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BFD Stability
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Abstract

This document describes extensions to the Bidirectional Forwarding Detection (BFD) protocol to measure BFD stability. Specifically, it describes a mechanism for the detection of BFD packet loss.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on 1 May 2026.

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1. Introduction

The Bidirectional Forwarding Detection (BFD) [RFC5880] protocol operates by transmitting and receiving BFD control packets, generally at high frequency, over the datapath being monitored. In order to prevent significant data loss due to a datapath failure, BFD session detection time as defined in BFD [RFC5880] is set to the smallest feasible value.

A BFD [RFC5880] session will remain in the Up state as long as it receives at least one BFD packet within the Detection Time interval. However, additional packet loss within that time interval is not noted by the BFD state machinery. Noting the other missed packets provides a valuable indicator of systemic issues or a deteriorating network that may warrant preventive action.

This document proposes an experimental mechanism to detect lost packets in a BFD session in addition to the datapath fault detection mechanisms of BFD. Such a mechanism, combined with 'received-packet-count' defined in the YANG Data Model for Bidirectional Forward Detection (BFD) [RFC9314] permits operators to measure the stability of BFD sessions. The details of the motivation for experimental status can be found in Appendix A. Implementations may also do additional analysis of the packet loss over a time interval. Such an analysis is outside the scope of this document.

This document does not propose any BFD extension to measure data traffic loss or delay on a link or tunnel, and the scope is limited to BFD packets.

1.1. Note to the RFC Editor

This document uses several placeholder values throughout the document. Please replace them as follows and remove this section before publication.

RFC XXXX, where XXXX is the number assigned to this document at the time of publication.

2025-10-28, with the actual date of the publication of this document.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119] and RFC 8174 [RFC8174].

The reader is expected to be familiar with the BFD [RFC5880]. In particular, the term 'meticulous' specified in Meticulous Keyed ISAAC for BFD Optimized Authentication [I-D.ietf-bfd-secure-sequence-numbers] means that the Sequence number is incremented on every new packet that is sent.

3. Use Cases

Bidirectional Forwarding Detection, as defined in BFD [RFC5880] cannot detect any BFD packet loss if the loss does not last for the Detection Time. This document proposes a method to detect dropped packets on the receiver. For example, if the receiver receives BFD control packet k at time t but receives packet k+3 at time t+10ms, and never receives packet k+1 and/or k+2, then it has experienced a packet loss.

This proposal enables BFD implementations to generate diagnostic information on the health of each BFD session that could be used to preempt a failure on a datapath that BFD was monitoring by allowing time for a corrective action to be taken.

In a faulty datapath scenario, an operator can use BFD health information to trigger the delay and loss measurement OAM protocol Connectivity Fault Management (CFM) [Y-1731] or Packet Loss and Delay Measurement for MPLS Networks [RFC6374] to further isolate the issue.

4. Functionality

BFD stability measurement requires that a BFD Meticulous Authentication type is configured.

The ietf-bfd-stability YANG model, defined in this document, provides the ability to configure BFD stability measurement for BFD sessions by configuring the ’stability’ flag. The ’lost-packet-count’ leaf permits monitoring of stability issues as defined in this document for BFD sessions that have the stability flag enabled.

The configuration of BFD stability measurement and monitoring using other methods than the attached YANG model is out of scope from this document.

5. NULL Auth Type

The NULL Authentication Type, defined in this document, can be used to provide a meticulously increasing sequence number for stability measurement. It provides none of the protections desired for authentication and is used only to provide BFD stability services to BFD sessions that otherwise have no authentication in use.

If the Authentication Present (A) bit is set in the header as defined in Section 4 of BFD [RFC5880], and the Authentication Type field contains TBD, the Authentication section has the following format:

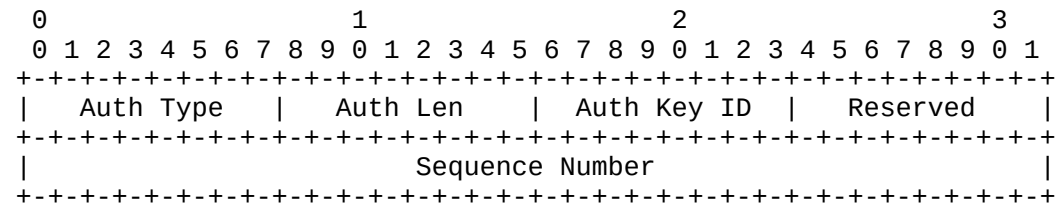

Figure 1: NULL Auth Type

where:

Auth Type: The Authentication Type, which in this case is TBD (NULL, to be assigned by IANA, with a suggested value of 6).

