Verification of Routes Using Region Authorization

https://datatracker.ietf.org/doc/draft-shen-sidrops-region-verification/

IETF 111

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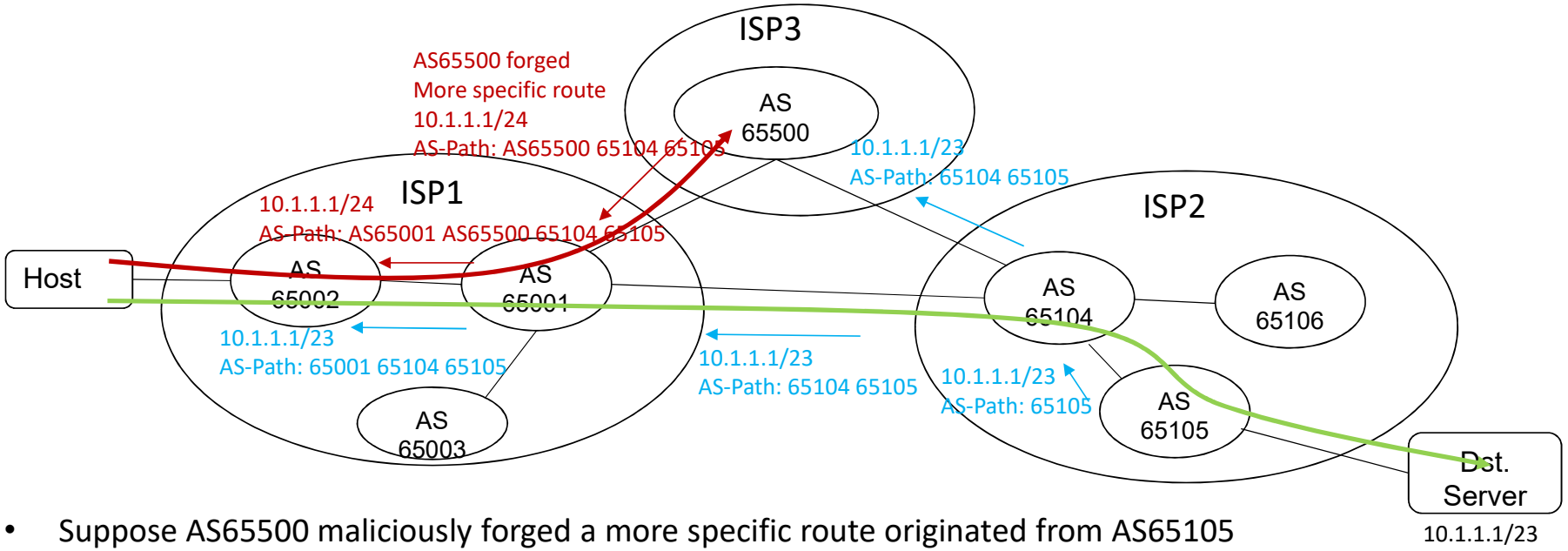
Route Hijack Case



- Suppose AS65500 maliciously forged a more specific route originated from AS65105
- Existing hijack detection method option 1 -- RPKI ROV (RFC6810, RFC6811, RFC8210)
  - Not route origin hijack, ROV cannot detect this hijack
  - Register the ROA based on the more specific route, may cause more complex for traffic adjusting
- Existing hijack detection method option 2 -- RPKI ASPA
  - If there exists (AS65001, AS65500) (AS65104, AS65500) ASPA profiles, so ASPA cannot detect this hijack
- Either ROV or ASPA can not detect hijacks, where the way of AS-path manipulation does not violate RPKI ROA/ASPA profiles.

