Avid Multicast Repeater Overview – Whitepaper V1.5.4

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Intended audience: General distribution - The intended audience are system designers and system installers.

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<th>Date</th>
<th>Comment</th>
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Abstract

This document discusses the requirement for IP multicast in Interplay PAM environments. Multicast is a fundamental requirement of Interplay PAM, this whitepaper discussed the requirements, and deployment methods available, also it discusses direct unicast client configuration for remote clients if required.

Note: This document has LEGACY status and most implementations using Unicast techniques for Look Up Services, in preference to Multicast. As shown in figures 1-3 below.

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1.0 Unicast is now the most common Deployment?

Much of the content in the document below is now of little relevance to Interplay Production Asset Manager (PAM) deployments in 2010. Most implementations use UNICAST techniques requiring Fully Qualified Domain Names (FQDN) configuration of all lookup services, as this speeds up the Avid Service Framework. The JINI architecture is still central to Interplay PAM.

The multicast commands for layer 3 switches in the appendices are not longer commonly deployed. However multicasting still occurs within a layer 2 domain, even though it may not achieve any results.

Note: While the content below was written about Interplay PAM, other Avid elements such as Interplay Capture and iNews Command, use similar techniques so the subject matter could be equally applied to these solutions.

Figure 1
1.1 Why are IP Multicasts still present?
A WIRESHARK trace will reveal IGMP join requests to 224.0.1.84 (JINI-announcement) and a multicast to 224.0.1.85 JINI-request, as these are fundamental elements of the embedded JINI architecture, they will occur even if a FQDN is configured.

The multicast discovery and unicast lookup locator discovery occur in parallel and are on equal footing. The JINI architecture has no preference regarding which method finds the LUS first. JINI will use the LUS as soon as one of those two mechanisms provides a "discovered" event. The multicast protocol is faster, so multicast usually wins unless there's a layer 3 hop in the way. Hence at layer 2 it is normally faster.
JINI Unicast packets are exchanged with 10.156.156.123 to port 4160 using the following LUS/GPS IP addresses:

- 10.156.156.14  ery-gps1-av.avid
- 10.156.156.15  ery-gps2-av.avid

1.2 What happens under the hood?
The net effect will depend on how the Interplay PAM engines and Look Up Servers are configured and how the Layer 3 switch is configured.

As state above: the multicast discovery and unicast lookup locator discovery occur in parallel and are on equal footing. The multicast protocol is faster, so multicast usually wins unless there's a layer 3 hop in the way.

Also considered that in the complex systems today, there are multiple JINI “systems” or “workgroups” running, in Figure 3 above, there are three, one for CAPTURE (ACECAPTURE), one for COMMAND (ACECMD) and one for INTERPLAY PAM (ACEMAIN), but there could also be another for Archive.

Consider the following as shown in the diagram below:

Interplay PAM cluster in “zone 3” subnet C (192.168.18.0/24), NewsCutter/Media Composers, Airspeeds, Media indexers and LUS/GPS in Zone 2 in Subnets 192.168.16.0/24 and 192.168.17.0/24 and Transfer Engines in the same subnets as Zone 1. Also add Interplay Capture and iNews Command in Subnet C. And finally Interplay Assist, Access and iNews Instinct in Subnet D (192.168.19.0/24). All devices configured with FQDN, No multicast routing configured.

Media Indexers, NC/MC, Airspeed Multistream, Transfer engine, will all find LUS via Multicast. Interplay Engines, Access, Assist and Instinct will all find LUS via unicast LUS.

While multicast routing MIGHT exist in the layer 3 Border switch (e.g. 4948/4900M), Zone 4 clients should always be configure with FQDN, but they will still multicast within their own layer 2 environment, but it is quite likely their multicast requests will go unanswered, and it maybe advisable to have an access list on the local layer 3 device to deny the JINI addresses if a global block on the Multicast range is not already in place.
Figure 5
2.0 What is IP Multicast?

IP Multicast is a method of forwarding UDP datagram messages to a group of interested receivers. The diagram below show a Multicast transmitter (PINK) and the multicast receivers (GREY)

Multicast traffic cannot cross a layer 3 switch or a router by default, special configuration has to be added. A customer network may not allow multicast traffic, as multicast can consume a lot of bandwidth. The multicast implementation used by Avid creates a very small load, as described below.

