

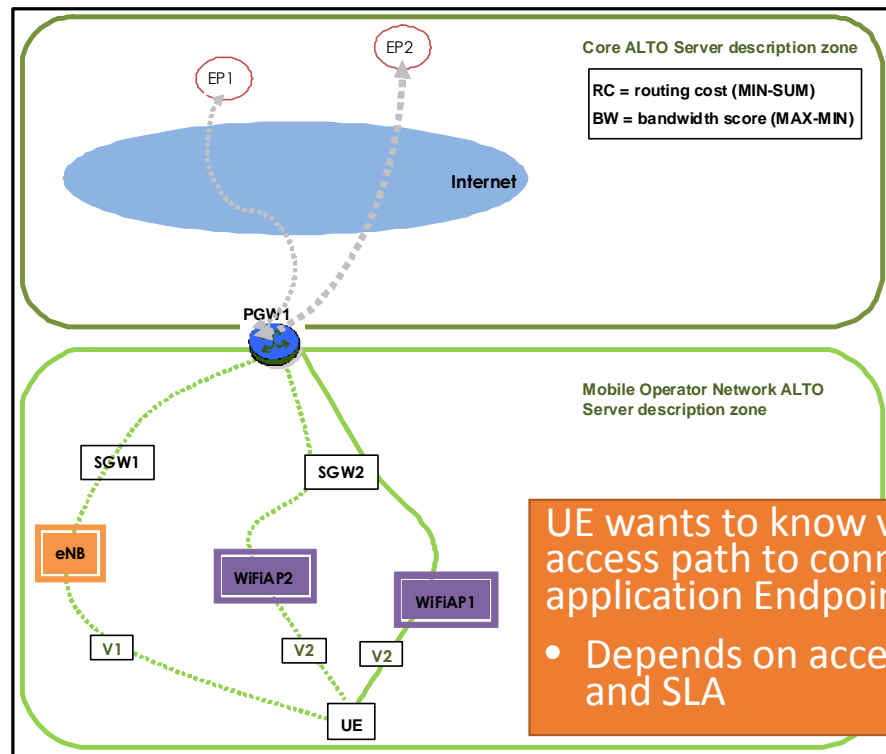
draft-randriamasy-alto-cost-context-02 updates since v01

Protocol extension proposal

ALTO WG meeting IETF99 - July 20th, 2017

S. Randriamasy

Use case 2



UE wants to know via which access path to connect to an application Endpoint

- Depends on access type and SLA

Use case 3

ALTO Client wants Cost Maps with values depending on different policies

- Discussion launched in 2012 for CDN applications
- Cost Maps for CDN can be voluminous

PROBLEM for cases 2 and 3

- Cumbersome to define a metric associated to context C1, C2, ... CN
- Cumbersome to get N cost maps
- Client wants one metric with N options

New use cases in PANRG (Path Aware Networking)

- The Internet architecture assumes a division between the end-to-end functionality of the transport layer and the properties of the path between the endpoints. The path is assumed to be invisible, homogeneous, singular, with dynamics solely determined by the connectivity of the endpoints and the Internet control plane
- **Increased diversity in access networks**, and ubiquitous mobile connectivity, have made this architecture's assumptions about paths less tenable.
- **Multipath protocols** taking advantage of this mobile connectivity begin to show us a way forward, though: if endpoints cannot control the path, at least they can determine the properties of the path by **choosing among paths available to them**.

Approach

- Extend cost information specified in [RFC7285] by
 - providing, **for a same cost metric, several possible cost values**
 - where each value depends on **qualitative** criteria as opposed to quantitative criteria such as time.
- Add member `cost-context` associated to a `cost-type-name` in IRD
 - “cost-context” has members
 - “cost-type-names”
 - “context-params” = [["cell", "wifi", "lan"], ["SLA-1", "SLA-2", "SLA-3"], ...] = array of attribute arrays
 - Where attributes can be combined among the attribute arrays
- Add member `context-params` in meta of ALTO queries and responses
 - Containing the selected combination of context attributes
 - E.g. [["cell", "wifi"], ["SLA-3"]] meaning ("cell" AND "SLA-3") + ("wifi" AND "SLA-3")
- ALTO server response = array of values, one for each combination
- Applicable ALTO services: Filtered Cost Map, Endpoint Cost Service

