Yang Data Model for OAM and Management of ALTO protocol

draft-zhang-alto-oam-yang

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ALTO WG @ IETF 113
Main Goal

Define a YANG data model for Operations, Administration, and Maintenance (OAM) & Management of ALTO Protocol.


Editor’s copy on GitHub: https://openalto.github.io/draft-alto-oam-yang/draft-zhang-alto-oam-yang.html

YANG modules: https://github.com/openalto/draft-alto-oam-yang/tree/main/yang
Major Changes since -01

- Change document title: OAM -> O&M (OAM and Management)
  - Follow the guidelines of RFC6291
  - This document targets not only OAM but also Management
  - Thank comments from Adrian Farrel
- Revised scope and requirements to be exactly aligned with RFC7285 and RFC7971
- Make the initial YANG module code ready
  - Ready to be reviewed: https://github.com/openalto/draft-alto-oam-yang/tree/main/yang
  - Thank Qiufang Ma’s contribution to the initial version
## Basic Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Reference</th>
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</thead>
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<td>R1: The data model should support configuration for ALTO server setup.</td>
<td>Sec 16.1 of RFC7285</td>
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<td>R2: The data model should provide logging management.</td>
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<td>R3: The data model should provide ALTO-related management information.</td>
<td>Sec 16.2.2 of RFC7285</td>
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<td>R4: The data model should provide metrics for server failures.</td>
<td>Sec 16.2.3 of RFC7285, Sec 3.3 of RFC7971</td>
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<td>R5: The data model should support configuration for different data sources.</td>
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<td>R5-1: The data model should support configuration for different data sources.</td>
<td>Sec 16.2.4 of RFC7285, Sec 3.2 of RFC7971</td>
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<td>R5-2: The data model should support configuration for information resource generation algorithms.</td>
<td>Sec 16.2.4 of RFC7285</td>
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<td>R5-3: The data model should support configuration for access control at information resource level.</td>
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<td>R6: The data model should provide performance monitoring for ALTO-specific metrics.</td>
<td>Sec 16.2.5 of RFC7285, Sec 3.4 of RFC7971</td>
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<tr>
<td>R7: The data model should support configuration for security policy management.</td>
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Additional Requirements

R8: As the ALTO protocol is extensible, the data model for ALTO O&M should allow for augmentation to support potential future extensions.
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<td>sources.</td>
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<td>R8: The data model should allow for augmentation to support future</td>
<td>N/A</td>
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<td>extensions.</td>
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Data Model Overview

A reference ALTO server architecture:

- **Performance Monitor:** `ietf-alto-stats.yang`
- **Logging and Fault Manager:** `ietf-alto-stats.yang`
- **Server Manager:** `ietf-alto.yang`
- **Information Resource Manager:** `ietf-alto.yang`
- **Algorithm Plugin:** `example-ietf-alto-alg.yang`
- **Data Source Listener:** `ietf-alto.yang`
- **Data Broker**

Inside Data Model Scope

Out of Data Model Scope

Out of ALTO Scope

Callback

Inside Data Model Scope

Out of Data Model Scope
Data Model for Server Setup [R1]

- Meta Information for Server-level O&M

```
module: ietf-alto
  +--rw alto-server
    |   +--rw hostname? inet:host
    |   +--rw cost-type* [cost-type-name]
    |     |   +--rw cost-type-name string
    |     +--rw cost-mode cost-mode
    |     +--rw cost-metric cost-metric
    |   +--rw meta* [meta-key]
    |     |   +--rw meta-key string
    |     +--rw meta-value string
    ...
```

TODOs:
- HTTP server listen configuration
- DNS configuration (for server discovery [RFC7286] [RFC8686])
Data Model for Information Resource Management [R5]

**Common Parameter**

```
module: ietf-alto
  +--rw alto-server
    ...
    +--rw resource* [resource-id]
    |    +--rw resource-id  resource-id
    |    +--rw resource-type identityref
    |    +--rw description? string
    |    +--rw accepted-group* [user-group]
    |    +--rw dependency* resource-id
    |    +--rw auth
    |    |    +--rw (auth-type-selection)
    |    |    |    +--rw (auth-key-chain)
    |    |    |    +--rw (auth-key)
    |    |    |    +--rw (auth-tls)
    |    ...
    +--rw (resource-params)
    |    +--rw (ird)
    |    |    +--rw alto-ird-params
    |    |    +--rw delegation inet:uri
    |    +--rw (networkmap)
    |    +--rw alto-networkmap-params
    |    |    +--rw is-default? boolean
    |    |    +--rw filtered? boolean
    |    |    +--rw (algorithm)
    ...
```

