

Security Protocols in Networking: Theoretical Foundations and Emerging Trends

Dr. Pradeep V¹, Nisarga Naik², Nandini Boragave³, Nikita Shetty⁴, Navya Y R⁵

Department of Information Science and Engineering¹⁻⁵

Alva's Institute of Engineering and Technology, Mijar, Karnataka, India

pradeepv@aiet.org.in, nisarganaik2004@gmail.com, nandiniboragave23@gmail.com,

navyarajanna484@gmail.com, Shettynikitha141@gmail.com

Abstract: *The rapid developments in networking technologies require highly robust security protocols that should ensure data integrity, confidentiality, and authenticity across different communication systems. The paper discusses the theoretical foundations of security protocols for networks, important cryptographic principles, and formal verification approaches. Recent trends include blockchain technology, IoT security, and the growth of 5G networks. The most up-to-date research and practice is integrated, bringing forth a comprehensive overview of existing challenges and future directions for network security protocols. This list of findings includes the fact that new strategies for current as well as future challenges would have to be developed by interdisciplinary collaboration*

Keywords: Network Security, Blockchain, IoT Security, 5G Security, Cryptography, Artificial Intelligence, Post-Quantum Cryptography, Software-Defined Networking (SDN)