Generic Metric extensions for AIGP attribute

draft-ssangli-idr-bgp-generic-metric-aigp-07

IETF 119

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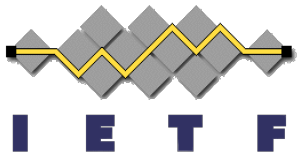


Agenda

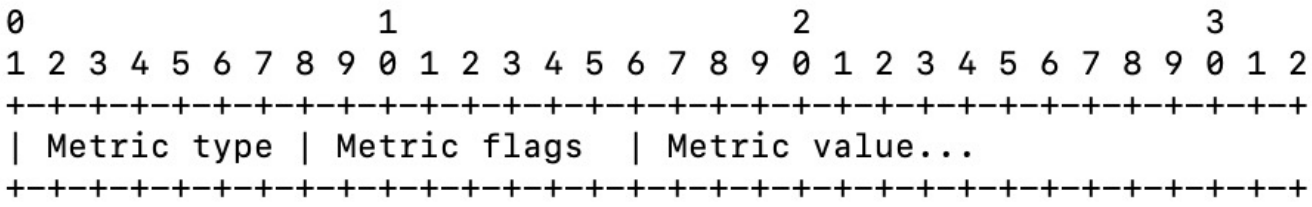
- Recap of Problem statement
- Generic Metric Capability Proposal
- Deployment considerations
- Next Steps

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.
  - Alignment of metric type & value with IGP registry.
- AIGP attribute defined in RFC7311 specifies AIGP TLV to carry default IGP-Metric
- Different interpretations of RFC7311 deployed today
- AIGP attribute suffers from attribute scoping and metric discontinuity.

Generic Metric Encoding

- Generic Metric Capability encodes the following
  - metric type as per IGP metric registry
  - metric flags indicates metric manipulation along the path
  - metric value is the accumulated cost of the path



The metric-flags indicate Discontinuity and Normalization

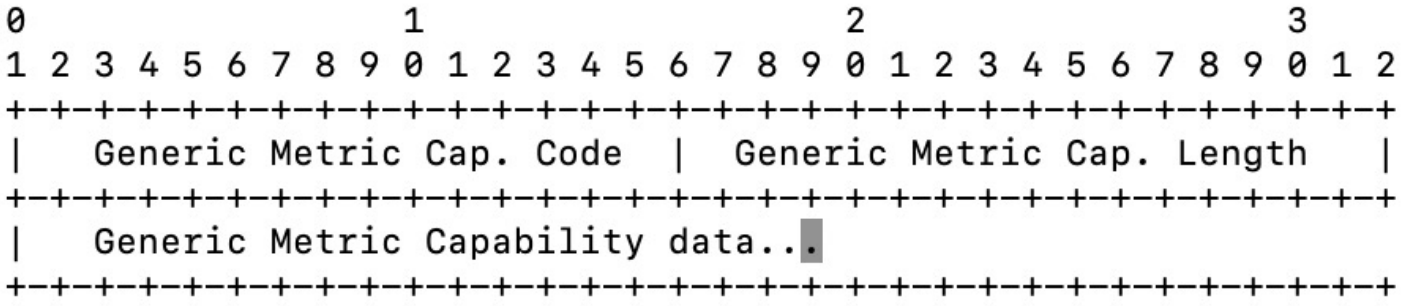
Bit 0 : D: if set, indicates discontinuous path

Bit 1 : N: if set, indicates that metric-value has been normalized

Bit 2-7: R: Reserved for future use

Generic Metric in NHC

- Generic Metric TLV as a new capability in NHC attribute



Generic Metric Capability Code assigned as per draft-ietf-idr-entropy-label.

