



The HEASARC CALDB

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The HEASARC

- ? Provides multi-mission archive
 - Gamma-ray, X-ray, EUV data
- ? Contains data for 20+ missions
- ? Stores and distributes mission data in FITS format
- ? Developed and distributes FITIO library for data access

The HEASARC CALDB

- ? Provides a structure to store calibration data
- ? Provides documentation for calibration data
- ? Stores calibration data

Calibration Data flow

? Stage 1

- Ground data
- Flight data
- Instrument models

? Basic Calibration Files (BCFs)

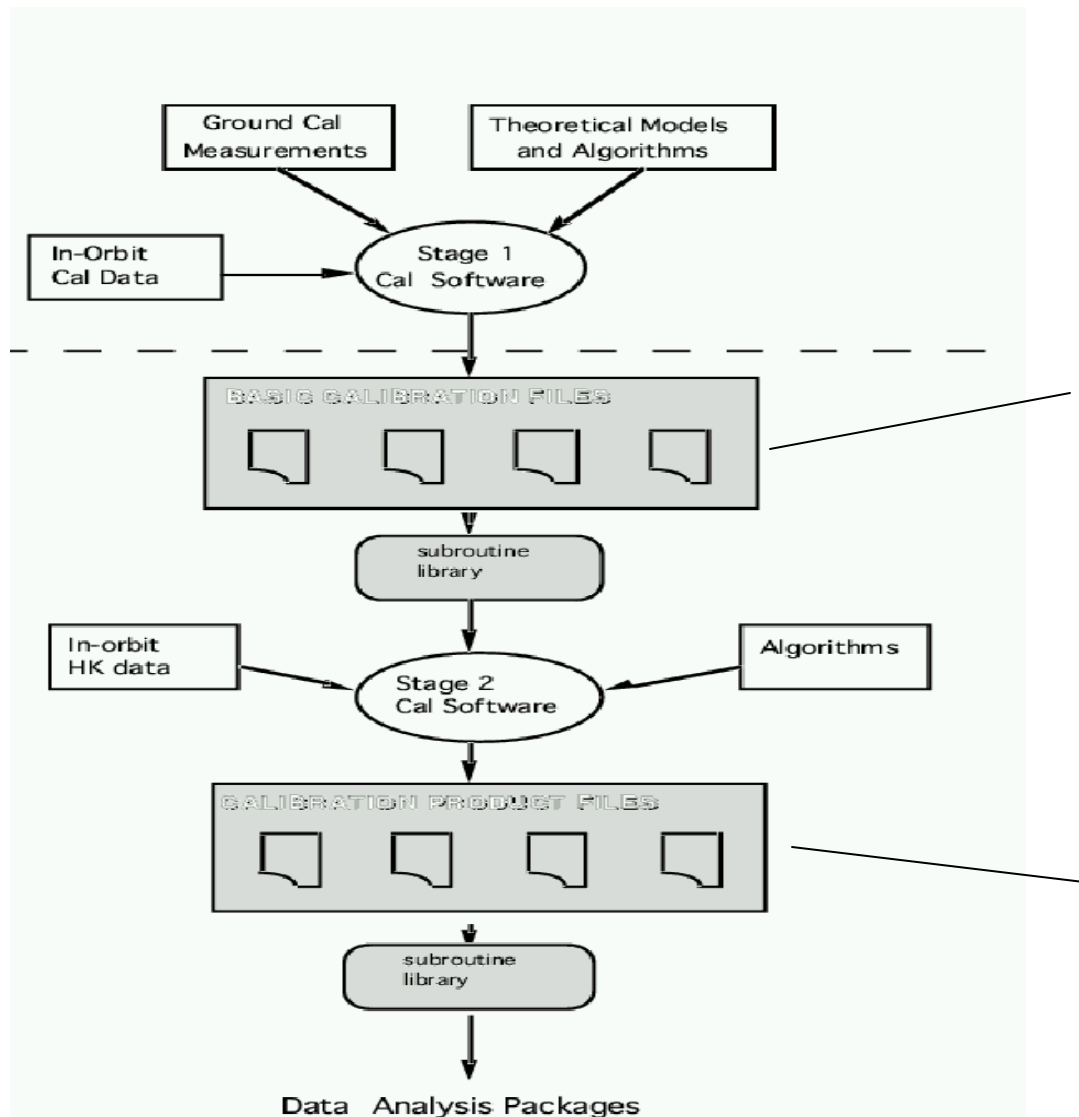
- Instrument PSF
- Gain Maps
- Efficiency maps
- Vignetting

Calibration Data flow cont.

