**Chandra X-ray Center**

# Modules for Scientific Analysis

The primary motivation for embedding an interpreter such as S–Lang into CIAO is to provide the user with the means to extend the software in ways that were not anticipated by the designers. Modules extend this capability to libraries by providing access to libraries via the scripting language. A module is a shared object that is dynamically linked into a S–Lang application during runtime via the import statement.

There are a number of S–Lang modules that are distributed with the CIAO software package and are essential to its operation. Other modules not distributed with CIAO, but can run from within it as well as standalone. A list of available modules is provided in the following table; there is an explanation of the different columns located at the end of the table.

| Module | Description | Bundled with CIAO? | Depends On |
|---|---|---|---|
| *caldb* | The interface between the S–Lang interpreter and the CXC caldb library. The caldb library functions are used in CIAO in the acis_fef_lookup tool, which is written in S–lang. | Yes | CIAO |
| *cfitsio* | Generic FITS input/output functions. | Yes | CFITSIO |
| *chips* | The plotting package of CIAO which can be used to create plots from S–Lang. The S–Lang programming language can also be used to manipulate or create data for plotting. | Yes | CIAO |
| *group* | The interface between the S–Lang interpreter and the CXC group library, which bins histogram data based on various user–selected rules. | Yes | CIAO |
| *GUIDE* | GUIDE can be used to store and retrieve models and model parameters. One of it's more advanced applications is in identifying spectral lines to derive physical conditions and differential emission measures. | Yes | CIAO |
| *histogram* | Allows for the creation and manipulation of one– and two–dimensional histograms. | No | (none) |

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| *isis* | ISIS is a fully programmable spectral analysis system designed to facilitate the interpretation and analysis of high resolution X–ray spectra. ISIS also supports analysis of CCD resolution spectra and a number of other applications. | Yes | CFITSIO, PGPLOT |
| *paramio* | The interface between the S–Lang interpreter and the CXC parameter library. | Yes | CIAO |
| *pixlib* | The interface between the S–Lang interpreter and the CXC pixlib library. | Yes | CIAO |
| *pvm* | PVM (Parallel Virtual Machine) is a software package which permits a heterogeneous collection computers connected by a network to be used as a single large parallel computer. The S–Lang pvm module provides a S–Lang interface to PVM. | No | PVM |
| *region* | The interface between the S–Lang interpreter and the CXC region library. | Yes | CIAO |
| *Sherpa* | *Sherpa* provides a loadable module, which can be imported into other S–Lang applications at run–time (e.g., *ChIPS*, slsh). The module has many functions that provide access to datasets and invoke *Sherpa* functions. See the documentation on sherpa–module for a list of *Sherpa*/S–Lang module functions. | Yes | CIAO |
| *SLglade* | Used in conjunction with SLgtk, it allows you to design your GUIs using Glade (a GTK+ user interface builder), save them in Glade's XML format, and then generate your S–Lang script's graphical interface directly from the XML at runtime. | No | Glade |
| *SLgsl* | The GNU Scientific Library, or GSL, is a well–written and well–supported C library that contains a vast number of numerical routines. The GSL module makes many of those functions available to any application that makes use of the S–Lang interpreter's ability to dynamically load interpreter modules. | No | GSL |
| *SLgtk* | Binds the GIMP Toolkit, also known as GTK, to the S–Lang scripting language. It provides an importable module which makes most of GTK and its constituent libraries callable directly from S–Lang scripts. | No | GTK |
| *SLxpa* | SLxpa binds the XPA library to the S–Lang language. The SLxpa package adds significant enhancements to the original bindings of the | No | XPA |

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|---|---|---|---|
| | CIAO xpa module. | | |
| *stackio* | The interface between the S–Lang interpreter and the CXC stack library. | Yes | CIAO |
| *varmm* | The Varmm library (Variable, Math and Macro) provides a number of functions for reading data from files (both ASCII and FITS formats), and assigning them to variables. In addition to Varmm, there are many I/O functions within S–Lang itself which can also be used. | Yes | CIAO |
| *xpa* | The interface between the S–Lang interpreter and the XPA library. | Yes | CIAO |
| *xspec* | An ISIS–specific module which provides an interface to all the xspec spectral models including additive and multiplicative models, convolution models, and table models. This interface is primarily intended to support using the ISIS fitting engine to fit data with xspec spectral models. | No | HEAsoft |

# Explanation of Table Columns

*Module*
> The name of the module. It is linked to a help file or webpage which provides further information, when available.

*Description*
> A brief description of the module.

*Bundled with CIAO?*
> "Yes" if the module comes with the CIAO package; "No" if it needs to be downloaded separately. The *Module* column is linked to documentation that explain how to obtain the module.

*Depends On*
> If the module depends on the CIAO installation, e.g. because it needs CIAO libraries, "CIAO" is noted in this column. Otherwise, any necessary external libraries are listed.