Supplementary File for "A Place-timed Petri Net-based Method to Avoid Deadlock and Conflict in Railway Networks"

The PN model of the network, i.e., (N_2, M_{20}) is given in Fig. 7. F_{2006}[12] for (N_2, M_{20}) contains nine constraints:

1) $M(p_1) + M(p_{13}) + M(p_{15}) + M(p_{23}) \leq 2$;
2) $M(p_2) + M(p_{12}) + M(p_{16}) + M(p_{22}) \leq 2$;
3) $M(p_5) + M(p_9) \leq 1$;
4) $M(p_6) + M(p_8) \leq 1$;
5) $M(p_{17}) + M(p_{21}) \leq 2$;
6) $M(p_{18}) + M(p_{20}) \leq 1$;
7) $M(p_2) + M(p_{12}) + M(p_{16}) + M(p_{17}) + M(p_{21}) + M(p_{22}) \leq 3$;
8) $M(p_5) + M(p_6) + M(p_7) + M(p_8) + M(p_9) + M(p_{10}) \leq 1$;
9) $M(p_3) + M(p_{12}) + M(p_{17}) + M(p_{18}) + M(p_{19}) + M(p_{20}) + M(p_{21}) + M(p_{22}) \leq 2$.

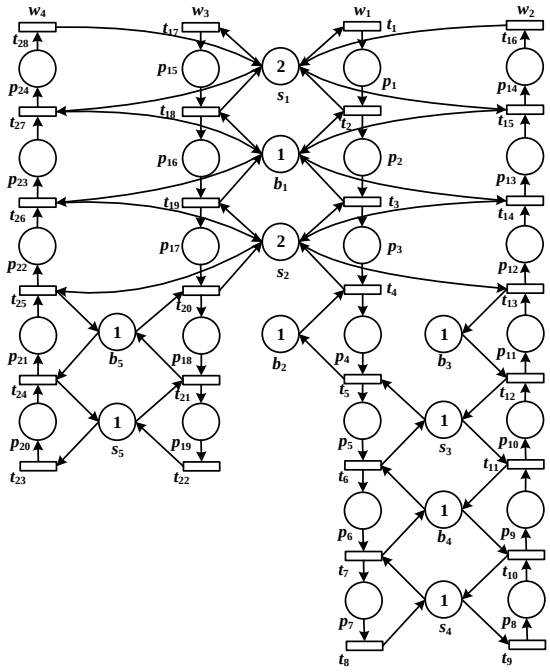

Fig. 7. PN of the railway network in [12].

The PN model of the network, i.e., (N_3, M_{30}) is given in Fig. 8, where s_1 corresponds to p_2, b_1 corresponds to p_5, s_2 corresponds to p_8, b_2 corresponds to p_{11}, b_3 corresponds to p_{12}, s_3 corresponds to p_{15}, b_4 corresponds to p_{18}, and s_4 corresponds to p_{21} in the PN model in [14]. G_{2008}[14] for (N_3, M_{30}) contains nine constraints:

1) $M(p_4) + M(p_9) \leq 2$;
2) $M(p_{17}) + M(p_{22}) \leq 2$;
3) $M(p_{14}) + M(p_{19}) \leq 2$;
4) $M(p_{14}) + M(p_{22}) \leq 3$;
5) $M(p_1) + M(p_6) \leq 3$;
6) $M(p_1) + M(p_9) \leq 4$;
7) $M(p_7) + M(p_{10}) + M(p_{12}) + M(p_{16}) \leq 5$;
8) $M(p_4) + M(p_7) + M(p_9) + M(p_{10}) + M(p_{12}) + M(p_{16}) \leq 6$;

9) $M(p_7) + M(p_{10}) + M(p_{12}) + M(p_{14}) + M(p_{16}) + M(p_{19}) \leq 6$.

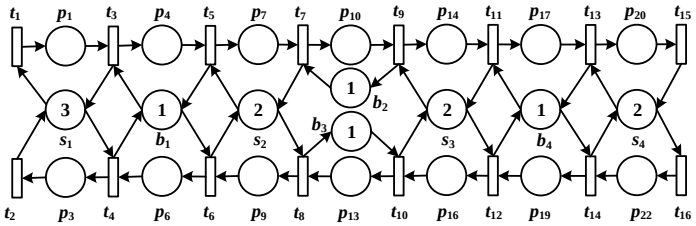

Fig. 8. PN of the railway network in [14].