Discussions on Topics Beyond Current ALTO WG Deliverables

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As a result of discussions with many
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ALTO High-Level Goals

• Network information **abstraction** for applications (content)

• Network information **retrieval** by applications (transport)

• In the context of application-aware networking
ALTO Protocol Framework (Transport)

- Network information **divided** into (network) information resources
  - Explicit division allows modularity (**media types**), flexibility, scalability
  - Dependency (**consistency**) among information resources can be specified
  - List of available information resources provided by **Information Resource Directory (IRD)**
    - Bootstrap server provided by **server discovery**
- Each individual information resource is provided as a **RESTful service**
  - Has a simple, but so far working well **grammar**
- A generic, SSE-based framework to **stream-control, push, incrementally update** information resources
- A generic framework supporting **entity properties, inheritance**
- Information resources can be **filtered**
ALTO Network Abstractions

- A network consists of nodes and paths
- Nodes can be
  - endpoints
  - aggregations of endpoints (PID)
  - abstract network elements
- Endpoints, partitions, abstract network elements are called entities
- Entities have properties that can be inherited
- Entities can have capabilities

- A path has path properties:
  - cost metrics, calendars
  - vector of abstract network elements
- A set of paths can form a co-flow, with:
  - shared abstract network elements cross the co-flows
ALTO Network Abstractions

- UP/EPS/CDNi
- Net Map
- Cost Map
- ECS
- PV
ALTO RFCs/WG Docs/Drafts

- Multicost (RFC8189)
- Deployment (RFC7971)
- Server Discovery (RFC7286)
- Base Protocol (RFC7285)
- Requirements (RFC6708)
- Problem Statement (RFC5693)

CDNi
Path Vector
XDOM
SSE/Incr Update
Cost Calendar
Cost Metrics

Multi-domain Orchestration
Compressing PV
Implementation & Use Cases
Cellular Address
Unified Resource Representation
Flow-based Cost Query
Multipart Messages

Multi-domain (Broker Assisted)
Work Beyond Current WG Items

- Domain: ALTO deployment
- Focus: collaborative, distributed, exa-scale data sciences, e.g., SDN for End-to-End Networked Science at the Exascale (SENSE)
- Applications planning to be supported: LHC, LIGO, LSST, EHT ...

- Ongoing work solving issues:
  - Cost services supporting [1]
    - Time-Block-Maximum Bandwidth
    - Bandwidth-Sliding Window
    - Time-Bandwidth-Product
Work Beyond Current WG Items

- Domain: ALTO protocol framework

- IRD with context info
- Multipart information resources
- Simple grammar vs YANG model
- Leveraging more flexible transport (HTTP/2)
Work Beyond Current WG Items

- **Domain:** ALTO network abstractions

- **Key entity domains beyond** (ipv4/ipv6 endpoints, pid for network regions)

- **Information + Actions Integration**
Work Beyond Current WG Items

- Domain: ALTO backend/realization
- Smart/on-demand measurements (query miss trigger, start and collect measurements, formalize the protocol, connect to IPPM, accuracy/freshness, what kind of info to be provided)
- Proxy architecture, for scale, interdomain, for fault tolerance, for security/privacy
- ...

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Backup Slides
Mixing of connectivity, services, consistent view, integrated into a common network view.

- **Other Info model 1**
- **Control Module 1 (SDN)**
- **MPLS Setup**

**Mechanisms**

- **Information Resource Directory**
- **Network Resource Directory**
- **Path Vector**
- **Capability Footprints / Unif Pro**
- **Network Cost Map (calendar, ...)**
- **Info Consistency (tags, dependency, multi-info resources)**
- **Information Update Model (SSE, Incremental)**

**Abs Modules**

- **Interdomain/Multi Server Model: multiple operators (owners)?**
- **Dynamicly how to populate, update the info?**

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ALTO Work Beyond Current WG Deliverables
Potential Info + Action Model

- Network -> app
  info, choices, but also link to action
  mix of network info, choices => to point to
  action modules
  
  <option flow=""", name="path1"" option
  ="aaa">