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# Integrating Cloud Computing and IoT for Community Health service

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**Abstract.** Nowadays, China is stepping into an aging society, and most people care about their personal health with the Chinese economic development. Chronic-diseases have become the major threat to the elder people in China. In order to ensure a real-time health care for the elders, we propose health cloud platform with IoT for community health service. The platform includes IoT health services subsystem, health cloud application service subsystem and data management subsystem. The System development and service scheme is composed of six parts according to the function: front-end data acquisitioning module, message middleware, storage center, data mining center, medical graphics image processing center and presentation layer. The health cloud platform has two main functions: real time medical care technology and personalized health service. The successful deployment of health cloud can take demonstration for others application, and promote itself cloud computing technologies development.

## Introduction

With the Chinese economic development, most people care about their personal health, and China is stepping into an aging society. Chronic-diseases, such as hypertension, diabetes, have become the major threat to the elder people in China[1]. It has become a hot research field about how to do medical care for elder people. Model-based smart environments with lots of intelligent interfaces are ready quite a long tradition, which are based on the idea of analyzing the tasks users currently perform and designing a task model of their envisaged activities[2,3]. Along with the new concept updating and new technology development, combination Internet of Things(IoT) and cloud computing technology towards health care become a new trend[4-6].

Community health care, namely medical service, is taking an increasingly important role on medical system reform in China. In this paper, we propose a social health cloud platform based on IoT technology. It has two main functions: real time medical care technology and personalized health service. A community doctor can discover timely the change of sign parameters of his/her community residents by health cloud based on IoT. It has low cost, wide coverage, high-quality service to the elder people with chronic diseases.

## The system architecture and main functional modules

The objective of heath cloud aims at improving the quality of life for elder people with chronic, through building intelligent health cloud and IoT technology. The health platform integrating cloud computing and IoT technology can provide a complete set of cloud management system for community health service. This platform mainly includes IoT health services subsystem, health cloud application service subsystem and data management subsystem (as shown in Fig.1).

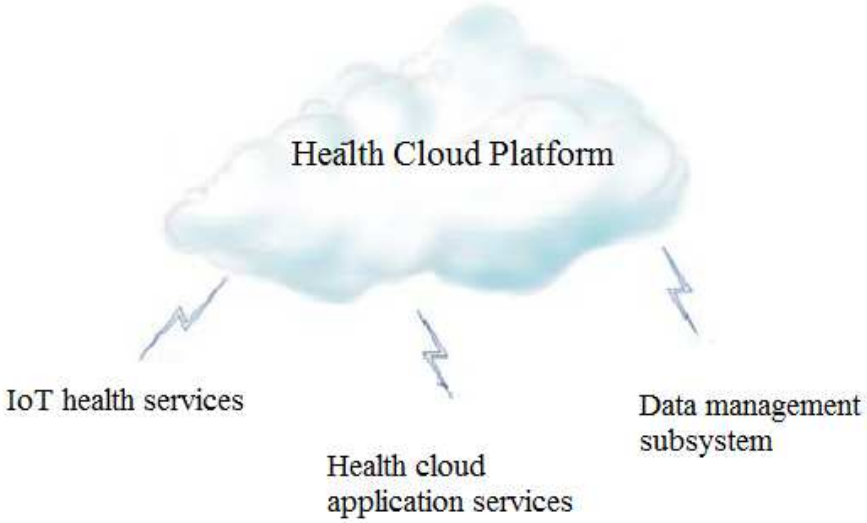


Fig. 1. The architecture of health cloud platform

**IoT health service subsystem.** The Internet of things is essentially a kind of integrated technology, which involves in various types of technologies. The key and core technology of IoT health service subsystem is how to integrate software and Middleware in the system as well as the data exchange and processing standards and the corresponding software architecture. The most important work is the construction of sensing layer and network layer of IoT. For sensing layer, the useful data can be obtained through a variety of sensing equipment, such as intelligent self-check-up devices, intelligent wearable sensors, to monitor the person's various key vital signs parameters real-time. The main function of network layer is to collecte data from sensoring layer of IoT. In order to reduce cost and maximum to use the existing network conditions, we can use wireless broadband network, mobile network, Internet.

**Health cloud application service subsystem.** Health cloud application service subsystem accepts a large number of remote application services request through the load balancing servers, and responses remote or local application service request. The subsystem consists of three parts: Load balancing servers, virtualized cluster and data base set (as shown in Fig.2). Load balancing servers are in the front of the subsystem, which balances the request tasks. Server virtualization can realize the physical servers integration and share each other's resources.

