



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

FEABHAS

#### Feabhas Ltd

5, Lowesden Works  
Lambourn Woodlands  
Hungerford, Berkshire  
RG17 7RY, UK

Tel: +44 (0) 1488 73050

Fax: +44 (0) 1488 73051

Email: [info@feabhas.com](mailto:info@feabhas.com)

Web: [www.feabhas.com](http://www.feabhas.com)