AN OVERVIEW OF MEDM[*]

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Abstract

MEDM, which is derived from Motif Editor and Display Manager, is the primary graphical user interface to the EPICS control system and has also been used for other control systems. MEDM has two modes of operation, EDIT and EXECUTE. In its EDIT mode it provides the drawing tools needed to design control screens for operator interfaces. In its EXECUTE mode it manages those screens to communicate with the control system. MEDM provides a set of interface objects that falls into three main categories: (1) Monitors, such as text, meters, and plots; (2) Controllers, such as buttons, menus, and sliders; and (3) Drawing Objects, such as lines, rectangles, and images. Each of these objects has many options, allowing for the development of screens ranging from simple to quite sophisticated. MEDM has been developed over the last decade, primarily at Argonne National Laboratory, and is a large, well tested, extensively used program. It runs on most flavors of UNIX, VMS, and Windows 95/98/NT. It has been used to design thousands of control screens, such as the one shown in Fig. 1, at the Advanced Photon Source and other sites around the world. This paper presents an overview of MEDM and its features.

1 INTRODUCTION

This paper assumes the reader is familiar with the Experimental Physics and Industrial Control System (EPICS). Further information on EPICS and MEDM may be found in the extensive online and printed EPICS documentation [1]. MEDM is an X Windows program that uses Motif, a standard collection of widgets. (Widgets are X Windows interface objects.) Its attractive look and feel is derived from the three-dimensional appearance of Motif. MEDM has been designed for UNIX systems but will run on VMS as well. It will run as native code on Windows 95/98/NT, provided the Exceed X Server and X libraries [2] are used. MEDM has extensive help, both menu-driven and context-sensitive, as well as a comprehensive reference manual. The interactive help utilizes Netscape [3], which can be controlled from within MEDM.

2 MEDM OBJECTS

MEDM supports a relatively small number of objects, which are used as its building blocks in designing control screens. These screens are also called displays.

Table 1: MEDM Objects

Graphics	Monitors	Controllers
Arc	Bar Monitor	Choice Button
Image	Byte Monitor	Menu
Line	Cartesian Plot	Message Button
Oval	Meter	Related Display
Polygon	Scale Monitor	Shell Command
Polyline	Strip Chart	Slider
Rectangle	Text Monitor	Text Entry
Text		

The MEDM objects are listed in Table 1. In addition, there are two special objects, the Display itself and the Composite, which is a group of MEDM objects defined either by grouping the objects in EDIT mode or by


Figure 1: Advanced Photon Source status display.

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reading them from a file. Each of these objects has properties or attributes that can be specified by the screen designer and in some cases modified by the user. The objects range in complexity from the Graphics objects to the relatively sophisticated Strip Chart and Cartesian Plot. Except for the Related Display and Shell Command, they can all be attached to EPICS process variables. The Controllers and Monitors set or read the values of the associated process variables, and the Graphics objects determine their visibility (whether they are drawn or not) or color from the values of the process variables. The visibility of Graphics objects is calculated via an expression similar to that used in the EPICS Calc record. This expression can involve the values of up to four process variables as well as other properties, such as the limits or alarm status, of the main process variable. The visibility of the Composite can be controlled in the same way as for the Graphics, allowing displays to change dynamically.

All of the Controllers are also Monitors; that is, they reflect the current value of the process variable. Some objects are drawn on the display background. Others are implemented as widgets and have their own X windows. Most of these widgets are MEDM custom widgets, but some are standard Motif widgets.

The **Arc**, **Line**, **Oval**, **Polygon**, **Polyline**, **Rectangle**, and **Text** are geometrical shapes or text that are drawn on the background of the display.

The **Image** is a Graphical Interchange Format (GIF) image. If the GIF file has more than one frame, the Image may be set to animate or to have a particular frame show based on a Calc expression similar to that used for visibility.

The **Bar Monitor** is a filled horizontal or vertical bar with optional decorations. It may be used to make bar graphs.

The **Byte Monitor** shows bit values and is used with the EPICS mbbiDirect and mbboDirect records.

The **Cartesian Plot** displays one or more array process variables or sequential values of single-valued process variables on an XY plot.

The **Meter** shows its process variable as a meter with a needle indicating the value.

The **Scale Monitor** shows the process variable as an indicator mark on a horizontal or vertical scale.

The **Strip Chart** shows time traces of one or more process variables on a strip chart plot.

The **Text Monitor** displays the value of a process variable as text in one of several formats. It is also drawn on the display background.

The **Choice Button** is a Motif radio box widget with radio toggle buttons. It is used for ENUM process variables, those that have specific values represented by a set of character strings or integers.

The **Menu** is a Motif pulldown menu widget. It is also used for ENUM process variables.

The **Message Button** is a Motif button that sends a value to a process variable when pressed and/or released.

The **Related Display** is a Motif pulldown menu that brings up other displays. There is a macro capability to replace keyword names in the display file with specified values so one file can be used for similar items, for example, different power supplies of the same type. This object can also be hidden under a Graphics object, so that clicking on the graphics object activates another display.

The **Shell Command** is a Motif menu of commands that are executed by the operating system as separate processes from MEDM. Special characters in the command are replaced by things like the name of a process variable or allow the user to complete the command.

