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# NICA detectors: status report

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Tango 2020 November meeting, 17.11.2020  
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# NICA (Nuclotron-based Ion Collider fAcility)





# NICA current status



MPD hall

BM@N

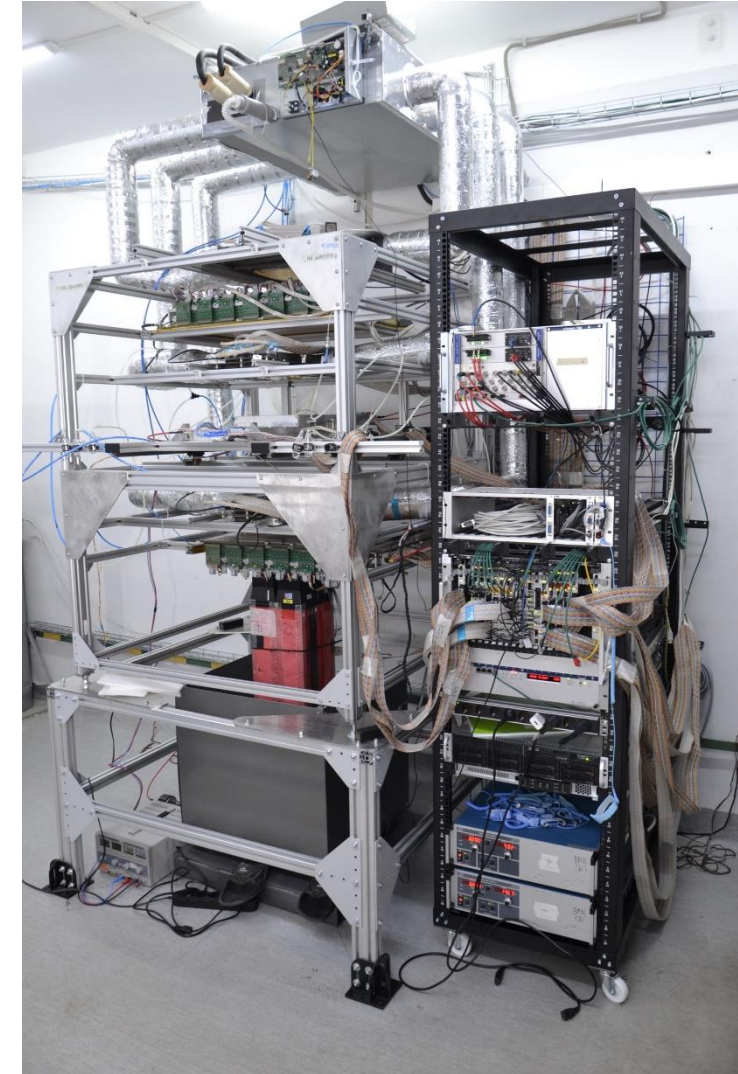
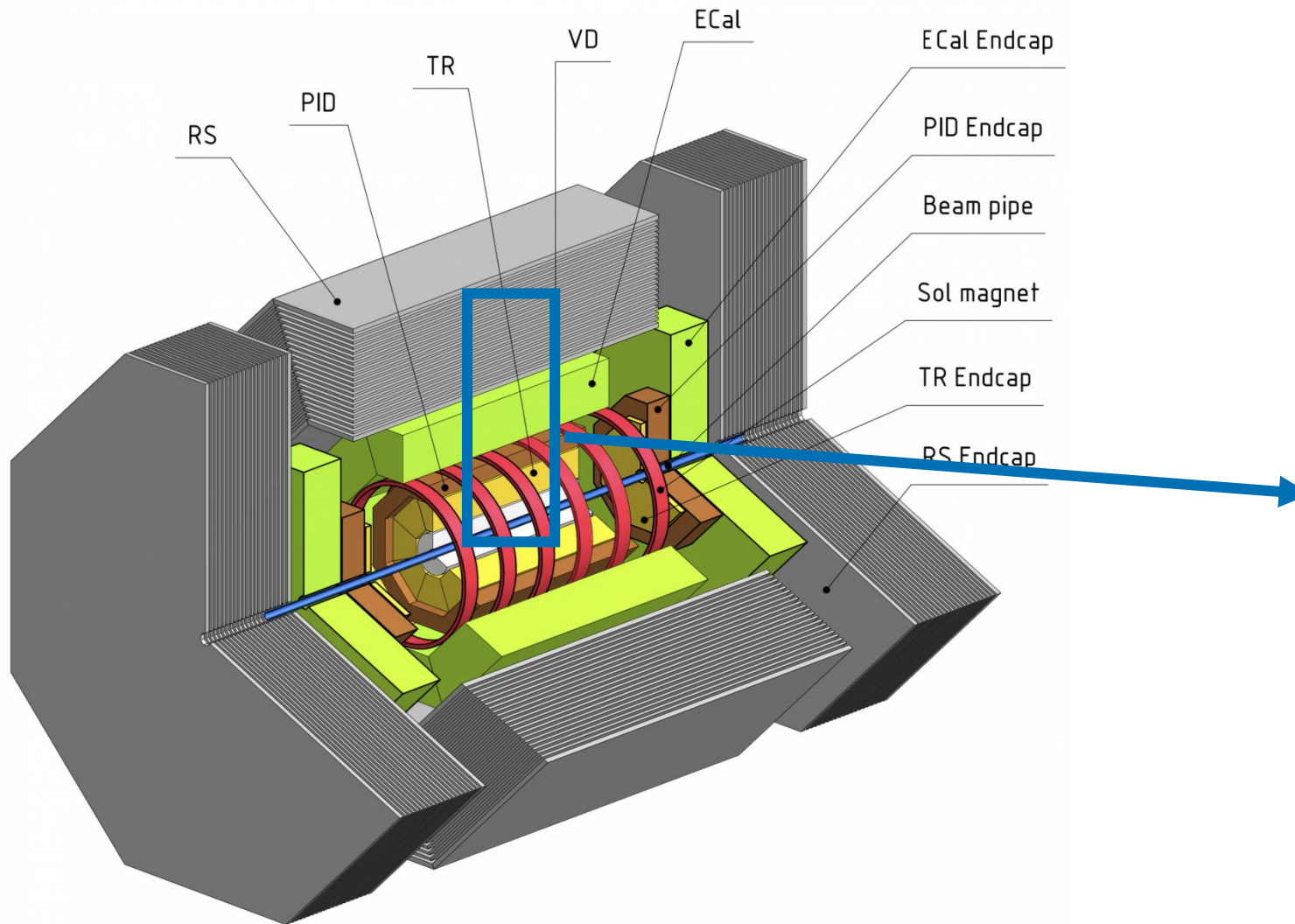
MPD superconducting magnet

