Introduction of a computerised planning system in Eurovision operations
Presentation of the “TPP” system

W. Lloyd (EBU)

At the end of 1993 a computer system was introduced in Eurovision Network planning operations. This system replaced a paper-based methodology in existence since the advent of Eurovision and which was no longer capable of handling increases in workloads due to an upward trend in both the volume of transmissions and the underlying complexity of network operations. The system employs fourth-generation software products and high-performance graphical workstations.

1. Introduction

The technical areas of Eurovision - Network Planning and the Eurovision Control Centre (EVC) - are together responsible for the planning and coordination of transmissions across the Eurovision network. The Eurovision network covers the European Broadcasting Area, with a web of links extending from Reykjavik to Cairo and Moscow to the Azores.

The EBU has the permanent lease of four wide-beam 72 MHz transponders on Eutelsat II F4M which are configured into six channels for analogue television, four 8-Mbit/s digital channels also for television, plus four 2-Mbit/s wideband audio channels which include Euroradio operations. The network also uses 8 900 kms of leased terrestrial links. A permanent connection to EBU offices in the United States is provided via an Intelsat lease, organised into two 17-Mbit/s television channels. *Fig. 1* shows a top-level overview of the network, as displayed on a workstation of the TPP planning system described later.

Eurovision Planning is responsible for the optimal planning of the network in response to requests for transmissions from EBU Members and clients, received either directly or via the Eurovision News or Programme coordination offices. The EVC is responsible for last-minute planning and the actual coordination of the transmissions as they are transmitted. The network is composed of some 50 national control rooms (CNCTs) all cooperating together with the assistance and coordination of the Planning Office and the EVC in Geneva.

