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PRIVACY PRESERVATION IN: INFORMATION, WEB TECHNOLOGY, SEMANTIC WEB, PARALLEL AND CLOUD COMPUTING

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Abstract

With new-generation technology, the volume of data used is increasing every day. Users are encouraged to conduct day-to-day and analysis tasks in the field of data processing through technologies, which increases the automation of certain human-machine interactions around the world. The only infrastructure house proposed in today's scenario to accommodate the expanded data population is cloud data storage. With numerous services and implementation configurations, the cloud infrastructure platform aids in the management and maintenance of records. Data backup on local servers is greatly aided by outsourcing data to the cloud. However, the protection of outsourced data remains a challenge. The lack of consumer data privacy has an effect on cloud service reliability. The majority of researchers have suggested several security mechanisms that help to ensure privacy in the cloud for a specific standard. According to a study conducted by different scholars, there is currently no full privacy preservation scheme accessible in the world. A comparative analysis of cloud privacy protection strategies is presented in this article, which gives a good picture of the privacy problems and approaches for preserving privacy in cloud data storage.

Keywords: Cloud computing, Privacy, Data Security, Data storage, Access control.

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1. INTRODUCTION

Currently, technology is being developed in response to the global human population. Many inventions have been developed in recent years, each serving a particular purpose for humans. For successful use, this technology necessitates the use of resources such as hardware and software. It is stored with a large volume of data from successful use. In this planet, there is an enormous volume of data to deal with. This condition forces one to see cloud infrastructure as a remedy [1]. Cloud computing is a paradigm for providing simple, always-on network access to a common pool of configurable computing services. This model includes a variety of offerings and implementation options. Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) are the service models available (IaaS) [2]. Public cloud, private cloud, community cloud, and hybrid cloud implementation frameworks are available. In the technical environment, data storage has been a big concern. With the support of online data management systems, storing and maintaining large amounts of data has never been simpler. This allows you to store any vast amount of data through many storage centers. Each position is run independently of the others. The Cloud Service Provider is in charge of data management (CSP). The CSP is the individual in charge of monitoring and metering data access [3]. Companies and individuals provide different data management services. The data was outsourced to cloud storage by the customer. Data is sent from a client computer to a storage system as it is outsourced. For the outsourced data, a specialized cloud provider with a compatible platform model is chosen. The data can be stored in every old Virtual System (VM) location by the virtual machine admin. The Virtual Machine Administrator creates and maintains these virtual machines (VMM). Storage as a Commodity is a service paradigm for companies (STaaS) [4]. This is a subscription-based revenue model for multinational companies. Such organizations that have cloud data management facilities include Google, Amazon, and IBM. Security concerns arise as data is outsourced. CSP bears the burden of ensuring the protection of outsourced data and providing dependable support to its customers. Confidentiality, Integrity, and Availability (CIA) are confidentiality properties that must be met by data storage. The data can only be downloaded by those who have been given permission to do so. Making the data in an unfamiliar format is a secure option. Unknown or any other individuals other than the owner cannot modify the records. These three protection assets guarantee that a reliable data management facility is offered [5].

2. INFORMATION CONCEPTS

In the fields of computer science and information science, the procedure of locating and retrieving data in response to a query is referred to as "information retrieval" (or "IR" for short). This can refer to the process of locating and retrieving data from a database or other information storage media. It is feasible to conduct searches thanks to the existence of all forms of content-based indexing, including full-text indexing [6]. The process of searching through databases to locate documents, photographs, and sounds is referred to as "information retrieval," and the phrase is used to characterize the study that is conducted. The term "information retrieval" may apply to any one of several data mining processes. Many people find that using automated methods of retrieval is the most effective way to cope with the overwhelming quantity of data

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that is now accessible. One kind of software that might do this purpose is a system that makes use of infrared (IR) technology. You will need an IR if you read books and periodicals on a regular basis and want to maintain a record of what you have read. Google and Bing are now the only companies that employ IR to a greater extent than any other company [7].

It's possible that the retrieval procedure won't get underway until after a user or searcher has input their query into the system. Queries, which are also known as information requests, are a more formal means of conveying the demand for information than, for example, the words that are typed into a search box. Queries are also known as information requests. It is not always guaranteed that a single, identifiable answer will be provided in response to information retrieval requests [8]. There are other aspects that might shed light on the issue, and the value of each component could change in relation to the other factors depending on which factor is being considered. If both a digital file and a physical thing have a record in a database that corresponds to them, then the word "object" may be used to refer to either one of them in this context. When handling requests from users, we compare the information requested by those users to the information that is already stored in our database. There is no guarantee that the information that is retrieved will correspond to the query in the same way that there is when regular SQL queries are executed against a database. The arrangement of the findings is thus considered to be standard practice. Database searches are distinguished from information retrieval methods in significant part by the fact that the results of the former are presented in a ranked order. There are many different ways that information may be carried, some of which include but are not limited to textual records, photos, sound recordings, and mind mapping. In certain cases, the actual documents are not stored in the IR system; rather, a "surrogate" or "metadata" representation of the papers is maintained there. Inferencing and reasoning (IR) systems will, as a general rule, first quantify how well each database item fits the query, and then order the results numerically. The next step for the customer is to investigate the goods that are selling the most copies. Simply restarting the search process will present the user with a new set of recommendations to help reduce the scope of the search [9].

In most cases, an IR method will reformat the documents into a more aesthetically pleasing representation in order to raise the percentage of successful document retrieval attempts. In the same way that there are many different formats for documents, there is also a vast array of different retrieval methods. On the right-hand side of the picture are graphical representations of several different structures that are regularly utilized. In order to construct a visual hierarchy of the models, the mathematical underpinnings as well as the attributes of the models were taken into consideration [10].

An information retrieval (IR) system must first be evaluated before one can determine whether or not it is effective in meeting the information requirements of the people who use it. In the majority of instances, the evaluation will not be able to provide relevant results unless it first takes into consideration the search query and the collection of documents that are being evaluated. Accuracy in making predictions and memory of previous events were often used as assessment criteria in the past. The use of these metrics is beneficial to both the Boolean retrieval and the top-k retrieval processes. Every statistic relies on the assumption that a proper

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concept of relevance exists, according to which each page can be correctly categorized as either relevant or irrelevant to a certain search. People often ask inquiries in everyday settings that either aren't explicit enough or are wholly unrelated to the issue at hand [11].

People are less likely to adopt the technique of information retrieval if they are placed in a situation in which they would find the additional knowledge to be unpleasant or difficult to get. When compared to database management systems (DBMS), the data modelling procedure in IR systems is simpler. DBMS stands for "database management system." Analysis of the length of a dissertation presented in the form of a collection of articles. Confusion is caused when a collection of papers does not have a structure that is consistent across all of them. An information retrieval system may be assisted in its search for the material that is required by input from the user. This input may consist of keywords or extracts from documents. One of the most common examples in point is the need to locate every use of the phrase "database systems" that appears in the printed canon. Both textual content and visuals, such as photographs, contribute to its overall efficacy. One may argue that the search engine on the internet is the most well-known example of an IR system [12].

By contrast, database management systems are considerably different. IR does not cover modifications due to a transaction (including concurrency control and recovery). The information included in databases is often organized in line with predetermined schemas. Unlike conventional database management systems, information retrieval systems come equipped with their own unique querying architecture. This allows IR systems to more effectively address challenges that are exclusive to IR. Find results that are only loosely associated with the terms you submitted, give points to the results based on how well they meet your criteria, and so on [13].

A reversal of the file hierarchy that is based on keywords: After being presented for the first time at the Text Retrieval Conference in the 1960s, the SMART system went on to gain widespread use in the decades that followed. A diverse assortment of retrieval strategies may be implemented using document databases. The process of crawling occurs when an automated system "surfs" the web in search of new content to read, analyze, and index. This process is referred to as “crawling” [14].

3. WEB TECHNOLOGY

Web technologies is an umbrella word that describes the processes through which computers and a wide variety of other electronic devices communicate with one another. Markup languages that are widely used are what we rely on in order to communicate with one another. The process of using hypertext markup language to develop content for the World Wide Web, as well as to disseminate that information and have editorial control over it, is referred to as internet communication (HTML). On the internet, it is possible to examine many different kinds of documents, one of which is called an HTML page (hypertext markup language). Because of technological advancements, it is now possible for humans and robots to communicate with one another in a way that is more natural, which, in their perspective, makes the world appear like a much smaller place. People have had access to a wealth of information

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that was previously either inaccessible to them entirely or very difficult to acquire ever since the invention of the World Wide Web [15].

A file formatted in such a way that it can be opened and viewed in a web browser such as Safari, Firefox, Chrome, Opera, Internet Explorer, Edge, and so on. There are additional instances in which the term "pages" is used to refer to these things. When discussing the Internet, the term "website" refers to a collection of interconnected web pages that are organized in a hierarchical fashion and are able to interact with one another through internal links. The terms "website," "site," and "site" are all often used as abbreviations for "site." Service Provider that Deals with Network-Related Matters a highly advanced computer system that serves as a backbone for the World Wide Web by storing information online and making it available to users. In recent years, cloud hosting has become more popular as a viable alternative for the platform that websites are stored on [16].

The creation of a website, whether for the World Wide Web (WWW) or an internal network, is referred to as "web development," which is an abbreviation for "the process of establishing a website" (a private network). The manufacture of a simple informative website to the design of a platform for social networking are just two examples of the many different tasks that are involved in the development of a website. When people talk about "Web development," they are frequently referring to a much wider range of activities, such as web engineering, web design, web content generation, client liaison, client-side/server-side scripting, web server and network security settings, and e-commerce development. These are just some of the activities that fall under the umbrella term "Web development." All of these things may, to a certain degree, be grouped together under the umbrella term "Web development." Marking up and writing code are the two most significant aspects of establishing a website that are not related to the design of the site. In the vocabulary of Web experts, the term "Web development" refers to these two aspects of producing a website. When developing websites, content management systems, often known as CMS, are used. These systems make it feasible for non-technical users to make changes to the website's content. As a direct consequence of this change, a greater number of people will be able to contribute to the website. When developing websites for large companies and organizations, web development teams, which may number in the hundreds, adhere to industry standards and adopt best practices such as the agile process. It is possible that a single full-time or contract developer, or a developer who works in partnership with another profession such as graphic design or information technology, might be sufficient for a small firm. This is something that has to be evaluated on a case-by-case basis. The building of a website could not sensibly come under the control of any one single division; rather, it required the joint efforts of a large number of different departments to accomplish [17].

