

Paths Extension for the ALTO Protocol

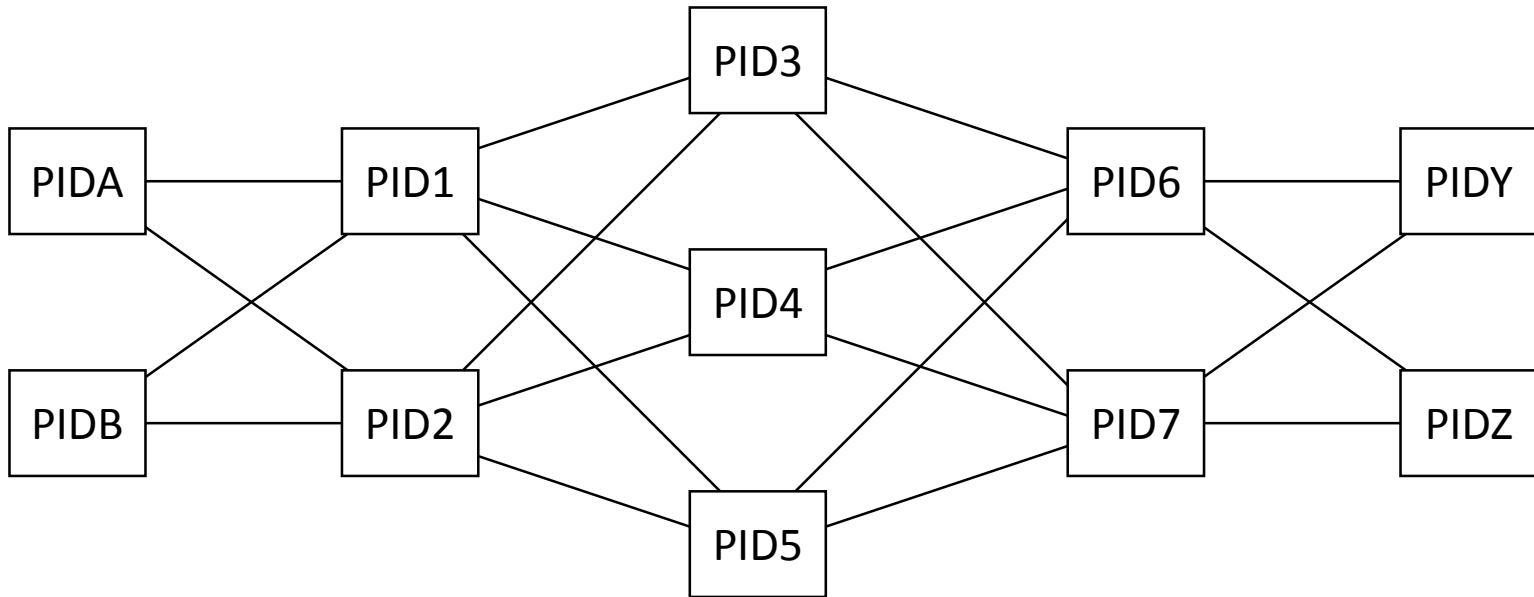
draft-wydrych-alto-paths-00

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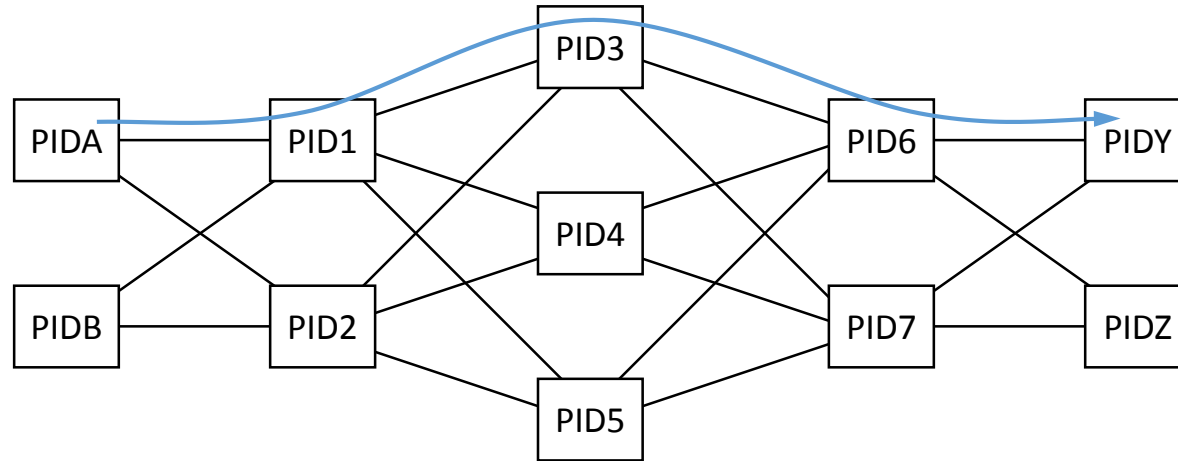
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Motivation

