WORLD METEOROLOGICAL ORGANIZATION

_____

COMMISSION FOR BASIC SYSTEMS

OPAG ON INFORMATION SYSTEMS & SERVICES

IMPLEMENTATION-COORDINATION TEAM ON INFORMATION SYSTEMS & SERVICES

GENEVA, 9-13 SEPTEMBER 2002

ICT-ISS 2002/Doc. 8.1(2)

(7.IX.2002)

_____

ITEM 8.1

ENGLISH only

EVOLUTION OF THE GTS INTO THE FWIS

(Submitted by Peiliang Shi, China)

Summary and Purpose of Document

The document reviews the current structure of GTS, and analysed its strength and weakness. Some key technical issue related to the evolution was discussed, and a case-study analysis of an RTH's evolution process was provided.

1. Structure of the GTS at present

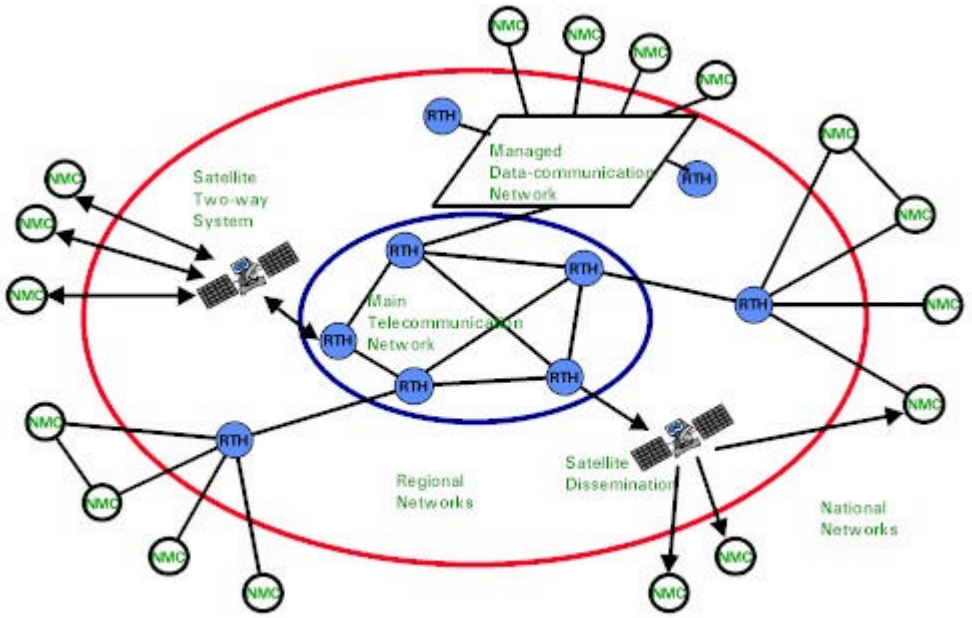

Figure 1 - Structure of the Global Telecommunication System

1.1. The GTS consists of an integrated network of point-to-point circuits, and multi-point circuits which interconnect meteorological telecommunication centres. The circuits of the GTS are composed of a combination of terrestrial and satellite telecommunication links. They comprise point-to-point circuits, point-to-multi-point circuits for data distribution, multi-point-to-point circuits for data collection, as well as two-way multi-point circuits. Figure 1 shows the structure of the the GTS. Meteorological Telecommunication Centres are responsible for receiving data and relaying it selectively on GTS circuits. The GTS is organized on a three level basis, namely:

(a) The Main Telecommunication Network (MTN);

(b) The Regional Meteorological Telecommunication Networks (RMTNs);

(c) The National Meteorological Telecommunication Networks (NMTNs);

1.2. The Main Telecommunication Network is the core network of the GTS. It links together three World Meteorological Centres and 15 Regional Telecommunication Hubs. These are:

(a) WMCs: Melbourne, Moscow and Washington;

(b) RTHs: Algiers, Beijing, Bracknell, Brasilia, Buenos Aires, Cairo, Dakar, Jeddah, Nairobi, New Delhi, Offenbach, Toulouse, Prague, Sofia and Tokyo.

The **Main Telecommunication Network** (MTN) has the function of providing an efficient and reliable communication service between its centres, in order to ensure the rapid and reliable global and interregional exchange of observational data, processed information and other data required by Members.

1.3. The Regional Meteorological Telecommunication Networks consist of an integrated network of circuits interconnecting meteorological centres, which are complemented by radio broadcasts where necessary. The Regional Meteorological Telecommunication Networks are to ensure the collection of observational data and the regional selective distribution of meteorological and other related information to Members. The RTHs on the MTN perform an interface function between the Regional Meteorological Telecommunication Networks and the MTN. There are six Regional Meteorological Telecommunication Networks:

Africa, Asia, South America, North & Central America, South-West Pacific and **Europe**

1.4. The National Meteorological Telecommunication Networks enable the National Meteorological Centres to collect observational data and to receive and distribute meteorological information on a national level.

