

RODOS

1PPS triggered scheduling

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In many distributed systems, like for example in satellite applications, we have the situation where software modules running on different hardware units have to work synchronized. A very often solution is to have an global and external beat signal which comes very precisely once per seconds, the so called One Pulse Per Second (1PPS). Very often comes this 1PPS from the GPS receiver, which have a very accurate time notion.

In RODOS Threads and all kind of time events are synchronized and scheduled using a node internal clock. This method will not work globally if we have several nodes each having its own clock (the clocks will drift very fast).

In this tutorial we show a scheduler which is triggered by an external 1PPS. We define a class Activity1PPS. Instances of this class shall be activated relatively to the external 1PPS and not to the internal clock. Each Activity1PPS defines an offset and a frequency.

The frequency says how often the activity shall be executed in each seconds. Other in other words: How often this activity shall be executed after each 1PPS.

The offset (in nanoseconds) says how long to wait to execute the activity for the first time after each 1PPS.

Restrictions:

Activities1PPS shall be executed at least once per second. Frequency ≥ 1
The offset has to be less than $1 \text{ * SECOND / frequency}$

The scheduler will then trigger all activities which are registered in the activity list, like the normal RODOS scheduler does with all threads registered in the Thread List.

The first execution will be after "offset" nanoseconds after each 1PPS.

Subsequent executions will be separated by $1 \text{ * SECOND / frequency}$.

No activity will be activated after one second after the last 1PPS.

If no 1PPS arrives, no activity will be executed.

1. Execution

In this example we generate the 1PPs using the Linux signals and the RODOS interrupt distribution.

RODOS distributes “termInterrupts” which can be generated using the kill shell command, (eg “killall tst”) using the topic interruptSigterm.

Our scheduler subscribes interruptSigterm and uses them to trigger the activities.

The example-activities1pps.cpp are some very simple examples how to implement activities1PPS.

Use the shell scripts to compile and execute the files.

Execute the RODOS program by calling

```
% tst
```

On other terminal generate the 1PPS signals using

```
% killall tst
```

Or to generate it periodically use the delivered shell script

```
% generate-1pps.sh
```

Please note: The generated 1PPS signals take a little longer than 1 second. So you will notice a time drift. The script “generate-1pps.sh” aims to be simple and not to be accurate.