Title: Estimating the Maximum Size of IDRP OPEN PDU

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At our September meeting, additional information was requested on the practical maximum size of an IDRP OPEN PDU. The item that seemed of most concern was the inclusion of the *RIB-AttsSet* field in the OPEN PDU. This contribution outlines a method for estimating a worst-case size of the OPEN PDU as a function of the environment in which it will be used.

How many elements in a RIB-AttsSet?: The field *RIB-AttsSet* provides an enumeration of each RIB-Att that a given BIS supports. The maximum number of RIBAtts (that is, the number of sets of Distinguishing Attributes) is limted to 256 by the 1-octet field in the OPEN PDU that encodes the number of distinct RIBAtts. But for practical purposes, let us assume that a given BIS will support less than 50 RIB-Atts.

How many Distinguishing Attributes can a RIB-Att contain?: The answer is that a given RIB-Att can be comprised of at most 3 distinguishing attributes. This can be derived from a consideration of the encoding of the ISO 8473 header, from which the NPDU-derived Distinguishing Attributes are derived. Each RIB-Att consists of a set of Distinguishing Attributes (see clause 6.7), and there is a one-to-one correspondence between an NPDU-derived Distinguishing Attribute and the corresponding Distinguishing Path Attributes carried in IDRP's UPDATE PDUs (see clause 6.8). It is important to note that all 9 of IDRP's distinguishing attributes are carried within only 3 fields of the NPDU header.

1. *GROUP I:* Within the ISO 8473 NPDU, the QOS Maintenance Parameter is used to encode six distinguishing attributes: TRANSIT DELAY, RESIDUAL ERROR, EXPENSE, CAPACITY, SOURCE SENSITIVE QOS, and DESTINATION SENSITIVE QOS.

   The encoding requirements of ISO 8473 dictate that at most one of these distinguishing attributes can be present in a given NPDU (see ISO 8473, clause 7.5.6). Stated differently, the encoding rules for ISO 8473 make these 6 attributes mutually exclusive, and therefore a valid RIB-Att can contain at most one of them.

2. *GROUP II:* The distinguishing attribute PRIORITY is encoded in its own parameter field in ISO 8473 see ISO 8473, clause 7.5.7).

3. *GROUP III:* Finally, ISO 8473 uses its Security Parameter to encode both SOURCE SENSITIVE SECURITY and DESTINATION SENSITIVE SECURITY. A review of ISO 8473's encoding requirements shows that these two attributes are also mutually exclusive (see ISO 8473 clause 7.5.3). Since only one of them can appear in a given NPDU, a valid RIB-Att can contain at most one of them.

In summary, we conclude therefore that a valid RIB-Att can contain at most three distinguishing attributes: one each from GROUP I, GROUP II, and GROUP III.

Coding Considerations: Let us assume that every RDI has a fixed length of 20 octets (worst case). Then, the length of the fixed fields in an OPEN PDU will be 56 octets. The additional variable length fields that we must consider are: Authentication Data, Confed-IDs, and RIB-AttsSet:

- Authentication Data is used in conjunction with IDRP's authentication function. Its content is not specified by IDRP, but most likely it will be used to exchange data which is related to a security association. For purposes of estimation, let us assume that this field is 30 octets long (big enough for a typical password, for example).

- Confed-IDs lists the RDIs of each confederation to which the BIS belongs. Let′s assume that each RDI is 20 octets long, and that the BIS belongs to k confederations. The length of this encoded field will then be equal to $1 + k(21)$ octets.

  In typical applications, it is unlikely that a given BIS would belong to more than 20 confederations.

- For purposes of analysis, assume that a given BIS supports m distinct RIB-Atts, each of which is comprised of three distinguishing attributes (which is the maximum number possible). IDRP places an upper limit of 256 on the number of RIB-Atts that a a given BIS can support, but a value of 30 might be more typical in practical situations.

  Since a RIB-Att can contain only one element from each of the three groups mentioned above, we next determine the maximum encoded size for each group:

  - Within GROUP I, the largest encoding will occur for SS-QOS. If we assume that there are 65K distinct ″QOS values″ for a given source address prefix, then IDRP′s QOS value field would have a length of 2 octets. For the finest granularity (a single NSAP address), the NSAP prefix could be 20 octets long. In this worst-case situation, we find that the encoding of the SS-QOS attribute in the OPEN PDU will contain 25 octets.
  - Within GROUP II, the encoding of the PRIORITY attribute will occupy 3 octets.
  - Within GROUP III, the assumptions made for GROUP I also apply. Therefore,the maximum length for a GROUP III attribute is also 25 octets.

  If we then construct a worst-case RIB-Att (one worst-case-length encoding from each group), we arrive at a worst-case length of 54 octets for any particlar RIB-Att.

Now, let us assume that the field *RIB-AttsSet* contains m individual RIB-Atts. Its total length will then be given by $1+ 55m$ octets.

