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Cloud-based Application of Encipher Scheme for Web of Things

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Abstract: In view of the absence of the unified coding method for the products in all areas in the circumstance of internet of things, this study brings up a new coding method. This method extracts the displacement objects and the physical objects, expound the relations between them, elaborate the coding principle and set up a virtual database corresponding to the real world. And we can meet the requirements of the real time monitoring and intelligent management of every products real state under the circumstance of the internet of things by establishing the corresponding parsing information service system.

Key words: Classification, items identity, code resolution, cloud resolution

INTRODUCTION

The concept of "The Internet of Things" (Fan, 2013) was put forward in 1999 from the M.I.T. Auto-ID Research Center of the United States. The Internet of Things was defined as follows: To link all things with the radio frequency and bar code and other information systems for realizing intelligentized identification and management. The Internet of Things is part of Internet in the future, it is negotiation based on standard and communication agreement and has ability in configuring dynamic world network foundation structure. All the tings in "Internet of Things" (Zhang *et al*., 2010) have identifier, physics character and special property and are in conformity with information network.

The unified coding identification is the foundation of the construction of Internet of things. However, at present there are many problems in the development of the Internet of Things. The coding systems are not uniform, not compatible with one another and limited to certain areas, thus being unable to be applied to a multi-industry and cross-platform in a large-scale way. Due to adoption of the respective coding schemes, the domestic application of the Internet of Things demonstration project will encounter such a bottleneck problem that the code identification is not unified, when being applied to a multi-industry and cross-platform in a large-scale way. Along with the deep-going development of the Internet of things, information interaction as well as collaboration and information sharing (Sarma and Girao, 2009) among heterogeneous systems will gradually increase. It has become a consensus to establish a unified coding identification system for Internet of Things.

Pros and cons of the current coding system

EPC coding system: EPC (Wang, 2004) is a set of digits that is made of version number, domain administrator, object classification and serial number and is the most promising article numbering system (Wang, 2004). Since, there is a variety of field length in different domain administrator, there differences between EPCs. For example, since there are different field lengths managed by domain name, the number of controlled manufacturers varies with the versions of EPC. The hierarchy configurations of natural domain name are different, as can be illustrated by the following Fig. 1.

Ucode coding: Ucode coding which is the only products identification all over the globe, is made by the Japanese ubiquitous network. The coding system is available of four versions (128, 256, 384 and 512 bite code). The total length of the ucode coding system and the lengths of the fields are not specific. Since, manufacturers use it separately, the specific information can only be achieved under the environment of various ucode bars provided by various manufacturers. The Fig. 2 shows the coding structure of the 128 bite code ucode.

Commerce product code: CPC is firstly made and used by the international electronic center of Chinese commerce department. The structure of CPC is as Fig. 3 lists.

CPC is made of 78 bite code decimal digits. The first field is area code, accounting for 10 decimal digits; the second is maker codes, accounting for 14 decimal digits; the third is product serial code, accounting for 16 decimal digits, with the first 15 as standard code and the last as the digital check.

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		Version No.	Domain management	Object classification	Serial No.
EPC-64	Type 1	2	21	17	24
	Type 2	2	15	13	34
	Type 3	2	26	13	23
EPC-96	Type 1	8	28	24	26
EPC-256	Type 1	8	32	56	160
	Type 2	8	64	56	128
	Type 3	8	128	56	64

Fig. 1: EPC coding structure

Version	TLDC	Class code	dc+ic
4	16	4	104

bits

Fig. 2: 128 bite ucode coding structure

	Geographical codes	Vendor identification code	Product serial code	Serial No.
CPC-78	10	14	16	38

Fig. 3: CPC structure

For different application areas, different coding identification methods are used. The coding systems vary greatly and are not universal. So it is impossible to sort out all the problems only by one specific coding method which is especially true in the solving of the coding problems for new products and new things. Last, different coding systems are not compatible. All the problems are the obstacles for the development of the internet of things.

MATERIALS AND METHODS

Ideological origins of coding: According to the needs of the development of the Internet of things now, put the items as much information as possible, in the most concise form of coding identify specific items, at the same time also can meet the needs of society in the future, will greatly simplify the subsequent work of iot system is the labeling, identification, decoding, etc., convenient or compatible now transform coding system (Kong *et al*., 2008) in some areas, the development of the Internet of things in the whole world, a profound impact.

Classification of item: Matter exists in the form of: movement and stillness (Xu *et al*., 2013), all matter in motion.

Therefore, the form of the material is movement, items form of movement is mainly manifested in the change of position and use value of the loss. In the commodity economy, commodity form generally must undergo the exchange value, namely the ownership of the goods changes, then people use, access to use value finally disappear. The information factors that describes the main items, therefore, is produced, displacement, the real right change, such as use value loss of state information.

