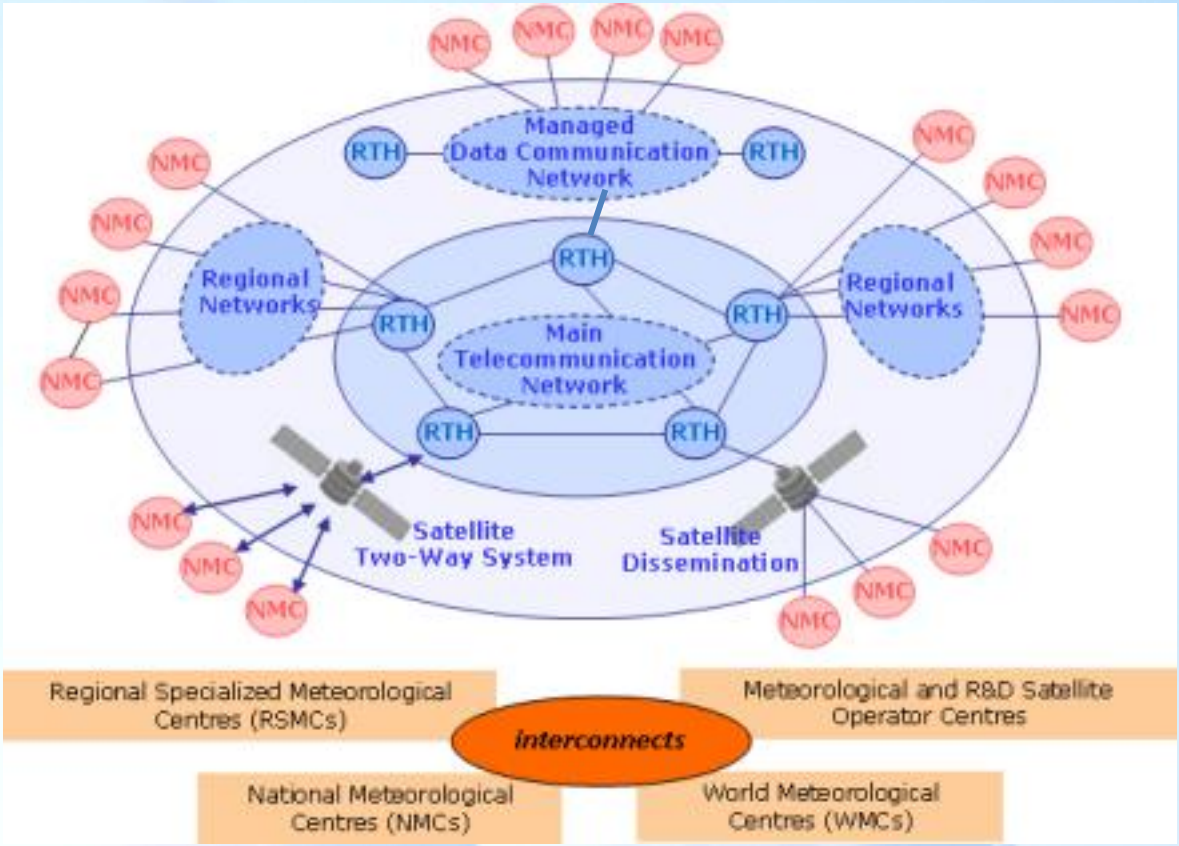
MET Communication

भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

Global Telecommunication System (GTS)



The Global Telecommunication System (GTS) is "The coordinated global system of telecommunication facilities and arrangements for the rapid collection, exchange and distribution of observations and processed information within the framework of the World Weather Watch."

GTS - Objective

The Global Telecommunication System (GTS) is an integrated network of surface-based and satellite-based telecommunication links of point-to-point circuits and multi-point circuits, interconnecting meteorological telecommunication centres operated by countries for round-the-clock reliable and near-real-time collection and distribution of all meteorological and related data, forecasts and alerts. This secured communication network enables the real-time exchange of information that is critical for forecasting and warning of hydrometeorological hazards.

The Global Telecommunication System is the backbone system for the exchange of data and information that supports multi-hazard, multi-purpose early warning systems. This includes all meteorological and related data; weather, water and climate analyses and forecasts; tsunami related information and warnings; and seismic parametric data. WMO is building on its Global Telecommunication System to achieve an overarching WMO Information System (WIS) that enables systematic access, retrieval, dissemination and exchange of all WMO data and information as well as that of related international programmes.

GTS - Structure

The Global Telecommunication System has a hierarchical structure on three levels:

1. The Main Telecommunication Network (MTN):

   Link the 3 World Meteorological Centres (WMCs) in Melbourne, Moscow and Washington and the 15 Regional Telecommunication Hubs (RTHs) in Algiers, Beijing, Bracknell, Brasilia, Buenos Aires, Cairo, Dakar, Jeddah, Nairobi, New Delhi, Offenbach, Toulouse, Prague, Sofia and Tokyo. This core network provides an efficient, rapid and reliable communication service between the Meteorological Telecommunication Centres (MTCs).

2. Regional Meteorological Telecommunication Networks (RMTNs)

   An integrated network of circuits covering the six WMO regions -

   Region I - Africa,

   Region II - Asia,

   Region III - South America,

   Region IV - North America, Central America and the Caribbean,

   Region V - South-West Pacific,

   Region VI - Europe and Antarctic.

   By interconnecting the Meteorological Telecommunication Centres (MTC), the network ensures the collection of observational data and regional selective distribution of meteorological and other related information to Members.

GTS - Structure

3. National Meteorological Telecommunication Networks (NMTNs):

   Enable the National Meteorological Centres (NMCs) to collect observational data and receive and distribute meteorological information on a national level.

Meteorological Message on the Global Telecommunication System (GTS)

Format of meteorological messages:

A routine meteorological message transmitted on the Global Telecommunication System shall comprise:

- **A starting line containing alphanumeric and special characters.**
- **An abbreviated heading.**
- **Meteorological bulletin. Meteorological bulletin may contain messages of many stations.**
- **end-of-message signals containing alphanumeric and special characters.**

There shall be only one meteorological bulletin per meteorological message.

Example of one Meteorological message

SAIN31 VOMM 092000
METAR VOBL 092000Z VRB03KT 6000 NSC 18/18 Q1017 TEMPO 3000 BR=

SAIN31 VOMM 092000
METAR VOBL 092000Z VRB03KT 6000 NSC 18/18 Q1017 TEMPO 3000 BR=
METAR VOCB 092000Z 03003KT 4000 BR FEW012 23/21 Q1014 NOSIG=
METAR VOCI 092000Z NIL=
METAR VOCL 092000Z 01002KT 5000 HZ FEW015 26/21 Q1012 NOSIG=
METAR VOHS 092000Z 14006KT 5000 BR FEW015 20/18 Q1015 NOSIG=
METAR VOML 092000Z 03003KT 6000 NSC 24/21 Q1012 NOSIG=
METAR VOMM 092000Z 00000KT 5000 BR FEW020 26/25 Q1012 NOSIG=
METAR VOTR 092000Z 00000KT 3500 BR FEW018 23/21 Q1013 NOSIG=
METAR VOTV 092000Z 05002KT 3000 BR FEW015 SCT080 26/23 Q1011 NOSIG=

Heading/Header for WMO Message/Bulletin

T1 T2 A1 A2 ii CCCC YYGGgg (BBB)

SIIN90 VECC 090300 CCA

AAXX 09034

42399 31995 10000 10160 20139 40149 71000 80001

333 20114 59029 555 10000=

T1 is an alpha character that designates the general code form of the contents of the bulletin.

T2 is an alpha character that designates the data type. It depends on the designator T1.

A1 is an alpha character that designates the geographical area the content of the bulletin covers. It depends on designator T1.

A2 is an alpha character that designates the geographical area, or may define the forecast period.

ii is a numeric set of two characters. It depends on designator T1.

Heading/Header for WMO Message/Bulletin

T1 T2 A1 A2 ii CCCC YYGGgg (BBB)

SIIN90 VECC 090300 CCA

CCCC is the identification of the processing center that generated the bulletin. Commonly centers use alpha character identification designators from ICAO's Location Indicators.

YYGGgg is the day, hour, and minute the bulletin was prepared or the reporting time of the contained reports in it.

(BBB) is an optional group of alpha characters.

The BBB indicator shall have the following forms:

RRX for additional or subsequent issuance of bulletins;

CCX for corrections to previously relayed bulletins;

AAX for amendments to previously relayed bulletins;

where x is an alphabetic character starting from A.

RRA Example

SAIN31 VOMM 092000

METAR VOBL 092000Z VRB03KT 6000 NSC 18/18 Q1017 TEMPO 3000 BR=

METAR VOCB 092000Z 03003KT 4000 BR FEW012 23/21 Q1014 NOSIG=

METAR VOCI 092000Z NIL=

METAR VOCL 092000Z 01002KT 5000 HZ FEW015 26/21 Q1012 NOSIG=

METAR VOHS 092000Z 14006KT 5000 BR FEW015 20/18 Q1015 NOSIG=

METAR VOML 092000Z 03003KT 6000 NSC 24/21 Q1012 NOSIG=

METAR VOMM 092000Z 00000KT 5000 BR FEW020 26/25 Q1012 NOSIG=

METAR VOTR 092000Z 00000KT 3500 BR FEW018 23/21 Q1013 NOSIG=

METAR VOTV 092000Z 05002KT 3000 BR FEW015 SCT080 26/23 Q1011 NOSIG=

SAIN31 VOMM 092000 RRA

METAR VOCI 092000Z 00000KT 4000 HZ FEW015 SCT090 23/23 Q1011 NOSIG=

CCA Example

SIIN90 VECC 090300

AAXX 09034 42399

31995 10000 10160 20139 40149 71000 80001 333 20114 59029 555 10000=

SIIN90 VECC 090300 CCA

AAXX 09034

42399 31995 10000 10160 20139 40149 71000 80001 333 20114 59029 555 10000=

Length of meteorological messages

The length of meteorological bulletins shall be determined according to the following:

(a) Alphanumerical messages for transmission on the GTS should not exceed 15 000 octets;

(b) Sets of information, transmitted using segmentation into a series of bulletins, shall not exceed 250 000 octets;

(c) The limit for meteorological bulletins for binary data representation or pictorial form shall be 500 000 octets;

(d) Sets of information may be exchanged using the file transfer technique, particularly where sets larger than 250 000 octets are concerned.

Observational data should not be unnecessarily held up for transmission merely for the purpose of retention until a message of appropriate length can be compiled.

BUFR: Binary Universal Form for the Representation of meteorological data

The Binary Universal Form for the Representation of meteorological data, or BUFR, is a data format maintained by the WMO.

It is used mainly for encoding meteorological observations of all sorts, including those from synoptical stations, radiosondes and satellites.

Because BUFR is encoded in binary, it can be stored, transmitted and processed efficiently.

It is table driven, so that it can encode data in a flexible fashion. This makes it easy to use BUFR to describe new types of observations or describe old types of observations in new ways.

BUFR is designed to be processed using machines, not directly by humans. Therefore, specialized software is required in order to work with it.

Structure of a BUFR message

Data encoded in BUFR is called a message. A message consists of one or more subsets of related meteorological data. The structure of a BUFR message is described below:

Section 0: Indicator section

Contains the letters "BUFR", the length of the message and the BUFR edition number.

Section 1: Identification section

Contains information about the type of data contained in the BUFR.

Section 2: Optional section

Contains local data that is not regulated by the WMO

.

Structure of a BUFR message

Section 3: Data description section

Describes what variables the BUFR contains in the data section and where they are to be found. It also states how many times this description is repeated in the form of subsections. Elements in section 3 can be meteorological variables that were observed and other metadata, such as the instrument used to make the observation or data quality. They can also signify known sequences of elements that occur commonly; it's possible to encode a sequence that always contains height, latitude and longitude, for example, rather than describing these elements individually. This saves space.

