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On the versatility of Bracha’s Byzantine reliable broadcast algorithm. (English)

Summary: G. Bracha presented in [Inf. Comput. 75, 130–143 (1987; Zbl 0622.68032)] a simple and efficient reliable broadcast algorithm for \( n \)-process asynchronous message-passing systems, which tolerates up to \( t < n/3 \) Byzantine processes. Following an idea recently introduced by M. Hirt et al. [“Multi-threshold asynchronous reliable broadcast and consensus”, LIPIcs – Leibniz Int. Proc. Inform. 184, Article 6, 16 p. (2021; doi:10.4230/LIPIcs.OPODIS.2020.6)], instead of considering the upper bound on the number of Byzantine processes (\( t \)), the present short article considers two types of Byzantine behavior: the ones that can prevent the safety property from being satisfied, and the ones that can prevent the liveness property from being satisfied (a Byzantine process can exhibit only one or both types of failures). This Byzantine differentiated failure model is captured by two associated upper bounds denoted \( t_s \) (for safety) and \( t_\ell \) for liveness). The article shows that only the threshold values used in the predicates of Bracha’s algorithm must be modified to obtain an algorithm that works with this differentiated Byzantine failure model.

MSC:
68M14 Distributed systems
68M15 Reliability, testing and fault tolerance of networks and computer systems

Keywords: broadcast algorithm; asynchronous system; Byzantine process; distributed computing; fault-tolerance; liveness property; message-passing; reliable broadcast; safety property; upper bound

Full Text: DOI

References:
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