

Research on the Application of "Cloud Computing" Based on 5G Technology in Digital Media

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Abstract. With the advent of the digital age, 5G technology has pushed the computing speed of mobile Internet to a new level, information has become more convenient and efficient, and this technology has affected people's work and lifestyle. The field of digital media art, which relies on technical forces such as virtual reality, artificial intelligence, and big data, will break through new heights and become a high-speed, high-reliability and low-latency media platform, and the development of 5G technology will also be popularized. The dynamic power of the digital media approach. Based on the background of the "5G" era, this paper systematically analyzes the current situation faced by digital media in the development and application, and takes "cloud computing" in the era of big data as the object, and illustrates its development trend in the digital media in the 5G era through a case study. application problem.

Keywords: 5G; digital media; cloud computing; virtual reality

1 Introduction

With the development of cloud computing, traditional single-machine operations have begun to develop into network services, and single-task processing has begun to develop into parallel computing^[1-2]. The great changes that are taking place now from the Internet era to the cloud computing era are turning IT infrastructure into public infrastructure, enterprise application services into public services, and application platforms into public platforms. More enterprises have begun to explore the cloud according to the actual situation of their industry, using low-cost investment^[3], starting from infrastructure (IaaS)^[4], software as a service (SaaS)^[5] and platform as a service (PaaS)^[6], a public and open cloud system is constructed at three levels to provide users with more efficient, stable and secure services.

2 Industry status of digital media and cloud computing

2.1 Status Quo of Digital Media Industry

2.1.1 Data Mass Quantification

The most notable feature of digital industry data information is that a single file is large and unstructured files are the main body. With the large-scale application of high-definition materials and virtual reality real-time materials, the amount of data will increase faster and faster. For example, for a medium-sized provincial media resource network, the amount of data that needs to be archived for persistent storage every day is about 300GB, especially for some traditional TV stations, because of the production of documentary entertainment programs, multi-camera settings, and all-weather recording. Therefore, large-capacity storage volumes and file systems and databases that support unstructured storage are required.

2.1.2 Diversification of coding

The video and audio coding technology in the digital media industry has been continuously improved and updated^[7]. The coding methods and encapsulation formats are rich and diverse, from the original AVI and MPG formats to the streaming media WMV, MP4, FLV, etc. These formats are widely used in various broadcasting and publishing occasions. With the frequent content sharing and interaction between TV stations, film and television institutions, and Internet backgrounds, the mutual conversion and identification of different file formats are also particularly important. To achieve an efficient and undistorted transcoding effect, a high-performance and highly stable computing platform is needed as support, as shown in Figure 1, an implementation architecture of video image encoding scheme based on cloud storage is described.

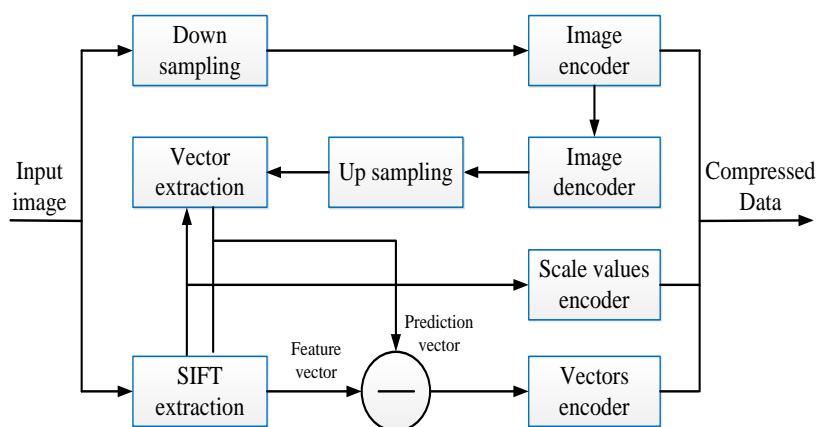


Fig. 1. The implementation architecture of video image encoding scheme based on cloud storage (Introduced from “Research on image lossless compression based on distributed coding[D]. University of Science and Technology of China, 2015.”)

