

OFFLOAD: An Office Workstation in a Portable Software Environment

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Abstract

In order to exploit the ready availability of low cost, general purpose microcomputers as office workstations, an integrated environment has been assembled to allow for the straightforward use of a collection of software components. A closed user environment has been provided through the use of the OffLoad command interpreter which makes appropriate calls on the underlying operating system and utilities.

The software components provided within the OffLoad system include a document preparation editor, a filing system, document formatters, printing and help facilities. Utilities include a numeric calculator, a mailing list and form letter management system, cash flow analysis and data management aids. Interactive and file transfer communications are provided from the OffLoad workstation to a computer network which provides archive and shared file storage, electronic mail, ViewData, expensive peripherals and many other services.

The individual components of the workstation have common user interfaces and have been carefully integrated to ensure that their composite use is straightforward. Simple, but effective, aids are present to allow the user to configure the OffLoad system to personal tastes or particular office practices.

Introduction

The Edinburgh Regional Computing Centre (ERCC) Microcomputer Support Unit has responsibility for the introduction and support of personal computers in Edinburgh University. From 1979 to 1981 some 150 personal computers of significant size (i.e. not board level systems) have been introduced. The majority of these use the UCSD p-System (SofTech, 1981) which has been chosen as the basis for support. In 1981 the Microcomputer Support Unit was asked to undertake a requirements analysis of several administrative offices and evaluate computer systems with a view to satisfying those requirements in the University context (Macintosh, 1982).

As part of the ensuing Office Systems Study, several sub-projects were initiated. The evaluation and specification of three levels of office workstation based on the following hardware was undertaken.

- 1) a terminal (VDU) to a mainframe system
- 2) a general purpose microcomputer
- 3) a commercially available word processor/office system

In addition to consideration of the workstation as a separate entity, much effort went into exploring the ways in which the various types of workstation could be used as part of the extensive computer network already available in Edinburgh.

The OffLoad project was part of the Office System Study and was intended to collect together and integrate the various separate packages and utilities already in use on the supported microcomputer systems within the University and make them more suited to secretarial and administrative staff. An equally important aim was to identify gaps in the range of facilities provided to local users for use on their microcomputer systems. Existing and future users could then make use of their systems for administrative tasks and document preparation as well as for their primary purposes.

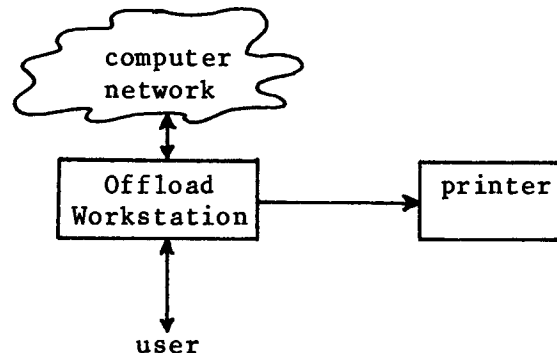
The Edinburgh Computer Network and Systems

To put the OffLoad project into context, this section outlines the computer services available to Edinburgh University users. The ERCC manages a network which provides several large public mainframes and services (e.g., twin ICL 2972, ICL 2980, a separate 3000 MByte filestore for distributed computer users, many peripheral services, etc), access to departmental mainframes (e.g., DEC 10, VAXs, PDP-11s, etc) and access to national and international networks via a gateway. The various network services can be accessed from nearly 700 terminals or other computers scattered around the three campuses of the University and its outlying research centres.

In addition to providing and operating the network and services on behalf of the University, a comprehensive range of consultancy, advisory and training facilities are made available. Support is given to users of the large mainframes operating system EMAS (Edinburgh Multi-Access System - Whitfield and Wight 1973), the departmental level multi-user computer operating system UNIX (Ritchie and Thompson, 1978) and the personal computer operating system UCSD p-System (SofTech, 1981).

Facilities Available to an Office Workstation via Communications

The OffLoad system is conceived as a workstation with significant local intelligence but operating in an environment where a connection to a computer network and various services is readily available.



For any type of office workstation which can provide interactive and file transfer communications to the Edinburgh network (and this includes the OffLoad workstation) a wide range of services of importance to flexible use of the system are provided in Edinburgh.

