

**Resource Public Key Infrastructure (RPKI) object profile for Signed
Checklist (RSC)
draft-ietf-sidrops-rpki-rsc-01**

Abstract

This document defines a Cryptographic Message Syntax (CMS) profile for a general purpose listing of checksums (a 'checklist'), for use with the Resource Public Key Infrastructure (RPKI). The objective is to allow an attestation, in the form of a listing of one or more checksums of arbitrary digital objects (files), to be signed "with resources", and for validation to provide a means to confirm a specific Internet Resource Holder produced the Signed Checklist. The profile is intended to provide for the signing of an arbitrary checksum listing with a specific set of Internet Number Resources.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#) [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

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1. Introduction

This document defines a Cryptographic Message Syntax (CMS) [[RFC5652](#)] profile for a general purpose listing of checksums (a 'checklist'), for use with the Resource Public Key Infrastructure (RPKI) [[RFC6480](#)].

The objective is to allow an attestation, in the form of a listing of one or more checksums of arbitrary files, to be signed "with resources", and for validation to provide a means to confirm a given Internet Resource Holder produced the RPKI Signed Checklist (RSC). The profile is intended to provide for the signing of a checksum listing with a specific set of Internet Number Resources.

Signed Checklists are expected to facilitate inter-domain business use-cases which depend on an ability to verify resource holdership. RPKI-based validation processes are expected to become the industry norm for automated Bring Your Own IP (BYOIP) on-boarding or establishment of physical interconnection between Autonomous Systems.

The RSC concept borrows heavily from RTA [[I-D.ietf-sidrps-rpki-rta](#)], Manifests [[RFC6486](#)], and OpenBSD's [[signify](#)] utility. The main difference between RSC and RTA is that the RTA profile allows multiple signers to attest a single digital object through a checksum of its content, while the RSC profile allows a single signer to attest the existence of multiple digital objects. A single signer profile is considered a simplification for both implementers and operators.

2. RSC Profile and Distribution

RSC follows the Signed Object Template for the RPKI [[RFC6488](#)] with one exception. Because RSCs MUST NOT be distributed through the global RPKI repository system, the Subject Information Access (SIA) extension is omitted from the RSC's X.509 EE certificate.

What constitutes suitable transport for RSC files is deliberately unspecified. It might be a USB stick, a web interface secured with conventional HTTPS, PGP-signed email, a T-shirt printed with a QR code, or a carrier pigeon.

3. The RSC ContentType

The ContentType for an RSC is defined as `rpkiSignedChecklist`, and has the numerical value of `1.2.840.113549.1.9.16.1.TBD`.

This OID MUST appear both within the `eContentType` in the `encapContentInfo` object as well as the `ContentType` signed attribute in the `signerInfo` object (see [[RFC6488](#)]).

4. The RSC eContent

The content of an RSC indicates that a checklist for arbitrary digital objects has been signed "with resources". An RSC is formally defined as:

RpkiSignedChecklist-2021

```
{ iso(1) member-body(2) us(840) rsadsi(113549)
  pkcs(1) pkcs9(9) smime(16) mod(0) TBD }
```

DEFINITIONS EXPLICIT TAGS ::=
BEGIN

IMPORTS

```
CONTENT-TYPE, Digest, DigestAlgorithmIdentifier
FROM CryptographicMessageSyntax-2009 -- in [RFC5911]
{ iso(1) member-body(2) us(840) rsadsi(113549) pkcs(1)
  pkcs-9(9) smime(16) modules(0) id-mod-cms-2004-02(41) }
```

```
ASIdOrRange, IPAddressFamily
FROM IPAddrAndASCertExtn -- in [RFC3779]
{ iso(1) identified-organization(3) dod(6) internet(1)
  security(5) mechanisms(5) pkix(7) mod(0)
  id-mod-ip-addr-and-as-ident(30) } ;
```

```
ct-rpkiSignedChecklist CONTENT-TYPE ::=
{ TYPE RpkiSignedChecklist IDENTIFIED BY
  id-ct-signedChecklist }
```

```
id-ct-signedChecklist OBJECT IDENTIFIER ::=
{ iso(1) member-body(2) us(840) rsadsi(113549) pkcs(1)
  pkcs-9(9) id-smime(16) id-ct(1) TBD }
```

```
RpkiSignedChecklist ::= SEQUENCE {
  version [0] INTEGER DEFAULT 0,
  resources ResourceBlock,
  digestAlgorithm DigestAlgorithmIdentifier,
  checkList SEQUENCE SIZE (1..MAX) OF FilenameAndHash }
```

```
FilenameAndHash ::= SEQUENCE {
  filename IA5String OPTIONAL,
  hash Digest }
```

```
ResourceBlock ::= SEQUENCE {
  asID [0] AsList OPTIONAL,
  ipAddrBlocks [1] IPList OPTIONAL }
-- at least one of asID or ipAddrBlocks MUST be present
( WITH COMPONENTS { ..., asID PRESENT } |
  WITH COMPONENTS { ..., ipAddrBlocks PRESENT } )
```

```
AsList ::= SEQUENCE (SIZE(1..MAX)) OF ASIdOrRange
```

```
IPList ::= SEQUENCE (SIZE(1..MAX)) OF IPAddressFamily
```


END

4.1. version

The version number of the RpkISignedChecklist MUST be 0.

