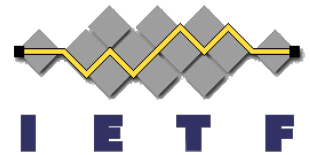# FLEX ALGO IN IP NETWORK
draft-bonica-lsr-ip-flexalgo
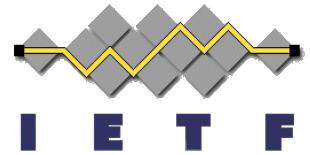# IETF 109

Ron Bonica, Juniper Networks
Shraddha Hegde, Juniper Networks
Parag Kaneriya, Juniper Networks
William Britto, Juniper Networks
Rajesh M, Juniper Networks
Peter Psenak, Cisco Systems

I E T F

Agenda

- Introduction
- Use cases
- Proposed Solution

Introduction

- IGP Flex-Algorithm computes constraint-based paths to SR-MPLS prefix segments and SRv6 locators

  - Therefore IGP Flex-Algorithms cannot be deployed in the absence of SR-MPLS and SRv6

- This draft extends IGP Flex-Algorithm, allowing it to compute constraint-based paths to IPv4 and IPv6 prefixes

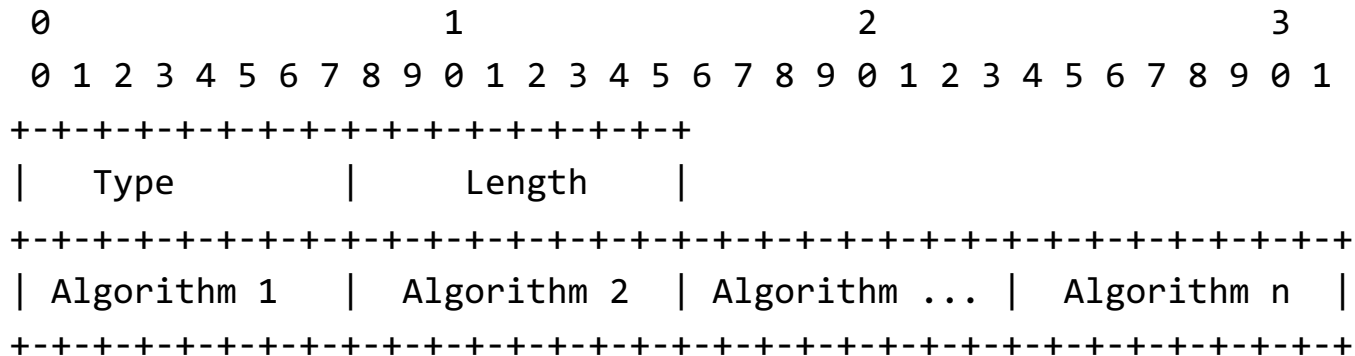 - So Flex-Algorithms can be deployed in the absence of SR-MPLS and SRv6
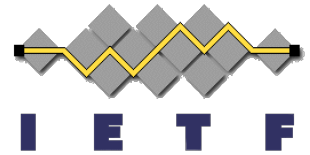
Egress Node Procedures

- Loopback interface is associated with one more IP addresses

- Each loopback address is associated with an IP flex-algo

- If packet sent to a loopback address associated with flex-algo, it follows the constraint-based path calculated by that flex-algo

  - Otherwise, the packet follows the IGP least-cost path

4

Advertising IP Algorithms
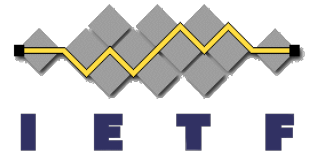
- Each participating node advertises an IP Algorithm sub-tvl

  - Router capability in ISIS
  - Router information LSA in OSPF

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    Type       |    Length     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Algorithm 1   | Algorithm 2   | Algorithm ... | Algorithm n   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Advertising Flex-Algorithm Definitions (FAD)
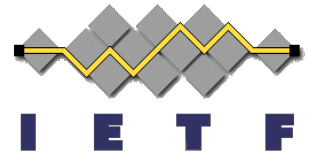
- All routers participating in IP-flex algo must agree on the FAD

- Selected nodes within the IGP domain advertise FADs

- We can leverage FAD protocol machinery from Sections 5, 6 and 7 of I-D.ietf-lsr-flex-algo

