

# The astronomy group IT system

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## 1 Introduction

This manual is an attempt to help staff and students in the astronomy group at IFA to use the IT services available to the group. The overall AUIT services are documented on the web page

<http://medarbejdere.au.dk/en/administration/it/main-academic-areas/au-it-scitech/>

and should be consulted whenever the present document does not explain the possibilities in detail. You can also send your questions or cry for help to the Help Service at [helpdesk@nfit.au.dk](mailto:helpdesk@nfit.au.dk). From February 20, 2014 the address is [aarhus.st.it@au.dk](mailto:aarhus.st.it@au.dk).

## 2 Network

The astronomy group servers are members of a domain called 'phys.au.dk'. Your own desktop/laptop can get a fixed address in this domain and the same IP number each time, if it is needed. Otherwise, you will get a new IP number and hostname each time you connect your cable to the wall plug or switch and you will belong to the domain 'nfit.au.dk'. A plug in the wall will connect you to one or the other Vlan and needs to be reconnected, if you want to change the network setup.

At the Ole Rømer Observatory there is a VPN connection that brings you inside the firewall and you can either define a fixed address in the range 10.12.33.2–10.12.33.10 - Do NOT use the address for the router 10.12.33.1 - or you attach a machine to the network and get your address using DHCP. You will then be allocated an address in the range 10.12.33.11–10.12.33.255.

Both at the institute and the observatory you can use the wireless network, which will bring you on the internet. To get to our servers at the institute you need to use a VPN connection. See instruction under the network menu point at <http://www.nfit.au.dk>.

At the institute you should connect to the network AU-Gadget using your NFIT username and password.

## 3 Remote desktop

On some of our Linux servers we have installed the NOMACHINE server, which permit you to run a remote desktop on the server. You need to install the nxclient program on your desktop/laptop running Windows or Linux.

### 3.1 Administration details

On the server you can add two users (because we are using a free version) and the command to do this is:

```
sudo /usr/NX/bin/nxserver --useradd user --system
```

As only two users are permitted on each server you can check who they are by the command:

```
sudo /usr/NX/bin/nxserver --userlist
```

The nxserver is presently installed on the following servers: blade03, ast and ast1. Ask the system manager if you is interested in using the remote desktop option and ask him to find a 'slot' for you on one of the servers. With three servers we can have six users on at the same time.

Table 1: Servers for computing

Linux server	Hardware	Type
ast.phys.au.dk	8CPU, 32GB RAM	Main server
ast1.phys.au.dk	8CPU, 32GB RAM	User server
blade03.phys.au.dk	8CPU, 16GB RAM	User server
blade04.phys.au.dk	8CPU, 16GB RAM	User server
neo.phys.au.dk	8CPU, 16GB RAM	Kasoc server

You need to generate an authentication key:

```
sudo /usr/NX/bin/nxserver --keygen ,
```

which will generate a key file `/usr/NX/share/keys/default.id_dsa.key`.

Now, on the client machine copy this key file to your machine one way or the other and start the NX client program. Push the *configure* button and enter: the IP address of the host server, the port number (22) and select the *key* button and *import* the key file. *Save* and press *OK*. Now enter the username and password in the relevant field and a desktop should come up from the server.

## 4 Servers

A number of Linux servers supply the tools to the members of the astronomy group and its visitors at IFA and elsewhere. The system consists of a few physical servers, but is slowly being migrated to virtual servers maintained by the AUIT team. The idea has for many years been, that you can use any of the servers and always have a similar environment. All servers are running the Redhat Enterprise system from RHEL4 to RHEL6. The resources available on a server vary in terms of hardware capabilities and software implementations.

### 4.1 Computing servers

In Table 1 we give a list of the present servers. The 'blade' servers are real physical servers, while the 'ast' servers are virtual servers hosted by AUIT. You should not worry about which type of server you are using, and your setup should look very similar. The software installed on each server is not the same, but the main compilers and programs like Matlab or IDL should be present. The 'neo' server is running the KASOC services and should not be used for heavy computing.

### 4.2 File servers

A number of file servers provide an evergrowing set of file systems, which for historical reasons mainly have names `/aixx`, where `xx` is a number. The user home directories are spread over several file servers, but are mounted during login using a NIS table to keep track of the link between file server and user name. The file servers are listed in Table 2.

