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Multicast Geo-Distribution Control
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Abstract

Consider a content provider that wants to deliver a particular content to a set of customers/subscribers, where the provider and the subscribers are connected by an IP service provider. This document covers two areas needed to accomplish this:

1. Providing the content provider with the information of whether it can use the multicast connectivity service provided by the IP service provider to deliver a particular content to a particular set of subscribers, and
2. Providing the content provider with a mechanism to restrict delivery of a given content to a particular set of the subscribers.

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Multicast Geo Distribution Control

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1. Specification of Requirements

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

1.1. Introduction

Consider a content provider that wants to deliver a particular content to a set of customers/subscribers, where the provider and the subscribers are connected by an IP service provider. This document covers two areas needed to accomplish this:

1. Providing the content provider with the information of whether it can use the multicast connectivity service provided by the IP service provider to deliver a particular content to a particular set of subscribers, and
2. Providing the content provider with a mechanism to restrict delivery of a given content to a particular set of the subscribers.

For the purpose of this document we assume that a content provider consists of one or more Content Servers, and one or more Content Distribution Controllers. While this document assumes communication between Content Servers and Content Distribution Controllers, the procedures for implementing such communication is outside the scope of this document.

Content Servers are connected to one or more IP service providers (ISP) that can offer both multicast and unicast connectivity service to the subscribers of the content provider. The content provider uses this ISP(s) to deliver content to its subscribers.

Subscribers are connected to the Edge Routers (ERs) of the ISP. Note that the multicast connectivity service provided by the ISP extends

all the way to the ERs. Such service could be provided by either deploying IP multicast natively, or with some tunneling mechanism like AMT, or by a combination of both within the ISP. However, between the ERs and the subscribers there may, or may not be multicast connectivity.

In the case where a particular subscriber of a given content provider does not have multicast connectivity to its ER, the content provider would use IP unicast service provided by the ISP to transmit the particular content to that subscriber.

A subscriber may want to access a particular content that is not

available to that subscriber due to policy reasons. When that subscriber would have received that content via unicast connectivity, the Content Distribution Controller, or the Content Servers, or both may enforce the policy to not deliver the content. However, when the content would be delivered via multicast connectivity it may be possible for the subscriber to receive the content by illicitly participating in the multicast signaling for that content.

To prevent a subversion of the intent of this content delivery policy, a mechanism is provided to make this policy available to devices participating in multicast signaling.

[1.2.](#) Multicast Content Distribution Zones

For each item of content provided by a content provider, the content provider maintains a list of subscribers who are either excluded or allowed to receive the content. For the purpose of maintaining this list this document assumes that subscribers are grouped into "zones" based on IP addresses, so that exclusion/inclusion uniformly applies to all the subscribers within a given zone. Procedures by which subscribers are grouped into zones are outside the scope of this document. However, this document assumes that this grouping is done consistently by both the content provider and the ISP(s) that the content provider uses for delivering its content.

One example of an implementation of such a zone is based on the geographic location of the subscribers. Such zones may be used to implement broadcast "blackout" of some content such as a sporting event that may not be allowed to air in certain regions due to

regulatory reasons.

1.3. A Brief Overview of Multicast Distribution Reachability Signaling

Content providers and Content Distribution Controllers need to know the transport mechanism that a subscriber can use to receive some content. Since not all subscribers may be capable of receiving content via IP multicast, Multicast Distribution Reachability Signaling [[MDRS](#)] is used to permit the subscriber's ISP to provide this information.

MDRS permits advertises a BGP prefix with a new SAFI, MCAST-REACH, to indicate subscribers in the accompanying AFI of the MCAST-REACH SAFI can receive multicast traffic.

Please see the MDRS document for more details.

1.4. A Brief Overview of Multicast Distribution Control Signaling

A content provider or a service provider may need to enforce policies to exclude access to an item of content that is delivered by IP multicast. Multicast Distribution Control Signaling [[MDCS](#)] permits this such enforcement to be distributed as BGP flowspec filters with a new SAFI, MCAST-FLOWSPEC. This filters are used by the multicast control plane to determine whether access to multicast content may be made available to downstream routers, including ERs.