Proposal: Region-based Route Verification Design Principles

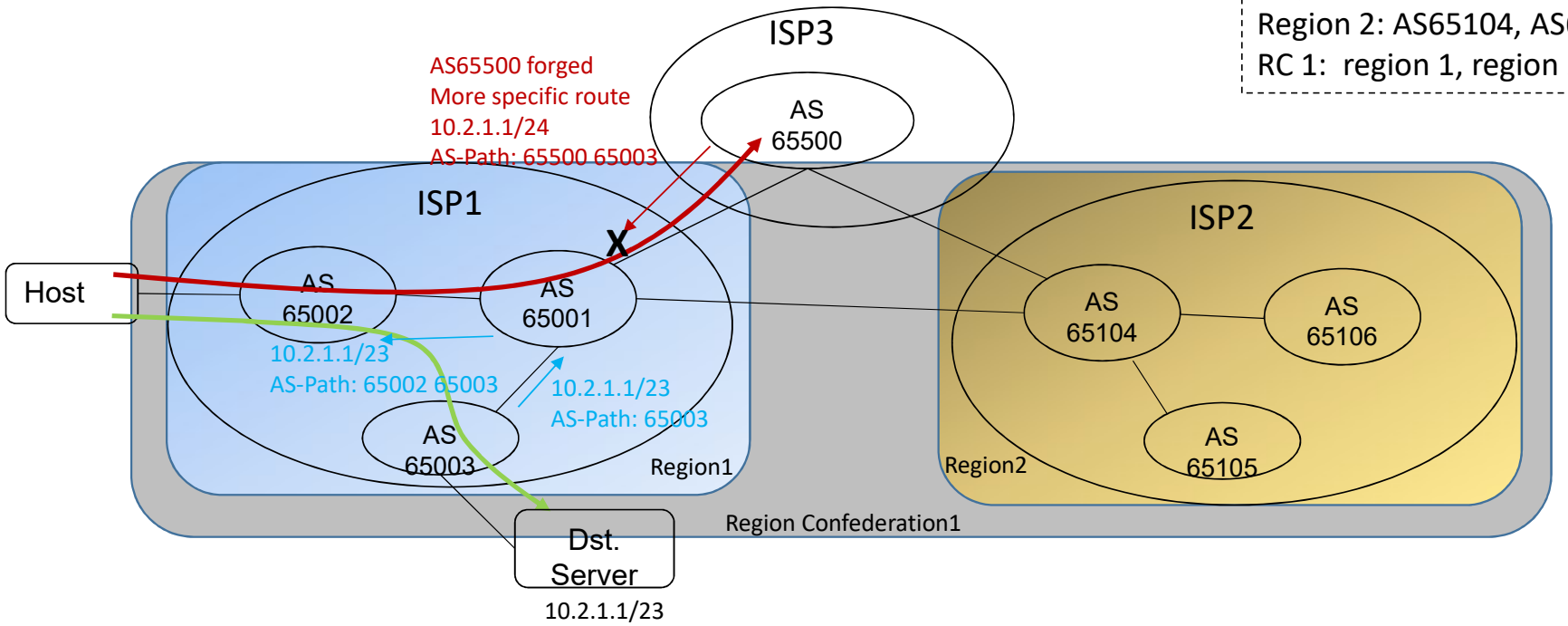
- The concept of Region and Region Confederation (RC)
  - Region: consists of ASes from one ISP (e.g.,)
  - RC: consists of regions, where each region must be connected to all other regions within the RC through BGP
- Assumption
  - Routers within the same Region are trust-worthy (no hijacking)
  - Routers within the same Region Confederation are trust-worthy (no hijacking)
- Benefit
  - Protect routes, that originated within the same Region/RC, from being hijacked by non-trusted Region/RC routers
- Prerequisite of Region Verification – RPKI ROA/ROV
  - ROA/ROV provides the mapping of: routes <--> origin AS, thus provides mapping of: routes <--> origin Region/RC
- Validation rules:
  - REJECT routes, that are originated within the local Region but are received from an external region eBGP peer
  - REJECT routes, that are originated within the local Region Confederation, (not local Region) but are received from an external region confederation eBGP peer

Proposal: Region-based Verification Steps

- Step 0: region and region confederation division
  - Mutual agreement reached between cooperative ISPs
- Step 1: ISPs register their own RPKI region-based profile (to be defined) :
  - <RC#, region#, AS#>
- Step 2: routers download region-based profiles from RPKI RP server, use the region-based profiles to decide the eBGP peer roles
  - Decide if an eBGP peer (using its AS# to correlate with the region-based profile) is within the local Region or within the local region-confederation
- Step 3: routers execute ROV
  - If the prefix ROV returns “valid”, we assume that the route is originated from the origin AS in the AS-path, and thus deciding if the route is originated from the same Region/RC
- Step 4: routers execute region-based hijack validation
  - If the route is originated within local Region, but the eBGP peer is not belong to local Region, then reject
  - If the route is originated within local Region Confederation, but the eBGP peer is not belong to local Region Confederation, then reject

