376

Report on the fourteenth meeting of Computing Representatives, 27 – 28 May 2002

P. Prior (Compiler)

Operations Department

August 2002

Contents

Preface

The fourteenth meeting of Computing Representatives took place on 27-28 May 2002 at ECMWF. Eighteen Member States and Co-operating States, plus EUMETSAT, were represented. The list of attendees is given in Annex 1.

The Head of the Computer Division (Walter Zwieflhofer) opened the meeting and welcomed representatives. He gave a presentation on the current status of ECMWF's computer service and plans for its development. Each Computing Representative then gave a short presentation on their service and the use their staff make of ECMWF's computer facilities. There were also presentations from ECMWF staff members on various specific developments in the ECMWF systems. The full programme is given in Annex 2.

This report summarises each presentation, with additional detail on those topics expected to be of particular interest to Member States and Co-operating States. Part I contains ECMWF's contributions and general discussions. Part II contains Member States' and Co-operating States' contributions; all the reports were provided by the representatives themselves.

Part I

ECMWF Staff contributions

ECMWF Computing Service: Status and Plans – *W. Zwieflhofer*

The configuration of ECMWF's computer system current at May 2002 is given in Fig. 1 below.

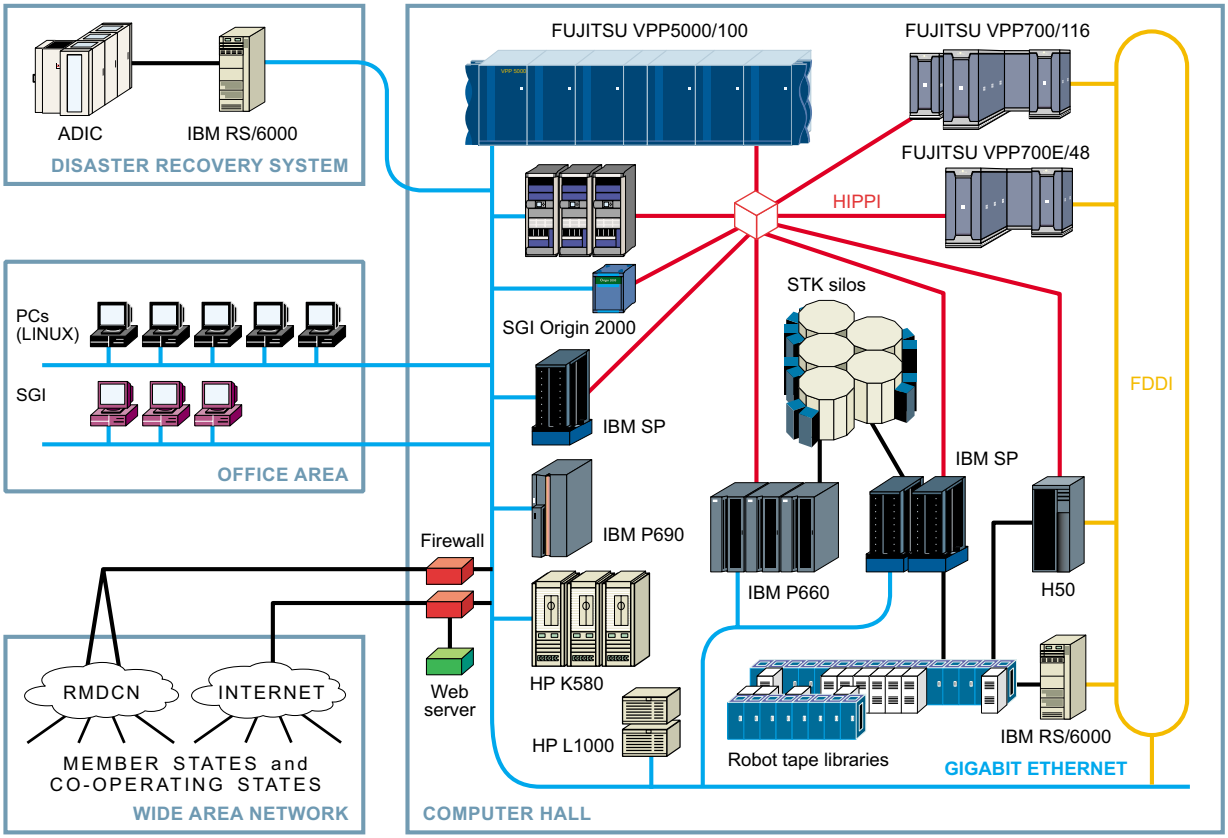


Figure 1

Fujitsu service

The Fujitsu machines have been very stable and provided an extremely reliable service over the past year; average user availability has been above 99%. Average CPU utilisation has been approximately 85%, slightly lower than in the previous year because of the increasing complexity and size of some of the jobs submitted. The average percentage of the available processing power used by Member States' users has increased and is now close to a weekly average of 15%.

Fujitsu replacement

The procurement process took place over most of 2001. There were four replies to the Invitation To Tender (Cray, Fujitsu, IBM and NEC). The benchmark used was complex and comprehensive, comprising a full 4D-Var data assimilation at fairly high resolution; a deterministic forecast at a resolution higher than the current operational version and a 50-member EPS. Vendors were required to commit contractually to their equipment's performance on each of the three elements of the benchmark. Following thorough tender evaluation over four months, IBM was selected as the supplier of the next High Performance Computing Facility (HPCF). The equipment will be rented and the contract will expire on 31 March 2007.

The IBM High Performance Computing Facility

The basic building blocks of the system are IBM p690 servers, each of which has 32 processors. Each server will be divided into four 8-processor partitions (nodes), using the Logical Partitioning (LPAR) feature; since each node has its own switch cards, the switch capacity of the whole system can be increased in this way. Each partition runs its own copy of the operating system, AIX. The parallel file system that will be provided GPFS (Global Parallel File System),

is rich in features and options; batch job submission and execution will have to migrate from NQS to LoadLeveler; there will be a need for a period of familiarisation before their advantages can be fully exploited. The system will be divided into two identical clusters. System maintenance can be performed on the clusters separately and individual nodes can be taken out of service and reintroduced without affecting the operation of the cluster. It is anticipated that these features will enhance system stability.

More information is given in a later presentation.

Table 1, below, lists the characteristics of the system to be delivered at each of the three phases. Each of these phases must meet a contractually guaranteed level of performances (1).

	PHASE 1	PHASE 2	PHASE 3
Processor	1.3 GHz Power4	1.3 GHz Power4	Faster Power4
Number of processors	1408	1920	~3000
Interconnect	Dual-Colony (PCI)	Dual-Colony (PCI-X)	Federation
I/O Nodes	8 NH-2	8 NH-2	4 p690 follow-on
Disk space (Fibre Channel)	8.4 TB	12.4 TB	27 TB
Sustained performance	1.3 x VPPs	1.9 x VPPs	5.2 x VPPs

Access to the IBM HPCF for Member State users

One Phase 1 cluster will be delivered to ECMWF in June/July 2002 to enable the development of an ECMWF specific environment and the fine-tuning and adjustment of the file system and queuing structures. Member State users who have a particular need to gain early experience with the new system will be given the opportunity to access a 'familiarisation configuration' in its immature state from 1 August; this possibility will not be generally announced but Computing Representatives are invited to offer the opportunity to those users they think would benefit and these users may discuss their needs with their User Support Contact Point.

It is planned that an official trial service for Member State users will start at the beginning of November 2002. This system will be suitable for the migration of Member State codes and scripts, although file system changes may be required and there may be more frequent interruptions of service than usual for reconfigurations and similar.

Provided that the 30-day Operational Acceptance is passed by 23 December 2002, it is planned to provide a full user service from January 2003. The IBM and Fujitsu systems will then run in parallel until the end of March 2002, when the Fujitsu service will be ended.

(Failure of the IBM system to pass Operational Acceptance by 23 December will necessitate the extension of the Fujitsu contract beyond March 2003.)

Migration of Member States' workload

The contract with IBM includes twenty-four man-months of support (advice and general problem solving) from IBM applications specialists; these resources will be shared with the Member States and should be applied for via the appropriate User Support Contact Point.

GPFS is very different from the current Fujitsu I/O subsystem. ECMWF will formulate advice, once some experience has been gained in-house.

Training

There are three training courses planned in 2002:

24 – 28 June	How to use an IBM cluster 1600 (including AIX, LoadLeveler, compilers, etc.). An ECMWF specific environment will not be available; a single p690 only will be available.
28 Oct – 1 Nov	How to use an IBM cluster 1600, (including AIX, LoadLeveler, compilers, etc.).
and 18 – 22 Nov	An ECMWF specific environment will be available; practical training will use the full cluster.

(1) In the period between the Computer Representatives' Meeting and the publishing of this report, tests have revealed that more processors than shown in Table 1 will be required to meet the contractual performance levels.

Data Handling System

Following a procurement in 2002, it was decided to replace the existing TSM-based (Tivoli Storage Manager) Data Handling System with a new system based on HPSS (High Performance Storage System). HPSS is a hierarchical storage management software designed to cope with large volumes of data. It is founded on concepts of 'servers', 'data movers' and other components, which can be distributed over multiple machines. This distributed approach provides excellent scalability but does lead to increasing complexity.

The most important information for users is that, although there are major changes in the underlying hardware and software, both the ECFS client and MARS client will remain unchanged under the new DHS. Figure 2 (below) shows the structure of the new DHS.

Data migration

Migration of data to the new system will be a major and lengthy operation. The copying of MARS research data (240 TB) will begin in autumn 2002 and is expected to be complete by mid 2003. Migration of MARS operational and ERA data (180 TB) and ECFS data (200 TB) will then begin and is expected to be complete by the end of 2004/early 2005.

Data migration will be carried out by the DHS team at ECMWF and will, in general, be transparent to users.

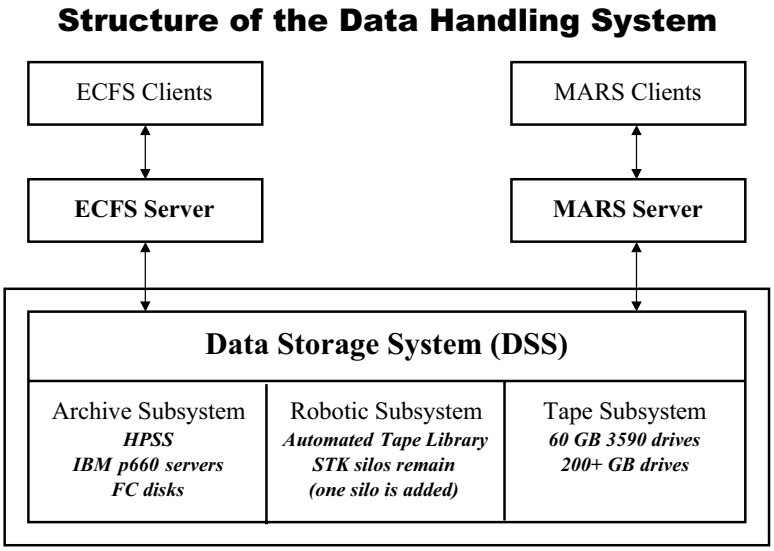


Figure 2 Structure of the Data Handling System

Desktops and servers

The first 40 scientific desktops have been installed. They have 2 GHz Pentium 4 processors with 1 GB of memory and Nvidia Quadro 2 graphics cards. They run under Linux with VMware providing office applications under Windows 2000. Metview and Vis5D run very efficiently on these systems.

Internal work is being migrated from the SGI servers to the IBM Nighthawk II servers. Ecgate1 has been upgraded to improve facilities for Member State and Co-operating State users. At some point during the four-year (PC and server supply) contract with IBM, ecgate1 will be replaced by an IBM server. Member States and Co-operating States will receive plenty of notice of the change and it will be preceded by a period of parallel running. A diagram showing ecgate1 CPU utilisation in April/May 2002 indicates that there were still plenty of resources available (see Fig. 3).

Web services

Domain-based access for users at national meteorological services has proved a satisfactory solution to the problems caused by the previous need for certificates. Additional graphical products and the 'your room' feature have provided popular new facilities.

The public (www) and Member State (wms) sites have been merged into a single web site (www), resulting in a more intuitive structure. An access control system ensures that restricted information can be accessed only by authorised users.

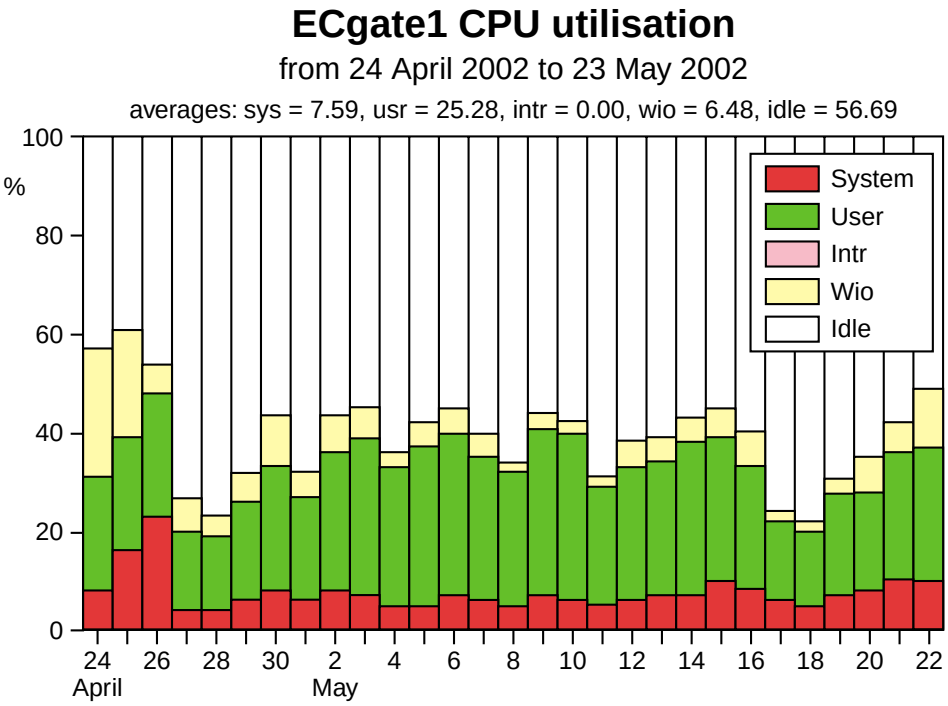


Figure 3 Ecgate1 CPU utilisation

RMDCN

The RMDCN continues to expand. EUMETSAT has joined, with connections to both ECMWF and DWD, Germany. The Czech Republic has become an ECMWF Co-operating State and there is now a connection between the Centre and Prague. The Russian Federation also joined in September 2001, so that all the RTHs (Regional Telecommunications Hubs) of Regional Association VI are now connected to the RMDCN. In total, there are now 35 sites connected and various upgrades have been carried out. The Syrian Arab Republic will be connected via SITA. The service is very stable and is meeting the contractual conditions of the Service Level Agreement. Currently, the technical options for continuing the RMDCN project after the first five years (beyond 15 March 2005) are being assessed.

IBM HPCF – *Neil Storer*

The first two phases of the new HPCF will comprise quantities of 32-processor p690 servers; the exact numbers are still to be defined. Although the time-critical operational suite requires the resources of the whole system, no individual task needs more than half the system's performance, so the system can be split into two identical, independent clusters. This means that, should either of the clusters be down for any significant length of time, the operational workload can be continued on the other, albeit with delays in the production schedule. To allow this method of operation, codes and data will be replicated on both clusters.

The p690 server is the first p-Series system to support logical partitioning (LPARing), which will allow each server to be partitioned into four 8-processor nodes. Since only two switch connections per operating system image (node) are possible, the division into four nodes increases the available bandwidth to 8 switch connections. Most nodes will have 8 Gigabytes of memory, though a small number will have 32 Gbytes. There is communication between the nodes but not at the user level: for this, MPI must be used. Hence, it is anticipated that the 32 GB nodes will allow certain user jobs to run within an LPAR, using OpenMP alone, obviating the need for the use of MPI and, thus, increasing efficiency.

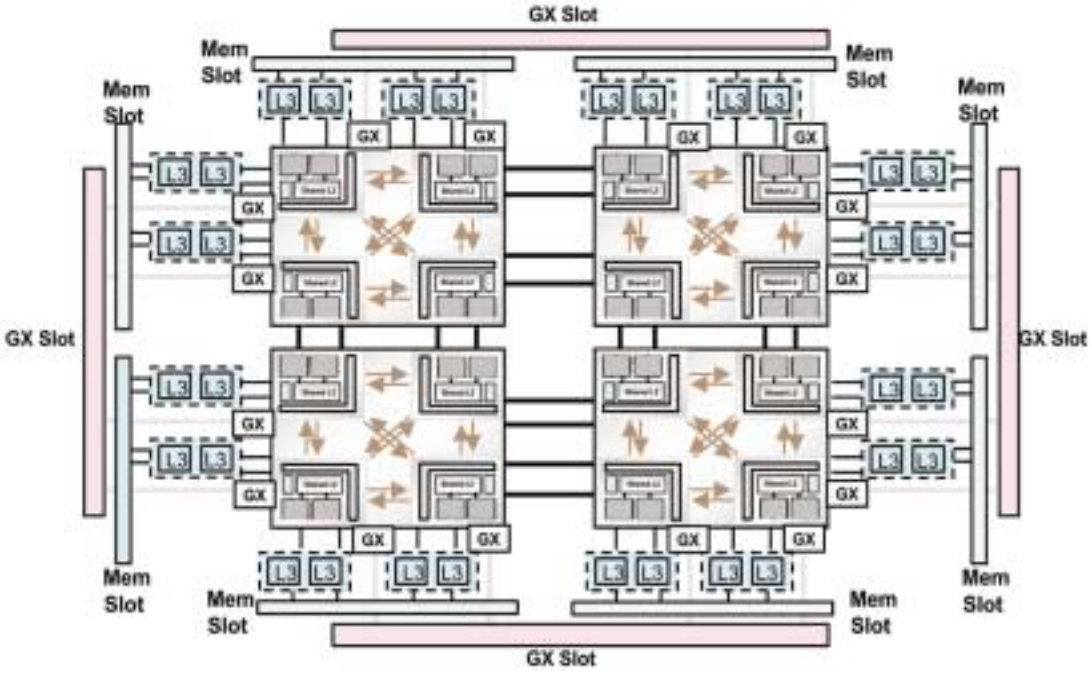


Figure 4 32-processor p690

There are various new devices to increase resilience. The use of chipkill(tm) memory allows a certain number of memory errors without bringing the whole system down; there is built-in self-testing; level 1 and level 2 errors can be corrected; faulty components, such as CPUs, cache and even whole LPARs can be deactivated on the fly, allowing the remaining system to continue operations. p690 servers use a PCI connection, which is slow and inefficient, to the switch. Nighthawk nodes, which use a native MX connection, will therefore be used for I/O and will provide throughput which is approximately two or three times faster than that of the p690s.

Phase 2 of the system will add more p690 servers, some with 128 and some with 32 Gigabytes of memory.

Phase 3 will comprise an even greater number of servers, which will be the follow-on from the p690 (currently referred to as the 'p690+', for convenience). The p690+ servers will have improved I/O capabilities, so there will be no need for Nighthawk nodes in this phase. They will be replaced by p690+ servers with 16 CPUs and 16 GB of memory. The Colony switches, using PCI, which served the Phase 1 and 2 systems, will be replaced by native Federation switches, which are expected to be approximately ten times faster than the current PCI switches. The increased bandwidth of the Federation switches may make it unnecessary to LPAR. As in Phases 1 and 2, a small number of the p690+ servers will have 128 Gbytes of memory, the remainder will have 32.

File System

The p690 clusters will be served by the Global Parallel File System (GPFS). This is a distributed file system, which provides global filename space within a cluster (although inter-cluster transfers will require NFS, FTP or similar mechanisms). Currently, it is planned to have separate $HOME file systems for each cluster, to enable one cluster to continue operation if the other is out of service. GPFS is journalled, so recreation of the latest status should be possible after system crashes. GPFS allows much higher performance than other mechanisms, such as NFS, and is highly scalable, both in the number of disks and the number of I/O servers possible. The Recoverable Virtual Shared Disk (RVSD) facility provides improved resilience. Initial testing of GPFS is encouraging but greater experimentation will be possible, once Cluster 1A arrives with its FASt T500 fibre channel disks. There is some concern about the suitability of GPFS for small block I/O, such as is created by 'std out', 'std err' and shell scripts.

Disks

The system will be supported by an Enterprise 500 RAID storage server and FASt T500 fibre channel disks. Multiple levels of RAID are supported but the ECMWF system will mainly use RAID-5. The disk configuration is not finally decided yet, but is likely to be four data disks and one parity disk, in which case it will have a capacity of approximately 440 Gigabytes of data on six logical disk units.

Batch processing subsystem

The new system will use LoadLeveler as its batch processing subsystem. The Centre already has some experience with LoadLeveler, which is already installed on the two general-purpose Nighthawk servers. It is not extremely dissimilar to NQS, which is used currently on the Fujitsu VPP systems, so conversion is not expected to be problematic. LoadLeveler has a job dependency feature to enable the running of defined jobs to be dependent on the outcome of earlier jobs.

Migration to the IBM HPCF – *Mats Hamrud*

The task of migration from Fujitsu to IBM will be more straightforward than for the Cray to Fujitsu migration, when major codes, written in Fortran 77 with Cray extensions had to be almost entirely rewritten in Fortran 90 and there was a change from shared to distributed memory. At that time, a major effort was made to produce a standards-compliant, highly portable, non-manufacturer specific and non-architecture dependent code. This current migration will reap the benefit of these earlier efforts and the main issues to be concentrated on will be:

- the efficient use of a scalar machine;
- working efficiently with an order of magnitude more processors;
- the need for possible retuning of I/O to exploit GPFS;
- efficient use of LoadLeveler;
- efficient message passing to compensate for slower switches (until the installation of Federation switches);
- the possible use of shared memory parallelism (as was used on the Cray C90).

Known areas needing optimisation

As the power of one p690 node (eight processors) is approximately equal to the power of one VPP5000 processor, one processor VPP5000 jobs will need to be parallelised over eight processors using OpenMP or MPI.

Although the p690s have no vector hardware, vector-style loops still work well because the p690s make extensive use of unrolling for efficient use of their CPUs. However, current methods of data access and data reuse are very inefficient on a cache-based machine and must be redesigned. Divides and square roots are very costly compared to multiplies and adds, so their use must also be reassessed, and worked around, when possible. Stride 1 data access was important on the Fujitsus but will give even more significant gains on the p690s. Fortran 90 array syntax, already rather inefficient on the Fujitsus, is even more so on the p690s. The use of vector intrinsics must be reassessed and optimised; BLAS routines should be used as much as possible.

Computer optimisation

Computer optimisation was begun conservatively at level 02; level 03 is now running correctly, however, it is restricted by use of the -qstrict option, which allows no reordering of code. This ensures that results remain reproducible at bit level. The -g option provides a symbolic traceback to aid debugging without any performance penalty. 64 bit addressing is used throughout. Much useful information on selecting compiler options and retuning was gained from IBM's Red Book 'Power4 Tuning Guide' (see www.redbooks.ibm.com).

Caching

The IFS already uses a high-level blocking scheme. Results of tests with a lower resolution (T159 L60) forecast model on the eight-processor familiarisation p690 were presented, showing that the p690 is tolerant of block lengths from 8-64; block lengths outside this range, however, have significant impacts on performance.

Profiling of codes

There are two profiling tools available; xprofiler and gprof. xprofiler is the tool used at ECMWF. To obtain information at the subroutine level, the program must be linked with the -pg option. To obtain more detailed information about what is happening within subroutines, the program must be compiled with the -pg option. Xprofiler also provides a graphical output, which some users have found very helpful: the height and width of the blocks presented corresponds to the time spent on various parts of the code, thus clearly identifying the most expensive parts of the code for more detailed investigation. The Hardware Performance Monitor (HPM) provides more detailed, low-level information. The HPM toolkit was originally intended for hardware engineers but has proved very helpful in the optimisation process. More information can be gained from www.spscicomp.org/scicomP5/abstracts.html.

It was noted that prepared scripts containing the appropriate optimisation options had been created for the convenience of users. These will be presented at the forthcoming user training courses and will also be made generally available to Member State users.

In response to a query about MPI 2, **M. Hamrud** replied that IBM will have a complete implementation of MPI 2, apart from spawning, which they currently have no plans to implement.

M. Pithon (France) asked about the need to avoid arrays, as Météo-France's code makes quite high use of arrays. **M. Hamrud (ECMWF)** replied that if one array was simply being copied to another array, it should cause no problem. However, if array syntax was being used for blocks of computation, then the compiler would treat each statement independently, with no re-use of variables from one statement to another. Compiling at optimisation level 4 will perform a high level reorganisation of the code but is risky, as pointed out earlier, as code may be resequenced.

ECaccess – A portal to access ECMWF – *L. Gougeon*

ECaccess provides interactive and batch access to ECMWF archiving and computing facilities. This facility is currently available via the Internet only. Interactive authentication is via SecurID cards and x509 certificates provide batch authentication from within a script. Date integrity and confidentiality is ensured between the Member States and ECMWF networks by the SSL (Secure Socket Layer) protocol.

ECaccess can be used through an extended (single sign-on) FTP server, via HTTP/S through a web browser, through a secure (single sign-on) Telnet access or a secure X windows access via telnet.

ECaccess is constructed with a multi-tier (4 tier) architecture:

ECaccess client

The ECaccess client comprises all the applications which a Member State/Co-operating State user will need to install on their workstation in order to use ECaccess: a standard Telnet, an FTP client and a web browser, standard X windows and FTP servers. These are all standard applications, which are usually found in a UNIX box. A standard set of ECaccess tools are also supplied. They are shell scripts that interface to the FTP server to automate the login process for batch work.

ECaccess gateway

This is an application running on the Member State network, which is the entry point for all ECaccess users. Its first function is to verify the user's authentication. If the verification is successful, the gateway starts several daemons including Telnet, FTP and web server daemons. Telnet, FTP and HTTP/S protocols are also implemented on the gateway. The daemons use the gateway runtime to access the ECaccess server at ECMWF, via a secure tunnel through ECMWF firewalls. The ECaccess gateway application is duplicated at ECMWF, for those users who do not have access to a local application.

ECaccess server

This is the entry point at ECMWF for all the ECaccess gateways within various Member States. It first authenticates each of the gateways, by means of an x509 certificate, which is valid for two years. Once authenticated, the gateway can be supplied with a variety of functions by the server: job and file management; monitoring of file transfers; systems access; recording of users' activity.

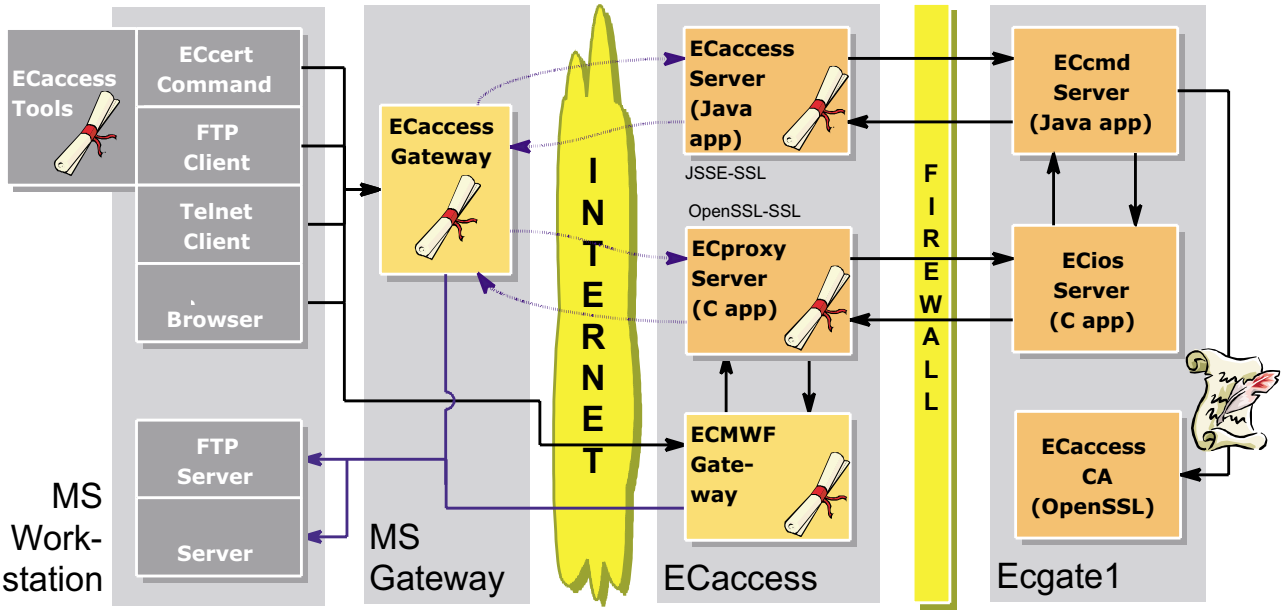


Figure 5 Ecaccess architecture

ECaccess - ECgate1

This final tier is a daemon running on ECgate1 to provide and control various functions: the Certification Authority, the interface between ECaccess and NQS (in the future, it will supply the interface to LoadLeveler), and to home, scratch and ECFS file systems. It manages job submission, output and any error files created and also unattended file transfers via the ECtrans command.

L. Gougeon then described ECaccess basic commands, file management commands and job/transfer management commands. The presentation ended with a real-time demonstration of ECaccess. Computing Representatives were informed that all the ECaccess packages, tools and gateway are available for downloading from the www.ecmwf.int website.

In reply to a query from **A. Emmanouil (Greece)**, **L. Gougeon** replied that it was possible to Telnet to ECaccess from a laptop to start an X-application and then, providing the defined machine is accessible by ECaccess, specify a different machine to view the output (via the 'display' command).

R. Urrutia (Sweden) commented that if the ECaccess gateway keeps a secure access to ECMWF open, the Member State system in which it is implemented must be quite powerful. **L. Gougeon** replied that the power required depended on the number of users supported. Java 1.3 is the only concrete requirement. A Linux Netfinity machine was used for development at ECMWF.

E. Krenzien (Germany) asked whether ECaccess would still be secure, if installed on a large shared machine. L. Gougeon replied that this would not compromise security.

In reply to **K. Holmlund (EUMETSAT)**, **L. Gougeon** replied that Java 1.3 was essential, as it supplied various services not provided in earlier versions.

Computing Representatives: Their rôle and responsibilities – *Umberto Modigliani*

Introduction

Each Member State and Co-operating State is asked to appoint a 'Computing Representative', to improve the information flow and facilitate various administrative transactions between ECMWF and countries that have access to ECMWF's computing services.

The services available to users in these countries are wide-ranging and there is a need for a knowledgeable contact in each country for day-to-day dealings with ECMWF and as a source of information to ECMWF regarding the countries' plans for use of ECMWF's computing facilities.

A number of decisions to be taken by Member States and Co-operating States, such as access rights, are conveyed to ECMWF through the Computing Representative.

Description of responsibilities

The main rôle of the Computing Representatives is to represent their countries on day-to-day matters relating to the use of the Centre's computing service. To this end, Computing Representatives will preferably have a good overview of on-going work in their home countries, in particular in their national meteorological services, and a general understanding of the computing services offered by ECMWF.

Each Computing Representative is allocated a named ECMWF User Support Contact Point (and deputy) who should be their main point of liaison.

Most Computing Representatives find it useful to keep in regular contact with their User Support Contact Point. An up-to-date list of all User Support Contact Points is available at:

http://www.ecmwf.int/services/computing/help/User_Support_Contact_Points.html

A description of Computing Representatives' responsibilities is given below. Computing Representatives are encouraged to nominate and inform ECMWF of deputies and may delegate responsibilities as they see fit.

