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Identification

Overview of Initial Version of Resource Expenditure Metering
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Purpose

In order to account for and control the usage of the system resources precisely, and aid in the debugging of the initial Multics system, it is necessary to be able to measure and record resource consumption. This section describes the technique used in the initial implementation of resource expenditure metering.

The initial implementation of resource usage metering is a simplified, smaller version of the final metering implementation. It will be designed and implemented to allow for expansion and easy modification so that the metering system can be easily upgraded to its final form in increments. The advantages to this attack are ~~obvious~~ ~~many~~ first, by implementing a simpler system originally, there will be at least some accounting information available to the system early in the initial versions of Multics for debugging purposes. Second, the simpler the system is, the less it will depend on the operation of the rest of the system, and hence will be able to operate with more dependability than if it had a large interaction with the system. Third, by being able to incrementally modify the accounting and metering procedures there will (hopefully) be no long delays for testing purposes, since each increment will be small enough to make it easily testable.

Performance Measurement

iv rel.

Overview

The initial implementation for the resource usage meters will measure the following quantities:

1. Processor Usage- defined as the ^{total} number of CPU-memory accesses consumed by the execution of a process.
2. Real-Time Usage - The ^{total} real time corresponding to the Processor usage of a process. (Note that the real time will in general not be equal to the number of CPU-memory accesses times a constant; This is due to the phenomenon of interference.)
3. Secondary Storage Residence - the number of word-seconds attributed to an account because of its use of secondary storage. ~~this will only register~~

dummy entries will accept, and ignore, all the info --- and

In order to measure the consumption of these resources precisely, the system modules directly concerned with the use of each resource must perform metering operations, and must make the meter readings available to supervisor modules concerned with accounting and monitoring.

The initial implementation of the metering module will keep all records of metering in a wired down table called the Active Meter Table. Since it and its accompanying procedures are wired down, this table will be able to accumulate and record usage figures at all times, even at times when a page fault is not permitted.

Logically one would like to have ~~multiple entries~~ an Active Meter Table entry for each account number, so that "billing" could be accomplished. In the initial implementation there will be one Active Meter Table entry per account number, however the account numbers will be arranged a little differently. Since in the early testing stages of MULTICS there will only be at most a few users connected, the important items to be measured might be time used by ~~multics~~ multics for overhead type operations, time actually used by users for execution of their processes, (time used for page moving, etc.) This will be accomplished by appropriate account number management.

obscure

Only distinguishes time used by different users.

X

Every entry in the Active Process Table and every entry on the Active Segment Table contains a pointer to an Active Meter Table Entry used to record the resource usage associated with the Segment or Process. Whenever a new segment or process is established, the Active Meter Table is searched to see whether an entry for that account number exists, and a new Active Meter Table entry is created if not. Since ^{during} the time when this initial ~~sys~~ metering implementation is being used, the number of users will be small, the number of entries will likewise be rather small.

Text entries to be provided, determine to be pointer of any. odd or entry to read the contents of a selected account, by a TPEEK-like command, for checking to see how expensive the last ^{command} operation was.

[Comment: each process will be assigned a sequential account number at its creation. (instead of ~~over~~ referring one from a file data file.)