



## ***GEONETCast Implementation Plan***

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## **1 INTRODUCTION**

### **1.1 Purpose and Scope**

The scope of this document is to describe the technical and management baseline for the implementation of GEONETCast, a dissemination component of the Global Earth Observation System of Systems (GEOSS). GEONETCast is a dissemination system by which environmental *in situ*, airborne, and space-based observations, products, and services from contributions to the GEOSS will be transmitted to Users through a global network of communications satellites, using a multicast, access-controlled, broadband capability.

### **1.2 Reference Documents**

- [RD.1] GEONETCast in the Americas: A Vision and Concept (Draft v1.0)
- [RD.2] IGDSS Implementation Plan (v1.0)
- [RD.3] GEO White Paper
- [RD.4] GEONETCast Global Design Document (EUM/OPS/DOC/06/1799)
- [RD.5] GEO 2007-2009 Work Plan (Task Description CB-06-04)

## **2 BACKGROUND**

### **2.1 GEO Framework**

Ministers agreed at the third Earth Observation Summit in February 2005 to develop the GEOSS to meet the need for timely, quality, long-term, global environmental information as a basis for sound decision making and to enhance delivery of the benefits to society. GEONETCast is a dissemination system under development by which GEOSS environmental satellite and *in situ* data and products from participating Data Providers will be transmitted to Users through satellites using a multicast, access-controlled, broadband capability.

This capability would be especially useful in parts of the world where high speed land lines and/or internet are not available. Participation in GEONETCast as a Data Provider, end user, or dissemination infrastructure provider is voluntary. The intergovernmental Group on Earth Observations (GEO) has defined the GEONETCast task as Capacity Building Task #CB-06-04 with oversight by the GEO Architecture and Data Committee. It is critical, however, that the task also work with the GEO User Interface and Capacity Building Committees and others to identify additional data, products, and services to meet the needs of all nine societal benefit areas under GEO.

U.S. Co-Chair Conrad Lautenbacher, based on discussions between European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the United States/National Oceanic and Atmospheric Administration (NOAA), presented the concept to the GEO Executive Committee on September 30, 2005. EUMETSAT and NOAA then presented it to the second GEO plenary meeting in December 2005 - which adopted the concept in principle. GEO Members and participating organisations recognized that GEO

could add value to existing operational and prototype technological efforts underway to enhance the delivery of data and information to users.

## 2.2 Concept and Benefits

A key feature in increasing the use of environmental data globally is to make it accessible to all nations in a cost-effective and efficient manner. Given the rapidly increasing volume and diversity of data and products, particularly from Earth observation and environmental satellites, this presents a real challenge. Adding to the complexity of the situation is the diversity of organisations and national entities involved in Earth observation satellite systems, in-situ observations and production activities.

The introduction of a coordinated, coherent, global dissemination scheme that addresses the existing problems of data dissemination is to be welcomed, and GEONETCast has the potential to achieve these goals in coordination with other data dissemination methods.

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

## 3 STANDARDS

### 3.1 Overview

GEONETCast consists of a number of major components:

- Existing dissemination infrastructure;
- Data Providers/Sources;
- The global environmental User community.

In terms of existing dissemination infrastructure, EUMETCast, operated by EUMETSAT, currently provides the dissemination infrastructure that hosts GEONETCast. This provides geographic coverage of Europe, the Middle East, Africa, and South, Central and most of North America.

Discussions are at quite an early stage with the Chinese Meteorological Administration (CMA) to integrate FengYunCast into GEONETCast. This would provide geographic coverage of the Asia/Pacific region. FengYunCast is planned as an evolution of an existing CMA-operated dissemination system which provides geographic coverage of China and a number of neighbouring countries.

NOAA has a stated intention to establish a dissemination system providing comprehensive coverage of the Americas, which is likely to be called GEONETCast Americas. The draft GEONETCast in the Americas: A Vision and Concept Document [RD.1] provides an overview of the GEONETCast Americas concept developed within NOAA. Users in the

region will, with GEONETCast Americas, be provided with a long-term perspective for access to GEONETCast.

