



ANGLO-AUSTRALIAN OBSERVATORY

INFORMATION TECHNOLOGY STRATEGIC PLAN

**2004/2005
to
2006/2007**

Version 1.3

INFORMATION TECHNOLOGY STRATEGIC PLAN

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1 Statement Of Purpose

The main purpose of the Anglo-Australian Observatory is to facilitate the best possible science through the provision of world-class optical and infrared observing facilities for British and Australian astronomers. It also takes a leading role in the formulation of long-term plans and strategies for astronomy in both countries and, through its research and development of new instrumentation, to the advancement of astronomy internationally.

The AAO Corporate Plan identifies five key result areas and desired outcomes:

Key result areas	Desired outcomes
1. Telescope operations	Satisfied users and good data
2. Research	Good science
3. AAO instrumentation	An integrated suite of instruments and telescope controls that best meet, in timely fashion, the needs of the astronomical community, with the instruments working as well as they need without being over-engineered
4. External Projects	Satisfied customers
5. AAO Resources	AAO people and funds deployed optimally and stimulated, productive, creative and focussed staff working in a safe environment

The Information Technology Strategic Plan has been developed in the context of the Corporate Plan and to support the achievement of the AAO's corporate outcomes.

The AAO is undergoing a transformation to ensure that it remains relevant for the future. The IT strategies will need to follow this transformation. In addition to the traditional support for Telescope Operations, significant support is also required for project based instrumentation projects for non AAO telescopes. The successful support of the Instrumentation team is vital for the long term success of the AAO.

2 Users

The AAO's IT Strategy must always be relevant to the needs of users and the outcomes they require. The key users of the AAO's IT resources are identified as:

- AAT and UKST Observers (Visiting and staff)
- The Instrument Science Group
- The Instrumentation Group
- Operations staff
- Administrative staff
- The wider astronomy community

3 Strategic areas

This IT Strategic Plan considers the following major strategic areas:

Strategic area	Priority	Timeframe	Cost
Infrastructure management	High	2004-06	\$584,000
Security	High	2004-05	\$30,000
Communication between sites	High	2004-05	\$275,000
Information management	High	2004-05	\$175,000
Telescope Control systems ****	High	2004-05	\$250,000
Business Interruption & Disaster Recovery	High	2004-05	\$120,000
Information Technology Resources	High	2004-05	\$95,000
Funding and budget management	High	2004-06	N/A

Note: **** Telescope Control System costs included in AAT refurbishment

The strategies to address the above are outlined in more detail below and will primarily be implemented by the Information Technology and Instrumentation Groups.

4 Strategy - Infrastructure Management

4.1 Objective

To keep AAO systems current, relevant and cost efficient with maximum interconnectivity and transfer of data.

4.2 Current position

The current AAO infrastructure is outlined in attachment A. In summary,

- All computers at the AAO are networked through local and wide area networks
- A mixture of Unix based systems (including Solaris, Linux and Macintosh OS-X) are primarily used for:
 - Astronomical Data Processing and Storage.
 - Instrument Control and Development.
 - Data processing and instrument control software development.
 - Data storage.
 - Email serving.
 - WWW hosting.
 - Archiving.
- A mixture of Windows based desktop systems for running Office and specialised CAD software. Users without direct access to a Windows computer may access Windows applications through a multi-user Windows system (The "Wincenter")
- A mixture of Notebook systems for staff that require the flexibility and portability such systems offer. These systems may be based upon Windows, Linux or Mac OS-X.
- Legacy systems such as:

- VAX 4000 and 3800 series are used to support instrumentation including the Observer/CCD system, UCLES/UHRF, TAURUS.
 - Interdata Model 70 is used for the Telescope Control Computer System (CCS)
 - X-Terminals providing a thin client interface to the Unix systems.
 - Old DOS, Windows or Linux based PCs running specialist applications.
- A variety of applications are in use and include:
 - Starlink, IRAF, Figaro and IDL are supported for data acquisition and data reduction.
 - Pine, Netscape and Mozilla are used primarily for Email front ends, depending on user preference.
 - Microsoft Office products including Word, Excel, Access and PowerPoint are used on most desktop systems.
 - Specialised CAD packages such as Autocad Inventor, Protel, Zemax and others.
 - Microsoft Project is used for Project Management.
 - Netscape or Mozilla are the primary WWW browsers used by most users, although some people also use Internet Explorer.
 - Pagemaker is used for Newsletter and Annual Report generation.
 - PhotoShop is used for image manipulation.
 - Various AAO developed applications exist, such as 2dFDR.

The wide variety of equipment and applications used in the AAO does increase the total cost of support (covering people, licences, upgrades, maintenance etc.), is less efficient in data transfer and interconnectivity, and does lead unintentionally to some highly specialised/obscure areas.

4.3 Action required

The ongoing maintenance and routine replacement of systems is a never-ending task. As described above, the large variety of equipment leads to additional support effort and costs. It is highly desirable to standardise as much as possible on a single desktop environment and a single server environment. As the world of IT is changing at an ever-increasing rate, full standardisation is probably never achievable.

Recent years have seen a major revolution in the IT industry. The maturation of Open Systems has led to the opportunity for significant cost savings. Similarly, the explosion in quality and performance of commodity PC hardware brings almost infinite computer power into reach. Where once we may have paid many thousands of dollars for a mid powered system, now visitors come along with cheap notebook computers that outperform our fastest servers.

