ROAs and Detecting "Bad" Originations

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SIDR WG

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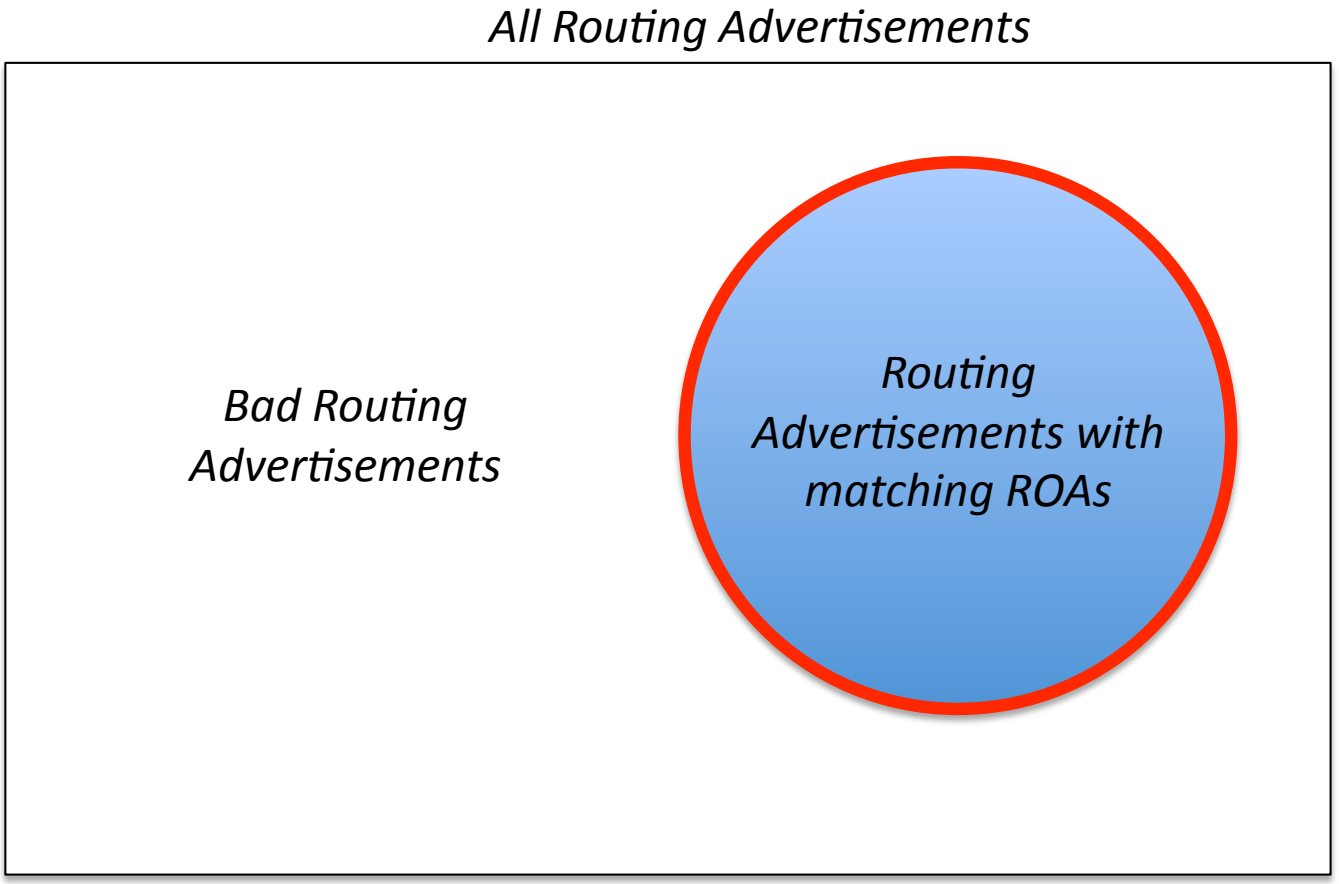
What's the Problem ?

