CLAIMS

What is claimed is:

1. A game data processing method, executed by a computer device, comprising:

receiving a cloud gaming livestreaming request for a target cloud gaming transmitted by a cloud gaming client, and establishing a livestreaming service connection between a cloud server and a livestreaming server associated with the cloud gaming client based on the cloud gaming livestreaming request; wherein the cloud server comprises a media forwarding process started based on the cloud gaming livestreaming request; the media forwarding process is used for keeping the livestreaming service connection between the cloud server and the livestreaming server;

acquiring game image data and game audio data of the target cloud gaming based on the livestreaming service connection, and recording an image collection timestamp corresponding to the game image data and an audio collection timestamp corresponding to the game audio data, the image collection timestamp and the audio collection timestamp being timestamps in a same reference frame;

mixing, in response to acquiring to-be-processed audio data of a livestreamer object transmitted by the cloud gaming client, the game audio data and the to-be-processed audio data to obtain mixed audio data, a mixing timestamp corresponding to the mixed audio data being consistent with the audio collection timestamp; and

obtaining a livestreaming data stream corresponding to the target cloud gaming based on the mixed audio data, the audio collection timestamp, the game image data and the image collection timestamp, and delivering the livestreaming data stream to a livestreaming client associated with the cloud gaming client through the livestreaming server, comprising:

acquiring the mixed audio data, acquiring mixed audio frames and the audio collection timestamps corresponding to the mixed audio frames from the mixed audio data, sorting the mixed audio frames based on the audio collection timestamps, and writing the sorted mixed audio frames into an audio cache queue associated with the media forwarding process; and

acquiring the game image data, acquiring image frames and the image collection timestamps corresponding to the image frames from the game image data, sorting the image frames based on the image collection timestamps, and writing the sorted image frames into a video cache queue associated with the media forwarding process.

2. The method according to claim 1, wherein before the receiving a cloud gaming livestreaming request for a target cloud gaming transmitted by a cloud gaming client, the method further comprises:

performing, in response to acquiring a game access request transmitted for the target cloud gaming by the cloud gaming client, authentication processing on a game start identifier corresponding to the cloud gaming client based on the game access request to obtain an authentication result corresponding to the game start identifier, the game access request carrying a client environment system where the cloud gaming client is located;

establishing, in a case that the authentication result indicates that the cloud gaming client has permission to access the target cloud gaming through the game start identifier, a game service connection between the cloud server and the cloud gaming client, and configuring, based on the game service connection, a cloud virtual container for running the target cloud gaming for the client environment system where the cloud gaming client is located; and

starting a game process of the target cloud gaming in the cloud virtual container, and running the target cloud gaming through the game process.

3. The method according to claim 2, wherein a game display interface corresponding to the cloud gaming client comprises a livestreaming indication control for indicating performing cloud gaming livestreaming by the livestreamer object; and

the establishing a livestreaming service connection between a cloud server and a livestreaming server associated with the cloud gaming client based on the cloud gaming livestreaming request comprises:

receiving the cloud gaming livestreaming request for the target cloud gaming transmitted by the cloud gaming client, the cloud gaming livestreaming request being generated by the cloud gaming client in response to a trigger operation executed by the livestreamer object for the livestreaming indication control.

4. The method according to claim 2, wherein the cloud gaming livestreaming request carries the game start identifier; and

the establishing a livestreaming service connection between a cloud server and a livestreaming server associated with the cloud gaming client based on the cloud gaming livestreaming request comprises:

transmitting a livestreaming authentication request to the livestreaming server associated with the cloud gaming client based on the game start identifier such that the livestreaming server configures a livestream pushing address for livestreaming the target cloud gaming for the cloud gaming client based on the livestreaming authentication request; and

receiving the livestream pushing address returned by the livestreaming server, and triggering, in response to returning the livestream pushing address to the cloud gaming client, the establishment of the livestreaming service connection between the cloud server and the livestreaming server.

5. The method according to claim 1, wherein the target cloud gaming is run by a game process in a cloud virtual container; the cloud virtual container is configured by the cloud server for a client environment system where the cloud gaming client is located; and

the acquiring game image data and game audio data of the target cloud gaming based on the livestreaming service connection, and recording an image collection timestamp corresponding to the game image data and an audio collection timestamp corresponding to the game audio data comprises:

starting, based on the livestreaming service connection, a media coding process associated with the game process in the cloud virtual container;

capturing background audio frame data and game video frame data associated with the target cloud gaming through a data collection component indicated by the media coding process, and storing the captured background audio frame data and the game video frame data in a cloud cache space associated with the data collection component, the cloud cache space being a cloud memory independent of the cloud virtual container;

collecting an image frame matched with a first frame rate indicated by a first collection time interval from the game video frame data stored in the cloud memory through a timer indicated by the media coding process, taking the collected image frame as the game image data of the target cloud gaming, and recording the image collection timestamp corresponding to the game image data in a reference frame indicated by the timer; and

collecting an audio frame matched with a second frame rate indicated by a second collection time interval from the background audio frame data stored in the cloud memory through the timer, taking the collected audio frame as the game audio data of the target cloud gaming, and recording the audio collection timestamp corresponding to the game audio data in the same reference frame

indicated by the timer, the second collection time interval being smaller than the first collection time interval, and the second frame rate being greater than the first frame rate.

