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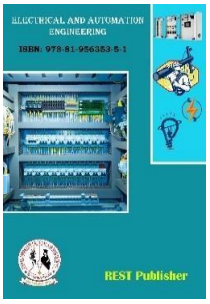

A Review on Solid State Drives Transformer Concept: A New Era in Power Supply

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Abstract: *Solid State Drives (SSD) are single drive. The performance is greater than that produced by disks allow Their low latency and parallelism Possibilities for operations, operating system I/O Read data at speeds that break interfaces They also allow writing. In addition, their performance Characteristics in existing grading systems Reveal gaps. An SSD is more Efficiency, high activity rates and more to operate with minimum latency under demanding conditions We prove that it can. High efficiency SSDs with Future High-Performance Computing (HPC) Dramatic parallel I/O performance for systems This suggests that the method can be improved. our Instead of traditional hard drives in public laboratories Using solid-state drives, our Public perception of services How technology has had an immediate effect This article also explains. Solid State Drives (SSDs) are more popular now Dense and compact are NAND flash Due to the growth in the cost of memories widely is used.*

Keywords: *The 3d Nand Flash, Solid State Storage Systems, Solid-state circuit breakers, Boost converter.*

1. INTRODUCTION

Solid-state based non-flash memory Drives (SSD) are high capacity, low power, Magnetic due to small size and excellent reliability Hard disk drives (HDDs) have seen tremendous growth have found Solid state rather than hard disk drives Drives (SSD) have many advantages. curiosity is increasing dramatically.[1] Also, SSDs As density and price continue to decrease, Major cloud providers also flash their cloud Based on drivers operating systems are integrating. In performance computing SSDs Cloud services and high-speed mass storage are now a very useful solution for computers There are [4]. The main limitation of SSDs is their reliability, which is based on NAND memories A volatile used as a medium. "Smart Phones" And with the advent of tablets, solid state drives (SSD) for their low latency and low power turned out to be very important to the operation. Solid State drives (SSDs) Enterprise and Client Applications gain speed, performance and More and more difficult by providing less power Replaces disk drives (HDDs).[5]. In company, data Fast Center Server and Storage System Developers CPU performance has grown exponentially over the past two decades has grown This chapter differs from the solid state Focuses on drivers. Consumer and institutional solid Solid State Drives and SATA Solid State Drives and SAS and SATA for SSDs and for SAS protocols Differences Between Solid State Drives Inc Describes, while overall space, power and Performance while reducing energy footprint and Increases reliability.

2. SOLID-STATE DRIVES (SSDS)

Solid state drives are the company's performance and Increase reliability, while data Overall location, energy and energy of centers Traces are computer-level simulations reduces Solid State Drives are known for their reliability, These are efficiency and low power consumption of sensitive data stored on the drives.[13] are becoming more popular for data storage due to This Chapter 10 Personal File on Solid State Drives Cleaning is reliable for FTL sec provides a method, which is page-based encryption A method called generally Flash translation Setting layer coordinates. [14]. These devices Standard I/O is performance and access Also offer latency, spinning hard-disk drives Better size than (HDD). Orders are. Also, SSDs Consume significantly less

power, moving parts Absence reduces strength and shock resistance Improves dramatically. [20]. NAND Flash Solid State Drives (SSDs) in terms of memory Hard disk drives are becoming increasingly popular (HDDs), performance, shock and vibration of SSDs Many advantages in terms of resistance, power consumption and weight Along with these advantages, mobile devices provide. and SSDs in various environments such as enterprise systems are widely used [25]. Currently, there are many in the market SSDs are available. Flash memory chips (MLC/ SLC), RAM buffer size and hardware controller Complexity is high in their performance and Price varies. In this work, by manufacturers Three representatives of the two largest SSDs created, we We chose state-of-the-art SSDs. Different performance Each SSD market has different warranties, Aim for low-end, mid-range, high-end. Among them, two are SSDs with MLC flash memory based, and the high-end one is SLC flash Based on memory. [26]. Solid-state Drives (SSDs) are growing storage devices. NAND Flash memory chips are fascinatingly simple Properties. High speed, low power consumption, light weight and small size. Because of these advantages, SSDs Recently widely used. Personal Computers, Laptops and Consumer Electronics, Tablet computers. SSDs are the only ones in enterprise servers Time is used and prices are constant Falling draws their considerable attention. As efficiency and effectiveness improve. In industry Leading IT companies second SSDs state storage Devices or cache memories started to be used. [28].

