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Software Resource Re-sharing in Middle-sized Enterprise Cloud Manufacturing System

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Abstract

Some significant and related researches on software resource re-sharing in Cloud Manufacturing system at home and abroad is introduced, in addition, analyzing the structure of the software that applied to manufacturing currently are web-based, software are directly sharing, or package-based and remote sharing using the internet server provided the common software in a indirect sharing way. So the software re-sharing concept proposed self-evidently in order to meeting the needs of special requirements of Cloud Manufacturing. A re-sharing approach proposed for the software sharing solution of Cloud Manufacturing according to the features from enterprises, which is compatible, extended, low-cost and very suitable for the Cloud Manufacturing for the small and medium-sized enterprises.

Keywords: software resource, re-sharing, cloud manufacturing system

1. Introduction

Cloud Manufacturing is an advanced mode which is combination of the existing advanced manufacturing mode and cloud computing technology. The generation and application background is the same with other advanced manufacturing mode. Cloud Manufacturing is the result driven by the requirement and technology. Cloud Manufacturing is the important manufacturing mode for enterprise to win in the market competition in the new period; it will enhance the informatization level, the manufacturing capacity, and the manufacturing rate of manufacturing industry of China so as to shorten the gap with developed countries as soon as possible.

As the manufacturing enterprise, product modeling, design, simulation and test, each link needs software to support manufacturing services, packaging and virtualization. Therefore software resource sharing has become a very important issue of informatization of manufacturing enterprise and its all kinds of advanced manufacturing mode.

In the Cloud Manufacturing, on the demand of abstractive and customizable manufacturing capability that makes it is more dependent to the software sharing. At the same time, the requirement of software sharing for Cloud Manufacturing is higher. The requirement for the software at the same demand of computational requirements as cloud computing, which includes high reliability, availability, customizability and scalability.

In this paper, a re-sharing approach proposed for the software sharing solution of Cloud Manufacturing according to the features from enterprises, which is compatible, extended, low-cost and very suitable for the Cloud Manufacturing for the small and medium-sized enterprise.

2. Related Work

Cloud Manufacturing is the combination of cloud computing, networked manufacturing and other advanced manufacturing technology, and the main research areas are the advanced manufacturing technology and cloud computing.

In 1991, Lacocca Research Institute of Lehigh University combine with the 13 largest state-owned companies to write the report “The strategy of the 21st century manufacturing enterprise” under the support of US Congress and the department of defense. The report firstly puts forward the new strategy that using the Agile Manufacturing to revitalize the manufacturing

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industry. As a new manufacturing model, it gets recognition and support quickly by American industry, government agencies and the community, and soon become the highlight of theoretical research and manufacturing practice. The two typical application mode of agile manufacturing is the collaborated network of the virtual enterprises [1-3].

Networked manufacturing is the continuation and development of Agile Manufacturing and other mode. With the rapid development of information science and network technology, and particularly the emergence of Web technologies, which entrust the networked manufacturing different meanings, that is, a series of new concepts and ideas were proposed. After that, it gets rapid development in the mid-20 century. US, Japan and other developed countries carried out a large number of practices for the networked manufacturing technology research, and also got a series of achievements.

Cloud computing technology has been developing rapidly since 2006 and matured gradually. Some scholars integrate Cloud computing and the advanced networked manufacturing of manufacturing mode into the new model- Cloud Manufacturing that makes full advantage of the capabilities of data processing of cloud computing, function integration, and the high availability and high customizability.

Cloud Manufacturing aims to achieve an agile, service-oriented architecture system for manufacturing, and green and intelligent are the new development directions of networked manufacturing. In some extent, Cloud Manufacturing expands the existing advanced manufacturing mode in concepts, models, organization and implementation of the technical architecture and other fields.

As an advanced manufacturing, ASP is a model which integrated with cloud computing technology. SaaS mode was used in the specialized extended manufacturing without much research on the software sharing of Cloud Manufacturing.

3. Analysis of the Current Situation of using the Manufacturing Software

The software support play a key role in the business execution for manufacturing enterprises, and many of them are large, complex, and expensive, the requirement for hardware is higher and it is difficult to deploy and maintain. In practical work, only small part of time is serving the business actually. As a result, on the one hand, the enterprise has the purchase capability and severely rely on the software resource, but has not been fully utilized. Most of the time, the software and related support hardware are idle. On the other hand, some enterprises without purchase capability or the software dependency in a low state, out of economical reasons, have the capability of purchase and deploy the related software, instead, using ineffective or even very original mode. This not only affect the advantages and convenience brings from the advanced software, but also have an effect on the improvement of the service quality and business efficiency.

