Digital Map
IETF Hackathon

IETF 120
20–21 July 2024
Vancouver, Canada
Hackathon Plan

• The goal is to demonstrate how operators can use the IETF Topology Yang models to represent a real carrier IP/MPLS network.

• We want to demonstrate if RFC8345 is the suitable standard for representing the multi-layered topology for Digital Map and show the models comparison with and without the identified gaps.

• This is the first iteration, the hackathon will continue during IETF121 and beyond

• What drafts/RFC’s were involved (initial set)

  • https://www.rfc-editor.org/rfc/rfc8345 (ietf-network, ietf-network-topology)
  • https://www.rfc-editor.org/rfc/rfc8944 (ietf-l2-topology)
  • https://www.rfc-editor.org/rfc/rfc8346 (ietf-l3-unicast-topology)
  • https://datatracker.ietf.org/doc/draft-ogondio-nmop-isis-topology (ietf-l3-isis-topology)
  • https://datatracker.ietf.org/doc/rfc9130 (ietf-isis)
  • https://datatracker.ietf.org/doc/draft-davis-opsawg-some-refinements-to-rfc8345
Hackathon Plan (cont)

• The scope of the IETF120 Hackathon (first iteration):
  • The **multi-vendor operator LAB** was used for this hackathon (with Huawei, Cisco, Juniper devices)
  • We started with one particular problem space: How to use IETF topology model to represent a real carrier network based on IS-IS and OSPF domains (target for planning/simulation purposes).
  • This IETF120 Hackathon focused on generic topology queries, and started to compare IS-IS topology drafts augmenting RFC8345 versus potential RFC8345bis (gaps identified in RFC8345) approaches.
  • Start analysis and prototypes how to retrieve performance metrics or configuration attributes (defined in RFC9030 and retrieved via device API) northbound from the Controller via RFC8345 API and its IS-IS Augmentation
Hackathon LAB

We used this multi-vendor Operator LAB for real-time discovery

We also have demo for
• 2 other Operator LABs
• 1 vendor LAB

All discovered before the Hackathon and simulated for this Hackathon

Discovered Huawei, Cisco and Juniper from the Operator LAB, Nokia planned for next Hackathon
What was achieved

• We discovered L2 and ISIS topology for multi-vendor network and build relationship between different layers
• We mapped different device models to the network wide topology models and retrieved them via IETF Topology API
• We implemented 2 options for comparison:
  – ISIS Areas modelled as ietf-networks (not currently supported in RFC8345 as it does not allow for links between network)
  – ISIS Areas modelled as attributes only in ietf-node and ietf-termination-point
• We started working on how to connect ietf-l3-isis-topology to ietf-isis
  – First attempt via augmenting ietf-l3-isis-topology with ietf-isis subtrees
  – Conclusion: we need better approach to do at the next hackathon
• CODE (will make public in the next few days):
  – digital-map-exp/digital-map-public (github.com)
Topologies

L2 Topology

ISIS Topology

ISIS Areas (Option 1)

ISIS Topology with Topology L2 undelay

ISIS Areas (Option 2)
What we learned

• We demonstrated that IETF RFC8345 is the suitable standard for representing the multi-layered topology for Digital Map

• The operator may have one ISIS Area in the ISIS Domain or multiple ISIS Areas in the ISIS Domain, there is need for flexibility to model both ways

• In the case of multiple areas in ISIS Domain, the RFC8345 does not provide the capability for inter-area links

• We implemented 2 options for comparison

• We need a new RFC8345 augmentation for the purpose of:
  - Connecting IETF Topology Module to other IETF YANG Modules
    - What yang paths are connected to node, termination-point
  - Defining what IETF Topology Module instances are related to the IETF YANG Module instances (because we have different keys)
  - To avoid duplicating the properties in RFC8345 augmentations
IETF APIs (2 Options)

OPTION 1: ISIS Area modelled as network (can support links between networks)

- processes grouped in the area via the standard IETF RFC 8345 network->node relationship
- applications and algorithms will understand topologies based on the generic entities and relationships, do not need to understand specific IS-IS attributes
- aligned with the IS-IS topology model and the IS-IS network view in the manuals and documentation, cloud entity exists in the model

OPTION 2: ISIS Area modelled as attributes (current RFC8345 approach for domains with multiple areas)

- processes grouped in the area via the specific IS-IS property
- generic topology applications would need to understand the IS-IS attribute meaning and IS-IS attribute extensions in order to understand IS-IS topology
What next (IETF 121)

• Add more layers:
  – BGP, SRv6
  – Separate L3 topology from ISIS topology (different option)
• Add more operator LABs
• Add more vendors
• Implement more advanced option for connecting ietf-l2-isis-topology to ietf-isis. The solution must be generic to support any other augmentations and yang files.
• Start working on other use cases
  – Candidates: simulation / emulation
Team members

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