



TDR Demonstrator Progress



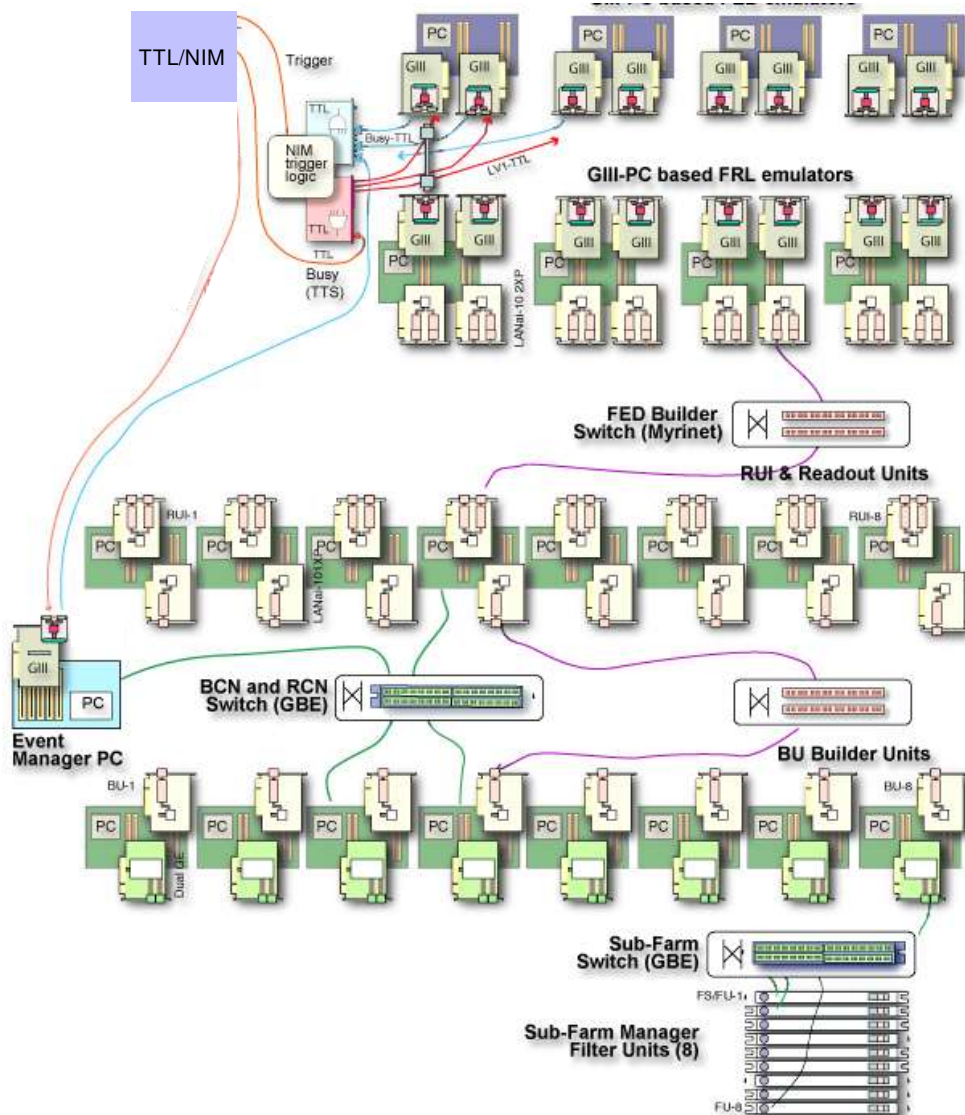
Layout

Components / test setup

FED Builder integration

Measurements

Plans for the march-release



8 Pseudo FEDs (GIII)

NIM trigger fan in/out for Trigger/Busy

8 FRLs (GIII), 8 FBIs (Myrinet Lanai 9)

1 FEDBuilder (1 8x8 Myrinet Switch)

8 Rus

1 EVM / Trigger (Fedkit based)

1 RU builder switch (Myrinet or Gigabit Eth)

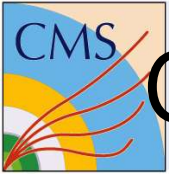
8 Bus

1 Filter Farm Switch (Gigabit Ethernet)

8 FUs



- **FRL** will be the final version
 - Not anymore GIII based
 - The prototype has been tested in lab: 7 modules in a Compact PCI crate
- **FED Builder**
 - Based on **Lanai X** (with two 2.5 Gb links per NIC-card)
 - FED Builder will have **two 8x8 switches**
- **Trigger emulator** will be integrated
 - Possibility to run in partitioned mode
- **FMM prototype** will be used



