METADATA

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Abstract

This book deals with the subject of Software-Defined Networks (SDN) with an emphasis on their analytical modelling. SDNs introduced the clear separation of a network's control logic from the hardware of network devices, as well as well-defined centralized control. Therefore, they are fertile ground for an analytical approach to network issues. The book's subject matter includes analytical and algorithmic topics introduced by SDNs and their very structure and operation. Such are problems of distributed synchronization, transition to new routing rules, network resource commitment by independent SDN applications, access control and network integration, routing with checkpoints and partial network control. Then, the topic is specialized in the analytical modelling of specific wired and wireless networks under SDN. In the case of wired networks, SD-WAN (Software-Defined Wide Area Network) infrastructure systems are examined covering the concepts of competitive resource allocation, Lyapunov network stability, generalized link-flooding (Crossfire) attacks and defences, and adaptive operation in changing network load conditions. In the case of wireless networks, programmable wireless environments under SDN are considered, which utilize intelligent (meta)surfaces to achieve controlled propagation of electromagnetic waves in a space. Issues of analytical modelling of these networks are introduced, and problems are addressed: their optimal regulation concerning the needs of multiple users, mobility control, physical level security, dealing with dropouts and Doppler effects in Wi-Fi and mm-Wave networks. Finally, in both wired and wireless networks, the book studies the interface with machine learning techniques and intelligent network equipment.

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