Example use case2: IRD – and response

```
"resources" : {  
  "filtered-cost-calendar-map" : {  
    "uri" : "http://###/endpointcostmap/lookup/context",  
    "media-types" : [ "application/alto-endpointcost+json" ],  
    "accepts" : [ "application/alto-endpointcostparams+json" ],  
    "capabilities" : {  
      "cost-constraints" : true,  
      "cost-type-names" : [ "num-routingcost",  
        "num-bandwidthscore"],  
      "cost-context" : [// ++NEW  
        {"cost-type-names" : "num-routingcost",  
          "context-params" : [ ["cell", "wifi", "lan"],  
                               ["SLA-1", "SLA-2", "SLA-3"] ]  
        }  
      ]  
    }  
  }  
} // end ECM capab  
... other resources ...  
} // end resources
```

If Client requests 2 combos:

- « cell » AND « SLA-3 »,
- « wifi » AND « SLA-3 »

```
HTTP/1.1 200 OK  
Content-Length: [TODO]  
Content-Type: application/alto-endpointcost+json  
{  
  "meta" : {  
    "cost-type" : {"cost-mode" : "numerical",  
                  "cost-metric" : "routingcost"},  
    "context-params" : [ ["cell", "wifi"], ["SLA-3"] ]  
  }  
  "endpoint-cost-map" : {  
    "ipv4:192.0.2.2" : {  
      "ipv4:192.0.2.89" : [10, 4],  
      "ipv6:2000::1:2345:6789:abcd" : [4, 6]  
    }  
  }  
}
```

Same context-params arrangement as in request input

Array of 2 context-based values:
[cell AND sla, wifi AND sla]

Updates since v01

- Addressed WG concerns on (near) real-time changes in wireless networks,
 - Section 2.1: clarified meaning of the example cellular connection cost and naming it "ARFcost" for Abstracted RFcost,
- Added definitions and rules on context attributes and backwards compatibility
 - Section 4 and 4.1: ALTO Server MUST provide values as in RFC 7285
 - If context attributes not requested or not supported
- Updated the example combination in IRD /use case 1 – section 4.2
- Updated the example FCM request in section 4.4.1
- Clarifying re-wording

Example IRD – use case 1

```
"filtered-cost-calendar-map" : {  
  "uri" : "http://alto.local.example.com/costmap/filtered/calendar/context",  
  "media-types" : [ "application/alto-endpointcost+json" ],  
  "accepts" : [ "application/alto-endpointcostparams+json" ],  
  "capabilities" : {  
    "cost-constraints" : true,  
    "cost-type-names" : [ "num-routingcost", "num-RFcost" ],  
    "calendar-attributes" : [  
      {"cost-type-names" : "num-routingcost", "time-interval-size" : "1 hour", "number-of-intervals" : 24},  
      {"cost-type-names" : "num-RFcost", "time-interval-size" : "5 minute", "number-of-intervals" : 12}  
    ],  
    "cost-context" : [ // ++NEW  
      {"cost-type-names" : "num-RFcost",  
        "context-params" : [{"uda", "udna "}, {"uplink", "downlink"}] // context-params arrangements  
      }  
    ]  
  }  
}
```

ALTO Client may pick e.g.
(uda AND uplink) OR (udna AND downlink)

AND-combination

LIST/OR-combination

Example use case 1: request and response

```
POST /costmap/filtered/calendar/context HTTP/1.1
Host: alto.example.com
Accept: application/alto-costmap+json,application/alto-error+json
Content-Type: application/alto-costmapfilter+json
Content-Length: ###
{
  "cost-type" : { "cost-mode": "numerical", "cost-metric": "ARFcost"},
  "calendared" : true,
  "context-params" : [ ["uda", "uplink"],
                      ["uda", "downlink"],
                      ["udna", "uplink"],
                      ["udna", "downlink"] ],
  "pids" : [
    {"srcs" : [ "Cell1" ], "dsts" : [ "Cell1" ]},
    {"srcs" : [ "Cell2" ], "dsts" : [ "Cell2" ]}
  ]
}
```

All context-param combinations selected

```
HTTP/1.1 200 OK
Content-Type: application/alto-costmap+json
Content-Length: ###
{
  "meta" : {
    "dependent-vtags" : [
      {"resource-id": "my-default-network-map",
       "tag": "3ee2cb7e8d63d9fab71b9b34cbf764436315542e"}
    ],
    "cost-type" : {"cost-mode": "numerical", "cost-metric": "RFcost"},
    "calendar-response-attributes" :
      { "calendar-start-time" : Tue, 1 Sept 2016 13:00:00 GMT,
        "time-interval-size" : "5 minute",
        "numb-intervals" : 12},
    "context-params" : [ ["uda", "uplink"], // ++NEW
                        ["uda", "downlink"],
                        ["udna", "uplink"],
                        ["udna", "downlink"] ]
  } // end meta
  "cost-map" : {
    "Cell1": { "Cell1": [[70, 20, 90, 20], ... ,[50, 20, 70, 20]],
              "Cell2": { "Cell2": [[20, 70, 20, 90], ... ,[20, 50, 20, 70]]
            }
  }
}
```


