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An Appraise of Web Service based on SOA as a step Towards Cloud Computing, Big Data and IoT

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ABSTRACT

Internet of Things and Cloud Computing can cooperate, which can address to the Big Data issues. Huge information is really a term utilized for a tremendous informational collection that performs tasks like stockpiling of information, investigation, sharing, move, prescient examination; refreshing and so forth informational collection can develop quickly. Informational indexes have distinctive examination on information that include cycle of assessing, change and demonstrating of information in order to find new data, and to reach on a few specific choice. There are some specific information examination procedures from which information mining is a mainstream one, which centersaround demonstrating and disclosure of new realities. This paper also proposes relation between service oriented architecture and emerging technology i.e. cloud computing, Big Data and IoT.

Keywords:Big Data, IoT, Cloud Computing, SOA and Web Service

Introduction

Cloud computing is a paradigm that focuses on sharing data and computations over a scalable network of nodes. Examples of such nodes include end user computers, data centers, and Web based Services [2]. Cloud computing models are of two types: Deployment model and Service model. There are four types of deployment models: private cloud, community cloud, public cloud, and hybrid cloud. As well Service model is also classified into three namely Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) [3]. The Internet of Things (IoT) is a network of physical items that have sensors, software, and other technologies integrated with them for the purpose of communicating and exchanging data with other devices and systems over the Internet. The IoT includes both industrial and consumer uses. Industrial applications necessitate increasingly open, self-maintaining intelligent systems that enable automation without human intervention. Consumer systems must change to accommodate novel services, such as context-aware, tailored services, that make life more joyful and efficient [5].Big data refers to large, complex, organized, and unstructured data collections that performs operations like storage of data, analysis, sharing, transfer, predictive analysis; updating etc. data set can grow rapidly. Distinct data sets have different data analytics, which entail the process of analyzing, transforming, and modeling data in order to uncover new information and make a specific choice [2]. These big data platforms often include a variety of servers, databases, and business intelligence tools that enable data scientists to manipulate data in order to uncover trends and patterns.The software architecture of a Service-Oriented Architecture (SOA) based on service computing resources, with loosely linked services and indirect addressing capability. Service for business processes as reusable components that simplify information services or the status of the data conversion process, respond to customer requests, and deliver high quality services are the essential features of SOA design. In SOA- based system integration, long-running business transaction often involve incompatible trust domains, asynchrony and periods of inactivity, presenting challenges to traditional ACID (Atomicity, Consistency, Isolation, Durability)-style transaction processing [7]. Each SOA block can play one or both of the following two roles: service provider and /or service consumer. The service provider develops a web service and, in some cases, publishes interface and access details to

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the service registry. Each provider must select what services to disclose, how to strike a balance between security and ease of use, how to conveniently charge for services, or (if no money is charged) how/whether to exploit them for other purposes. Service consumer - Regardless of the service that the service consumer want, they must obtain it from the broker's registration, form a binding with the service, and then use it. If the service broker provides numerous services, they can use them all [10].

Literature Review

This section outlines some basic concepts about the Cloud computing tremendous paradigm, Service Oriented Architecture and Cloud SaaS World, Internet of Things, and Big Data Analytics.

A. **Cloud Computing Tremendous Paradigm:** By the definition of cloud, Cloud computing based on decades of study in virtualization, distributed computing, utility computing, networking, web-based services, and software services. It entails a SOA, lower end-user IT overhead, greater flexibility, lower total cost of ownership, and on-demand services, among other things. The notion of "cloud" computing, the difficulties it attempts to address, and associated research subjects are all discussed in this paper. This research looked into the cloud-computing concept and compared it to the older grid-computing notion. A Vouk, Mladen_ Et.al [1] focuses on various existing cloud systems and explains their characteristics and applications. Various aspects of cloud computing are discussed. The problem of Cloud interoperability also brought up, which might be use as a basis for future study and development. The different cloud providers were also examined in this article. According to this article, cloud computing is becoming a tremendous paradigm that is attracting many businesses, both small and large, and it has the potential to touch a variety of businesses because it is drastically changing the IT sector.

