[0077] The multicast resource allocation indication is used to instruct the OTT live proxy server to allocate the multicast resource to the specified channel. The media description of the specified channel includes at least one resolution of the specified channel and a uniform resource locator (Uniform Resource Locator, URL) corresponding to media data of the at least one resolution. The multicast resource includes a multicast group corresponding to the specified channel, or a multicast group corresponding to the specified channel and a port corresponding to the at least one resolution.

[0078] Certainly, it should be understood that, before step S201, the OTT live proxy server further needs to receive the multicast resource allocation indication. The multicast resource allocation indication is sent by an OTT server of the OTT live proxy server, or the multicast resource allocation indication is sent by a multicast replication point in a metropolitan area network in which the OTT live proxy server is located.

[0079] S202: Obtain, from an OTT server to which the specified channel belongs and in a unicast manner according to the media description of the specified channel, media data corresponding to at least one resolution.

[0080] Specifically, the OTT live proxy server may obtain, in a unicast manner according to the URL in the media description, the media data corresponding to the URL.

[0081] S203: Convert the media data corresponding to the at least one resolution into multicast media data, and send the multicast media data to a multicast group in a multicast manner.

[0082] In this embodiment of the present invention, an OTT live proxy server allocates a multicast resource of a channel according to a channel allocation indication of an OTT server, obtains media data of the channel from the OTT server, and sends, in a multicast manner, the media data of the channel to a multicast group corresponding to the channel, so that a multicast replication point in the multicast group can transmit the media data of the channel to an OTT client joining the channel. In this way, a large quantity of repeated live streams can be avoided from passing through a backbone network, thereby greatly reducing a quantity of repeated packets transmitted from the OTT server to a metropolitan area network, and reducing bandwidth of a bearer network occupied by live media data.

[0083] In addition, compared with that the OTT client obtains an audio program or a video program of the channel from the OTT server, in the method in this embodiment of the present invention, the OTT client obtains an audio program or a video program of the channel from a nearest network device (multicast replication point). This can shorten a video start delay and reduce a packet loss rate/jerkiness, thereby providing better user experience.

[0084] Optionally, in an embodiment, before step S201, the method further includes: obtaining

to the multicast replication point.

[0312] After receiving the channel joining indication, the OTT live proxy server may send the channel joining indication to the multicast replication point to which the OTT client 1 belongs, so that the multicast replication point to which the OTT client 1 belongs authenticates a broadcast request of the OTT client 1.

[0313] The following operations may be similar to those in the embodiment shown in FIG. 5 or FIG. 7, and details are not described in this embodiment of the present invention again.

[0314] FIG. 12 is a schematic structural diagram of an OTT live proxy server 1200 according to an embodiment of the present invention. As shown in FIG. 12, the OTT live proxy server 1200 may include: an obtaining unit 1201, a multicast resource allocation unit 1202, and a multicast unit 1203.

[0315] The multicast resource allocation unit 1202 is configured to allocate a multicast resource to a specified channel according to a multicast resource allocation indication of the specified channel and a media description of the specified channel.

[0316] The multicast resource allocation indication is used to instruct the OTT live proxy server to allocate the multicast resource to the specified channel. The media description of the specified channel includes at least one resolution of the specified channel and a uniform resource locator (Uniform Resource Locator, URL) corresponding to media data of the at least one resolution. The multicast resource includes a multicast group corresponding to the specified channel, or a multicast group corresponding to the specified channel and a port corresponding to the at least one resolution.

[0317] The obtaining unit 1201 is configured to obtain, from an OTT server to which the specified channel belongs and in a unicast manner according to the media description of the specified channel, the media data corresponding to the at least one resolution.

[0318] The multicast unit 1203 is configured to: convert the media data corresponding to the at least one resolution into multicast media data, and send, in a multicast manner, the multicast media data to a multicast replication point that already joins the multicast group.

