PROBLEM STATEMENT

OF PATH VALIDATION

A MATERIAL FOR:

Path Validation Side Meeting @ IETF118

DATE:	TIME:	ROOM:
Nov 7, Tuesday	6:30PM – 8:00PM	Karlin 4

WHAT IS THE GOAL OF THIS SIDE MEETING?

Clarify the definition of path validation, its goal, scope, history, concrete use cases, and current technical gap.

WHAT IS PATH VALIDATION?

Path validation is a technique that verifies whether the data was actually forwarded on a predetermined path.

WHAT IS THE CURRENT PROBLEM, OR GAP?

The actual forwarding path a traffic took in the data plane may deviate from the path planned in the control plane. Control plane security mechanisms (such as BGPSEC, RPKI) can only achieve routing integrity and *imply* forwarding integrity, causing a gap between the two.

WHAT IS THE DIRECT CAUSE OF THIS GAP?

The lack of a mechanism that directly verifies forwarding outcome, such as **Proof-of-Transit (POT).**

OK, WHAT IS THE GOAL OF PROOF-OF-TRANSIT?

To achieve verifiable assurance of hop-by-hop forwarding integrity.

WHAT GOOD DOES PATH VALIDATION DO TO FILL THIS GAP?

Path validation mechanism consists of two parts:

1. **Validating the planned path is a trusted, authorized path.**
2. **Validating what path that a packet has actually traversed.**

The part two is exactly the proof-of-transit mechanism, directly filling the gap.

These two parts helps achieve routing integrity and forwarding integrity progressively.

WHAT ARE THE DIRECT BENEFITS FROM PATH VALIDATION?

Explicit Routing: Segment Routing, Service Function Chaining, Path-aware Networking. (Obviously)

Conventional Routing: Policy-based Routing, Multipath Routing (ECMP, TE). (Enhanced Visibility)

Network Telemetry: IOAM/IFIT.

Ingress Filtering: uRPF, SAV.

TRIVIA / HISTORY

- The term “path validation” was **first used** in the BGP security context, referring to the validating “is every AS on a BGP route announcement (AS path) has explicitly authorized this announcement?”.
- Path validation was **later interpreted** as “validating the packet traversed the planned path in the correct order”, mostly by research papers. In the IETF community, this extended interpretation later disambiguates into **Proof-of-Transit**.
- The first Proof-of-Transit solution was proposed by Frank Brockners in the SFC WG but discontinued due to negative SECDIR reviews.

NEXT STEPS:

- Improve the problem statement draft.
- Identify concrete use cases and standardization opportunities.
- Establish a proof-of-transit design team.