RISC OS Technical Overview

Introduction

The RISC OS operating system is a highly modular system, consisting of a central kernel providing low level facilities and numerous modules (in excess of one hundred and fifty) providing higher level libraries and functions. Some modules depend only on the kernel for the services they require (Eg. they only want memory for workspace), though others, such as User Interface components require the services of other modules, Eg. font and bitmap capability.

As would be expected from a modular system, everything apart from the kernel is replaceable dynamically - even after the operating system has started (in most cases - the window manager can not be replaced after it has started task manager services). For example a ROM might contain the kernel and several modules. New or replacement modules can then be loaded into RAM to extend the system.

In addition it is possible to turn an application into a module - then when in ROM, the application only requires a small amount of RAM to run in (used for stack and data storage etc.). A number of RISC OS applications already exist in this form and generally there is little difference between the sources.

This document describes the features and functionality of the kernel and some of the important modules.

The Kernel

The kernel is required for any RISC OS system to work. Unlike other systems it provides many services including a low level graphics library (though this may be removed for custom designs). The kernel provides the backbone for the module system - allocating module memory, software & hardware interrupt despatchers and inter module communication. It also has an application concept which allows non privileged execution - this can be further extended by the window manager and taskwindow modules to provide multitasking.

The graphics library supports simple text, bitmaps and primitives. It can cope with bpps from 1 to 32 and can also move or copy blocks of the framebuffer around. Its features can be extended by other modules, for example supporting more bitmap operations. A novel feature is that at run time the pixel depth and resolution may be changed on the fly. Many resolutions are supported (in fact only limited by the hardware) including 'TV' style modes which may be interlaced or have rectangular pixels.

Graphics support

As well as primitives, there is an advanced bitmap system, allowing scaling and rotation of bitmaps. There is also fast JPEG decompression and a vector based drawing system which can also handle beziers. A disc based application also supports conversion between many popular industry standards and the internal bitmap format (called Sprite in RISC OS).

Hardware support

RISC OS contains many drivers for supporting internal and external hardware. There are drivers for the IOMD/VIDC environment and the COMBO 665 chip. This provides serial, parallel, IDE and floppy disc support. Keyboard and mouse drivers are also available, with both PS/2 and quadrature mice support available.

Filing Systems

RISC **OS** provides a hierarchical modular filing system structure. Thus, at a low-level, it can support SCSI & IDE hard discs, SCSI &ATAPI CD-ROMs**,** floppy discs and, with third party modules, other SCSI devices (such as tapes). Support also exists for memory based filing systems, which may be resident in RAM, ROM, or both: allowing applications to access their resources easily and quickly. When combined with networking support, NFS, LanManager and a client-server filing system become readily available.

Support for DOS (as well as native) formats exists at a high level, and third party software is available allowing access to MAC OS formats.

In addition to this, the modular nature of the system allows a simple module to be written, supporting access to physical media using the native file format via the FileCore module. Full flexibility for any underlying filing system and physical media configuration can be obtained conveniently using the FileSwitch module: the hierarchical 'parent' of FileCore.

User interface

RISC OS provides an intuitive multitasking desktop environment - It is the most popular GUI in British schools. In addition to the standard Window and Icon support, there is also a high level toolkit of Objects providing standard GUI features like Print dialogue boxes or Font choosing mechanisms. This set may be extended by writing new modules. This toolkit makes GUI based application writing very simple as UI objects generate events and may be operated on with methods. A certain amount of functionality is also handled automatically and controlled via a configuration file - this may be edited with a high level Drag 'n' Drop based system.

There is also a Pinboard allowing applications or files to be 'pinned' to the desktop making them easily accessible. An icon bar lets the user control any application which has been loaded and gain access to the installed filing systems. Directories may be opened and modified by clicking and dragging.

Service applications are also supplied to change screen mode and monitor memory usage and task activity.

Printing

The printing system consists of a Manager application (which defines a protocol for print job managing and queueing) and a number of modules for driving the physical printer. Despite supporting hundreds of different printers, only a few basic drivers are required - these are then configured at run time (Eg. colour, dpi) via a configuration file. This generally means that printers from an existing manufacturer can easily be supported and their advanced features exploited.

Library support

A RISC OS ROM may also include a 'shared C library' (providing a RISC OS variant of the ANSI standard C library) which allows disk or PCMCIA based applications to link with a small 'stub' and then dynamically link to the ROM based library. This means that such applications may be very small. In addition many modules provide high level functionality such that an advanced function may only require the overhead of software interrupt. This is in some respects more flexible than the shared library as when only using a few functions, the overhead is very small. An example of this is the GUI toolkit which implements object handling within the module itself.

Applications

In the RISC OS application set are applications for text editing, bitmap generation/manipulation and vector drawing (including bezier support). There are also some simple desktop applications for character entry, online help and time/scheduling. The Acorn Browser is also available for local or networked web browsing.

Footprints

RISC OS S/W Packs

RISC OS is available as a whole or via various 'packs'. The following sections describes the contents of each pack and the approximate footprint (ie. size and where possible runtime RAM usage). Note that these are only approximate since a complete solution may not require the entire pack (eg. not all of the printer drivers are required at once), in addition a solution may not require the general interface provided by RISC OS.

Base Pack

	ROM size	RAM use	Notes
'Low level'			
Kernel	155k	100-200k	Actual amount depends on memory configuration excludes framebuffer size.
FPEmulator	30k	1k	
Various drivers	20k (total)	1-2k	Mouse, keyboard etc.
Shared C Lib	205k	5k per client	Clients can RAM or ROM based
'GUI'			
Window Manager	90k	10-30k	Provides WIMP and multitasking
Pinboard	20k	5k+backdrop	
Task Manager	15k	2k	
Desktop Filers	60k	10k	Filers for HD, CD, FD & SCSI
GUI Toolbox	300k	50k+	Provides high level UI interface
Misc	100k	20k	GUI servers
'Resources'			
Sprites, etc.	715k		Can be cut down as required
Fonts	250k		Four fonts with italic and bold

	ROM size	RAM use	Notes
Graphics Lib			
(low level graphics in kernel)			
Draw	15k	5k	
JPEG	20k		
Bitmap manip.	75k	10k	Caches common translations to improve performance
Colours	20k	5k	Provides RGB-palette control
Font Manager	60k	5k+cache	
'Printing'			
Printer Manager	210k	60k	
Drivers	40k each	5k	
'File systems'			
High level	100k	10k+buffers	
HD/FD	40k	10k	
CD+driver	40k	10k+buffers	
PCMCIA	60k	20k	

Multi Media Pack
Most CODECs are currently disc based, though ROMable

	ROM size	RAM use	Notes
Total package	500k		Depends on sound/movies
TimeCode	10k	5k	Including SMPTE

Networking

	ROM size	RAM use	Notes
Internet	120k	10k+buffers	Includes full TCP/IP stack
Drivers & FS	120k	10k+buffers	Including peer to peer disk sharing
Filers	100k	50k	Support for NFS
Lan Manager	50k	10k	

Applications

	ROM size	RAM use	Notes
!Draw	200k	60k+	
!Browser	450k	300k+images	Includes HTTP, FTP, URL and PPP driver
!Paint	150k	60k+	
!Edit	50k	60k+	

RISC OS Pack

All of above in 4 MB ROM image (+additional disk image) minimal configuration, 2 MB DRAM (which includes frame buffer) allowing ROM based applications to run, subject to size of object being edited.