Instalación y configuración del software para el ordenador de control del terminal VLBI del CAY

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Índice

1.   Aim (short introduction in spanish)

Las observaciones de VLBI se realizan con ayuda de una aplicación denominada FS (Field System) que permite el control remoto y automático del terminal VLBA4, y de algunos dispositivos adicionales, como el sistema de calibración de fase y el control de los diodos de ruido. Dicha aplicación se ejecuta en un PC con Debian.

Habitualmente la EVN y el GSFC distribuyen un sistema completo donde se incluye el sistema operativo, y el FS, para un tipo de ordenador totalmente especificado. Esta política tiene la ventaja de que la instalación es uniforme en todos los observatorios donde se emplea el FS. Sin embargo en la práctica tiene dos inconvenientes, uno de caracter general y otro asociado a la idiosincracia del OAN. El primero es que la actualización de este sistema se hace con poca frecuencia, con lo que pueden producirse fallas de seguridad ante la aparición de nuevos virus, u otro tipo de amenazas informáticas. El segundo se corresponde con el hecho de que el PC que se usa en el OAN no es el mismo que en la mayor parte de los observatorios ante la imposibilidad burocrática de adquirirlo por los cauces que emplean otras instituciones. Esta circunstancia se ha resuelto tratando de adquirir un ordenador lo más similar posible al que que se aconseja.

El sistema que distribuye la EVN y el GSFC está basado en la distribución Debian. Este informe describe por tanto los pasos necesarios para instalar en el ordenador del OAN una distribución actualizada de Debian y las tareas de configuración e instalación necesarias para que el FS funcione con los componentes hardware con los que está equipado el PC del OAN. El autor considera que esta aproximación al problema, aunque más trabajosa, es la única posible en este momento y ofrece más garantías de seguridad, porque permite beneficiarse de las actualizaciones permanentes de seguridad que ofrece Debian a sus usuarios.

Este informe ha sido redactado en inglés para que el resto de las estaciones pertenecientes a la EVN o la red de observación de Geodesia lo puedan leer y hagan uso, si lo consideran oportuno, de las instrucciones que aquí se describen.

2.   Introduction

Since 1997, the EVN and the geodetic VLBI network chose Debian as their default Linux distribution to run the FS, an environment which drives the VLBI terminal and in some cases the antenna and other equipment used during the VLBI observations.

The aim of this memo is to provide a quick guide for the installation and configuration of Debian on the FS computer. The last sections are devoted to explain how to install all the necessary tools to succesfully compile and install the FS on the system. The author will show the options used while installing and configuring Debian at the Yebes FS computer, which should be rather standard within the EVN and geodetic FS computers.

This memo does not intend to offer a complete description of the steps because there is plenty of written material which can be found in Internet. On the other hand, the installation and configuration procedures offer information to the user to help him/her take a decision when it is prompted to do so.

2.1.   Linux and Debian

Linux is the name used to define the kernel of a well known Unix operative system (OS) which works on personal computers. However in practice this name is also used for the group of applications and utilities that accompany the kernel. As the number of applications is very high and it is rather tedious and, in some cases, complex to compile and setup them, in the last years several companies and organizations offer these utilities packed and ready to be executed (in binary form). Presently there may be more than 200 Linux distributions, being possibly the most well known ones, RedHat, Suse, Mandrake, Caldera, Slackware and Debian.

Debian is an organization formed by volunteers. The distribution offers more than 4000 packages for different hardware architectures and it is specially oriented to Internet since the complete distribution is offered by several servers, syncronized among them, all over the world. The installation of Debian is not easy since, contrary to other distributions, it does not have hardware autodetection. However its major strengh relies on the package and the system management, and that is the main reason why it is probably one of the most popular distributions among Linux hackers. Package management is done through some tools that check the dependencies of the different packages and allow partial or complete updates of the host while it is running Linux. These updates may be easily done through Internet. This allows to keep a high degree of security in the system.

Debian offers major releases with a frequency of two years and follows a rigorous test cycle to correct and repair bugs before the stable release is offered to the public. Each mayor release is constantly updated with minor releases that are mainly orientated to solve security problems. Each release is identified by a number and a name from a character of the "Toy Story" film: "Bo", "Ham", "Slink", "Potato", "Woody"....

For more information on Debian you may want to visit `http://www.debian.org`. Debian also offers packages with documentation on Debian and its system of packages, so that you can always read all the documentation locally in your machine.

2.2.   A fresh installation of Debian

The latest Debian release used in the FS was "Slink" (version 2.1). Since then, two major releases have appeared, "Potato" (version 2.2) and "Woody" (version 3.0). In this report I describe a new installation of the whole distribution in the FS computer. Two main reasons support this decision:

- An upgrade from 2.1 to 3.0 would probably not be clean since the upgrade is originally thought for the transition from 2.2 to 3.0. A transition from 2.1 to 3.0 may not be successfull although Debian claims it is possible.

