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CONFIDENTIAL

Independent Market Research

Audiovisual Cloud Service Market in China

For and on behalf of
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Methodologies

Methodologies

The projection on the size of each of the related markets in China takes into consideration various factors, including

- (i) historical market size data,
- (ii) the public filings of, and other publicly available information regarding Audiovisual market, Audiovisual cloud service market and its segmentations and the companies' projections of the related industries from interviews or communications with them,
- (iii) the projections of other industry experts,
- (iv) views and estimates of industry developments.

The Report is based on the assumptions that

- (i) the social, economic and political environments of China will remain stable during the forecast period, which ensures a sustainable and steady development of Audiovisual market, Audiovisual cloud service market and its segmentations
- (ii) the data quoted from authoritative agencies remains unchanged,
- (iii) related key industry drivers remain relevant and applicable in the forecast period,
- (iv) there will be no subversive changes to the related industries.

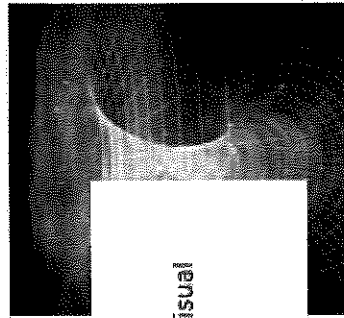
The reliability of the Report may be affected by the accuracy of the foregoing assumptions and factors.

Chapter Navigation

1

Chapter 1

Overview of Audiovisual
Industry in China



2

Chapter 2

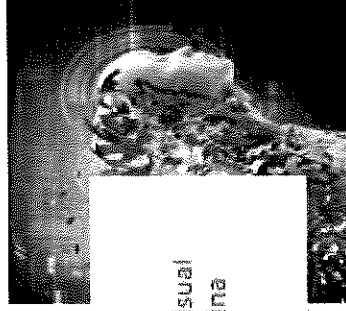
Overview of Audiovisual
Cloud Service Market in China



3

Chapter 3

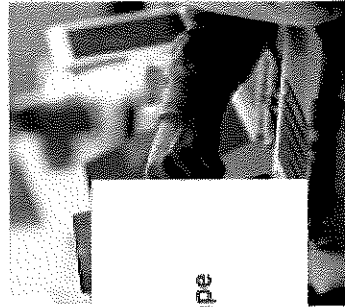
Overview of Audiovisual
APaaS Market in China



4

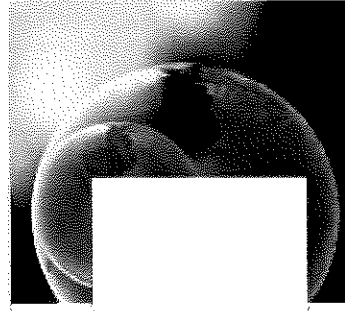
Chapter 4

Competitive Landscape



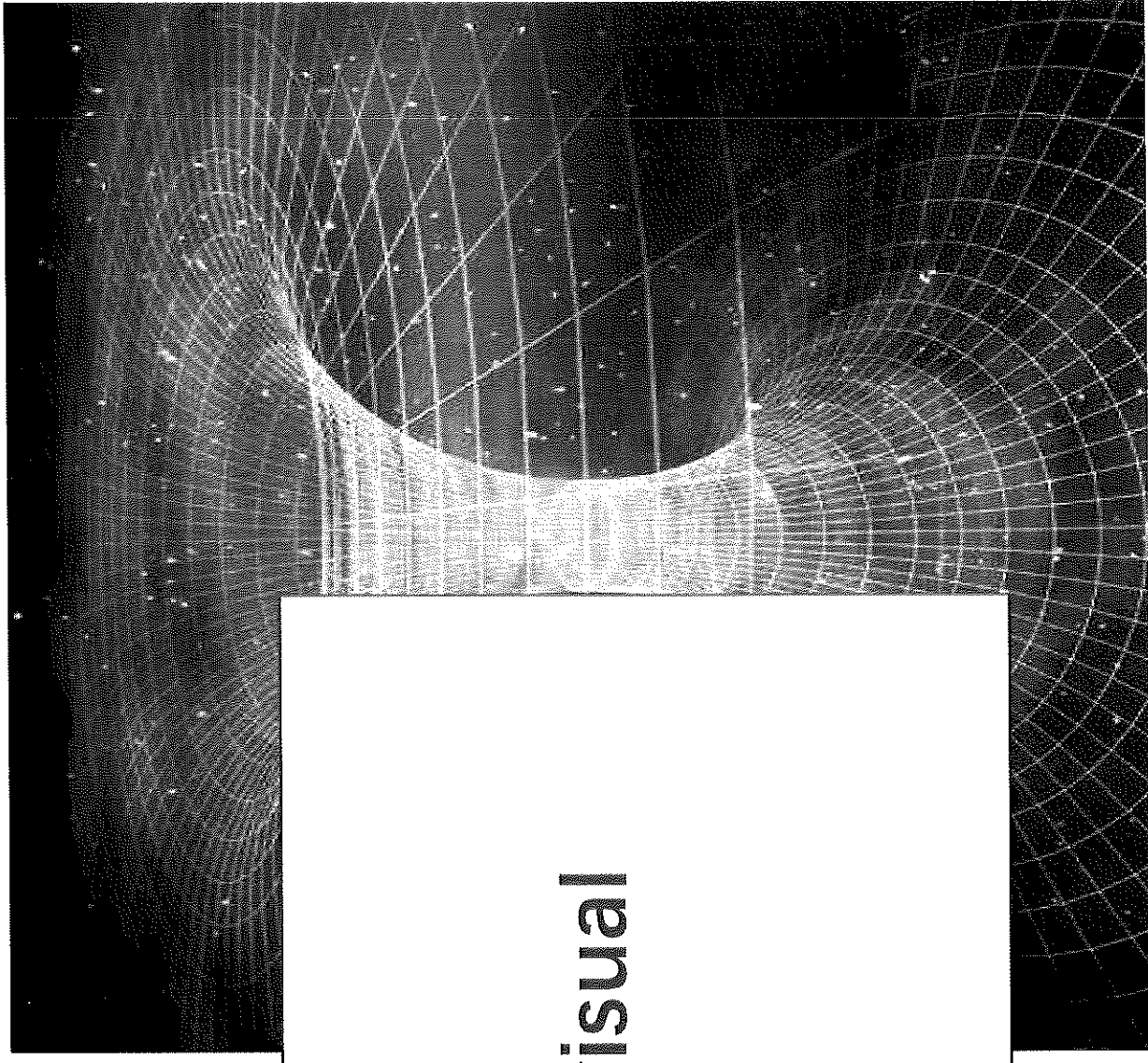
Chapter 5

Appendix



Chapter 1

Overview of Audiovisual Industry in China



Overview of the audiovisual market in China

Continuous development of the audiovisual market

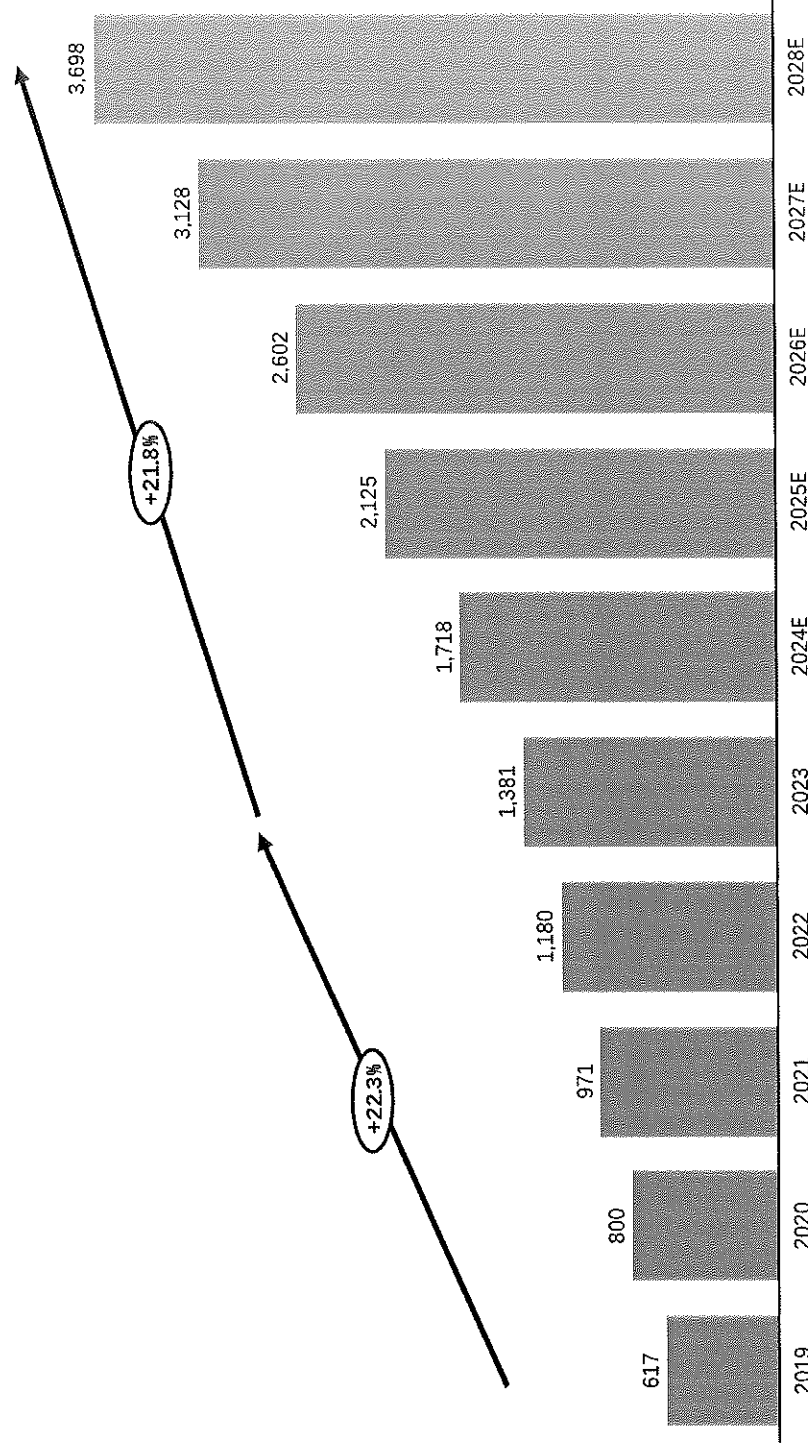
> With developments in network technology and increasing popularity of audiovisual, the audiovisual market in China continues to expand and many segments of the market have emerged, including long video, short video, live streaming, RTC, and their related services such as content production and audiovisual cloud services. In 2023, the size of the audiovisual market in China is nearly RMB1.4 trillion and is expected to continue to grow at a CAGR of 21.8% from 2023 to 2028.

> Commencing from 2022, with the continuous development of computing power, pre-training models and multimodal technology, the audiovisual market entered the AIGC (e.g. Wenxin Yige, an AI-generated art and creative assistant platform created by Baidu) and metaverse era. Going forward, as an auxiliary tool, AIGC is expected to enhance efficiency, quality, creativity and diversity of content production and audiovisual cloud service. The innovations are also expected to improve the overall audiovisual experience and promote the development of the audiovisual industry.

Note: The size of the audiovisual market includes revenue from online video advertising and payment, short video and live streaming, online audio, intelligent speech, virtual reality, cloud services and other markets.

Audiovisual market size in China, 2019-2028E

RMB billion



Source: The Game working Committee of China Audio and Digital Association, China Game Industry Research Institute, expert interview, (Research

Current status of the audiovisual market in China

Growing user scale of the audiovisual market

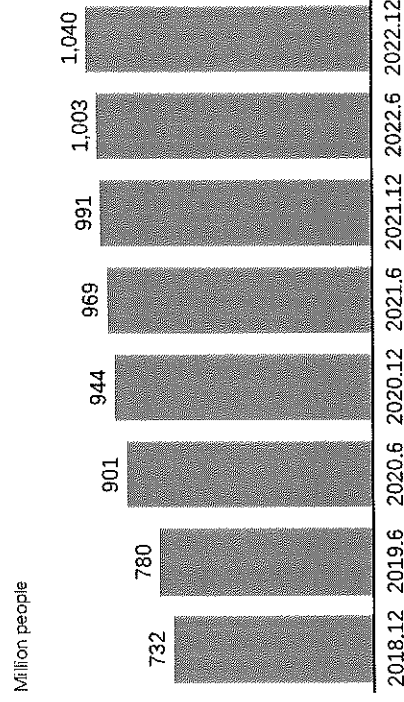
> Audio and video are becoming the mainstream carriers of social information activities, deepening their penetration among users.

> As of December 2022, the number of online audiovisual users in China reached 1,040 million people. The user scale of online videos in China (including short videos) reached 1,044 million people, and the user scale of online live streaming in China reached 765 million people as of June 2023.

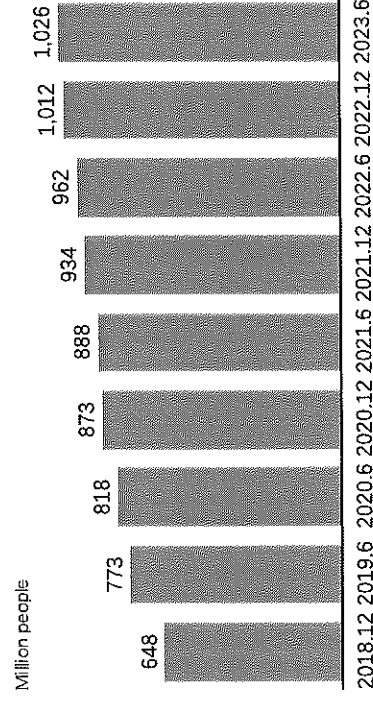
> The short duration of short videos aligns with people's fragmented reading habits, and they have rapidly become a popular tool for social entertainment in recent years. The user scale has experienced significant growth, reaching 1,026 million people as of June 2023.

> In the future, data will primarily consist of unstructured data such as images, photos, audio, and video. Audio and video will become core components of future data.

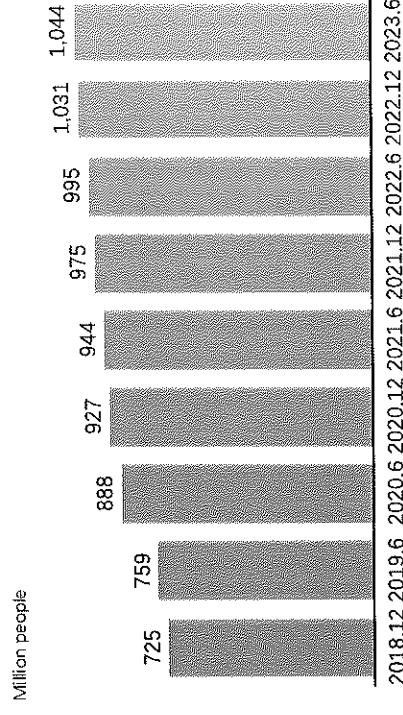
Number of online audiovisual users in China¹, 2018-2022



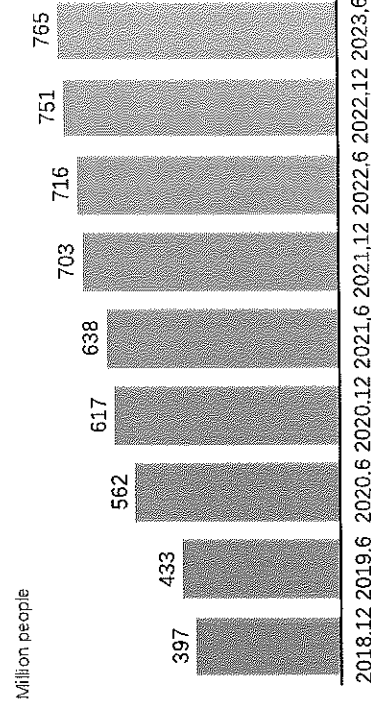
Number of online short video users in China¹, 2018-2023



Number of online video users in China, 2018-2023



Number of online livestreaming users in China¹, 2018-2023



Note: Online audiovisual users refer to the combined user base of comprehensive videos, short videos, online audio, and online live streaming.

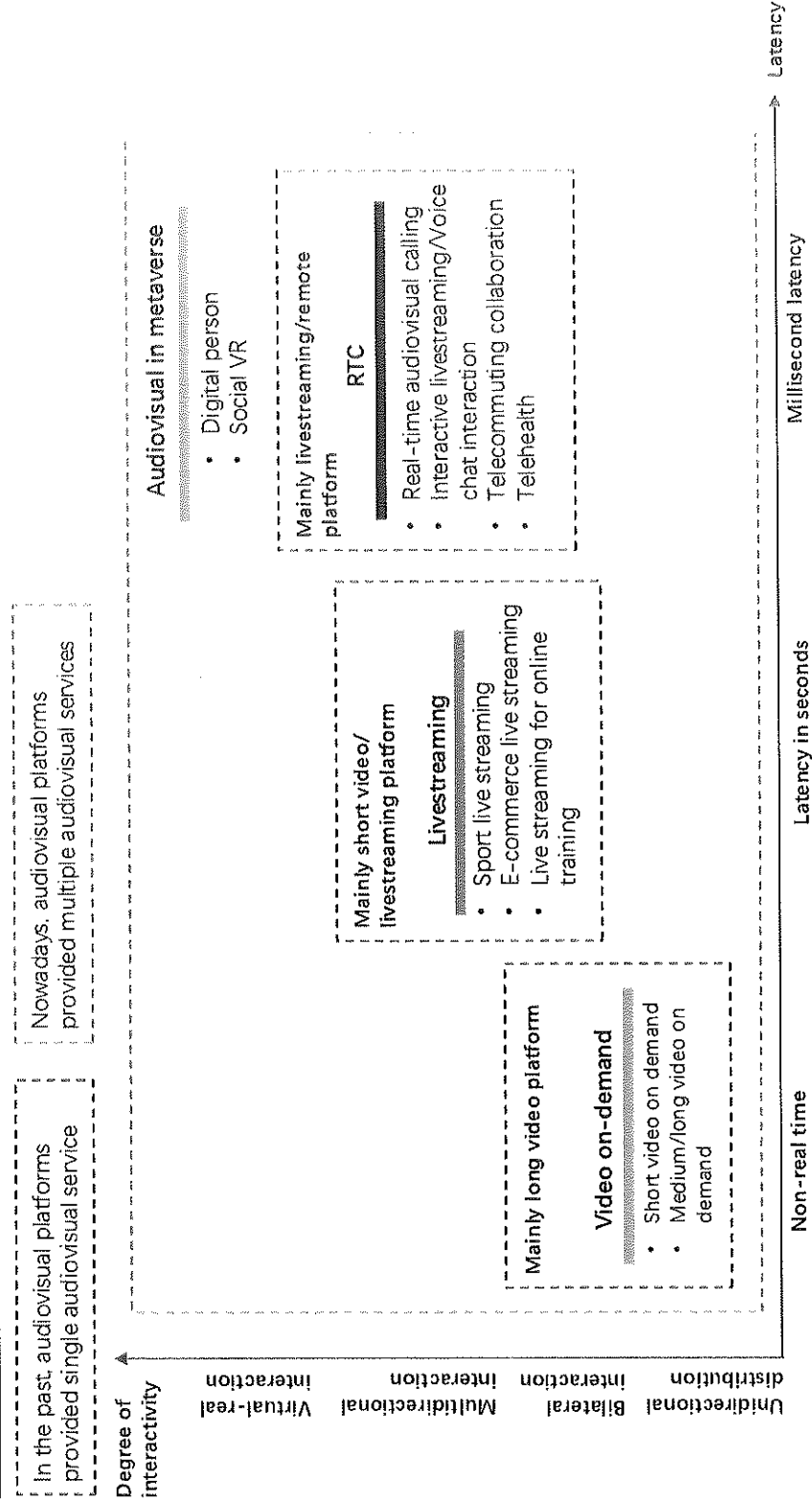
Source: China Netcasting Services Association, CNNIC, iResearch

Market drivers of the audiovisual market in China (1/5)

Shift in audiovisual consumption habits drives the development of audiovisual technology

- Nowadays, audio and video have become important means for people to access, publish, and exchange information. Audiovisual content is collected mainly through mobile phone cameras, monitor cameras and computer cameras. The main forms of interaction include one-way live streaming, on-demand and two-way real-time interaction.
- With users paying more attention to the interactive, real-time and immersive experience of audiovisual services, as well as continuous breakthroughs in key technologies, the audiovisual service has achieved outstanding development from video on-demand and live streaming to real-time communication and is exploring the application of audiovisual technology in metaverse that enables virtual and real-world interaction.
- Furthermore, audiovisual platforms no longer provide single audiovisual service but integrate more services and explore advanced audiovisual technology. In the past, long video platforms mainly provided on-demand services for medium/long videos. Nowadays, they also incorporate short video on-demand, live streaming, and interactive live streaming, while starting to make early layouts for audiovisual application in the metaverse.

