

Marte by Time4Sys

REVISION HISTORY

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Chapter 1

Introduction

This document presents the main result of the Waruna project, ie an Ecore implementation of the OMG's Marte specification. This implementation follow quite closely its original specification excepts in a few areas as explained in following chapter.

Chapter 2

Deviation from OMG Marte specification

2.1 Pattern of Activation

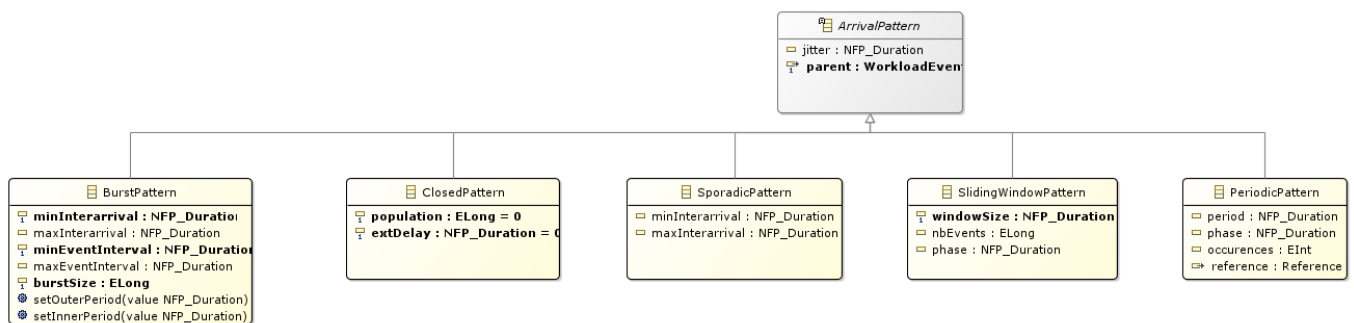


Figure 2.1: activation-pattern

Contrarily to the Marte specification, we have flatten the hierarchy and also haven't (yet?) implemented all pattern.

Table 2.1: Comparisons of arrival pattern table

Pattern	Marte	Time4Sys	Description
PeriodicPattern	X	X	It describes periodic interarrival patterns, with an optional maximal deviation (jitter)
AperiodicPattern	X		It describes an unbounded pattern that is defined by a distribution function.
SporadicPattern	X	X	It describes a bounded pattern that is defined by a corner case interarrival times and a maximum deviation (jitter).
BurstPattern	X	X	It describes a bursty interarrival pattern with a number of events that can occur in a bounded period.
IrregularPattern	X		It describes an aperiodic pattern that is described by a table of successive interarrivals durations measured from a starting phase.
ClosedPattern	X		It describes a workload characterized by a fixed number of active or potential users or jobs that cycle between executing the scenario.

Table 2.1: (continued)

Pattern	Marte	Time4Sys	Description
OpenPattern	X		It describes a workload that is modeled as a stream of requests that arrive at a given rate in some predetermined pattern (such as Poisson arrivals).
SlidingWindowPattern		X	It describes a bounded pattern that is defined by the maximum number of events that can occur on a sliding window.

2.2 Links of Precedence between tasks

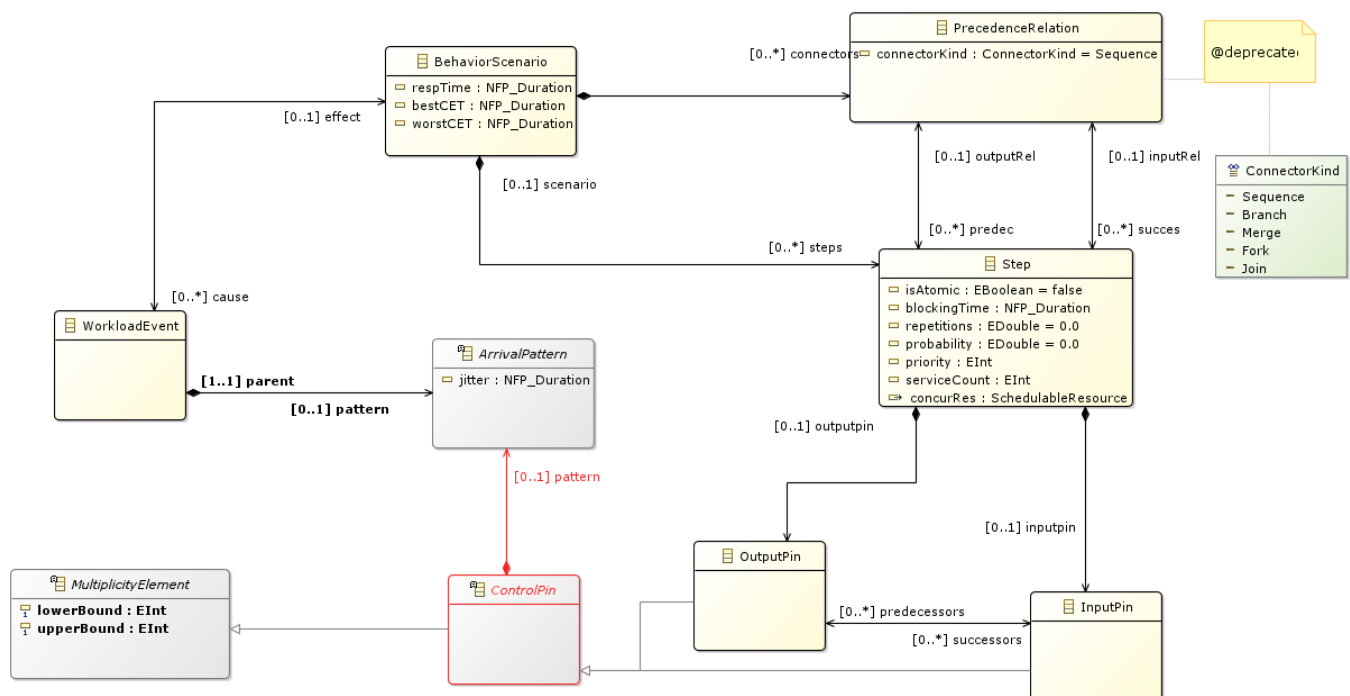


Figure 2.2: precedence-diagram

The model from Marte is not precise enough to express other than simple relationship. Thus we reuse the concepts of Pin from the UML 2.5 Activity Diagram.

NB: Shall we also reuse ActivityEdge instead of the successor-predecessor link?

2.3 EndToEnd Flow

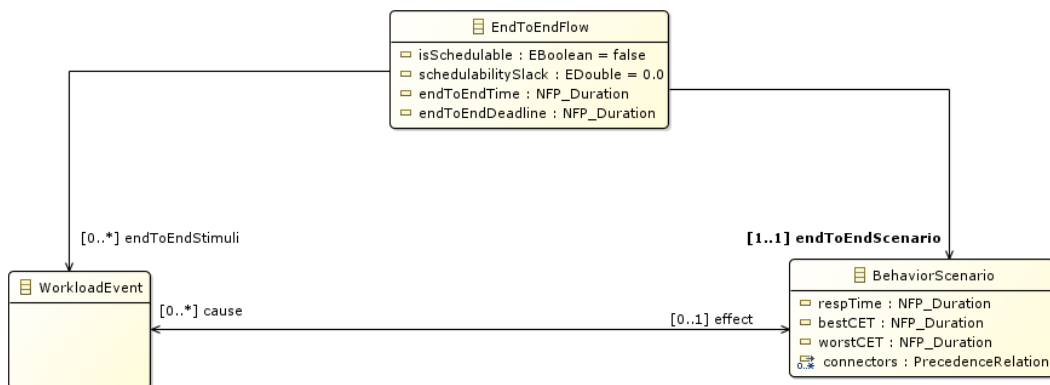


Figure 2.3: endtoendflow-diagram

This class is modeled in the Gqam Package while originally it is from the Sam MARTE subpackage. This is subject to futur modification, especially when the constraint (aka timing requirements) will be further developped.

Chapter 3

Marte package

3.1 Overview

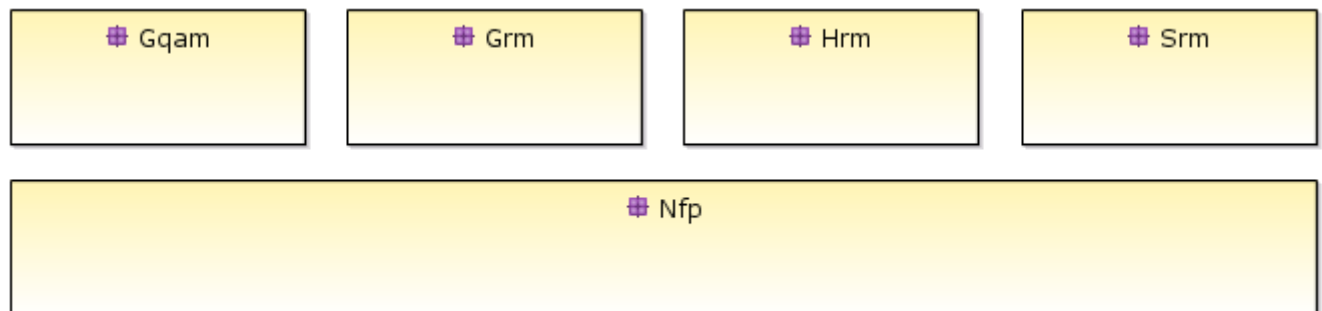


Figure 3.1: Marte-class-diagram-overview

Chapter 4

Gqam package

4.1 Overview

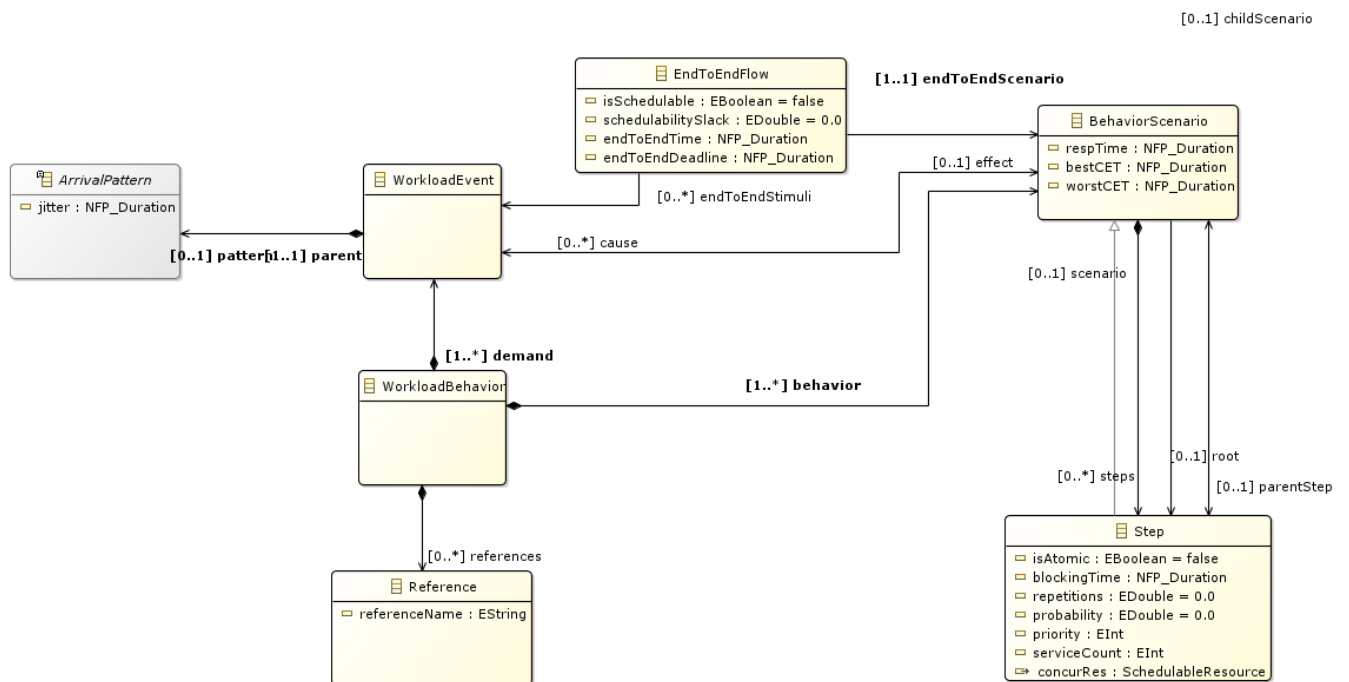


Figure 4.1: gqam-class-diagram-overview

Same as the UML 2.5 Pin with isControl=true.

