Codification of AS 0 Processing

Abstract

This document updates RFC 4271 and proscribes the use of Autonomous System (AS) 0 in the Border Gateway Protocol (BGP) OPEN, AS_PATH, AS4_PATH, AGGREGATOR, and AS4_AGGREGATOR attributes in the BGP UPDATE message.

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1. Introduction

Autonomous System 0 was listed in the IANA Autonomous System Number Registry as "Reserved – May be use [sic] to identify non-routed networks" ([IANA.AS_Numbers]).

[RFC6491] specifies that AS 0 in a Route Origin Attestation (ROA) is used to mark a prefix and all its more specific prefixes as not to be used in a routing context. This allows a resource holder to signal that a prefix (and the more specifics) should not be routed by publishing a ROA listing AS 0 as the only origin. To respond to this signal requires that BGP implementations not accept or propagate routes containing AS 0.

No clear statement that AS 0 was proscribed could be found in any BGP specification. This document corrects this omission, most importantly in the case of the AS_PATH. This represents an update to the error handling procedures given in Sections 6.2 and 6.3 of [RFC4271] by specifying the behavior in the presence of AS 0.

At least two implementations discard routes containing AS 0, and this document codifies this behavior.

1.1. Requirements Notation

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 [RFC2119].
2. Behavior

A BGP speaker MUST NOT originate or propagate a route with an AS number of zero in the AS_PATH, AS4_PATH, AGGREGATOR, or AS4_AGGREGATOR attributes.

An UPDATE message that contains the AS number of zero in the AS_PATH or AGGREGATOR attribute MUST be considered as malformed and be handled by the procedures specified in [RFC7606].

An UPDATE message that contains the AS number of zero in the AS4_PATH or AS4_AGGREGATOR attribute MUST be considered as malformed and be handled by the procedures specified in [RFC6793].

If a BGP speaker receives zero as the peer AS in an OPEN message, it MUST abort the connection and send a NOTIFICATION with Error Code "OPEN Message Error" and subcode "Bad Peer AS" (see Section 6 of [RFC4271]). A router MUST NOT initiate a connection claiming to be AS 0.

Authors of future protocol extensions that carry the Autonomous System number are encouraged to keep in mind that AS 0 is reserved and to provide clear direction on how to handle AS 0.

3. IANA Considerations

The IANA has updated the registry for "16-bit Autonomous System Numbers" so that the entry for AS 0 is simply "Reserved".

4. Security Considerations

By allowing a Resource Public Key Infrastructure (RPKI) resource holder to issue a ROA saying that AS 0 is the only valid origin for a route, we allow them to state that a particular address resource is not in use. By ensuring that all implementations that see AS 0 in a route ignore that route, we prevent a malicious party from announcing routes containing AS 0 in an attempt to hijack those resources.

In addition, by standardizing the behavior upon reception of an AS_PATH (or AS4_PATH) containing AS 0, this document makes the behavior better defined.
5. References

5.1. Normative References


5.2. Informative References


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Authors’ Addresses

Warren Kumari
Google
1600 Amphitheatre Parkway
Mountain View, CA  94043
United States

Email: warren@kumari.net

Randy Bush
Internet Initiative Japan
5147 Crystal Springs
Bainbridge Island, WA  98110
United States

Email: randy@psg.com

Heather Schiller
Google
1600 Amphitheatre Parkway
Mountain View, CA  94043
United States

Email: has@google.com

Keyur Patel
Cisco Systems
170 W. Tasman Drive
San Jose, CA  95134
United States

Email: keyupate@cisco.com