[0319] In this embodiment of the present invention, the OTT live proxy server 1200 allocates a multicast resource of a channel according to a channel allocation indication of an OTT server, obtains media data of the channel from the OTT server, and sends, in a multicast manner, the media data of the channel to a multicast group corresponding to the channel, so that a multicast replication point in the multicast group can transmit the media data of the channel to an OTT client joining the channel. In this way, a large quantity of repeated live streams can be avoided from passing through a backbone network, thereby greatly reducing a quantity of repeated packets transmitted from the OTT server to a metropolitan area network, and reducing bandwidth of a bearer network occupied

CLAIMS

What is claimed is:

1. An over the top OTT live proxy server, comprising:

a multicast resource allocation unit, configured to allocate a multicast resource to a specified channel according to a multicast resource allocation indication of the specified channel and a media description of the specified channel, wherein the multicast resource allocation indication is used to instruct the OTT live proxy server to allocate the multicast resource to the specified channel, the media description of the specified channel comprises at least one resolution of the specified channel and a uniform resource locator URL corresponding to media data of the at least one resolution, and the multicast resource comprises a multicast group corresponding to the specified channel, or a multicast group corresponding to the specified channel and a port corresponding to the at least one resolution;

an obtaining unit, configured to obtain, from an OTT server to which the specified channel belongs and in a unicast manner according to the media description of the specified channel, the media data corresponding to the at least one resolution; and

a multicast unit, configured to: convert the media data corresponding to the at least one resolution into multicast media data, and send the multicast media data to the multicast group in a multicast manner.

2. The OTT live proxy server according to claim 1, wherein

the obtaining unit is further configured to obtain the media description of the specified channel from the OTT server; or

the media description of the specified channel is pre-stored on the OTT live proxy server.

3. The OTT live proxy server according to claim 1 or 2, wherein

the multicast resource allocation indication is sent by the OTT server; or

the multicast resource allocation indication is sent by a multicast replication point in a metropolitan area network in which the OTT live proxy server is located.

4. The OTT live proxy server according to any one of claims 1 to 3, further comprising:

a forwarding unit, configured to: receive a channel joining indication sent by the OTT server, and send the channel joining indication to the multicast replication point in the metropolitan area network in which the OTT live proxy server is located, so that the multicast replication point adds an OTT client to an authorized subscriber list of the specified channel, wherein the channel joining indication is used to indicate that the OTT client is allowed to join the specified channel.

5. The OTT live proxy server according to claim 4, further comprising:

a registration unit, configured to register, with the OTT server, an Internet Protocol IP network segment of the metropolitan area network in which the OTT live proxy server is located and an IP address of the OTT live proxy server.

6. The OTT live proxy server according to claim 4 or 5, wherein the multicast resource allocation unit is further configured to feed back the allocated multicast resource to the OTT server, so that the OTT server sends the multicast resource to the OTT client, and the OTT client can join the multicast group.

7. The OTT live proxy server according to any one of claims 4 to 6, wherein the multicast resource allocation unit is further configured to send a correspondence between the specified channel and the multicast group of the specified channel to the multicast replication point in the metropolitan area network in which the OTT live proxy server is located, so that the multicast replication point determines, according to a request sent by the OTT client for joining the specified channel, the multicast group corresponding to the specified channel.

8. The OTT live proxy server according to claim 7, wherein the multicast resource allocation unit is further configured to send the multicast resource to the OTT client according to the request sent by the OTT client for joining the specified channel, so that the OTT client requests the media data of the specified channel from the multicast replication point.

9. The OTT live proxy server according to any one of claims 1 to 8, further comprising: a multicast group management unit, configured to:

add the multicast replication point to the multicast group according to a multicast joining request of the multicast replication point, and add an egress port corresponding to the multicast replication point to a multicast forwarding entry of the multicast group; or

delete the multicast replication point from the multicast group according to a multicast leave request of the multicast replication point, and delete an egress port corresponding to the multicast replication point from a multicast forwarding entry of the multicast group.

10. The OTT live proxy server according to claim 9, wherein the multicast resource allocation unit is further configured to: when a quantity of egress ports in the multicast forwarding entry of the multicast group is zero, delete the multicast forwarding entry of the multicast group, and disconnect a link for downloading the media data of the specified channel from the OTT server.

