

# Efficient Method of Context-aware on Mobile Computing Environments

Wonseok Kim, Temuujin.B, Euiin Choi

**Abstract**— The development of mobile devices and the spread of wireless network help share and exchange information and resources more easily. Therefore users are able to use the information and service more free than previous wire network due to development of wireless network and device. In order to provide appropriate user services, it enables to recognize user's current state, analyze the user's profile like user's tendency and preference, and draw the service answering the user's request. Most existing frameworks, however, are not very suitable for mobile devices because they were proposed on the web-based. And other context information except location information among user's context information is not much considered. Therefore, this paper proposed the context-aware framework, which provides more suitable services by using user's context and profile.

**Keywords**— Cloud computing, Context-aware, Provisioning, Intelligence Service, Mobile cloud computing

## I. Introduction

The market of mobile recently has been evolving rapidly and Cloud Computing is spreading into mobile as well. That is why Mobile Cloud Computing is becoming a new issue today. Cloud Computing is the computing that provides virtualized IT resources as a service by using Internet technology. In Cloud Computing, a user lends IT resources (software, storage, server, network) as needed, uses them, get a support of real-time scalability according to service load, and pays as he/she goes. Especially the Cloud Computing environment distributes distributed IT resources and allocates according to user's request, so there should be a study on technology that manages these resources and deals with effectively[1].

Mobile Cloud Computing creates a new chance for IT industry because it allows the superiority and economic of Cloud Computing to meet the mobility and convenience of mobile and draws a synergy effect for both. Also Mobile Cloud Computing refers to an infrastructure that data storage and data processing is done outside mobile device by using Cloud Computing in the regardless of kinds of mobile devices. Mobile devices used in the mobile environment include personal information and enable to provide the environment that collects a variety of context-aware information. Users' demand on service types suitable for the individual situation has been increasing. 'Service users' mobile cloud computing environment has become even more important. User service means to provide the appropriate services to users using information such as the user's current situation, behavior, disposition, and preference.

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To provide user service able to provide services respond to the request by analyzing the user profile, such as the user's needs, behaviors, and preferences, as well as with the recognition for their service in order to provide system users in the situation. However, services to the users of the existing of most web-based services of the desktop environment most are not very suitable for mobile devices. Thus, for the users of mobile cloud environment, situational awareness, and the user's personal preferences should be considered. Diverse and wide range of services on the network and retrieve information. Each user efficiently and suitable situation Can provide a personalized service.

Therefore, this paper designs a context-aware knowledge Mobile Cloud service platform and develops in order to the optimized Mobile Cloud service through recognizing the conditions of user and Cloud server and reasoning on the basis of external context achieved from mobile or internal user's personal information and information of resources from Cloud server and service use information.

## II. Related Works

Mobile platform is mainly referred to mobile middleware what lets users operate the optimized contents or service on mobile and it provided a formed interface to UI and service by using RTOS (Realtime OS) and hardware function. There are Windows Mobile, iPhone, Android, Symbian, etc. as these mobile platform[2, 3, 5, 7].

There are Context-aware information modeling techniques such as Key-value model, Markup scheme model, Graphical model, Object oriented model, and ontology based model which are used in the existing ubiquitous environment and Web environment[1]. Ontology model, a Context-aware model which has been studied mostly recently, enables to express concepts and interactions easily. Recently ontology model has been studied lively related to Semantic Web study based on OWL(Web Ontology Language) and there is a movement to adapt ontology-based model in a variety of context-aware framework. One of the early methods of context modeling using ontology was proposed[4, 6].

Provisioning technology is referred to the technology related to activities and the procedure that prepares knowledge needed in advance to find the optimized resources among multiple resources and supplies by requests. It makes users and enterprises use the system by allocating, arranging and distributing IT infrastructure resources according to need of user or business. In particular, Storage provisioning identifies wasted or unused storage and drops it into a common pool. When the demand on storage is received, the administrator takes storage out form the common pool and provides to be used. It enables to construct infrastructure to heighten the efficiency of storage. Thin provisioning method and Hadoop provisioning method

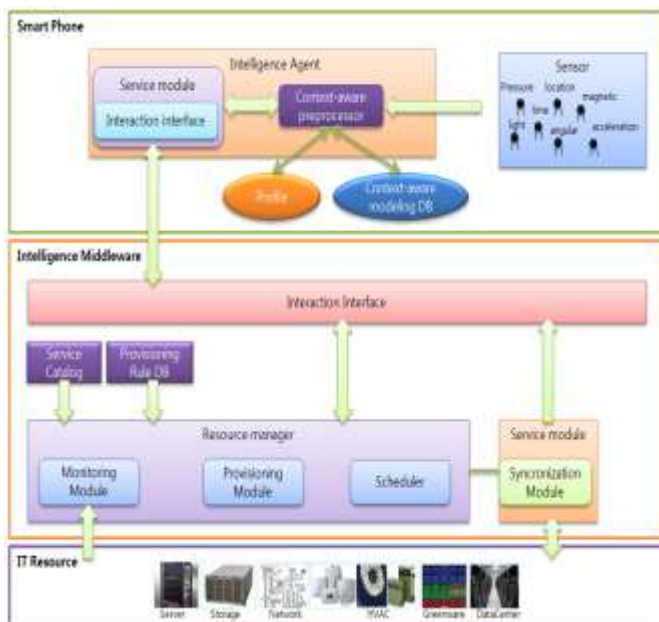
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are the representative storage provisioning methods. Thin Provisioning method is the first announced technology by 3par storage which is a joint company of Sun, Oracle, and Symantec and is a management method of storage resources. It limited IT administrators to allocate the physical storage through virtualization. There are studies on Hadoop provisioning technique: the technique that sets up software required simply or generates basic configuration files by loading data in advance and operates Hadoop work automatically and the technique that compares the similarity among resources groups and performs provisioning according to the optimized resources group which has the closest similarity. A proposed a provisioning technique based on signature[9]. It is divided into RS Maximizer and RS Sizer. RS Maximizer calculates the optimized parameters for Hadoop work to use each resources group completely and RS Sizer decides the number of resources groups in order to maximize the performance and minimize the cost when each resources group is available. Signature based technique generates signatures of optimized resources group in advance, compares them to new signature group of resources required to operate, and allocates resources according to the most similar signature information.

