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A Novel Architecture for Mobile Crowd and Cloud computing for Health care

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Abstract

The rapid pace of growth in internet usage and rich mobile applications and with the advantage of incredible usage of internet enabled mobile devices the Green Mobile Crowd Computing will be the suitable area to research combining with cloud services architecture. Our proposed Framework will deploy the eHealth among various health care sectors and pave a way to create a Green Mobile Application to provide a better and secured way to access the Products/ Information/ Knowledge, eHealth services, experts / doctors globally. This green mobile crowd computing and cloud architecture for healthcare information systems are expected to lower costs, improve efficiency and reduce error by also providing better consumer care and service with great transparency to the patient universally in the field of medical health information technology. Here we introduced novel architecture to use of cloud services with crowd sourcing.

Keywords: *mobile crowd computing, mobile cloud computing, remote execution, offloading, crowd sourcing*

1. Introduction

The quick pace of development in the field of health care sector and e-Health. In spite of the fact that the medicinal services segment has an extraordinary potential in India however it's as yet undiscovered completely in the field of Medical Health Information Technology (MHIT) or Health informatics. With regards to the entrance of therapeutic reports or history of a during emergency situations and covering medical coverage it turns into the most teddies undertaking to achieve .Because in health care, the patient health records is with the specialist or in the doctor's facility database records or even at patients home or misfortune them perpetually by characteristic catastrophes. The majority of the legislature and private health care associations in India aside from few pursues the customary path in taking care of the patient archive or patient medicinal services records. Digitalization in the health care segment and digitize health records can help make carefully enabled India and exceed expectations in the field of Medical health data innovation (MHIT). Where eHealth is a key mainstay of Digital India. The Electronic Health Record (EHR) is the focal segment of the Medical Health IT foundation. This advanced health record can be shared among different offices and organizations for different purposes.

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Crowd computing been conceptualized in different courses as being identified with group sourcing, human calculation, social registering, distributed computing and mobile processing. Mobile computing can give a registering apparatus when and where it is required independent of client development, in this way supporting area autonomy. Notwithstanding, the innate issues of Mobile computing, for example, resource shortage, finite energy and low availability present issues for generally applications.
These issues can be tended to by 'sharing' resource escalated work with a resource rich server. Anyway in circumstances concerning mobile phones, associating with a remote resource cloud through WiFi or 3G isn't achievable in view of transmission capacity issues, information get to charges, and the battery deplete. Expanding use and capacities of advanced mobile phones, joined with the capability of group processing can give a cooperative crafty resource pool to tackle these issues.

We characterize 'mobile crowd computing' as a neighbourhood 'mobile resource cloud' involving a gathering of neighbourhood close-by mobile phones, used to accomplish a shared objective in a circulated way. Work appropriation in a mobile situation represents an alternate arrangement of issues than a run of the mill distributed/grid environment.

1) Less processing power on a mobile device than on s node in distributed processing system.
2) A mobile node has on a finite energy source.

3) A resource pool made up of mobile devices is highly volatile, and hence node availability is inconsistent.

4) In a mobile cloud, the devices will be unknown to each other a priori, unlike in a grid environment where nodes are established and approved beforehand. Therefore a mobile cloud calls for a more opportunistic and ad hoc behaviour.

5) A mobile cloud is most likely to be heterogeneous.

By mobile crowd computing, we mean machine computation and in addition human calculation on a group (pool) of mobile phones. Here, machine computation alludes to work done absolutely on PCs without human mediation, and human calculation alludes to work done on PCs utilizing human ability. A circumstance comprising of a 'known' network is well on the way to succeed. It should be noticed that we just propose the clients are 'known' to one another, not the gadgets. Crowd computing, "astute systems can be utilized to spread calculation and gather results. Where the hubs in such systems are mobile phones, substantial data transfer capacity is accessible and crowd computing processing can be utilized “as a means of distributing human interaction tasks to mobile devices.

"One approach to consider crowd computing is as the human simple to distributed computing." Here the cloud gives versatile, accessible access to calculation and capacity resources and the group gives comparative access to human abilities. Coordinating human registering capacity into the cloud can generate diverse rising and developing on the web networks.

