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Handling of unidirectional links with DVMRP

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Abstract

This document defines the modifications which can be applied to DVMRP
[rfc1075] which make the communication over asymmetric links
feasible.

1. Introduction

DVMRP is a distance-vector-style routing protocol for routing

multicast datagrams through the internet. It was designed to work on

networks where adjacent gateways routing multicast datagrams

communicate using the same link in both directions. In case links are

unidirectional, DVMRP can not be used without modifications.

2. Overcoming DVMRP restrictions

A satellite network comprises two sets of stations, feeds that can
both send and receive multicast packets, and receivers that can only
receive packets.

Feeds must be allowed to forward over the satellite links the
multicast packets which are bound to subnets accessible through other
feeds or through receivers.

Receivers will never send any packet via the satellite link. They
must however send routing messages to the feeds to supply routing
information, recently changed routes or responses to requests.

If the network included only feeds, DVMRP could be used unchanged.
Usage by a mix of receivers and feeds requires some extensions.

[3](). Proposed solution

In our example we assume that G1 and G2 (Gateways) are connected to
symmetric and asymmetric networks (See Figure 1) and support
multicast routing. G3 and G4 also support multicast routing and are
connected to symmetric networks.

```
                route N1                          ----

   N2        ----                    ----<=========>|G3|<==---

  ---======>|G1| ==================> |G2|      ----    ----

         ----        update msg     ----<===>|G4|<==--

          /\                        /\      ----

          ||   -----------------    ||

          ====|  regular       |====

          N3 |    connections |  N4

              -----------------
```

Figure 1

G1 will send routing messages to G2 multicast to address 224.0.0.4..

G1 will never receive messages from G2 via route N1, DVMRP must be

modified to take into account that asymmetry.

3.1. Adding information to DVMRP datagrams

DVMRP datagrams are composed of two portions: a small, fixed length

IGMP header, and a stream of tagged data. The stream is composed of

commands. We suggest to modify a command in order to provide a way to

authenticate a route taken by a datagram as part of the satellite

network.

The Flag0 command provides a way to set a number of flags.

Format: 0 1 2 3 4 5 6 7   0 1 2 3 4 5 6 7

        +-+-+-+-+-+-+-+-+ +-+-+-+-+-+-+-+-+

        | 5 | | value |

        +-+-+-+-+-+-+-+-+ +-+-+-+-+-+-+-+-+

Meaning of bits in value:

   Bit 7: Destination is unreachable.

   Bit 6: Split Horizon concealed route.

Default: All bits zero.

Bits 0 to 5 are unused, for our needs we propose to set the bit 5,

this specifying that the link is unidirectional. By default bit 5

would be unset.

Any DVMRP datagram sent by multicast feeds over the satellite network

will be authenticated.

Any multicast router connected to the satellite network (feeds and
receivers) have to support that functionality when they process
routing datagrams. Other multicast routers will simply ignore this
extra flag and the process of DVMRP datagram will not be affected.

3.2. Handling by receivers

Upon reception of a DVMRP packet, receivers examine the flag0 command
and note that this packet was sent by a satellite feed (bit 5 set).
They add the packet address [IP source] to a list of "potential
feeds".

Receivers behave "as if" their virtual interface connected to the
satellite network can transmit packets. This way, the shortest
reverse path tree can be computed by the receivers with the metric
associated to the satellite link.

At pseudo-regular intervals, receivers will send to the feeds a DVMRP
packet. This packet, however, will not be sent to the multicast
address of the feed. A copy of this packet will be sent to the
unicast address of each feed found in the list of "potential feeds"
through regular connections.

Every FULL_UPDATE_RATE seconds routers normally send out DVMRP

messages to all of their virtual interfaces with all of their routing

information. Receivers will propagate routing information about the

destination addresses "reachable" via the virtual interfaces

connected to the satellite network. Thus, routers (i.e. G3 and G4,

see Figure 1) can compute the shortest reverse path tree to the

source address of a multicast packet even if there is no real path.

This procedure assumes that there is another route, beside the

satellite link, by which the receiver can send packets to the feed

(See Figure 1).

3.3. Processing by feeds

Any routing message sent over the multicast link (satellite network)

is authenticated adding the Flag0 command and setting the bit 5.

All incoming unicast packets are processed even if they were not

tunneled or sent to a multicast address.

References

[rfc1075] S. Deering, C. Partridge, D. Waitzman, "Distance Vector

          Multicast Routing Protocol", November 1988.

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