

System Interfaces to the STIS Calibration Pipeline

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Abstract. The routine processing of STIS data in the calibration “pipeline” requires an interrelated set of software tasks and databases developed and maintained by many groups at STScI. We present the systems-level design of this calibration pipeline from the perspective of the STIS instrument group at STScI. We describe the multiple interfaces to the pipeline processes that the STIS group works across in an effort to provide for the routine calibration of STIS data. We provide a description of the pipeline processing while treating the actual processing software as a collection of black boxes. We describe the systems engineering requirements levied by and against the STIS group needed to carry out day-to-day calibration of STIS observations.

1. Functional View of STIS Calibration Pipeline

The functional view of the STIS calibration pipeline (Figure 1) illustrates the interactions between the external world and the pipeline itself. In this case, there are two sets of external users: observers (including GO and GTO) and the STIS group at STScI. The two groups of users are similar in that they both receive data products consisting of raw and calibrated STIS data from the calibration pipeline system. Additionally, the STIS instrument scientists are responsible for calibrating STIS and feeding these calibration parameters back to the pipeline system. (Note: the arrows that are used in all three figures indicate the flow of information between groups.)

2. Top Level Object Interaction Diagram of STIS Calibration Pipeline

To demonstrate the number of details that must be managed to run a calibration pipeline for STIS we identify distinct entities within the Space Telescope Science Institute with which the STIS group interacts in the course of keeping the STIS calibration pipeline up and running. Borrowing from the object-oriented paradigm, we designate these entities as “objects”. The Object Interaction Diagram (OID) of the STIS calibration pipeline (Figure 2) shows in detail the “objects” within STScI that the STIS group interacts with in the process of ensuring that STIS data are properly calibrated. These objects consist of three distinct classes: Operations, Database and Tools. The Operations class consists of subsystems (usually controlled by distinct management groups) that actually handle STIS data on a daily basis. The Database class consists of databases con-

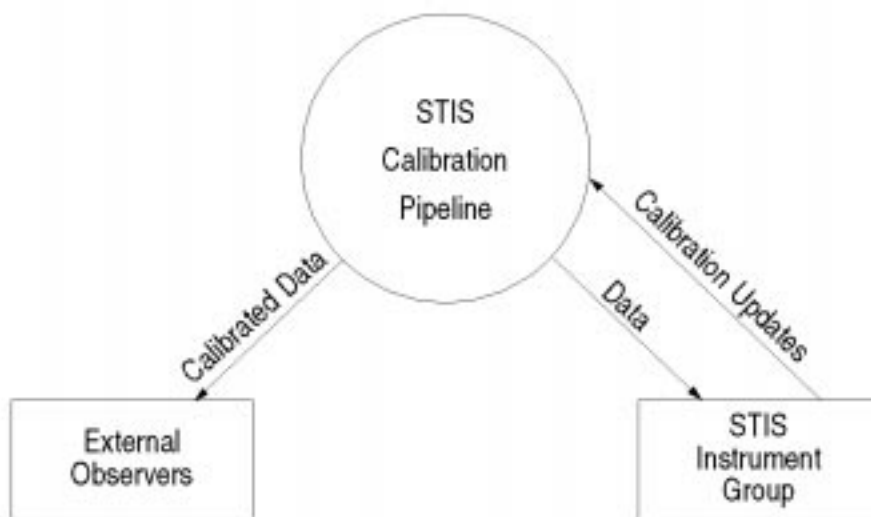


Figure 1. Functional View of STIS Calibration Pipeline.