Together, these three regional systems (EUMETCast, FengYunCast and GEONETCast Americas) form GEONETCast, and have the capability to provide near global geographic coverage. The added value that GEONETCast brings is to facilitate and enhance access, particularly for developing countries, to key environmental data in the nine societal benefit areas of GEO by applying standards across, and encouraging the development of, regional systems.

These three regional systems are seen as the minimum required to establish global geographic coverage. Should additional regional systems be made available, the GEONETCast concept is flexible and scalable enough to easily accommodate them.

### 3.2 Service Standards

Each of the dissemination systems which together form GEONETCast – and any future regional systems - are recommended to comply with a number of Service Standards:

- Each regional system provides a single entry point – known as a Network Centre;
- The Network Centre can be linked together to provide data exchange between Network Centres;
- Each Network Centre should provide connectivity and system capacity to Data Providers from all GEO Societal Benefit Areas within the region;
- Each Network Centre should provide bandwidth to support data dissemination from outside the region;
- Network Centre operators are responsible for managing and interfacing with Users in coordination with Data Providers located within the region;
- Network Centre operators are responsible for managing and interfacing with Users in coordination with the other Network Centre operators acting in place of Data Providers of the other regions.

### 3.3 Technical Standards

At the technical level, a number of standards have emerged as forming the baseline for dissemination systems which contribute to the GEONETCast infrastructure:

- Contributing dissemination systems should be generic, multi-service dissemination systems, based on standard Digital Video Broadcast (DVB) technology;

- Using commercial broadcast channels on television, direct-to-home (DTH) telecommunication satellites;
- Utilising commercial, off-the-shelf, commonly available reception equipment;
- Using Internet Protocol (IP) over DVB standard coding;
- Systems should support transparent transfer of files – files should be received exactly as sent;
- Use of standard, openly described file formats is encouraged – examples currently in use are L/HRIT, BUFR, GRIB, HDF, netCDF;
- Contributing systems should provide secure access control at individual file and User level;
- The systems should be open, flexible, and scalable at both the Network Centre and User Terminal level;
- Quality of service should be ensured and regularly monitored;
- Catalogues of transmitted data should be maintained and made available for consultation by Users in order to facilitate data discovery and subscription;
- Dissemination should be organised in multiple multicast channels corresponding to product categories, which are associated with Programme Identifiers (PID).

## 4 ARCHITECTURE

### 4.1 Overview

The GEONETCast concept is an interconnected global network of real-time, regional, satellite dissemination systems to link GEOSS environmental Data Providers and Users. Each regional system will be focused on a specific geographic sector, or region, of the globe.

These systems will utilise uplink ground stations and available telecommunication technology from geostationary satellites so that costs can be kept affordable for Users through the purchase of existing off-the-shelf equipment. Data from each region can be disseminated outside the originating region through the utilisation of data-exchange links between the regions. This inter-region data exchange can take place using a number of possible methods such as dedicated data-exchange links, overlapping satellite footprints, or some existing network such as the Global Telecommunication System (GTS) or the Internet.

This satellite-based dissemination system is one component of a larger GEO data distribution network that may utilise the Internet and/or high-speed fiber optic land lines; however, these methods are not specifically addressed by the current GEONETCast concept. The scope of GEONETCast may evolve over time to include these data distribution methods as a means to distribute data to Users as required.

### 4.2 Regional Dissemination Systems

The regional components of the GEONETCast system include one or more data collection, management, and dissemination hubs that receive, process, prioritise, and schedule the

incoming, real-time, GEOSS datastreams or products originating within the particular region. These are termed GEONETCast Network Centres – generally there needs to be one per region.

