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ABOUT THE CONCEPT OF DEVELOPMENT THE FUTURE WMO INFORMATION SYSTEMS

(Submitted by the Expert from the Russian Federation)

Summary and the Purpose of the Document

The document contains the analysis of the document " Vision of the Future WMO Information Systems ", submitted by the Interprogramme Task Team on the Future WMO Information Systems (August 2001), in light of working information and organizational structure of WWW, its lacks are marked and the suggestions on the completion of the document are given.

ACTION PROPOSED

It is suggested to take into account the information submitted in the present document, and to use it at the completion of the concept of the Future WMO Information Systems.

1. Analysis of working WWW Information structure.

1.1 The basic task of a meteorological service is the maintenance of human community by the data on the current status of an environment and forecast of development of processes in it with the purpose of maintenance of high economical activity, safety existence and decreasing the risk of destruction of the environment as a result of impact on it by human activity.

The accuracy of forecast development of the processes in the environment and also the accuracy and timeliness of revealing of unfavorable processes in the course of environmental monitoring, which can lead to the catastrophic consequences is provided with application of modern numerical models.

The meteorological phenomena in an environment are connected with global processes, the monitoring and forecast of which development requires coordination of interaction of national meteorological services and manipulation with global complete sets of the data.

The meteorological service in view of necessity of manufacture constantly increased in volume, nomenclature and accuracy of complete sets of the observation data in a combination with the methods of their processing is expensive branch, the solution of which within the framework of a national service practically is impossible.

In connection with latter, the World Meteorological Organization (WMO) has developed modern structure of the World Weather Watch (WWW), directed on coordination of the obligations of the centers of the “overnational” structure on production, which is freely distributed between National Meteorological services for use in operative and not operative practice.

1.2. A nuclear of such structure is operation of the centers of Global Data Processing System (GDPS). The principal purpose of GDPS consists in preparation and providing by the most profitable way to the Members of the analyses of meteorological fields and prognostic products. The functions and organizational structure GDPS should be coordinated with needs and opportunities of the Members and to provide their economical functioning.

The basic operative and not operative functions GDPS include:

- a) preliminary data processing (search, quality surveillance, decoding, sorting of the data kept in a database for use in technologies of preparation of the prognostic products);
- b) analysis of three-dimensional structure of an atmosphere on various (up to global) territory;
- c) calculation according to the operating models of global prognostic products and products on the limited territory (fields of the basic and derivative atmospheric parameters) on terms 1-10 days;
- d) preparation of specialized prognostic products: the products on the limited territory with a fine grid; short, medium and long-range forecasts; specialized forecasts for a marine fleet, aircrafts; monitoring of an environment and other purposes;
- e) data quality control.
- f) postprocessing of numerical weather forecast products (NWF), including technologies of the automated workplaces (AWP) on the basis of workstations and personal computers, with the purpose of reception of additional products in the field of weather forecasts and forecasts of a climate derived directly from the NWF data.
- g) preparation in global or regional scales of specialized products for the climatic diagnosis (such as 10- and - or 30-day's averaging, sums and anomaly);
- h) quality assessment of the analysis and forecasts, data quality control, verification of accuracy of prognostic fields, research and development of the schemes of the diagnosis and NWF;
- i) long-term storage of the observation data and GDPS' products, including the use of accumulated data for verification of operative and research products;
- j) maintenance of the constantly modified catalogue for data and prognostic products stored in the system;

- k) special information exchange among the GDPS' centers through the distributed databases; Quality and timeliness of the availability of products from the GDPS centres, mainly depends on:
- a) availability of the complete data sets on the atmosphere and ocean state, and underlying surface as well;
 - b) observation data quality;
 - c) timeliness of reception of the observation data;
 - d) quality of the analysis of the data and possibility of their assimilation by the models;
 - e) quality of the model calculation of prognostic products;
 - f) speed of model running.
 - g) Global Observing System (GOS) and Global Telecommunication System (GTS) are created for successful functioning of national meteorological services and GDPS centres in the WWW structure.

