Interim (BGPSEC Tutorial) Summary

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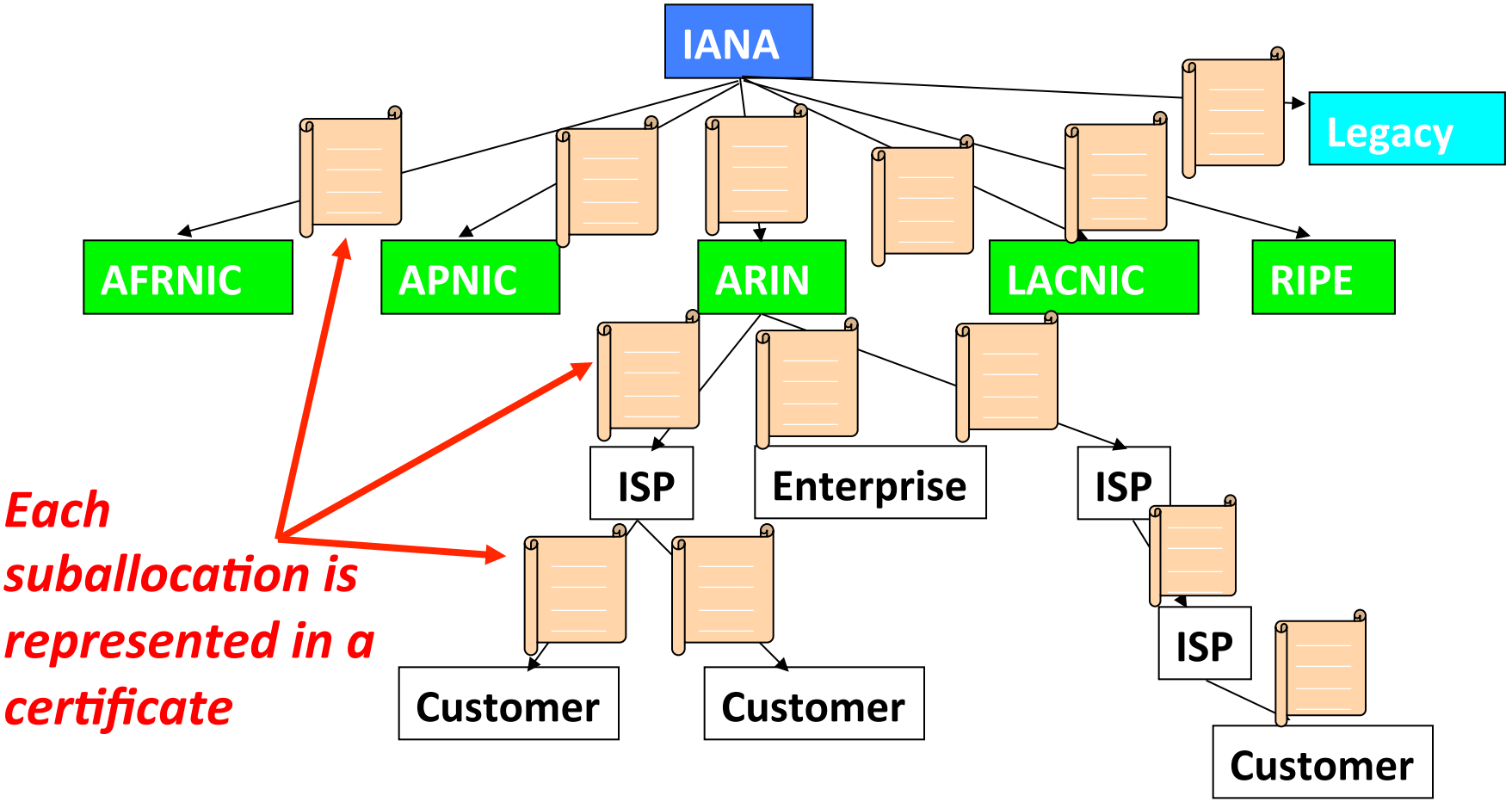
Why BGPSEC, isn't RPKI enough?