4.2 AcquireStep classifier

TODO: write an overview

4.2.1 Generalizations

- [Step](#) from [gqam](#)

4.2.2 Attributes

- resUnits: EInt [0:1]

4.2.3 Semantics

TODO: write a semantic

4.3 ArrivalPattern classifier

TODO: write an overview

4.3.1 Specializations

- [BurstPattern](#) from [gqam](#)
- [ClosedPattern](#) from [gqam](#)
- [Once](#) from [gqam](#)
- [PeriodicPattern](#) from [gqam](#)
- [SlidingWindowPattern](#) from [gqam](#)
- [SporadicPattern](#) from [gqam](#)

4.3.2 Attributes

- jitter: NFP_Duration [0:1]
- phase: NFP_Duration [0:1]

4.3.3 Semantics

TODO: write a semantic

4.4 BehaviorScenario classifier

TODO: write an overview

4.4.1 Generalizations

- [NamedElement](#) from [grm](#)
-

4.4.2 Specializations

- [AcquireStep](#) from [gqam](#)
- [CommunicationStep](#) from [gqam](#)
- [Delay](#) from [gqam](#)
- [ExecutionStep](#) from [gqam](#)
- [ReleaseStep](#) from [gqam](#)
- [RequestedService](#) from [gqam](#)
- [Step](#) from [gqam](#)

4.4.3 Attributes

- respTime: NFP_Duration [0:1]
- bestCET: NFP_Duration [0:1]
- worstCET: NFP_Duration [0:1]

4.4.4 Semantics

TODO: write a semantic

4.5 BurstPattern classifier

It describes a bursty interarrival pattern with a number of events that can occur in a bounded period.

TODO: write an overview

4.5.1 Generalizations

- [ArrivalPattern](#) from [gqam](#)

4.5.2 Attributes

- minInterarrival: NFP_Duration [1:1]The minimum interarrival duration between two successive occurrences of a burst.
 - maxInterarrival: NFP_Duration [0:1]The maximum interarrival duration between two successive occurrences of a burst.
 - minEventInterval: NFP_Duration [1:1]The minimum interval between two event occurrences within a burst.
 - maxEventInterval: NFP_Duration [0:1]The maximum interval between two event occurrences within a burst.
 - burstSize: ELong [1:1]The number of event occurrences within a burst.
-

4.5.3 Semantics

TODO: write a semantic

4.6 ClosedPattern classifier

This is a TupleType that contains the parameters that are necessary to specify a closed pattern. It is characterized by a fixed number of active or potential users or jobs that cycle between executing the scenario, and spending an external delay period (sometimes called “think time”) outside the system, between the end of one response and the next request.

TODO: write an overview

4.6.1 Generalizations

- [ArrivalPattern](#) from [gqam](#)

4.6.2 Attributes

- population: ELong [1:1]The size of the workload (number of system users).
- extDelay: NFP_Duration [1:1]The delay between the end of one response and the start of the next for each member of the population of system users.

4.6.3 Semantics

TODO: write a semantic

4.7 CommunicationChannel classifier

TODO: write an overview

4.7.1 Generalizations

- [SchedulableResource](#) from [grm](#)

4.7.2 Semantics

TODO: write a semantic

4.8 CommunicationStep classifier

TODO: write an overview

4.8.1 Generalizations

- [Step](#) from [gqam](#)

4.8.2 Attributes

- msgSize: EInt [0:1]

4.8.3 Semantics

TODO: write a semantic

4.9 ConnectorKind classifier

TODO: write an overview

4.9.1 Values

- Sequence
- Branch
- Merge
- Fork
- Join

4.9.2 Semantics

TODO: write a semantic

4.10 ControlPin classifier

The concept is from UML 2.5 Pin, where isControlPin=true.

TODO: write an overview

4.10.1 Generalizations

- [MultiplicityElement](#) from [gqam](#)
- [NamedElement](#) from [grm](#)

4.10.2 Specializations

- [InputPin](#) from [gqam](#)
 - [OutputPin](#) from [gqam](#)
-

4.10.3 Semantics

The semantic is the same as per UML 2.5. It can be seen as tokens passing. The cardinality of the pin indicates how much tokens it needs for the task to be activable, and how much at maximum it will consume.

All in all, it enables to express advance activation patterns. For instance, all pattern that can be expressed with logical expressions can easily be encoded.

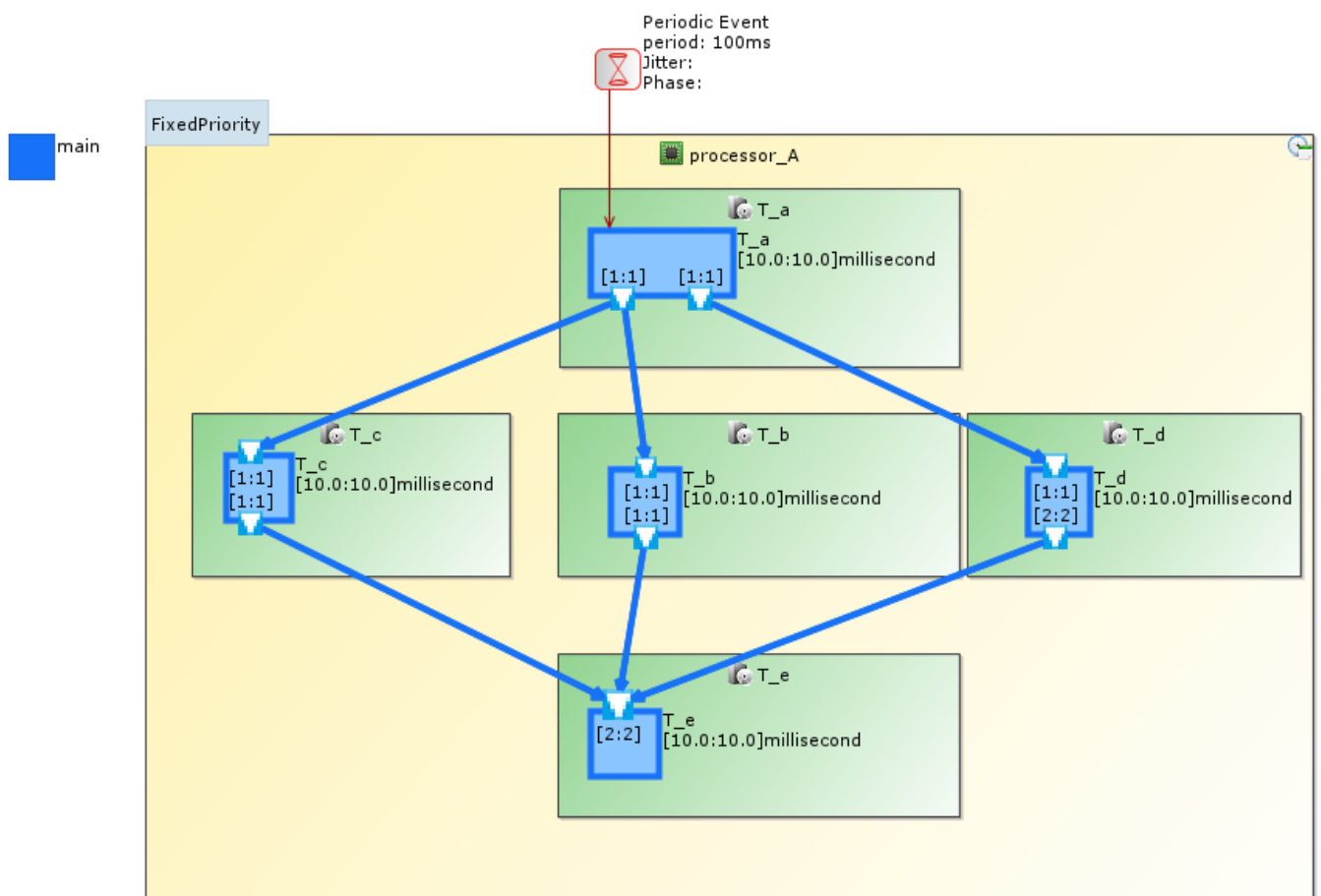
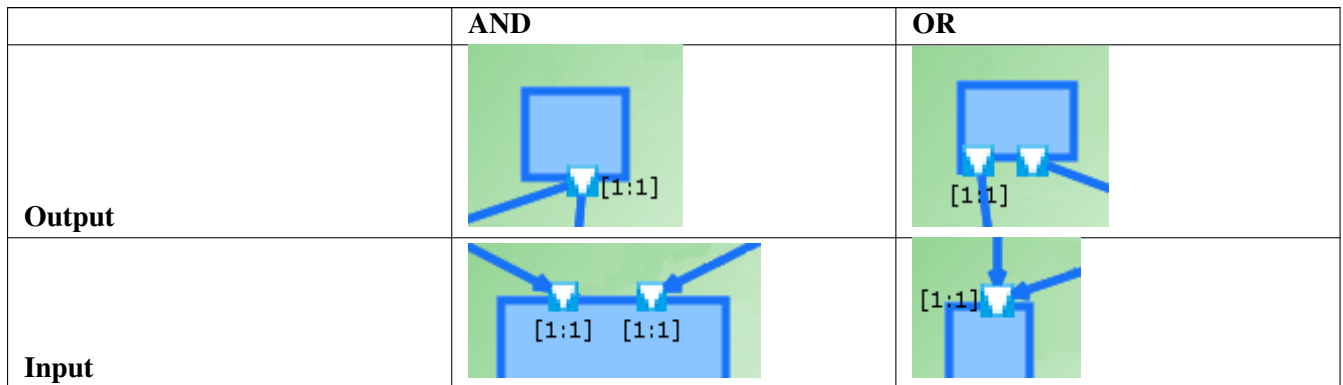


