STRATEGIC INMARSAT MONITORING SYSTEM FOR MOI ABU DHABI

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Content

1 INTRODUCTION

1.1 Scope of document

This document contains product information and specifications of a strategic INMARSAT Monitoring System (IMS). The purpose of the document is to provide a detailed overview of the system and its capabilities.

1.2 Confidentiality and distribution

This document is provided in confidence and is authorized for distribution only to the parties indicated on page ii.

1.3 Applicable document

The Inmarsat Monitoring system, as described in this document, form part of the MMS system as described in the MMS specification in document "J-LA-001-SSP-01 LA System Specification". Please refer to "J-LA-001-SSP-01 LA System Specification" further detail as well as interfacing detail between the different sites.

1.4 Lay-out of document

The document consists of an executive summary, an overview of the IMS system and some details of its major components.

Section 1	Introduction to the purpose and structure of the technical proposal.
Section 2	Executive Summary of the system
Section 3	Description of the INMARSAT Monitoring System (IMS).
Section 4	Details and specifications for the proposed system.
Section 5	Details of the functionality for the strategic INMARSAT monitoring system. The section includes system management, data processing and analysis.
Section 6	Details of the restricted access to the IMS system.
Section 7	Details of the maintenance schedule and the after sales support available.
Section 8	Details of the system technical specification, data viewer description and contains some screen shots.

2 EXECUTIVE SUMMARY

VASTech provides network recording systems for law enforcement agencies and commercial recording applications. We offer solutions for terrestrial and satellite networks that have circuit switched and packet switched infrastructures.

Drawing from years of experience and today's software technologies, VASTech proudly presents an INMARSAT Monitor System (IMS) for government law enforcement agencies.

The IMS is a strategic solution that is software centric runs on standard servers and can expand to meet future requirements.

The INMARSAT Monitoring System is ideally positioned to satisfy the main acquisition criteria pertaining to a system of national importance:

- Provides unique intelligence opportunities cost-effectively
- Protects your investment against changes in the threat
- Enables long term support with minimal vendor assistance.

This monitor system provides the ideal platform for passive surveillance of the INMARSAT network.

3 INTRODUCTION

3.1 Overview

The International Mobile Satellite Organization (INMARSAT) was formed in 1979 to provide satellite communications to ships at sea and distress and emergency communications. INMARSAT provides telephony and data services to users via special terminals. A terminal contacts the satellite and communicates to a ground station through the satellite.

Services include traditional voice calls, low-level data tracking systems, and high-speed data services as well as distress and safety services. Other services provide mobile ISDN links used by the media for live reporting on world events via videophone.

INMARSAT operates a constellation of 10 geostationary satellites that deliver phone, fax and data communications to every part of the world (excluding the polar-regions). The INMARSAT-4 satellites extend the boundaries of 3G networks to areas with unreliable, insecure or non-existent telecoms infrastructures. Each satellite is equipped with a global beam, 19 regional spot beams, and 228 narrow spot beams. Two INMARSAT-4 satellites are currently in operation, and the company plans to launch a third.

Governments, international aid agencies, and a wide range of commercial sectors including the media, oil and gas, construction, finance, maritime, and aeronautical industries use INMARSAT. It delivers its services through a global network of partners; such as BT, France Telecom Mobile Satellite Communications, KDDI, SingTel, Stratos/Xantic, Telefonica, and Telenor.

INMARSAT at sea

INMARSAT provides global satellite communications to the maritime industry including the merchant, fishing, leisure and government sectors.

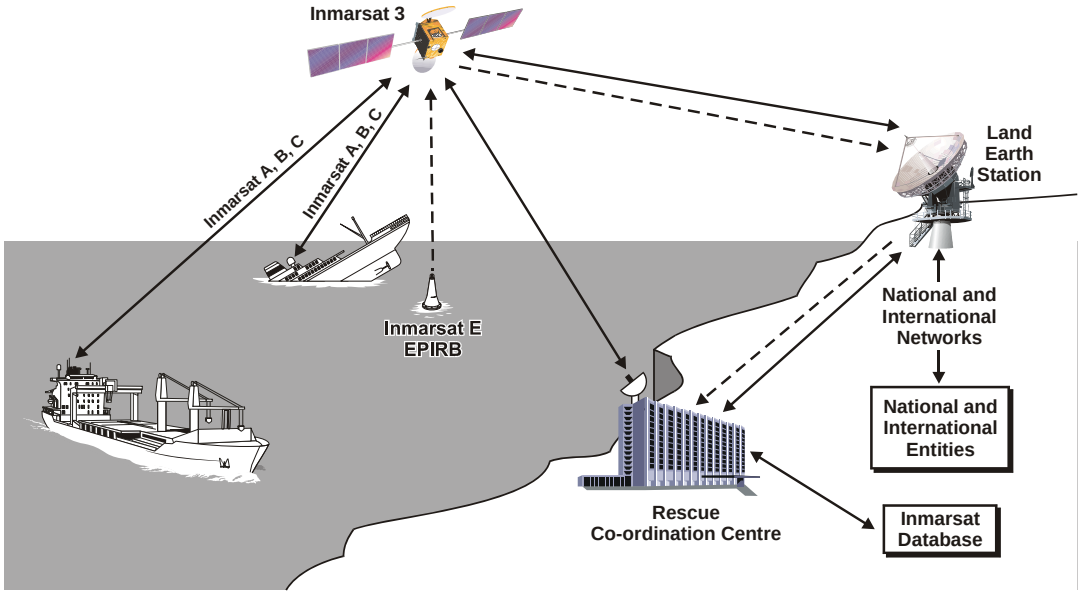


Figure 1: Global distress and safety services (GMDSS)

As a public service INMARSAT provides global distress and safety services (GMDSS) to ships and aircraft at no charge.

Fleet 77 offers a single dedicated channel of 128kbps ISDN. It provides vessels with faster remote network access, faster access to IP services, and improved functionality for videoconferencing, ship management applications, online chart updates and weather information, vessel telemetry, email and other data communications.

INMARSAT on land

INMARSAT introduced its Broadband Global Area Network (BGAN) service in 2006. BGAN offers voice and broadband data connectivity through a portable terminal. It delivers standard IP connectivity at up to 492kbps, guaranteed data rates of up to 256kbps and circuit-switched voice at cell phone quality.

It can deliver secure and on-demand access to telephony, Virtual Private Networks, file transfer, videoconferencing, email and the Internet to multiple simultaneous users in a mobile environment. The service is used by international broadcasters for live news reports (BBC, CNN), by aid agencies in relief efforts and crisis response, by oil and gas companies at exploration sites, and by governments in emergency response. BGAN has been used in more than 175 countries.

In collaboration with ACeS (Asian hand-held voice satellite services operator) INMARSAT launched a new range of low-cost satellite phone services in July 2007. Initially available in Asia, Middle East and Africa, the new services will undergo an extensive network and terminal development programme before being rolled-out globally later this year.

INMARSAT in the air

INMARSAT's aeronautical services provide in-flight connectivity for the cockpit, cabin crew and, increasingly, passengers. Satellite communications are installed on most long-haul aircraft, and the services are also used extensively by business and government aircraft.

The Swift 64 service delivers voice and data connectivity at 64kbps to aircraft. A new service, SwiftBroadband was recently introduced.

Through distribution partners, INMARSAT's aeronautical services are at the forefront of new solutions to enable in-flight use of GSM mobile phones. A number of airlines have announced trials or plans to install INMARSAT-based GSM services

3.2 Network elements.

The network consists of a space segment, land segment and subscriber stations or terminals.

