Environmental slow control system for the DESY-II Testbeam Area.

as a central monitoring system at DESY-II

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Brief Opening

- Being **Motivated…**
  - many complex system tests at DESY-II require logging environmental parameters of both detectors and experimental area;
- **Aiming** at…
  - a central monitoring system maintained by DESY
  - to monitor:
    - Common TB parameter;
    - Area specific parameter;
    - User configurables.
- **Requiring** easy to maintain/integrate…
  - Data outstream easy to integrate to user data;
    - short learning period
    - integrated to common DAQ: i.e. EUDAQ2
  - Flexible to integrate user customizing slow control system;
  - Mobility and stability mechanically

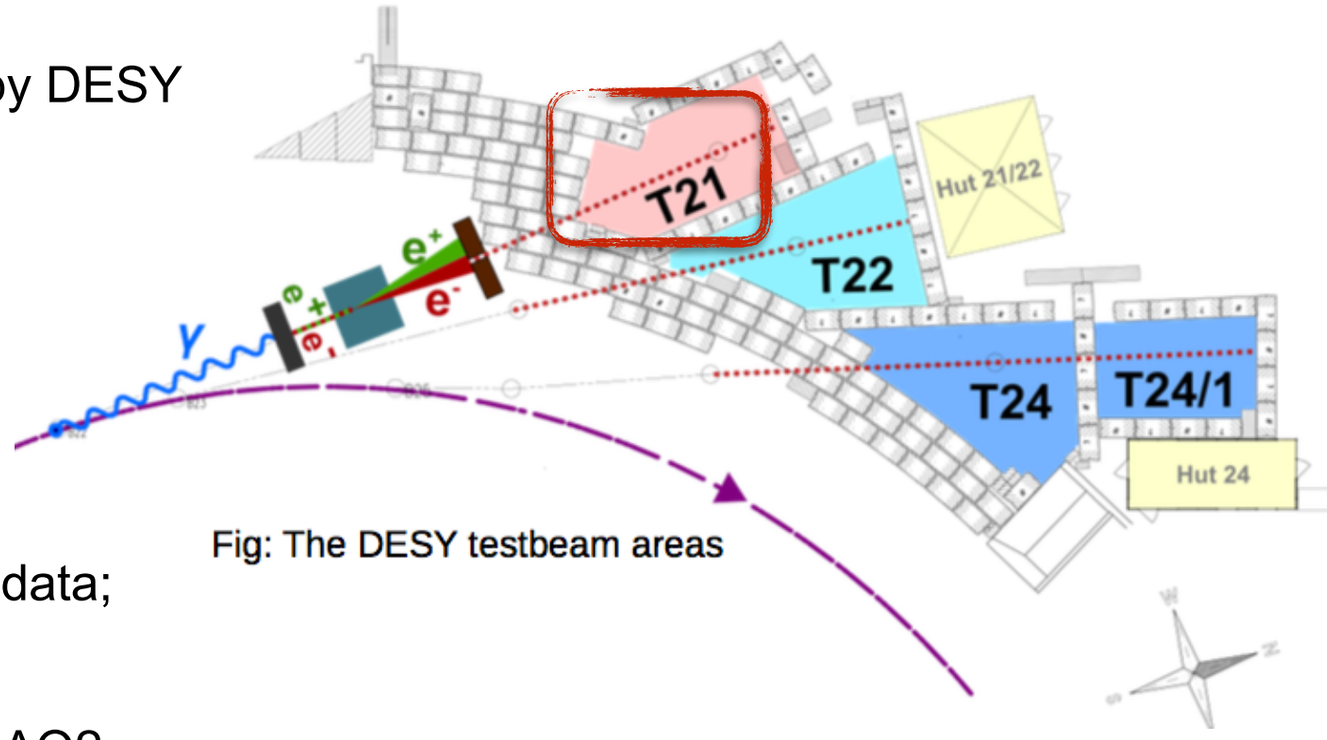


Fig: The DESY testbeam areas

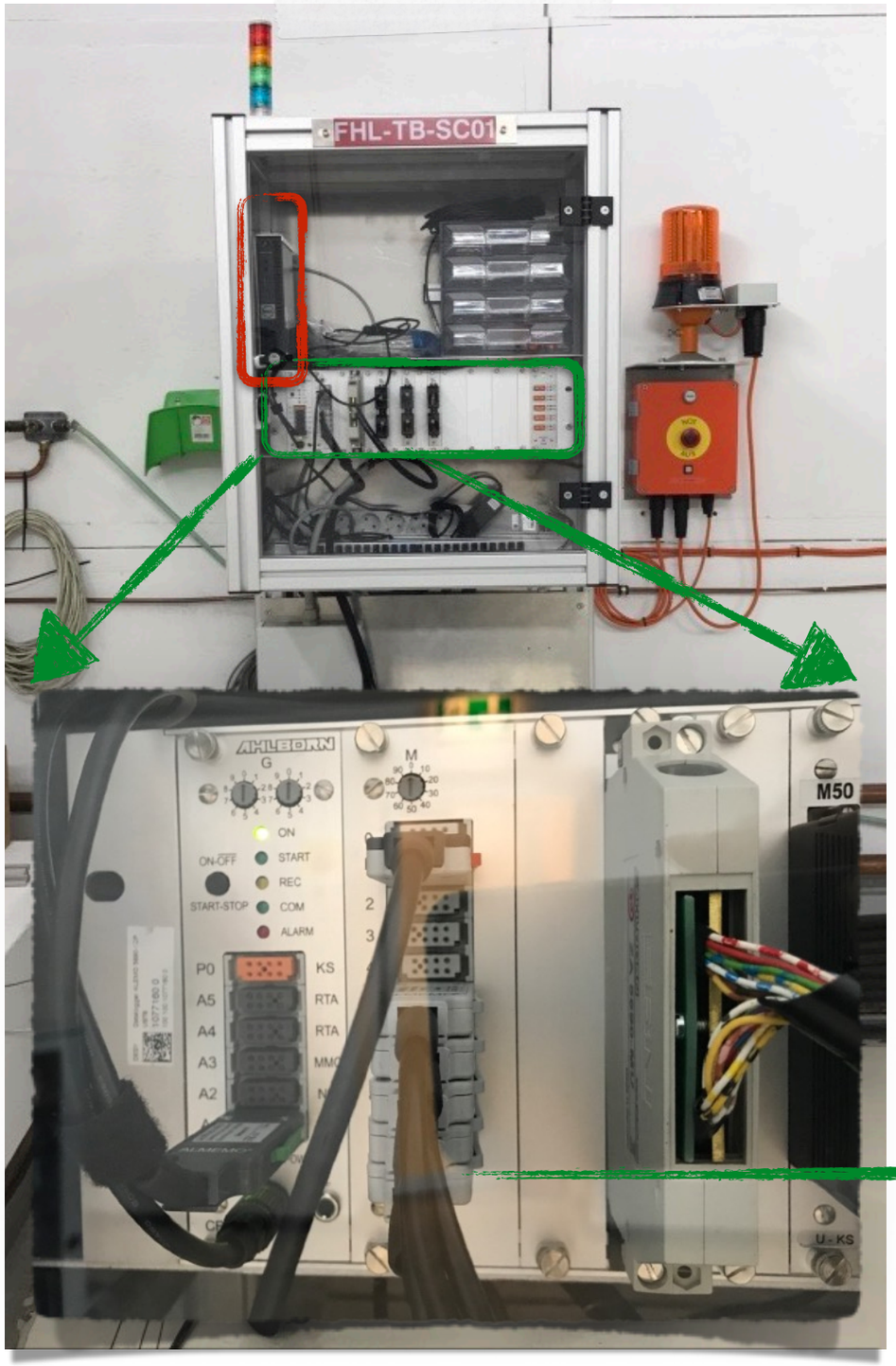
Introduction

* 1st rack installed in DESY-II beam area 21

Current Status Report

- Hardware **assembled** in October 2016
- Software **succeeded in lab** at DESY end of July 2017
- **1st test beam** commissioning in August 2017: **succeeded**;
- Project **delivered** with further development ongoing;
- Documentation done, manual in updating;
- **1st user** case from 11/2017 to 01/2017 with an internship student (Lars Fischer): **successfully** proccessed.

