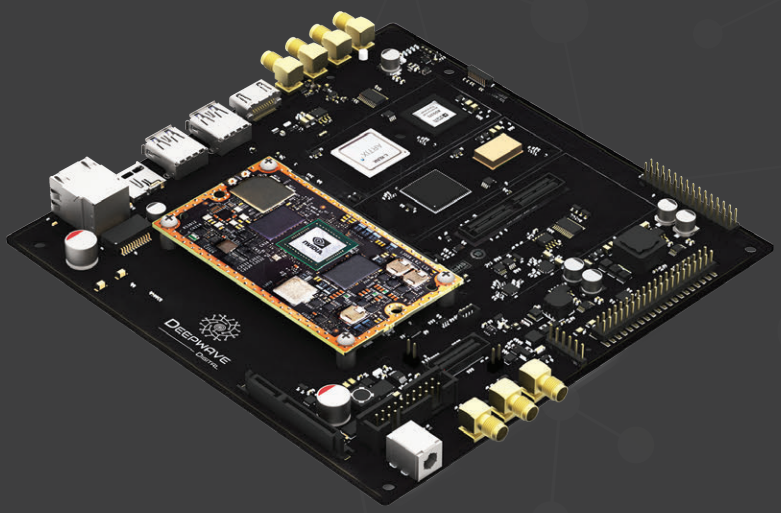
DEEPWAVE DIGITAL

AIR-7101X2

Artificial Intelligence Radio Transceiver (AIR-T)



Overview

Deepwave's AIR-T is the first software defined radio with embedded high performance computing. It contains three unique digital processors for any application:

- FPGA for strict real-time operations
- GPU for highly parallelized processing
- CPU for control, I/O, and software applications

The AIR-T allows users to easily incorporate artificial intelligence into their radio frequency and wireless technologies.

This versatile system can function as a highly parallel SDR, data recorder, or inference engine for deep learning algorithms. The embedded GPU allows for SDR applications to process bandwidths greater than 200 MHz in real-time.

Key Specifications

- **Dual Channel MIMO Transceiver**
  - 300 MHz to 6 GHz
  - 100 MHz bandwidth Rx (per channel)
  - 250 MHz bandwidth Tx (per channel)
- **Digital Signal / Deep Learning Processors**
  - Xilinx Artix 7 FPGA
  - NVIDIA Jetson TX2
    - ARM Cortex-A57 CPU (4 core)
    - NVIDIA Denver2 CPU (2 core)
    - NVIDIA Pascal GPU (256 core)
    - 8 GB of memory
- **Connectivity**
  - GPS Sync via 1 PPS and 10 MHz
  - USB 3.0, USB 2.0/3.0, SATA
  - High-speed digital I/O (GPIO/UART)
  - 1 Gbps Ethernet, WiFi, Bluetooth
- **Dual Power Mode:**
  - 22 / 14 Watts

Software Support

GPU Acceleration
HPC with CUDA toolkit using C/C++ or Python interfaces

Signal Processing
Support for industry leading SDR development environment

Deep Learning
Train and deploy AI systems using standard frameworks

Operating System
Ubuntu 16.04

Mechanical

- Size - 17.0 x 17.0 x 3.5 cm
- Weight - 0.35 kg

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Final layout may slightly differ from artistic drawing

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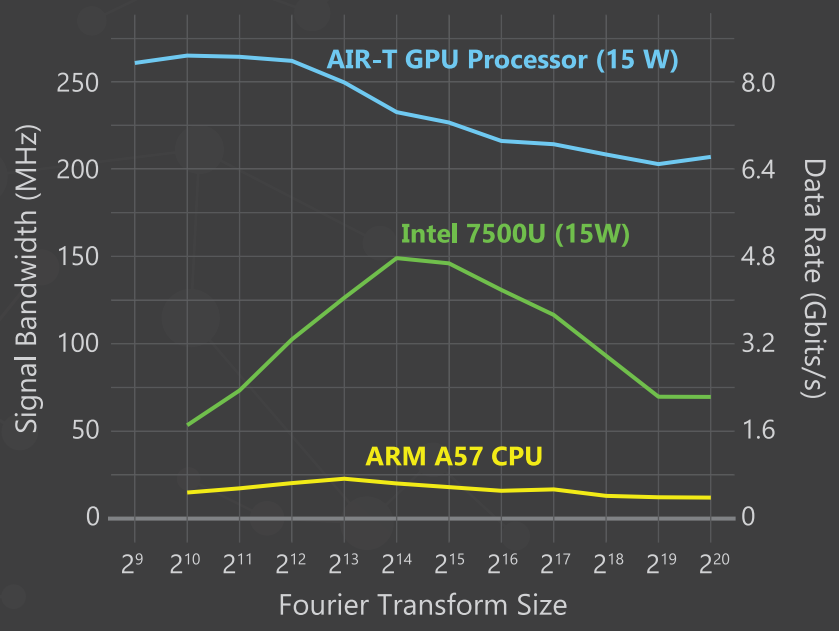
Performance

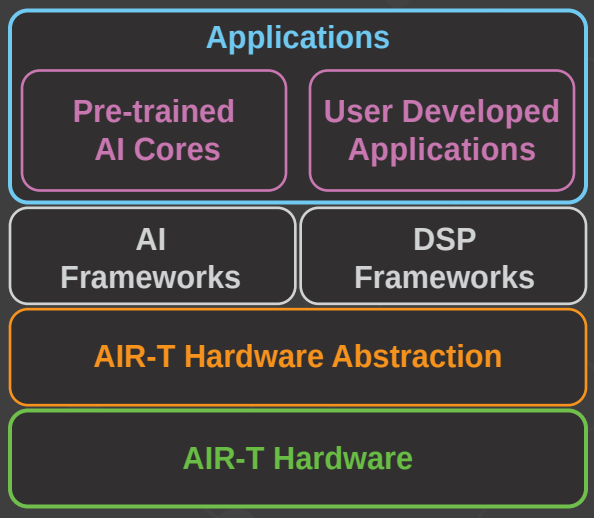
The AIR-T uses 256 GPU cores to create a highly parallel compute environment making wideband processing for software defined radio (SDR) applications obtainable.

Using the embedded NVIDIA Jetson TX2 the AIR-T provides 250% bandwidth improvement over a power-comparable CPU and 1,350% bandwidth improvement over an embedded CPU for real-time SDR applications.

The AIR-T uses zero copy memory access to overcome the data transfer overhead typically associated with GPU processing.

Real-time DSP Measurements





Interfaces

- Open architecture hardware platform
  - Python and C++ control interfaces
- Support for multiple deep learning frameworks
  - Example code provided to optimize and deploy user trained neural networks
  - AIR-T optimized and tested neural networks available
- Execute existing GNU Radio code built on other SDRs*
- Deploy open-source or proprietary software
- High-speed data recording for acquiring training data

*AIR-T supports SoapySDR, a hardware agnostic driver.

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