2.2 Status Quo of Cloud Computing

2.2.1 The production of digital media content for cloud computing requires 5G network support.

With the continuous improvement of end users' demands for content quality and real-time performance in video projects and virtual reality projects, the demand for ultra-high-speed networks in digital media content production is increasing day by day. Related technologies include real-time keying in the direction of content acquisition, panoramic shooting, and content editing. Cloud 3D reconstruction, virtual and real scene fitting, stitching and stitching, spatial calculation, and WebXR in the direction of content playback.

2.2.2 5G cloud computing innovation technology can ensure the high-end quality of digital media products

With the support of the 5G network, the high-performance stitching and stitching technology can be moved to the edge cloud to achieve panoramic live broadcast with high-precision image quality. The 5G-based cloud processing method helps amplify the effect of machine vision on environmental perception, and completes real-time spatial perception and semantic labeling with lower latency. The larger data flow is in line with the transmission characteristics of 5G network. Table 1 shows the bandwidth and latency requirements of devices with different resolutions and refresh rates in cloud rendering under 5G technology.

Table 1. The bandwidth and latency requirements of devices with different resolutions and refresh rates under cloud rendering (Self-drawn)

Equipment	device resolution	screen refresh rate	Bandwidth requirements	Latency requirements
Shadow VR	2k(2560X1440)	75hz	0.8Gbps-1Gbps	13ms
Action one	2k(2560X720)	90hz	0.5Gbps-0.63Gbps	13ms
HTCvivefocus	3k(2880X1600)	75hz	1Gbps-1.3Gbps	13ms
Isealens K3+	4k(3840X2160)	72hz	1.8Gbps-2.3Gbps	13ms

3 Application case of cloud computing based on 5G technology in digital media

3.1 "Light Code" Data Cloud Platform Solution Based on 5G Technology

In view of the current situation of digital media content collection, processing, management and operation under the new situation, with the support of 5G technology, a "light code" big data video transmission and storage application platform solution is proposed. The platform structure is shown in Figure 2.

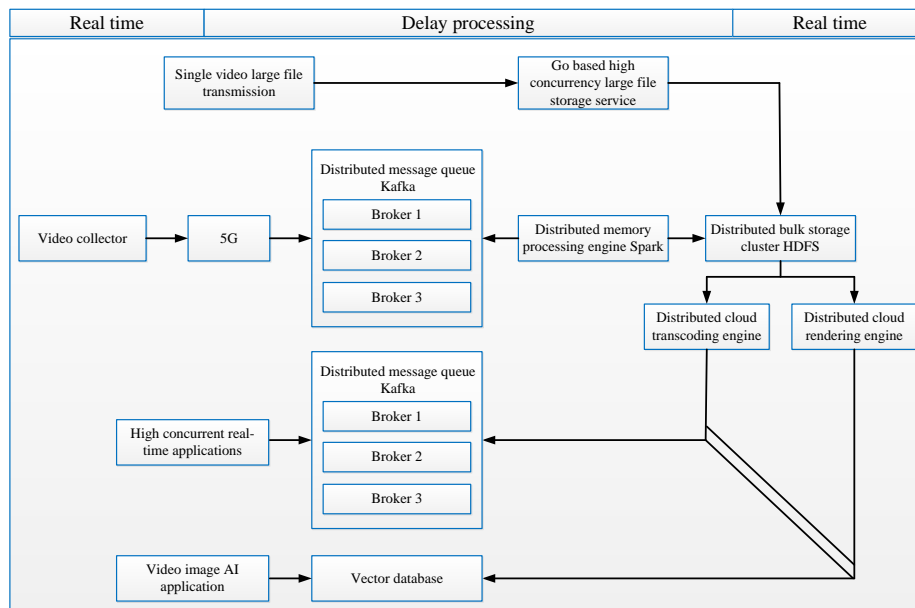


Fig. 2. The solution composition of the "light code" big data video transmission and storage application platform (Self-drawn)

3.1.1 Data cloud computing

The innovative platform first configures various network devices such as servers, storage and switches through virtualization and intelligence, creates a cloud-based resource pool for the entire platform, and virtualizes data computing. The unified video and audio encoding and decoding calculation can meet the needs of video and audio processing in various formats, can display CPU and memory status calculations in real time, and provide cloud resource pool performance information and resource overuse calculations.