SPD hall





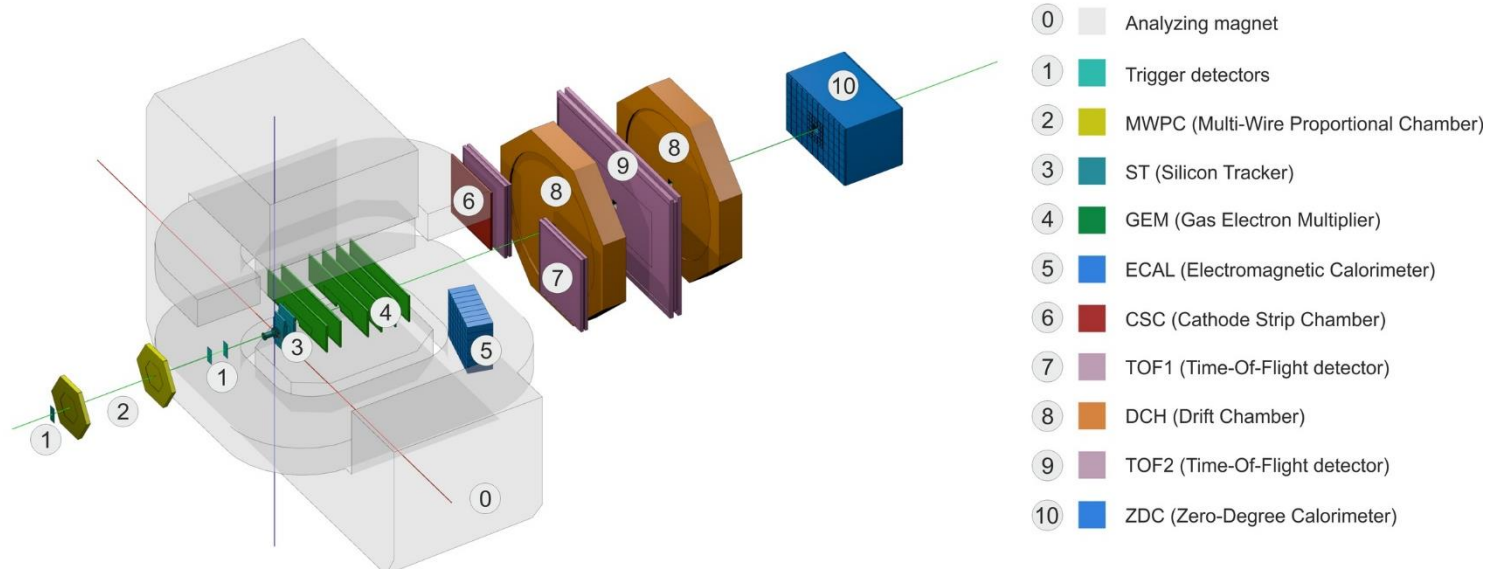
# SPD (Spin Physics Detector)