The profession of Web development is comprised of a number of different sub-disciplines, the most prominent of which are referred to by their respective names: front-end developers, back-end developers, and full-stack developers. The "front-end developers" are the ones responsible for the user interfaces of web browsers and how they behave. Back-end developers concentrate their efforts mostly on the servers that are used to host the software. In the years that followed Tim Berners and Tim Lee's development of the World Wide Web at CERN, the industry

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developed, and the Web evolved into one of the technologies that has experienced the most extensive usage in the history of technology. This is because the Web is one of the technologies that allows for hypertext transfer over the internet [18].

As a result of the fact that web design encompasses not only the production of websites but also their maintenance throughout time, it requires a diverse set of skills and knowledge. The term "web design" refers to a variety of specialized fields, including user experience design, graphic design, interface design, authoring (using both open-source and commercial tools), and search engine optimization (SEO). Even while there are certain designers that are able to handle everything, it is by far more common for a group of experts to work together on a project. In common parlance, the term "web design" refers to the processes involved in developing a website's user interface (the part visible to visitors). It's possible that this process will include the generation of markup. Although the terms "web design" and "web engineering" are frequently used interchangeably, there is a significant amount of overlap between the two when discussing the whole process of "web development." If a web designer's job needs them to develop markup, then they should be acquainted with the best practices for making content accessible to individuals who have impairments. This is especially important if they are designing websites for people with disabilities [19].

The process of developing a website so that it may be accessed through the World Wide Web (WWW) or an internal network (intranet) is referred to as "web development" (a private network). In this sense, the term "web development" refers to the whole of the work that is done in preparation for coming live on the World Wide Web. This includes anything from the most basic HTML page to the most complex web-based applications, electronic enterprises, and social networking services. Web development encompasses a wide range of professions, including web engineering, web design, the production of web content, client liaison, client-side/server-side scripting, the establishment of web server and network security, and the development of e-commerce platforms. Web development is an umbrella term. The phrase "web development" is used by professionals in the area of website creation to define the most important phases involved in the process of developing a website that are not directly tied to the design of the site. The procedures of developing markup and coding are two examples of these activities [20]. When developing websites, content management systems, often known as CMS, are used. These systems make it feasible for non-technical users to make changes to the website's content. As a direct consequence of this change, a greater number of people will be able to contribute to the website [21].

Several hundreds of web developers are employed by several significant businesses and organizations in order to design and manage their websites in tandem, making use of tried and tested processes and approaches such as agile development. It is possible that a single full-time or contract developer, or a developer who works in partnership with another profession such as graphic design or information technology, might be sufficient for a small firm. This is something that has to be evaluated on a case-by-case basis. The production of a website was not something that could be delegated to just one division; rather, it required the collaboration of a large number of different departments and organizations. As a web developer, you have

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the option of concentrating your efforts on either the front end, the back end, or the whole stack. Full-stack engineers are responsible for both the front and back ends of a project. This is in contrast to front-end developers, who concentrate on the browser used by the end user, and back-end developers, who concentrate on the servers used by the application. Developers with professional expertise who are proficient with both React and Node. JS are in high demand in the modern day all over the world in every region [22].

The methods by which computers and other electronic devices are able to communicate with one another and exchange information are sometimes referred to as "Web technologies," which is a word that is used rather frequently. In a symmetrical manner, by making use of markup languages that are widely used. A computer programming language known as Hypertext Markup Language, or HTML, is used for the production, dissemination, and management of information on the World Wide Web (HTML). HTML stands for hypertext markup language, and one of the types of documents that may be located on the internet is referred to as an HTML page (hypertext markup language). They contend that the world has become more controllable as a result of people and robots being able to communicate instantaneously and back and forth with one another. As a direct consequence of the expansion of the Internet, individuals may now have simple access to a range of information that was before inaccessible to them. This access may have been previously unavailable to them [23].

one that may be read using a web browser such as Google Chrome, Mozilla Firefox, Microsoft Internet Explorer, Apple Safari, Opera, Microsoft Edge, and so on. Because we want to keep things straightforward, we often simply refer to them as "pages." When referring to the World Wide Web, a grouping of linked web pages that make sense together and have some form of relationship between them is referred to as a "website," and the word "website" is the term that is used to characterize such a grouping. When engaging in casual conversation, it is common practice to shorten "site" to "website" or simply "site." Provider of Connectivity-Related Services Servers are very sophisticated computers that play an important role in the operation of the Internet by storing data that may be accessed by several users at the same time. Before the availability of third-party hosting services, every aspect of website management had to be performed internally [24].

The process of planning, developing, and releasing a website, either for public consumption on the World Wide Web or for internal usage solely inside an organization is referred to as web development (a private network). What we often refer to as "web development" comprises a wide variety of activities, ranging from the creation of a straightforward informational website to the construction of an intricate social networking platform. The term "Web development" is often used to refer to a wide range of activities, including but not limited to web engineering, web design, web content generation, client liaison, client-side/server-side scripting, web server and network security settings, and e-commerce development. However, these are just some of the activities that fall under the umbrella of web development. When discussing components of website development that are not tied to design, it is standard practice to use the phrase "markup and code" interchangeably with "Web development." This is because both terms refer to the same thing. A content management system, sometimes known as a CMS, is a kind of

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software that makes it simpler for users who lack technical expertise to make changes to the content of a website. It is not unusual to hire teams of web developers numbering in the dozens, if not the hundreds, when designing websites for major companies and organizations. This is because the work involved in this process may be rather complex. The agile approach is a great example of a strategy like this one in action. For smaller businesses, it may be sufficient to employ the services of a single full-time or contract developer, or for the developer to work in conjunction with another professional, such as a graphic designer or an information technology specialist. Because the development of a website requires contributions from a wide variety of departments, it was impossible to delegate this task to just one of them [25].

Within the larger field of Web development, the three primary sub-disciplines that are considered to be the most important are front-end developers, back-end developers, and full-stack developers. The front end developer is the one who is responsible for creating the user interface that is visible. Back-end developers are responsible for working on the servers, while front-end developers are in charge of the user interface and the functionality that it offers in the browser. Front-end developers are also responsible for working on mobile devices. Since Tim Berners-Lee first conceptualized the World Wide Web at CERN in 1989, the Internet business has grown substantially, cementing the Web's position as one of the most widely implemented technologies in history [26].

In order to construct and maintain a website, it is necessary to acquire knowledge in and experience in a wide variety of fields, which are together referred to as web design. The phrase "web design" is often used to refer to an umbrella word that covers a broad variety of specialized knowledge and skills. While it's possible that some designers may choose to work on a project separately from the others, it's far more common for design teams to work together on projects. The process of designing a website's front-end (client side), which is generally referred to as "web design," and which may entail the creation of HTML, is known as "web development." A website's back-end, often known as the server side, is sometimes referred to when people talk about "web design." When considering the wider picture of what goes into the creation of an online presence, web design and web engineering are generally intertwined and work together in a complementary manner. Web designers whose responsibilities include producing markup are expected to be conversant with the requirements for making information accessible to people with impairments so that they may do their work effectively and fulfill their responsibilities [27, 28].

The process of developing a website, whether it is intended for use by the general public on the World Wide Web (WWW) or by employees of a single organization on an internal network known as an intranet, is referred to as "web development" (a private network). To put it another way, "web development" refers to the process of producing anything that can be accessed over the internet. Everything from the most basic HTML webpage to the most intricate online games, applications, electronic enterprises, and social networking services might be considered part of this category. The term "web development" refers to a wide range of activities, including web engineering, online design, the generation of web content, client liaison, client-side/server-side scripting, web server and network security settings, and the development of e-commerce

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systems. These are just some of the activities that fall under the umbrella term "web development." When discussing the process of creating websites, web developers often use the term "web development" to refer to the aspects of the process that are unrelated to the website's design, such as the markup and the code. This is because web development is not the same as web design. A content management system, often known as a CMS, may be included during the development of a website in order to facilitate the modification of the site's content by users who have a lower level of technical expertise [29].

When it comes to designing and developing websites for large firms and organizations, teams consisting of dozens or even hundreds of web developers collaborate to use Agile methodologies and other best practices from the industry. One full-time or contract developer, or a developer who also works in another field such as graphic design or information technology, may be sufficient for a small business, depending on the nature of the business. Because it requires input from such a wide variety of sources, the creation of websites cannot be given to a single organization to handle [30]. As a web developer, you have the option of concentrating on either the front end or the back end, or both. You currently have three options available to you. Back-end developers, in contrast to front-end developers, are responsible for managing the actual servers that are used to host the project. Front-end developers focus on the browser. Front-end developers are responsible for the creation of the user interface that end users will interact with. At this time, businesses are actively seeking individuals who have experience working with both React and Node.JS.

4. CONCEPTS OF SEMANTIC WEB

The World Wide Web Consortium developed the Semantic Web, which is often referred to as Web 3.0 (but should not be confused with Web3) (W3C). One of the primary goals of the Semantic Web is to make it feasible for computers to access and make use of the massive quantities of data that are currently accessible on the internet. This is one of the key ambitions of the Semantic Web. Two technologies, referred to respectively as the Resource Description Framework (RDF) and the Web Ontology Language, are used to make it possible to integrate semantics inside data. The World Wide Web Consortium, often known as W3C, is the organization that is in charge of developing both of these standards (OWL). There are many different ways that metadata may be properly represented [31]. Definitions in ontology may encompass not just the concepts and items in question, but also the relationships those ideas and entities have with one another and with more generalized categories of things. The capacity to reason about data and the capability to interact across many different data sources are only two of the numerous advantages made available by this integrated semantics. There are many more benefits. RDF in particular is one of several information exchange formats and protocols that needed to be standardized so that they could be utilized throughout the web. These rules were designed to do just that. According to the World Broad Web Consortium (W3C), the Semantic Web makes it easier to share and repurpose data across a wide variety of different systems and organizations. The process of finding and retrieving information is now at its most streamlined state, making it possible for this to take place. It would seem that a great number

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of content and information platforms are turning to the Semantic Web as a technique for building links among themselves [32].

Tim Berners-Lee came up with the term "machine readable" to refer to a data web, which is essentially a network of information that can be accessed and read by machines. Skeptics' arguments are refuted by proponents of the concept, who argue that the idea is more than just a theory by citing instances from the corporate world, the biological sciences, and the social sciences in an effort to demonstrate that the concept has real-world applications. When the idea of a "Semantic Web" is finally brought into fruition in the not-too-distant future, robots will be able to speak with one another in order to carry out the laborious duties that are associated with business, government, and daily life. The creation of "intelligent agents" makes it possible for a great number of individuals to have their dreams and wants realized [33].

