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### Identification

Overview of the Graphic Display Monitoring System (GDM)  
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### Reference

"The Graphic Display as an Aid in the Monitoring of a Time-Shared Computer System," MAC-TR-52 (thesis).

### Introduction

The Graphic Display Monitoring System (GDM) is an experimental monitoring facility for the Multics Time Sharing System implemented at Project MAC. It allows design, systems programming, and operating staff to graphically view the dynamically changing properties of the system. It was designed and implemented by the author in an attempt to provide a medium for experimentation with the real-time observation of time-sharing system behavior. This implied that it would be on-line, that is, active while the system was in operation - not just collecting data for future analysis, and would provide dynamically changing graphic output (as well as hard copy if desired). It was to be designed in such a way that the act of monitoring did not cause observable interference to the time-sharing system and that it would not be necessary to make more than a few minor changes to supervisory procedures in order to incorporate the GDM system (as opposed to the type of monitoring done by Scherr on the Compatible Time-Sharing System). Since the GDM System was to be an experimental tool, it was also considered especially important that it be easily expandable and adaptable to new or different monitoring requests. Coupled with these requirements was the need to make a simple yet effective user interface in order to insure its continued use after initial implementation. In this regard, many useful ideas were received as more and more of the systems programming staff was made aware of GDM.

The GDM System consists of four major components:

- A. A procedure running under Multics to transmit data as requested to the display computer (see BW.1).
- B. A monitor system operating on the display computer to facilitate the creation, storage, and retrieval of display templates (see below) and various other housekeeping functions.

- C. A series of display computer subroutines for manipulating data and generating command sequences for the display. (See BW.3.03)
- D. A language for describing desired data manipulation and display formats (Display Description Language), a (planned) compiler for translating such descriptions into display computer assembly language programs, and a set of macro-definitions for simplifying display computer programming and for calling the subroutines mentioned under C.

Figure 1 gives a functional representation of the various GDM subsystems showing the interaction among them, the two computers, and the user. Figure 2 gives a more detailed view of the hardware configuration.

The GDM Monitor provides a convenient interface between the user of the GDM System and PDP-8 File System. By typing simple commands on the PDP-8 teletype, the user can cause display template tape files to be created or loaded, tape "snapshots" of displays to be taken or displayed, display data dispatches to be initiated, and various other miscellaneous functions to be performed. A summary listing of the commands is found in the Appendix to BW.3.01.

### Monitor Commands

The GDM command format is as follows ("(NL)" indicates the "new line" character):

```
tape_unit command_name arg_1 arg_2 arg_3 ... (NL)
```

where tape\_unit is an optional argument indicating which unit number (1-8) is to be regarded as the current tape unit (default setting is tape unit 1). The command\_name is one or two letters and the number and type of arguments depends on the command.

To load a display template file from a tape and initiate the display, two commands are required:

```
LN file_name display_name (NL)
```

```
display_name (NL)
```

The LN command (mnemonic for "load and name") will look for file `file\_name M' on the current tape unit and will load it onto the disc. Display\_name (one or two letters) will be added to the command table so that the display can be started by simply typing its name (as in the second command line above). The LN command accepts multiple argument pairs on a single line and can store up to eight templates on the disc at a time. The "C" command will clear the disc and the display command name table if it is desired to start anew.

Once a display has been initiated by typing its name, the teletype is no longer active. Depressing the "manual interrupt" button on the display pushbutton box will temporarily suspend "execution" (data retrieval is halted) and allow commands to be typed on the teletype. An "R" command will resume the data dispatch.

If it is desired to stop the display at some particular point in its execution in order to study the display or photograph it, it is only necessary to depress the manual interrupt button. The "SN" command will save the display in a special tape file so that this "snapshot" may be viewed later. Typing the "SH" command will accomplish this.

Auxiliary commands are also provided to set the date display and reset the interval timer provided by the system (DD), print the current command and display names (P), and return to the OS/8 Operating System (Q). Commands to create display template files are discussed in BW.3.03.