B. **Service Oriented Architecture and Cloud SaaS World:** The most prominent software engineering paradigms, SOA and Cloud SaaS, have both contributed to software development. Despite their benefits, SOA and Cloud SaaS both have flaws, necessitating greater research into how to improve both models' effectiveness. This paper proposed Shaymaa A. Mohamed, A. Yousif [4] a new model that straddles the SOA and Cloud SaaS worlds. The proposed architecture comprises the framework of SaaS multitenant applications with SOA concepts applied to the computing and application code structure. An empirical study and a case study technique were used in the research. According to the evaluation results, the suggested model has a high level of complexity and implementation time and effort, which necessitates the use of high-level skills and additional security considerations. Cloud computing offers a service-oriented architecture with a high level of flexibility at a cheap cost, as well as a decreased information technology overhead for the end user. Santosh Kumar_et al [6] various cloud concerns and research areas were discussed, as well as their implementations. According to the author, cloud computing is the next step in the evolution of technologies that deliver online and on-demand services, and it is based on resource virtualization.

C. **Internet of Things and Web Application:** A physical object that collects and transfers data between objects is called an Internet of Things (IoT) [8] these objects are embedded with software, sensors, and other electronic components. Cloud-based applications are the majority of IoT applications today [9]. The cloud applications implemented here [11] provide portability and usability while combining the characteristics of desktop, and web applications. In the near future, Internet of Things is expected to change virtually every aspect of our lives. There are five main categories of IoT [8]: smart wearables, smart buildings, smart cities, smart environments, and smart enterprises. Currently, IoT architectures treat Things as private property, which is the main problem. An organization or individual owns a Thing, and it provides them with the functions they need to accomplish a task. Its owner can only carry out a Thing’s use. It is counterproductive to group Things as service providers, because anyone can provide these services. It should be possible for any client to find something that provides the service that the client requires. Physical tasks, information required for decision-making, or a virtual task can be provided by this service. Owners should publish services provided by Things, and clients should be able to find Things that provide certain services. This philosophy, however, is not supported in current IoT architectures. Therefore, the goal of this paper is to investigate the use of service-oriented architectures.

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D. **Big Data Analytics:** Research and application developers face many challenges and opportunities when using the Internet of Things as a big data source. Developing innovative services is made easier with big data from multiple sources. In spite of these challenges, managing IoT data appropriately is difficult, since IoT data needs to be processed and analyzed using big data analytics. The requirements are based on the quantity, velocity, and variety of data generated by IoT devices. In the context of big data, Lambda and Kappa are the two best-known reference architectures. Many big data applications use one or both of these architectures. Fault tolerance, scalability, and distributed processing were all used in both architectures [12]. Nate Marz developed the Lambda architecture to make Twitter a more powerful system. As with Kappa, Jay Kreps designed this architecture in order to support data generated by LinkedIn.

Feature Components

A. **SOA based IoT Architecture:** The focus of this section is on the creation, discovery, and provision of services in the Internet of Things as well as Cloud Computing using a novel SOA-based architecture. Several criteria were intended to ensure the architecture achieves its intended result [14].

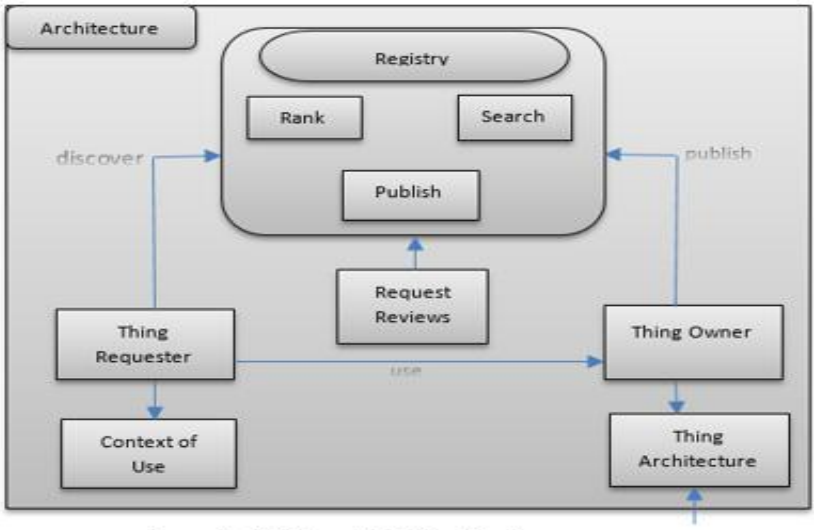

Figure1: SOA based IoT Architecture

Figure 1 depicts our recently developed SOA-based architecture for the publication, discovery, and supply of services supplied by Things in the Internet of Things. This structure meets all seven of the aforementioned criteria. The aspects of the architecture are discussed below.

