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DQM Database Needs

DQM System Overview

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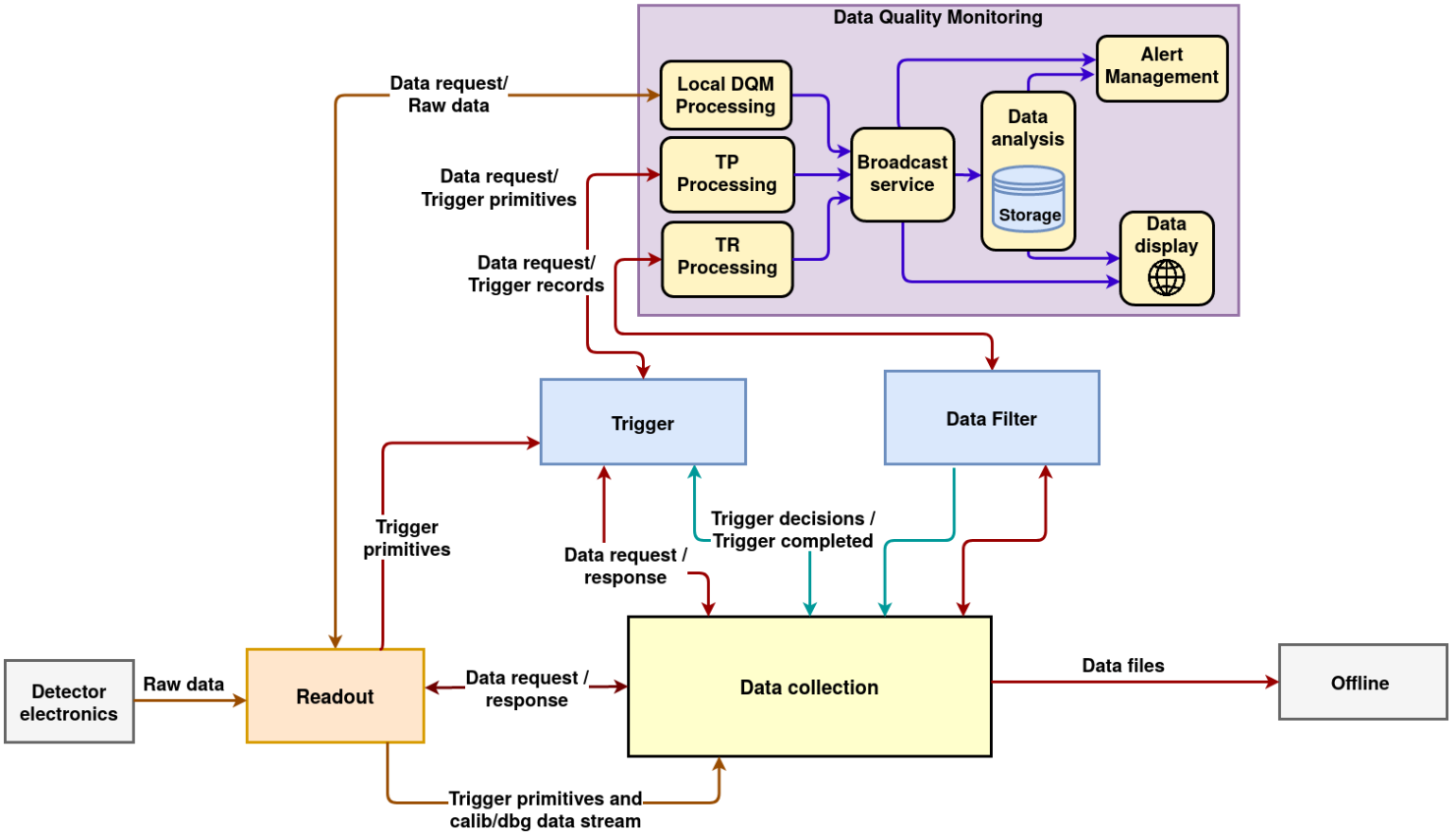

