Pixel monitoring integration in CMS OMS

July 3 2019

Hamburg Pixel Phase 1 Meeting

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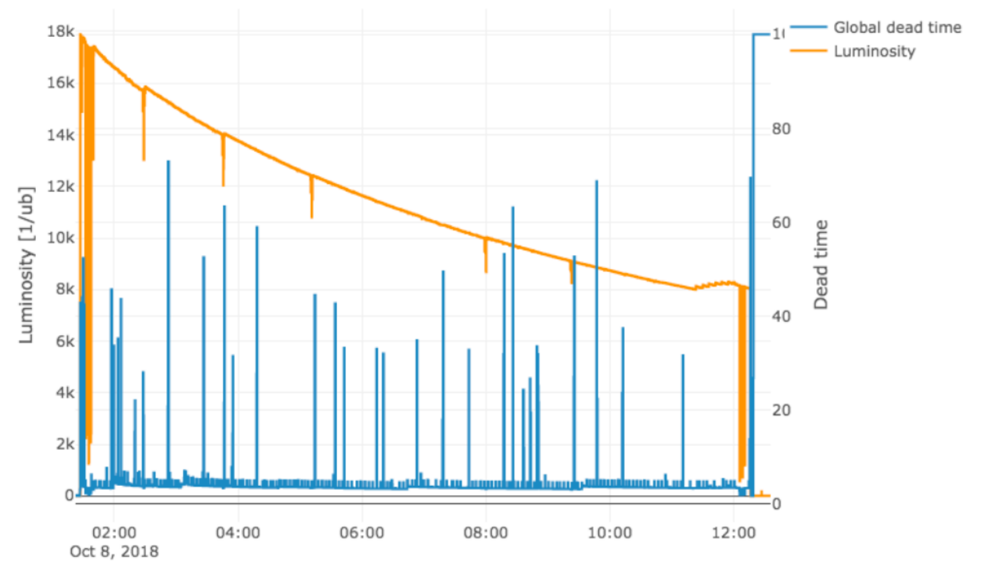
Tracker Online Monitor (TOM)

CMS Pixel Online Monitoring | Views ▼ | DAQ monitor | Issues DB | Data quality ▼ | Radiation damage ▼ | Masked channels | CASTOR DCDCs | Tools ▼ | PixDB ▼ | Help ▼ | Links ▼ | BETA

