

# BFD Path Consistency over SR

**draft-lin-bfd-path-consistency-over-sr-01**

Presenter: Changwang Lin (New H3C Technologies)

Weiqiang Cheng (China Mobile)

Wenying Jiang (China Mobile)

IETF-117

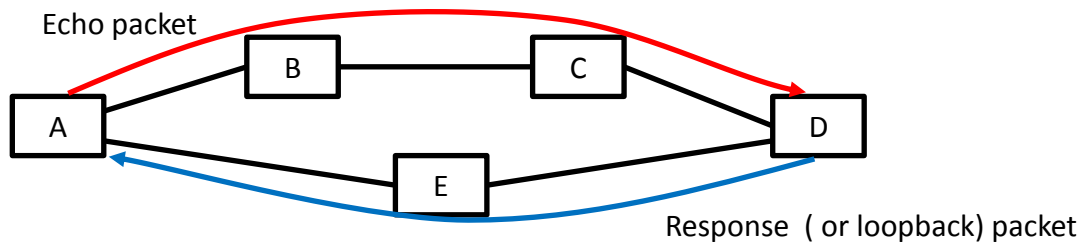
# Background

- Bidirectional Forwarding Detection (BFD) can be used to monitor paths between nodes.
- U-BFD defined in [I-D.ietf-bfd-unaffiliated-echo] can effectively reduce the device equipment.
- Seamless BFD (S-BFD) provides a simplified mechanism which is suitable for monitoring of paths that are setup dynamically and on a large scale network, with supporting verification on reflector
- Monitoring SR Policy

U-BFD/S-BFD could be used to monitor SR Policy, a session associated with a segment list.

# Requirement of path consistency

- Path inconsistency may cause false positive issue
- To the issue, **The consistency of forward and reverse path** of the same session should be guaranteed
- This draft describes how to realize the bidirectional path consistency of packet when monitoring SR policy by U-BFD/S-BFD



# Path consistency for S-BFD - Correlating bidirectional path using Path Segment

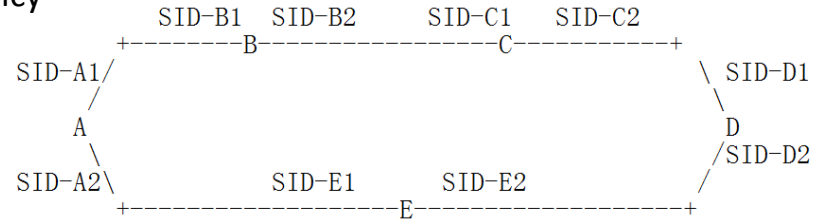
- Path Segment is used to identify an SR path

In SR for MPLS, is defined in [draft-ietf-spring- mpls-path-segment]

In SR for IPv6, is defined in [draft-ietf-spring-srv6-path-segment]

- [draft-ietf-idr-sr-policy-path-segment] extends BGP SR Policy

```
SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>
Attributes: Tunnel Encaps Attribute (23)
Tunnel Type: SR Policy
  Binding SID
  Preference
  Priority
  Policy Name
  Explicit NULL Label Policy (ENLP)
  Segment List
    Weight
    Path Segment
    Segment
    Segment
    ...
  Reverse Segment List
    Path Segment
    Segment
    Segment
    ...
```



## NodeA:

```
SR Policy A-D
Candidate Path1
Segment list1
  SID-A1, SID-B2, SID-C2
  Path Segment: SID-Path-1
  Reverse Path Segment:
    SID-Path-2
Segment list2
  SID-A2, SID-E2
  Path Segment: SID-Path-3
  Reverse Path Segment:
    SID-Path-4
```