Please note that Computing Representatives have no specific responsibilities in relation to the handling of Special Projects but they are involved in the registration process of the individual Special Project users. The Centre does not expect Computing Representatives to be the main contact point for registered users, such as Special Project users, not belonging to the national meteorological services.

Registration of projects and allocation of ECMWF computing resources between projects

Currently, only use of the High Performance Computing Facility and the Data Handling System are accounted for; other services, such as archive retrieval and access to the ecgate1 server, are at present not charged for.

Annually, at its autumn session, the Technical Advisory Committee (TAC) is informed of the proposed allocations of computer resources to Member States for the following year. After the TAC has commented on them, Computing Representatives receive information on their Member States' resource allocation by letter. The letter also requests that the Computing Representatives register projects for the following year.

Computing Representatives may distribute these resources between the various projects within their countries as they see fit and must inform ECMWF of the distribution.

Additionally, all projects that are to continue from the previous year must be re-registered, so that their users may continue to use the ECMWF systems. Project registration forms and explanatory notes can be found at:

http://www.ecmwf.int/services/computing/forms/

Redistribution of computing resources

ECWMF sends out a 4-weekly resource usage summary for the High Performance Computing Facility by e-mail to those Computing Representatives who request it. Computing Representatives are also able to check on resource usage via the acct_status and ecfs_status commands. A description of the accounting system is available at:

http://www.ecmwf.int/services/computing/docs/fujitsu/accounting.html

A User Support Contact Point will normally alert the appropriate Computing Representative when any project has used 90% of its allocated resources.

Based on information from these various sources, Computing Representatives are able to redistribute resources between their Member States' registered projects during the course of a year, as necessary. Information on the redistribution of resources is to be found at:

http://www.ecmwf.int/services/computing/docs/fujitsu/accounting.html#section-4

Registration of users

The Computing Representative provides a central, local point for the registration of all users in his/her country. This ensures that there is always at least one person within a country who is aware of all users and their computer user identifiers (UIDs).

The Computing Representative is required to sign each registration form, verifying that all the information given is correct, to the best of his/her knowledge, thus providing an initial check before the application is sent to ECMWF.

There are some restricted facilities available for users, which are not automatically provided but require authorisation by the relevant Member State or Co-operating State on an individual user basis. At present these are:

- access to currently valid forecast data;
- access to the high performance computing facilities (except for Special Project users);
- access to ECMWF's computer systems via the Internet1

The Computing Representative informs ECMWF which of the above access should be granted to a user.

Users do NOT require annual re-registration, as they are automatically re-registered when any of their projects are re-registered. User registration forms may be found at:

http://www.ecmwf.int/services/computing/forms/

Administration of SecurID cards

As ECMWF runs time-critical, operational work, access security is very important. On registration, computer users are issued with limited-life SecurID cards. ECMWF issues these cards via the Computing Representative and it is the Computing Representative who collects cards that are no longer required and exchanges expired cards. For these reasons, the Computing Representatives have been given 'administrator' privileges for the management of SecurID cards, which allow them the enabling, disabling, etc. of the SecurID cards issued to users in their countries. More information on the SecurID card system can be found at:

http://www.ecmwf.int/publications/bulletins/computer/source/b105.ps

Deregistration of users

User identifiers (UIDs) which continue to be registered after the corresponding users have no use for them are considered a security risk. ECMWF relies upon Computing Representatives to inform it of necessary deregistrations, as soon as possible. The form required to deregister a user can be found at:

http://www.ecmwf.int/services/computing/forms/

To ensure that unused UIDs do not go unnoticed, ECMWF annually requests the deletion of all UIDs, which have remained unused for 2 years. It notifies Computing Representatives of all their users who will have their UID deleted; each individual user is also informed by letter.

Registration of Section Identifiers

The first 2 letters of a User Identifier are known as a Section Identifier and form the basis of the 3 letter UIDs. They must be unique not only within a country, but within the whole ECMWF user community. Different Section Identifiers are only necessary to the extent that the Computing Representative wishes to differentiate between different groups of users. Computing Representatives act as a focal point within their country to create Section Identifiers in liaison with ECMWF. Section Identifier registration forms can be found at:

http://www.ecmwf.int/services/computing/forms/

Provision of local technical support

Good training is essential for efficient, effective use of ECMWF's computing facilities but it is generally not feasible for all external users to attend courses at ECMWF.

Computing Representatives have the opportunity to attend regular meetings, when ECMWF presents updates on the latest in-house developments. The representatives can then disseminate this information to their local users (see section 3 below).

Each new user is supplied with a 'New User's Pack' of the basic information needed to get started on the ECMWF system. This pack is usually sent via the Computing Representative (unless arranged otherwise), so that they are aware when each new user is enabled to become active. The content of this pack is also available at:

http://www.ecmwf.int/services/computing/help/new_user/pack

Ideally, the Computing Representative will be able to provide initial help for users to get started and a first level of user support for commonly encountered problems. To help Computing Representatives in this activity an increasing amount of technical information is available on the ECMWF web site, in particular at:

http://www.ecmwf.int/services/computing/

Assignment of ECMWF training course places

Computer User Training Courses are held annually at ECMWF. Occasionally, demand for places is too high and the Centre cannot take all the applicants from a particular country. ECMWF therefore asks users to apply via their Computing Representative, so that, if necessary, a Member State or Co-operating State is able to prioritise the assignment of course places to its users.

Information on the computer user training courses is available at:

http://www.ecmwf.int/services/computing/training/

Provision of planning information

For the efficient use of ECMWF high performance computing systems it is important to have comprehensive information on the countries' computing plans. For instance, this is useful for the effective management of work and the possible need to reconfigure job schedulers.

Computing Representatives are the main sources of information to ECMWF regarding their countries' plans for use of ECMWF's computing facilities.

Information dissemination

In April 2002, ECMWF had over 1,000 registered external users. Although most information can be electronically broadcast to all users, it is sometimes useful to allow the Computing Representative to distribute documents to the most appropriate users/locations. For example, only Computing Representatives receive a set of the high performance computing facility manuals.

Computing Representatives' meetings

Since 1979, several meetings of Computing Representatives have been held at ECMWF. These meetings provide an excellent forum where views and experiences are exchanged between ECMWF and the Computing Representatives. They are scheduled as required, with the interval between meetings being typically between 12 and 18 months. During these meetings, representatives are usually asked to give a presentation outlining their countries' involvement in the computer service at ECMWF.

The meetings have provided ECMWF with valuable feedback on the computer service offered. Further information can be found at:

http://www.ecmwf.int/publications/member_states_meetings/computing_representatives/

Liaison within the National Meteorological Services

In addition to the Computing Representatives, ECMWF also has regular dealings with and shares information with:

- Technical Advisory Committee representatives;
- Meteorological Contact Points;
- Security Representatives;
- Individuals to whom Computing Representatives may have delegated responsibilities.

It is usually helpful if the Computing Representative can maintain regular contact with these members of staff.

P. Burton (UK) commented that being a new Computing Representative was quite daunting, as many of his users knew much more than he did. Would it be possible to have a 'New Computer Representative Pack'? The Centre replied that the proposed document (above) was intended to fulfil this function, being itself relatively short, but with many pointers to essential information in other documents or on the web. If P. Burton or any of the other Representatives were aware of a particular omission, then User Support would be please to hear of it.

P. Burton also noted that he did not know the e-mail address of all his users and would like to have a directory available on the web.

A. Emmanouil (Greece) asked whether Computing Representatives should be involved in requests for software from ECMWF. ECMWF explained that, legally, Member States own all ECMWF software, so for requests from National Meteorological Services (NMSs) it is mainly a matter of packing and transfer. Requests for software should be made directly to ECMWF Data Services.

R. Rudsar (Norway) considered that Computing Representatives should be informed when software had been supplied, to enable them to give support, if required. Some central point in each NMS should have an overview of which versions have been supplied on which platforms, etc.

W. Zwieflhofer (ECMWF) noted that when access to ECMWF via the Internet was initially made available, several Member States were rather cautious and requested that authorisation be made per individual user. Internet usage has now become much more widespread and high levels of security have been implemented to protect the ECMWF system, so he asked whether Computer Representatives considered that access via the Internet could now be given by default, at least for non-NMS users for whom there is no alternative.

R. Rudsar (Norway) asked whether domain addresses still needed to be known. ECMWF replied that the Internet access information requested on the application form was not always appropriate, as users often came in from many different IP addresses.

R. Rudsar stated that she would like to encourage users to use the Internet, to keep the RMDCN line available for operational traffic.

P. Burton (UK) noted that the UK Meteorological Office did not allow their users interactive Internet access. P. Roth (Switzerland) added that they do not allow interactive access either, but this constraint was imposed locally. There was no opposition to the proposal to make interactive Internet access the default for all users.

W. Zwieflhofer (ECMWF) noted that the restriction on default interactive access had been imposed by the TAC, so the TAC would have to approve the change in policy. He could now report to the TAC that Computing Representatives saw no reason to retain this restriction.

R. Rudsar (Norway) noted that many of the Special Projects could be of interest to users throughout the ECMWF community. General users had no information on Special Projects except their titles. What reports are produced by Special Project researchers? Walter Zwieflhofer replied that the Scientific Advisory Committee recommends which projects should be approved by Council and annual progress reports should be produced for the SAC and Council. To date, the production of the reports has been rather lax, so this year, in an attempt to ensure reports are submitted, the reallocation of computer resources will depend on the receipt of a report. More information on Special Projects, including interim reports, will be made available on the ECMWF website, but the range of access and any restrictions must still be discussed.

R. Rudsar considered that, since all Member States took part, via the Council, in approving Special Projects, all would have an interest in following their progress. It was also important to prevent duplication of effort.

M. Pithon (France) commented that, from her experience, Computing Representatives were as involved in handling Special Projects (administrative tasks, queries, etc.) as they were with ordinary projects. It was difficult to see a difference between Special and ordinary projects, except that Special Projects tend to be short term and require relatively few computing resources; any project in France requiring major resources tends to be registered as an ordinary project, whether or not its researchers are based at Météo-France.

To conclude, **W. Zwieflhofer (ECMWF)** stated that the proposed document would be amended to include the comments on Special Projects and issued to new Computing Representatives in the future. He encouraged Computing Representatives to inform ECMWF (User Support) of any changes or additions they would like made.

User Registration – *U. Modigliani*

U. Modigliani (ECMWF) noted that the TAC, having had certain difficulties pointed out to them by the Computing Representatives, requested ECMWF to investigate possible streamlining of the user registration process. He began by summarising the processes currently involved in user registration, commenting that registration and deregistration was a constantly growing overhead.

M. Pithon (France) asked whether default Internet access was proposed for all users or purely for non-NMS users. ECMWF replied that it was to be decided. Unless some NMSs did not want their users to have Internet access, it would seem reasonable, from ECMWF's point of view, to make this the normal means of access for users, leaving the RMDCN connection available for operational work.

R. Urrutia (Sweden) was in favour of having registration forms on the web, with users completing most of the questions and Computing Representatives undertaking verification only. W. Zwieflhofer (ECMWF) saw no way of avoiding a paper copy of each user's signed undertaking to abide by copyright and security regulations, etc. This form could be printed from the web. Computing Representatives' validation of the web registration could be achieved by an electronic key system. W. Zwieflhofer noted that, in any case, the validation of users at non-NMS sites was problematic, as it was unlikely that Computing Representatives would know them.

W. Zwieflhofer asked whether Computing Representatives saw any problem in New User Packs and SecurID cards being sent directly to new Special Project users. M. Pithon (France) said that Computing Representatives needed to be informed that the pack and card had been sent, so that they could be prepared to provide support, if required. U. Modigliani pointed out that some Member States already chose to have New User Packs sent directly to users; this option could be offered to all Computing Representatives.

N. Kreitz (ECMWF) observed that many Special Projects were international, so it was awkward to link them to any one Member State. In such cases, it was better for them to liase directly with User Support (using the Contact Point appropriate for the Principal Investigator for that project).

M. Pithon (France) said that it was a waste of time and resources for Computing Representatives to forward New User Packs to external (non-NMS) users: the need for contact for activating the SecurID card gave an opportunity for an initial contact. On the other hand, handing over the New User Pack to in-house users gave an added opportunity to pass on other documentation and exchange various information. L. Frappez (Belgium) agreed.

R. Rudsar (Norway) stated that she needed to know some very basic information about Special Project users: their name, how to contact them and the name of their Special Projects. The Centre replied that a web page or utility listing all registrations, their contact details and resource status could be created. U. Modigliani noted that the current account status command gave information on resource usage for all projects and Special Projects.

J. Greenaway (ECMWF), taking up a comment made by H. de Vries (Netherlands), noted that users currently have to sign an undertaking on receipt of their SecurID cards which duplicates in part that which they sign on the registration form. It was agreed that a simple notification of safe receipt was all that was needed in the future and that this could be done by e-mail.

A. Emmanouil (Greece) asked whether the changes would affect authorisation to access current forecast data. The Centre replied that there would be no change from the present position: the default will remain no access to real-time forecast products.

P. Burton commented that UK users often needed to retrieve one data set and then did not use the ECMWF system again for some time. Would it be possible to set up a short-term account for such users? W. Zwieflhofer replied that a temporary web account, for instance for use of web-based MARS, would be fairly easy to implement. Temporary full access to run jobs, for example to process the data retrieved, would be more complicated.

W. Zwieflhofer (ECMWF) noted that the Centre was considering the creation of various specialist mailing lists, for instance HPCF news, MARS news, etc., to which interested users could subscribe to keep informed of the latest information. P. Burton (UK) suggested that an interactive message board would be even more helpful, allowing users to assist one another. W. Zwieflhofer replied that a message board/discussion group would require much more work to support/moderate than a pure list of announcements; it is doubtful whether ECMWF could provide the manpower required.

Graphics update – *J. Daabeck*

J. Daabeck began by announcing that it was hoped to set up message boards for MAGICS and METVIEW with the aim of keeping users better informed of the status of various releases, plans, known problems and solutions, etc.

MAGICS 6.6

MAGICS 6.6 is the current 'export version', available to the Member States since April 2002. It is available on the following UNIX platforms:

Linux	SuSE 7.1 and 7.2 (with the Portland Fortran compiler)
IBM	AIX 4.3
SGI	IRIX 6.5
HP	HP-UX B.11
Sun	Sun Solaris 5.7
Compaq	OSF1 V5.1

New features in MAGICS 6.6

- Line styles have been modified and improved.
- Aithoff and Ocean Section projections have been added.
- T256 EPS data and T511, T799 and T1023 data are catered for.
- The automatic generation of titles has been enhanced.
- The medium resolution coastline has been updated and improved.
- Since version 6.4 the Lambert projection and pie charts have been added.

Plans for MAGICS

- All coastlines are to be updated.
- There will be limited NetCDF support, primarily for Metview for data that does not fit into the GRIB/BUFR context.
- There will be a major migration from Fortran to C++. How this will be achieved is still under discussion. Some drivers and other lower level code are already in C++.
- The new observation format database will be supported.
- Metview 3.3

Metview 3.3 is the 'export version' available to the Member States since February 2002. It is available on the following UNIX platforms:

Linux	SuSE 7.1 and 7.2 (with the Portland Fortran compiler)
IBM	AIX 4.3
SGI	IRIX 6.5
HP	HP-UX B.11
Sun	Sun Solaris 5.7

Plans for Metview

- The release of Metview 3.4, export version, is planned for 3rd quarter 2002; it will contain support for Compaq OSF1 V5.1.
- Volume 3 of the Metview 3 User Guide will be produced.
- Support for the new observation format database will be developed.
- The handling of high volume satellite data will be modified within Metview.
- EPS meteograms

EPS meteograms are now available via ECMWF web pages. There is still a Metview interface but the web interface is likely to be more convenient for most purposes. Classic Meteograms are no longer available to users outside ECMWF.

H. de Vries (Netherlands) commented that they had had problems installing software with Linux other than SuSE. J. Daabeck replied that in such cases, advice on known problems may be included in the Installation Guide published on the web with the release; otherwise, Graphics section at ECMWF will try to reproduce the problem reported and find a solution or workaround, which is then added to the Installation Guide pages.

H. de Vries also asked about the possibility of software distribution in binary format. **J. Daabeck** acknowledged that this was generally desirable but, though theoretically possible, various versions of e.g. Linux are not as compatible as might be expected. Binary distribution would also prevent the possibility of getting updates on the fly via the web pages, which currently proves very convenient.

In reply to an earlier query, **J. Daabeck** asked users to let his section know if anything did not function properly with high-resolution data. ECMWF's Research Department is currently working with T1000 resolution experiments (approximately 0.2°/20km). If any users wished to work with higher resolutions they were welcome to send the Graphics Section a test dataset.

Another query related to the possibility of improved coastlines. **J. Daabeck** replied that there had been a growing internal demand for this and it had been decided to implement a scheme from the public domain called GSHHS, which is a Global, Self-consistent, Hierarchical, High-resolution Shoreline database (http://www.ngdc.noaa.gov/mgg/shorelines/gshhs.html). Four predefined sets are available with 0.2, 1.0, 5.0 and 25 km tolerances. It has yet to be decided which resolutions will be supported at ECMWF.

P. Burton (UK) asked whether the preparation of precompiled executables had been considered. **J. Daabeck** replied that it had so far been discounted as being too complex to produce a truly portable binary, taking into account the numerous different components of the package. It was also suspected that support would become more difficult. **J. Daabeck** said that the area could be reinvestigated.

P. Burton asked how ECMWF had decided which version of Linux to implement, when the initial decision to move to Linux was taken. **R. Fisker** replied that the first version tested (Red Hat) did not work; when SuSE did work, there seemed little point in investigating further.

P. Burton again suggested that rather than a mailing list; there might be an interactive message board for users to share information, macros, etc. for MAGICS and Metview. **J. Daabeck** replied that it had been considered but would require a good deal of support. Currently, users mail information to the Graphics Section who post it on the web if they consider it generally useful. This method works well and is not labour-intensive.

R. Rudsar (Norway) asked whether ECMWF had an overview of the platforms on which MAGICS and Metview had been installed throughout their user community. **J. Daabeck** replied that no record was kept of this information.

MARS and dissemination update – *J. Hennessy*

Dissemination

575,000 products and 6.9 Gigabytes are now disseminated daily (compared to 350,000 products and 3.7 Gigabytes in 2001); approximately 4,700 files are produced. The 00 UTC project ended on 31 December 2001 and the dissemination of full field forecast products ended. There is a growing demand for Boundary Conditions frame field products, which now comprise 30% of the dissemination volume. J. Hennessy warned that dissemination of 18 UTC BC products occurred at the same time as dissemination of some of the main deterministic forecast products. Computing Representatives were advised that they could adjust the priorities on the files to ensure that they received them in the desired order. The multi-analysis is a new project: the ECMWF model is run from an ensemble of analyses from DWD, Météo-France, UKMO and NCEP (Washington). A weighted average, known as the consensus, is also produced from these and the ECMWF analyses and the ECMWF model run from it. Products from the project are now available as dissemination products.

New products

- Fine mesh rotated grids.
- Additional parameters in weather parameter BUFR files.
- Additional parameters for deterministic, EPS and BC forecasts.
- Products from Multi-analysis Ensemble forecasts (as described above).

Full details of parameters may be obtained from 'News' on the Dissemination pages of the ECMWF website.

New wave products

- 2D spectra forecasts from the European Shelf.

Other dissemination changes

- Cycles 23r4, 24r3 and 25r1 of the model were introduced. These were transparent to users, apart from the changes in the model identifier in the GRIB headers. (The identifier is currently 201 in a range from 121-203. Users were informed that once 203 was reached, the identifier would return to the beginning of the range, i.e. 121).
- Earlier dissemination of BUFR products.
- GRIB additions for Multi-analysis Ensemble data to allow an indication of how many were received, how many were used, to be added to the GRIB1 as local extensions.
- Low-resolution Gaussian grids - Resolutions of N32, N48, N80, N128, N160 and N200 have been made available for the deterministic forecast and N32, N48 and N80 for the EPS.

Web based dissemination management system

A new web based dissemination management system, with Java based tools, will be available in the near future to replace the current PERL based system. It will provide better management and better monitoring facilities.

MARS – the current operational system

- Additional support has been provided for new observation types as they became available, for instance QuikScat and AMDAR. Late arriving oceanographic data were problematic: normally archiving is completed within two days and oceanographic data may arrive one month or more in arrears. This problem was solved by making an incremental archive for oceanographic data.
- The MARS client has been modified to provide improved, faster FDB access.
- MARS and the MARS language have been adapted to accommodate the monthly forecast project, the seasonal forecast project and the DEMETER project.
- Post-processing now includes fine rotated grids for the Hirlam rotations and second order packing is also now available for grid point data. Second order packing typically reduces data volume by approximately 40% (and is also available for dissemination).

The new MARS

- The MARS client has been modified to run on the p690 with full functionality.
- The server must be migrated to the hardware and software of the new system. A migration strategy has been developed and work has begun.
- Object Store, the object-orientated database used for the current MARS is not available for the new hardware, so it has been replaced by in-house software. This provides vendor independence and therefore improved portability and has also proved to give better performance and scalability.
- MARS code is now standard ISO C++.
- HPSS (the new data handling system) support has been added.
- A test server with the new IBM hardware has been set up to load test with Research Department data.

Daily archive

The volume of the operational archive is now 152.2 Gigabytes per day, which is approximately double last year's total. This does not include research or parallel e-suite data.

Observations	4.5 Gigabytes
O-suite	67.6 Gigabytes
Multi-analysis	21.0 Gigabytes
MC-suite (the Ensemble)	18.0 Gigabytes
MC 00 UTC	18.0 Gigabytes
BC-suite	13.8 Gigabytes
SENS-suite (sensitivity)	1.4 Gigabytes
Seasonal suite	362.5 Megabytes

Web MARS

Web MARS is now available on Linux and the documentation has been kept up to date. Web services continue to be developed and improved.

Plans

The generation of dissemination products will have to be moved to the p690. This should be user-transparent but will involve much manpower effort. The dissemination schedule is constantly under review and improvements will be made, when possible.

All the archive data must be migrated to the new DHS, which will be a time consuming process. Data will not be converted to GRIB2; no site is using GRIB2 operationally yet.

J. Hennessy was asked to give some clarification on NetCDF and GRIB. He explained that GRIB is solely a data format; NetCDF is a data management package where the physical format is hidden from the user by the application software layer. They serve two different purposes. All operational meteorological centres running global models disseminate in GRIB and almost all archive in GRIB. This is primarily because of data volumes, since NetCDF takes two to three times the volume taken by GRIB format data. NetCDF, with its associated software tools, is useful for researchers who wish to perform visualisations and so on. However, it has very limited availability: it is only available on approximately one quarter of the platforms used by the WMO members; it has no parallel version and no control over I/O (which is essential for HPCs). Moreover, ECMWF already has good visualisation and data manipulation packages (Metview and MARS) available. **R. Rudsar (Norway)** asked if any conversion software between GRIB and NetCDF existed. J. Hennessy reported that NCAR certainly had conversion software but users actually stored both versions.

Web development – *A. Brady*

Introduction

Access to the ECMWF web services is based on a single machine in the DMZ (De Militarised Zone) running Apache web server with six or seven different Apache virtual host processes. Tomcat provides a Java environment for running dynamic applications. A number of web application servers run behind the firewall, producing dynamic applications which present products or forecasts or dynamic pages which can be personalised for the user. The Fastcgi protocol is used to communicate between the web servers and the back end dynamic servers. These web services are based on four IBM Netfinity 4500R servers with Linux 7.1/7.3 operating systems.

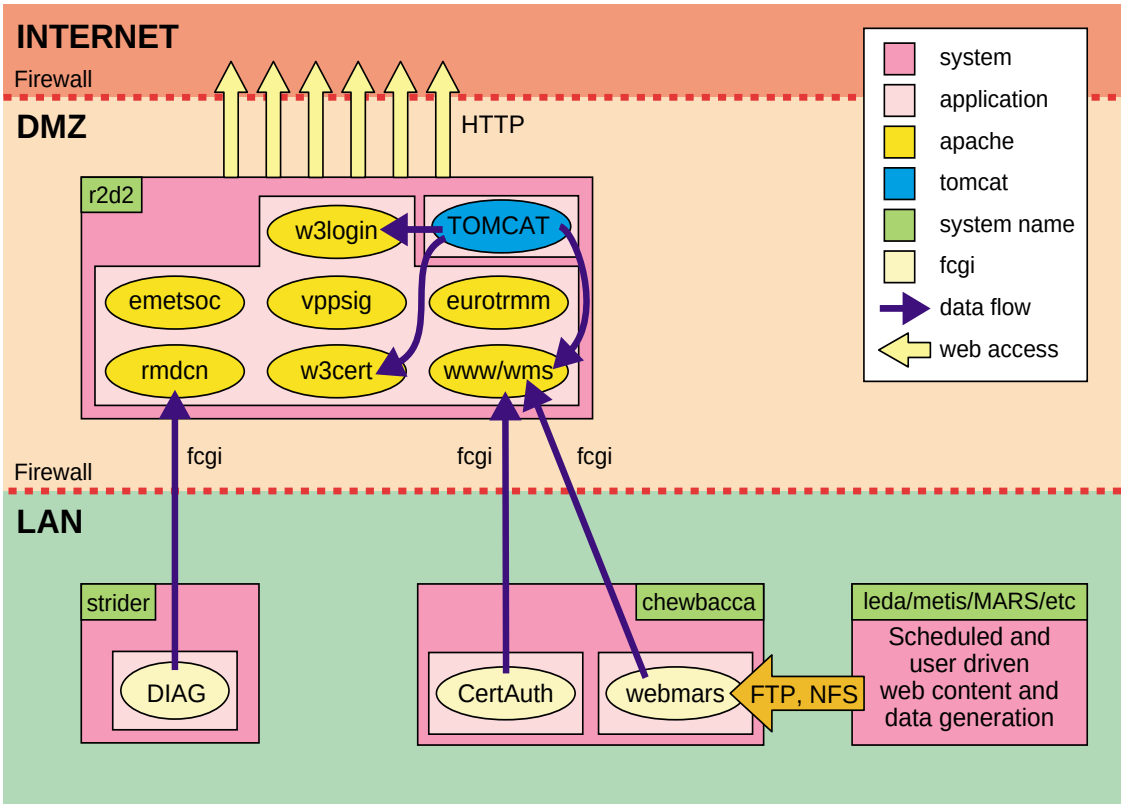


Figure 6 Web service architecture overview

Authentication

The authentication process is not triggered for public access pages, but protects access to certain documents, such as Council, TAC and SAC papers, and certain forecast products, for instance. The process is depicted in Fig. 8 below.

Users are presented with different pages, according to the permissions they have. Permissions may be stored in a personal cookie, containing a user ID and access profile or may be linked to the domain from where the user has logged in. A member of the general public sees, for instance, only three medium-range forecast options and has no clue that there are two other options available to appropriately authorised users.

Once a forecast type has been selected for viewing, the process moves to a web application on a separate server. At this level, different products for the same forecast type may have different access controls. A colour-coded box at the right hand side of the title line of each product specifies its broad access control. By clicking on any coloured box, users may see the key to the colour coding.

Users may sometimes be prevented from viewing pages, which they believe themselves authorised to access. This is often because they are registered as an individual user and are also eligible to access as a domain user. The two access methods are quite separate, so once a user has logged in as a registered individual, he/she will not be granted the wider access levels that might be available to them, if they logged in as domain users and vice versa.

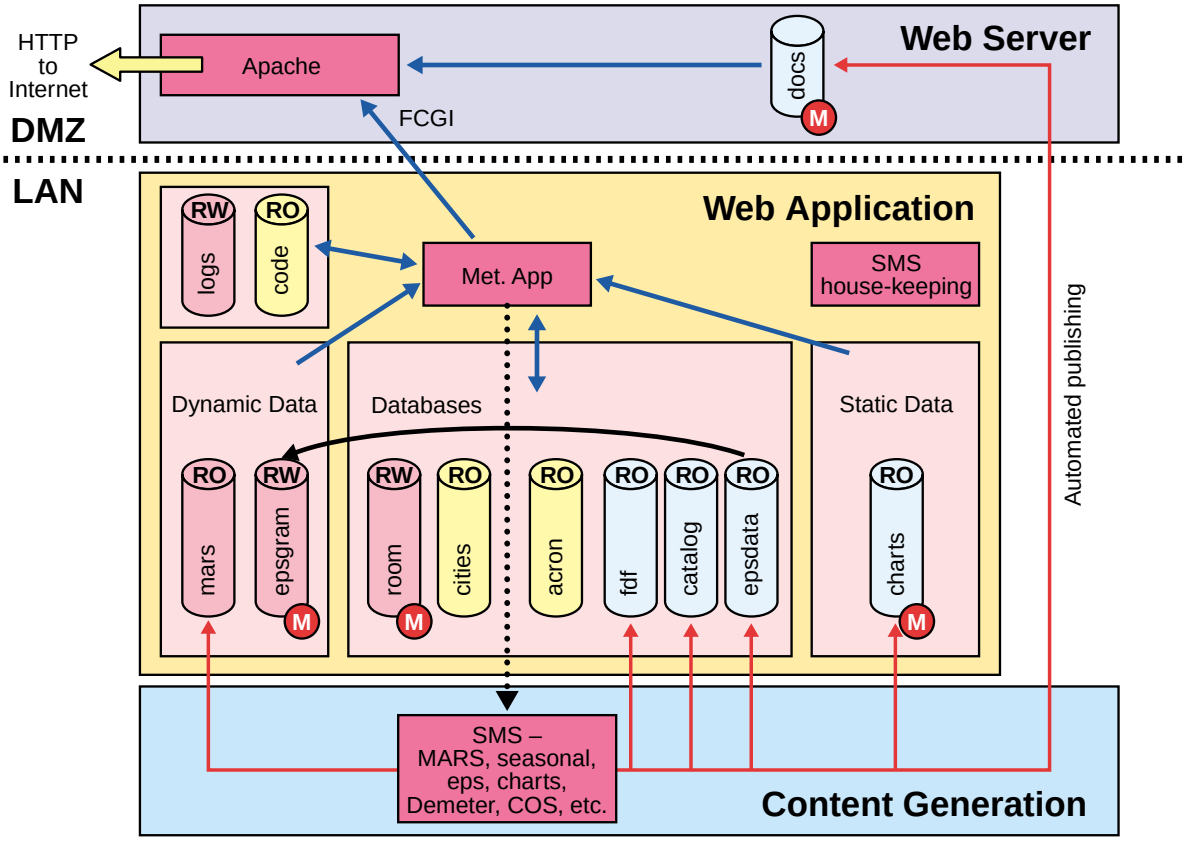


Figure 7 Detailed web service architecture

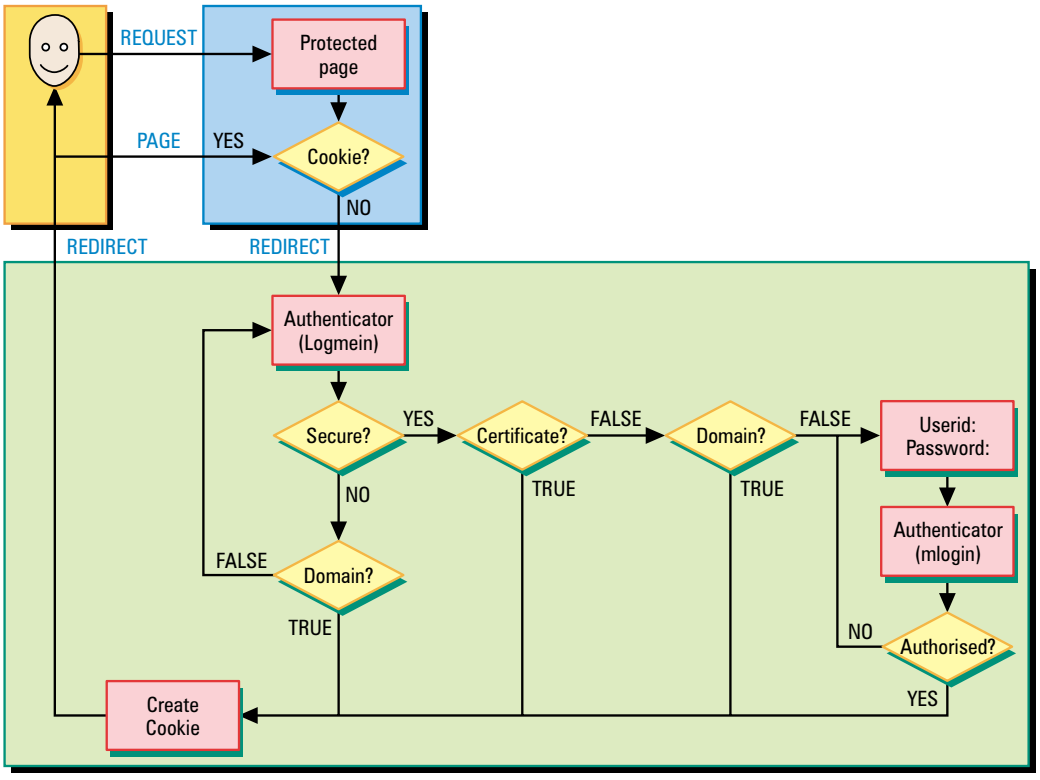


Figure 8

ECMWF is aware that the use of user certificates, although practical when successfully installed, is problematic for some users. This is usually as a result of the interface to certificates used by different web browsers. There are other, unresolved, issues with more recent browsers (Netscape6, Mozilla). Unfortunately, these problems are beyond ECMWF's control. It is planned to become less dependent on certificates in the future, though they will be supported as far as possible.

