

# 2022 China Gaming Cloud Service Market Research

2022年中国游戏云市场报告

2022年中国ゲームクラウド市場報告

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Key Points:

cloud-side collaboration;

development via cloud;

operation and maintenance via cloud

# Instruction

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Frost & Sullivan and LeadLeo Research Institute hereby release the annual report “2022 China Gaming Cloud Service Market Report” as one of the China cloud computing series reports. This report aims to analyze current situation, application prospects, technical trends and development trends of China Gaming Cloud service market, and to identify the competitive landscape in the Gaming Cloud service market, while reflecting respective competitive advantages of leading vendors in this market segment.

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Frost & Sullivan and LeadLeo Research Institute conducted downstream user experience surveys on Gaming Cloud Service market. Respondents are of different sizes and in different segments in each of its industry that includes consumption, media, operators.

Trends in Gaming Cloud Service market presented in this report also reflect trends in the Cloud Service industry as a whole. The report's final judgment on market ranking and leadership echelon are only applicable to the industry development cycle of this year.

All figures, tables and text in this report are based on the surveys from Frost & Sullivan China and LeadLeo Research Institute. All data are rounded to one decimal place.

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# Chapter 1 Overview of Gaming Cloud Service Market of China

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**1.1** What is the basic architecture of the Gaming Cloud service and how do vendors efficiently implement information flow transmission?

**1.2** What is the application status and user demand of different segments of Gaming Cloud service?

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- The multi-level cloud architecture can be divided into Gaming Cloud service content layer, Gaming Cloud PaaS layer, and Gaming Cloud IaaS layer. This multi-level architecture help achieve efficient information flow transmission for game developers and operator.
- The multi-scenario practice of Gaming Cloud service broadened concerning user coverage, enriched application scenarios, and attracted loyal paying users while strengthening deep-binding user relationship. Along with hardware upgrading progress, Gaming Cloud service vendors fully considered the existing demands of game developers and gamers. Further technical methods such as edge computing and GPU multi-channel rendering also promoted Gaming Cloud service to grow with a faster pace.

