

AFTER THE FPGA: BUILDING DSP PROCESSING PIPELINES ON A NON-REAL-TIME PLATFORM

Jayce Dowell, *University of New Mexico*.

The conversion of analog radio frequency signals into digital data is only one step in building a functioning instrument. The data also need to be transported, aggregated, sorted, and processed. Instruments that require massively parallel computation now use a hybrid, scalable FPGA/GPU architectures, typically benefiting from reduced development costs. The FPGAs are used for the initial digitization of time-series, and often conversion to the frequency domain, while the GPUs are used to handle the subsequent processing. Bifrost is an open-source modular C++/Python framework that is intended to foster growth of a "CASPER of GPUs," by making it straightforward to build reliable high-performance data capture and analysis pipelines using CPUs and GPUs. The framework uses circular memory buffers to transport data between blocks that implement particular algorithms. This framework allows arbitrary operations to be inserted into a pipeline and for pipelines to be quickly reconfigured to accommodate new analysis methods. I will provide an overview of Bifrost and its concepts. I will also discuss the Bifrost-based FPGA/GPU beamformer and correlator in use at the Sevilleta station of the Long Wavelength Array.