

Satellite based data distribution system

It is envisaged that a telecommunication means providing timely delivery to users (both national and other) of the basic volume of products will be “Meteoinform” satellite system functioning on the MITRA technology the basis for which is the DVB-S standard use.

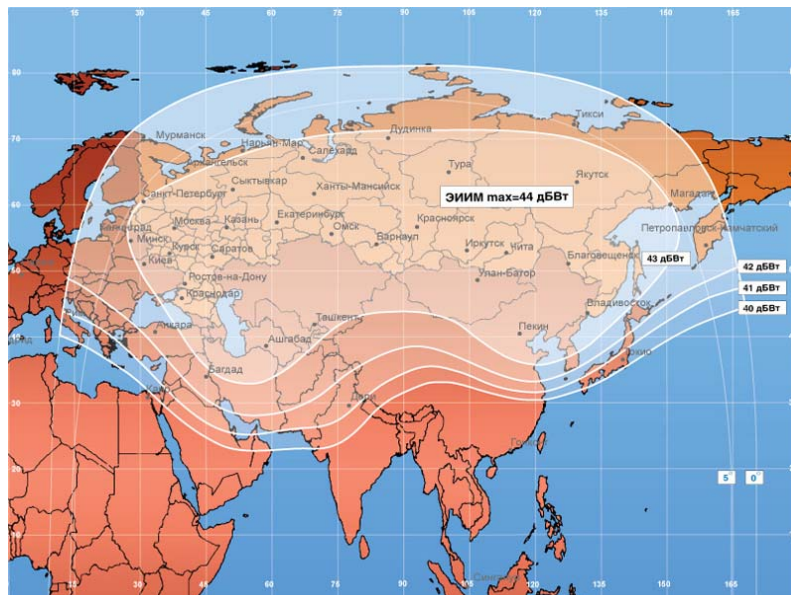
.Actual METEOINFORM system

Now the METEOINFORM system is used by more than 200 subscribers over the territory of Russia and neighboring states: Kazakhstan, Tadjikistan, Kirgisiya, Armenia, Byelorus.

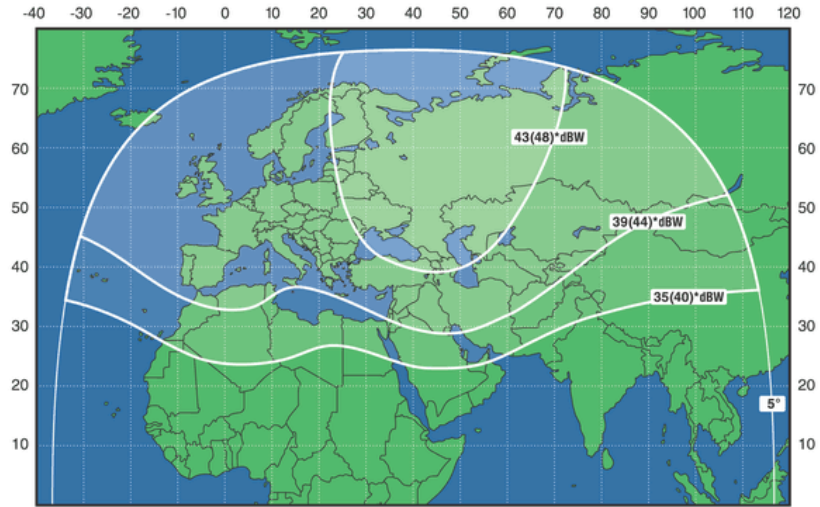
METEOINFORM satellites

Currently the METEOINFORM system uses C-band DVB-S transponders on four satellites, covering the whole territory of Europe and significant part of Asia. Footprints of the transponders are shown below.

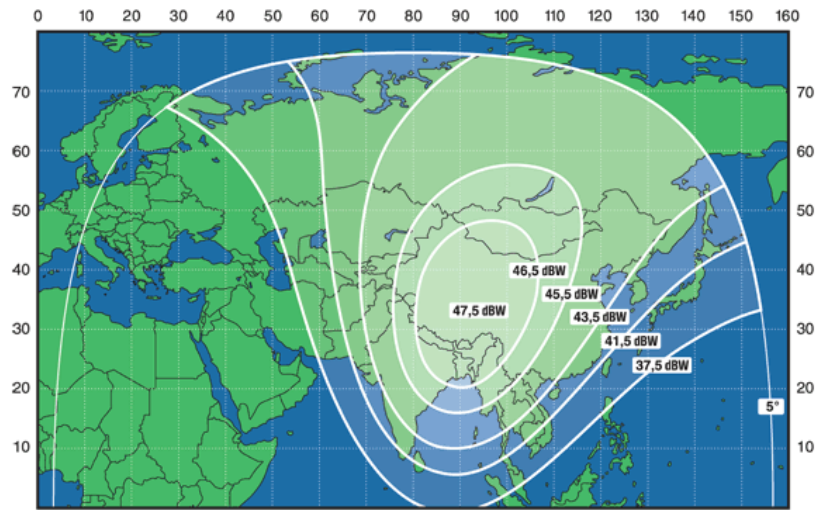
MITRA technology the basis for which is the DVB-S standard use.