Component & test bench development



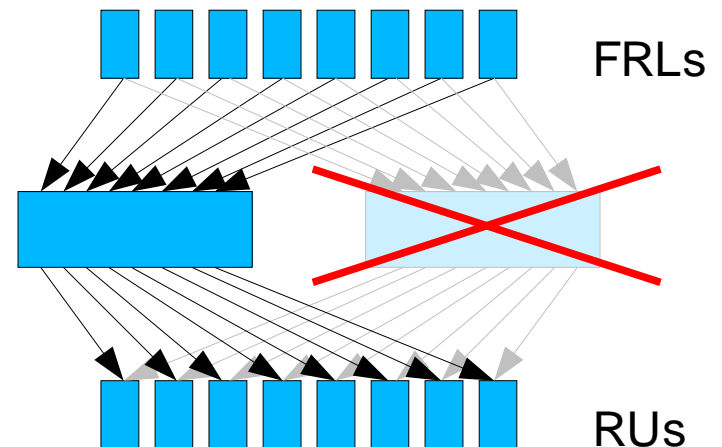
- FRL
 - 10 FRLs have been produced and successfully tested
 - Production of 60 FRLs for pre-series is launched
- Test bench for pre-series / final production
 - Test bench with software is set up
 - Three stage testing: electrical, jtag, full functionality test
 - Results in database
- Ongoing work / To be done
 - Test software
 - Firmware programming cycles



– Cable measurements

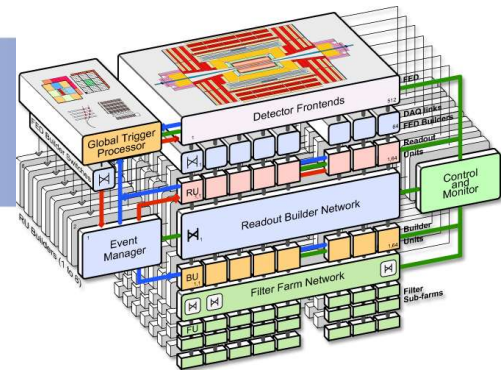
- Status: all delivered cables work at nominal speed.
- Optimal operating voltages and frequencies have been found with high frequency - oscilloscope and – probes
- **To be done:**
 - Collect statistics to measure **cable-to-cable variations**: for many cables measure “limit-frequency”.
 - Investigate if limit-frequency stays **constant for a given cable** (time, mechanical bending).
 - **Define “limit-frequency”**: the frequency “where data error occur” for a given operating voltage

- Details of FED-Builder functionality: Talk of F. Meijers
- **Basic functionality**
 - Fragments (1 or 2 FEDs data blocks) pushed by FRL to FBI (FED builder input: NIC card) (buffer loaning scheme)
 - FBI determines destination via Lookup table : trigger-number LSB -> destination port.
 - Fragment via switch to RUI.
- **Current limitations**
 - Myrinet NICs are Lanai9 based:
 - One 2.5 Gb link
 - One 8x8 Myrinet switch
 - No barrel shifter
 - Only max 100 MB/s