3. THE 3D NAND Flash

Solid state drives and multimedia cards are 3D NAND Flash is dense mass storage It is the preferred storage medium for applications. of these systems Like CPUs and GPUs that improve latency between computer components and the storage environment It is the task of bridging the gap. To this extent, data Storage such as programming and data erasure Relatively time-consuming activities in media Priority and overall system quality of service By short operations like reading data to optimize should be interrupted.[11]. 3D NAND Flash- Based on SSDs for their superior storage density, Low total cost of ownership (TCO) and hard disk Inherently higher compared to hard drives (HDDs). A preferred solution due to reliability. 3D NAND Flash memories are a program for iteration and verification Consider nuclear activity. Program pause functionality is off-the-shelf sub-100-layer TLC 3D NAND Flash in its instruction set The chip features NAND flash in SSDs The prevalence of memories is institutional and client Applications for Computing This is the new of innovation Unleashed the ways. Performance, reliability Basically take full advantage of SSD and power The criteria for using the system are architectural changes required Specifically, PCRAM, FeRAM, RRAM and MRAM class Emerging storages such as memories (SCM). Commonly used are volatile and Non-volatile memories are constantly changing.[13]. Data on solid state drives NAND flash stores in memory, which are blocks and divided into pages. on each page There are many blocks. Pages means read and write operations Units are destroyed in blocks. a page NAND flash must be erased before writing Safe removal of drives This section is current Discussing work. An interface A user interacts with a physical medium using The interface receives the user's data objects For a format suitable for storage on physical media Converts provides functions.[14] Last 10 Over the years, NAND Flash Memory (NFM) based Solid state drives (SSDs) notably have gained importance. The market share of SSDs is increasing Coming because SSDs were previously hard disk drives (HDDs) dominated the price market and was equal to performance.[15].

4. SOLID STATE STORAGE SYSTEMS

Multiple flash-memory storage with multiple chips Although there are systems, most of the existing channels There are connected FTL designs improve the level of parallelism Improve storage performance through flash chips Full bus bandwidth and parallelism Not using. Multi-chip flash-memory like SSD Due to performance improvement demands of storage systems This research is motivated. [21]. Block-level liveness information, on-disk layout, smart Caching, intelligent prefetching etc Can be used to upgrade. This is smart storage Lead to systems development. [25]. Flash memory Based on SSD is called computer "technology". To revolutionize storage systems the key. Improve the proposed cluster Data for applications based on flash memory- Beta state with extreme performance and power consumption Target storage systems. Recently, their study, SSDs for enterprise storage from a cost perspective Possibilities of integration into systems SSD is an interesting model to analyze suggests that there may be [26]. The technology continues with NAND flash memory cells Program/Erase (P/E) cycle achievable by decay Drive endurance continues to degrade, this SSD A significant barrier to widespread adoption of Especially in high-end computing and data storage systems. [27]. A simulator called SSD- DiskSim Executing Tyler uses. storage systems, and real-world Evaluation using workload is the company's Collected from servers. of storage systems Error control coding in improving reliability The method is very useful. SST using a single AC-AC converter Although can be implemented, additional energy savings Availability of LV DC bus to integrate systems is a significant advantage.[31] Modern storage systems are based on flash SSDs, especially in performance computing infrastructures Gaining more popularity, however, there are many more inherent Technologies exist, and their limitations are widespread Prevent deployment. One

of the major concerns SSDs have a limited lifespan The number of characters is directly related to size Flash memory, traditionally defined as In situations, in the form of a flash-based SSD Now prevalent in modern storage systems, Their ever-expanding capacity and forever As the price decreases. Their performance advantages, esp Due to the high random read performance, SSDs overall Greatly improve computer performance. [37].

