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Preservation Mechanism of Network Electronic Records Based on Broadcast-Storage Network in Urban Construction

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Abstract: With the wide application of information technology in urban infrastructure, urban construction has entered the stage of smart city, forming a large number of network electronic records. These electronic records play a vital role in the maintenance of urban infrastructure. However, how to preserve the network electronic records in the field of urban construction is still lack of a comprehensive and serious study. Aiming at this problem, the paper proposes to use the technology of broadcast-storage network to preserve the network electronic records for a long time and gives the concrete preservation process.

Keywords: Electronic record, urban construction, broadcast-storage network.

1 Introduction

City is the main place of human activities. It is the hub of human flow, logistics, information flow and value flow. It has a great influence on economy, society and ecology. Urbanization is an important driving force for the economic and social development of developing countries. According to statistics, the urbanization rate of China in 2015 is 56.1%, and the process of urbanization has entered a new stage [Li (2017)]. At present, it is a critical period of new urbanization, industrialization and Informaionization in China. The carrying capacity of cities is limited, and the demand for urban development continues to grow. The harmonious development of city economy, society and ecology is facing enormous challenges, and many urban diseases have emerged. To build a city with low carbon, green and sustainable development and achieve a better city life is the common goal of human beings.

In the contemporary era, urban construction is entering the era of Internet and big data. Urban construction also presents new characteristic of the times. On the one hand, urban construction should be people-oriented, which will focus on individual and group

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behavior, city space cognition and emotion measurement, and provide intelligent services more friendly for individuals, organizations and government agencies [Li, Yao and Shao (2014); Liu, Li and Jia (2018)]. On the other hand, urban construction should be guided by problems, explore and solve the challenges of economy, society and ecology in new urbanization, so as to achieve a better and harmonious urban life.

In the current era, a large number of sensors are deployed in urban construction and a wireless network has been formed. Specifically, the inductor is embedded and equipped to various objects such as power grids, railways, bridges, tunnels, highways, buildings, water supply systems, oil and gas pipelines, etc., and is universally connect-ed to form the internet of things [Wang, Shen, Li et al. (2018); Shi (2018); Ren, Shen, Liu et al. (2016); Zhang, Chen, Du et al. (2016)]. These sensors provide users with fixed, nomadic and mobile ubiquitous applications and services through various wired and wireless networks. For example, these sensors will collect all kinds of information, including state data of buildings, high speed rail, and so on. Thus, large quantities of network electronic records in the field of urban construction are produced and widely used. How to ensure the long-term preservation of urban and rural construction activity in the real history and ready to use, has been throughout the construction sector, an urgent and arduous task of building the system of business management department and engineering construction, construction, design and supervision units facing. This paper focuses on the study of the long-term preservation of network electronic records in urban construction.

The rest of the paper is organized as follows. Section 2 introduces the related work. In Section 3, the problem of the preservation for network electronic record in urban construction are stated. And Section 4 introduces the technology of broadcast-storage network. Section 5 gives our preservation scheme based on broadcast-storage network. Finally, Section 6 concludes this paper.

2 Related work

In recent years, international academic exchanges and research activities related to the management of urban construction archives are becoming more and more frequent. For example, the British Archivists' Association held a seminar on the preservation of architectural archives at the British National Archives. In 2000, the Ameri-can association for the conservation of literature held an academic seminar on building documentation management in Pennsylvania. In the same year, the building archives of the international archives council were formally established, and the first international symposium on building archive appraisal was held. In 2002, the international association of architectural museum in the Austrian capital Vienna held the 11th international conference on the building museum, joint, discusses the new mode of architectural museums and archives, new methods and new activities and new opportunities [Wang (2014); Gou (2017); Bi and Xie (2015)]. In 2003, the National Archives Building Council archives with the Spanish Ministry of culture and Industry University in Madrid Alcala de henares held the first International Conference on building archives, which discussed construction record generation, construction records management, retrieval, protection, utilization and identification, destruction and so on [Jiang and Li (2015); He, Wu, Wang et al. (2017)].

Construction of archives in recent years the international academic research has obtained certain achievements, the international council on archives construction experts published in 2000 “A guide to the preservation of architectural documents in the 19th and 20th centuries”, designed to guide the construction of such archives construction file storage, especially for the preservation and protection of electronic records; American buildings record protection committee published in 2000, the Massachusetts construction records “in digital age, electronic records are discussed information and protection is faced with various problems and some practical counter-measures; The traffic in the central government, local government and regional departments in 2002 published “metadata optimization management principle”, to guide the government in the geographic information, spatial data management optimization of management experience and methods; 2002 European countries put forward the digital environment action plan in the study of history, of the archaeological sites, monuments, historic buildings, landscape architecture, such as European cultural heritage protection and digital record proposed to establish the integration of data standards of research topic, for the European countries to establish historical environment information resource network of cooperation study provides guidelines; In 2003, the American association of archivists published standards for archiving and cataloguing of architectural and landscape design records [Yu and Lu (2009); Xiao and Wu (2015)].

