DetNet

Discussions

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DetNet Service
Networking characteristics

• Service types
  • L2/TSN
  • IP

• DetNet Encapsulation:
  • MPLS
  • IP
DetNet functions & nodes
(as per draft-ietf-detnet-architecture)

• DetNet functions
  1. Congestion protection (Queuing) need: flow identification
  2. Explicit routes (TE) need: flow identification
  3. Service protection (PREF, IOD) need: flow id + sequence number

  Note: These three techniques can be applied independently ...
  
  Note: Svc Proxy = DN-Inter-Working Function (DN-IWF)

• DetNet nodes
  • Edge node req.functions: 1, 2, 3
  • Relay node req.functions: 1, 2, 3
  • Transit node req.functions: 1, 2
Agenda

• MPLS DetNet
• IPv{4|6} DetNet
• Edge behaviors
• Other topics
MPLS DetNet
MPLS encapsulation with PREF
MUST include d-CW (for PREF)

DetNet MPLS-based encapsulation

DetNet Flow
Payload Packet
(e.g., IP, Eth)

DetNet Control Word
S-Label
T-Label(s)
Data-Link
Physical

DetNet control word (d-CW) provides sequencing number for packet replication and duplicate elimination purposes.

DetNet S-Label that identifies a DetNet flow within a DetNet Edge or a Relay node.

*Note: end-system without IP stack
MPLS encapsulation without PREF

Should we include d-CW (no PREF)?

**DetNet control word (d-CW)** provides sequencing number for packet replication and duplicate elimination purposes.

**DetNet S-Label** that identifies a DetNet flow within a DetNet Edge or a Relay node.
IPv{4|6} DetNet
DetNet IP

1. Simplified IP
   - Using appl. native encap. format, limited or no DetNet encap. headers
   - DetNet Encapsulation: unmodified IP stack
     - 6-tuple (5+DSCP) to identify flows (may include wildcards ...)
     - No sequence number included

No end-to-end PREF

Simplified IP scenario

DetNet Functions Coverage

IP packet 6-tuple is matched and mapped to DetNet capable link/sub network
Simplified IP encapsulation

- Encapsulation of a native IPvX (6-tuple)

  6-tuple = {src-IP, dst-IP, Proto, src-Port, dst-Port, DSCP}
  any field can be wildcarded/masked

- IP PSN scenario
  - Flow identification per hop
  - Standard router IP header processing (only TTL/Checksum modified)

- Implementing DetNet functions with simplified IP
  1. Congestion protection (Queuing) need: flow-identification
     - 6-tuple match based queue selection, latency control
  2. Explicit routes (TE) need: flow-id
     - Paralels Policy Based Routing on 6-tuple match
  3. Service protection (PREF, IOD) need: flow-id + Seq#
     - Not supported
Encapsulation of a DetNet-flow IPv6 packet at the DetNet Edge node

Optional DetNet DstOpt hdr (1)

Inner IPv6 header (with set Flow label) (1)

Optional Routing header

Optional DetNet DstOpt hdr (2)

Outer IPv6 header (with set Flow label) (2)

DetNet Flow Payload

DetNet IP Examples

ingress/egress (PE nodes of DetNet domain)

src/dst

DetNet Flow Payload

Optional DetNet DstOpt hdr (1)

Inner IPv6 header (with set Flow label) (1)

Optional Routing header

Optional DetNet DstOpt hdr (2)

Outer IPv6 header (with set Flow label) (2)

Encapsulation of a DetNet-flow IPv6 packet at the DetNet Edge node

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Edge Behaviors
DetNet functions & nodes
(as per draft-ietf-detnet-architecture)

- DetNet functions
  1. Congestion protection (Queuing) need: flow-ID
  2. Explicit routes (TE) need: flow-ID
  3. Service protection (PREF, IOD) need: flow-ID + Seq#

Note: These three techniques can be applied independently ...