Conceptual Design Report is being prepared



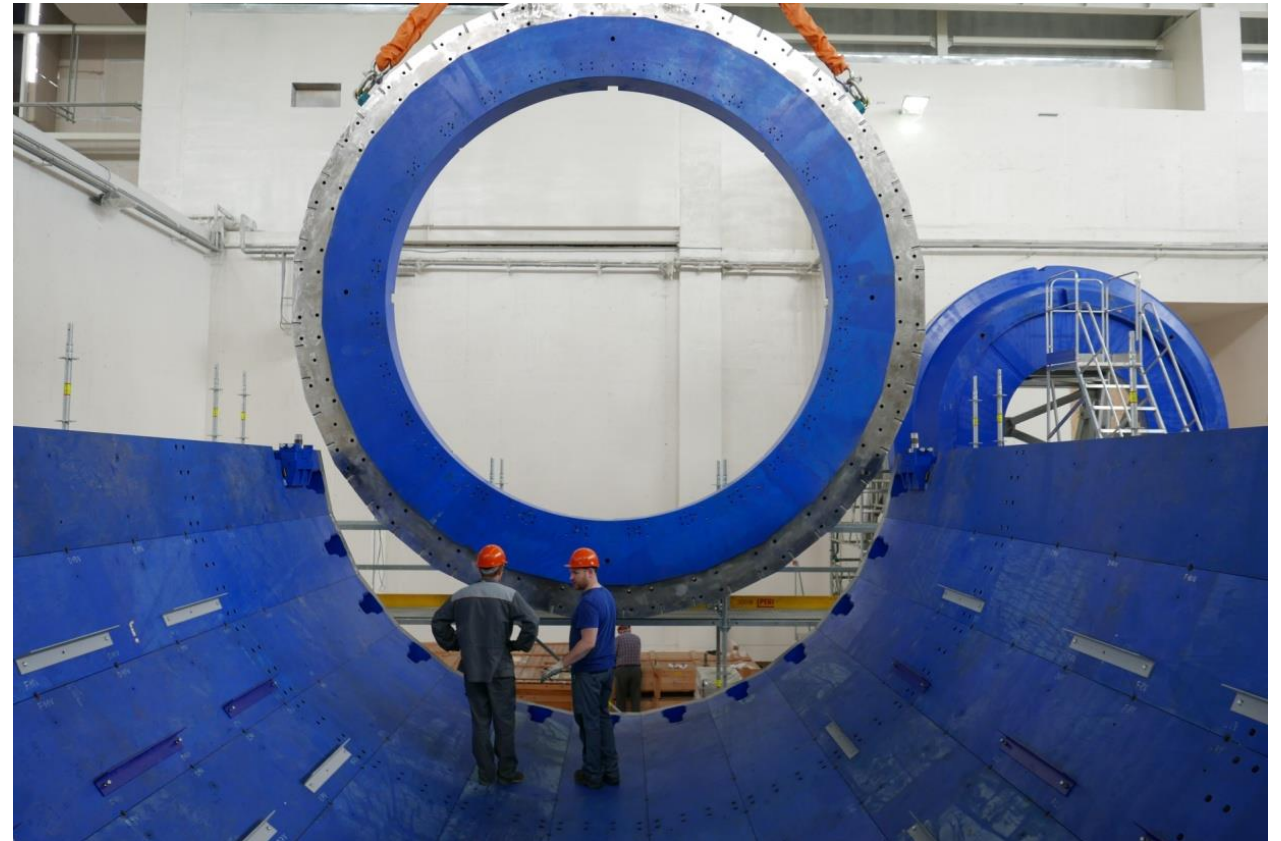
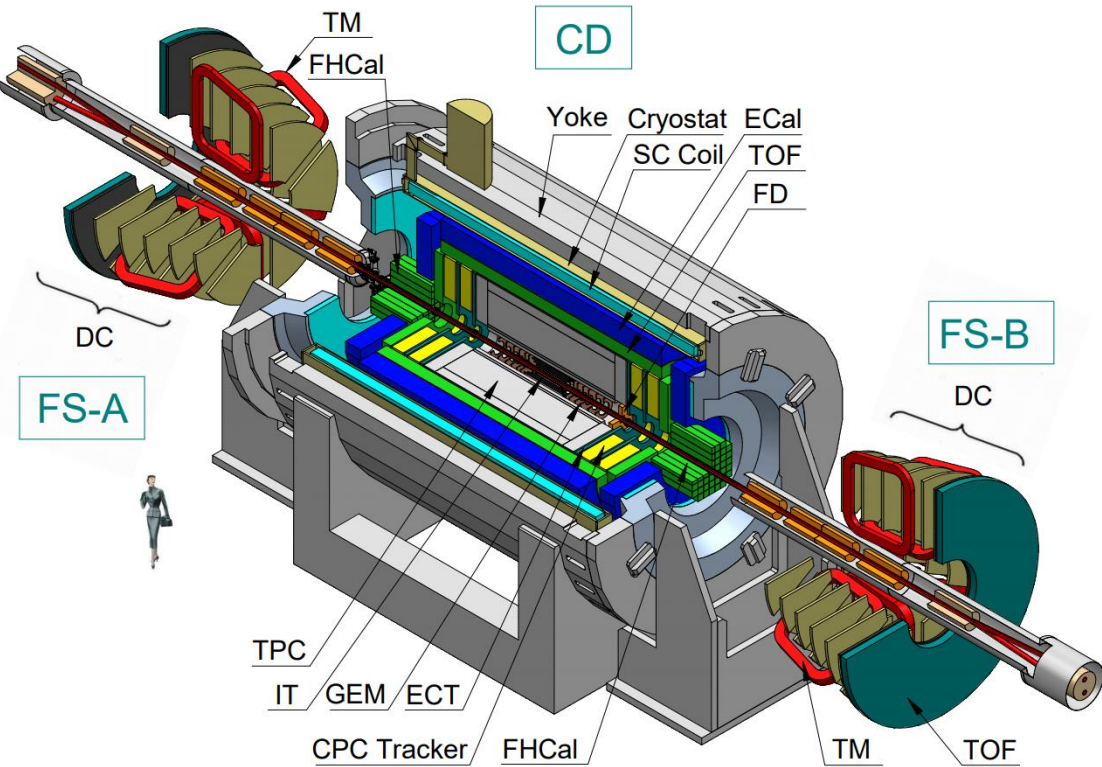
# BM@N (Baryonic Matter at Nuclotron)



