

All Vantage™ Research Ultrasound Systems provide real-time access to the RF data acquired from each channel. For many applications this is sufficient, but some researchers require the additional ability to visualize the data acquired as images, either to better understand the data, perform advanced processing, or to share it with others.

The Verasonics' Image Reconstruction software option provides state-of-the-art, software-based imaging technology that can be used to display data, or to compare to a researchers' own imaging reconstruction algorithms. This technology is available as a licensable feature on all Vantage systems, and is optional on the Vantage 64 and Vantage 32 LE. It can be acquired with the system at purchase or added as a software upgrade at any time.

Vantage System Image Reconstruction Configuration Options

System	Vantage 32 LE	Vantage 64	Vantage 64 LE	Vantage 128	Vantage 256
Channels	64 Tx / 32 Rx	64 Tx / 64 Rx	128 Tx / 64 Rx	128 Tx / 128 Rx	256 Tx / 256 Rx
Image Reconstruction Software	Purchasable option	Purchasable option	Included	Included	Included
*Image Reconstruction Simulation Software	Included with Image Reconstruction Software purchase	Included with Image Reconstruction Software purchase	Included	Included	Included

**The Image Reconstruction Software license enables not only Image Reconstruction on the host controller computer included with the system, but also enables Image Reconstruction on additional computers using the simulation software licenses that are available with the system.*

Potential Applications:

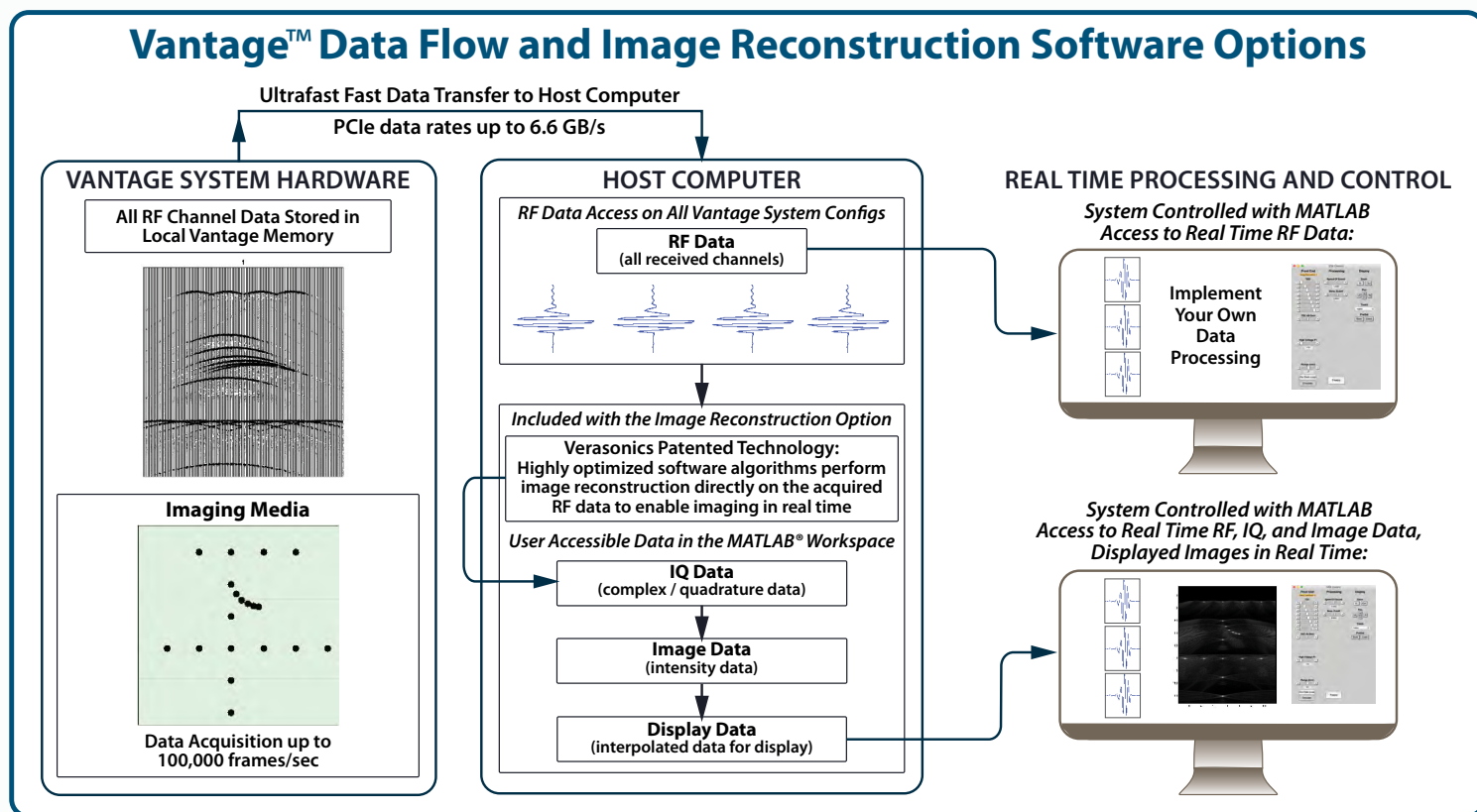
- B-mode
 - Harmonics
 - Spatial Compounding
 - In combination with FUS or Photoacoustics
- Doppler mode
 - Color Doppler
 - Power Doppler
- Elastography
- And more

Benefits:

- Provides advanced real-time imaging without the need for programming by the user when imaging scripts are employed
- Replaces hardware beamformers with software algorithms, allowing the user to make changes to imaging algorithms and see the results immediately
- Performs reconstruction speeds at over 40 million pixels/sec for 128 channels

Image Reconstruction Option

Verasonics' Image Reconstruction software uses a proprietary method of software beamforming to create images using backscattered data from the subject material. These raw images are then further processed and displayed as depicted in the diagram below, with several opportunities to replace Verasonics-provided processing with custom research code.



Software beamforming via Pixel-Oriented Processing is accomplished by applying a modified delay-and-sum algorithm to the received waveforms for each of the array elements to compute the echo signal from each pixel in the image grid. The delays are computed using the geometrical path lengths from elements of the array to pixel locations, and include the travel time of the transmitted wavefront to each pixel. These travel times are stored in large lookup tables for convenience and speed. The element signals are interpolated, delayed, and demodulated prior to summation, ultimately producing a complex backscattered intensity value at each pixel (designated as IQ Data, above). In practice, these signal processing operations are performed simultaneously using matrix multiplications that are implemented using vector instructions and parallel processed using all available CPU cores. The efficient use of processor resources has led to a very fast beamformer algorithm, resulting in pixel reconstruction rates of tens of Mpixels/s on a typical computer. Reconstructions of hundreds of frames per second are readily achieved, providing practical frame rates for many compounded imaging methods.

The Verasonics reconstruction algorithm produces results that have become a standard benchmark for execution speed and image characteristics to compare with other algorithms and hardware combinations. Combined with the fast data transfer speed of raw data from the Vantage hardware, the Verasonics beamformer provides efficient imaging for the ultrasound investigator.

