

Enhancing Route Origin Validation by Aggregating Validated ROA Payloads

draft-zhang-sidrops-vrp-aggregation-00

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IETF 119 SIDROPS Meeting



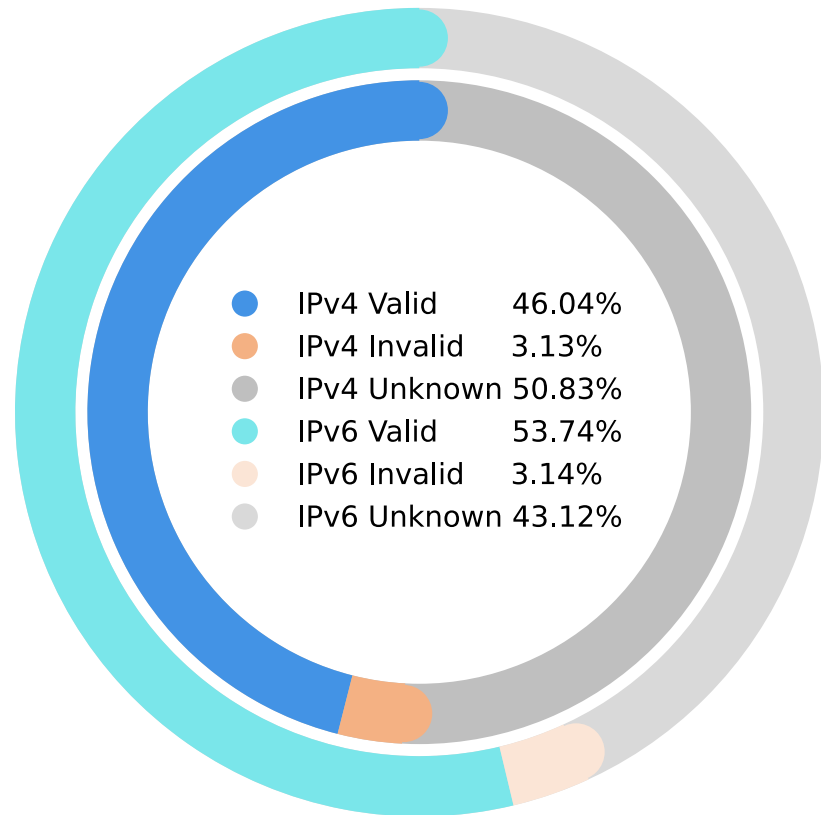
中关村实验室
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清华大学
Tsinghua University

Problem Statement

Is the `Invalid` BGP Route truly Invalid?



ROA Stats 2024-03-13

INVALID: > 40K BGP Routes

All route origin hijacking? **NO!**

Due to route aggregation, traffic engineering...

Prefix

In the BGP Route

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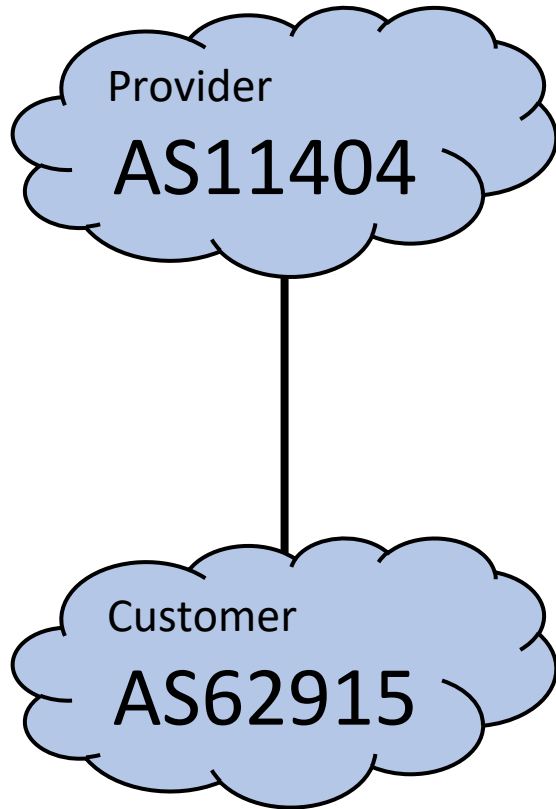
Prefix

