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SERIES F: NON-TELEPHONE TELECOMMUNICATION SERVICES

Multimedia services

Requirements for cloud gaming systems

Recommendation ITU-T F.743.17

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Recommendation ITU-T F.743.17

Requirements for cloud gaming systems

Summary

Recommendation ITU-T F.743.17 describes the requirements for a cloud gaming system including user requirements, service requirements, performance requirements, management requirements, security requirements, network requirements and terminal requirements for a cloud gaming system. It also describes the typical scenarios including cloud game distribution scenario, cloud game running scenario, cloud game cross-platform scenario and cloud game live streaming scenario for cloud gaming system in Appendix I.

This Recommendation is intended to provide a reference for cloud gaming service providers, platform providers, and developers when they build and operate a cloud gaming system.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T F.743.17	2022-03-16	16	11.1002/1000/14958

Keywords

Application scenarios, cloud gaming system, requirements.

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* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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1 Scope

This Recommendation describes the requirements for cloud gaming system.

The scope of this Recommendation includes:

1) User requirements for the cloud gaming system.
2) Service requirements for the cloud gaming system.
3) Performance requirements for the cloud gaming system.
4) Management requirements for the cloud gaming system.
5) Security requirements for the cloud gaming system.
6) Network requirements for the cloud gaming system.
7) Terminal requirements for the cloud gaming system.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

None.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following term defined elsewhere:

3.1.1 cloud computing [b-ITU-T Y.3500]: Paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 cloud gaming: A way of playing the game on a cloud server. In the "cloud gaming" mode, game storage, computing, rendering, and so on are completed in the cloud, players can experience high-quality games through any terminal, anytime anywhere.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CGD Cloud Gaming Developer

CGPP Cloud Gaming Platform Provider

CGS Cloud Gaming System

CGSP Cloud Gaming Service provider

CGU Cloud Gaming User

5 Conventions

In this Recommendation:

– The keywords "is recommended" indicate a requirement that is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

6 Overview

Cloud game is a game mode based on cloud computing. Under the operation mode of cloud games, all games are running on the cloud side, and the game images are compressed and transmitted to users through the network after rendering. On the client side, the user's game device does not need any high-end processors or graphics cards, simply a basic video decompression capability is needed. In the cloud gaming system (CGS), there are four roles: cloud gaming developer (CGD), cloud gaming platform provider (CGPP), cloud gaming service provider (CGSP) and cloud gaming user (CGU). CGD completes the development of the game content and technical implementation on the game development platform, CGPP builds the cloud gaming platform to provide the cloud game service and management; CGSP distributes and operates the cloud games in the form of cloud game platforms or channels, including the development of client / terminal devices for the business side and the optimization of cloud game capabilities for the terminals. CGU uses cloud game apps to play games. The relationship between these roles is shown in Figure 6-1.

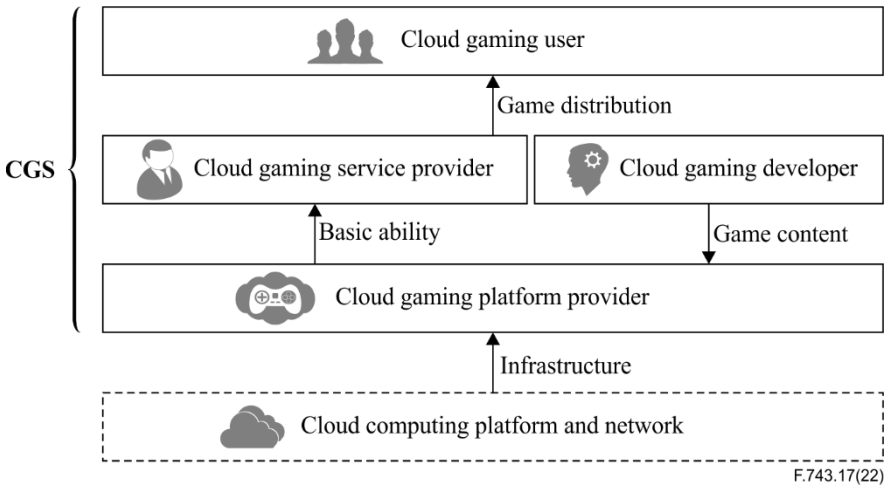

Figure 6-1 – Roles in cloud gaming system (CGS)