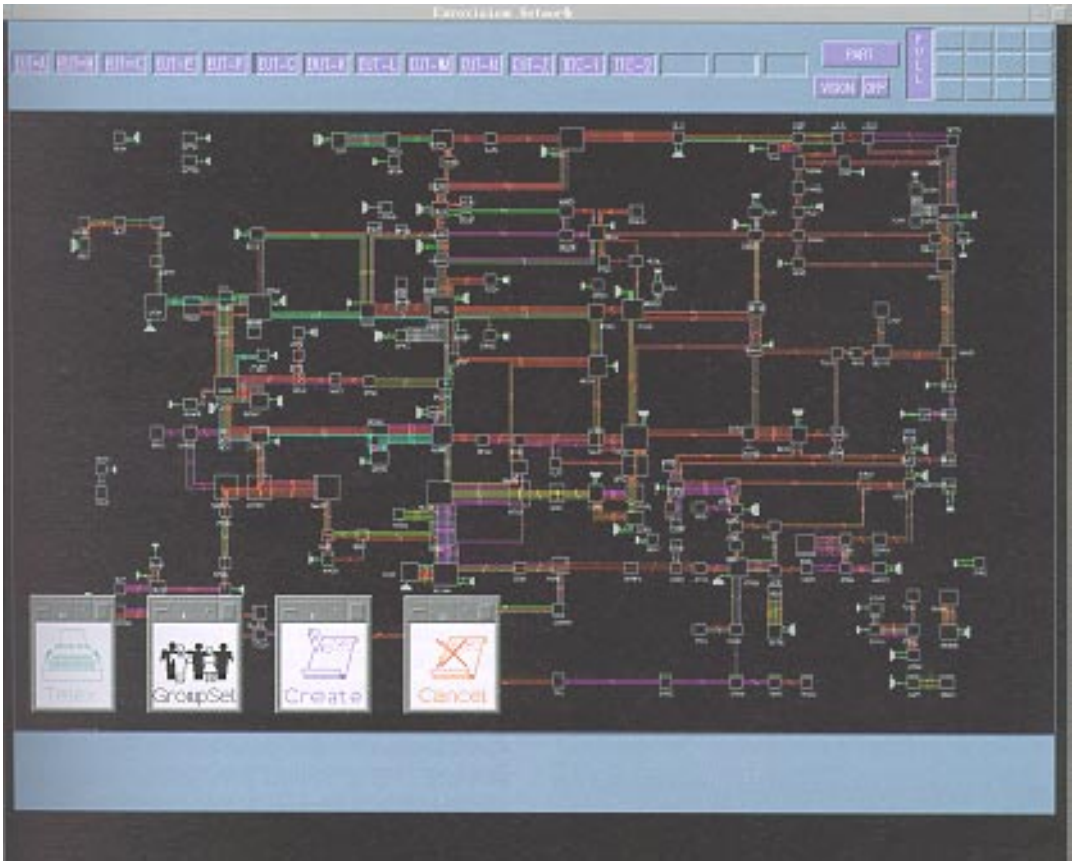


Figure 1
TPP network overview.

Since the advent of Eurovision 40 years ago, and until December 1993, the planning tools employed remained basically unchanged; paper-based forms, card files and master booking sheets using handwritten entries were the basis of all planning work.

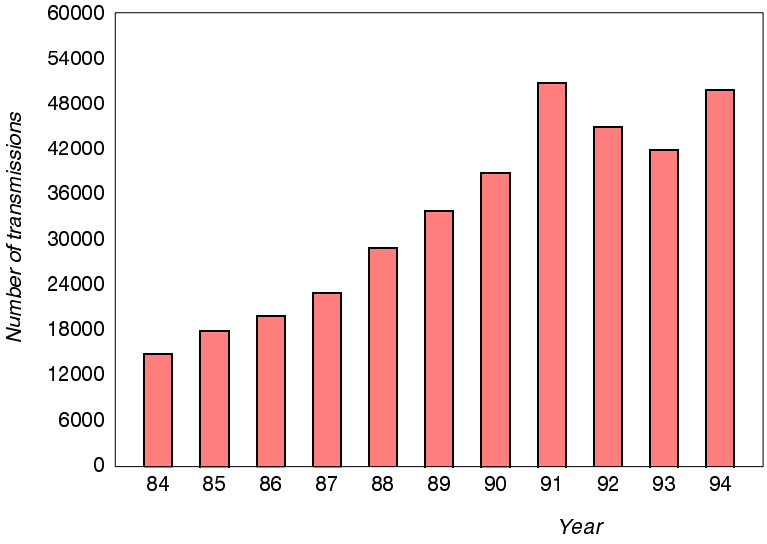
On 15 December 1993, a new computerised system called "the TPP" (standing for Transmission Planning and Procedures) was introduced to Eurovision technical operations.

2. Forces for change

Allowing for exceptionally busy years due to news events such as the Gulf War, *Fig. 2* summarises an almost continuous rise in the annual number of transmissions over the last 10 years – from 15 000 in 1984 to 50 000 in 1994.

Over this same period, network management and operation has tended to become more complicated and require more coordination at the planning level. The period 1984–1994 has witnessed a shift in the use of network resources: from relatively stable and easily-allocated terrestrial connections serving a participation limited to EBU members, the tendency today is to have more dynamic configurations dependent upon satellite technology and serving an expanded EBU membership augmented by non-Member clients. Outside the core network based upon the fixed EBU standard earth stations at the Members' premises, an examination of the present levels of transmission traffic shows that many operations use mobile earth stations to uplink news and sports special event programmes directly from the sites of

Figure 2
Number of Eurovision transmissions per year.