In the ROA

Sometimes Valid

Problem Statement

Eg. Route-Aggregation-Caused Error Validation



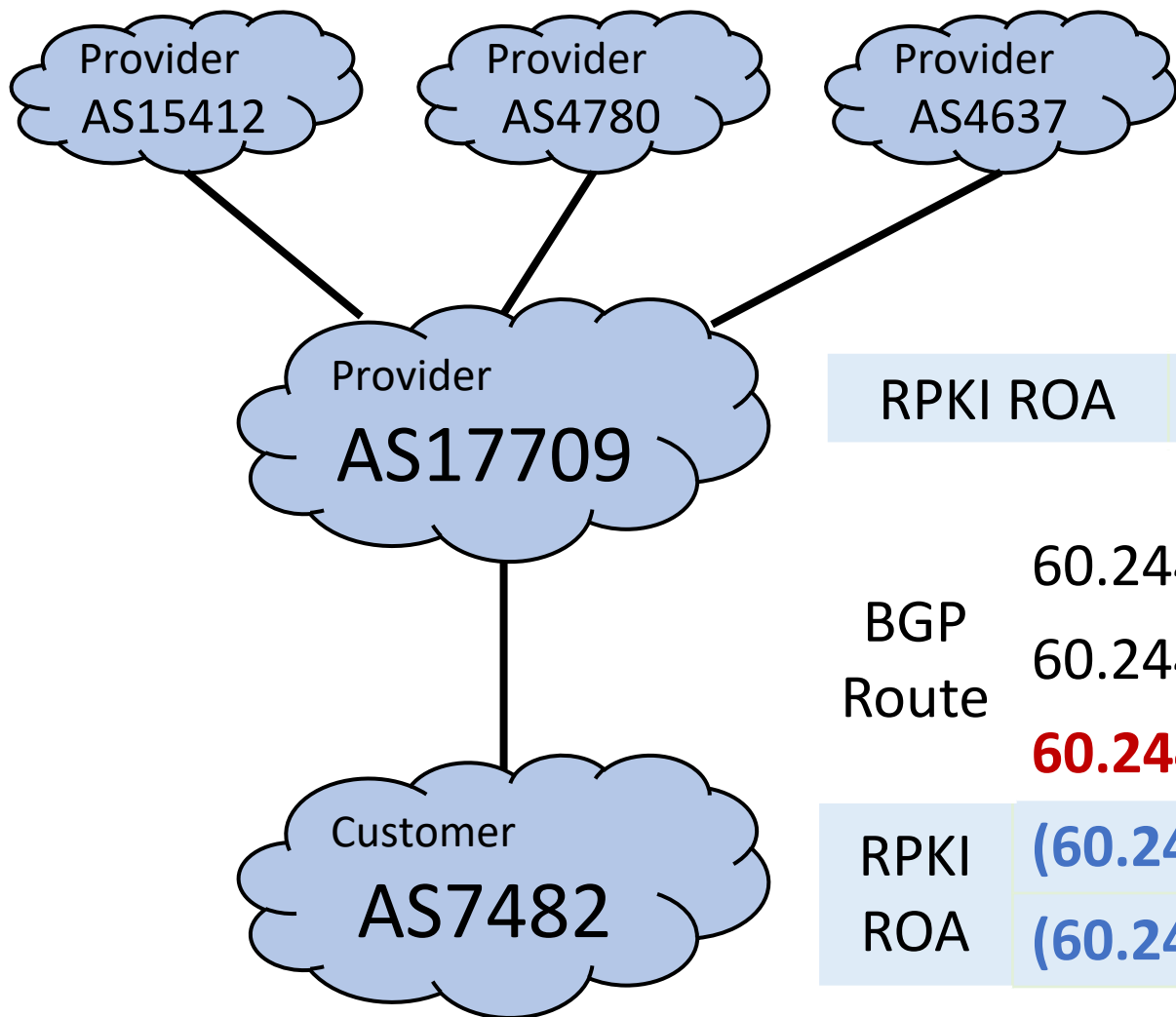
BGP Route	(76.191.64.0/18	AS11404)	Valid
RPKI ROA	(76.191.64.0/18	AS11404	24)

Should it be Valid?