Hardware: mobility, stability, easy to maintain…

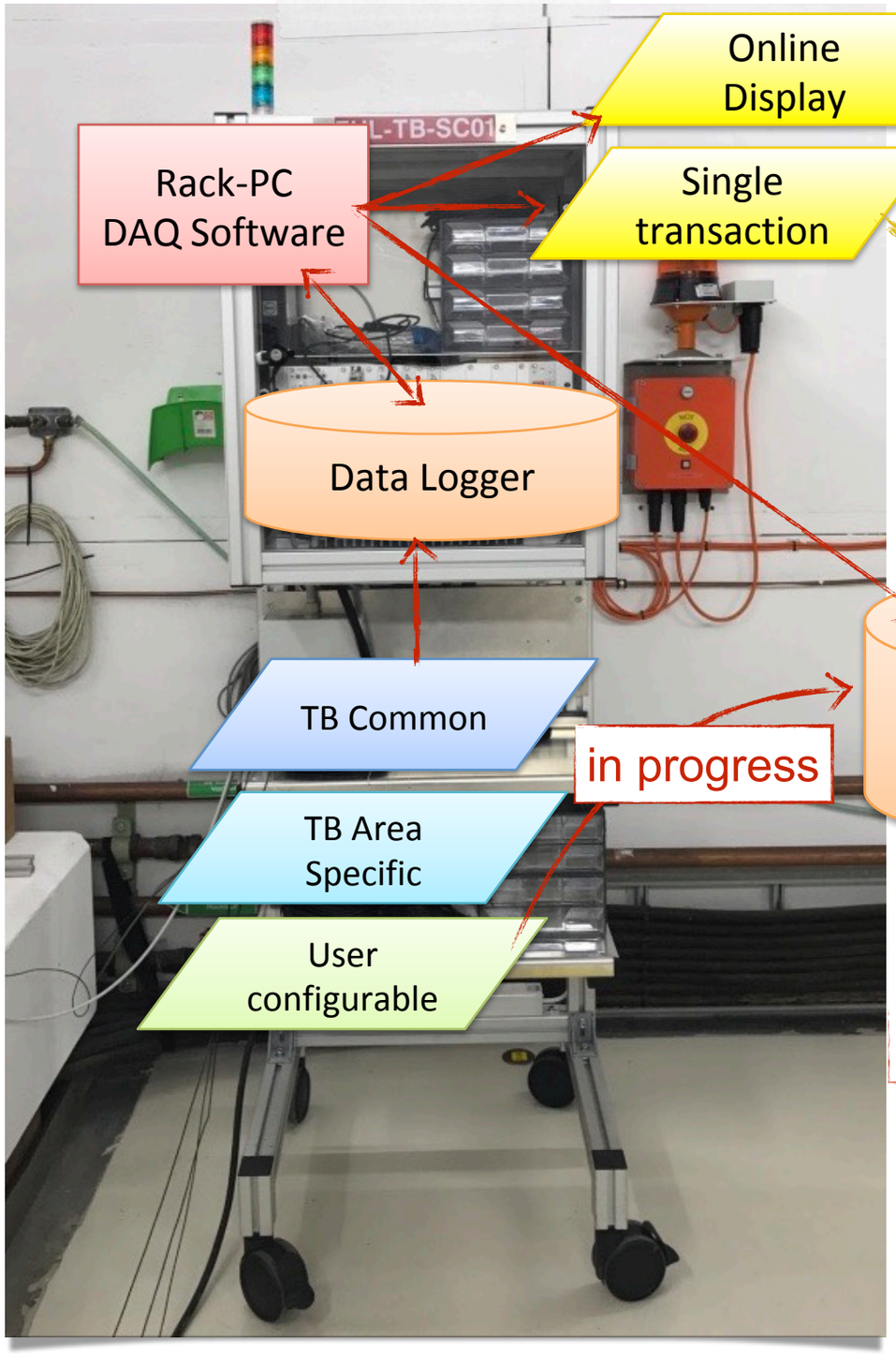


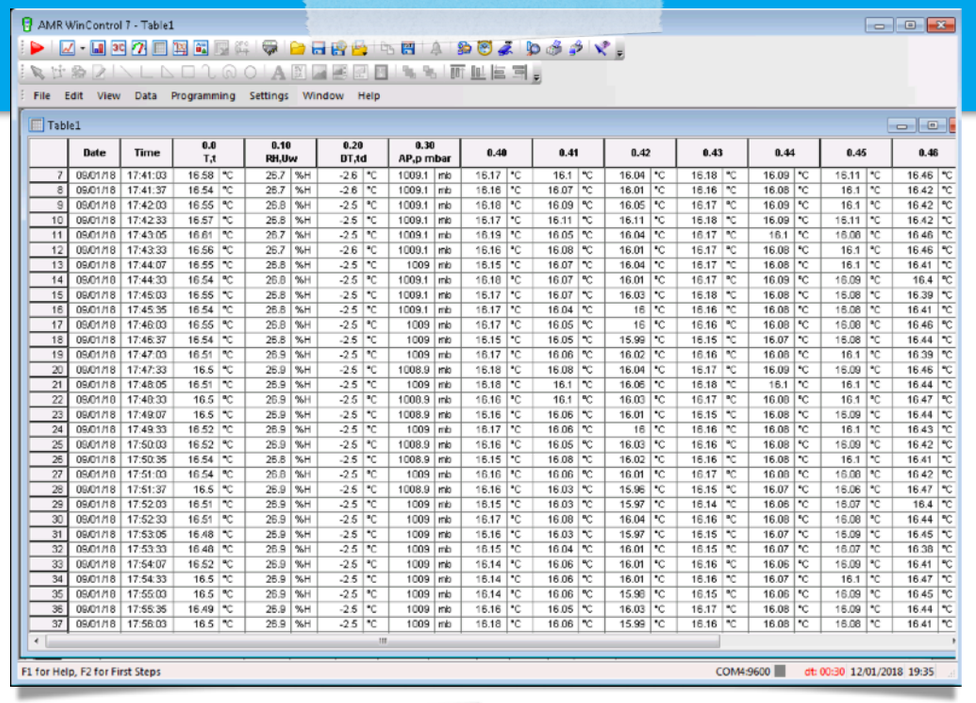
* Currently 10 NTC and 1 DIGI connceted (temperature, humidity, dew-point and pressure)

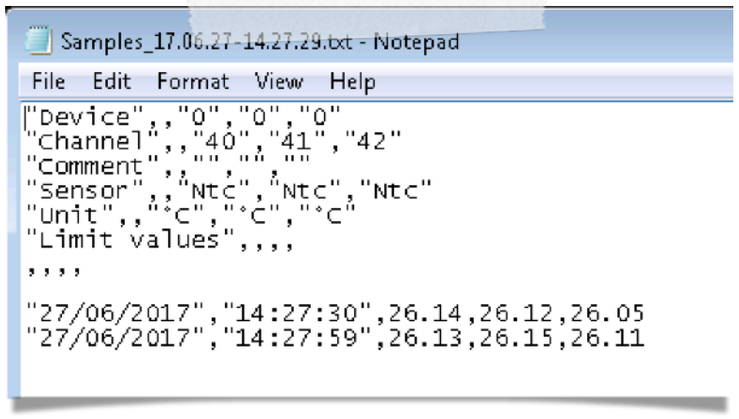
Hardware

- A rack-based SC system built up as shown
  - Four wheels w/ brakes;
  - Fixed data logger able to connect to variable sensors;
  - A rack-PC to collect/distribute data;
  - MySQL database w/ ODBC connections;
  - EUDAQ2 module provided w/ eudaq raw data production prepared.

