Handling multiple verifiers in RATS architecture

draft-zhang-rats-multiverifiers-01

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NASR Side Meeting

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Motivation

- RFC9334 specifies the information flow between 1 Attester, 1 Verifier and 1 Relying Party for RATS.
- Single verifier may face single-point of failure, “achilles’ heel” of the attestation verification system (AVS).
- Augment the RATS architecture to explicitly multiple Verifiers scenarios?
  - Scalability: How many evidences to generate?/How many verifiers to contact?
  - Robustness: How to handle heterogeneous verifiers (delayed update, compromised, different RIM policy, …)

Goal

Acknowledge and address potential inconsistent behaviors of Verifier by:

- Aggregating Attestation Results collected from multiple Verifiers at the Relying Party
- Simplifying the policy and operation

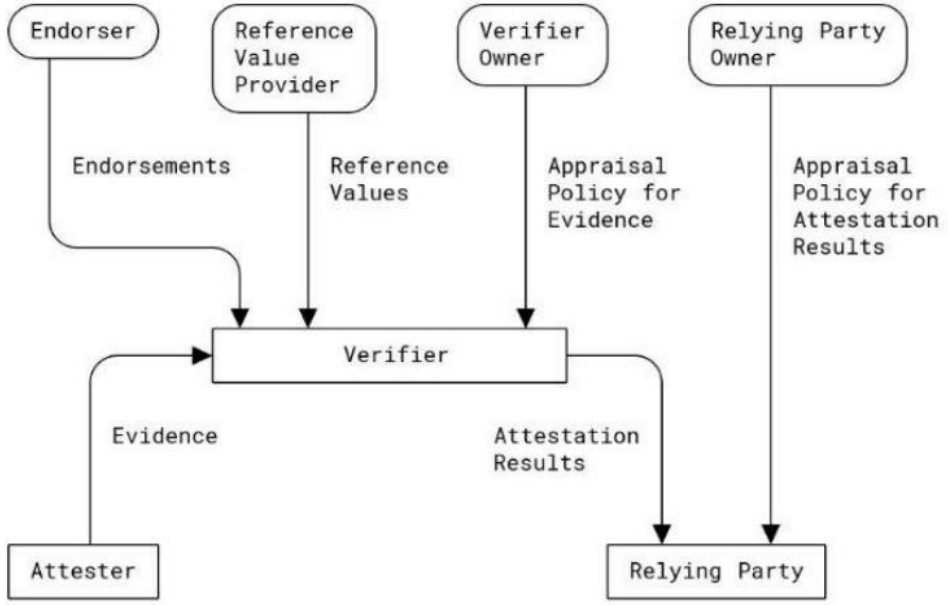


Fig. 1: RATS information flow in RFC9334

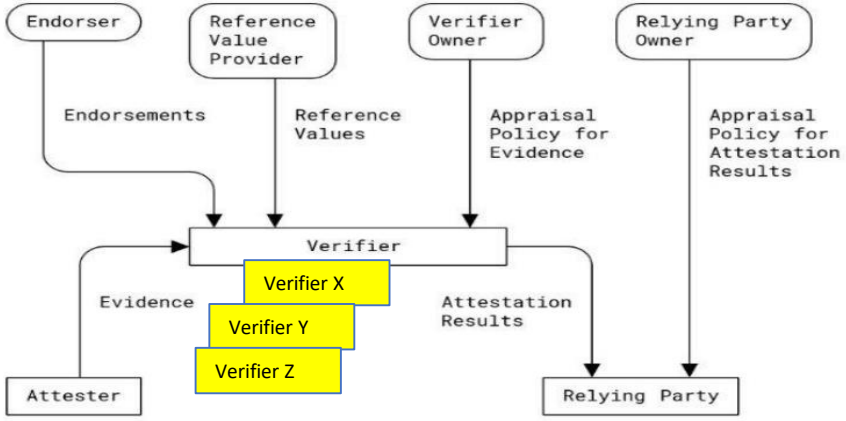
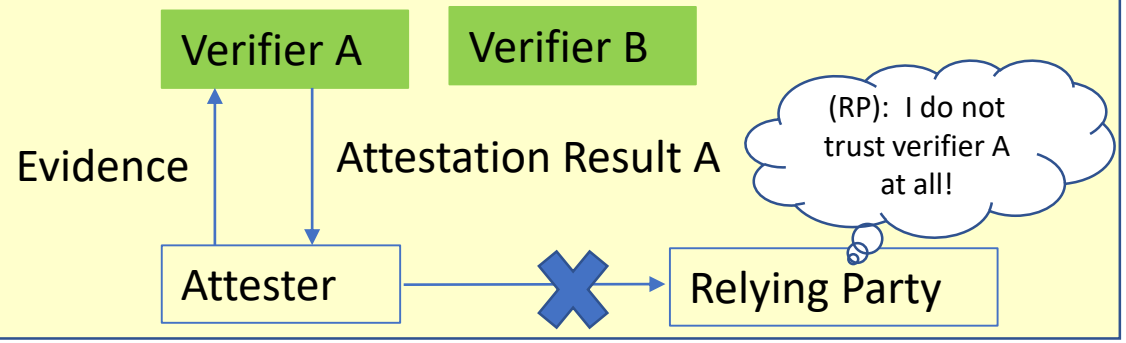


