ALTO Framework and Remaining Issues

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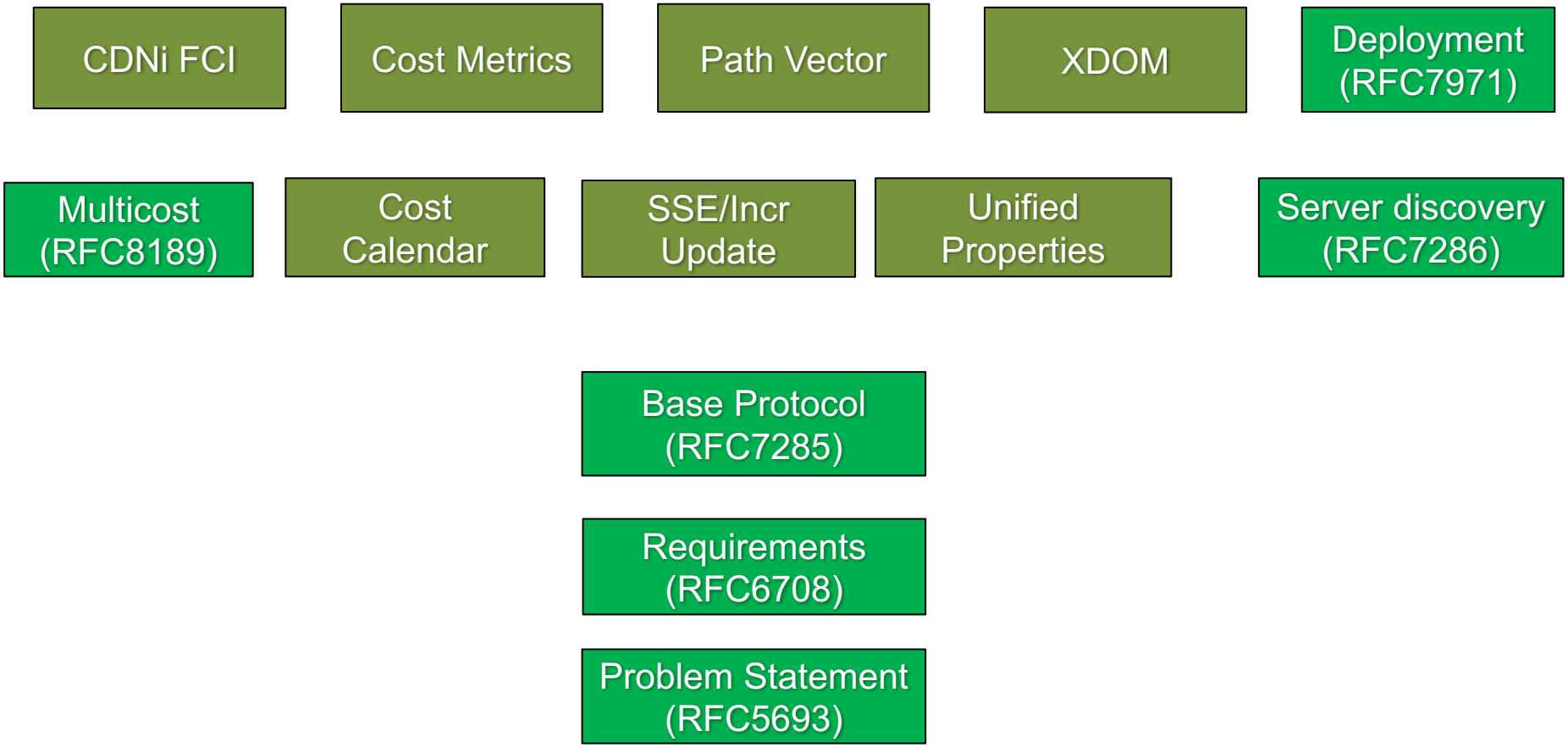
Existing RFCs/WG Docs/Drafts

	CDNi	Multi-domain Orchestration	Multi-domain (Broker Assisted)
Multicost (RFC8189)	Path Vector	Compressing PV	
Deployment (RFC7971)	Unified Properties	Implementation & Use Cases	
Server Discovery (RFC7286)	XDOM	Cellular Address	
Base Protocol (RFC7285)	SSE/Incr Update	Unified Resource Representation	
Requirements (RFC6708)	Cost Calendar	Flow-based Cost Query	
Problem Statement (RFC5693)	Cost Metrics	Multipart Messages	

