

PNTD for GSPN

Draft version 0.1.0
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Objetives :

This document offers the Petri Net Type Definition [2] (PNTD) for Generalised Stochastic Petri Nets [4] (GSPN). The PNTD proposed in this document offers the rules to create PNML documents to describe GSPN.

The main purpose in defining a PNML PNTD for GSPN is to gain the ability of interchange GSPN models among different tools.

The PNML here defined is currently uses by de PNPDA tool [6]. Then it does not take into account: marking dependencies and transitions server semantics.

Section 1 gives the PNTD for GSPN which is based on the basic PNML [2]. Section 2 gives the PNML code for a simple GSPN that includes: immediate and timed transitions, places, marking, arcs, inhibitors arcs, rates, probabilities, labels and arc inscriptions. Section 3 depicts the type model of GSPN systems.

1. PNTD for GSPN based on basic PNML.

```
<!-- PNTD for GSPN based on basic PNML -->
<!-- Editor's note:
    green text : labels included in Conventions Document [5].
    red text   : new labels, specifically for GSPN.
-->

<?xml version="1.0" encoding="UTF-8"?>
<!-- jing (RELAX NG validator) does not recognize SGML's !DOCTYPE
    Thus, for validating this schema the following line must be hided. -->
<!-- <!DOCTYPE grammar PUBLIC "-//thaiopensource//DTD RNG 20010705//EN" "">
-->

<grammar ns="http://webdiis.unizar.es/~jmerse/GSPN"
    xmlns="http://relaxng.org/ns/structure/1.0"
    xmlns:a="http://relaxng.org/ns/compatibility/annotations/1.0">
    xmlns:conv="http://www.informatik.hu-berlin.de/top/pnml/conv">

    <a:documentation>
        Petri Net Type Definition for GSPN nets (basec on basic PNML)
        RELAX NG implementation of gspn.pntd
        version: 1.0
        date    : 2005-05-20
        (c) 2005
        Eduardo Monteagudo, 431340@unizar.es
    </a:documentation>

    <a:documentation>
        We include PNML with the correct URI for our Petri Net Type Definition.
    </a:documentation>
    <include href="http://www.informatik.hu-berlin.de/top/pnml/basicPNML.rng">
    <define name="nettype.uri" combine="choice">
        <a:documentation>
            We define the net type URI declaring the namespace of this Petri net type
            definition.
        </a:documentation>
        <value>http://webdiis.unizar.es/~jmerse/GSPN</value>
    </define>
    </include>

    <a:documentation>
        Some of the labels of this Petri net type come from the Conventions Document
    </a:documentation>
    <include href="http://www.informatik.hu-berlin.de/top/pnml/conv.rng"/>

    <define name="net.labels" combine="interleave">
        <a:documentation>
            A P/T net may have a name.
        </a:documentation>
        <optional><ref name="conv:Name"/></optional>
    </define>
```

```
<define name="place.labels" combine="interleave">
  <a:documentation>
    A place of a GSPN net may have a name and an initial marking.
  </a:documentation>
  <interleave>
    <optional><ref name="conv:Name"/></optional>
    <optional><ref name="conv:PTMarking"/></optional>
  </interleave>
</define>
```

```
<define name="GSPNTransitionType">
  <a:documentation>
    Label definition for the type of GSPN transitions.
    <contributed>Eduardo Monteagudo Moreno</contributed>
    <date>2005-05-20</date>
  </a:documentation>
  <element name="type">
    <element name="text">
      <choice>
        <value>immediate</value>
        <value>timed</value>
      </choice>
    </element>
  </element>
</define>
```

```
<define name="GSPNPriority">
  <a:documentation>
    Label definition for priority of GSPN transitions.
    <contributed>Eduardo Monteagudo Moreno</contributed>
    <date>2005-05-20</date>
  </a:documentation>
  <element name="priority">
    <element name="text">
      <data type="nonNegativeInteger"
        datatypeLibrary="http://www.w3.org/2001/XMLSchema-datatypes"/>
    </element>
  </element>
</define>
```

```
<define name="GSPNWeight">
  <a:documentation>
    Label definition for weight (probability or rate) of GSPN transitions
    <contributed>Eduardo Monteagudo Moreno</contributed>
    <date>2005-05-20</date>
  </a:documentation>
  <element name="weight">
    <element name="text">
      <data type="double"
        datatypeLibrary="http://www.w3.org/2001/XMLSchema-datatypes"/>
    </element>
  </element>
</define>
```

```
<define name="transition.labels" combine="interleave">
  <a:documentation>
    A transition of a P/T net may have a name.
  </a:documentation>
  <interleave>
    <optional><ref name="conv:Name"/></optional>
    <ref name="GSPNTransitionType"/>
    <ref name="GSPNPriority"/>
    <ref name="GSPNWeight"/>
  </interleave>
</define>
```

```
<define name="GSPNArcType">
  <a:documentation>
    Label definition for the type of the arcs in GSPN-nets.
    <contributed>Eduardo Monteagudo Moreno</contributed>
    <date>2005-05-20</date>
  </a:documentation>
  <element name="type">
    <element name="text">
      <choice>
        <value>normal</value>
        <value>inhibitor</value>
      </choice>
    </element>
  </element>
</define>
```

```
<define name=" EditorStartConnector">
  <a:documentation>
    This Label is specific for PNPDA Tool version 1.0.
    It only will be used into toolspecific arc element
    An EditorStartConnector describes a Cartesian coordinate.
    <contributed>Eduardo Monteagudo Moreno</contributed>
    <date>2005-05-20</date>
  </a:documentation>
  <element name="StartConnector">
    <ref name="coordinate.attributes"/>
  </element>
</define>
```

```
<define name=" EditorEndConnector">
  <a:documentation>
    This Label is specific for PNPDA Tool version 1.0.
    It only will be used into toolspecific arc element
    An EditorEndConnector describes a Cartesian coordinate.
    <contributed>Eduardo Monteagudo Moreno</contributed>
    <date>2005-05-20</date>
  </a:documentation>
  <element name="EndConnector">
    <ref name="coordinate.attributes"/>
  </element>
</define>
```