# 1.1

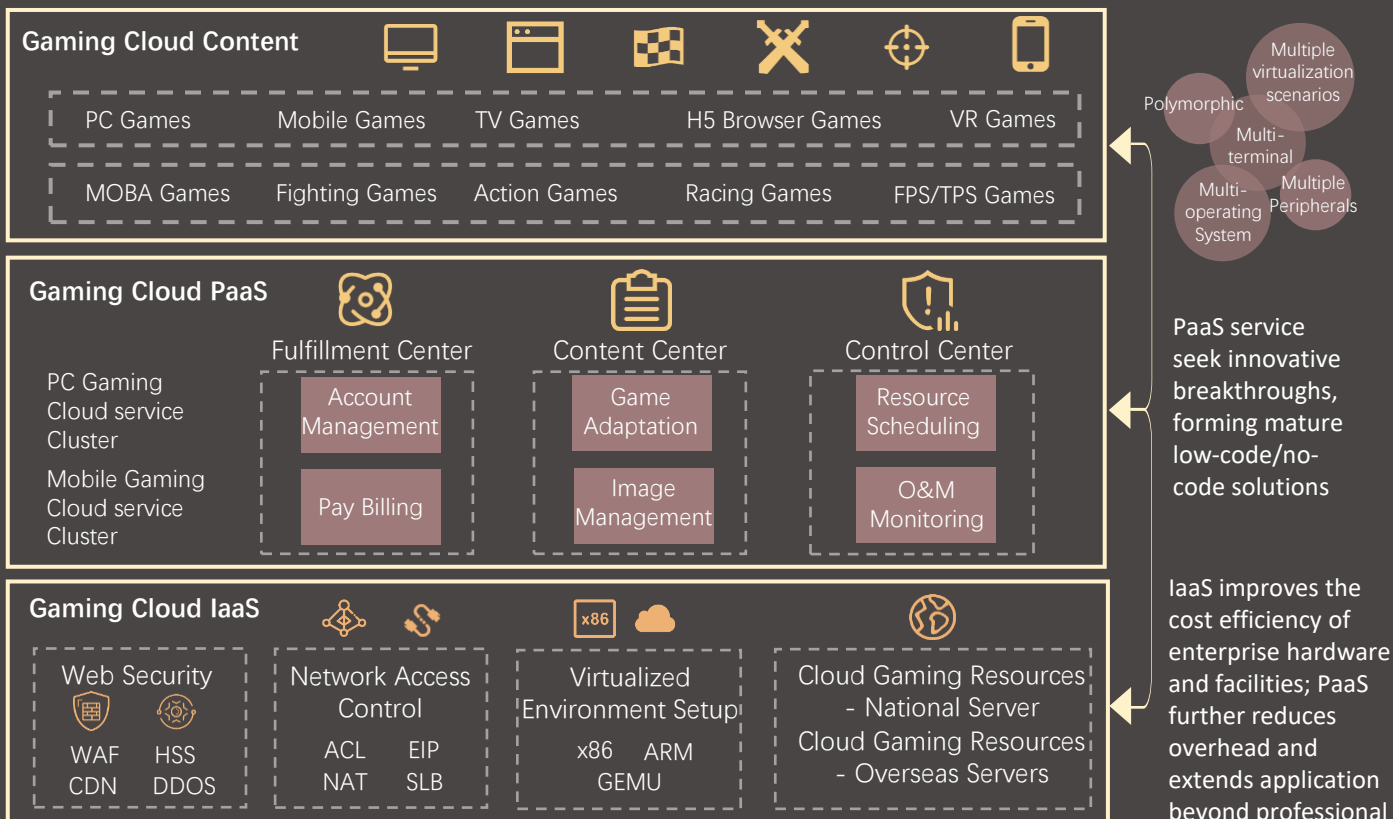
## Gaming Cloud Service Infrastructure

- Gaming Cloud service utilizes multi-layered architecture to achieve efficient information flow transmission

To achieve more efficiency in game development, game operation, game dissemination and game distribution, Gaming Cloud service began to be widely used by game developing companies. The architecture of gaming cloud service mainly includes gaming cloud content layer, gaming cloud PaaS layer and gaming cloud IaaS layer. While the computing power of game operation evolves, end-devices for players to reach gaming content also gradually expanded, including cell phones, tablets, PCs, large-screen entertainment systems, VR all-in-one machines, etc.

Gaming Cloud service enjoy features such as long-term connection retention session, long-term state maintenance, low-latency network, high IO throughput, and high computing performance. The gaming scenario enquires fluent interaction among gamers. While cloud service structure is progressively layered and decoupled, users still require high computing power from the underlying server. Hence, It is necessary to solve issues concerning cloud rendering, streaming, encoding and decoding, and meet up with requirement from cloud mobile games, mobile games, VR and even enterprise-level visual rendering scenarios.

Figure 1: Schematic diagram of the Gaming Cloud service infrastructure



# 1.2

## Core Demanding Points of Gaming Cloud Services

- Emerging integration between gaming cloud service and game multi-consumption scenes; paying willingness of C-end users increased

The integration of gaming cloud services with VR, live streaming, advertising, shopping and other emerging scenarios further expands the range of users reached and covered by various game workshops and enhances the richness of game payment scenarios. Based on solid industry chain resources on cloud computing, gaming cloud service providers gradually strengthen gaming cloud products and function matrix, and help game enterprises with rich development tools, promotion and distribution channels to attract more C-end consumers to participate and make payment. This deepens the binding effect between and application depth of gaming cloud services and game industry while expanding the revenue scale of the whole game industry.

Figure 2: Gaming Cloud service function application and key points of user demand



□ **Clear pursuit of integration between Gaming Cloud service and big data, AI, 5G and other emerging technology**

From the perspective of game developers and other entities served by Gaming Cloud service vendors, hardware upgrading and innovation is only part of their main focus. These entities also put more efforts in pursuing cheaper and high-quality cloud services. Gaming Cloud service providers need to continuously expand their service scale and improve cloud computing quality to meet up with customer needs.

Edge computing technology enables computing resource from service platforms to sink closer to the user side, shortening latency and improving user experience. Also, Increasing user demand on GPU related functions has spawned multi-form of cloud computing service and differentiated method on configuration. The implementation of Gaming Cloud services structure is also accelerated by multiple 5G application scenarios, such as mobile broadband (eMBB), ultra-reliable and low-latency communication (uRLLC), and massive machine-based communication (mMTC).





## Chapter 2 Gaming Cloud Service - Convergence of Emerging Technologies

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**2.1** How does 5G technology converge with Gaming Cloud service? And how does the process go?

**2.2** Under what kind of scenarios is intelligent technology applied to and integrated with the Gaming Cloud service?

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- Favorable factors from both the market environment and industry chain ecology promoted the development of 5G technology. The convergence between 5G technology and Gaming Cloud service took a big leap from theoretically feasible to commercial take-off during the past two decades.
- Intelligent technology is also widely applied to the Gaming Cloud service industry, help forming an intertwining technical system, and promotes the construction of AI/ML cloud service ecology to become the underlying foundation of Internet service of the next-generation.