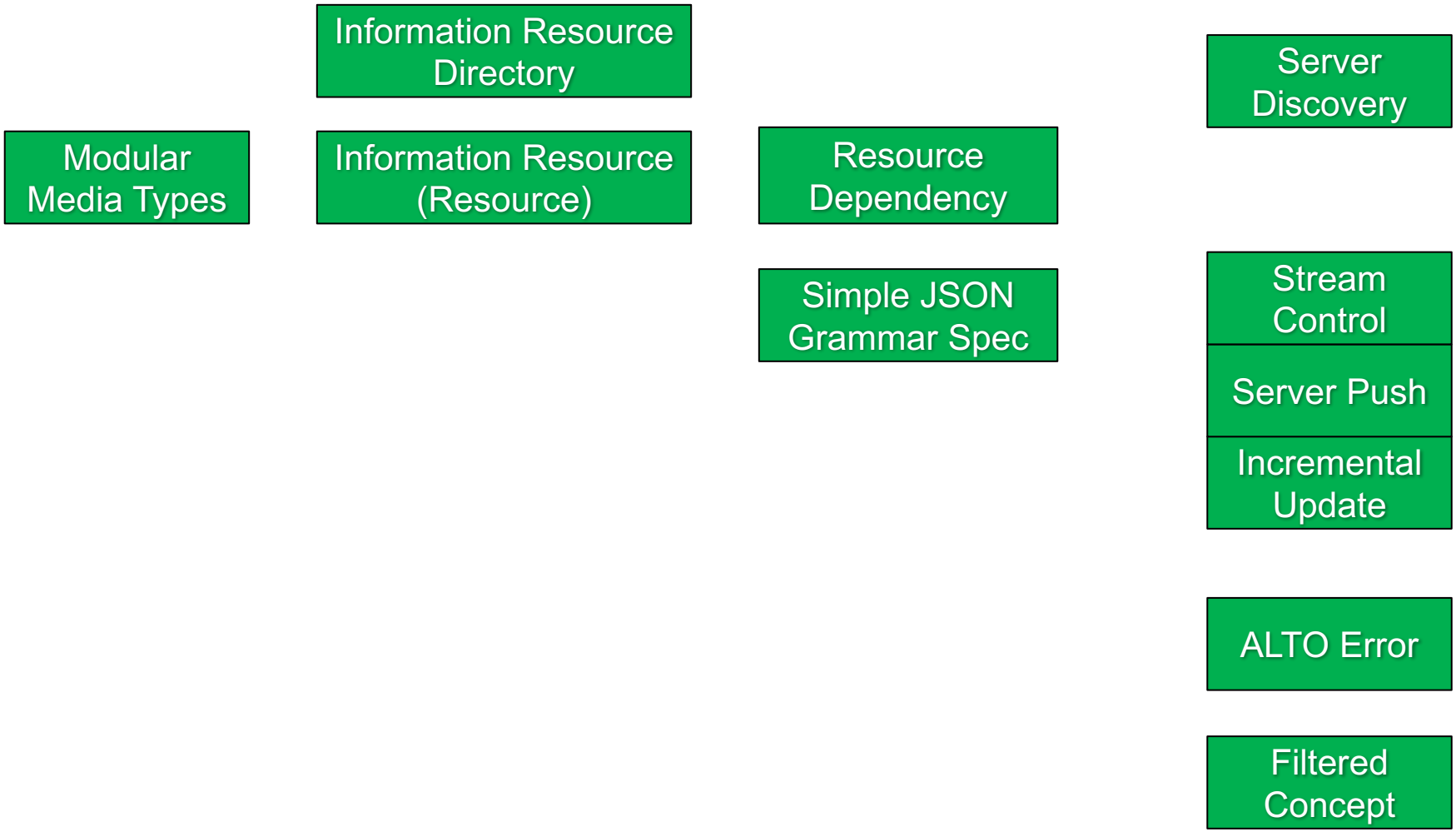
Existing RFCs/WG Docs



ALTO Protocol Framework

- 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
- Information resource can be filtered
- A generic, SSE-based framework to stream-control, push, incrementally update information resources
- A generic framework supporting entity properties, supporting inheritance, entity decomposition

