

Cloud computing and IoT integration for health checking system

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ABSTRACT

With the raise of technologies in the fourth industry revolution, Internet of things appeared as an emerging technology, especially, in the healthcare industry. The cloud computing as a main section of IoT structure can be a great integration to get more benefits to provide healthcare for our society. In this paper, researchers more concentrated on individuals and autonomous extension of solitary strategies, with less emphasis on patient monitoring. While the main aim of technology management of healthcare information systems has been accomplished throughout the proposed combination of Internet of Things and Cloud Computing in the context of medical profession. A low-cost, secure, and trusted healthcare tracking system that offers real-time monitoring dashboard for biological indicator has been proposed. The utilization of this integration to track and control health system was applied, thus, a remotely controlled platform based on the cloud computing design paradigm has been developed in the field of health information, while an efficient algorithm in future hospital cloud service and monitoring system implementations have examine and evaluate this design. A CloudSim simulation results showed that the proposed algorithm revealed better results from analogue anneals algorithm and ant colony optimal design with an improvement of 40% in the system efficiency. Therefore, the integrated proposed algorithm is of an importance to be developed and could be applied to non-coordinate system to improve solutions to the optimization and scattering.

Keywords: Internet of Things, Cloud Computing, Healthcare Information System, Healthcare Monitoring System, e-health, Health Informatics.

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1. Introduction

In the global network and dynamic infrastructure, the IoTs prototype is depend on self-configuring and intelligent nodes or things which are interconnected lively [1]. This technology represents key troublemaking techniques to produce the enveloping and everywhere computing outlook [1] [2]. Usually, the IoT refers to little things and real words storage which is able to process important difficulties about performance, privacy, reliability, and security [3]. The cloud computing is unlimited processing energy and storage which is represents a further adult technique at slightest to confident amount to resolve the difficulties of IoTs [4]. To interrupt the future and existing world, the information technology platforms in cloud computing and IoT are a matching technique merged together to produce new and novel generation [5]. This combination method is so called IoT-Cloud technology [6]. The IoT and cloud computing literature integration are promising topic in industry researches which is conducted in this work to introduce an integrated usage of both technologies. The major development in the IT field is the IoTs to solve many problems in society of current and future contribution [7]. In new logistic management construction, information technology provides speed faster, minimum cost, and good services [8]. In modern applications, medical information technology includes wide function of healthcare



which is close to national humans and welfare living [9]. Due to large scale of cloud computing and IoT applications of health care could be high breakthrough [10]. The advantages of cloud computing is represents by high reliability, efficiency, virtualization and scalability [11]. The public cloud construction in patients and hospital could endorse cost saving, resource sharing, high efficiency of build medical management and monitoring systems [12-20]. To realize high safe, quality, and fast execution in medical management and controlling, the internet could support is major technology of audio electromagnetic feelers and photos [21-25]. Additionally, this technology could achieve breakthrough in the transmission of medical information, accurate location, and intelligent healthcare monitoring [26]. To offers new opportunities for hospitality, cloud computing and IoT could be integrated together in the monitoring and managing of medical platform even in social area. Numerous approaches have been proposed in this field as in [27-34]. In this paper, model analysis and forward putting model of medical information construction with fast and accurateremote management and monitoring policyis presents. An efficient algorithm of management and monitoring in cloud computing applications has been introduced. The adopted reference to final research is illustrated in Figure 1 and the experimental simulation results show an effectiveness of these techniques.

