IRAF Installation Guide For Mac Users

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IRAF (Image Reduction and Analysis Facility) is a general purpose software system for the reduction and analysis of astronomical data. The software was written by the National Optical Astronomy Observatories (NOAO) in Tucson, Arizona. However, development and maintenance of IRAF is discontinued since 2013. Since then, IRAF was distributed Astroconda and few other platforms but latest macOS versions (Catalina and above) do not support their 32-bit versions of IRAF.

This guide is meant to make the experience of installing IRAF on Macs smoother, especially on Macs equipped with latest ARM based Apple Silicon processors. *On a general note, it is recommended that IRAF shouldn't be used for new projects as it is really old and difficult to maintain. Instead, use Astropy package of Python which has a larger community of users and developers and is capable of doing most analysis work.*

System Requirement and Dependencies

The following method to install IRAF on Macs is applicable to both 32-bit as well as 64-bit supporting macOS versions. There is no specific hardware requirement. We need a C compiler, the "make" program, flex and some development packages. These requirements can be fulfilled by installing the XCode command line tools which can be installed as follows:

Open Terminal on your Mac and enter the following command:

```
$ xcode-select --install
```

Click "Install" to download and install Xcode Command Line Tools.

IRAF Installation

The IRAF Community Distribution has made available IRAF v2.16.1 snapshots on their GitHub page. The latest snapshot is available at

https://github.com/iraf-community/iraf/releases/latest/

The snapshot has the release date as a suffix in the version number and in the file name.

Download the `.tar` file (or `.zip` file, anything would do) and unpack it by double clicking the downloaded file. This will create the source directory named just as the `.tar` file. This can be done in Terminal as

```
$ tar zxf /<path>/iraf-2.16.1-2021.06.14.tar.gz
```

Now change directory to the source directory using

```
$ cd iraf-2.16.1-2021.06.14/
```

In the source directory, execute the install script to create needed links:

```
$ ./install            # execute the install script
```

The script will prompt you for the path to the default image directory, the cache directory and the binary files directory. Usually, you can everywhere use the default settings when asked from the install script. When it asks you to enter the type of terminal, enter `xgterm`. You will need to include the binary files directory in your PATH before proceeding to the `<make>` step. In BASH this can be done with the command:

```
$ export PATH=/path/to/iraf/bin/:$PATH
```

where `</path/to/iraf/bin/>` is the binary files path specified to the install script.

Now you can configure the system for the proper architecture as:

```
$ make <arch>
```

For `<arch>`, use the proper IRAF architecture name:

`<arch>`	Operating system	Supported CPU types
`macos64`	macOS 64-bit	arm64
`macintel`	macOS 64-bit	x86_64
`macosx`	macOS 32-bit	i386

Executing the above command should have created a directory named `bin.<arch>` in the source directory. For example if one executes `make macos64`, then `bin.macos64` directory will be created in the source directory. Check whether contents of `/.iraf/bin/` (the binary files path provided to installation script) point to the contents of `bin.macos64` directory. If everything is proper then build the system using:

```
$ make sysgen 2>&1 | tee build.log
```

This should successfully install IRAF on your Mac.

Testing the Build

IRAF comes with a small set of basic tests to ensure that the build works fine. To execute the tests, run:

```
$ ./test/run_tests
```

Installing X11IRAF

IRAF needs a GUI to output graphical content produced by some functions in IRAF. For this, we need X11 utilities like `xgterm` and `ximtool`. IRAF Community Distribution also provides X11IRAF package. The `ism_wcspix.e` helper of XImtool, requires a working IRAF installation (so first install IRAF by above method). Make sure that XCode C compiler works and can be found in PATH. Instructions to install X11IRAF are as follows:

First download and install XQuartz from

https://www.xquartz.org

The X11IRAF snapshots are available on IRAF Community Distribution GitHub page. The latest snapshot is available at

https://github.com/iraf-community/x11iraf/releases/latest/

The snapshot has the release date as a suffix in the version number and in the file name.

Download the `.tar` file and unpacked it by double clicking the downloaded file. This will create a source directory having same name as the `.tar` file. This can also be done in Terminal as

```
$ tar xzf /<path>/x11iraf-2.0+2020.06.15.tar.gz
```

Now change the directory to the source directory using

```
$ cd x11iraf-2.0+2020.06.15/
```

To build the sources, in the source directory, type

```
$ make
```

This will automatically compile all sources and create the executables `xgterm/xgterm` and `ximtool/ximtool`, and the helper `ximtool/clients/ism_wcspix.e`. If this command is giving some errors the try the following command which will probably solve the issue:

```
$ CFLAGS=-Wno-implicit-function-declaration make
```

The compilation can be tuned by setting `CFLAGS` and `LDFLAGS`. If the environment variable `OSI_COMPLIANT` is set to `YES`, the build uses only source files that are Open Source.

We need to copy the executables to `/usr/local/bin`. To do this, use `sudo -i` to execute the following command as root:

```
# make install
```

This will also install the manpages to `/usr/local/man/` and the required `terminfo` file for

xgterm to `/usr/share/terminfo/`. If you don't want to invoke `make install`, you should make sure to run `tic xgterm/xgterm.terminfo` to compile and install the terminfo file.

This completes the installation of X11IRAF.

Starting IRAF

Once IRAF and X11IRAF are installed and if the IRAF tests were successful then we are ready to start using IRAF. First, open XQuartz and Terminal. In the terminal window, type the command

```
$ source ~/.login
$ cl
```

from any directory to use the global login file created in the `/.iraf` directory. If this doesn't work, try using

```
$ source ~/.bashrc
$ cl
```

This should start IRAF welcome page. If you wish to have a `login.cl` or `uparm` that is specific to a particular directory, you will need to type

```
$ mkiraf
$ cl
```

You can even change the terminal type of IRAF from its `login.cl` file to xterm if you want to start IRAF using xterm.

DS9

Spectra usually come as images stored as FITS (`.fits`) files. FITS stands for Flexible Image Transport System. We use IRAF to reduce and analyse the spectral data stored in FITS files, so we often need a tool to view the images stored in FITS files. One such tool is SAOImageDS9 or simply DS9. It can be downloaded from the following website:

https://sites.google.com/cfa.harvard.edu/saoimageds9

Installing DS9 is fairly straightforward. One can access DS9 via command line by adding an alias to `.bashrc` file which is located in the home directory. In terminal, type `open  /.bashrc`. This will open the `.bashrc` file in TextEdit and add the following line to the file and SAVE the file:

```
alias ds9="/Applications/SAOImageDS9.app/Contents/MacOS/ds9"
```

This will define an alias `ds9` which you can use in command line to open DS9. While working with a FITS file in IRAF, one can open a FITS file by typing the command `ds9 <filename>.fits`

in xgterm/xterm window. This will open the FITS file in DS9.

References

- [IRAF Community Distribution guide for installing IRAF](#)
- [IRAF Community Distribution guide for installing X11IRAF](#)

Help

If you face any issues while installing or working with IRAF, a very good place to get help from is the Issues and Discussions pages on IRAF Commmunity GitHub page. Search your problem in the list of Discussions/Issues or ask your problem by starting a new Discussion/Issue and you will quickly get all the help you need to solve your problem.

- [IRAF Community Discussions page](#)
- [IRAF Community Issues page](#)