MPB - Soundness analysis checklist

* Questo modulo registrerà il tuo nome, inserire il nome.

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1. Which kind of workflow net are you analysing?

○ ORCHESTRATION: the net represents the business process of a single participant

☒ COLLABORATION: the net represents a collaboration between the business processes of two or more participants (it is a workflow system)

2. Check that your net N is a workflow net (wf net for short)

☑ INITIAL PLACE: there is a unique node with no incoming arcs and it is a place

☑ FINAL PLACE: there is a unique node with no outgoing arcs and it is a place

☑ NODE REACHABILITY: every node belongs to (at least) one directed path from the initial place to the final place

3. Check that your workflow net is properly initialised

☒ YES: it has one exactly token in the initial place

4. Check your expertise about the properties to check

☑ I know the meaning of the property NO DEAD TASKS

☑ I know the meaning of the property OPTION TO COMPLETE

☑ I know the meaning of the property PROPER COMPLETION

☑ I know that a wf net is SOUND iff it satisfies no dead tasks, option to complete, proper completion

☑ I know the meaning of the property LIVENESS

☑ I know the meaning of the property BOUNDEDNESS

☑ I know that N* is the net obtained by adding the RESET transition to the wf net N

☑ I know that a wf net N is SOUND iff N* is live and bounded

5. Check your expertise about the concepts that can be useful for the analysis

☑ I know what S-invariants and T-invariants are

☑ I know what S-nets and T-nets are

☑ I know what a free-choice net is

☑ I know what an S-component is

☑ I know what an S-cover is

☑ I know what a PT-handle is

☑ I known what a TP-handle is

☑ I know what a well-handled net is

☑ I know what a well-structured net is

6. Check if your workflow net N is an S-net (then IT IS SOUND)

○ S-NET: every transition has exactly one incoming arc and exactly one outgoing arc

☒ NOT S-NET: there is (at least) one transition whose pre-set or post-set is not a singleton

7. Check if N* is a T-net (then N is sound IFF N HAS NO CIRCUIT)

○ N* IS T-NET: by adding the reset transition to N, every place has exactly one incoming arc and exactly one outgoing arc

☒ N* NOT A T-NET: there is (at least) one place whose pre-set or post-set is not a singleton

8. Check if you can conclude that the net is safe and sound by construction

Iteratively, find some safe and sound building blocks inside the net and replace them with a single transition

☒ YES: the iterative procedure led you to a wf net with a single transition

○ NOT SURE: the iterative procedure led you to a wf net of reduced size which can still be more convenient to use for the soundness analysis

9. Check if N is free-choice (if the net is not free-choice, then the soundness analysis can take a large amount of time)

(Use Woped semantic analysis, expert mode to have the list of free-choice violations)

○ FREE-CHOICE: any two transitions have equal pre-sets or disjoint pre-sets

☒ NOT FREE-CHOICE: there are (at least) two transitions whose presets are different but have some places in common

10. Advanced: If you wf net N is free-choice, check which (non-trivial) conditions of the Rank Theorem are met by N*

(you can use any linear algebra tool for finding S-invariants, T-invariants and the rank of the matrix)

- [ ] the initial marking marks every proper siphon

- [ ] there is a positive S-invariant

- [ ] there is a positive T-invariant

- [ ] the rank of the incidence matrix of N* is the same as the number of clusters minus 1

11. Check if N is well-structured

(Use Woped semantic analysis, expert mode to have the list of PT-handles and TP-handles)

- ◯ WELL-STRUCTURED: N* has neither PT-handles nor TP-handles

- ☒ NOT WELL-STRUCTURED: N* has some PT-handles or TP-handles

12. Check if N* is S-coverable

(Use Woped semantic analysis, expert mode to have the list of S-components and of the places not covered by them)

- ☒ S-COVERABLE: it is a good sign, it has a positive S-invariant and therefore it is bounded

- ◯ NOT S-COVERABLE and free-choice: it is a bad sign, N is not sound

- ◯ NOT S-COVERABLE and well-structured: it is a bad sign, N is not sound

- ◯ NOT S-COVERABLE, not free-choice, not well-structured: no conclusion can be drawn, but places not covered by S-components can be unbounded

13. Check if N* is live and bounded (iff N IS SOUND)

(Use Woped semantic analysis, expert mode, to have the list of dead tasks, non-live tasks, unbounded places)

☐ N* HAS SOME UNBOUNDED PLACES: maybe proper completion is not satisfied by N

☐ N* HAS SOME DEAD TASKS: N has some dead tasks and thus it is not sound

☐ N* HAS SOME NON-LIVE TASKS: maybe option to complete is not satisfied by N, because a deadlock or lovelock is possible

14. Inspect the coverability graph G and let U be the set of states in which some place has infinite multiplicity

(Use Woped to generate the coverability graph)

☒ the set U IS EMPTY: it is a good sign, N is bounded and maybe also N*

☐ the set U IS NON-EMPTY: the net N (and thus N*) has some unbounded places

15. Inspect the coverability graph G and let D be the set of states with no outgoing arcs (deadlocks)

(Use Woped to generate the coverability graph)

☐ the final place of the wf net is unmarked in every state of G: it is a bad sign, option to complete is not satisfied

☐ the final place of the wf net is marked in more than one state of G: it is a bad sign, proper completion is not satisfied (and N* is unbounded)

☐ the set D IS EMPTY: it is a bad sign, the net may have a livelock

☐ the set D contains states where some non-final places of N are marked: it is a bad sign, there are deadlocks that prevent the option to complete

☒ the set D contains exactly one state and it consists of exactly one token in the final place (and no token elsewhere): it is a good sign, the wf net satisfies proper completion

16. I have started the semantics analysis with Woped, but got no answer and Woped is not responding

☐ Try to run Woflan instead (windows only)

☐ Try to run the Woflan plugin in ProM (all platforms)

17. The net is unsound and I'd like to locate where the problems are

☐ Run Woflan: if the wf net does not satisfy proper completion, the tool should tell you which transition firings are problematic (they are the last transitions of some unbounded error sequence)

☐ Run Woflan: if the wf net is bounded but does not satisfy option to complete, the tool should tell you which transition firings are problematic (they are the last transitions of some non-live error sequence)

18. Extract some statistics about your model: How many places, transitions and arcs does the wf net N have?

(Use Woped)

> 74 places, 71 transitions and 170 arcs

19. Extract some statistics about your model: How many nodes and arcs does the cover ability graph of the wf net N have?

(Use Woped)

> Non visualizzato con WoPed

20. Advanced: The layout of the net is not satisfactory

☐ Try OPTIMIZE LAYOUT option in the VIEW panel of Woped

☐ (RISKY, MAKE A COPY OF THE .pnml FILE before editing it) Open the .pnml file with a text editor and change manually the positions of places and transitions

21. Please upload the pnml code of your workflow net: unfortunately it seems that Microsoft Forms accepts only a few kinds of files, so please change the suffix .pnml to .doc to make the upload possible (do not edit the file, just rename its suffix)

↑ Carica file

Limite del numero di file: 1   Limite di dimensioni del file singolo: 10MB   Tipi di file consentiti: Word