

# The ODI Pipeline Scheduling Agent ICD

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## 1 Introduction

The Pipeline Scheduling Agent (PSA) is the element of the PPA which manages the submission and resubmission of data to be processed by the Automatic Calibration Pipeline (AuCaP). Managing means defining sets of exposures to process, defining when they are processed, and keeping track of what has been processed and archived.

The key concepts are *datasets* and *subsets*. Both of these refer to a set of ODI exposures with the latter being a subset of the former. A dataset is generally defined as all exposures from one or more nights. A subset is generally defined as exposures which are logically independent of each other either by type of exposure – calibration, static science, guided science – or by filter.

Datasets are defined externally by a pipeline scientist based on the telescope schedule. Subsets are defined by the calibration planner as a dataset is broken down into a sequence of workflows.

Datasets and subsets are managed using a database called the Pipeline Scheduling Queue Database (PSQDB). There are two tables corresponding to datasets and subsets. Initial datasets are entered by the pipeline scientist, subsets are entered by messages from the data engine, and additional "reprocessing" datasets are generated as needed by the operator.

The PSA submits datasets to be processed to the data engine. Datasets are submitted in three ways; automatically based on the time the exposures in the dataset are available, automatically when datasets to be processed are pending, and manually by a request from the operator. The PSA acts as a processing throttle in that it normally limits processing to a single dataset at a time though the operator can override this.

A design feature is that reprocessing is controlled at the subset level. It is typically the case that only some subsets of a dataset fail for some reason. By the definition of a subset, it is possible to reprocess it independently of other subsets. So it would be inefficient to reprocess an entire dataset just to reprocess a subset.

## 2 Database Schema

Figure 1 shows the database schema for the dataset and subset tables. The database engine used is not critical and specific schema details may depend on the engine.

### 2.1 Examples

Figure 1: PSQDB database schema.

```
CREATE TABLE DATASETS (  
    dataset      char(32),  
    nights       varchar(512),  
    procafter    char(19),  
    status       char(16)          DEFAULT 'pending',  
    priority     int              DEFAULT 1,  
    submitted    char(19),  
    completed    char(19),  
    comments     varchar(512),  
    PRIMARY KEY (dataset, procid)  
);  
  
CREATE TABLE SUBSETS (  
    dataset      char(32),  
    subset       char(32) CHARACTER SET binary,  
    procid       char(16),  
    status       char(16),  
    submitted    char(19),  
    completed    char(19),  
    archived     char(19),  
    comments     varchar(512),  
    PRIMARY KEY (dataset, procid, subset)  
);
```

Figure 2: DATASETS Table: Example record before processing.

```
dataset      = 20111031  
nights       = 2011-10-31,2011-11-01,2011-11-02  
procafter    = 2011-11-02T12:00:00  
status       = pending  
priority     = 1  
procid       = NULL  
submitted    = NULL  
completed    = NULL  
comments     = Example
```

Figure 3: DATASETS Table: Example record after processing.

```
dataset      = 20111031  
nights       = 2011-10-31,2011-11-01,2011-11-02  
procafter    = 2011-11-02T12:00:00  
status       = completed  
priority     = 1  
procid       = 7dec3a  
submitted    = 2011-11-15T21:10  
completed    = 2011-11-16T03:30  
comments     = Example
```

Figure 4: SUBSETS Table: Example records from subsets.

```
dataset = 20111031
subset = Bias
procid = 7decd3a
status = archived
submitted = 2011-11-04T09:50:47
completed = 2011-11-04T10:05:25
archived = 2011-11-04T12:19:44
comments = NULL

dataset = 20111031
subset = BF
procid = 7decd3a
status = archived
submitted = 2011-11-04T10:05:30
completed = 2011-11-04T10:20:04
archived = 2011-11-04T12:21:22
comments = NULL

dataset = 20111031
subset = B
procid = 7decd3a
status = archived
submitted = 2011-11-15T15:34:56
completed = 2011-11-15T18:19:07
archived = 2011-11-18T22:59:55
comments = NULL

dataset = 20111031
subset = BS
procid = 7decd3a
status = reprocess
submitted = 2011-11-15T18:49:09
completed = 2011-11-15T19:12:55
archived = NULL
comments = Reprocess without applying a sky flat.
```

Figure 5: DATASETS and SUBSETS Tables: Reprocessing.

