ALTO Re-charter Item: General ALTO protocol extensions

ALTO WG meeting IETF109

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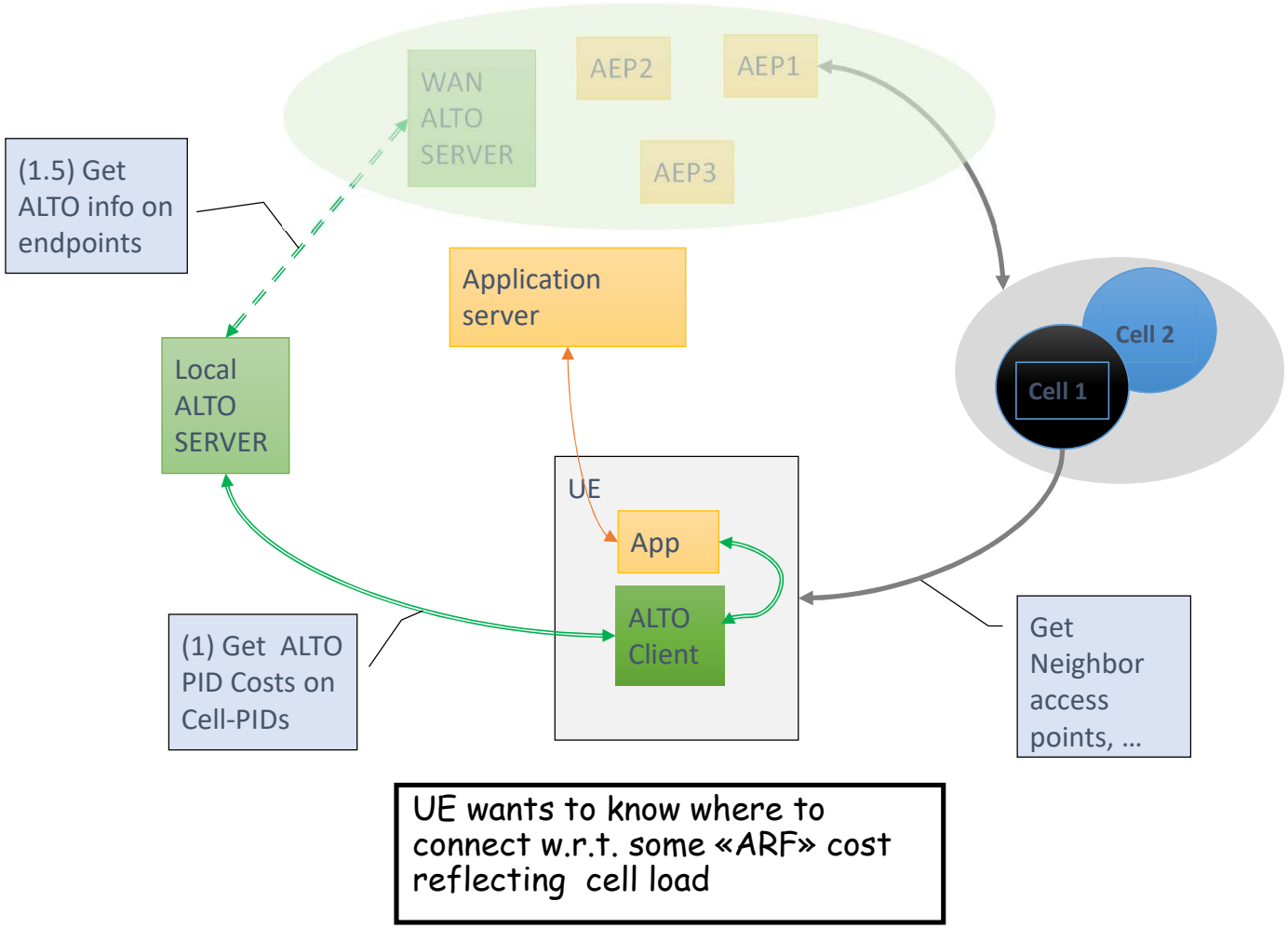
S. Randriamasy et al.

Proposed Paragraph

Protocol extensions to convey a richer and extensible set of additional attributes on ALTO information allowing clients to make more informed decisions beyond simple "where" and "when". Such additional attributes will be related both to path costs (e.g., ALTO path cost value with attributes such as real-time network indications or policy), and to entities (e.g., ALTO entity properties with attributes reflecting time dependency).