- A number of paths between source and destination



Motivation



- $\text{Cost}[\text{PIDA}, \text{PIDY}]$ (via: PID1, PID3, PID6)
 $\neq \text{Cost}[\text{PIDA}, \text{PID1}] + \text{Cost}[\text{PID1}, \text{PID3}]$
 $+ \text{Cost}[\text{PID3}, \text{PID6}] + \text{Cost}[\text{PID6}, \text{PIDY}]$
- E.g., $C[\text{PID1}, \text{PID3}]$ is a cost of sending traffic originating in PID1 and destined for PID3, not a cost of transiting traffic

Use-cases

- MPLS + RSVP-TE, LISP
 - Assistance in tunnel creation/selection
- CDNs
 - Assistance in replication
- SFC
 - Assistance in selection of virtualized NFs

ID-wydrych-alto-paths-00

- Introduces PPID – Provider-defined Path ID
 - Name follows PID reqs & begins with “path.”
 - Is made of PIDs
 - Nesting is OK, circular dependencies are not OK
- Extends network & cost maps service (incl. map filtering) and endpoint cost service
- Introduces path computation service

Network Map

```
"network-map": {  
  "PIDA": { "ipv4": [ "192.0.2.0/25" ] },  
    :      :      :      :  
  "PIDZ": { "ipv4": [ "203.0.113.128/25" ] },  
  "path.1-3-6": [ "PID1", "PID3", "PID6" ],  
  "path.1-4-7": [ "PID1", "PID4", "PID7" ],  
  "path.2-5-7": [ "PID2", "PID5", "PID6" ],  
  "path.1-3-6-Y": [ "path.1-3-6", "PIDY" ],  
  "path.1-3-6-Z": [ "path.1-3-6", "PIDZ" ],  
  "path.1-4-7-Z": [ "path.1-4-7", "PIDZ" ],  
  "path.2-5-7-Z": [ "path.2-5-7", "PIDZ" ]  
}
```

nesting

Cost Map

```
"cost-map": {  
  "PIDA": { "PIDY": 50, "PIDZ": 100,  
    "path.1-3-6-Y": 10,  
    "path.1-3-6-Z": 15,  
    "path.1-4-7-Z": 10,  
    "path.2-5-7-Z": 20 },  
  "PIDB": { "PIDY": 75, "PIDZ": 125,  
    "path.1-3-6-Y": 20,  
    "path.1-3-6-Z": 30,  
    "path.1-4-7-Z": 25,  
    "path.2-5-7-Z": 20 }  
}
```

"PIDB":

source is a key,
PPID does not
contain source

any path
(best effort?)

using known path

Endpoint Cost Service (Request)

```
"endpoints": {  
  "srcs": [ "ipv4:192.0.2.129" ],  
  "dsts": [  
    "ipv4:203.0.113.129",    any path (best effort?)  
    [  
      "ipv4:198.51.100.1",  
      "ipv4:198.51.100.3",    using known path  
      "ipv4:198.51.100.6",  
      "ipv4:203.0.113.129"  
    ]  
  ]  
}
```


Endpoint Cost Service (Response)

```
"endpoint-cost-map": {  
  "ipv4:192.0.2.129": {  
    "ipv4:203.0.113.129": 125,  
    "ipv4:198.51.100.1": {  
      "ipv4:198.51.100.3": {  
        "ipv4:198.51.100.6": {  
          "ipv4:203.0.113.129": 30  
        }  
      }  
    }  
  }  
}
```

any path
(best effort?)

using known path

Path Computation Service (Request)

```
"endpoints": [  
  [ "ipv4:192.0.2.129" ],  
  [ "ipv4:198.51.100.1" ],  
  [ "ipv4:198.51.100.3", "ipv4:198.51.100.4" ],  
  [ "ipv4:198.51.100.6", "ipv4:198.51.100.7" ],  
  [ "ipv4:203.0.113.128.129" ]  
]
```

- To compose a path – pick exactly one endpoint from each list (order matters!)

Path Computation Service (Response)

```
"computed-paths": [  
  {  
    "path": [  
      "ipv4:192.0.2.129",  
      "ipv4:198.51.100.1",  
      "ipv4:198.51.100.3",  
      "ipv4:198.51.100.6",  
      "ipv4:203.0.113.128.129"  
    ],  
    "cost": 30  
  }, ...  
]
```

General Considerations

- Do you see need for such an extension?
 - Seems to be compatible with multi-cost & updates
- TODOs
 - Path computation service – this or separate draft?
 - Work on encoding. **Definitely** it can be improved
 - Define JSON objects (like in RFC7285)