

BFD Working Group  
Internet-Draft  
Updates: 5798 (if approved)  
Intended status: Standards Track  
Expires: November 25, 2018

G. Mirsky  
ZTE Corp.  
J. Tantsura  
May 24, 2018

Bidirectional Forwarding Detection (BFD) for Multi-point Networks and  
Virtual Router Redundancy Protocol (VRRP) Use Case  
draft-mirsky-bfd-p2mp-vrrp-use-case-02

Abstract

This document discusses use of Bidirectional Forwarding Detection (BFD) for multi-point networks to provide Virtual Router Redundancy Protocol (VRRP) with sub-second Master convergence and defines the extension to bootstrap point-to-multipoint BFD session.

Status of This Memo

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

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on November 25, 2018.

Copyright Notice

Copyright (c) 2018 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of

the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

## Table of Contents

1. Introduction . . . . .	2
1.1. Conventions used in this document . . . . .	2
1.1.1. Terminology . . . . .	3
1.1.2. Requirements Language . . . . .	3
2. Problem Statement . . . . .	3
3. Applicability of p2mp BFD . . . . .	3
3.1. Multipoint BFD Encapsulation . . . . .	5
4. IANA Considerations . . . . .	5
5. Security Considerations . . . . .	5
6. Acknowledgements . . . . .	5
7. Normative References . . . . .	5
Authors' Addresses . . . . .	6

## 1. Introduction

The [RFC5798] is the current specification of the Virtual Router Redundancy Protocol (VRRP) for IPv4 and IPv6 networks. VRRPv3 allows for faster switchover to a Backup router. Using such capability with software-based implementation of VRRP is may prove challenging. But it still may be possible to deploy VRRP and provide sub-second detection of Master router failure by Backup routers.

Bidirectional Forwarding Detection (BFD) [RFC5880] had been originally defined detect failure of point-to-point (p2p) paths: single-hop [RFC5881], multihop [RFC5883]. Single-hop BFD may be used to enable Backup routers to detect failure of the Master router within 100 msec or faster. [I-D.nitish-vrrp-bfd] demonstrates how, with some extensions to [RFC5798], that can be achieved.

[I-D.ietf-bfd-multipoint] extends [RFC5880] for multipoint and multicast networks, which is precisely characterizes deployment scenarios for VRRP over LAN segment. This document demonstrates how point-to-multipoint (p2mp) BFD can enable faster detection of Master failure and thus minimize service disruption in a VRRP domain. The document also defines the extension to VRRP [RFC5798] to bootstrap a VRRP Backup router to join in p2mp BFD session.

### 1.1. Conventions used in this document

### 1.1.1. Terminology

BFD: Bidirectional Forwarding Detection

p2mp: Pont-to-Multipoint

VRRP: Virtual Router Redundancy Protocol

### 1.1.2. Requirements Language

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 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

## 2. Problem Statement

A router may be part of several Virtual Router Redundancy groups, as Master in some and as Backup in others. Supporting sub-second mode for VRRPv3 [RFC5798] for all these roles without specialized support in data plane may prove to be very challenging. BFD already has many implementations based on HW that are capable to support multiple sub-second session concurrently.

## 3. Applicability of p2mp BFD

[I-D.ietf-bfd-multipoint] may provide the efficient and scaleable solution for fast-converging environment that uses default route rather than dynamic routing. Each redundancy group presents itself as p2mp BFD session with its Master being the root and Backup routers being tails of the p2mp BFD session. Figure 1 displays the extension of VRRP [RFC5798] to bootstrap tail of the p2mp BFD session. Master