# 2.1

## 5G Technology Integration & Application

### Favorable market factors: positive signals from consuming side

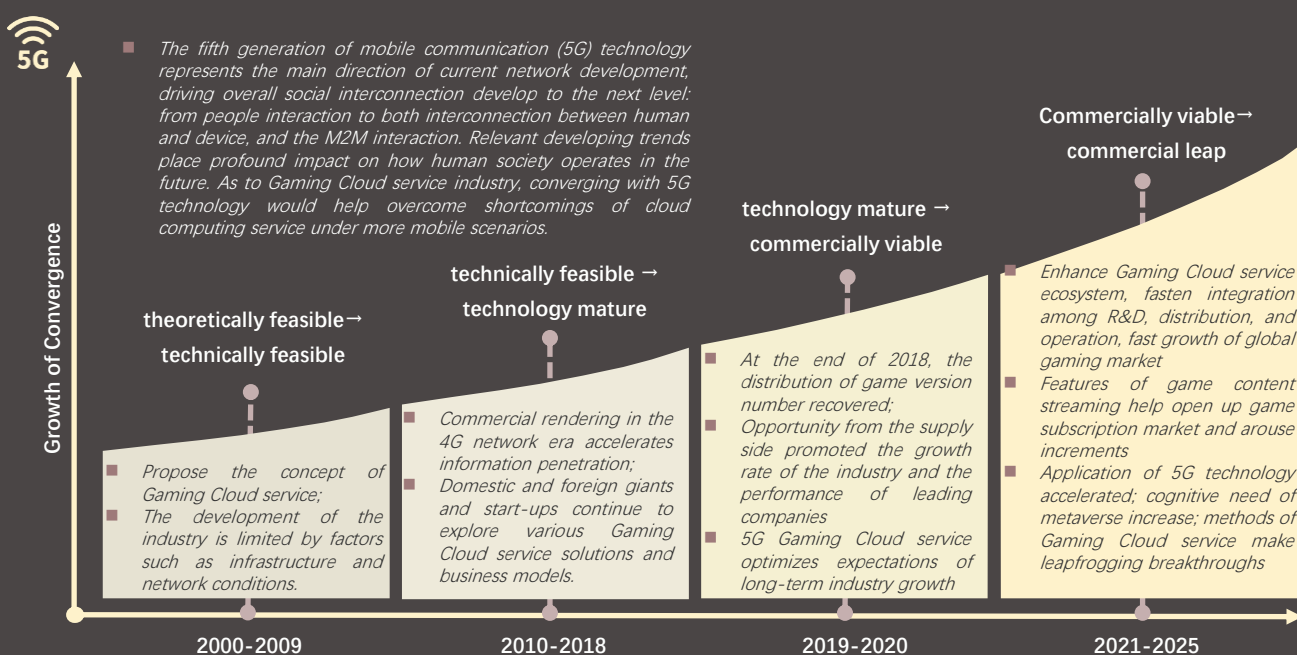
We have witnessed harsh challenges from the COVID pandemic within the past three years. And at current stage, we face urgent need from market to seek quick rebound in economic development. Potential consumption in the global market is further released by actively enriching the application scenarios of 5G technology, driving the consumption of 5G cell phones and other terminals, promoting other consumption in e-commerce, and encouraging online education and online entertainment, etc. Up to now, China Mobile has built about 300,000 5G base stations, aiming to cover all nationwide cities above the prefecture level with 5G networks. As 5G networks and terminals gradually gain acceleration in popularity and application, the obvious advantages of high speed, low latency and wide connectivity were given full play and greatly enhanced experience for gamers.

### Favorable ecology factors: extension and reinforcement of industry chain

Along with changes in consumers' perception of payment scenarios, as an emerging part of the cloud computing economy, the Gaming Cloud service is now leading the cloud industry to become one of the most significant influencer and market booster under the pandemic. The effect of "stay-at-home economy" accelerates the penetration of games among potential users, driving more potential end point users to notice and enjoy cloud gaming, hence nurturing user habits to purchase different form of cloud platform related service. Leading enterprises within cloud service industry use their own advantages to drive continuous growth of the Gaming Cloud service market.

Game content developers such as Tencent and NetEase also play a vital role in the Gaming Cloud service industry chain. By gradually migrating from traditional developing platform to cloud developing platform, while paying more attention to game content and increasing investment in production and research of high-quality games and large-scale games.

Figure 3: Convergence of Gaming Cloud service with 5G



## 2.2

# Intelligent Technology Integration & Application

Electronic devices such as game consoles, mobile phones, AR/VR devices are systems derived from traditional computing systems for specific purposes. Based on different forms of devices, Intelligent technology such as computer language design, computer algorithm design, computer graphics, software and hardware architecture, network debugging and adaptation, interactive devices and many others are broadly applied and upgraded with a fast pace, while promoting the development, operation and maintenance efficiency of Gaming Cloud service. The way that intelligent technology integrate with Gaming Cloud service can be divided into three periods.

### Basic Convergence

At this point, service related to game development and operation begin to merge with intelligent technology on a basic level. Intelligent technology help assist rule design of the architecture of Gaming Cloud service and help form automatic functions for game development.

