Review of P2P Computing System Cooperative Scheduling Mechanisms

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ABSTRACT

An emerging technology, grid computing pools resources from multiple locations to tackle massive problems. The term "peer to peer" (P2P) computing refers to a method of computing in which a network of interconnected computers pool their resources to tackle massive problems or complete complex jobs. In order to solve massively parallel applications, it makes use of the unused processing power of every computer on the network. The most significant problem faced by the peer-to-peer network in terms of optimal resource utilization and job assignment is the development of an efficient scheduling system. Due to the fact that users of P2P networks often consume resources without contributing anything in return, cooperation is crucial. In order to demonstrate how effective various cooperative scheduling strategies are in addressing issues with inefficient resource consumption and scalability, this paper compares and contrasts them.

Keywords: Cooperative Scheduling; Resource Utilization; Grid Computing

Introduction

Distributed heterogeneous resources make up grid computing. Resources can join or exit a grid system at any moment due to the system's dynamic nature. The system has trouble scheduling resources due to the dynamic nature of the Grid, which leads to inefficient use of resources and management of those resources. Allocating tasks to available resources is what scheduling is all about. Despite the development of several approaches for task scheduling in relation to available resources, optimal utilization of these resources remains an elusive goal. Distributed computing systems leverage the unused processing power of computers linked over the Internet to complete tasks, which can lead to resource overload and inefficient use of system resources [1–20]. Executing large-parallel distributed programs is what they do with the resources. Such systems require an efficient scheduling mechanism so that the tasks can be assigned to the heterogeneous computing resources. However, as scheduling techniques in decentralized contexts demand significant processing times, the centralized scheduling approaches looks to be inefficient. This is because they may cause bottleneck and a single point of failure.

In order to enhance system performance, it is essential to create incentive techniques that encourage cooperation and resource sharing among peers. Users in P2P networks make the most of the resources they receive while contributing a little amount, hence cooperation is highly valued. For effective distribution of parallel applications in P2P computing systems, a two-level scheduler method is employed [21–35].

Following is the structure of this document. We go over the main points of this paper in Section II. The comparison study is presented in Section III. We talk about the cooperative scheduling mechanism in Section IV. We compare several scheduling mechanisms in Section

Essential Ideas

Computer networks

The phrase "grid computing" describes the practice of accomplishing massive tasks by pooling together numerous, geographically distributed resources. It offers methods for accessing and making use of a wide variety of materials. The resources and duties of a grid system may change quickly, making it dynamic. The grid's heterogeneity lies in the fact that it brings together a wide variety of dispersed resources and tasks. from different sources to solve a common goal. The grid system provides the user the capabilities with large scale, i.e. the system should be capable to collect large number of resources and tasks and provide the users a secure way to access them.

Peer-to-Peer computing

Peer-to-peer (P2P) computing is a popular distributed paradigm for building applications that pool resources from many sources to solve problems. These applications can be anything from large-scale scientific applications to modest ad hoc information sharing. The difficulty of resource sharing in a grid setting arises, however, from the fact that peers are dynamic and diverse across domains.

Nevertheless, these settings make resource management a challenging task. Effective mechanisms for fair resource sharing, adaptation to changing dynamic nature, protection from participating peers' internet assaults, and coordination of policies, cost models, and loads vary between peers are required for these systems [36–49].

Planned collaboration

In cooperative scheduling, processors pool their knowledge to determine how to best allocate resources. This demonstrates the process's autonomy by allowing it to choose its own resources and make judgments about them. Each processor in a cooperative setup is responsible for its own scheduling job, but they coordinate their efforts to maximize efficiency. On the other hand, in a non-cooperative system, each processor operates autonomously, making decisions about its own resources without impacting the others.

Use of Resources

Resource utilization handles the balance of the load efficiently. A distributed system may have any number of processes unexpectedly needing greater processing resources. Once if the technique is implemented effectively the resources may be priced and transported to the processors with less loads more efficiently.

Comparative Study

In this part, we look at how different cooperative scheduling strategies affect the performance and scalability of P2P networks. Assuming fifty managers are randomly assigned 10,000 employees, the mechanisms perform as intended. There will be no more than 400 peers per area, it is anticipated. The peers are expected to be similarly task-oriented.

Global Grid Workflow Scheduling that is Both Cooperative and Decentralized

In order to address the issue of inefficient scheduling across distributed resources and resource utilisation, a method was devised for cooperative and decentralized workflow scheduling in dynamic and distributed grid environments [4].

