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A. Santoni
Actalis S.p.A.
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Syntax for binding documents with time stamps

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Abstract

This document describes a syntax which can be used to bind a generic document (or any set of data, not necessarily protected by means of cryptographic techniques) to one or more time-stamp tokens obtained for that document, where "time-stamp token" has the meaning defined in [\[TSP\]](#). Additional types of temporal evidence are also supported.

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Whereas digital time stamping has become the standard technique for proving the existence of a document before a certain point in time, there is not a generally accepted syntax for keeping together one document and the associated time-stamps in a single "bundle". Such a syntax would facilitate keeping track of which time-stamps belong to what documents and would therefore improve the efficiency of timestamp-aware applications.

This document proposes a simple syntax based on [\[CMS\]](#), by defining a new contentType.

Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC-2119](#) [\[KEYWORDS\]](#).

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[1.](#) Introduction

Digital time stamping has become the standard technique for proving the existence of a document before a certain point in time. Several digital signature legislations around the world embrace the concept and provide for time-stamping services as an approved means for attesting the signing time and/or for extending the validity of signed documents beyond the expiry date of the signer's certificate.

However, while digital time stamping enhances digital signature, its

value does not depend on this latter. It can obviously be useful to time-stamp a document even if this is not signed. And it can also be useful, or even mandatory in some cases, to time-stamp a document in its entirety, regardless of how many signatures it contains.

When a time-stamp is related to a digital signature, there already exist a way to keep the two pieces together: [\[TSP\]](#) describes how one or more TimeStampTokens can be included in a SignerInfo structure as unsigned attributes. On the other hand, when time-stamps are not related to a digital signature, there is no standard way to keep together the time-stamped document and the related time-stamps.

In such cases two approaches are typically being adopted:

- o time-stamps are kept as separate files (keeping track of what time-stamps belong to what documents is up to the user);
- o an ad hoc solution is adopted for specific applications, like e.g. a ZIP archive or a proprietary "envelope" of some kind.

Both solutions are obviously inadequate when interoperability is aimed at, like in this memo.

This document proposes a simple syntax for bundling one document (actually, any kind of file) to the corresponding temporal evidence, this latter being typically represented by one or more [RFC 3161](#) TimeStampTokens [\[TSP\]](#). Additional types of temporal evidence, like e.g. an [RFC 4998](#) EvidenceRecord, are also supported via an "open" syntax. However, for the sake of interoperability, the emphasis is given to TimeStampTokens.

The proposed syntax is broadly based on the [\[CMS\]](#) syntax.

2. Syntax for TimeStampedData

The proposed data structure is called TimeStampedData. It is a new variation of ContentInfo [\[CMS\]](#) marked by the following specific contentType OID:

```
id-timestamped-data OBJECT IDENTIFIER ::= { iso(1) member-body(2)
us(840) rsadsi(113549) pkcs(1) pkcs7(7) 7 }
```

This particular OID signals that the content field of the ContentInfo has the following syntax:

```
TimeStampedData ::= SEQUENCE {
  version      INTEGER { v1(1) },
  fileName     UTF8String,
  mimeType     PrintableString,
```

```
  content      OCTET STRING,
  evidence     Evidence
}
```

```
Evidence ::= CHOICE {
  timeStamps   [0] SET (SIZE(1..MAX)) OF TimeStampToken
  -- additional evidence types to be registered with the IETF
}
```

The version field contains the version number of the TimeStampedData syntax. The initial version number is 1.

The fileName field contains the original filename (without path) of the document which was time-stamped and whose content was inserted into the TimeStampedData structure.

The mimeType field contains a MIME type (according to [\[MIME\]](#)) for the bundled file. It is an advisory information which may help decide how to open the file after having "detached" it from the TimeStampedData structure, regardless of the filename extension (which could be missing or unknown).

The content field carries the entire content, in its original format, of the file which was time-stamped. The file need not be a document in the strict sense; it can be any kind of file (e.g. an executable, a database, etc).

The evidence field carries the evidence that the content data existed before a certain point in time. Different types of evidence can be used, in theory, but this document defines and mandates support for one specific type: a non-empty set of [RFC 3161](#) TimeStampToken's [\[TSP\]](#).

Additional types of evidence may be used after having registered them (and having had a distinguishing tag assigned to them) with the IETF. A suitable registration procedure will be defined for that purpose.

3. Compliance requirements

Compliant applications MUST support the [RFC 3161](#)-based type of evidence (i.e. the timeStamps CHOICE).

Compliant applications SHALL always populate the fileName field of TimeStampedData structure with a non-empty string, which is supposed to be the real name of the time-stamped file. Path information MUST NOT be included. A valid example is "patent123.doc". An invalid example is "c:\Documents and settings\John\Desktop\patent123.doc".

Compliant applications SHALL always populate the mimeType field of TimeStampedData structure with a valid MIME content-type string. A valid example is "application/pdf". An invalid example is "whatever".

4. Recommended processing

When generating the TimeStampedData structure, applications are supposed to behave like follows:

- o populate the version field with the integer value v1(1);
- o populate the fileName field with the real name of the file, without path;
- o populate the mimeType field with an appropriate MIME type string, preferably, or at least with "application/octet-stream";
- o populate the content field with the entire contents of the file;
- o add the necessary evidence (e.g. one or more TimeStampTokens);
- o insert the TimeStampedData into a ContentInfo structure, with the id-timestamped-data OID in the contentType field;
- o BER-encode the ContentInfo structure and save it with the same name of the time-stamped file, but with the file extension recommended in [section 5](#).

When parsing an existing TimeStampedData structure, applications are supposed to behave like follows:

- o check that the contentType field of the ContentInfo structure has the expected value (id-timestamped-data) in its contentType field; then, extract the inner TimeStampedData structure and continue processing;
- o check the version field (it should be v1);
- o check the fileName field (it must not be empty) and keep it for later use;
- o check the mimeType field (it must not be empty) and keep it for later use;
- o read the content field and prepare to save it in a separate file and/or show it to the user;

- o check that the evidence field not be empty; extract the inner data and prepare to show them to the user and/or save them to separate files;
- o validate the evidence data (e.g. in case of timeStamps: check that each TimeStampToken does indeed contain the hash of the time-stamped document and it was signed by a trusted TSA);
- o depending on the application, show the evidence data to the user;
- o depending on the application, show the time-stamped document to the user, possibly by activating a suitable external "viewer"; if the fileName extension is not sufficient to figure out the suitable viewer, try using the mimeType field as an additional hint;
- o depending on the application, save the content field into a separate file with the name specified by the fileName field (or let the user specify the desired filename).

5. Recommended file extensions

A file containing a TimeStampedData structure SHOULD bear the .tsd

extension. Example: "patent123.tsd"

6. Security Considerations

There are no security issues.

7. IANA Considerations

This document defines one object identifier under the pkcs7 arc:

```
id-timestamped-data OBJECT IDENTIFIER ::= { iso(1) member-body(2)
us(840) rsadsi(113549) pkcs(1) pkcs7(7) 7 }
```

8. Acknowledgments

This document was prepared using 2-Word-v2.0.template.dot.

9. References

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Author's Addresses

Adriano Santoni
Actalis S.p.A.
Via Taramelli 26
I-20124 Milano

Phone: +39-02-68825.1
Email: adriano.santoni@actalis.it

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