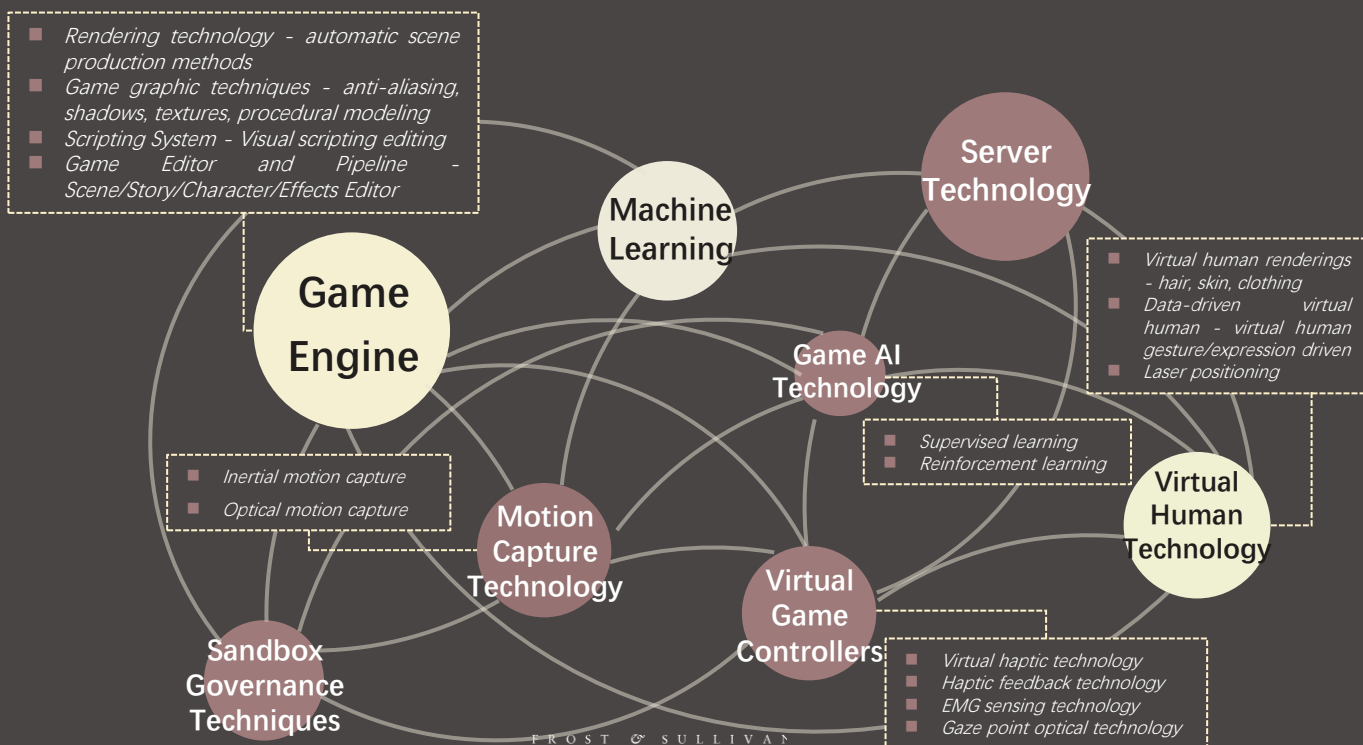
### Convergence and technology iteration

Cloud service vendors have preliminary experience in the application of intelligent technology in game business and begin to try to accelerate the development and adaptation of intelligent tools in user interaction experience upgrading, massive data correlation analysis, automated operation and distribution, etc.

### Convergence and function spillover

The application of intelligent technology in the game field comes to mature, and the application of intelligent technology in the front-end expanded to fields like personalized content creation, numerical value tuning, game logic design, AI competitive robot, private domain socialization, etc. In the back-end, it provides more mature solutions for game enterprises in public opinion analysis, advertising and precise promotion.

Figure 4: Intelligent technology and Gaming Cloud service integration mapping





## Chapter 3: Opportunities in and Challenges to Gaming Cloud Service Market of China

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**3.1** What kind of application scenarios are involved in the gaming cloud service and what kind of opportunities exist?

**3.2** What are bottlenecks and challenges to technology upgrade and iteration within gaming cloud service?

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- The Gaming Cloud vendors face many customer groups, including game developers, game publishers, game operation platforms, game media platforms and the gamers group, and the personalized demands of different customer groups bring opportunities for gaming cloud service market to expand.
- The Gaming Cloud service industry in China faces opportunities and challenges at the same time. Concerning requirement of network security protection, complex dynamic database construction, and rich global backbone network construction, cloud service providers need to combine their own advantages and grow from single-point technology breakthrough to comprehensive technology stack construction.

# 3.1 Opportunities in Scenario Expansion

Gaming Cloud service face multiple user groups, including game developers, game operators, communication operators, etc. Vendors provide customized services to stimulate potential consumption and help customers to upgrade their capacity.

**Low Configuration**

**Multi-Terminal**

**Game Masterpieces Experience**

Vendors support users to run games across multiple terminals (PC terminal, mobile terminal, web page, workload, etc.) simultaneously by adapting to gaming cloud platforms. Owe to upgraded functions concerning GPU virtualization, edge computing, container technology, audio and video codec technology, cloud service help gamers who can only get access to low-end equipment find suitable ways to reach heavy load games, hence reduce threshold and help developers to improve user accumulation and retention rate.

**Download-Free, Installation-Free,**

**Cloud Trial**

Gaming Cloud supports multiple traffic entrances, including advertising slots, information streams, application market, etc. Through lightweighted entry, users can access games without downloading, hence increase game conversion rate. Through cloud service functions, video website operator could greatly improve efficiency in video traffic conversion. For example, game hosts can transfer gaming control to fans in video stream or let viewers to enter game scene directly through video stream.

**Large Screen**

**High Image Quality**

**Smooth Interactive Experience**

Game developers cooperate with smart TV manufacturers by rendering technical system through cloud platforms and provide high-quality game experience for large-screen TV users, almost as well performed as professional gaming devices in terms of image quality and latency standards. By connecting gamepad or cell phone virtual handler with large-screen TV system, more players would be attracted to large-screen scenario and hence release potential demand for big screen game experience.