The observatory must take advantage of these price reductions and performance increases. Other than for Windows based desktops, we should standardise on Open Systems running on powerful PC derived hardware. As each Sun system reaches the end of its life, it should be replaced by a Linux based system. The only exception here should be where a significant investment has been made in custom software that only operates in a Solaris environment. In these cases, it is more cost effective to continue to use a Sun system rather than instigate a major project to port the software. This situation should only apply in telescope operational areas or perhaps

with in-house developed laboratory software. All standard business and data reduction type applications should be available in the Linux environment.

The observatory should:

- Standardise on a Linux based replacement for each Sun system as it reaches its end of life.
- Consider accelerated retirement for Sun systems where possible to reduce the overall support load. Plan to have all Corporate Sun systems retired within three years.
- Standardise on a particular version of the Windows operating system for the desktop systems in order to reduce support loads.
- Continue to take advantage of Microsoft products in the desktop space.
- Plan an ongoing process of replacing systems to ensure the infrastructure is maintained to an acceptable level.
- Be mindful of the replacement costs of all systems purchased to ensure that replacing them at their end of life will be affordable.

4.4 Budget needs

Major capital funding of \$584,000

4.5 Priority

High

5 Strategy - Security

5.1 Objective

To ensure that systems are secure and workable.

5.2 Current position

There are many threats to the ongoing operation of the AAO's systems. They include but are not limited to:

- Computer viruses and worms.
- People wishing to "hack" into our systems because "they are there".
- Hackers compromising our systems to obtain a safe launching pad against their real target.
- Vandalisation of our web site to make a political or other statement.
- Bulk unsolicited email (spam).
- Theft of AAO intellectual property.
- Improper use of facilities by internal AAO staff and visitors.

The consequences of attacks can be many and include:

- Damage to the AAO's reputation, as we may appear to be originating attacks or spam.
- Business disruption and cost as infected systems are repaired.
- Loss of data.
- Loss of a competitive edge if our critical intellectual property became known to our competitors.

Clearly security is something that must be given the highest priority but it must be recognised that security is a necessary constraint on the business; it is not in itself a goal.

To provide protection from these threats, the observatory currently implements:

- Symantec antivirus software on all Windows based desktop systems.
- Sophos mail filtering software use to eliminate Virus infected emails before they are received by the end user and to help minimise the quantity of unsolicited bulk email (spam).
- Firewall to limit connectivity to and from the Internet to only legitimate and approved purposes.
- A "double authentication" scheme to allow AAO authorised users to connect to AAO systems from locations external to the observatory.
- Comprehensive monitoring of activity by IT Support staff to identify problems at the earliest opportunity.

5.3 Action required

Investigation of new and secure ways to provide users with the access they need without imposing significant restrictions. Include an investigation of VPN technology and Secure ID type systems.

Investigation of techniques and tools that will better enable the automation of security related functions such as the monitoring of activity and the application of security patches to all computer systems.

The Information Technology Group will prepare and maintain a security policy document. This security document shall include but not be limited to:

- An acceptable use policy
- Ongoing security monitoring policy
- Techniques to ensure the timely installation of operating system security patches on all systems.
- Techniques to prevent emails containing viruses or spam from being received by end users.
- Techniques to ensure anti-virus software is run on each Windows based system.
- Procedures to be followed in the event that a security breach is detected.
- Firewall configuration policy.

In providing secure systems, a balance needs to be found between the security measures and the goal of providing easy to use systems for legitimate users. New technologies are becoming available that assist with this balance. While there may

be some constraints on legitimate user activity, it is essential that this need for security does not become an excuse for failing to meet user needs. Surveys of AAO staff and users shall be performed to determine whether the current security policies are having the greatest adverse affect on ease of use, and solutions for these areas will be identified.

5.4 Budget needs

Capital injection of \$30,000 required allowing the automation of security patch management.

Other security related costs are considered in the section 6.

5.5 Priority

High

6 Strategy - Communication between sites

6.1 Objective

- To provide high speed access between AAO sites.
- To provide easy access for remote users of AAO facilities no matter where they are in the world.
- To provide efficient communication between the AAO and other organisations with whom the AAO is collaborating.

6.2 Current position

The traditional focus of this section relates to communication between Epping and Siding Spring. For many years, the Internet connection to Siding Spring has been a single 128Kbit ISDN line. All users of Siding Spring Observatory shared this link. The costs of providing a faster link are very high and the cost effective option has been for the AAO to contribute towards a fast link to be provided by RSAA. An agreement has been reached that will see this link, operating at gigabit speeds, becoming available to SSO in late 2005 or early 2006.

The poor performance of the Internet connection to the telescope has been one of the most frequent complaints made by visiting observers who complete the feedback form. The low speed of the link also severely limits other remote activities from Epping. As an interim measure, a 512Kbit link became available from May 2004 and has improved facilities for visiting observers as well as improved remote access for Epping based staff to the SSO site.

While the traditional focus is still important, of vital importance to the AAO is the provision of excellent connectivity to other organisations with whom the AAO may be

collaborating on instrumentation projects. In particular, the provision of Video Conferencing facilities and ease of access to share information are essential.