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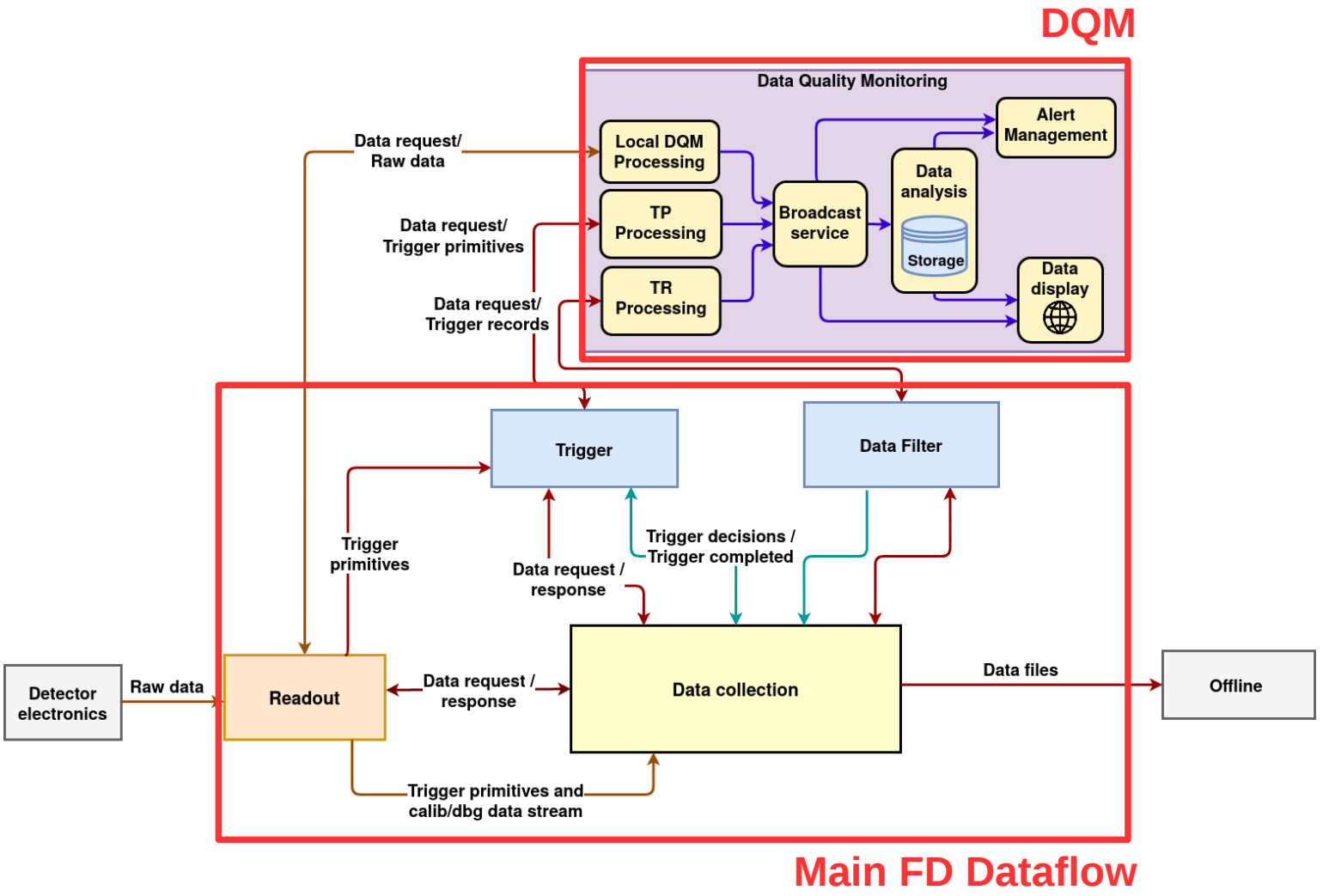