11. An over the top OTT server, comprising:

a multicast resource allocation indication unit, configured to send a multicast resource allocation indication to an OTT live proxy server registered with the OTT server, wherein the multicast resource allocation indication is used to instruct the OTT live proxy server to allocate a multicast resource to a specified channel;

a media description management unit, configured to send a media description of the specified channel to the OTT live proxy server according to a request sent by the OTT live proxy server for obtaining the media description of the specified channel, wherein the media description of the specified channel comprises at least one resolution of the specified channel and a uniform resource locator URL corresponding to media data of the at least one resolution; and

a media resource management unit, configured to send the media data of the at least one resolution of the specified channel to the OTT live proxy server in a unicast manner according to a request of the OTT live proxy server for obtaining the media data of the specified channel.

12. The OTT server according to claim 11, further comprising:

a registration unit, configured to record an Internet Protocol IP network segment of a metropolitan area network in which the OTT live proxy server is located and an IP address of the OTT live proxy server according to a registration request sent by the OTT live proxy server, wherein the registration request carries the IP network segment of the metropolitan area network in which the OTT live proxy server is located and the IP address of the OTT live proxy server.

13. The OTT server according to claim 11 or 12, further comprising: an authentication unit, configured to determine, according to a request for joining the specified channel by an OTT client in the metropolitan area network in which the OTT is located, whether to allow the OTT client to join the specified channel, wherein

the multicast resource allocation indication unit is specifically configured to: after the authentication unit determines to allow the OTT client to join the specified channel, and when the multicast resource of the specified channel sent by the OTT live proxy server does not exist in the OTT server, send the multicast resource allocation indication to the OTT live proxy server.

14. The OTT server according to claim 13, wherein the authentication unit is further configured to: after allowing the OTT client to join the specified channel, send a channel joining indication to the OTT live proxy server, wherein the channel joining indication is used to notify the OTT live proxy server that the OTT client is allowed to join the specified channel.

15. The OTT server according to claim 13, wherein the authentication unit is further configured to send, to the OTT client, the multicast resource that is fed back by the OTT live proxy server and that is allocated to the specified channel, so that the OTT client requests the media data of the specified channel from a multicast replication point, wherein the multicast resource comprises a multicast group corresponding to the specified channel, or a multicast group corresponding to the specified channel and a port corresponding to the at least one resolution of the specified channel.

16. The OTT server according to claim 13, further comprising:

a redirection instruction unit, configured to instruct, according to the request of the OTT client for joining the specified channel and the multicast resource of the specified channel, the OTT client to redirect the request for joining the specified channel to the OTT live proxy server.

17. A media data live broadcast method, comprising:

allocating a multicast resource to a specified channel according to a multicast resource allocation indication of the specified channel and a media description of the specified channel, wherein the multicast resource allocation indication is used to instruct an OTT live proxy server to allocate the multicast resource to the specified channel, the media description of the specified channel comprises at least one resolution of the specified channel and a uniform resource locator URL corresponding to media data of the at least one resolution, and the multicast resource comprises a multicast group corresponding to the specified channel, or a multicast group corresponding to the specified channel and a port corresponding to the at least one resolution;

obtaining, from an OTT server to which the specified channel belongs and in a unicast manner according to the media description of the specified channel, the media data corresponding to the at least one resolution; and

converting the media data corresponding to the at least one resolution into multicast media data, and sending the multicast media data to the multicast group in a multicast manner.

18. The method according to claim 17, wherein

before the allocating a multicast resource to a specified channel according to a multicast resource allocation indication of the specified channel and a media description of the specified channel, the method further comprises: obtaining the media description of the specified channel from the OTT server; or

the media description of the specified channel is pre-stored on the OTT live proxy server.

19. The method according to claim 17 or 18, wherein

before the allocating a multicast resource to a specified channel according to a multicast resource allocation indication of the specified channel and a media description of the specified channel, the method further comprises: receiving the multicast resource allocation indication of the specified channel, wherein

the multicast resource allocation indication is sent by the OTT server; or

the multicast resource allocation indication is sent by a multicast replication point in a metropolitan area network in which the OTT live proxy server is located.

20. The method according to any one of claims 17 to 19, further comprising:

receiving a channel joining indication sent by the OTT server, and sending the channel joining indication to the multicast replication point in the metropolitan area network in which the OTT live

proxy server is located, so that the multicast replication point adds an OTT client to an authorized subscriber list of the specified channel, wherein the channel joining indication is used to indicate that the OTT client is allowed to join the specified channel.

