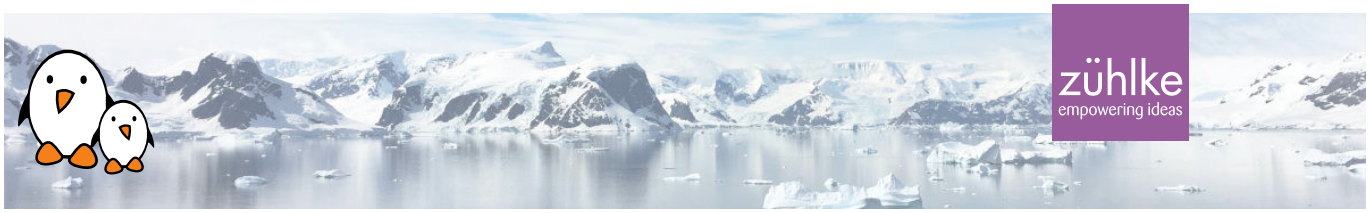
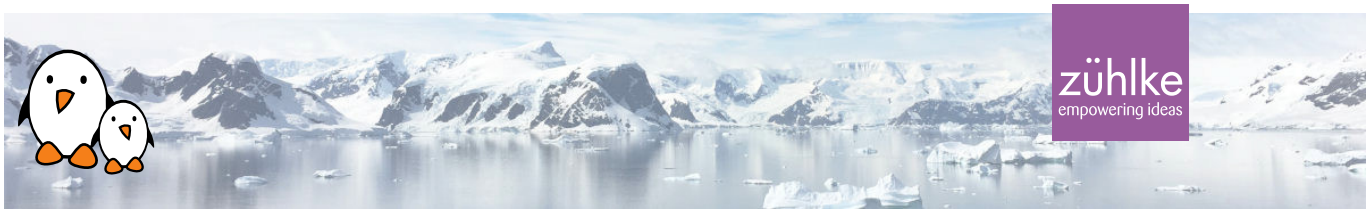


Yocto Project and OpenEmbedded training

3-day session

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	**Three** days - 24 hours (8 hours per day). 40% of lectures, 60% of practical labs.
Trainer	Nikola Jelić nikola.jelic@zuehlke.com
Language	Oral lectures: English. Materials: English.
Audience	Companies and engineers interested in using the Yocto Project to build their embedded Linux system.
Prerequisites	**Knowledge of embedded Linux** as covered in the embedded Linux training (`https://bootlin.com/training/embedded-linux/`) **Knowledge and practice of UNIX or GNU/Linux commands** People lacking experience on this topic should get trained by themselves, for example with the freely available on-line slides: `https://bootlin.com/blog/command-line/`

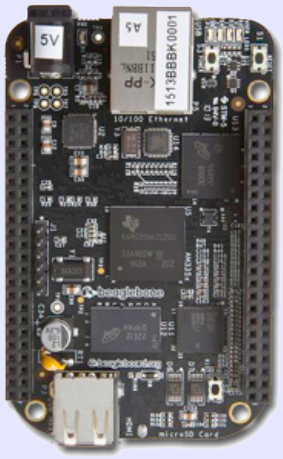
Required equipment	• PC computers or VMs with at least 8 GB of RAM, a CPU at least equivalent to an Intel Core i5 and Ubuntu Linux installed in a **free partition of at least 50 GB.** • We need Ubuntu Desktop 16.04 (Xubuntu and other variants are fine) or Debian. We don't support other distributions, because we can't test all possible package versions. • **High Speed Connection to the Internet** (direct or through the company proxy). • **PC computers with valuable data must be backed up** before being used in our sessions. Some people have already made mistakes during our sessions and damaged work data.
Materials	Electronic copies of presentations and labs. Electronic copy of lab files.