Section 4: Data section

This section contains the actual data described in section 3.

Section 5: End section

This section contains the letters "7777", signifying that the message has come to an end. It can be used together with the length of the message, encoded in section 0, to check that the BUFR was transferred properly.

Section: 0

Octet number	Content
1-4	BUFR four letters in CCITT International Alphabet No.5
5-7	Total length of Bufr message in bytes
8	Bufr Edition number

Bufr Section - 1

Octet number	Content
1-3	Length of section 1
4	Bufr master table (zero id standard WMO FM 94-IX BUFR tables are used)
5	Originating/generating sub-centre
6	Originating/generating centre: Code table 001031
7	Update sequence number (zero for original BUFR messages; incremented by one for updates)
8	Bit 1 = 0 No optional section Bit 1 = 1 Optional section follows Bit 2-8 Set to zero (reserved)
9	Originating/generating centre: Code table 001031
10	Bufr message subtype (defined by local automatic data processing centre)
11	Version number of master table used (currently 11 for WMO FM 94-IX Ext. BUFR tables)
12	Version number of local tables used to augment the master table in use
13	Year of century (100 for 2000 year)
14	Month
15	Day
16	Hour
17	Minute
18-	Reserved for local use by ADP (Automated Data Processing) centres

Optional section Section: 2

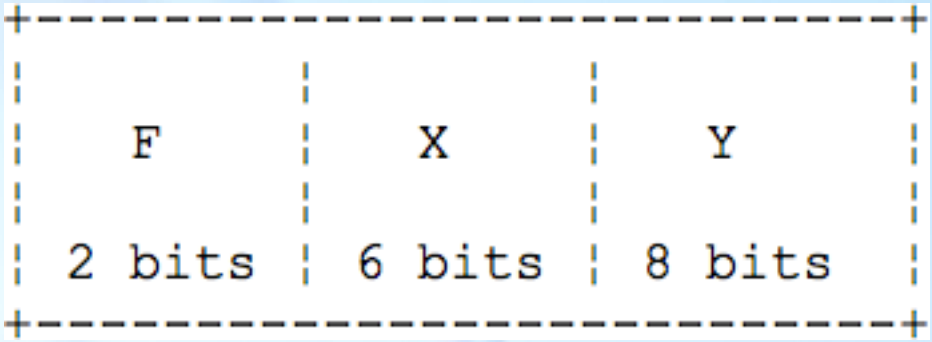
The presence of Section 2 of the Bufr message is indicated by a flag in the 8th byte of Section 1. This section can be used locally by Automated Data Processing centres.

Octet number	Content
1-3	Length of section in bytes
4	Set to zero (reserved)
5-	reserved for local use by ADP centres

Data description section: Section: 3

Octet number	Content
1-3	Length of section
4	set to zero (reserved)
5-6	Number of data subsets
7	Bit 1 = 1 Observed data Bit 1 = 0 Other data Bit 2 = 1 Compressed data Bit 2 = 0 Non compressed data Bits 3-8 set to zero (reserved)
8-	A collection of element descriptors, replication descriptors, operator descriptors and sequence descriptors, which define the form and contents of individual data elements comprising one data subset in the data section.

BUFR Descriptor



- BUFR descriptor: a set of 16 bits divided into 3 parts: F, X, and Y
  - F denotes the type of descriptor.
    - F = 0 ➔ Element descriptor (Table B entry)
    - F = 1 ➔ Replication operator
    - F = 2 ➔ Operator descriptor (Table C entry)
    - F = 3 ➔ Sequence descriptor (Table D entry)
  - X (6 bits: 00-63) indicates the class or category of descriptor.
  - Y (8 bits: range from 00-255) indicates the entry within a class X.

BUFR Descriptor: example

Section 3 (Data Description)		Section 4 (Data)	
012245	Descriptor (pointer)	101	BUFR message

Class 12 - Temperature

TABLE REFERENCE			TABLE ELEMENT NAME	BUFR			
				UNIT	SCALE	REFERENCE VALUE	DATA WIDTH (Bits)
F	X	Y					
0	12	001	Temperature/dry-bulb temperature	K	1	0	12
0	12	002	Wet-bulb temperature	K	1	0	12
0	12	245	Temperature	C	1	-2732	14

1) F = 0 : table B
2) X = 12 : class 12 (temperature)
3) Y =245 : NCEP defined temperature

245 entry in the class 12 (temperature class) of BUFR table B is NCEP defined temperature entry

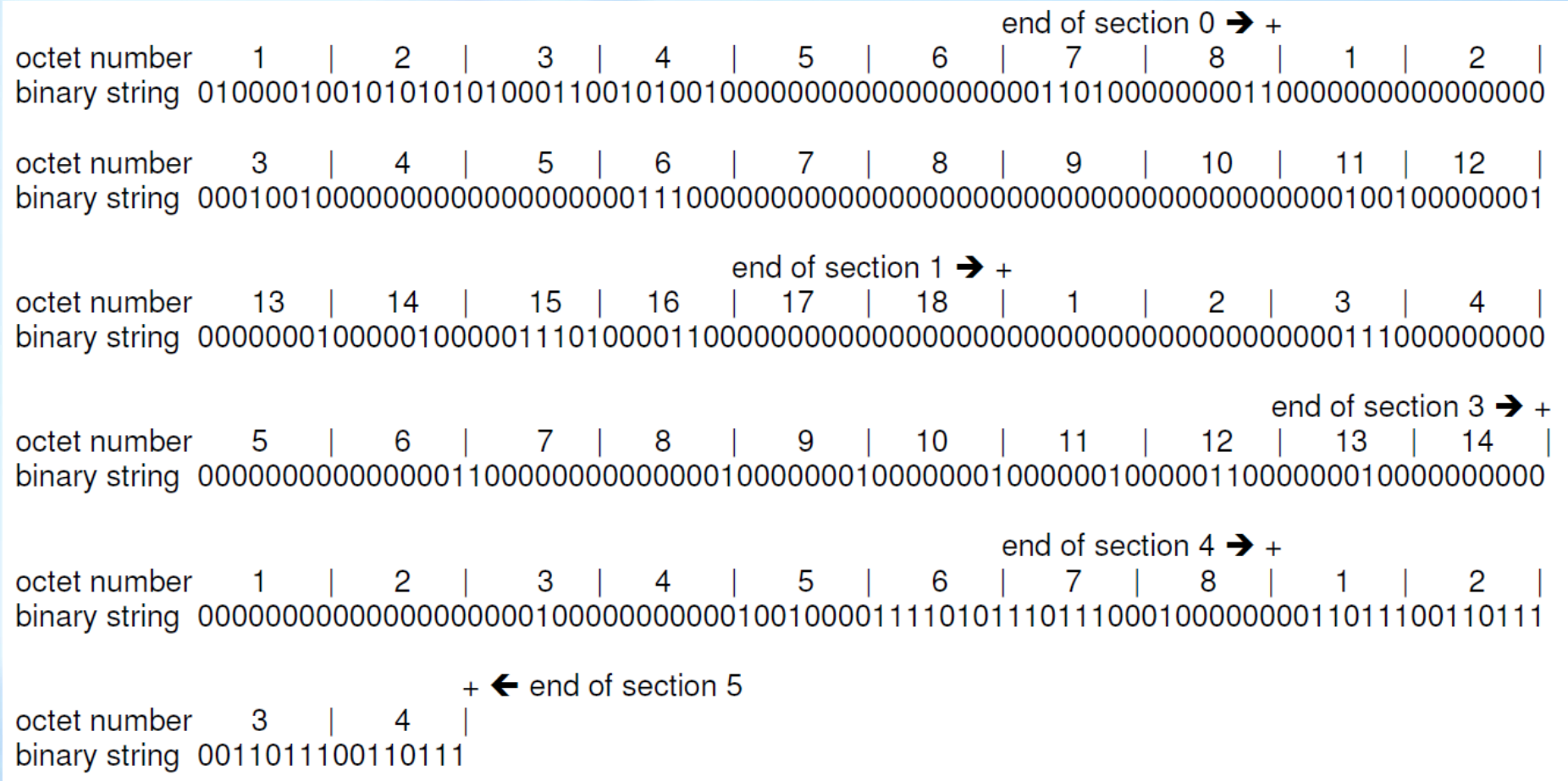
Data Section: Section: 4

Octet number	Content
1-3	Length of section in bytes
4	set to zero (reserved)
5-	Binary data as defined by sequence descriptors

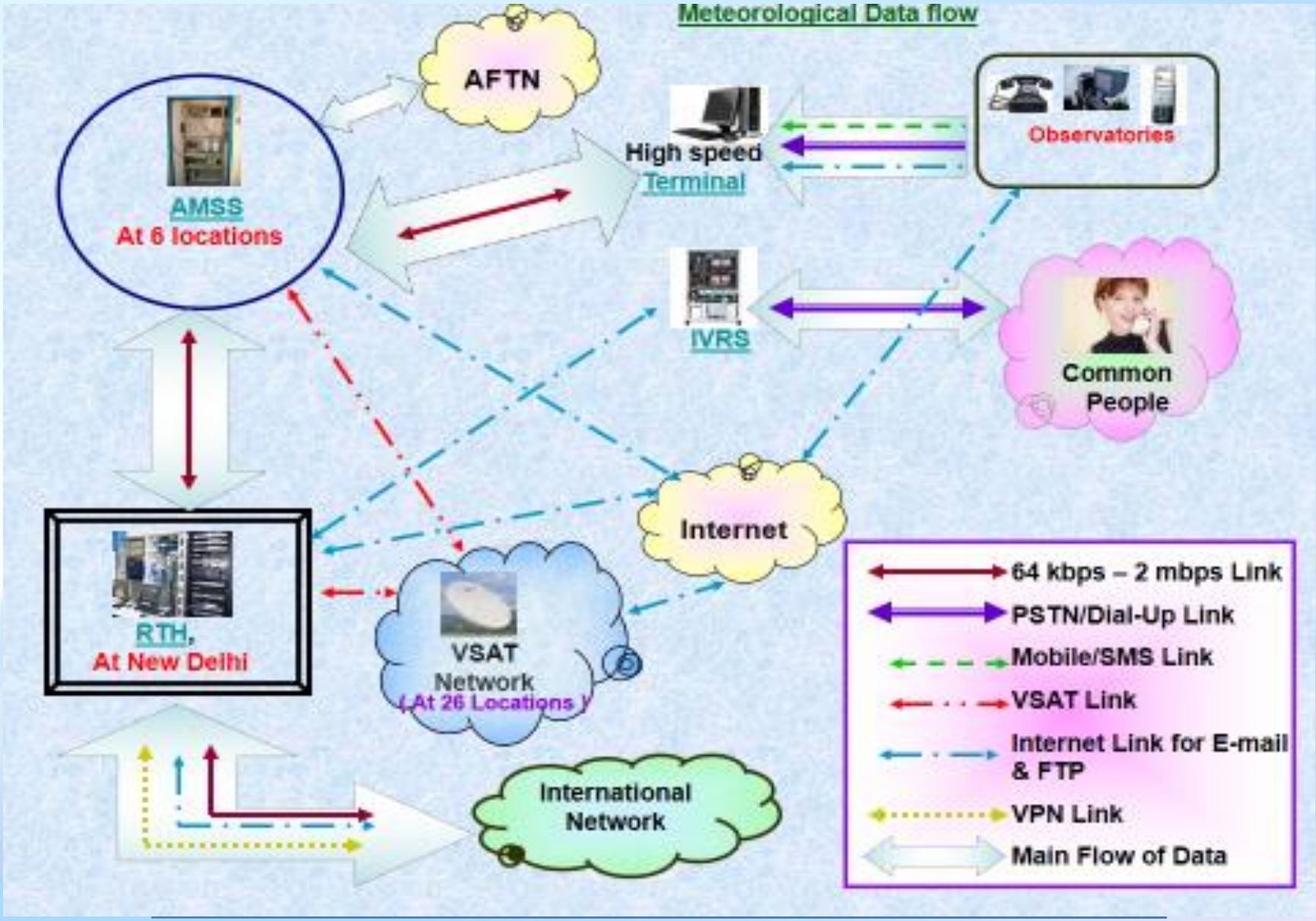
End section : Section: 5

Octet number	Content
1-4	”7777” (coded according to the CCITTIA No 5)

Example of a complete BUFR message containing 52 octets



MET Data Flow



Main function of AMSS

AMSS (Automatic Message Switching System) is the backbone for observational data collection and distribution within India.

