

RAW Keynote 1: The Outer Limits: Reconfigurable Computing in Space and In Orbit

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Programmable hardware offers unique opportunities for flexible control and processing on board spacecrafts and satellites. Space missions dictate stringent requirements on size, weight, power, versatility and performance of the on-board data acquisition and computing resources. Reconfigurable FPGA-based devices, with the programmability of software and speed/size approaching application-specific integrated circuits, make it possible to control and communicate with sensors, as well as process scientific data right on the spacecraft, sending only relevant information back home over the low bandwidth communications link.

Challenges to computing in harsh space environments abound: vibration, thermal cycling, heat dissipation, and radiation all take their toll on space electronics. In spite of these barriers, notable experiments in reconfigurable computing for space applications are being undertaken. These include NASA's reconfigurable scalable computing project, intended for planetary rovers, cameras, and other sensors; the Queensland University FedSat and its successors, using FPGAs for near real-time image processing, communications, and navigation; and the Cibola Flight Experiment, a Los Alamos National Laboratory experiment in on-orbit signal processing using radiation-tolerant FPGAs.

This talk will discuss the perils and possibilities of reconfigurable computing at the outer limits.