

Summary of Image and Plotting Software (IPS) packages collected for possible use with GLAST Science Analysis Tools

For the Science Analysis Tools, we will need the capability to make plots, and display images on the screen. It would not be an efficient use of our manpower to write a custom set of plotting tools if we can find a package available that satisfies our needs. To this end the User Interface committee has settled on a list of basic requirements for science analysis graphics and have begun to look at some packages. The packages and their characteristics are contained in table 1 below.

It seems quite clear that the choice of package is intimately related to the scope of what we want to do. For example if our tools only have to put up plots and images with minimal interactive analysis, then the plotting packages (the first group in table 1) are desirable. If we want to have more complicated interactions with the user and more extensive image manipulation (rotatable images, e.g.), then something more like a graphic toolkit would be desirable. If we decide to go the latter route and use a tool like Qt, then we need programmers to start working immediately to create the basic plotting classes and methods to ensure this does not hold up development of the science tools. The basic requirements have already reduced the number of packages to < 20, but we need to better define the requirements in greater detail to narrow it down to two or three packages.

Basic requirements (IPS= Image and Plotting Software):

- 1) The IPS must be freely available for use, modification, and re-distribution.
- 2) Any external libraries used by the IPS must be well-supported, tested, and free.
- 3) The IPS must be available on all supported platforms.
- 4) The IPS must provide an API for C++, and optionally, for JAVA or for a high-level scripting language.
- 5) The IPS must be extensible, allowing the creation of custom widgets.
- 6) The IPS must be simple to install, preferably through a binary distribution for end-users.
- 7) IPS must be able to generate publication quality images, including PostScript.
- 8) The IPS must allow export of images into standard browser supported formats (e.g., GIF, JPEG, TIFF, etc.)
- 9) The IPS must provide facilities to create line, scatter, and contour plots.
- 10) Support for 3D and surface plots is desirable.
- 11) Plots shall be modifiable, rather than forcing regeneration of plots from scratch.
- 12) Users shall have control over plot details such as axis range, bin size, linear vs. logarithmic scaling, etc.
- 13) The IPS must display and possibly rotate images.
- 14) The IPS must support overlaying of images and contours and images and plotted points.
- 15) The IPS must provide for returning interactive graphical inputs such as cursor position.
- 16) Multiple color tables must be available, including a facility for specifying user-defined color tables.
- 17) Color tables must be scalable, preferably via mouse or cursor inputs.
- 18) The display rate should be less than about 2 seconds for tasks that are not data intensive.
- 19) Interactive sessions should provide logging capabilities.

AstroMD	Y	N	Y	B	C	Y	N?	Y?	Y	Y
Ds9	N - Tcl	N	Y	E	O= XPA	N-Sol	Y	Y	Y	Y
FOX	Y	N	Y	L	C	Y	Y	Y	?	?
Fv/ POW	?	Y/no 3-D	Y	B	O= Tcl	Y	Y	Y?	Y	Y
Qt	Y	N	Y	L	C	Y	Y	Y	Y?	?
VisAD	Y	Y	Y	L	C	Y	Y	Y	Y	?
VTK	Y	Y?	Y	L	C	Y	Y	Y	Y	?
Xforms	Y	No 3d or cont	Y	L	C	N	Y	Y	Y	Y
ximage		N	Y	E	L	N (Win)	Y	Y	Y?	?
key	Good	Bad								

Package Information:

Line Plot based

Dataplot

<http://www.itl.nist.gov/div898/software/dataplot/>

gnuplot

<http://www.gnuplot.info/>

Note there is a Qt front end for GNUplot: <http://www.flash.net/~dmishee/xgfe/xgfe.html>

<http://sourceforge.net/projects/gnuplot/>

Grace

<http://plasma-gate.weizmann.ac.il/Grace/>

hippodraw

<http://www.slac.stanford.edu/grp/ek/hippo/>

JAS - Java Analysis Studio

<http://www-sldnt.slac.stanford.edu/jas>

PAW - Physics Analysis Workstation? -

<http://wwinfo.cern.ch/asd/paw/>

QDP <http://heasarc.gsfc.nasa.gov/docs/software/ftools/others/qdp/node3.html> (front end for PGPLOT)