A distributed hash table-based d-dimensional logical index space is utilized by the technique. Everyone involved in the system relies on one another.In order to decentralize the system and manage coordination objects, it offers a way for using the DHT-based geographical index. For task-to-resource mapping in the coordination space, it offers a decentralized algorithm for provisioning resources. Efficient scheduling with greater scalability and the elimination of performance bottlenecks are both obtained with the deployment of the technique [50-77].

Peer-To-Peer System Load Management in Coordination

Decentralized coordination and resource allocation were the driving forces for the development of Coordinated load management in peer-to-peer grid systems [5]. Resource brokering services govern the full management of the applications in the distributed Grid computing systems.

To efficiently handle the coordination objects, the coordinated load management approach uses a Distributed Hash Table. Specifically, under this technique the resource brokers and resources are structured based on a DHT overlay. In this method, brokers may post requests for resources into the coordination space using Resource Claim objects, while providers can use Resource Ticket objects to notify each other of their availability. These items are mapped to coordination services using a hashing approach.

Cash Based Mechanism

Level of collaboration determines how well peer-to-peer systems work. As it is, peer-to-peer networks do not collaborate. Previous approaches to the issue, although theoretically sound, either make implementation difficult or fail to offer sufficient incentives for cooperation. The premise of the cash-based approach [3] is that the node may earn money and get paid to make downloads if users offer to do so.

In order to trade bytes within the system, users utilize tokens. Users should get rewards for uploading and being online, and they should pay to download. In order to download the whole file, a user must have the necessary tokens.Systems that rely on currency are excessively complicated [78-98].

Incentive Systems Based on Exchanges

Participants' collaboration determines the performance of peer-to-peer resource sharing networks. To encourage collaboration in a peer-to-peer setting, an incentive mechanism based on exchanges is given [2]. Without the hassle of cash-based or credit-based systems, this method gives users more time to utilize the service and substantial incentives for file sharing.

The core principle is that people would prioritize helping those among their peers who can do the same for them. Systems with increased load or that are overburdened are good candidates for the mechanism. It provides strong incentives for users to share resources.

Incentive Technique for Scheduling Work in a Peer-To-Peer Computing System.

A two-tiered credit structure formed the basis of the incentive and scheduling system [1]. A non-negative credit function is implemented at the low level. Increased collaboration amongst peers is a result of credit reinvestment. Improved scalability is accomplished regardless of the number of peers with the introduction of the upper level, which allows scheduling [99–110].

Taking into account the replication and multitasking on each peer might enhance the global incentives system. The method enhances the system's throughput while limiting the number of free riders.

Using a Social Network Algorithm to Boost Collaboration Between Peers

The inclusion of peer-to-peer credit transfer was a key component of the social network algorithm [6]. Peers who behave cooperatively are rewarded, while those who behave badly are punished, by the process. It appears that there is less security for the credit transfer between peers. The history of credit transfer between the peers is not kept and this impacts the secure transfer. The credit transfer system helps to avoid misbehaving peers by takingaway the credits and transferring them to more cooperative peers. The social network algorithm gives mechanism that promotes the collaboration among peers and boosts the delivery ratio and also the success ratio.

A System for Collaborative Scheduling

For distributed and parallel applications in peer-to-peer computing systems, a cooperative scheduling method [7] was designed with a two-level architecture. At the area level, each manager is responsible for low-level scheduling.It is believed that the scheduler already knows all of the necessary information on the resources. The low-level scheduler maps jobs in a near-optimal way by applying scheduling strategy. The introduction of high-level scheduling is a response to the scalability problems. Additional schedule details are needed at the top level. Scheduling criteria are utilized to distribute tasks across the various regions, therefore reducing the amount of data needed for this level of scheduling[111-125].

When dividing up work among departments, the distributed scheduler comes in handy. There is a fair and effective distribution of labor. Additionally, the system manages and reduces the scheduling cost. To function in a large, dispersed, and diverse setting, the cooperative scheduling method was developed [126-134].

Conclusion

Studies and classifications of the several cooperative scheduling systems have been made. We have also spoken about the pros and cons of them. This study aims to shed light on the features of each mechanism and make comparisons between them. The research will be useful in creating better scheduling algorithms. Prioritizing the removal of mechanisms'

drawbacks in order to make them more efficient in a dynamic environment might guide future effort..

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