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 of PID properties.
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" ]
  },
},
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 \( \text{pid} \) which consists of a set of endpoints \{ip1, ip2, ..., ipn\}
  - \( \text{ip1}.\text{prop} \) as the value of prop of endhost ip1
  - \( \text{pid}.\text{prop} \) as the value of prop of PID \( \text{pid} \)

- **Then, conceptually, ALTO Server computes**
  - \( \text{pid}.\text{prop} = \text{aggreg}(\text{ip1}.\text{prop}, \text{ip2}.\text{prop}, ..., \text{ipn}.\text{prop}) \),
    where possible \( \text{aggreg} \) can be functions such as
      - average/mean,
      - mode (degenerate to common if all same value),
      - geo-center;
      - union,
      - bounding box,
      - ...
  - meaningful \( \text{aggreg} \) depends on \( \text{prop} \)
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’ \textit{partially covers} PID P iff some CIDR in P is a refinement of a CIDR in P’.
    • PID P’ \textit{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 \textit{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