Highlights:

• Accelerates CPU performance for most Java applications by up to 55X (peak) and 15X (sustained)

• Ideal for next generation set top boxes, PDAs, and web access devices

• Interfaces with any CPU, and is compatible with any OS and Java Virtual Machine (JVM)

• Accelerates Java while preserving all previous CPU, operating system, and software application capabilities

• Better performance than a Just-in-Time (JIT) compiler, without JIT latency, code bloat, or memory footprint

• High-speed operation and efficient power design

• Available in synthesizable Verilog

• Approximately 35K gates

Overview

inSilicon’s next generation Java accelerator core, JVXtreme, is supplied as a synthesizable RTL core for system integration along with its support software for the Java Virtual Machine (JVM). The JVXtreme technology works with the CPU to execute and accelerate Java byte code instructions by up to 55x (peak) and 15x (sustained). The JVXtreme accelerator core can interface to and integrate with any microprocessor or microcontroller. The CPU + JVXtreme combination preserves all CPU capabilities and can execute Java code at speeds near that of compiled code.

The JVXtreme solution is ideal for wired information devices such as set-top boxes, game consoles, and web phones/terminals, as well as mobile information devices such as PDAs, mobile phones, and advanced pagers.

Universal CPU Compatibility

The JVXtreme core can be designed-in for any CPU family, ranging from microcontrollers to the latest RISC processors. This enables designers to choose any CPU that meets their requirements or to upgrade their existing design or device with a JVXtreme-powered version of its CPU or microcontroller. inSilicon’s JVXtreme core is CPU independent; the relatively simple interface logic between JVXtreme and the CPU is architecture specific.

JVXtreme Performance

JVXtreme eliminates the overhead of the software-based Java interpreter loop by implementing the instruction loop logic and thread switching logic in hardware. Interpreted Java byte codes take many clock cycles on any host CPU. JVXtreme accelerates the actual execution of Java by executing 87 of the most commonly used Java byte codes in hardware. Most of these accelerated byte codes execute in one clock cycle. The overall performance of a JVXtreme-accelerated CPU can be very close to compiled code performance. Benchmarks have shown an improvement factor of about 15X (sustained) and 55X (peak) over interpreted code executing on the same CPU. Implemented as a coprocessor for an ARM9™ processor operating at 200 MHz with a K Virtual Machine (KVM), the JVXtreme core exhibits an Embedded Caffeine Mark of approximately 1300.

Hardware Support

inSilicon’s JVXtreme core can interface with the processor in two ways: as a memory-mapped device on the CPU’s high-speed bus, or as a coprocessor on the CPU’s coprocessor bus. A JVXtreme-powered CPU can be made pin-compatible with its base CPU, so it can be directly plugged into any hardware design. This feature provides tremendous time and cost savings to companies that want to introduce new designs with Java capabilities, while retaining their original hardware and software investment.
Software Support
JVXtreme technology augments CPU capabilities, accelerating Java transactions while leaving the original code for the CPU—including operating systems, drivers, and proprietary and legacy code—intact and executable as usual. A JVXtreme-enabled CPU can switch between Java and native code.

A JVM must be available on the CPU with the selected OS. The design of JVXtreme technology imposes no requirements or restrictions on the OS, and operates with any OS and JVM. JVXtreme software support is a simple JVM integration in which the JVXtreme interpreter API is called by the JVM's interpreter, as shown below.

Implementation Considerations
• The JVXtreme core is implemented using the same process technology as the CPU; it does not necessitate special requirements for clocking and physical design.
• The core size is approximately 35K gates—including the CPU interface logic and hardware stack.
• JVXtreme technology is power efficient, operating at approximately 200µW/MHz and <10 µW/MHz (in standby mode).
• JVXtreme core implementation results in significantly less clock cycles and memory accesses for Java program execution, further reducing power consumption.
• JVXtreme technology is memory efficient, requiring no more memory than a standard JVM.

Java Compatibility
The JVXtreme core is fully Java compliant and is independent of a special Java subset definition and JDK version. JVXtreme technology will work with any Java development environment, such as Sun®, HP®, and Microsoft®; the Java subset (e.g. CLDC) conformance level is determined only by the JVM used.

JVXtreme Core Integration and Test Environment
The JVXtreme test environment includes a comprehensive suite of tests to insure the JVXtreme core is operating properly in the target system. In addition, the test environment includes the following integration and verification programs:
• Hardware interface logic definition and reference implementations
• JVXtreme C functional model for early software development
• Software test suite in C language for execution on the target system for complete system validation
• Sample JVM and JVXtreme software modules
• Software APIs
• A Java test program

inSilicon Support and Maintenance Program
inSilicon’s Support and Maintenance Program includes full customer support via hotline (1-888-482-4477) and email (support@insilicon.com).