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Virtualization: Overview and Future Directions

Okram Andrew and Aditya Tiwari
Department of Computer Science and Application
Sharda School of Engineering & Technology, Sharda University, Greater Noida
2023333648.okram@ug.sharda.ac.in 2023333648.aditya@ug.sharda.ac.in

Abstract: *The technology of virtualization, which produces abstract and software-based models of physical elements, has developed out of a server consolidation tool to become the staple of contemporary computing, driving cloud data centres, intelligent grids, and metaverses. In this paper, the author presents an overview of the existing situation with the virtualization technologies, their evolution and the analysis of how they can be used in various fields, including IT infrastructure, power systems, and social communication. We review the recent literature to examine recent research trends, such as performance optimization, security implications, and new architectural technologies, such as containerization and hybrid hypervisor. Comparative analysis shows that some problems exist such as security trade-offs, interoperability issues, and complexity in management. The most important conclusions are that, even though virtualization can help to substantially increase scalability, flexibility, and resource efficiency, it also creates additional attack points and makes systems more difficult to keep. The review outlines fundamental gaps in the current literature, especially on the uniform security frameworks to be used in emergent case scenarios and the ultimate social consequences of deep virtualization. Our last suggestion is what the future will bring and we identify the prospects of virtualization as an engine to drive the large-scale earth modeling of climates and urban planning, the incorporation of AI to manage autonomous systems, and the intersection with neuro-technologies. This review highlights the transformative nature of virtualization and provides a path to the future research to deal with its own challenges and open new frontiers.*

Keywords: Virtualization, Hypervisor, Virtual Machines, Cloud Computing, Cybersecurity, Future Trends, Metaverse

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