Shift in audiovisual consumption habits and corresponding technology development



Market drivers of the audiovisual market in China (2/5)

The high -level development of digital infrastructure construction lays a good foundation for the development of audiovisual market

Overview of digital infrastructure construction in China

Fusion application	Calculation	Data	Network communication
Internet of Things: 6.6 billion Number of China's IoT Connections in 2023	Supercomputer: 32.4% Proportion of supercomputers in China among the world's top 500 supercomputers in 2022	Data output: World 2nd In 2022, China's data output reached 8.1ZB, which accounts for 10.5% of the world's data output, ranking	5G base station: 60%+ As of May 2023, the number of 5G base stations in China was 2.6 million, accounting for 60% of 5G base stations in the world
Industrial Internet: 150+ Number of China's industrial internet platforms with industrial and regional influence in February 2023 96 million+ Number of China's industrial equipment connections in 2023 590,000+ Number of China's industrial apps in 2021	Computing power: RMB1.8 trillion Market size of China's core industries in 2022	Big data: RMB1.6 trillion Market size of China's big data industry increased from RMB470 billion in 2017 to RMB1.6 trillion in 2022	Patent for 5G standards: 42%+ As of September 2023, China owns more than 42 percent of the standard essential patents for 5G technology
Software industry: RMB12.3 trillion Revenue of China's software industry in 2023	Cloud computing: +40.9% Market size of China's cloud computing market reached RMB455.0 billion in 2022, achieving a year-on-year growth of 40.9% Rack and server: Nearly 20 million units As of the end of June 2022, the number of China's data center racks in use exceeded 5.9 million, and the number of China's data server reached	Data center: +26.6% In 2022, the total revenue of China's data center reached RMB190 billion with a year-on-year growth of 26.6%	Fixed broadband: 94.5% In 2023, 94.5% of internet users in China had access to a broadband connection with speed of 100Mbps and above.
		Digital economy: 41.4% Market size of China's digital economy was RMB50.3 trillion in 2022, accounting for 41.4% of GDP	Mobile broadband: 86.7% In 2021, the number of mobile broadband 3G/4G/5G users reached 1.4 billion, 4G/5G accounted for 86.7% of mobile phone users

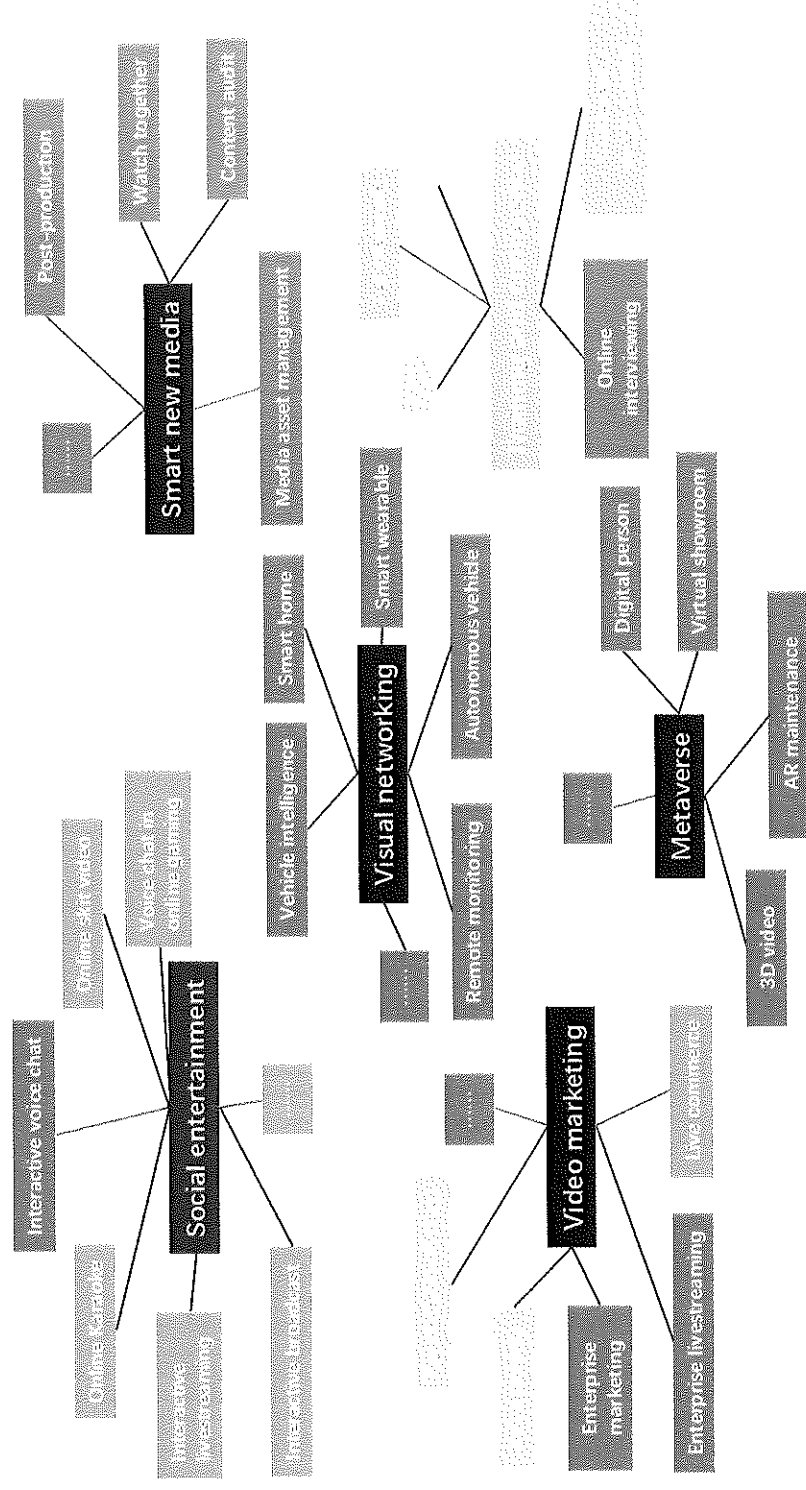
Source: IDC, MIT, MIT Thinktank, CAC, public resources, iResearch

Market drivers of the audiovisual market in China (3/5)

Ever-increasing, constantly developing, and imaginative audiovisual application scenarios

- Audiovisual technology is continuously being implemented commercially in various application scenarios, such as social entertainment, smart new media, visual networking, video marketing, training and conferences, and the metaverse.
- Among them, audiovisual solutions such as online karaoke, interactive livestreaming, and voice chat in online gaming have been widely used in current social entertainment scenarios.
- With the accelerated digital transformation of industries, video marketing, training and conference scenarios have become popular for enterprises in the post-pandemic era, aiming to enhance enterprise efficiency. Specially, live streaming has been increasingly applied to marketing events, training, conferences and other common scenarios of enterprises, with an aim to foster a closer relationship with their users through highly interactive marketing strategies.
- The application of audiovisual technology in the metaverse scenario is still in its early stage, but it holds broad development prospects in areas such as industrial inspection, AR maintenance, and digital person. Additionally, there are numerous unexplored application scenarios.

Expanding audiovisual application scenarios¹



Note: The darker the color of the box, the higher the future commercialization potential of the application scenario.

Market drivers of the audiovisual market in China (4/5)

Immense opportunities presented by the overseas markets



- Due to the maturity of the audiovisual market, increasingly fierce market competition, and limited market demand in China, numerous audiovisual platforms in China are exploring overseas market to create new business growth.
- Taking social entertainment apps expanding overseas as an example, popular social entertainment apps in China, such as short video, long video, livestreaming, online audio, social media, and novels and comics, are replicating their domestic success and localizing themselves in overseas markets. These exported social entertainment apps typically provide multiple audiovisual services.
- The overseas expansion of Chinese audiovisual apps also brings new growth opportunities for related players in the Chinese audiovisual content production and audiovisual cloud service providers, further accelerating the development of the audiovisual market in China.
- According to iShangqi Chanyeos, as of April 2023, there are 45,677 companies in China with cloud related services. Among them, there are 327 listed companies, 1,480 specialized and innovative enterprises, and 4,964 high-tech enterprises.

Social entertainment apps are expanding their presence in overseas markets			
Popular types of pan-entertainment apps	Chinese apps	Chinese apps branching in overseas markets	Major types of media
Short video	抖音、快手	Tik Tok, Huoshan Video, Vmate	Audio + video + Text and graphics
Long video	Tencent Video (腾讯视频) iQiyi (爱奇艺)	Tencent Video, iQiyi	Audio + video
Livestreaming	YY	BIGO, Yome live	Audio + video
Online Karaoke	WeSing (全民K歌)	WeSing, StarMaker	Audio
Online Podcast	Himalaya (喜马拉雅)	Himalaya, Castbox	Audio
Music	QQ Music (QQ音乐)	Joox Music, Zynn	Audio
Online Novels and Comics	Qidian (起点中文网)	WebNovel, Web comics, Manga Toon	Audio + Text and graphics
Strange dating	Tantan (探探)	Tantan, Blued, Mico	Audio + video + Text and graphics

Market drivers of the audiovisual market in China (5/5)

Favorable policies supporting audiovisual and related industries have been released in succession



Audiovisual-related policies and guidelines

Policies	Issue Date	Issuer	Description
Plan for the Overall Layout of Building a Digital China 《数字中国建设整体布局规划》	February 2023	The State Council	Accelerate the construction of Digital China, including network infrastructure, computing power infrastructure and application infrastructure. Vigorously develop cyber culture, strengthen the supply of top-quality cyber culture products, and guide all kinds of platforms as well as netizens at large to create and produce positive, healthy, upright, and beneficial cyber cultural products.
Notice on the issuance of the "14 th Five-Year Plan" for the development and popularization of national science and technology 关于印发《“十四五”国家科学技术普及发展规划》的通知	August 2022	The State Council	The policy mentioned to vigorously develop online science popularization, leverage the advantages of fast dissemination, stronger interactivity, and wider coverage offered by online new media, and encourage to popularize science through new media platforms such as short videos and live streaming.
Official news on the establishment of "Audiovisual+" standard 关于启动“音视频+”系列标准编制工作的官方消息	May 2022	China Academy of Information and Communications Technology	CAICT mentioned to start the preparation of "audiovisual+" standard establishment, focusing on audiovisual-related infrastructure, platform services, industry integration and other aspects of the ability to develop a series of technical standards. The standard establishment involves RTC, 5G ultra-low latency audiovisual, cloud rendering, and user experience enhancement.
2022 Government work report 《2022年政府工作报告》	May 2022	The State Council	The policy proposed to strengthen the overall layout of digital China construction, build digital information infrastructure, gradually build a national integrated big data center system, promote the large-scale application of 5G, promote the digital transformation of industry, develop smart cities, digital villages, accelerate the development of industrial Internet, cultivate and grow integrated circuits, artificial intelligence and other digital industries, and release the potential of data elements.
Proposal on Further Unleashing Consumption Potential for Sustained Recovery of Consumption 《关于进一步释放消费潜力促进消费持续恢复的建议》	April 2022	The State Council	The policy mentioned to promote the standard establishment of the fifth generation of mobile communications (5G), Internet of Things, cloud computing, artificial intelligence, blockchain, big data and other technologies, accelerate the standards pre-research of ultra-HD video, interactive video, immersive video, cloud games, virtual reality, augmented reality, wearable and other technologies, and strengthen the interface with the relevant application standards.

Market drivers of the audiovisual market in China (5/5)

Favorable policies supporting audiovisual and related industries have been released in succession



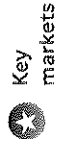
Audiovisual-related policies and guidelines

Policies	Issue Date	Issuer	Description
14 th Five-Year Plan for the Development of Radio, Television, and Online Audiovisual 《广播电视和网络视听“十四五”发展规划》	October 2021	National Radio and Television Administration	The policy proposed to fully leverage the content-related advantages of the radio and online audiovisual industry, develop broadcasting, TV series, animation, documentary films, web series, short videos, and online movies industry, and strengthen the management of innovative industries such as online variety shows, live commerce, and short videos.
Guiding Opinions of the Ministry of Commerce on Strengthening Standardization Construction in the Field of Commerce during the 14 th Five-Year Plan Period 《商务部关于加强“十四五”时期商务领域标准化建设的指导意见》	August 2021	Ministry of Commerce	The policy mentioned to strengthen the construction of standards for digital technology application in the field of commerce, promote the standardized development of live commerce and social commerce, and improve the public service standard system for e-commerce.
The Three-year Action Plan for the Development of New Data Centers (2021-2023) 《新型数据中心发展三年行动计划（2021-2023年）》	July 2021	Ministry of Industry and Information Technology	The policy mentioned to promote the layout optimization of the construction of new data centers, improve network quality, accelerate computing power empowerment, enhance the stability of the industrial chain, develop green and low-carbon technologies, improve security guarantee, and build a new intelligent computing power ecosystem to effectively support the digital transformation in various fields.
《中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要》	March 2021	The State Council	The policy encouraged the nurturing and strengthening of emerging digital industries such as artificial intelligence, big data, blockchain, cloud technology, and cybersecurity, while also enhancing the level of industries such as communication equipment, core electronic components, and key software.

Source: Public resources, iResearch

Overview of Audiovisual Cloud Service Market in China

Definition and segmentation of cloud service market in China



Segmentation of cloud service market

Cloud services are infrastructure, platforms, or software that are hosted by third-party providers and made available to users through the internet.

Segmentation

By type of content or data being managed

1

Audiovisual cloud service

Audiovisual cloud services refers to the producing, storing, processing, distributing, analyzing, auditing, retrieving, and recommending unstructured audiovisual content in multi-media formats. Such audiovisual content include audio recordings, short videos, livestreaming videos, music, images and texts.

2

Non-audiovisual cloud service

Non-audiovisual cloud services refers to the producing, storing, processing, distributing, analyzing, auditing, retrieving, and recommending contents other than audiovisual contents. Such content include all sorts of structured data, such as financial data, client contact lists, and all other data with standardized tabular formats, accessible by ERP, CRM, and other similar databases. Also unstructured data unrelated to audiovisual content, such as emails, documents, developed applications and programs, etc.

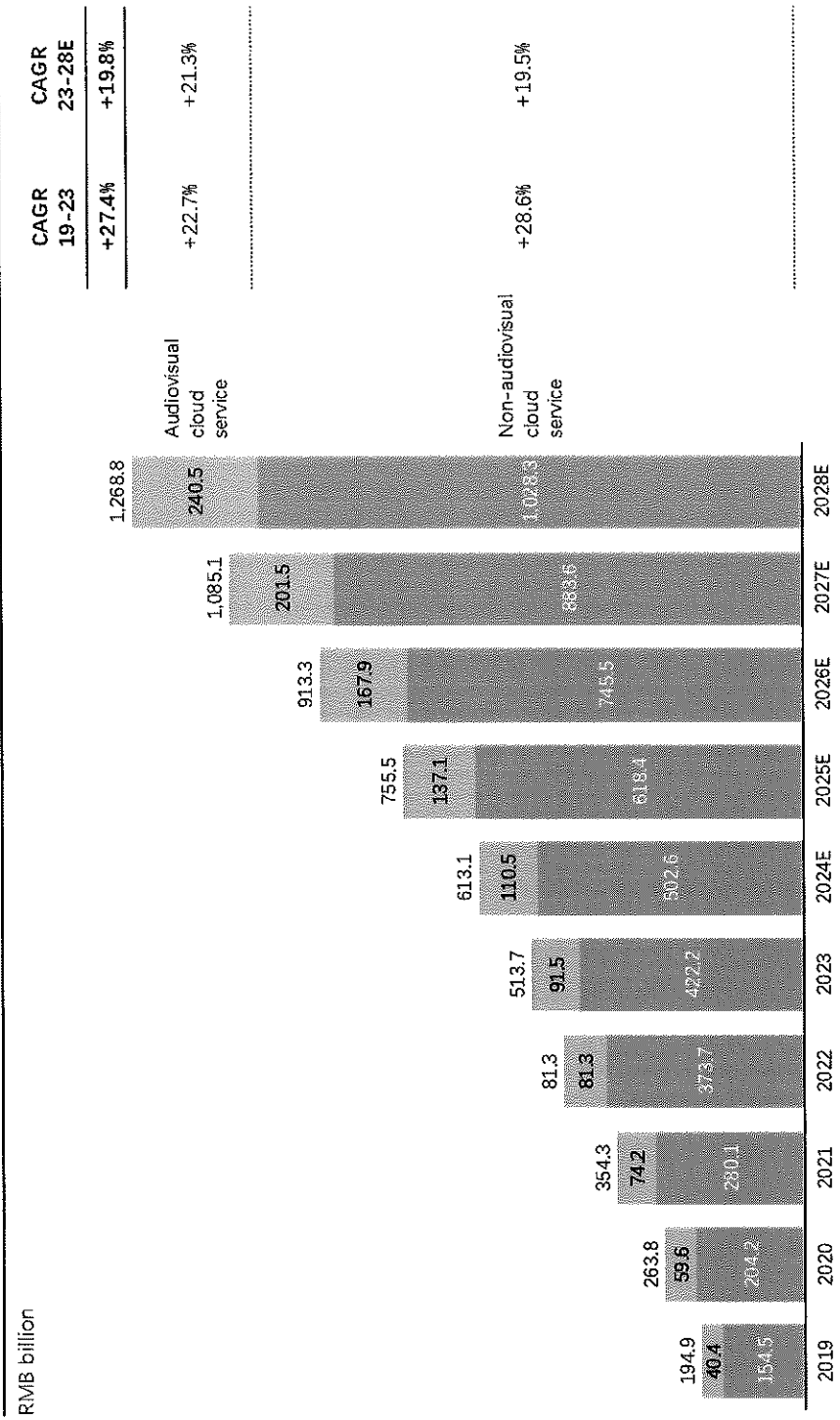
Market size of cloud service market in China

In 2023, market size of cloud service market in China has reached RMB513.7 billion



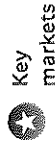
- > The cloud service market in China include cloud services related to audiovisual cloud, AI cloud, governmental cloud, retail and catering cloud, industrial cloud, office automation (OA) and big data, and others.
- > The cloud service market in China reached RMB513.7 billion in 2023. Audiovisual cloud service market reached RMB91.5 billion and accounted for 17.8% of the total cloud service market in China in 2023.
- > Driven by the increasing demand for computing power and the development of AIGC, it is expected that the cloud service market in China will continue to grow and will reach RMB1,268.8 billion in 2028. Audiovisual cloud service market is expect to reached RMB240.5 billion and account for 19.0% of the total cloud service market in China in 2028.

Market size of cloud service market in China, 2019-2028E



Source: China Academy of Information and Communications Technology(CAICT) iResearch

Definition and segmentation of audiovisual cloud service market in China

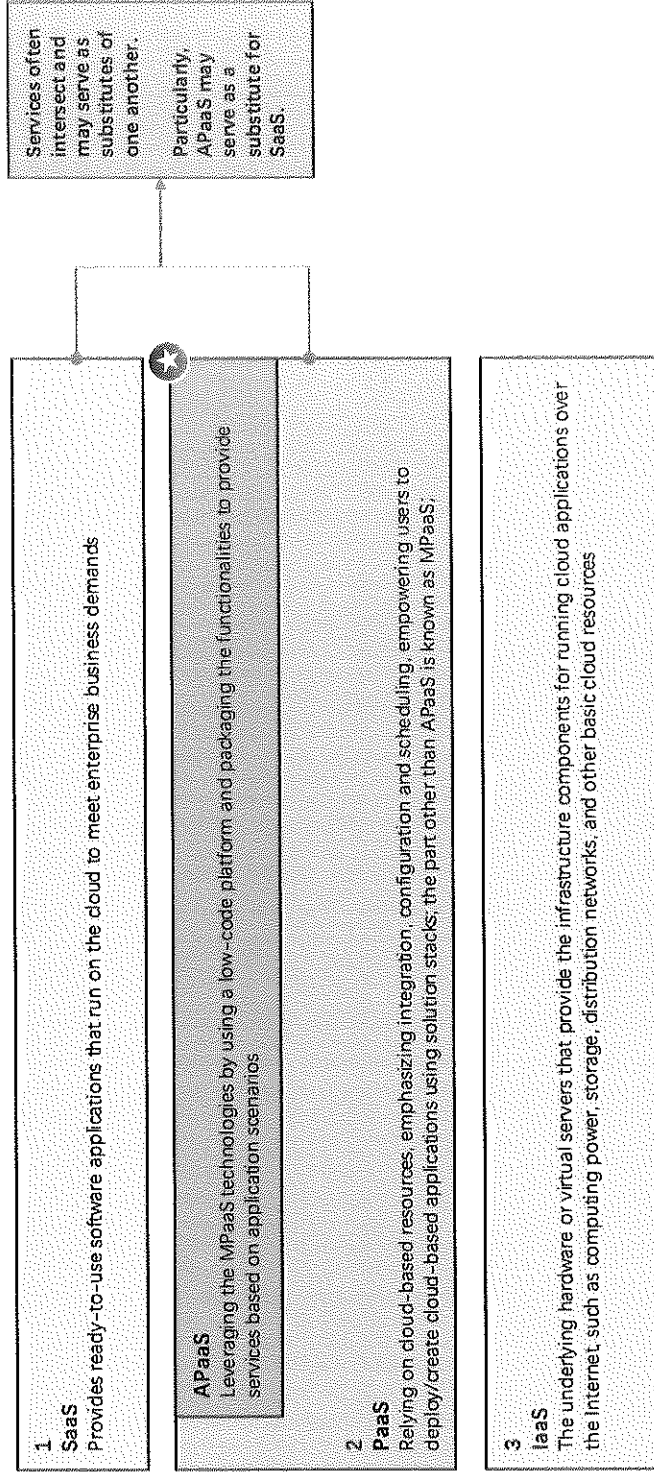


Segmentation of audiovisual cloud service market

Audiovisual cloud services are based on cloud computing technology and tailored to meet the specific needs of the production, storage, processing, distribution, analysis, auditing, retrieval and recommendation of audiovisual content.

