# Unified Properties for ALTO

draft-ietf-alto-unified-props-new-07

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# Unified Properties Draft Updates - summary

## Goal of revisions -06 and -07

- Clarify the basic concepts and definitions with motivations and examples
- Clarify the issue on resource dependency of property map
- Clarify the approach to specify resource dependencies for property map

## Design decisions and discussions

- Two design options to specify resource dependencies for property map:
  - Option 1: domain-specific property design; a property is bound to an entity domain (current revision v07)
  - Many drawbacks with option 1:
    - ➔ Option 2: resource-specific design, inspired by relational database; dependencies bind to each individual entity and property
    - Will be specified in a next revision

# Overview of Updates in V07

- Major changes in Section 2
- Revisited definitions of the unified properties
  - Property Type = unique domain-specific property identifier
  - Property Name: the name used in the Property Type
  - Dependency Type: media type of the dependent information resource
- Changed some terminology
  - Entity Address -> Entity Identifier
- Proposed an Option 1 to indicate resource dependencies
- Option 1 will be revised

# Resource Dependencies in a property map

- Some properties are only applicable for particular entity domains
  - **Example**: the "pid" property is not applicable for entities in the "pid" domain.
- The interpretation of the value of a property may depend on the entity domain
  - **Example**, if some "geo-location" property is defined as the "latitude, longitude" coordinates of a point,
  - when applied to an entity identified by an address in the ipv4 or ipv6 domain, e.g., a host, the property describes the host location and does not depend on any resource
  - when applied to an entity with an identifier in the "pid" domain, e.g., "myPID10"
    - Property may indicate the location of the center of all hosts in entity "myPID10" ➔ different meaning
    - Property depends on the Network Map defining this "pid" entity ➔ specific dependent resource type

# Resource dependency ambiguity in a property map: example

- If a Server wants to expose
  - Properties: "cdni-fci-capabilities" and "pid"
  - for entities in the domains: "ipv4", "ipv6", "countrycode" and "asn"
- The IRD entry below does not allow to relate properties and "used" resources because it introduces ambiguities

  - "filtered-cdnifci-property-map" : {…

    "uses" : [ "my-default-network-map" , "my-default-cdnifci-map" ]

    "capabilities" : {

    "entity-domain-types" : [ "ipv4", "ipv6", "countrycode", "asn" ],

    "prop-types" : [ "cdni-fci-capabilities ", "pid" ]

    }

# Resource dependency ambiguity in a property map: example

- because "pid" cannot be directly mapped to entities in the "countrycode" and "asn" domains, Server may have to define 2 property maps and compose its IRD information resources as follows:
- "filtered-cdnifci-property-map" : {…

  "uses" : [ "my-default-cdnifci-map" ]

  "capabilities" : {

  "entity-domain-types" : [ "ipv4", "ipv6", "countrycode", "asn" ],

  "prop-types" : [ "cdni-fci-capabilities" ]

  }
- "filtered-cdnifci-pid-property-map "{…

  "uses" : [ "my-default-network-map", "my-default-cdnifci-map" ]

  "capabilities" : {

  "entity-domain-types" : [ "ipv4", "ipv6" ],

  "prop-types" : [ "cdni-fci-capabilities", "pid" ]

  }

# Design Proposal in current version 07: Option 1

- Introduction of Property Type
  - Associates property name with applicable entity domain
  - Each property type has a unique identifier encoded with the following format:
    - PropertyType ::= DomainName : PropertyName
  - DomainName: indicates which entity domain the property type applies to.
  - PropertyName: a JSON string
- **Example:** property types "ipv4:pid" and "ipv6:pid"
  - have the same Property Name "pid" associated with both "ipv4" and "ipv6" domains.
- Different property types can have the same property name applied to different entity domains, if they have similar semantics.

# Option 1: Rules to Specify Dependencies

- Each property type (entity domain : property) MUST indicate a sequence of dependency types (can be empty), e.g.,
  - "ipv4:geo-location" has no dependency
  - "pid:geo-location" depends on resource type "alto-networkmap"
  - "pid:cdni-fci-capabilities" depends on resource types "alto-networkmap" and "alto-cdnifci"
- Property types with different types of dependent resources MUST NOT be put into the same property map, e.g.,
  - Property map for {"entity-domains": ["ipv4", "pid"], "properties": ["geo-location"]} is illegal.
- All entities and property values in a same property map MUST have the same dependent resources, e.g.,
  - Property ipv4:pid using *networkmap1* cannot be in the same property map as property ipv4:pid using *networkmap2*

# Issue with option 1

- Design option 1 binds the resource dependencies to the whole property map.
  - **Benefit**: each property map is very simple and easy to handle.
  - **Drawback**:
    - the ALTO server may need to export too many property maps.
    - Design is too complex

# Option 2 Motivation: Revisit Endpoint Property Map in RFC7285: A Database View

```
"netmap-1": {
  "PID1": {
    "ipv4": [
      "1.1.1.0/24",
      "1.1.2.0/24"
    ]
  },
  "PID2": {
    "ipv4": ["1.1.3.0/24"]
  }
}
```

