ASPA Path Verification at RS-clients and Other Down-Path ASes (Scenarios involving transparent/non-transparent IXP RS)

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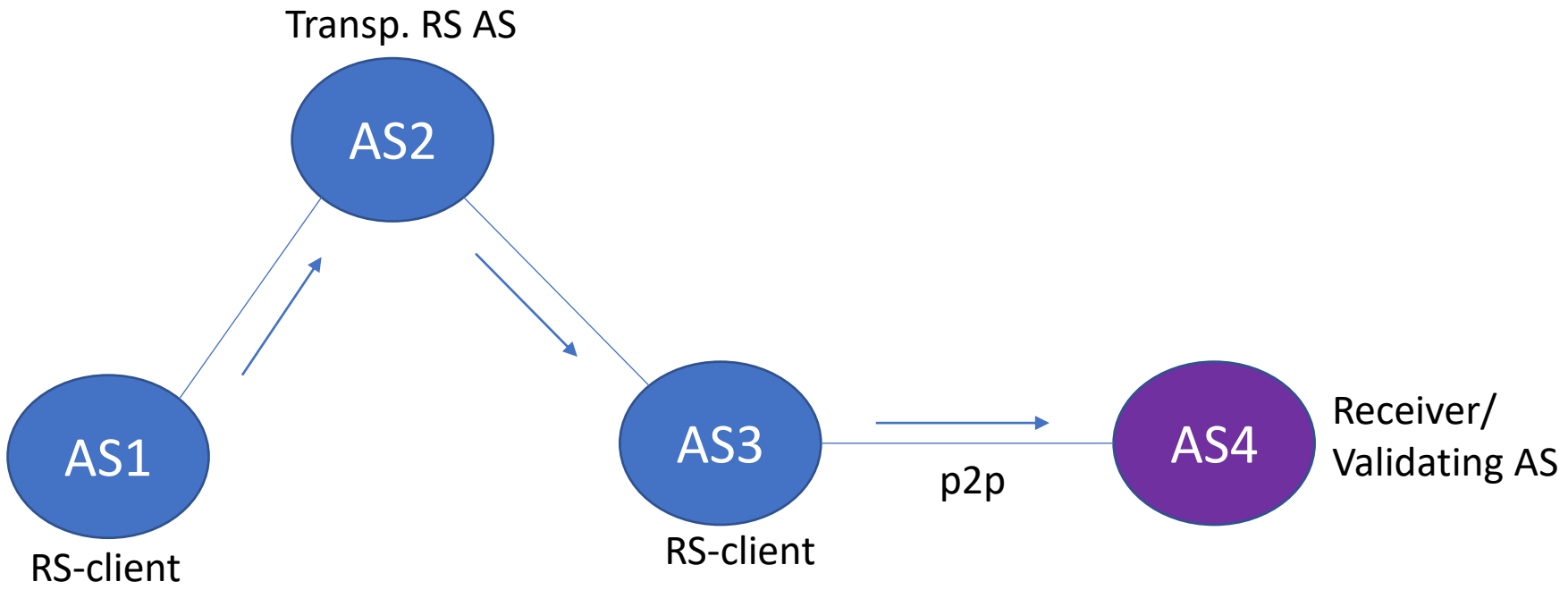
December 2022

ASPA Verification Draft v-11 Correctness about IXP RS

- ASPA verification draft v-11 is correct about ASPA path verification at RS-clients and other down-path ASes (for scenarios involving transparent/non-transparent IXP RS)
- See Sections 5.1.1 and 5.2
  - Remove the RS ASN from the AS Path in case of a non-transparent AS
  - Apply the Algorithm for Upstream Paths (for transp. and non-transp. RS)
- The draft requires that
  - IXP RS must register an AS 0 ASPA (like Tier-1 AS)
  - RS-client must register an ASPA including the RS AS in both transparent and non-transparent cases
- Fresh discussions with Claudio point to a relaxation for an RS-client of a transparent RS:
  - Such an RS-client must have an ASPA but it is not necessary that the RS AS be included in the SPAS.
  - It is sufficient if the RS-client has an ASPA in one of the following ways:
    - An AS 0 ASPA (e.g., RS-client is a Tier-1 AS)
    - An ASPA with the SPAS including its direct transit providers (if any)
    - An ASPA with SPAS including the RS AS
- Question: How would an RS know about the type of RS it is connected to?
  - From out of band communication?
  - Deduce it from BGP Updates received from the RS?
  - To keep it simple, should an RS-client be required to include the ASN of the RS in the SPAS regardless of whether the RS is transparent or non-transparent?

