Network Working Group
Internet-Draft
Intended status: Informational
Expires: November 1, 2019

R. Bush
Internet Initiative Japan

April 30, 2019

Use Cases for Localized Versions of the RPKI
draft-ietf-sidrops-lta-use-cases-06

Abstract

There are a number of critical circumstances where a localized routing domain needs to augment or modify its view of the Global RPKI. This document attempts to outline a few of them.

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1. Introduction

Today RPKI-based Origin Validation, [RFC6811], relies on widespread deployment of the Global Resource Public Key Infrastructure (RPKI), [RFC6480]. In the future, RPKI-based Path Validation, [RFC8205], will be even more reliant on the Global RPKI.

But there are critical circumstances in which a local, clearly-scoped, administrative and/or routing domain will want to augment and/or modify their internal view of the Global RPKI.

This document attempts to lay out a few of those use cases. It is not intended to be authoritative, complete, or to become a standard. It is informative laying out a few critical examples to help frame the issues.

2. Suggested Reading

It is assumed that the reader understands the RPKI, see [RFC6480], the RPKI Repository Structure, see [RFC6481], Route Origin Authorizations (ROAs), see [RFC6482], and GhostBusters Records, see [RFC6493].

3. What is 'Local'

The RPKI is a distributed database containing certificates, CRLs, manifests, ROAs, and GhostBusters Records as described in [RFC6481]. Policies and considerations for RPKI object generation and maintenance are discussed elsewhere.

Like the DNS, the Global RPKI tries to present a single global view, although only a loosely consistent view, depending on timing,

updating, fetching, etc. There is no 'fix' for this, it is not broken, it is the nature of distributed data with distributed caches.

There are critical uses of the RPKI where a local administrative and/or routing domain, e.g. an end-user site, a particular ISP or content provider, an organization, a geo-political region, ... may wish to have a specialized view of the RPKI.

For the purposes of this exploration, we refer to this localized view as a 'Local Trust Anchor', mostly for historical reasons, but also because implementation would likely require the local distribution of one or more specialized trust anchors, [RFC6481].

4. Example Uses

We explore this space using three examples.

Carol, a resource holder (Local Internet Registry (LIR), Provider Independent address space (PI) holder, ...), operates outside of the country in which her Regional Internet Registry (RIR) is based. Someone convinces the RIR's local court to force the RIR to remove or modify some or all of Carol's certificates, ROAs, etc. or the resources they represent, and the operational community wants to retain the ability to route to Carol's network(s). There is need for some channel through which operators can permit Carol to be believed and exchange local trust, command, and data collections necessary to propagate patches local to all their RPKI views.

Bob has a multi-AS network under his administration and some of those ASs use private ([RFC1918]) or 'borrowed' address space which is not announced on the global Internet (not to condone borrowing), and he wishes to certify them for use in his internal routing.

Alice is responsible for the trusted routing for a large organization, commercial or geo-political, in which management requests routing engineering to redirect their competitors' prefixes to socially acceptable data. Alice is responsible for making the Certificate Authority (CA) hierarchy have validated certificates for those redirected resources as well as the rest of the Internet.

5. Some Approaches

In these examples, it is ultimately the ROAs, not the certificates, which one wants to modify or replace. But one probably can not simply create new ROAs as one does not have the private keys needed to sign them. Hence it is likely that one has to also do something about the [RFC6480] certificates.

The goal is to modify, create, and/or replace ROAs and GhostBuster Records which are needed to present the localized view of the RPKI data.

One wants to reproduce only as much of the Global RPKI as needed. Replicating more than is needed would amplify tracking and maintenance.

One can not reissue down from the root trust anchor at the IANA or from the RIRs' certificates because one does not have the private keys required. So one has to create a new trust anchor which, for ease of use, will contain the new/modified certificates and ROAs as well as the unmodified remainder of the Global RPKI.

Because Alice, Bob, and Carol want to be able to archive, reproduce, and send to other operators the data necessary to reproduce their modified view of the global RPKI, there will need to be a formally defined set of data which is input to a well-defined process to take an existing Global RPKI tree and produce the desired modified re-anchored tree.

It is possible that an operator may need to accept and process modification data from more than one source. Hence there is a need to merge modification 'recipes'.

Simplified Local Internet Number Resource Management with the RPKI (SLURM), [RFC8416], addresses many, but not all, of these issues and approaches. This document was originally a gating requirements document for SLURM and other approaches.

6. Security Considerations

Though the above use cases are all constrained to local contexts, they violate the model of a single Global RPKI, albeit to meet real operational needs. Hence the result must be able to be validated as if the changed data were part of the validatable Global RPKI while including the local context, perhaps with the addition of trust anchors or authenticatable patching of trust.

Modification 'recipes' may lack authentication. E.g., if modifications to the tree are passed around a la SLURM files, see [RFC8416], what was object security becomes, at best, transport security, or authentication by other trust domains such as PGP.

7. IANA Considerations

This document has no IANA Considerations.

8. Acknowledgments

The author thanks Chris Morrow, Karen Seo, Rob Austein, and Steve Kent for comments and suggestions.

9. References

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Author's Address

Randy Bush
Internet Initiative Japan
5147 Crystal Springs
Bainbridge Island, Washington 98110
US

Email: randy@psg.com