Global Symmetries vs. Local Symmetries

Introduction

At this stage, you know:

- Symmetric Nets with their syntax and semantics
- how to build a Reachability Graph
- how it can be used for system analysis
- how to use CosyVerif platform to practice these concepts and formalisms.

Introduction

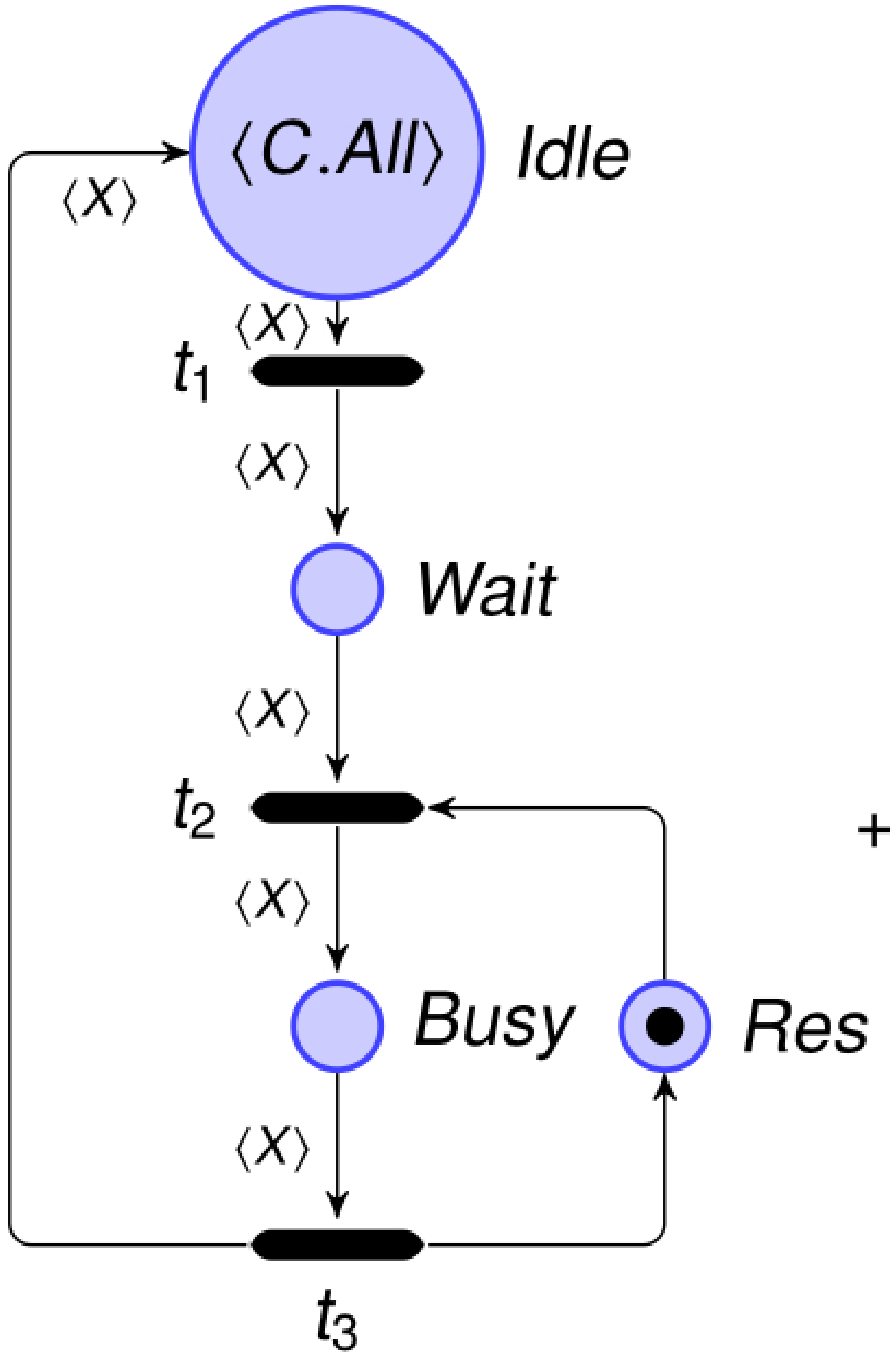
At this stage, you know:

