LOGICAL DATA CORPORATION

Features

- **Transparent to Standard MODCOMP⁺ System I/O**
- **Site Configurable**
- **Dynamic User Task Priority Control**
- **Controls Resident Memory Usage for Each Task**
- **File Manager Support**
- **Block and Conversational Mode Terminal Operation**
- **Simplifies Creation and Maintenance of CRT Forms**
- **Virtual Terminal Support**
- **Application Programs Independent of Terminal Type**
- **Supports Most Terminal Features**
- **Terminal/Printer Spooling**
- **Terminal Usage Statistics**
- **Site Definable Security**
- **Master Terminal Control**
- **User-Defined Modules Supported**
- **Transparent Pre/Post Processing**
- **Language Independent Interface**
- **Variable Format Control of Local Printer**
- **Manages Direct, Dial-Up, and Port Contention Communications**
- **I/O Trace**

TSX/32

Time Sharing Executive & Transaction Processor
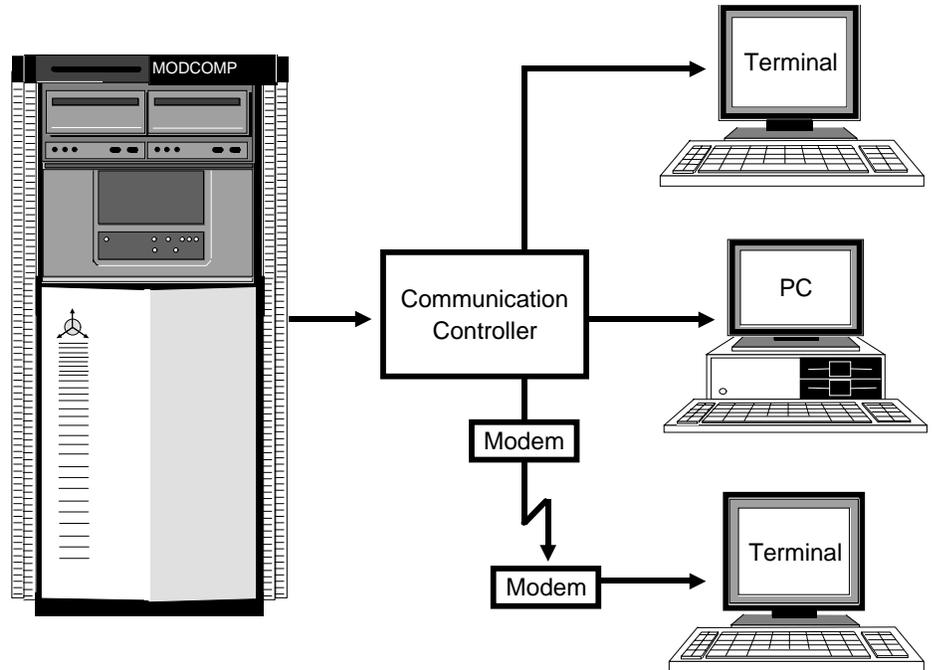

Figure 1: Multi-User Interface for MIS & Control Systems

The Time Sharing Executive and Transaction Processor (TSX/32) expands the capabilities of the MAX 32 Real-Time Operating System. It provides an excellent multi-user interface for environments from process control to information systems without compromising the high speed real-time facilities of the operating system.

By supporting both conversational I/O and full screen forms using block mode I/O, TSX/32 makes programming easier. TSX/32 supports advanced terminal features in a format independent of terminal type, protecting valuable applications from expensive modifications as newer devices become available. While eliminating the need to understand the complexities of each type of terminal, TSX/32 maximizes system efficiency by utilizing the intelligence of each terminal while off-loading the central processing unit.

In addition, TSX/32 solves communications, presentation, and security problems using a layered system architecture.

FUNCTIONAL DESCRIPTION

Basic Structure

TSX/32 is a table-driven symbiont task. It buffers I/O between the user tasks and corresponding user terminal devices while synchronizing the relative priority of user tasks on a demand basis. All operations are transparent to programs and users.

TSX/32 provides log-on security control, user task activation and monitoring, and system resource and communications management. User tasks are unrestricted by TSX/32 and are free to perform any function permissible under the MAX 32 Real-Time Operating System.

TSX/32 can be tailored to individual site requirements by macro statements describing the terminal characteristics, tuning parameters, and security options. These statements are assembled and link-edited in a process similar to that used in a System Generation. The resulting version is stored as the symbiont task, which can be scheduled to automatically begin operation whenever the system is started.

