DQM4HEP
Status and prospects.

AIDA-2020 WP5 meeting - DESY

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DESY

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Software overview

Key points :

- Standalone plugin system
  - Plugin = C++ class in a shared library
  - Load shared library at runtime and hook plugin class
- **Generic event data model/format**. User needs to define :
  - Event model
  - Conversion Model $\leftrightarrow$ Binary

More general features :

- Online analysis (API)
- Distributed system (TCP/IP)
- Data collectors : event and histogram collector servers
- Quality test tools : interface + quality test templates
- Visualization interface (histograms and quality tests)

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Quality test API

Monitor element

- Wrap a ROOT TObject
- Optionally hold a ROOT TObject as reference

Quality test

- Implement the logic to test a monitor element
- Output a quality report (quality flag, success, etc)

One monitor element can be tested with many QTests, e.g :

- Kolmogorov test using a reference histogram
- Mean of histogram within an expected value

One QTest can be attached to many monitor elements, e.g :

- Test different histograms with the same gaussian distribution

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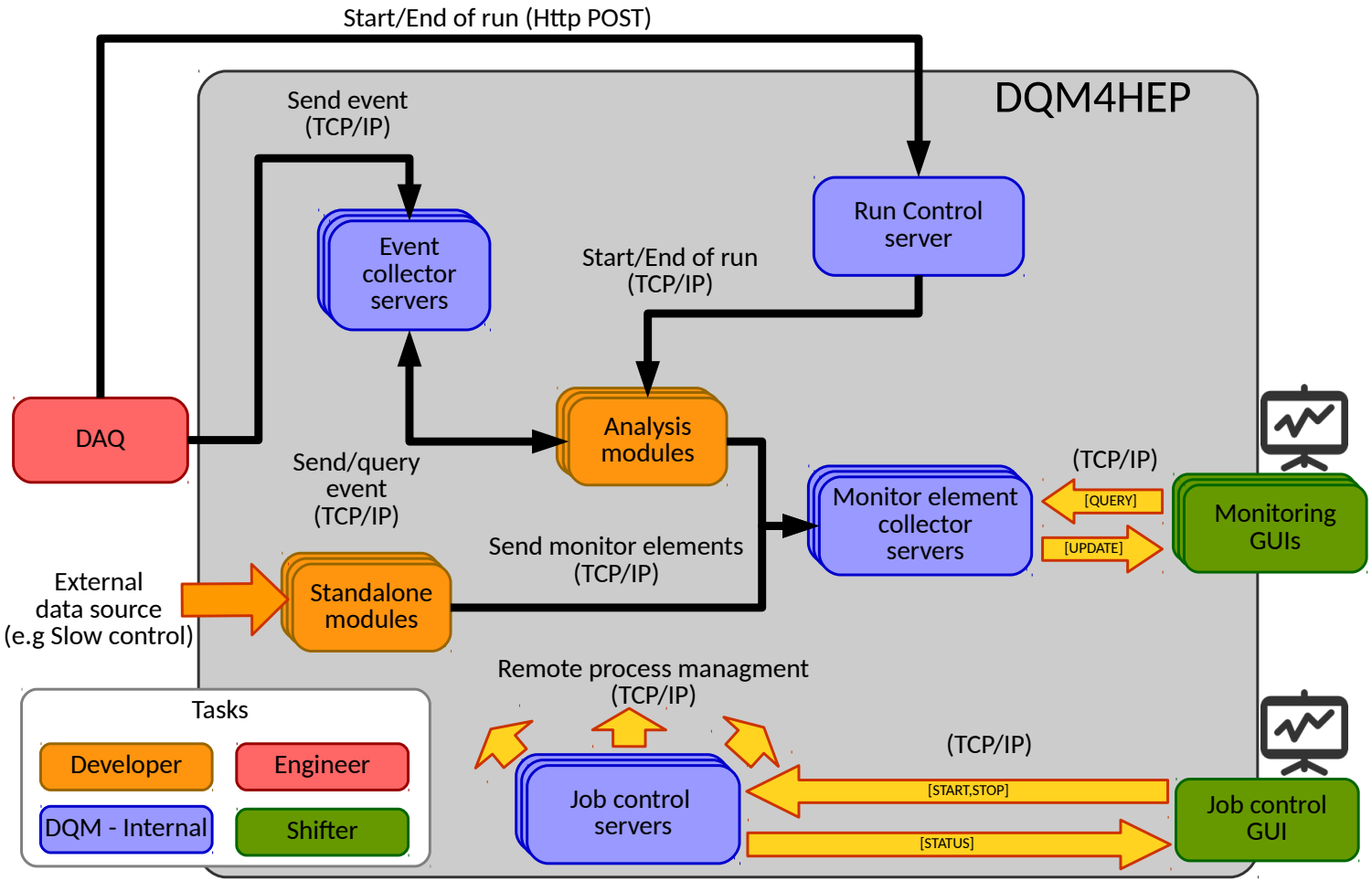
Online architecture