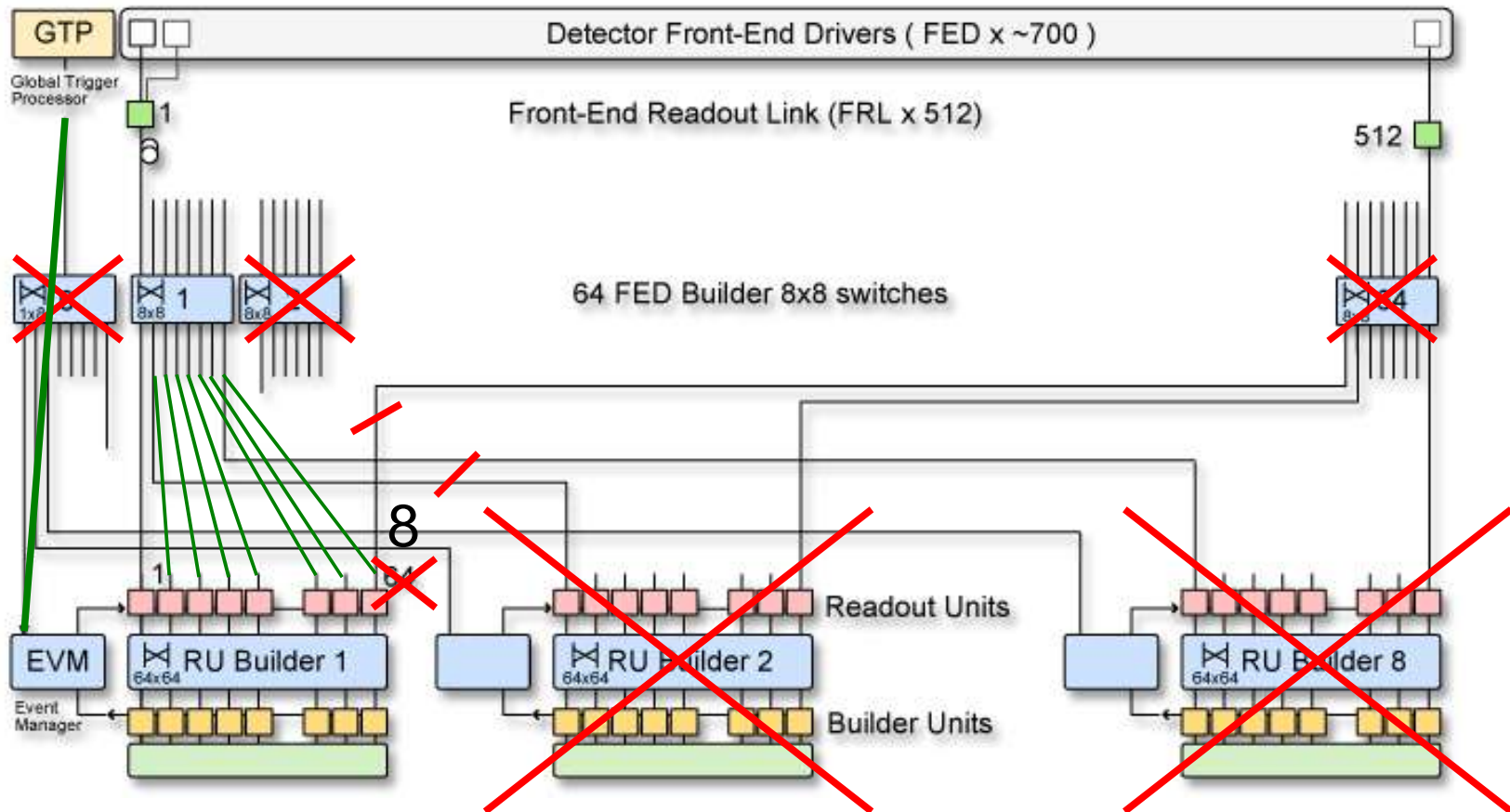




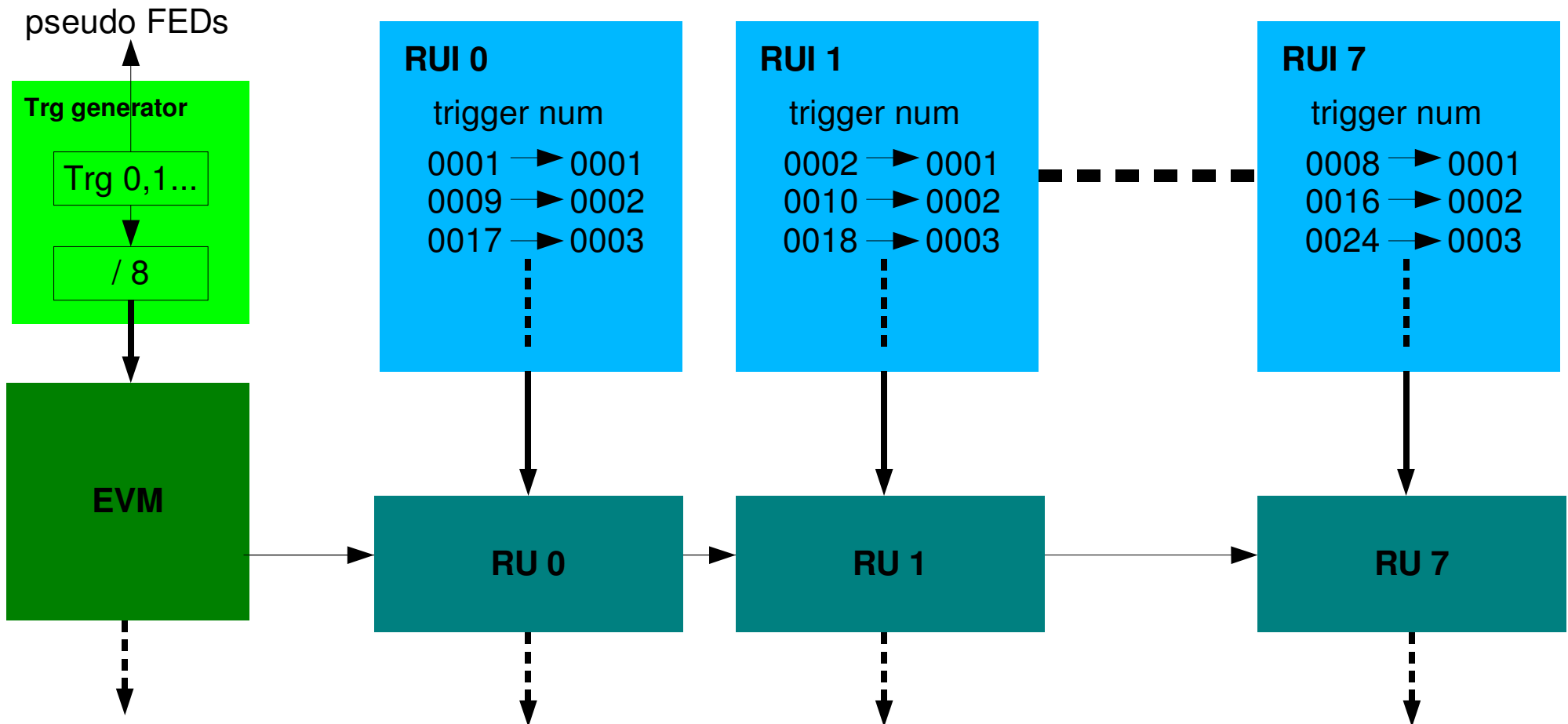
FED builder: TDRDemo limitations



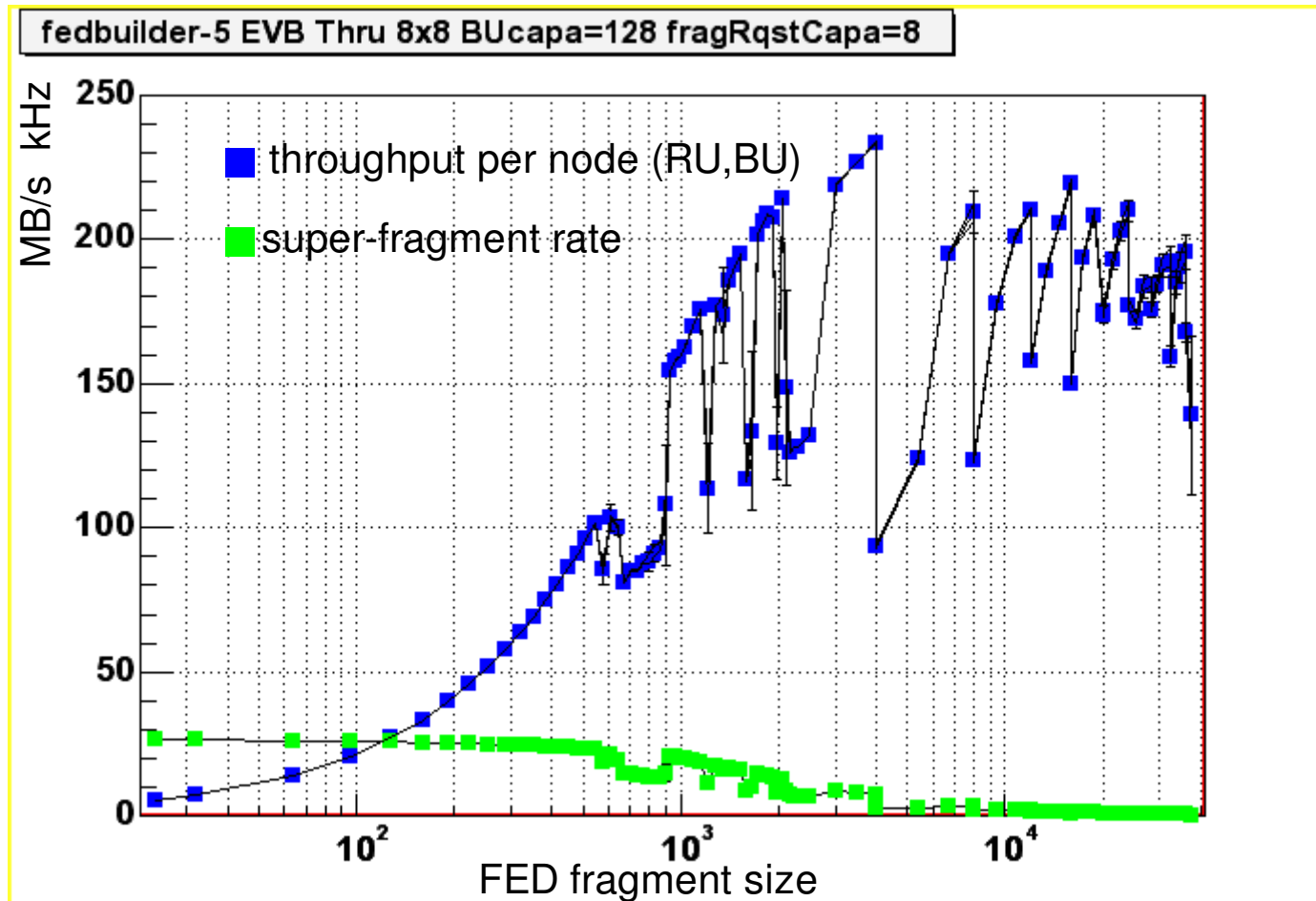
- Only one RU Builder (no slices)



- Only one RU Builder (no slices)
 - To test the whole system, a trick has to be played:



- Constant FED-fragments size





Constant FED Fragment Sizes



- Throughput limited by FED builder
 - (see measurements without FED building in previous talks)
- Features
 - Low average throughput since no barrel shifter in FED-builder
 - Spikes up to 230 MB/s : FED Builder falls by itself into barrel shifter mode.
 - Small fragments: 28 KHz superfragment rate = 224 kHz fed-fragment rate. 4.5 s FED builder overhead per FED-fragment in RUI.