In order to solve this problem, comes up the Software-Sharing concept, that is, let the enterprises have the software to improve manufacturing condition. On the one hand, the software companies can get some incomes based on services provided for enterprises. On the other hand, enterprises without software can take less cost but get advanced software services and eliminate the cost to deploy the software and maintain its failures [4].

In order to use the Sharing software in a convenient way that needs the network to support the sharing process so that the users can use the software via the Internet without too much coordination and running for users. Generally speaking, software sharing is the network-based and also the highlight of software sharing.

With the rapid development of network and a variety of related technologies, then becomes mature, the process began with the C/S structure, then Web-based software, next the ASP mode, SaaS delivery model. The use of Web software sharing mode has initially realized, especially with the popularity of cloud computing. Many Web-based networked storage system, MIS system, CRM system have been used in various enterprises [5].

4. Analysis of Existing Software Sharing Technology

The web-based software sharing mainly utilize the generalized C/S mode to develop software so that most of the functions of the software are on the server side and clients obtain the functions and services provided by server-side software. This is a software-sharing mode

since the rise of computer network and it is also the most convenient and intuitive way for software sharing. The software developer can be directly deployed to provide to the user sharing services without providing additional technical support. In short, users only need to open the browser or install the corresponding client software and then can use the software services. However, due to historical reasons, users have no high requirement for software sharing, and there are much software already appeared before the popularity of computer network. Much large software, especially the large-scale professional software in the manufacturing field has not been developed for sharing support. So too much work of redeveloping this kind of software and many of them yet not directly provide mature development model for sharing support [6].

So the sharing mode is mainly used in the newly developed software and has better support for manufacturing software sharing. And the direct sharing mode divided into two kinds according to the difference clients: Web mode and App mode.

Web software, in other words, the B/S mode software which is a specialized C/S software mode and the client is a browser. You can use the sharing software simply install a Web browser.

App software is the new development of C/S software mode and needs to be developed specified software for the client and each client must install the corresponding client software [7-10]. C/S mode software proposed in this article refers to the narrow sense of it. App software made a greater improvement and development on the basis of the C/S structure and integrated advantages of Web software.

Package-based sharing software provides sharing support for software that cannot be shared without redeveloping. However, it requires additional technical support in some application areas and mainly used for building software sharing services for large-scale software.

Server-based computing (SBC), also known as thin-client computing, which is a computing model that application running on one or more central server and the thin clients only deal with I/O, keyboard, mouse messages and ensure screen the updating data from screen transmitting through the network rather than the programming code and data. Through support software, client will receive the image of the interface from the server side and input the user information (mouse or keyboard messages) to the server. Then the server sends it to the appropriate application, and passes back the result image compression through output interface of application to the client. Once the client has the basic view of the server session, server only sends the screen changes to save network bandwidth. Server-based computing is mainly shared by the following three techniques [12-13].

5. Dilemma of Core Manufacturing Software Sharing and Proposed Solution

Although enterprises owned manufacturing software, but do not control software sharing technology. And software deployment, maintenance and sharing are not the core business of manufacturing enterprises. Sometimes may outweigh the benefits. As manufacturing enterprises, its software is always ensuring their own use, if it is available to other companies to share on condition that software utilization reaches a certain level and the software will appear some contention problems. So it is difficult to ensure the quality of the sharing service for manufacturing companies. So it needs specialized third-party software to provide sharing software in order to guarantee the quality of software services. Providing sharing software by a professional third-party software provider which responsible for software deployment, maintenance and guarantee the quality of software services. Today, some of the more successful software sharing cases is basically using this program. However, this can only correspond to the new third-party deployment software and enterprises cannot make full use of existing hardware and software resources. Due to network limitations, data security and other factors, many advanced manufacturing companies prefer to purchase and deploy the software rather than using third parties sharing software. As a result, the third-party software sharing provider provides some core sharing software for the manufacturing enterprises of few areas.

