Software Product Description

PRODUCT NAME: DEC OPS5 for RISC, Version 4.0A **SPD 39.31.01**

DESCRIPTION

DEC OPS5 is a language (Compiler and Run-Time Library) for constructing high-performance, forward chaining, rule-based applications.

A rule (or production) is defined as an "if-then" statement consisting of a conditional part, called the Left Hand Side (LHS), and an action sequence, called the Right Hand Side (RHS). Rules operate on in-memory objects that represent concepts or entities in the real world. These objects, called Working Memory Objects, are composed of a set of attributes and their associated values.

During each recognize-act cycle, OPS5 examines the LHS of all active rules to determine which rules' LHS conditions are satisfied given the current state of visible Working Memory Objects. It then applies conflict resolution criteria to determine which rule should have its action sequence executed. Actions can modify the state of Working Memory Objects. This cycle is repeated until no more rules are satisfied or until a rule explicitly halts processing.

A rule-based language differs from a conventional programming language in that rules are not processed in sequential order, rather, the order of execution is driven by the current state of working memory data.

DEC OPS5 is the preferred tool for developing high-performance, commercial quality, rule-based systems. Systems developed with DEC OPS5 are well suited to solve problems in:

- Configuration
- Selection
- Diagnosis
- Process monitoring and control
- Scheduling
- Planning
- Decision support
- Rapid prototyping

Applications involving these problems are found in such industries as petrochemical, insurance, banking, transportation, aerospace, education, and government.

DEC OPS5 is an evolution of the OPS5 language as described in the *OPS5 User's Manual* by Charles L. Forgy, Department of Computer Science, Carnegie-Mellon University.

DEC OPS5 for RISC is the first in a new line of rule-based language products with enhanced functionality over VAX OPS5. DEC OPS5 for RISC provides an upward compatible migration path for users of VAX OPS5 V3.0 or earlier versions. DEC OPS5 is also available in source-compatible form on the VAX/OpenVMS platform. Refer to the DEC OPS5 for OpenVMS Software Product Description (SPD 27.04.xx) for details.

Applications written in DEC OPS5 can call routines written in other languages, and those routines can, in turn, call back to the DEC OPS5 run-time system. A main program written in another language can also call a DEC OPS5 application.

Features

- Call-out with automatic argument type conversion
- Disjunctions of Condition Elements
- New set of NAS compliant Run-Time Library routines, including data type conversion functions
- Single inheritance relations between classes of objects
- Default values for attributes
- Multi-valued attributes including new match predicates
- Unique Object identifiers
- WMHISTORY and PPCLASS debugging commands
- COPY action
- CONCAT function

DEC OPS5 for RISC consists of two components: the Compiler and the Run-time system.

Compiler

DEC OPS5 achieves high performance through a compiled language implementation, and utilizes a technique called the Rete Match Algorithm to represent the interdependencies of rules and data in a highly efficient way.

The Rete network greatly speeds up the pattern-matching (inference) operation by eliminating the need for exhaustive redundant tests at execution time. The DEC OPS5 compiler translates the Rete Network into MIPS assembly source code.

By default, DEC OPS5 automatically generates an executable image, or the user can opt to modularly compile several OPS5 files, to be assembled and linked together later, possibly including object modules from other languages.

This capability facilitates the integration of DEC OPS5 programs into larger applications that include components developed in other languages.

These implementation techniques have been proven to enable DEC OPS5 applications to run faster and allow better integration than those using interpreter- or LISP-based forward-chaining implementations of rule-based languages.

Run-Time System

DEC OPS5 Run-time system implements the rule inference mechanism by sequencing through all the rules in a program in what is called the recognize-act cycle.

The cycle consists of the following steps:

1. Recognize — Examine the current contents of working memory to locate all objects that satisfy the LHSs of rules.
2. Conflict Resolution — Select one rule with a satisfied LHS; if there is no satisfied LHS, then halt.
3. Act — Execute the RHS of the selected rule.
4. Return to Step 1.

DEC OPS5 Run-time system also includes a command interpreter that lets the user control the running of DEC OPS5 programs and issue debugging commands including a RESTART command for resetting execution context and re-executing the startup.

DEC OPS5 Run-time system also provides a set of service routines callable from other languages.

HARDWARE REQUIREMENTS

Processor and/or hardware configurations as specified in the System Support Addendum (SSA 39.31.01-x).

SOFTWARE REQUIREMENTS

DEC OPS5 for RISC ULTRIX

ULTRIX Operating System

DEC OPS5 for DEC OSF/1®

DEC OSF/1 Operating System

Refer to the System Support Addendum (SSA 39.31.01-x) for availability and required versions of prerequisite /optional software.

ORDERING INFORMATION

DEC OPS5 for RISC ULTRIX

Software Licenses: QL-MKMA*-**
Software Media: QA-MKMAA-**
Software Documentation: QA-MKMAA-GZ
Software Product Services: QT-MKMA*-**

DEC OPS5 for DEC OSF/1

Software Licenses: QL-MKNA*-**
Software Media: QA-MKNAA-**
Software Documentation: QA-MKMAA-GZ
Software Product Services: QT-MKNA*-**

* Denotes variant fields. For additional information on available licenses, services, and media, refer to the appropriate price book.

