

GEO-Netcast White Paper
Final Draft
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Improving access to data, products and services through GEOSS

A concept presented to GEO II by EUMETSAT and NOAA

1 INTRODUCTION

Ministers agreed at the third Earth Observation Summit in February 2005 to put in place a Global Earth Observation System of Systems (GEOSS) *inter alia* to meet the need for timely, quality, long-term global information as a basis for sound decision making and to enhance delivery of the benefits to society. High-level decision makers in governments and elsewhere will be looking for early results from GEO to realise in part the promise of GEOSS. The Group on Earth Observations (GEO) could add value to existing operational and prototype technological efforts underway to enhance the delivery of data and information to users, particularly those in developing countries, at reasonable cost to both providers and users.

GEO-Netcast is a concept by which environmental satellite and *in situ* data and products from participating data providers within GEO would be transmitted to all users through a global network of communications satellites, using a multicast access controlled broadband capability. U.S. Co-Chair Conrad Lautenbacher, based on discussions between EUMETSAT and the United States/NOAA, presented the concept to the GEO Executive Committee on September 30. It has been elaborated following discussions with Japan/MEXT and JAXA, with WMO, with ESA and the United States/NASA, and with the satellite operating agencies of both the Coordination Group on Meteorological Satellites (CGMS) and the Committee on Earth Observation Satellites (CEOS).

This document sets out a broad overview of the concept and proposes that the GEO undertake GEONETCast as a task in the 2006 GEO Work Plan. Additionally, GEO II should provide guidance as to a specific Implementation Group that would be responsible for GEONETCast development and operations.

2 THE NEED

A key feature in increasing the use of environmental data is to make data accessible to all nations in a cost-effective and efficient manner. Given the volume of data and products, particularly from satellites, and the diversity of data sets, this is not an easy challenge. It is also complicated by the fact that in order to undertake activities, data is usually needed from sources outside the specific country.

The introduction of a well co-ordinated, coherent, global dissemination scheme that addresses the existing problems of dissemination is to be welcomed, and GEO-Netcast has the potential to achieve these goals.

GEO-Netcast promises to facilitate and enhance access, particularly for developing countries, to key environmental data and products in the nine societal benefit areas.

3 CONCEPT

Environmental data and products, both satellite and *in situ*, from participating data providers would be transmitted to ground receiving stations through a global network of communication satellites and thereby shared with users. Data reception would be through satellite user reception stations that can be located anywhere within the dissemination satellite “footprint”. Thus, users could receive global data, products, and services from providers regardless of their location. The multicast file broadcast capability allows different data sets to be handled in parallel regardless of the source.

GEO can provide a framework for enhanced co-ordination of existing efforts to initiate a global scheme using as far as possible commercially available technology and ensure the necessary training and capacity building. Existing national and international data policies can be respected by the use of an access control capability, which allows the distributed files to be made available to all users, while respecting data policies, or to be targeted at individual or groups of users. The concept will allow for the seamless inclusion of data/product sets from polar or geostationary satellites, as well as from surface based or airborne data networks.

The major conceptual points are:

- Accessibility – the use of standard user reception terminals, which will make data access easy and affordable for a larger number of users.
- Coverage - GEO-Netcast is able to give a truly global system of coverage
- Controllability – the availability of access control enables existing data policies to be respected for each data stream.
- Flexibility – data from any source and type can be injected as a file using the multicast file broadcast system.
- Scalability – the communications infrastructure can be progressively upgraded to match the planned increase in data volumes.
- Robustness – the use of commercial systems provides robustness.
- Usability - having a standard approach to the multicast and stations using commercially available hardware and software improves usability.
- Responsiveness – respond to end user requirements for the nine Societal Benefit Areas.

The main issues in making GEO a true global system rather than a collection of independent dissemination schemes are:

- **Multicast file broadcast service:** This controls the file distribution, and ideally should be the same system globally. It provides for an uplink capability with multiple files handled in a structured fashion. Use of a common multicast file broadcast system also simplifies the transfer of data between regions.
- **Ability to respect data policies of providers:** This requires that for each data file transmitted the ability of each station to receive the data set is controllable individually through an access controlled system.

4 CURRENT SITUATION

A number of dissemination systems are already in place or in the planning phase involving GEO Members and Participating Organizations:

- EUMETSAT already has an operational system that disseminates satellite data and *in situ* meteorological data through its EUMETCAST system. This employs commercial communication satellite services and covers Europe, the Middle East and Africa. It also has plans to start a service over South America and much of North America. All the dissemination schemes use a common ground reception facility and have the ability to respect the data policies of data providers through access control.
- The European Space Agency disseminates its ERS and ENVISAT data through a digital video broadcast satellite (DVB-S) to users in Europe and Africa with a trial planned for South America.
- France has a system known as Retim for distribution to Africa.
- China has indicated its intention to trial an Advanced Dissemination Methods (ADM) covering nearly all the Asia Pacific region as part of WMO's Integrated Global Data Dissemination Service (IGDDS).
- A Japanese initiative, Sentinel Asia, under the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the space agency (JAXA) is planning to disseminate satellite and *in situ* data throughout the Asia-Pacific region, initially through the Internet and prospectively through DVB-S means.
- The United States/NASA, the Central American Commission for Environment and Development (CCAD) and other partners have established the SERVIR prototype visualization and monitoring system for Mesoamerica. It provides,

currently through the Internet, free and open access to satellite and other spatial data sets.