5. SOLID-STATE CIRCUIT BREAKERS

Solid-state circuit breakers, solid- With the usual solutions with state breakers In comparison, high- Based on power semiconductors are enormous Can provide benefits. Switch in seconds. Therefore The maximum current is greater than the rated current Not twice as high (1.8 kA) and voltage The decay lasts for about 100 seconds. A complete induction motors phase as 1.8 kA If rated, dynamic such as inrush current does not lead to significant increase in loads because At higher loads, the phase voltage drops. Induction Motors inrush currents are just a few of the currents The percentage is absolute phase increment, therefore No problem with the circuit breaker.[23] Power Electronics based solid-state circuit breakers (SSCBs) can interrupt the current within millisecond range. However, they are expensive and semiconductor High losses due to equipment loss To achieve SSCP duality, two meet But the devices cells must be connected in series to be connected in reverse with voltage polarities want. A single energy semiconductor Limited current/voltage of the device Equivalent to high-power applications due to ratings or serial devices may be required.[50] The need for fast switching capability is enhanced The latest in performance semiconductor technologies In addition to developments, in the area of solid-state circuit breakers spurred an increase in research and development [49]. Existing electromechanical protection solutions are DC Security systems are limited because more surge current and fault currents (di/dt). Rate and inherent slowness of mechanical systems Response time. Also, natural zero at DC Mechanical circuit fault due to lack of current Additional arc to zero the current to the breakers Extinguishing mechanisms are required. To overcome these challenges, Many researchers like solid-state circuit breakers Looking for alternative solutions. WBG semiconductors are more devices Considerable amount of research on state circuit breakers are developing. For solid-state circuit breakers More complete characteristics of the tripping industry Not developed, therefore, traditional tripping Designed electromechanical with properties Many researchers for breakers and Designers follow Also, Semiconductor Devices are limited because overloading capacity, Tripping curve Solid- state circuit breaker's self- Note that it also helps with security want.[49].

6. BOOST CONVERTER

Using a new boost converter array the novel that is created is a repetitive stimulus. This article describes a voltage generator. Short life of conventional generators, less operating frequency and constant pulse width The proposed generator is series-connected To troubleshoot capacitors and boost converter Designed insulated gate bipolar with array Using transistors [34]. Proposed circuit switches, capacitors, inductors and contains the number of diodes. This is Apparently a boost converter makes the sequence. In particular, the positive or by ground level and load This is to get negative pulses may be designed.[34].The number of channels is limited by budget. A common MLC based on an SSD is raw NAND The write speed is 20MByte/sec and the number of channels is 8 is, resulting in a write speed of 1.4Gbps. Low-power boost with a proposed 68% reduction Power of NAND 3D-SSD with converter. of channels The count increases from 8 to 15 and SSD writes Speed increases to 2.6Gbps. However, of the channels Booster's watch, regardless of count stable.[13]. load Demand exceeds renewable energy production capacity A diverter can be used when present. Supreme Production capacities demand load in certain periods If more than , excess power is bilateral A converter can be used to feed back into the grid.[31]. Power 20 kV–300 A pulsed generators with a converter Increase using. By removing the transformer High voltage regular pulse, proposed Advantages of electric circuit generators are more than, The result is high frequency operation, simple structure and high performance. Specifically, the input voltage and the voltage of the switches series-connected IGBT Modules are used to increase the rating, which Reducing the number of converter arrays and devices Reduced line induction. So, high voltage testers, laser equipment and various high such as environmental applications Proposed converter for voltage pulse applications Very promising.

7. CONCLUSION

This article features and functions and Flash Reminiscences describe well-known authenticity, But the most reliable SSDs are NAND component optimization, Controller and firmware design mitigations And full endurance and accelerated Build credibility through retention-life qualification can Solid-state drives are

definitely storage and have had an impact on the field of computing, high Performance is inconsistent and continuous read/write Performance, rugged storage, multi-convenient format Factor offers and data reliably Storage methods etc. are desirable provide properties. Many SSDs are the same Modeling and benchmarking, SSD The main distinguishing and distinguishing in sFactors include reliability, new features and SSD's Performance and effectiveness throughout life Factors affecting the stability of including In this chapter, NAND and System Circuit techniques for parallel controller design are described. As a result, much of the SSD Reliable and high-speed operation is achieved. For specific metrics that indicate drive aging, SSD can be tested with SmartTool. Layered 3D NAND By using grids, of SSD storage Density can be increased at a higher rate annually.

REFERENCES

[1]. Mielke, Neal R., Robert E. Frickey, Ivan Kalastirsky, Minyan Quan, Dmitry Ustinov, and Venkatesh J. Vasudevan. "Reliability of solid-state drives based on NAND flash memory." Proceedings of the IEEE 105, no. 9 (2017): 1725-1750.

