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BIER Underlay Path Calculation Algorithm and Constraints
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Abstract

This document specifies general rules for interaction between the BAR and IPA fields defined in [[I-D.ietf-bier-isis-extensions](#)] and [[I-D.ietf-bier-ospf-bier-extensions](#)].

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119](#).

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[1.](#) Terminologies

Familiarity with BIER protocols and procedures is assumed. Some terminologies are listed below for convenience.

[To be added].

[2.](#) Introduction

In the BIER architecture, packets with a BIER encapsulation header are forwarded to the neighbors on the underlay paths towards the BFERs. For each sub-domain, the paths are calculated in the underlay topology for the sub-domain, following a calculation algorithm specific to the sub-domain. The <topology, algorithm> could be congruent or incongruent with unicast. The topology could be a

default topology, a multi-topology [[RFC5120](#)] topology. The algorithm could be a generic IGP algorithm (e.g. SPF) or could be a BIER specific one defined in the future.

In [[I-D.ietf-bier-isis-extensions](#)] and [[I-D.ietf-bier-ospf-bier-extensions](#)], an 8-bit BAR field and 8-bit IPA field are defined to signal the BIER specific algorithm and generic IGP Algorithm respectively and only value 0 is allowed for both fields currently. This document specifies the general rules for the two fields and their interaction when either or both fields are not 0.

3. General Rules for the BAR and IPA fields

For a particular sub-domain, all routers SHOULD be provisioned with and signal the same BAR and IPA values. When a BFR discovers another BFR advertising different BAR or IPA value from its own provisioned, it MUST treat the advertising BFR as incapable of supporting BIER for the sub-domain. How incapable routers are handled is outside the scope of this document.

It is expected that both the BAR and IPA values could have both algorithm and constraints semantics. To generalize, we introduce the following terms:

- o BC: BIER-specific Constraints
- o BA: BIER-specific Algorithm
- o RC: Generic Routing Constraints
- o RA: Generic Routing Algorithm
- o BCBA: BC + BA
- o RCRA: RC + RA

A BAR value corresponds to a BCBA, and a IPA value corresponds to a RCRA. Any of the RC/BC/BA could be "NULL", which means there are no corresponding constraints or algorithm.

For a particular topology X (which could be a default topology or multi-topology topology) that a sub-domain is associated with, a router calculates the underlay paths according to its provisioned BCBA and RCRA the following way:

1. Apply the BIER constraints, resulting in BC(X).
2. Apply the routing constraints, resulting in RC(BC(X)).
3. Select the algorithm AG as following:

- A. If BA is NULL, AG is set to RA.
 - B. If BA is not NULL, AG is set to BA.
4. Run AG on RC(BC(X)).

3.1. When BAR Is Not Used

The BIER Algorithm registry established by [\[I-D.ietf-bier-isis-extensions\]](#) and also used in [\[I-D.ietf-bier-ospf-bier-extensions\]](#) has value 0 for "No BIER specific algorithm is used". That translates to NULL BA and NULL BC. Following the rules defined above, the IPA value alone identifies the calculation algorithm and constraints to be used for a particular sub-domain when BAR is 0.

4. IANA Considerations

No IANA Consideration is requested in this document.

5. Acknowledgements

The authors thanks Alia Atlas, Eric Rosen, Senthil Dhanaraj and many others for their suggestions and comments. In particular, the BCBA/RCRA representation for the interaction rules is based on Alia's write-up.

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