SW1 - System Workbench for Linux

Building embedded Linux systems using System Workbench

Objectifs

- Creating Embedded Linux platforms using System Workbench
- Using and customizing System Workbench

Labs are conducted on target boards, that can be:
Dual Cortex/A7 and M4F "STM32MP15-DISCO" boards from STMicroelectronics.
Quad Cortex/A9-based "SabreLite" boards from NXP.
Quad Cortex/A53 and M4F "imx8q-evk" boards from NXP.
We use the last Ac6 System Workbench for Linux Classic Edition" version, using a recent Linux kernel.

Course environment

- Printed course material (in English)
- One Linux PC for two trainees.
- One target platform (i.MX6 Sabre from NXP) for two trainees
- Ac6 System Workbench for Linux Classic Edition

Prerequisite

- Good C programming skills
- Knowledge of Linux user programming (see our D0 - Linux user mode programmingcourse)
- Knowledge of Linux Embedded systems (see our D1 - Embedded Linux with Buildroot and Yoctocourse)
  - For those without a prior knowledge of Embedded Linux, see our D1S - Embedded Linux with Ac6 System Workbench course
- Preferably knowledge of Linux kernel and driver programming (see our D3 - Linux Driverscourse)

Target Audience

- Any embedded systems engineer or technician with the above prerequisites.

Course Outline

Introduction to Ac6 System Workbench

- Overview
  - Eclipse
  - Kernel and modules
  - Platforms and Root file-systems
- The build system architecture
  - Building individual packages
  - Building platforms
  - Building Root file-systems
- Developing with System Workbench
  - Creating an application
  - Building the application
  - Debugging

Exercise: Building a root file system using a pre-defined platform template

Developing applications with System Workbench

- Creating a Linux program
- Creating a library
  - Static library
  - Shared library
- Debugging on the target
  - Using an SSH connection
  - Debugging shared libraries

Exercise: Create a small program, with a custom shared library, and debug it on the target

Creating a Linux Platform

- Creating a platform project
  - Importing a pre-configured platform
  - Creating a platform from scratch
- Configuring the platform
  - Source and installation directories
  - Link to a target Rootfs
  - Build configurations

Exercise: Create and configure a minimum platform from scratch, using library packages

- Populating the build environment
  - Import packages in the build environment
  - Build individual packages
  - Build the whole platform

Exercise: Build the platform, manually building some packages

- Adding packages to a platform
  - From a library
  - From an existing Eclipse project

Exercise: Add the previously developed application to the platform

- Creating a new package
  - Specifying the source
  - Patching the official sources
  - Adding package-specific resources
  - Adding package configuration directives

Exercise: Add a new open-source package to the platform
Exercise: Compiling and customizing the kernel

Compiling and customizing the kernel

- Kernel projects
  - Creating a kernel project
  - Selecting the architecture and configuration
  - Customizing the configuration
  - Compiling the kernel

Exercise: Configure and compile the kernel in the platform

- Module projects
  - Creating a module project
  - Linking it to a kernel project
  - Creating and building modules

Exercise: Add and configure an external module

Creating a Root File-System

- Creating a rootfs project
  - Creating the rootfs structure
  - Add files to the base structure

- Edit standard configuration files
  - File systems
  - Initialization
  - Starting applications
- Creating and populating the root filesystem
  - Linking the file system to the platform
  - Installing platform components
  - Installing libraries

Exercise: Create the root filesystem for the platform just built

Managing Package Libraries

- Creating a Library
  - Adding packages from a platform
  - Creating packages in the Library
- Importing a library
- Exporting a library

Exercise: Create a library with the kernel, module and application created