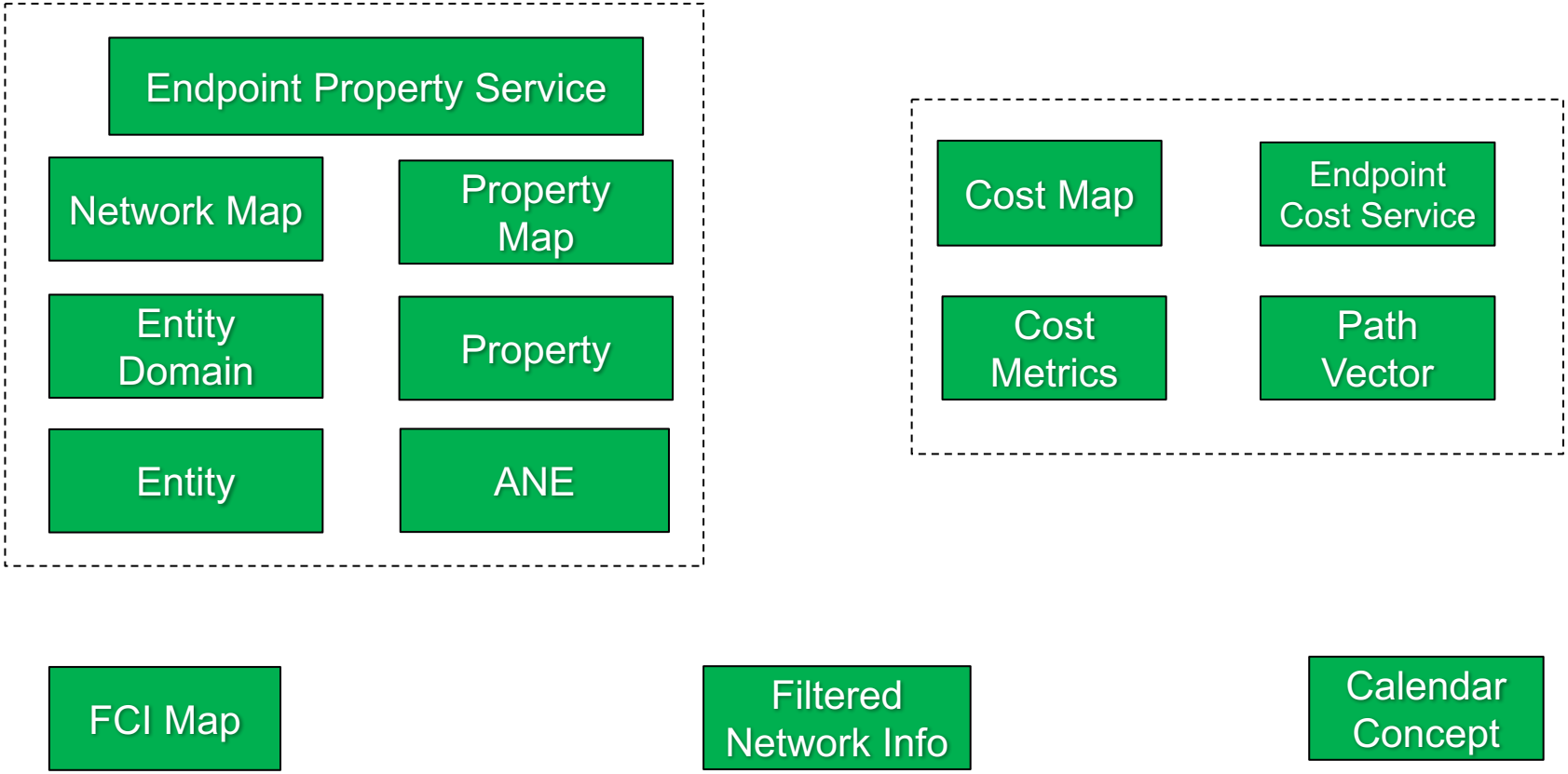
ALTO Protocol Framework



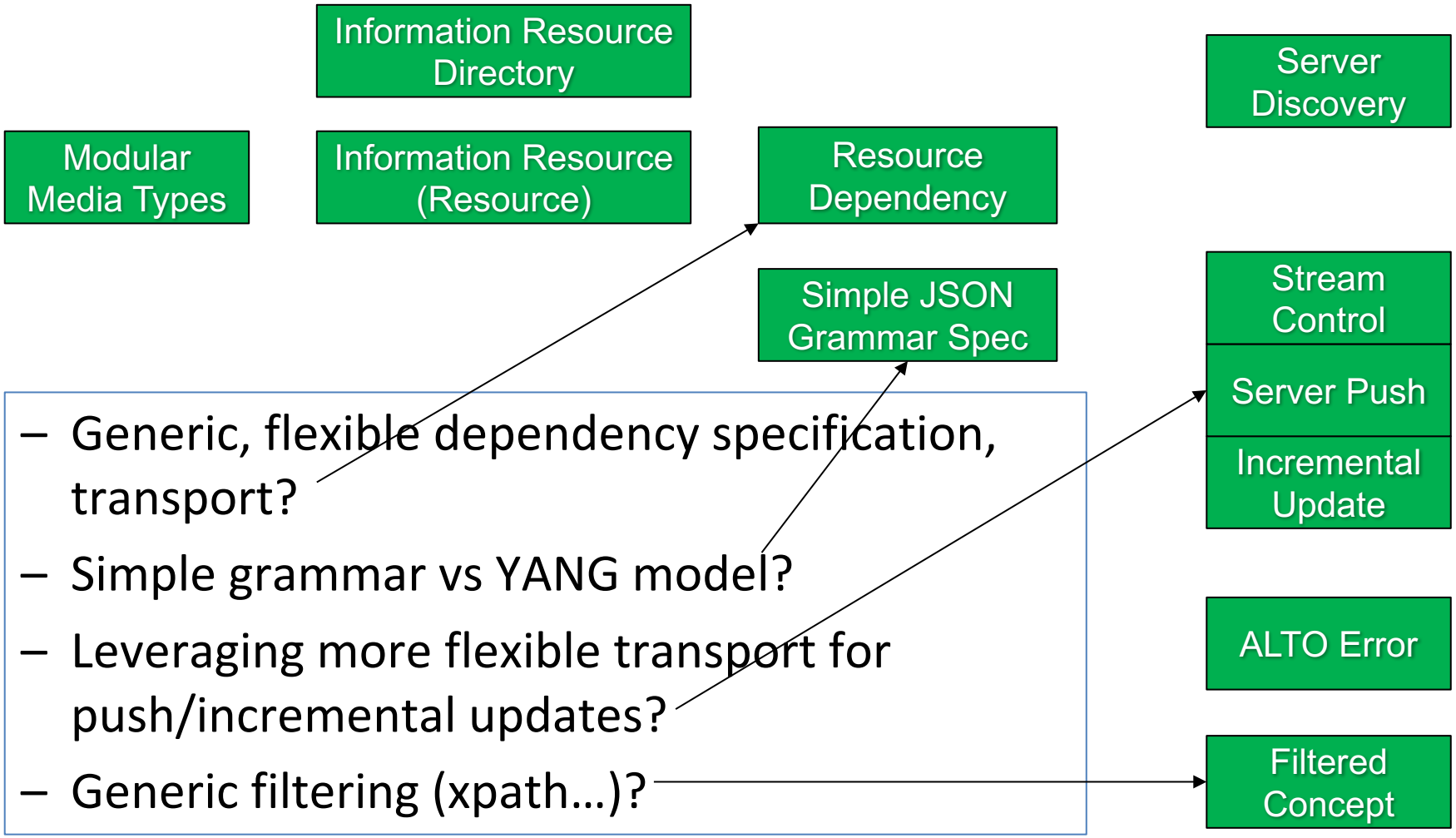
ALTO Network Abstractions to Applications

- 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, decomposed
- A path has path properties:
  - cost metrics, calendars
  - vector of abstract network elements