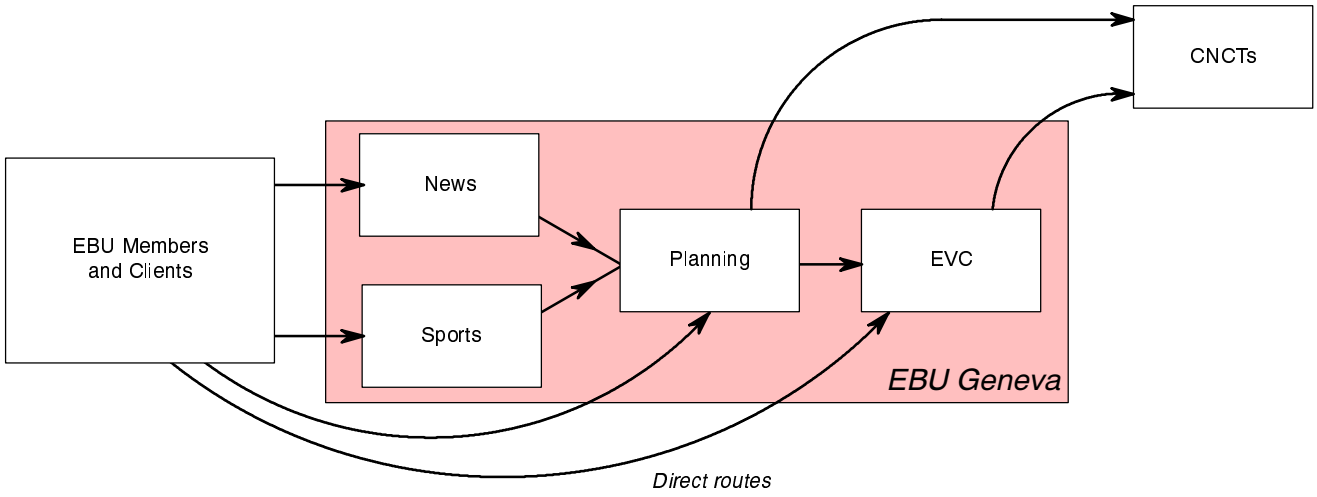


Figure 3
Flow of planning information.

the events. The expansion of the network to include the new EBU Members in the former Eastern Europe, the use of Eurovision services by organizations outside the EBU Membership, and the consequent requirement to provide extra assistance to the latter clients who may be unfamiliar with Eurovision operations, are other complicating factors.

While the paper-based system had evolved over the years it could no longer cope with operations in an efficient manner; there are definite limitations on the amount of information that can be processed with paper-based tools. After a certain level, adding more staff tends to increase confusion, and productivity does not increase in a linear manner.

The probability of error increases with each hand-written reprocessing of information. On busy days the number of errors due to circuit double-bookings would increase substantially. The EVC - which was also working under increasing pressure - would then have to resolve these errors, often with very little time to spare before the start of transmission.

The extraction of up-to-date statistical information summarising network occupancy and performance was also extremely difficult. This inevitably led to difficulties in the costing of operations.

The requirement to re-copy the technical summaries of transmission arrangements, known as a technical synopsis, into the message-sending computer led to increased costs and was a further source of copying errors.

3. Eurovision information flow

Fig. 3 provides a simplified overview of the flow of information through Eurovision.

The gathering of information for the coordination of complicated multilateral transmissions is carried out by EBU news and sports coordinators. Information on programme requirements is then communicated to the Planning Office which coordinates the details of the transmission, determines the optimal network configuration and arranges the allocation of the technical resources. Unilateral requests that are not associated with a multilateral or a special event are handled directly by the Planning Office.

The information is then passed to the EVC and the CNCTs. If required, the EVC must also modify the network arrangements at short notice and plan last-minute transmissions.

4. System requirements

Network planning and coordination are skilled tasks that frequently have to be carried out under conditions of stress and pressure, so it was important that the system design should satisfy the following criteria:

Fast response

Sudden high workloads should be handled efficiently and with relative ease. Response times of the systems should be very short: typically, delays in excess of 1 or 2 seconds could not be tolerated.

Multitasking

A user has to be able to switch between a number of concurrent tasks, if necessary leaving some tasks awaiting completion until a later time.

Reliability

The system has to be reliable and fault tolerant.

Ease of use

The system has to be user-friendly.

Interfaces to other systems

It has to be possible to build interfaces to other systems including, in descending order of priority: the CASE Beeline MSS, the EBU in-house VAX-based computer and, for the future, systems at the sites of EBU Members.