I/O Interface

TSX/32 interfaces with individual user tasks through the basic I/O System. It processes all I/O requests for ASCII mode operations according to the rules of the Asynchronous I/O Handler. Certain binary operations are extended for additional special functions. Programs may be written in any language.

Terminal communication occurs through full or half-duplex, asynchronous channels. Output data is routed through spooling files to the output channel while input is directly buffered by TSX/32. Fully spooled output allows programs to complete execution at a maximum rate, independent of communication speed.

Advanced Spooling System

TSX/32 includes a high performance output spooling task named SPL/32. ASCII and binary operations are supported transparently, conveying both data and I/O options. A single symbiont supports all spooling operations on as many devices as needed. Efficient queuing techniques reduce SPL/32 overhead proportionally to actual work, not to the number of devices.
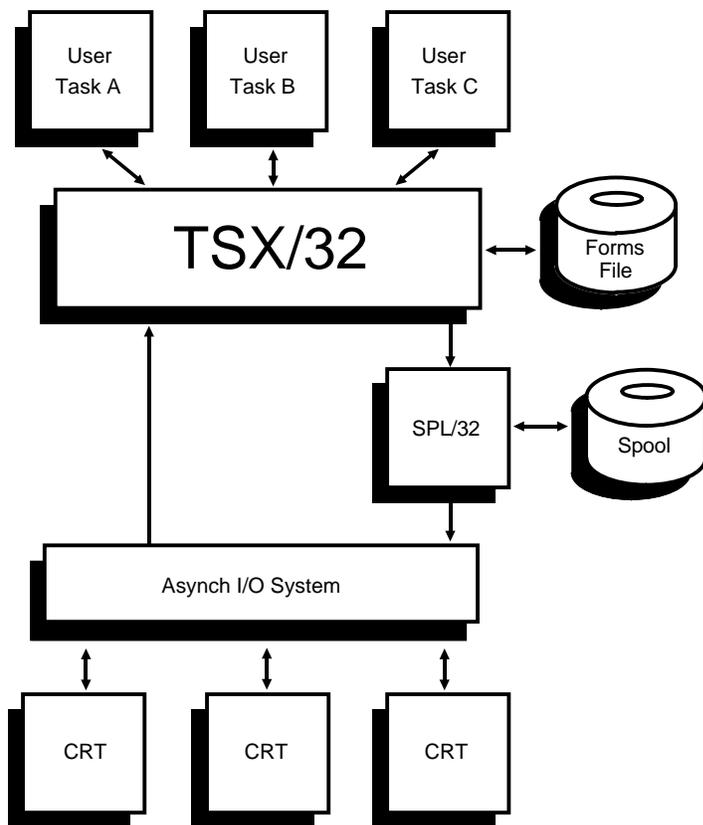

Figure 2: TSX/32 System Interface

Storage can be specified in blocks located in memory and/or on disk. Single disk files can be shared among many spool files. SPL/32 notifies the operator(s) of any condition delaying output. An Operator Control (OC) directive allows display of spool status, help, and control of spool operation. User custom code may be included to control physical device acquisition and release in order to support peripheral switching or other special handling.

Virtual Terminal Control

Extended I/O options provide additional features useful in terminal communications and transaction processing. TSX/32 recognizes a set of terminal independent control codes and attributes that are converted at I/O time to actual escape sequences for specific terminals. Under this concept, TSX/32 supports a variety of terminal types while maintaining independence in user application software. Refer to Figure 3.

Input translation options may be specified to detect function key sequences and cursor position, convert input to a terminal-independent format, and solicit immediate transmission of data on the CRT display.