http://tom.cern.ch

Options **DAQ: masked channels and ROCs over time (Run 324245)**

Plot Info

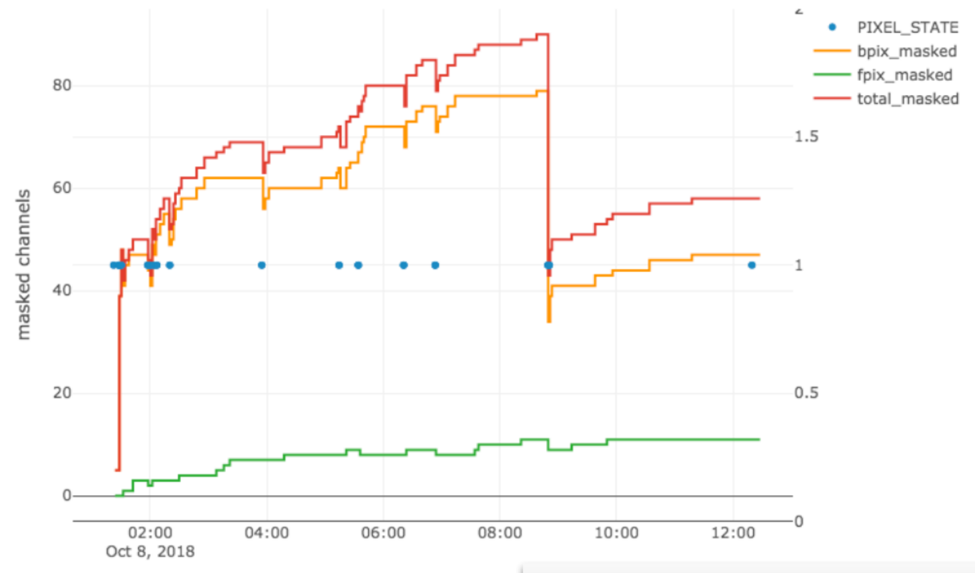


Export data

Luminosity and global deadtime

lumi & dead time

Plot Info

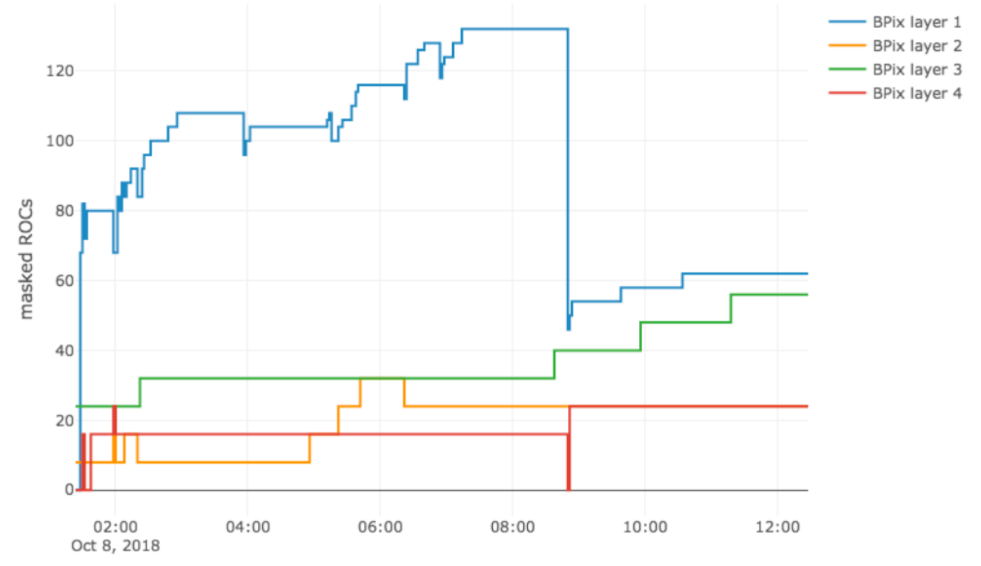


Export data

Masked channels

masked channels and pixel state info