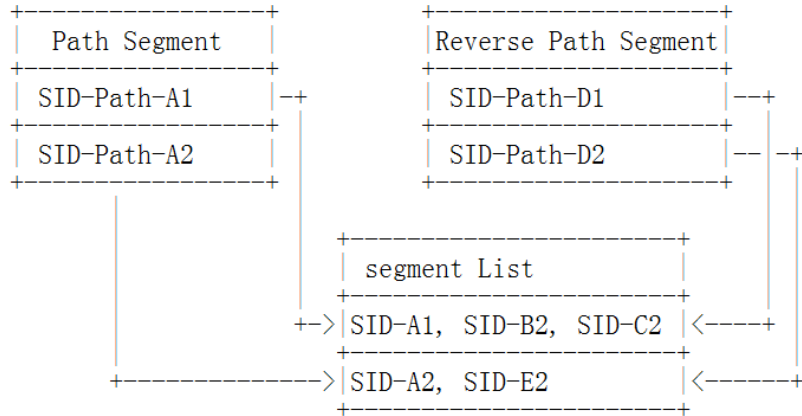
## NodeD:

```
SR Policy D-A
Candidate Path1
Segment list1
  SID-D1, SID-C1, SID-B1
  Path Segment: SID-Path-2
  Reverse Path Segment:
    SID-Path-1
Segment list2
  SID-D2, SID-E1
  Path Segment: SID-Path-4
  Reverse Path Segment:
    SID-Path-3
```

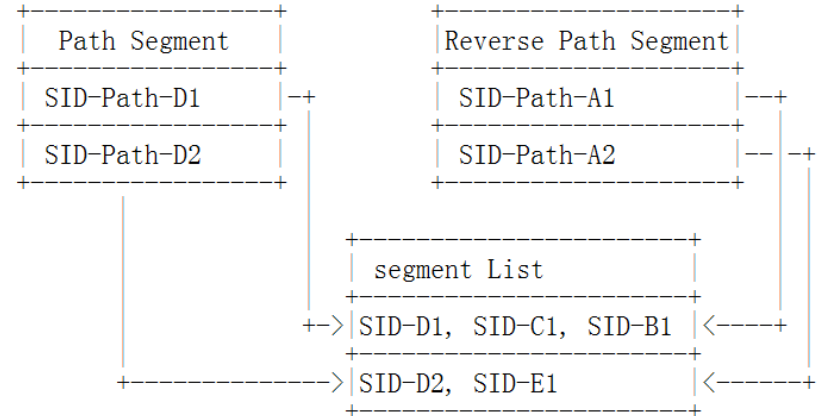
# Path consistency for S-BFD - Correlating bidirectional path using Path Segment(2)

- Using path segment and reverse path segment to establish a mapping table
- Using the mapping table to get segment list by reverse Path segment

## NodeA:



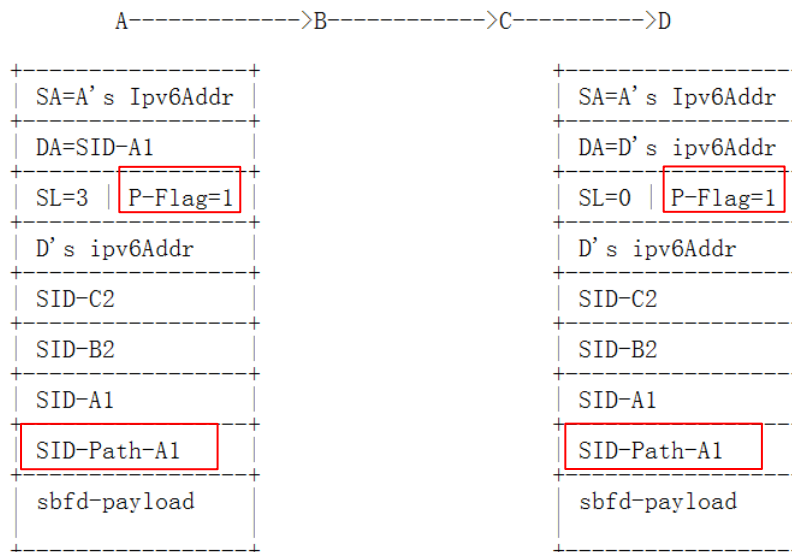
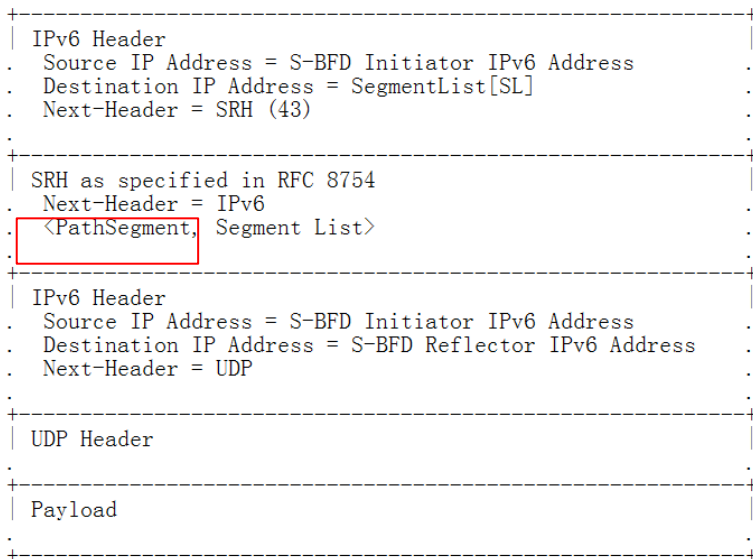
## NodeD:



# Path consistency for S-BFD - S-BFD Initiator procedure for SRv6

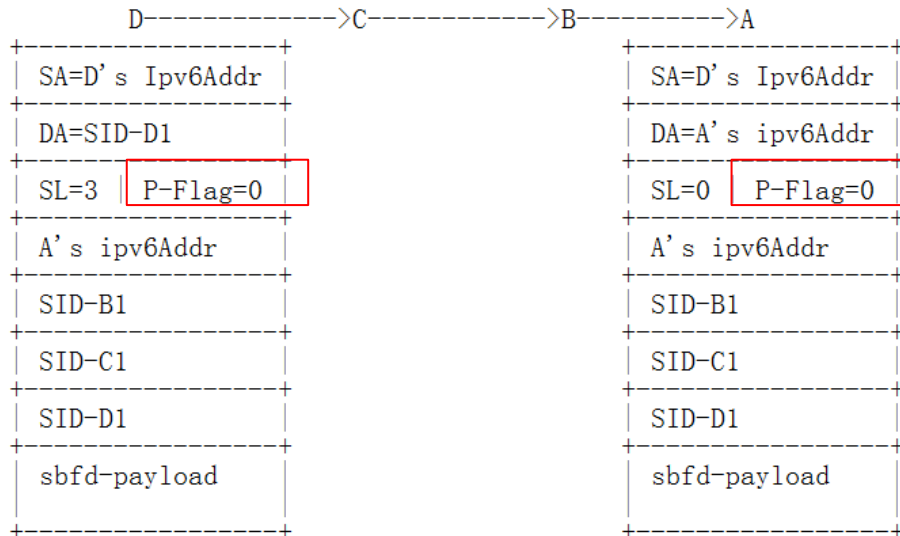
- Encapsulating the segment list associated with S-BFD-session session to SRH
- Encapsulating the path segment of segment list1 (i.e. SID-Path-A1) in SRH, and set **SRH.P-Flag**

```
Segment list1
  SID-A1, SID-B2, SID-C2
  Path Segment: SID-Path-A1
  Reverse Path Segment:
    SID-Path-D1
```



# Path consistency for **S-BFD** - S-BFD reflector procedure for **SRv6**

- If SRH.P-flag is set, extracts the path segment (i.e. SID-Path-A1)of the forward path from SRH
- Get segment list of reverse path by the path segment as a reverse path segment from mapping table
- Encapsulating response packet with the reverse segment list



# Path consistency for S-BFD - S-BFD Initiator procedure for SR

- Encapsulating the segment list associated with SBFd-session session to label stack
- Encapsulating the path segment of segment list1

