



CIAO Update - Jonathan McDowell

- Chandra Source Catalog production is underway
 - Public access to database began Oct 8, with user interface and documentation
 - Full catalog release Jan 2009
 - Ian Evans will report on this
- CIAO 4.1 on schedule for release in December
 - Improvements to Sherpa - no longer Beta
 - First of the catalog-developed tools migrating to CIAO
- CIAO patch in spring 2009
 - More catalog tools, ACIS afterglow/flare tool
- CIAO release in late 2009
 - More catalog tools
 - First batch of development from CUC input
- Catalog Release 2
 - Coadd overlapping fields
 - plus incremental improvements
 - No schedule yet (depends on review of release 1)
- L1 and L2 pipelines:
 - pipeline standard data processing (SDP) is stable; we will respond to any spacecraft issues but no major near-term science changes are expected. Considering replacing L2 celldetect with L3 source detection
 - DS will complete major upgrade to new Solaris10 version (DS 8.0 release)



SDP



Community support

- Requested and received CUC input, folded into future planning
- Increased helpdesk/testing junior staff
 - Liz Galle now with us for 8 years
 - Nina Bonaventura joined us in 2008, has led documentation of Catalog (under guidance of I. Evans)
 - Nick Durham left this summer, offer made to replacement whom we hope will start in November.
- Helpdesk: 55 new tickets (Jun 1 - Oct 1), 3 still open
 - median time to first answer 1.5h, longest time 4d (over weekend)
 - median time to close ticket 1 day, average 3 days
 - some tickets take longer to close, e.g. waiting for feedback from user, or from internal specialist
- Restarted CIAO workshops: 2008 CIAO workshop is next week, 33 attendees registered; presentations will be on web.
 - Presenters: McDowell, Burke, Siemiginowska, Fruscione, Nowak, Huenemorder, Houck, Davis, Glotfelty. I. Evans
- Presence at AAS and HEAD meetings
- 1-page CIAO 'cheat sheet' flyers created



CIAO roadmap



- Items relevant to CUC request list are identified, e.g. [CUC A4]
- Point-by-point reply to request list has been made available
- Main themes in near term: catalog tools, and improved point source analysis



CIAO 4.0

CIAO 4.0 was released in Dec 2007

CIAO 4.0.1 was released in Feb 2008 with the new ObsVis

CIAO 4.0.2 was released in Apr 2008 for Mac Leopard support

Downloads since Apr 1 by user's platform:

Linux	CIAO4 345, CIAO3.4 20
	- Most common: FC8, FC7, Debian
	- Still a few FC1,2,3
Solaris	CIAO4 18, CIAO3.4 1
Mac	CIAO4 225, CIAO3.4 19
	- 131 OS 10.5, 113 OS 10.4
Unknown	CIAO4 125, CIAO3.4 19

CIAO4.1 release will
replace FC7 build with FC8

FC4 build still included
No Mac, Solaris change

Solaris 10 build under
consideration for 2009

The CUC input shows that some CIAO 4.0 functionality needs more documentation, and we will work on this over the next few months:

- Better ChIPS examples [CUC A4]
- Using dmgroup with ycolumn=net_counts (group to fixed SNR) [CUC A9]
- Pileup warning thread (and script?) [CUC A5]
- ACIS windows thread (and script?) [CUC A11]



CIAO 4.1

CIAO 4.1 is in testing, with a small amount of development to go.

CIAO 4.1 is relatively limited in scope because we were busy with the Catalog.

- **Sherpa**
 - CIAO 4.0 Sherpa was a beta release, now improved - details on next slide
- **Science Tools**
 - `aprates` Aperture photometry with confidence intervals [CUC A3] (uses user-supplied PSF fraction)
 - `eff2evt` Calculates `eff.area` and 'flux' for each photon in event list
 - `lc_clean` Revised to use new ChIPS [CUC C7]
 - `mkpsfmap` Gives image of approximate PSF size for use in detect apps (not for use in aperture corrections)
 - `lim_sens` Limiting sensitivity calculation (for catalog)
 - `dmellipse` Find ellipse containing given fraction of source [CUC C6]
 - `dmimgadapt` New adaptive binning tool [CUC A6]
 - Upgrades to `wavedetect`, `acis_build_badpix`
- **Infrastructure**
 - DataModel Ascii Kernel - cleaned up, no longer beta - "Release 1" status
 - Image handling improved, can bin tables to images
 - String handling in tables improved, fixed bugs with internal quotes and escape chars.
 - CALDB - new generation CALDB allows better internal organization
 - Prism file viewer improved
 - new interface, better functionality and connection to plots
 - Array columns expanded inline, not in popup; multiple files appear in tabs
 - GUIs (Prism, PEG, TaskMon) - changed out MOTIF for GNU compliant GTK
 - `ardlib` tools now accept data model filters



