



## caQtDM , an EPICS Display Manager with Qt

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At the Paul Scherrer Institut (PSI) the display manager MEDM was used until recently for the synoptic displays at all our facilities, not only for EPICS but also for another, in-house built control system ACS. However MEDM is based on MOTIF and Xt/X11, systems/libraries that are starting to age. Moreover MEDM is difficult to extend with new entities. Therefore a new tool has been developed based on Qt. This reproduces the functionality of MEDM and is now in use at several facilities. As Qt is supported on several platforms this tool will also run on Microsoft Windows. The MEDM data files (.adl) were used as an initial set for the new system and were converted into the new xml format using the parser tool adl2ui. These were then edited further with the Qt-Designer and displayed with the new Qt-Manager caQtDM. The integration of new entities into the Qt designer and therefore into the Qt based applications is very easy, so that the system can easily be enhanced with new widgets. New features needed for our facility were implemented. The caQtDM application uses a C++ class to perform the data acquisition and display; this class can also be integrated into other applications.

## Qt, caQtDM: Motivation

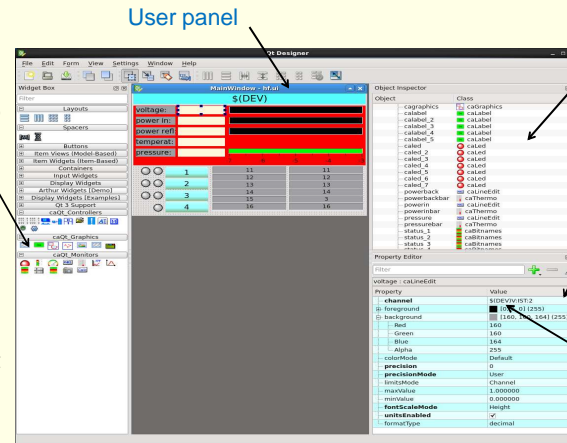
- **MEDM, EDM** based on “end of life” graphical systems
- **New requirements** for synoptic displays (cameras, LEDs, ...)
- **Qt** provides a platform independent graphical environment
- **Qt-Designer**, distributed with Qt as GUI editor needs only to be extended with your specialized widgets through its plug-in mechanism, therefore no need for developing another editor.
- **Third party libraries** based on Qt for 2D and 3D plotting graphics already exist (**qwt**, **qwtplot3d**).

The actual version of Qt used at PSI is **Qt 4.8.2**.

## Qt-Designer, the graphic user interface provided with the Qt-framework

**Plugin widgets** for the Qt-Designer to be used for designing the CS-panels.

- Strip plot, Cartesian plot, wheel switch, include, camera, LEDs, toggles, internal channels and many more
- Include (composite) widget is represented in Qt-designer with its contents
- Actually 30 widgets, including all MEDM objects.
- **Widgets are not directly CS-aware**, but provide the properties and methods to be used with applications.



Objects dropped into the user panel.

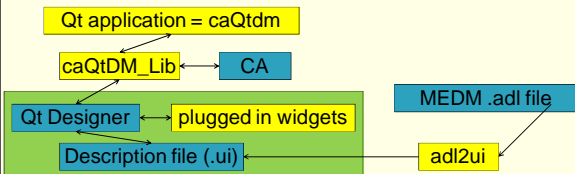
(Labels, LEDs, bars, values, bitnametables, rectangle), ...

Properties of active object. The device name (epics channel) is the most important one.

Channel name will be expanded by using a macro at start

## Components

- **Qt-Designer** with the graphical objects plugins
- **caQtDM\_Lib**, the display and control system aware library class (**EPICS, EPICS4, older in-house made CS**). Other control systems could be easily integrated.
- **caQtDM**, the display manager using **caQtDM\_Lib**
- **adl2ui**, MEDM file to xml file translator.



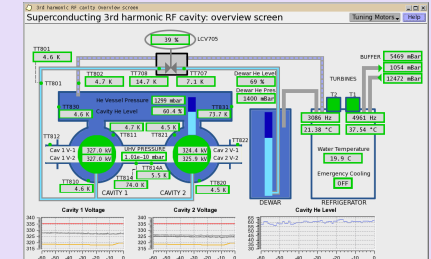
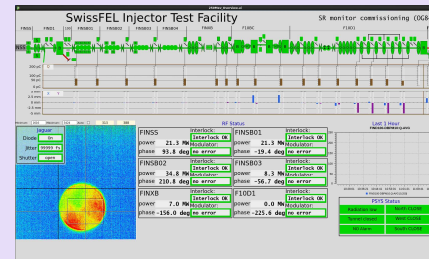
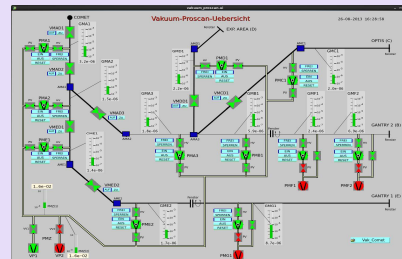
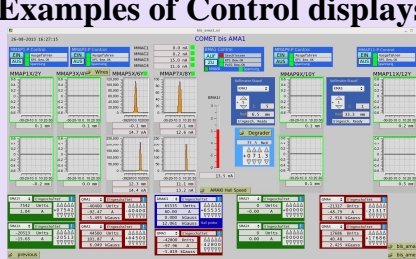
## Features

- Replaces MEDM functionality using modern graphic tools running on many platforms.
- Runs on **Linux** as well as on **Windows** native (no X11 server required)
- Requires **Qt4.8.2 with Qwt6.0.1, Epics3.14.12** or **Qt5.1 with Qwt6.1.0, Epics3.14.12**  
Qt5.1 needs a patch for [QTBUG-33130](#)
- Translation tool **adl2ui** for converting MEDM files (adl) to Qt files (ui)
- Supports already **EPICS4** for simple data and can be extended easily.
- Supports besides ui files also an in-house developed scripting language for fast prototyping of displays.

## Developing /Rendering a display

- If **MEDM** file exists, translate file with **adl2ui** and edit if necessary in Qt-Designer. A stylesheet is automatically integrated.
- When developing from scratch, integrate the standard stylesheet into “mainwindow”. The background can then be changed by modifying the stylesheet: `QWidget#centralWidget {background: rgba(187, 187, 187, 255);}`
- Display your file with **caQtDM**. When file changed use the reload function of **caQtDM**.
- Display rate: **caQtDM\_Lib** uses a mechanism that limits the display rate to 5Hz, This can be changed by specifying `{“monitor”:{“maxdisplayrate”:20}}` after a pv.
- **caQtDM** can resize the displays. When Qt layouts are used the resize work is performed by Qt.

## Examples of Control displays



**Qt-Designer** extended by our plugins and **caQtDM** represent a good control system environment for developing and rendering control system data displays.