Goods generally have changes in position from production to abandonment. The change of location depends on the movement of an article. According to the movement properties of items-whether goods can provide displacement services for other goods, we put all the items into the following two categories: Displacement items which can offer the displacement services for other goods and the entity objects. For example, T110 train is the displacement object from Shanghai to Beijing station. From the point of view of the motion form of matter, it is actually an acting factor provided by the Shanghai railway bureau to turn the physical location of the passengers or cargoes from Shanghai to Beijing and the acting factor in this study, is referred to as a displacement item, while people and goods on the train are referred to as the entity objects.

Relationship among articles:

- Through the organic combination, Physical objects form new items. Boeing parts manufacturers of goods, for example, final assembly into Boeing aircraft

- Displacement between items can carry each other, for example, the logistics industry is the displacement from point "a" to point "b", for example, the China post mail from point a to point b, can provide the displacement with the aid of railway and civil aviation services
- With the aid of displacement class goods, Entity class objects move in the form of displacement. Take online shopping for example; shopping goods, for example, through the logistics of displacement of highway, railway and aviation and so on to provide products, finally reaches the consumer
- Vendors provide displacement goods through physical objects. For example, the Railway Bureau provides displacement services for other entity articles through the train

How to encode items: Entity class carrier and displacement class entity items with common coding elements, so the code uses the same method. According to the items below code elements: geographic coordinates, item category code, singletons, one by one introduce encoding rules for analysis.

Encoding method for physical objects:

- **Location information:** The source of the goods is relatively fixed only. The origin of a product or factory, for example, relative to the earth reference frame and its address is fixed, can be determined by (longitude, latitude and altitude) only and also determines the number of countries, regions, zip code, street manufacturers such as registration information. Therefore, company registration, on the basis of the existing information, coupled with their geographic coordinates. The formula is shown as follows:

$$g(x, y, z) \rightarrow e,\ e \in E \quad (1)$$

Wherein, x denotes the latitude, y means the longitude, z refers to the height relative to the surface (applicable to the high-rise buildings and can be omitted when manufacturers are on the same coordinate,). E represents the world's existing or future goods manufacturers, e refers to a particular manufacturer. Later in the article section, if not otherwise specified, these parameter variables have the same meanings

Due to the coordinates of the point on the surface of the earth is infinite, it determines numerous manufacturers, but also can hold unit that may occur in the future. To solve coding problem due to the expansion of the future social development, once and for all. It has broken the traditional countries, regions and a series of encoding discrimination, unfair problem such as registration order etc.

- **Categories of items info:** With the constant progress of science and technology, the world economy rapid development. Material wealth rapid expansion, the rapid growth of item. And a wide range of USES. The traditional encoding method is facing severe challenges. Here presents a new scheme to solve the problems of traditional coding in goods classification. For a manufacturer e, the types of produced goods are very limited. Therefore, the categories of items are just numbered in accordance with the order of the production. You can create a mapping function from the Item Type No to detailed information of this article (for example, type name, brand, raw materials, transportation, processing, valid, weight, size, etc.). The function is expressed as follows:

$$g(x, y, z, m) \rightarrow m \in \{M\} \quad (2)$$

Wherein, m represents the number of item categories produced by the e, M denotes the kind of products information (categories of items name, brand, raw materials, transportation, processing, valid, weight, size, etc.).{M}is an aggregate which contains all kinds of product information produced by the e

- **Single product code information:** In daily life, the enterprises engaging produce a lot of product types. Need for each product serial number. Plus two pieces of code above, a function relationship between the item code and the single product information can be finally established. Below is the function:

$$g(x, y, z, m, n) \rightarrow N,\ n \in \{N\} \quad (3)$$

Wherein, n denotes the n-th article of certain self-ID, {*N*} is the specific details of a product collection

Coding the displacement of the service information: With physical objects the same coding method, can accomplish carrier code of the item. the analysis information which corresponds to the code, is the only difference:

- **Location information:**

$$g(x, y, z) \rightarrow e,\ e \in E$$

Wherein, x denotes the latitude, y means the longitude and z refers to the height relative to the surface (applicable in the high-rise buildings and capable of being omitted when manufacturers are on the same coordinate). E represents the world's existing or future displacement goods manufacturers, e refers to a manufacturer. Later in the article section, if not otherwise specified, these parameter variables have the same meanings.

- **Displacement category code:**

$$g(x, y, z, m) \rightarrow m \in \{M\}$$

Wherein, m represents the No of displacement provided by the e, M denotes the kind of displacement product information (starting point, destination, departure time, arrival time, etc.). {M} is the aggregate which contains the details of the kind of displacement

- **A displacement encoder:**

$$g(x, y, z, m, n) \rightarrow N, n \in \{N\}$$

Wherein, n represents a displacement article number, N represents this displacement goods details (physical objects equipped with this displacement goods, owner, status information), {N} refers to the all the displacement products detailed information

Above all, the item coding method and the parsing information are shown in follows Fig. 4.

