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The complexity of diagnosability and opacity verification for Petri nets. (English)

[Zbl 1393.68111](#)

van der Aalst, Wil (ed.) et al., Application and theory of Petri nets and concurrency. 38th international conference, PETRI NETS 2017, Zaragoza, Spain, June 25–30, 2017. Proceedings. Cham: Springer (ISBN 978-3-319-57860-6/pbk; 978-3-319-57861-3/ebook). Lecture Notes in Computer Science 10258, 200-220 (2017).

Summary: *Diagnosability* and *opacity* are two well-studied problems in discrete-event systems. We revisit these two problems with respect to expressiveness and complexity issues.

We first relate different notions of diagnosability and opacity. We consider in particular fairness issues and extend the definition of V. Germanos et al. [“Diagnosability under weak fairness”, ACM Trans. Embedded Comput. Syst. 14, No. 4, Article No. 69, 19 p. (2015; doi:10.1145/2832910)] of weakly fair diagnosability for safe Petri nets to general Petri nets and to opacity questions.

Second, we provide a global picture of complexity results for the verification of diagnosability and opacity. We show that diagnosability is NL-complete for finite state systems, PSPACE-complete for safe Petri nets (even with fairness), and EXPSPACE-complete for general Petri nets without fairness, while non diagnosability is inter-reducible with reachability when fault events are not weakly fair. Opacity is ESPACE-complete for safe Petri nets (even with fairness) and undecidable for general Petri nets already without fairness.

For the entire collection see [[Zbl 1365.68011](#)].

MSC:

- [68Q85](#) Models and methods for concurrent and distributed computing (process algebras, bisimulation, transition nets, etc.)
- [68Q17](#) Computational difficulty of problems (lower bounds, completeness, difficulty of approximation, etc.)

Full Text: [DOI](#)