- **Registry:** The registry is the institution that will be in charge of publishing, discovering, matching, and ranking things. It will allow the owner of the Thing to post his Things and for users to discover them. The Registry is made up of four primary components: I.e. Rank, Search, Publish and Registry, which are below discussed.
- **Rank:** This element is in charge of ranking the items that meet the client's needs. It is usual for the registry to discover many Things that satisfy the client's needs. As a result, a ranking is required. The ranking element will use algorithms to rate the matching Things based on the context and priorities of the client.
- **Search:** This element is in charge of discovering Things. Clients will be able to locate Things that give the services they require. Client context and published Things context will both be taken into account when the discovery is done.
- **Publish:** This component will be in charge of storing the data provided by Things owners. The information provided by the providers will be organized using the Thing structure.
- **Requester Reviews:** To ensure the correctness of the information contained in the registry. The registry will also allow Thing users to review Things after using them. The reviews completed by users will be managed by this element. The review can include, how the service performed, the correctness of the description, and any experiences the client have with the Thing owner.

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- **Context of User:**This entity is in charge of gathering and organizing the user's context. This is a dynamic entity. It keeps track of the user's current situation and updates the context information accordingly. When dealing with the registry, the client will use the context information given by this object.
- **Things Architecture:**The framework that the Thing owner should use to describe his items will be defined by this entity. The architecture of the Thing has been formally defined. As a result, the Registry can formally verify the Thing description.

B. **Organize Service-Oriented Architecture with Cloud Computing:**Application-programming interfaces (APIs) are the terms used to describe the connections to the cloud (APIs). Web services like SOAP, REST, and JSON are used in these APIs.

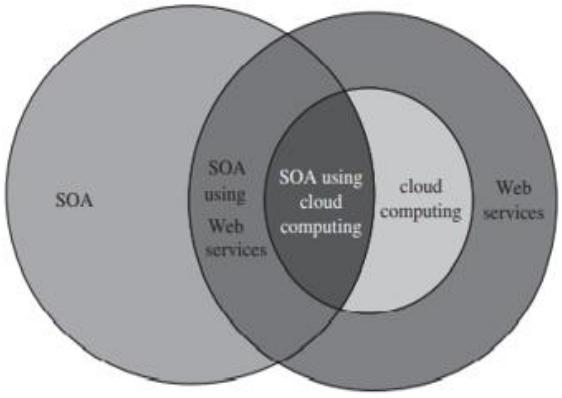

Figure 2: Relation of Web Services, SOA and Cloud Computing

Figure 2 uses a Venn diagram to illustrate the relationship between Web services, SOA, and cloud computing. Web services are shown within cloud computing to demonstrate that cloud computing makes use of Web services [13]. The cloud computing approach allows businesses to distribute programs over the Internet, avoid the costs of owning and managing data centers, and benefit from the efforts of other software developers.

C. **Relationship of Web Services and SOA**:The relationship between SOA and Web services are the overlapping area in the center represents SOA using Web services for connections.

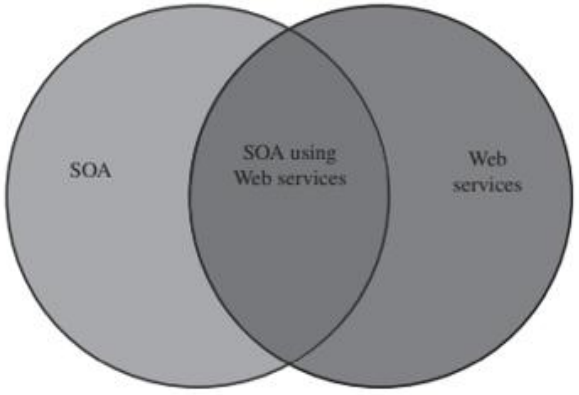

Figure 3 Relationship of Web Services and SOA

The non-overlapping area of Web services denotes that while Web services can be used to build connections, they do not constitute a SOA. The non-overlapping area of SOA denotes that a SOA can use both Web services and non-Web service connections (the original specifications of CORBA and DCOM are examples) [13].

