MUP Architecture for DMM

draft-mhkk-dmm-mup-architecture-00

IETF119, DMM Working Group

Satoru Matsushima (SoftBank) on behalf of co-authors:

Katsuhiro Horiba, Ashiq Khan, Yuya Kawakami (SoftBank)
Tetsuya Murakami, Keyur Patel (Arrcus)
Miya Kohno, Teppei Kamata, Pablo Camarillo, Jakub Horn (Cisco)
Daniel Voyer (Bell Canada)
Shay Zadok, Israel Meilik (Broadcom)
Ashtosh Agrawal, Kumaresh Perumal (Intel)

Updates: Dataplane Independent

- MUP is a Dataplane Independent Architecture
  - Not depends on any specific dataplane protocols anymore

  - I-D.mhkk-dmm-mup-architecture superseded the previous draft:
    "I-D.mhkk-dmm-srv6mup-architecture"

  - SRv6MUP is a MUP architecture implementation with SRv6 dataplane in the draft
    - Section 4.1: Dataplane consideration
    - Section 7: Illustrations

Updates: Architecture Principles (1)

- “Segment” defined in MUP Architecture
  - Defined as the mobile user plane abstraction in MUP architecture
  - Two types of MUP Segment defined in the draft (Section 4):
    - Interwork Segment
    - Direct Segment

  - NOTE: “Segment” can be seen in many technologies, and is defined in each technology context:
    - “Segment” in Ethernet
    - “Segment” in (Multi-Segment) Pseudo-Wire (RFC5659)
    - “Segment” in EVPN (RFC7432)
    - “Segment” in Segment Routing Architecture (RFC8402)
    - “Segment” in Network Slicing (RFC9543)
    - “Segment” in MUP Architecture (This I-D)

Updates: Architecture Principles (2)

- MUP Segment Auto-Discovery
  - MUP PE should be able to discover MUP Segments in the remote MUP PEs
    - MUP PE advertises auto-discovery route for hosted MUP Segments

  - MUP Segment Auto-Discovery Route (Section 5)
    - Interwork Segment Discovery (ISD) route
    - Direct Segment Discovery (DSD) route
    - Dataplane independent
    - Any dataplane specific attributes should be able to attach to the auto-discovery route
      - Service-SID in BGP Prefix-SID Attribute for SRv6MUP
      - BGP Tunnel-encap Attribute allows many dataplane options

BGP Tunnel Encapsulation Attribute Tunnel Types

Registration Procedure(s)

First Come First Served

Reference

[RFC9012]

Available Formats

CSV

Value	Description	Reference
0	Reserved	[RFC9012]
1	L2TPv3 over IP	[RFC9012]
2	GRE	[RFC9012]
3	Transmit tunnel endpoint (DEPRECATED)	[RFC9012]
4	IPsec in Tunnel-mode (DEPRECATED)	[RFC9012]
5	IP in IP tunnel with IPsec Transport Mode (DEPRECATED)	[RFC9012]
6	MPLS-in-IP tunnel with IPsec Transport Mode (DEPRECATED)	[RFC9012]
7	IP in IP	[RFC9012]
8	VXLAN Encapsulation	[RFC8365]
9	NVGRE Encapsulation	[RFC8365]
10	MPLS Encapsulation	[RFC8365]
11	MPLS in GRE Encapsulation	[RFC8365]
12	VXLAN GPE Encapsulation	[RFC8365]
13	MPLS in UDP Encapsulation	[RFC7510][RFC Errata 4350]
14	IPv6 Tunnel	[Martin_Djernaes]
15	SR TE Policy Type	[draft-ietf-idr-segment-routing-te-policy]
16	Bare	[Nischal_Sheth]
17	SR Tunnel (DEPRECATED)	[RFC9125]
18	Cloud Security	[Ramesh_Babu_Yakkala]
19	Geneve Encapsulation	[RFC8926]
20	Any-Encapsulation	[draft-ietf-bess-bgp-multicast-controller-06]
21	GTP Tunnel Type	[Keyur_Patel][Tetsuya_Murakami]
22	Dynamic Path Selection (DPS) Tunnel Encapsulation	[Venkit_Kasiviswanathan]
23	Originating PE (OPE)	[draft-heitz-bess-evpn-option-b-01]
24	Dynamic Path Selection (DPS) Policy	[https://eos.arista.com/eos-4-26-2f/dps-vpn-scaling-using-bgp][Sarah_Chen]
25	SDWAN-Hybrid	[draft-ietf-idr-sdwan-edge-discovery-04]
26	X-over-UDP	[Jeffrey_Haas]
27-65535	Unassigned	

https://www.iana.org/assignments/bgp-tunnel-encapsulation/bgp-tunnel-encapsulation.xhtml

Updates: Architecture Principles (3)

- Transforms Session to Routing
  - To leverage dataplane protocol to optimize the datapath for DMM

- Session Transformed (ST) Route (Section 6)
  - MUP Controller (MUP-C) advertises following ST routes:
    - Type1 ST (ST1) Route
    - Type2 ST (ST2) Route
  - Auto-discovery route should be used to resolve reachability for the ST routes
  - ST routes should be dataplane independent as well

Reminder: DMM Requirements (RFC7333)

MUP Architecture Principles guide DMM design and operation to fulfill the Reqs

- **REQ1: Distributed mobility management**
  - *IP mobility, network access solutions, and forwarding solutions provided by **DMM MUST enable traffic to avoid traversing a single mobility anchor far from the optimal route**. It is noted that the requirement on distribution **applies to the data plane only**.*

- **REQ3: IPv6 deployment**
  - *DMM solutions **SHOULD target IPv6 as the primary deployment environment** and **SHOULD NOT be tailored specifically to support IPv4**, particularly in situations where private IPv4 addresses and/or NATs are used.*

- **REQ4: Existing mobility protocols**
  - *A DMM solution **MUST first consider reusing and extending IETF standard protocols** before specifying new protocols.*

- **REQ5: Coexistence with deployed networks/hosts and operability across different networks**
  - *A DMM solution may require loose, tight, or no integration into existing mobility protocols and host IP stacks. Regardless of the integration level, DMM implementations **MUST be able to coexist with existing network deployments, end hosts, and routers** that may or may not implement existing mobility protocols. Furthermore, **a DMM solution SHOULD work across different networks, possibly operated as separate administrative domains**, when the needed mobility management signaling, forwarding, and network access are **allowed by the trust relationship between them**.*

MUP Architecture designed under the principles provides:

- Independent from specific mobile service architecture
  - MUP is consumable by any mobile service architectures
- Pluggable User Plane part of mobile service architecture
  - MUP can be co-exist with genuine user plane defined in each mobile service architecture
- Independent from specific dataplane protocols
  - MUP can be implemented with any dataplane protocols

Next Step

- The co-authors will review the section contents against the architecture principles
  - Review and feedbacks from WG members should be welcome
- Update the draft to reflect the review results
  - WG adoption will be requested after the updates