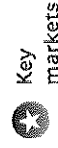
Segmentation

By service model



Service contents of audiovisual cloud service market in China

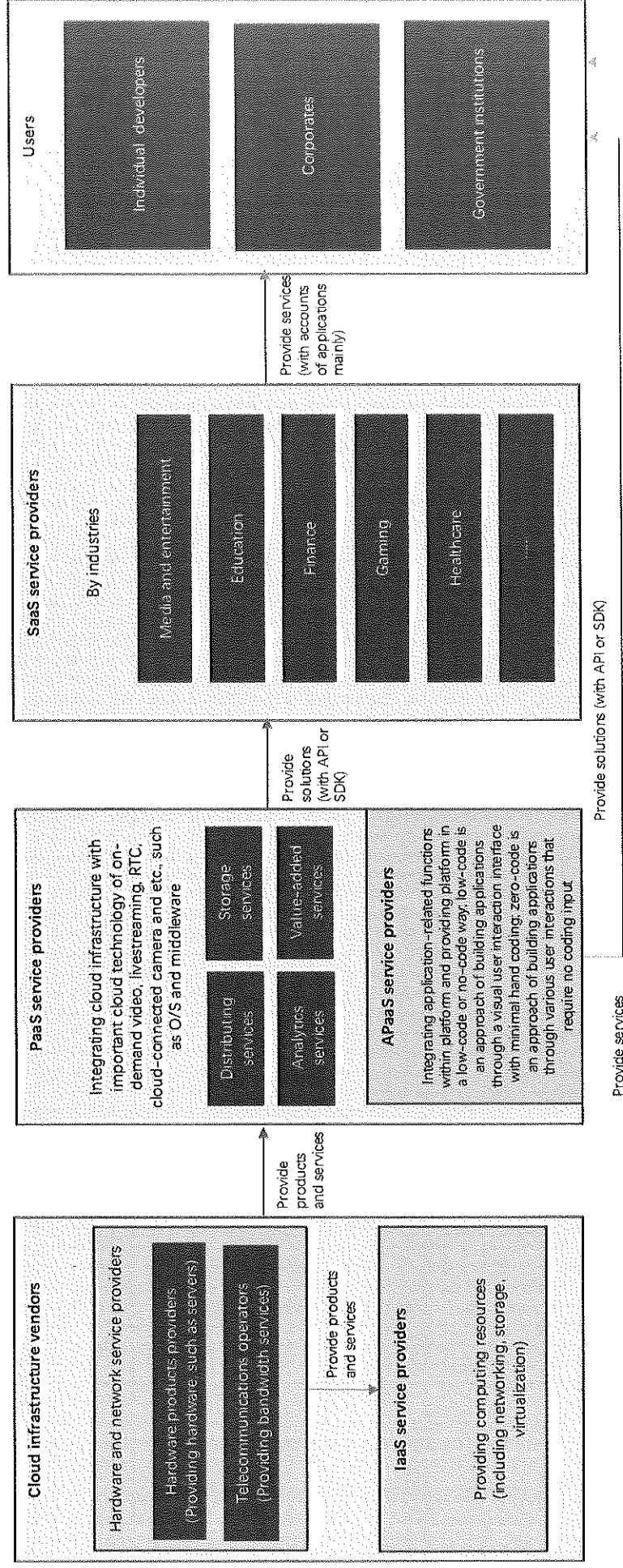
Service contents of audiovisual cloud service market in China



	Service contents	Main participating providers	Main target users
SaaS	Directly interacting with business operations and providing a standardized business processes and functions with low degree of customizability. For example, users are only required to create an account to operate or use a live streaming platform	Independent audiovisual cloud service providers, with a few non-independent audiovisual cloud service providers	Business personnel without programming ability
PaaS 	Providing customizable and scenario-integrated products with underlying IaaS and MPaaS capabilities, in which basic functionalities are combined for different scenarios, and connecting with customers through low-code platforms, characterized by easy deployment and scalability	Both non-independent and independent audiovisual cloud service providers, of which independent audiovisual cloud service providers are the majorit	Business personnel without programming ability or possessing only basic programming ability
MPaaS ¹	Providing basic functionalities such as storage, distribution, production and basic processing, and other value-added functions, covering cloud on demand, cloud live streaming, RTC, instant messaging, cloud connected cameras, generally accessing multiple APIs according to need	Both non-independent and independent audiovisual cloud service providers	Professional programmers
IaaS	Providing computing resources such as virtual machines, cloud hosts and cloud servers, storage resources, network resources, transmission technologies and related database	Non-independent audiovisual cloud service providers, with a few independent audiovisual cloud service providers	Professional programmers

Note: 1. "MPaaS" or Media Platform as a Service as defined by the Company, refers to audiovisual platform as a service in industry terms, while "APaaS" refers to audiovisual application platform as a service in industry terms. "MPaaS" is capable of affording multiple definitions with the different interpretations of "M", for example, "MPaaS" was defined as "mobile platform as a service" by Alipay as an application development product. It is also not uncommon for industry players to specially name their products or solutions. For example, Alibaba Cloud has named its audiovisual APaaS solution as "vPaaS" (specifically, Low-Code Audio and Video Factory vPaaS).

Value chain of audiovisual cloud service market in China



Cloud products and services are provided along the value chain of the audiovisual cloud service market. Cloud infrastructure vendors provide cloud products and services to PaaS providers and end users. PaaS providers provide solutions with API or SDK to SaaS providers. Meanwhile, PaaS providers may directly serve end users using APaaS solutions. SaaS providers usually provide specific applications to end users built on the solutions powered by PaaS providers and cloud infrastructure vendors. Given the complex workflow involved in delivering audiovisual cloud services that low-code platform is and will remain the mainstream technology in accessing audiovisual APaaS solutions in the industry in the near future.

Market size of audiovisual cloud service market in China

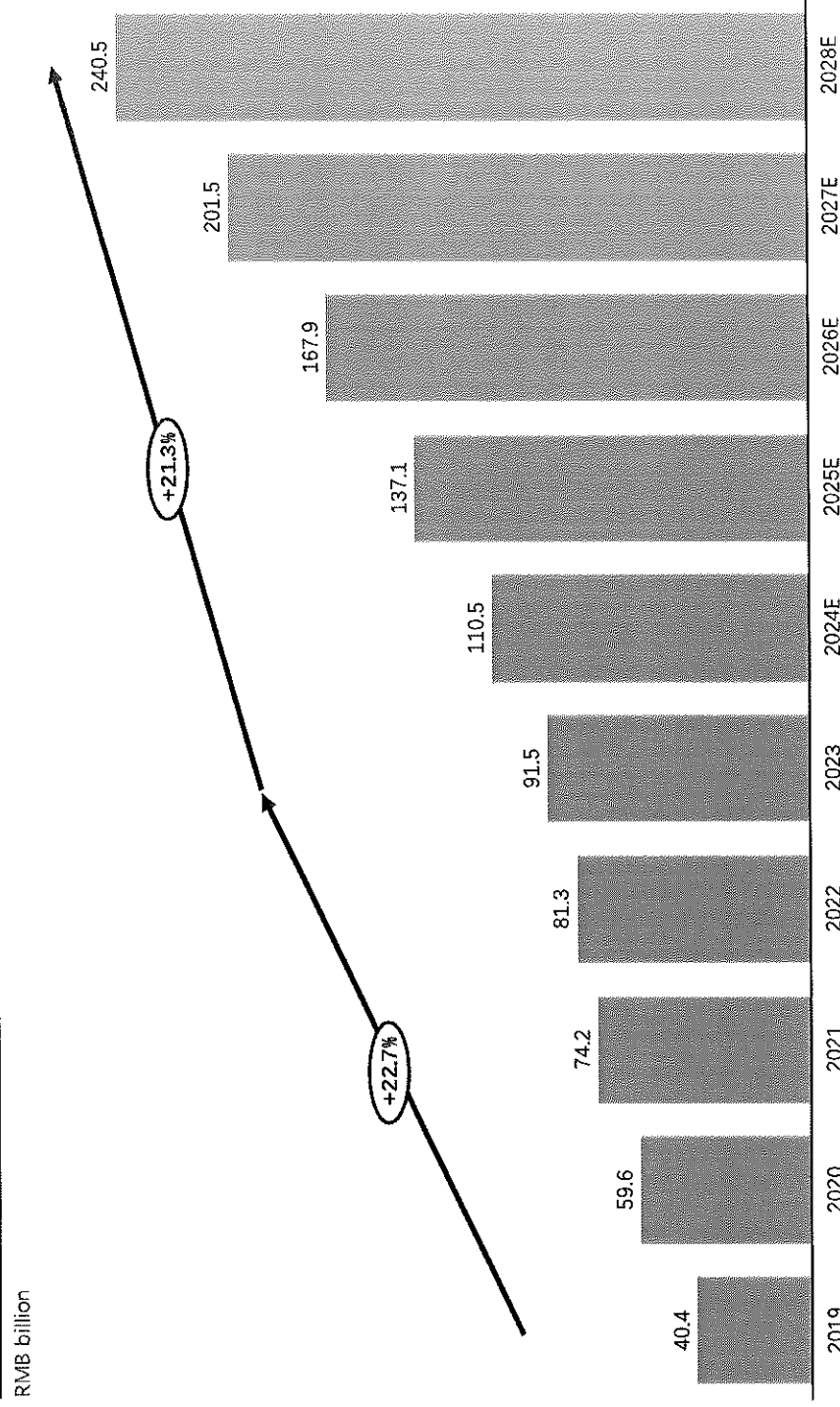
In 2023, market size of audiovisual cloud service market in China has reached RMB91.5 billion



- > Driven by upgrade of network infrastructure, iteration of audiovisual transmission technologies, and other factors, audiovisual service latency has gradually reduced and the application in various industries has been developed, resulting in the growth of the audiovisual cloud service market in China. In 2023, the size of the audiovisual cloud service market in China reached RMB91.5 billion.
- > The development of the audiovisual cloud industry, like many other technology-driven industries, is typically prone to fluctuations, subject to factors such as the iterations of technologies, competition between existing market players and new entrants, transformation into new application scenarios and shifts in policies, which would in turn lead to fluctuations of industry demands
- > Besides, AIGC is expected to bring tremendous growth potential to the market. The audiovisual cloud service market in China will continue to grow at a CAGR of 21.3% from 2023 to 2028, reaching RMB240.5 billion by 2028.

Note: The market size is calculated based on the total revenue of audiovisual cloud service providers.

Market size of audiovisual cloud service market in China¹, 2019-2028E



Source: Expert interview, iResearch

Market size of audiovisual cloud service market in China

The market share of PaaS is nearly 25% and will gradually increase

By service model, the audiovisual cloud service market in China can be divided into IaaS, SaaS and PaaS markets.

> SaaS

SaaS provides standardized applications.

However, customers in the audiovisual market in China have highly differentiated needs, resulting in a bottleneck in the development of the SaaS market.

> PaaS

With the development of audiovisual applications in various industries, the market share of PaaS, which has potential for further development, is expected to rapidly increase. The market share of PaaS in the audiovisual cloud service market is expected to increase from 24.9% in 2023 to 32.3% in 2028. With the applicability of low-code addressing differentiated demand of the market, APaaS is expected to see significant growth.

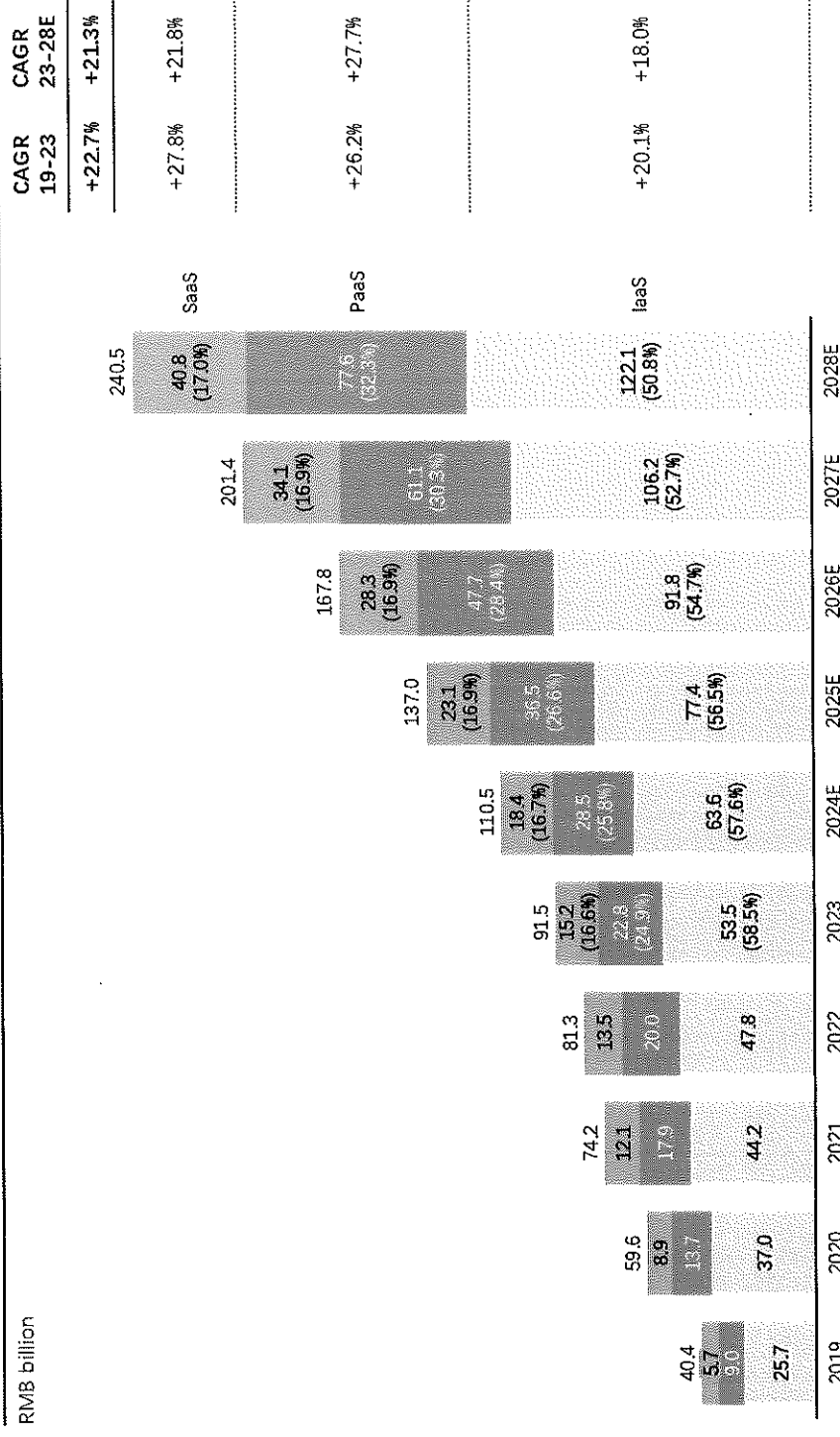
> IaaS

As the underlying infrastructure, IaaS is an essential component and the underlying infrastructure of audiovisual cloud. IaaS accounts for 58.8% of audiovisual cloud service. In recent years, PaaS market has experienced intensifying competition from large internet enterprises which focused on IaaS that have expanded to provide PaaS and SaaS solutions. These IaaS enterprises typically have accumulated significant underlying resources, which give them competitive edge in resource-heavy segments, particularly CDN business, and price reduction pressure will mainly concern CDN business going forward. Key market players in the cloud services market are continuing to invest significant capital into research and development in order to maintain competitiveness.

Note: The market size is calculated based on the total revenue of audiovisual cloud service providers. Any discrepancies in the chart between totals and sums of amounts listed therein are due to rounding.

Market size of audiovisual cloud service market in China, by service model, 2019-2028E

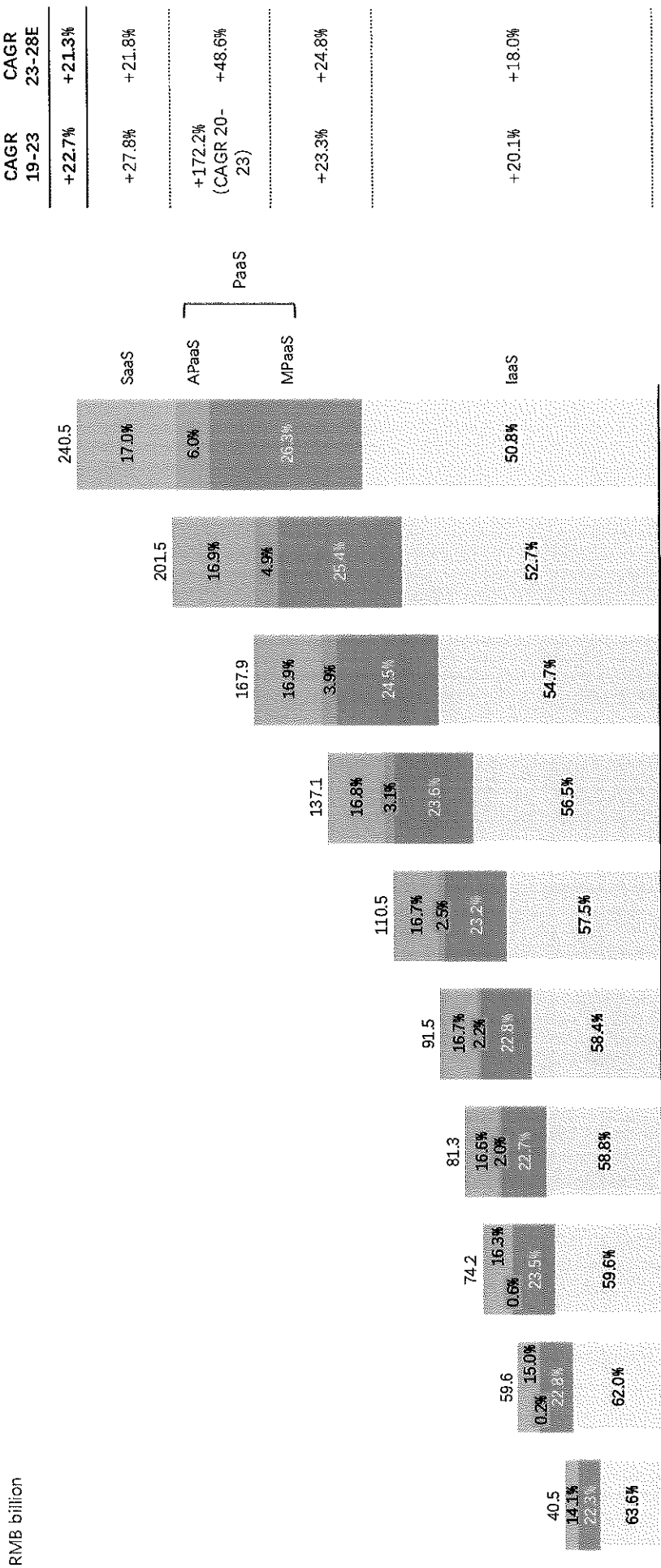
RMB billion



Source: Expert interview, iResearch

Market size of audiovisual cloud service market in China

Market share of each service model in audiovisual cloud service market in China, 2019 -2028E



Note: The market size is calculated based on the total revenue of audiovisual cloud service providers. Any discrepancies in the chart between totals and sums of amounts listed therein are due to rounding.

