IS-IS: Homenet and Data Centers

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Homenet Requirements

- Homenet is trying to develop supporting technologies for a very simple, but technologically advanced, home
  - Primarily focused on IPv6
  - Zero Configuration if at all possible
  - Interface to Smart Grid technologies including Zigbee/802.15.4
  - Multi-subnet with routing an option
  - Potentially multihomed to multiple ISPs
  - Edge Routing to resolve BCP 38 issues
I have been asked about ISIS-Multi-Topology

- Topologies are defined by metrics on links between router interfaces within the routing domain
  - The link does or does not have a metric within the topology
  - Automatically routes around discrepancies between physical and logical topology
- A number of source/destination routing cases could be implemented as multi-topology
- Edge routing is routing to a default route that is outside the routing domain
  - The IS-IS topologies for each PA prefix are identical
  - There is no link advertised in IS-IS that might have the indicated metric
- Edge routing is a reachability problem, not a topology problem
RFC 5308 defines a Reachability TLV for reachable IPv6 Prefixes

- It also defines a format for sub-TLVs, which it says may be of value in the future

I’m looking at

- Homenet requirements for egress routing
- Homenet requirements for automated prefix allocation as in draft-ietf-ospf-ospfv3-autoconfig
- Multi-tenant Data Center requirements for tenant-to-tenant access control
Concept:

- A specific system, maybe the CPE router that has received a DHCP-PD prefix allocation, announces the prefix into a network.
- Routers (including pseudonodes) allocate a /64 at random from the prefix.
- If there is a collision, conflicting routers back off a random interval and guess again.
- If the TLV is withdrawn, they forget the derived IPv6 prefix.
Autoconfiguration TLV

- Fields:
  - Type: IANA
  - Length of TLV
  - U/X as normal
  - No need for sub-TLV flag
  - Prefix Length
  - Prefix, same format as in Reachability TLV
Flow label and Source Address sub-TLVs

- Premise:
  - Reachability TLV, with sub-TLV(s), identifies a set of possible messages to send down a route
  - Need comments on route calculation and FIB design
Backward compatibility

- OSPF WG asked about making this work in networks with RFC 5340 format LSAs as well; IS-IS probably has same question
- Really not a problem:
  - Definition of source prefix sub-TLV:
    - A zero-length LSA (::/0) can be represented with a sub-TLV whose length is zero or no sub-TLV
  - Definition of flow label sub-TLV:
    - “any” flow label is specified by leaving the sub-TLV out
- RFC 5308 TLV by definition leaves those sub-TLVs out. Semantically equivalent.
Route Calculation

- Normal IS-IS route calculation:
  - Identifies a sequence of routers and links from calculating router to router advertising TLV
  - “Router” might be a pseudonode
- TLV, in this case, identifies not only the destination but a qualification
  - Traffic with a different source address or flow label follows a different route, or no route
FIB Design

- Not subject to standardization.
- Some suggestions in an appendix
  - Linux (Waikato extensions) has separate FIBs by source prefix.
    - One could insert destination into appropriate FIB, or all FIBs if source not specified
  - PATRICIA tree
    - Allows a discontiguous bit string, differing don’t-care sets
    - Recursive descent following most useful bits
    - Final answer compared to entire specification
Possible use cases

Source Prefix

- Egress Routing
  - Most TLVs in network destination-only
  - Default routes to upstream specify PA source prefix
- One could imagine more general uses, such as dynamic “ACL”

Flow Label (RBAC model)

- Long discussion about use of the Flow Label in the IETF, with many suggestions
- One could also use it as a tenant id in a multi-tenant data center
  - IPsec or TLS still required for proper end-to-end security
  - Tagged route limits attack possibilities to neighbors that know the “password”