medm Tutorial

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- Derived from 2004 “Medm” lecture by Kenneth Evans Jr.
- 2013 Abridged version by Tim Mooney for SSG class

medm Tutorial Introduction

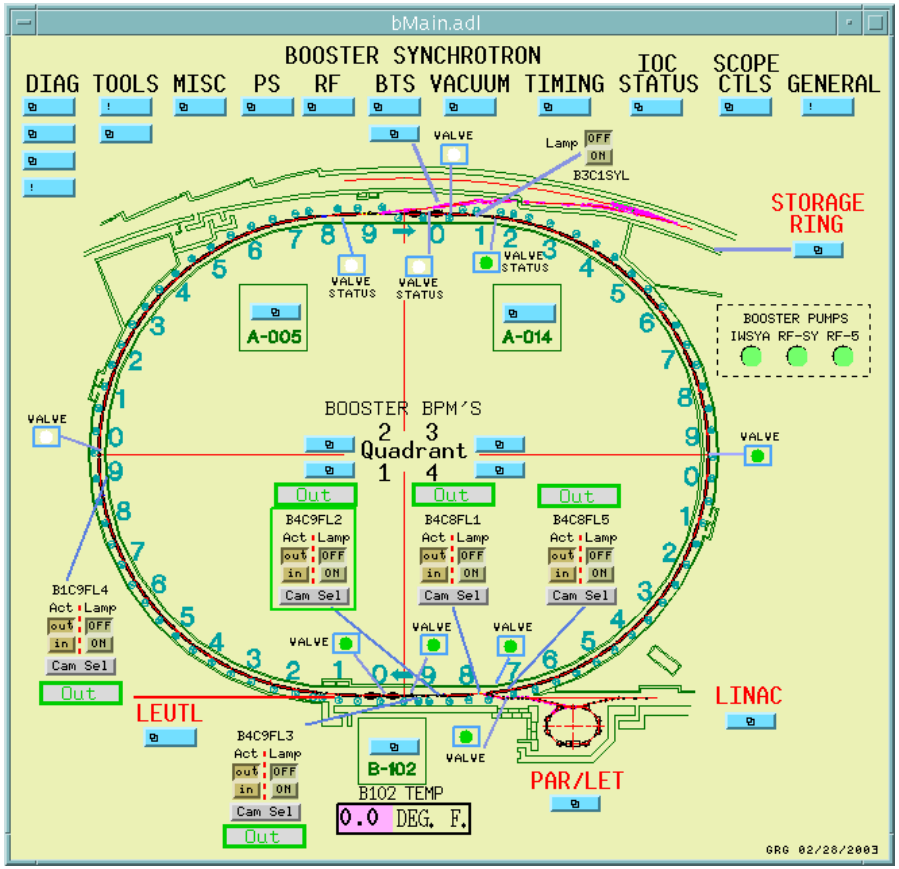
Introduction:

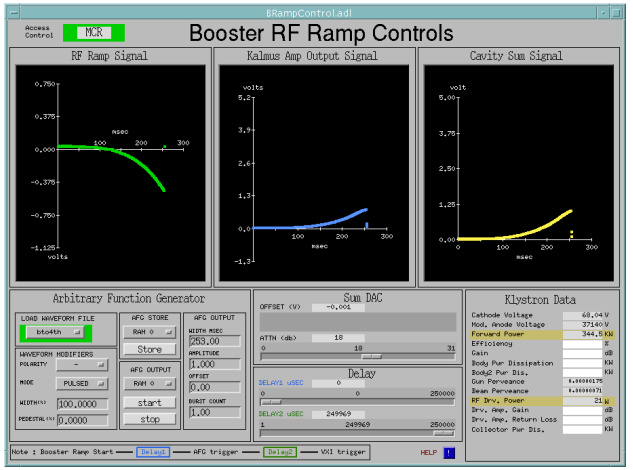
medm is an acronym for Motif Editor & Display Manager

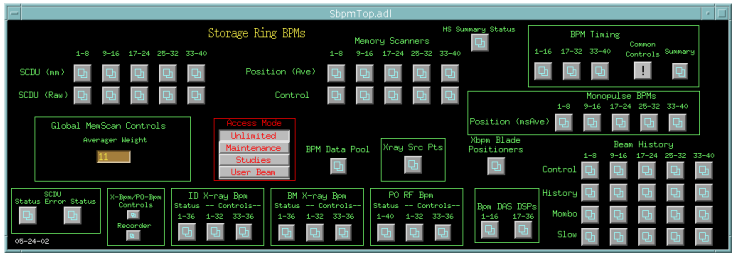
- A graphical user interface (GUI) for creating control screens
- Motif is a widget toolkit for the Unix “X Window” system
- It is a mature program
- Tens of thousands medm screens (APS +7900 displays)
- Adopted by Epics community worldwide

  Others: EDM, CSS-BOY, caQtDM
- It is the primary tool operators use to control the APS accelerator

