CDB Introduction

- CDB =
  - ▷ conditions database
    - detector conditions (turned on/off, dead components, . . .)
    - alignment
    - calibration constants
    - arguably not configurations (but those can be hosted in the CDB :-)

  → normally accessed in (mostly) non-analysis code
  - ▷ run database
    - list of runs
    - summary information: shift crew/comments, time, N_{evts}, B field, . . .
    - run types (good, cosmic, beam, calibration, debugging)

  → non-analysis and analysis codes need lists of desired runs
- CDB location
  - ▷ mongodb server, currenty pc11740.psi.ch (PSI intranet, proxy'ed)
  - ▷ JSON files
    - "bootstrap" minimal version created during make install (mu3e repository)
    - "full" version at merlin-l-002.psi.ch:/data/experiment/mu3e/code/cdb/

      → rsync this one to your local institute (as data)

CDB Contents

```
/data/experiment/mu3e/code/cdb:
total 18
drwxr-xr-x. 2 usr  4096 Apr 23 15:38 configs
drwxr-xr-x. 2 usr  4096 Apr 23 15:38 runrecords
drwxr-xr-x. 2 usr  4096 May  3 13:57 globaltags
drwxr-xr-x. 2 usr 16384 May  6 08:53 payloads
drwxr-xr-x. 2 usr  4096 May  6 09:29 tags

/data/experiment/mu3e/code/cdb/configs:
total 0

/data/experiment/mu3e/code/cdb/runrecords:
total 1
-rw-r--r--. 1 usr 375 May  5 17:28 runlog_004

/data/experiment/mu3e/code/cdb/globaltags:
total 5
.. snip
-rw-r--r--. 1 usr 181 Apr 29 16:03 mcidealv5.4
-rw-r--r--. 1 usr 195 Apr 29 16:03 mcidealv6.1=2025CosmicsVtxOnly
-rw-r--r--. 1 usr 207 Apr 29 16:03 mcidealv6.1
-rw-r--r--. 1 usr 238 May  5 17:28 datav6.1=2025CosmicsVtxOnly

/data/experiment/mu3e/code/cdb/tags:
total 12
.. snip ..
-rw-r--r--. 1 usr  58 Apr 29 16:03 tilealignment_mcidealv6.1
-rw-r--r--. 1 usr  55 Apr 29 16:03 detsetupv1_mcidealv6.1
-rw-r--r--. 1 usr  78 May  5 17:28 pixelalignment_mcidealv6.1=2025CosmicsVtxOnly
-rw-r--r--. 1 usr  74 May  5 17:28 detsetupv1_mcidealv6.1=2025CosmicsVtxOnly
-rw-r--r--. 1 usr  73 May  5 17:28 detconfv1_mcidealv5.4=2025CosmicsVtxOnly
-rw-r--r--. 1 usr 404 May  6 08:53 pixelqualitylm_datav6.1=2025CosmicsVtxOnly

/data/experiment/mu3e/code/cdb/payloads:
total 15108
-rw-r--r--. 1 usr 497200 Apr 29 16:03 tag_tilealignment_mcidealv6.1_iov_1
-rw-r--r--. 1 usr  18730 May  5 17:28 tag_pixelalignment_mcidealv6.1=2025CosmicsVtxOnly_iov_1
-rw-r--r--. 1 usr  11412 May  6 08:51 tag_pixelqualitylm_datav6.1=2025CosmicsVtxOnly_iov_551
.. snip ..                            .. snip ..
-rw-r--r--. 1 usr  10088 May  6 08:53 tag_pixelqualitylm_datav6.1=2025CosmicsVtxOnly_iov_248
```

CDB Global tags (GT), tags

- Global tag contains all required tags

```
cat globaltags/mcidealv6.1=2025CosmicsVtxOnly
{ "gt" : "mcidealv6.1=2025CosmicsVtxOnly",
         "tags" : [
             "pixelalignment_mcidealv6.1=2025CosmicsVtxOnly",
             "detsetupv1_mcidealv6.1=2025CosmicsVtxOnly",
             "detconfv1_mcidealv5.4=2025CosmicsVtxOnly" ]
}
```

- Tag contains
  - (calibration/data) record name/version
  - "intervals of validity" (IOV)

```
cat tags/pixelalignment_mcidealv6.1=2025CosmicsVtxOnly
{ "tag" : "pixelalignment_mcidealv6.1=2025CosmicsVtxOnly", "iovs" : [ 1 ] }

cat tags/pixelqualitylm_datav6.1=2025CosmicsVtxOnly
{"tag" : "pixelqualitylm_datav6.1=2025CosmicsVtxOnly", "iovs" : [1, 248, 256, 264, 277,
    278, 283, 284, 323, 330, 337, 338, 339, 340, 341, 342, 415, 416, 417, 418, 419, 420,
    .. snip ..
    472, 473, 481, 482, 483, 489, 490, 512, 513, 551, 552, 553]}
```

