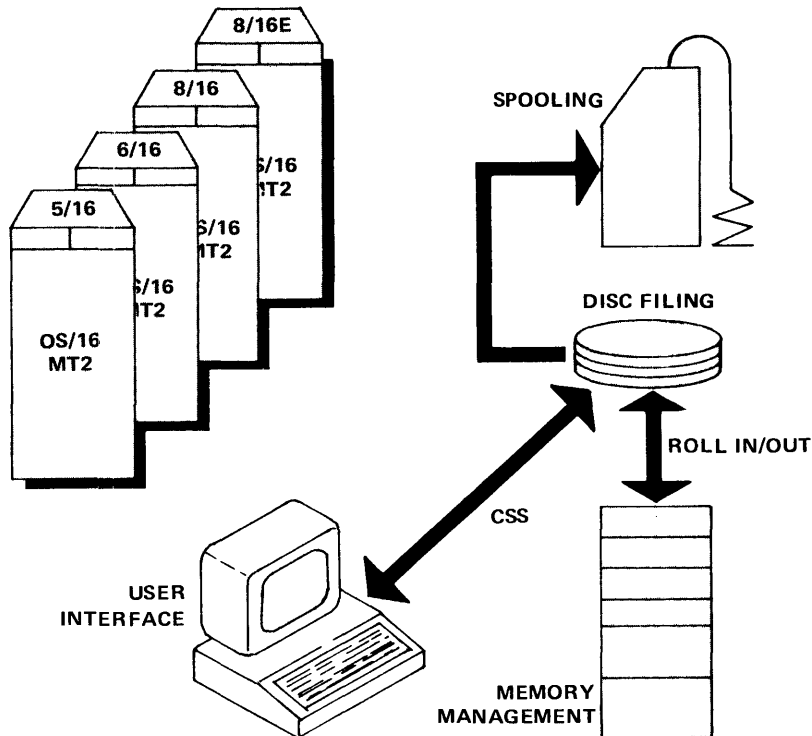


OS/16 MT2

Real-Time Multi-Tasking Operating System



PRODUCT DESCRIPTION

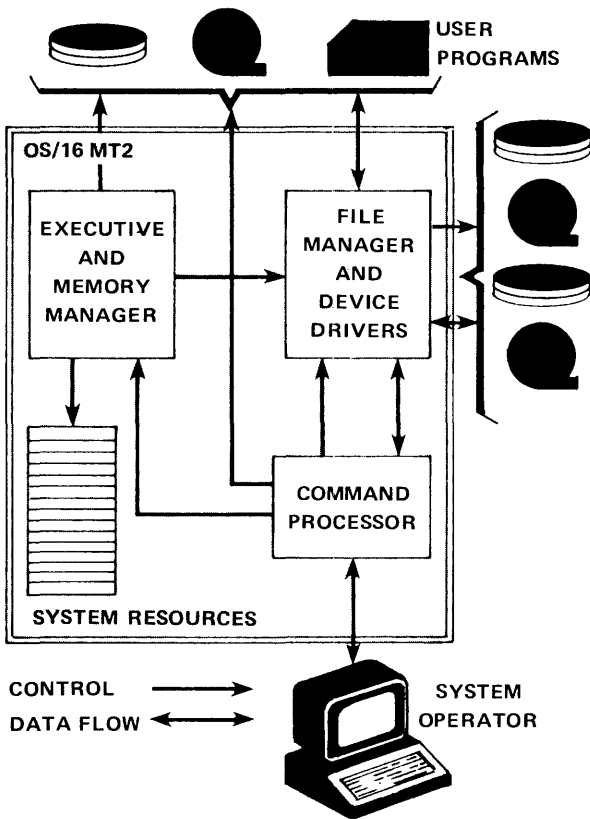
OS/16 MT2 is a multi-purpose operating system which provides an event-driven environment for user application systems on Interdata's entire family of 16-bit processors. Designed for power and flexibility, OS/16 MT2 provides support from Interdata's 5/16 with 8 KB of memory through the extended 8/16E with 256 KB. OS/16 MT2 can be completely memory resident to satisfy real-time response requirements, or disc resident for less time-critical OS functions.