3.2.1 Space segment.

The constellation consists of 10 active satellites of INMARSAT-2, INMARSAT-3 and INMARSAT-4 series. The satellites are situated in a geostationary orbit at a height of 35 786 km.

The satellites are digital transponders that receive digital signals, reform the pulses, and then retransmit them to ground stations.

The coverage area is separated into four ocean regions:

- Pacific Ocean Region (POR)
- Indian Ocean Region (IOR)
- East part of Atlantic Ocean (AOR-E)
- West part of Atlantic Ocean (AOR-W)

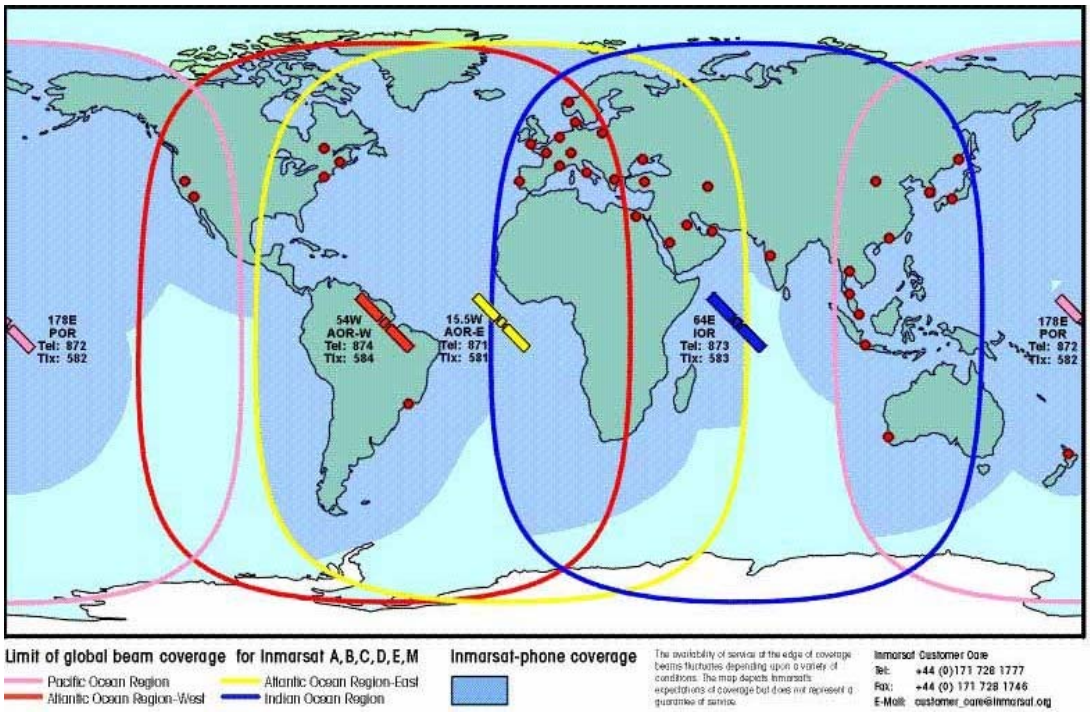


Figure 2: Worldwide Coverage Map

Each region has its own telephone country code:

- **871** Atlantic Ocean Region – East (AOR-E)
- **872** Pacific Ocean Region (POR)
- **873** Indian Ocean Region (IOR)
- **874** Atlantic Ocean Region – West (AOR-W)
- **870** SNAC (Single Network Access Code)

The 870 SNAC number is a locator service so that you don't have to know to which satellite the destination INMARSAT terminal is logged in.

Calls to INMARSAT area codes are from $ 2.00 to $10.75 per minute depending on the ocean region being called.

3.2.2 Land segment.

A call from an INMARSAT mobile terminal goes directly to the satellite overhead, which routes it back down to a Land Earth Station. From there the call passes into the public phone network for connection to home, office or cell.

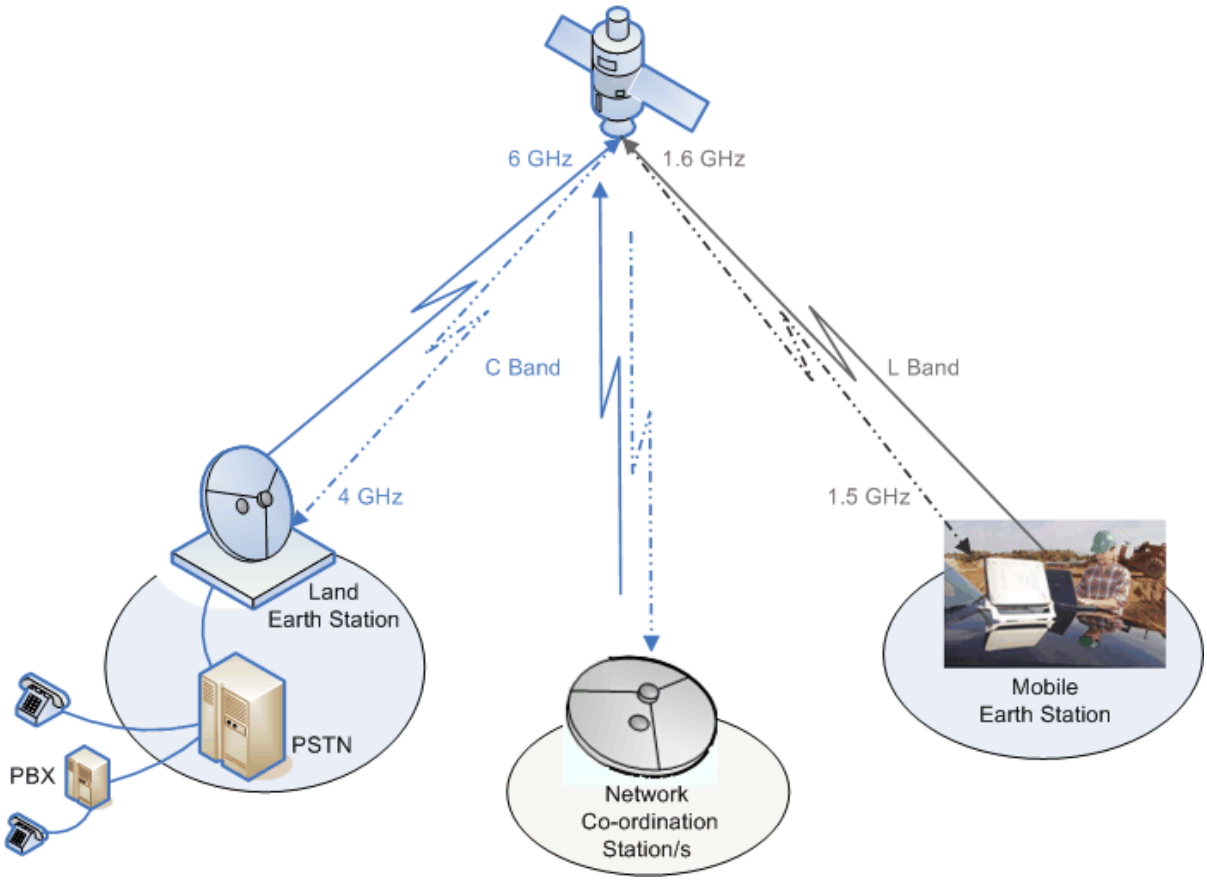


Figure 3: Network operation

Mobile Earth Stations (MES) or the user terminals as they are known, communicate with the space segment in L-band. They transmit between 1626.5 -1660.5 MHz and receive from 1525.0 -1559.0 MHz, a total of 34 MHz in each direction.

