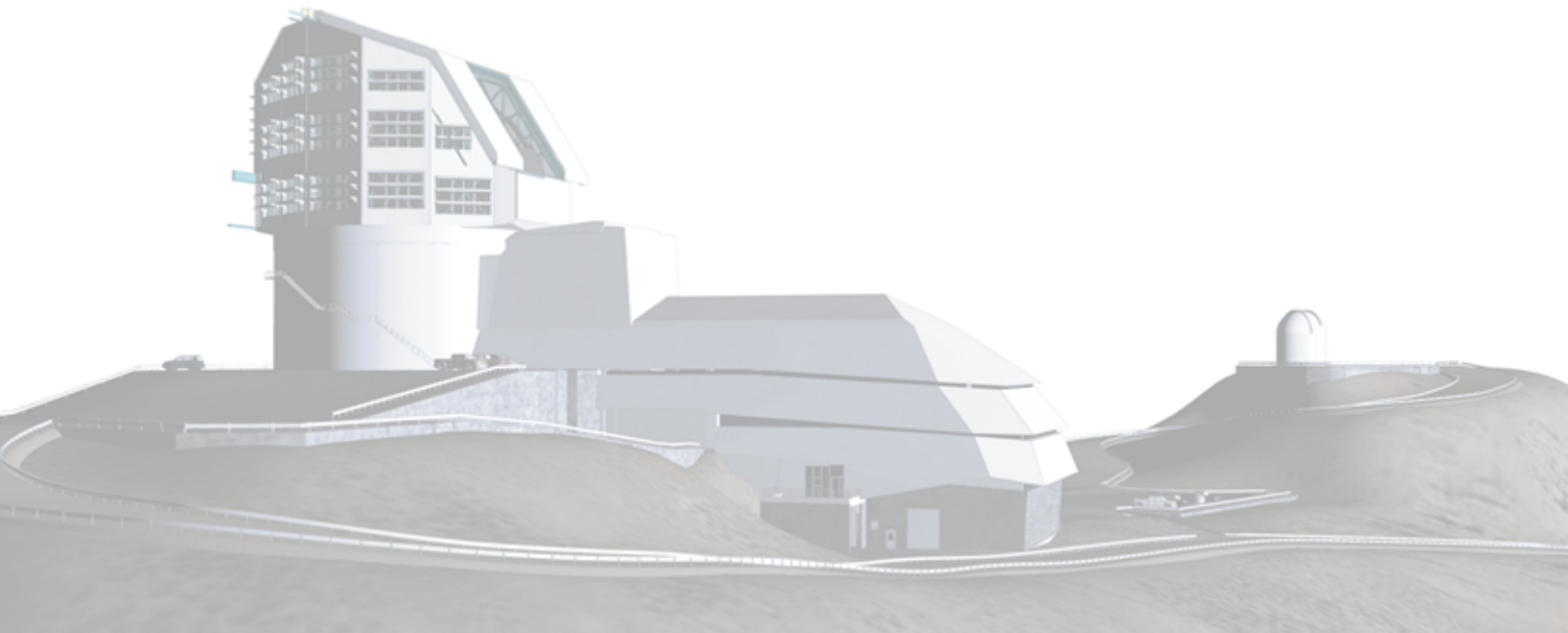

Vera C. Rubin Observatory
Systems Engineering

Visits, snaps, seqNums, and exposureIDs

Robert Lupton

SITCOMTN-032

Latest Revision: 2022-03-30

Abstract

How we define visits and use them in pipeline code and notebooks is changing with RFC-836. This note describes what this means to users

Change Record

Version	Date	Description	Owner name
1	2022-03-28	Initial Version.	Robert Lupton

Document source location: `https://github.com/lsst-sitcom/sitcomtn-032`

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Visits, snaps, seqNums, and exposureIDs

1 Introduction

The LSST defines exposures by the tuple `(instr, controller, dayObs, seqNum)` (which are referred to as `(instr, controller, day_obs, seq_num)` in the butler (*e.g.* `(AT, C, 2022-03-28, 666)`); see Sec. for an explanation. When we take snaps (back-to-back exposures which will be combined early in the DM processing), they are assigned sequential values of `seqNum`.

Rubin also has the concept of a *visit*, which is used to express two distinct concepts:

- These data maps to a point on the sky (as opposed to *e.g.* a flat field exposure)
- These data were taken as snaps, and the visit is the identifier for the combined data

While logically distinct, Jim Bosch and the middleware group prefers to use visit to mean *both* of these, as it avoids repeated "does this visit map to a region of the sky?" tests.

