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Security in Multi-Controller Software-Defined Networks: Present Trends and Future

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In the digital age, the networking field has undergone a marvelous transformation in various aspects. The fundamental networks struggle to build diverse, novel hardware-centric architectures to meet increasing demands such as network agility, flexibility, security, and efficiency. As the network applications become more dynamic, rapidly adaptable network infrastructure is essential to respond to the dynamiclarge-scale environments quickly. This ground breaking solution, Software Defined Networking (SDN), is increasing due to the decoupling nature of data and control planes. A Multi Controller Software Defined Network (MC-SDN) is a revolutionary concept comprising multiple controllers and switches separated using programmable features, enhancing network availability, management, scalability, and performance. The MC-SDN is a potential choice for managing large, heterogeneous, complex industrial networks. Despite the rich operational flexibility of MC-SDN, it is imperative to protect the network deployment with proper protection against potential vulnerabilities that lead to misuse and maliciou sactivities on the MC-SDNstructure. The security holes in the MC-SDN structure significantly impact network surviv ability and performance efficiency. Hence, detecting MC-SDN security attacks is crucial to improving network performance. Accordingly, introduces and illustrates the key developments in the MC-SDN defense mechanisms proposed using the latest developments in blockchain technology and machine learning. It highlights and identifies the potential studies in SDN and its security frameworks that significantly contribute to the current literature and substantially impact the relevant research.