Upgrading. Next run is planned for late 2021.



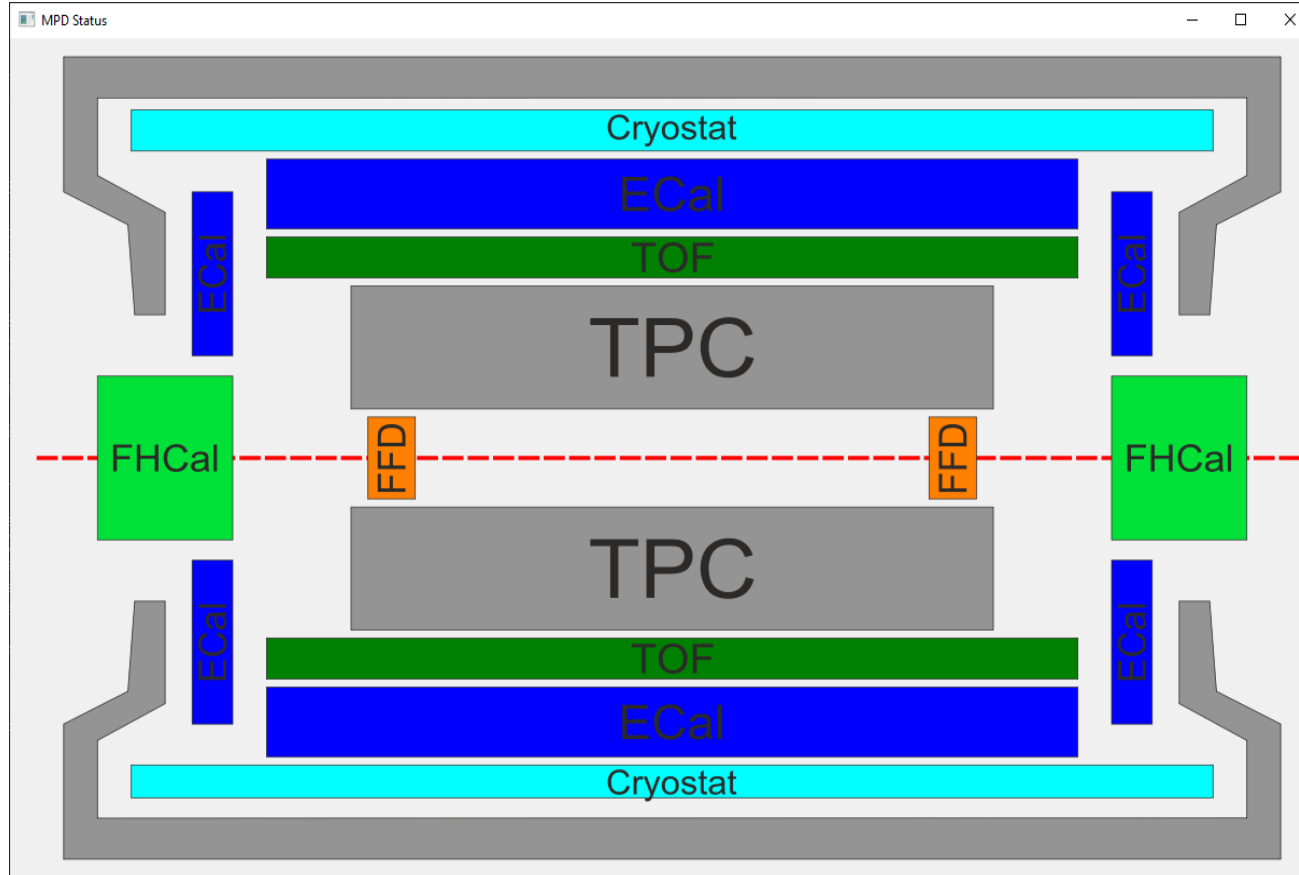
# MPD (Multi-Purpose Detector)