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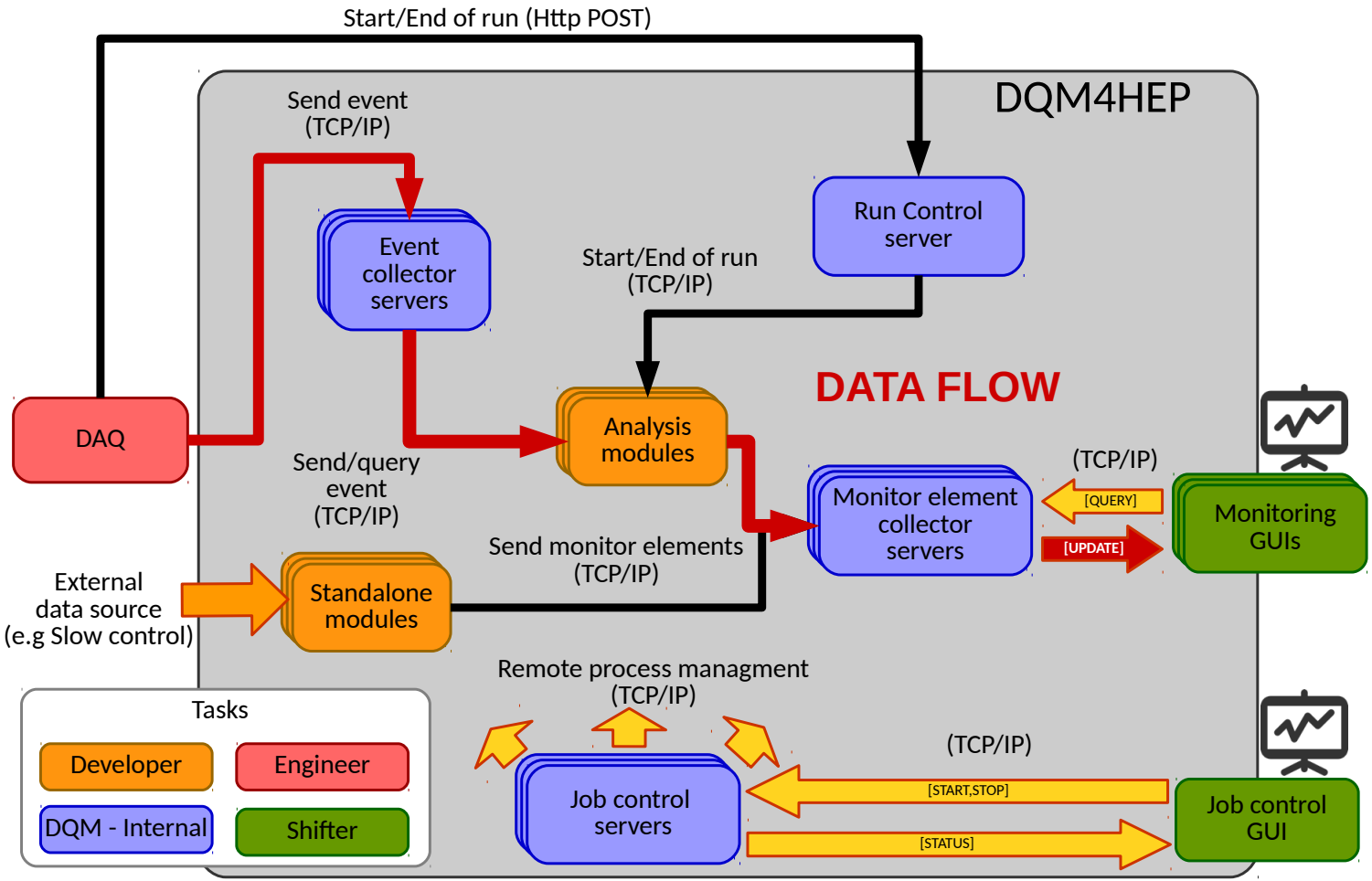
Online architecture



