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Ramesh Govindan
USC/ISI
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Configuring IDRP Confederations

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Abstract

In the Inter-Domain Routing Protocol (IDRP), all border routers (border intermediate systems (BISs) in ISO terminology) of a routing domain confederation (RDC) must be configured with the identity of all RDCs that overlap or enclose that RDC. This draft describes some minor modifications to IDRP specification that removes this requirement.

1 The Inter-Domain Routing Protocol

In the Inter-Domain Routing Protocol (IDRP, [1]), border intermediate systems (BISs) of routing domains (RDs) exchange route updates. A

route update advertises reachability to one or more address prefixes (Network Layer Reachability Information, or NLRI, in ISO terminology). Each IDRPs route update also contains an RD_PATH attribute; the RD_PATH is a list of Routing Domain Identifiers (RDIs) of RDs traversed by a route update. The RD_PATH is used to detect routing loops.

In a large internet, a routing update's RD_PATH may contain a large number of RDIs. To allow shorter RD_PATHs, two or more topologically adjacent RDs may be combined into a single IDRPs Routing Domain Confederation (RDC). In turn, two or more topologically adjacent RDCs may be combined into a single, larger, RDC. RDCs may also overlap. An RD outside an RDC A sees only the A's RDI in RD_PATHs of route updates from A; that is, RDIs of RDs completely enclosed by A are not visible outside A.

2 RDC Configuration

Section 7.13.2 of [1] specifies that a border router (or Border Intermediate System (BIS)) that participates in one or more RDCs must:

be aware of the RDIs of all confederations of which it is a member, and it must know the partial order which prevails between these confederations: that is, it must know the nesting and overlap relationships between all confederations to which it belongs.

Such configuration is undesirable because changing an RDC's boundaries may require significant coordination between that RDC and all other RDCs that it contains or overlaps.

To understand the need for such configuration, we briefly describe RD_PATH formation in IDRPs (the interested reader is referred to Section 7.12.3 of [1] for details). When a routing update message enters an RDC, the RDC's BIS inserts an ``entry'' marker in the RD_PATH. Thus, the RD_PATH of a route update that has entered three RDCs A, B and C looks like this:

...Enter(A)....Enter(B)....Enter(C)....

The ellipses indicate RDIs of other RDs or RDCs traversed by the route.

When this route exits RDC B, B's BIS removes its ``entry'' marker and updates the RD_PATH according to the rules described in [Section 7.12.3](#)

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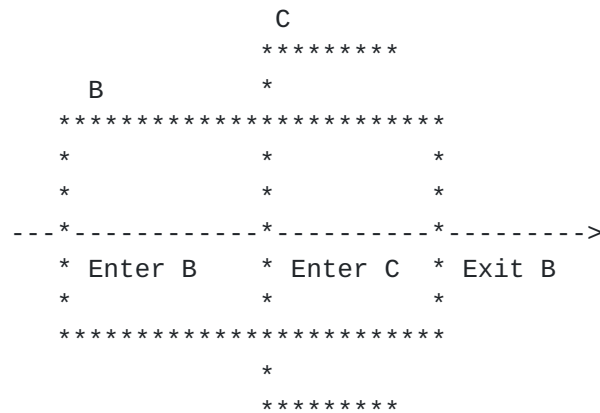


Figure 1: Suppose a route's RD_PATH contains an ``entry'' marker for RD B followed by an ``entry'' marker for RD C. If the route exits B before exiting C, C must overlap B.

of [1]. These rules depend on the nesting or overlap relationship between B and all RDCs whose ``entry'' markers are listed in the RD_PATH. As we show below, B cannot determine these relationships from the RD_PATH alone. For this reason, [1] specifies the configuration rule described above.

By simple examination of the RD_PATH, B's BIS can unambiguously assert that RDC C overlaps RDC B. Indeed, all ``entry'' markers in the RD_PATH to the ``right'' of B's ``entry'' marker correspond to RDCs that overlap with B (Figure 1).

