RDB and CDB
(Run DB and Conditions DB)

Urs Langenegger

2025/05/27

- RDB
  - ▷ improved filtering
  - ▷ run summary information

- CDB
  - ▷ updates

Run DB

- ## Mirrored to internet-at-large through proxy mu3eon.psi.ch
  - ▷ read-only. Update only within PSI intranet

Mu3e Run Database

Significant Runs only ☑   Run class [All classes ▼]   Run range [min] [max]   Max runs [limit]   Search comments [search in comments]   [Apply Filters]

Showing the last 89 runs (significant runs only)

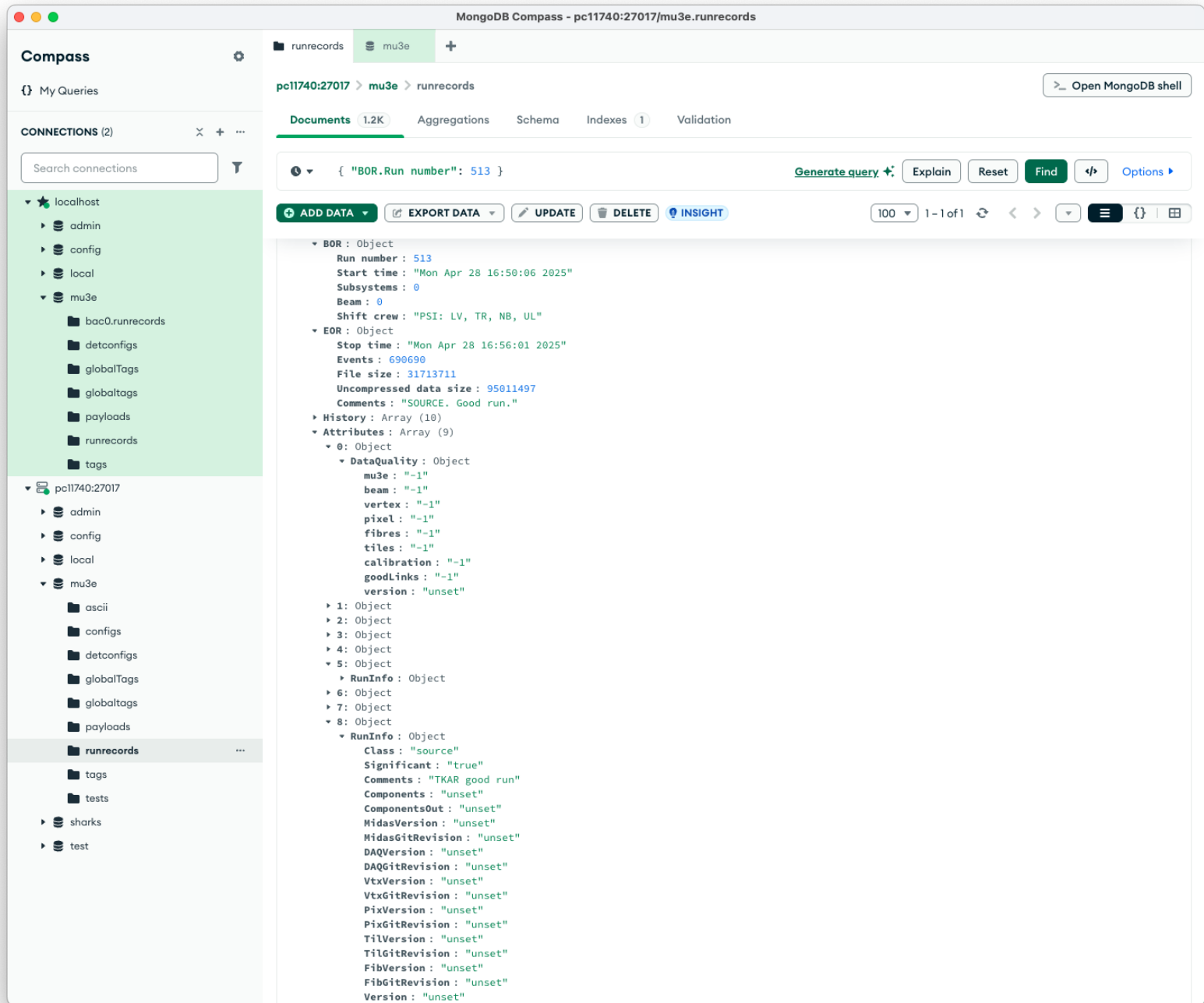| Run	Start time	End time	Sig.	Class	Events	Shift crew	Shift Comments/RunInfo Comments
1099	Tue May 6 19:42:37 2025	Tue May 6 19:47:25 2025	✓	source	4797359	PSI: LV, J, MS, MK, and more	Full US source GOOD /TKAR good run, with large noise bursts
553	Mon Apr 28 19:25:25 2025	Mon Apr 28 19:38:49 2025	✓	cosmic	805650	PSI: LV, NB	COSMICS
552	Mon Apr 28 19:22:25 2025	Mon Apr 28 19:25:17 2025	✓	cosmic	203299	PSI: LV, NB	COSMICS
551	Mon Apr 28 19:18:11 2025	Mon Apr 28 19:22:05 2025	✓	cosmic	144453	PSI: LV, NB	COSMICS
513	Mon Apr 28 16:50:06 2025	Mon Apr 28 16:56:01 2025	✓	source	690690	PSI: LV, TR, NB, UL	SOURCE. Good run. /TKAR good run
490	Tue Apr 22 17:54:48 2025	Tue Apr 22 17:55:34 2025	✓	cosmic	104974	PSI: NZ, FW Remote: MK	Stable - cosmic data taking - COSMIC /TKAR good run, low noise
489	Tue Apr 22 17:54:12 2025	Tue Apr 22 17:54:40 2025	✓	cosmic	52412	PSI: NZ, FW Remote: MK	Stable - cosmic data taking - COSMIC /TKAR good run, low noise
483	Tue Apr 22 16:42:55 2025	Tue Apr 22 16:48:26 2025	✓	cosmic	6364	PSI: NZ, FW Remote: LV	Stable - cosmic data taking - COSMIC /TKAR good run, low noise
482	Tue Apr 22 16:41:00 2025	Tue Apr 22 16:42:46 2025	✓	cosmic	37469	PSI: NZ, FW Remote: LV	Stable - cosmic data taking - COSMIC /TKAR good run, low noise
481	Tue Apr 22 16:37:39 2025	Tue Apr 22 16:38:08 2025	✓	cosmic	64909	PSI: NZ, FW Remote: LV	Stable - cosmic data taking - COSMIC /TKAR good run, low noise
	Tue Apr 22 16:34:32	Tue Apr 22 16:35:37				PSI: NZ, FW Remote:	

