Name Consistency Checker in ATOM3

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Overview

- Main constraint
- Constrain Checker (CC) revisited
- Implementation in ATOM3
- Demo
- Future Work

Goal

- Enforce name consistency over elements in a model.
- Petri Net Example.

Recall: The Constraint Checker (CC)

1. Map consistency constraint to checking rule:
   - *if* **Expression** *then* **Action**
2. Apply checking rule to model.

The Constraint

- UML Well-formedness rule:
  - *If a contained element, which is not an Association or Generalization, has a name then the name must be unique in the Namespace*

Generalization of Rule

- Well-formedness Rule:
  - *No instantiation of the same meta element may have the same name*

Petri Net Name Constraints

1. *No two places may have the same name within a model.*
2. *No two transitions may have the same name within a model.*

Map Name Constraint to Checking Rule

- Checking rule:
  - If *two instantiations of the same meta element have the same name* then *they should be the same instantiation.*

Problem with Checking Rule

- Checking rule implies should merge similarly name places and transitions into one.
- Problem:
  - if modeler intended for separate entities, merger will cause loss of info.
- Solution:
  - rename one entities instead of merging.

Alteration of Checking Rule

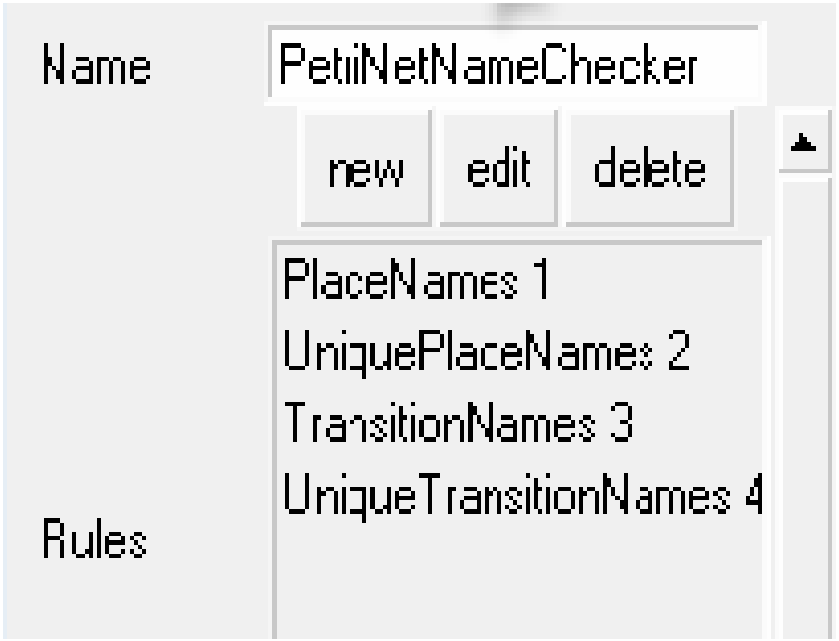
- New Checking Rule:
  - If *two instantiations of the same meta element has the same name* then *rename one of the instantiations*

Petri Net Checking Rules

1. If *two places have the same name within the model*, then *rename a place of them*
2. If *two transitions have the same name within the model*, then *rename a transition of them*

CC Implementation in ATOM3

- Implement constraint checking rules as graph grammars in ATOM3's graph rewriting system.

