

Yang Data Model for OAM and Management of ALTO protocol

draft-ietf-alto-oam-yang

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Current Status

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

Latest version: <https://datatracker.ietf.org/doc/html/draft-ietf-alto-oam-yang-05>

Editor's copy on GitHub: <https://ietf-wg-alto.github.io/draft-ietf-alto-oam-yang/draft-ietf-alto-oam-yang.html>

YANG modules: <https://github.com/ietf-wg-alto/draft-ietf-alto-oam-yang/tree/main/yang>

Current Status (Cont.)

Discussed Issues and Reached Agreements in IETT 115:

- IANA-maintained module is overdesign and not supported in this draft
- Server-to-server communication only focuses on the cross-domain server discovery
- Implementation-specific configuration on how ALTO data is aggregated, translated, stored, is not in the scope of the base model
 - But the way on how ALTO data can be collected can be modelled
 - e.g., collect via routing protocols, provision policies, dynamic information export, external interface from third party

Open Issues (solved in revision -03):

- Resource-level access control in ALTO O&M (Req 5-3) has been discussed
 - https://mailarchive.ietf.org/arch/msg/alto/NX_Y_nvJrNDj6FIVreRbzzo3XNg/
 - https://mailarchive.ietf.org/arch/msg/alto/MO0jMaucFR4aK_hOMIJAMxKt4NE/

Thanks for excellent reviews by Jordi and Sabine.

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Add base data model for ALTO client.

Support resource-level access control.

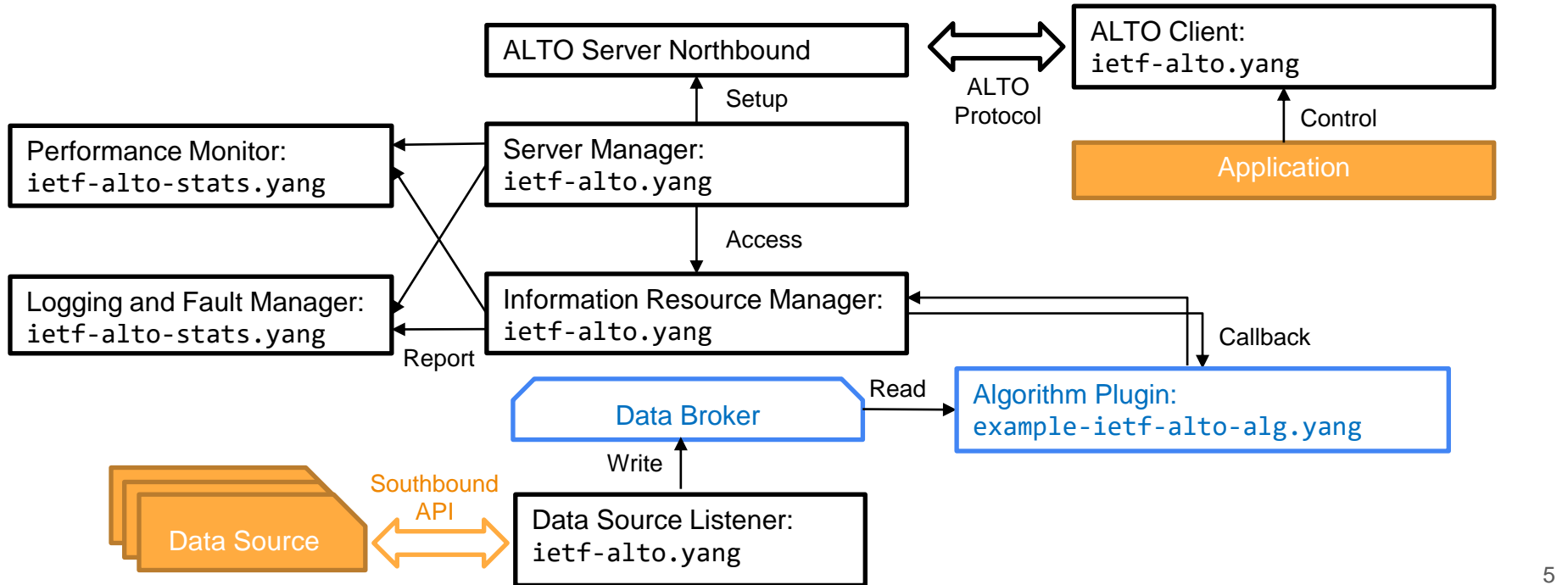
Support failure monitoring metrics.

