Multicast configuration plan for CLARA network

CLARA Network Engineering Group

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This document presents the NEG proposal for multicast implementation and configuration within the backbone of CLARA network.

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Version-1.2

VERSION MANAGEMENT

This guide outlines the basic guidelines for configuring IP multicast infrastructure at CLARA network. When new procedures are required or other changes made, it will be updated accordingly, and the new version release will be recorded in the table below.

Version	Modification description	Date	Reviewed by
preliminary	First draft	08-Sep-2004	Eriko Porto
1.0	Corrections and changes	16-Sep-2004	Eriko Porto & Hans L. Reyes
1.1	Corrections and changes	24-Sep-2004	Eriko Porto & Hans L. Reyes
1.2	Corrections and changes	04-Oct-2004	Eriko Porto & Hans L. Reyes

Summary

1. Introduction

The implementation discussed in this document is to leverage the network infrastructure of CLARA backbone to create additional incremental revenue streams and provide value-added services to the LA-NRENs by enabling interdomain multicast.

The goal is to efficiently provide content access from content providers to subscribers by enabling IP multicast.

The initial interdomain multicast network topology is depicted in Figure 1. The figure shows the physical connections from the LA-NRENs domains and upstream providers to CLARA network backbone, in which interdomain multicast will be deployed. Each LA-NREN has a Border Gateway Protocol (BGP) peering with CLARA and its own autonomous system (AS) established.

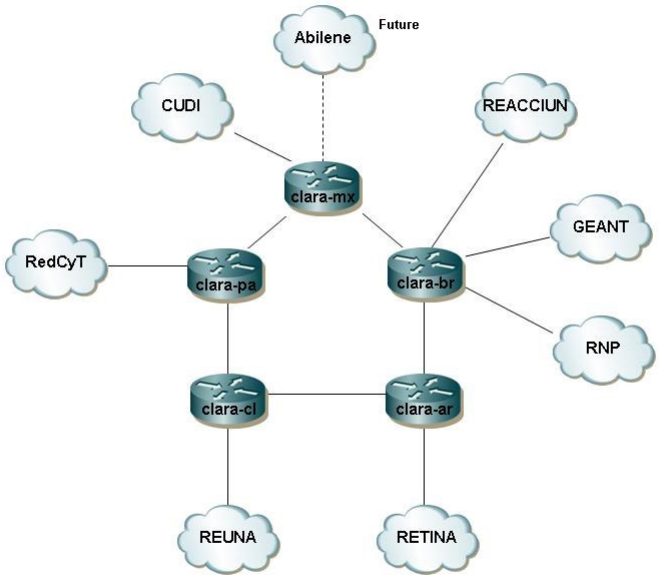

Figure 1: LA-NRENs and upstream providers connection

CLARA network will be deploying PIM-SM within its backbone to deliver multicast traffic. Only network segments with active receivers that have explicitly requested the data will be forwarded the traffic. PIM-SM uses a shared tree to distribute information about active sources, and this tree is based on a central router designated as a Rendezvous Point (RP).

Clara Network will be deploying PIM-SM within its backbone to deliver multicast traffic in all links of the backbone (STM-1 links at the ring). This will be done in order to avoid problems with the RPF protocol, which is needed for multicast routing. The activation of the multicast peering session on the link to the LA-NREN will be done only when requested.

All backbone routers will be configured as RPs in order to set up all the MSDP sessions to the LA-NRENs using the wan IP address. The address of the RP will be defined using the loopback interface.

When multicast routing is activated in the link to the LA-NREN, PIM-SM will be enabled but with a boundary filtering policy of administrative scope.

Because all CLARA routers will be configured as RPs, some sources and some receivers will end up using different RPs, a method is needed for the RPs to exchange information about active sources. This information exchange is done using MSDP. All the RPs are configured to be MSDP peers of each other. Each RP will know about the active sources in the area of the other RP. If any of the RPs were to fail, IP routing would converge and one of the RPs would become the active RP in both areas

2. IP Multicast deployment

The multicast infrastructure of CLARA network will be deployed using MBGP and MSDP protocols.