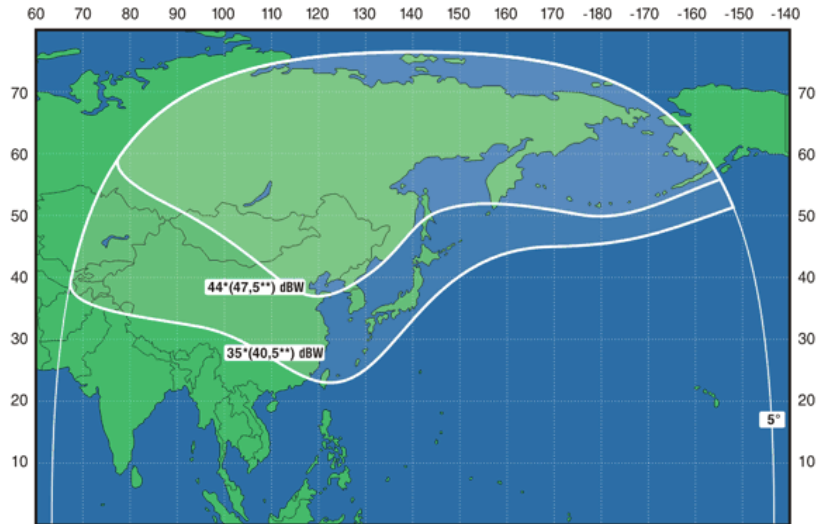
Yamal 200 #1 (90E)



Express AM-1 (40E)



Express AM-2 (80E)



Express AM-3 (140E)

The Express satellites were decided for the purpose of regional area coverage as the overwhelming majority of users are interested in the products of a regional nature or the products (images) of high resolution, which are intended in general for local usage. The Yamal 200#1 satellite which belongs to another operator reserves the Express satellites.

Information transmitted

To be transmitted user's content is to be presented as files, named according to a users' requirements. Thereby, using MITRA technology, any type of information may be disseminated. As a matter of convenience, disseminated files are aggregated in file flows with predefined priority. Presently in METEOINFORM system the following file flows exist:

- Flow of files with data of the GTS (observed data, forecasts, maps in WMO code forms GRIB, BUFR and etc.)
- Images from satellites NOAA-12, NOAA-15, NOAA-17, NOAA-18

- Products from SRC "Planeta" (http://planet.rssi.ru/english/index_eng.htm) – images and montages from satellites METEOSAT-9, METEOSAT-7, NOAA, GOES-E, MTSAT-1R.
- System flow (for terminals software upgrade, technical support, users' instruction transmission and etc.)

MITRA Terminal hardware

MITRA terminal is based on wide-spread personal computers with serial low-cost (200-500 USD) communication equipment:

- Satellite dish 1,2-2,4 meters (dish size depends on a terminal geographical position)
- DVB-S receiver card SkyStar 2 (PCI-internal or USB-external modification)

For unscrambling data and users addressing USB key with unique number for each METEOINFORM system subscriber is given.

MITRA Terminal Software

For data receiving special software is used. A connection of the terminal to the MSS on WMO standardized protocols is provided.

Software for presentation text messages and graphic (weather maps, satellite images and etc.) information in standard supply configuration is included.

For deeper processing and sophisticated presentation of various types of hydrometeorological data "GIS Meteo" software developed by MapMakers Group Ltd. (<http://mapmak.mecom.ru>) is used.

MITRA TECHNOLOGY ROBUSTNESS

Unfortunately, satellite broadcasting technologies often used for data transmission in the “push” mode do not assure the delivery of information to a user. There are many reasons for it – noises from active radio equipment, strong wind gusts, solar interference, receiving station overloading, etc. Therefore special care for the system robustness and provision of guaranteed content delivery was spared at the MITRA technology development.

