ALTO Re-charter Item: Operation Automation for ALTO

IETF 109, Virtual Event

Nov. 19, 2020

Proposed Paragraph

Documentation of best practices and extension of ALTO for facilitating operational automation tasks. Although the working group has proposed a best practice document (i.e., RFC7971) about deployment considerations, newer ALTO protocol extensions (e.g., the incremental update mechanism, cost calendar, unified properties, and path vector) and newer use cases (e.g., ZSM closed-loop automation, mobile edge computing) require additional considerations. Those include, e.g., decisions on information resources exposed in the information resource directory (IRD), notification of changes either in proactive or reactive mode, or aggregation/processing of the collected information according to the clients' requests, for mentioning just a few. Furthermore, newer ALTO services may require more interaction with applications to better predict/decide which low-level information should be collected/measured, and which aggregated information should be precomputed. The working group will (1) investigate the best practices in ALTO operations automation, including the support of newer ALTO protocol extensions and use cases; (2) propose new protocol extensions to allow applications to better express needs about interested flows and related resources.

Details: Problem (Relevance)

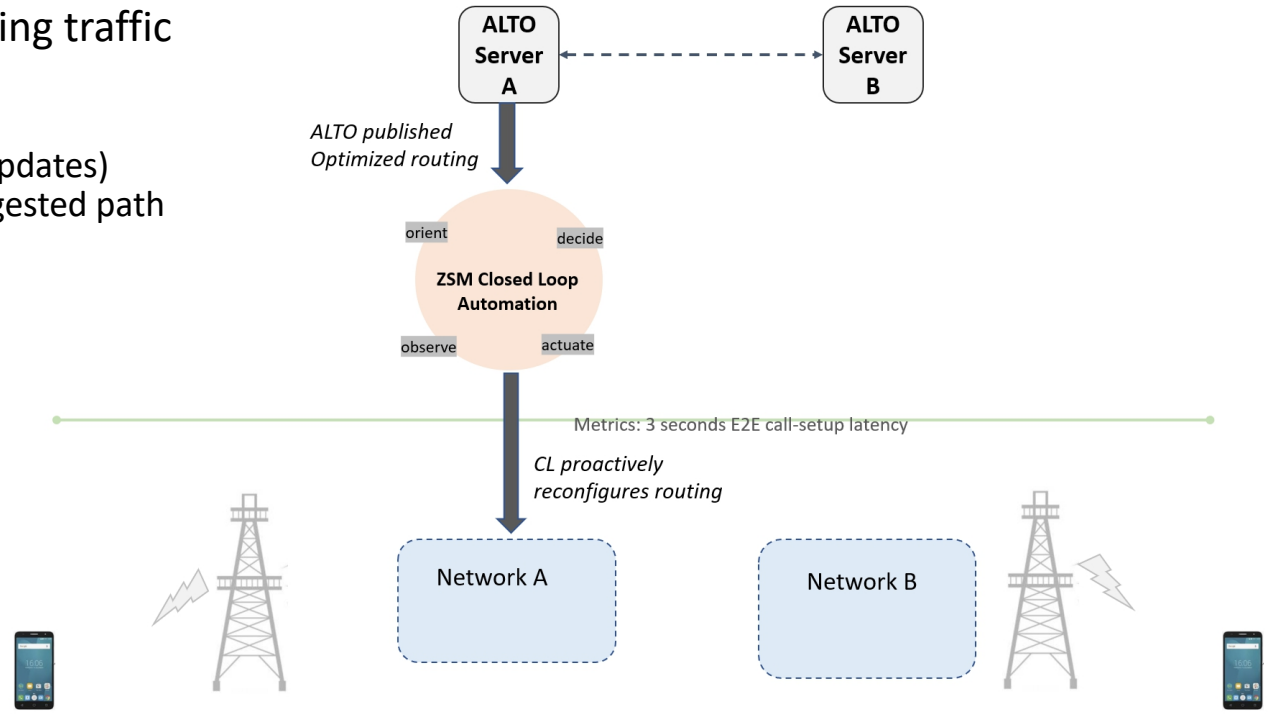
- Complexity of operations on new extensions and new use cases
  - Practical operations of an ALTO server includes the complex workflow
  - New ALTO protocol extensions (e.g., the incremental update mechanism, cost calendar, unified properties, and path vector) require new architectural and deployment considerations
  - New use cases (e.g., ZSM closed-loop automation, mobile edge computing) require new operation integrations with different systems
- Reactive measurement and computation
  - ALTO information resource may be populated reactively, which requests more communications with applications to predict/decide which low-level information (e.g., INT) should be collected/measured, and which intermediate information (e.g.,

Details: Best Practices

- Investigate best practices (extending RFC7971) including:
  - Automatic IRD generation
  - ALTO information resources population from information collected by existing routing systems and measurement tools (e.g., TEDB, LSPDB, SNMP)
  - Reactive ALTO information resources update
  - Aggregation of different information sources
  - Considerations about intermediate abstraction (e.g., history, path cache)
- Related documents
  - https://tools.ietf.org/html/draft-bertz-alto-aggrimpl-00
  - https://tools.ietf.org/html/draft-contreras-alto-service-edge-02