Figure 4.2: $e = (b \text{ and } c) \text{ or } d$

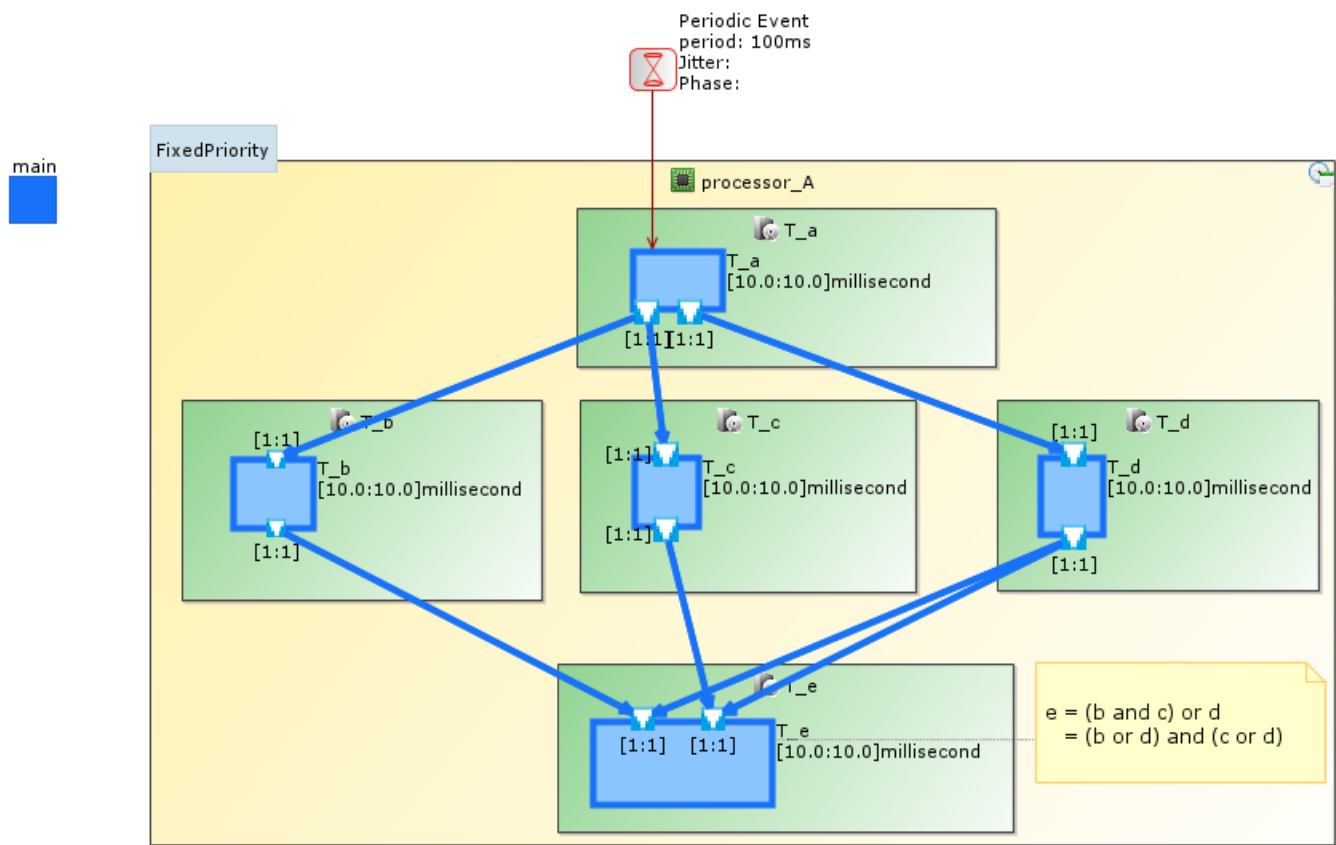


Figure 4.3: Another way of describing activation pattern based on CNF

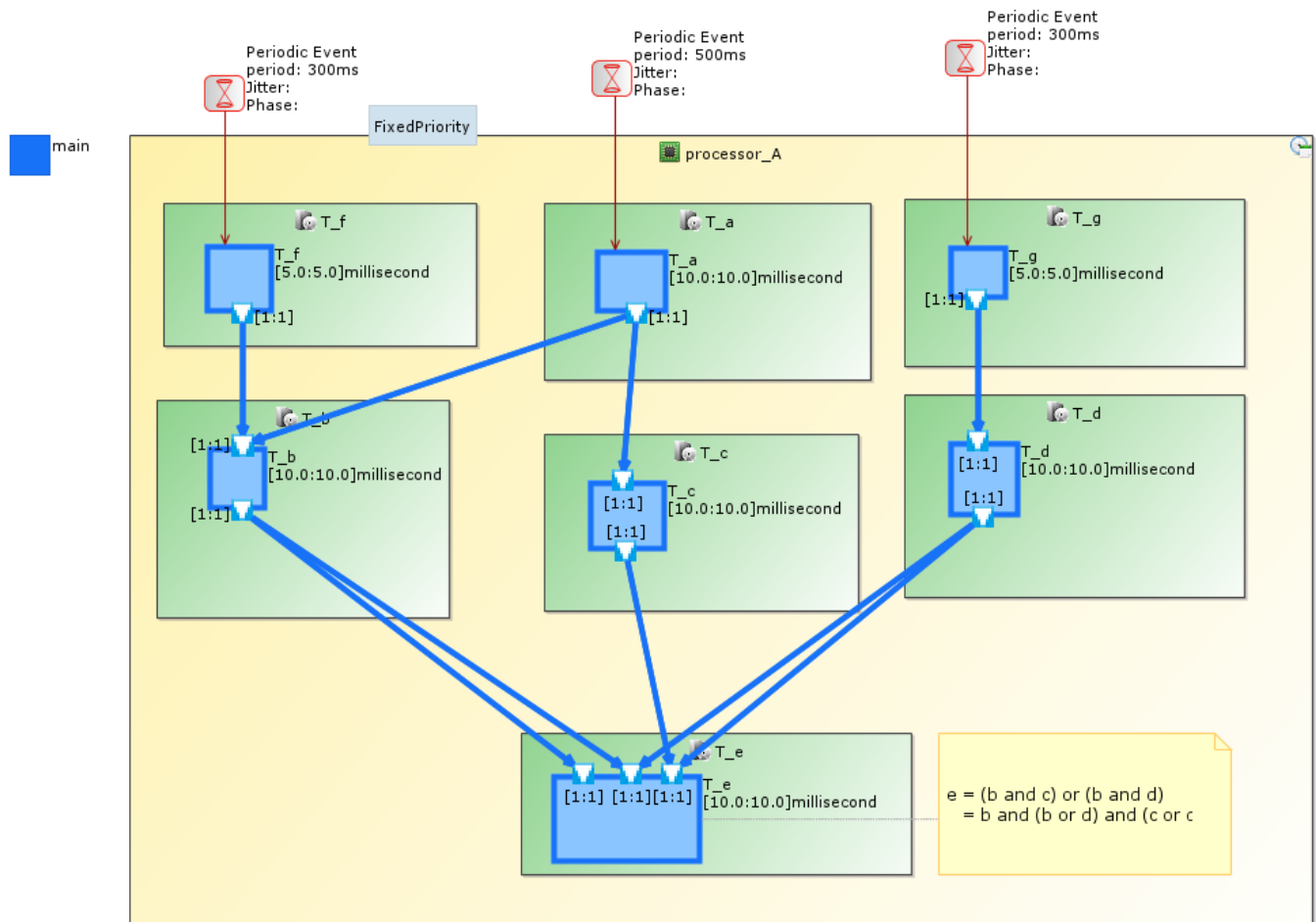
Figure 4.4: Complex pattern of activations of the task T_E

Figure 4.4 illustrates a pattern activation that could be expressed with a logical expression. For ease of encoding, it needs to be rewritten in conjunctive normal form (CNF).

4.11 Delay classifier

A special kind of Step that just introduce a delay without any resource consumption.

TODO: write an overview

4.11.1 Generalizations

- Step from [gqam](#)

4.11.2 Attributes

- duration: `NFP_Duration` $[1:1]$

4.11.3 Semantics

TODO: write a semantic

4.12 EndToEndFlow classifier

Deprecated.

This shall be moved to the SAM Marte Package.

TODO: write an overview

4.12.1 Attributes

- isSchedulable: EBoolean [0:1]
- schedulabilitySlack: EDouble [0:1]
- endToEndTime: NFP_Duration [0:1]
- endToEndDeadline: NFP_Duration [0:1]

4.12.2 Semantics

TODO: write a semantic

4.13 ExecutionStep classifier

TODO: write an overview

4.13.1 Generalizations

- [Step](#) from [gqam](#)

4.13.2 Semantics

TODO: write a semantic

4.14 InputPin classifier

from UML 2.5

TODO: write an overview

4.14.1 Generalizations

- [ControlPin](#) from [gqam](#)
-

4.14.2 Semantics

TODO: write a semantic

4.15 NFP_Duration classifier

TODO: write an overview

See `org.polarsys.time4sys.marte.nfp.Duration`.

TODO: write a semantic

4.16 MultiplicityElement classifier

from UML 2.5

TODO: write an overview

4.16.1 Specializations

- [ControlPin](#) from [gqam](#)
- [InputPin](#) from [gqam](#)
- [OutputPin](#) from [gqam](#)

4.16.2 Attributes

- `lowerBound`: `EInt [1:1]`
- `upperBound`: `EInt [1:1]`

4.16.3 Semantics

TODO: write a semantic

4.17 Once classifier

TODO: write an overview

4.17.1 Generalizations

- [ArrivalPattern](#) from [gqam](#)

4.17.2 Semantics

TODO: write a semantic

4.18 OutputPin classifier

from UML 2.5

TODO: write an overview

4.18.1 Generalizations

- [ControlPin](#) from [gqam](#)

4.18.2 Semantics

TODO: write a semantic

4.19 PeriodicPattern classifier

It describes periodic interarrival patterns, with an optional maximal deviation (jitter).

TODO: write an overview

4.19.1 Generalizations

- [ArrivalPattern](#) from [gqam](#)

4.19.2 Attributes

- period: NFP_Duration [0:1]
- occurrences: EInt [0:1]

4.19.3 Semantics

TODO: write a semantic

4.20 PrecedenceRelation classifier

This is to be deprecated by ports usage.

TODO: write an overview

4.20.1 Attributes

- connectorKind: ConnectorKind [0:1]

4.20.2 Semantics

TODO: write a semantic

4.21 Reference classifier

TODO: write an overview

4.21.1 Attributes

- `referenceName`: `EString` [0:1]

4.21.2 Semantics

TODO: write a semantic

4.22 ReleaseStep classifier

TODO: write an overview

4.22.1 Generalizations

- [Step](#) from [gqam](#)

4.22.2 Attributes

- `resUnits`: `EInt` [0:1]

4.22.3 Semantics

TODO: write a semantic

4.23 RequestedService classifier

TODO: write an overview

4.23.1 Generalizations

- [Step](#) from [gqam](#)

4.23.2 Semantics

TODO: write a semantic

4.24 SlidingWindowPattern classifier

TODO: write an overview

4.24.1 Generalizations

- [ArrivalPattern](#) from [gqam](#)

4.24.2 Attributes

- windowSize: NFP_Duration [1:1]
- nbEvents: ELong [0:1]

4.24.3 Semantics

TODO: write a semantic

4.25 SporadicPattern classifier

It describes a bounded pattern that is defined by a corner case interarrival times and a maximum deviation (jitter).