[2]. Jahns, Thomas M. "Improved reliability in solid-state AC drives by means of multiple independent phase drive units." IEEE Transactions on Industry Applications 3 (1980): 321-331.

[3]. Zuolo, Lorenzo, Cristian Zambelli, RinoMicheloni, DavideBertozzi, and Piero Olivo. "Analysis of reliability/performance trade-off in solid state drives." In 2014 IEEE International Reliability Physics Symposium, pp. 4B-3. IEEE, 2014.

[4]. Li, Yongkun, Patrick PC Lee, and John CS Lui. "Stochastic analysis on RAID reliability for solid-state drives." In 2013 IEEE 32nd International Symposium on Reliable Distributed Systems, pp. 71-80. IEEE, 2013.

[5]. Pon, Harry Q., Justin R. Dayacap, Robert E. Frickey, SireeshaGogineni, Peter Joseph, Eric S. Lin, Florence R. Pon, and James P. Slattery. "Reliability issues studied in solid-state drives." In 2014 IEEE 6th International Memory Workshop (IMW), pp. 1-4. IEEE, 2014.

[6]. Huang, Ping, Guangping Wan, Ke Zhou, Miaoqing Huang, Chunhua Li, and Hua Wang. "Improve effective capacity and lifetime of solid-state drives." In 2013 IEEE Eighth International Conference on Networking, Architecture and Storage, pp. 50-59. IEEE, 2013.

[7]. Grossi, Alessandro, Lorenzo Zuolo, Francesco Restuccia, Cristian Zambelli, and Piero Olivo. "Quality-of-service implications of enhanced program algorithms for charge-trapping NAND in future solid-state drives." IEEE Transactions on Device and Materials Reliability 15, no. 3 (2015): 363-369.

[8]. Micheloni, Rino. Inside solid-state drives (SSDs). Edited by Alessia Marelli, and KamEshghi. Heidelberg/Berlin, Germany: Springer, 2013.

[9]. Wasilewski, John E. "Solid-state AC drives: new reliability for packaging equipment." IEEE transactions on industry applications 1 (1985): 107-111.

[10]. Zambelli, Cristian, Lorenzo Zuolo, Antonio Aldarese, SalvatriceScommegna, RinoMicheloni, and PieroOlivo. "Assessing the role of program suspend operation in 3D NAND flash based solid state drives." Electronics 10, no. 12 (2021): 1394.

[11]. Riggs, H., S. Tufail, I. Parvez, and A. Sarwat. "Survey of solid-state drives, characteristics, technology, and applications." In 2020 SoutheastCon, pp. 1-6. IEEE, 2020.

[12]. Takeuchi, Ken. "Highly reliable low power solid-state drives (SSDs)." In 2012 IEEE International Meeting for Future of Electron Devices, Kansai, pp. 1-2. IEEE, 2012.

[13]. Singh, Bhupendra, Ravi Saharan, Gaurav Somani, and Gaurav Gupta. "Secure file deletion for solid state drives." In IFIP International Conference on Digital Forensics, pp. 345-362. Springer, Cham, 2016.

[14]. Yoon, Joohyeong, Won SeobJeong, Won Jeon, and Won Woo Ro. "Efficient and reliable NAND flash channel for high-speed solid state drives." In 2018 International Conference on Electronics, Information, and Communication (ICEIC), pp. 1-4. IEEE, 2018.

[15]. Kohli, D. R., and E. Balagurusamy. "Reliability of statically controlled drives." Microelectronics Reliability 14, no. 3 (1975): 287-292.

[16]. Jang, Jinwoo, Gunhee Jang, Juyub Lee, Yeungjung Cho, and Yusuf Cinar. "Fatigue life estimations of solid-state drives with dummy solder balls under vibration." International Journal of Fatigue 88 (2016): 42-48.

[17]. Chang, Yuan-Hao, Wei-Lun Lu, Po-Chun Huang, Lue-Jane Lee, and Tei-Wei Kuo. "An efficient FTL design for multi-chipped solid-state drives." In 2010 IEEE 16th International Conference on Embedded and Real-Time Computing Systems and Applications, pp. 237-246. IEEE, 2010.

[18]. Meyer, Christoph, Stefan Schroder, and Rik W. De Doncker. "Solid-state circuit breakers and current limiters for medium-voltage systems having distributed power systems." IEEE transactions on power electronics 19, no. 5 (2004): 1333-1340.

