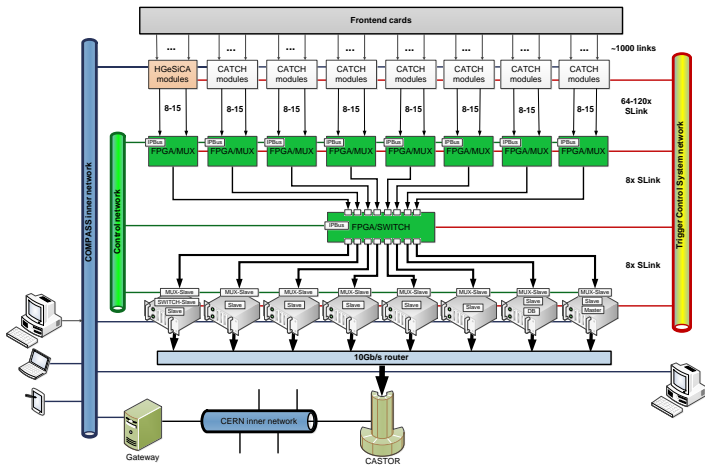


# Prototype of new data acquisition system for COMPASS experiment

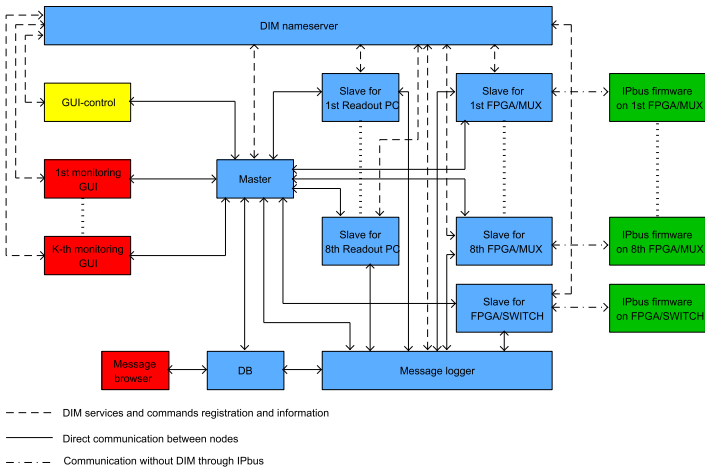
Josef Nový

Faculty of Nuclear Sciences and Physical Engineering  
Czech Technical University in Prague  
&  
CERN

