

Specification and Verification of Distributed Systems

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Exercise 8

Prove the following statements for $Proc = \{1, 2, 3, 4\}$ and $Msg = \{a\}$:

- (a) Locally accepting MPA are strictly weaker than MPA.
- (b) Safe MPA are strictly weaker than MPA.
- (c) Strongly 2-bounded locally accepting product MPA are strictly weaker than $\forall 2$ -bounded locally accepting product MPA.

Which of the above statements hold for two or three processes?

Exercise 9

Show that $\{\mathcal{L} \subseteq \text{MSC} \mid \text{there is an MPA } \mathcal{A} \text{ such that } \mathcal{L}(\mathcal{A}) = \mathcal{L}\}$ is closed under union and intersection.

Exercise 10

Show that the following problems are undecidable:

- (a) INPUT: MPA \mathcal{A} and $B \geq 1$. QUESTION: Is \mathcal{A} $\forall B$ -bounded?
- (b) INPUT: MPA \mathcal{A} . QUESTION: Is \mathcal{A} $\forall B$ -bounded for some $B \geq 1$?

Exercise 11

Show that the following problems are decidable:

- (a) INPUT: Safe MPA \mathcal{A} and $B \geq 1$. QUESTION: Is \mathcal{A} $\forall B$ -bounded?
- (b) INPUT: MPA \mathcal{A} and $B \geq 1$. QUESTION: Is \mathcal{A} strongly B -bounded?