A Reconfigurable Advanced Tamper Resistant Embedded Processing Platform

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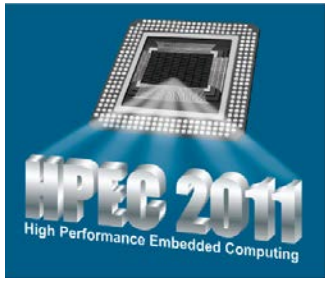

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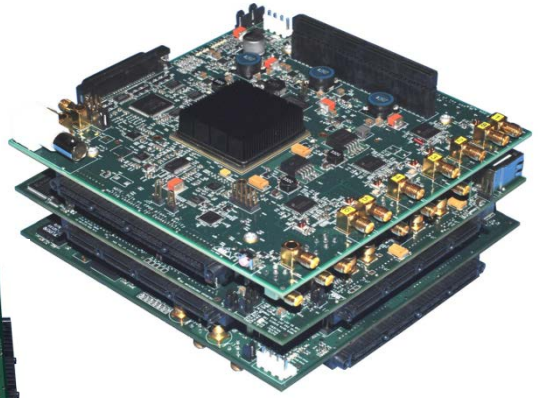
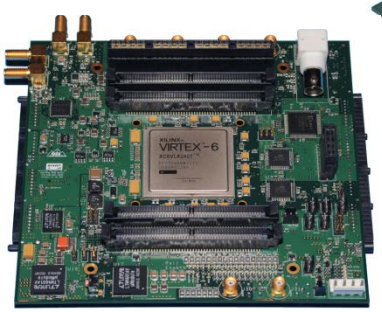
Reconfigurable Advanced Rapid-prototype Environment (RARE)

- Modular embedded computing
- Flexibility to fit both spatial and processing requirements
- Connectivity via standard interfaces (e.g., PCIe, LVDS)
- Programming via a model-based SDK
- Modules for general purpose processing, ADC, DAC, platform interface (e.g., aircraft, ship), 10 GbE, system clock control

2 Processor modules connected side-by-side, each with a PowerPC and Virtex-6.



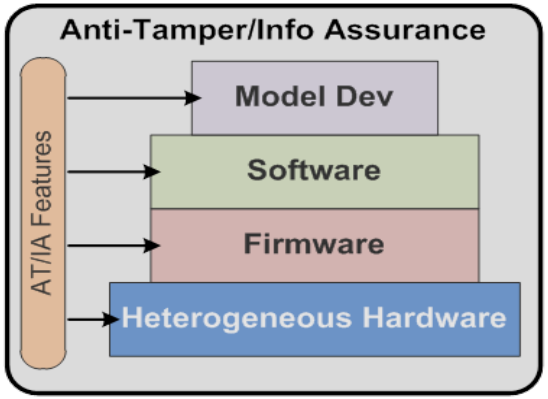
A vertical stack of ADC (top), Processor and DAC modules. The ADC provides 10 channels at 16-bits, 160 MSa/s

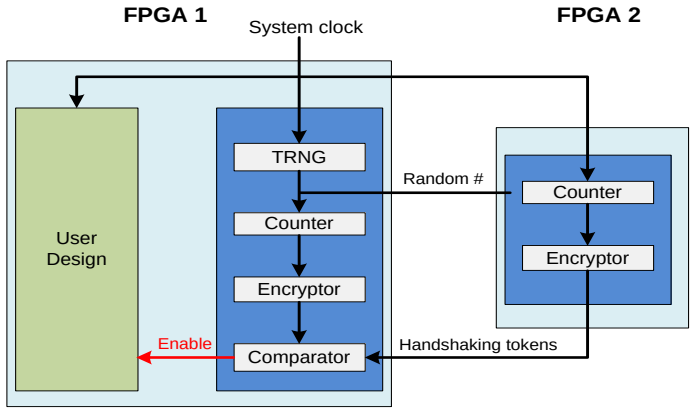


A 250 MHz, 16-bit DAC module with two independent channels

Protection

- Anti-Tamper/Information Assurance features are added at all levels of a hardware based system
- Heterogeneous hardware platform provides the infrastructure to the software and firmware
- Development using model-based software development kit
- AT/IA features are integrated at all levels
- Utilize security features in Virtex-6 (defense grade), PPC460SX, flash memories





An example mutual authentication scheme between module FPGAs (across boards) to assure that the system contains the appropriate, as-designed components. Correct handshaking tokens must be received for normal operations.

MCU System Health and Status Monitoring

- Each RARE module contains MCUs connected to global I2C bus
- Master-slave configuration when multiple modules present
- I2C protocol provides details on network discovery and management plus a mechanism to broadcast status to all modules
- MCUs sequentially power up each module and control FPGA booting if applicable
- MCUs can shut down individual modules to protect system from overheating, save power, etc.
- Data are stored in EEPROMs to enable extraction after a full power shutdown
- Monitors all voltage rails, current from the switched power supply and up to five temperature sensors
- Fully programmable
- Can utilize MCU security features