6.3 Action required

From the time the new link to site is first made operational, the AAO will be able to take advantage of 10Mbits of bandwidth. This represents at least a twenty fold improvement on the current situation, but is only a tiny fraction of the bandwidth that is available. To fully take advantage of the new link, additional equipment will be required:

- Gigabit link between the AAT and the ANU administration building.
- New firewall/VPN Router in the AAT
- New firewall/VPN Router in Epping.

The VPN Routers will also provide the capability to allow secure access to the AAO network for staff working from home or other remote locations and to facilitate connectivity with other organisations with whom the AAO is collaborating.

Provisioning of Video Conferencing facilities to allow Epping to connect to the rest of the world (not just site) are essential.

Prior to the gigabit link becoming available, the IT group will prepare a policy document which should include, but not be limited to:

- Integration of the SSO Site and Epping Networks using virtual private network (VPN) technology.
- Provision of video conferencing possibilities.
- An investigation of reducing telephone costs by using voice over IP technology.
- Strategies for reducing the need for Epping staff to visit SSO Site to do work on computer systems, possibly even to reduce the need to travel to provide observing support.
- Provision of full access to instrumentation systems at site to Epping based software support staff.

An essential element of successful integration of Epping and Site is that users receive a consistent experience at both locations. Computer set-ups and policies should be consistent between both Epping and Site. A user based at Epping should be able to visit site and find a familiar computing environment. Where possible, a staff member will be allocated prime responsibility for an area at both Epping and Site, thereby ensuring consistency. This should also reduce the overall workload of the group, as work will not be independently performed at each location.

6.4 Budget

Major Capital funding of \$275,000 required to implement:

- Secure VPN based computer communications
- Video Conferencing
- Update of PABX infrastructure.

6.5 *Priority*

High

7 **Strategy - Information Management**

7.1 *Objective*

To capture data once and ensure that multiple users are able to process, analyse and report on that data in a timely and cost effective manner.

7.2 *Current position*

AAO information is processed and stored on disparate systems some of which are electronic and some manual. This is a cumbersome and inefficient way of dealing with information and results in delays, frustration and errors.

7.2.1 Financial Systems: The AAO financial management system is confined to a small local network accessible only by the Administration Group. Many work groups need to keep details for project life costs of past expenditure for goods and materials and often keep parallel sets of information. They also produce a hard copy purchase order that is then re-keyed into the financial system. The output of the financial system (budget reports and so on) is manually distributed. In addition to duplication of effort, the information is difficult to use. At a minimum, the financial system will be made available to all users, with appropriate security. This would enable users to key in their own purchase orders directly and access the archive. Ideally, the user interface would be web-based. In any event, there would be a clear gain in efficiency and useability.

7.2.2 Project Tracking/Accounting: The AAO is heavily engaged in building instrumentation some of it for other organisations. Project schedules and time and money spent on projects are important information elements. The project schedules are on-line but are difficult for team members to access. Time spent on projects is logged on Excel spread sheets, is manually keyed into the project schedules by project managers, and manually keyed into the financial system by the Personnel Officer. The link between the financial system and the project schedules is also manual.

The project management systems would be more difficult to address. An attempt a couple of years ago to automate time recording and the linkage of purchase orders to projects was unsuccessful. It is time to revisit the issue. A rigorous review, involving all interested parties, will be conducted under the aegis of the IT Strategic Plan.

7.2.3 Project documentation: Document management and change control is not done well in the AAO. Again, a rigorous review, including consideration of document storage, will be conducted under the aegis of this Strategic Plan.

7.3 Action required

- Survey and documentation of user and organisational requirements
- Preparation of project briefs and business cases
- Implementation of interim measures and improved training
- Preparation and implementation of Document and Change Control policies and procedures. See also appendix C.

7.4 Budget

Major Capital funding of \$175,000 to allow:

- Implementation of a new Accounting/financial management system
- Implementation of a new Project Tracking/Accounting system
- Update of Administration network and systems.

7.5 Priority

High

8 Telescope Control System

8.1 Objective

To allow the continued efficient and reliable operation of the AAT with reduced maintenance and support effort required. The new system will also allow more flexibility to accommodate future observing needs that may become required due to innovative instrumentation or research concepts.

8.2 Current position

The Telescope control system is currently based on an Interdata model 70 minicomputer. This is still the same system that was installed when the telescope was constructed. The system has proven to be extremely reliable, but it is aging, and reliability can be expected to fall in future years. Only a single staff member holds full knowledge of the system.

Replacing the Interdata system will also remove dependencies that presently prevent the updating of other aging electronic systems.

The system has been augmented over the years with facilities well beyond anything available in the early 1970s. Future enhancements are both risky and expensive, if they are possible at all.

8.3 Action required

Implementation of the Telescope control System Project.

8.4 Budget

The budget requirements of \$250,000 for this project are detailed in the Telescope Infrastructure project.

8.5 Priority

High

9 Business Interruption and Disaster Recovery

9.1 Objective

To minimise the risk of a disastrous event and to plan to deal with a disaster should it occur.

9.2 Current position

The AAO has developed a business interruption and disaster recovery plan. The key components of the plan being:

- Disaster prevention
 - System redundancy
 - Data back-up and archiving
 - Records management
 - System security and plans.
- Disaster planning
- Disaster recovery
- Business recovery
- Archive and contact listing records

These plans are complete for Epping but there are gaps in relation to Siding Spring; this will be remedied as a priority. Detailed plans are shown in Appendix C.

