ALTO: A Multi Dimensional Peer Selection Problem

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Peer selection

- The peer selection problem is applicable to various aspects of p2p systems
  - Picking a peer for content download
  - Neighbor selection
  - Picking a super peer, mirror, TURN server, the best semantic next hop for a query, etc.
- The information needed to assist peer selection in each of these is likely quite different
  - Performance metrics(Bandwidth etc), network coordinate, services offered, network impact, Cost, etc.
- However, a common framework for such information exchange is very feasible and has exactly two aspects to it
  - Information exchange between the peers and the network
  - Information exchange among peers
- ALTO should define this common framework and potentially standardize a subset of the information types itself
  - Create a registry for other information types to be registered later

Inputs for peer selection information

- Peers
  - Peers publish information about general application agnostic parameters such as
    - Bandwidth
    - Link type
    - Virtual coordinates
- Network
  - Network operators publish information about network impact of peer selection
    - P-distance

Peer input not enough

- Goal
  - Optimize data transfer performance

- Leads to
  - Traffic crosses network boundaries multiple times

ISP input not enough

- Some of the information needed may not be available to the ISP
- ISP's goals are to
  - Minimize congestion near hotspots
  - Minimize interdomain traffic
- That leads to
  - ISP cost reduction not always tied to improved application performance
    - All hosts within the ISP are DSL or overloaded
    - Geographically close peers with different access network

Overall Design goals

- ISPs provide information
- Peers provide information
  - e.g. bw, link type, GNP coordinate, services
- Applications makes decision based on these two inputs
- Benefits
  - Presence of both types of information important for spurring adoption
  - Common reusable information plane available across applications and reduces overhead

Multidimensional ALTO

- Steps needed for multi-dimensional ALTO
  - ALTO service discovery
  - ALTO information publication framework
  - ALTO service query
    - Network location identifier to ALTO service identifer
      - Maybe be ALTO service specific
    - Set of ALTO service identifier pairs
      - May have complex query for metric of interest
  - ALTO service response
    - Metrics annotated with ALTO service identifer pairs
      - May be ALTO service specific

Design Recommendations

- The ALTO service should accommodate specific hosts providing network topology information
- The ALTO service should allow peers to publish ALTO related information in an application agnostic manner
- The ALTO service should allow for both centralized and distributed service models
- The ALTO protocols should be agnostic to the actual peer selection algorithm in use
- The ALTO protocols should be generic to allow any type of information useful for performing ALTO services to be exchanged. The ALTO protocols should be extensible to allow carrying new types of information that may be defined at a future point

Summary

- Let's design the ALTO query and response to be extensible and enable a variety of peer selection services
  - Potentially leave publication framework as future work