RDB information contents

- MIDAS: beginning-of-run (BOR) and end-of-run (EOR) JSON records
  - ▷ "online/message/runlogs"
  - ▷ automatic upload to RDB server pc11740
  - ▷ basic run parameters (start/end/events/shift crew/shift comments/...)

- also upload additional vanilla information:
  - ▷ DataQuality
    - to be filled by "DQM"
  - ▷ RunInfo
    - anything else that might be useful
  - ▷ stored in Attributes array
    (multiple copies/updates possible)

```
{                                    {
    "DataQuality": {                     "RunInfo": {
        "mu3e": "-1",                        "Class": "unset",
        "beam": "-1",                        "Significant":  "unset",
        "vertex": "-1",                      "Comments": "unset",
        "pixel": "-1",                       "Components": "unset",
        "fibres": "-1",                      "ComponentsOut": "unset",
        "tiles": "-1",                       "MidasVersion": "unset",
        "calibration": "-1                   "MidasGitRevision": "unset",
        "goodLinks": "-1",                   "DAQVersion": "unset",
        "version": "unset"                   "DAQGitRevision": "unset",
    }                                        "VtxVersion": "unset",
}                                            "VtxGitRevision": "unset",
                                             "PixVersion": "unset",
                                             "PixGitRevision": "unset",
                                             "TilVersion": "unset",
                                             "TilGitRevision": "unset",
                                             "FibVersion": "unset",
                                             "FibGitRevision": "unset",
                                             "Version": "unset"
                                         }
                                     }
```