- 1) Archive and secure file storage and sharing of data through a large separate filestore for distributed computer users. Straightforward facilities are provided to allow files to be moved between the major mainframes, the filestore and distributed computers.
- 2) An Electronic Mail service across all the major mainframes. This mail service uses protocols which will allow it to be integrated to national and international mail services in due course.
- 3) A ViewData system used by many groups to publish "pages" of information on many subjects relevant to the University. Information may be accessed by browsing through the hierarchy of pages and their summary pages or by using keyword searches on page titles. The ViewData system is used by the mainframe systems staff for giving help to users in all the major system components; by the University Library for publishing book acquisitions; by support groups (such as Micro Support) for publishing software library catalogues, price lists, etc; by administrators for publishing minutes of committee meetings; etc.
- 4) A wide range of high volume and/or high quality output devices are available on a shared basis. These include photo-typesetters and graphical output devices.

Using the UCSD p-System as a basis for OffLoad

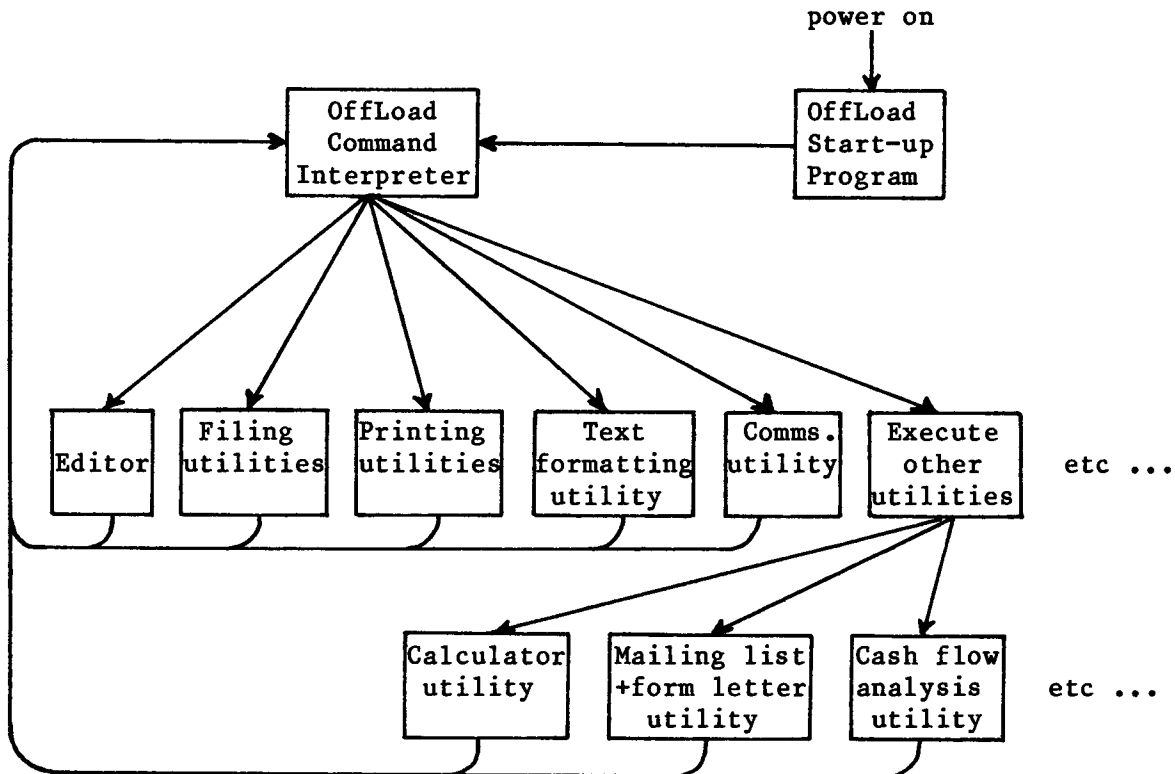
The UCSD p-System has been adopted as the basis for microcomputer support within the University. It allows for the effective exploitation of today's low performance microcomputer systems such as the Apple II, Intertec SuperBrain and DEC LSI-11 based systems. At the same time, it allows for the preparation of software which will port very easily onto the mid-performance systems now becoming available - such as the IBM Personal Computer and 16-bit microprocessor-based systems. In addition, the UCSD p-System has a strong development path which makes it a likely contender for effectively exploiting advanced, networked personal computers in the future.