Market size of audiovisual PaaS market in China

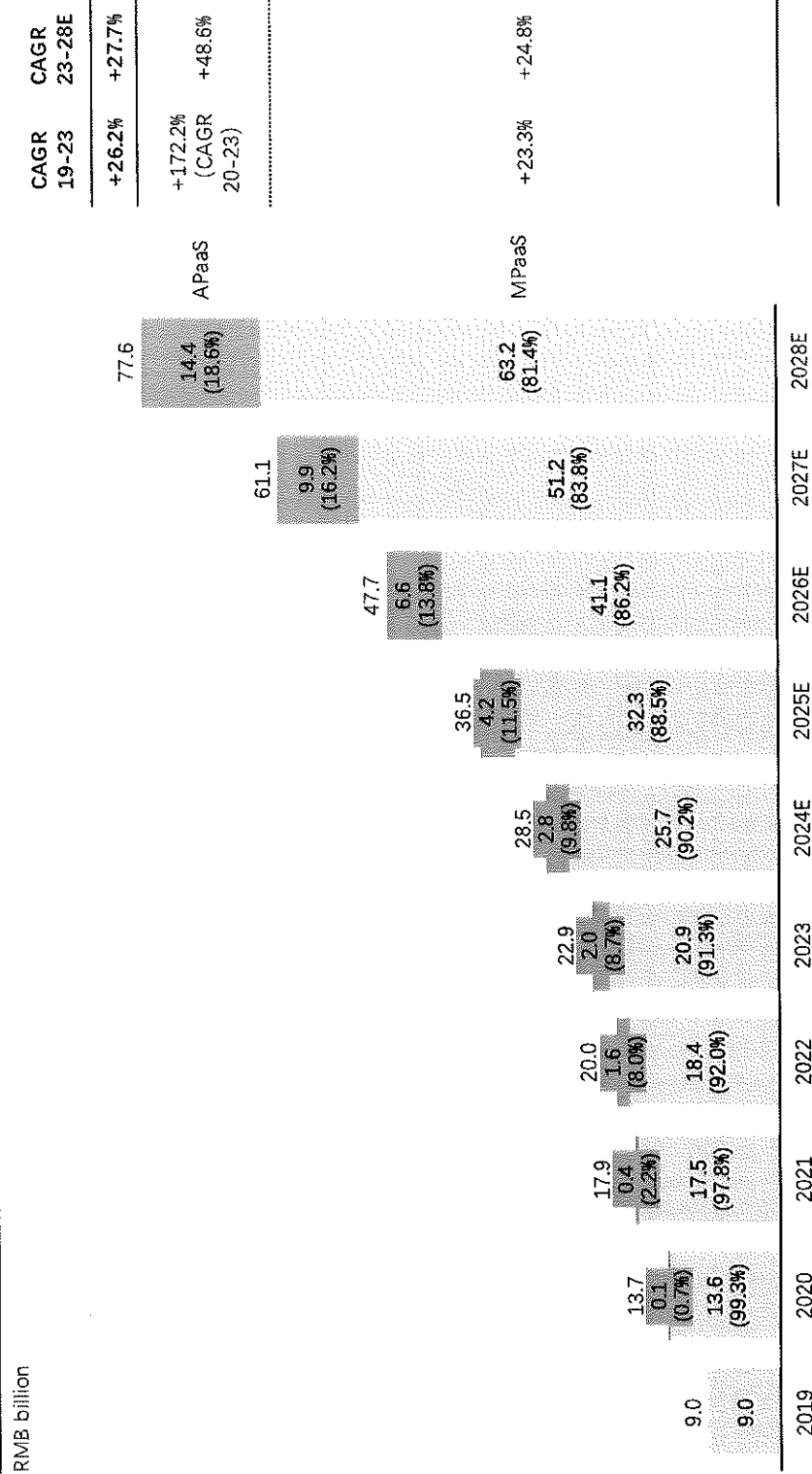


> PaaS
PaaS is a computing service model by which cloud service providers offer a suite of hardware and software resources to their users via a platform, enabling the users to focus on writing codes and management of applications without the need to divert time and resources to the development and maintenance of the infrastructure underlying the platform.

> APaaS
APaaS is a computing service model by which cloud service providers offer a one-stop platform for users to develop, run and manage applications. With the gradual development of the audiovisual cloud service industry, customers are increasingly valuing service quality and efficiency.

Audiovisual PaaS service providers typically do not distinguish zero-code platform and low-code platform. Low-code platform contemplates a wide spectrum of application scenarios, from zero-code scenarios which typically have clearly delineated workflow and simple data structure to low-code scenarios addressing the majority of the audiovisual needs which typically involve more complex modes of interaction and sophisticated data structure.

Market size of audiovisual PaaS market in China, by service model, 2019-2028E



Note: The market size is calculated based on the total revenue of audiovisual PaaS providers. Any discrepancies in the chart between totals and sums of amounts listed therein are due to rounding.

Source: Expert interview, iResearch

Market size of audiovisual cloud service market in China

Audiovisual PaaS and SaaS market has promising prospects

PaaS and SaaS have different technological directions from IaaS

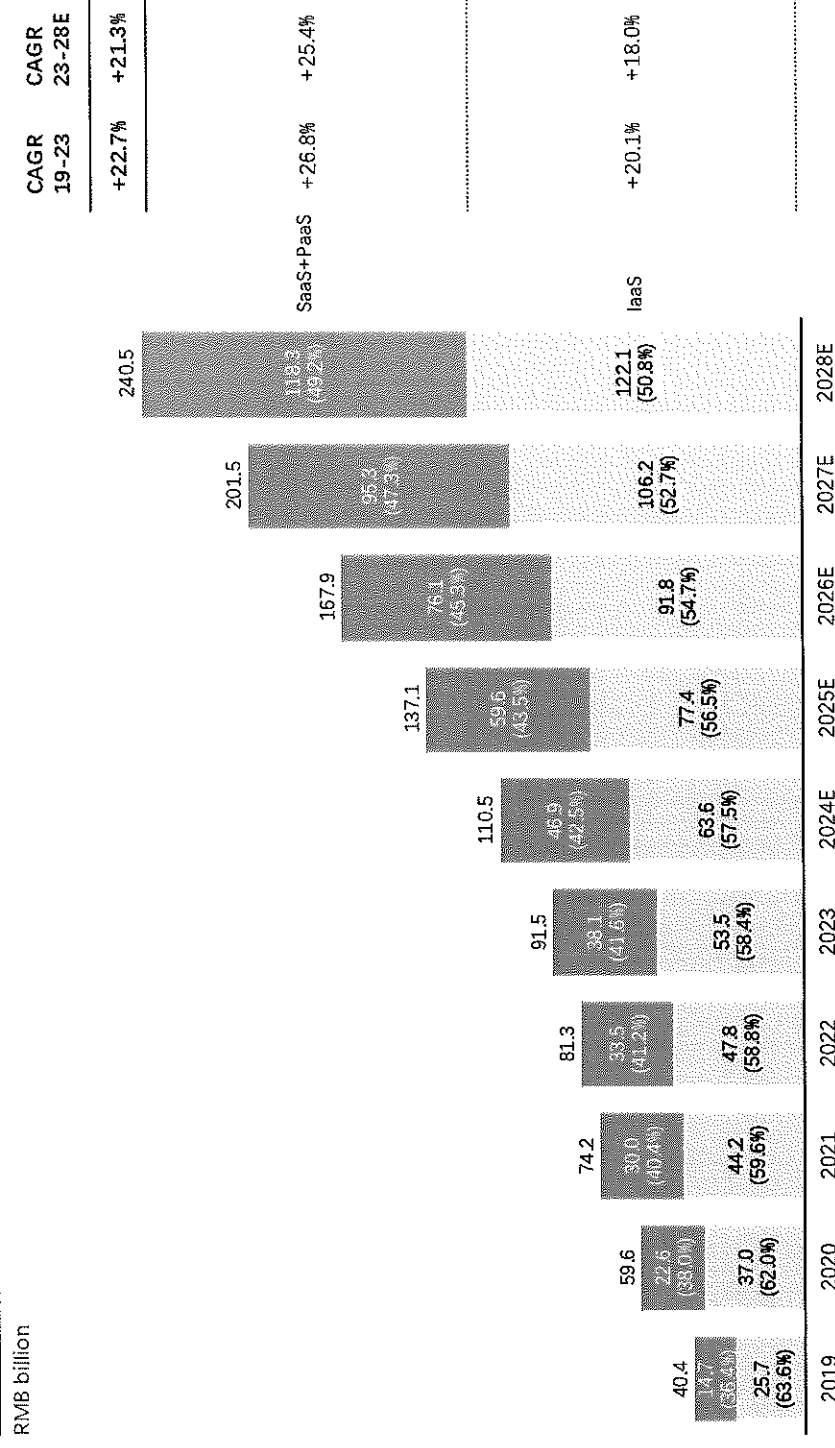
IaaS providers focus on the computation and processing of underlying computer resources. However, PaaS and SaaS providers focus more on audiovisual functionality development, including audiovisual transmission, audiovisual content production, and audiovisual processing.

The boundaries between the PaaS and SaaS markets are becoming more blurred

The emergence of low-code solutions has led to higher overlap in service offerings and target customers between PaaS and SaaS. Therefore, the boundaries between the PaaS and SaaS markets are becoming more blurred.

With the mature of audiovisual PaaS and SaaS solutions, audiovisual PaaS and SaaS will penetrate into more scenarios at a faster pace. Customers who previously only purchased computer resources from audiovisual IaaS providers will start using audiovisual PaaS and SaaS products. This will contribute to the accelerated growth of the audiovisual PaaS and SaaS market.

Market size of audiovisual cloud service market in China, by IaaS and PaaS+SaaS, 2019-2028E



Note: Any discrepancies in the chart between totals and sums of amounts listed therein are due to rounding.

Source: Expert interview, Research

Market size of of audiovisual cloud service market in China Audiovisual application in various scenarios continues to deepen

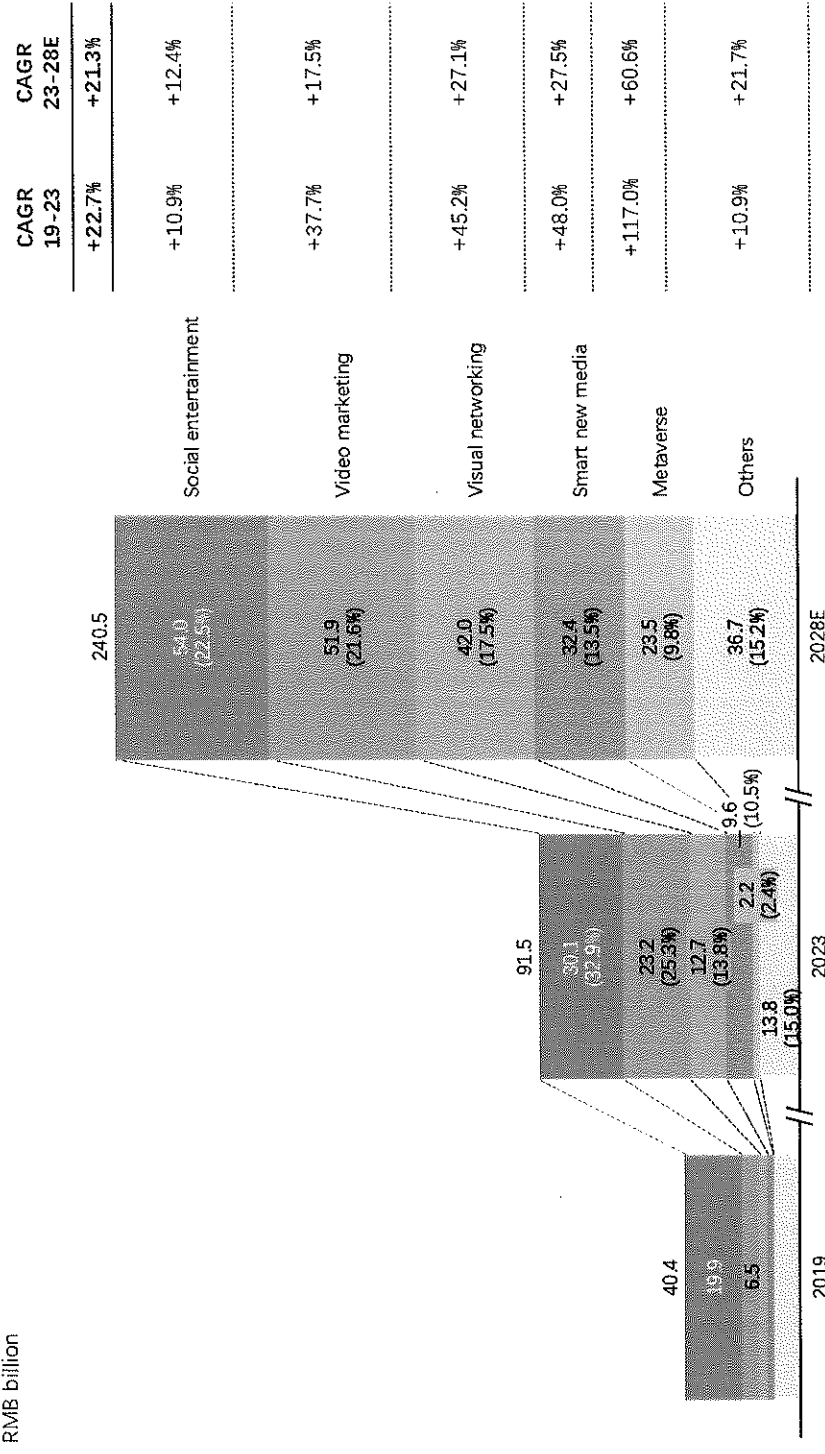
> **Social entertainment**
Audiovisual cloud services have already penetrated into online video, short videos, gaming, and other scenarios before 2018. Therefore, the penetration rate of audiovisual cloud services in social entertainment has reached a high level. In the future, AIGC will empower social entertainment with more diverse experiences, driving continuous growth in audiovisual cloud service market.

> **Video marketing**
From 2019 to 2023, live commerce has driven rapid growth in audiovisual cloud service market in video marketing. In the future, audiovisual cloud service market in video marketing enabled by AIGC will be adopted by numerous enterprises.

> **Smart new media, Visual networking, and metaverse**
The penetration rate of audiovisual cloud service in smart new media, visual networking and metaverse scenarios is still low, but has certain growth potential in the future. Among them, the emergence of AIGC provides a strong support to the 3D content production of metaverse, boosting the development of audiovisual cloud service market in metaverse.

Market size of of audiovisual cloud service market in China, by application scenarios, 2019-2028E

RMB billion



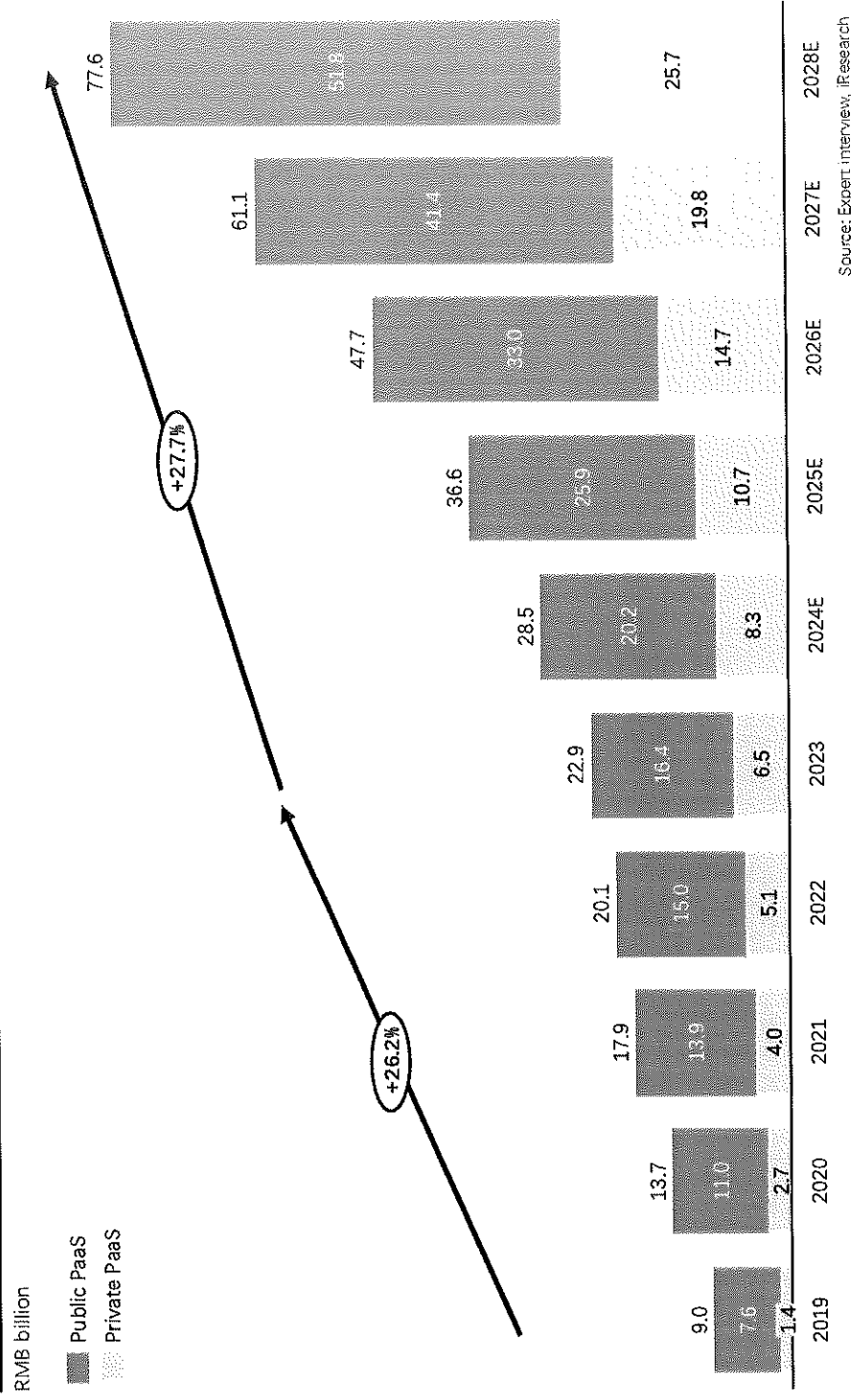
Note: Others include training and conference, administrative services, etc. Any discrepancies in the chart between totals and sums of amounts listed therein are due to rounding.

Source: Expert interview, iResearch

Market size of audiovisual PaaS service market in China

Public cloud takes the dominant part, while private cloud is seen a significant increase

Market size of audiovisual PaaS service market in China, 2019-2028E



> Audiovisual PaaS can be delivered through public and private clouds. With public PaaS, customers share infrastructure, including database, servers and storage system, etc., that PaaS vendors provide and manage, and deliver over the internet. Customers usually pay service fees based on utilization and duration of usage. Public PaaS is less costly for customers as it requires less maintenance cost and is more scalable. In 2023, market size of public audiovisual PaaS reached RMB16.4 billion, accounting for 71.6% of the entire audiovisual PaaS market.

> Private PaaS works within the customers' private cloud and PaaS vendors help establish cloud environment on the customers' infrastructure, charging on a project basis. Infrastructure can be customized to cater to customers' preferences and rules. For example, customers may prefer to store data on their local servers and access the data within firewall. Private PaaS has advantages in conformity with security requirements. In 2023, market size of private audiovisual PaaS reached RMB6.5 billion, accounting for 28.4% of the entire audiovisual PaaS market.

Audiovisual cloud service market in oversea market

Audiovisual cloud service market in Southeast Asia and Middle East is significantly potential

Countries	Degree of demand to audiovisual cloud service	Penetration rate of audiovisual cloud service	Competitive landscape of audiovisual cloud service	Summary
U.S.	Relatively high Internet audiovisual markets have reached relatively high level of user penetration rate, with more than 50% in on-demand video and gaming. Development of emerging fields (e.g. metaverse, visual networking) are at the forefront globally, bringing high level of needs to audiovisual cloud service.	Relatively high Both public cloud and audiovisual cloud market are developed maturely, providing comprehensive solutions.	Highly competitive ① Internet giants provide mature and non-independent audiovisual cloud services, including APaaS, such as Google, Microsoft and Amazon. ② Players who focus on specific scenarios are also expanding audiovisual cloud services, such as Zoom, Meta and Clubhouse.	There are great demand to audiovisual cloud service while competitive environment is worse than other countries.
Southeast Asia	Relatively high User penetration rates of internet audiovisual markets are still at a low level, with 27.9% in on-demand video and 11.6% in gaming. However, audiovisual industry is developing rapidly, and many Chinese Internet service providers are expanding businesses in Southeast Asia, bringing numerous cooperating opportunities.	Relatively low Both cloud and audiovisual cloud market are at early development phase, having enormous development potentials.	Relatively friendly competitive environment ① No core competitor dominates the market. ② There are great amounts of cooperative opportunities with Chinese audiovisual service providers. ③ Cultures are highly inclusive, making entry environment relatively friendly. Moderate competitive environment ① No core competitor dominates the market. ② There are great amounts of cooperative opportunities with Chinese audiovisual service providers. ③ Differences of cultures may create barriers when compete with local cloud service providers.	The penetration rate of the audiovisual cloud service market in Southeast Asia and the Middle East are generally low, and the audiovisual cloud service market is at an early development phase presenting significant growth potential
Middle East	Relatively high User penetration rates of internet audiovisual markets are increasing rapidly, with 34.8% in on-demand video and 26.0% in gaming. Internet infrastructure is well-established and continually improving, creating better development environment of cloud services.			
China	Relatively high Internet audiovisual markets have reached relatively high level of user penetration rate, with more than 50% in on-demand video and gaming. With years of development, audiovisual cloud market has achieved high level of commercialization.	Medium Both cloud and audiovisual cloud market are developing rapidly.	Moderate competitive environment There are plenty of players in audiovisual cloud market and leading players dominate greater market share.	There are great demand to audiovisual cloud service and audiovisual cloud service market is reaching a more advanced stage.

Note: 1. Data on this page is based on the year 2022 unless specified; 2. Only users of online audio and video platforms in this specific segment are counted, leading a lower user penetration rate compared to statistics of China Netcasting Services Association who counts all audiovisual users in all audiovisual and related platforms.