The working group will specify such extensions in coordination with both other ALTO working group items and IETF working groups that have a focus on the related use cases. The scope of extensions is not limited to those identified by the WIs and WGs but is limited by the criteria set out below.

Use case 1

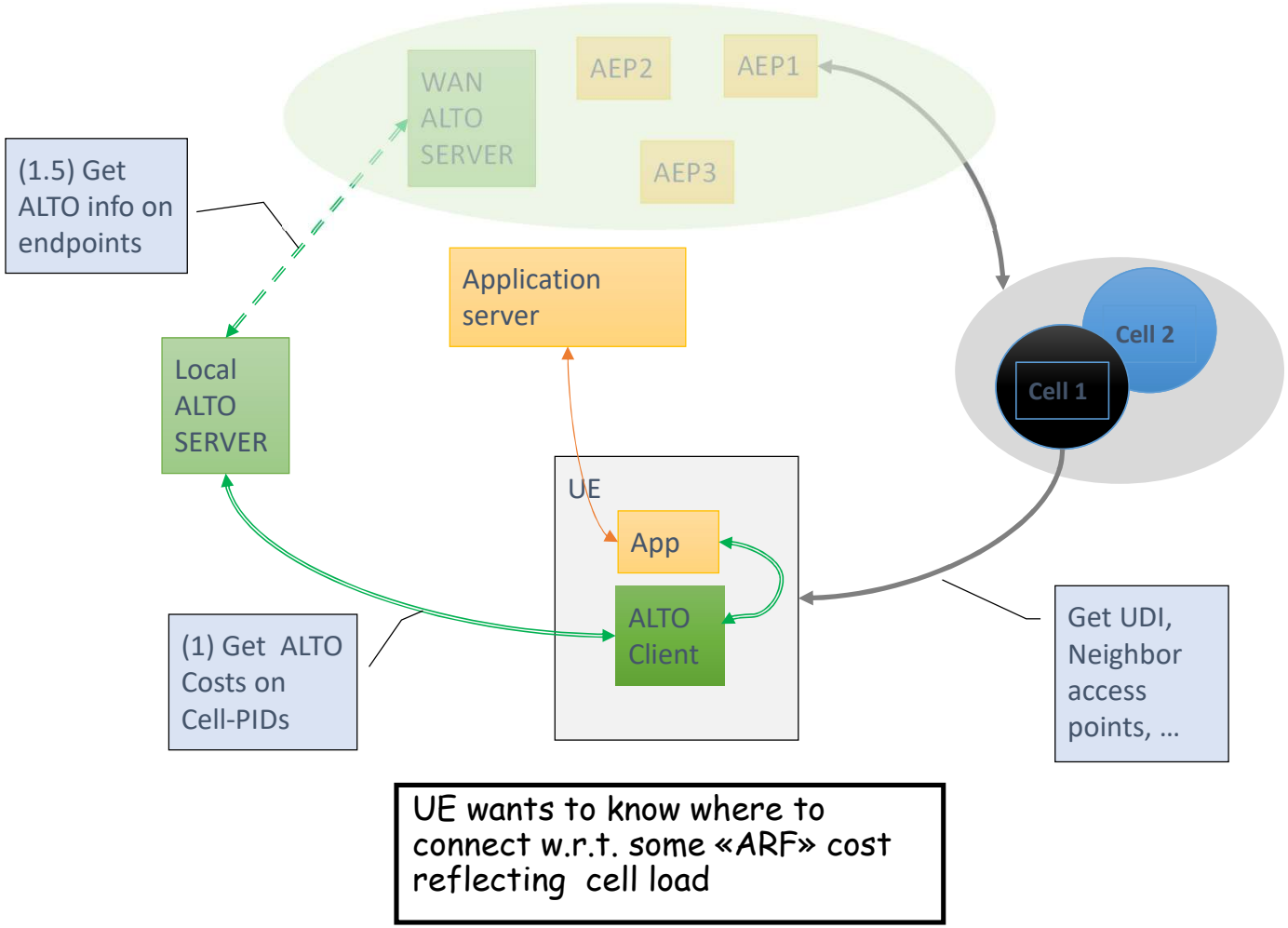


- Cell1 = PID1, Cell2 = PID2, …
- Abstracted RF Cost «ARF» in Cell1
- Current ALTO format is
  - ARF(C1) = Cost (PID1, PID1)

