engineering proceedings

MDPI

Proceeding Paper

Cloud Service Broker Using Ontology-Based System †

Neeraj Kumar Singh [1], Abhishek Jain [1], Shruti Arya [2], Pawan Bhambu [3], Tanya Shruti [4] and Vipin Kumar Chaudhary [5,*]

[1] Department of Computer Science and Engineering, Jaipur Engineering College and Research Centre, Jaipur 302017, Rajasthan, India; neerajkrsingh9@gmail.com (N.K.S.); abhishekjain.cse@jecrc.ac.in (A.J.)
[2] Department of Artificial Intelligence and Data Science, Jaipur Engineering College and Research Centre, Jaipur 302017, Rajasthan, India; arya.shruti07@gmail.com
[3] Department of Computer Science and Engineering, VGU University, Jaipur 302017, Rajasthan, India; pawan.bhambu@vgu.ac.in
[4] Department of Computer Engineering, Pimpri Chinchwad College of Engineering (PCCOE), Pimpri-Chinchwad, Pune 411044, Maharashtra, India; tanyashruti03@gmail.com
[5] Department of Computer Science and Engineering, Lovely Professional University, Jalandhar 144411, Punjab, India
* Correspondence: chaudharyv209@gmail.com
† Presented at the International Conference on Recent Advances in Science and Engineering, Dubai, United Arab Emirates, 4–5 October 2023.

Abstract: Cloud computing offers more advantages to clients and associations regarding capital uses and working cost investment funds. This study gives an ontological model of the cloud fabricating space to help with the data trade between the cloud-producing assets. The ideas of the proposed model depend on a writing survey of models of the cloud and models of assembling. In the research article, the problem addressed is how cloud brokers are providing cloud services in an efficient way to cloud users. It is the main prologue to an ontology-based, process-situated, and specialist framework that is autonomous of a society that permits most associations to utilize it. The rising number of cloud providers, the nonappearance of interoperability, and the heterogeneity in current open cloud stages lead to the requirement for creative frameworks to track down the foremost fitting cloud resource plan as successfully and mechanized as may be anticipated. In this paper, we depicted the building arrangement of a cloud organization made of two agreeable modules. The Cloud Agency's objective is to naturally secure assets from suppliers on the premise of SLA evaluation rules and find the foremost reasonable cloud supplier that fulfills users' prerequisites, and the Semantic Motor's objective is to make a rationalist depiction of assets based on users' benefit prerequisites and a brokering framework.

Keywords: computing parameters; cloud services; cloud brokers; cloud resources; scheduling; cloud ontology; cloud simulation

check for updates

Citation: Singh, N.K.; Jain, A.; Arya, S.; Bhambu, P.; Shruti, T.; Chaudhary, V.K. Cloud Service Broker Using Ontology-Based System. *Eng. Proc.* **2023**, *59*, 11. https://doi.org/10.3390/engproc2023059011

Academic Editors: Nithesh Naik, Rajiv Selvam, Pavan Hiremath, Suhas Kowshik CS and Ritesh Ramakrishna Bhat

Published: 11 December 2023

Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

These ideas effectively foster new regions as cloud organizations and administrations. There are now figuring executions for car industry administrations. A few models are network as a help, stockpiling as an assistance, and collaboration as an assistance. Subjects and lines of exploration that have solidified as of late incorporate the connection between distributed computing and operations, business mix, and assembling process combination [1]. Research results show that distributed computing upholds the joining of inventory network cycles and exercises since it significantly further develops versatility, adaptability, spryness, variation to change, and production network arranging [2]. The business angles and patterns go past the exemplary furthest reaches of the store network by changing to portable distributed computing [3]. Figure 1 shows the cloud ontology system for cloud services. Teaming up with Google Cloud offers us the chance to show this present reality

business benefit of coordinating blockchain innovation with other mechanical trains, for example, distributed computing, which is a fundamental stage in bringing the blockchain into standard use [4,5]. Ontology is similarly the examination of how we conclude regardless of whether things exist, as well as the gathering of presence. It tries to take things that are hypothetical and format that they are, indeed, veritable. Ontology is a piece of thinking that ganders at the genuine thought of things, their being, cause, or character [6,7].