5. How it works - A functional overview

Upon entering the system, the user is presented with a choice of four icons (*Fig. 1*). The user can then easily move between different sessions and can run several simultaneous sessions without incurring a heavy manual overhead in the servicing of file routines.

X-Window techniques provide a user-friendly method of dialogue with the system, and allow a smooth transfer when moving between different tasks. Screen graphics are used for the allocation of circuit resources to different transmissions. Typical screen displays are given in *Figs. 1*, *4* and *5*.

When planning a transmission, the network planner enters a selected time zone in order to view available circuits. Existing transmissions are highlighted, and the planner moves around the visual display of the network using a mouse to interrogate the booking status of circuits and to allocate circuits to transmissions by clicking on terminals (either terrestrial or satellite or a combination of both).

A top-level view of the map is shown in *Fig. 1*. Toolbars at the top and bottom of the screen allow the planner quickly to select a pre-formatted section of the network with the option of further expanding any section with variable zoom facilities. *Fig. 5* shows such a magnified section in the background to an alphanumeric listing of transmissions.

At any time the planner can "click" with a mouse on a circuit or terminal and obtain an alphanumeric text-box displaying details of the availability of the particular circuit. In a similar manner, network nodes can be interrogated for inventories

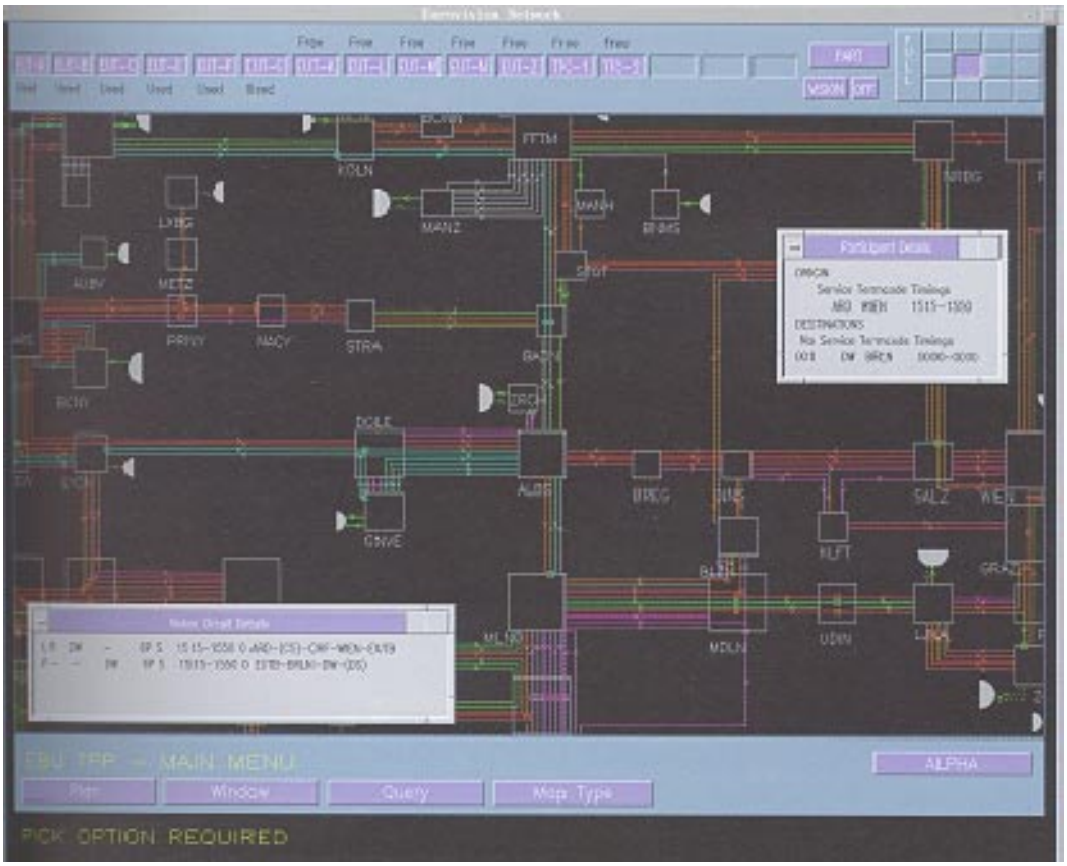


Figure 4
TPP screen.