[19]. Zuolo, Lorenzo, Cristian Zambelli, Alessandro Grossi, RinoMicheloni, Stephen Bates, and Piero Olivo. "Memory system architecture optimization for enterprise all-RRAM solid state drives." In 2016 IEEE 8th International Memory Workshop (IMW), pp. 1-4. IEEE, 2016.

[20]. Chen, Feng, David A. Koufaty, and Xiaodong Zhang. "Understanding intrinsic characteristics and system implications of flash memory based solid state drives." ACM SIGMETRICS Performance Evaluation Review 37, no. 1 (2009): 181-192.

[21]. Micheloni, Rino, Luca Crippa, and Alessia Marelli. Inside NAND flash memories. Springer Science & Business Media, 2010.

[22]. Van Der Merwe, J. W., and H. du T. Mouton. "The solid-state transformer concept: A new era in power distribution." In AFRICON 2009, pp. 1-6. IEEE, 2009.

[23]. Meza, Justin, Qiang Wu, Sanjev Kumar, and OnurMutlu. "A large-scale study of flash memory failures in the field." ACM SIGMETRICS Performance Evaluation Review 43, no. 1 (2015): 177-190.

[24]. Kaboli, Shahriyar, Mohammad Reza Zolghadri, and AlirezaKhaligh. "Reliability Improvement of Industrial Drives Using Multi-Objective Optimization." In 2008 IEEE Industry Applications Society Annual Meeting, pp. 1-6. IEEE, 2008.

[25]. El Maghraoui, Kaoutar, GokulKandiraju, JoefonJann, and PratapPattnaik. "Modeling and simulating flash based solid-state disks for operating systems." In Proceedings of the first joint WOSP/SIPEW international conference on Performance engineering, pp. 15-26. 2010.

[26]. Huang, Ping, Guangping Wan, Ke Zhou, Miaoqing Huang, Chunhua Li, and Hua Wang. "Improve effective capacity and lifetime of solid state drives." In 2013 IEEE Eighth International Conference on Networking, Architecture and Storage, pp. 50-59. IEEE, 2013.

[27]. Nalini, M., A. Prasanth, Arunkumar Gopu, and D. Lakshmi. "Introduction to Cognitive Computing." In Cognitive Computing for Internet of Medical Things, pp. 23-44. Chapman and Hall/CRC, 2022.

[28]. Wang, Fei, Zheyu Zhang, Terry Ericsen, Ravisekhar Raju, Rolando Burgos, and DushanBoroyevich. "Advances in power conversion and drives for shipboard systems." Proceedings of the IEEE 103, no. 12 (2015): 2285-2311.

[29]. Rodrigues, Rostan, Yu Du, Antonello Antoniazzi, and Pietro Cairoli. "A review of solid-state circuit breakers." IEEE Transactions on Power Electronics 36, no. 1 (2020): 364-377.

[30]. Polepaka, Sanjeeva, B. Gayathri, Shahnawaz Ayoub, Himanshu Sharma, Yudhveer Singh Moudgil, and S. Kannan. "Privacy Preserving Encryption with Optimal Key Generation Technique on Deduplication for Cloud Computing Environment." In 2022 International Conference on Automation, Computing and Renewable Systems (ICACRS), pp. 464-470. IEEE, 2022.

[31]. Shanmugasundar, G., R. Yokesh, S. Yuvaranjith, R. Barath, and S. Balasubramanian. "Design and Fabrication of Intelligent Gas Stove for Indian Women Safety." International Journal of Pharmaceutical Research (09752366) 12, no. 2 (2020).

[32]. Gopu, Arunkumar, and V. Neelanarayanan. "Multiobjective virtual machine placement using evolutionary algorithm with decomposition." In Proceedings of 6th International Conference on Big Data and Cloud Computing Challenges: ICBCC 2019, UMKC, Kansas City, USA, pp. 149-162. Springer Singapore, 2020.

[33]. Rathor, Ketan, Sushant Lenka, Kartik A. Pandya, B. S. Gokulakrishna, Susheel Sriram Ananthan, and Zoheib Tufail Khan. "A Detailed View on industrial Safety and Health Analytics using Machine Learning Hybrid Ensemble Techniques." In 2022 International Conference on Edge Computing and Applications (ICECAA), pp. 1166-1169. IEEE, 2022.

