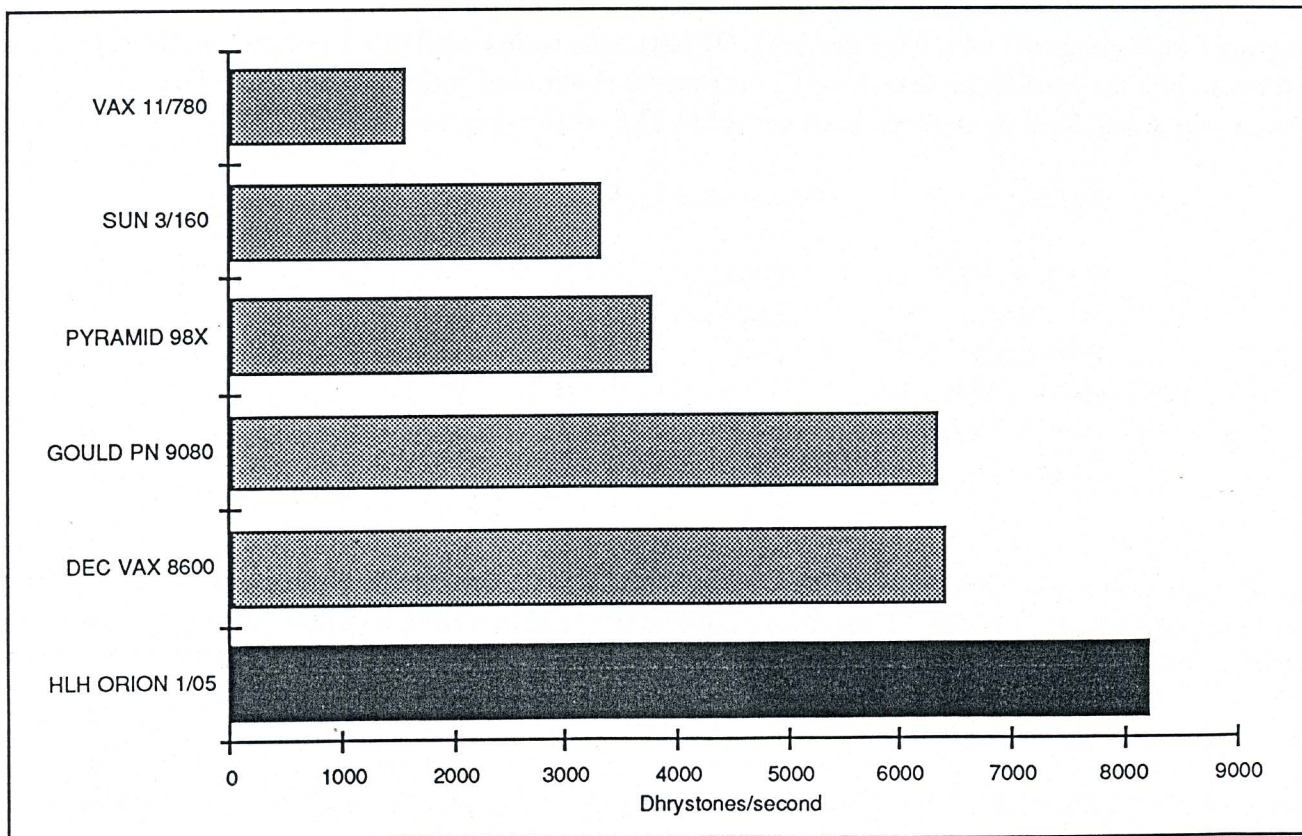# ORION† 1/05 SUPERMINICOMPUTER

Dhrystone Benchmark

This note characterises one aspect of the the performance of the new ORION 1/05 Central Processing Unit (CPU), an advanced high-performance 32-bit computer architecture which draws on mainframe/supercomputer techniques. The CPU includes an IEEE 754 floating-point unit and two combination cache-plus-memory management units, one for data and one for instructions. It makes extensive use of concurrency, including a sophisticated pipeline and separate buses for instructions and data.

The Dhrystone Benchmark

The Dhrystone benchmark is a measure of processor and compiler efficiency in executing a typical but synthetic program. This program was designed by measuring statistics on a number of real programs and the test program then written (by Rheinhold P. Weicker) using these statistics. The test program is balanced according to statement type as well as data type; it does not use floating-point arithmetic, perform I/O, nor call the UNIX† operating system. The results shown below are measured in Dhrystones/second using the 1.1 version of the benchmark.

Bar chart: Dhrystones/second

- VAX 11/780
- SUN 3/160
- PYRAMID 98X
- GOULD PN 9080
- DEC VAX 8600
- HLH ORION 1/05

X-axis: 0, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000 — Dhrystones/second

Tested Configurations

Measurements on the ORION systems were taken by High Level Hardware Limited whilst those on the other systems are taken from the MIPS Performance Brief, Issue 2.2, April 1987. Details of some of the tested systems are

    DEC VAX 11/780
        CPU: Proprietary
        Main memory: 8 Mbytes
        Operating system: 4.3 BSD UNIX

    SUN 3/160M
        CPU: MC68020 (16.67 MHz)
        Main memory: 8 Mbytes
        Operating system: 4.2 BSD UNIX (Release 3.2)

    DEC VAX 8600
        CPU: Proprietary
        Main memory: 20 Mbytes
        Operating system: Ultrix Version 1.2 (4.2 BSD UNIX)

    HLH ORION 1/05
        CPU: CLIPPER (33 MHz)
        Main memory: 8 Mbytes
        Operating system: OTS Release 2.1 (4.2 BSD UNIX)

All programs were compiled with optimisation (-O). Systems were tested in the normal multi-user environment, with the load factor less than 0.2 (as measured with the uptime command). The benchmark was run at least three times and averaged. The resulting figures were

System	Dhrystones	Relative
VAX 11/780	1,571	1.0
SUN 3/160	3,325	2.1
PYRAMID 98X	3,773	2.4
GOULD PN 9080	6,340	4.0
DEC VAX 8600	6,423	4.1
HLH ORION 1/05	8,210	5.2

Most people seem to think of the performance of the VAX 11/780 running the Dhrystone 1.1 benchmark as being equivalent to 1 MIP. The relative column of the above table is calculated on this basis, and can therefore be regarded as showing the ORION 1/05 as having a rating of 5.2 MIPs.