Source: IMF, Statista, iResearch

Market drivers and entry barriers of audiovisual PaaS market in China



Market drivers

- Demand for social entertainment, video conferencing and other scenarios continues to diversify**
In recent years, people tend to consume media and entertainment content on the Internet. In addition, new forms of entertainment such as short video and live streaming have gradually become an integral part of people's daily lives. With the rise of remote working driven by enterprise globalization and the COVID-19 pandemic, more enterprises are communicating and collaborating through video conferencing and remote collaboration tools. To support social entertainment, video conferencing and other scenarios, reliable audiovisual cloud services are essential. Audiovisual PaaS, which provides efficient, stable and development-enabled video processing, storage services, distribution services, among others, are crucial for meeting the increasing demand for audiovisual content.
- Customers' demand for scalable, customizable, low-cost and highly efficient audiovisual cloud services is growing**
With the growing popularity of audiovisual applications including pan-entertainment, e-commerce, and metaverse, the customer demand is increasing and rapidly changing, requiring more integrated and scalable audiovisual cloud service.
As the popularity of the Internet and mobile devices continues to grow, users are increasingly demanding high quality audiovisual services. To meet these demands, audiovisual business requires flexible, efficient and scalable audiovisual cloud services that can quickly respond to changes in business development and user needs. Audiovisual PaaS provides open platforms and API interface based on packaged functionalities, allowing customers to develop customized solutions. This approach helps reduce development costs and improve efficiency.
- Advanced technologies including cloud computing, AI, and 5G technology continue to develop**
The development of the advanced technologies, such as cloud computing, 5G, AI, AIGC and VR/AR, along with their integration into audiovisual PaaS service have greatly contributed to the rise in market demand for such services.
 - Cloud computing technology provides elastic scalability, high availability, and flexibility for audiovisual PaaS service, enabling efficient storage, processing, and transmission of large volumes of audiovisual content.
 - 5G technology allows faster and more reliable audiovisual content transmission, making possible the pervasive distribution of high-definition videos, low-latency livestreaming, and many other audiovisual contents.
 - AI and AIGC technology can be widely deployed in automated editing of audiovisual contents, improving image and audio quality, generating original audiovisual contents from prompts, etc.
 - VR/AR technologies increase the consumption of video contents, such as live streaming, video chats, in virtual reality or augmented reality devices, increasing the usage of audiovisual PaaS services

Entry barriers

- Technical barriers**
Technical capabilities covering multiple fields such as multimedia, network communication and cloud computing are required for audiovisual PaaS to achieve high reliability, high scalability, low latency and high definition. To provide high-quality audiovisual PaaS that effectively meets the business needs of their customers, PaaS providers need to possess competent technical capabilities.
- Infrastructure resource barriers**
The provision of audiovisual PaaS requires large-scale network equipment and server resources to provide data distribution and storage capabilities. Audiovisual PaaS also requires a large amount of bandwidth resources to ensure fast and stable transmission of audiovisual data. The stability of the infrastructure resources are crucial for the provision of audiovisual cloud services. As a result, PaaS providers need to maintain a stable and reliable quality of infrastructure resources, and strengthen the management and optimization of infrastructure resources to improve resource utilization and reduce operational costs.
- Brand barriers**
The reputation of audiovisual PaaS providers is mainly built upon their service quality and customer satisfaction. Customers generally choose an audiovisual PaaS provider based on the sufficiency of service coverage, service quality and after-sales support for audiovisual encoding and decoding, audiovisual transmission, live streaming, VoD, RTC services, among others. As a result, providers with good reputation and long service track record are more likely to attract customers.

Development trends of audiovisual PaaS market in China

Development trends

01 PaaS is becoming increasingly popular among audiovisual cloud services, and has become a new growth driver for cloud service providers

- Currently, there has been an emerging trend of "narrowing the gap between demand and solution" in audiovisual cloud services. Customers prefer to directly purchase a set of solutions that can simultaneously meet their demand and for infrastructure resource allocation, customizability and high usability, compared to the original service process from IaaS to PaaS to SaaS and finally to customers.
- PaaS, as the middle tier between SaaS and IaaS, is most likely to have both general and application capabilities. Through continuous improvement in customer understanding, PaaS providers are expected to launch more solutions, and bring new growth for cloud services.

02 More audiovisual cloud service providers are making efforts to provide APaaS

- With the advantages of easy deployment and scalability of APaaS, service providers in the industry have devoted more attention to low-code solutions. Starting from 2021, many service providers have begun to introduce APaaS, in the form of low-code solutions, and even begun to make efforts towards becoming APaaS providers.
- Currently, service providers launch APaaS mainly by packaging SDKs which contain basic UI and functionalities.
- The emergence of APaaS has addressed the shortcomings of other service models, such as MPaaS which has a high development capability requirement to customers and SaaS which has low customizability. APaaS allows customers to take the initiative in development, while reducing development costs and shortening development cycles.

03 Innovative integration of cloud technology with AI, AIGC and VR/AR will accelerate the use of PaaS in more scenarios

- As emerging technologies such as AI, AIGC and VR/AR are increasingly being utilized, audiovisual, as an important medium, will most likely play a part in the implementation of emerging technologies on the cloud including:
 - Cloud rendering: Cloud rendering technology moves rendering work to the cloud to meet the requirements of complex computing and real-time rendering, and address bottlenecks in the metaverse applications;
 - Digital person: Digital person technology presents the characters vividly by combining rendering, voice generation, animation generation, audiovisual synthesis display and interaction.
- In the future, the integration of audiovisual cloud technology and emerging technologies are expected to penetrate more industries, including film and television, Internet media, games, finance, culture and tourism, healthcare and manufacturing.

Challenges

01 Interactive revolution is limited by hardware and networks

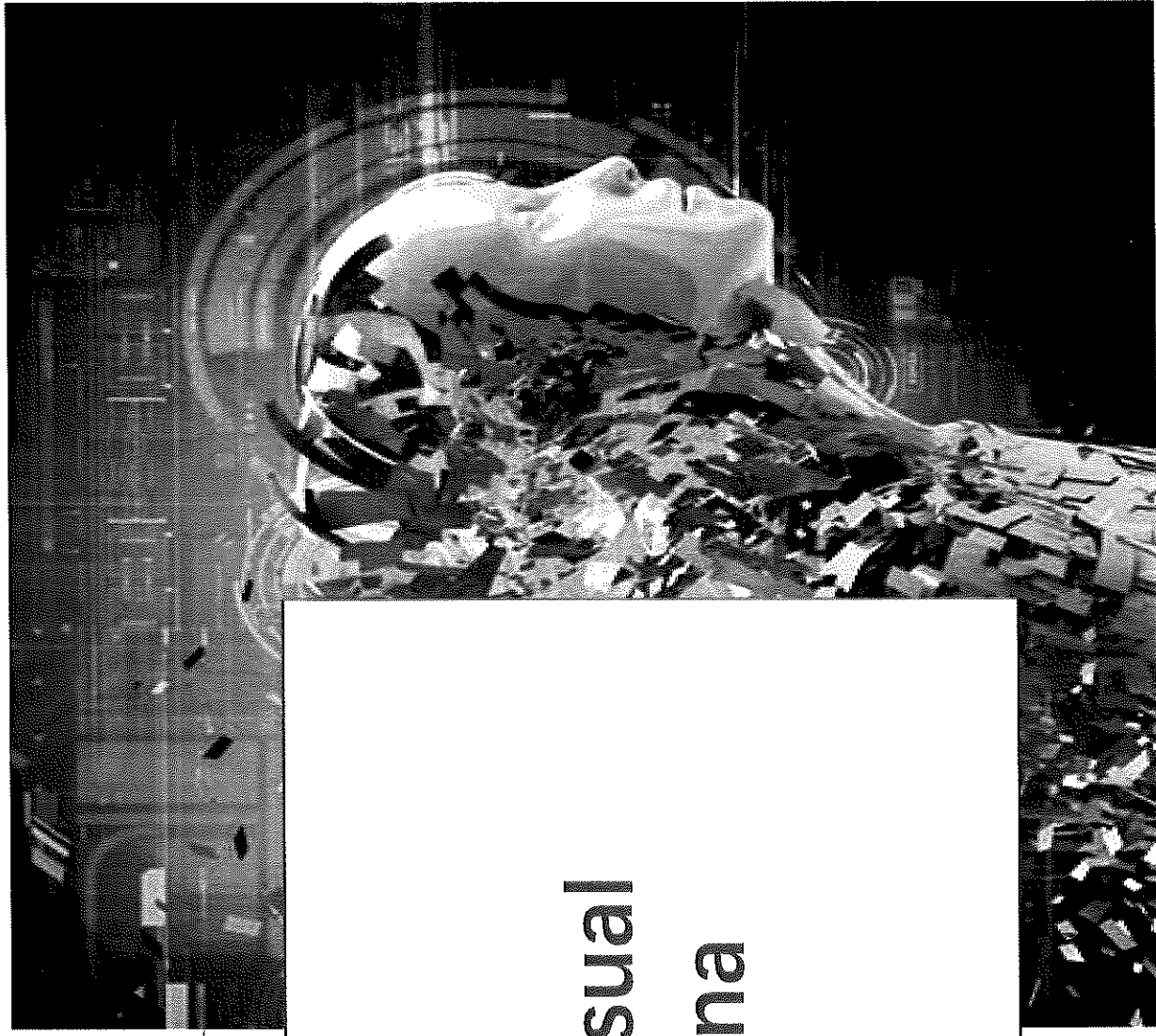
- Audiovisual is an important medium in the metaverse and Web 3.0 revolution.
- The ultimate realization of interaction in the metaverse and Web 3.0 requires hardware to achieve holographic images and visual effects. The hardware or hardware-related technological breakthroughs will have an impact on the practical application of audiovisual cloud services in the interactive revolution.
- In addition, the interactive revolution requires high-speed network to transmit large amounts of data and to ensure data security, which poses certain requirements on the network transmission technology.

02 Competition in the PaaS market is becoming increasingly fierce

- The prospects of development not only offer opportunities, but also bring potential and fierce competition to market participants.
- As the market share of PaaS is expected to rapidly increase, IaaS and SaaS providers have started to compete in the PaaS market, and the competition between non-independent audiovisual cloud service providers and independent audiovisual cloud service providers have become fierce. The influx of market participants will also bring new challenges.
- Going forward, in the increasingly competitive environment, the technical capabilities, business development capabilities and scenario understanding of market participants will become key measures of competitiveness and establish entry barriers.

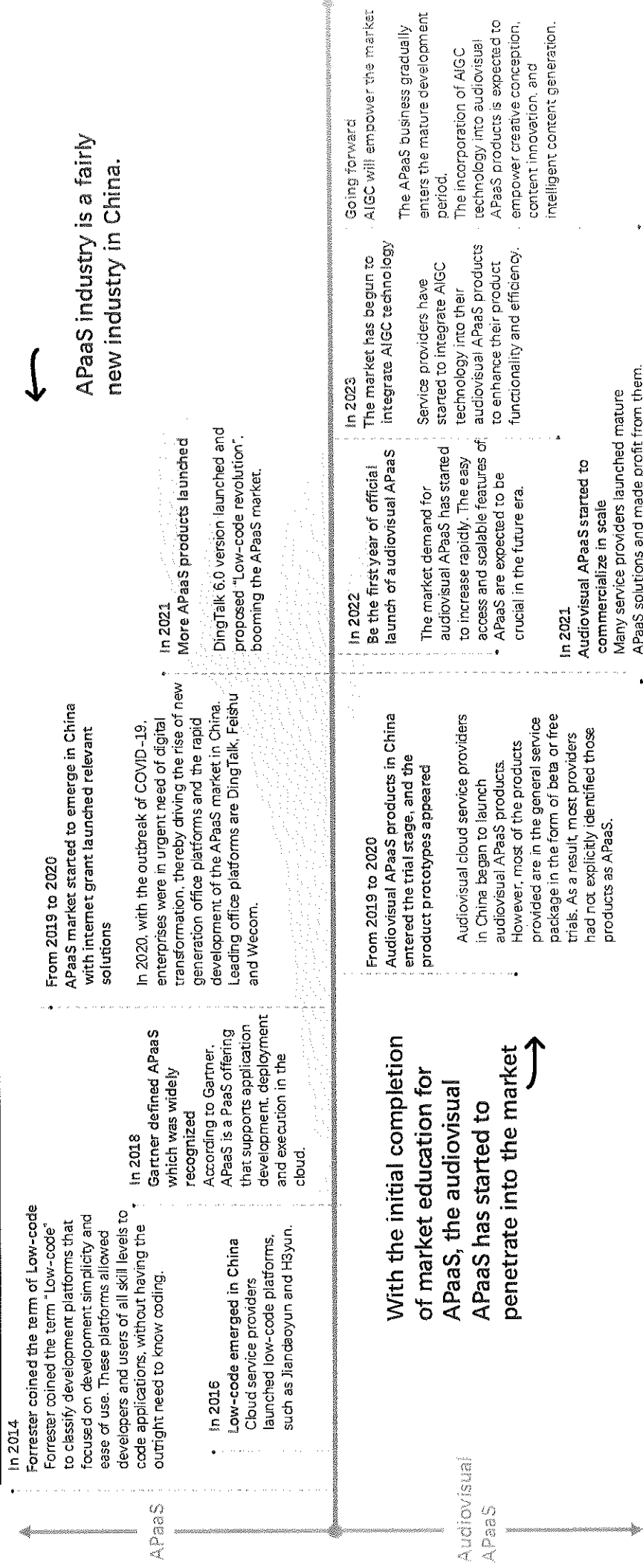
Source: iResearch

Overview of Audiovisual APaaS Market in China



Overview of the audiovisual APaaS Market

History of APaaS and audiovisual APaaS



Overview of the audiovisual APaaS Market

From the view of customers, APaaS have the advantages of lower cost and higher development efficiency

Type of cloud service	Product form	Accessibility	User group	Application development efficiency	Application development threshold	Degree of application customizability	Maintenance cost	Data usage efficiency
APaaS	Zero-code platform	High Functions are packaged to modules and applications can be easily developed by selecting SDK modules and API	Business personnel Understand business flows but without any technical skills	High An application can be developed at the average hourly level	Low Visual development without any technical skills	Relatively high General business flows have been preset and defined by the platform, and cannot be customized. Customers can select functions, set up simple rules or quickly access to third-party components	Low Maintenance is generally performed by the platform instead of customers themselves	High Data can be stored on the platform and leveraged for inter-enterprise applications
	Low-code platform		Entry-level developers Possess entry-level programming skills but not in audiovisual fields	Medium 1-7 days are generally needed for launching an application	Medium General software development capabilities are needed	Relatively high Customers can adjust some components, such as UI interface, to support customized development on fixed templates	Medium Maintenance requires platform's intervention, and customer can involve in troubleshooting. But maintenance cost is relatively lower	
	Pro-code platform		Professional developers Both general and audiovisual programming skills are needed. Besides, understanding of business flows is necessary	Low Generally, on a project basis, around 2 to 3 months are needed	High Both general software development capabilities and professional audiovisual technical capabilities are needed	High Customers can customize and freely develop according to their actual needs	High Maintenance requires platform's intervention, and customer can involve in troubleshooting	
SaaS	Direct business-oriented software product services	High Use only by opening an account	Business personnel It is even not necessary for business personnel to understand the business flows	No customer development required Users only need to open an account to use the platform immediately		Low Single service scenario with fixed business process	Low Maintenance is generally performed by the platform instead of customers themselves	Low It is difficult to connect various SaaS into a single platform, which can easily form "data island" within the enterprise
IaaS	Infrastructure which provides essential resources	Low Various resources need to be accessed by integrating API	Professional developers More general and audiovisual programming skills are needed. Besides, understanding of business flows is necessary	N/A It is essential resources of cloud application, and is not directly related to application development efficiency and threshold. However when customer access infrastructure without PaaS or SaaS, application development efficiency is meant to be lower and threshold higher and degree of application customizability higher and post-maintenance cost higher				N/A

Zero code is an approach of developing applications which requires no coding input at all. Zero-code approach, while particularly suitable for users with no programming skills at all, mainly applies to application scenarios such as office automation, which primarily involve the use of uniformly structured tables and stable workflows. Low-code approach, however, involves developing applications with minimal coding input, which offers higher flexibility and has more application scenarios in the audiovisual cloud industry involving audiovisual content with typically more complex structure.

Overview of the audiovisual APaaS Market

From the view of customers, APaaS have the advantages of lower cost and higher development efficiency

Key features	Drawbacks	Target customers	Pricing model	Value added to our customers	Underlying technology infrastructure
MPaaS - Enabled through lower-level (i.e. more generally applicable) APIs or SDKs - Better meet customers' scalability requirements while not subject to changes in business application scenarios - Requires greater resource and stability capabilities from the service providers	- Requires stronger technical capabilities to access our products - Pricing more significantly influenced by resource fluctuations - More moderate premium as a result of intense market competition	Customers with stronger technological capabilities requiring higher flexibility	(For public cloud) Charged a monthly service fee based on actual usage or based on service package (For private cloud) Charged a fee based on the scale of software and hardware required and duration of authorization for private cloud	- Flexibility - Stability and reliability	- Basic audiovisual capabilities - AI technologies - Resource scheduling capability - Resource scalability capability - Fault isolation capability
APaaS - Enabled through higher-level (i.e. more specialized and scenario-based) APIs with access to multiple capabilities through our low-code platform - Scenario-based solutions offering greater commercial value	- Lesser extent of scalability compared to MPaaS products - Requires higher costs for the research and development and commercialization of new solutions	- Customers with relatively limited technological capabilities and clearly delineated business scenarios requiring rapid verification - Customers with the necessary technological knowhow but reluctant to expend resources on developing such capabilities	(For public cloud) Charged a monthly service fee based on actual usage or based on service package (For private cloud) Charged a one-off service fee based on the specific needs of the project	- Easy access - Diverse capabilities based on business scenarios - Strong scalability and iteration ability	- Low-code platform - Supports upgrade with simple plugins to incorporate new features

While SaaS provides ready-to-use software applications that run on the cloud to meet enterprise business demands, PaaS emphasizes on integration, configuration and scheduling, empowering users to deploy/create cloud-based applications using solution stacks leveraging its cloud-based resources. Therefore, PaaS (as contrast to SaaS) can be tailored made according to the customers' need which could better serve different customers' specific business need, hereby provide more value to the customers than those that can be brought by SaaS as it allows only very limited customization. MPaaS, in particular, provides a pro-code platform that professional developers can use for highly customized application development comparing to SaaS, and provides integrated and easy-to-use resources platform comparing to IaaS.

Positioned between PaaS and SaaS, the emergence of APaaS was attributable to the following reasons: (1) the lower development cost associated with the deployment of APaaS renders it more suitable for companies which lack strong technical capabilities, while the flexibility and ease of use to design applications associated with APaaS can address specific needs of customers in a short time, fostering innovation and adaptability; (2) SaaS, while suitable for companies with limited technical capabilities, also has its shortcomings such as lack of flexibility and customization, data security risks (as most data is maintained by the service provider), and constant need for updates provided by the SaaS service providers; (3) implementing in-house solutions requires significant development costs and expenditure of resources and thus is not a cost-effective solution for verifying business models of companies.

APaaS leverages the MPaaS technologies by using a low-code platform and packaging the functionalities to provide services based on application scenarios, which effectively address the pain points of PaaS, SaaS and in-house development. It not only enables the development of solutions catered to the industry and business needs, but also provides high flexibility and can be deployed with minimal development costs and enable customers to retain control over their data with higher security level.

