Bourke, Timothy; van Glabbeek, Robert J.; Höfner, Peter
Showing invariance compositionally for a process algebra for network protocols. (English) [Zbl 1416.68153]

Summary: This paper presents the mechanization of a process algebra for mobile ad hoc networks and wireless mesh networks, and the development of a compositional framework for proving invariant properties. Mechanizing the core process algebra in Isabelle/HOL is relatively standard, but its layered structure necessitates special treatment. The control states of reactive processes, such as nodes in a network, are modelled by terms of the process algebra. We propose a technique based on these terms to streamline proofs of inductive invariance. This is not sufficient, however, to state and prove invariants that relate states across multiple processes (entire networks). To this end, we propose a novel compositional technique for lifting global invariants stated at the level of individual nodes to networks of nodes.

For the entire collection see [Zbl 1294.68020].

MSC:
68T15 Theorem proving (deduction, resolution, etc.) (MSC2010)
68M12 Network protocols
68Q85 Models and methods for concurrent and distributed computing (process algebras, bisimulation, transition nets, etc.)

Software:
Isabelle/HOL; AWN; Isabelle/Circus; TPTP; Isabelle; HOL; Isabelle/jEdit

Full Text: DOI