About This Manual

Objectives

This manual provides a concise collection of the information required for writing programs that directly access the CM-5 vector unit (VU) accelerators. There are two low-level instruction sets available on the CM-5: DPEAC and CDPEAC. A program that directly manipulates the VU accelerators will typically include subroutines written in either DPEAC or CDPEAC. Both methods of programming the vector unit accelerators are described in this manual.

IMPORTANT

You do *not* have to use the methods described in this book to write programs that access the CM-5 VUs. The compilers for high-level CM languages (such as CM Fortran and C*) automatically take advantage of the VUs where possible, without the need for explicit instructions. The information presented here is intended for knowledgeable users who want to hand-code specific low-level subroutines for execution on the VUs.

Intended Audience

This is a programmer's handbook, not a tutorial. This document describes the DPEAC and CDPEAC instruction sets in detail, and provides some examples of their use, but is intended to be used by knowledgeable CM programmers in writing low-level code. For the most part, this handbook contains concise summaries of information that these low-level programmers will find helpful.

Revision Information

This is a new manual.

Organization of This Manual

Chapter 1 Introduction
Presents an overview of the CM-5 and the two low-level instruction sets DPEAC and CDPEAC.

Chapter 2 The CM-5 Vector Units
Describes the design and features of the CM-5's vector unit accelerators.

Chapter 3 The DPEAC Instruction Set
Explains the syntax and structure of the DPEAC instruction set.

Chapter 4 DPEAC Instruction Set Reference
Lists the arithmetic, memory, modifier, and accessor instructions of the DPEAC instruction set.

Chapter 5 The CDPEAC Instruction Set
Explains syntax and structure of the CDPEAC instruction set.

Chapter 6 CDPEAC Instruction Set Reference
Lists the arithmetic, memory, modifier, and accessor instructions of the CDPEAC instruction set.

Chapter 7 Using DPEAC/CDPEAC in Programs
Presents an example of using a DPEAC (or CDPEAC) subroutine in a CM Fortran program.

Appendixes:

Appendix A VU Memory Mapping
Explains the layout of VU parallel memory.

Appendix B VU Memory Maps
A three-page VU memory map and register quick-reference.

Appendix C VU Pipeline
Describes of the operation of the VU instruction pipeline, and its effects on execution of VU vector instructions.

Appendix D VU Arithmetic Operations
Describes the arithmetic instruction set of the VUs, with special emphasis on the status bits that are modified by each instruction.

Appendix E The dpas Assembler
Describes **`dpas`**, the DPEAC assembler.

Appendix F The dpcc Compiler
Describes **`dpcc`**, the CDPEAC compiler.

Appendix G How CDPEAC Works
Describes the implementation of CDPEAC via the GCC compiler's **`asm`** statement and macro facility.

Appendix H CMRTS and CM Memory Allocation
Describes the CM Run-Time system, CM parallel array data structures, and methods for allocating parallel memory either through the CMRTS or by other means.

Related Documents

These documents are part of the Connection Machine documentation set.

- *Programming the NI*, Version 7.1.
- *DPEAC Reference Manual*, CMOST Version 7.1.

Notation Conventions

The table below displays the notation conventions observed in this manual.

Convention	Meaning
`bold typewriter`	UNIX and CM System Software commands, command options, and filenames, when they appear embedded in text. Also programming language elements, such as keywords, operators, and function names, when they appear embedded in text.
italics	Argument names and placeholders in function and command formats.
`typewriter`	Code examples and code fragments.
`%` **`bold typewriter`** `regular typewriter`	In interactive examples, user input is shown in **`bold typewriter`** and system output is shown in `regular typewriter` font.