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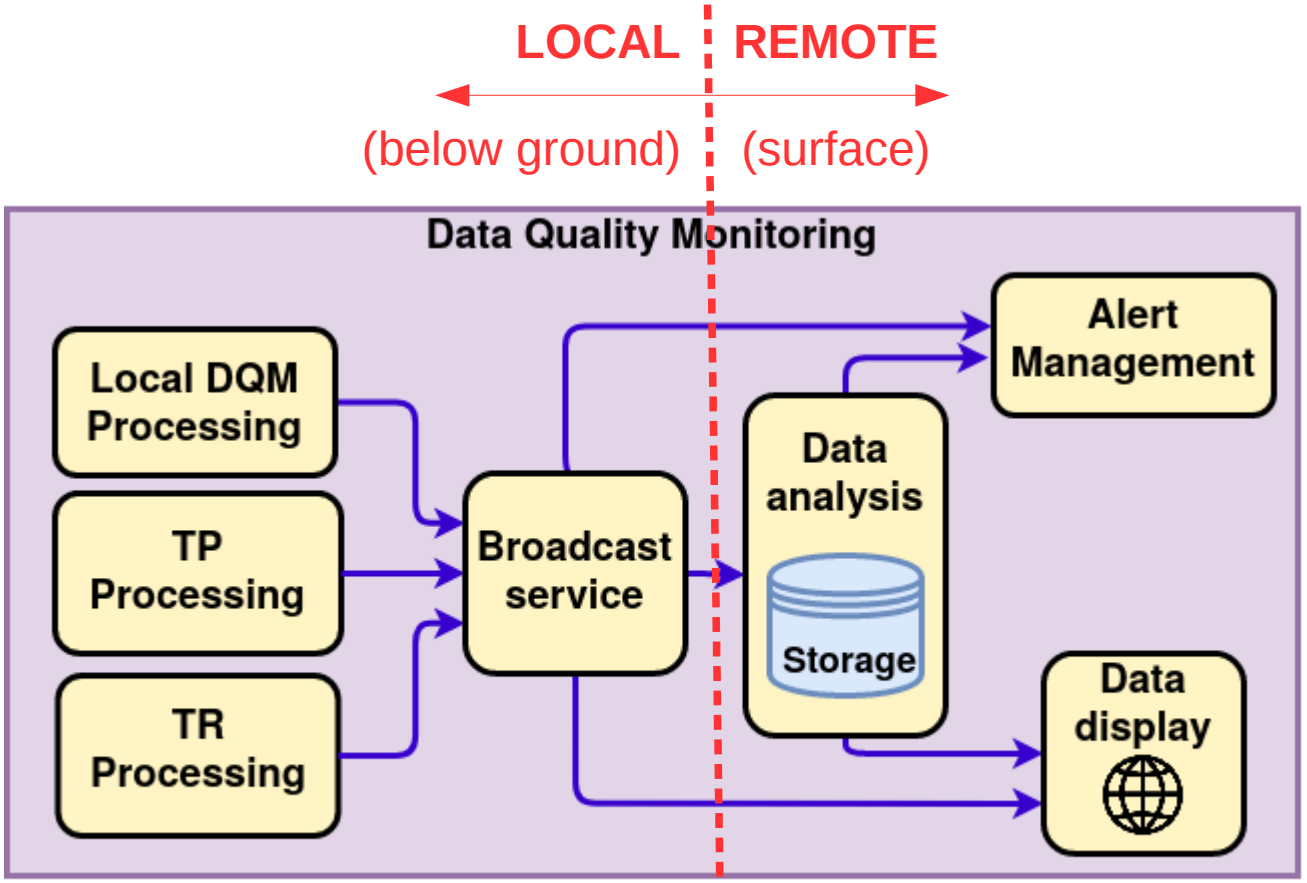

- Resource-constrained (1 core per APA)
- Minimal dependencies, basic computation.
- Running within the DAQ app fwk

- Running on its own server.
- Advanced capabilities (e.g. machine learning).
- Outputs interface to CCM and web.

