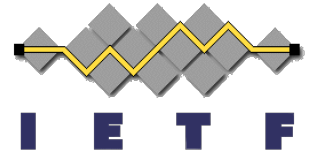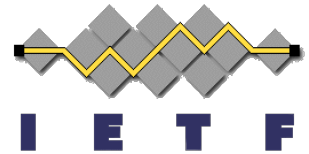# Generic Metric extensions for AIGP attribute
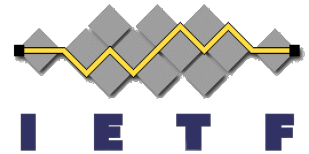## draft-ssangli-idr-bgp-generic-metric-aigp-07
IETF 118

Srihari Sangli, Juniper Networks
Shraddha Hegde, Juniper Networks
Reshma Das, Juniper Networks
Bruno Decraene, Orange
Bin Wen, Comcast
Mozak Kozak, Comcast
Jie Dong, Huawei
Luay Jalil, Verizon
Ketan Talaulikar, Cisco

I E T F

Agenda

- Recap

- Updates to the draft

- Deployment options

- Next steps

Recap

- Operator may provision intent-based end-to-end path across multiple AS domains
  - Need metrics beyond IGP-default, e.g. delay, bandwidth, administratively assigned metric-types.
- AIGP attribute defined in RFC7311 can carry default IGP-Metric
  - 1 TLV defined - AIGP TLV carries the default IGP cost
- Extensions to AIGP attribute to carry Generic-metric TLV
  - metric-type and metric-value sub-fields map to IGP metric-type registry
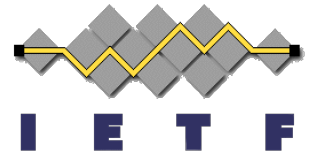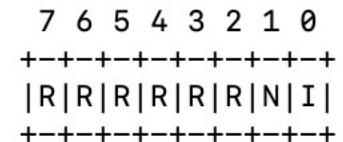
Updates to 05 version (1/3)

- Introduces metric-flags sub-field

```
0                   1                   2                   3
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 2
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |                Length             | metric-type |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| metric-flags| metric-value                                    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+........................
```
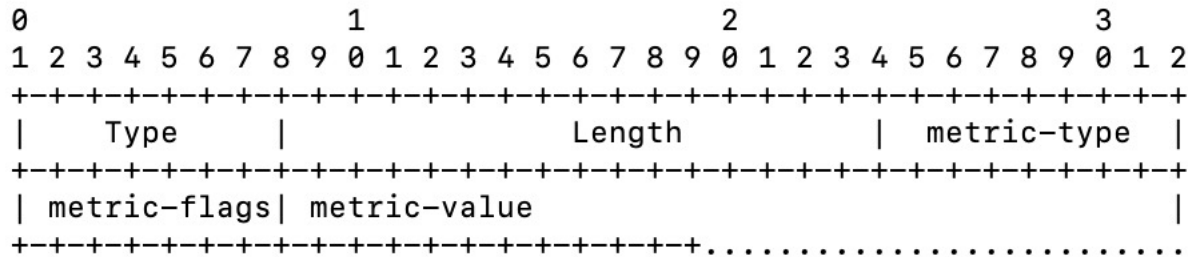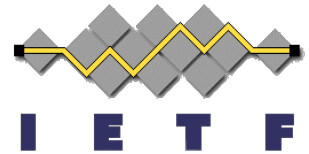
  - The flags indicate Continuity and Normalization
    - I – indicates Incomplete or discontinuous
    - N – indicates that metric-value has been normalized
    - R – Reserved for future use

```
7 6 5 4 3 2 1 0
+-+-+-+-+-+-+-+-+
|R|R|R|R|R|R|N|I|
+-+-+-+-+-+-+-+-+
```

