Research on Computer Network Structure Service Oriented to Advanced Manufacturing Technology

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Abstract. With the rapid development of computer network technology today, computer network services is not only easy to accumulate in hardware and software, including the reliability, service standards and service monitoring, service maintenance and technical support etc. Advanced manufacturing technology is to meet the requirements of the times, improve competitiveness, the manufacturing technology continues to optimize and bring forth the new. The manufacturing technology in twenty-first Century is developing towards globalization, automation, greenness and integration. In view of the advanced manufacturing technology in computer network structure, service research, especially in the computer network, the optimization of service quality is above. This paper first introduces the theoretical knowledge of advanced manufacturing technology, advanced manufacturing technology, including advanced manufacturing technology connotation and characteristics; secondly introduces the basic problems of computer network services; and then analyzes the computer network service quality optimization method for the advanced manufacturing technology; finally discusses the computer network service quality optimization model.

1. Introduction
The manufacturing technology in twenty-first Century is developing towards globalization, automation, greenness and integration. Advanced manufacturing technology is to meet the requirements of the times, improve competitiveness, the manufacturing technology continues to optimize and bring forth the new [1, 2]. Advanced manufacturing technology manufacturing industry is constantly absorbing machinery, electronic information, energy and modern management system and other aspects of the results, and the whole process of the comprehensive application in product design, manufacturing, testing, management, sales, use, and service recovery [3]. Finally, we will realize the goal of high quality, high efficiency, low consumption, clean and flexible production, and improve the adaptability and competitive ability of manufacturing technology to the dynamic and changeable product market.

With the gradual expansion of computer network business, the demand for the network of various businesses is also increasing. With the rapid development of computer network technology today, computer network services is not only easy to accumulate in hardware and software, including the reliability, service standards and service monitoring, service maintenance, technical support and so on, only in a few aspects to meet the requirements of the service is really the service [4, 5]. In order to ensure the normal and effective deployment of network services, it is necessary to improve or protect the critical service quality in a particular business. The related QoS evaluation index mainly includes network throughput, delay, packets loss rate and so on. They can be regarded as the utility of network protocols. In a resource limited network system, the dual problem is to minimize the cost of network operation. In order to further improve the QoS of the network, not only the existing network protocols need to be evaluated, but also the reengineering of the network is necessary [6, 7]. Using the optimization theory
to model and analyze the network system, we can make the network performance as satisfactory as possible.

To sum up, the research of computer network structure service oriented to advanced manufacturing technology is of great significance, especially in the optimization of service quality in computer networks. This paper first introduces the theoretical knowledge of advanced manufacturing technology, advanced manufacturing technology, including advanced manufacturing technology connotation and characteristics; secondly introduces the basic problems of computer network services; and then analyzes the computer network service quality optimization method for the advanced manufacturing technology; finally discusses the computer network service quality optimization model.

2. Advanced manufacturing technology theory knowledge

2.1. The connotation of advanced manufacturing technology
The concept of advanced manufacturing technology was first proposed by the United States in the late 1980s to enhance the competitiveness of manufacturing and promote national economic growth according to the challenges faced by the domestic manufacturing industry. Since then, some industrialized countries and new industrialized countries have taken advanced manufacturing technology as their priority in science and technology development and high technology implementation [8]. In recent years, with the rapid development of modern science and technology which is dominated by information technology, profound changes have taken place in the traditional manufacturing industry. Advanced manufacturing technology has greatly improved the quality of enterprises, economic efficiency and market competitiveness, which greatly improved the product structure, production process and management model. More and more enterprises take advanced manufacturing technology with high quality, quick response, agility and agility to meet customer's requirements as an effective way for enterprises to continue production and development.

Advanced manufacturing technology is a relative and dynamic concept. Although the advanced manufacturing technology is still not a clear consistent definition, but after analyzing its connotation and characteristics, can be defined as: advanced manufacturing technology manufacturing industry is constantly absorbing mechanical electronic information (computer and communication, control theory, artificial intelligence, etc.) and modern energy management system the achievements, and its application in product design, manufacturing, testing, management, sales, use, service and recycle the whole manufacturing process, in order to achieve high quality, high efficiency and low energy consumption, clean production, flexible manufacturing technology, which provided high on the dynamic changing market adaptability and competitiveness [9].