Fig. 2: RATS architecture with multiple Verifiers

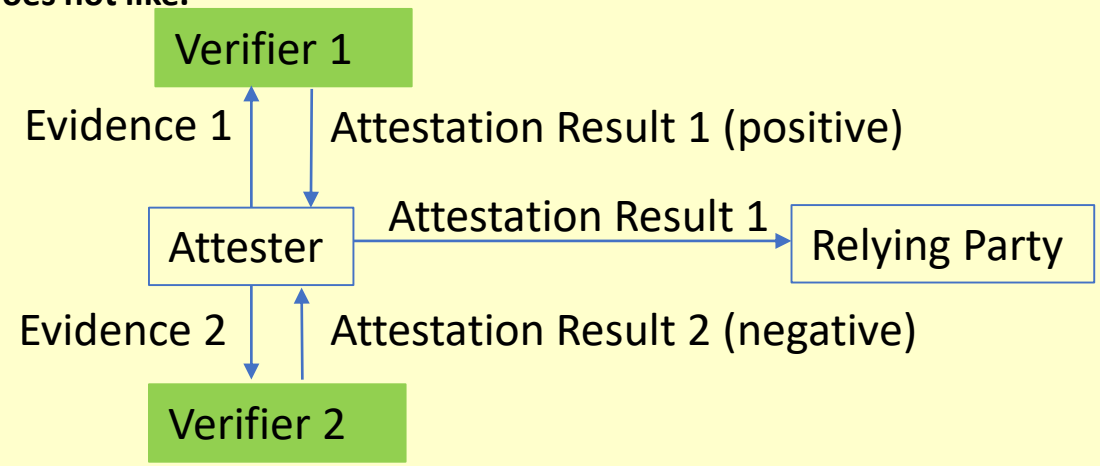
Possible issues to handle multiple verifiers in current RATS architecture

Passport model

Case a: Attester does the attestation in vain because RP does not trust attestation result from certain verifier

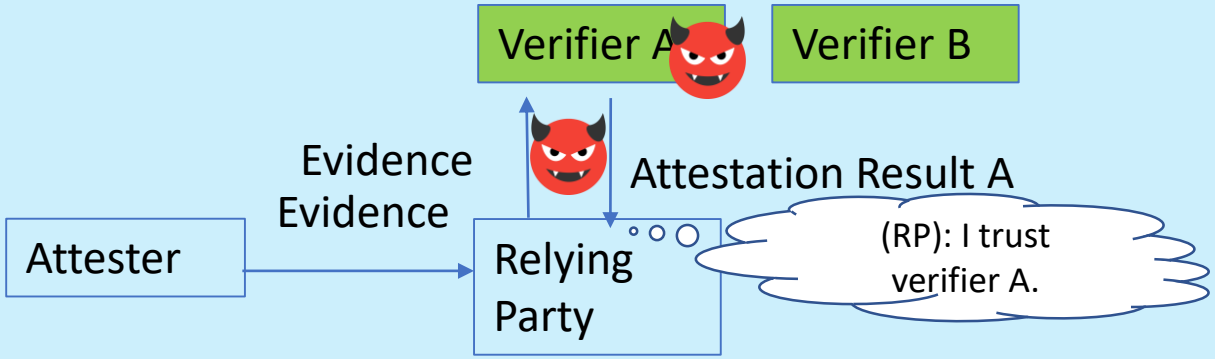


Case b: The attester can cheat by dropping attestation results that it does not like.

