

D8 - USB Linux Drivers

Writing USB-2.0 and USB-3.0 host and gadget drivers on Linux

Objectives

- ▶ Learn to write Linux drivers for USB-2.0 and USB-3.0
 - Explore the Linux USB host-driver stack
 - Learn the structure of USB device drivers
 - Discover USB gadget drivers (2.0 and 3.0)
 - Understand the support for OTG-2.0 and OTG-3.0.
- ▶ Understand the specifics of the Linux kernel in the management of devices and drivers.
- ▶ Learn to configure the Linux kernel for optimal hotplug management.
 - Understand how hotplug events are generated and how to use them in drivers.
 - Install and use external hotplug daemons: udev, libusb, etc ...
- ▶ Discover Linux kernel changes up to the latest versions (up to 3.6.39 and 3.x).
- ▶ Master the techniques of kernel debugging.

We use a recent linux kernel, as provided by the distribution used or available on www.kernel.org.

Labs are conducted on target boards, that can be:

Atmel ARM9-based boards, with Lauterbach JTAG probes.

*Labs are conducted using the **System Workbench for Linux - Basic Edition** IDE, for which all trainees will get a free license, so that they can continue to work, after the training, in a convenient and efficient environment.*

-->

Course environment

- ▶ A PC workstation and a target board per two trainees group.
- ▶ Printed course material.

Prerequisite

- ▶ Good practice of C programming on Linux
- ▶ Good knowledge of Linux kernel and driver programming (see our [D3 - Linux Drivers](#) course and [D7 - Power Management in Linux Drivers](#) courses)

Plan

First day

Reminders on kernel programming

- ▶ Reminders on kernel module development
- ▶ Kernel objects

Exercise: Writing a kernel module creating and using kernel objects and sets

- ▶ The sysfs file system

Exercise: Interacting with a kernel module through a kernel object and the sysfs file system

Hotplug

- ▶ Hotplug in the kernel
 - uevents

Exercise: Writing a kernel module sending hotplug events to a user mode program.

- ▶ Hotplug at user level
 - Udev
 - Hal and Dbus

Exercise: Cross-compiling, configuring and using Udev.

Second Day

Devices and Drivers

- ▶ The Device/Driver model in Linux
 - Device class and types
 - Bus drivers
- ▶ Bus types
 - Generic devices and drivers
 - System devices and drivers
 - Platform devices and drivers

Exercise: Writing a platform device driver showing how device matching work

USB Drivers

- ▶ The USB bus
 - USB devices
 - USB descriptors
 - USB endpoints
 - USB requests
- ▶ User view of the USB bus and devices
- ▶ USB device drivers
 - Hotplug
 - Communicating with devices through URBs

Exercise: Writing a basic usb device driver using URBs

Exercise: Writing an usb device driver using synchronous request management

Third Day

The libUSB user-mode USB driver framework

- ▶ The libUSB libraries.
 - libUSB 0.1.12.
 - libUSB 1.0

Exercise: Building libUSB

Exercise: Writing a user-mode USB driver using libUSB

USB gadget drivers

- ▶ Basic USB gadgets.
- ▶ Composite USB gadget drivers.

Exercise: Writing a gadget driver and the corresponding host driver on the Linux workstation.

- ▶ The USB On-The-Go (OTG) specification.
 - OTG support in Linux

Renseignements pratiques

Duration : 3 days
Cost : 2290 € HT