

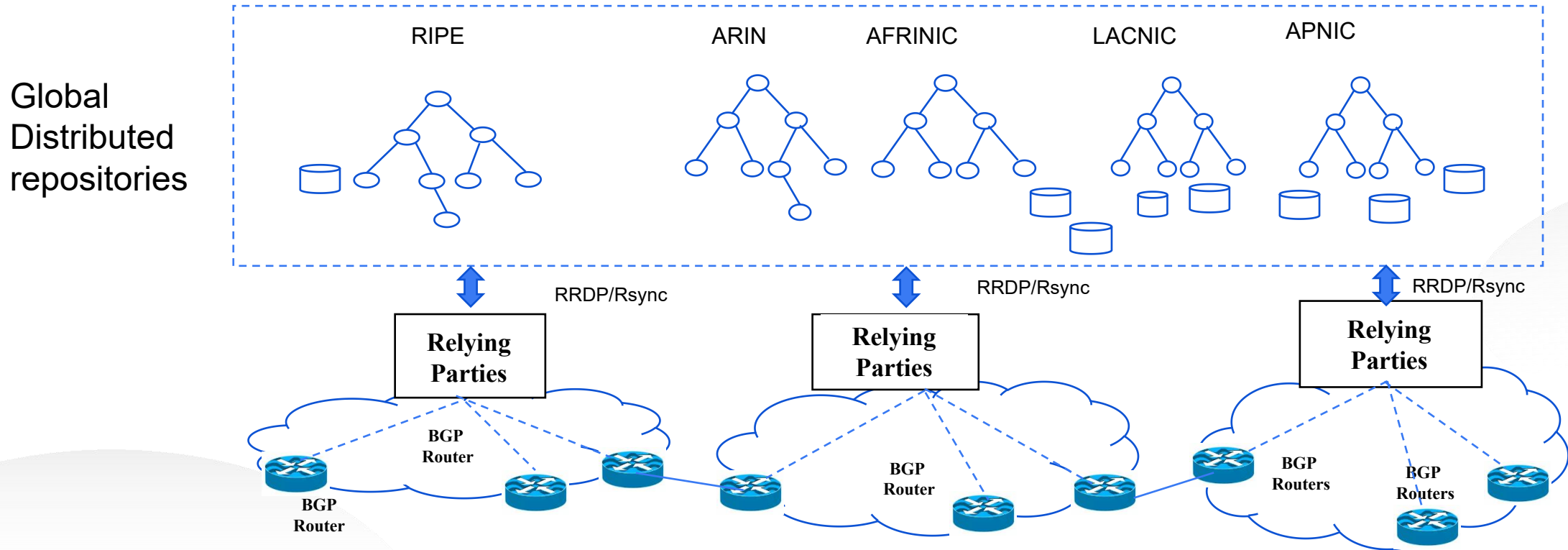
Operational Monitoring of RPKI Repositories' Health and Safety

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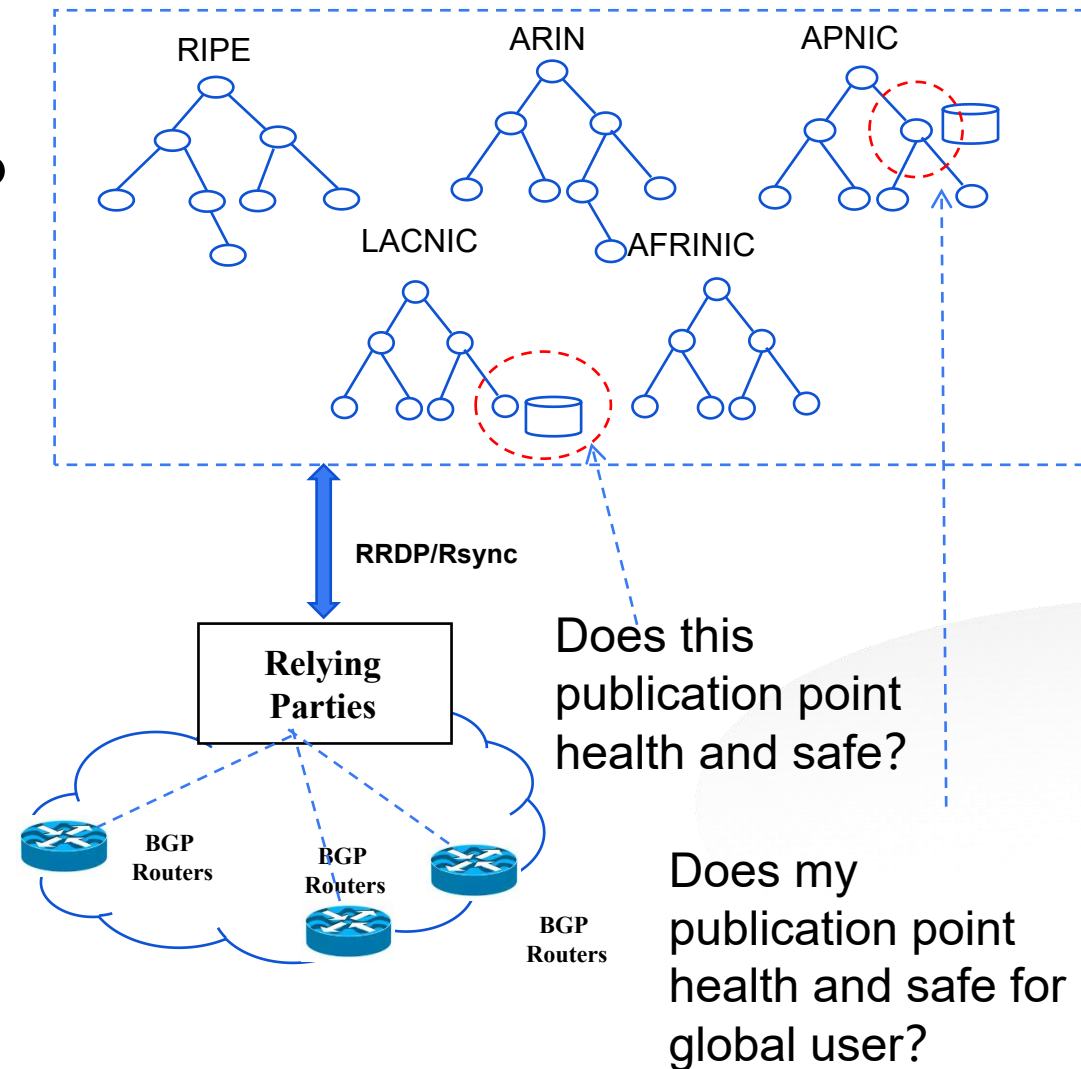
1 Introduction