- Assumption that the aim of the SIDR work is to allow the identification of "bad" routing information
  - What forms of routing information is "bad"?
    - We are not (yet) working on the integrity of AS path and hop-by-hop attributes in the routing system
  - Lets restrict the question a little: What forms of *origination information* in routing is "bad"?

What's the Problem?

Scenario A: Comprehensive Use of ROAs



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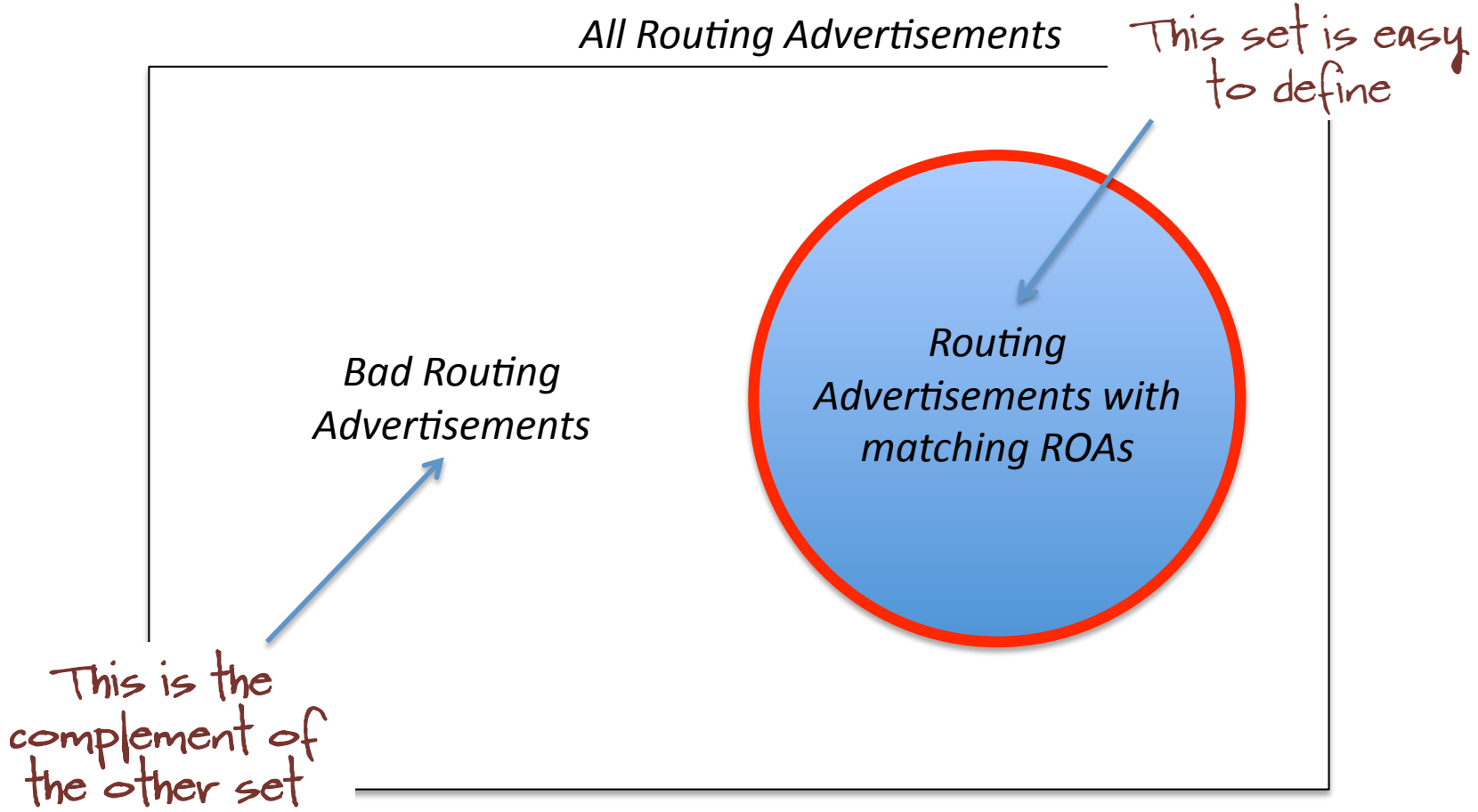
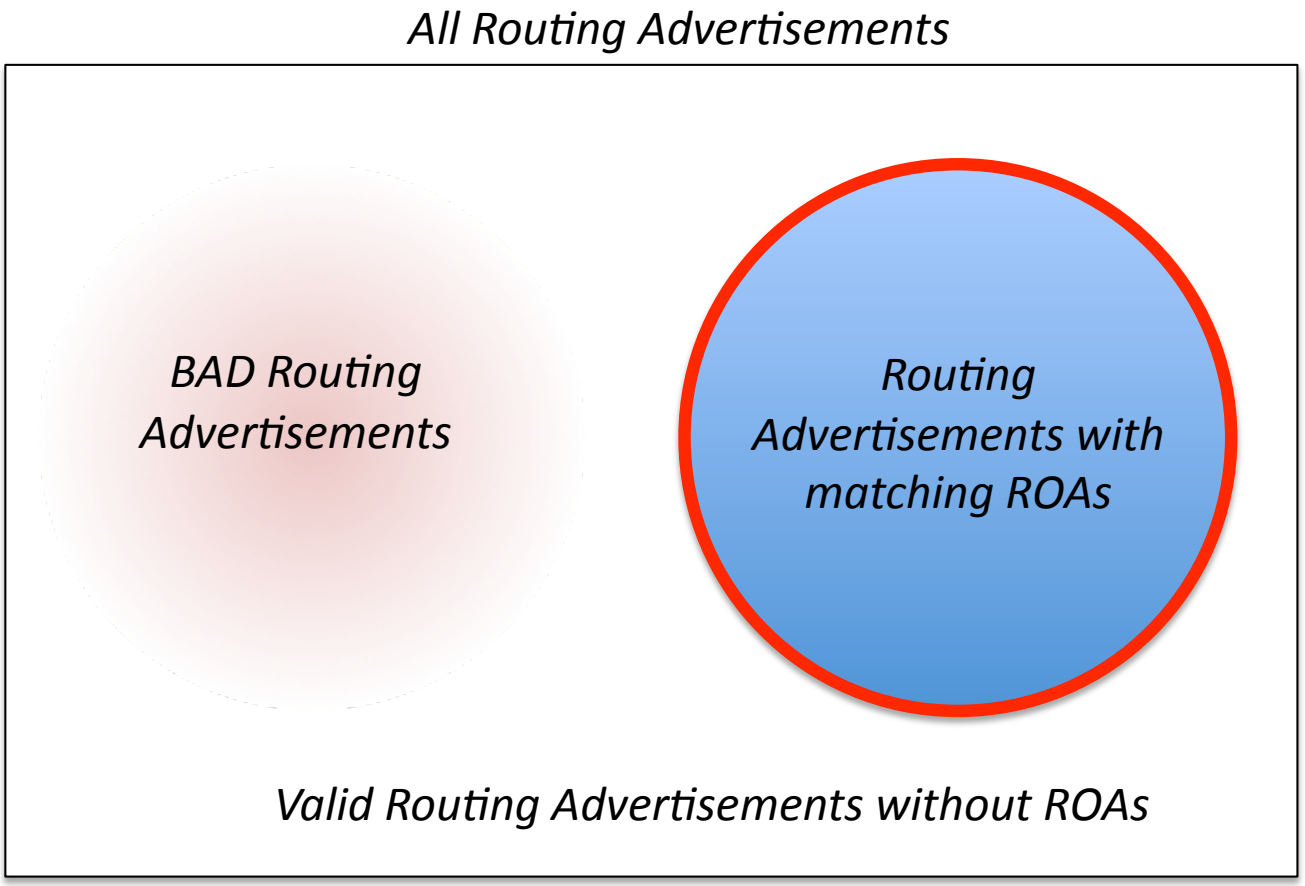


What's the Problem?