This Recommendation describes the requirements for the CGS. For cloud gaming system requirements, it describes typical requirements including user requirements, service requirements, performance requirements, management requirements, security requirements, network requirements, and terminal requirements. For application scenarios, it describes typical scenarios including cloud game distribution scenario, cloud game running scenario, cloud game cross-platform scenario and cloud game live streaming scenario in Appendix I.

7 User requirements

7.1 CGU requirements

– [USR-01] The CGS is recommended to support user account registration, account cancellation, and personal information modification. All these features need to be presented to the CGU in a simple, intuitive UI.

– [USR-02] The CGS is recommended to support user login and logout. Multiple login forms support is recommended, including account password, fingerprint identification, face recognition and voiceprint recognition, etc.

– [USR-03] The CGS is recommended to support user points, achievements, rankings, forums and comments, etc., to fully mobilize consumer engagement and enhance the sociality of the game.

– [USR-04] The CGS is recommended to support user account exchange. CGUs can host their own account to the CGS, and others can easily borrow or lease these accounts.

7.2 CGSP requirements

– [USR-05] The CGS is recommended to support business account registration, account cancellation and corporate information modification.

– [USR-06] The CGS is recommended to support business account login and logout.

– [USR-07] The CGS is recommended to support game titles management, including game release, update, revocation, etc.

– [USR-08] The CGS is recommended to support funds management, including top up service, resource leasing and game operations.

7.3 CGD requirements

– [USR-09] The CGS is recommended to support the channel access function, which defines the API connection of various functions such as account, payment and advertisement used in different channels to provide a unified environment for the development and operation of the cloud games and reduce the developer's access cost.

– [USR-10] The CGS is recommended to support platform hardware capability, to make hardware capabilities of client devices for use on cloud devices, such as cameras, microphones, Bluetooth, accelerometers, compasses, gyroscopes, motors, and other capabilities add more playability to the game.

– [USR-11] The CGS is recommended to support user input interaction, for transferring input operations from cloud devices to client devices so that local input methods can be used more smoothly and cleanly.

8 Service requirements

– [SER-01] The CGS is recommended to support game distribution. The CGS can assign a game instance to the CGU in response to the request, transmitting the game video stream to the designated terminal, and receiving game operation instructions for the user.

– [SER-02] The CGS is recommended to support the game resource supply function. Based on the flexible resource supply capability of the cloud computing system, the CGS can automatically allocate operations, storage, network resources, etc. to game instances according to the requirements.

– [SER-03] The CGS is recommended to support game rendering. Cloud game instances can perform operations and graphics rendering in the cloud and generate real-time game video streams.

– [SER-04] The CGS is recommended to support cross-platform adaptation. In CGS, game parameters such as resolution, display scale, image effects, HDR, etc. can be configured to adapt to the different platforms and terminals.

– [SER-05] The CGS is recommended to support preloading. The cloud game system can pre-instantiate popular games according to game popularity statistics and predictions, reducing user waiting time and improving the quality of the game experience.

– [SER-06] The CGS is recommended to support the game's live broadcasting function. Combined with the game live broadcast, the cloud game video stream can have the functions of barrage interaction, anchor interaction, game relay, etc., increasing the sociability and playability of the cloud game.

9 Performance requirements

– [PFM-01] The CGS is recommended to support short-term waiting to achieve click-and-play, reducing game launching time.

– [PFM-02] The CGS is recommended to support low latency to achieve a fast response of user operations on the game screen, and the end-to-end time delays are better to no higher than 70 ms.

