

# Discussions on Topics Beyond Current ALTO WG Deliverables

Presenter: Y. Richard Yang

As a result of discussions with many  
(Borje Ohlman, Christian Rothenberg, Danny A. Lachos,  
Farni Boten, Franck Le, Jensen Zhang, Kai Gao,  
Luis Contreras, Sabine Randdriamasy, Qiao Xiang,  
Yeonsup Lim, Yunfei Zhang)

IETF 105  
July 25, 2019  
Montreal

# ALTO High-Level Goals

- Network information **abstraction** for applications (content)
- Network information **retrieval** by applications (transport)
- In the context of application-aware networking

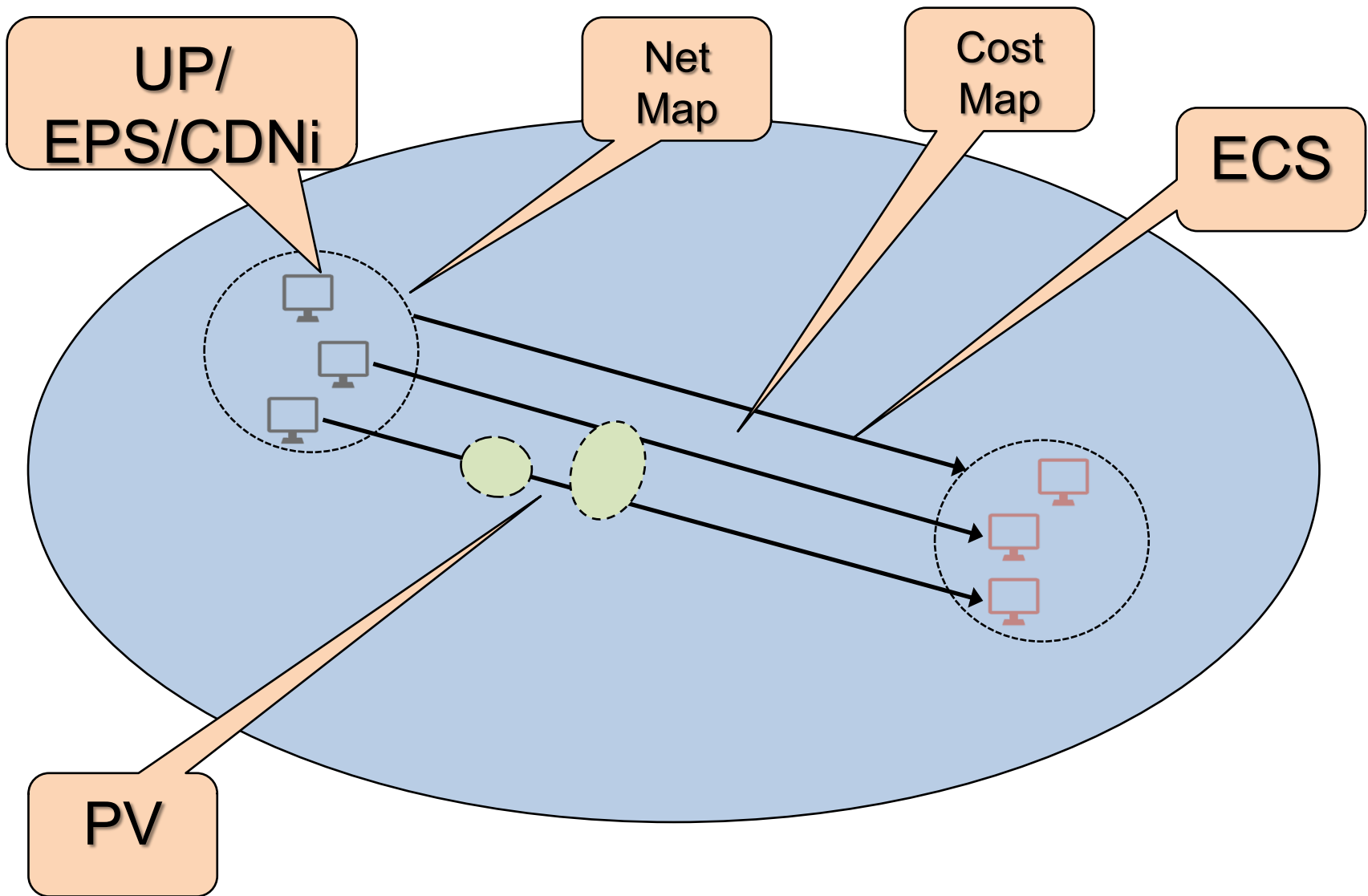
# ALTO Protocol Framework (Transport)

