the main results are captured in a set of recommendations which will be considered shortly by the relevant decision-making body within RA III. The main intent behind these recommendations is to close the residual open issues concerning the definition of the RA III RARS architecture so that the implementation can proceed in a timely manner.

29. At the forthcoming global RARS workshop, to be held in Geneva on 1-2 December 2005, it is envisaged that the following issues will be addressed:

- further refinement of regional data requirements;
- implementation status of the South American RARS;
- implementation status of the Asia-Pacific RARS;
- discussion of proposed standards for RARS operators;
- documentation of the global RARS architecture
- possible evolutions of the global architecture to accommodate new observing systems (e.g., NPP, Metop).

30. The RARS approach is revolutionary in the history of satellites in which there is a strong emphasis on one of the critical issues with satellite technology, namely increasing availability and use of the data. The RARS approach is entirely consistent with the new WMO model for satellite data dissemination in which there will be a balance between a limited number of coordinated ground stations coupled with wide availability of data and products.

Next steps towards the IGDDS

31. As agreed by the WMO Executive Council the IGDDS shall integrate all the aspects of satellite data exchange and dissemination required by WMO programmes. This would potentially include the following satellite data sources, depending on the region considered:

- Imagery and other data from GEO satellites operated from the Region(s);
- Global data dumped from LEO satellites operated from the Region(s);
- Sounding data from LEO satellites collected and processed by a RARS within the Region (s);
- Other data from LEO satellites collected and processed through a mechanism similar to RARS;

- Products derived by the satellite operator(s) or other processing centres in the Region (s);
- Data from R&D satellites operated and/or processed within the Region (s);

32. R&D data needs that cannot be fulfilled by internal data sources, would rely on exchange with other regions. Inter-regional Data exchange requirements thus derive from the comparison of data sources and data needs of each region.

33. The increasing need to access global sets of data would require to considerably expand the inter-regional data exchange mechanisms beyond the existing arrangements such as:

- global sounding or radiance data from NOAA/NESDIS sent to Europe and Asia-Pacific;
- Foreign Satellite Data Service collecting GOES and MTSAT imagery for EUMETSAT users;
- operational link between NOAA/NESDIS and EUMETSAT for the Initial Joint Polar System.

34. CGMS may wish to refine the vision of the IGDDS and consider its possible outline for each specific WMO region in the light of the latest developments of RARS and ADM initiatives.

35. Noting that ADMs used for the dissemination of satellite and other data have a regional footprint, and having regard to the regional nature of the field of view of geostationary satellites, it is considered that the dissemination function should be organized on a regional basis, over discrete dissemination areas, and performed in accordance with regional requirements. The satellite operators of operational geostationary and polar satellite systems within a region, being the main data and product providers, are expected to take responsibility for implementing and operating dissemination services over this region, relying in most cases on commercial service providers.

36. It is suggested that each dissemination service coverage be defined with reference to the location of the primary users of geostationary services, and thus be consistent with the field of view of the different geostationary meteorological satellite systems. In view of the current configuration of geostationary systems, it is furthermore suggested to identify four discrete dissemination service areas, each one being assigned to a satellite operator or a consortium of satellite operators. The addition of all dissemination service areas would cover all WMO Regions, with some overlap, ensuring availability of data from all sources required by WMO Regions and WMO Programmes.

37. A schematic illustration of the possible implementation of the IGDDS within the WMO Information System (WIS) is provided in Figure 1 below, where data sources are in the upper part of the diagram, and data dissemination is the lower part. IGDDS components are in colour while non-satellite components of the WIS are in black. With reference to the WIS structure, satellite operators are assumed to play the role of Data Collection and Product Centres (DCPC). This scheme would be implemented in at least four parts of the globe, with an inter-regional exchange mechanism which is symbolised by large block arrows on each side.

38. Emphasis shall be put on ensuring that data management, metadata definition and handling, and user management are harmonized along internationally agreed standards, although the approach to metadata is still in an early phase in the WIS. This standardization is a key to interoperability, which is an essential objective to ultimately provide the user with a transparent access to multiple data sets that are managed by various operators. It is understood that the data transmission to the users would not only include routine dissemination (in a PUSH mode) but also interactive access allowing the user to browse a catalogue, to request specific stored data, as well as to subscribe to a routine dissemination service.

39. It is recalled that the following way forward has been defined in the WMO Space Programme Implementation Plan:

- (a) Identify the precise coverage area of each dissemination service;
- (b) Consolidate the data dissemination requirements applying to each dissemination service, taking into account regional, global and interoperability requirements;
- (c) Identify one or more satellite operators to provide the dissemination service in each area and thereby responsible for acquiring regional data and exchanging data within the IGDDS;
- (d) Define the global architecture with a coordinated approach to communication standards, data format standards, encryption mechanism and user station operating systems;
- (e) Identify actions that will enable global networking;
- (f) Produce an overall schedule for the introduction of the IGDDS.

40. The WMO Space Programme will continue its active role to support the establishment of a coordinated RARS network and the implementation of the IGDDS, which will be a core component of the WIS and, beyond, of the GEOSS. Satellite operators are invited to take steps towards the further implementation of IGDDS with the view to cover all WMO Regions with ADMs by January 2007. CGMS Members should note that the GEO 2006 Work Plan, Version 1, contains the following description of a data dissemination service called GEONETCast:

3.1.1 Special Initiative: GEONetcast

GEO will design and launch "GEONetcast", a major initiative to develop a worldwide, operational, end-to-end Earth observation data collection and dissemination system, using existing commercial telecommunications infrastructure. GEONetcast will build on the success of such projects as Puma and Eumetcast, as well as other similar national and regional projects, and take advantage of emerging concepts such as the WMO's Integrated Global Data Dissemination System (IGDDS). GEONetcast will collect and disseminate space-based and in-situ derived data, metadata, and products for all GEO societal benefit areas. As a first step towards the development of GEONetcast, GEO will assess current data transfer & dissemination systems in all societal benefit areas. [RES]

41. Thus GEOSS's data exchange and dissemination service will be based on the CGMS Member activities including EUMETCast and IGDDS. IGDDS will serve as one of the core contributors to GEONETCast.

Figure 1: IGDDS including ADMs, RARS, in the context of WIS

