Research on P2P Algorithm of Chord under Internet of Things

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Abstract. P2P (PeertoPeer, referred to as P2P) becomes the new trend of Internet of things, can be discovered integrate any networking protocol and equipment platform. Internet of things P2P technology gradually popular. Chord algorithm is one of the four algorithms in P2P. It is proposed by MIT (Massachusetts Institute of Technology) in 2001. The other three algorithms are: (1) CAN, (2) Pastry, (3) Tapestry. The chord is an algorithm, and also a protocol. As an algorithm, Chord can rigorously prove its correctness and convergence from a mathematical point of view; as a protocol, Chord defines the message types of each link in detail. Of course, one of the main reasons why Chord is so popular is that Chord is simple enough, and the 3000 line of code is enough to implement a full Chord. The chord is the simplest and most accurate ring P2P model. The word "Chord" in English refers to "string", in a distributed system refers to the "chord ring" in the field of P2P refers to the chord ring topology based on distributed hash table (DHT) or with the P2P network construction.

Introduction


Methods

P2P solution technology of Internet of things. Introduce the principle, product line and usage of the LAN P2P IOT solution. P2P principle: P2P (Peer to Peer) abbreviation, in computer network communication P2P is relative to the client/ server mode, usually the server/ client mode is connected to a powerful server to accept a large number of clients. When clients need to communicate with each other, they need to be forwarded through the server. This model, when the client size extends to a certain extent, the server's CPU processing capacity, bandwidth is a great test. P2P technology allows direct communication between clients to achieve so-called end-to-end (P2P) direct communication, where the load on the central server is significantly reduced.

Traditional central server model and P2P communication model as shown in Figure 1 and Figure 2, although the structure of P2P also has a P2P authentication server, but the server is in the two communication client needs to do a pre authentication and a matchmaking role in the actual data interaction is directly between clients. Download tools for Internet applications, BitTorrent, emule, video on demand, PPLive, thunder, instant messaging, Skype, and QQ are all using this technology. With the rise of the Internet of things, Shanghai Zhuo LAN P2P will be introduced to the Internet, and
the successful development of P2P single chip solutions, the P2P hardware modular concept, realize the interconnection of all things an important step.

![Figure 1. Traditional central server model.](image1)

![Figure 2. P2P communication model.](image2)

P2P in the Internet of things. There are several advantages of using P2P technology in Internet of things. Firstly, in the Internet of things, there are many nodes and large number of access networks. At this point, using P2P technology can effectively reduce the load of the central node. Second, to solve the difficulty of accessing internal network devices. In the application of the Internet of things, the acquisition and control equipment is generally in an intranet. At this time, there are two ways to access the intranet equipment through the Internet. (1) dynamic domain name, port mapping”. (2) set up the server for forwarding.

![Figure 3. Connecting internal network devices via Internet.](image3)

As shown in Figure 3, assuming that there is a gateway, which works in the TCP server mode, it has a IP address inside 192.168.1.200, it through an internet router, IP network router is 192.168.1.1, IP is 116.1.2.3. When the user's mobile phone outdoors want by 3G/4G (Internet) to access the intelligent gateway when the user does not know the IP address of the router, because this address is may change at any time, at this time you need to use the dynamic domain name, such as a computer network login software dynamic domain (some routers also support dynamic domain name) at this point, the user can access through mobile phone may like abc.gicp.net domain name to access the router, but in order to let the router forwards the data to the gateway, but also need to do a "port mapping on a router". However, some routers (such as telecom custom gateways) do not allow login routers to configure at all, and other configurations require strong expertise. Using the LAN P2P scheme, you can directly penetrate the router with P2P technology, establish communication between the mobile phone and the intelligent gateway, and save the trouble of "dynamic domain name" and "port mapping". Another method is the user through leasing a server on the Internet, will be the gateway for TCP clients.
connected to the server, the mobile phone is connected to the server and then transmitted through the
server, is shown in Figure 1 the traditional center server mode. But: (1) setting up servers requires
additional costs, including rental fees and technical maintenance costs. (2) it requires users to develop
a client server program on the server, and the cost of system development and maintenance is
relatively large. The use of Shanghai Zhuo LAN P2P program, as long as the purchase of LAN LAN
P2P chip or related hardware products, you can give the free computer side software, without the
development and leasing of servers. The investment cost is low and the product is mature and stable.
Third, some projects, such as remote PLC monitoring, and DCS systems may have only a few
monitoring points, and there is no need to build a separate server for these separate projects. In
particular, when this collection point is communicating through 3G/4G DTU, there is no fixed IP, and
it is hard to install dynamic domain name software. At this point, the use of P2P based 3G/4G DTU
ZLAN8343N is very convenient.

