

Chapter 2

Literature Review

2.1 Introduction

Numerous research work has done and is still rethinking data center design and architecture. Various researcher has done work around the green energy data center, challenges. If we talk about rethinking data center design then it is required for data center services, hardware and maintenance cost, and energy cost. Data center also consumes more energy than air conditioning. The major research work is on green energy and energy-sufficient data center design and some research work is on network architects in the data center. Every data center service is required today all the digitization is online.

Man's research did the work on cloud data center technology represents but the cloud data centre are third-party services providers, that require the data center design to use every small and medium enterprise are use the services as per requirement. I reviewed hundreds of papers and blogs to work on the data center but compare to other data center-related research work is less, and more research is energy related but I research the data center services at a local level with zero latency. Today Artificial intelligence and machine learning-related apps require more accurate connections on a server in this time internet require faster and this is the dependency of application and server and users. But local level data centers are solving these issues.

If we look last 10 years the cloud environment is grove rapidly and the attached compliance is many but no need for every user to this compliance. The redundancy is a good thing for data center and reliable connections but it generates more cost of data center deployment and users charges. The redundancy is designed as per user requirements this design direct effect data center cost and user budget.

Many researchers have analysed the future data center design but the data centre is a simple server room and requires how this server room design is useful to users a data centre. We rethinking the data center design as a town, the town is bigger than a server room but smaller than the cloud data center its cost-effective services provide local data centre services.

2.2 Previous Work Around Data Centre

Berezovskaya, Y. et al. IT equipment and cooling systems are the two most significant energy consumers in data centres, thus the energy efficiency of any data centre mainly

relies on the energy efficiency of its computational and cooling systems. Existing techniques of optimizing the energy usage of both these systems have to be compared [1]. However, such experiments cannot be conducted in real plants as they may harm the electronic equipment. This paper proposes a modeling toolbox that enables building models of data centers of any scale and configuration with relative ease.

Sutor, S. et al. In this work the convergence of ICT security and physical security is addressed. Starting by analyzing the impact of technology penetration on the global market and subsequently on security. Security spending in the Global IT market is analyzed, focusing on the development of the split out, which revealed the fact that spending is not always in the right sector [2]. ICT Security and its classification in the different sectors are presented by taking into consideration the major security classes and their impact. Finally, an outlook of emerging future technologies is presented, focusing on the sector of video surveillance, which is the driving potential of both physical and ICT- security

Vijayan, V. et al. The data centre plays an important role nowadays because of the prompt growth of cloud computing. This survey discusses data centres of various organizations and the characteristics and hardware requirements of Data Center Networks (DCN). The service provided, factors affecting the performance, and various maintenance issues of DCNs are also discussed. The analysis of our survey can use as an overview of ongoing research in this area [3].

Reddy, V. D. et al. To predict growth or set effective goals, it is important to choose the correct metric and be aware of their expressivity and potential limitations. As cloud-based services and the use of ICT infrastructure are growing globally, continuous monitoring and measuring of data center facilities are becoming essential to ensure effective and efficient operations [4]. We propose a taxonomy of metrics based on core data center dimensions. Based on our observations, we argue for the design of new metrics considering factors such as age, location, and data center typology thus assisting in the strategic data center design and operations processes.

Dayarathna, M. et al. Data centers are critical, energy-hungry infrastructures that run large-scale Internet-based services [5]. Energy consumption models are pivotal in designing and optimizing energy-efficient operations to curb excessive energy consumption in data centers. Based on these observations, we conclude the survey by describing key challenges for future research on constructing effective and accurate data center power models.

Chuang, C. C. et al. With the explosive growth of cloud-based services, large-scale data centers are widely built for housing critical computing resources to gain significant economic benefits. In data centers, cloud services are generally accomplished by multicast-based group communications. We prove the problems are mythical $\{NP\}$ -hard and propose efficient heuristic algorithms for the two problems [6]. Based on real traces and practical settings obtained from commercial data centers, a series of experiments are conducted, and the experimental results show that our proposed algorithms are effective for reducing multicast data traffic.

Xiong, J. et al. In this paper, Through role re-encryption key updating and revoking, our system achieves the dynamic which is based on convergent encryption and the role re-encryption algorithm to prevent the privacy data leakage in the cloud and it also achieves the authorized deduplication and satisfies the dynamic privilege updating and revoking [7]. Meanwhile, our system supports ownership checking and achieves proof of ownership for the authorized users efficiently. With the convergent encryption algorithm and the role re-encryption technique, it can be guaranteed that only the authorized user who has the corresponding role re-encryption key can access the specific file without any data leakage. Through role re-encryption key updating and revoking, our system achieves the dynamic

Miano, S. et al. In recent years, the complexity of the network data plane and its requirements in terms of agility has increased significantly, with many network functions now implemented in software and executed directly in data centre servers [8]. This paper aims at guiding the reader through the intricacies of the above-mentioned technologies, leveraging Smart NICs to build a more efficient processing pipeline and providing concrete insights on their usage for a specific use case, namely, the mitigation of Distributed Denial of Service (DDoS) attacks. In particular, we enhance the mitigation capabilities of edge servers by transparently offloading a portion of DDoS mitigation rules in the Smart NIC, thus

Minakhmetov, A. et al. report on possible 75% lower energy consumption for packet transport in data center networks by replacing electronic with hybrid optical packet switching (optical switches with a shared electronic buffer) combined with the enhanced transmission control protocol [9].