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID1 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

```
"netmap-2": {
  "PID2-1": {
    "ipv4": ["1.1.1.0/24"]
  },
  "PID2": {
    "ipv4": [
      "1.1.2.0/24",
      "1.1.3.0/24"
    ]
  }
}
```

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID2 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

```
"endpoint-property-map": {
  "ipv4:1.1.1.0/24": {
    "netmap-1.pid": "PID1",
    "netmap-2.pid": "PID1"
  },
  "ipv4:1.1.2.0/24": {
    "netmap-1.pid": "PID1",
    "netmap-2.pid": "PID2"
  },
  "ipv4:1.1.3.0/24": {
    "netmap-1.pid": "PID2",
    "netmap-2.pid": "PID2"
  }
}
```

| ipv4 | netmap-1.pid | netmap-2.pid |
|---|---|---|
| 1.1.1.0/24 | PID1 | PID1 |
| 1.1.2.0/24 | PID1 | PID2 |
| 1.1.3.0/24 | PID2 | PID2 |

# Option 2 Motivation: Revisit Endpoint Property Map in RFC7285: A Database View

- Each resource defines a table in a database
- A column of a table defines an attribute
- The projection of a column defines its domain

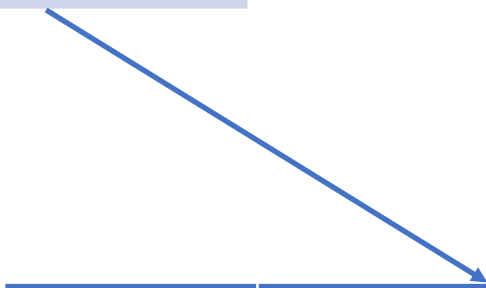
- Each table defines one or multiple mappings
  - Table1 (netmap-1)
    - ipv4 -> pid
    - [pid -> ipv4]
  - Table2 (netmap-2)
    - ipv4 -> pid
    - [pid -> ipv4]
- A property map defines a view
  - attr -> property
- UP as a SQL query (for each input)
  - select ipv4, netmap-1.pid, netmap-2.pid
    from netmap-1, netmap-2
    where netmap-1.ipv4=ipv4.input
    netmap-2.ipv4=ipv4.input

Table1: netmap-1

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID1 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

Table2: netmap-2

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID2 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |



| ipv4 | netmap-1.pid | netmap-2.pid |
|---|---|---|
| 1.1.1.0/24 | PID1 | PID1 |
| 1.1.2.0/24 | PID1 | PID2 |
| 1.1.3.0/24 | PID2 | PID2 |

# Design Space for Option 2: Entity

- Entity Domain Type Name Space: ipv4, ipv6, pid, asn, ane, …
  - Analogy to DB: a type and name of a table column
- Entity Domain:
  - A set of entities from the attribute of a specific resource
    - Analogy to DB: a projection of a column/attribute
  - Identification
    `<domain_id> ::= <resource-id>.<domain_type>`
- Entity:
  - An element in an entity domain, identified by
    `<entity_id> ::= <domain_id>:<domain_specific_entity_id>`

Table1: netmap-1

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID1 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

Table2: netmap-2

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID2 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

# Design Space for Option 2: Property

- Property Type Name Space: pid, …, geo-location
- Goal: Identify a property for an entity in an entity domain
- Identified by
  - **<resource-id>.<prop>** (same as Sec 10.8 of RFC7285)

Table1: netmap-1

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID1 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

Table2: netmap-2

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID2 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

# Design Space for Option 2: Resource Type -> Property Map

- Each resource type (network map, endpoint property map) defines
  - Entities: a list of
    - entity domain type in Entity Domain Name Space
    - properties in Property Name Space of entities in the entity domain type
- Example:
  - For the network map (alto-netmap) resource type
    - Entity domain type: ipv4
      - Property of this domain type -> pid property
    - Entity domain type: ipv6
      - Property of this domain type -> pid property

Table1: netmap-1

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID1 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

Table2: netmap-2

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID2 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

# Design Space for Option 2: Property Map Resource

- A unified property map resource itself includes
  - An entity domain type
  - Properties provided for the entities (refer to as this.prop)
  - Properties imported from other resources (refer to as resource-id.prop)
- Note: this can be a recursive process

Table1: netmap-1

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID1 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

Table2: netmap-2

| pid | ipv4 |
|---|---|
| PID1 | 1.1.1.0/24 |
| PID2 | 1.1.2.0/24 |
| PID2 | 1.1.3.0/24 |

# How to Proceed with IANA Registry

- Registry for each entity domain type
- Registry for each property type (just call property)
- Registry for the mapping provided by each resource type
  - Entity domain types
  - For each entity domain type
    - Properties

# Next Steps

- Process
  - Discuss option 1 and option 2, will
    - post on mailing list
    - arrange at least two meetings in the weekly alto design meeting (all are welcome to join)
  - Finish the new revision of the draft for WGLC (in 2 weeks)
    - Draft of option 2 exists, but have not checked in
      - The main text will **not change**, mostly focus on only two subsections and example notitions
- Authors goal:
  - Submit draft with the final design to WG by end of April