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Graceful Restart Extensions for BGP  
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## Abstract

The current BGP Graceful Restart mechanism limits the usage of BGP Graceful Restart to BGP protocol messages other than a BGP NOTIFICATION message. This document defines an extension to the BGP Graceful Restart that permits the Graceful Restart procedures to be performed when the BGP speaker receives a BGP NOTIFICATION Message. This document also defines a new BGP NOTIFICATION Cease Error subcode to prevent BGP speakers supporting the extension defined in this document from performing a Graceful Restart.

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## 1. Introduction

For many classes of errors, the BGP protocol must send a NOTIFICATION message and reset the peering session to handle the error condition. The BGP Graceful Restart extension defined in [\[RFC4724\]](#) requires that normal BGP procedures defined in [\[RFC4271\]](#) be followed when a NOTIFICATION message is sent or received. This document defines an extension to BGP Graceful Restart that permits the Graceful Restart procedures to be performed when the BGP speaker receives a NOTIFICATION message. This permits the BGP speaker to avoid flapping reachability and continue forwarding while the BGP speaker restarts the session to handle errors detected in the BGP protocol.

This document defines a BGP NOTIFICATION cease Error subcode for the Cease Error code to prevent BGP speakers supporting the extension defined in this document from performing a Graceful Restart.

### 1.1. Requirements Language

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

## 2. Modifications to BGP Graceful Restart Capability

The BGP Graceful Restart Capability is augmented to signal the Graceful Restart support for BGP NOTIFICATION messages. In particular, the flags field for Address Family is augmented as

follows:

```
+-----+
| Restart Flags (4 bits) |
+-----+
| Restart Time in seconds (12 bits) |
+-----+
| Address Family Identifier (16 bits) |
+-----+
| Subsequent Address Family Identifier (8 bits) |
+-----+
| Flags for Address Family (8 bits) |
+-----+
| ... |
+-----+
| Address Family Identifier (16 bits) |
+-----+
| Subsequent Address Family Identifier (8 bits) |
+-----+
| Flags for Address Family (8 bits) |
+-----+
```

## Flags for Address Family:

This field contains bit flags relating to routes that were advertised with the given AFI and SAFI.

```

  0 1 2 3 4 5 6 7
+--+--+--+--+--+--+
|F|N| Reserved  |
+--+--+--+--+--+--+
```

The second most significant bit "N" is defined as a BGP Graceful Notification bit, which is used to indicate the Graceful Restart support for BGP NOTIFICATION messages. BGP speaker indicates the Graceful Restart support for BGP NOTIFICATION messages and its ability to handle the new BGP NOTIFICATION Cease message subcode and the format for a BGP NOTIFICATION Cease message defined in [[RFC4486](#)] when the Graceful NOTIFICATION bit is set (value 1).

### [3.](#) BGP Hard Reset Subcode

A new BGP Cease message subcode is defined known as BGP Hard Reset Subcode. The value of this subcode is 9.

Whenever a BGP speaker receives a NOTIFICATION message with the Cease

Error code and Hard Reset Error subcode, the speaker MUST terminate the BGP session following the standard procedures in [[RFC4271](#)].

### [4.](#) Operation

A BGP speaker that is willing to receive and send BGP NOTIFICATION messages in Graceful mode should advertise the BGP Graceful Notification Flag "N" using the Graceful Restart Capability as defined in [[RFC4724](#)].

When a BGP Speaker receives a BGP NOTIFICATION message, it SHOULD follow the standard rules of the receiving speaker mentioned in [[RFC4724](#)] for all AFI/SAFIs for which it has announced the BGP Graceful Notification flag. The BGP speaker generating a BGP

NOTIFICATION message SHOULD follow the standard rules of the receiving Speaker in [\[RFC4724\]](#) for all AFI/SAFIs that were announced with the BGP Graceful Notification flag.

Once the session is re-established, both BGP speakers MUST set their "Forwarding State" bit to 1 if they want to apply planned graceful restart. The handling of the "Forwarding State" bit should be done as specified by the procedures of the Receiving speaker in [\[RFC4724\]](#) are applied.

As part of this extension, possible consecutive restarts SHOULD NOT delete a route (from the peer) previously marked as stale, until required by rules mentioned in [\[RFC4724\]](#).

## [5.](#) Acknowledgements

The authors would like to thank Robert Raszuk for the review and comments.

## [6.](#) IANA Considerations

This document defines a new BGP Cease message subcode known as BGP Hard Reset Subcode. IANA maintains the list of existing BGP Cease message subcodes. This document proposes defining a new BGP Cease message subcode known as BGP Hard Reset Subcode with the value 9.

## [7.](#) Security Considerations

This extension to BGP does not change the underlying security issues inherent in the existing [\[RFC4724\]](#) and [\[RFC4271\]](#)

## [8.](#) References

### [8.1.](#) Normative References

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