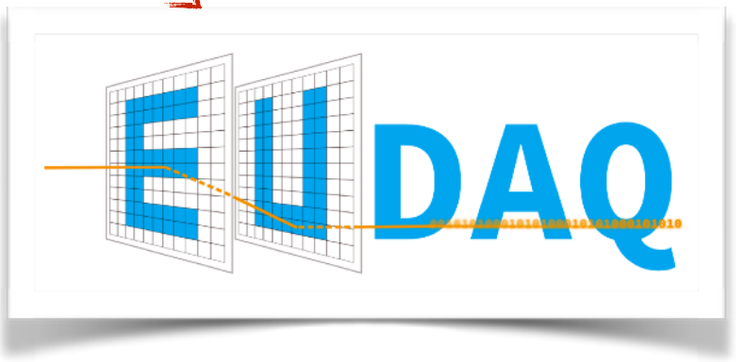
Software: common DAQ terminal…





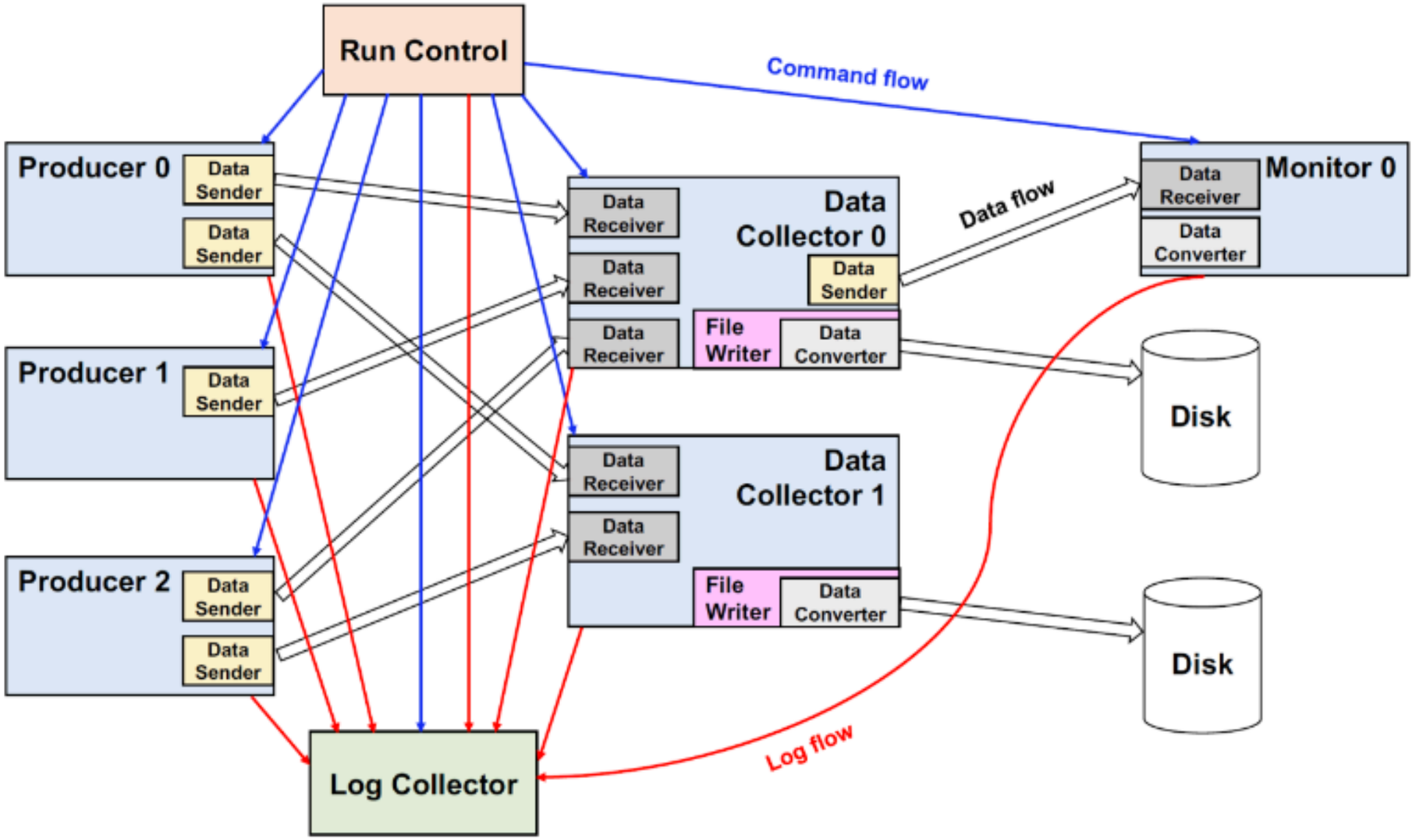


System to be accessed via the EUDAQ for user



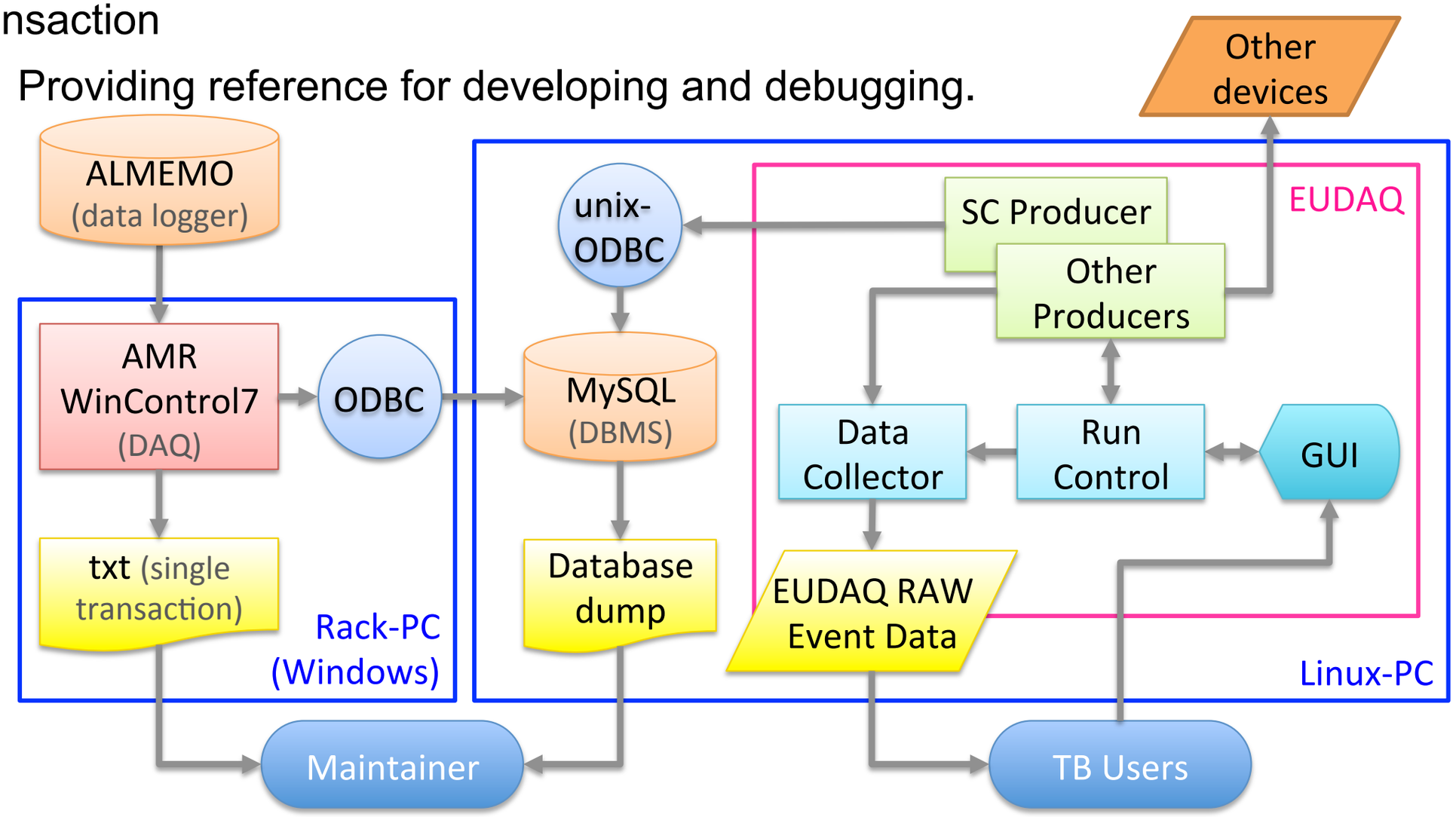
A glimpse at EUDAQ2

- Eudaq2 now provides nice scheme for derivatives development
- With the sync keeping easily
- For our use, we modify the following modules:
  - Run control and it's GUI
  - Producer
  - DataCollector
