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M. Aelmans
Juniper Networks
M. Stucchi
Independent
J. Snijders
Fastly

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BGP Maximum Prefix Limits Inbound
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Abstract

This document describes mechanisms to limit the negative impact of route leaks [RFC7908] and/or resource exhaustion in BGP [RFC4271] implementations.

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.

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 October 16, 2021.

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1. Introduction

This document updates [RFC4271] by revising control mechanism which limit the negative impact of route leaks [RFC7908] and/or resource exhaustion in Border Gateway Protocol (BGP) implementations. While [RFC4271] described methods to tear down BGP sessions or discard UPDATES after certain thresholds are exceeded, some nuances in this specification were missing resulting in inconsistencies between BGP implementations.

2. Changes to RFC4271 Section 6

This section updates [RFC4271] to specify what events can result in AutomaticStop (Event 8) in the BGP FSM.

The following paragraph replaces the second paragraph of Section 6.7 (Cease), which starts with "A BGP speaker MAY support" and ends with

"The speaker MAY also log this locally.":

> A BGP speaker MAY support the ability to impose a locally-configured, upper bound on the number of address prefixes the speaker is willing to accept from a neighbor (inbound maximum

> prefix limit). The limit on the prefixes accepted from a neighbor can be applied before policy processing (Pre-Policy) or after policy processing (Post-Policy). When the upper bound is reached, the speaker, under control of local configuration, either:
>
> A. Discards new address prefixes from the neighbor, while maintaining the BGP connection. As these prefixes are discared, their reachability information is not stored on the local router, which might lead to inconsistent routing behaviour;
>
> B. Receives all the new prefixes exceeding the threshold, accepts them and generates a log of the event;
>
> C. Terminates the BGP connection with the neighbor.
>
> If the BGP speaker decides to terminate its BGP connection with a neighbor because the number of address prefixes received from the neighbor exceeds the locally-configured, upper bound, then the speaker MUST send the neighbor a NOTIFICATION message with the Error Code Cease.

Subcode	Symbolic Name
1	Threshold exceeded: Maximum Number of Prefixes Received

> The speaker MAY also log this locally.

3. Changes to RFC4271 Section 8

This section updates Section 8 [RFC4271], the paragraph that starts with "One reason for an AutomaticStop event is" and ends with "The local system automatically disconnects the peer." is replaced with:

Possible reasons for an AutomaticStop event are: A BGP speaker receives an UPDATE messages with a number of prefixes for a given peer such that the total prefixes received exceeds the maximum number of prefixes configured (either "Pre-Policy" or "Post-Policy"). The local system automatically disconnects the peer.

4. Changes to RFC4271 Section 9

This section updates [RFC4271] by adding a subsection after Section 9.4 (Originating BGP routes) to specify various events that can lead up to AutomaticStop (Event 8) in the BGP FSM.

9.5 Maximum Prefix Limits

9.5.1 Pre-Policy Inbound Maximum Prefix Limits

The Adj-RIBs-In stores routing information learned from inbound UPDATE messages that were received from another BGP speaker Section 3.2 [RFC4271]. The pre-policy limit uses the number of NLRIs per Address Family Identifier (AFI) per Subsequent Address Family Identifier (SAFI) as input into its threshold comparisons. For example, when an operator configures the pre-policy limit for IPv4 Unicast to be 50 on a given EBGP session, and the other BGP speaker announces its 51st IPv4 Unicast NLRI, the session MUST be terminated.

Pre-policy limits are particularly useful to help dampen the effects of full table route leaks and memory exhaustion when the implementation stores rejected routes.

9.5.2 Post-Policy Inbound Maximum Prefix Limits

RFC4271 describes a Policy Information Base (PIB) that contains local policies that can be applied to the information in the Routing Information Base (RIB). The post-policy limit uses the number of NLRIs per Address Family Identifier (AFI) per Subsequent Address Family Identifier (SAFI), after application

of the Import Policy as input into its threshold comparisons. For example, when an operator configures the post-policy limit for IPv4 Unicast to be 50 on a given EBGP session, and the other BGP speaker announces a hundred IPv4 Unicast routes of which none are accepted as a result of the local import policy (and thus not considered for the Loc-RIB by the local BGP speaker), the session is not terminated.

Post-policy limits are useful to help prevent FIB exhaustion and prevent accidental BGP session teardown due to prefixes not accepted by policy anyway.

5. Security Considerations

Maximum Prefix Limits are an essential tool for routing operations and SHOULD be used to increase stability for the global routing ecosystem.

6. IANA Considerations

This memo requests that IANA updates the name of subcode "Maximum Number of Prefixes Reached" to "Threshold exceeded: Maximum Number of Prefixes Received" in the "Cease NOTIFICATION message subcodes" registry under the "Border Gateway Protocol (BGP) Parameters" group.

7. Acknowledgments

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8. Implementation status - RFC EDITOR: REMOVE BEFORE PUBLICATION

This section records the status of known implementations of the protocol defined by this specification at the time of posting of this

Internet-Draft, and is based on a proposal described in RFC7942. The description of implementations in this section is intended to assist the IETF in its decision processes in progressing drafts to RFCs. Please note that the listing of any individual implementation here does not imply endorsement by the IETF. Furthermore, no effort has been spent to verify the information presented here that was supplied by IETF contributors. This is not intended as, and must not be construed to be, a catalog of available implementations or their features. Readers are advised to note that other implementations may exist.

The below table provides an overview (as of the moment of writing) of which vendors have produced implementation of inbound prefix limits. Each table cell shows the applicable configuration keywords if the vendor implemented the feature.

Vendor	Type A Pre-Policy	Type B Post-Policy
Cisco IOS XR		maximum-prefix
Cisco IOS XE		maximum-prefix
Juniper Junos OS	prefix-limit	accepted-prefix-limit, or prefix-limit combined with 'keep none'
Nokia SR OS	prefix-limit	
NIC.CZ BIRD	'import keep filtered' combined	'import limit' or 'receive limit'

	with 'receive limit'	
OpenBSD OpenBGPD	max-prefix	
Arista EOS	maximum-routes	maximum-accepted-routes
Huawei VRPv5	peer route-limit	
Huawei VRPv8	peer route-limit	peer route-limit accept-prefix

First presented by Snijders at [RIPE77]

Table 1: Maximum prefix limits capabilities per implementation

9. Appendix: Implementation Guidance

TBD

10. References

10.1. Normative References

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10.2. Informative References

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[RFC7908] Sriram, K., Montgomery, D., McPherson, D., Osterweil, E., and B. Dickson, "Problem Definition and Classification of BGP Route Leaks", RFC 7908, DOI 10.17487/RFC7908, June 2016, <https://www.rfc-editor.org/info/rfc7908>.

[RIPE77] Snijders, J., "Robust Routing Policy Architecture", May 2018, <https://ripe77.ripe.net/wp-content/uploads/presentations/59-RIPE77_Snijders_Routing_Policy_Architecture.pdf>.

Authors' Addresses

Melchior Aelmans
Juniper Networks
Boeing Avenue 240
Schiphol-Rijk 1119 PZ
The Netherlands

Email: maelmans@juniper.net

Massimiliano Stucchi
Independent

Email: max@stucchi.ch

Fastly
Theodorus Majofskistraat 100
Amsterdam 1065 SZ
The Netherlands

Email: job@fastly.com