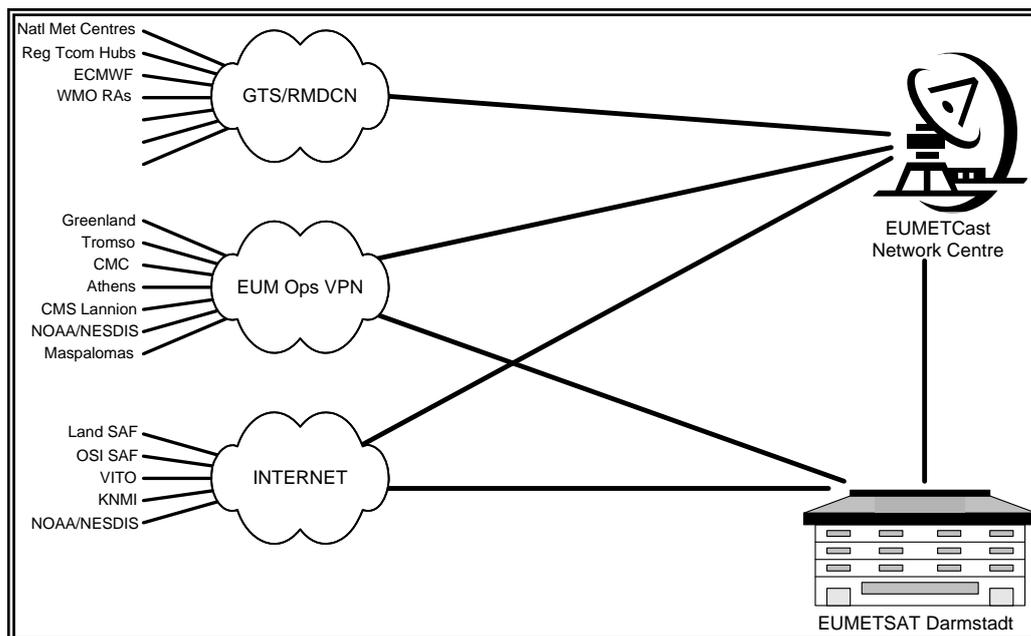
These datastreams may come into the Network Centres via dedicated land lines, existing networks such as the GTS and/or the Internet. The Network Centre then forwards in real-time the prioritised data stream via a dedicated land line to the uplink ground station, which receives the datastream and processes it into standard digital direct-to-home television (DTH) dissemination protocols (e.g., Digital Video Broadcast-Satellite/ DVB-S) and then immediately uplinks it to a commercial satellite for dissemination at Ku or C band frequency (the DTH standards).

Multiple multicast channels and programme identifiers (PIDs) may be used for multiple product categories. Multiple satellites, uplink ground stations, and turnaround ground stations may be necessary to cover the geographic region of interest in a particular global sector. Turnarounds extend the area of footprint coverage by receiving the real-time satellite broadcast from one primary satellite, turning it around, and forwarding it on immediately to another secondary satellite that may cover a different region in the same sector or an adjacent sector. Multiple sequential turnarounds are possible.

### **4.3 Network Centres**

The Network Centres will have a scalable architecture so that larger datastreams can be accommodated in the future. Expandable data capacity will be enabled through the purchase of an increased satellite service with larger data rates to accommodate potentially larger future datastreams.

A typical Network Centre configuration – in this case the EUMETCast Network Centre - is shown below:



## 5 IMPLEMENTATION

### 5.1 Overview

The greatest initial challenges in implementing GEONETCast have been to work towards global coverage, engage users to identify needs, expand data and products being transmitted beyond meteorology, and demonstrate an initial technical capability. Continued interaction with prospective users, whether through the GEO committees or other organizations and venues, and with prospective data providers will be required on an ongoing basis.