CIAO 4.1: Sherpa

- Release 1 of the new Sherpa
 - Improved stability compared to CIAO3.4
 - A robust suite of optimization methods suitable for many kinds of parameterized model fitting problems.
 - Levenberg-Marquardt*
 - Simplex (Nelder-Mead implementation)*
 - Monte Carlo*
 - Support for modelling and fitting all kinds of Chandra datasets (spectral, spatial, time series)
 - Fitting of general data (e.g. L(bol) vs size, hot pixels vs time trend)
 - Extensible package with S-Lang and Python interfaces, ability to manipulate the data arrays, integrate with user scripts.
- Sherpa enhancements in CIAO4.1 compared to CIAO4.0
 - Improved convergence for all methods
 - Improved robustness in projection method
 - Support for grating data, multiple responses
 - Support for PSF fitting
 - Support for user models (script, C, Fortran)
 - Additional statistics (including simple least-squares)
 - Improved documentation



CIAO 4.1: Dax

- Dax (DS9 Analysis for X-rays) is a suite to support CIAO analysis in DS9. It appears as a 'CIAO' entry in the DS9 Analysis menu.
- Dax is a beta release in CIAO 4.1

The screenshot displays the DS9 software interface. The main window shows a grayscale image of a celestial object with a green circle highlighting a region. The 'Analysis' menu is open, showing the 'CIAO' option. A 'Statistics' window is also open, displaying the following data:

```
File Edit
MAR(X, Y)
min: 2 e: ( 4076.5 4084.5 )
max: 287 e: ( 4028.5 4140.5 )
rd[log] : ( 502.18108705 515.16968626 )
rd[phys] : ( 4013.9486964 4117.8574901 )
gma_cenrd: ( 1788.8505829 1836.3836699 )
good: 645
null: 1047731
-----
MAR(X, Y)
min: 0 e: ( 5332.5 4644.5 )
max: 30 e: ( 5316.5 4764.5 )
rd[log] : ( 664.97764034 597.1527117 )
rd[phys] : ( 5316.3211227 4773.7216936 )
gma_cenrd: ( 1021.243274 916.72294712 )
good: 885
null: 1047691
```

The 'Statistics' window also shows a list of statistics to be displayed, including 'All (centroid)', 'All (no centroid)', 'centroid', 'counts', 'min', 'max', 'mean', 'median', 'stdev', 'area', and 'centroid snap selected'.



Prism



prism (on devel6)

File Edit View

rprofile_exclmore_DTCOR.fits

Extension	Type	Dimensions
PRIMARY	image	NULL
HISTOGRAM	table	25 cols, 50 rows
STDGTI01	table	2 cols, 6 rows
STDGTI02	table	2 cols, 6 rows
STDGTI03	table	2 cols, 6 rows
STDGTI04	table	2 cols, 6 rows
STDGTI05	table	2 cols, 6 rows
STDGTI06	table	2 cols, 6 rows
STDGTI07	table	2 cols, 6 rows
STDGTI08	table	2 cols, 6 rows
STDGTI09	table	2 cols, 6 rows

Header Keywords

Name	Value
TSTART	235679548.36329001
TSTOP	235690486.12031999
COMMENT	This FITS file may contain long string keyword
COMMENT	continued over multiple keywords. The HEASA
COMMENT	character at the end of each substring which is
COMMENT	on the next keyword which has the name CON
TIMEUNIT	s
TIMESYS	TT
MJDREF	50814.00000000
TIMREF	LOCAL
TASSIGN	SATELLITE
TIMEZERO	0

HISTOGRAM rows: (1-25)/50 page: 1/2

	BG_ERR	BG_COUNTS	BG_RATE	BG_SUR_BRI	BC_SUR_BRI_ERR	NET_COUNTS	NET_ERR	NET_RATE	ERR_RA
units	count	count	count/s	count/pixel*	count/pixel**2	count	count	count/s	count/s
1	98.3412426	9671	0.99624788	8.30223735	8.4422742045	1208.45677	35.0577186	0.12448790	0.00361
2	98.3412426	9671	0.99624788	8.30223735	8.4422742045	714.823688	27.4803003	0.07363680	0.00283
3	98.3412426	9671	0.99624788	8.30223735	8.4422742045	518.191865	24.0493216	0.05338098	0.00247
4	98.3412426	9671	0.99624788	8.30223735	8.4422742045	430.602307	22.3264349	0.04435804	0.00229
5	98.3412426	9671	0.99624788	8.30223735	8.4422742045	372.266993	21.2757458	0.03834869	0.00219
6	98.3412426	9671	0.99624788	8.30223735	8.4422742045	426.790666	22.9790851	0.04396539	0.00236
7	98.3412426	9671	0.99624788	8.30223735	8.4422742045	442.968532	23.6726029	0.04563193	0.00243
8	98.3412426	9671	0.99624788	8.30223735	8.4422742045	437.087766	23.9772820	0.04502613	0.00246
9	98.3412426	9671	0.99624788	8.30223735	8.4422742045	489.695614	25.4661779	0.05044547	0.00262