Plans

Various improvements to the access control system are planned. The possibility of providing symmetric access to the ECMWF web site over the RMDCN is being investigated. It would be very complex to achieve and potential demand is unknown. Computing Representatives were asked whether there was still a requirement for this facility.

There was no absolute demand for Internet access via RMDCN, but A. Emmanouil (Greece) considered that it would be a useful feature. A. Brady noted that there was currently no support for Netscape 6 or Mozilla; Member States using either browser would have either to export and re-import their certificates or revoke them and apply for new ones. **R. Rudsar (Norway)** requires stricter access controls for the commercial arm of the Norwegian Meteorological Service. ECMWF replied that subnets could be catered for.

DISCUSSION – TIME OF NEXT MEETING

P. Burton (UK) asked when the next significant upgrade would be. **W. Zwieflhofer** replied that Final Acceptance for Phase 2 of the HPCF was planned for early 2003, so the information status would be approximately the same in the spring and autumn 2003. Representatives unanimously voted for the next meeting to take place in 12 months' time (May 2003).

PART II

Member States' and Cooperating States' Presentations

AUSTRIA AUSTRIA

Central Institute of Meteorology and Geodynamics, Vienna, Austria

ECMWF-Products in Austria

The following data streams are currently used by Austrian Weather Services:

1. A0D-Data: Main Production Stream (T511 grib data), described in detail

The A0D-Data contain

- deterministic forecasts on pressure levels 1000-200 hPa, temperature, geopotential, u/v/w-wind, relative humidity
- surface parameters:
  cloud amount (total, low, medium, high), precipitation amount (large-scale, convective), 2m temperature/dew point, 10m u/v-Wind, surface temperature, sea level pressure, snowfall, snow depth)
- Area 90W-90E, 90N-18N with 1.5×1.5 deg grid point distance (121×49 grid points in longitude and latitude)
- Analyses 18, 00, 06, 12 UTC and forecasts from +6 to +240 hours after base time in 6-hr intervals
- a smaller set of global data is also available (forecasts from +12 to +96 hr) with 8 elements (500 hPa geopotential, 10M u/v wind, cloud cover (general), 2m temperature/dew point, sea-level pressure, total precipitation)

A number of special products are derived from the A0D-Data

- Several additional elements derived from the A0D-Gribdata (e.g. the Baroclinic Zone Indicator, a specific Humidity Index, Temperature Advection, Showalter-Index, level with 0° Celsius temperature and others)
- QFA-forecasts for 500 different locations in the whole world (QFAs are ECMWF-forecasts interpolated from the grid points to the locations)

  (e.g. the newest application: the Austrian Television shows weather forecast charts for Europe derived from the ECMWF QFAs daily in the evening news since May 2002)
- Graphical products (weather charts for Europe and Austria by using MAGICS) as hardcopies and visualized in the Intranet Server.

Mainly used are charts for Europe/North Atlantic for sea level pressure, geopotential 850 and 500 hPa, equivalent relative topography, humidity index, precipitation, temperature and vorticity advection, baroclinic zone indicator, total cloud cover, temperature 2m and 850 hPa.

- A new application of A0D-Date comprises special forecasts of temperature and precipitation amount for selected regions (are used by the main electric supply company for managing hydro-electric power plants)
- The Satellite Working Group uses the A0D-Data to combine them with the satellite weather images producing a special analysis, called “satrep”.
- The Model Working Group uses the A0D-Data for verification and compares them with the data from other forecast models
- A0D-Data are used also as input for AUSTROMOS (Model Output Statistics for Austria) forecasting local weather for 112 weather stations in Austria and 150 locations (main towns) outside of Austria (temperature, relative humidity, 10m wind, probability of categories of precipitation and cloud amount, probability of fog and thunderstorm, ceiling and visibility)
- Selected products (QFAs and MOS-Data) are stored in a data bank used internally for deriving products for specific customers

The other grib data streams are used only for special purposes and are only briefly described:

2. A1D-Data: Grib data on Model Levels

The A1D-Data contain deterministic forecasts for the same region as A0D but on model levels instead of pressure levels and with a higher resolution (1×1 deg) from +6 to +84 hours in 6-hr interval. They are used in the Environmental Department of the Central Institute to compute trajectories.

AUSTRIA AUSTRIA

3. A0E-Data: Ensemble forecasts on grid points

The A0E-Data Stream contains cluster means, ensemble means and standard deviation and probability forecasts for the same region as the A0D-Data for the day 1 to 7 at 12 UTC (precipitation, temperature 850 hPa, geopotential 1000/500 hPa).

The A0E-data are processed with MAGICS and shown as graphical weather charts (only internal use).

4. AYA/AYB-Data: Weather Parameters (the only product in bufrcode)

The AYA and AYE Data are deterministic (AYA) and EPS-Forecasts (AYB, perturbed and control forecasts) of temperature for Vienna used by the Vienna Main Heating plant ('Fernwaerme').

5. A0M-Data: Deterministic Wave Products for the Mediterranean Sea

The A0M-Data contain forecasts of significant wave height and mean wave direction for the days 1-3 at 12 UTC in the Mediterranean area. They are used, together with the A0D-Data, to generate sea weather forecasts for private (sailing) boats and are published in the Austrian HF-Radio.

6. A2D/A2E-Data: Forecasts for Italy

The A2D and A2E-Data contain deterministic (A2D) and EPS Forecasts (A2E, Ensembles 1-50) for a grid point in Northern Italy and is sent to ARPA (Regional Weather Service Venezia) via e-Mail (12 to 240 hours after base time in 12-hr intervals).

Additionally, graphical products as Postscript-Files are transmitted to Austria by user jobs:

7. EPS-Meteograms (Postscript Files)

EPS-Meteograms are drawn for Vienna and the capitals of the 8 districts in Austria by a user job (ecgate1) and are transmitted to Austria by FTP, printed out and visualized in the Intranet Server.

In the last months the generating of EPS-Meteograms has failed several times due to new data structures, missing access rights and installation of new Versions of Metview unknown to the users.

8. Seasonal forecasts

At the beginning of a month the actual graphical Seasonal Forecasts are sent to Austria with FTP as Postscript Files and are visualized in the Intranet-Server (only restricted internal use for special users and scientific purposes):

Precipitation, 2m-temperature, surface temperatures (Sea) and mean sea-level pressure (global or for individual continents; probabilities and ensemble means).

AUSTRIA AUSTRIA

The usage of ECMWF-Data

1. Processing the ECMWF-Data

Most products are transmitted to Austria on a daily basis by using the ECMWF-Dissemination System, but the EPS-Meteograms and the Seasonal Forecasts are transmitted by a user job running on ecgate1.

The ECMWF-Data are copied to the Servers zaaecm1 and zaaecm2 in Vienna (zaaecm2 is used when the zaaecm1 has broken down).

On the zaaecm[12] the data are checked and sent to the multi-user server zaamus1p (coupled with zaamus2p) for public use, when they are available and correct.

On the zaamus[12]p the derived products are generated and disseminated (e.g. QFAs for selected locations and weather charts using MAGICS).

The software consists of Korn-Shell Scripts (Solaris Unix-System) for operational control of the data and Fortran77-Programs for deriving special products. The grib data are processed by using the GRIBEX-Software.

Corresponding grib data are also available from the DWD (German Weather Service), based on the observations at 00, 12 and 18 UTC, but only up to 72 hours after the base time and with fewer elements and no Ensemble products.

The Programs written for ECMWF-Data will be applied to the DWD-Data.

Additionally also the Output of the ALADIN-Model is used (fine meshed model, but only for middle Europe and two forecast days).

2. Users of ECMWF Products

ECMWF-Data are used by the Austria Weather Services internally (operational and scientific purposes) and to derive products for private customers:

a) Internal use within the Austrian Met Services for operational products

- Central Institute and Regional Departments in Innsbruck, Salzburg, Klagenfurt and Graz ('ZAMG')
- Military Weather Service ('Bundesheer')
- Aviation Weather Service ('ACG' - Austro Control) Maybe the three public weather services will be combined to one (private) Weather Service 'Met Austria' at the end of 2002.

b) Scientific purposes (special projects)

- Internal use in the Central Institute of Meteorology (e.g. the Model Working Group and the Satellite Working group)
- University Institutes in Vienna, Innsbruck, Graz (e.g. Steinacker, Ehrendorfer, Haimberger and advanced students)

c) Private and public customers (derived products), e.g.

- ORF - Austrian Broadcasting Corporation
- Local authorities
- Some newspapers
- Organizers of sport and culture events
- Tourist traffic offices
- Street services
- Environmental purposes

AUSTRIA AUSTRIA

Plans for the next year

1. Higher resolutions for deterministic forecasts:

Test data are disseminated with 0.5×0.5 deg resolution and are compared with the products derived from the corresponding data with 1.5×1.5 deg grid point distance.

Maybe high-resolution data will be used only for local weather forecasts in Austria, but not global.

2. Extension of the usage of EPS-Products:

The importance of Ensemble Forecasts will increase. New EPS-Products will be defined and disseminated to Austria, e.g.

- EPS-precipitation amount and temperature forecasts for Austria (Ensembles 1-50 and Control forecast), esp. for managing the hydroelectric power plants
- New Weather Parameter forecasts for locations in Austria

3. Extracting Data from MARS

- Deterministic grib data for Austria for developing new versions of the statistical forecast models used here
- EPS-forecasts of precipitation for Austria, tested by the model working group (precipitation amount and probabilities)

4. The newest MAGICS-Version will be installed and tested

5. Adaptation of our 'ECMWF-Programs' to other models

The Computer programs used for ECMWF-Products will be applied on the corresponding data generated by the DWD (German Weather Service) and the fine-mesh model ALADIN.

6. New ECMWF Servers

The ECMWF-Servers zaaecm[12] will be replaced by new, more powerful hosts in June 2002.

7. Metview Installation and BC-Project

Metview-facilities and the 00Z-data from the Boundary-Conditions Project are not used but it is discussed to install them.

8. Special projects of the University Institutes in Austria

Several members of the Vienna and Innsbruck University have user accounts on the ecgate1, esp. for getting data from MARS.

The university institute of Meteorology has been separated from the Central Institute (commercial weather service) and has moved to a different location in another district of Vienna.

Therefore I have no contact to the Universities and don't exactly know what the institute is doing. The university members communicate directly with the User Support but not with me.

AUSTRIA AUSTRIA

Computer equipment

The following equipment is mostly doubled (same type if not specially shown by *or special remark), new equipment in bold:

a) **Production Server**
SUN Server 420, 2 CPUs/450 MHz, 2 GB Memory, Disk 2 Gb, CD-ROM

b) **Development Server** (single equipment):
SUN Server 420, 4 CPUs/450 MHz, 2 Gb Memory, Disk 2*18 GB Raid1, CD-ROM

c) **Fileserver** (single equipment with double access):
NET APPLIANCE Network Attached Storage, Disk 500 Gb proprietary Raid (~Raid 4)

d) Short-Range-Database Server:
SUN Ultra Enterprise 450 Server, 2 CPUs/300 MHz, 2 GB Memory, Disk 4 @ 9,1 GB, CD-ROM, Floppy 3.5"

e) **Long-Range-Database Server**

SUN Enterprise E3500 Server, 4 CPUs/336 MHz, 2 GB Memory, Disk 4 x 9,1 GB, CD-ROM,
SUN StorEdge A3500 Disk Array, Disk 2 x 51 @ 9,1 GB

f) ECMWF-Server:
SUN SPARCstation 10, 1 CPU, 65 MB Memory, Disk 2.5 GB, CD-ROM,
*SUN SPARCstation 10, 1 CPU, 65 MB Memory, Disk 3.5 GB, CD-ROM

g) GTS-Server:
SUN Ultra-1, 1 CPU, 256 MB Memory, Disk 6.3 GB,
*SUN SPARCstation 20, 1 CPU, 192 MB Memory, Disk 4.2 GB, CD-ROM

h) Internet- and Product Server:
SUN SPARCstation 20, 2 CPUs, 96 MB Memory, Disk 6.3 GB, CD-ROM

i) Intranet-Server
SUN Ultra-1, 1 CPU, 65 MB Memory, Disk 10.5 GB, CD-ROM

j) Domainname-, Administration- and Operating Server
SUN ULTRA 5_10, 1 CPU, 132 MB Memory, Disk 5.2 GB, CD-ROM
*SUN Ultra-1, 1 CPU, 65 MB Memory, Disk 4.2 GB, CD-ROM

k) RC-LACE Distribution and Archive Server:
SUN SPARCstation 20, 2 CPUs, 96 MB Memory, Disk 9.45 GB, CD-ROM, Tape 4mm DAT
Single Equipment with double Access:
DLT Cartridge Roboter (960 MB, 4 drives)

l) Backup-/Archive-Server:
SUN Enterprise 250 Server, 2 CPUs, 128 MB Memory, Disk 26.4 GB
Single Equipment with double Access:
DLT Cartridge Roboter (3.5 TB, 4 drives)
Single Equipment:
Tape 0.5", 9-track, 6250/3000/1600/800 bpi)
Optical Disk Roboter (4 Drives, 144 Slots re-writeable Magneto-Optical Disk, 650MB Cartridge)

m) RC-LACE Model Group (single equipment):
Digital Personal Workstation 600 AU, 1 CPU, 1 GB Memory, Disk 8.6 GB, CD-ROM, Tape 4mm DAT

n) FIREWALL
XXXXXXX, *Confidential*

and more than 60 other Servers and Clients depending on special needs at the several Departments and Regional Services of ZAMG, and a flock of nearly 300 PCs, some of them used for routine work, e.g. for forecasters and to supply special Media (Broadcast and Television, Newspapers).

AUSTRIA AUSTRIA

Software

SUN-Systems

Operating System:	Solaris (UNIX)
Compiler:	Fortran 77, Fortran 90, C, ANSI C, C++
Script language:	Perl
Graphics:	Xelion GKS, MAGICS, PV-Wave, OpenGL
Libraries:	IMSL, NAg
Database:	SYBASE
GIS:	ARC/INFO
Backup SW:	Veritas Netbackup
e-mail:	Z-mail

Digital Workstation

Operating System:	Digital UNIX
Compiler	Fortran 90, C++
Graphics:	NCAR Graphics

Personal Computer

Operating System:	Windows NT, Windows 95, (Windows 2000), (Windows 3.11), S.U.S.E LINUX, SCO UNIX, MacOS
Compiler:	Fortran, Visual Basic, C
Graphics:	Xelion GKS, MAGICS
Applications:	MS Office, ABC Flowcharter, ARC/VIEW, CorelDraw, Exceed, Exchange, OnNet, PageMaker, PhotoShop, SYBASE ODBC, QuarkXpress
Internet/e-mail:	Netscape, Internet Explorer, Outlook / Outlook Express

Network ZAMGNET: WAN

Equipment

Cisco Routers and Switches

Communication Protocol

TCP/IP

Structure: ZAMG-intern

Vienna: LAN: Ethernet, 2 x FDD

Regional Plants (Innsbruck, Graz, Klagenfurt, Salzburg) and Regional Offices (Bregenz, Linz, St.Pölten): LAN: Ethernet

***Remark**: the connection between Vienna and the Regional Plants is performed by tunnelling through Austro Control Network ACN and to the Regional Offices by dedicated lines from Vienna directly.*

Structure: ZAMG-extern

Internet Access:	ACOnet (Austrian Academic Computernetwork) separated domain (zamg.ac.at), local domainname-server
ECMWF:	RMDCN
GTS Access:	RMDCN with special connection to Austro Control (RTH-Vienna)
RC-LACE:	RMDCN Bratislava, Budapest, Ljubljana, Prague, Zagreb)

Special Connections – National:

- Austro Control: use of MAVIS, TAWES (Semi-Automatic Weather Stations): Network by Austrian Health Authority
- National Ozone Compound: CNA (Corporate Network Austria)
- Satellite Data Receiver
- Radar Compound
- Universities (direct lines to use MAVIS): with LANs in responsibility of ZAMG to avoid connections to the Information Services at the relevant Universities:
- Inst. of Meteorology and Geophysics Univ. Vienna
- Inst. of Meteorology and Physik Univ. for Agriculture, Vienna

AUSTRIA AUSTRIA

Special Connections – International:

Bozen, Arabba: AT&T Global Network (Use of MAVIS)

Use of ECMWF Products:

1. Data of Normal Dissemination

Modification of these products to produce charts for the local effort, partly published used within MAVIS (Met Austria Visualisation System)

Further special information to/for:

Energy Plants, Environmental Purposes, Leisure and Sports, Local Authorities: Street-Service, Transport

2. EPS Products

additional to 1., but not published

3. MARS-Data

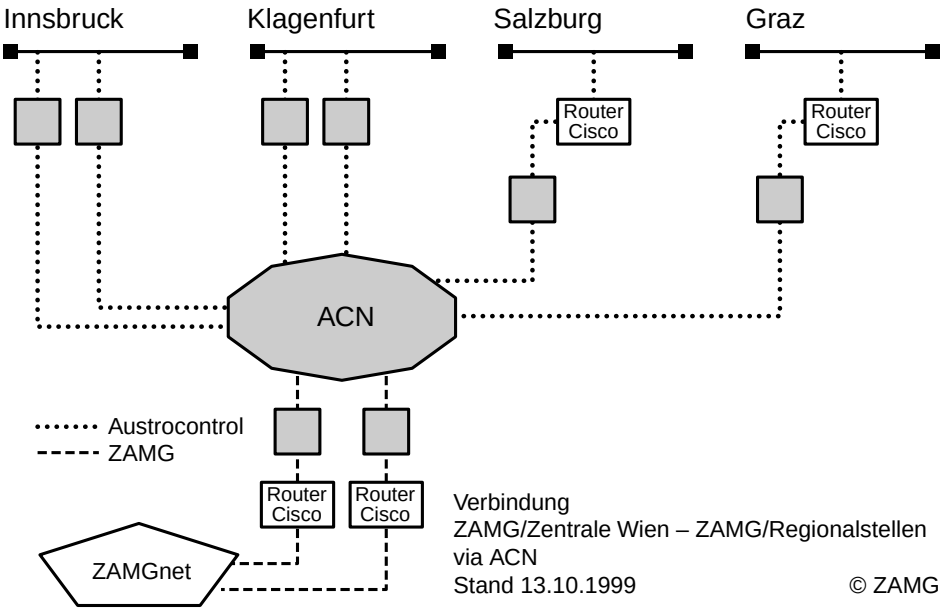
for special investigations, mostly together with Institute of Meteorology and Geophysics of University of Vienna

4. 00z Data (Frames)

till now no use of these data but planned

5. Metview

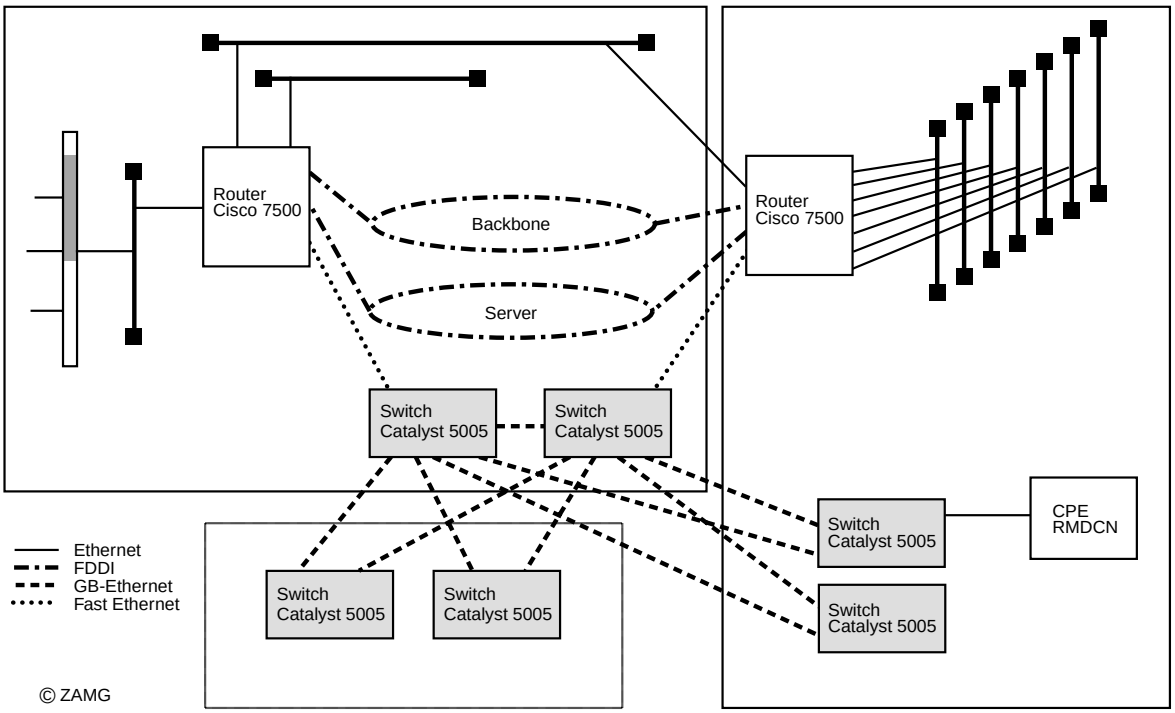
planned to use



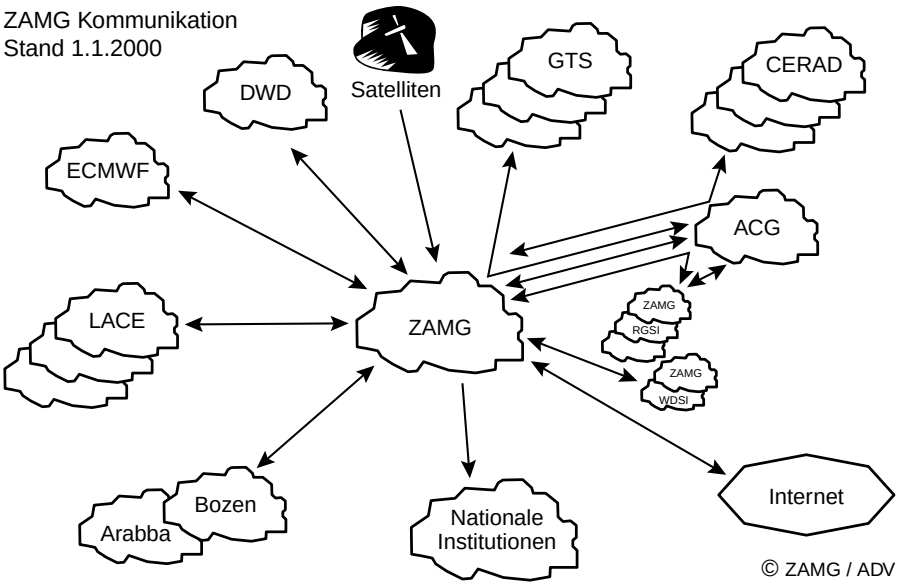
AUSTRIA

AUSTRIA

ZAMG internal Network

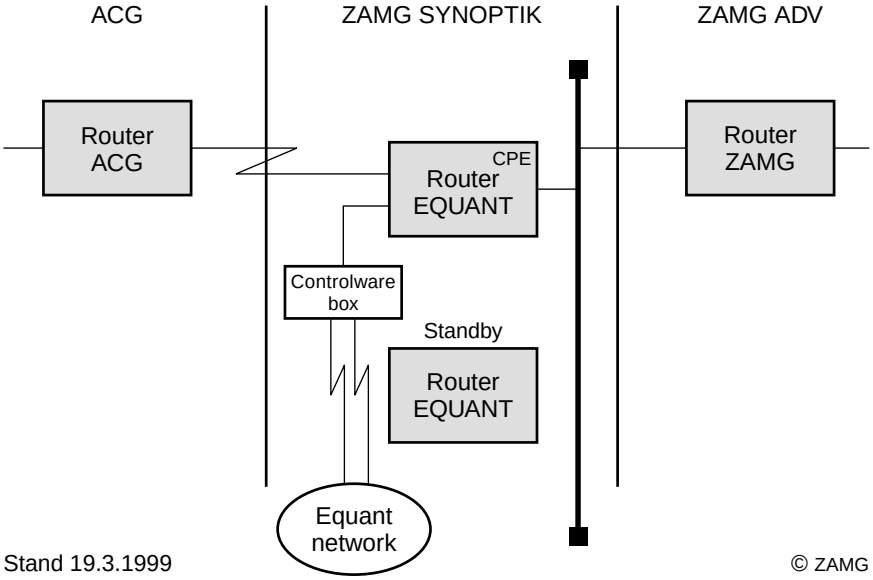


ZAMG Kommunikation
Stand 1.1.2000



AUSTRIA

AUSTRIA



Connection		Port	CIR		GTS		CIR	GTS	% - LACE	Relation GTS / total (%)	GTS in / GTS total (*100 %)	Share		Remarks
FROM	TO		OUT	IN	OUT	IN	in + out = total	in + out				Connected State %	Country GTS %	
AUSTRIA		512	376	296										
	Croatia		64	8	16	8	72	24	66.67	33.33	0.33	88.89	11.11	RC-LACE
	Czech Rep		16	128	8	16	144	24	83.33	16.67	0.67	88.89	11.11	RC-LACE
	Germany		24	24	24	24	48	48		100.00	0.50	50.00	50.00	ACG
	Hungary		64	16	16	8	80	24	70.00	30.00	0.33	90.00	10.00	RC-LACE
	Slovakia		48	16	8	8	64	16	75.00	25.00	0.50	87.50	12.50	RC-LACE
	Slovenia		64	8	8	8	72	16	77.78	22.22	0.50	88.89	11.11	RC-LACE
	ECMWF		96	96	192									ECMWF

Budgetary costing for RC-LACE countries – percentage of account

BELGIUM BELGIUM

Royal Institute of Meteorology, Brussels, Belgium

1. Computer infrastructure at the RMI

Parts of the network and the computing resources that are used in the three institutes sharing the same campus (the Belgian Institute for Space Aeronomy, the Royal Observatory of Belgium and the RMI) are continuously upgraded. Last year the changes concerned the servers shared by the three institutes. Some are still in progress.

1.1. Shared infrastructure

Network

The three institutes' networks are connected by a Gigabit Ethernet backbone. A Cisco Catalyst 4006 routing switch is located at the core of the backbone. This switch is connected with a gigabit Ethernet connection over fibre to one HP Procurve 8000 switch at each institute. Each institute has its own switched Ethernet network connected to these Procurves.

The new compute server and file server cluster are directly connected to the backbone routing switch.

The previous shared servers and each institute's most important servers are connected to a dual FDDI ring. This will be disabled, as the last shared server connected to it will be withdrawn from use in July 2002.

Computing resources

The new servers infrastructure consist of:

- 2 HP 9000/L2000 (2 processors, 3 GB memory, 2x18 GB internal disks): file server cluster. Both nodes are active (load balancing).
- 1 HP FC-60 Fibre Channel disk arrays with 2 TB of storage, to be complemented by an additional FC-60 with 2 TB in two years.
- SGI Origin 3400 (24 processors, 24 GB memory, 584 GB internal disks): compute server.
- 2 HP 9000/A500 (1 processor, 1 GB memory): mail, DNS, internet server ...

In the near future

- 1 HP 9000/A400: split horizon DNS

1.2. Computer infrastructure specific to RMI

In addition to the shared resources listed above, the RMI has the following servers in use:

- HP 9000/L2000 (2 processors, 2 GB memory, 72 GB internal disks): login and application server (soon upgraded to 4 processors and 4 GB memory).
- HP 9000/D390 (2 processors, 128 MB memory, 9 GB internal disks): Met Office server. This server and the following two form a high availability cluster where each node is capable of taking over the functions of the other nodes.
- HP 9000/D370 (2 processors, 128 MB memory, 2x2 GB internal disks):

Telecommunications server.

- HP 9000/K100 (1 processor, 256 MB memory, 2x3 GB internal disks): login server management and pilot database server.
- HP 12H AutoRAID disk array with 200 GB disk space: storage for the cluster detailed above.
- HP 9000/R380 (1 processor, 512 MB memory, 2x9 GB internal disks): Nearline storage server and intranet server.
- DLT jukebox with 2 drives and 30 tape slot: Nearline storage.
- HP 9000/A500 (1 processor, 512 MB memory, 2x18GB internal disks): web server.

The servers in the high availability array are marked for gradual replacement over the following years, starting with a full database server (cluster of 2 HP9000/L2000) and the Met Office server.

BELGIUM BELGIUM

External communication links at the RMI

The institute has the following external communication links:

- Internet connection: over a directional wireless link with Winstar (34 MB/s maximum), and from there to Belnet, the Belgian leg of the European research network. A backup to Belnet at 2 Mb/s via a television cable (Brutele) was added last year.
- RMDCN: leased line to SITA POP Brussels (256 Mb/s) with dual ISDN backup.

The following CIRs are used:

- ECMWF: 96 kb/s
- Brussels to Toulouse: 32 kb/s
- Toulouse to Brussels: 96 kb/s
- Bracknell: 16 kb/s
- Belgocontrol (civil aviation service): 64 kb/s leased line through Cisco router
- MeteoWing (military aviation): 64 kb/s leased line through Cisco router
- branch office in Zeebrugge (AWZ): 128 kb/s ISDN through Cisco Router
- branch office in Dourbes: 96 kb/s leased line through Cisco Router, with binary radar data multiplexed on the line
- leased line to VRT (national television): 256 kb/s
- several MODEMs for data collection and distribution
- a MODEM pool for users (dialback)
- to the lightning detection system SAFIR
- to Météo-France RETIM system (via satellite)

2. RMI use of ECMWF computer facilities

Most of the Belgian projects are importing MARS archives for local use, e.g. data for model calibration (snow, smog, surface models) and ozone calibration measurements, as well as the use of reanalysis data set in a study to improve regional climate modelling of extreme events.

One specific project used the Fujitsu compute server in running a coupled global atmosphere ocean sea-ice model (AOGCM) to study the influence of air-sea-ice interactions in the polar regions on global climate.

Belgian users are very satisfied with the service and support by and from ECMWF.