9.3 Action required

9.3.1 System redundancy: For many critical functions at the AAO, there is no System redundancy. A failure of a critical system can prevent key business functions from operating until the faulty system is repaired. For many critical systems, spare parts or maintenance contracts may be held to facilitate a speedy repair. For some computer systems, it is not the hardware that is critical, but rather a particular software application that is running. Wherever possible, such software applications should be installed, ready to go on multiple systems. This would enable operations to continue in the event of a failure of a key machine.

The Information Technology Group shall prepare documentation identifying the roles of each IT system, and identifying the business functions that will be unavailable in the event of a complete failure of a system. Wherever possible, systems will be set up in such a way that users would be able to switch to an alternative system in the event of a failure of the primary machine. For observing related systems, such a switch should be able to be performed by rostered staff without the need to call on any IT support people.

9.3.2 Data Backup & archiving: Data backup is important not only in the context of a major disaster, but also in the normal day-to-day operation of IT systems. Individual

computer failures may not be considered a disaster to the organisation, but can be effectively a disaster for the individual staff involved.

Large amounts of computer data are stored on various computers throughout the Observatory. This data may represent:

- Archived observing data
- Intellectual property being developed by the project teams
- Management information
- Email
- Research papers and results
- The work output of many people within the Observatory
- The set-up and configuration of computer systems

The data may be distributed in a number of places. It may be on one or more servers, PCs and notebook computers. All systems are vulnerable to a potential disk failure. Notebook systems are also vulnerable to theft. It is vital that critical data be backed up such that it will not be lost in the event of a disk failure or theft of equipment.

The responsibility for backing up data is also distributed:

- The Information Technology Group is responsible for backing up information contained on corporate servers (i.e. all servers that do not “belong” to a particular workgroup).
- Individual work groups are responsible for backing up data located on their own servers
- Individuals are responsible for backing up data located on their own notebook or desktop PC hard drive.

This distribution of responsibility is problematic and the potential for loss is too great to allow this to continue. The Information Technology Group will conduct a review of this area, and move to take over the responsibility, as far as is practical, for automated and central backing up data located on individual’s PCs.

With the purchase of any new system that requires backup support, consideration must be given at the time of purchase how the backup requirements for the new system will be met. For systems managed by a work group, the Information Technology group will provide advice and assistance as required.

A System Backup Policy shall be created which should clearly state:

- what data is backed up
- what data is not backed up
- central and local backup schedules and techniques
- policy for maintaining off-site copies of backed up data.

9.4 Budget

Major Capital funding of \$120,000 required allowing the implementation of a centralised data backup system.

9.5 Priority

High

10 Information Technology Resources

10.1 Objective

To ensure that the IT strategy and goals are adequately resourced, roles and expectations clearly defined, and inter group co-operation enhanced.

10.2 Current position

IT resources are contained within the IT, and Software working groups and may be both at Epping and site. Individual workgroups also provide, to a limited extent, their own IT support. For example, work groups may choose to take responsibility for their own IT hardware purchases. In all cases, the resources of the IT group are available to assist where required.

The workload of the IT Support group is very high, and day-to-day emergencies sometimes limit the time available to consider more long term issues.

Software development, while a traditional IT role, is arranged in an independent group within the Observatory. The focus of the software group is toward project work rather than the day to day running of IT within the organisation.

IT Support coverage is only provided during the normal working day. Routine support outside of normal working hours is provided only on a best efforts basis and fully at the discretion of the staff involved. The IT staff are not “on call” and are under no obligation to be available outside of normal hours. That being said, the IT Support team has an excellent record for providing all support possible regardless of the time of day. Where a specific event or activity of very high priority is to take place outside of normal hours, arrangements may be made with the team to provide support for that particular event or activity.

Details on the IT work group are contained in Appendix B.

10.3 Action required

- Modernisation of work practices to facilitate a reduction in routine workload.
- Guidelines for IT support activities that are being carried out by non-IT people.

10.4 Budget

Major Capital funding of \$95,000 required to:

- Purchase Help Desk Software
- Provide comprehensive training for the IT Support team.

10.5 Priority

High

11 Strategy – Funding and Budget Management

11.1 Objective

To obtain capital funding to meet long term needs, reduce the total cost of ownership, make greater use of bulk purchasing power, and to use more cost/benefit analyses to assist in investment decisions.

11.2 Current position

The acquisition of information technology is a major investment decision which should only be made if the benefits exceed the costs. Costs include the capital cost of hardware and software, maintenance contracts, and the cost of IT support and other staff time.

The AAO has already moved towards a more strategic approach in deciding upon an appropriate capital budget and the allocation of that budget. There is still considerable room for improvement. There is a tension between central control and decentralised purchasing.

11.3 Action required

- Preparation and costing of long term IT plans (see framework below)
- Clearer policy on hardware and software purchases and the model for central versus decentralised purchasing.
- Preparation by the Information Technology Group of guidelines for the purchase of IT hardware and software.

