Plotting Facilities for the GLAST Science Tools

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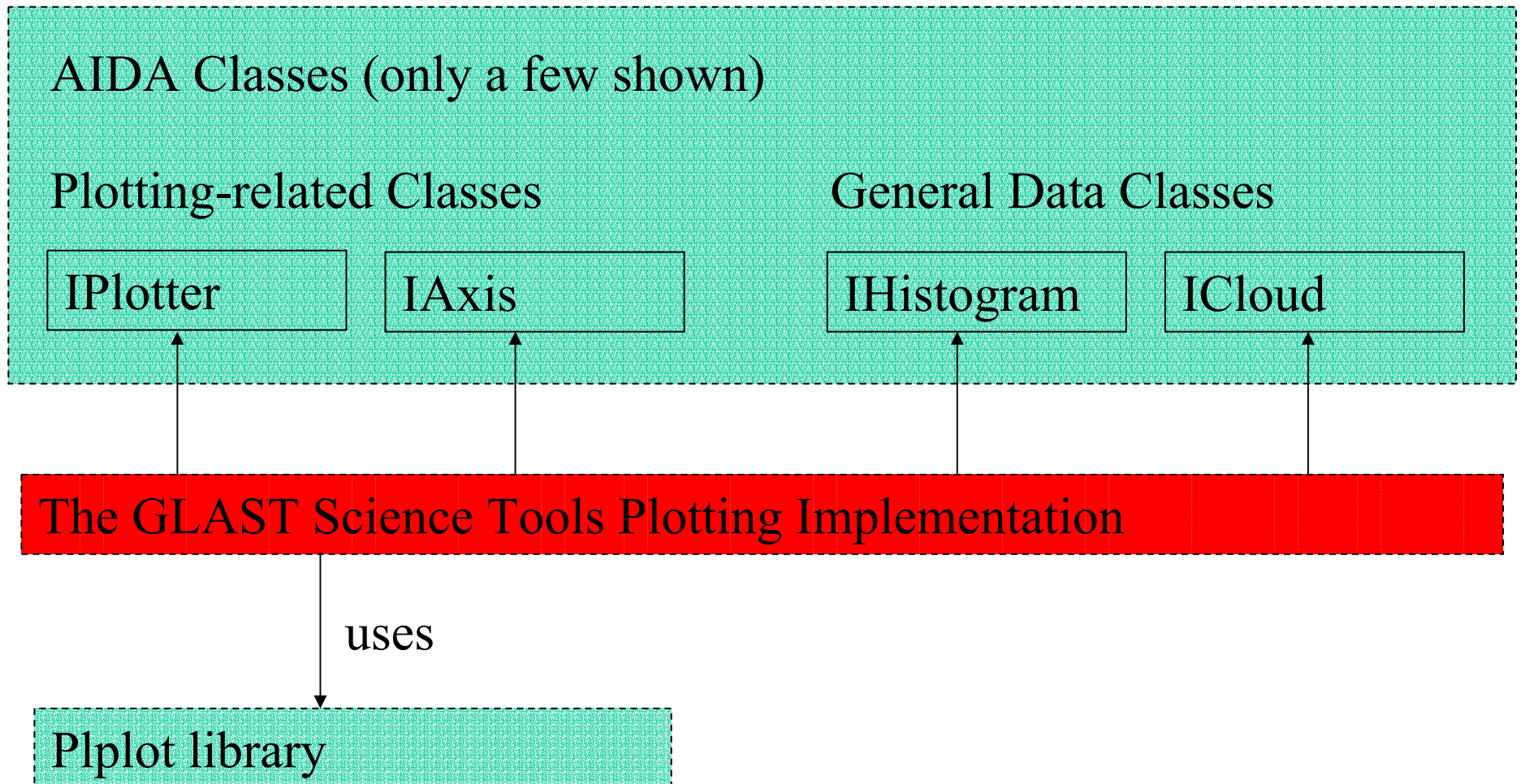# Brief History of Science Tools Plotting Issues, Part 1

- The User Interface group began assessing plotting options for the science tools in April, 2002.

- Initial use cases took the form of four plot types.

- A large number of plotting packages were evaluated based on their suitability to implement the four types. Front-runners included Plplot and Root.

- The use cases were expanded to contain nine plot types, some of which may not be necessary.

Brief History of Science Tools Plotting Issues, Part 2

- The UI group recently elected to use an abstract interface for the plotting library. This is so that the underlying (low-level) plotting library could be changed later with minimal impact to any tool which plots.