Auth Len: The length of the NULL Auth Type, in bytes; i.e., 8 bytes

Auth Key ID: The authentication key ID in use for this packet. MUST be set to zero and ignored on receipt.

Reserved: This byte MUST be set to zero on transmit and ignored on receipt.

Sequence Number: The sequence number for this packet. This value is incremented for each successive packet transmitted for a session. Implementations will use sequence numbers (bfd.XmitAuthSeq) as defined in BFD [RFC5880].

If bfd.AuthSeqKnown is 1, and the received Sequence Number field is not equal to bfd.RcvAuthSeq + 1 (in a circular number space), then the loss count is incremented by the difference between the received Sequence Number and bfd.RcvAuthSeq and bfd.RcvAuthSeq is set to the received Sequence Number.

Otherwise (bfd.AuthSeqKnown is 0), bfd.AuthSeqKnown MUST be set to 1, and bfd.RcvAuthSeq MUST be set to the value of the received Sequence Number field as defined in BFD [RFC5880], Section 6.8.1, and the packet MUST be accepted.

According to BFD [RFC5880], Section 6.7.3 a receiver MUST discard a received packet that lies outside the range of bfd.RcvAuthSeq and bfd.RcvAuthSeq + (3 * Detect Multi). If it is within that range, but is missing a packet, it can be used to detect a loss. In case of NULL authentication where packets containing sequence numbers are accepted on receipt, an attacker with unauthenticated sequence number could move the Sequence Number forward. Meanwhile, the actual BFD neighbor that continues to send packets will find them discarded and the session would drop. To prevent such an attack, the received Sequence Number MUST NOT be compared with bfd.RcvAuthSeq for purposes of discarding the BFD packets.

6. Theory of Operation

This mechanism allows operators to measure the loss of BFD control packets.

When using MD5 or SHA authentication, BFD MUST use an authentication type (bfd.AuthType) that is of type Meticulous Keyed MD5 Authentication, Meticulous Keyed SHA1 as defined in BFD [RFC5880] or other authentication types that provide for meticulously increasing sequence numbers can also be used. This includes the NULL authentication mechanism defined in this document or Meticulous Keyed ISAAC for BFD Authentication [I-D.ietf-bfd-secure-sequence-numbers].

6.1. Loss Measurement

Loss measurement counts the number of BFD control packets missed at the receiver during any Detection Time period. The loss is detected by comparing the Sequence Number field in successive BFD control packets. The Sequence Number in each successive control packet generated on a BFD session by the transmitter is incremented by one. This loss count can then be exposed using the YANG module defined in the subsequent section. See discussion on Out of Order Packets (Section 6.2) later in the document.

The first BFD authentication section with a non-zero sequence number, in a valid BFD control packet, processed by the receiver, is used for bootstrapping the logic.

6.2. Out of Order Packets

Some transmission mechanisms - for example, Link Aggregate Groups (LAG), or Equal Cost Multipath (ECMP) - can result in out of order packet delivery. In circumstances where BFD packets are not lost, but are delivered out of order, strict comparison of increasing sequence numbers may result in classifying the out of order packets as packet loss.

Implementations MAY provide mechanisms wherein all expected packets received across an expected interval, but delivered out of order are not considered lost packets.