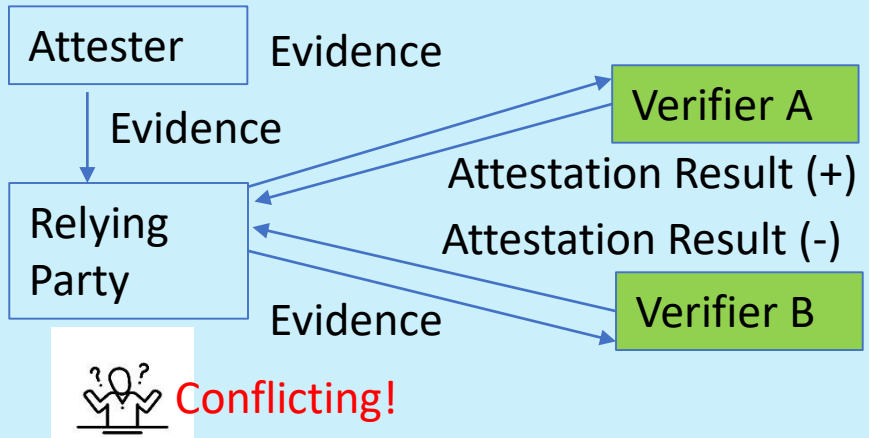


Background-check model

Case c: A trusted verifier can be compromised, or not available.



Case d: Multiple verifiers may have inconsistent behaviors



Handling multiple verifiers

Extension of background-check model

Objective: introduce multiple Verifiers to ensure the resilience of the attestation service, and the support for Attestation Result aggregation based on the same Evidence.

Extension of the background-check model

- Mostly on relying party side
  - RP initiates the attestation flow and generates the nonce.
  - RP forwards evidence to all its recommended Verifiers.
  - RP aggregates the attestation results from these Verifiers.
- Benefit
  - Ensure attestation is not done in vain.
  - Ensure availability & security of remote attestation by "**Wisdom of Crowds**" & support aggregation of Attestation Results from heterogeneous Verifiers
  - Avoid redundant generation of evidence
  - Shortlisted Verifiers (detailed in **Verifier Manager** part)