DQM System Overview

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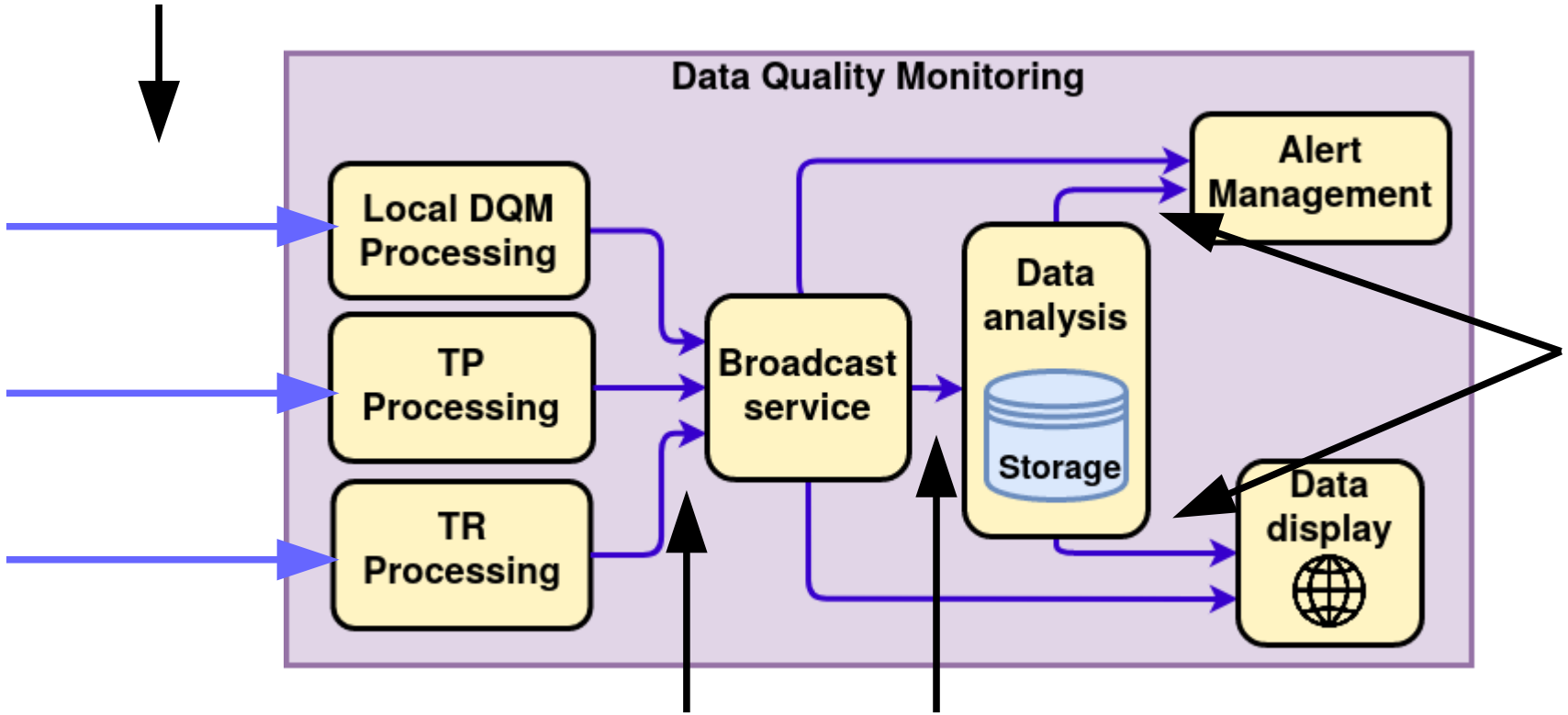
Native format data
e.g. raw data,
trigger primitives,
trigger records