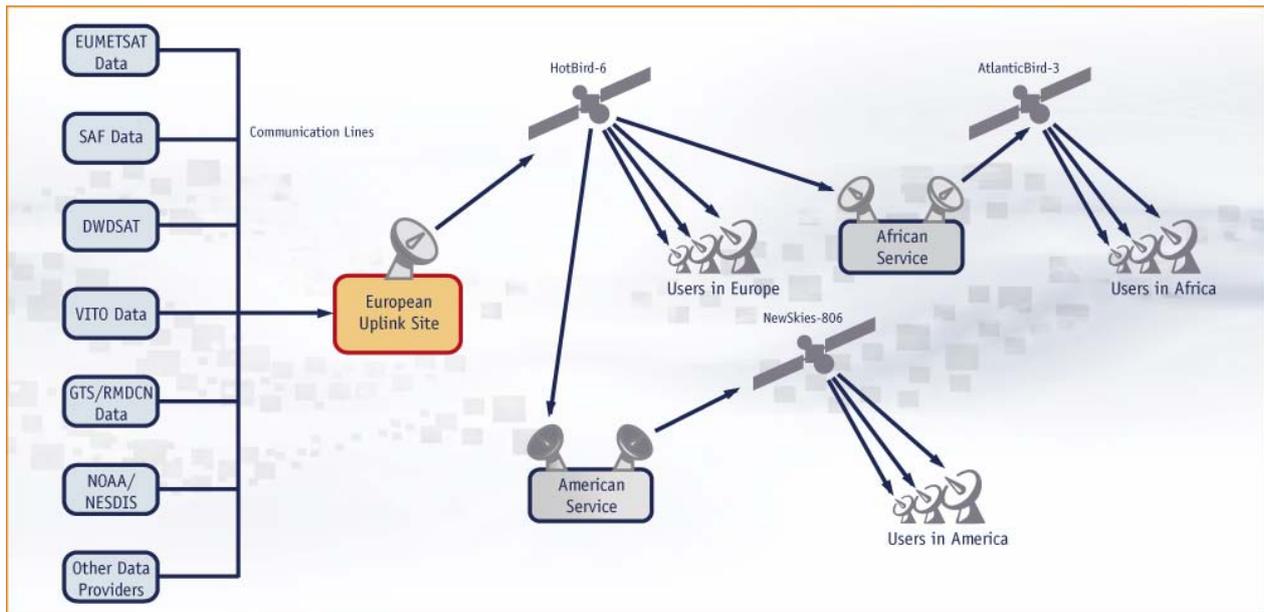
The GEONETCast concept necessitates the enhancement of existing dissemination infrastructure in two areas:

- enhancing the geographic coverage to global;
- providing dedicated bandwidth for GEONETCast related traffic.

In order to address these two areas, a phased implementation scheme for the GEONETCast system has been developed.