4.2. resources

The resources contained here are the resources used to mark the attestation, and MUST match the set of resources listed by the EE certificate carried in the CMS certificates field.

4.3. digestAlgorithm

The digest algorithm used to create the message digest of the attested digital object. This algorithm MUST be a hashing algorithm defined in [[RFC7935](#)].

4.4. checkList

This field is a sequence of FilenameAndHash objects. There is one FilenameAndHash entry for each arbitrary object referenced on the Signed Checklist. Each FilenameAndHash is an ordered pair of the name of the directory entry containing the digital object and the message digest of the digital object. The filename field is OPTIONAL.

5. Operational Considerations

When creating digital objects of a plain-text nature (such as ASCII, UTF-8, HTML, Javascript, XML, etc) it is RECOMMENDED to convert such objects into a lossless compressed form. Distributing plain-text objects within a compression envelope (such as GZIP [[RFC1952](#)]) might help avoid unexpected canonicalization at intermediate systems (which in turn would lead to checksum verification errors). Validator implementations are expected to treat a checksummed digital object as string of arbitrary single octets.

6. RSC Validation

To validate an RSC the relying party MUST perform all the validation checks specified in [[RFC6488](#)] as well as the following additional RSC-specific validation steps.

- o The message digest of each referenced digital object, using the digest algorithm specified in the the digestAlgorithm field, MUST be calculated and MUST match the value given in the messageDigest

field of the associated FileAndHash, for the RSC entry to be considered valid.

- o If a filename field is present, the field's content MUST contain only characters specified in the Portable Filename Character Set as defined in [[POSIX](#)].

7. Security Considerations

Relying parties are hereby warned that the data in a RPKI Signed Checklist is self-asserted. These data have not been verified by the Certificate Authority (CA) that issued the CA certificate to the entity that issued the EE certificate used to validate the Signed Checklist.

8. Implementation status - RFC EDITOR: REMOVE BEFORE PUBLICATION

This section records the status of known implementations of the protocol defined by this specification at the time of posting of this Internet-Draft, and is based on a proposal described in [RFC 7942](#). The description of implementations in this section is intended to assist the IETF in its decision processes in progressing drafts to RFCs. Please note that the listing of any individual implementation here does not imply endorsement by the IETF. Furthermore, no effort has been spent to verify the information presented here that was supplied by IETF contributors. This is not intended as, and must not be construed to be, a catalog of available implementations or their features. Readers are advised to note that other implementations may exist.

According to [RFC 7942](#), "this will allow reviewers and working groups to assign due consideration to documents that have the benefit of running code, which may serve as evidence of valuable experimentation and feedback that have made the implemented protocols more mature. It is up to the individual working groups to use this information as they see fit".

- o A signer and validator implementation [[rpki-rsc-demo](#)] based on perl and OpenSSL was provided by Tom Harrison from APNIC.
- o A validator implementation based on OpenBSD's rpki-client is expected to be published after IANA Early Allocation of the OIDs.

9. IANA Considerations

9.1. OID

The IANA has registered the OID for the RPKI Signed Checklist in the registry created by [[RFC6488](#)] as follows:

Name	OID	Specification

Checklists	1.2.840.113549.1.9.16.1.TBD	[RFC-TBD]

9.2. File Extension

The IANA has added an item for the Signed Checklist file extension to the "RPKI Repository Name Scheme" created by [[RFC6481](#)] as follows:

Filename Extension	RPKI Object	Reference

.sig	Signed Checklist	[RFC-TBD]

9.3. Media Type

The IANA has registered the media type application/rpki-checklist as follows:

```
Type name: application
Subtype name: rpki-checklist
Required parameters: None
Optional parameters: None
Encoding considerations: binary
Security considerations: Carries an RPKI Signed Checklist
                          [RFC-TBD].
Interoperability considerations: None
Published specification: This document.
Applications that use this media type: RPKI operators.
Additional information:
  Content: This media type is a signed object, as defined
           in [RFC6488], which contains a payload of a list of
           checksums as defined above in this document.
  Magic number(s): None
  File extension(s): .sig
  Macintosh file type code(s):
Person & email address to contact for further information:
  Job Snijders <job@fastly.com>
Intended usage: COMMON
Restrictions on usage: None
Author: Job Snijders <job@fastly.com>
Change controller: Job Snijders <job@fastly.com>
```


10. References

10.1. Normative References

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10.2. Informative References

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Appendix A. Acknowledgements

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Appendix B. Document changelog - RFC EDITOR: REMOVE BEFORE PUBLICATION

B.1. changes from -00 -> -01

- o Readability improvements
- o Update document category to match the registry allocation policy requirement.

B.2. individual submission phase

- o On-the-wire change: the 'Filename' switched from 'required' to 'optional'. Some SIDROPS Working Group participants proposed a checksum itself is the most minimal information required to address digital objects.

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