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Comparative Analysis

Research Challenge of Service based on SOA towards Cloud Computing, Big Data and IoT.

S.NO.	Author & Publication	Classes	Advantage	Performance Analysis	Limitations
[1]	Somayya, et al. [15]	Cloud Computing, IoT	IoT& Cloud Computing definition requirements	Cloud implementation based on VCL technology is discussed.	Often vulnerable to instability and other technological problems.
[2]	Leu, et al. [16]	Scheduling method for the IoT	They provide the effective scheduling method for the IoT messaging system	Even during unstable network conditions, this scheduling technique achieves better results.	The Chrome browser does not provide the desired result with their method.
[3]	Y. Zhang, et al. [17]	Integrating SOA distributed events	Using SOA, they design the upper-level applications with communication capabilities.	The solution has been shown to be effective and applicable.	Throughput increases in a gradual manner at the top, with some jitter in the slope.
[4]	Cheng, et al. [18]	IoT service by SOA paradigm.	By using the event-driven SOA paradigm, they designed their IoT service.	A model for event-derived service coordination is automatically detected in SEDL.	It is not a lightweight process, and it needs to be optimized.
[5]	Tiburski, et al. [19]	IoT middleware systems	IoT based SOA can be secured by the standard security architecture provided by this method.	On the device, they provide lightweight web services as well as resources for other processes.	It is possible to achieve high security but the flexibility is low.
[6]	Chen, et al. [20]	They provide the method like Distributed SOA	The SOA-based IoTis designed with a scalable trust management system.	Typically, these strategies are used with devices that have low memory resources.	Random attacks and collisions are not suitable for their method.
[7]	Zinal D. Patel, et al. [5]	SOA for IoT	SOA for the efficient communication and privacy of services.	Comparison to summarize and analyze the SOA under concern.	Fault recovery methods can be developed in the future.

[8]	Karandeep, et al. [21]	Survey on SOA, Big, Data, Cloud Computing and IoT	huge data set that performs operations like storage of data, analysis, sharing, transfer and predictive analysis	IoT, Cloud computing can work together, which can address to the Big Data problems.	Can be pursued independently, or concurrently as complementary activities.
[9]	Krishna, et al. [22]	Survey on the IoT-Based SOA	Analysis the performance of the methods.	the major problem in the IoT-based SOA system and their better solution	Lack in security.

The table above summarizes the many papers analyzed, with classes denoting the topic of the paper, advantages denoting their definition and needs, performance analysis denoting the technologies and tactics, and limits conclude the table.

Krishna Kumar, et al. [22] IoT-based SOAs deliver information to users in a more efficient and timely manner. The main issue with IoT-based SOA is that it must communicate with heterogeneous devices, as each device operates differently. To analyze the performance of the techniques, the survey is based on various research connected to IoT-based SOA. This also explains the main issue with IoT-based SOA systems and their improved solutions.

Naseem Ibrahim, et al. [14] has introduced an SOA-based architecture for the publication, discovery and provision of services provided by Things in IoT. It also offered a Thing description architecture. Set theory has been used to formally define both architectures.

Zinal D. Patel, et al [5] a detailed survey of some Service Oriented Architecture for IoT presented in this paper. In terms of application requirements, each Service Oriented Architecture explained and examined. Furthermore, all of the different designs has compared in terms of security, evaluation metric, problem diagnostics, and other factors.

Claudiu PIRNAU, et al. [10] in modern service-oriented architectures and servers, temporary disconnection managed automatically, so that data securely delivered between applications and clients. Data-push features enable client applications to receive data without having to query a server first.

Conclusion

Accordingly, IoT has viewed as a research topic in architecture, where higher-level approaches are being proposed. The paper presents a comprehensive survey of some IoT Service Oriented Architectures. The Service Oriented Architectures has explained and analyzed in terms of their classes, performance and limitations. Moreover, each architecture has evaluated in terms of security, evaluation metric, fault diagnosis, etc. In this study, the performance of IoT-based SOAs has analyzed using a survey of various studies. In addition, the IoT-based SOA system is also discussed and their better solution for it. Implementing the provision architecture is part of our future work. Additionally, cloud computing, Internet of Things, and Big Data will be used to develop the registry.

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