Problem Space and Modelling Issues of the Digital Space at NMOP#119

RFC8345 Gaps for Digital Map Modelling and Next Steps

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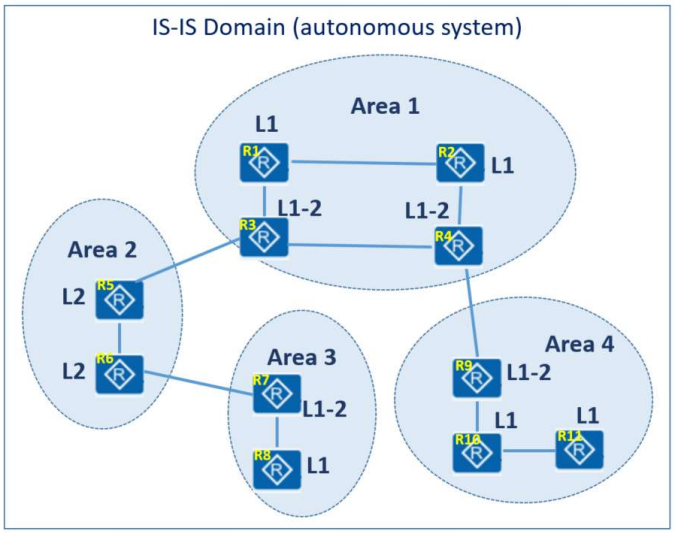
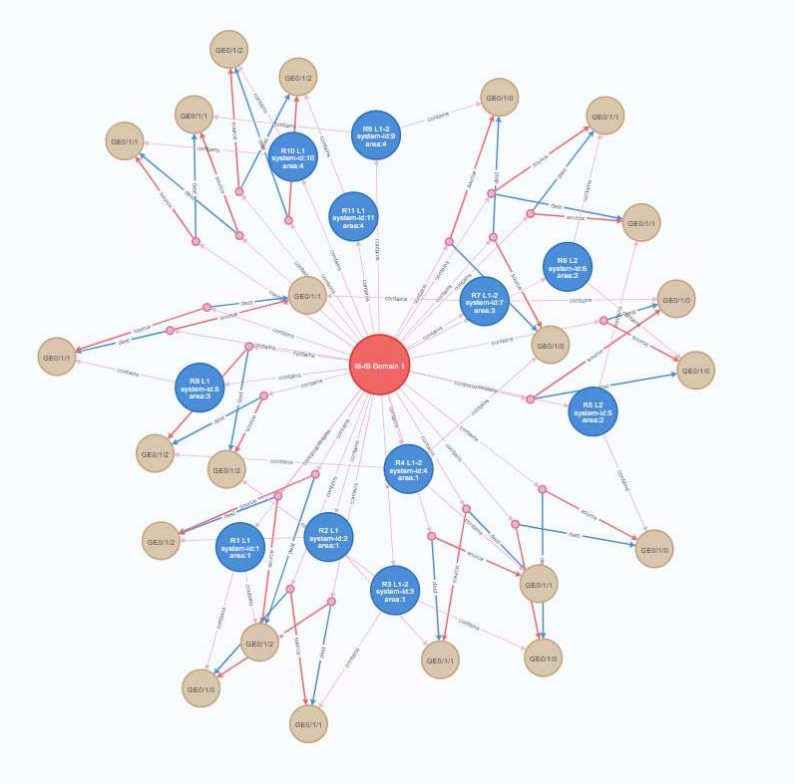
IS-IS Experiment: Modelling IS-IS Areas with *draft-ogondio-nmop-isis-topology* based on the current RFC 8345



IS-IS Domain is network, IS-IS Areas info in attributes. Why?