3 Problem statement

The Internet of things made up of mass sensors in urban construction will continue to collect massive amounts of data. These large data need to be stored, processed, querying, and analyzed to be fully applied to all types of applications, thus providing intelligent services. As a result, it also leads to the difficulties in the preservation of the mass urban construction network electronic records. The original, authenticity and integrity of the electronic records of urban construction have the following challenges. Under the current large data environment, it is a great challenge to ensure the aboriginality, authenticity and integrity of urban construction electronic records.

A. Aboriginality

The aboriginality of electronic records is not easy to judge and confirm. The original nature of the traditional paper files can be expressed in the form of its content and carrier. People can analyze their primordial nature through fonts, imprints, even handwriting, paper, etc. However, an electronic record is generated, in which the form of an electronic record changes from an entity state to a virtual state. And it is completely out of this primitive state. The state of the generation of an electronic record is exactly the same as the state of transmission and reception. Therefore, the electronic record is original and replicating.

B. Authenticity

Electronic records are easy to modify and can be separated from the carrier, this makes the electronic record likely to be altered in the process of formation or trans-mission. Whether the processed electronic records are the same as the original also has the difficulty of identifying. The probability of information content error is far higher than

the traditional paper archives. Electronic records can be copied from the original sample. Even electronic records can be tampered with no trace of modification.

C. Integrity

Electronic records are often in a state of flow, such as from the generator of records to the manager of records. If the electronic record is not collected and arranged in time, it may cause information loss of record. The structure of electronic record is complex, and the storage methods are diverse, which can easily cause the defect of information of electronic record. The form of record is diverse, the storage of record is dispersed, and it is easy to lose due to the electronic form. The features of records easily cause the electronic record to lose its integrity.

4 Broadcast-storage network

At present, more than 90% of the traffic of the Internet comes from content distribution. The Internet has evolved into a scale-free network that obeys the power law. The mainstream Internet application paradigm is undergoing profound changes to content-centered information sharing. The existing Internet architecture adds an auxiliary network characterized by broadcast radiation transmission + ubiquitous content storage. This secondary structure network is called broadcast-storage network [Gu, Yang and Dong (2017)].

The feature of the broadcast-storage network is that it is a physical revolution based on the complementary advantages of a variety of networks including internet, telecommunication and broadcast network. And it is also the future internet innovation scheme based on the dual network thinking of the main and secondary structure conjugate [Huang, Yang and Gu (2016)]. Its outstanding advantage is functional coordination and logic decoupling as a secondary auxiliary structure of future internet architecture, comparing with the primary structure of existing Internet TCP/IP. And it does not hinder a variety of evolution or refactoring schemes for the main structure of the Internet, including IPv6, software defined network (SDN) and information centric network (ICN).

Broadcast -storage network and information centric network have some similarities, such as they emphasize the concerns of the network from the place (where) to the content (what), pay attention to the presentation of new content-oriented identity, they are more dependent on the network in the cache, etc. But there exist obvious differences between broadcast-storage network and information centric network. For example, the study on routing and forwarding capabilities that are usually highlighted in the ICN. Because physical broadcasting naturally has radiation distribution characteristics without media and bandwidth constraints, it is greatly weakened in broadcast-storage network. In addition, most of the ICN research projects emphasize the idea of "clean-slate", which is often difficult to reconcile the relationship between the new scheme and the existing internet architecture. And this is a hindrance to its promotion. In the sense, SDN is much more relaxed about the existing Internet architecture than ICN. So, its real acceptance is better than ICN. In contrast, the storage network is cost efficient as the core criterion for future internet architecture, which is not limited to unified thinking bound. It not only

recognizes the main position of the existing internet architecture, but also introduces a secondary auxiliary structure to make up for its significant mismatch with the mainstream internet application paradigm. Moreover, it defuses the realistic resistance to try to recreate a new network and provides an innovative solution for the research of the internet architecture with minimal evolution costs [Yang and Li (2015)].

The network model is shown in Fig. 1. The unified content label (UCL) and information resources are one-to-one correspondence, which contains the abstraction information of information resources. The user receives full UCL and determines whether need access to information resources. The network embodies the design concept of content centered for the identification of the contents, distribution, cache, navigation, and adaptation, which are all based on the unified content label. In short, UCL can be represented as the binary group (UCL-Code, UCL-Properties >. The UCL-Code is fixed UCL identification code, and UCL-Properties is flexible long property description contents. UCL is different from the current WWW based on URL, which uses an address location method in information space. It is different from the NDN and LISP, which use the "name" to index information content, and it can be more comprehensive description of the content-rich semantic information. And it is closely related to the content of the readers, authors and managers, and based on the content of security to provide foundation. The organic combination of broadcast distribution and ubiquitous storage, as well as the UCL that serves as a bridge between the two, together form a creative base for the network architecture [Gu, Yang and Luo (2015)].

