A BGP-Based Control Plane for Service Function Chaining
draft-mackie-bess-nsh-bgp-control-plane-01

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Objectives

• Use BGP to
  • Discover SFFs
  • Learn what SFs are supported by each SFF
  • Distribute information about complete SFPs
• Re-use BGP VPN methodology and lessons learned
• Fully support SFC architecture and NSH protocol
  • RFC 7665
  • draft-ietf-sfc-nsh
• Allow flexible, high-function implementations and deployments
• Support multiple SFC overlay networks on a common underlay
How it Works

• BGP used to advertise using a new AFI/SAFI with two route types
  • Service Function Forwarder and Service Function discovery
  • Service Function Path composition

• SFC Overlay Networks
  • The SFFs are connected together by tunnels crossing underlay networks
  • The SFFs form an overlay network
  • We allow multiple overlay networks at once and distinguish them using Route Targets

• Service Function Types
  • New registry of type indicators for service functions

• SFF/SF discovery
  • Each SFF advertises a Service Function Instance Route (SFIR) for each SFI it supports

• SFPR for SFP distribution
  • The controller advertises the whole SFP so that nodes on the path know about it
Service Function Instance Route (SFIR)

- Each SFF advertises for each SFI to which it provides access
  - Allows other SFFs to know how to route to the advertised SFI
    - And the information to build tunnels across the underlay
    - Allows controller to see all available SFIs
- Advertisement contains
  - Route Target
    - Identifies the overlay network
    - Other nodes only import when the RT matched
  - Route Distinguisher (SFIR-RD)
    - Identifies the SFI advertisement
  - SF Type (SFT)
    - From the FCFS IANA registry
- The combination SFIR-RD/SFT uniquely identifies a specific SFI
Service Function Path Route (SFPR)

• Service Function Paths are constructed and advertised by controllers
• An SFP is a sequence of SFIs
• Advertisement contains:
  • Route Target
    • So only participating nodes need to import the advertisement
  • Route Distinguisher (SFPR-RD)
    • Identifies the SFP advertisement
  • Service Path Identifier (SPI)
    • Uniquely identifies the SFP
      • Used in the forwarding plane to identify this SFP
  • Series of hops in the path each encoded as a Hop TLV
The Hop TLV

• One instance of the Hop TLV for each hop in the path
• Each Hop TLV contains
  • Service Index
    • Used in the forwarding plane to identify this hop
  • A Service Function Type
    • The type of SF that must be executed
  • An SFIR-RD
    • The RD of the SFIR that advertised the SFI to be executed

• The uncomplicated case
  • SFPR is just a series of Hop TLVs each with one SFT/SFIR-RD
A Simple Example

SFIR-RD = 198.51.100.1, 201
SFT = orange
SFIR-RD = 198.51.100.1, 202
SFT = orange
SFIR-RD = 198.51.100.1, 42
SFT = blue
SFPR-RD = 198.51.100.100, 1
SPI = 501
Hop {SI = 255, SFT = orange, RD = 198.51.100.1, 202}
Hop {SI = 254, SFT = green, RD = 198.51.100.2, 37}
Hop {SI = 253, SFT = red, RD = 198.51.100.3, 110}
SFPR-RD = 198.51.100.100, 2
SPI = 502
Hop {SI = 255, SFT = blue, RD = 198.51.100.1, 203}
Hop {SI = 254, SFT = grey, RD = 198.51.100.3, 110}
Advanced Function

• Offering a choice of next hop
  • A Hop TLV can carry multiple SFI identifiers
    • Allows for load-balancing or other policy choices through re-classification
    • Choice may be between SFIs of same or different types
  • Choice may be open
    • A Hop TLV indicates a specific SFT, but leaves choice of SFI open
    • Allows SFF to select “best” next hop considering load and underlay network

• Explicit control of next hop can be achieved using a “special purpose SFT”
  • Standards action range (1-31)
  • One value defined: “Change Sequence”
  • In this case the SFIR-RD is overloaded to contain SPI/SI of next hop
    • May be anywhere on the same SFP (“jumping”)
    • May be another SFP (“branching”)

• Encapsulation between SFFs
  • The SFIR can include a Tunnel Encapsulation attribute to tell other SFFs how to reach the SFI

• Association of SFPs
  • SFPR can include an Association TLV containing the SFPR-RD and SPI of an associated SFP
  • Allows creation of a bidirectional SFP
    • Opposite directions do not need to be co-routed
Points of Contention

• Is this work for BESS or SFC?
  • In charter at BESS, out of charter at SFC
  • BUT, MUST socialize to SFC

• Support for looping, jumping, branching, spiralling
  • Yes, we support all of them
  • There is a danger inherent in the SFC architecture of infinite loops caused by looping and branching
    • SFC WG needs to think about a solution

• Whose job is it to decrement SI?
  • Out of scope of this document
  • This control plane solution supports anyone decrementing SI

• Does “decrement SI” mean “decrement SI by one”?
  • Out of scope of this document
  • This control plane solution supports any decrement of SI

• When can re-classification happen
  • A re-classifier can be co-resident with SF or SFF, or in between per RFC 7665
  • This document supports any of these options
  • Our work allows the definition of choices in the SFP
    • Whenever a choice is made, this is “re-classification”. Also known as “local policy”.

• How does this relate to draft-ietf-sfc-control-plane?
  • Compatible with forwarding requirements in that draft