Monitoring results
e.g. alerts,
anomaly
detection

Monitoring plots
e.g. histograms,
heat maps

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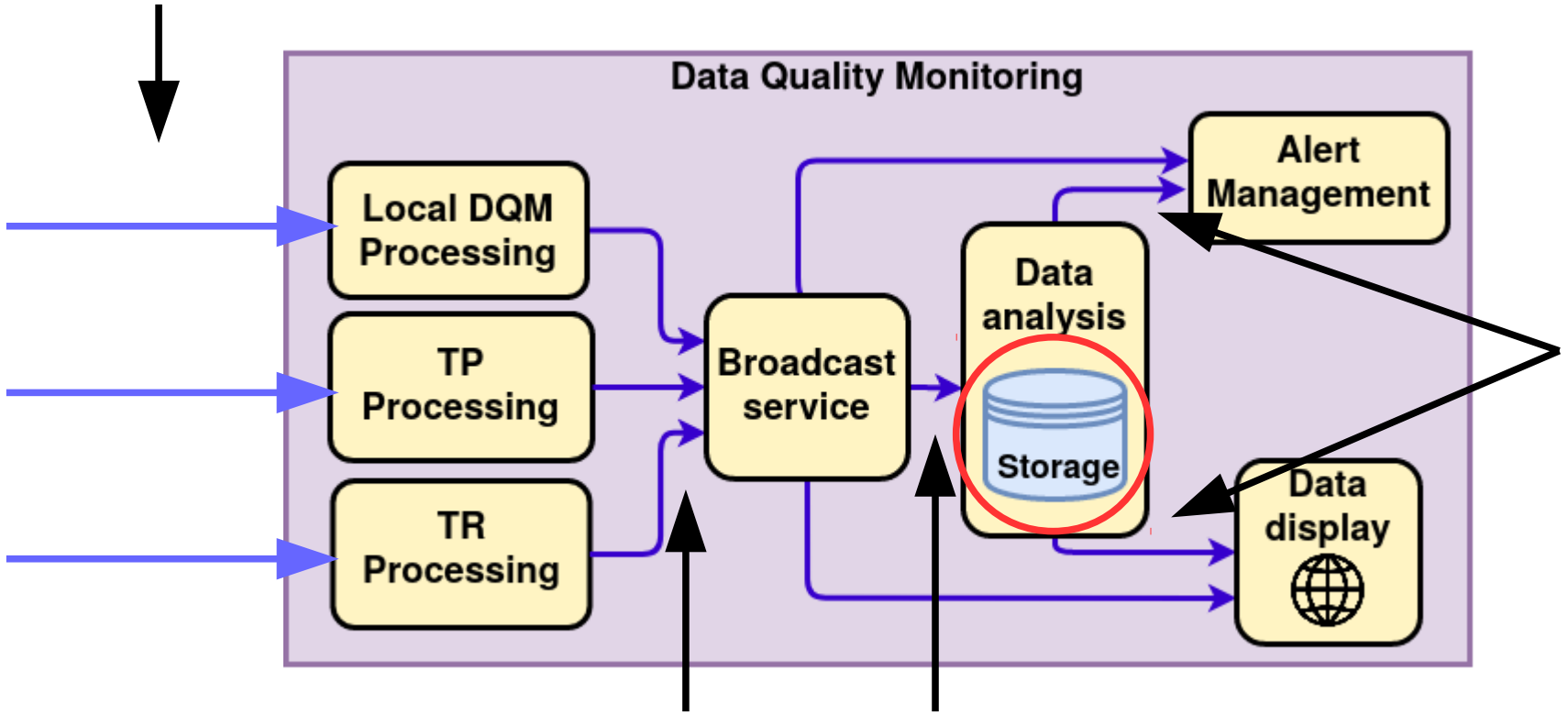

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e.g. alerts,
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What Data To Store?