Assembling and tests. Commissioning planned 2022-2023



# MPD status GUI



- PySide2/PyQt5
  - QtSvg
  - PyTango
- Event-based
- **Windows ???**

**On app close**

Assertion failed: Successful WSASTARTUP not yet performed  
(..\..\src\signaler.cpp:377)

<https://github.com/tango-controls/pytango/pull/367>

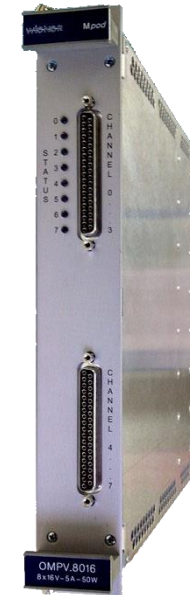


**Switched HDB++ from MySQL to TimescaleDB**





# Wiener MPOD



## Wiener MPOD Device Server

- PySNMP
- Scan crate, create dynamic spectrum attributes
- Push data on read (not attr polling)

## Wiener Module Device Servers (both HV (Iseg) and LV (Wiener))

- Subscribe to spectrum attrs
- Split data to dynamic scalar attributes
- Push archive event on new recv data



# Grafana



HDB attribute configs / HDB attrs mpd-ecal-sc-1

att_conf_id ↑	att_name	table_name	cs_name	domain	family	member	name
35	tango://mpd-ecal-sc-1.he.jinr.ru:10...	att_scalar_devdouble	mpd-ecal-sc-1.he.jinr.ru:10000	spd	stand	wiener_module_1	out_mes_sens_voltage_13
36	tango://mpd-ecal-sc-1.he.jinr.ru:10...	att_scalar_devdouble	mpd-ecal-sc-1.he.jinr.ru:10000	spd	stand	wiener_module_1	out_mes_sens_voltage_14
37	tango://mpd-ecal-sc-1.he.jinr.ru:10...	att_scalar_devdouble	mpd-ecal-sc-1.he.jinr.ru:10000	spd	stand	wiener_module_1	out_mes_sens_voltage_15
38	tango://mpd-ecal-sc-1.he.jinr.ru:10...	att_scalar_devdouble	mpd-ecal-sc-1.he.jinr.ru:10000	spd	stand	wiener_module_2	out_mes_current_0
39	tango://mpd-ecal-sc-1.he.jinr.ru:10...	att_scalar_devdouble	mpd-ecal-sc-1.he.jinr.ru:10000	spd	stand	wiener_module_2	out_mes_current_1
40	tango://mpd-ecal-sc-1.he.jinr.ru:10...	att_scalar_devdouble	mpd-ecal-sc-1.he.jinr.ru:10000	spd	stand	wiener_module_2	out_mes_current_2
41	tango://mpd-ecal-sc-1.he.jinr.ru:10...	att_scalar_devdouble	mpd-ecal-sc-1.he.jinr.ru:10000	spd	stand	wiener_module_2	out_mes_current_3

mpd-ecal-sc-1 Query options

A

```
SELECT
  data_time AS "time",
  value_r * 1000000 as "i_1 mod_2"
FROM att_scalar_devdouble
WHERE
  $__timeFilter(data_time)
  and
  att_conf_id = 38
ORDER BY 1
```

