



TRAINING IN REAL-TIME
EMBEDDED DEVELOPMENT

Course EL-301: Graphics for Embedded Linux

Course Description:

Increasingly, embedded systems incorporate graphical displays and touch screens to create a rich man-machine interface. Linux, of course, has the capability to display complex graphics as anybody who has seen Linux running on a desktop PC will know. But, graphical environments are memory-hungry and can easily eat up hundreds of MB of RAM and storage. This course describes the architecture of graphical environments on Linux, especially the X windows system, and shows how to create optimised systems that are suitable for embedded use. Topics include X servers, frame buffers, programming environments, the GTK+ and Qt widget libraries.

Overview:

A three-day course, providing hands-on experience of configuring and programming graphical environments on Embedded Linux. Practical sessions use the Nokia 770 web pad.

Course Objectives:

After completing the course attendees will:

- Understand how to include complex graphical interfaces in small memory embedded systems
- Be able to cross-compile and load X on a typical target board
- Understand the architecture of X, frame buffers and window managers
- Have an overview of graphics programming libraries

Prerequisites:

- Good knowledge of 'C' or C++
- Some knowledge of Linux is an advantage

Who Should Attend:

Application programmers and software engineers who need to build a graphical user interface on Linux

Duration:

Three days

Course Materials:

- Delegate Handbook

Related Courses:

- EL-503 Developing for embedded Linux

Course Outline

Linux and graphics

- Types of display hardware
- Frame buffer drivers
- Input devices: keyboard, mouse, touch-screen

The X Window system

- The X.org project
- Components of X
- X modules
- Kdrive (Micro X)

Building X

- Selecting components
- Cross-compiling
- Installing X on the target

Running X

- Configuring display and input devices
- Fonts: bitmapped vs scaled
- Anti-aliasing
- Networked access to X servers
- Testing and debugging common problems

Window managers

- The role of window manager: do you really need one?
- Examples: twm, ICE, Matchbox

Writing graphical applications

- Different layers, widget sets
- Low-level libraries: xlib
- Xt and the Athena widget set
- The Motif widget set
- The GTK+ widget set
- The Qt widget set
- Nano-X

Programming with Xlib

- Description of Xlib
- Example program using Xlib
- What Xlib can and can't do!

Programming with GTK+

- GDK, Glib and GTK+
- Using Glade to design application layout
- Writing GTK+ applications in 'C'
- Other language bindings

Programming with Qt

- Qt Objects
- Event handling: signals and slots
- Using Kdevelop for application design
- Writing Qt programs in C++
- Other language bindings

Living without X

- Other ways to program graphical applications
- Qt Embedded
- GTK+ Direct

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