Scenario 1:
AS1 has no ASPA



- AS4 is the validating AS
- AS4 receives AS_PATH: AS3 AS1
- AS4 applies Algorithm for Upstream Paths (Sec. 5.2)
- AS1 to AS3 hop is Unknown (i.e., could be any type of Role)
- Outcome: The AS_PATH is Unknown

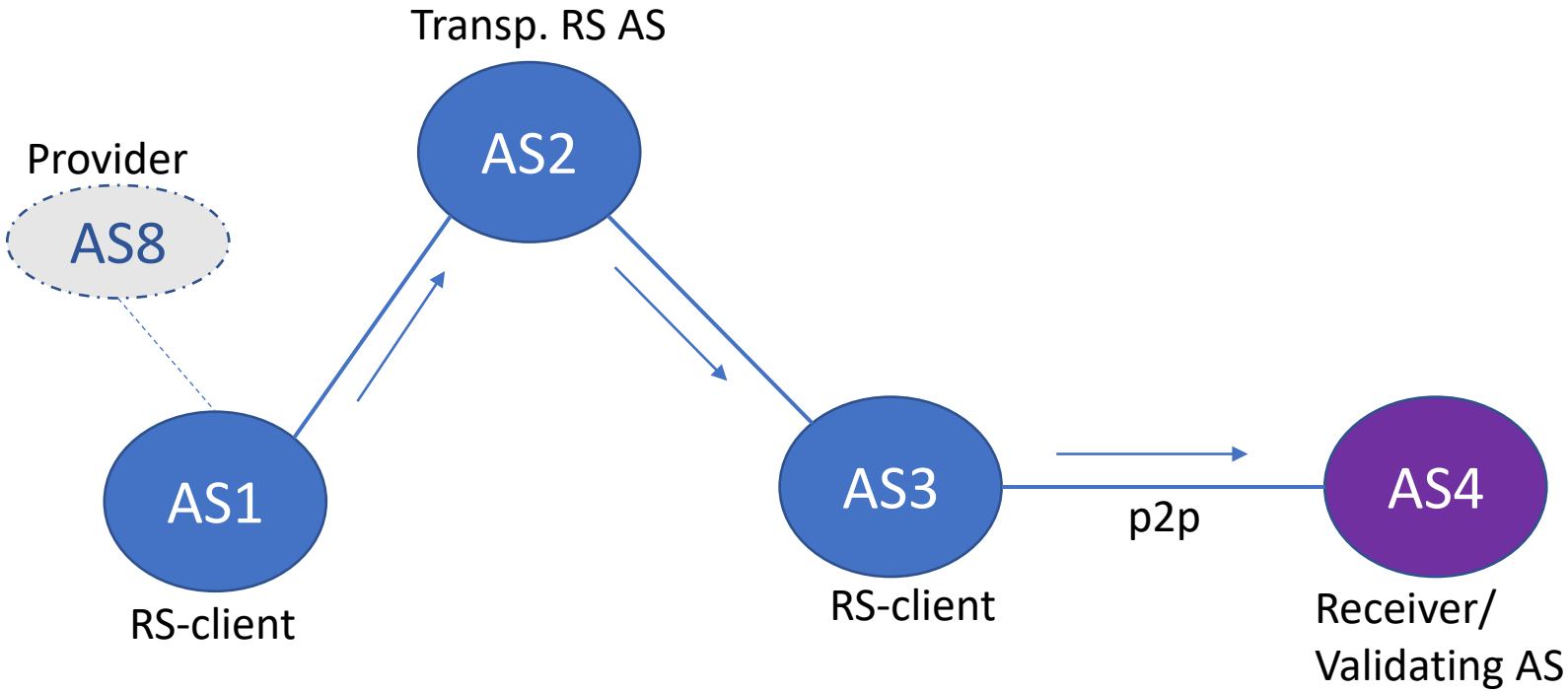
p2p = lateral peers

→ BGP Update flow

- ➢ AS_PATH {AS3 AS1} is clearly a route leak based the topology
- ➢ But the route leak is not detectable because AS1 has no ASPA

Scenario 2:

AS1 has an ASPA --
(a) an AS 0 ASPA (RS client AS1 is also a Tier-1 AS),
or, (b) ASPA: (AS1, AS8) -- AS8 is the only transit provider of AS1,
or, (c) ASPA: (AS1, AS2) – RS AS2 is included in the SPAS.