# Hardware/Software structure of the new DAQ

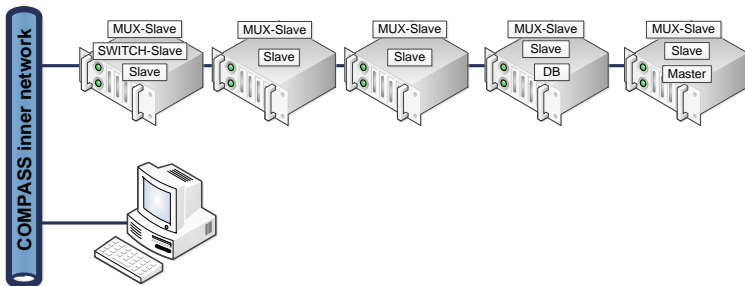


# Software structure of the new DAQ

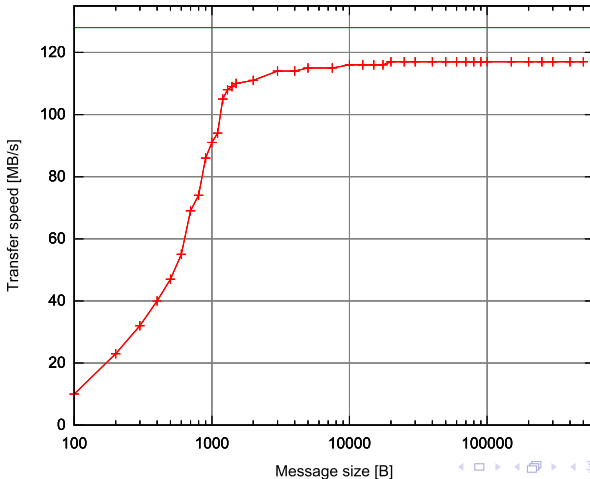


# Prototype phase 1 - communication tests

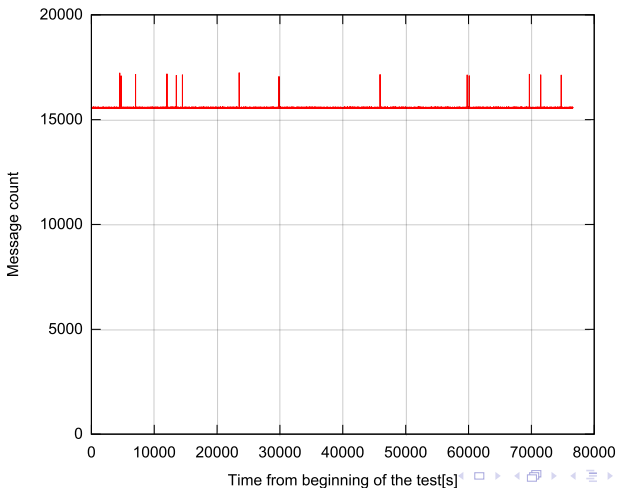
- ▶ DIM tests
- ▶ basic GUI design
- ▶ state machine design



# Speed



# Stability



# GUI prototype

**Run Control (logged as Master)**

Run User Window Help

**Status window**

names	status
▶ master1	ready
▶ jmenoSI	ready

**Run control**

Start slaves Connected to db successfully  
Slaves conf  
Slaves unconf

Stop slaves

Configure

Unconfigure

Dryrun

Run

**Configuration**

Mode: Master->Slaves Test

Run number: 123

Number of spills: 200

Trigger settings: Random trigger

Configure equipment

**Event size**

**Trigger rates**

**Computer status**

master1	jmenoSI
Memory 50%	Memory 50%
Network 80%	Network 80%
CPU 20%	CPU 20%
Details	Details

Ready to start a run Current spill: 0 Timestamp: 2010-10-20 12:06:00

Prototype phase 1 - communication tests

# MessageBrowser prototype

The screenshot displays the MessageBrowser prototype interface. At the top, there is a 'Column filter' section with checkboxes for columns: id, tm, dt, sender, severity, runNum, spillNum, eventNum, and text. To the right are 'Check All' and 'Uncheck All' buttons. Further right is a 'Filters' section with 'Hide filters' and 'APPLY FILTER' buttons.

The main area contains a table of log messages with the following columns: id, tm, dt, sender, severity, runNum, spillNum, eventNum, and text. The rows are color-coded by severity: red for Fatal Error, yellow for Error, green for Warning, and white for Info.