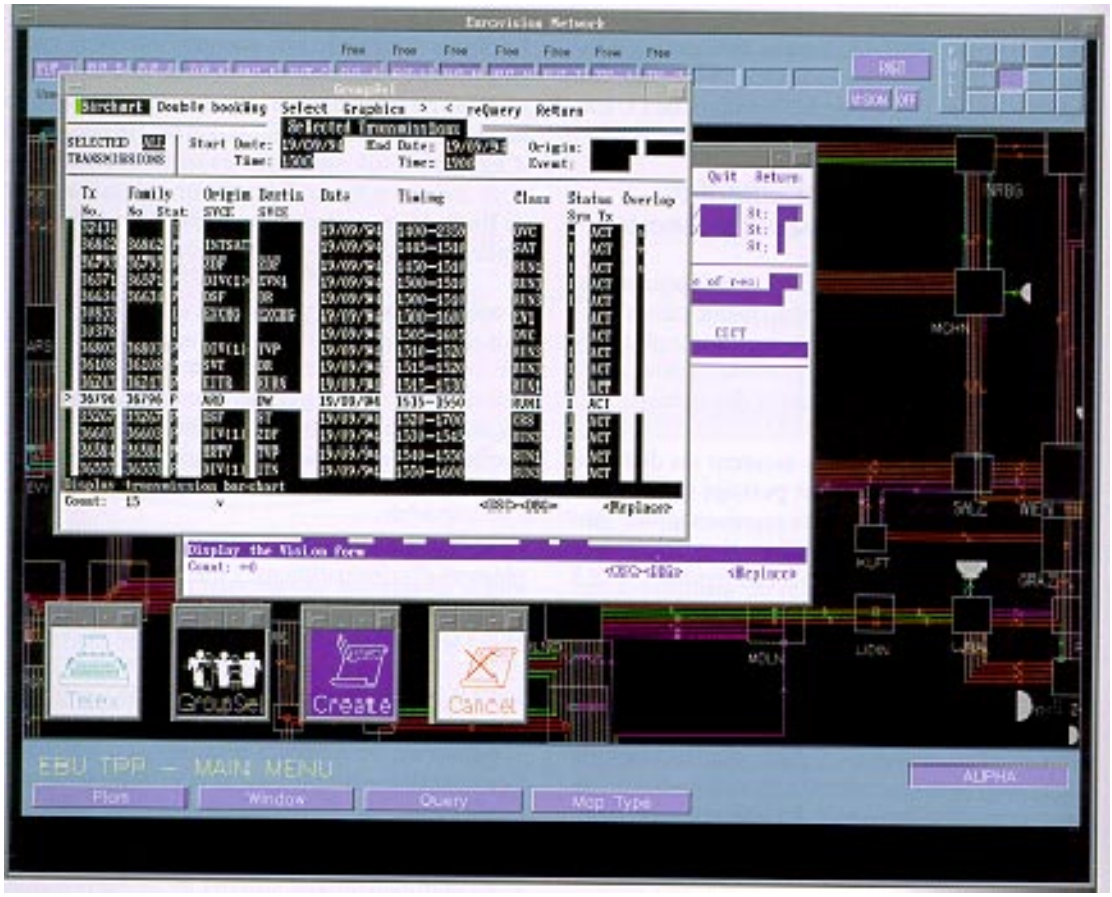


Figure 5
TPP screen.

Figure 6
The “Global vision” screen.

and allocations of special equipment, and for connections to broadcasters.

The same principle of obtaining detailed information via text-boxes applies to another tool, known as "Global Vision" (*Fig. 6*). This easily-accessible display allows the operator to interrogate the overall bookings on each circuit during a given time period.