Plot Info

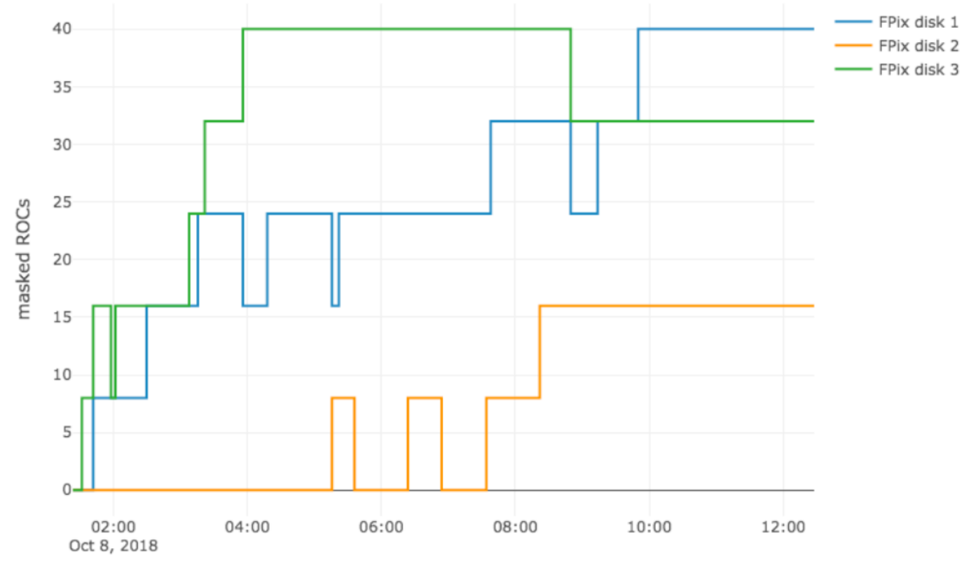


Export data

Masked BPix ROCs

masked BPix ROCs

Plot Info

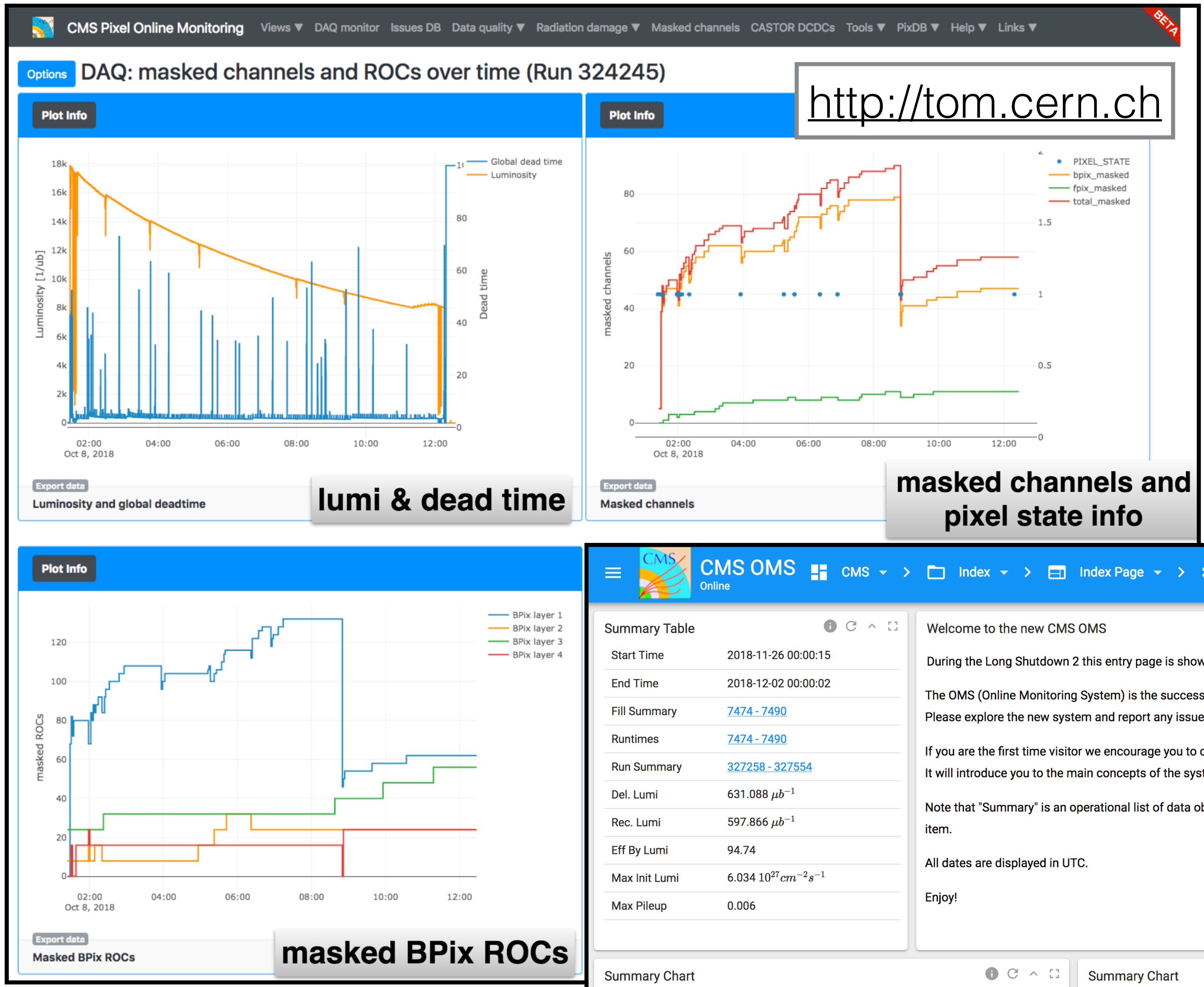


Export data

Masked FPix ROCs

masked FPix ROCs

Integration in the Online Monitoring System (OMS)



DAQ: masked channels and ROCs over time (Run 324245)