1.3 GOS represents decentralized structure of observing networks in each country, and also centres for collection and preprocessing of the specialized data: satellite, aircraft, radar, buoy and other automated systems. GOS does not cover a significant part of land and yet the most part of ocean so far. The data quality provided by GOS, does not satisfy completely requirements of models of the GDPS centers.

1.4 GTS should provide timely, reliable and effective from the point of view of the cost of the data and products arrival in National Meteorological Centers (NMC) and GDPS centers. GTS is based mainly on interrelation of a number of the centres, namely NMC, RSMC, RTH and WMC. In this connection it operates as the incorporated network intended for the collection, exchange both distribution of the data and products on the world basis, with the purpose of effective and effective satisfaction of needs all National Meteorological Services, and also the World Meteorological Centers within the framework of the coordinated systems WWW.

GTS is organized on the three-level basis:

- a) The Main Telecommunication Network (MTN), linking together the WMCs as well as designated Regional Telecommunication Hubs (RTH);
- b) The regional telecommunication networks;
- c) The national telecommunication networks.

GTS now works as a network of the centers with allocated (physical or logic) with channels between them, on which are supported standardized WMO' protocols and procedures of information exchange. The network of the centers and channels of communication is supplemented by satellite and radio transmissions.

GTS, basically, copes with the operative function of timely collection and providing of the observing data in NMC and GDPS centers, except for the satellite and radar-data. As to providing of processed information, here situation is a little bit worse, though the overwhelming majority NMC and GDPS centres receive the information, necessary for them in time..

The non operative needs of the WWW programs are satisfied through GTS only partially, others are provided with other means (mail, Internet and so on). The needs for information exchange of other WMO programs are satisfied GTS also partially, as it resources are directed on satisfaction, basically, operative needs.

1.5 The information structure of WWW is conditionally represented in a fig. 1 and 2.

The new requirements to information WWW services (providing of data sets and information on the time-table and on request, realization of network access NMC and other users to DB and products) recently have appeared which they, and in particular GTS, can not satisfy fully. Therefore necessity has arisen to remove shortcomings of information WWW services (GTS and GDPS).

A part from the technological information structure WWW is connected by organizational structure WMO, which includes 6 regions (Associations), which in turn put before WWW, sometimes original requirements and influence on technological information structure of

WWW. In this connection it is necessary to consider requirement of national services for the observing data and processed information, which in our opinion could be presented as follows:

1. Complete observing data set for the GDPS centres, providing issue global, hemispheric and regional products - WMC, RSMC with regional specialization. Only 10-15 centres all in all.
2. Complete set of the processed information of a global coverage for reservation of own products and comparison - WMC, part of RSMC. Only 8-10 centres all in all.
3. Complete data set and processed information of hemispheric coverage is required for 8-10 centres (RSMC).
4. Complete data set and processed information of a regional coverage is required for significant quantity NMC (50).
5. Complete data set and processed information in frameworks of a regional coverage (partly) for the overwhelming majority NMC (about 100).

Thus, it is possible to make a conclusion, that 10 up to 20 centres require the all complete data set and significant part of the information, the rest centres require information of regional and less, than regional coverage. It means, that the interests of the majority NMC are concentrated in regions and on their joints, i.e. the working organizational structure of WWW should be kept.

1.6 Functioning MTN includes 18 RTH and almost all centres requiring for a complete data set and the processed information of global and hemispheric coverage. Each of the MTN centres has from 2 up to 5 circuits connecting it to other MTN centres and much a lot of circuits, connecting it with others RTH and NMC.

The necessity such quantity of circuits is dictated:

- By requirements of the collection and dissemination of the information on a zone of the responsibility;
- By desire to increase reliability of information exchange in global, regional and interregional scale;
- By insufficient bandwidth of some circuits.

Cost of rent and support of serviceability of such quantity of circuits requires significant financial assets, therefore it is rather desirable to find a way of reduction of these charges.

The majority RTH on MTN, RTH and part of the national centres give access to databases and processed information, which physically are located either at the GTS centres or at the GDPS centres. The data and information are available, as a rule, as the bulletins and much less often as a data set. The access to DB is carried out through GTS, as a rule, only from the adjacent centres and through the Internet, that does not allow with due quality to satisfy needs of National Services and other users of the information.