Table 1. Application class with collective intelligence

Application class	Crowd	Computing platform	Predetermined purpose	Human capabilities	Collective intelligence
Web 2.0 and social computing	Yes, online	Yes, mostly Internet	Sometimes, may be used just for sharing or social activity	Yes, social behaviour, creativity	Sometimes
Crowdsourcing	Yes, mostly online	Mostly, Internet, but can involve no technology	Yes, includes creation, problem-solving, idea generation	Yes, various	Yes
Human computation	Mostly, but can involve individuals	Yes, mostly Internet	Yes, performing tasks, e.g. problem solving	Yes, various	Sometimes
Audience/crowd computer interaction	Yes, online and physical	Yes, can include mobile, sensors, other	Yes, typically for engagement	Yes, social behaviour, coordination	Sometimes

The objective of the Health care crowd computing framework is twofold:

1. In case of human aided computation such as qualitative classification tasks, to enable collaboration of multiple
2. Human users using mobile devices. For example, conducting surveys, asking for opinions, image identification and comparison, audio transcribing, collecting data etc.

2. In case of machine computation, improve the efficiency of the execution by either giving a speedup gain, and/or conserving resources (eg: battery). For example, image processing, natural language processing, e-learning, and multimedia search. Here briefly explained here using an example scenario that combines human and machine intelligence.

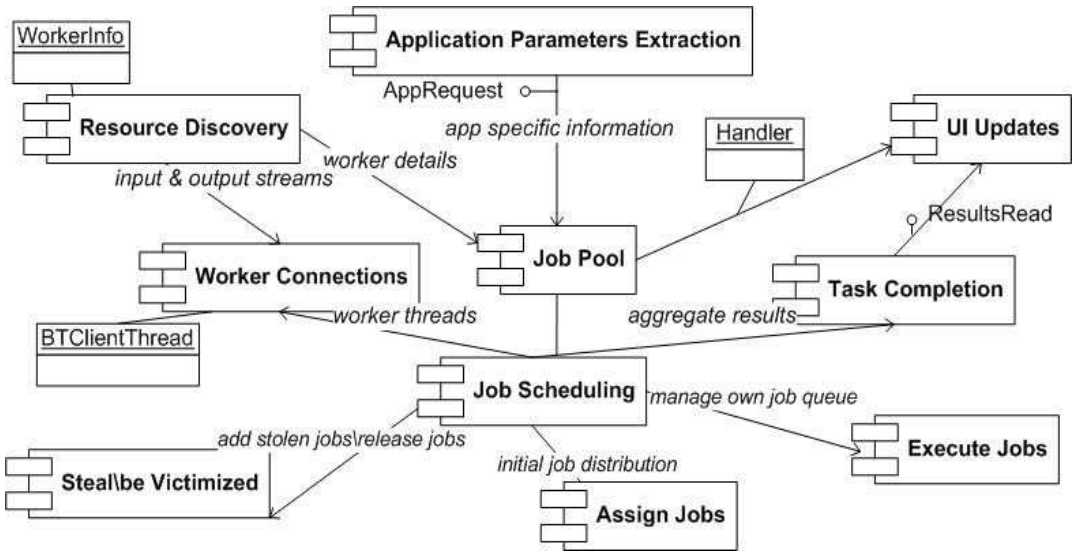

Figure.1 Crowd Computing Application Characteristics

Table. 2 Crowd Computing Application Characteristics

Application example	Description	Application class	Crowd	Computing platform	Purpose	Human capabilities	Collective intelligence
ESP Game	Players suggest labels for images	Human computation Crowdsourcing Web 2.0	Online Collective – anonymous Different times, different places Members work independently	Internet-based	Problem solving – image identification	Visual recognition	Implied
Missile Command Game	Players coordinate to destroy missiles	Audience-Computer Interaction	Physical collocated crowd Same time, same place Members work cooperatively	Camera tracks movement, computer displays and processes.	Engaging the audience	Physical coordination	Not applicable
Wikipedia	People contribute to online encyclopaedia	Crowdsourcing Web 2.0 Social computing	Online Collective Different times, different places Members build on others' contributions	Internet-based	Creation	Knowledge, writing	Yes, diversity of contributors
FixMy-Street	Citizens report, update and track resolution of community problems	Crowdsourcing Web 2.0	Online Collective – focus on local communities Different times, same place Members can post and update	Internet-based	Problem reporting and resolution (information flow)	Local knowledge, sense of interest and identity	Yes, by fostering cooperation to address problems
Innovation Jam	Participants submit and refine business ideas	Crowdsourcing Social computing	Online large Group or Collective Same time, different places Members contribute ideas, may build on each other's contributions	Internet-based	Ideation and development	Creativity, knowledge, analytical or strategic skills	Yes, by incorporating stakeholders into innovation process