MBGP provides a method for providers to distinguish which route prefixes they will use for performing multicast RPF checks. The RPF check is the fundamental mechanism that routers use to determine the paths that multicast forwarding trees will follow and to successfully deliver multicast content from sources to receivers.

In order to deploy multicast routing between CLARA network and the other providers it is necessary to establish a MBGP peering session between the border routers of the other networks and the CLARA routers, as depicted in Figure 2.

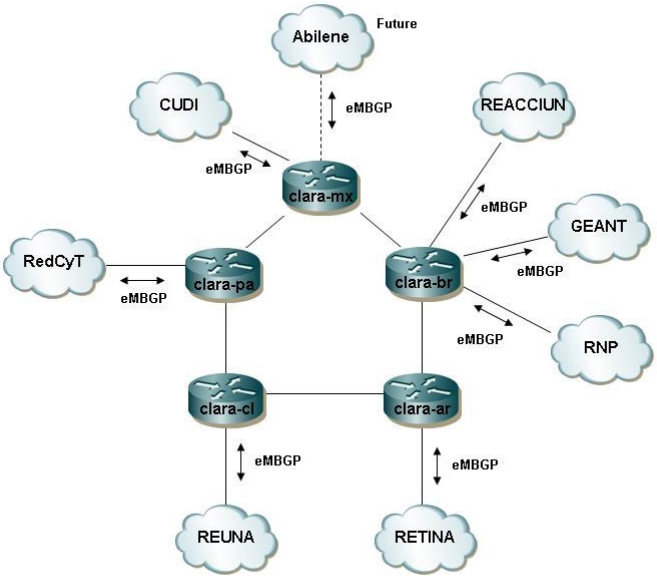

Figure 2: MBGP peering

MSDP is a mechanism that allows RPs to share information about active sources. Each RP knows about the receivers in their local domain. When a RP in remote domains hears about the active sources, he can pass on that information to their local receivers and multicast data can then be forwarded between the domains. A useful feature of MSDP is that it allows each domain to maintain an independent RP that does not rely on other domains, but it does enable RPs to forward traffic between domains. PIM-SM is used to forward the traffic between the multicast domains

In this scenario there will be two kinds of MSDP peering sessions: internal and external MSDP peering.

The external domains RPs will have to establish a MSDP external peering session to one of the RPs of CLARA domain. Since all CLARA routers are configured to be RPs, the MSDP external peering session will be established between the LA-NREN router and the access router from CLARA backbone that connects to the LA-NREN. Figure 3 shows the intradomain multicast network diagram for CLARA network and its peer networks.

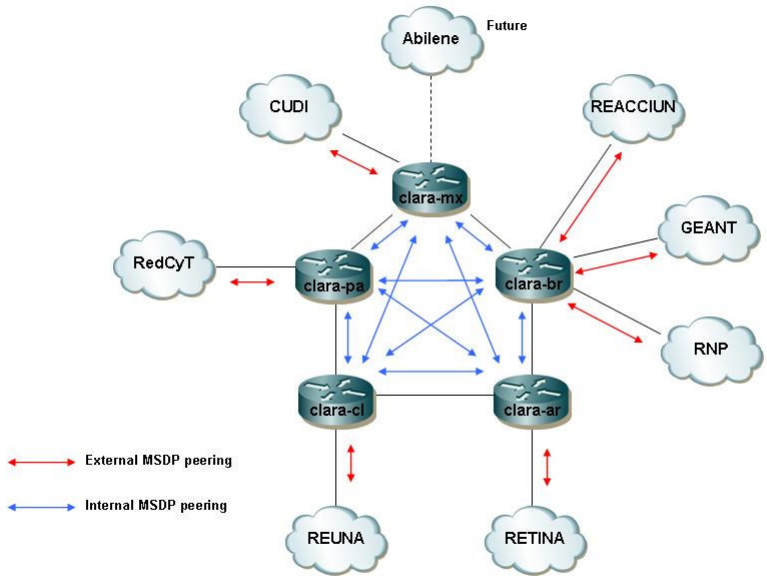

Figure 3: MSDP peering

3.
Multicast configuration guidelines

3.1.
PIM and interfaces configuration

Step 1 – Configure multicast globally.

