

Data Acquisition Networking

This article will narrow our networking perspective to just what happens in the data acquisition area.

1. Why We Care

Our claim is that the decision making process can be improved by having an accurate mental model of our computing environment. In particular, instrumentation hardware and observing programs should both take networking into account.

The key to the proper mental model is that we have not just added new features but that we have undergone a phase change. The very nature of computing in a properly structured network is different. This phase change from many computers, each with its own services, to one seamless computing environment, was precipitated by:

- Summit network. There is a complete network setup and operating at the summit.
- Waimea link. Tying our two local area nets into one wide area net is a major increase in connectivity.
- Current industry standards. Even though we are a multi-vendor house (DEC, HP and SUN) we have not compatibility problems.
- Previous CFHT investments. Our investments are not all new. Our Waimea SUNs, VMS net, cabling, terminal servers are all integrated in.
- Advent of new computers. This particular project was timed well to allow us the advantages of this technology.

2. Implications

Even the most basic implications of the phase change are many and each is quite important to our ability to perform better science more efficiently. All CFHT computing resources are technically accessible all of the time. Sophisticated observing programs that would require the Waimea SUN-4 or a VMS application as part of the observing loop can now be considered.

Data can be acquired to and from anywhere easily and quickly. Our system design can now consider such questions as "should data be directly acquired onto the Waimea disc drives?" An automated archiving system is also possible.

Instruments (CFHT and visitors) can be direct network devices. We have in fact tested the network to both coudés and the cassegrain environment. Also, we have just completed a successful CIRCUS run in which the French-built CIRCUS control computer was a network device and data was acquired directly across the net.

Remote acquisition and development is now possible. Much engineering at the summit from Waimea has already occurred. We are also planning to use our world wide network connection to benefit instrument development. Our Canadian link will be used to test the MOSIS control electronics before delivery to CFHT.

We are also striving to become a tapeless society. Tape handling errors (especially at 14,000 ft.) and tape processing time are major factors in our current operation. It is

not uncommon when processing imaging data to discover that much more time is spent getting data on and off tapes than is actually spent processing it. It is also true that error checking for correct data transfer on the network is more robust than for tapes.

3. Constraints

We have some real and some self-imposed constraints:

- No system level modification for special run accommodation. This is a bad idea anytime but especially in a multi-tasking networked computing environment.
- Our own CFHT data acquisition software will run primarily on one machine. This will simplify software version control and equipment backup/damage-control strategies.
- Tape drives must still exist as backup equipment and as recognition that some astronomers wouldn't be comfortable without them.
- Much corporate policy has yet to be worked out. Note that we have not discussed remote observing either from Waimea or outside Hawaii.

4. Summary

When designing new equipment or planning a novel scientific program, one really should give the network some thought. Networking is already making a big difference to our nighttime possibilities.

Jon Brewster

An Integrated Observing Environment

1. Previous Situation

In the observatory's design, and in the original implementation, the telescope operator and observer were together in the control room. Unfortunately, it was not feasible to accommodate large visitor instruments and instruments which required CAMAC or instrumentation cabling. The solution was to move the observer to the nearest large, open area, which became the observing room. This has been the situation for the last seven years. That the arrangement did work cannot be argued. That it had significant problems is also a fact. The isolation kept the telescope operator and observer from working as a real team. It left the observer alone with a lot of complicated equipment which had to be operated correctly to achieve good observations. Although the problem was recognized, and frequently discussed, it was not easily possible to alter the observatory layout. Thus, the situation persisted for many years.

2. Planning

With the continuing computerization of instruments and the emergence of CCD's as the preeminent detectors, the observing situation was reconsidered. A working group was formed to study the possibility of again combining the functions of T.O. and observer in one room. The group determined that the amount of equipment required to support CCD imaging and spectroscopy was compatible with a control room redesign. However, at the same time it decided that most other observing, including visitor instruments, would have to remain in the present observing room for a

variety of reasons. It was decided that it would be possible to work within these limitations, and that observing could be performed in both rooms as needed. It is hoped that a later redesign will move the computer room, and make way for a single large control room which handles all observing tasks.