A template facility has proven very useful. The planners have built up an extensive library of frequently-used network configurations via templates that can be called up for re-use and this avoids the requirement to recreate "popular" transmissions. An additional feature which allows block-bookings of repetitive transmissions has also proven very useful.

While the network planner is moving across the network display allocating circuits, in the background these routines are being translated into the alphanumeric format of the technical synopsis. At the same time, another process builds a telex or fax message format of the technical set-up, complete with appropriate message addresses. This message then awaits the "send" signal of the planner before being transmitted automatically via the CASE Beeline Message-Sending System (MSS) computer to the outside world.

Incoming message traffic from the MSS is also included in the same electronic file of the associated transmission, referenced via a transmission log.

Once the transmission is completed at the planning level it is forwarded to the EVC for coordination on the actual day of transmission.

An EVC dedicated tool, the Transmission Schedule, allows the EVC staff to scroll through condensed summaries of the daily transmission schedules. The EVC enters the final details of the transmission, such as the real timings.

Subsequently, the completed transmission will be downloaded to the VAX computer environment for statistical analysis and for billing purposes.

TPP system users can access the office tools provided by the DEC "All-in-One" system (used throughout the EBU Geneva Headquarters for word-processing, e-mail, and data-base management), and the news-dedicated BASYS system, by using appropriate windows on their workstations.

It must be emphasised that the overall system remains a planning and coordination aid: it does not replace the ingenuity and the experience of operational staff.

6. Technical overview

6.1. The hardware

The basic hardware configuration is shown in *Fig. 7*.

A token-ring network operating at 16 Mbps connects a number of IBM RISC-based computers in a server-client relationship. The architecture is based around 2 RS6000 type 590 computers serving RS6000 type 32H workstations with large (19-inch) graphical displays.

The system includes 12 operational workstations in the Planning Office and three in the EVC. A number of other workstations fulfil maintenance and system functions.

Serial connections provide links to the EBU telex and BASYS systems. A IBM 6611 router interfaces the TPP network with the main, EBU-wide Ethernet network thus allowing TPP users to connect to the VAX cluster and run applications such as All-In-One office tools.

The two servers are grouped in a clustered configuration and operate in a reliable fault-tolerant en-

Eurovision Planning Office, Geneva.

