

ALTO Extension for Operation Automation

12/08/2020

Development Update

- API for ALTO operators: intents to CRUD ALTO information resources
 - Operators can CRUD ALTO information resources
 - An ALTO information resource can support multipart (multiple sub resources)
 - MUST have a root resource
 - Each sub resource can have separated capabilities
 - An ALTO information resource can access multiple data sources
 - internal: the data source in the same DataStore of the ALTO server
 - external: the data source come from the external service/database
 - reactive: the data source will not proactively generate data, but the ALTO server can interact with the data source to request some on-demand measurement

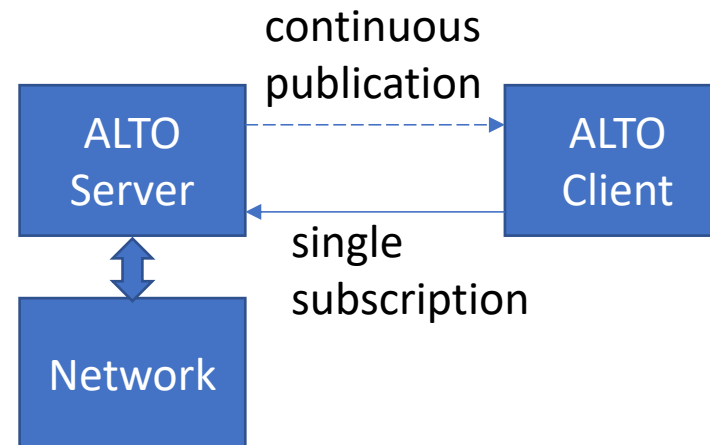
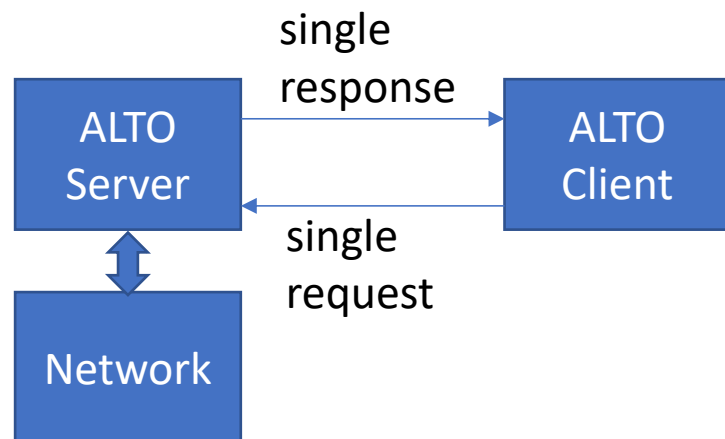
Intent to CRUD ALTO Information Resources

```
+-rw resource-id      alto-types:resource-id
+-rw resource-type    alto-types:service-type
+-rw description?     string
+-rw resource-params* [sub-resource-id]
| +-rw sub-resource-id alto-types:resource-id
| +-rw dependency*     alto-types:resource-id
| +-rw (sub-resource-params)
| | +--:(networkmap)
| | | +-rw alto-networkmap-params
| | +--:(costmap)
| | | +-rw alto-costmap-params
| | | | +-rw cost-type* [cost-mode,cost-metric]
| | | | | +-rw cost-mode      alto-types:cost-mode
| | | | | +-rw cost-metric    alto-types:cost-metric
| | | +-rw test-constraints?  boolean
| +--:(endpointcost)
| | +-rw alto-endpointcost-params
| +--:(endpointprop)
| | +-rw alto-endpointprop-params
| +--:(propmap)
| | +-rw alto-propmap-params
| +--:(cdni)
| | +-rw alto-cdni-params
| +--:(update)
| | +-rw alto-update-params
```

```
+-rw data-source* [source-id]
| +-rw source-id      uuid
| +-rw source-type    alto-types:source-type
| +-rw (source-params)
| | +--:(internal)
| | | +-rw internal-source-params
| | +--:(external)
| | | +-rw external-source-params
| | | +-rw source-uri   uri
| | +--:(reactive)
| | | +-rw reactive-source-params
| | | +-rw reactive-source-uri uri
+-rw (algorithm)
```

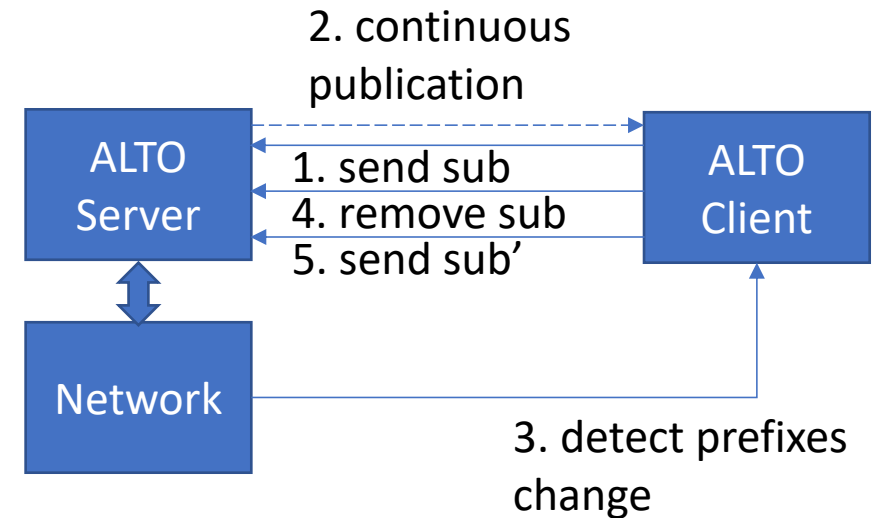
Automatically Handle Dynamicity for ALTO