- Multiple metric types can be encoded in NHC attribute

Why NHC

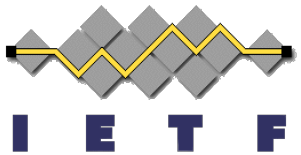
- Why NHC ? draft-ietf-idr-entropy-label
  - Provides next hop-based attribute scoping
- NHC an optional transitive attribute
  - Eases the deployment, operational benefits
- NHC Attribute scoping helps in determining discontinuity for e2e generic metric
  - 1st order discontinuity
    - Sending router does not support NHC, it fails to update next hop
    - Receiving router finds the discontinuity through next hop validation
  - 2nd order discontinuity
    - Sending router supports NHC, but not Generic Metric capability
    - It will drop the Generic Metric capability when NHC is reconstructed
  - 3rd order discontinuity
    - Sending router supports NHC and Generic Metric capability but does not support a specific generic metric type
    - It can reconstruct Generic Metric capability to carry additional information indicating discontinuity of that specific generic metric type

Leverage NHC

- Next Hop Dependent Capabilities
  - Intent expressed via one or more metric types.
  - The metric value is referenced during next hop reachability evaluation and cumulative cost computation.

- NHC procedures
  - Originator of the route encodes the advertised next-hop in NHC
  - Non-originator of the route that does not modify the next hop will propagate all NHC capabilities
  - Non-originator of the route that modifies the next hop, updates the next hop field and reconstructs the attribute refreshing the capabilities
  - Receiver accepts the route if the next hop field in NHC matches with next hop advertised, processes the capabilities

Generic Metric Capability Origination Procedures (1/2)



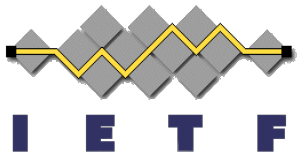
Originator of the route

- Add the next-hop as per NHC rules
- Add Generic Metric Capability to NHC attribute
  - Encode the intent as one or more metric types and metric value
  - Set D=0, N=0 in metric flags field

Non-originator of the route that does not modify next hop

- Will propagate NHC as is
- No change to Generic Metric Capability

Generic Metric Capability Origination Procedures (2/2)



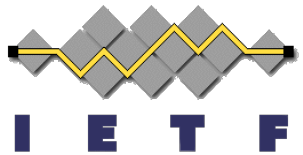
Non-originator of the route that modifies the next hop

- Updates the next hop field
- Retains the Generic Metric Capability and all metric types

- For each unrecognized metric type
  - D=1 will be set in TLV's metric flags field
  - Discontinuous path of 3rd order. Solution : Deal with this at ingress via policy

- For each recognized metric type
  - If local domain's metric type matches with TLV's metric type
    - Local cost to next hop is added to TLV's metric value field
  - If local domain's metric type doesn't match with TLV's metric type
    - Local cost to next hop is normalized before adding to TLV's metric field
    - N=1 will be set in TLV's metric flags field

Generic Metric Capability Receiver Procedures



Receiver of the route

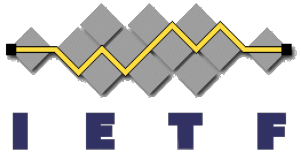
- NHC's Next hop field not equal to the advertised next hop
  - Entire NHC Attribute including Generic Metric Capability ignored
  - Discontinuous path of 1st order. Solution: Upgrade

- NHC's next hop field equal to advertised next hop, use accumulated cost during best path computation
  - Local domain metric type matches with TLV ? TLV's metric value is added to next hop's local cost
  - Local domain metric type does not match with TLV ? TLV's metric value is added to normalized non-zero local cost to next hop

- If the route is re-advertised, it will follow Non-Originator rules

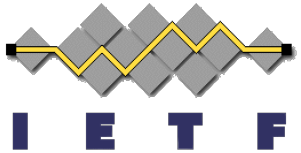
Deployment considerations

- NHC deployment in domain is needed. Scoping check is a must.
- Generic Metric TLV carrying IGP default cost and AIGP carrying IGP default cost can co-exist.
  - Metric types are comparable and hence lowest cumulative cost wins
- A router that modifies next hop should carry forward the Generic Metric capability when it reconstructs NHC.
  - This enables intent propagation end-to-end
  - Indicate normalization and discontinuity for each metric type where it is applicable
- Ingress router can enforce policy to handle discontinuous paths
  - Discard them
  - Put low preference
  - Use as tie-breaker



Next Steps

- Comments welcome!
- Requesting for WG adoption



Thank you