  - Eudaq std evt/clip evt converter
  - EuCliConverter/ Reader

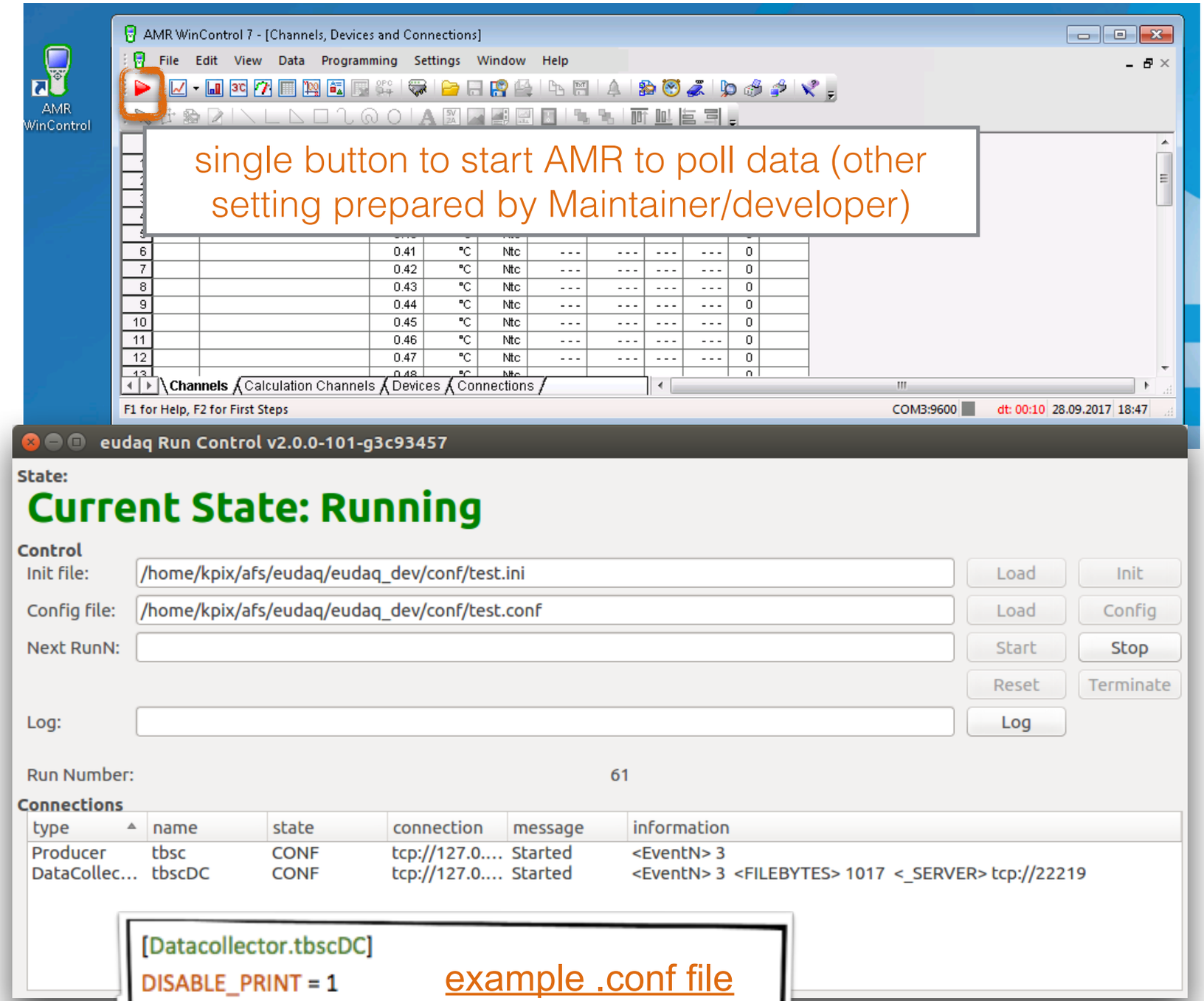


A bite for Developers

- A correspondent DAQ software AMR from Alhborn company;
- Able to export data every 90 seconds (adjustable) to any database
  - MySQL is chosen here;
- For each data-taking from AMR, it can do online monitoring and save data in a single transaction
  - Providing reference for developing and debugging.