- 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



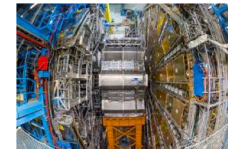
# ALTO RFCs/WG Docs/Drafts

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

# 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 ...

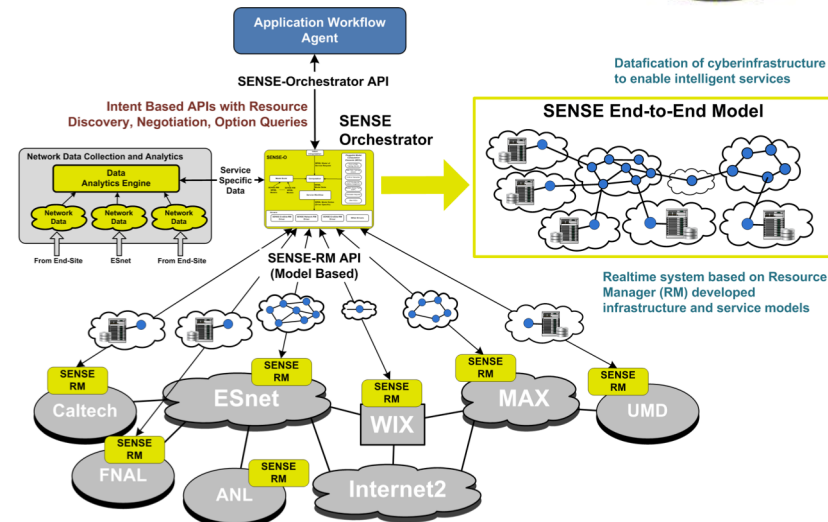


- Ongoing work solving issues:

– Cost services supporting [1]

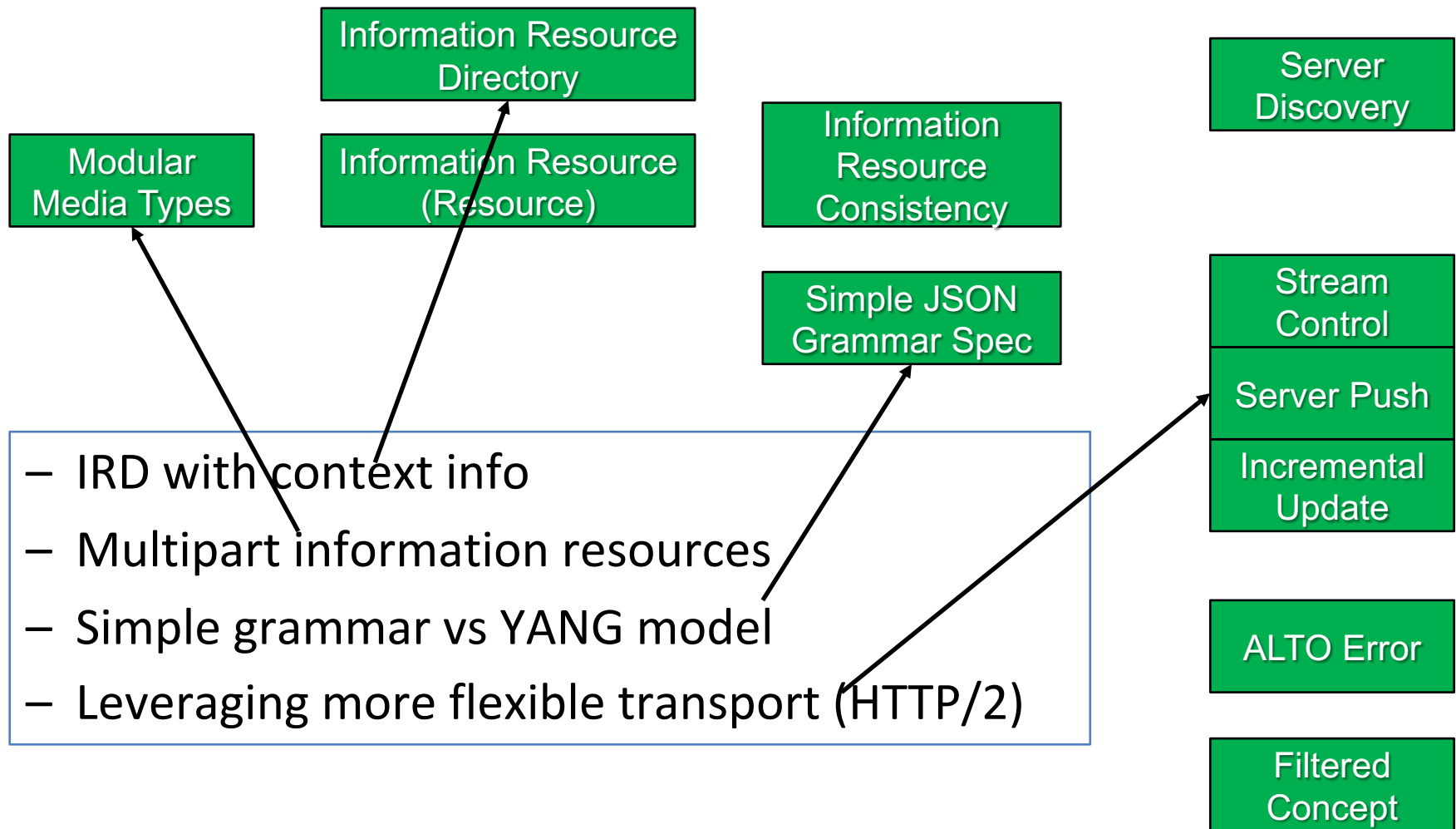
- Time-Block-Maximum Bandwidth
- Bandwidth-Sliding Window
- Time-Bandwidth-Product