ALTO Network Abstractions to Applications

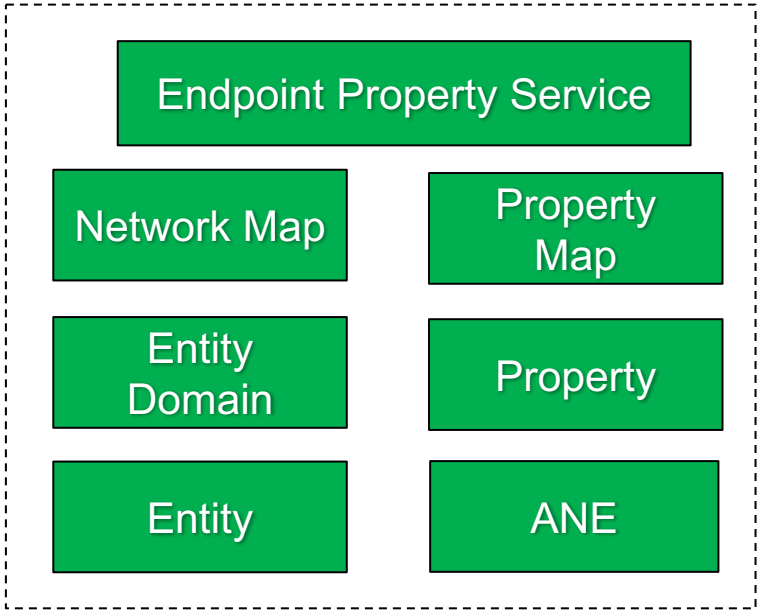


Remaining Issues – Protocol Framework

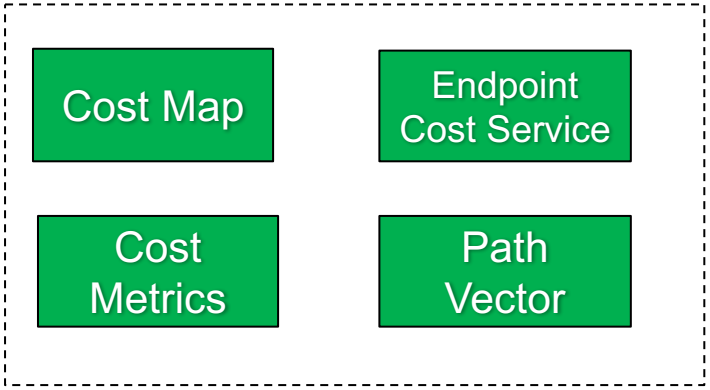


Remaining Issues: ALTO Network Abstractions to Applications

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



- Unified, generic path (cost): e.g., endpoint/pid pair -> flow/multicast/multipath/?



FCI Map

- FCI to general network capability exposure?

Filtered Network Info

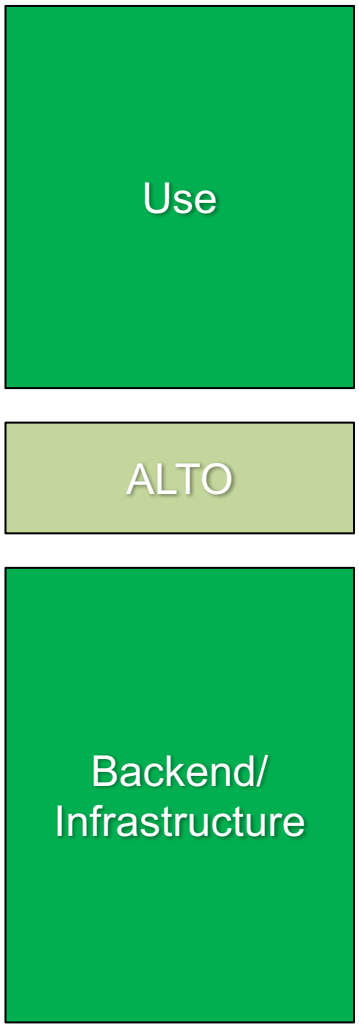
- General, network information filtering/extraction (unified resource discovery)?

Calendar Concept

- Generic calendar mechanism?

Remaining Issues – Bigger Picture (Most Important)

- App use cases/requirements
  - Systematic study of how ALTO info be integrated/utilize in ***orchestration***
    - One aspect ALTO + PCE, ABNO, Path based, …
  - Extension to important settings such as multi-domains, NFV, edge clouds, IoT
- Backend/infrastructure, e.g.,
  - 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



Comments?