**Simple Installation**

**Preloading**

**Game Instant Launching**

Gaming cloud service vendors support real-time cloud rendering to help game developers efficiently build one-stop "game micro-end", providing gamers with additional functions such as cloud trial, silent download, login/payment penetration and update package free installation. Players with low-end cell phone configuration can get game experience almost the same as original gaming terminals through micro end package. Reduced package size can effectively lower cost of customer acquisition and improve launch effect.

# 3.3 Technology upgrade challenges

The Gaming Cloud service industry in China faces opportunities and challenges at the same time. Concerning requirement of network security protection, complex dynamic database construction, and rich global backbone network construction, cloud service providers need to combine their own advantages and grow from single-point technology breakthrough to comprehensive technology stack construction.

## ❑ Gaming cloud service faces multi-faceted security threats

With the expansion of the deployment scale and the scope of global network collaboration, coupled with the edge computing architecture collaboration, GPU virtualization and the complex information flow (audio and video streams), the exposure of the gaming cloud assets has increased, and the global attackers carried out more frequent and decentralized attacks on the gaming cloud-related network facilities, aiming at paralyzing the facilities and extorting high ransoms, and implement DDoS attacks on networks and applications, and this would pose challenges to the stability of the gaming cloud.

In addition, there are security loopholes in different parts of the game production chain, such as design, implementation and testing. This requires cloud service providers to take comprehensive measures such as threat modeling, security code review, fuzzy testing and security testing to take control in front and minimize risks caused by security events.

## ❑ Cross-services and cross-regional data synchronization

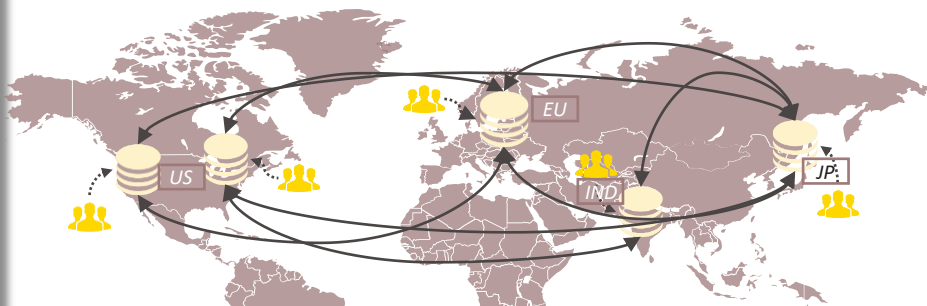
In order to help gamers meet less restriction from region while experiencing high-quality games from Chinese game developers and share game strategies, game experiences and form battle teams through multiple social channels, gaming cloud service providers need to ensure that user-device interaction data and device-device interaction data (M2M) can be efficiently and smoothly synchronized globally. Gaming cloud service providers need to build globally unified account system by constructing global synchronized multi-writing database and by using cross-regional data replication architecture to create stable and safe account synchronization experience for gamers.

## ❑ Global-level matchmaking gamers seek ultra-low latency

Cross-border matchmaking and global gaming scenarios break national boundaries, and the gaming cloud architecture help gamers in different regions and language systems achieve smooth interaction in various cooperative scenarios and competitive matchmaking scenarios.

Under the demand-oriented influence from “microservice + automation”, cloud service providers face multiple challenges: to further control bandwidth costs while promoting architecture automation and high-performance transmission efficiency.

**Figure 6: Global Service implements multi-write synchronous relational/non-relational database**



### Pain points of the global server game:

- Architecture design: different types of games design and how to deploy game access layer, logic layer and data layer
- Network delay: Players in different regions can access the game smoothly
- Data R/W: Reading and writing data efficiently and maintain data consistency
- Resource management: Unified and efficient game operation and maintenance and resource management



## Chapter 4 Trends in application of Gaming Cloud Computing Resource

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**4.1** Customized Cloud Computing Power applied to gaming cloud service

**4.2** Reusing computing resource within gaming cloud service

**4.3** Trends of traffic entrance and terminal devices

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- The growing trend of customized cloud computing service is mainly manifested by three points, namely the optimization from product side, the improvement from technical side and the improvement from service side.
- The development of computing power includes the improvement of infrastructure capabilities and the increase in computing efficiency. The multiplexing of computing power is conducive to the efficient use of computing power and the realization of global optimization.
- The mainstream entrance to game content is more diversified and large screen gaming experience is under pursuit; the continuous expansion of cloud intelligent terminal market creates momentum for continuous growth in game and gaming cloud business.