Estimating the Size of OPEN PDUs: When we combine the size estimates for Authentication Data, Confed-IDs, RIB-AttsSet, and the fixed length fields, we obtain the following expression for the length of an OPEN PDU:

$$L = 56 + 30 + (1 + 21k) + (1 + 55m),$$

where k is the number of confederations to which the BIS belongs, and m is the number of RIB-Atts that it supports. Figure 1 on page 3 shows contours of constant L as a function of both number of confederations and number of RIB-Atts. Some example values are:

- 0 confederations, empty RIB-Att only: 88 octets
- 0 confederations, 10 RIB-Atts: 638 octets
- 0 confederations, 30 RIB-Atts: 1738 octets
- 0 confederations, 50 RIB-Atts: 2838 octets
- 10 confederations, empty RIB-Att only: 298 octets
- 10 confederations, 10 RIB-Atts: 848 octets
- 10 confederations, 30 RIB-Atts: 1948 octets
- 10 confederations, 50 RIB-Atts: 3048 octets
- 20 confederations, empty RIB-Att only: 508 octets
- 20 confederations, 10 RIB-Atts: 1058 octets
- 20 confederations, 30 RIB-Atts: 2158 octets
- 20 confederations, 50 RIB-Atts: 3258 octets

Since this estimate is predicated upon simultaneous occurrence of several ″worst-case″ situations (maximum size for all NSAP prefixes, maximum size for all RDIs, and every RIB-Att contains 3 worst-case sized attributes), an upper limit of 3000 octets for the size of an OPEN PDU should be able to handle all practical cases of interest.

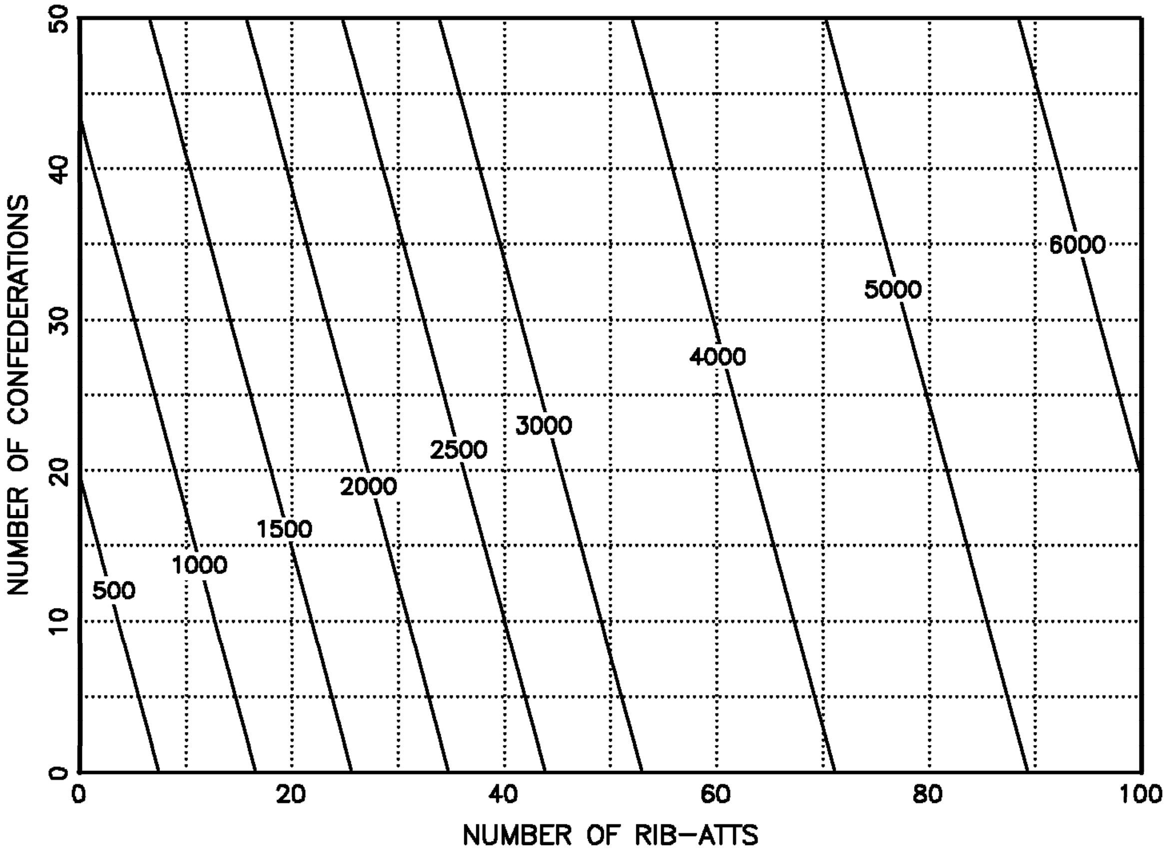

Figure 1. Worst-case Size of OPEN PDU. Lines of constant OPEN PDU size in octets are shown.