Generic Metric extensions for BGP
draft-ssangli-idr-bgp-generic-metric-09

IETF 120

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Agenda

- Recap
- Updates to the draft
- Next steps
End-to-End Intent-aware path

- Operator may provision intent-based end-to-end path across multiple AS domains, under common administration
  - Metric for end-to-end path apart from IGP-default, e.g. delay, bandwidth, administratively assigned metric-types cater various service requirements
- Issues with AIGP (RFC7311)
  - AIGP attribute defined in RFC7311 specifies AIGP TLV to carry default IGP-Metric only
  - Different interpretations of RFC7311 deployed today
  - Discontinuous paths undetected if AIGP were extended to support additional metric types.
- Network operations can benefit with alignment of metric type & value with IGP registry

Path1: cost=a+b+c+d
Path2: cost=a+e+g

All routers understand new metric except R4
Changes in draft-09 (1 of 5)

1. Generic Metric in NHC

   • Next Hop Capability attribute
     - Optional & transitive
     - Provides next hop level scoping
     - Details in draft-ietf-idr-entropy-label

   • Accumulated Metric (AMetric) in NHC
     - Metric type matches with IGP Protocol registry
     - Metric flags supports bits to indicate discontinuity & normalization

Next Hop Capability:

```
<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
<th>Usage of Attribute Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>Accumulated Metric Code</td>
<td>Set to 1 for Discontinuous path</td>
</tr>
<tr>
<td>2-3</td>
<td>Accumulated Metric Length</td>
<td>Set to 1 if metric was normalized</td>
</tr>
<tr>
<td>4-8</td>
<td>Accumulated Metric Data</td>
<td>For future use</td>
</tr>
</tbody>
</table>
```

Accumulated Metric Data:

```
<table>
<thead>
<tr>
<th>Bit</th>
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<th>Usage of Attribute Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>Metric-type</td>
<td>Set to 1 for Discontinuous path</td>
</tr>
<tr>
<td>2-3</td>
<td>Metric-flags</td>
<td>Set to 1 if metric was normalized</td>
</tr>
<tr>
<td>4-8</td>
<td>Metric value</td>
<td>For future use</td>
</tr>
</tbody>
</table>
```
2. AMetric procedures (draft clarifies and states explicitly)

- If intent is expressed via multiple metric types, the originator router may add more than one AMetric each carrying unique metric.
- For each AMetric, the non-originator router (that modifies next hop) must perform the following
  - Retain received AMetric and update it during reconstruction of NHC
  - Accumulate the metric value with cost to next hop, normalizing the value if metric-type does not match.
  - Regarding metric flags, set “D” to 1 if metric-type is not understood. Set ”N” to 1 if metric normalization was done
3. Handling discontinuity

- Three types of discontinuity
  - Type-A: Router does not support NHC
  - Type-B: Router does not support AMetric
  - Type-C: Router does not support the type of metric representing the end-to-end intent

- NHC attribute and AMetric procedures help detect discontinuity for end-to-end path deterministically
  - Type-A and Type-B handled by NHC procedures
  - Type-C handled by AMetric procedures
4. Best path computation when paths have different metric types

- AMetric (with IGP-default metric) can be compared with AIGP (with IGP-default metric)
- Among paths having AMetric, lower metric-type wins to break the tie
- Implementations should support local policy to specify or override the preferences
5. Deployment considerations

- Discontinuity checks help prevent inadvertent usage of AMetric.
  - AS border routers that support AMetric/base NHC, must filter AMetric at common administration AS boundary
  - If not, the NHC (& AMetric) will leak into neighboring ASes
    - Unless manually filtered
    - or until it reaches an ASBR supporting either AMetric or base NHC
    - NHC detects the leak, filters it and prevents the usage of AMetric by a AMetric capable router

- Ingress router may enforce a policy to handle discontinuous paths
  - Discard / Low preference / Tie-breaker

- All routers in a domain must use AMetric in best path computation unless tunnelling is used to reach the next hop.
Next Steps

- WG adoption is ongoing
  - Comments welcome
draft-ietf-idr-entropy-label

- Capability is misleading (as seen on IDR list)
  - Request authors to consider renaming Capability → Characteristics
Thank you