

# Study on Digital Resources Sharing and Management System Integration in Cloud Environment

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**Abstract**—The purpose of this study is to present a new idea of digital resources sharing and management system integration with cloud computing to provide better service to users with cloud sharing. Looking at present new environment of digital resources utilization, this study researched establishment, solutions and prospects of digital resources sharing and management system integration in cloud environment. The result is building a digitized cloud service computing platform, which includes the platform's theory system, implementation model, platform API, implementation program, digitized resource production process and mechanism. The originality is realization of digital resources sharing and management system based on “cloud computing”.

**Keywords**—digital resources management; system and integration; digital information service; cloud computing; cloud sharing

## I. INTRODUCTION

Cloud computing is the result of development and integration of traditional computer technologies and network technologies, such as network computing, distributed computing, parallel computing, utility computing, network storage, virtualization and load balancing. It aims at integrating several relatively low-cost computing entities into a perfect system which is of powerful computing capability. Then that powerful computing capability can be distributed to end users with the help of SaaS, PaaS, IaaS, MSP and other state-of-the-art business models. The goal is to provide safer, lower-cost cloud computing resources management and service [1]. Cloud computing, as a development tendency of computer network and a progressive idea of dealing with information resources, has been widely used in many fields. In addition, it has brought a lot of new inspirations to digital resources sharing and management. So, the writer argues that with the gradual deployment of cloud technology environment on a global scale, digitized information resources sharing develops to digital resources sharing in cloud environment. From the point of view of digital resources sharing, combined with digital resources sharing theory, we should try our best to develop the new technology, research new ways and tap new information about digital resources sharing, and then share them. For example, digital technology, network technology and cloud technology make a difference to

expanding the depth and breadth of digital resources sharing. Then different user markets and information needs can be met as far as possible. It has very important effect on extension of digital resources management and service, business expansion, management model and change to building and sharing. For this reason, cloud computing technology has a great value and practical significance to promoting the developments of digital resources building, sharing and service management.

## II. RESEARCH STATUS OVERVIEW

As of March 6, 2013, the author has searched “cloud computing”, “digital resources” and “cloud computing resources” for foreign research in SCI, Elsevier, ProQuest and ISTP. And there are very few results which are highly correlated with digital resources in cloud computing environment. On the other hand, the author has searched “cloud computing resource” for domestic research in CNKI, Elsevier, ProQuest and Google Scholar. And there are only 18 results. In terms of China's National Social Science Fund Project since 1996-2012, there are 2 projects which take “cloud computing” as subject heading. One is in 2009 and the other one is in 2012. Both of them are about cloud technology applied to the field of library. There are 9 projects which take “digital resources” as subject heading. They are 1 in 2006, 1 in 2008, 2 in 2009, 1 in 2011 and 4 in 2012. All of them are about digital resources pavilion building. In terms of China's National Natural Science Fund (1999-2012), under the category of Information Science Department – Computer network – Resource sharing and management, there are only 6 project records which take “digital resources” as subject heading. And there are 19 project records which take “cloud computing” as subject heading, including 7 projects in 2011 and 12 projects in 2012. All the 19 projects research key technology, model building and data management of cloud computing and distributed resource. Under the category of Management Science Department – information resource management – government and social information resource management, there are only 9 project records which take “digital resources” as subject heading. And there are 7 project records which take “cloud computing” as subject heading, including 1 in 2005, 1 in 2007, 1 in 2009, 2 in 2011 and 2 in 2012. All the 7 projects research cloud computing in

information resource construction, development and strategy.

After analyzing the subjects, achievements and views of above researches, we can conclude that there are only a few scholars who study digital information resource from the perspective of cloud computing. Related subjects and academic achievements are few. These studies show that both domestic and foreign researches have initially formed universal cognitive theories and methods. The research status can be summarized as: (1) Cognitions of cloud computing and preliminary study on how to apply cloud computing to digital resources field are generally stuck in a shallow level. (2) Thinking about digital resources building and service with cloud computing are almost concentrated in combination of “cloud computing” and “digitization”. Existing researches lack empirical analysis and guidance on the practical application. (3) Discussions about digital resources sharing with cloud computing are forward-looking but it lack actual IT deconstruction and application model analysis.

