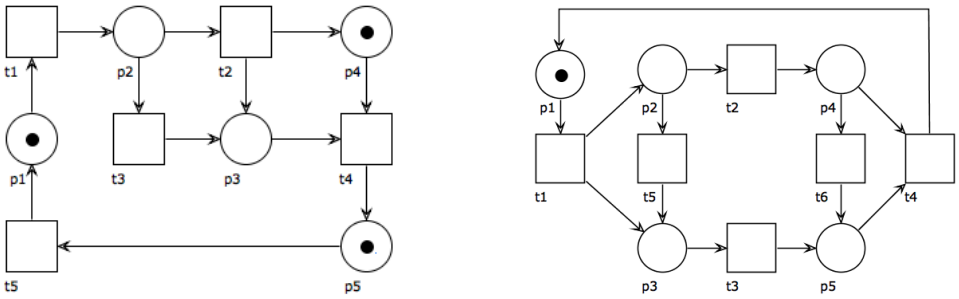
MPB 2017/18 – Nov 2, 2017



(a) $M_0 = p_1 + p_4 + p_5$ (b) $M_0 = p_1$

Figura 1: Two net systems

[**Ex. 1**] What is the goal of EAI middleware? Give some examples of EAI middleware solutions.

[**Ex. 2**] Explain the difference between primary and secondary processes.

[**Ex. 3**] Consider a net system (P, T, F, M_0). Formalize the statement "*there is a dead transition and it is attached to a safe place*".

[**Ex. 4**] Consider the system in Figure 1(a).
(i) Is it a T-system? (explain)
(ii) Show that the system is not deadlock-free.
(iii) Is the system live? (explain)
(iv) Show that no positive S-invariant exists.
(v) Does (iv) imply that there is an unbounded place?

[**Ex. 5**] Consider the system in Figure 1(a). Exploit the Marking Eq. Lemma:
(i) to find the marking reached after having fired the sequence

$$\sigma = t_1\ t_3\ t_5\ t_4\ t_1\ t_2\ t_5\ t_1\ t_3\ t_4;$$

(ii) to prove that the sequence $\sigma' = t_1\ t_3\ t_5\ t_4\ t_1\ t_2\ t_3$ is not fireable from M_0.

[**Ex. 6**] Consider the system in Figure 1(b).
(i) Find a positive S-invariant.
(ii) Use (i) and the Fundamental prop. of S-invariants to show that p_1 is safe.
(iii) Show that no positive T-invariant exists.
(iv) Can we conclude from (i) and (iii) that the system is not live?

[**Ex. 6, Optional**] Draw the complete reachability graph for the net system in Figure 1(b) (8 nodes, 12 arcs).