Hierarchical Service Function Chaining (hSFC)

draft-dolson-sfc-hierarchical-03

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History

• Concept introduced in draft-homma-sfc-forwarding-methods-analysis
• At IETF 92 (Dallas), there was interest in creating a separate draft
• Version -02 presented at IETF 93 (Prague)
• Initial Draft posted May 25, proposing some mechanisms
• 2 updates due to feedback
• Incorporated contributions from draft-liu-sfc-nesting-use-case-01
• Current version -03 posted Oct. 2.
The Problem

• SFC controller complexity in very large networks.
  • Millions of hosts
  • Thousands of forwarding elements

• Asymmetrical routing
  • But some SFs require bidirectional symmetry.

• Multiple operational teams

• How to avoid a “super controller”?
The Solution:

• Make a big problem into several smaller problems

• The Key Idea:
• An SFC Sub-Domain can appear as a single SF to a high-level SFC domain
Hierarchical Service Paths

In sub-domain 1
- Stateful 5-tuple classification
- Dynamic network policy
- Co-located classifiers to handle bidirectional traffic
- Co-located SFs to handle chatty control plane and NFV elasticity.

In sub-domain 2
- Coarse classification
- Relatively static paths
- Geographically distributed classifiers
The Internal Boundary Node (IBN)

• SFC Architecture describes an “SFC Boundary Node”
  • [RFC7665, section 4.4]
  • Connecting SFC domains together
  • Does not specify details

• We propose the IBN to bridge levels of hierarchy within a single administrative domain
  • A variant of “SFC Boundary Node”
  • We have specified IBN behavior that is not described in RFC7665.
  • We identify IBN behavior to allow hSFC to be done safely.
Mechanisms

• Packets exiting lower-level domains are returned to paths in the higher levels. Challenge: which higher-level paths?

• Options:
  • Flow-stateful IBN – remember which path per 5-tuple
  • Encode upper-level paths as context metadata of lower-level
  • Unique lower-level paths per upper level path
Metadata Implications

• Metadata in the higher-level domain must be preserved when traversing the lower-level domain, by either:
  • Single metadata schema across domains
  • Pushing/popping/mapping mechanisms
Control Plane Implications

• IBN is an SF in the higher-level
• IBN is a Classifier in the lower-level
• Independence is desired

• Control-plane standards should permit hSFC
Examples in the draft

• Reducing the Number of Service Function Paths
  • Total number of managed paths is reduced

• Managing a Distributed Data-Center Network *new*
  • Avoid a super-controller across multiple DCs
Contributions

• Scalability to large networks
  • Can hide scaling considerations within a sub-domain
  • Avoid costly stateful classification in distributed classifiers

• Manageability of multiple domains
  • Simpler controllers
  • Easier to reason about

• Support multiple operational teams with local control
  • E.g., security team and optimization team

• IBN Function defined
Document Status

• Contributions from multiple authors
• Thorough review/contributions by several individuals
• All received comments have been addressed
• We are working to better describe mechanisms
• Would like the working group to adopt
  • To inform or standardize IBN behaviors