6. The method according to claim 5, further comprising:

running a first coding thread associated with the media coding process in the cloud virtual container;

acquiring a cloud gaming coding standard indicated by the first coding thread, and performing audio coding on the captured background audio frame data based on the cloud gaming coding standard to obtain a first audio coded stream of the target cloud gaming;

performing video coding on the captured game video frame data based on the cloud gaming coding standard to obtain a first video coded stream of the target cloud gaming; and

taking the first audio coded stream and the first video coded stream as a game coded stream of the target cloud gaming, and returning the game coded stream to the cloud gaming client such that the cloud gaming client decodes the game coded stream to obtain the background audio frame data and the game video frame data to be synchronously played in the cloud gaming client.

7. The method according to claim 5, wherein the cloud server is configured to run the game process, the media coding process and a media transmission process; the media transmission process being run in an auxiliary virtual container independent of the cloud virtual container; and

the method further comprises:

running a second coding thread associated with the media coding process in the cloud virtual container;

acquiring a cloud livestreaming coding standard indicated by the second coding thread, and performing audio coding on the game audio data associated with the second frame rate based on the cloud livestreaming coding standard to obtain a second audio coded stream of the target cloud gaming;

performing video coding on the game image data associated with the first frame rate based on the cloud livestreaming coding standard to obtain a second video coded stream of the target cloud gaming; and

taking the second audio coded stream and the second video coded stream as a to-be-processed coded stream of the target cloud gaming, and forwarding the to-be-processed coded stream to the media transmission process such that the media transmission process executes the operation of

mixing, in response to acquiring to-be-processed audio data of a livestreamer object transmitted by the cloud gaming client, the game audio data and the to-be-processed audio data to obtain mixed audio data in the auxiliary cloud virtual container based on the to-be-processed coded stream.

8. The method according to claim 1, wherein the mixing, in response to acquiring to-be-processed audio data of a livestreamer object transmitted by the cloud gaming client, the game audio data and the to-be-processed audio data to obtain mixed audio data comprises:

decoding, in response to acquiring the to-be-processed audio data of the livestreamer object transmitted by the cloud gaming client, the to-be-processed audio data to obtain a to-be-processed audio frame of the livestreamer object and a recording timestamp of the to-be-processed audio frame;

acquiring an audio frame in the game audio data based on the second collection time interval corresponding to the game audio data, taking the acquired audio frame as a reference audio frame, and determining a mixing timestamp of the reference audio frame according to a collected audio timestamp corresponding to the game audio data; and

adjusting the recording timestamp based on the mixing timestamp, mixing the reference audio frame and the to-be-processed audio frame based on the adjusted recording timestamp to obtain a mixed audio frame corresponding to the mixing timestamp consistent with the collection timestamp, and taking the obtained mixed audio frame and the mixing timestamp corresponding to the mixed audio frame as the mixed audio data of the target cloud gaming.

9. The method according to claim 8, further comprising:

counting the number of the acquired audio frames, and characterizing, in a case that the number of the audio frames is M and M is a non-zero positive integer, the number of times of mixing to be performed with M; and

enhancing, in executing the operation of adjusting the recording timestamp based on the mixing timestamp, mixing the reference audio frame and the to-be-processed audio frame based on the adjusted recording timestamp, the volume of the to-be-processed audio frame based on the number of times of mixing to be performed, and reducing the volume of the reference audio frame.

10. The method according to claim 9, further comprising

skipping, in a case that the number of the audio frames is null or the number of the to-be-processed audio frames is null, mixing the reference audio frame and the to-be-processed audio frame.

11. The method according to claim 1, wherein the obtaining a livestreaming data stream corresponding to the target cloud gaming based on the mixed audio data, the audio collection timestamp, the game image data and the image collection timestamp, and delivering the livestreaming data stream to a livestreaming client associated with the cloud gaming client through the livestreaming server further comprises:

acquiring a smooth acquisition thread associated with the media forwarding process, acquiring a video data packet matched with a first frame rate indicated by a first collection time interval from the video cache queue through the smooth acquisition thread, and acquiring an audio data packet matched with a second frame rate indicated by a second collection time interval from the audio cache queue through the smooth acquisition thread; and

packetizing the video data packet and the audio data packet to obtain the livestreaming data stream corresponding to the target cloud gaming, and delivering the livestreaming data stream to the livestreaming client associated with the cloud gaming client through the livestreaming server.