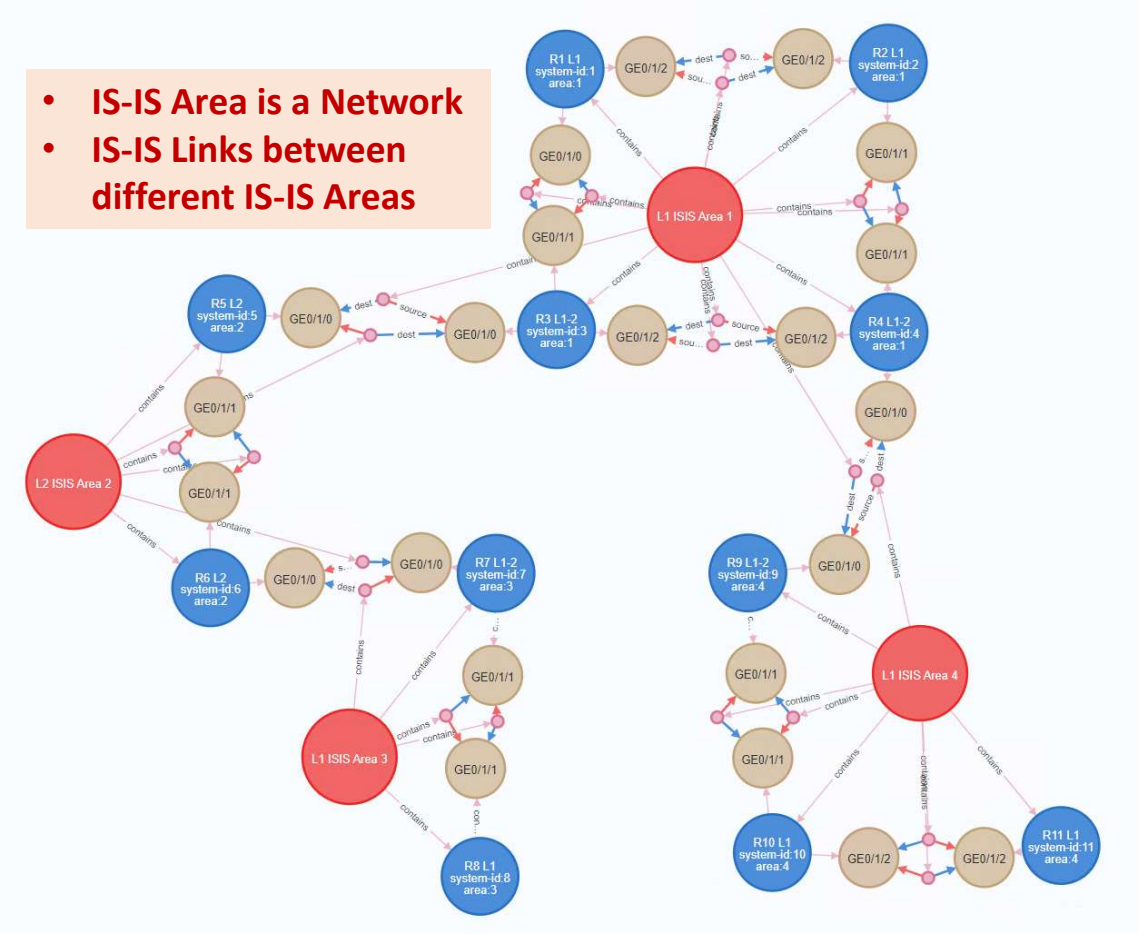
- RFC8345 cannot model links between networks
- RFC8345 networks cannot be part of other networks

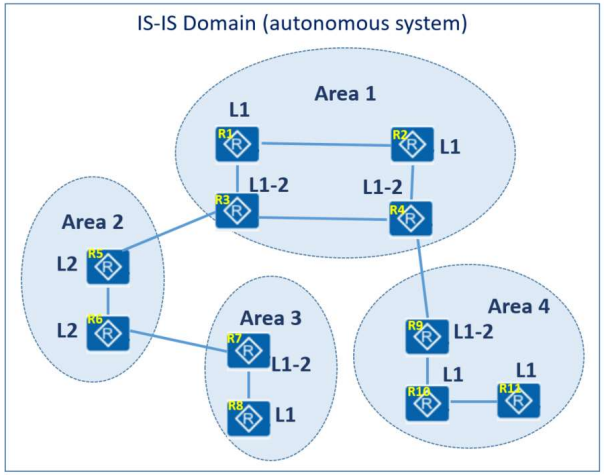


- IS-IS processes grouped in the IS-IS area via the specific IS-IS attribute
- applications would need to understand the meaning of the specific IS-IS attributes in order to understand IS-IS topology
- does not represent the topology of the IS-IS Domain via entities & relationships
- does not represent the topology via core RFC8345 topological entities