11.4 Total IT Budget Requirements

Budget type	2004/2005	2005/2006	2006/2007
Capital	\$300,000	\$867,000	\$112,000
Recurrent	\$240,000	\$234,000	\$224,000
TOTALS	\$540,000	\$1,101,000	\$336,000

11.4.1 Corporate IT Capital Budget Requirement

ITEM	Strategy ref.	2004/2005	2005/2006	2006/2007
Infrastructure management	4	\$105,000	\$367,000	\$112,000
Security	5	\$0	\$30,000	\$0
High Speed Link	6	\$175,000	\$100,000	\$0
Information Management	7	\$0	\$175,000	\$0
Business Interruption & disaster recovery	9	\$20,000	\$100,000	\$0
Information Technology resourcing	10	\$0	\$95,000	\$0
TOTALS		\$300,000	\$867,000	\$112,000

TOTAL	\$1,279,000
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Note: **** Telescope Control System costs (Strategy ref. 8) included in AAT refurbishment.

11.4.2 Recurrent Budget

ITEM	2004/2005	2005/2006	2006/2007
Corporate IT Maintenance	\$60,500	\$55,000	\$40,000
Mechanical Workgroup IT Maintenance	\$27,000	\$23,000	\$23,000
Electronics Workgroup IT Maintenance	\$10,000	\$8,000	\$8,000
Administration Workgroup IT Maintenance	\$500	\$500	\$500
Epping IT Consumables	\$12,000	\$13,000	\$14,000
Coonabarabran IT Consumables	\$33,000	\$33,000	\$34,000
Direct Training Costs – IT Support Staff	\$8,000	\$8,000	\$8,000
Software Costs	\$62,500	\$67,000	\$70,000
Other	\$26,500	\$26,500	\$26,500
TOTALS	\$240,000	\$234,000	\$224,000

11.5 Priority

Varies according to project

APPENDIX A- Summary of Current Infrastructure

This section summarises the current IT infrastructure at the AAO at its two telescopes and Epping laboratory. It is not completely exhaustive, but covers the major systems and applications.

A.1 Local and Wide Area Network

All computers at the AAO are networked. Ethernet running at 10 and 100 Megabits per second (Mbps) is used at both Siding Spring and Epping as the primary interconnection method between computers. Siding Spring also has Gigabit Ethernet (1000 Mbps) available in the control room and the main computer room. The main protocol used on the Ethernet is TCP/IP.

Epping runs a collapsed switched 100 Mbps backbone between fast Ethernet switches and central servers. All nodes run on 10 or 100 Mbps switched Ethernet ports. At Coonabarabran, the AAT runs a Gigabit switched fibre optic Ethernet backbone implementing a single subnet connecting both critical observing systems and standard infrastructure servers such as the mail server. All computer and control room nodes run on 10, 100 or 1000 Mbps switched connections. Other work areas (1st floor offices, 2dF area, 4th floor etc), run on 10 or 100 Mbps switched connections. A small quantity of 10Mbit shared connections are still in use but are being phased out of service. The Schmidt telescope currently runs 10 and 100 Mbps Switched Ethernet. A plan is in place to split the AAT subnet to separate critical observing functions and the non-critical user network. There is a 100 Mbps fibre optic Ethernet connection between the AAT and Schmidt telescopes, and a 10 Mbps fibre optic Ethernet connection between the AAT and the facilities of Siding Spring Observatory (SSO).

There is currently a 512 Kilobit per second (Kbps) connection between SSO and the ANU/Mount Stromlo Observatory in Canberra. This link provides access to the Internet for the AAT and Schmidt telescopes.

There is a 100 Mbps fibre optic Ethernet connection between Epping and the CSIRO TIP. This provides Epping with high speed access to the Internet, via CSIRO and AARNet. The Epping link to the telescopes is via the AARNet connection to MSO.

A.2 Unix/Linux/Macintosh Systems

The AAO uses a mixture of Unix based systems. These include:

- Solaris
- Linux in many flavours
- Macintosh OS-X

From a cost and systems management perspective, it is highly desirable to limit the proliferation of such a variety of systems. Currently, a wide range of such systems are being supported.

The main Unix systems in use at the AAO are based on Sun hardware running the Solaris Operating System. These are primarily used for:

- Astronomical Data Processing and Storage.
- Instrument Control and Development.
- Data processing and instrument control software development.
- Data storage.
- Email serving.
- WWW hosting.

The Sun systems will be phased out of service as they fall due for replacement and will be replaced by Linux based systems except where legacy software applications make it impractical to do so.

The Sun systems include the following:

- Main disk and Email server (one each at Epping and the AAT).
- Two compute servers (one each at Epping and the AAT) with additional disk space. These are used for general data reduction and instrument control.
- 2dF Systems (one each at Epping and the AAT). 2dF software control is based on the DRAMA system.
- Two new “instrumentation” servers at the AAT.
- WFI data processing systems (one each at Epping and the AAT).
- WWW server system (Epping). This system also provides an FTP server and serves the COSMOS database.
- WWW mirror system (AAT).
- Software development system (one each at Epping and the AAT).
- System management systems (two at Epping and one at the AAT).
- Schmidt Telescope data processing system.

The age of the Suns varies from several months to seven years. Both Epping and the AAT currently have around 500 Gbytes of disk space connected to various Suns. The main disk servers currently have 150 Gbytes of local data disk available, and the compute servers each have at least 18 Gbytes of local disk space. There is about 40 Gbytes of disk space available on the Schmidt telescope Sun.

Exabyte and DAT tape drives are connected to a number of Suns at each site for general use. DLT systems are used at the AAT and Epping for main disk system backups.