id	tm	dt	sender	severity	runNum	spillNum	eventNum	text
1	11:00 AM	11/11/11	8	FATAL ERROR	1000	7	5	Random text 3 6
2	1:00 AM	11/11/11	9	ERROR	1004	7	9	Random text 2 9
3	1:01 AM	11/11/11	8	ERROR	1004	13	3	Random text 2 8
4	1:01 AM	11/11/11	9	INFO	1004	13	12	Random text 0 9
5	3:01 AM	11/11/11	8	WARNING	1004	13	17	Random text 1 8
6	1:02 AM	11/11/11	7	INFO	1004	14	6	Random text 0 7
7	1:03 AM	11/11/11	8	WARNING	1004	22	9	Random text 1 8
8	2:03 AM	11/11/11	6	WARNING	1005	5	5	Random text 1 6
9	2:04 AM	11/11/11	8	FATAL ERROR	1005	14	4	Random text 3 2
10	2:04 AM	11/11/11	7	INFO	1005	14	7	Random text 0 7
11	2:04 AM	11/11/11	1	INFO	1005	14	14	Random text 0 1
12	2:05 AM	11/11/11	8	FATAL ERROR	1005	14	18	Random text 2 10
13	2:04 AM	11/11/11	8	WARNING	1005	14	22	Random text 1 8
14	2:05 AM	11/11/11	10	FATAL ERROR	1005	24	7	Random text 3 10
15	2:06 AM	11/11/11	8	FATAL ERROR	1005	31	3	Random text 3 4
16	2:06 AM	11/11/11	3	WARNING	1005	31	7	Random text 1 3
17	2:06 AM	11/11/11	2	WARNING	1005	31	10	Random text 1 7
18	3:06 AM	11/11/11	6	ERROR	1014	7	1	Random text 2 6
19	3:07 AM	11/11/11	10	WARNING	1014	12	9	Random text 1 10
20	3:08 AM	11/11/11	1	INFO	1014	19	10	Random text 0 1
21	3:09 AM	11/11/11	9	WARNING	1014	25	3	Random text 1 9
22	1:09 AM	11/11/11	8	ERROR	1014	25	10	Random text 2 9
23	3:09 AM	11/11/11	7	ERROR	1014	25	14	Random text 2 7
24	3:10 AM	11/11/11	4	INFO	1014	31	2	Random text 0 4
25	3:11 AM	11/11/11	9	ERROR	1014	37	4	Random text 2 9
26	4:12 AM	11/11/11	8	FATAL ERROR	1016	10	8	Random text 2 8
27	4:12 AM	11/11/11	7	ERROR	1016	12	10	Random text 2 7
28	4:12 AM	11/11/11	9	ERROR	1016	12	13	Random text 2 9
29	4:13 AM	11/11/11	10	WARNING	1016	17	9	Random text 1 10
30	4:14 AM	11/11/11	4	ERROR	1016	18	3	Random text 2 4
31	4:14 AM	11/11/11	2	WARNING	1016	18	4	Random text 1 2
32	4:15 AM	11/11/11	2	WARNING	1016	21	5	Random text 1 2
33	4:15 AM	11/11/11	8	FATAL ERROR	1016	21	10	Random text 3 9
34	4:15 AM	11/11/11	6	ERROR	1016	21	18	Random text 2 6
35	5:15 AM	11/11/11	5	INFO	1023	10	6	Random text 0 5
36	6:15 AM	11/11/11	9	INFO	1027	8	6	Random text 0 9
37	6:16 AM	11/11/11	9	ERROR	1027	15	4	Random text 2 9
38	6:16 AM	11/11/11	8	FATAL ERROR	1027	15	11	Random text 3 4
39	7:16 AM	11/11/11	3	INFO	1036	7	7	Random text 0 3
40	7:16 AM	11/11/11	3	ERROR	1036	7	11	Random text 2 3
41	8:16 AM	11/11/11	1	ERROR	1041	10	7	Random text 2 1
42	8:17 AM	11/11/11	9	FATAL ERROR	1041	17	8	Random text 3 5
43	8:18 AM	11/11/11	1	INFO	1041	19	5	Random text 0 1
44	8:18 AM	11/11/11	9	INFO	1041	19	14	Random text 0 9
45	9:18 AM	11/11/11	9	WARNING	1043	3	6	Random text 1 9

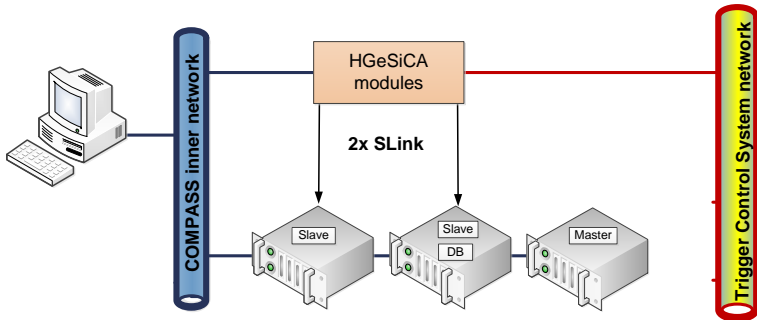
The right sidebar contains a 'Message filter' section with the following options:

- Severity:** Info (checked), Warning, Error. Buttons: Check All, Uncheck All.
- Sender:** test001 (checked), test002, test003. Buttons: Check All, Uncheck All.
- Run number:** Exact: Current (1000). Range: From 1000, To 1300.
- Spill number:** Exact: 55. Range: From 25, To 55.
- Event number:** Exact: 5. Range: From 3, To 6.
- Date - time:** From: 11/11/2011 00:00, To: 11/11/2011 00:00.
- Error text:** (empty input field).

