Conditional Distribution Technology for IP Multicast

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Abstract

Conditional distribution based on the receiver's location and/or on his/her contract with the content provider is required if IP (Internet protocol) multicast is to be applied to IP broadcasting. This article describes some issues for conditional distribution of IP multicast and proposes Multicast AAA to achieve conditional distribution. It also shows that Multicast AAA is applicable to admission control for multicast.

1. Introduction

IP (Internet protocol) broadcasting (IPTV) includes two models for limiting access to contents: area-limited broadcasting based on the current television area license and subscription-based broadcasting based on content distribution service contracts. As shown in **Fig. 1**, with area-limited broadcasting, it is necessary to provide a mechanism that prevents users outside the broadcaster's licensed area from accessing the content. With subscription-based broadcasting, it is necessary to prevent non-subscribers from accessing content. For example, this mechanism might use content encryption techniques such as CAS (conditional access system) cards placed in television sets. With IP broadcasting over the Next Generation Network (NGN), it is important to control content distribution at the packet level. High-priority transfer is being considered for stable transfer of high-quality video. In a multi-service network with multiple quality-of-

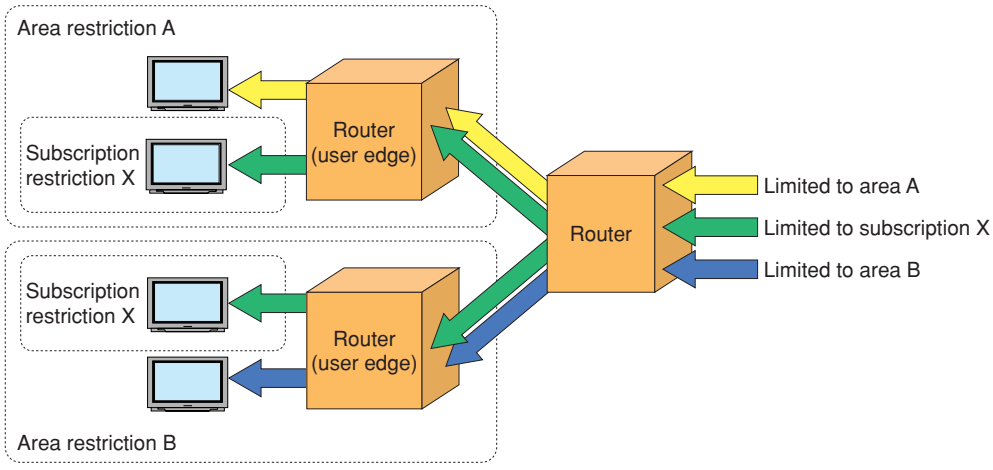

Fig. 1. Distribution conditions.

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service (QoS) classes like the NGN, high-priority packets might interfere with the packet transfer and cause quality deterioration for other services and users.

2. Existing multicast transmission control methods

In multicast, it is necessary to provide functionality for limiting content transmission at the user edge where transmission to receivers is controlled directly. When transmission limitations are required, the solution has been to use router filtering. There are two common filtering configurations. One is to set IGMP/MLD Join message policy conditions at the receiver side input interface at the user edge, and reject Join messages that do not meet the transmission policy. The other method is to set packet filtering conditions at the receiver side output interface at the user edge, and to discard packets that do not meet the transmission policy.

Both methods have several drawbacks. It is necessary to set the filtering rules for each user in all user edge routers. If the number of users is large, it is difficult to manage the filter policy settings. Filter condition descriptors require a large amount of memory, which increases costs at user edges. Furthermore, having many settings in the router causes problems related to the ease of maintenance operations: for example, the time required to register new users and configure user conditions and the time required to retrieve configuration information.

3. Transmission control using Multicast AAA

With Multicast AAA (Authentication, Authorization and Accounting), an AAA server connected to the user edge is responsible for deciding multicast transmission conditions [1]. AAA is a technique used for user authentication. As shown in **Fig. 2**, if the user edge receives a Join message, details are forwarded to the AAA server, which then judges whether transmission is to be permitted or not, and the user-edge bases multicast transmission control on this response. By aggregating the distribution policy on the AAA server it is possible to apply distribution limitations based on geographic area or subscriptions. It is necessary to identify users and their access locations in order to apply Multicast AAA to transmission limitations based on subscriptions and area policies. Assuming that the user's access to the network is limited to a specific user edge interface, user identification is possible using the VLAN-ID (virtual local area network identification) or other user access interface number. Location determination is possible by either defining the area for each user or reporting the user edge router ID to the AAA server where the deployment of routers is separated by area.