Overlapping of the satellites covering maps

The most part of users of a system based on MITRA technology have a choice to receive data from two or three satellites depending on a signal quality. Using several antennas, adjusted to different satellites, it is even possible to receive data from two or three satellites simultaneously and see a few data flows as unique without duplication. It is also important that satellite Yamal and satellites Express belong to independent satellite operators.

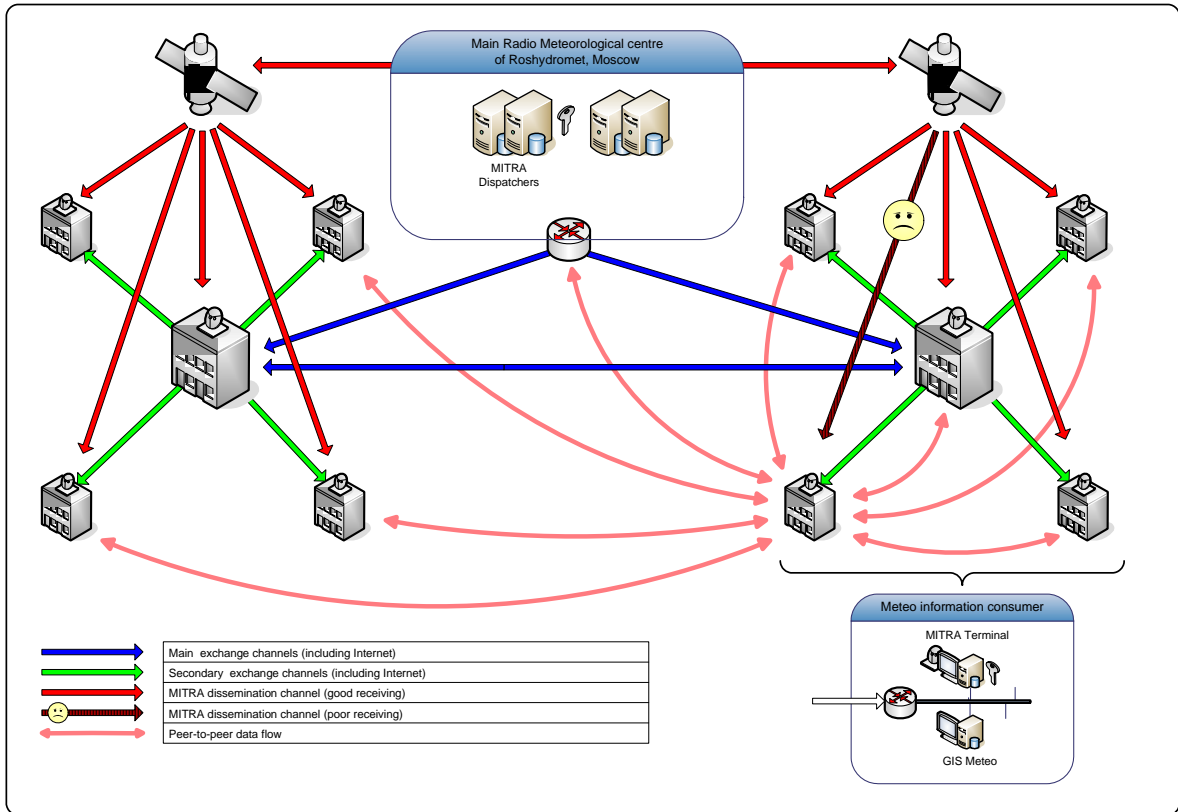
Using additional Forward Error Correction (FEC)

For fight with possible data errors additional (in respect of DVB-S standard) FEC is used, which allows to restore a piece of lost information due to signal distortion caused, for example, by radars, GSM relay stations, meteorological factors, etc.