TODO: write an overview

4.25.1 Generalizations

- [ArrivalPattern](#) from [gqam](#)

4.25.2 Attributes

- minInterarrival: NFP_Duration [0:1]
- maxInterarrival: NFP_Duration [0:1]

4.25.3 Semantics

TODO: write a semantic

4.26 Step classifier

TODO: write an overview

4.26.1 Generalizations

- [BehaviorScenario](#) from [gqam](#)
-

4.26.2 Specializations

- [AcquireStep](#) from [gqam](#)
- [CommunicationStep](#) from [gqam](#)
- [Delay](#) from [gqam](#)
- [ExecutionStep](#) from [gqam](#)
- [ReleaseStep](#) from [gqam](#)
- [RequestedService](#) from [gqam](#)

4.26.3 Attributes

- isAtomic: EBoolean [0:1]
- blockingTime: NFP_Duration [0:1]
- repetitions: EDouble [0:1]
- probability: EDouble [0:1]
- priority: EInt [0:1]
- serviceCount: EInt [0:1]

4.26.4 Semantics

TODO: write a semantic

4.27 WorkloadEvent classifier

TODO: write an overview

4.27.1 Generalizations

- [NamedElement](#) from [grm](#)

4.27.2 Semantics

TODO: write a semantic

4.28 WorkloadBehavior classifier

TODO: write an overview

4.28.1 Generalizations

- [NamedElement](#) from [grm](#)

4.28.2 Semantics

TODO: write a semantic

Chapter 5

Grm package

5.1 Overview

grm-class-diagram-overview.png

Figure 5.1: grm-class-diagram-overview

5.2 AccessControlPolicy classifier

TODO: write an overview

5.2.1 Generalizations

- [NamedElement](#) from [grm](#)

5.2.2 Specializations

- [MutualExclusionProtocol](#) from [grm](#)
- [SchedulingPolicy](#) from [grm](#)

5.2.3 Semantics

TODO: write a semantic

5.3 ClockResource classifier

TODO: write an overview

5.3.1 Generalizations

- [TimingResource](#) from [grm](#)

5.3.2 Semantics

TODO: write a semantic

5.4 CommunicationEndPoint classifier

TODO: write an overview

5.4.1 Specializations

- [ResourcePort](#) from [grm](#)
- [HardwarePort](#) from [hrm](#)
- [MessageComResource](#) from [srm](#)
- [NotificationResource](#) from [srm](#)
- [SharedDataComResource](#) from [srm](#)
- [SoftwareCommunicationResource](#) from [srm](#)
- [SoftwareInteractionResource](#) from [srm](#)
- [SoftwareMutualExclusionResource](#) from [srm](#)
- [SoftwarePort](#) from [srm](#)
- [SoftwareSynchronizationResource](#) from [srm](#)

5.4.2 Attributes

- packetSize: EInt [0:1]

5.4.3 Semantics

TODO: write a semantic

5.5 CommunicationMedia classifier

TODO: write an overview

5.5.1 Generalizations

- [CommunicationResource](#) from [grm](#)
 - [ProcessingResource](#) from [grm](#)
-

5.5.2 Specializations

- [MessageComResource](#) from [srm](#)
- [SharedDataComResource](#) from [srm](#)
- [SoftwareCommunicationResource](#) from [srm](#)

5.5.3 Attributes

- elementSize: EInt [0:1]
- capacity: EFloat [0:1]
- packetTime: EFloat [0:1]
- blockingTime: EFloat [0:1]
- transmMode: TransmModeKind [0:1]

5.5.4 Semantics

TODO: write a semantic

5.6 ComputingResource classifier

TODO: write an overview

5.6.1 Generalizations

- [ProcessingResource](#) from [grm](#)

5.6.2 Specializations

- [HardwareAsic](#) from [hrm](#)
- [HardwareComputingResource](#) from [hrm](#)
- [HardwarePld](#) from [hrm](#)
- [HardwareProcessor](#) from [hrm](#)

5.6.3 Semantics

TODO: write a semantic

5.7 ConcurrencyResource classifier

TODO: write an overview

5.7.1 Generalizations

- [Resource](#) from [grm](#)

5.7.2 Specializations

- [CommunicationChannel](#) from [gqam](#)
- [SchedulableResource](#) from [grm](#)
- [Alarm](#) from [srm](#)
- [InterruptResource](#) from [srm](#)
- [SoftwareConcurrentResource](#) from [srm](#)
- [SoftwareSchedulableResource](#) from [srm](#)

5.7.3 Semantics

TODO: write a semantic

5.8 CommunicationResource classifier

TODO: write an overview

5.8.1 Generalizations

- [Resource](#) from [grm](#)

5.8.2 Specializations

- [CommunicationMedia](#) from [grm](#)
 - [HardwareArbiter](#) from [hrm](#)
 - [HardwareBridge](#) from [hrm](#)
 - [HardwareBus](#) from [hrm](#)
 - [HardwareCommunicationResource](#) from [hrm](#)
 - [HardwareDma](#) from [hrm](#)
 - [HardwareMedia](#) from [hrm](#)
 - [MessageComResource](#) from [srm](#)
 - [SharedDataComResource](#) from [srm](#)
 - [SoftwareCommunicationResource](#) from [srm](#)
-

5.8.3 Semantics

TODO: write a semantic

5.9 DeviceResource classifier

TODO: write an overview

5.9.1 Generalizations

- [ProcessingResource](#) from [grm](#)

5.9.2 Specializations

- [HardwareActuator](#) from [hrm](#)
- [HardwareDevice](#) from [hrm](#)
- [HardwareIo](#) from [hrm](#)
- [HardwareSensor](#) from [hrm](#)
- [HardwareSupport](#) from [hrm](#)

5.9.3 Semantics

TODO: write a semantic

5.10 DynamicUsage classifier

TODO: write an overview

5.10.1 Generalizations

- [ResourceUsage](#) from [grm](#)

5.10.2 Semantics

TODO: write a semantic

5.11 MutualExclusionProtocol classifier

TODO: write an overview

5.11.1 Generalizations

- [AccessControlPolicy](#) from [grm](#)

5.11.2 Attributes

- protocol: ProtectProtocolKind [0:1]
- otherProtocol: EString [0:1]

5.11.3 Semantics

TODO: write a semantic

5.12 MutualExclusionResource classifier

TODO: write an overview

5.12.1 Generalizations

- [SynchResource](#) from [grm](#)

5.12.2 Specializations

- [SoftwareMutualExclusionResource](#) from [srm](#)

5.12.3 Semantics

TODO: write a semantic

5.13 NamedElement classifier

TODO: write an overview

5.13.1 Specializations

- [AcquireStep](#) from [gqam](#)
 - [BehaviorScenario](#) from [gqam](#)
 - [CommunicationChannel](#) from [gqam](#)
 - [CommunicationStep](#) from [gqam](#)
 - [ControlPin](#) from [gqam](#)
 - [Delay](#) from [gqam](#)
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- [ExecutionStep](#) from [gqam](#)
 - [InputPin](#) from [gqam](#)
 - [OutputPin](#) from [gqam](#)
 - [ReleaseStep](#) from [gqam](#)
 - [RequestedService](#) from [gqam](#)
 - [Step](#) from [gqam](#)
 - [WorkloadEvent](#) from [gqam](#)
 - [WorkloadBehavior](#) from [gqam](#)
 - [AccessControlPolicy](#) from [grm](#)
 - [ClockResource](#) from [grm](#)
 - [CommunicationMedia](#) from [grm](#)
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 - [HardwareMemory](#) from [hrm](#)
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- [SoftwareScheduler](#) from [srm](#)
- [SoftwareService](#) from [srm](#)
- [SoftwareSynchronizationResource](#) from [srm](#)
- [SoftwareTimerResource](#) from [srm](#)

5.13.2 Attributes

- name: EString [0:1]

5.13.3 Semantics

TODO: write a semantic

5.14 ProcessingResource classifier

TODO: write an overview

5.14.1 Generalizations

- [Resource](#) from [grm](#)

5.14.2 Specializations

- [CommunicationMedia](#) from [grm](#)
 - [ComputingResource](#) from [grm](#)
 - [DeviceResource](#) from [grm](#)
 - [HardwareActuator](#) from [hrm](#)
 - [HardwareAsic](#) from [hrm](#)
 - [HardwareComputingResource](#) from [hrm](#)
 - [HardwareDevice](#) from [hrm](#)
 - [HardwareIo](#) from [hrm](#)
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- [HardwarePld](#) from [hrm](#)
- [HardwareProcessor](#) from [hrm](#)
- [HardwareSensor](#) from [hrm](#)
- [HardwareSupport](#) from [hrm](#)
- [MessageComResource](#) from [srm](#)
- [SharedDataComResource](#) from [srm](#)
- [SoftwareCommunicationResource](#) from [srm](#)

5.14.3 Attributes

- speedFactor: EFloat [0:1]

5.14.4 Semantics

TODO: write a semantic

5.15 ProtectionParameter classifier

TODO: write an overview

5.15.1 Generalizations

- [NamedElement](#) from [grm](#)

5.15.2 Attributes

- priorityCeiling: EInt [0:1]
- preemptionLevel: EInt [0:1]

5.15.3 Semantics

TODO: write a semantic

5.16 ProtectProtocolKind classifier

TODO: write an overview

5.16.1 Values

- FIFO
- NoPreemption
- PriorityCeiling
- PriorityInheritance
- StackBased
- Undef
- Other

5.16.2 Semantics

TODO: write a semantic

5.17 Resource classifier

TODO: write an overview

5.17.1 Generalizations

- [ResourcePackageableElement](#) from [grm](#)

5.17.2 Specializations

- [CommunicationChannel](#) from [gqam](#)
 - [ClockResource](#) from [grm](#)
 - [CommunicationMedia](#) from [grm](#)
 - [ComputingResource](#) from [grm](#)
 - [ConcurrencyResource](#) from [grm](#)
 - [CommunicationResource](#) from [grm](#)
 - [DeviceResource](#) from [grm](#)
 - [MutualExclusionResource](#) from [grm](#)
 - [ProcessingResource](#) from [grm](#)
 - [ResourceBroker](#) from [grm](#)
 - [ResourceManager](#) from [grm](#)
 - [Scheduler](#) from [grm](#)
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- [SchedulableResource](#) from [grm](#)
 - [SecondaryScheduler](#) from [grm](#)
 - [StorageResource](#) from [grm](#)
 - [SynchResource](#) from [grm](#)
 - [TimingResource](#) from [grm](#)
 - [TimerResource](#) from [grm](#)
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 - [HardwareCommunicationResource](#) from [hrm](#)
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 - [HardwareMmu](#) from [hrm](#)
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- [HardwareRam](#) from [hrm](#)
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 - [SoftwareInteractionResource](#) from [srm](#)
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 - [SoftwareSchedulableResource](#) from [srm](#)
 - [SoftwareScheduler](#) from [srm](#)
 - [SoftwareSynchronizationResource](#) from [srm](#)
 - [SoftwareTimerResource](#) from [srm](#)
-

5.17.3 Attributes

- resMult: EInt [0:1]
- isProtected: EBoolean [0:1]
- isActive: EBoolean [0:1]

5.17.4 Semantics

TODO: write a semantic

5.18 ResourceBroker classifier

TODO: write an overview

5.18.1 Generalizations

- [Resource](#) from [grm](#)