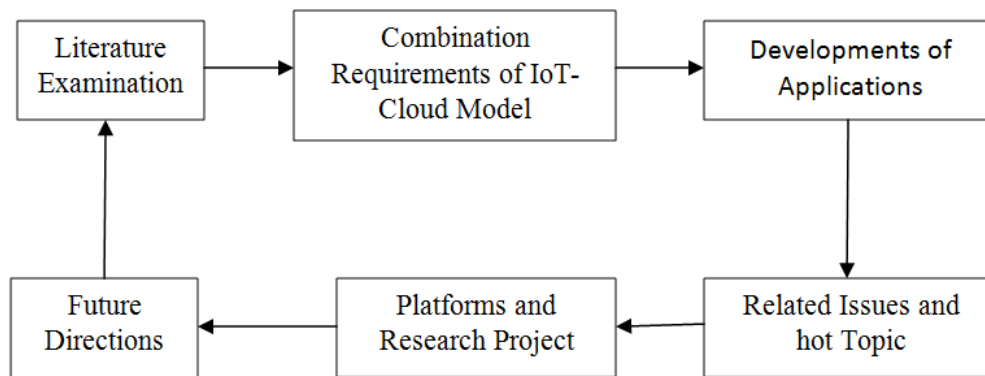


Figure 1. Research methodology

2. Materials and methods

2.1. Cloud- IoT integration importance

An independent evaluation has been seen of cloud-IoT technology. Hence, many advantages resulting from integration of these two techniques to identify in the literature to predict the near future. The IoT could gained from cloud unlimited resource and capacity to carry out the method constraints. Particularly, an effective solution could be provided by cloud computing to realize the internet services managing with composition and data applications usages. From other hand, cloud computing could be gained from IoTs by extending the scope to deal with things in real world more dynamic method and spreads to offers new services on big number of real-life situations. Basically, the cloud computing acts as intermediate layer between the applications and things while it hides all complexities and necessary functionality to implement the letters. The problems and benefit were summarization when IoT-Cloud techniques have been used. A very high and big amount of data sources could be involved by IoTs with producing a large amount of unstructured data of three main characteristics of information that is a volume, variety, and speed. Therefore, meaning that the collection, visualization, processing, archiving, sharing, and acquisition could search larger quantity of information. This will provide on-demand and unlimited storage capacity with low cost. The cloud is the most cost-effective solution and convenient to deal with data generation by IoTs. New convergence scenario could be realized by this integration where new chance arises for data sharing, integration, and aggregation with third party. Formerly to the cloud, the data could be in uniformly method via standard API with top using of security protection and direct access from anywhere with visualization. The processing resource equipment of IoT are not permit to field processing of data collection which is usually aggregate and transmit to powerful node processor feasibility, while, not appropriate scalability challenge to infrastructure achievement. The on-demand of cloud model is infinite capacity permits to appropriate content and provides the IoT to deal with complex analysis of unprecedented require. The prediction algorithms and data drive decision making is possible with minimum cost to provide decreasing the risks and increasing revenues. The main requirement of IoTs is to make IP access equipment communicate via dedicated hardware with very expensive communication assistance. In addition, the cloud

connection offers effectiveness and cheap solution in manage and track anything at anytime and anywhere to use the built-in and custom portal applications. To solve numerous problems, the integration could be used to offer extra features as ease-of-use, ease-of-access, and deployment cost reduction.

2.2. Integration applications

Figure 2 shows the instruction of integration with wide applications that are making it possibility or considerably improved the IoT-Cloud model. the healthcare will illustrate and discussed specially in the usage.