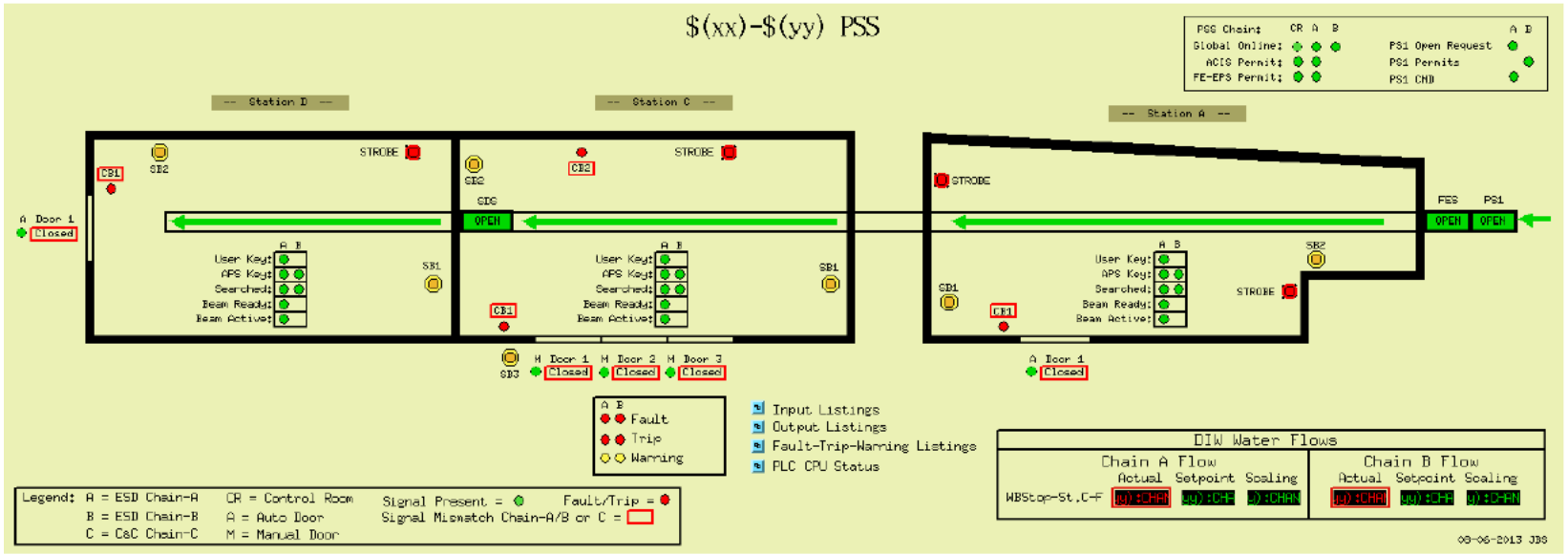
medm Examples







medm Beamline Display



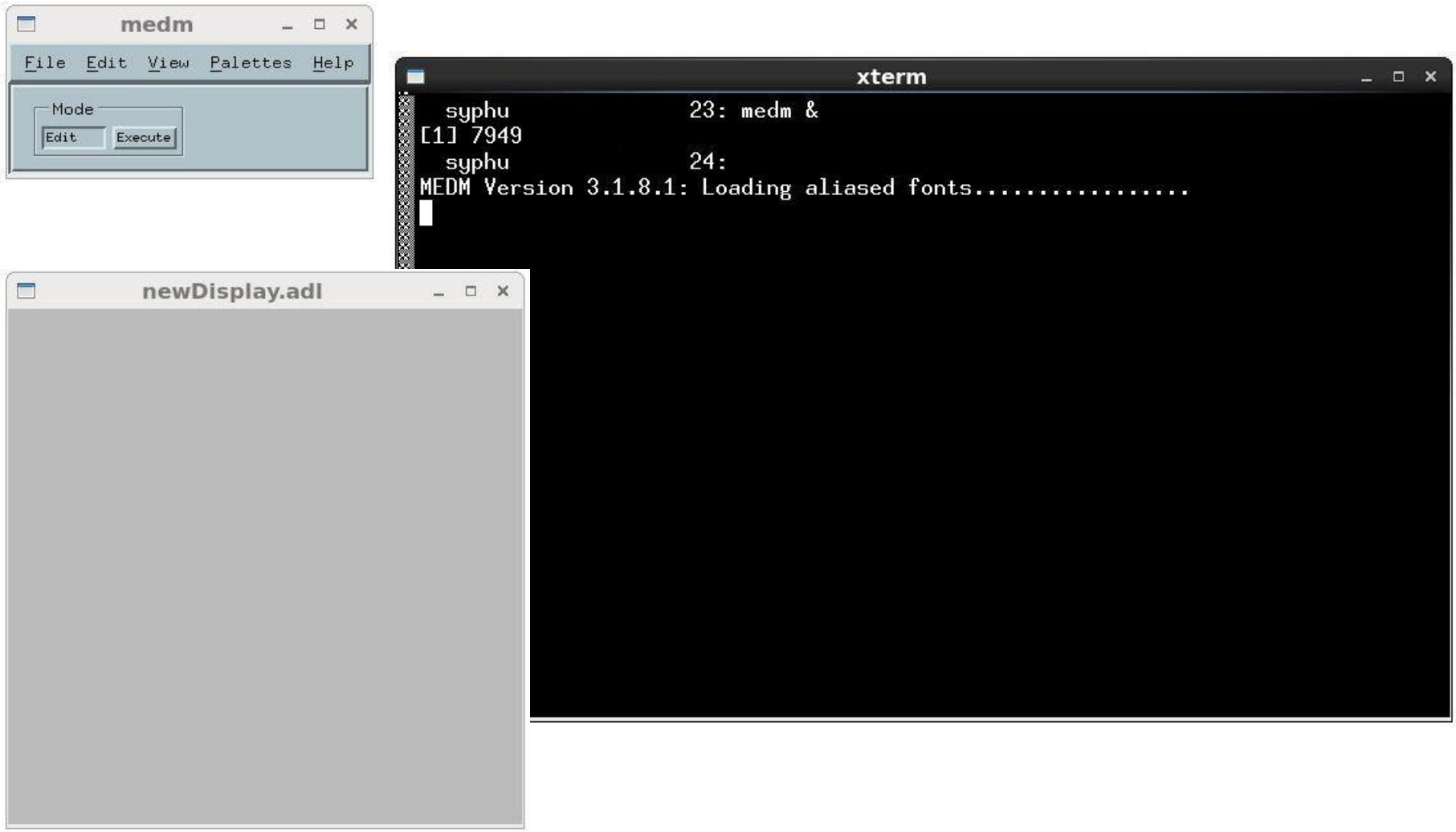
medm History

- It is an APS product
- Started by Mark Anderson in 1990
  - Responsible for the look and feel, much of the implementation
  - Based on DM and EDD written at Los Alamos
  - Selected Motif for a more impressive interface
- Taken over by Fred Vong from Fall 1994 to Winter 1996
  - Created the Ascii data list file format
  - Rewrote the Strip Chart & added Channel Access security
  - Improved the performance under load
- Taken over by Ken Evans in 1996 to 2010
  - Concentrated on robustness, stability
  - Added most of the Editing features (Undo, Align, etc.)
  - Made Composite object be dynamic
  - Added animated GIFs, many other features

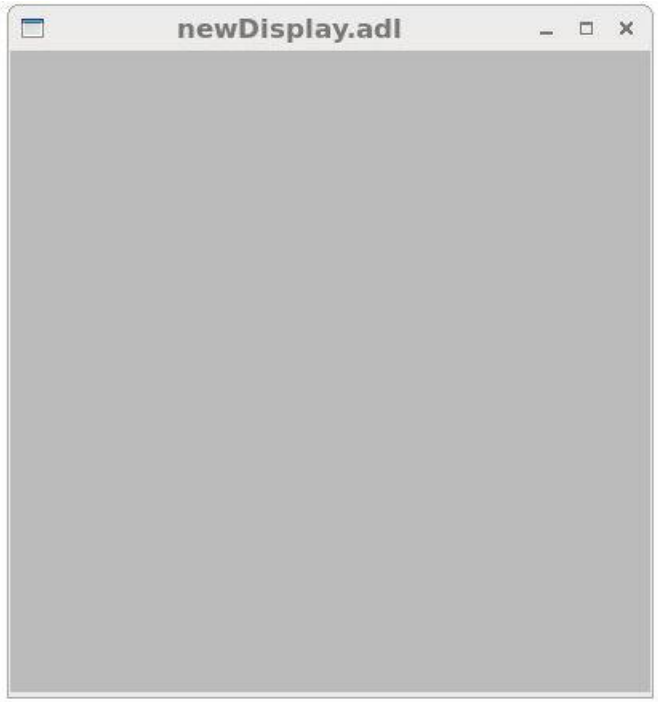
medm Documentation

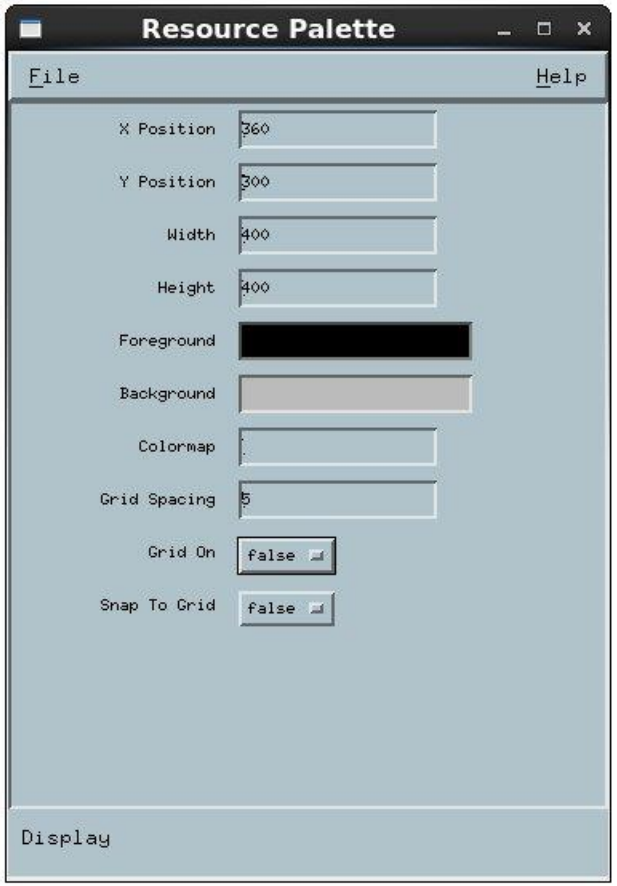
- The main source of information is the MEDM Reference Manual
  - Can be accessed from the Help Menu
    - Uses your browser to display HTML help
  - Also available as a Word document, Postscript, and PDF
- There is an MEDM web page
  - http://www.aps.anl.gov/epics/extensions/medm
  - Has the Reference Manual and tar files of recent versions
- MEDM for Windows is in the EPICS WIN32 Extensions
  - See the MEDM web page

Starting medm



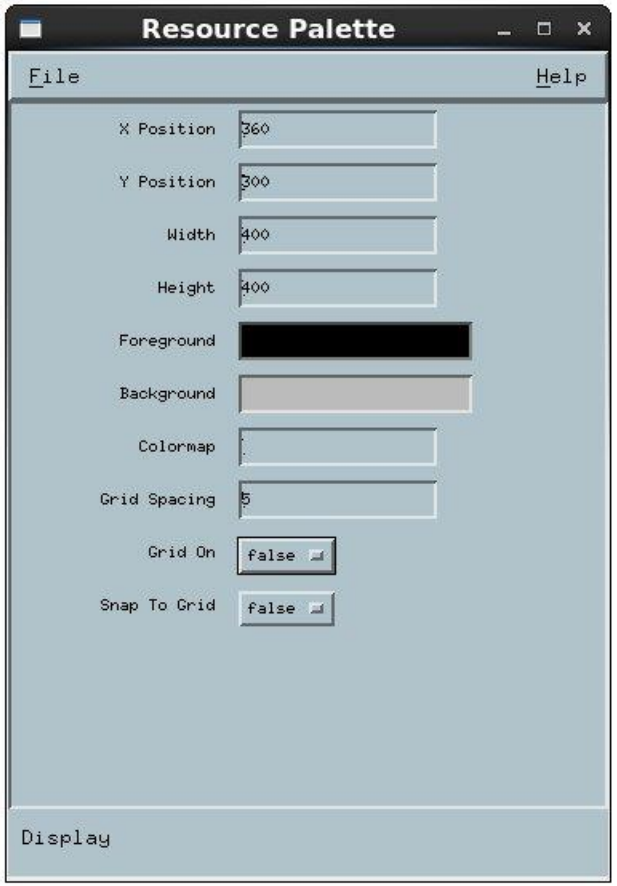
medm Resource Palette



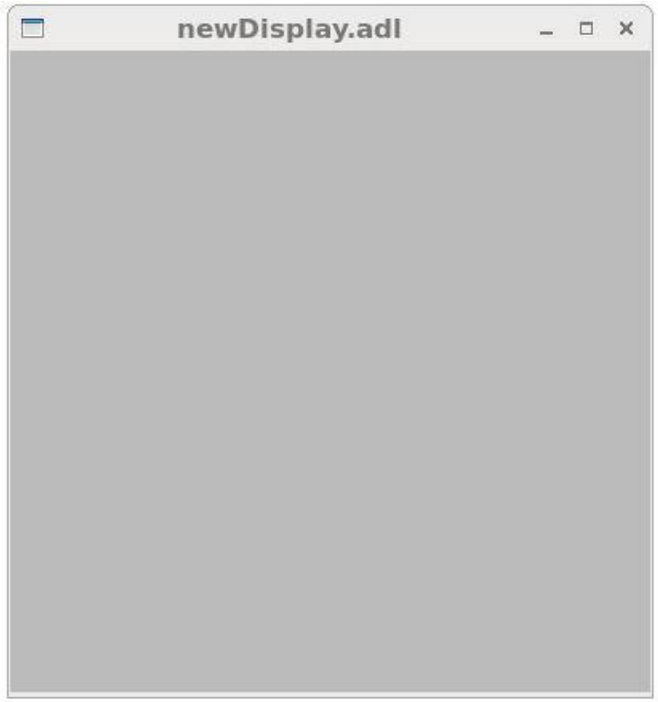


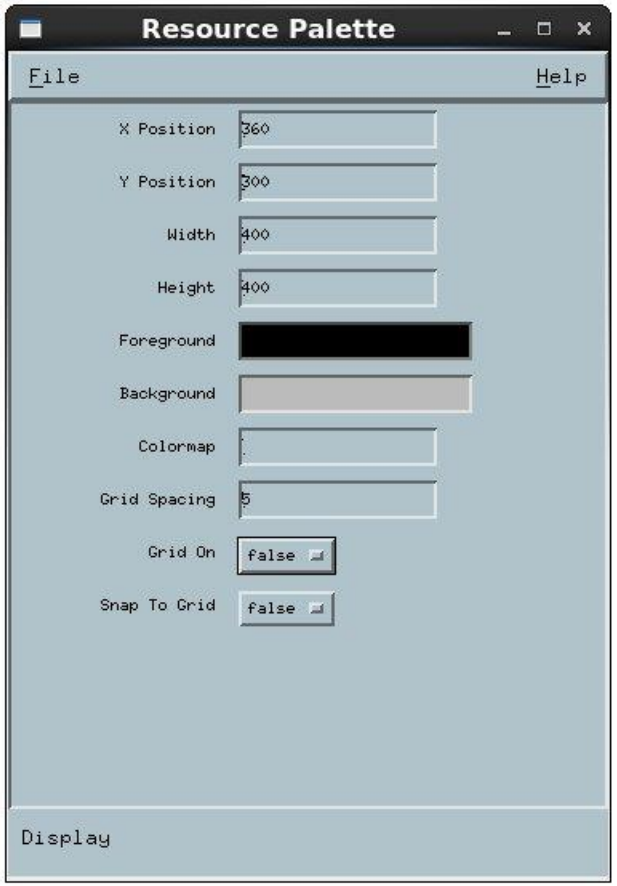
medm Resource Palette

- Each object has a set of properties
- The properties are chosen via the Resource Palette
- All objects have
  - X and Y Position
  - Height and Width
- Others vary depending on the object
- Properties are specified by
  - Text Boxes
  - Color selectors
  - Pull down menus
  - Dialogs