Application Scenario 1: Hijack Protect for routes originated within local Region

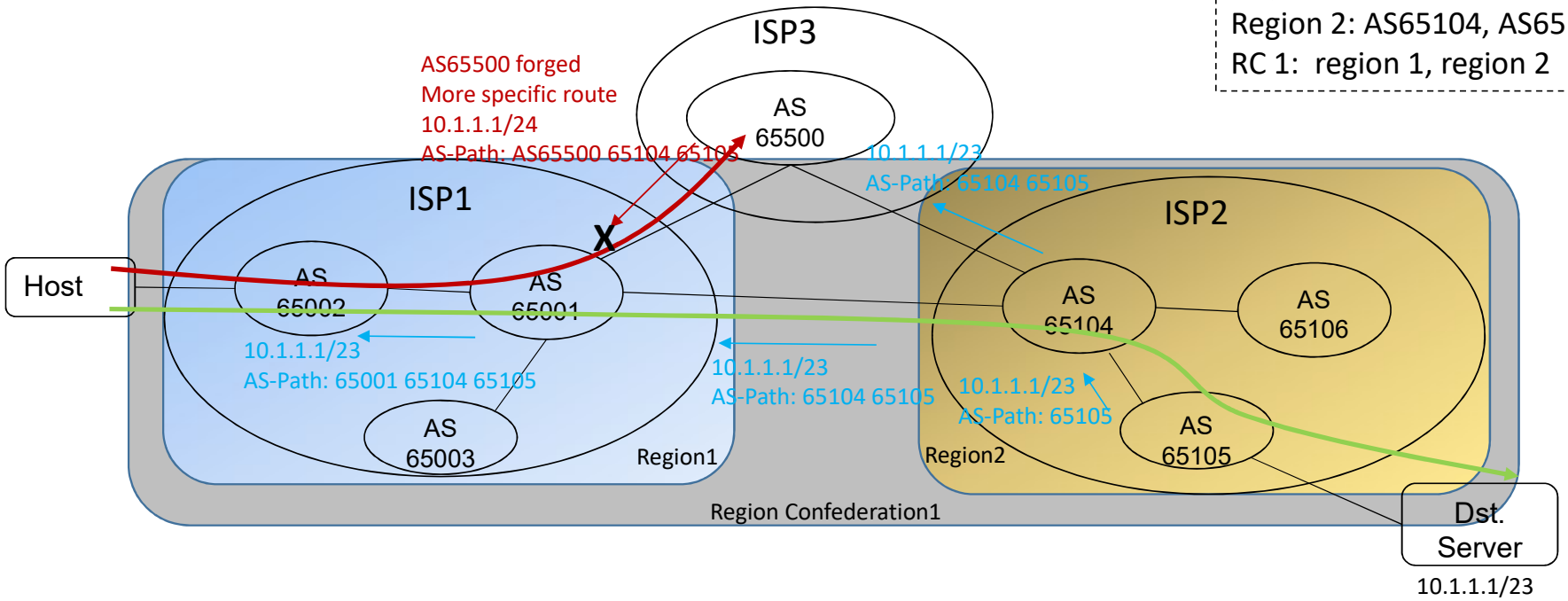
Region 1: AS65001, AS65002, AS65003
Region 2: AS65104, AS65105, AS65106
RC 1: region 1, region 2



- Step 1:
  - ISP 1 region-based profile registration: <RC1, Region 1, AS65001>, <RC1, Region 1, AS65002>, <RC1, Region 1, AS65003>
- Step 2:
  - AS65001 (RC1, Region1) decides that the eBGP peers to AS65500 are not within the local region
- Step 3:
  - 10.2.1.1/24 received from AS65500 is valid for ROV, but it should be originated from local region
- Step 4:
  - Reject 10.2.1.1/24 received from AS65500, since the eBGP peer is out of region 1

Application Scenario 2: Hijack Protect for routes originated within local RC but not local Region

Region 1: AS65001, AS65002, AS65003
Region 2: AS65104, AS65105, AS65106
RC 1: region 1, region 2



- Step 1:
  - ISP 1 region-based profile registration: <RC1, Region 1, AS65001>, <RC1, Region 1, AS65002>, <RC1, Region 1, AS65003>
  - ISP 2 region-based profile registration: <RC1, Region 2, AS65104>, <RC1, Region 2, AS65105>, <RC1, Region 2, AS65106>
- Step 2:
  - AS65001 (RC1, Region1) decides that the eBGP peers to AS65500 (non-RC 1 member) are not belong to local RC
- Step 3:
  - 10.1.1.1/24 received from AS65500 is valid for ROV, but it should be originated from RC1, Region 2
- Step 4:
  - Reject 10.1.1.1/24 (originated from RC1, Region2) received from AS65500, since the eBGP peer from AS65500 is out of RC1

Next steps

- Need comments

Thank you!