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Multiple Algorithm support for IS-IS Prefixes
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Abstract

This document specifies an extension to Intermediate System to Intermediate System (IS-IS) protocol by adding an Algorithm support for prefixes advertised. This allows multiple independent algorithm usage for computing the reachability of nodes and prefixes as opposed to only one algorithm.

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](#) [[RFC2119](#)].

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[1.](#) Introduction

Reachability of various nodes or prefixes attached to these nodes is done through Shortest Path First (SPF) algorithm as defined in [IS010589]. This is done today with in a single topology [[RFC5305](#)] [[RFC5308](#)] or in multi-topology (MT) routing [[RFC5120](#)] and with out any explicit advertisement of computation algorithm that is being used.

IS-IS Segment Routing (SR) extensions

[[I-D.ietf-isis-segment-routing-extensions](#)], extended the support for reachability computation for other algorithms other than SPF. This is done by advertising the computation algorithms supported at node level and also by advertising the algorithm being supported by Prefix Segment Identifier (SID) sub-TLV advertised in reachability prefixes.

While the above would give the flexibility to use different reachability computation algorithm than the SPF, it is restricted to one particular data plane as opposed to the prefix itself. This document removes that restriction and advertises the algorithm to be used for reachability computation in the prefix itself, thus applying

the same to any underlying data plane (E.g. SR-MPLS, SRH, IPv6, IPv4).

[Section 2](#) details the details of the sub-TLV and [Section 3](#) talks about how to use the same and restrictions around it.

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[1.1.](#) Acronyms

IGP	-	Interior Gateway Protocols
IS-IS	-	Intermediate System to Intermediate System
LSR	-	Link State Routing
MT	-	Multi Topology
OSPF	-	Open Shortest Path First
SID	-	Segment Identifier
SR	-	Segment Routing

[2.](#) IS-IS Route Computation Algorithm sub-TLV in prefixes

This section defines the encoding of Route Computation Algorithm (RCA) value that MUST be used while calculating the reachability to other nodes or to the prefixes attached to the other nodes. The RCA sub-TLV has the following format:

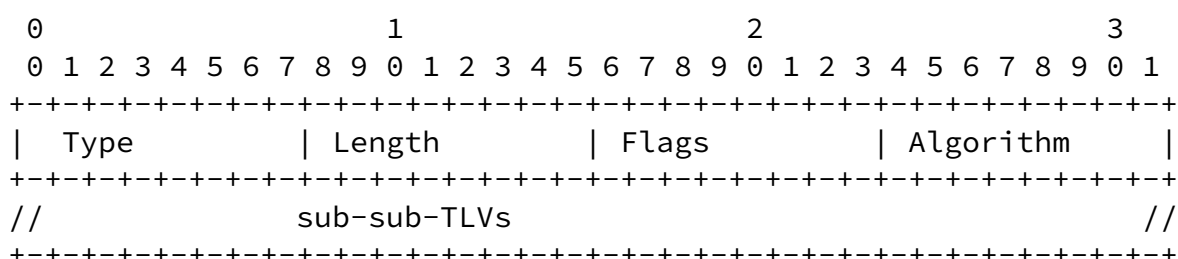


Figure 1: Route Computation Algorithm - sub-TLV Format

Type - TBD (IANA) from Sub-TLVs for TLVs 135, 235, 236, and 237 (Extended IP reachability, MT IP. Reach, IPv6 IP. Reach, and MT IPv6 IP. Reach TLVs) registry.

Length - Total length of the value field in bytes (variable).

Flags - TBD

Algorithm - Route Computation Algorithm value as defined in "IGP Algorithm Types" registry defined under "Interior Gateway Protocol (IGP) Parameters" IANA registries.

sub-sub-TLVs - Optional and can be used to specify any information w.r.t to the algorithm being advertised with this prefix (TBD).

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If multiple algorithms have to be advertised for the prefix, multiple instances of this sub-TLV with different algorithms can be used. If Algorithm value is '0' is the only algorithm on the prefix, it is optional to advertise it in this sub-TLV. Thus, not including such a sub-TLV in the prefix implies Algorithm value '0' capability only.

3. Elements of Procedure

When provisioned an IS-IS node MUST compute reachability for more than one algorithm as indicated in the reachability prefix through this sub-TLV.

Default metrics used for computation of any algorithm MUST be as defined in [[RFC5120](#)]. However, a particular algorithm can define other than default metrics and can be used while doing the computation. If non-default metrics are being used, those MUST be configured on the links and MUST be advertised through IS-IS Area/domain.

If a prefix is provisioned with multiple algorithms and after the reachability computation, nexthop is different for each algorithm it MUST use the lowest algorithm number to resolve the conflict.

Once computation is done with the specified algorithm, this is applicable to all the data planes that are being supported for the prefix. If a particular data plane specific 'algorithms' as defined is in [[I-D.ietf-isis-segment-routing-extensions](#)] conflict (for e.g. preference) with data plane independent prefix algorithm (as defined in this draft); preference defined in a particular data plane MUST be

used.

[3.1.](#) Single Topology or Multi-Topology Mode

An SPF trigger can be common to multiple IS-IS Levels or for multiple address families with multi-topologies. Currently there is no specified order for reachability computation today and it is implementation dependent. This document specifies the order of reachability computation MUST be IS-IS area/level, topology [[RFC5120](#)] and algorithm specified in the reachability prefix. Doing computation in a particular order is also important for avoiding micro-loops as described in [[I-D.ietf-rtgwg-spf-uloop-pb-statement](#)].

If network uses single topology mode with only IPv4 address family [[RFC 5305](#)] or in Single topology mode with IPv6 address family [[RFC 5308](#)] - a node configured with multiple algorithms MUST do route computation with all the algorithms as advertised in the prefixes. If network uses MT [[RFC 5120](#)], for each MT ID, per algorithm route computation MUST be done.

[4.](#) Acknowledgements

TBD.

[5.](#) IANA Considerations

This document requests IANA to assign a sub-TLV code point from the "Sub-TLVs for TLVs 135, 235, 236, and 237 (Extended IP reachability, MT IP. Reach, IPv6 IP. Reach, and MT IPv6 IP. Reach TLVs)" registry as follows: Route Computation Algorithm - Route Computation Algorithm sub-TLV as described in [Section 2](#).

TLV #	Name
TBD	Route Computation Algorithm sub-TLV in IS-IS Prefix TLVs

[6.](#) Security Considerations

Security concerns for IS-IS are addressed in [[RFC5304](#)] and [[RFC5310](#)]. Further security analysis for IS-IS protocol is done in [[RFC7645](#)] including analysis of both the above documents. Advertisement of the

additional information defined in this document introduces no new security concerns in IS-IS protocol.

7. References

7.1. Normative References

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