[34]. Samborski, Tomasz. "Test system for electromechanical drives used in changeable ambient conditions." In Solid State Phenomena, vol. 237, pp. 257-262. Trans Tech Publications Ltd, 2015.

[35]. Venkatachalam, Gopalan, Arunkumar Gopu, Pitchumani Shenbaga Velu, Neelanarayanan Venkataraman, Dinesh Ramesh Salunke, and Raghava Rao Mukkamala. "Study on Tensile Properties of Fly Ash, Sugarcane Fiber and Carbon Nanotube-Reinforced Polymer Matrix Composite Using Objective Evolutionary Algorithm." Nanomaterials 12, no. 23 (2022): 4112.

[36]. Felthousen, Mat. "Reducing costs, improving service, and extending the life of computers with solid-state drives." In Proceedings of the 40th annual ACM SIGUCCS conference on User services, pp. 199-202. 2012.

[37]. Chen, Feng, BinbingHou, and Rubao Lee. "Internal parallelism of flash memory-based solid-state drives." ACM Transactions on Storage (TOS) 12, no. 3 (2016): 1-39.

[38]. Hemanand, D., N. P. G. Bhavani, Shahanaz Ayub, Mohd Wazih Ahmad, S. Narayanan, and Anandakumar Haldorai. "Multilayer vectorization to develop a deeper image feature learning model." Automatika 64, no. 2 (2023): 355-364.

[39]. Selvi, S. Annal Ezhil, and R. Anbuselvi. "An Analysis of Data Replication Issues and Strategies on Cloud Storage System." In International Journal of Engineering Research & Technology (IJERT), NCICN-2015 Conference Proceedings, pp18-21. 2015.

[40]. Lv, Yina, Liang Shi, Qiao Li, Chun Jason Xue, and Edwin H-M. Sha. "Access characteristic guided partition for read performance improvement on solid state drives." In 2020 57th ACM/IEEE Design Automation Conference (DAC), pp. 1-6. IEEE, 2020.

[41]. Gayathri, B. "Gray Wolf Optimisation Based Energy Efficient Green Cloud Computing." Journal of Algebraic Statistics 13, no. 1 (2022): 932-940.

[42]. Huffman, Howard H. "Introduction to solid-state adjustable speed drives." IEEE transactions on industry applications 26, no. 4 (1990): 671-678.

[43]. Rathor, Ketan, Keyur Patil, Mandiga Sahasra Sai Tarun, Shashwat Nikam, Devanshi Patel, and Sasanapuri Ranjit. "A Novel and Efficient Method to Detect the Face Coverings to Ensurethe Safety using Comparison Analysis." In 2022 International Conference on Edge Computing and Applications (ICECAA), pp. 1664-1667. IEEE, 2022.

[44]. Shanmugasundar, G., S. Gurudarshan, N. Kirubaharan, and M. S. Sundar. "Design and Development of Tank Cleaning and Inspection Robot." Journal of Pharmaceutical Negative Results (2022): 1009-1012.

[45]. Ramasubramanian, B., K. Elangovan, D. Hemaanand, and K. Kavin Kumar. "A Comprehensive Analysis of Various Delineation method for Exudates in Fundus Images using Miniaturized Pi Board." In Journal of Physics: Conference Series, vol. 2466, no. 1, p. 012021. IOP Publishing, 2023.

[46]. Bharti, Rajendra Kumar, D. Suganthi, S. K. Abirami, Relangi Anil Kumar, B. Gayathri, and S. Kayathri. "Optimal Extreme Learning Machine based Traffic Congestion Control System in Vehicular Network." In 2022 6th International Conference on Electronics, Communication and Aerospace Technology, pp. 597-603. IEEE, 2022.

[47]. Narayanan, Dushyanth, EnoThereska, Austin Donnelly, SamehElnikety, and Antony Rowstron. "Migrating server storage to SSDs: analysis of tradeoffs." In Proceedings of the 4th ACM European conference on Computer systems, pp. 145-158. 2009.

[48]. Rathor, Ketan, Anshul Mandawat, Kartik A. Pandya, Bhanu Teja, Falak Khan, and Zoheib Tufail Khan. "Management of Shipment Content using Novel Practices of Supply Chain Management and Big Data Analytics." In 2022 International Conference on Augmented Intelligence and Sustainable Systems (ICAISS), pp. 884-887. IEEE, 2022.

