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**Deprecation of the use of BGP AS\_SET, AS\_CONFED\_SET.  
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Abstract

This document deprecates the use of the AS\_SET and AS\_CONFED\_SET types of the AS\_PATH in BGPv4. This is done to simplify the design and implementation of the BGP protocol and to make the semantics of the originator of a route more clear. This will also simplify the design, implementation and deployment of ongoing work in the Secure Inter-Domain Routing Working Group.

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## 1. Introduction

The AS\_SET path segment type of the AS\_PATH attribute ([\[RFC4271\]](#), [Section 4.3](#)) is created by a router that is performing route aggregation and contains an unordered set of ASs that the update has traversed. The AS\_CONFED\_SET path type ([\[RFC5065\]](#)) of the AS\_PATH attribute is created by a router that is performing route aggregation and contains an unordered set of Member AS Numbers in the local confederation that the update has traversed. It is very similar to AS\_SETs but is used within a confederation.

By performing aggregation, a router is, in essence, combining multiple existing routes into a single new route. This type of aggregation blurs the semantics of what it means to originate a route which can cause operational issues that include reachability problems and traffic engineering issues.

From analysis of past Internet routing data it is apparent that aggregation that involves AS\_SETs is very seldom used in practice on the public network and, when it is used, it is usually used incorrectly -- reserved AS numbers ([\[RFC1930\]](#)) and / or only a single AS in the AS\_SET are by far the most common case. The reduction in table size provided by the aggregation is outweighed by additional complexity in the BGP protocol and confusion regarding what exactly is meant by originating a route.

In the past AS\_SET had been used in a few rare cases to allow route aggregation where two or more providers could form the same prefix, using the exact match of the others prefix in some advertisement and configuring the aggregation differently elsewhere. The key to configuring this correctly was to form the aggregate at the border in the outbound BGP policy and omit prefixes from the AS that the aggregate was being advertised to. The AS\_SET therefore allowed this practice without the loss of BGP's AS\_PATH loop protection. This use of AS\_SET served a purpose which fell in line with the original intended use.

Without AS\_SET aggregates must always contain only less specific prefixes (not less than or equal to), and must never aggregate an exact match. Since this practice is thought to no longer be widely used, it is thought to be safe to deprecate the use of AS\_SET.

## 2. 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 [\[RFC2119\]](#).



### **3. Recommendation to Network Operators**

Operators are strongly advised to not generate any new announcements containing AS\_SETs or AS\_CONFED\_SETs. If they have already announced routes with AS\_SETs or AS\_CONFED\_SETs in them, then they should withdraw and re-announce those prefixes without AS\_SETs in the updates. This may require undoing the aggregation that was previously performed, and announcing more specifics. Route aggregation that was previously performed by proxy aggregation is still possible under some conditions without the use of AS\_SETs. As with any change, the operator should understand the full implications of the change.

It is worth noting that new technologies (such as those that take advantage of the "X.509 Extensions for IP Addresses and AS Identifiers" ([RFC3779](#))) may not support routes with AS\_SETs / AS\_CONFED\_SETs in them, and MAY treat as infeasible routes containing them. Future BGP implementations may also do the same.

It is expected that, even before the deployment of these technologies, operators may begin filtering routes that contain AS\_SETs or AS\_CONFED\_SETs.

### **4. IANA Considerations**

This document requires no IANA actions.

### **5. Security Considerations**

This document discourages the use of aggregation techniques that create AS\_SETs. Future work will update the protocol to remove support for the AS\_SET path segment type of the AS\_PATH attribute. This will remove complexity and code that is not exercised very often, which decreases the attack surface. This will also simplify the design and implementation of the RPKI and systems that will rely on it.

### **6. Acknowledgements**

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provided input

Apologies to those who we may have missed, it was not intentional.

## **7. Informative References**

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