Complete security considerations for YANG modules

Add more examples of implementation-specific data models in appendix.

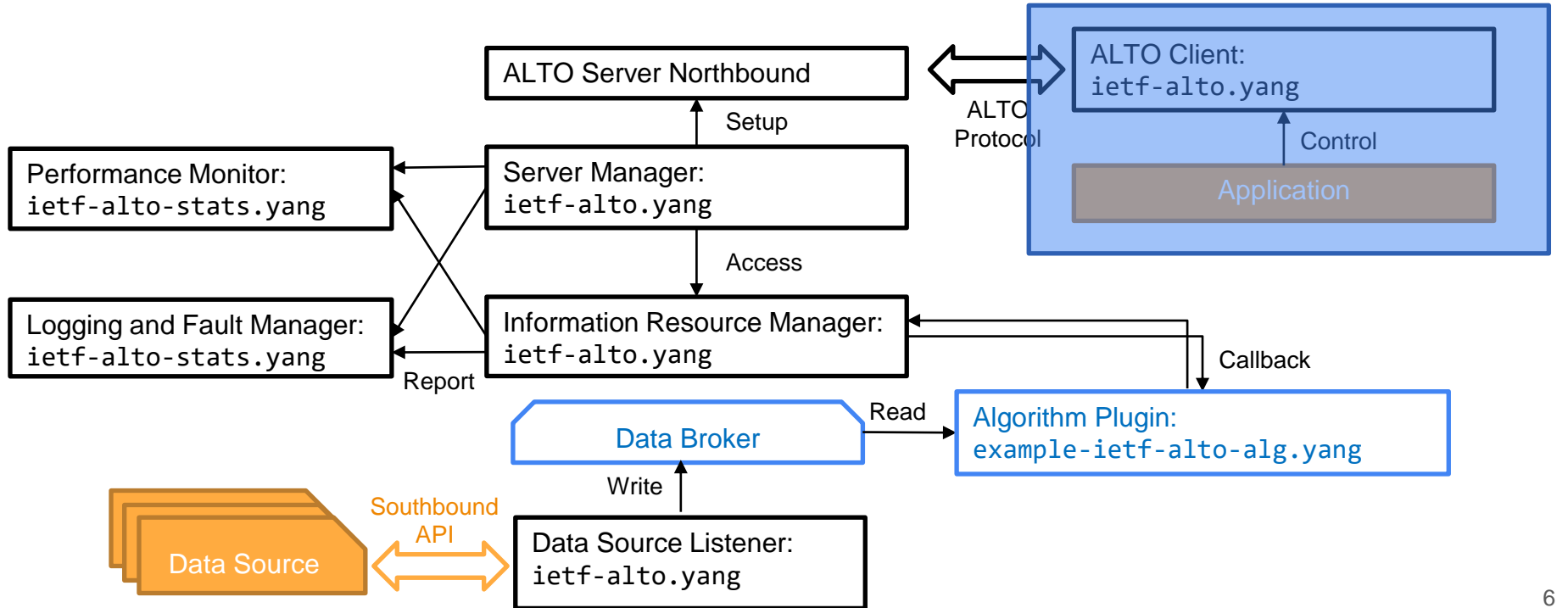
Data Model Overview

A reference ALTO client-server architecture:



Data Model Overview

A reference ALTO client-server architecture:



ALTO Client Configuration

Purpose:

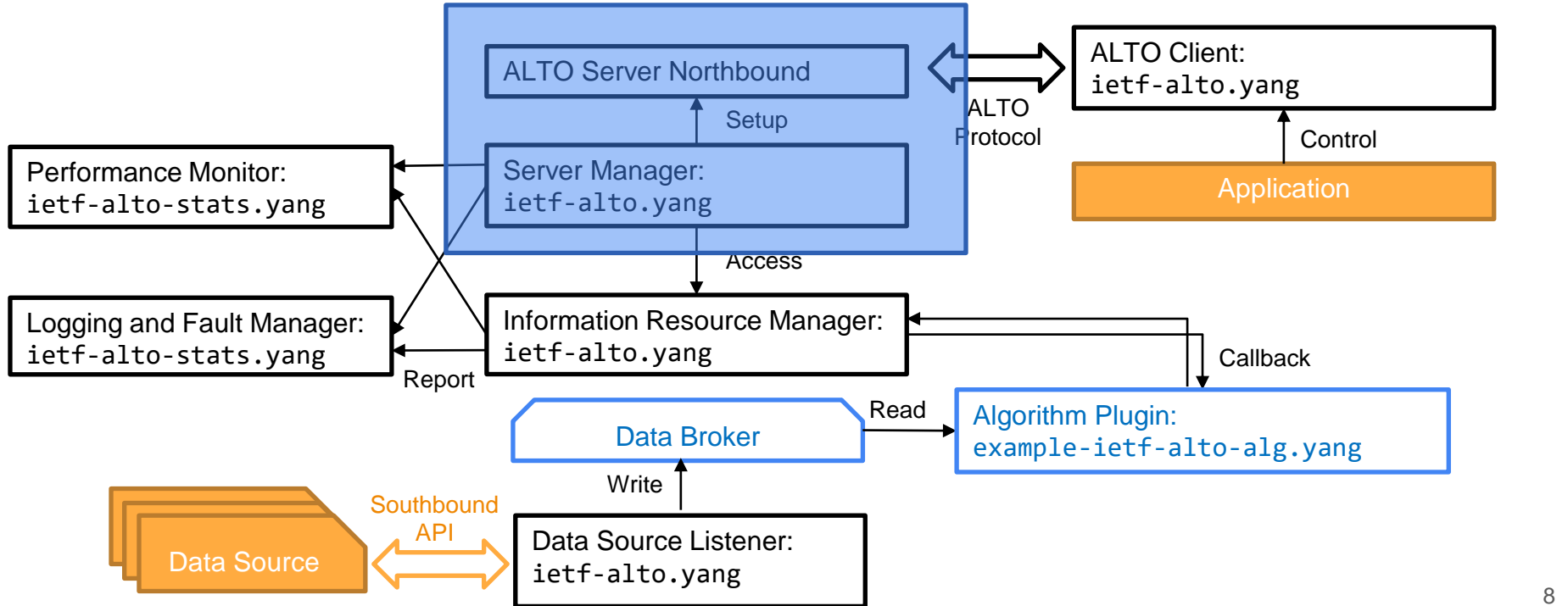
- Define basic data model to configure ALTO clients
- Other applications can use the configured ALTO clients to access ALTO servers

The basic data model only contains the minimal required configuration (server discovery)

```
module: ietf-alto
  +--rw alto!
    +--rw alto-client* [client-id]
      |  +--rw client-id          string
      |  +--rw server-discovery-client
      |  +---u alto-server-discovery-client-grouping
      ...
```

Data Model Overview

A reference ALTO client-server architecture:



ALTO Server-level Operation and Management

```
module: ietf-alto
  +--rw alto!
    ...
    +--rw alto-server
      +--rw listen
        | +---u alto-server-listen-stack-grouping
      +--rw server-discovery
        | +---u alto-server-discovery-grouping
      +--rw logging-system
        | +---u alto-logging-system-grouping
      +--rw cost-type* [cost-type-name]
        | +--rw cost-type-name    string
        | +--rw cost-mode         identityref
        | +--rw cost-metric       identityref
        | +--rw description?     string
        | +--rw cost-context {performance-metrics}?
        |   +--rw cost-source    identityref
        |   +--rw parameters
        |     +--rw (parameters)?
      +--rw meta* [meta-key]
        | +--rw meta-key         string
        | +--rw meta-value      string
    ...
```

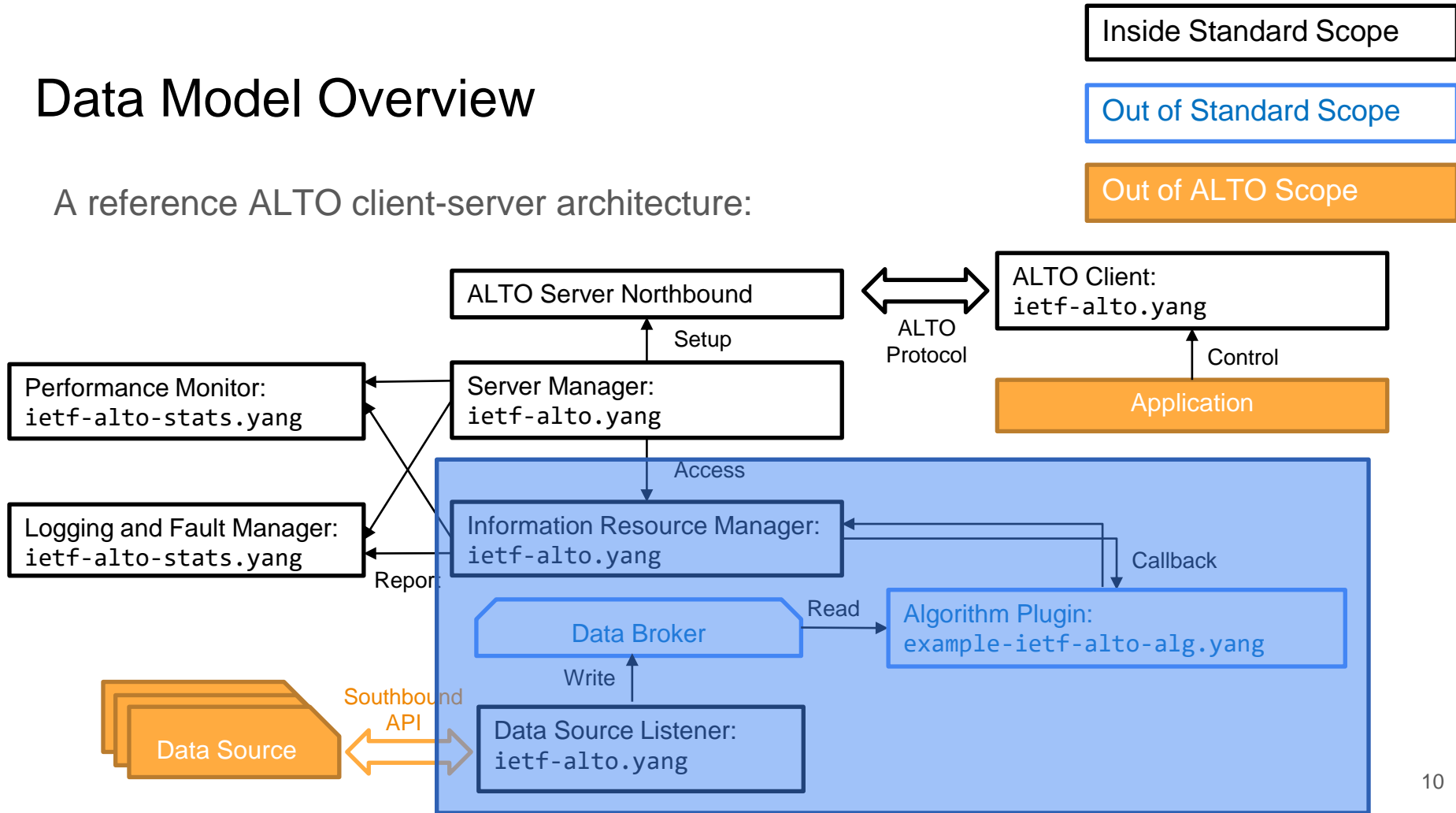
Server-level data model contains:

- Configuration of server northbound setup (listen stack: http/https, tls, tcp)
- Configuration of server discovery (basic model only defines rDNS based server discovery [RFC8686])
- Configuration of logging system
- Other meta data

Security configuration is covered by TLS in server northbound setup

Data Model Overview

A reference ALTO client-server architecture:



ALTO Server Configuration: Data Source

```
module: ietf-alto
  +--rw alto!
    ...
    +--rw alto-server
      ...
      +--rw data-source* [source-id]
        | +--rw source-id          string
        | +--rw source-type       identityref
        | +--rw (update-policy)
        | | +--:(reactive)
        | | | +--rw (publish-mode)?
        | | | | +--:(on-change)
        | | | | | +--rw on-change    empty
        | | | | +--:(periodic)
        | | | | | +--rw feed-interval uint32
        | | | | +--:(proactive)
        | | | | | +--rw poll-interval uint32
        | | | +--rw (source-params)?
        | ..
      ..
```

Sub/pub mode

push updates immediately once data source changes

push updates periodically

Req/res mode: pull data periodically

Specific data source configuration;
Augmented by extended models

ALTO Server Configuration: Information Resource

```
module: ietf-alto
  +--rw alto!
    ...
    +--rw alto-server
      ...
      +--rw resource* [resource-id]
        +--rw resource-id          resource-id
        +--rw resource-type        identityref
        +--rw description?         string
        +--rw accepted-role*
          |   -> /alto/alto-server/role/role-name
        +--rw dependency*
          |   -> /alto/alto-server/resource/resource-id
        +--rw (resource-params)?
          +--:(ird)
            | +--rw alto-ird-params
            |   +--rw delegation    inet:uri
          +--:(networkmap)
            | +--rw alto-networkmap-params
            |   +--rw is-default?   boolean
            |   +--rw filtered?     boolean
            |   +---u algorithm
```

Role-based access control: which roles can access the given resource

identityref of dependent information resources

Specific algorithm configuration; Augmented by extended models

ALTO Server Configuration: Access Control

```
module: ietf-alto
  +--rw alto!
  ...
  +--rw alto-server
  ...
  +--rw auth-client* [client-id]
  |   +--rw client-id          string
  |   +--rw (authentication)?
  |   |   +--:(http)
  |   |   |   +--rw http-auth-client
  |   |   |   |   {http-listen,http:client-auth-supported,
  |   |   |   |   http:local-users-supported}?
  |   |   |   +--rw user-id    leafref
  |   |   +--:(https)
  |   |   +--rw https-auth-client
  |   |   |   {http:client-auth-supported,
  |   |   |   http:local-users-supported}?
  |   |   +--rw user-id    leafref
  |   +--rw role* [role-name]
  |   |   +--rw role-name    role-name
  |   |   +--rw client*
  |   |   |   -> /alto/alto-server/auth-client/client-id
  |   ...
```