Format as Time series Query Builder Show

B

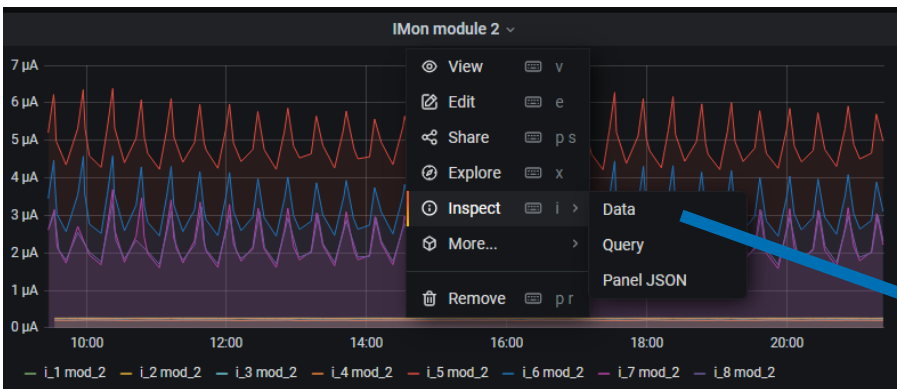
```
SELECT
  data_time AS "time",
  value_r * 1000000 as "i_2 mod_2"
FROM att_scalar_devdouble
WHERE
  $__timeFilter(data_time)
  and
  att_conf_id = 39
ORDER BY 1
```

Format as Time series Query Builder Show

C

```
SELECT
  data_time AS "time",
  value_r * 1000000 as "i_3 mod_2"
FROM att_scalar_devdouble
WHERE
  $__timeFilter(data_time)
  and
  att_conf_id = 40
ORDER BY 1
```

Format as Time series Query Builder Show



Inspect: IMon module 2

8 queries with total query time of 211 ms

Data Stats JSON Query

Data options Series joined by time, Formatted data Download CSV

Show data frame Series joined by time

Formatted data Table data is formatted with options defined in the Field and Override tabs. Download for Excel Adds header to CSV for use with Excel

Time	I_1 mod_2	I_2 mod_2	I_3 mod_2	I_4 mod_2
2020-11-16 20:32:39	0.27			
2020-11-16 20:42:39	0.27			
2020-11-16 20:52:39	0.27			
2020-11-16 21:02:39	0.26			
2020-11-16 21:12:39	0.26			
2020-11-16 21:22:39	0.27			
2020-11-16 09:32:39		0.26		
2020-11-16 09:42:39		0.26		
2020-11-16 09:52:39		0.26		





# Grafana





## As online monitoring tool:

>**pos:1** total time: 01:25:57 (**45.6%, CPU: 45.6%**, IO: 0.0%) calls: 455,823 (4.01%) avg\_time: 11.32ms (IO: 0.0%)  
user: grafana db: hdb **rows: 1,657,026,394 (61.17%)**

>**pos:2** total time: 01:01:40 (**32.7%, CPU: 32.7%**, IO: 0.0%) calls: 227,005 (2.00%) avg\_time: 16.30ms (IO: 0.0%)  
user: grafana db: hdb **rows:1,047,196,384(38.66%)**

>**pos:5** total time: 00:06:22 (3.4%, CPU: 3.4%, IO: 0.0%) **calls: 3,466,737 (30.47%)** avg\_time: 0.11ms (IO: 0.0%)  
user: hdb\_event\_sub db: hdb rows: 3,466,737 (0.13%) query:  
**INSERT INTO att\_scalar\_devdouble (att\_conf\_id,data\_time,value\_r,quality) VALUES (\$1,TO\_TIMESTAMP(\$2),\$3::float8,\$4)**

>**pos:7** total time: 00:00:02 (0.0%, CPU: 0.0%, IO: 0.0%) **calls: 3,471,411 (30.51%)** avg\_time: 0.00ms (IO: 0.0%)  
user: hdb\_event\_sub db: hdb rows: 0 (0.00%) query:  
**BEGIN**

