Overview of Traffic Controller Data Bases
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Purpose

Associated with the Traffic Controller are certain data bases, some of which are per-system and other of which are per-process. (Per processor data bases are discussed in sections BK.) The details of these various data bases are discussed in the remaining sections of BJ.1. The present section is an overview and a discussion of the strategies used for selecting a particular data base for a particular item.

Per System Data Bases

All per-system data bases are maintained by the Traffic Controller in segment <tc_data>. There are five major parts of this segment:

1. The Traffic Controller Data Block (TCDB)
2. The Active Process Table (APT)
3. The Process Wait Table (PWT)
4. The APT Hash Table (APTHSH)
5. The Device Signal Table (DST)

The Traffic Controller Data Block is a collection of miscellaneous items in segment tc_data; some of these items are internal to the Traffic Controller (pointers to the various tables, table descriptions), others (such as the variable containing the number of loaded processes) are of general interest.

There are two main categories of items in this data block: Certain per-system Traffic Controller items have to go somewhere and seem most naturally to go here. There are also system parameters which presumably will not be changed other than occasionally by a system administrator (for example, the number of levels in the multi-level ready-list). Rather than have these parameters built into code as constants, it seems more appropriate to collect them all in a single place. The TCDB is described in BJ.1.01.
The Active Process Table contains certain information about each process which is currently active. An item must go into the APT if it needs to be accessed from other processes. For example, sending a wakeup to a process involves knowing that process' execution-state; likewise, selecting the next process to run from the top of the ready-list involves knowing that process' eligibility. Consequently, those pieces of information have to be kept in the process' APT entry. The APT is discussed in BJ.1.02.

All processes waiting for a particular system event are threaded into a single list (associated with this event) and the head of the thread is kept in the Process Wait Table. The PWT is a table containing a group of pointers to a collection of event threads running through the APT. The PWT is described in BJ.1.03.

Communication between processes is done on the basis of (symbolic) process identification, but the communication itself requires knowing the location of the target-process' APT entry. To make looking up the APT given a process-id efficient, a hash-table of process-ids is maintained by the Traffic Controller; APThSH is a typical hash table associating process-ids and relative pointers into the APT. The APThSH is described in BJ.1.04.

The Device Signal Table is a table similar to the APT hash table which gives a device_number/APT-entry correspondence and thus provides an interface between I/O interrupts and the Traffic Controller's entry point 'Wakeup'. The Device signal table is described in BJ.1.05.

All of these data bases are accessed in the hardcore ring at times when page faults cannot be tolerated, so segment <tc_data> (as well as the procedures constituting the Traffic Controller) is wired down. It is accessible for reading and writing in the hardcore ring only.

Segment <tc_data> is pre-assembled, and loaded during system initialization time from the Multics System Tape (MST). It is initialized by a procedure named tc_data_init which allocates space in <tc_data> for the various above-mentioned tables, initializes the tables and puts values into the variables in TCDB. By convention, mainly for reasons of clarity, all tables begin at an address that is 0 mod 64, and all APT entries begin at an address that is 0 mod 16.
Per Process Data Bases

In addition to the per-system data bases described above, the Traffic Controller maintains certain data bases for each process in the system. In general, there are two types of data: that which must be wired down, and that which need not be. The former is kept in the Process Data Segment (PDS) and the latter in the Process Definition Segment (PDF).

The process data segment contains two basic items: The process' concealed stack and a block of miscellaneous data referred to as the Process Data Block (PDB). The PDS is discussed in BJ.1.06.

The process definition segment is similar to the process data segment but it is not wired down. It also contains two items: The fault stack and the Process Definition Block. The PDF is discussed in BJ.1.07.

Strategies

All Traffic Controller data items of a per-system nature are kept in segment tc_data. Per-process items can be kept in either the APT, the PDS or the PDF. If the item must be accessed by any other process it is kept in the APT. Otherwise, the decision as to which block to put it in is based on whether or not it must be wired-down; If so, it must go into the process data block; while if not, it may go into the process definition block. Clearly, it is desirable to put as few items as possible into the process data block so as to minimize the amount of wired-down core.

For convenience, certain items are kept in both the APT and the PDS. These are items which other processes need to know, but which the current process must access frequently. Accessing the PDS is more efficient.