INMARSAT services are offered through 40 Land Earth Stations situated in different countries. The Land Earth Stations link the satellites and the public terrestrial telecommunications networks. The LES communicates with the space segment in both C (4/6 GHz) and L bands.

The ocean regions are controlled by individual Network Co-ordination Stations (NCS). Each ocean region operates as an individual network.

A NCS manages the communication traffic within its specific region. It allocates available channels to the Mobile Earth Stations (satellite terminals), and reassigns them when the channel is no longer in use.

The NCS continuously monitors the flow of traffic through its satellite and ensures that calls are set up correctly. The NCS is permanently connected to all the Land Earth Stations that are working through that particular satellite and monitors them to ensure that they are servicable.

The NCS allocates the channel to be used by the mobile station and by the LES for each and every call.

BGAN uses gateways, called Satellite Access Stations (SAS). INMARSAT partner Xantic operates the SAS in the Netherlands, and the other, in Fucino, Italy is operated by Telespazio.

All the NCSs are in turn monitored and controlled by the Network Control Centre at INMARSAT Headquarters in London. A Satellite Control Centre, also located in London, is linked to a series of tracking stations around the world and it monitors the orbit of each satellite, adjusting it as necessary to keep the satellite exactly where it is supposed to be.

3.3 INMARSAT Services

INMARSAT has over time developed a series of networks providing certain sets of services. They are grouped into two sets, IP-based services and existing and evolved services.

3.3.1 Classic services.

Existing and evolved services are offered through Land Earth Stations which are not owned nor operated by INMARSAT, but through companies which have a commercial agreement with INMARSAT.

- **INMARSAT-A**: This is the only analog network and is being phased out.
- **Aeronautical (Classic Aero)**: provides voice/fax/data services for aircraft. Three levels of terminals, Aero-L for packet data including ACARS and ADS, Aero-H for medium quality voice and fax/data at up to 9600 bit/s, and Aero-I for low quality voice and fax/data at up to 2400 bit/s.
- **INMARSAT-B**: provides voice services, telex services, medium speed fax/data services at 9.6 kbit/s and high speed data services at 56, 64 or 128 kbit/s.
- **INMARSAT-C**: a "satellite telex" terminal with store-and-forward capabilities.
- **INMARSAT-M**: provides voice services at 4.8 kbit/s and medium speed fax/data services at 2.4 kbit/s.
- **Mini-M**: provides voice services at 4.8 kbit/s and medium speed fax/data services at 2.4 kbit/s.
- **GAN (Global Area Network)**: provides a selection of low speed services like voice at 4.8 kbit/s, fax & data at 2.4 kbit/s, ISDN like services at 64 kbit/s (Mobile ISDN) and shared-channel IP packet-switched data services at 64 kbit/s, called Mobile Packet Data Service. Is also known as "M4".
- **Fleet**: a family of networks that includes the INMARSAT-Fleet77, INMARSAT-Fleet55 and INMARSAT-Fleet33 members. Provides a selection of low speed services like voice at 4.8 kbit/s, fax/data at 2.4 kbit/s, medium speed services like fax/data at 9.6 kbit/s, ISDN like services at 64 kbit/s and shared-channel IP packet-switched data services at 64 kbit/s . The latest service to be supported is Mobile ISDN at 128 kbit/s on INMARSAT-Fleet77 terminals.
- **Swift 64**: Similar to GAN, providing voice, low rate fax/data, 64kb/s ISDN, and MPDS services, for private, business, and commercial aircraft.

- **INMARSAT-D/D+**: The new INMARSAT-D+ terminals are two-way pagers. The main use of this technology is in tracking trucks and buoys and SCADA applications. INMARSAT D+ is the only GPS tracking service available via INMARSAT.
- **MPDS (Mobile Packet Data Service)**: Previously known as IPDS, this is an IP-based data service in which several users share a 64kb/s carrier in a manner similar to ADSL

3.3.2 IP-based shared-carrier services

IP-based services are provided via distribution partners but the satellite gateways are owned and operated by INMARSAT.

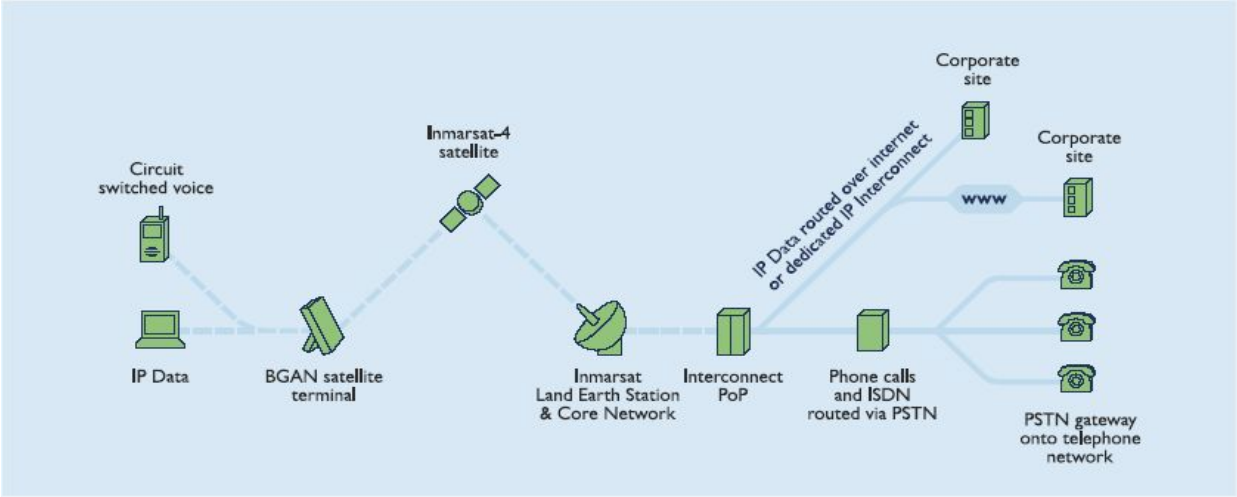


Figure 4: IP carrier network

- **Regional BGAN**: RBGAN offers a shared-channel IP packet-switched service of up to 144 kbit/s based on GPRS technology. Coverage is limited to parts of Europe, Asia, Africa & Australia. INMARSAT have announced the closure of the RBGAN service on December 31, 2008.
- **BGAN**: Broadband Global Area Network offers a shared-channel IP packet-switched service of up to 492 kbit/s and a streaming-IP service from 32 up to 256 kbit/s. Services depend on terminal model.

  Certain terminals also offer circuit-switched Mobile ISDN services at 64 kbit/s and even low speed (4.8 kbit/s) voice services.
- **Fleet Broadband (FB)**: offers similar services and using the same infrastructure as BGAN.
- **Swift Broadband (SB)**: Like FB, Swift Broadband is based on BGAN and offers similar services. SB is designed for aeronautical users and terminals are specifically designed for use aboard commercial, private, and military aircraft.

3.3.3 Handheld Voice Services

- **IsatPhone**: provides voice services at 4.8 kbit/s and medium speed fax/data services at 2.4 kbit/s. Emerges from a collaboration agreement with ACeS.

3.4 Principles of operation

INMARSAT uses signalling (TDM) and Single Channel per Carrier (SCPC) communications channels. To successfully intercept communications on this network it is therefore necessary to simultaneously receive and process both of these channels.

