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Origin Validation Signaling
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Abstract

Within a trust boundary, e.g. an operator's PoP, it may be useful to have only a few central devices do full Origin Validation using the Resource Public Key Infrastructure, and be able to signal to an internal sender that a received route fails Origin Validation. E.g. route reflectors could perform Origin Validation for a cluster and signal back to a sending client that it sent an invalid route. Routers capable of sending and receiving this signal can use the extended community described in [RFC8097]

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in [RFC2119] only when they appear in all upper case. They may also appear in lower or mixed case as English words, without normative meaning.

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1. Introduction

Within a routing trust boundary, e.g. an operator's Point of Presence (PoP), it may not be desirable or necessary for all routers to perform Origin Validation using the Resource Public Key Infrastructure (RPKI) per [RFC6811]. A good example is route reflectors (see [RFC4456]).

An RPKI-enabled device, an Evaluator, SHOULD signal receipt of an Invalid route back to the sender by announcing that route back to the sender marked with the BGP Prefix Origin Validation State Extended Community as defined in [RFC8097] with a last octet having the value 2, meaning "Invalid."

We use the term "Sender" to refer to the router announcing routes to the device evaluating the Origin Validation of the announcements. Beware that the Sender receives signaling back from the Evaluator, which can be somewhat confusing.

We use the term "Evaluator" to describe the device receiving routing announcements from senders, applying RPKI-based Origin Validation, and possibly signaling route Invalidity back to the sender(s).

2. Suggested Reading

It is assumed that the reader understands BGP, [RFC4271], the RPKI, [RFC6480], RPKI-based Prefix Validation, [RFC6811], and the BGP Prefix Origin Validation State Extended Community as described in [RFC8097].

3. Trust Boundary

As a general rule, we discourage 'outsourcing trust,' i.e. letting others make security decisions for us. But there are operational environments with a somewhat wide trust boundary, a single operator's PoP for example.

As described in [RFC7115], a PoP might have a single RPKI Cache, hence all trust is outsourced to it. So it is reasonable that routers in that PoP could share Origin Validation results instead of each doing full validation.

An [RFC4456] Route Reflector Cluster is an obvious candidate for this approach. The route reflector(s) would perform Origin Validation and signal an Invalid route back to the sending client.

[RFC8097] provides the obvious signaling mechanism, the BGP Prefix Origin Validation State Extended Community. The device performing OV SHOULD signal back to the sender by announcing the offending prefix marked with the extended community with the last octet having the value 2, indicating an Invalid route.

4. The OV Signaling Capability

Unfortunately, the router sending the Invalid announcement is not normally expecting to receive it back. Therefore, both parties MUST agree on this feature by using a BGP Capability.

To advertise the OV Signaling Capability to a peer, a BGP speaker uses BGP Capabilities Advertisement [RFC5492]. By advertising the OV Signaling Capability to a peer, a BGP speaker conveys that it is able to send, receive, and properly handle OV Signaling using the BGP Prefix Origin Validation State Extended Community.

A peer which does not advertise this capability MUST NOT send OV Signaling, and BGP OV Signaling MUST NOT be sent to it.

The OV Signaling Capability is a new BGP Capability [RFC5492] defined with Capability code [TBD] and Capability length 0.

5. Recommended Action

This section assumes that the OV Signaling Capability has been negotiated by the sending and receiving routers.

An Evaluating device which performs Origin Validation on a route received from a capable sender and finds a prefix with a particular origin AS to be Invalid (in the [RFC6811] sense), SHOULD announce

that prefix back to the sending router from which it was received with the Invalid origin AS and the addition of the Prefix Origin Validation State Extended Community with the last octet being 2.

A sender receiving the returned prefix announcement so marked SHOULD withdraw all routes it had announced to that prefix with the Invalid origin AS. This includes withdrawing any instances of additional paths with that origin AS advertised under [RFC7911].

For a sender to properly evaluate the community returned by the evaluator, the sender MUST recognize the community before loop detection. This is a change to the Phase 2 Route Selection process of [RFC4271] Section 9.1.2.

If a sender originally received the Invalid route from an evaluator within its trust boundary with which it has negotiated the OV Signaling Capability, it MAY also propagate that signal to the original sender.

6. Security Considerations

As with all communities which cause semantic change, this use of the BGP Prefix Origin Validation State Extended Community may be abused as an attack vector. Therefore the operator MUST configure their incoming external border to strip the community.

As the BGP sessions are already established using whatever channel security the operator chooses or not, this change specifies no additional channel or object security.

Outsourcing security is usually considered bad policy.
Section Section 3 above discusses why that is not a problem here.

Otherwise, this document does not create security considerations beyond those of [RFC6811].

7. IANA Considerations

This document requests the IANA assign the "OV Signaling Capability" to the BGP Capabilities described in Section 2.1 in the "Capability Codes" registry's "IETF Review" range [RFC8126].. This document is the reference for the new capability.

8. Acknowledgments

Thanks to Rob Austein for useful security snark.

9. References

9.1. Normative References

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9.2. Informative References

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[RFC6480] Lepinski, M. and S. Kent, "An Infrastructure to Support Secure Internet Routing", RFC 6480, DOI 10.17487/RFC6480, February 2012, <http://www.rfc-editor.org/info/rfc6480>.

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