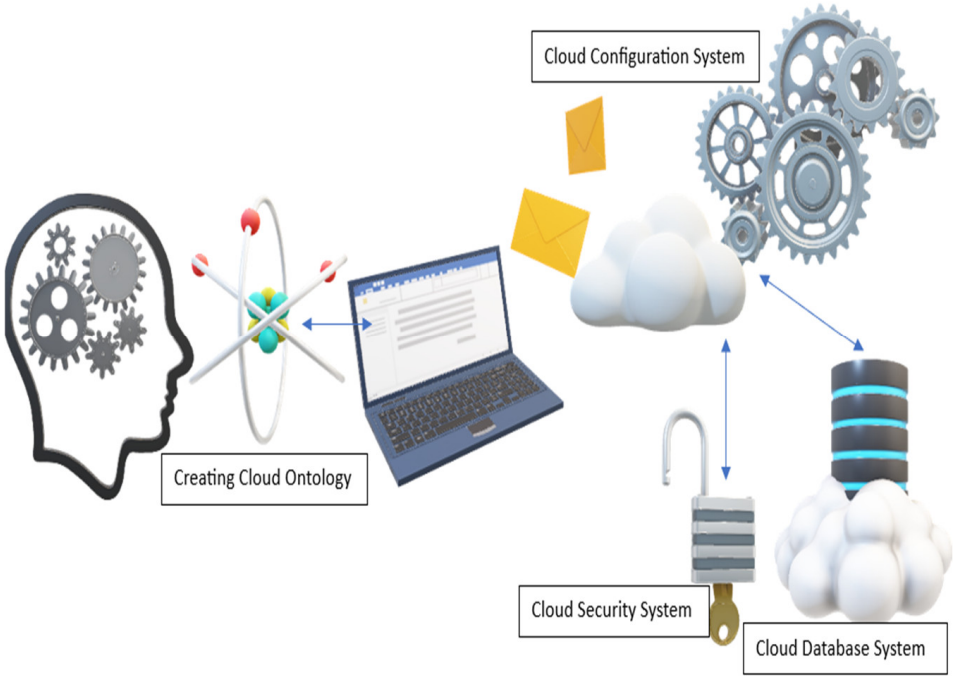


Figure 1. Basic structure of cloud ontology in Google Cloud.

Ontology is also the study of how we determine if things exist or not, as well as the classification of existence. It attempts to take things that are abstract and establish that they are, in fact, real. Ontology is a part of metaphysics, a branch of philosophy that looks at the very nature of things, their being, cause, or identity [8]. Figure 1 shows the working structure of the cloud ontology in the Google Cloud system. Cosmology's obligation to an overall undertaking run by Google is another high-profile endorsement of our imaginative cognizance and extensive industry experience. We can barely hold on to get everything going [8]. Resource power is used to give an environment that gives a modified shifting focus over to organizations. There are a couple of districts where cosmology is used in conveyed figuring. They integrate the going with the following [9]:

- Savvy cloud ontology-based vaults are utilized for the unique divulgence of resources of conveyed processing across various stages in the appropriated registering world.
- Cloud ontology can be used to help SaaS to give insightful customization.
- Work-based permission control using cosmology works with the arrangement of the security system.

Ontological statements relate to the concepts of being and existence. The existence of God, or at the very least, some sense of a higher entity, has likely been the subject of the longest-running ontological debate on human thought. The motive behind presence, the concept of deductive thinking, the significance of tactile experience, and what constitutes a serious dispute have all been addressed because of this. Thinking about metaphysics refers to convictions about the central tenet of the real world, specifically friendly reality, in the more pragmatic realm of social analysis. The suggested framework would concentrate on ensuring cloud computing security and privacy. Since the cloud is highly sophisticated, we consider that it will be difficult to provide a single holistic solution to protect the cloud.;

hence, our approach is to choose a certain domain and its apps using the cloud and make enhancements to provide security in the cloud [10]. Figure 2 explains the framework of the ontology-based access to cloud services.