Multicast will be configured on all CLARA routers.

```
ip multicast-routing distributed
```

Step 2 – Configure multicast on the interfaces.

Example of multicast configuration for the interface of the CLARA router. Multicast will be configured on the interfaces of all CLARA routers.

```
interface Loopback0
 ip address 200.0.205.5 255.255.255.255
 no ip directed-broadcast
 ip pim sparse-mode
 ip router isis backbone
 ip mroute-cache distributed
 ip sdr listen

interface GigabitEthernet1/1   !border interface
 ip address 200.0.204.129 255.255.255.252
 no ip directed-broadcast
 ip pim bsr-border
 ip pim sparse-mode
 ip mroute-cache distributed
 ip multicast boundary multicast-boundary

interface POS2/0   !backbone internal connection
 ip address 200.0.204.5 255.255.255.252
 no ip directed-broadcast
 ip pim sparse-mode
 ip router isis backbone
 ip mroute-cache distributed

ip access-list standard multicast-boundary
 deny   224.0.1.39
 deny   224.0.1.40
 deny   239.0.0.0 0.255.255.255
 permit any
```

Step 3 – Configure the router as a RP.

The loopback address will be used to configure PIM-SM in CLARA routers.

```
interface Loopback0
 ip address 200.0.205.5 255.255.255.255
 no ip directed-broadcast
 ip pim sparse-mode
 ip router isis backbone
 ip mroute-cache distributed
 ip sdr listen
!
ip pim rp-address 200.0.205.29
```

Step 4 – MSDP internal peering configuration.

Configuration of the MSDP peering session from each CLARA router to all other routers in the backbone using the IP addresses of the Loopback0 interface (same used for the iBGP peering sessions):

```
! one similar configuration for each other CLARA router
ip pim rp-address 200.0.205.5
ip msdp peer 200.0.205.13 connect-source Loopback0
ip msdp peer 200.0.205.21 connect-source Loopback0
ip msdp peer 200.0.205.29 connect-source Loopback0
ip msdp peer 200.0.205.37 connect-source Loopback0
ip msdp cache-sa-state
```

3.2. MBGP configuration

Example of configurations for the BGP peers. The configuration is different for each router.

For clara-br router:

```
router bgp 27750
 neighbor eRNP peer-group
 neighbor eRNP remote-as 1916
 neighbor eRNP update-source GigabitEthernet1/1
 neighbor 200.0.204.130 peer-group eRNP
 neighbor eGEANT peer-group
 neighbor eGEANT remote-as 20965
 neighbor eGEANT update-source POS3/0
 neighbor 62.40.105.13 peer-group eGEANT
 neighbor INTERNAL peer-group
 neighbor INTERNAL remote-as 27750
 neighbor INTERNAL update-source Loopback0
 neighbor 200.0.205.13 peer-group INTERNAL
 neighbor 200.0.205.21 peer-group INTERNAL
 neighbor 200.0.205.29 peer-group INTERNAL
 neighbor 200.0.205.37 peer-group INTERNAL
```

```
!
address-family ipv4 multicast
 neighbor eRNP activate
 neighbor 200.0.204.130 activate
 neighbor eGEANT activate
 neighbor 62.40.105.13 peer-group eGEANT
 neighbor INTERNAL activate
 neighbor 200.0.205.13 peer-group INTERNAL
 neighbor 200.0.205.21 peer-group INTERNAL
 neighbor 200.0.205.29 peer-group INTERNAL
 neighbor 200.0.205.37 peer-group INTERNAL
 no auto-summary
 exit-address-family
```