Segment list1

SID-A1, SID-B2, SID-C2  
 Path Segment: SID-Path-A1  
 Reverse Path Segment:  
 SID-Path-D1

```

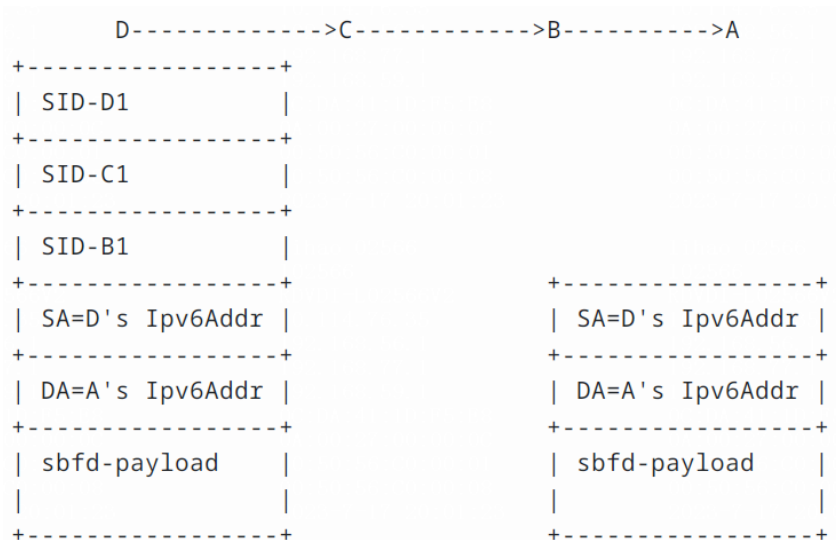
+-----+
|     ...     |
+-----+
|   Label 1   |
+-----+
|   Label 2   |
+-----+
|     ...     |
+-----+
|   Label n   |
+-----+
| Path Segment |
+-----+
| IPv6 Header: |
| Source IP    |
| Destination IP |
~             ~
+-----+
~ sbfd-Payload ~
+-----+
    
```





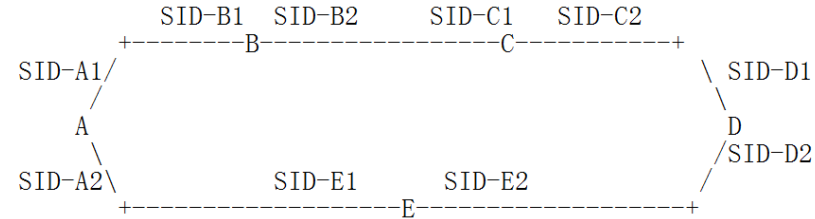
# Path consistency for **S-BFD** - S-BFD reflector procedure for **SR**

- If path-segment exists, Get segment list of reverse path by the path segment as a reverse path segment from mapping table
- Encapsulating response packet with the reverse segment list



# Path consistency for U-BFD – Getting reverse segment list

- [draft-ietf-idr-sr-policy-path-segment] extends BGP SR Policy to distribute reverse path information
- The reverse path segment can be used for S-BFD path consistency, and the **reverse segment list** can be used for U-BFD path consistency



```
SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>
```

```
Attributes: Tunnel Encaps Attribute (23)
```

```
Tunnel Type: SR Policy
```

```
Binding SID
```

```
Preference
```

```
Priority
```

```
Policy Name
```

```
Explicit NULL Label Policy (ENLP)
```

```
Segment List
```

```
Weight
```

```
Path Segment
```

```
Segment
```

```
Segment
```

```
...
```

```
Reverse Segment List
```

```
Path Segment
```

```
Segment
```

```
Segment
```

```
...
```

```
SR Policy A-D
```

```
Candidate Path1
```

```
Segment list1
```

```
SID-A1, SID-B2, SID-C2
```

```
Path Segment: SID-Path-1
```

```
Reverse segment list
```

```
SID-D1, SID-C1, SID-B1
```

```
Reverse Path Segment:
```

```
SID-Path-2
```

```
Segment list2
```

```
SID-A2, SID-E2
```

```
Path Segment: SID-Path-3
```

```
Reverse segment list
```

```
SID-D2, SID-E1
```

```
Reverse Path Segment:
```

```
SID-Path-4
```

```
SR Policy D-A
```

```
Candidate Path1
```

```
Segment list1
```

```
SID-D1, SID-C1, SID-B1
```

```
Path Segment: SID-Path-2
```

```
Reverse Segment list
```

```
SID-A1, SID-B2, SID-C2
```

```
Reverse Path Segment:
```

```
SID-Path-1
```

```
Segment list2
```

```
SID-D2, SID-E1
```

```
Path Segment: SID-Path-4
```

```
Reverse segment list
```

```
SID-A2, SID-E2
```