Most of the Suns run Solaris 2.6, Solaris 8 or Solaris 9. A small number (two or three) of systems are running earlier versions of the Sun operating system for compatibility reasons. A project is underway to upgrade all 2.6 and earlier systems to Solaris 9.

Linux is widely used by astronomers, particularly running on notebook computers and some desktop computers. Linux systems are also destined to replace the Sun systems as they come to the end of their life. Major Linux systems currently in place include:

- Data reduction servers: 1 at Epping, 2 at the AAT and 1 at the Schmidt.
- Disk server at the AAT.
- Web mail server at Epping
- Document server at Epping and the AAT.
- Archiving system at the AAT

The disk space offered by these systems is huge in comparison to the Sun systems. At the AAT, the disk space exceeds 2 Terabytes.

Macintosh OS-X is growing in popularity. It is mainly used on notebook systems, although a number of desktop systems also exist within the observatory. It is a candidate for consideration in server applications, although no plans currently exist to deploy it in this way.

Staff and visiting astronomers use a mixture of Sun workstations, Network (X) Terminals and Linux/Windows notebook computers. Several astronomers have Sun workstations on their desktops with local disk space. Visitors to the AAT are more and more relying on their own notebook computers for data reduction purposes rather than on AAT provided systems.

A number of astronomers and most programmers use Network (X) terminals to access Suns and the WinCenter system. Network Terminals are also used at the AAT in the Control room and visitor offices.

A Unix policy document shall be created describing the support status of the various Unix like operating systems. In particular, this should describe the preferred Linux platform for use within the observatory once a potential winner in the astronomical community becomes apparent. Hardware considerations also shall be included in the document.

A.3 Legacy Systems

The AAO operates a number of “Legacy Systems”. This term refers to systems that are still in use despite having exceeded the lifetime anticipated by their manufacturer. Such systems, while probably performing their intended purpose very well, can represent a significant support challenge.

The key legacy systems operated by the Observatory in 2004 include:

- VAX 4000 system at the telescope controlling the detectors for the UCLES instrument and the UCLES instrument itself.
- VAX 3800 system at the telescope, providing disk sharing capability for the VAX 4000
- VAX 4000 at Epping used for Software development
- Interdata Model 70 operating the Telescope Control System.
- Interdata Model 70 at Epping available for software development
- Nine Track Tape drives at Epping and Site.
- Numerous old PC based systems.

VAX 4000 systems running VMS 5 are operated at each site to support instrumentation including the Observer/CCD system (at each site), UCLES/UHRF, TAURUS etc. These instrumentation systems are based on the ADAM environment. The AAT VAX 4000 system has additional disk space for raw CCD data acquisition (9 Gbytes). The VAXs are networked via 10 Mbps Ethernet connections.

An Interdata Model 70 is operated at the AAT as the Telescope Control Computer System (CCS). There are several decommissioned Interdata computers at the AAT providing spares for this system. There is also an Interdata Model 70 at Epping used for occasional software development and support. The CCS and the VAX 4000 communicate via a CAMAC based shared memory system. A VxWorks VMEbus system with a parallel interface to the CCS provides a network interface to the CCS for Unix based systems.

Plans are in place to decommission and replace the larger of these legacy systems. As time rolls on however, other systems may potentially move into the “legacy” class.

Of particular concern with many legacy systems is that they may represent the weak link in terms of security. Security patches may either not be available, or, if they are available, it may be considered too high a risk to install such patches on a working but fragile system.

A document shall be maintained detailing all systems considered to be “legacy” systems. This document shall identify any special security, support and spare parts requirements, plus which staff possess knowledge about the system and identify a plan for the replacement of the system. This document should be reviewed and updated at least once a year.

The planning of all new systems put in should also include consideration of the system’s end of life. Plans should include wherever possible “sunset” planning for each system’s eventual retirement or replacement. This may be far more difficult for instrument systems than for general IT systems.

A.4 Maintenance

The AAO holds maintenance contracts for key hardware and software systems.

- For software systems, these contracts primarily provide access to product updates for the duration of the contract.
- For hardware, these contracts act as either an “extended warranty” or perhaps as an insurance policy to protect against potential failures.

The contracts are held for key hardware systems to ensure that they can be restored to full function after a failure in minimum time. The Information Technology Group should review the systems under maintenance each year, and only critical systems should be covered.

Like any insurance policy, the cost of paying the premium must be compared with the potential cost of not being insured. Maintenance contracts are also only of value if they are called upon when a failure occurs. Particular care needs to be taken in choosing maintenance contracts. For example, paying for a 4 hour response to problems is pointless for equipment that is located at site unless the provider has the capability to service regional areas. As equipment ages, it is also necessary to keep a close eye on the maintenance costs. For example, in the 2003/2004 financial year, we were originally asked to pay 3 to 5 times the replacement cost for an old SUN system for the annual maintenance fee. Maintenance contracts are held for the critical Sun systems at each site. The VAX 4000 systems and some of their peripherals are under maintenance due to the fact that they remain critical for day to day operation. Network equipment at each site is also under maintenance due to the fact that it is critical to AAO operation.

With extremely powerful Computing hardware now available at very modest prices, hardware maintenance contracts are becoming less and less attractive. Most new systems are supported by a three year warranty from new, and after that time, would be easily replaced with equivalent commodity hardware should the need arise.