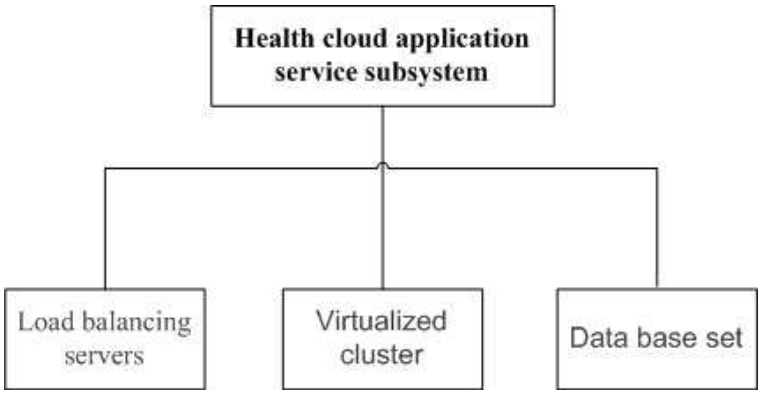


Fig. 2. Structure diagram of health cloud application service subsystem

**Data management subsystem**. Data management subsystem mainly includes parallel file system and SAN(storage area network) virtualized storage system(as shown in Fig.3). Parallel file system stores heterogeneous data, which creates a storage space in an optical fabric network for heterogeneous data in hardware and application systems. SAN virtualized storage system mainly creates a data storage space in a database system to store structured data. Data management

subsystem has a mass of data fusion capability. It takes the whole storage device as a storage pool, and reassigns to the capacity according to the front-end server.

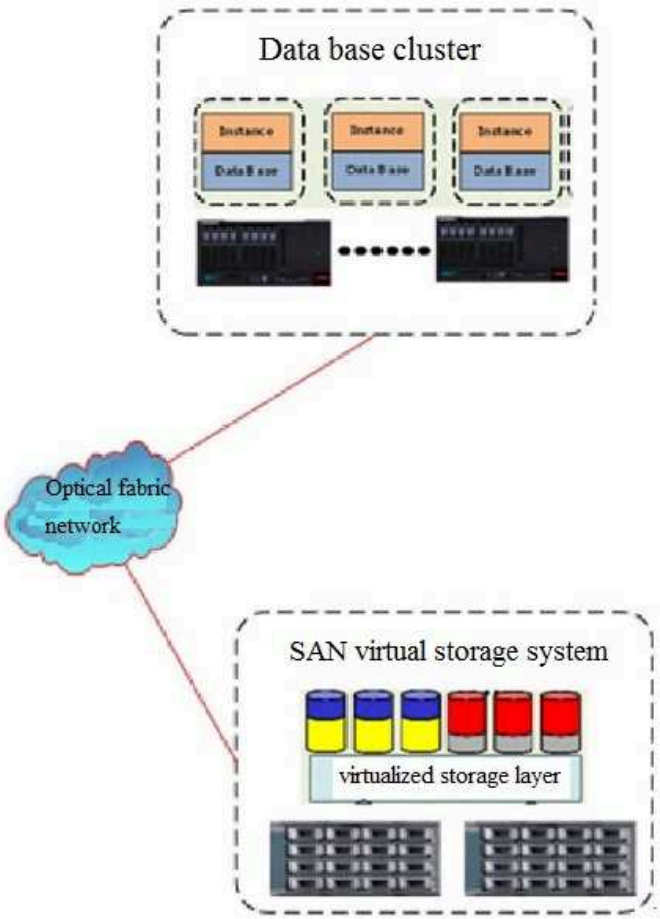


Fig. 3. Structure diagram of Data management subsystem

**System development and service scheme.**

Our health cloud platform is designed as a self-physical-check-up health cabin, which is based on IoT technology. It consists of six parts according to the function: front-end data acquisitioning module, message middleware, storage center, data mining center, medical graphics image processing center and presentation layer(as shown in Fig.4). Each part can make up a child cloud independently. Data mining center,medical graphics image processing center and presentation layer share a common storage center, which construct a looser coupling communication by message middleware based on pub-sub model .