Plot Dialog (on devel6)

Plot Settings

Curve X: AREA Y: NET_COUNTS Errs: NET_ERR

Line Style: solid Thickness: 3.0 Color: Default

Symbol Style: cross Size: 6 Color: Default

Error Style: line Thickness: 2.0 Color: Default

Behavior: Overplot New Windo Erase Existing

Chips Server Id: [] Launch

Interactive Shell: None Python S-Lang

win4 (on devel6)

Tue 07-Oct 16:47:48 Added curve of /pool14/anto/rprofile_exclmore_DTCOR.fits[HISTOGRAM][cols AREA,NET_COUNTS,NET_ERR] to c
 Tue 07-Oct 16:47:48 Failed to connect to chips server
 Tue 07-Oct 16:47:32 Added curve of /pool14/anto/rprofile_exclmore_DTCOR.fits[HISTOGRAM][cols AREA,NET_COUNTS,NET_ERR] to c
 Tue 07-Oct 16:47:32 Failed to connect to chips server
 Tue 07-Oct 16:47:18 Added curve of /pool14/anto/rprofile_exclmore_DTCOR.fits[HISTOGRAM][cols AREA,NET_COUNTS,NET_ERR] to c
 Tue 07-Oct 16:47:18 Failed to connect to chips server
 Tue 07-Oct 16:47:07 Added curve of /pool14/anto/rprofile_exclmore_DTCOR.fits[HISTOGRAM][cols AREA,NET_COUNTS,NET_ERR] to c



CIAO 4.1.1

CIAO 4.1.1 (spring 2009) will include some more Catalog related tools and some pipeline improvements

We had originally hoped to get these in CIAO4.1, but ran out of time.

Contents are still tentative (some items may slip to CIAO4.2, others may be added to the list). Tool names may change!

- Science Tools for CIAO 4.1.1
 - afterglow New afterglow tool using 3D algorithm [CUC C3]
 - glvary Gregory-Loredo variability tool [CUC D2]
 - flux_calc Convert counts to flux given model [part of CUC A3]
 - MHO/iss Source extent calculation [part of CUC A2]
 - ACIS reprocessing script first version? [CUC A1]
 - Grating scripts, discussed in TGCat presentation later
 - Improved HRC gain and filtering
 - Working on ACIS graded mode CTI correction



CIAO 4.2

CIAO 4.2 (late 2009) planning is now beginning

Focus is point source analysis, and more catalog-derived tools

Here is a list of some projects we are considering for inclusion in CIAO4.2

- Candidate Science Tools for CIAO 4.2 - calibration
 - ACIS reprocessing scripts [CUC A1] (HRC not as high a priority)
- Candidate Science Tools for CIAO 4.2 - fluxes
 - BEHR BEHR algorithm for hardness ratios [CUC D1]
 - flux_eval Use eff2evt to make flux estimate, add confidence intervals
 - srcrate Source rate using Feldman-Cousins, etc. [CUC D3]
- Candidate Science Tools for CIAO 4.2 - extent
 - extent_test Source extent test [rest of CUC A2]
 - sub_pixel Support for sub-pixel resolution [related to CUC C5]
 - saotrace User wrappers for SAOTrace (issue: still no Mac port)
- New functionality in existing tools
 - acis_process_events support for graded CTI [request from Cal team]
 - sherpa Option to fix grouping energy band [part of CUC A9]
 - sherpa Max Like. fit to unbinned 1D data
 - sherpa R&D on responses with calibration uncs., fitting response params



CIAO longer term

Some items we believe probably cannot get done by CIAO4.2:

- Higher priority point source tools
 - Accurate source positions for off axis sources [CUC C2]
 - Grating extended source extraction [CUC A10]
 - Further improved source properties [CUC C8]
 - BLoCXS Gibbs sampler method [CUC A8]
- Lower priority general tools
 - Lupton color method, adapted for x-rays [CUC A7]
 - Advanced image reconstruction [CUC C5]
 - Advanced handling of bad pixel lists [CUC B2]
- Later release themes
 - Coadded data analysis
 - Mosaics
 - Extended source analysis tools