2. Related Work

K. Zheng et, al [2013] introduce Honeybee; a crowd computing framework for mobile devices. Honeybee enables mobile devices to share work, utilize local resources and human collaboration in the mobile context. It employs 'work stealing' to effectively load balance tasks across nodes that are a priori unknown and describe the design of Honey bee, and report initial experimental data from applications implemented using Honeybee [1]

Rathod et, al[2016] review a crowd computing for mobile devices. Here they explore this concept of 'work stealing' for crowd computing on an opportunistic network of mobile devices, for both machine and human computation and also present experimental data and discuss the findings. [2]

Ivan Stojmenovic [2012] introduce the development of mobile cloud computing and describe some applications involving multimedia, vision/recognition, graphics, gaming, text processing. Next, it will present the transmission, computation, and sensing challenges of green computing in mobile cloud. It will also discuss the possible solutions from various perspectives. Energy savings for task outsourcing and location based services will be discussed in detail. 'Crowd computing' combines mobile devices and social interactions to achieve large-scale distributed computation. Examples include task farming, participatory and opportunistic crowd-sourced sensing. One particular emerging concept is the 'vehicular cloud'. For example, traffic lights in a congested area could be rescheduled by running the rescheduling code (controlled by municipality) on the collective computational platform provided by the cars. [3]

M. Somasundaram et, al [2011] describes about the management of medical image data in a cloud

computing environment with access to mobile users through a mobile application to help the patients and doctors to view patient health records and prescriptions on their handheld devices that supports Android OS. The application that has been effectively implemented allows a flexible medium for patients to access vital health records at their convenience, without a need to visit the hospital to view the same. The application is an advantage to people residing in remote areas and who cannot access hospitals in cities at tease. [4]

Griebel et al [2015], discuss about biggest threat and the adoption in the healthcare domain is caused by involving external cloud partners: many issues of data safety and security are still to be solved. Until then, cloud computing is favoured more for singular, individual features such as elasticity, pay-per-use and broad network access, rather than as cloud paradigm on its own. [5]

Derek et al [2010], introduce and motivate crowd computing, which combines mobile devices and social interactions to achieve large-scale distributed computation. An opportunistic network of mobile devices offers substantial aggregate bandwidth and processing power. Here analyse encounter traces to place an upper bound on the amount of computation that is possible in such networks and also investigate a practical task-farming algorithm that approaches this upper bound, and show that exploiting social structure can dramatically increase its performance. [6]

ChengYe et al [], we introduce a crowdsourcing framework to support the annotation of medical datasets, and they further demonstrate a workflow for crowdsourcing clinical chart reviews including (1) the design and decomposition of research questions; (2) the architecture for storing and displaying sensitive data; and (3) the development of tools to support crowd workers in quickly analyzing information from complex datasets. [7]

Imdat As et al [], discuss the methods and techniques of architectural crowdsourcing and illustrate the processes and outcomes through a series of projects: a remodelling project for a closet; an interior design challenge for a dining space; and a layout problem for an apartment complex. We will then evaluate the protocol and outcome of architectural crowdsourcing, and convey the professional and popular media response to this new method of architectural design acquisition. [8]

Kerri Wazny, discuss the Eight areas where crowdsourcing has been used in health were identified: diagnosis; surveillance; nutrition; public health and environment; education; genetics; psychology; and, general medicine/other. Many studies reported crowdsourcing being used in a diagnostic or surveillance capacity. Crowdsourcing has been widely used across medical disciplines; however, it is important for future work using crowdsourcing to consider the appropriateness of the crowd being used to ensure the crowd is capable and has the adequate knowledge for the task at hand. Gamification of tasks seems to improve accuracy; other innovative methods of analysis including introducing thresholds and measures of trustworthiness should be considered. [9]

Braden Kelley, discuss how as we learn more about a knowledge (or work) area, our understanding and abilities allow us to move the piece of knowledge (or work) from something that is mysterious and performed in an ad hoc way by experts, to a level of maturity where we start to observe the patterns (or heuristics) in the knowledge area (or piece of work), to a stage where the work or knowledge is well-understood and can be reduced

to an algorithm (or set of best practices) performed by lower skilled employees, and possibly even

implemented as a piece of code to be executed by a robot or computer. [10]

3. Proposed Architecture for Crowd Computing and Cloud Computing

To improve the application's reliability and security, clouds from different cloud service providers are encouraged. This architecture provides several benefits that other architectures fail to provide. It provides loose coupling among the components. Each cloud and the mobile device have its own responsibility in the application. If any failure occurs, it only affects one of the components, the other functions of the system are still workable.