However, these provisioning techniques have a disadvantage that they do not consider important personal information like context information because of provisioning by using simple information of resources. Therefore, this paper proposes a context-aware knowledge Mobile Cloud service platform in order to manage resources more effectively by using personal context information and do modeling context-aware information in mobile platform and reason.

### III. Proposed Architecture



**Fig. 1.** Proposed Architecture

In this paper, we suggested context-aware-based intelligence mobile cloud service platform for efficiently managing resource to use context-aware information.

As shown figure 1, suggested system consisted of intelligence agent and intelligence middleware. Intelligence agent was responsible for understanding a variety of

context-aware information and inferring it. And it consisted of sub-modules such as service module, context-aware preprocessor, personal profile, context-aware information modeling database. Intelligence middleware was responsible for providing services and efficiently managing IT resources by user's request on mobile cloud computing. Context-aware preprocessor on intelligence agent included process for collecting context-aware information and modeling it, inferring context-aware information, and responsible for understanding what user's situation was. Service module was responsible for sending context-aware information to intelligence middleware, providing services that suitable to user. Personal profile was repository which was stored personal information, such as service information by using user, user's ID, password. Context-aware modeling database was stored to information which was modeled by using ontology. The proposed framework is Sensor handlers, context information collector, the situation engine, the proposed framework, the situation manager, service analysis module and a cloud DB. Sensor handlers collect information from sensors scattered around the situation by passing the information to the collector. To digital converter to convert sensor data and received data so that the computer can recognize context information collector consists of the stream handler. Valid handler receives the data redundancy of data to perform the inspection and the effective handler from the transducer to the sensor data passed through contextual information and the user's profile information and uses the context information modeling. Engine consisting of an inference engine reasoning situation, a user's personal information, preferences, and to store information, such as the role of the situation, save the profile and circumstances to provide the information needed for management and context-aware applications for situation awareness modeling and Manager, consisting situation, reasoning that uses the situation. Analysis services required to service analysis module, and a cloud DB. Ontology-based context model configuration Structured situation of ontology-based information obtained from sensors or computing resources to the concept of class and instance (instance). Instance of the generated class inherits all the attributes defined in the class. All properties of a class defined in the ontology instance of his inheritance. This instance actually will take on the data that obtained from sensors or computing resources. Also includes the class attribute (attribute), this attribute contains the actual sensor data. Defined as shown below, and these configuration schema based ontology for modeling context information about the user. In Context Manager and the data received from the handler is valid situational awareness and profile modeling using inference engine to infer the user's situation plays a role. In this system, the inference of the axiomatic approach with built-in ontology inference system Bossam used [8]. The inference engine developed for the first time in the domestic wrapped was developed to support the W3C's Semantic Web standards. Develop a variety of application services. Arithmetic expression is to be less in terms of predicates.

Intelligence middleware consisted of interaction interface for communicating to agent, resource manager, service manager, Service catalog, Provisioning Rule Database. Resource manager responsible for effectively allocating and

managing service information was required for processing user's request service, and consisted of monitoring module, provisioning module, and scheduler. Monitoring module crawled information of IT resource utilization.

Provisioning module set up plan for providing best service to analyze context-aware information which was transferred by user and utilization information of IT resource. Scheduler was scheduled to utilization of service and resource by plan which was established to provisioning module.

Service Catalog was stored service information for which user used, provisioning rule database was stored rule for providing best provisioning process to use context-aware information and utilization of resource. Also, service module was responsible for executing service and using distributed IT resource to providing service to user, and consisted of sub-module, such that synchronization module. Synchronization module responsible for synchronizing resource which user was using on cloud computing.

#### iv. Conclusion

In this paper, that contains the profile of the user's personally identifiable information and affiliation, affinity, and with contextual information. More suitable in the mobile cloud environment can provide personalized service framework is proposed. In this paper, we proposed Context-aware services for users of the framework are as follows. Situation entered a couple of engine status information and user profile information, and defined in ontology by the rules and to provide appropriate services to a user through the user's situational awareness and reasoning.

When compared to the proposed framework and the existing framework Context Toolkit, CoBrA, Gaia, SOCAM in handling the situation, CoBrA, SOCAM, the proposed framework using OWL-based ontology. SOCAM and proposed framework only support mobile services. In addition, a framework for service discovery in an inference engine or knowledge base and inference engine to use a combination of the SOCAM, CoBrA, proposed framework. In light of these characteristics, this paper proposed a context-aware framework using the existing context-aware framework, mobile cloud, users can provide service more appropriate and accurate. In this paper, a context-aware knowledge Mobile Cloud service platform was proposed to provide users with suitable services and manage resources effectively by using context information in the Mobile Cloud environment. The proposed platform by the paper is expected to help have the optimized personalized service and effective IT resources management in the Mobile Cloud environment.

As a further research, so as to embody the proposed platform, studies are needed on the technique that extracts context information and does modeling, the resources management technique that manages distributed IT resources effectively by using context information, and the part that examines the performance and tests after embodying the actual platform proposed

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