Hierarchical Service Function Chaining (hSFC)

draft-dolson-sfc-hierarchical-05

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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
• Initial Draft posted May 2015, proposing some mechanisms
• Version -02 presented at IETF 93 (Prague)
• Version -03 presented at IETF 94 (Yokohama)
• Incorporated contributions from
  • draft-liu-sfc-nesting-use-case-01
  • draft-ao-sfc-for-dc-interconnect-01
• Current version -05 posted March 7, 2016
Hierarchical Service Paths

- **Sub-domain 2 In DC2**
  - Coarse classification
  - Relatively static paths
  - Geographically distributed classifiers

- **Sub-domain 1 In DC1**

In sub-domain:
- 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.

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The Internal Boundary Node (IBN)

• We propose the IBN to bridge levels of hierarchy within a single administrative domain
  • A variant of “SFC Boundary Node” (per RFC7665)
  • 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
  • **Nesting upper-level NSH within lower-level NSH**  **New in -05**
Nesting NSH

• Simplifies IBN responsibilities at the expense of complexity in the SF
• Requires a new allocation allowing NSH as “Next protocol” in the lower-NSH header.
Implementation

• Victor Vu has put together an implementation using OpenDaylight

• Method: encoding upper-level paths as context meta-data in the lower-level metadata

• And a presentation
  • https://goo.gl/EfyOmE
Control Plane Implications

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

• Control-plane standards should permit hSFC
Metadata Implications

• If in use, 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
Contributions

• Scalerability 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