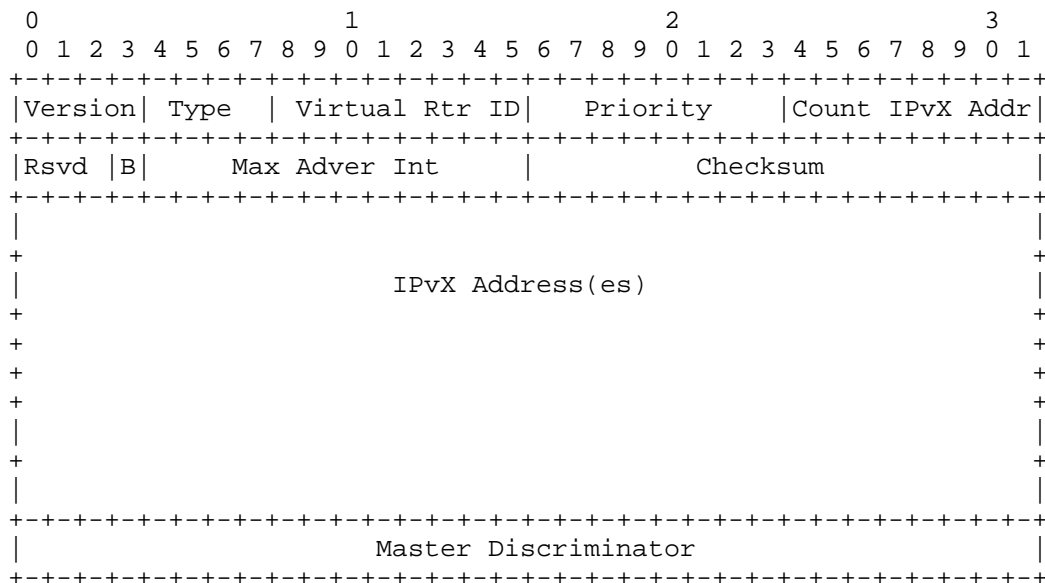


Figure 1: VRRP Extension to Bootstrap P2MP BFD session

where new fields are interpreted as:

B(FD) - one bit flag that indicates that the Master Discriminator field is appended to VRRP packet defined in [RFC5798];

Master Discriminator - My Discriminator value allocated by the root of the p2mp BFD session.

The Master router that is configured to use p2mp BFD to support faster convergence of VRRP starts transmitting BFD control packets with VRID as source IP address and My Discriminator. The same value of My Discriminator MUST be set as value of Master Discriminator field and BFD flag MUST be set in the VRRP packet. Backup router demultiplexes p2mp BFD test sessions based on VRID that it been configured with and the My Discriminator value it learns from the received VRRP packet. When a Backup router detects failure of the Master router it re-evaluates its role in the VRID. As result, the Backup router may become the Master router of the given VRID or continue as a Backup router. If the former is the case, then the new Master router MUST select My Discriminator and start transmitting p2mp BFD control packets using Master IP address as source IP address for p2mp BFD control packets. If the latter is the case, then the Backup router MUST wait for VRRP packet from the new VRRP Master router that will bootstrap new p2mp BFD session.

### 3.1. Multipoint BFD Encapsulation

The MultipointHead of p2mp BFD session when transmitting BFD control packet:

MUST set TTL value to 1 (though note that VRRP packets have TTL set to 255);

SHOULD use group address VRRP ('224.0.0.18' for IPv4 and 'FF02:0:0:0:0:0:0:12' for IPv6) as destination IP address

MAY use network broadcast address for IPv4 or link-local all nodes multicast group for IPv6 as destination IP address;

MUST set destination UDP port value to 3784 when transmitting BFD control packets, as defined in [I-D.ietf-bfd-multipoint];

MUST use Master IP address as source IP address.

### 4. IANA Considerations

This document makes no requests for IANA allocations. This section may be deleted by RFC Editor.

### 5. Security Considerations

Security considerations discussed in [RFC5798], [RFC5880], and [I-D.ietf-bfd-multipoint], apply to this document.

### 6. Acknowledgements

### 7. Normative References

[I-D.ietf-bfd-multipoint]

Katz, D., Ward, D., Networks, J., and G. Mirsky, "BFD for Multipoint Networks", draft-ietf-bfd-multipoint-16 (work in progress), April 2018.

[I-D.nitish-vrrp-bfd]

Gupta, N., Dogra, A., Docherty, C., Mirsky, G., and J. Tantsura, "Fast failure detection in VRRP with BFD", draft-nitish-vrrp-bfd-04 (work in progress), August 2016.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.

- [RFC5798] Nadas, S., Ed., "Virtual Router Redundancy Protocol (VRRP) Version 3 for IPv4 and IPv6", RFC 5798, DOI 10.17487/RFC5798, March 2010, <<https://www.rfc-editor.org/info/rfc5798>>.
- [RFC5880] Katz, D. and D. Ward, "Bidirectional Forwarding Detection (BFD)", RFC 5880, DOI 10.17487/RFC5880, June 2010, <<https://www.rfc-editor.org/info/rfc5880>>.
- [RFC5881] Katz, D. and D. Ward, "Bidirectional Forwarding Detection (BFD) for IPv4 and IPv6 (Single Hop)", RFC 5881, DOI 10.17487/RFC5881, June 2010, <<https://www.rfc-editor.org/info/rfc5881>>.
- [RFC5883] Katz, D. and D. Ward, "Bidirectional Forwarding Detection (BFD) for Multihop Paths", RFC 5883, DOI 10.17487/RFC5883, June 2010, <<https://www.rfc-editor.org/info/rfc5883>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

## Authors' Addresses

Greg Mirsky  
ZTE Corp.

Email: [gregimirsky@gmail.com](mailto:gregimirsky@gmail.com)

Jeff Tantsura

Email: [jefftant.ietf@gmail.com](mailto:jefftant.ietf@gmail.com)