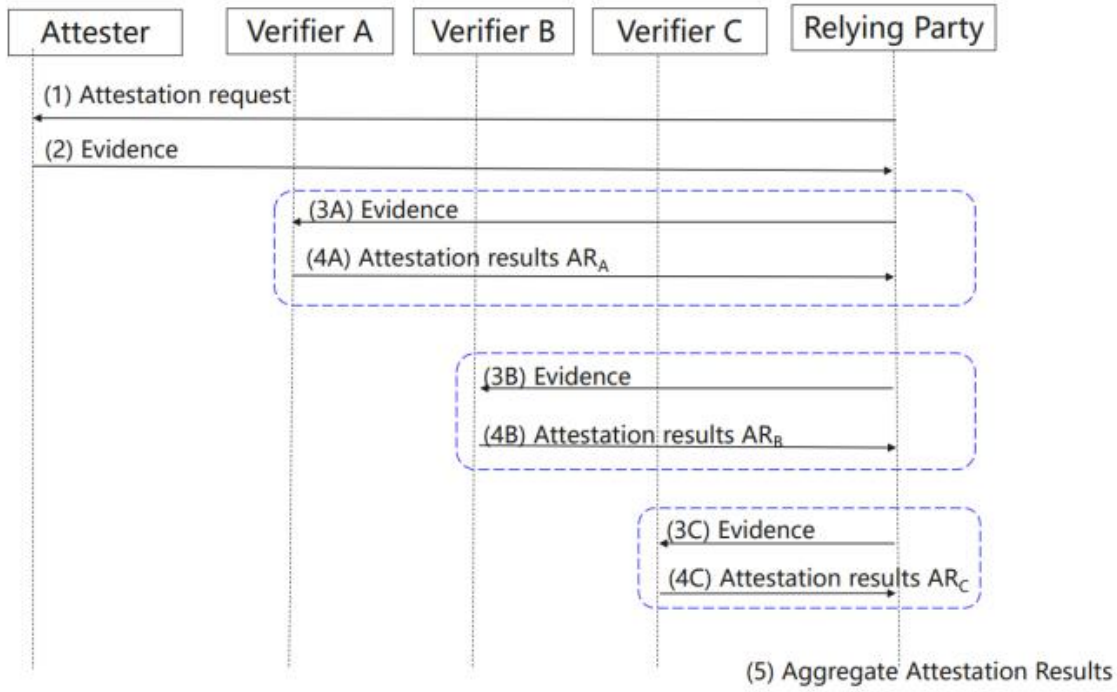


Fig. 3 Augmented Background-Check Model to support the aggregation of Attestation Results from multiple Verifiers

Verifier manager

Objective: support for flexible verifiers configuration at relying party

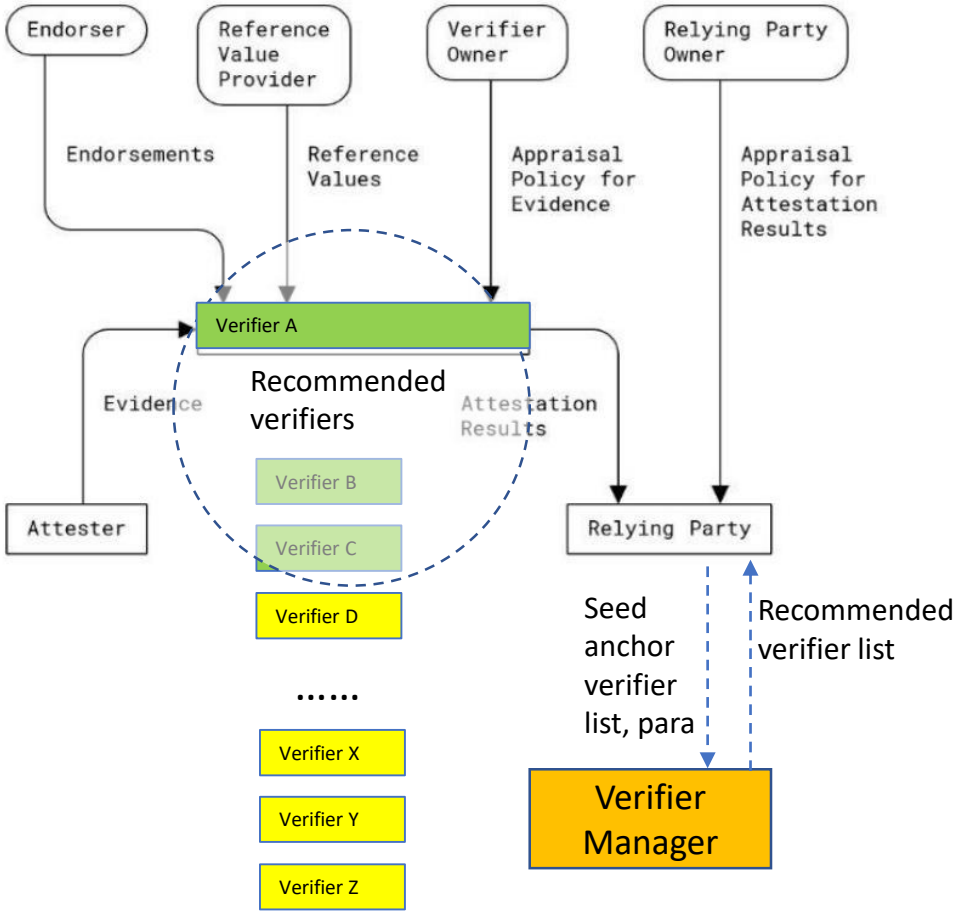


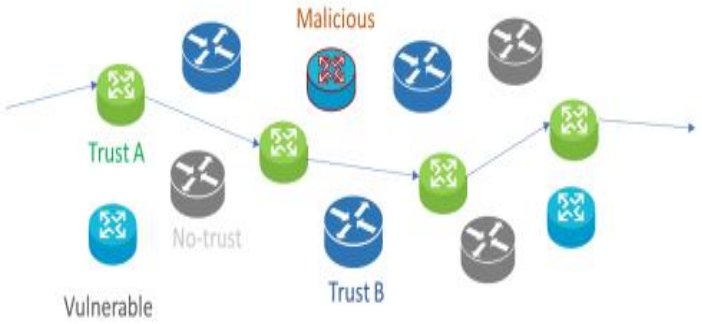
Fig. 4 Interaction between a verifier manager and a relying party