Of importance to the OffLoad project were UCSD p-System facilities to allow the following:

- 1) the writing of hardware independent interactive utilities (with all screen control being handled by an operating system package)
- 2) facilities to chain programs together and to return control to the calling program. This together with the ability to nominate a program to be run when the operating system is booted enables a command interpreter (or shell) to be written which can replace the normal operating system command interpreter.
- 3) operating system functions to allow for the re-direction of system and program input and output. This will be familiar to users of the UNIX operating system (Ritchie and Thompson, 1978). It means that system facilities may be called upon from programs and utilities chained together to achieve composite functions in a user friendly manner.

The OffLoad command interpreter was provided using the above features and makes use of the normal UCSD p-System Editor and Filing System Utilities.

The OffLoad System Software Structure



On power on (or re-booting) the OffLoad system runs a start-up program which gives a greeting and encourages the user to set the current date if it is not correct. Many low cost microcomputers do not have clocks or calendars. So, the user must set the date to be used to log file changes, etc. After this, the start-up program calls the OffLoad Command Interpreter.

The OffLoad Command Interpreter presents a 'menu' or list of the choices at this point. This menu is uniform for every component and level of the OffLoad system. This gives the impression of the entire system being one integrated large program rather than many separate pieces. The form of the menus and the method of selection from them is described later.

The command interpreter directly provides help facilities for the following:

- 1) the functions of the main OffLoad components
- 2) the list of executable utilities available and their functions

- 3) special keys for using the workstation
- 4) several 'packaged' filing system utilities (called DiskAids) which allow the user to perform disk formatting, initialising, back-up, copying and tidying in a workstation independent way
- 5) a user or manager provided 'hints' page.

Once a legal selection from the components available has been made, the utility or sub-system is called. It will present its own menu if appropriate and user interaction will continue. When use of the utility finished, the OffLoad Command Interpreter will be recalled and its outer level menu will re-appear.

Menus - a Uniform User Interface

As mentioned above, every component and level of the OffLoad system which presents user choices uses a common interface.

The UCSD p-System provides an operating system module to control screen output and keyboard input in a terminal independent way. The operating system itself uses this package (though not completely in present releases). One function in this screen control package allows a 'menu' of choices to be presented for display on the screen and checks replies against a list of legal responses. The system automatically copes with splitting the prompt into lines of a length which can be displayed on the current screen size (to allow for screen window size specification by outer level systems), allowing the user to cycle through the choices if there are more than will fit in one screen window width and checking the user's (single character) responses until one matches the legal choices.

The 'menu' has a regular format shown in the following example:

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OffLoad: E(dit, F(iler, L(ist, C(omms, D(iskaid, X(ecute, H(elp, ?
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Such a prompt would normally be displayed along the top line of the current screen window. First the component or level name is displayed followed by a ':' to keep the user aware of the current level. Next each choice is given with a bracket separating off a character (normally a capital letter) showing what should be typed to make that selection. For example, type an 'E' to select the Edit option when 'E(dit' is shown. The '?' at the end of the line indicates that there are further choices which can be displayed by typing the '?' character. These can be cycled through if there are several lists of further choices (this most often happens on a screen in which only a narrow window is currently in use). To make the interface more uniform, it is common to use 'Q' for 'Q(uit' to go back up one level in the hierarchy of prompt levels or system components.

This mechanism has been exploited in the OffLoad Command Interpreter and the various components of the system. The software interface is such that we expect that no change to the high level components will be necessary to exploit different menu presentation and selection methods on future computers (such as 'pop-up' menus with pointer selection).

Configuration and Tailoring in OffLoad

The OffLoad system and its various components achieve hardware independence by making use of configuration information held as tables on the system disk rather than having built-in constants. These are used for the following (amongst other uses):

- 1) information on how to perform disk operations such as disk formatting, initialising, copying, etc.
- 2) use of special keys for workstation use
- 3) the size of disks, the properties of the communications port and the printer port
- 4) the type of printer in use and its characteristics.

