ALTO Extensions to Support Application and Network Resource Information Exchange for High Bandwidth Applications
<draft-lee-alto-app-net-info-exchange-00.txt>

ALTO Extensions for Collecting Data Center Resource Information
<draft-lee-alto-ext-dc-resource-00.txt>

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84th IETF – Vancouver DC, July 29 - August 3, 2012
Large Bandwidth Use Case

<draft-bernstein-alto-large-bandwidth-cases-01>

Case 1: End System Aggregation: Many clients using services offered at two or more “data centers”

Case 2: Traffic engineered “express lanes” between data centers and end user regions

Case 3: Data Center to Data Center Communications: Application Overlays, Recovery

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ALTO i2aex

ALTO Client can collect Net Resource and DCN Resource Information and interact with APP Orchestrator for joint APP-NET orchestration and resource allocation.

ALTO Extensions for Collecting Data Center Resource Information (draft-lee-alto-ext-dc-resource-00.txt)

ALTO Extensions to Support Application and Network Resource Information Exchange for High Bandwidth Applications <draft-lee-alto-app-net-info-exchange-00.txt>
ALTO Query Mechanism that filters the request constraints

- End Point Source Address(es)
- End Point Destination Address(es)
- Cost Type :={summary, graph}
- Constraints /* For instance, constraints can be the minimum bandwidth, maximum latency, maximum hop counts, maximum packet loss, etc. */
- Parameters /* a set of result parameters that each result (summary or a link in graph) should have. For instance, latency, cost, etc.) */
- Objective-function: The summary or the graph should be computed based on optimizing which parameter – IGP cost, latency, residual bandwidth, etc.
ALTO Response Mechanism with Reduction of Data Sets

- The list of feasible Source-Destination pair and its Cost Type
- For each feasible S-D pair, indicate the following:
  - Constraints Values /* indicate the actual values of each constraint requested */
  - Administration Domain ID /* For each network administration domain, the domain ID needs to be conveyed */
Info Model and Encoding Suggestions

Alto query:

object {
  TypedEndpointAddr src;
  TypedEndpointAddr dsts<1..*>;
} EndpointFilterExt;

object {
  CostMode cost-mode;
  CostType cost-type;
  JSONString constraints<0..*>;  
  [OPTIONAL]
} EndpointFilterExt endpoints;

} CsoReqEndpointCostMap;

Alto response:

object {
  JSONNumber hopcount;
  JSONNumber latency;
  JSONNumber pktloss;
} DstCostsConstraints;

object EndpointDstCosts {
  DstCostsConstraints[TypedEndpointAddr];  ... 
};

object EndpointCostMapData;

object {
  CostMode cost-mode;
  CostType cost-type;
  EndpointCostMapData map;
} CsoInfoResourceEndpointCostMap;

POST /endpointcost/lookup HTTP/1.1
Host: alto.example.com
Content-Length: [TODO]
Content-Type: application/alto-csoendpointcostparams+json
Accept: application/alto-csoendpointsummary+json,application/alto-error+json

{  
  "cost-mode" : "numerical",
  "cost-type" : "summary",
  "constraints": ["bw gt 20", "latency lt 10", "hopcount lt 5", "pktloss lt 0.03"],
  "endpoints" : {
    "srcs": [ "ipv4:192.0.2.2" ],
    "dsts": [ "ipv4:192.0.2.89", "ipv4:198.51.100.34", "ipv4:203.0.113.45" ]
  }
}

HTTP/1.1 200 OK
Content-Length: [TODO]
Content-Type: [TODO]
Content-Type: application/alto-csoendpointsummary+json

{  
"meta" : {},
"data" : {
  "cost-mode" : "numerical",
  "cost-type" : "summary",
  "map" : {
    "ipv4:192.0.2.2": {
      "ipv4:192.0.2.89"  : [ “latency eq 5”, “hopcount eq 8”, “pktloss eq 0.01” ],
      "ipv4:18.51.100.34" : [ “latency eq 9”, “hopcount eq 10”, “pktloss eq 0.02” ],
      "ipv4:203.0.113.45" : [ “latency eq 40”, “hopcount eq 12”, “pktloss eq 0.02” ]
    }
  }
}

}
ALTO Collection of DC Resource Information

- Data Center Identifier (DCI)
- Data Center Location Identifier (e.g., IP address of the gateway node)
- Time Stamp
- Abstracted Memory Usage
- Abstracted Available Memory
- Abstracted CPU usage
- Abstracted Available CPU
- Abstracted Power Consumption Level & Cost
- DC Network Cost Models (Reserve, On-demand, Spot)
- DC Network Cost
- DC Network Resource Constraints
Encoding Suggestions

Pull based Query:
Based on GET URL /getdcinfo

Pull based response:
object
{
  VersionTag vtag; [OPTIONAL]
  TypedEndpointAddr all addr;
  JSONNumber srvload;
  JSONNumber ramusage;
  ...
} InfoDCProperty;

GET /dcinfo HTTP/1.1
Host: alto.example.com
Accept: application/alto-dcinfo+json
HTTP/1.1 200 OK
Content-Length: [TODO]
Content-Type: application/alto-dcinfo+json
{
  "meta" : {},
  "data" : {
    "vtag" : "1266506139",
    "addr" : "ipv4: 10.18.51.151:5060",
    "srvload" : 25,
    "ramusage" : 60
  }
}

Push based Query:

object
{
  VersionTag vtag; [OPTIONAL]
  TypedEndpointAddr all addr;
  JSONNumber srvload;
  JSONNumber ramusage;
  ...
} InfoDCProperty;

Push based response:
200 OK with body NUL
POST /dcinfo HTTP/1.1
Host: alto.example.com
Content-Length: [TODO]
Content-Type: application/alto-dcinfo+json
{
  "meta" : {},
  "data" : {
    "vtag" : "1266506139",
    "addr" : "ipv4: 10.18.51.5060",
    "srvload" : 25,
    "ramusage" : 60
  }
}
HTTP/1.1 200 OK
Host: alto.example.com
Multi-Domain Issues

Inter APP Domain ??

Hierarchical Network Inter-domain

Peer Network Inter-domain

Network 1

Network 2

Network 3

Network N

Network 1

Network 2

Network N

ALTO Client

Application Orchestrator

ALTO Client

Application Orchestrator
Summary & Next Steps

- We presented two ALTO extension drafts that would help joint APP-NET orchestration and resource allocation for large bandwidth use case in the data center environments.
- Future work would include multi-domain issues.
- Greg’s next presentation “Bandwidth Constraint Representation” to reduce amount of information shared while promoting optimization
  - Abstract paths with abstract shared bottlenecks
  - Abstract cost-constraint graphs