BELGIUM

BELGIUM

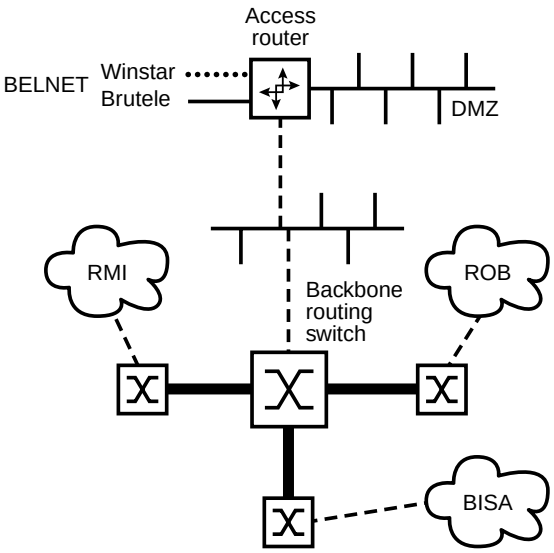


Fig. 1: Shared network architecture (May 2002)

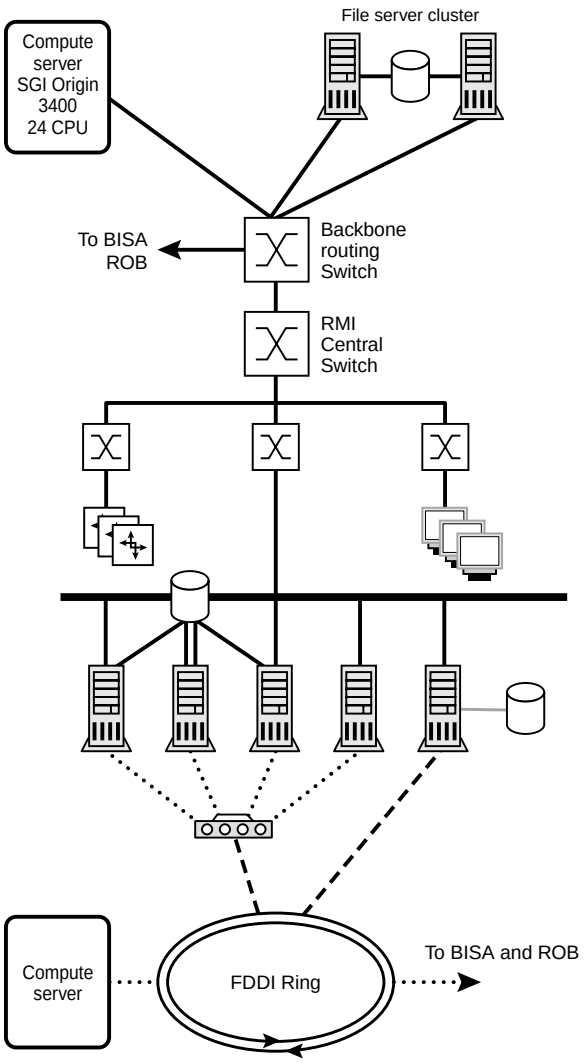


Fig. 2: Computer infrastructure at RMI (May 2002)

CROATIA CROATIA

Nevenka Kadic, Meteorological and Hydrological Service of Republic of Croatia

1. General

DHMZ is the governmental meteorological and hydrological service of Republic of Croatia. It is situated in Zagreb and has two branch-offices on the coast for maritime services (weather reports and forecasts for Adriatic Sea). Aviation traffic control has a separate meteorological service for the dedicated purpose.

2. Network

The main computer resources are located in DHMZ headquarters in Zagreb. The branch-offices on the Adriatic coast, Zagreb airport, GTS network, automatic station network, Ministry of defence, national TV and the Internet are connected by WAN via ISDN and MODEMs. We are connected to Reading and Vienna through RMDCN.

LAN consists of several machines under a UNIX operational system, 3 VAX VMS machines, terminals and PCs under WIN and LINUX. Some of the computing tasks are performed on old VAX machines but we are now migrating them to UNIX platforms. Applications are currently performed on both platforms.

3. Computer resources

The two main servers are SGI Origin 200 computers called cirus and lahor. They are responsible for the processing of GTS and climatological data. The lahor computer is our gateway to RMDCN connections to ECMWF and LACE.

SGI Indy is the graphical workstation used for post-processing of ECMWF dissemination data and their graphical representation.

2001 - We have bought a 16-processor SGI Origin 3400 that now runs ALADIN-Croatia twice a day.

EUMETSAT images are downloaded on PC and transferred to the Intranet. Data from DWD (FAXE) are received on dedicated HP workstation.

Observation station and automatic observation station data are collected on two PCs under WIN NT and processed on SGI servers.

The Marine centre in Split and the Marine office in Rijeka are equipped with PC servers. They are connected to Zagreb via ISDN.

Radar centres situated at the northern part of Croatia are equipped with PC servers, mainly under WIN NT and they are connected to Zagreb through ISDN. The product from Puntijarka Radar Center is sent to Graz, and then processed as part of a Central European Radar Composite, available trough GTS products exchange.

4. Operational service

The majority of our operational service is done by our own application related to GTS, climatological and hydrological data processing. Products are prepared for hardcopy and Intranet. Some products are also available on the Internet.

The weather forecast is relying on products of several numerical models (ECMWF models, ALADIN-Croatia, ALADIN-LACE, ARPEGE and DWD models).

5. Use of ECMWF products

- Operational forecast model products (12Z based products)
- Ensemble products
- Mediterranean wave model products

Received data are in GRIB and BUFR form. They are used mainly for weather forecast.

- Occasional retrieval of MARS data.

CROATIA

CROATIA

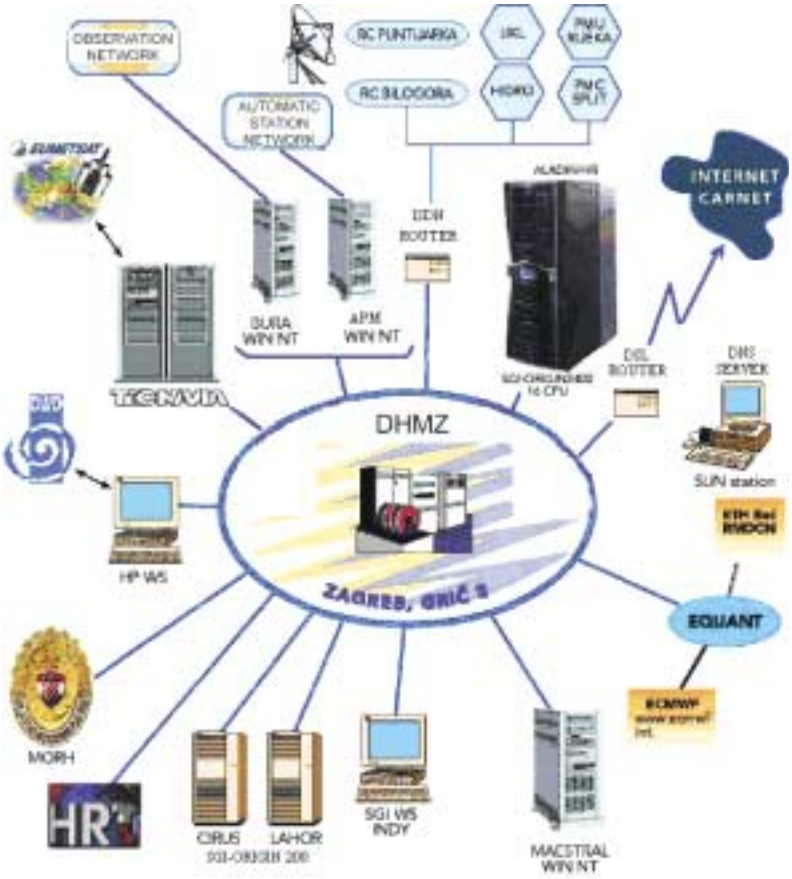


Fig. 1: Computer configuration at DHMZ

DENMARK DENMARK

The computer system at DMI

The software that manages the GTS communication is installed on to sun sparc stations and has functioned for several years without any problems.

The received data is transferred to the SGI Origin 200 computers for decoding and to two sun sparc stations for AFTN use.

The decoding programs for SYNOP, METAR and Sea level has in the last year been modified in order to make some extra quality control of the observations from Denmark, Greenland and Faroe Islands. The new quality control will be taking the different climatological limits in account when checking the observations. The implemented controls consist of max/min check, step check and check for internal conflicts in the observation. The quality of the observation is stored in the BUFR-record for later use. All decoded observation is stored in the GTS-database in BUFR-format.

Data from 3 Danish weather radars of which 2 are handled by micro-Vax 3100 computers are transferred to DMI via ISDN using ftp. The weather radar placed at Stevns in the southeast of Seeland has been operational since July 2001.

The old weather radar from Copenhagen airport has been moved to Bornholm. Data from this radar will in near future be transferred to DMI. The data will later be included in the operational suite

Data from ECMWF are received on a sun ultra sparc, transferred to 3 servers and stored in the GRIB database for use in the operational suite.

Meteosat and NOAA data are received on PCs and transferred to two sun ultra sparc stations for processing and generation of products.

The main computing system for running different weather prediction models still consists of a 16 processor NEC SX-4 with 4 GB MMU, 8Gb XMU, 136 GB disc storage. The HIRLAM weather prediction model is run for an area around Greenland and an area around Denmark. The run consists of nested models, where the first model run uses ECMWF frames as boundary fields, while the nested models uses the hirlam as boundary conditions. The data generated is stored in the mass storage system, that holds up to 16 TB.

The NEC SX-4 computer was installed at DMI around 6 years ago and in order to replace the computer, DMI send out an ITT in the summer 2001.

Later 2001 DMI decided to buy a NEC SX-6 computer to replace the SX-4.

The new SX-6 computer system consists of two SX-6 nodes each containing 8 processors with 32 GB memory and two front-end computers containing 4 ia64 800 MHz processors with 8 GB memory.

The system has attached 1,12 Tb disc storage.

The computers running the operational suite and the computers used by the forecasters are monitored by a software system called patrol. This software system makes it possible to monitor the computers for disk-usage, CPU-usage and queue-lengths. Furthermore it is possible to implement modules that makes it possible to monitor whatever you want. With one of these modules it is possible to monitor if the GRIB data from ECMWF has been stored in the GRIB database.

In order to make it easier for the operator a product-database has been implemented. This database holds information of the products made available for the customers.

ECMWF Products

Denmark receives approx. 400 Mbytes per day from the operational forecast model, the wave models and the Ensemble Predictions.

12Z based products:	370 Mbytes
00Z based products:	10 Mbytes
Ensemble Products:	3 Mbytes
Wave model products:	20 Mbytes
Frames:	750 Mbytes

The data received from ECMWF is transferred to the computers holding the GRIB database. The data is the accessible by the graphics package that is based on Metview that is originally obtained from ECMWF.

DENMARK DENMARK

Projects run at ECMWF

The remote jobs run at ECMWF are to a large extent data retrieval from the MARS archives.

The research department are running some experiments on the HIRLAM 3D-Var code. Some jobs have been run in order to compare the new 3D-Var code with the reference HIRLAM system.

The VPP 700 has also been used in calculating trajectories for the stratosphere and there have also been run jobs connected to a research project on reduction of the ozone layer.

DMI has recently sent to requests for two special projects.

The two projects covers the areas 'Heavy rain in Europe' that is connected to 'A European Flood Forecasting system' and 'detection of Changing Radiative Forcing over Recent Decades'.

UNIX servers

3 SGI Origin-200

- 1 server with 4 R10000 processors, 2 GB main memory, 300 GB disk storage
- 1 server with 4 R10000 processors, 2 GB main memory, 150 GB disk storage
- 1 server with 2 R10000 processors, 2 GB main memory, 74 GB disk storage

These systems handle the data pre-processing, message switching, the generation of the GRIB database, the post-processing and most of the production of graphical products.

SGI Origin-200

- 1 R5000 processor, 128 MB main memory, 4 GB disk storage.
- Applications development and testing.

SGI Origin-2000

- 4 R10000 processors, 1 GB main memory, 64 GB disk storage.
- File server for the research department.

SUN Ultra 10 Servers

- 1 processor, 128 MB main memory, 9 GB disk storage.
- Serves as file servers for the different departments.

SUN Ultra enterprise Server

- 2 processors, 256 MB main memory, 68 GB disk storage of which 60 GB is raided.
- Climatological database based on Ingres DBMS

2 SUN Ultra 10 Servers

- 1 processor, 128 MB main memory, 9 GB disk storage.
- ftp servers

2 SUN Ultra 10 Servers

- 1 processor, 128 MB main memory, 9 GB disk storage.
- ftp servers.

2 SUN Ultra 10 Servers

- 1 processor, 128 MB main memory, 9 GB disk storage.
- Firewalls.

2 SUN Ultra 10 Servers

- 1 processor, 128 MB main memory, 9 GB disk storage.
- Internet servers.

2 SUN Sparc 5

- 1 processor, 96 MB main memory, 18 GB disk storage.
- Handling of GTS communication, receiving of SADIS data.

6 SUN

- Different models.
- Handling of data to be sent to external users.

2 SUN Sparc 5

- 1 processor, 64 MB main memory, 20 GB disk storage.
- Handling satellite data from Meteosat and NOAA.

Linux servers:

The web-servers and firewalls used at DMI are installed on Linux-servers

UNIX Workstations

There are about 50 UNIX Workstations, of which most are PCs that have Solaris installed. Most of these PCs are equipped with two screens.

Linux workstations

During the last year there have been around 30 Linux workstations installed for use in the research department.

Windows

In the last year DMI has upgraded around 200 PCs to windows 2000 using office XP.

Network

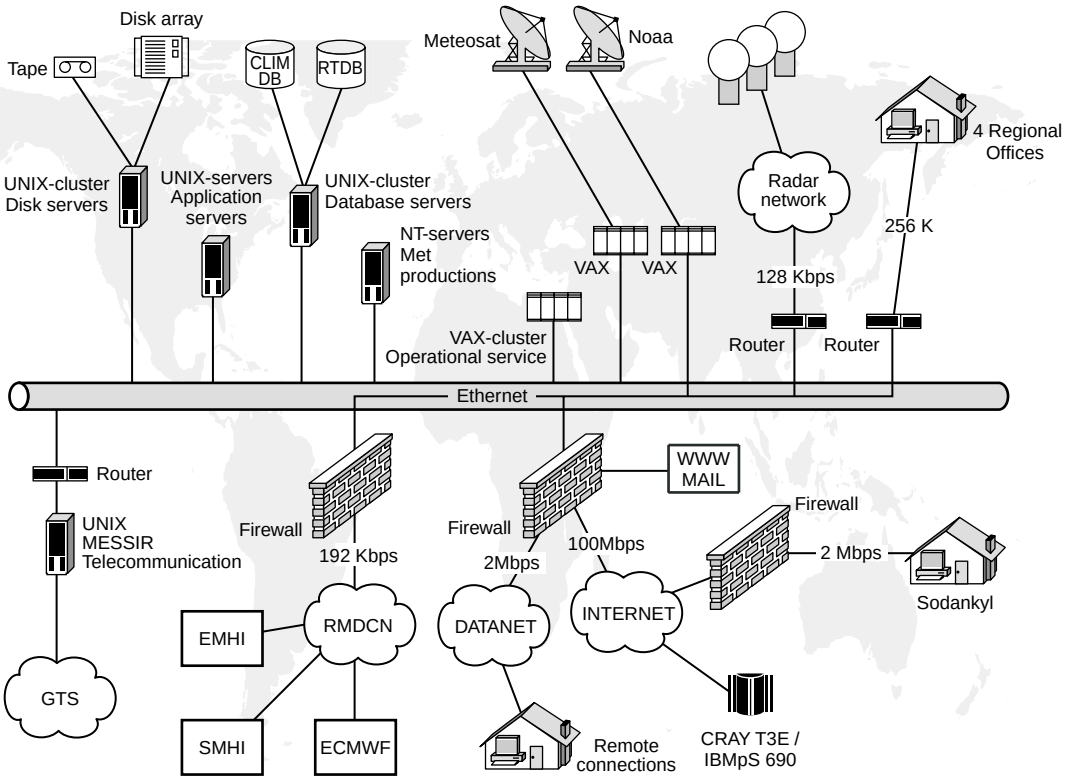
On the Local Area Network we link the network using routers, bridges and switches. The networks at the regional centres are linked by bridges via leased lines, using ISDN as backup.

FINLAND FINLAND

Use of ECMWF-resources in Finland

1. Updates in Computer Environment

- This year we are updating the database into Oracle 9i and at the same the servers are being replaced. The starting configuration for the servers is a cluster of two Compaq Alpha Server DS20E of 833 MHz with 1 GB of central memory in each.
- Another thing that will be new this year is a disk server called Stora. It will provide centralised disk space to all systems including PCs, SGI-servers and even the new Oracle database. In the first phase it will have a disk volume of 2 TB. The disk server consists of a cluster of two Compaq Alpha Server DS20E of 833/666 MHz having 1024/768 MB of central memory. The operating system is Tru64 UNIX V5.1A. The system includes a tape backup system MSL5026 (26 tapes) with 2 SuperDLT1 of 110/220 GB and a TL894 (48 tapes) of 4 DLT7000 of 35/70 GB. The backup software is Legato Networker.
- The present Finnish number cruncher Cray T3E is being replaced with an IBM pSeries 690 having 16 pSeries 690-nodes, each of which has 32 Power4-processors (totally 512 processors). The clock frequency of the processors is 1.1 GHz. The Cray should be off duty at the latest at the end of this year.



2. Use ECMWF Resources

- Our use of the ECMWF resources is mainly use of MARS using either batch requests or directly Metview.
- Members of Hirlam developing group use the supercomputing possibilities to some extent.
- Our benefiting of supercomputer resources at ECMWF could be a lot larger. We expect the new Ecaccess software package makes it easier to use ECMWF resources. We have not yet had the opportunity to try it.
- Using ECMWF web pages even in routine forecasting is fairly common, because there are products that are not available in house. The web pages have mostly been working well. A few occasions have come into my knowledge where using web pages without a certificate was impossible. These situations have been corrected quite fast. I have however not had a report of the reason.

FINLAND FINLAND

A few comments of using IBMpS 690 series (by Kalle Eerola)

1. These comments are user's comments, because CSC takes care of the system matters.
2. At CSC there exists now four p960 nodes available, but at the present they are not connected to each other. In Sp we have used only one node in our experiments.
3. The Hirlam forecast model was already implemented on IBM PS system and there were no problems in implementing it into p690 system.
4. In 3D-Var the problem was that when compiling in -q32-mode the 2 GB is the limit for allocable memory. The -q64 solved this problem but extra work was needed with some C-programs, because pointers are presented in 64 bits in -q64 mode.
5. Some problems has been seen in paging when running 28 processors of 32 and other jobs running at the same time. Probably there is not enough space reserved for paging. CSC supposes that there are some problems in the operating system in controlling the memory, but this hopefully is corrected while updating the operating system. (I don't know exactly which version of AIX is running)
6. We don't yet have experience how the system will work for giving high priorities to certain jobs (HIRLAM).
7. The nodes are at the moment separate, so we don't have experience of running parallel jobs on several nodes.

FRANCE FRANCE

Marion Pithon, Météo France

1. Computing environment and Network Configuration at Météo France - Future plans

1.1 Central computing system

There have been no significant changes to the computing environment since the previous meeting. The current configuration is the following:

- Vector computing: VPP5000 (31 PEs)
- File server and archiving system: O2000 (8 processors), 2 STK 9310 silos and a STK 9710 silo.
- Production system (pre and post processing, databases...): HP servers
- Scalar systems: HP servers
- Visualization system: SUN servers
- Climatological database: a SUN server
- Backup system: a SUN server and a STK9710 silo
- Telecommunication system: SUN servers
- Internet Web server: 2 SUN servers running Solaris and 4 PC running LINUX
- Office servers: 11 Windows NT4 servers for office applications and development purpose.
- Desktops: A growing numbers of personal computers running Windows NT or Linux and Sun workstations.

Supercomputer

The VPP5000 is a distributed memory parallel vector computer with 31 PEs (delivering each a peak performance of 9.6 GFlops), 208 GBytes of total memory and 2 TBytes of RAID5 disks. The current configuration was installed in October 1999.

All operational tasks (different runs of a global model (ARPEGE) with a 4D-Var assimilation scheme, different runs (on different area) of a limited area model (ALADIN), some post processing, two wave models, trajectories models, seasonal forecasts...) are run on the VPP5000 since February 2000. They use about 20% of the total CPU delivered.

Many research models (climate model, mesoscale model, chemistry model, coupled ocean atmosphere models) use also VPP resources.

An upgrade of the system is planned for mid 2003 to meet the requirement of a performance increase (4 times the actual system). The administrative procedure is in progress to an upgrade of our current system to 124 PEs. The configuration will probably be two machines (one with 64 PEs, the other with 60 PEs). This upgrade will enable Météo France to keep vectorial systems up to the end of 2006. This choice satisfies research teams who were reluctant about migration to a massively parallel scalar system in a near future and give more time to migrate all the different codes. This deferment could perhaps be of benefit to the emergence of technological progress and more competition among providers.

File server and backup system

The data management is provided by an archiving system made of a SGI O2000 (8 processors, 4 Gbytes of memory and 1.8 TBytes of RAID3 disk cache) that controls two StorageTek 9310 silos (with 42 drives in total) and a STK9710 silo (with 6 DLT drives) in a remote location for double copies. The total capacity of the system is 150 Tbytes. The data handling system manages currently 100 Tbytes (about 5 Million of files) with a monthly growth of 3 TBytes. The software used for the file service and archiving system is SGI's DMF. To cover data handling requirements for the next future and the increase of data that will be generated by the upgrade of the supercomputer an ITT is planned for the end of 2002.

The backup service is provided by the software "Time Navigator" from Atempo on a SUN E450 and a STK9710 silo. The replacement of the backup solution is planned for the end of the year. An ITT was issued and the responses are scheduled for this summer. The requirements are a more judicious localization of backup copies (in a different building from the original ones), an increase in the capacity and the same system for central services and regional centres.

FRANCE FRANCE

HP servers

A set of HP servers (2 N4000, 2 D370 and 2L1000) is in charge of all the operational tasks: The 2 N4000 handle pre-processing and post-processing of meteorological data and the databases for observations and forecast products. Oracle software is used. The start of the models on the supercomputer, the monitoring and supervision of all operational tasks are made on the D370. There is also one server for tests and integration.

5 HP servers (1 L2000 with 4 processors, 2 K570 with 3 processors and 2 D and J class servers with 2 processors) are available to users for development purpose, use of graphical tools, code management, front end server for the VPP (cross compiling, job submission to the VPP, use of graphical libraries for visualization...)

SUN servers

2 E3500, 1 E450, 9 Ultra 60 (2 processors), 9 Ultra 10 are used for the interactive visualization system for forecasters.

A SUN E450 (2 processors) houses the backup system.

A SUN Enterprise 5000 is used for a climatological database (based on ORACLE).

A SUN E3000 (2 processors) handles the telecommunication system (locally developed software TRANSMET) which is in charge of real-time reception and broadcast of meteorological data.

Desktop systems and servers

Currently, in Toulouse, there are about 700 PCs running Windows NT4 (only 5% running LINUX, mainly RedHat distribution), 100 X-Terminals and about 100 workstations.

11 Windows NT4 servers are used for office applications and development purpose.

1.2 Network

Local area network:

The backbone of our LAN is based on 2 CABLETRON equipments (SSR2000) which provide Ethernet 100 connections between hosts.

A HIPPI link enables fast transfers between the VPP5000 and the O2000 (file server). This link is backed up by a Gigabit Ethernet connection between the two systems.

Computers dedicated to operational purpose are linked together through a FDDI ring.

The backbone will be replaced by Ethernet Gbit connections. The choice of the provider should be made before this summer (evaluation of the responses are in progress) for an install in autumn 2002.

Wide-area network:

The connections between central services, the 7 regional centres and almost all other Météo centres (about 90) are covered by a Frame Relay network. The Committed information rate (CIR) between Toulouse and the regional centres is now 1Mb/s, and 64 kb/s between Toulouse and the local centres. Some leased lines remain for connection with outside services or X25 applications.

Connections to Internet (access to RENATER, the French academic and research network) are made trough "GALACTIS", a high bandwidth ATM network in Toulouse, with a 4Mb/s access. The bandwidth will be upgraded to 10 Mb/s in a very next future. These connections are protected by a firewall implementation. The software used is Firewall1 from Checkpoint on dedicated equipment (NOKIA).

1.3 Connection to ECMWF

Our connection to the GTS and to ECMWF is made through the RMDCN network. The delivered bandwidth is asymmetric with a CIR of 512 kbps in and 256 kbps out.

Users also use Internet (with a maximum throughput of 10 Mbits/s very soon) to connect to ECMWF and they are highly encouraged to use this mean for file transfers to avoid concurrent traffic with dissemination. The convenient transfer tools (such as the new tool ECaccess) can be configured to use the Internet by default and are a good way to promote the use of Internet among users.

FRANCE FRANCE

2. Use of ECMWF resources

Operational products

The total volume of data concerned by the dissemination of ECMWF products is about 1.1 GB compressed per day, which corresponds to 2 GB if not compressed (30% to 50% savings). The products transferred are: IFS 12Z results in GRIB codes and some raw products (divergence, vorticity, some surface fields...), Wave models and EPS results. All these products are used for operational meteorological activity.

The projects

40 Météo-France projects and 6 special projects are registered for this year with a total of 176 users; the main activity is data retrieval from MARS on ecgate1 (almost 75% of Météo France users). Only 10% of users compute on the VPPs. The more active projects are:

- Climate simulations.
- Mesoscale model experiments.
- Participation in the DEMETER project.
- Atmospheric predictability studies.
- Statistical works on ECMWF data.
- Control and monitoring of data.
- Studies on EPS.

The following are registered as special projects in 2002:

- MERCATOR project: build a global ocean circulation simulation tool based on a high-resolution model assimilating real time data (SPFRMERC)
- Universal software for data assimilation: variational method for global ocean (SPFRPALM)
- Chemistry cloud and radiation interactions in a meteorological model (SPFRPECH)
- Seasonal to interannual predictability of a coupled ocean-atmosphere model (SPFROASP)
- Decadal climate variability over the North Atlantic European region (SPFRNAOA)
- Forecasting optical turbulence of Astronomy applications with the MesoNH mesoscale model coupled with ECMWF products. (SPFRSEE)

The majority of users are MARS users and, above all, they work on ecgate1. They are principally interested in MARS data access, local storage on ECFS (or on disks on ecgate1), efficient file transfers from ECMWF to Météo France (their workstations or Météo France file server) and Web services.

A few projects, however, need to work on the supercomputer. In 2000, the CPU usage represented 5% of the total allocation, in 2001 it increased to 8% and in May 2002 it's already 9% of the allocation, so a modest but steady increase in the use of supercomputer resources. The projects more likely to use such resources are those coming from research laboratories outside of Météo France or those participating in European projects with data located at ECMWF. These projects will be concerned by the migration to the IBM system.

Migration to the IBM system

A survey has been made among 9 projects (which have used VPP resources this year) about their need for the migration to the IBM. Users are aware that Fujitsu service will terminate at the end of March 2003 and their runs should be over at that date (end of DEMETER project, no operational runs on the VPP and no climatological runs in progress) so the migration won't be an critical issue. However some users express the need to compute on the VPP5000 up to the end.

To be able to use the IBM system, the main issues are:

– the availability of ECMWF tools such as PREPIFS or job submission from remote hosts (through ECaccess for instance)

– the availability of software such as: MPI 64 bits library, MPI2 (with "SPAWN" functionality), NETCDF library and performance visualization tools.

– detailed information about F90 compiler (digest on the main options and their meanings) and debuggers.

– advice and help for optimisation. Some users are afraid of bad performance on "only" MPI codes.

FRANCE FRANCE

Use of PREPIFS

Only two French accounts use PREPIFS on a regular basis: PREPIFS is fine if experiments conform to the standard IFS configuration. Users expect it to be more "open" in terms of configuration with more access to ASCII files that could be modified at each step. A lot of work (with the essential and irreplaceable help of user support) has been necessary to install the coupled ocean-atmosphere model for the LODYC (a French laboratory).

ECaccess

The client tools and the gateway (version 1.1) have been installed without any problem on a HP machine (HPUX11) with a virtual Java machine 1.3.

At the moment, only a few tests have been made especially regarding file transfers. The functionality offered by the ecbatch commands (eccopy, ecget/ecput and ecqsub) is covered by ECaccess tools (ectrans, ecput/ecget, ecjput) so the replacement should not be a difficult issue.

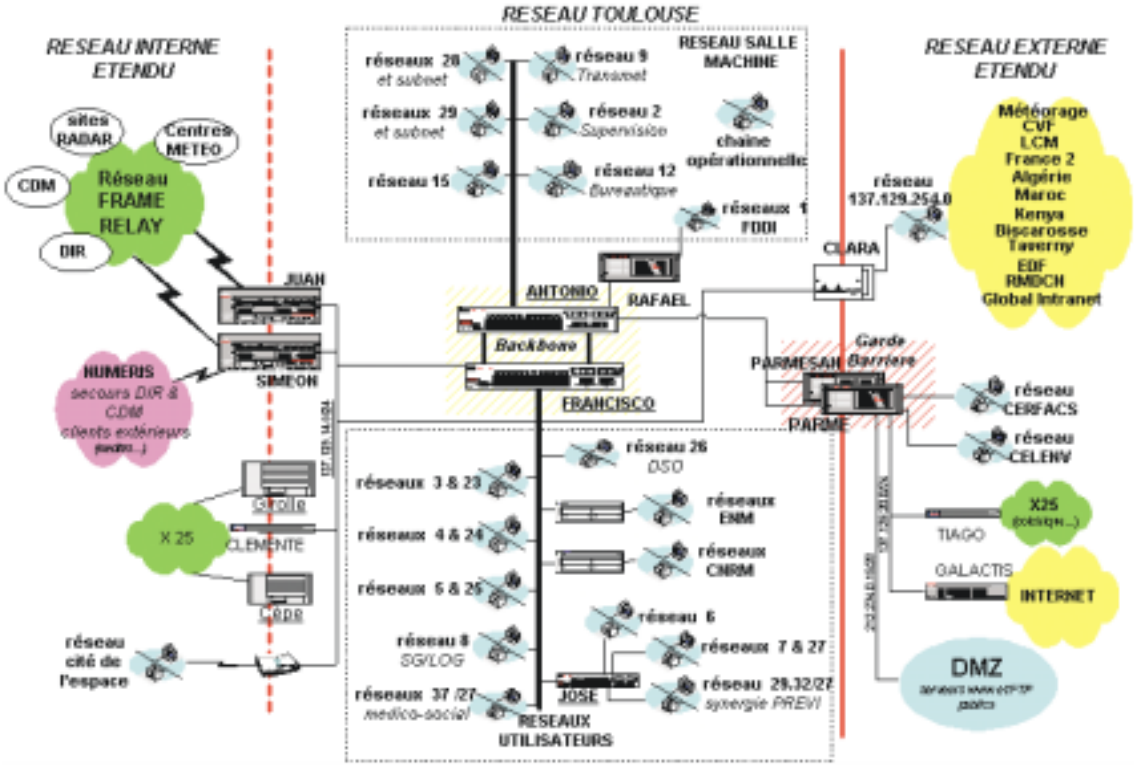
As the web interface makes the tool more attractive and easy to use than the older commands, more users are likely to use it and we have to check the performances related to the number and the size of requests.

More intensive tests will be planned during the next two months with beta-test users in order to replace the ecbatch commands during autumn.

Web services

There are more access to ECMWF member state website, especially to meteorological products. The domain-based access is very convenient in that case (for non registered users) but the access policy seems to be quite complex: there is no information about products available according to the access level. For instance, EPS meteograms seem to be only available with a certificate.

A great effort has been made regarding documentation and users appreciate the availability of computer training course on the Web.