Introduce verifier manager in the architecture to:

- Provide a recommended Verifier list to RP based on input of a seed anchor verifier list and parameters
- Enable RP to contact a list of selected Verifiers
- Enable RP to configure its desired verification policy by configuring seed anchor verifier list

Use case 1: Node Attestation for Trusted Routing

Trusted Routing requires traffic to go through trusted nodes while they can be appraised by the Verifier (Fig. 5).



Challenge:

Single Verifier may not be available or may be compromised

Fig. 5 Trusted routing Use Case from NASR use cases

Solution:

Provide multiple Verifiers (primary and secondaries) to ensure the availability of the attestation verification service (AVS) for nodes in the network (Fig. 6)

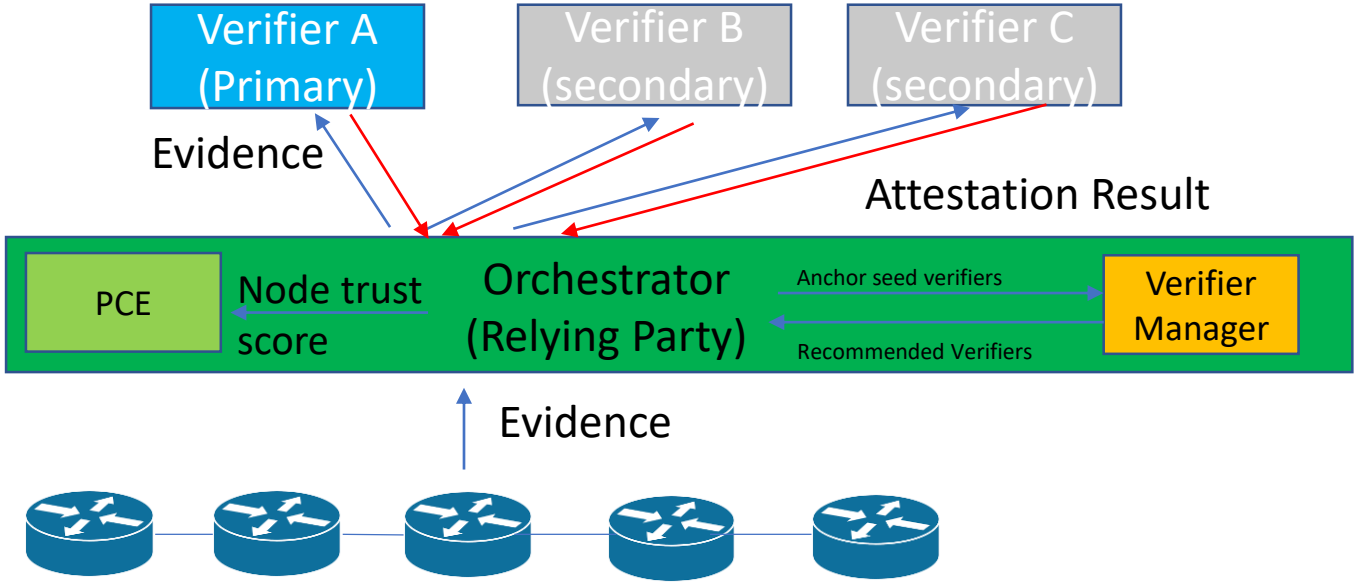


Fig. 6 Node attestation for trusted routing with multiple Verifiers

Questions?

