SRC Computers’ Reconfigurable Server Technology Differentiation

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OVERVIEW

SRC Computers provides the only mature general purpose reconfigurable server having a tightly coupled hardware system and application development environment. The latest hardware product is in the 12th generation of product development, and the SRC Carte™ development environment has been used by customers since 2002. The tight coupling of these two technologies leads to higher application performance, lower power consumption, reduced footprint, and superior total cost of ownership (TCO) advantages.

EASE OF PROGRAMMING

The Carte++™ development environment takes an application written in a high level language (HLL) (C/C++) and compiles it for the microprocessor and reconfigurable logic components (IMPICIT+EXPICIT™ Architecture) of an SRC system. SRC Computers has enhanced Carte over the years with many performance features such as data streams, specialized forms of DMAs, support for switch based memory pools, and hundreds of parallel compute threads which are not available in other HLL compiler implementations. Carte++ is the second generation and builds upon the strengths of the original Carte development environment by incorporating the popular, well-supported Clang/LLVM project as its C/C++ compiler. Carte++ was designed to support applications written in programming languages such as Java, Python and Fortran and computational algorithms written in OpenCL.

NOT ALL RECONFIGURABLE SYSTEMS ARE THE SAME

Traditional solutions that utilize the FPGA on a PCIe card have several usability issues that pose significant barriers to achieving high performance. First, the application development environments of PCIe solutions are often limited by what is provided by the FPGA vendors, and there is no tight integration of the microprocessor and FPGA runtime environments. In many situations, programmers are often forced to learn a hardware description language (HDL) such as Verilog/VHDL in order to write algorithms for the reconfigurable logic because there is no support for a high level language compilation into HDL.

Second, the scalability of a PCIe FPGA solution based system is limited by the number of PCIe connections provided on the microprocessor motherboard. Scalability can only be achieved by increasing the number of microprocessor motherboards since these FPGA solutions are not autonomous.

HARDWARE AND SOFTWARE WORKING TOGETHER FOR A SUPERIOR SOLUTION

The SRC Carte++ programming environment fully integrates the compilation and runtime environments of the microprocessors, reconfigurable processors and Linux operating system. SRC systems treat the microprocessors and reconfigurable processors as peers on a shared memory which provides for very fast data transfers between the peers. This tightly coupled environment lets SRC do things that cannot be accomplished with a system built with off the shelf “FPGA on a PCIe card” boards.

The SRC system architecture also insures minimal impact on the application lifecycle. This is because the Carte++ programming environment removes the need for any source code dependencies based on the particular microprocessor and reconfigurable elements used in the system. All that is needed to use different devices in a new...
system is a recompilation of the application. SRC Computers is therefore not tied to a specific FPGA vendor (Altera, Xilinx, etc.) or CPU vendor (Intel, AMD, ARM, or IBM).

SRC Computers’ technology is designed to be able to create very large systems built with an arbitrary number of microprocessors and reconfigurable processors. These processor numbers are driven only by application computational performance requirements. Over the years system hardware enhancements have been driven by the computing needs of the customers. This has resulted in system scalability features such as switch based reconfigurable server interconnects and large shared memories as well as superior size, weight and power (SWAP). Since SRC Computers uses the same subassemblies in all systems, commercial systems have the same high reliability as our military systems.

SRC Computers’ superior hardware, firmware and development environment are all protected by forty patents having over a thousand claims.

### SUMMARY

The SRC Carte++ Development Environment provides the ability for application developers to easily harness the computational potential of reconfigurable processors. SRC Computers’ tightly coupled hardware environment leads to a high performance, scalable system. This combination allows SRC Computers to offer reconfigurable servers with higher performance, extremely low power consumption, and smaller system footprints at a lower purchase price and lower operating costs than traditional systems.

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2. SRC Application Implementations on a Saturn 1 Processor, SRC Computers LLC, MKT-054-00, August 3, 2012.