- A fresh installation allows to install a journaling file system. A journaling file system is a failure tolerant system, which modifies the metainformation of the files in a log or journal file before the blocks are modified. In this way the integrity of the system is preserved against sudden crashes.

3.   Previous to installation: Hardware

The FS PC in Yebes is composed by the following hardware components. All of them were selected to correctly operate with Linux. The motherboard has support for SCSI and a removable hard disk storage system which allows to extract and insert the SCSI disks from the front.

CPU:	Intel Pentium II (Klamath)
Cache memory:	16kB L1, 512 Kb L2
RAM memory:	128 Mb
CPU clock:	300 MHz
Bus clock:	66 MHz
Motherboard:	Asus, P2L97-S AGP
Serial ports:	16550A
CD-ROM:	CD2423E
Disks:	2 x IBM DCAS-34330W 4,3 Gb
SCSI driver:	Adaptec AIC-7880U
Monitor:	Sony CPD-200ES
Keyboard:	IBM Modelxo M
Disk storage system:	SSI SI-024

Board	Manufacturer	Model	Others
Video	S3 Inc.	S3 Virge DX	4096 kB
Ethernet	3Com	3C900 (Combo)	
Sound	Ensoniq	5880 AudioPCI	
Multiport	Digi International	Xr 920	
GPIB	National Instruments	AT-GPIB	

Cuadro 1: *Boards in the FS PC*

4.   Previous to installation: backup and getting the CD

This report is completely based on the experience of the author with a specific machine. You may also find useful to download the original installation instructions from `http://www.debian.org/releases/stable/i386/install.en.txt` or `http://www.debian.org/releases/stable/i386/install.en.pdf` and print them for your convenience. In `http://www.debian.org/releases/stable/releasenotes` you may even find instructions in your native language.

Getting the CD

The first operation is to check that the BIOS of your computer may boot from the CD. If that is the case one has to get, at least, the first CD for the Debian 3.0 release. This can be downloaded from `http://www.debian.org/CD/`. Debian 3.0 comprises 8 binary disks, but we only need the first one, since the rest of the system will be downloaded through the

network. The first CD will occupy 650 Mb and a CD writer will be necessary to generate it. In the case of OAN the author bought the 8 CDs for 18 €. It is also possible to boot from floppies but this will not be described here.

Saving some contents

It is advisable to make a tar of the `/etc` directory and transfer it to any computer that is available in your LAN. The `etc` directory contains all configuration files for your system. It may be helpful while configuring your new system to have it somewhere where you can have a look at it. You should also tar all the `/usr2` directory and transfer it to another computer available in the LAN:

```
cd /
tar cvzf etc.tgz /etc
tar cvzf usr2.tgz /usr2
```

Files `etc.tgz` and `usr2.tgz` should then be transferred via FTP to another machine, or written to a CD-ROM.

Backing up the whole disk

Power on the PC with both hard disks in their bays and backup the whole system in one of them. This is described in section 5.8 of the Computer Reference chapter of the MKIV Field System Documentation.

This operation will copy the whole content of disk 0 (/dev/sda) on disk 1 (/dev/sdb). We therefore assume that the backup system is disk 1 and disk 0 is the one with the latest data.

```
dd if=/dev/sda of=/dev/sdb bs=16k
```

Once finished insert the first Debian CD in the CD driver and shutdown the computer:

```
shutdown -h now
```

After the PC powers down extract the backup copy from the PC and keep it in a safe place. Restart the computer. The PC will boot from the CD and the installation (bootstrap) procedure will be fired.

5. OS Installation and configuration

5.1. Quick installation

This section shows the options used by the author when installing Debian in the FS computer at Yebes. The bootstrap and the configuration methods provide a description of each of the steps that are to be taken. We shall not repeat this same information, but will make some comments which may be useful.

1. Selecting the boot method. When the PC boots from the CD you will get a welcome message. Press F1 and you will be presented with a whole menu of options. The boot options for installation are described if you press F3. Enter bf24 in the boot line, and the system will boot a 2.4.18 Linux kernel.

    ```
    boot: bf24
    ```

    The kernel will start with the framebuffer module, which gives the screen a different look. It may be possible you see a penguin in the upper part of the screen.

2. Choosing the language. A window will appear so that you can choose your language. In our case we chose "Spanish", although throughout this memo we will refer to the dialogs in english.

3. Configuring the keyboard. We chose: "qwerty/es: spanish" In case we want to reconfigure later we can issue the following instruction, when the installation and configuration procedures are finished:

    ```
    dpkg-reconfigure console-data
    ```

4. Partition a hard disk. Since we are using a disk already partitioned the bootstrap procedure will select by default an option to "Format and activate swap partition". If you want to change the hard disk partitions select "Partition disk option" by moving up and down with the vertical arrow keys and press Enter. If you want to keep your old partition scheme, proceed and press Enter (and continue reading next item). Take into account that if you install a *Reiserfs* you will need 32Mb of aditional disk space.

