Multi-Cost ALTO

draft-randriamasy-alto-multi-cost-08

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Motivation – use cases

- Use multiple selection metrics for endpoints and e2e paths
  - To jointly meet application needs while keeping network awareness
    - E.g. by ***jointly*** getting 'routingcost' meeting NP interests and 'bandwidth score' meeting app interests
- Save time and bandwidth on ALTO requests
  - 1 Multi-Cost transaction on N metrics rather than N on 1 metric
  - 1 Multi-Cost Map is smaller than N Cost Maps
- Consistency of metric values
  - Different cost-types may change at different paces
  - For multi-variate optimization
- Enrich filtering constraints to represent compromises, e.g.
  - *select paths with moderate 'routingcost' OR null 'hopcount'*

Design

- Requests and responses convey an Array of cost-metrics and values
  - New member: ‘cost-types’
  - Array may contain any Cost Mode combination
    - Requested Cost-types array

      ```
      ["num-routingcost", "ord-hopcount", "calendar-
        quarterlyvalue", "string-status"]
      ```

    - Taking values:

      ```
      [23, 6, [2, 5, 4, 1], "medium"]
      ```

  - **RULE**: cost values for each Source/Destination pair MUST be provided in the same order as in the array of Cost Types

Design

- Suggested new properties and costs
  - Aggregate values with or without units
    - EP-Nominal Memory, EP-Nominal Bandwidth
    - EP Occupied memory, EP Occupied bandwidth,
    - Path Occupation Cost, // or Bandwidth Score,

- Multi-Cost filtering constraints
  - Combine AND and OR operators
  - Are applied to cost-types present in value request
    - NOTE: [draft-lee-alto-app-net-info-exchange] proposes to use constraints on metrics not present in value request

Example request for filtered MC Map - § 6.3.8

Filtering: ‘

- OR-Constraints: (‘routingcost’ > 5 AND <10) OR (‘hopcount’ = 0)
- From ["PID1", "PID2"] to ["PID1", "PID2", "PID3"]

```
POST /multi/multicostmap/filtered HTTP/1.1
Host: alto.example.com
Content-Type: application/alto-multicostmapfilter+json
Accept: application/alto-multicostmap+json,application/alto-error+json

{
   "cost-types" : [
      {"cost-mode": "numerical", "cost-metric": "routingcost"},
      {"cost-mode": "numerical", "cost-metric": "hopcount"}
   ],
   "or-constraints" : [ ["[0] ge 5", "[0] le 10"],
                        ["[1] eq 0"] ]
   "pids" : {
     "srcs" : [ "PID1", "PID2" ],
     "dsts" : [ "PID1", "PID2", "PID3" ]
   }
}
```

Example response – filtered MC Map § 6.3.8

```
HTTP/1.1 200 OK
Content-Length: [TODO]
Content-Type: application/alto-multicostmap+json

{
"meta" : {
  "dependent-vtags" : […],
  "cost-types" : [
    {"cost-mode": "numerical", "cost-metric": "routingcost"},
    {"cost-mode": "numerical", "cost-metric": "hopcount"}]
  }

"multi-cost-map" : {
  "PID1": { "PID2": [5,23], "PID3": [10,5] },
  "PID2": { "PID2": [1,0]                  }
 }
}
//RULE: Source/Destination pairs for which the Path Costs do not
   meet the constraints MUST NOT be included in the returned Cost
   Map
```

Discussion

- Filtering constraints
  - can be extended to have constraints on cost-types not present in the value request
- New field: cost-types

THANK YOU