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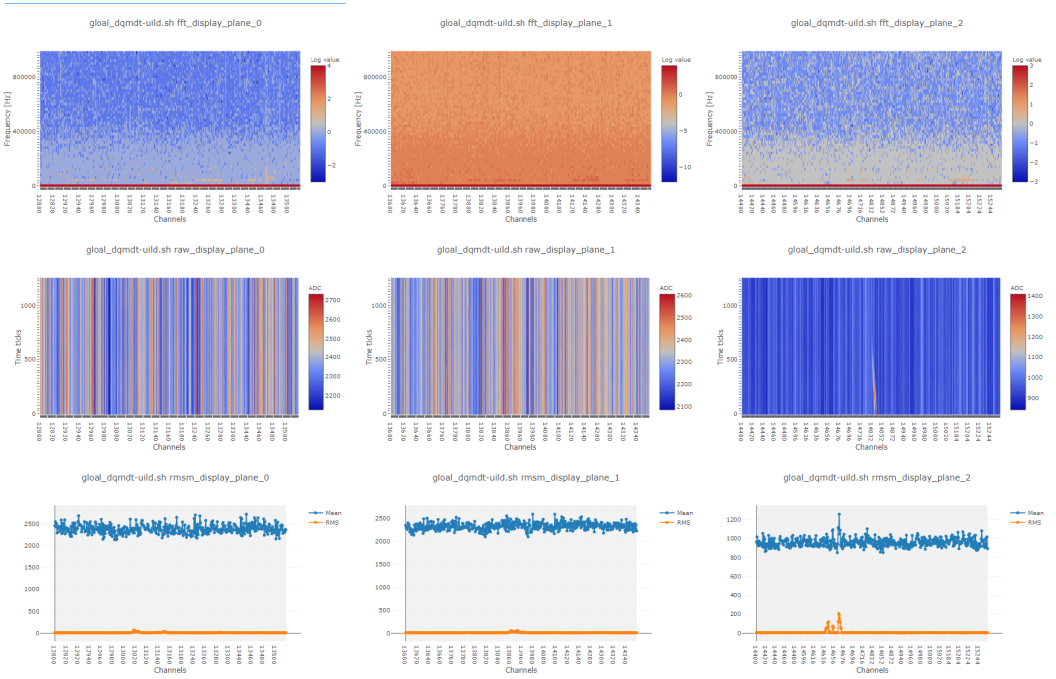
1. **Monitoring plots**
   Plots summarising the sampled data. Fully interrogatable; accompanied by metadata describing e.g. time, detector unit.
2. **Monitoring results**
   Derived from monitoring plots. Can take a range of forms, from a boolean flag (e.g. an alert) to another plot. Flexible category.



Monitoring plots produced in last cold box run.

How Much?

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- In our most recent cold-box runs, our heat map plots were ~1 MB each. We generated 2 per plane (⇒ 6 per APA) every 10s.
- Scaling that up to a full FD module of ~150 APAs, a nominal data rate might be 90 MB/s.
- Not all this data necessarily needs to be kept long-term. Some sensible archive downsampling scheme is intended (but not yet implemented/tested), informed by storage budget.
- **This is all still very fluid.**
  - Our current sampling rates are arbitrary (and likely to fall).
  - We have many more systems to hook in whose monitoring processes have to run in parallel inside the same CPU budget.
  - Our plots (and other metrics) are being defined and redefined as we go along.

How Will It Be Used?

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1. **Live Inspection**
   Users of the web display need to be able to navigate through all the subsystems and units of the detector to view monitoring plots and results as they're generated in real time.
2. **Historical record**
   Users also need to be able to go back and use the monitoring plots/results to assess the detector state at a given time in the run history, just as they would live (though maybe not with the same time resolution).

A lot of information to represent, and a lot of potential questions users may be trying to answer, so important that users are able to access and display the data in a configurable way (e.g. show me variables X, Y and Z from systems A, B and C).

Access & Support

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- The vision for the DQM display is to be entirely web-based, so that shifters can easily view and query it from anywhere in the world with minimal prerequisite setup.
- Access would be gated through CERN/FNAL SSO.
- A smaller group of DQM experts would be responsible for DB management.
- The DQM will be critical for good data collection, so 24/7 support seems a requirement during runtime – both on the software and the hosting infrastructure. The long-term provision of that support is a conversation we're yet to have.