Other Suns, all PCs, printers and other equipment are repaired or replaced when or if they fail.

Specialist hardware used within instrumentation systems is maintained by ensuring a good stock of spare parts is kept. Maintenance contracts are not used for this type of equipment.

A.5 Desktop Systems and Applications

There are a number of Windows PC Workgroups at Epping as follows:

- The Administration Workgroup uses several PC based Windows Workstations and a Server. These systems primarily run MS Office products and a Management Information System. The Administration workgroup runs on its own IP subnet for security reasons. The administration system hardware and MIS software support is largely outsource.
- The Epping Electronics Workgroup uses several PC based Windows Workstations and a Server. These systems primarily run the Portal electronics development system and MS Office products in addition to some other Electronics CAD packages and tools.
- The Epping Mechanical Workgroup uses several PC based Windows Workstations and a Server. These systems primarily run AutoDesk, Mechanical Desktop and MS Office Products and some other optical and mechanical CAD packages (e.g. Zemax) and tools.

There are also several non-workgroup PC based Windows systems used for desktop applications, including the library, IT systems support and the Director's Assistant. Some of these systems use Pagemaker for producing the AAO's newsletter. The library database is a commercial product called MicroCAIRs.

Several other PCs running various versions of Windows are used for application specific tasks in the electronics, mechanical and optical labs.

There are a number of standalone Windows Workstations at the AAT and Schmidt telescopes. These are used for the Archive database, as well as individual desktop systems and other application specific functions. There are a number of older PCs running earlier versions of Windows also for application specific functions.

There are WinCenter (multi-user Windows 2000) PC systems at Epping, and the AAT. These are used to provide Unix and Network terminal users with access to desktop applications. The Epping system is also used as a server for project documentation and information.

Several users at Epping and one user at the AAT run Macintoshes for desktop applications.

Desktop Applications packages are based on Microsoft Office suite of products, including Word, Excel, Access and Powerpoint. Microsoft Project is used for project management. In the 2003/2004 year, the AAO enrolled in the "NSW (Government) Agreement for Microsoft Software" (NAMS). This agreement provides comprehensive coverage for all Microsoft software within the AAO, at a price below what we used to pay only for limited Microsoft Office licenses. The agreement has been negotiated by the NSW Government, and in addition to other benefits, brings "Enterprise" licensing, usually reserved for organisations with greater than 200 seats, to smaller organisations such as the AAO. The agreement lasts for a mandatory three years, with an optional further two years. It is probable that a similar agreement will be negotiated at the conclusion of the five year term.

In summary, the NAMS agreement entitles us for each of our PCs to:

- Microsoft Windows Operating System
- Microsoft Office (Including for Macintosh)
- Non Office productivity tools (Project, Visio, publisher)
- Microsoft Windows Server software.

We are entitled to use the version of our choice of each of the packages.

The Information Technology Group shall support the newest version of each product wherever possible. Where a workgroup has a particular requirement for an older version of a Microsoft product, it will be supported at the request of the work group. The minimum versions supported for new installations would be Windows 2000 and Office 2000. Windows NT 4, will be phased out as opportunity to do so arises.

A.6 World Wide Web

Extensive use is made of World Wide Web tools mainly for information distribution and publicity. There are two separate WWW servers, one for external public access, and the second is for internal access only. The later system is used to provide all staff with access to corporate and management information, staff information, computing facilities information etc.

The Information Technology group shall provide a Web Policy document. This document shall include:

- Guidance on the formatting of AAO web pages
- Policy regarding personal web pages hosted on AAO servers
- Identification of the staff responsible for particular aspects of the AAO web sites.
- Guidance regarding the publication of Intellectual property, including methods to restrict the viewing of appropriate material to only authorised people.

A.7 Hardcopy

There are a number of black and white laser printers available at each site for hardcopy. Most of these have duplexors and most are network accessible. Each site has a low cost colour inkjet printer and a high quality A4 colour laser printer.

A.8 Programming Languages and Instrumentation Environment

C/C++, Java, Fortran (77 and 90) are provided for programming on Suns. C/C++ is also available for Windows. Linux provides C/C++, Java and Fortran.

The DRAMA instrumentation environment was developed at the AAO for the 2dF control system. This is a cross platform system running on Unix, VMS, VxWorks and Linux. It is also used for IRIS2 and 6dF instrument control, and will be used for AAOmega.

A.9 Applications

There are many applications in use. Some of the major ones include:

- Starlink, IRAF, Figaro and IDL are supported for data acquisition and data reduction.
- Pine, Netscape and Mozilla are used primarily for Email front ends, depending on user preference.
- Microsoft Office products including Word, Excel, Access and PowerPoint are used on most desktop systems.
- Microsoft Project is used for Project Management.
- Netscape or Mozilla is the primary WWW browser used by most users, although some people also use Internet Explorer.
- Pagemaker is used for Newsletter and Annual Report generation.
- PhotoShop is used for image manipulation.
- Various AAO developed applications exist, such as 2dFDR.

A.10 AAT Control Room Environment

The AAT control room environment is a significant factor influencing the experience of visiting observers. While the control room is not officially controlled by the IT group, it is never the less dominated by all things IT. This ranges from issues of noise, to the experience of using the provided computer systems. Adverse comments made by visitors about the control room tend to reflect strongly on the IT group.