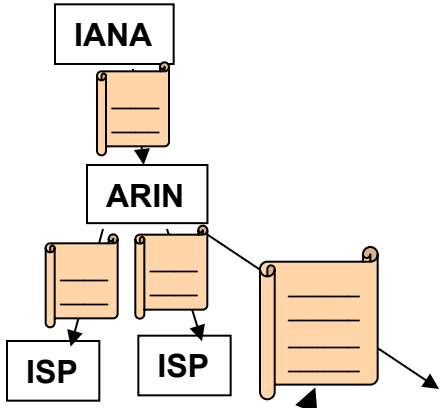
- RPKI is the set of data which provides certification of resource allocation
- Right now, RPKI can be used to protect origin validation
- BGPSEC is about protecting path validation

RPKI – Resource Certificates



Resource **certificate, not identity certificate**

Certs & Route Origin Authorization



Sign a Route Origin Authorization (ROA) for your address space. Your certificate validates the signature

Enterprise

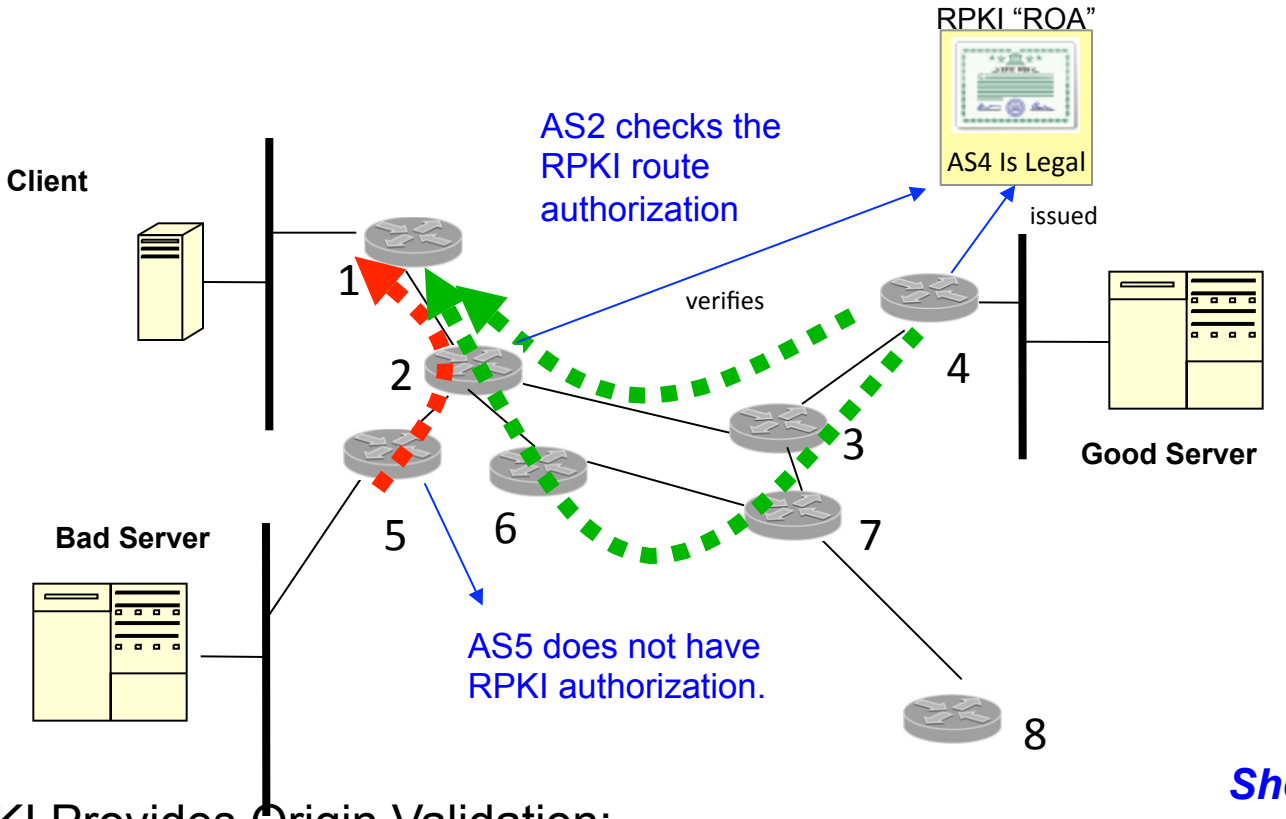
Certificate lists the addresses you hold and who gave them to you