How to authenticate a given client

Define roles for access control:
which clients are assigned to the given role

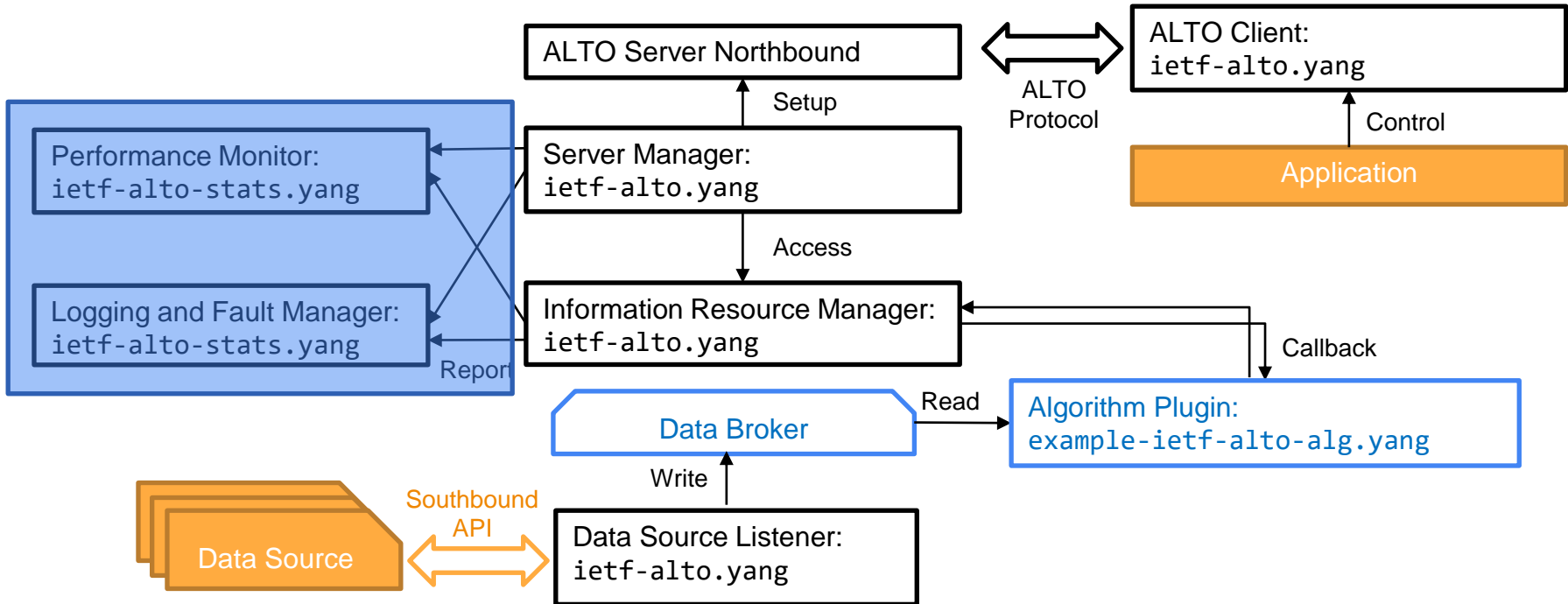
Data Model Overview

A reference ALTO client-server architecture:

Inside Standard Scope

Out of Standard Scope

Out of ALTO Scope



ALTO Server Statistics

```
module: ietf-alto-stats
```

```
augment /alto:alto-server:
  +--ro num-total-req?      yang:counter32
  +--ro num-total-succ?    yang:counter32
  +--ro num-total-fail?    yang:counter32
  +--ro num-total-last-req? yang:counter32
  +--ro num-total-last-succ? yang:counter32
  +--ro num-total-last-fail? yang:counter32
augment /alto:alto-server/alto:resource:
  +--ro num-res-upd?      yang:counter32
  +--ro res-mem-size?    yang:counter32
  +--ro res-enc-size?    yang:counter32
  +--ro num-res-req?     yang:counter32
  +--ro num-res-succ?    yang:counter32
  +--ro num-res-fail?    yang:counter32
augment /alto:alto-server/alto:resource/alto:resource-params
  /alto:networkmap/alto:alto-networkmap-params:
  +--ro num-map-pid?     yang:counter32
augment /alto:alto-server/alto:resource/alto:resource-params
  /alto:propmap/alto:alto-propmap-params:
  +--ro num-map-entry?   yang:counter32
augment /alto:alto-server/alto:resource/alto:resource-params
  /alto:cdn/alto:alto-cdni-params:
  +--ro num-base-obj?    yang:counter32
augment /alto:alto-server/alto:resource/alto:resource-params
  /alto:update/alto:alto-update-params:
  +--ro num-upd-sess?    yang:counter32
  +--ro num-event-total? yang:counter32
  +--ro num-event-max?   yang:counter32
  +--ro num-event-min?   yang:counter32
  +--ro num-event-avg?   yang:counter32
```