7. Stability YANG Module

7.1. Data Model Overview

This YANG module augments the base BFD YANG module to add attributes such as the flag ’stability’ related to the experiment of BFD Stability. The feature statement ’stability’ needs to be enabled to indicate that BFD Stability is supported by the implementation. In addition, a loss count per-session or lsp for BFD packets that are lost has also been added in this model.

```
   module: ietf-bfd-stability

     augment /rt:routing/rt:control-plane-protocols
               /rt:control-plane-protocol/bfd:bfd/bfd-ip-sh:ip-sh
               /bfd-ip-sh:sessions/bfd-ip-sh:session:
       +--rw stability?   boolean {stability}?
     augment /rt:routing/rt:control-plane-protocols
               /rt:control-plane-protocol/bfd:bfd/bfd-ip-mh:ip-mh
               /bfd-ip-mh:session-groups/bfd-ip-mh:session-group:
       +--rw stability?   boolean {stability}?
     augment /rt:routing/rt:control-plane-protocols
               /rt:control-plane-protocol/bfd:bfd/bfd-lag:lag
               /bfd-lag:sessions/bfd-lag:session:
       +--rw stability?   boolean {stability}?
     augment /rt:routing/rt:control-plane-protocols
               /rt:control-plane-protocol/bfd:bfd/bfd-mpls:mpls
               /bfd-mpls:session-groups/bfd-mpls:session-group:
       +--rw stability?   boolean {stability}?
     augment /rt:routing/rt:control-plane-protocols
               /rt:control-plane-protocol/bfd:bfd/bfd-ip-sh:ip-sh
               /bfd-ip-sh:sessions/bfd-ip-sh:session
               /bfd-ip-sh:session-statistics:
       +--ro lost-packet-count?   yang:counter64 {stability}?
     augment /rt:routing/rt:control-plane-protocols
               /rt:control-plane-protocol/bfd:bfd/bfd-ip-mh:ip-mh
               /bfd-ip-mh:session-groups/bfd-ip-mh:session-group
               /bfd-ip-mh:sessions/bfd-ip-mh:session-statistics:
       +--ro lost-packet-count?   yang:counter64 {stability}?
     augment /rt:routing/rt:control-plane-protocols
               /rt:control-plane-protocol/bfd:bfd/bfd-lag:lag
               /bfd-lag:sessions/bfd-lag:session/bfd-lag:member-links
               /bfd-lag:micro-bfd-ipv4/bfd-lag:session-statistics:
       +--ro lost-packet-count?   yang:counter64 {stability}?
     augment /rt:routing/rt:control-plane-protocols
               /rt:control-plane-protocol/bfd:bfd/bfd-lag:lag
               /bfd-lag:sessions/bfd-lag:session/bfd-lag:member-links
               /bfd-lag:micro-bfd-ipv6/bfd-lag:session-statistics:
       +--ro lost-packet-count?   yang:counter64 {stability}?
     augment /rt:routing/rt:control-plane-protocols
               /rt:control-plane-protocol/bfd:bfd/bfd-mpls:mpls
               /bfd-mpls:session-groups/bfd-mpls:session-group
               /bfd-mpls:sessions/bfd-mpls:session-statistics:
       +--ro lost-packet-count?   yang:counter64 {stability}?
```