2. Analysis of the document " Vision of the Future WMO Information Systems "

2.1 The concept of development of the future WMO information systems is determined in the special document " Vision of the Future WMO Information Systems " (Revised vision of the Future WMO Information System) of August 8, 2001 prepared at the third meeting of Interprogramme Task Team on Future WMO Information Systems.

The concept prescribes presence 3 levels of responsibility:

The Global Information System Centres (GISC), Data Collection or Product Centres (DCPC) and National Centres (NC). A key role in all information system will play GISCs, which functions are stated in item 11 of the mentioned above document.

2.2 It is obvious, that the basis proposed GISCs will be databases and means of access to them. There are questions:

- Will these databases contain only the reports, the bulletins or they will contain and - or parameters?
- Will these databases be independent or it is databases of the GDPS centres (their copy or part) or RTH?
- If they are not databases of the GDPS centres or RTH, than what is a differences from them?
- If they are databases of the GDPS centres, RTH or they a little bit differ from them what for to create new structures, instead of to modernize working?

2.3 The basic direction of changes in the Future WMO Information System (FIS) is a replacement GTS for 3 level system of the centres, between which should be carried out the exchange of data sets with the use «push» and «pull» technologies. And for «push» technologies use of systems of similar subjects is possible which are used now in GTS, and for «pull» technologies, basically, the request - reply through the new Telecommunication environment, including Internet, that for performance of operative functions of some national centres sometimes can create serious problems.

2.4 Data Collection or Product Centres (DCPC) is basically existing RSMC, it is possibly WMC and centres producing specialized observations. Almost all these centres had the telecommunication centres of a various level, which were included into structure GTS. In FIS the part of functions of working telecommunications structures is assigned on DCPC, and the part is not mentioned at all (for example, monitoring). The document " Vision of the Future WMO Information Systems " does not foresee preservation GTS in WWW structure, moreover it does not consider and does not suggest new WWW structure at all. It is supposed, that the Future WMO Information Systems will be more effectively working, however of some assumptions are not sufficient - the feasibility report is necessary.

2.5 The functions GISC specify:

2.5.1 " Collect observational products that are intended for a global exchange, from NC in a zone of the responsibility ". There is a question: And what to do with the data for a regional, interregional, bilateral exchange, is especially NC from a zone of the responsibility of different GISCs? If to transmit them through GISCs, what is their responsibility and duties? If to transmit directly to NC or through DCPC, how does the new system differ from working system?

2.5.2 " Aggregation of the observational data in data sets for their responsible areas " Obviously it is more, than one or several bulletins, therefore some questions arise:

- Time of data sets accumulation;
- Procedures of preparation and sending of data sets with delayed data.

In any case data sets accumulation will lead to the delay of data transmission much more, than distribution of the national bulletins.

2.5.3. " Dissemination of the entire set of data and production agreed by WMO for routine global exchange (this dissemination can be via any combination of the Internet, satellite, multicasting etc) ".

Questions:

- and what to do with the data and products for a regional, interregional, bilateral exchange intended for NCs from a zone of the responsibility of different GISCs?
- If to transmit them through GISCs, then what are their responsibilities and duties for it?
- If to transfer directly in NC or through DCPC, then than does the new system differ from working system?

- What volume of the entire data set and products for a global exchange is expected?
- Besides if WMCs disappear from GDPS, who will fulfil their functions, for example, archiving of the data, products etc.

2.6. Requirements of NCs and other users in data sets, not only in kinds of the data, but also in sets of parameters (some observation data) can significantly influence on the future DB arrangements and their content. The possibility of providing of National Services with such sets of data can considerably lower the cost of the automated workstations for a weatherman(AWS), as a requirement in availability of significant quantity S/W, providing preparation of these data sets at AWS of National Services, will disappear. It will be necessary to estimate such approach to DB and to generate more exact requirements to them, both from the WWW programmes and other programs supported by WMO.

2.7. The questions related to WWW WMO organizational regional structure and the problems of financing, establishment, functioning and providing of services by GISCs are not mentioned in the document as well.

It is necessary to emphasize, that the National Services, voluntarily with the WMO approval assumed responsibilities of implementation of GISCs functions, should provide without restrictions and free of charge the interested other National Services with basic data and products (resolution 40).