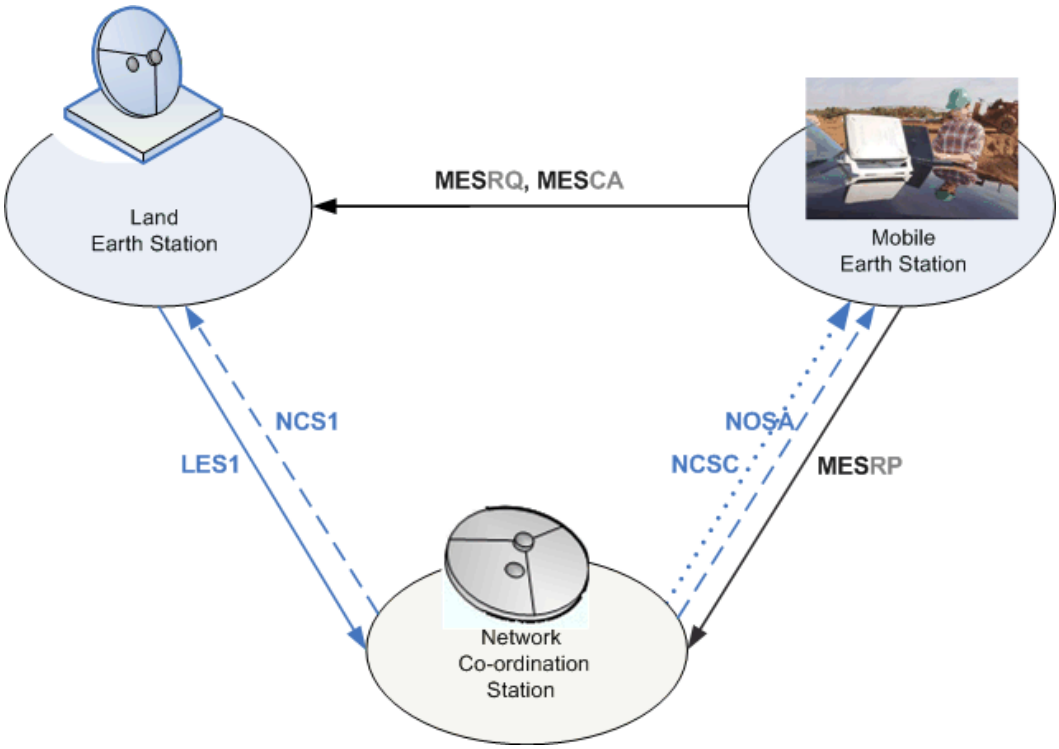


Figure 5: Signalling and access control channels

Signalling channels (TDM) transmit control information required to establish a connection. TDM channels contain frequency assignment and call related messages.

SCPC channels carry call content. Two SCPC channels are used in duplex transmissions of digital voice (6.4 kbps) and data transmissions (2.4 kbps).

3.4.1 INMARSAT Channels

NCSC – Common channel of Network Coordinating Station

This channel with TDM compression contains signalling messages from the NCS, including call setup messages, information about network status (Bulletin Board) and selective channel clearance. It is continuously active and is used for identification of global beam carriers and for tuning user terminals to the satellites.

NCSA – Allocation channel of Network Coordinating Station.

This channel contains frequency allocation messages for calls from mobile devices and for calls from stationary devices.

NCSI – Inter-exchange signaling channel of **Network Coordinating Station.**

This channel transmits signaling messages from NCS to LES.

MESRQ – **Mobile Earth Station request channel**.

This is a random access channel (slotted Aloha), working in packet mode and containing access requests from MES to addressed LES.

MESCA - **Mobile Earth Station call confirmation channel**.

This is a random access channel (Aloha) in packet mode that contains confirmation messages for simplex calls from stationary devices.

Channel type	Coding	Modulation	Speed (bps)
Forward signalling channels **TDM** (NCSC, NCSA,NCRA, NCSS, NCSI, LESA, LESI)	½	BPSK	6000
Reverse signalling channels **ALOHA** (MESRQ, MESRP, MESCA, MESRR)	½	BPSK	3000
Communication channels LESV, MESV (SCPC voice channels at codec speed 6.4 kbps)		QPSK	8000
LESD, MESD (SCPC channels in data transmission mode with speeds of 2.4 kbps)	3/4	QPSK	8000

Table 1 – **Communication and signalling channels (INMARSAT-M)**

SCPC - **Single channel per carrier channels**

Operate in both directions in the following modes:

- Voice transmission mode (telephony)
- Data transmission and Fax transmission modes
- Inbound signalling mode

4 IMS DESCRIPTION

The INMARSAT Monitoring System passively intercepts C and L-Band downlinks from the satellites. The system automatically processes INMARSAT B, C, M, mini-M, M4 including high speed data, BGAN and R-BGAN carriers.

The IMS decodes facsimile, telex and data transmission sessions as per the table.

INMARSAT C	Telex and mail
INMARSAT B	Voice, fax and data
INMARSAT M	Voice, fax and data
INMARSAT mini M	Voice, fax and data including 64kbits/s channels
INMARSAT BGAN	IP traffic, VoIP and Internet
INMARSAT R-BGAN	IP traffic, VoIP and Internet

Table 2 – **IMS monitoring capabilities**

The system is flexible and scalable as it does not rely on dedicated receivers for each of the services. The IMS uses digital receivers managed by software processes to receive and demodulate different services. New services can be accommodated with software upgrades.

The IMS monitors INMARSAT terminals based on target priorities configured in the database by the user. It dynamically allocates hardware and processing resources available to complete a task.

4.1 IMS Architecture

VASTech offers to supply, install and support the following:

- One (1) C-band subsystem
- One (1) L-band subsystem
- Information Processing subsystem

4.1.1 RF front end

The RF front end consists of C and L Band antennas and RF conversion and distribution modules.

Figure 6: C Band antenna

The RF front end consists of a parabolic C-band and L-band antenna with inter facility links and RF conversion and distribution units. The C Band antenna is steer-able and has auto tracking facilities. It can be tuned to satellite repeaters in different regions, for example, Atlantic Ocean Region - East (AOR-E) and Indian Ocean Region (IOR).

The C-band antenna feed is designed for frequencies between 3400 and 4200 MHz of right hand and left hand circular polarized RF signals (RHCP/LHCP).

The L-band antenna feed system caters for the INMARSAT down link band of 1525 - 1559 MHz for right hand circular polarized RF signals.

The antennas receive signals from the INMARSAT satellite repeater. The complete radio-frequency signal of 30MHz spectrum width is now available for conversion and distribution to the digital receivers.