7.2. YANG Module

This YANG module imports modules defined in Common YANG Types [RFC6991], A YANG Data Model for Routing [RFC8349], and YANG Data Model for Bidirectional Forwading Detection (BFD) [RFC9314].

```
<CODE BEGINS> file "ietf-bfd-stability@2025-10-28.yang"
module ietf-bfd-stability {
  yang-version 1.1;
  namespace "urn:ietf:params:xml:ns:yang:ietf-bfd-stability";
  prefix "bfd-s";

  import ietf-yang-types {
    prefix "yang";
    reference
      "RFC 6991: Common YANG Data Types";
  }

  import ietf-routing {
    prefix "rt";
    reference
      "RFC 8349: A YANG Data Model for Routing Management
       (NMDA version)";
  }

  import ietf-bfd {
    prefix bfd;
    reference
      "RFC 9314: YANG Data Model for Bidirectional
       Forwarding Detection.";
  }

  import ietf-bfd-ip-sh {
    prefix bfd-ip-sh;
    reference
      "RFC 9314: YANG Data Model for Bidirectional
       Forwarding Detection.";
  }

  import ietf-bfd-ip-mh {
    prefix bfd-ip-mh;
    reference
      "RFC 9314: YANG Data Model for Bidirectional
       Forwarding Detection.";
  }

  import ietf-bfd-lag {
    prefix bfd-lag;
```

```
      reference
        "RFC 9314: YANG Data Model for Bidirectional
         Forwarding Detection.";
    }

    import ietf-bfd-mpls {
      prefix bfd-mpls;
      reference
        "RFC 9314: YANG Data Model for Bidirectional
         Forwarding Detection.";
    }

    import ietf-key-chain {
      prefix key-chain;
      reference
        "RFC 8177: YANG Key Chain.";
    }

    organization
      "IETF BFD Working Group";

    contact
      "WG Web:   <http://tools.ietf.org/wg/bfd>
       WG List:  <rtg-bfd@ietf.org>

       Authors: Mahesh Jethanandani (mjethanandani@gmail.com)
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                Mach Chen (mach.chen@huawei.com).";


    description
      "This YANG module augments the base BFD YANG model to add
       experimental attributes related to BFD Stability.
       In particular, it adds a per-session count for BFD packets
       that are lost.

       Copyright (c) 2025 IETF Trust and the persons identified as
       authors of the code.  All rights reserved.

       Redistribution and use in source and binary forms, with or
       without modification, is permitted pursuant to, and subject to
       the license terms contained in the Revised BSD License set
       forth in Section 4.c of the IETF Trust's Legal Provisions
       Relating to IETF Documents
       (https://trustee.ietf.org/license-info).
```

```
      This version of this YANG module is part of RFC XXXX
      (https://www.rfc-editor.org/info/rfcXXXX); see the RFC itself
      for full legal notices.

      The key words 'MUST', 'MUST NOT', 'REQUIRED', 'SHALL', 'SHALL
      NOT', 'SHOULD', 'SHOULD NOT', 'RECOMMENDED', 'NOT RECOMMENDED',
      'MAY', and 'OPTIONAL' in this document are to be interpreted as
      described in BCP 14 (RFC 2119) (RFC 8174) when, and only when,
      they appear in all capitals, as shown here.";

  revision "2025-10-28" {
    description
      "Initial Version.";
    reference
      "RFC XXXX: BFD Stability.";
  }

  feature stability {
    description
      "This feature enables BFD sessions to be monitored for lost
       packets.";
  }

  identity null-auth {
    base key-chain:crypto-algorithm;
    description
      "BFD Null Auth type defined in this draft.";
    reference
      "RFC XXXX: BFD Stability.";
  }

  grouping lost-packet-count {
    leaf lost-packet-count {
      if-feature "stability";
      type yang:counter64;
      description
        "Number of BFD packets that were lost, where loss is
         determined by the fact that the sequence number is
         not consecutive. This counter should be present only if
         stability is configured.";
    }
    description
      "Grouping of statistics related to BFD stability.";
  }

  augment "/rt:routing/rt:control-plane-protocols/" +
          "rt:control-plane-protocol/bfd:bfd/bfd-ip-sh:ip-sh/" +
          "bfd-ip-sh:sessions/bfd-ip-sh:session" {
```

```
      leaf stability {
        if-feature "stability";
        type boolean;
        must "../bfd-ip-sh:authentication/bfd-ip-sh:meticulous = " +
             "'true'";
        default false;
        description
          "If set to true, this enables the BFD session to monitor
           for stability, i.e., to watch how many packets are getting
