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The Gemini Quick Look System

Norman Hill, Séverin Gaudet, Jennifer Dunn, Shannon Jaeger, Steve Cockayne

National Research Council Canada/Herzberg Institute of Astrophysics, 5071 West Saanich Rd. Victoria B.C. Canada, V8X 4M6

Abstract. The Gemini Data Handling System (DHS) developed by the Canadian Astronomy Data Centre (CADC) is required to provide a "Quick Look" display system that allows near real-time display of image data collected by the instruments of the Gemini Telescopes. The Gemini Quick Look System allows data to be displayed on multiple display tools, possibly on different systems, allows the display of data from multiple data streams, and allows images to be sent incrementally (in chunks). The Quick Look Tool is based on the European Southern Observatory (ESO) Skycat display tool, and expands on the functionality provided by Skycat. This paper describes the design and function of the Gemini Quick Look System.

1. Introduction

The Quick Look System of the DHS is intended to provide a near real time display of data collected by the Gemini instruments, and to display data produced by the DHS Data Processing system. The initial version of the DHS, including a working version of the Quick Look System was accepted by the International Gemini Project Office in August, 1998. A second version of the DHS is tentatively scheduled to be delivered in May 1999. This will include some of the enhancements to the Quick Look System described section 3. Other aspects of the Gemini DHS are described in Dunn et al. (1999), Gaudet (1996), Gaudet et al. (1999), Hill et al. (1999), and Jaeger et al. (1999).

2. Quick Look Data Flow

Figure 1 depicts the data flow through the Quick Look System. The components that manipulate the data are divided into three sections:

- **Data Sources** are the sources for the original data which are all external to the DHS. Data sources may include all Gemini instruments, the Gemini Observatory Control System (OCS), and may include non-science instruments like the Guide Camera. Data for a single dataset may be sent by more than one data source and each source may send the data for a single dataset in more than one chunk. It is also possible several data sources to be simultaneously sending data to the DHS. The data structure is described in detail in Dunn et al. (1999).
- **Data Handling System** are the subsystems of the DHS which run on the DHS computers at the summit. All data received by the DHS Data Server

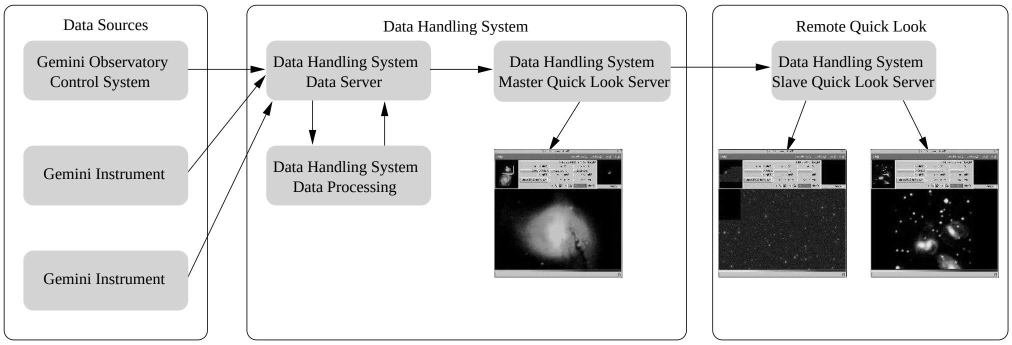

Figure 1. Quick Look Data Flow.

are forwarded to the Quick Look Server for display, and to the DHS Data Processing system for pre-arranged data reduction. Data created by the Data Processing system may be sent back to the Data Server for archival storage or to be forwarded to the Quick Look Server.

- **The Remote Quick Look** components are the parts of the DHS which would run on any remote computer system that is displaying Quick Look data. These systems may be computers dedicated to Quick Look, or they may be computers primarily used for other Gemini functions, which have Quick Look as a secondary function (the systems running the OCS for example).

2.1. The Quick Look Server

The master Quick Look Server receives data from the Data Server and routes the data to appropriate Quick Look Tools and slaved Quick Look Servers. Data routing is based on Quick Look stream names, which are assigned to a dataset by one of its data sources (see section 2.3.). Data is sent to Slave Quick Look Servers using the IMP (Shortridge 1997) message passing system, and to the Quick Look Tools using memory mapped files.

If Quick Look data is to be displayed on computer systems other than the one running the master Quick Look Server, a slave Quick Look Server must be run on the second system. The master Quick Look Server transfers only one copy of each dataset to each slave Quick Look Server, and so even if more than one Quick Look Tool is displaying a dataset, only one copy of the data will be transferred over the network. Having a separate Quick Look Server on each computer also allows memory mapped files to be used to transfer data between Quick Look Server and Quick Look Tools, and avoids having to transfer the entire image over the network each time a chunk is received, which maximizes Quick Look Tool display speed.

2.2. The Quick Look Tool

The DHS Quick Look Tool is a Tcl/Tk program based on the ESO Skycat display tool (Albrecht et al. 1997). It uses the OcsWish Tcl/Tk interpreter provided by the Gemini Project (Walker & Gillies 1998). All existing Skycat functionality is retained.

