Linux Real-Time training
(LEVEL : Advanced)

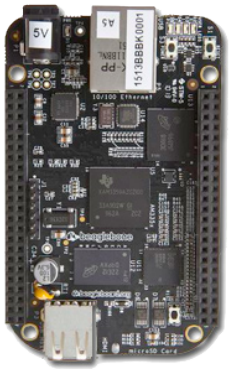
Title	Linux Real-Time training
Overview	Understanding Linux real-time approaches Linux preemption options Linux real-time extensions Xenomai Practical labs with ARM-based board
Duration	**ONE** day - 8 hours. 50% of lectures, 50% of practical labs (approx.)
Trainer	Marco Cavallini m.cavallini (AT) koansoftware.com
Language	Oral lectures: English or Italian Materials: English.
Audience	People that need to learn how to build Linux device driver People using special hardware with embedded Linux systems
Prerequisites	**Good knowledge of Linux** as covered in our embedded Linux trainings (`http://koansoftware.com/en/content/linux-embedded-course`) **Knowledge and practice of GNU/Linux** **Knowledge of Linux kernel** People lacking experience on these topics should not attend this course.

Required equipment	**For public sessions** Everything is supplied by KOAN in public sessions except the PC. Participants must have **their own PC laptop computer** with: • PC computers with at least **2GB of RAM**, and **40GB** of free disk space. • **VMWare Player > 6.x** installed. • We will work with Lubuntu Desktop 14.04 (64 bit) We don't support other distributions, because we can't test all possible package versions. • **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. **For on-site sessions** please add the following • Video projector • **Connection to the Internet** (direct or through the company proxy).
Materials	Print and electronic copies of presentations and labs. Electronic copy of lab files.

Hardware

The hardware platform used for the practical labs of this training session is the **BeagleBone Black** board, which features:

- An ARM AM335x processor from Texas Instruments (Cortex-A8 based), 3D acceleration, etc.
- 512 MB of RAM
- 4 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



Note:
Content and order of this agenda may slightly vary between sessions and will be determined by the participants and the specific needs of the class.

Day 1 - Morning

Lecture - Real-Time Linux

- Linux and real-time approaches
- Xenomai project

Lecture - Linux commands and filesystem

- Understanding latency
- Interrupt latency
- Understanding preemption
- Processes and threads

Lab - Using linux RT PREEMPT

Using the ARM board

- Buildig a normal kernel
- Buildig a Real-Time kernel
- Latency comparison between two kernels

Day 1 - Afternoon

Lecture - Developing kernel modules

- Inter-process communication
- Linux real-time extensions
- Xenomai architecture
- The Adeos interrupt pipeline abstraction
- How to build Xenomai
- Xenomai APIs

Lab - Extending linux with Xenomai

Using the ARM board

- Using Debian on the ARM board
- Extending Debian with Xenomai patches
- Latency measurement with Xenomai
- Latency measurement with Xenomai
- Testing CPU affinity and isolation