2.2. Characteristics of advanced manufacturing technology
Advanced manufacturing technology is a huge scientific system. Compared with the traditional production model, advanced manufacturing technology has the following characteristics, and as shown in figure 1.
Advanced manufacturing technology is a manufacturing technology facing the twenty-first century. Advanced manufacturing technology is the latest development stage of manufacturing technology. It is developed from traditional manufacturing technology, and has a qualitative leap with the introduction of new and high technology and the change of manufacturing environment. It has now become an engineering technology that can effectively control material flow, information flow and value flow in manufacturing systems. With the development of modern science and technology to higher level, intelligence, precision, fine, systematization, automation, integration and environmental protection will become the development trend of advanced manufacturing technology in twenty-first Century.

Advanced manufacturing technology focuses on the organic integration of technology, management and personnel of the three. Practice has proved that the advanced manufacturing technology is not only a technical problem, in the process of the implementation of advanced manufacturing technology, if adopted from technology to technology practices, while ignoring the organization, management and personnel, in the implementation are not satisfactory. Therefore, in the process of using advanced manufacturing technology, we should pay attention to the organic integration of technology, management and personnel, so that the whole process can be optimized, and the organization management model will be more active and rational [10].

Advanced manufacturing technology runs through the whole process of manufacturing and pays attention to environmental protection factors. Advanced manufacturing technology into the market forecast, product design, procurement, production management, customer service, service, scrap recycling throughout the manufacturing process, so that the entire manufacturing process into a set of market, product and manufacturing system as one of the. Nowadays, resources, environment and population are three major problems faced by human society [11]. For this reason, people put forward the strategy of sustainable development. For manufacturing, new concepts and developments such as green manufacturing, cleaner production and eco factory in the field of advanced manufacturing technology are powerful weapons to support the strategy of sustainable development.

Advanced manufacturing technology is a product of many disciplines. Advanced manufacturing technology is not only an extension of a single technology development, but also a system integration technology formed by cross-disciplinary integration of many specialties and disciplines. The boundaries of various disciplines and disciplines gradually fade and even disappear, which makes advanced manufacturing technology tend to be systematic and integrated. Advanced
manufacturing technology has developed into a new cross technology which integrates mechanical, electronic, information, material and management technology.

Advanced manufacturing technology is a technology for global competition. Since the 80s of last century, the globalization of the market has been further developed, and the developed countries have fought for the world, dumping products and exporting capital through financial, economic and technological means. With the formation of the global market, the market competition becomes more and more fierce, and advanced manufacturing technology is just in order to adapt to this fierce market competition. Thus, a country's advanced manufacturing technology, its main body should have the world advanced level, should be able to support the country's manufacturing industry in the global market competitiveness.

3. Optimizing service quality of computer network based on advanced manufacturing technology

3.1. Basic issues of service
Creating a stable and reliable service is an important job for a system administrator. In doing this, the system administrator has to consider a number of basic elements, the most important of which is to take into account the needs of the user at all stages of design and development. To communicate with the user, to find the user's requirements and expectations of the service, and then make a list of other requirements, such as management requirements, such a list can only be seen by the team of system administrators. In such a process (what is) is more important than what it is, otherwise it will easily sink into the mire and lose its target in concrete implementation.

Services should be established in the server machine and the machine should be placed in the right environment, as the server machine should have appropriate reliability and performance. Service and service on the machine should be monitored once malfunction alarm or fault record list. As a part of the machine and the software should rely on those established in the host software and the same or higher standard on the reliability of a service reliability and it depends on the service chain the weakest link is considerable [12-13]. A service should not rely solely on hosts that are not part of the service.

The system administrator must make several decisions in the construction of a service, for example, from which the manufacturer to buy equipment, for a complex service with one or more servers, build a service to leave much redundancy. A service should be as simple as possible, as small as possible, so as to improve reliability and maintainability.