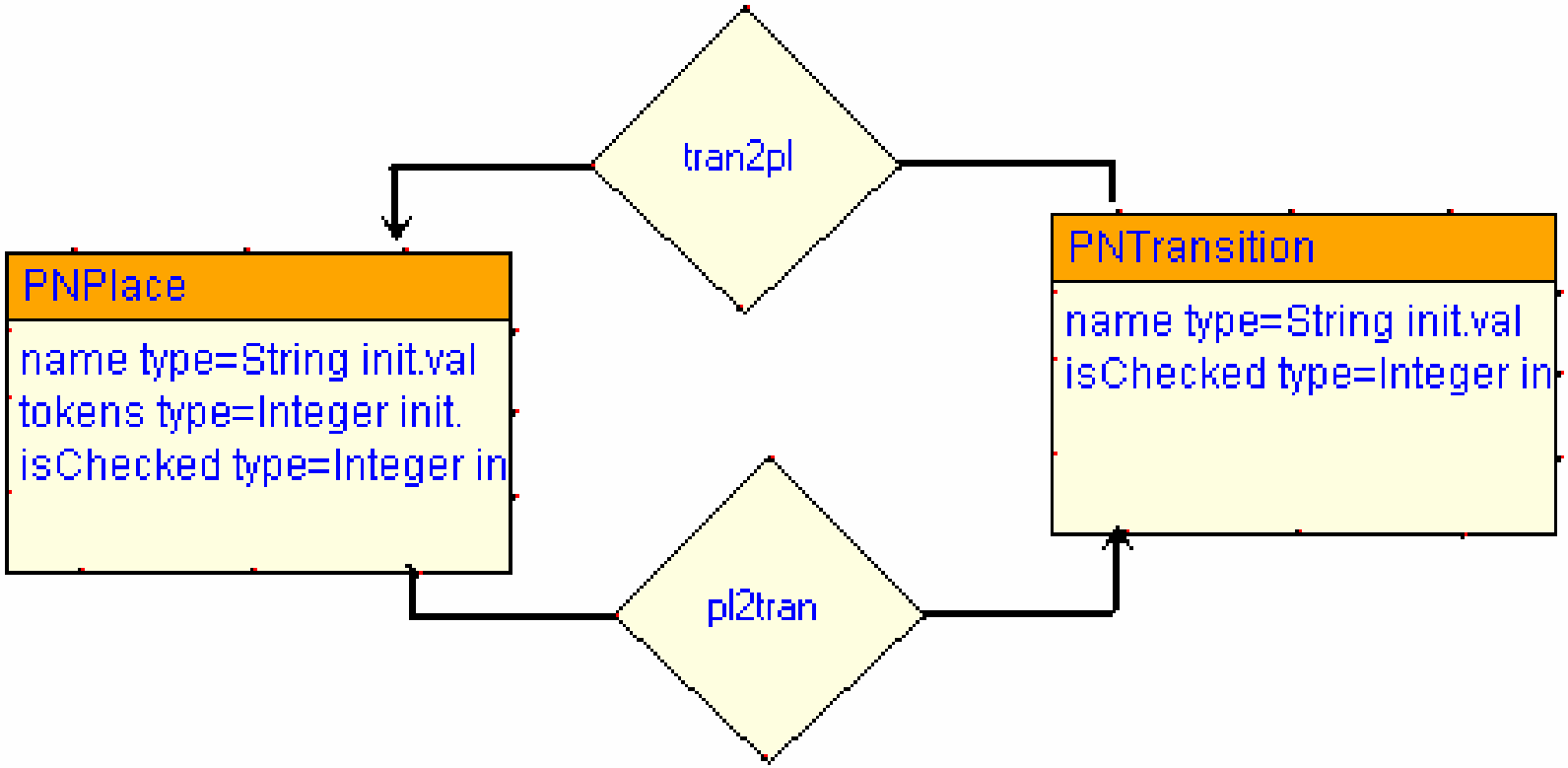


Implementation Issues

- Problems:
  - Need to know whether entity has been checked.
  - Need to trace changes made (which entities were renamed).

Solution: Use Stereotypes

- Extend metamodel with a tagged value.



The Tagged Values

- Implemented as an integer attribute of Place and Transition for Petri Net.
- Tagged Values
  - (isChecked, value)
  - Value = 0: Initial
  - Value = 1: Name is unique
  - Value = 2: Name is not unique

Graph Rewriting Rules for CC

- Preprocessing
- Rule 1: Place Names
  - Add all names of places to the global name list
  - Set their tagged values to 1

Graph Rewriting Rules for CC (2)

- Apply checking rules for places in CC
- Rule 2: Unique Place Names
  - Look up duplicated names in the global name list
  - Rename non-unique names until no more duplicated names are found
  - Add new name to global name list, remove its old name and set their tagged value to 2

Graph Rewriting Rules for CC (3)

- Rules for transition namespace
  - Similar to rules for place namespace
- Rule 3 : Preprocessing
- Rule 4 : Apply checking rules for transitions

Future Work with ATOM3

- Automation of extending meta element with tags
- Get user input to force action

References

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- WenQian Liu, Steve Easterbrook and John Mylopoulos: *Rule-based Detection of Inconsistency in UML Models, Conditions,Workshop* on Consistency Problems in UML-based Software Development, 2002

- UML Semantics: *http://www-inf.int-evry.fr/COURS/UML/semantics/*, INT - Département INFormatique, France