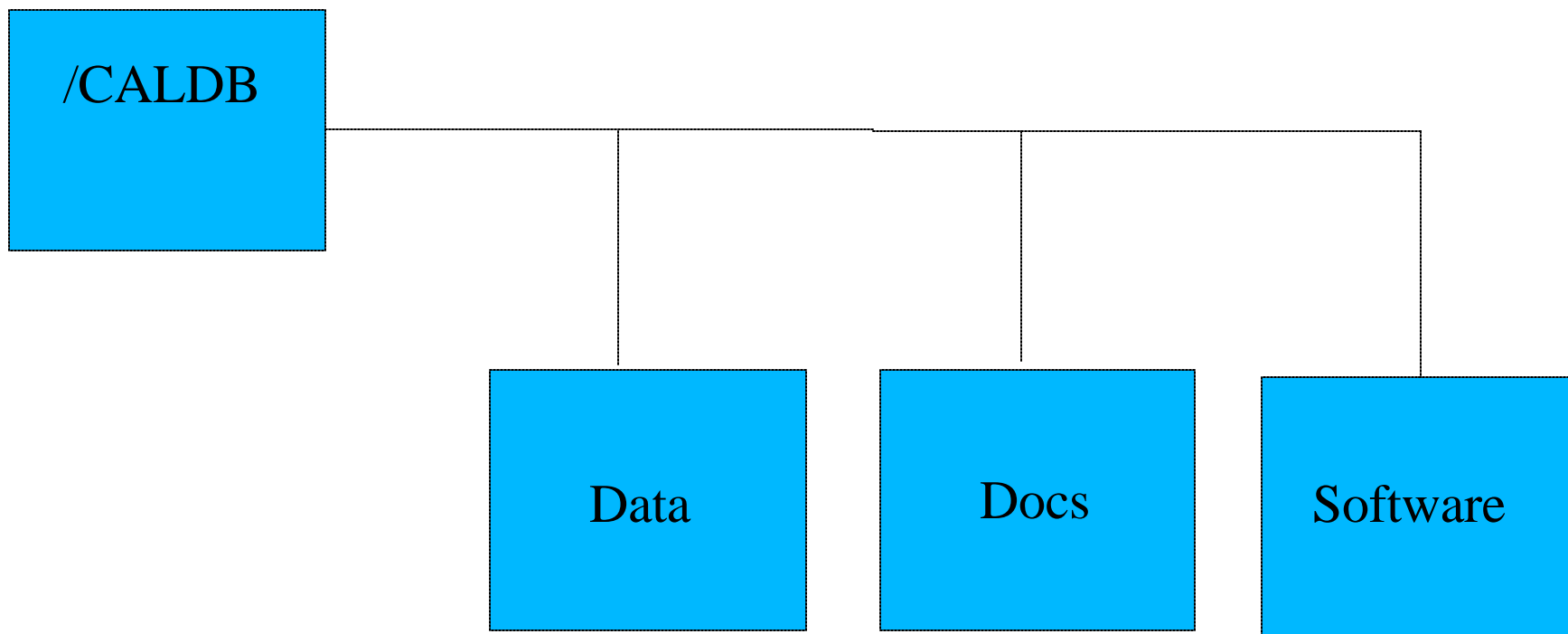
? Stage 2

- Stage 1 data is convolved/joined to generate Calibration Product Files (CPFs)
- With satellite Housekeeping files
 - SAA passage
 - Viewing constraints
- Basic Calibration Product Files (CPFs)
 - Instrument RMF
 - Effective area maps