# 4.1

## Customized Cloud Computing Services Applied to Gaming Cloud Scenario



*"Cloud computing power services are becoming a new delivery form, enabling the high-quality development of the computing economy."*

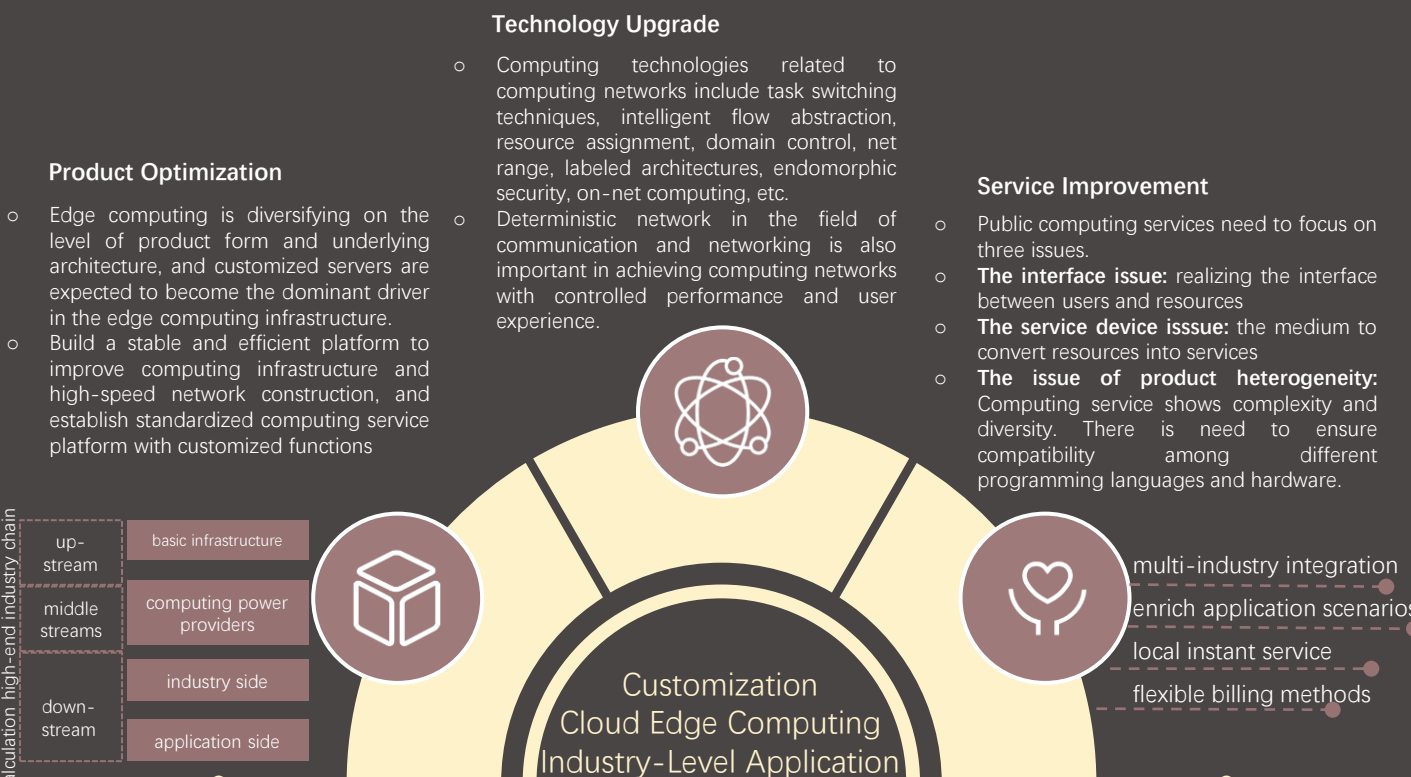
—Baohong, He, Director of the Institute of Cloud Computing and Big Data, CAICT

As a new type of resource delivery method, computing service has gradually derived from basic cloud computing to AI computing, supercomputing and other modes, and the computing efficiency can be measured and optimized through the dimensions of connection, volume, elasticity and capacity of computing. The application of customized computing service to gaming business mainly shows following characteristics.

- (1) Gaming cloud resources integrate heterogeneous computing power to promote the universality of computing service to game enterprises of different scales;
- (2) Multi-layer hierarchical computing resources promote the ubiquity of gaming cloud services in different aspects of the gaming business;
- (3) The gaming cloud resources unify the computing output standard and promote the standardization of computing service in the gaming industry.

Compared with the initial centralized cloud service model, the cloud-edge collaborative computing service model has richer connotation, including the computing resource from the whole chain of cloud, edge and end; intelligent computing power is more user-centered, providing customized services, helping the traditional industry transform and upgrade, and constructing more effective R&D, operation and promotion workflow for gaming industry.

Figure 7: Customized Cloud Computing Application Points



### Product Optimization

- o Edge computing is diversifying on the level of product form and underlying architecture, and customized servers are expected to become the dominant driver in the edge computing infrastructure.
- o Build a stable and efficient platform to improve computing infrastructure and high-speed network construction, and establish standardized computing service platform with customized functions

### Technology Upgrade

- o Computing technologies related to computing networks include task switching techniques, intelligent flow abstraction, resource assignment, domain control, net range, labeled architectures, endomorphic security, on-net computing, etc.
- o Deterministic network in the field of communication and networking is also important in achieving computing networks with controlled performance and user experience.

### Service Improvement

- o Public computing services need to focus on three issues.
- o **The interface issue:** realizing the interface between users and resources
- o **The service device issue:** the medium to convert resources into services
- o **The issue of product heterogeneity:** Computing service shows complexity and diversity. There is need to ensure compatibility among different programming languages and hardware.



