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Maximum Number of Paths Reached Notification for BGP  
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## Abstract

This document defines a new BGP Cease NOTIFICATION message subcode, "Maximum Number of Paths Reached", used when a BGP speaker terminates a peering because the number of paths received from a neighbor, as permitted by BGP ADD-PATH, exceeds a locally configured upper bound.

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## 1. Introduction

The BGP Cease NOTIFICATION message [RFC4271] is used when a BGP speaker terminates its peering with a neighbor. [RFC4486] defines subcodes for the Cease NOTIFICATION message to aid network operators in correlating network events and diagnosing BGP peering issues, including the "Maximum Number of Prefixes Reached" subcode.

BGP ADD-PATH [RFC7911] permits a BGP speaker to advertise multiple paths for the same address prefix. As a result, a BGP speaker may enforce a locally configured upper bound on the number of paths it accepts from a peer, distinct from any bound on the number of prefixes. No existing Cease subcode precisely describes the termination of a peering for this reason.

This document defines the "Maximum Number of Paths Reached" Cease NOTIFICATION subcode for this purpose.

## 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.

## 3. Maximum Number of Paths Reached Subcode

The value TBD (suggested value 11, see Section 6) has been allocated by IANA for the "Maximum Number of Paths Reached" Cease NOTIFICATION message subcode. When a BGP speaker terminates a peering because the number of paths [RFC7911] received from the neighbor for one or more <AFI, SAFI> exceeds a locally configured upper bound, the BGP speaker SHOULD send a NOTIFICATION message with the error code "Cease" and

the error subcode "Maximum Number of Paths Reached".

Following the format defined in [RFC4486], Section 4, the message MAY optionally include the Address Family information [RFC4760] and the upper bound in the "Data" field, as shown in Figure 1.

```

+-----+
| Address Family Identifier (2 octets) |
+-----+
| Subsequent Address Family Identifier (1 octet) |
+-----+
| Paths upper bound (4 octets) |
+-----+

```

Figure 1: Maximum Number of Paths Reached Data Field

The "Paths upper bound" field indicates the locally configured maximum number of paths, for the indicated <AFI, SAFI>, that triggered the termination. If a BGP speaker terminates a peering because the bound was exceeded for more than one <AFI, SAFI>, it MAY include the Data field for any one of them.

#### 4. Operational Considerations

This subcode is meaningful only when BGP ADD-PATH [RFC7911] has been negotiated for at least one <AFI, SAFI> with the peer. A speaker that bounds only the number of prefixes continues to use the "Maximum Number of Prefixes Reached" subcode [RFC4486].

The PATHS-LIMIT Capability [I-D.abraitis-idr-addpath-paths-limit], when supported by both peers, lets a receiver negotiate with the sender the maximum number of paths it is willing to receive, per <AFI, SAFI>, so that the sender can avoid exceeding that bound in the first place. This subcode is the complementary enforcement signal: it indicates termination when the number of received paths exceeds the receiver's locally configured upper bound regardless of whether the PATHS-LIMIT Capability was negotiated, for example because the sender does not support it, ignored it, or sent more paths than indicated. Where feasible, graceful handling that preserves the session, as recommended in [I-D.ietf-idr-add-paths-guidelines], is preferred over termination.

When BGP Graceful Restart with NOTIFICATION support has been negotiated, a speaker that sends or receives this subcode follows the procedures of [RFC8538]. A speaker whose local policy requires the immediate discard of the routes received from the peer uses the Hard Reset mechanism of [RFC8538], carrying the "Cease" code and "Maximum Number of Paths Reached" subcode in the Data field of the Hard Reset message.

## 5. Security Considerations

This document defines a subcode for the BGP Cease NOTIFICATION message that provides information to aid network operators in correlating network events and diagnosing BGP peering issues. This subcode is purely informational and has no impact on the BGP Finite State Machine beyond that already documented by [RFC4271], Sections 6.6 and 6.7.

## 6. IANA Considerations

IANA is requested to assign a value (suggested value 11) from the "BGP Cease NOTIFICATION message subcodes" registry, with the name "Maximum Number of Paths Reached" and a reference to this document.

## Acknowledgements

TBD

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