In consideration of the above research situation at home and abroad, this article looks at present new environment of digital resources utilization. It is mainly about how to achieve management and service of digital resources building and sharing, how to improve the reliability and validity of digital resources and how to acknowledge and utilize related techniques with cloud computing. Using existing academic achievements and practical experience at home and abroad for reference, the author present a new idea on the basis of own research achievements. This idea is about how to realize digital resources building and sharing with cloud computing in line with features of cloud technology and general character of digital resources and how to achieve frame system, storage architecture, cloud terminal production process as well as policy and mechanism of digital resources cloud service platform.

### III. ESTABLISHING DIGITAL RESOURCES SHARING AND MANAGEMENT SYSTEM INTEGRATION BASED ON CLOUD ENVIRONMENT

#### A. Analysis of Value Proposition for Digital Resources Sharing and Management System Integration in Cloud Environment

The national and regional “Cloud Service” platform is built after analyzing value orientation of digital resources sharing and management system in cloud environment. Files can be saved and utilized properly with “Cloud Storage”. The “Cloud Model” can help to save cost, improve efficiency, create digital resources construction model of “low-carbon economy” and change ways of digital resources access and knowledge dissemination [2]. That is instructive basic research on digital resources sharing and management system with cloud computing.

#### B. Building “Cloud Computing” Implementation Model of Digital Resources Management System and Integration Service

As shown in Figure 1, this “cloud computing” implementation model is to design a theory scheme of digital resources management system and integration service with cloud computing. Combined with the actual requirements of digital resources management system and integration service [3,4], the “cloud computing” implementation model consists of 3 layers: resource layer, management middleware layer and service layer.

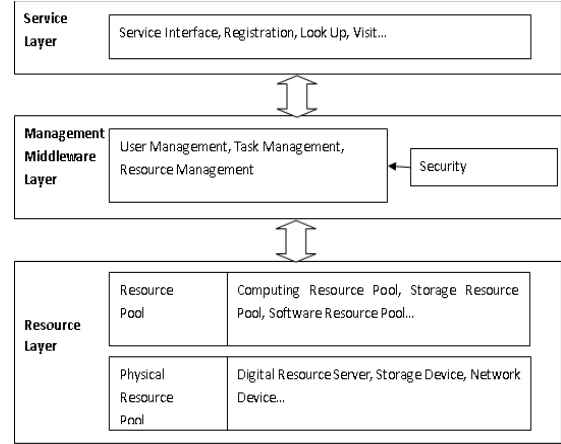


Figure 1. Implementation model of digital resources management system and integration service based on “cloud computing”

#### C. The Establishment of Application and Data Center of Digital Resources Management System and Integration Service in Cloud Environment

The implementation of digital resources management system and integration service relies on digital resources application and data center. With the help of existing cloud computing service platform, digital resources management system and integration service would be outsourced to cloud service providers, in order to build digital resources management “Cloud Service” center [5].

#### D. Building a “Cloud” Access Platform of Digital Resources Management System and Integration Service

From the current situation we can see that cloud computing applications are still in their infancy and yet unknown to most institutions and individuals. The establishment of digital resources management and integration service system based on cloud computing relies on an effective “Cloud” access platform. Thus different departments and institutions could easily log on to the “Cloud” of digital resources management and integration service system [6]. There should be an effective security mechanism for “Cloud” access platform to effectively identify user identity and prevent illegal operation and incursion, in line with security management system of management middleware layer.

*E. Implementation Program of Digital Resources Management System and Integration Service in Cloud Computing*

For a long time, because of disunion of technology and standards, the heterogeneous database of digital resources is universal. This brings about difficulties to realization of digital resources management system and integration service [7]. For this reason, the research emphasize on analyzing status of digital resources service as well as technologies and standards applied in current digital resources service and management, in order to find which technologies and standards can form digital resources with regulatory requirements and which still need to be handled [8]. Standards related to digital resources management system and integration service should be improved right along to regulate the use of information technology. In addition, coordination between standards of digital resources management system and integration service and standards of other digital resources service should be noticed, so as to realize the digital resources management system and integration service on a larger scale.