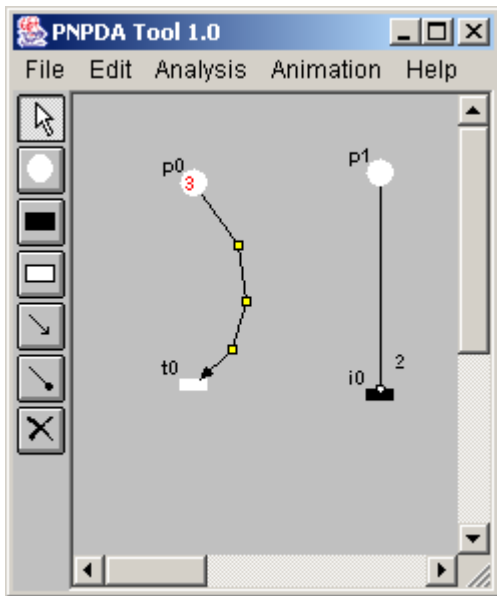
```
<define name="toolspecific.element" combine="interleave">
  <a:documentation>
    This Label is specific for PNPDA Tool version 1.0.
    Each arc have two connectors (start/end), which are graphical information.
    <contributed>Eduardo Monteagudo Moreno</contributed>
    <date>2005-05-20</date>
  </a:documentation>
  <interleave>
    <ref name="EditorStartConnector"/>
    <ref name="EditorEndConnector"/>
  </interleave>
</define>

<define name="arc.labels" combine="interleave">
  <a:documentation>
    An arc of a GSPN net may have an inscription.
  </a:documentation>
  <interleave>
    <optional><ref name="conv:PTArcInscription"/></optional>
    <ref name="GSPNArcType"/>
    <ref name="toolspecific.element"/>
  </interleave>
</define>

</grammar>
```

2. PNML code of an example net.

Figure 1: A simple GSPN



Listing 1: PNML code of the example net in Figure 1

```
<pnml>
  <net id="net154209649" type="http://webdiis.unizar.es/~jmerse/GSPN">
    <place id="p0">
      <graphics>
        <position x="53" y="37" />
      </graphics>
      <name>
        <text>p0</text>
      </name>
      <initialMarking>
        <text>3</text>
      </initialMarking>
    </place>
    <place id="p1">
      <graphics>
        <position x="146" y="32" />
      </graphics>
      <name>
        <text>p1</text>
      </name>
      <initialMarking>
        <text>0</text>
      </initialMarking>
    </place>
  </net>
</pnml>
```

```
<transition id="i0">
  <graphics>
    <position x="146" y="147" />
  </graphics>
  <name>
    <text>i0</text>
    <graphics>
      <offset x="-8" y="-12" />
    </graphics>
  </name>
  <type>
    <text>immediate</text>
  </type>
  <priority>
    <text>1</text>
  </priority>
  <weight>
    <text>1.0</text>
  </weight>
</transition>
```