Design choices & discussion

- Keep the Cost Type definition as specified in RFC 7285
 - To ensure backwards compatibility
- List the supported context attributes in information resources
 - Attributes encoded in JSON Strings with constant values,
 - To moderate number of context parameters and avoid too many indirections for the Server,
 - Context parameters are qualitative and expected to have few values.
 - → **discussion**: flexibility of e.g. “access-type” VS [“lan”, “wifi”, “cell”] ?
 - Can a context-parameter take numerous values?
- Logical combination of several sets of context parameters
 - moderating thus the set of conveyed parameters combinations
 - → **discussion**: is the combination design OK?
- No new media type

Next steps

- Collect WG feedback and suggestions
 - Thanks for the already collected feedback
- Examples for the EP property service
- Adopt extension or consider for next charter?

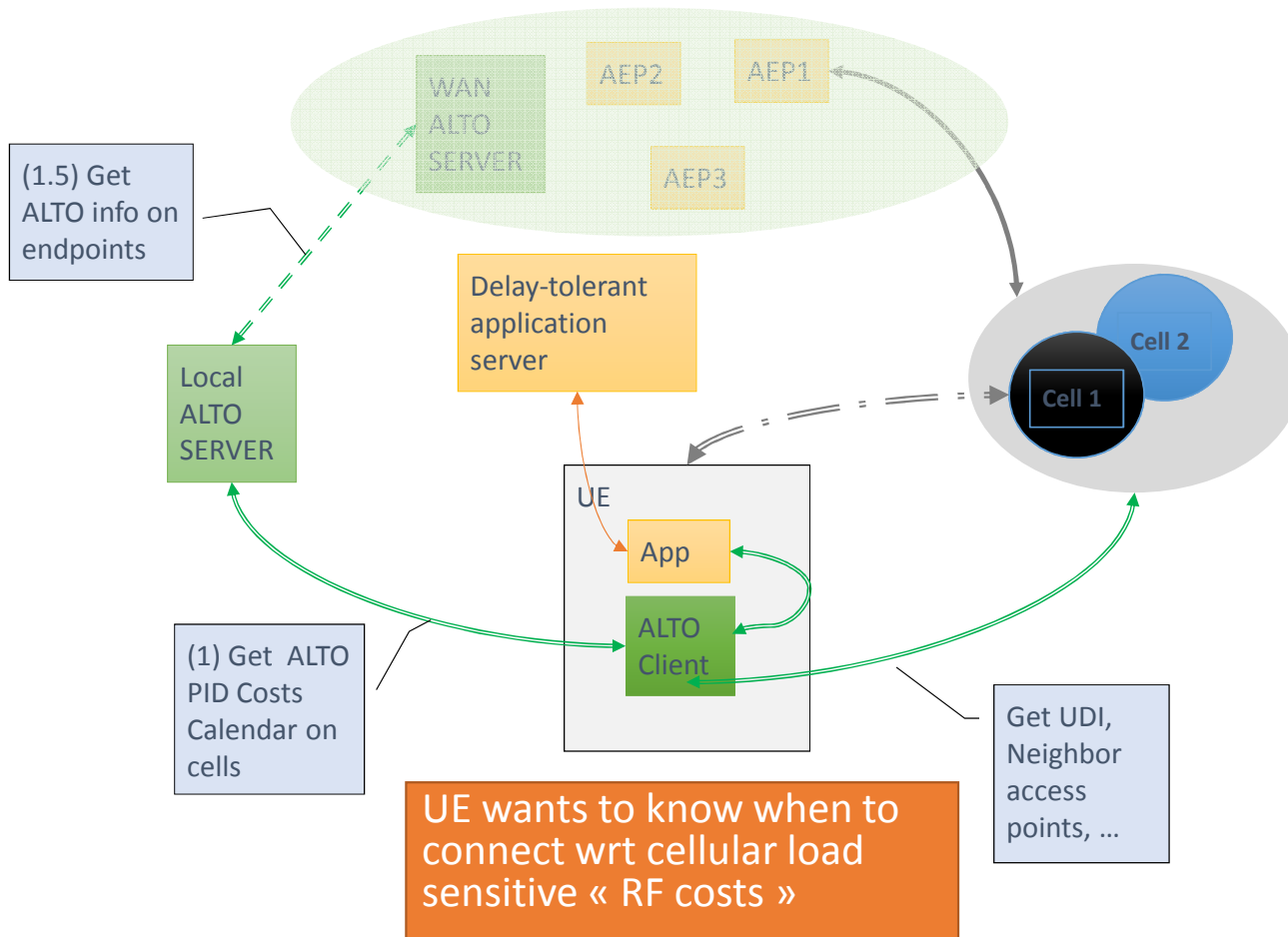
Thank you

Back-up follows

ALTO Cost Context overview

- Resumes previous discussions and proposals
 - Discussion in 2012 on how to get Cost Map K associated to policy Y
- Applicable to many network types
- Use cases in this draft: in cellular and wireless networks.
 - assumes the availability of cellular cost metrics and associated namespace.
- Allows finer grained decisions
- To avoid defining as many metrics as context parameters
 - Instead of: cost_policyA, ... cost_policyT, CCost_uda, Ccost_udna, ...
 - → cost_policy[pA, ... pT], Ccost[uda, udna]
- Avoid heavy request input, e.g.
- Applicable ALTO services
 - Filtered Cost Map service, Endpoint Property Service

Use case 1



UDI= Unattended Data Indicator

« Simple » ALTO Cost Calendar

5	1	3	2	5
---	---	---	---	---

Other network information eg LTE release 13 may **instantly** indicate whether unattended data transmission is allowed or not.
 → UE may do finer grained transmission/connection decisions

Example: context_param = [uda, udna]

« Simple » ALTO Calendar

5	1	3	2	5
---	---	---	---	---

« UDI aware » ALTO Calendar

4	1	2	1	4	UDNA
5	2	4	3	5	UDA

- UDA = Unattended Data Allowed
 - Indicates good connection
- UDNA = Unattended Data Not Allowed
 - Indicates poor connection

ALTO Calendar values = NON REAL TIME
UDI = REAL TIME provided by network

EXAMPLE

- UDI sent every 1 msec:
 - = UDA when RFCost \geq 3
 - = UDNA otherwise
- ALTO Calendar attributes
 - Nb time intervals: 5
