Development of a Real-Time Parallel UHF SAR Image Processor

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Problem Statement

• Objective: Design and develop a real-time parallel SAR image processing system for rapid integration on an airborne Dash-8 platform

• Method: Use Open System Architecture real-time development methodology to produce a parallel image processing system that executes on ruggedized COTS hardware

• Programmatic constraints:
  • Size, weight, and power (SWaP)
    • 1500 lbs, 10kW
  • Demanding real-time requirement
    • SAR image formation and change detection in less than 10 minutes
  • Schedule
    • 18 months
Open Architecture Development Methodology

Focus:

Algorithm development

Computational optimizations

- Serial processing development:
  1. Finalize Matlab signal processing stream
  2. Convert Matlab code to serial C/C++ code

- Parallel processing development:
  1. Parallelize Matlab code using pMatlab to determine optimal mappings
  2. Convert serial C/C++ code to parallel C/C++ code (use pMatlab maps)

Open Architecture Development Methodology enables rapid prototyping
Middleware software allows for scalable infrastructure on different hardware configurations
Results

- 136 Intel cores perform real-time image processing within programmatic constraints
  - 1.632 TFLOPS throughput
  - 544 Gbytes Memory
  - 10 Tbytes storage

Test Strategy

- Software Integration Lab
- Systems Integration Lab
- Twin Otter
- Dash-8