IS-IS Experiment: Modelling IS-IS Areas without the current RFC 8345 limitations

- **IS-IS Area is a Network**
- **IS-IS Links between different IS-IS Areas**





- processes grouped in the area via the standard IETF RFC 8345 network->node relationship
- applications and algorithms will understand topologies based on the generic RFC8345 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 training material, IS-IS area entity exists in the model

RFC8345 Limitations for Digital Map Modelling

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5.1.  What Is Not in The Base Model?  . . . . . .
  5.1.1.  Bidirectional Links . . . . . .
  5.1.2.  Multipoint Connectivity . . . . . .
  5.1.3.  Links Between Networks  . . . . . .
  5.1.4.  Networks Part of Other Networks . . . . .
  5.1.5.  Nodes, tps and links in multiple networks
  5.1.6.  Missing Supporting Relationships  . . . .
  5.1.7.  Missing Topology Semantics  . . . . . .
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Proposed solutions in (to be moved to nmop):
draft-davis-opsawg-some-refinements-to-rfc8345
- to be moved to nmop

Implemented the IS-IS and OSPF using the drafts:
draft-ogondio-nmop-isis-topology
draft-ogondio-opsawg-ospf-topology
- to be moved to nmop
Identified these 3 limitations

Missing Supporting Relationships:
- Node->Network
- Link->Network
- TP->Node

Missing Topology Semantics:
- Node Roles (e.g. PE, CE)
- TP Roles (e.g. hub, spoke)
- Resiliency (e.g. primary, backup)

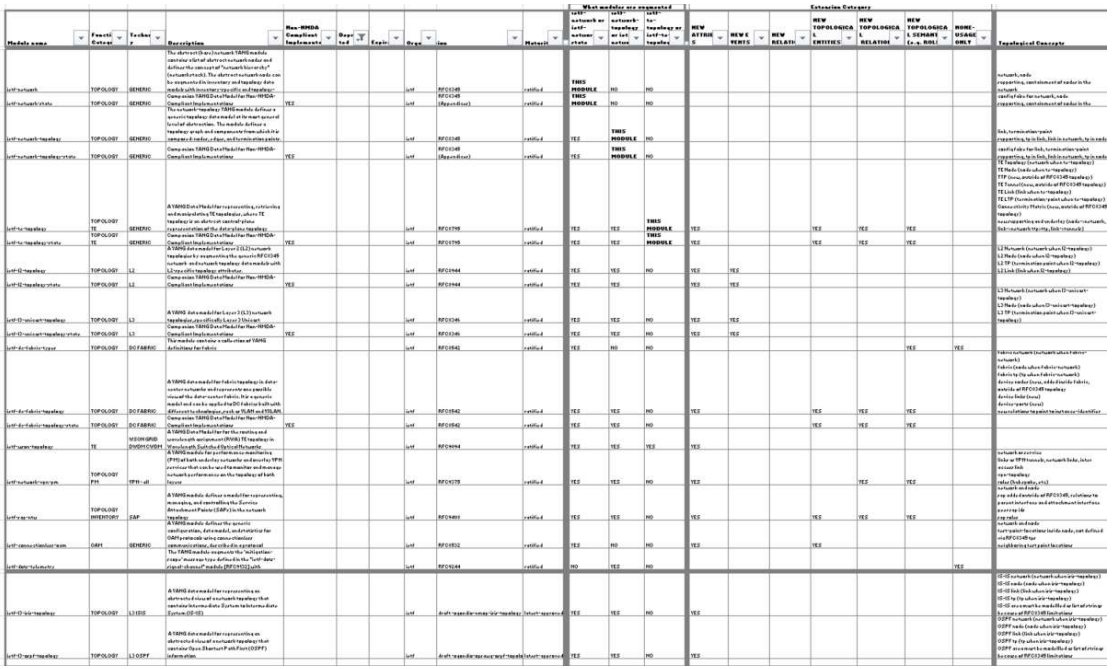
Candidate Approaches to address RFC8345 Limitations for Digital Map Modelling