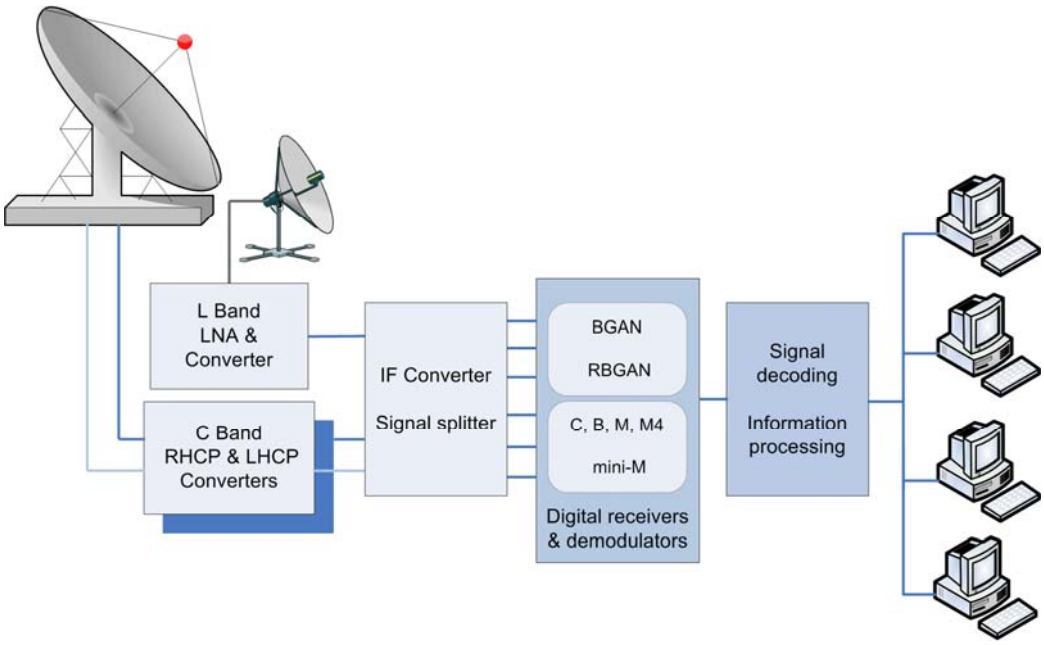


Figure 7: INMARSAT Monitoring System

The signals are converted to IF1 frequencies of 70 MHz (50 - 90 MHz base-band), before down conversion to IF2 base-band signals of 20 MHz (±19 MHz). The three IF2 base-band frequencies corresponding to the INMARSAT communication bands (L band, C-band RHCP and LHCP) are distributed to digital receivers and demodulators.

The digital receivers extract channels of interest and the signal processors demodulate, decode and convert the received signals. A standard data stream is presented on the LAN for processing by servers according to the types of messages intercepted.

The receivers are flexible. Channels can either be configured by the users or automatically by the system for the different services.

4.1.2 Information processing system

The IPS consists of:

- Database server
- File and application servers
- Operator workstations

The IPS processes all communication sessions for IP based carrier services (BGAN) and the following existing and evolved services:

	M	mini-M	B
Traffic types	Data, Fax, Tlf	Data, Fax, Tlf	Data, Fax, Tlf
SCPC Channel rates	8 Kbps	5,6 Kbps	24 Kbps
Data rates	6,4K-Tlf	4,8K-Tlf	16K-Tlf

	2,4K-Data,Fax	2,4K-Data,Fax	2,4K-Data,Fax
Voice coding algorithm	IMBE	AMBE	APC
Noise-resistant coding	Data, Fax- convolution R=3/4	Data, Fax- convolution R=1/2 and 2/3	Data, Fax- convolution R=1/2 and 2/3

Communication sessions are recorded and stored in the file server according to the type of traffic.

- DVocWav (WAV – file with voice record)
- PageFax (Fax page)
- OutDat (Data after removal of PPP)
- DecAMBE or DecIMBE (Vocoder data of AMBE and IMBE standards)
- DecFax (Data of FAX type)
- DecTlx (Data of TELEX type)
- DecDat (Data)

Service information records from all communication sessions are stored in the database. Tables of selected sessions (Target Interception Lists) are also stored in the database.

The information processing system provides:

- demodulation and processing of NCS signalling channels
- analysis of signal units of NCS channel, extraction of physical identifiers and tuning of reception sections to informational channels in accordance with selection parameters (priorities)
- demodulation and recording of up to 8 simplex information channels of M, mini-M and C standards, up to three channels of B standard and up to two channels of M4 standard
- automated processing (descrambling, decoding, decompression, sorting, etc.) of informational channels of M, mini-M, B, C and M4 standards
- finding service parameters of the session (date, time, frequency, identifiers of land and mobile stations, beam, priority in accordance with target selection table, record file name, type) and storing them in the database
- transcode voice signals with IMBE coding(M standard), AMBE coding(mini-M standard), APC coding(B standard)
- processing FAX messages with fax pages extraction and protocol processing on the basis of ITU-T T.4, T.6, T.30 recommendations
- processing modem sessions and their storage in bit form with the possibility of further processing by external applications
- processing telex sessions and their storage into TXT file (for C standard)

- input/output and editing of target selection criteria with results loading in ONLINE mode
- on-line analysis of results of statistical data processing
- simultaneous operation in all modes with resources distribution.

When configured for *target selection* mode the system further provides:

- permanent control of frequencies allocation and releasing for simplex channels;
- interception of physical identifiers and their comparison with target selection parameters, with consideration of priority settings;
- tuning of the receiver unit to channels of interest;
- processing and storing of messages of voice/data/fax types;
- sorting of messages by traffic types: voice/data/fax;
- permanent processing of signalling, being transmitted in-band with information channel (SUB channel);
- error checking of information;
- release of receivers when the communications session is finished.

4.2 Monitored information

Comprehensive information related to the monitored calls is stored in the database including;

- Satellite
- Ship Earth Station/Mobile Earth Station ID
- Coastal Earth Station /Land Earth Station ID
- Beam
- Service
- Status
- Time and date
- Duration
- Phone number
- Direction MES Identity
- Terminal Type.
- ELRP (dbm)
- Eb/No (db)
- Bandwidth (kHz)
- Centre Frequency(kHz)

The software provides a graphical user interface for entering parameters and viewing information such as call log files, database entries, filters for mobile numbers, etc,.