CA certificate
Key: EnterpriseKey
Signed by: ARIN
Addresses: 10.2/16

ROASignedObject
Signed by: EnterpriseKey
Addresses: someofyouraddresses
Valid Origin: some one ASN

The ROA lists the valid origin for those addresses

Example RPKI Origin Validation



Should be rejected

RPKI Provides Origin Validation:

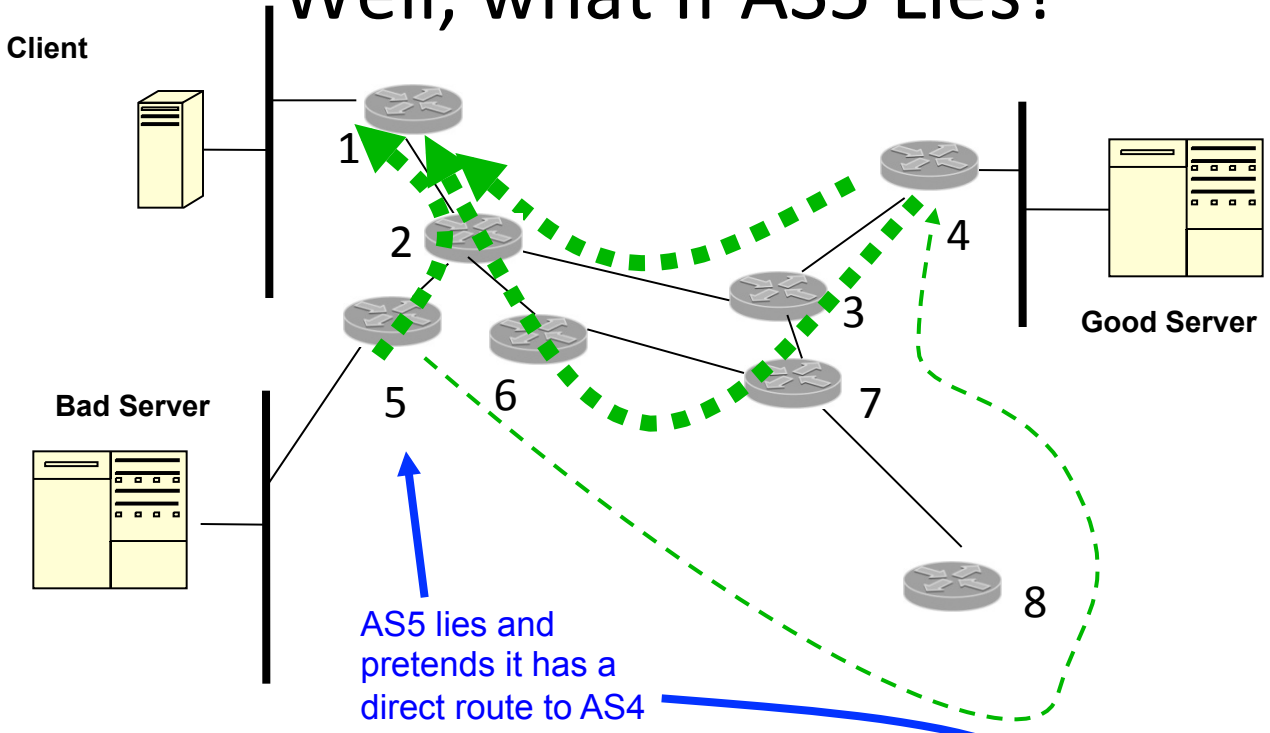
RPKI "ROA": prefix holder authorizes AS4 to advertise routes to Good Server

AS2 checks the validation state of the routes:

- INVALID (Origin is not AS4): AS2 ▶ AS5
- VALID (Origin is AS4): AS2 ▶ AS3 ▶ AS4
- VALID (Origin is AS4): AS2 ▶ AS6 ▶ AS7 ▶ AS3 ▶ AS4

Why isn't origin validation enough?

Well, what If AS5 Lies?



