



Yocto Embedded Linux training

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Training goals

- Understanding Embedded Linux principles (0.5 day)
- Understanding Yocto / OpenEmbedded principles (2.5 days)
- Writing sample recipes based on OSS standards
 - Autotools
 - CMake
 - Linux drivers
 - Device Tree
- Customizing existing Yocto recipes
- Using Yocto tools (SDK, Devtool, ptest, testimage, etc.)
- Building a Yocto “IoT” device !



Prerequisite

- Basic UNIX/Linux knowledge (using the shell !)
- Basic C language knowledge



Training environment

- Practical work on QEMU/ARM emulator
- The training is based on Yocto 3.1 (Dunfell, LTS)
- The Linux environment is Ubuntu 18.04 (VirtualBox)
- The training duration is 3 days, i.e. 21 hours course (7h/day)



Embedded Linux section (ARM board)

- GNU/Linux reminders
- GPL/LGPL licenses
- Introducing the cross-compilation
- Cross-compiling the Linux kernel
- BusyBox
- Using a “build system”
 - Pros and cons
 - Main tools (Buildroot, Yocto/OpenEmbedded, etc.)



Yocto section (QEMU/ARM)

- History (OpenEmbedded → Yocto)
- Main concepts : BitBake, metadata, layers, inheritance, etc.
- Creating the *core-image-minimal* image for QEMU/ARM
- Generated directories (deploy and work)
- Tuning and optimisation (`local.conf` / `bblayers.conf`)
- Creating a test layer
- Writing recipes (`.bb` files)
- Package management (OPKG)
- Autotools / CMake classes
- Static and dynamic dependencies
- Layer priority, extending recipes (`.bbappend`)
 - Applying patches
 - Using configuration fragments
- Device tree integration



Yocto section (QEMU/ARM)

- Kernel recipes and modules (the “module” class)
- Custom images and “packagegroup” class
- Testing a custom image with NFS-Root
- Creating a custom distribution (aka “distro”)
- Building and using the cross-toolchain (SDK/eSDK)
- Using “Devtool”
- Using SysvInit and systemd
- Using CI (“ptest” and “testimage”)



Provided software components

- The user name is “stage” and the password is “stage0”
- Use sudo for root access
- Everything is located in the LE_Yocto directory on the desktop