2 Changes Proposed in (DM) RFC-863

Most users of Rubin data will not care whether or not the data is taken using snaps, and there are significant types of data taken on sky that are not taken as snaps; for example, intra-/extra-focal pairs of images taken to analyze the state of the optics.

RFC-836 therefore proposes simplifying the current visit system:

- All exposures, whether consisting of snaps or not, may be referred to by their first `seqNum` without any need for the user to explicitly define a visit.
- Visits must consist of exactly one or two snaps.
- `groupId`s may not be used to define visits, but there will be selecting exposures identified by a `group_id`, in much the same way that one can filter on an exposure type. We expect that external tools will use this information to generate lists of exposures to be processed.

The restriction to one or two snaps allows us to simplify the processing of snaps — they are only used when the two snaps may be considered as part of a single interrupted exposure. For *e.g.* Deep Drilling Fields (DDFs) where we may take tens or even hundreds of exposures, each image is assigned a separate visit.

We anticipate that `groupIds` *will* be used to define groups of *e.g.* flat field exposures that should be handled together, or a series of exposures taken in a DDF. If you want to use `takeImages` with $N > 2$ this information will be stored in the butler's exposure record, but the butler will not define a visit.

2.1 Metadata and the EFD

The snaps within a visit are identified by 1-indexed keywords `CURINDEX` and `MAXINDEX`, which correspond to EFD names `imageIndex` and `imagesInSequence` respectively.

2.2 Butler Access to Snaps

Once this work is completed (expected to be *c.* mid-April 2022) users will be able to use `(day_obs, seq_num)` to refer to data whether it's a single exposure or a visit (in which case `seq_num` will be the first of the pair of snaps, if two snaps were taken), but this means that we will need to add special syntax to access the first of the snaps (the second is easy, as its `seq_num` cannot be confused with a visit identifier), *e.g.* `(day_obs, seq_num, snap)` with `snap=1,2`. The details are not yet decided.

3 Image identifiers

Due to a feature in `postgres`, whereby it converts non-quoted text to lower case although it supports case-sensitive schema, the butler maps camel-case names ('`dateObs`') to snake-case names ('`date_obs`'). This document does not always follow this convention, as names in ICDs have been specified using the former convention. Caveat Lector.

projectedVisitId A unique identifier issued by the Scheduler that identifies a science visit (composed of one or two exposures taken with a single takeImages command) that is planned to be taken within N hours (N < 100).

nextVisitId A unique identifier, expected to be timestamp-based, that identifies an exposure or visit (science or calibration) that is about to be taken within N seconds (N < 100).

groupId A unique identifier, expected to be timestamp-based, that identifies a single execution (past, present, or future) of a script in the Script Queue. The script may contain multiple takeImages commands. May be used as the nextVisitId if there is only one takeImages command.

subGroupId A unique identifier, derived from the groupId, that identifies a particular execution of a takeImages command in a script in the Script Queue. May be used as the nextVisitId if it is available early enough.

snapId Either 0 or 1. When a two-image, on-sky, same-pointing, science visit is taken using the takeImages command, the first exposure is snapId 0 and the second is snapId 1. No other uses of the takeImages command result in snaps.

dayObs A natural number representing the observation day (in timezone UTC-12:00) when the takeImages command began executing. Does not change during a takeImages command, but may change during a script.

seqNum A non-negative integer representing the number of exposures taken so far during this observation day. Some sequence numbers may be missing if exposures are aborted or cause errors/faults. It is guaranteed that the seqNums associated with a single takeImages command are sequential.

exposureId A unique identifier, composed of multiple fields, including the dayObs and seqNum. It does not include the nextVisitId, groupId, subGroupId, or snapId.

firstImageId A non-negative integer representing the seqNum of the first image taken by a given takeImages command.

lastImageId A non-negative integer representing the seqNum of the last image taken (or to be taken) by a given takeImages command.

visitId A unique identifier identical to the exposureId of a visit where the seqNum is equal to the firstImageId or, equivalently, the snapId is 0.

A References

B Acronyms

Acronym	Description
AT	Auxiliary Telescope
DDF	Deep Drilling Fields
DM	Data Management
EFD	Engineering and Facility Database
LSST	Legacy Survey of Space and Time (formerly Large Synoptic Survey Telescope)
RFC	Request For Comment
SE	System Engineering
UTC	Coordinated Universal Time