When a subset is marked as `reprocess` a new dataset record is created. When it is run a new process ID is generated. Below is an example during reprocessing.

```
dataset    = 20111031
nights     = 2011-10-31,2011-11-01,2011-11-02
procafter  = 2011-11-02T12:00:00
status     = submitted
priority   = 1
procid     = 7decff1
submitted  = 2011-11-17T11:10
completed  = NULL
comments   = Example. B filter reprocessing.
```

  

```
dataset    = 20111031
subset     = BS
procid     = 7decff1
status     = processing
submitted  = 2011-11-17T11:34:56
completed  = NULL
archived   = NULL
comments   = Reprocess without applying a sky flat.
```

### 3 Messages

Communication between the data engine, and potentially other components, is through the PPA messaging system. In this section we illustrate messages generically.

Figure 6 shows the principle PSA-DataEngine messages for submitting a dataset as a set of nights, for receiving a completion message, and for reprocessing subsets. The subset names are those previously defined by the calibration planner. The `replace` part of the message can be a little confusing. Reprocessing can occur both before archiving and after archiving. In the former case, the results are provisional and the data engine is first notified that the provisional results can be deleted prior to reprocessing. In the latter case, the results of previous processing were accepted for archiving and are in the mass storage system of the PPA. The `replace` request is used to override the default behavior of the data engine that previously completed and archived data, that is raw exposures which have associated archived data products, be skipped. The objective is that the provisional buffering of data products for acceptance by the operator will make replacing archived data a rare event.

Figure 7 illustrates messages to the data engine to accept or reject provisional data products.

Figure 8 shows messages dealing with subsets.

Figure 6: Dataset-level messages

```
MESSAGE PSA -> DATA ENGINE: # Submit a set of nights.
  time       = 2011-11-04:09:40:10
  dataset    = 20111031_7decd3a
  procid     = 7dec3a
  nights     = 2011-10-31,2011-11-01,2011-11-02
  subsets    = *
  replace    = no

MESSAGE DATA ENGINE -> PSA: # All processing done with some failures.
  time       = 2011-11-04T10:06:30
  dataset    = 20111031_7decd3a
  status     = incomplete

MESSAGE PSA -> DATA ENGINE: # Resubmission for reprocessing of subsets
  time       = 2011-11-06T10:06:30
  dataset    = 20111031_7decff1
  procid     = 7decff1
  nights     = 2011-10-31,2011-11-01,2011-11-02
  subsets    = BS,VS,RS
  replace    = no
```

Figure 7: Subset accept and archive messages

```
MESSAGE PSA -> DATA ENGINE: # Accept and archive
  time       = 2011-11-05T10:06:30
  dataset    = 20111031_7decff1-calB
  archive    = yes

MESSAGE PSA -> DATA ENGINE: # Reject
  time       = 2011-11-04T12:05:21
  dataset    = 20111031_7decff1-ftrBS
  archive    = no
```



Figure 8: Subset-level messages

```
MESSAGE DATA ENGINE -> PSA: # Bias workflow started.
  time      = 2011-11-04T09:50:47
  dataset   = 20111031_7decd3a-calB
  status    = submitted

MESSAGE DATA ENGINE -> PSA: # Bias workflow completed.
  time      = 2011-11-04T10:05:25
  dataset   = 20111031_7decd3a-calB
  status    = completed

MESSAGE DATA ENGINE -> PSA: # B flat workflow started.
  time      = 2011-11-04T10:05:30
  dataset   = 20111031_7decd3a-calBF
  status    = submitted

MESSAGE DATA ENGINE -> PSA: # B flat workflow failed.
  time      = 2011-11-04T10:05:30
  dataset   = 20111031_7decd3a-calBF
  status    = failed
```