The statistics model contains two parts:

- Server/resource status monitoring
 - Server-level logging and failures
 - Resource-level logging and failures
- ALTO-specific performance monitoring
 - Total amount of requests and responses
 - System resource usage
 - Resource-specific measurement

This data model only focuses on the performance metrics that can be directly measured at the ALTO server.

Although RFC7971 also suggests some metrics for "**Measurement of the Impact**", e.g.,

- Total amount and distribution of traffic
- Application performance

They are not in the scope.

Extending the Basic Data Model

```
grouping alto-server-discovery-grouping:
+-- (server-discovery-manner)?
+---:(reverse-dns)
  +-- rdns-ntp-records
  +-- static-prefix*          inet:ip-prefix
  +-- dynamic-prefix-source*
     -> /alto-server/data-source/source-id
```

```
grouping alto-logging-system-grouping:
+-- (logging-system)?
+---:(syslog)
  +-- syslog-params
  +-- config-file?          inet:uri
```

```
module: ietf-alto
+--rw alto!
...
+--rw alto-server
...
+--rw auth-client* [client-id]
| +--rw client-id string
| +--rw (authentication)?
+--rw role* [role-name]
| +--rw role-name role-name
| +--rw client* [client-id]
|   +--rw client-id
|   -> /alto/alto-server/auth-client/client-id
...
```

```
module: ietf-alto
+--rw alto!
...
+--rw alto-server
...
+--rw data-source* [source-id]
  +--rw source-id          string
  +--rw source-type        identityref
  +--rw (update-policy)
  | +---:(reactive)
  | | +--rw (publish-mode)?
  | | +---:(on-change)
  | | | +--rw on-change    empty
  | | +---:(periodic)
  | | | +--rw feed-interval uint32
  | | +---:(proactive)
  | | | +--rw poll-interval uint32
  | +--rw (source-params)?
```

The following parts can be extended in real implementation:

- New server discovery mechanisms
- New logging systems
- New client authentication mechanisms
- New data sources
- New resource creation algorithms

```
+--rw (resource-params)?
+---:(ird)
| +--rw alto-ird-params
|   +--rw delegation      inet:uri
+---:(networkmap)
| +--rw alto-networkmap-params
|   +--rw is-default?    boolean
|   +--rw filtered?     boolean
|   +--rw algorithm
```


Example of Implementation-Specific Extension

```
module: example-ietf-alto-data-source
```

```
augment /alto:alto/alto:alto-server/alto:data-source
  /alto:source-params:
  +--:(yang-datastore)
    +--rw yang-datastore-source-params
      +--rw datastore          ds:datastore-ref
      +--rw target-paths* [name]
        | +--rw name                      string
        | +---u yp:selection-filter-types
      +--rw protocol?          identityref
      +--rw restconf
        | +---u rcc:restconf-client-app-grouping
      +--rw netconf
        +---u ncc:netconf-client-app-grouping
```

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

```
augment /alto:alto/alto:alto-server/alto:resource
  /alto:resource-params/alto:networkmap
  /alto:alto-networkmap-params/alto:algorithm:
  +--:(l3-unicast-cluster)
    +--rw l3-unicast-cluster-algorithm
      +--rw l3-unicast-topo    leafref
      +--rw depth?            uint32
```



refer to **source-id**

Next Step

- YANG doctor review
- WGLC