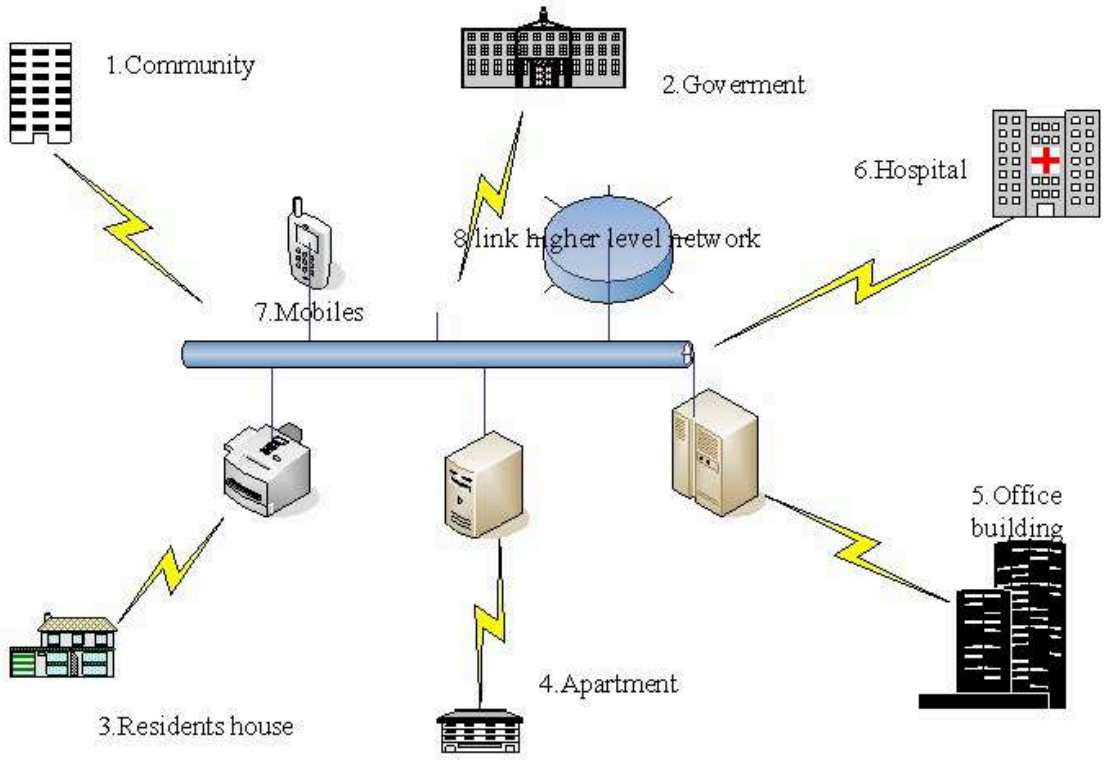


Fig. 4. The framework of health cloud platform

**Front-end data acquisitioning module.** It is an interaction model built in self-physical-check-up health cabin. When a person enters the cabin wearing the intelligent devices, ambient sensors in the cabin can"tell" you the "first hand" collecting data using IoT technology with screening about your basic vital signs, such as blood pressure, diabetes, arteriosclerosis, osteoporosis, cardiovascular disease, lung disease, and system uploads the data to the cloud automatically.It can offer personalized disease prevention and health guidance to the supervised object.

**Message middleware.** Message middleware realizes completely uncoupled among the presentation layer, data mining center,medical graphics image processing cente in the aspect of time, space and synchronization relationship using the publish/subscribe communication model.

**Storage center.** It provides the data for the entire health cloud platform. It preserves collecting data from front-end acquisition module and the analysis results from data mining algorithms from the center in the form of the files or database.

**Data mining center.** It is the core part of whole health cloud platform, which is composed of many servers with high performance computing capability. It undertakes the most important algorithm analysis.

**Medical graphics image processing center.it** parses the package of message using message middleware, and draws medical graphics by original original vital signs data.

**Presentation layer. This** layer is used for providing a user-friendly graphical interface, such as providing online experience, log/exit and other interfaces for users. It publishes system‘s data mining news theme and the original medical graphing message to other subsystems of health cloud platform by messaging middleware, and presents the graphical feedback to the users.

## Conclusions

On one hand, our health cloud platform realizes distributed data collection and integrated application of different forms of information intelligent health management; on the other hand it resolves heterogeneous data storage and sharing problems in network data processing. It covers health data spatial distribution, medical information, medical data, measuring health assessment, equipment operation and parameters of dispersion system . These mass data are distributed in heterogeneous

systems, which are based on different data format and data analysis. So we need to adopt the corresponding method to integrate medical resources and health care resources.

Only cloud computing and internet of things technology apply to specific industry, can these advanced technology play a major role in their application. The successful deployment of health cloud can take demonstration for others application, and promote itself cloud computing development.

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