- Notes
  - ▷ "Offline", this information is combined into class runRecord
  - ▷ "shift comments" will/should not be modified anymore
  - ▷ tools exist to (batch) update/filter this information
  - ▷ I would keep curation to a small circle

RDB run "records"

Run summary information

- **Runs can be "significant"**
  - ▷ automatic determination based on keywords in shift comments
    - • "bad", "unstable", "error", "problem", "dbx", "fail", "debug", "test", "dummy"
  - ▷ can be overridden manually

- **Run classification**
  - ▷ "beam", "cosmic", "source", "calib", "junk"
  - ▷ automatic determination based on keywords in shift comments
    - • "mask", "tune", "tuning", "calib"
  - → "calib" and "junk" runs are never "significant"
  - ▷ conflicts not well solved so far:

480	Tue Apr 22 16:34:32 2025	Tue Apr 22 16:35:37 2025	✓	cosmic	540734	PSI: NZ, FW Remote: LV	Stable - cosmic data taking - MASKING - do not analyze
479	Tue Apr 22 16:32:39 2025	Tue Apr 22 16:33:32 2025	✓	cosmic	182269	PSI: NZ, FW Remote: LV	Stable - cosmic data taking - MASKING - do not analyze
478	Tue Apr 22 16:27:24 2025	Tue Apr 22 16:30:05 2025	✓	cosmic	937131	PSI: NZ, FW Remote: LV	Stable - cosmic data taking - MASKING - do not analyze

- **Run annotations**
  - ▷ shift comments - can be useful and sometimes less so
  - ▷ RunInfo comments:
    - ▷ add additional information
    - ▷ $e.g.$, for the April data: Tamasi's "good run" list (thanks! :-)

⇒ All three can be used as filters in web UI

RDB Access

- There is one master instance of the RDB
  - ▷ mongoDB server, currently pc11740.psi.ch/rdb
    access through mu3eon.psi.ch from outside PSI intranet
  - ▷ provides REST interface for read/write access
    - updated by MIDAS, *et al.*, from mu3ebe
  - ▷ in case of interest, could provide JSON files for external mongodb setups

- RDB mirror for all significant runs through JSON CDB backend
  - ▷ updated at merlin-l-002.psi.ch:/data/experiment/mu3e/code/cdb/
  - ▷ can be rsync'ed to external institutes (just like data)
    cf Mu3e twiki

- "Offline" complete API to access all (relevant) RDB information

```
#include "Mu3eConditions.hh"
cdbAbs *pDB = new cdbRest("mcidealv6.1", urlString, 0); // should also work as cdbAbs (by now ... )
Mu3eConditions *pDC = Mu3eConditions::instance("mcidealv6.1", pDB);

vector<string> vRunNumbers = pDB->getAllRunNumbers();
for (int it = 0; it < vRunNumbers.size(); ++it) {
  int irun = stoi(vRunNumbers[it]);
  if (irun < firstRun) continue;
  if ((lastRun > 0) && (irun > lastRun)) continue;

  runRecord rr = pDB->getRunRecord(irun);
  if (rr.isSignificant()) {
    // do something
  }
}
```

CDB

- **CDB contents for (staging area) data taking**
  - ▷ global tag: datav6.1=2025CosmicsVtxOnly
  - ▷ tag: pixelqualitylm_datav6.1=2025CosmicsVtxOnly
  - ▷ Uptodate in
    - pc1140
    - merlin-l-002:/data/experiment/mu3e/code/cdb/

    ```
    merlin-l-002>du -ks  /data/experiment/mu3e/code/cdb
    17237 /data/experiment/mu3e/code/cdb
    ```

- **CDB contents for data-taking?**
  - ▷ no subset yet for Fibres and Tiles
    - which IDs are present/expected?
  - ▷ could do things by mixing in MC tags for Fibres/Tiles

- **And overall: we should get a new mu3e release**
  - ▷ mu3e v6.0 does not work with the CDB
  - ▷ need v6.1 (after merging in CDB work)