AS5 can still advertise a route to the Good Server with AS4 at the origin:
(even though AS5 isn't connected to AS4)

- VALID (Origin is AS4): AS1 ▶ AS2 ▶ AS5 ▶ AS4
- VALID (Origin is AS4): AS1 ▶ AS2 ▶ AS3 ▶ AS4
- VALID (Origin is AS4): AS1 ▶ AS2 ▶ AS6 ▶ AS7 ▶ AS3 ▶ AS4

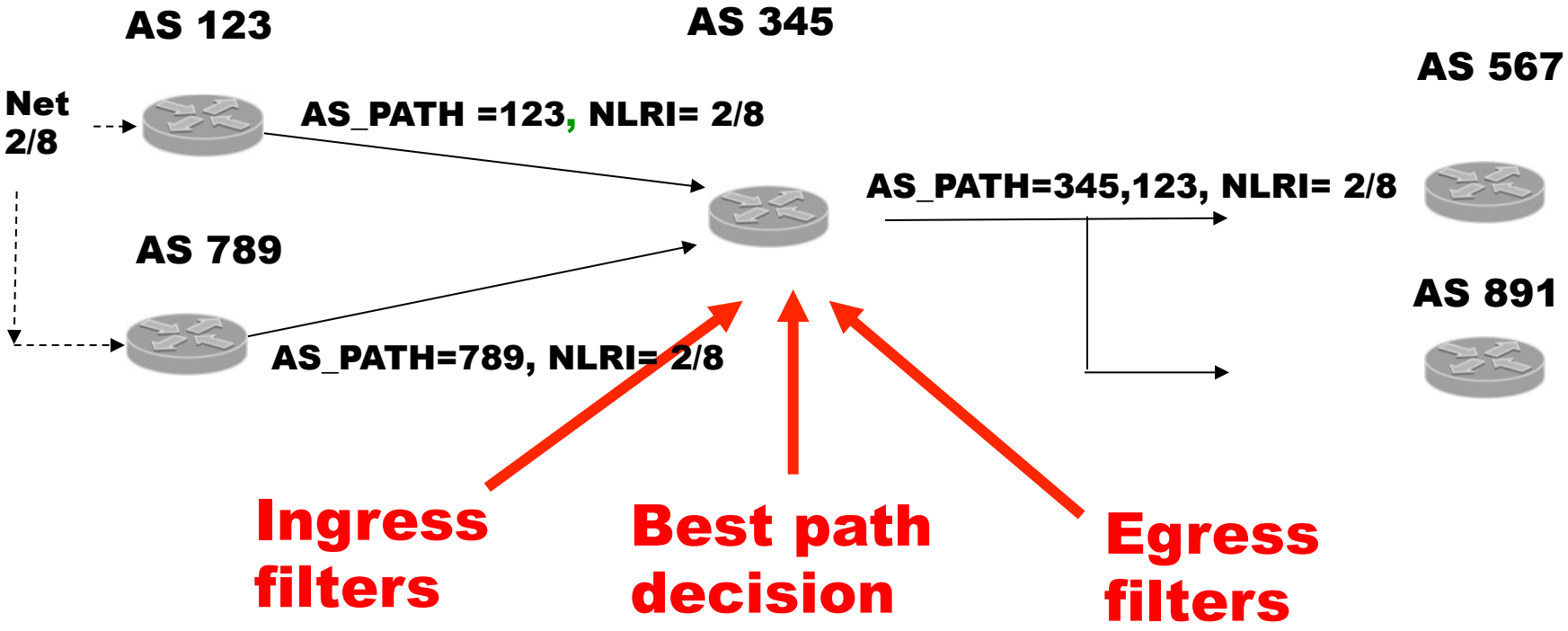
SIDR BGPSEC Doc Overview

- **draft-ietf-sidr-bgpsec-overview – overview of the set of documents related to BGPSEC** *(good summary)*
- Basis for BGPSEC work
  - **RFC7132** - Threat Model for BGP Path Security (basis for why)
  - **RFC7353** - Security Requirements for BGP Path Validation
- **draft-ietf-sidr-bgpsec-protocol-09 - BGPSEC Protocol Specification** *(obviously important to read)*
- **draft-ietf-sidr-bgpsec-ops-05 - BGPsec Operational Considerations** *(explains concept of operations)*
- Crypto stuff *(not crucial to understand BGP impact*)
  - draft-ietf-sidr-bgpsec-pki-profiles-08 - A Profile for BGPSEC Router Certificates, Certificate Revocation Lists, and Certification Requests
  - draft-ietf-sidr-bgpsec-algs-08 - BGP Algorithms, Key Formats, & Signature Format
- Crypto stuff *(about router crypto management, more than BGP impact)*
  - draft-ietf-sidr-rtr-keying - Router Keying for BGPsec