- Feedback and reviews are welcome to help to improve the draft
- We will present it in RATS session (Tuesday, 15:00 - 16:00, Liffey A)

Email: junzhang1@huawei.com

Github: https://github.com/ietf-rats/draft-zhang-rats-multiverifiers/

Thank you

Use case 2: Attestation in Data Centers

In Data Center (Fig. 7), units (CPU, DPU,GPU) appraise each other to guarantee the trustworthiness of the workload inside the units. Each unit (as attester) can be appraised by many Verifiers (Fig. 8). This results in large amount of request of evidence from the Attester.

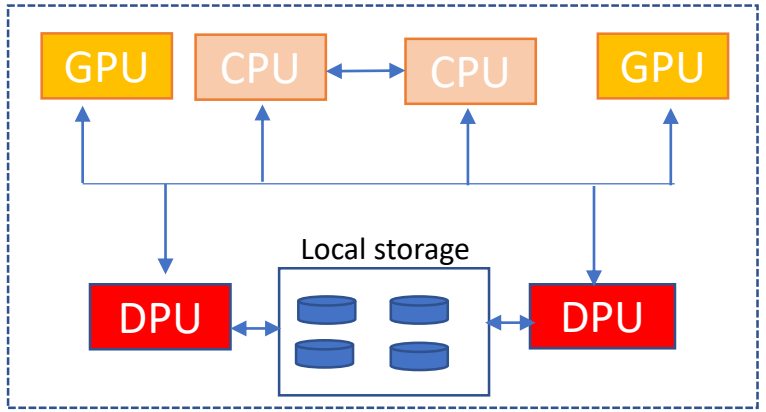


Fig. 7 Interaction between units in Dater Center

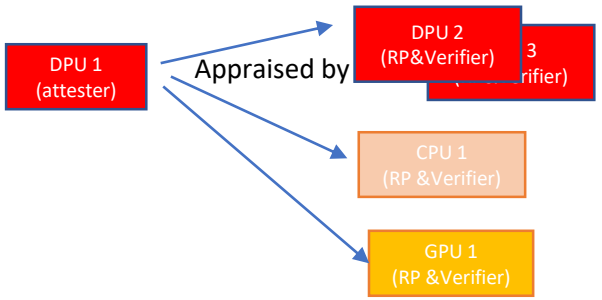


Fig. 8 Attestation between units in Dater Center

Two challenges to address

- **Handle the case when some Verifiers do not work** (not available, compromised)
- **Reduce the number of evidence to generate**

Following our proposal to handle multiple verifiers (Fig. 9).,

- Resilience to the dysfunction of certain verifiers
- One evidence is sufficient for verification requirement from *n* units

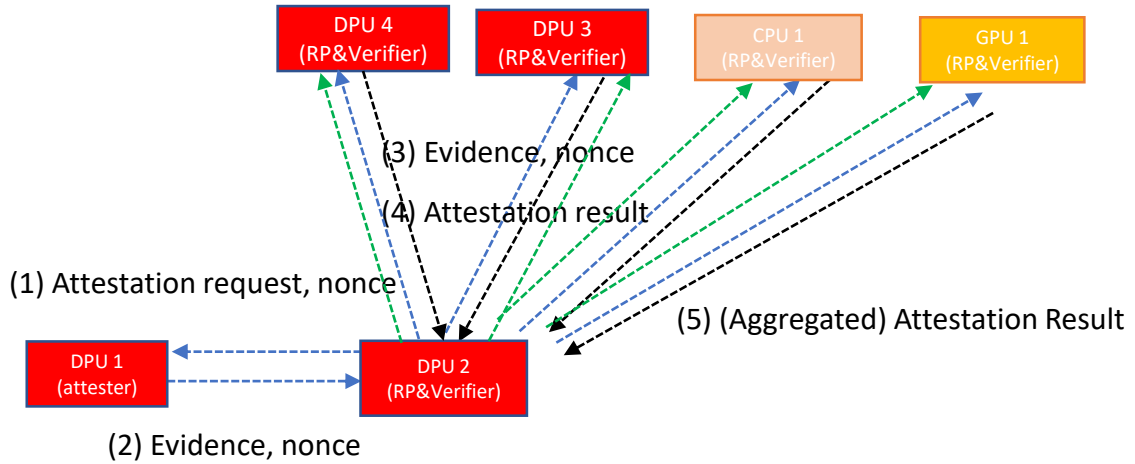


Fig. 9 Handling multiple Verifiers for the attestation in Data Center