PID Property Extension
# for ALTO Protocol

draft-roome-alto-pid-properties-00

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Motivation

- A network map defines a set of PIDs, where each PID represents a set of endpoints with similar properties

- But the Base Protocol defines only the name and the set of endpoints of each PID, not the similar properties

- Goal: allow ALTO Server to publish the properties of PIDs
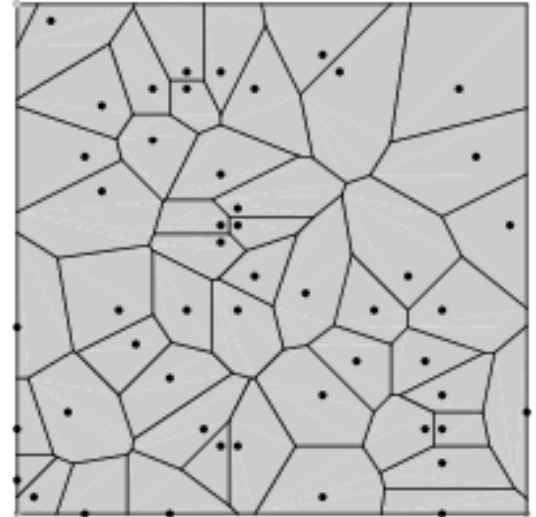
PID Properties and Network Maps

- The set of PID Properties that make sense depends on how the endpoints are partitioned
  - partition respects country boundary, => country-code(s)
  - partition respects AS boundary, => ASN(s)
  - partition respects endpoint type, => endtype (e.g., server, end user)
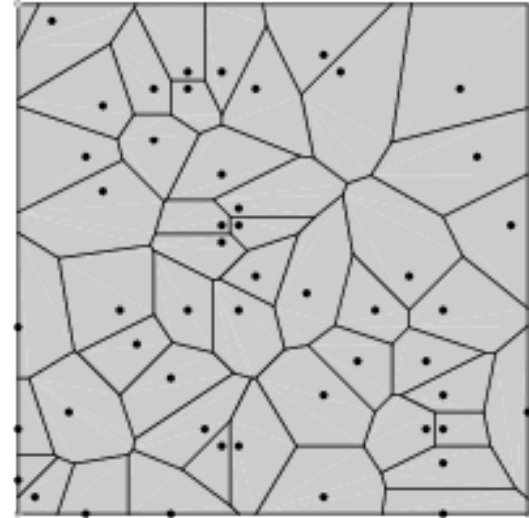
- Implication: Different network maps may define different sets PID properties

Network Map — m   m — PID Property
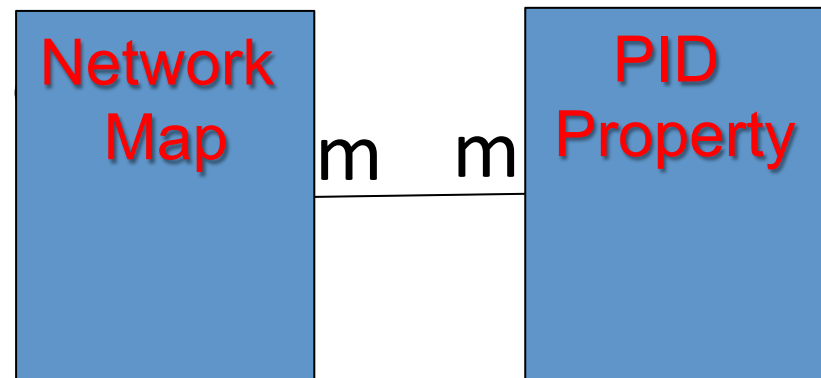
PID Properties: Retrieval

- Issue: How to return the PID Properties of a Network Map?
- Option 1: Return in the network map
  - Problems:
    - Larger map response
    - Redefines existing response message
    - Implies vtag changes whenever a property value changes
- ✓ Option 2: Define new Full & Filtered PID Property Services:
  - Analogous to Full & Filtered Cost Map Services
  - Messages are similar to Endpoint Property Service
  - IRD "uses" a Network Map Resource to indicate the base Network Map

PID Properties: Advertisement

- Issue: How does an ALTO Client know the set of PID Properties associated with a PID Properties Resource?
  - Announce as a list in "capabilities" of a PID Properties Resource, similar to endpoint properties

```
"pid-property-1" : {
        "uri" : "http://alto.example.com/pidprop/netmap1/pidp1",
        "media-type" : "application/alto-pidprop+json",
        "uses" : ["my-default-network-map" ]
        "capabilities" : {
          "prop-types" : [ "country-code",
                           "asn" ]
        },
    },
```