5.18.2 Specializations

- [Scheduler](#) from [grm](#)
- [SecondaryScheduler](#) from [grm](#)
- [HardwareArbiter](#) from [hrm](#)
- [HardwareDma](#) from [hrm](#)
- [HardwareMmu](#) from [hrm](#)
- [HardwareStorageManager](#) from [hrm](#)
- [DeviceBroker](#) from [srm](#)
- [MemoryBroker](#) from [srm](#)
- [SoftwareScheduler](#) from [srm](#)

5.18.3 Semantics

TODO: write a semantic

5.19 ResourceConnector classifier

TODO: write an overview

5.19.1 Specializations

- [HardwareConnector](#) from [hrm](#)
- [SoftwareConnector](#) from [srm](#)

5.19.2 Semantics

TODO: write a semantic

5.20 ResourceControlPolicy classifier

TODO: write an overview

5.20.1 Generalizations

- [NamedElement](#) from [grm](#)

5.20.2 Semantics

TODO: write a semantic

5.21 ResourceInstance classifier

TODO: write an overview

5.21.1 Generalizations

- [ResourcePackageableElement](#) from [grm](#)

5.21.2 Semantics

TODO: write a semantic

5.22 ResourceInterface classifier

TODO: write an overview

5.22.1 Generalizations

- [ResourcePackageableElement](#) from [grm](#)
-

5.22.2 Specializations

- [HardwareInterface](#) from [hrm](#)
- [SoftwareInterface](#) from [srm](#)

5.22.3 Semantics

TODO: write a semantic

5.23 ResourceManager classifier

TODO: write an overview

5.23.1 Generalizations

- [Resource](#) from [grm](#)

5.23.2 Specializations

- [Alarm](#) from [srm](#)
 - [DeviceBroker](#) from [srm](#)
 - [InterruptResource](#) from [srm](#)
 - [MemoryBroker](#) from [srm](#)
 - [MemoryPartition](#) from [srm](#)
 - [MessageComResource](#) from [srm](#)
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 - [SoftwareConcurrentResource](#) from [srm](#)
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 - [SoftwareMutualExclusionResource](#) from [srm](#)
 - [SoftwareResource](#) from [srm](#)
 - [SoftwareSchedulableResource](#) from [srm](#)
 - [SoftwareSynchronizationResource](#) from [srm](#)
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5.23.3 Semantics

TODO: write a semantic

5.24 ResourcePackage classifier

TODO: write an overview

5.24.1 Generalizations

- [NamedElement](#) from [grm](#)

5.24.2 Specializations

- [HardwareInterfacePackage](#) from [hrm](#)
- [HardwareResourcePackage](#) from [hrm](#)
- [SoftwareInterfacePackage](#) from [srm](#)
- [SoftwareResourcePackage](#) from [srm](#)

5.24.3 Semantics

TODO: write a semantic

5.25 ResourcePackageableElement classifier

TODO: write an overview

5.25.1 Generalizations

- [NamedElement](#) from [grm](#)

5.25.2 Specializations

- [CommunicationChannel](#) from [gqam](#)
 - [ClockResource](#) from [grm](#)
 - [CommunicationMedia](#) from [grm](#)
 - [ComputingResource](#) from [grm](#)
 - [ConcurrencyResource](#) from [grm](#)
 - [CommunicationResource](#) from [grm](#)
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- [DeviceResource](#) from [grm](#)
 - [MutualExclusionResource](#) from [grm](#)
 - [ProcessingResource](#) from [grm](#)
 - [Resource](#) from [grm](#)
 - [ResourceBroker](#) from [grm](#)
 - [ResourceInstance](#) from [grm](#)
 - [ResourceInterface](#) from [grm](#)
 - [ResourceManager](#) from [grm](#)
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 - [SynchResource](#) from [grm](#)
 - [TimingResource](#) from [grm](#)
 - [TimerResource](#) from [grm](#)
 - [UsageTypedAmount](#) from [grm](#)
 - [FirmwareArchitecture](#) from [hrm](#)
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 - [HardwareArbiter](#) from [hrm](#)
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- [HardwareIo](#) from [hrm](#)
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- [SoftwareScheduler](#) from [srm](#)
- [SoftwareSynchronizationResource](#) from [srm](#)
- [SoftwareTimerResource](#) from [srm](#)

5.25.3 Semantics

TODO: write a semantic

5.26 ResourcePort classifier

TODO: write an overview

5.26.1 Generalizations

- [CommunicationEndPoint](#) from [grm](#)
- [NamedElement](#) from [grm](#)

5.26.2 Specializations

- [HardwarePort](#) from [hrm](#)
- [SoftwarePort](#) from [srm](#)

5.26.3 Semantics

TODO: write a semantic

5.27 ResourceService classifier

TODO: write an overview

5.27.1 Generalizations

- [NamedElement](#) from [grm](#)
-

5.27.2 Specializations

- [HardwareService](#) from [hrm](#)
- [SoftwareAccessService](#) from [srm](#)
- [SoftwareService](#) from [srm](#)

5.27.3 Semantics

TODO: write a semantic

5.28 ResourceUsage classifier

TODO: write an overview

5.28.1 Specializations

- [DynamicUsage](#) from [grm](#)
- [StaticUsage](#) from [grm](#)

5.28.2 Semantics

TODO: write a semantic

5.29 SchedPolicyKind classifier

TODO: write an overview

5.29.1 Values

- Undef
 - EarliestDeadlineFirst
 - FIFO
 - FixedPriority
 - LeastLaxityFirst
 - RoundRobin
 - TimeTableDriven
 - Other
-

5.29.2 Semantics

TODO: write a semantic

5.30 Scheduler classifier

TODO: write an overview

5.30.1 Generalizations

- [ResourceBroker](#) from [grm](#)

5.30.2 Specializations

- [SecondaryScheduler](#) from [grm](#)
- [SoftwareScheduler](#) from [srm](#)

5.30.3 Semantics

TODO: write a semantic

5.31 SchedulableResource classifier

TODO: write an overview

5.31.1 Generalizations

- [ConcurrencyResource](#) from [grm](#)

5.31.2 Specializations

- [CommunicationChannel](#) from [gqam](#)
- [SoftwareSchedulableResource](#) from [srm](#)

5.31.3 Semantics

TODO: write a semantic

5.32 SchedulingParameter classifier

TODO: write an overview

5.32.1 Generalizations

- [NamedElement](#) from [gram](#)

5.32.2 Attributes

- value: EString [0:1]

5.32.3 Semantics

TODO: write a semantic

5.33 SchedulingPolicy classifier

TODO: write an overview

5.33.1 Generalizations

- [AccessControlPolicy](#) from [gram](#)

5.33.2 Attributes

- policy: SchedPolicyKind [0:1]
- otherSchedPolicy: EString [0:1]

5.33.3 Semantics

TODO: write a semantic

5.34 SecondaryScheduler classifier

TODO: write an overview

5.34.1 Generalizations

- [Scheduler](#) from [gram](#)

5.34.2 Semantics

TODO: write a semantic

5.35 StaticUsage classifier

TODO: write an overview

5.35.1 Generalizations

- [ResourceUsage](#) from [grm](#)

5.35.2 Semantics

TODO: write a semantic

5.36 StorageResource classifier

TODO: write an overview

5.36.1 Generalizations

- [Resource](#) from [grm](#)

5.36.2 Specializations

- [HardwareCache](#) from [hrm](#)
- [HardwareDrive](#) from [hrm](#)
- [HardwareMemory](#) from [hrm](#)
- [HardwareProcessingMemory](#) from [hrm](#)
- [HardwareRam](#) from [hrm](#)
- [HardwareRom](#) from [hrm](#)
- [HardwareStorageMemory](#) from [hrm](#)

5.36.3 Semantics

TODO: write a semantic

5.37 SynchResource classifier

TODO: write an overview

5.37.1 Generalizations

- [Resource](#) from [grm](#)
-

5.37.2 Specializations

- [MutualExclusionResource](#) from [grm](#)
- [NotificationResource](#) from [srm](#)
- [SoftwareMutualExclusionResource](#) from [srm](#)
- [SoftwareSynchronizationResource](#) from [srm](#)

5.37.3 Semantics

TODO: write a semantic

5.38 TimingResource classifier

TODO: write an overview

5.38.1 Generalizations

- [Resource](#) from [grm](#)

5.38.2 Specializations

- [ClockResource](#) from [grm](#)
- [TimerResource](#) from [grm](#)
- [HardwareClock](#) from [hrm](#)
- [HardwareTimingResource](#) from [hrm](#)
- [HardwareTimer](#) from [hrm](#)
- [HardwareWatchdog](#) from [hrm](#)
- [SoftwareTimerResource](#) from [srm](#)

5.38.3 Semantics

TODO: write a semantic

5.39 TimerResource classifier

TODO: write an overview

5.39.1 Generalizations

- [TimingResource](#) from [grm](#)
-

5.39.2 Specializations

- [SoftwareTimerResource](#) from [srm](#)

5.39.3 Attributes

- duration: EFloat [0:1]
- isPeriodic: EBoolean [0:1]

5.39.4 Semantics

TODO: write a semantic

5.40 TransmModeKind classifier

TODO: write an overview

5.40.1 Values

- simplex
- half_duplex
- full_duplex

5.40.2 Semantics

TODO: write a semantic

5.41 UsageDemand classifier

TODO: write an overview

5.41.1 Attributes

- event: EString [0:1]

5.41.2 Semantics

TODO: write a semantic

5.42 UsageTypedAmount classifier

TODO: write an overview

5.42.1 Generalizations

- [Resource](#) from [grm](#)

5.42.2 Attributes

- execTime: EInt [0:1]
- msgSize: EInt [0:1]
- allocatedmemory: EInt [0:1]
- usedMemory: EInt [0:1]
- powerPeak: EInt [0:1]
- energy: EInt [0:1]

5.42.3 Semantics

TODO: write a semantic

Chapter 6

Hrm package

6.1 Overview

hrm-class-diagram-overview.png

Figure 6.1: hrm-class-diagram-overview

6.2 CacheType classifier

TODO: write an overview

6.2.1 Values

- data
- instruction
- unified
- other
- undef

6.2.2 Semantics

TODO: write a semantic

6.3 ComponentState classifier

TODO: write an overview

6.3.1 Values

- operating
- storage
- other
- undef

6.3.2 Semantics

TODO: write a semantic

6.4 ConditionType classifier

TODO: write an overview

6.4.1 Values

- temperature
- humidity
- altitude
- vibration
- shock
- other
- undef

6.4.2 Semantics

TODO: write a semantic

6.5 Direction classifier

TODO: write an overview

6.5.1 Values

- in
 - out
 - inout
-

6.5.2 Semantics

TODO: write a semantic

6.6 EnvCondition classifier

TODO: write an overview

6.6.1 Attributes

- type: ConditionType [0:1]
- status: ComponentState [0:1]
- description: EString [0:1]
- range: EInt [0:1]

6.6.2 Semantics

TODO: write a semantic

6.7 FirmwareArchitecture classifier

TODO: write an overview

6.7.1 Generalizations

- [HardwareResource](#) from [hrm](#)

