

ALTO Cost Calendar

draft-randriamasy-alto-cost-calendar-01

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ALTO Cost Calendar: Overview

- Allows applications to decide not only 'where' to connect to, but also 'when'
- New Cost Mode =**"calendar"**
 - Array of time-dependent ALTO Cost values
 - Specifies Calendar attributes on applicable date and duration
- Fulfill updated charter item #3
 - Protocol extensions to convey a richer set of attributes to allow applications to determine not only « where » but also « when » to connect

Use Cases

Non-real time applications that have a degree of freedom on *when* to use network resources,

- Resource = content in a CDN server, physical resource in a DC, service
- Bulk data transfer scheduling
 - W.r.t. surrogate location time zones, network maintenance
- Limited connectivity or access to datacenters
 - endsystems with scarce resources, patching
- SDN Controller guided access to application endpoints
 - ALTO Server in SDN-C guided traffic balancing
- Large flow scheduling on extended ALTO topologies
 - Any metric with quantitative or qualitative values
- Time-sensitive TE metrics Calendaring
 - ALTO bandwidth values = estimates based on TE measurements

Design

- Q:** How to provide information so that apps can schedule their transfers and access to app resources?
- Insight: provides forecast to apps of cost metric values



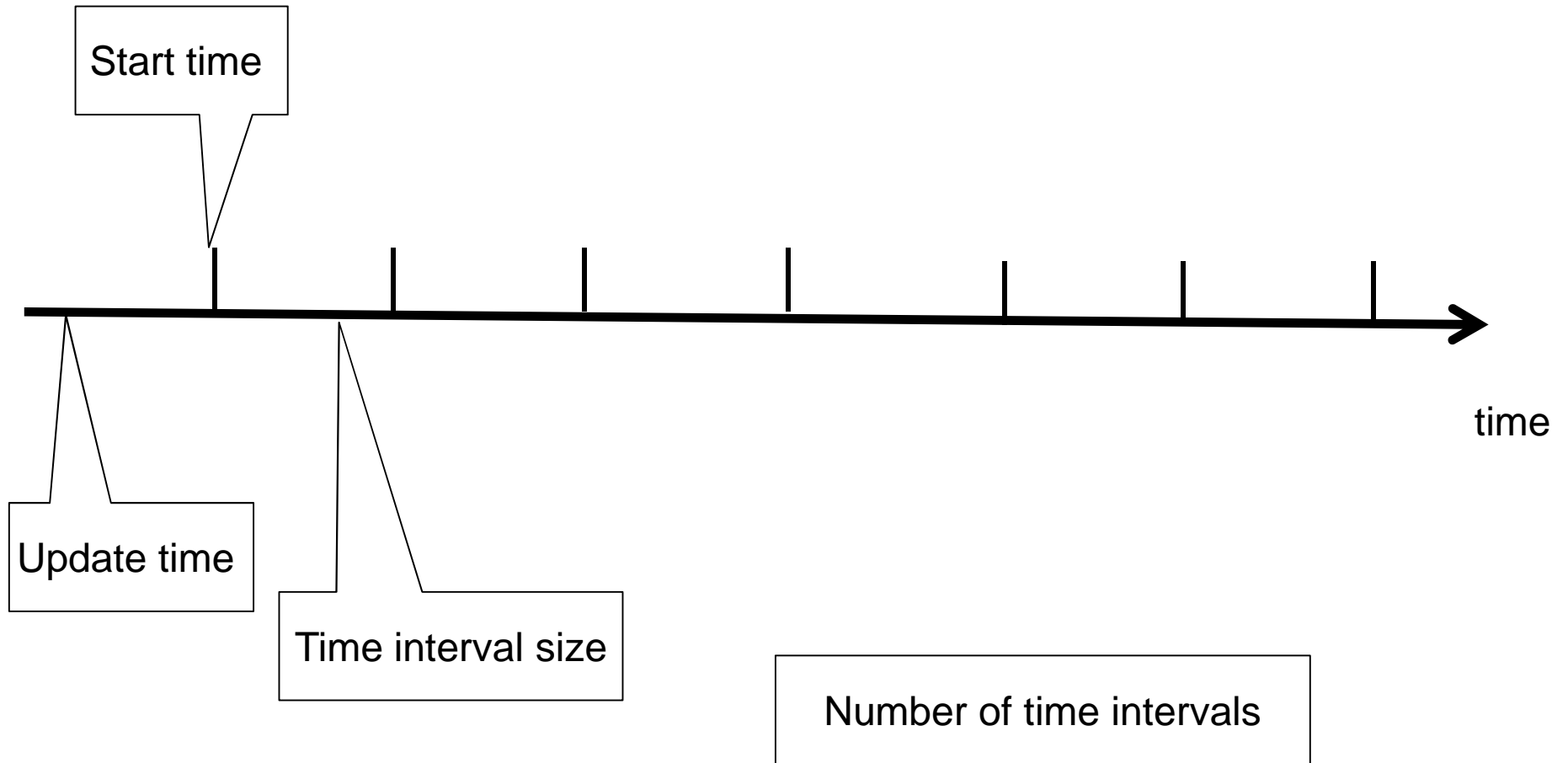
Design Decision

A sequence (e.g., 8) of forecast values of a given timing interval (e.g., hourly)

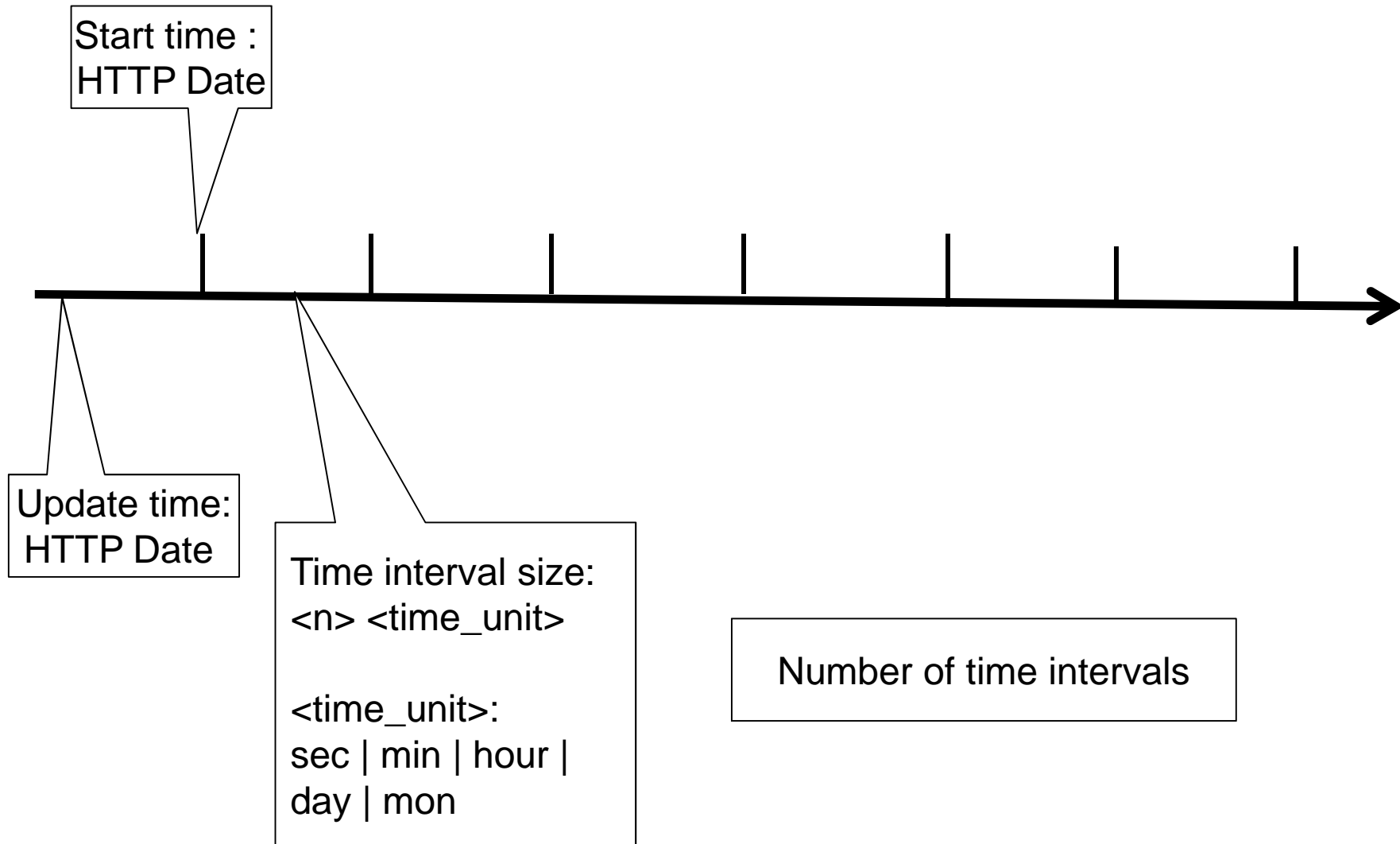
Note

- Forecast computation should reflect both natural traffic pattern (e.g., diurnal patterns) and policy (e.g., scheduled maintenance).