From observatory data is collected by AMSS through High Speed Data Terminal (HSDT), locally developed web portals of AMSS, Email, Telephone etc.

AMSS is the sole provider of Indian Meteorological data to Aeronautical Fixed Telecommunications Network (AFTN) for Aviation.

There are six AMSS in India namely Delhi, Chennai, Mumbai, Kolkata, Guwahati and Nagpur. These AMSS are connected among themselves as well as Regional Telecommunication Hub (RTH) at New Delhi. RTH New Delhi gets all the meteorological observations/data of whole India through the six AMSS.

Area of Responsibility of AMSS:

Respective RMC.

Main function of RTH

RTH New Delhi gets all the meteorological observations/data of whole India through the six AMSS.

RTH, New Delhi is also connected to various foreign cities/countries like Tokyo, China, Moscow, Melbourne, Dhaka, Colombo, Tehran, UK, Melbourne etc. through various dedicated as well as Internet links.

India meteorological data is distributed to these countries as per mutual agreement with WMO.

Similarly RTH, New Delhi gets data all over the world through those links.

RTH New Delhi transmitted those data to RMC, MC and other forecasting centres of India through the AMSS.

Area of Responsibility of RTH New Delhi:

Bangladesh, Bhutan, India, Maldives, Myanmar, Nepal, Pakistan, Sri Lanka, adjacent sea and ocean areas

Communication Protocol between systems

FTP (File Transfer Protocol):

FTP is an application layer protocol that is used for transferring both text and binary files over the Internet.

Client / Sender login to the FTP Server using username and password and put data in a specified folder. Port no. 21 of FTP server is used for login to the server where as port no. 20 of the FTP Server is used for uploading the data to the server.

Different communication servers send data at different folders of the FTP server of Message Switching System. The message switching system recognizes different source of data by the data uploaded at different folders of the server.

Communication Protocol between systems

TCP/IP Socket Connection:

Socket of one end of a peer-to-peer connection of a TCP/IP based distributed network application is uniquely defined by two parameters.

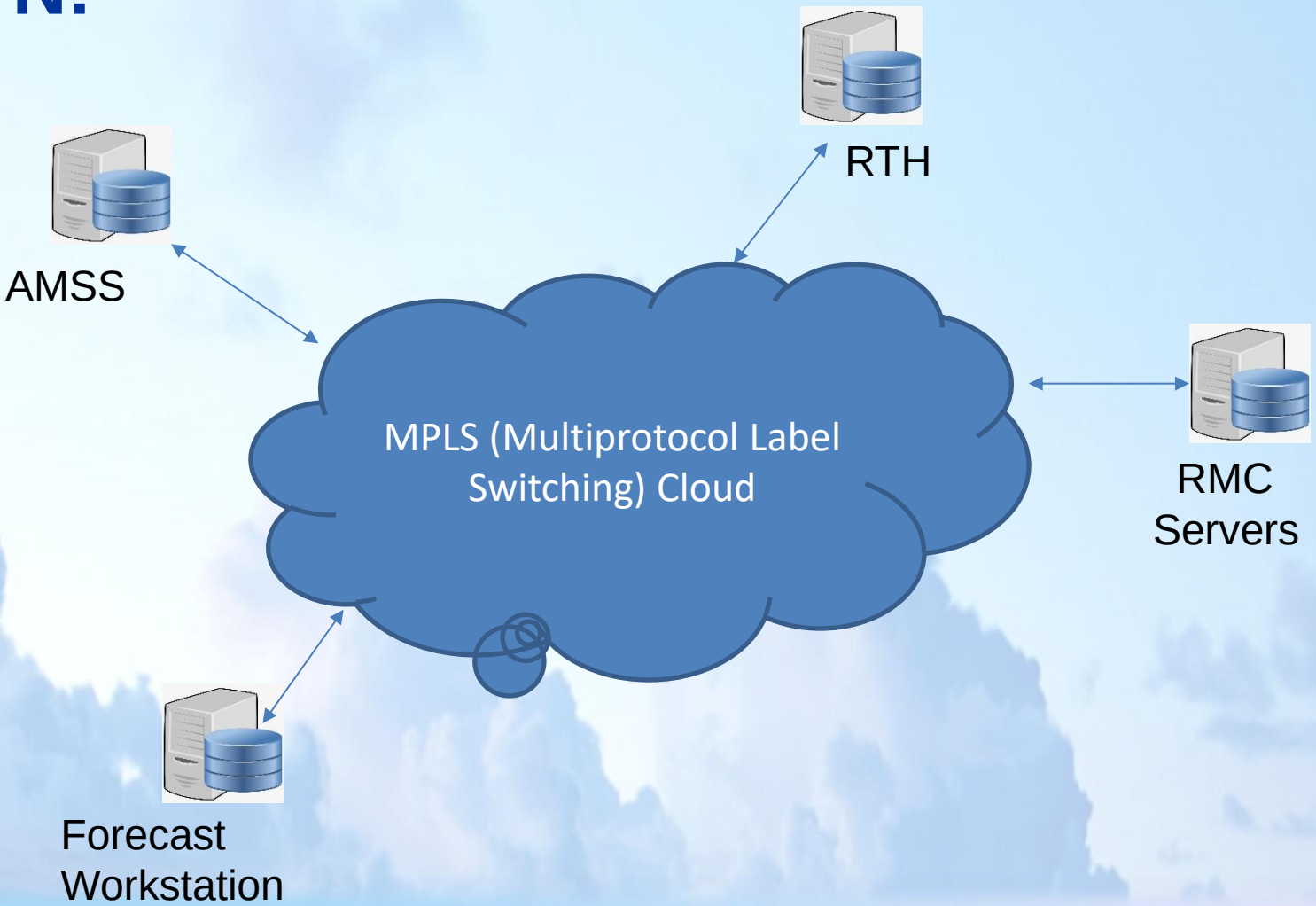
1. Internet address
   - for example 210.212.116.31 (in an IPv4 network) or FF01::101 (in an IPv6 network).

2. Port
   - A numerical value, identifying an communication application
     - ✓ for example port 60000, port 60001, port 63065 etc.

Various communication systems can send data to a particular message switching system at different ports. The recipient server can recognise different source by the different ports associated by different sources and accordingly show data received from different sources.

Communication Medium

IPVPN:



Communication Medium

Internet:

Observational data is transmitted from observatory by Email or Web based message submission system using Internet.

Data communication channels are also setup among MET Communication Servers (AMSS, RTH etc.) and MET data processing systems using internet as backup communication medium.

Communication Medium

(National Knowledge Network) NKN:

It has two types of links / channels.

- **Internet:**

  Generally it is used for Internet browsing by clients, Hosting of Web / FTP servers etc.

- **Data Link:**

  It is mainly used for secured data communication through VPN. This VPN is separate from IMD IPVPN.

Monitoring of Messages / Channels at AMSS/RTH

One of the main purpose of RTH as well as AMSS system is to monitor various types of messages for their timely reception.

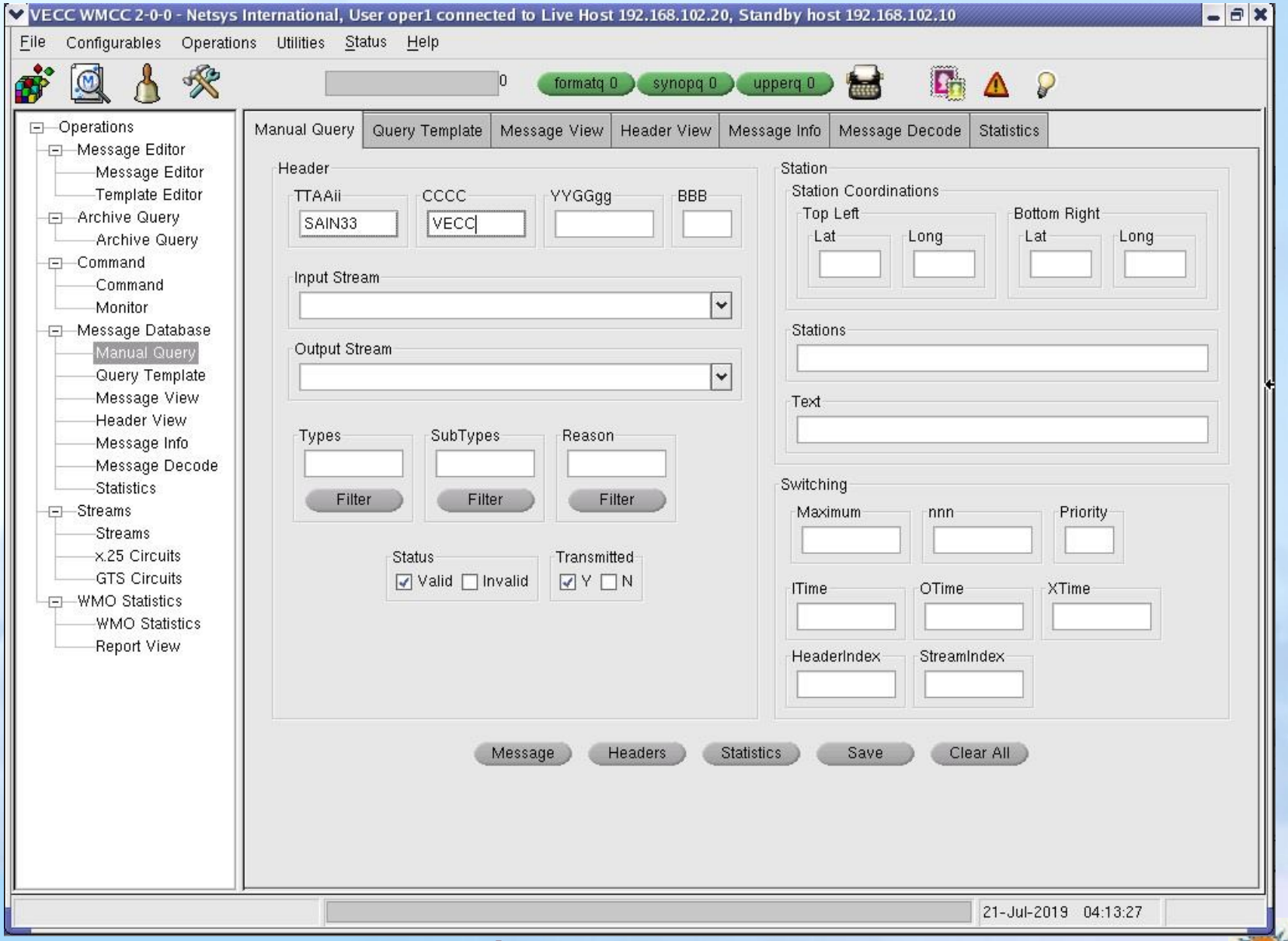
If any message is not received, then it is the duty of the Duty Officer/staff to contact the respective user responsible for data transmission for immediate transmission of data. If the existing link for data transmission is unserviceable, then alternate arrangement is to be made for immediate collection of data.