ROOT - ROOT Analysis package -

<http://root.cern.ch>

Both Line Plot and Image manipulation

Chaco

http://www.scipy.org/site_content/chaco

Requires wxPython and Numeric (Python)

ChiPS Chandra Plotting and Image Manipulation Tool

http://cxc.harvard.edu/ciao/download/doc/chips_html_manual/index.html

ESO-MIDAS

<http://www.eso.org/projects/esomidas/>

NCAR_Graphics - <http://ngwww.ucar.edu/ng4.2/>

PDL - The PERL data Language

<http://pdl.perl.org/>

PGPLOT

<http://www.astro.caltech.edu/~tjp/pgplot/>

Plplot

<http://plplot.sourceforge.net/>

wxPython/SciPy/plt

<http://www.wxpython.org/>

<http://www.scipy.org>

http://www.scipy.org/site_content/tutorials/plot_tutorial

Image Manipulation programs

AstroMD - Multi Dimensional visualization and analysis toolkit for astrophysics

<http://www.cineca.it/astromd/>

ds9 - Astronomical Data Visualization Application

<http://hea-www.harvard.edu/RD/ds9/>

FOX

<http://www.fox-toolkit.org>

fv/POW - FITS viewer

<http://heasarc.gsfc.nasa.gov/docs/software/fvtools/fv/>

Qt - <http://www.trolltech.com>

VISAD

<http://www.ssec.wisc.edu/~billh/visad.html>

VTK

<http://public.kitware.com/VTK>

Xforms

<http://world.std.com/~xforms/>

ximage

<http://heasarc.gsfc.nasa.gov/docs/xanadu/ximage/ximage.html>

Not listed:

SAL - Scientific Data Processing & Visualization - Software Packages

<http://sal.kachinatech.com/D/1/index.shtml>

(contains links to many packages)

Starlink – OpenDX

<http://www.starlink.rl.ac.uk/star/docs/sun203.htx/sun203.html#xref>

IRAF

<http://iraf.noao.edu>

TABLE 2

Pros and Cons

Package	Pros	Cons
Dataplot		
Gnuplot	Lightweight, supported Front ends many add-ons available.	Barely publication quality, Main Dataplot is an environment, A separate module handles C interface. And GUI front end. C interface not supported on Windows. Documentation is scattered. Big plans for gnuplot on sourceforge – not there yet
HIPPODRAW	Supported on all platforms, Java	Documentation??
JAS	JAS written in Java so all java library is available. Servlet capability built in.	Histogramming supported – how hard to adding contour plots, overlays, etc?
PAW		Was the precursor to ROOT, written in FORTRAN
QDP		Uses PGPLOT for graphics – why not just use PGPLOT?
ROOT	Already being used for GLAST. May add image display capability and FITS IO for INTEGRAL	BIG package to ask people to install.
Chaco	Under development with HST we have a chance to influence directions. Plan is to include image manipulation and plotting.	Limited capability now – based on wxPython. No contour plots or histograms. Need to understand better why we would want to use Chaco and not wxPython/SciPy, which already works.
ESO-MIDAS		
NCAR_graohics		
Pdl	Written in PERL	Complicated dependency for windows? Maybe this is automatically handled by the install package?
Pgplot	Provides all basic functionality Long history	Graphs are not as pretty as we would like Not native C or C++ No support for Windows.
Plplot	Looks like PGPLOT with windows suppot. Source Forge asserts publication quality plots – Are other fonts available now? Source Forge actively improving the package.	Quality in demo plots about the same as PGPLOT Not sure it can really display images.
Plt/wxPython/Sci Py	Handles image manipulation, 2D graphics and widgets.	Does not do contour plots or histograms. Do we really want our whole plotting package API in Python? Full 3D graphics possible with VTK – why not skip the middleman and use VTK?
AstroMD	No built in line plots	Needs VTK based on OpenGL toolkit
Ds9		
FOX	Great GUI toolkit, meant to perform	Plotting part must be written
Fv/ POW	Tcl/Tk-based, and therefore supported on all platforms,	POW lifetime unknown, will need XPA to interface to C, C++, Fortran
Qt	Great GUI Toolkit	No Plotting, Free Qt for Windows not up