SOFTWARE LICENSING

Licensees of DEC OPS5 may reproduce and distribute delivery applications software developed with DEC OPS5, provided such programs are: (1) in accordance with the provisions of Licensee's standard software license; (2) with Licensee's copyright notice included on such programs; or (3) if conditions (1) or (2) are not met, with Digital's COPYRIGHT notice included on such programs.

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License Management Facility

DEC OPS5 for RISC ULTRIX supports the ULTRIX License Management Facility.

License units for this product are allocated on an Unlimited System Use plus Personal Use basis.

Each Personal Use license allows one identified individual to use the layered product.

For more information on the License Management Facility, refer to the ULTRIX Operating System Software Product Description (SPD 26.40.xx) or the *Guide to Software Licensing* in the ULTRIX Operating System documentation set.

SOFTWARE PRODUCT SERVICES

A variety of services are available from Digital. For more information, contact your local Digital office.

SOFTWARE WARRANTY

Warranty for this software product is provided by Digital with the purchase of a license for the product as defined in the Software Warranty Addendum of this SPD.

System Support Addendum

PRODUCT NAME: DEC OPS5 for RISC, Version 4.0A **SSA 39.31.01-A**

HARDWARE REQUIREMENTS

Processors Supported

DECstation: DECstation 2100, DECstation 3100, DECstation 3100s

Personal DECstation 5000 Model 20/25 MX, Personal DECstation 5000 Model 20/25 HX, Personal DECstation 5000 Model 20/25 TX, Personal DECstation 5000 Model 20/25 PXG+, Personal DECstation 5000 Model 20/25 PXG Turbo+

DECstation 5000 Model 120/125/133 MX, DECstation 5000 Model 120/125/133 CX, DECstation 5000 Model 120/125/133 HX, DECstation 5000 Model 120/125/133 PX, DECstation 5000 Model 120/125/133 TX, DECstation 5000 Model 120/125/133 PXG, DECstation 5000 Model 120/125/133 PXG+ DECstation 5000 Model 120/125/133 PXG Turbo, DECstation 5000 Model 120/125/133 PXG Turbo+

DECstation 5000 Model 200 MX, DECstation 5000 Model 200 CX, DECstation 5000 Model 200 HX, DECstation 5000 Model 200 PX, DECstation 5000 Model 200 TX, DECstation 5000 Model 200 PXG, DECstation 5000 Model 200 PXG+, DECstation 5000 Model 200 PXG Turbo, DECstation 5000 Model 200 PXG Turbo+

DECstation 5000 Model 240 MX, DECstation 5000 Model 240 HX, DECstation 5000 Model 240 TX, DECstation 5000 Model 240 PXG+, DECstation 5000 Model 240 PXG Turbo+

DECsystem: DECsystem 3100, DECsystem 5000 Model 25, DECsystem 5000 Model 200, DECsystem 5000 Model 240, DECsystem 5100, DECsystem 5400, DECsystem 5500, DECsystem 5810, DECsystem 5820, DECsystem 5830, DECsystem 5840, DECsystem 5900

Disk Space Requirements

Disk space required for installation:

DEC OPS5 for RISC ULTRIX

Root file system:	/	0 Kbytes
Other file systems:	/usr	3250 Kbytes (Base System)
	/usr	3542 Kbytes (Including Optional Files)

DEC OPS5 for DEC OSF/1®

Root file system:	/	0 Kbytes
Other file systems:	/usr	3582 Kbytes (Base System)
	/usr	3874 Kbytes (Including Optional Files)

Disk space required for use (permanent):

DEC OPS5 for RISC ULTRIX

Root file system:	/	0 Kbytes
Other file systems:	/usr	3250 Kbytes (Base System)
	/usr	3542 Kbytes (Including Optional Files)

DEC OPS5 for DEC OSF/1

Root file system:	/	0 Kbytes
Other file systems:	/usr	3582 Kbytes (Base System)
	/usr	3874 Kbytes (Including Optional Files)

These counts refer to the disk space required on the system disk. The sizes are approximate; actual sizes may vary depending on the user's system environment, configuration, and software options.

SOFTWARE REQUIREMENTS

DEC OPS5 for RISC ULTRIX

ULTRIX Operating System V4.0 - V4.3

DEC OPS5 for DEC OSF/1

DEC OSF/1 V1.0

GROWTH CONSIDERATIONS

The minimum hardware/software requirements for any future version of this product may be different from the requirements for the current version.

DISTRIBUTION MEDIA

TK50 Streaming Tape

ORDERING INFORMATION

DEC OPS5 for RISC ULTRIX

Software Licenses: QL-MKMA*-**
Software Media: QA-MKMAA-**
Software Documentation: QA-MKMAA-GZ
Software Product Services: QT-MKMA*-**

DEC OPS5 for DEC OSF/1

Software Licenses: QL-MKNA*-**
Software Media: QA-MKNAA-**
Software Documentation: QA-MKMAA-GZ
Software Product Services: QT-MKNA*-**

* Denotes variant fields. For additional information on available licenses, services, and media, refer to the appropriate price book.

The above information is valid at time of release. Please contact your local Digital office for the most up-to-date information.