



IETF Hackathon

**ALTO Transport Information Publication
Service (TIPS)**

IETF 116

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Yokohama, Japan



Hackathon Plan

- Provide a reference implementation of ALTO Transport Information Publication Service (TIPS) in OpenALTO framework
- Deploy a living demo in National Research Platform (NRP) Kubernetes cluster
- Documents
 - <https://datatracker.ietf.org/doc/draft-ietf-alto-new-transport/>

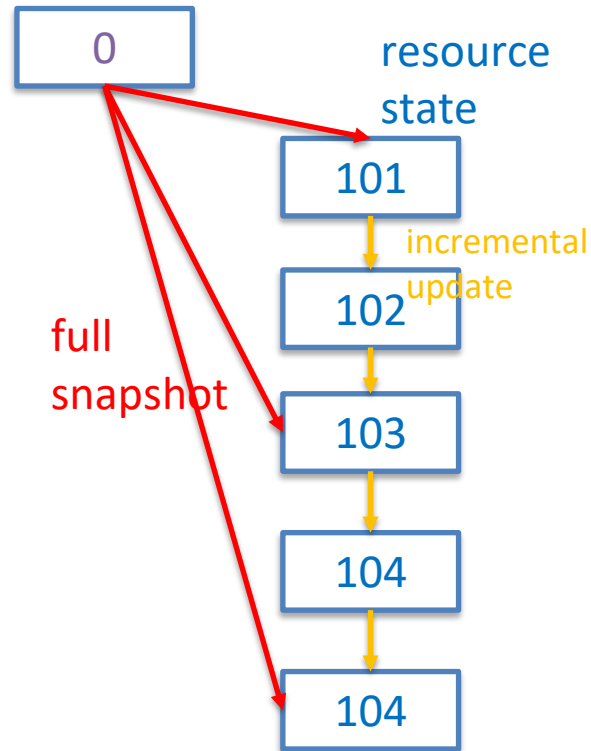
ALTO TIPS Implementation

- Basic idea
 - Store *version history* of subscribed ALTO information resource in *persistent database*
 - Maintain the *updates graph* of information changes in *Zookeeper Data Directory*
 - Extend ALTO to support *TIPS* as a frontend to subscribe/unsubscribe/get updates of ALTO information resource

ALTO TIPS Implementation

- Updates Graph

reserved for initial empty state



```
→ curl -s -u cern:lhcone -k https://localhost:8443/tips/dynamic-networkmap/9e688c58a5487b8eaf69c9e1005ad0bf/meta/ug | jq .
```

```
{
  "updates-graph": {
    "0": {
      "101": {
        "media-type": "application/alto-networkmap+json",
        "tag": "b78902ba90985182917c9c24cd21a20d72218556",
        "size": 287
      },
      "103": {
        "media-type": "application/alto-networkmap+json",
        "tag": "bbe642da2ed7721be66c2f191ca592aecedcb5fcd",
        "size": 305
      },
      "105": {
        "media-type": "application/alto-networkmap+json",
        "tag": "b9b75fe42aae0478f1d79d2a32be1568f6511690",
        "size": 254
      }
    }
  }
}
```

Metadata summary of the update graph

```
→ curl -s -u cern:lhcone -k https://localhost:8443/tips/dynamic-networkmap/9e688c58a5487b8eaf69c9e1005ad0bf/meta/ug/101/102 | jq .
```

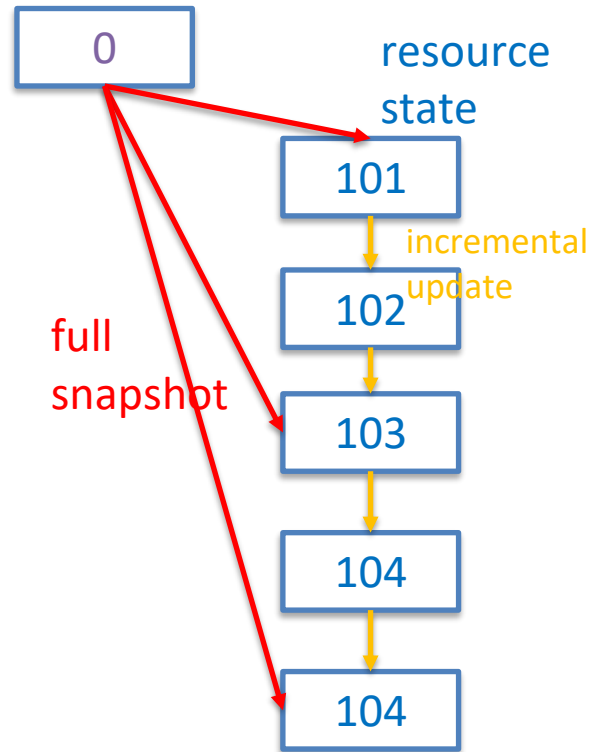
```
{
  "updates-graph": {
    "101": {
      "102": {
        "media-type": "application/merge-patch+json",
        "tag": "d72ffd564ee651ddf63d5c3d02f86568f02e17d7",
        "size": 157
      }
    }
  }
}
```