An AAT Control Room Policy document shall be provided. This document shall identify who is responsible for all aspects of the control room, and clearly identify the IT related requirements and facilities. The document should consider the full IT experience seen by visiting observers.

APPENDIX B- Information Technology Group

The Information Technology Group exists to enable others within the organisation to achieve their goals. The group must be responsive to the ever-changing needs of the Observatory in an IT environment that is itself very dynamic. The group must:

- Provide mechanisms for users to request assistance both to resolve problems and to provide new facilities within agreed service level standards.
- Implement changes that are needed only after consultation with affected stakeholders.
- Communicate effectively in both directions between itself and its users.
- Have solid work plans that exist over and above the day-to-day issues of keeping the systems running.
- Provide proactive plans for systems growth and evolution.

B.1 Group Structure

In June 2003, The IT Support groups underwent a restructure. The key change was the creation of an IT Manager position, the moving of hardware and corporate purchasing responsibility into the group, and the renaming of the group to the Information Technology Group.

In May 2004, the group consists of nominally 5 full time positions, consisting of:

- IT Manager Based at Site
- 1 Support group member at Site
- 3 Support group members at Epping

Two people, each part time, fill one of the Epping based positions.

Particular work areas are to be identified where an Epping based staff member may take responsibility for both Epping and Site. This will have the added advantage of ensuring consistency between the two locations. The IT Manager should also have a formal presence in Epping at pre-arranged times, providing formal IT briefings for Epping staff and providing an opportunity for personal consultation.

B.2 Requesting Assistance

Users must have reliable means by which help or new work can be requested from the Information Technology Group. Requests tend to arrive on one of three ways:

- A quick chat, either in person or on the telephone
- Email
- A formal electronic request system

The best choice for any but the smallest of problems is the formal request system. Requests may of course be initiated through informal methods, but should be backed up within the formal system. Such a system shall be maintained by the group, and users will be encouraged to use it. Formal systems such as this provide a number of benefits:

- Requests and their consequential results are “on record”, making overall management of the group’s activities easier.
- Requests are visible to all group members, not just the person who happened to be in the office at the time the request was made.
- Users do not need to know who is the right person for a particular task.

B.3 Communication and Feedback

There need to be formal meetings in which the Information Technology Group can discuss issues with the various staff groups. Feedback can be given at any time over any issue, but a formal and regular meeting is an excellent opportunity for routine matters to be discussed.

At least twice a year, meetings shall be organised by the Information Technology Group at both Epping and site. All staff would be welcome to attend the meetings. The agenda of the meetings would typically include:

- Update/Report from the IT manager about current events.
- A presentation/discussion on a particular theme of interest.
- Open session for the raising of issues by staff.
- General discussion.

In addition to regular formal meetings, it is essential that users be consulted on changes that may affect them, and informed of when and how changes will take place. As changes occur, it is essential that user documentation be kept up to date.

Visiting observers at the telescopes provide feedback via a web-based form at the conclusion of their observing run. This feedback is made available to the board as a measure of the Observatory's performance in all areas (not just in IT). The IT related scores and comments received from this form are important feedback for consideration by the IT group. Issues raised should be promptly addressed.

B.4 Work Planning

A group such as the Information Technology Group spends a lot of time responding to routine problems. In some circumstances, a cycle can develop whereby all the group's energy is consumed by solving problems, and no time is left over to look at more strategic improvements. The failure to look at the more strategic issues will no doubt cause an increase in routine problems, which leaves less time for strategic issues and so on.

It is vital that the Information Technology Group fully participates in the work planning process followed by the Observatory. These work plans should be regularly reviewed.

The focus of the work plans should be both the implementation of new facilities requested by users, but also the use of new technologies to always aim to provide a better experience for users for reduced effort by the Information Technology Group staff.

APPENDIX C - IT Supporting Documents

As part of the implementation of this plan, various IT documents and policies have been identified. Two key documents to be produced are:

- (a) An “action plan” which will describe the people responsible for and the milestones for each project.
- (b) Document control for which a central index page will be created that clearly lists for each document:
 - Who is responsible for the document
 - Date of last review/update
 - Version control
 - Due date for next review/update

Where possible, these documents and policies shall be made available on the AAO Intranet.

The following represents the minimum set of documents that shall exist:

Document	Status as at 31/01/05
• IT Strategic Plan implementation “action plan”	Early draft available
• Security Policy	Available
• Privacy Policy	Available
• Computer Usage Policy	Available
• High Speed link: What it could mean to the AAO	Document to be developed. Due for completion end 2005
• Financial Systems Management Review	Project brief to be developed
• Project Systems Management Review	Project brief to be developed
• Business Continuity policy <ul style="list-style-type: none"> - IT Backup Policy - Disaster Recovery Plans - Computer Disaster Recovery Analysis & Plan 	Available Available Available
• IT Systems Roles and Redundancy	Document to be developed. Due for completion June 2005
• Infrastructure Management <ul style="list-style-type: none"> - Hardware Purchasing Guidelines - Maintenance Contract Policy - Legacy Systems Policy - Microsoft Software Policy - Unix Systems Policy - PC standard image - AAT Control Room Policy - Web Policy - Archiving of observing data Policy 	Available Available Available Available Available Available Available Available Available