Encoding of Design Decision



Encoding of Design Decision

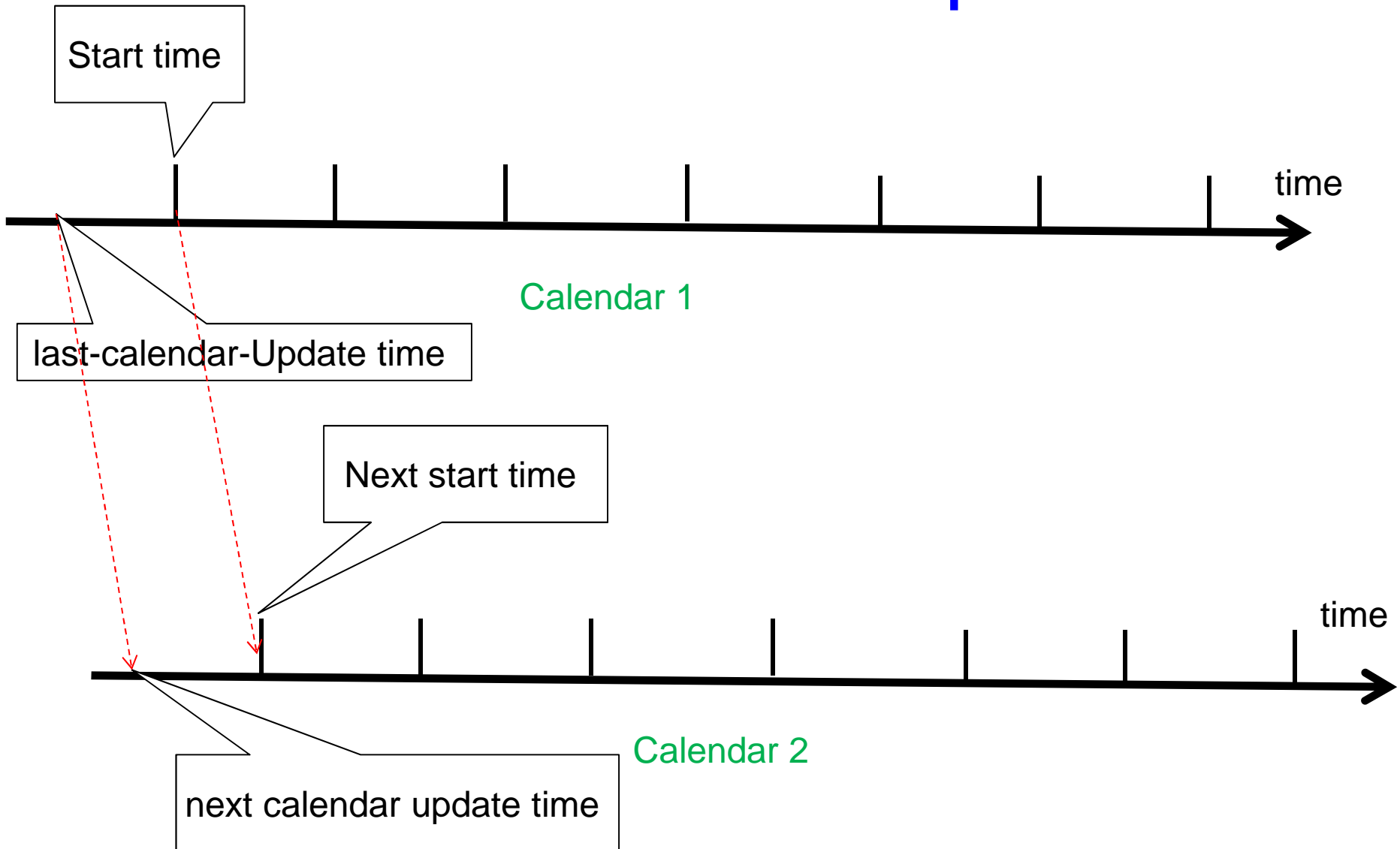


Example IRD

- 1 daily calendar of 12 time intervals of 2 hours, computed every day
- IRD GET done on Tuesday July 1st at 13:15

```
"meta" : { "cost-types": {  
    "calendar-abw": {  
        "cost-mode" : "calendar",  
        "cost-metric": "Availbandwidth",  
        "description": {  
            "calendar-start-time" :  
                Tue, 1 Jul 2014 00:00:00 GMT,  
            "time-interval-size" : "2 hour",  
            "numb-intervals" : 12,  
            "calendar-update-time" :  
                Mon, 30 Jun 2014 23:59:00 GMT  
        }  
    }  
}
```