BGP Route	(76.191.74.0/23	AS62915)	Valid
	(76.191.76.0/22	AS62915)	Invalid
RPKI ROA	(76.191.74.0/23	AS62915	24)
	(76.191.76.0/23	AS62915	24)
	(76.191.78.0/23	AS62915	24)

Problem Statement

Eg. Traffic-Engineering-Caused Error Validation



Should it be Valid?

RPKI ROA	(60.244.0.0/16	AS17709	17)
BGP Route	60.244.0.0/18	AS7482	* 4637 17709 7482
	60.244.0.0/18	AS7482	* 4780 17709x3 7482
	60.244.0.0/16	AS7482	* 15412 17709x7 7482
RPKI	(60.244.0.0/17	AS7482	24)
ROA	(60.244.128.0/17	AS7482	24)

Solution

Yes! Those BGP Route should be validated as `Valid`.

- Main factor: Network routing policies or incomplete registration.
 - Which the address space holders are not aware of when issuing ROAs.
- Our solution

Extend the Original VRPs by Generating Aggregated VRPs!

Algorithm

Which VRPs Can Be Safely Aggregated?

Prefix	ASN	MaxLength
185.207.116.0/24	AS559	24
185.207.117.0/24	AS559	24
185.207.118.0/23	AS559	24

① Contiguous Prefix ② Same AS ③ Same MaxLength

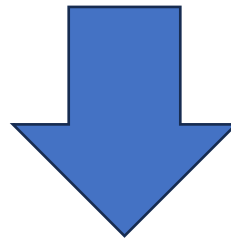
✗ Overlap

✗ Gap

Algorithm

How to Aggregate?

Prefix	ASN	MaxLength
185.207.116.0/24	AS559	24
185.207.117.0/24	AS559	24
185.207.118.0/23	AS559	24