Luminosity and global deadtime

Masked channels

Masked BPix ROCs

http://tom.cern.ch

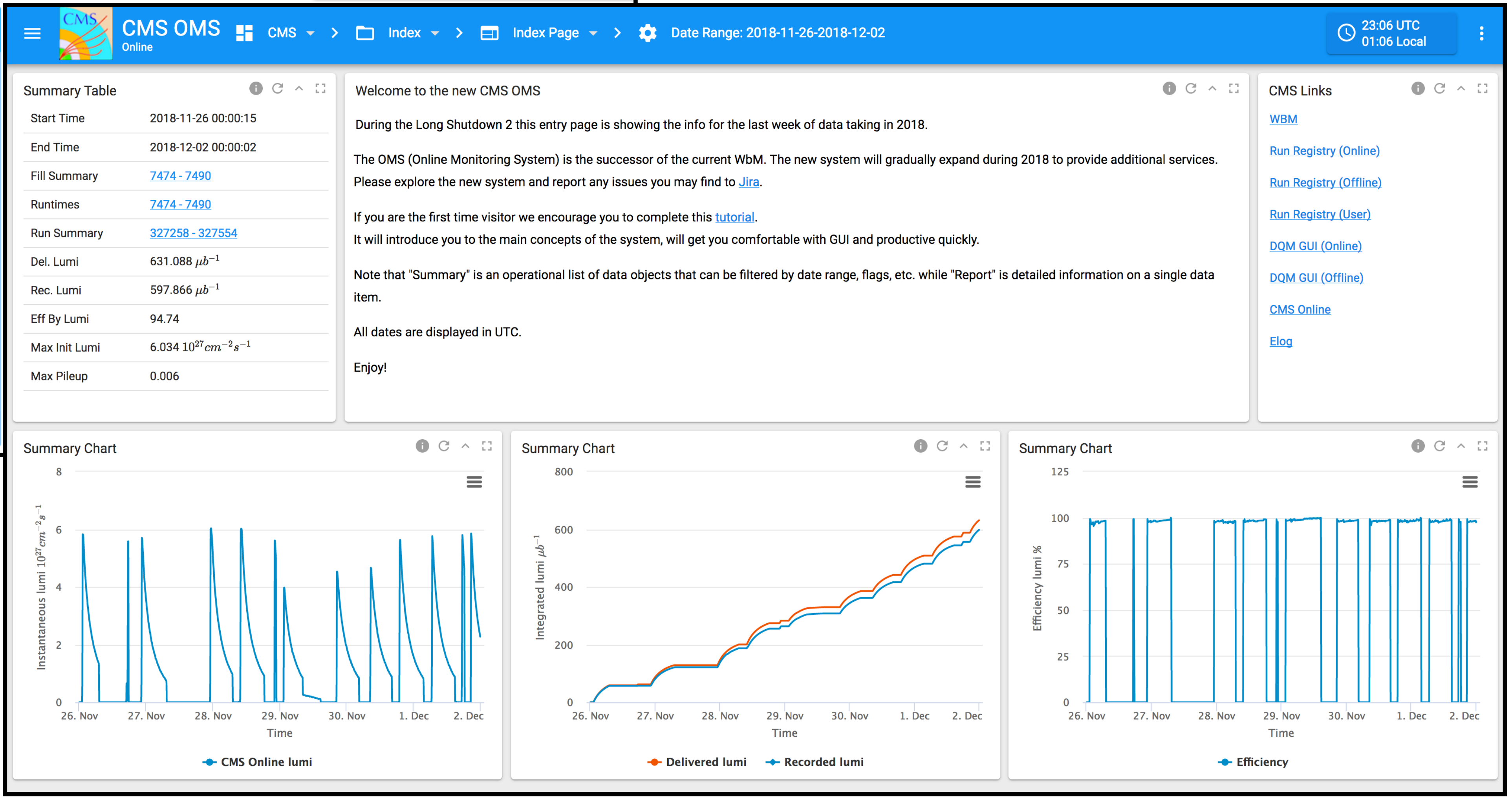
lumi & dead time

masked channels and pixel state info

masked BPix ROCs

use common interface + customized aggregation layer for querying pixel-specific data

—> integrate pixel monitoring as a workspace in CMS OMS



Summary Table

Start Time	2018-11-26 00:00:15
End Time	2018-12-02 00:00:02
Fill Summary	7474 - 7490
Runtimes	7474 - 7490
Run Summary	327258 - 327554
Del. Lumi	631.088 μb^{-1}
Rec. Lumi	597.866 μb^{-1}
Eff By Lumi	94.74
Max Init Lumi	6.034 $10^{27}cm^{-2}s^{-1}$
Max Pileup	0.006

Welcome to the new CMS OMS

During the Long Shutdown 2 this entry page is showing the info for the last week of data taking in 2018.