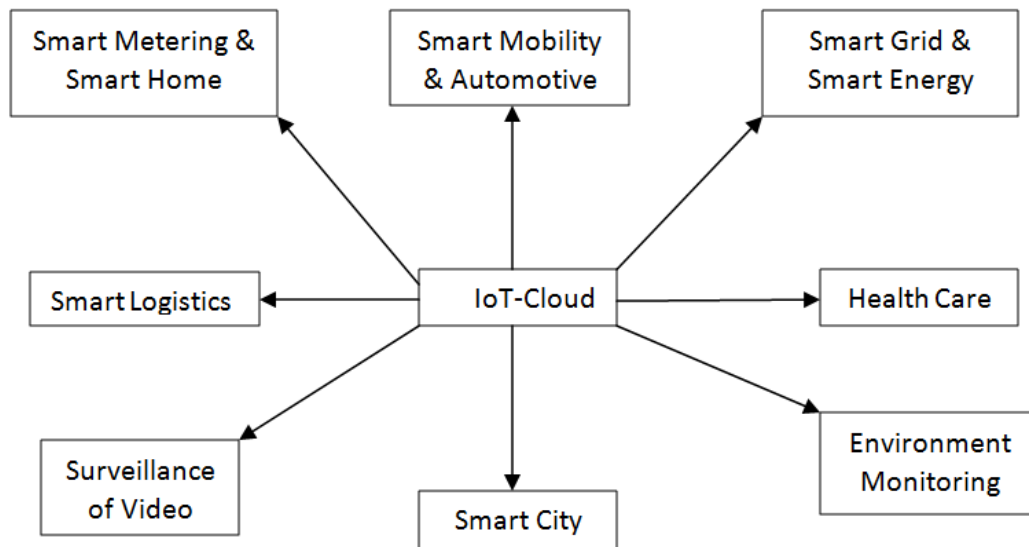


Figure 2. Scenarios of cloud IoT applications

The cloud adoption of above scenarios is lead to the abstraction of technical details, control over, requirement for expertise removing, and infrastructure of technologies. Additionally, this adoption provides security implementation of multimedia healthcare services to avoid any problems when the device running of big number of security and multimedia algorithm with incomplete energy and small battery. In this field, the widespread problem with safety, legal investigation, management, and technologies, the interoperability, quality of services, and system security, the dynamically increasing of storage is consider a hardly. One of the more widespread cardiovascular diseases is the hypertension which is reported of about 200 million people who suffer from this disease. The heart disease and incidence of hypertension is trending to rise and ensures to early observe. In case of the user in dangerous situation or emergency, these techniques could notify the mechanism of emergency. Hence, the developing of medical treatments is captured and simplifies to found in general health recorders to offer decision making base for district disease by comparing and examine of medical data. The remote checking cloud platforms of medical data include the sensors of the body, family gateway, network sensors, communication module, processing platforms, medical data analyzing, and medical staff is used to collect different data. Rapidly, personal healthcare record data is huge and growing in existing time to facilitate the fast treatments. Consequently, a large amount of required data is need to automatically classifying, processing, and analyze as data service provider. As examples of these situations, security services center is used to offers security services, disease control center of emergency is used to detect and control the situation in advance and so on.

2.3. Structural design of suggested module

Figure 3 illustrates the flow chart of information from data sensors to data transferred by the gate way. A number of research issues contain real time location, medium access timetable, and routing. The communications system might be hard or soft real time. The real time communication model is to produce real time abstraction level which is required to be distributed in real time computing and real time communication technique in the dynamic network topologies.

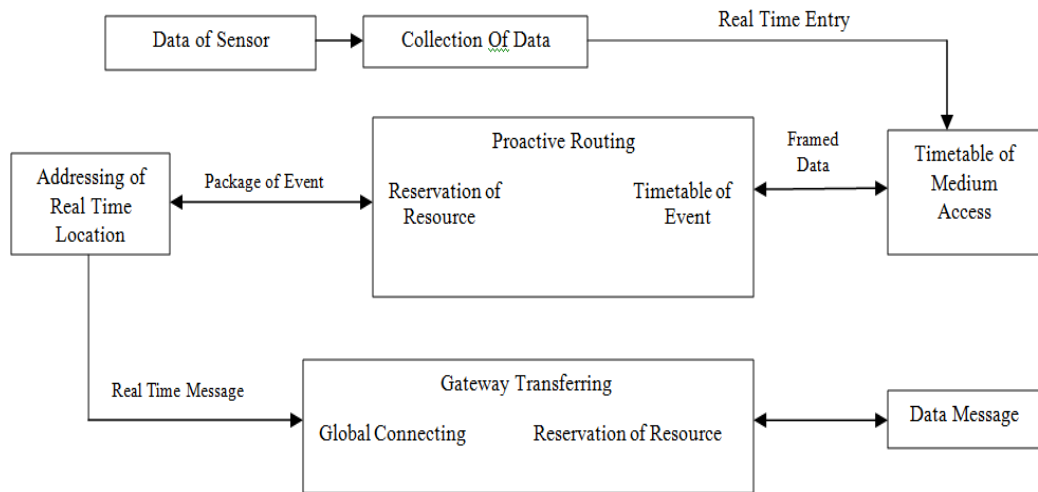


Figure 3: Suggested data flow chart

The cloud services could provide applications of upper user such as data analysis and patient healthcare doctor monitor. This section plays vital role to support many kinds of operating system platform and offer high performance computing methods as illustrated in Figure 4.