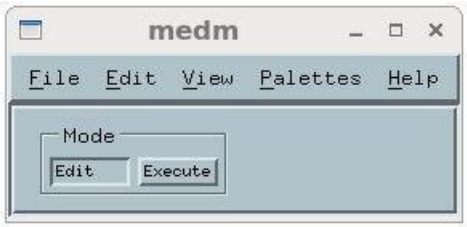


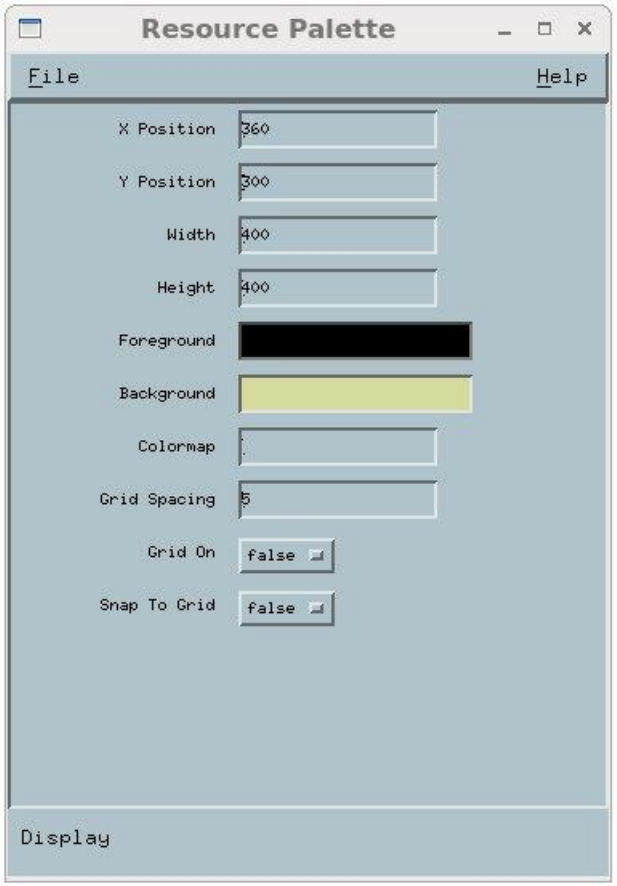
medm Resource Palette



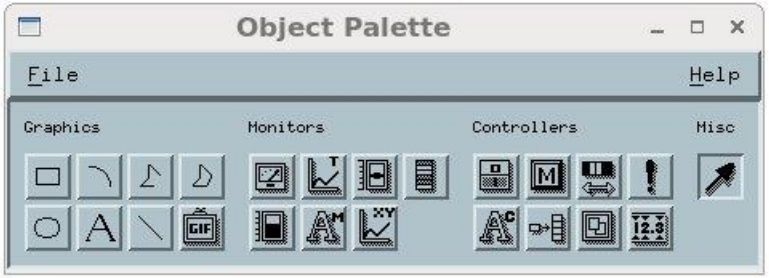


medm Color Palette



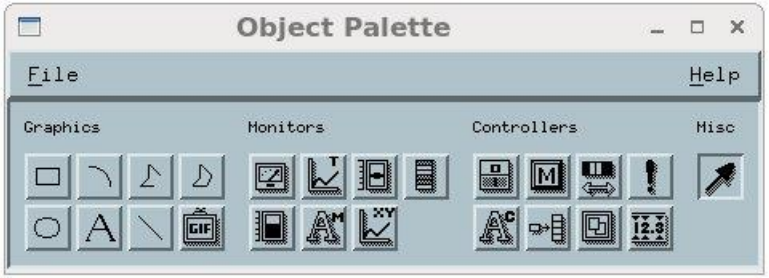


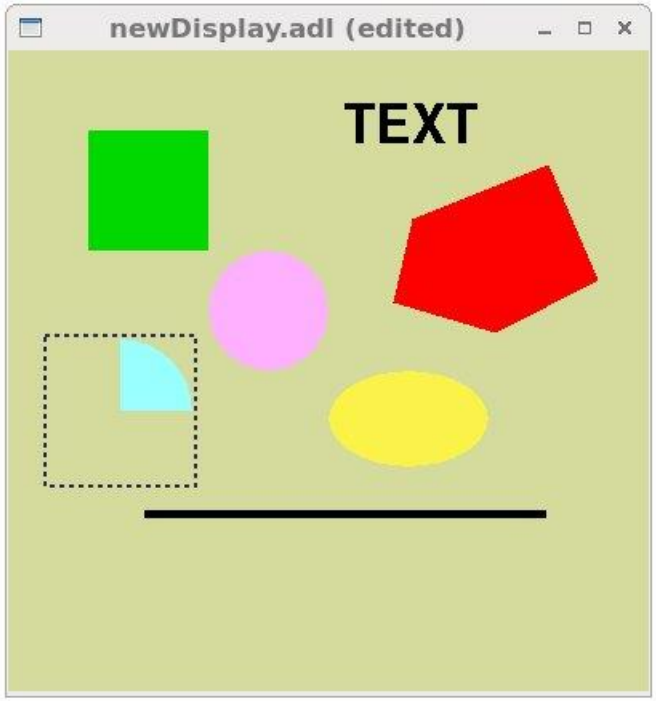
medm Object Palette

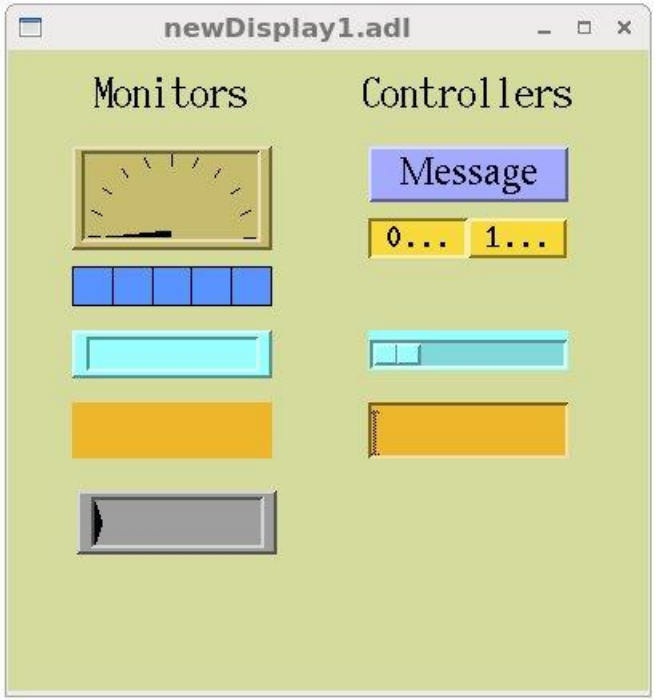


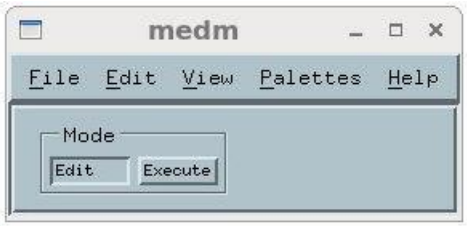
Graphics	Monitors	Controllers	Special
Arc	Bar Monitor	Choice Button	Composite
Image	Byte Monitor	Menu	Display
Line	Cartesian Plot	Message Button	
Oval	Meter	Related Display	
Polygon	Scale Monitor	Shell Command	
Polyline	Strip Chart	Slider	
Rectangle	Text Monitor	Text Entry	
Text			