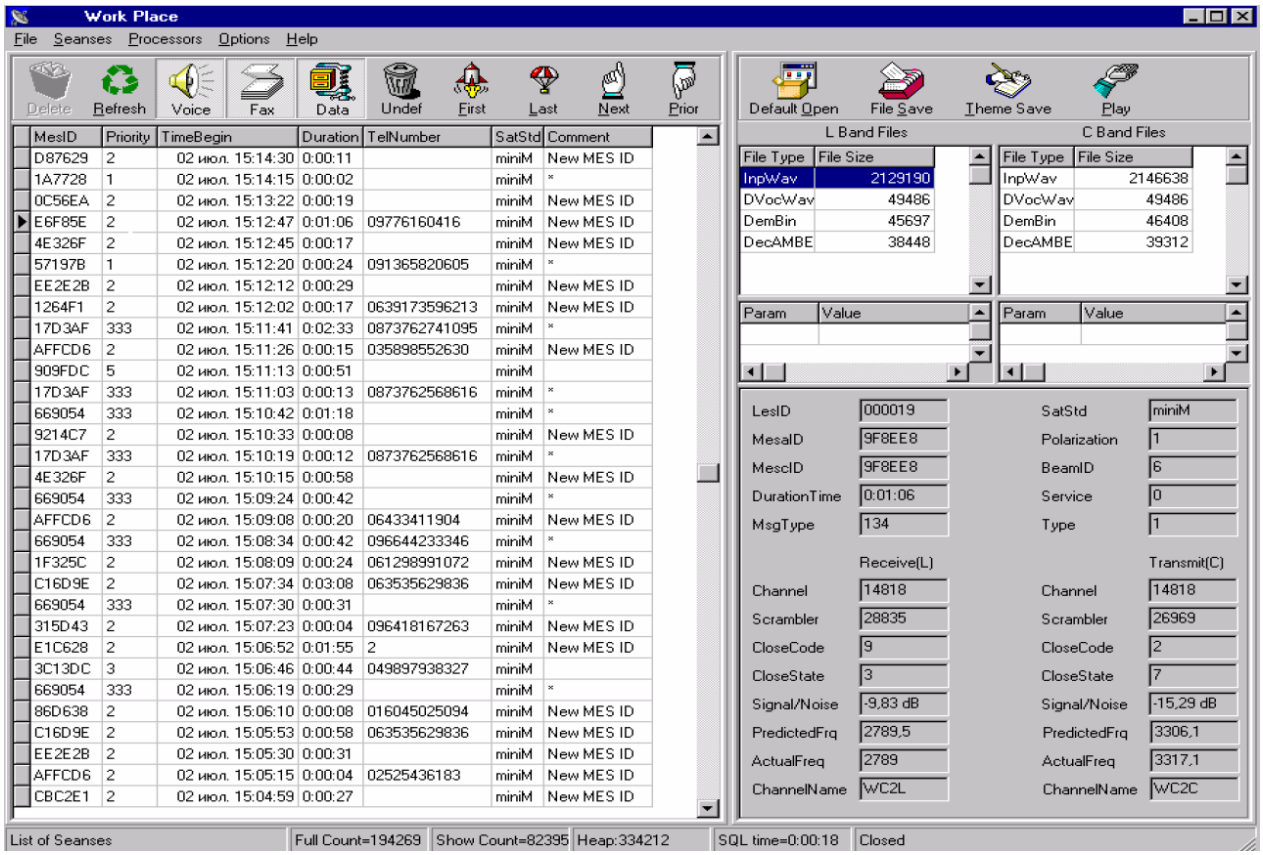


Figure 8: - Operator interface

Missions can be assigned to operator workstations to process sessions, based on predefined attributes. These attributes may include identifiers of mobile stations, telephone numbers, identifiers of LES, numbers of satellite beams, types of sessions - voice, fax, modem/data, telex etc.

The information most operators are interested in is easily accessible and includes:

- Date and time of call.
- The telephone number dialled by the MES.
- Call content - Voice, Fax and Data.
- Calling Line Identity Presentation (CLIP). The telephone number of call originator may be available on some calls.
- Type of INMARSAT service, M, mini M, etc.

4.3 System characteristics

The proposed system provides central system management and operation.

The following system characteristics apply:

- The capability to intercept 64 simultaneous calls.
- The possibility to expand the number of simultaneous call intercepts to 128.
- A total of 4 operator (user) workstations and 1 administrator workstation are provided.
  The number of operator workstations may be extended to 8 as an option.
- Automatically process C, B, M, mini-M, M4 BGAN and R-BGAN carriers.

The monitoring system can perform the following tasks:

- Receive, demodulate, decode and descramble carrier signals
- Pre-process and filter data according to user configurable parameters
- Intercept open channels or specific channels(number of interest mode)
- Adjust processing paths of information channels with respect to selected attributes , e.g., priorities
- Define service relation information (SRI) of a session (calling telephone number, date, time, frequency, prioritise according to the target selection list, name of registration files, type of loading, etc.) and record the details in the database
- Transcode IMBE and AMBE voice coded signals to .WAV
- Process facsimile and data transmission sessions

4.4 Uninterruptible Power Supply

An Uninterruptible Power Supply (UPS) is provided with the IMS, to provide power conditioning and support for the system during brownouts and power outages.

The UPS subsystem comprises a self-contained UPS, distributed to match the system load requirements. One UPS is installed in the system rack, and further units may be provided as free-standing items to supply cluster of workstations. The arrangements are dependent on the location of the rack and the computers and are installation-specific.

The UPS communicate with the computer system via serial interfaces. The UPS subsystem is configured so that the supply driving the system rack and its server determine the power status of the whole IMS. If a primary power failure occurs, the UPS subsystem provides power for a pre-determined time. If primary power is not restored during this period, the system is shut down in a controlled manner to avoid loss of data. Users are warned of impending shutdown via the Ethernet connections.

Typical autonomous run times before system shutdown commences are of the order of 30 minutes for the Main Monitoring Centre equipment

The system may be configured to re-start automatically, and a time delay may be incorporated to overcome problems of temporary of primary power and subsequent failure.

5 IMS FUNCTIONALITY

5.1 System Management and Configuration

The following management characteristics are provided:

- The ability to set users and assign permissions to system resources.
- The ability to monitor the Database server status.

5.2 Real-time Calls and Traffic Monitoring

5.3 Processing and Analysis

The following analysis characteristics are provided:

- The ability to query call and MES history.
- The ability to playback intercepted audio.
- The ability to view intercepted faxes.
- The ability to view data traffic.
- The ability to view data in its raw format.

5.4 Voice Playback

If a session contains voice content the call may be replayed by the operator. Both forward and return links of a duplex conversation are available for monitoring, presented on separate loudspeakers or headset earpieces.

The operator may fast forward and move back through a recording by positioning a slider in the display. This also allows phrases in the recording to be repeatedly played for analysis.

The output level and balance between speakers (headphones) may be adjusted, and may be muted by a single action from mouse or keyboard.

The voice recording may be saved as a .WAV file, which can then be exported for further analysis outside the IMS.

5.5 Database archive and retrieval

The database may be archived at any time by the system administrator. The preferred medium is DVD DL R/W disks as supplied with the equipment, which provide a nominal storage capacity of 8.5 GByte per disk as standard.

Archiving is achieved through a dedicated selection window, into which the Start Archive date and End Archive date are entered. Dates are entered as date and hours, minutes and seconds in

24 hour format. The IMS responds by displaying the earliest and latest database entry in the Call Database within the selected time window. On administrator's acceptance of the time range, the IMS archives the material to the DVD drive and delete the corresponding data from the hard disk, freeing space for further data.

6 ACCESS CONTROL

6.1 Overview

Access to the IMS system is restricted. Typically, a range of security measures are used, including physical access restriction, a private internal network, operating system and database management system security and encryption of external data links. Users accessing the IMS configuration and intercepts make use of configured IMS user accounts with specific associated rights. The application server is responsible for allowing users to connect to the system and restricting their access according to the configuration of the user accounts they are using.

6.2 Information security

Access to stored files via the system is subject to IMS access control.

The servers/storage equipment where files are hosted is only accessible via the internal network of the system.

Access to stored files via the file system is subject to an administrative user name and password.

7 SUPPORT

7.1 Training

All training courses and training materials are presented in the English language.

Three training courses are offered with the IMS, these cover:

- IMS Administration
- IMS Operation and Data Analysis
- IMS Maintenance

The training courses are generally held at the customer site upon successful completion of the system installation. Table 6-1 lists the different training courses available along with their duration, and recommended number of attendees. Greater numbers of attendees may be accommodated on the on-site training course by agreement at an early stage.

Table 3 – Typical Training Course Arrangements

Course	Attendees	Typical Duration
IMS Administration	Up to 4 persons	2 days
IMS Operation	Up to 8 persons	2 days
IMS Maintenance	Up to 4 persons	2 days

7.2 Maintenance Procedures

During the warranty period the system is maintained to the following level of availability:

- Major disruptions include an inoperable Monitoring Centre.
- Minor disruptions include single equipment failures and feature problems, which do not affect system operability.

Maintenance philosophy is to replace faulty equipments after quick analysis of monitoring and alarm indications. Actual repair is undertaken at a repair base.

We establish a methodology for providing maintenance service, to be approved by the customer, including: 24-hour support, trouble reporting forms, trouble reporting procedures, telephone numbers, and maintenance organizational chart showing supervision and key personnel, and escalation procedures, including named personnel and their office and home telephone number. The trouble reporting procedures includes the ability for the customer to elevate any failure to critical level, requiring a response as a major disruption as defined above. We provide maintenance reports to the customer throughout the warranty period detailing specific failures, repairs, and response times.

7.3 Spares

A list of critical spares is included in the commercial proposal.

