Demo: ALTO-SDN

Application-layer traffic optimization in software-defined mobile networks

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Demo C: BME-MIK / ALTO-SDN
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Scope:
- endpoint selection during connection to distributed services

Motivation:
- increased elasticity, portability of network functions
- dynamicity of endpoint selection policies and rules

ALTO protocol
- IETF RFC 7285, Sep 2014
- ALTO server provides guidance for ranking endpoints

Our approach:
- ALTO client in SDN controller

Main benefits:
- ALTO guidance is decoupled from the application
- Reduced deployment cost of ALTO service.
- SDN: enabler for dynamic network information provision and flow redirection.

IETF ALTO WG (https://datatracker.ietf.org/wg/alto/)
Building blocks of ALTO-SDN

ALTO C2S: ALTO client-to-server REST API
ALTO N2S: ALTO network-to-server REST API
ALTO C2R: ALTO client-to-redirect server REST API
ALTO policies (config.xml)

- The SDN controller must know, which service classes require ALTO service.
- Multiple ALTO service classes can be defined
- An ALTO service class includes
  - definition: name, IP address and TCP port of available endpoints
  - network map id,
  - cost types and weights,
  - traffic direction (downlink or uplink)
  - reachability of redirect server (optional)
- Reachability of
  - ALTO server (IP, port, root of the servlet)
  - Gateway IPs of the controlled SDN network segments
Achievements

- Dynamically configurable ALTO policies
- ALTO client-to-server (C2S) interface following IETF ALTO protocol
- ALTO client-to-redirect server (C2R) interface (new)
- ALTO network-to-server (N2S) interface (new):
  - Single switch view of the network
  - Cost types:
    - Number of hops
    - Utilization of the links
- Two types of reactive redirection mechanisms are supported:
  - Transparent
  - Non-transparent (illustrated in the figure)
Demo scenario

Same video service can be reached at multiple servers/caches in an SDN network segment.

- Demonstration objectives
  - Transparent and non-transparent redirection of HTTP video streaming.
  - Influence of cost types, weights and background traffic on the decision
  - Network and cost maps on ALTO server side
Calculation of costs

- **Numerical cost metrics:**
  - "num-routing" = number of switches between the end hosts
  - "num-delay" = average utilization of the path in the last 5 seconds
    - [number of bits] measured on the output/input ports of the switches on the E-E path,
    - divided by
      - [link capacity in bps],
      - [5 seconds] and
      - [number of output/input ports on the path]

- **Ordinal cost types ("ord-routing", "ord-delay"):**
  - calculated based on numerical cost types.
    - Collect the set of numerical values from the numerical cost map
    - sort the values in increasing order and
    - assign to each value an ordinal value, increasing from 0 to the number of values
Recognized issues, future work

- Extension of dynamic network and costmap information provision:
  - from non-SDN network segments
  - from multiple network controllers (merging information in ALTO server)
- ALTO protocol applies abstract network and cost maps:
  - Pros: privacy of topology information
  - Cons: sometimes not enough fine grained
  - Rank aggregation: which method should we select?
- Support of non reactive packet forwarding methods
Publications

Accepted:


Submitted:

- ALTO-SDN Demo Poster, Celtic-Plus Event 2015, 27-28 April, Vienna, abstract, poster (submitted)

Software:

- Demo set up instructions and ALTO-SDN components are available at http://mik.bme.hu/~zfaigl/ALTO-SDN/doc/