medm Object Palette



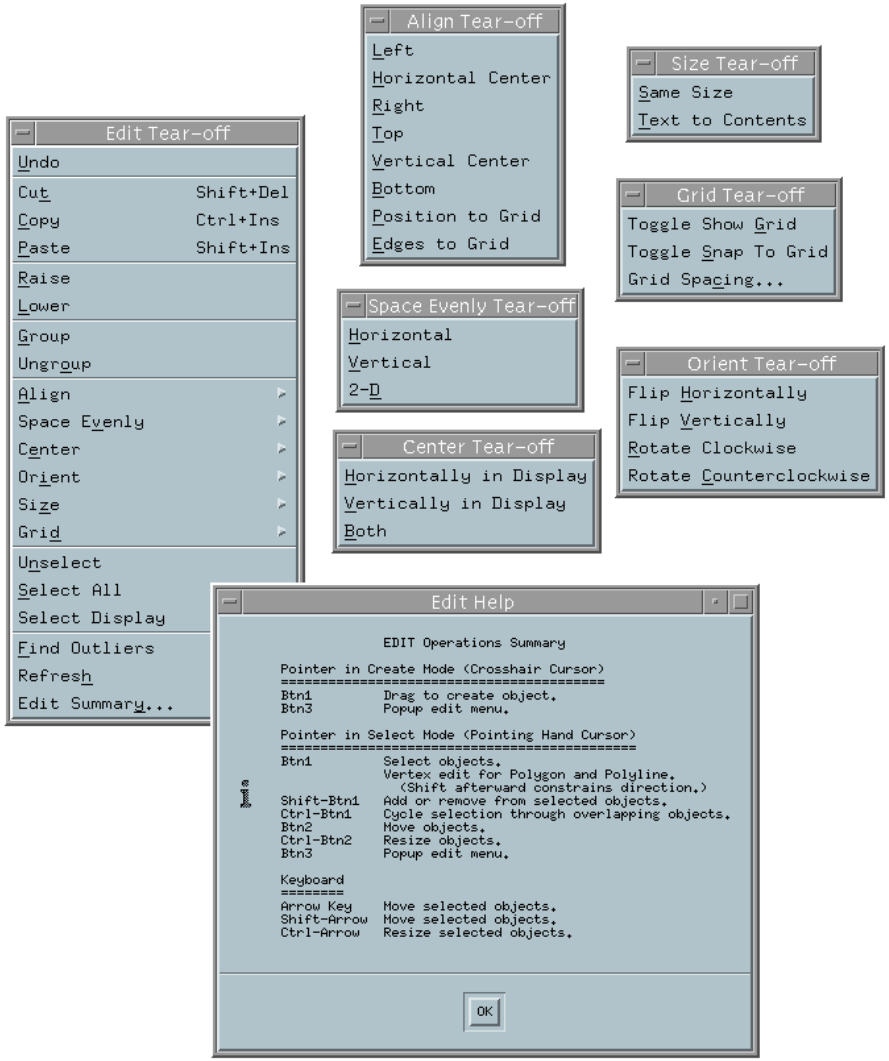


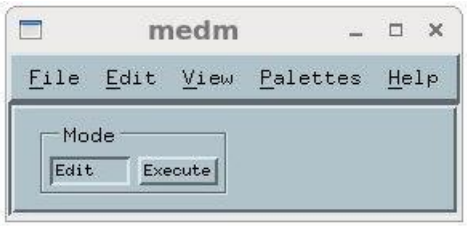




medm Editing

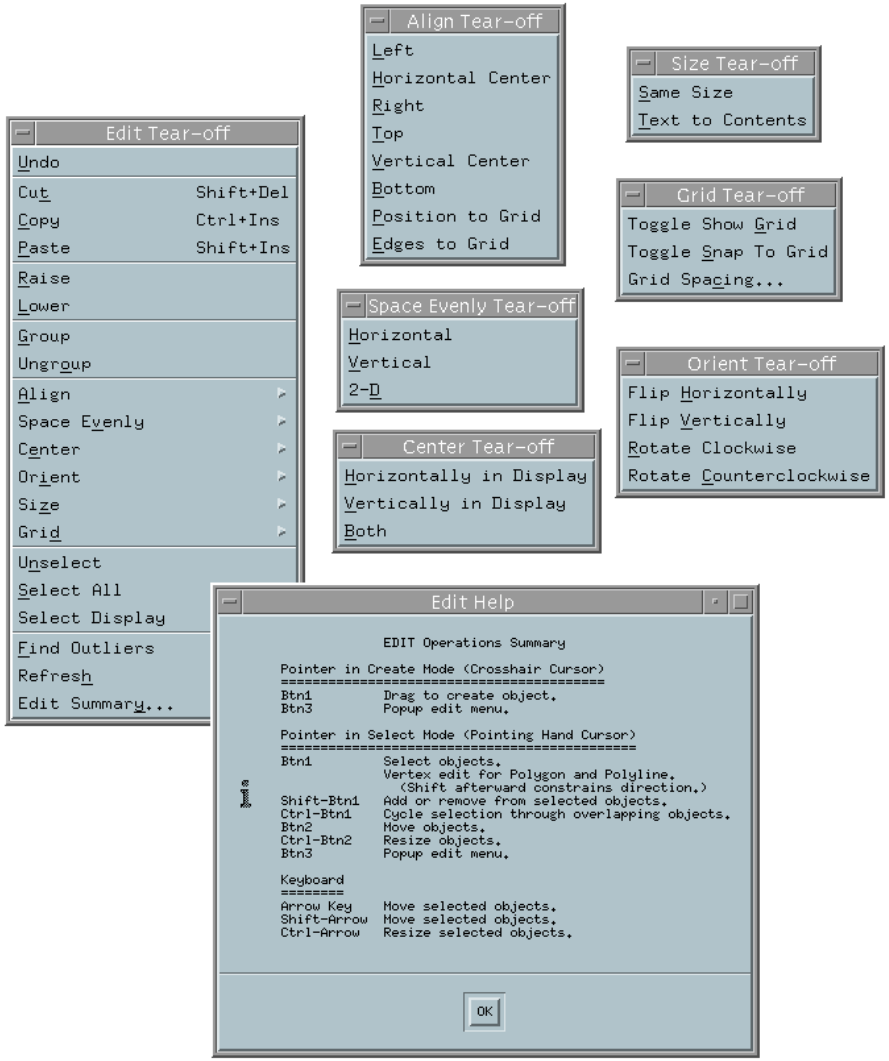
- **Menus are all Tear-Off**
- **Undo (only one operation)**
- **Align**
  - Left, Horizontal Center, Right
  - Top, Vertical Center, Bottom
  - Position to Grid
  - Edges to Grid
- **Space Evenly**
  - Horizontal and Vertical
  - 2-D
- **Grid**
  - Toggle Show Grid
  - Toggle Snap to Grid
  - Set Grid Spacing





medm Editing

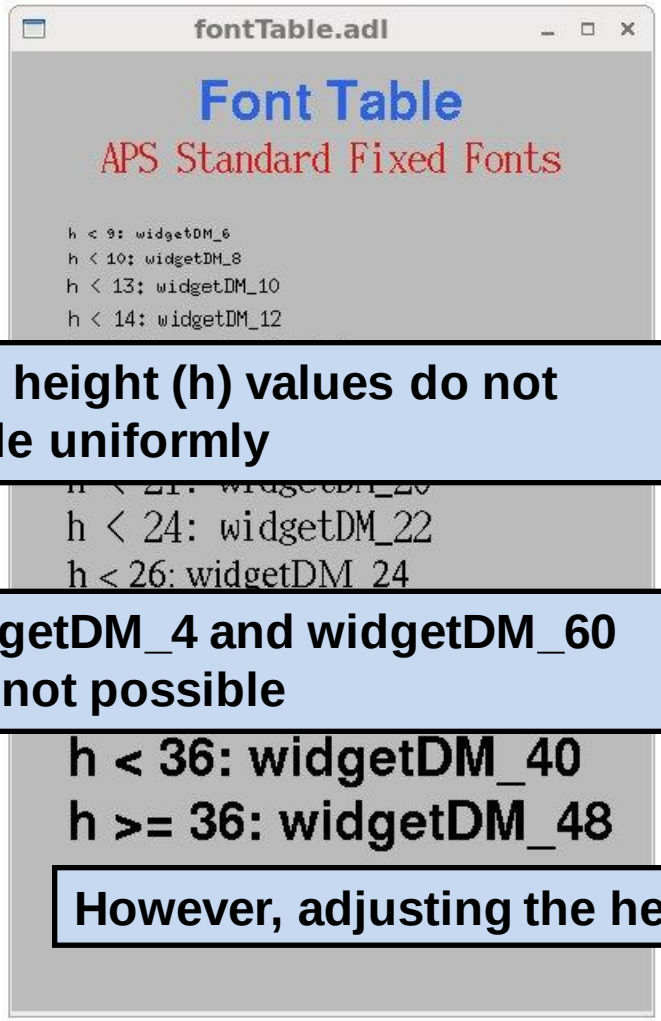
- **Center**
  - Horizontally and Vertically in Display
  - Both
- **Orient**
  - Flip Horizontally and Vertically
  - Rotate Clockwise and Counterclockwise (90°)
- **Size**
  - Same Size
  - Text to Contents
- **Others**
  - Find Outliers
  - Refresh
- **Edit Summary** (Keyboard & Button Shortcuts)

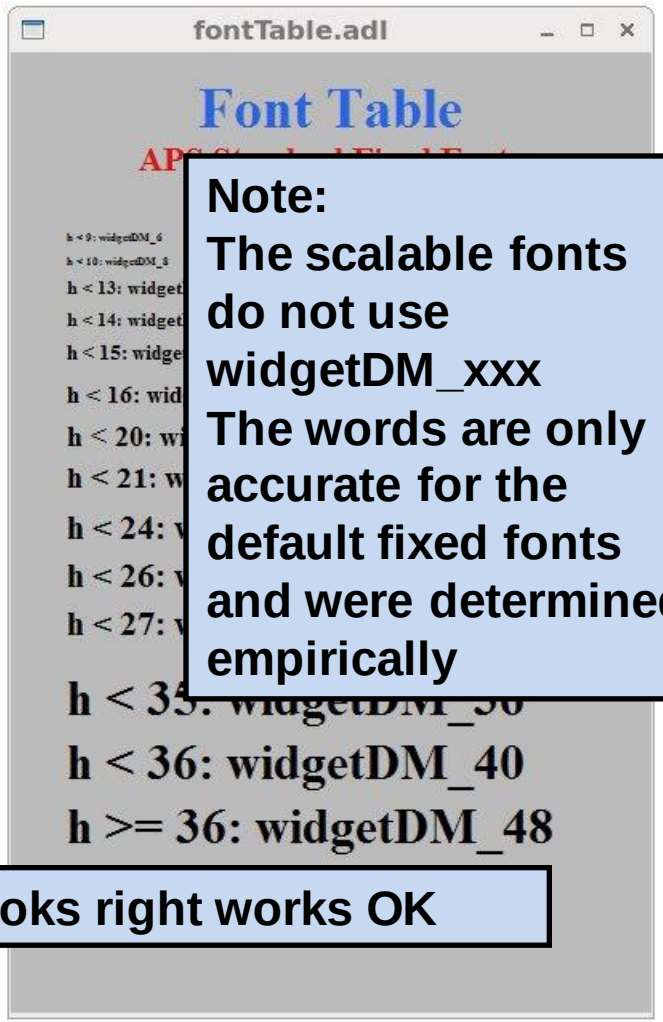


medm Fonts

- **Fonts in MEDM are somewhat limited**
  - Changing them would trash thousands of existing screens
- **MEDM can use either Fixed or Scalable fonts**
- **Fixed fonts use font aliases for flexibility**
  - widgetDM_4, widgetDM_6, … ,widgetDM_60
  - These can be assigned to any X Windows Font
  - We are stuck with the original APS assignments
  - File location = /usr/share/X11/fonts/misc/fonts.alias
- **Scalar fonts use one font (your choice) and vary the size**
  - Was not available when the APS was started
- **For new sites, the defaults can be changed in siteSpecific.h**
  - When MEDM is built
- **The font size is determined by the height of the text box**
  - The text can extend beyond the box horizontally
  - In practice you vary it until it looks right