Apart from that, this architecture provides better security which is very crucial to protect the healthcare data in the application. All the data are transferred in the encrypted form except the sending of raw data from the mobile phone/integrated system to the security cloud. Data sharing is a significant issue in medical field. Most of the mobile cloud computing architectures do not have this facility that makes the healthcare application fails to adapt to their architecture.

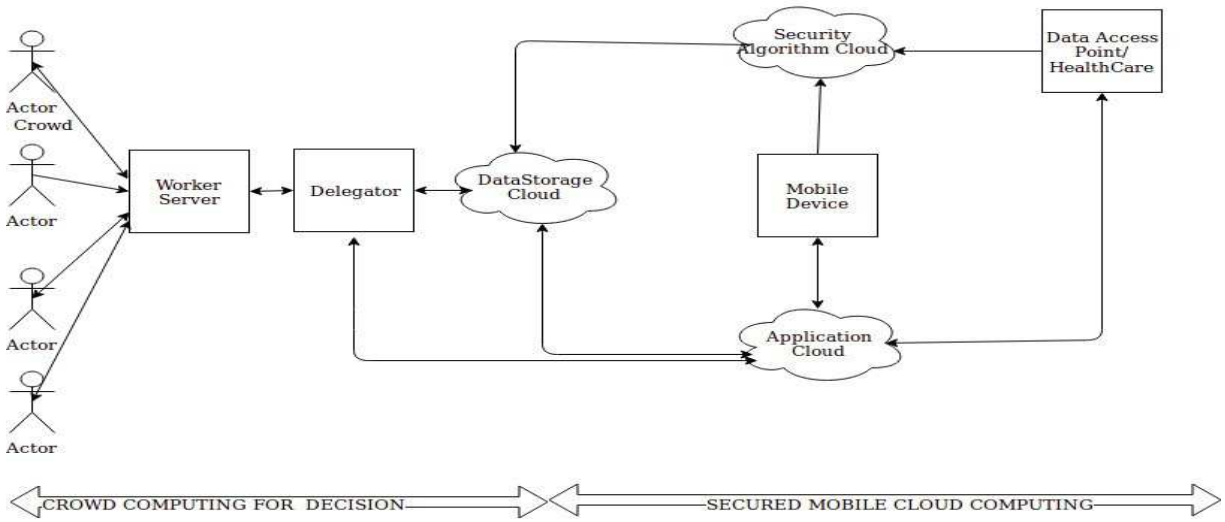

Figure: 2 Crowd and Mobile Cloud Architecture for Health Care.

It involves mobile devices, three different functions of clouds and crowd computing

1) Data storage cloud for storing the patient/ user's data. Health Records are stored.

2) Security cloud that consists of security algorithm to encrypt the data before the dat is sent to be stored in the data storage cloud.

3) Application cloud that contains the main algorithm to run the calculation and services provided by the applications and integrated systems from the authorized parties.

4) Data Storage Health records given to Delegator and queues the work and send it to Work server.

5) Work Server get the work from Delegator and given to Mobile Crowd

6) Crowd member analyze the existing data and knowledge present and sent back to work server.

7) Work server Collaborate the knowledge and given to Delegator.

8) Delegator give back the Health care Record with Crowd Knowledge
9) Application cloud do the calculation with algorithm to find the relation with crowd knowledge and Health record. And, find the optimal solution in the form of recommendation (Best hospital, Medicine, doctors, alternative like wise.)

4. Conclusion

The core characteristics of crowd computing are participation by a crowd of humans, interaction with cloud computing technology, activity that is predetermined by the initiator or application itself and the execution of tasks by the crowd utilizing innate human capabilities. We have proposed 'A novel architecture for cloud and mobile crowd computing for health care records" comprising of a collection of local nearby mobile devices, utilized to achieve a common goal in a distributed manner. Our results with crowd sourcing on mobile devices with cloud computing shows that it is a viable method for efficient work distribution in a mobile cloud especially health care records. Work distribution in a mobile environment and cloud poses algorithms to find the relation with crowd knowledge and Health record. And, find the optimal solution in the form of recommendation (Best hospital, Medicine, doctors, alternative like wise.). By the novel architecture we provide lower costs, improve efficiency and reduce error by also providing better consumer care and service with great transparency to the patient universally in the field of medical health information technology.

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