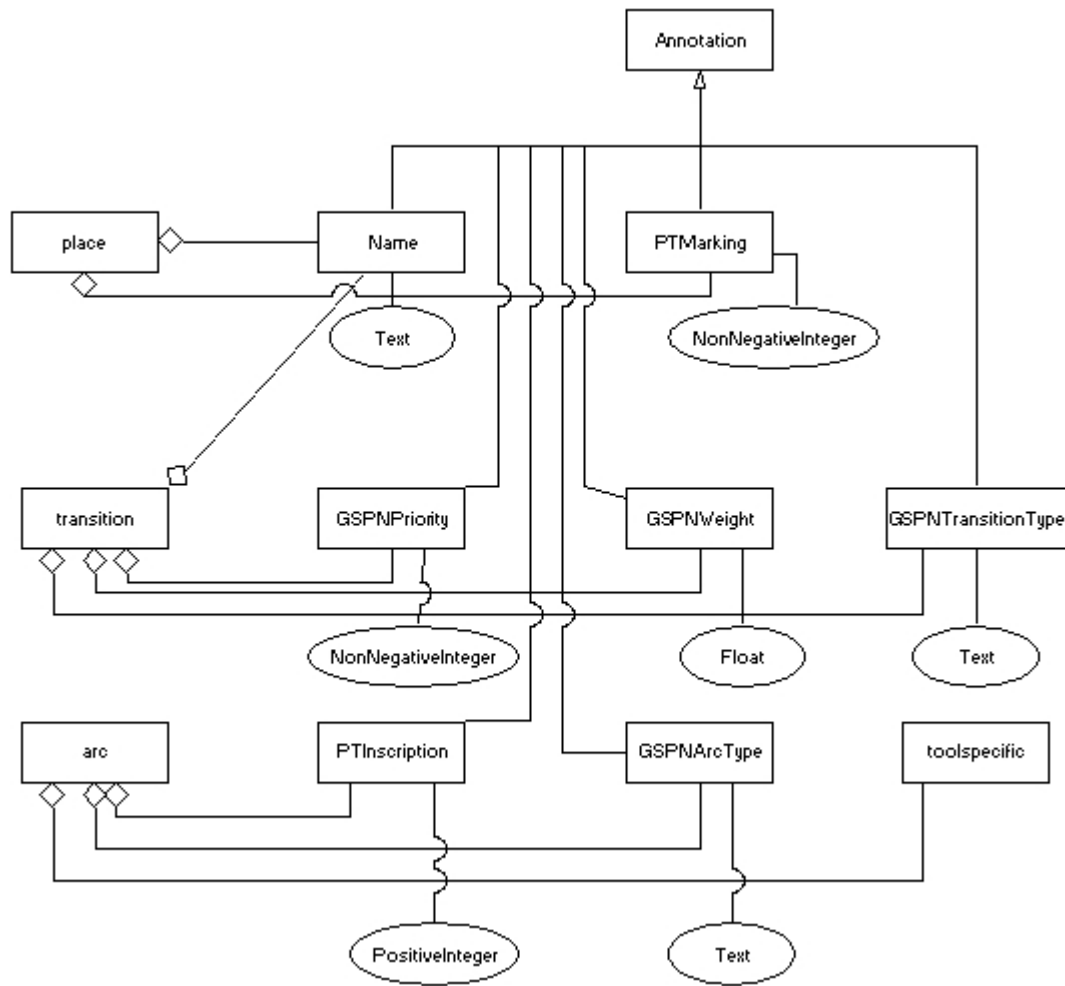
```
<transition id="t0">
  <graphics>
    <position x="53" y="142" />
  </graphics>
  <name>
    <text>t0</text>
    <graphics>
      <offset x="-8" y="-12" />
    </graphics>
  </name>
  <type>
    <text>timed</text>
  </type>
  <priority>
    <text>0</text>
  </priority>
  <weight>
    <text>1.0</text>
  </weight>
</transition>
```

```
<arc id="a0" source="p0" target="t0">
  <type>
    <text>normal</text>
  </type>
  <inscription>
    <text>1</text>
  </inscription>
  <graphics>
    <position x="82" y="75" />
    <position x="86" y="103" />
    <position x="79" y="127" />
  </graphics>
  <toolspecific tool="PNPDA" version="1.0">
    <StartConnector x="64" y="50" />
    <EndConnector x="63" y="142" />
  </toolspecific>
</arc>

<arc id="ai0" source="p1" target="i0">
  <type>
    <text>inhibitor</text>
  </type>
  <inscription>
    <text>2</text>
  </inscription>
  <toolspecific tool="PNPDA" version="1.0">
    <StartConnector x="153" y="46" />
    <EndConnector x="153" y="147" />
  </toolspecific>
</arc>
</net>
</pnml>
```

3. The type model of GSPN systems

Figure 2: The type Model of GSPN Systems



4. References:

[1] RELAX NG specification :

URL: <http://www.oasis-open.org/committees/relax-ng/>

[2] PETRI NET MARKUP LANGUAGE :

URL : <http://www.informatik.hu-berlin.de/top/pnml/about.html>

[3] High-level Petri Nets – Transfer Format :

Working Draft of the International Standard ISO/IEC 15909 Part 2 (version 0.5)

URL : <http://www.informatik.hu-berlin.de/top/PNX/download/ISO-IEC-15909-2-Draft.0.5.0.pdf>

[4] MODELLING WITH GENERALISED STOCHASTIC PETRI NETS:

M. Ajmone Marsan, Gianfranco Balbo, Gianni Conte, Susanna Donatelli, Giuliana Franceschinis

[5] Conventions Document for petry net types:

URL : <http://www.informatik.hu-berlin.de/top/pnml/download/pnml/conv.rng>

[6] Development of the application Petri Net PDA Tool 1.0 (PNPDAT) :

Eduardo Monteagudo, Master's Science Thesis, University of Zaragoza