

Research on hierarchical manufacturing resource sharing model based on the chord

Shuqi wang, Yunxia Jiang, Dongnan Sun, Bowen Zhao

College of Mechanical and Power Engineering, Harbin University Science and Technology,
Harbin 150080, China
School of Automation, Harbin University of Science and Technology Harbin 150080, China
Email: wang_hongjing2008@163.com

Abstract. In order to realize the sharing and full use of the distributed and stochastic manufacturing resources, a covering network structure of two-layer like Chord ring is constructed. According to the Chord protocol, a distributed manufacturing resource sharing system model is proposed, making logic subrings by the type of resources and the logic main rings by the super nodes. The relay of the resource rings and the convergence of different types of resources for application are completed by super nodes. On this basis a framework model of manufacturing resource sharing system is built. The sharing system prototype instance is given finally.

Keywords: Manufacturing resource, Hierarchical chord, Sharing model, Resource ring

1 Introduction

With the development of information technology and the cloud computing technology and the proposing of smart city, today's manufacturing environment has a fundamental change, whose form transfer the traditional production to service. The cloud manufacturing mode highlights the sharing ideas of the underlying resources in cloud computing, and through the cloud computing technology and related platform, cloud manufacturing coordinates many resources [1]. In the virtual shared resource pool, the dynamic and coordinative manufacturing environment is built to use optimally the underlying manufacturing resources and to integrate the top manufacturing application tasks.

Based on the characteristics of high query efficiency and strong extensibility of the structured P2P network, the paper has set up a cover for the two types of Chord ring network structure, a covering network structure of two-layer like Chord ring is constructed, and on this basis a framework model of manufacturing resource sharing system is built [2].

2 The two-layer polycyclic chord model

Due to the advantages of the simplicity of the Chord agreement, and under the condition of the dynamic join and leaving of numerous nodes, the good query efficiency Chord stable algorithm can maintain, many research projects have been built on Chord [3]. But Chord still exist the shortage of the affecting efficiency. The two-layer polycyclic Chord model will improve Chord from the topology structure.

The two-layer polycyclic Chord model is an improved model of Chord based on resource classification. The first layer is the super ring which is a like Chord structure and is mainly responsible for communication among subrings; The second layer is the resource ring which is also a like Chord structure, and it is classified through resource type of the nodes. Nodes classify the same type of resources as a class and they join the same resource ring to form a like Chord structure. The architecture of the model is shown in figure 1.

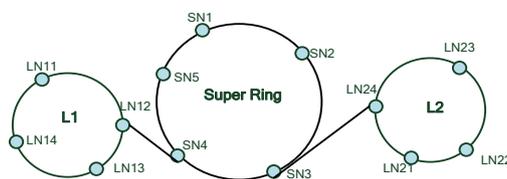


Fig.1. Two-layer polycyclic Chord structure

2.1 The super ring

The main function of super ring mentioned above is responsible for the communication among subrings, as the entrance of the resource ring [5]. It is the first problem to be solved that what kind of node to choose as the super node. To maintain a certain number of super nodes in a dynamic file sharing system is necessary to ensure the reliability of the system [6]. The topology maintenance overhead will increase with large number, so we configure the super node number as the system parameter Ans. The next one is which super node to choose as the entrance of the subring. The select way is: Hash the resource type L_i to get a hash value L_k , and lookup the node of L_k in the super ring successor as the entrance node of L_i Ring[4].

2.2 The resource ring

Nodes classify the same kind of resources as a class and join the same resource ring to form a like Chord structure, and resource types are classified according to the needs of upper layer. There are two kinds of logical nodes in the resource ring. One is the super nodes, and another is the nonsuper nodes, namely the ordinary nodes. Ordinary nodes find the super nodes in the super ring by maintaining the successor nodes list of

resources type in its resource ring. If the successor node of the resource type belongs to super nodes, it can find the super node in the super ring.

3 The manufacturing resources sharing model

This paper divides the manufacturing resource sharing system structure into four layers, and guarantees the independent update and undertaking of each layer, to complete the function of resource sharing commonly, as shown in figure 2.

Network layer is the network architecture of the resource sharing system. The manufacturing resource nodes consist of the resource providers; Data layer realizes the description and storage of the manufacturing resources, and the description of the resource meta data; Portal layer is also a interface interaction layer of the resource sharing system, which provides the providers and consumers of the resources with the registration, enrollment and other management functions, and provides the resource providers with the resource encapsulation, release, maintenance, management and interaction functions.

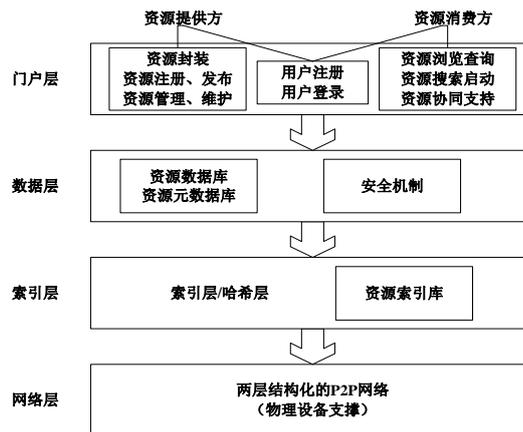


Fig.2. The hierarchical model of the manufacturing resource sharing system

4 Prototype instance

On the basis of the above research, to select milling CNC machine tools, to develop the together and sharing prototype system of distributed machining equipment. Lathe-type resources and milling-type machine resources construct two logical resource rings, defined as L1 and L2, respectively, each node sets as a resource physical nodes PN, at least having a machining equipment resources on each PN, to simulate the LN on the corresponding resources ring, to implement distributed resource pool. The portal system of prototype is shown in figure 3.

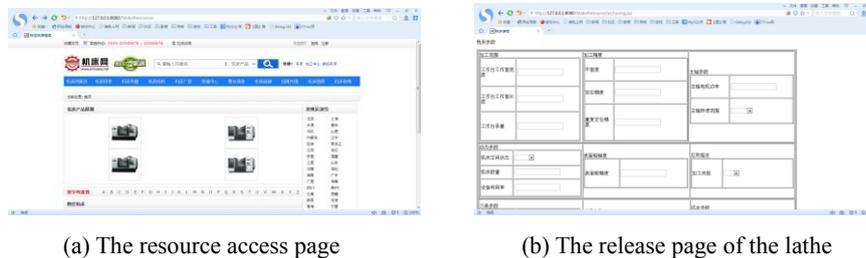


Fig.3. The portal page of the manufacturing resource sharing system

5 Conclusion

This paper proposes a distributed manufacturing resource sharing platform based on the two-layer like Chord structure. On the basis of the sharing model, a sharing system of the lathe and milling machines is built and the searching key words sets and the corresponding search and release interface are given. However, the incentive mechanism of the resource sharing and the superiority of the two-layer like Chord structure net needs further study.

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