Source: iResearch

Overview of the audiovisual APaaS Market

From the view of customers, APaaS have the advantages of greater flexibility

Key features	Target customers	Value added to our customers	Underlying technology infrastructure	Application	Pricing model
- Enabled through ready-to-use software applications that run on the cloud - Fixed functions pre-set by providers	Customers with limited or no technological capabilities and clear business needs (often business personnel)	- Easy access - Diverse capabilities based on business scenarios	- Ready-to-use software applications - Supports upgrade automatically	Widely applied in various audiovisual scenarios with greater focus on delivering scenario-specific functions	Generally charged a regular subscription fee (usually annually)
- Enabled through higher-level (i.e. more specialized and scenario-based) APIs with access to multiple capabilities through our low-code platform - More customized functions, achieving greater flexibility	- Customers with relatively limited technological capabilities and clearly delineated business scenarios requiring rapid verification - Customers with the necessary technological knowhow but reluctant to expend resources on developing such capabilities	- Easy access - Diverse capabilities based on business scenarios - Strong scalability and iteration ability - Data can be stored on themselves' platform and leveraged for inter-enterprise applications	- Low-code platform - Supports upgrade with simple plugins to incorporate new features	Widely applied in various audiovisual scenarios with greater flexibility to deliver cross-scenario functions	- Charged a monthly service fee based on actual usage or based on service package - Or charged a one-off service fee based on the specific needs of the project

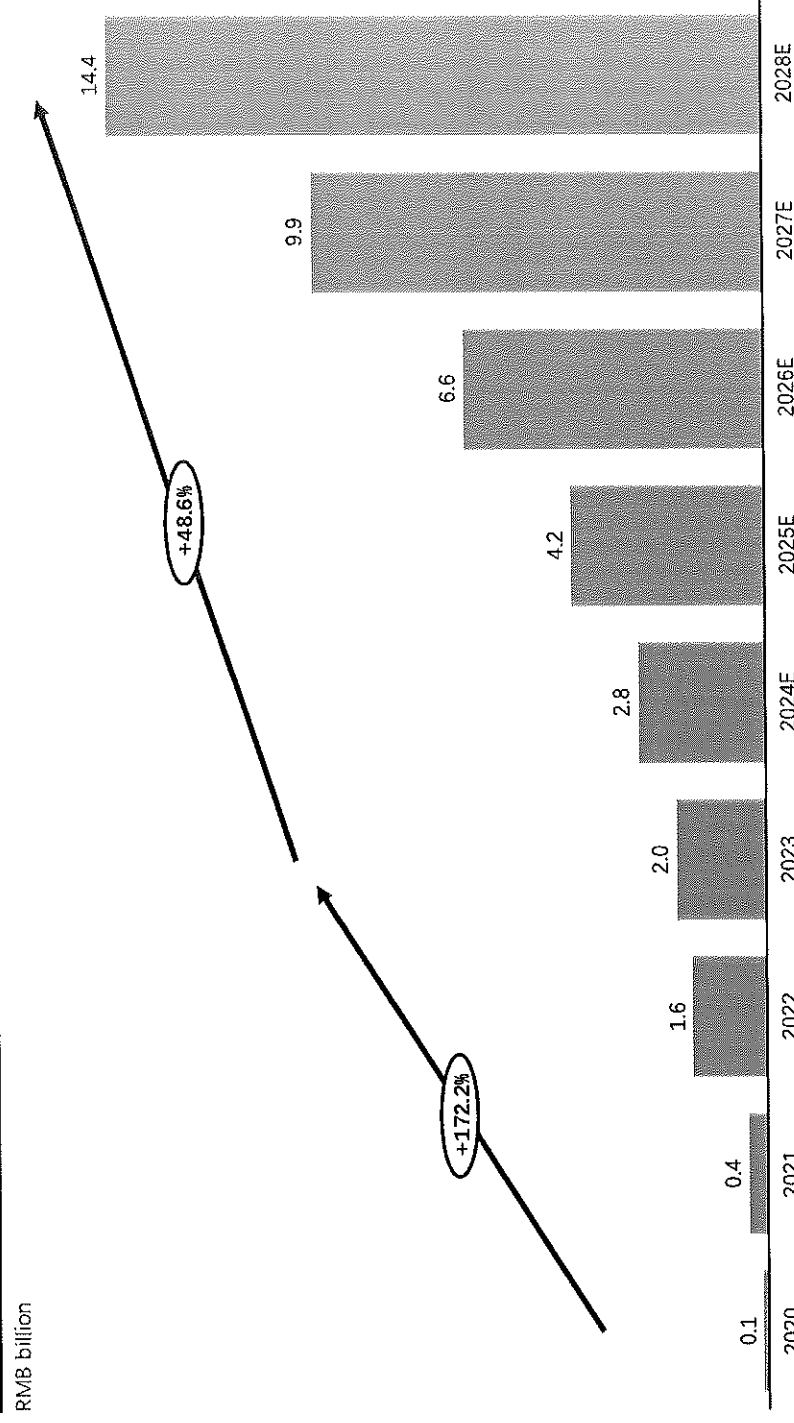
APaaS refers to a service that leverages the MPaaS technologies by using a low-code platform and packaging the functionalities to provide services based on application scenarios. Users can leverage the APaaS's flexibility and ease of use to design applications that address specific needs in a short time, fostering innovation and adaptability. In contrast, SaaS requires users to rely on ready-to-use features and updates provided by SaaS service providers, limiting the ability to customize the application to meet specific demands. Therefore, APaaS is interchangeable to SaaS in achieving specific functions with less development resources and shorter development cycle.

It is expected that APaaS will be able to penetrate SaaS market, especially meeting the customization needs of medium and small-sized clients. Audiovisual service market exhibits characteristics that favors the development of APaaS as most of the audiovisual content processing and engagement are applicable across various scenarios, for which APaaS can be delivered easily.

Market size of audiovisual APaaS market in China

- As the audiovisual cloud industry evolved, the demand for (i) stronger customization of audiovisual capabilities, (ii) deeper understanding of multiple scenarios which the customers operate in, (iii) easier access with lower technological threshold in a timely manner, (iv) more intelligent array of scenario-based audiovisual capabilities; and (v) in general, higher service quality and efficiency, has increased significantly. Against this background, APaaS, which is a one-stop platform on which users are allowed to develop, run and manage applications with higher development efficiency and lower cost than MPaaS and higher flexibility than SaaS.
- Many technology companies strategically reposition from the MPaaS business model to the MPaaS and APaaS double engines model.
- The audiovisual APaaS market size in China was RMB2.0 billion in 2023, with a penetration rate of 5.2% in the audiovisual PaaS and SaaS markets. The audiovisual APaaS market size is expected to reach RMB14.4 billion in 2028, with a CAGR of 48.6%. In 2028, the penetration rate of APaaS in the audiovisual PaaS and SaaS markets is expected to reach 12.1%.

Market size of audiovisual APaaS market in China, 2020-2028E



Note: The market size is calculated based on the total revenue of audiovisual APaaS providers. Any discrepancies in the chart between totals and sums of amounts listed therein are due to rounding.

Source: Expert interview, iResearch

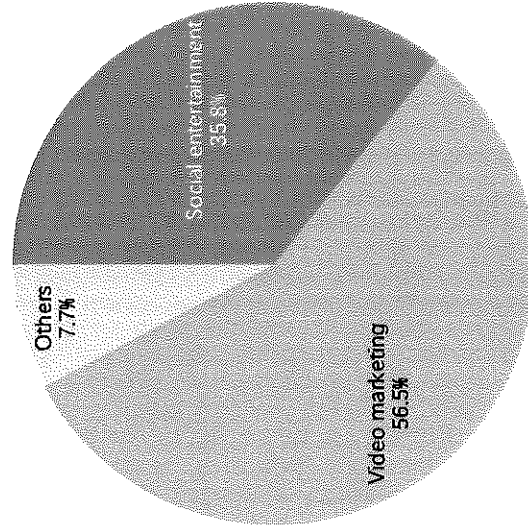
Market size of audiovisual APaaS market in China



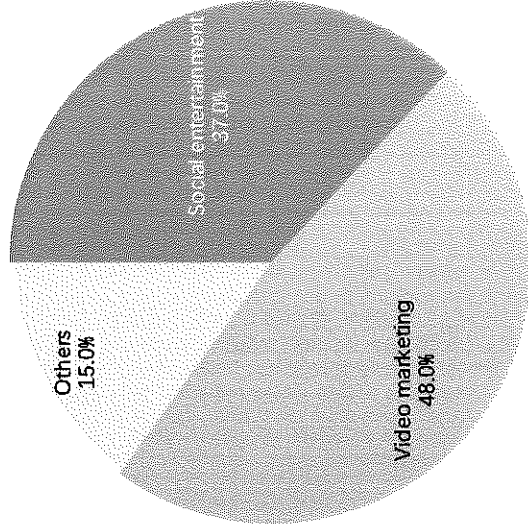
Market size of audiovisual APaaS market in China, 2023&2028E

RMB billion

2023
Total audiovisual APaaS market
RMB20.0 billion



2028E
Total audiovisual APaaS market
RMB14.4 billion



Note: The market size is calculated based on the total revenue of audiovisual APaaS providers. Any discrepancies in the chart between totals and sums of amounts listed therein are due to rounding.

Source: Expert interview, Research

Overview of the audiovisual APaaS Market Advantages of APaaS compared to MPaaS

Customers' demand to audiovisual APaaS

1 Demand to scenario-based one-stop solutions need to be met

As enterprise and individual developers move away from traditional applications and platforms, they need more lightweight and integrated audiovisual cloud service to efficiently produce, process and distribute custom audiovisual content, audiovisual APaaS that integrates multiple functional components can meet this demand.

2 Low-code platform is needed to realize more efficient application development

The demand for personalized audiovisual content production and distribution has been heightened by the development of mobile and audiovisual technologies. Corporate customers require low-code solutions that are easy to use, rapidly deployable and strong scalability to meet the different customized needs of a diversified user base. These can also be satisfied by audiovisual APaaS.

Values of audiovisual APaaS provided to service providers

1 Business model that can be quickly replicated

The audiovisual APaaS can quickly replicate and penetrate into new scenarios and help service providers form a business model that can be quickly replicated after the customer needs are translated into solutions.

2 Empowerment by existing services

In addition, the audiovisual PaaS providers may utilize their own PaaS capabilities and resources to expand APaaS business, as it is easier for PaaS providers to develop the APaaS compared to other providers.

Market drivers of audiovisual APaaS market in China

The audiovisual PaaS market can be divided into the audiovisual MPaaS market and the audiovisual APaaS market. As a sub-segment within the PaaS market, the audiovisual APaaS market has certain similar market drivers, entry barriers and development trends as the audiovisual PaaS market. In addition, the audiovisual APaaS market distinguishes itself from the audiovisual PaaS market with the following unique driving factors, entry barriers and development trends as audiovisual APaaS is easy to use, rapidly deployable and readily expandable.

Market drivers

Continuous scenario penetration

In the social entertainment scenario, virtual reality applications will likely lead to the growth of audiovisual cloud services, and the ability of APaaS to quickly launch applications makes it possible for rapid expansion. In addition, APaaS applications are gradually integrated to reshape existing business and audiovisual cloud services may introduce live streaming in marketing, visual sensing in automatic driving, remote maintenance in manufacturing, and other applications.

Demand for APaaS solutions in some scenario applications:

- Along with the significant growth of e-commerce platform, the demand for processing image, from storage to style processing, review and copyright protection, has also seen significant growth.
- The conventional television variety show's filming and production process typically takes at least ten days, from site preparation and on-site filming to footage delivery, clustering and transcoding. The development of 5G network, ultra-high-definition video and other advanced technologies increase the demand for alternatives to the traditional production process, including multi-camera centralized management, remote monitoring of production and quick editing of massive raw audiovisual contents. ...; and the ability of APaaS to quickly launch applications to efficiently produce, process and distribute custom audiovisual content makes it possible for rapid expansion.

Improvement of functions

In addition to basic services such as audiovisual transmission, production and processing, more scenario-based value-added services have been developed at customers' business level, such as traffic management in corporate live streaming and AI editing in new media. These new services added more practical features to APaaS, as well as providing customers with services of value. Different from PaaS, APaaS may be able to derive more diversified revenue sources with higher premium services. In addition, integrating multiple technologies in relation to VoD, live-streaming and RTC may further drive up the profitability of APaaS products.

Development of AIGC

AIGC is powered by large language model and it realizes code generation by natural language processing. Thus, AIGC can widen the road of the way of developing applications by low-code and zero-code technology. Supporting by AIGC, application development efficiency by using APaaS solutions can improve significantly. Thus, the application of AIGC can drive the development of APaaS market.

Entry barriers of audiovisual APaaS market in China

Entry barriers	Explanations
Technology barrier 	In addition to the complex R&D process of audiovisual technology, full stack self-developed audiovisual APaaS solutions have even higher development barriers with platform-based, scenario-specific, and commercializable features. As a result, audiovisual APaaS providers that lack technical R&D and iterative capabilities will likely face the risk of losing competitiveness. In recent years, audiovisual IaaS, PaaS and SaaS service providers have begun to expand their offerings to audiovisual APaaS. As compared to audiovisual IaaS and SaaS providers, audiovisual PaaS providers can leverage their existing PaaS capabilities and resources and have technical advantages. The expansion into APaaS business requires service providers to re-construct their platform and develop scenario-based solutions, which has a technical threshold and development cycle.
Scenario knowledge barrier 	The audiovisual APaaS integrates different functionalities with scenario-specific knowledge using low-code platform. As a result, service providers will be able to deliver scenario-based solutions that directly address customers' needs only if they have in-depth understanding of customers' business processes. New entrants are unlikely to accumulate a deep understanding of multiple audiovisual scenarios in a short time.
Customer resource barrier 	Audiovisual APaaS providers may improve audiovisual technology capabilities, scenario understandings, and customer service capabilities by accumulating experiences in providing services to different customers. As audiovisual APaaS solutions may be swiftly replicated to different customers, high-quality audiovisual APaaS solutions that have been validated by customers are more likely to win purchase orders and build customer loyalty. Lacking sufficient customer service experience and competitive products, new entrants may face difficulties in securing customer orders.
Product capability matrix barrier 	Audiovisual APaaS provides an integrated service package with a variety of audiovisual service components. Audiovisual APaaS providers are not only required to have a set of mature audiovisual general functionalities, such as VoD, live streaming and RTC, but are also required to accumulate various scenario-based plugins, such as bullet chat, camera filter, and content auditing. As a result, an audiovisual APaaS provider with diversified product capabilities will be able to better meet the growing demand of customers and gain a favorable competitive position in the market.

Development trends of audiovisual APaaS market in China

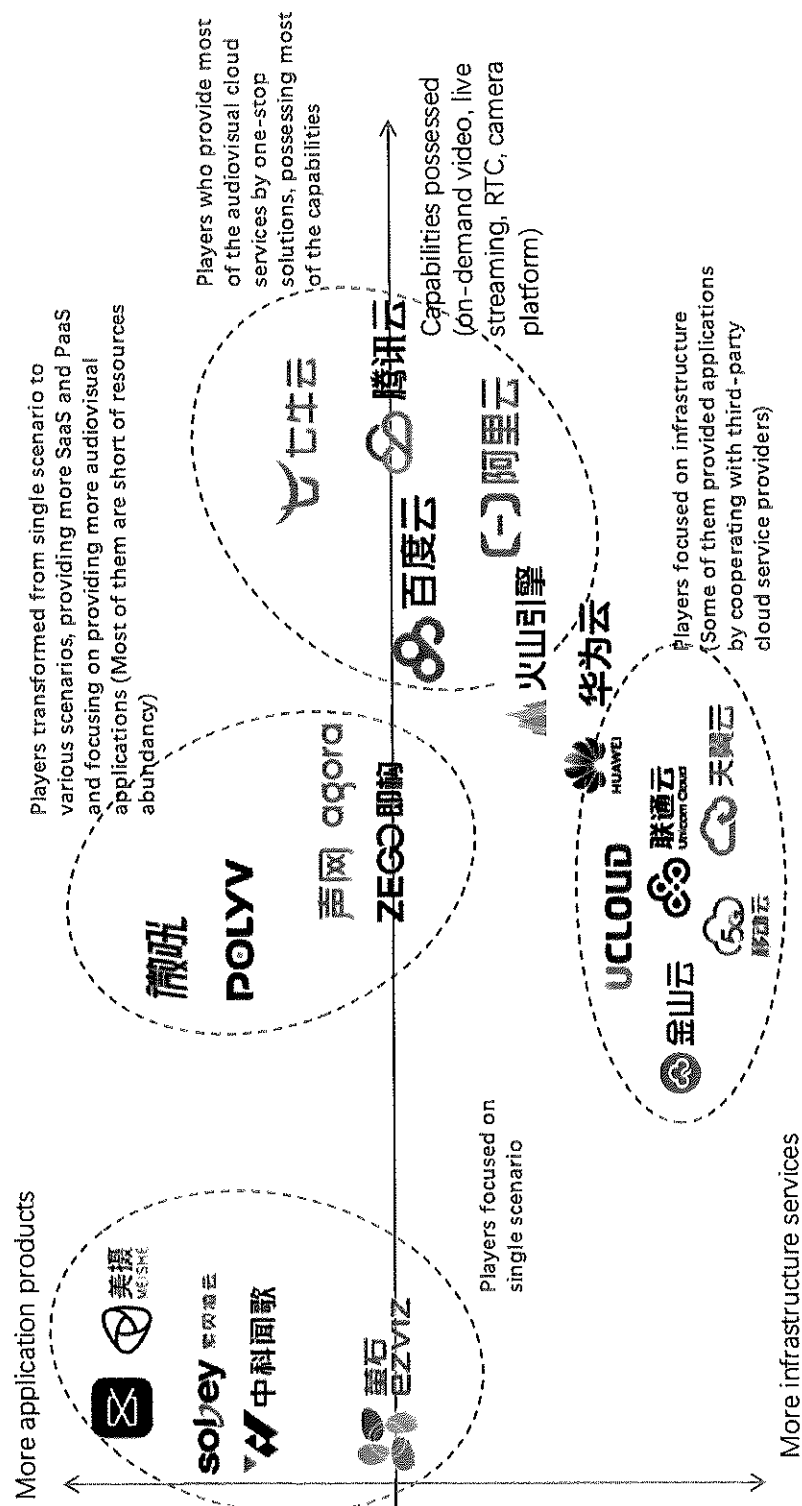
Development trends	Explanations
01 Integrated APaaS products will expand to more scenarios and add real value to customer's business	Audiovisual APaaS products that can be quickly launched and customized will be better integrated with customers' business and generate real values. For example, using remote maintenance instead of on-site maintenance in manufacturing can significantly reduce operating costs. Financial companies may also use audiovisual cloud technologies for claims settlement.
02 Technology is developing towards high definition, low latency, strong immersion and interaction	By improving resolution, frame rate and color gamut, videos will be ever closer to reality. By reducing latency, time interval between video presentation and capture will continue to narrow. The technology can also be applied to automatic driving that has high audiovisual latency requirement. Furthermore, the metaverse and Web 3.0 will require audiovisual technologies to create future-oriented perceptual experiences.
03 AI/CG technology is expected to drive changes in audiovisual APaaS industry	"AI/CG + audiovisual APaaS" is expected to emerge as a new form of audiovisual APaaS in the future, allowing users to automatically generate content and assemble a complete audiovisual application with simple input. Compared to existing audiovisual APaaS products, "AI/CG + audiovisual APaaS" offers certain advantages, including increased efficiency, convenience, and ease of application generation. AI generated code, a subfield of AI/CG (AI generated content), has the potential to improve the efficiency and code quality through the use of AI.
04 Deepened cooperation among audiovisual APaaS providers	Future trend in the audiovisual APaaS market is expected to be characterized by increasing cooperation among service providers. As more scenarios are created in APaaS and it becomes increasingly difficult for a service provider to cover a full range of scenarios, audiovisual APaaS providers may cooperate with each other to achieve efficiency. Individual service providers may provide infrastructure resources, technologies or industry know-how in a specific scenario in order to benefit from the integrated output. Service providers may also benefit from participating third-party developers to enrich the functionalities and capabilities of their audiovisual cloud services. In this process, leading service providers may benefit from open and established platforms with wide scenario coverage.

Competitive Landscape



Market positioning of audiovisual cloud service providers in China

Market positioning of audiovisual cloud service providers in China, 2023



The audiovisual cloud service market is competitive, rapidly evolving and constantly changing with innovations. The audiovisual cloud service market is subject to rapid technological changes, evolving industry standards, regulations and customer needs, requirements and preferences. Meanwhile, marketing approaches and tools in the market for MPaaS products and APaaS solutions in China are evolving. The principal competitive factors in the market include research and development capabilities, industry know-how, continuous capital investment, product portfolio, among others.

Audiovisual cloud service providers compete in markets where there are a large number of patents, copyrights, trademarks, trade secrets, and other intellectual and proprietary rights, as well as disputes regarding infringement of these rights.

Main participants of audiovisual cloud market in China

company	Whether it is an independent provider	Audiovisual cloud services			Development path	Strengths
		IaaS	PaaS	SaaS		
Alibaba Cloud	×	Main business	Main business	Minor presence	Focus on audiovisual IaaS and PaaS, and launch APaaS solutions	1. Non-independent audiovisual cloud service providers have accumulated a great amount of cloud resources, programming experience and partners, making it easier to develop PaaS and SaaS business
Tencent Cloud	×	Main business	Main business	Main business	Focus on audiovisual SaaS application development and enhance competitiveness	
Baidu AI Cloud	×	Main business	Main business	Several solutions	Provide comprehensive services covering all parts of the audiovisual business flow	2. Most of them have a great amount of users which gives advantages to operate on-demand and live streaming cloud business
Huawei Cloud	×	Main business	Several solutions	Minor presence	Focus on audiovisual IaaS, enabling customers by cooperating with third-party cloud service providers	
Qiniu	√		Main business	Strategic Business	Focus on audiovisual PaaS and related services, enabling customers by APaaS solutions and cooperated SaaS products	1. Independent audiovisual cloud service providers provide one-stop solutions compatible with various audiovisual applications, without the concern of incompatibility of non-independent vendors' solutions
Agora	√		Main business	A few products	Focus on audiovisual PaaS service	
Zego	√		Main business	A few products	Focus on audiovisual PaaS service and provide more related services	2. Most of them provide comprehensive services based on specific scenarios, differentiating from non-independent vendors' PaaS and SaaS service
Vhall	√		A few solutions	Main business	Provide audiovisual SaaS, APaaS and MPaaS, focusing on enabling customers directly	

The relationship between audiovisual PaaS providers and IaaS providers

IaaS providers typically serve a broader range of customers with their foundation-level resources while audiovisual PaaS providers focus more on serving customers with audiovisual needs. Given their larger service scale, IaaS providers are not focused on catering to the customized or industry-specific needs of its customers, rather, they often defer to their business partners, namely, audiovisual PaaS providers, to penetrate into this market. Such allocation of markets or dislocation of competition is evident from the recent announcements of large Internet enterprises such as Alibaba1 and Tencent2. In other words, the Company's business model can be distinguished from its IaaS competitors and contribute to a dislocation competition between them.

