Environmental slow control system for the DESY-II Testbeam Area

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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
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** processed.

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

* Currently 10 NTC and 1 DIGI connected (temperature, humidity, dew-point and pressure)
Software: common DAQ terminal...

- **Rack-PC DAQ Software**
  - **Online Display**
  - **Single transaction**
  - **Data Logger**
  - **TB Common**
  - **TB Area Specific**
  - **User configurable**
  - **Any Database**

System to be accessed via the EUDAQ for user.

Any Database

- **Online Display**
- **Single transaction**
- **Data Logger**
- **TB Common**
- **TB Area Specific**
- **User configurable**

Software: common DAQ terminal...
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 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

- 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.

example .conf file

```plaintext
[Datacollector.tbscDC]
DISABLE_PRINT = 1

[Producer.tbsc]
EUDAQ_DC = "tbscDC"
TBSG_DEBUG = "false"
TBSG_INTERVAL_SEC = 90
TBSG PARA_MASK = "timer,ch0,ch10,ch20,ch30,ch40,ch41"
```
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,

<table>
<thead>
<tr>
<th>Date Time</th>
<th>T</th>
<th>RH</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/09/17 16:49</td>
<td>24.21</td>
<td>44.2</td>
</tr>
<tr>
<td>01/09/17 16:51</td>
<td>24.22</td>
<td>44</td>
</tr>
<tr>
<td>01/09/17 16:52</td>
<td>24.32</td>
<td>43.7</td>
</tr>
<tr>
<td>01/09/17 16:54</td>
<td>24.23</td>
<td>43.9</td>
</tr>
<tr>
<td>01/09/17 16:55</td>
<td>24.22</td>
<td>44</td>
</tr>
<tr>
<td>01/09/17 16:57</td>
<td>24.28</td>
<td>43.8</td>
</tr>
</tbody>
</table>

**Humidity from DIGI sensor**

**Temperature from DIGI sensor**
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:
  - successfully 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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Outlook

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  - Possible to integrate user’s customized slow control system, benefiting from the SQL module used in this system.
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

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

Preliminary MySQL database structure

```
Your MySQL connection id is 22
Server version: 5.7.18 MySQL Community Server (GPL)
Copyright (c) 2000, 2017, Oracle and/or its affiliates. All rights reserved.
Oracle is a registered trademark of Oracle Corporation and/or its 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 by setting -A
```
```sql
Database changed
mysql> select * from aida_channels;
<table>
<thead>
<tr>
<th>ch0</th>
<th>ld</th>
<th>unit</th>
<th>sensor</th>
<th>comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ch0</td>
<td>0.8</td>
<td>u2103</td>
<td>DIGI</td>
<td>T_t</td>
</tr>
<tr>
<td>ch10</td>
<td>0.1</td>
<td>RH</td>
<td>DIGI</td>
<td>RH, Uw</td>
</tr>
<tr>
<td>ch20</td>
<td>0.1</td>
<td>u2103</td>
<td>DIGI</td>
<td>DT, td</td>
</tr>
<tr>
<td>ch30</td>
<td>0.0</td>
<td>NTC</td>
<td>DIGI</td>
<td>AP, p mbar</td>
</tr>
<tr>
<td>ch40</td>
<td>0.0</td>
<td>u2103</td>
<td>NTC</td>
<td></td>
</tr>
<tr>
<td>ch41</td>
<td>0.0</td>
<td>u2103</td>
<td>NTC</td>
<td></td>
</tr>
<tr>
<td>ch42</td>
<td>0.0</td>
<td>u2103</td>
<td>NTC</td>
<td></td>
</tr>
<tr>
<td>ch43</td>
<td>0.0</td>
<td>u2103</td>
<td>NTC</td>
<td></td>
</tr>
<tr>
<td>ch44</td>
<td>0.0</td>
<td>u2103</td>
<td>NTC</td>
<td></td>
</tr>
<tr>
<td>ch45</td>
<td>0.0</td>
<td>u2103</td>
<td>NTC</td>
<td></td>
</tr>
<tr>
<td>ch46</td>
<td>0.0</td>
<td>u2103</td>
<td>NTC</td>
<td></td>
</tr>
<tr>
<td>ch47</td>
<td>0.0</td>
<td>u2103</td>
<td>NTC</td>
<td></td>
</tr>
<tr>
<td>ch48</td>
<td>0.0</td>
<td>u2103</td>
<td>NTC</td>
<td></td>
</tr>
<tr>
<td>ch49</td>
<td>0.0</td>
<td>u2103</td>
<td>NTC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14 rows in temp (0.00 sec)</td>
</tr>
</tbody>
</table>
```
```sql
mysql> select * from aida_sc;
| counter | timer | ch0 | ch10 | ch20 | ch30 | ch40 | ch41 | ch42 | ch43 | ch44 | ch45 | ch46 | ch47 | ch48 | ch49 |
|---------|-------|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
```
ODBC setup example from rack-pc