– [PFM-03] The CGS is recommended to support the adaptive resolution. Users can manually or automatically select the game resolution suitable due to the different network environments. The resolution is set to be smooth, standard definition, high definition and ultra-definition.

– [PFM-04] The CGS is recommended to support a minimum of 30 frames of game screens. The ultra- definition image quality needs to support a minimum of 60 frames of game screens to ensure the smoothness of the game.

– [PFM-05] The CGS is recommended to support variable bitrate transmission to dynamically adjust the bitrate based on the clarity and the quality of the game.

10 Management requirements

– [MAN-01] The CGS is recommended to support resource managements, such as resource usage dashboard, statistics and resource elastic configuration.

– [MAN-02] The CGS is recommended to support system management, for example, providing a unified system management UI to implement the functions of the cloud gaming system.

– [MAN-03] The CGS is recommended to support the operation and maintenance management, including recording the operating status of the system and maintaining the stable operation of the system.

11 Security requirements

– [SEC-01] The CGS is recommended to support permission security management. The CGS provides users with an authentication mechanism to ensure user rights and prevent unauthorized users from accessing the CGS.

– [SEC-02] The CGS is recommended to support system security management. The CGS provides the system with the ability to prevent viruses and attacks.

– [SEC-03] The CGS is recommended to support content security management, including content information security, content distribution security and content audit and other capabilities.

– [SEC-04] The CGS is recommended to support personal information protection management, including in the entire life cycle of information collection, transmission, storage, sharing and other protection capabilities.

– [SEC-05] The CGS is recommended to support network security management, including access control, slice security, edge computing security and other capabilities.

– [SEC-06] The CGS is recommended to support business and application security management, including identity authentication, data transmission, business security, application security and other capabilities.

12 Network requirements

– [NET-01] The CGS is recommended to support wide network coverage, indoor, outdoor, and hot spots coverage should be realized. In some extreme scenarios, there will be a high demand for outdoor high-speed coverage capability of the network.

– [NET-02] The CGS is recommended to support network slicing, different types of games differentiation ability and SLA web service demand. Network slice of network operator needs to satisfy the cloud game differentiation deterministic network capacity, and fulfill the need to give business operators the provision to provide flexible quick open network business ability. This can be flexible according to the need to deploy and manage, thereby meeting the needs of the cloud game business scenario.

– [NET-03] The CGS is recommended to support MEC, with distributed sharing mode of computing node edges, which brings lower interaction delay and higher image response speed, thus further improving user experience, including edge rendering capability, business operation environment, graphics API interface, resource management interface and other capabilities.

13 Terminal requirements

– [TER-01] The CGS is recommended to support various game terminals, including mobile terminals, such as intelligent terminal products; immersive terminals, such as VR / AR devices and products; console terminals, such as game controllers; large-screen terminals, such as PC, TV and other large-screen products.

– [TER-02] The CGS is recommended to support key technical capabilities which have consistent decoding capability, screen touch delay, operation mode and other common hardware performance on terminal devices, providing open access capability for all kinds of cloud game terminals.

Appendix I

Typical application scenarios of cloud gaming system (CGS)

(This appendix does not form an integral part of this Recommendation.)

This appendix describes the typical application scenarios of cloud gaming systems (CGS).

I.1 Game as a Service (GaaS)

The CGS provides GaaS to implement the servitization of games for CGSP and CGU. CGSP can publish cloud games as a service swiftly by uploading game packages, configuring archive paths, resolutions and other simple operations. CGU can play a cloud game via the Internet as a service.

Step 1: The CGSP logs in to the CGS, uploads the game package body and fills in the game description metadata information, including game type, game introduction, game icon, game screenshots and videos, etc.

Step 2: The CGS analyses the uploaded game package body and allocates resources to the game.

Step 3: The CGS automatically or manually configures the game save path, resolution, resource requirements, etc.

Step 4: After CGS review and manufacturer test, the cloud game is successfully released.