Scenario B: Piecemeal Use of ROAs



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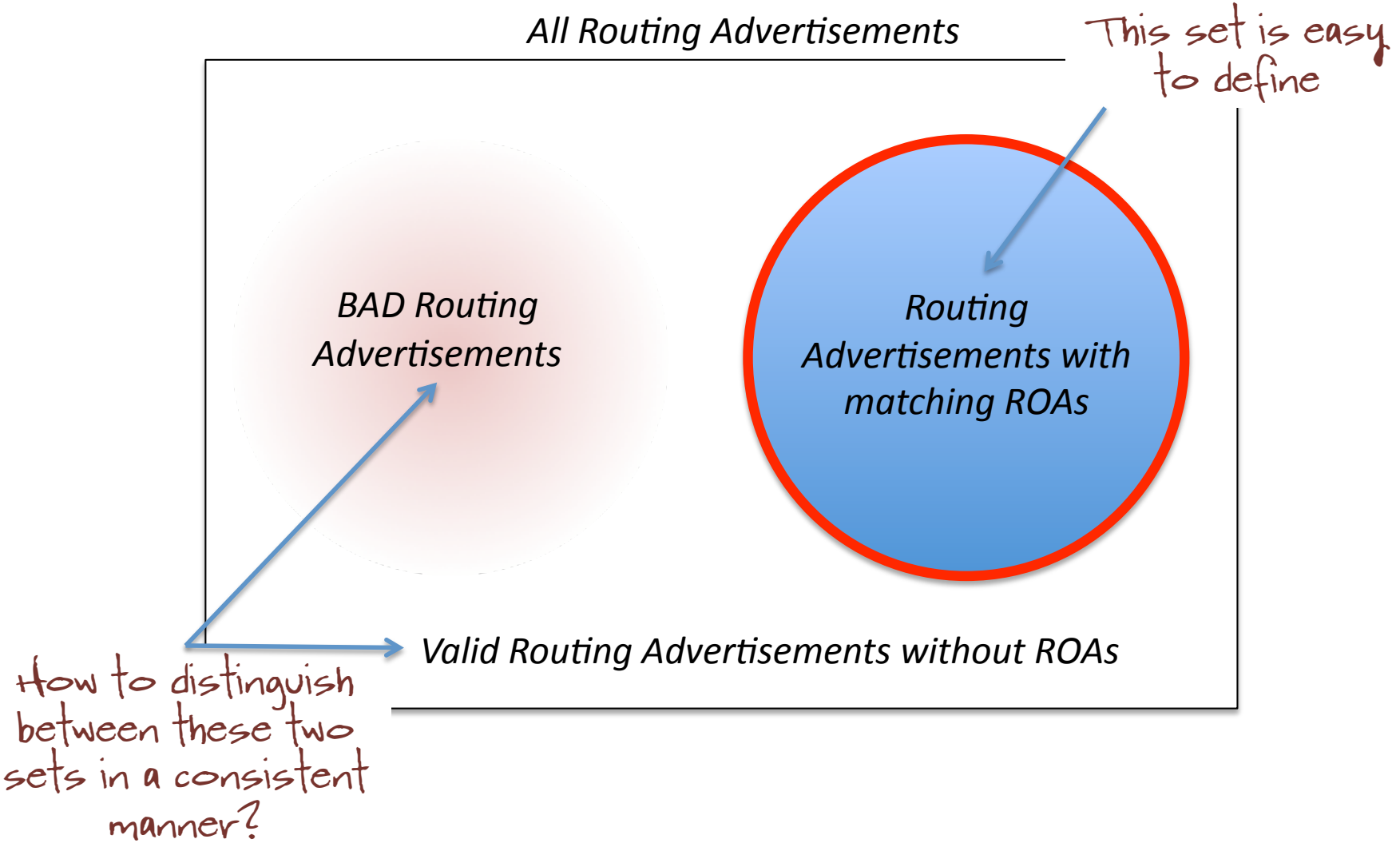
Scenario B: Piecemeal Use of ROAs



“Bad” Originations

No ROA

- Use of a prefix that is not currently allocated for public use
- Use of an AS that is not currently allocated for public use

A valid ROA exists, but…

- Use of a prefix (address and mask) that is **more specific than authorized** by the prefix holder
- Use of a prefix (address and mask) that is an **aggregate of what is authorized** by the prefix holder
- Use of a prefix (address and mask) by an AS that is **not authorized** by the prefix holder

ROA Scope Considerations

ROA: Prefix and Origin AS binding

ROA = prefix: 198.18.0.0/16 , maxlength: 20, origin: AS64500

- More specific than ROA Prefix?