GERMANY GERMANY

Elisabeth Krenzien, Deutscher Wetterdienst

1. Computer equipment at DWD and connections to ECMWF

In accordance with the five years' contract signed by DWD and SGI in 1997 to upgrade the central IT DWD took the opportunity to reconsider the hardware solution for the last upgrade phase of the compute server and installed an IBM SP RS/6000 system to reach the targeted sustained performance and thus the final configuration.

The major changes in the computing centre environment since the last meeting (Figure 1) besides the replacement of the Cray T3E-1200 compute Server at the beginning of April 2002 is the change towards Fibre Channel Technology for the StorageTek tape drives.

	J90	**SP RS/6000**	Routine Servers **O2000** Data Servers			
Processor	CMOS / Vector	POWER3 SMP	MIPS R 10 000 +			
CPU / processors	32	1280	8	14	24	24
Main Memory (GB)	8	792	6	8	24	24
Disk Space (GB)	172	3790	94	680	7853	7853
Tape Drives	6	–	–	–	26	–
Networks	FDDI HIPPI	HIPPI Fast Ethernet	Fast Ethernet HIPPI / ATM			
Operating System	UNICOS 10	AIX 4.3.3	IRIX 6.5			

Table 1: Current specifications of the central servers

The new DWD compute server consists of 80 16 way compute nodes NightHawk II compute nodes equipped with 375 MHz Power3 processors with a peak performance of 24 Gflops and between 8 and 16 GB memory per node adding to an aggregated performance of 1.92 Tflops and 792 GB of main memory. The nodes are interconnected with an intermediate SP Switch2 to allow for an upgrade towards 128 nodes.

The system has RAID-5 SSA disk management for the IBM parallel high performance file system GPFS. The communication network for MPI and the GPFS is a single plane Colony Switch that serves all nodes. The system is logically partitioned into two systems to clearly separate production (28 nodes) and development (52 nodes). Each partition has its own GPFS fileservers and file systems. Three nodes are dedicated to login and interactive usage. Two control workstations in high availability mode serve as central management point and together with the login nodes are the only visible parts in the LAN.

The system software installed consists of the AIX 4.3.3 operating system, the SP system management software PSSP and the LoadLeveler as batch system. Currently the user environment includes the Fortran, C and C++ compilers, MPI, the ESSL library and a debugger; third party application software will be installed soon.

Since the key activities necessary to retire the reliable T3E system such as the installation of the SP hard- and software, network and disk systems, the refurbishment of the computer hall including power and air conditioning upgrade and move of operator room, the migration of the NWP system including a redesign of the GME assimilation scheme and the switch to a different vendor had to go in parallel it took ten months to successfully complete them.

At the moment, the system is rather stable and users and administrators having got used to the complexity of their environment gain from the high performance of the system.

Currently the production SP and one of the routine servers are the main platforms for the operational model chain, Lokal Modell (LM)/Global Modell (GME), that will stay in production until 2003 approximately. The second routine server and the Cray J90, the only vector system left, host non-time-critical operational tasks and user activities that originate on X-terminals, SGI workstations and Windows NT4.0 systems within the DWD LAN.

The data handling system at DWD comprises two O2000 servers in high availability SGI Failsafe mode, about twenty Oracle database instances (Oracle 8.1.7), the Adic AMASS/DataMgr HSM software package and a three component StorageTek Powderhorn silo with 26 STK FC tape drives (9840. 9940). Augmenting the number of tape drives has greatly increased the stability of the whole system. The total amount of data stored is 300 Tb in about 5.2 Million files and the monthly growth reaches 10 Tb.

GERMANY GERMANY

The evaluation of the pilot operation of the distributed computing centre DMRZ (based on HPC resources of the national (Offenbach) and military (Traben Trarbach) weather service) is still ongoing as is the implementation of the unified user environment based on the UNICORE software.

DWD uses RMDCN as its main telecommunication link to Reading for exchange of operational data and products, while users are highly advised to use the Internet access to the Centre. DWD aims to finally set-up the backup management centre for RMDCN. The data communication to ECMWF is schematically shown in Figure 2.

2. Projects and experience using ECMWF resources

The implementation of the ECMWF ecfs software package on DWD platforms that will replace the nfs based direct access to the user archive is completed and the user testing is about to start. Full production is expected to begin in late summer, giving the users more time to accept the changed functionality when accessing their archival data.

The co-operation contract signed in late 1999 by DWD and ECMWF to provide DMRZ users an interface to both computing sites in a seamless environment based on UNICORE has been extended for another two years giving the partners the opportunity to implement/introduce the CSOMARS interface which is currently in ‚beta-test' at DWD as part of the new ECaccess service. It offers the opportunity of a uniform access to both MARS and DWD databases via csobank.

Although the test bed for the next generation of the operational GME/ LM NWP system on the VPP5000 system had to be redesigned, its implementation is expected to be completed soon and available in July. The new test suite will consist of the global model GME with different mesh sizes (60, 40, 30 km), 35 layers and a forecast range of 174 h which will be run in data assimilation mode plus one forecast per day.

Due to the tight schedule of the T3E replacement the capacity of DWD staff to participate in non-operational migration related activities was reduced and consequently planned projects had to be postponed.

In 2001 nine projects with 55 users and 11 Special Projects with 51 user have been registered, the majority of them retrieves data from MARS on ecgate1 via the Internet. About 26% of the allocated Fujitsu units have been used by mainly two DWD projects: the LLM studies, that have come to a preliminary end and specific LM and GME reference experiments within sensitivity studies.

The Special Projects of the Max-Planck-Institute of Meteorology run their climate and coupled ocean/atmospheric model studies on the VPP5000 with great success.

The majority of new users now comes from outside DWD and requests access to MARS data with growing interest in the operational forecast data to support short term international field campaigns, an easy procedure to handle the resulting amount of administration work would be helpful.

In principle, there are no difficulties in using the computer equipment because of the portable code development strategy at DWD in general. The professional support provided by the ECMWF user support certainly is part of this success.

3. Plans

The Research Department of DWD still considers implementing the Observational Data Base (ODB) developed at ECMWF to meet NWP requirements and plans to test it in a systematic comparison of observational data sets at DWD and ECMWF but wants to know about the status of the project.

The implementation of UNICORE software at ECMWF is in delay and will be carried out in the near future when UNICORE 4.0 is available.

As a partner in varies international projects DWD intends to use ECMWF resources within ELDAS Project (EU Project European Land Data Assimilation System) that will provide an assimilation infrastructure for estimating soil moisture for better prediction of floods and droughts. The resources for this new initiative are still in discussion.

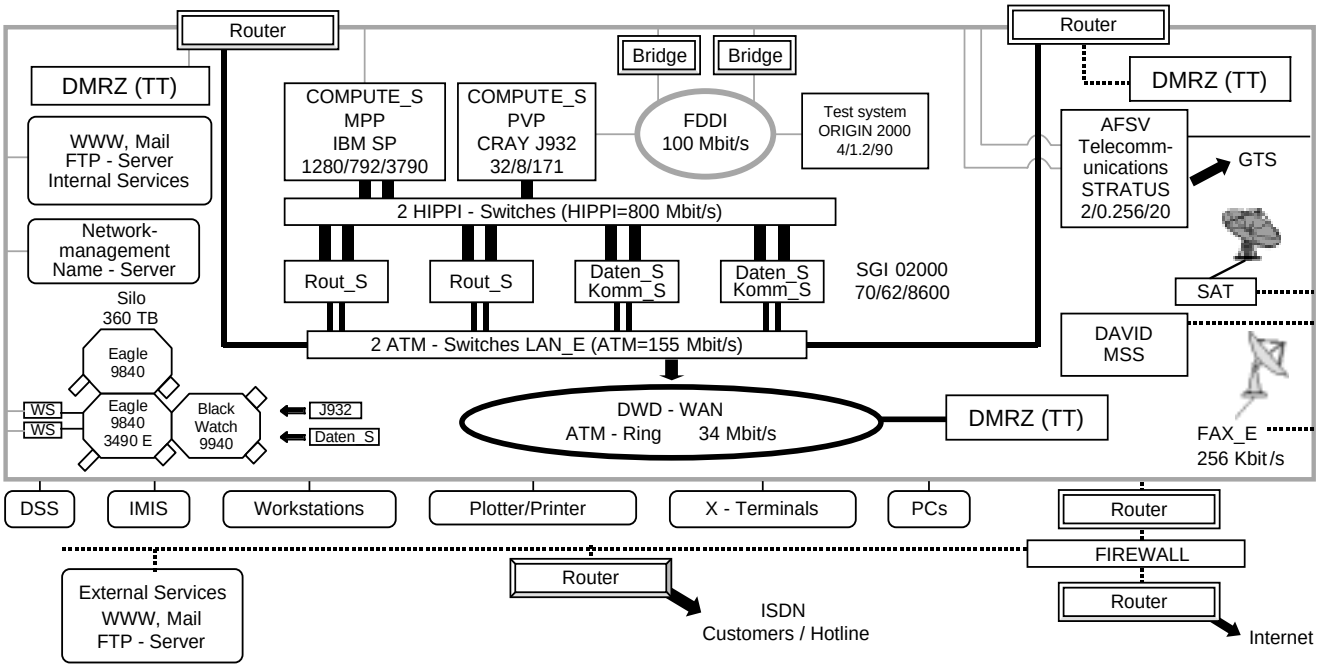
Well planned is the implementation of the COSMO LEPS Project that will build a limited area ensemble prediction system based on defined EPS members for severe weather prediction for the project partners Germany, Greece, Italy and Switzerland.

With respect to the homogeneous IBM platforms in both centres DWD expects to use the new resources as soon as they are available.

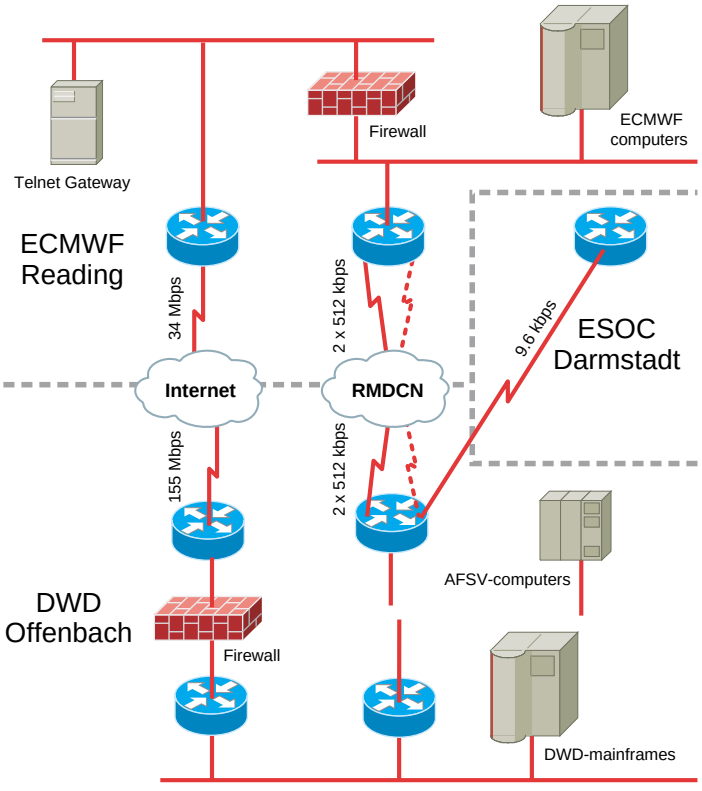
GERMANY GERMANY

Configuration 2002 - DMRZ (OF)

Status April 2002 Keys: Processors/Memory in GB/Discspace in GB

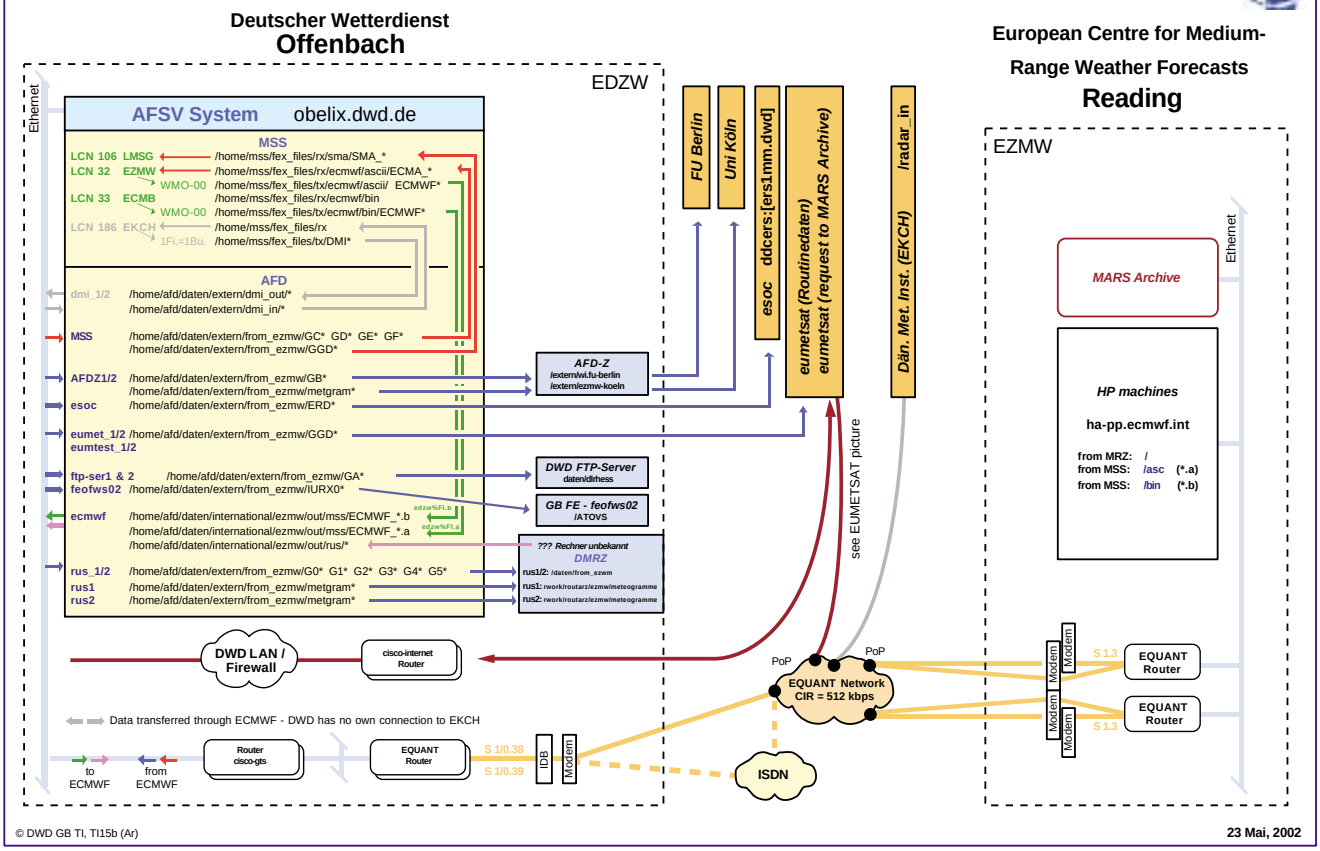


Principles of data communication between DWD and ECMWF



GERMANY GERMANY

Link between EDZW (RA VI) and ECMWF



GREECE GREECE

Hellenic National Meteorological Service

We have had few changes from the previous year. However we do expect more important changes during the following years.

Software:

- New PC based software for Meteorological Stations, has been developed.
- Upgrade of our PC-based software for visualization of Meteorological products.

Telecommunication System

- New MSS system Corobor Messir.
- The AFD communication system is tested.
- New firewall has been installed
- New Postfix Mail server
- Web Server (apache-zope) is expected to be operational in June. Currently being tested on a Linux system but operationally will be based on a Sun workstation.
- Virtual Private Network project

Future Plans:

All our future plans have a strong relationship with the Olympic Games of 2004. We are moving fast to upgrade all our systems and improve our infrastructure.

Concerning ECMWF apart from the VPN project, the RMDCN connection will be upgraded.

Usage of ECMWF Computer facilities:

We are very satisfied with the staff of ECMWF. The new services of the web server include useful information, something that is very helpful and saves time to many people.

HUNGARY HUNGARY

Hungarian Meteorological Service, Budapest (www.met.hu)

Computing Representative: Istvan Ihasz (Ihasz@met.hu), User Support Contact Point: Umberto Modigliani
Report is presented by Laszlo Tolgyesi (Tolgyesi.L@met.hu)

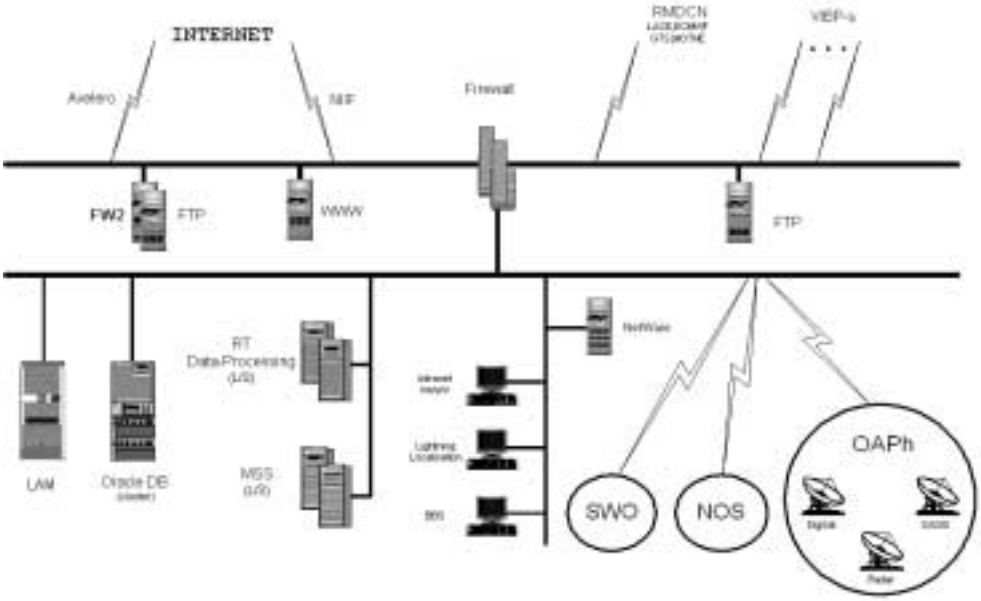


Fig. 1: HMS logical network diagram

Computer resources

Servers:

- Dual Message Switching Computer (Linux) for Netsys WeatherMan
- RT UNIX servers (HP D280, K250) for data processing and controlling
- ORACLE (8.1.6) server (HP L2000 cluster, 2x2 CPU, ~100 GB AutoRAID disk)
- IBM pSeries 690 (Regatta) (32 CPU, 32 GB RAM, 360 GB disk) for LAM AladinHU and research studies
- SGI ORIGIN 2000 (16 CPU, 8 GB RAM, 88 GB disk) for GIS, WEB, modelling (nowcasting, ...)
- SUN Netra T1 AC200 and HP C200 for firewall
- Linux and Netware servers for other purposes (mail, news, files, printers)

Workstations:

- DEC, SUN, HP and Linux Workstations for visualisation and development
- about 300 PC (Windows NT and 2000)

Network

- LAN: 100 Mb/s, structured UTP cabling system, CISCO switches
- WAN: 64 kb/s and 128 kb/s leased lines, 2 Mb/s and 4 x 2 Mb/s microwave channels
- Internet: 512 kb/s via University Network and 128 kb/s via private provider for customer
- RMDCN:
  - ECMWF: 80 kb/s;
  - Vienna (AC RTH and ZAMG LACE): 80 kb/s
  - Bratislava is under implementing: 32 kb/s
- Firewall: Internet segment and DMZ

HUNGARY HUNGARY

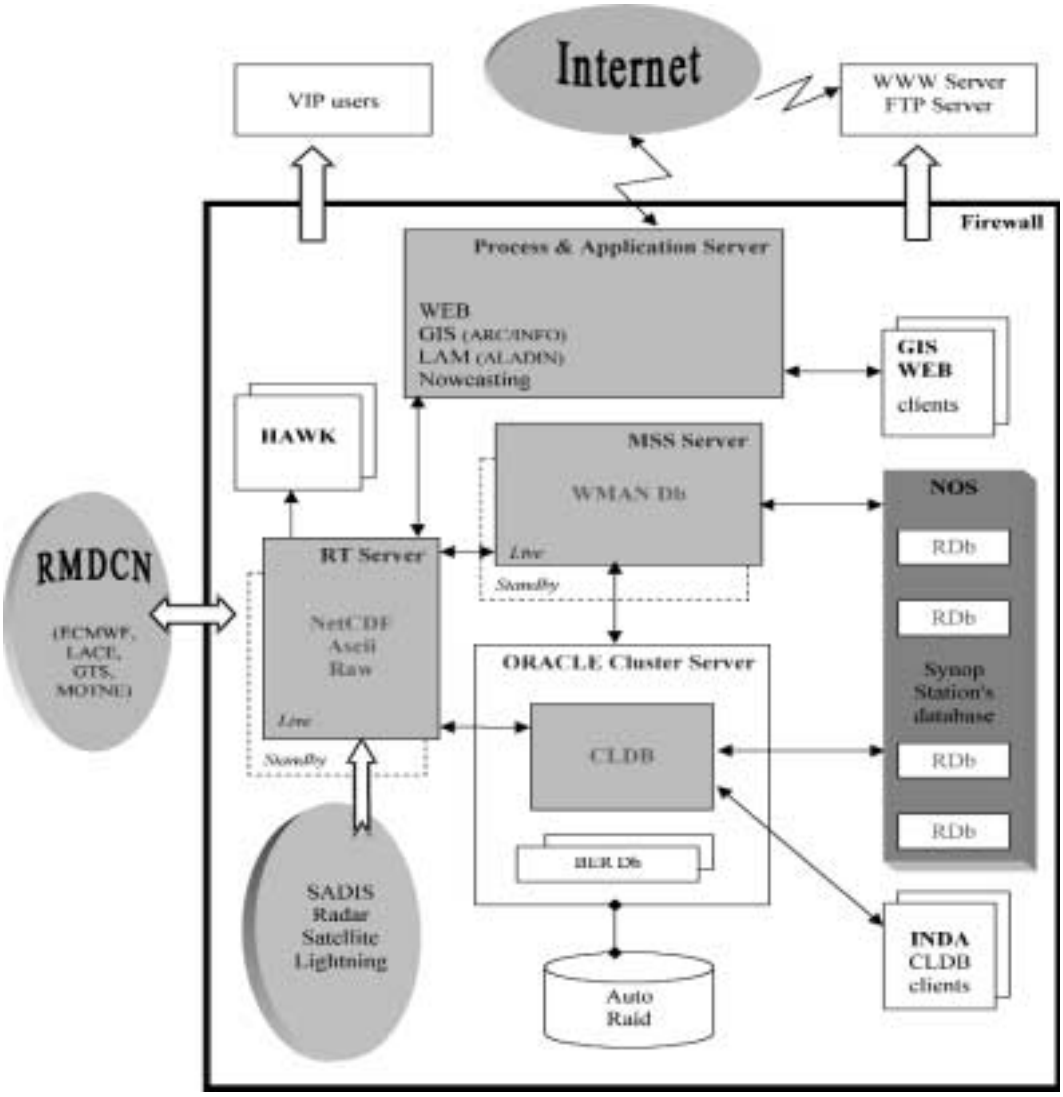


Fig. 2: HMS information system

Connection to ECMWF

- Co-operating member of ECMWF since 1994
- GRIB and BUFR dissemination files received on a Linux FTP server in the DMZ
- Access to https://happ.ecmwf.int:8844/requirements / (since September 1999)
- MARS, EMOS, ECLIB, MAGICS, METVIEW, EPS plume software packages are installed on HP-UX platforms
- Seven registered users (since April 2002)
- Access to ecgate1.ecmwf.int (since September 2001)
- Access to new http://wms.ecmwf.int (since January 2002)
- Installation of ECaccess client and gateway (May 2002)
- No projects run at ECMWF
- Participation on ECMWF Computer Users Training Courses (2000, 2001)
- Computing Representative has been invited to take part in Computing Representatives Meetings since 2000
- Visit of Umberto Modigliani November 2001 at HMS (Budapest)

HUNGARY HUNGARY

ECMWF data coming to HMS

Data type	number of files	MB/day	arriving time [UTC]
Data coming via dissemination			
H1D - GRIB DET 12 UTC	48	98	10.00 pm - 1.30 am
H1E - GRIB EPS 12 UTC	10	3	2.00 - 3.50
H4E - GRIB EPS 12 UTC	41	32	"
H3A - BUFR DET WORLD	1	5	2.00 - 3.00
H5A - BUFR DET HUNGARY	1	1	"
H5B - BUFR EPS HUNGARY	1	3	"
H6B - BUFR EPS WORLD	1	1	"
Data downloading from MARS			
EPS 00 UTC Control Forecasts	30	2	4.00 pm - 5.00 pm
EPS 00 UTC Perturbed Forecast	15	2	"
EPS 00 UTC Forecast Probability	30	1	"
Seasonal Forecast for Hungary	5		

Future plans

- Complete the ORACLE database with international data and forecast model products
- Automatic product generation
- Meteorological Web(WAP) portal for users registered
- New WEB based visualization system
- New central archives with ORACLE registry (1.9 TB storage capacity, SAN)
- Installation of MARS, EMOS, MAGICS, METVIEW, etc software packages on SGI (Origin 2000) and IBM pS690 (Regatta)

Thanks to User Support and staff of ECMWF for fruitful co-operatio.

ICELAND ICELAND

IMO's Computer Department's Responsibilities

- Management and maintenance of computer systems.
- Data receiving and data distribution.
- Data processing.
- The central database.
- Telecommunications.
- Website.
- Security.
- Training and help desk.

The computer system at IMO

Overview

- Servers: VAX/VMS, Sun/Solaris, Compaq Alpha/Digital Unix, IBM/AIX, Windows 2000.
- Clients: PCs running Windows 95/98, NT, 2000, PCs running Intel Solaris or Linux, Sun workstations running Solaris.
- Communication: Internet (2MB), weather stations, radar, weather satellites, automatic phone service, ... and RMDCN (including GTS traffic (IMO-UKMO) and reception of model output).

Servers

- VAX/VMS - GTS message switch, WMO encoding and decoding, traditional forecasting, weather radar, these tasks will gradually be moved to other servers in the future.
- Sun/Solaris - Model output processing, graphical presentation, mail-, file- and print servers, web.
- Windows 2000/NT - mail-, file- and print servers for Windows clients.

Database Server

- Gradually moving from Ingres to DB2.
- New server IBM/AIX P620.
- Development of data warehouse including observations, Kalman filtered parameters and selected areas and periods from the direct model output.
- Access via web pages using JDBC and XML.

Model output received over RMCDN

- From ECMWF - Operational forecast model, UTC 12, 23 MB/day:
  - 1.5° resolution up to +240 hrs.
  - 0.5° resolution up to +72 hrs.
- From ECMWF - Global wave model, 1 Mb/day.
- From DMI - Hirlam, 83 Mb/day.
- From UKMO - UKG and UKL, 6 Mb/day.

ICELAND ICELAND

Usage of ECMWF products

- MARS archive.
- Deterministic model.
  - Forecasting data for meteorologists.
    Direct output on workstations.
    Post processed T2m maps using a Digital Evolution Model and geostrophic wind maps.
    Statistical model to predict the probability of precipitation, in development.
    Interactive forecast on the web, in development.
  - Kalman filtering of ECM 12 for up to 70 local weather stations.
  - Post processed data is used in value added services for newspapers, road authorities, shipping companies, ...
  - Adaptive Kalman filtering, gives reliable prediction intervals, pre-operational, will soon replace the older KF.
- Wave forecasts are used by the Icelandic Maritime Administration to calculate 'dangerous waves'.

Plans involving ECMWF usage

- Improved utilisation of data from the deterministic model.
  - more parameters.
  - higher resolution (0.5°).
- Install Metview 3 on Linux.
- Increased use of EPS.
  - Severe weather forecast.
- Seasonal forecast.

IRELAND IRELAND

Paul Halton, Met Éireann - The Irish Meteorological Service, Dublin. Ireland.

1. Computer equipment at Met Éireann

The main computing environment at Met Éireann is shown in Figure 1. The Linux Operating System (Red Hat or SuSe) is used as the preferred platform for the development of new in-house applications. Recent Linux based developments include the RMDCN servers; Observation Collection System for the collection of reports from Automatic Weather Stations; and a dual processor Linux PC, with a PGI Fortran compiler to run a backup version of the HIRLAM model.

NWP Servers

- Since October 2001, the new IBM RS/6000 SP with 10 WinterHawk II nodes is used to run the operational 3D-VAR Analysis, the HIRLAM model and the WAM model. Work is progressing on the porting of the hourly analysis applications to this platform.

  This server has 9 x Power3 SMP Nodes (each with 4 x 375MHz CPUs). It has one I/O node. Each node has a 9.1GB disk pair. It has a total of 19GB of distributed memory and RAID-5 SSA disk management. The disks are connected in a loop configuration and there are two paths to each disk. The system has a Control Workstation that has 256MB memory and 3 x 9.1GB disks
- Backup versions of the HIRLAM and WAM models also continue to run on the SGI Challenge L server. A high spec dual processor Linux PC will replace this in June 2002.
- Since April 2001, a dual-processor PC is used to run a Foot-and-Mouth Disease (FMD) model which is a specially adapted version of the HIRLAM model.

Backup System

In October 2001, IBM installed four extra disks (18.2GB capacity each) in the Control Workstation supplied with the IBM RS/6000 SP computer system. The extra disk space will facilitate the routine on-line backup to disk of all UNIX/Linux workstations and servers on the HQ network. IBM 3590E MAG Tape Cartridges (20GB capacity each, uncompressed) are used for full and incremental backups. A number of new scripts were developed on the Control Workstation to control the backup system to enable IT Operations staff to manage the routine backups more efficiently. Total cost of this solution was much less than the estimated cost of a separate standalone backup system.

Graphics Servers

- Two SGI Origin 200 servers decode and process GRIB bulletins received from the GTS and ECMWF over the new RMDCN circuit. Configuration: 1 x MIPS R10000 processor (180 MHz each), 128MB Memory, IRIX 6.5, and 12.7GB disk capacity each.

  The graphics servers support X-based applications to display NWP products from HIRLAM, UKMO, DWD and ECMWF. The graphics servers also support Plotting applications; ADE database (BUFR), DNS services and file and print services for UNIX systems.
- A SGI O2 is used as a FAX server for Analysis, Forecast and WAFS charts. Aviation weather charts are automatically faxed to aviation forecast offices. This server also supports the delivery of weather forecast products for the Met Éireann web site (www.met.ie) and it hosts the Met Éireann Intranet.

UNIX Workstations

- An SGI O2 workstation is used to display NWP products in the General Forecast Office. All SGI Indy workstations were replaced with high spec PCs with Red hat Linux.