3.0 Interplay PAM Multicast Repeater

LEGACY – NO LONGER DEPLOYED

A Multicast Repeater (MCR) is an Avid Interplay PAM software component used to “bridge” multicast packets that are required by the Interplay framework to send messages across IP subnets that would not otherwise pass multicast packets.

Strictly speaking, a multicast repeater is used to transport multicast packages (tunnels them as encapsulated unicast packets to a remote MCR) across a non-multicast enabled network. It was always a round peg in a square hole and hopefully no new deployments exist after 2008!

An Interplay PAM MCR is not needed if the L3 switches or routers that are used in an Interplay network are configured to route multicast packets. Multicast support for Avid L3 switches has been successfully prototyped and is currently being utilized at customer sites.
However there may also be circumstances where it may be desirable to isolate one subnet from the others multicast packets and the MCR will provide forwarding and yet provide isolation. The Avid Interplay PAM MCR will only forward Interplay framework multicast packets.

In Interplay services, multicast packets are utilized to perform two functions:

- **Client Requests** – Such as Finding Interplay Lookup Services Requests are sent out by any Interplay process that starts up and wants to join an Interplay workgroup. These messages are only sent when the application starts up.

- **Announcements** - Informing Interplay clients about a new Lookup Service Announcements are sent out by each Lookup Service every 2 minutes to keep informing the "Interplay world" that it is there and available.

So, there will be a couple multicasts whenever a process starts and a packet every 2 minutes for every Lookup service deployed. Overall, traffic should be very low.

Each Interplay PAM client also generates a request packet at the time that is starts up. The amount of traffic scales linearly with the number of Interplay clients - but doesn't stay at a constant level since the multicast packets only get sent at start-up. Announcements scaled based on the number of Interplay Lookup services deployed. The interplay multicast packets are small packets, less than 1KB each.

There are a few non-Avid applications that use multicast to transmit audio or video from a single server to a large number of clients. Simultaneous delivery of high quality video to each of a large number of delivery platforms will exhaust the capability of even a high bandwidth network. One way to significantly ease scaling to larger groups of clients is to employ multicast networking. An example of a commercial software application that makes use of multicast for video conferencing can be found at [www.conferencexp.net](http://www.conferencexp.net).

An MCR is not needed at all if all the Interplay clients on the remote subnet have been configured with individual Lookup Locators. “Lookup Locators” to clients on remote subnets, are created by putting the LUS Server hostname into the Workgroup Properties application so remote clients know what server to contact to find a Lookup Service.

Please refer to figures 7-9 below.
This uses the same steps outlined in the interplay PAM install document in “Configuring a Multicast Repeater”, the difference is that there is no MCR involved and it would need to be done on every client in the remote subnet.

Figure 7

Figure 8
When a client is configured here is disables automatic discovery of lookup service

NOTE! And FQDN should have been used here and not a unicast IP address, otherwise JINI would still used Multicast!!!

Figure 9

This configuration is fairly constant too (in that baring the addition of additional lookup services it does not need to be updated). If the number of clients is large it would be easier to install an MCR than to try and configure all of the clients.

Direct Client Configuration
When a small number of clients are widely dispersed, using a multicast repeater in each case is not feasible, individual clients can be configured with the unicast FQDN of the look up service. As multiple host names can be entered, this reduces some aspects of the in-built resilience of the Jini infrastructure.

If a MCR is desired or needed then it should be a machine that is not rebooted often, but does not need to be an SR2400 class system. A client similar to what is required for Interplay Assist should be adequate (http://www.avid.com/products/interplay/interplay_Assist.asp ) - or:

<table>
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<tr>
<th>Platform</th>
<th>Pentium P4 2GHz or faster processor</th>
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<tr>
<td>Network</td>
<td>1 Gb networking card</td>
</tr>
<tr>
<td>System Memory</td>
<td>512 MB of RAM minimum</td>
</tr>
<tr>
<td>OS Windows XP</td>
<td>Professional with SP2</td>
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The basic configuration requires at least two (network interfaces?) – one on the subnet with the Lookup Services and a second on the subnet with the clients.
Figure 10
Fault tolerance can be achieved on both sides of the switch or router. The MCR will eliminate redundant links and avoid creating multicast storms.

Figure 11
4.0 JINI – used by Avid

The technology used by Avid for the multicast system in Interplay is based on the open source JINI architecture

JINI IS STILL USED BUT NOT ASSOCIATED WITH MULTICAST

Jini is not an acronym.
It is a Java network technology developed initially by Sun Micro Systems®.
http://www.sun.com/software/jini/overview/index.xml

JINI Multicast packets are sent to port 4160 using the following IP addresses:
- 224.0.1.84 jini-announcement
- 224.0.1.85 jini-request

See http://www.iana.org/assignments/multicast-addresses for further multicast listings.