Liao, Z. et al. the data access Low-latency is attractive to an upcoming user demand and gradually significant challenge. The appropriate design of the data center can reduce data time to leave data between disseminated server systems, which contributes

meaningfully to the latency decrease [10]. The designing technology can assist the data center networks to study past access information and make ideal data storage result. To deliberate an additional real-world network with three topologies, we apply a deep-learning technology k-means to help store data blocks and then improve the read and write latency of the DCN, where k is the number of cores in the fat-tree.

Linaje, M. et al. However, regarding their own data storage, data is usually sent to Fog/Cloud servers. Fog/Cloud storage solutions provide several advantages over sensor network storage solutions, but also some drawbacks. For instance, in Cloud environments, privacy and legal issues may appear, while in Fog, additional costly hardware must be purchased and maintained, at least a server with redundant storage or many servers when the distributed data storage is required [11]. Nowadays, sensor nodes count in thousands around us, and they have significantly increased their storage and computational capabilities over the past few years.

Alkadi, O. et al. Virtual Machine migration are vital and a secure precaution cloud data centers protect inbound and outbound network attacks. In this paper, we propose a collaborative anomaly recognition system for learning insider and outsider attacks from cloud data centre and their migration process [12]. The proposed system utilizes Gaussian-mixture models for fitting network data and a local outlier issue purpose for learning irregular patterns in data centre network traffic. In mandate to validate the efficiency of the models, the datasets of employed.

Kim, S. et al. With the popularity of 5G network technology, the cloud computing paradigm in data center (DC) networks has drawn increased attention. DC is a pool of computational and storage resources interconnected using a communication network [13]. Using the matching game model and Mood value, we propose new resource allocation algorithms, which attempt to equalize users' satisfaction concerning an effective distribution of the DC resource [14]. To handle the growing demands of cloud computing services, resources in DC should be used efficiently. In this paper, we design a new DC resource provisioning scheme based on the cooperative game theory.

Araslanov, N. et al. The rapid growth of traffic inside data centers caused by the increasing adoption of cloud services necessitates a scalable and cost-efficient networking infrastructure [15]. Space-division multiplexing (SDM) is considered a promising solution to overcome the optical network capacity crunch and support cost-effective network capacity scaling. Multi-core fiber (MCF) is regarded as the most feasible and efficient way to realize SDM networks, and its deployment inside data

centers seems very likely as the issue of inter-core crosstalk can still have a considerable effect on MCF over short distances, which can limit the transmission reach and in turn the data center's size.

Wexler, J. et al. The rapid growth of traffic inside data centers caused by the increasing adoption of cloud services necessitates a scalable and cost-efficient. Multi-core fiber (MCF) is regarded as the most feasible simulation that combines bi-directional transmission in dense core fibers with tailored resource allocation schemes and significantly increases the network capacity [17]. Networking infrastructure. Space-division multiplexing (SDM) is considered a promising solution to overcome the optical network capacity crunch and support cost-effective network capacity scaling. Moreover, a multiplexing scheme that combines SDM and WDM can achieve up to 33 times higher link spatial efficiency and up to 300 times greater capacity compared to a WDM solution.

Adnan, M. et al. We refer to this paper to present a recommendation approach to an unsupervised learning algorithm for Data Centre object segmentation. We trust continuous network sampling to extract a set of broadcasters and train our model to similar things between them on both entomb and intra-video levels. However, a simple arrangement to train a machine learning model results in a perverted solution [18]. Our training neutral confesses efficient application and displays fast working out divergence. Well-known standards, our method surpasses the division accuracy of preceding effort notwithstanding using meaningfully training data and figure influence.

Xu, F. F. et al. In this study, wide research efforts were completed to identify individual studies that useful supervised machine learning models on single prediction [19]. Two databases were examined for different types of search items then we selected forty-eight articles in the assessment among alternative supervised and unsupervised machine learning algorithms for deciding prediction. Supervised machine learning algorithms have been a main method in the data mining field. This study aims to identify the key trends between different types of supervised machine learning algorithms, and their concert and usage for prediction.