Climatology and Intranet Servers

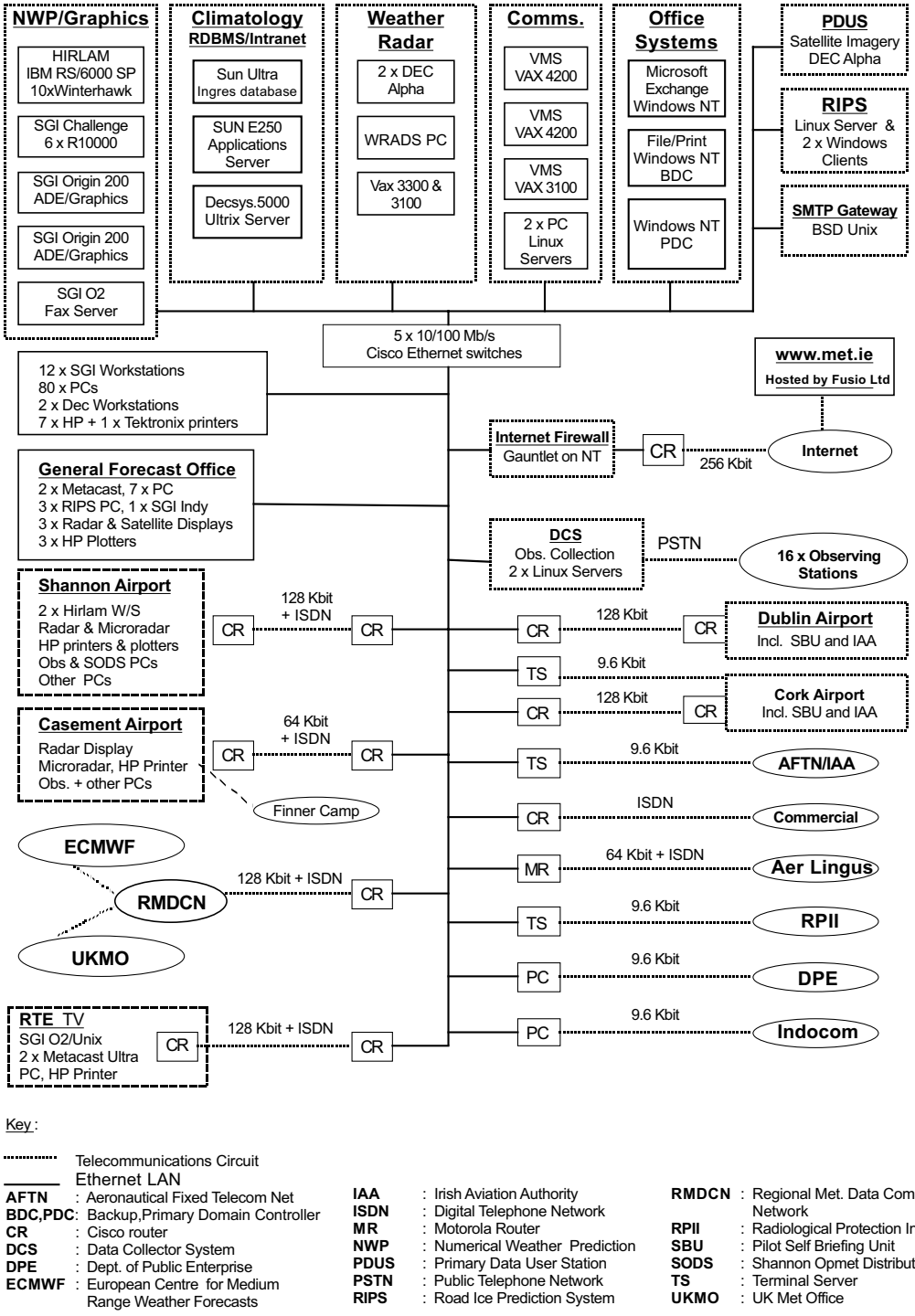
- Sun Ultra 170 running Solaris (2.5); Ultrasparc 170 MHz processor; 18.5 Gbytes storage. Runs Openingres RDBMS from Computer Associates (CA). This is the database server. It processes climate data and sends automated e-mail and fax messages to customers.

IRELAND

IRELAND

Met Éireann

I.T. Infrastructure at H.Q. Glasnevin Hill, Dublin and remote sites



Lanmetaug 2001.doc 3 Aug 2001 wd

Fig. 1 The main computing environment at Met Éireann. © Met Éireann, May 2002

IRELAND IRELAND

- Sun Enterprise 250 Server running Solaris (2.6); Ultrasparc 300 MHz processor; 13 GB storage. Runs Openingres RDBMS from Computer Associates. This is an applications server. It handles climate data processing and automated transmissions of climate data to customers. It also hosts climate user logins and hosts the Climate INTRANET web site.
- Browser enabled PCs and workstations, can extract and view climatological, radar, satellite, and synoptic data on the INTRANET site.

Weather Radar Systems

- The EWIS (Ericsson) Radar data from Dublin Airport is received over a 2Mbps Microwave link and stored on a VaxStation-3300 linked to a MicroVax-3100 through a Local Area VAX Cluster.
- The RAINBOW (Gematronik) Radar data from Shannon Airport is distributed on a network of 5 x DEC AlphaStation 200 4/100, running Compaq Tru64 UNIX V4.0E. Two servers (Shannon & HQ) have 128MB RAM and 10GB disk capacity each. Three clients have 64MB RAM and 6GB of disk capacity each. RainBow V3.3 is installed. High Resolution 1km x 1km Irish Radar Composites are generated.
- UKMO RadarNet Composites (5km x 5km) and Sferic data are received on the RMDCN link from UKMO and stored on a dedicated WRADS server. New Java-based versions of the WRADS server and clients have been developed in-house and are ready for operational use.

From June 2002, radar data from 4 beams will be sent to UKMO rather than Pseudo-Cappi products.

- Four BUFR files will be sent every 15 minutes instead of one from each radar
- GTS headers will be changed from PAIE40 EIDB to PAAL40 EIDB
- Radar images are downloaded to the INTRANET site only. A selection of the radar data is archived in, and can be retrieved from, the Climatological database.

Communications Computers

- The Vax-4200 cluster handles the real time reception and pre-processing of data from the AFTN, IAA and Irish observing stations. A project to replace the VAX-cluster has commenced.

RMDCN Servers

- 2 x PC's running Red Hat Linux are used to handle the processing of all incoming RMDCN data, including data from ECMWF and the GTS. They also transmit outgoing GTS data.

Internet Firewall

- Gauntlet Firewall on a Windows NT server protects the permanent Internet 256kbit link to a local ISP, Eircom.net. The bandwidth was doubled in 2001. The firewall will be upgraded later in 2002.

Web Site and FTP Site

- Development, hosting and support of the Met Éireann web site (www.met.ie) was awarded to Fusio Ltd. Forecast data & static content data is prepared at HQ and uploaded to the site.

Data Collection Systems (DCS)

- 2 x Linux Servers support the DCS system for the collection of weather reports from Automatic Weather Stations. Reports collected by the DCS are sent to the VAX-4200 cluster for bulletin distribution.
- The Linux-based PC application OBS, written in-house, is installed at each of the manual synoptic stations. The OBS system applies local quality control to all Synoptic reports before they are sent by dial-up to the DCS at HQ.

Satellite Data

- Satellite data from METEOSAT and GOES are received, stored and processed on a DecAlpha Station 255, with OpenVMS v6.2H with Y2K patches. VCS, Germany, supplies the PDUS software. Special images are produced for the SATREP project, TV Graphics Systems, the INTRANET and the new Met Éireann web site.
- MSG: On May 24, Met Éireann will issue an ITT for new MSG reception & processing system.

IRELAND IRELAND

Road Ice Prediction System (RIPS)

- A Linux Server supports the RIPS system which collects reports from 50 Road Side Automatic Weather Stations. 2 x Windows 98 client PCs are used to view the observation data and to input NWP forecast data which is transferred to the National Roads Authority.
- NWP products from the fine-mesh version of the HIRLAM model are uploaded to the RIPS.

Office Systems

- Two Windows NT Servers provide office services, including e-mail, file and print facilities.
- MS Exchange on the Windows NT servers supports MS-Outlook on c. 120 user PC's.
- An SMTP Gateway Server on BSD UNIX supports Internet mail and DNS services.
- Dr. Solomon's Anti-Virus and Mailsweeper with Sophos anti-virus toolkit are used

Graphics Output Devices

- 2 x HP DesignJet 1050C plotters with Postscript are used for plotting charts at CAFO & Shannon.
- Laser printers in use include: HP 4000N, 4050N and 8000N; 1 x Tektronix Colour A4 LaserJet. A Mita photo-copier with multiple printing options is connected to the HQ LAN.

TV Graphics Systems

- 4 x SGI O2 workstations, running IRIX v6.5, 512MB RAM are installed - two at RTÉ and two at HQ. All systems run Metacast Ultra from Weather One AB, Norway. At HQ two O2 workstations are used for TV fore-cast preparation. At the TV stations, the O2's are set up as clients.

Networks

- In 2001, the HQ LAN was upgraded to 100Base-T (Fast Ethernet).
- The new LAN equipment consists of 5 x Cisco 3548-XL switches, 5 x GBIC 50cm cables. The installation also includes CiscoWorks and 'What's up Gold', for Windows.
- Network cabling and active LAN equipment was installed at Valentia Observatory to that the instrument PCs and desktop PCs can be networked and managed from a central point.
- The WAN links to Dublin, Cork and Shannon airports were all upgraded
- The bandwidth on the Internet link was doubled to 256kbps

Special Projects

In May 2002, Met Éireann submitted requests for two special projects. These are as follows:

- Joint DANISH and IRISH Project, based at UCC, Cork: Verification of Ensemble Prediction Systems for a new market: Wind Energy.
- An IRISH Project, based at Met Éireann, Dublin: The Community Climate Change Consortium for Ireland (C4I) will establish a capability to address the climate issues of vital national concern in an effective, coordi-nated way. At the core of C4I will be a Regional Climate Analysis, Modelling and Prediction Centre (RCAMPC) to simulate the detailed climate of Ireland and model climate change.

RMDCN Link

Met Éireann will need to increase bandwidth on the RMDCN link to ECMWF within the next year.

ECaccess

Some User comments . . .

- Had a go at it . . . seems ok but very detailed (I have not downloaded the docs etc.)
- Had no difficulty logging in and getting access to my account on ecgate1
- Downloaded documentation but did not have time to read it yet

- Is Internet access sufficient for us?
- How will this affect the CAFO trajectory model run?
- Can we have more than 1 gateway (backup). This may be necessary for the CAFO traj model.
- How much of a load will this system put on the gateway machine?

ECMWF Boundary Condition data

The BC data with second order packing used for the operational HIRLAM area (0.147 x 0.147 degrees resolution). It consists of Analysis data (Full Field) and forecast data (Frames) at 3-hour intervals up to 60hours. The Main NWP server, SWIFT, and the backup server, Lambay, are set up for the operational use of the BC data.

GRID point Database Usage

- FAX Charts containing Wave Plumes from the ECMWF EPS were set up for CAFO for a number of grid points:
- Direct model output from HIRLAM is used to produce new SMS (Short Message Service) for the delivery of short-range text-based forecasts to mobile phone subscribers.

Future Use of ECMWF facilities

- The layout and features included on the new ECMWF Web Site are very helpful and the recent visit to Dublin by two ECMWF representatives was very beneficial. In particular, users welcome the 'your Room' facility .
- The existing special project, Fastex, will be concluded during 2002.
- Improvements to the RMDCN bandwidth will be required
- It is expected that the IBM supercomputing facilities at ECMWF will be utilised more in the future as the system architecture will be similar to the IBM RS/6000 SP
- User access to the ECMWF computing resources will be through the new ECaccess facility
- Extra data will be required in the routine dissemination schedule, including the new 'Wind Gust forecast' parameter. Met Éireann would expect to schedule the reception of these new data
- In the future, Met Éireann and the Marine Institute will require ocean model boundary condition data. Detailed plan are not available as yet
- Some initial preparations have been made at Met Éireann in anticipation of the introduction of GRIB Edition-2. Met Éireann would like to ask ECMWF to make the GRIB Ed-2 decode software available to Member States and to make available sample test data for download and testing.
- Use of LoadLeveler in place of NQS for the submission of jobs at ECMWF.
- A number of users will attend the special COM5 training Modules in October or November 2002.

Main developments in the past year

- Web Site and FTP site successfully launched in June 2001
- NWP server installed, 3D-Var Analysis and MPI version of HIRLAM on a 15 km grid successfully introduced operationally in October 2001
- Backup system for Linux workstations successfully implemented in November 2001
- WAN links to Dublin, Cork and Shannon airports upgraded
- Bandwidth on Internet link doubled to 256kbps
- BC data from ECMWF used for main HIRLAM runs
- HQ LAN upgrade to 100BaseT was completed
- All remaining SGI Indy Workstations were replaced with Linux (Red Hat) PCs
- High-Resolution (15km x 15km) Boundary data with second order packing was successfully introduced for the HIRLAM model during February 2002..
- In February 2002, PCs with SuSe Linux were set up for Research Division to run MetView
- In April 2002, the IBM RS/6000 SP was upgraded with the latest patches of software such as: AIX, LoadLeveler, PSSP

IRELAND IRELAND

Some future plans at Met Éireann

- New Linux-based server, with PG1 Fortran compiler, will be installed in June 2002 to replace the SGI Power Challenge L, to run the backup version of the HIRLAM and WAM models
- VAX-4200 Cluster will be replaced before the end of 2002
- An MPI version of the WAM model will be installed to run on the IBM RS/6000 SP
- Work on the development of integrated forecaster workstations will be advanced
- MSG Project established to receive and process satellite data. ITT issued at end of May 2002.
- TUCSON Project: The development and installation of Automatic Weather Stations
- The Firewall will be upgraded
- Complete installation of new LAN equipment at Valentia observatory.
- Improvements to the Web site and Intranet site will continue to be implemented

Current use of ECMWF facilities

Currently, the ECMWF computing facilities are used as follows:

- Data retrieval for the MARS archive
- Experimental runs of the HIRLAM Model
- Trajectory Model
- Running MetView in batch mode
- The Fastex special project
- Boundary Condition data for the HIRLAM model

ITALY ITALY

Col. Giuseppe Tarantino, Italian Meteorological Service

1. Computer equipment and ECMWF connection.

Since the last meeting the most important piece of news is that the whole operational area has been moved to Pratica di Mare. During this period IMS has managed to upgrade the Computing equipments improving CPU and Disk Capacity of the Servers looking forward to install the new equipments for the RADAR Area, the DVB satellite broadcast system and the new Computing facility system.

a. Radar Area

We are removing the old Motorola Computers both at the RADAR sites and at the collected data Center with the new ones:

- Server Compaq DS20 (Two CPU) at every RADAR Sites,
- Server Compaq ES40 (Four CPU),at the collect data centre
- WS Compaq XP1000 or Compaq DS10 for graphical presentation.

b. Broadcast area

We are installing a WS Compaq XP1000 as server for a DVB satellite Broadcast system to distribute data to users according to definite schedule.

c. NSED (New Computing Facility System)

Are also in progress the acceptance tests of the new Computing System.

This area will be, in the next future, the principal computing architecture. It is based on a Cluster memory channel connection of five Compaq Alpha Servers, each of them dedicated for a particular activity:

- Number crunching Area - One Compaq GS60 Server with 4 processors and 2GB RAM memory. This server will be dedicated for the run of Italian High-Resolution Model;
- Operational Meteorological Area - One Compaq GS60 Server with 4 processors and 2GB RAM memory. This server will be dedicated for data and product generation;
- Meteorological Data Base Area - One Compaq AS 4100 with 2 processors and 1 GB RAM memory. This server will be dedicated for the online data base of all the text and binary products;
- Climatological Data Base Area - One Compaq AS 4100 with 2 processors and 1 GB RAM memory. This server will be dedicated for the climatological purposes.
- WS Areas - WS DS10 with 512 MB RAM memory and 40 GB HD;
- System and Application Supervisor Area - One Compaq AS 1200 with 1 processors and 512 MB RAM memory. This server will be dedicated for the monitoring of activities, processes, LAN, WAN, Data Bases, etc.

The total amount of Storage for the cluster is about 100 GB on a RAID Storage Cabinet connected via memory channel with each member of the cluster.

2. Project, experience and plans

We have more or less 100 users using ECMWF services and most of them use Internet access. The main usage of ECMWF services has been the retrieval of MARS data associated with the decoding software to run either models or MAGICS and METVIEW applications.

ECMWF GRIB data are disseminated in real time to users for their operational activity (civil emergency, agriculture, pollution etc.).

At the Operational Center ECMWF data are also used:

- as support for the operational meteorological activity
- as boundary condition for the forecast model
- as input for post processing programs
- as input to produce information and maps useful for aeronautical activity
- to compute and plot thermodynamic diagram

ITALY ITALY

A subset of ECMWF GRIB data are also distributed to MDD users by Rome MDD Uplink Station.

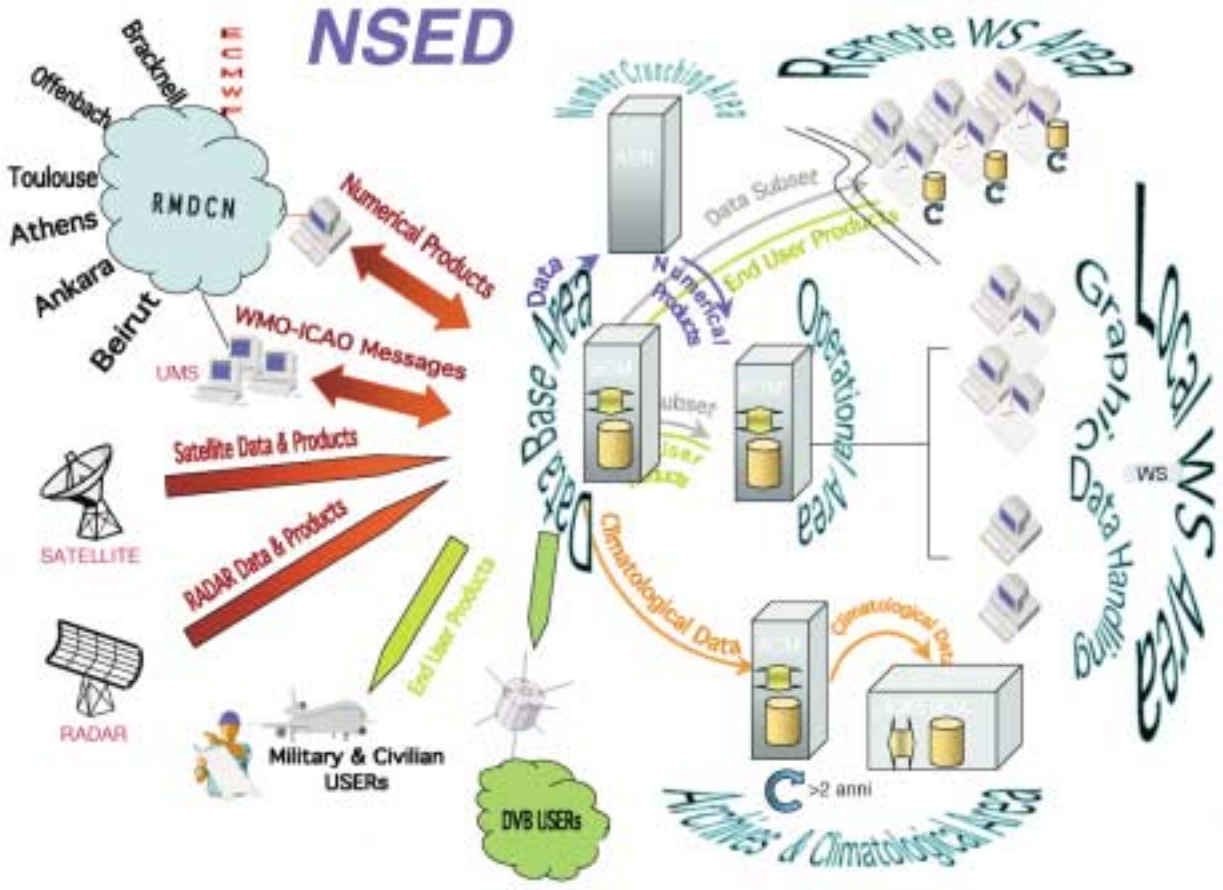
New projects:

- A test suite of the Local Model is implemented and daily runs at ECMWF to verify the impact of Boundary Condition (originated from IFS) versus the operational version running with BC from GME.
- COSMO LEPS (Limited area Ensemble Prediction System) project.
  The project is to produce routinely probabilities and description of severe weather events over a geographic region enclosing Germany, Italy, Greece and Switzerland. Multiple runs of the COSMO limited area high-resolution model (set at 10km resolution) will be initialised by appropriate ECMWF EPS members selected via a specific clustering technique in order to maximize possible meteorological perturbations.

The current special projects are:

- Evaluation of the performance of the ECMWF meteorological model at high resolution.
- Non-linear aspects of the systematic error of the ECMWF coupled model

Col Giuseppe TARANTINO
UGM - V. di Centocelle, snc - 00175 Roma
Tel. +39.06.2400.2728
Fax +39.06.2440.1359
E-mail: g.tarantino@meteoam.it



NETHERLANDS NETHERLANDS

KNMI's Computer Infrastructure and ECMWF

KNMI is the Dutch national data and knowledge centre for weather, climate and seismology. It performs scientific reasearch, maintains the extensive infrastructure for observations and information processing and provides data and services, general weather information and severe weather warnings.

In 1999 all market related ('commercial') activities have been transferred to a newly established company HWS. Since then the only products that go directly to the public are the severe weather warnings, weather reports and forecasts on the Internet.

KNMI operates from its main office in De Bilt. At the end of 2001 also the operational activities from branch offices at Schiphol Airport (aviation) and Hoek van Holland (maritime meteorology) were concentrated there.

1. Infrastructure

Figure 1 gives a schematic view of KNMI's current computer infrastructure. The LAN is currently being rebuilt around a Gbit/s backbone with connections of at least 100 Mbit/s to all endpoints.

Connections to the Internet (1 Gbit/s) and other telecommunication services are separated from the LAN by a firewall. KNMI's public web server (www.knmi.nl) is located outside this firewall.

Computer facilities in the LAN are:

- A StorageTek PowderHorn 9310 mass storage system, initial capacity 15TB; current capacity 35TB; maximum capacity of 120TB (by adding more tapes).
- A 2 CPU SGI Origin 2000 (backup 2 CPU Origin 200) server for the mass storage system (DMF software).
- A Sun Fire 15000 server (StarCat) with 48 UltraSparc III 900 MHz CPUs, 1GB memory per CPU, for (operational) HIRLAM, Climate research and applied research.
- A Sun Fire 3800 server with 8 UltraSparc III 750 MHz CPUs for Climate research.
- A 16 CPU SGI Origin 2000 for post-operational HIRLAM and applied research (until June 2002).
- A cluster of 4 DEC-Alpha workstations for operational applications.
- Many (≥ 20) DEC-Alpha meteorological workstations.
- Several (~ 5) DEC-Alpha workstations for development of operational applications.
- 66 SGI-Linux workstations.
- A growing number of Linux workstations on Compaq hardware.
- A steadily decreasing number of SGI-Irix (O2) personal workstations.
- A high-availability SGI-Linux NFS server with general software and site licenses for (currently only Linux) workstations.
- A Sun NFS server with general software for DEC-Alpha's and O2's.
- Many (>~ 500) Windows-XP PCs.
- 5 SGI Origin 200 Web servers.
- A WNT exchange server which handles all e-mail.
- A WNT Windows Terminal Server to give access to WNT applications in a UNIX environment (Citrix client).
- Several WNT application servers.
- A VMS cluster (2) for message switching.

NETHERLANDS NETHERLANDS

Developments in 2001

- Start of a 4-year Sun server contract. During Phase 1, which started in the 2nd half of 2001, KNMI had a 64-CPU Sun Enterprise 10000 server at its disposal for operational HIRLAM and a Sun Fire 3880 for Climate research. For Phase 2, which started early this year, both machines were replaced by a 48-CPU Sun Fire 15000 server and in Phase 3, to start mid 2003, the Sun Fire 15000 will be upgraded to 84 CPUs.
- Upgrade of the Internet bandwidth from 2 Mbit/s to 1 Gbit/s.
- Installation of a high-availability SGI-Linux NFS server.
- SGI ended the contract for Linux workstations.
- Centralization of all meteorological services in De Bilt.

Developments in 2002

- A new standard for Linux workstations on Compaq hardware.
- Upgrade of all PCs from Windows-95 to Windows-XP.
- LAN upgrade toward a Gbit/s backbone and >= 100 Mbit/s everywhere.

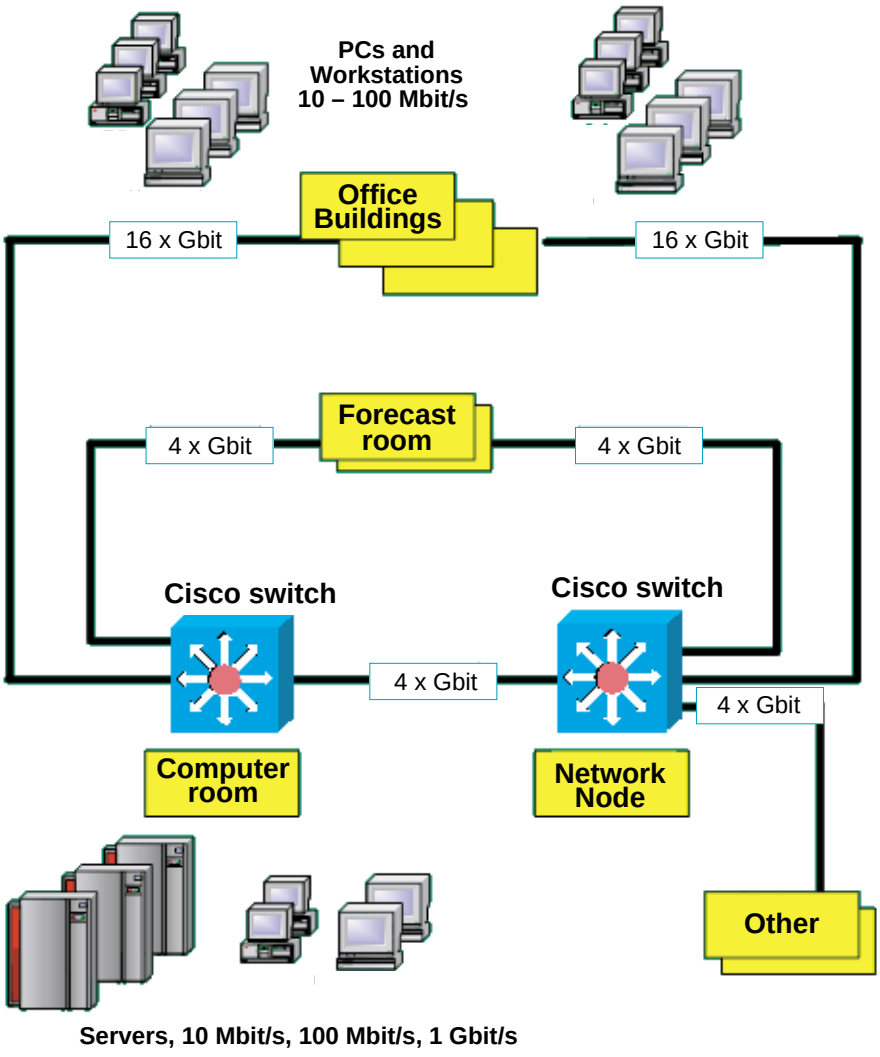


Figure 1: KNMI's computer Infrastructure

NETHERLANDS NETHERLANDS

2. ECMWF use

Operations

For its weather forecasts, KNMI uses various ECMWF products. To give an impression:

- The deterministic model for medium range (up to day 5) forecasts.
- The Ensemble Prediction System for forecasts up to 9 days ahead (also available on the Internet).
- Trajectory computations.
- Boundaries from the deterministic model for HIRLAM.

Software packages

The following software packages from ECMWF have been installed for general use:

- emoslib
- eccopy
- Magics
- Metview
- ECaccess (first tries)

Users

On May 13, 2002, there were 92 Dutch users (90 on May 2, 2001) with an account on ecgate1. Of these 30 had logged in to ecgate1 earlier this month; 38 had logged in earlier in 2002; 13 had not logged in since May 4, 2001. Five users had never logged in yet.

Eleven users are from outside KNMI: 5 from Utrecht University, 3 from Wageningen University, one from the Netherlands Energy Research Foundation, ECN, one from the National Institute of Public Health and the Environment, and one from IHE-Delft (International Institute for Infrastructural, Hydraulic and Environmental Engineering).

Projects

Table 1 lists the Dutch projects for access to the Fujitsu services with their total use of resources in 1999, 2000 and 2001. Of the allocated 336 kSBU for 2001, 173 kSBU or 51% have been used. Special projects used another 15 kSBU or 15%of the allocated 100 kSBU.

55 users have access to the Fujitsu machines in one of the regular projects, and 24 of them actually did use SBUs. Furthermore, 20 users have access to at least one of the special projects. 22 users have no access to Fujitsu machines.

For 2002 the total allocation for regular projects is 356 kSBU. Until May 20 226 kSBU or 63%had already been used.

NETHERLANDS NETHERLANDS

Operations		1999 Used [kSBU]	1999 Alloc [kSBU]	2000 Used [kSBU]	2000 Alloc [kSBU]	2001 Used [kSBU]	2001 Alloc [kSBU]
nlcwdtra	Trajectory computations for local emergencies	0.2		0.2		0.2	
Climate research							
nlglomac	Atmospheric Composition	1.4		3.1		63.2	
nlhirkli	Climate research with HIRLAM	0.2		3.5		1.5	
nloocean	Oceanography	7.1		6.7		21.4	
nldmwgac	Other climate research	39.4		21.3		26.0	
Applied research							
nldmlam	HIRLAM maintenance	14.3		25.0		60.0	
nlsatnwp	Satellite data research	14.1		0.0		0.0	
nlwmcalc	Other applied research	0.3		0.5		0.3	
Total		**77.0**	**142.0**	**60.4**	**348.0**	**172.6**	**336.0**
Special Projects							
spnlagul	Limited area ocean model of the Agulhas Region	1.7	15.0	0.3	20.0	6.5	20.0
spnlctmk	Chemistry and transport studies	1.8	3.0	0.3	3.5	0.0	4.0
spnlflux	Validation of reanalysed A/S fluxes	17.1	20.0	0.0	20.0	0.1	20.0
spnlles	Large Eddy simulations of BL clouds	0.7	10.0	2.5	15.0	4.3	25.0
spnlmix	OGCM mixed-layer modules and assimilation	2.5	15.0	0.0	15.0	2.9	15.0
spnlozas	Assimilation of GOME and SCIAMACHY chemical species	0.02	1.7	0.0	1.7	0.0	1.7
spnlprob	Short-term regional probabilistic fc using IFS	5.4	5.0	8.7	10.0	0.0	10.0
spnlsiep	Stratosphere – troposphere exchange	1.2	2.0	2.5	5.0	0.8	4.0
Total		**30.3**	**71.7**	**14.3**	**90.2**	**14.6**	**99.7**

Table 1: Netherlands' projects in 2001

3. Experience and suggestions

Metview

Earlier this year we implemented Metview 3.3 for our RedHat Linux 7.2 workstations. Due to the fact that Public Domain graphics libraries have not quite converged (Open Motif conflicted with LessTiff which was installed and used by accident; do we use Mesa Motif widgets or SGI Motif widgets for OpenGL in Mesa?) this was not trivial.

In the end we succeeded in getting it running, thanks to pointers from the ECMWF Metview group (Vesa Karhila).

In line with other software packages, it might be considered to make binary exports of Metview. We found, however, that the Metview which we compiled for RedHat Linux did not run on SuSe or Slackware systems, probably due to incompatibility of shared object libraries.

Due to the increased interest in high-resolution modelling (details <~1°) we would welcome if Metview and Magics were made suitable for this. This needs much more detailed coastlines and also handling of features smaller than 1° do not seem to work properly.

NETHERLANDS NETHERLANDS

ECaccess

The newly released ECaccess system looks very promising. Users are already enthusiastic about logging in to ecgate1 over the Internet without waiting for passcodes to change. Also the web interface for file transfer is very useful.

We are eagerly waiting for the eccopy-like facilities to be available on our side. A point of concern might be the Internet bandwidth on the ECMWF side.

User administration

Since the previous MSCR meeting there have been 11 user registrations and 8 user deregistrations. Completing and sending the forms is not a terrible lot of work, but might be eased with a web-based (de)registration procedure.