Details: Use Case (ZSM)

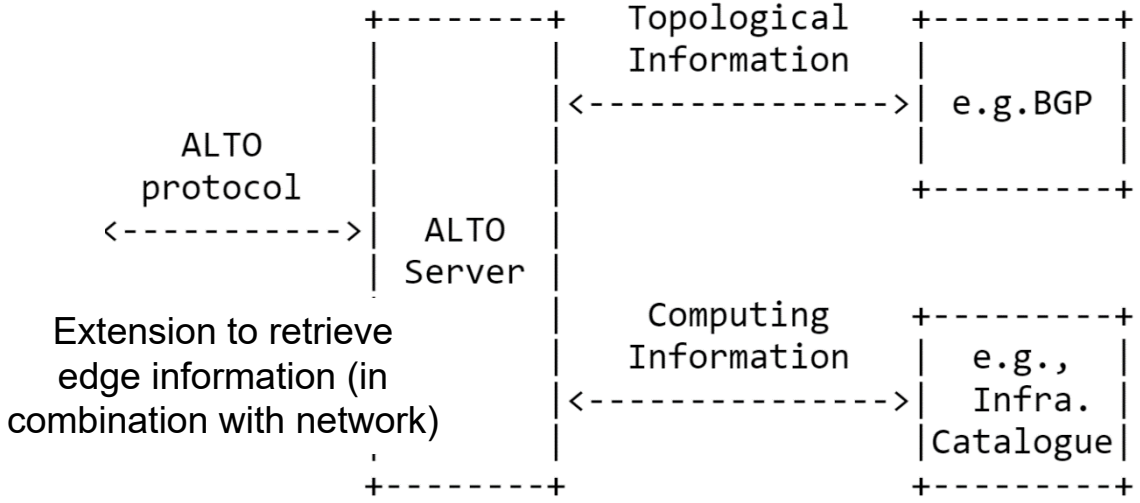
- Today: ZSM Closed Loop automation would react to network anomaly (e.g. E2E call setup latency for 5G VoNR)
  - Example resolution is to reroute the signaling traffic to use a less congested path (reactive)
- ALTO to proactively and reactively (through incremental updates) provide optimized routing to ZSM framework – avoid congested path
- ALTO extensions to realize ZSM support
  - Support cellular entities
  - Support cellular performance metrics
- Collaboration with ETSI ZSM (LS)
  - ZSM004 Landscape specification
  - ZSM009-2 CL automation-Solution



Details: Use Case (Service Edge Determination)

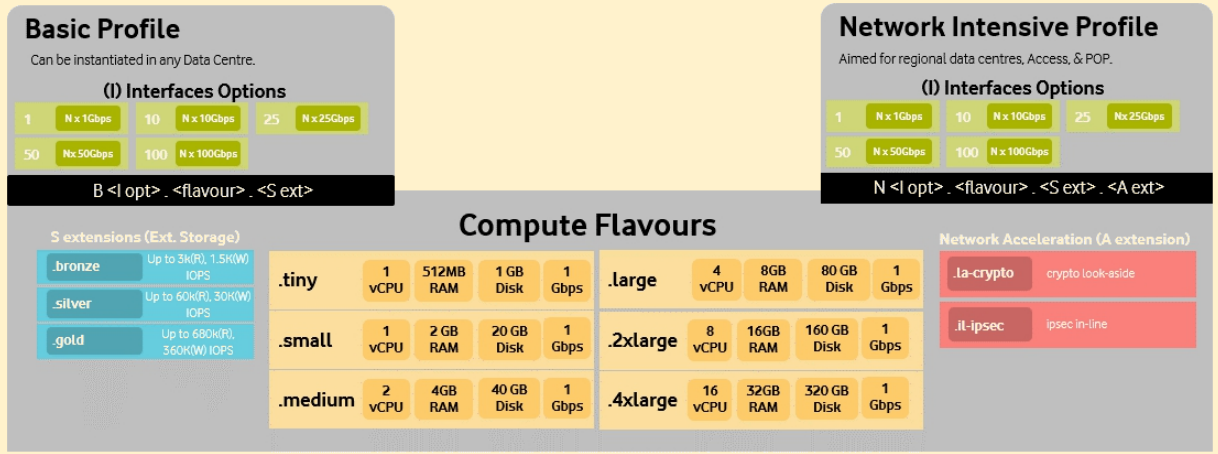
draft-contreras-alto-service-edge

- *Use case*
  - *Multiple data centers of different sizes across the network of distinct sizes (CPUs, memory, storage, bandwidth, etc)*
  - *Identify the proper DC for a given application considering both compute and transport substrates*
  - *Leverage on ALTO to assist on the selection of the mo "convenient" edge combining transport network information*
- *Requirements*
  - *Allowing clients to request edge information*



Example

Common Network Function Virtualisation Infrastructure Telecom Taskforce (CNTT)