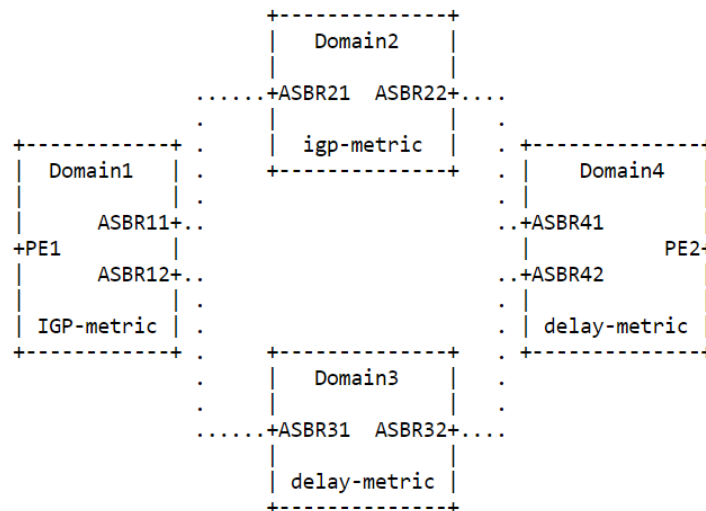- Multiple Generic-Metric TLVs can be sent by originator to express the intent

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Updates to 05 version (2/3)

- Originating BGP speaker
  - Set metric-flags I=0 & N=0

- Non-originating BGP speaker
  - Before propagating to peers, update metric-flags
    - I=1 if metric-type is unrecognized
    - N=1 if intra-domain IGP cost was normalized

- Updates to Section 4 RFC7311 Decision Process for tie breaker between two routes with Generic-Metric TLV
  - Prefer route with "I=0" over "I=1", meaning prefer complete accumulation over incomplete accumulation of end-to-end metric
  - Prefer route with "N=0" over "N=1" routes, meaning prefer non-normalized over normalized metric

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Updates to 05 version (3/3)
Deployment use case3

Router along the path does not understand new metric-type

```
                     +--------------+
                     |   Domain2    |
                     |              |
             .......+ASBR21  ASBR22+....
+------------+ .    |              |   . +--------------+
|  Domain1   | .    |  igp-metric  |   . |   Domain4    |
|            | .    +--------------+   . |              |
|     ASBR11+..                        ..+ASBR41        |
+PE1         |                           |          PE2+
|     ASBR12+..                        ..+ASBR42        |
|            | .                       . |              |
| IGP-metric | .                       . | delay-metric |
+------------+ .    +--------------+   . +--------------+
              .     |   Domain3    |   .
              .     |              |   .
             ......+ASBR31  ASBR32+....
                    |              |
                    | delay-metric |
                    +--------------+
```

- domain1, domain2 use igp-metric
- domain3, domain4 use delay-metric

- Domain2 does not understand delay-metric and ASBR21 sets "I" bit of metric-flags
- PE1 will have 2 paths, Prefer complete over incomplete path.
  - Metric complete accumulation via Domain3
  - Metric incomplete accumulation via Domain2

6
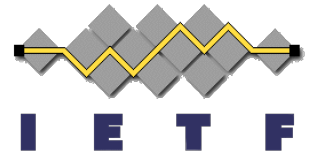
Issue

- ## At least few different interpretations of RFC7311
  - Some vendors propagate AIGP TLV and drop unrecognized TLV
  - Some vendors update AIGP TLV with metric-type other than default IGP-metric
  - Some vendors do not propagate AIGP attribute if AIGP TLV is missing even if Generic-Metric TLV is present
  - May be more..

- ## The Continuity bit will not solve all scenarios
  - A router along the path does not recognize Generic-Metric TLV, does not update value and flags, yet will propagate AIGP attribute
  - Receiving router cannot determine the metric continuity
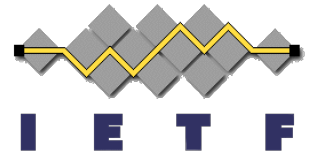
Options for deployed networks

Option1: Current AIGP attribute with Generic-Metric TLV

- Issue: The continuity bit does not provide deterministic behavior

- Solution: Upgrade all routers that modify next hop along the path

Option2: New AIGPv2 as optional & non-transitive attribute
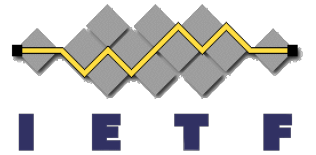
- Generic-Metric TLV only in AIGPv2

- Upgrade all routers including Route Reflectors

  - If any router along the path is not upgraded, it drops AIGPv2 hence deterministic

- Continuity bit will provide deterministic behavior in all scenarios
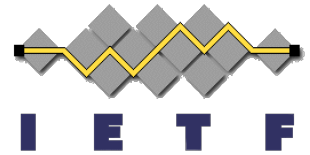
Next Steps

- Request review and comments

Thank you