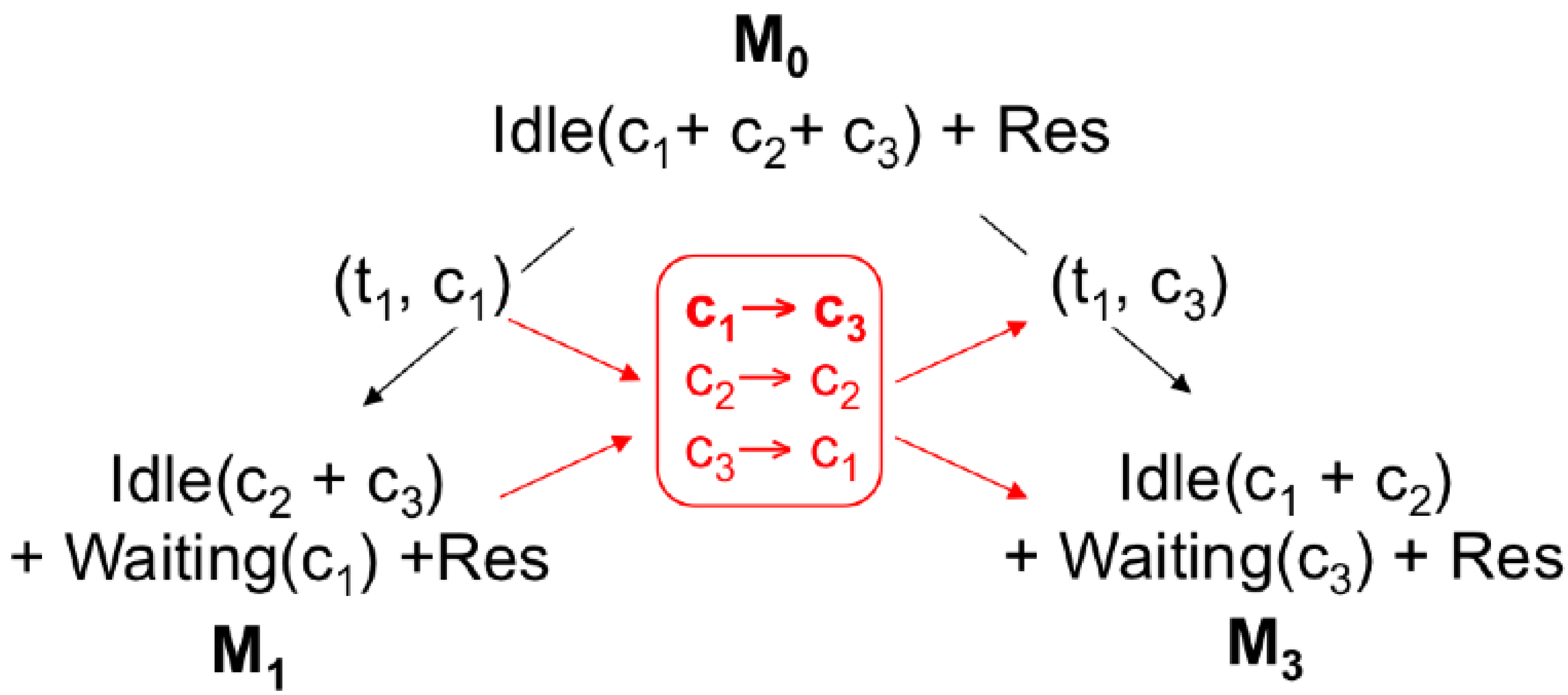
- Symmetric Nets with their syntax and semantics
- how to build a Reachability Graph
- how it can be used for system analysis
- how to use CosyVerif platform to practice these concepts and formalisms.

Let's now have an idea about the use of symmetries and local symmetries to reduce the size of the constructed structures.

Towards the use of symmetries (1/2)

$C = \{c_1, c_2, c_3\}$





- In the initial Marking, t_1 is enabled for each colour instance marking of *Idle*.
- If we apply a permutation on the transition colour, the obtained markings are identical up to this permutation.

Towards the use of symmetries (2/2)

- We can represent this set of firings using variables:

$$idle(x+y+z) + Res \xrightarrow{(t_1,\, z)} Idle(x + y) + Wait(z) + Res$$

$x, y, z \in C,$
$x \neq y \neq z$

- Then, we obtain the actual firings by testing all possible instantiations for x, y and z.

Permutations on Bags

- Let `A` be a set, `s` a permutation on `A`, and `a` a bag of `A`.

$$s.a = s(\sum_{x \in A} a(x).x) = \sum_{x \in A} a(x).s(x)$$

- In particular : $s.a(s.x) = a(x)$ (notation : $s.c = s(c)$)
- Example:
  - Let $a = c_1 + 2.c_2$ be a bag of $A = \{c_1, c_2, c_3\}$, and
  - s, with $s.c_1 = c_3$, $s.c_2 = c_1$, $s.c_3 = c_2$, be a permutation on A,
  - then, $s.a = s(c_1 + 2.c_2) = s.c_1 + 2.(s.c_2) = c_3 + 2.c_1$

Conclusion

At this stage, you:

- know Symmetric Nets with their syntax and semantics,
- have an intuitive idea about the notion of symmetries in SNs.

Conclusion

At this stage, you:

- know Symmetric Nets with their syntax and semantics,
- have an intuitive idea about the notion of symmetries in SNs.

Let's now study, formally, these symmetries and their usage for the construction of a reduced reachability graph (next sequence).