However, we now require new users to sign the registration form and also require special authorization from the management in case of non-KNMI users. For a web-based registration we would also need some official authorization, but electronic signatures do not seem to be suitable and accepted yet. Could we do something with certificates?

Few users apply for an account only to access the information on ECMWF's web pages, especially since the web services have been made more open to anyone who comes from the KNMI network.

SecurID administration is little work: enabling the accounts of new users once and replacing a broken or lost card every now and then.

Trajectory model

In the past, KNMI has made a commitment to the TAC to maintain the Trajectory model. With the upgrade of the supercomputer, this also has to be moved to a different platform.

Is it a good idea to move it to ecgate1 to make it also available to users who do not have access to the supercomputers, especially from the Cooperating States?

Comments

The help of User Support, especially John Greenaway, is very much appreciated. Any questions are always answered promptly and adequately. The visit of Dominique Lucas to KNMI in October has been very useful.

New systems make use of the ECMWF facilities increasingly easy. PrepIFS and the system for running HIRLAM on ecgate1 and the VPP machines have this year already resulted in a strong increase in the use of the HPCF allocation.

Turnaround times for MARS tape retrievals are sometimes long.

Queuing times on ecgate1 seem to have increased dramatically recently (after the installation of the new CPUs?) Statistics on the web do not give any indications as to why

NORWAY NORWAY

Rebecca Rudsar, Met.no, Oslo, Norway

The Computing Environment at met.no

Computer Resources

The communication for data acquisition and routing of observations is managed by the NORCOM software. This software now runs under Linux OS.

Observation data is transferred to the SGI Origin 2000 for decoding. The decoded observations are stored in an internal format and temporarily in BUFR format for input to the 3D-Var analysis program that became operational in December 2000.

VAX4000-200 is used for running the Nordic Radar system, NORDRAD, which is a communication system for the distribution and collection of radar data between Nordic countries.

VAX3300 is connected to a radar unit (Hagahogget) covering Southeast Norway and is used for communication to the previously mentioned VAX4000-200.

Two Sun Ultrasparc10 computers are connected to a radar unit (Hægebostad) covering the very south of Norway. These are used for acquisition, for product generation and monitoring and for display.

Processing of data from NOAA satellites is done by the MEOS system (Multi Mission Earth Observation System). The MAPP (MEOS Advanced Product Presentation Facility) is installed on five SGI workstations.

Alpha-200 is used for processing the data obtained from the geo-stationary satellite Meteosat. The data consists of satellite pictures, DCP (Data Collection Platform) data and MDD (Meteorological Data Distribution) data.

Oracle software is used for the Climate database and a Verification database. It is also used for the Climate data warehouse. A web interface for accessing the Climate data warehouse has been developed.

The total number of drives in the StorageTek tape robot is now three. In addition to being used for archiving observations and model results, the tape robot is heavily used by several research projects. A DLT tape station, HP Surestore DLT80, connected to a Linux PC is used for the remote backup of specific disk areas. Backup copies are taken approximately every 3 months and the tapes are stored at another site.

The SGI Origin 200 receives the disseminated data from ECMWF and transfers it to the operational suite. Data from jobs run regularly at ECMWF and transferred using eccopy (soon to be ECaccess) is also processed on this computer. The RMDCN connection was increased to 256 kbps in the beginning of May this year.

Met.no is connected to the University network, Uninett, via a 10 Mbps connection for Internet and a 100 Mbps connection for access to the supercomputer in Trondheim. Supernet (ATM) is a part of Uninett and at present the theoretical transmission rate between the University of Oslo and the University of Trondheim (NTNU) is 123Mbps.The Supercomputing Project at NTNU operates and supports High Performance Computing equipment for use by Norwegian universities and the Norwegian Meteorological Institute.

The SGI Origin 3800, installed this time last year, was taken into operational use in December. It had 220 500 MHz processors, 220 GB of memory and the Operating System TRIX- 6.5 Release. Upgrade of this computer to 384 processors plus the installation of a new SGI computer with 512 600 MHz processors both of which will be connected to a 5 TB fast disk system through a common Clustered XFS is happening at this moment. It is hoped that acceptance tests can start before 1.June.

The Norwegian version of HIRLAM was replaced by HIRLAM reference version 5.0.2 in December 2001. However, due to disappointing verification scores and some stability problems, the physics of the model was downgraded to the old (2.6) version. The operational resolutions are still 50 km and a nested 10 km model. Experiments with a new 20 km model with 40 vertical levels covering the same area as the 50 km model has run in parallel since December 2001. It is planned to make the 20 km model operational in the near future. The assimilation in the 20 km model uses a newer version of the 3D-VAR code and will, from late May 2002, begin to assimilate ATOVS (AMSU-a) radiances in addition to the conventional observations used in the 50 km assimilation.

The computers running the operational suite are SGI Origin 2000 and Origin 200. All pre- and post- processing is at present performed on the SGI Origin 2000. The Supervisor Monitor Scheduler (SMS) and the X Command and Display program (XCDP), developed at ECMWF, are used to control and monitor the operational suite.

NORWAY NORWAY

The telecommunication links to the forecasting centres at Bergen and Tromsø were upgraded to 2 Mbps. Operational products are distributed to two fileservers at each centre using the TCP/IP protocol. ISDN links (128 Kbps) are used as backup.

The satellite distribution system (Infosat), the automatic fax distribution system (Autofax) and the customer database for the distribution of products via a WEB interface (Værbutikk) are run on IBM RS6000 computers. The system for processing data from automatic observing stations (AutoObs) runs under Linux OS. An enhanced version of the distribution system (Transfer-Products) is currently being developed.

The interactive DIgital ANAlysis application (DIANA) has been upgraded several times and is now used as the main graphical viewing system. The forecasting meteorologists run this application on 2-screen Linux PCs. Many of the S.G. workstations have been replaced by Linux PCs.

As well as running the MM5 model (1km resolution) in connection with an Air Pollution project (Bedre Byluft) the Linux Cluster is used as a backup computer for the supercomputer in Trondheim. Some of the backup models have a lower resolution but the results are then interpolated in order that products can be generated. When the two supercomputers are stabile then the Linux cluster will only be used as backup in the case of a failure of the network to Trondheim.

ECMWF Products

Disseminated data from the operational forecast model, the global wave model, the Ensemble Prediction System and Boundary Condition data are received from ECMWF. This data amounts to approx. 345.5 Mbytes per day.

Deterministic model	40.7 Mbytes
EPS	11.8 Mbytes
WAVE_Models	3.0 Mbytes
Boundary Condition	290.7 Mbytes

Dissemination data received from ECMWF is converted from GRIB format and placed in our present fields database. The data is then accessible by the graphics packages that have been developed at met.no.

The data is also used

1. for general forecasting by the forecasting department.
2. as boundary values for the Norwegian limited area models.
3. as backup for the Norwegian limited area models.
4. as input to the maritime and air pollution models.
5. as input to a ship routing program for the Pacific.
6. the Norwegian Institute for Air Research still receives ECMWF data on a regular basis. The data is utilized in the European Arctic Stratospheric Ozone Experiment.
7. by a commercial weather forecasting company.
8. by the commercial department of Norwegian Meteorological Institute.

Data retrieval from MARS is used for research projects.

Projects at ECMWF

The following are registered as Special Projects in 2002-2004:

- Parametrization of clouds in general circulation models.
- Ozone as a climate gas.
- Targeted ensembles providing boundary values for limited area models.
- REGCLIM: Regional Climate modelling.
- The HIRLAM Project.

Experiments include:

- The generation of climatological fields.

NORWAY NORWAY

Computers:

- 2 x PCs with Linux OS (Communication)
  – Dual 650MHz, memory 256MB, Mylex RAID SCSI card
- SGI Origin 2000 (File server/Tape archive/Databases)
  – 2x180 MHZ R10000 CPUs, memory 512Mbyte, disk storage capacity 3x34 Gbytes Raid
- SGI Origin 200 (Databases/File server)
  – 2x225 MHZ R10000 CPUs, memory 768Mbyte, disk storage capacity 2x34 Gbytes Raid
- StorageTek 9710 (Tape Robot)
  – 3DLT 7000 drives, 588cassettes, Storage Capacity 35 GBytes per cassette (max, capacity 20 TBytes)
- SGI Origin 2000 (Operational suite)
  – 4 (R12000) CPUs, memory 1792 Mbytes, disk storage capacity 14 Gbytes
- SGI Origin 200 (Backup for Operational suite)
  – 2 (R10000) CPU's, memory 768 Mbytes, disk storage capacity 26 Gbytes
- Raid disk system for Operational suite
  – 225 Gbytes
- SGI O2 (NOAA)
  – 1 (R10000) CPUs, memory 320 Mbytes, disk storage capacity 8 Gbytes
- VAX3300 (Radar)
  – memory 20 Mbytes, disk storage capacity 570 Mbytes
- VAX-station 3100 (Radar Display Unit)
  – memory 24 Mbytes, disk storage capacity 330 Mbytes
- Sun Ultrasparc10 *2 (Radar Control/Display)
  – memory 128 Mbytes, disk storage capacity 9 Gbytes
- VAX4000-200 (Nordrad)
  – memory 32 Mbytes, disk storage capacity 1.9 Gbytes
- Alpha-200 (Meteosat)
  – memory 64 Mbytes, disk storage capacity 2.1 Gbytes
- Linux Cluster (1km town-model/Backup for supercomputer)
  – 10 nodes, 2*800 MHz processors/node, memory 512 Mbytes, disk storage capacity 30 Gbytes
- Workstations* 90
  – SGI O2 and Indys, IBM RS6000
- PCs with Linux OS * 80
- Terminals / PCs
  – approx. 330
- Graphical Devices: pen plotters and laser printers.

Networks:

- Ethernet
  – connecting all computers and workstations and several PCs. Most of the network is Switched Ethernet giving 10 Mbps to each machine.
  – connecting the four main SGI Origin 2000/200 computers is a 100 Mbps net.

NORWAY NORWAY

Feedback from the users

Total number of users = 30

Computer Rep., Operations = 2

The total usage in 2001 was 65% of our quota. For 2002 we have so far used 13%.

In response to a request for feedback for this talk 15 of the remaining 28 users replied.

Seven of these replies were from users mainly using MARS.

Comments from users include:

'There is a strong need to obtain data in the netCDF format. There are many analysis packages (Matlab, IDL. PV-Wave, R, etc) that read netCDF but not GRIB. I have had a lot of problem with GRIBformat because of the lack of a good f90 compiler for my Linux PC. NetCDF is such a normal format for climate and ocean researchers that it would be stupid not to support it. CDC (in USA) make their data available in netCDF format, several of my colleagues have to convert data from GRIB to netCDF before they can analyse the data.'

'I use MARS quite a lot. Would like to have a better overview of available parameters and a better description of what is special for the different types of data. Would like more tools available for conversion between different data formats. I also use www.ecmwf.int as a source of documentation of GRIB and other formats connected to ECMWF-data'

'Very little permanent disk space is a problem. Have to retrieve software from ecfs and install in $SCRATCH regularly.'

'Would like more disk on ecgate1.'

'The BUFR-encoding/decoding of current satellite data is already pushing the limits of the ECMWF BUFR library, which is written in the rigid FORTRAN77 language.

It would be beneficial if ECMWF developed new, user friendly and flexible BUFR encoding/decoding software, in a more dynamic and platform independent language. I strongly recommend PERL.'

'Would like more workdisk (SCRATCH) on ecgate1. 2GB is in many cases too little. It means that heavy data conversion jobs must be run on the vpp5000.'

The 2 users who used PrepIFS were very satisfied with it.

The users are also very enthusiastic about User Support and mention fast response and very good service.

All users use Internet for data transfer.

Plans include:

- more runs of the HIRLAM reference-system.
- use of the regional climate model HIRHAM.
- use ERA-40 data in connection with Climate modelling.

SPAIN SPAIN

E. Monreal, Instituto Nacional de Meteorología, Spain

1. Computer equipment and connection to ECMWF

The main computing environment at INM is shown in figure 1. Except for the introduction of the SUN Enterprise 10000, there has no been significant changes to our computer systems since previous meeting.

Main computer:

The main computer system is a 9-year old CRAY C94A configured with 4 processors, 1 Gbyte of memory, 1 Gbyte SSD and 85 Gbytes of disk storage. It is used for numerical weather prediction and climate research. The HIRLAM weather prediction model runs 4 times a day with 0.5° and 0.2° resolution in a nested configuration.

After 8 months delay, an ITT for the procurement of a new supercomputer that will replace the CRAY C94A was issued on 28 February with closing date for tenders on 22 April. Tenders from CRAY, COMPAQ and General Electric have been received and now we are involved in the evaluation process. The initial system of at least 50 times the capacity of the C94A should be installed by the end of 2002. Further upgrades will lead the system on 2005 to a final capacity of about 200 times the C94A.

Data archiving and retrieval system

It comprises two subsystems, a data handling system and a data management system:

Data handling system:

Acts as the central repository for user files and all operational data. It is based on AMASS software running on a 2 processor HP 9000 K570 server configured with 2 Gbytes of memory and 300 Gbytes of disk storage, used as cache space for AMASS, which controls an IBM3494 tape library with 10 3590 drives and a total capacity of 17 Tbytes. At present, the system is storing about 5.5 Tbytes in 900,000 files.

Data management system

Designed to provide access at the atomic level (fields) to model and observational data with a user access interface rather similar to MARS. There are four Relational Data Bases: observations, NWP model fields, satellite images and products. The system comprises a cluster of two HP 9000 K460s, configured with 2 processors, 1 Gbyte of memory each and 220 Gbytes of shared disk (in RAID 5) running Service Guard High-Availability software.

Main UNIX servers

Sun Enterprise 10000

Installed in 2000 and initially devoted to the in-house development of a new message switching system, it is configured with:

- 5 system boards with 8 processors, 10 Gbytes of memory, 144 Gbytes of disk.

The SUN 10k is divided in three domains, the main two are:

- NIS master server and file server for SUN workstations (operational since mid 2001)
- 2 System boards with 3 processors, 4 Gbytes of memory, 36 Gbytes of disk.
- New Message Switching System (in its final testing phase)
- 2 System boards with 4 processors, 4 Gbytes of memory, 72 Gbytes of disk.

2 Sun ULTRA Enterprise250

- 2 processor, 512 Mbytes of memory, 36 Gbytes of disk each.
- these two systems handle the data pre-processing and Report DB as well as the reception of ECMWF dissemination, most of graphics production and post-processing.

Sun Enterprise3000

- 2 processors, 512 Mbytes of memory, 12 Gbytes of disk storage.
- Applications development and testing.

SPAIN SPAIN

Sun SPAR server 1000E

- 2 processors, 512 Mbytes of memory, 24 Gbytes of disk storage.
- Climate database based on ADABAS DBMS.

Sun Ultra10

- 1 processor, 128 Mbytes of memory, 12 Gbytes of disk.
- Intranet Web server and anonymous ftp server, secondary NIS server, MarsCache server.

Sun Ultra1:

- 1 processor, 128 Mbytes of memory, 6 Gbytes of disk.
- NQE server for job submission to the CRAY C94A. Also used as a gateway to ECMWF for non-operational usage.

Sun Enterprise-450:

- 1 processor, 256 Mbytes of Memory, 12 Gbytes of disk storage.
- Internet Web server, anonymous ftp server

McIdas servers:

The McIdas production system that deals with satellite image processing and serves as operational WS for forecasters runs on a distributed environment. The main McIdas servers, handling data ingestion, are:

2 Sun ULTRA60:

- 2 processors, 1 Gbyte of memory each, 18 & 36 GBytes of disk storage.
- national radar centre (radar & satellite image composition) and model grids data ingestion.

2 Sun ULTRA1 170E

- 1 processor, 256 Mbytes of memory each, 16 & 13 GBytes of disk storage.
- GOES images and observation data ingestion.

2 Sun SPARCstation 20/712:

- 2 processors, 256 Mbytes of memory each, 20 & 8 Gbytes of disk storage.
- TIROS and METEOSAT images ingestion.

Other computers

Message switching. A dual DECsystem 5900, running Ultrix. Based on UMS software deals with GTS, AFTN, MOTNE, etc.

Graphics dissemination. A high availability cluster, comprising two HP9000 k200 configured with 2 processors, 128 Mbytes of memory each and 2x8Gbytes of shared disk storage (disk mirroring) replaced the facsimile dissemination.

Once the new Message Switching become fully operational (expected within 2 months), both the 2 DECsystem 5900 and the HP9000 k200 cluster will be decommissioned.

Radar Network: A VAX 4500, running open VMS, handles radar images reception from the 14 meteorological radars currently in operation.

Network

All the computers in the central office are connected through a local area network (see figure 1). The LAN is basically Switched Ethernet, with an ATM backbone at 622 Mbps linking the data archiving and retrieval systems and a small FDDI ring on which the CRAY C94A is connected. A number of Cisco Catalyst switches manage the Ethernet giving 100 Mbps to each of the main UNIX servers and 10 Mbps to the rest of the systems.

All the subsidiary offices, 15 regional centres (CMTs) and 60 airport's Meteorological Offices (OMAs), are connected via Frame Relay to the central LAN in a wide area network. The current configuration is as follows:

	Access lines number x speed	PVCs to Madrid (central office): number x C.I.R. (In/Out)
Central office	8x 2 mbps (channels)	N.A.
11 CMTs (forecasting activities)	1x 512 kbps	2x 192/32 1x 32/32 (non meteorological data)
4 CMTs (no forecasting activities)	1x 256 kbps	2x 96/32 1x 32/32 (non meteorological data)
60 OMAs	1x 128 kbps	2x 48/16

The central office is linked to two different Points of Presence (PoP) through two diversely routed lines, whereas subsidiary offices have single access lines and ISDN as backup.

Connection to RMDCN is shown in figure 2. ISDN connection for backup purposes and the access line are diversely routed. Links to ECMWF, Météo-France and DWD are through RMDCN, while operational links to UKMO and Portugal are still through leased lines.

The two connections to the Internet (a 2 mbps leased line to REDIRIS, the Spanish academic and research network, and a 64 kbps link to IBERNET, a commercial provider) are protected by a firewall implementation based on Firewall-1 software.

Connection to ECMWF:

Figure 3 shows the data flow through INM connection to ECMWF. ECMWF dissemination is received in GRIB code on a Sun ULTRA-250 server via ftp, where it is decoded and plotted as well as sent to the C94A to be used as boundary conditions for the HIRLAM model, to the data management system to be archived and to the McIdas grid server where is again decoded and ingested. The other Sun ULTRA-250 server is used as backup.

A Sun ULTRA 1 workstation is used as gateway for the non-operational usage; interactive work, file transfers -ftp and eccopy-, etc.

Submission of operational jobs to ECMWF computers is done, for the most part, in ecgate1 through SMS. Ecbatch software runs on all the users workstations and on the two Sun ULTRA-250 servers for operational jobs. Use of MARS remote client software, with the Sun Enterprise-10 acting as cache server, is allowed to any user Workstation within the LAN.

Access to ECMWF computing resources through the Internet is now authorized to all of our users although most of them still access ECMWF through RMDCN.

2. Projects run at ECMWF

We currently have 52 registered users, the majority of them access the Centre's computing resources to extract data from MARS for both operational and research work. We also run Metview in batch mode on ecgate1 to produce derived products from EPS.

Concerning the usage of the Centre´s High-Performance Computing Facilities, it is basically due to the following projects:

- Experimental runs of the HIRLAM model using the reference system
- Large-Eddy Simulations (LES) of the stable atmospheric boundary layer (SBL).
- Isentropic trajectory computation in the stratosphere for an international project that extended the 'Stratospheric Climatology using Ultraviolet-Visible Spectroscopy (SCUV)' project already finished.
- Trajectory computations with KNMI model.

There is a remarkable increase in the use of ECMWF HPCF. The total usage on 2001 was a 65% of our allocation of FUJITSU VPPs units -only a 13% used in 2000-, mainly due to the preparation and testing of benchmark versions of the HIRLAM model for the replacement of the CRAY C94A and other HIRLAM experiments at high resolution that could not be run at INM because the lack of computing resources. For 2002 we have so far used a 45% of our quota, half of the spent resources have been used by the LES experiments, very expensive in computations.

SPAIN SPAIN

3. Experience using ECMWF computers

Spanish users are in general very satisfied with ECMWF computer services and the assistance and help we get from User Support is very much appreciated.

Users of the HIRLAM model reference system are now running their experiments through mini-SMS, which seems to work fine but as it is a distributed system with some jobs running on ecgate1 on others on the VPPs is more dependent on network connections.

Unfortunately, there has not been possible to install at INM new ECaccess software so I have no experiences to report.

4. Future plans

The new message switching is planned to be operational this summer. For the rest of 2002 and during next couple of years the main project is the new supercomputer that also involves in 2002 a new computer hall and the upgrade of the LAN with a gigabit backbone.

The use of the Centre's High Performance Systems over next couple of years is expected to decrease as the computing resources at INM will dramatically increase once the new supercomputer is available. In respect to the projects run at ECMWF there are plans to start two new projects that would use the RCA model, a climate version of HIRLAM from the Rossby Centre:

- Limited Area Model seasonal-forecasting within the framework of the project DEMETER.
- EUROCS.

For the rest of the use of ECMWF resources no changes are envisaged in the immediate future.

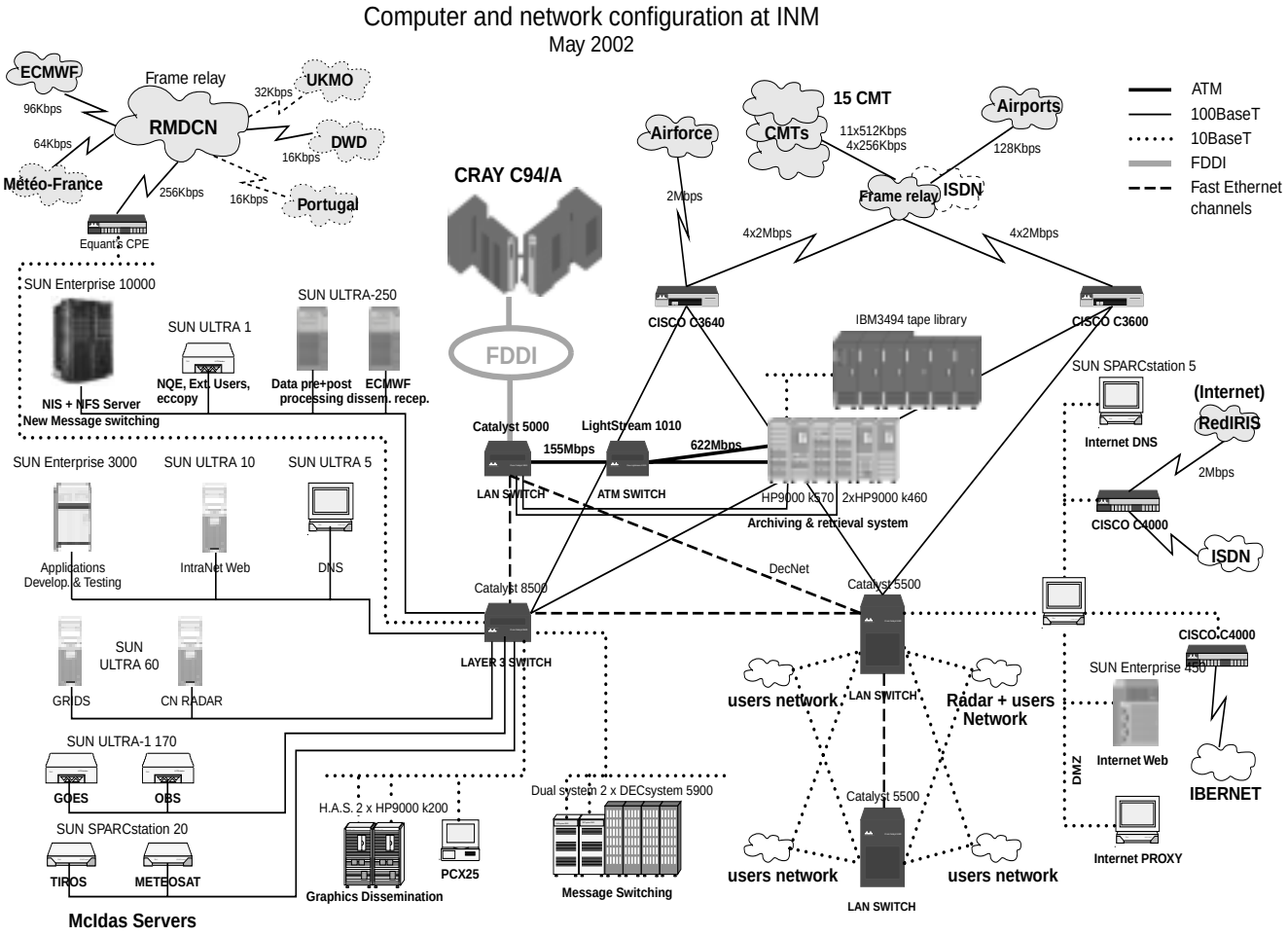


Fig. 1

SPAIN **SPAIN**

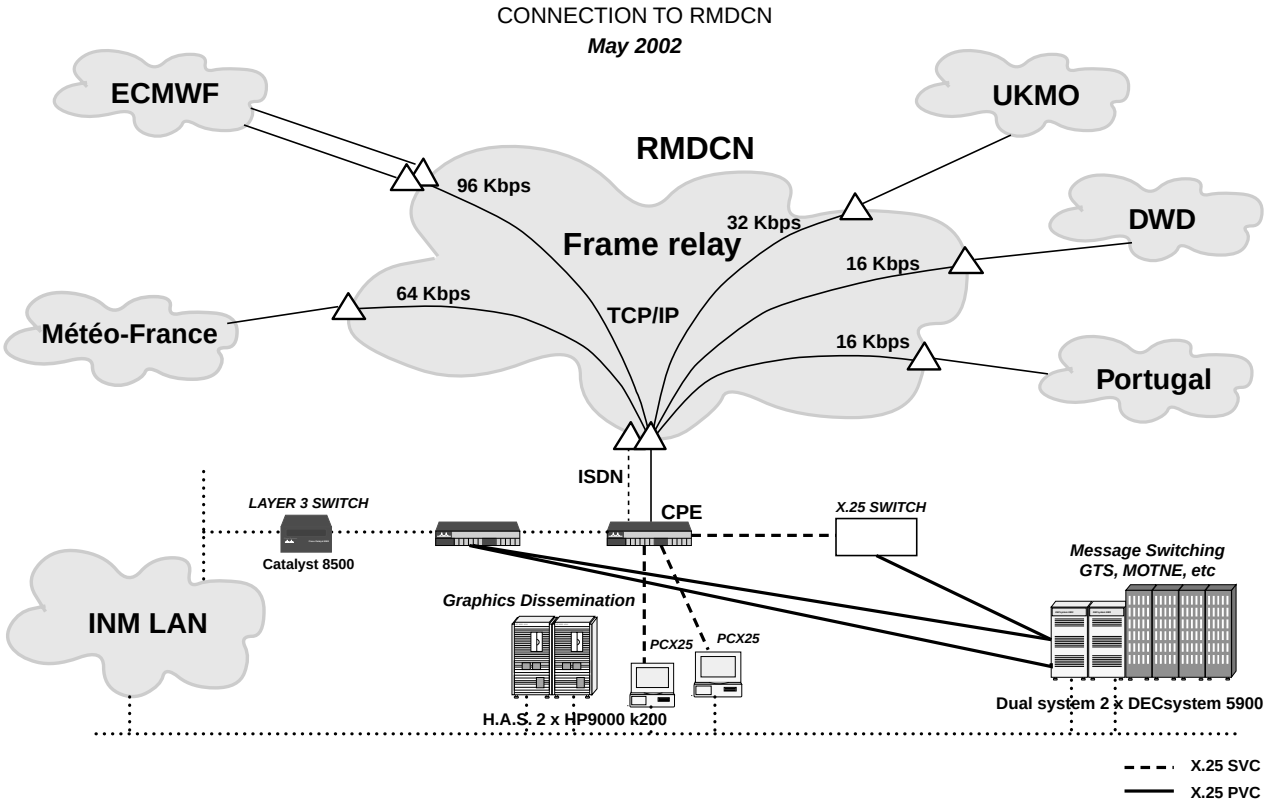


Fig. 2

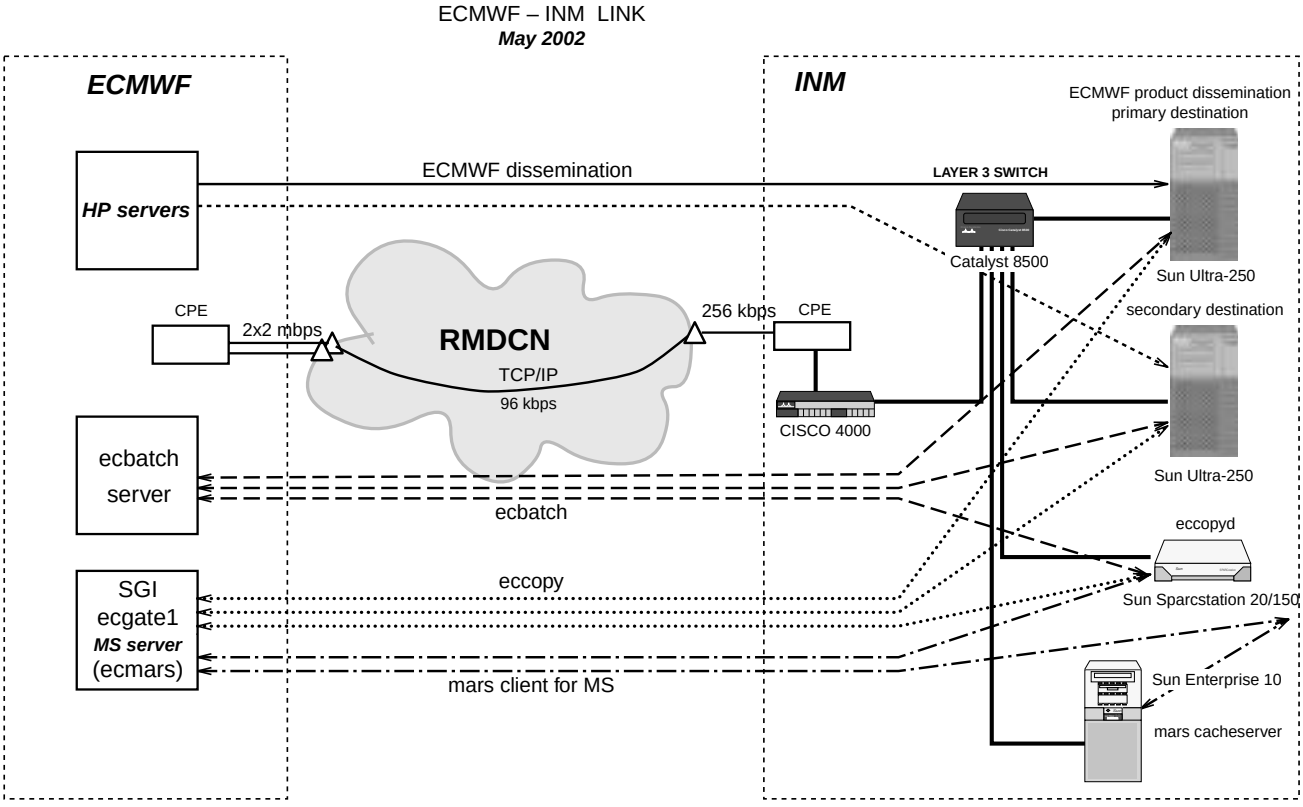


Fig. 3

SWEDEN SWEDEN

Rafael Urrutia, SMHI, Sweden

The computer equipment at SMHI

Do you remember this...

"Our equipment and IT-Infrastructure has been described before at these meetings and not many big changes have been done. But... we are working to realise a new IT architecture and this means big changes in our network, renewing servers platforms, security routines/platform and an updated IT-policy".

