Autonomic Prefix Management in Large-scale Networks

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draft-jiang-anima-prefix-management

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Revision

Motivation

- To validate the application and reusability of Anima components
- In large networks, prefix management still depends on human planning. Management of IPv6 prefixes is rigid and static after initial planning.
- The autonomic networking mechanism is to dynamically and autonomically manage IPv6 address space in large-scale networks, so that IP addresses can be used efficiently.
  - But retain explicit policy control (difference from HNCP).

Intended User & Administrator Experience

- Normal users should see no difference.
- For administrators of a large-scale network, the management of IPv6 address space needs much less effort. Ideally, administrators just configure a single IPv6 prefix for the whole network and the initial prefix length for each device role.

Revision

Requirements

- The requesting router (also between prefix repositories) needs to know the prefix length it should request.
- The requesting router needs to know what device to send the request.
- The requested device should have enough resource for the request. If no, there should be some follow-up.
- Currently, human configuration or human intervention are needed to meet these requirements.
- The autonomic network mechanism should support network to incrementally grow.
  - Hierarchical delegation does not work

Revision

Discovery and Negotiation

- A prefix requesting device that needs new or more address space
  - firstly discover peer devices that may be able to provide extra address space
  - by sending out a Generic Discovery & Negotiation protocol (GDNP) [draft-carpenter-anima-gdn-protocol] Discovery message that contains a Prefix Objective option
- A peer device receiving a Discovery message with a Prefix Objective option
  - respond with a GDN Response message the available prefix length matching the request, if it is able to provide such a prefix
  - Or return a GDN Response message, which contains a longer prefix length (smaller address space) that it can provide, if the peer device does not have enough resource
  - Or a divert option that indicates another potential providing device
- Till find a providing device or settle for smaller prefix

Prefix Management Intent

- With in a single administrative domain, the network operator could manage all their devices with a given role
- A prefix management Intent, which contains all mapping information of device role and their default prefix length, should be flooded in the network
- Upon receiving the prefix management intent, every device can decide its default prefix length by matching its own role
- Both discovery and negotiation and prefix management intent flooding should go through the Autonomic Control Plane (ACP) [draft-behringer-anima-autonomic-control-plane]
- Intent flooding mechanism is currently missing, and some related work has been done in “Intent Distribution for Autonomic Networking” [draft-liu-anima-intent-distribution]

Example of Prefix Management Intent (1)

- Prefix management Intent is used to carry mapping information of device roles and their default prefix lengths.
- In this example, the prefix length of
  - RNC* Site Gateway (RSG) is supposed to be 34
  - Aggregation Site Gateway (ASG): 44
  - Cell Site Gateway (CSG): 56

Note: Standard Intent format is TBD. Some related work has been done in “Autonomic Network Intent and Format” [draft-du-anima-an-intent]

*RNC = Radio Network Controller

Example of Prefix Management Intent (2)

```
<autonomic_intent>
    <protocol_version>1.0</protocol_version>
    <intent_type>Network management</intent_type>
    <autonomic_domain>CT_11</autonomic_domain>
    <intent_name>Prefix management</intent_name>
    <intent_version>1</intent_version>
    <intent_timestamp>2015-05-04 00:00:00</intent_timestamp>
    <intent_lifetime>Permanent</intent_lifetime>
    <content>
      <role>
        <role_name>RSG</role_name>
        <role_characteristic>
          <prefix_length>34</prefix_length>
        </role_characteristic>
      </role>
```

Example of Prefix Management Intent (3)

```
<role>
    <role_name>ASG</role_name>
      <role_characteristic>
        <prefix_length>44</prefix_length>
      </role_characteristic>
    </role>
    <role>
      <role_name>CSG</role_name>
      <role_characteristic>
        <prefix_length>56</prefix_length>
      </role_characteristic>
    </role>
  </content>
</autonomic_intent>
```

Comments are welcomed!

Thank You!