3.1.2 Content Distribution Cloud

For the transmission and distribution of video data, as well as traditional high-concurrency real-time application materials, the information is decomposed into data clusters of distributed message queues, and finally transmitted to the receiving nodes one by one for use. While for artificial intelligence, virtual reality and other image or video information that needs to be processed in combination with equipment and environments, it is distributed through distributed information. The cloud rendering engine renders the relevant data of digital media into a specific data pattern, and distributes the specific data directly through the vector database, as shown in Figure 3, so that the equipment using AI or VR can directly read the information through the database.

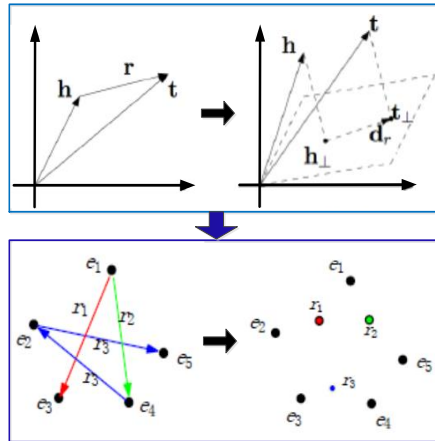


Fig. 3. Hyper-graph training knowledge graph representation method based on a vector database (Self-drawn)

3.2 Analysis of Advantages of "Light Code" Data Cloud Platform Solutions Based on 5G Technology

Compared with the processing methods of traditional application systems, the computing efficiency and processing quality have been greatly improved. The main advantages are:

3.2.1 Huge improvements in computational efficiency

The traditional computing mode can be said to be a single machine and a single job. After the cloud architecture is adopted, the file segmented management method is adopted, and jobs are allocated in real time according to their CPU and memory conditions, and multiple machine groups work together to complete a task. The result analysis of the WEB browser display of digital media materials using different types of technical routes is shown in Table 2.

Table 2. Comparison of technical routes (Self-drawn)

Compare items	Cloud rendering	Actives	WebGL
Maximum file size supported	Unlimited, but increase according to your needs	50MB	40-50MB
File load time	The loading time of a 50M model is about 10-15S	50MB model takes 2MIN, and then about 1MIN.	50MB model takes about 2MIN
Graphic display frame rate	Refresh rate can reach 60F/S, model operation is smooth	Refresh rate is 5-10 F/s, model operation time is stuck	Refresh rate is 10-20 F/s, model operation time is obviously stuck
Model interaction	Support complex operations	Support complex operations	Cut and explode effects are not supported
Browser Compatibility	Supports all major browsers	Only supports IE11 kernel browser	Supports all major browsers
Install the plugin	unnecessary	necessary	necessary

3.2.2 System reliability is more guaranteed

When a single point of failure occurs on the machine, the cloud platform automatically performs data backup, internal processor switching, and file fault-tolerant verification to ensure uninterrupted and consistent tasks, and all operations are open and transparent to users. Users only need to care about the final result of the business.

3.2.3 Reduce the cost of investment

Using a new platform, the existing systems and equipment can be fully exploited and utilized, which reduces the capital investment in purchasing more hardware facilities. At the same time, the "low-code" operation mode also reduces the labor cost of developers. The company's human resources and equipment investment costs have been saved.

4 Conclusion

In the situation of rapid development of digital media, the status quo of digital media industry and cloud computing are introduced, and the cloud computing application in 5G background are analyzed by actual examples. The study concludes the following conclusions: The digital media cloud computing technology based on 5G technology realizes the lightweight conversion of source files, solves the problem of inconsistent video file formats, and reduces the volume of files, which is conducive to the dissemination and sharing of files. Besides, a large-scale file browser display solution based on cloud rendering technology is proposed, and large-scale video data and model browser display and interactive operations are realized through 5G technology.

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