The 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 web of Things, this paper bring 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 web of Things by establishing the corresponding parsing information service system.

Keywords: hadoop; code resolution; Cloud resolution

1. Introduction

The concept of "The Internet of Things" was put forward in 1999 from the M.I.T. Auto- ID Research Center of the United States. All the things in "Internet of Things" 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 among heterogeneous systems will gradually increase. It has become a consensus to establish a unified coding identification system for Internet of Things.

2. The Pros and Cons of The Current Coding System

2.1. EPC Coding System

EPC 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. Since there is a variety of field length in different domain administrator, their differences between EPCs. For example, since there are different field length 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 Figure 1 and Table 1.

		Version number	Domain Management	Object classification	Serial Number
EPC-64	TYPE1	2	21	17	24
	TYPE2	2	15	13	34
	TYPE3	2	26	13	23
EPC-96	TYPE1	8	28	24	26
EPC-256	TYPE1	8	32	56	160
	TYPE2	8	64	56	128
	TYPE3	8	128	56	64

Figure 1. EPC Coding Structure

2.2. 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 bite code,256 bite code 384bite code 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 following table

shows the coding structure of the 128 bite code ucode, shown as Figure 2.

Table 1 The Components of the EPC System

System Components	Name	Note
EPC system	EPC standard	Identify the specific code of a single product
RFID system	EPC tag	Be attached to the goods or embedded in articles
	Reader	Read EPC tags
Information network system	EPC savant	The software support system of EPC system
	ONS(Object Naming Service)	Position the corresponding information of goods
	PML(Physical Markup Language)	Describe the information of goods

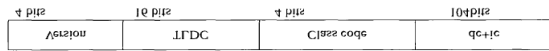| qc+ic	Class code	LTDC	Version
104bits	4 bits	16 bits	4 bits

Figure 2. 128 - bit Ucode Coding Structure

2.3. Commerce Product Code

CPC is firstly made and used by the international electronic center of Chinese commerce department. The structure of CPC is shown as Figure 3.

	Geographical codes	Vendor identification code	Product serial code	Serial Number
CPC-78	10	14	16	38

Figure 3. CPC Structure

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.

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 methods, 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, shown as Figure 4.
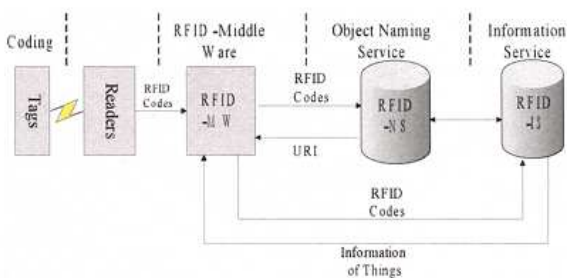
Figure 4. The Structure of Internet of Things

3. The Unicode Ideas

3.1. Object Classification Method

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 Shanghaito Beijing, and the acting factor in this paper, is referred to as a displacement item, while people and goods on the train are referred to as the entity objects.

3.2. The Relationship Between Physical Objects And Displacement Articles

(1)Physical objects can form new items by means of organic combination. For example, those items from the supplier who provides parts of the Boeing, are eventually assembled into a Boeing aircraft..

(2)Displacement items can be carried by each other. What is provided by a logistics company is the displacement from point A to point B. For example, postal mails of China Post from point a to point b, can take advantage of the displacement service provided by the railroad or the civil- -aviation.

(3)By the means of displacement goods ,physical objects move in the form of displacement. Take online shopping for example, first of all, we pay for physical objects, and then these objects are delivered by a logistics company, and eventually reach the consumer with the help of displacement products from highway, railway, aviation and so on.

(4)Vendors provide displacement goods through physical objects. For example, the Railway Bureau provides displacement services for other entity articles through the train.

4. Item Unified Coding Principles

As physical goods and displacement articles share the same coding elements, they can be coded through the same method. Here coding rules are introduced and analyzed one by one according to the components of article coding as follows: geographic coordinates, Item category code, and singletons code.

4.1. Physical Objects Coding Principles

(1)Geographic coordinates
Goods have a relatively fixed and unique production place, relative to the earth as a reference. The location of

the goods is uniquely determined by longitude, latitude and altitude. At the same time, the goods also determine the country, region, zip code, street number and manufacturer information. Therefore, when a company is registered, a mapping function from geographical coordinates to manufacturers can be set up by combining its geographical coordinates and the existing information. The formula is shown as follows:

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

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.