To start the detail design task, a floor plan of the present control room was made on AutoCAD. Various arrangements of control consoles and desks were drawn utilizing the available space. Front panel layouts were drawn, to give an idea of the space available for equipment. Consideration was given to the interaction between the T.O. and observers in making the plans and locating equipment.

The plan finally selected involved the least electronic relocation and cabling in the Telescope Control System. It essentially left the T.O. in his original location. The plan extended the control console across the entire room, and placed the observer on the left side of the room. Observer only equipment would be on that side, shared equipment in the middle, and T.O. only equipment on the right. The console would be extended up to the ceiling; putting TV displays at eye level, and infrequently used and read-only items mounted even higher.

In order to evaluate the ergonomic aspects of the proposed layout, a full scale, wooden mock-up was made of the console and desks. Equipment front panel drawings were pinned to the mock-up, and various staff members and users took turns "test driving" the mock-up. It was decided that the plan would provide ample space for both an observer and telescope operator, and all of their equipment. In fact, some empty panel space was left for expansion.

However, due to the limited floor space in the room it was decided that it would be best to ban all visitor instruments from the control room. It was also decided that the number of persons in the control room should be minimized. Concerns over lighting were noted, to allow astronomers to have a darkened work area while the T.O. has enough light to work efficiently.

3. Implementation

As no down time was given for the project, it had to be fitted into the schedule where possible. The only realistic time turned out to be the aluminizing shutdown in August. The project was broken into two main phases.

Phase one was the renovation of the control room and installation of the new console and desks. No observing functions were moved to the new facility at this time. Preparations preceded the shutdown, and the bulk of the work was done during the shutdown.

After the shutdown, the new console was used for observing as before. The problems noted by the T.O.'s were corrected as required. During this time, preparations were being made to move all the observing equipment to the main control room. This involved building a lot of new cables.

Phase two involved movement of the observing equipment. A coudé run was chosen as the best time, as no observing room support was required. All of the TV controls, leaky memories, and support equipment were moved and tested.

CCD observing started from the new main control room with a coudé run by John Glaspey. This was followed by two

UV Prime spectrograph runs, and then two imaging runs using FOCAM.

As a full circle test, observations have again made from the observing room by teams with visitor instruments.

The switch to the new setup has not been without its problems, but generally all has gone well. We are still in a shakedown period, and are learning how to best have the T.O. and observer work together. It is hoped this area can remain flexible, to adjust to needs of individual observers.

4. Future

While the main control room is already looking very professional, it is not yet finished. There are plans to improve lighting and provide shelf storage areas. It may be necessary to install soundproofing to reduce background noise. And, there may be changes prompted by user's suggestions.

The new setup will certainly bring about changes in observing procedures. For the first time, it is possible for the telescope operator to control the television cameras and leaky memories. This should improve autoguiding by providing more consistent control of the TV system. The T.O. can also be asked to find a guide star, and initiate the AutoGuider. These procedures may be done as part of slewing the telescope to an object. Thus, it may now be possible to efficiently observe with only one astronomer.

However, the layout of the control console still permits observer control of the television system for those observers who wish to do so. Additionally, teams observing from the old observing room must either have the T.O. perform all TV camera manipulations, or dispatch one of their members to the main control room to assist in this function. On the other hand, the small size of the main control room makes it an undesirable base of operations for large observing parties.

5. Summary

The Main Control Room changes are certainly not the ultimate control room that everyone would like. However, considering that the project was performed under limitations of space, time, manpower, and budget, and the constraint of no additional down time, the results are more than was hoped for. The working group believes the changes are a major step forward for the observatory, and that the new control room can only help the quality of data obtained at CFHT.

William Cruise

August 1988 Engineering Shutdown

A 7 day planned shutdown was taken at the end of August with these objectives:

- Aluminize the primary mirror, previously recoated May 1986
- Correct primary mirror support systems deficiencies
- Install load cells as part of the axial defining pads, to enable monitoring primary mirror support behavior
- Renovate the telescope control room to accommodate combined observing and operating activities