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# Distributed continuous event – based data acquisition using FlexRIO FPGA

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Traditionally, continuous, low sampling speed data acquisition and event-based high-speed data acquisition have been carried out using different hardware solutions. In particular, high-speed event driven acquisition is normally performed by ADC boards with a given number of pre and post trigger samples that are recorded upon the occurrence of a hardware trigger, being then transferred to the host computer possibly in parallel with the management of new triggers. A direct physical connection is therefore required between the source of event (trigger) and the ADC because any other software-based communication method would introduce a delay in triggering that would turn out not acceptable in many cases.

This paper proposes a solution for the relaxation of the event communication time that can be in this case carried out by software messaging (e.g. via a LAN) provided that the system components are synchronized in time (e.g. using IEEE 1588 synchronization mechanism). The information about the exact event occurrence time is contained in the software packet sent to communicate the event and is used by the ADC FPGA to identify the exact sample in the ADC sample queue. The length of the ADC sample queue will depend on the maximum delay in software event message communication time. At the same time, the system can provide a subsampled continuous data stream, providing data bursts corresponding to high sampling speed windows centred around the effective event occurrence times.

A prototype implementation using a National FlexRIO FPGA board connected with an ADC device will be presented as proof of concept.

**Primary author:** TALIERCIO, Cesare (Consiglio Nazionale Delle Ricerche)

**Co-authors:** LUCHETTA, Adriano (Consorzio RFX (CNR, ENEA, INFN, Università di Padova, Acciaierie Venete SpA)); RIGONI, Andrea (Consorzio RFX (CNR, ENEA, INFN, Università di Padova, Acciaierie Venete SpA)); MANDUCHI, Gabriele (Consorzio RFX (CNR, ENEA, INFN, Università di Padova, Acciaierie Venete SpA))

**Presenter:** TALIERCIO, Cesare (Consiglio Nazionale Delle Ricerche)

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