OS/16 MT2 manages all system resources, including processor access. Access is provided on a strict user-defined priority basis. Up to 256 levels of task priority are available. OS/16 MT2 provides intertask control and communication facilities, including task common and re-entrant libraries.

The comprehensive command set offers large mainframe-like flexibility and process control capability. By using the Command Substitution System (CSS) embedded in the OS, a user can readily create operational procedures on disc, permitting complex operations to be performed with a single command. Multiple CSS files allow the user to customize his interface with the OS to match individual requirements and work habits. Interdata also supplies a High Level Operator Command Package (HLOC) implemented as a set of CSS files. This package performs a variety of commonly used program preparation and development sequences.

FEATURES

- Comprehensive Task Management
 - Up to 256 task priorities
 - Task Scheduling
 - Intertask Communications
 - Task-Handled Traps
- Extensive Memory Management
 - Partitioned System with Foreground, Background, Task Common and Resident Library
 - Extended Memory Support up to 256 KB
 - Task environments up to 64 KB, of which 32 KB is sharable with other tasks
 - Task Establisher Utility; image loading of foreground tasks
 - Up to 126 Tasks in Memory
 - Roll In/Roll Out
 - Overlay Facilities
- Powerful File Management
 - Indexed and Contiguous Files
 - File Protection at File and Task Level
 - Device-independent I/O
 - Named and Protected Devices
- Convenient User Interface
 - Powerful Command Set
 - Operator Communication through the Command Substitution System
 - Program Interface through Supervisor Calls
 - Spooling



TASK MANAGEMENT

Task Management is the overall process by which a task is created, scheduled and executed. OS/16 MT2 supports user-written tasks with up to 256 priorities. Processor access is provided on a strict user-defined priority basis. Several or all tasks can share the same priority, with processing between them shared on a round-robin basis. When round-robin scheduling is selected, processor access is rotated on either an I/O or a precision interval clock interrupt.

Task Scheduling

Task Scheduling is performed on a priority basis, an individual task being activated by any of four events.

- Operator Request – Through the command console, the operator can request tasks to be run at any time.
- Hardware Interrupt – The full range of ISA process control event facilities is provided at the task level (CONNECT, THAW, FREEZE, UNCONNECT).
- Time Scheduled Tasks – Tasks can be scheduled to run at a particular time of day or after an elapsed period of time.
- Inter-task Events – Tasks can communicate with and activate other tasks.

Intertask Communications

By means of a Supervisor Call (SVC), foreground tasks are provided with a wide range of intertask communications capabilities which enable the user to build a well-structured system of tasks. The Supervisor Call permits a user task to load, start, suspend, or cancel a task and to queue a parameter or send a block of data to tasks. Other capabilities

of the Supervisor Call permit the changing of a task's priority and the ability of a task to respond to an external interrupt.

Task-Handled Trap

This powerful task-level facility permits a task to be interrupted from its normal execution sequence by any one of a number of software or hardware causes. Task-handled traps can occur as a result of an external interrupt, completion of an I/O proceed request, termination of a specified time, or receipt of a data block from another task. Task-handled traps are invaluable for the real-time systems programmer dealing with an environment of multiple asynchronously occurring events.

MEMORY MANAGEMENT

Partitioned Memory

OS/16 MT2 provides complete supervisory services for Foreground, Background, Task Common, and Resident Library partitions. As tasks are loaded, executed, or terminated, the OS/16 MT2 Executive performs all checks, status changes, loading, and clearing of partitions. OS/16 MT2 partition management facilities provide a flexible and reactive system that is easily adjusted to user needs.

Extended Memory Support

OS/16MT2 provides full support for Interdata 16-bit processors with a maximum of 256 KB of memory. The features of OS/16MT2 extended memory support are:

- All user software currently running under a non-extended OS/16MT2 system will run without modification.
- Established and non-established tasks can be loaded anywhere in memory.
- Multiple task environments are up to 64 KB each, depending upon available memory, 32 KB sharable with other tasks.
- Memory Page Size is 32 KB for minimum system overhead.

| | |
|------------------------|--|
| Fourth 32KB Page | 12KB systems space |
| | 10KB user 10KB user |
| Third 32KB Page | 12KB user 10KB user 10KB user |
| | 13KB user 19KB Basic Interpreter |
| First 32KB Page | 8KB user 8KB user 16KB OS/16 MT2 |

This example system is SYSGENed with 9 foreground partitions in a 128KB environment, and is dedicated to BASIC.