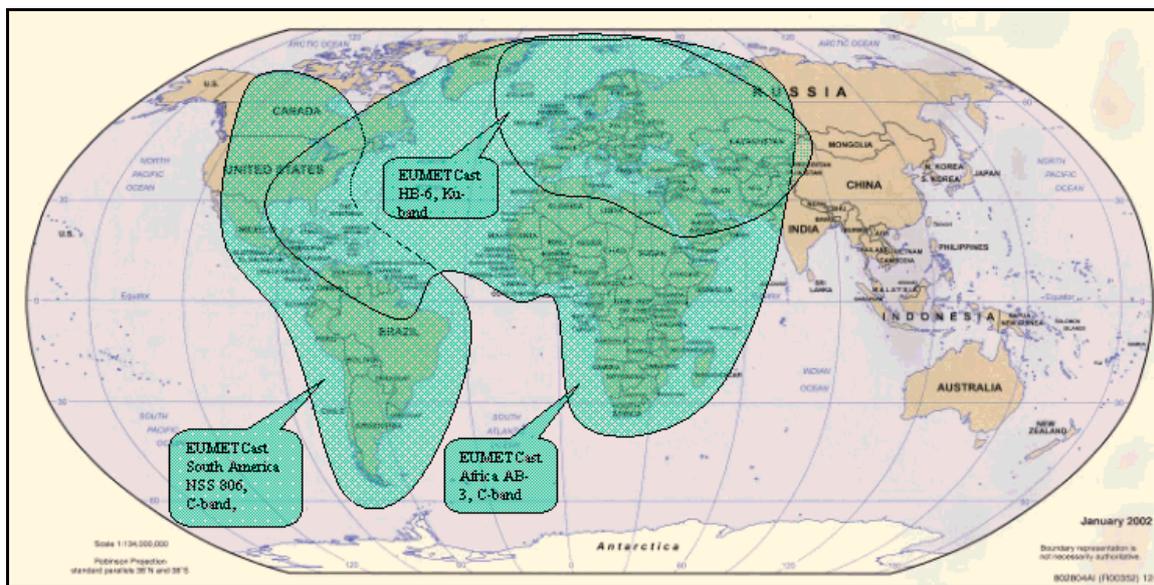
### 5.2 Phase 1 – Initial Demonstration

The current, initial phase of development and demonstration of GEONETCast is based on EUMETSAT’s existing EUMETCast system in Europe and Africa, which was launched in 2002 and expanded to cover the Americas in 2006. GEONETCast will leverage upon the EUMETCast commercial satellite dissemination infrastructure already in place in this Phase 1 (see below).



EUMETSAT has an operational Network Centre in Usingen, Germany, that uplinks data to a DVB-S, Ku-band, commercial satellite with a footprint centered on Europe and the Middle East. It receives and disseminates primarily meteorological satellite data from Europe. Additionally, there are two commercial DVB turnaround stations in Fucino, Italy, and Paris, France, which receive and re-broadcast the DVB-S data using C-band to two other commercial satellites with footprints over Africa and the Americas, respectively.

The figure below shows the existing EUMETCast geographic coverage:



GEONETCast Phase 1 is an extension of EUMETCast in that GEOSS demonstration environmental products from outside Europe (currently NOAA products) are flowing into the existing EUMETCast Network Centre and being disseminated in a GEONETCast demonstration mode.

NOAA's Satellite and Information Service (NESDIS) Office of Satellite Data Processing and Distribution (OSDPD) is currently transferring a subset of the NOAA demonstration products, focused on non-meteorological applications, to the EUMETCast Network Centre in coordination with EUMETSAT. The dissemination is accomplished through sharing of existing bandwidth with EUMETSAT's datastreams and operational products. Spare bandwidth is currently available and is being contributed by EUMETSAT for the purposes of the GEONETCast demonstration.

Because this phase 1 GEONETCast configuration is based on an existing operational system being used by operational meteorological organisations in Europe and surrounding areas, there are limitations on the quantity and size of GEOSS products that NOAA can currently transmit to EUMETSAT since the available spare bandwidth is limited. EUMETSAT recently established a separate dedicated channel (Americas CH1) with a programme identifier (PID) that will be devoted solely to dissemination of NOAA-sourced demonstration products; however, the satellite broadcast bandwidth will be limited to approximately 200 Kbps. Additional channels with increased capacity may be added in the future as the need arises.

### 5.3 Further Phases

Further phases in the implementation of the GEONETCast concept will focus on enhancements to the existing infrastructure in the areas of:

- increasing the geographic coverage until global coverage of is achieved;

- providing dedicated bandwidth capacity for GEONETCast traffic;
- implementing data exchange between Network Centres.

### 5.4 Further Issues

Further issues to be addressed include:

- o Mobilisation of other Data Providers;
- o Preparing a framework agreements with Data Providers addressing cost sharing, data policy, user registration, quality of service, duration..;
- o Preparing draft interface specifications for Data Providers;
- o Information of regional user communities;
- o Information of thematic user communities (per societal benefit areas);
- o Interaction with relevant GEO bodies : ADC, UIC, ...

These issues will be addressed by the GEONETCast Implementation Group as GEONETCast evolves and develops towards its initial operational configuration.

## 6 MANAGEMENT AND OPERATIONS

### 6.1 Implementation Group

The GEONETCast Implementation Group is made up of EUMETSAT, US/NOAA, China, and the WMO. The function of the group is to implement GEONETCast as described in the GEO Work Plan 2007 – 2009 GEONETCast task sheet [RD.5].

The current membership of the group may be extended as the operators of further dissemination system infrastructure make their regional systems compliant with GEONETCast standards and available for integration into GEONETCast.

### 6.2 Operational Group

The GEONETCast Operational Group will consist of the Network Centre operators – once all the Network Centres have achieved operational status.