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The PHENIX Event Builder

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The PHENIX detector consists of 14 detector subsystems. It is designed such that individual subsystems can be read out independently in parallel as well as a single unit. The DAQ used to read the detector is a highly-pipelined parallel system. Because PHENIX is interested in rare physics events, the DAQ is required to have a fast trigger, deep buffering, and very high bandwidth.

The PHENIX Event Builder is a critical part of the back-end of the PHENIX DAQ. It is reponsible for assembling event fragments from each subsystem into complete events ready for archiving. It allows subsystems to be read out either in parallel or simultaneously and supports a high rate of archiving. In addition, it implements an environment where Level-2 trigger algorithms may be optionally executed, providing the ability to tag and/or filter rare physics events.

The Event Builder is a set of three Windows NT/2000 multithreaded executables that run on a farm of over 100 dual-cpu 1U servers. All control and data messaging is transported over a Foundry Layer2/3 Gigabit switch. Capable of recording a wide range of event sizes from central Au-Au to p-p interactions, data archiving rates of over 400 MB/s at 2 KHz event rates have been achieved in the recent Run 4 at RHIC. Further improvements in performance are expected from migrating to Linux for Run 5.

The PHENIX Event Builder design and implementation, as well as performance and plans for future development, will be discussed.

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