Editorial

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The advent of 5G networks, in tandem with cloud and edge computing, represents a watershed moment in the evolution of telecommunications. These technologies collectively forge a path toward a future where data transmission is not just faster but is also more reliable and efficient than ever before. This special issue of the *International Journal of Networking and Virtual Organisations* (*IJNVO*) delves into the pioneering research at the confluence of 5G technology with cloud and edge computing paradigms, including a significant contribution by Shafiei et al. (2021), who propose a hybrid technique based on genetic algorithms for optimising multi-objective problems in 5G, IoT, and mobile edge computing. It is dedicated to unearthing and discussing innovative approaches that promise to redefine connectivity, service delivery, and network management across the globe.

The integration of 5G with cloud and edge computing is not just a step forward; it is a leap toward addressing the voluminous data demands of modern applications in healthcare, transportation, entertainment, and communication. The current landscape, characterised by multimedia sensors generating massive volumes of audio and video data, has stretched the capacities of existing network technologies. Edge computing emerges as a crucial player in this context, positioned at the data source to pre-process and streamline data for the 5G network, thereby circumventing the bottlenecks posed by bandwidth limitations and latency issues. This approach is further explored by Mazhar et al. (2022) in their examination of the role of ML, AI, and 5G technology in managing smart energy and smart buildings, highlighting the synergistic potential of these technologies in automating and enhancing building operations.

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The role of edge computing extends beyond mere data pre-processing; it acts as a localised extension of cloud computing, executing higher-level computations near the data source. This not only alleviates the load on centralised cloud systems but also significantly enhances application speed and real-time data processing. By integrating edge computing, 5G networks are poised to witness substantial improvements in three pivotal areas: latency reduction, bolstered privacy and security, and improved spectral efficiency. Through sophisticated software tools that pre-process data – reducing noise, enhancing quality, and ensuring data encryption – edge computing ensures that the data transmitted over the network is both secure and efficient, consuming less bandwidth and reducing overall transmission time.

Moreover, cloud computing complements these advancements by employing machine learning algorithms to predict and manage traffic congestion, allocate additional bandwidth, and maintain network integrity. This synergy between cloud and edge computing not only enhances network performance but also paves the way for innovative applications, such as self-driving cars and remotely operated cyber-physical systems, which rely on the low latency and high reliability offered by these technologies. Ijaz et al. (2021) offer insights into the integration and applications of fog and cloud computing based on IoT for the provision of healthcare services at home, demonstrating the efficacy of these technologies in improving healthcare delivery.

The first article paper of our collection, titled 'An improved data aggregation for fog computing devices in internet of things', by M. Jalasri and L. Lakshmanan, delves into the realm of fog computing as a critical intermediary layer between cloud computing and IoT devices (Article 1). The authors propose a novel clustering algorithm that enhances network performance through the use of backup cluster heads and a multi-route protocol for efficient data transmission to the fog system. Their work introduces a combined particle swarm optimisation (PSO) and river formation dynamics (RFDs) algorithm, aimed at optimising cluster head election in wireless sensor networks (WSNs) for energy-efficient data conveyance. This approach not only secures IoT data but also significantly reduces service latency, a pivotal advancement in fog computing research.

The second article, 'An efficient optimal load balancing algorithm for distributed file systems in cloud environment', presents a ground-breaking framework developed to address the challenges of load balancing in cloud computing environments (Article 2). The proposed efficient optimal load balancing (EOLB) algorithm optimises the distribution of tasks and node allocation based on various parameters, including CPU, memory usage, and disk IO occupancy rates. This methodology ensures enhanced operational efficiency in distributed file systems, showcasing a notable improvement in response and processing times when compared to existing models. The research underscores the critical role of load balancing in enhancing the performance and reliability of cloud services.

'The nexus between allied policies of GST and FDI with dependent telecom policies of licensing and universal service in India', the third article, offers a comprehensive analysis of the interplay between telecommunications policies and broader economic regulations in India (Article 3). The study evaluates the effectiveness of stakeholder participation in policy formulation for foreign direct investment (FDI) and the goods and services tax (GST), contrasting these with the implementation of telecom policies. The findings reveal the complexities and challenges in policy formulation and implementation, shedding light on the dynamics of rent-seeking behaviour and regulatory gaps. This research contributes to a deeper understanding of policy impacts on the

telecommunications sector, highlighting the need for more inclusive and effective policy-making processes.

Following this examination of policy and regulation, we then delve into the practical applications and architectural innovations in the field. 'Architectural framework for multiplayer cooperative cloud gaming to optimise quality of service', the fourth article, investigates the burgeoning field of cloud gaming, particularly focusing on cooperative multiplayer experiences (Article 4). The authors propose an architectural model designed to significantly improve bandwidth and latency issues, critical factors in the quality of service for cloud gaming. Through a detailed analysis of video frame handling and resource utilisation, the study demonstrates the potential of their model to enhance the gaming experience substantially. This research not only contributes to the technical advancement of cloud gaming but also underscores the growing importance of cloud services in entertainment and social connectivity.

The fifth article, 'The triggers on compulsive online shopping of jeans', broadens the scope of our issue to include the implications of 5G and associated technologies on consumer behaviour (Article 5). This study provides a descriptive analysis of the factors leading to compulsive online shopping, a phenomenon that is likely to become more prevalent with the increased adoption of 5G networks that facilitate instant access to e-commerce platforms. The authors' use of a purposive sampling design in an online survey underscores the role that data analysis and understanding consumer behaviour play in the successful deployment of marketing strategies in the age of pervasive digital connectivity.

In conclusion, the articles in this special issue collectively provide a multi-dimensional exploration of the challenges and opportunities presented by the integration of 5G networks with cloud and edge computing. From enhancing technical performance and addressing policy challenges to reshaping the digital marketplace and consumer behaviour, the range of topics covered herein reflects the vast potential of these technologies to transform every aspect of our connected world. As we stand on the brink of this new era, the insights offered by these studies are both timely and critical for academics, industry professionals, policymakers, and consumers alike.

References

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