All enhancements will consider current usage and will be backward compatible wherever possible

	Identified gap	Candidate Approaches	Proposal
1	Bidirectional Links	• Implement via multiple unidirectional links or via virtual nodes (current RFC8345 approach) • Leave to different augmentations to solve the problem their own way • Augment RFC8345 via basic approach from draft-davis-opsawg-some-refinements-to-rfc8345 • Augment RFC8345 via sophisticated approach from draft-davis-opsawg-some-refinements-to-rfc8345 • Consider RFC8345 bis	➢ Start the work on RFC8345bis to provide the **BACKWARD COMPATIBLE MODEL** to support all these limitations ➢ 1 and 2: Start from basic **BACKWARD COMPATIBLE** approach from draft-davis-opsawg-some-refinements-to-rfc8345 ➢ Evaluate any implementations inside the current augmentations for simplicity and if generic ➢ 3, 6 and 7: consider RFC8795 approach ➢ 5: The solution needs further analysis as it has bigger impact on the topology tree than other enhancements
2	Multipoint Connectivity		
3	Links between networks	• Implement domains via properties in augmentations • Leave to different augmentations to solve the problem their own way (see how it is done in RFC8795) • Augment RFC8345 by adding some simple solution (e.g. move RFC8795 approach for multi-domain links to RFC8345) • Consider RFC8345bis	
4	Networks part of another network	• Implement via supporting relationship or via modelling domains in the IP network • Leave to different augmentations to solve the problem their own way • Augment Rfc8345 by adding some simple solution • Consider RFC8345bis	
5	Nodes, tps, links in multiple networks	• Use the current approach – this is not problem for read but may be an issue for write • Augment RFC8345 to optionally allow nodes to be defined outside of the network tree and referenced. • Consider RFC8345bis	
6	Missing Supporting Relationships	• 1. Leave to different augmentations to solve the problem their own way (see how it is done in RFC8795) • 2. Augment RFC8345 by adding some simple solution (e.g. move RFC8795 approach for multi-domain links to RFC8345) • 3. Consider RFC8345bis	
7	Missing Topology Semantics		

The RFC 8345 Augmentations

- We started working on the analysis and categorization of all RFC8345 augmentations and usage
- Categorization:
  - functional (Topology, TE, PM, Inventory, ..)
  - technology (generic, L3, L2, OSPF, IS-IS, ..)
  - extension
    - ✓ New attributes
    - ✓ New events
    - ✓ New relations
    - ? New topological entities
    - ? New topological relations
    - ? New topological semantics
    - ? New sublayer
    - ✓ Usage (e.g. types reuse)



Some challenges for multi-layer digital map (examples):

- topological entities defines outside of RFC8345 for TE tunnel and ttps but pm augments link for VPN tunnels
- topological entities defined outside for RFC8345 for fabric
- subset of underlay defined outside of RFC8345 for TE underlay
- some generic extensions (e.g. cross-domain links) defined in augmentations (e.g. te-topology) but needed for non te augmentations as well
- some roles for topological entities defined in augmentations in custom ways

The RFC8345 augmentations are not consistent, which makes it very hard to deploy the multi-layer digital map
Goal: topological entities and topological relations for all layers of Digital Map could be modelled using RFC8345

What's Next?

1. Start working on RFC8345bis to include the changes to ietf-network and ietf-network-topology modules for the gaps identified in *draft-havel-nmop-digital-map*
   - Provide **SIMPLE BACKWARD COMPATIBLE** solution to the identified limitations / gaps
   - Start from *draft-davis-nmop-some-refinements-to-rfc8345*, RFC8795 and other existing augmentations
   - Implement all proposed RFC8345bis changes in the PoC, progress at the next hackathon at IETF120
2. Start working on Guidelines for Creating a Digital Map
   - Finalize analysis and categorization of all RFC8345 augmentations and categorization of extension categories
   - The RFC8345 augmentations are not consistent, which makes it very hard to deploy the multi-layer digital map
3. Joint meeting between NMOP / TEAS to discuss RFC8345 / RFC8795 approach
   - RFC8345 links/termination-points/supporting versus RFC8795 tunnels/TTPs/underlay

Comments ? Questions?