Data can be monitored using varios parameters like TTAAii, CCCC, station code, date and time (DDYYgg) etc.

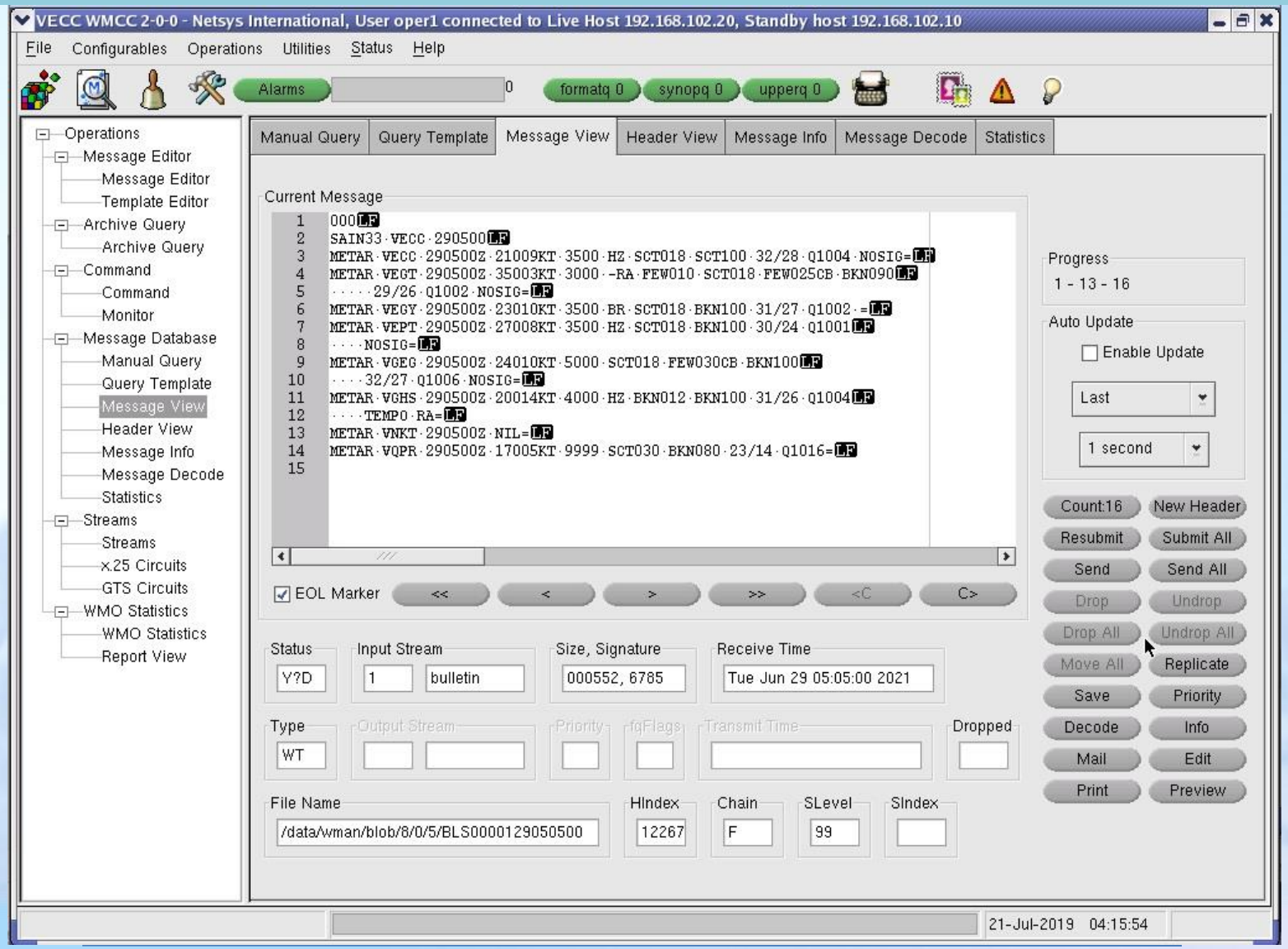
Another important aspect of this monitoring tool is the detection of messages with wrong message format. If there is any message with wrong format, then the message is sent by the system in a error queue and highlighted prominently and the message is prevented from transmission. Once the message is corrected by the on duty staff, the corrected message is transmitted.

All the data channels of AMSS / RTH are also monitored for any disruption due to link falure.

Monitoring Tool



Monitoring Tool



RTH/AMSS Scheduler

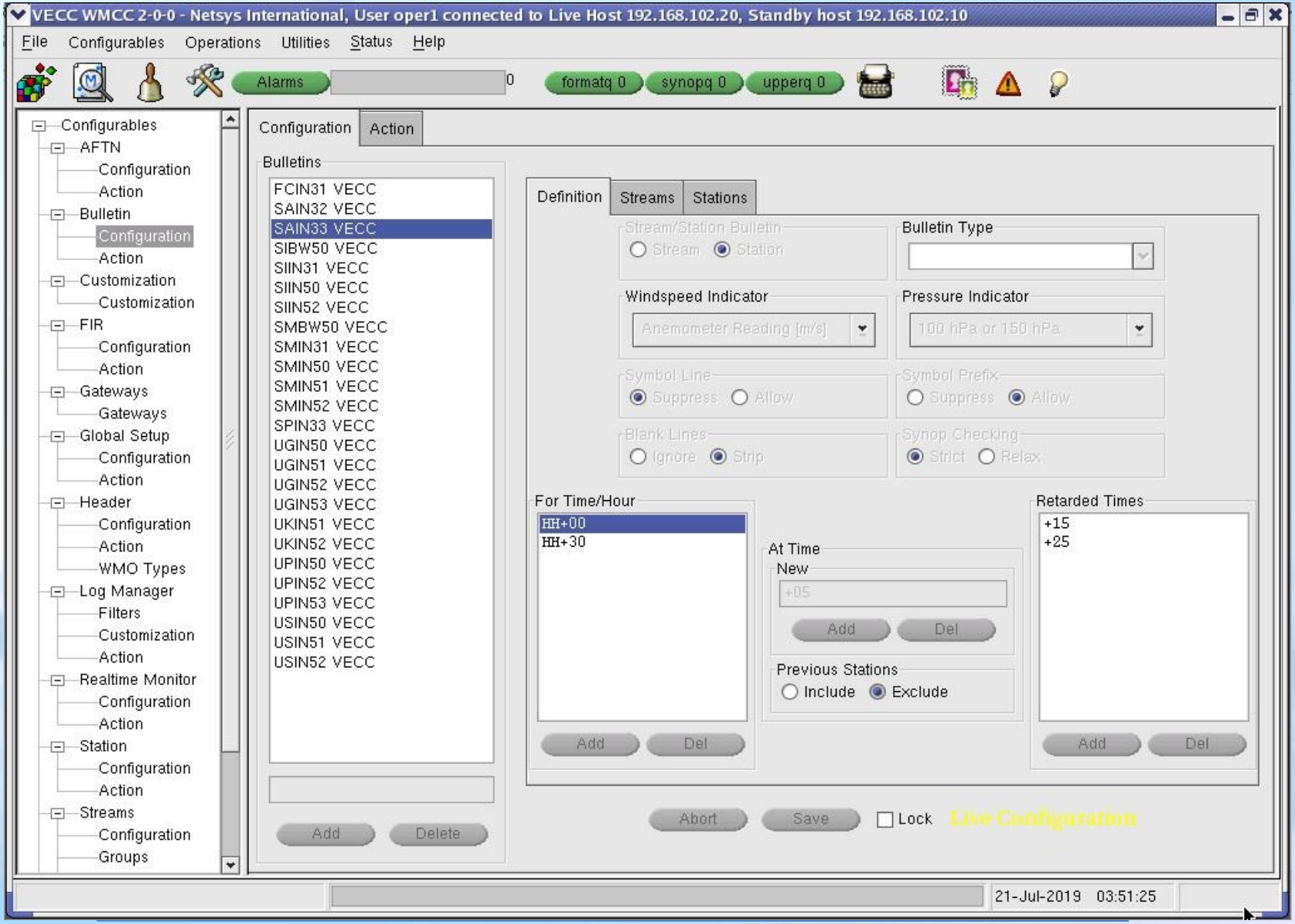
In RTH as well as AMSS, scheduler is a very important modules of the system.

This scheduler is used to transmit a message with a particular header at a predefined time.

The scheduler can perform repetitive task at predefined times of every hour, at predefined times of a day, at a predefined time in a month etc.

Often this scheduler is associated with Bulletin generation and transmission of bulletin at predefined time using the help of scheduler.

RTH/AMSS Scheduler



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Data transmission channel for AMSS/RTH

In RTH as well as AMSS, there is GUI to configure data channel.

By configuring this channel, we define what types of messages will be transmitted to a particular station from another station.

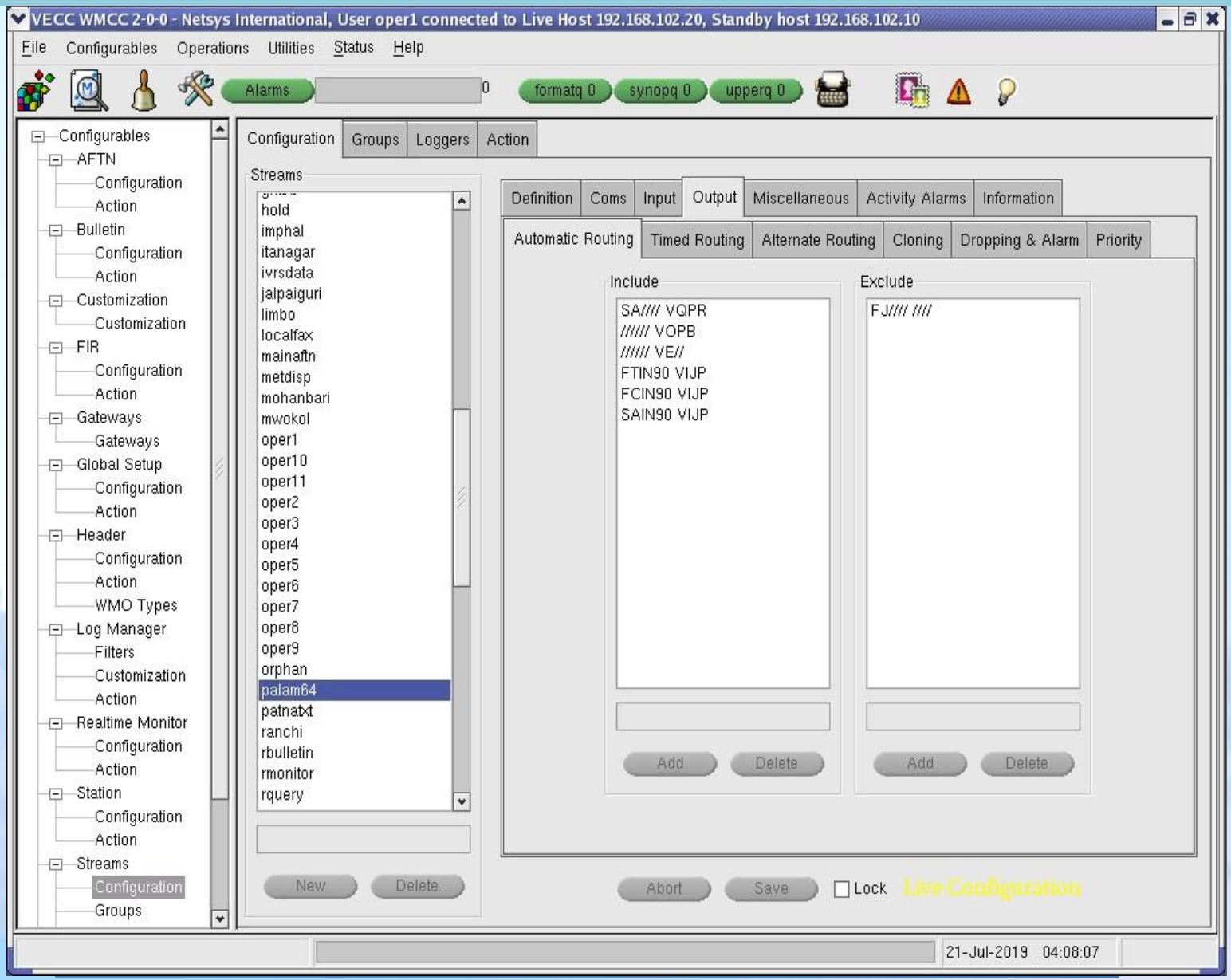
There is configuration for both incoming as well as outgoing messages.

