

Hands-on course , 5
day(s)
Ref : HYP

Participants

Architects or developers in charge of realtime application deployment merging realtime applications and opensource general purpose operating system.

Pre-requisites

Basic knowledge of C programs development, realtime executives and Linux or UNIX.

Next sessions

Hypervisors and realtime Linux

OBJECTIVES

At the end of this training you will be able to choose between the different realtime solutions for Linux and to develop realtime applications based on Linux-RT, Xenomai or a realtime hypervisor architecture.

1) Virtualisation using Linux

2) The XEN Hypervisor

3) Overview of realtime architectures with Linux

4) Realtime Hypervisors

Case study

The exercises are proposed using skeletons to be completed to allow the student to write a realtime application and to interface it with Linux.

1) Virtualisation using Linux

- Overview of virtualization. History. Theory of virtualization. Virtualization types and modes.
- The new virtualization helpers in modern CPU, Intel VT-X and ARM Trust-zone.
- Virtualization gains. Securing a system by diminution of the trusted software base.
- Virtualization using Linux. Namespaces and application virtualization.
- Overview of QEMU and KVM. Focus on XEN.

2) The XEN Hypervisor

- Presentation of the XEN Hypervisor. Installation, commands overview.
- Storage management, console, networking with XEN.
- CPU virtualization, scheduling, checkpoints and migration.
- Limits of the XEN scheduling. Tries to makes XEN realtime.
- The XEN Development interface.

Workshop

Installation and management of the XEN Hypervisor. Implementation of a bare XEN application. Port of an Operating System to XEN. Xen scheduler.

3) Overview of realtime architectures with Linux

- Linux realtime evolution. Origin of the problem.
- Schedulers, bottom halves and latency. Linux-RT and new schedulers.
- Nano kernels and interrupt virtualization. Overview and history of RT_Linux and RTAI nano kernels.
- Interrupt virtualization using ADEOS and xenomai.
- Virtualization using ADEOS. Domains management and events handling. Interrupt management.
- Xenomai applications development. Posix interface. Native interface.
- RTDM interface. Interacting with linux. COMEDI.
- RTNET and determinist ethernet networking using TDMA.

Workshop

Installation of Xenomai, development of a realtime application with Posix and Native Interface. Benchmark comparing Linux standard applications and Xenomai applications under heavy load.

4) Realtime Hypervisors

- History and overview of realtime hypervisors.
- Opensource realtime hypervisors, XtratuM and L4/Pistachio.
- Commercial hypervisors, VLX, OK-L4, PikeOS.
- XtratuM. Building an application with XtratuM. Linux port to XtratuM
- Inter domain communication.
- Scheduling and memory management with XtratuM.

Workshop

Installation of Xtratum and realtime OS Partikle. Development of a realtime application. Benchmark.