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Simulating wireless and mobile systems: The Integration of DEUS and Ns-3. The Integration of DEUS and Ns-3. (Book Chapter)

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Abstract

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Wireless and mobile experiments in the real world are not easily or accurately repeatable, reducing the usefulness of such experiments for validation. Most challenges are due to the complications and subtleties of physical movement and wireless propagation, making the system highly variable. Moreover, mobile and distributed applications are characterized by decentralized goals and control, with high levels of concurrency and asynchronous interaction. For the qualitative and quantitative analysis of such systems, discrete event modeling and simulation-in which time jumps from event to event-are usually adopted.Widely known discrete event simulation tools, such as ns-2, ns-3, and OMNeT++, are highly specialized in communication networks. As they are not general-purpose, they can hardly support the analysis of large-scale distributed applications. Conversely, general-purpose tools like DEUS and CD++ are not provided with sound, highly recognized packages for the simulation of networking aspects. To fill the gaps between the two families of discrete event simulators, a co-simulation (co-operative simulation) approach may be very efficient.In this chapter, we review the existing approaches for co-simulation of wireless and mobile systems. We then focus on a recently adopted co-simulation approach, allowing individual components to be simulated by different simulation tools, exchanging information in a collaborative manner. In particular, DEUS (which is application-level oriented, Java-based, and characterized by ease of use and flexibility) is integrated with ns-3 (which is generally known as a highly reliable and complete open-source C++ tool for the discrete event simulation of Internet systems). We then propose a specific application, where ns-3's LTE-EPC package supports the DEUS-based simulation of a peer-to-peer overlay scheme called Distributed Geographic Table (DGT), which allows mobile nodes to efficiently share information without centralized control.

Author keywords

Co-simulation; DEUS; DGT; LTE; Mobile systems; Ns-3; Peer-to-peer

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