    If there is only one disk inside the PC you will be presented with one option for the device to be partitioned, probably "/dev/sda".

    The application used for partitioning is *cfdisk*. The upper part of the application screen shows the present partitions with information on the device, flags, type of partition, type of file system and size in MBytes. If one of the partitions is higlighted you may modify its settings using the menu options in the lower part. You can move between options with the horizontal arrow keys.

    If you want to create a new partition move to the free space line with the vertical arrow keys. Select New. By default the file system type will be "Linux". To modify this value for the swap partition, select Type and number 82. When all partitions are defined select Bootable for the first Linux partition, then Write, and finally Quit to quit the application.

    A common partition scheme:

    a) Use 3 partitions: for the system, for swaping and for the users.

    b) The minimum size for the swap partition should be twice the RAM. We use 256 Mb.

    c)   The minimum recommended size for the system is 3 GBytes in order to allow, for future upgrades.

The swap partition has to be selected with type number 82, and the type number for the other linux partitions should be 83, even if we plan to install "ext3" or "reiserfs" on them.

5. "Initialize and Activate a swap partition". You may skip here the bad block check if you feel your disk is OK. Linux checks the integrity of the disks periodically after a number of reboots.

6. Initialize a Linux partition. Select "/dev/sda1". You will be prompted to select a file system type. We have selected "ext3", a journaling file system, which is the next generation of "ext2". Choose "/dev/sda1" as the partition to initialize.

   The table with the inodes, the journaling information, the superblocks and file system accounting will be created. You will be prompted if you wish to mount "/dev/sda1" as "/" (the file system root). Type "Yes".

7. You will be given the possibility to install the kernel. Move to the next option to "Initialize a Linux partition". Repeat the selections you chose in the previous item, but this time for "/dev/sda3".

   You will be prompted to select the mounting location for "/dev/sda3". Select "Enter another name", and use "/usr2" since this will be the partition used by the FS.

8. "Install kernel and driver modules". The bootstrap method will detect the Debian CD-ROM and will ask you if you wish to use the kernel and modules in the CD. Accept and press "Enter".

9. Configure device driver modules. There are plenty of modules here. Here you should select at least the ethernet network module. Other modules may be loaded at a later stage, when the installation procedure is finished.

   To select the ethernet network module, move with the vertical arrow keys to "kernel/drivers/net" and press "Enter". Select the appropiate option. In our case it was: "3C59x". You will be shown a window with options. Press "Enter" and the default options (none in most cases) will be used. If the installation succeeds you will get a message with "Installation suceeded". Select "Exit" in the upper part of the list and press "Enter".

   It is also advisable to load the APM (Advanced Power Management BIOS suport) module. So select "kernel/arch/i386/kernel", at the bottom of the list, and select "apm". When the module is successfully installed, press "Enter" and "Exit".

   Select "Exit' again and press "Enter" to leave the configuration of modules and return to the main bootstrap method. You can always come back to the configuration of modules once Debian is installed issuing the following command:

```
modconf
```

10.   "Configure the Network".

    a)   Select a name for your host.

    b)   Decide if you use DHCP or BOOTP to automatically configure the ethernet interface or not. We do not use this option because the FS computer has a static IP address. So select "No".

    c)   Enter the IP number of the host.

    d)   Enter the netmask. If it is a C class usually: "255.255.255.0"

    e)   Enter the IP for the gateway. In our case: 193.146.252.1.

    f)   Enter the domain name. In our case "cay.oan.es".

    g)   Enter the IP number of the DNS (Domain Name Solver), that is the host that relates IP numbers with names.

11.   Install the Base System. Select "cdrom" as the source to get the base system from. It is not necessary to open and close the CD-ROM drive even if you get a message saying so. The directory to use is "/instmnt". This step will take some time.

12.   When this completes you will be presented with "Make System Bootable". Since this is the FS computer it is advisable to use this option, so press "Enter"

13.   You will be prompted to install LILO in the MBR. LILO is a boot loader. Since the FS computer probably does not have any other OS in the disk this is the best option. Press "Enter". Even if the FS computer had another OS in the disk LILO can manage booting in different OSs.

14.   It is advisable to create a Boot Floppy, just in case something goes wrong. Once you have created it, you can proceed.

15.   "Reboot the System". Before confirming extract the CD-ROM from the drive. Once there are no floppies or CD-ROMs in the drives, select "Yes" and reboot.

5.2.   Quick configuration

Once you have suceeded installing the kernel and the modules, you are about to configure the base system. In case you feel you should repeat this process you can always rerun the procedure once the configuration process is finished by issuing:

```
/usr/sbin/base-config
```

It will even be possible to configure different parts of the configuration individually.