[49]. Hemanand, D., P. Sridhar, C. Priya, and P. J. Sathish Kumar. "Trust aware clustering based secure routing techniques in wireless sensor network." Journal of Intelligent & Fuzzy Systems Preprint (2023): 1-16.

[50]. Siva Shankar, S., Bui Thanh Hung, Prasun Chakrabarti, Tulika Chakrabarti, and Gayatri Parasa. "A novel optimization based deep learning with artificial intelligence approach to detect intrusion attack in network system." Education and Information Technologies (2023): 1-25.

[51]. Takeuchi, Ken. "Storage Class Memory and NAND Flash Memory Hybrid Solid-State Drives (SSD)." ECS Transactions 58, no. 5 (2013): 3.

[52]. Selvi, S., and R. Anbuselvi. "Popularity (Hit Rate) Based Replica Creation for Enhancing the Availability in Cloud Storage." International Journal of Intelligent Engineering & Systems 11, no. 2 (2018).

[53]. Kumar, Ashish, Ketan Rathor, Snehit Vaddi, Devanshi Patel, Preethi Vanjarapu, and Manichandra Maddi. "ECG Based Early Heart Attack Prediction Using Neural Networks." In 2022 3rd International Conference on Electronics and Sustainable Communication Systems (ICESC), pp. 1080-1083. IEEE, 2022.

[54]. S .R .Sushmitha Evangeliene; D. S. Robinson Smart; Vimala Saravanan; M. Ramachandran, "An Overview High Performance of Stress Corrosion Cracking Behavior for Aeronautic Applications" Journal on Materials and its Characterization 2(2), 2023: 9-19.

[55]. Shanmugasundar, G., G. Manoj Kumar, S. E. Gouthem, and V. Surya Prakash. "Design and Development of Solar Powered Autonomous Seed Sowing Robot." Journal of Pharmaceutical Negative Results (2022): 1013-1016.

[56]. Babu, R. Ganesh, D. Hemanand, V. Amudha, and S. Sugumaran. "Design of Clustering Techniques in Cognitive Radio Sensor Networks." COMPUTER SYSTEMS SCIENCE AND ENGINEERING 44, no. 1 (2023): 441-456.

[57]. Selvi, S. "Implementation of Raaes: Reliability-Assured and Availability-Enhanced Storage System." Journal of Algebraic Statistics 13, no. 2 (2022).

[58]. Suresh Kumar, S., Martin Margala, S. Siva Shankar, and Prasun Chakrabarti. "A novel weight-optimized LSTM for dynamic pricing solutions in e-commerce platforms based on customer buying behaviour." Soft Computing (2023): 1-13.

[59]. Manjunath, C. R., Ketan Rathor, Nandini Kulkarni, Prashant Pandurang Patil, Manoj S. Patil, and Jasdeep Singh. "Cloud Based DDOS Attack Detection Using Machine Learning Architectures: Understanding the Potential for Scientific Applications." International Journal of Intelligent Systems and Applications in Engineering 10, no. 2s (2022): 268-271.

[60]. Shanmugasundar, G., M. Gowtham, E. Aswin, S. Surya, and D. Arujun. "Design and fabrication of multi utility agricultural vehicle for village farmers." In AIP Conference Proceedings, vol. 2393, no. 1. AIP Publishing, 2022.

[61]. Krishna, S. Rama, Ketan Rathor, Jarabala Ranga, Anita Soni, D. Srinivas, and Anil Kumar. "Artificial Intelligence Integrated with Big Data Analytics for Enhanced Marketing." In 2023 International Conference on Inventive Computation Technologies (ICICT), pp. 1073-1077. IEEE, 2023.

[62]. Minu, R. I., Martin Margala, S. Siva Shankar, Prasun Chakrabarti, and G. Nagarajan. "Early-stage esophageal cancer detection using hybrid quantum CNN." Soft Computing (2023): 1-6.

[63]. Vimala Saravanan, M. Ramchandran, Ashwini Murugan, "A Study on Alumina Nana Particles Mechanical Properties using the GRA Method" Journal on Materials and its Characterization 2(2), 2023: 01-08.

[64]. Chinnasami Sivaji; M. Ramachandran; Chandrasekar Raja, "Preference Analysis of Operating System Using PROMETHEE Method" Journal on Electronic and Automation Engineering 1(1), 2023: 1-8.