Metadata of a specific edge of the updates graph

ALTO TIPS Implementation

- Incremental Update

reserved for initial empty state



```
/tips/dynamic-networkmap/9e688c58a5487b8eaf69c9e1005ad0bf/ug/101/102
```

```
* curl -s -D - -u cern:lhcone -k https://localhost:8443/tips/dynamic-networkmap/9e688c58a5487b8eaf69c9e1005ad0bf/ug/101/102
HTTP/1.1 200 OK
Server: nginx/1.15.5
Date: Sun, 26 Mar 2023 02:02:40 GMT
Content-Type: application/merge-patch+json
Content-Length: 147
Connection: keep-alive
Allow: GET, HEAD, OPTIONS
X-Frame-Options: DENY
Vary: Cookie
X-Content-Type-Options: nosniff
Referrer-Policy: same-origin
Cross-Origin-Opener-Policy: same-origin

{"meta":{"vtag":{"tag":{"dafb9c1b9a78d00ab6896c09b8e350f727fd966c"}}, "network-map":{"PID2":null, "PID1":{"ipv4":["192.0.2.0/24", "198.51.100.0/24"]}}}}
```

Incremental updates in JSON
Merge Patch format

ALTO TIPS Deployment

- Docker-based deployment

```
→ docker ps --format 'table {{.ID}}\t{{.Image}}\t{{.Names}}'
```

CONTAINER ID	IMAGE	NAMES	
c2153f981ba2	openalto/alto	alto-alto-lg-agent-1	→ ALTO Data Source Agent
8065edaa8f23	redis	alto-alto-db-1	→ Persistent Database
2c93a598ded3	openalto/alto	alto-alto-cric-agent-1	→ Another ALTO Data Source Agent
1d6549420de4	zookeeper	alto-zoo2-1	
5f6b5901e492	zookeeper	alto-zoo1-1	→ Zookeeper Data Directory
7908dea7cbb8	zookeeper	alto-zoo3-1	
f3e954349419	openalto/alto	alto-alto-frontend-1	→ Core of ALTO server
9a7ea8144168	nginx	alto-gateway-1	→ Gateway

A demo server will be running and accessible at NRP cluster (<https://alto.nrp-nautilus.io/>) during Hackdemo Happy Hour

What got done and not

- Specification of ALTO TIPS (<https://datatracker.ietf.org/doc/draft-ietf-alto-new-transport/>)
 - ALTO Information Resource Directory (IRD) entry for TIPS (Sec 3)
 - TIPS Open/Close (Sec 4)
 - TIPS view metadata directory (Sec 5)
 - /tips/<digest>/meta
 - /tips/<digest>/meta/ug
 - /tips/<digest>/meta/ug/<i>/<j>
 - TIPS data transfer (Sec 6)
 - /tips/<digest>/<i>/<j>
- Missing features
 - Refresh directory (Sec 5.4)
- Source code: <https://github.com/openalto/alto>

What we learned

- ALTO TIPS
 - Some URI patterns defined in the draft have potential conflicts
 - `/<tips-view-uri>/ug/meta/<i>/<j>` may be resolved as the root of `/<tips-view-uri>/ug/<i>/<j>` in some REST frameworks, but they are routes for different services
 - Some O&M efforts need to be clearly defined (e.g., how frequently a full snapshot node should be generated, size limit of a TIPS queue)
- OpenALTO
 - This is just a reference implementation to verify functionality of the new specification of ALTO protocol
 - Performance / scalability issues need to be verified in larger scale, long-term running deployment

Wrap Up

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Open Issues of OpenALTO
project:

<https://github.com/openalto/alto/issues>