The ALTO Path Vector Extension

draft-ietf-alto-path-vector-09

K. Gao²  Y. Lee³  S. Randriamasy¹  Y. R. Yang⁵  J. Zhang⁴,⁵

¹Nokia Bell Labs  ²Sichuan University  ³Sungkyunkwan University
⁴Tongji University  ⁵Yale University

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Quick Summary

What new feature does this extension provide?

▶ Reveal **internal structures** and **detailed property information** from the ISP’s point of view for **end-to-end application-layer communications**
  ▶ e.g., bottleneck links, 5G UPF, MEC, service edge

Why is this extension essential?

▶ Such information is **useful** in many networking scenarios
  ▶ deriving resource correlations of flows, e.g., shared risk resource groups and “co-flow” scheduling\(^1\)
  ▶ context-aware service selection and optimization, e.g., 5G UPF, MEC for cloud gaming, video streaming

▶ Such information is **fundamentally new** in ALTO
  ▶ ALTO only has “cost” for (src, dst) pairs

Quick Summary (2)

How does this extension provide such information?
- Internal structures: abstract network elements (ANE)
- Detailed property information: unified property map\(^2\) for the ANEs
- End-to-end: ALTO cost map and endpoint cost services

What are the potential technical problems and how to address them?
- Representation issue: how to represent the internal structures?
  - physical v.s. abstract
  - persistent v.s. temporary
  - Decision: **abstract network element both persistent and temporary**
- Practical considerations
  - Scalability & consistency: one-round communication v.s. two-round communication
  - Complexity: design a new message format v.s. reuse ALTO message format
  - Decision: **one-round communication with a multipart response**

\(^2\)Unified Properties for the ALTO Protocol, draft-ietf-alto-unified-props-new-09
Recap of -08

Finalize the specification for cost type

- cost mode: array, cost metric: ane-path

Clarify the property negotiation process

- Available properties are announced in an IRD entry capability
- Selected properties are submitted in a query

Introduce persistent-entities property as an initial registry entry

- An array of entity identifiers that are persistent in the scope of an ALTO server

Clarify Part Resource ID (integration with SSE)

- Sync’d with SSE draft -16 (draft-ietf-alto-incr-update-sse-16)
- ResourceID of each part = Client ID + ‘.’ + Part Resource ID

Propose solutions for cost calendar compatibility

- Flows only interfere in the same time interval
  ⇒ The calendar results can be inferred from the PV of each interval
- Both correlations and properties may change over time
  ⇒ Only make the PV part calendared (enough to represent both changes)
In -09 (a minor revision)

- We emphasize that ANE by design is dynamic to the query in multiple places in the document (in introduction, terminology, specification, etc.)
- We also highlight the benefits of on-demand dynamic ANEs
  - It reduces the information leaked to multiple queries
  - The ALTO server can use property-specific optimizations to compute ANEs
Remaining issues

Dependency on the UP draft

▶ Terminology from the UP draft (e.g., Entity, Entity Domain, etc., Sec 3)
▶ The property map part reuses the response data format from UP (in Sec 7.1.6 and 7.2.6)
▶ One property domain and two properties are registered using the UP registration procedure (which may lead to an IANA dependency, Sec 12)
▶ Sync’d with UP -08

Dependency on the SSE draft

▶ Sync’d with SSE -16
▶ SSE -17 includes multipart handling so the related part can now be removed from PV (to be done in the next submission)
▶ Terminology inconsistency (part resource Id in PV and content Id in SSE)
Revision Plan

Writing

- Fix the dependency issues
- Improve the quality of writing
  - Need feedback from the WG
Heterogeneous ANE?

Why

- The Internet infrastructure has heterogeneous components already
- Side meeting talks (e.g., cloud gaming) and some other IETF work (e.g., CFN) show that capability discovery is useful in network-aware end-to-end communication
- ALTO PV can be used as a mechanism to expose capabilities for end-to-end communication
- This strengthens the power of ALTO extensions and extends the scope of ALTO

How

- Define the entity type hierarchy for ANEs
- The capabilities announced in IRD reuses the UP capabilities

What follows

- Identify ANE types (maybe work with other WG) and register the entity type, properties and their bindings to UP
Conclusion

- Current status
  - The motivations and potential problems are relatively clear
  - Most part of the specifications are relatively complete and stable
  - New inputs are received during IETF 106

- Great thanks to the coauthors and the WG for the feedback and guidance

- Next steps:
  - Make a revision
  - Set a milestone for WGLC? (Maybe IETF 107)
  - Call for reviews
Q & A

Join the Discussion at alto@ietf.org!

Questions and Comments are Welcome!