In the early 1960s, researchers in the disciplines of cognitive science, linguistics, and psychology—specifically Allan M. Collins, M. Ross Quillian, and Elizabeth F. Loftus—came up with the idea for a theory that would later be referred to as the semantic network model. M. Ross Quillian was the name of the linguist who was being referred to. When it is applied to the present iteration of the internet, it makes data on the sites and the connections that exist between them available to computers. This results in an increase in the number of linked web pages that can be viewed by humans. This opens the way for automated agents that are both more intelligent and more competent to have access to the internet and to fulfill more requests on behalf of customers. Tim Berners-Lee, the guy responsible for the creation of the World Wide Web and the current director of the World Wide Web Consortium (often abbreviated as "W3C"), is credited for coining the term "Semantic Web." Berners-Lee is the one who came up with the term in order to characterize the process of developing Internet protocols. In a nutshell, he describes the Semantic Web as follows: "a collection of data sets that are related to one another and can be automatically searched and evaluated either alone or in conjunction with one another. a collection of data sources that are linked to one another and that may be accessed by computers in both direct and indirect ways." When it first became involved, many of the technologies that the World Wide Web Consortium (W3C) is presently advocating for weren't even in use at the time. They are very skilled in the management of data that is highly specialized to a certain subject and may be discovered in a broad range of situations, ranging from academic research to the exchange of information between businesses. In addition to this, they are employed in the medical field [34].

There are two basic categories that may be applied to the information that is saved on a computer: texts that are readable by humans, and data that can be used by computers. Written material encompasses everything that can be deciphered by the average reader. Here, everything goes; nothing is off-limits. Users of application software are able to see information drawn from a variety of sources, filter content according to various criteria, and blend content drawn from a variety of sources. Calendars, contact books, music playlists, and spreadsheets are all examples of this kind of utility. Reading the data and working with it won't be difficult for you at all, and vice versa. HTML, which is an acronym for "Hypertext Markup Language," is the language used to construct web pages that include multimedia components such as photos

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and interactive forms. The existing architecture of the Internet is constructed on top of a language known as hypertext markup language (HTML). Documents written in HTML are what hold the Internet together as a whole. Metadata is a framework for organizing and summarizing information that has been connected to content. Its primary purpose is to assist computers in better comprehending the stuff they encounter on the internet. Computer, "cheap widgets for sale," and "John Doe" are some of the keywords, descriptions, and authors that are pertinent to this section [35, 36].

Other computers may be able to rapidly and simply access the required values from the shared data set if the metadata of the data is appropriately labeled and categorizes the values. After then, the computers are able to put these values to use for their own objectives. Using HTML and a piece of software that is able to render it, a page for a product catalog may be created and shown. This is possible (such a web browser or another user agent). However, the HTML of this catalog page is unable to make assumptions about individual products. For example, the HTML cannot determine whether or not item X586172 is an Acme Gizmo or whether or not it costs €199. Instead, HTML may indicate that the X586172 text span should be positioned in close proximity to the elements "€199," "Acme Gizmo," and any others that may be relevant. In and of themselves, neither the name "Acme Gizmo" nor the price of "€199" are sufficient to demonstrate that the item in question is a catalog, nor would they be sufficient to prove that it is a catalog in and of itself. In addition, there is no way to verify that the facts presented above add up to a consistent image of a single creature, as opposed to, for example, a random aggregation of various objects. This is because there is no way to distinguish between the two. The term "semantic HTML" refers to a kind of markup that concentrates on the content of a page rather than the display of that material, as the name suggests [37].

We may be able to look forward to the Semantic Web as the next phase in this development now that the Internet has arrived at a turning point in terms of its potential to provide solutions. In order to accomplish the task of publishing, data-oriented languages such as RDF, OWL, and XML are employed (XML). Markup languages such as HTML are put to use in the process of describing documents and the connections between them. On the other hand, general-purpose languages like as RDF, OWL, and XML may be used to describe everything from people and events to individual components of airplanes [38].

It is usual practice to employ a mix of these strategies, which is a strategy that may be used to either augment or totally replace the language that is used on websites. Examples of content include publication markup (which is often written in Extensible HTML (XHTML) and XML, or, more frequently, fully in XML with layout or rendering hints preserved elsewhere), as well as descriptive data that is saved in databases and can be accessed through the internet. Because these descriptions are accessible by machines, content managers have the ability to increase the usefulness of the material by providing more specifications than are currently available about the structure of the information. Because computers can be trained to replicate human reasoning and inference, someday they could be able to replace people in the process of gathering and analysing information. Now that computers can automatically obtain and evaluate data, we can get findings that are both more exact and efficient. Tim Berners-Finished

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Lee's Product as an Artist and Programmer The phrase "Giant Global Graph," which was coined by Lee, is used by a lot of individuals to characterize his network of Linked Data [39]. The term "Hyper Text Markup Language" (often abbreviated as "HTML") is the language that forms the basis of the World Wide Web. The sharing of data, according to Berners-forecast, Lee's will become as commonplace as the sharing of files has been in the past. As a response to the question "how," he provides the reader with three pieces of guidance to consider. To begin, you'll need to provide an accurate URL to the material that you want to access. Second, it is really important that everyone who goes to that URL sees the exact same thing. Third, arrows that lead to other URLs on the web with data that is comparable to the one being linked to should be included in the data that is being connected. The Semantic Web has a number of challenges, including the need to address its expansiveness, complexity, lack of standards, and vulnerability to manipulation, to name a few of these barriers. In order for the Semantic Web to reach its full potential, automated reasoning systems will first have to surmount all of these obstacles [40].

• Scope: It is believed that the internet has billions upon billions of pages that may be accessed by users. There is currently no technology that can quickly remove all semantically redundant terms from the medical terminology ontology known as SNOMED CT. This ontology has a total of 370,000 different class names. Processing a significant volume of information is necessary for the operation of any sort of automated reasoning system.

This lack of specificity causes problems for a variety of terms, including "young" and "tall," among others. This problem is made even more difficult by a number of factors, including the ambiguity of user queries, the breadth of ideas represented by content providers, the difficulty of matching query words to provider terms, and the effort required to combine multiple knowledge bases with concepts that overlap but are very different from one another. When presented with uncertainty, the great majority of individuals immediately fall back on fuzzy reasoning [41].

Because they are theoretical concepts with ill-defined meanings, the future consequences are not entirely obvious at this time. When a patient comes in presenting a wide range of symptoms, the chance that any one diagnosis applies to them is varied. When presented with uncertainty, humans often turn to strategies that are grounded on probabilistic thinking [42].

The creation of huge ontologies and the merging of ontologies derived from a variety of sources have the potential to result in logical incompatibilities, which we refer to as "inconsistency." Because of this, it could be difficult for us to make connections between different thoughts, which might be a problem. This has me worried since it may easily lead to misunderstandings. Every effort at reasoning is rendered futile in the presence of inconsistency since "anything flows from a contradiction," which implies that "anything flows from a contradiction," also implies that "anything flows from a contradiction," In order to address contradictions, it is possible to use either defensible reasoning or paraconsistent reasoning [43].

To conceal anything from another person is to intentionally mislead them. Recently, in order to mitigate the effects of this threat, new security procedures that make use of cryptographic

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approaches have been put into place. However, problems with credibility need to be solved, and one way out of this predicament is to devise a method for determining how accurate and trustworthy the information is. During this analysis, take into account any and all pertinent facts, as well as any history you may have on the company or organization that originated or made the data available to the public [44].

When dealing with the "unifying logic" and "evidence" layers of the Semantic Web, there are several challenges to contend with. The following is not intended to be a complete list of all of these challenges; rather, it is only an illustration of a few of them. The W3C Incubator Group's final report, titled "Uncertainty Reasoning for the World Wide Web," addresses all of these challenges, which are grouped together under the overarching term "uncertainty" (URW3-XG). To adequately support the suggested solutions, the Web Ontology Language (OWL) would need a wide range of improvements. One of these improvements is the capability of annotating conditional probabilities. Researchers are now looking into this matter [45].

5. PARALLEL COMPUTING PRINCIPLES

The term "Chip Multi-Threading" (or "CMT" for short) refers to a technology that is now being used extensively in a number of supercomputers as well as other types of enormous computing systems. Servers, personal computers, embedded devices, and a variety of other components are all components of these configurations. The ability to do this is made possible by combining the computing capability of several cores onto a single silicon chip (multicore or Chip Multiprocessing, CMP). Depending on how it's configured, it's feasible for a single core to satisfy the requirements of many threads that are executing in parallel at the same time (Simultaneous multithreading, SMT). Because SMT enables multiple threads to independently issue instructions to a superscalar's many function units throughout each cycle, it has the potential to significantly increase the maximum number of threads that can work concurrently on a given platform. This is because SMT allows multiple threads to independently issue instructions to a superscalar's many function units. SMT-enabled threads on a single core share the hardware resources they have access to. Although each core in a processor has its own specialized resources, such as its own pipeline and L1 cache, these resources are often shared throughout all of the cores in the CPU [45]. CMT server processors from previous generations include AMD Opteron, Intel's Itanium 2 dual-core, Sun Microsystems' Ultra SPARC IV, Ultra SPARC T1, and Ultra SPARC T2 server processors, and IBM's POWER4 and POWER5 central processing units (CPUs). AMD Opteron is an example of a server processor from IBM. Due to the high level of competition in the desktop computer market, consumers have a wide variety of processor alternatives from which to choose, including Intel's Xeon, Pentium D, Core Duo, and Core 2 Duo, as well as AMD's dual-core Athlon 64X2 processor. These days, consumers may choose from a broad range of multicore and multithreaded processors, each of which comes with its own unique set of benefits and drawbacks. On the other hand, the L2 cache of the Power4 processor is shared by both of its cores, which results in much enhanced inter-chip communication. The two cores of the Ultra SPARC IV work independently from one another, with the exception of some data ports that are located off-chip. Dealing with the repercussions of sharing and contention, in addition to the potentially hierarchical structure of

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sharing across threads, is one of the most challenging parts of developing programs that may run on several CPUs at the same time [46]. This is because competition for limited resources is endemic in both scenarios, which explains why there is a correlation between the two. One of the most pressing challenges that application developers are going to have to face as a result of the multicore revolution is the requirement to save memory and access data in a way that makes effective use of the memory hierarchy. This is one of the challenges that has been brought about by the multicore revolution. This is because on-chip memory and access to system memory are both becoming more difficult to come by, which in turn limits the speed of individual threads. In the not too distant future, a single central processing unit (CPU) will be able to accommodate a number of additional cores, each of which will provide improved capabilities as well as scalability and power management. Right now, you may be able to get your hands on goods that have either 4 or 8 cores. It is anticipated that in the not-too-distant future, a single CPU will be capable of housing tens, if not hundreds, of cores. This development is anticipated to take place. By using unique topologies for the purpose of joining processor cores, it will be possible to achieve faster on-core connection. There is a possibility that in the not too distant future, caching may be made more flexible, allowing for access to be granted either to the whole world or to a more limited group of individuals. On-chip storage capacity that is advantageously located close to the central processing unit cores will need to be increased. Due to the fact that the expense of maintaining cache coherency rises linearly with the number of cores in a computer, it is possible that computers with a large number of processors will not have access to this capacity. In addition, contemporary architectures emphasize the projected need for a wide array of computer components. It has been argued that heterogeneous architectures are the most effective method for processing both sequential code, which runs best on a core that is robust, and parallel code, which runs best on a large number of cores that are relatively weak. This is because sequential code runs best on a core that is robust, and parallel code runs best on a large number of cores that are Others maintain that graphics processing units are essential in order to keep up with demand, despite the fact that some people say that power-efficient accelerators are more critical than they have ever been. The general-purpose multicore central processing units (CPUs), field-programmable gate arrays (FPGAs), general-purpose graphics processing units (GPUs), SIMD co-processors, and other types of hardware modules that can be found on a board can have vastly different instruction sets and functionalities from one another. It's possible that the different components of the system will need to engage in explicit data exchanges with one another. There will be yet another iteration of alterations carried out. In order to handle such a high processing density, CMT systems will need a balance to be struck between their performance and their power consumption. The vast majority of today's CPU designs are equipped with power-saving features that need to be taken into consideration by the underlying computational model. These technologies improve performance while reducing power consumption. They do this by dynamically adjusting the frequency and voltage of the central processing unit (CPU). It is possible to virtualize a single multicore system as several unified computers, which has the effect of concealing the system's multicore nature, hiding its underlying complexity and variety, and improving the system's level of security. It is possible that in the not too distant future, transactional memory that is supported by hardware will be an option worth considering.