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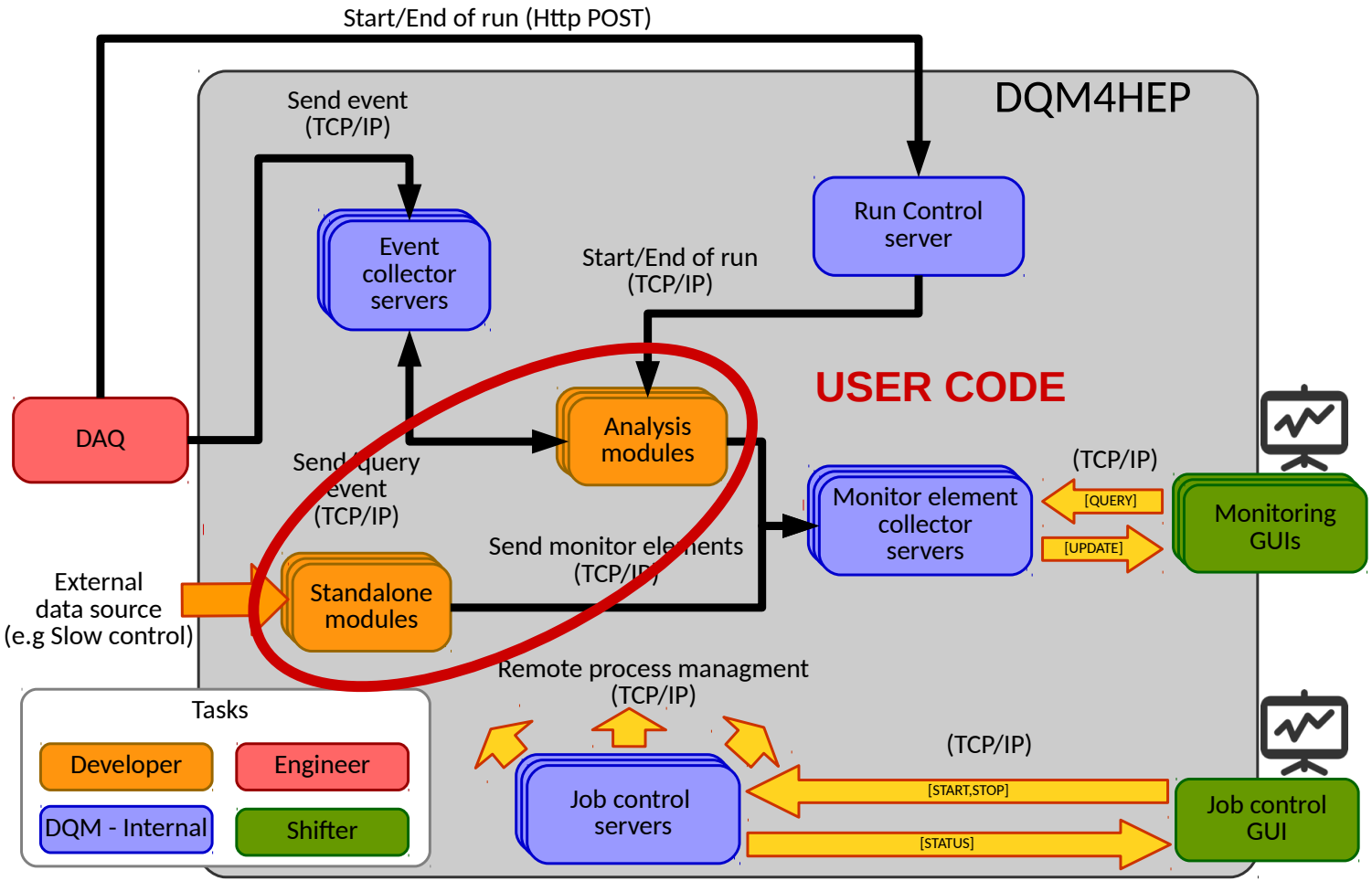
Online architecture