           dropped.";
      }
      description
        "Augment the 'bfd' container to add attributes related to BFD
         stability for IP Single Hop Sessions.";
    }

    augment "/rt:routing/rt:control-plane-protocols/" +
            "rt:control-plane-protocol/bfd:bfd/bfd-ip-mh:ip-mh/" +
            "bfd-ip-mh:session-groups/bfd-ip-mh:session-group" {
      leaf stability {
        if-feature "stability";
        type boolean;
        must "../bfd-ip-mh:authentication/bfd-ip-mh:meticulous = " +
             "'true'";
        default false;
        description
          "If set to true, this enables the BFD session to monitor
           for stability, i.e., to watch how many packets are getting
           dropped.";
      }
      description
        "Augment the 'bfd' container to add attributes related to BFD
         stability for Multi Hop Sessions.";
    }

    augment "/rt:routing/rt:control-plane-protocols/" +
            "rt:control-plane-protocol/bfd:bfd/bfd-lag:lag/" +
            "bfd-lag:sessions/bfd-lag:session" {
      leaf stability {
        if-feature "stability";
        type boolean;
        must "../bfd-lag:authentication/bfd-lag:meticulous = " +
             "'true'";
        default false;
        description
          "If set to true, this enables the BFD session to monitor
           for stability, i.e., to watch how many packets are getting
           dropped.";
```

```
      }
      description
        "Augment the 'bfd' container to add attributes related to BFD
         stability for LAG session.";
    }

    augment "/rt:routing/rt:control-plane-protocols/" +
            "rt:control-plane-protocol/bfd:bfd/bfd-mpls:mpls/" +
      "bfd-mpls:session-groups/bfd-mpls:session-group" {
      leaf stability {
        if-feature "stability";
        type boolean;
        must "../bfd-mpls:authentication/bfd-mpls:meticulous = " +
             "'true'";
        default false;
        description
          "If set to true, this enables the BFD session to monitor
           for stability, i.e., to watch how many packets are getting
           dropped.";
      }
      description
        "Augment the 'bfd' container to add attributes related to BFD
         stability for MPLS.";
    }

    augment "/rt:routing/rt:control-plane-protocols/" +
            "rt:control-plane-protocol/bfd:bfd/bfd-ip-sh:ip-sh/" +
            "bfd-ip-sh:sessions/bfd-ip-sh:session/" +
            "bfd-ip-sh:session-statistics" {
      uses lost-packet-count;
      description
        "Augment the 'bfd' container to add statistics related to BFD
         stability for IP Single Hop Sessions.";
    }

    augment "/rt:routing/rt:control-plane-protocols/" +
            "rt:control-plane-protocol/bfd:bfd/bfd-ip-mh:ip-mh/" +
            "bfd-ip-mh:session-groups/bfd-ip-mh:session-group/" +
            "bfd-ip-mh:sessions/bfd-ip-mh:session-statistics" {
      uses lost-packet-count;
      description
        "Augment the 'bfd' container to add statistics related to BFD
         stability for IP Multi Hop Sessions.";
    }

    augment "/rt:routing/rt:control-plane-protocols/" +
            "rt:control-plane-protocol/bfd:bfd/bfd-lag:lag/" +
            "bfd-lag:sessions/bfd-lag:session/bfd-lag:member-links/" +
```

```
            "bfd-lag:micro-bfd-ipv4/bfd-lag:session-statistics" {
      uses lost-packet-count;
      description
        "Augment the 'bfd' container to add statistics related to BFD
         stability for Micro BFD sessions for IPv4.";
    }

    augment "/rt:routing/rt:control-plane-protocols/" +
            "rt:control-plane-protocol/bfd:bfd/bfd-lag:lag/" +
            "bfd-lag:sessions/bfd-lag:session/bfd-lag:member-links/" +
            "bfd-lag:micro-bfd-ipv6/bfd-lag:session-statistics" {
      uses lost-packet-count;
      description
        "Augment the 'bfd' container to add statistics related to BFD
         stability for Micro BFD sessions for IPv6.";
    }

    augment "/rt:routing/rt:control-plane-protocols/" +
            "rt:control-plane-protocol/bfd:bfd/bfd-mpls:mpls/" +
            "bfd-mpls:session-groups/bfd-mpls:session-group/" +
            "bfd-mpls:sessions/bfd-mpls:session-statistics" {
      uses lost-packet-count;
      description
        "Augment the 'bfd' container to add statistics related to BFD
         stability for MPLS sessions.";
    }
  }
  <CODE ENDS>
```