- AS4 is the validating AS
- AS4 receives AS_PATH: AS3 AS1
- AS4 applies Algorithm for Upstream Paths (Sec. 5.2)
- AS1 to AS3 hop is Invalid (i.e., not Provider)
- Outcome: The AS_PATH is Invalid (i.e., Route Leak)

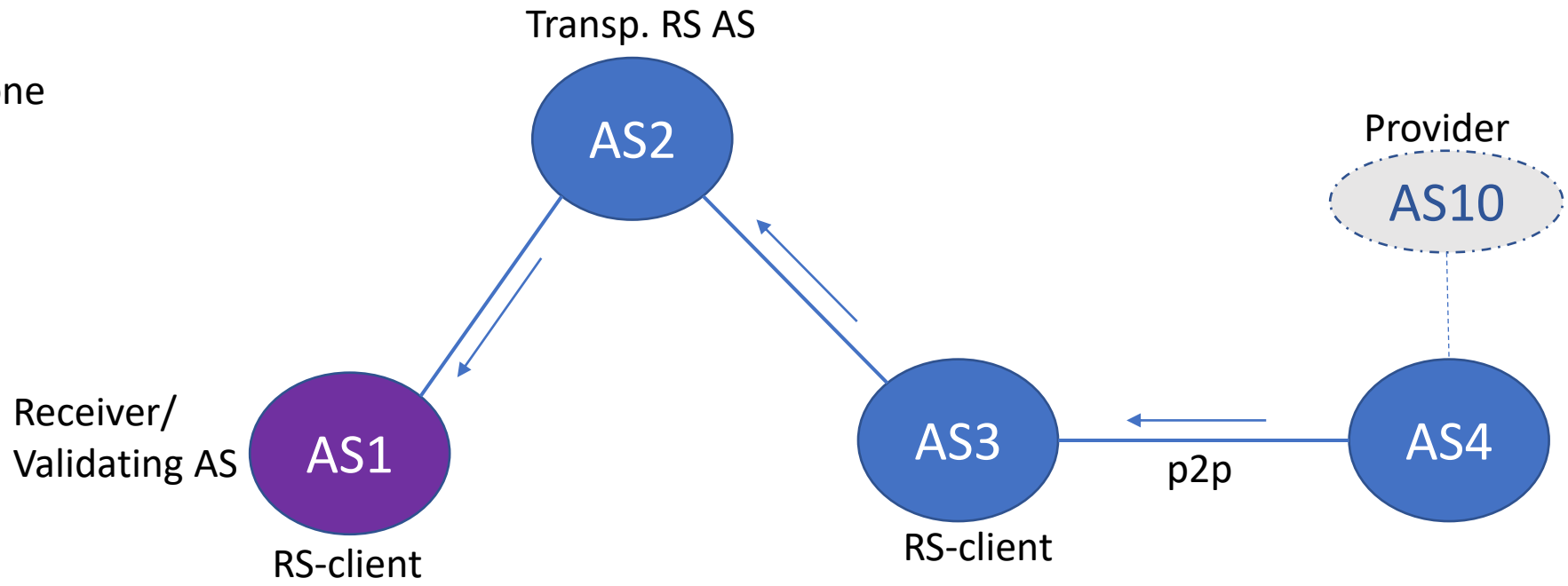
→ BGP Update flow

- AS_PATH {AS3 AS1} is a route leak based the topology
- It is detectable because AS1 has an ASPA (not necessary that it should include AS2 in the SPAS)

Scenario 3:

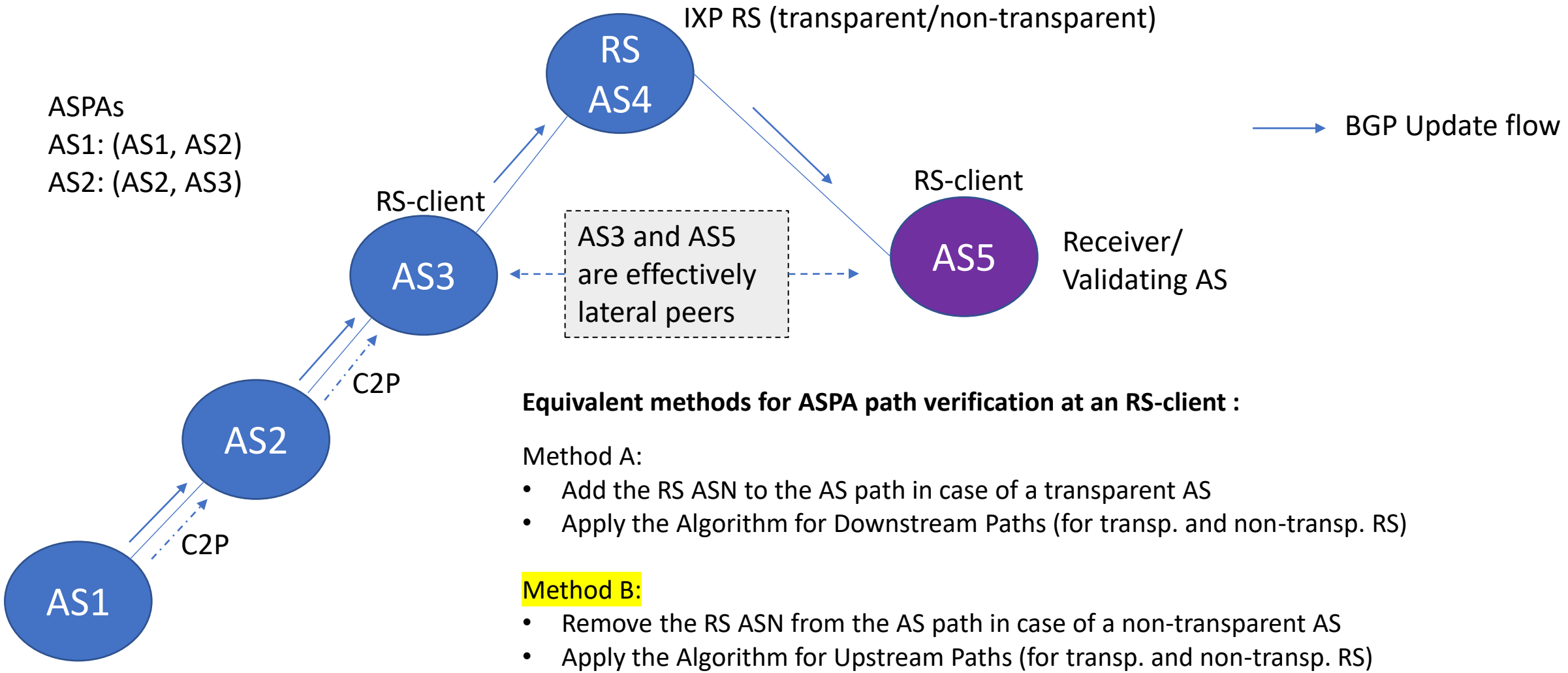
AS1 has ASPA: (AS1, AS2) or none

AS4 has ASPA: (AS4, AS10)



- AS1 is the validating AS
- AS1 receives AS_PATH: AS3 AS4
- AS1 applies Algorithm for Upstream Paths (Sec. 5.2)
- AS4 to AS3 hop is Invalid (i.e., not Provider)
- Outcome: The AS_PATH is Invalid (i.e., Route Leak)

- AS_PATH {AS3 AS4} is a route leak based the topology in the figure
- It is detectable because AS4 has an ASPA
- The outcome is independent of whether AS2 and AS3 have ASPA or not



Equivalent methods for ASPA path verification at an RS-client :

Method A:

- Add the RS ASN to the AS path in case of a transparent AS
- Apply the Algorithm for Downstream Paths (for transp. and non-transp. RS)

Method B:

- Remove the RS ASN from the AS path in case of a non-transparent AS
- Apply the Algorithm for Upstream Paths (for transp. and non-transp. RS)