[1] <http://sense.es.net/services>



# Work Beyond Current WG Items

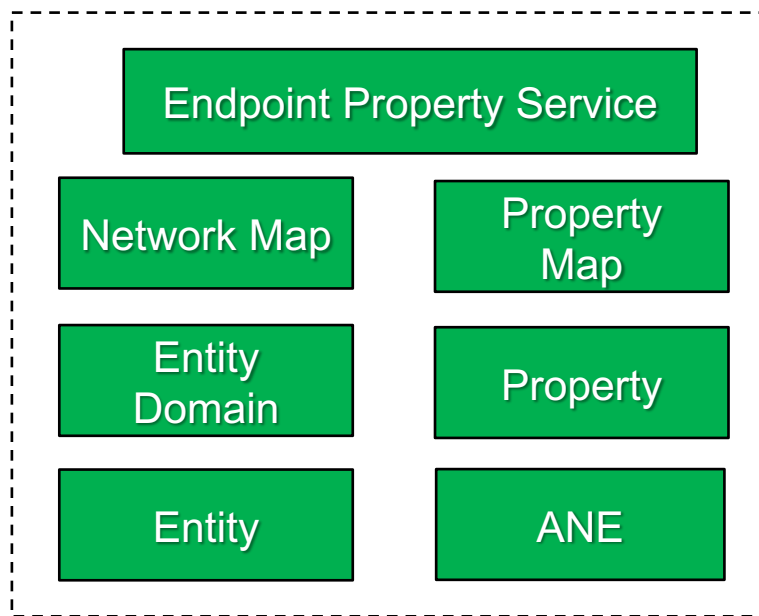
- Domain: ALTO **protocol framework**





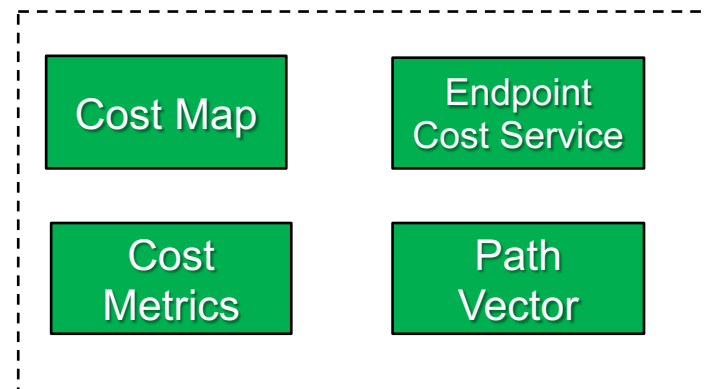
# Work Beyond Current WG Items

- Domain: ALTO **network abstractions**

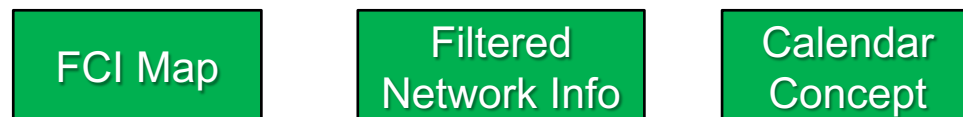


- Key entity domains beyond (ipv4/ipv6 endpoints, pid for network regions)