AU IT offers access to a file server, where you can backup your important files and access them from your desktop/laptop. The service is described in the following web page:

<http://medarbejdere.au.dk/en/administration/it/it-at-the-main-academic-areas/it-at-science-and-technology/aarhus/file-servers/>

Table 2: File server list

Linux server	Size	File system
airaid.phys.au.dk	7.7TB	/ai51
airaid.nfit.au.dk	7.7TB	/ai49
aibkup.phys.au.dk	7.4TB	/ai50
ifavir02.phys.au.dk	5.2TB	/hercules (main home directories)
ifavir04.phys.au.dk	7.9TB	various old systems (/ai39–/ai48 etc.)
aifs.nfit.au.dk	30TB	/ai52 and /ai53

The system works on a user basis and you can attach the file system to a Windows or a Mac or Linux system. In the case of a Linux system (one of servers maybe) you need help with the setup, as you need administrative rights to mount and unmount the file system. These rights can be granted on a user by user basis.

#### 4.2.1 Hints for administration

In addition to the instructions given on the web page for Linux users, the following may need to be done:

Install 'keyutils':

```
[apt-get|yum] instal keyutils
```

Add the following to /etc/request-key.conf:

```
create cifs.spnego * * /usr/sbin/cifs.upcall -c %k
create dns_resolver * * /usr/sbin/cifs.upcall %k
```

For a given user 'peter' create a script in /usr/local/bin called mount.peter and umount.peter with the proper mount/umount command and permit in the /etc/sudoers file the user peter to execute these scripts (use visudo).

### 4.3 Backup

The file space on the servers are being backed up when relevant. Table 3 is a list of the complete backup scheme.

#### 4.3.1 Recovering files

Instructions from Michael Glad on how to restore a complete file system (in this case /ai49):

```
# cd /ai49
# screen
# script -f
# /opt/tivoli/tsm/client/ba/bin/dsmc restore '/ai49/*' -subdir=yes -quiet
-pitdate=02/15/2012
```

Wait for a question about overwriting of existing files and answer 'no to all'

```
# Control-a d
```

All output will now be logged to /ai49/typescript and you will be able to logout again. Another simpler restore operation is typical, when a small set of files has been deleted by mistake:

Table 3: Backup definitions

Backup name	Server	Directories
ST_IFA_HERCULES_BA	hercules.phys.au.dk	/, /ai44, /appl, /home.old, /usr/local, /usr, /var
ST_AIFS	aifs.nfit.au.dk	/ai52, /ai53
ST_AIRRAID1_BA	airaid.phys.au.dk	/ai51
ST_IFA_AIBKUP_BA	aibkup.phys.au.dk	
ST_IFA_AIRRAID_BA	airaid.nfit.au.dk	/ai49
ST_IFA_IFAVIR04_BA	ifavir04.phys.au.dk	??
ST_IFA_SS1N1_BA	ss1n1.phys.au.dk	/, /boot, /home, /media/OS, /opt, /srv
	neo.phys.au.dk	
	Old servers	
ST_IFA_MBLADE_BA	mblade.phys.au.dk	/, /boot, /old/ai45, /old/ai46, /old/scratch1
ST_IFA_TUC47_BA	tuc47.phys.au.dk	/, /appl, /home, /old/ai39, /opt, /usr
ST_IFA_HERCULES_BA	hercules2.phys.au.dk	/, /ai44, /appl, /home.old, /usr/local, /usr, /var

```
# /opt/tivoli/tsm/client/ba/bin/dsmc restore '/ai49/isab/bhyi/*.p*'
-pitdate='09/14/2010' -subdir=yes -replace=no
```

Finally, one might want to check whether there is a backup of a file and this can be done as in the following example:

```
# /opt/tivoli/tsm/client/ba/bin/dsmc query backup /etc/passwd
```

which will tell you when the last backup of the password file /etc/passwd took place.

## 5 Connecting to the servers, ssh

To login to the servers you must use 'ssh'. You also have to be on the internal network inside the firewall. Connect to the local network and use VPN if needed or connect from the outside, where you must use VPN to get access to the servers. If you want more than a simple terminal session use the command 'ssh -X blade03.phys.au.dk' or 'ssh -X user@blade03.phys.au.dk'. You are asked for a password, unless you generate a key on your own machine or the one you are trying to connect from as described here. We recommend to use these keys as it means you can connect with ssh, sftp and scp etc. without typing a password. It is more secure and less work.

### 5.1 Using Secure shell (linux version)

- (1) log onto your own desktop: xxx.phys.au.dk
- (2) type: ssh-keygen A directory called .ssh is created containing a private key in the file id\_rsa and a public key in the file id\_rsa.pub
- (3) type: cp id\_rsa.pub xxx.pub Then you can easily recognise the public key.
- (4) type: cat xxx.pub >> authorized\_keys The file authorized\_keys must contain the public keys for all the computers that you wish to log onto. You can now use ssh to log onto xxx.phys.au.dk, which may not look all that interesting as you are already logged onto xxx.phys.au.dk.

