Deprecation of AS_SET and AS_CONFED_SET

https://tools.ietf.org/html/draft-ietf-idr-deprecate-as-set-confed-set-02

K. Sriram, Warren Kumari, Lilia Hannachi, Jeff Haas

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Interest in deprecation of AS_SET and AS_CONFED_SET

- WG seems to have strong motivation to eliminate the use of these Attributes

Analysis of AS_SETs in BGP (IPv4)

\# Unique prefixes (with or without AS_SET) : 826535

Total \# routes with AS_SETs : 477

\# routes with only one AS in AS_SET : 383
\# routes that are /24 prefix (aggregate) announcements : 239

Total \# routes that seem meaningless or malformed : 456

Total \# routes that seem meaningful : 21

Details: https://www.nist.gov/sites/default/files/documents/2019/10/23/detailed-as_set-analysis.txt

Analysis of AGGREGATOR, ATOMIC_AGGREGATE

*** When there is AGGREGATOR without AS_SET ***

     # Unique prefixes (with or without AS_SET) : 826535
     # Unique prefixes without AS_SET but with AGGREGATOR: 75698 (9.2%)
     # Unique prefixes with ATOMIC_AGGREGATE: 47258
     # Unique prefixes with AGGREGATOR and ATOMIC_AGGREGATE: 44971
     # Unique prefixes with AGGREGATOR and without ATOMIC_AGGREGATE: 31769

https://www.nist.gov/sites/default/files/documents/2019/10/23/detailed-as_set-analysis.txt

Source of some unusual aggregated AS_PATHs (jhaas)

41.196.34.0/23 701 174 8452 24863 {37069}

RFC 4271 compliant implementations of aggregation can yield an AS_SET of length one under the following conditions:
1. One or more contributing routes that are completely internal. (NULL AS_PATH.)
2. One or more contributing routes with the same single AS number.

The longest common AS_PATH per the rules is NULL. Putting all additional ASes in a set yields an AS_SET of length one.

Source of some unusual aggregated AS_PATHs (jhaas) (2)

It is possible to alter the code for such cases of a single AS in the AS_SET.
- In such a case, it could be merged into the adjacent AS_SEQ.
- The path length is preserved.
- However, does this properly preserve the origin intent? This may be arguable. "brief" style aggregation discarding the AS_SET may be the right thing to do here.