Information + Actions  
Integration



- Unified, generic coflow, multicast/multipath/



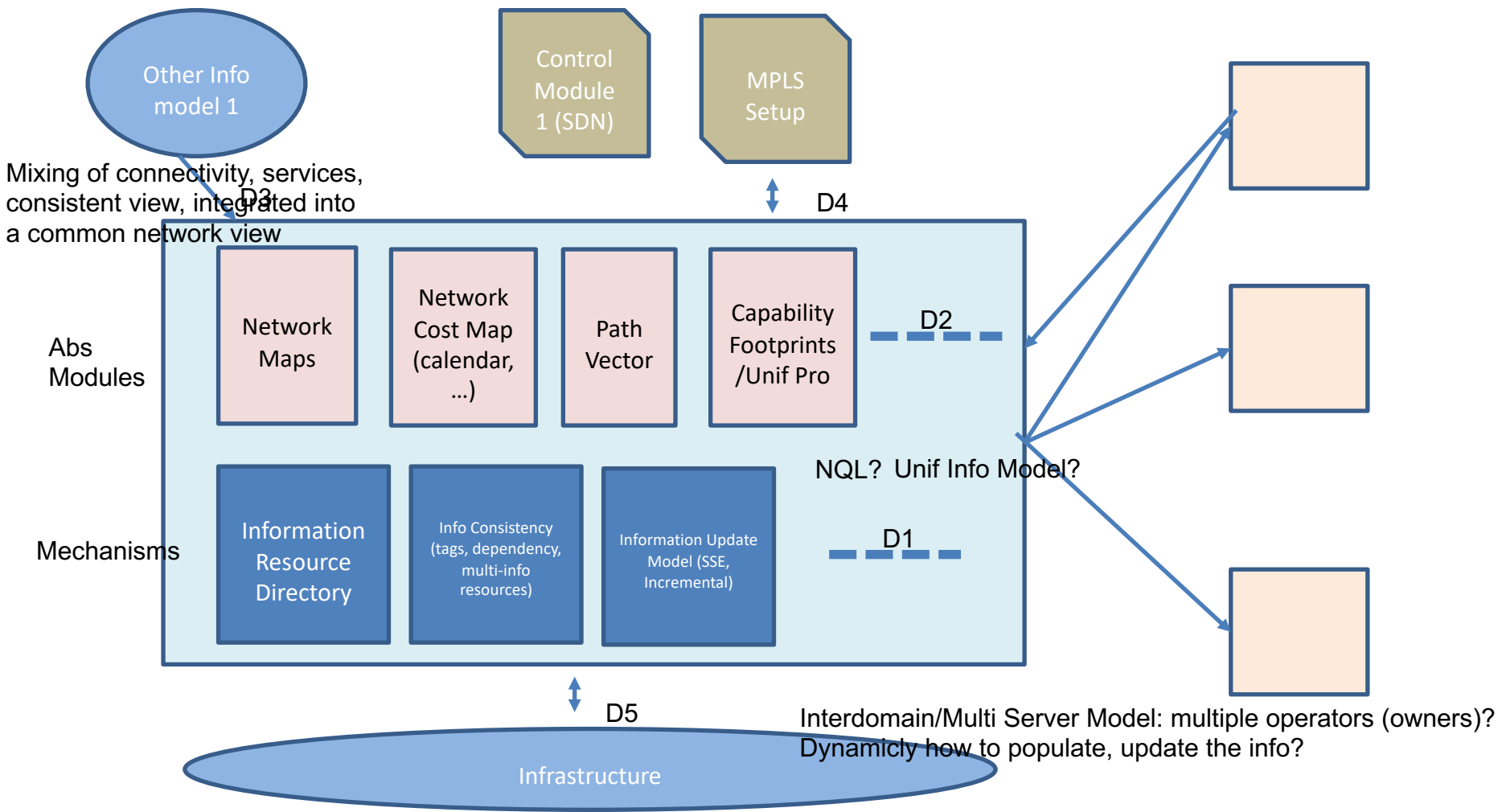
- FCI to general network capability exposure
- General, network information filtering/extraction (e.g., netsql)

# 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
- ...



# Backup Slides



# 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">`