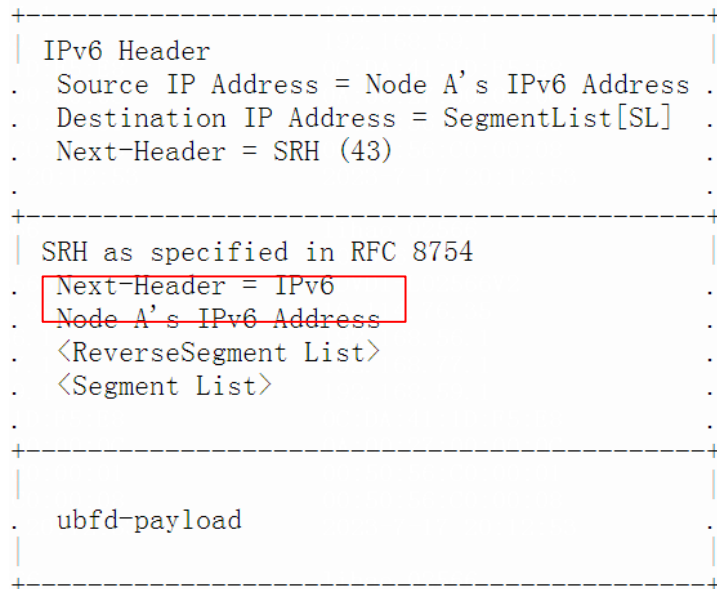
```
Reverse Path Segment:
```

```
SID-Path-3
```

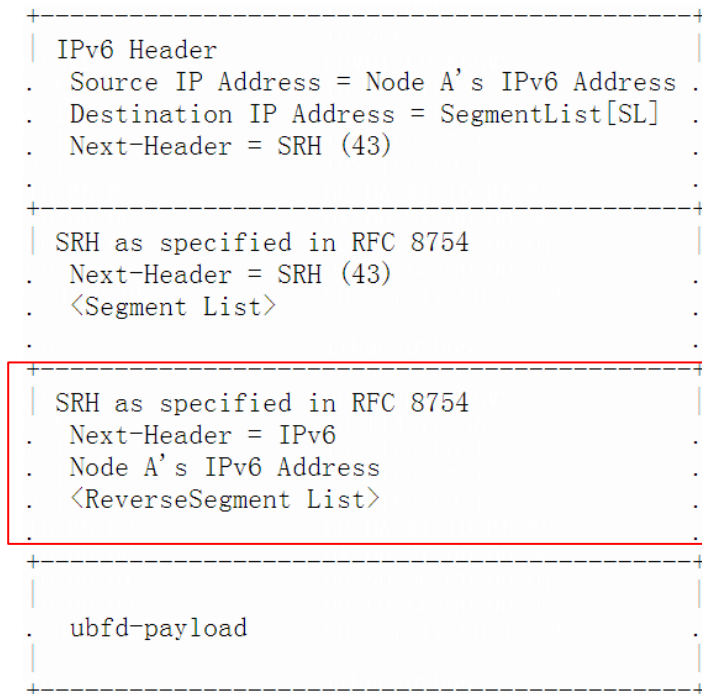
# Path consistency for U-BFD - U-BFD for SRv6

- In an SRv6 network, the reverse segment list can be encapsulated in the U-BFD packet.
- When the packet reaches the tailend node, U-BFD can be returned to the head node in the data plane based on the reverse segment list.