 - Time interval length: 1-5 minutes

PROBLEM

- **Cumbersome to define a metric associated to context C1, C2, ... CN**
- **Request input may be too heavy**
- **Not affordable to get N cost maps**

Example use case 1: request and response

```
POST /costmap/filtered/calendar/context HTTP/1.1
Host: alto.example.com
Accept: application/alto-costmap+json,application/alto-error+json
Content-Type: application/alto-costmapfilter+json
Content-Length: ###
{
  "cost-type" : { "cost-mode": "numerical", "cost-metric": "RFcost"},
  "calendared" : true,
  "context-params" : [{"uda", "uplink"},
                      ["uda", "downlink"],
                      ["udna", "uplink"],
                      ["udna", "downlink"]],
  "pids" : [
    {"srcs" : ["Cell1"], "dsts" : ["Cell1", "Cell2"]},
    {"srcs" : ["Cell2"], "dsts" : ["Cell1", "Cell2"]}
  ]
}
```

All context-param combinations selected

```
HTTP/1.1 200 OK
Content-Type: application/alto-costmap+json
Content-Length: ###
{
  "meta" : {
    "dependent-vtags" : [
      {"resource-id": "my-default-network-map",
       "tag": "3ee2cb7e8d63d9fab71b9b34cbf764436315542e"}
    ],
    "cost-type" : {"cost-mode": "numerical", "cost-metric": "RFcost"},
    "calendar-response-attributes" :
      { "calendar-start-time" : Tue, 1 Sept 2016 13:00:00 GMT,
        "time-interval-size" : "5 minute",
        "numb-intervals" : 12},
    "context-params" : [{"uda", "uplink"}, // ++NEW
                       ["uda", "downlink"],
                       ["udna", "uplink"],
                       ["udna", "downlink"]}
  ] // end meta
  "cost-map" : {
    "Cell1": { "Cell1": [[70, 20, 90, 20], ... ,[50, 20, 70, 20]],
              "Cell2": { "Cell2": [[20, 70, 20, 90], ... ,[20, 50, 20, 70]]
            }
  }
}
```

Required ALTO extensions for use cases in draft

- Cost value context parameters: a capability to allow exposing several possible context-dependent values for one metric,
 - **Focus of this draft**
- Extended input for the Filtered Cost Map Service: to allow the input to comprise several(source-array, destination-array) pairs,
 - has been proposed in [draft-yang-alto-path-vector]
- Cost metrics for cellular and wireless networks: these features would extend current proposals in the WG,
 - could be added to [draft-ietf-alto-performance-metrics]
- For cellular and wireless networks: entities with associated address space and properties
 - could be added to [draft-roome-alto-unified-props]