3.2. Computer network service quality optimization method
In the computer network, the main method to optimize the network quality of service is through field modification of service types, including differentiated services, optimize the business flow, the choice of broadband agent and comprehensive services in four ways. Differentiated services can take the border operation, not only can reduce the burden on routers, but also can maintain the normal operation of the work of computer network content, usually applied to large local area networks and wan. DiffServ refers to the use of some technical support in the computer network to form a partitioned service router, which enables the information services in the network to be classified through different routers [14]. The principle of this optimization method is able to classify for communication services effectively, and the performance of scale differentiated service and be clear, on the quality of network service optimization, to achieve a more open network environment.

Optimizing traffic flow is to control the traffic flow in the network and improve the quality of service, because the traditional network is realized by one port. In this way, traffic flow is always on the edge of the network, which leads to poor quality of network services, and the optimization of traffic needs not to be improved. This method can improve the quality of network services by optimizing traffic flow [15]. The choice of broadband (cyber source manager), mainly through the control of the cyber source separation, data control layer and the transport layer, control network data sending and receiving, collecting all kinds of information (topology, node and link state) and other means to improve the
specificity of network equipment to improve network quality of service. The optimization method is classified as shown in Table 1.

**TABLE 1 Classification of optimization methods**

| Classification basis | Function and variable type of a mode                              | Solution method of model                  | Model implementation plan |
|----------------------|-----------------------------------------------------------------|------------------------------------------|---------------------------|
| 1                    | Single objective optimization and multi-objective optimization  | Easy problem                            | Static implementation     |
| 2                    | Continuous variable optimization and discrete variable optimization | Difficult problem                        | Dynamic implementation   |
| 3                    | Linear programming and nonlinear programming                    | Deterministic algorithm                  | Centralized implementation |
| 4                    | Optimization of parameters and optimization of stochastic parameters | Stochastic algorithm                     | Distributed implementation |
| 5                    | Convex optimization and nonconvex optimization                  |                                         |                           |

The choice of integrated services means that under certain broadband resources, for the user's data transmission service to provide controllable load, end to end and best effort these three service levels. Among them, the controlled load service is the use of IP communication services to reduce the network packet loss ratio and improve the quality of network services [16, 17]. The best effort is to control the packet delay and improve the quality of service under the condition of broadband utilization. This provides grade of service, the need for the four function definition of the router, the router access control, resource reservation protocol, the scheduler and classifier, to improve the quality of network services through the reasonable definition of the router. However, integrated services can only be used outside the network, mainly because the change of IP communication will change the service scalability of the network and reduce the scalability. In addition, it requires routers to meet four functional definitions, otherwise the QoS of the network can not be guaranteed.

4. Computer network service quality optimization model

4.1. Model building
The network system aims to provide users with the highest possible quality of service, and network technology is evolving to accommodate more potential users and enhance user experience. Figure 1 describes the goals and steps of optimizing the quality of network services:

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Management and control of network system

Modeling  Solve  Implementation  Evaluate
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Figure 2. Optimization goals and steps of network service quality
The whole network system can be regarded as a system with producers and consumers, and producers provide relatively limited resources to the service principal. The consumer corresponds to the user and
uses the resources allocated by the producer. For example, for wireless resources, the limited bandwidth does not meet the increasing demand of wireless services and users. This not only promotes the introduction of new strategies and technologies, such as dynamic spectrum access technology for restricted wireless bandwidth resources. At the same time, the problem of resource allocation under the technical background has attracted more and more researchers' attention, and is more devoted to solving the problem of insufficient supply of resources. The resource allocation problem contains a series of QoS index, the effectiveness of resource allocation decision network utilization, equity balance degree allocation decisions of the network, and the QoS index constitute the unity of each user and the whole network of social utility.

The network QoS optimization model contains 4 elements: the optimization objective, the decision variable, the constraint condition and the fixed parameter. Figure 2 describes the corresponding elements of the network optimization model.

1. For different research objects, the expression of the objective function is different, which can be divided into the target of the end users and the targets of the network operators.
2. Decision variables often correspond to scheduling policies, and the number of variables determines the degree of freedom of network system design.
3. Constraints limit the amount of resources available for scheduling or specify some strategic and technical limitations.
4. The fixed parameter is the constant of the system, and is the invariable factor in the network.