medm Default Fixed & Scalable Fonts





The height (h) values do not scale uniformly

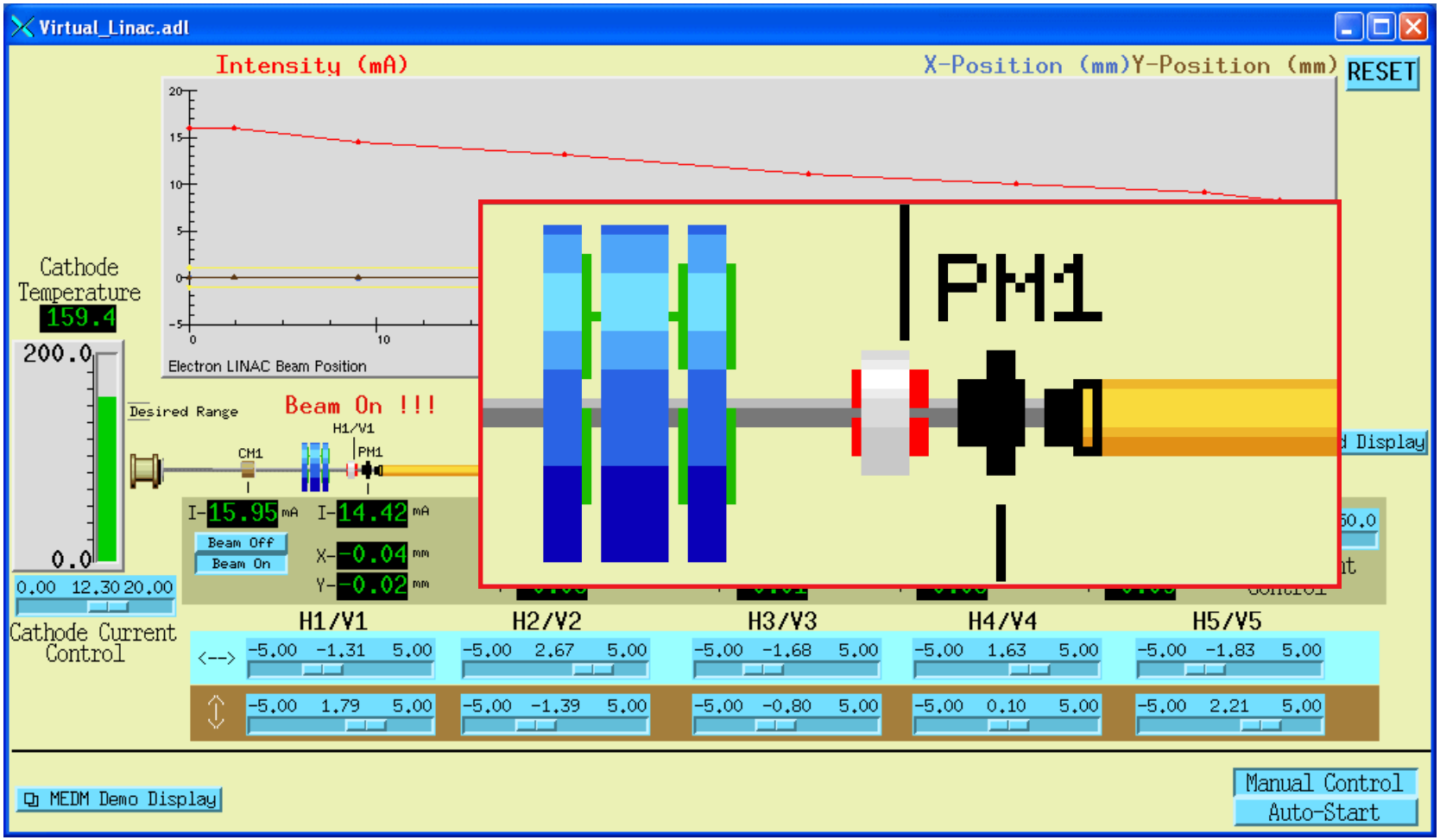
widgetDM_4 and widgetDM_60 are not possible

Note:
The scalable fonts do not use widgetDM_xxx
The words are only accurate for the default fixed fonts and were determined empirically

However, adjusting the height until it looks right works OK

medm Graphics Objects

- **Many effects are created with Graphics objects**

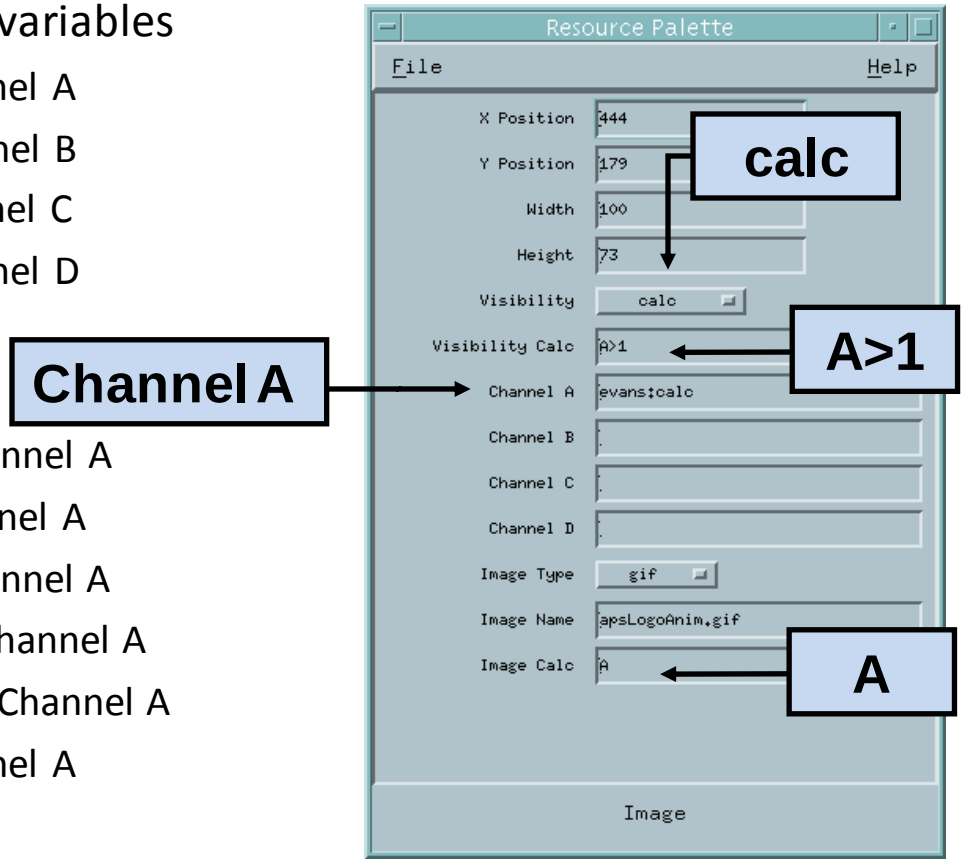


medm Dynamic Attribute

- **Applies primarily to Graphics objects**
- **Objects with a Dynamic Attribute can have their color or visibility change based on process variables or conditions**
- **Color Mode**
  - Object has alarm colors (Green, Yellow, Red, White)
- **Visibility Mode**
  - Visible only if the process variable is zero or only if not zero
- **Visibility Calc Mode**
  - Visibility is based on a CALC expression involving up to 4 process variables plus HOPR, LOPR, STAT, SEVR, etc.
- **Also applies to the Composite (also called a "group")**
  - Allows whole sections of the display to appear or disappear
  - Means any object can have a Dynamic Attribute
    - Make it be a Composite with just one member

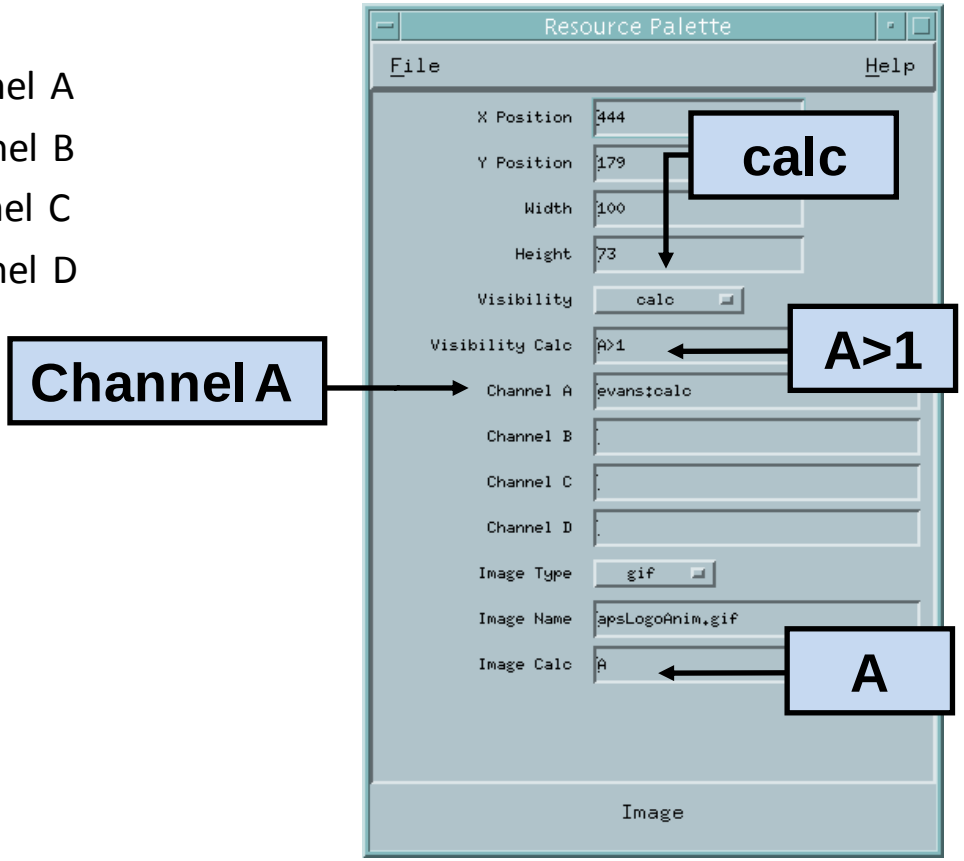
medm Calc Expression

- Expression involving 16 variables
  - A The value of Channel A
  - B The value of Channel B
  - C The value of Channel C
  - D The value of Channel D
  - E Reserved
  - F Reserved
  - G The COUNT of Channel A
  - H The HOPR of Channel A
  - I The STATUS of Channel A
  - J The SEVERITY of Channel A
  - K The PRECISION of Channel A
  - L The LOPR of Channel A



medm Calc Expression

- Expression
  - A The value of Channel A
  - B The value of Channel B
  - C The value of Channel C
  - D The value of Channel D