- (5) log onto yyy.phys.au.dk
- (6) type: ssh-keygen
- (7) type: cp id\_rsa.pub yyy.pub You can now easily recognise the public key for yyy.phys.au.dk
- (8) type: cat yyy.pub  $\ll$  authorized\_keys You can now use ssh to log onto yyy.phys.au.dk from yyy.phys.au.dk.
- (9) Use ftp or ncftp to get xxx.pub from xxx.phys.au.dk. Now you have both xxx.pub and yyy.pub in your .ssh directory on yyy.phys.au.dk
- (10) type: cat yyy.pub xxx.pub  $\ll$  authorized\_keys You can now use ssh to log onto both xxx.phys.au.dk and yyy.phys.au.dk from yyy.phys.au.dk.
- (11) log onto xxx.phys.au.dk
- (12) Use ftp or ncftp to get yyy.pub from yyy.phys.au.dk. Now you have both xxx.pub and yyy.pub in your .ssh directory on xxx.phys.au.dk
- (13) type: cat xxx.pub yyy.pub  $\ll$  authorized\_keys You can now use ssh to log onto both xxx.phys.au.dk and yyy.phys.au.dk from xxx.phys.au.dk.
- (14) Now do the same for other servers you are using. If you have the same home directory you only need to add the zzz.pub key once and it will work for all the servers.

## 5.2 Windows ssh

Use the package 'putty', which contains a 'ssh' client, a 'sftp' and a 'scp' programs and connect using VPN. Aain it is possible to generate a key in order to have to avoid typing a password, which is a more secure way to operate than typing passwords in clear text and passing them over a network.

## 5.3 Setup files

When you login to a server with ssh your environment is defined by the startup file .cshrc (csh or tcsh users) or .bashrc (bash users). To make your settings correct for a given server the startup file .cshrc could consist of only these lines:

```
# Default user .cshrc file (/bin/csh initialization).
source /hercules/aisys/cshrc.obs
source $HOME/cshrc.usr
```

where the first line contains definition of system parameters and the second is a similar startup with all you personal definitions. The first file will, for the *ast1* server, have the following lines:

```
setenv PGI /appl/pgi124
set path=(. $PGI/linux86/12.4/bin /appl/Wolfram/bin
/appl/dao/bin $path) ,
```

which chooses the 32bit version of the Portland compilers and adds e.g. a path to the Mathematica software from Wolfram.

The second line calls a setup script for your own specific definitions of environment or alias settings, where you can start up with the system `cshrc.obs` file as a model, delete all the system stuff and insert your own favorite settings either for specific servers or general settings you wish to have for all servers. You are welcome to look at my own file `cshrc.srf`, which you will find in my home directory.

## 6 Email and Calendar

First consult the web page:

<http://medarbejdere.au.dk/en/administration/it/email-calendar-email-addresses/>

A mail interface is present on the web at the address <http://mail.au.dk>, which also contains the AU calendar system. Then you can check your emails and calendar from anywhere using one of the standard web browsers on any machine.

If you are using Windows you can install outlook. The Microsoft Exchange server is known to be very slow at remote locations, where you should use the web mail client. For advice on outlook check

<http://medarbejdere.au.dk/en/administration/it/email-and-calendar/outlook-manuals/>

Finally linux system users can use the Thunderbird mail client or Evolution to administer their mail files. Then you need to consult the IMAP settings as described in the IT web page:

<http://medarbejdere.au.dk/en/administration/it/email-and-calendar/imap/>

## 7 Printing and Scanning

Depending on your office you will have a printer nearby, that you possibly prefer to use. The printers are labeled with their name. To setup your Desktop/Laptop for printing you do the following.

- Linux Make or change a file named `/etc/cups/client.conf` to contain one line 'Server-Name `cups.nfit.au.dk`'. Then restart cups: `/etc/init.d/cups`. You need administrator permissions to do this. Now you are able to print a postscript file with the command `'lpr -P1520-500-c-psc05a file.ps'` or selecting the one you want in the normal printer menus popping up.
- Windows Go to the web page '<http://www.nfit.au.dk>' and select the menu point 'print'. Then follow the instruction for Windows. Find the printer you want to use and install it. It is all done automatically. In other words start a Windows Explorer and type in

```
\\ print.ad.nfit.au.dk
```

and choose the printer based on the name.