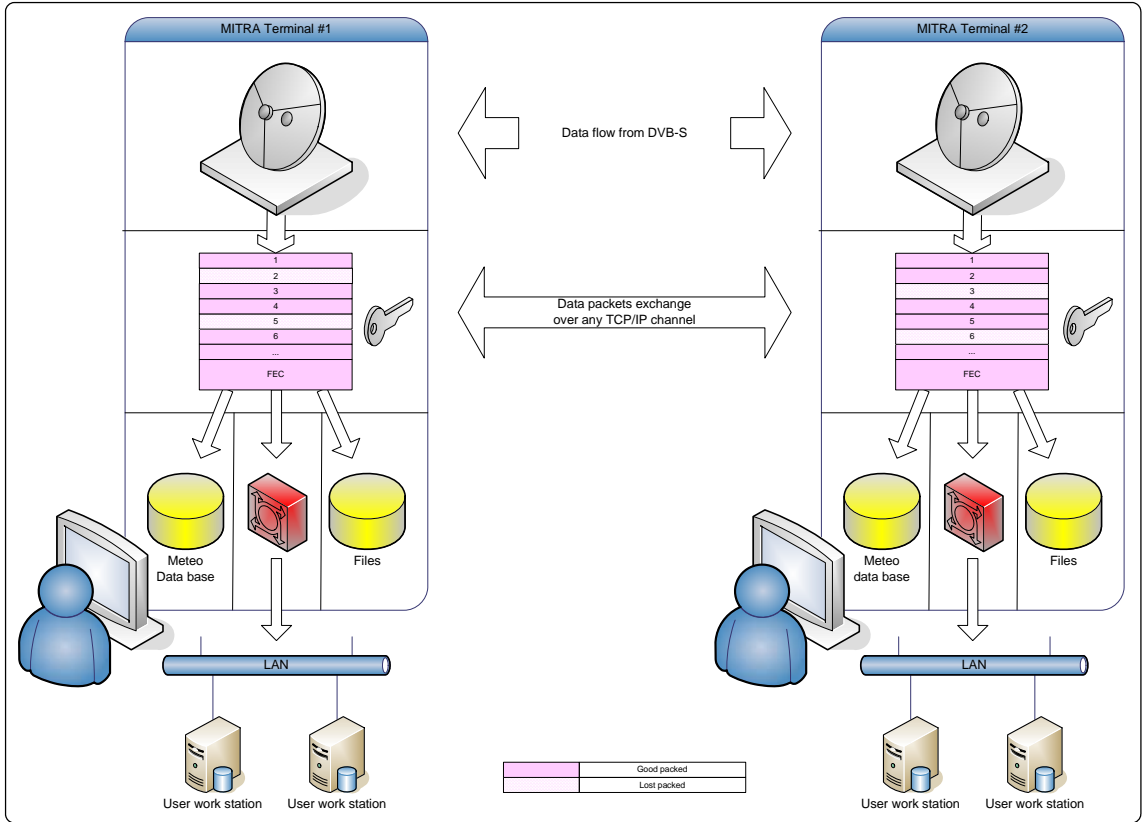
Using TCP/IP networks

When the additional FEC is not effective to restore all lost information, any available TCP/IP networks can be used to make sure the true content delivery. The MITRA technology allows a MITRA terminal to pool any number of lost data blocks from other terminals of a system accessible over a TCP/IP network. This method of communications is named “peer-to-peer” and widely is used in various content delivery networks (CDN). Use of this method allows

restoring data even in cases of strong distortions of a signal received from a satellite or long breaches of the signal receiving.



The model of interaction of the MITRA terminals using a “peer-to-peer technology for restoring lost data is shown in the following picture.



Let us suppose that as a result of the affect of strong noises on the DVB-S signal reception some data cannot be restored by FEC and id found lost. If the terminal shown in the picture are connected between each other by one or several TCP/IP networks, MITRA S/W of Terminal 1 receives from MITRA of Terminal 2 missing packets (2 and 3 in our picture) and MITRA S/W of Terminal 2 receives from MITRA of Terminal 1 missing packets 3 and 6. Thus, data on the both terminals is found completely restored. In case, when there appear not two but more terminals, information delivery assurance is provided. In such a manner the delivery assurance when transmitting data in the “push” mode is provided. An important feature of the “peer-to-peer” technology is the fact that the network nodes “find” each other themselves, define thee most optimal connections themselves and arrange cooperation `between each other themselves. It allows using simple and clear adjustments for the nodes even in case of a complicated network topology.

Advantages of MITRA Technology

The use of satellite broadcasting DVB-S technologies for data transmission in the “push” mode together with the “peer-t-peer” technology for the provision of the assurance of delivery has several important advantages

over the technologies functioning in the GTS on the principle of message switching:

- Low cost of delivery of information of large volumes to a significant number of recipients;
- Low requirements for the land communication network capacity (surface network, in general, is used only for the restoration of lost data and the input of own content);
- High vitality of the system (outage of one or even several nodes and circuits will not lead to the failure of the rest nodes);
- The simplicity of the system adjustment even on the use of several TCP/IP networks of a complicated topology (the "peer-to-peer" technology allows building self-organizing networks);
- The whole transmitted content is presented in the form of files and is accessible for the processing by any applications.