Digitizers deliver endless data streaming with 10 GS/s sampling speed

COTS solutions store over 6 hours of data and perform continuous signal processing

Spectrum's M5i.33xx digitizers are able to acquire data at 10 GS/s, streaming it non-stop to a GPU for analysis or to an SSD array for storage, with the streaming PC made out of COTS parts.

GROSSHANSDORF, GERMANY, October 4, 2023 /EINPresswire.com/ -- Setting a new standard for data acquisition, Spectrum Instrumentation has added a new streaming mode to its flagship M5i.33xx digitizer series. The mode allows these ultrafast ADC cards to continuously acquire, stream and analyse data at a maximum sampling rate of 10 GS/s. The new capability enables the digitizers to be used with COTS (Commercial Off-The-Shelf) PC technology, such as GPUs for endless signal processing, and SSD arrays to create streaming systems that can record for hours on end.

The M5i.33xx digitizer family consists of seven different models, offering sampling speeds from 3.2 to 10 GS/s, 12-bit vertical resolution and bandwidths from 1 to 4.7 GHz. The different product variants all feature a 16-lane Gen3 PCIe bus, that is capable of transferring data at rates up to 12.8 GB/s. This market-leading transfer speed allows data, acquired on one channel at a sampling rate of 6.4 GS/s, or two channels at 3.2 GS/s, to be streamed directly to the PC environment without any loss of information. If faster sampling rates are needed, a special 8-bit transfer mode has been added that supports the streaming of data acquired at rates up to 10 GS/s on one channel, or 5 GS/s on two.

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> *Oliver Rovini, Chief Technical Officer at Spectrum*

Send data to a GPU for continuous signal processing

For situations that involve streaming and intensive signal processing, the M5i.33xx series

digitizers use SCAPP (Spectrum CUDA Access for Parallel Processing). The SCAPP software package transfers the acquired data, using an RDMA process, directly from the digitizers to off-the-shelf GPUs based on Nvidia's CUDA Standard. Once there, users can utilize the GPUs multiple (up to 10,000) processing cores and large (up to 48 GB) memory for on-the-fly parallel processing.

SCAPP includes a set of routines for interaction between the digitizer and GPU cards, as well as a set of CUDA parallel processing examples. These examples provide easy building blocks for powerful processing functions like Digital Down Conversion (DDC), filtering, signal averaging, data de-multiplexing, data conversion or Fast Fourier Transforms (FFTs). All the SCAPP software is based on C/C++ and Python, making implementation and customization easy with just normal programming skills.

For example, in applications that require continuous spectral analysis, time domain data can be collected at 10 GS/s and streamed directly to a GPU for non-stop conversion to the frequency domain. Using a system that includes an M5i.33xx series digitizer (switched to the new 8-bit-mode), SCAPP and a moderately priced GPU, a conversion process that involves multiplexing, windowing, FFT and averaging with an FFT block size of 1M – could run endlessly! At the 10 GS/s sampling rate, such an FFT will cover a frequency range from DC to 5 GHz and deliver a frequency resolution of 10 kHz. Larger FFT block sizes can also be used to produce even better resolutions.

Stream data to RAID storage for post-acquisition analysis

The company also offers streaming and data storage systems based on a Supermicro server, with an AMD EPYC processor, and RAID storage using U.2 SSDs. With up to 240 TB of storage, these COTS systems can record an incredible 6+ hours of data at the maximum 10 GS/s sampling rate. The acquired data is completely seamless, with no gaps or missing information. Once stored, it can be inspected, partitioned, and processed. The systems provide a unique data logging capability at unprecedented speeds and over ultrawide frequency ranges.

PC-systems with COTS parts

Oliver Rovini, CTO at Spectrum, said: "We're always looking for ways to provide cost-effective solutions to challenging signal acquisition and analysis applications. By allowing our digitizers to interface directly with standard PC components, like GPUs and RAID based SSD storage systems, our customers can benefit directly from the latest developments in the PC world. GPUs offer a great solution for processing intensive situations, like those often found in imaging, communications, astronomy, spectroscopy and aerospace applications while storage systems provide a unique tool for anyone needing to monitor signals over extended time periods, such as for those users involved in quality control, mapping or surveillance."

Software possibilities

To enable easy integration into almost any test system, the digitizers can be programmed with a variety of popular languages including C, C++, C#, Delphi, VB.NET, J#, Python, Julia, Java, LabVIEW,

and MATLAB. An SDK is provided that contains an assortment of programming examples and the necessary driver libraries for running with either Windows or LINUX operating systems. For situations that require a turnkey solution, the company also has its own measurement software, SBench 6 Professional, which provides full card control, along with display, analysis, storage, and documentation capabilities. SBench 6 is designed to handle large data files and has a number of processing tools, including a plug-in interface that allows the use of custom calculation functions, as well as variety of import and export filters.

The M5i.33xx series digitizers and streaming systems are available now. The new 8-bit transfer mode is part of every M5i digitizer card. For more information please visit: https://spectrum-instrumentation.com/products/families/33xx_m5i_pcie.php

About Spectrum Instrumentation
Spectrum Instrumentation, founded in 1989, uses a unique modular concept to design and produce a wide range of more than 200 digitizers and generator products as PC-cards (PCIe and PXIe) and stand-alone Ethernet units (LXI). In 30 years, Spectrum has gained customers all around the world, including many A-brand industry-leaders and practically all prestigious universities. The company is headquartered near Hamburg, Germany, known for its 5-year warranty and outstanding support that comes directly from the design engineers. More information about Spectrum can be found at: https://spectrum-instrumentation.com

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