What We Already Have

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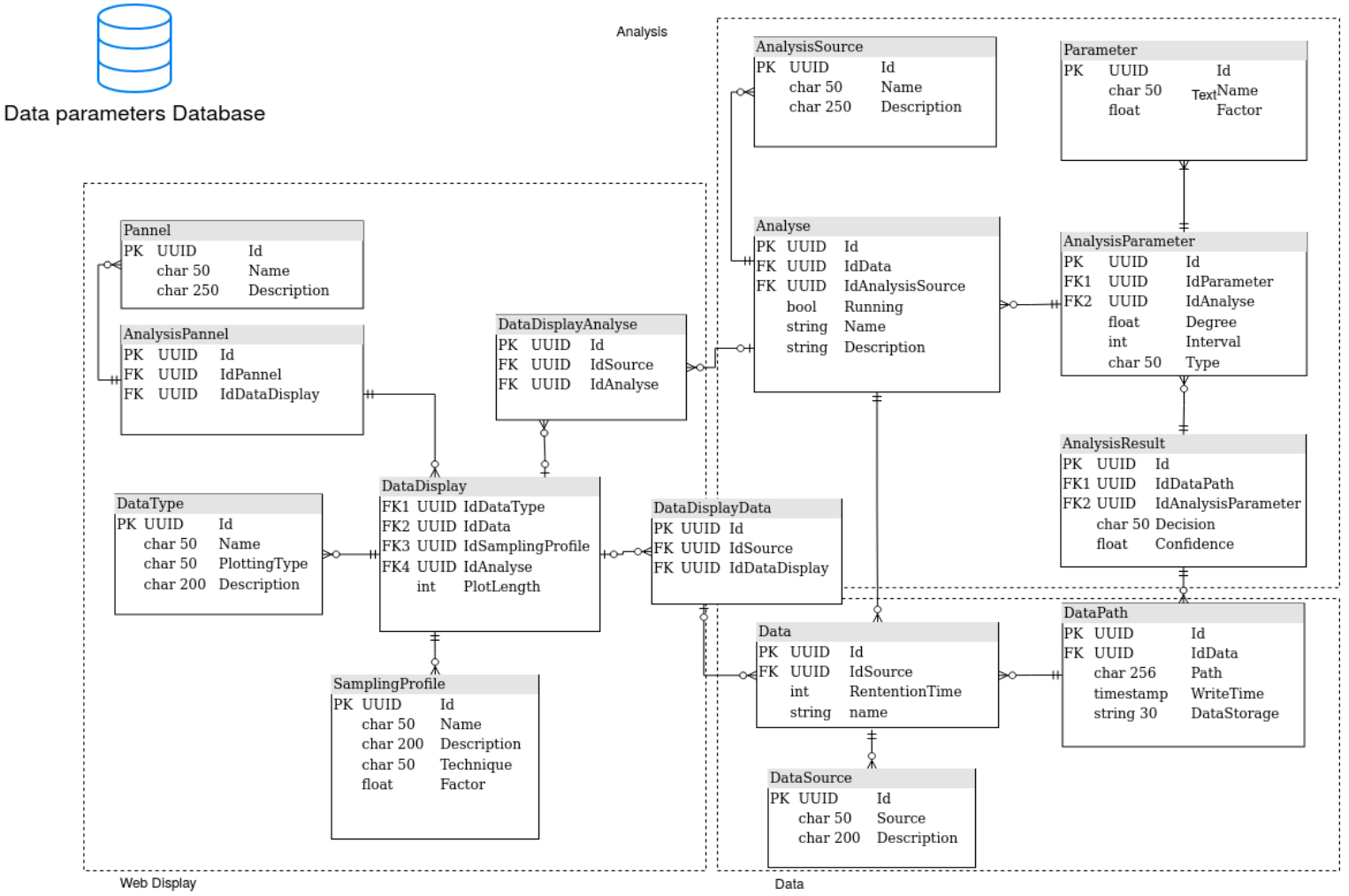

- This DB schema was drawn up by Yann Donon to serve the needs of the remote platform.
- Currently an instance hosted at CERN.
- **Subject to change!**
  - ASP.NET infrastructure proving v. difficult for us to maintain.
  - Looking at rebuilding this end of the system with django.

Summary

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- The DQM DB needs to store monitoring plots and results covering the full run history of the experiment.
  - No benchmarking on data volumes here yet, but expect <<< volumes from main dataflow.
- The DB needs to allow users to interrogate its contents through the web display along many dimensions (data type, detector unit, channel, time, etc.).
- We have a design for such a DB, but we're currently in the process of rebuilding it from the bottom up!