The **Slider** is a Motif scale widget. It allows changing a process variable by dragging the slider on the horizontal or vertical scale.

The **Text Entry** is a Motif text widget. It allows changing the process variable by entering characters or numbers.

3 EDIT MODE

In EDIT mode MEDM is essentially a drawing program. As such, it allows creating, positioning, and sizing of the MEDM objects on the display. It also provides a means of changing the properties of the objects, including assigning process variables to them. MEDM has most of the features of a drawing program, including undo, cut, copy, paste, raising, lowering, grouping, spacing, alignment, centering, and snap-to-grid as well as several features special to MEDM. Much of the editing is accomplished through three MEDM palettes.

The Object Palette, shown in Fig. 2, is used to select the type of a new object. The name of the object pops up as shown in the figure if the cursor is held over the icon representing the object. The type can also be selected via the Edit Menu. After selecting the type, the object is created by dragging a rectangle of the desired size on the display.
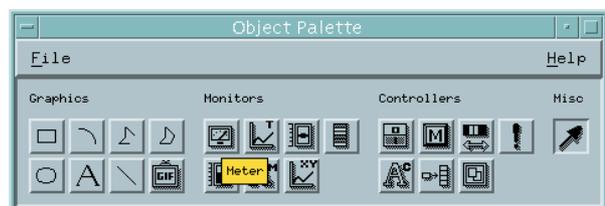
Figure 2: Object Palette with popup showing the icon is for the Meter.

The Resource Palette, shown in Fig. 3 for a Meter, is used to change the properties of the object. What appears in the Resource Palette for a particular object depends on what properties the object supports. The property choices may be specified through text boxes, menus, a color selector, or buttons that bring up dialog boxes.
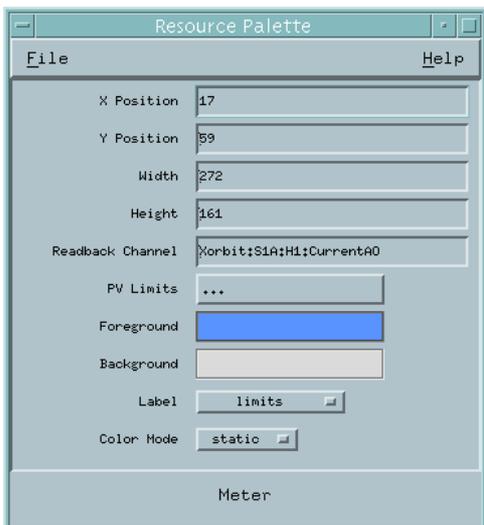

Figure 3: Resource Palette displaying the choices for a Meter.

The color selector brings up the Color Palette, shown in Fig. 4. MEDM has a colormap consisting of 65 colors. There is a default colormap, but each display may have its own colormap, defined in its display file or specified by the name of a separate colormap file.
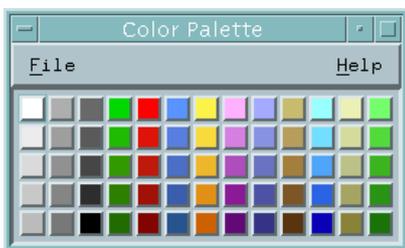
Figure 4: Color Palette showing the default colors.

4 EXECUTE MODE

In EXECUTE mode MEDM manages the connections to all the process variables associated with all the objects in all of the displays that it has open and also keeps the MEDM objects updated with the latest values. It handles user input to change the values of the process variables and interact with any of the MEDM objects.

MEDM can manage one hundred or more displays at the same time, depending on the complexity of the displays and the power of the workstation on which it is running. There is a command line option that allows new invocations of MEDM to pass their displays to an already-running MEDM, then exit, avoiding a proliferation of executables and providing efficiency. It also makes it easier to write scripts that bring up all the necessary displays to operate a particular device such as an accelerator ring.

There is a popup menu of options for the user in EXECUTE mode. The user can print or close the display and can obtain extensive information about the process variables associated with an MEDM object that is selected with the cursor. The resulting dialog box for doing this is shown in Fig. 5. The user can set the limits of objects, such as the Meter or Bar Monitor, for which limits are appropriate or set the precision (number of decimal places) of numbers displaying in the object. The user can obtain a list of all the currently managed displays and can access an optional, configurable submenu of custom commands.
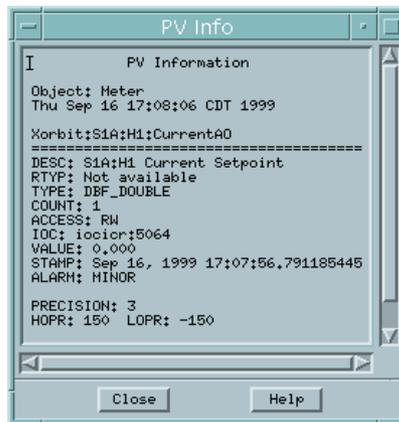
Figure 5: PV Info dialog box.

5 REFERENCES

[1] http://www.aps.anl.gov/epics has extensive information on all parts of EPICS as well as links to both the HTML and Postscript versions of the MEDM Reference Manual.
[2] Exceed is a product of Hummingbird Communications Ltd., North York, Ontario, Canada.
[3] Netscape is a product of Netscape Communications Corporation, Mountain View, CA.