*F. Study on Theory, Method, Applications and Countermeasures of Digital Resources Management System and Integration Service with Cloud Computing*

This part includes: research on classification, archiving, general principles of description, requirements, elements, methods, specifications and technical programs of digital resources management system and integration service with cloud computing; research on digital resources integrated management and service system with cloud computing; research on digitization, networking and informatization of digital resources integration management and service system, as well as technical requirements, technical elements, technical approach, technical specifications and technical solutions with cloud computing [9].

#### IV. DIGITAL RESOURCES SHARING AND MANAGEMENT SYSTEM INTEGRATION SOLUTIONS IN CLOUD ENVIRONMENT

*A. Design of Metadata Registry (MR) System for Digital Resources Sharing and Management in Cloud Environment*

Digital resources metadata registry system is used to release, register, manage and retrieve specification standards which includes defined information, markup scheme, conversion rule, description rule and application guide. It also supports discovery, identification, analysis, calling, interface, searching and exchange digital resources metadata specification in “cloud computing”, and then achieve conversion, excavation and reuse of digital resources metadata [10]. Therefore, the primary goal of digital resources metadata registry system is to establish a authoritative, reliable, scalable and sustainable registration management mechanism of digital resources metadata specification and application system with “Cloud Storage” and “Cloud Service”.

*B. Memory Architecture of Digital Resources Should Be Built in Accordance with “Cloud Computing” Service Management System*

After applying “cloud computing” service technique, digital resources museum just need to submit all digital resources to selected cloud service providers, and sign information security agreement with providers. Thus staff of digital resources museum could complete information storage of digital resources without knowing stored procedure and server location. However, as archives are usually closed which often involve national security and information confidentiality, it is inconvenient to disclose all the digital resources information which need to be selected and identified. Unified standards in national archival work should be planned so that digital resources which are appropriate to be shared in public “cloud computing” can be searched and utilized directly by users after selected and identified [11]. At the same time, digital resources which are not appropriate to open to the public will be placed in private part of “cloud computing” which possesses infrastructure autonomous right. Only users through certification can make an inquiry, so as to provide intelligent and personalized service, as well as to protect information security.

*C. Building Unified Metadata Repository System of Digital Resources with “Cloud Computing” According to the International Organization of Standardization (ISO)*

The metadata simple feature specifications and standards(ISO/ICE 1179) established by ISO, that is the metamodel and basic attributes of metadata registry, support sharing and reuse of data elements. Obviously, digital resources metadata management is the central issue of this research project. Digital resources metadata repository system is created for digital resources metadata access and the whole digital resources metadata lifecycle management. It is a platform of digital resources metadata access and aggregation which can achieve off-site digital resources metadata integration. In addition, digital resources metadata exchange pathway, that is digital resources metadata exchange protocol, need to be established so that digital resources metadata in different system can be mutually visited by this pathway. As a result, digital resources metadata management is achieved by integrating distributed and heterogeneous digital resources.

*D. Digital Resources Sharing and Management System Must Be Constructed in the “Cloud Computing” Infrastructure Service Platform*

Infrastructure as a service (IaaS): a data center which is built using virtualization technology put computing resources and storage resources (including memory, I/O device, computing power CPU, bandwidth, storage, etc.) distributed in lots of computers and storage devices (including local and remote devices) together to form a virtual resource pool, so as to provide service on demand to network users [12]. Applying platform built with network service media, all digital resources museums can integrate

and uniformly store their digital resources and storage resources in virtual repository. Digital resources museums located in various regions can share servers, databases, routers and switches and other system equipment, so as to reduce workload of application programs [13]. Implementation of digital resources sharing and management system infrastructure service cloud platform is conducive to conversion of scientific ideas and programs for digital resources sharing and construction. View of investment is switched from physical infrastructure to virtual facilities which are provided to users as convenient services.

