

COMPUTATION CENTER
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TO: Computation Course Laboratory Instructors.

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SUBJECT: CLSYS, a Program to Facilitate the Use of the MAD Translator for Large (class-size) Batches.

Abstract

An on-line, self-loading program has been written which copies the M.I.T. FORTRAN Monitor System tape, removing the FORTRAN compiler and, if desired, the FAP assembler records. The resulting time saving of ten seconds per MAD job may prove significant for users with large batches of small MAD jobs, such as classes.

With the present ordering of the M.I.T. system tape, timing of a typical short MAD compile and execute job such as the first machine problem given to a 6.251 class is as follows:

Read MAD, compile 10 instruction program, and backspace over MAD	3.4 sec.
Two-way space over FORTRAN	7.5 sec.
Two-way space over FAP	2.5 sec.
BSS load and library search	1.8 sec.
Execute and test object program	2.0 sec.
On-line printing of monitor 12 lines	4.8 sec.
1 card	0.5 sec.
Other time spent in Sign-on, scan, and moving system tape.	5.0 sec.
total	<u>27.5 sec.</u>

These figures were arrived at by direct calculation, except for the last, which is the difference between calculated and observed average time per job.

Since no more than 7.5 of these 27.5 seconds are devoted directly to the project at hand, compiling and executing a student MAD program, it is apparent that significant overall time savings can be realized if certain of the non-essential procedures are abridged.

The most significant time waster in this operation is the two-way space over the FORTRAN compiler. To reduce this time, an extremely simple approach has been taken. The M.I.T. system tape is copied, record for record, except that in place of the 19 long FORTRAN compiler records are inserted dummy three word records. In place of the first FORTRAN record is put a 6-instruction program to return control to Monitor Scan. Thus, for all operations not requiring execution of the FORTRAN compiler, the system operates precisely as before, but with much more efficiency on MAD jobs. If desired, replacement of FAP is a very simple option also, enabling a total saving of 10 seconds per job and a 30% reduction in the time needed for an average class run.

Operation

This program is used in the form of 704 absolute row binary cards, labeled CLSYS00-CLSYS08. This deck must be preceded by an absolute upper loader, and followed by a transfer card to location 12_g. (This transfer card is provided by the FAP assembler.)

The program is read by the on-line card reader. It copies the M.I.T. system tape, on drive A1, onto a blank tape dialed to A5. Since the total time spent reading CLSYS and copying the system tape is about 20 seconds, this operation may be done just prior to the beginning of a class batch and there is no need to save the compressed system tape after the batch is processed.

There are three stops, identifiable by examining the accumulator register or storage register (if the interval timer is off.)

<u>Stop</u>	<u>Identifier</u>	<u>Recovery</u>
normal end (tapes rewind)	HPR 77777,7	all finished.
read check on A1	HPR 1,7	press start to try 10 more times.
write check on A5	HPR 8,7	start over, preferably with a new A5.

Assembly

The symbolic deck of CLSYS must be assembled (by macro-FAP) with a symbolic table in which each entry corresponds to one record on the system tape. The address of each word of the table should be zero, or non-zero as the corresponding record should be deleted or transcribed intact, respectively. End-of-file records do not appear in the table, except as remarks; for each end-of-file on A1, CLSYS will write one on A5.

The New System

The compressed system tape operates exactly as the ordinary M.I.T. - F.M.S. tape, except in two respects:

1. If a FORTRAN program appears on the system input tape, the comment "begin compilation" will be printed on the on-line printer, and the source program in question will be listed on the system output tape. The source program will be ignored in all other respects.
2. MAD jobs will take 10 seconds fewer than otherwise.

Observations

A compressed system tape has been used for the past term in 6.251, with time savings of up to 30% on each batch of 100 student MAD programs. An off-hand estimate is that no more than 1 minute is consumed writing the compressed system tape for such a run. This balances well against roughly 15 minutes saved by removing FORTRAN and FAP from the system tape.

Appendix

1. When teaching a class the use of the UPDATE facility of FAP, a considerable simplification and speedup may be obtained if each student can assume that the UPDATE input tape is in a rewind state when he begins to assemble his program. Achieving this objective, however, requires that the monitor system itself be modified to rewind this tape between jobs.

This tape rewind has been accomplished by the CLSYS system tape transcribing program. During transcription, when the Sign-on record is in core, a single instruction is modified before it is transcribed onto the new system tape. This instruction would normally clear the (F2PM) console restart location; since (F2PM) is not used with class runs the clear instruction is not needed. It is replaced with a REWA 6 instruction; as tape A6 is used as the UPDATE input tape in 6.251.

This option in CLSYS has been placed under sense switch control. If sense switch one is down during transcription, the sign-on record will be modified as it passes through.

2. In examining the chart of time spent in processing a job, it becomes apparent that if the nine lines and one card of statistics printed between each job could be eliminated, roughly another 5 seconds could be saved per job.

The job of printing these statistics falls upon the sign-on record of the monitor. However, since sign-on is used at the beginning of a batch when there are no statistics of a previous job to publish, it must test for the existence of such statistics. This test is made by examining the monitor line count cell. If zero, it is assumed that there was no job before. The instruction sequence used is:

..		
NZT*	(LNCT)	check linecount
TRA	MOVE	zero, skip statistics
..		non-zero, print statistics

The system tape transcribing program, CLSYS, will modify the sign-on record while it is in core, replacing the NZT* instruction with a NOP. The new system tape so produced will no longer print statistics after every job; occasional cards may be punched if several assemblies or compilations are made; only the terminal card is suppressed.

It should be noted that while the program CLSYS is relatively independent of the version of the monitor used, these modifications will not work correctly if the sign-on record is changed appreciably. If CLSYS is unable to modify sign-on properly, it will come to a stop with the AC containing HPR 70707. Pressing start will cause transcription to be continued, and the change will not be made to the sign-on record.