Everyone listening on port 4160 receives the same packet if no router blocks it.

It is possible to use access lists to prevent anything other than 224.0.1.84 and 224.0.1.85 from generating traffic on port 4160

The Interplay multicast repeater is intelligent and will only forward when necessary, and will not forward multicast traffic other than that required by the JINI infrastructure.

5.0 Who needs to use an MCR?

LEGACY – NO LONGER DEPLOYED

In an ISIS/Interplay PAM environment the LUS (Look Up Service[s]) may either be connected to both the ISIS VLANS, (left and right) so the multicast traffic generated by Zone 1 and Zone 2 clients' will not need an MCR.

However when two L3 switches are used in an a redundant HSRP or VRRP configuration, then the Interplay Engine and LUS may be placed on Vlan-30 (Zone-3) and therefore multicast messages must be forwarded to Vlan-10 and 20.

For Zone 3 Interplay clients an MCR will be needed in each additional VLAN, unless multicast routing is enabled on the Z2/Z3 border switch

For Zone 4 Interplay clients, each instance, as described below, may need a device acting as a Multicast Repeater
5.1 Current network design – Multiple VLANS
The most common design for the corporate network uses lots of smaller IP networks to create small manageable broadcast domains, as shown in the diagram below.

Consider a building with 5 floors. Floor 1 is where the ISIS and Interplay systems exist and on floor 2 most of the Editing stations are present, and they can directly connect to the Zone 2/3 border switch. However the Zone 4 clients are distributed in several locations. There 20 users on floor 3 using Interplay Assist. On floor 4 there are 20 users with Interplay Access and on Floor 5 another group of 30 users using Interplay Assist. Current network design will mean each floor will need its own MCR unless local configuration is used.
Appendix A - Enabling Multicast on a Cisco 4948

By default a layer 3 switch such as the 4948 used by Avid “contains” the multicast traffic in the local domains. This is a feature of all router boundaries and not specific to Cisco. To allow multicasts traffic to pass between networks, multicast routing must be enabled. An example of the configuration command needed on the Zone 2/3 border switch are given below. However multicast routing may also be required for Zone 4 clients in the customer network, unless an MCR is used. However, if the customer has multiple users located in many VLANs, as per a standard data network design, then several MCR instances may be required.

```
switch>enable
switch# show ip multicast
   Verify multicast status (off)
switch # config t
switch(config)# ip multicast-routing
!
switch(config)# int vlan10
switch(config-if)# ip pim sparse-dense-mode
!
switch(config)# int vlan20
switch(config-if)# ip pim sparse-dense-mode
!
switch(config)# int vlan30
switch(config-if)# ip pim sparse-dense-mode
!
switch(config)# int vlan40
switch(config-if #) ip pim sparse-dense-mode
!
! Note - Repeat for other VLANs as required/configured (e.g. 30)
!
switch(config-if #)exit
!
switch(config)#exit

switch # show ip multicast
   Verify multicast status (on)
!
```
switch # show run

Verify Vlan setup shows pim setup
!
switch # copy run start
Appendix B - Enabling Multicast on a Foundry FESX-424

By default a layer 3 switch such as the FESX-424 used by Avid “contains” the multicast traffic in the local domains. To allow multicasts traffic to pass between networks, multicast routing must be enabled. An example of the configuration command needed on the Zone 2/3 border switch are given below. However multicast routing may also be required for Zone 4 clients in the customer network unless an MCR is used. However, if the customer has multiple users located in many VLANs, as per a standard data network design, then several MCR instances may be required.

switch> enable
switch # config t
switch(config)# router pim
!
switch(config-if)# int ve 10
switch(config-if)# ip pim
!
switch(config-if)# int ve 20
switch(config-if)# ip pim
!
switch(config-if)# int ve 30
switch(config-if)# ip pim
!
switch(config-if)# int ve 40
switch(config-if)# ip pim
!
! Note - Repeat for other VLANs as required/configured (e.g. 30)

switch(config-if)# exit
!

switch(config)# exit
!
switch # write mem

Appendix C – SMC 8724 ML3 - No MULTICAST

Note: Multicast routing is not supported on the SMC 8724 L3 switch as supplied by avid although some multicast functions are available.

~END~