Research on Automotive Cloud Technology Platform and Solutions

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Abstract. With the emergence of cloud computing technology, various industries have solved many problems through cloud computing technology. In terms of auto companies, in order to quickly respond to market demand and seek new automotive R&D models, cloud computing technology has been effectively introduced into automobile enterprises and it provides enterprises with new solutions.

Keywords: Automobile Research and Development, Informatization, Cloud Computing Technology

1. Introduction

For enterprises, cloud computing is not just a technology, but a new service model and system structure that solves problems in the automotive industry. This paper mainly analyzes the status quo of automotive R&D, and it also introduced the automobile service platform, which was built through cloud computing technology.

2. Research status

2.1. Current status of foreign automobile R&D and design

In the last century, the automobile industry has undergone unprecedented changes, which can be said to be revolutionary. This is due to an industrial restructuring, which affects even every corner of the world, mainly in technology research and development activities and research and development models. Change on. At present, foreign automobile R&D mainly represents schools, such as the United States in North America, Germany in Europe, and Japan in Asia all speeding up the development of their R&D centers. This has a very important position in the growth of enterprises and the launch of products. Generally speaking, international car companies have gone through three stages in the evolution of R&D models, as shown in Table 1 [1].
Table 1. The three stages that international car companies have experienced in the evolution of R&D models

| Mode                           | Development of                                                                 | Features                                                                 |
|--------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| Home country centralized R&D   | Phase 1: Absolute concentration of the home country. Phase 2: Relative concentration of the home country | Centralized management of rights and knowledge technology                |
| Axis coordinated research and development | Transformed and developed from the centralized R&D model of the home country | Set up a strict main control center:                                     |
| Global collaborative integrated research and development | Axis coordinated R&D no longer meets the requirements and needs of the times: 1. Increasing operating costs. 2. Restrict the creation of subordinate R&D institutions. 3. Lack of flexibility and motivation. | Reflected competitive advantage: 1. Take the user as a guide. 2. Strategic concentration. 3. Provide sufficient support technology. |

2.2. Current status of domestic automobile R&D and design
In the late 1980s, the country implemented the policy of "market for technology". During this period, domestic auto companies (including established companies such as FAW and Dongfeng) almost gave up research and development, and all technologies were imported from foreign countries. Even if there are R&D activities, the organization of R&D personnel is only to select dozens of technical personnel with relevant experience within the company to conduct special technical research. There is no scale and standard, and it is impossible to establish a R&D system of its own. The "market for technology" policy has resulted in domestic companies having no right to speak in joint ventures and lack of competitiveness in the market, thus gradually losing their independent research and development capabilities and even their own brands [2]. All this has made domestic auto companies thoroughly understand the importance of establishing R&D centers.

So far, many automobile companies have gradually realized the significance of technology research and development for the development of enterprises, so they invested a lot of money to establish their own research and development centers, and have high hopes for the research output of new results. In the process of combining its own characteristics and continuously learning the development model of foreign new technologies, my country's automobile research and development has got rid of the closed and backward state, and has made considerable progress in hardware and software.

2.3. Current status of cloud computing research
Because the concept of cloud computing has only been put forward for a few years, its development and research are in the exploratory stage of a new technology field. It mainly integrates software and hardware, as well as IT resources such as network and storage resources, to realize its core content: service. The technology and business prospects of cloud computing have made capital, talent and innovation more concentrated. There are currently about 150 companies involved in cloud computing in Silicon Valley, and new business models are emerging one after another. Industry giants that have publicly announced their entry into or support the development of cloud computing technology include Microsoft, Google, IBM, Amazon, Netsuite, Net App, Adobe, etc [3]. At present, there is no unified technical standard for cloud computing. IT giants have launched different cloud computing services according to the characteristics of their companies. Typical cloud computing companies include Microsoft, Google, IBM, and Amazon. These IT giants have taken cloud computing services as an
important business strategy project and have achieved initial commercial progress and successful practices.

3. Cloud computing

3.1. Features of cloud computing
In terms of cloud computing itself, it has the following characteristics:

① Greater flexibility, huge scale and unlimited extension. Cloud computing can reasonably allocate required resources according to the usage conditions of users during peak or valley periods.

② Virtualization. Virtualization technology is a relatively core part of cloud computing technology. It hides the difference between real and virtual machines through the abstraction of computing, storage, and operation, and is used by users at different levels [4].

③ Strong compatibility. Cloud computing can realize the operation of multiple different applications, and it is also feasible to deploy multiple different applications at the same time with the support of cloud technology, and it is not aimed at a specific application.

④ On-demand self-service, good security. Users can use cloud computing to obtain application services anytime, anywhere, using different terminal devices (even the simplest). In addition, the disaster recovery solution provided by cloud computing is a good solution to the situation that users worry about virus intrusion or data cannot be restored when the system crashes.