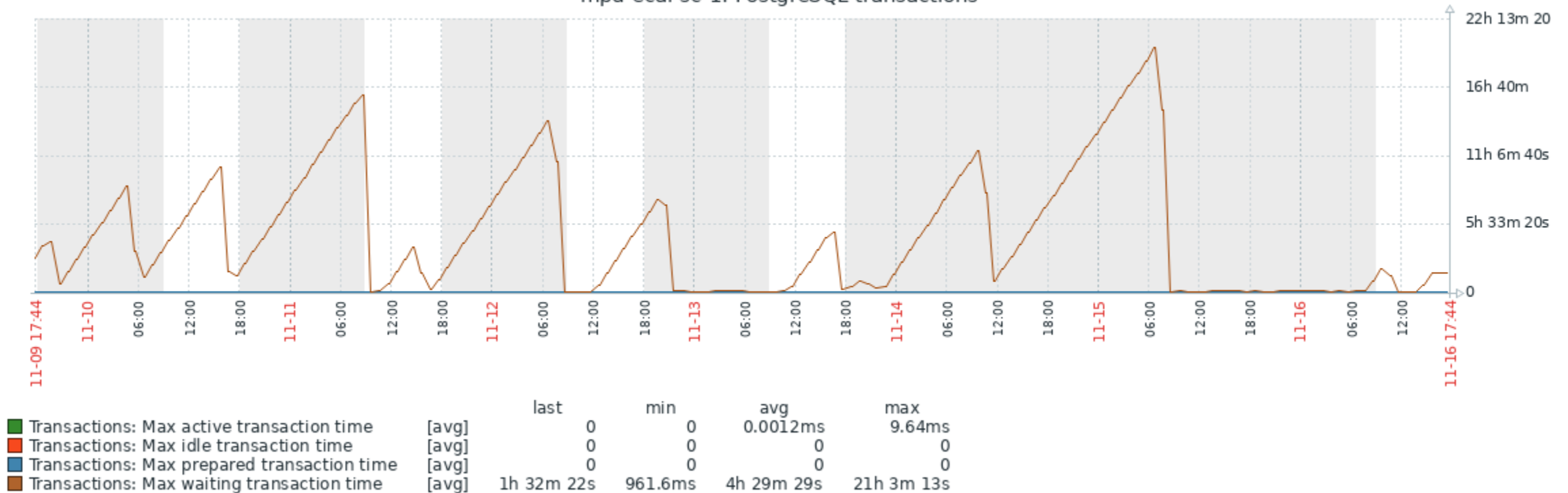
>**pos:8** total time: 00:00:01 (0.0%, CPU: 0.0%, IO: 0.0%) **calls: 3,471,407 (30.51%)** avg\_time: 0.00ms (IO: 0.0%)  
user: hdb\_event\_sub db: hdb rows: 0 (0.00%) query:  
**COMMIT**

24-hour query statistics

[https://github.com/dataegret/pg-utils/blob/master/sql/global\\_reports/query\\_stat\\_total.sql](https://github.com/dataegret/pg-utils/blob/master/sql/global_reports/query_stat_total.sql)



mpd-ecal-sc-1: PostgreSQL transactions



hdb++es COMMIT transaction lag - performance issues/bug?