The Resource Public Key Infrastructure (RPKI) relies on a globally distributed set of repositories to deliver signed routing authorization data to Relying Parties (RPs).



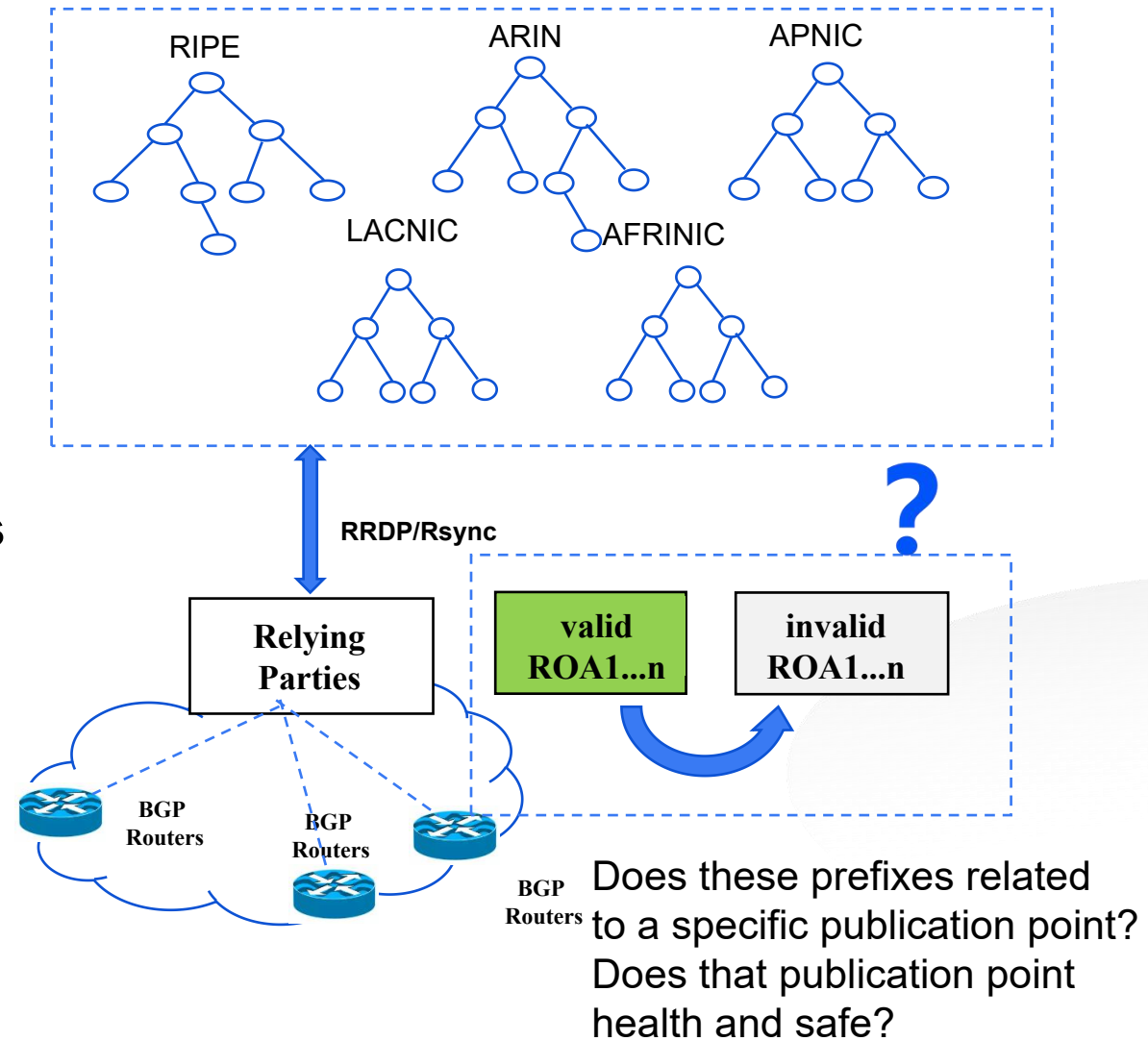
2 Problem

Internet Service Providers (ISPs) depend on RPs to collect RPKI objects from distributed repositories and validate them cryptographically, resulting in hundreds of thousands of Validated Route origin authorization Payloads (VRPs). Nevertheless, even with multiple RPs deployed, ISPs have limited insight into the operational health and reliability of each Publication Point (PP).



2 Problem

When there are excessive objects churn from valid to unknown or invalid, operators often lack sufficient information to diagnose the cause, which may stem from an outage or instability in a specific PP. Consequently, ISPs cannot easily determine whether these changes are caused by routine updates, malicious behavior, or underlying network instability.



2 Problem

For an ISP, it want to know:

Does my PP in the world reachable, available, and valid?

Does my PP behaving normally over time, or does something suddenly change?

Does the users around the world could recieve ROAs timely and right?

2 Problem

This draft provides guidance for monitoring the health and safety of RPKI repositories on a per-publication point basis.

It identifies three kinds of indicators.

It describes how these indicators can be used to detect degraded or unsafe publication point behavior.

3 Metric Model

Metrics are divided into three classes:

Base Counters:

Primitive observable events. Used for diagnostics and as inputs to derived metrics.

Health Indicators:

Ratios or computed values representing instantaneous repository correctness and usability. These indicators SHOULD be used for alerting.

State-Change (Churn) Indicators:

These indicators detect abnormal or unexpected publication behavior over time.

4 Base Counters

For Base Counters monitoring Transport Counters, Synchronization Counters, Object Retrieval Counters, and Validation Counters.

For Transport Counters: how many connections attempts initiated, and how many successful connections.

For Synchronization Counters: how many synchronization attempts, and how many successful synchronizations.

For Object Retrieval Counters: how many objects such as ROA, Certificates, manifest, CRL etc. downloaded succesful and how many downloaded failed.