⑤ Low cost, energy saving and environmental protection. First of all, for individuals and enterprises, there is no need to spend a lot of money to purchase well-equipped Internet terminal equipment, especially for enterprises that often use more professional software, which is tens of thousands or hundreds of thousands, because the cloud resource pool will be based on the user’s Demand is supplied on demand, thereby reducing purchase/construction costs. Secondly, once users purchase their own applications on the cloud, all subsequent upgrades, repairs, and replacement issues will be provided by the cloud service provider without having to bear management costs. In addition, the core technology adopted by cloud computing-virtualization, can integrate existing application deployments, accelerate deployment progress, and promote the improvement of equipment utilization [5].

For enterprises using cloud computing, cloud computing brings obvious advantages:

Cloud computing can reduce enterprise operation and maintenance costs and management costs. The user does not need to manage the resources used when using cloud computing. All his work is to choose the application or infrastructure he needs and pay the corresponding fee for it. It can be said that companies only need to focus on their own business, and don't spend too much energy on operations and management of unfamiliar parts (such as financial analysis or decision-making judgments, and software and hardware upgrades).

Cloud computing flexibly changes the needs of users. The flexibility of cloud computing business is reflected in the additional resources that it can release well and adapt to market changes easily and quickly. The key to all this is that cloud computing can scale the entire IT infrastructure. The actual experience that these advantages bring to users is the transformation of payment and consumption methods, as shown in Figure 1 [6].
3.2. Key technology analysis

①Virtualization technology Virtualization technology is a core part of cloud computing technology, and it is also the most important basic technology. Specifically, it is the virtualization of storage and computing, the virtualization of the server that executes the requested command, the virtualization of the operating system, the virtualization of the desktop, and so on. Through the abstraction of computing, storage, and operation, it hides the difference between real and virtual machines for use by users at different levels. In the case of separating hardware and software, unified scheduling and allocation of software and hardware resources and servers to improve resource utilization.

②Parallel programming model Most cloud computing uses Map-reduce programming mode or programming tools developed based on Map-reduce ideas [7]. Map-reduce is a collection of task scheduler model and task programming model, and its scheduling efficiency is extremely high. Simply put, Map-reduce is the decomposition of tasks and the aggregation of results. The basic principle is to decompose a task into several different fragments (Map), assign them to different work machines to read and execute them in parallel, and then summarize the results of multiple work machines (reduce), as shown in Figure 2.

③Storage and management of massive data Using distributed and redundant methods to store data can ensure high availability and reliability of data. That is to say, the same data samples are stored on different servers and multiple copies are kept, and this server and the copies are all virtual, and quick changes can be made as needed to ensure its economy and high throughput. At the same time, all the steps and services are parallel and can provide services to many users.

The data management technology of cloud computing requires that the system can analyze and process large amounts of data efficiently. Judging from the current situation, Google's BT data
management technology and the open source data management module HBase developed by the Hadoop team are the mainstream data management technologies [8].

4. Establishment of cloud computing platform for automobile R&D

4.1. Overall architecture model of cloud computing platform

The core content and real purpose of developing a car is to perfectly reflect the needs of end customers into the product, and to provide customers with the brand concept and thoughtful service of connected products, not just for research and development. This coincides with the purpose of cloud computing. The idea that cloud computing technology takes the customer as the service center has made great achievements in solving the communication difficulties faced by the above-mentioned auto companies and the lack of the same platform. Reduce IT investment, reduce IT risks, and improve auto companies' ability to respond to business changes. At the same time, the ultra-large-scale computing and storage capabilities it provides can provide technical support for process communication and reorganization between enterprises and departments, and optimize business processes in depth.

Combining the characteristics of cloud computing platform and automobile enterprise business, this paper puts forward a cloud computing technology-based research and development cloud computing application model for the automotive industry after analysis and demonstration, as shown in Figure 3.

![Figure 3. Overall solution diagram](image)

4.2. Application and maintenance of cloud computing service platform

In the long run, cloud computing technology will not only bring huge cost reduction space to enterprises, but more importantly, increase the space for their business development. The focus of operation and maintenance management has also changed from traditional monitoring and management to resource allocation to ensure the active, elastic, and continuous supply of resources [9].

The operation and maintenance management of the cloud computing platform has crossed geographical restrictions, which will change the original passive operation and maintenance method and shift to the active operation and maintenance management of IT, anytime, anywhere, without restriction. Specifically, in traditional operation and maintenance management activities, vertical operations have obvious characteristics. The person in charge of each business platform completes the deployment and maintenance by themselves. In addition, continuous monitoring of the application is inevitable, so as to judge whether the server has failed nodes or the load is too high. The solution is to reconfigure or completely initialized; in the cloud computing environment, interact with the original operation and maintenance system of the previous enterprise, and establish a special public resource
maintenance group (which can be handed over to a third-party operation and maintenance when appropriate) to implement horizontal operation and maintenance Mode, unified by professional departments to maintain the network, computer room, equipment, etc.

5. Conclusion
In summary, applying cloud computing technology to auto companies has beneficially improved the development of auto companies. Of course, as a new technology, cloud computing must have some problems, but with the development and gradual maturity of cloud computing technology, I believe that these problems will be solved easily. Therefore, companies should strengthen the application of cloud computing, this can bring new development scale and prospects to auto companies.

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