Photo: Fabrice Piraud

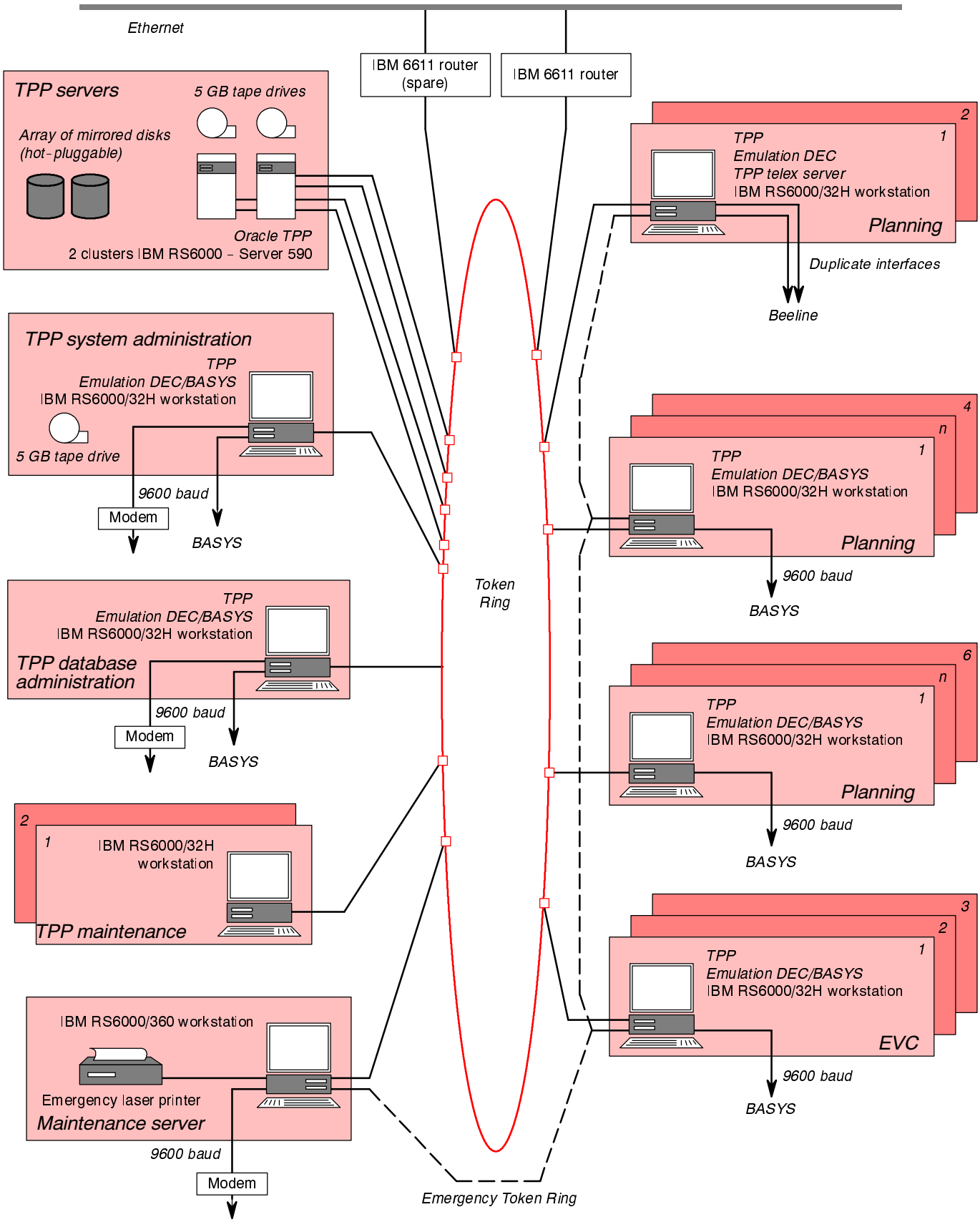


Figure 7
TPP hardware architecture.

vironment using RAID disk technology. Should main network problems occur, an emergency Token Ring network connects a core system.

6.2. The software

The application software lies at the core of the system (see *Fig. 8*).

This has been developed by a specialist company, Syntegra, with the active involvement of the EBU personnel in every stage of development, from the original specifications through to full system testing and acceptance. The system employs Oracle V7 in parallel mode as the relational database, while Forms and SQL language are used for the clients.

User interfaces are achieved through X-Windows (X-Open Motif windows manager) which allows the simultaneous management of several windows: four Oracle forms plus two full-screen Graphical Kernel System (GKS) windows. High-performance graphical displays have been implemented through the GKS graphics toolkit.

In addition to the use of Oracle forms, a large part of the application is written in standard "C" language using Oracle and GKS libraries.

Communication between clients and servers is achieved through Oracle SQL*net software using the TCP/IP protocol.

Use of the IBM AIX operating system ensures full UNIX System V compatability.

7. The change

The complete change period lasted several months. As in the introduction of all major changes, 3 overlapping phases were noticeable during the overall cycle.

7.1. Staff acceptance

This phase involved the "unfreezing" of the attitudes and habits of the staff away from the paper-based system. The planning staff underwent considerable training and preparation. Key-users visited the application development centre in order to test and comment on the last software release, thereby increasing commitment and involvement;

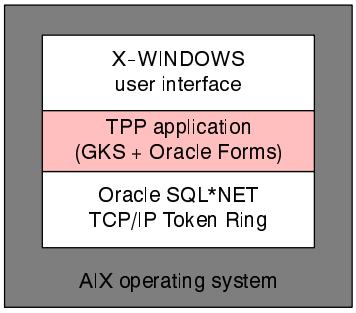


Figure 8
Software architecture.