The OMS (Online Monitoring System) is the successor of the current WbM. The new system will gradually expand during 2018 to provide additional services. Please explore the new system and report any issues you may find to Jira.

If you are the first time visitor we encourage you to complete this tutorial.
It will introduce you to the main concepts of the system, will get you comfortable with GUI and productive quickly.

Note that "Summary" is an operational list of data objects that can be filtered by date range, flags, etc. while "Report" is detailed information on a single data item.

All dates are displayed in UTC.

Enjoy!

CMS Links

- WBM
- Run Registry (Online)
- Run Registry (Offline)
- Run Registry (User)
- DQM GUI (Online)
- DQM GUI (Offline)
- CMS Online
- Elog

Summary Chart

Summary Chart

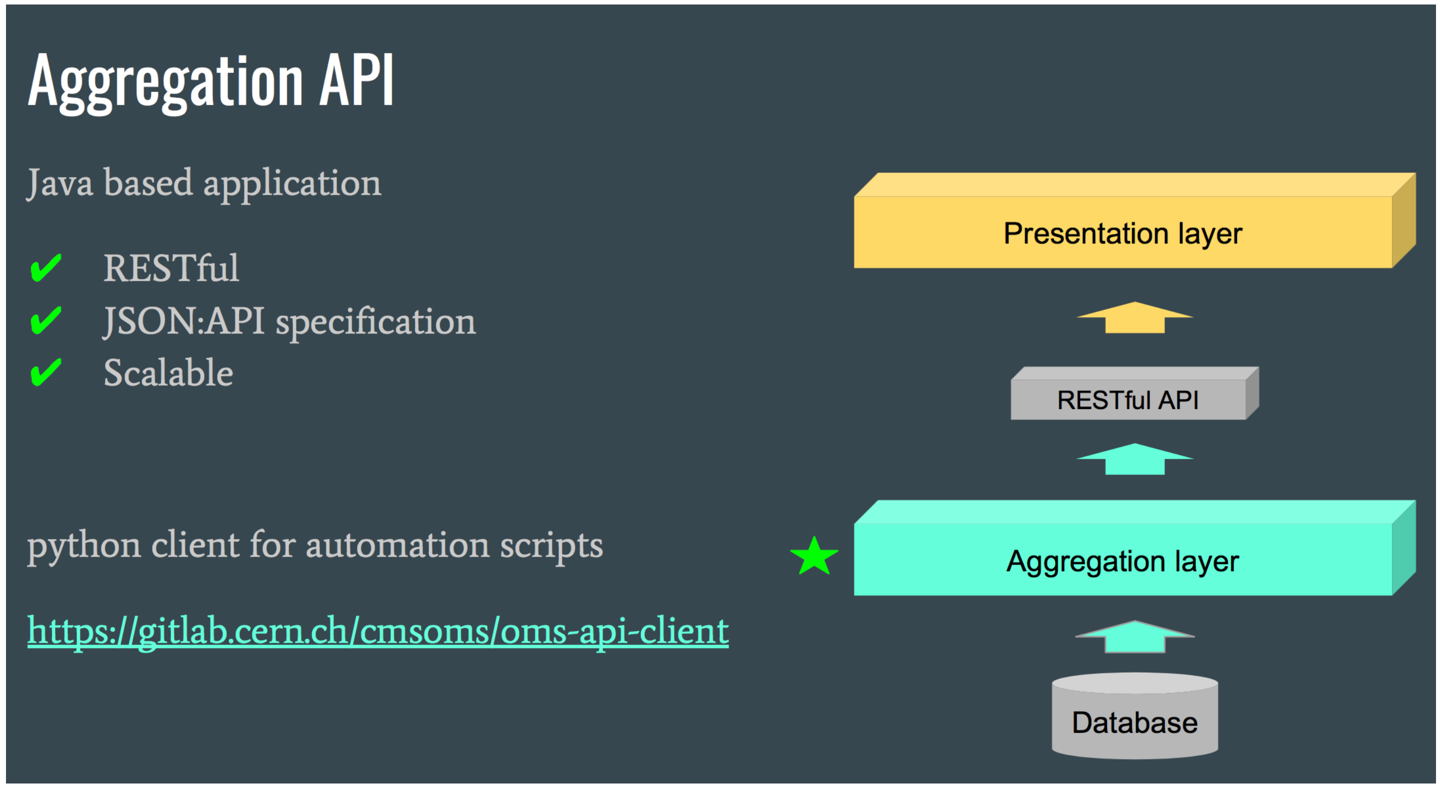
Summary Chart

CMS OMS
Online

https://cmsoms.cern.ch/

OMS and TOM data

- CMS OMS provides a stable, centrally-managed monitoring GUI for Run-3
  - test possible integration of data provided by TOM
  - need to export data via aggregation layer:



Aggregation API

Java based application

- ✔ RESTful
- ✔ JSON:API specification
- ✔ Scalable

python client for automation scripts

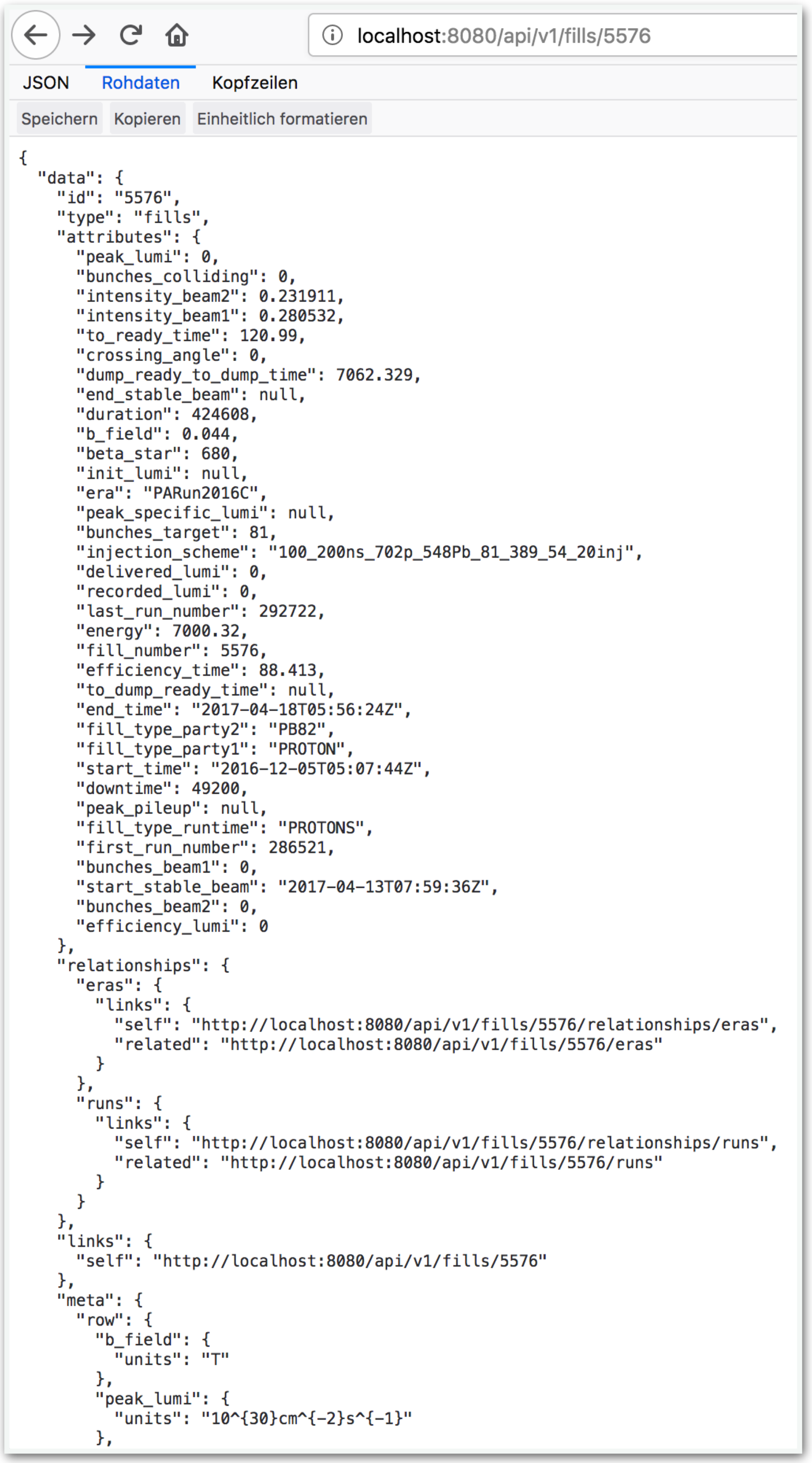
https://gitlab.cern.ch/cmsoms/oms-api-client