1.   Once reboot has completed, the installation procedure will congratulate you for having sucessfully install Debian. Now you will configure the Debian system.

2.   Time zone area:

- The procedure will prompt you if the system should have the clock set to GMT, so select "Yes". The FS computer should always run in UTC time.

- Next screen will allow you to select the area of the world where you live. Select "None of the above".

- And then select GMT, since the FS computer will run with UTC time.

3. Paswords and accounts:

   - Select MD5 passwords unless you meet one of the problems mentioned in the screen, like using NIS. This will provide a better security scheme. So select "Yes".

   - Enable shadow passwords. If selected, the passwords will be stored in a different file with different permissions than the traditional one. Select "Yes".

   - Enter a password for root. You will be prompted to repeat it to check you typed it correctly.

   - Create a normal account. For example: "manager". You will be prompted for a description and a password, which you will need to retype. It is **not advisable** to create the "oper" or "prog" account" at this stage. That will be done later.

4. Remove PCMCIA packages since the FS computer usually is not a laptop computer and does not have PCMCIA cards. So select "Yes".

5. Usually you will not require a PPP connection since you are already connected through the ethernet to your LAN and to Internet. So select "No".

6. Configuration of the available servers and sections.

   The packages for Debian are organized in three sections called "main" "contrib" and "non-free". All sections are available in a number of servers throughout the world. The next steps will help you to configure the servers and the sections to use. You will also decide the method to get the packages. At the end of this part the procedure will write this information in `/etc/apt/sources.list`. You can always edit this file and modify it according to your needs.

   - Select here "http" as the method to download software. You will be prompted if you want to use non-US sofware. Read the screen about this option and take a decision. At Yebes we use non-US software so we select "Yes". From now on you will probably not need the CD-ROM.
     Note: If you have the 8 CD-ROM pack with the complete Debian distribution and your bandwidth to Internet is small you may want to select cdrom. It will save you a lot of time. But in order to keep your system updated with the latest security patches you will need to modify by hand your `/etc/apt/sources.list` when the installation is finished.

   - It is advisable to use non-free software. Some useful applications are in this section, and you probably will want them in your system. So select "Yes"

- It is also advisable to use Contrib software. Select "Yes".

- You will be presented with a list of mirrors all over the world. Select the one that fits you better. Each country may have more than one mirror. Usually you will not need a proxy. If you need it, fill in the information when prompted to do so.

- The system now will download the databases with the available packages. Debian will generate a local database with a list of all available packages. This list is generated from the databases in the servers, and for each of the sections specified in `/etc/apt/sources.list` Therefore if you have several sections and servers you will download a database for each those.

  This step may take some time which depends on the bandwidth of your connection. The procedure shows the size of the downloaded database and how long it will take to complete. The time is computed dinamically.

- "Add another source apt source". Select "Yes" and select "Edit sources by hand". You will be presented with an awkward editor. Move to the end of the file and add the following line:

  ```
  deb http://security.debian.org stable/updates main contrib non-free
  ```

- You will be prompted again with "Add another source apt source". Do not add any other apt source and proceed. Therefore select "No".

7. List of packages to download.

   Once the local database with all the available packages is generated you have to select which packages you want to install.

   - "Run tasksel". This option offers you the possibility to select groups of packages defined by their aim. Select "Yes" and have a look at the list. You can select tasks by pressing the space bar. At Yebes we usually **do not select** any of these groups to keep the system as tidy as possible. We add individual packages so that we make sure we only have what is really needed. Once you are ready move with the tabulator to "Finish" and proceed.

   - "Run dselect". This application allows you to select, install and remove packages, but many newbies find it a nightmare. Therefore it is not recommended unless you know how to manage with this. Select "No".

   - The system will read the package list and will present you list of the packages to be downloaded. It also informs you how many Mb it will download and how much space the new software will occupy in the disk. You will be prompted if you want to continue. Enter "Y" and wait.

8. Now you need to configure the packages as they are installed. In most of the cases, if you do not understand what the system asks you, you should use the default options. We will only comment some cases.

- Locales. There are many options and they do not fit in the screen so move up and down with the vertical arrow keys. You should select at least "en_US". To select an option press the space bar. At Yebes we also selected "es_ES" and "es_ES@euro". Move with the tabulator to "OK" and press Enter.

  Then you should select your default system environment. At Yebes we use "es_ES@euro".

- Ssh. Select "Allow SSH protocol 2 only". It will increase your security. Select the other default options and use the "sshd" server option to allow remote access to the FS computer. In Yebes remote access to the FS computer is only possible through SSH even within the LAN.

- "Do you want to erase any previously downloaded .deb files". Select "Y". Debian keeps all ".deb" package files in a specific directory. If you do not have much space in the disk it is recommended you remove them.