**Resource-Specific Parameter**

```
module: ietf-alto
  +--rw alto-server
    ...
    +--rw resource* [resource-id]
    |    +--rw resource-id  resource-id
    |    +--rw resource-type identityref
    |    +--rw description? string
    |    +--rw accepted-group* [user-group]
    |    +--rw dependency* resource-id
    |    +--rw auth
    |    |    +--rw (auth-type-selection)
    |    |    |    +--rw (auth-key-chain)
    |    |    |    +--rw (auth-key)
    |    |    |    +--rw (auth-tls)
    |    ...
    +--rw (resource-params)
    |    +--rw (ird)
    |    |    +--rw alto-ird-params
    |    |    +--rw delegation inet:uri
    |    +--rw (networkmap)
    |    +--rw alto-networkmap-params
    |    |    +--rw is-default? boolean
    |    |    +--rw filtered? boolean
    |    |    +--rw (algorithm)
    ...
```

**Creation Algorithm**

```
  /alto:networkmap/alto:alto-networkmap-params
  /alto:algorithm:
    +--rw l3-unicast-cluster-algorithm
    +--rw l3-unicast-topo
    |    -> /alto:alto-server/data-source/source-id
    +--rw depth? uint32
```
Data Model for Server Monitoring [R6]

Measurement information suggested by RFC7971:

- **Measurement of impact**
  - Total amount and distribution of traffic
  - Application performance

- **System and service performance**
  - Requests and responses for each information resource
  - CPU and memory utilization
  - ALTO map updates
  - Number of PIDs
  - ALTO map sizes

Other useful measurement information for ALTO extensions:

- Number of other ALTO entities
- Statistics for update sessions and events
- Statistics for calendars
Extension of ALTO O&M Data Model [R8]

The following example shows how the developer augments the algorithm choice of alto-networkmap-params with a creation algorithm for the network map resource:

```
module: example-ietf-alto-alg

    /alto:networkmap/alto:alto-networkmap-params
    /alto:algorithm:
      +=-(l3-unicast-cluster)
      --rw l3-unicast-cluster-algorithm
      --rw l3-unicast-topo
      |   -> /alto:alto-server/data-source/source-id
      --rw depth?  uint32
```

Discussions

Q1: This model references several identities and enumeration typedefs (e.g., `cost-metric`) which are managed by IANA registries. To make the model extensible, should we move them into a separated `iana-alto-types.yang`?

Current status: Asking yang-doctors about the best practice
[https://mailarchive.ietf.org/arch/msg/yang-doctors/rVfIF_sVEv3fR4reZ6y93ikD2yE/](https://mailarchive.ietf.org/arch/msg/yang-doctors/rVfIF_sVEv3fR4reZ6y93ikD2yE/)

Argument: Making this change will also make the future updates like `draft-ietf-alto-performance-metrics` and `draft-bw-alto-cost-mode` easy to be supported without updating the basic YANG module.
Discussions

Q2: Lots of parameters can be configured for specific ALTO information resources. Which ones should be defined in the standard basic module? Which ones should be delegated to algorithm extensions?

- Default two PIDs of cost map
- Granularity of network map and cost map
- Client-specific configuration
Discussions

Q3: So far, all the requirements are for ALTO server. What will be requirements for ALTO client?

For our experience, ALTO clients do need O&M (e.g., caching mgmt, server discovery, multi-server mgmt). But how useful the YANG model will be for the client O&M?
Update to Milestones

- Ready to be adopted as a WG item?
- Make the main structure of YANG modules stable by IETF 114
  - If possible, do some simple demo in IETF 114 Hackathon
- Make the document ready for IESG review by IETF 115
Further Feedback

Email to ALTO WG mailing list: alto@ietf.org
Or cc Authors: draft-zhang-alto-oam-yang@ietf.org

Open an issue in GitHub:
https://github.com/openalto/draft-alto-oam-yang/issues/new/choose

We are looking forward to receiving your feedback!