ORION[†] SUPERMINICOMPUTER

Configuration Guide

The purpose of this document is to provide some guidance in configuring an ORION system. Please note, however, that the optimum configuration of a system depends to quite a large extent on the applications for which it will be used. High Level Hardware will be pleased to offer advice and put you in touch with existing users working in similar areas if required.

You will have to reach a decision about eight main elements:

- Central Processing Unit (CPU)
- Size of memory
- Size and number of disks
- Type of tape backup
- Number of terminal ports
- Communications
- Enclosure
- Software

Minimum System

A minimum ORION system consists of the following components

OR-CPU1/05

ORION 1/05 32-bit 5.5 MIPS CPU with integral 1 Mflop floating point processor, 8 Mbytes of main parity memory, support for demand paged virtual memory, 4 Mbytes of file system cache, DMA based controller for up to 3 mass storage devices (disk or tape), and four RS-232C serial ports (50 to 38,400 Baud) with modem control.

OR-F168   High performance fixed disk drive with a formatted capacity of 144 Mbytes (20 ms average access time).

OR-Q150   150 Mbyte ¼-inch QIC-150 format cartridge tape drive.

OR-ENCN   Standard enclosure (340 mm wide, 800 mm deep and 750mm high).

OR-OTS   Licence for the ORION Time-sharing operating system (OTS), based on UNIX[‡] 4.3 BSD, and the Network File System[§] (NFS).

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† ORION is a registered trademark of High Level Hardware Limited.

‡ UNIX is a registered trademark of AT&T in the U.S.A. and other countries.

§ Network File System is a trademark of Sun Microsystems

Such a system is capable of supporting up to four users and will run all the OTS software.

Central Processing Unit

The ORION CPU options currently include three models with a range of cost and performance. The entry level model, 1/05, provides approximately 5.5 MIPS of integer performance and 1 Mflop of double precision floating point performance. The 1/07 offers approximately 33% greater performance for both integer and floating point work (7.3 MIPS and 1.33 Mflops), whilst the 1/10 offers a further 30% improvement for integer and single precision floating point, and over 150% for double precision floating point (10 MIPS, 3 Mflops).

All models are fully compatible allowing applications to move unchanged from one to another. Furthermore, systems are field upgradable, so processing power can be increased later as required.

Size of memory

An ORION system is supplied with a minimum of 8 Mbytes of main memory, together with 4 Mbytes of file system cache. This provides good UNIX performance for up to four users. The ideal amount of memory depends upon what the system will be used for. For up to 16 users running fairly small applications, the minimum 8 Mbytes may suffice, but this amount of memory could be needed for a single user if there is a large amount of active data. In an 8 Mbyte configuration the operating system uses about 0.5 Mbytes, so about 7.0 Mbytes of users' memory can be in use before the system starts paging. More main memory can be added in 8 Mbyte or 32 Mbyte increments, to a maximum of 96 Mbytes. For heavy multi-user applications it is worth while increasing the size of the file system cache memory, in increments of 2 Mbytes.

Size and number of disk drives

It is necessary to take into account several factors in determining the required disk capacity. The size of the basic system software is around 20 Mbytes for the essentials, plus about 12 Mbytes for optional items (on-line manual, documentation, and games). To this must be added provision for other applications software, temporary files, the virtual memory paging area, and space for user files. Experience has shown that a minimum of 168 Mbytes unformatted capacity (144 Mbytes formatted) is required. Large applications, or a larger number of users will certainly require more disk capacity.

A range of high capacity drives is available, currently including models with unformatted capacities of 337, 690, 823, and 1000 Mbytes. Other drives are under development; please contact the Sales Office for the latest position.

One drive of any capacity can be housed in the standard enclosure. More can be added if the expansion enclosure is purchased (see below).

Two disks always give better performance than one, even when the total capacity is the same, for the system supports overlapped seeks and will interleave paging onto more than one drive. For ultimate performance, each drive should be interfaced through a separate controller (OR-PIC), allowing data transfers to be overlapped as well as seeks. Installation of an additional disk/tape controller also provides a further four RS-232C lines.

Disk backup and archiving

Some form of disk backup is essential, not because the disk systems are unreliable but because the nature of UNIX makes it essential to preserve important copies of the files off the machine. We strongly recommend that customers include at least a ¼-inch cartridge

tape drive in their systems for backing up the disk. The OR-Q150 is a streaming device which employs the de-facto standard QIC-24, QIC-120, and QIC-150 recording formats and appears to software such as *tar*(1) to be similar to a standard ½-inch magtape drive. The formatted capacity is about 150 Mbytes using a DC600XTD cartridge. This is usually sufficient to hold an entire active file system partition on a small disk drive and to allow it to be backed up without user intervention, but for larger partitions a multi-volume backup may be performed.

Although the cartridge drive offers a degree of interchangeability with other manufacturers' systems, the only universally accepted standard is still ½-inch magtape.