The configuration of outgoing and incoming messages is through Message headers.

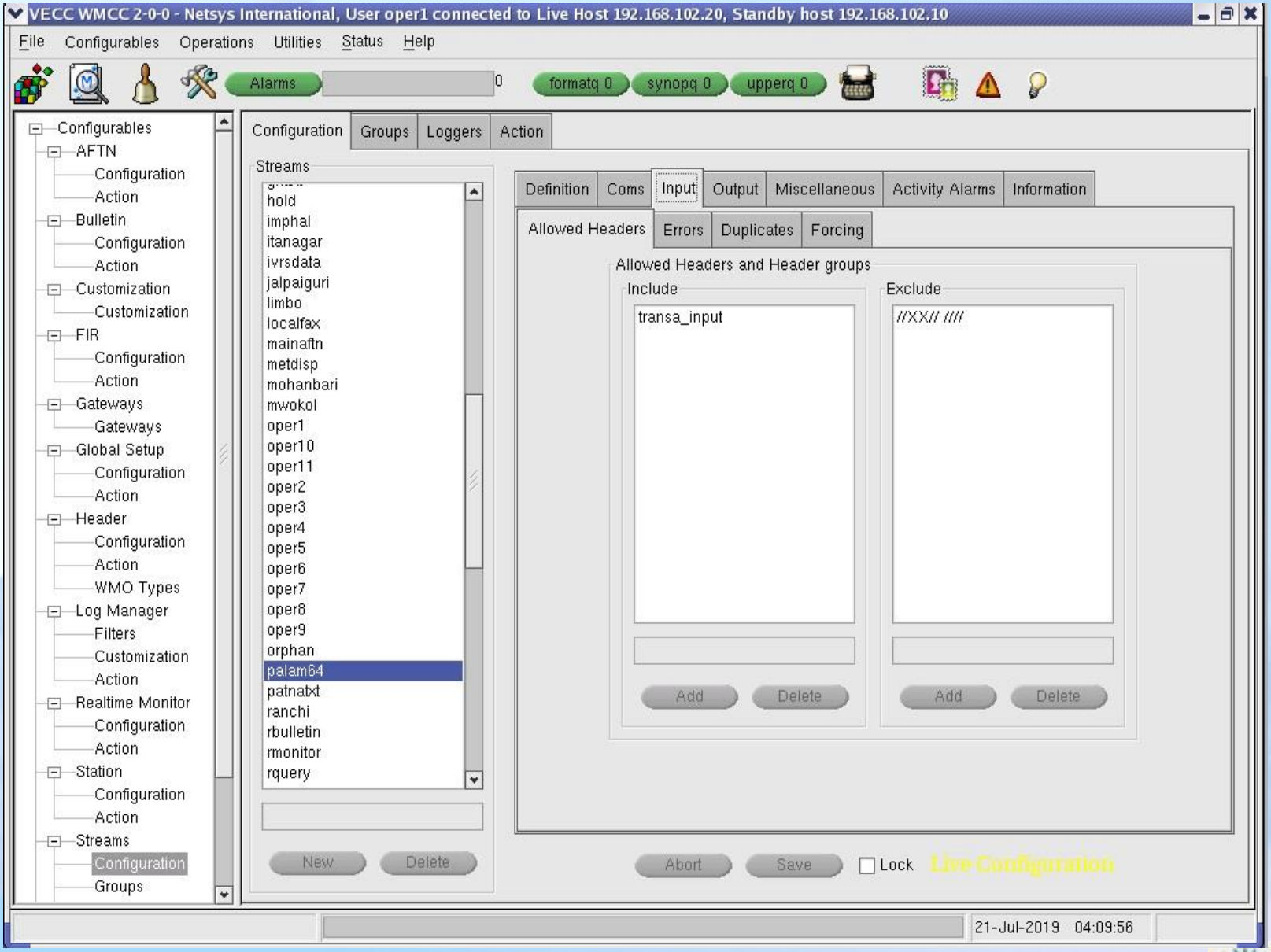
In configuration of outgoing and incoming messages, wild cards are used to configure group of messages using one wild card header.

There is also configuration for types of protocol to be used for data communication i.e. socket, FTP, Email etc. along with destination Server IP, Email etc.

Data transmission channel for AMSS/RTH (Output)



Data transmission channel for AMSS/RTH (Input)



ROUTING CATALOGUES of RTH

The routing catalogue should be produced as an ASCII file, which could be imported into database applications. The information should therefore be presented in a database structure.

The file containing the routing catalogue of a GTS centre should be named: CCCCROCA.TXT, where CCCC is the location indicator of the centre.

The date of the preparation of the catalogue should be inserted in the first line of the line as YYYYMMDD (where YYYY is the year, MM the month and DD the day).

ROUTING CATALOGUES of RTH

For each abbreviated heading, a records should comprise the following fields

Field number	*Contnt*	*Width*
1	**Abbreviated heading TTAAii CCCC**	**11**
2	**GTS circuit from which the bulletin is received**	**4**
3	**circuit to which the bulletin is sent**	**4**
As many additional fields in the format of field No.3 as additional circuits to which the bulletin is sent.		

Sample of structure of DEMSROCA.TXT (DEMS=India):

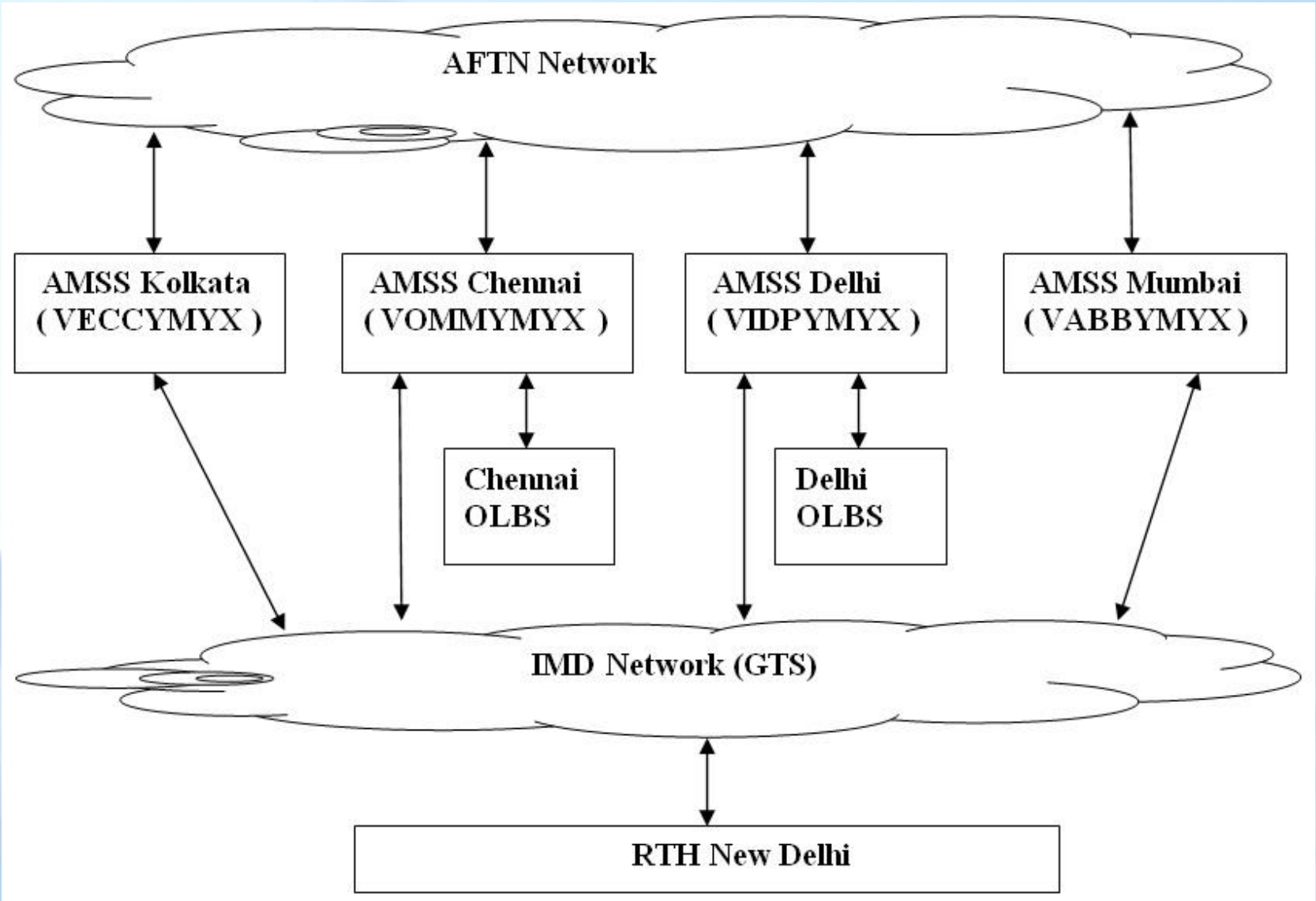
20170623
“SMAA01 EGRR”,“RJTD”,“ANOU”,“NFFN”,“NTAA”,“NZKL”,“PMBY”
“SMAA01 EGRR”,“KWBC”,“NZKL”
“SMAA10 KWBC”,“EGRR”,“NFFN”,“NTAA”,“NZKL”,“WIIX”

Online Met Briefing System (OLBS)

Online Met Briefing System (OLBS) provides weather information to pilots, dispatchers and air traffic controllers to support flight safety and efficiency. It provides a crucial service to the national and international civil aviation sector in fulfillment of the requirements prescribed by the International Civil Aviation Organization (ICAO) and the Director General of Civil Aviation of India (DGCA).

OLBS Server is a combination of a Message Handler and a Web Server. It is connected to the AMSS/RTH communication server and handles messages. Hence it receives global aviation data and products through AMSS/RTH. The web-server provides web pages for online Met Briefing as well as data input pages to input Take Off data, Local Weather Forecast, Warnings etc., by other Met Offices. All products are either automatically uploaded on receipt from AMSS/RTH or product generator upload using web-pages.

On Line Briefing System (OLBS) connectivity



OLBS Products

The products uploaded in OLBS can be classified as

1. **Scheduled products, which are to be uploaded and made available always and**
2. **Non-scheduled products are uploaded as and when the products are generated by the issuing offices. All timings are in UTC.**

OLBS Scheduled Products:

METAR:

Originator: AMS and AMOs

Time of observation: HH+00, HH+30

It is required to transmit METAR within 05 minutes of observation. After transmission, the data is automatically received by OLBS through the communication network of IMD and AFTN.