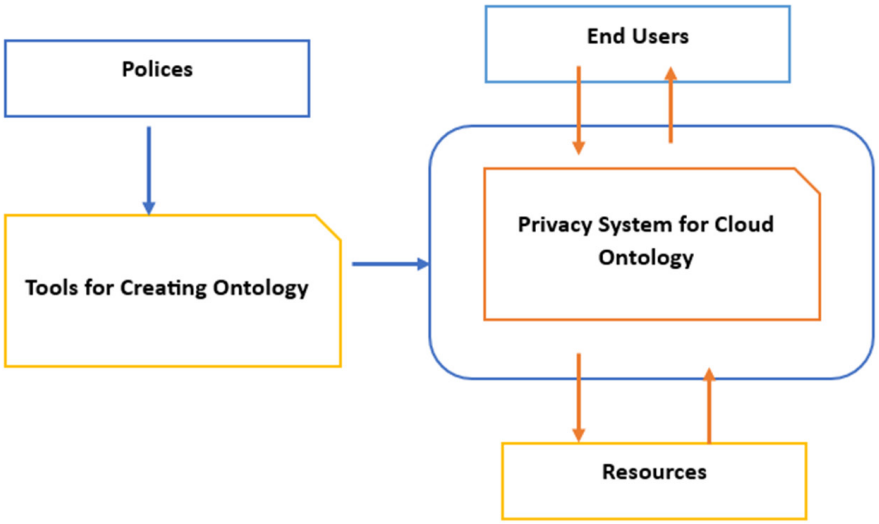


Figure 2. Ontology-based access control system.

2. State of the Art

There have been productive fundamentals to include cloud starting points for meeting advanced creating setup needs. In [11], we plan a testbed to research distant composed exertion and access of front-line creating resources using the GENI establishment. Other cloud establishments have been used as progression conditions in [12] for building programming applications. There are furthermore a couple of cloud-based business places that exist [13] for different spaces, and our work develops near thoughts concerning front-line delivering application joint endeavors to satisfy client needs. Task induction control is stable, which may not be appropriate in a setting that is changing rapidly. The entrance mechanism in trademark-based permission control is based on the characteristics of the client. This strategy will not work because we have several clients who are sharing cloud resources. In the development of a planned technique, the client is assigned a task and polled regarding the level of taste under a particular circumstance. Relationship assessments, contraption methods, and reasonings are used in relationship-based permission control to put together what can be accessed [14]. When a relationship graph and food chain are created, the problem takes a strong turn. To divide the circumstance and provide access, situation planning is employed. The intrusive party can mimic the circumstances, and therefore, he gains induction. The client is given an activity, and the client is judged based on what is acceptable under a specific circumstance [15]. The relationship examinations, device tactics, and rationales gather what may be attained in relationship-based admission control. Once the relational hierarchy and pecking order are established, the problem becomes stubborn. Circumstance mapping is utilized to break down the circumstance and give access. Circumstances can be emulated by the gatecrasher, so he gains admittance.

3. Ontology of Cloud Services

The progression of distributed computing has empowered specialist organizations to give a variety of cloud administrations to clients with various qualities at a scope of expenses. Figure 3 defines the connectivity of cloud computing with the cloud service, cloud brokers, and end users as cloud consumers [16]. Finding reasonable help from the rising number of cloud benefits that fulfill the client prerequisites like execution, cost, and security has turned into a major test. The range of administration depiction nonuniform naming and the heterogeneous sorts and elements of cloud administrations make cloud administration revelation a difficult issue [17].

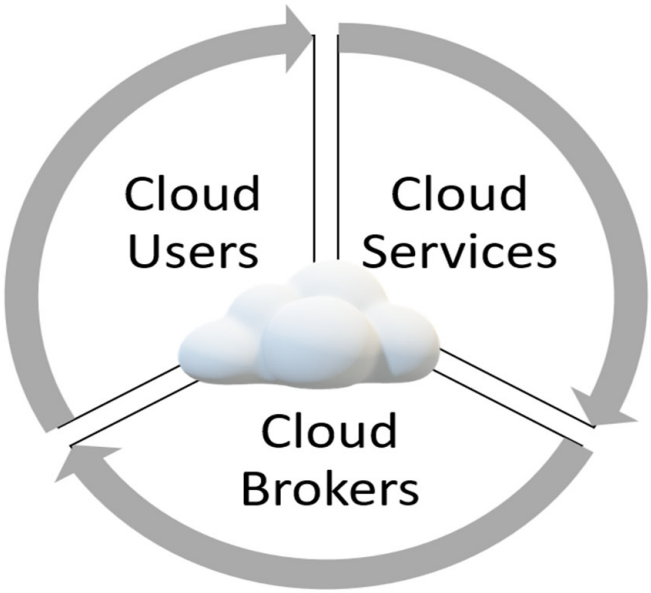


Figure 3. The 3D cloud connection.