The printers on the 5th floor of building 1520 are both duplex colour printers:

- 1520-500-c-psc05 is a Konica-Minolta colour printer, but also a copy machine and scanner. It can print A4 pages as well as A3 pages.
- 1520-500-c-psc05a is an HP colour printer.

- 1520-400-b is a black and white HP printer on the 4th floor.

There are a lot of other printers, that you can use. When you print a file on a Linux machine you will see the whole set.

## 8 Software

A large range of software is present on the servers. The most recent server, which will be the standard server in the future whatever hardware it is based on, is setup with a set of standard Linux packages as well as additional compilers and utilities.

### 8.1 Compilers

The standard setup is offered on the server 'ast1' as well as on 'blade03' server. The compilers offered are:

- FORTRAN: The standard linux 'gfortran' compiler and the Portland compilers 'pgf77', 'pgf90' etc. including MPI libraries for those who want to make distributed computing. The compiler is located in a directory indicated by the \$PGI environment parameter (see Sect. 5.3). Documentation can be found there too. The Portland compilers offer 32 and 64 bit versions, depending on the binaries you select in your PATH definition. To speed up computations you can define the environment variable  
setenv OMP\_NUM\_THREADS 8
- C and C++: Again, the standard compilers are installed (cc, gcc, c++) as well as the Portland compilers (pgcc, pgcpp).
- Python plus packages: Python is installed in version Python 2.6, which is the standard Redhat RHEL version 6 package. The packages installed you will find in Table 4

### 8.2 Programming tools

We have a variety of programming tools at our disposal with a varying number of licenses available.

#### 8.2.1 IDL

Latest version installed is 8.2. If you use the system setup file a standard IDL setup file is called and you will get the latest version (i.e. 8.2). But you can look in the different versions in the /usr/local/bin directory and locate the 'system' version of idl by looking at the path obtained by the

```
ls -l /usr/local/bin/idl
```

/smallskip command. In the 'bin' directory you will find different versions of the IDL setup file, which you can copy to one of your own directories and customize to fit your needs. You can also take a look at the /hercules/aisys/idlbase directory, where some setup



Table 4: Python modules installed

Cython	Python C interface
numpy	Numerical tools
scipy	
matplotlib	
ATpy	
gmpy	
mpi4py	MPI interface
Pyraf	Python-IRAF interface
pylab	
itertools	
mpmath	
pyximport	
time	

files have been created (sometimes long ago) plus an example of a 'idlstartup' file, that could be useful.

Then insert a line in your shell startup file, typically .cshrc or .bashrc:

```
source $HOME/idl/my_idl_setup.csh
```

You can define different setup files for different servers or depending on the problem you are working on.

### 8.2.2 Matlab

Matlab is running on all our main servers. Just type:

```
matlab
```

to start the Graphical User Interface (GUI).

### 8.2.3 Mathematica

We have a group license to Mathematica Vers. 9.0 and you can start it in a terminal mode by typing:

```
math
```

or the GUI by typing:

```
mathematica or Mathematica
```

Documentation is located in the directory: */appl/Wolfram/Documentation*.

### 8.2.4 Other tools

## 8.3 Remote client

The NOMACHINE server is installed on the three servers *blade03*, *ast* and *ast1* and using the *nxclient* program (Linux or Windows versions exist), you can run a remote desktop on the three servers. The free version we are using means unfortunately that only two

Table 5: Registered users for NOMACHINE

Server	users
blade03	f041080 and kasoc
ast	jcd, hg62
ast1	srf

dedicated users per server can run at a time. The users with permissions are at the momentare given in Table 5.

If you would like to run a remote desktop, then contact the system administrator(s).

## 9 KASC/KASOC

Adccess to data from the *Kepler* mission is handled by the KASOC webserver

<http://kasoc.phys.au.dk>,

which is hosted on the virtual server *neo.phys.au.dk* as well as on a secondary server *aibkup.phys.au.dk*. If you are a member of KASC you should have a username and password for the KASOC server.

## 10 SONG

The SONG network has its center in Aarhus, which means that data is stored here in Aarhus and made accessible to the SONG members by the webpage <http://sosoc.phys.au.dk> (under construction). The main SONG server controlling the network is <http://ss1n1.phys.au.dk>, which among a lot of other services runs a virtual machine hosting the Tenerife web page as <http://song.phys.au.dk>. In addition there is a general SONG page at <http://song.au.dk>, which is a Typo3 based web page with the normal AU web design.

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