6.7.2 Semantics

TODO: write a semantic

6.8 IsaType classifier

TODO: write an overview

6.8.1 Values

- risc
 - cisc
 - vliw
-

- simd
- mimd
- other
- undef

6.8.2 Semantics

TODO: write a semantic

6.9 HardwareActuator classifier

TODO: write an overview

6.9.1 Generalizations

- [HardwareIo](#) from [hrm](#)

6.9.2 Semantics

TODO: write a semantic

6.10 HardwareArbiter classifier

TODO: write an overview

6.10.1 Generalizations

- [HardwareCommunicationResource](#) from [hrm](#)
- [ResourceBroker](#) from [grm](#)

6.10.2 Specializations

- [HardwareDma](#) from [hrm](#)

6.10.3 Semantics

TODO: write a semantic

6.11 HardwareAsic classifier

TODO: write an overview

6.11.1 Generalizations

- [HardwareComputingResource](#) from [hrm](#)

6.11.2 Semantics

TODO: write a semantic

6.12 HardwareBranchPredictor classifier

TODO: write an overview

6.12.1 Generalizations

- [HardwareResource](#) from [hrm](#)

6.12.2 Semantics

TODO: write a semantic

6.13 HardwareBridge classifier

TODO: write an overview

6.13.1 Generalizations

- [HardwareMedia](#) from [hrm](#)

6.13.2 Semantics

TODO: write a semantic

6.14 HardwareBus classifier

TODO: write an overview

6.14.1 Generalizations

- [HardwareMedia](#) from [hrm](#)
-

6.14.2 Attributes

- addressWidth: EInt [0:1]
- wordWidth: EInt [0:1]
- isSynchronous: EBoolean [0:1]
- isSerial: EBoolean [0:1]

6.14.3 Semantics

TODO: write a semantic

6.15 HardwareCache classifier

TODO: write an overview

6.15.1 Generalizations

- [HardwareProcessingMemory](#) from [hrm](#)

6.15.2 Attributes

- level: EInt [0:1]
- type: CacheType [0:1]
- nbSets: EInt [0:1]
- blockSize: EInt [0:1]
- associativity: EInt [0:1]

6.15.3 Semantics

TODO: write a semantic

6.16 HardwareCard classifier

TODO: write an overview

6.16.1 Generalizations

- [HardwareComponent](#) from [hrm](#)
-

6.16.2 Specializations

- [HardwarePlatform](#) from [hrm](#)

6.16.3 Semantics

TODO: write a semantic

6.17 HardwareChannel classifier

TODO: write an overview

6.17.1 Generalizations

- [HardwareComponent](#) from [hrm](#)

6.17.2 Specializations

- [HardwareArbiter](#) from [hrm](#)
- [HardwareBridge](#) from [hrm](#)
- [HardwareBus](#) from [hrm](#)
- [HardwareCommunicationResource](#) from [hrm](#)
- [HardwareDma](#) from [hrm](#)
- [HardwareMedia](#) from [hrm](#)

6.17.3 Attributes

- nbWires: EInt [0:1]

6.17.4 Semantics

TODO: write a semantic

6.18 HardwareChip classifier

TODO: write an overview

6.18.1 Generalizations

- [HardwareComponent](#) from [hrm](#)
-

6.18.2 Specializations

- [HardwareActuator](#) from [hrm](#)
- [HardwareAsic](#) from [hrm](#)
- [HardwareCache](#) from [hrm](#)
- [HardwareClock](#) from [hrm](#)
- [HardwareComputingResource](#) from [hrm](#)
- [HardwareDevice](#) from [hrm](#)
- [HardwareDma](#) from [hrm](#)
- [HardwareDrive](#) from [hrm](#)
- [HardwareIo](#) from [hrm](#)
- [HardwareMemory](#) from [hrm](#)
- [HardwareMmu](#) from [hrm](#)
- [HardwarePld](#) from [hrm](#)
- [HardwareProcessingMemory](#) from [hrm](#)
- [HardwareProcessor](#) from [hrm](#)
- [HardwareRam](#) from [hrm](#)
- [HardwareRom](#) from [hrm](#)
- [HardwareSensor](#) from [hrm](#)
- [HardwareStorageManager](#) from [hrm](#)
- [HardwareStorageMemory](#) from [hrm](#)
- [HardwareSupport](#) from [hrm](#)
- [HardwareTimingResource](#) from [hrm](#)
- [HardwareTimer](#) from [hrm](#)
- [HardwareWatchdog](#) from [hrm](#)

6.18.3 Attributes

- technology: EInt [0:1]

6.18.4 Semantics

TODO: write a semantic

6.19 HardwareClock classifier

TODO: write an overview

6.19.1 Generalizations

- [HardwareTimingResource](#) from [hrm](#)

6.19.2 Attributes

- frequency: EInt [0:1]

6.19.3 Semantics

TODO: write a semantic

6.20 HardwareCommunicationResource classifier

TODO: write an overview

6.20.1 Generalizations

- [CommunicationResource](#) from [grm](#)
- [HardwareResource](#) from [hrm](#)
- [HardwareChannel](#) from [hrm](#)

6.20.2 Specializations

- [HardwareArbiter](#) from [hrm](#)
- [HardwareBridge](#) from [hrm](#)
- [HardwareBus](#) from [hrm](#)
- [HardwareDma](#) from [hrm](#)
- [HardwareMedia](#) from [hrm](#)

6.20.3 Semantics

TODO: write a semantic

6.21 HardwareComponent classifier

TODO: write an overview

6.21.1 Specializations

- [HardwareActuator](#) from [hrm](#)
 - [HardwareArbiter](#) from [hrm](#)
 - [HardwareAsic](#) from [hrm](#)
 - [HardwareBridge](#) from [hrm](#)
 - [HardwareBus](#) from [hrm](#)
 - [HardwareCache](#) from [hrm](#)
 - [HardwareCard](#) from [hrm](#)
 - [HardwareChannel](#) from [hrm](#)
 - [HardwareChip](#) from [hrm](#)
 - [HardwareClock](#) from [hrm](#)
 - [HardwareCommunicationResource](#) from [hrm](#)
 - [HardwareComputingResource](#) from [hrm](#)
 - [HardwareDevice](#) from [hrm](#)
 - [HardwareDma](#) from [hrm](#)
 - [HardwareDrive](#) from [hrm](#)
 - [HardwareIo](#) from [hrm](#)
 - [HardwareMedia](#) from [hrm](#)
 - [HardwareMemory](#) from [hrm](#)
 - [HardwareMmu](#) from [hrm](#)
 - [HardwarePlatform](#) from [hrm](#)
 - [HardwarePld](#) from [hrm](#)
 - [HardwarePort](#) from [hrm](#)
 - [HardwareProcessingMemory](#) from [hrm](#)
 - [HardwareProcessor](#) from [hrm](#)
 - [HardwareRam](#) from [hrm](#)
 - [HardwareRom](#) from [hrm](#)
 - [HardwareSensor](#) from [hrm](#)
 - [HardwareStorageManager](#) from [hrm](#)
 - [HardwareStorageMemory](#) from [hrm](#)
 - [HardwareSupport](#) from [hrm](#)
-

- [HardwareTimingResource](#) from [hrm](#)
- [HardwareTimer](#) from [hrm](#)
- [HardwareWatchdog](#) from [hrm](#)

6.21.2 Attributes

- dimension: EInt [0:1]
- area: EInt [0:1]
- posX: EInt [0:1]
- posY: EInt [0:1]
- grid: EInt [0:1]
- nbPins: EInt [0:1]
- weight: EInt [0:1]
- price: EInt [0:1]

6.21.3 Semantics

TODO: write a semantic

6.22 HardwareComputingResource classifier

TODO: write an overview

6.22.1 Generalizations

- [ComputingResource](#) from [grm](#)
- [HardwareResource](#) from [hrm](#)
- [HardwareChip](#) from [hrm](#)

6.22.2 Specializations

- [HardwareAsic](#) from [hrm](#)
- [HardwarePld](#) from [hrm](#)
- [HardwareProcessor](#) from [hrm](#)

6.22.3 Attributes

- opFrequencies: EInt [0:1]
-

6.22.4 Semantics

TODO: write a semantic

6.23 HardwareConnector classifier

TODO: write an overview

6.23.1 Generalizations

- [ResourceConnector](#) from [grm](#)

6.23.2 Semantics

TODO: write a semantic

6.24 HardwareDevice classifier

TODO: write an overview

6.24.1 Generalizations

- [DeviceResource](#) from [grm](#)
- [HardwareResource](#) from [hrm](#)
- [HardwareChip](#) from [hrm](#)

6.24.2 Specializations

- [HardwareActuator](#) from [hrm](#)
- [HardwareIo](#) from [hrm](#)
- [HardwareSensor](#) from [hrm](#)
- [HardwareSupport](#) from [hrm](#)

6.24.3 Semantics

TODO: write a semantic

6.25 HardwareDma classifier

TODO: write an overview

6.25.1 Generalizations

- [HardwareStorageManager](#) from [hrm](#)
- [HardwareArbiter](#) from [hrm](#)

6.25.2 Attributes

- nbChannels: EInt [0:1]
- transferWidth: EInt [0:1]

6.25.3 Semantics

TODO: write a semantic

6.26 HardwareDrive classifier

TODO: write an overview

6.26.1 Generalizations

- [HardwareStorageMemory](#) from [hrm](#)

6.26.2 Attributes

- sectorSize: EInt [0:1]

6.26.3 Semantics

TODO: write a semantic

6.27 HardwareInterface classifier

TODO: write an overview

6.27.1 Generalizations

- [ResourceInterface](#) from [grm](#)

6.27.2 Semantics

TODO: write a semantic

6.28 HardwareInterfacePackage classifier

TODO: write an overview

6.28.1 Generalizations

- [ResourcePackage](#) from [grm](#)

6.28.2 Semantics

TODO: write a semantic

6.29 Hardwarelo classifier

TODO: write an overview

6.29.1 Generalizations

- [HardwareDevice](#) from [hrm](#)

6.29.2 Specializations

- [HardwareActuator](#) from [hrm](#)
- [HardwareSensor](#) from [hrm](#)

6.29.3 Semantics

TODO: write a semantic

6.30 HardwarelpBlock classifier

TODO: write an overview

6.30.1 Generalizations

- [HardwareResource](#) from [hrm](#)

6.30.2 Semantics

TODO: write a semantic

6.31 HardwareIsa classifier

TODO: write an overview

6.31.1 Generalizations

- [HardwareResource](#) from [hrm](#)

6.31.2 Attributes

- family: EString [0:1]
- instWidth: EInt [0:1]
- type: IsaType [0:1]

6.31.3 Semantics

TODO: write a semantic

6.32 HardwareMedia classifier

TODO: write an overview

6.32.1 Generalizations

- [HardwareCommunicationResource](#) from [hrm](#)

6.32.2 Specializations

- [HardwareBridge](#) from [hrm](#)
- [HardwareBus](#) from [hrm](#)

6.32.3 Semantics

TODO: write a semantic

6.33 HardwareMemory classifier

TODO: write an overview

6.33.1 Generalizations

- [StorageResource](#) from [grm](#)
- [HardwareResource](#) from [hrm](#)
- [HardwareChip](#) from [hrm](#)