Inform Client on Update



Example IRD

- 7 daily calendars of 12 time intervals of 2 hours, computed every week on Sunday
- IRD GET done on Tuesday July 1st at 13:15

```
"meta" : { "cost-types": {  
    ...  
    "calendar-routing": {  
        "cost-mode" : "calendar",  
        "cost-metric": "routingcost",  
        "description": {  
            "calendar-start-time" :  
                Tue, 1 Jul 2014 00:00:00 GMT,  
            "last-calendar-update-time" :  
                Sun, 29 Jun 2014, 23:59:00 GMT,  
            "time-interval-size" : "2 hour",  
            "numb-intervals" : 12,  
            "next-start-time" : Fri, 4 July 2014 00:00:00 GMT  
            "next-calendar-update-time" :  
                Sun, 6 Jul 2014, 23:59:00 GMT  
        }  
    }  
}
```

Example Calendar Transaction

Request on 'Availbandwidth' Calendar:

- **daily pattern of 12 values on 2h intervals, computed every day, updated at 0h00, for 24 hours, with the first interval starting at 0h00**

```
POST /endpointcalendarcost/calendar/lookup HTTP/1.1
```

```
Host: alto.example.com
```

```
Content-Length: [TODO]
```

```
Content-Type: application/alto-endpointcostparams+json
```

```
Accept: application/alto-endpointcalendarcost+json,application/alto-error+json
```

```
{
  "cost-type" : { "cost-mode" : "calendar", "cost-metric" : "Availbandwidth" },
  "endpoints" : {
    "srcs": [ "ipv4:192.0.2.2" ],
    "dsts": [
      "ipv4:192.0.2.89",
      "ipv4:198.51.100.34",
      "ipv4:203.0.113.45"
    ]
  }
}
```

Example Calendar Transaction

Client receives a 12-value array + calendar attributes

```
HTTP/1.1 200 OK
Content-Length: [TODO]
Content-Type: application/alto-endpointcalendarcost+json
{
  "meta" : {
    "cost-type" : {"cost-mode" : "calendar", "cost-metric" : "Availbandwidth"},
    "calendar-start-time" : Tue, 1 Jul 2014 00:00:00 GMT,
    "last-calendar-update-time" : Sun, 29 Jun 2014, 23:59:00 GMT,
    "time-interval-size" : "2 hour",
    "numb-intervals" : 12,
    "next-start-time" : Fri, 4 July 2014 00:00:00 GMT,
    "next-calendar-update-time" : Sun, 6 Jul 2014, 23:59:00 GMT
  }

  "endpoint-cost-calendar-map" : {
    "ipv4:192.0.2.2": {
      "ipv4:192.0.2.89" : [... Array of 12 values],
      "ipv4:198.51.100.34" : [... Array of 12 values],
      "ipv4:203.0.113.45" : [... Array of 12 values]
    }
  }
}
```

Summary

- Introduce ALTO calendar cost mode
- Applicable to any ALTO cost metric types
- Applicable to multiple ALTO Services
 - Endpoint cost service
 - (Filtered) cost map
- Next step:
 - Further discuss and specify the calendar attributes
 - Update draft according to discussions