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It is anticipated that the process of constructing individual cores will become less complicated as time goes on. For example, in the past, branch prediction hardware support frequently required a buffer in order to remember which path was actually taken whenever a particular branch was encountered. This was done so that the hardware could correctly predict which path would be taken. It's possible that in the future this will become irrelevant. It is possible that this will render the software and hardware that are currently being used for branch prediction useless. In the event that the situation with the on-chip memory becomes critical, this might be discarded. In a similar vein, it's possible that out-of-order execution won't work on hardware either. This possibility is related to the previous point. To put the magnitude of these shifts in perspective, to say the least, the implications are enormous. Since these systems are organized in a sequential fashion, it is unfortunate that the majority of scripts that were not created in the high-performance computing environment, such as FORTRAN, C, and C++, are unable to make use of these systems. Utilizing memory hierarchies will be given a significant amount of attention in this fresh set of guidelines for program optimization that we have developed. Application developers may need guidance to learn how to incorporate specialized hardware components, such as graphics processing units, into their standard-issue programs. Examples of such components include video cards and sound cards. In such a scenario, receiving instruction is obligatory. In addition, the compiler and the environment in which it runs have substantial new requirements to fulfill as a result of these modifications. They require a thorough revaluation of the accepted wisdom concerning parallel programming as well as the strategies that are used to put it into action. Compiler translation solutions for the shared memory model need to be rethought in light of the resource sharing and contention features of modern computing systems, as well as the implications of energy efficiency and virtualization. This is the case in light of the fact that modern computing systems have these features. Implementations face a significant obstacle when attempting to accommodate heterogeneity and translate programs for particular accelerators [47].

Even though they share memory, multiple processors can still operate independently of one another. When one of the computers' central processing units (CPUs) modifies the data that is kept in a particular section of memory, those alterations are instantly replicated by all of the other CPUs that are a part of the system. The following are just a few of the numerous advantages: Having access to global address space makes it possible to apply a programming lens that is already familiar to the end user to memory. This is made possible by the existence of a shared IPv4 address space on the international level. Due to the fact that the memory and the processors are located in such close proximity to one another, it is possible to carry out data transfers both quickly and accurately. Despite this, a number of potential drawbacks are discussed further below. You are only able to upgrade a single component of a computer at a time when performing an upgrade (RAM or CPU). The amount of data that is being transferred between each CPU and the shared memory has a direct correlation with the number of CPUs that are currently being utilized. The responsibility for ensuring "correct" access to global memory rests squarely on the shoulders of the programmer [48].

The inter-processor memories that make up a distributed memory architecture are connected to one another by means of a communications network. Every single CPU, also known as a

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central processing unit, comes equipped with its very own private memory. Each central processing unit (CPU) possesses the computational independence necessary to carry out its duties without depending on any of the other CPUs in the system. Interaction of some kind between two computer processors is required in order for information to be moved from one computer processor to another. It's useful in a number of different ways, including the ones that are listed below: It is possible that the size of the memory could increase in a manner that is proportional to the square of the number of cores that are present in the system. It is no longer necessary for the global cache to remain coherent because each CPU now has rapid access to its own memory; as a result, a potential performance barrier has been removed. The fact that the programmer is responsible for managing the myriad details and complexities of data transfer between processors is one of the system's drawbacks. The challenging task of moving existing data structures over to a new architecture that makes use of global memory requires careful planning and execution [49].

Because it is a design that combines the benefits of shared memory and distributed memory architectures, hybrid distributed shared memory is used by the most powerful and largest computers in the world. This is because hybrid distributed shared memory is a design. This is because the architecture combines the most advantageous aspects of shared memory and distributed memory layouts into a single structure, which explains why it is able to achieve this result. A graphics processing unit, or GPU, could be used instead of a dedicated computer for shared memory. This is one of the possible alternatives to using a dedicated computer. Memory that is used by one CPU is shared with other CPUs that are located on the same compute node. It is essential to put in place a communication protocol if one wishes to ensure the seamless transfer of data between different computer nodes. Both distributed memory and shared memory systems are comparable in the sense that each presents its own set of advantages and disadvantages. A significant advantage is that positional growth ought to be relatively uncomplicated. Beginners will likely struggle with the task of authoring complicated computer programs [40].

A higher level of abstraction exists above the underlying hardware and memory architecture, and this higher level is known as the parallel programming paradigm. Together Maintain Your Connection to Your Ancestry (without threads). Discussion Change of Subject (Pthreads, OpenMP). Recollections that are open to the scrutiny of others, as well as the means by which information is communicated (MPI). This item, which is designed in the form of a parallelepiped, has the potential to be utilized as a data storage device. Hybrid. It Is Possible to Search an Extremely Large Dataset Utilizing Just One Code (SPMD). There are many applications and sources available for managing information (MPMD) [40, 50].

POSIX threads are frequently used as a model for concurrent processes because of the similarities between the two types of processes. The use of libraries and parallel programming are both incorporated into this example. Support is only provided for the C programming language itself, despite the fact that a wide variety of other interfaces, such as Perl, Python, and others, are available. Pthreads is now generally accepted as the term to use when referring to events of this nature. Pthreads are now supplied by a number of different companies, each of

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which has their very own proprietary threading technology. Even though the parallelism in OpenMP is simple and easy to understand, the programmer must still exercise caution when working with it. Those components of the compiler that make it possible to generate code in a serialized format. Manufactured by some of the most well-known companies in the industry of producing computer parts and software, and regularly updated by those companies. Windows and Unix are among the operating systems, hardware platforms, and devices that are compatible with this product. It is guaranteed that there will be no errors in the compatibility with C/C++ and Fortran. uses a method of parallelism that is more contemporary, making it possible for individuals who have never heard of it to experience the benefits of using it [51].

A model that incorporates distributed memory and the ability to forward messages not only gives each job its own copy of the data, which it then processes in its own right, but it also facilitates communication between the various jobs. It is possible for multiple processes to be executed concurrently on the same machine, or they could be distributed across an unlimited number of servers. The ability to communicate with one another is essential for the purposes of exchanging information and gaining an understanding of how projects are developing. When moving data from one computer system to another, it is frequently necessary for a large number of separate processes to collaborate and work in unison in order for the data transfer to be a complete and unqualified success. A good illustration of this is the requirement for both parties involved in an information exchange to take reciprocal action. Message Passing Interface (MPI), which has effectively replaced all previously commercially used implementations of message passing, has become the "de facto" standard for message passing in the business world. MPI stands for "de facto" standard. The phrase has been condensed into the abbreviation "Message Passing Interface" (MPI). On modern computing platforms that utilize parallel processing, an MPI implementation is almost always in use. Partitioned Global Address Space (PGAS) is an idea that is well-known in the field of computing. The acronym "Data Parallel Model" is a condensed form of the phrase "Partitioned Global Address Space" (PGAS). In addition to this, it has each of the following qualities: The tasks that are carried out in the same parallel work on the entire dataset, in contrast to the operations that are carried out in separate parallels, which operate only on specific parts of the same data structure. To get out of this mess, anyone can use the strategy that you are using, which is fine [52].

6. CLOUD COMPUTING

The term "the cloud" may, in its most basic form, be understood to refer to a network of distant servers that are connected to the internet and are used to carry out computing activities. This phenomena may be directly attributed to people having access to faraway computer sites via the use of the internet. The use of cloud computing enables users to perform a variety of tasks, such as accessing and storing data, hosting applications, and more, all from within a web browser and without the need to install any supplementary software. Cloud computing also eliminates the need for users to back up their data locally.

The concepts that underpin cloud computing differentiate it from earlier iterations of internet service. Some examples of such concepts are included below for your consideration: Cloud

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service providers may be able to reap large economies of scale if they work together to pool their resources and cooperate on cloud computing projects. When they were setting up their enormous storage network, they used the exact identical methods for both the configuration and the security of the system. Users no longer need to be concerned about incompatibilities between their software and hardware when virtualization is put into action. Elasticity is one of its most enticing properties since it enables the quick and easy addition of resources such as storage space and bandwidth. This is one of the reasons why it is so popular. This practical use may be partially responsible for the item's widespread popularity. Cloud computing has the potential to grow into a global industry if data is duplicated across several data centers situated in various geographic regions [53].

Computing in the cloud makes it easier to deploy resources by automatically adapting and customizing them to meet the requirements of each individual user. Customers are only charged for the amount of a resource that they really use when it is metered. Cloud computing is able to give substantial benefits over traditional Internet service providers (ISPs), including cheaper prices, greater degrees of automation, and more user freedom, since it adheres to the standards outlined above [54].

Platform virtualization makes it possible for cloud computing service providers to provide customers server resources that are quickly deployable, cost less money, and can scale as needed. Among the particular characteristics are those that are described below: Platform virtualization results in increased server utilization; in the absence of this technology, the data centers of many companies only make use of a small portion of their available servers (between 5 and 10 percent). Surprisingly, the limit is just roughly 20% even when the machine is operating at its maximum capacity. The creation of several virtual servers inside a single physical system is made possible by platform virtualization, which enables cloud service providers to take use of this. Because of this, cloud companies are able to rent out more virtual servers while keeping the same amount of hardware in place. Because to cloud computing, both service providers and their clients may be able to relax about the possibility of incompatibilities between their various pieces of hardware. They should to simplify their service level agreements and application software. Nothing more is required of them. The operating system and performance will be handled automatically, allowing the developers to concentrate only on their job. One of the many advantages of using virtualization is that it reduces the need to handle software dependencies, such as those related with device drivers. This is just one of the many advantages that virtualization offers. With the help of virtualization, a "server" may be brought online and operational in a matter of seconds by only loading the image of the virtual computer, and it can be turned off in the same amount of time as it took to bring it online by doing the opposite action[55] .