![Diagram of network optimization model]

The most general objective function is defined as utility function, which can be an objective physical index, and may also be mixed with certain subjective factors.

1. Objective utility functions, such as network throughput, packet average delay, link utilization, and network energy usage, can be rigorously defined using mathematical expressions.
2. The utility function of subjective factors is added. Utility function is sometimes used to express the satisfaction degree of users to network service. Because different users have different requirements.
for QoS, such as some users are sensitive to delay, and some users can tolerate a certain range of delays, so this utility function is usually mixed with subjective factors.

The utility function is usually a monotonically increasing concave function, that is, the marginal effect of the improvement of the performance index is gradually weakened with the decision variable. This satisfies the practical situation that the marginal utility gradually decreases, and also provides a theoretical basis for transforming the maximization utility problem into convex optimization problem.

The general optimization form can be expressed as:

$$\min_{x} \quad f(x)$$

subject to \quad \begin{align*}
    f_i(x) &\leq 0, \quad i = 1, 2, \ldots, m \\
    h_i(x) &= 0, \quad i = 1, 2, \ldots, p
\end{align*}$$

Or

$$\max_{x} \quad U(x)$$

subject to \quad \begin{align*}
    f_i(x) &\leq 0, \quad i = 1, 2, \ldots, m \\
    h_i(x) &= 0, \quad i = 1, 2, \ldots, p
\end{align*}$$

4.2. Solution of network optimization model

Because the network nodes have limited processing resources, many network deployments do not have a dedicated centralized control node. Therefore, in general, the nodes in the network shoulder the dual functions of the control level and the data level, and bear greater burden. In order to achieve real-time and effective control and performance optimization, it is necessary to design algorithms with less resources and low complexity. Especially, the nodes which have less energy and can not frequently replenish energy, such as wireless sensors or network services with higher real-time requirements. This requires that not only improve the network performance, we need the optimization algorithm, but also the optimization algorithm itself needs to be optimized. Many problems if the model is transformed into a model to understand as everyone knows, such as linear programming problem, which can find the optimal solution in polynomial time by solving the mature theory. Otherwise, it is very likely to be a NP-hard problem. At this time, we can only find approximate algorithms and ensure that the approximation algorithm itself is less expensive. Moreover, the approximate scheme is close to the theoretical optimal scheme to some extent.

We can classify the implementation of the optimization algorithm according to space and time. According to the different location of the optimization algorithm, it can be divided into centralized optimization implementation scheme and distributed optimization implementation scheme. As the name suggests, centralized optimization requires a centralized controller and performs task scheduling or resource allocation with its computed optimization results. The optimization of distributed algorithm for solving distributed parallel process itself is completed, the relevant nodes in the network are a part of the optimization process, and the necessary information, each node in the use of information scheduling and control on their own. According to different time, the optimization algorithm can be divided into static optimization and dynamic optimization. Static optimization in the algorithm process all parameters are locked, and the dynamic optimization algorithm in the process of reference to the state of the network to make decisions, and at each point in time may make different decisions. The quality of an optimization algorithm depends on its implementation in the actual network. The lower the complexity of the optimization scheme, the smaller the amount of traffic needed, the lower the cost.

Therefore, we need to evaluate the cost and performance of the optimization scheme. Some indexes are easy to write an evaluation of expressions, such as complexity can be described by the O expression of the classic, but some indicators need to be deployed to the real practical application, which is evaluated by the statistical test method, such as the adaptability of the algorithm etc.
5. Conclusion

Optimization theory for advanced manufacturing technologies in the network will become the basic starting point of network system design. It can not only optimal decision is derived strictly in the network at the same level of resource allocation and task scheduling, and cross-layer design guide network. Many network mechanisms are based on heuristic design and need to be improved, so network optimization theory is needed. Moreover, there are many difficulties in network optimization theory, such as communication information transmission, dynamic programming based on state, simplification of state space and so on. In practice, each node in the network has limited energy and resources, and it is also urgent to find a more efficient optimization algorithm. In addition, the evaluation of optimization algorithms is also a challenge, especially those that are difficult to quantify, such as adaptability. The evaluation result of the optimization algorithm will provide a reference for the algorithm which has the best compromise performance index.

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