TSX/32's modular architecture supports both standard and user-written translation routines.
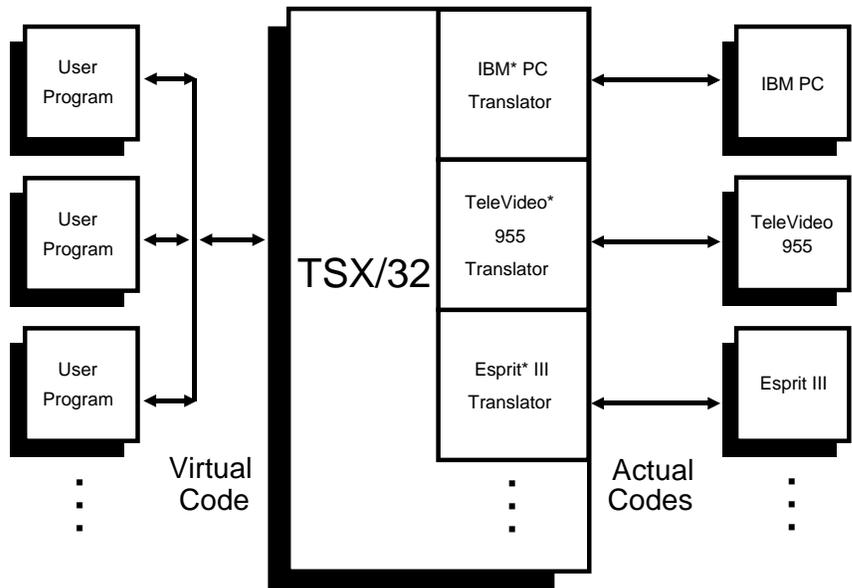

Figure 3: Virtual Terminal Control

Device Simulation

TSX/32 models and simulates vertical format control defined for standard line printers to accurately interface between applications and slower speed serial printers to provide consistent output with end of form feedback.

Terminals with suitable auxilliary ports may support attached slave printers or other devices. TSX/32 simulates these as two independent logical units automatically inserting switching codes to conserve communications links.

Communications Control

TSX/32 supports direct connect, dial-up, and a variety of special devices and networks using its rich set of RS-232 signal options. Direct connect terminals can be attached without use of control signals. TSX/32 supports all standard MODCOMP communications controllers including DCS for dial-up as a ring, break, and disconnect linemonitor task. Dial-up support ensures proper session protection if interruption of communication occurs. TSX/32 can control data terminal ready (DTR) at end of session to automatically disconnect modems or signal port contention switches.

Diagnostic Trace

TSX/32 provides a complete, formatted trace of I/O flowing between an application and TSX/32 or between TSX/32 and any terminal. This diagnostic tool can be enabled at any time on one or more ports. This eliminates the need for line analysis in many cases and lets the programmer accurately view data flow at all interfaces. This can save hours of diagnostic programming and fault isolation for software and hardware problems.

Priority and Memory Scheduling

TSX/32 dynamically controls the memory residency of each user task through an internal queuing algorithm. Tasks completing terminal input are raised to the highest priority to allow prompt response. Programs that are highly interactive tend to remain responsive, independent of CPU loading. As programs execute, the priority is lowered based on memory consumption and time.

Tasks awaiting terminal input are lowered in priority, reducing system overhead. TSX/32 controls Task Control Block (TCB) roller flags for each user to allow for a roller task to swap user tasks to and from disk. Currently, MAX 32 does not support a roller task, but such a task can be user written if memory requirements are exceeded. The TSX/32 roll

algorithm is identical to the MAX IV TSX roll algorithm. Namely, tasks awaiting terminal input are rollable and will be flagged to roll after a specified period if input is not received. If total private memory usage exceeds a specified value, tasks lowest in the priority list will be flagged to roll out of memory. This makes room for higher priority (more interactive) users.

Operator Controls

Operator Communication (OC) directives allow the system operator to examine and control processing activities of each terminal, security passwords, communication line parameters, and terminal translation facilities.

Terminal Control Functions

Selected TSX/32 terminal users can exercise control over their jobs from their terminal keyboard. Users may suspend or resume output, terminate processing, suppress output, and display statistics by entering special control codes. These functions, interpreted by TSX/32, are completely transparent to programs running under TSX/32. Additional site-defined control functions may be added to TSX/32 to extend this facility.

In addition to these control functions, MAX 32 users can invoke the Terminal Monitor Program (TMP) and Operator

Communications (OC) features at the terminal level. Permission for this level of access is dependent upon the individual site system generation (SYSGEN).

Security

User name security prevents unauthorized access. A TSX/32 user must log on using an identifying password to gain access to the system. User names can be restricted to specific terminals to provide controlled access. The system operator can add, delete, or modify access for any user name during operation. TSX/32 can detect repeated attempts to gain access unsuccessfully. It will alert the system operator and lock or disconnect the port to prevent further attempts.

Complete application program systems can be accessed without requiring the user to use Job Control or any other "system" functions. True security is maintained by restricting users to only authorized applications. More extensive user-password security fully integrated with TSX/32 is available as an optional package.