PID and Endpoint Properties: Properties Are Properties
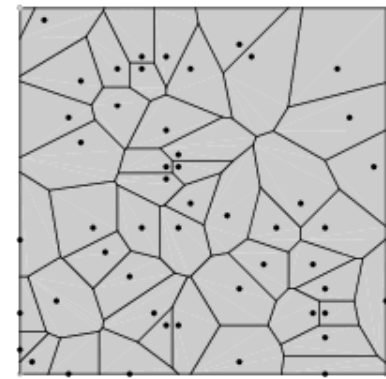
- A PID Property is common to all endpoints in the PID

=>

- Conceptually each defined PID Property also defines an Endpoint Property

=>

- PID and Endpoint Properties use the same property name space and semantics
- Property names must be registered with IANA:
  - The registry does not distinguish Endpoint Properties from PID properties
  - Perhaps change IANA registry name from "ALTO Endpoint Property Types" to just "ALTO Endpoint/PID Property Types"

# Semantics: PID Property Value as Aggregation of Endpoint Property Values in the PID

- Denote
  - PID `pid` which consists of a set of endpoints {`ip1`, `ip2`, …, `ipn`}
  - `ip1.prop` as the value of `prop` of endhost `ip1`
  - `pid.prop` as the value of `prop` of PID `pid`
- Then, conceptually, ALTO Server computes
  - `pid.prop = aggreg(ip1.prop, ip2.prop, …, ipn.prop}`,
    where possible `aggreg` can be functions such as
    - average/mean,
    - mode (degenerate to common if all same value),
    - geo-center;
    - union,
    - bounding box,
    - …
  - meaningful `aggreg` depends on `prop`

Consistency of PID Properties

- If two PID Properties Resources offer the same Property (e.g., country-code):
  - Both must follow the property format
  - But the values for the same endpoint may differ, e.g.,
    - One provides a country-code "US", while the other "CA"

- Decision: do not check such consistency, as neither do we validate this for cost-metrics:
  - Suppose Network Maps NM1 and NM2 both define PIDs PA and PB with the same CIDRs
  - Further suppose both maps have "hopcount" Cost Maps
  - ALTO does *not* require that the "hopcount" from PA to PB be the same in those two Cost Maps

Consistency of Endpoint and PID Properties: Inheritance Override

- If both an EPS and a PID Properties Resource offer values to the same Property (e.g., geo-location), the value from EPS overrides that from the PID Properties