## 4.2

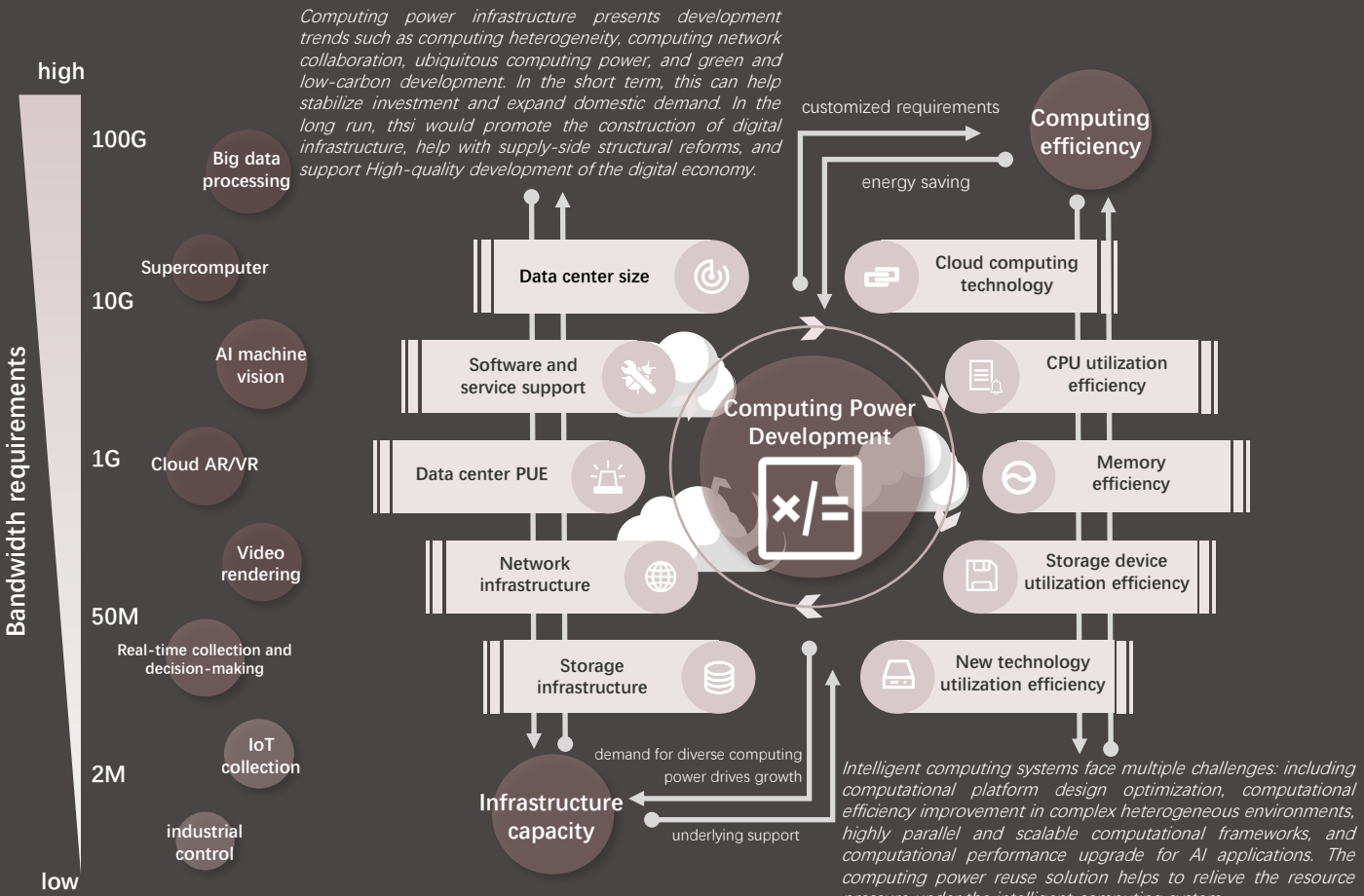
# Reusing Computing Power within Gaming Cloud Scenario

### Efficient utilization of computing system to achieve global optimization of computing power

Based on the complex network demand and requirement to optimize computing resource, cloud service providers gradually master the computing network linkage control solution. Through the integrated management and collaborative scheduling of multiple resources such as network, storage and others, vendors achieve the global optimization of connectivity and computing. The linkage control solution includes centralized solution, distributed solution, hybrid solution and other routes in technical implementation, and would help realize the route reachability of computing nodes and fully mobilize the control ability of IP router nodes.

Service providers can reuse the resources under the existing IP network, and improve the computing information distribution efficiency while fully considering real-time network status and computing resource invocation status, hence support high-speed scheduling of different applications, and ensure that massive applications can reach the appropriate computing nodes.