- In Same SRH with forward segment list

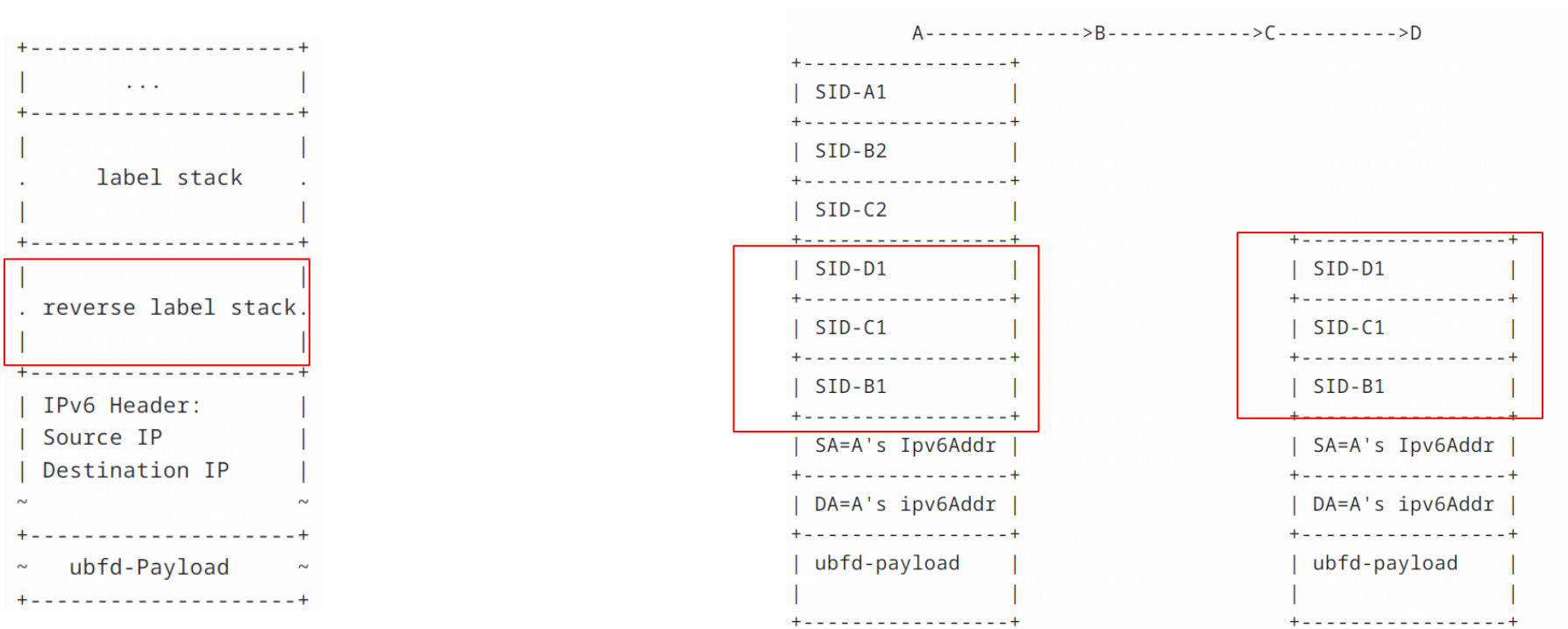


- In different SRH from forward segment list



# Path consistency for U-BFD - U-BFD for SR

- In SR-MPLS, Reverse segment list can be encapsulated in the label
- When the packet reaches the tail node D, the remaining label stack identifies the return path



# Next Steps

- This draft has been presented at the IETF-114
- Added Both S-BFD and U-BFD after IETF-115
- Added Both MPLS-SR and SRv6 after IETF-115
- Any questions or comments are Welcomed
- Seeking WG adoption after revision

Thank You