However, without configured information, B's BIS cannot unambiguously determine whether RDC A overlaps or contains RDC B. Indeed, any ``entry'' marker in the RD_PATH to the ``left'' of B's ``entry'' marker may correspond to an RDC that either overlaps with, or completely contains, B (Figure 2).

3 Solution

With the following modification to the RD_PATH formation rules of Section 7.12.3 ([1]), the configuration rule of the previous section is no longer necessary:

In the absence of configured information, a BIS for an RDC B (say) shall assume that B is nested within RDCs whose

ENTRY_SEQs and ENTRY_SETs appear to the ``left'' of B's
ENTRY_SEQ or ENTRY_SET.

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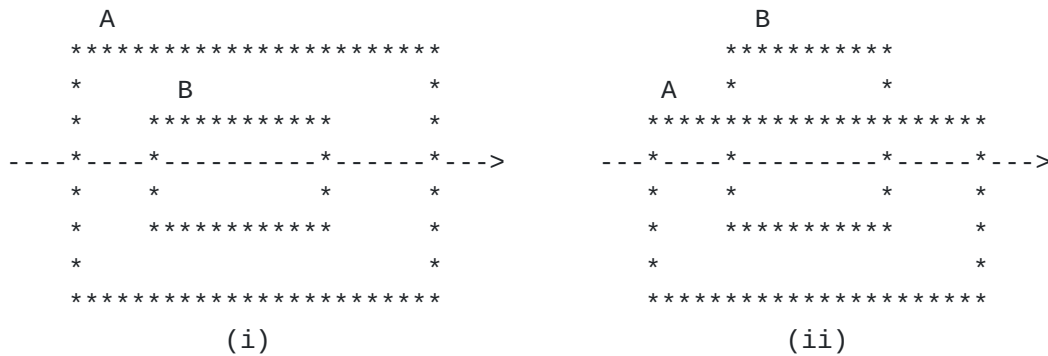


Figure 2: Suppose a route's RD_PATH contains an ``entry'' marker for RD A followed by an ``entry'' marker for RD B. If the route exits B before exiting A, (i) A may completely enclose B, or (ii) B may overlap A.

Instead, [Section 7.13.2](#) now requires the following configuration information:

Each BIS must be aware of the RDCs entered by UPDATE PDUs received from each of its neighbors. Each BIS must also be aware of the RDCs exited by UPDATE PDUs sent from the BIS to each of its neighbors.

That is, a BIS need know only about RDCs which it borders, not all the RDCs in which it participates. Two related modifications to [\[1\]](#) are necessary. [Section 7.13.3](#) is now redundant; in our proposed solution, confederation boundaries are configured. For the same reason, the OPEN PDU ([Section 6.2](#)) need no longer carry RDC IDs.

This solution has one important consequence. Consider the case when A overlaps with B in the RD_PATH shown in the previous section (Figure 2(ii)). If B's BIS were configured with this information, both A and B's RDIs would appear in the route's RD_PATH, when seen at any RD outside A. With our proposed solution, only A's RDI would appear in the RD_PATH, when seen at any RD outside A. This is because our solution treats B as if it were nested within A. Thus, the fact that the route traverses RDC B is not visible outside RDC A. This does not violate loop detection. If, for policy reasons, it is desirable to have B's RDI appear in the RD_PATH, B's network administrator can configure nesting and overlap relationships according to the configuration rule of [Section 2](#).

Finally, an equally correct solution would have been to always assume

that A overlaps B. This solution provides no reduction, however, in

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the length of RD_PATHs, a primary motivation for introducing RDCs.

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References

- [1] Protocol for exchange of inter-domain routing information among intermediate systems to support forwarding of iso 8473 pdus.
ISO/IEC 10747: Information Processing Systems
Telecommunications and Information Exchange between Systems,
October 1993.