Figure 8: Computing power development and typical application bearing requirements



# 4.3

## Trend in Network Traffic and Terminal Development

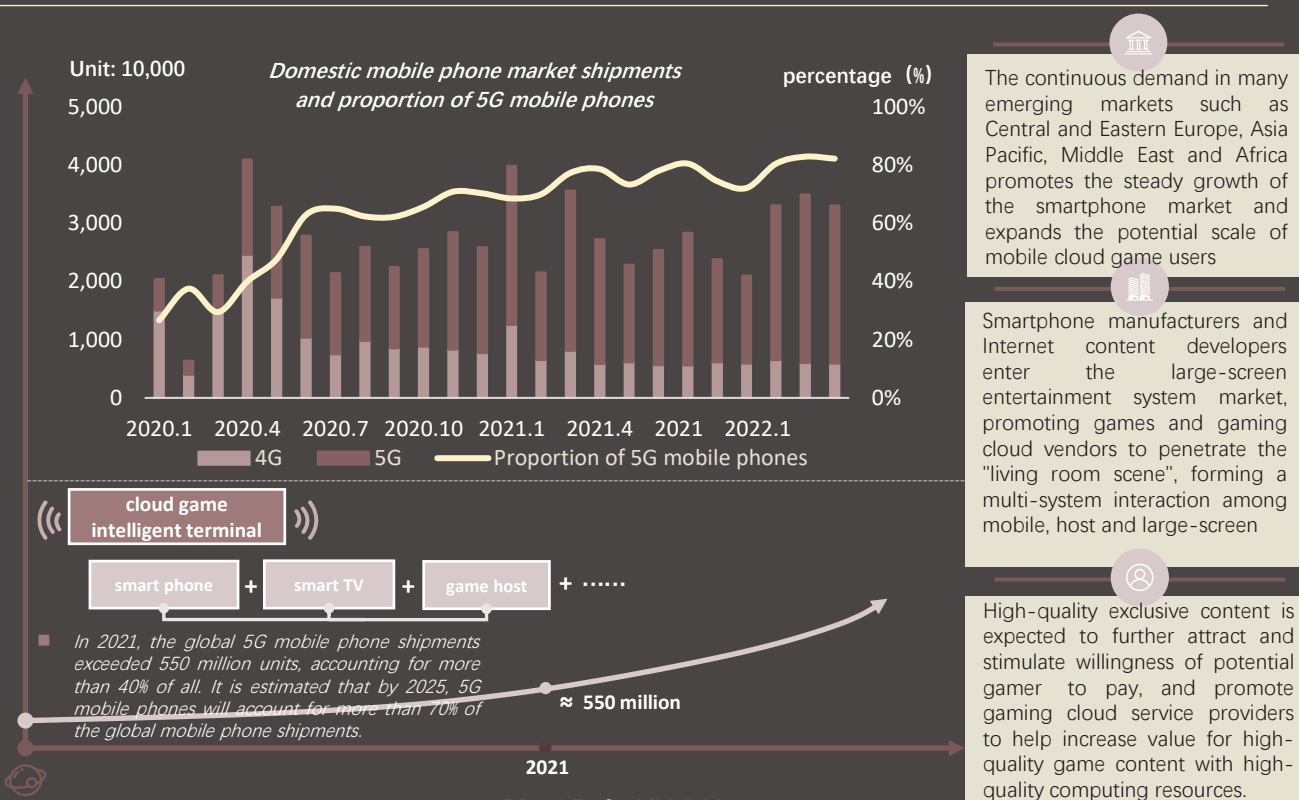
### □ Diversified development of traffic entrances and rapid popularization of cross-system workflow

Currently, the mainstream traffic entrances of cloud gaming include cell phones, tablets, PCs, etc. Terminals like smart TVs, VR/AR devices, smart cars and other end point devices also gradually become potential gaming traffic entrances. The existing market bonus in smart terminal market also bring strong increasing potential for the development of gaming cloud. With the combination of "Large screen + ultra-high definition + game handle", more and more host-like gaming system can create ultimate user experience for players. In this case, large-screen gaming scenario also become one of the key targets of gaming cloud services vendors. The growing application of game content platforms help game developers to switch flexibly and optimize workflow collaboration among Windows, OS, Android, IOS, Linux, TV, browser and other heterogeneous systems.

### □ Requirement for fast upgrade and iteration of system and hardware also drive creation of game and deployment of gaming cloud service

Factors such as rapid iteration of screen technology, upgraded mobile side network connection, various entertaining scenario from TV side, improved content experience through game consoles, and steady raise of PC ownership all contribute to the expanded gamer groups. During the period of the COVID pandemic, we have noticed proliferation of remote interactive scenes. This help promote end-device consuming market enter into a new incremental cycle. Living room TV come to play more of a vital role in remote education, meeting, entertainment and other social conditions. Hence, living room interactive entertainment begin to provide new opportunities towards gaming cloud service.

Figure 9: Growth of Cloud Gaming Smart Terminals



# Methodology

- ◆ Frost & Sullivan has conducted in-depth research on the market changes of 10 major industries and 54 vertical industries in China with more than 500,000 industry research samples accumulated and more than 10,000 independent research and consulting projects completed.
- ◆ Rooted on the active economic environment in China, the research institute, starting from data management and big data fields, covers the development of the industry cycle, follows from the enterprises' establishment, development, expansion, IPO and maturation. Research analysts of the institute continuously explore and evaluate the vagaries of the industrial development model, enterprise business and operation model, Interpret the evolution of the industry from a professional perspective.
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