198.18.0.0**/24** , originated by AS64500

- Aggregate Prefix?

198.18.0.0**/15** , originated by AS64500

- Unauthorized Origin AS

198.18.0.0/16 , originated by **AS64501**

Approaches (1)

A ROA implicitly defines its complete "anti-set":

- The AS's listed in this ROA are authorized to originate a prefix in the range of this ROA and no other AS's have this authority, and no more specific prefix may be used by any AS (unless another ROA specifically authorizes such use)

Approaches (2)

The AS 0 ROA (with maxlength=32 v4, 128 v6)

- A ROA authorizing AS 0 to originate a prefix is an explicit (and verifiable) declaration by the prefix holder that NO AS should originate this prefix, and NO AS should originate any more specific prefix (unless there is a ROA explicitly authorizing such use)

- This approach is a refinement of the "anti-set" interpretation of a ROA in so far as an AS 0 ROA authorizes NO use, so the AS 0 ROA has an anti-set interpretation that is intended to encompass ALL AS's

Approaches (3)

The BOA

- A signed instrument with a similar (but not identical) structure to a ROA that asserts that set of prefixes (and their more specifics) AND the set of AS's listed in the instrument should not be used in a public routing context, unless there is a ROA explicitly authorizing such use.

Some Open Issues

- In the AS 0 approach, do conventional ROAs include an implicit “anti-set” interpretation, or is this strictly limited to AS 0 ROAs?
- In the AS 0 approach, what is the interpretation of a ROA with an AS list that includes 0 with a maxlength less than 32 (128)?
- Should the anti-set be limited to the prefix up to maxlength and say nothing about more specifics?
- In the BOA approach, should ROAs carry an anti-set interpretation as well, or should all forms of authority ‘negation’ be performed by the BOA?

Some Open Issues

- What, if any, authority framework would allow a route for, say, 192.0.0.0/8 to be flagged as invalid? (*invalid aggregate*)
- What authority framework would allow a route for 191.0.0.0/8 to be flagged as invalid? (*unallocated address*)
- Should AS 0 and/or BOAs include semantics that include aggregates?

What is “partial deployment”?

- This uncertainty in validity stems from partial deployment of ROAs
- What scenarios should these ‘partial deployment’ approaches encompass?
  - Should a prefix holder be required to operate in an “all or none” mode with respect to ROA issuance?
    - once a prefix holder issues a ROA then ALL uses of the prefix and more specifics of that prefix that are not described by a ROA should be considered unauthorized?
    - What if the prefix holder wants to indicate that NO authority has been given to any AS?
  - Should the actions of a prefix holder in issuing a ROA force a more specific prefix holder to issue ROAs?
    - coerced ROA issuance for more specifics
  - Should the actions of a more specific prefix holder in issuing a BOA for the force the encompassing prefix holder to issue ROAs?
    - coerced ROA issuance for aggregates

Yet More Open Issues

- In a world of partial deployment, where some valid routes do not have ROAs, how should ROAs (and BOAs) be interpreted?
  - Accept / Reject?
  - Relative local preference setting?
- In a relative local preference setting framework are some omissions or authority failures more serious than others? (i.e. how should the failure modes be compared relative to each other?)

One possible way forward?

A ROA implicitly defines an AS "anti-set":

- The AS's listed in this ROA are authorized to originate a prefix in the range of this ROA and no other AS's have this authority, ~~and no more specific prefix may be used by any AS~~ (unless another ROA specifically authorizes such use)

A ROA for AS0 with a maxlength=32 v4, 128 v6 acts as a verifiable attestation in terms of an explicit denial capability