6

Advertising IP Flex-algo reachability TLVs

- Associate IP/IPV6 prefix with flex-algo, new TLVs are define in ISIS

  - ➢ IPV4 Algorithm prefix reachability TLV
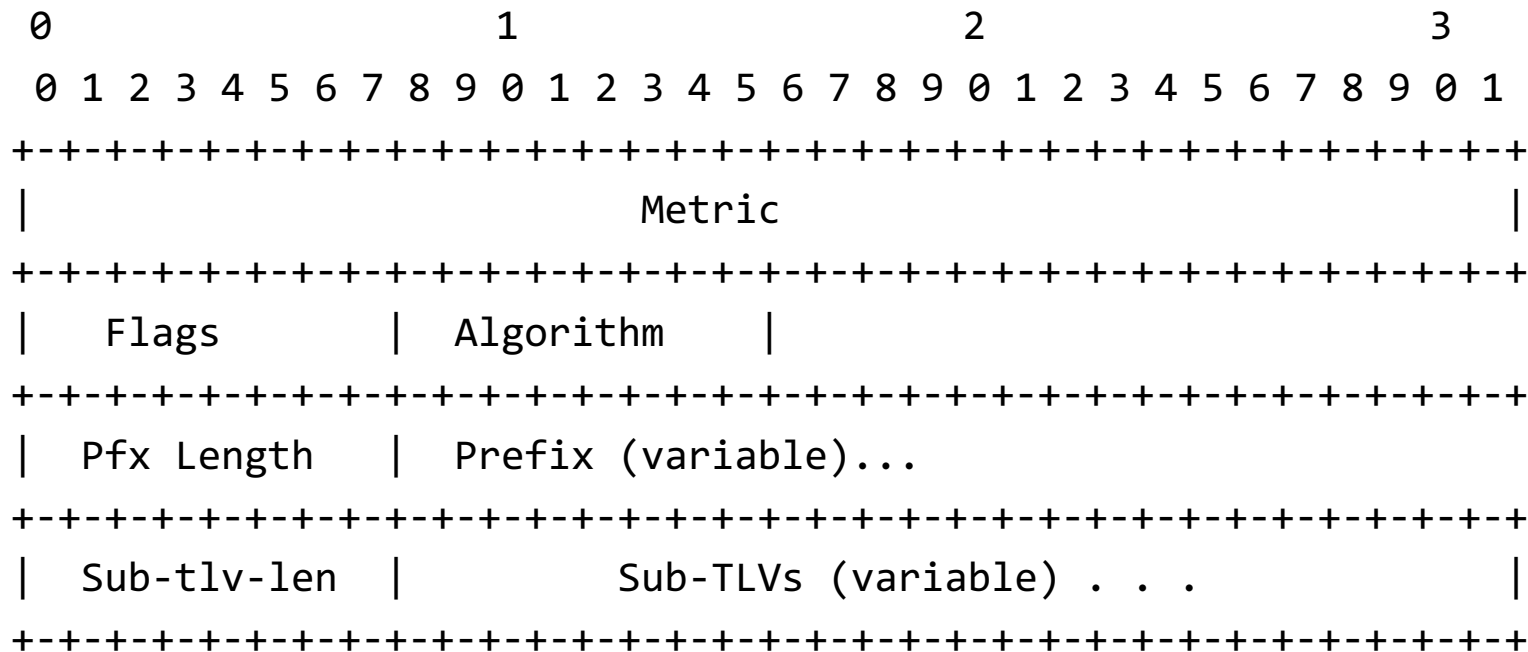 - ➢ IPV6 Algorithm prefix reachability TLV
  - ➢ These TLVS share the sub-TLV space define for TLV 135,235,236,237 (not all sub-TLVs are applicable)

