ALTO Southbound Based on IETF Mechanisms Supporting Base ALTO Base Services

(Deployment Catalyst)

ietf116-interim-data-sources, draft-yang-alto-multidomain, ietf116-cascading-alto

IETF 117; July 27, 2023

Presenter: Sabine Randriamasy, Y. Richard Yang
on behalf of team
High-Level: ALTO Specifications

- Northbound: Relatively well specified
  - What (info) and how (to discover and transport)
- OAM: Good progress lately
- Southbound (how to obtain ALTO info)
  - Some ALTO info (e.g., fancy cost maps) can be network secret sauce, but basic ALTO info (e.g., standard, e2e perf metrics) has a standard answer but is hard to compute, impeding ALTO deployment
  - The difficulty has become clearer in deployment efforts

**Application**

**Management (7971, OAM)**

**Transport**
- RFC7285, 8895 (SSE), new-transport

**Discovery**
- RFC7285, 7286, 8686

**Abstractions**
- RFC7285 (Base), 8189 (Multicost), 8896 (Calendar), 9240 (Unified Prop), 9275 (PathVec), 9439 (Metrics)

**Southbound**
- ?

**Network**

**RFCs**
- RFC7285 (Base), 8189 (Multicost), 8896 (Calendar), 9240 (Unified Prop), 9275 (PathVec), 9439 (Metrics)
- RFC7285 (Base), 8895 (SSE), new-transport

**Discovery**
- RFC7285, 7286, 8686

**Transport**
- RFC7285, 8895 (SSE), new-transport

**Abstractions**
- RFC7285 (Base), 8189 (Multicost), 8896 (Calendar), 9240 (Unified Prop), 9275 (PathVec), 9439 (Metrics)
Southbound Complexity in Realizing Base ALTO Cost Service

- Basic southbound task deploying ALTO server for Net N: each link has a link metric $m$, compute aggregated e2e metric $m$ for the src->dst path in N

- Basic subtasks:
  - Where is the ingress point?
  - What is the set of links traversed?
  - What is the metric of each link (if not totally static)?

- Even though Net N owns all devices, they can come from multiple vendors as closed source systems---need ways to extract the info
Subtask

- Obtain routing state
- Determine ingress

Complexity and Issues

- IGP passive peering (BGP-LS retrieval); handling network structures properly (e.g., areas), and replicating behaviors from topology data
- xFlow/IPFIX sampling/report; must have traffic, scalable concern
ALTO Southbound using IETF Mechanisms: Path Measurement Based Deployment

- Base ALTO server at CERN/WLCG, which uses PerfSonar data
  - Based on IETF-defined ICMP (RFC792), OWAMP (RFC4656) mechanisms
  - Many issues: e.g.,
    - ICMP has issues including node aliasing, (multi-)path aliasing;
    - PS servers are different from target endpoint locations (complex, limited anchoring algorithms)

Node aliasing

Path aliasing

https://www.netbraintech.com/blog/limitations-of-traceroute/
juniper.net/documentation/us/en/software/junos/transport-ip/topics/topic-map/icmp.html

Possible traceroute outcome:

https://dl.acm.org/doi/pdf/10.1145/1177080.1177100
Work Item Proposal *(Related w/ This Presentation)* and Participants

**Work item**
- Evaluate, guide, and propose solutions to ALTO southbound implementation and deployment barriers
  - Focus on computing ALTO base services providing ALTO **standard** metrics, using IETF standard mechanisms

**Participants/champions**
- CERN/WLCG ALTO server as driver: Y. Richard Yang, Sabine Randriamasy, Dong Guo, Jordi Ros Giralt, Jensen Zhang and Kai Gao
- Benocs systems as driver: Danny Lachos and Ingmar Poese
- Telefonica BGP-LS based ALTO server as driver: Luis M. Contreras and team
Some Details

• IETF standard mechanisms [to be advised by WG/AD]
  – standard routing systems (e.g., IGP) passive peering; BMP (RFC7854);
    BGP-LS based topology export (RFC7752 and TE extensions draft-ietf-idr-te-lsp-distribution, rfc9085, RFC9351);
    YANG topology models RFC8345/8795;
    IETF-standard driven measurements integration such as IPPM.

• Ongoing, related, non-charter southbound implementations
  – Investigate robust, efficient, standard-based mechanisms (e.g., cascading ALTO) to compute ALTO cost metrics in a network for cross-domain traffic
  – Implement and deploy ALTO southbound based on hybrid topology (BGP-LS) and path retrieval (retrieve path segment)