Cloud computing is a relatively new notion in the realm of computing in which consumers are provided with a collection of virtualized services that are readily expandable. These services are made available to users over the internet. An growing number of industry professionals are coming to the conclusion that cloud infrastructure will bring about substantial changes to the operations of the information technology sector. Users of cloud computing technologies can

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use a wide variety of devices, such as personal digital assistants (PDAs), personal computers (PCs), smartphones, and tablets, to connect to the Internet and access the data storage, software, and application development platforms offered by cloud computing providers. The technology behind cloud storage offers a number of advantages, including reduced operating expenses, enhanced performance, and simple scalability. Cloud computing is described by some as a service that gives users access to a shared collection of resources via the use of an internet interface. Software as a Service, often known as SaaS, is a kind of information technology service that is typically delivered by means of cloud computing platforms and occupies the very top position in the stack. Customers may access and use their software from any location in the globe when it is hosted in a SaaS environment. PaaS is comparable to IaaS in that it provides the essential operating systems and underlying infrastructure that an application must have in order to function properly. The provision of computational services through the internet is referred to as "infrastructure as a service" (IaaS). This includes things like virtual machines, which guarantee a certain level of computing power, data storage space, and connectivity to the network [56].

Cloud computing is a term that describes programs and services that operate on a distributed network utilizing virtualized infrastructure and are accessible using shared interest protocols and networking concepts. Three content distribution models are categorizes based on virtualization levels. Platform as a Service (PaaS), Infrastructure as a Service (IaaS), and Software as a Service (SaaS) are the three terms used to describe these services (SaaS). SPI stands for Software, Platform, and Infrastructure, and it is made up of these model [57].

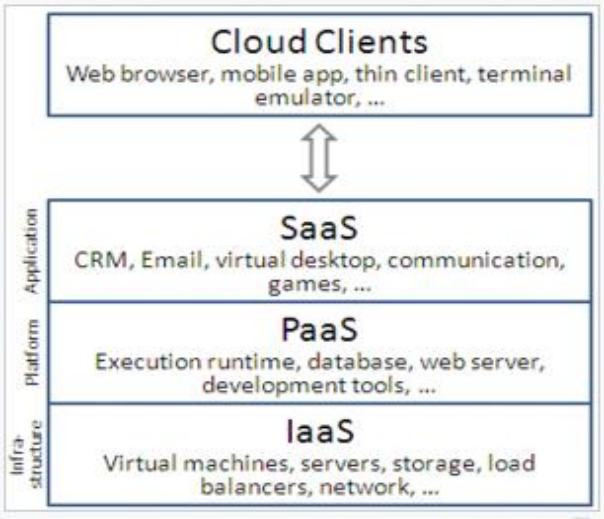

Figure 1: Types of cloud storage services stacked as layers.

6.1 Software-as-a-Service (SaaS)

It is a method of making software available to end users in which they may access it via a web browser without the need for the program to be downloaded, installed, or updated. It is also known as "software as a service." Graphical applications may now be operated at a pace that

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is equivalent to the processing rates of machines found on personal computers, which is sixty frames per second. This is made feasible by the development of markup languages that are more contemporary and efficient, such as the specifications for HTML 5. A one-to-many feature is designed after a single piece of server-side software that acts as a service within the framework of this service paradigm. Multiple customers are connected to the service by joining themselves via their web browsers while simultaneously executing this piece of software. Consider the Google Play Store as an illustration: despite the fact that it is theoretically possible for several users to buy and install the application at the same time, there is in fact only one copy of the software that is operating in the cloud. Customers have the opportunity to save money on resources thanks to the fact that end users are not responsible for the installation or maintenance of the program. Additionally, renting software through the Cloud is an easy and quick process [58].

6.2 Platform-as-a-Service (PaaS)

Users would be responsible for the design and development of their own applications under this model by making use of the various programming languages and resources made accessible by the cloud service provider. Customers that wish to maintain full control over the apps they have deployed to the cloud may benefit from using this service management model. The inaccessibility of cloud-based resources, operating systems, data storage, and network servers, as well as the problems associated with their maintenance, are among the drawbacks of this service model. Another disadvantage of Platform as a Service is that cloud providers sometimes preconfigure server operating systems and software before hosting or providing applications. This is done in the name of convenience. As a result, it will be challenging to satisfy the requirements for the program launch. Take into consideration the topic of whether or not a certain software has a restricted compatibility range or not. As of right moment, the only operating systems that cloud providers are willing to support are Net 4.5 and the provider's own proprietary software. It's possible that deploying apps using Net 3.5 may come with certain constraints [59].

6.3 Infrastructure-as-a-Service (IaaS)

This model provides access to the essential features of the cloud, such as renting out storage systems that are based on a network or charging by the gigabyte for their usage. In this model, the cloud service provider has the ability to exert control over the installation of the cloud's operating system, and it is also feasible to deploy applications and software that are not typical of the cloud environment. Because of this, the proprietor of the cloud also acts in the capacity of administrator for the computer system. As a direct consequence of this, the upkeep of data security, the avoidance of failures in operating systems, and the adaption to changing circumstances are all major problems [13] under this service architecture. IaaS, PaaS, and SaaS are all examples of cloud computing services that are built atop the core architecture of cloud computing. IaaS stands for "Infrastructure as a Service," PaaS stands for "Platform as a Service," and SaaS is for "Software as a Service." [60].

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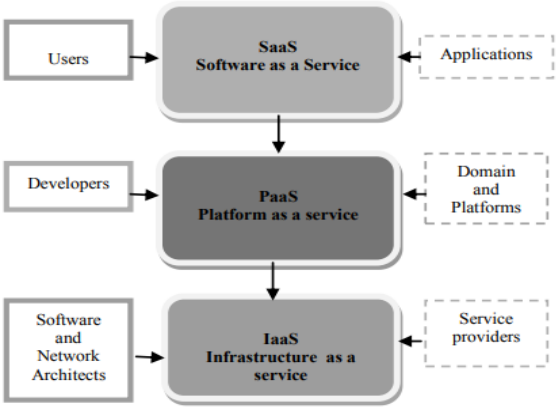

Figure 2. A Cloud Architecture

7. PRIVACY

In general, privacy relates to the act of concealing one's identity or vision. This condition must be attained in places where classified items, such as data and archives, are used. Data, user identification, and access protection are all important considerations of cloud data storage. As people's privacy is violated, the scheme suffers a huge setback. It is important to implement and use any service successfully while maintaining data privacy [61].

7.1 Privacy issues in cloud

The data in the cloud data storage is held in a number of different places. CSP is the individual in charge of keeping all of the data secure. The confidentiality of the storage service is violated if adequate security mechanisms are not enforced. Only the designated individual has access to the data. In this cloud model, a CSP may read client data for his own purposes. Any data owner's competitors may pay a fee to the CSP in exchange for access to the data. Internal CSP employees can gain access to the data and sell it to businesspeople for a fee. Tender facilities, investigative papers, and other government-related data files, the industrialist could need property inspections. As a result, the individual contacts the CSP and requests the details. CSP will provide it to the person in exchange for money or some other service. Malicious individuals gain access to the sensitive details of prominent people such as the Prime Minister, world-famous athletes, and actors in order to carry out illegal activity. It is theft to gain access to a user's data in order to run any action with it. Data is being removed from storage by certain attackers. Threats and malicious malware are added to this storage in order to obtain access to and learn about the records [62]

7.2 Privacy preservation

The accessibility and availability of personal details to the expected users is referred to as privacy. Only users with sufficient control rights can access and modify data that has been outsourced. Consider a company that has planned and outsourced the data to the cloud. The contents of the outsourced data are provided to the local administrator to upload to the cloud. It's a good idea to make sure that the administrator can't see or change the results. No one, even

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the service provider, may access or change the contents of a file since it has been outsourced. It must not be done whether the service provider or local administrator tries to interpret the contents of the register. The term "privacy protection" refers to the level of security provided by outsourced records. Cryptographic methods may be used to guarantee this [55, 63].

8. LITERATURE REVIEW

[64] Revealed that the DADP architecture is a novel framework for protecting users' privacy that is based on the usage of distributed agents. This framework adds a new layer consisting of multiple agents between the users and the untrusted server. It is possible for a user to choose an agent at random while using the anonymous access method. The user then communicates their check-in credentials to the selected agent rather than sending them directly to the untrusted website. Following the collection of data from the population, each agent uses the Laplace process to make unpredictable changes to the overall statistical profile of the group. After that, the overall perturbed statistics are composed by merging the perturbed statistics from each individual agent. Specifically. Several different DADP techniques have been developed in order to guarantee that adequate resources have been distributed to each agent for the purposes of grouping and perturbation. They demonstrated that w-event-differential protection can be met by DADP despite the distributed nature of the data and the untrusted server. The findings of trials conducted on two datasets taken from the actual world demonstrate that DADP is much more useful than BA and BD, and that it virtually matches the functionality of Rescue DP.

[65] The technology behind the Domain Name System (DNS) is used in the recently announced innovative approach to remote monitoring that is both safe and private for the Internet of Things. The bulk of the communication that takes place between Internet of Things devices and gateways is carried out via the use of standard protocols such as CoAP and MQTT. On the other hand, the DNS protocol is mostly employed for remote monitoring. Only authorized users will be able to query and decode encrypted Internet of Things data that is stored as a DNS TXT record of the domain name of the IoT system. This is possible thanks to DNS TSIG authentication and asymmetric encryption. They created a demonstration approach using name-bound virtual networks (NBVNs), in which all virtual nodes are automatically registered in DNS and network traffic is confined to each NBVN. Evaluations conducted at an early stage demonstrated that the proposed technique is suitable for ensuring remote monitoring of the Internet of Things while simultaneously preserving the privacy of users.

[66] They discuss a privacy protection system for smartphones that is based on the differential privacy approach. This system is designed to safeguard the personal information of smartphone users' locations by encrypting it. Second, "mission responders" are those who have been hand-picked from among smartphone users to carry out sensing activities. We model the interaction between the mobile requester and the mobile users as a reverse auction game in order to encourage mobile users to participate in crowd sensing. After modeling the interaction as a game, we evaluate the optimization problem in order to determine the optimal strategy for bidding.

