Yocto Project and OpenEmbedded training

On-line seminar

Title	**Yocto Project and OpenEmbedded development training**
Overview	Understanding the Yocto Project Using it to build a root filesystem and run it on your target Writing and extending recipes Creating layers Integrating your board in a BSP Creating custom images Application development with the Yocto Project SDK
Duration	**Four** half days - 16 hours (4 hours per half day). 80% of lectures, 20% of practical demos.
Trainer	One of the engineers listed on 80% of lectures, 20% of practical demos.
Language	Oral lectures: English Materials: English.
Audience	Companies and engineers interested in using the Yocto Project to build their embedded Linux system.
Prerequisites	**Familiarity with embedded Linux** as covered in our embedded Linux training (`https://bootlin.com/training/embedded-linux/`) **Familiarity with Unix or GNU/Linux commands** People lacking experience on this topic may get trained by themselves, for example with our freely available on-line slides: `https://bootlin.com/blog/command-line/`

Required equipment	• Computer with the operating system of your choice, provided it is supported by Zoom (`https://zoom.us` for videoconferencing • Webcam and microphone (preferably from an audio headset) • High speed access to the Internet
Materials	Electronic copies of presentations, demo instructions and data.

Hardware

STMicroelectronics STM32MP157A-DK1 Discovery board

- STM32MP157A (dual Cortex-A7) CPU from STMicroelectronics
- USB powered
- 512 MB DDR3L RAM
- Gigabit Ethernet port
- 4 USB 2.0 host ports
- 1 USB-C OTG port
- 1 Micro SD slot
- On-board ST-LINK/V2-1 debugger
- Arduino Uno v3-compatible headers
- Audio codec
- Misc: buttons, LEDs

Half day 1

Lecture - Introduction to embedded Linux build systems

- Overview of an embedded Linux system architecture
- Methods to build a root filesystem image
- Usefulness of build systems

Lecture - Overview of the Yocto Project and the Poky reference system

- Organization of the project source tree
- Building a root filesystem image using the Yocto Project

Demo - First Yocto Project build

- Downloading the Poky reference build system
- Building a system image

Lecture - Using Yocto Project - basics

- Organization of the build output
- Flashing and installing the system image

Demo - Flashing and booting

- Flashing and booting the image on the board

Half day 2

Lecture - Using Yocto Project - advanced usage

- Configuring the build system
- Customizing the package selection

Demo - Using NFS and configuring the build

- Configuring the board to boot over NFS
- Learn how to use the `PREFERRED_PROVIDER` mechanism

Lecture - Writing recipes - basics

- Writing a minimal recipe
- Adding dependencies
- Development workflow with *bitbake*

Demo - Adding an application to the build

- Writing a recipe for *nInvaders*
- Adding *nInvaders* to the final image

Lecture - Writing recipes - advanced features

- Extending and overriding recipes
- Adding steps to the build process
- Learn about classes
- Analysis of examples
- Logging
- Debugging dependencies

Half day 3

Demo - Learning how to configure packages

- Extending a recipe to add configuration files
- Using `ROOTFS_POSTPROCESS_COMMAND` to modify the final rootfs
- Studying package dependencies

Lecture - Layers

- What layers are
- Where to find layers
- Creating a layer

Demo - Writing a layer

- Learn how to write a layer
- Add the layer to the build
- Move *nInvaders* to the new layer

Lecture - Writing a BSP

- Extending an existing BSP
- Adding a new machine
- Bootloaders
- Linux and the linux-yocto recipe
- Adding a custom image type

Demo - Implementing the kernel changes

- Extend the kernel recipe to add the nunchuk driver
- Configure the kernel to compile the nunchuk driver
- Play *nInvaders*

Half day 4

Lecture - Creating a custom image	Demo - Creating a custom image
• Writing an image recipe • Adding users/groups • Adding custom configuration • Writing and using package groups recipes	• Writing a custom image recipe • Adding *nInvaders* to the custom image
Lecture - Creating and using an SDK	**Demo - Experimenting with the SDK**
• Understanding the purpose of an SDK for the application developer • Building an SDK for the custom image	• Building an SDK • Using the Yocto Project SDK

Questions and Answers

- Questions and answers with the audience about the course topics
- Extra presentations if time is left, according what most participants are interested in.