Coding theory according to the entity and the displacement of the binding mode:

- **Coding between physical objects:** By means of organic combination physical objects form new items. Assume an example below. A_1, A_2...A_n, represent a series of physical objects, provided by different manufacturers. And a new product B is produced by organic combination of other enterprises. B adopts the above coding method. Its parsing information should include these codes of A_1, A_2...A_n directly besides the necessary instructions, so as to find out the details of the article B easily. If B combines with other products to form a new article, the analyzing information should contain the code about B. For more complex situations, use the above method, with a nested loop resolution
- **Coding regulation between the displacement services:** Displacement items carry each other. Suppose that the parameters C and D represent the displacement of the items. Assume the following circumstances. C, as a displacement article, from point a. to point b., needs the services of displacement item D. The corresponding analysis information of the D code must contain the code of C. The state information of them is interrelated. Here cites an instance to illustrate their relevance. Found in the status information from the code of C, its position is changing with the updating state of the D. Analyse the multiplet mounted article with the same manner as above
- **Parsing rules between entities and displacement:** By the means of displacement goods, physical objects move in the form of displacement. Displacement goods regard physical objects as a carrier, offering displacement service to other physical objects. Assume that the displacement Item C supply a physical object E with the displacement service and an entity object F carrying C is a means of transport. Then analytical information of C should include codes of F and E. The information of the displacement item C and transport vehicle F can be obtained from the code of E. And literal explanation of their analytical information can depend on actual situation

CLOUD-BASED ANALYTIC SERVICE SYSTEM THE PARSING INFORMATION SYSTEM ON THE HADOOP

In the user's view, the resources of the cloud platform are infinitely expandable. Taking advantage of a variety of terminal equipment, users can be connected to the cloud platform via., the network (Wang and Zhang,

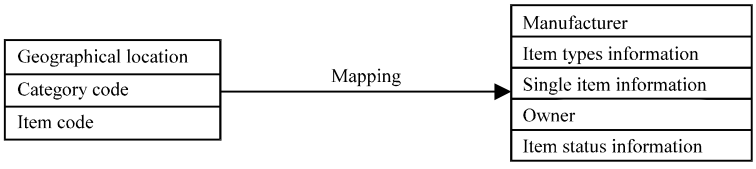

Fig. 4: Coding parsing structure diagram

2013), to obtain in any time, use in real-timely, extend and compute and store resources according to the demand. It can satisfy the following requirements of the Internet of Things data processing: massive, multi-state, dynamic and associative.

The data (Zhang *et al*., 2013) generated by the internet of things needs to be collected, processed, stored, analysed and used. And to manage and integrate the quantitative nodes and data, we need a distributed data management system. Cloud storage, as the main base and application of the cloud computing, can manage quantitative date set and store, process, analyse and visit the specific objects efficiently in quantitative data which can be powerful enough to manage the data of the internet.

What is more, cloud storage system (Zhong and Zhong, 2013) can reliably, availably and economically provide multiple copys for one data. The distribution of the copys will be directly related with the expenses of the storage, research and updating of the copys. As location information is available in the coding method of this study, we can, with the least copys, effectively lower the cost of date visiting, avoid the concentrated distribution of the copys and make sure the loading balance of the storage severs by allocating the copys to the lower cost storage severs (Li *et al*., 2013). With this, it is bound to facilitate the date management of cloud storage under the circumstance of the internet of things.

Hadoop effectuate the open source of cloud computing technology of Google and can provide service for the application program (Zhang *et al*., 2013) of the quantitative date. And this system frame provides a set of reliable connectors for application programs and set up a highly reliable and scalable distributed system. So, Hadoop clusters should be used to study the resolution service of unified coding of the internet of things

With the foregoing coding rule and the relations and states of the products in the real world, we can store all the information of the products in the HDFS and set up the corresponding virtual products database. HDFS take the Master/Slave model and a HDFS cluster is made of several namenodes (Zhang *et al*., 2010) and many datanodes.

In the cluster, only one namenode is taken as HDFS cluster center server. Namenode is operated by the manager of the internet of things. But datenode dateblock can collect products information from various units, in which, the static information is from the manufactures' updating while the dynamic information of the circulation transaction of products is from owner's updating.

Any application (Quanyin and Chen, 2013) for the amendment of the file system name or the attribution will be recorded by the nodecode. And every datanode will periodically send heartbeat signals and states of file blocks so that namenode can acquire the overall view of the states of file block in the work clusters and can track the states to decode.

CONCLUSION

This study analyzes the properties of the items in real life, puts forward a novel uniform coding system and thoughts, abstracts out the "displacement goods" and "physical objects and expounds the relations between the two, respectively corresponds to four kinds of circumstances about coding, solves the problem of unified coding in production phase and circulation phase with a new coding method, further explains how to update the item information corresponding to the coding, in stages of sale and use, so as to meet the requirement that real-time monitoring and intelligentized management to each item can be realized.

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