- As a supplement to the direct readout broadcast system on its environmental satellites, the United States/NOAA is currently developing a prototype system for an Alternative Dissemination Methods for distribution of data and products via a commercial communication satellite vendor, Internet, and/or landline for North, Central, and South America by 2007. The United States/NOAA is further involved in an initiative in support of the U.S. GEO implementation strategy in making current and future NOAA environmental data more readily available in the Americas with a focus on working with partners to build an Earth Observation Partnership of the Americas (EOPA) to promote Earth observation data collection, data access, data sharing, data integration, and data utilization for use by decision makers. The United States/NOAA also currently employs the communications capability on a retired GOES satellite to transmit emergency weather information to far islands of the Pacific, combined with Internet and other services.
- Through the support of the United States/NOAA and USAID and many other national agencies and developmental aid organizations, RANET combines innovative satellite and terrestrial communication technologies with appropriate applications to make weather, climate, and related information more accessible to remote and resource poor populations. RANET currently operates in parts of Africa, Asia, and the Pacific.
- WMO has developed and is implementing an Integrated Global Data Dissemination Service (IGDDS) to act as a global network of regional Advanced Dissemination Methods (ADM). An inherent feature is its interconnectivity and the ease by which data and products could be relayed from one region to another. While EUMETCAST already serves the European, African and North Atlantic and parts of South America regions, WMO set 31 December 2006 as the target date for bringing other ADMs into operational implementation. WMO and CGMS have established an IGDDS Management Group to ensure technical control for coordination during implementation and operations.

5 POSSIBLE SOLUTION

To provide a full global coverage would require as a minimum 5 operators, but given the complexity and frequency of the “spot beam” coverage, will probably need up to 10 operators. Technically, the concept is achievable. GEO Members and Participating Organizations would rent channels from commercial communication satellite providers that broadcast to regions around the world using a standard protocol interface, i.e., a DVB-S protocol, in C- and/or Ku-band frequencies, which are also used for Direct to Home Television (DTH) transmission worldwide. (See attached diagram for C-band and Ku-band coverage areas.)

Within each channel different data streams or products would be available on separate channels from which a user with appropriate reception equipment could draw as suited his/her needs. The data streams and products would differ in format, but the reception interface would be standard at a minimum within a region, so all prospective data types could be received. Such dissemination of data and products might be particularly useful in parts of the world where it is difficult to receive such information via Internet or landlines.

GEO Members and Participating Organizations would also need to identify a regional data collection and consolidation centre, which would;

- Receive from providers the prospective data and products to be disseminated in the region,
- Schedule the dissemination based upon the available bandwidth and the priorities given by providers and users,
- Retransmit data that is shared between regional partners,
- Ensure the end to end dissemination in the zone of coverage.

The user terminal software should be modular and flexible in each region, and to the extent possible consistent between regions. The user terminal would have the capability of receiving the DVB-S signal and restoring the received broadcast data to the form of its original data set. The user decides when to pull a data set onto his terminal and which data are to be managed and saved locally. The terminal should allow the user to install software to process data products.

Costs appear reasonable. With current communication satellite costs running at ~\$25,000 per megabit per year, the cost of a 10 megabit channel, as EUMETCAST uses, would be ~\$250,000 per year. Channels with 25 megabit capability, which is the Direct TV standard, would cost ~\$625,000 per year. On the receiving end, a user would need a computer and an antenna that receives C-band and Ku-band, which are the Direct TV standards, for a minimum cost of ~\$1000 – \$3000 depending upon location and frequency. This excludes the data processing capability. A custom station with processing capabilities would be more costly.

6 PROPOSED NEXT STEPS FOR GEO CONSIDERATION

The role of GEO would be to work with existing and potential supporters of a new satellite dissemination service to provide a framework for an overall concerted global system and expansion of the types of data and products transmitted to serve all nine GEOSS societal benefit areas.

A scenario to develop a GEO-Netcast initiative could proceed as follows:

- GEO-II would be invited to endorse the concept in principle and to elaborate on next steps toward its realisation. Besides the United States and

EUMETSAT, GEO Members/Participating Organisations would be invited to commit to provision of data transmission services.

- GEO II should endorse a mechanism to enable senior technical and other representatives from such providers and from prospective GEO users to further examine the concept. The initial tasks would be to focus on standards for a multicast system, examining as well the feasibility of adapting EUMETSAT's key access control mechanism. It would also propose an overall co-ordination and management framework to oversee GEO-Netcast implementation.
- The agreed mechanism would be required to co-ordinate with all relevant GEO committees and the GEO Secretariat.
- GEO should take advantage of the expertise within the satellite community, for example, within the Committee on Earth Observation Satellites (CEOS) and its working groups and within the Co-ordination Group for Meteorological Satellites (CGMS), in the development of proposed standards and formats.

7 SUMMARY

GEO-Netcast promises to be a highly visible and achievable result to which GEO can point as value added and a near-term success. GEO-Netcast could be the launching pad for other GEO initiatives, such as an International Charter for Emergency Communications, and should enhance our capability to develop a comprehensive, coordinated, and sustained Global Earth Observation System of Systems.