In this manner, a shrewd assistance disclosure framework is important for looking for and recovering suitable administrations precisely and rapidly. Many investigations have been directed to find cloud administrations utilizing various procedures, for example, metaphysics models and specialists' innovation. The current cosmology for cloud administrations does not cover cloud ideas, and it is expected to be utilized for explicit undertakings as it were. Because of its productive, adaptable, and dynamic base in data innovation and administration quality boundary assessments, distributed computing has become perhaps the main issue in the PC world. Finding cloud administration has acted as a key issue in high-productivity connections [18]. To complete one's own tasks in the cloud space, any client needs to demand a few different administrations either all the while or as per a functioning daily schedule. These administrations can be introduced by various cloud makers or different dynamic approaches. In this manner, the administration of the board is one of the significant testing issues in distributed computing [19].

The reasoning appears to be quite innovative at this stage since the demands of transcendentalism are fundamental to the demands made in the pleasant evaluation of the thoughts we have and the actions we conduct.

4. Parameters Affecting Cloud Service

The aim of the ontology parameters is to find an efficient and effective system in cloud services for cloud users. The class progressive system assumes the focal part in the philosophy information model [20]. This comprises a bunch of cosmology classes connected by a subclass of, superclass of, and equivalent class relations. Every cosmology class is identified by a URI. The URI of every cosmology asset should be exceptional [12]. Each class can have a ton of super classes and a ton of subclasses; these are utilized to foster the class demand. The subclass and superclass of relations is transitive, and systems are given by the programming point of connection to deal with the transitive end for these relations given a class. Figure 4 shows the creation of classes in the ontology system. The transitive end for the arrangement of super classes for a given class is a set containing every one of the superclasses of that class, as well as the super classes of every close by superclass, etc., until no more are found. This appraisal is finite, and the upper bound is the arrangement of the overall gigantic number of classes in perspective [5]. A class that has no super classes is known as a top class. Supernatural quality can have several top classes.