- Potential extension to EPS:
  - EPS IRD indicates that the default of a Property is from a given PID Properties Resource
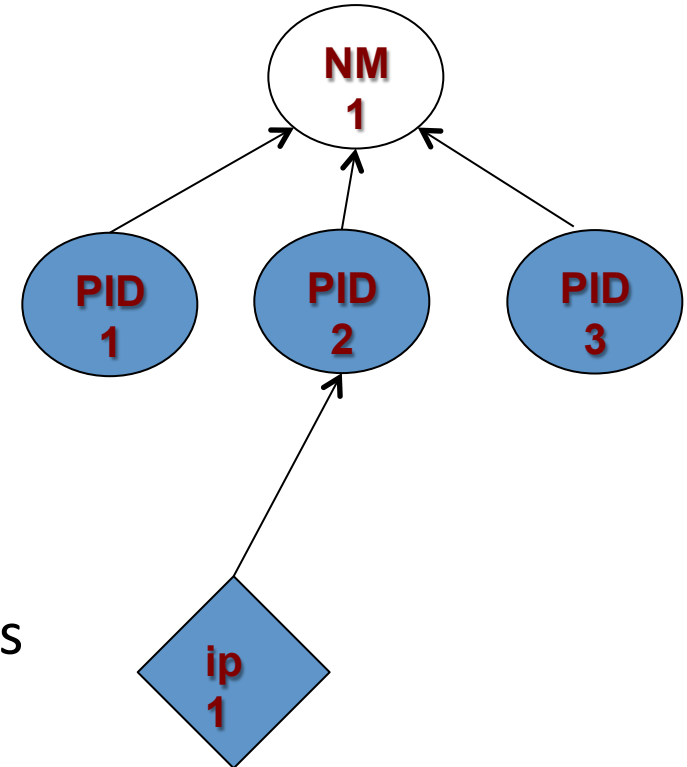
Discussion: Properties under General Inheritance
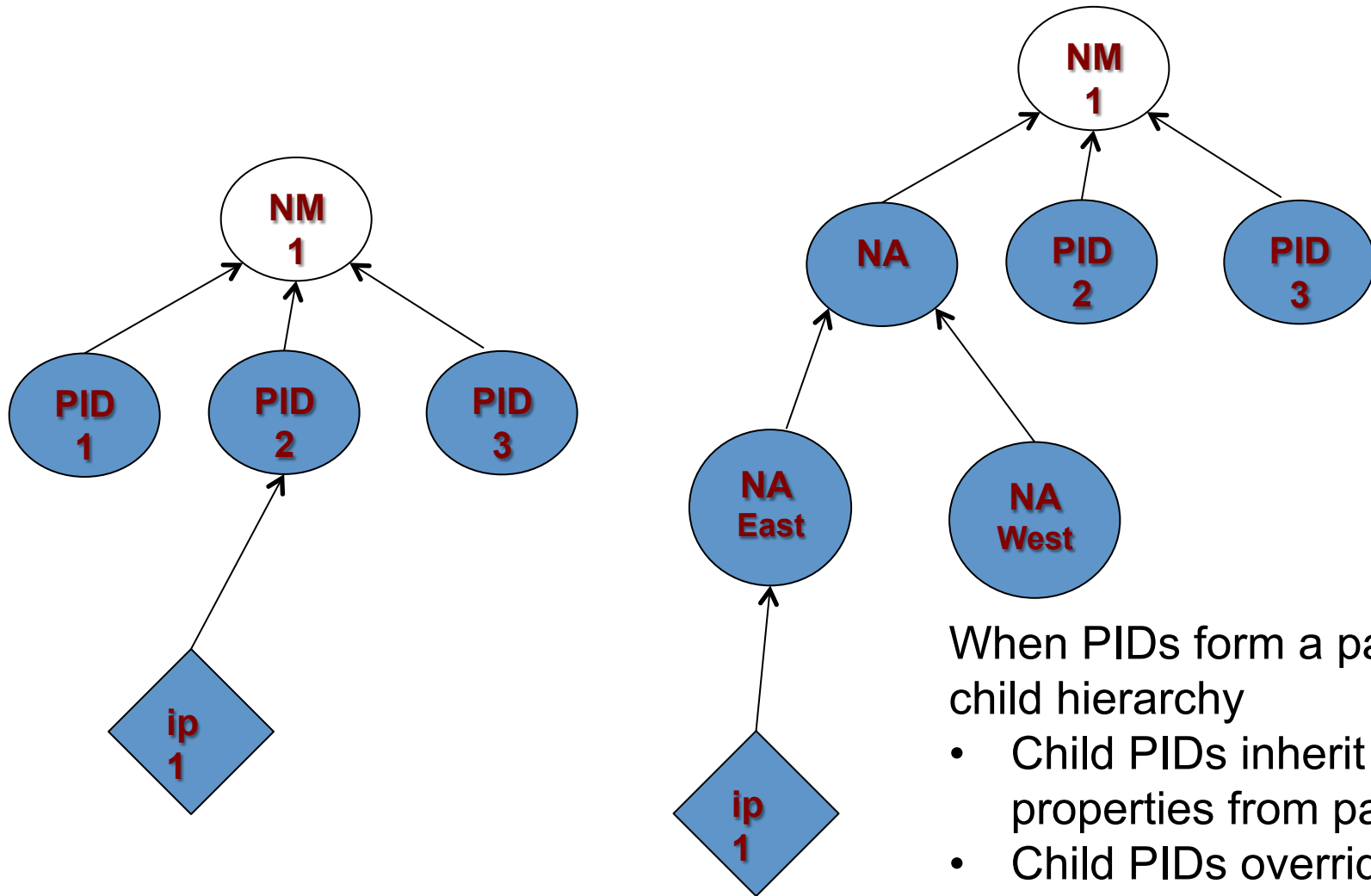
When PIDs form a parent-child hierarchy
- Child PIDs inherit properties from parent
- Child PIDs override parent property

Possible Formal Definition
of PID Property Inheritance

- Defining PIDs hierarchy
  - Approach 1: allowing using PIDs in defining PIDs, e.g.,
    - "P'" : { "PID" : ["P"], "ipv4" : [...], "ipv6" : [...] }
  - Approach 2: derived
    - PID P' **partially covers** PID P iff some CIDR in P is a refinement of a CIDR in P'.
    - PID P' **fully covers** PID P iff every CIDR in P is a refinement of a CIDR in P'.
    - Let PC(P) be the set of all PIDs that partially cover P. If PC(P) has a unique PID P' such that every other PID in PC(P) fully covers P', then P' is the **immediate parent** of P. Otherwise, P does not have an immediate parent.
- Property inheritance
  - PID P recursively inherits all properties of its immediate parent.
  - Limit to single inheritance

Next Steps

- This draft
  - Specify the encoding of base PID Properties Resource

  - Define a relatively more extensive set of Properties (e.g., asn, country-code, endpoint-type, …) either in this doc or a separate one.

  - Integrate inheritance

- Propose PID Properties Resource as a WG item (does not need to use this draft)

Backup Slides

Some Additional Points

- EPS defaults
  - May extend Endpoint Property Service:
    - If an EPS "uses" a Network Map Resource, the default properties for an endpoint from the are those of its PID in that map
    - Otherwise an EPS may or may not use PID properties from some Network Map as defaults

- May need to define Property variations according to aggregation, e.g.,
  - country-code => country-codes to allow a set