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Clarifications to BGP Origin Validation Based on Resource Public Key Infrastructure (RPKI)

Abstract

Deployment of BGP origin validation based on Resource Public Key Infrastructure (RPKI) is hampered by, among other things, vendor misimplementations in two critical areas: which routes are validated and whether policy is applied when not specified by configuration. This document is meant to clarify possible misunderstandings causing those misimplementations; it thus updates RFC 6811 by clarifying that all prefixes should have their validation state set and that policy must not be applied without operator configuration.

Status of This Memo

This is an Internet Standards Track document.

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Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at <https://www.rfc-editor.org/info/rfc8481>.

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1. Introduction

Deployment of RPKI-based BGP origin validation is hampered by, among other things, vendor misimplementations in two critical areas: which routes are validated and whether policy is applied when not specified by configuration. This document is meant to clarify possible misunderstandings causing those misimplementations.

When a route is distributed into BGP, the origin validation state is set to NotFound, Valid, or Invalid per [RFC6811]. Operational testing has shown that the specifications of that RFC were not sufficient to avoid divergent implementations. This document attempts to clarify two areas which seem to cause confusion.

The implementation issues seem not to be about how to validate, i.e., how to decide if a route is NotFound, Valid, or Invalid. The issues seem to be which routes should be evaluated and have their evaluation state set, and whether to apply policy without operator configuration.

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. Suggested Reading

It is assumed that the reader understands BGP [RFC4271], the RPKI [RFC6480], Route Origin Authorizations (ROAs) [RFC6482], and RPKI-based Prefix Validation [RFC6811].

4. Evaluate ALL Prefixes

Significant Clarification: A router MUST evaluate and set the validation state of all routes in BGP coming from any source (e.g., eBGP, iBGP, or redistribution from static or connected routes), unless specifically configured otherwise by the operator. Otherwise, the operator does not have the ability to drop Invalid routes coming from every potential source and is therefore liable to complaints from neighbors about propagation of Invalid routes. For this reason, [RFC6811] says:

When a BGP speaker receives an UPDATE from a neighbor, it SHOULD perform a lookup as described above for each of the Routes in the UPDATE message. The lookup SHOULD also be applied to routes that are redistributed into BGP from another source, such as another protocol or a locally defined static route.

[RFC6811] goes on to say, "An implementation MAY provide configuration options to control which routes the lookup is applied to."

When redistributing into BGP from any source (e.g., IGP, iBGP, or from static or connected routes), there is no AS_PATH in the input to allow RPKI validation of the originating Autonomous System (AS). In such cases, the router MUST use the AS of the router's BGP configuration. If that is ambiguous because of confederation, AS migration, or other multi-AS configuration, then the router configuration MUST provide a means of specifying the AS to be used on the redistribution, either per redistribution or globally.

5. Set State, Don't Act

Significant Clarification: Once routes are evaluated and have their state set, the operator should be in complete control of any policy applied based on the evaluation state. Absent specific operator configuration, policy MUST NOT be applied.

Automatic origin validation policy actions such as those described in "BGP Prefix Origin Validation State Extended Community" [RFC8097] MUST NOT be carried out or otherwise applied unless specifically configured by the operator.

6. Security Considerations

This document does not create security considerations beyond those of [RFC6811].

7. IANA Considerations

This document has no IANA actions.

8. Normative References

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- [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>>.

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