Yes, you are right, we are still working on big and small changes in our IT architecture.

Our Internet platform is based on Sparc/Solaris and Compaq Intel/Windows 2000 and Linux.

The Software we are using

Iplanet Web- and Ldap- server, ProFTPd, MS IIS, Apache, ht://Dig. Firewalls are based on Cisco Pix and Alta Vista Firewall 98 (the last one are we migrating from).

The main computer system is based on a Unix environment at SMHI, then we have important systems based on OpenVMS and minor systems are based on Windows NT. The office environment is mainly provided by MS Office on the Windows Platform.

We have a Unix Alpha TruCluster working as Fileserver. It provides FS via NFS for Unix and CIFS for Windows (via Compaq's ASU).

For Unix users MS Office is provided via Metaframe and a Windows Terminal server.

The mail services are done by MS Exchange.

The satellite receiving system comprises two AlphaStation 200 4/166s running OpenVMS, one system for Meteosat data and one system for NOAA data.

The system for satellite-image processing and for production of various image products is based on two AlphaServers DS10 466MHz, 512 Mb memory with a total of 52Gb disk space in an Available Server environment (TruCluster).

Important SMHI products are provided by system based on SGI and HP UNIX station.

We try to provide the same development environment as we have in our production one. This means Unix, OpenVMS and Windows platforms. The Unix systems are of type Sparc Solaris, Alpha Tru64, Alpha OpenVMS and Intel Linux.

SMHI has the responsibility for running the Swedish system connected to the GTS. SMHI is now using a new MSS application, MESSIR-COMM. This is a High-Availability system (with software-managed automatic fall-over) on two Compaq Proliant DL380 servers, with Windows 2000.

SMHI has put distributed techniques such as CORBA (ObjectBroker & Orbix) and OSF/DCE into operation. New developments are using Java, Servlet, JRE, and JDBC.

Many Internet tools and freeware are used. Example Phyton, Apache, Perl, Gimp, Ghostscript, ghostview, ImageMagick, Jakarta-Tomcat, and more...

The Cray system, provided by the National Supercomputer Centre in Sweden (NSC), is used to run operational models such as the local implementation of the HIRLAM model and HIROMB (High Resolution Operational Model of the Baltic Sea Area), and also climate models.

There are presently five Vax systems supporting weather-radar, one in Norrköping, one in Stockholm, one in Göteborg, one on the island of Gotland and one in Leksand. There are also connections between Norrköping and the military weather radar.

The radar in Sweden, Norway and Finland are connected using concentrator nodes in the three countries, which in turn will be connected to the computers of each radar system.

SWEDEN SWEDEN

Experience using ECMWF computers

In Sweden we have around 60 ECMWF users. 45 of them at the SMHI office and the remainder coming from the outside, for example the Swedish University and the Swedish armed forces.

The assistance, help and other relation we have with ECMWF is very good.

What are the users doing?

We have registered about 12 projects at the ECMWF. These projects are related to the following areas:

- aerodynamics and air-pollution modelling
- high-resolution limited-area model development
- extraction of data for operational usage
- research on regional transport
- hydrodynamic models
- atmospheric chemistry
- trajectory studies

SWITZERLAND SWITZERLAND

MeteoSwiss

Actual Computer Environment

No remarkable changes to our computer equipment have been done during the last year (the slides shown at the last meeting, are more or less still valid).

The major figures of our equipment are:

- Servers
  - 40 SUN (of different types) / Solaris 2.5, 2.6
  - 3 VAX / VMS
  - 2 Alpha / VMS
  - 2 PDP 11 / VMS (will be replaced this year by a system in the actual SUN environment)
  - 2 HP 9000 / HP-OS (Unix)
  - 2 Siemens / Unix
  - 7 NT-Servers
- Workstations
  - approximate 250 SUN workstations (of different types) / Solaris 2.8
  - a PC board is installed in 75% of the workstations / Windows NT
- Network
  - LAN: 100 Mb/s
  - WAN: 2 Mb/s (no backup-lines!)
  - ETH/CSCS: 10 Mb/s
  - Internet: 2 Mb/s (will be increased this year to 5 Mb/s)
  - RMDCN: - ECMWF: 96 kb/s
  - DWD: 128 kb/s
  - Météo-France: 16 kb/s

Plans

The actual state of the project 'Server, Storage & Client' (SSC) is:

- Goals
  - replacing old systems (some of them are out of live)
  - extending the storage capacity (some systems are on its limit)
  - optimising the resources (CPU and storage)
  - reducing the maintenance (particularly manpower)
  - simplifying the management
  - **Overall:** increasing the availability and the scalability of the whole system and reducing the costs
- Mandatory
  - Sparc architecture (may become optional)
  - Operation System Solaris (may become optional)
  - maximum storage capacity required: 6 TB (starting with 600 GB)
  - a good integration of office applications, running Windows
  - the integration of Windows systems into the storage system must be possible

- Possible solution (actually most favourite)
  - Server consolidation at Zurich (at least 30% of the servers) and at each regional office
  - Storage Area Network (SAN) at Zurich and at each regional office
  - a backup-line for the WAN
  - optional: a second system designed as a 'Disaster-Recovery-System'
  - optional: a 'thin client' solution over the WAN for office applications (more tests necessary)
- Results of the tests for a 'thin client' solution over the WAN for meteorological and climatological applications
  - the performance is bad, especially for loops, even with a high CIR (100 Mb/s)
  - problems with middleware products
  - **Conclusion:** not producible and not economical
- End of project
  - December 2003

Experience using ECMWF Computer Services

MétéoSuisse makes use of:

- the dissemination system
- MARS
- 'eccopy'
- MAGICS applications running at ECMWF

The users are very satisfied of the user support and the services from ECMWF.

Question: *Is it possible to get a user account at ECMWF for a group? We think there are two cases where this could be useful.*

- Operating: Monitoring the 'Product dissemination to Member States' using web access
- Research projects (especially at the universities): The researchers only use the account for a few times and the staff change very often.

UNITED KINGDOM UNITED KINGDOM

Paul Burton, Met Office, UK.

1. Main Computer Systems

The computer infrastructure at the Met Office remains much as described in the previous meetings. The main systems and their interconnections are illustrated in Figure 1.

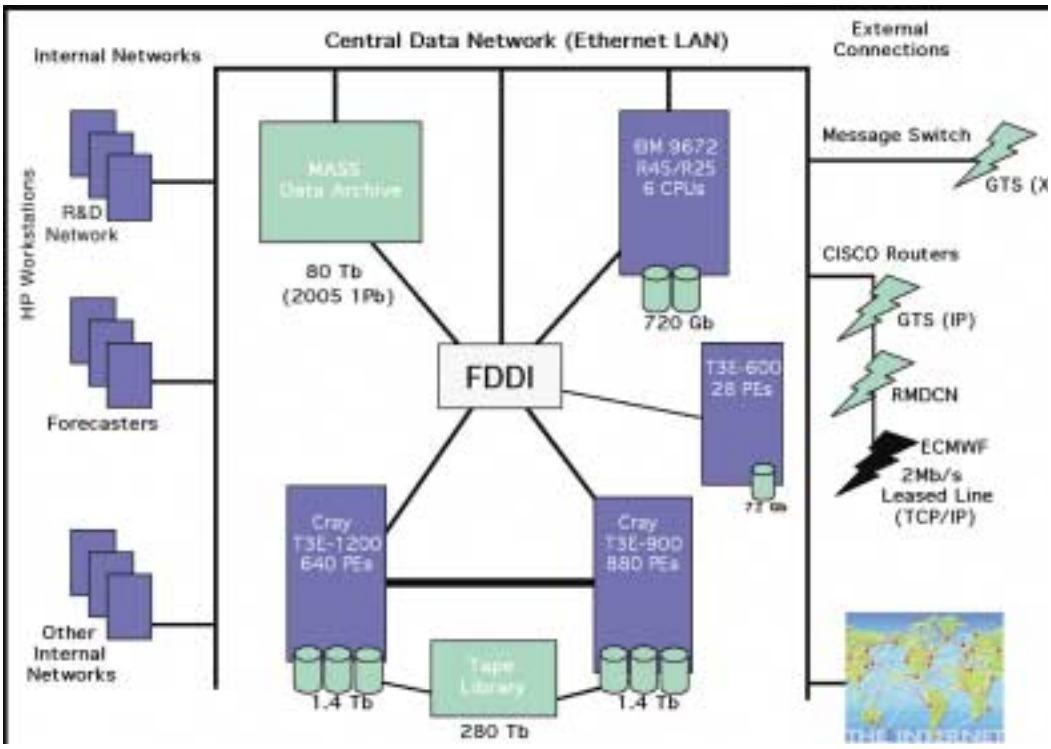


Fig. 1: Main Met Office Computer Systems

The main supercomputer system consists of an 880 processor T3E-900 (installed 1997) and a 640 processor T3E-1200 (installed 1999). About 60% of the CPU capacity of these machines is dedicated to climate prediction, and the remaining 40% to Numerical Weather Prediction.

The IBM 9672 acts as the database server for observations and forecast products and controls the flow of data between the T3Es and the GTS message switch. The R45 module has four CPUs and is split into MVS and UNIX partitions. The R25 module has 2 CPUs and is dedicated to the pre and post-processing of operational forecast information.

Our data handling system, known as MASS, comprises a SUN E6500 multi-processor computer running StorHouse proprietary software, and a StorageTek Powderhorn tape silo with up to 32 StorageTek 9840 tape drives. MASS uses relational database technologies to provide access to model and observational data at the atomic (field, observation group) level. It can also act as the central repository for user files and other data. The amount of data being managed by MASS is expected to grow from the initially installed 80Tb to around 1Pb by 2005.

2. Connections to ECMWF

All of our prime intra-regional links are connected via RMDCN, however we continue to use the existing 2Mb/s leased line to ECMWF, which is utilised for the exchange of all data and products with the Centre as well as for user access to the Centre's computing facilities.

Data is sent to and from an Alpha Server 1200 on the Central Data Network (CDN) at Bracknell, with a second Alpha Server 1200 acting as a backup. The connection supports the receipt of observational data and the dissemination of ECMWF products. Along with Offenbach, the UK provides one of the connections between ECMWF and the GTS.

Telnet, FTP, eccopy and ecqsub are available from the HP workstation network and from both T3Es. We are currently awaiting the arrival of new HP servers, one of which will host the new ECaccess gateway service.

UNITED KINGDOM UNITED KINGDOM

3. Changes to the system

By the end of 2003 it is planned that the Met Office will have completed its relocation from its premises in Bracknell to a new purpose built facility in Exeter. This major move is also being used as an opportunity to upgrade and replace many parts of the IT infrastructure we currently use.

The most important change will be the replacement of our supercomputer systems. Although we plan to move both T3Es to Exeter to allow the smooth transition of our business, we will also be installing our new supercomputer system as soon as the new computer halls are ready for use.

The competitive procurement process resulted in three bidders (Cray, NEC, SGI) being short-listed to offer a solution to the Met Office. We have just announced our decision to choose NEC as the preferred bidder for our next supercomputer. Subject to satisfactory negotiations a final contract should be signed within the next month.

The first phase of the solution, to be accepted by early 2004 will be based around NEC's SX-6 supercomputer system, and will provide the Met Office with a 6 times increase over our current performance capability. The second phase, to be accepted by Spring 2005 will install additional SX-6X hardware to raise the total capability to 12.5 times current.

We will also be replacing the desktop systems. The current scientific desktop, consisting of HP servers and X terminals will be replaced with flat-screen PC hardware running the Linux operating system. Some of the more powerful HP servers will be kept as a resource for running more computationally intensive work, removing its impact from the desktop systems.

The Central Data Network will be upgraded to Gigabit Ethernet, with local connections to this generally running at 100Mb/s.

The Tandem Message Switch is being replaced by a Unix based system running proprietary message switching software. This new system will be sized to cope with an expected doubling of traffic over the next 3-5 years.

4. Use of ECMWF Computer Systems

As ever, there continues to be a relentless rise in the number of registered users - numbers have increased from 92 users at the last meeting, to 114 at the last count. The majority of these users have fairly simple data retrieval requirements. Some of these users really only require a one-off access to ECMWF data - the current account initiation process is a large and possibly unnecessary overhead for such needs.

The majority of users, with relatively simple data access requirements, continue to report a high level of satisfaction with the documentation and ease of use of the system. There have, however, been a few cases this year where a small number of users with more complex requirements have caused problems, possibly overloading systems - often because they were not aware of the consequences of their requests or how to form them in a more system-friendly manner.

We will shortly be installing the new ECaccess gateway software - we are currently awaiting the arrival of new hardware on which this service will be provided. There are some worries about running the service through our firewall - and also just running all requests through a single access point rather than a distributed system as we currently use. However, we have already received useful advice and assistance from ECMWF and I doubt we will encounter any insurmountable problems.

We continue to use Metview on our HP workstation system, and users benefit from a transparent access to ECMWF data via the MARS client software. The current version of Metview used on the HP workstations is version 2, but we have recently completed the installation of version 3 on a test HP workstation (with much gratefully received assistance from ECMWF experts). This will be rolled out to all HP workstations within a few months once users have had an opportunity to upgrade their macros where necessary. We look forwards to our new Linux desktop, which as well as making the installation of new Metview versions much smoother, offers a far better performance and user experience than our current HP hardware.

Our use of Fujitsu units continues to grow - with most of our time being taken running multi-model ensembles for our long range and seasonal forecasting groups. We run atmosphere only and coupled ocean-atmosphere versions of our Unified Model system. Currently this runs single processor on the VPP700, but with up to eight instances running simultaneously. As development of the system continues we will soon require a greater number of runs. We expect to need assistance from ECMWF staff to allow us the necessary throughput so we can effectively use our allocation of Fujitsu units for this work.

UNITED KINGDOM UNITED KINGDOM

In preparation for the change in the ECMWF supercomputer system, work has started to port the Unified Model system to the IBM hardware, running in MPP mode. However, we have long running work which needs to complete on the Fujitsu hardware, and we need to ensure that we have access to the necessary machines long enough to allow this work to finish successfully.

EUMETSAT **EUMETSAT**

1. The EUMETSAT computer systems

1.1 General Overview

The EUMETSAT computer equipment is separated in operational, office and external information services computer systems. The operational systems provide the satellite related infrastructure, the office computer systems provide the internal office and research environments and the external information services systems provide Internet alike services.

1.2 The MTP ground segment

The Meteosat system provides continuous and reliable meteorological observations from space to a large user community. In addition to the provision of images of the Earth and its atmosphere every half-hour in three spectral channels (Visible, Infrared and Water Vapour), a range of processed meteorological products is produced. Meteosat also supports the retransmission of data from data collection platforms in remote locations, at sea and on board aircraft, as well as the dissemination of meteorological information in graphical and text formats. The MTP Ground Segment (GS) system includes the Mission Control Centre (MCC) located within the EUMETSAT Headquarters in Darmstadt, which is composed of five main facilities:

- The Core Facility (CF), providing satellite, ground segment and mission monitoring and control functions, image processing and dissemination, meteorological data collection and distribution. This is facility is based on around 100 Compaq Digital servers and workstations running OpenVMS;
- The Meteorological Products and Extraction Facility (MPEF) derive meteorological products by processing satellite images and ECMWF data supplied by the core facility. A second instance of this facility, the reprocessing MPEF (RMPEF), derives meteorological products from historical images retrieved from the MARF archive and uses ECMWF analysis data retrieved from ECMWF via the MARS interface using an off-line workstation and then transferred to the RMPEF via tape. This is facility is based on around 30 HP servers and workstations running HP-UX.
- The Meteorological Archive and Retrieval Facility (MARF) provides the means for the archive and retrieval of satellite images and meteorological products generated by the MPEF and RMPEF facilities. This is facility is based on around 40 SUN servers and workstations running SUN Solaris and two StorageTek DLT tape libraries.
- The User Station and Display Facility (USDF) to visualise data/images disseminated over the satellites, based on around 11 Compaq Digital servers and workstations running OpenVMS;
- The Encryption Facility (EF) for encrypting uplinked and disseminated data and the associated communication links equipment based on 2 Compaq Digital servers running OpenVMS.

The backbone communications equipment is based on around 9 [Compaq] Digital Decnis routers. The main routing protocol is RIP, using static routes to WAN interfaces.

There are also a number of low speed data links connecting elements within the MTP Ground Segment either to provide services to various EUMETSAT users or to support maintenance activities. There are two X.25 leased lines to the Deutsche Wetter Dienst (DWD) to allow information exchange over the Global Telecommunications Systems (GTS) of the World Meteorological Organisation (WMO). ECMWF data (forecast atmospheric profiles, sea surface temperatures and radiosonde data) is received twice a day via the Core Facility and sent to the Meteorological Products and Extraction Facility (MPEF).

IP is the predominant protocol used within the MTP ground segment. For LAN interconnections, the IP packets are transported in Ethernet or FDDI frames. The two main exceptions are X.25 for the GTS and DECNET for the Core Facility layered products (DTSS, DNS, DFS). TCP/IP is used by the communication layers to provide a reliable transfer protocol.

1.3 The MSG Ground Segment

The MSG Ground Segment (GS) system includes the Mission Control Centre (MCC), which is composed of:

- The MSG Central Facility (CF) provides integrated support for mission operations and is responsible for monitoring and control of all other MSG facilities including all MSG satellites, it is based on around 90 Compaq servers and workstations running Windows NT.
- The Meteosat Second Generation Image Processing Facility (IMPF) is responsible for the reception, preparation and subsequent distribution of the MSG payload data. It is based on around 25 Compaq Digital servers and workstations running TRU64UNIX.
- The Data Acquisition and Dissemination Facility (DADF) is responsible for the acquisition, dissemination and distribution of the MSG mission data. This includes acquisition of satellite images, DCP messages, foreign satellite data, meteorological data and SAF products. These data are then disseminated in encrypted and compressed form (if required). DCP bulletins and meteorological products are distributed via the Global Telecommunication Network (GTS). It is based on around 45 Compaq Digital servers running Windows NT.
- The Meteorological Product Extraction Facility (MPEF) generates meteorological products. The MPEF receives input data for the generation of meteorological products from the IMPF and from the DADF (F/C Data, Observation Bulletins, and Foreign Satellite Data). It is based on around 30 HP servers and workstations running HP-UX.
- The Unified Archive and Retrieval Facility (UMARF) provides the archive and retrieval of MSG data. It also provides user services to the users via an Internet web server. Its is based on around 15 Compaq Digital servers and workstations running TRU64UNIX and two ADIC tape libraries using SONY AIT-2 media.

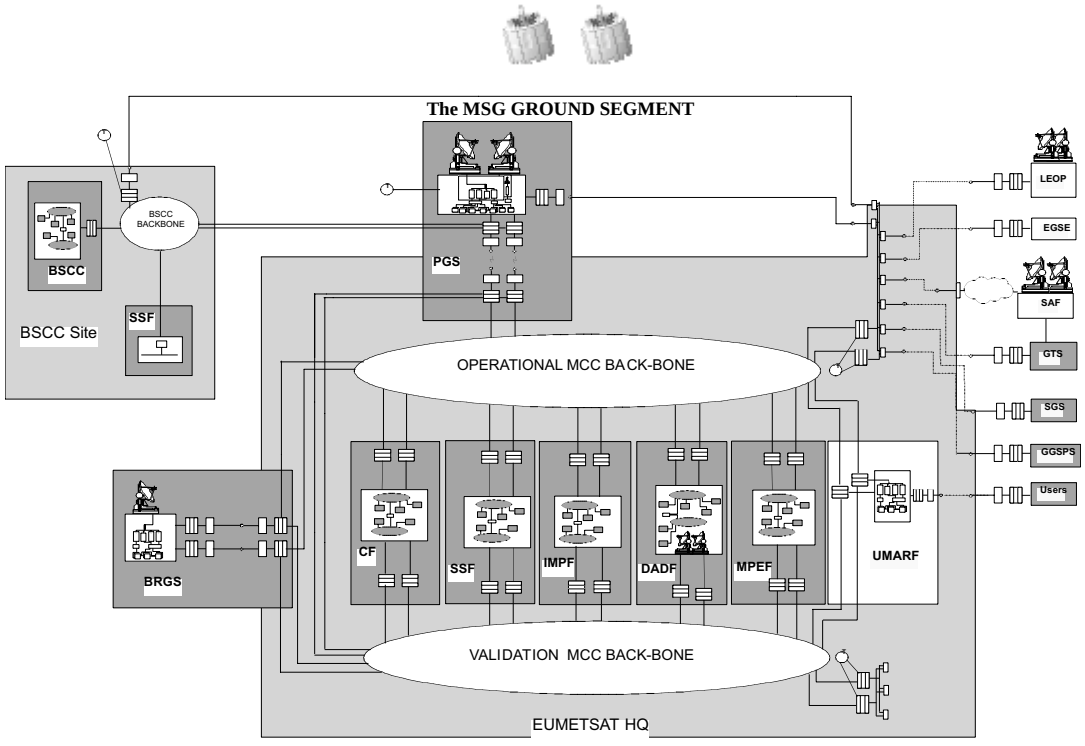


Fig. 1: The MSG Core Ground Segment.

The connectivity between and within facilities is provided by means of a common networking approach, i.e. network management and communication protocols. The concept is based on an FDDI backbone architecture, which is operated in a dual-homing configuration to provide a high degree of fault tolerance. TCP/IP is used. The communications equipment is based on around 45 Cisco routers, 20 switchers and 45 concentrators. The main routing protocol is OSPF, using static routes to WAN interfaces.

1.4 The Office Computer Network and the External Information System

The office computer systems provide the internal office and prototyping and research environments. There are 14 users registered with the MARS service. ECMWF data is for testing new algorithms for the extraction of products from existing meteorological satellites, to support the definition of new generation satellites. The ECMWF services are accessed via the RMDCN network and in the near future using Ecaccess via Internet. Specifically the following data and services are used:

- Forecast and analysis fields
- Foreign satellite data (e.g. SSM/I)
- Metview1.8A is used daily for obtaining the ECMWF weather charts.
- Daily SMS jobs to produce Metgrams and Epsgrams for several European cities, run at ECMWF.

2. The new RMDCN Infrastructure

2.1 Current implementation

In order to connect to the RMDCN and comply with the EUMETSAT security policy, a new infrastructure is being implemented. The RMDCN is connected via a single firewall to the operations internal network. Files arriving from the RMDCN into the file servers are distributed to all the internal users using the Deutsche Wetter Dienst Automatic File Distribution (AFD) software.

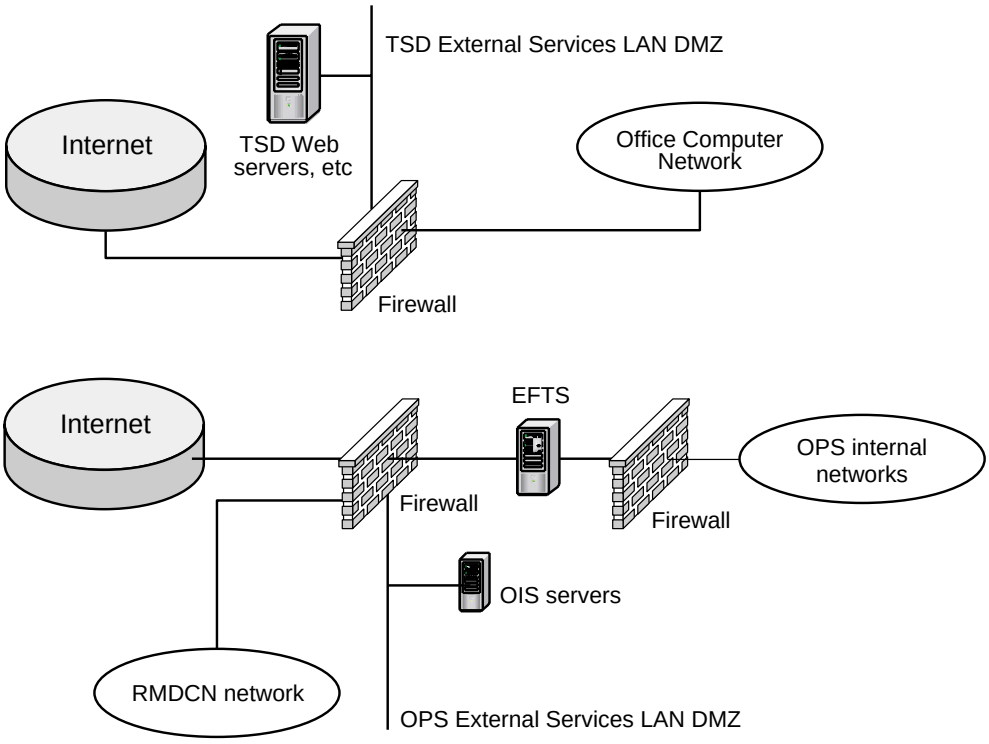


Fig. 2: The RMDCN set-up.

2.2 Future systems

The next step of for the use of the RMDCN is to connect the EUMETSAT Polar System (EPS) to the RMDCN. It is foreseen that the design activities will be completed by September 2002 and remaining phase 1 activities by the end of 2002. Validation and acceptance tests are foreseen for the 1st quarter of 2003. In the future also the MSG Ground Segment will be connected to the RMDCN service, but the current schedule is still open. Additionally to the RMDCN connectivity also the present capacity has to be reassessed when the EPS data volume is known. The volume of data to/from RMDCN needs to be identified at least 6 months in advance so that the upgrade can be requested in time.

3. MTP Mission Control Centre relocation activity

In preparation for the EPS programme the current MTP Mission Control Centre (MCC) has to be relocated in order to make room for the EPS Core Ground Segment (CGS) equipment. It is foreseen that the EPS CGS installation work will start during the first half of 2003; hence the relocation project of the MTP MCC is already well advanced. The physical relocation is ongoing and will be finished during the 2nd quarter of 2003. During the relocation the current MTP MCC hardware, consisting of roughly a 100 servers and workstations in total, has been reviewed. Based on the analysis various sub-systems have been compressed, with the most significant reduction in equipment for the MTP MPEF that was reduced from 24 HP-servers to 4. Simultaneously with the relocation the MTP LAN will be simplified. All thick-wire Ethernet (10Base5) will be removed. For workstations having only the Ethernet interface, the thick wire will be replaced with a twisted pair (10/100bT) transceiver-AUI interface; new workstations will be supported by twisted-pair fast-Ethernet (100BaseT).

4. The EUMETSAT ATOVS retransmission service

Based on request from EUMETSAT Member States, a EUMETSAT ATOVS Retransmission Service (EARS) project has been established. The aim is to use existing ground stations over the Northern Hemisphere to collect ATOVS data from the current polar orbiting NOAA satellites. EUMETSAT will provide dedicated workstations for each ground station that are remotely controlled from EUMETSAT. The workstations are configured with the Advanced ATOVS Processing Package (AAPP) and will send the AAPP products via an IP VPN network to EUMETSAT. From EUMETSAT the data will be forwarded to the up-link station and disseminated using Digital Video Broadcasting (DVB) to local receiving stations.

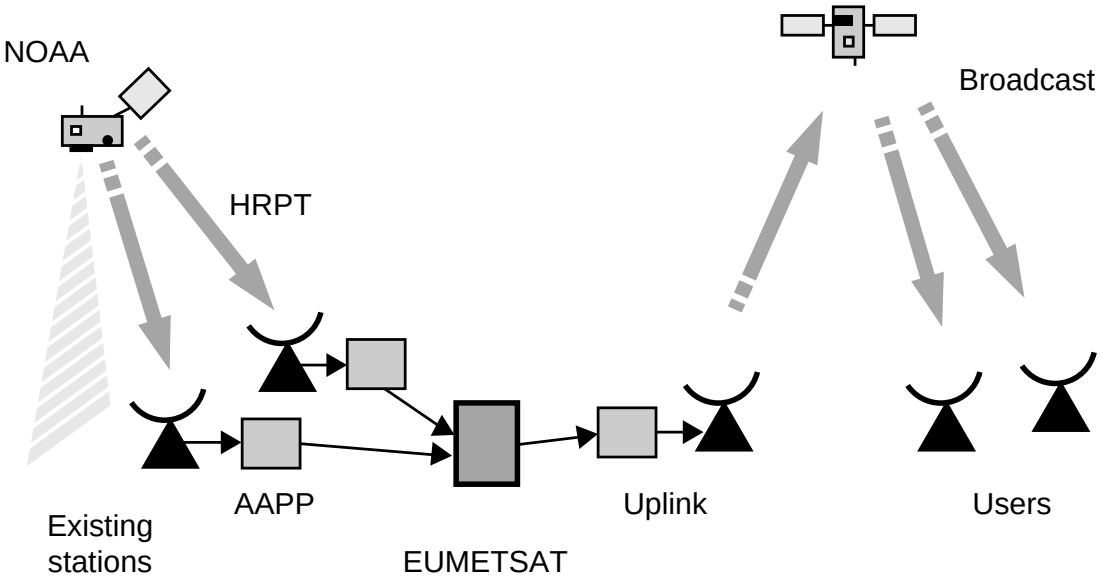


Fig. 3: The EUMETSAT ATOVS Retransmission Service (EARS) set-up.

ANNEX 1 ANNEX 1

Fourteenth Meeting of Computing Representatives

ECMWF, Shinfield Park, Reading, U.K., 27-28 May 2002

Participants

Austria	Gerhard Hermann
Belgium	Liliane Frappez
Croatia	Nevenka Kadiæ
Denmark	Niels Olsen
Finland	Kari Niemelä
France	Marion Pithon
Germany	Elisabeth Krenzien
Greece	Antonis Emmanouil
Hungary	László Tölgyesi
Iceland	Kristin Thorsdottir
Ireland	Paul Halton
Italy	Giuseppe Tarantino
Netherlands	Hans De Vries
Norway	Rebecca Rudsar
Spain	Eduardo Monreal
Sweden	Rafael Urrutia
Switzerland	Peter Roth
United Kingdom	Paul Burton
Eumetsat	Kenneth Holmlund
ECMWF:	Jens Daabeck
	Richard Fisker
	Laurent Gougeon
	John Greenaway
	Mats Hamrud
	John Hennessy
	Norbert Kreitz
	Dominique Lucas
	Carsten Maass
	Umberto Modigliani
	Pam Prior
	Andy Brady
	Neil Storer
	Walter Zwieflhofer

ANNEX 2 ANNEX 2

Programme

Monday, 27 May

09.30 *Coffee*

10.00 Welcome

ECMWF's computer status and plans . . . . . .*W. Zwieflhofer*

Member States and Co-operating States presentations

Each representative is asked to speak for a maximum of ten minutes, outlining their Member State's or Co-operating State's involvement (actual or planned) in the computer service at ECMWF. This should include:

- diagram of own computer equipment, and of connection to ECMWF
- projects run at ECMWF (if applicable)
- experience using ECMWF computers/services, including suggestions and queries regarding the present service
- plans (involving ECMWF usage over next couple of years)

12.30 *Lunch*

14.00 New IBM HPCF: hardware and software . . . . . .*N. Storer*

Migration to new IBM HPCF: early experiences . . . . . .*M. Hamrud*

Coffee

ECaccess . . . . . .*L. Gougeon*

Computing Representatives: . . . . . .*U. Modigliani*

Their rôle and responsibilities

User registration . . . . . .*U. Modigliani*

Graphics update . . . . . .*J. Daabeck*

MARS and dissemination update . . . . . .*J. Hennessy*

17.40 *Cocktails, followed by an informal dinner*

Tuesday, 28 May

09.00 **Member States and Co-operating States presentations** (continued)

10.30 *Coffee*

Web developments . . . . . .*A. Brady*

Discussion

12.30 **End of meeting**

For additional copies please contact

The Library
ECMWF
Shinfield Park
Reading, Berks RG2 9AX

library@ecmwf.int

Series: ECMWF Technical Memoranda

A full list of ECMWF Publications can be found on our web site under:
http://www.ecmwf.int/publications.html