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             Metric                            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    Flags      |   Algorithm    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Pfx Length   |  Prefix (variable)...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Sub-tlv-len  |        Sub-TLVs (variable) . . .             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
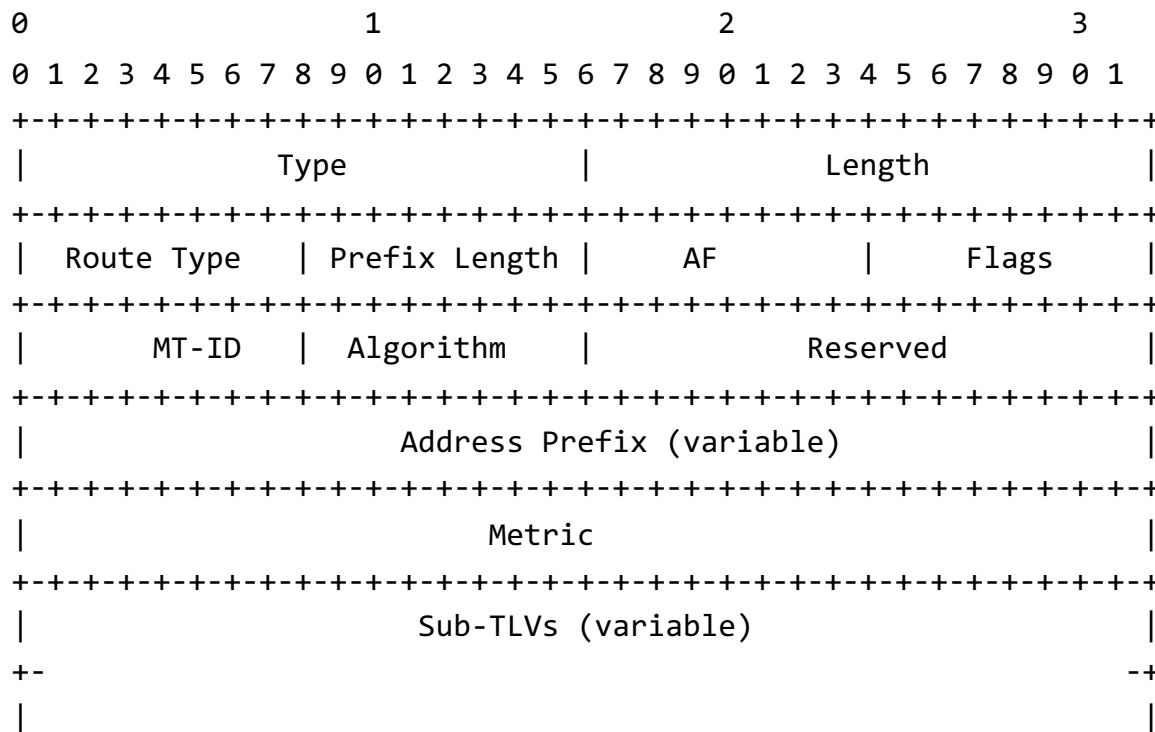
Note: ISIS TLV for illustration purpose.

# Advertising IP Flex-algo reachability Continue….

- Associate IP/IPV6 prefix with flex-algo, new TLVs are define in OSPF
  - IPV4 Algorithm prefix reachability TLV (OSPFv2)
- OSPFv2 IP Algo Prefix reachability TLV
  - Advertise via TOP level TLV in OSPFv2 Extended prefix Opaque LSA.

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|              Type             |             Length            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Route Type   | Prefix Length |       AF      |     Flags     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|    MT-ID      |   Algorithm   |            Reserved           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    Address Prefix (variable)                  |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                           Metric                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    Sub-TLVs (variable)                        |
+-                                                             -+
|                                                               |
```
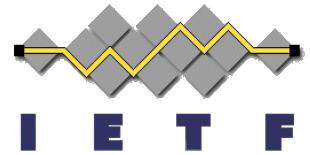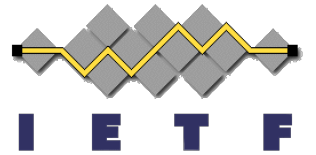
Calculating IP flex algo path
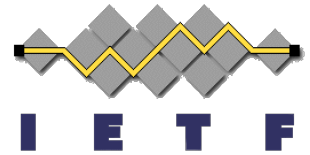
- IP flex algorithm is yet another application of flex-algorithm

- It follows the same procedures for calculating path (Section 10 and 11 of I-D.ietf-lsr-flex-algo).

- For computing path to node, it must use IP flex algo participation and it is independent of any other flex algo (SR and SRV6).

- LFA can be used to protect constraint-based paths

Next steps

- Call for adoption

Thank you