A bite for Users




```
[Datacollector.tbscDC]
DISABLE_PRINT = 1
[Producer.tbsc]
EUDAQ_DC = "tbscDC"
TBSC_DEBUG = "false"
TBSC_INTERVAL_SEC = 90
TBSC_PARA_MASK = "timer,ch0,ch10,ch20,ch30,ch40,ch41"
```

example .conf file

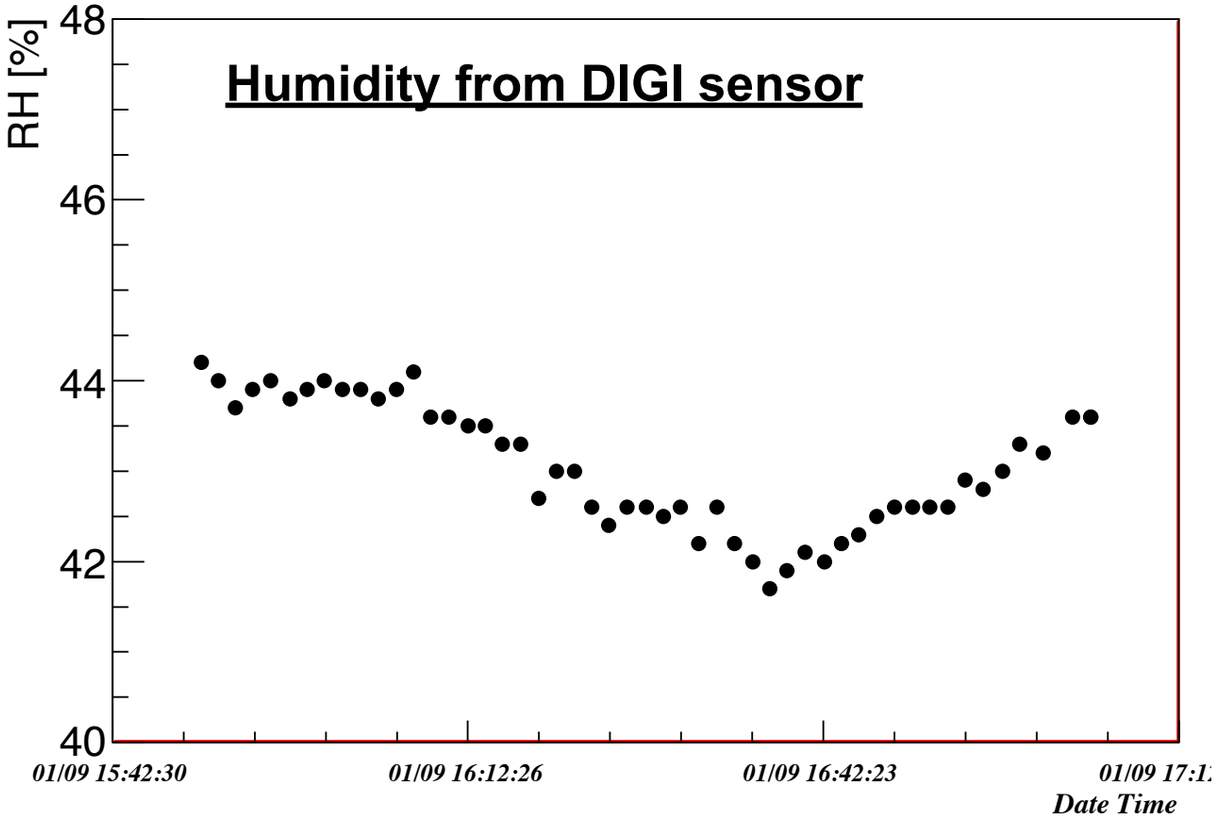
- MySQL database is currently built up on the same PC as Eudaq2
  - Ideally if data increasing rapidly, can be moved to a centralized PC
  - Able to dump an xml file for cross-check
- EUDAQ2 module on Github
  - **Producer/DataCollector** provided
  - **DataConverter** provided
  - Misc.: example ini/conf files, SQL file to setup an example MySQL DB, and other mini tools provided
  - Able to produce/sync to user data stream in the std **EUDAQ raw** format.