Since the coordinates of points on the Earth's surface is infinite, it identified numerous manufacturers to accommodate the existing and coming future vendors. Therefore, it can solve the problem of coding extension once and for all to meet the economic and social development..It solves the traditional coding discrimination and unfairness, due to the order of registration and alphabet.

(2)Item category code

With the advancement of technology, new products have been mushrooming. It is difficult to make accurate classification. therefore, 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:

$$f(x, y, z, m) \rightarrow M, M \in \{M\} \qquad (2)$$

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.

(3)Single item code

In a class of products produced by the enterprise, each product is marked with a unique identifying number of numbers. 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:

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

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

4.2. Displacement Goods Coding Principles

Physical object encoding method is also applied to carrier items.However, the analysis information,which corresponds to the code,is the only difference.

(1)Geographic coordinates

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

Wherein, x denotes the latitude, y means the longitude, 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.

(2)Item category code

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

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.

3)Single item code

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

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.

5. 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, 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 that is generated by the internet of things needs to be collected, processed, stored, analyzed 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, analyze and visit the specific objects efficiently in quantitative data, which can be powerful enough to manage the data of the internet.

The traditional distributed condition saving can solve the problem of saving an ocean of data information; however, saving of such a huge of information

makes it inefficient when the information is on searching, since it brings quite a lot of useless work to the equipment and thus its speed is limited. Besides, people are more likely to operate the state information rather than the data information itself in the Internet of Things, the space the state information takes to save is much smaller than the data information takes. So directly using the traditional distributed method cannot satisfy the need of the Internet of Things.
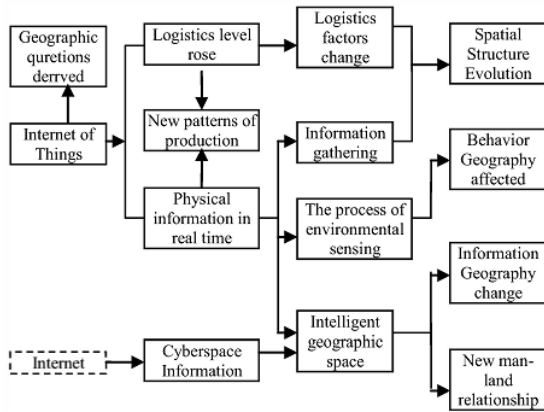

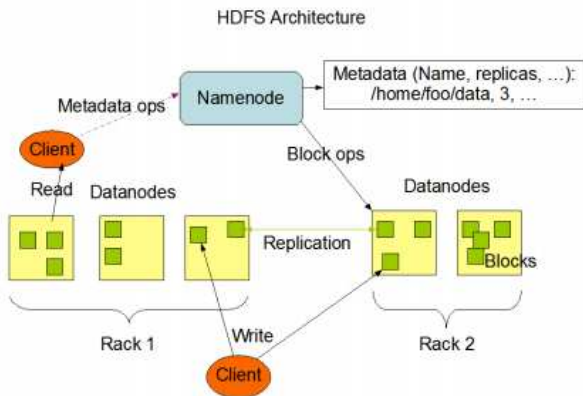**Figure 5. Research System of Internet of Things Geography**

Figure 6. HDFS Structure

What is more, cloud storage system can reliably, availably and economically provide multiple copies for one data. The distribution of the copies will be directly related with the expenses of the storage, research and updating of the copies. As location information is available in the coding method of this paper, we can ,with the least copies, effectively lower the cost of date visiting, avoid the concentrated distribution of the copies and make sure the loading balance of the storage severs by allocating the copies to the lower cost storage servers . 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 of the quantitative date. And this system frame provide 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.

MapReduce programming model divide problems to be solved into Map and Reduce, the two kinds operations.When it receives a request, its processing flow is like in the Figure 7.
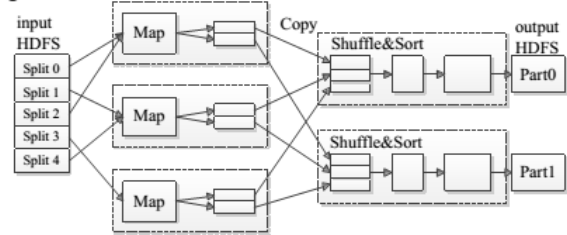

Figure 7. MapReduce Programming Model

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 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 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 paper 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, which 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.

Acknowledgment

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