- Exim. `Exim` is a replacement for `sendmail`. It is much easier to configure than `sendmail`. When installing this package a simple configuration procedure will start. In Yebes we select "option 2: Internet site using a smarthost". You will have to provide more information.

  If you want to fine tune `exim` you should read the manual and modify `/etc/exim/exim.conf`, but probably you will not need this, since the FS is not the mail server of your institution.

- The last screen will greet you for choosing Debian and the main installation procedure will be finished.

6.   Installing packages

The postinstallation deals basically with installing and configuring new packages in the FS computer. There are three basic ways to install packages in Debian:

- dpkg. This is the basic tool, and the other two are frontends for this one. This application installs packages that are in the local disk. If you have experience with "rpm" it is similar to it. Use `man dpkg` to learn about it.

- dselect. This is an aplication which provides you a frontend for `dpkg`. You can view the list of available packages and you can remove, install and upgrade them. It is very powerful, but it is easy to get lost while using it. So be careful if you decide to use it.

- apt. Apt is the newest frontend for dpkg. It manages packages in a very simple and powerful way. Therefore this is the one we will use.

We have already mentioned that we need a file called `/etc/apt/sources.list` so that `apt` recognizes the method to access the software, the servers from which it will download the packages and the sections we will use. A typical `/etc/apt/sources.list` is:

```
deb http://http.us.debian.org/debian stable main contrib non-free
deb http://non-us.debian.org/debian-non-US stable/non-US main contrib non-free
deb http://security.debian.org stable/updates main contrib non-free
deb ftp://ftp.oleane.net/pub/java-linux/debian woody main non-free
```

At Yebes we use different sources for this file because we have a mirror of the Debian server in our LAN.

Once you have modified your `/etc/apt/sources.list` you should create the local database with the available packages. This operation **should** be performed **before** installing new packages to avoid problems. The servers may change their packages from one day to another but this is rather odd if you are using a stable distribution. The updates are frequent only from the `security.debian.org` server. To update the list of available packages use:

```
apt-get update
```

If you want to upgrade you should issue:

```
apt-get upgrade
```

If you want to install a given package, for example `a2ps`:

```
apt-get install a2ps
```

or several packages at a time, for example `a2ps` and `gv`:

```
apt-get install a2ps gv
```

If you need to remove a package, for example `a2ps`:

```
apt-get remove a2ps
```

For more information on `apt-get` use:

```
man apt-get
```

Later, when the graphical environment is set, you may use graphical frontends for `apt`, like `kpackage`, which belongs to the KDE suite.

6.1. Packages for compilers and libraries

You will need several packages to be able to compile and make the FS work properly. You may install them by issuing:

```
apt-get update
apt-get install tcsh flex bison patch make g77
apt-get install f2c fort77 libc6-dev gcc tcl8.3 tk8.3
apt-get install libncurses-dev ntp
```

When installing `ntp` you will need to supply the IP address of the NTP server. At Yebes we have one primary server, provided by the GPS receiver.

6.2. X Windows

This is one of the most important steps to perform. Debian 3.0 comes with XFree86 version 3.3.6 and version 4.1.0. XFree86 3.3.6 supports more boards than 4.1.0, but the latter has more features and therefore should be used by default. Check that your video board is supported by version 4.1.0 at `http://www.xfree86.org/4.1.0/index.html`.

- The following packages with fonts should be installed. There are more available fonts, for example for chinese, but here we will install only some basic ones:

```
apt-get install xfonts-base xfonts-75dpi xfonts-100dpi xfonts-scalable
apt-get install xfonts-75dpi-transcoded xfonts-100dpi-transcoded
```

- Install the Xserver and some basic X applications.

```
apt-get install xserver-xfree86 xserver-common xbase-clients xterm
```

After downloading these packages you will be prompted with several questions to configure the X server:

1. "Manage X server wrapper configuration file with debconf". "Yes"

2. "Manage XFree86 4.x server configuration file with debconf". "Yes"

3. "Select the desired X server". You will be presented with a list of drivers. It may happen that the driver for your board is not here. In that case you will need to install the 3.3.6 Xserver, while keeping the rest of X software as of version 4.1
   At Yebes we use: "s3virge"

4. "Use kernel framebuffer device interface?". Select "Yes"

5. "Select the XKB rule set to use". Use default: "xfree86".

6. "Select keyboard model". At Yebes: "pc105"

7. "Select keyboard layout". At Yebes "es".

8. Keyboard variant. Normally you can leave it blank

9. Keyboard options. Normally you can leave it blank

10. Mouse port. At Yebes "/dev/psaux"

11. Description of the mouse. At Yebes with a Logitech wheel mouse: "ImPS/2"

12. "Is your monitor a LCD device?". At Yebes "No".