For clara-cl router:

```
router bgp 27750
 neighbor eREUNA peer-group
 neighbor eREUNA remote-as 11340
 neighbor eREUNA update-source GigabitEthernet1/1
 neighbor 200.0.204.142 peer-group eREUNA
 neighbor INTERNAL peer-group
 neighbor INTERNAL remote-as 27750
 neighbor INTERNAL update-source Loopback0
 neighbor 200.0.205.5 peer-group INTERNAL
 neighbor 200.0.205.13 peer-group INTERNAL
 neighbor 200.0.205.21 peer-group INTERNAL
 neighbor 200.0.205.37 peer-group INTERNAL
!
address-family ipv4 multicast
 neighbor eREUNA activate
 neighbor 200.0.204.142 peer-group eREUNA
 neighbor INTERNAL activate
 neighbor 200.0.205.5 peer-group INTERNAL
 neighbor 200.0.205.13 peer-group INTERNAL
 neighbor 200.0.205.21 peer-group INTERNAL
 neighbor 200.0.205.37 peer-group INTERNAL
 no auto-summary
 exit-address-family
```

3.3.
MSDP external peering sessions configuration

The following sample configurations show the MSDP peering sessions in CLARA network:

For clara-br router:

```
! geant
ip msdp peer 64.40.105.13 connect-source Loopback0 remote-as 20965
ip msdp sa-filter in 64.40.105.13 list msdp-sa-filter
ip msdp sa-filter out 64.40.105.13 list msdp-sa-filter

! rnp
ip msdp peer 200.0.204.130 connect-source Loopback0 remote-as 1916
ip msdp sa-filter in 200.0.204.130 list msdp-sa-filter
ip msdp sa-filter out 200.0.204.130 list msdp-sa-filter

! reacciun
ip msdp peer 200.0.204.150 connect-source Loopback0 remote-as 20312
ip msdp sa-filter in 200.0.204.150 list msdp-sa-filter
ip msdp sa-filter out 200.0.204.150 list msdp-sa-filter
```

For clara-mx router:

```
! cudi
ip msdp peer 200.0.204.134 connect-source Loopback0 remote-as 18592
ip msdp sa-filter in 200.0.204.134 list msdp-sa-filter
ip msdp sa-filter out 200.0.204.134 list msdp-sa-filter
```

For clara-pa router:

```
! redcyt
ip msdp peer 200.0.204.139 connect-source Loopback0 remote-as xxxx
ip msdp sa-filter in 200.0.204.139 list msdp-sa-filter
ip msdp sa-filter out 200.0.204.139 list msdp-sa-filter
```

For clara-cl router:

```
! reuna
ip msdp peer 200.0.204.142 connect-source Loopback0 remote-as 11340
ip msdp sa-filter in 200.0.204.142 list msdp-sa-filter
ip msdp sa-filter out 200.0.204.142 list msdp-sa-filter
```

For clara-ar router:

```
! retina
ip msdp peer 200.0.204.146 connect-source Loopback0 remote-as 3597
ip msdp sa-filter in 200.0.204.146 list msdp-sa-filter
ip msdp sa-filter out 200.0.204.146 list msdp-sa-filter
```

Access list used to filtering the source advertisements (SAs).

```
ip access-list extended msdp-sa-filter
 deny   ip any host 224.0.1.2
 deny   ip any host 224.0.1.3
 deny   ip any host 224.0.1.22
 deny   ip any host 224.0.1.24
 deny   ip any host 224.0.1.35
 deny   ip any host 224.0.1.39
 deny   ip any host 224.0.1.40
 deny   ip any host 224.0.1.60
 deny   ip any host 224.0.2.2
 deny   ip any host 225.1.2.3
 deny   ip any host 229.55.150.208
 deny   ip any host 234.42.42.42
 deny   ip any host 234.142.142.142
 deny   ip any 224.0.0.0 0.0.0.255
 deny   ip any 232.0.0.0 0.255.255.255
 deny   ip any 239.0.0.0 0.255.255.255
 deny   ip 10.0.0.0 0.255.255.255 any
 deny   ip 127.0.0.0 0.255.255.255 any
 deny   ip 172.16.0.0 0.15.255.255 any
 deny   ip 192.168.0.0 0.0.255.255 any
 permit ip any any
```