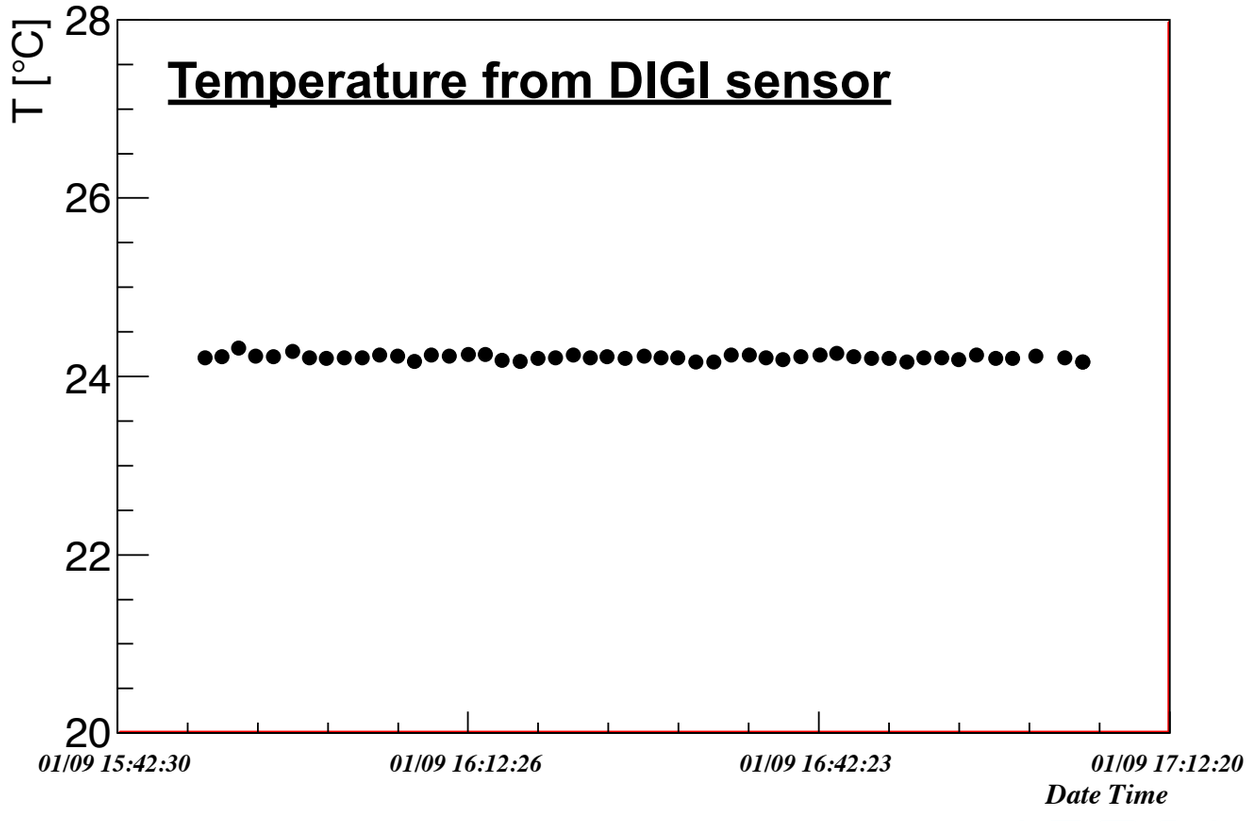
1st test beam commissioning: system validated

Example:

- Data collected at DESY TB Area 21 on 01/09/2017 from 16:50 to 18:05:
- cross checked with MySQL database dumped csv file;
- perfect agreed as expected,

Date Time	T	RH
01/09/17 16:49	24.21	44.2
01/09/17 16:51	24.22	44
01/09/17 16:52	24.32	43.7
01/09/17 16:54	24.23	43.9
01/09/17 16:55	24.22	44
01/09/17 16:57	24.28	43.8

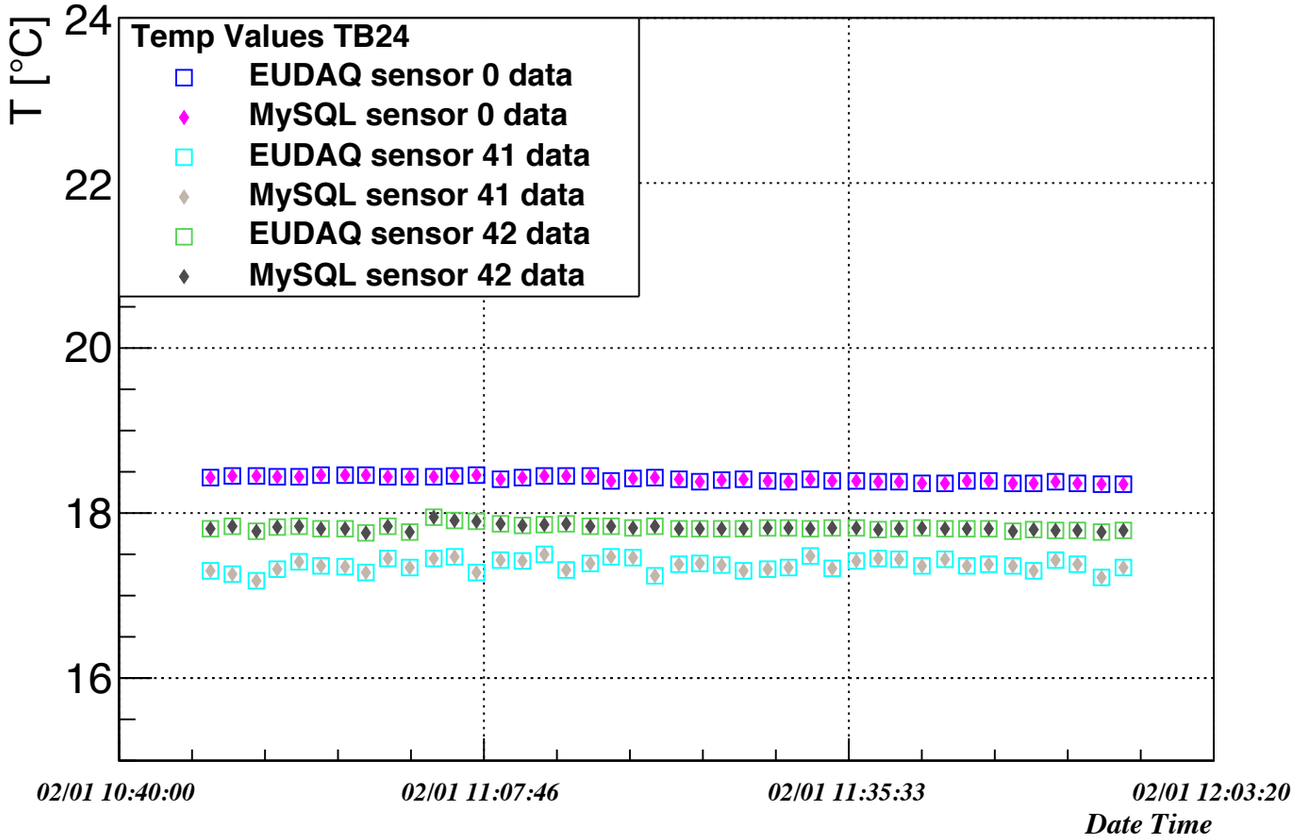




1st user commissioning

Testing a **second rack** in DESY-II **beam area 24**:

- Data collected on 02/01/2018 from 10:40 to 12:00;
- Cross checked with MySQL database dumped csv file;
- Perfect **agreed** as **expected**;
- Able to conduct cross-rack comparison with EUDAQ2.
- Installation and data taking by intern student:
  - proof for short learning period;
  - 1st user experience helped to update the system.



Environmental slow control system at DESY-II testbeam

Closing

- System ready w/ first test beam commisionning succeed
- manual is on updating see http://cds.cern.ch/record/2284369.
- project delivered on 27/10/2017;
- 1st user experience from one intern student Lars Fischer:
  - sucessfully install a second rack;
  - manage to take data and validate system.
  - **More users** are **welcomed**!

Outlook

- Possible futher development/update under discussion
  - possible to use **DQM4HEP** as the **online monitor** module for the system (see Remi's talk);
  - possible to **integrate user's** customized **slow control** system, benefiting from the SQL module used in this system.

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谢谢观赏！

Many thanks for your attention!

Danke schön!

Merci beaucoup!

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Everyone needs back up :)

User: how SC data looks like in EUDAQ2.raw

EUDAQ .conf file section for the Slow Control Producer: here to choose which channels to save to EUDAQ data stream

```
[Producer.scp]
TBSC_DEBUG = "false"
TBSC_INTERVAL_SEC = 90
TBSC_PARA_MASK="ch1,ch11,ch41"
```

Print out an example of the EUDAQ RAW event for Slow Control Producer

```
kpix@aida2020-kpix2:~/afs/eudaq/eudaq_dev/bin$ more out.txt
<Event>
  <Type>2149999981</Type>
  <Extendword>2433815158</Extendword>
  <Description>SCRawEvt</Description>
  <Flag>0x00000000</Flag>
  <RunN>0</RunN>
  <StreamN>0</StreamN>
  <EventN>0</EventN>
  <TriggerN>0</TriggerN>
  <Timestamp>0x0000000000000000  ->  0x0000000000000000</Timestamp>
  <Timestamp>0  ->  0</Timestamp>
  <Tags>
    <Tag>ch1=28.66</Tag>
    <Tag>ch11=31.3</Tag>
    <Tag>ch41=28.1</Tag>
    <Tag>test=ttt</Tag>
  </Tags>
  <Block_Size>0</Block_Size>
</Event>
```

MySQL database structure

Preliminary MySQL database structure

kpix@aida2020-kpix2: ~ | kpix@aida2020-kpix2: /afs/desy.de/user/m/mengqing/eu... | kpix@aida2020-kpix2: ~/afs/eudaq/eudaq_dev/build

```
Your MySQL connection id is 22
Server version: 5.7.18 MySQL Community Server (GPL)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use aidaTest;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> select * from aida_channels;
+------+------+--------+--------+-----------+
| chid | id   | unit   | sensor | comment   |
+------+------+--------+--------+-----------+
| ch0  | 0.0  | \u2103 | DIGI   | T,t       |
| ch10 | 0.10 | %H     | DIGI   | RH,Uw     |
| ch20 | 0.20 | \u2103 | DIGI   | DT,td     |
| ch30 | 0.30 | mb     | DIGI   | AP,p mbar |
| ch40 | 0.40 | \u2103 | Ntc    |           |
| ch41 | 0.41 | \u2103 | Ntc    |           |
| ch42 | 0.42 | \u2103 | Ntc    |           |
| ch43 | 0.43 | \u2103 | Ntc    |           |
| ch44 | 0.44 | \u2103 | Ntc    |           |
| ch45 | 0.45 | \u2103 | Ntc    |           |
| ch46 | 0.46 | \u2103 | Ntc    |           |
| ch47 | 0.47 | \u2103 | Ntc    |           |
| ch48 | 0.48 | \u2103 | Ntc    |           |
| ch49 | 0.49 | \u2103 | Ntc    |           |
+------+------+--------+--------+-----------+
14 rows in set (0.00 sec)

mysql> select * from aidaSC;
+------------+---------------------+-------+------+------+--------+------+------+------+------+------+------+------+------+------+------+
| counter    | timer               | ch0   | ch10 | ch20 | ch30   | ch40 | ch41 | ch42 | ch43 | ch44 | ch45 | ch46 | ch47 | ch48 | ch49 |
+------------+---------------------+-------+------+------+--------+------+------+------+------+------+------+------+------+------+------+
| 0000000001 | 2017-08-29 13:56:18 | 24.64 | 52.8 | 14.4 | 1010.8 | 24.43 | 24.31 | 24.49 |  24.4 | 24.31 | 24.34 | 24.46 |  16.9 | 24.69 |  26.3 |
| 0000000002 | 2017-08-29 13:56:53 | 24.71 | 52.7 | 14.5 | 1010.7 | 24.49 | 24.33 | 24.41 | 24.42 | 24.35 | 24.36 | 24.48 | 16.92 | 24.69 | 26.44 |
```

ODBC setup example from rack-pc