Hierarchical Service Function Chaining (hSFC)

draft-dolson-sfc-hierarchical-05

David Dolson (ddolson@sandvine.com) -- presenting

Shunsuke Homma (homma.shunsuke@lab.ntt.co.jp)

Diego R. Lopez (diego.r.lopez@telefonica.com)

Mohamed Boucadair (mohamed.boucadair@orange.com)

Dapeng Liu (max.ldp@alibaba-inc.com)

Ting Ao (ao.ting@zte.com.cn)

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 1 In DC1

Sub-domain 2 In DC2

CL

SFF1

SFF2

Up-link

Down-link
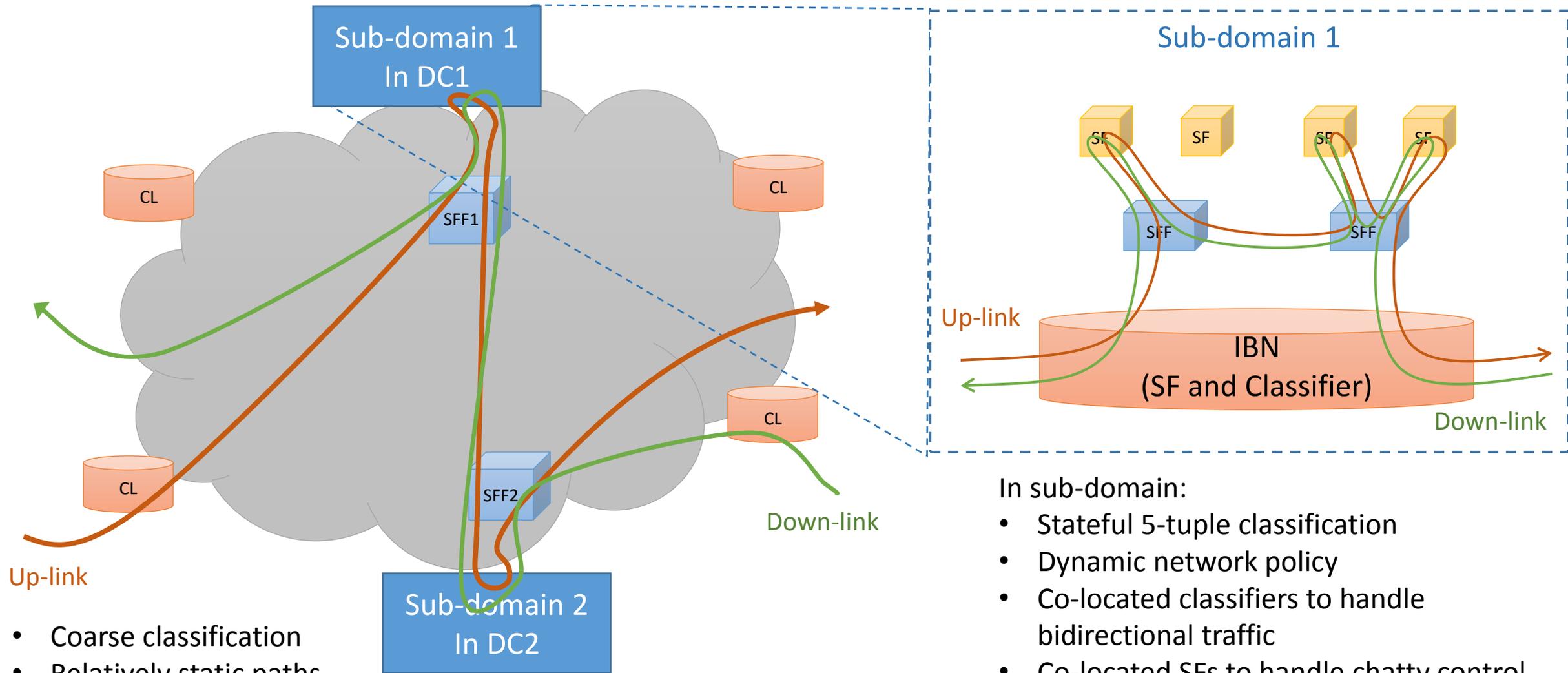
- Coarse classification
- Relatively static paths
- Geographically distributed classifiers

Sub-domain 1

SF

SFF

IBN (SF and Classifier)

Up-link

Down-link

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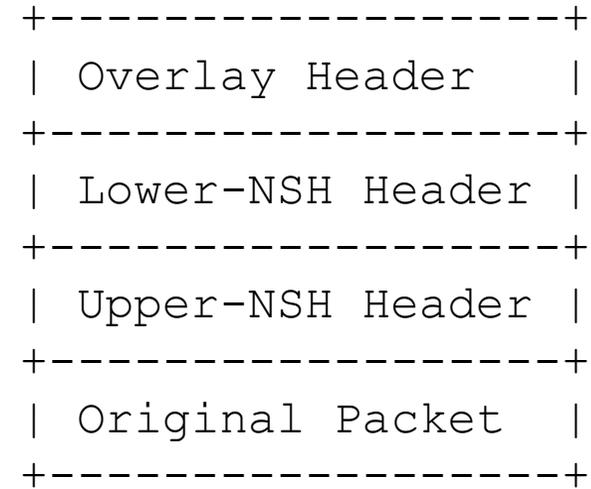- Co-located SFs to handle chatty control plane and NFV elasticity.

3

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

```
+-------------------+
| Overlay Header    |
+-------------------+
| Lower-NSH Header  |
+-------------------+
| Upper-NSH Header  |
+-------------------+
| Original Packet   |
+-------------------+
```
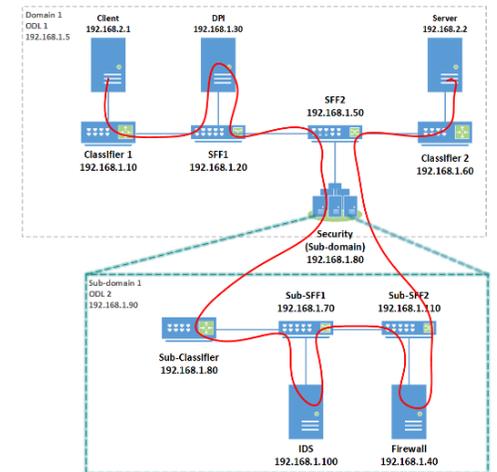
- Simplifies IBN responsibilities at the expense of complexity in the SF

- 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

- 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