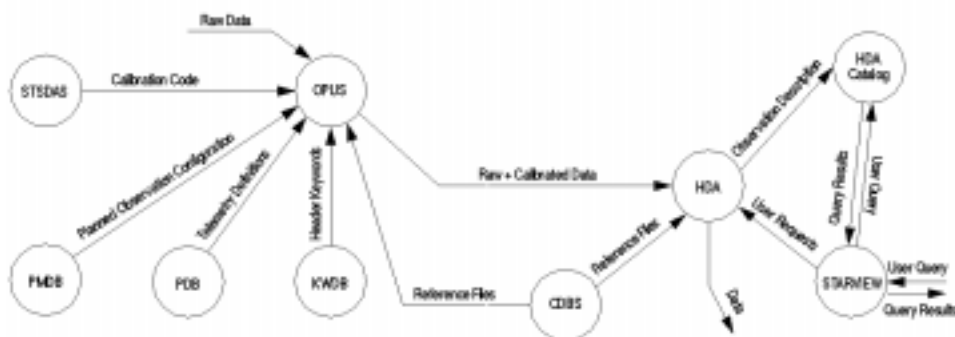


Figure 2. Top Level Object Interaction Diagram of STIS Calibration Pipeline

taining myriad details of STIS operations which are cared for by the database designers and operators. The third class of object in this model, Tools, consists of groups of programmers with the responsibility of producing specialized software tools. The OID concepts used in this description of the calibration pipeline have been adapted from Morris, et al. (1996).

3. Object Interaction Diagram (OID) of the STIS Group Interface with the STSDAS Group

Missing from the OID of the STIS calibration pipeline is the explicit interaction between the STIS group and each object in the model of the STIS calibration pipeline. The OID shown in Figure 3 gives, as an example, the detailed descrip-

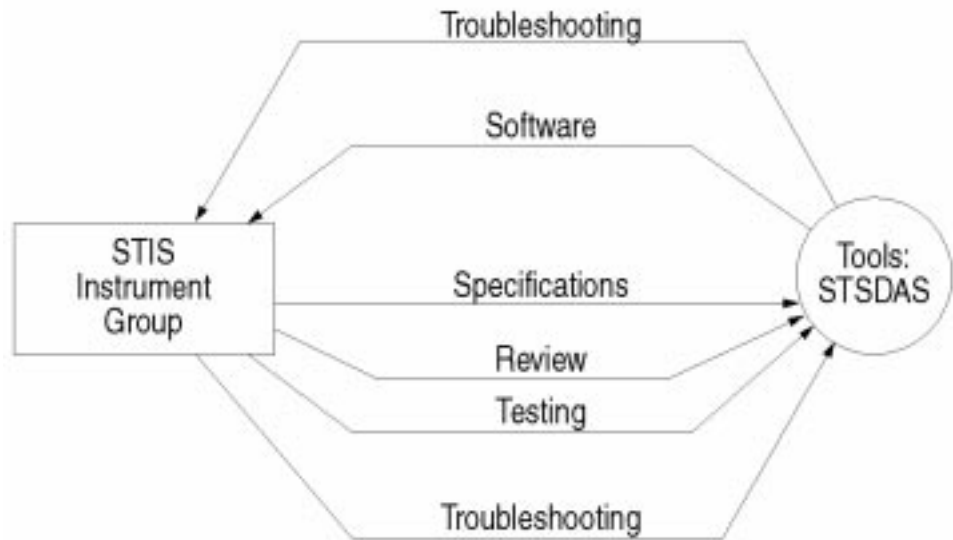


Figure 3. Object Interaction Diagram of the STIS Group Interface with the STSDAS Group

tion of the interface between the STIS group and the Tools class object, the STSDAS programming group. The STSDAS group is responsible for crafting the highly specialized calibration code used to process STIS data. This code runs not only in the pipeline but also as stand-alone tasks. Special attention should be paid to the interactions (pair of arrows) labeled “Troubleshooting”. A critical part of negotiating the implementation of STIS-specific features of the pipeline is the ability and willingness of the STIS group and the relevant operations group, programming group or database group to identify and resolve problems in a timely manner.

4. Systems Engineering Details

To assist in the management of the STIS portion of the calibration pipeline, the STIS group is subject to constraints imposed by the systems engineering of the pipeline process. For example, the STIS group:

- maintains ICD-19 which is a description of the data formats for all STIS data including specifications for the header keywords. This information is stored in the Keyword Database (KWDB).
- maintains ICD-47 which is a description of the STIS calibration reference file formats. This information is stored in the Calibration Database System (CDBS).
- performs cross-subsystem testing of software changes affecting STIS.
- participates in the biweekly Pipeline Working Group consisting of representatives from all of the calibration pipeline “objects” (groups).

- provides documented specifications via instrument science reports (ISRs), technical instrument reports (TIRs) and the problem reporting (OPR) system.

References

Morris D., Evans, G., Green, P. & Theaker, C. 1996. Object Oriented Computer Systems Engineering. (New York: Springer), 70