I.2 Click-and-play scenario

The CGS provides CGU with click-and-play, free-to-install gaming services. The computing and rendering of the game are completed in the cloud. The CGU can receive the game video stream and send control commands to the cloud after installing and running the cloud game system client on the terminal devices, such as mobile phones, tablets, TVs, game consoles, computers, etc.

Step 1: CGU logs in to the cloud game client and the client sends an authentication request to the CGS.

Step 2: After the CGS authenticates the user, the client sends a game list request to the CGS and the CGS sends the corresponding game list to the client.

Step 3: The CGU selects the game and the client sends a request for a game instance to CGS.

Step 4: The CGS receives the application request for the game instance, establishes the instance in the cloud, calls the corresponding game and archived information, generates the video stream through coding and sends the address of the video stream to the client.

Step 5: The client receives the game video stream, and the CGU starts the game and sends control commands to the instance through the controller.

I.3 Cloud game cross-platform scenario

Cloud games provide cross-platform gaming services to CGUs. Users can play games when at home, during work, or when having fun. CGU can easily play games anytime anywhere with all the information, including user information, VIP rights, and archive data, saved in the cloud and shared across all terminals.

Case 1: One terminal, all games

CGU can play all types of games such as console games and PC games, on a certain terminal, for example, a mobile phone, through the proprietary or virtual peripheral controller. Consistent gaming experience is guaranteed.

Step 1: CGU logs in to the cloud game system client on one terminal, select games on other terminals, and initiate game requests.

Step 2: The CGS receives the game request, generates the game instance, adapts the parameters according to the difference in terminals and returns the address of the game instance.

Step 3: The client receives the game instance address, starts the game, initializes the corresponding terminal controller and sends a game video stream request to the instance address.

Step 4: The instance receives the video stream request reads the game archive and sends the game stream to the client.

Step 5: The client receives the game video stream, and the CGU starts the game and sends control commands to the instance through the controller.

Case 2: One game, all terminals

GC can share the same game archive through the cloud game system and use different terminals to play the same game on different occasions. For example, on the way to work, CGU plays the game using a mobile phone. At home, the user can continue the game through a computer or a console for a better gaming experience.

Step 1: CGU uses a terminal to log in to the CGS client and selects a game archive to initiate a game request.

Step 2: After completing steps 2-5 in Case 1, the CGU plays the game.

Step 3: The CGU ends the game and initiates a game termination request.

Step 4: The CGS receives the game termination request, saves the game and ends the video stream transmission.

Step 5: CGU uses other terminals to log in to the CGS client and selects the game archive to initiate the game requests.

Step 6: After completing steps 2-5 in Case 1, the CGU continues with the game.

I.4 Live cloud game streaming scenario

As a video streaming, the cloud game itself can be integrated with existing live streaming platforms. Combined with the interactive nature of the cloud game video streaming and the socialization of the live video streaming, a fusion scene based on various functions such as barrage interaction, anchor interaction and game relay is formed.

Steps: [TBD]

I.5 Other scenarios

Two important features of cloud gaming are: 1) game screen is transmitted through streaming media; 2) game running and operation instruction input are separated. Using these two characteristics, the following scenarios can be derived:

I.5.1 Interactive live broadcast scenario

Similar to the traditional live game, the streamer plays games and other users watch it. On this basis, we can take advantage of the separation of game running and operation instruction input in cloud gaming to support the transfer of game control from the streamer to one audience. This can provide stronger interactivity.

I.5.2 Screen clone scenario

The game screen generated by a cloud gaming instance can be transmitted to different user terminals at the same time. Multiplayer games can realize one screen for one person.

I.5.3 Instruction splitting scenario

Game operation instruction originally issued by one terminal can change to the instruction issued by multiple terminals, and the instruction synthesis is carried out at the server. The non-multiplayer game can support the multiplayer in this scenario.

Bibliography

[b-ITU-T Y.3500] Recommendation ITU-T Y.3500 (2014) | ISO/IEC 17788:2014, *Information technology – Cloud computing – Overview and vocabulary*.

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