Common Scenario: AGGREGATOR without AS_SET

P/23 AS3 {AGG. = AS3}

AS3

AS4

P1/24 AS3 AS1

P1/24

P2/24 AS2

P/23 AS4 AS3 {AGG. = AS3}

AS2
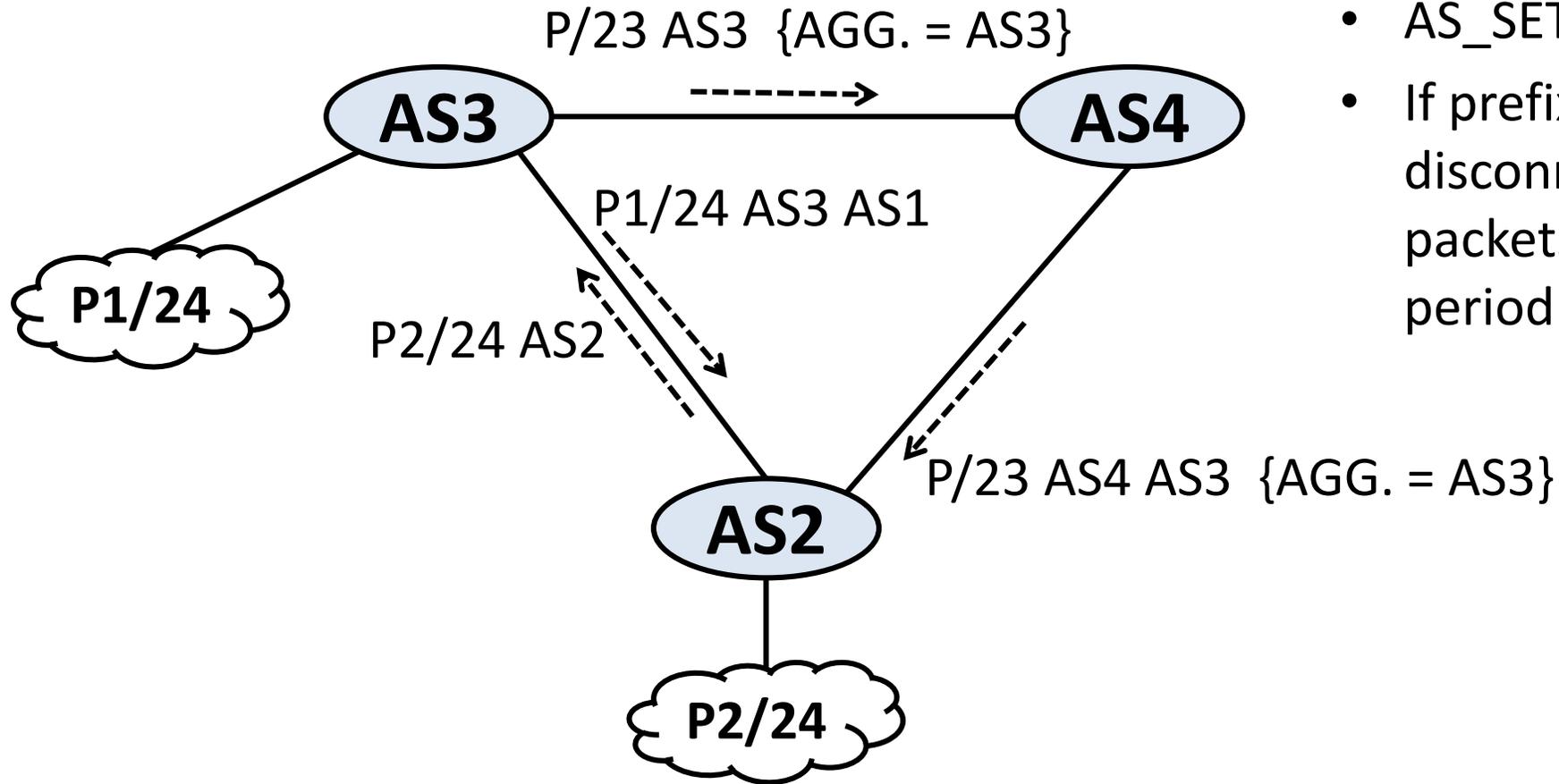
P2/24

P/23 = P1/24 + P2/24

- AS_SET not really required
- If prefix P2/24 gets disconnected, then data packets loop for a brief period

AGG. = AGGREGATOR

MUST / SHOULD Question

- Conformant BGP speakers MUST NOT locally generate BGP UPDATE messages containing *SET

- Upon receipt of messages with *SET, conformant BGP speakers SHOULD use the "Treat-as-withdraw" error handling behavior

  ➢ SHOULD → MUST ?

Updating RFCs 4271, 5065, 6793 – Level of Detail?

- RFC 4271 has 26 mentions of AS_SET

- RFC 5065 has 11 mentions of AS_CONFED_SET

- RFC 6793 has 1 mention of AS_SET and 10 mentions of AS_CONFED_SET

Strategy for making necessary updates to these RFCs?

RFC 5065: Autonomous System Confederations for BGP
RFC 6793: BGP Support for Four-Octet Autonomous System (AS) Number Space

Alternative path for standardization (jhaas)

- Most (all?) implementations of BGP should be able to support "brief" style aggregation already. No new code need be deployed to change how aggregation works.

  - And no need to intrusively change several RFCs.

  - RFC 6472 already covers this requirement.

- Implementations should be asked to add a policy element that permits AS_SETS to be detected.

  - Having done so, it is possible to implement policy to discard routes having AS_SETs.

  - In the absence of operators cleaning up routes that have sets, RPKI filtering will eventually provide them "incentive" to clean up.

Alternative path for standardization (jhaas) (2)

- An Operational Considerations section for this document should be added that covers the issues with not using sets:

    - The aggregator must supply the more specific contributors to the contributing ASes.

    - The aggregator should not supply the aggregate route to the contributing ASes.

    - ASes that have reachability that is being aggregated should likely reject routes that contain their reachability to prevent forwarding loops.

        - Potentially enshrine the practice of internally advertising a discard route for the destination addresses belonging to one's subnet to prevent in-AS traffic from being sent off-AS. (However, see AS-bridging scenarios.)

Questions / Discussion