Problem 1

- ALTO Cost (PID1, PID1) cannot account for uplink or downlink
- Cumbersome to define and register specific ALTO cost for uplink and downlink

Use case 2



UE wants to know where to connect w.r.t. some «ARF» cost reflecting cell load

Device may receive other external network parameters

- Via a different channel
- At a different pace, e.g. real time
  - E.G. UDI (3gpp R13)

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

Problem 2

- ARF Cost may differ w.r.t. value of external network parameter
- ALTO does not support real-time information
- ALTO cannot combine real-time and non-real time information
- Cumbersome to define and register specific cost for UDA, UDNA and all other potential external parameters

Some other use cases

- Path costs may be affected by parameters such as SLA
- Several paths may be possible between a source and destination
  - Each path may have a different cost
- Entity property values may change over time
  - E.g. Paths may traverse ANEs that are server groups with time-varying properties on CPU, RAM, Storage
  - Or link groups with time-varying properties on connectivity
- Awareness on attributes such as SLA, time-dependency of entity properties
  - Can be enable to carefully schedule operations on order to avoid incidents due to resource shortage
  - Can improve efficiency and cost-effectiveness of delay-tolerant operations such as database backups or Data Center connection for delay tolerant applications

Potential solutions - cost and property attributes

- Extend ALTO path cost and ALTO entity property values with attributes
- ALTO Path Cost value attributes provide several values for a cost type
  - Each value depends on *qualitative* attributes as opposed to quantitative attributes such as time.
  - Each attribute is specified in the IRD
    - lists the applicable ALTO cost types
    - specifies the possible values it may take
- ALTO Entity property value attributes provide several values for a property
  - Each value depends on a quantitative attributes which is time
  - Design may be inspired by ALTO Cost Calendar

Example IRD – cost attributes gathered in « context » capability

```
"filtered-cost-map" : {
  "uri" : "http://alto.local.example.com/costmap/filtered/context",
  "media-types" : [ "application/alto-endpointcost+json" ],
  "accepts" : [ "application/alto-endpointcostparams+json" ],
  "capabilities" : {
      "cost-constraints" : true,
      "cost-type-names" : [ "num-routingcost",  "num-RFcost"],
      "cost-context" : [
        {"cost-type-names" : "num-RFcost",
         "context-params" :  [["uda", "udna " ], ["uplink", "downlink"]]}
      ]
   }
}
```

Example use case 1: request and response

```
POST /costmap/filtered/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"},
  "context-params" : [["uda", "uplink"],
                      ["uda", "downlink"],
                      ["udna", "uplink"],
                      ["udna", "downlink"]],
   "pids" :  [
             {"srcs" : [ "Cell1"], "dsts" : [ "Cell1"]},
             {"srcs" : [ "Cell2"], "dsts" : [ "Cell2"]}
   ]
}
```

Client selects all logical combinations of attribute values are 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"},
   "context-params" : [["uda", "uplink"],
                       ["uda", "downlink"],
                       ["udna", "uplink"],
                       ["udna", "downlink"]]
    } // end meta
  "cost-map" : {
    "Cell1": { "Cell1" : [70, 20, 90, 20]},
    "Cell2": { "Cell2": [20, 70, 20, 90]}
   }
}
```

Design considerations and remaining issues

- Flexible design
  - Extensible association of ALTO cost type and attributes
    - Example: attribute representing SLA may apply to several cost types
    - A cost-type may have several attributes
  - Logical combinations of attributes values
    - Example: [“uplink”, “downlink”] combined with [“uda”, “udna”]
- Attribute values
  - For the moment qualitative
    - Quantitative values should be processed as metrics or properties
- Scalability
  - Number of attribute values
    - Some attributes have few potential values that can be hard coded, see example above
    - Some may have a larger number of unpredictable values and may not
  - The issue of cross product in “src” and “dst”
- IANA considerations
  - Should attributes be registered?

Planning

- Who will work on it
  - Sabine, Nokia
  - People involved in ALTO WG items that may use these extensions
  - Anybody interested

- Milestones
  - IETF 110
    - First collection of use-cases
    - Reactivation and update of related existing ALTO drafts
  - IETF111
    - Initial draft for ALTO Cost attributes
    - Initial draft for ALTO Property Calendars

- Some previous work
  - https://tools.ietf.org/html/draft-randriamasy-alto-cost-context-03

Thank you