6.33.2 Specializations

- [HardwareCache](#) from [hrm](#)
- [HardwareDrive](#) from [hrm](#)
- [HardwareProcessingMemory](#) from [hrm](#)
- [HardwareRam](#) from [hrm](#)
- [HardwareRom](#) from [hrm](#)
- [HardwareStorageMemory](#) from [hrm](#)

6.33.3 Attributes

- memorySize: EInt [0:1]
- addressSize: EInt [0:1]
- timings: EInt [0:-1]
- throughput: EInt [0:1]

6.33.4 Semantics

TODO: write a semantic

6.34 HardwareMmu classifier

TODO: write an overview

6.34.1 Generalizations

- [HardwareStorageManager](#) from [hrm](#)

6.34.2 Attributes

- virtualAddrSpace: EInt [0:1]
 - physicalAddrSpace: EInt [0:1]
 - memoryProtection: EBoolean [0:1]
 - nbEntriesTlb: EInt [0:1]
-

6.34.3 Semantics

TODO: write a semantic

6.35 HardwarePin classifier

TODO: write an overview

6.35.1 Generalizations

- [NamedElement](#) from [grm](#)

6.35.2 Attributes

- width: EInt [0:1]
- direction: Direction [0:1]

6.35.3 Semantics

TODO: write a semantic

6.36 HardwarePlatform classifier

TODO: write an overview

6.36.1 Generalizations

- [HardwareResource](#) from [hrm](#)
- [HardwareCard](#) from [hrm](#)

6.36.2 Semantics

TODO: write a semantic

6.37 HardwarePld classifier

TODO: write an overview

6.37.1 Generalizations

- [HardwareComputingResource](#) from [hrm](#)
-

6.37.2 Attributes

- `pldTechnology`: `PldTechnology` [0:1]
- `nbRows`: `EInt` [0:1]
- `nbColumns`: `EInt` [0:1]
- `kind`: `PldClass` [0:1]
- `nbLuts`: `EInt` [0:1]
- `nbLutInputs`: `EInt` [0:1]
- `nbFlipFlops`: `EInt` [0:1]

6.37.3 Semantics

TODO: write a semantic

6.38 HardwarePort classifier

TODO: write an overview

6.38.1 Generalizations

- [ResourcePort](#) from [grm](#)
- [HardwareComponent](#) from [hrm](#)

6.38.2 Attributes

- `type`: `PortType` [0:1]

6.38.3 Semantics

TODO: write a semantic

6.39 HardwareProcessingMemory classifier

TODO: write an overview

6.39.1 Generalizations

- [HardwareMemory](#) from [hrm](#)

6.39.2 Specializations

- [HardwareCache](#) from [hrm](#)
- [HardwareRam](#) from [hrm](#)

6.39.3 Attributes

- replPolicy: ReplPolicy [0:1]
- writePolicy: WritePolicy [0:1]

6.39.4 Semantics

TODO: write a semantic

6.40 HardwareProcessor classifier

TODO: write an overview

6.40.1 Generalizations

- [HardwareComputingResource](#) from [hrm](#)

6.40.2 Attributes

- architecture: EInt [0:1]
- mips: EInt [0:1]
- ipc: EFloat [0:1]
- nbCores: EInt [0:1]
- nbPipelines: EInt [0:1]
- nbStages: EInt [0:1]
- nbAlus: EInt [0:1]
- nbFpus: EInt [0:1]

6.40.3 Semantics

TODO: write a semantic

6.41 HardwareRam classifier

TODO: write an overview

6.41.1 Generalizations

- [HardwareProcessingMemory](#) from [hrm](#)

6.41.2 Attributes

- nbRows: EInt [0:1]
- nbColumns: EInt [0:1]
- nbBanks: EInt [0:1]
- wordSize: EInt [0:1]
- isSynchronous: EBoolean [0:1]
- isStatic: EBoolean [0:1]
- isNonVolatile: EBoolean [0:1]

6.41.3 Semantics

TODO: write a semantic

6.42 HardwareResourcePackage classifier

TODO: write an overview

6.42.1 Generalizations

- [ResourcePackage](#) from [grm](#)

6.42.2 Semantics

TODO: write a semantic

6.43 HardwareResource classifier

TODO: write an overview

6.43.1 Generalizations

- [Resource](#) from [grm](#)
-

6.43.2 Specializations

- [FirmwareArchitecture](#) from [hrm](#)
 - [HardwareActuator](#) from [hrm](#)
 - [HardwareArbiter](#) from [hrm](#)
 - [HardwareAsic](#) from [hrm](#)
 - [HardwareBranchPredictor](#) from [hrm](#)
 - [HardwareBridge](#) from [hrm](#)
 - [HardwareBus](#) from [hrm](#)
 - [HardwareCache](#) from [hrm](#)
 - [HardwareClock](#) from [hrm](#)
 - [HardwareCommunicationResource](#) from [hrm](#)
 - [HardwareComputingResource](#) from [hrm](#)
 - [HardwareDevice](#) from [hrm](#)
 - [HardwareDma](#) from [hrm](#)
 - [HardwareDrive](#) from [hrm](#)
 - [HardwareIo](#) from [hrm](#)
 - [HardwareIpBlock](#) from [hrm](#)
 - [HardwareIsa](#) from [hrm](#)
 - [HardwareMedia](#) from [hrm](#)
 - [HardwareMemory](#) from [hrm](#)
 - [HardwarePlatform](#) from [hrm](#)
 - [HardwarePld](#) from [hrm](#)
 - [HardwareProcessingMemory](#) from [hrm](#)
 - [HardwareProcessor](#) from [hrm](#)
 - [HardwareRam](#) from [hrm](#)
 - [HardwareRom](#) from [hrm](#)
 - [HardwareSensor](#) from [hrm](#)
 - [HardwareStorageMemory](#) from [hrm](#)
 - [HardwareSupport](#) from [hrm](#)
 - [HardwareTimingResource](#) from [hrm](#)
 - [HardwareTimer](#) from [hrm](#)
 - [HardwareWatchdog](#) from [hrm](#)
-

6.43.3 Semantics

TODO: write a semantic

6.44 HardwareRom classifier

TODO: write an overview

6.44.1 Generalizations

- [HardwareStorageMemory](#) from [hrm](#)

6.44.2 Attributes

- type: RomType [0:1]
- nbRows: EInt [0:1]
- nbColumns: EInt [0:1]
- nbBanks: EInt [0:1]
- wordSize: EInt [0:1]

6.44.3 Semantics

TODO: write a semantic

6.45 HardwareSensor classifier

TODO: write an overview

6.45.1 Generalizations

- [HardwareIo](#) from [hrm](#)

6.45.2 Semantics

TODO: write a semantic

6.46 HardwareService classifier

TODO: write an overview

6.46.1 Generalizations

- [ResourceService](#) from [grm](#)

6.46.2 Semantics

TODO: write a semantic

6.47 HardwareStorageManager classifier

TODO: write an overview

6.47.1 Generalizations

- [ResourceBroker](#) from [grm](#)
- [HardwareChip](#) from [hrm](#)

6.47.2 Specializations

- [HardwareDma](#) from [hrm](#)
- [HardwareMmu](#) from [hrm](#)

6.47.3 Semantics

TODO: write a semantic

6.48 HardwareStorageMemory classifier

TODO: write an overview

6.48.1 Generalizations

- [HardwareMemory](#) from [hrm](#)

6.48.2 Specializations

- [HardwareDrive](#) from [hrm](#)
- [HardwareRom](#) from [hrm](#)

6.48.3 Semantics

TODO: write a semantic

6.49 HardwareSupport classifier

TODO: write an overview

6.49.1 Generalizations

- [HardwareDevice](#) from [hrm](#)

6.49.2 Semantics

TODO: write a semantic

6.50 HardwareTimingResource classifier

TODO: write an overview

6.50.1 Generalizations

- [HardwareResource](#) from [hrm](#)
- [TimingResource](#) from [grm](#)
- [HardwareChip](#) from [hrm](#)

6.50.2 Specializations

- [HardwareClock](#) from [hrm](#)
- [HardwareTimer](#) from [hrm](#)
- [HardwareWatchdog](#) from [hrm](#)

6.50.3 Semantics

TODO: write a semantic

6.51 HardwareTimer classifier

TODO: write an overview

6.51.1 Generalizations

- [HardwareTimingResource](#) from [hrm](#)
-

6.51.2 Specializations

- [HardwareWatchdog](#) from [hrm](#)

6.51.3 Semantics

TODO: write a semantic

6.52 HardwareWatchdog classifier

TODO: write an overview

6.52.1 Generalizations

- [HardwareTimer](#) from [hrm](#)

6.52.2 Semantics

TODO: write a semantic

6.53 HardwareWire classifier

TODO: write an overview

6.53.1 Semantics

TODO: write a semantic

6.54 PldTechnology classifier

TODO: write an overview

6.54.1 Values

- sram
 - antifuse
 - flash
 - other
 - undef
-

6.54.2 Semantics

TODO: write a semantic

6.55 PldClass classifier

TODO: write an overview

6.55.1 Values

- symetricalArray
- rowBased
- seaOfGates
- hierarchicalPld
- other
- undef

6.55.2 Semantics

TODO: write a semantic

6.56 PortType classifier

TODO: write an overview

6.56.1 Values

- male
- female
- other
- undef

6.56.2 Semantics

TODO: write a semantic

6.57 ReplPolicy classifier

TODO: write an overview

6.57.1 Values

- lru
- nfu
- fifo
- random
- other
- undef

6.57.2 Semantics

TODO: write a semantic

6.58 RomType classifier

TODO: write an overview

6.58.1 Values

- maskedRom
- eprom
- otpEprom
- eeprom
- flash
- other
- undef

6.58.2 Semantics

TODO: write a semantic

6.59 WritePolicy classifier

TODO: write an overview

6.59.1 Values

- writeBack
- writeThrough
- other
- undef

6.59.2 Semantics

TODO: write a semantic

Chapter 7

Nfp package

7.1 Overview

nfp-class-diagram-overview.png

Figure 7.1: nfp-class-diagram-overview

7.2 Duration classifier

TODO: write an overview

7.2.1 Attributes

- value: EDouble [0:1]
- unit: TimeUnitKind [0:1]
- best: EDouble [0:1]
- worst: EDouble [0:1]
- clock: EString [0:1]
- precision: EDouble [0:1]

7.2.2 Semantics

TODO: write a semantic

7.3 TimeUnitKind classifier

TODO: write an overview

7.3.1 Values

- ps
- ns
- us
- ms
- s
- mn
- h
- d

7.3.2 Semantics

TODO: write a semantic

7.4 TimeInterval classifier

TODO: write an overview

7.4.1 Attributes

- minOpen: EBoolean [1:1]
- maxOpen: EBoolean [1:1]

7.4.2 Semantics

TODO: write a semantic

7.5 DataSizeUnitKind classifier

TODO: write an overview

7.5.1 Values

- BYTE
 - BIT
 - KB
 - MB
 - GB
-

7.5.2 Semantics

TODO: write a semantic

7.6 DataSize classifier

TODO: write an overview

7.6.1 Attributes

- value: EDouble [0:1]
- unit: DataSizeUnitKind [1:1]