Bujang, S. D. A. et al. A key challenge in developing and deploying Machine Learning (ML) systems is understanding their performance across a wide range of inputs. To address this challenge, we created the What-If Tool, an open-source application that allows practitioners to probe, visualize, and analyze ML systems, with minimal coding. The What-If Tool lets practitioners test performance in hypothetical situations, analyze

the importance of different data features, and visualize model behavior across multiple models and subsets of input data. It also lets practitioner's measure systems according to multiple ML fairness metrics [20].

Basu, S. et al. Cloud computing has been a topic of discussion, research, study, and analysis for the last decade. And in the coming years, it will gain more importance and more of its new aspects will be explored. The services of cloud computing have been provided via different Data Centers [21]. Cloud Service Providers build their data centers and provide different types of services.

Mytton, D. et al. The information communication technology sector will experience huge growth over the coming years, with 29.3 billion devices expected online by 2030, up from 18.4 billion in 2018. To reliably support the online services used by these billions of users, data centres have been built around the world to provide the millions of servers they contain with access to power, cooling, and internet connectivity [22]. Whilst the energy consumption of these facilities regularly receives mainstream and academic coverage, analysis of their water consumption is scarce.

Roig, P. et al. The number of required hosts is usually far smaller, and so is the number of switches needed to make the interconnections among them. In this paper, an approach based on multidimensional geometry is proposed for building up basic switching architectures for Data Centres, in a way that the most common convex regular N-polytopes are first introduced, where N is treated incrementally to reach a generic high-dimensional N, and in turn, those resulting shapes are associated with their corresponding switching topologies [23].

Angra, S. et al. Nowadays, a large amount of data is available everywhere. Therefore, it is very important to analyze this data to extract some useful information and develop an algorithm based on this analysis. This can be achieved through data mining and machine learning. Machine learning is an integral part of artificial intelligence, which is used to design algorithms based on data trends and historical relationships between data [24]. Machine learning is used in various fields such as bioinformatics, intrusion detection, Information retrieval, game playing, marketing, malware detection, image convolution, and so on

Hwang, R. et al. the data center SDN technology has been reflected as an effective clarification to manage the numerous challenges of a cloud data center, Including high quantity, data centre network virtualization, reckless liability detection and recapture, and network load balancing. Though some investigations have approved a specifically

designed organization, such as partly sapling, to shorten the above-mentioned challenges, most data centers still adopt a multi-rooted diagram as the original organization topology due to its flexibility and rapid development of high-speed switches [25].

Li, D. et al. the design and analysis of Data Center Network (DCN) architectures for interconnecting dual-port servers. Unlike existing works, we propose the concept of Normalized Switch Delay (NSD) to distinguish a server-to-server-direct hop and a server-to-server-via-switch hop, to unify the design of DCN architectures [26]. Then we consider a fundamental problem: maximizing the number of dual-port servers, given network diameter and switch port number; and giving an upper bound on this maximum number.

Nadaf, S. et al. Data Centers (DCs) are crucial for the efficient functioning and benefit of the Enterprise business. In practice, the network of an enterprise DC is complicated, and designing such a network for deployment involves a considerable amount of effort, skills, and experience. In this paper, we discuss the network design process of an enterprise DC and propose a tool called 'NetDes' to ease this process [27].

Arlitt, M. et al. Reduction of resource consumption in data centers is becoming a growing concern for data center designers, operators, and users. Accordingly, interest in the use of renewable energy to provide some portion of a data center's overall energy usage is also growing. One key concern is that the amount of renewable energy necessary to satisfy a typical data center's power consumption can lead to prohibitively high capital costs for the power generation and delivery infrastructure, particularly if on-site renewables are used [28]. In this paper, we introduce a method to operate a data center with renewable energy that minimizes dependence on grid power while minimizing capital cost.

Shuping, N. et al. The architecture of the basic communication equipment of the distributed dual-active data center is designed to achieve network reliability and availability through technical means such as line redundancy. To solve the short-board effect of the traditional data center, we use the switch cluster virtualization technology to ensure the availability of the entire architecture; Smart DNS technology (BIND 9) and Nginx reverse proxy technology are used to select the nearest data center in different regions to reduce the data transmission delay caused by physical distance [29].

Mujib, M. et al. Research on the design of data center infrastructure is increasing, both from academia and industry, due to the rapid development of cloud-based applications

such as search engines, social networks, and large-scale computing. On a large scale, data centers can consist of hundreds to thousands of servers that require systems with high-performance requirements and low downtime. To meet the network's needs in a dynamic data center, the infrastructure of applications and services is growing. It takes the process of designing a network topology so that it can guarantee availability and security [30].

Gill, S. et al. The tendency of cloud data centre computing is rushing lengthways with developing tools such as usefulness computing, network computing, and disseminated computing. Cloud computing is viewing remarkable possible to offer flexible [31], cost-actual, and controlling possessions across the internet, and is a lashing force in today's most projecting computing types of machinery.

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