7.4 Documentation

VASTech provides standard operational and maintenance documentation and will deliver the following system/equipment documentation

- System Manual which includes detailed system manuals describing the overall operational procedures and functionality of all components of the system.
- System Inventory which contains at a minimum complete records of the model number, serial number, hardware revision, firmware revision, software load, delivery date, installation location, installation date, and acceptance date, for every significant system component.

7.5 Warranty and Repairs

The equipment is delivered with a standard one year warranty, unless otherwise specified. Opening the equipment during the warranty period will void the warranty. It is recommended that defective or damaged equipment is returned to VASTech unopened for repair or replacement.

The routing and documentation for returned equipment is country specific, and is detailed in the Technical Manual delivered with the system.

Computer equipment failure should, in general, be addressed to the in-country support facilities of the computer manufacturer. The arrangements for specific installations are detailed in the Technical Manual delivered with the system.

8 APPENDIX

A. RF FRONT END SPECIFICATION

1 – Antennas

C-Band antenna
Receive only meeting FCC and INTELSAT specifications.
9.3 meter Cassegrain antenna.
G/T better than 32dB/ K.
Steer able with auto tracking facility.
Dual polarized feed with LHCP & RHCP.
LNB: 2+1 Configuration
L-Band antenna
1.5 meters parabolic Antenna.
G/T better than 4 dB/K.
Fixed installation.
LNB: 1+1 Configuration

2 – Downconverters

C-Band	
Input Frequency Range:	3400MHz - 4200 MHz
Output Frequency IF 1	50 MHz - 90 MHz
Output Frequency IF 2	1MHz - 39 MHz
Gain (RF to IF):	50 dB, ±10 dB

L-Band	
Input Frequency Range:	1525MHz - 1560 MHz
Output Frequency IF 1	50 MHz - 90 MHz
Output Frequency IF 2	1MHz.- 39 MHz
Gain (RF to IF):	50 dB ± 10 dB

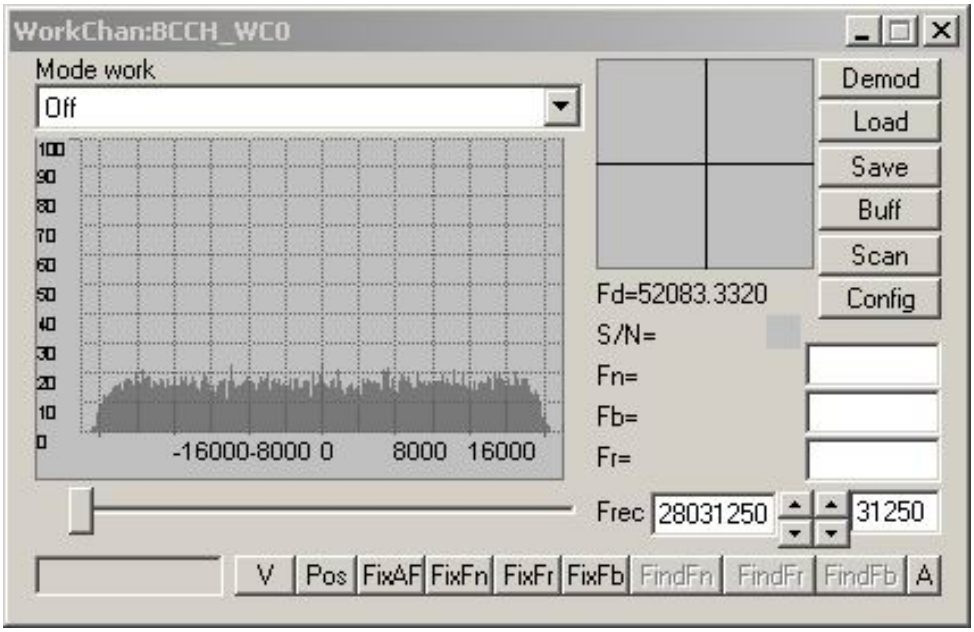
Note: The L-band down-converter is integrated with the L-band low noise amplifier.

3 – Digital receivers

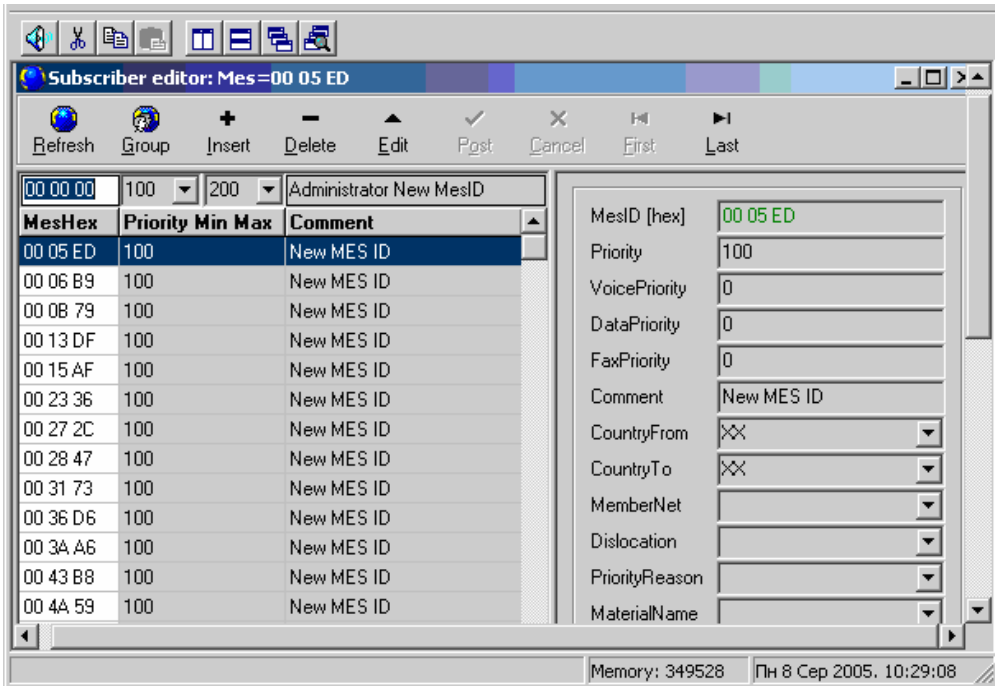
Frequency range:	1MHz- 39 MHz
Tuning steps	1Hz
Input level	60 dBm to-30dBm