OLBS Scheduled Products:

Short TAF Schedule:

Validity	Issue Time/Upload Time
00-09	2300
03-12	0200
06-15	0500
09-18	0800
12-21	1100
15-24	1400
18-03	1700
21-06	2000

Long TAF Schedule:

Validity	Issue Time/Upload Time
00-06	2300
06-12	0500
12-18	1100
18-24	1700

OLBS Scheduled Products:

Take-Off Data Schedule:

Validity	Issue Time/Upload Time
0100-0600	0030
0400-0900	0330
0700-1200	0630
1000-1500	0930
1300-1800	1230
1600-2100	1530
1900-2400	1830
2200-0300	2130

Area forecast Schedule:

Validity	Issue Time/Upload Time
0600-1400	0530
1400-2200	1330
2200-0600	2130

OLBS Scheduled Products:

World Area Forecast Centre (WAFC) Wind/Temp Charts:

Validity Time in UTC
0000
0600
1200
1800

World Area Forecast Centre (WAFC) Significant Weather (SIGWX) Charts:

Validity Time in UTC
0000
0600
1200
1800

IMD Wind/Temp Charts:

Validity Time in UTC
0000
0600
1200
1800

OLBS Scheduled Products:

- - Radar Pictures:
- Originator: DWR Stations
- Time Of Issue: Every 10 minutes
- Mode of collection and upload: FTP

- - SAT Images:
- Originator: SAT Met, New Delhi
- Time of Issue: Every 30 Mts
- Mode of collection: FTP

- - IWB:
- Originator: IMD, Pune
- Time of Issue: Based on 0300UTC and 1200UTC
- Mode of collection and upload: AMSS through RTH New Delhi

OLBS Non-Scheduled Products:

- These products are generated by Offices whenever certain weather phenomena occur in the area concerned. They are i. Aerodrome Warning, ii. SIGMET iii. Tropical Cyclone Advisories.

i. Aerodrome Warning:

- Originator: AMO
- Mode of collection and upload: OLBS WEB form

ii. SIGMET:

- Originator: MWO
- Mode of collection and upload: AMSS

iii. Tropical Cyclone Advisories:

- Originator: TCAC, New Delhi
- Mode of collection and upload: Received through Email and uploaded using Graphical Tropical Cyclone Advisory

WMO Information System (WIS)

The WMO Information System (WIS) acts as a one-stop shop for all activities related to data management.Users with access privileges can easily find and retrieve all the weather, climate and water data and products they need in one place. Data and products that are of worldwide interest remain available in the 24-hour GISC cache. Authorized users can gain immediate access to data without waiting for requests to be routed through various GTS hubs before the data can be delivered.

WIS enables discovery of authoritative meteorological and hydrological data and supports the collection of data and its exchange between WMO Centres and their users. The "WIS Catalogue" describes the data and products available across WMO Centres. Data and products are registered with the WIS by submitting a metadata record to the WIS Catalogue that describes the content, structure and access mechanisms for the associated data or product.

The majority of data and products published through WIS are provided as files and made available via FTP servers or distributed using the Global Telecommunication System (GTS) for exchange between collaborating Centres. However, the Web is increasingly used to publish data on WIS.

WIS Structure

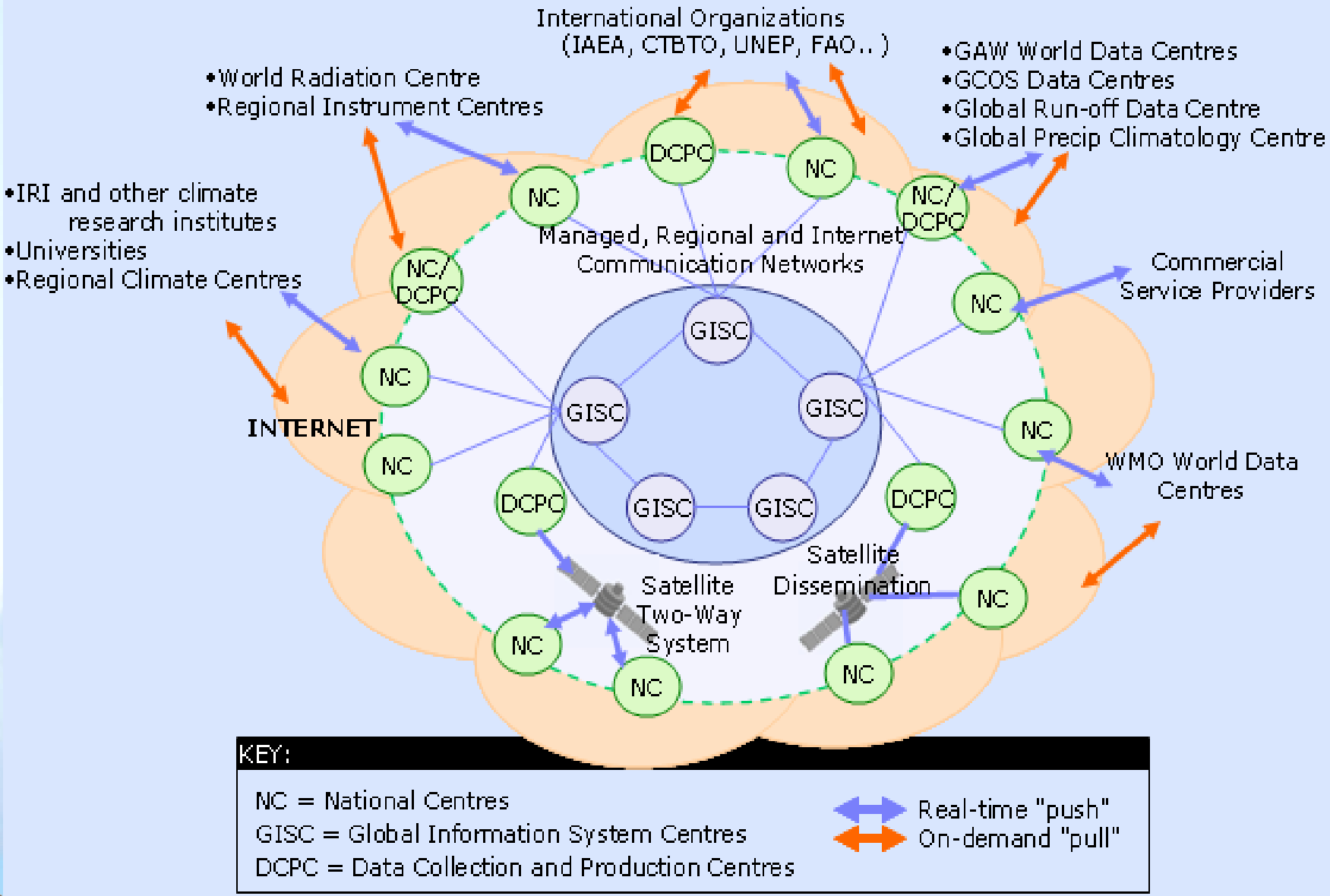
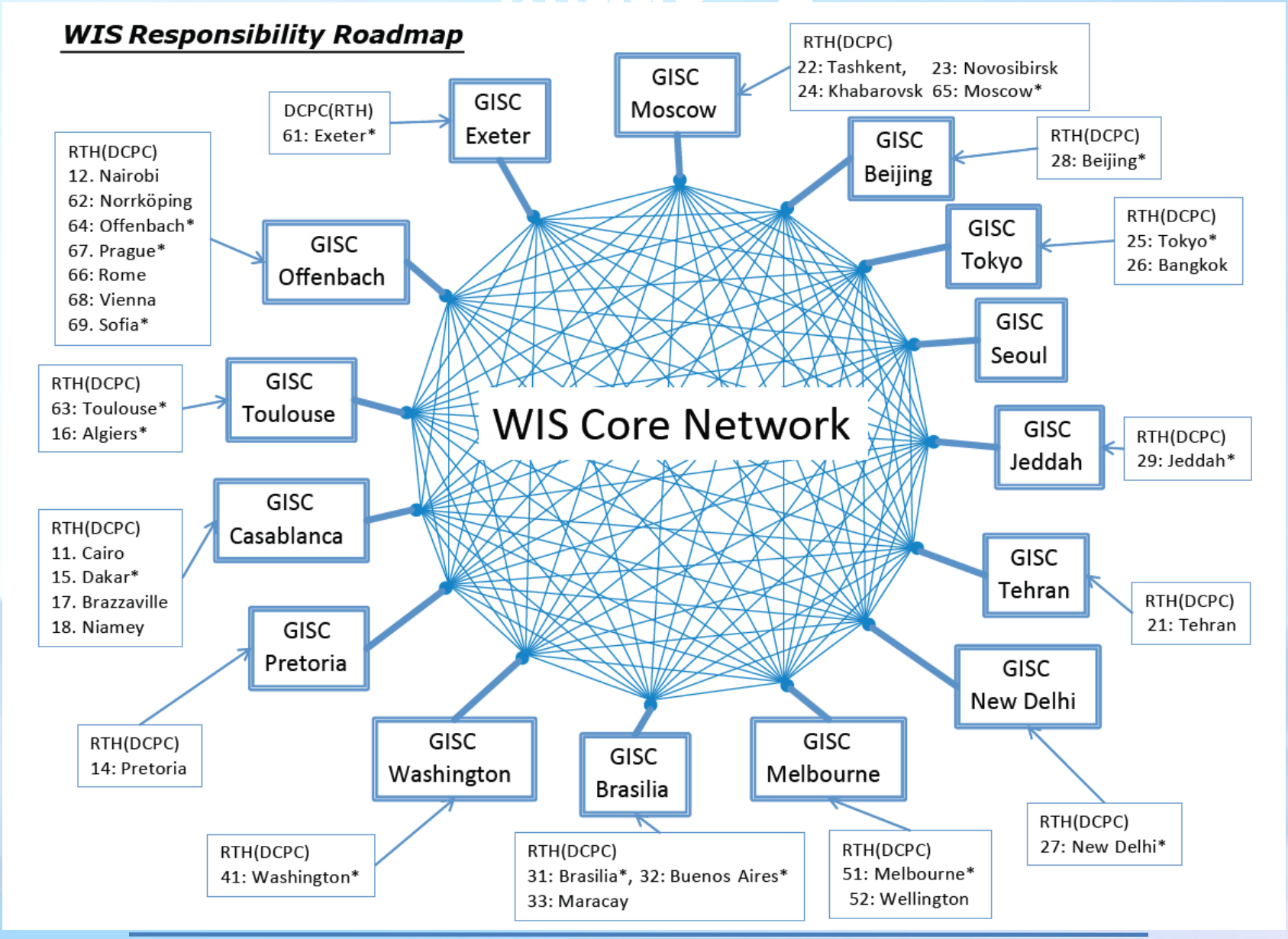


Image - 1


WIS Responsibility Roadmap
WIS Core Network
GISC Moscow
RTH(DCPC)
22: Tashkent, 23: Novosibirsk
24: Khabarovsk 65: Moscow*
GISC Exeter
DCPC(RTH)
61: Exeter*
GISC Beijing
RTH(DCPC)
28: Beijing*
GISC Offenbach
RTH(DCPC)
12. Nairobi
62: Norrköping
64: Offenbach*
67. Prague*
66: Rome
68: Vienna
69. Sofia*
GISC Tokyo
RTH(DCPC)
25: Tokyo*
26: Bangkok
GISC Seoul
GISC Toulouse
RTH(DCPC)
63: Toulouse*
16: Algiers*
GISC Jeddah
RTH(DCPC)
29: Jeddah*
GISC Casablanca
RTH(DCPC)
11. Cairo
15. Dakar*
17. Brazzaville
18. Niamey
GISC Tehran
RTH(DCPC)
21: Tehran
GISC Pretoria
GISC New Delhi
RTH(DCPC)
14: Pretoria
GISC Washington
GISC Brasilia
GISC Melbourne
RTH(DCPC)
27: New Delhi*
RTH(DCPC)
41: Washington*
RTH(DCPC)
31: Brasilia*, 32: Buenos Aires*
33: Maracay
RTH(DCPC)
51: Melbourne*
52: Wellington

WIS Structure

The main components of WIS are: National Centres (NC), Data Collection and Product Centres (DCPC), Global Information System Centres (GISC) and data communication networks connecting the components.