slides = training slides

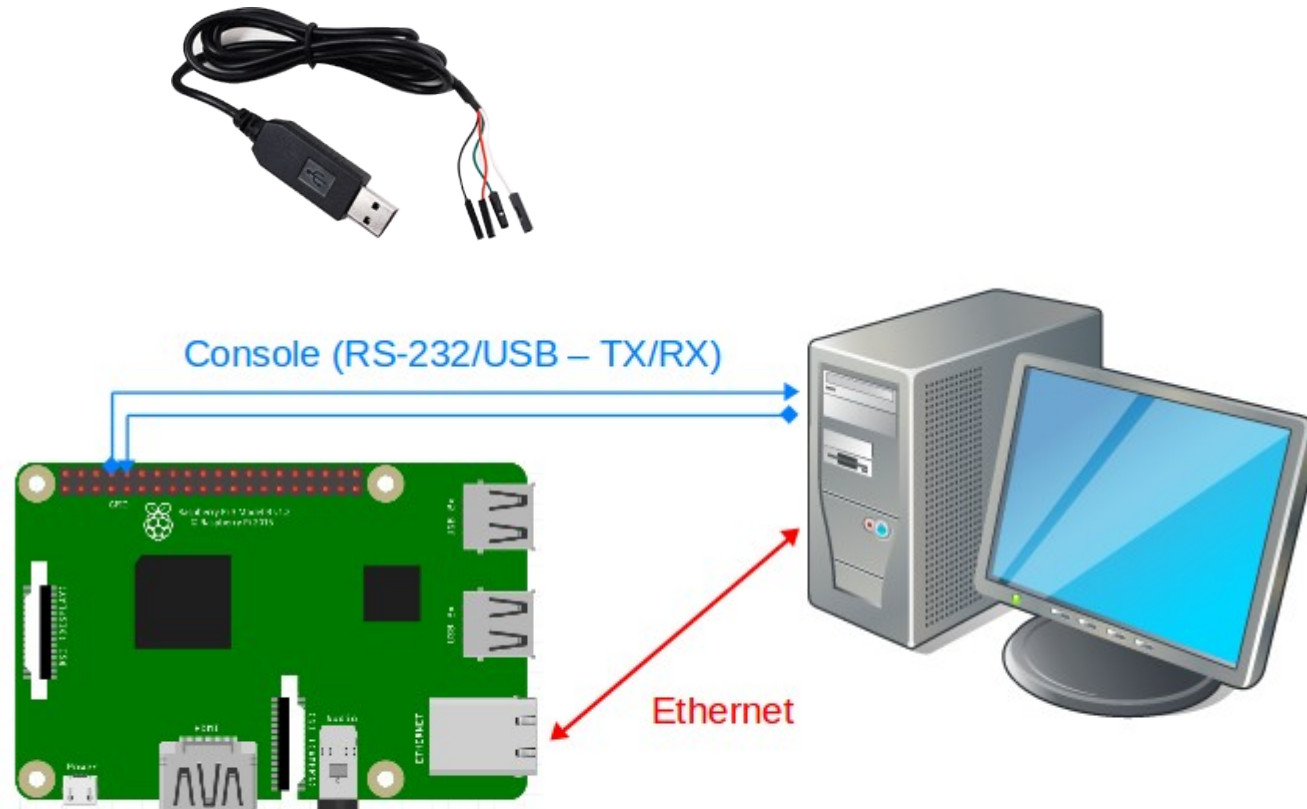
PW = practical work

poky = Yocto sources and binaries

misc = training layers



Training configuration (Pi)





Training configuration (QEMU)

```
Fichier Machine Écran Entrée Périphériques Aide
Activités Terminal lun. 10:42

Fichier Édition Affichage Rechercher Terminal Aide
[ 4.806028] VFS: Mounted root (ext4 filesystem) on device 253:0.
[ 4.808882] devtmpfs: mounted
[ 4.877167] usb 1-1: new high-speed USB device number 2 using xhci_hcd
[ 4.885534] Freeing unused kernel memory: 2048K
[ 4.888774] Run /sbin/init as init process
INIT: version 2.96 booting
[ 5.061498] input: QEMU QEMU USB Tablet as /devices/platform/3f000000.pcie/pc
i0000:00/0000:00:02.0/usb1/1-1/1-1:1.0/0003:0627:0001.0001/input/input0
[ 5.064474] hid-generic 0003:0627:0001.0001: input: USB HID v0.01 Mouse [QEMU
QEMU USB Tablet] on usb-0000:00:02.0-1/input0
[ 5.224102] usb 1-2: new high-speed USB device number 3 using xhci_hcd
FBIOPUT_VSCREENINFO failed, double buffering disabled[ 5.481884] input: QEMU
QEMU USB Keyboard as /devices/platform/3f000000.pcie/pci0000:00/0000:00:02.0/usb
1/1-2/1-2:1.0/0003:0627:0001.0002/input/input1
[ 5.558204] hid-generic 0003:0627:0001.0002: input: USB HID v1.11 Keyboard [Q
EMU QEMU USB Keyboard] on usb-0000:00:02.0-2/input0
Starting udev
[ 6.018613] udevd[136]: starting version 3.2.9
[ 6.083772] udevd[137]: starting eudev-3.2.9
[ 6.966416] EXT4-fs (vda): re-mounted. Opts: (null)

Poky (Yocto Project Reference Distro) 3.1.18 qemuarm /dev/ttyAMA0
qemuarm login: 
```