12. The method according to claim 11, wherein the acquiring a smooth acquisition thread associated with the media forwarding process, acquiring a video data packet matched with a first frame rate indicated by a first collection time interval from the video cache queue through the smooth acquisition thread, and acquiring an audio data packet matched with a second frame rate indicated by a second collection time interval from the audio cache queue through the smooth acquisition thread comprises:

acquiring the smooth acquisition thread associated with the media forwarding process, acquiring a data collection component having a same collection time interval as the smooth acquisition thread, and determining the first collection time interval associated with the game image data and the second collection time interval associated with the game audio data based on the collection time interval of the data collection component;

determining a smooth video acquisition timestamp matched with the first collection time interval through the smooth acquisition thread, acquiring a cached video frame with an image collection timestamp smaller than the smooth video acquisition timestamp from the video cache queue, and encapsulating the acquired cached video frame and the image collection timestamp corresponding to the cached video frame to obtain the video data packet matched the first frame rate indicated by the first collection time interval; and

determining a smooth audio acquisition timestamp matched with the second collection time interval through the smooth acquisition thread, acquiring a cached audio frame with an audio

collection timestamp smaller than the smooth audio acquisition timestamp from the audio cache queue, and encapsulating the acquired cached audio frame and the audio collection timestamp corresponding to the cached audio frame to obtain the audio data packet matched the second frame rate indicated by the second collection time interval.

13. The method according to claim 12, wherein after the delivering the livestreaming data stream to a livestreaming client associated with the cloud gaming client through the livestreaming server, the method further comprises:

determining a maximum audio collection timestamp of the livestreaming data stream; and

discarding, in a case that an audio collection timestamp of a to-be-transmitted audio data packet recorded through the smooth acquisition thread is smaller than the maximum audio collection timestamp, the to-be-transmitted audio data packet, the to-be-transmitted audio data packet referring to a next audio data packet to be transmitted to the livestreaming server.

14. The method according to claim 12, wherein after the delivering the livestreaming data stream to a livestreaming client associated with the cloud gaming client through the livestreaming server, the method further comprises:

determining a maximum image collection timestamp of the livestreaming data stream; and

discarding, in a case that a video collection timestamp of a to-be-transmitted video data packet recorded through the smooth acquisition thread is smaller than the maximum video collection timestamp, the to-be-transmitted video data packet, the to-be-transmitted video data packet referring to a next video data packet to be transmitted to the livestreaming server.

15. A game data processing apparatus, comprising:

a livestreaming request receiving module, configured to receive a cloud gaming livestreaming request for a target cloud gaming transmitted by a cloud gaming client, and establish a livestreaming service connection between a cloud server and a livestreaming server associated with the cloud gaming client based on the cloud gaming livestreaming request; wherein the cloud server comprises a media forwarding process started based on the cloud gaming livestreaming request; the media forwarding process is used for keeping the livestreaming service connection between the cloud server and the livestreaming server;

a data acquisition module, configured to acquire game image data and game audio data of the target cloud gaming based on the livestreaming service connection, and record an image collection timestamp corresponding to the game image data and an audio collection timestamp corresponding

to the game audio data, the image collection timestamp and the audio collection timestamp being timestamps in a same reference frame;

a mixing module, configured to mix, in response to acquiring to-be-processed audio data of a livestreamer object transmitted by the cloud gaming client, the game audio data and the to-be-processed audio data to obtain mixed audio data, a mixing timestamp corresponding to the mixed audio data being consistent with the audio collection timestamp; and

a livestream delivery module, configured to obtain a livestreaming data stream corresponding to the target cloud gaming based on the mixed audio data, the audio collection timestamp, the game image data and the image collection timestamp, and deliver the livestreaming data stream to a livestreaming client associated with the cloud gaming client through the livestreaming server;

wherein the livestream delivery module is further configured to:

acquire the mixed audio data, acquire mixed audio frames and the audio collection timestamps corresponding to the mixed audio frames from the mixed audio data, sort the mixed audio frames based on the audio collection timestamps, and write the sorted mixed audio frames into an audio cache queue associated with the media forwarding process; and

acquire the game image data, acquire image frames and the image collection timestamps corresponding to the image frames from the game image data, sort the image frames based on the image collection timestamps, and write the sorted image frames into a video cache queue associated with the media forwarding process.

16. A computer device, comprising a memory and one or more processors, the memory storing computer-readable instructions, and the computer-readable instructions, when executed by the processor, causing the one or more processors to execute the operations in the method according to any one of claims 1 to 14.

17. One or more non-volatile readable storage media storing computer-readable instructions, the computer-readable instructions, when executed by one or more processors, causing the one or more processors to implement the operations in the method according to any one of claims 1 to 14.

18. A computer program product, comprising computer-readable instructions, the computer-readable instructions, when executed by a processor, implementing the operations in the method according to any one of claims 1 to 14.