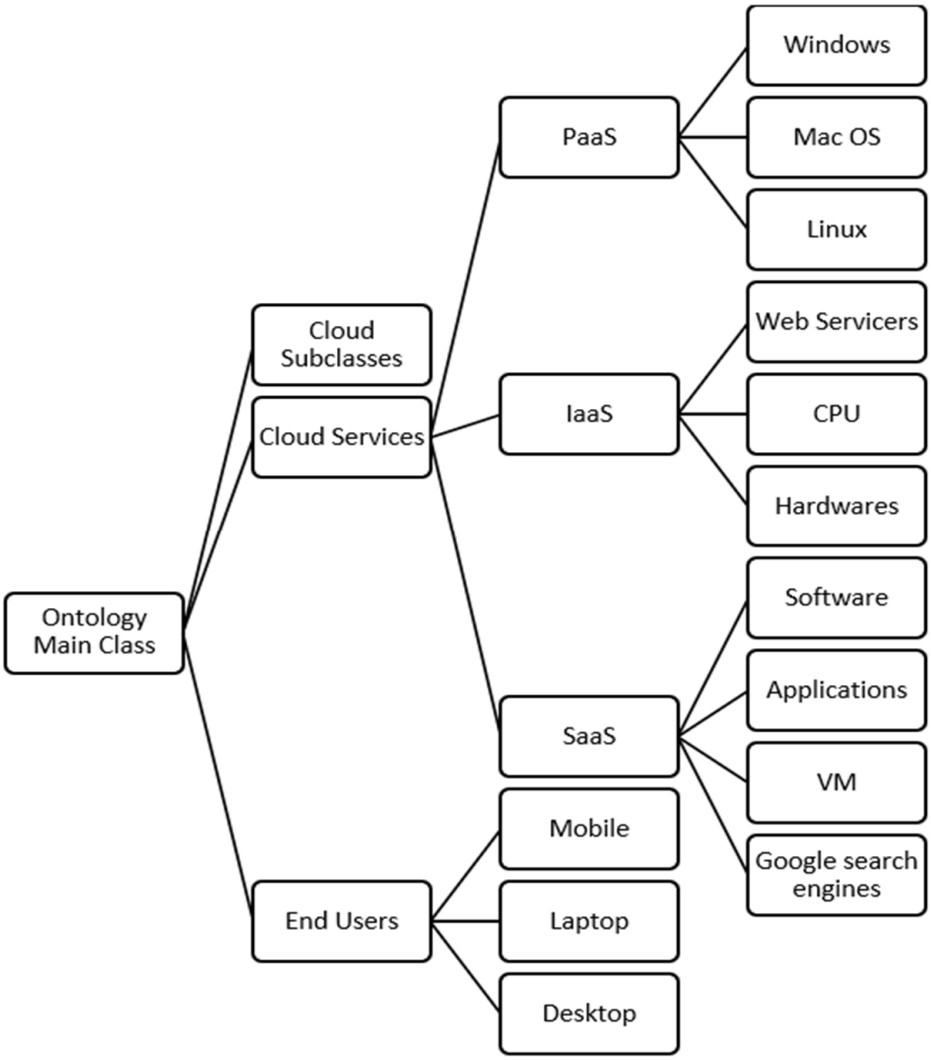


Figure 4. Ontology parameter-based cloud service in the Cloud.

The throughput of the framework characterizes the quantity of administrations given inside the ordinary period. The most motivation behind this boundary is to streamline the assets for the approaching data. Administration on request is that the fundamental boundary of distributed computing dealing with the SLA is given to each side. The idleness pace of the information on offer illuminates the execution time and holding-up season of the solicitation. Its primary point is to assess the holding-up season of the framework. The organization property shapes the capacity and its principles. It has accessible arrangements with the system administrations from the different gadgets like versatile, PCs, work areas, and so forth. The rapid increment of capacities will find the assets that give the enormous scope of finished clients at whatever point [8].

5. Proposed Algorithm

The proposed Algorithm 1 creates the cloud ontology for the cloud datacenters by the broker.

For working on the potential and usage of assets, the executives of assets are to be finished in a reasonable way. The energy is estimated from every one of the gadgets. Daintiness is the innovation that structures assets in straightforward use and lavishly for clients. The metering arrangement of the cloud assets ought to quantify on the thought per buyer. The metering is finished on a customary span premise. Get-togethers of the assets of the administration provider are given to multi-occupants by numerous physical and

virtual data. A predictable interest generally benefits the top clients, who do not have any data regarding the data area. The help period manages utilization which may be checked, controlled, and detailed giving straightforwardness for each provider and purchaser of the utilized assistance. The administration solidifies arrangements with a fiasco of the board of the information.

Algorithm 1 The proposed algorithm efficient cloud services are provided

Input: The parameters of cloud datacenters are counted as the input in the algorithm.
Output: The efficient cloud services to the cloud users.
1: Procedure (Methods)
2: If (cloud service) then
3: {
4: Perform making classes of each cloud service.
5: If (The classes are created then go for property checks)
6: {
Perform the property check of each cloud service.
7: {
If (cloud service property is checked) then
Step 1: Divide the all the classes into functional and nonfunctional properties of classes.
8: }
end if
9: Step 2: Formulate the different clusters of the cloud services.
}
10: end if
11: end if
20: end procedure

6. Evaluation System of Ontology

A rundown of all its super classes is obtained. For each class in this rundown, a rundown of its subclasses is obtained, and the erased class is eliminated from it. All subclasses of the erased class are eliminated from philosophy. A rundown of all its identical classes is obtained. For each class in Figure 5, a rundown of its identical classes is shown, and the erased class is eliminated from it. All occasions of the erased class are taken out of the ontology.