Auto Log-on

Ports may be automatically logged on to a predefined password at start-up. This allows timeshared support of devices that do not have the capability of "logging on". Programs can then be connected

to operate devices like badge readers, gas meters, point-of-sale terminals, and other specialized devices. If a fatal error occurs in the application used, TSX/32 will automatically restart the program.

Resource Allocation

TSX/32 allocates system resources specifically designed for each user. A user can log on to different terminals and always maintain a consistent operating environment.

Sets of user resource directives are cataloged on a USL directoried source library. At log-on and log-off, these directives are processed by the TSX/32 Program Loader to control the operating environment for each user task.

Resource files control logical file assignments, task operating options, file manager commands, pre/postprocess program definitions, and file list and copy functions. Resources files can be nested, calling other resource files.

Complete File Manager support is included to provide for automatic file creation and/or opening at log-on. At log-off, File Manager files may be destroyed or closed as desired, all transparently.

Resource files may contain text string substitution meta characters to incorporate user name, user id, and port number on a dynamic basis for even greater flexibility.

Specifications

- **TSX/32 Task Nucleus - 46 Kb**

- **Translator - 1.5 Kb**

- **Tables and Buffers - 1.2 Kb per port**

- **SPL/32 Task - 2.6 Kb code and 3.4 Kb per device (minimum) or 7.9 Kb per device (average)**

- **576 ports (maximum)**

Custom Elements

TSX/32 recognizes the need for custom features to be added to TSX/32 and its environment. A number of internal structures have been developed with this concept in mind. Custom codes that may be added to the TSX/32 task include those listed on the left.

Custom pre- and post-processing application programs executed at log-on and log-off may be included to perform custom accounting, file access, security, or other functions transparently to user applications.

Custom elements added to TSX/32 have allowed control of TSX/32 terminals to be given to other tasks or terminal handlers and to be returned in an orderly fashion. Others have implemented network pass-through capabilities, allowing a TSX/32 terminal to be dynamically connected to TSX/32 on remote CPUs.

To assist in permitting user-written custom elements to be upwardly compatible with future TSX/32 revisions, a complete set of TSX/32 data structure equates is supplied.

Migration

No modifications are required to move 16-bit TSX applications to TSX/32 and vice versa. Most 16-bit applications developed on either system may be executed in object format on the other system without recompilation or relinking. Two identical subroutine libraries are supplied for 16- and 32-bit applications, allowing 16-bit programs to be converted easily to 32-bit versions as needed.

Custom TSX elements are also easily upgraded to TSX/32 since register interfaces have been preserved. Even the TSX/32 task generation macro statements are identical with those used by MAX IV TSX.

Subroutine Libraries

Callable routines to support commonly used functions using terminal independent virtual codes for CRT-oriented transaction processing are available for Fortran, Fortran 77, COBOL, Pascal, C, and Assembler. The TSX subroutine library includes:

- CALL FORM - display form on CRT

- CALL LINE (LINE2) - position data with or without visual attributes on specified terminal (A1 or A2 data)

- CALL POS - position cursor on CRT with up to 50 lines and 132 columns

- CALL ERASE - clear CRT screen from position specified to end of display, erase data for all unprotected blanks, or position cursor and output a virtual code to activate a different erase function

- CALL CUHOME - position cursor to first unprotected position on CRT

- CALL OUTA1 (A2) - output buffered data on specified terminal (A1 or A2 data)

- CALL REPLY (REPLY2) - read buffered data or Function Key input from terminal (A1 or A2 data)

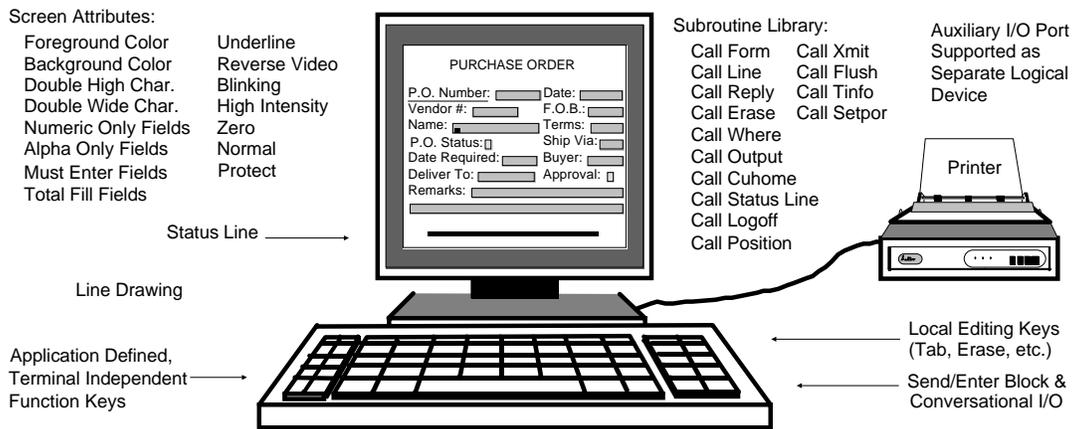- CALL QREPLY (QREPL2) - allow program to continue processing while receiving reply (A1 or A2)