Results

Both nodes and key have their own identifier, a m-bit identity. Hash keys are assigned to node
according to the following way: the identifier of clockwise rows into a ring, key is assigned to change
the clockwise identifier value that node closest to the key. And the node is called the successor (key).
That is, each key is assigned to a successor (key). When nodes join and leave the N chord network,
hash can maintain consistent minimum damage before certain key is assigned to n successor, now
have to be transferred to N, when n left, it only needs to transfer to n successor key. Without any other
changes. Four, Chord implementation principle. And ensure the consistency of the Node hash Chord
and Key mapped to the same space, in order to ensure the repeatability of Chord SHA-1 is selected as
the hash, hash function, SHA-1 will produce a 2160 space, each for a 16 byte (160bit) large integer.
We can think of these integrated end to end forming a ring, called the Chord ring. Integer in the Chord
ring according to the size of the clockwise arrangement, Node (the IP address of the machine and Port)
and Key (Resource Identifier) are hashed into the chord ring, so we assume that the state of the P2P
network as a virtual ring, so we say that Chord is a structured P2P network. Here are a few definitions:

We call each node on the Chord ring a flag. If a Node is mapped to a marker, the standard identifier
is continued to be Node. According to the clockwise, the front of the node becomes the predecessor
(predecessor), and the latter becomes the successor (successor); similarly, the first predecessor is
called the direct predecessor, and the first successor is called the direct successor\(^9\). As shown in
Figure 4.

![Figure 4. Chord ring.](image)

The red dot is Node, and the blue is the symbol. The above is only part of the node and symbol, and
the node N1 is used as an example to illustrate the successor in the Finger table, Finger table as shown
in Table 1:
Mapping both Node and Key into a range is a measure of how dogs and cats are together, although it's a bit odd, but this ensures consistent hashing. Obviously, the number of Node distribution in the Chord ring is far less than the symbol number (2160 is a cannot be measured, so astronomical) Chord ring Node will be very sparsely distributed in the Chord ring, theory should be randomly distributed, but as discussed in front of consistent hashing, if the number of nodes not sure, the distribution is not uniform, consider adding virtual nodes to increase its balance, if more nodes (such as the P2P network of large-scale millions of machines) without introducing virtual nodes. Obviously, any search results as long as Chord along a ring must be found, so the time complexity is O (N), N is the number of nodes, but for a millions of nodes, and nodes frequently join and leave the P2P network, O (N) is unbearable, so Chord put forward the following nonlinear search algorithm: Each node maintains a Finger table with the length of M (M is the number of digits, 160 in Chord), and the item I of the table stores the (n+2i-1) mod, 2m, successor (1<=i<=m) of the node n. Each node maintains a list of predecessor and successor, which can quickly locate, pre- and follow up, and periodically detect pre- and subsequent health status, That is to say the successor is stored by multiples of 2 incremental, since it is because the last node modulo successor is several nodes at the beginning, such as a definition of a node to the first node of the largest, The resource Key is stored on the following Node: along the Chord ring, the first Node of the hash (Node) >= hash (key), we call this Node the Key of this successor, Given a Key, follow the steps below to find the node in which the corresponding resource is located, that is, the successor that looks for the Key: (if the lookup is done on the node n)

1. See if Hashi of Key falls between the node n and its direct successor, and if the end of the lookup is found, then of the successor is for the find. In the Finger table of N, find the successor that is closest to hash (Key) and <hash (Key), which is the closest Key to the predecessor in the Finger table, and forwards the lookup request to the n, Go ahead with the process until you find the corresponding node for Key. Intuitively speaking, the last search process should be exponential convergence, similar dichotomy search, convergence speed should be very fast; in turn, search time or routing complexity should be logarithmic that, in the following we will prove this point[10].

### Conclusions

A chord is a very good P2P algorithm. At this time, Zhuo Lan Zlan1043N single chip embedded into the smart home network Guanzhong, combined with Zhuo LANs Android, IOS mobile library, you can easily upgrade the original mobile phone software. Since then, there's no need to worry that some users' routers can't do port mapping. As the user P2P device more, I hope to set up their own P2P authentication server, users on the LAN to buy P2P server software, set up all their own complete P2P systems. In 2017, block chain technology was the hottest pet. Machine learning Tensorflow black technology combat, including the necessary basic knowledge of neural networks and the overall framework of the neural network. RMSE, root, mean, square, error root mean square error, also known as standard error, is defined as: the sum of squares of error divided by the number of samples to reduce the square root of one. Regularization (regularization), refers to the theory of linear algebra,
the ill posed problem is usually defined by a set of linear algebraic equations, and the equations derived from the group usually has a great number of conditions of ill posed inverse problem. The large condition means that rounding errors or other errors can seriously affect the results of the problem. KMSE is the abbreviation of Kernel Minimum Squared Error, meaning kernel based learning method, which is a kind of machine learning method. Svm is a kernel function, and artificial intelligence kmse kernel function modeling is similar to svm. Extract Network and video parameters, build new models, compare performance with other models. Such as testoff Union and Jingdong Amazon where the network and entity shop wholesale Xidan zoo world nation is the future direction of the coordinated development of e-commerce and logistics. Medical, financial beauty, for example, to ensure physical and mental health, regular mental examination, smart early enough to eat lunch, eat late, eat less intelligence, less oil, less salt, intelligent movement and intelligent green eye protection instrument is also the future direction of development. Intelligent mobile phone TV computer WeChat SMS QQ, intelligent voice and video, remote learning, intelligent English, smart cars and smart card mobile phone brush subway, intelligent, intelligent logic is what why how to do is the future direction of communication. High thinking turn thinking and intelligence to do application system and the intelligent housing system and intelligent transportation and intelligent building and intelligent engineering system and intelligent sponge farm and JSP in the Internet of things is the future direction of development. Physics experiments and applications of RFID and random processes and mathematical model and the latest systems such as win10 and MAC systems in the Internet of things are the future directions.

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