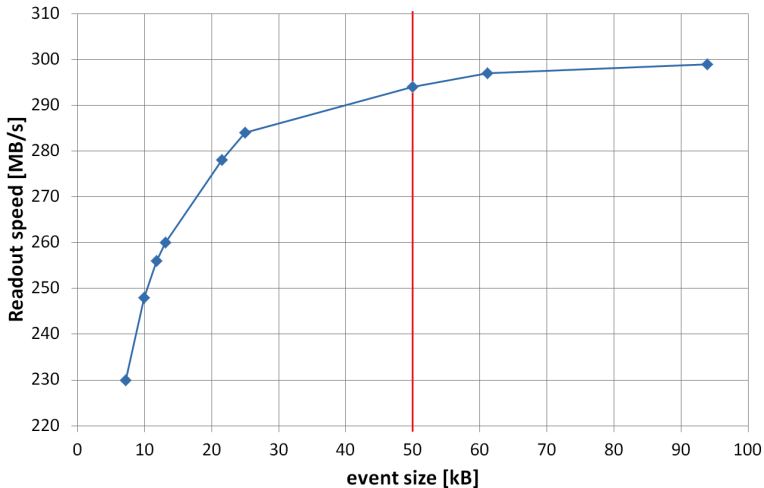


## Prototype phase 2 - readout tests

- ▶ 2xPCI-express spillbuffers
- ▶ fixed size events generated by HGeSiCa



# Readout speed test

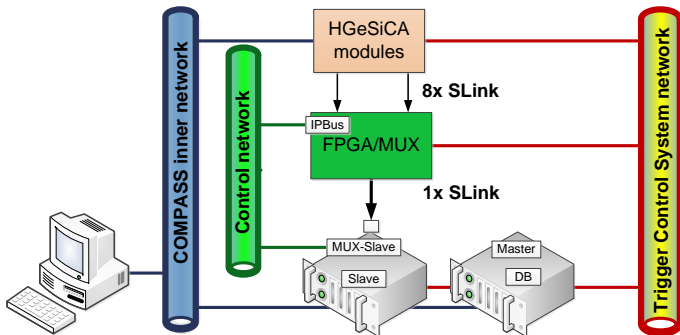


## Readout speed test - result

- ▶ readout speed limited by SLink transfer speed
- ▶ big events better for readout
- ▶ final DAQ with 8 spillbuffer cards up to 1200 MB/s
- ▶ maximum CPU usage around 40%
- ▶ all data read during on-spill

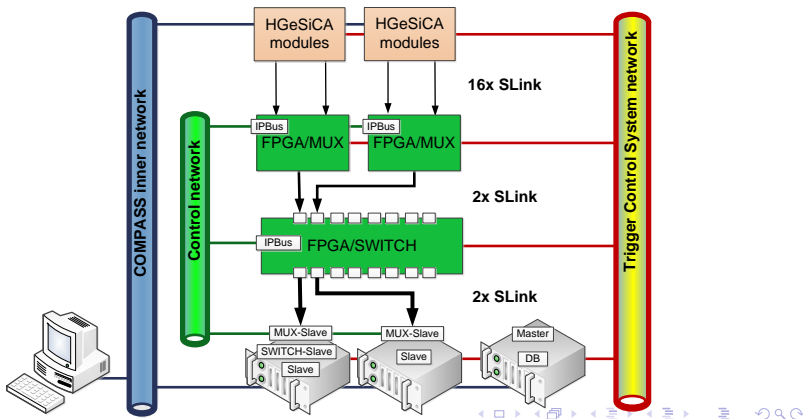
## Prototype phase 3

- ▶ new hardware module
- ▶ new input data format



# Prototype phase 4

- ▶ hardware event building



- ▶ Prototype phase 1 - communication tests → DONE
- ▶ Prototype phase 2 - readout tests → DONE
- ▶ Prototype phase 3 - FPGA/MUX test → summer 2013
- ▶ Prototype phase 4 - FPGA/SWITCH test → autumn 2013
- ▶ Full scale prototype → winter 2013