5.1. System Model

In this paper, the author proposed a sharing program which is suitable for small and medium-sized manufacturing enterprises and meet the Cloud Manufacturing requirements according to the software features of manufacturing enterprise, the encountered problems of

software sharing as well as cloud computing and Cloud Manufacturing. In addition, the program integrated the Third-party platform which provides low-threshold services of software sharing and the quality technical supports for the manufacturing enterprises.

To take full use of the program through redundancy, backup and fault-tolerance technology which makes a large number of resources become highly reliable and integrates the unreliable idle resources of enterprises. Sharing platform not only provides software sharing interface but also a full range of software sharing access scheme, maintenance optimization technology, security and use of service management. Any enterprise with idle software can access to a sharing platform and any access software should be carried out strict management. On the one hand, provide a full range of technical supports for software provider, as a result, it is not only balance the burden of the software sharing platform but also provides the professional services support that free from disturbing burden on it. On the other hand, the program will provide high quality and reliable software services to users through the idle integration and the management of software resources.

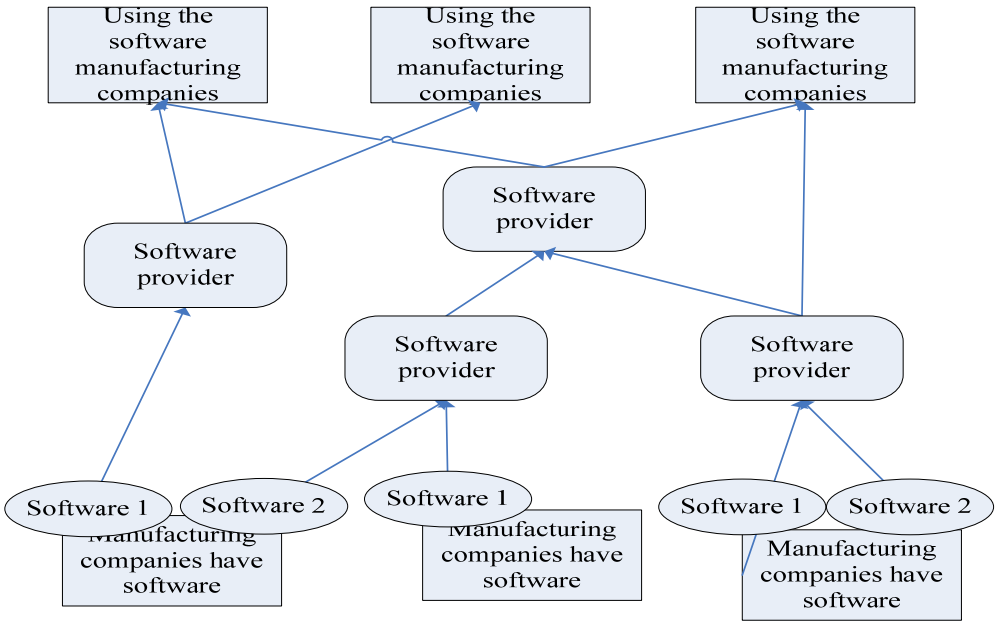

Figure 1. Sharing structure of clouding manufacturing system

In this case, the manufacturing companies only need to share the idle software resources access to software sharing platform of the appropriate software sharing provider. And do not need too much attention to software service availability and reliability. And also can get technical support from the software sharing platform.

5.2. Software Management, Access and Deployment Model of Sharing Software Provider

Sharing software provider provides sharing software based on software features and manufacturing enterprise's sharing software services in the Cloud Manufacturing. Then uniformly manage these software resources so as to achieve Cloud Manufacturing requirements. The specific implementation may be of a variety of ways, but not visible to users. Specified management and deployment model of software is shown in Figure 2.

Sharing software provider either deploy software by itself or access software from some other manufacturing enterprises. The former always having higher availability and reliability, but the latter is not. The ultimate high availability and reliability depends on strict management of the software instead of accessing software from other manufacturing enterprises.