Analysis module

- **Receive and process event (e.g from DAQ)**
- Book and fill histograms
- Process quality tests
- Send histogram and QReports to collectors with cycle structure
  - Every N events/seconds
  - User can reset histogram if needed at end of cycle

Standalone module

- **Receive and process data from external source (e.g slow control)**
- Book and fill histograms
- Process quality tests
- Send histogram and QReports to collectors every N seconds

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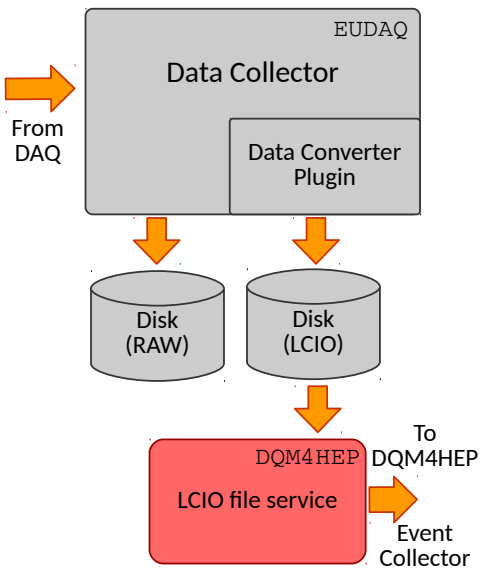
EUDAQ binding

Binding between the EUDAQ framework and DQM4HEP is ongoing.

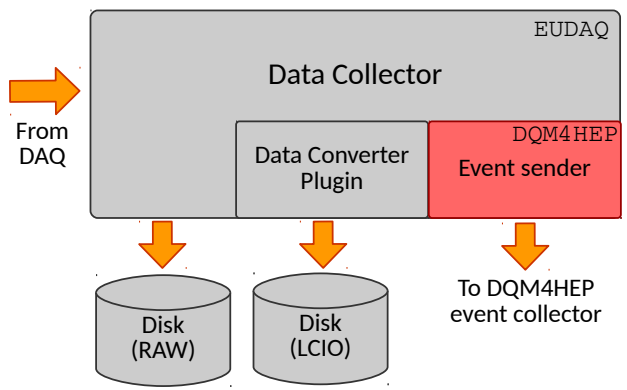
Need to :

- implement event streamer plugin
- implement the run control interface
- integrate DQM4HEP in EUDAQ

Possible EUDAQ update to use DQM4HEP :



Current



Foreseen

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Ongoing work on framework

ILD collaboration entering in a new MC production process.

Need for automatic data quality checks for simulated/reconstructed quantities.

Ongoing work to separate the main package (DQMCore) into two different software

dqm4hep-core

- MonitorElement (ROOT)
- Quality test
- Event interface
- Streaming (xdrstream)
- Plugin management
- DB tools (MySQL)
- Logging (spdlog)

dqm4hep-online

- Modules (User classes, Online API)
- Event collector (server and client)
- Monitor element collector (server and client)
- Run control (server, client and external interface)

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Ongoing work on framework

Current effort to provide an important set of quality test templates in core library

Users can also implement their own quality tests

- **Kolmogorov test (hist + ref)**
- Mean withing range
- Mean 90 within range
- No data after limit
- No data before limit
- **Fit function and check χ^2**
- Likelihood fit
- Fraction of data after limit exceed
- Fraction of data before limit exceed
- RMS lower than
- RMS 90 lower than
- RMS greater than
- RMS 90 greater than
- Mean lower than
- Mean 90 lower than
- Mean greater than
- Mean 90 greater than
- RMS within range
- RMS 90 within range
- **Fit function and check parameters within range**
- Distance between two values

Incoming work : **possibility to test any object in ROOT files using these quality tests**

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Timeline

Current work

- Quality tests (Tom) : 2 months
- Core tools (Remi) : 2 months

Future work

- Online package under total review
  - Online architecture remains the same
  - Change networking layer (dqm4hep-net)
- Implement EUDAQ↔DQM4HEP interface
- Develop web interface to replace
  - Monitoring GUI
  - Job control
  - Framework status

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URLs and contact

GitHub collaboration

`https://github.com/dqm4hep`

Installation package (`v04-03-00`)

`https://github.com/dqm4hep/dqm4hep`

Slack channel (Announcements, issues, management)

`https://dqm4hep.slack.com`

Contact us !

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