NCs (National Centres):

NCs (National Centres) can be established in each WMO member state. They are responsible for collecting national observation data and submitting them to the WIS network. NCs are also responsible for domestic data distribution networks.

DCPCs (Data Collection and Production Centres):

DCPCs are Centres that fulfil, within specific international responsibility, for the generation and provision of data, forecast products, processed or value-added information, and/or for providing archiving services, are referred to as DCPC. DCPCs also provide metadata catalogues, Internet portals and data access management. Examples of DCPCs are the Regional Specialized Meteorological Centres (RSMC) with activity specialization or geographic specialization, as well as the Regional Climate Centres, the Hadley Centre (UK), ECMWF and EUMETSAT etc.

WIS Structure

Global Information System Centre (GISC):

Global Information System Centres (GISCs) are operated by WMO Members as a major component of the WMO Information System (WIS) infrastructure. A GISC's primary role is to collect from and disseminate information to WIS centres in its area of responsibility and with the global WMO community. GISCs also provide search portals through which information from WMO and other interoperable systems can be discovered and accessed.

Global Information System Centres (GISC) are networks hubs that maintain synchronized copies of the WIS Catalogue, provide a portal to search the WIS Catalogue, maintain a cache of data and products for near-real-time exchange between operational centres and offer mechanisms to download or subscribe to data and products within the cache. It is important to note that this "global cache" represents a very small subset of the data that is discoverable on WIS.

Aeronautical Fixed Telecommunication Network (AFTN)

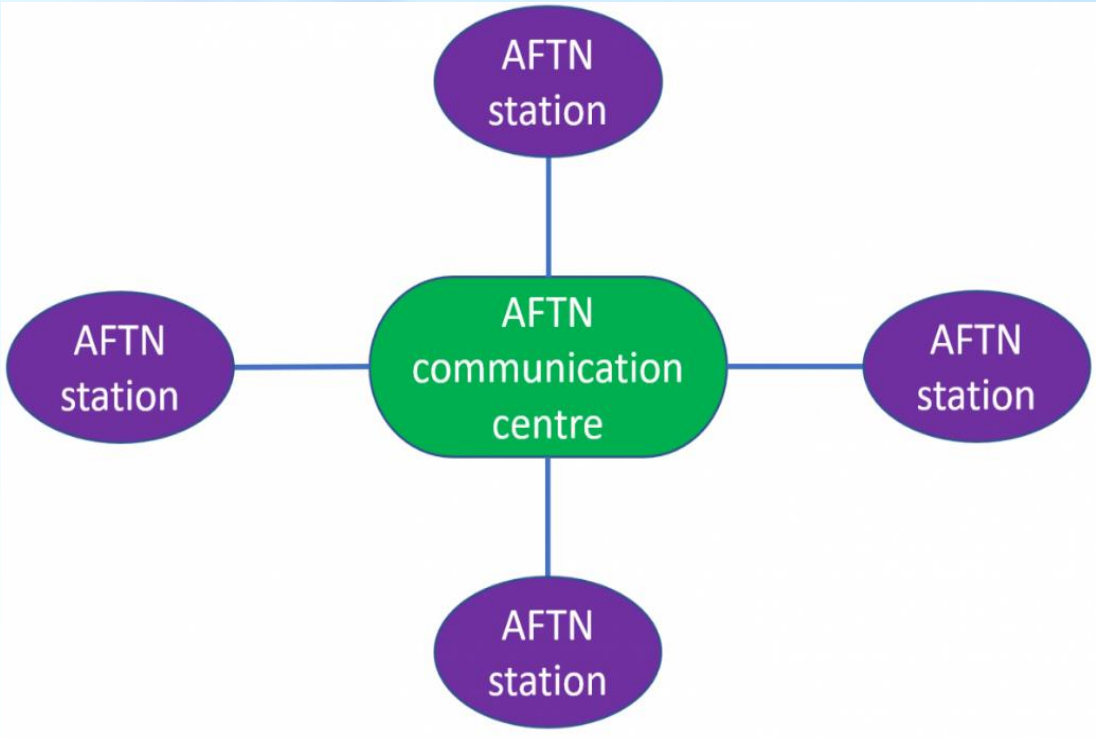
Definition

A worldwide system of aeronautical fixed circuits provided, for the exchange of messages and digital data between aeronautical fixed stations having the same or compatible communications characteristics.

Description

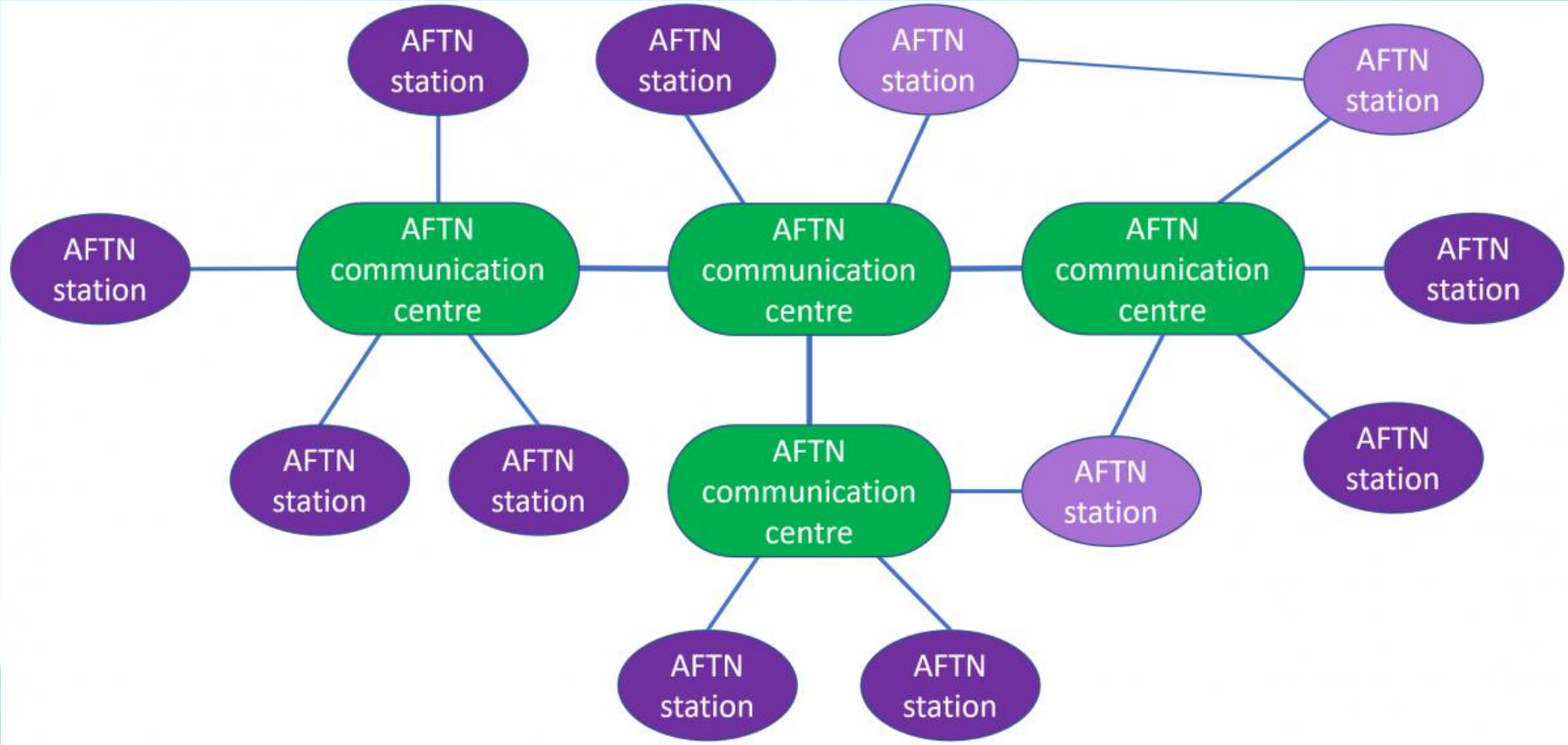
The AFTN uses two types of aeronautical fixed stations - AFTN communication centres and AFTN stations. The AFTN communication centre is an AFTN station whose primary function is to relay AFTN messages to or from a number of other interconnected AFTN stations.

An example of an AFTN circuit



At the majority of aerodromes where ATS is provided, there is an AFTN station. A number of such stations grouped together around an AFTN Centre and form an AFTN circuit.

An example of a network of AFTN centres



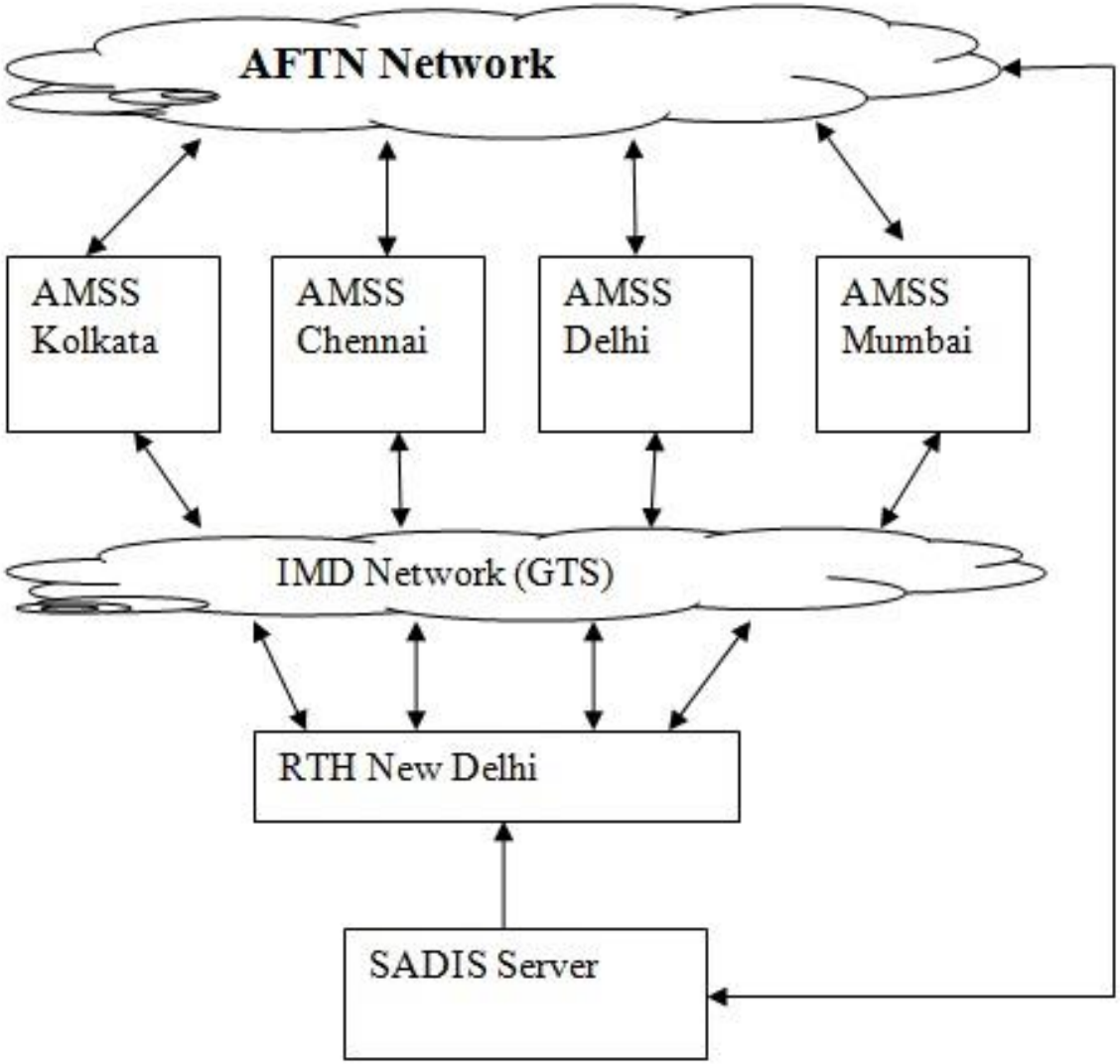
Several AFTN communication centres, when connected to each other, form a network of fixed aeronautical telecommunication lines through which every AFTN station can be reached. Sometimes AFTN stations are connected to more than one centre or to other stations.
The AFTN stations are connected using terrestrial or radio lines.