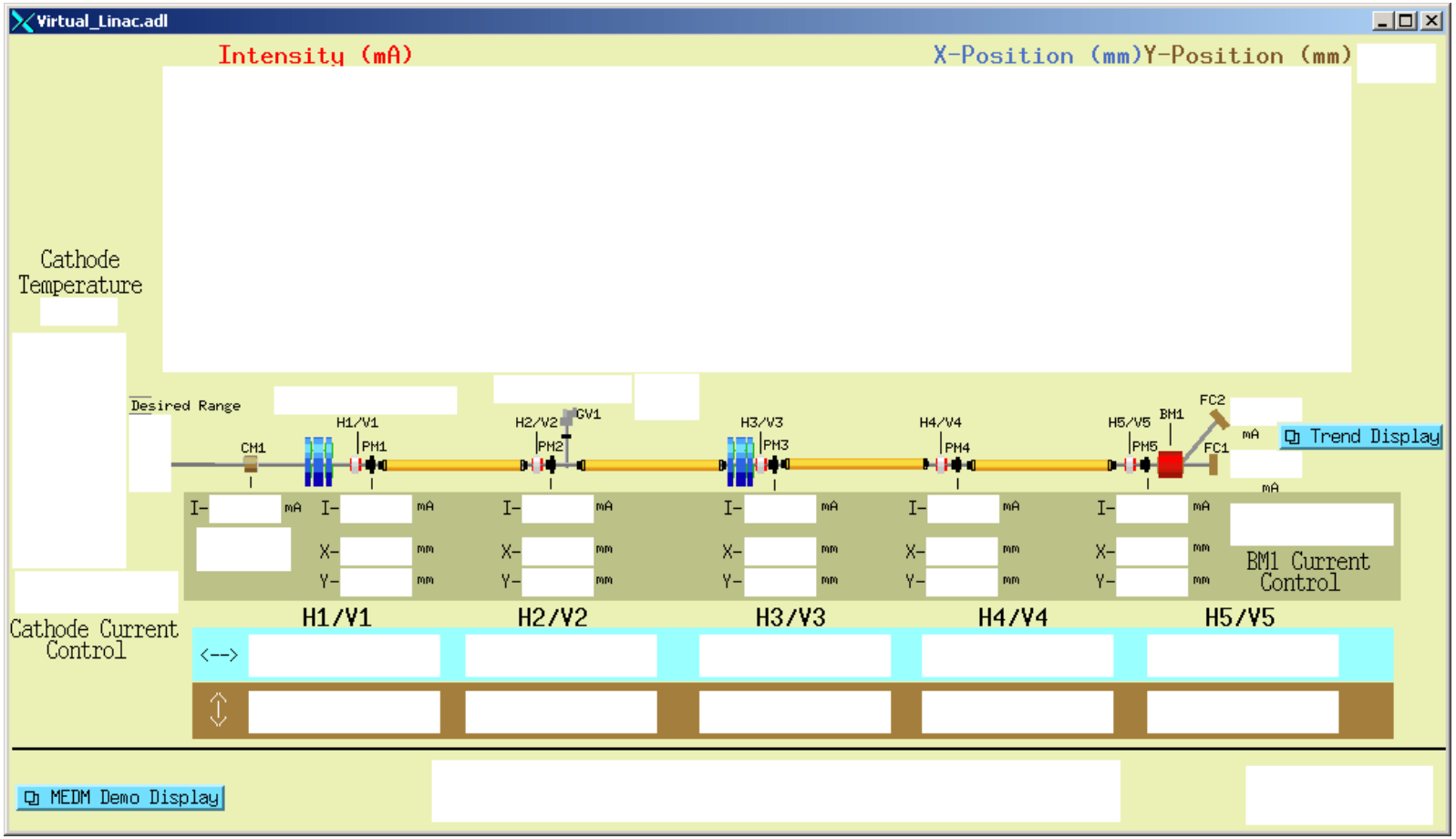


medm Calc Expressions

- **Syntax is the same as for the EPICS CALC record**
  - See the Record Reference Manual
- **Some True/False Examples (for Visibility)**
  - !A — Value is zero (Same as "if zero")
  - A — Value not zero (Same as 'if not zero")
  - A=12 (or A==12) — Value is 12
  - A#12 (or A!=12) — Value is not 12
  - A<0&&B<0&&C<0 — All are negative
  - A>.9*H — Beyond 90% of upper limit
  - !J — SEVERITY is not zero
- **Some Number Examples (for Image Calc)**
  - A — Frame is value of A
  - A=12 — Frame 0 or 1
  - (A+B)*SIN(C) — Frame determined by expression

medm Execute Mode

- What's wrong with this screen?



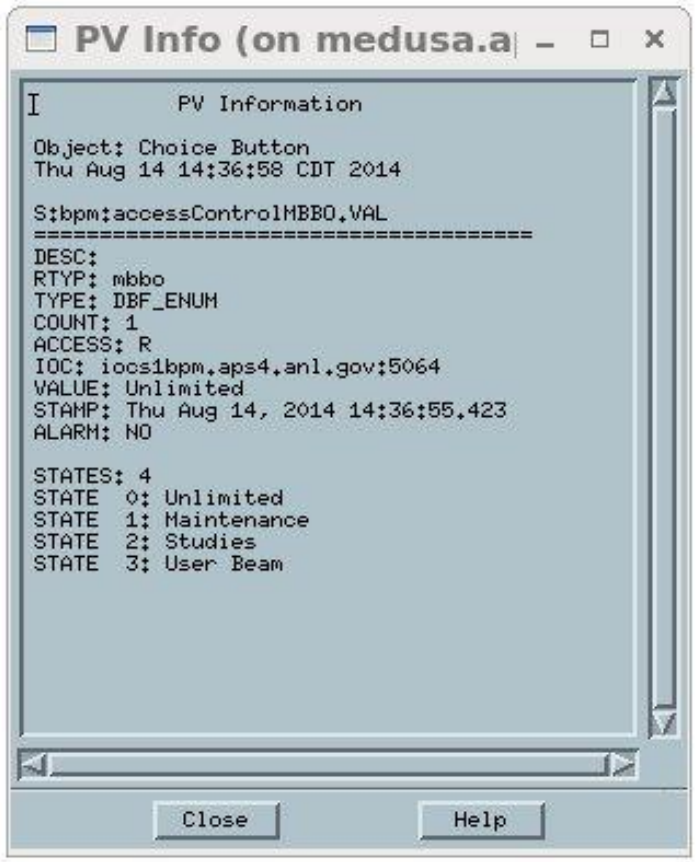
- MEDM objects turn white when the connection is lost !

medm Drag & Drop

- **You can drag the process variable names from an object**
  - Use Mouse Button 2 (the middle button)
- **The Process variable name appears in its alarm color on black**
- **Can be dragged to any Motif Drop Site**
  - This includes Probe, StripTool, HistTool, and others
- **Names now go into the X Clipboard as well**
  - Can paste them in the usual places without even dragging
- **Mouse Button 2 is a fast way to see the process variable name**
- **Doesn't work on a Mac**

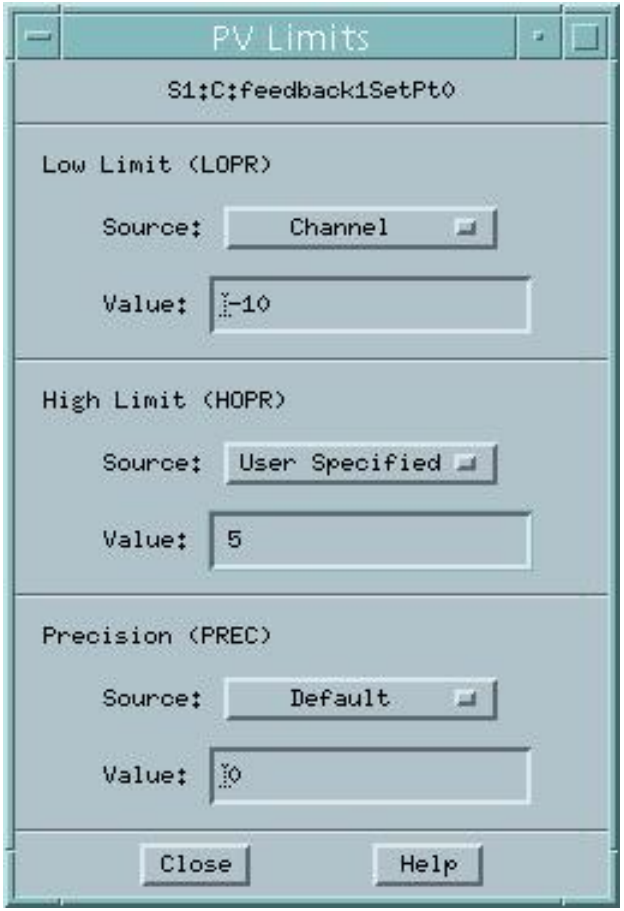
medm PV Info

- **PV Info**
  - Gives extensive information about the process variable
- **Accessed through the Execute-Mode Menu**
  - Right click the display
  - Use the cursor to pick which object



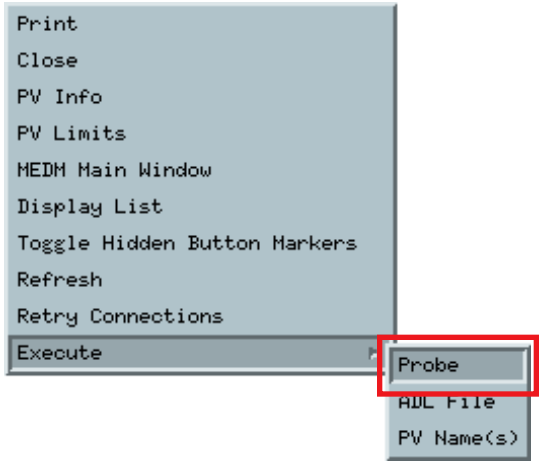
medm PV Limits

- **PV Limits**
  - Allows you to set the limits for Meters, Sliders, etc
- **The user can:**
  - Use the values from Channel Access (HOPR, LOPR, PREC)
  - Use the defaults set by the screen designer
  - Set her own values
- **The screen designer can:**
  - Set it to use Channel Access values for the defaults
  - Set the defaults
- **Setting Found On Resource Menu**



medm Execute Menu

- **The Execute Menu is a user-configurable menu that can be added to the right-click menu on displays in Execute Mode**
- **Specified by the MEDM_EXEC_LIST environment variable**
  - If not specifed, it doesn't appear at all
- **Example**
  - `setenv MEDM_EXEC_LIST 'Probe;probe &P &:`
    `ADL File;echo &A:PV Name(s);echo &P'`
  - Gives the menu shown
  - Selecting the Probe item, for example, will allow you to select an object, then run Probe on its process variable
- **See the manual for details**