Cai Yinghua, Vice President of Alibaba Group and President of Global Sales of Alibaba Cloud, announced at the 2022 Alibaba Cloud Summit 'Back to Basic' that Alibaba Cloud will shift its focus towards the underlying IaaS layer's technology and **encourage partners to play a more substantial role in delivering industry-specific solutions directly to clients**, with the ultimate goal of achieving long-term and stable ecological development.
Source: https://www.sohu.com/a/568290655_120143330

Wangfeng, the head of Tencent's industry ecosystem cooperation, shared during the 2023 Tencent Global Digital Ecosystem Summit that Tencent Cloud has successfully implemented a comprehensive client classification system to clearly define the collaboration boundaries with partners. Simultaneously, Tencent Cloud is directing its efforts towards refining and marketing its in-house developed cloud products. **The responsibility for customization, integration, and delivery of industry-specific solutions to clients is delegated to partners, allowing them to leverage their diverse capabilities and contribute to the overall success of the ecosystem.**

Source: <https://m.3wcoffee.com/qfnews/detail?id=7291>

Comparable companies

The group ranked third in terms of revenue of the audiovisual PaaS market in China in 2023



Rankings of audiovisual PaaS service providers

No.	Company	2023 Comparable revenue ¹ RMB billion	2023 Market share %
1	Company A	3.89	17.0
2	Company B	1.47	6.4
3	The Group	1.33	5.8
4	Company C	1.31	5.7
5	Company D	0.99	4.3
Sum of top five service providers		8.99	39.2

The Company accounts for 1.5% of the entire audiovisual cloud service market in 2023. And the Company accounts for 1.6% of the entire audiovisual cloud service market in 2023.

The companies operating in the audiovisual PaaS industry have generally yet to achieve profitability, given heavy investments upfront especially in research and the general pricing strategies adopted to quickly capture additional market share.

Meanwhile, the leading audiovisual PaaS providers, though still keen in competition, are making effort in improving their profit margin and service quality, reducing large-scale sale promotions. For example, in Sep. 2023, the CEO of Tencent Cloud said Tencent Cloud made good progress in supply chain management and loss-making segments management, the company's overall gross profit margin achieved a very large increase this year, and the goal was to achieve breakeven. Also, Alibaba Cloud first declared positive EBITA in 2022 and continued in 2023. It is expected that such trend is beneficial to the profitability of the market as a whole, and contributes to a stabilizing competitive landscape.

- It is respectfully submitted that the audiovisual PaaS service market is in the phase of expansion with new entrants join in the market. The aggregated market share of Top5 audiovisual PaaS service providers decreased from 46.5% in 2019 to 39.4% in 2023, representing a 7.1% market share decrease over the past five years, despite an increase in the aggregated revenue of Top 5 audiovisual PaaS service providers during the same period. Particularly, the Company recorded increased market share in 2023 as compared to 2022, while the aggregated market share of Top5 audiovisual PaaS service providers further decreased from 40.9% to 39.4% during the same period, which demonstrates that the Group is well-positioned to capture market growth. And the concentration rate of the market is expected to further decrease before getting stabilized. The aggregated market share of Top5 audiovisual PaaS service providers is expected to decrease from 39.4% in 2023 to 35.9% in 2025, despite an increase in the expected aggregated revenue of Top 5 audiovisual PaaS service providers during the same period.
- The growth rate in the Group's revenue in 2023 (i.e. 16.3%) is higher than the average growth rate of top five audiovisual PaaS service providers (including three IaaS enterprises) in China during the same period (i.e. 11.4%), and the Group's market share in the audiovisual PaaS market has increased from 5.7% to 5.8% during the same period.

Note: Comparable revenue is based on the revenue of audiovisual PaaS business of the company. Any discrepancies in the chart between totals and sums of amounts listed therein are due to rounding.

Source: iResearch

Comparable companies

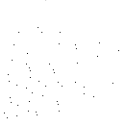
The group ranked second in terms of revenue of the audiovisual APaaS market in China in 2023



Rankings of audiovisual APaaS service providers

No.	Company	2023 Comparable revenue ¹ RMB billion	2023 Market share %
1	Company B	0.33	16.6
2	The Group	0.28	14.1
3	Company A	0.19	9.5
4	Company C	0.10	4.9
5	Company E	0.06	3.0
Sum of top five service providers		0.96	48.1

The group ranked second in terms of revenue of the audiovisual APaaS market in China.



Note: 1. Comparable revenue is measured as the revenue generated from audiovisual APaaS business of the companies or the relevant revenue calculated based on an estimated percentage of revenue from audiovisual PaaS. Only revenue generated from commercialized APaaS products is included. Any discrepancies in the chart between totals and sums of amounts listed therein are due to rounding.

Source: Research

Comparable companies

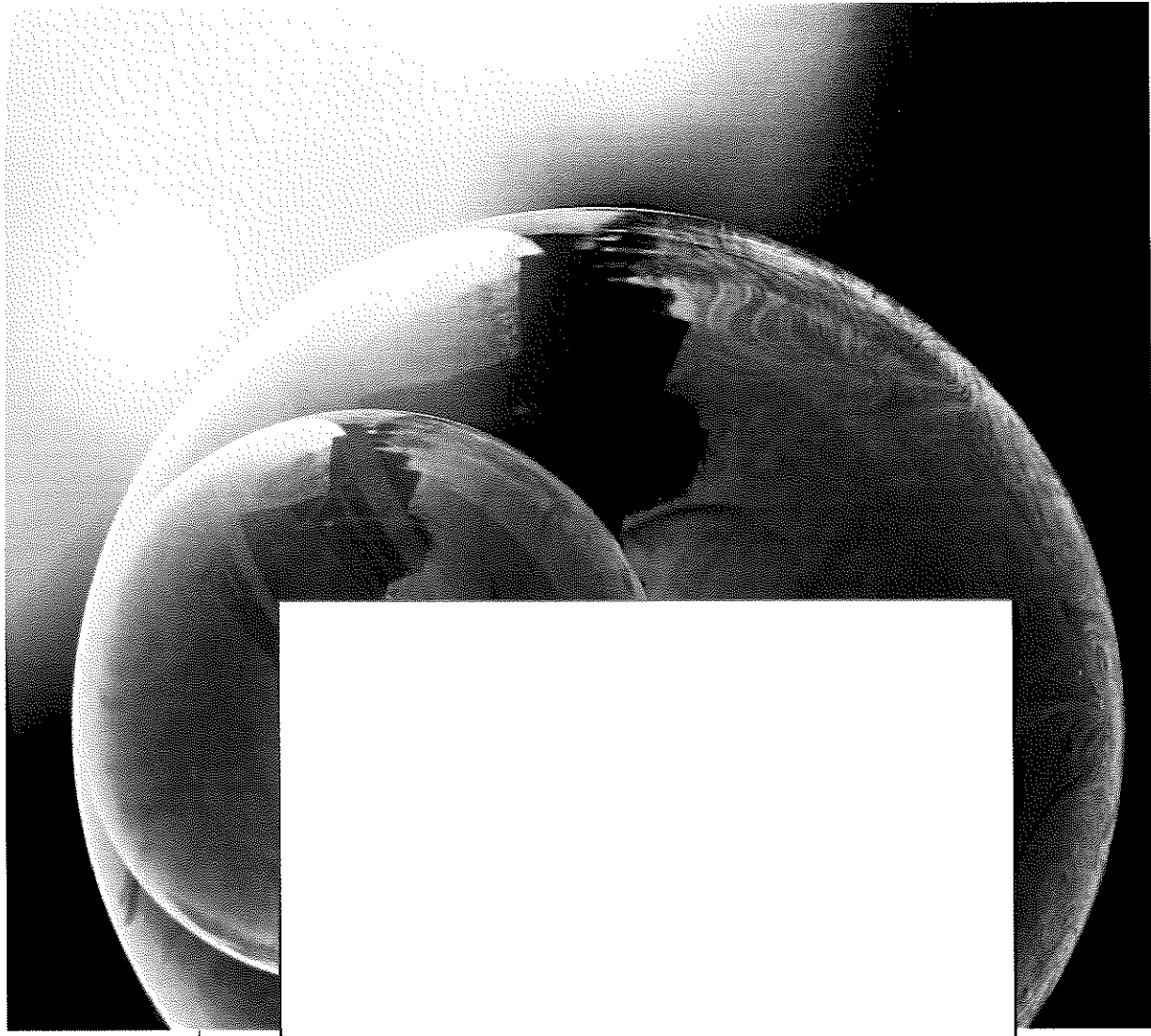


- Competitor A, founded in 2009, is a company providing cloud computing and artificial intelligence services. It is a subsidiary of a company that was listed on the New York Stock Exchange in 2014 and had its secondary listing on the Hong Kong Stock Exchange in 2019.
- Competitor B, founded in 2010, is a China-based technology company that provides globalized cloud products and services. It is a subsidiary of a company that was listed on the Stock Exchange in 2004.
- Competitor C, founded in 2012, is a company focusing on cloud computing, big data, and AI services. It is a subsidiary of a company that was listed on the NASDAQ Global Select Market in 2005 and had its secondary listing on the Stock Exchange in 2021.
- Competitor D, founded in 2014, is a company providing real-time voice and video engagement services. It was listed on the NASDAQ Global Select Market in 2020.
- Competitor E, founded in 2010, provides an enterprise-level interactive video cloud platform in China. Competitor E is a private company and based on public information, it completed series D financing in the amount of RMB230 million in 2018.

Note: 1. Comparable revenue is measured as the revenue generated from audiovisual APaaS business of the companies or the relevant revenue calculated based on an estimated percentage of revenue from audiovisual PaaS. Only revenue generated from commercialized APaaS products is included. Any discrepancies in the chart between totals and sums of amounts listed therein are due to rounding.

Source: IResearch

Appendix



Verification

The group's leading market position

Indicators

- 1 The group is one of the first market participants in China to develop audiovisual APaaS solutions and achieve commercialization (in 2021).
- 2 The group is one of the first PaaS players in China to develop software-defined global live streaming network.
- 3 The group is one of the first players in China to develop a cloud-native media data analytics architecture (in 2014).
- 4 The group is one of the first PaaS players in China to develop multi-cloud intelligent scheduling management for CDN services (in 2016).
- 5 The group is able to achieve high data reliability with an industry leading redundancy rate of 1.14 for public cloud service.
- 6 The group is able to achieve high data reliability with an industry leading redundancy rate of 1.10 for private cloud service.
- 7 It is an industry norm to have overlapping customer-suppliers in the audiovisual cloud service market.
- 8 The group is one of the few companies that have developed comprehensive and high-performance MPaaS products and possessed technology capabilities that are efficiently integrated and cover all aspects of the audiovisual business.
- 9 The group established one of the earliest platforms that provides audiovisual cloud services in China.
- 10 The group's platform delivers industry-leading performance around latency and media quality.
- 11 The group is one of the few audiovisual PaaS providers possessing comprehensive AI capabilities and are one of the first audiovisual PaaS providers that have capabilities for applying the development components of large language models to audiovisual cloud services.
- 12 The group's MPaaS paying customer retention rate of 67.6% in 2023 is above industry average level, mainly taking advantage of larger proportion of smaller customers (smaller clients of the company have a higher yearly retention rate for their purchase of one-year service packages).
- 13 The group's APaaS paying customer retention rate of 87.9% in 2023 is above industry average level. The indicator of industry level ranges from 50% to 90%.

Verification

The group's leading market position

Indicators

14	The group's dollar-based net expansion rate of MPaaS paying customer of 111.7% in 2023 is within the range of the industry norm, which ranges from 85% to 122% among leading players.
15	Dollar-based net expansion rates of APaaS paying customer vary drastically among service providers as APaaS has just started commercialization since 2021, and many of the competitors experienced surge due to small customer base.
16	The group's number of APaaS paying customers of 2,597 in 2023 is above industry average level. The industry level ranges from 200 to several thousands.
17	The group's number of MPaaS paying customers of 92,480 in 2023 is above industry average level. The indicator of industry level ranges from several thousands to several tens of thousands.
18	As of December 31, 2023, the group had accumulated approximately 1,292 APIs, which was among the high end of the industry level. The industry level ranged from 200 to 1500.
19	The group's approximate number of applications utilizing network modules of 21,000 as of December 31, 2023 is above industry average level. The industry level ranges from 10,000 to 35,000.
20	The group's number of registered users of over 1.4 million as of December 31, 2023 is above industry average level. The indicator of industry level ranges from tens of thousands to millions.
21	The group's daily average audiovisual playback of MPaaS platform of 3.6 billion minutes as of December 31, 2023 is at the high-end of industry average level, where the leading audiovisual PaaS service providers provide a daily average of over one billion minutes of audiovisual playback.
22	The group's daily average audiovisual content processing of MPaaS platform of over 1.2 million minutes as of December 31, 2023 is at the industry average.
23	The Group stays abreast of the latest industry trends of AIGC and have explored and developed relevant service capabilities.
24	Based on the business model of the Group and that of other listed companies, no directly comparable companies were identified among Hong Kong, Mainland China or the United States listed companies.
25	Only a few top-ranking audiovisual PaaS market players, including the Group, possess comprehensive AI capabilities coverage, while most other market players tend to specialize in specific area(s) of AI technology based on their business focus, and the Company is a top five player in the audiovisual PaaS industry possessing comprehensive coverage of AI capabilities as illustrated above.

Note: A comparison of companies in audiovisual PaaS industry in relation to the number of premium customers is unavailable as different companies have different definitions and set different parameters for premium customers.

Source: Expert interviews, Research

Verification

The group's leading market position

Indicators

26	The Company is also among the first movers of audiovisual PaaS industry to develop in AI capabilities. The Company first commercialized its first AI functions, specifically human body detection and object detection functions in the form of APIs, in January 2018.
27	As of December 31, 2023, the company's MPaaS platform had a total data storage scale of 1.4 EB and a total number of files stored at 491.9 billion. The average data storage scale among industry audiovisual PaaS service providers is around EB level. Due to the diverse file types and sizes stored, the number of stored files ranges from millions to trillions among the industry players.
28	The group's average revenue contribution of MPaaS paying customers of RMB10,537 in 2023 is within the range of the industry norm, which ranges from several hundred to several hundred thousand.
29	The group's average revenue contribution of APaaS paying customers of RMB108,340 in 2023 is within the range of the industry norm, which ranges from several hundred to several hundred thousand.
30	The industry levels of average MPaaS/APaaS revenue contributions range from several hundred to several hundred thousand, depending on the customer types and pricing strategies of the industry peers, and our average MPaaS/APaaS revenue contributions are within industry average.
31	Comparison with industry peers with respect to certain operating metrics is not possible primarily because (i) different industry players adopt varied definitions of the metrics; (ii) limited sample size available or (iii) the wide spectrum of metrics among different industry players.
32	Different companies in the audiovisual cloud service industry adopt varied definitions of active users and therefore a comparison with industry peers is not meaningful.
33	Different companies in the audiovisual cloud service industry adopt varied calculation methods of conversion rate and therefore a comparison with industry peers is not meaningful.

Other noteworthy characteristics of MPaaS market

Characteristics	Explanations
01 Gross profit margin of MPaaS market	The outbreak of the COVID-19 pandemic in 2020 led to numerous companies shifting their offline businesses online, which increased the demand for audiovisual telecommuting solution. At the same time, end users spent significantly more time on online entertainment such as short video, gaming, and livestreaming during the lockdown period. These factors led to high demand and limited supply for audiovisual cloud service. Therefore, service providers had higher bargaining power, thus gaining higher profit margins. However, as China gradually lifts pandemic restrictions, the supply-demand relationship is gradually returning to balance, resulting in a gradual decline in the gross profit margins of the audiovisual cloud service industry after 2020.
02 The development of cloud storage service market	In 2021, as face-to-face activities were affected by the outbreak of COVID-19 and the demand for online audiovisual services including online videos, live streaming, video conferences picked up pace which led to a rapid growth of investment in private and public cloud storage by companies. As the increased demand for cloud storage was gradually saturated after a rapid growth of investment in cloud storage due to the outbreak of COVID-19, the growth in cloud storage slowed down in 2022. Besides, chip supply chain risk in China in affecting server production and the geopolitical risk and the COVID-19 resurgence in 2022 causing serious supply chain disruption to hardware related business affected the availability and performance of cloud storage services, also leading to the decreasing growth of cloud storage service market in China.
03 The development of CDN market	The CDN market in China has numerous market participants and can be divided into four categories: traditional CDN service providers, cloud CDN service providers, audiovisual platforms with self-built CDNs, and telecommunication carriers. The competition in the CDN market became more intense with enterprises scaling down their budgets and spending mainly due to the resurgence of the COVID-19 pandemic and major telecommunication carriers investing more heavily in 2022.
04 Increasing demand for media data analytics	In 2021, the growing market for live streaming and on-demand videos which resulted in increasing demand for media data analytics.
05 Billing method of MPaaS service	Customer may enter into several framework agreements with MPaaS service providers and are charged by actual usage on a monthly basis. There is no project sum or minimal purchase amount defined in the framework agreements.

Other noteworthy characteristics

Characteristics	Explanations
01 Competition with IaaS service providers	- IaaS providers may enter audiovisual PaaS market and compete with existing PaaS service providers, but IaaS providers may fall short of necessary technical expertise and scenario knowledge, which have been the major competitive advantage of long-established PaaS providers. - Unlike IaaS market, which lays the basic infrastructure and is applicable across all scenarios, PaaS market is more fragmented with scenario-focused needs, such as industrial, operational, governmental, retail, and audiovisual service needs. It is difficult for IaaS providers to cater to all the needs with quality. In addition, IaaS providers are limited in their capacity and capability in exploring niche business opportunities, and PaaS providers have more channels for reaching more end customers. - It is possible that market participants would reduce price in an attempt to obtain competitive advantage. However, price may not be the sole consideration for customers of PaaS as they would also consider a variety of factors, for example the overall data security and reliability, and value-added services available to them. - Due to the high fixed costs in maintaining their infrastructure and resources, the IaaS enterprises normally require a stable demand and plan for such market demand earlier on without much room of flexibility.
02 Number of target companies	There are over 20 companies located in China that can meet the following criteria: (i) at a growing stage, (ii) led by senior management with more than five years of experience, (iii) with a successful track record offering PaaS or SaaS products with robust IPs, talent and technical skills in the audiovisual or AI technologies, and (iv) with average annual revenue of at least RMB50 million for the past three years and with a valuation ranging from RMB100 million to RMB500 million (subject to future market condition, industry development and valuation on multiples such as price-to-sales ratios and price-to-earnings ratios of comparable companies).
03 Competition within PaaS service	- Innovation is commonplace in the market, and it does not necessarily cannibalize market share of existing business. Take Tencent as an example, the launch of Weixin in 2011 had strong adverse impact on its then core product QQ. However, as the penetration rate of mobile Internet continued to increase and the application scenarios of Weixin expanded in scope and depth, Weixin has gradually replaced QQ as Tencent's core product, while QQ has also repositioned itself along with the industry trend and achieved a second wave of development. - As the industry continues to develop and the audiovisual technology penetrates into more application scenarios, the audiovisual cloud industry as a whole will continue to expand, and the demand for MPaaS products and APaaS solutions will grow simultaneously.

Source: Expert interview, iResearch

Other noteworthy characteristics

Characteristics	Explanations
01 Number of participants in CDN and storage service market	There are approximately 1500 licensed CDN service providers in China, while the number of market participants in object storage business is considerably lower.
02 CDN and interactive live streaming seldom deployed on private clouds	- Private cloud is often considered to be more expensive than public cloud as it comes with higher capital investment in hardware during deployment and higher maintenance cost after deployment. Insofar as CDN is concerned, the demand for customers to build content delivery network via private cloud is limited to special industries with stringent requirements for data security, such as government and finance industries, and often involves complicated customization requirements, therefore resulting in lower return on investments for the customers and thus restricting its development - Insofar as interactive live streaming is concerned, deployment on private cloud would require a large number of transmission nodes for enabling real-time interaction, which substantially drives up the cost for infrastructure construction and therefore unsuitable for the majority of customers.
03 Price reduction pressure mainly concerns CDN business	- It is respectfully submitted that while price reduction pressure is not uncommon across resource-heavy business segments (such as CDN and object storage) given the competition in the audiovisual cloud industry, the extent of such pressure in CDN business is more significant than any other business segments (for example, object storage business) because of the different natures of these businesses which result in varying magnitude of migration costs on the part of the customers, which is a key consideration of the customers when deciding whether to switch service providers. For instance, migrating data from one object storage provider to another can result in significant expenses associated with data transfer, setup, security control, and configuring the new storage environment. There is also a risk of data spills and loss during the migration process. In addition, extra resources and expenses may be incurred to address compatibility issues, especially if the data formats or APIs are not standardized between object storage providers. Therefore, when compared to object storage services, which have various costs, security, and compatibility issues to be assessed when migrating data from one supplier to another, resulting in higher overall switching costs, CDN services focus on data delivery and therefore have relatively lower switching costs. - Moreover, CDN business typically has more market participants than other sub-segments of the audiovisual cloud industry. There are approximately 1500 licensed CDN service providers in China, while the number of market participants in object storage business is considerably lower. Therefore, apart from competing on service quality, market participants tend to compete on pricing as the customers of CDN services are generally more price sensitive.

Source: Expert interview, iResearch

Other noteworthy characteristics

	Characteristics	Explanations
01	Potential market size and competitive landscape for agricultural industry	The market size of smart agriculture, which include smart plantation and cultivation, agricultural drones is estimated at approximately RMB90 billion in 2023. The major audiovisual cloud service providers that have also participated in agriculture industry include Baidu AI Cloud, Alibaba Cloud, Vhall.
02	Potential market size and competitive landscape for agricultural industry for smart new media industry	The market size of smart media, which include production editing and media resource management of films, TV series, and variety shows, is estimated at approximately RMB112.0 billion in 2023. The major audiovisual cloud service providers that have also participated in smart media industry include Alibaba Cloud, Baidu AI Cloud, Tencent Cloud, Polyw.