Aeronautical Fixed Telecom Network (AFTN)

AFTN (Aeronautical Fixed Telecom Network) is the dedicated telecommunication network used for exchange of aeronautical messages and data between different aeronautical stations. It is also the primary channel for exchange of Operational Met Messages(OPMET)between different Aerodrome Met Offices and Aeronautical Met Stations.

The IMD departmental telecommunication network is linked to AFTN through six AMSS centers located at Delhi, Kolkata, Mumbai, Chennai, Nagpur and Guwahati.

AFTN and GTS Network Connectivity



AFTN Message Format

AFTN messages consist of a heading, message text and an ending.

The heading consists of:

- **a heading line, containing message identification**
- **an address line, containing a priority indicator and the AFTN addresses the message is to be sent to**
- **originator information, containing the filing time and the AFTN address of the sender**

The message text uses plain text (capital letters, numbers and special characters).

End-of-Message Signal is the four characters NNNN. The Ending itself comprises twelve letter shift signals which represent also a Message-Separation Signal

AFTN Addresses

An AFTN address comprises the following:

- **The four-letter location indicator**
- **The three-letter designator identifying the organization/section.**
- **An additional letter, representing a department within the organization. The letter X is used to complete the address when explicit identification is not required.**

Example: Address EBLGZTZX is decoded as location EBLG (Liège Airport), organization ZTZ (aerodrome control tower) and additional letter X (explicit identification is not required).

AFTN Address System

Organization/section designators:

Facility code	refers to
YNYX	"NOTAM Office"
YZYX	"Met Data Bank"
YMYX	"Local Met Office"
YFYX	"AFTN Office"
ZTZX	"Control tower"
ZPZX	"ATS Reporting Office"
ZQZX	"Area Control Center"

As per the above addressing system, The AFTN address VIDPYMYX will refer to Met Office of Delhi (Palam) airport (VIDP is the ICAO Code of Delhi) and VOMMZTZX will refer to Control Tower Chennai airport (VOMM is the ICAO Code of Delhi).

Message Categories and Priority Indicators

The following categories are accepted for transmission by the aeronautical telecommunication service:

- **Distress messages (priority indicator SS). This message category comprises messages sent by aircraft reporting that they are threatened by imminent danger and all other messages relative to the immediate assistance.**

- **Urgency messages (priority indicator DD). This category comprises messages concerning the safety of a ship, aircraft or other vehicles, or of some person on board or within sight.**

- **Flight safety messages (priority indicator FF) comprise movement and control messages, messages by the operator that are of immediate concern to aircraft and some meteorological messages (SIGMET, special air-reports, AIRMET, volcanic ash and tropical cyclone advisories).**

- **Meteorological messages (priority indicator GG) comprise messages concerning forecasts (TAFs) and observations and reports (METAR, SPECI).**

  Flight regularity messages (priority indicator GG) comprise e.g. messages concerning aircraft servicing, non-routine landings, aircraft arrival or departure, parts and materials urgently required for the operation of aircraft, NOTAMs etc.

  .

- **Aeronautical administrative messages (priority indicator KK) comprise messages regarding the operation or maintenance of facilities, the functioning of aeronautical telecommunication services etc.**

The order of priority for the message transmission is:

1. **SS**
2. **DD**
3. **FF**
4. **GG**
5. **KK**

Example of an AFTN message:

IMD2236 130505

GG OPZZYPYX RJAAYPYX RJTDYPYX RJTDYZYX VABBYPYX VCCCYPYX VECCYJYX<
VECCYPYX VGEGYPYX VGHSYPYX VHZZYPYX VIDPCTFM VIDPYPYX VNKTYPYX<
VTBBYPYX VTBBYZYX WSSSYZYX WSZZYPYM YBBBYPYX YBZZSPWX
281305 VECCYMYX
SAIN33 VECC 281300
METAR VECC 281300Z 20010KT 3600 HZ SCT018 SCT100 31/27 Q1003 NOSIG=
METAR VEGT 281300Z 00000KT 4000 BR SCT018 BKN100 30/26 Q1001 NOSIG=
METAR VEGY 281300Z 00000KT 3000 HZ SCT020 BKN100 33/27 Q1001=

In the above message:

Sequence number is 2236,

Transmit Time is 130505.

Priority is GG,

Transmit Date and time: 281305

Originating Station: VECCYMYX

Destination addresses: OPZZYPYX RJAAYPYX RJTDYPYX RJTDYZYX VABBYPYX VCCCYPYX VECCYJYX VECCYPYX VGEGYPYX VGHSYPYX VHZZYPYX VIDPCTFM VIDPYPYX VNKTYPYX
VTBBYPYX VTBBYZYX WSSSYZYX WSZZYPYM YBBBYPYX YBZZSPWX

Message header: SAIN33 VECC 281300

Messages:

METAR VECC 281300Z 20010KT 3600 HZ SCT018 SCT100 31/27 Q1003 NOSIG=
METAR VEGT 281300Z 00000KT 4000 BR SCT018 BKN100 30/26 Q1001 NOSIG=
METAR VEGY 281300Z 00000KT 3000 HZ SCT020 BKN100 33/27 Q1001=

Secure Aviation Data Information Service (SADIS)

SADIS 2G provides a point to multi-point service on a 24-hour basis via satellite.

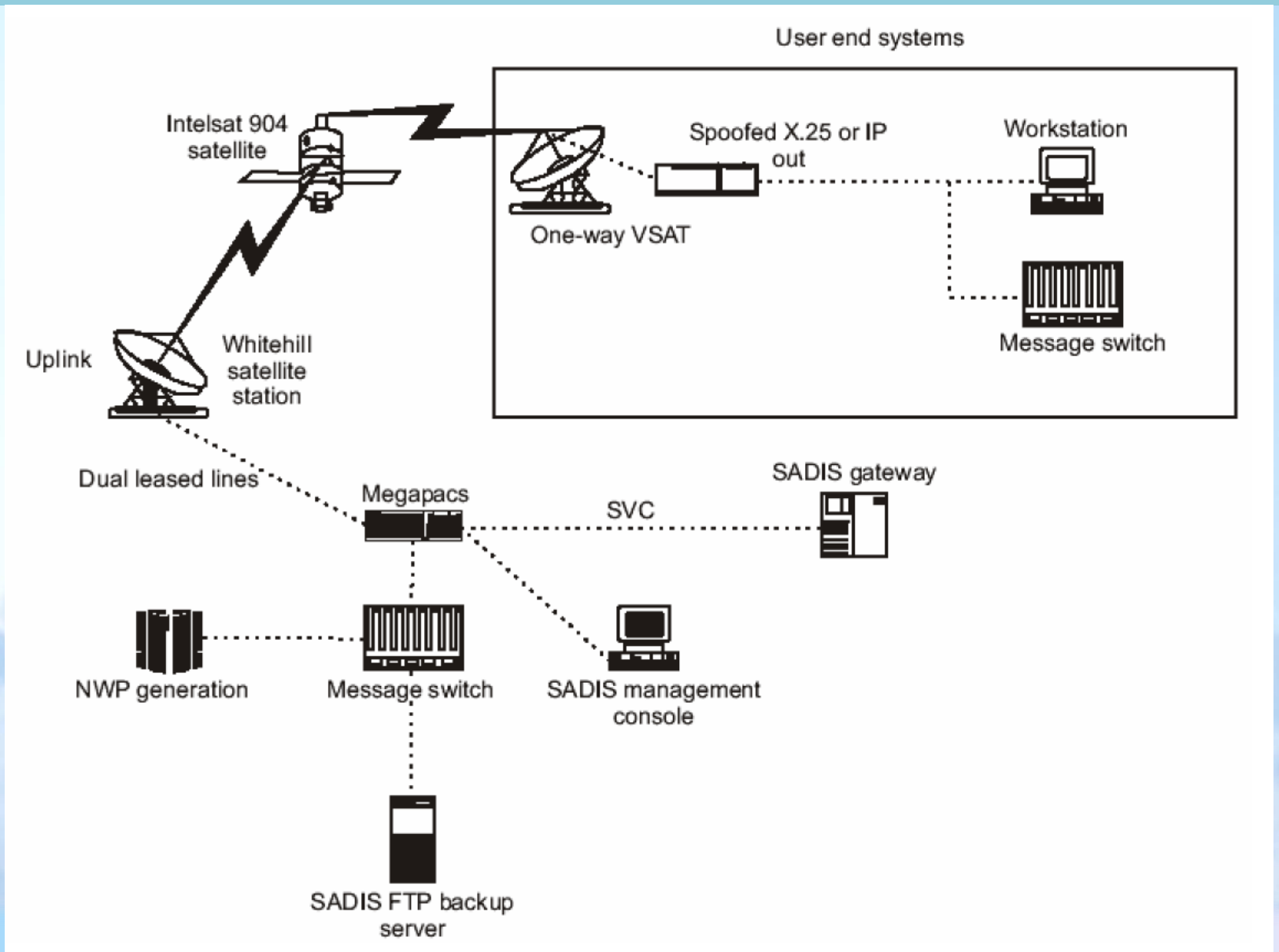
The SADIS 2G uplink is situated at the Cable & Wireless hub at Whitehill Earth Station, north of Oxford in the United Kingdom.

WAFS forecasts are provided from WAFC London at the United Kingdom Met Office (referred to as “Met Office”), Exeter, and are uplinked from the hub at Whitehill to the INTELSAT satellite located over the Indian Ocean at 60°E.

OPMET information is provided by the National Air Traffic Services (NATS) SADIS Gateway facility at Swanwick near Southampton, United Kingdom. Data from the SADIS Gateway is transmitted to the Met Office for onward promulgation to Whitehill.

The data are downlinked via a global beam to users anywhere in the EUR, AFI and MID Regions and in the ASIA Region as far eastwards as140°E.

Components of Second Generation SADIS Broadcast (SADIS 2G)



Secure Aviation Data Information Service (SADIS)

SADIS 2G is an operational system dedicated primarily to aeronautical meteorological information in line with ICAO worldwide provisions.

WAFS forecasts and OPMET information is disseminated without conflict or delay which could be caused by the dissemination of non-operational data.

This ensures full availability of the service and the largely error-free transmission of all information required for pre-flight planning.

WAFS GRIB and BUFR forecasts are backed up, with WAFC London and WAFC Washington products being inter changeable.

SADIS 2G delivers WAFS forecasts in digital format, as well as alphanumeric OPMET information required for pre-flight planning.

In addition to the SADIS 2G satellite service, approved SADIS users can access all OPMET information and WAFS forecasts using FTP over the public Internet via the Secure SADIS FTP service.

Image - 1