Echo Request/Reply for DetNet Capability Discovery

draft-tan-detnet-cap-discovery-00

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Agenda

- Requirements
- Alternative solutions
- Ping/Traceroute solution
- DetNet Echo Request/Reply extension
- DetNet Capability Discovery Objects
- Encapsulation of Data Plane
- Next steps
Requirements

- As per [RFC8665], DetNet provides a capability to deliver data flows with extremely low packet loss rates and assured maximum end-to-end delivery latency. DetNet functionality is divided into forwarding and service sub-layers.

- As per [I-D.ietf-detnet-oam-framework]:
  - DetNet OAM MUST support the discovery of DetNet relay nodes in a DetNet network.
  - DetNet OAM MUST support the discovery of Packet Replication, Elimination, and Order preservation sub-functions locations in the domain.
  - DetNet OAM MUST support the collection of the DetNet service sub-layer specific (e.g., configuration/operation/status) information from DetNet relay nodes.
Alternative solutions

- Netconf/Yang
- IGP/BGP
- Ping/Traceroute
- ......
Ping/Traceroute Solution

• As per [I.D.varga-detnet-service-sub-layer-oam], it introduces “DetNet PING” mechanism, and mentions that DetNet Echo Request/Reply packets could be used to discover DetNet capabilities of DetNet relay nodes, such as:
  • Identity of a DetNet service sub-layer node.
  • Discover Ingress/Egress flow-specific configuration of a DetNet service sub-layer node.
  • Detect the status of the flow-specific service sub-layer function.
In our new draft, we introduce DetNet Capabilities Discovery Objects to deliver DetNet capabilities.

In each DetNet Echo Request/Reply message used for DetNet capability discovery, DetNet Capability Matadatas are delivered by several kinds of DetNet Capabilities Discovery Objects defined in this new draft.

These objects comprise of DetNet Capability Matadatas and an abstract object header which has the corresponding format depending on the specific type of DetNet data plane (e.g., MPLS/IP).

The format of DetNet Capability Discovery Objects is shown as below.

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+--------------------------------------------------+
| DetNet Capabilities Discovery Header             |
+--------------------------------------------------+
| DetNet Capabilities Discovery Metadata           |
+--------------------------------------------------+
```

DetNet Capabilities Discovery Header: abstract header, with varied length and format depending on the DetNet data plane type.
DetNet Capabilities Discovery Metadata: detailed information of DetNet capabilities, with varied length and format depending on the DetNet capability type.
DetNet Capability Object

Flags (4 bytes): DetNet Capability Flags
- S: Service sub-layer capability
- F: Forwarding sub-layer capability
- I: Incoming flow configuration
- O: Outgoing flow configuration
DetNet Relay Node Identifier Object

- Node ID: DetNet node id (MPLS)
- IPv4 addr: DetNet node id (IPv4)
- IPv6 addr: DetNet node id (IPv6)
- OP: Service operation on node
  - 0x00: No operation of service
  - 0x01: Initiation of service
  - 0x02: Termination of service
  - 0x03: Relay (Swap) of service
DetNet service protection function objects

- **Service Protection Object**
  - Flags (4 bytes): service protection flags.
  - SL (2 bits): Sequence number length.
    - 0b00/01/10: 0/16/28 bits
  - OP (3 bits): Service protection functions.
    - 0b001/010/100: Replication/Elimination/Ordering

- **Replication/Elimination/Ordering Capability Sub-Object**
  - Flags (4 bytes): unused
DetNet Service Flow Information Objects (MPLS)

- DetNet Service Flow Information Object (MPLS)

- Flags (4 bytes):
  - I: Incoming flow
  - O: Outgoing flow
  - P: platform-label-space

- Service Label Sub-Object
DetNet Service Flow Information Objects (IPv4)

- DetNet Service Flow Information Object (IPv4)

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-------------------+-------------------+
| DetNet Capabilities Discovery Header |
+-------------------+-------------------+
| Flags             | S|I|A|I|O|
+-------------------+-------------------+
```

- IPv4 Header Identifier Sub-Object

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-------------------+-------------------+
| DetNet Capabilities Discovery Header |
+-------------------+-------------------+
| Source Address    | Destination Address |
| Source Port       | Destination Port   |
| Protocol          | Dscp               |
| RESERVED          |                    |
```

- IPSec-SPI Sub-Object

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-------------------+-------------------+
| DetNet Capabilities Discovery Header |
+-------------------+-------------------+
| IPSec Security Parameters Index    |
+-------------------+-------------------+
```

- Flags (4 bytes):
  - I: Incoming flow
  - O: Outgoing flow
  - A: IPv4 header identifier (6-tuple)
  - S: IPsec Security Parameters Index (IPSec-SPI)
DetNet Service Flow Information Objects (IPv6)

- DetNet Service Flow Information Object (IPv6)

  Flags (4 bytes):
  - I: Incoming flow
  - O: Outgoing flow
  - A: IPv6 header identifier (6-tuple)
  - S: IPsec Security Parameters Index (IPSEC-spi)
  - L: IPv6 flow label

- IPv6 Header Identifier Sub-Object

- IPv6 Flow Label Sub-Object
Encapsulation of Data Plane (MPLS)

- MPLS TLV Header

- DetNet Capabilities Discovery Object (MPLS)
Next Steps

• Aggregation configuration
• Forwarding sub-layer configuration
• Data plane specification: MPLS/IP
• Commits and suggestions are always welcome.
Thank you