medm Macros

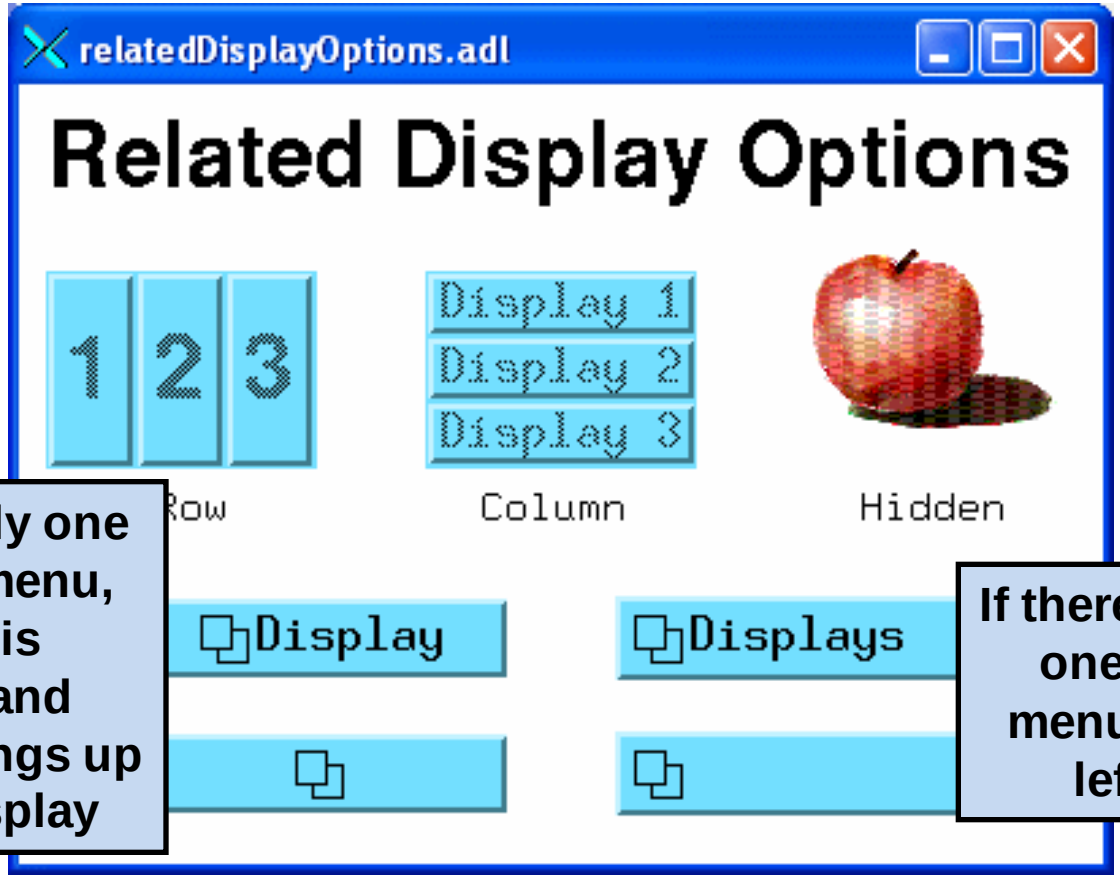
- **Strings of the form $(name) in an ADL file can be replaced by some other string**
  - For example, enter $(sector):$(corrector) as part of a PV name
- **Replacement is specified:**
  - 1. On command line:

    medm –x –macro ”sector=S1A,corrector=H2”
  - 2. In Related Display configuration:

    Resource Palette dialog
- **Allows you to design one screen and use it for many similar items**
- **The Virtual Linac uses $(user) in front of PV names**
  - So different users have their own PV names
  - Look at the startup scripts for MEDM for the Virtual Linac

medm Related Display

- Brings up a menu of other displays
- As with most MEDM objects there are many options

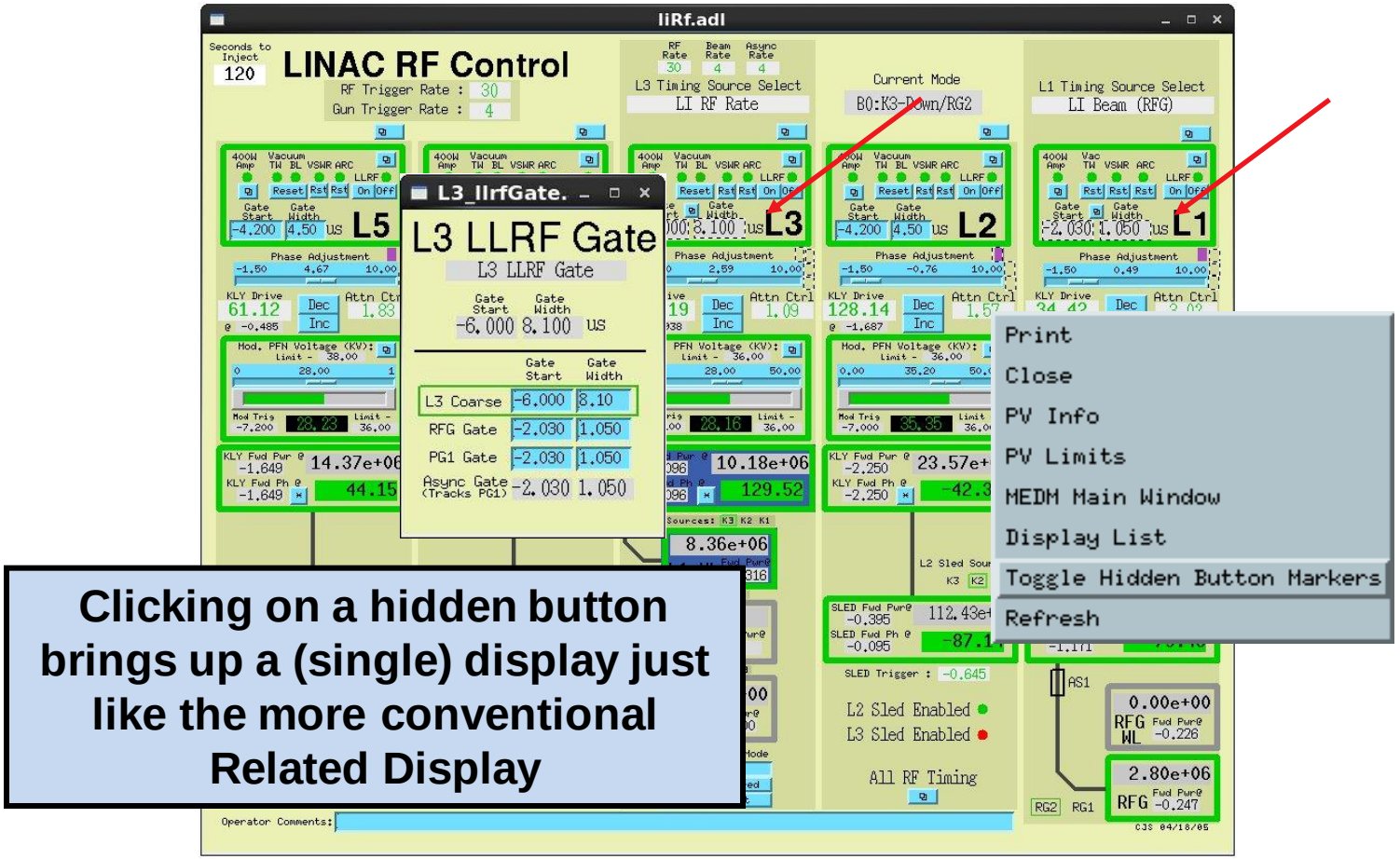


If there is only one item in the menu, the label is centered, and clicking it brings up that one display

If there is more than one item in the menu, the label is left justified

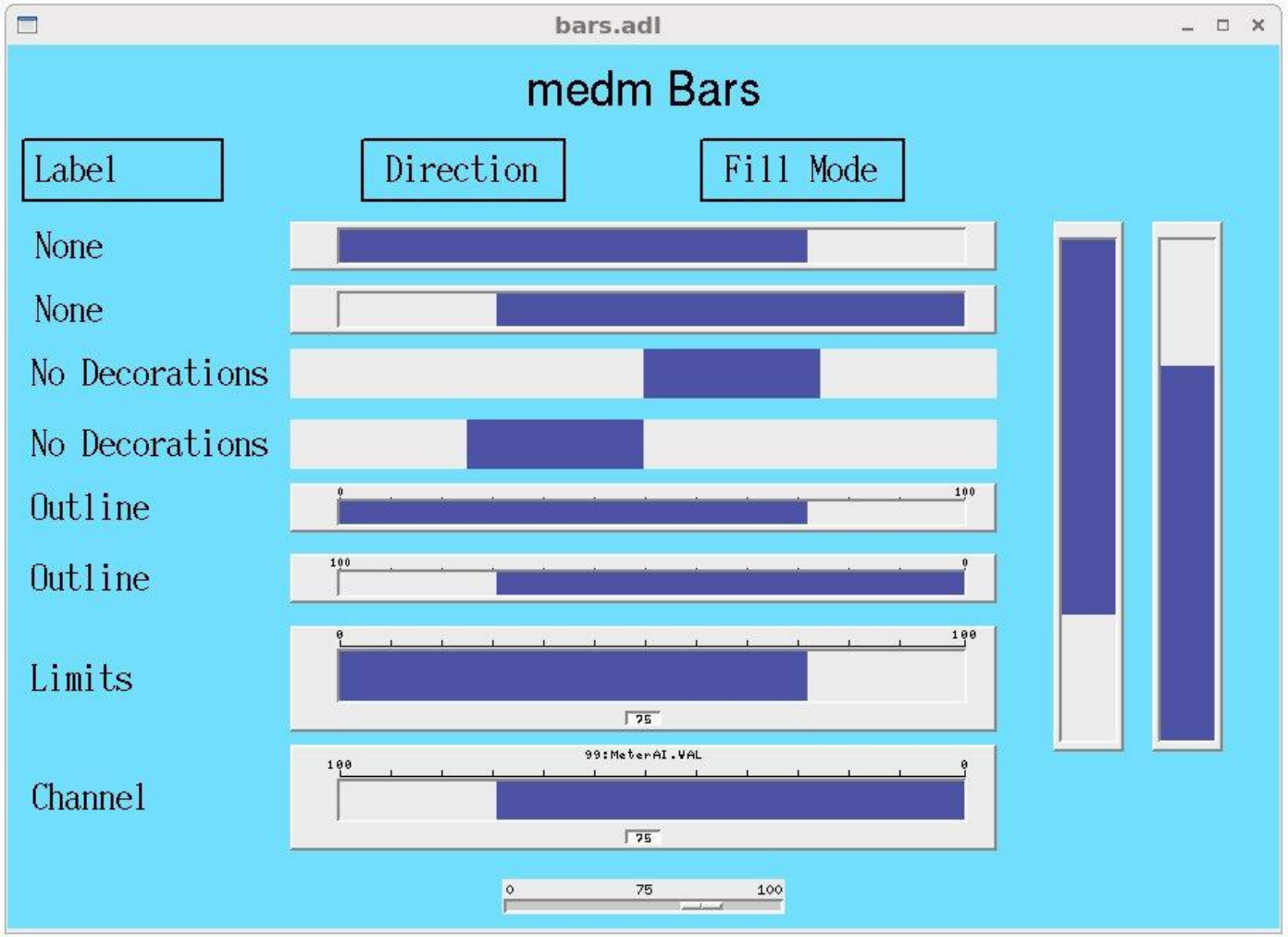
medm Hidden Button Markers

- Related Displays can be hidden under other objects
- Toggle Hidden Button Markers shows where they are