Figure 4: TSX/32 Programming Aids and Generated Form

- CALL TREPLY - terminate a QREPLY or QREPL2 call

- CALL FLUSH - request output of accumulated buffer data

- CALL TINFO - request information about a terminal: program name, load module, user id, resource name, loader option word, user alias, terminal name, terminal characteristics

- CALL LOGOFF - log off a port with or without locking it

- CALL WHERE - locate current position of cursor on CRT

- CALL XMIT (XMIT2) - transmit all unprotected data from CRT (A1 or A2 format)

- CALL STLIN (STLIN2) - turn off status line, dislay default status line, or display specified status line (A1 or A2 formatted message)

- CALL SETPOR - switch all I/O from caller's port to specified port (effects entire package of subroutines)

CRT Forms Generator

CRT forms have many uses as easy to use application program screens, menus, and even log on displays. The

TSX/32 Forms Generator simplifies the creation, storage, and maintenance of CRT forms. Forms up to 160 columns by 64 lines are supported.

The TSX/32 Forms Generator converts user-supplied screen source input into a compact form, utilizing the virtual terminal control codes. The program stores these forms on a dedicated, directorized file.

Application programs can efficiently handle data entry and retrieval using TSX/32 forms and the buffered input ability of TSX/32. User programs simply request the form to be displayed; TSX/32 does the rest. Since forms are not embedded in application programs, forms maintenance can be performed without affecting executable programs. As shown in Figure 4, terminal independent screen attributes, function keys, and local editing keys are available with TSX.

Terminals Supported by Standard Translators

- **Lear Seigler ADM 31 and 42**

- **Hazeltine Esprit III**

- **Hewlett Packard 2392A**

- **IBM 3164**

- **IBM PC, XT, AT, PS/2, and compatibles**

- **TeleVideo 925**

- **TeleVideo 950**

- **TeleVideo 955/65**

- **Wyse WY-50**

ADDENDUM

The following provisions have been established for Software Licensing, Installation, and Maintenance for TSX/32 Time Sharing Executive and Transaction Processor.

Documentation

Each TSX/32 license includes two reference manuals. Additional copies can be purchased.

Licensing

TSX/32 is a licensed software product and requires receipt of a completed, written LOGICAL DATA CORPORATION PROGRAM LICENSE AGREEMENT prior to shipment. This Agreement provides in part that the software and any part thereof may be used on only the single CPU on which the software is first licensed (provision is made for a backup system), and it may be copied in whole or in part (with the inclusion of the Logical Data Corporation copyright notice and proprietary notice(s) on the software) only for use on such CPU.

Code Availability

TSX/32 software is provided to customers in object code format.

Software Release Media

The standard release of TSX/32 is provided on either 9 track 800 or 1600 BPI magnetic tape. Software can be provided on alternate media subject to additional media and labor charges.

Installation

Software may be installed by the customer or by Logical Data Corporation. Installation is configuration dependent and requires a SYSGEN. Logical Data Corporation provides telephone support without additional charge to assist customers during installation. On-site installation assistance can be provided by Logical Data Corporation at additional charge. Specific information and fees regarding on-site installation may be obtained by consulting the LOGICAL DATA CORPORATION PRODUCT CATALOG or by contacting LDC.

Maintenance

Each TSX/32 license includes one year of software maintenance, which consists of telephone support for on-site product problems, software corrections, and all enhancements. After the first year the customer may continue maintenance under the LOGICAL DATA CORPORATION SOFTWARE MAINTENANCE AGREEMENT.

Customer Services

Logical Data Corporation supplies a complete range of services including consulting, configuration design, site planning, installation, training, and support.

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