1.5. Satellite-based data collection and/or data distribution systems are integrated in the GTS as an essential element of the global, regional and national levels of the GTS. Datacollection systems operated via geostationary or near-polar orbiting meteorological/environmental satellites, including ARGOS, are widely used for the collection of observational data from *Data Collection Platforms*. Marine data are also collected through the International Maritime Mobile Service and through INMARSAT. International data distribution systems operated either via meteorological satellites such as the Meteorological Data Distribution (MDD) of METEOSAT, or via telecommunication satellites, such as RETIM or FAX-E via EUTELSAT are efficiently complementing the point-to-point GTS circuits. Several Countries, including Argentina, Canada, China, France, India, Indonesia, Mexico, Saudi Arabia, Thailand and the USA, have implemented satellite-based multi-point telecommunication systems for their national Meteorological Telecommunication Networks.

2. Strength and weakness of GTS

GTS is one of the most successful co-operation project among WMO members. As a result of decades of efforts by members, the current GTS is effective in routine collection of observed data and automatic dissemination of scheduled products. There is a complete set of procedures for the operation of the GTS, which contributed to the reliability of the GTS.

GTS has been adapting itself to the changing requirements and available technology. Over the years, leased lines were gradually replaced by managed data communication network services; the data rate changed from 50baud, 75baud, to 64, 128kbps; the dominant protocol changed from asynchronous, to X.25, Frame Relay and TCP/IP; in the beginning, only character data were exchanged, binary data exchange was supported in the 1980s, and now almost any type of data can be exchanged using transparent file format. In addition to message switching, HF radio broadcasting, low speed satellite broadcasting, high speed satellite broadcasting were also implemented. In conclusion, GTS is a good starting point and basis for FWIS.

However, when we compare the GTS with the vision of the FWIS, we can easily find some of the major deficiencies of the traditional GTS, namely lack of capacity to meet the new requirements of WWW and other programmes of WMO, and lack of flexibility to meet different types of requirements.

3. Some key technical issues in evolution

File switching - Meteorological bulletins identified by AHLs has been the basic unit for data exchange on GTS for many years. As more and more data need to be exchanged, and there is an increasing difficulty to accommodate more data with remaining un-allocated AHLs, it is evident that “file” will be the basic unit for data exchanged in the FWIS. There are very efficient and reliable software packages for message switching running at various centres. File manipulation involves more system overhead than message switching. Although modern computers are hundreds or thousands of times faster that those in the 1980s, if the designers ignore the performance issue, the resulting system would have unbearable performance.

Immediate switching of the incoming message was a feature of the traditional message switching system. When we migrate to file switching, there is a tradeoff between the size of the file to be transmitted and the interval between transmissions. The total time needed for any centre to receive a certain set (national, regional and global) of real time data should not exceed that of the message switching system.

The prioritized transmission of messages, to guarantee quick dissemination of urgent messages over the GTS, is another feature of message switching systems. This feature should also be implemented in the FWIS to guarantee the priority of real time data over non-real time data.

File naming convention – One of the urgent tasks of CBS is to workout a file naming convention for data communication. The recent session of ET-EUDCS and the ad hoc group after the session developed a file naming scheme, which was submitted to this meeting for discussion. This scheme, after improvement, should be submitted to the next meeting of the Inter-programme Task Team on Future WMO Information Systems, to solicit comments from other programes of WMOm. The early agreement on a WMO wide file naming convention would save members significant amount of efforts.

Software development, open source approach? Computer hardware and communication services are becoming cheaper and cheaper. The key elements of FWIS will be the application software. As proposed by the Inter-programme Task Team on Future WMO Information Systems, tapping the resource from the open source community might be a solution. In order to keep relevant software development efforts focused on functions of different components of the FWIS, requirement specifications, especially for National Centres, should be worked out by OPAG/ISS as soon as possible.

4. Evolution of an RTH into a GISC – a Case study of RTH Beijing

As one of the RTHs on the MTN at present, RTH Beijing's is aiming at becoming one of the Global Information System Centres in the frame work of FWIS. The following is an analysis of the status and things-to-do for RTH Beijing to evolve into a GISC.

Responsibilities of a GISC	RTH Beijing current status or plan
a. Collect observational data and products that are intended for global exchange from national centres within their area of responsibility, reformat as necessary and aggregate into products that cover their responsible area	Implemented
b. Collect information that is intended for global exchange from Data Collection or Product Centres within their area of responsibility	Implemented
c. Receive information intended for global exchange from other Global Information Systems Centres	Implemented
d. Disseminate the entire set of data and products agreed by WMO for routine global exchange (this dissemination can be via any combination of the Internet, satellite, multicasting, etc. as appropriate to meet the needs of Members that require its products)	Implemented
e. Hold the entire set of data and products agreed by WMO for routine global exchange and make it available via WMO request/reply ("Pull") mechanisms	To be implemented in 2003
f. Describe its products according to an agreed WMO standard and provide access to this catalogue of products	Bulletin catalogue and routing directory was implemented; new product catalogue to be implemented when WMO standard is adopted

g. Provide around-the-clock connectivity to the public and private networks at a bandwidth that is sufficient to meet its global and regional responsibilities.	Permanent connection (through firewall) to Internet at 10Mb/s, to be upgraded to higher speed when needed; 128Kbps access line to RMDCN to be implemented in 2002, and to RTH Tokyo in 2003, to be upgraded to higher speed when needed;
h. Provide facilities to collect observations from and deliver products to all NMHS within its area of responsibility	To be enhanced.
i. Ensure that they have procedures and arrangements in place to provide swift recovery or backup of their essential services in the event of an outage (due to, for example, fire or a natural disaster).	To be enhanced.
j. May perform the functions of a Data Collection or Product Centre and/or a National Centre.	YES