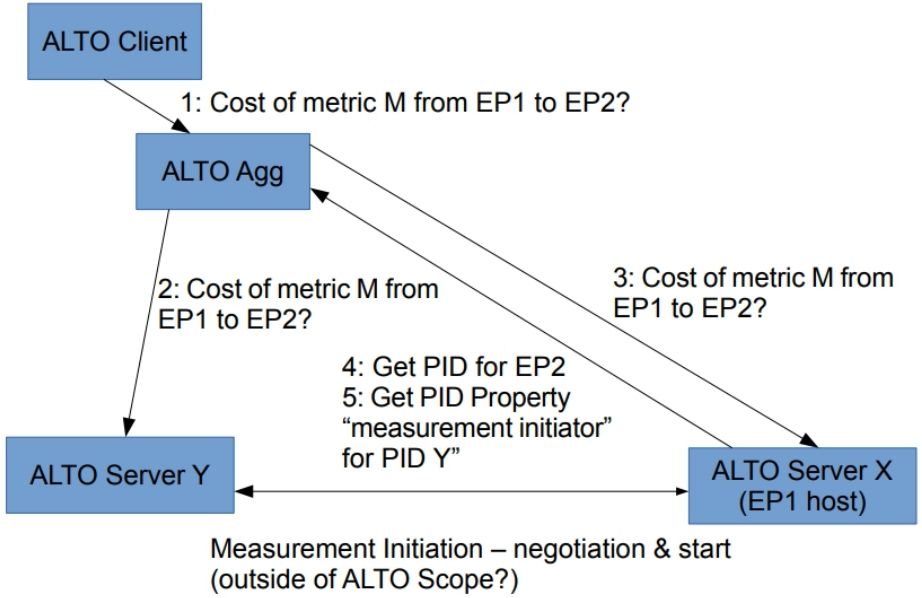
https://cntt-n.github.io/CNTT/doc/ref_model/chapters/chapter04.html

Flavor Name	Type of instance (T)	Interface Option (I)	Compute flavor (F) {CPU, RAM, disk and bandwidth}	S.	A.
Small-1	Basic	{1, 2, 3, 4, 5, 6, 7, 8, 9 Gbps}	{1,512 MB,1 GB,1 Gbps}	...	...
Small-2	Network Intensive	{1, 2, 3, 4, 5, 6, 7, 8, 9 Gbps}	{1,512 MB,1 GB,1 Gbps}	...	...
Medium-1	Network Intensive	{25, 50, 75, 100, 125, 150 Gbps}	{2,4 GB,40 GB,1 Gbps}	...	...
Large-1	Compute Intensive	{50, 100, 150, 200, 250, 300 Gbps}	{4,8 GB,80 GB,1 Gbps}	...	...
Large-2	Compute Intensive	{100, 200, 300, 400, 500, 600 Gbps}	{8,16 GB,160 GB,1 Gbps}	...	...
...	...	...	...	...	...

Details: Use Case (Aggregation)

Longer Presentation / discussions - https://datatracker.ietf.org/meeting/96/materials/slides-96-alto-0
Related - https://tools.ietf.org/html/draft-bertz-alto-aggrimpl-00
Related - draft-bertz-alto-sdnnfvalto-02
Aggregation (with filtering) of data concept is required in ALTO

- Client side integration is complex and defeats the ease of service ALTO provides
- There will be multiple domains and with filters people are likely to share data
- Big issue for ALTO is an incorrect assumption of number of sources, esp. SDN Controllers. If this is a service, Client should only need to connect to one server and not all of them.



As systems go up / down data will not be present in the system. We have also identified 3 Use Cases that can help take advantage of aggregation:
UC 1 : Data is present in underlying Server BUT not visible in ALTO Server (implies a Filter) => ALTO MUST support Server side filtering (On Demand Measurements is proposed)
UC 2: Data is not present server at all => ALTO MUST support some form of Measurement Initiation
UC 3: Metric not currently supported by ALTO Sever => Dynamic loading of measurement data

Details: A Potential Solution (Feasibility)

- Define a new interface (service) to allow applications to better express needs about interested flows and related resources
- The interface allows applications to request the following needs
  - Interested E2E flows
  - Constraints for flows
  - Related resources
- The ALTO server can schedule and initiate measurement and precomputation to build up-to-date view of status and capabilities of the network to fit applications' needs

Details: Key Remaining Issues

- How to reactively populate on-demand ALTO information resources (e.g., path vectors) based on client queries
- Flows that applications are interested in may change because of dynamic network state
  - e.g., applications are only interested in the endpoints attached to the specific PoP (Point of Presence)
- Constraints for interested flows may be correlated
  - e.g., filter all sources whose total upload bandwidth are higher than the threshold

Details: Who Will Work on It

- Luis Contreras, Telefonica
- Jensen Zhang, Tongji
- Kai Gao, SCU
- Lyle Bertz, Sprint
- Farni Boten, T-Mobile

Details: Potential Milestones (1-2 years)

- Mar. 2021 (IETF 110): Protocol statement
- July 2021 (IETF 111): Initial draft for the protocol extension
- Nov. 2021 (IETF 112): Best practice documentation
- Mar. 2022 (IETF 113): Iteration
- July 2022 (IETF 114): Submit to IESG

Summary: Proposed Paragraph

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