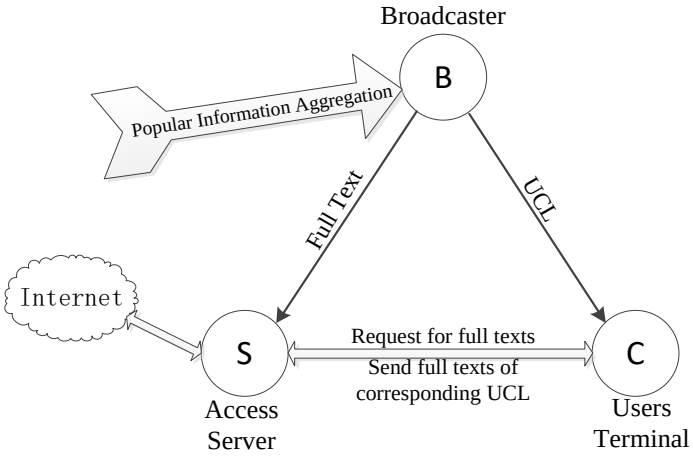

Figure 1: Broadcast-storage network model

Unified content label is a metadata containing information resources, such as web pages, which is used to describe and index the attributes and contents of information resources. It is the key to realize the broadcast- storage network. UCL contains a summary of information resources. The users can browse through UCL to see if they are interested in their corresponding information resources.

5 Preservation mechanism of network electronic records based on broadcast-storage network

Because the UCL content is concise and occupies a small space, it can be centralized storage, unified broadcast, distributed storage, or both. The method of centralized storage stores all UCL to the server, and automatically updates the database once new pages and new content appear.

Distributed storage requires adding UCL hypertext code based on existing web structure. The XML represents the extended markup language. XML is a simple data storage language that uses a series of simple tags to describe the data, which can be built conveniently, extremely simple, easy to master and use. According to the schema of the corresponding network electronic record, the database is initialized. The schema is used to define XML records. The working principle is shown the following figure.

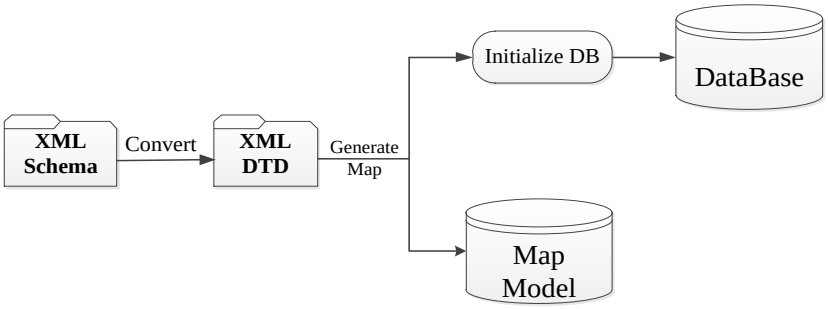

Figure 2: Initializing of the XML database

Converting the XML Schema to a DTD, using DTD-to-database mapping theory to automatically generate a Map model based on the input of DTD, which is essentially an XML document that accords with a specific DTD. And it is used to describe the mapping rules for the XML and relational databases associated with the DTD. And it is sent to the mapping entity model library for unified management and maintenance. At the same time, the records containing the initialization information of the database is generated. The module of Initialize-DB handles the records containing the initialization information, which generates the tables corresponding to each element type, and defines the primary key of each table and the reference relationship among the tables.

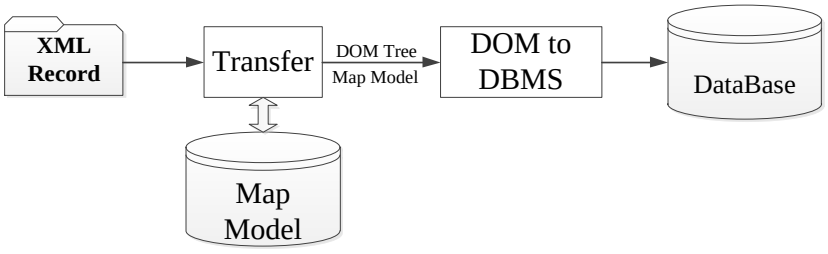

Figure 3: Preservation of the XML record

In transform XML data to relational database, the transfer modules firstly parse the XML document through the XML parser, establishes the document object model tree. And then, the corresponding mapping entities in the model library are transferred. DOM is submitted to the module DOMToDBMS with the mapping entity, which stores XML into the user specified database based on the mapping rules defined in the mapping entity.

6 Conclusions

With the wide application of information technology in urban infrastructure, urban construction has entered the stage of smart city, forming a large number of network electronic records. These electronic records play a vital role in the maintenance of urban infrastructure. However, how to preserve the network electronic records in the field of urban construction is still lack of a comprehensive and serious study. Aiming at this problem, the paper proposes to use the technology of broadcast-storage network to preserve the network electronic records for a long time, and gives the concrete preservation process.

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