- Current ALTO query model:
 - net: (flows, metrics) \rightarrow costs/props
- Two types of dynamicity
 - Network dynamicity: net \rightarrow net'
 - Demand dynamicity: (flows, metrics) \rightarrow (flows', metrics')
- SSE is a starting point to handle network dynamicity



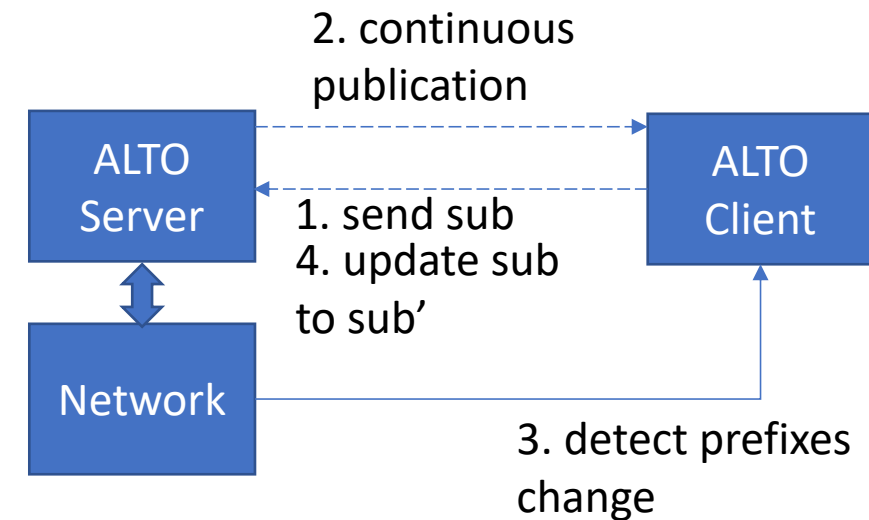
Use Case of Telefonica CDN

- CDN cache nodes change
 - Reconfigured cache node address
 - Add/remove cache nodes
- ISP PoPs change
 - Reconfigured PoPs (e.g., IP prefixes)
 - Add/remove PoPs
- The application (CDN user mapping service) need to detect those changes and re-send a new subscription



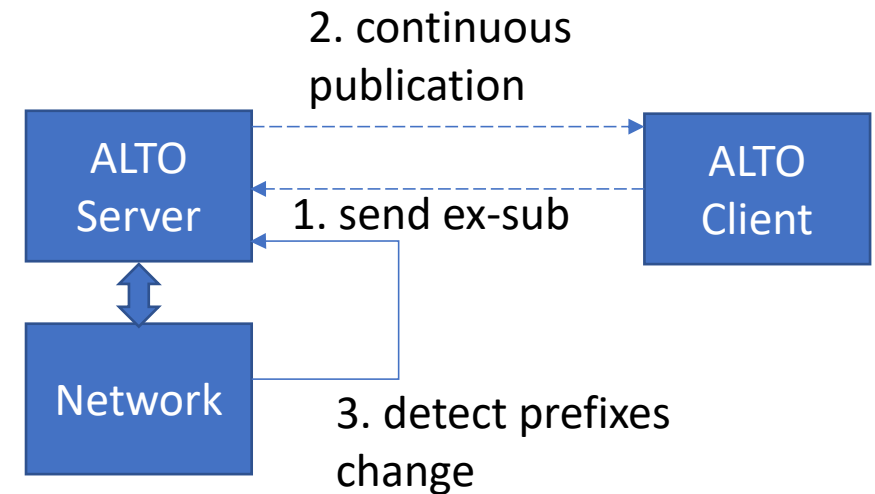
Proposed Solution 1

- Allow the ALTO client to update existing subscriptions
- Benefits:
 - Reduce time/resource to destroy and re-initiate substreams
 - Reduce time/resource to destroy and re-initiate data collection/computation process
 - ALTO server can reuse old data collection/computation



Proposed Solution 2

- Allow the ALTO client to send general conditions/constraints to specify which flows/metrics it is interested in
- When network state changes, the ALTO server can automatically find new flows/metrics satisfying the conditions/constraints and update the response to the ALTO client



```
prop-map:  
  192.0.2.0/24:  
    pop: pop1  
  198.51.100.0/25:  
    pop: pop2  
  198.51.100.128/25:  
    pop: pop3  
  192.0.2.1/32:  
    cdn-cache: cache1.tcdn.com
```

```
prop-map:  
  192.0.2.0/24:  
    pop: pop1  
  198.51.100.0/25:  
    pop: pop2  
  198.51.100.128/25:  
    pop: pop1  
  192.0.2.1/32:  
    cdn-cache: cache1.tcdn.com
```

```
query:  
  metric: rt-delay  
  srcs: *.pop == pop1  
        or *.pop == pop2  
  dsts: *.cdn-cache ==  
        cache1.tcdn.com
```

Backup

- Moving from req/res (direct query) to pub/sub (streaming query)
- Streaming query is changing the way to operate ALTO
- SSE is a good starting point
- What is missing in SSE?
 - Output dynamicity -> input dynamicity
 - ALTO server can be aware of what input the client wants to query for
- What-if query

ALTO vs Closed Loop Automation