B. IMS SCREEN SHOTS

B.1 Spectral analysis view

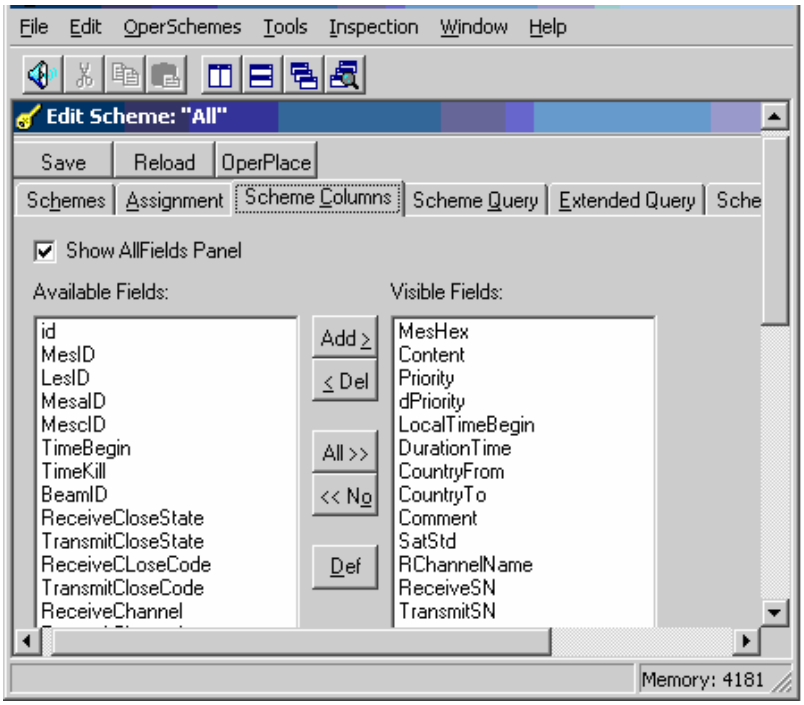


B.2 Subscriber editor



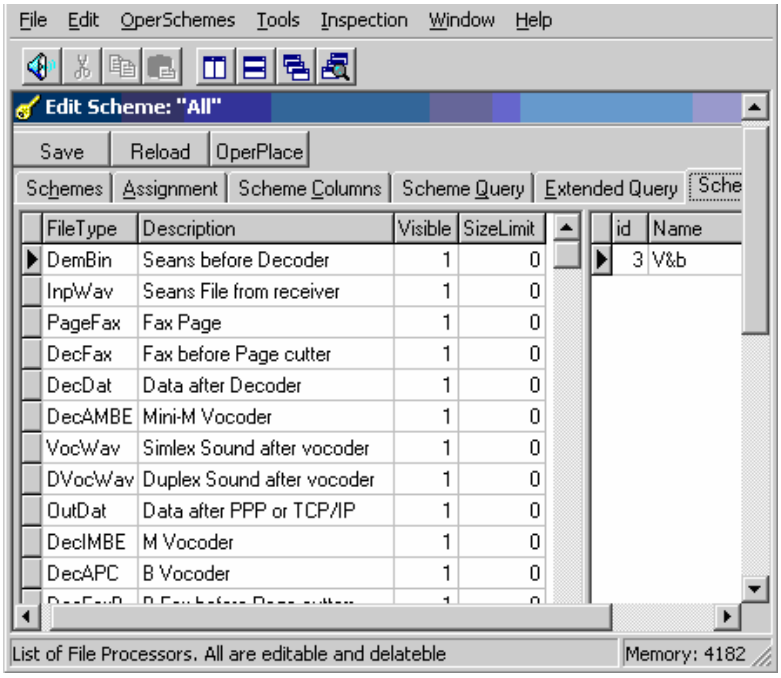
Sets priority for certain MES, defining the country of origin, main directions of communications and adding comments

B.3 Fields editor



The administrator can selects database fields to be indicated on an operator workstation. The right column shows the fields, which will be visible to operator.

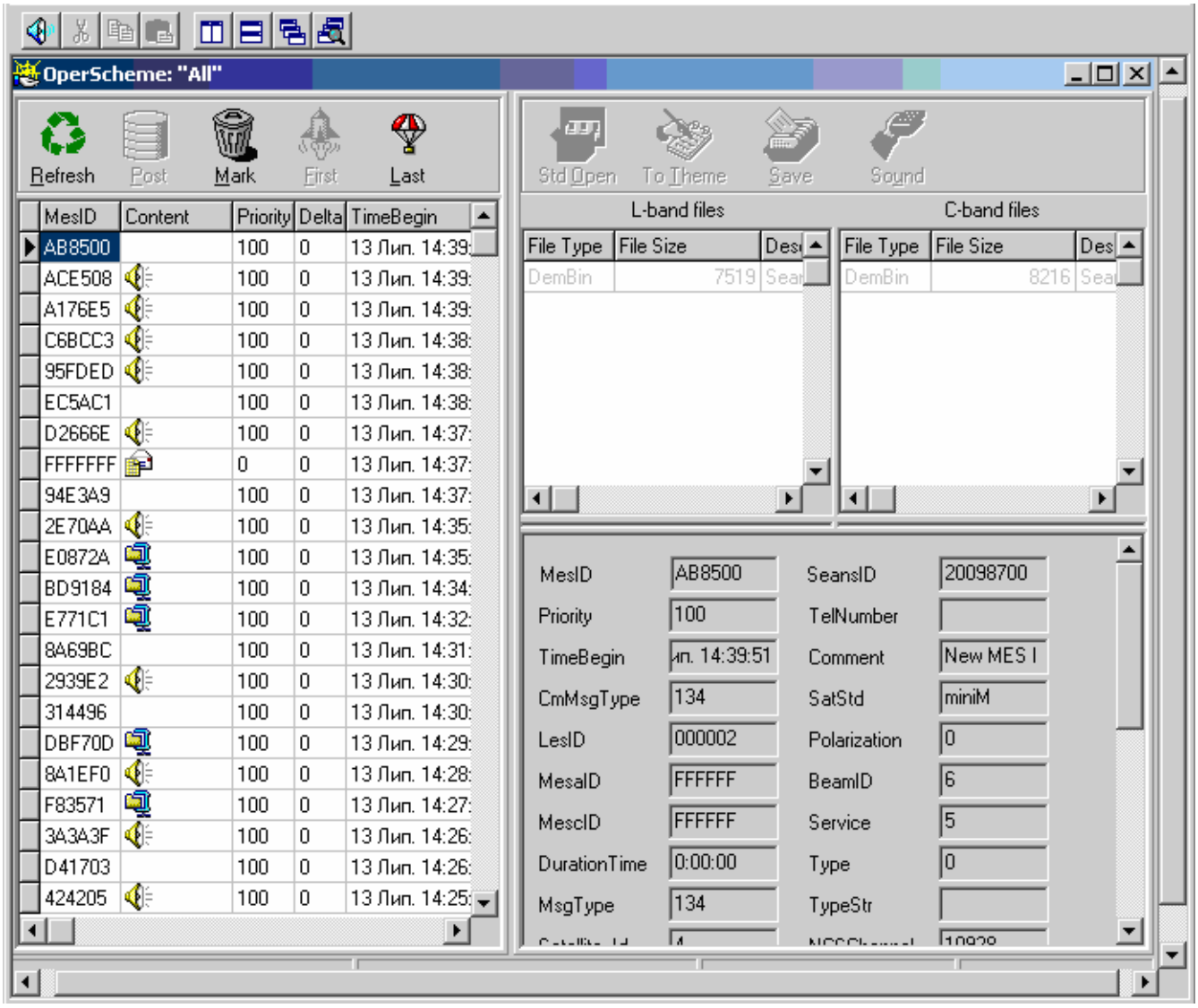
B.4 Processor editor



Administrator can assign processing resources and tasks

C. OPERATOR WORKSTATION

The operator workstation provides listening to voice sessions, viewing fax messages and results of intercepted data transmissions.



When a task is set by the administrator, it is automatically presented to the operator workstations. An operator can choose the schemes available for him from the Operator Scheme menu point.

In this menu all schemes, available for this workstation will be shown. When one of the schemes is selected the “Operational Schemes” window appears.

It contains the following icons:

Refreshes the information on the screen

Selects only voice sessions

Selects only fax sessions

Selects only data sessions

Operator can choose any session from table for processing. At the right side of "Operational Schemes" window the information, regarding selected communication session is shown. Also presented here is the information about files, recorded during primary processing.

- InpWav - input stream
- DemBin – binary code after demodulator
- DVocWav - voice file
- DecAMBE – stream after removal of vocoder

An operator can easily move between sessions and perform different tasks.

- Default Open – viewing (listening) to the files
- File Save – save file to the path set by operator
- Theme Save – save file as a certain theme
- Play – voice files