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Control System of the European XFEL Accelerator

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The European XFEL is an X-Ray Free Electron Laser in the final construction and commissioning phase. While the injector is already operating the stepwise installation and commissioning of the RF stations and beam lines is still ongoing. The start of delivering electrons with 17.5GeV through the 3.4km long facility is planned for Q4 2016. Since more than 200 MicroTCA crates are spread out along the beam lines the synchronization of all subsystems and distributed data acquisition is provided by a precision timing system. Triggers and clocks are distributed to the hardware with a 10ps RMS precision. And the FPGAs and front-end software are receiving various data blocks to allow synchronization of the data flow and information to qualify all electron bunches. The machine protection systems, beam distribution devices and feedback software use this information.

This paper describes the architecture of the MicroTCA based front-end and server based middle layer hardware and the software with a synchronized data flow up to the central fast data acquisition system. With 27000 bunches per second the facility generates more than 1GB/sec continuous data flow that is used in operator displays, fast feedbacks and is finally stored to provide offline analysis of special events like interlocks.

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