13. Select the way you want to characterize the monitor. At Yebes "Advanced"

14. Horizontal sync range: At Yebes: "30-70"

15. Vertical sync range: At Yebes: "50-120"

16. Select the video modes. At Yebes: "1280x1024, 1024x768, 800x600 640x480". The modes are selected pressing the space bar. Move with the tabulator to "OK" and press Enter.

17. Default color depth: At Yebes: "16"

The configuration will be written on file `/etc/X11/XF86Config-4`, which you can always modify by hand although it is not advisable.

- Install a default window manager. A light one in terms of CPU cost is wmaker, and we will use it for the "oper" and "prog" accounts.

```
apt-get install wmaker wmaker-data
```

- Now you can test if the X graphics installation was successful. Issue:

```
startx
```

The graphics screen will take some time to appear. If it works you are almost done with the X configuration. Click on the desktop with the right mouse button, and select "Exit".

6.3. Other graphical packages

You can complete this part by installing several graphical packages. At Yebes we have KDE as the main desktop environment, and we use it in all accounts except for the "oper" and "prog" ones. KDE comes with localization for 50 different languages, and at Yebes we use the spanish environment, so:

```
apt-get install kde kde-i18n-es
```

We also use CUPS under KDE and run the KDE browser with Java and JavaScript support, and have an astronomical package:

```
apt-get install j2re1.3
apt-get install kdelibs3-cups kdelibs3-crypto kstars
```

If you have a CD writer at the FS computer you may also want a graphical frontend:

```
apt-get kreatecd
```

Next time you boot your machine X Windows will start `kdm`, a login manager, which provides several features, like shutdown, restart of the X server and of course account login management. You can customize `kdm` from the KDE Control Center in the "root" account.

Other packages you may be interested:

```
apt-get gv xemacs21 xfig netscape
```

After this step we extract any CDROM or floppies from the drives and reboot the computer:

```
shutdown -r now
```

If the previous installation was succesful your screen will show the login manager `kdm`.

Log into the root account and follow the instructions of the wizard. If you installed your KDE localization package you may configure your environment in your native language. You can fully customize the desktop and applications appearance. At Yebes we usually customize `konsole` which comes with tiny fonts and size and a white painful background by default.

6.4.   Printing

Possibly the best printing backend is CUPS (Common Unix Printing Server). Together with KDE, they provide a simple and powerful interface. You can also use CUPS from the command line.

To install it, open a `konsole` (the monitor with the shell icon) and issue:

```
apt-get install cupsys cupsys-client cupsys-bsd cupsomatic-ppd
```

Then open the KDE Control Center (icon with the monitor and board besides it) and select *System ->Printing Manager*. The listbox at the bottom should be selected to CUPS

To create a new printer click on the icon with the magic wand and follow the instructions of the wizard. At Yebes the printers are connected to the LAN and the wizard allows to scan all TCP or IPP printers and select them.

Once you have finished you will be able to print using: `lp`, `lpr`, or `kprinter`. The latter will show you a dialog window with many options which can be modified interactively.

6.5.   Accounts and recovering the old usr2 content

Open a konsole and ftp back all the content of the old `/usr2` directory, and decompress its whole content.

```
cd /tmp
ftp yourmachine
ftp> get usr2.tgz
ftp> bye
cd /
tar xzvf /tmp/usr2.tgz
rm -rf /tmp/usr2.tgz
```

Now create the "rtx" group and the "oper" and "prog" accounts.

```
addgroup --gid 1100 rtx
adduser --gid 1100 --home /usr2/oper --shell /bin/tcsh oper
adduser --gid 1100 --home /usr2/prog --shell /bin/tcsh prog
```

Add "oper" and "prog" to the following groups, so that you have no problems executing specific applications:

```
adduser oper dialout
adduser oper cdrom
adduser oper floppy
adduser oper tape
adduser oper audio
adduser oper backup
adduser prog dialout
```

```
adduser prog cdrom
adduser prog floppy
adduser prog tape
adduser prog audio
adduser prog backup
```

At Yebes we also have accounts for "meteo" and "maser".

```
adduser --home /usr2/meteo meteo
adduser --home /usr2/maser maser
```

Now we need to change the old ownerships in the `/usr2` tree, since probably the old group had a different GID than the present one.

For "oper" and "prog":

```
chown -R oper:rtx /usr2/oper /usr2/control /usr2/proc /usr2/sched /usr2/log
chown -R prog:rtx /usr2/prog /usr2/st-* /usr2/st /usr2/fs-9*
```

You may want to check if there are other files in the `/usr2` directory with wrong ownerships and change them.

7.   Recompilation of the kernel and instalation of the modules

The proper instalation of the drivers for the DigiBoard board and the NI board requires the kernel to be recompiled. That means that we need to install package `kernel-source-2.4.18`

1. You should still be in the root account using a graphical environment like KDE and with an opened `konsole` or xterm.

2. When installing package `kernel-source-2.4.18` a file called `kernel-source-2.4.18.tar.bz` will be created in the directory `/usr/src`.