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[67] They introduced a customized privacy-preserving work allocation mechanism for mobile crowd sensing in order to properly allocate responsibilities while also guaranteeing the confidentiality of individuals' whereabouts. Workers provide the server with their own obfuscated distances and their own personal privacy levels rather than telling the server their true locations and the distances to the jobs they are applying for. This is the core notion behind the system. They proposed a PWSM (Probabilistic Winner Selection Mechanism) to assign each task to the worker who is most likely to be located closest to it, thereby minimizing the total travel time for masked worker information. This would result in a reduction in the amount of time needed to uncover the identities of workers. In addition, they proposed a Vickrey Payment Determination Mechanism (VPDM) to determine the appropriate payment to be given to each winner. This mechanism takes into account the cost of transportation and the privacy standard, and it satisfies the criteria for truthfulness, profitability, and probabilistic human rationality. The viability of the proposed methodologies has been verified by exhaustive testing on real datasets.

[68] Suggested using an SSE strategy inside a P-McDb as a means of protecting against inference attacks (Privacy Preserving Multi-Cloud Secured Database). You are able to do sub-linear searches using P-McDb without revealing any information about the search, the entry, or the size of the data collection. They developed a functional model of P-McDb and demonstrated its uses in real-world scenarios. Because of its flexible approach to key management, P-McDb eliminates the need for re-encrypting data and renewing encryption keys in the event that a user account is revoked.

[69] The organization came up with a brand new method of Dynamic Privacy Aggregate Key Re-Encryption that they referred to as DPAK-RE (Dynamic Privacy Aggregate Key Re-Encryption). The DPAK-RE algorithm provides security for the exchange of data inside the cloud. They were emblems for a cloud-based data sharing system that places a high value on the confidentiality and safety of its users. Data Corner now has access to the required admissions procedure for processing personal data within the relevant government entities thanks to the access that was provided to them. Users with the appropriate permissions have the ability to combine several sets of secret keys into a single master key. A new private key is produced by using the encrypted version of the aggregate key, and the size of the key does not change at any point throughout this process. The processing of sensitive data in the cloud is made safer by the use of this Personal key, which encrypts the data. It has been shown that the suggested technique would result in the sharing of information in the cloud that is both more secure and more efficient, and its implementation has been carefully investigated.

[70] They developed a system that would utilize a function learning algorithm to infer people' social relationships based on their location data, and then create the resultant social network in order to safeguard the anonymity of users. This system would then be used to construct the social network. After that, it locates the best possible map between the predicted social graph and the social graph obtained from social networks, therefore pinpointing the locations of the toxic nodes. The trials that were carried out on two different real-world data sets, two different baseline works, and two different types of poisoning assaults indicated that MEC P3 offers

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privacy protection against poisoning assaults. The fundamental concept is to make use of feature learning to build an inferred social graph, which is then compared to the social graph that is retrieved from social networks in order to find the locations that have the highest risk of being affected by poisoning.

[71] They came up with the idea of a distributed shared PHR system (dsPPS), which gives patients complete authority over their medical histories without compromising their right to confidentiality. To be more precise, the Attribute-Based Health Information Access (ABHIA) scheme and the Biometric-Based Safe Patient Data Collection (BBC) scheme are both compatible with the dsPPS (ABA). Patients are able to quickly and safely aggregate their fragmented health data from a variety of conventional health networks with the assistance of the BBC scheme, which is made possible by the PHR registry, which gives consumers (health systems) access to the PHR registry while protecting the sensitive characteristics of those consumers. A comprehensive investigation is carried out on dsPPS in order to provide evidence that it is resistant to the kinds of attacks that are most often used. dsPPS has been demonstrated to perform well in tests done on both mobile phone and personal computer (Intel) platforms in the areas of storage, connection, and processor overhead. These are all aspects of the protocol.

[72] They came up with a way to send programs that protected users' privacy to a local server using a hybrid cloud strategy, and then they used those apps to transmit documents to the public cloud while maintaining the required degree of security for those documents. This approach is excellent for businesses that wish to open their important papers to the public in order to facilitate data mining and analysis; in other words, they want to share them with the world. Applications that are able to function inside a cloud computing environment are likely to attract a greater number of users than those that are unable to. Reviewing device outputs on already-deployed cloud infrastructure was one of the topics covered, along with creating and deploying a private cloud infrastructure for use in academic and scientific settings with the help of the open-source platform OpenStack.

[73] They worked together to solve the requirement for identity verification and data access control in wearable devices that were aware of both time and location. In the space-aware edge computing mode, secret sharing and MinHash-based authentication are used to keep similarity computations private without disclosing sensitive data; in the time-aware cloud computing mode, cipher text policy attribute-based encryption is used for fine-grained access control; and a bloom filter is used to achieve an efficient data structure without compromising privacy. The GNY logic-based security formal analysis reveals that the proposed system allows cooperative privacy protection for wearable devices in smart health with very minimal connection overhead and processor cost. This is shown by the fact that the analysis was conducted.

[74] Aware of one's reputation they suggested that MCC may benefit from Trust and Privacy Preservation as a solution. They addressed confidence management in the first phase by picking cloud providers who had a solid reputation and a technique of collecting CCs in which the CSP keeps a trust score for both the data requesters and the CCs themselves. This approach was implemented by selecting cloud providers. During the second phase, they were successful in protecting the privacy of users by implementing the Anonymous Secure-shell Cipher text-

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policy Attribute Based Encryption that they had recommended (AS-CABE). In addition to this, they suggested a method for gathering hierarchical qualities by using a hybrid policy tree. This method might be used in security solutions as well as key management. An anonymous protected shell is then established in between the CCs and the crowd servers in order to provide an additional level of assurance that registration will only take place once it has been sanctioned by a reputable authority. In addition to this, they suggested an outsourced encryption and decryption system for mobile devices. This system would place an even greater emphasis on encryption and decryption service providers in order to cope with complicated operations.

[75] They propose something called the MSCryptoNet, which is an architecture for securing user privacy that is built on homomorphic cryptosystems and distributed deep neural networks. Because of this ingenious design, the accuracy and efficiency of the neural networks did not suffer when they were being trained on data sets encrypted using a broad range of different schemes and keys. Their method surpassed other state-of-the-art options in terms of the complexity and safety of the solution it provided.

[76] Because of the usage of blockchain technology, a system that allows for the exchange of medical data that is both safe and secret has been built. The data requester will use the keyword scan provided by the data provider to locate relevant EHRs on the EHR consortium blockchain. Once the relevant EHRs have been located, the data requester will get the re-encrypted cipher text from the cloud server after receiving permission from the data holders. The approach utilizes searchable encryption and conditional proxy re-encryption as its primary tools for protecting the confidentiality, integrity, and availability of the data. Both of these tools may be found here. In order to ensure that the device functions correctly, consensus frameworks for consortium blockchains that are based on proof of authorization are currently being created. Following an exhaustive review of the protocol's security procedures, it was determined that the protocol satisfies the requirements necessary for the application to which it is suited. They also implemented the proposed method on the Ethereum blockchain, which is a distributed ledger system, in a setting that simulated cryptographic primitives. An analysis reveals that the strategy that was suggested is quite effective from a computational standpoint.

According to what they mentioned, [77]in this day and age of big data analytics and cloud computing, maintaining the privacy of users has become an extremely important consideration to keep in mind. Every company monitors the activities of its customers and clients on the internet and makes use of the information obtained in either a deliberate or inadvertent manner. In the event that this data is made public for the purposes of analysis and other analytics without first being cleansed of PII, a violation of privacy will have taken place (PII). Existing anonymization algorithms have a hard time striking the right balance between protecting user privacy and making effective use of collected data. A solution based on Mondrian's k-anonymity is provided as an attempt to strike a compromise between concerns about users' privacy and the possible usefulness of the data that has been acquired. We suggest using an architecture that is based on deep neural networks in order to ensure the privacy of high-dimensional data (DNNs). The results of the experiments provide validity to the assertion that

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the technique being offered reduces the risk of identity leaking in data while still maintaining secrecy.

[78] They came up with a unique set of grouping concerns that preserve user privacy in order to cut down on the amount of communication overhead that occurred at the edge clouds during the process of private bidding and sharing. Both tree-based hierarchical edge clouds and graph-based connected edge clouds, two very different types of edge clouds, each need their own unique set of grouping strategies in order to successfully accomplish the optimization aim. In order to determine if any of the proposed technologies are useful, exhaustive testing is carried out on datasets that are either simulated or taken from the actual world. As a consequence of this, they developed and researched participant grouping difficulties in mobile crowd sensing over hierarchical or entangled edge clouds in order to safeguard the participants of the crowd's right to privacy. By implementing privacy-preserving grouping in edge clouds, information about participants may be kept private at the local edge server. This makes it possible to quickly pick participants via secure bidding and sharing among group members, which speeds up the whole process. Both privacy and scalability have undergone significant sea changes in recent years.

[79] They devised a method for the Internet of Vehicles that makes use of the cloud that allows for the safe transmission of warning messages and respects the users' right to personal privacy. They used attribute-based encryption as a method for safeguarding the distributed warning code and supplied a framework for validated encryption and decryption outsourcing in order to reduce the amount of computing effort that was required of individual cars. Second, they proposed a privacy-preserving system with conditions, in which the reliable authority would be able to monitor the true identity of the malicious vehicle while still being able to verify and test the integrity of messages sent from anonymous vehicles. This system would have conditions such as: This method used a signature tactic that was founded on the concept of anonymous identification. They were able to increase the performance of the authentication by using batch verification. According to the findings of the study, their method improves protective capabilities while simultaneously lowering the amount of computing overhead in cars.

[80] They proposed for the use of a novel privacy-protecting transmission method known as Semi-Outsourcing Privacy Saving (SOPP), which would be employed in scenarios involving the transfer of data pertaining to IoT interfaces. SOPP removes the need for the time-consuming and financially burdensome production of trusted private clouds, which was a requirement of the work that was originally done utilizing PKI and trustworthy clouds. To conform to a more general cloud architecture for data collecting from IoT devices, in which the data centre is segregated from untrustworthy public clouds, separate authentication and decryption operations (including integrity checking) are required (semi-outsourcing). On the other hand, SOPP could decrease network throughput and the amount of time it takes to transmit data, making it an excellent choice for Internet of Things users who are limited on resources. As a direct result of this, SOPP is more applicable and affordable for small and medium-sized businesses and organizations (SMEs and organizations) that rely on public clouds that are not

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trusted for their information and communications technology infrastructure because these businesses and organizations do not have the financial resources to develop large-scale trusted clouds.