PixelQualityLM

- Currently with a simple 10σ noisy pixel filter

```
payload ->/data/experiment/mu3e/code/cdb/payloads/tag_pixelqualitylm_datav6.1=2025CosmicsVtxOnly_iov_473<-
dir ->/data/experiment/mu3e/code/cdb/payloads/<-
hash ->tag_pixelqualitylm_datav6.1=2025CosmicsVtxOnly_iov_473<-
calPixelQuality::printBLOB(string)
   header: deadface (note: 0 = good, 1 = noisy, 9 = not turned on)
   chipID: 0 link status A/B/C/M: 9/9/9/9
            defective pixels (col/row/qual): 0/2/1
   chipID: 1 link status A/B/C/M: 9/9/9/9
.. snip ..
   chipID: 33 link status A/B/C/M: 1/0/1/0
   chipID: 34 link status A/B/C/M: 0/0/0/0
            defective pixels (col/row/qual): 39/53/1, 162/155/1, 167/216/1
   chipID: 35 link status A/B/C/M: 0/1/0/0
            dead columns: 7, 12, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 28, 29, 31, 32, 35, 36, 37, 38, 40, 41, 44,
            defective pixels (col/row/qual): 0/36/1, 0/76/1, 0/80/1, 0/89/1, 0/117/1, 0/139/1, 0/144/1, 0/145/1, 0/1
   chipID: 36 link status A/B/C/M: 9/9/9/9
.. snip ..
   chipID: 1062 link status A/B/C/M: 9/9/9/9
   chipID: 1089 link status A/B/C/M: 0/0/0/0
            defective pixels (col/row/qual): 49/28/1, 52/186/1, 69/50/1, 105/48/1, 129/0/1, 134/249/1, 140/59/1, 141
   chipID: 1090 link status A/B/C/M: 0/0/0/0
            dead columns: 28, 73, 83, 122, 126, 141, 149, 157, 168, 170, 171, 221, 226, 247
            defective pixels (col/row/qual): 2/44/1, 3/55/1, 3/83/1, 3/169/1, 27/26/1, 30/16/1, 30/33/1, 38/12/1, 48
   chipID: 1091 link status A/B/C/M: 0/0/0/0
            dead columns: 4, 6, 7, 10, 17, 23, 24, 27, 30, 38, 48, 61, 64, 66, 67, 81, 82, 84, 95, 97, 98, 107, 117,
            defective pixels (col/row/qual): 1/225/1, 13/218/1, 20/218/1, 20/220/1, 39/43/1, 54/205/1, 56/135/1, 110
   chipID: 1092 link status A/B/C/M: 9/9/9/9
.. snip ..
   chipID: 1249 link status A/B/C/M: 0/1/0/0
            dead columns: 33, 36, 41, 57, 81, 205, 209, 213
            defective pixels (col/row/qual): 0/3/1, 0/183/1, 0/240/1, 1/22/1, 1/40/1, 1/138/1, 1/157/1, 1/218/1, 1/2
   chipID: 1250 link status A/B/C/M: 0/0/0/0
            defective pixels (col/row/qual): 0/32/1, 0/40/1, 0/42/1, 0/53/1, 0/61/1, 0/65/1, 0/112/1, 0/116/1, 1/80/
   chipID: 1251 link status A/B/C/M: 0/0/0/0
            dead columns: 56, 57, 65, 77, 84, 89, 117, 153, 155, 175, 193, 217, 219, 232
            defective pixels (col/row/qual): 1/27/1, 1/131/1, 1/152/1, 2/1/1, 2/21/1, 2/35/1, 2/97/1, 2/169/1, 2/215
   chipID: 1252 link status A/B/C/M: 9/9/9/9
..snip..
```

Summary and Outlook

- RDB with substantial upgrade
  - ▷ significant runs and automatic classification of run types
  - ▷ Better filtering (web), API allows production of individual run lists

- CDB
  - ▷ complete (functional) tags for staging setup data
  - ▷ complete mirror on merlin

- Outlook CDB/RDB
  - ▷ merge code into mu3eUtil/cdb
  - ▷ (global) tag for data-taking including fibres/tiles
  - ▷ include "proper" DQM run assessment
  - ▷ API to read mask files? Non trivial!
    - data volume! at which level? what is loaded into h/w?

- Outlook Offline
  - ▷ backup of merlin data
  - ▷ prompt reco workflow re-instantiation
  - ▷ migration to merlin7?
  - ▷ re-arrangement of JSON CDB/RDB backend with subdirectories (eventually)