Figure 3: *The ESO-Garching remote control room.*

Tentative Time-table of Council Sessions and Committee Meetings

November 12–13	Scientific Technical Committee
November 16–17	Finance Committee
November 26–27	Observing Programmes Committee
December 1–2	Council

All meetings will take place in Garching.

standard network facilities, remote shell, ftp and the X protocol to transfer and/or display scientific data. It takes about one minute to display an image, independent of detector size, in a standard MIDAS display window using the X protocol. Actual transfer of the raw data takes between 3 and 7 minutes for a 1k×1k frame, depending on a user selectable compression algorithm.

The User Interface [6] based on the Pegasus package developed at CFHT, interfaces to these other packages. It runs on top of OSF/Motif and uses standard widgets for data presentation and user interactions. It is completely configurable in the sense that everything that appears on the screen and associated control actions are described in simple ASCII files.

2.2 Second Level Remote Observing

The second level hardware and software configuration has been developed with the aim of implementing a system able to manage remote observations on a multi-telescope, multi-instrument system from European astronomical institutes, and allowing the main control centre of ESO-Garching the full control of the remote operations [4]. The basic three-channel hardware configuration is also maintained for second level remote observing. Full compatibility with the first level and userfriendliness are, of course, provided. Since more than one instrument could be active in the general architecture, multiple secondary levels are foreseen in the overall configuration in order to allow flexible scheduling. The possibility of managing remote observations from more secondary levels on more telescopes is therefore a natural extension of the system.

Since the data channel connects computers already operating, in most cases on networks, two bridges allow an easy way to connect the LAN of the first level with the LAN of the second one. A single Remote Control LAN, comprehensive of all the three levels, is thus obtained allowing an easier use of computing facilities. Future extension of this channel to multiple second levels is straightforward.

Voice and video channel, even if devoted to different uses, can be treated in the same way, since the original signals they have to manage are intrinsically analogous. This fact, on the other hand, added a few more problems to the channel management. The electrical and communication protocols of the serial lines (these channels are generally implemented according to X.21 or V.24 standards) define a point-to-point link instead of a distributed environment. Therefore, in the simplest configuration, voice and video channels directly connect zero level with the second level observing site. However, a direct connection between the zero and first level is required to allow communications between night assistants and the ESO-Garching control centre. In order to maintain a simple hardware configuration, a software solution (SUN talk) was implemented. In the perspective of multiple second levels, a distribution board for serial lines has to be foreseen.

The link connecting first and second level sites should have a bandwidth of at least 64 kbps in order to completely manage all three channels. In a multiple-site configuration, while the first to second level lines will maintain this bandwidth, the main link between the zero level and the first one will obviously need a higher bandwidth, i.e. at least N×64 kbps where N is the number of secondary sites observing at the same time.

A 64 kbps digital ground-based link was leased jointly by ESO and OAT for this test for the duration of one month. Such a connection proved to be a novelty for the German and the Italian PTT companies. Some days at the beginning of the connection period were lost owing to tests on both sides. This kind of problem will hopefully disappear with the increasing integration of the European Community.

The control room at the secondary level site is a duplicate of the main control room at ESO-Garching in line with the resources of the institute. As a general rule, one workstation, two X-terminals and two PCs are required; if the need arises, a disk server for image storage could be used even if it is not essential. Specific equipment for voice and video channels (i.e. telephone set, monitor . . .) is also required.

The extension of the software for second level remote observing involved the implementation of a hierarchical structure. Each node must be defined as primary or secondary according to its level. The secondary node sends its requests (direct access or updating list) to the primary one. It is up to the primary node to route the request to the final target, i.e. the instrument or the telescope control computer. Thus, no direct access to zero level database is allowed from the secondary level. Even if this mechanism may induce some time delay in response, the resulting filter action obtained is very important for the con-