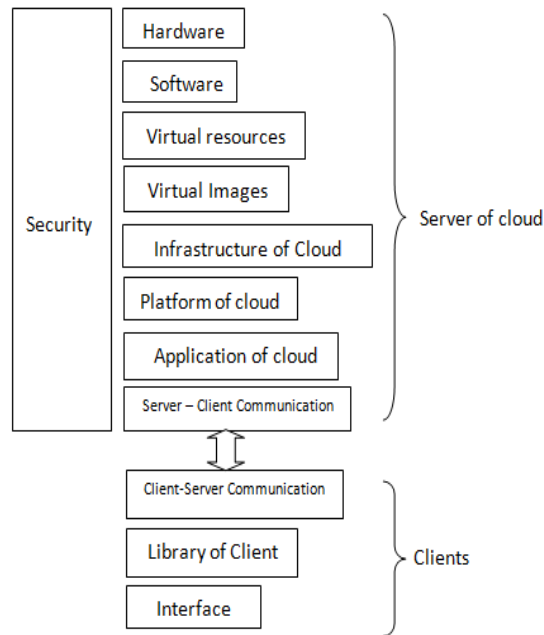


Figure 4. Model of cloud computing structure

3. Results and discussion

For effectiveness verification of suggested techniques, many simulation experiments were done using CloudSim environments with 6-physical machines, 2-TB hard disk, and 8GB RAM. The software programs are installed on Window XP, Intel core 2 quad cores, 3.2 GHz, and 4GB RAM. Cloud infrastructure simulator was used in CloudSim. The parameters of experiment setting are illustrated in Table 1. Figure 5 illustrate the execution time of every task which is clearly shown the simulated annealing and ant colony optimization algorithms spent more time with the increasing of tasks numbers. Optimization algorithms of ant colony are to execute a task gradually at first time, while, when the less increasing than developed simulation annealing algorithms due to the positive feedback. These results of suggested algorithm execute time less than other approaches. The major reason is that the suggested model combines fast searching capability of simulated anneals method. This will not only could develop the convergence rate, but as well overcome falling into local optimal situations. Therefore, the proposed algorithms shorten the normal time of duties. Table 2 illustrates the

results compression between proposed work and current approaches.

Table 1. Parameters setting of experimental simulation

Parameters	Value
Weight of Tracking	1.00
Weight of Information	6.00
Parameter of Evaporation	0.30
Constant of Updating	9.00
Ant Number	6.00
Step Vector of Controlling	2.00
Factor of Temperature decreasing	0.88
Initial Temperature	55
Operating time	25
Study Factor of Self Consciousness	1.5
Factor of Inertia	0.87
Size of population	25

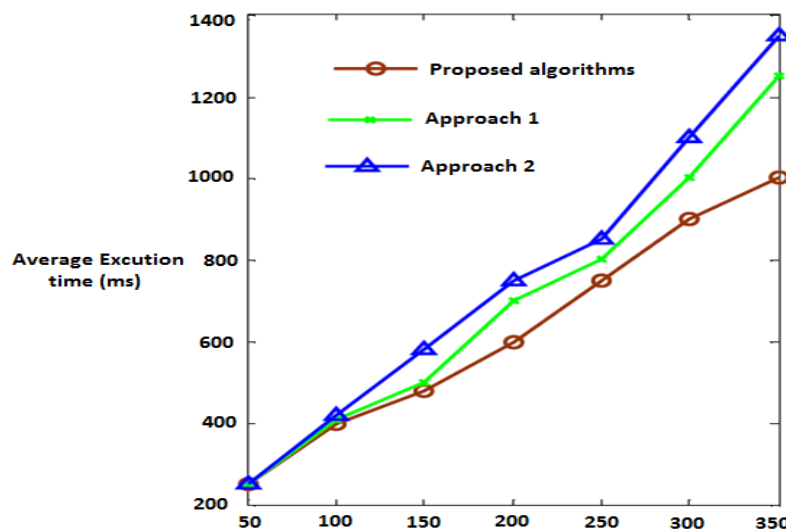


Figure 5. Time of average execution

Table 2. Results compression between proposed work and current approaches

Parameters	Current Approaches	Proposed algorithms	Utilizations
Execution time (ms)	1300-1400	Less than 1000	30%
Performances of Service Applications	Low efficiency	High efficiency	50%

4. Conclusion

This paper introduced new algorithms of IoTs and cloud computing combination in order to serve the medical field with fast and accurate executing time. Healthcare monitoring system plays a vital role in the early expecting issue concerning to the people health. This system will cutting the medical cost based on hospital monitor and doctor visiting. Therefore, the system development could deliver health information from patient place to medical specialist or relative become important with demand increasing. This work introduces low cost, secure, and trusted healthcare tracking that offers real time monitoring dashboard for biological indicator within accurate and secure environments depend on IoT-Cloud techniques. The proposed system is a combination of internet of things techniques and cloud computing technology. In the first place, cloud platform constructor is founded for medical data remotely monitoring based model. After that, this design is examined and evaluated as well. At the end an efficient algorithm was introduced for monitoring issues in the hospitality data plan. The simulation by CloudSim shows that the suggested algorithms are better than the analogue anneals algorithms and ant colony optimal design with an improvement of 40% in the system efficiency. To modify this technique in the future, this technique could apply to non-coordinate system to find out more solutions to the optimization and scattering. In same time, one could conduct more in-depth approaches on the mathematical evaluation to

the suggested method in basis to this research.

Declaration of competing interest

The authors declare that they have no any known financial or non-financial competing interests in any material discussed in this paper.

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