The GDM System was developed as part of an effort to prove the feasibility of on-line, real-time monitoring of time-shared computer system. As such, it was necessary to demonstrate its usefulness via pre-planned displays. The System is sufficiently "open-ended," however, so that the real advantages of such a system will be seen when the programming systems staff uses GDM to measure the effects of installing new supervisor modules, or increasing the amount of core memory dedicated to an individual process, or removing a memory bank, or changing the scheduling algorithm, or any of a host of other tasks.

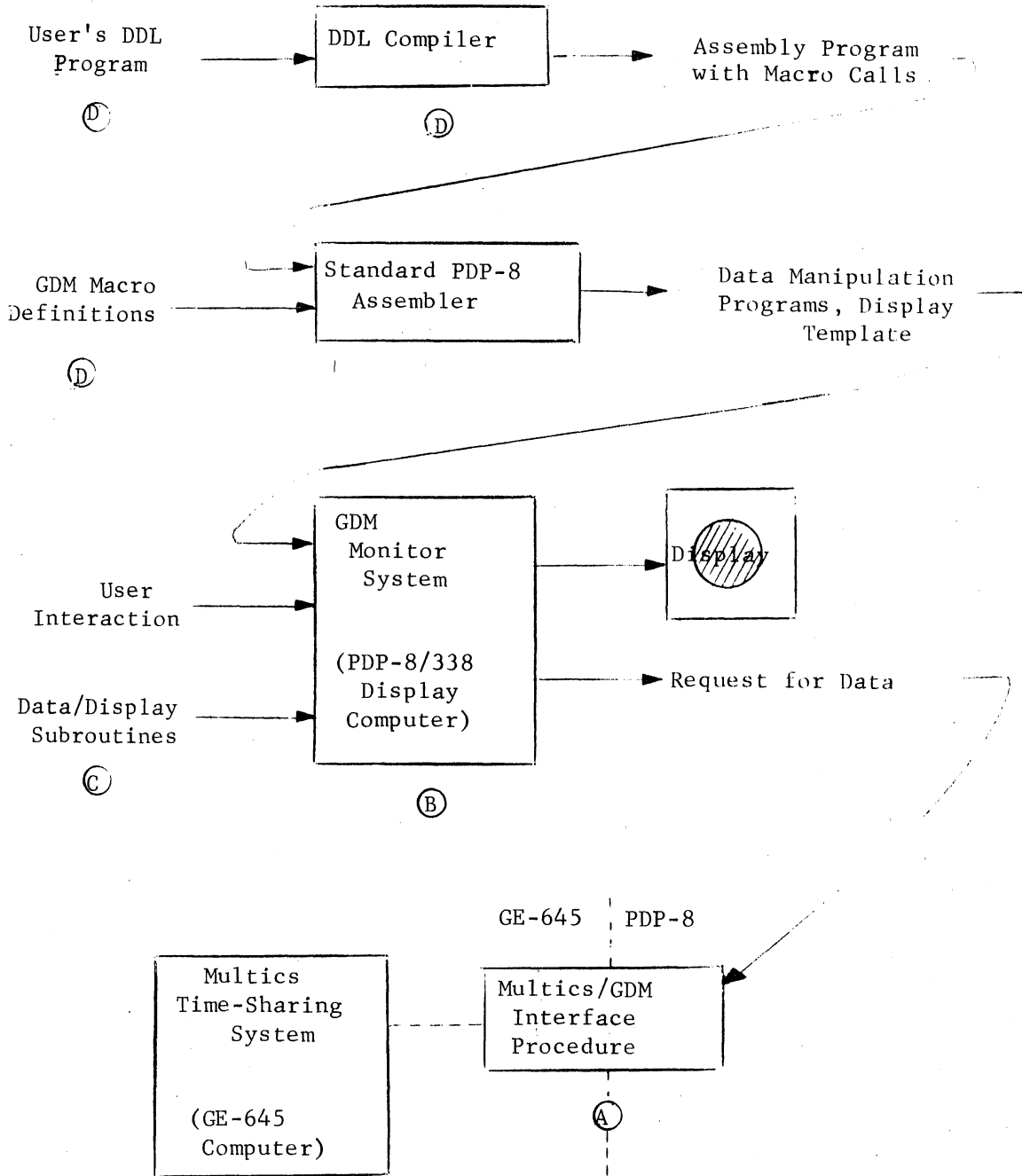


Figure 1  
GDM Subsystem Interactions

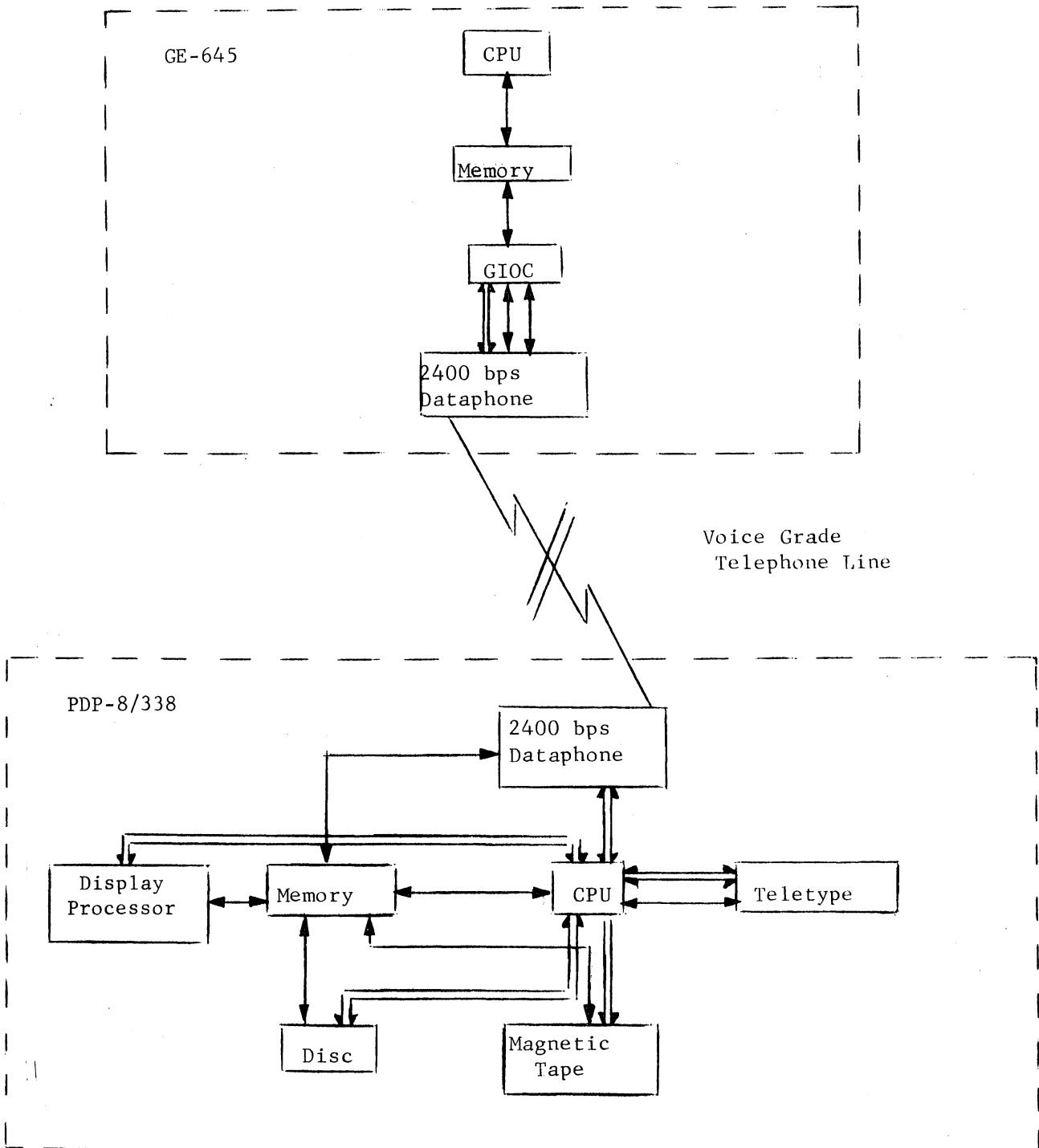


Figure 2  
Hardware Configuration