In addition, those utilities which need to take default values for parameters, when not specified explicitly by a user, use a mechanism which allows the user to configure the workstation (once) so that subsequently the utilities will use the set value rather than the utilities' own defaults. In addition to this, care has been taken to ensure that the actual defaults built into the utilities offer a consistent 'feel' to the separate components. For example, printing utilities, text formatters and the documented methods for creating and using documents all default to A4 formatting with the same margin specifications, etc. This helps the user to move between components as necessary without undue preparatory work.

The Components of OffLoad

It is not the function of this paper to describe the various components of the OffLoad system in detail. However, an overview of the main components may help in understanding the type of Office Workstation we have provided.

- 1) Screen Editor. The screen oriented editor incorporates elaborate document preparation commands. These include filling mode insertion for rapid input of text, margin specification and re-margining, cut and paste operations, exchange (or paint) mode editing, column manipulation and previewing page boundaries with moving commands. If the display hardware can support it, selections from two fonts can be made for the text in a document.
- 2) Filing System Utilities. There is a collection of facilities to examine the directories of the system disk, to copy, remove and change the names of files, to copy entire disks, etc. The 'DiskAids' facilities in OffLoad are intended to provide a straightforward method of manipulating entire disks, taking back-up copies of disks, etc.

- 3) Simple Paginated Output Utility. A simple utility performs rapid printing of documents allowing underlining, selection of an alternative printer font and user-definable page lengths with automatic page numbering in several styles. Layout is menu selectable or can be configured via the OffLoad facilities.
- 4) More Complex Formatting Utility. The user interface is upwards compatible with the simple output utility. In addition, the more extensive utility provides for right and left justification of text, complex layout specification, line spacing variations, automatically generated indexes, proportional spacing on certain printers, etc.
- 5) Diagram Preparation and Printing. On workstation hardware which supports graphics, facilities are available to allow for the preparation of diagrams for inclusion in papers. They are only a crude start towards the provision of facilities that will become more important when the appropriate editing and printing technology is readily available.
- 6) Mailing Information. This is a utility to manage a data base of name, address and other information. It allows for the production of two types of output: mailing labels and form letters. Extensive selection criteria for mailings can be specified.
- 7) Communications. The communications package enables the microcomputer to act as a video terminal to a host computer and also to perform file transfers. This facility enables documents generated on the OffLoad system to be moved to a secure filestore and allows access to more sophisticated document preparation tools (e.g., on EMAS or UNIX) and printing devices (e.g., photo-typesetters).
- 8) Other Facilities. Other utilities available include workstation configuration aids, an arithmetic calculator, a document comparison utility, sort/merge facilities, a cash flow analysis system and others. A data base management system is nearing completion which will run on both the EMAS mainframe service and on the UCSD p-System on which OffLoad is based.

Resource Sharing in Low Cost Local Area Networks

The type of hardware suitable for running the OffLoad package is sufficiently low in cost that the price of a high quality printer can double the total cost of the workstation. Hence it is important to consider ways in which expensive peripherals can be shared effectively. We are currently experimenting with a low cost local area network which allows for shared use of fixed disk storage (in the 10 to 80 Mbyte range) and sharing of a printer and a communications gateway to a large computer network. Several different microcomputers can be attached to the network all running the UCSD p-System, OffLoad or other operating systems.

The OffLoad components which normally output to a printer use a machine specific printer interface module. This is being replaced by a module to send output to the shared printing facility instead.

Implementation

The OffLoad system has been provided in the UCSD p-System version IV.0 on an Intertec SuperBrain QD microcomputer in the first instance. There is little restriction on the type of microcomputer which could run OffLoad except that at least two disk drives with a minimum of half a MegaByte of storage between them is necessary to allow the major components of the OffLoad system to reside on a single disk (leaving the other disk free for user data and documents).

The command interpreter was provided during a project over Summer 1981 at ERCC. The various components used within the OffLoad system were already in existence in some form. However, a great deal of care was taken during the OffLoad project period to integrate the components fully into a uniform system as described in this paper.

The OffLoad system is now in use within Edinburgh University on a regular basis. The separate components are used on most microcomputers available within the University. Some of the components are proprietary and are only available under licence.

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