Motivation

A marked net $\langle N, M_0 \rangle$ with $N = (P, T, Pre, Post)$ specifies:

- an initial marking (i.e., state) M_0;
- the rules of evolution.

No explicit enumeration of:

- net language, i.e., the set of sequences of transitions that can fire:

$$L(N, M_0) = \{\sigma \in T^* \mid M_0[\sigma\rangle\};$$

- reachability set, i.e., the set of reachable markings:

$$R(N, M_0) = \{M \in \mathbb{N}^{|P|} \mid (\exists \sigma \in L(N, M_0))\ M_0[\sigma\rangle M\}.$$

The information on reachable markings and firing sequences is useful to determine if the net has given properties.

Reachability graph

The reachability graph of a marked net $\langle N, M_0 \rangle$ is an automaton $\mathcal{G} = (X, E, \delta, x_0)$ where:

- $X = R(N, M_0)$, i.e., the states of the automaton are the reachable markings;
- $E = T$, i.e., the events in the alphabet are the transitions of the net;
- for any two reachable markings M, M':

$$\delta(M, t) = M' \quad \iff \quad M[t\rangle M',$$

  i.e., there exists arc labeled t from M to M' on the automaton iff marking M' is reachable from M firing transition t;
- $x_0 = M_0$, i.e., the initial state of the automaton is the initial marking.

It can be constructed only if the reachability set if finite, i.e., if the net is bounded.