8. IANA Considerations

This document requests one new authentication type and registers one URIs in the "ns" subregistry of the "IETF XML" registry [RFC3688].

8.1. Auth Type

This document requests an update to the registry titled "BFD Authentication Types". IANA is requested to assign a new BFD AuthType:

* NULL Auth Type, with a suggested value of 6.

8.2. IETF XML Registry

Following the format in [RFC3688], the following registrations are requested:

URI: urn:ietf:params:xml:ns:yang:ietf-bfd-stability
Registrant Contact: The IESG
XML: N/A, the requested URI is an XML namespace.

8.3. The "YANG Module Names" Registry

This document registers one YANG module in the "YANG Module Names" registry [RFC6020]. Following the format in [RFC6020], the following registrations are requested:

```
name:         ietf-bfd-stability
namespace:    urn:ietf:params:xml:ns:yang:ietf-bfd-stability
prefix:       bfd-s
reference:    RFC XXXX
```

9. Security Considerations

9.1. BFD NULL Auth Security Considerations

The use of a BFD authentication mechanism that protects the BFD packets is RECOMMENDED.

The Security Considerations of [RFC5880] for unauthenticated BFD all apply to the new NULL authentication type. The NULL Authentication type, defined in this document, provides none of the properties desired for authenticating BFD packets. It is intended to provide BFD sessions that otherwise would not use authentication, a sequence number that can be used for purposes of detecting lost packets.

The lack of a computed AuthKey/Digest over the BFD packet, but the presence of a Sequence Number makes this authentication type susceptible to injection attacks. BFD without authentication is vulnerable to session resets; the NULL Auth type does not change this.

When the NULL Authentication type is used for BFD Stability purposes, maliciously injected packets that do not reset the BFD session can resemble high packet loss. Sessions such as multi-hop routed paths, tunnels without authentication, or MPLS LSP, therefore, have security guarantees that are identical to situations where BFD is run without authentication.

9.2. YANG Security Considerations

The YANG module specified in this document defines a schema for data that is designed to be accessed via network management protocols such as NETCONF [RFC6241] or RESTCONF [RFC8040]. These YANG-based management protocols have to use a secure transport layer (e.g., SSH [RFC4252], TLS [RFC8446], and QUIC [RFC9000]) and have to use mutual authentication.

The NETCONF Access Control Model (NACM) [RFC8341] provides the means to restrict access for particular NETCONF or RESTCONF users to a preconfigured subset of all available NETCONF or RESTCONF protocol operations and content.

The YANG module does not define any writeable/creatable/deletable data nodes that can have an adverse impact on a BFD session.

The only readable data nodes in YANG module may be considered sensitive or vulnerable in some network environments. It is thus important to control read access (e.g., via get, get-config, or notification) to these data nodes.

The model defines a read-only node to indicate the number of packets that were lost. Access to this information may allow a malicious user information on which links are experiencing issues. In addition, and as stated in Out of Order Packets (Section 6.2), on links such as LAG or ECMP, there is a possibility of packets being delivered out-of-order. A strict comparison of increasing sequence numbers may result in classifying those out of order packets as packet loss.

The YANG module does not define any RPC operations.

10. Contributors

The authors of this document would like to acknowledge Jeff Haas as a contributor to this document. His contribution lead to a significant improvement of the document. In addition, Manav Bhatia contributed to this document.

11. Acknowledgements

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Thanks to Reshad Rehman for being the shepherd of the document.

12. References

12.1. Normative References

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Appendix A. Experimental Status

This document describes an experiment that will present a candidate solution to predict whether a given BFD [RFC5880] session will continue to be stable. The experiment will use the packet lost count and the 'received-packet-count' defined in the YANG Data Model for Bidirectional Forward Detection (BFD) [RFC9314] to determine how stable is the session. The reason why this document is on an Experimental track is because there are no known implementations or proof-of-concept. As a result, the authors are not clear whether a simple lost count is enough to predict the stability or there will be a need to have a more granular count.

This document is classified as Experimental and is not part of the IETF Standards Track.

Appendix B. Examples

This section tries to show some examples in how the model can be configured for stability.