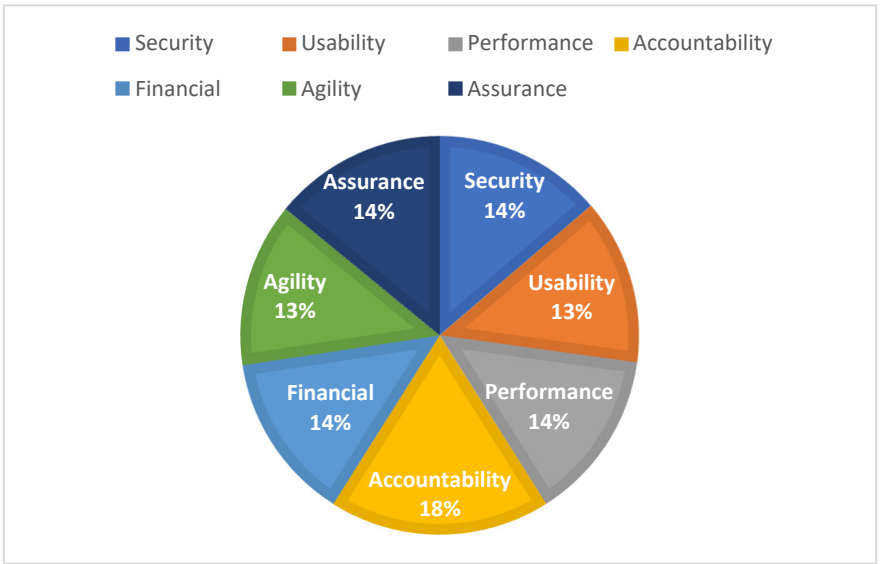


Figure 5. Quality attributes response time.

All properties are verified whether they contain the erased class as an individual from their space or reach. Provided that this is true, the particular property is likewise erased from the philosophy. Every one of the chosen hubs is eliminated when the client taps on the 'X' button. Kindly note that since cosmology assets are connected in different ways, erasing an asset can affect different assets in the Cloud, for instance, erasing an asset can cause different assets in a similar philosophy to be erased as well. Right-tapping on an occurrence raises a menu that gives a rundown of properties that are acquired and pertinent to its classes. Choosing a specific property shown in the figure from the menu permits the client to offer a benefit for that property. For instance, on the off chance that the property is an item property, another window appears which permits the client to choose at least one example that is viable within the scope of the chosen property. The chosen occasions are then set as property estimations. For classes, every one of the properties are recorded on the menu.

7. Conclusions and Future Work

In the proposed research, the investigation has been finished in a couple limits of cosmology and the appropriated processing. Later, the investigation will be connected with the IoTs, dimness handling, and additionally, further advancements. The researcher similarly considers figuring out more results in view of various limits which are being discussed in the paper, like the computation cost, correspondence cost, focal processor use, etc. The assessment additionally focuses later the relationship with the current estimations in the assistance plan with the objective that the presentation is not set in stone for the hard and fast time execution, the total cost of the execution, the gear cost, the information transmission size, and complete utilization of the focal processor in a compelling way. In this paper, the way of thinking expects to be a critical part in the assessment of the central processor and the hard and fast time taken in the datacenters, cloud expert center, cloud limits, and the end clients. Later, the assessment ought to be expanded with the cloud advancement structure and edge figuring systems.

Author Contributions: Conceptualization, N.K.S. and A.J.; methodology, S.A., P.B., T.S. and V.K.C.; validation, N.K.S. and A.J.; formal analysis S.A., P.B., T.S. and V.K.C.; investigation, N.K.S. and A.J.; resources, N.K.S. and A.J.; data curation, N.K.S. and A.J.; writing—original draft preparation, S.A., P.B., T.S. and V.K.C.; validation, N.K.S. and A.J.; writing—review and editing, S.A., P.B., T.S. and V.K.C.; validation, N.K.S. and A.J.; visualization, N.K.S. and A.J.; supervision, N.K.S. and A.J. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Choi, C.; Choi, J.; Kim, P. Ontology-based access control model for security policy reasoning in cloud computing. *J. Super Comput.* **2013**, *67*, 711–722. [CrossRef]
2. Srivastava, P.K.; Kumar, S.; Tiwari, A.; Goyal, D.; Mamodiya, U. Internet of thing uses in materialistic ameliorate farming through AI. In *AIP Conference Proceedings*; AIP Publishing: Jaipur, India, 2023; Volume 2782.
3. Dora Pravina, C.T.; Buradkar, M.U.; Jamal, M.K.; Tiwari, A.; Mamodiya, U.; Goyal, D. A Sustainable and Secure Cloud resource provisioning system in Industrial Internet of Things (IIoT) based on Image Encryption. In Proceedings of the 4th International Conference on Information Management & Machine Intelligence, Jaipur, India, 23–24 December 2022; pp. 1–5.
4. Ravula, A.K.; Ahmad, S.S.; Singh, A.K.; Sweeti, S.; Kaur, A.; Kumar, S. Multi-level collaborative framework decryption-based computing systems. In *AIP Conference Proceedings*; AIP Publishing: Jaipur, India, 2023; Volume 2782.
5. Koppaiyan, R.S.; Pallivalappil, A.S.; Singh, P.; Tabassum, H.; Tewari, P.; Sweeti, M.; Kumar, S. High-Availability Encryption-Based Cloud Resource Provisioning System. In Proceedings of the 4th International Conference on Information Management & Machine Intelligence, Jaipur, India, 23–24 December 2022; pp. 1–6.

