IN-DEPTH THEORETICAL MODEL AND ARCHITECTURAL FRAMEWORK FOR A SELF-HOSTED WAKE-ON-LAN (WOL) SYSTEM

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ABSTRACT

Wake-on-LAN (WOL) is a well-established networking standard that enables computers and network-enabled devices to be powered on remotely using a specially crafted broadcast message known as a magic packet. Although WOL has been extensively used in large-scale IT infrastructures, the increasing adoption of home automation, edge computing, and self-hosted personal servers has renewed interest in creating local, self-managed WOL systems independent of cloud-based platforms. This paper presents a detailed theoretical and architectural model for designing a self-hosted WOL system. The study examines protocol fundamentals, network dependencies, host-level configurations, software components, security implications, and remote accessibility constraints. Emphasis is placed on understanding how WOL behaves at different OSI layers, how network hardware processes magic packets, and how self-hosted controllers can be securely integrated into home or small-office networks. The paper also includes a structured comparison with cloud-based WOL systems, identifies common implementation challenges, and proposes a unified framework suitable for scalable, secure, and privacy-preserving deployments.

KEYWORDS *Wake-on-LAN, self-hosted networks, remote access, magic packet, network security, automation systems.*