3. Install the kernel-source package:

    ```
    apt-get install kernel-source-2.4.18 fileutils binutils bzip2
    apt-get install kernel-package debianutils initrd-tools
    ```

4. Prepare the directory:

    ```
    cd /usr/src/
    bunzip2 kernel-source-2.4.18.tar.bz2
    tar xf kernel-source-2.4.18.tar
    ln -s kernel-source-2.4.18 linux-2.4.18
    ln -s linux-2.4.18 linux
    ```

5. Copy the configuration file from the precompiled kernel of Debian so that we create a kernel with exactly the same options as the Debian one:

    ```
    cd /usr/src/linux
    cp /boot/config-2.4.18-bf2.4 .config
    ```

6. In case you want to modify any of the parameters using the Debian configuration as a template enter the following command and select the desired option to be modified:

    ```
    make xconfig
    ```

    You **need** to go to section "Loadable module support" and select option "Set version information on all module symbols". So click on "Y". At Yebes we also modified, type of processor from "386" to "Pentium II" (section "Processor type and features").

    Select "Save and exit".

7. Generate the kernel creating a Debian package which you can use in other machines:

    ```
    make-kpkg clean
    make-kpkg --initrd --revision=vlbi686 kernel_image
    ```

    This step will take some time and it may happen that the compilation stops due to compiler errors. In our case this is due to a memory hardware problem. If it happens repeat the command:

    ```
    make-kpkg --initrd --revision=vlbi686 kernel$_$image
    ```

    any times that would be necessary.

8. Some akward tweeking:

    ```
    cd /etc
    echo 'do_initrd = Yes' >> /etc/kernel-img.conf
    mv /lib/modules/2.4.18 /lib/modules/2.4.18.old
    ```

9. and you need to edit your `/etc/lilo.conf` file to include the following line:

    ```
    initrd = /initrd.img
    ```

    in the section which begins by `image=/vmlinuz`. This part of `/etc/lilo.conf` should look like this:

```
image=/vmlinuz
        label=Linux
        read-only
        initrd=/initrd.img

image=/vmlinuz.old
        label=LinuxOLD
        read-only
optional
```

10. You may also want to uncomment the following lines in `lilo.conf`:

```
prompt
timeout=20
```

so that you may choose while booting the new kernel or the old one (in case of problems).

11. You also need to edit file `/etc/mkinitrd/modules` and add a line with:

```
initrd = ext3
```

if you selectet "ext3" as the file system for the root partition.

12. Install your kernel package and generate the modules.

```
cd /usr/src
dpkg --install *.deb
mkinitrd -o /boot/initrd-2.4.18 /lib/modules/2.4.18
```

13. At the end of these procedure you will have a kernel, an "initrd" file system in "/boot", a directory of modules in "/lib/modules/", and a Debian package which can be used in other hosts with the same configuration.

Now reboot the FS computer.

8.   GPIB driver

If you are using a National Instruments board you can download the software from `http://www.ni.com/linux/ni488dl.htm`. You need to download file `nigpib-linux-0.8.2.tar.gz`. You should probably use the "manager"account for this operation and `Konqueror` or `Netscape`.

1. Once the file is downloaded log in as root

2. Untar and gunzip the file:

   ```
   tar xzf nigpib-linux-0.8.2.tar.gz
   ```

3. Initialize the configuration process:

   ```
   cd nigpib-0.8.2
   ./INSTALL
   ```

4. You will be prompted if you have an AT-GPIB/TNT board installed. Answer "y".

5. Provide the interruption (IRQ), IO channel and DMA of the board when being prompted. At Yebes:

   ```
   irq = 11
   io = 0x2c0
   dma = 5
   ```

6. You will be asked if the library and header files should be installed in `/usr/local`. Answer "y".

7. load the module by running:

   ```
   modconf
   ```

   The NI GPIB driver is under `kernel/drivers/char/nigpib`.

   Each time the module is loaded the system will generate a message like:

   ```
   National Instruments [Driver v0.8.2] AT-GPIB (gpib0),
         baseaddr=0x2c0, irq=11, dma=5
   ```

9. Digiboard driver

The DigiBoard drivers may be found at `ftp://ftp.dgii.com/drivers/linux/index.html`. where you can download files: `4001450N.tar.gz` y `9300239N.txt`

1. Create the directory where the files will be placed:

   ```
   mkdir /usr/src/dg/epca
   ```

2. Gunzip the files and install the software:

```
cd /usr/src/dg/epca
tar xzf 4001450N.tar.gz
ln -s epca-1.50-1 epca
cd epca
make install
```

