Wikiprint Book

Title: rtembed

Subject: Java Path Finder - projects/rtembed

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rtembed

The rtembed extension is aimed at verification of Java programs for real-time and embedded platforms, such as RTSJ.

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Features

Currently, the extension includes the following components:

- implementation of a significant part of RTSJ API and semantics,
- RTSJ-compliant scheduler based on priorities and limited preemption,
- abstractions of real time clock and thread periods,
- a listener that detects invalid usage of RTSJ memory areas, and
- an optimization of state space traversal based on platform-specific restrictions of concurrency.

The platform-specific restrictions of concurrency are described in

- Pavel Parizek and Tomas Kalibera. Platform-Specific Restrictions on Concurrency in Model Checking of Java Programs, In Proceedings of the 14th International Workshop on Formal Methods for Industrial Critical Systems (FMICS), LNCS, vol. 5825, 2009.

Running

To run the extension with all the features, you need to specify the following properties as a part of JPF configuration:

```
+jpf.listener=gov.nasa.jpf.rtembed.memory.MemoryAreasChecker,\
       gov.nasa.jpf.rtembed.scheduling.SchedulingDataManager,\
       gov.nasa.jpf.rtembed.time.TimedEventsManager
+vm.scheduler_factory.class=gov.nasa.jpf.rtembed.scheduling.RTSJSchedulerFactory
+vm.insn_factory.class=gov.nasa.jpf.rtembed.restrictpar.PlatformSpecificInstructionFactory
+rtembed.scheduler.processors=X
+rtembed.scheduler.timeslicing=true/false
+rtembed.scheduler.backbranches=true/false
+rtembed.scheduler.threadpriorities=true/false
+rtembed.scheduler.scopedmemaware=true/false
+rtembed.scheduler.priorityinheritance=true/false
+rtembed.scheduler.timemodel=true/false
```

Value of the `rtembed.scheduler.processors` property states how many processors a platform has (i.e., how many threads can run in parallel). The `rtembed.scheduler.timeslicing` property states whether JPF should simulate a platform that employs time-preemption (time slicing), and the `rtembed.scheduler.backbranches` property specifies whether JPF should consider back-branches as thread yield points. Other properties are related to various aspects of RTSJ-compliant scheduling and semantics, and generally should be set to 'true'.

Specifically, to run the extension in the RTSJ mode, you need to provide the following configuration:

```
+jpf.listener=gov.nasa.jpf.rtembed.memory.MemoryAreasChecker,\
       gov.nasa.jpf.rtembed.scheduling.SchedulingDataManager,\
       gov.nasa.jpf.rtembed.time.TimedEventsManager
+vm.scheduler_factory.class=gov.nasa.jpf.rtembed.scheduling.RTSJSchedulerFactory
+vm.insn_factory.class=gov.nasa.jpf.rtembed.restrictpar.PlatformSpecificInstructionFactory
+rtembed.scheduler.processors=1
+rtembed.scheduler.timeslicing=false
+rtembed.scheduler.backbranches=false
+rtembed.scheduler.threadpriorities=true
+rtembed.scheduler.scopedmemaware=true
+rtembed.scheduler.priorityinheritance=true
+rtembed.scheduler.timemodel=true
```

Repository

The Mercurial repository can be found on http://babelfish.arc.nasa.gov/hg/jpf/jpf-rtembed