4. Application of Multicast AAA

Multicast AAA is not only applied for transmission rules, but can also be linked with application servers, which perform network control or billing control,

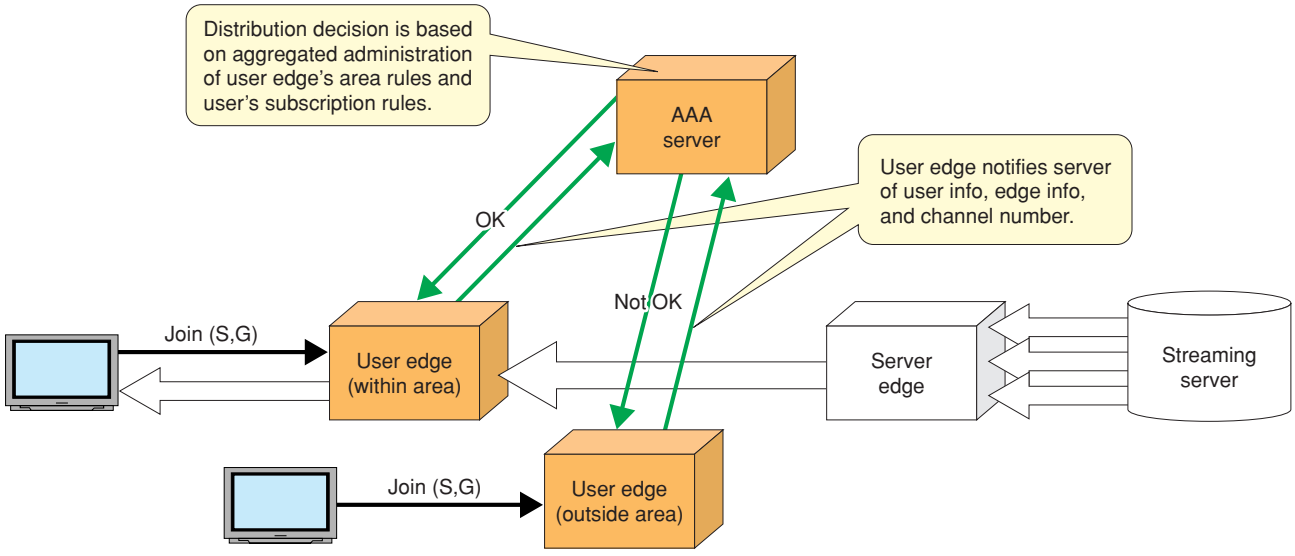

Fig. 2. Multicast AAA.

using the function where the user edge notifies an external AAA server of user identification and channel ID information [1]. Admission control is one of those applications. Admission control for IP multicast streaming is similar to call admission control for telephones in that it is responsible for deciding whether or not a transmission request will be accepted. However, in the case of admission control for an IP network, as shown in **Fig. 3**, it is possible to base the acceptance of the transmission request on whether there is sufficient bandwidth for the multicast channel by comparing the available unused bandwidth for the link with the bandwidth required for the multicast channel. As shown in **Fig. 4**, in the model where Multicast AAA is linked with admission control, the user ID and channel ID are notified to the admission control server. The bandwidth required for each channel and the link information and link bandwidth for each user are preconfigured on the admission control server. Therefore, if it is given the channel number by Multicast AAA, the admission control server can confirm the channel bandwidth. Moreover, the admission control server manages the link bandwidth and is aware of the total

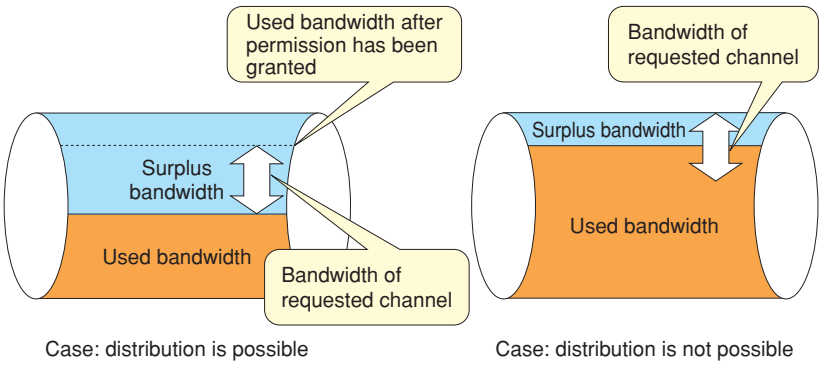

Fig. 3. IP admission control.