[81] They suggested a cloud-based Internet of Things (IoT) infrastructure called Data Bank to protect the private information of users. Data Bank offers tools for agreement visualization and privacy-utility trade-off while allowing users to monitor the information that is shared between their own devices. The architecture is multi-layered, with the bottom layer consisting of Internet of Things (IoT) artifacts and the top layer consisting of web and smartphone devices. Both of these layers are connected to one another through regulated communication mechanisms that move data from the bottom layer to the top layer, where it may be processed. The bottom layer is connected to the top layer through regulated communication mechanisms. They utilized the example of intelligent automobiles to clarify the idea they were trying to make.

[82] In order to generate (random) challenge records in an unpredictable manner, a blockchain is used, and it is the auditor's responsibility to archive the audit phase into the blockchain. They refer to it as "blockchain-based decentralized and privacy-preserving public auditing," and this is what they mean by it (DBPA). As a consequence of blockchain technology, consumers now have the option to check audit findings on their own independently. In addition, the DBPA employs zero-knowledge evidence to preserve user privacy throughout the duration of the audit period. This ensures that the answer supplied by the CS does not reveal any information on the user's data in any manner. Testing for both security and performance demonstrates that DBPA is dependable and effective.

[83] They experimented with 19 different Facebook privacy settings and tested out three different adaptation tactics (automation, highlighting, and suggestion) for each option. In all, they made 19 different changes. They invited participants in a "think-aloud" semi-structured interview sample (N=18) to assess the offered adaptable abilities and the three adaption processes that make use of them. The results of their investigation provide new perspectives on the viability of user-tailored privacy. It was shown that the users' level of knowledge and comfort with the privacy feature, as well as their impression of its invasiveness and permanence, were critical factors in choosing the best adaptation technique.

9. DISCUSSION AND COMPARISON

In a comparative analysis of privacy models, researchers suggested different approaches and strategies to try to protect their customers' records, several arrived at the conclusion that outsourced customers might need better privacy methods. Many access management proposals provide rights to the consumer in relation to the type of data and where it is located. it is applied on the basis of user functions, access attributes, user settings, community policies, and course policies. Encryption is done on documents and databases to protect sensitive information such as credit card numbers, e-mail passwords, etc. Attribute-based encryption is used to secure the data can be multilevel, but a single factor technique can be used to protect the identity. Therefore, information is obtained only from the data, rather than allowing data to influence

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the decisions made from the owner. Constraints are required at the time of entry. Users receive and use personal and anonymous ID authentication once they are allowed to enter a system. To gain immunity, approvals and controls must be revoked. It doesn't allow other files. It is not allowing for changes to data or for programs to be deleted. The whole file is required in these situations; it is necessary to re-encrypt and overwrite the file. Additional work was provided to us. Proxies are provided to the users to monitor access if required, so the owner need not always be on site. There is a great risk of server failure if the proxy is corrupted. They are not allowed for all types of data in homomorphic encryption. If the files are being used for operations that deal with analytics, the homomorphic encryption would not help them. A diverse group of cryptosystems and their respective schemes are outlined. However, there was no approach in place to making sure the privacy.

Table 1: Overview of Privacy Preserving Strategies

Reference	Access Control	Encryption	Key Management	Policy	Proxy	Security person
[64]	Fine-grained	No	No	No	No	Yes
[65]	CoAP Protocol	DNS protocol	NO	TSIG authentication	Encryption proxy	Yes
[66]	Attribute based	No	No	Incentive Scheme Based	NO	Yes
[67]	Fine-grained	No	yes	No	No	No
[68]	Fine-grained	Symmetric Encryption	SSE	Yes	Re-encryption	Yes
[69]	Fine-grained	Re-Encryption (DPAK-RE)	Broadcast group	No	Re-encryption	Yes
[70]	Yes	No	No	MEC	No	Yes
[71]	Fine-grained	CP-ABE and KP-ABE	Multi Authority	Cipher text-Policy	CPABE. Enc (M, PK, AS, CT)	yes
[72]	Yes	No	Rabbit MQ	No	No	yes
[73]	Fine-grained	cipher text	yes	cipher text-policy	Yes	Yes
[74]	Authorized access	Re-Encryption	hybrid policy tree mechanism	(AS-CABE)	ABE	Yes
[75]	Authorized access	MSCryptoNet	No	yes	homomorphic encryption	Yes
[77]	Attribute-based	re-encryption	No	Yes	re-encryption proxy	Yes
[78]	Attribute-based	Attribute-Based Encryption	PII	cross-domain	homomorphic encryption	Yes
[76]	No	No	participant grouping	No	No	Yes
[79]	Fine-grained	Attribute-Based Encryption	IBS	RSU. Encryption	symmetric encryption algorithm	Yes
[80]	Fine-grained	SOPP and MIRACL	Broadcast group	AES	AES-256 Encryption	yes
[81]	category-based	Yes	PPA	CBDC	Yes	Yes
[82]	No	yes	yes	DBPA scheme	Yes	Yes
[83]	Attribute-based	homomorphic encryption	ABF	Yes	AES	Yes

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10. CONCLUSION

In order to enable digital data access, cloud computing is used by the population any application and service framework and service features are included on the cloud service platform. The day-by-day expandability of the data collection and retrieval improved. As the service is about being available where and stable, the cloud must be protected to meet the expectations of customers. Because of the data being both public and private, it is critical to send and restorable, it is important to make sure the transmissions and restorations private. The usage of cryptographic mechanisms, proxy-based service structures for delivering these services is helpful in resolving these issues. It is vital to ensure the data is tested in rest, hence a reliable and trustable data verification is needed. It is common for both the owner and others to be able to carry out the job, since both the hash functions and the signatures are essential. These models provide strategies for localizing and recovering error, as well as learning from the mistakes that you have made. The terms of this definition can be found as a strategy to protect cloud computing.

References

1. Haji, S.H., et al., Comparison of software defined networking with traditional networking. Asian Journal of Research in Computer Science, 2021: p. 1-18.
2. Freet, D., et al. Cloud forensics challenges from a service model standpoint: IaaS, PaaS and SaaS. in Proceedings of the 7th International Conference on Management of computational and collective intElligence in Digital EcoSystems. 2015.
3. Yasin, H.M., et al., IoT and ICT based smart water management, monitoring and controlling system: A review. Asian Journal of Research in Computer Science, 2021. **8**(2): p. 42-56.
4. Bhardwaj, S., L. Jain, and S. Jain, Cloud computing: A study of infrastructure as a service (IAAS). International Journal of engineering and information Technology, 2010. **2**(1): p. 60-63.
5. Hassan, R.J., et al., State of art survey for iot effects on smart city technology: challenges, opportunities, and solutions. Asian Journal of Research in Computer Science, 2021. **22**: p. 32-48.
6. Shahzadi, S., et al. Infrastructure as a service (IaaS): A comparative performance analysis of open-source cloud platforms. in 2017 IEEE 22nd International Workshop on Computer Aided Modeling and Design of Communication Links and Networks (CAMAD). 2017. IEEE.
7. S.R., S., S. Ameen, and M. Sadeeq, Social media networks security threats, risks and recommendation: A case study in the kurdistan region. International Journal of Innovation, Creativity and Change, 2020. **13**: p. 349-365.
8. Soh, J., et al., Overview of azure infrastructure as a service (IaaS) services. Microsoft Azure: Planning, Deploying, and Managing the Cloud, 2020: p. 21-41.
9. Jijo, B.T., et al., A comprehensive survey of 5G mm-wave technology design challenges. Asian Journal of Research in Computer Science, 2021. **8**(1): p. 1-20.
10. Firozbakht, F., W.J. Obidallah, and B. Raahemi. Cloud computing service discovery framework for IaaS and PaaS models. in Proceedings of the Second International Conference on Internet of things, Data and Cloud Computing. 2017.
11. Abdulrahman, L.M., et al., A state of art for smart gateways issues and modification. Asian Journal of Research in Computer Science, 2021: p. 1-13.

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/CBDRV

12. Schubotz, M., Augmenting mathematical formulae for more effective querying & efficient presentation. 2017: Technische Universitaet Berlin (Germany).
13. Samann, F.E.F., S.R. Zeebaree, and S. Askar, IoT provisioning QoS based on cloud and fog computing. Journal of Applied Science and Technology Trends, 2021. **2**(01): p. 29-40.
14. Gruyter, D., Context-aware computing. Vol. 3. 2017: Walter de Gruyter GmbH & Co KG.
15. Haji, L.M., et al., Impact of cloud computing and internet of things on the future internet. Technology Reports of Kansai University, 2020. **62**(5): p. 2179-2190.
16. Maulud, D.H., et al., State of art for semantic analysis of natural language processing. Qubahan Academic Journal, 2021. **1**(2): p. 21-28.
17. Yahia, H.S., et al., Comprehensive survey for cloud computing based nature-inspired algorithms optimization scheduling. Asian Journal of Research in Computer Science, 2021. **8**(2): p. 1-16.
18. Jacksi, K., N. Dimililer, and S.R. Zeebaree, A survey of exploratory search systems based on LOD resources. 2015.
19. Yasin, H.M., S.R. Zeebaree, and I.M. Zebari. Arduino based automatic irrigation system: Monitoring and SMS controlling. in 2019 4th Scientific International Conference Najaf (SICN). 2019. IEEE.
20. Zebari, D.A., et al. Multi-level of DNA encryption technique based on DNA arithmetic and biological operations. in 2018 International Conference on Advanced Science and Engineering (ICOASE). 2018. IEEE.
21. Obaid, K.B., S. Zeebaree, and O.M. Ahmed, Deep learning models based on image classification: a review. International Journal of Science and Business, 2020. **4**(11): p. 75-81.
22. Zebari, S. and N.O. Yaseen, Effects of parallel processing implementation on balanced load-division depending on distributed memory systems. J. Univ. Anbar Pure Sci, 2011. **5**(3): p. 50-56.
23. Dino, H.I., et al. COVID-19 diagnosis systems based on deep convolutional neural networks techniques: A review. in 2020 International Conference on Advanced Science and Engineering (ICOASE). 2020. IEEE.
24. Hamad, Z.J. and S.R. Zeebaree, Recourses utilization in a distributed system: A review. International Journal of Science and Business, 2021. **5**(2): p. 42-53.
25. Du, Y., et al., A new early warning Criterion for assessing landslide risk. Natural Hazards, 2022: p. 1-13.
26. Saleem, S.M., S.R. Zeebaree, and M.B. Abdulrazzaq. Real-life dynamic facial expression recognition: a review. in Journal of Physics: Conference Series. 2021. IOP Publishing.
27. Salim, B.W. and S.R. Zeebaree. Design & Analyses of a Novel Real Time Kurdish Sign Language for Kurdish Text and Sound Translation System. in 2020 IEEE International Conference on Problems of Infocommunications. Science and Technology (PIC S&T). 2020. IEEE.
28. Ibrahim, R., S.R. Zeebaree, and K. Jacksi, Semantic Similarity for Document Clustering using TFIDF and K-mean. Master's Thesis, 2020.
29. Mostafa, S.A., et al., Applying Trajectory Tracking and Positioning Techniques for Real-time Autonomous Flight Performance Assessment of UAV Systems. Journal of Southwest Jiaotong University, 2019. **54**(3).
30. Zebari, G.M.O., K. Faraj, and S. Zeebaree, Hand Writing Code-PHP or Wire Shark Ready Application Over Tier Architecture with Windows Servers Operating Systems or Linux Server Operating Systems. 2016.
31. Ibrahim, R.K., et al. Clustering Document based Semantic Similarity System using TFIDF and K-Mean. in 2021 International Conference on Advanced Computer Applications (ACA). 2021. IEEE.