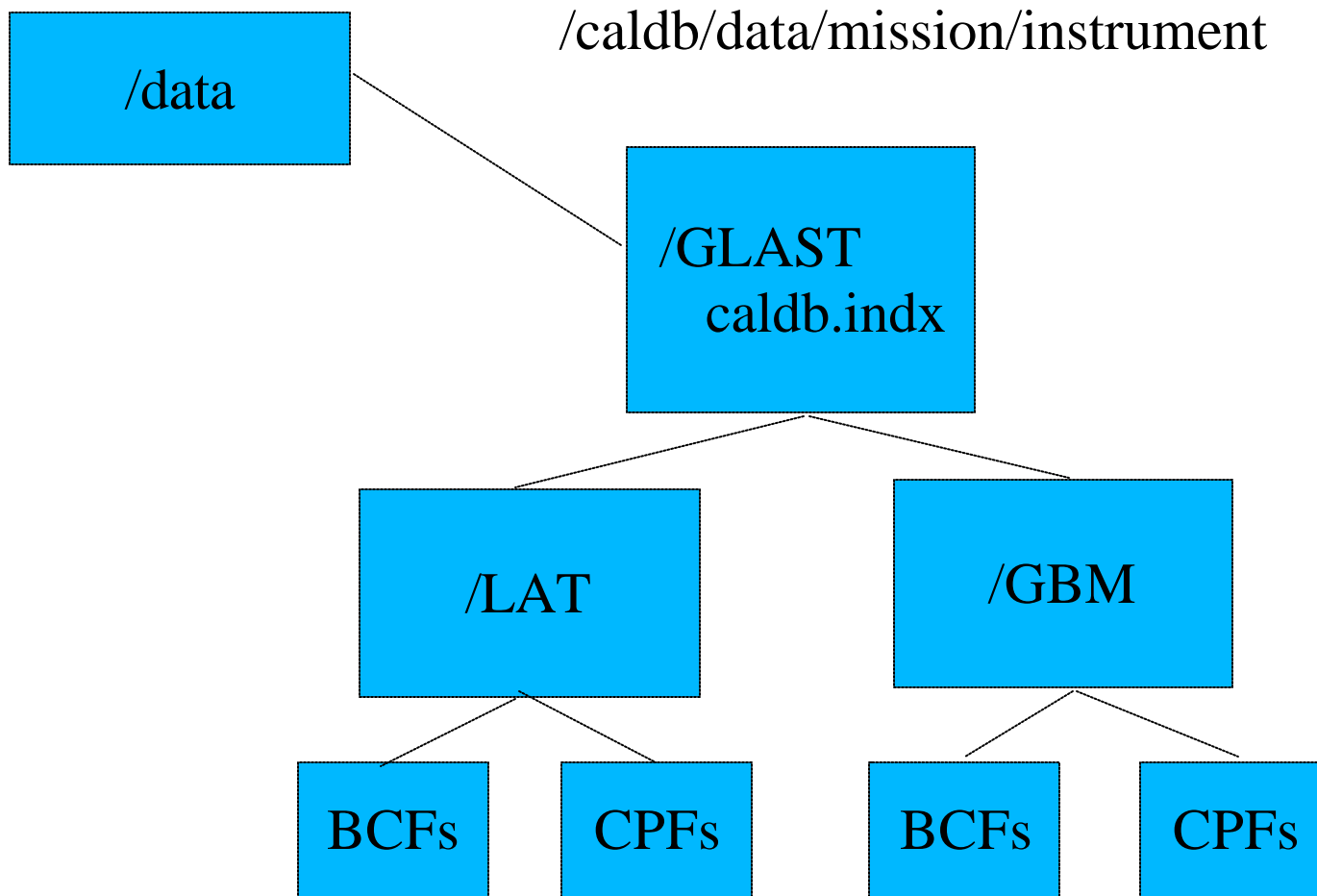
Calibration Data Flow cont.



CALDB Directory Structure



CALDB Directory Structure



Finding files in the CALDB

- ? Files are found using the caldb.indx file
 - Locates the file
 - Contains date stamp for usage
 - Contains flags for constrains
 - ? Detector off-axis angles
 - ? Energy range
 - ? Temperature range

CALDB Tools

? Maintenance Utilities

- caldbinit
- caldbinfo

? Format Conversion Tasks

- cmppha

? General Calibration Utilities

- quzcif
- calcrpsf

RMFs in the CALDB

- ? FITS file with a null primary extension and two extensions
 - Redistribution matrix
 - ? Stored using a simple compression method which stores only matrix values above a given threshold
 - Ebounds extension
 - ? Lists the nominal energy_lo and energy_hi for each detector channel

RMF generation

- ? RMFs can be generated using a variety of methods
 - Using functional forms eg. Gaussian, Lorentzian,...
 - Measured profiles eg. ground calibration data
 - Theoretical profiles

Grating RMFs

- ? Line Spread Function is fit with a function
- ? This is tabulated and stored in a FITS file (BCF)
 - Fit parameters are stored as a function of
 - ? Detector
 - ? Off-axis angle
 - ? Order
 - ? Energy
 - ? Encircled Energy fraction

Grating RMFs cont.

? mkgrmf

- Reads header info from spectral file (pha file)
 - ? Detector, off-axis angle, date, ...
- Calls CALDB with parameters from header to retrieve the correct files
- Interpolates fit parameters to generate RMF
- Recasts this into OGIP standard RMF file

PSF Storage

- ? PSF's can be stored as images
 - Separate file for each image
 - ? May be a large number of files
 - ? Difficult to manage
 - ? Inefficient retrieval
 - Image stacks eg. Fixed position & energy varies
 - ? More efficient storage
 - ? Easier to manage and update
 - ? Intermediate number of files

PSF Storage cont.

- PSF's can be stored as image cubes
 - ? One (or a small number) of files
 - ? Difficult to update
 - ? Inefficient retrieval

PSF Storage cont.

- ? PSF's can be stored as fitted parameters
 - Much more compact storage
 - ? Can be stored in a multidimensional array
 - ? More efficient interpolation
 - ? Easier to maintain and update
 - ? May be difficult to fit with analytic functions

Remote access to the CALDB

The HEASARC CALDB can be accessed remotely eliminating the need for distributing large files

This also means that the user does not have to worry about updating their local caldb

http://heasarc.gsfc.nasa.gov/docs/heasarc/caldb/caldb_remote_access.html

Conclusions

- ? CALDB allows mission data to be stored in a uniform structure
- ? Provides tools for accessing and updating CALDB
- ? Many representations are allowed as long as it can be cast into a FITS file
- ? Allows remote access to calibration data