For Validation Counters: how many objects are valid, how many not vailid.

5 Derived Health Indicators

The Derived Health Indicators including Reachability Indicators, Availability Indicators, Content Integrity Indicators. It uses the basic counts in section 4 to get the corresponding ratio.

- Reachability Indicators, it measures probability that the PP endpoint can be contacted.
Transport Reachability Ratio (TRR) = $\text{successful_connections} / \text{attempted_connections}$
- Availability Indicators, it including the Fetch success ratio, Synchronization Success Ratio, Update Freshness ratio.
- Content Integrity Indicators, it including Validation Success Ratio (VSR), Object Consistency Ratio (OCR), etc.

6 State-Change and Churn Indicators

A repository may remain reachable and consistent while exhibiting abnormal or unsafe publication behavior. Examples include: sudden bulk withdrawal of ROAs, excessive object churn, incomplete or partially applied updates. Such events can materially affect routing outcomes even when health indicators remain nominal.

To detect these conditions, monitoring systems SHOULD evaluate state-change indicators, also referred to as churn indicators, which quantify repository safety.

6 State-Change and Churn Indicators

The state-Change and Churn Indicators comprising:

- Object Change Count and ratio, it measures the how many objects are added, removed, or modified, and the corresponding ratio.
- ROA Stability Indicators, it measures the how many ROAs are changed, if there are accidental withdrawal or bulk.
- Certificate and CA Stability Indicators, it measures the number certificates change, big change maybe key rollover, mass reissuance, misconfiguration, or abnormal behavior.
- RRDP Publication Continuity indicators, it measures the serial number of RRDP transfer.

7 Conclusion

This draft provides guidance for monitoring the health and safety of RPKI repositories on a per-PP basis.

It identifies three kinds of metrics: base counter, health indicators, and state-change indicators to detect degraded or unsafe repository behavior.

Through the monitoring approach described above, we believe that ISPs and users can gain greater visibility into RPKI publication points, thereby improving their overall health, reliability, and security.

Q&A
Thanks!

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