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/CBDRV

32. Abdulraheem, A.S., S.R. Zeebaree, and A.M. Abdulazeez, Design and implementation of electronic human resource management system for duhok polytechnic university. Technology Reports of Kansai University, 2020. **62**(4): p. 1407-1420.
33. Zebari, G.M., et al., Predicting Football Outcomes by Using Poisson Model: Applied to Spanish Primera División. Journal of Applied Science and Technology Trends, 2021. **2**(04): p. 105-112.
34. Ahmed, S.H. and S. Zeebaree, A survey on Security and Privacy Challenges in Smarthome based IoT. NEW ARCH-INTERNATIONAL JOURNAL OF CONTEMPORARY ARCHITECTURE, 2021. **8**(2): p. 489-510.
35. AGEED, Z.S., et al., WEB TECHNOLOGY DEVELOPMENT AND DATA-INTENSIVE INFLUENCES ON SEMANTIC INFORMATION RETRIEVING BASED ON PARALLEL AND CLOUD COMPUTING.
36. Razaq, H.H.A., et al., Designing and implementing an arabic programming language for teaching pupils. Journal of Southwest Jiaotong University, 2019. **54**(3).
37. Abdullah, H. and S.R. Zeebaree, Android Mobile Applications Vulnerabilities and Prevention Methods: A Review. 2021 2nd Information Technology To Enhance e-learning and Other Application (IT-ELA), 2021: p. 148-153.
38. Ageed, Z.S., et al. Comprehensive Study of Moving from Grid and Cloud Computing Through Fog and Edge Computing towards Dew Computing. in 2021 4th International Iraqi Conference on Engineering Technology and Their Applications (IICETA). 2021. IEEE.
39. Dino, H.I., et al., Impact of load sharing on performance of distributed systems computations. International Journal of Multidisciplinary Research and Publications (IJMRAP), 2020. **3**(1): p. 30-37.
40. Abdulqader, D.M. and S.R. Zeebaree, Impact of Distributed-Memory Parallel Processing Approach on Performance Enhancing of Multicomputer-Multicore Systems: A Review. QALAAI ZANIST JOURNAL, 2021. **6**(4): p. 1137-1140.
41. Jghef, Y.S., et al., Bio-Inspired Dynamic Trust and Congestion-Aware Zone-Based Secured Internet of Drone Things (SIoDT). Drones, 2022. **6**(11): p. 337.
42. Chavhan, S., et al., Design of Space Efficient Electric Vehicle Charging Infrastructure Integration Impact on Power Grid Network. Mathematics, 2022. **10**(19): p. 3450.
43. Sami, T.M.G., et al., Distributed, Cloud, and Fog Computing Motivations on Improving Security and Privacy of Internet of Things. Mathematical Statistician and Engineering Applications, 2022. **71**(4): p. 7630-7660.
44. Abdulrahman, L.M., S.R. Zeebaree, and N. Omar, State of Art Survey for Designing and Implementing Regional Tourism Web based Systems. Academic Journal of Nawroz University, 2022. **11**(3): p. 100-112.
45. Aljuboury, A.S., et al., A New Nonlinear Controller Design for a TCP/AQM Network Based on Modified Active Disturbance Rejection Control. Complexity, 2022. **2022**.
46. Abdalla, H.B., et al., Rider weed deep residual network-based incremental model for text classification using multidimensional features and MapReduce. PeerJ Computer Science, 2022. **8**: p. e937.
47. Kumar, K.P.M., et al., Privacy Preserving Blockchain with Optimal Deep Learning Model for Smart Cities. CMC-COMPUTERS MATERIALS & CONTINUA, 2022. **73**(3): p. 5299-5314.
48. Majety, V.D., et al., Ensemble of Handcrafted and Deep Learning Model for Histopathological Image Classification. CMC-COMPUTERS MATERIALS & CONTINUA, 2022. **73**(2): p. 4393-4406.
49. Abed, A.M., et al., Trajectory tracking of differential drive mobile robots using fractional-order proportional-integral-derivative controller design tuned by an enhanced fruit fly optimization. Measurement and Control, 2022: p. 00202940221092134.

The Seybold Report
ISSN 1533-9211
DOI 10.17605/OSF.IO/CBDRV

50. Abedi, F., et al., Severity Based Light-Weight Encryption Model for Secure Medical Information System.
51. SALIM, B.W. and S.R. ZEEBAREE, ISOLATED AND CONTINUOUS HAND GESTURE RECOGNITION BASED ON DEEP LEARNING: A REVIEW.
52. Zeebaree, S.R.M., New Hashing Algorithm and an Authentication Technique to Improve IoT Security.
53. Pattnaik, S.K., et al., Future Wireless Communication Technology towards 6G IoT: An Application-Based Analysis of IoT in Real-Time Location Monitoring of Employees Inside Underground Mines by Using BLE. Sensors, 2022. **22**(9): p. 3438.
54. Zeebaree, A., et al., Designing an ontology of E-learning system for duhok polytechnic university using protégé OWL tool. J Adv Res Dyn Control Syst Vol, 2019. **11**: p. 24-37.
55. Chang, W.Y., H. Abu-Amara, and J.F. Sanford, Transforming enterprise cloud services. 2010: Springer Science & Business Media.
56. Wyld, D.C., Moving to the cloud: An introduction to cloud computing in government. 2009: IBM Center for the Business of Government.
57. Hill, R., et al., Guide to cloud computing: principles and practice. 2012: Springer Science & Business Media.
58. Katal, A., S. Dahiya, and T. Choudhury, Energy efficiency in cloud computing data centers: a survey on software technologies. Cluster Computing, 2022: p. 1-31.
59. Pahl, C., Containerization and the paas cloud. IEEE Cloud Computing, 2015. **2**(3): p. 24-31.
60. Mohammed, C.M. and S.R. Zeebaree, Sufficient comparison among cloud computing services: IaaS, PaaS, and SaaS: A review. International Journal of Science and Business, 2021. **5**(2): p. 17-30.
61. Van Eyk, E., et al., Serverless is more: From paas to present cloud computing. IEEE Internet Computing, 2018. **22**(5): p. 8-17.
62. Jamsa, K., Cloud computing. 2022: Jones & Bartlett Learning.
63. Copeland, M., et al., Microsoft azure. New York, NY, USA:: Apress, 2015: p. 3-26.
64. Dhinakaran, D. and P.J. Prathap, Protection of data privacy from vulnerability using two-fish technique with Apriori algorithm in data mining. The Journal of Supercomputing, 2022. **78**(16): p. 17559-17593.
65. Ibrahim, R.F., Q. Abu Al-Haija, and A. Ahmad, DDoS Attack Prevention for Internet of Thing Devices Using Ethereum Blockchain Technology. Sensors, 2022. **22**(18): p. 6806.
66. Dai, M., et al., Vehicle assisted computing offloading for unmanned aerial vehicles in smart city. IEEE Transactions on Intelligent Transportation Systems, 2021. **22**(3): p. 1932-1944.
67. Wang, Z., et al., Personalized privacy-preserving task allocation for mobile crowdsensing. IEEE Transactions on Mobile Computing, 2018. **18**(6): p. 1330-1341.
68. Cui, S., et al., Privacy-preserving Dynamic Symmetric Searchable Encryption with Controllable Leakage. ACM Transactions on Privacy and Security (TOPS), 2021. **24**(3): p. 1-35.
69. Reddy, P.M., S. Manjula, and K. Venugopal, Secure data sharing in cloud computing: a comprehensive review. International Journal of Computer (IJC), 2017. **25**(1): p. 80-115.
70. Jiang, H., et al., Location privacy-preserving mechanisms in location-based services: A comprehensive survey. ACM Computing Surveys (CSUR), 2021. **54**(1): p. 1-36.
71. Akiyama, K., et al., First M87 event horizon telescope results. IV. Imaging the central supermassive black hole. The Astrophysical Journal Letters, 2019. **875**(1): p. L4.

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72. Nithya, K., A. Sathish, and P.S. Kumar, Packed bed column optimization and modeling studies for removal of chromium ions using chemically modified Lantana camara adsorbent. Journal of Water Process Engineering, 2020. **33**: p. 101069.
73. Liu, H., et al., Cooperative privacy preservation for wearable devices in hybrid computing-based smart health. IEEE Internet of Things Journal, 2018. **6**(2): p. 1352-1362.
74. Zafar, F., et al., Carpooling in connected and autonomous vehicles: current solutions and future directions. ACM Computing Surveys (CSUR), 2022. **54**(10s): p. 1-36.
75. Kwabena, O.-A., et al., Mscryptonet: Multi-scheme privacy-preserving deep learning in cloud computing. IEEE Access, 2019. **7**: p. 29344-29354.
76. Wang, Y., J.H. Han, and P. Beynon-Davies, Understanding blockchain technology for future supply chains: a systematic literature review and research agenda. Supply Chain Management: An International Journal, 2018.
77. Jiao, L., et al., Metal–organic frameworks as platforms for catalytic applications. Advanced Materials, 2018. **30**(37): p. 1703663.
78. Andrew, J. and J. Karthikeyan, Privacy-preserving big data publication:(K, L) anonymity, in Intelligence in Big Data Technologies—Beyond the Hype. 2021, Springer. p. 77-88.
79. Zheng, F., et al., Clinical characteristics of children with coronavirus disease 2019 in Hubei, China. Current medical science, 2020. **40**(2): p. 275-280.
80. Duan, K., et al., Effectiveness of convalescent plasma therapy in severe COVID-19 patients. Proceedings of the National Academy of Sciences, 2020. **117**(17): p. 9490-9496.
81. Jaimunk, J., Privacy-Preserving Architecture for Cloud-IoT Platform. 2021, King's College London.
82. Miao, Y., A. von Jouanne, and A. Yokochi, Current technologies in depolymerization process and the road ahead. Polymers, 2021. **13**(3): p. 449.
83. Novak, I., et al., State of the evidence traffic lights 2019: systematic review of interventions for preventing and treating children with cerebral palsy. Current neurology and neuroscience reports, 2020. **20**(2): p. 1-21.