#### E. Realizing Digital Resources “Cloud Computing” Service

If the digital resources information is placed in the cloud center, users can retrieve digital resources “virtual resource pool” in cloud environment with cloud computing technology. As a result, “literature information barriers” in traditional literature are broken, and problems about “literature information islands” are effectively solved. In addition, the communications and exchanges of various digital resources “Clouds” will no longer only store digital resources in various resource institutions. These institutions can work together to build “Cloud” library of digital resources. Therefore, resource catastrophes caused by earthquake, fire and other force majeure events can be avoided and digital resources “Cloud” service becomes another form of offsite backup [14]. When virtual machines is necessary to be repaired, administrators only need to create a virtual machine image and back original data up one by one to this image, so as to effectively guarantee the safety of digital resources.

### V. THE PROSPECTS OF DIGITAL RESOURCES SHARING AND MANAGEMENT SYSTEM INTEGRATION IN CLOUD ENVIRONMENT

In summary, applying cloud computing technology and combining revolution ideas, digital resources integration and sharing, core technology, management strategies and methods of digital resources management in archives informatization field, the writer studies theoretical framework, system architecture, storage structure, security system, calculation methods, service platform, process management and security mechanism of digital resources sharing and management system based on “Cloud Platform”. The designing scheme about metadata register system, metadata storage system, shared service system, information security system and other functions of digital resources sharing and management is put forward. Taking advantage of characteristics of cloud storage and cloud service, new mode of digital resources sharing and management is combined with “low-carbon economy”. Access and transmission modes are changed. What is more, innovation and security mechanism of organization and management, process, resource sharing and acquisition, fund operation, system platform and other service platforms of digital resources combined with cloud computing is proposed. The innovation of the system construction is realization of

digital resources sharing and management combined with “cloud computing” service.

In brief, users are satisfied with digital resources, management process is cost effective and management result realizes its best value by means of integrating and controlling digital resources service, customer service, management process and management result. The specific contents are as follows:

- User satisfaction of digital resources in cloud environment: The study is mainly about regarding social information, market demand and service of digital resources construction in cloud environment as an organic continuous whole, and building a theoretical system of digital resources integrated management and service in cloud environment, which treats customer satisfaction as the core with history, reality and future.
- Cost-effective process of digital resources management and service in cloud environment: International standards need to be carried out to establish quality system and standard framework which run effectively. Thus the formation, protection, classification, utilization and other business links of digital resources are always controlled in cloud environment. This provides efficient and cost-effective optimization theory and practice guidance to digital resources construction and service management.
- Best value realization of digital resources service and management result: It is necessary to promote digital resources construction, as well as accumulation, sharing and exchange of digital information and knowledge. Knowledge management mode can provide long-term available, desirable in time, real, reliable, complete and accurate evidence, information and memory of digital resources construction for sustainable development in cloud environment.

### VI. CONCLUSION

“Digital resources cloud sharing” is the challenge for development of digital resources in cloud environment. It is committed to mutual sharing of digital resources in a freer cloud environment and a broader space, in order to provide more digital services and knowledge services to all users [15]. From perspective of digital resources sharing, this article discusses the connotation of “digital resources cloud sharing” as well as integration of its management and service system, on the basis of in-depth exploration to cloud computing technology and cloud service concept. On the one hand it is conducive to help users to clearly recognize their resource demand and accurately obtain relevant services of “digital resources cloud sharing” on demand in cloud environment. On the other hand, it is conducive to help service providers to selectively offer sharing service which can meet users’ needs to the maximum combined with the situation of providers, in order to provide a good collaborative environment for the development of “digital

resources cloud sharing” and achieve a wide range of digital resources sharing to a maximum. However, this article does not in-depth analyze issues like how to deal, which algorithm to adopt, how to manage these shared digital resources and how to guarantee the safety of “digital resources cloud sharing” service, when multiple users use “digital resources cloud sharing” at the same time. These issues will be the writer’s research contents in future.

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