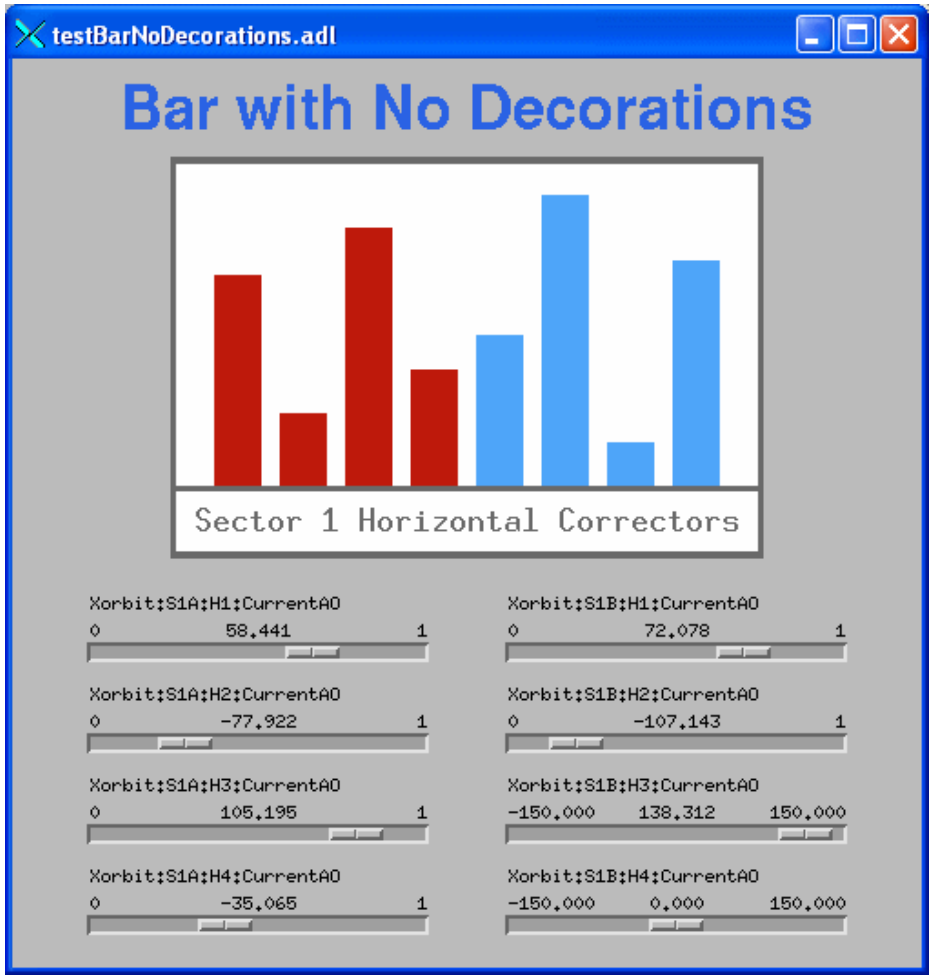
medm Bar Monitor

- Here are some options for the Bar Monitor



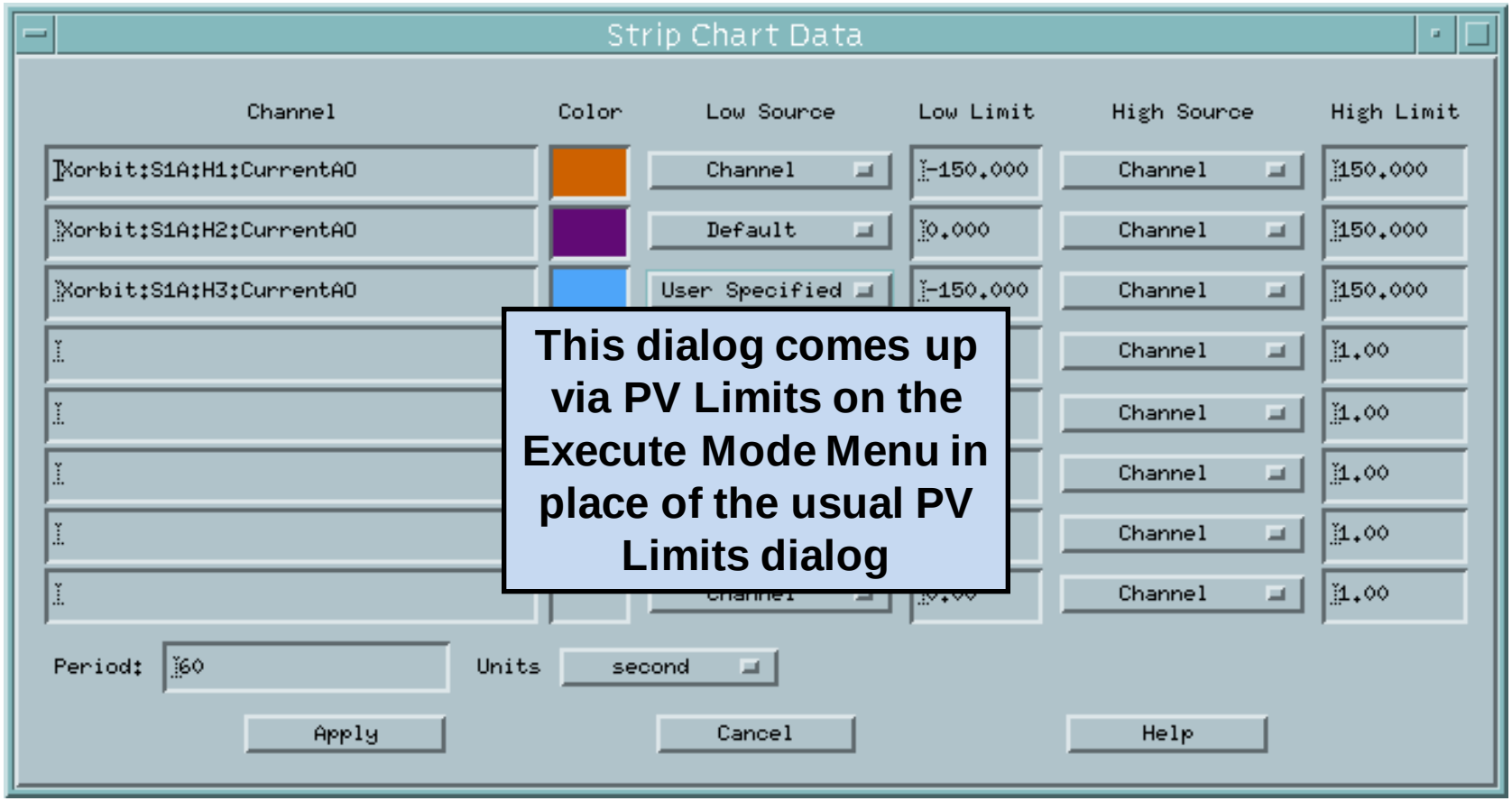
medm Bar Monitor

- The no decorations mode, useful for bar graphs and effects



medm Strip Chart

- While not as powerful as StripTool, the MEDM Strip Chart has many features, which can be changed on the fly



medm Cartesian Plot

- The Cartesian Plot is the most complicated MEDM object
- MEDM provides generic support for different plot packages
- XRT/Graph
  - Most complete implementation is XRT/Graph
  - Commercial product, not available for Windows
  - Requires a license on each machine on which it is built
  - Many features and works well
- SciPlot
  - Public Domain, modified extensively for MEDM
  - Included with MEDM, should work on any platform
  - Currently missing Second Y axis and Fill Under
- JPT
  - Developed at TJNAF
  - Does not support all MEDM Cartesian Plot features

medm Environment Variables

Environment Variables

- EPICS_DISPLAY_PATH
  - Normally set by a script that reads the application's configure/RELEASE file.
- EPICS_CA_ADDR_LIST
  - Tells channel access clients where to look for process variables
  - For beamlines, normally includes the IP address of a PV gateway.
- EPICS_CA_MAX_ARRAY_BYTES
  - The maximum number of **bytes** transferred for an array.
  - This should be >= the definition in the IOC.
- MEDM_EXEC_LIST
  - Described earlier, on "Execute Menu" slide.

medm Tutorial

‘Hands On’ Demonstration

- How To Create A Display
  - Mode Button, File Edit & Palette Menus
- File Operations
  - New Display, New, Open, Save, Close & Print
- Palettes
  - Object Types (Graphic, Monitors, Controllers)
  - Resource, Color, & Object Palettes
  - Dimensions, Colors, Objects
- Macros & Dynamic Attributes
  - String Substitutions, Calc Expressions

VNC Instructions For A Mac Laptop

1. In Apple Finder, Press Command-K, or in the menu, select “Go Connect to Server…”. This brings up the Connect to Server dialog box.
2. In the Server Address box type "vnc://crackle-vm:5962" and press the Connect button. The Screen Sharing application should start and prompt you "Enter your password to share the screen of crackle-vm:5962".
3. Type "epics!" into the the password box (without the quotes) and press Connect.
4. You should now see the redhat Linux login screen where you can enter the username and password given to you.