7.2. The change itself

The actual changeover from the paper-based system commenced on 15 December 1993. This was certainly the most challenging period and lasted until March 1994, when a server upgrade improved the system response times. In spite of long training periods for the staff, and extensive equipment testing, it is very difficult to assess objectively the success of a new system before full operational use takes place.

This is particularly true in the case of a key function such as network planning, where a even a short-term failure in efficient operations could threaten the overall success of Eurovision operations.

Assessment of the system itself under real operational conditions, and of the competences of the staff when fully experienced, is an on-going activity.

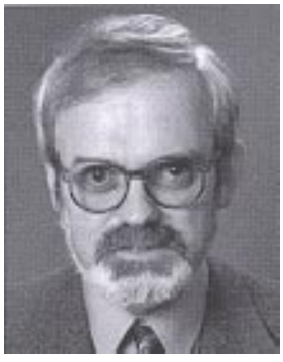
7.3 TPP becomes the normal way of working

This phase is characterized by a "refreezing" of attitudes to work around the TPP, and will have

William Lloyd *graduated from the Atlantic College, Dublin and, after commencing his career as a maritime radio officer, he completed his studies in teleommunications and electronics at the College of Technology, Dublin. Following employment in the private sector, he was employed as a Master Control engineer at RTE.*

He joined the EBU in 1971, commencing operational duties in Eurovision as an EVC technician. In 1985 he was transferred to project engineering and has been responsible for the implementation of various specialized systems. He was project leader for the TPP.

He is presently Head of Network Planning, Eurovision.



been accomplished when the system achieves full operational credibility, and is seen by the users as the normal working environment. This period commenced March 1994, and has been progressively reinforced to date.

Reflecting the passage from the development phase to full operational use, the TPP is now the responsibility of the EBU Computer Service, both for on-going support and the implementation of future developments.

8. Conclusions

Apart from an interruption due to the installation of a new server in February 1994, the TPP has been in continuous service since the implementation in December 1993. An increase in average monthly traffic levels of almost 20% in comparison with 1993 has been experienced during 1994. The number of transmissions handled each day has peaked at times to more than 400. Within this operational environment, the TPP has:

- assisted the Planning Office in handling these workloads with a similar number of staff;
- improved qualitative aspects. The problem of double-bookings has been resolved. Network use has been optimalised. The prompt delivery of accurate statistics is now possible. The data obtained from the TPP has allowed revision of the accounting procedures, leading to more transparent costing and faster billing.
- reduced message-handling overheads considerably, both in the number of staff required and in transmission costs.

9. Future developments

Specialised tools for joint operations involving both the Planning Office an the News Coordinators, in the case of special events, are being developed within the TPP environment and are planned for operational use in early 1995. Following completion of such developments, interfaces will be built with the EBU Sports Programme Division.

As regards an extension of the system towards EBU Members, and in particular the CNCTs across the network, the transmission schedule, developed for the EVC has already been used at a remote site during a special news event. The public switched telephone network (PSTN) was used for data-communications.

A Eurovision Network Management System (ENMS) is currently under development[1]. This system uses the guidelines set out in CCITT Recommendation M.30 and covers management functionalities known as TMN (Telecommunications Management Network). Extension of the transmission schedule to the CNCTs fits within the ENMS programme and could prove very useful to operators throughout the network, by reducing routine coordination voice traffic on the Eurovision technical coordination conference network (TCC); this would free this conference for more urgent tasks. The data-communication component of existing multiplexed leased circuits could be used for signal transport; for the future, the VSAT network could extend the use of this facility.

Some studies into the development of a Members' Access Module (MAM) have been carried out. This would allow Members and clients to access the TPP database directly and send transmission requests, and then to receive feedback on the status of such requests.

However, in the final analysis such future interfaces to the outside world depend upon an overall management approach to the development of the network and its coordination. Future developments of the TPP functionalities will reflect this overall policy.

1. See *page 35* of this issue of **EBU Technical Review**.