6. Tiwari, A.; Garg, R. Eagle Techniques in Cloud Computational Formulation. *Int. J. Innov. Technol. Explor. Eng.* **2019**, *8*, 422–429.
7. Mohan, K.; Aramudhan, M. Ontology-based access control model for healthcare system in cloud computing. *Indian J. Sci. Technol.* **2015**, *8*, 213. [CrossRef]
8. Tiwari, A.; Garg, R. Reservation System for Cloud Computing Resources (RSCC): Immediate Reservation of the Computing Mechanism. *Int. J. Cloud Appl. Comput.* **2022**, *12*, 1–22. [CrossRef]
9. Tiwari, A.; Garg, R. Orrs Orchestration of a Resource Reservation System Using Fuzzy Theory in High-Performance Computing: Lifeline of the Computing World. *Int. J. Softw. Innov.* **2022**, *10*, 1–28. [CrossRef]
10. Kumar, S.; Kumari, B.; Chawla, H. Security challenges and application for underwater wireless sensor network. In Proceedings of the International Conference on Emerging Trends in Expert Applications & Security, Jaipur, India, 17–18 February 2018; Volume 2, pp. 15–21.
11. Kumar, S.; Srivastava, P.K.; Srivastava, G.K.; Singhal, P.; Singh, D.; Goyal, D. Chaos based image encryption security in cloud computing. *J. Discret. Math. Sci. Cryptogr.* **2022**, *25*, 1041–1051. [CrossRef]
12. Kaur, R.; Jain, A.; Kumar, S. Optimization classification of sunflower recognition through machine learning. *Mater. Today Proc.* **2022**, *51*, 207–211. [CrossRef]
13. Devi, M.U.; Akilandeswari, P.; Eliazer, M. Stock Market Ontology-Based Knowledge Management for Forecasting Stock Trading. *Adv. Sci. Technol.* **2023**, *124*, 433–443.
14. Nishad, L.S.; Kumar, S.; Bola, S.K.; Beniwal, S.; Pareek, A. Round robin selection of datacenter simulation technique cloudsim and cloud analsyt architecture and making it efficient by using load balancing technique. In Proceedings of the 2016 3rd International Conference on Computing for Sustainable Global Development (INDIACom), New Delhi, India, 16–18 March 2016; pp. 2901–2905.
15. Kumar, S.; Kumar, S.; Ranjan, N.; Tiwari, S.; Kumar, T.R.; Rafsanjani, M.K. Digital watermarking-based cryptosystem for cloud resource provisioning. *Int. J. Cloud Appl. Comput.* **2022**, *12*, 1–20. [CrossRef]
16. Tiwari, A.; Sharma, R.M. Rendering Form Ontology Methodology for IoT Services in Cloud Computing. *Int. J. Adv. Stud. Sci. Res.* **2018**, 273–278.
17. Rohinidevi, V.V.; Srivastava, P.K.; Dubey, N.; Tiwari, S.; Tiwari, A. A Taxonomy towards fog computing Resource Allocation. In Proceedings of the 2022 2nd International Conference on Innovative Sustainable Computational Technologies (CISCT), Dehradun, India, 23–24 December 2022; pp. 1–5.
18. Singh, N.K.; Jain, A.; Arya, S.; Gonzales, W.E.G.; Flores, J.E.A.; Tiwari, A. Attack Detection Taxonomy System in cloud services. In Proceedings of the 2022 2nd International Conference on Innovative Sustainable Computational Technologies (CISCT), Dehradun, India, 23–24 December 2022; pp. 1–5.
19. Hameed, B.Z.; Naik, N.; Ibrahim, S.; Tatkar, N.S.; Shah, M.J.; Prasad, D.; Hegde, P.; Chlosta, P.; Rai, B.P.; Somani, B.K. Breaking barriers: Unveiling factors influencing the adoption of artificial intelligence by healthcare providers. *Big Data Cogn. Comput.* **2023**, *7*, 105. [CrossRef]
20. Kumburu, N.P. Ontology-based knowledge management framework in business organizations and water users networks in Tanzania. In *Handbook of Hydroinformatics*; Elsevier: Amsterdam, The Netherlands, 2023; pp. 333–348.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.