



# Implementation of a General-Purpose Dataflow Multiprocessor (Research Monographs in Parallel and Distributed Computing)

*Gregory M. Papadopoulos*

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Dataflow is one of the major models of parallel computation. *Implementation of a General Purpose Dataflow Multiprocessor* extends work in this area by introducing an unusually simple model of dynamic dataflow execution, called the Explicit Token Store (ETS) architecture, and its realization in Monsoon, a large-scale dataflow multiprocessor. Monsoon is currently under construction at the Motorola Microcomputer Division.

Papadopoulos argues that the underlying sequential architecture of contemporary multiprocessors has not been able to support the synchronization demands of parallel execution and that these systems have largely failed to meet expectations for programmability and performance. He points out that processors must be fundamentally changed to execute a parallel machine language that coordinates parallel activities efficiently as instructions are scheduled. Although dataflow architectures have met this challenge by radically reformulating the basic specification of a machine program, they have suffered from substantial implementation shortcomings, notable the need for large associative memories. The ETS architecture Papadopoulos introduces here achieves the power of previous tagged-token dataflow architectures, but with a much leaner cycle and much less complexity.

Gregory Papadopoulos is an Assistant Professor of Electrical Engineering and Computer Science in the Laboratory for Computer Science at MIT.

**Contents:** General Purpose Multiprocessing. The TaggedToken Dataflow Architecture. The Explicit Token Store. Compiling for an ETS Dataflow Processor. Compiling Imperative Languages for an ETS. Monsoon: An ETS Multiprocessor. A Monsoon Instruction Decoding.

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