Note: Svc Proxy = DN-Inter-Working Function (DN-IWF)

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  - Transit node req.functions: 1, 2

Scenarios
- L2VPN/TSN over MPLS
- IP over MPLS
Edge node behaviors
Relationship to classic VPN capabilities

• End-systems may have both regular and DetNet traffic
• Usually there is a DN related “classic VPN” service
  • DetNet traffic and regular traffic use a common UNI
    • same Link or Subnet
  • DN flows are “directed” to/from DN-PW
    • Upstream:
      • select DN-PW, encapsulate and execute DN functions (e.g., PR)
    • Downstream:
      • Execute DN functions (e.g., EF) and remove DN-PW encap
      • send to AC/Subnet
        (AC: may need modify L2 header e.g., VLAN translation)
        (Subnet: may need interaction with node local functions, e.g., ARP)
Discussion items
Eth/TSN over MPLS

• Definition of Eth/TSN over MPLS
  • Mapping of TSN and non-TSN flows to DetNet encap
    • Number of d-CWs?
    • Number of S-labels?
    • T-label per TSN flow or per aggregate: both allowed
  • PREF and no-PREF cases

[Diagram of DetNet Flow through edge node]
Discussion items
IP over MPLS

• Definition of IP over MPLS
  • Mapping of IP flows to MPLS LSPs
    • IP over native MPLS or IP over L3VPN or both?
  • PREF and no-PREF cases
    • TSN/DetNet Inter-Working Function for further study
Other topics
Other topics
Each requires more work, please contribute (text or drafts)

• IP host: DetNet flow to TSN flow mapping
• Queuing
  • What is the depth we need to go here? Is pointing at other specifications and stating obvious factual requirements enough?
• Aggregates
  • There’s existing text pointing at H-LSP and DSCP based aggregation approach directions.. Is this fine?
• OAM
  • Would this actually need a separate document/work?
• TSN host to DetNet host interconnection
• Transport protocol impact (Transport = TSV area)
  • Should not be in our scope at the moment
Thanks ...
Backup

Service & Encapsulations
DetNet Service
Encapsulation within the DetNet domain – L2 service

• L2 service (tunneling for L2)
  • Hosts are in same BC domain
  • Forwarding based on L2 address (i.e. "dst-L2")
    • MUST keep L2 header during transport
  • Tunnel Encapsulation: add new IP/MPLS header

Option 1: PWE3

DetNet Encapsulated

Host-part
DetNet-part

L2 remains
PSN encap added (DetNet specific)

src/dst
ingress/egress (PE nodes of DetNet domain)
DetNet Service
Encapsulation within the DetNet domain – Routing service (MPLS)

• Routing service (adding an MPLS tunnel)
  • Hosts are in different BC domain
    • L3 hosts only
  • Forwarding based on L3 address (i.e. "dst-L3")
  • Tunnel Encapsulation: add new MPLS header

Option 1: PWE3
**DetNet Service**

Encapsulation within the DetNet domain – *Routing service (IP PSN)*

- **Routing service**
  - Hosts are in different BC domain
  - Forwarding based on L3 address (i.e. "dst-L3")
    - Host-part IP contains source/destination
  - Tunnel Encapsulation: add new IP header
    - DetNet-part IP contains ingress/egress

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**Diagram:**

- **Host-part**
  - L2
  - IP
  - X

- **DetNet-part**
  - L2
  - IP
  - X

**DetNet Encapsulated**

- src/dst
- ingress/egress (DetNet domain)

**Option 1: PWE3**

- IP PSN encap added (DetNet specific)

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DetNet Service

Simplified IP – Routing service (IP PSN)

• Routing service
  • DetNet Encapsulation (simplified): IP header
    • 6-tuple (5+DSCP) to identify flows
    • No Seq# included
  • Impact on network design
    • DetNet functions provided per network segment
    • May require e.g., PBR

Option 2: Simplified IP

L3 host

Host-part

DetNet-part

L2 stripped

IP encap NOT modified=

Encapsulated

src/dst +