Interdata's implementation of extended memory support maps a maximum of 256KB into eight pages of 32KB each. Mapping for individual tasks is accomplished at load time and is transparent to the user. The OS occupies the first page. Task Common and a reentrant library, such as Interdata's BASIC Level II, reside in the second memory page. The remaining six pages of memory contain user tasks. A user task anywhere in memory can directly reference Task Common and/or a sharable library in the first or second pages.

For efficient memory use, user tasks can also be loaded in the first and second pages. For a system dedicated to BASIC, both the OS, suitably SYSGENed, and the BASIC Level II Interpreter can be placed in the first page, allowing seven 32KB pages for user tasks. Each page can be partitioned as desired and individual tasks on a page can be specified as memory-resident or eligible for rolling.

Task Establisher

Object modules produced from compilations and assemblies can be established using the Task Establisher (TET/16). TET/16, a user level task which operates in batch or conversational mode, automatically builds a load module in memory image suitable for execution under control of OS/16 MT2. Establishment includes satisfying all external references, setting task priority and defining overlay structure. Other parameters include such items as task size, whether Task Common or Resident Library is used, or whether a task should be considered resident.

Roll-In/Roll-Out

While up to 126 tasks may be resident in memory, space requirements may necessitate that the Executive roll-out a low-priority task to execute a higher priority task. The rolled-out task is stored on disc file and, upon completion of higher priority processing, is rolled-in and restarted at the point that its execution was suspended.

Overlay Facilities

OS/16 MT2 has multi-level task overlay facilities which are defined for a task via the Task Establisher TET/16. Additionally, several sections of OS/16 MT2 may be optionally overlaid. The system planner can choose to make OS/16 MT2 completely memory resident to enhance real-time response, or to overlay such portions as the File Manager or Command Processor to minimize memory usage.

FILE MANAGEMENT

Indexed and Contiguous Files

Files in OS/16 MT2 are identified by a three-part file descriptor consisting of volume name, file name, and extension. An example of a file descriptor is DSK1:FORT.SRC, which specifies a disc known as "DSK1" to the system and a file containing FORTRAN source.

The indexed file structure provides a file organization that allows the manipulation of logical records that are automatically blocked and deblocked. These logical records can be accessed either sequentially or randomly by

specifying a logical record number. The indexed file is open-ended, does not require pre-allocation of disc space, and allows new data to be appended to it.

The contiguous file organization is designed for those applications in which the file is fixed in terms of growth and activity. The user can apply his own particular algorithms or logic for data management with minimal system overhead. Contiguous files are particularly useful for real-time data acquisition applications where data must be obtained and stored rapidly for later analysis. The file consists of pre-allocated, contiguous sectors which are to be read or written using relative sector numbers for either sequential or random access.

File Protection

Files and devices can be protected either statically or dynamically.

For static file protection, the read/write keys are allocated with the file and must be provided to assign the file.

For dynamic file protection, the user requests shared or exclusive access privileges, either read or write, at assignment time. Dynamic file protection allows a task to prevent other tasks from accessing a file while it is being used, and remains in effect only while the file is assigned.

USER INTERFACE

OS/16 MT2's interface simplifies communication between the user and his system at both program and operator level.

Program Interface

Program Interface is provided through Supervisor Call instructions. Supervisor Call instructions are executed by programs to request OS/16 MT2 services. The parameters associated with the request are passed to the OS in a parameter block. Most console services are available through Supervisor Call instructions.

Operator Interface

The operating system is controlled by the operator through a system console, typically a CRT, Carousel, or Teletype. The operating system reads commands from the console and writes system messages to it. Tasks may write messages to the system console.