7.6.2 Semantics

TODO: write a semantic

Chapter 8

Srm package

8.1 Overview

srm-class-diagram-overview.png

Figure 8.1: srm-class-diagram-overview

8.2 AccessPolicyKind classifier

TODO: write an overview

8.2.1 Values

- Read
- Write
- ReadWrite
- Undef
- Other

8.2.2 Semantics

TODO: write a semantic

8.3 Alarm classifier

TODO: write an overview

8.3.1 Generalizations

- [InterruptResource](#) from [srm](#)

8.3.2 Attributes

- isWatchdog: EBoolean [0:1]

8.3.3 Semantics

TODO: write a semantic

8.4 ConcurrentAccessProtocolKind classifier

TODO: write an overview

8.4.1 Values

- PCP
- PIP
- NoPreemption
- Undef
- Other

8.4.2 Semantics

TODO: write a semantic

8.5 DeviceBroker classifier

TODO: write an overview

8.5.1 Generalizations

- [ResourceBroker](#) from [grm](#)
- [SoftwareResource](#) from [srm](#)

8.5.2 Attributes

- accessPolicy: AccessPolicyKind [0:1]
- isBuffered: EBoolean [0:1]

8.5.3 Semantics

TODO: write a semantic

8.6 InterruptKind classifier

TODO: write an overview

8.6.1 Values

- HardwareInterrupt
- ProcessorDetectedException
- ProgrammedException
- Undef
- Other

8.6.2 Semantics

TODO: write a semantic

8.7 QueuePolicyKind classifier

TODO: write an overview

8.7.1 Values

- FIFO
- LIFO
- Priority
- Undef
- Other

8.7.2 Semantics

TODO: write a semantic

8.8 InterruptResource classifier

TODO: write an overview

8.8.1 Generalizations

- [SoftwareConcurrentResource](#) from [srm](#)

8.8.2 Specializations

- [Alarm](#) from [srm](#)

8.8.3 Attributes

- kind: InterruptKind [1:1]
- isMaskable: EBoolean [1:1]
- maskElements: EString [0:-1]
- vectorElements: EString [0:-1]
- isrEntryPoints: EString [0:-1]

8.8.4 Semantics

TODO: write a semantic

8.9 MemoryBroker classifier

TODO: write an overview

8.9.1 Generalizations

- [ResourceBroker](#) from [grm](#)
- [SoftwareResource](#) from [srm](#)

8.9.2 Attributes

- accessPolicy: AccessPolicyKind [0:1]
- memoryBlockAddressElements: EString [0:-1]
- memoryBlockSizeElements: EString [0:-1]

8.9.3 Semantics

TODO: write a semantic

8.10 MemoryPartition classifier

TODO: write an overview

8.10.1 Generalizations

- [SoftwareResource](#) from [srm](#)

8.10.2 Semantics

TODO: write a semantic

8.11 MessageComResource classifier

TODO: write an overview

8.11.1 Generalizations

- [SoftwareCommunicationResource](#) from [srm](#)

8.11.2 Attributes

- isFixedMessageSize: EBoolean [1:1]
- messageSizeElements: EString [0:-1]
- mechanism: MessageResourceKind [0:1]
- messageQueuePolicy: QueuePolicyKind [0:1]
- messageQueueCapacityElements: EString [0:-1]

8.11.3 Semantics

TODO: write a semantic

8.12 MessageResourceKind classifier

TODO: write an overview

8.12.1 Values

- MessageQueue
 - Pipe
 - Blackboard
 - Undef
 - Other
-

8.12.2 Semantics

TODO: write a semantic

8.13 MutualExclusionResourceKind classifier

TODO: write an overview

8.13.1 Values

- BooleanSemaphore
- CountSemaphore
- Mutex
- Undef
- Other

8.13.2 Semantics

TODO: write a semantic

8.14 NotificationResource classifier

TODO: write an overview

8.14.1 Generalizations

- [SoftwareSynchronizationResource](#) from [srm](#)

8.14.2 Attributes

- policy: OccurrencePolicyKind [1:1]
- mechanism: NotificationResourceKind [1:1]
- occurrenceCountElements: EString [0:-1]
- maskElements: EString [0:-1]

8.14.3 Semantics

TODO: write a semantic

8.15 NotificationResourceKind classifier

TODO: write an overview

8.15.1 Values

- Barrier
- Event
- Undef
- Other

8.15.2 Semantics

TODO: write a semantic

8.16 OccurrencePolicyKind classifier

TODO: write an overview

8.16.1 Values

- Memorized
- Bounded
- Memoryless
- Undef
- Other

8.16.2 Semantics

TODO: write a semantic

8.17 SharedDataComResource classifier

TODO: write an overview

8.17.1 Generalizations

- [SoftwareCommunicationResource](#) from [srm](#)

8.17.2 Semantics

TODO: write a semantic

8.18 SoftwareAccessService classifier

TODO: write an overview

8.18.1 Generalizations

- [ResourceService](#) from [grm](#)

8.18.2 Attributes

- isModifier: EBoolean [0:1]
- accessedElement: EString [0:1]

8.18.3 Semantics

TODO: write a semantic

8.19 SoftwareArchitecture classifier

TODO: write an overview

8.19.1 Generalizations

- [SoftwareResource](#) from [srm](#)

8.19.2 Semantics

TODO: write a semantic

8.20 SoftwareCommunicationResource classifier

TODO: write an overview

8.20.1 Generalizations

- [SoftwareInteractionResource](#) from [srm](#)
 - [CommunicationMedia](#) from [grm](#)
-

8.20.2 Specializations

- [MessageComResource](#) from [srm](#)
- [SharedDataComResource](#) from [srm](#)

8.20.3 Semantics

TODO: write a semantic

8.21 SoftwareConcurrentResource classifier

TODO: write an overview

8.21.1 Generalizations

- [SoftwareResource](#) from [srm](#)
- [ConcurrencyResource](#) from [grm](#)

8.21.2 Specializations

- [Alarm](#) from [srm](#)
- [InterruptResource](#) from [srm](#)
- [SoftwareSchedulableResource](#) from [srm](#)

8.21.3 Attributes

- periodElements: EString [0:-1]
- activationCapacity: EInt [0:1]
- priorityElements: EString [0:-1]
- stackSizeElements: EString [0:-1]
- heapSizeElements: EString [0:-1]
- entryPoints: EString [0:-1]
- arrivalPattern: EString [0:1]

8.21.4 Semantics

TODO: write a semantic

8.22 SoftwareConnector classifier

TODO: write an overview

8.22.1 Generalizations

- [ResourceConnector](#) from [grm](#)

8.22.2 Semantics

TODO: write a semantic

8.23 SoftwareInteractionResource classifier

TODO: write an overview

8.23.1 Generalizations

- [CommunicationEndPoint](#) from [grm](#)
- [SoftwareResource](#) from [srm](#)

8.23.2 Specializations

- [MessageComResource](#) from [srm](#)
- [NotificationResource](#) from [srm](#)
- [SharedDataComResource](#) from [srm](#)
- [SoftwareCommunicationResource](#) from [srm](#)
- [SoftwareMutualExclusionResource](#) from [srm](#)
- [SoftwareSynchronizationResource](#) from [srm](#)

8.23.3 Attributes

- `isIntraMemoryPartitionInteraction`: EBoolean [1:1]
- `waitingQueuePolicy`: QueuePolicyKind [0:1]
- `waitingQueueCapacity`: EInt [0:1]
- `waitingPolicyElements`: EString [0:-1]

8.23.4 Semantics

TODO: write a semantic

8.24 SoftwareInterface classifier

TODO: write an overview

8.24.1 Generalizations

- [ResourceInterface](#) from [grm](#)

8.24.2 Semantics

TODO: write a semantic

8.25 SoftwareInterfacePackage classifier

TODO: write an overview

8.25.1 Generalizations

- [ResourcePackage](#) from [grm](#)

8.25.2 Semantics

TODO: write a semantic

8.26 SoftwareMutualExclusionResource classifier

TODO: write an overview

8.26.1 Generalizations

- [SoftwareSynchronizationResource](#) from [srm](#)
- [MutualExclusionResource](#) from [grm](#)

8.26.2 Attributes

- concurrentAccessProtocol: ConcurrentAccesProtocolKind [0:1]
- mechanism: MutualExclusionResourceKind [0:1]

8.26.3 Semantics

TODO: write a semantic

8.27 SoftwarePort classifier

TODO: write an overview

8.27.1 Generalizations

- [ResourcePort](#) from [grm](#)

8.27.2 Semantics

TODO: write a semantic

8.28 SoftwareResource classifier

TODO: write an overview

8.28.1 Generalizations

- [ResourceManager](#) from [grm](#)

8.28.2 Specializations

- [Alarm](#) from [srm](#)
 - [DeviceBroker](#) from [srm](#)
 - [InterruptResource](#) from [srm](#)
 - [MemoryBroker](#) from [srm](#)
 - [MemoryPartition](#) from [srm](#)
 - [MessageComResource](#) from [srm](#)
 - [NotificationResource](#) from [srm](#)
 - [SharedDataComResource](#) from [srm](#)
 - [SoftwareArchitecture](#) from [srm](#)
 - [SoftwareCommunicationResource](#) from [srm](#)
 - [SoftwareConcurrentResource](#) from [srm](#)
 - [SoftwareInteractionResource](#) from [srm](#)
 - [SoftwareMutualExclusionResource](#) from [srm](#)
 - [SoftwareSchedulableResource](#) from [srm](#)
 - [SoftwareSynchronizationResource](#) from [srm](#)
-

8.28.3 Attributes

- memorySizeFootprint: EInt [0:1]
- stateElements: EString [0:-1]
- identifierElements: EString [0:-1]

8.28.4 Semantics

TODO: write a semantic

8.29 SoftwareResourcePackage classifier

TODO: write an overview

8.29.1 Generalizations

- [ResourcePackage](#) from [grm](#)

8.29.2 Semantics

TODO: write a semantic

8.30 SoftwareSchedulableResource classifier

TODO: write an overview

8.30.1 Generalizations

- [SchedulableResource](#) from [grm](#)
- [SoftwareConcurrentResource](#) from [srm](#)

8.30.2 Attributes

- isStaticSchedulingFeature: EBoolean [1:1]
 - isPreemptable: EBoolean [1:1]
 - deadlineElements: EString [0:-1]
 - deadlineTypeElements: EString [0:-1]
 - timeSliceElements: EString [0:-1]
-

8.30.3 Semantics

TODO: write a semantic

8.31 SoftwareScheduler classifier

TODO: write an overview

8.31.1 Generalizations

- [Scheduler](#) from [grm](#)

8.31.2 Semantics

TODO: write a semantic

8.32 SoftwareService classifier

TODO: write an overview

8.32.1 Generalizations

- [ResourceService](#) from [grm](#)

8.32.2 Semantics

TODO: write a semantic

8.33 SoftwareSynchronizationResource classifier

TODO: write an overview

8.33.1 Generalizations

- [SoftwareInteractionResource](#) from [srm](#)
- [SynchResource](#) from [grm](#)

8.33.2 Specializations

- [NotificationResource](#) from [srm](#)
 - [SoftwareMutualExclusionResource](#) from [srm](#)
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8.33.3 Semantics

TODO: write a semantic

8.34 SoftwareTimerResource classifier

TODO: write an overview

8.34.1 Generalizations

- [TimerResource](#) from [grm](#)

8.34.2 Attributes

- durationElements: EString [0:-1]

8.34.3 Semantics

TODO: write a semantic