3. Modify the configuration file `/etc/init.d/epca` that is run during the startup of the OS. The modifications deal with file ownerships and file permissions.

```
DEBUG_OWN="root.dialout"
DEBUG_PERM="660"
TTY_OWN="root.dialout"
TTY_PERM="660"
```

4. We move the "epca.o" module that comes with the kernel to another file. The kernel will find the new compiled one in another directory.

```
cd /lib/modules/2.4.18/kernel/drivers/char/
mv epca.o epca.o.sos
```

5. Make sure the DigiBoard will be initialized next time we boot:

```
cd /etc/rcS.d
ln -s ../init.d/epca S61epca
```

6. To configure the DigiBoard run:

```
./etc/init.d/epca start
```

You will be prompted for a list of options:

```
How many boards you want to install? 1
What type of board is this? 13 (Acceleport 8r-920 PCI)
Do you want to set Altpin on this board? n
```

The devices will be created and the module will be loaded.

9.1. Notes on other multiport boards

This may not be necessary for other multiport boards since the kernel supports several multiport serial boards: Specialix (this works in Yebes), Riscom, Stallion, Boca... Visit `http://www.tldp.org/HOWTO/Hardware-HOWTO/multiport.html` to know about the supported boards. In any case it might be necessary you create the devices to access your serial ports.

10.   Window manager for oper and prog

The window manager used by default by the FS for the "oper" account is `fvwm`, which has been replaced by `fvwm2` in Debian 3.0. Since the configuration of keyboard shortcuts with `fvwm2` is a bit awkward we installed `WindowMaker`. `WindowMaker` keeps the same minimalist appearence of `fvwm`, and is very light in CPU cost.

Modify `/usr2/oper/.xsession`:

```
 #!/bin/sh
source .profile

#set blanking time to 1 hour
xset s 3600
# start some nice programs
#xsetroot -solid SlateGrey
/usr/bin/X11/wmaker &
xterm -C -ls  -name login_sh -fn 10x20 -geometry 99x24+0+0
```

With this setup any time an "oper" session is opened a wide xterm will appear with the traditional geometry. On closing this window the session will also be closed.

You may change the background by clicking with the right mouse button on any empty space of the desktop and choosing *Appearence ->Background* and selecting the option that suits you best.

The configuration of the desktop appearence and behaviour is done by clicking twice on the colored icon present at the upper right part of the screen. A window with "Window Maker Preferences Utility"will appear. You have 12 icons in the upper part of the window which allow to customize your desktop. The shortcuts and the appeareance of the right click menu can be customized by clicking on the 9th icon, counting from the left.

You should also modify `/usr2/prog/.xsession` for the "prog" account:

```
#!/bin/sh
source .profile
exec /usr/bin/X11/wmaker
```

11.   FS compilation

Download the latest FS version and follow the instructions to install it.

Once the FS is compiled you will need to make sure that `/usr2/fs/misc/rc.fs` is executed when the computer boots:

```
cp /usr2/fs/misc/rc.fs /etc/init.d/
cd /etc/rcS.d
ln -s ../init.d/rc.fs S80rc.fs
```

In order to use the NI GPIB driver you will need to correctly configure `/usr2/control/dev.ctl`. The first line of this file should be:

```
gpib0
```

12.   Fine tuning for Yebes

The system at the Yebes telescope requires some tuning which is due to local requirements:

- All accounts have the color environment defined by editing their `.bashrc` and `.bash_profile`.

- "oper" and "prog" accounts use different files since they run `tcsh`, but these come with the FS distribution.

- The sticker pages used in Yebes are supplied by APLI. The refence number is Ref. 1275. In order to use them we modified file `usr2/control/skedf.ctl` accordingly inserting the following line:

```
label_size  1.575 4.133    7      2      -0.69   0.0   APLI Ref. 1275
```

- In order to print a schedule so that the lines fit properly in an A4 page we have defined a command for printing in portrait mode in file `usr2/control/skedf.ctl`:

```
portrait a2ps --portrait --columns=1 --font-size=8 $*
```

- There are a number of station procedures useful to test the VLBA4 equipment. We have included them in the appendix.

13.   Station programs at Yebes

The implementation of station software programs is described in report IT-CAY 1996/6. Since then, some changes have been undertaken. Phase calibration and noise source control continue to be operated in the same way, but the readout of the weather data and gps is done in a different way. `stqkr` was modified accordingly to take the new methods into account.

Accounts "meteo" and "maser" run a periodic program (`/home/maser/gps-client` and `/home/meteo/wx-client`), using crontab, that queries another computer for the weather data and the GPS-maser comparison every two minutes. After the query is completed the values are stored in the shared memory stack and therefore available from any program which reads shared memory.

The appendix includes `stqkr` and all programs called from there.

14.   Appendix

This section includes control files, the Makefile in the "stqkr" directory, and source code in C but it is only available in paper.