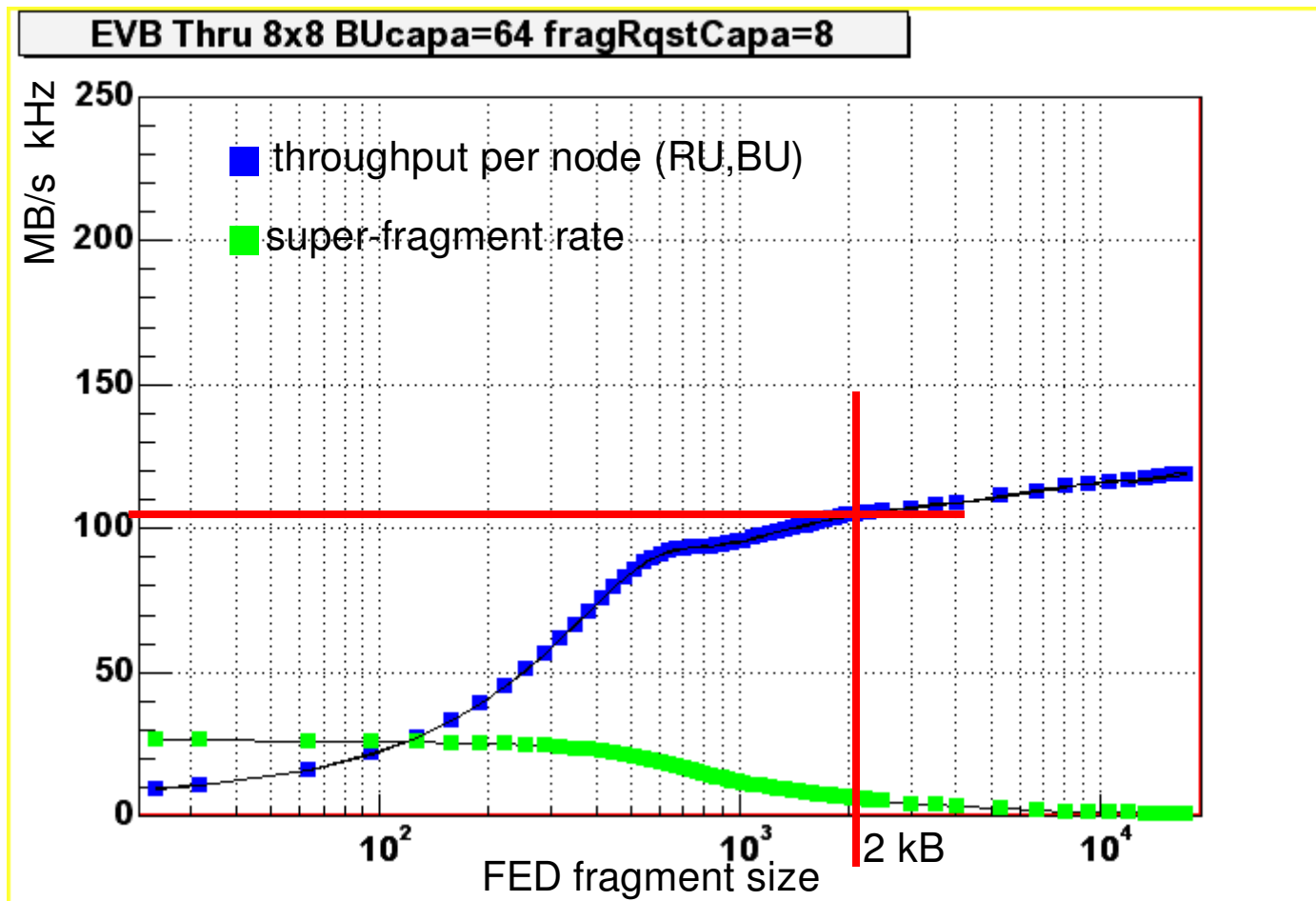
Uncorrelated log normal FED fragment sizes



- FED Fragment size distribution
 - Log normal with rms = mean
 - Minimal event size 24 Bytes
 - Maximal event size 64 kB (cut-off)
 - 65500 different events
 - Every FED has a different seed (uncorrelated)

- Results
 - Small fragment sizes: as before (limited by FED Builder overhead)
 - FED builder does not fall in Barrel shifter mode
 - Spikes are “washed out”
 - Performance according to expectation : 100 MB/s for 2 kB (ca. 50 % of wire speed in Myrinet network)