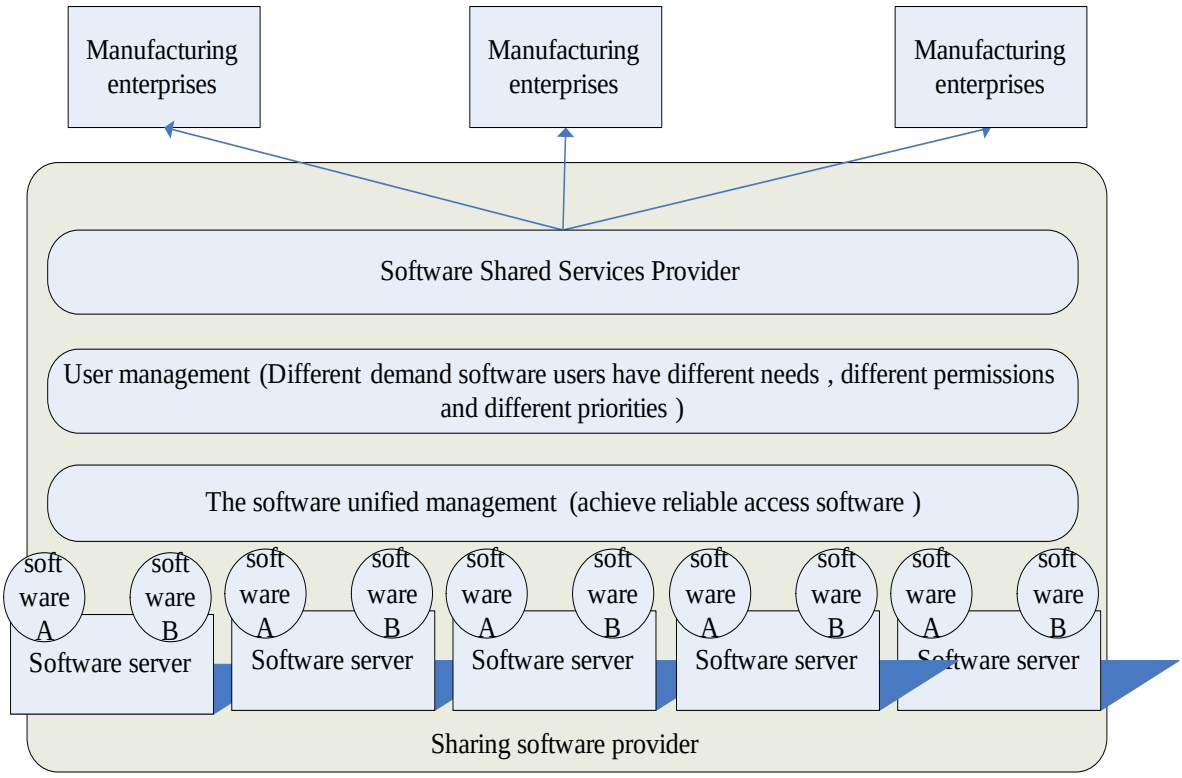

Figure 2. The software deployment, management and provide model of software provider