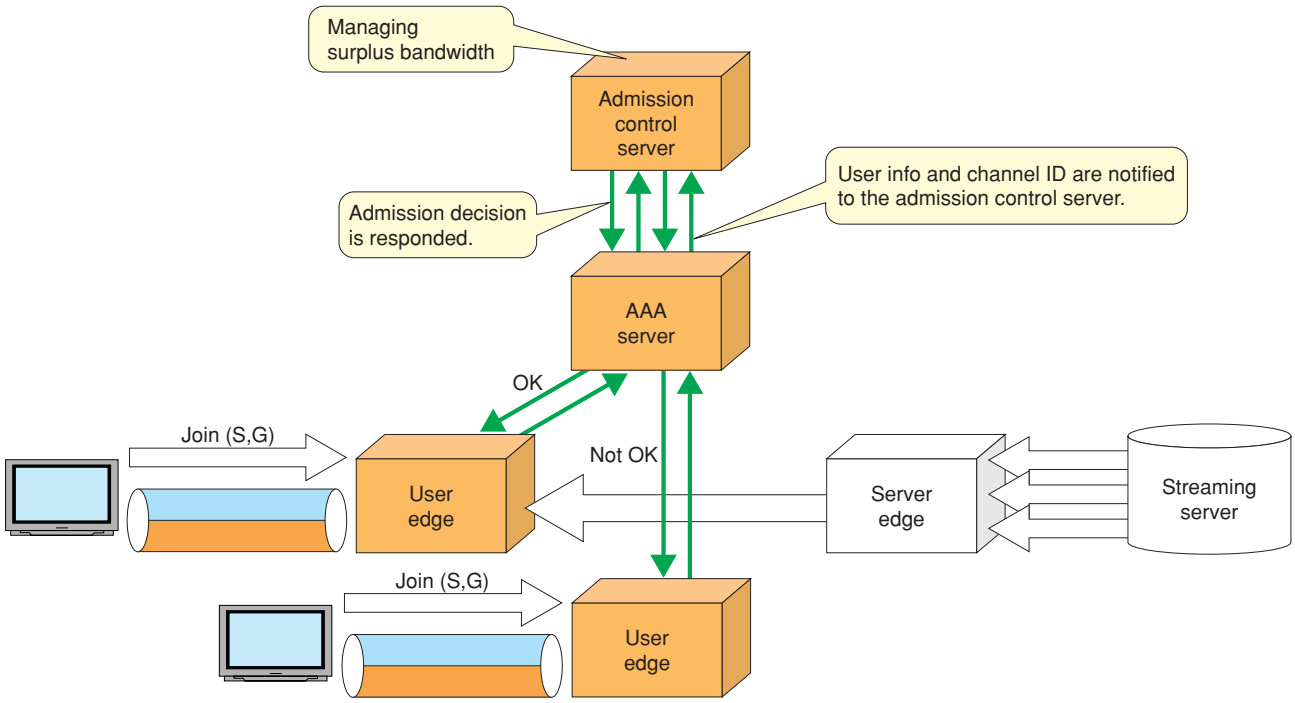

Fig. 4. Connection between Multicast AAA and admission control.

dedicated bandwidth because it adds the bandwidth that has been granted for transmission to the already used bandwidth. If transmission has ended for a certain channel, then that channel bandwidth is subtracted from the used channel bandwidth.

5. Standardization efforts

Efforts to standardize Multicast AAA are underway in the mboned working group of IETF (Internet Engineering Task Force). Currently, a requirements draft [2] and a framework draft [1] are being discussed. In the future, works on solutions and protocols based on the framework will be conducted.

6. Conclusion

This article described Multicast AAA for application to conditional distribution for IP broadcasting. Multicast AAA also helps to achieve high-quality IP networks when applied to the linkage method between routers and the admission controller.

References

[1] H. Satou, H. Ohta, T. Hayashi, and H. He, "AAA Framework for Multicasting," draft-ietf-mboned-multiaaa-framework-xx.
[2] T. Hayashi, H. He, H. Satou, H. Ohta, and S. Vaidya, "Requirements for Accounting, Authentication and Authorization in Well Managed IP Multicasting Services," draft-ietf-mboned-maccnt-req-xx.

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