- Uncorrelated log normal distributed fragment size



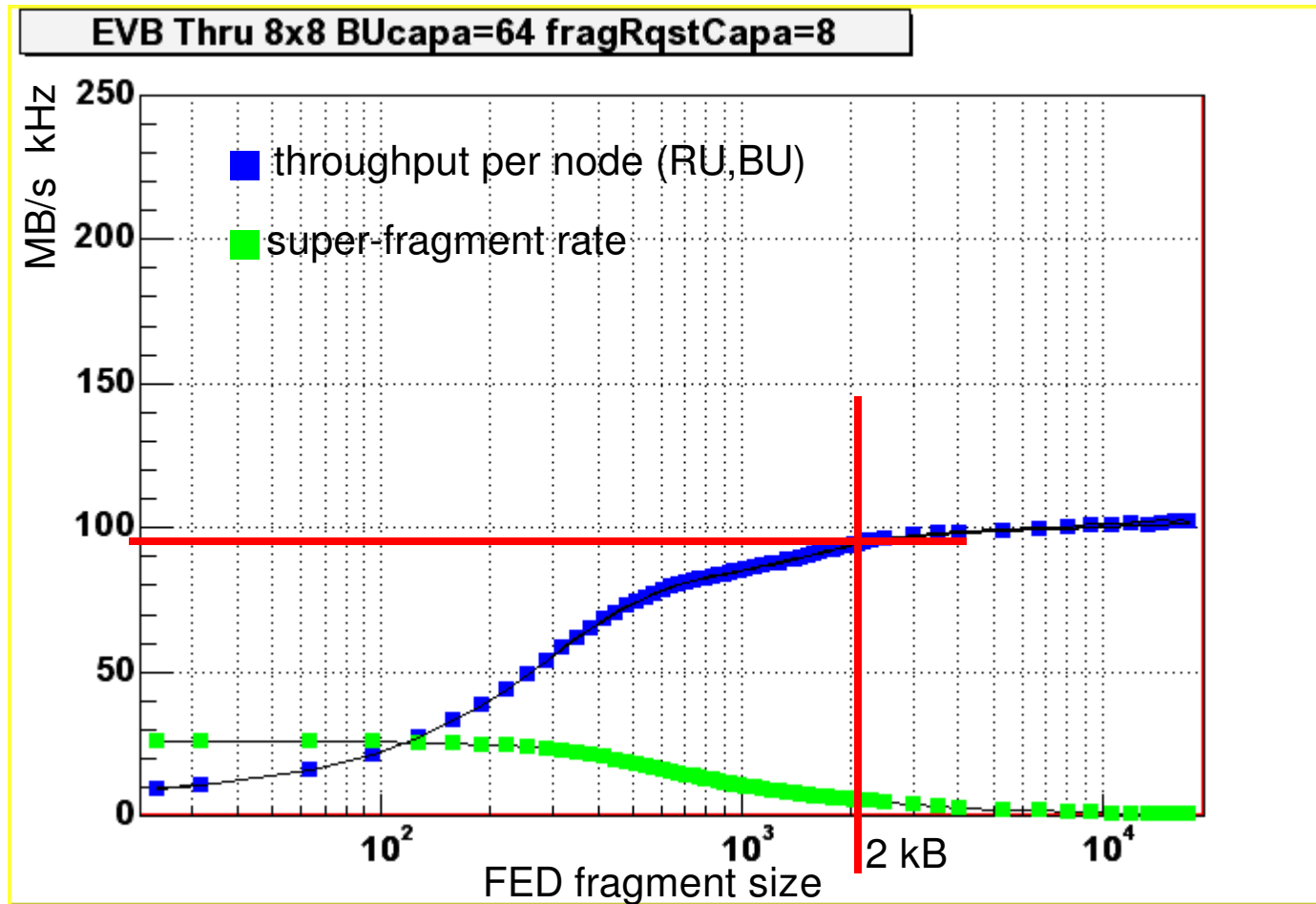


Correlated log normal FED fragment size



- 100% correlation between FED fragment size distributions
 - Every FED gets the same seed.
 - All other conditions as before

- Measurement: <math><100\text{MB/s}</math> for 2kB FED fragment size





Plans for march release



- March release purpose:
 - Provide detector groups with coherent set of online software components for testbeam, software development, ...
 - Components : XDAQ, RunControl, EventBuilder, Filter (skeleton)
 - Test bed is TDR Demonstrator
- Ongoing activities
 - Run Control integration (details later in presentation of A.Oh and G.Maron)
 - Job control
 - Function Manager implementation for EventBuilder
 - Resource Service Java client
 - Fills the resource database
 - Eases the use of run control in large systems



- To be done
 - Trigger interface suitable for testbeam applications
 - RUI interface (FedKit based)
 - Needs to insert FRL headers
 - Implement Interface BU-FU
 - Follow BU-FU interface design in archive of XDAQ
 - Implement part of the interfaces possibilities: only entire events,...
 - Deliver skeleton for Filter code
 - Filter incorporation (use work of Emilio)