Thank you

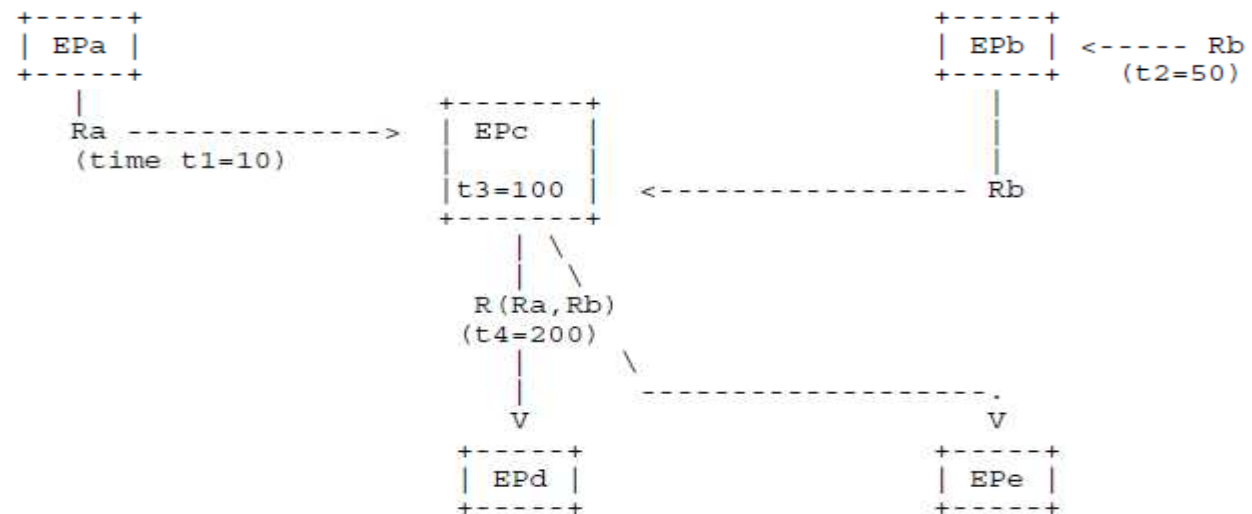
Back-up slides

Use case limited resources

- End systems with connectivity or access to datacenters that is *variable* and *predictable*
 - Applications: remote learning, enterprise database update, remote distributed computation, ...
 - ➔ Wish to schedule their connection to application Endpoints

Example: scattered endpoints/resources

➔ Interaction with Endpoints can be scheduled at times with the best possible ALTO Cost value



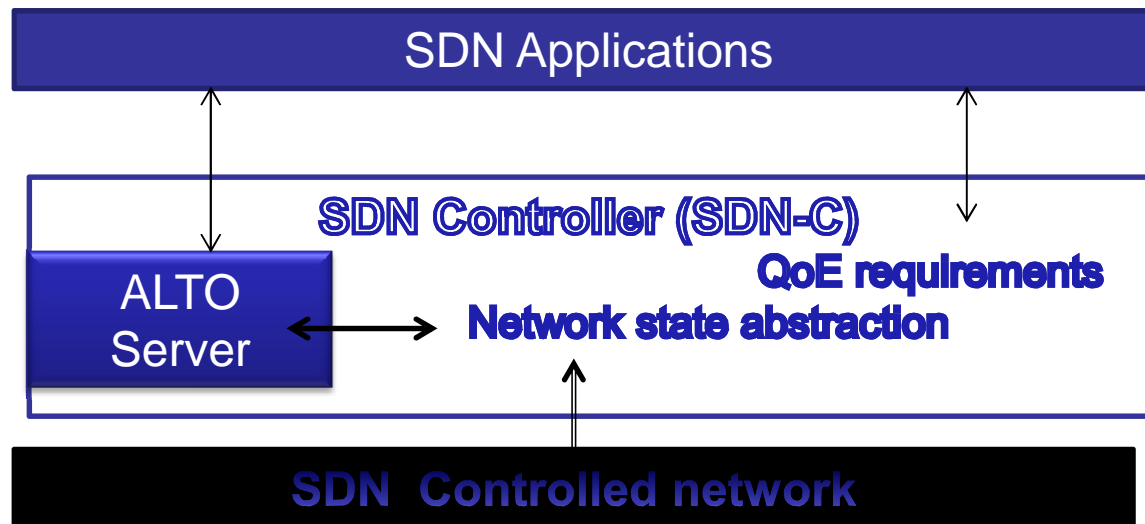
- ALTO Client themselves can schedule their ALTO requests
- they now when ALTO Calendar values are updated

SDN Controller guided traffic balancing

- SDN-C can use ALTO Cost Calendar to influence the scheduling of application traffic
 - Do network state *estimation/prediction* over time periods
 - Store their abstraction in ALTO server
 - Give the values to SDN applications via the ALTO ECS
- ➔ Applications get a better QoE as they pick the best time
- ➔ SDN-C improves load balancing as it may
- guide application traffic to selected Endpoints
 - AND indirectly distribute application traffic over time via carefully specified ALTO cost Schedule values

SDN Controller guided access to application endpoints

- Base ALTO protocol allows to perform SDN primitives
 - Abstraction, Get Network Topology, Get device capabilities



- SDN primitive “Get network resources”
 - Provides applications with informations to evaluate QoE
 - Abstracting e.g. delay, bandwidth → requires new ALTO Cost Types