Largest parent prefix

185.207.116.0/22

Aggregated VRP

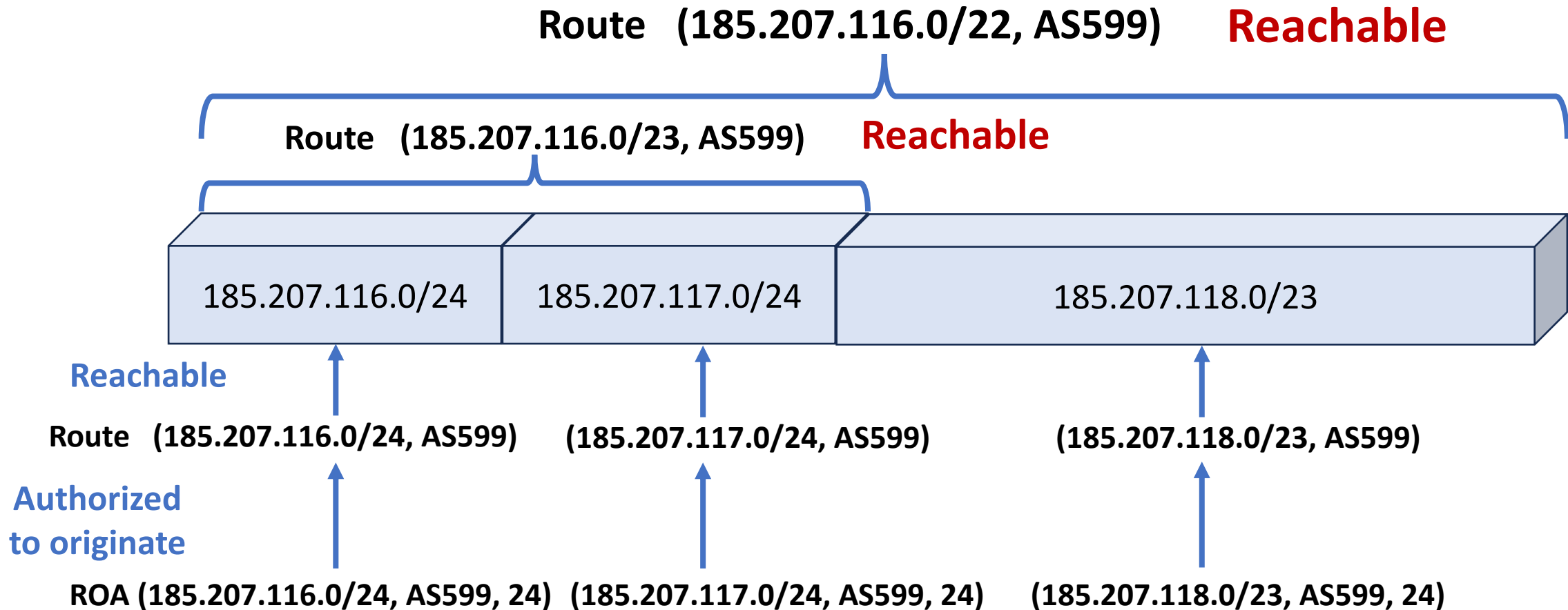
AS559

24

Algorithm

Is the aggregated VRP the same as the original VRP?

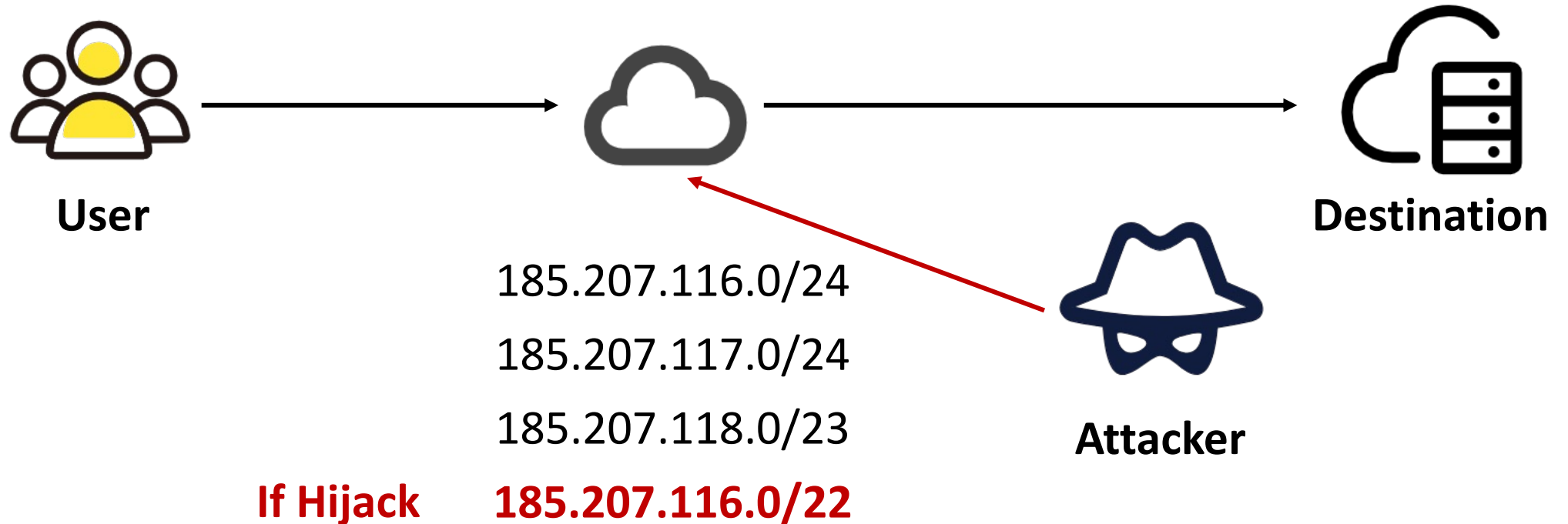
Reachability: Yes



Algorithm

Is the aggregated VRP the same as the original VRP?

Security: Yes



No Other traffic will be routed here!

Algorithm

Is the aggregated VRP the same as the original VRP?

Usage for ROV: No

VRPs	Prefix	ASN	MaxLength
Original	185.207.116.0/24	AS559	24
	185.207.117.0/24	AS559	24
	185.207.118.0/23	AS559	24
Aggregated	185.207.116.0/22	AS559	24

When Update comes...

