HOWTO setup Linux with PREEMPT_RT properly

Linux in itself is not real time capable. With the additional PREEMPT_RT patch it gains real-time capabilities. The sources have to be downloaded first. After unpacking and patching, the kernel configuration has to be adapted. Then, the kernel can be built and started.

Getting the sources

First, the kernel version should be chosen. After this, take a look if the PREEMPT_RT patch is available [https://www.kernel.org/pub/linux/kernel/projects/rt] for this particular version.

The source of the desired version has to be downloaded (for the Linux kernel as well as for the PREEMPT_RT patch). This example is based on the Linux kernel version 4.4.12.

```
$ wget https://www.kernel.org/pub/linux/kernel/v4.x/linux-4.4.12.tar.xz
$ wget https://www.kernel.org/pub/linux/kernel/projects/rt/4.4/patch-4.4.12-rt19.patch.xz
```

After downloading, unpack the archives and patch the Linux kernel:

```
$ xz -cd linux-4.4.12.tar.xz | tar xvf -
$ cd linux-4.4.12
$ xzcat ../patch-4.4.12-rt19.patch.xz | patch -p1
```

Configuring the kernel

The only necessary configuration for real-time Linux kernel is the choice of the “Fully Preemptible Kernel” preemption model (CONFIG_PREEMPT_RT_FULL). All other kernel configuration parameters depend on system requirements. For detailed information about how to configure a kernel have a look at Linux kernel documentation [https://www.kernel.org/doc/Documentation/kbuild/kconfig.txt].

When measuring system latency all kernel debug options should be turned off. They require much overhead and distort the measurement result. Examples for those debug mechanism are:

- DEBUG_PREEMPT
- Lock Debugging (spinlocks, mutexes, etc. . .)
- DEBUG_OBJECTS
- …

Some of those debugging mechanisms (like lock debugging) produce a randomized overhead in a range of some micro seconds to several milliseconds depending on the kernel configuration as well as on the compile options (DEBUG_PREEMPT has a low overhead compared to Lock Debugging or DEBUG_OBJECTS).

However, in the first run of a real-time capable Linux kernel it might be advisable to use those debugging mechanisms. This helps to locate fundamental problems.

Building the kernel

Building the kernel and starting the kernel works similarly to a kernel without PREEMPT_RT patch.

realtime/documentation/howto/applications/preemptrt_setup.txt · Last modified: 2017/06/20 14:11 by anna-maria