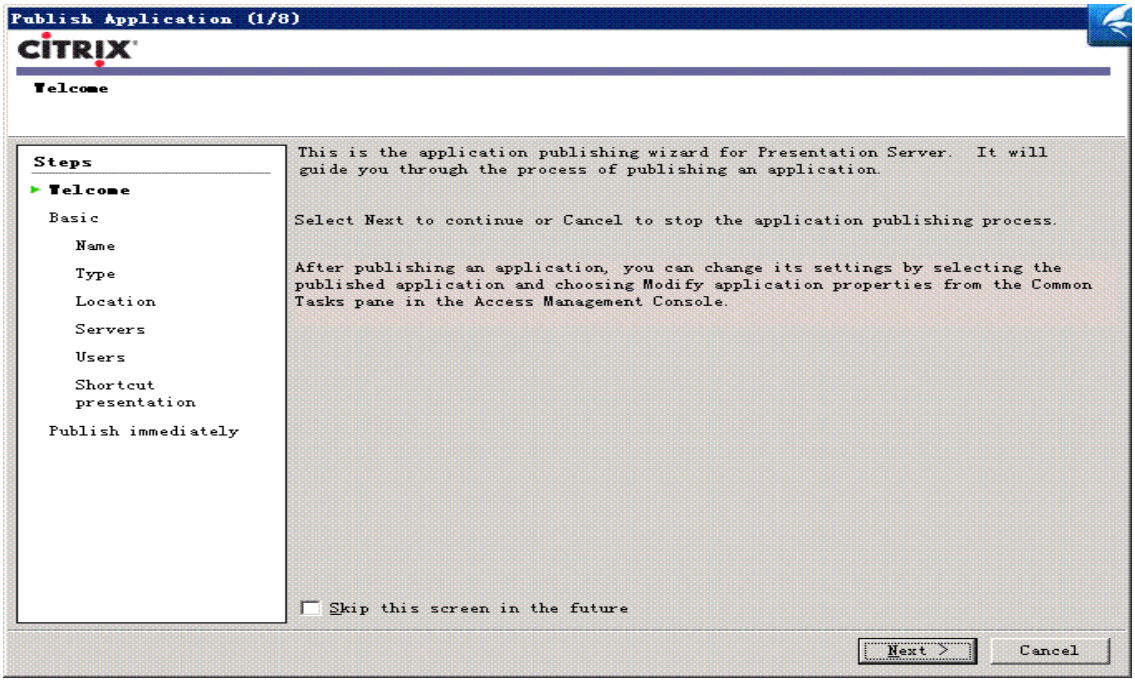

Figure 3. The software deployment, management structure

5.3. Software Access Management

The low demand of software access requires the strict management of software. The sharing software provider cannot require quality and availability of accessing software, but have

to know the quality and availability of it. After accessing the software, the owners of the software should explain the services capacity and services time. The provider of the sharing software record the service capacity and service time, then improve the record through tests and experiments.

Different enterprises use different software and a variety of software is published based on the customer demands. The client sends the application requests, and then we use the Citrix Access Management Console management tools publishing software. The publishing process is shown in Figure 3 and 4.

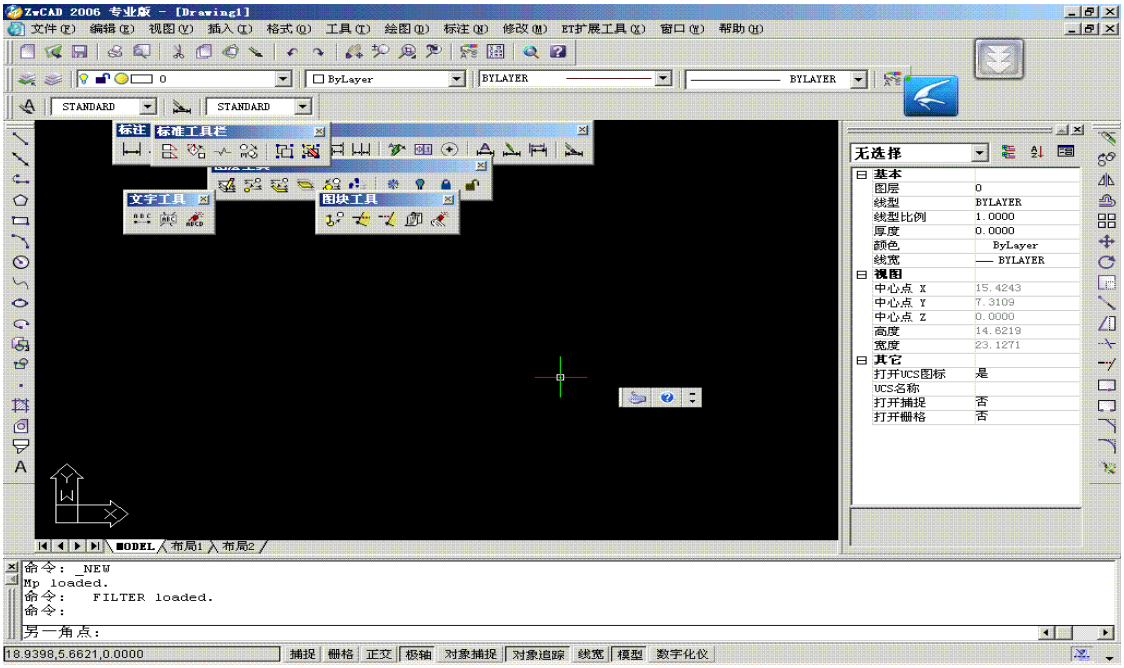

Figure 4. The software re-sharing running interface of clouding manufacturing system

6. Conclusion

The provider of the sharing software get unreliable resources from some manufacturing enterprises, and then offer reliable resource to some manufacturing enterprises by using relevant fault-tolerance technology. On the one hand, the provider of the sharing software directly manage the software users and data resources which includes the software usage and processing data of the software so as to exchange the software at any time without affecting the normal work. On the other hand, the provider of the sharing software look up the available time at any time and monitor the running condition of software. They exchange the software when they find the software may not be available so as to provide users with reliable software services.

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