

## Description

Synthetic Aperture Radar (SAR) is a technique used in modern radars to acquire high-resolution images of scene. SAR is becoming popular not only in military, but also in law enforcement, agriculture and remote environment sensing. To achieve high-resolution it's typically required to use narrow beam antenna. However SAR achieves high-resolution using algorithmic approach by merging information from multiple views of the scene. This step in the SAR is called image formation. Back-Projection (BP) is a "golden" algorithm for image formation. It doesn't make any approximations or assumptions on image collection. Besides superior image quality, it allows very distinctive advantages. Those include ability to overlay the radar image over topographic maps, perform selective image formation and create multi-resolution images. It also allows arbitrary collection pattern by moving platform. This expands mission flexibility of the system. The outstanding benefits of BP come with significant computational cost in compare to other image formation algorithms. As modern airborne platform transform to UAS constraining SWaP, which makes it challenging in real-time implementation. Altera's FPGA are enabling such technology even under tight SWaP constrains. It allows performing processing of BP using highly integrated platform. FPGA makes it possible to create dedicated processing node with much smaller footprint and significantly lower power than any other competitive platform. Image Formation is done by streaming pixels through array of cores highly optimized for Back-Projection. The design performance can be scaled across multiple FPGAs. The architecture allows expanding the formation beyond single component using integrated multi-gigabit transceivers. Such additional level of scaling flexibility makes it perfect choice not just for compact but also for high performance system.

## Features

- Global Back-Projection Image Formation
- Efficient and Scalable Array Architecture
- 33.2 Billion Back-Projections / Second
- FPGA Floating-Point Core
- Stratix 10
- OpenCL Design Flow
- "GOTCHA" Dataset

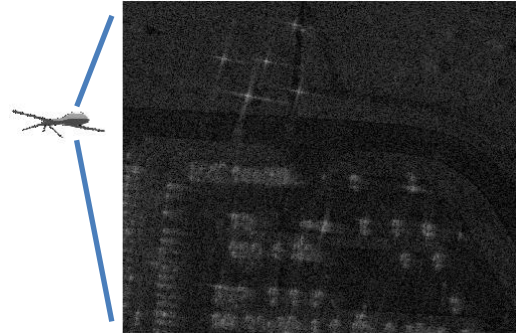


Figure 1: Image Formation Output

## Applications

- Synthetic Aperture Radar (SAR)
- Synthetic Aperture Sonar (SAS)

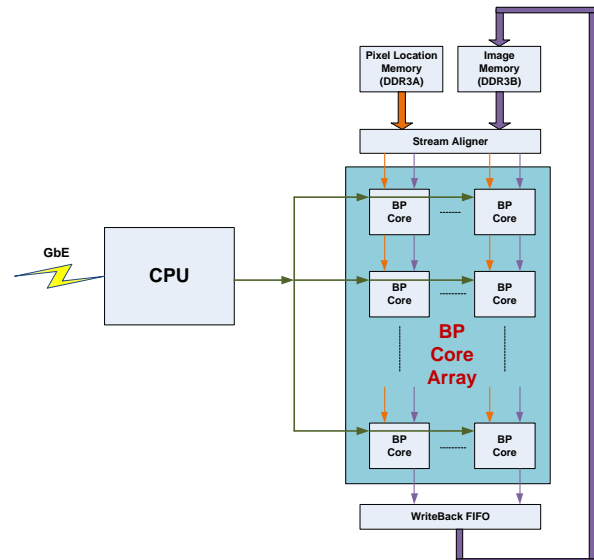


Figure 2: Back-Projection Architecture on FPGA



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