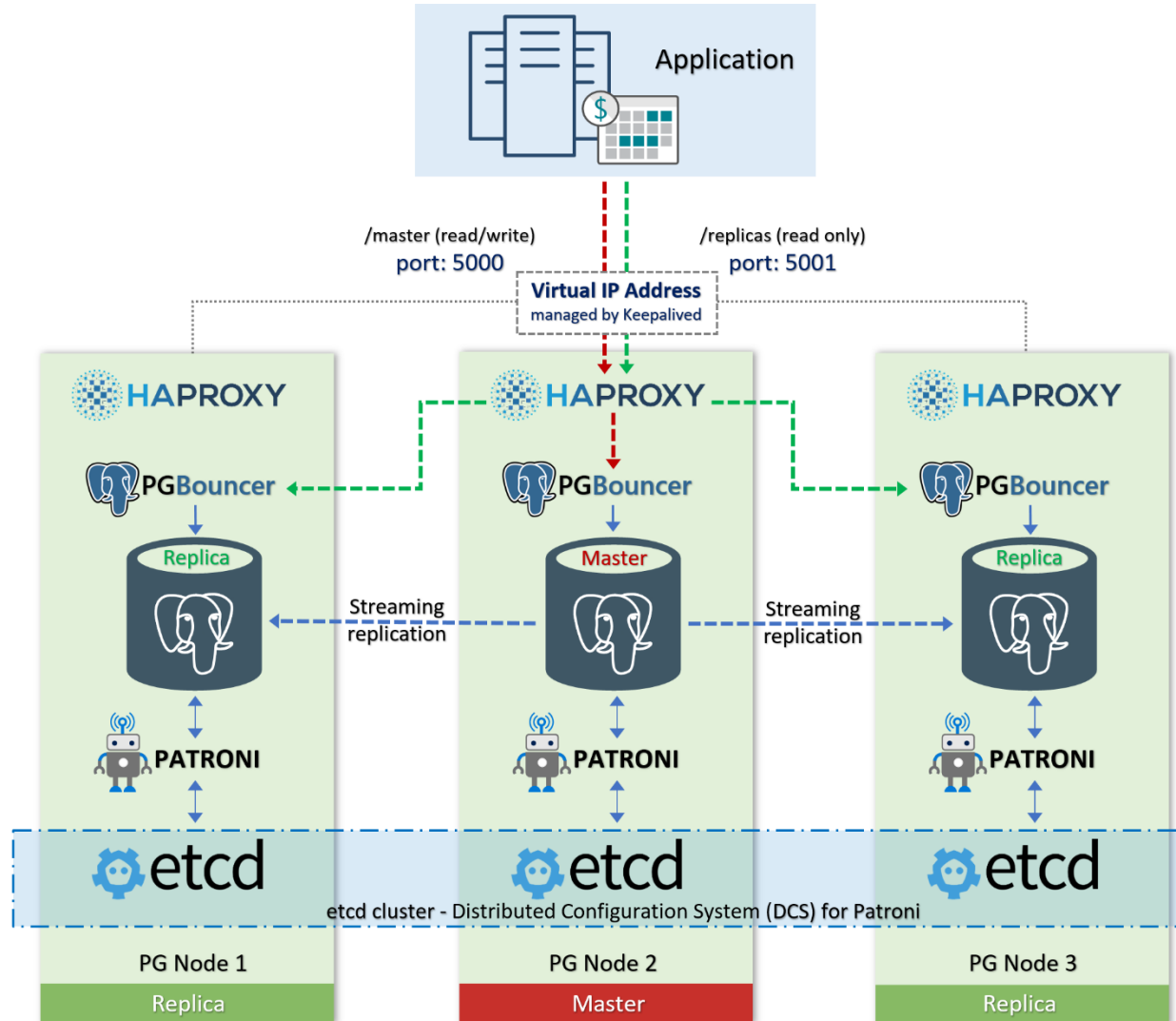
hdbpp repositories are a bit messy right now



# PostgreSQL cluster



ANSIBLE





ANSIBLE

- MySQL Server
- Tango
- PyTango
- HDB++ (PostgreSQL 12+TimescaleDB)
- Zabbix agent
- ...



# Zabbix



+



Grafana







# Estimated data archived



MPD Time-Of-Flight HV system:

- 112 channels => at least 224 monitored values ( $I_{mes}$ ,  $V_{mes}$ )
- $\sim 10$  ev/2h for each attribute according to current values from HDB configurator
- $10\text{ev} * 224 \text{ attr} * 12 \text{ h} \sim 27\text{k}$  events daily
- One event  $\sim 30$  kB in the DB











$\sim 800$  MB archived data daily for only one subsystem for one detector





# Community involvement



-  **tango-controls-hdbpp/hdbpp-es Strange TTL** 6  
#12 by Diego91RA was closed on 2 Oct
-  **tango-controls/TangoSourceDistribution "tango start" doesn't work for new MariaDB versions** 1  2  
#84 by Diego91RA was closed on 13 Aug
-  **tango-controls/TangoSourceDistribution DataBasesd crashes** 1 24  
#61 by Diego91RA was closed on 9 Mar
-  **tango-controls-hdbpp/hdbpp-cm TimescaleDB support** 38  
#6 by Diego91RA was closed on 16 Apr
-  **tango-controls-hdbpp/libhdbpp-timescale connect\_string not found** 4  
#2 by Diego91RA was closed on 8 Dec 2019
-  **tango-controls/pytango Wrong data type conversion - 'int' to DevLong or DevLong64** 4  
#282 by Diego91RA was closed on 27 Jul 2019
-  **tango-controls-hdbpp/hdbpp-es Can't add attribute** 32  
#10 opened on 23 Jul by Diego91RA

We are always ready to test new features



**Thanks for your attention!**  
**Keep safe**