Presentation layer
RESTful API
Aggregation layer
Database

- install separate aggregation layer instance on TOM / testing instance, make data available via RESTful API, which can be then used by OMS GUI
- data aggregation is also (mostly) separated from the GUI on TOM
  - probes e.g. return a generic plotting object which can be either used for JSON export or for plot.ly

API running on testing instance

- set up new OpenStack instance for OMS integration testing: testing-oms.cern.ch
- test API on running instance, e.g. http://testing-oms.cern.ch:8080/api/v1/fills/5576 => returns JSON:
- successfully connected to our database accounts
- working on our own OMS resources



```
{
  "data": {
    "id": "5576",
    "type": "fills",
    "attributes": {
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      "bunches_colliding": 0,
      "intensity_beam2": 0.231911,
      "intensity_beam1": 0.280532,
      "to_ready_time": 120.99,
      "crossing_angle": 0,
      "dump_ready_to_dump_time": 7062.329,
      "end_stable_beam": null,
      "duration": 424608,
      "b_field": 0.044,
      "beta_star": 680,
      "init_lumi": null,
      "era": "PARun2016C",
      "peak_specific_lumi": null,
      "bunches_target": 81,
      "injection_scheme": "100_200ns_702p_548Pb_81_389_54_20inj",
      "delivered_lumi": 0,
      "recorded_lumi": 0,
      "last_run_number": 292722,
      "energy": 7000.32,
      "fill_number": 5576,
      "efficiency_time": 88.413,
      "to_dump_ready_time": null,
      "end_time": "2017-04-18T05:56:24Z",
      "fill_type_party2": "PB82",
      "fill_type_party1": "PROTON",
      "start_time": "2016-12-05T05:07:44Z",
      "downtime": 49200,
      "peak_pileup": null,
      "fill_type_runtime": "PROTONS",
      "first_run_number": 286521,
      "bunches_beam1": 0,
      "start_stable_beam": "2017-04-13T07:59:36Z",
      "bunches_beam2": 0,
      "efficiency_lumi": 0
    },
    "relationships": {
      "eras": {
        "links": {
          "self": "http://localhost:8080/api/v1/fills/5576/relationships/eras",
          "related": "http://localhost:8080/api/v1/fills/5576/eras"
        }
      },
      "runs": {
        "links": {
          "self": "http://localhost:8080/api/v1/fills/5576/relationships/runs",
          "related": "http://localhost:8080/api/v1/fills/5576/runs"
        }
      }
    },
    "links": {
      "self": "http://localhost:8080/api/v1/fills/5576"
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    "meta": {
      "row": {
        "b_field": {
          "units": "T"
        },
        "peak_lumi": {
          "units": "10^{30}cm^{-2}s^{-1}"
        },
```

in contanct with Ulf Behrens from OMS:

- we are the first subsystem among CSC which will use OMS
- each subsystem runs its own aggregation API server
- testing instance with development workspace: **https://vocms0184.cern.ch/cms/index/index**
- database input will be still handled by our webserver, as OMS will be strictly read-only
- shifter reports can be implemented as separate pages in our workspace (=> PDF export available)

Current tasks

- until we can use our aggregation server in OMS, create TOM probes which can read the server's JSON output
  - switch to a separate development branch, use only JSON probes
- make `pixDB` tables visible to the `cms_trk_r` account,
  reorganize `pixDB` database structure and document e.g. on a Twiki page
- **creation of OMS resources on our aggregation server**:
  - create OMS resources for pixel currents, voltages, temperatures, leakage currents, FED error counts / channel info, (FEDMONITORPERSISTENT), castor probes (integration DB -> OMDS), clean room probes, CO_2 flow, humidity, masked channels (read from integration DB as well), readbacker (va, vd, vbg, vana from pixDB)
  - this is mainly DB work => need to make integration DB visible, create views in order to create OMS resources
  - GUI implementation and contact / co-development with OMS GUI developer would be a good opportunity for our summer student

- after migration to OMS, new pixel monitor developments would mostly be database work (fill tables, create views)