21. The method according to claim 20, further comprising:

registering, with the OTT server, an Internet Protocol IP network segment of the metropolitan area network in which the OTT live proxy server is located and an IP address of the OTT live proxy server.

22. The method according to claim 20 or 21, further comprising:

feeding back the allocated multicast resource to the OTT server, so that the OTT server sends the multicast resource to the OTT client, and the OTT client can join the multicast group.

23. The method according to claim 21 or 22, further comprising:

sending a correspondence between the specified channel and the multicast group of the specified channel to the multicast replication point in the metropolitan area network in which the OTT live proxy server is located, so that the multicast replication point determines, according to a request sent by the OTT client for joining the specified channel, the multicast group corresponding to the specified channel.

24. The method according to claim 23, further comprising:

sending the multicast resource to the OTT client according to the request sent by the OTT client for joining the specified channel, so that the OTT client requests the media data of the specified channel from the multicast replication point.

25. The method according to any one of claims 17 to 24, further comprising:

adding the multicast replication point to the multicast group according to a multicast joining request of the multicast replication point, and adding an egress port corresponding to the multicast replication point to a multicast forwarding entry of the multicast group; or

deleting the multicast replication point from the multicast group according to a multicast leave request of the multicast replication point, and deleting an egress port corresponding to the multicast replication point from a multicast forwarding entry of the multicast group.

26. The method according to claim 25, further comprising:

when a quantity of egress ports in the multicast forwarding entry of the multicast group is zero, deleting the multicast forwarding entry of the multicast group, and disconnecting a link for downloading the media data of the specified channel from the OTT server.

27. A media data live broadcast method, comprising:

sending, by an over the top OTT server, a multicast resource allocation indication to an OTT live proxy server registered with the OTT server, wherein the multicast resource allocation

indication is used to instruct the OTT live proxy server to allocate a multicast resource to a specified channel;

sending, by the OTT server, a media description of the specified channel to the OTT live proxy server according to a request sent by the OTT live proxy server for obtaining the media description of the specified channel, wherein the media description of the specified channel comprises at least one resolution of the specified channel and a uniform resource locator URL corresponding to media data of the at least one resolution; and

sending, by the OTT server, the media data of the at least one resolution of the specified channel to the OTT live proxy server in a unicast manner according to a request of the OTT live proxy server for obtaining the media data of the specified channel.

28. The method according to claim 27, further comprising:

recording, by the OTT server, an Internet Protocol IP network segment of a metropolitan area network in which the OTT live proxy server is located and an IP address of the OTT live proxy server according to a registration request sent by the OTT live proxy server, wherein the registration request carries the IP network segment of the metropolitan area network in which the OTT live proxy server is located and the IP address of the OTT live proxy server.

29. The method according to claim 27 or 28, further comprising:

determining, by the OTT server according to a request for joining the specified channel by an OTT client in the metropolitan area network in which the OTT is located, whether to allow the OTT client to join the specified channel; and

the sending, by an OTT server, a multicast resource allocation indication to an OTT live proxy server registered with the OTT server comprises: after the OTT server determines to allow the OTT client to join the specified channel, and when the multicast resource of the specified channel sent by the OTT live proxy server does not exist in the OTT server, sending, by the OTT server, the multicast resource allocation indication to the OTT live proxy server.

309. The method according to claim 29, further comprising:

sending, by the OTT server, a channel joining indication to the OTT live proxy server after allowing the OTT client to join the specified channel, wherein the channel joining indication is used to notify the OTT live proxy server that the OTT client is allowed to join the specified channel.

31. The method according to claim29, further comprising:

sending, by the OTT server to the OTT client, the multicast resource that is fed back by the OTT live proxy server and that is allocated to the specified channel, so that the OTT client requests the media data of the specified channel from a multicast replication point, wherein the multicast resource comprises a multicast group corresponding to the specified channel, or a multicast group

corresponding to the specified channel and a port corresponding to the at least one resolution of the specified channel.

32. The method according to claim 29, further comprising:

instructing, by the OTT server, the OTT client to redirect the request for joining the specified channel to the OTT live proxy server according to the request of the OTT client for joining the specified channel and the multicast resource of the specified channel.