- Nota bene
  - Maybe I'll change the tag name convention (replace the "=")
  - The current pixelqualitylm payloads are just a first version
    - will be replaced with better information without new tag

CBD payloads

- Payloads are JSON files, with (base64 encoded) BLOBs

```
merlin-l-002>cat /data/experiment/mu3e/code/cdb/payloads/tag_mppcalignment_mcidealv6.1_iov_1
{"hash" : "tag_mppcalignment_mcidealv6.1_iov_1",
 "comment" : "mcidealv6.1 MPPC detector initialization",
 "schema" : "ui_mppc,vx,vy,vz,colx,coly,colz,i_ncol",
 "date" : "2025-04-29 16:03:23",
 "BLOB" : "zvqt3gAAAAAAAAAAAAAAANMAkhp1Iz/AV8buwyM2S0AAAAAAAMRiwO ..snip.. "
}
```

- Unpack BLOB with tool cdbPrintPayload

```
cdbPrintPayload ~/data/mu3e/cdb/payloads/tag_pixelqualitylm_datav6.1=2025CosmicsVtxOnly_iov_553
payload ->/Users/ursl/data/mu3e/cdb/payloads/tag_pixelqualitylm_datav6.1=2025CosmicsVtxOnly_iov_5
dir ->/Users/ursl/data/mu3e/cdb/payloads/<-
hash ->tag_pixelqualitylm_datav6.1=2025CosmicsVtxOnly_iov_553<-
calPixelQuality::printBLOB(string)
   header: deadface (note: 0 = good, 1 = dead, 9 = not turned on)
   chipID:     0 link status A/B/C/M: 9/9/9/9
   chipID:     1 link status A/B/C/M: 9/9/9/9
   chipID:     2 link status A/B/C/M: 9/9/9/9
   chipID:    34 link status A/B/C/M: 0/0/0/0
            dead columns: 0, 41, 61, 77, 99, 111, 113, 116, 125, 127, 130, .. snip ..
   chipID:    35 link status A/B/C/M: 0/1/0/0
   chipID:    36 link status A/B/C/M: 9/9/9/9
.. snip ..
```

PixelQuality and payloads in general

- calPixelQualityLM
  - 4 words for dead links
  - map for dead columns (outside of dead lints)
  - map for dead pixels (outside of dead columns)
  - accessor functions for link/pixel status
- Currently determined payloads for "good" runs in April 2025
  - (private dummy) code produces CSV files, based on dqm_histos_00*.root
    #chipID,linkA,linkB,linkC,linkM,ncol[,icol] NB: linkX: 0 = no error, 1 = dead
    1,9,9,9,9,0
    33,1,1,0,0,0
  - no dead pixels determined yet
  - still need more validation, code to be committed to mu3eUtil/cdb
- Modus operandi to obtain CDB payloads
  - determined by non-users, validation required, upload (mongodb) restricted

$\Rightarrow$ User analysis should not be based on (e.g.) calPixelQualityLM

$\rightarrow$ this complicates your life too much. Do anything else (c.g. CSV, JSON)

RunDB: good runs list

- For analysis "good runs" lists are essential
  - "good" with multiple aspects
    - "really" good runs with "real" cosmics
    - dedicated source/DAQ debugging/calibration/timing scan/. . . runs
- This information is derived from the RunDB (not the CDB)
  - run lists change over time (issues being recovered or discovered)
  - → "tagged" access?
    "cosmicVTX2025-US"
    "cosmicVTX2025-source"
    "cosmicVTX2025-V1"
    . . .
  - manual curation likely
- Currently can
  - upload DQ(M) information to (mongodb) RDB
- Currently cannot yet
  - display on RDB web UI
  - access this from user analysis code

Conclusion and Outlook

- CDB remote access
  - rsync merlin-l-002.psi.ch:/data/experiment/mu3e/code/cdb/
- mu3e v6.0
  - must use GT mcidealv6.1
- Pixel data quality PixelQualityLM
  - first test case for exercising system
  - improve (dead sensor?)/validate/commit to mu3eUtil/cdb $\rightarrow$v6.1!
  - Recreate "all" April 2025 payloads with v6.1, O(10kB) per run
- Run DB
  - add "data quality" information to run record (tricky, will need to interate)
    - no record left by (online) DQM so far
    - shift comments are partially cryptic
  - plan:
    - upload (manual) DQ contents for "good" runs to RunDB
    - mirror to merlin-l-002.psi.ch:/data/experiment/mu3e/code/cdb/
    - API to access DQ contents

$\Rightarrow$ Implement Run DB functionalities now