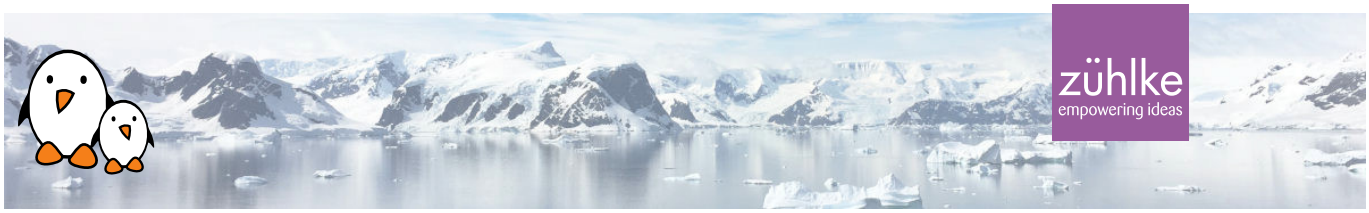


Hardware

BeagleBone Black board

- An ARM AM335x processor from Texas Instruments (Cortex-A8 based), 3D acceleration, etc.
- 512 MB of RAM
- 2 GB of on-board eMMC storage
  (4 GB in Rev C)
- USB host and device
- HDMI output
- 2 x 46 pins headers, to access UARTs, SPI buses, I2C buses and more.





Day 1 - Morning

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

Lab - First Yocto Project build

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

Day 1 - Afternoon

Lecture - Using Yocto Project - basics

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

Lab - Flashing and booting

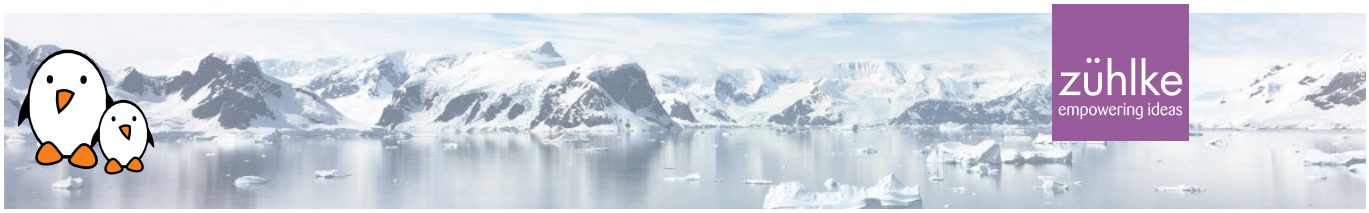
- Flashing and booting the image on the board

Lecture - Using Yocto Project - advanced usage

- Configuring the build system
- Customizing the package selection

Lab - Using NFS and configuring the build

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



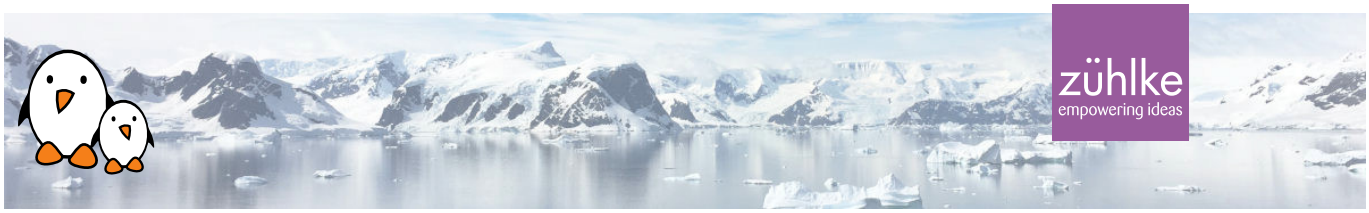
Day 2 - Morning

Lecture - Layers	Lab - Writing a layer
• What layers are • Where to find layers • Creating a layer	• Learn how to write a layer • Add the layer to the build • Move *nInvaders* to the new layer

Lecture - Writing recipes - basics	Lab - Adding an application to the build
• Writing a minimal recipe • Adding dependencies • Development workflow with *bitbake*	• Writing a recipe for *nInvaders* • Adding *nInvaders* to the final image

Day 2 - Afternoon

Lecture - Writing recipes - advanced features	Lab - Extending a recipe
• Extending and overriding recipes • Adding steps to the build process • Learn about classes • Analysis of examples • Logging • Debugging dependencies	• Applying patches to an existing recipe • Using a custom configuration file for an existing recipe • Extending a recipe to fit your needs



Day 3 - Morning

Lecture - Writing a BSP	Lab - Create a custom machine configuration
• Extending an existing BSP • Adding a new machine • Bootloaders • Linux and the linux-yocto recipe • Adding a custom image type	• Creating a custom machine configuration • Understanding how the target architecture is dynamically chosen

Day 3 - Afternoon

Lecture - Creating a custom image	Lab - 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 • Choosing the exact packages for the board
Lecture - Creating and using an SDK	**Lab - 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