- As a starting point, the UI group further decided to try implementing the AIDA interface using Plplot.
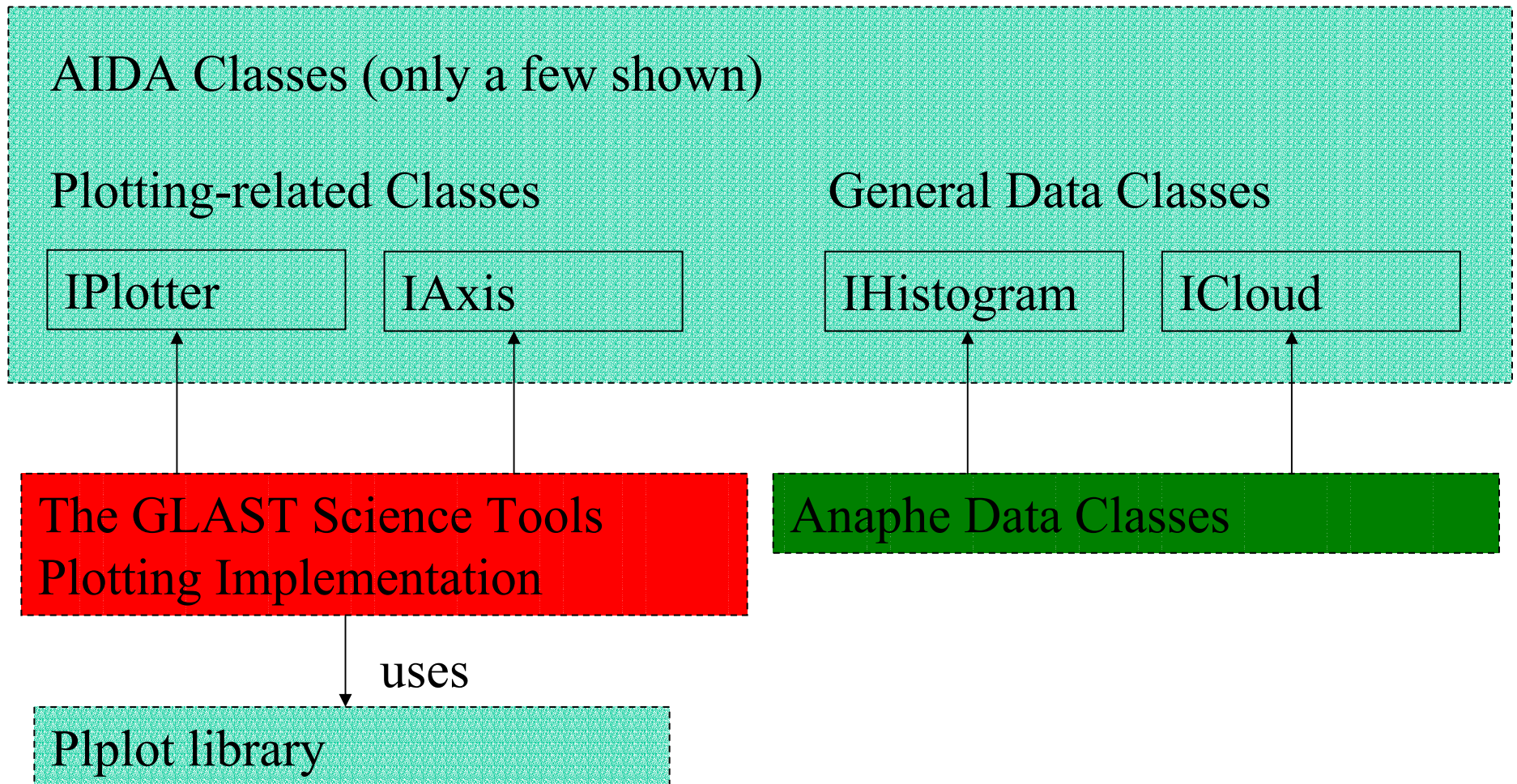
A Plotting Implementation Using AIDA and Plplot

AIDA Classes (only a few shown)

Plotting-related Classes   General Data Classes

| IPlotter | IAxis | | IHistogram | ICloud |

The GLAST Science Tools Plotting Implementation

uses

Plplot library

Initial Report on AIDA

- AIDA's plotting interfaces use a number of AIDA data abstractions (histograms, trees, etc.)

- Implementing plotting using AIDA would thus require a fairly large amount of code, more than that required strictly by the plotting.

- Anaphe, an existing AIDA implementation, could be used to save some development, but it is fairly large, and is not well supported on Windows.

A Plotting Implementation Using AIDA, Plplot and Anaphe

AIDA Classes (only a few shown)

Plotting-related Classes   General Data Classes

| IPlotter | IAxis | IHistogram | ICloud |

The GLAST Science Tools Plotting Implementation

Anaphe Data Classes

uses

Plplot library

Initial Report on Plplot

- Plplot provides all necessary features for eight of the nine current use cases. The exception is Lego plots.

- Lego plots may not be essential?

- Plplot contains lower-level functions which could probably be used to implement Lego plots.

- Otherwise, Plplot seems workable, albeit not object-oriented.

Conclusions Drawn from Initial Reports

- Plplot remains a viable candidate for the low level plotting for the science tools.

- AIDA's role in the science tools is less certain. Plotting is only one small part of it, but getting the plotting to work requires implementing a large part of it.

- If AIDA is selected, Anaphe is worthy of further consideration, but it too comes at a price.

The Next Step for the UI Group

Must decide between the following options:

- Implement our own AIDA interface. Pro: no new third party software dependencies. Con: lots of work.

- Use Anaphe. Pro: most of implementation done for us. Con: another third-party dependency, unknown amount of work to support Windows.

- Write our own abstract interface. Pro: interface would be custom fit to our needs. Con: lose AIDA's potential benefits.

- Simply implement plotting using Plplot. Pro: fastest development. Con: lose flexibility.

Appendix A: Minimal AIDA Classes Needed for Plotting

IAnalysisFactory

IAxis

IBaseHistogram

ICloud

ICloud2D

ICloud3D

IHistogram

IHistogram1D

IHistogram2D

IHistogramFactory

IPlotter

IPlotterFactory

IPlotterLayout

IPlotterRegion

ITree

ITreeFactory

ITuple

ITupleFactory

Appendix B: The Nine Plotting Use Cases

1) Cartesian contour plot

2) Cartesian plot with points and optional error bars (optionally asymmetric)

3) One dimensional histograms (bar format)

4) Two dimensional lego plots (with adjustable viewing angle)

5) Cartesian color maps ("Images" or representations of two dimensional histograms)

6) Spherical contour plot with adjustable field of view

7) Spherical contour plot with points and optional error elipses

8) Spherical contour plot, but with color coding as in plot 5

9) Cartesian scatter plot