B.1. Single Hop BFD Configuration

This example demonstrates how a Single Hop BFD session can be configured to enable monitoring of a session for stability.

```
=============== NOTE: '\' line wrapping per RFC 8792 ===============

<?xml version="1.0" encoding="UTF-8"?>
<key-chains
    xmlns="urn:ietf:params:xml:ns:yang:ietf-key-chain"
    xmlns:kc="urn:ietf:params:xml:ns:yang:ietf-key-chain">
  <key-chain>
    <name>bfd-stability-config</name>
    <description>"An example for BFD Stabalized configuration."</de\
scription>
    <key>
      <key-id>55</key-id>
      <lifetime>
        <send-lifetime>
          <start-date-time>2025-01-01T00:00:00Z</start-date-time>
          <end-date-time>2025-02-01T00:00:00Z</end-date-time>
        </send-lifetime>
        <accept-lifetime>
          <start-date-time>2024-12-31T23:59:55Z</start-date-time>
          <end-date-time>2025-02-01T00:00:05Z</end-date-time>
        </accept-lifetime>
      </lifetime>
```

```
        <crypto-algorithm>kc:sha-1</crypto-algorithm>
      </key>
    </key-chain>
  </key-chains>
  <interfaces
      xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces"
      xmlns:if-type="urn:ietf:params:xml:ns:yang:iana-if-type">
    <interface>
      <name>eth0</name>
      <type>if-type:ethernetCsmacd</type>
    </interface>
  </interfaces>
  <routing
      xmlns="urn:ietf:params:xml:ns:yang:ietf-routing"
      xmlns:bfd-types="urn:ietf:params:xml:ns:yang:ietf-bfd-types"
      xmlns:stability="urn:ietf:params:xml:ns:yang:ietf-bfd-stability\
  ">
    <control-plane-protocols>
      <control-plane-protocol>
        <type>bfd-types:bfdv1</type>
        <name>name:BFD</name>
        <bfd xmlns="urn:ietf:params:xml:ns:yang:ietf-bfd">
          <ip-sh xmlns="urn:ietf:params:xml:ns:yang:ietf-bfd-ip-sh">
            <sessions>
              <session>
                <interface>eth0</interface>
                <dest-addr>2001:db8:0:113::101</dest-addr>
                <desired-min-tx-interval>10000</desired-min-tx-interv\
  al>
                <required-min-rx-interval>
                  10000
                </required-min-rx-interval>
                <stability:stability>true</stability:stability>
                <authentication>
                  <key-chain>bfd-stability-config</key-chain>
                  <meticulous>true</meticulous>
                </authentication>
              </session>
            </sessions>
          </ip-sh>
        </bfd>
      </control-plane-protocol>
    </control-plane-protocols>
  </routing>
```

B.2. Use of NULL Auth

This example demonstrates how to configure NULL Auth to enable monitoring of a session for stability.

```
=============== NOTE: '\' line wrapping per RFC 8792 ===============

<?xml version="1.0" encoding="UTF-8"?>
<key-chains
    xmlns="urn:ietf:params:xml:ns:yang:ietf-key-chain"
    xmlns:stability="urn:ietf:params:xml:ns:yang:ietf-bfd-stability\
">
  <key-chain>
    <name>bfd-stability-config</name>
    <description>"An example for BFD Stability configuration."</des\
cription>
    <key>
      <key-id>55</key-id>
      <lifetime>
        <send-lifetime>
          <start-date-time>2025-01-01T00:00:00Z</start-date-time>
          <end-date-time>2025-02-01T00:00:00Z</end-date-time>
        </send-lifetime>
        <accept-lifetime>
          <start-date-time>2024-12-31T23:59:55Z</start-date-time>
          <end-date-time>2025-02-01T00:00:05Z</end-date-time>
        </accept-lifetime>
      </lifetime>
      <crypto-algorithm>stability:null-auth</crypto-algorithm>
    </key>
  </key-chain>
</key-chains>
<interfaces
    xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces"
    xmlns:if-type="urn:ietf:params:xml:ns:yang:iana-if-type">
  <interface>
    <name>eth0</name>
    <type>if-type:ethernetCsmacd</type>
  </interface>
</interfaces>
<routing
    xmlns="urn:ietf:params:xml:ns:yang:ietf-routing"
    xmlns:bfd-types="urn:ietf:params:xml:ns:yang:ietf-bfd-types"
    xmlns:stability="urn:ietf:params:xml:ns:yang:ietf-bfd-stability\
">
  <control-plane-protocols>
    <control-plane-protocol>
      <type>bfd-types:bfdv1</type>
```

```
        <name>name:BFD</name>
        <bfd xmlns="urn:ietf:params:xml:ns:yang:ietf-bfd">
          <ip-sh xmlns="urn:ietf:params:xml:ns:yang:ietf-bfd-ip-sh">
            <sessions>
              <session>
                <interface>eth0</interface>
                <dest-addr>2001:db8:0:113::101</dest-addr>
                <desired-min-tx-interval>10000</desired-min-tx-interv\
   al>
                <required-min-rx-interval>
                  10000
                </required-min-rx-interval>
                <stability:stability>true</stability:stability>
                <authentication>
                  <key-chain>bfd-stability-config</key-chain>
                  <meticulous>true</meticulous>
                </authentication>
              </session>
            </sessions>
          </ip-sh>
        </bfd>
      </control-plane-protocol>
    </control-plane-protocols>
  </routing>
```

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