Grid computing is a technology that utilizes the idle computing resources of internet computers to perform calculations, while cloud computing utilizes computing systems on the internet to support various internet applications. From the definitions of the two, they both aim to view various IT resources as a virtual resource pool and provide corresponding services to users. Both grid computing and cloud computing are scalable. Scalability is achieved through the load balancing of application instances running independently on various operating systems connected through Web services, with CPU and network bandwidth allocated and recovered based on demand. System storage capacity is adjusted according to the specific user numbers, instance numbers, and data transmission volumes at a particular time. Both computing types involve multi-tenancy and multi-tasking, where many users can perform different tasks and access one or more application instances. By sharing resources among a large user pool to reduce infrastructure costs and improve peak load capacity. Both computing types provide service level agreements (SLAs) to ensure availability, such as 99%. If the service does not meet the promised normal operating time, the consumer will receive compensation for data delay.

From the connotation of grid computing, on the one hand, it is so-called utility computing or on-demand computing; on the other hand, it is virtual supercomputer. Cloud computing is a broad concept that allows users to access various IT-based services over the internet, while users do not need to understand the underlying IT infrastructure architecture. Both computing types involve multi-tenancy and multi-tasking, and both provide online computing or storage services through a resource pool or distributed computing resources to reduce infrastructure costs. Their differences mainly lie in the narrow definitions of grid computing and cloud computing.[1]

The specific aspects of these differences are as follows:

1 Business model: Traditional business models for software are usually one-time payment and unlimited use, but the cloud-based business model requires customers to pay a base fee while also paying extra attention to the economic scale of the cloud model to achieve the dual goals of reducing consumer spending and increasing supplier profits. Cloud computing was born for enterprise business applications, and its business model is clearer. The business model based on the grid model is more oriented towards scientific research applications, with its specific network service units paying special attention to standardization specifications, complexity, but lacking a successful business model.

2 Programming model:In essence, the programming model for the grid environment is no different from traditional distributed computing and parallel computing, but the grid is more focused on solving dynamically changing, unstable tasks. The emergence of the grid was mainly to solve large-scale scientific computing problems, so there are higher requirements for the speed and efficiency of program execution, and the algorithm compilation must also meet certain reliability and fault tolerance requirements. Cloud computing typically uses Web service API, and users use predefined APIs for access, configuration, and programming. Although cloud computing uses common communication protocols such as HTTP or SOAP, integrating all services and applications and achieving interoperability is still the biggest challenge facing the cloud model.[2]

3 Approach to heterogeneity:Grid computing uses middleware to mask heterogeneous systems, aiming to provide users with the same environment and make the use of computing, storage, and other resources transparent, while leaving the difficulties to the middleware and having the middleware complete the tasks. Therefore, grid computing also needs to solve many non-technical coordination problems. Cloud computing actually recognizes heterogeneity and uses mirrored execution or service provisioning mechanisms to solve the problem of heterogeneity. At present, different cloud computing systems have not yet reached a unified standard, for example, Google uses its own proprietary internal platform to support the construction of heterogeneous systems.

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