① 185.207.116.0/23, AS559

Valid

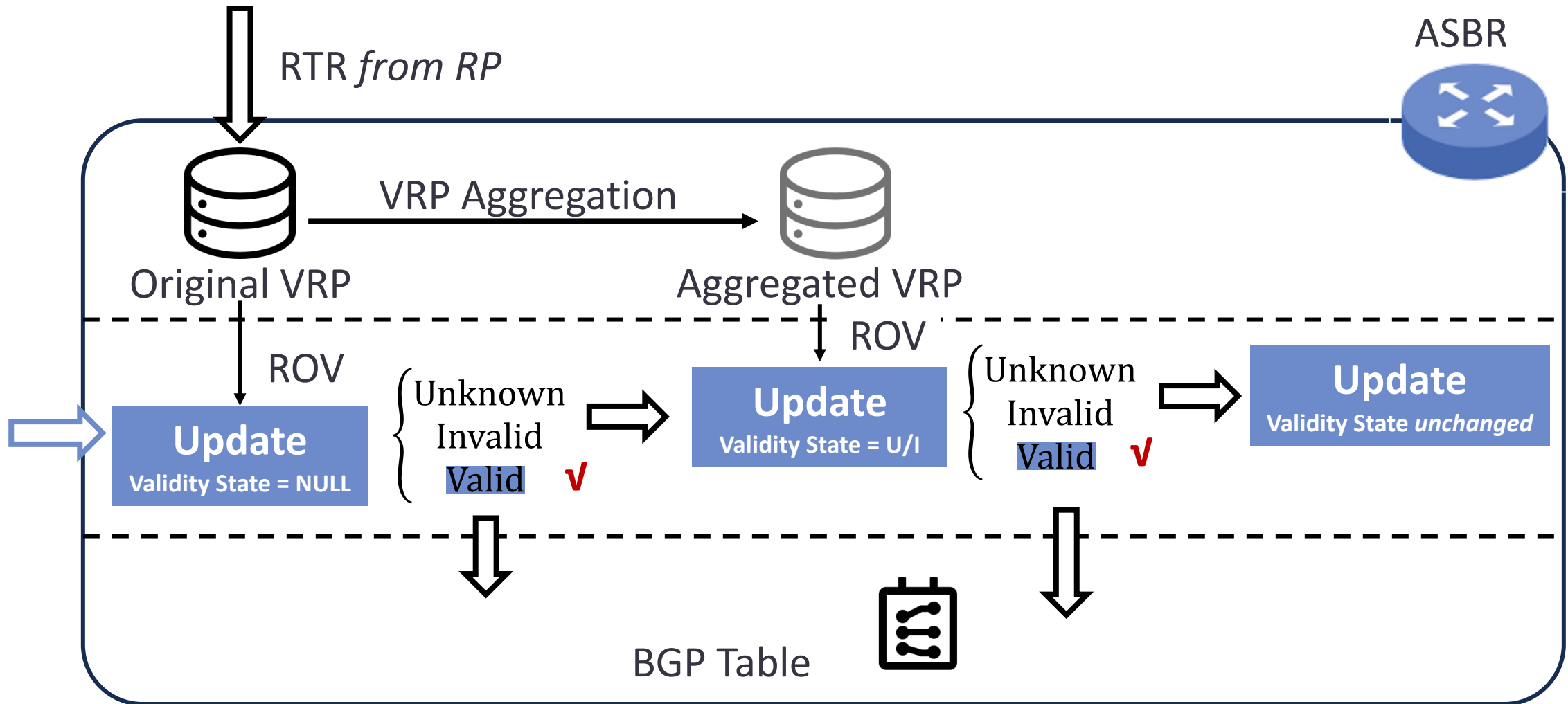
② 185.207.116.0/22, AS100

Invalid

?? Up to the original VRPs!!

Implementation

Extension on the Router



Document Status & Next Steps

- draft-zhang-sidrops-vrp-aggregation-00
- Questions, criticisms, and applause are welcome.
- Further discussion is needed.
 - Implementation
 - Is router modification the most practical solution?
 - Or should we consider more extensive architectural modification?
 - Incremental Aggregation

Thank you !

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