Other noteworthy characteristics

Comparable peers	AIGC-related capabilities and solutions	Large language model used in their AIGC solutions
Qiniu Cloud	Qiniu Cloud proposed to offer AIGC digital person solution, AIGC 3D content generation platform, and AIGC Kodo solution	Used commercial LLMs, such as Wenxin Yige and ChatGPT, as well as the adoption of open-source LLMs like Llama3
Alibaba Cloud	Alibaba Cloud leveraged its LLM model to upgrade its audiovisual cloud solutions, including media production, media asset management, and media processing. For instance, digital human editing, intelligent real-time production, and one-click video compilation are developed for media production. Additionally, LLM-based search capabilities are used in media asset management. Moreover, algorithm optimization is used in media processing.	Adopted self-developed LLM called Tongyi Qianwen, and may also involved third-party LLMs
Tencent Cloud	Tencent Cloud developed AI Digital Human, a multi-modal human-computer interaction system, to create intelligent, visual and interactive digital avatars used for AI digital anchor, digital customer service, digital assistant, etc.	Adopted self-developed LLM called Hunyuan, and may also involved third-party LLMs
Baidu AI Cloud	Baidu AI Cloud developed "Yinian", an AIGC-enabled content creation platform, for the production, management (analysis and audits), and distribution of AIGC-enabled audiovisual contents.	Adopted self-developed LLM called Wenxin, and may also involved third-party LLMs
Agora	Agora developed its AIGC RTE solution, with which developers can create their application, such as AI companion and AI speaking teacher, by integrating third-party LLMs, speech-to-text engines, and synthetic voices.	Integrated third-party large language models

It is also respectfully submitted that the adoption of AIGC capabilities in audiovisual cloud service market has only been enabled in recent 2 years. Many AIGC capabilities are used in existing products, and are not separately charged or not yet commercialized, making the calculation of an AIGC-related market share difficult.

Source: Expert interview, iResearch

List of audiovisual APaaS solutions in China

Company	Solution	Description	Launch year	Commercialization year
Tencent Cloud	- TRTC solutions - Low-code Interactive Classroom	APaaS is involved in TRTC solutions, including low-code interactive classroom solution, audio chat social networking solution and cloud gaming solution.	2020 APaaS has involved in TRTC solutions September 2022 Launched Low-code Interactive Classroom for education scenario	2020 Achieved commercialization in 2020
Alibaba Cloud	vPaaS low-code audio and video factory	Alibaba Cloud Video Cloud provides audiovisual services, also called VPaaS low-code audio and video factory, that are easy to access, strong expansion, efficient deployment, and multi-scenario coverage, helping enterprises quickly build high-quality audiovisual application.	2020 H2 – 2021 H2 Opened in public testing	2021 H2 Achieved commercialization in 2021 H2
Baidu AI Cloud	Audiovisual APaaS capability of Baidu AI Cloud audio and video have been embedded in enterprise services and solutions in multiple scenarios, including social entertainment, smart new media, conference and training, and smart auto.		2020 For in-house application 2021 Provided solutions based on APaaS	2021 Derived revenue from inside of the group in 2020, and derived revenue from external clients and achieved commercialization in 2021
Qiniu	APaaS solutions based on low-code platform	Qiniu developed APaaS solutions that cover a range of audiovisual scenarios based on its proprietary low-code platform consolidates different scenario-based functionalities.	2021 Launched APaaS business	2021 Achieved commercialization in 2021
Vhall	Vhallyun	Vhallyun is an aPaaS solution for interactive video provided by Vhall. It combines corporate live streaming with zero-code platform, empowering the digitalization of enterprises.	September 2021 Launched Vhallyun	2020 Generated revenue before public release through some cooperation, and achieved commercialization in 2021
Zego	Roomkit	RoomKit is designed to help customers from all industries build audio and video applications quickly.	March 2020 Launched aPaaS solution for all industries	2021 Achieved commercialization in 2021
	GoClass	GoClass is an aPaaS solution for online interactive classrooms provided by ZEGO. It modularizes the audio and video calls, whiteboards/files, cloud recording, real-time messaging, business background and other capabilities required for online classrooms.	August 2020 Launched aPaaS solution 'GoClass' for education scenario	
Agora	Flexible Classroom	It is Agora's aPaaS solution to interactive online classes for teachers and students, covering a variety of functions, such as real-time audio and video interaction, messaging, whiteboard, recording, screen sharing, and also teaching tools.	January 2021 Launched aPaaS solution 'Flexible Classroom' for education scenario	2020 Generated revenue before public release through some cooperation, and achieved commercialization in 2021

Source: Expert interview, iResearch

List of top 20 audiovisual mobile applications in China in terms of the number of monthly unique devices

Mobile application			
1	Weixin (微信)	11	QQ Music (QQ音乐)
2	Douyin (抖音短视频)	12	Xiaohongshu (小红书)
3	Sina Weibo (新浪微博)	13	Bilibili (哔哩哔哩)
4	QQ	14	Honor Of Kings (王者荣耀)
5	iQIYI (爱奇艺)	15	Kuwo Music (酷我音乐)
6	Kuaishou (快手)	16	NetEase Cloudmusic (网易云音乐)
7	WeTV (腾讯视频)	17	Buzz Video (西瓜视频)
8	Mango TV (芒果TV)	18	Meitu Pic (美图秀秀)
9	KuGou Music (酷狗音乐)	19	WeCom (企业微信)
10	YOUKU (优酷)	20	Happy Eliminating (开心消消乐)

Note: The list is selected based on the ranking of audiovisual mobile apps (including communication, music and video, social entertainment, gaming, photo editing, etc.) in China in terms of the number of monthly unique devices in December 2023 as tracked by iResearch User Tracker.

Market price and cost of CDN, object storage service and hardware in audiovisual PaaS market in China

Market price and cost of CDN, object storage service and hardware

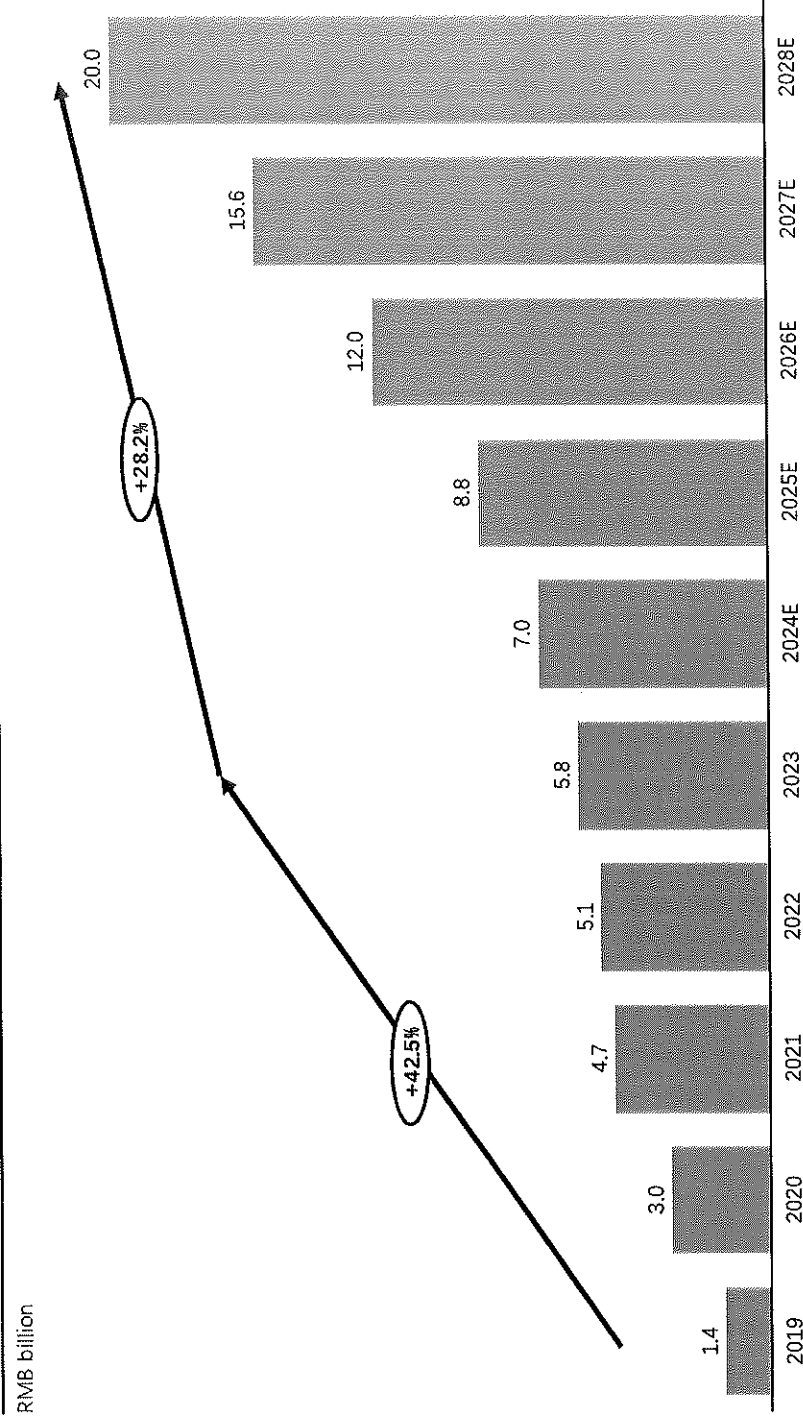
Product/Service	Market price	Cost
CDN	CDN services are usually charged based on usage, and it is usually charged cumulatively by tier by stage. In practice, charges vary significantly due to different billing methods and different discounts provided by CDN service providers. Therefore, we list publish price for reference. The industry average price of CDN services in terms of monthly peak bandwidth is around 7 RMB/Mbps/month to 8 RMB/Mbps/month. The industry publish price range of CDN services in terms of traffic is around RMB0.1 to RMB0.25 per GB depending on actual data usage. In practice, charges vary significantly from publish prices due to different billing methods and different discounts provided by CDN service providers. From 2014 to 2021, CDN service providers have been steadily lowering their prices to seize market share. CDN price decreased by 16% from 2021 to 2022 and further decreased by around 5% from 2022 to 2023. Going forward, CDN price is expected to be on a steady decreasing trend in line with its cost decline.	Relevant cost involved in CDN primarily include network and bandwidth costs. - Network and bandwidth are purchased from network operators and cloud providers. Network and telecommunication resources witnessed a steady decrease during the track record period because of China taking measures to lower the average rates of broadband and dedicated Internet access services for enterprises. - Tracking the price trends of network and bandwidth across different operators is difficult due to the fluctuating discounts offered for varying usage levels and various promotional activities. Instead, based on the results of expert interviews performed, there has been a single-digit decline in the network and bandwidth prices of the operators during the Track Record Period. - It is expected that the prices of network and bandwidth will continue to decrease due to intensified competition among telecom carriers and China government is taking measures to lower the average rates of broadband and dedicated Internet access services for enterprises.
Object storage service ("OSS")	Object storage services are charged based on usage, ranging from 0.02RMB/GB/month to 0.15 RMB/GB/month in 2023. The service fees for object storage services have experienced moderate increase during track record period due to its better support for the storage of unstructured data, such as graphs, audio and video.	Relevant cost involved in OSS primarily include server and storage costs. - Server and storage costs. The global average price of servers rose from USD8,048.7 per unit to USD10,427.1 per unit from 2021 to 2023, representing a CAGR of 13.8% during the same period, according to IDC and Counterpoint Research. - The price of servers has experienced an increase at the beginning of pandemic outbreak. The rise in prices is linked to ongoing chipset shortages, COVID-19 restrictions continuing to disrupt supply chains and increasing demand for online activities. The average price has declined and returned to a relatively stable level with the ease of supply chain disruptions. The average price has gradually declined before increased again in 2023 because of the impact of supplier production reductions and resurgence of consumer market demand. It is anticipated that this fluctuating trend influenced by supply and demand dynamics and technology advancement will continue in the future. - The global price of storage units has been relatively stable during the Track Record Period, according to Statista. It slight increased from USD13.5 in 2021 per unit to USD14.1 per unit in 2023 with a CAGR of 2.2% and is expected to continue this stable trend.
Server hardware	The price of servers could vary significantly depending on processor speed, memory capacity, storage size, and software features provided, etc.	The global average price of servers rose from USD8,048.7 per unit to USD10,427.1 per unit from 2021 to 2023, representing a CAGR of 13.8% during the same period, according to IDC and Counterpoint Research. Relevant cost involved in servers primarily include hard disks and other components. Due to the supply chain shortages during the early stages of the pandemic and followed by a subsequent slowdown in consumer market demand, the prices of major storage hardware components have exhibited an initial increase and then a decrease. Recently, the impact of supplier production reductions and resurgence of consumer market demand drives the prices increase again. It is anticipated that this fluctuating trend influenced by supply and demand dynamics and technology advancement will continue in the future.

Source: IDC, Counterpoint, Statista, Expert interview, Research

Market size of storage services in audiovisual PaaS market in China

- In 2023, the size of the storage services in audiovisual PaaS market in China has reached RMB5.8 billion. By 2028, the size of the market is expected to reach RMB20.0 billion, with a CAGR of 28.2% from 2023 to 2028.

Market size of storage services in audiovisual PaaS market in China, 2019-2028E



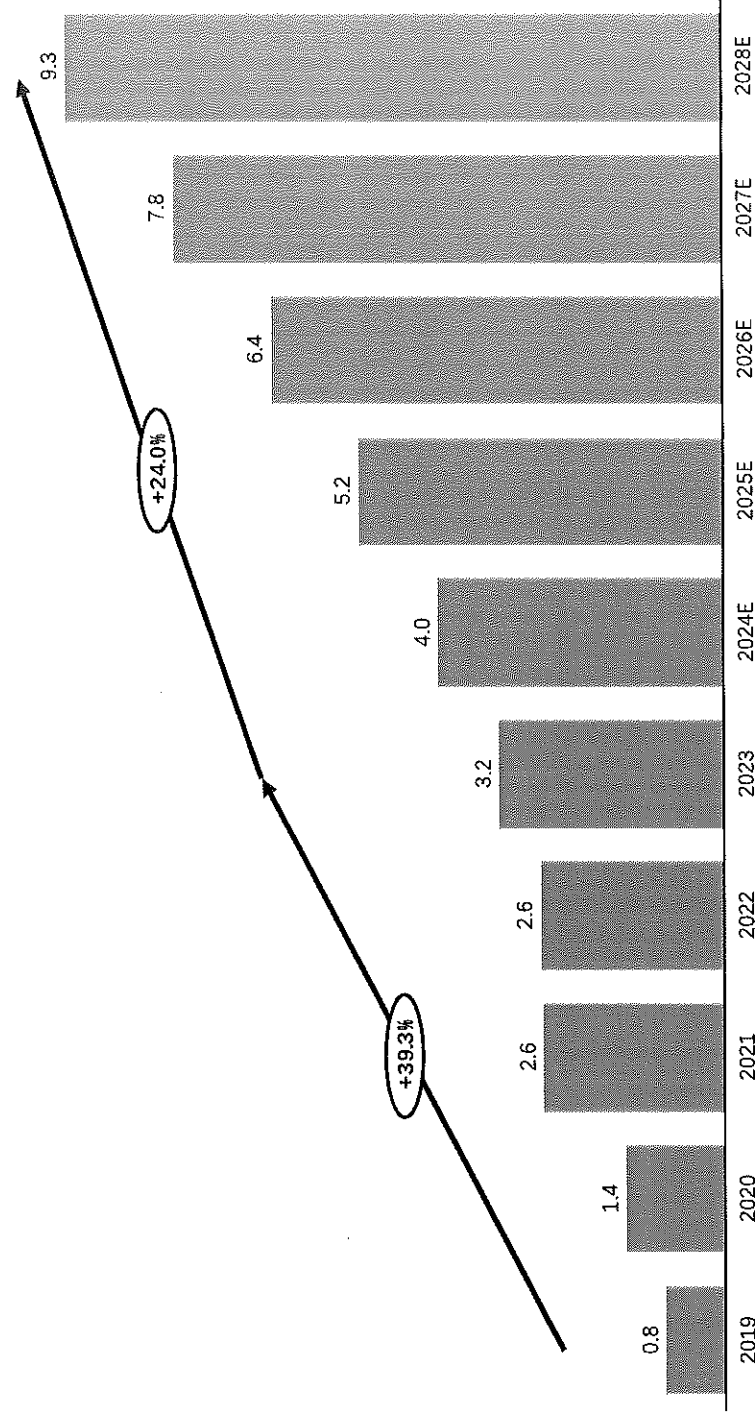
Market size of server hardware in audiovisual PaaS market in China

- Audiovisual PaaS hardware mainly includes different types of servers, such as all-in-one storage system, etc. All-in-one storage system combines server and hard disk enclosures with audiovisual PaaS service to build storage pools and provides unified storage services.

- In 2023, the size of the server hardware in audiovisual PaaS market in China has reached RMB3.2 billion. By 2028, the size of the market is expected to reach RMB9.3 billion, with a CAGR of 24.0% from 2023 to 2028.

Market size of server hardware in audiovisual PaaS market in China, 2019-2028E

RMB billion



Source: China Academy of Information and Communications Technology, IResearch

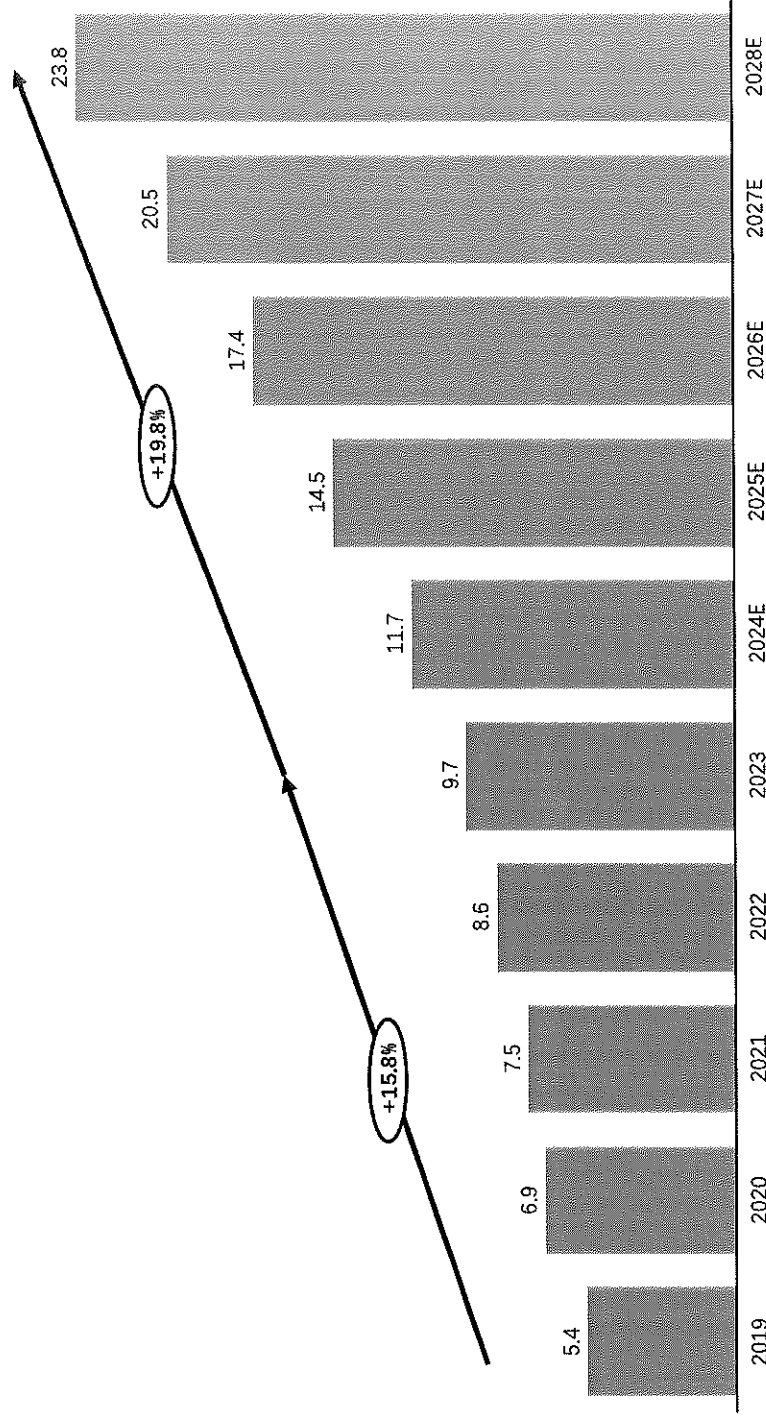
Market size of CDN services in audiovisual PaaS market in China

- CDN (content delivery network, or content distribution network) is a geographically distributed group of servers that caches content close to end users. CDN services allow for the quick transfer of assets needed for loading Internet content, including HTML pages, JavaScript files, stylesheets, images, and videos. CDN service is typically the major battleground in the competition with IaaS enterprises.

- According to Cloudflare, the popularity of CDN services continues to grow, and today the majority of web traffic is served through CDNs. In 2023, the size of the CDN services in the audiovisual PaaS market in China has reached RMB9.7 billion. By 2028, the size of the market is expected to reach RMB23.8 billion, with a CAGR of 19.8% from 2023 to 2028.

Market size of CDN services in audiovisual PaaS market in China, 2019-2028E

RMB billion



Source: China Academy of Information and Communications Technology, Qianzhan, Wikipedia, Cloudflare, iResearch

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