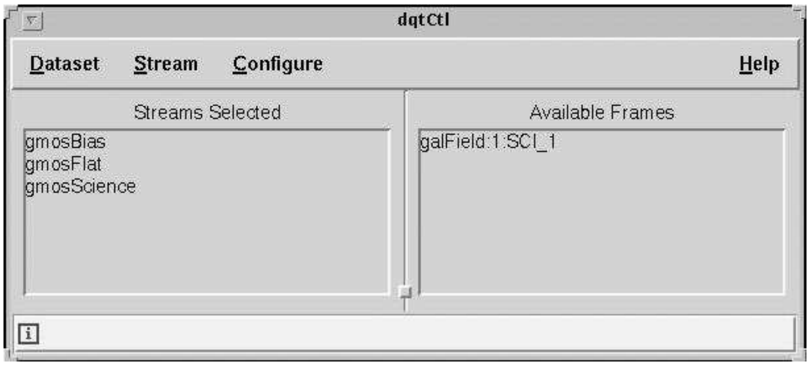

Figure 2. Quick Look Control Panel.

The Quick Look Tool merges data chunks into a single coherent image and displays the most recently received dataset and frame. See Dunn et al. (1999) for more information about chunking. The control panel shown in Fig. 2 was added to Skycat to control the new Quick Look functions. The control panel:

- Shows the list of currently subscribed streams (see section 2.3.).
- Allows the list of subscribed streams to be modified.
- Displays a list of frames available for the current dataset.
- Allows a frame to be selected for display.
- Allows the Quick Look Tool configuration to be modified.
- Allows a specific dataset to be retrieved from the DHS Data server and displayed.
- Allows the currently displayed frame to be saved to the Gemini archive.

2.3. Quick Look Streams

Data are directed to appropriate Quick Look Tools based on Quick Look stream names. A set of Quick Look stream names are assigned to each dataset by one of its data sources. Each Quick Look Tool individually subscribes to a set of Quick Look streams. The initial list of subscribed streams are determined from the Quick Look Tool configuration file, and the user may change the subscribed streams with the control panel (section 2.2.). When the Quick Look Server receives data for a dataset, the data is forwarded only to those Quick Look Tools which have subscribed to at least one of the Quick Look streams associated with the dataset.

Quick Look streams allow simple and flexible control over the routing of data to Quick Look Tools.

3. Future Enhancements

There are several enhancements to the Quick Look System which will be added in the near future:

- The newest version of Skycat allows overlay graphics to be stored in the input files. This feature will be used to allow data displayed by the Quick Look System to contain graphics and graphics overlays.

- Simple image processing as data is received. This will allow removal of flat or bias effect, or application of a bad pixel map.
- The Quick Look control panel will be merged into the Skycat interface using the Skycat plug-in capability.
- The ability to merge separate frames into a rough mosaic. This will allow a unified view of images from instruments with multiple detectors.

4. Conclusions

At the time of writing, there are no operational instruments for the Gemini telescopes, however we have tested the Quick Look System with instrument simulators. We have met our throughput requirements of:

- 10 frames per second for 128×128 pixel images.
- 1 frame per second for 512×512 pixel images.
- .5 frame per second for 1024×1024 images.

The Quick Look System is now being used by instrument developers and by Gemini integration and testing staff for testing and development of Gemini instruments.

A high frame update rate will allow instruments that collect data continuously (e.g., the Gemini Guide Camera) to display data with the appearance of continuous motion. It is expected that the throughput of the Quick Look System will be high enough that the Gemini Guide Camera will be able to use the Quick Look System as a real time display, eliminating the need for a dedicated real time display system.

References

Albrecht, M. A., Brighton, A., Herlin, T., & Biereichel, P. 1997, in ASP Conf. Ser., Vol. 125, Astronomical Data Analysis Software and Systems VI, ed. G. Hunt & H. E. Payne (San Francisco: ASP), 333

Dunn, J., Jaeger, S., Hill, N., Gaudet, S., & Cockayne, S. 1999, this volume, 167

Gaudet, S. 1996, in ASP Conf. Ser., Vol. 101, Astronomical Data Analysis Software and Systems V, ed. G. H. Jacoby & J. Barnes (San Francisco: ASP), 388

Gaudet, S., Hill, N., Dunn, J., Jaeger, S., & Cockayne, S. 1999 this volume, 3

Hill, N., Gaudet, S., Dunn, J., Jaeger, S., & Cockayne, S. 1999, this volume, 155

Jaeger, S., Dunn, J., Cockayne, S., Gaudet, S., & Hill, N. 1999, this volume, 159

Shortridge, K. 1997, Interprocess Message Passing (IMP) System, (AAO/IMP_MANUAL_8, Drama Software Report 8) (Sydney: Anglo-Australian Observatory)

Walker, S. & Gillies, K. 1998, OcsWish Technical Manual, (ocs.ocs.015-OcsWishTechnical/02) (Tucson: NOAO)