Idea of BGPSEC

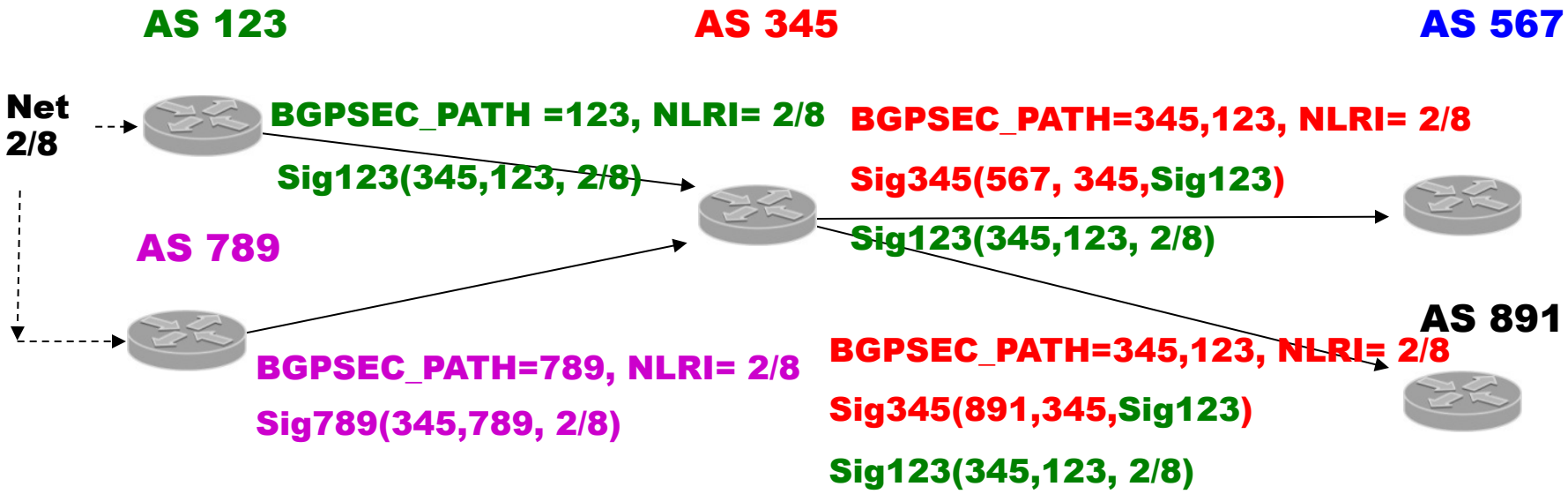
- Need to protect the formation of the AS_PATH
  - Prevent grafting valid origin on path
  - Prevent path poisoning
- So sign everything you receive to prove you didn't invent the path
  - Include the AS you are sending to, to prevent cut-and-paste creation of a signed path
- New attribute
- New capability – only send new attribute to neighbors who can handle it

BGP Process



- BGP receives many routes to the same prefix
- Ingress filter decides what routes to consider
- Decision process picks just one best route
- Egress filter decides what neighbors receive an update

BGPSEC Process



- Each update has a signature for each AS in the BGPSEC_PATH
  - Each signature covers BGPSEC_PATH to that point and the "sent-to" AS
- At ingress, check all signatures
- At egress, add a new signature to the list when you add your AS, and include the AS you are sending to in the signature
- Routers have keys tied to their AS in the RPKI

Differences from BGP

- No AS_PATH attribute – path is encoded in the BGPSEC_Path attribute
- One neighbor per Update
- One NLRI per Update
- Route servers – they appear in the BGPSEC_Path

Not Different from BGP

- Prepending (use a count)
- Confederations (use a flag)
- AS Migration
- Route servers
  - (they appear in the BGPSEC_Path attribute but not counted in the path length)