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# Warp processor for dynamic translation of binaries to FPGA circuits

Tech ID: 19151 / UC Case 2004-390-1

#### **BRIEF DESCRIPTION**

Traditional microprocessor software bits represent sequential instructions that are executed by a programmable microprocessor. In contrast, modern FPGA software bits are mapped onto FPGA's configurable logic fabric via a circuit. Both software types free developers from needing to design hardware. A computation may execute faster on an FPGA than as sequential instructions on a microprocessor because a circuit allows concurrency (single rather than multiple cycle passes) from the bit to the process level

#### **FULL DESCRIPTION**

UC researchers have invented a warp processor, a microprocessor that allows the dynamic and transparent partitioning of an executing software's binary kernels into customized FPGA circuits resulting in 2 to 100 times speed up over executing on microprocessors. The UC invention's dynamic approach allows techniques associated with dynamic software optimization to be applied to hardware/software partitioning. The profiler, compiler and synthesis tools are entirely on-chip, so that warp processor partitioning does not require extra designer effort or disruption to standard tool flow.

# ADVANTAGES

- 1) The invention utilizes single pass optimizations that require less memory (up to 20 times less) and execution time than most current commercial approaches.
- 2) The technique offers reduced energy consumption (up to 74%) over corresponding embedded benchmarks.
- 3) Dynamic partitioning is completely transparent, allowing a designer to gain the benefits of partitioning, while writing a regular software application using standard software tools.
- 4) The warp processor's dynamic partitioning can adapt to an application's actual usage in real-time, eliminating the need for optimization via cumbersome static simulations.

### **SUGGESTED USES**

UC's invention has immense commercial applications as almost any kind of microprocessor-based technology can utilize the benefits of warp processing. These include everything from video and audio processing, encryption and decryption, encoding, compression and decompression and bioinformatics to mainframe computers and even relatively simple consumer electronic items such as TV's. Embedded systems such as medical instruments and security scanners can also perform real-time recognition using warp-enhanced FPGA's.

#### CONTACT

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#### **INVENTORS**

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- ▶ Vahid, Frank

#### OTHER INFORMATION

#### **CATEGORIZED AS**

**▶** Computer

Software

RELATED CASES

2004-390-1

UCR is looking for commercial partners who are interested in utilizing warp processing for their applications. For more information, please

contact Dr. Eric Tonui (eric.tonui@ucr.edu) on 951 827 4967.

# **PATENT STATUS**

Country	Туре	Number	Dated	Case
United States Of America	Issued Patent	7,356,672	04/08/2008	2004-390

# ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Warp Processors: Dynamic Hardware/Software Partitioning

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