

A Clustered Multiprocessor and Its Multicore Building Block

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Abstract

The presentation describes the SiCortex cluster systems and the SoC cluster node building block. We discuss architectural tradeoffs, power aware design, the cluster communication fabric, and reliability features. SiCortex has paid particular attention to reliability in the system design. All memory structures are ECC protected. All communication links feature automatic retry and robust error detection. SiCortex systems allow system designers to deploy cluster applications in places where commodity clusters cannot go.

SiCortex has introduced two integrated cluster systems. The SC5832 contains 972 multicore nodes of six MIPS processors each, providing 5,832 processors in less than 150 cubic feet and dissipates less than 18KW. The SC648 contains 108 multicore nodes in a standard 42U computing rack and dissipates less than 2KW.

Both systems are built upon a multicore system on a chip that provides a cache coherent six processor symmetric multiprocessor, two DDR2 DRAM ports, and a high performance message passing fabric interface. Nodes in a SiCortex system communicate among themselves via a high speed, low latency, reliable fabric.

The SiCortex systems are designed to run Linux applications using either MPI or TCP/IP (sockets) communications mechanisms. Applications support is provided for C, C++, FORTRAN, Java, Perl, and other programming languages. The software environment builds on the rich software ecosystem built around millions of SoC deployments of the MIPS processor architecture.

Finally, we present performance characteristics of the system and our initial experience with applications.