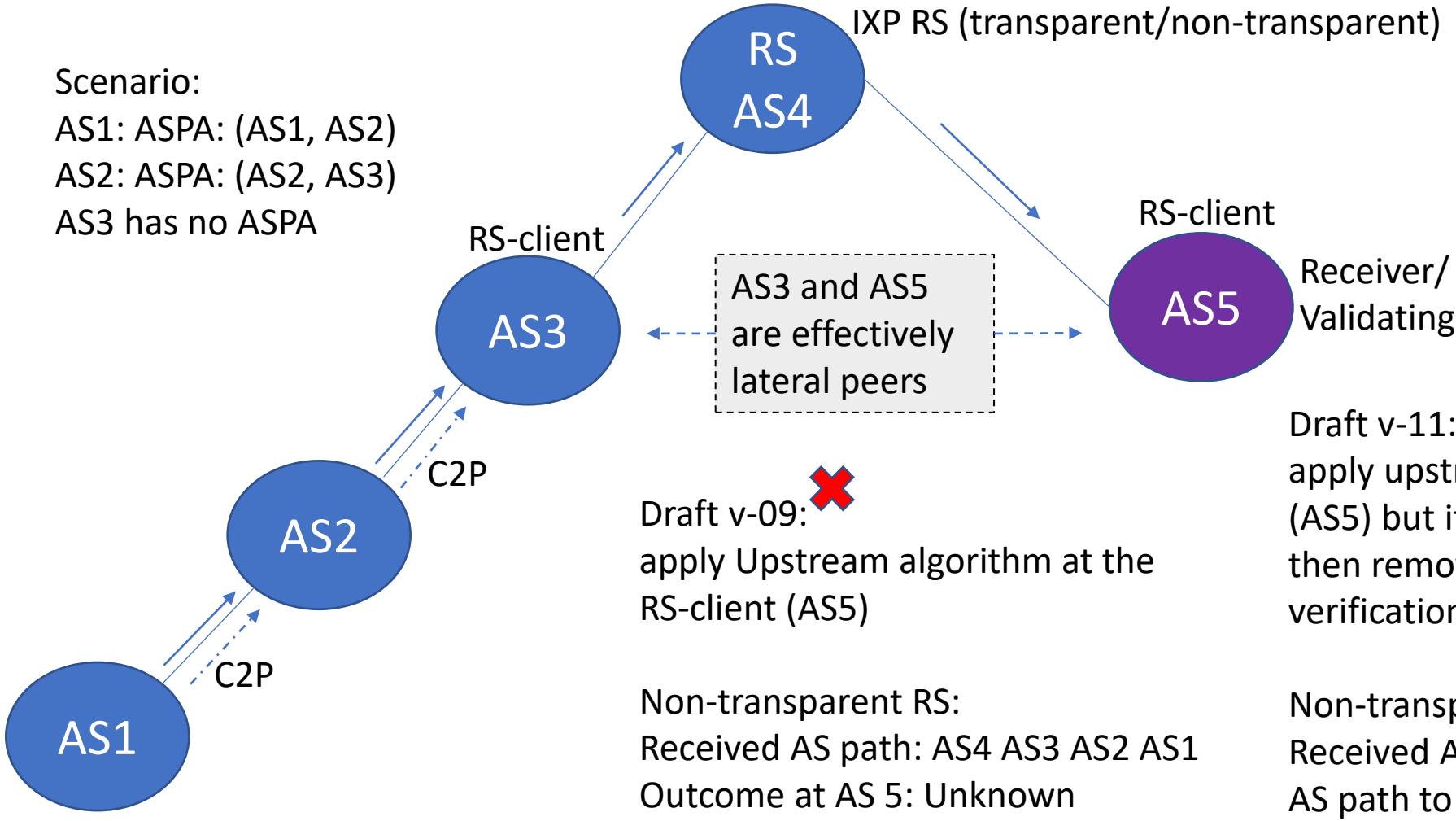
Method C:

- Keep the AS path as is
- Apply the Algorithm for Upstream Paths if the RS is transparent
- Apply the Algorithm for Downstream Paths if the RS is non-transparent

v-11 verification draft uses Method B (reason: non-transparent RS AS are rare; minimizes processing)

Backup slides

Scenario:
AS1: ASPA: (AS1, AS2)
AS2: ASPA: (AS2, AS3)
AS3 has no ASPA



Draft v-09:
apply Upstream algorithm at the RS-client (AS5)

Non-transparent RS:
Received AS path: AS4 AS3 AS2 AS1
Outcome at AS 5: Unknown

Transparent RS:
Received AS path: AS3 AS2 AS1
Outcome at AS 5: Valid

Inconsistent Outcomes

Draft v-11:
apply upstream algorithm at the RS-client (AS5) but if the RS AS is non-transparent, then remove its ASN from the AS path for verification purposes only:

Non-transparent RS:
Received AS path: AS4 AS3 AS2 AS1
AS path to be validated: AS3 AS2 AS1
Outcome at AS 5: Valid

Transparent RS:
Received AS path: AS3 AS2 AS1
Outcome at AS 5: Valid

Consistent Outcomes