An extension to OS/16 MT2, the Command Substitution System (CSS), allows commonly performed operations to be executed with one command. The user establishes files of commands that can be called from the console and executed in a defined sequence. In this way, complex operations are carried out with a few operator commands. These commands are analogous to macro instructions in assembly language.

High-Level Operator Commands

To simplify the use of OS/16 MT2, Interdata has developed a library of commonly used operator command sequences. CSS commands including:

FORTCLG — Performs a FORTRAN compile and go sequence

RUN — Executes a program

ESTAB — Established a task in OS/16 MT2

Spooling

OS/16 MT2 provides an output spooling capability through an Interdata-supplied Spooling Task. Print output to be spooled is directed to an intermediate disc file instead of directly to the print device. The Spooling Task searches file directories for files to be printed. The installation can run this task continually, or at off-peak hours. Files can be submitted for spooling when the Spooler Task is not active and printed later when memory requirements permit.

The Spooler Task requires less than 2KB of memory. For installations with multiple printer devices, multiple copies of the Spooler Task can be run concurrently, each assigned to a particular print device.

COMPATIBILITY

OS/16 MT2 is a generally compatible subset of Dynamic OS/32 MT, the operating system for Interdata's 32-bit computer. Thus, programmers at installations with Interdata 16-bit and 32-bit products need no extensive retraining to work on the larger 32-bit machines. Disc files written under OS/16 MT2 are completely portable and can be read under Dynamic OS/32MT without modification.

SOFTWARE SUPPORT

The following software packages can be used in conjunction with OS/16 MT2.

Language Processors

- Extended FORTRAN IV ANSI standard with extensions. Run Time Library includes ISA/Purdue Real Time Extensions.
- BASIC II Dartmouth standard plus extensions, including string and matrix manipulations.
- CAL (Common Assembly Language) Assembler Allows user to target object code to either 16-bit or 32-bit processors.
- CAL/16 Subset of CAL; allows assembly of 16-bit source programs.

Software Utilities

- OS EDIT Interactive character editor allowing update of either ASCII or binary files.
- OS AIDS Comprehensive interactive debugging program.
- OS Library Loader Provides user with tools to create, maintain, update, and load from program libraries.
- OS Copy Binary or ASCII copy of file volume for peripheral conversion, reproduction, or data retention.

- ITAM/16 Provides the user with a simple device-independent method for data transmission over synchronous or asynchronous communications lines (for 64 KB systems only).
- CUP Generates assembly code required to customize OS/16 MT2.
- TET Provides simple establishment of user tasks.
- Disc Compress Provides for maintaining and copying user discs.
- Disc Integrity Checker Gives user double check of disc validity.

SYSTEM CONFIGURATION

Minimum hardware configuration to support OS/16 MT2 requires the following Interdata products:

- Interdata 16-Bit Processor
- 8 KB Memory for OS Operation
- 64 KB Memory for SYSGEN Assembly of OS/16 MT2
- Console Turnkey Panel
- Console Device
- Binary Input Device

MINIMUM SYSTEM GENERATION HARDWARE

A system without disc requires two ASCII I/O devices, a binary I/O device and 64 KB of memory.

A system with a disc requires one ASCII I/O device and 64 KB of memory.

Interdata can supply an in-house system SYSGEN for users without minimum hardware requirements.

SUPPORTED INTERDATA EQUIPMENT

Display Panels
Power Fail-Auto Restart
Memory Protect
7 and 9-Track Magnetic Tape
INTERTAPE Cassette
Floppy Disc
Discs, 2.5, 10, 40 Megabyte, MSM80 and MSM300
High Speed Paper Tape Reader/Punch
Line Printer (60 to 600 lpm)
Card Reader (400 to 1000 cpm)
Carousel Terminal
TTY
Video Displays, Model 1100
Mini Input/Output System (A/D, D/A)
Universal Clock Module
Single and Multi-Line Asynchronous Communications
Adapters — PALS, PASLA
Real-Time Analog System (RTAS)

INTERDATA PRODUCT NUMBER

S90-010 OS/16 MT2

The information contained herein is intended to be a general description and is subject to change with product enhancement.