One of two types of ½-inch industry standard magtape drive can be installed and will allow software to be exchanged readily with other similarly equipped installations. The OR-9600 is a competitively priced self loading unit which supports the standard densities of 800 bpi and 1600 bpi at 45 ips and the non-industry standard density of 3200 bpi, also at 45 ips. The more expensive quad-density OR-9610 additionally supports GC recording and replay at 6250 bpi, giving a capacity of approximately 180 Mbytes on a 2400 ft reel. Both drives will handle extended length 3600 ft tapes, increasing the capacity of a single reel to approximately 270 Mbytes. The ½-inch tape drives require an expansion enclosure (see next section).

The *tar*(1) format at 1600 bpi is a common method of exchanging files between UNIX systems on ½-inch magtape. The *dd*(1) program reads and converts tapes written on non-UNIX systems.

On systems with disk capacities exceeding 1 Gbyte, even ½-inch magtape becomes inconvenient as a backup medium. Multi-volume archives become essential and the resulting large numbers of tapes are expensive and bulky to store. For these situations, a very high capacity device, based on helical scan technology, is available. The OR-EXB stores in excess of 2 Gbytes on a single 8mm video cartridge, little larger than an audio cassette. The high quality of the media, small physical size, and long term data retention properties make this an excellent choice for high volume data archiving. Although not currently an industry standard, this format promises to be one in the near future.

System enclosure

The standard OR-ENCN enclosure is approximately the same height as an office desk and only 340 mm wide, and, as mentioned earlier, a CPU, one disk drive, a ¼-inch cartridge or helical scan tape drive, additional I/O sub-systems, and up to 32 terminal ports can be housed within it. More than one disk drive, more than 32 terminal ports, either the OR-9600 or OR-9610 ½-inch magtape drive, or an additional cartridge tape drive requires an OR-ENCW expansion enclosure which is attached to the right hand side of the standard enclosure. This is the same height and depth as the standard enclosure and 540 mm wide, bringing the total width to 880 mm. More than one OR-ENCW can be attached.

The ORION is suitable for use in an office environment. The heat output of a typical system is less than 1 kW and the power requirements can be met from a standard 13A mains outlet. The noise level is low, and composed of relatively pleasant white noise.

Terminal ports

The minimum system provides four RS-232C ports, used typically for up to three terminals and a printer. All data rates from 50 to 38,400 Baud are supported, with the provision for XON/XOFF or hardware (modem control) handshaking, 7 or 8 bit data, and even, odd or no parity. A 12 channel DMA based terminal multiplexor is available (OR-MUX), bringing the total number of ports to 16. To further increase the number of ports, more than one terminal multiplexor can be installed. Additional disk/tape controllers (OR-PIC) or communications controllers (OR-COM, see below) each provide an additional four

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ports.

The system supports a maximum of 64 terminal ports. Please note there is an additional software licence charge for systems that can support more than 16 users.

Communications

The OR-COM communications controller provides access to the industry standard 10 Mbit/sec Ethernet local area network (LAN). The ORION operating system (OTS) provides support for NFS and the DARPA TCP/IP protocols for remote login, file transfer, file system backup, electronic mail, and file sharing. The OR-COM hardware also includes four RS-232C serial ports which can be used to access wide area networks such as X.25 or JANET via a PAD, or as terminal ports. More than one OR-COM can be installed, allowing the system to act as a gateway.

It is also possible to operate the same networking software at reduced performance between ORION systems via simple serial terminal line connections.

For large installations, a high performance communications sub-system is available giving access to both X.25 networks and the CR82 Cambridge Ring. For the UK academic community a full suite of JNT coloured book protocols is supported by this option.

Software

The ORION operating system (OTS) is derived from UNIX 4.3 BSD and includes the Network File System. An optimising compiler for the C programming language is provided with the basic system.

Available at additional cost are compilers for Fortran 77, Pascal, COBOL, and Common Lisp, and interpreters for Prolog and BASIC. SQL is supported by a number of the database management products listed below. Support for windowing is provided by the X Window System[†].

The growing list of applications includes the REDUCE symbolic algebra system, the NAG mathematical and graphical Fortran subroutine libraries, the data analysis package SPSS-X, and the database management systems INGRES, Empress, and SIR.

All of these will run on a minimum ORION system.

Optional Items

ORION options include:

OR-LW   ORION LaserWriter. This high quality text and plotter facility is full integrated with the standard UNIX text and graphics processing software and can perform tasks ranging from printing simple text files to the production of high quality documents, forms, graphics and camera ready copy.

OR-IEEE488
    IEEE 488 instrumentation interface, including support software.

OR-PIF   General purpose 16-bit parallel DMA interface, including support software.

StarPoint   A choice of monochrome, grey-scale, or colour frame buffers with 1280x1024 resolution is available. Up to two of these can be added to the system to provide either high performance work-station facilities or dedicated graphics output devices. These are supported by mouse, keyboard, and the industry standard X Window System, allowing easy porting of graphics applications.

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† The X Window System is a trademark of MIT.