2.8. Creation of any information system and the more such a significant one, as Future WMO Information System, should be implemented on the quite certain stages, basic of which are:

- Formation of the requirements to the system and its components (not only general, but also specific ones, such as: accessibility, reliability, time of respond for request, time duration of data storage and many another);
- Development of the outline and technical projects, including the feasibility report;
- Implementation of the project, including the pilot projects.
- Actually none of the listed above stages is realized. There are only requirements and offers of general character.

Conclusion:

The document " Vision of the Future WMO Information Systems " requires completion.

As the creation of the Future WMO Information Systems is directed on increase of efficiency of organization of the collection, dissemination and providing of access to the data, the Future WMO Information Systems should in the maximum extent possible be coordinated with existing WWW structure (especially in a part of GDPS functions).

The further work on the Future WMO Information Systems should be carried out not from the positions of network creation essentially new information centres (GISC, DCPC and NC), but from the positions of development of a network WMC, RSMC and NMC in WWW system and expansion of their functions (in particular, at the expense of merging various functions of processing and telecommunications).

In view of above-stated, and also taking in to account the directions of EC-LIII and EC-LIV sessions and in the light of discussions taking place at EC-LIV session it is proposed to improve the document " Vision of the Future WMO Information System", using the suggestions and comments on modification of the document " Vision of the Future WMO Information System ", given in the ANNEX 1, which take into account a part of the listed above comments.

ANNEX 1

Suggestions on modification of the document " Vision of the Future WMO Information Systems "

1. To insert in the text of the document " Vision of the Future WMO Information Systems " a preamble of the following content: " The basic purpose of the Future WMO Information Systems is organizational and technological development and improvement of the World Weather Watch (WWW) system of the of World Meteorological Organization for:
 - a) providing of the increasingly growing requirements of WMO countries - Members with the meteorological and related to it information,
 - b) giving WWW new qualitative functions directed on meeting the requirements of all WMO programs "
2. To replace the text of the paragraph 4 (4. The Future WMO Information System will continue to rely upon the WMO communication system to provide highly reliable and timely delivery of data and products. Currently, this requires a private network but this may change as public communications services evolve) for the text of the following contents: " the Future WMO Information Systems supplement and develop information structure and functions of the World Weather Watch (WWW) of World Meteorological Organization ",
3. To bring to the text the additional paragraph 4* of the following contents: " Telecommunication environment of the future WMO information systems will be a part of GTS system of the World Weather Watch (WWW) of the World Meteorological Organization ".
4. To replace the text of the paragraph 9 (9. GISCs would usually be located within or closely associated with a centre running a global data assimilation system or having some other global commitment. However, the proposed architecture does not dictate that this be a requirement.) for the text of the following contents: " the GISC's functions are carried out by the World Meteorological Centers of the WWW systems of WMO. The GISC's functions with the approval of WMO can be taken up by the WWW WMO Regional Specialized Meteorological Centers or by other centers (group of the centers) ".
5. To replace the text of the first item of the paragraph 12 (12. Several dozen centers would serve as Data Collection or Product Centers (DCPC). Existing World Meteorological Centers and Regional/Specialized Meteorological Centers would function as DCPCs. However, many additional centers would also serve as DCPCs. This would include suppliers of special observations (e.g. ARGOS, ARINC), research projects, and centers producing products related to a specific discipline.) for the text of the following contents: " It is supposed that several tens of Centers of Specialized Products (CSP) will be existed, the functions of which will be carried out by the Regional Specialized Meteorological Centers of WWW WMO or by other centers which have taken on these obligations. In addition to that the CSP's functions can be carried out and by centers which are not included in the structure of WWW WMO ".

Note: It is meaningful to consider the question of changing RSMC's names for the names of the regional Meteorological Centers (RMC) and Centers of Specialized Products (CSP).
6. To replace the text of the paragraph 13 (13. National Centers would form the foundation of the Future WMO Information System. Many National Centers would be part of an NMHS but others would have national responsibility for functions falling within WMO Programmes but located outside of the NMHS.) for the text of the following contents: " The National Centers will be included into structure of NHMS and to form a basis of the Future WMO Information Systems ".