These flowspec filters are distributed in BGP with Route Targets [[RFC4360](#)] that identify the include or exclude policy for a zone. Multicast routers receiving these filters maintain an ordered list of these Route Target policies to install the filters. The multicast control plane then makes use of the filter database to implement the desired policy.

1.4.1. An example of configuration on ERs

Consider an ER in Manhattan that has a port that is provisioned with the following import RTs:

```
<include-manhattan, exclude-manhattan, include-nyc, exclude-
nyc, include-east, exclude-east, include-usa, exclude-usa>
```

When the ER receives a Flow Spec route with <exclude-nyc, include-manhattan, include-usa> RTs, the ER first try to match "include-manhattan" or "exclude-manhattan" (the first ones on the list) - and the result is "include-manhattan". Therefore, the (S, G) carried in the Flow Spec route is allowed on that port of the ER.

Consider another ER in Boston that has a port that is provisioned with the following import RTs:

```
<include-cambridge, exclude-cambridge, include-bos, exclude-
bos, include-east, exclude-east, include-usa, exclude-usa>
```

The above mentioned Flow Spec route will be imported (due to the include-usa RT), and will result in the (S, G) carried in the flow Spec route to be allowed on that port of the ER.

Now consider a different Flow Spec route with the <exclude-usa, include-bos, include-nyc, exclude-manhattan> RTs. The (S, G) carried in the route will be disallowed in Manhattan, allowed in Boston, and allowed in Queens (as the route will match the "include-nyc" RT).

[2.](#) Overview of Operations

An ISP, using the procedures described in Multicast Distribution Reachability Signaling [[MDRS](#)], provides a content provider, and specifically Content Distribution Controller(s) of that content provider, with the information of whether a particular subscriber of that content provider has multicast connectivity to an ER of that ISP with the information of whether a particular group of subscribers can receive multicast content.

To enforce the exclusion/inclusion policies, the content provider uses procedures described in Multicast Distribution Control Signaling [[MDCS](#)].

For each content provided by a content provider, the content provider

selects a particular multicast channel (S, G) for distributing this content using multicast connectivity service. Procedures by which the content provider selects a particular multicast channel, and maintains the mapping are outside the scope of this document.

Subscribers are connected to the Edge Routers (ERs) of the ISP. Note that when multicast connectivity service provided is by the ISP, that service extends all the way to the ERs. Such service could be provided by either deploying IP multicast natively, or with some tunneling mechanism like AMT, or a combination of both within the ISP. However, between the ERs and the subscribers there may, or may not be multicast connectivity.

When a subscriber wants to receive the particular content from its content provider, the subscriber issues a request for this content to the Content Distribution Controller of the provider. When the Content Distribution Controller receives the request, the Content Distribution Controller uses the information carried in the request (e.g., IP address of the subscriber) to determine the zone of the subscriber, and based on that zone to determine whether the subscriber can receive this content.

If the Content Distribution Controller determines that the subscriber can receive the content, then based on the information provided by the multicast distribution reachability signaling the Content Distribution Controller determines whether the subscriber can receive this content using multicast connectivity service, and if yes, then returns to the subscriber the multicast channel selected for distributing the content.

If the Content Distribution Controller determines that the subscriber can receive the content, but can not receive the content using multicast connectivity service, the Content Distribution Controller

returns to the subscriber the information needed to receive this content using unicast connectivity service.

If the content would have been delivered to the subscriber via multicast connectivity, but the Content Distribution Controller had determined the subscriber was not permitted access to this content, then this policy may need to be enforced by the Edge Routers or upstream multicast routers to prevent illicit access of this content.

This policy is enforced by utilizing filtering information distributed using Multicast Distribution Control Signaling [[MDCS](#)].

Specification of the procedures for communication between subscribers and Content Distribution Controllers are outside the scope of this document.

[3.](#) IANA Considerations

This document introduces no IANA Considerations.

[4.](#) Security Considerations

TBD

[5.](#) Acknowledgements

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[6.](#) References

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